



An Coimisiún um
Rialáil Cumarsáide
Commission for
Communications Regulation

Multi Band Spectrum Award (MBSA2)

DotEcon's Award Assessment

Information Notice

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1 Introduction

1.1 This document introduces the assessment of DotEcon Ltd., ComReg's economic and spectrum award advisors, of ComReg's Multi-Band Spectrum Award ("MBSA2"). The award was completed in 2023 and resulted in an additional 465 MHz (or a 46% increase) of spectrum rights being successfully assigned to four winning bidders for mobile wireless broadband ("WBB") services.

1.1 A positive outcome albeit delayed by litigation

1.2 Following the discontinuance of Three's Appeal¹ of ComReg's MBSA2 Decision², ComReg successfully completed the MBSA2 in January 2023 resulting in nearly €450 million in spectrum fees³ with the issue of circa 20 year licences to the four winning bidders⁴, being:

- Meteor Mobile Communications Limited (trading as Eir, "Eir");
- Imagine Communications Limited ("Imagine");
- Three Ireland (Hutchison) Limited ("Three"); and
- Vodafone Ireland Limited ("Vodafone").

1.3 Each of the three mobile network operators ("MNOs") (Eir, Three and Vodafone) increased their spectrum holdings in both sub-1 GHz⁵ bands (ideal for coverage) and supra-1 GHz⁶ bands (ideal for capacity), while Imagine (the largest fixed wireless broadband operator in Ireland) doubled its spectrum holdings by adding an additional 55 MHz of supra-1 GHz spectrum nationally.

1.4 This spectrum is suitable for the widespread provision of advanced 5G services, and the improvement of other mobile and fixed WBB services, such as 4G (LTE) or Fixed Wireless Access ("FWA") services.

¹ High Court Record Number: 2021/9 MCA.

² Document [20/122](#), "Multi Band Spectrum Award – Response to Consultation and Decision", published 18 December 2020, available at www.comreg.ie

³ This includes both the upfront Spectrum Access Fees (SAFs) determined by the auction and the ongoing Spectrum Usage Fees (SUFs) which are payable over the duration of the licence.

⁴ See Annex 1 for details of the MBSA2 spectrum rights assigned.

⁵ Sub-1 GHz spectrum refers to the harmonised spectrum bands below 1 GHz which are generally used for providing cost-effective coverage in mobile networks. Currently, there are three such spectrum bands assigned in Ireland: the 700 MHz, 800 MHz and 900 MHz spectrum bands.

⁶ Supra-1 GHz spectrum refers to the harmonised spectrum bands above 1 GHz which are generally used for providing capacity in mobile networks. Currently, there are five such spectrum bands assigned in Ireland: the 1800 MHz, 2.1 GHz, 2.3 GHz, 2.6 GHz and 3.6 GHz spectrum bands.

- 1.5 While the completion of the MBSA2 took longer than expected (in the main due to Three's Appeal of the MBSA2 Decision, which delayed the assignment of some MBSA2 spectrum rights by up to 14 months^{7,8}) with consequential costs to the Irish economy⁹, **the MBSA2 achieved a very positive outcome for Ireland and, in doing so, should importantly promote further competition in the provision of WBB services in Ireland.**

1.2 DotEcon's award assessment

- 1.6 In light of the importance of the MBSA2, Three's appeal of two key aspects of the award design (the sub-1 GHz spectrum competition cap in combination with the Combinatorial Clock Auction ("CCA") format), the introduction of some advanced and novel features in the award (exposure pricing, assignment option generation), and given DotEcon's breadth of experience in the design and running of spectrum awards¹⁰, ComReg commissioned DotEcon to provide a post-award evaluation, noting that such observations may usefully inform future awards.
- 1.7 DotEcon is a leader in the design and implementation of high-value auctions and was ComReg's economic and spectrum award design and implementation consultant for the MBSA2. During this process, DotEcon produced numerous economic and award design reports for the MBSA2¹¹ and implemented the software used in the auction.
- 1.8 DotEcon's assessment is published alongside this document as ComReg Document 24/11a and a summary of DotEcon's main observations are set out below.

⁷ Based on the expected commencement dates in the MBSA2 Information Notice (Document [21/40](#)) of 14 February 2022 (for the 700 MHz, 2.3 GHz and 2.6 GHz bands) and 16 October 2022 (for the 2.1 GHz band), spectrum rights in the:

- 700 MHz, 2.3 GHz and 2.6 GHz bands were delayed between circa 11 to 14 months; and
- 2.1 GHz band were delayed between circa 3 to 6 months.

⁸ Annex 2 sets out a chronology of the main events in the MBSA2 award and its litigation.

⁹ In the MBSA2 High Court proceedings, ComReg obtained reports from economic experts Dr. Dan Maldoom and Professor J. Peter Clinch (see below) which estimate the likely economic benefits from the widespread deployment of 5G to be in the order of €1 bn per annum. See:

- ComReg Document [23/35a](#) version of Dr. Dan Maldoom's report of DotEcon titled "Issues arising from delay of the MBSA2 Award" published 17 April 2023 available at www.comreg.ie ; and
- ComReg Document [23/35b](#) "Redacted version of expert report of Professor J. Peter Clinch titled "Economic Impact of a Delay in the MBSA2 Award" published 17 April 2023 available at www.comreg.ie .

¹⁰ DotEcon has advised companies, regulators and government agencies in the design of nearly 60 auctions across 16 countries. More information at <http://www.dotecon.com>

¹¹ See [ComReg's MBSA2 Webpage](#), available at www.comreg.ie

2 Summary of DotEcon's main observations on the MBSA2

2.1 In its report, DotEcon provides an assessment on various aspects of the award including the auction design and the auction outcome, as well as observations on Three's Appeal.

2.1 Three's legal challenge and delays to the award

2.2 In relation to **Three's legal challenge and delays to the award**, DotEcon notes that:

- (i) ***The award outcome itself demonstrates that none of the harms claimed by Three came to pass.***
- (ii) *As part of the MBSA2 litigation, ComReg submitted evidence from Dr. Dan Maldoom (which was verified by Prof. Peter Clinch) regarding the **very high costs to the Irish economy of delays to widespread 5G roll-out.** These were estimated by DotEcon to be **in the order of €1 bn per annum**, and potentially double that. (emphasis added)*
- (iii) *Whilst ComReg was justified in not acceding to Three's request to relax the sub-1 GHz cap for the reasons set out in its Decision, it is worth noting that even if **ComReg had acceded to Three's request to relax the sub-1 GHz cap, there is no certainty that this would have avoided the resulting delay and its costs.** Such a fundamental modification of the rules could simply have triggered an appeal from an interested party other than Three, which could also have delayed matters. (emphasis added)*
- (iv) *In addition, had ComReg modified the sub-1 GHz cap, say to allow all MNOs to acquire three blocks of 700 MHz spectrum within the auction, **this could have permitted outcomes** for the distribution of sub-1 GHz spectrum **that were much more asymmetric than the pre-auction position, potentially with one MNO holding twice as much sub-1 GHz spectrum as another.** This would have entailed substantial economic welfare losses from distorted downstream competition, potentially over an extended period, as there are no current plans for further release of sub-1 GHz spectrum that could rectify such an outcome. (emphasis added)*
- (v) *Therefore, **even in hindsight knowing the delay that ensued, we consider that ComReg's sub-1 GHz cap was entirely justified.***

2.2 Outcome of the MBSA2

2.3 In relation to the **outcome of the MBSA2**, DotEcon notes that:

- (i) ***The award achieved a very good outcome which provides a highly favourable framework for a competitive Irish telecoms industry;***
- (ii) *All the MNOs increased their spectrum holdings, with the level of spectrum asymmetry between them reducing. A non-MNO bidder (Imagine) also won a large amount of spectrum.*
- (iii) *Each of the incumbent MNOs (Eir, Three and Vodafone) won a combination of 700 MHz spectrum and higher frequencies, allowing for the continued provision of existing services, the expansion of existing networks and the roll-out of high-speed 5G services.*
- (iv) *Comparing pre- and post-award differences in spectrum holdings across MNOs, asymmetry has reduced, measured both in absolute terms and as a percentage of total MNO holdings. This outcome should be favourable for downstream competition and partially redresses the much more asymmetric situation created by the Hutchison-Telefónica merger, which was opposed by ComReg but cleared by the European Commission.*
- (v) *Imagine, a non-MNO, won 55 MHz of TDD spectrum for use until 2042. This was likely facilitated by ComReg's use of the CCA format, which encourages bidders to compete for greater amounts of spectrum. In this format, competing unsuccessfully for more spectrum does not lead to a higher price for a smaller quantity eventually won, avoiding incentives for strategic demand reduction.*

2.3 Spectrum competition caps and the Combinatorial Clock Auction format

2.4 In relation to performance of the **spectrum competition caps and the CCA** in the award (i.e. the two items which were the subject of Three's legal challenge), DotEcon notes that:

- (i) ***The spectrum competition caps do not appear to have shaped the auction outcome...***
- (ii) *No bidder won the maximum amount of spectrum allowed under the overall cap of 375 MHz. Therefore, this overall spectrum cap had a purely prudential function.*
- (iii) *In the 700 MHz band, both Vodafone and Eir won 2x10 MHz, strictly below the maximum amount they could have acquired, while Three obtained an amount strictly equal to its cap (two blocks of 700 MHz).*

- (iv) **The choice of a CCA format for the main stage met the objective of mitigating bidders' exposure to aggregation risks** due to the scope for complementarities between lots (arising from combining multiple similar lots, lots across bands and across time periods).
- (v) Bidders often combined lots across time slices. There was also switching of multiple lots as a block across bands.
- (vi) All bidders won a combination of lots that is consistent with enjoying the benefits from expected complementarities, so without any stranded lots (such as single lots that may not be technically efficient).

2.4 Other aspects of the award

2.5 In relation to **other aspects of the auction**, DotEcon notes that:

- (i) **Use of activity rules.** ... some of the most sophisticated aspects of the auction, such as the greater opportunity that the relaxed activity rules gave bidders in relation to switching demand and time slicing, were used by bidders ... This suggests that the additional complexity introduced by these more sophisticated features is likely justified and was understood by bidders. A less efficient auction outcome might well have occurred absent the relaxed activity rules.
- (ii) **Exposure pricing.** ... This was the first time that exposure prices have been used in any auction and was developed in response to concerns raised by stakeholders during the consultation.... Despite this being a potentially challenging computation, exposure prices worked well during the actual auction and provided bidders with information on the most it might have to pay for any lots it wins.
- (iii) **FDD vs TDD pricing**...the final primary bid round prices for the frequency generic 5 MHz TDD lots (in both the 2.3 GHz and 2.6 GHz bands) were similar to (and slightly in excess of) the final round prices for the 2x5 MHz frequency generic lots in the 2.6 GHz band ... **The evidence is consistent with the view that, on a per MHz basis, TDD is becoming more important and valuable to operators**, most likely as a result of the benefits it offers for services with asymmetric uplink/downlink traffic patterns.
- (iv) ...**the assignment stage (including the assignment option generation algorithm) worked well**, with all winning bidders receiving contiguous frequencies aligned across time slices in each band and having a wide range of choice.
- (v) **Bidder engagement and training.** Steps were taken to engage actively with bidders to ensure that there was a sufficient level of understanding of

*the rules, their implications, and the operation of the EAS. ... The fact that both the three MNOs and a non-MNO bidder won a considerable amount of spectrum suggests that **the auction design and training provided to bidders also met the objective of ensuring a level playing field amongst interested parties.***

2.5 DotEcon's concluding remarks

2.6 Overall DotEcon **concludes** that:

- (i) ***the award was conducted in a way that met ComReg's objectives and statutory obligations, leading to a very good outcome that facilitates downstream competition, and***
- (ii) ***ComReg's choices in relation to the auction design and measures to ensure effective competition were justified and appropriate.***

Annex 1: Details of MBSA2 spectrum rights assigned

A 1.1 Details of the spectrum rights assigned in the MBSA2 licences issued to Eir, Imagine, Three and Vodafone are set out in Table 1 and Figures 1 and 2 below.



Figure 1: MBSA2 frequency assignments in the 700 MHz, 2.1 GHz and 2.6 GHz FDD bands

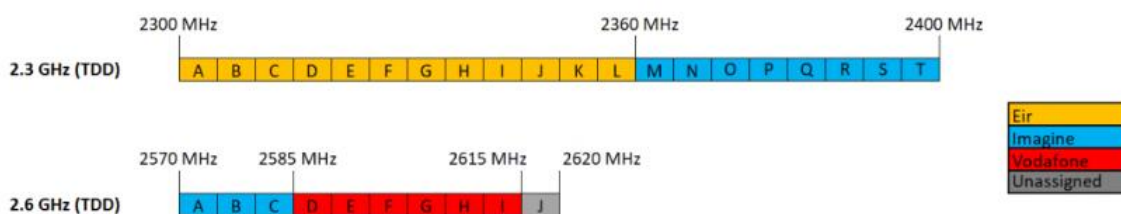


Figure 2: MBSA2 frequency assignments in the 2.3 GHz and 2.6 GHz bands

Table 1: Commencement dates of MBSA2 spectrum rights

	Eir	Imagine	Three	Vodafone
Licence commencement and expiry	20-Jan-23 to 13-Feb-42	20-Jan-23 to 13-Feb-42	20-Jan-23 to 13-Feb-42	20-Jan-23 to 13-Feb-42
700 MHz	Blocks A&B: 02-Apr-23	N/A`	Blocks C&D: 26-Jan-23	Blocks E&F: 02-Apr-23
2.1 GHz	Block I: 04-Mar-23 Blocks J-L: 12-Mar-27	N/A	Blocks A&B: 26-Jan-23 Block C: 14-Feb-23 Block D: 25-Feb-23	Block E: 25-Feb-23 Blocks F-H: 02-Apr-23
2.3 GHz	Blocks A-L: 20-Jan-23	Blocks M-T: 20-Jan-23	N/A	N/A
2.6 GHz FDD	N/A	N/A	Blocks A-G: 20-Jan-23	Blocks H-N: 20-Jan-23
2.6 GHz TDD	N/A	Blocks A-C: 20-Jan-23	N/A	Blocks D-I: 20-Jan-23

Annex 2: Chronology and overview of award outcome

The MBSA2 Decision

A 2.1 In December 2020, following a comprehensive consultation process, ComReg set out its MBSA2 Decision for the award of 470 MHz of spectrum in the 700 MHz, 2.1 GHz, 2.3 GHz and 2.6 GHz bands.

Three's appeal of the MBSA2 Decision

A 2.1 In January 2021, Three submitted a legal challenge on the MBSA2 Decision (the "Appeal" or "substantive proceedings").

A 2.2 Three's Appeal of the MBSA2 Decision concerned the combined use of two key aspects of the MBSA2 Decision, namely the:

- sub-1 GHz spectrum competition cap, which was important to prevent spectrum holding outcomes that could distort downstream competition, noting that sub-1 GHz spectrum is particularly important in Ireland given our rural characteristics; and
- combinatorial clock auction (CCA) format, which was important to mitigate the aggregation risks of awarding substitutable and complementary spectrum rights in one award process, noting that this multi-band format also encourages participation by smaller bidders.

Three's stay on the running of the MBSA2 auction

A 2.1 While Three's Appeal of the MBSA2 Decision did not itself prevent ComReg from progressing the award, in June 2022 Three sought a stay Order preventing ComReg from commencing the main stage (i.e. auction) of the MBSA2.

A 2.2 This stay Order was granted by the High Court in July 2022, pending the delivery of judgment in the substantive proceedings or further order ("Stay").

Court of appeal allows ComReg to run the MBSA2 auction

A 2.1 On 25 July 2022 ComReg lodged an appeal¹² against the Order granting the Stay. This was heard in the Court of Appeal in October and early November 2022.

¹² Court of Appeal Record Number 2022/189.

A 2.2 On 8 November 2022, the Court of Appeal made an order varying the Stay. This allowed ComReg to progress the main stage of the MBSA2 but prevented ComReg from notifying the Winning Bidders of their entitlement to apply for licences¹³ or taking any subsequent steps pending the determination of the substantive proceedings or further order.

Results of the main stage of the MBSA2

A 2.1 On 14 December 2022, ComReg published an Information Notice (Document 22/105)¹⁴ setting out the results of the main stage of the MBSA2. There were four Winning Bidders: Eir, Imagine, Three; and Vodafone.

A 2.2 In relation to the 700 MHz band, Eir, Three and Vodafone all won two lots, and In Document 22/105, ComReg noted that bidding for this lot category “ended after just one Primary Bid Round” and “[t]here was no material competition for this lot category”.

Three's withdrawal of its Appeal and the Stay

A 2.1 Later that same day, 14 December 2022, ComReg received correspondence from Three indicating that it had filed a motion with the Courts Service seeking leave to discontinue its Appeal and have the Stay lifted.¹⁵

A 2.2 The application was heard in the High Court on Monday 19 December 2022, where an Order was made:

- granting Three leave to discontinue the Appeal; and
- awarding ComReg its costs against Three.

Court of Appeal's lifting of Stay and its judgment

A 2.1 As the Stay was varied by the Court of Appeal, an order of that Court was necessary to lift the Stay.

A 2.2 On 21 December 2022, the Court of Appeal:

¹³ As provided for in paragraph 3.259 of the Information Memorandum (“IM”) [Document 21/40](#), “Multi Band Spectrum Award – Information Memorandum and Draft Regulations The 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands”, published 16 April 2022, available at www.comreg.ie.

¹⁴ [Document 22/105](#), “Multi Band Spectrum Award – Results of the Main Stage”, published 14 December 2022, available at www.comreg.ie.

¹⁵ [Document 22/113](#), “Multi Band Spectrum Award – Three granted leave to withdraw its Appeal and ordered to pay ComReg's costs”, published 20 December 2022, available at www.comreg.ie.

- delivered its judgment in respect of ComReg's appeal of the Stay ordered by the High Court;
- made an Order which lifted the Stay; and
- ordered Three to pay ComReg's costs relating to both the High Court stay application and Court of Appeal Proceedings.

A 2.3 On 23 January 2023, the judgment of the Court of Appeal was published.¹⁶

Issue of MBSA2 Liberalised Use Licences and assignment of all spectrum rights

A 2.1 Following the submission of complete applications, on 19 January 2023 ComReg issued MBSA2 Liberalised Use Licences to each of the Winning Bidders, i.e. Eir, Imagine, Three and Vodafone. Each of these licences commenced on 20 January 2023 and expires on 13 February 2042.

A 2.2 On 17 April 2023, ComReg published an Information Notice (Document 22/35)¹⁷ noting that all MBSA2 spectrum rights of use for Time Slice 1 have been commenced. This followed the completion of transition activities in the 2.1 GHz band and the expiry of the short-term ECS licences¹⁸.

¹⁶ The Court of Appeal, Record Number: 2022/189, "[Judgment of Mr. Justice Maurice Collins delivered on 21 December 2022](#)", available at www.courts.ie

¹⁷ [Document 23/35](#), "*Multi Band Spectrum Award – Commencement of all MBSA2 spectrum rights - Supporting new 5G investments and its substantial benefits*", published 17 April 2023, available at www.comreg.ie.

¹⁸ See ComReg, "[Short-Term ECS Licensing Framework](#)", available at www.comreg.ie