Commission for
Communications Regulation

Submissions to Consultation

Digital Dividend in Ireland

A new approach to spectrum use in the UHF Band

Submissions received from respondents

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Submissions

1 Broadcasting Authority of Ireland (formerly the Broadcasting Commission of Ireland)

2 BT Ireland Limited

3 Centre Telecommunications Value-Chain Research (CVTR)

4 Eircom Limited

5 Ericsson (LM Ericsson)

6 GSM Association

7 Ireland Offline Organisation

8 Meteor Mobile Communications Limited (Meteor)

9 Nokia and Nokia Siemens Network

10 O2 Ireland (Telefonica O2 Europe Plc)

11 Qualcomm Europe Incorporated

12 Radio Telifis Éireann (RTÉ) and RTÉ Network Limited

13 UPC Ireland Limited

14 Vodafone Plc

1 Broadcasting Authority of Ireland (formerly the Broadcasting Commission of Ireland)

BCI Response to ComReg Consultation (09/15) on the Digital Dividend

Q. 1. What would you consider to be the levels of value and benefits, including any social value which may be produced for Irish consumers / citizens and Ireland's digital economy arising from non-broadcasting uses of the digital dividend?

Digital dividend may provide opportunities to provide enhanced coverage and increase competition in the provision of broadband services. At a European level some discussion is also taking place in relation to its use for communications to the public and between various agencies during disaster or national emergencies (PPDR – Public Protection and Disaster Relief).

Q. 2. How in your view could various industry sectors, for example transport, healthcare, education or other public sector industries, benefit from utilising digital dividend spectrum? Please include details of the potential spectrum requirements of the industry in your answer.

In addition to Broadband, and PPDR raised in our response to Q1, the potential extension of DVB-H to frequencies above Ch 55 is also a possibility for consideration. Multimedia applications via telecommunications networks could also be considered.

Q. 3. Please outline your views regarding (i) the types of applications and services which you consider the digital dividend should be used for; (ii) possible spectrum requirements of those applications; (iii) timeframes for making available rights of use for digital dividend spectrum; and (iv) the potential levels of competition which may result in existing or new products and services markets.

Our replies to Q1 and 2 are relevant and are based on the digital dividend being deployed in the 800 MHz band. The BCI also considers that ASO may open opportunities for further DTT multiplexes in the band below 800MHz. Such additional multiplexes are required to ensure that DTT can migrate to newer technology standards (DVB-T2), can increase the number of High Definition channels, and ultimately ensure a successful and viable operator that provides competition in the provision of multi-channel television services.

Q. 4. Would you consider there to be other key issues which should be considered in terms of gaining a deeper understanding of the spectrum requirements of new applications and services? If so, what are they and please elaborate.

A need exists for a harmonised digital dividend band throughout Europe. This will ensure that the necessary R&D will be put in place to produce products and services. A coherent European approach in relation to how the digital dividend band (790 to 860 MHz) gets subdivided and the technologies that may be deployed should be considered. It may be prudent to retain part of the digital dividend spectrum or to release it in stages to allow for the introduction of new services / technologies and to allow for the migration of technologies to alternative frequencies within the digital dividend band if new products or services are identified at a pan European level.

Q. 5. What are your views regarding the level of demand for Ireland to reserve UHF spectrum for innovation and experimentation? Please support your views with consideration to the availability of UHF spectrum.

Retention of a small part of the digital dividend band for innovation and experimentation may be worthwhile. However such innovation and experimentation could also be accommodated in other parts of the UHF band if a "mixed approach" is favoured. Both are worthy of consideration.

Q. 6. In light of your views on non-broadcasting services, do you consider that a mixed approach to spectrum allocation in the UHF spectrum band should be adopted? Please provide reasons for your view.

Yes, a mixed approach should be favoured as it will maximize spectrum efficiency and economic return. However it needs to be signalled early so that improvement may be considered or implemented in the interference rejection characteristics of DVB-T receivers. Protocols would also need to be established between operators and ComReg in relation to interference complaints and remedies. A mixed approach would also support experimentation and innovation through ComReg's test and trial scheme.

Q. 7. Do you agree with ComReg's assessment regarding the initial mix between broadcasting and non-broadcasting services? Please answer in terms of your views regarding the initial mix between broadcasting and non-broadcasting services and any other considerations that you consider relevant.

The BCI is of the view that further DTT multiplexes may be required. These could be accommodated in the band below 800MHz. Such additional multiplexes are required to ensure that DTT can migrate to newer technology standards (DVB-T2), can increase the number of High Definition (HD) and Standard Definition channels, and ultimately ensure a successful and viable operator that provides competition in the provision of multi-channel television services. The BCI notes that a mechanism for consultation in regard additional DTT capacity requirements, above the mandatory 6 multiplexes, is included in the 2007 Act. The BCI requests further discussions with ComReg on this matter to ensure that a successful Commercial DTT network can be established and continue to develop. We believe that in the absence of such a viable commercial DTT offering, the take up and conversion to DTT will be slower resulting in a delay to ASO and impact on the timeline for release of the digital dividend channels in the 800MHz part of the band.

Analogue television currently occupies frequencies within the proposed digital dividend "800 MHz" band. DTT will also commence operation using channels in this part of the band as it is necessary to do so during the transition period. Significant frequency planning and co-ordination is required to identify new channels for the DTT services in order to free up the digital dividend channels. At least 15 and possibly up to 20 DTT multiplexes will need to change frequency to accommodate the digital dividend after analogue switch off. This will be costly to a new market entrant and some mechanism for cost recovery should be considered.

Q. 8. Do you consider that, if the spectrum demand for the provision of DTT services does not meet the level envisaged by the 2007 Act, a review of the initial mix should be carried out following analogue switch-off of television services in the UHF spectrum band? If so, please provide reasons for your view and also indicate which stakeholder(s) should participate in such a review. If not, please provide reasons for your view.

Yes a review should be considered as it may open the possibility of parts of the UHF band being used for additional services. However, a long term view needs to be considered given the policy dimension and in the interest or ensuring that a terrestrial television distribution system is located and available within the island of Ireland. Traditionally broadcast networks have taken a longer time to establish. Rights issues limit access to a satellite distribution network on a FTA basis so a terrestrial transmission network is required to ensure that indigenous content and television channels can develop over time. DCENR sets policy and oversees legislative developments and are therefore the major driver of any such change. Stakeholders would include ComReg, BCI, DTT, Digital Dividend, telecommunication, the general public and other spectrum users.

Q. 9. Do you consider that the 800 MHz sub-band should be reserved for services other than broadcasting? Please provide reasons for your view

There is merit in reserving the 800 MHz band for non broadcasting services. However this decision also needs to be balanced by the legislative requirement to provide **six, or more,** DTT layers. The frequencies used for DTT should ensure a similar level of reception from all multiplexes operating from the same site. Given that receive antennas perform better across a specific range of channels, ideally the DTT channels at each site should be within a finite range. To achieve this, it may be a requirement to use one channel in the proposed digital dividend sub-band if a suitable alternative cannot be identified or coordinated.

Q. 10. How do you consider that the current uses of channel 69 in Ireland, for example Programming Making and Special Events (PMSE) uses, would be impacted by reserving the 800 MHz band for non broadcasting services? Please provide your view on how PMSE uses could be accommodated if such uses were to be displaced from channel 69.

SAB and SAP service could be accommodated using a mixed approach in interleaved spectrum. However Ch 69 is extensively used in theatres, halls, churches and other venues for radio microphones and in homes for wireless headphones etc. It may take longer to migrate users from this channel and this may need to be factored into the timing of the licensing and use of Ch69 as part of the digital dividend.

Q. 11. Do you consider there to be merits in the identification of additional sub-band(s)? If so, please provide details in terms of timing and any other details which you consider relevant and reasons for your view. If not, please provide details and reasons for your view

It may be premature to identify particular sub-bands as a harmonised approach has obvious advantages. It may be better to consider some possible scenarios and to take these into account in the current re-planning of the UHF band to accommodate DTT and the 800 MHz digital dividend band. This could include frequency planning being based on eight or more DTT layers per transmission site. One or more of these layers could be located within the 31 to 38 sub-band to allow for future flexibility in the event that the UK or other European countries implement other services in this section of the band.

Q. 12. What type of channel configurations would you consider would deliver most economies of scale in terms of availability of equipment and tuning / roaming of equipment? Please explain in terms of an indicative channel plan of frequencies, see for example Figure 2.0, and if you propose a channel configuration please give details of how this might impact broadcasting use of the band?

A key concern is potential interference to DTT and reception of other wide area services due to the presence of transmission networks operating in the UHF band in urban areas. Such networks can punch holes in the coverage areas of DTT and other network providers in the area close to the transmitter located in an urban environment. Methods to minimise the impact of such networks by careful frequency selection that result in frequencies being located for transmission purposes in an urban area being located as far as possible away from DTT and other wider area receive frequencies that also need to be received in the same area.

Q. 13. Do you consider there to be merits in accelerating access to a digital dividend sub-band in Ireland? If so, what considerations do you believe would need to be taken into account and how would they impact accelerating access to the digital dividend, for example (i) possible opportunity costs of delayed access; (ii) time-table for analogue television switch-off; (iii) geographic location of potential cleared spectrum bands; (iv) risk of fragmentation of digital dividend; and (v) any other risk/benefits which would need to be considered.

While analogue television and DTT continue to use spectrum in the proposed digital dividend 800 MHz part of the band, it is difficult to see opportunities for accelerating access to the 800 MHz area. One suggestion that could be of merit is one whereby costs associated with DTT multiplexes migrating from the 800 MHz band could be borne by the new Digital Dividend entrants or by ComReg and reclaimed through the licensing regime. Ultimately an accelerated take up of DTT could shorten the transition period. This can best be achieved by ensuring that a successful and commercial DTT network is established that can develop and compete with other television multichannel suppliers. Some form of set top box promotion, subsidy or DTT integration into other devices could accelerate this process.

A phased release of digital dividend channels and an indicative licensing date of 2012 would be useful as it ensures sufficient time for R&D resulting in suitable products being developed and brought to market.

Q. 14. What would you consider to be an optimal time for holding awards for digital dividend spectrum? Please refer to the considerations outlined in question 13 above

When some surety is present in relation to technologies that can be adopted at a pan European level in this non-mandatory harmonized band. 2012 is a potential date for consideration.

Q. 15. Please qualify your answers to questions 13 and 14 in terms of what benefits might accrue to Irish consumers and citizens and Ireland's digital economy if access to a sub-band could be made available as soon as possible?

Q. 16. Please also provide views on the opportunity cost of delayed access to cleared spectrum and the possibility of negotiating early access directly with broadcasting spectrum users?

There is merit in considering some level of financial support to cover the costs associated with migrating DTT multiplexes from the 800 MHz band. Ultimately an accelerated take up of DTT could shorten the transition period. This can best be achieved by ensuring that a successful and commercial DTT network is established that can develop and compete with other television multichannel suppliers. Some form of set top box promotion, subsidy or DTT integration into other devices could also accelerate this process.

Q. 17. Do you consider that service and technology neutrality should generally be a key principle for spectrum rights of use arising from the digital dividend? Please provide reasons for your view.

Service and technology neutrality has benefits but may prevent some operators from accessing available or unused spectrum. Some spectrum should either be retained or released on a phased basis to ensure that spectrum is available for PPDR or other services of a benefit to Irish citizens.

Q. 18. Do you consider that spectrum rights of use arising from the digital dividend should exclude the ability to provide DTT services? Please provide reasons for your view.

Yes. Consistency is important in terms of regulation. DTT services should be based on the legislative provisions of the 2007 Act and regulated in an identical manner.

2 BT Ireland Limited

Digital Dividend in Ireland

ComReg 09/15

BT welcomes this opportunity to comment on this important subject and is providing the following comments. For clarity BT has provided the questions and very direct responses.

Detailed Response

Q. 1. What would you consider to be the levels of value and benefits, including any social value which may be produced for Irish consumers / citizens and Ireland's digital economy arising from **non-broadcasting** uses of the digital dividend?

Response
- Increased allocation of spectrum for wireless BB in rural areas would help reduce the digital divide and assist the information economy in Ireland.
- However, advantages must be brought to fruition in a way to ensure greater competition. Spectrum awards should be designed in way to strengthen additional competition to accelerate benefits being realised.

Q. 2. How in your view could various industry sectors, for example transport, healthcare, education or other **public sector industries**, benefit from utilising digital dividend spectrum? Please include details of the potential spectrum requirements of the industry in your answer.

Response
Activities to improve the Information Economy are key to both the private and public sectors in Ireland. If this can be done in a way to stimulate private investment in the near future such solutions should be considered.

Q. 3. Please outline your views regarding (i) the types of **applications and services** which you consider the digital dividend should be used for; (ii) possible **spectrum requirements** of those applications; (iii) **timeframes** for making available rights of use for digital dividend spectrum; and (iv) the potential levels of **competition** which may result in existing or new products and services markets.

Response
- Applications will follow once bandwidth is available hence bandwidth and IP connectivity is key.
- Generalised spectrum requirements: minimum of 30MHz per operator up to say 60MHz / WiMAX Forum indications
- Timeframes: ASAP
- Competition: new players into Market

Q. 4. Would you consider there to be **other key issues** which should be considered in terms of gaining a deeper understanding of the spectrum requirements of new applications and services? If so, what are they and please elaborate.

Q. 5. What are your views regarding the level of **demand for** Ireland to reserve **UHF spectrum for innovation and experimentation**? Please support your views with consideration to the availability of UHF spectrum.

Response
- We take no position in this matter?
- Force winners to accommodate experimenters if use isn't disrupted?
- Spectrum shouldn't be specifically reserved but T&D license should be granted if they do not interfere with commercial services.

Q. 6. In light of your views on non-broadcasting services, do you consider that a **mixed approach to spectrum allocation** in the UHF spectrum band should be adopted? Please provide reasons for your view.

Response
- BT Agrees.

Q. 7. Do you agree with ComReg's assessment regarding the initial **mix between broadcasting and non-broadcasting services**? Please answer in terms of your views regarding the initial mix between broadcasting and non-broadcasting services and any other considerations that you consider relevant.

Response
- Initially agree - If not using what they've got the mix isn't right.
- Allocation of 6 x multiplexes to RTE
- Only 1 x multiplex to commercial
- 2nd multiplex for RTE for HDTV
- 4 muxes rather than six

Q. 8. Do you consider that, if the spectrum demand for the provision of DTT services does not meet the level envisaged by the 2007 Act**, a review of the initial mix should be carried out** following analogue switch-off of television services in the UHF spectrum band? If so, please provide reasons for your view and also indicate which stakeholder(s) should participate in such a review. If not, please provide reasons for your view.

Response
- See above

Q. 9. Do you consider that the 800 MHz sub-band should be reserved for **services other than broadcasting**? Please provide reasons for your view.

Response
- BT's view is maintain technology neutrality and a market driven approach.

Q. 10. How do you consider that the current uses of **channel 69** in Ireland, for example Programming Making and Special Events (PMSE) uses, would be impacted by reserving the 800 MHz band for non broadcasting services? Please provide your view on how PMSE uses could be accommodated if such uses were to be displaced from channel 69.

Response:

- UK proposed move to Ch38…Could use White Space between terrestrial TV muxes…Ch69 should be cleared to harmonise with EU. If not feasible alternative channels considered

Q. 11. Do you consider there to be merits in the identification of **additional subband**(s)? If so, please provide details in terms of timing and any other details which you consider relevant and reasons for your view. If not, please provide details and reasons for your view.

Response
- Yes - Lower band in UK. See Q8.

Q. 12. What type of **channel configurations** would you consider would deliver most economies of scale in terms of availability of equipment and tuning / roaming of equipment? Please explain in terms of an indicative channel plan of frequencies, see for example Figure 2.0, and if you propose a channel configuration please give details of how this might impact broadcasting use of the band?

Response
- We believe contiguous blocks to be freed-up wherever possible…5 & 10MHz raster for mobile…

Q. 13. Do you consider there to be merits in accelerating access to a digital dividend sub-band in Ireland? If so, what considerations do you believe would need to be taken into account and how would they impact **accelerating access to the digital dividend**, for example (i) possible opportunity costs of delayed access; (ii) time-table for analogue television switch-off; (iii) geographic location of potential cleared spectrum bands; (iv) risk of fragmentation of digital dividend; and (v) any other risk/benefits which would need to be considered

Response
- BT believes that the earliest possible award of available spectrum is in the interests of delivering innovative customer propositions and business models into the market place.

Q. 14. What would you consider to be an **optimal time for holding awards** for digital dividend spectrum? Please refer to the considerations outlined in question 13 above.

Response
- The optimal time is to align with nearby countries where possible.

Q. 15. Please **qualify your answers** to questions 13 and 14 in terms of what benefits might accrue to Irish consumers and citizens and Ireland's digital economy if access to a sub-band could be made available as soon as possible.
Response ideas:
- Helps deliver pan-European solutions. Including NI and RoI.

Q. 16. Please also provide views on the **opportunity cost of delayed access** to cleared spectrum and the possibility of negotiating early access directly with broadcasting spectrum users.

Response:
- Delay prevents competition.

Q. 17. Do you consider that **service and technology neutrality** should generally be a key principle for spectrum rights of use arising from the digital dividend? Please provide reasons for your view.

Response:
Yes it is important to maintain service and technology neutrality as the market should decide the use and not the regulator. This aligns with the general principles of regulation to allow the market to work.

Q. 18. Do you consider that spectrum rights of use arising from the digital dividend should **exclude the ability to provide DTT services**? Please provide reasons for your view.

Response:
- No – as the same principles of Q17 should apply.

3 Centre Telecommunications Value-Chain Research (CVTR)

Digital Dividend in Ireland

Consultation Response Reference: Submission re ComReg 09/15

1. What would you consider to be the levels of value and benefits, including any social value which may be produced for Irish consumers / citizens and Ireland's digital economy arising from non-broadcasting uses of the digital dividend?

We believe that there exists huge potential for value and benefits to be produced for Irish consumers/citizens through non-broadcasting use of the digital dividend. In particular, these benefits can be realized through the use of digital dividend spectrum to provide broadband internet access, both fixed wireless and mobile.

Digital dividend frequencies exist at a natural "sweet spot" in the electromagnetic spectrum, providing improved coverage and building penetration for a given transmit power than higher frequencies in the 2.4 or 3.5GHz bands for example. At the same time, sufficient bandwidth is available at these frequencies to provide the throughput required for broadband internet access. These properties make digital dividend frequencies perfectly suited to the provision of wireless broadband internet access.

The benefits of broadband internet access to consumers and citizens are well recognized, particularly in the context of the knowledge economy to which this country aspires. Internet connectivity provides access to a vast knowledge base on all subjects and forms a platform for new companies and business models. Indeed, much of the entrepreneurship currently being shown around the country is internet based, especially in the area of small and medium-sized enterprises.

The ongoing convergence of technologies means that a wide range of services can now be provided over a general broadband internet link. These services include telephony (e.g. Skype, Google Talk, Blueface), video on demand (e.g. RTE player, BBC iplayer, youtube), social networks (e.g. Facebook, LinkedIn, Twitter), streaming radio, e-books and so on. The wealth of services available through broadband internet access means that the social benefits are arguably greater than those of broadcasting alone.

Digital dividend spectrum offers a significant opportunity to enable broadband services in rural areas through fixed wireless access. Permitting internet services to be provided using digital dividend spectrum would promote the deployment of fixed wireless access as an effective last mile solution, greatly improving broadband penetration throughout the country.

A further, related area of potential benefit to consumers and citizens is that of experimentation and innovation. As Ireland moves towards a knowledge economy, the digital dividend provides an opportunity to foster innovation in the areas of telecommunications and wireless networks. By making spectrum available for research and development in cutting edge technologies such as cognitive wireless networks, dynamic spectrum access networks, self-configuring and self-healing

networks, the development of valuable intellectual property and formation of innovative new companies can be encouraged.

2. How in your view could various industry sectors, for example transport, healthcare, education or other public sector industries, benefit from utilising digital dividend spectrum? Please include details of the potential spectrum requirements of the industry in your answer.

We believe that all industry sectors could benefit from the use of digital dividend spectrum to provide ubiquitous wireless broadband internet access. While we don't believe it is necessary to separate the benefits on the basis of industry sector, ubiquitous internet access would provide a platform for the development of new systems and services within each sector.

3. Please outline your views regarding (i) the types of applications and services which you consider the digital dividend should be used for; (ii) possible spectrum requirements of those applications; (iii) timeframes for making available rights of use for digital dividend spectrum; and (iv) the potential levels of competition which may result in existing or new products and services markets.

We believe that the use of the digital dividend should be determined primarily by market forces. This can be achieved through a technology and service-neutral approach to regulation. However, we believe that digital dividend spectrum is particularly suited for:

- Broadband internet access (fixed and/or mobile)
- Backhaul for fixed/mobile access points

If employed for broadband internet access, spectrum requirements are dictated by the required throughput. Taking the IEEE 802.16 2004 standard as an example, the aggregate PHY-layer data rate for a 10MHz channel using Time-Division Duplexing (TDD) with a 3:1 downlink to uplink ratio and employing QPSK with a ¾ code rate is 7.56 MB/s in the downlink and 2.016 MB/s in the uplink[1].

Timeframes for service rollout depend primarily upon the availability of equipment. Ideally, rights of use for digital dividend spectrum should be available as soon as equipment for accessing that spectrum becomes available. In the context of experimentation however, the sooner access can be provided to digital dividend spectrum, the better. Equipment for experimentation at these frequencies is currently available and access to spectrum would afford first mover advantage in developing IP and products targeting digital dividend spectrum.

With the introduction of standards-based equipment for wireless internet access using digital dividend spectrum, high levels of competition could be expected in new products and services markets. These products and services could in addition compete with existing solutions for broadband internet access such as DSL, cable and 3G.

[1] *Fundamentals of WiMAX*, Andrews J.G., Ghosh A., Muhamed R.

4. Would you consider there to be other key issues which should be considered in terms of gaining a deeper understanding of the spectrum requirements of new applications and services? If so, what are they and please elaborate.

We believe that targets for national broadband penetration and capacity should be taken into consideration.

5. What are your views regarding the level of demand for Ireland to reserve UHF spectrum for innovation and experimentation? Please support your views with consideration to the availability of UHF spectrum.

We believe the digital switchover and the digital dividend provides a great opportunity to drive research and innovation in telecommunications and wireless networks. Currently, Irish researchers within these areas are exploring such cutting edge technologies as cognitive wireless networks, dynamic spectrum access networks, self-configuring/self-healing/self-optimizing networks and emerging network architectures including mesh networks.

By reserving spectrum within the UHF band, these research activities can be promoted, leading to the development of valuable intellectual property and innovative new services and applications. Furthermore, the availability of spectrum for experimentation could encourage researchers to come to Ireland to join existing research teams or carry out research in collaboration with Irish research centres. This was seen, for example, in 2007 during the IEEE Dynamic Spectrum Access Networks (DySPAN) conference. At this conference, the availability of spectrum for experimentation made it possible for live demonstrations and experiments to be carried out by research groups such as Shared Spectrum Company, Motorola and QinetiQ in collaboration with CTVR.

One option for providing UHF spectrum for innovation and experimentation would be to reserve a single channel in the range 470-862MHz. Short-term access could be permitted to this spectrum playground for researchers carrying out experimentation. Sharing of the available spectrum between interested parties could be achieved on the basis of time or geography.

An alternative option for providing access to UHF spectrum for innovation and experimentation would be to permit access to *interleaved spectrum*. Interleaved spectrum refers to spectrum which is assigned for DTT use but which is unused in a given geographical area due to the frequency reuse pattern employed. Access to this spectrum could be easily controlled due to the small geographical area typically used in wireless experimentation and the relatively static DTT allocations which will exist following the digital television switchover. Currently, systems which are capable of operating within this interleaved spectrum while avoiding the creation of harmful interference for licensed operators are a very active research topic. The availability of interleaved spectrum within Ireland for experimentation would make the country very attractive for research groups and companies wishing to develop systems and services to be deployed using interleaved spectrum.

6. In light of your views on non-broadcasting services, do you consider that a mixed approach to spectrum allocation in the UHF spectrum band should be adopted? Please provide reasons for your view.

We believe very strongly that a mixed approach to spectrum allocation in the UHF spectrum band should be adopted.

UHF spectrum is highly valuable due to its unique mix of propagation and capacity properties. With the switch from analogue to digital television, the bandwidth required for television broadcasting is greatly reduced. Allocation of additional spectrum for broadcasting will provide very limited additional benefits. However, the allocation of spectrum for alternative uses, including the provision of broadband internet has the potential to provide significant benefits for consumers/citizens.

7. Do you agree with ComReg's assessment regarding the initial mix between broadcasting and non-broadcasting services? Please answer in terms of your views regarding the initial mix between broadcasting and non-broadcasting services and any other considerations that you consider relevant.

We believe that reserving such a large portion of UHF spectrum for broadcasting services is unnecessary and that there is no evidence that such additional capacity is required or can be filled.

Broadcast television is currently losing ground to the on-demand entertainment and richer set of interactive services which can be provided through internet access. As this trend continues, the initial mix between broadcasting and non-broadcasting services will need to be re-examined.

8. Do you consider that, if the spectrum demand for the provision of DTT services does not meet the level envisaged by the 2007 Act, a review of the initial mix should be carried out following analogue switch-off of television services in the UHF spectrum band? If so, please provide reasons for your view and also indicate which stakeholder(s) should participate in such a review. If not, please provide reasons for your view.

We strongly believe that there should be provision for ongoing reviews of the broadcasting/non-broadcasting mix.

While the scope for deriving additional benefits from broadcasting is limited, there is significant scope for benefits deriving from non-broadcasting uses of the UHF spectrum.

Stakeholders participating in this review should include broadcasters, mobile-telephony companies, WISP service providers and researchers.

9. Do you consider that the 800 MHz sub-band should be reserved for services other than broadcasting? Please provide reasons for your view.

We strongly believe that the 800MHz sub-band should be reserved. Harmonization of this band within the EU would permit economies of scale to be realized and maximum benefit to be derived from the use of this spectrum.

10. How do you consider that the current uses of channel 69 in Ireland, for example Programming Making and Special Events (PMSE) uses, would be impacted by reserving the 800 MHz band for non broadcasting services? Please provide your view on how PMSE uses could be accommodated if such uses were to be displaced from channel 69.

We believe that current uses of channel 69 such as PMSE uses should be relocated in a similar approach to that being taken in the UK. By reserving channel 38 for such uses, harmonization with the EU within the 800MHz band and with the UK within channel 38 can be achieved.

11. Do you consider there to be merits in the identification of additional subband(s)? If so, please provide details in terms of timing and any other details which you consider relevant and reasons for your view. If not, please provide details and reasons for your view.

We believe there are certainly merits to the identification of additional subbands. In terms of timing, it may be beneficial to wait until after digital switchover, at which time demand for spectrum for both broadcasting and other systems and services can be determined. Furthermore, by waiting until after switchover, it may be possible to harmonize these additional subbands with other EU countries taking a similar approach.

12. What type of channel configurations would you consider would deliver most economies of scale in terms of availability of equipment and tuning / roaming of equipment? Please explain in terms of an indicative channel plan of frequencies, see for example Figure 2.0, and if you propose a channel configuration please give details of how this might impact broadcasting use of the band?

A channel configuration similar to that being proposed currently within the UK would deliver most economies of scale in terms of the equipment available. This configuration involves the clearance of channels 31-37 for non-broadcasting use and the allocation of channel 38 for PMSE use.

13. Do you consider there to be merits in accelerating access to a digital dividend sub-band in Ireland? If so, what considerations do you believe would need to be taken into account and how would they impact accelerating access to the digital dividend, for example (i) possible opportunity costs of delayed access; (ii) time-table for analogue television switch-off; (iii) geographic location of potential cleared spectrum bands; (iv) risk of fragmentation of digital dividend; and (v) any other risk/benefits which would need to be considered.

In terms of rollout of new services and systems, the limiting factor is the availability of equipment, rather than the availability of spectrum. In this context therefore, there is limited benefit to be derived from accelerated access to a digital dividend subband.

However, for experimentation and innovation, accelerated access to spectrum could provide a significant advantage in terms of leading experimentation and the development of innovative systems and services for UHF spectrum. This could in turn lead to the development of valuable intellectual property, products and start-ups companies.

14. What would you consider to be an optimal time for holding awards for digital dividend spectrum? Please refer to the considerations outlined in question 13 above.

15. Please qualify your answers to questions 13 and 14 in terms of what benefits might accrue to Irish consumers and citizens and Ireland's digital economy if access to a sub-band could be made available as soon as possible.

Providing access as soon as possible to UHF spectrum for experimentation could encourage inward investment and R&D.

16. Please also provide views on the opportunity cost of delayed access to cleared spectrum and the possibility of negotiating early access directly with broadcasting spectrum users.

17. Do you consider that service and technology neutrality should generally be a key principle for spectrum rights of use arising from the digital dividend? Please provide reasons for your view.

We believe very strongly that service and technology neutrality should be a key principle for spectrum rights of use. A service and technology-neutral approach to spectrum regulation can encourage innovation and lower access barriers for new systems and services. This in term maximizes the benefits that can be derived from the use of spectrum for consumers/citizens.

18. Do you consider that spectrum rights of use arising from the digital dividend should exclude the ability to provide DTT services? Please provide reasons for your view.

We believe that as spectrum is already allocated in the UHF band for the provision of DTT services, it makes sense that this should be excluded in spectrum rights of use arising from the digital dividend. However, we question the necessity of such an exclusion. If spectrum arising from the digital dividend is allocated on a basis of technology and service neutrality, the use of that spectrum should be determined by market demand. In the event that a demand for DTT service using this spectrum arises, it should be possible for that demand to be satisfied.

4 Eircom Limited

eircom Ltd.

Response to ComReg Doc. 09/15

Consultation on Digital Dividend in Ireland

A new approach to spectrum use in the UHF Band

7th May, 2009

DOCUMENT CONTROL

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Digital Dividend Response

Introduction

eircom welcomes the opportunity to respond to ComReg consultation document 09/15: Digital Dividend in Ireland: A new approach to spectrum use in the UHF Band.

eircom's approach is to respond in a summary fashion, rather than answering individual questions.

The Radio spectrum released by the Digital Dividend is a resource of huge economic importance for both the Irish economy and the larger European economy. The Digital Dividend spectrum will be important spectrum for the Irish broadband market place. This valuable spectrum is additional to that currently available in the sub 1 GHz band and is required to deliver increased capacity and coverage.

Given the importance of this National and European asset, it is critical that ComReg clearly identify the maximum amount of spectrum and the appropriate band(s) to be allocated for Mobile and Broadband use.

Harmonisation across member states will ensure the maximum benefit is obtained from the resulting economies of scale. The key band of 790 to 862 MHz must be the cornerstone of any decision. This has already been recognised in the DCENR's policy document on the Digital Dividend.

The Digital dividend should not be considered in isolation, ComReg should pursue an integrated approach to spectrum strategy, bearing in mind the totality of spectrum available now and in the near future eg the 2.6 GHz band, 900/1800 MHz liberalisation etc

eircom recommends that ComReg should focus on the following key points, when looking to implement the 7 key policies, identified by the DCENR, for the Digital Dividend.

- A coordinated approach to the Digital Dividend across Europe using the 790 – 862 MHz band as the basic band.
- Ireland should become a signatory to the use this sub band at WRC 2011
- Clear identification of the amount of spectrum, frequency bands and timing of availability.
- A just and impartial reallocation of spectrum released.
- Digital Dividend should be part of an holistic approach to spectrum availability within Ireland. Ensuring a sound basis for investment and strategic planning.

Harmonised Approach

The re-allocation of analogue spectrum needs to be cognisant of developments in other Member States. to ensure that the economies of scale can be realised. Sweden, France, Switzerland and Finland have identified the use of the 790 – 862 MHz band for electronic communication services. The UK is also re consulting on the use of this band as the Digital Dividend. The combined population of these 7 countries plus Ireland enables a potential market of 236 million people.

ComReg should also look at other potential sub bands across Europe to see if there is any common band that would drive economies of scale.

Bearing in mind our unique position as an island at the edge of Europe, our population density, distribution and the terrain of Ireland, it is quite feasible that Ireland can afford a larger dividend than elsewhere in Europe. Hence ComReg should look at potential bands which leverage the economies of scale associated with larger Geographic blocks. For example, in the USA, the Digital Dividend is based on the 700 MHz band, with a potential market size of 303 million.

Economic studies

There are many studies showing the greater economic value per MHz of bandwidth for telecommunications compared to digital TV. The release of this spectrum will facilitate broadband services reaching users that are now left out from or have limited access to broadband access ie the "Digital Divide"

The Digital Dividend will also allow for delivery of potentially cheaper broadband services to a larger number of customers using the latest wireless technologies eg LTE (Long Term Evolution).

Spectrum for Telecommunication Services

790-862 MHz has evolved as the preferred band for telecommunication services across Europe. We would recommend that ComReg ensure that the framework is put in place to release this band. While 72 MHz of spectrum is a considerable resource, CEPT is currently looking at leaving a 12 MHz centre gap, leaving only 2 x 30 MHz of FDD (Frequency Division Duplex) spectrum

Dividing this band across 4 operators will limit the effectiveness of new technologies, such as LTE. LTE can provide bandwidths of up to 100 Mbit/s, but requires 2 x 20 MHz of FDD spectrum.

The maximum benefit to the consumer from the Digital Dividend would be served if sub bands beyond the initial 790 – 862 MHz (800 MHz band) can be delivered. Sub bands outside the 800 MHz band should leverage the Digital Dividend in other large Geographical blocks eg Europe or the USA (700 MHz band).

While technology and service neutrality are recognised as the most flexible approach, it is important that guidelines from standardisation bodies (eg spectrum masks and technologies certified for use in that band, similar to the EC directive identifying UMTS as a recognised technology for the 900 MHz band) ensure spectrum efficiency, coexistence and minimum interference are supported.

A key issue which needs to be understood is the potential of the interleaved spectrum (White spaces). A single Broadcast transmitter will broadcast 6 muliplexes ie 48 Mhz of spectrum (6 x 8 MHz channels). This may leave up to 276 MHz of broadcast spectrum unused in large geographic areas (assuming 470 – 790 MHz is the band used for DTT).

If this interleaved spectrum could be utilised through the use of inter alia cognitive radio, it would greatly enhance the benefits from the digital Dividend.

Spectrum for DTT Services

ComReg has identified 272 to 312 MHz of spectrum required for DTT. Considering the population density, distribution and the terrain of Ireland, this seems to be a large amount of

spectrum to deliver 6 Muxes. A Detailed frequency plan should identify the exact amount of spectrum required, as recommended by the DCENR's policy paper on the Digital Dividend

Timeframes

Operators require certainty and clarity in terms of overall spectrum availability. The Digital Dividend is clearly an important development in releasing additional spectrum to serve new and existing demands. However, it needs to be seen in terms of total spectrum availability and timing of same. Certainty around the amount and timing of the Digital Dividend spectrum to be released, will influnce strategic and investment decisions with regard to other spectrum initiatives, such as the 900/1800 MHz band and the 2.6 GHz band

5 Ericsson (LM Ericsson)

Digital Dividend in Ireland

Ericsson's Confidential Response to ComReg Consultation Document 09/15

May 2009

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1. General comments

LM Ericsson ("Ericsson") welcomes the opportunity to respond to ComReg's Digital Dividend Consultation (09/15) and would like to take the opportunity to compliment ComReg on how quickly the consultation was issed after the Goverment policy paper.

Ericssons believes that the Digital Dividend offers real opportunities for wireless innovation in relation to a number of different services. For example:

- Wider coverage for advanced services in remote and rural areas;
- New mobile services, with high quality video and interactive media delivered to handheld devices;
- Wireless broadband services, with high-speed data and voice services;
- The enablement of the "internet of things" supporting smart cities, m-health, m-government, smart grids etc;
- Advanced business and broadcasting services, such as those used to support major sporting events;
- Additional television channels including possible High Definition (HD) channels carried on DTT networks.

Spectrum-related activities have become an increasingly important part of the Irish economy in recent years, with significant numbers of jobs dependent on the use of radio spectrum. The social and cultural benefits arising from spectrum use are also significant.

Ericsson has studied ComReg's proposed Digital Dividend Consultation in detail and we would like to commend ComReg on the thoroughness of its approach and the way in which it has prepared the consultation with a balanced view of the potential benifts for increased use of spectrum for Broadcasting, Innovation/R&D and Mobile services such as high speed broadband. This balanced approach should ensure a balanced return for our nation from a social, cultural and econimic perspective. With the current climate in the financial markets it has never been as important for market players of all kinds, be they manufacturerers, program makers, broadcasters, operators or suppliers to get certainty regarding future market developments. In setting out its proposed approach to examining the potential uses of the Digital Dividend, ComReg is helping to ensure that stakeholders have the required regulatory certainty in planning future investments and other initiatives.

Ireland is currently experiencing severe economic difficulties and in this context it is challenging to see that other regulators (notably US) have already released spectrum arising from analogue switchover (ASO) for reuse in the area of mobile broadband services. Ireland is already lagging other countries as regards DTT deployment and ASO and Ericsson believes it is vital that we do what we can at this stage to ensure that the DTT is planned in a way that ensures Digital Dividend spectrum is freed up for reuse as mobile broadband spectrum at the earliest possible opportunity. In this context Ericsson is greatly encouraged by ComReg's foresight in examining the potential of an additional sub band and the concept

of accelerating access to digital dividend sub-band(s) including the timeframe for holding license competitions for digital dividend spectrum.

In considering the digital dividend Ericsson believes that the VHF Band III (174 to 230 MHz) and not just the UHF Bands IV & V (470MHz to 862 MHz.) should be considered. While only DTT would be planned in the UHF band, the 56 MHz of the VHF band could be planned to support Digital Audio Broadcasting (DAB) and Digital Terrestrial Television (DTT) as it is highly unlikely a large proportion of the 56MHz would be required for DAB after analogue switch off. This band could support DAB and a number of DTT multiplexes thus leaving more flexibility for other uses of the UHF band.

2. Clarifications

Ericsson would like to point out what it believes to be an error in section 3.7 and section 6.

Our understanding of the broadcasting act is that while it speaks of the number of multiplexes reserved for broadcast (2 x public service, 4 x Commercial with provision for an additional 2) it does not speak to specific spectrum being reserved for broadcast. For example were SFN's used the 2 x public service, 4 x Commercial and provisional additional 2 multiplexes could be accommodated in 64 MHz of spectrum. As it is the responsibility of ComReg to ensure efficient use of spectrum Ericsson would be of the view that as much as possible SFN's should be encouraged to ensure valuable spectrum that may be required for HD, 3D or very high bandwidth mobile broadband would not be wasted.

In addition it is not clear when ComReg talk of spectrum reserved for broadcast services what they mean by "(272 to 312 MHz)". The *spectrum* in the band from 272 to 312 is not designated for broadcast but for Mobile National –e.g. Mobile emergency, search and rescue, Government services and position fixing. If however ComReg mean that somewhere between 272 MHz and 312MHEricsson would like some clarification of these points.

2. Responses to Questions

Q. 1. What would you consider to be the levels of value and benefits, including any social value which may be produced for Irish consumers / citizens and Ireland's digital economy arising from non-broadcasting uses of the digital dividend?

Ericsson Response:
The potential benefits would be enormous. It is recognized that the application of ICT is key to reducing our carbon foot print. While the ICT sector has a modest carbon footprint: 2% of global CO2, ICT's share of world economy is about 7% (Revenues/GDP). The SMART 2020 report (1) concludes that ICT could reduce global emissions by at least 15 per cent by 2020 through enabling reductions in other sectors. Spectrum in this band has wide coverage range and can penetrate buildings this is essential for economically connecting devices such as smart meters and elements of mobile health smart transport systems

In the digital age we live increasingly entertainment, music, video etc is delivered over broadband networks. These same networks enable internet access and social inclusion through web based communities, e-government and access to global markets for small indigenous industries

In economic terms Spectrum Value Partners predict the NPV of the Digital dividend in Europe to be somewhere between €70-232 Billion of which €62.6 to 144.8 billion would be

[1] See http://www.smart2020.org/

contributed by mobile. According to Viviane Reding, European Commissioner, the European telecoms market is worth approximately €300 Billion. This would mean the digital dividend could increase the market size by between 23% and 77%. From ComReg's quarterly reports and Spectrum Strategy consultation (08/20) the Irish Telecoms market is worth approximately €4.4 Billion and contributed €1.693 Billion to GDP and employed 6,168 in 2006 alone. This would mean

Q. 2. How in your view could various industry sectors, for example transport, healthcare, education or other public sector industries, benefit from utilizing digital dividend spectrum? Please include details of the potential spectrum requirements of the industry in your answer.

Ericsson Response:
Economies of scale are essential when looking at making the most of spectrum and many pages could be written on the potential uses. Currently utilities such transport, healthcare, education or other public sector industries are making extensive use of mobile operators GPRS and HSPA networks. The great potential of the UHF spectrum is that it makes it much more economical to provide coverage indoors and in rural areas this will have the knock on effect of making services more robust and cheaper for end users such as utilities such transport, healthcare, education or other public sector industries.

Q. 3. Please outline your views regarding (i) the types of applications and services which you consider the digital dividend should be used for; (ii) possible spectrum requirements of those applications; (iii) timeframes for making available rights of use for digital dividend spectrum; and (iv) the potential levels of competition which may result in existing or new products and services markets.

Ericsson Response:
As per the above responses economies of scale are essential when looking at making the most of spectrum. In general terms all applications such as high speed internet, access to TV, Video, Music and the use by utilities such transport, healthcare, education or other public sector industries need the cheapest and most economic access to bandwidth.

(i) In light of the above Ericsson belive the most return to society can be gained from the use of a very large part of the digital dividend to mobile broadband.

(ii) Current state of the art in terms of mobile broadband requires 20MHz channels with 40MHz and 100MHz channels envisaged in the future. However spectrum sub 1GHz is a very scarce resource so channel allocations of 5-10MHz are likely more appropriate. Spectrum trading and spectrum sharing will enable higher channel bandwidths when necessary. In term of overall spectrum requirements this would depend on ComReg and the department of Communications Energy and Natural Resources vision of what kind of mobile broadband infrastructure and end user data rates they would like in Ireland. Ericsson would suggest that something in the region of 120-140 MHz would be optimal with 100MHz being the minimum.

(iii) As soon as possible as the considerable benefits to Ireland are obvious.

(iv) Ericsson would envisage that the release of digital dividend spectrum would increase competition and greatly improve end user experience.

Q. 4. Would you consider there to be other key issues which should be considered in terms of gaining a deeper understanding of the spectrum requirements of new applications and services? If so, what are they and please elaborate

Ericsson Response:
Ericsson would consider that there are two key issues that should be considered.
1.) The increasing need for wider channels to meet the demand for mobile broadband
2.) HD and 3D video and the potential impact on DTT and internet bandwidth requirements

Q. 5. What are your views regarding the level of demand for Ireland to reserve UHF spectrum for innovation and experimentation? Please support your views with consideration to the availability of UHF spectrum.

Ericsson Response:
As a user of spectrum for R&D, testing, innovation and experimentation, Ericsson would consider that there would be a level of demand similar to that existing currently as most of the activities can be simulated or done over cable. It is only at the final stages of product testing and verification that demand for 'live' spectrum is required and this is also limited to specific geographical locations.

Q. 6. In light of your views on non-broadcasting services, do you consider that a mixed approach to spectrum allocation in the UHF spectrum band should be adopted? Please provide reasons for your view?

Ericsson Response:
Yes. A mixed approach gives greatest flexibility in ensuring the best social, cultural and economic return for the Irish people.

Q. 7. Do you agree with ComReg's assessment regarding the initial mix between broadcasting and non-broadcasting services? Please answer in terms of your views regarding the initial mix between broadcasting and non-broadcasting services and any other considerations that you consider relevant.

Ericsson Response:
Yes. However, Ericsson would suggest that something in the region of 120-140 MHz would be optimal with 100MHz being the minimum.

Q. 8. Do you consider that, if the spectrum demand for the provision of DTT services does not meet the level envisaged by the 2007 Act, a review of the initial mix should be carried out following analogue switch-off of television services in the UHF spectrum band? If so, please provide reasons for your view and also indicate which stakeholder(s) should participate in such a review. If not, please provide reasons for your view.

Ericsson Response:
Yes. The economy as well as the areas of broadcast and mobile telecommunications are rapidly changing a regular review of the situation makes sense. The main users of spectrum by far are likely to be the broadcast and telecommunications industries, assuming that all other interested parties have been adequately catered for the obvious stake holders are the broadcast and telecommunications industries.

Q. 9. Do you consider that the 800 MHz sub-band should be reserved for services other than broadcasting? Please provide reasons for your view.

Ericsson Response:

Yes. Like GSM in the 90's this is suggested by CEPT as the sub band that should be coordinated across the EU for mobile services. It should therefore be reserved for services other than broadcasting.

Q. 10. How do you consider that the current uses of channel 69 in Ireland, for example Programming Making and Special Events (PMSE) uses, would be impacted by reserving the 800 MHz band for non broadcasting services? Please provide your view on how PMSE uses could be accommodated if such uses were to be displaced from channel 69.

Ericsson Response:
This challenge is not uniquely Irish as there will be an impact in other European countries. Ericsson suggests that we follow the industry trend across Europe for alternative channels for PMSE.

Q. 11. Do you consider there to be merits in the identification of additional sub band(s)? If so, please provide details in terms of timing and any other details which you consider relevant and reasons for your view. If not, please provide details and reasons for your view.

Ericsson Response:
Yes. However it is complex and needs careful consideration and there are potentially significant drawbacks.

- It is obvious there are huge benefits to be gained from the release of the digital dividend spectrum and in these challenging economic times Ireland needs to do all it can to realize some or all of these benefits as soon as possible.
- It is also quiet apparent that the 72Mhz in the 800MHz suggested by CEPT may not be optimal and that that something in the region of 120-140 MHz or more would be more optimal from a mobile broadband perspective with 100MHz being the minimum.
- Equipment will be available this year in the 700MHz band 746-758/ 776-788 (Band 13). This is because the US is ahead of many countries with regard to releasing digital dividend spectrum.
- In the current consultation with regard to the liberalization of the 900MHz band it is obvious there is not enough spectrum to accommodate demand.
- However it is also very important to make informed decisions and to balance long term and short term objectives. Ericsson's view is that while early use of the 700MHz sub band may provide a quick solution we would suggest that there are also potentially significant drawbacks. There is ongoing work in APAC and Europe with regard to additional spectrum below 790 MHz. The risk for Ireland would be that using the US band plan could potentially slow or block Ireland from taking advantage of a larger harmonized market should this develop. For further details on our thoughts please see Annex I Proposed Harmonized Frequency Arrangment For UHF Band 698-806.
- If after careful consideration ComReg considers some use of the 700MHz sub band is the best way forward then we would suggest moving cautiously and only (Band 13) 746-758/ 776-788 should be considered due to the extenuating circumstances in Ireland.

Q. 12. What type of channel configurations would you consider would deliver most economies of scale in terms of availability of equipment and tuning / roaming of equipment? Please explain in terms of an indicative channel plan of frequencies, see for example Figure 2.0, and if you propose a channel configuration please give details of how this might impact broadcasting use of the band?

Ericsson Response:
As per the previous response Ericsson would suggest that if after careful consideration ComReg considers some use of the 700MHz sub band is the best way forward then we would suggest only (Band 13) 746-758/ 776-788 should be considered at this stage. Today only (Band 13) 746-758/ 776-788 would give the best economies of scale in terms of availability of equipment and tuning / roaming of equipment. Although roaming in Europe could potentially be a problem depending on the multiple bands included in devices.

The table below provides some detail, however without the latest channel plan for broadcast in the band it is not possible to asses the impact. Impact may be minimal if there was scope for broadcast re-planning/retuning or considerable if there was no scope for re-planning/retuning and if the proposed sub band affected a major broadcast site. Ericsson would be happy to work with ComReg, the BCI and the broadcasters to asses and or minimise any potential impact.

	CEPT 800Mhz Band No sub bands yet			US 700MHz Band with sub bands 12,13,14 & 17			US 700MHz sub bands
Channel	From	To		From	To		
21	470	478		470	478		
22	478	486		478	486		
23	486	494		486	494		
24	494	502		494	502		
25	502	510		502	510		
26	510	518		510	518		
27	518	526		518	526		
28	526	534		526	534		
29	534	542		534	542		
30	542	550		542	550		
31	550	558		550	558		
32	558	566		558	566		
33	566	574		566	574		
34	574	582		574	582		
35	582	590		582	590		
36	590	598		590	598		
37	598	606		598	606		
38	606	614		606	614		RMBEZ
39	614	622		614	622		
40	622	630		622	630		
41	630	638		630	638		
42	638	646		638	646		
43	646	654		646	654		
44	654	662		654	662		
45	662	670		662	670		
46	670	678		670	678		
47	678	686		678	686		
48	686	694		686	694		
49	694	702		694	702		698-716 (Band 12 Includes Band 17)
50	702	710		702	710		704-716 (Band 17)
51	710	718		710	718		
52	718	726		718	726		
53	726	734		726	734		728-746 (Band 12 Includes Band 17)
54	734	742		734	742		734-746 (Band 17)
55	742	750		742	750		

56	750	758		750	758		746-758 (Band 13)
57	758	766		758	766		758-768 (Band 14)
58	766	774		766	774		
59	774	782		774	782		776-788 (Band 13)
60	782	790		782	790		
61	790	798		790	798		788-798 (Band 14)
62	798	806		798	806		
63	806	814		806	814		
64	814	822		814	822		
65	822	830		822	830		
66	830	838		830	838		
67	838	846		838	846		
68	846	854		846	854		
69	854	862		854	862		

Q. 13. Do you consider there to be merits in accelerating access to a digital dividend sub-band in Ireland? If so, what considerations do you believe would need to be taken into account and how would they impact accelerating access to the digital dividend, for example (i) possible opportunity costs of delayed access; (ii) time-table for analogue television switch-off; (iii) geographic location of potential cleared spectrum bands; (iv) risk of fragmentation of digital dividend; and (v) any other risk/benefits which would need to be considered.

Ericsson Response:
Yes.
Considerations:

1.) 900/1800 liberalization
2.) Current Economic conditions
3.) Impact if any on broadcasting (Including UK)
4.) Availability of equipment
5.) Demand form operators

Giving a meaningful answer to questions (i) to (iv) would require significant input and engagement with ComReg, the BCI and the broadcasters as Ericsson does not current have enough information to respond in any more detail than some of the previous responses.

Q. 14. What would you consider to be an optimal time for holding awards for digital dividend spectrum? Please refer to the considerations outlined in question 13 above.

Ericsson Response:
As soon as possible the economic and social benefits are we belive clear. However it is also very important to make informed decisions and to balance long term and short term objectives.

Q. 15. Please qualify your answers to questions 13 and 14 in terms of what benefits might accrue to Irish consumers and citizens and Ireland's digital economy if access to a sub-band could be made available as soon as possible.

Ericsson Response:
Please see answer to question one.

Q. 16. Please also provide views on the opportunity cost of delayed access to cleared spectrum and the possibility of negotiating early access directly with broadcasting spectrum users.

Ericsson Response:
No opinion.

Q. 17. Do you consider that service and technology neutrality should generally be a key principle for spectrum rights of use arising from the digital dividend? Please provide reasons for your view.

Ericsson Response:
In general yes but economies of scale and government policy must be considered.

Q. 18. Do you consider that spectrum rights of use arising from the digital dividend should exclude the ability to provide DTT services? Please provide reasons for your view.

Ericsson Response:
No opinion.

Annex I

ASIA-PACIFIC TELECOMMUNITY
The 6th Meeting of the APT Wireless Forum

31 March – 03 April 2009, Danang, Vietnam

Document AWF-6/INP-64
31 March 2009

PROPOSED HARMONIZED FREQUENCY ARRANGEMENT FOR UHF BAND 698 – 806 MHZ

by

Ericsson Thailand, Nokia Singapore, Nokia Siemens Network Singapore

1. Introduction

IMT mobile broadband is here to stay. Worldwide the rapid increase in mobile data that provides internet access and other services with more than 100 millions HSPA subscriber in over 250 high bit-rate mobile broadband networks, now providing bit-rates of up to 21 Mbps, with thousands of HSPA capable terminal types to support the different interest of customers. Today there are over 4 billion mobile subscribers on a global basis that are all potential high data-rate mobile broadband users, providing a bright future but putting requirements not only on future capacity and coverage expansion of networks and devices. In that respect, the availability of additional spectrum suitable to provide cost efficient mobile broadband is of outmost importance. This creates a demand for spectrum in lower frequency bands, such as UHF, and with large enough contiguous blocks.

In the WRC-07 parts of the UHF band was identified for IMT attracting significant interest from both the Member States and mobile industry understanding the potential benefit that this frequency band would give to customers and the society as a whole when being used by mobile communications. Currently the 698-806 MHz band has been arranged in the USA, while in the CEPT countries the band 790-862 MHz is being considered for a 2x30 MHz arrangement. In Figure 1 the global use of the 850 MHz and 900 MH band arrangements are shown. From this it is clear that there is a division in use of the band 698-960 MHz in different countries. Typically, with some exceptions; CEPT countries and North Africa use only 900 MHz band, Americas are using only 850 MHz band, while in many APAC and African countries, both bands are used in parts. This shows that; total global harmonization is not possible but regional is, and that the larger momentum is in the 698-806 MHz band is fashioned due to the fact that 70% of the world population have access to the 850 MHz band.

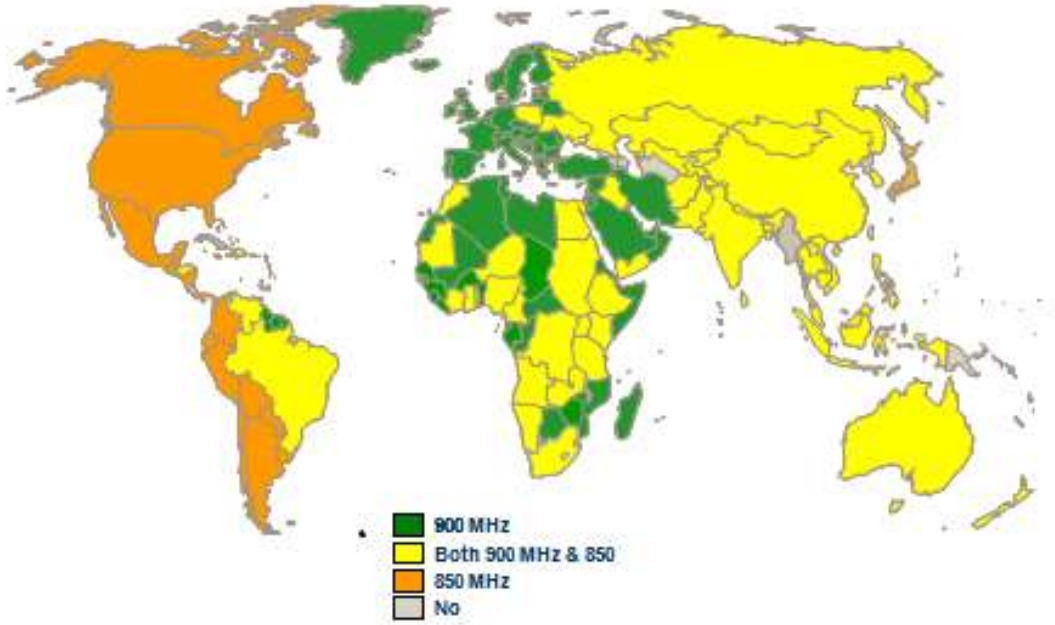


Figure 1. The license status of 850 MHz and 900 MHz bands (February 2009)

The possibility to use the 698-806 MHz band for mobile communications provides a rare opportunity for providing cost efficient wireless solutions for voice and high data-rates. To be able to provide mobile broadband access to contiguous spectrum blocks is a basic requirement, but in addition using frequencies below 1 GHz will also allow for cost efficient coverage by mobile systems giving the unique opportunity to provide mobile broadband to rural areas affordable to all and thus assisting in reducing the digital divide. In Figure 2, the relation between the number of required base stations in relation to frequency is shown.

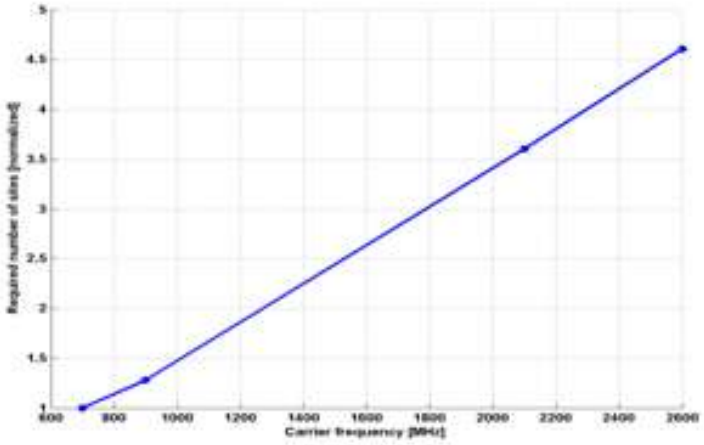


Figure 2. The carrier frequency (MHz) and required number of base stations show that with a deployment in the 1800 MHz band three times more base stations are required for wide area coverage as compared to the 700 MHz band.

This shows the significant opportunity that access to the 698-806 MHz band that exists and thus it is extremely important that the decisions when developing a harmonized arrangement for this band so that it is possible for the mobile industry (operators and manufacturers) to provide low cost mobile access. This is possible through harmonized and large-enough blocks of spectrum to operators that can provide necessary mobile access to end-users yet considering existing services in neighboring bands.

2. Opportunities with a 2x50 MHz spectrum efficient and contiguous arrangement

It is important to develop an arrangement that is capable of providing a spectrum efficient solution, with large contiguous blocks. Large contiguous blocks would facilitate a true mobile broadband experience. It is also important to develop an arrangement that is free of constraints caused by legacy issues of previous use; however, careful considerations of continued use of other radio communication services in adjacent bands is needed.

The most efficient solution in the band 698-806 is a 2x50 MHz arrangement as shown in Figure 3.

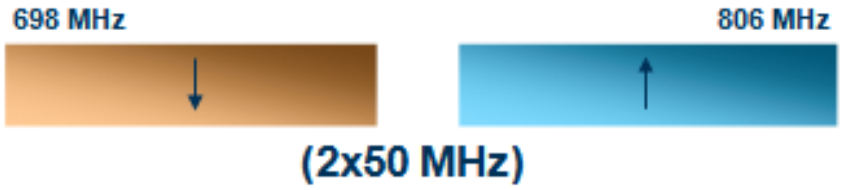


Figure 3. A 2x50 MHz arrangement between 698-806 MHz with an 8 MHz gap between downlink and uplink directions

From an implementation point of view, the sources of this contribution are proposing to do this in a "dual split duplexer arrangement" according to Figure 4 below.

Figure 4. A solution with dual duplexers having the same duplex distance that could be of same or different sizes (DL1 paired with UL1 and DL2 paired with UL2)

There are several advantages with this arrangement. The 2x50 MHz arrangement will minimize the risk of unfavorable fragmentation of the UHF-band for mobile broadband usages. As such, this will minimize the complexity of the terminals. It utilizes the largest amount of the available 108 MHz in the 698-806 MHz band. Due to the two adjacent duplex arrangements, the gap between DL (downlink) and UL (uplink) blocks can be made smaller than the duplex gap(s) in some other FDD arrangements.

In APT countries (and in Africa) the most probable service is high power broadcasting below frequency 698 MHz. To avoid and limit interference between broadcasting and mobile services it has been acknowledged that a reversed duplex arrangement is preferred. If the DL is not placed next to the 698 MHz frequency there is a need for a sufficient guardband at the 698 MHz border. In European discussions of the guard band between broadcast and mobile at 790 MHz frequency border, it is concluded in the CEPT Report 23 [1] that at least an 8 MHz guard band would be required between digital broadcast (DVB-T) and mobile UL (IMT). Therefore it is suggested to reverse the duplex transmission arrangement also for a harmonized APT arrangement.

In APT countries (and Africa) there is use of a public safety, PPDR, trunked systems, mobile systems, etc, in the band 806-821 MHz paired with 851-866 MHz, with uplink in the lower band. It is thus important that the proposed arrangement have an uplink close to the 806 MHz frequency border.

The proposed arrangement (with a "in-band filter" solution of either 2x30+2x20 MHz or 2x40+2x10 or two 2x25 blocks) can handle the wider HSPA and LTE carrier bandwidths (up to LTE 20 MHz, or possibly MC-HSPA 20 MHz) that may be of interest for many countries in APT countries (and Africa). Such two-duplexer arrangement can be implemented by current standard filter technology and no state-of-art filter design is needed. This would minimize the cost and complexity of equipments.

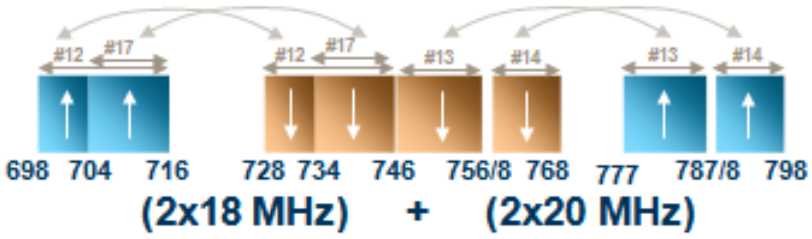
The 2x50 MHz arrangement would promote the whole band for mobile use in a very spectrum efficient way. However, in case there is a national decision made to solve a specific national need, there is a possibility for a national arrangement by using only one of the two duplex pairings.

The 8 MHz gap between UL and DL blocks will put requirements on the terminals to avoid UE-UE interference. The BS-BS interference can be handled by additional filtering using conventional technologies. Related to UE-UE interference, with 10 MHz and narrower channel bandwidths the 8 MHz gap seems usable without special arrangements. About 20 dB duplexer attenuation is enough in the worst case and typical emission levels have clear margin to the specification limit. In order to deploy 15-20 MHz carrier bandwidths channels in the proposed arrangement with an 8 MHz gap, some additional measures may be needed. For example, by suitable "in-band filter arrangements" 10 MHz (or narrower) channels could be used adjacent to the 8MHz gap and for the wider bandwidths of 15 MHz or 20 MHz, they should be implemented away from this 8 MHz gap.

3. Considerations on the US arrangement in 698-806 MHz band

In US, parts of the 698-806 MHz band have been auctioned for use to mobile communications (US700). However, due to legacy services and issues related to US internal reasons the arrangement have been segmented into two major bands with services related to mobile, high power broadcasting and public safety. The mobile arrangements as specified by 3GPP include four different arrangements as shown in Figure 5 (3GPP bands 12, 13, 14, and 17).

Figure 5. The four frequency bands specified in 3GPP (Bands 12, 13, 14, and 17) identified as the US700 arrangement.



The maximum use of this arrangement with specifications in 3GPP is this 2x18 MHz + 2x20 MHz. However, today the actual 3GPP implementation is limited to band 13 (primarily Verizon) and band 17 (primarily AT&T).

The US700 arrangement has some complexity and disadvantages due to the inclusion of broadcasting and public safety and division into two segments. There is a risk that other countries with the intention to follow with a "US-like arrangement" will have similar type of inclusions of services that are not mobile communications, but that are specified with somewhat different requirements that may lead to the need for "country specific" solutions, specifications, and implementations. There is therefore a risk that a "US-like arrangement" will lead to global fragmentation of the UHF-band.

4. Proposal

This document proposes an implementation of a spectrum arrangement for the APT member countries and possible other parts of the world that could provide for harmonized and cost efficient deployments of mobile broadband systems in the band 698 – 862 MHz. The APT member countries having, or consider having, both the 850 MHz and 900 MHz bands implemented will have the possibility to be at an advantage in the way to be able to provide mobile broadband by coverage and capacity in frequency bands below 1 GHz as depicted in Figure 6.

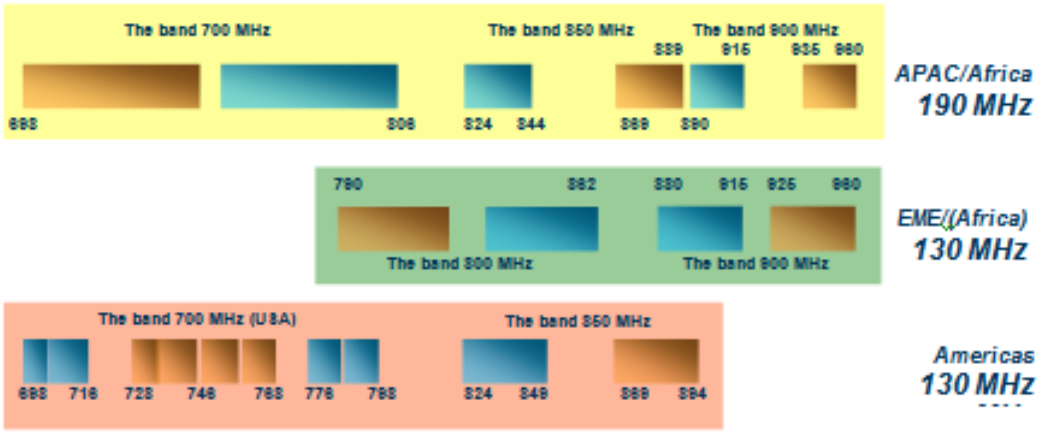


Figure 6. Amount of spectrum that could be allocated for mobile communications in the different Regions in the future.

It is therefore proposed by the co-signers of this contribution that APT/AWF should urgently develop a harmonized arrangement for APT countries that would consist of:

- a spectrum efficient 2x50 MHz arrangement out of the available 108 MHz in the frequency band 698-806 MHz and a small gap of 8 MHz between uplink and downlink blocks
- dual duplexer solution
- reversed duplex arrangement for better co-existence with adjacent radio communication services.

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6 GSM Association

GSM Association response to ComReg's consultation "Digital Dividend: A new approach to spectrum use in the UHF band" May 2009

OVERVIEW

The GSMA welcomes the opportunity to respond to ComReg's consultation on the Digital Dividend. The GSMA agrees with ComReg that the Digital Dividend has the facility to enable new and innovative communications products and services for the benefit of Irish citizens, in particular enhanced mobile broadband services and Internet connectivity throughout the country.

We believe strongly in the merits of a coordinated approach to the Digital Dividend between EU Member States; access to UHF spectrum in bands harmonised across Europe is extremely important to ensure broadband availability in rural areas. The benefits of having a band available for mobile that is compatible with the rest of Europe far outweigh the anticipated costs of migrating services out of the 790-862MHz band.

Harmonised Digital Dividend spectrum will also allow mobile broadband to reach its full potential as a viable alternative to fixed broadband for many consumers. This is of particular importance in countries such as Ireland, where fixed broadband penetration is below the EU average[1]. An increase in competition for broadband services will benefit all broadband users. The growth of mobile broadband will also help to foster long-term economic growth. This is of clear importance in the current economic climate.

The net outcome of harmonisation with Europe will be cheaper and better handsets for all Irish consumers, due to economies of scale in handset production. This will allow mobile broadband to better serve consumer needs in rural areas and developing markets.

We strongly recommend that Ireland should align with the World Radiocommunications Conference (WRC) 2007 identifications and allocate the frequency band 790-862 MHz to mobile broadband. In doing so, Ireland will join a growing number of major markets that will use this band for mobile broadband in Europe.

Q1 What would you consider to be the levels of value and benefits, including any social value which may be produced for Irish consumers/citizens and Ireland's digital economy arising from non-broadcasting uses of the digital dividend?

The GSMA has long believed that there are substantial benefits – economic, social and technical - to be had from harmonised spectrum assignments for mass market mobile services.

[1] See http://ec.europa.eu/information_society/policy/ecomm/doc/implementation_enforcement/annualreports/14threport/ie.pdf

The economic benefits of broadband are clear[2] and have been demonstrated by numerous economic studies. Allocating some of the Digital Dividend spectrum to mobile operators would have a significant positive economic impact, driving innovation, job creation, productivity and competitiveness. Across Europe, allocating up to 100MHz of UHF spectrum to mobile would generate between €63bn and €165bn in extra economic value[3].

In terms of social benefits, policy makers globally have identified widespread internet access as a critical tool in social development; it has an essential role to play in improving health, wealth, education and social mobility and bridging the digital divide between rural and urban areas. Currently mobile broadband penetration in Ireland is 20.5%, considerably higher than the EU-27 average of 13%[4]. More widespread roll-out of mobile broadband will continue to bridge the digital divide between rural and urban areas and allow more Irish citizens to fully engage with services such as e-government, as well as enhancing inclusion, quality of life, community ethos, cultural understanding, education of citizens and informed democracy. Environmental benefits will also ensue from deploying mobile broadband in the UHF band as significantly fewer base stations will be required.

The technical benefits are two-fold: better designed mobile devices with superior radio performance[5], and improved interference control between countries.

Q3 Please outline your views regarding (i) the types of applications and services which you consider the digital dividend should be used for; (ii) possible spectrum requirements of these applications; (iii) timeframes for making available rights of use for digital dividend spectrum

(i) The GSMA believes that digital dividend spectrum is ideal for the deployment of mobile broadband services, in particular HSPA, HSPA+ and the newest version of 3G technology, LTE (Long Term Evolution). In the GSMA's response to the European Commission workshop on the Digital Dividend in Europe[6] in March 2009, we made clear our view that if sufficient favourable regulatory signals are given by national administrations in Europe by the end of this year, LTE services could start to be deployed as early as 2011, with large-scale deployment by 2012. Mobile Internet access via these technologies will enable a multitude of new and innovative services, including government, health, education and entertainment services, to be delivered widely cost-effectively in rural areas of Ireland as well as urban.

(ii) Ideally, a minimum of 100MHz of harmonised digital dividend spectrum would be allocated to deliver mobile broadband services in the UHF band. This would be sufficient to license larger frequency channels, which would deliver higher data rates and support several operators in the Irish market, ensuring vigorous competition. Each operator needs a minimum of 2 x 10 MHz to provide an efficient LTE service.

100MHz represents only approximately 25% of the spectrum currently used for terrestrial broadcasting.

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[2] See http://www.analysysmason.com/PageFiles/11730/GSMA.pdf
[3] Source: Spectrum Value Partners, Getting the most out of the Digital Dividend, 2008
[4] See http://ec.europa.eu/information_society/policy/ecomm/doc/implementation_enforcement/annualreports/14threport/ie.pdf
[5] See http://www.gsmworld.com/our-work/public-policy/spectrum/digital-dividend/frequency_harmonisation.htm for more detail.
[6] http://www.analysysmason.com/PageFiles/11730/GSMA.pdf (conclusion to question 4)

(iii)The GSMA believes that the harmonised band of 790-862MHz should be made available as soon as possible to ensure that citizens of Ireland can derive the maximum benefit from mobile broadband, and that the country can maintain international competitiveness. Although analogue switchover in Ireland is not scheduled for completion until 2012, the sooner mobile operators have certainty on the issue, the sooner they can confirm their network investment plans. This will ensure that Irish consumers can benefit from new services as quickly as possible.

Q6 In light of your views on non-broadcasting services, do you consider that a mixed approach to spectrum allocation in the UHF spectrum band should be adopted?

The GSMA agrees with ComReg's view that a mixed approach will be central to Ireland's ability to achieve greatest benefit from its digital dividend. The characteristics of UHF spectrum mean that it can comfortably be shared by mobile, TV and potentially other service providers (eg public safety).

We believe at least 100MHz of UHF spectrum can easily be freed for mobile services without impacting broadcast TV services, as digital TV is between five and ten times more spectrally efficient than analogue. From a mobile network perspective, the excellent propagation characteristics of UHF spectrum mean that fewer base stations are required, making it much cheaper to provide mobile broadband coverage than over 2100MHz[7]. Networks can therefore be rolled out and services delivered to consumers more quickly and cost-effectively.

In our view, a mixed approach to UHF spectrum allocation will provide consumers in Ireland with the 'best of both worlds' – more television channels of higher quality, and faster and cheaper access to mobile broadband.

Q7 Do you agree with ComReg's assessment regarding the initial mix between broadcasting and non-broadcasting services?

With regard to ComReg's view that 80 to 120MHz of UHF spectrum should exclude the ability to provide DTT services, it is our opinion that ideally this tranche should be a minimum of 100MHz. A smaller allocation would limit the number of providers able to operate in the market, reducing competition.

Q9 Do you consider that the 800MHz sub-band should be reserved for services other than broadcasting?

The GSMA believes that the sub-band 790-862MHz should be reserved for mobile broadband. This band was identified for mobile broadband in Region 1 at WRC 07, and is currently being planned by the CEPT. By aligning with the WRC frequency band, Ireland would join a growing number of major markets that will use this band for mobile broadband in Europe. The decision will increase momentum and encourage other countries to follow suit in a "domino effect". The benefits of having a band available for mobile that is compatible with the rest of Europe far outweigh any costs of migrating services out of the 790-862MHz band.

[7] See http://www.digitaldividend.eu/files/digital_dividend_summary_report.pdf

Conclusion

Clear and timely decisions on the allocation of digital dividend spectrum will enable stakeholders such as mobile operators to invest early and with confidence in the future of mobile broadband and the services it will deliver. This kind of future-proofing is essential if the mobile industry is to continue to deliver social and economic benefits in Ireland and other European countries.

For questions regarding this response please contact:

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rercole@gsm.org

About the GSMA

Founded in 1987, the GSMA is the global trade association of the mobile industry, representing more than 750 GSM and 3G mobile phone operators across 218 countries and territories of the world. In addition, more than 180 manufacturers and suppliers support the Association's initiatives as associate members.

The primary goals of the GSMA are to ensure that mobile phones and wireless services work globally and are easily accessible, enhancing their value to individual customers and national economies, while creating new business opportunities for operators and their suppliers. The Association's members represent more than 3.7 billion GSM and 3G connections – nearly 90% of the world's mobile phone connections.

The GSMA plays a pivotal role in the development of the GSM platform and the global wireless industry. Much of the GSMA's work is focused on two areas: Emerging Services and Developing Markets. The GSMA helps its members develop and launch new services, ranging from mobile instant messaging to video sharing to mobile Internet access, which will work across networks and across national boundaries. At the same time, the GSMA is heavily engaged in the industry's push to extend basic voice, text and broadband access services to more people and assisting Administrations in developing communications infrastructure in their countries.

More information about the Digital Dividend is available on our website at:
www.gsmworld.com/digitaldividend

7 Ireland Offline Organisation

Ireland Offline believes that recent developments, largely in the Commercial DTT Area render this consultation superflous at this time.

We believe that no Commercial DTT will launch in Ireland and that the actual Dividend shall be 200MHz rather than 100Mhz once that fact is recognised .

We therefore propose to address the High Level principles and recommend that the core of this consultation be deferred until the latter half of 2009 when Comreg envisages Phase II will commence .

We note that Comreg refuse to consider the *"Size of Reservation of Spectrum for UHF Broadcasting"* at this time despite the fact that this current reservation will account for over half the Dividend Spectrum in certain areas. We understand that Comreg feel constrained by the Broadcasting Act 2007

Confusingly Comreg later say *"ComReg may consult in the future on mechanisms that could be employed to exclude DTT services from spectrum rights of use. Nevertheless, it welcomes any preliminary views respondents may have on such mechanisms."*

Even more confusingly Comreg state *"As discussed in Section 3.7, ComReg considers that in the event spectrum demand for the provision of DTT and other broadcasting services not meeting the level envisaged in the 2007 Act, this initial level should be reviewed."*

Therefore we submit the following as a ***preliminary view*** because it appears that no other views shall be considered .

By late 2009 we should have :

1. An end to Commercial DTT discussions
2. ERO / EU should have advanced their work on EU wide harmonisation , particularly in the 790-862mhz area .

We believe that Comreg should simply state that this Phase 1 consultation concludes that most issues are not settled in principle and should be rolled forward to the Phase II where detailed consideration can be given .

To the questions

Q. 3. Please outline your views regarding (i) the types of applications and

services which you consider the digital dividend should be used for; (ii) possible

spectrum requirements of those applications; (iii) timeframes for making

available rights of use for digital dividend spectrum; and (iv) the potential levels

of competition which may result in existing or new products and services

markets.

Ireland Offline Position .

We wish to ensure that the maximum amount of spectrum is made available for Fixed Broadband services and that a general statement to that effect should suffice until Phase II when we believe that significantly more spectrum can be made available than is now envisaged.

Q. 14. What would you consider to be an optimal time for holding awards for

digital dividend spectrum?

Ireland Offline Position .

Not before 2010 save where an EU Wide Common Allocation exists . We also believe that portions of the VHF3 band should properly be considered leading to anywhere from 50MHz to 250MHz of Dividend in the 250MHz to 550MHz portion of the Band in Dividend , dependent on UK Co-Ordination and release of unused DTT spectrum .

8 Meteor Mobile Communications Limited (Meteor)

Response to ComReg Consultation 09/15
Digital Dividend in Ireland: a New Approach to Spectrum Use in the UHF Band

7 May 2009

Executive Summary

Meteor Mobile Communications Ltd. (Meteor) welcomes the opportunity to respond to ComReg consultation document 09/15: Digital Dividend in Ireland: A new approach to spectrum use in the UHF Band.

The publication of the consultation is a long overdue first step in preparing for the release of spectrum that will become available after the switch off of analogue broadcasting services. Digital dividend spectrum will be hugely important spectrum for the Irish broadband marketplace, spectrum that is additional to that currently available and spectrum that can be used to deliver increased capacity and coverage. Given its importance, and the number of countries worldwide that have already made determinations on future use, Meteor welcomes the focus that ComReg is now giving to future access.

Radio spectrum is a resource of huge economic importance for the Irish economy. Proper management of that resource is vital for both users and consumers and ComReg has a responsibility to ensure that future access is administered in a manner that is open, transparent and above all efficient.

Given the importance of the spectrum in question, the determination of the amount of spectrum to be released for alternative use and the allocative process governing access to that spectrum will realise a unique opportunity for operators who gain access to develop and expand products and services. Ensuring access to the mobile sector could transform the provision of broadband services throughout Ireland, especially the provision of rural broadband.

As operators, governments and regulators across the globe have acknowledged the opportunities that could arise with a re-deployment of analogue spectrum, the process that ComReg is now entering into needs to be cognisant of developments in other Member States and ensure that best practice is followed.

Meteor would, therefore, urge ComReg to ensure the following guide discussion on a new approach to spectrum use in the UHF band:

- The need for a fair and well-balanced reallocation
- The requirement to approach spectrum reform on a holistic basis
- The designation of the spectrum bands 790-862 MHz for mobile broadband services
- The need to develop a coordinated European approach to the digital dividend
- The promotion of efficiency, encouragement of investment, and delivery of enhanced services to consumers

Q1.
What would you consider to be the levels of value and benefits, including any social value which may be produced for Irish consumers / citizens and Ireland's digital economy arising from non-broadcasting uses of the digital dividend?

In order to assess the value of the Irish digital dividend in purely economic terms it is important to reference a number of recent studies that have looked at the benefit of the digital dividend for the European economy as a whole.

Economic studies

The European Commission[1] cites the value of electronic communications services that currently depend on radio spectrum in the EU to exceed 250 billion. Indeed the i2010 initiative[2] also recognised the role of radio spectrum as an enabler for growth, as a facilitator for innovation in ICT, and to help provide more affordable services to European citizens.

Within the context of growth and development, spectrum that is currently used for analogue broadcasting (spectrum between 470-862 MHz) is particularly attractive across the electronic communications sector as it offers the optimal balance of capacity, distance and coverage. For this very reason, spectrum that will become available for alternative uses further to the switch off of analogue television services has to be seen as optimal spectrum for a range of services, including the availability of broadband in rural areas.

Looking specifically at the "dividend" from a reallocation of UHF spectrum, a study by Spectrum Value Partners[3]found that allocating at least some UHF spectrum to mobile operators would generate between €63 billion and €145 billion in net present value to the European economy. In addition, a study by SCF Associates[4] found that the economic output per MHz of bandwidth to be estimated at €68 million for mobile compared to €28 million for digital TV.

It is important, therefore, that Ireland not only benefits from this dividend, but maximises the potential that exists for expansion of much needed broadband coverage.

Therefore, as wireless broadband services have the potential of reaching users that are now left out or have limited access to broadband services, Meteor strongly supports the goal of bridging the digital divide by providing access to a portion of the UHF band to the mobile sector.

[1] Reaping the full benefits of the digital dividend in Europe: A common approach to the use of the spectrum released by the digital switchover Com (2007) 700 final
[2] EU policy framework for the information society and media
[3] Getting the most out of the digital dividend: allocating UHF spectrum to maximise the benefits for European society. Spectrum Value Partners, March 2008
[4] The Mobile Provide: Economic Impacts of Alternative Uses of the Digital Dividend, 2007

The need for European Coordination

The European Commission Communication[5] recognises that there are three broad categories of services for which spectrum resulting from the digital dividend would be suited. Theses are: wireless broadband communications; additional terrestrial broadcast services and mobile multi-media. Within these categories, however, further consideration is given to need for the optimal use of digital dividend spectrum. The Commission stresses that technical barriers should be removed thereby unlocking the digital dividend's full capacity and ultimately ensuring that economies of scale and scope are upheld. The Commission also makes it clear that coordination across Member States is critical to ensure and stimulate economic development and indeed argues that a coherent approach across the EU is in the general public interest.

It is important, therefore, that when we are discussing the level of benefit and value that could be derived from digital dividend spectrum that regulators ensure that the greatest value is realised. Indeed ensuring delivery should guide decisions on spectrum allocation, i.e. the optimal split in terms of economic and social objectives.

The benefits of harmonisation

The World Radio Conference 2007 saw the identification of the 790-862 MHz band for mobile in Europe, the Middle East and Africa from 2015. In addition, a number of EU Member States are signatory to a footnote to that decision allowing for mobile services to use this band in advance of 2015. Meteor would argue that spectrum at 700/800 MHz is needed by mobile operators to allow economically efficient mobile broadband coverage and would urge the Irish government to ensure that, at the next ITU WRC (to be held in 2011), Ireland is signatory to this amendment.

The decision taken by the WRC in respect to the designation of the band 790-862 MHz for mobile services is extremely important with regard to future use, applications and services that could avail of the spectrum, and the implications for the development of competition. Ensuring that digital dividend spectrum is harmonised as much as possible will help to maintain and indeed enhance the economic value of the spectrum. It is important to recognise that separate national band-plans destroy value and there is a need to control cross-border interference and reduce terminal costs.

Harmonisation has been identified as key in the realisation of the value of the digital dividend by a number of regulatory authorities and governments across the European Union. Indeed OFCOM in its deliberations on the digital dividend[6], highlighted a number of European countries that have already publicly identified the 800 MHz band as their digital dividend: Sweden (2007), Finland (2008), France (2008) and Switzerland (2008). Recognising the importance of a common approach OFCOM stated that

> *"these countries have a combined population of 84 million. Germany, Ireland and Norway, who are known to be considering similar plans, would take this figure to 175 million. Other European countries may follow suit, not least given the debate within the European Union about a common approach to the use of the digital dividend.*

[5] Reaping the full benefits of the digital dividend in Europe: A common approach to the use of the spectrum released by the digital switchover Com (2007) 700 final

[6] "Digital Dividend: clearing the 800 MHz Band", OFCOM, 2009

Population or, more specifically, market size, is important as it affects manufacturers' ability to realise economies of scale and so set process for network and handset equipment".

Meteor has referenced this statement as it adds further weight to the need for a common coordinated approach across Europe.

Q. 2
How in your view could various industry sectors, for example transport, healthcare, education or other public sector industries, benefit from utilising digital dividend spectrum? Please include details of the potential spectrum requirements of the industry in your answer.

Use of the digital dividend is all about the ability to deliver high quality, expansive, fast data services and in turn extend access to such services to a greater number of people. In addition, digital dividend spectrum should enhance the ability for industry to deliver new products and services, thereby meeting the growing needs of society. Every sector of society can benefit from enhanced mobile broadband access services and internet connectivity as providing the access mechanism allows for development and innovation.

The following is a brief overview of the types of services that could be developed in the sectors highlighted above. This is not an exhaustive list, however, should provide a flavour of the potential that is there to be tapped, if access is granted and if access is managed in a pro-active and holistic basis.

1. Health Care:

   Adoption of techniques generally used by countries with expansive land mass but low population density where patient monitoring is done remotely by the patient themselves and transmitted back to central health care office for follow up/management of the care. Consider reductions in health care resources and budget, assuming suitable products available.

2. Transport:

   Positioning services coupled with MBB would facilitate fleet management and remote business capabilities. Higher speed and improved service offerings enabling home office environments could lead to reductions in travel, carbon emissions, congestion etc.

3. Education:

   Tech streams could be included in school curriculum with the development of virtual classrooms.

Q. 3

Please outline your views regarding:

- **(i) the types of applications and services which you consider the digital dividend should be used for;**
- **(ii) possible spectrum requirements of those applications;**
- **(iii) timeframes for making available rights of use for digital dividend spectrum; and**
- **(iv) the potential levels of competition which may result in existing or new products and services markets**

(i) Types of applications and services

Digital divided spectrum is ideal spectrum to be used for the delivery of mobile broadband services. Indeed the GSM Association has argued that if just 25%, or around 100MHz, of the spectrum currently used by analogue TV (470 - 862 MHz) was re-allocated to mobile communications, the mobile industry could dramatically speed up the rollout of broadband communications and increase coverage.

The spectrum that could become available is ideal for the delivery of mobile broadband applications as its characteristics would allow for the delivery of rural broadband in a more economically efficient manner, i.e. it would allow operators to cover large geographical areas with fewer base stations: with resulting savings in expenditure and huge environmental benefits. The result, Meteor would argue, is the delivery of potentially cheaper broadband services to a larger number of customers. In addition, the spectrum would also ensure higher quality indoor coverage, enhancing operators' ability to provide a range of products and services to the market.

In terms of the types of applications and services that could be delivered, these include:

- Mobile broadband
- Mobile TV
- Video streaming
- Mobile music
- Video calling and blogging
- Gaming

(ii) Spectrum requirements

As outlined previously, the development of mobile applications and the delivery services could be hugely enhanced by the designation of a portion of the digital dividend to the mobile sector. Making further spectrum available would facilitate early launch of LTE and/or further HSPA deployments, while at the same time not risking the provision of existing GSM services for consumers.

However, for society as a whole to truly benefit from the dividend, there is a requirement to have a meaningful and sizeable amount of spectrum assigned. As a first step, therefore, Meteor would urge Ireland to be signatory to the footnote to the ITU WRC decision

designating 792-860 for mobile services, and ensure that the framework to allow for the spectrum to be realised on the national market is put in place as soon as possible.

This framework should ensure that operators have at least a 2x10 MHz assignment of spectrum as this is the minimum required to provide an efficient LTE service.

(iii) Timeframes

The benefits of the digital dividend can only be realised when analogue broadcast services are switched off and dividend spectrum is released. In this regard, Ireland is hampered by a failure to adequately plan for the switch off of analogue TV at the earliest opportunity with the resulting loss of opportunity for use.

Meteor welcomes, therefore, this first planning step. However, as Meteor has indicated in its response to ComReg Consultation 09/14[7], it is imperative that spectrum access reform should be conducted in a holistic manner. Certainty around the amount spectrum available and its timing will influence strategic and investment decisions with regard to other spectrum initiatives, such as 900/1800 MHz band and the 2.6GHz Band. From the outset, Meteor would argue that any decisions taken regarding access to the digital dividend is also aligned with decisions in respect to access rights for 900 MHz and 1800 MHz bands.

Furthermore, we would welcome the publication of ComReg's response to consultation 08/44 on the release of certain UHF spectrum which must be considered in the context of developing a holistic and coherent approach to the availability of spectrum for the evolution and development of mobile services.

(iv) Potential for competition

The availability of digital dividend spectrum for the delivery of mobile broadband services has the very real potential to enhance both the scope and depth of products and services offered by mobile operators.

As outlined above, the benefits of using digital dividend spectrum for the provision of mobile broadband are enormous, both in societal and economic terms. However, new technology such as LTE (Long Term Evolution) will require larger bandwidth. Therefore, regulators need to be mindful of the detrimental impact that some forms of regulatory intervention could have. Meteor would argue that limiting spectrum bandwidth or inflating access prices could result in fewer operators, reduced competition, higher consumer prices and a lessening of service differentiation.

It is important for Ireland to ensure that access to the spectrum is optimised to ensure that operators can utilise the spectrum in the most technically efficient manner possible and deliver enhanced services to the widest number of people as possible. Utilising digital dividend spectrum will allow for an expansion of services which should, if managed correctly, play an important role in improving economic performance and in bridging the digital divide.

[7] Response to Consultation: Liberalising the future use of the 900 and 1800 MHz spectrum bands and spectrum release options, ComReg 09/14, 2009

Q. 4
Would you consider there to be other key issues which should be considered in terms of gaining a deeper understanding of the spectrum requirements of new applications and services? If so, what are they and please elaborate.

With respect to the provision of new applications and services through new technology, the only limiting factor on the type of technology used within the bandwidth is interference with neighbouring spectrum. Future services have not yet been defined, however, the spectrum potentially being made available now must support a significant increase in speed required for such applications and services (may be downlink or uplink).

With this in mind, while technology and service neutrality are recognised as the most flexible approach, it is important that guidelines from standardisation bodies (e.g. spectrum masks and technologies certified for use in that band, similar to the EC directive identifying UMTS as a recognised technology for the 900 MHz band) ensuring spectrum efficiency, coexistence and minimum interference, are supported.

In addition to harmonisation of the band to be made available, it is important that standardised channels and duplexing criteria are followed. The use of a single duplexing methodology e.g. Frequency Division Duplexing, will ensure minimum use of guardbands and maximum spectral efficiency. CEPT guidance, where available, should be followed in this regard.

A key issue which needs to be understood is the potential of the interleaved spectrum (White spaces). A single broadcast transmitter will broadcast 6 muliplexes, i.e. 48 MHz of spectrum (6 x 8 MHz channels). This may leave up to 276 MHz of broadcast spectrum unused in large geographic areas (assuming 470 – 790 MHz is the band used for DTT).

If this interleaved spectrum could be utilised through the use of inter alia cognitive radio, it would greatly enhance the benefits from the digital dividend.

This spectrum could be released as unlicensed (as in the USA) or licensed. A cost benefit analysis would be required on which licensing regime would best suit the consumer.

Q. 5

What are your views regarding the level of demand for Ireland to reserve UHF spectrum for innovation and experimentation? Please support your views with consideration to the availability of UHF spectrum.

In a paper published by the Department of Communications, Energy and Natural Resources in 2009[8], the Department recognised the need to develop an Irish band plan for the release of digital dividend spectrum in a manner that is compatible with the general trends in the industry.

Whilst Meteor is hugely supportive of innovative use and the requirement to ensure that new products and services are provided with the environment in which to cultivate and test new services, it is crucial that operators and manufacturers currently active within the marketplace can develop and innovate in a defined and stable environment. Industry needs to be confident in the security of spectrum allocations and confident that such allocations will be developed in a harmonised manner across the EU.

The development of GSM and 3G/WCDMA networks, handsets and services requires significant investment by the industry and, therefore, regulators need to consider all the implications of spectrum-related decisions to design consistent long-term spectrum policies. Meteor would argue, therefore, that any reservation of bands for testing and experimentation should be in addition to the bands being made available to operators for commercial use.

Q. 6

In light of your views on non-broadcasting services, do you consider that a mixed approach to spectrum allocation in the UHF spectrum band should be adopted? Please provide reasons for your view.

Meteor agrees with ComReg that a mixed approach to spectrum allocation in the UHF band should be adopted, and would argue that such an approach will derive the maximum benefit for society as a whole. However, as stated above, whilst Meteor would urge the Irish government to be a signatory to the WRC decision designating 790-862 MHz for mobile services, we would urge the regulator to look beyond just this provision as additional spectrum could be made available.

[8] Development of a National Policy Framework for identifying spectrum for the Digital Dividend, DCENR, 2009

Q. 7

Do you agree with ComReg's assessment regarding the initial mix between broadcasting and non-broadcasting services? Please answer in terms of your views regarding the initial mix between broadcasting and non-broadcasting services and any other considerations that you consider relevant.

The mobile sector has long argued that a proportion of digital dividend spectrum should be assigned to the mobile sector for the development and delivery of mobile broadband services. This requirement has been acknowledged by the WRC through the designation of the band 790-862 MHz for wireless broadband services post 2015. This, mobile operators believe, is the minimum required to ensure efficiency of use.

ComReg has, however, identified 272 to 312 MHz of spectrum for Digital Terrestrial Television. Considering the population density, distribution and the terrain of Ireland, Meteor would query whether this spectrum assignment is appropriate as it would appear to be overly generous. A detailed frequency plan should identify the exact amount of spectrum required.

Q. 8.

Do you consider that, if the spectrum demand for the provision of DTT services does not meet the level envisaged by the 2007 Act, a review of the initial mix should be carried out following analogue switch-off of television services in the UHF band? If so, please provide reasons for your view and also indicate which stakeholder(s) should participate in such a review. If not, please provide reasons for your view.

Meteor would agree that a review of the initial mix of spectrum assigned for broadcasting and non-broadcasting services should be reviewed, however, would not agree that such a study should be deferred until after the switch-off of television services in the UHF Band.

Meteor would urge ComReg to carry out a detailed review of the initial assignment as soon as possible. Such a study should, therefore, provide the basis on which to adequately plan for the future use and provide current and potential new users with greater clarity on spectrum that could be made available for alternative use post analogue switch off.

All stakeholders / users of radio spectrum should be invited to participate in such a review.

Q. 9.

Do you consider that the 800 MHz sub-band should be reserved for services other than broadcasting? Please provide reasons for your view.

Meteor believes that the sub-band 790-862 MHz should be reserved for mobile broadband.

Q. 10.
How do you consider that the current uses of channel 69 in Ireland, for example Programming Making and Special Events (PMSE) uses, would be impacted by reserving the 800 MHz band for non broadcasting services? Please provide your view on how PMSE uses could be accommodated if such uses were to be displaced from channel 69.

Including this channel within a reservation of spectrum for non-broadcasting services would result in an assignment of 72 MHz at 790-862. A possible commercial outcome would realise the greatest access to the spectrum block for as many operators as possible.

As part of ComReg's deliberations, Meteor would like to highlight the recently published OFCOM consultation[9] which examines the benefits of including channel 69 in the UK's upper sub-band for non broadcasting services. OFCOM concludes that the benefits arising from clearing the channel and ensuring access in a lower channel (Channel 38) would greatly outweigh any cost of replacing the channel at a lower frequency range. As justification for such action the regulator cites the decisions taken in other European countries to release the entire block 790-862 MHz for non-broadcast services, and considers the benefits in adopting a harmonised approach.

As regards the Irish market, Meteor would stress that the use of this spectrum would be more efficient if current users of channel 69 were moved to channel 38.

Q. 11.
Do you consider there to be merits in the identification of additional sub-bands? If so, please provide details in terms of timing and any other details which you consider relevant and reasons for your view. If not, please provide details and reasons for your view.

Meteor would argue that frequencies below 790MHz (down to 700MHz currently occupied by UHF transmitters) could be used more efficiently by mobile technology, thereby increasing the potential uses for this spectrum. Indeed the GSMA has argued that at least 100 MHz of UHF spectrum can easily be freed for mobile services without impacting broadcast TV services.

Again, however, coordination and harmonisation needs to be paramount as its success for use by mobile can only be truly realised if adoption is at a pan-European level.

[9] Digital Dividend: clearing the 800 MHz band

Q. 12

What type of channel configuration would you consider would deliver most economies of scale in terms of availability of equipment and tuning / roaming of equipment? Please explain in terms of an indicative channel plan of frequencies, see for example Figure 2.0, and if you propose a channel configuration please give details of how this might impact broadcasting use of the band?

As stated previously, advanced technology such as LTE will require wider bandwidths to offer mobile broadband data rates (for example 2 x 20 MHz for up to 150 Mbits/sec downlink). This will deliver services that consumers want with the utmost efficiently.

However, Meteor would stress that spectrum needs to be allocated to accommodate multiple operators thereby promoting competition. As such a larger assignment of spectrum for mobile broadband could ensure delivery. Again, Meteor would emphasise that a lack of synchronisation across member states will increase the time to market for new products and services and therefore impede the roll-out of mobile broadband in Ireland.

Q. 13

Do you consider there to be merits in accelerating access to a digital dividend sub-band in Ireland? If so, what considerations do you believe would need to be taken into account and how would they impact accelerating access to the digital dividend, for example:

- **(i) Possible opportunity costs of delayed access;**
- **(ii) Time-table for analogue television switch-off;**
- **(iii) Geographic location of potential cleared spectrum bands;**
- **(iv) Risk of fragmentation of digital dividend; and**
- **(v) Any other risk/benefits which would need to be considered.**

As highlighted in many of the previous responses, what industry in Ireland requires is certainty on development, certainty of delivery and clarity on rights and access. If this is provided, industry can adequately plan the delivery of services and make solid investment decisions. It is for this reason that Meteor has argued that long-term holistic planning is what is required for the Irish market.

In the first instance, Meteor would urge the government to be signatory to the WRC designation of the sub-band for the delivery of mobile broadband services in 2011. Industry requires this decisive action to allow for future planning.

In addition, we would again reiterate the need for far reaching decisions on spectrum access to be taken in the round. In this regard, we would urge ComReg to defer decision making on the future release of 900 MHz and 1800 MHz spectrum and a decision on 2.6 GHz expansion band until clarity on the digital dividend can be offered. This will allow industry to ensure that investment is best placed and will contribute to long term network investment.

With respect to additional benefits, Meteor would urge the regulator to extend available spectrum for mobile broadband to 700MHz, thereby releasing 700MHz-862MHz.

Q. 14
What would you consider to be an optimal time for holding awards for digital dividend spectrum? Please refer to the considerations outlined in question 13 above.

A number of issues should be taken into consideration as regards timing.

Meteor's GSM Licence, determining access to 900 and 1800 MHz spectrum, has been granted for an initial period of 15 years. This is due to expire in 2015, however, licences granted to other GSM licences will expire in advance of this date.

At the same time ComReg will also need to make decisions on both access to potential digital dividend (from 2012) and the 2.6 GHz expansion band (current licences expire in 2014).

Access to spectrum assignments in such important spectrum bands will shape and influence the development of the telecommunications sector in Ireland for many years to come. It is important, therefore, that decisions are taken in the round, thereby affording operators the means on which to ground investment decisions.

Q. 15
Please quantify your answers to questions 13 and 14 in terms of what benefits might accrue to Irish consumers and citizens and Ireland's digital economy if access to a sub-band could be made available as soon as possible.

Increasing the quantity of spectrum available for mobile services will deliver significant benefits including:

- Continued provision of service to consumers which will benefit society
- Removal of artificial constraints to business continuity arising from spectrum licensing which would allow further development of services and infrastructure by operators
- Earlier time to market for more advanced services
- Continued market place competition thereby benefiting consumers
- Competition differentiation based on service offerings

Q. 16
Please provide views on the opportunity cost of delayed access to cleared spectrum and the possibility of negotiating early access directly with broadcasting spectrum users.

There are a number of international studies (see response to question 1) which highlight the broad economic benefits anticipated from the release of digital dividend. We would expect that the conclusions of these studies, demonstrating significant economic benefits from alternative use of digital dividend spectrum, would apply equally in Ireland. However we are not aware of any detailed study specifically focussed on Ireland. We would recommend that such a study is commissioned by ComReg to promote informed decision making.

The timing of access to cleared spectrum will depend on a number of factors which are influenced by DCENR, ComReg, and BCI policy decisions. We strongly believe that there is a need for a more joined up approach between the relevant policy makers to Ireland's switchover to digital television and release of the resulting digital dividend.

Q. 17
Do you consider that service and technology neutrality should generally be a key principle for spectrum rights of use arising from the digital dividend? Please provide reasons for your view.

Meteor agrees that service and technology neutrality is an important principle. However as highlighted earlier in this response this needs to be balanced with minimising technical interference and maximising the benefits that accrues to smaller countries, such as Ireland, from harmonisation of use.

Q. 18
Do you consider that spectrum rights of use arising from the digital dividend should exclude the ability to provide DTT services? Please provide reasons for your view.

Meteor strongly believes that there are significant benefits from releasing the digital dividend to alternative uses. Consequently we would agree that the provision of DTT services, addressed under the 2007 Act, should be excluded.

9 Nokia and Nokia Siemens Network

7 May 2009

Nokia[1] and Nokia Siemens Network[2] Response to Comreg UHF consultation 09/15

Q. 1. What would you consider to be the levels of value and benefits, including any social value which may be produced for Irish consumers / citizens and Ireland's digital economy arising from non-broadcasting uses of the digital dividend?

We submitted the following response to a recent DCENR consultation on spectrum policy:

"Radio spectrum below 1GHz is especially suitable for coverage provision for mobile broadband communication. We encourage Ireland to consider the band 790-862MHz for mobile broadband use, as has already been decided in several European countries."

We also endorse the conclusions of the Spectrum Value Partners (SVP) report.

Provision of spectrum in 790-862MHz will enable more economic deployment of mobile services. SVP found that for nationwide coverage 30-45% fewer base stations would be required, than if the spectrum was not available, for the countries they focused on. Lower site and energy costs are even more significant than CAPEX.

Indoor coverage will also be improved.

Q. 2. How in your view could various industry sectors, for example transport, healthcare, education or other public sector industries, benefit from utilising digital dividend spectrum? Please include details of the potential spectrum requirements of the industry in your answer.

Q. 3. Please outline your views regarding (i) the types of applications and services which you consider the digital dividend should be used for; (ii) possible spectrum requirements of those applications; (iii) timeframes for making available rights of use for digital dividend spectrum; and (iv) the potential levels

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[1] **About Nokia**
Nokia is a world leader in mobile communications, driving the growth and sustainability of the broader internet and communications industries. Nokia connects people to each other and the information that matters to them with easy-to-use and innovative products like mobile phones, devices and solutions for imaging, games, media and businesses. Nokia provides equipment, solutions and services for network operators and corporations.

[2] **About Nokia Siemens Networks**
Nokia Siemens Networks is a leading global enabler of communications services. The company provides a complete, well-balanced product portfolio of mobile and fixed network infrastructure solutions and addresses the growing demand for services with 20,000 service professionals – out of a total work force of almost 60,000 employees worldwide. Nokia Siemens Networks is one of the largest telecommunications infrastructure companies with operations in 150 countries.

of competition which may result in existing or new products and services markets.

See Q1.
In addition Comreg should investigate the use of the spectrum by licence-exempt cognitive radio devices in part of the band (we have proposed to the UK that use is restricted to channels below 698MHz.)

Q. 4. Would you consider there to be other key issues which should be considered in terms of gaining a deeper understanding of the spectrum requirements of new applications and services? If so, what are they and please elaborate.

Q. 5. What are your views regarding the level of demand for Ireland to reserve UHF spectrum for innovation and experimentation? Please support your views with consideration to the availability of UHF spectrum.

Q. 6. In light of your views on non-broadcasting services, do you consider that a mixed approach to spectrum allocation in the UHF spectrum band should be adopted? Please provide reasons for your view.

As we say in Q17 a distinction between broadcasting and mobile can often be justified. But the overiding consideration in this band is that mobile should be permitted in 790-862MHz. We support the adoption of the CEPT FDD bandplan in this regard.

Q. 7. Do you agree with ComReg's assessment regarding the initial mix between broadcasting and non-broadcasting services? Please answer in terms of your views regarding the initial mix between broadcasting and non-broadcasting services and any other considerations that you consider relevant.

See Q6

Q. 8. Do you consider that, if the spectrum demand for the provision of DTT services does not meet the level envisaged by the 2007 Act, a review of the initial mix should be carried out following analogue switch-off of television services in the UHF spectrum band? If so, please provide reasons for your view and also indicate which stakeholder(s) should participate in such a review. If not, please provide reasons for your view.

Q. 9. Do you consider that the 800 MHz sub-band should be reserved for services other than broadcasting? Please provide reasons for your view.

This is probably not necessary (subject to interference considerations) but we would support the use of the CEPT band plan in preparation in TG4.

Q. 10. How do you consider that the current uses of channel 69 in Ireland, for example Programming Making and Special Events (PMSE) uses, would be impacted by reserving the 800 MHz band for non broadcasting services? Please

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provide your view on how PMSE uses could be accommodated if such uses were to be displaced from channel 69.

Funding will be needed to re-allocate PMSE users in channel 69.

Q. 11. Do you consider there to be merits in the identification of additional subband(s)? If so, please provide details in terms of timing and any other details which you consider relevant and reasons for your view. If not, please provide details and reasons for your view.

Even though the SVP report concluded that the economic benefits would be maximized if 92MHz are allocated to mobile operators the emphasis should be on the harmonized band 790-862MHz.

Q. 12. What type of channel configurations would you consider would deliver most economies of scale in terms of availability of equipment and tuning / roaming of equipment? Please explain in terms of an indicative channel plan of frequencies, see for example Figure 2.0, and if you propose a channel configuration please give details of how this might impact broadcasting use of the band?

The CEPT FDD bandplan should be adopted.

Q. 13. Do you consider there to be merits in accelerating access to a digital dividend sub-band in Ireland? If so, what considerations do you believe would need to be taken into account and how would they impact accelerating access to the digital dividend, for example (i) possible opportunity costs of delayed access; (ii) time-table for analogue television switch-off; (iii) geographic location of potential cleared spectrum bands; (iv) risk of fragmentation of digital dividend; and (v) any other risk/benefits which would need to be considered.

We submitted the following response to the recent DCENR consultation on spectrum policy:

"In general the principle is supported. Not only should external benefits be taken in to account but so should costs to third parties and the environment. Decisions on spectrum management or technology choice can impact energy use, especially in mobile networks. For example, energy and environmental savings can be made if lower frequencies are used, or if base station sharing can be encouraged at off-peak times (that is to say, some base sations could be switched of at night). As a consequence of regulatory independence these issues need to be taken in to account in a more systematic way.

High up-front payments should be avoided in licensing, e.g. auctions which require payment for the entire licence period in advance are not economically efficient. Revenue from later years is discounted by bidders at a rate which far exceeds that which would apply to societal benefits (the social discount rate.)"

Q. 14. What would you consider to be an optimal time for holding awards for digital dividend spectrum? Please refer to the considerations outlined in question 13 above.

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It is in general preferable to hold awards as soon as possible, even if the spectrum will not be immediately available. This will increase supplier confidence in terms of investment, and thereby increase competition in supply.

Q. 15. Please qualify your answers to questions 13 and 14 in terms of what benefits might accrue to Irish consumers and citizens and Ireland's digital economy if access to a sub-band could be made available as soon as possible.

Q. 16. Please also provide views on the opportunity cost of delayed access to cleared spectrum and the possibility of negotiating early access directly with broadcasting spectrum users.

Q. 17. Do you consider that service and technology neutrality should generally be a key principle for spectrum rights of use arising from the digital dividend? Please provide reasons for your view.

We submitted the following response to the recent DCENR consultation on spectrum policy:

"Technology neutrality: This has a variety of different meanings in different contexts. In some countries, it has been used as a policy to try to incorporate new technologies in an existing regulatory framework. Whilst new and additional competition is welcome, flexibility should be provided in the spectrum domain in a sound manner, incorporating good radio engineering practices.

Nokia and NSN support technology neutrality, when it refers to the issue that a certain band is not limited to a certain technology but all technologies that fulfil the 'rules of the band' can be used. However, in the name of spectrum efficiency, harmonized band plans designating the paired (FDD) and unpaired (TDD) bands should be respected. Mixing FDD and TDD in the same band result in more expensive and complex equipment. Typically, all technologies (like LTE, WiMAX, UMB) have both duplex methods available and can make FDD and TDD equipment available, based on the business case. A good example is the band plan for 790-862 MHz, where the majority of European players favours FDD arrangement to make the full benefit out of the better propagation conditions. Mixing FDD and TDD would only decrease the available spectrum to all users.

Nokia and NSN support technology neutrality as long as it does not increase fragmentation of the market or violate basic spectrum usage conditions (such as causing harmful interference) or violate consumer rights or other public interests. Also, technology neutrality brings value only if interoperability is not compromised. If technology neutrality happens without interoperability, benefits are lost and complexity is increased (e.g. multi-radio), leading to an increased Total Cost of Ownership

Service neutrality:

Nokia and NSN support a coherent regulatory regime for services/ networks/ applications that are offering the same kind of services in different frequency bands. Although the distinction between different ITU-R Services (Mobile, Broadcasting and Fixed) has blurred through convergence the differences of allocation are usually still justified. In this way interference is minimised and a diverse range of services – not just the most profitable one – is maintained. Neutrality in terms of content is supported."

Q. 18. Do you consider that spectrum rights of use arising from the digital dividend should exclude the ability to provide DTT services? Please provide reasons for your view.

10 O2 Ireland (Telefonica O2 Europe Plc)

Digital Dividend in Ireland

Response to Consultation Document 09/15

7 May 2009

1. Introduction

As ComReg rightly points out in its consultation document, the switchover from analogue broadcasting to digital presents a "once in a generation" opportunity to review the way we use parts of the radio spectrum. Digital modulation will be significantly more efficient and will produce a "dividend" in the form of released spectrum. This dividend is particularly important in the UHF band because this spectrum is suited to use for many applications, including mobile electronic communications.

ComReg and the Department of Communications, Energy, and Natural Resources (DCENR) must now develop a strategy for how Ireland can best use the Digital Dividend, and this will involve balancing the interests of various different services and a number of different bands, both VHF and UHF. While we have some advantages in being on the west coast of Europe with few near neighbours, Ireland can not develop its policy in complete isolation. International frequency coordination and economies of scale for equipment manufacture mean we must take into account developments in other countries. Against this background, a number of studies have shown that a mixture of broadcasting and other services using the UHF spectrum would deliver the greatest overall benefit.

2. Holistic Review

There are several services that could have overlapping requirements for access to spectrum, and in addition there are several different frequency bands that can meet these requirements. ComReg and DCENR should consider all of these issues together in order to optimise the match of spectrum availability to demand. Decisions regarding one band or service should not be taken in isolation from other relevant ones.

The next generation of mobile communications service will require greater bandwidths for individual networks, and there will likely be insufficient spectrum available in the 900MHz band. The Digital Dividend might be a substitute for this band and allow for overall demand to be met using both bands together, but its availability needs to be known as early as possible, as this may impact on assignments in the 900MHz band.

Equally, the overall demand for spectrum by various services in different bands should be assessed, as this will give an indication of how much spectrum can be made available in the valuable UHF band. O2 is of the view that the bands listed in the table below should form part of this broader consideration.

In addition O2 notes that in mid 2008, ComReg opened a consultation on the possible award of UHF spectrum for mobile TV service (08/44). ComReg should now conclude that consultation and publish its response.

VHF Band I	Currently broadcasting
VHF Band II	Currently analogue broadcasting
VHF Band III	Currently broadcasting, suitable for DAB or DTT
VHF Bands IV & V	Currently broadcasting, suitable for several services, including DTT, and mobile voice/broadband. Possible substitute for 900MHz
900MHz	Mobile voice/broadband
1800MHz	Mobile voice/broadband
2.6GHz	Currently broadcasting (MMDS). This will be the first band for 4th Generation broadband (LTE). ComReg to consult in 2010.

3. Matching Supply and Demand

O2 notes the reference in section 3.7 of ComReg's consultation document to the requirement under the 2007 Broadcasting Act[1] to reserve 6 multiplexes for DTT (Digital TV). An assumption seems to have been made that this requirement must be met using UHF. O2 believes there are a number of considerations that should be examined which could reduce the amount of UHF spectrum that is required for DTT, thus releasing it for other services. The Act does not specify that the UHF band should be used to provide the DTT multiplexes, and VHF could be used to meet some of the requirement. In many respects VHF is more suited to terrestrial broadcasting than UHF.

There are three VHF bands available, providing a total of over 92MHz of spectrum. O2 believes this spectrum can be used to meet the requirements for analogue sound broadcasting, digital sound broadcasting (DAB), and at least some of the DTT service. There are indications that the real demand for digital broadcasting spectrum that was envisaged in the 2007 Act may never emerge in reality:

- Ireland has a relatively low usage of terrestrial broadcasting, with over 75% of households subscribing to satellite, cable, or MMDS
- the withdrawal of Boxer TV from the provision of DTT could indicate that the demand for multiplexes will not emerge
- indications are that there will be a relatively small demand for spectrum for DAB
- the 2.6GHz is currently in use to provide a broadcasting service in Ireland. This already carries much of the programme material that would be provided on DTT.

4. Clarifying Analogue Switch-off

The Digital Dividend can not be realised until analogue TV is actually switched off (ASO), and as of yet a definite date has not been set for ASO

[1] Broadcasting Amendment Act 2007, 15 of 2007

in Ireland. It is more difficult to develop plans for investments and the future development of the spectrum against a background of uncertainty as to when the Digital Dividend spectrum will actually be available. While this situation persists there is an increasing risk that ASO and the benefits will be delayed.

O2 believes the Minister for Communications, Energy, and Natural Resources should clarify the details of ASO by:

- setting a definite date for switch off
- clarifying whether VHF and UHF TV will be included in ASO
- clarifying plans for the VHF spectrum following ASO.

5. Supporting Standardisation

For mobile electronic communications, it is important that common band-plans are available. This facilitates international roaming, but more importantly allows manufacturers to achieve economies of scale – making end user equipment less costly. Ireland is a relatively small market in the context of manufacture of mobile terminals and devices, thus needs to support common European band-plans where possible.

O2 is aware that the ECC has been mandated to examine issues relating to the band-plan that could be used for electronic communications services in the 790MHz to 862MHz band (800MHz). The ECC has prepared a draft recommendation for a band-plan that would facilitate FDD. The draft recommendation leaves flexibility for national administrations to determine how the spectrum is to be used, but the adoption of the recommendation would give manufacturers the certainty needed to develop equipment for this band. O2 urges ComReg to support this draft ECC decision, and in Ireland would advocate the adoption of the arrangement specified in Annex 1.

6. Benefits of Mobile Broadband

Broadband penetration in Ireland has always lagged behind the EU average, and it is only since the launch of mobile broadband products with HSDPA technology that it has been possible to close this gap. Mobile broadband now accounts for 26% of broadband connections, and with an annual growth rate of 146% is the fastest growing method of broadband access. Consumers have "voted with their feet" for mobile broadband and it has brought significant consumer benefits. The UHF band is ideally suited for provision of mobile electronic communications services – it is good for both penetration of buildings in urban and suburban areas, and for providing coverage in rural areas.

Ireland stands to make substantial gains by making an early allocation of spectrum from the Digital Dividend to electronic communications services. A number of reports have assessed the benefit of making spectrum

available for mobile broadband or other electronic communications use. The most relevant are probably the study by Spectrum Values Partners covering Europe, and the report produced by Europe Economics for ComReg focusing on Ireland. The Europe Economics report showed that maximum benefit could be gained by allocating between 80MHz and 120MHz to services other than Broadcasting.

As demand for higher-speed broadband services continues to grow, so the bandwidth that will be required to meet that demand will grow. The next generation of mobile broadband service will require that each network operator use greater contiguous bands of UHF spectrum, e.g. 3G LTE will need bandwidths of up to 2x20MHz per operator to be fully effective. This requirement can not be met for all operators from the 900MHz band; however it may be possible to meet demand for sub-1GHz spectrum by using both the 800MHz band and the 900MHz bands.

7. Response to Questions

Q. 1. What would you consider to be the levels of value and benefits, including any social value which may be produced for Irish consumers / citizens and Ireland's digital economy arising from non-broadcasting uses of the digital dividend?

The allocation of Digital Dividend spectrum for non-broadcasting use will allow for mobile communications services to use this spectrum. Spectrum below 1GHz is particularly suitable for mobile use, and high speed broadband services like LTE will need more bandwidth than is currently available at 900MHz. This would facilitate the introduction of 4th generation mobile services, bring high-speed broadband to customers who can't currently avail of it (particularly in rural areas), and increase competition between broadband providers. Europe Economics has estimated that the peak net value can be reached by allocating approximately 100MHz to mobile broadband use; this gives an NPV in excess of €1.7bn from non-broadcast use.

Q. 2. How in your view could various industry sectors, for example transport, healthcare, education or other public sector industries, benefit from utilising digital dividend spectrum? Please include details of the potential spectrum requirements of the industry in your answer.

It is O2's position that mobile broadband has an immediate requirement, however can envisage that there are other services and applications that could use some of the Digital Dividend.

Q. 3. Please outline your views regarding (i) the types of applications and services which you consider the digital dividend should be used for; (ii) possible spectrum requirements of those applications; (iii) timeframes for making available rights of use for digital dividend spectrum; and (iv) the potential levels of competition which may result in existing or new products and services

markets.

The spectrum from the Digital Dividend that will be made available for mobile broadband should be clarified as soon as possible, as this will have a direct impact on decisions made regarding the 900MHz band. The range of services will be very wide: from mobile broadband type of services (Internet, ecommerce, video streaming, video on demand, IPTV, etc…) to niche service requiring total freedom of movement (indoor and outdoor) like healthcare, security, insurance identification, transportation, e-payment and mobile banking.

In the longer term, for high-speed mobile broadband, each operator may require 2x15MHz to 2x20MHz of spectrum in a single band below 1GHz. In this case, the 900MHz band would be insufficient to cater for the existing operators. As a harmonised band plan is optimum for roaming and terminal cost, Ireland should support the band-plan in Annex 1 to the proposed ECC decision.

Q. 5. What are your views regarding the level of demand for Ireland to reserve UHF spectrum for innovation and experimentation? Please support your views with consideration to the availability of UHF spectrum.

As discussed above, O2 believes the true requirement for UHF spectrum for broadcasting may be overestimated at present, particularly when the VHF band is taken into consideration and as consumers move away from linear viewing. O2 supports ComReg's initiatives to encourage innovation using spectrum, but has doubts whether a defined fixed allocation is the best solution. This may lack the flexibility required for innovation and end up with spectrum being under-used.

Q. 6. In light of your views on non-broadcasting services, do you consider that a mixed approach to spectrum allocation in the UHF spectrum band should be adopted? Please provide reasons for your view

Yes, see further comment above in section 6.

Q. 7. Do you agree with ComReg's assessment regarding the initial mix between broadcasting and non-broadcasting services? Please answer in terms of your views regarding the initial mix between broadcasting and non-broadcasting services and any other considerations that you consider relevant.

As stated above, O2 believe actual demand for spectrum for digital broadcasting will not be as great as envisaged in the 2007 Act. In addition, when the VHF spectrum is taken into account, there will be substantially reduced demand for broadcasting use of the UHF band.

Q. 8. Do you consider that, if the spectrum demand for the provision of DTT services does not meet the level envisaged by the 2007 Act, a review of the initial mix should be carried out following analogue switch-off of television services in the UHF spectrum band? If so, please provide reasons for your view and also indicate which stakeholder(s) should participate in such a review. If

not, please provide reasons for your view.

Such review should be carried out, however it should not wait for ASO to be completed – a firm date for this has not yet been set. The review should be carried out this year, and be open to all interested parties.

Q. 9. Do you consider that the 800 MHz sub-band should be reserved for services other than broadcasting? Please provide reasons for your view.

Yes, for the reasons specified above.

Q. 10. How do you consider that the current uses of channel 69 in Ireland, for example Programming Making and Special Events (PMSE) uses, would be impacted by reserving the 800 MHz band for non broadcasting services? Please provide your view on how PMSE uses could be accommodated if such uses were to be displaced from channel 69.

O2 recognises that PMSE has a requirement to use spectrum, but believes there are options other than channel 69. It would be preferable not to use channel 69 for these services as this reduces the spectrum that would be available in Ireland using the CEPT proposed FDD band-plan. PMSE services are generally used by professionals who would be capable of using the "white spaces in broadcasting allocations without causing interference. In addition ComReg could consider use of other spectrum, including possibly part of a sub-band in channels 31 to 37.

Q. 11. Do you consider there to be merits in the identification of additional subband(s)? If so, please provide details in terms of timing and any other details which you consider relevant and reasons for your view. If not, please provide details and reasons for your view

Yes ComReg should examine the possibility of releasing a further sub-band for non-broadcast use.

Q. 12. What type of channel configurations would you consider would deliver most economies of scale in terms of availability of equipment and tuning / roaming of equipment? Please explain in terms of an indicative channel plan of frequencies, see for example Figure 2.0, and if you propose a channel configuration please give details of how this might impact broadcasting use of the band?

As stated above, O2 believes ComReg should adopt the proposed ECC bandplan in Annex 1 for the sub-band 790 to 862MHz.

Q. 13. Do you consider there to be merits in accelerating access to a digital dividend sub-band in Ireland? If so, what considerations do you believe would need to be taken into account and how would they impact accelerating access to the digital dividend, for example (i) possible opportunity costs of delayed access; (ii) time-table for analogue television switch-off; (iii) geographic location of potential cleared spectrum bands; (iv) risk of fragmentation of digital

dividend; and (v) any other risk/benefits which would need to be considered

Yes, the decisions taken regarding the Digital Dividend sub-band could have a direct impact on operators demand for 900MHz spectrum, which is being considered at present. Accelerating the availability of the Digital Dividend will provide opportunities to third party companies to create jobs and export expertise to other EU countries (as verified in Italy with their early adoption of DVB-H technologies). Ireland should leverage further its unique benefits of being an island with only one neighbour to leapfrog the Digital Dividend implementation and be to the forefront of these new business communication segments of the digital economy.

Q. 14. What would you consider to be an optimal time for holding awards for digital dividend spectrum? Please refer to the considerations outlined in question

The date for ASO should be made firm as soon as possible to give certainty for making other decisions. O2 is of the view that this should be before 2012. It is not necessary for ASO to be completed before allocating a sub-band for other use – only to know that the spectrum will become available in a well defined and short time.

Q. 15. Please qualify your answers to questions 13 and 14 in terms of what benefits might accrue to Irish consumers and citizens and Ireland's digital economy if access to a sub-band could be made available as soon as possible.

See section 6 above.

Q. 16. Please also provide views on the opportunity cost of delayed access to cleared spectrum and the possibility of negotiating early access directly with broadcasting spectrum users.

See section 6 above.

Q. 17. Do you consider that service and technology neutrality should generally be a key principle for spectrum rights of use arising from the digital dividend? Please provide reasons for your view.

Yes, O2 supports this view. Technology and market changes are always quicker than the establishment of policies. The digital economy is by nature very agile and innovative. Therefore to develop the ecosystem to its full potential it is fundamental to provide an environment as free as possible from regulatory constraints.

Q. 18. Do you consider that spectrum rights of use arising from the digital dividend should exclude the ability to provide DTT services? Please provide reasons for your view

Following analogue switch off, the entire of bands IV and V will be available for digital service. If spectrum is to be reserved exclusively for digital broadcasting in these bands then this reservation should cater for the requirement, and other sub-bands should exclude broadcasting use.

The evolution of technology will profoundly modify consumption of television. Current indicators are that consumers want to be in control of the time and place of viewing, and this will bring about a move away from traditional linear television viewing. The future of television will be more "a la carte" than anything else. This will further reduce the need of DTT multiplexes in favour of more communication services offering "a la carte" communication services.

11 Qualcomm Europe Incorporated

Qualcomm Europe Inc.

Qualcomm response to the ComReg consultation paper on Digital Dividend in Ireland

Qualcomm congratulates ComReg on its vision with regards to the opportunities and challenges arising with the Digital Dividend. Qualcomm fully shares ComReg's high level analysis concluding that:

- The digital dividend is a unique opportunity for Ireland.

- Priority should be given to the supply of increased communication capacity. This should be fulfilled by the support for the release of a harmonised Digital Dividend band at a European level.

Q. 1. What would you consider to be the levels of value and benefits, including any social value which may be produced for Irish consumers / citizens and Ireland's digital economy arising from non-broadcasting uses of the digital dividend?

Wide area mobile broadband access has been recognized as a key driver for economic national competitiveness and reduction of the digital divide between urban and rural areas. Nationwide deployment is economically sensible in the sub-1GHz frequency bands, due to the favorable propagation characteristics of these bands. Therefore, nationwide deployment of mobile broadband networks should be considered a priority not only for telecommunication stakeholders but also in the interest of the general public and Ireland economic competitiveness.

This is supported by the conclusions of two key reports on the value of the Digital Dividend. Spectrum Value Partner issued in March 2008 a report entitled 'Getting the most out of the digital dividend'. The report concluded that the allocation of 80MHz of the Digital Dividend to mobile communication services would bring 94.2 to 163.3 billion Euros additional net value to the European economy.

Europe Economics issued in October 2008 a report entitled 'How Ireland can best benefit from its Digital Dividend'. The report highlighted that mobile broadband would bring an estimated additional 1250 millions to Ireland economy if it was assigned 80MHz of the digital dividend.

CEPT, mandated by the European Commission, is currently developing a harmonized band plan for mobile services in the band 790-862 MHz which will enable economies of scale and the development of technologies and products in this frequency band. France, Finland, Sweden and Switzerland have all decided to allocate the band 790-862 MHz to mobile services. UK and Germany are in the final stages in the process of adopting a similar decision. The emergence of a harmonized mobile broadband frequency band, i.e. 790-862MHz, provides a very strong incentive for Ireland to align with such a harmonized approach, in order to benefit from the economies of scale generated by several large countries in the deployment of affordable mobile broadband services.

Q. 2. How in your view could various industry sectors, for example transport, healthcare, education or other public sector industries, benefit from utilising digital dividend spectrum? Please include details of the potential spectrum requirements of the industry in your answer.

Mobile services increasingly participate in assisting people in life's everyday requirements. On a typical day, over 1 billion people worldwide rely on mobile-service offerings to get them through their daily routine.

3G services are important because they are an affordable way to provide voice and data access even in rural areas where landline access is limited or does not exist. For governments, this may mean that 3G and future LTE services are a fundamental way of increasing their countries' teledensity and Internet penetration rates and bridging the digital technology gap. For citizens, 3G and future LTE services may represent their primary way of making a phone call or how they are able to connect to the Internet and its resources. Mobile services are also key because they provide new avenues to address issues of public importance such as Internet connectivity, education, public safety, health care, governance and environmental conservation in a sustainable, efficient and cost effective manner.

3G is re-shaping the social relations between people, facilitating the creation and dissemination by individuals of new forms of online content, changing the way business is conducted, in particular by small entrepreneurs, and improving the security of citizens. Furthermore, the mobile industry has greatly contributed to economic growth, job creation, innovation and productivity gains in many sectors of the economy.

The development of reasonably priced new services such as e-health, e-education, public safety, government services, etc. will require the release of additional frequency resources in

lower frequency bands in the Digital Dividend in order to roll out cost efficiently 3G and future LTE networks:

Mobile Communication - Mobile services are changing the landscape of how people communicate daily; specifically, the why, when, how often, and in what degree they communicate. Today, mobile communication can be ubiquitous (anytime, anywhere, anyplace), personal (instant messaging, picture cards, video messaging) or interactive (push-to-talk [PTT], video telephony, video sharing).

Mobile Healthcare - Mobile healthcare services are designed to enable a better quality of life 24 hours a day, seven days a week for outpatient treatment and monitoring procedures. These services allow the capture of patients' medical data at the point of care, enabling faster diagnosis and timelier treatments. Mobile healthcare services provide freedom, mobility and an enhanced sense of wellness for outpatients and peace of mind for caregivers.

Via its Wireless Reach program Qualcomm partnered for example:

- with the Vodafone Spain Foundation and the Spanish Red Cross[1] for using 3G technologies to allow the elderly to stay connected and interact with their friends, family and caregivers and enable them to remain independent for a longer time in their own homes;

- with the Portugal Telecom Foundation[2] to improve the social inclusion of severely disabled people by using smartphones, broadband mobile enabled laptops and specific software and hardware.

Mobile and Remote Education - Mobile education services have created new avenues for learning. They provide the ability to receive live or cached classroom instruction or vocational training in a mobile or distance-learning environment.

Mobile Government – Mobile government services make public services more accessible to citizens and enterprises and hence contribute to improving the internal functioning public administrations. Public services become available 7/7 and 24/24, more convenient to use, better adapted to the needs of people and more personalized. Administrations can deal with requests more speedily, their transparency and reactivity are increased, administrative

[1] http://www.reuters.com/article/pressRelease/idUS107465+12-Sep-2008+PRN20080912
[2] http://www.webwire.com/ViewPressRel.asp?aId=81398

procedures are simplified, the information is released faster and, when needed addressed, to the specific groups concerned.

Mobile Public Safety – Intelligent cars and intelligent transport systems are amongst the new applications strongly promoted by the European Commission who encourages the development and the adoption of new technologies making cars safer, cleaner and more efficient:

- **eCall** is a European Commission project designed to improve transportation safety by providing rapid assistance to motorists involved in a collision anywhere in the European Union. The European Commission's objective is to introduce eCall as a standard option in all type-approved vehicles in the EU from end 2010 onwards. Qualcomm's eCall in-band modem was recently approved by 3GPP and ETSI and became the European standard for the interface and the transport between the eCall generator and the PSAP[3].

Location-Based Services (LBS) – LBS services will take full benefits of the future deployment of the Galileo system. For the enterprise customer, LBS means the efficient tracking of goods and services. For a consumer, LBS enhances the level of comfort by knowing the location of a child or elderly parent. For retail shops and restaurants, LBS provides timely directions for a customer who is lost. Mobile LBS provide end users with location information when and where they need it most.

Mobile Commerce - The old adage "time is money" has never been truer than in today's fast-paced economy. Mobile-commerce services (m-banking, m-payment, e-money, etc.) provide a new level of convenience and safety for managing money transactions.

Mobile Entertainment - Mobile entertainment gives end users the flexibility and freedom to engage their favourite form of entertainment programming on their terms. Mobile TV (live or cached), videos and movies (streaming or on demand), music (full tracks), gaming (casual and 3D multiplayer), or social networking (user-generated or community-developed content) are all available.

Mobile Enterprise - Mobile enterprise services are at the forefront of early wireless-technology service adoption. The implementation of mobile enterprise services provides a competitive advantage to corporations wanting to gain an edge.

[3] http://www.forbes.com/feeds/prnewswire/2009/04/06/prnewswire200904060300PR_NEWS_USPR_LA94673.html

Q. 3. Please outline your views regarding (i) the types of applications and services which you consider the digital dividend should be used for; (ii) possible spectrum requirements of those applications; (iii) timeframes for making available rights of use for digital dividend spectrum; and (iv) the potential levels of competition which may result in existing or new products and services markets.

As stated in Q1, Qualcomm considers wide area mobile networks as the prime target application for the 790-862 MHz band.

The digital dividend is a unique opportunity to obtain a 72MHz band harmonized across Europe. This band is a prime target to provide coverage of mobile broadband, and is especially interesting when considered in conjunction with the 2.6GHz, as these bands could provide a combination of capacity (2.6GHz) and coverage (790-862MHz) required for the roll-out of the next generation of mobile broadband network.

HSPA and LTE technologies roadmaps are illustrated in the figure below. The roadmap of products for the European 800 MHz band (790-862 MHz) specifically will depend on market demand, on the 800 MHz spectrum availability and its level of harmonisation across Europe and on the extent of adoption of the FDD band plan in the 800 MHz and its associated constraints, among other factors.

[Figure on available data rates from tech marketing]

Qualcomm therefore encourages ComReg to release the 790-862 MHz as soon as possible after the Digital Switch Over. An early release would provide certainty for market player and would foster product development.

The 790-862MHz is likely to allow the deployment of mobile technologies with 10 MHz channel bandwidth, due to the constraints in the handsets design. The ECC PT1 is currently developing a band plan providing 30 MHz of paired spectrum, i.e. the potential for deployment of 3 networks.

Q. 4. Would you consider there to be other key issues which should be considered in terms of gaining a deeper understanding of the spectrum requirements of new applications and services? If so, what are they and please elaborate.

ComReg would need to reconsider the issue of the harmonization of the band plan, since a common band plan has become a realistic opportunity in the past few months, contrary to the situation described by Europe Economics in its October 2008 report. France, UK and Germany have all three considered the harmonized 790-862MHz as their main priority with regards to the Digital Dividend.
ComReg may also consider the complementarities between the 790-862MHz band and the 2.6GHz band. The allocation of those bands for the deployment of mobile broadband provides significant synergies to an operator by responding to both coverage and capacity requirements.

Q. 5. What are your views regarding the level of demand for Ireland to reserve UHF spectrum for innovation and experimentation? Please support your views with consideration to the availability of UHF spectrum.

Ubiquitous mobile broadband will drive innovation, not only in terms of air interface technologies, but most critically by providing a basis for innovative mobile services. The allocation of the 790-862MHz band to mobile broadband based on a 2 x 30 MHz FDD band plan will enable to achieve this objective. The duplex gap of the FDD channeling arrangement would be appropriate for innovative low power wireless technologies

Mobile TV based on broadcasting networks also provides an innovative service and would allow to deliver efficiently mass media content and value-added services to consumers, thus off-loading mobile broadband network. New services can be designed to benefit from such a large and effective data broadcasting pipe to the users. Qualcomm believes that the allocation of part of the digital dividend, outside the band 790-862 MHz, to Mobile TV as put forward by ComReg in a previous public consultation would provide additional value for Ireland economy and would foster innovation at large.

Q. 6. In light of your views on non-broadcasting services, do you consider that a mixed approach to spectrum allocation in the UHF spectrum band should be adopted? Please provide reasons for your view.

Qualcomm urges ComReg to allocate and release the band 790-862 MHz to mobile broadband services as soon as possible after the Digital Switch Over.

Qualcomm also believes that the allocation of UHF spectrum, outside the band 790-862 MHz, for Mobile TV broadcasting services would also bring considerable value to consumers and would efficiently complement mobile broadband networks.

Q. 7. Do you agree with ComReg's assessment regarding the initial mix between broadcasting and non-broadcasting services? Please answer in terms of your views regarding the initial mix between broadcasting and non-broadcasting services and any other considerations that you consider relevant.

As stated before, Qualcomm supports the release of the band 790-862 MHz harmonised sub-band for mobile broadband networks. Qualcomm also support allocation of UHF spectrum outside the band 790-862 for Mobile TV, with additional advantages achievable if such spectrum is released as a harmonized sub-band adjacent to the band 790-862 MHz, rather than interleaved spectrum. The advantages linked with a mobile TV sub-band were studied extensively in the CEPT Report 21.

Q. 8. Do you consider that, if the spectrum demand for the provision of DTT services does not meet the level envisaged by the 2007 Act, a review of the initial mix should be carried out following analogue switch-off of television services in the UHF spectrum band? If so, please provide reasons for your view and also indicate which stakeholder(s) should participate in such a review. If not, please provide reasons for your view.

The UHF is very valuable spectrum, but this value can only be achieved through Europe wide harmonization of spectrum. A harmonized approach ensures timely availability and affordability of products. This was recognized by some of Europe larger markets when France, UK and Germany decided to adopt a harmonized band, i.e. 790-862 MHz, for the mobile broadband networks in the digital dividend. Such an approach would be even more critical for medium-sized countries. In the future, Qualcomm would recommend keeping as much flexibility in spectrum planning as possible in order to be able to align on any potential subsequent harmonized allocation of spectrum at European level. Such harmonization may concern e.g. an extension of the mobile broadband sub-band, Digital Terrestrial TV (e.g. DVB-T2 SFNs), Mobile TV sub-band or any other harmonized approach.

Q. 9. Do you consider that the 800 MHz sub-band should be reserved for services other than broadcasting? Please provide reasons for your view.

As detailed before, Qualcomm believes that the 800MHz sub-band should be released for mobile services. The release of this sub-band will have a major impact on ComReg's ability to roll-out nationwide mobile broadband networks.

Q. 10. How do you consider that the current uses of channel 69 in Ireland, for example Programming Making and Special Events (PMSE) uses, would be impacted by reserving the 800 MHz band for non broadcasting services? Please provide your view on how PMSE uses could be accommodated if such uses were to be displaced from channel 69.

PMSE usage of channel 69 and its future release to accommodate mobile broadband in this spectrum is not an issue specific to Ireland. UK is facing a similar situation and Qualcomm notes and supports UK's Ofcom proposal to allocate Channel 38 to PMSE as an alternative to Channel 69 in order to accommodate future PMSE needs.

Qualcomm also believes that interleaved UHF spectrum will remain the key spectrum for professional PMSE as it will ensure economies of scale as well as sufficient bandwidth for professional usage.

Q. 11. Do you consider there to be merits in the identification of additional subband(s)? If so, please provide details in terms of timing and any other details which you consider relevant and reasons for your view. If not, please provide details and reasons for your view.

Qualcomm believes that a sub-band for Mobile TV broadcasting, outside the sub-band 790-862 MHz, would provide additional benefits in terms of network planning, cost and spectrum compatibility with traditional fixed TV broadcasting.
Qualcomm also believes that any decision by ComReg would strongly benefit from a European harmonized approach

Q. 13. Do you consider there to be merits in accelerating access to a digital dividend sub-band in Ireland? If so, what considerations do you believe would need to be taken into account and how would they impact accelerating access to the digital dividend, for

example (i) possible opportunity costs of delayed access; (ii) time-table for analogue television switch-off; (iii) geographic location of potential cleared spectrum bands; (iv) risk of fragmentation of digital dividend; and (v) any other risk/benefits which would need to be considered.

Qualcomm considers that the 800MHz sub-band should be allocated to mobile services as soon as possible to provide certainty to operators and trigger product development. The sub-band should be cleared and released as soon as possible after the Digital Switch Over. Qualcomm notes that the 800MHz sub-band is very likely to be made available in a number of European countries in 2012, with the award of the spectrum as early as 2010.

Q. 14. What would you consider to be an optimal time for holding awards for digital dividend spectrum? Please refer to the considerations outlined in question 13 above.

Following our response to Question 13, Qualcomm believes that the award of the 800MHz sub-band should take place before 2012.

Q. 15. Please qualify your answers to questions 13 and 14 in terms of what benefits might accrue to Irish consumers and citizens and Ireland's digital economy if access to a sub-band could be made available as soon as possible.

Qualcomm believes that it is critical for Ireland to allocate the 800MHz in due time, as it will directly impact the Irish citizen access to mobile broadband networks. Furthermore, the roll-out of mobile broadband networks will result in significant investments in Ireland's economy. Qualcomm argues that the sooner the allocation of the spectrum to operators, the better for the Irish economy.

Q. 17. Do you consider that service and technology neutrality should generally be a key principle for spectrum rights of use arising from the digital dividend? Please provide reasons for your view.

Qualcomm strongly supports application and technology neutrality to drive innovation and foster competition. However, Qualcomm would like to underline that application and technology neutrality go hand in hand with the harmonization of spectrum usage at CEPT level.

Several technologies can coexist efficiently as long as they operate under a common harmonized FDD / TDD band plan and spectrum usage rights. As discussed before, harmonization directly leads to economies of scale and is critical to the availability and affordability of equipment. Application and technology neutrality associated with harmonization of spectrum usage rights are the best option to drive innovation and competition while allowing mass-market to develop.

Q. 18. Do you consider that spectrum rights of use arising from the digital dividend should exclude the ability to provide DTT services? Please provide reasons for your view.

The 800 MHz sub-band should be licensed to electronic communication networks on a technology neutral basis. This would cover mobile broadband networks. Under the principle of application neutrality, mobile broadband networks should be able to deliver TV services to consumers, including streaming content which would be also delivered though DTT broadcasting networks. However, introducing DTT high power broadcast networks into the 800MHz sub-band would be challenging and would fragment the use of the 800 MHz band. Indeed, this would put requirements on operators to acquire equipments specific to Ireland, which would considerably diminish the value of the band for operators, consumers and Ireland in general. It will also raise compatibility and interference challenges between mobile broadband networks and DTT networks.

Qualcomm believes that the 800MHz sub-band should be awarded to mobile broadband based on 2x30 MHz FDD allocation and that licence based coverage requirements are the most effective way to trigger investments and guarantee benefits to Ireland citizens and economy.

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12 Radio Telifis Éireann (RTÉ) and RTÉ Network Limited

RTÉ and RTÉNL Response to the

ComReg Consultation

on the Digital Dividend in Ireland

7th May 2009

Introduction

RTÉ, Ireland's primary Public Service Broadcaster (PSB), together with RTÉNL, welcome this opportunity to participate in this *Response* document to the ComReg Consultation on the Digital Dividend in Ireland. This initiative provides an opportunity for engaged debate during a time of considerable change in terrestrial broadcasting.

Radio spectrum is a significant national asset, and RTÉ has in recent years engaged with ComReg, DCENR and the EU Radio Spectrum Policy Group regarding the potential 'digital dividend' arising from the switchover from analogue to digital broadcasting. RTÉ recognises the importance of innovation in the development and testing of new digital technologies, and the potential availability of spectrum below 1 GHz would allow opportunities for additional electronic communications networks and services, such as wireless broadband and mobile multimedia services.

RTÉ wishes to highlight the role historically played by RTÉ as Ireland's national PSB, as defined in primary legislation, in contributing to the development of national policy in this regard.

RTÉ also wishes to state that it is entitled to sufficient and adequate spectrum for the carrying out of its obligations as the national Pubic Service Broadcasting organisation. The quality and availability of that spectrum available to RTÉ to fulfil its obligations of national, free-to-air and universal access services must be safeguarded to ensure that the quality of that resource cannot be degraded in any way. RTÉ, therefore, must preserve any and all of its rights relevant to the future allocation of spectrum which would in any way affect its rights and entitlements.

While RTÉ supports the need to ensure that spectrum is managed as efficiently and flexibly as possible, it wishes to re-state its concerns about potential interference issues arising where the sharing of spectrum among different services is proposed. For Irish broadcasting, the growth potential of DTT in Ireland must also be acknowledged, and any proposals for new spectrum usage must be evaluated in this context. Broadcasters throughout Europe are highlighting the importance of flexibility for the future evolution of the DTT platform and for switchover phases to new technologies (such as High Definition and DVB-T2).

It is likely that all (main) TV channels will migrate to HD over the coming years and therefore the additional two multiplexes in Ireland will have to be commissioned into use. Using modern compression schemes it is envisaged that up to 8 SD channels can be accommodated in a single multiplex. HD demands four times the bandwidth to retain quality. This dictates that the number of multiplexes must increase over the years if the same number of channels are to be retained, even if not all transition to HD. The erosion of the availability of broadcast spectrum would limit the ability, potentially seriously, to transition to HD over the longer term. Without the same constraints on cable and satellite it is likely that the DTT platform will be further undermined in the future if broadcast spectrum is withdrawn. It will be necessary for RTÉ and the commercial DTT multiplex holder to develop a longer term migration strategy to HD and to include consideration of the consequences for spectrum. In the meantime it would be inappropriate to concede broadcast spectrum.

Key points to note

- The European Commission have commissioned a study entitled *Exploiting the digital dividend - A common European approach.* The consultation for this study is now underway at Member State level, in order to gather information which will be used as the basis for a Commission recommendation, and an EU roadmap for exploiting the digital dividend. This study will be published in September 2009 and RTÉ believes that ComReg should ensure that the recommendations from the Commission form a central part of ComReg's own spectrum policy formation.

- Reference is made by ComReg to the recent DCENR policy paper[1], which clearly recognises that spectrum for digital dividend can only be released after analogue switch-off (ASO). Attempts to benefit from the early release of this spectrum have the potential to seriously disrupt the initial deployment of DTT in Ireland.

- In preparation for the digital dividend Ireland has already put considerable effort into proposing and implementing a modified DTT plan that minimises use of the band 790-862MHz. In response to the DCENR policy paper RTÉ proposed to develop a migration strategy and a post digital dividend frequency plan to move DTT channels from frequencies above 790MHz, in the period after analogue switch off. Work has now begun on developing this plan, in conjunction with DCENR, ComReg and the BCI. This process is also subject to a bilateral re-planning process with the UK, which is also re-planning DTT. Therefore no allocation of 'digital dividend' spectrum can be countenanced until all the necessary frequency spectrum planning work is complete. A comprehensive migration plan that ensures no loss or deterioration in the provision of Irish broadcasting services is required.

- The migration from digital dividend spectrum will in some cases involve major works and is likely to take significant time to complete. Allocating the cost of this migration is the key issue which needs to be addressed, primarily by ComReg.

- In addition, there are costs associated with spectrum liberalisation, especially if Ireland were to act before it is ready to do so, and these have not been adequately addressed in the ComReg *Consultation* paper.

- The release of contiguous blocks of spectrum below 790MHz, and in particular immediately below 790MHz, would be extremely difficult to facilitate. These frequencies will be heavily utilised to minimise the disruption caused by migrating from spectrum above 790MHz, and to maintain a high quality 6 Multiplex network plan alongside an 8 Multiplex plan in the UK.

[1] Development of a National Policy Framework for identifying spectrum for the Digital Dividend, DCENR, February 2009, see http://www.dcenr.gov.ie/NR/rdonlyres/5962FB63-6F77-49F9-BD65-A7B1A76036F2/0/DevelopmentofaNationalPolicyFrameworkforIdentifyingSpectrumfortheDigitalDividend.doc

- Finally, it should be noted that cable operators have recently reported issues in relation to interference on their networks that can or could be caused by allowing mobile use in the lower spectrum bands (of the 'digital dividend' spectrum). Any suggestion of interference in the reception of public television services should be fully investigated and no provision should be made to allow this to happen.

Response to Consultation Questions

Q. 1. What would you consider to be the levels of value and benefits, including any social value which may be produced for Irish consumers / citizens and Ireland's digital economy arising from non-broadcasting uses of the digital dividend?

The potential social value in terms of mobile wireless broadband etc., could be significant, if the demand actually materialises for these services.

Q. 2. How in your view could various industry sectors, for example transport, healthcare, education or other public sector industries, benefit from utilising digital dividend spectrum? Please include details of the potential spectrum requirements of the industry in your answer.

The sectors mentioned could benefit from greater innovation in the development of both the use and incorporation of technology in their industries. Spectrum availability is not currently preventing any developments in this regard.

Q. 3. Please outline your views regarding (i) the types of applications and services which you consider the digital dividend should be used for; (ii) possible spectrum requirements of those applications; (iii) timeframes for making available rights of use for digital dividend spectrum; and (iv) the potential levels of competition which may result in existing or new products and services markets

i) In relation to spectrum used for commercial non-broadcasting purposes, RTÉ agrees with the statement in section 4.1 "ComReg considers that digital electronic communications networks should not be restricted to carrying particular types of applications and services".

ii) Spectrum requirements are as determined by the industry and current market conditions.

iii) The priority must be to ensure that adequate time is allocated for the sizeable infrastructure changes needed to migrate the new DTT services away from the digital dividend spectrum. Available rights of use for digital dividend spectrum therefore cannot happen until approximately three years after ASO.

iv) Recent experience has shown it is difficult to assess the potential levels of competition for spectrum that should only realistically be fully accessible by 2015 (assuming ASO will occur in 2012).

Q. 4. Would you consider there to be other key issues which should be considered in terms of gaining a deeper understanding of the spectrum requirements of new applications and services? If so, what are they and please elaborate.

Greater research is required in this area.

Q. 5. What are your views regarding the level of demand for Ireland to reserve UHF spectrum for innovation and experimentation? Please support your views with consideration to the availability of UHF spectrum.

The current ComReg scheme for promoting innovation and experimentation in spectrum is widely recognised as an excellent scheme, and is working very well. Arguably this is sufficient for the present needs in terms of experimentation.. As a current user of the Test and Trial licence scheme RTÉNL believes that the key benefit of the current scheme is its flexibility, allowing experimenters potential access to spectrum at any frequency (or a frequency close enough to meet their requirements). This is a very efficient use of spectrum, allowing the relatively small number of innovative and experimental users to coexist with commercial and public service users. Creating a dedicated reservation for experimentation would encourage experimentation and development within a restricted portion of the band. Furthermore, creating a cleared zone for experimentation would have the un-intended side effect of making it more difficult to accommodate experiments outside of the dedicated reservation due to increased congestion. This would not be good for innovation nor would it be welcomed by the wireless development industry.

Q. 6. In light of your views on non-broadcasting services, do you consider that a mixed approach to spectrum allocation in the UHF spectrum band should be adopted? Please provide reasons for your view.

RTÉ supports the mixed-approach to the re-allocation of unused spectrum. This would be the most appropriate way to re-allocate digital dividend spectrum.

Q. 7. Do you agree with ComReg's assessment regarding the initial mix between broadcasting and non-broadcasting services? Please answer in terms of your views regarding the initial mix between broadcasting and non-broadcasting services and any other considerations that you consider relevant.

RTÉ believes that spectrum must be wholly dedicated for public service broadcasting as a priority. The re-allocation of any broadcast spectrum, or any other spectrum, for commercial non-broadcasting purposes should be on a technology and service neutral basis.

Q. 8. Do you consider that, if the spectrum demand for the provision of DTT services does not meet the level envisaged by the 2007 Act, a review of the initial mix should be carried out following analogue switch-off of television services in the UHF spectrum band? If so, please provide reasons for your view and also indicate which stakeholder(s) should participate in such a review. If not, please provide reasons for your view.

Where demand does not meet levels envisaged, or exceeds levels envisaged, ComReg should undertake a review. This is a core principle of spectrum management, and acknowledges that no regulatory body can anticipate how demand will arise. Such reviews should continue to be open to all stakeholders.

Q. 9. Do you consider that the 800 MHz sub-band should be reserved for services other than broadcasting? Please provide reasons for your view.

RTÉ supports the mixed-approach to the 800MHz sub-band.

Q. 10. How do you consider that the current uses of channel 69 in Ireland, for example Programming Making and Special Events (PMSE) uses, would be impacted by reserving the 800 MHz band for non broadcasting services? Please provide your view on how PMSE uses could be accommodated if such uses were to be displaced from channel 69.

Channel 69 is used in many domestic situations to connect equipment on the RF OUT to the television display. For example, most set-top-boxes use this channel. If Channel 69 was licensed to an operator whereby high power transmissions operated on this band then it is possible that it could interfere with domestic equipment. Channel 69 has been selected for connecting domestic equipment precisely because it is a 'free channel'. The implications of using this channel, especially in high power situations, are unknown

The effect of withdrawing Channel 69 would be significant for Outside Broadcast operators and those involved in special events such as concerts and major sports events (PSME) as their radio microphone equipment has been designed to operate on this channel. This would not have a direct impact on RTÉ and other terrestrial broadcasters in Ireland, but may entail increased costs for them due to the requirement for others to replace equipment. Therefore RTÉ recommends caution in any intent to reassign channel 69.

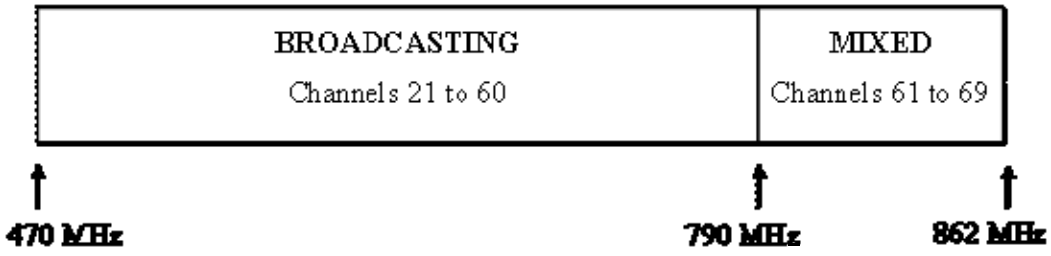
Q. 11. Do you consider there to be merits in the identification of additional sub-band(s)? If so, please provide details in terms of timing and any other details which you consider relevant and reasons for your view. If not, please provide details and reasons for your view.

With current levels of technology, and the currently planned broadcast usage of the UHF band, further sub-bands for digital dividend are not possible without reducing the quality of the broadcast network. Addressing this issue would require additional

new broadcast sites to meet coverage targets, with an associated additional cost. In developing the DTT plan with ComReg, RTÉNL has already incorporated the use of Channel 36 at low power sites, at least until ASO. Perhaps ComReg should consult all stakeholders specifically regarding Channel 36.

Q. 12. What type of channel configurations would you consider would deliver most economies of scale in terms of availability of equipment and tuning / roaming of equipment? Please explain in terms of an indicative channel plan of frequencies, see for example Figure 2.0, and if you propose a channel configuration please give details of how this might impact broadcasting use of the band?

An EU harmonised approach to the release of channels 61 to 69 would deliver the best economies of scale. Any non-harmonised sub-bands would be significantly less useful.



The harmonised approach is most likely to concentrate digital dividend spectrum into the channels 61 to 69 (790MHz to 862MHz), leaving channels 21 to 60 (470MHz to 790MHz) exclusively for broadcasting. While the UK is seeking to clear a lower sub-band it is not expected that this approach will be implemented on a harmonised basis. RTÉ proposes that the digital dividend spectrum be allocated for mixed use, allowing both broadcasting and non-broadcasting applications. There is a risk that countries which deviate from the harmonised approach may miss out on the benefits of both low cost equipment and the integrity of their high quality TV services.

Q. 13. Do you consider there to be merits in accelerating access to a digital dividend sub-band in Ireland? If so, what considerations do you believe would need to be taken into account and how would they impact accelerating access to the digital dividend, for example (i) possible opportunity costs of delayed access; (ii) time-table for analogue television switch-off; (iii) geographic location of potential cleared spectrum bands; (iv) risk of fragmentation of digital dividend; and (v) any other risk/benefits which would need to be considered.

Are there merits to accelerating access to digital dividend in Ireland? In this country, we need to follow a harmonised approach and any significant deviation from this process in terms of spectrum, usage, or timing would only limit the potential benefit of the released spectrum.

The deployment of a national DTT network is one of the largest tasks undertaken in Irish Broadcasting in recent times. This has taken over five years to plan. It is a significant challenge, and it would be extremely costly, and potentially also jeopardised, by forcing any early change in accelerating access to digital dividend spectrum.

i) There would be no opportunity cost of delaying access to digital dividend spectrum in Ireland, given that the availability of low cost equipment will be determined by the timing of the larger markets within the harmonised group.

However, there would be an opportunity cost to accelerating access to this spectrum, given that attractive licence fees and auction reserves would be lower in a spectrum market without low cost equipment, and the industrial development context of the market must also be taken into account. Furthermore, any accelerated approach to releasing digital dividend spectrum would have an impact on current Analogue TV viewers, either forcing them to migrate to DTT more quickly, or causing them interference.

ii) This is a matter for the DCENR, in consultation with the other major stakeholders.

iii) Cleared spectrum would be most useful on a national basis only. Any geographic segmentation would cause fragmentation, thus de-valuing the utility of the spectrum, and would be costly and difficult for ComReg to monitor adequately.

iv) As above.

Q. 14. What would you consider to be an optimal time for holding awards for digital dividend spectrum? Please refer to the considerations outlined in question 13 above.

Once the ASO date has been agreed, then the optimal time to hold awards for digital dividend spectrum would be early enough to allow the proceeds to be fed back into the migration process. Timing consideration should also be given to ensure the development of sustainable business propositions. Industry readiness, the availability of suitable equipment, for example, would all be pre-requisites for success.

Q. 15. Please qualify your answers to questions 13 and 14 in terms of what benefits might accrue to Irish consumers and citizens and Ireland's digital economy if access to a sub-band could be made available as soon as possible.

Releasing the digital dividend spectrum too early may only serve to disrupt existing services for Irish citizens and consumers, without any definite benefit.

Q. 16. Please also provide views on the opportunity cost of delayed access to cleared spectrum and the possibility of negotiating early access directly with broadcasting spectrum users.

There is no opportunity cost to delayed access to cleared spectrum. However, cost could be incurred by going too early to release spectrum if it does not yield the anticipated returns.

Q. 17. Do you consider that service and technology neutrality should generally be a key principle for spectrum rights of use arising from the digital dividend? Please provide reasons for your view.

Yes. Given the safeguarding of spectrum for public services purposes, experimentation can be allowed elsewhere. Service and technology neutrality should be applied to any or all of the spectrum being assigned for commercial non-broadcasting purposes. The increasing rate of technological advances, particularly in the wireless sector, makes it very difficult to anticipate changing market requirements.

Q. 18. Do you consider that spectrum rights of use arising from the digital dividend should exclude the ability to provide DTT services? Please provide reasons for your view.

No. As already stated above it is extremely important that spectrum which should be used for broadcasting purposes is preserved until Ireland has successfully made the transition to DTT and achieved analogue switch-off. The future needs for broadcasting, not simply the current requirements, must be central to all spectrum policy formation.

Finally, given the current state of dynamic change in the broadcasting landscape, RTÉ wishes to re-state that caution and carefulness are crucial at this time, so as to ensure that Ireland does not take any irreversible steps now with regard to the frequency spectrum and the digital dividend. ComReg already allows for spectrum innovation and experimentation with its Test and Trial licence scheme. The priority must be to protect broadcasting and public services, and only when that is secure, and safeguarded into the future, can other options be considered. In addition, the potential 'dividend' needs to be better defined, the market proven, and a total cost analysis completed, in advance of any irreversible decision to release spectrum.

RTÉ and RTÉNL, 7th May 2009.

13 UPC Ireland Limited

ComReg consultation on the Digital Dividend Document No: 09/15

Executive Summary

UPC Ireland welcomes the opportunity to comment on ComReg's consultation on the digital dividend.

Our interest in this debate stems from the fact that we are an existing spectrum user by virtue of our MMDS licences (albeit these are beyond the spectrum bands under consideration in the Digital Dividend). We are therefore interested in any and all discussions that relate to future harmonisation or liberalisation of spectrum bands in Ireland.

Secondly, we are currently more than half way through a five year, 350 m euro network upgrade that on completion, will deliver a network operating up to 860Mhz offering a triple play product offering that will include video, voice and data services.

Thirdly, our product portfolio currently spans and competes with those two industry sectors (broadcast and mobile), which (including ourselves) have a vested interest (as incumbent or new market entrant) in opportunities presented by the release of spectrum from the digital dividend.

Finally, UPC Ireland and indeed our parent company Liberty Global Inc. (LGI), continually reviews opportunities that may extend the reach of our fixed and fixed wireless networks. As such the company is very interested in opportunities that may arise from the digital dividend that could allow us offer enhanced or complimentary services to our current product portfolio. In addition, and given LGI has operations in eleven countries in Europe, we are interested in any discussion relating to the harmonisation of spectrum across EU member states.

ComReg should not consider options for the future use of the digital dividend in isolation. It is important that ComReg takes a holistic view on spectrum management in Ireland. In particular it should apply technology and service neutrality across *all* spectrum bands. In addition, it should ensure that decisions taken for one spectrum band are not in conflict with decisions taken for other spectrum bands. It will also need to ensure that it does not unfairly over - allocate valuable spectrum to one part of the business community to the detriment of competing business sectors. UPC would therefore call on ComReg to balance its obligations as custodian of spectrum in Ireland with its regulatory obligations to facilitate continued competition and innovation in the marketplace, which will be to the direct benefit of Irish consumers.

To this end, ComReg should give due consideration to preserving spectrum for new market entrants who will have to compete with existing incumbents that have already recouped costs associated their network build. This is particularly true for any new entrant that will have to compete with existing providers in the 900Mhz band and who, without obtaining spectrum below 1Ghz, stand little chance of introducing real competition to the current providers.

Where appropriate, UPC Ireland has provided feedback on questions raised in ComReg's consultation document.

UPC Ireland remains at ComReg's disposal should it require any additional information or clarification on any point raised in this paper.

Q. 1. What would you consider to be the levels of value and benefits, including any social value which may be produced for Irish consumers / citizens and Ireland's digital economy arising from non-broadcasting uses of the digital dividend?

Answer: UPC Ireland believes the digital dividend debate needs to be considered in tandem with decisions taken or proposals ComReg intends to make for other spectrum bands. Decisions on the digital dividend should not be taken in isolation but should fit with ComReg's overall strategy for spectrum use in Ireland.

The Digital Dividend represents a unique opportunity for ComReg to release spectrum – subject to addressing any interference concerns of any existing operators in that band – on a service and technology neutral basis. Released spectrum would enable existing and new market entrants offer new and/or complimentary services at competing prices to benefit of the Irish consumer.

UPC Ireland is a strong proponent of the benefits of platform competition since it believes this is a primary driver for delivering real consumer choice on product and price. Ireland already benefits from strong TV platform competition which includes Free –to – Air (FTA) Terrestrial, cable and satellite pay TV platforms, and increasingly a FTA satellite service (Freesat). Pay TV penetration in Ireland is already at 75% of which 60% is digital. [1] Digital TV penetration is set to increase with the expected launch of a FTA and Pay TV DTT platform later this year. And finally, Freesat which offers digital TV services (only) via overspill, also continues to gain market share.

Given this diversity of choice, in addition to adequate spectrum already allocated to DTT, we do not believe it necessary to reserve further spectrum for broadcasting purposes.

Broadband penetration in Ireland has increased significantly over the past 18 months. This is due in no small part to UPC Ireland's own investment which introduces a real alternative to the fixed line incumbent but other providers too have also invested considerably in their respective networks. In many markets however cable represents the only real competitive threat to traditional telecom incumbents. Where we have upgraded our network we offer real innovation and real choice on price and product to consumers.

A digital divide may continue to exist between rural and urban centres, however this is narrowing (and will increasingly do so under the National Broadband Scheme). If spectrum from the dividend is assigned on a technology neutral basis, this puts operators in a better place to identify further market opportunities which will in turn will lead to increased platform competition and may even result in closing any remaining divide.

As has been indicated in previous ComReg consultations on other spectrum bands, UPC believes that ComReg should consider preserving spectrum for new entrants and in particular link its final decision on the digital dividend to decisions it takes on liberalisation of other bands. In particular it would be important that ComReg avoids a situation whereby its decision on the 900 Mhz band coupled with similar decisions on the digital dividend grants extremely valuable spectrum to any one particular industry sector which would limit greater infrastructure competition in Ireland.

UPC is of the opinion that infrastructure competition is fundamental to a thriving, competitive marketplace. By their very nature, new market entrants have to be innovative if they are to seize market share from existing incumbents. Given incumbents will not have the same upfront costs as a new entrant, ComReg should consider provisions that will provide a more level playing field for any new market entrant that wishes to offer services in the digital dividend (or indeed any other)spectrum band. Incentives such as allocating spectrum based on beauty contests rather than auctions which could include targets on coverage could be considered.

[1] ComReg Quarterly Key Data Report, March 19, 2009 (Page 70)

Q. 2. How in your view could various industry sectors, for example transport, healthcare, education or other public sector industries, benefit from utilising digital dividend spectrum? Please include details of the potential spectrum requirements of the industry in your answer

Answer: UPC Ireland believes all these sectors could directly benefit from the digital dividend. Most of these sectors are currently engaged in a number of tender processes which seek to obtain broadband services for their constituents. Most service providers in the State are involved those tenders, the same service providers that will be seeking to avail of the digital dividend. Presumably any operator that will obtain spectrum from the dividend will be in a position to offer additional or complimentary services to those that they may be able to do so under the existing licence agreements. Certainly high bandwidth services (e.g. the electronic sharing of medical data (x-rays)) could be of considerable benefit for the sectors concerned.

Q. 3. Please outline your views regarding (i) the types of applications and services which you consider the digital dividend should be used for; (ii) possible spectrum requirements of those applications; (iii) timeframes for making available rights of use for digital dividend spectrum; and (iv) the potential levels of competition which may result in existing or new products and services markets.

Answer: See Answer to Question 1.

Other services that could be high speed data broadband services and 4G wireless data services. Applications in the future will be web based, more video centric and will be technology and interface agnostic. Such applications will require considerable bandwidth which in turn will need more spectrum. As previously indicated it will be important that ComReg gives due consideration to reserving spectrum for new market entrants, which will help introduce additional competition to the market as well as providing new entrants with a realistic chance against existing incumbents.

Q. 4. Would you consider there to be other key issues which should be considered in terms of gaining a deeper understanding of the spectrum requirements of new applications and services? If so, what are they and please elaborate

Answer: No Comment.

Q. 5. What are your views regarding the level of demand for Ireland to reserve UHF spectrum for innovation and experimentation? Please support your views with consideration to the availability of UHF spectrum.

Answer: No Comment.

Q. 6. In light of your views on non-broadcasting services, do you consider that a mixed approach to spectrum allocation in the UHF spectrum band should be adopted? Please provide reasons for your view

Answer: Yes. See answer to Question 1.

Q. 7. Do you agree with ComReg's assessment regarding the initial mix between broadcasting and non-broadcasting services? Please answer in terms of your views regarding the initial mix between broadcasting and non-broadcasting services and any other considerations that you consider relevant

Answer: See Answer to Question 1.

Q. 8. Do you consider that, if the spectrum demand for the provision of DTT services does not meet the level envisaged by the 2007 Act, a review of the initial mix should be carried out following analogue switch-off of television services in the UHF spectrum band? If so, please provide reasons for your view and also indicate which stakeholder(s) should participate in such a review. If not, please provide reasons for your view.

Answer: Yes, See answer to Question 1. All stakeholders should be involved in any future review of types of services (and platforms) that could avail of any spectrum released further to a lack of take up by the DTT platform.

Q. 9. Do you consider that the 800 MHz sub-band should be reserved for services other than broadcasting? Please provide reasons for your view.

Answer: UPC Ireland would caution against identifying a sub band for purposes other than broadcasting.

While UPC Ireland appreciates the issue of signal interference is a matter for CEPT at a European level, national regulators will be also interested in discussions related to possible interference new services may have on existing services, particularly if this will impact on consumers at large.

In this regard ComReg should be aware that the cable community has, in an number of EU member states, raised concerns over potential interference new services could have on TV and broadband services offered over the cable network.

As ComReg will be aware cable networks operate up to 860MHz. Cable operators in Germany and Austria, have undertaken tests which have been submitted to CEPT SE42 which demonstrates levels of interference in instances where mobile services are offered in the same spectrum band. The results from those tests concur with a recent Ofcom report which concluded that a separation distance of between 22 and 40 meters radius was required to prevent interference to TV viewers, although this separation distance did not appear to address the base station transmitters which would be at higher powers. [2]

In light of these initial results, Cable Europe – the EU trade association representing the cable community – has commissioned further tests to provide a broader validation of these conclusions. It plans to share these with CEPT.

While it is accepted that cable networks are a closed network and operators take all steps necessary to protect the integrity of the network, the above demonstrates that unless sufficiently verified and tested in advance, the deployment of new services in this band could have significant impact on existing services. By way of demonstration, LGI affiliates alone have over 11 million TV subscribers and over 4 million broadband subscribers across its European footprint. Virginmedia, our cable colleagues in the UK, has over 3.5 million TV and broadband subscribers.
UPC Ireland fully recognises the policy objectives of releasing the digital dividend. It will be important however that ComReg and its European counterparts, prior to releasing any new spectrum on a technology neutral basis, undertakes the necessary impact assessments to ensure that proposed new services do not affect existing quality of service for cable operators.

To this end ComReg should give due consideration whether or not interference will occur, in the event of which, how best to manage and limit its impact. Cable operators have considerable experience in managing networks in the digital dividend frequency range and may well be best positioned to be the platform provider community to offer services in this frequency range post the dividend (via fixed and wireless means).

[2] "Impact of interference from ECN terminal stations operating in the band 790 – 862 MHz on digital TV receivers operating below 790 MHz" Ofcom, Section 1.3

Q. 10. How do you consider that the current uses of channel 69 in Ireland, for example Programming Making and Special Events (PMSE) uses, would be impacted by reserving the 800 MHz band for non broadcasting services? Please provide your view on how PMSE uses could be accommodated if such uses were to be displaced from channel

Answer: No comment.

Q. 11. Do you consider there to be merits in the identification of additional subband(s)? If so, please provide details in terms of timing and any other details which you consider relevant and reasons for your view. If not, please provide details and reasons for your view

Answer: See Question 9.

Q. 12. What type of channel configurations would you consider would deliver most economies of scale in terms of availability of equipment and tuning / roaming of equipment? Please explain in terms of an indicative channel plan of frequencies, see for example Figure 2.0, and if you propose a channel configuration please give details of how this might impact broadcasting use of the band?

Answer: No comment.

Q. 13. Do you consider there to be merits in accelerating access to a digital dividend sub-band in Ireland? If so, what considerations do you believe would need to be taken into account and how would they impact accelerating access to the digital dividend, for example (i) possible opportunity costs of delayed access; (ii) time-table for analogue television switch-off; (iii) geographic location of potential cleared spectrum bands; (iv) risk of fragmentation of digital dividend; and (v) any other risk/benefits which would need to be considered?

Q. 14. What would you consider to be an optimal time for holding awards for digital dividend spectrum? Please refer to the considerations outlined in question 13 above

Answer: No comment.

Q. 15. Please qualify your answers to questions 13 and 14 in terms of what benefits might accrue to Irish consumers and citizens and Ireland's digital economy if access to a sub-band could be made available as soon as possible..

Answer: See question 1 and 11.

Q. 16. Please also provide views on the opportunity cost of delayed access to cleared spectrum and the possibility of negotiating early access directly with broadcasting spectrum users

Answer: No comment.

Q. 17. Do you consider that service and technology neutrality should generally be a key principle for spectrum rights of use arising from the digital dividend? Please provide reasons for your view

Answer: Yes, service and technology neutrality should prevail.

Q. 18. Do you consider that spectrum rights of use arising from the digital dividend should exclude the ability to provide DTT services? Please provide reasons for your view.

Answer: UPC Ireland believes that more than adequate spectrum has been allocated to DTT services in Ireland. We therefore believe that no further spectrum – beyond what has been already "gifted" to DTT under the Broadcasting Amendment Act 2007 - should be provided from the Digital Dividend. (See Answer to Question 1)

14 Vodafone Plc

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Vodafone Response to the ComReg Consultation on the Digital Dividend in Ireland

Ref. ComReg Document 09/15

Response Date: 7 May 2009

Introduction

Vodafone welcomes the opportunity to respond to this initial ComReg consultation on the Digital Dividend in Ireland. Our position on the particular issues addressed by ComReg is set out in full in response to the consultation questions below.

Response to Consultation Questions

Q.1. What would you consider to be the levels of value and benefits, including any social value which may be produced for Irish consumers/citizens and Ireland's digital economy arising from non-broadcasting uses of the Digital Dividend?

There are a range of non-broadcast uses which are possible arising from the Digital Dividend. Their use can deliver considerable economic and social value to Irish citizens. In its Consultation on the Report of the Working Group on Spectrum Policy, the DCENR identified mobile telephony, mobile broadband, broadband access to sparsely populated areas (Wi-Max), low-power devices, private mobile radio and emergency service communications. In its Digital Dividend Review, Ofcom identified the same areas and added additional Digital Dividend use in the area of Mobile TV, public safety services, healthcare, education, community development, and providing new services for people with disabilities. Ofcom also attempted to put values on the direct economic gains accruing to the some of the non-broadcasting uses as shown in the following table;

Service	Range of producer and consumer value (GBP)	Indicative range of external value (as a % of producer and consumer value)
Mobile multimedia	0.3 - 3 billion	Up to 10%
PMSE (professional and community use)	0.1 - 0.5 billion	n/a (this service was not covered by the market research)
Mobile broadband	0 - 2.5 billion	Up to 15%
Mobile communications	0 - 2.5 billion	Up to 15% (value generated by extending coverage in rural areas)

Source: OFCOM Digital Dividend Review

It is reasonable to assume that if a similar exercise was undertaken in Ireland, the producer and consumer values and the external values would also be positive, though at a proportionately lower level in line with our relative population size.

In April 2008, the consulting firm Spectrum Value Partners published the report “Getting the most out of the digital dividend – allocating UHF spectrum to maximise the benefits to society”. This report represented the first comprehensive economic analysis of the costs and benefits of allocating different quantities of UHF spectrum for mobile broadband and broadcast use throughout Europe. The aim was to determine the optimum balance which would maximise the economic benefit across the EU.

The study showed that allocation of some digital dividend spectrum to mobile would generate additional value of between €63bn and €165bn NPV over 20 years (the results differed from country to country, and between demand scenarios). This is in addition to the estimated €2.5-5 trillion in NPV that mobile generates for the European economy without any UHF spectrum. It also concluded that allocating at least 92 MHz of UHF spectrum to mobile operators would be most likely to maximise the value for the European economy as a whole, and would generate additional value of at least €95bn. The study did not specifically consider Ireland in detail. However, a simple calculation based on the Irish GNP\mobile multiplier (given in the SVP report) would give an estimate of the incremental value of between €1 billion and €3billion again depending on demand scenarios.

As has been well documented to date, Ireland continues to experience what is commonly called the ‘Digital Divide’. Significant areas of the country continue to be at a social and economic disadvantage due to lack of broadband infrastructure. Investment in the necessary broadband infrastructure in these areas is not currently economically feasible for providers on a purely commercial basis, a fact already recognized by the Government and the EU with the funding of the National Broadband Scheme (NBS). This scheme recognizes the fundamental importance of mobile technologies in serving those areas of the island which currently lack broadband.

An allocation of Digital Dividend spectrum will greatly assist in tackling the Digital Divide in Ireland. UHF spectrum has excellent propagation and coverage characteristics that would allow mobile operators to provide mobile broadband coverage with fewer base stations (and therefore at lower cost). This would enable mobile operators to offer cheaper mobile broadband services, accelerating their take-up and enhancing their value to consumers. It is also likely that there would be quality improvements in service provision, such as increased in building coverage, arising from the superior signal characteristics of UHF spectrum relative to the other spectrum bands that are currently used, or are likely in future to be available, for delivery of mobile broadband services.

The allocation of at least some of the Digital Dividend spectrum to mobile operators would clearly significantly increase consumer welfare and generate substantial economic value for the economy.

In addition to the economic value that would be generated by the provision of mobile broadband services using UHF spectrum, substantial social benefits would also arise. Social value would arise in particular from the potential to provide broadband to a greater proportion of the population than currently. The lower costs involved in mobile broadband service provision using UHF spectrum would allow mobile operators to efficiently increase coverage to include many areas where it is not currently feasible to provide service. This could make a major contribution to addressing Digital Divide concerns as mobile broadband would potentially be available in areas where it would not be economically viable to roll-out fixed broadband. Even in areas where fixed broadband is already available, competition and consumer choice in many areas would be enhanced by the emergence of a mobile broadband option for consumers.

Further benefits to society from facilitating mobile broadband service provision using UHF spectrum would arise from the increased mobility and productivity gains afforded by having mobile broadband available in areas that would not otherwise be covered. Although these are difficult to

quantify, they would certainly be significant. Environmental benefits that would arise from using UHF spectrum for the provision of mobile broadband would represent a considerable positive externality for society. The reduced requirement for additional base station sites would minimise visual intrusion and avoid the energy consumption involved in construction, maintenance, and operation of the extra sites that would otherwise be necessary to extend and improve coverage. The provision of 3G services such as mobile broadband to additional areas of the country, and improved provision in areas already in coverage, would also expand the options for remote working and thereby contribute to reducing problems such as traffic congestion and carbon emissions.

Vodafone believes that a comprehensive national cost-benefit analysis should be conducted to inform the decision on the appropriate allocation of Digital Dividend spectrum in Ireland and that ComReg should expedite the development of a comprehensive policy for the available Digital Dividend spectrum.

A reasonable degree of harmonisation of Digital Dividend frequencies for mobile use on a pan-European basis is essential for service interoperability across countries to be possible and for the mobile industry to achieve the economies of scale necessary to provide competitively priced mobile broadband services to customers. Vodafone therefore supports ComReg's participation in European level efforts to identify frequencies that could potentially be harmonised for the provision of a Digital Dividend. It is highly desirable, in the interest of maximising consumer welfare, that harmonisation for efficient service provision be achieved to the fullest extent possible. ComReg must seek to ensure that Digital Dividend frequencies recommended for harmonisation for the provision of mobile services at European level should also be available for allocation for this purpose in Ireland, and released in timeframes that are broadly aligned with other European jurisdictions.

Q2. How in your view could various industry sectors, for example transport, healthcare, education or other public sector industries, benefit from utilising Digital Dividend spectrum? Please include details of the potential spectrum requirements of the industry in your answer.

It is probably too early at this stage to have full visibility of the range of specific applications that will emerge to the benefit of sectors such as transport, healthcare, education, and government services. Most sectors, including public services, will benefit from the provision of advanced mobile services using Digital Dividend spectrum. For example transport problems are likely to be alleviated, and labour productivity significantly increased, by the increased capability for remote working that the provision of mobile broadband services using this spectrum will allow. Innovative new applications in the areas of e-medicine (diagnostic, health monitoring) and e-government are also likely to emerge over time.

It would be a grave mistake to fragment the Digital Dividend in order to facilitate the deployment of numerous and bespoke requirements. While a case can always be made for spectrum being reserved for non-broadcast social use (e.g. emergency services), in general a market led approach will ensure the greatest economic and social value will accrue.

Q3. Please outline your views regarding (i) the type of applications and services which you consider the Digital Dividend should be used for; (ii) possible spectrum requirements of those applications; (iii) timeframes for making available rights of use for Digital Dividend spectrum; and (iv) the potential levels of competition which may result in existing or new products and services markets.

(i)

The Digital Dividend can potentially be used for the provision of a range of non-broadcasting applications and services. A (non-exhaustive) list of these would include:

- Wireless/mobile broadband services;
- Mobile television and other types of mobile video and multimedia services;
- Wireless microphones and applications for PMSE;
- Other low power applications, like hubs to distribute content around the home or using ultra wideband (UWB) technologies;
- Innovation and experimentation;
- Emergency and public safety services;
- Cognitive radio;
- Digital radio;
- International and cross border uses (e.g. an international emergency channel);
- amateur and/or university use;

New applications and services that cannot currently be foreseen, but which may also be capable of being deployed in this band, may also emerge over time. In this regard it is appropriate that ComReg has decided to adopt the principle of technology neutrality as a key element of its approach, and is not proposing to be highly prescriptive in the types of non-broadcasting applications and services that can be provided. This will provide the necessary flexibility to facilitate future applications and services as appropriate, should they emerge.

Vodafone also agrees with ComReg's preliminary conclusion in section 3.7 of the consultation document that, beyond the spectrum reserved for licensing of six DTT multiplexes under the 2007 Act, any rights of use to remaining UHF spectrum comprising the Digital Dividend should exclude the ability to provide DTT and other services explicitly provided for under that Act.

It is critical, in the context of the unprecedented opportunity presented by the availability of the prime Digital Dividend spectrum, that this spectrum is put to its highest valued uses (in both economic and social terms) and it must be noted that many of the possible uses outlined above could also effectively be accommodated in other spectrum bands.

Vodafone considers that a comprehensive cost benefit analysis would help inform the assessment of the optimal uses of the Digital Dividend, and the balance between spectrum allocated to each use, but it is our view that part of the Digital Dividend must be allocated for the provision of advanced mobile broadband services given the unparalleled opportunity that use of this spectrum offers to address the Digital Divide in a cost efficient manner through competitive provision of high speed broadband services to rural/less populated areas of the country. Other potential uses of the spectrum may be accommodated in the Digital Dividend spectrum that remains once the optimal spectrum requirements for mobile broadband service provision and the 6 DTT multiplexes licensed under the 2007 Act have been met.

(ii)

Vodafone strongly agrees with the proposal at European level for a harmonised sub-band from channels 61-69 (790 MHz - 862 MHz) for the provision of uplink and downlink electronic communications networks and services. Vodafone considers that this is the absolute minimum amount of spectrum that should be allocated for this purpose and that it should be further explored whether additional spectrum could also be allocated for this use. However the benefit of additional spectrum for this use will be dependent on the extent to which this is harmonised on an international basis and thus can benefit from economies of scale in equipment procurement and deployment as now appears likely for the 790-862 MHz band.

Vodafone must emphasise that while there may well be a case for reserving some spectrum for experimental/innovation purposes, it would not be appropriate for spectrum to be allocated for this purpose from the sub-band covering channels 61-69 inclusive. Vodafone considers that a proposal to reserve spectrum in channels 61-69 for experimental/innovation purposes would fragment and/or seriously restrict the already limited amount of spectrum that would be available for wireless/mobile broadband service provision in the 790-862 MHz sub-band and could preclude interoperability and harmonised provision of wireless/mobile broadband services on a pan-European basis. Vodafone would therefore urge ComReg to confine any consideration of reserving spectrum for innovation and experimental purposes exclusively to available sub-bands lower down in the UHF spectrum, or to other spectrum bands.

(iii)

Vodafone believes that given the likely high opportunity cost of delays in making Digital Dividend spectrum available for allocation to mobile services the necessary spectrum should be released and re-allocated by 2012, if not earlier. The cost to Europe of a 3 year delay to 2015 has been estimated by the Spectrum Value Partners report to be in the order of €20bn. However the aim should be for the necessary planning work to be completed, and the process for assignment of spectrum to be implemented as soon as possible, and in any event significantly in advance of the time when spectrum can actually be released. This would provide the necessary high level of certainty to mobile operators in planning network investment.

(iv)

Vodafone anticipates that where the Digital Dividend spectrum would be allocated for the provision of wireless/mobile broadband services, this would further augment the already robust cross-platform competition observed in the provision of retail broadband services. In particular, by dramatically increasing the performance (eg. in terms of data speeds and indoor coverage quality) of mobile broadband services, these would become closer substitutes for fixed broadband services across a much broader range of applications than is currently the case. Greater choice in terms of broadband providers would be facilitated in geographic areas where competition is currently limited, extending robust competition in broadband service provision comprehensively across the island of Ireland. There would also likely be new dimensions added to competition given the ability to offer higher speed/higher capacity broadband products and services on a widespread basis using Digital Dividend spectrum given the more advanced technologies such as LTE for which equipment is due to become commercially available for deployment in this band in the medium term.

Q. 4. Would you consider there to be other key issues which should be considered in terms of gaining a deeper understanding of the spectrum requirements of new applications and services? If so, what are they and please elaborate.

Vodafone considers that other key issues which should be considered in terms of gaining a deeper understanding of the spectrum requirements for new non-broadcasting applications and services include:

- The need to ensure adequate protection from interference between spectrum allocations for different uses of the spectrum. This relates to the compatibility of use of different technologies and services.

- The need to ensure that spectrum use in Ireland is harmonised with that in the rest of Europe, particularly where this is necessary for the seamless provision of services on a pan-European basis, and to enable Ireland to benefit from economies of scale in terms of the sufficient availability at competitive prices of equipment that can provide services such as mobile broadband.

- The need to minimise migration/transition issues for end users, for example in terms of moving from legacy technologies and legacy spectrum bands that are currently used to provide services to these users.

Q. 5. What are your views regarding the level of demand for Ireland to reserve UHF spectrum for innovation and experimentation? Please support your views with consideration to the availability of UHF spectrum.

Vodafone welcomes ComReg's commitment to facilitate access to radio spectrum for the trialling of innovative technologies and services, as evidenced by the existing ComReg test and trail licensing scheme, and acknowledges the benefits that this offers. However as outlined in Vodafone's response to question 3, while there may well be a case for reserving some spectrum for experimental/innovation purposes, it would not be appropriate for spectrum to be allocated for this purpose from the sub-band covering channels 61-69 inclusive. Vodafone consider that this would fragment and/or seriously restrict the already limited amount of spectrum that would be available

for wireless/mobile broadband service provision in the 790-862 MHz sub-band and could preclude interoperability and harmonised provision of wireless/mobile broadband services on a pan-European basis. Vodafone would therefore urge ComReg to confine any consideration of reserving spectrum for innovation and experimental purposes exclusively to any available sub-bands lower down in the UHF spectrum and to be mindful of the need to avoid inefficient fragmentation of spectrum use and preserve any benefits of harmonisation of spectrum use on a pan European or wider basis.

Q. 6. In light of your views on non-broadcasting services, do you consider that a mixed approach to spectrum allocation in the UHF spectrum band should be adopted? Please provide reasons for your view.

Yes, Vodafone agrees that a mixed approach to spectrum allocation is optimal and should be adopted. We are in agreement with the conclusions of the Europe Economics report that, at the margin, the value of using part of the spectrum freed up in the UHF band by the digital switchover of broadcasting for non-broadcasting services such as wireless/mobile broadband exceeds that of using it exclusively for broadcasting (eg. in terms of further DTT channels than already provided for).

Q. 7. Do you agree with ComReg's assessment regarding the initial mix between broadcasting and non-broadcasting services? Please answer in terms of your views regarding the initial mix between broadcasting and non-broadcasting services and any other considerations that you consider relevant.

Yes, Vodafone agree with ComReg's approach for the reasons outlined in the response to question 6.

Q. 8. Do you consider that, if the spectrum demand for the provision of DTT services does not meet the level envisaged by the 2007 Act, a review of the initial mix should be carried out following analogue switch-off of television services in the UHF spectrum band? If so, please provide reasons for your view and also indicate which stakeholder(s) should participate in such a review. If not, please provide reasons for your view.

Yes, Vodafone agree that if the spectrum demand for the provision of DTT services does not meet the level envisaged by the 2007 Act, a review of the initial mix should be carried out following analogue switch-off of television services in the UHF spectrum band. Indeed, Vodafone considers that it would be incumbent on ComReg under its obligations in relation to efficient spectrum management to carry out such a review. Digital Dividend spectrum is far too valuable a natural resource to be allowed to remain unutilised for an extended period of time. At the time that such a review may become necessary, ComReg would have a better indication as to the level of demand that would exist in relation to any new channels that might become available. At present, it is not possible to comment on which stakeholders should participate and it would be premature for ComReg to preclude any particular course of action at this stage.

Q. 9. Do you consider that the 800 MHz sub-band should be reserved for services other than broadcasting? Please provide reasons for your view.

Vodafone considers that the 800 MHz sub-band should be reserved for the provision of advanced mobile broadband services, in order to allow Irish society to avail of the benefits of harmonisation of spectrum use on a pan European basis. These benefits would arise in particular, as ComReg has identified, in terms of apparatus and customer equipment for the provision of services such as wireless/mobile broadband that are produced for a European mass market.

Q. 10. How do you consider that the current uses of channel 69 in Ireland, for example Programming Making and Special Events (PMSE) uses, would be impacted by reserving the 800 MHz band for non broadcasting services? Please provide your view on how PMSE uses could be accommodated if such uses were to be displaced from channel 69.

Reservation of the proposed 800 MHz sub-band for non-broadcasting services such as mobile broadband would require that channel 69 could no longer be used for PMSE purposes. Vodafone believes that PMSE uses could potentially be accommodated either within the centre gap currently envisaged between the paired spectrum for uplink and downlink electronic communications use in the 800 MHz sub-band or in alternative spectrum that could be made available in sub-bands lower down in the UHF spectrum.

A replacement for channel 69 which is currently used for PMSE must closely replicate key characteristics of that spectrum. It must support at least eight wireless microphones/in-ear monitors and should be free from harmful interference from other services and be available on a national basis. Ideally, it should be adjacent to interleaved spectrum and have a low opportunity cost. Vodafone notes that technical work done by OFCOM suggests that, even in a plausible worst-case scenario, the usability of channel 38 for PMSE would still be a comparable to channel 69. Vodafone notes that Ofcom is therefore proposing to transfer PMSE use of UHF spectrum to channel 38. As channel 38 is, according to Figure 2.0 in the consultation, currently not used in Ireland, this may be a suitable candidate band for PMSE uses when channel 69 is cleared.

Q. 11. Do you consider there to be merits in the identification of additional sub-band(s)? If so, please provide details in terms of timing and any other details which you consider relevant and reasons for your view. If not, please provide details and reasons for your view.

There may be value in creating and clearing a second sub-band for the provision of non-broadcasting services lower down in the UHF spectrum than the proposed 800 MHz sub-band. The merits of such a proposal can only be fully determined through carrying out a comprehensive cost benefit analysis, which would incorporate consideration of the social as well as economic benefits and costs. In the case of commercial non-broadcasting uses of the spectrum, the extent to which spectrum for these purposes is harmonised with that in other jurisdictions is likely to be crucial in determining the benefits of UHF spectrum allocated to them. For example, if a second sub-band were to be aligned with the spectrum currently allocated for non-broadcasting uses in other international jurisdictions (such as in the 700 MHz band in the United States and certain other countries) and for which equipment for a mass market is currently or prospectively available, then it would be much more beneficial for electronic communications use than spectrum which was not harmonised across a sufficient number of countries to generate the necessary scale economies.

Vodafone must emphasise that any proposals for the identification of additional sub-bands should not be at the expense of allocating the optimal amount of spectrum (potentially up to 100 MHz or more) in the 800 MHz sub-band for the provision of advanced mobile broadband services. There are clear and substantial economic and social benefits to allocating the optimal amount of spectrum for mobile use in the 800 MHz sub-band on a pan-European harmonised basis whereas any potential benefits of additional sub-bands lower down in the UHF spectrum appear to be uncertain. More detail on any such proposals for additional sub-bands would be required before Vodafone could comment further.

Q.12. What type of channel configurations would you consider would deliver most economies of scale in terms of availability of equipment and tuning / roaming of equipment? Please explain in terms of an indicative channel plan of frequencies, see for example Figure 2.0, and if you propose a channel configuration please give details of how this might impact broadcasting use of the band?

Vodafone considers that the 790-862 MHz band should be allocated to mobile broadband in line with the conclusions of the WRC 2007. The proposed CEPT bandplan with 2 X 30 MHz of spectrum allocated to mobile use and a 12 MHz centre gap currently appears to deliver most economies of scale, as this proposal appears most likely to be adopted across administrations on a pan European basis.

Vodafone does not have detailed views at this time on the particular channel configurations that would be optimal to use for any additional sub-bands that may be identified for non-broadcasting uses elsewhere in the UHF spectrum. However channel configurations for additional sub-bands should be such as to provide the opportunity to avail of the benefits of harmonised pan-European and wider international use where possible.

Q. 13. Do you consider there to be merits in accelerating access to a digital dividend sub-band in Ireland? If so, what considerations do you believe would need to be taken into account and how would they impact accelerating access to the digital dividend, for example (i) possible opportunity costs of delayed access; (ii) time-table for analogue television switch-off; (iii) geographic location of potential cleared spectrum bands; (iv) risk of fragmentation of digital dividend; and (v) any other risk/benefits which would need to be considered.

Yes. Vodafone agrees with ComReg that the optimal timing of Digital Dividend spectrum release and the impact of delayed access to this spectrum are key considerations in the assessment of the merits of accelerated access to the 800 MHz sub-band in Ireland for mobile broadband use.

(i)

Vodafone believes that given the likely high opportunity cost of delays in making Digital Dividend spectrum available for allocation to mobile services the necessary spectrum should be released and re-allocated by 2012, if not earlier. The cost to Europe of a 3 year delay to 2015 has been estimated by the Spectrum Value Partners report to be in the order of €20bn. However the aim should be for the necessary planning work to be completed, and the process for assignment of spectrum to be implemented as soon as possible, and in any event significantly in advance of the

time when spectrum can actually be released. This would provide the necessary high level of certainty to mobile operators in planning network investment.

(ii)

Vodafone considers that the September 2012 timeline for analogue television switch off should be adhered to, and even brought forward if this is technically and economically feasible. This factor is clearly crucial in determining when Digital Dividend spectrum can actually be utilised for the provision of advanced mobile broadband services (however the process for allocation of the spectrum for mobile use can and should occur significantly in advance of this timeframe once the necessary preparatory work is completed.

(iii)

Spectrum cleared for mobile broadband use in the 800 MHz sub-band must be made available in Ireland on a national basis in order for the full benefits of harmonised use of this band in addressing the Digital Divide and providing competitive high performance mobile broadband services to consumers to be realised.

(iv)

Vodafone agrees with the importance that ComReg in Section 8 of the consultation places on avoiding fragmentation of the 800 MHz sub-band. This issue can be addressed by allocating up to a quarter of the Digital Dividend spectrum to mobile broadband use, in any event to include the harmonised 790-862 MHz band, on the basis of the bandplan adopted across other European administrations.

Q. 14. What would you consider to be an optimal time for holding awards for digital dividend spectrum? Please refer to the considerations outlined in question 13 above.

As set out in the response to question 13, an allocation process for the Digital Dividend spectrum should occur as soon as possible, but in any event significantly in advance of the time (currently anticipated to be in 2012) when spectrum would actually be released. This would provide the necessary high level of certainty to mobile operators in planning network investment.

Q. 15. Please qualify your answers to questions 13 and 14 in terms of what benefits might accrue to Irish consumers and citizens and Ireland's digital economy if access to a sub-band could be made available as soon as possible.

Please see the answer to question 1.

Q. 16. Please also provide views on the opportunity cost of delayed access to cleared spectrum and the possibility of negotiating early access directly with broadcasting spectrum users.

As set out in the response to question 13, Vodafone believes that given the likely high opportunity cost of delays in making Digital Dividend spectrum available for allocation to mobile services the necessary spectrum should be released and re-allocated by 2012, if not earlier. The cost to Europe of a 3 year delay to 2015 has been estimated by the Spectrum Value Partners report to be in the order of €20bn. The aim should be for the necessary planning work to be completed, and the process for assignment of spectrum to be implemented as soon as possible, and in any event significantly in advance of the time when spectrum can actually be released.

The relevant opportunity costs of delayed access to cleared spectrum include the costs to end users (in terms of potentially higher prices and restricted choice) from the fact that advanced mobile broadband services would not be available as an option for them, and the cost to the Irish economy of not being able to harness at an early stage the mobility and productivity benefits of enhanced mobile broadband services provided using Digital Dividend spectrum.

Q. 17. Do you consider that service and technology neutrality should generally be a key principle for spectrum rights of use arising from the digital dividend? Please provide reasons for your view.

No. There is an overriding requirement for harmonisation of spectrum to harness economies of scale in equipment, achieve interoperability, and facilitate pan-European and wider service provision. A totally flexible approach to Digital Dividend spectrum does not ensure spectrum will become available in a form suitable for the provision of enhanced mobile broadband services. The principle of technology neutrality should however be implemented subject to the requirement for harmonisation as there are a number of technology standards (eg. HSPA+, LTE) that may be used to provide advanced mobile broadband services and ComReg should not be overly prescriptive in terms of the technologies that could be used to provide these services.

The potential benefits of harmonisation in allowing end users to benefit from seamless service provision across EU member states, and economies of scale in terms of competitively priced end user equipment and associated services are too important not to be realised from ComReg's approach to the release and allocation of the Digital Dividend spectrum.

Q. 18. Do you consider that spectrum rights of use arising from the digital dividend should exclude the ability to provide DTT services? Please provide reasons for your view.

Vodafone agrees with ComReg's proposal that, beyond the spectrum reserved for licensing of six DTT multiplexes under the 2007 Act, any rights of use to remaining UHF spectrum comprising the Digital Dividend should exclude the ability to provide DTT and other services explicitly provided for under that Act. Broadcasting use of UHF spectrum is already adequately provided for under the arrangements currently in place for this following analogue switch off and Vodafone believes that the incremental value of using part of the spectrum freed up in the UHF band by the digital switchover of broadcasting for enhanced mobile broadband services exceeds that of using it exclusively for broadcasting (eg. in terms of further DTT channels than already provided for).