

**WIRELESS TELEGRAPHY ACT, 1926**

**WIRELESS TELEGRAPHY (LIBERALISED USE AND RELATED LICENCES IN THE 700 MHZ DUPLEX, 2.1 GHZ, 2.3 GHZ AND 2.6 GHZ BANDS) REGULATIONS 2021**

MBSA2 Liberalised Use Licence for terrestrial systems capable of providing Electronic Communications Services

Licence under section 5 of the Act of 1926 to keep and have possession of apparatus for wireless telegraphy for terrestrial systems capable of providing Electronic Communications Services.

The Commission for Communications Regulation, in exercise of the powers conferred on it by section 5 of the Act of 1926 hereby grants the following licence to Three Ireland (Hutchison) Limited of 28/29 Sir John Rogerson's Quay Dublin 2 ("the Licensee").

The Licensee is hereby authorised to keep and have possession of apparatus for wireless telegraphy for terrestrial systems capable of providing Electronic Communications Services as specified in Part 2 of this Licence, subject to such apparatus being installed, maintained, worked and used in accordance with the terms, conditions and restrictions set out in the Wireless Telegraphy (Liberalised Use and Related Licences in the 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands) Regulations 2021 (S.I. No. 264 of 2021) as amended by the Wireless Telegraphy (Liberalised Use and Related Licences in the 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands) (Amendment) Regulations 2022 (S.I. No. 483 of 2022) and Wireless Telegraphy (Liberalised Use and Related Licences in the 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands) (Amendment No. 2) Regulations 2023 (S.I. No. 594 of 2023) ("the Regulations"), including but not limited to, the following:

- (1) The Licensee shall ensure that it complies with all of the conditions contained within the Regulations and within Parts 1 to 4 of this Licence; and
- (2) The Licensee shall ensure that it makes payment of all fees as detailed in the Regulations.

For the purpose of this Licence, the definitions set out in the Regulations apply.

This licence amends the licence which came into effect on 20/01/2023 (the "Licence Commencement Date") and subject to revocation, suspension or withdrawal, expires on 13/02/2042.

Signed: 

For and on behalf of the Commission for Communications Regulation

Date of Issue: 23/02/2024

## Part 1

### Commencement and expiry dates of Liberalised Spectrum

<b>Authorised Band</b>	<b>Name of Spectrum Block</b>	<b>Frequency Assigned to Spectrum Block</b>	<b>Commencement Date per Spectrum Block</b>	<b>Expiry Date per Spectrum Block</b>
700MHz Duplex	700 MHz Duplex Block (Blocks C and D)	From 713 MHz to 723 MHz and from 768 MHz to 778 MHz	26 January 2023	13 February 2042
2.1 GHz	2.1 GHz Band Blocks (Blocks A to B)	From 1920 MHz to 1930 MHz and from 2110 MHz to 2120 MHz	31 January 2023	13 February 2042
2.1 GHz	2.1 GHz Band Blocks (Block C)	From 1930 MHz to 1935 MHz and from 2120 MHz to 2125 MHz	14 February 2023	13 February 2042
2.1 GHz	2.1 GHz Band Blocks (Block D)	From 1935 MHz to 1940 MHz and from 2125 MHz to 2130 MHz	25 February 2023	13 February 2042
2.6 GHz	2.6 GHz Band FDD Blocks (Blocks A to G)	From 2500 MHz to 2535 MHz and from 2620 MHz to 2655 MHz	20 January 2023	13 February 2042

## **Part 2**

The Apparatus to which this Licence applies

This information is updated annually and a non-confidential version is available separately on the ComReg webpage for “Mobile & WBB-Licensed Apparatus & Sites”.

## **Part 3**

Apparatus Location and Details

This information is updated annually and a non-confidential version is available separately on the ComReg webpage for “Mobile & WBB-Licensed Apparatus & Sites”.

## **Part 4**

### Licence Conditions

#### **Section 1: General**

##### 1. Definitions

The following additional definitions shall apply to Part 4:

“Base Station” means Apparatus connected to a backhaul network, which provides a Radiocommunication Service to Terminal Stations using the Liberalised Spectrum;

“LTE” means the technology defined by 3GPP called Long Term Evolution; and

“Terminal Station” means mobile user equipment and fixed customer premise equipment which communicates with a Base Station using the Liberalised Spectrum.

##### 2. Resolution of Harmful Interference

In the event of Harmful Interference, the affected Licensees shall exchange information with a view to resolving the Harmful Interference by mutual consent. Where resolution cannot be agreed between the affected Licensees, the Commission may mediate in accordance with its statutory functions, objectives and duties.

#### **Section 2: Technical Conditions**

##### 1. Definitions

The following additional definitions shall apply to this section:

“Active Antenna Systems” or “AAS” means a Base Station and an antenna system where the amplitude and/or phase between antenna elements is continually adjusted resulting in an antenna pattern that varies in response to short term changes in the radio environment. This excludes long-term beam shaping such as fixed electrical down tilt. In AAS Base Stations, the antenna system is integrated as part of the Base Station system or product;

“Non-Active Antenna Systems” or “non-AAS” means a Base Station and an antenna system that provides one or more antenna connectors, which are connected to one or more separately designed passive antenna elements to radiate radio waves. The amplitude and phase of the signals to the antenna

elements is not continually adjusted in response to short term changes in the radio environment;

“Aeronautical Primary Radars” means Apparatus (including “Star2000” and “TA10” models) providing primary aircraft detection used in airport surveillance networks;

“Block Edge Mask” or “BEM” is an emission mask that is defined as a function of frequency in relation to a ‘block edge’, the latter being the frequency boundary of a spectrum block for which rights of use are assigned to a Licensee. The BEM consists of several elements which are defined for certain measurement bandwidths;

“dBm” means decibels of power referenced to one milliwatt;

“Downlink” means transmissions from a Base Station to a Terminal Station;

“Inter-Licensee Synchronisation Procedure” means the synchronisation procedure set out in Section 3 of this Licence;

“Power Flux Density limit” or pfd limit (dBW/m<sup>2</sup>) means the interference threshold at radar receiver input (measured in dBW) minus the radar antenna gain (measured in dBi) plus  $10 \log (4\lambda / \pi^2)$ , where  $\lambda$  is the wavelength in metres;

“RurTel” means the Point to Multi-Point Radio Link system used to provide fixed telephony services in parts of county Donegal using the frequency ranges 2307 - 2327 MHz and 2401 - 2421 MHz;

“TD-LTE” means the TDD variant of LTE (Long Term Evolution) technology; and

“Uplink” means transmissions from a Terminal Station to a Base Station.

## 2. Technical Conditions

### (1) 700 MHz Duplex

- (a) Only terrestrial systems compatible with the Decision of 2016 can be worked and used in the 700 MHz Duplex.
- (b) The FDD mode of operation shall be used in the 700 MHz Duplex. The duplex spacing shall be 55 MHz with Terminal Station transmission (FDD Uplink) located in the lower frequency band 703-733 MHz and Base Station transmission (FDD downlink) located in the upper frequency band 758-788 MHz.

- (c) The Licensee shall comply with all Memoranda of Understanding ('MoU')<sup>1</sup> between the Commission and its neighbouring national regulatory authorities responsible for communications matters, in particular the Office of Communications ("Ofcom") in the UK, or its successor, in relation to the 700 MHz Duplex.

#### Base Stations

- (d) Within a 700 MHz Duplex Block assigned to the Licensee, the in-block power from a Base Station must not exceed a maximum mean EIRP of 64 dBm/5 MHz per antenna.
- (e) Outside of the 700 MHz Duplex Block(s) assigned to the Licensee, the Licensee shall comply with the out-of-block BEM as specified in Section B of the Annex of the Decision of 2016.

#### Terminal Stations

- (f) The maximum mean in-block power limit of 23 dBm for Terminal Stations shall apply<sup>2</sup>.
- (g) The technical conditions set out in Section C of the Annex to the Decision of 2016 shall apply to out-of-block Terminal Stations.
- (h) Where a Licensee is assigned more than two 700 MHz Duplex Blocks and if this assignment is deployed starting at 703 MHz, the Licensee shall ensure that the Terminal Station bandwidth is no greater than 10 MHz in order to meet the conditions as set out in Table 12 of the Annex to the Decision of 2016 to provide protection to the frequency range 470 - 694 MHz.

#### (2) The 2.1 GHz Band

- (a) Only terrestrial systems compatible with the Decision of 2012 can be worked and used in the 2.1 GHz Band.
- (b) The duplex mode of operation shall be FDD. The duplex spacing shall be 190 MHz with Terminal Station transmission (FDD Uplink) located in the lower part of the band starting at 1920 MHz and finishing at 1980 MHz and base station transmission (FDD downlink) located in the upper part of the band starting at 2110 MHz and finishing at 2170 MHz.

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<sup>1</sup> The current Memorandum of Understanding on frequency coordination between Ireland and the United Kingdom concerning the spectrum coordination of Land Mobile Radio Communication Networks in the frequency range 703 MHz to 2690 MHz, is available at [www.comreg.ie](http://www.comreg.ie).

<sup>2</sup> This power limit is specified as EIRP for Terminal Stations designed to be fixed or installed and as TRP for Terminal Stations designed to be mobile or nomadic. This value is subject to a tolerance of up to + 2 dB, to take account of operation under extreme environmental conditions and production spread.

- (c) The Licensee shall comply with all MoU<sup>3</sup> between the Commission and its neighbouring national regulatory authorities responsible for communications matters, in particular Ofcom in the UK, or its successor, in relation to the 2.1 GHz Band.

#### Base Stations

- (d) Within a 2.1 GHz Band Block assigned to the Licensee, the in-block radiated power from a Base Station transmitter in the downlink direction must not exceed:
  - i. an EIRP of 64 dBm/5 MHz per antenna for non-AAS; and
  - ii. a TRP limit of 57 dBm/5MHz per cell<sup>4</sup> for AAS.
- (e) Outside of the 2.1 GHz Band Block(s) assigned to the Licensee, the Licensee shall comply with the out-of-block BEM as specified in Section C of the Annex to the Decision of 2012.

#### Terminal Stations

- (f) The maximum mean in-block power limit over frequencies of FDD Uplink of 24 dBm for Terminal Stations shall apply<sup>5</sup>.

### (3) The 2.3 GHz Band

- (a) Only terrestrial systems compatible with the Decision of 2014 can be worked and used in the 2.3 GHz Band.
- (b) The TDD mode of operation shall be used in the 2.3 GHz Band.
- (c) The Licensee shall comply with the Inter-Licensee Synchronisation Procedure set out in Section 3 of this Licence.
- (d) The Licensee shall comply with all MoU<sup>6</sup> between the Commission and its neighbouring national regulatory authorities responsible for communications matters, in particular Ofcom in the UK, or its successor, in relation to the 2.3 GHz Band.

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<sup>3</sup> Current Memorandum of Understanding on frequency coordination between Ireland and the United Kingdom concerning the spectrum coordination of Land Mobile Radio Communication Networks in the frequency range 703 MHz to 2690 MHz, available at [www.comreg.ie](http://www.comreg.ie).

<sup>4</sup> In a multi-sector base station, the AAS radiated power limit applies to each one of the individual sectors.

<sup>5</sup> This power limit is specified as EIRP for Terminal Stations designed to be fixed or installed and as TRP for Terminal Stations designed to be mobile or nomadic. EIRP and TRP are equivalent for isotropic antennas. It is recognised that this value may be subject to a tolerance defined in the harmonised standards to take account of operation under extreme environmental conditions and production spread.

<sup>6</sup> Current Memorandum of Understanding on frequency coordination between Ireland and the United Kingdom in the frequency bands 2300 -2400 MHz to be applied in the area including the Republic of Ireland and the United Kingdom and the Isle of Man, available at [www.comreg.ie](http://www.comreg.ie).

- (e) If the Licence includes Spectrum Blocks in the range 2305 to 2330 MHz and the Licensee intends to deploy Base Stations in the coordination area<sup>7</sup>, the Licensee shall coordinate with the operator of the RurTel system to ensure coexistence with the RurTel system currently operating in the frequency range 2307-2327 MHz.

#### Base Stations

- (f) Within the 2.3 GHz Band Generic Frequency Blocks assigned to the Licensee, the in-block radiated power from a Base Station must not exceed an upper limit of:
  - i. 68 dBm/5 MHz EIRP per antenna for non-AAS; and
  - ii. 60 dBm/5 MHz TRP per cell for AAS.
- (g) Within the 2.3 GHz Band Fixed Frequency Block, if assigned to the Licensee, the in-block radiated power from a Base Station must not exceed an upper limit of:
  - i. 45 dBm/5 MHz EIRP for non-AAS; and
  - ii. 31 dBm/5 MHz TRP for AAS.
- (h) Outside of the 2.3 GHz Band Generic Frequency Blocks and the 2.3 GHz Band Fixed Frequency Block, if assigned to the Licensee, the Licensee shall comply with the out-of-block BEM requirements as specified in Section A2.1 “*Technical Conditions for MFCN Base Stations (TDD)*” of Annex 2 to the Decision of 2014.

#### Terminal Stations

- (i) The maximum mean in-block power limit of 25 dBm<sup>8</sup> for Terminal Stations shall apply.

#### (4) The 2.6 GHz Band

- (a) Only terrestrial systems compatible with the Decision of 2008 can be worked and used in the 2.6 GHz Band.
- (b) Within the 2.6 GHz Band FDD Blocks, the duplex mode of operation is FDD, where the duplex spacing shall be 120 MHz with Terminal Station transmission (Uplink) located in the lower part of the band starting at 2500 MHz (extending to 2570 MHz) and base station transmission (downlink) located in the upper part of the band starting at 2620 MHz.
- (c) Within the 2570 - 2620 MHz frequency range of the 2.6 GHz Band, the modes of operation permitted in accordance with the Decision of 2008 are:
  - i. TDD;
  - ii. Base Station transmission only; and
  - iii. Terminal Station transmission only.

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<sup>7</sup> The relevant coordination area is as defined in the Information Memorandum.

<sup>8</sup> This power limit is specified as EIRP for Terminal Stations designed to be fixed or installed and as TRP for Terminal Stations designed to be mobile or nomadic. A tolerance of up to + 2 dB has been included in this limit, to reflect operation under extreme environmental conditions and production spread.



- (d) To achieve coexistence of adjacent FDD and TDD networks:
  - i. the 2.6 GHz Band TDD Fixed Frequency Block (Lower) is a restricted spectrum block as described in the Annex of the Decision of 2008; and
  - ii. the 2.6 GHz Band TDD Fixed Frequency Block (Upper) may be utilised in accordance with the Decision of 2008 noting that it may suffer an increased risk of interference due to the emissions from the FDD downlink.
- (e) Licensees assigned 2.6 GHz Band TDD Blocks shall comply with the Inter-Licensee Synchronisation Procedure set out in Section 3 of this Licence.
- (f) The Licensee shall comply with all MoU<sup>9</sup> between the Commission and its neighbouring national regulatory authorities responsible for communications matters, in particular Ofcom in the UK, or its successor, in relation to the 2.6 GHz Band.

#### Base Stations

- (g) Within any 2.6 GHz Band FDD Blocks, any 2.6 GHz Band TDD Generic Frequency Blocks, and the 2.6 GHz Band TDD Fixed Frequency Block (Upper)<sup>10</sup> assigned to a Licensee, the in-block radiated power from a Base Station transmitter must not exceed an upper limit of:
  - i. 68 dBm/5 MHz per antenna for Non-AAS; and
  - ii. 60 dBm/5 MHz per cell for AAS.
- (h) Within the 2.6 GHz Band TDD Fixed Frequency Block (Lower), assigned to a Licensee, the in-block radiated power from a Base Station transmitter in the downlink direction must not exceed a mean in-block power of:
  - i. 25 dBm/5 MHz EIRP per antenna for Non-AAS; and
  - ii. 22 dBm/5 MHz TRP limit per cell for AAS.
- (i) Outside of any 2.6 GHz Band FDD Blocks assigned to the Licensee, the Licensee shall comply with the out-of-block BEM which is built up by combining Tables 2, 3 and 4 of Section C of the Annex of the Decision of 2008, in such a way that the limit for each frequency is given by the higher value out of the baseline and the in-block power limits.

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<sup>9</sup> Current Memorandum of Understanding on frequency coordination between Ireland and the United Kingdom concerning the spectrum coordination of Land Mobile Radio Communication Networks in the frequency range 703 MHz to 2690 MHz, available at [www.comreg.ie](http://www.comreg.ie).

<sup>10</sup> The 2.6 GHz Band TDD Fixed Frequency Block (Upper), which is immediately adjacent to the FDD downlink, may suffer an increased risk of interference due to the emissions from the FDD downlink.

- (j) Outside of the 2.6 GHz Band TDD Fixed Frequency Block (Lower), any 2.6 GHz Band TDD Generic Frequency Blocks and the 2.6 GHz Band TDD Fixed Frequency Block (Upper) assigned to a Licensee, the Licensee shall comply with the Inter-Licensee Synchronisation Procedure set out in Section 3 of this Licence.
- (k) Outside of the 2.6 GHz Band TDD Fixed Frequency Block (Lower) and where Base Station antennas are placed indoors, the BEM for Non-AAS may be in line with Table 6 of Section C of the Annex of the Decision of 2008, provided that at geographical borders to other Member States, Table 3 of Section C of the Annex of the Decision of 2008 applies and that Table 5 of Section C of the Annex of the Decision of 2008 remains valid nationwide.
- (l) A Licensee assigned any 2.6 GHz Band Blocks must ensure protection of all Aeronautical Primary Radars as follows:
  - i. observe a coordination zone of one kilometre radius around the location<sup>11</sup> of each Aeronautical Primary Radar to provide additional protection from MFCN base station emissions at the Aeronautical Primary Radar receiver;
  - ii. in relation to Star2000 Aeronautical Primary Radars, the Licensee shall:
    - A. comply with an out-of-band Power Flux Density limit (pfd) limit given<sup>12</sup> by  $-140 \text{ dBW/m}^2/\text{MHz} + (10 \times \text{Log}_{10} (\text{B}_{\text{op}}/120))$ , where  $\text{B}_{\text{op}}$  is the quantum of downlink (i.e. FDD downlink and TDD) spectrum in MHz assigned to the Licensee in the 2.6 GHz Band, to address the impact of MFCN spurious emissions at the radar antenna receiver location; and
    - B. until notified by the Commission in writing that filters are installed at the Aeronautical Primary Radar, comply with an in-band pfd limit, given<sup>13</sup> by  $-78 \text{ dBW/m}^2 + (10 \times \text{Log}_{10} (\text{B}_{\text{op}}/120))$ , where  $\text{B}_{\text{op}}$  is the quantum of downlink (i.e. FDD downlink and TDD) spectrum in MHz assigned to the Licensee in the 2.6 GHz Band, to address the impact of blocking and intermodulation effects at the Aeronautical Primary Radar receiver.

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<sup>11</sup> Aeronautical Primary Radar locations are available from the Commission.

<sup>12</sup> Where  $-140 \text{ dBW/m}^2/\text{MHz}$  is the limit required to protect the Star2000 Aeronautical Primary Radar installations from emissions by all operators for out-of-band (i.e.  $>2700 \text{ MHz}$ ) power.

<sup>13</sup> Where  $-78 \text{ dBW/m}^2$  is the absolute limit required to protect the Star2000 Aeronautical Primary Radar installation from emissions by all operators for in-band (i.e.  $2570 - 2690 \text{ MHz}$ ) power.

- iii. in relation to the TA10 Aeronautical Primary Radar, the Licensee shall, until otherwise notified by the Commission in writing:
  - A. comply with an out-of-band pfd limit given<sup>14</sup> by  $-151 \text{ dBW/m}^2/\text{MHz} + (10 \times \text{Log}_{10} (B_{\text{op}}/120))$ , where  $B_{\text{op}}$  is the quantum of downlink (i.e. FDD downlink and TDD) spectrum in MHz assigned to the Licensee in the 2.6 GHz Band, to address the impact of MFCN spurious emissions at the Aeronautical Primary Radar antenna receiver location; and
  - B. comply with an in-band pfd limit given<sup>15</sup> by  $-88 \text{ dBW/m}^2 + (10 \times \text{Log}_{10} (B_{\text{op}}/120))$ , where  $B_{\text{op}}$  is the quantum of downlink (i.e. FDD downlink and TDD) spectrum in MHz assigned to the Licensee in the 2.6 GHz Band, to address the impact of blocking and intermodulation effects at the Aeronautical Primary Radar antenna receiver.
- iv. in relation to models of Aeronautical Primary Radars other than the Star2000 and TA10, the Licensee shall comply with conditions as may be determined by the Commission.

#### Terminal Stations

- (m) The maximum mean in-block power (including Automatic Transmitter Power Control range) of:
  - i. 35 dBm/5 MHz EIRP; and
  - ii. 31 dBm/5 MHz TRP,shall apply to Terminal Stations<sup>16</sup>.

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<sup>14</sup> Where  $-151 \text{ dBW/m}^2/\text{MHz}$  is the limit required to protect the TA10 Aeronautical Primary Radar installation from emissions by all operators for out-of-band (i.e. >2700 MHz) power.

<sup>15</sup> Where  $-88 \text{ dBW/m}^2$  is the absolute limit required to protect the TA10 Aeronautical Primary Radar installation from emissions by all operators for in-band (i.e. 2570 – 2690 MHz) power.

<sup>16</sup> EIRP should be used for fixed or installed Terminal Stations and the TRP should be used for the mobile or nomadic Terminal Stations.

### Section 3: Inter-Licensee Synchronisation Procedure

This Section 3 applies only to Licensees assigned 2.3 GHz Band Blocks or 2.6 GHz Band TDD Blocks, or both 2.3 GHz Band Blocks and 2.6 GHz Band TDD Blocks.

#### 1. Definitions

The following additional definitions shall apply in this section:

“Default Frame Structure” means the frame structure as detailed in 3(1) below;

“Indoor Small Cell” means either a Non-AAS Base Station with an EIRP of less than or equal to 24 dBm per 20 MHz carrier or an AAS Base Station with a TRP of less than or equal to 16 dBm per 20 MHz carrier that is located indoors either within a residential or non-residential property;

“Other Frame Structure” means a frame structure other than the Default Frame Structure;

“Restrictive BEM” means, for Licensees utilising the Other Frame Structure (or failing to synchronise with adjacent channel networks for any other reason):

- (a) For any 2.6 GHz Band TDD Blocks assigned to a Licensee, a restrictive BEM<sup>17</sup> given by combining Table 3 and either Table 2<sup>18</sup> or Table 5<sup>19</sup> as appropriate in Section C of the Annex of the Decision of 2008, in such a way that the limit for each frequency is given by the higher value out of the baseline and the in-block power limits applies; and
- (b) for any 2.3 GHz Band Blocks assigned to a Licensee, a Restrictive BEM is given by combining the relevant maximum permitted in-block radiated power appropriate to the Licensee and the out-of-block limits from Table 3 and Table 6 (relating to unsynchronised TDD blocks) of Annex 2 to the Decision of 2014;

“Unrestrictive BEM” means, for Licensees utilising the Default Frame Structure on their network (and having a common reference phase clock with adjacent channel operators<sup>20</sup>):

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<sup>17</sup> Noting Section 2 Regulation 2(4)(k) relating to indoor use.

<sup>18</sup> For 2.6 GHz Band TDD Generic Frequency Blocks and the 2.6 GHz Band TDD Fixed Frequency Block (Upper).

<sup>19</sup> For the case of 2.6 GHz Band TDD Fixed Frequency Block (Lower).

<sup>20</sup> Each operator needs to ensure the start of frame is aligned with adjacent channel operators above and below its assignment.

- (a) for any 2.6 GHz Band TDD Blocks assigned to a Licensee, a BEM<sup>21</sup> given by combining Table 2<sup>18</sup> or Table 5<sup>19</sup> as appropriate, Tables 3 and 4 of Section C. of the Annex of the Decision of 2008, in such a way that the limit for each frequency is given by the higher value out of the baseline and the in-block power limits applies<sup>22</sup>; and
- (b) for any 2.3 GHz Band Blocks assigned to a Licensee, Table 3 and Table 6 of Annex 2 of the Decision of 2014 relating to synchronised TDD blocks applies.

## 2. Introduction

- (1) Licensees assigned 2.3 GHz Band Blocks or 2.6 GHz Band TDD Blocks or both shall be bound by the Inter-Licensee Synchronisation Procedure set out in this Section 3.
- (2) Licensees shall co-operate in such a way that one network deployment within the Liberalised Spectrum does not cause Harmful Interference to another Licensee within the Liberalised Spectrum.
- (3) This procedure sets out the circumstances in which Licensees may use the Unrestrictive BEM and the Restrictive BEM, so as to minimise the risk of Harmful Interference to other Licensees.

## 3. Conditions for using the Unrestrictive BEM

- (1) Default Frame Structure - the technical conditions for Unrestrictive BEM shall apply where a Licensee's Base Station complies with the Default Frame Structure outlined below:
  - (a) Transmissions from a Licensee's Base Station(s) shall have a frame structure as shown in Table 1. Indicated timeslots (or subframes) must not be allocated to anything other than Downlink (D) and Uplink (U) transmissions. 'S' denotes a special subframe. TD-LTE frame configuration 2 (Downlink: Uplink, 3:1) with special subframe configuration 6 or equivalent frame structures whose transmit and receive periods are aligned with this configuration are permitted;
  - (b) Timeslots shall have a duration of 1 millisecond; and
  - (c) Licensees shall ensure that frames start at a common reference time (+/- 1.5 µs) so that all Licensees' frames are aligned and transmissions synchronised.

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<sup>21</sup> Noting Section 2 Regulation 2(4)(k) relating to indoor use.

<sup>22</sup> As the 2.6 GHz Band TDD Fixed Frequency Block (Lower) is a restricted spectrum block the in-block limit is taken from Table 5 of Section C of the Annex of the Decision of 2008.

**Table 1: Default Frame Structure**

DL/UL ratio	Timeslot or Subframe number									
	0	1	2	3	4	5	6	7	8	9
3:1	D	S	U	D	D	D	S	U	D	D

4. Conditions for using the Restrictive BEM

- (1) Other Frame Structure — the technical conditions for Restrictive BEM shall apply where a Licensee’s Base Station complies with the Other Frame Structure as outlined below:
- (a) All frame configurations that are not compatible with TD-LTE frame configuration 2 (3:1) with special sub-frame configuration 6 or equivalent frame structure whose transmit and receive periods are aligned with this configuration are permitted;
  - (b) Licensees shall co-operate to minimise Harmful Interference caused by sub-frame overlaps if different technologies are used; and
  - (c) Licensees using the Restrictive BEM shall not cause Harmful Interference to those Licensees’ networks that use the Default Frame Structure (or equivalent). Achieving this may include applying internal guard bands or reduced in-block power levels, or a combination of both, in blocks adjacent to those Licensees’ networks that use the Default Frame Structure (or equivalent).

5. Indoor Small Cells

- (1) Indoor Small Cells for indoor domestic and other indoor locations are permitted to operate under the Unrestrictive BEM on the condition that they do not cause Harmful Interference to any other Licensees.

## Section 4: Coverage Requirements

### 1. Definitions

The following additional definition shall apply in this section:

“800 MHz Band” means radio frequency spectrum in the range 791 - 821 MHz paired with radio frequency spectrum in the range 832 – 862 MHz.

“900 MHz Band” means radio frequency spectrum in the range 880 – 915 MHz paired with radio frequency spectrum in the range 925 – 960 MHz.

“Eircode” means Ireland’s postcode system which identifies every home and business address in the State with a unique code.

“Existing MNO” means a Licensee that on 1 January 2021 was a holder of one or more of the following licences:

- (a) a licence under the Wireless Telegraphy (Liberalised Use and Preparatory Licences in the 800 MHz, 900 MHz and 1800 MHz bands) Regulations 2012 (S.I. No. 251 of 2012); and/or
- (b) a licence under the Wireless Telegraphy (Third Generation and GSM Mobile Telephony Licence) Regulations, 2002 (S.I. No 345 of 2002), as amended by the Wireless Telegraphy (Third Generation and GSM Mobile Telephony Licence) (Amendment) Regulations, 2003 (S.I. No 340 of 2003);

“Native Wi-Fi” means a technology which allows mobile phone calls and texts to be made on a device utilising a Wi-Fi connection rather than through the mobile network directly;

“New Entrant” means a Licensee that is not an Existing MNO;

“RSRP” means Reference Signal Received Power which is defined as the linear average of the reference signal power (in Watts) within a number of specific resource elements across a specified bandwidth within an LTE downlink signal. LTE specific equipment is required to decode the LTE downlink signal to make this measurement;

“Single user throughput cell edge” or “SUTP” means the downlink bit rate that can be successfully delivered to a single active user per cell at a particular depth and consistency of coverage. This is the downlink bit rate or download speed that a user could experience when not contending with other users for service in that cell, so that the cell delivers the maximum possible data rate to a single user consistent with the signal quality experienced by that user; and

“Wi-Fi” means the wireless technology, based on the IEEE 802.11 family of standards, commonly used for local area networking of devices and Internet access.

### 2. Minimum Coverage Requirements

- (1) A Licensee that is an Existing MNO and is assigned one or more 700 MHz

Duplex Blocks under this Licence shall achieve and maintain for the remaining duration of the licence:

- (a) the appropriate<sup>23</sup> General Outdoor Coverage Obligations for an Existing MNO as set out in Table 2 below; and
- (b) the appropriate<sup>24</sup> Outdoor Coverage Obligations at specific locations for an Existing MNO as set out in Table 3 below.

**Table 2: General Outdoor Coverage Obligations for an Existing MNO**

Quantum of spectrum assigned to the Licensee in the 700 MHz Duplex under this Licence	Outdoor coverage service (Single User Throughput Cell Edge)	Coverage dimension	Coverage % levels to be met in <sup>25</sup> :		
			3 Years	5 Years	7 Years
At least 2 × 10 MHz	30 Mbit/s	Population	85%	92%	95%
	30 Mbit/s	Motorways	75%	85%	90%
	30 Mbit/s	Primary Roads	60%	75%	80%
	3 Mbit/s	Population	99%	99%	99%
	3 Mbit/s	Geographic area	90%	91%	92%
Less than 2 × 10 MHz	20 Mbit/s	Population	85%	92%	95%
	20 Mbit/s	Motorways	75%	85%	90%
	20 Mbit/s	Primary Roads	60%	75%	80%
	3 Mbit/s	Population	99%	99%	99%
	3 Mbit/s	Geographic area	90%	91%	92%

<sup>23</sup> i.e. appropriate to the quantum of spectrum assigned to the Licensee in the 700 MHz Duplex under the Licence.

<sup>24</sup> i.e. appropriate to the quantum of spectrum assigned to the Licensee in the 700 MHz Duplex under the Licence.

<sup>25</sup> From the earliest commencement date of the 700 MHz Duplex Block(s).



**Table 3: Outdoor Coverage Obligations at specific locations for an Existing MNO**

Outdoor coverage service	Location	Coverage % levels and milestones <sup>26</sup>
<p>Outdoors:</p> <p><u>Case 1</u></p> <p>Where the Licensee is assigned at least 2 × 10 MHz in the 700 MHz Duplex under this Licence:</p> <p>30 Mbit/s (<i>Single User Throughput Cell Edge</i>)</p> <p><u>Case 2</u></p> <p>Where the Licensee is assigned less than 2 × 10 MHz in the 700 MHz Duplex under this Licence:</p> <p>20 Mbit/s (<i>Single User Throughput Cell Edge</i>)</p>	<p>Specific locations as particularised in the Information Memorandum which include:</p> <ul style="list-style-type: none"> <li>• <b>Business and technology Parks:</b> Business and technology Parks (including strategic sites): Industrial Development Agency (IDA) Ireland provides a list of 31 Business and Technology Parks and 9 Strategic Sites. The obligation also includes adjacent business and technology parks to those of IDA Ireland;</li> <li>• <b>Hospitals:</b> the Health Service Executive (HSE) identifies a list of the 48 public and 17 private hospitals;</li> <li>• <b>Higher Education Campuses:</b> The Higher Education Authority (HEA) identifies a list of 8 Universities, 11 Institutes of Technology and 5 other colleges;</li> <li>• <b>Air and Sea Ports:</b> the Department of Transport Tourism and Sport (DTTAS) identifies a list of the 7 main airports and the Irish Maritime Development Office (IMDO) identify a list of the 7 passenger sea ports;</li> <li>• <b>Train and bus stations:</b> the National Transport Authority (NTA) identifies the busiest 144 train stations and Bus Éireann identifies a list of the main 16 bus stations; and</li> <li>• <b>Top visitor attraction information points:</b> Fáilte Ireland identifies a list of the top 21 fee charging and 21 free entry visitor attractions.</li> </ul>	<p>For each category</p> <p>70 % in 3 years</p> <p>90 % in 5 years</p> <p>100 % in 7 years</p>

(2) A Licensee that is a New Entrant and is assigned one or more 700 MHz Duplex Blocks under this Licence shall achieve and maintain for the remaining duration of the licence the appropriate<sup>27</sup> Outdoor Coverage Obligations for New Entrants as set out in Table 4 below.

<sup>26</sup> From the earliest commencement date of the 700 MHz Duplex Block(s).

<sup>27</sup> i.e. appropriate to the quantum of spectrum assigned to the Licensee under the Licence.

**Table 4: Outdoor Coverage Obligations for New Entrants**

Quantum of spectrum assigned to the Licensee under this Licence	Outdoor coverage service (Single User Throughput Cell Edge)	Coverage dimension	Coverage % level to be met in <sup>28</sup> :		
			4 Years	6 Years	10 years
At least: a. 2 × 10 MHz in the 700 MHz Duplex <b>and</b> b. 2 × 20 MHz <sup>29</sup> across any of the 2.1 GHz, 2.3 GHz or 2.6 GHz Bands	30 Mbit/s	<b>Population</b>	75%	80%	90%
a. 2 × 10 MHz in the 700 MHz Duplex <b>and</b> b. less than 2 × 20 MHz <sup>30</sup> across any of the 2.1 GHz, 2.3 GHz or 2.6 GHz Bands	20 Mbit/s	<b>Population</b>	75%	80%	90%
a. 2 x 5 MHz in 700 MHz Duplex <b>and</b> b. any quantum <sup>31</sup> of spectrum across any of the 2.1 GHz, 2.3 GHz or 2.6 GHz Bands	10 Mbit/s	<b>Population</b>	75%	80%	90%

(3) If the Licensee is assigned one or more 700 MHz Duplex Blocks under this Licence and provides a mobile voice or text service, or both, using rights of use in any of the 700 MHz Duplex, 2.1 GHz, 2.3 GHz or 2.6 GHz Bands under this Licence, the Licensee shall within 2 years of the earliest commencement date of the 700 MHz Duplex Block(s):

- (a) use (i.e. deploy and maintain) Native Wi-Fi technology on its network in respect of rights of use to the Liberalised Spectrum; and

<sup>28</sup> From the commencement date of the 700 MHz Duplex Block(s).

<sup>29</sup> Or equivalent: i.e. 40 MHz of TDD spectrum.

<sup>30</sup> Or equivalent: i.e. 40 MHz of TDD spectrum.

<sup>31</sup> Which may include zero

- (b) make available Native Wi-Fi voice or text services or both (as appropriate to the type of mobile service/s provided by the Licensee) to all end users on its network (including the end users of third party customers<sup>32</sup>), where those end users:
  - i. have established for themselves a suitable Wi-Fi connection; and
  - ii. have a Native Wi-Fi / Wi-Fi calling-enabled mobile device.

### 3. Measuring and Monitoring Outdoor Coverage Compliance

(1) For the purpose of determining compliance with the above outdoor coverage obligations, the Commission will measure and monitor the outdoor coverage obligations based on the following principles:

- (a) the Commission's radio network planning tools, supported by field measurements which may include drive tests where appropriate, will be the key component in assessing compliance with the coverage obligations;
- (b) all rights of use available to the Licensee can be used to contribute to meeting the coverage obligations;
- (c) the Commission will use an RSRP metric for LTE as a proxy for determining the Licensee's compliance with the coverage levels;
- (d) the Commission acknowledges that while newer technologies will be rolled out over time, LTE technology is expected to continue to be used by operators in delivering data to consumers for some time;
- (e) the obligations are set to incentivise operators to rollout new sites as appropriate, upgrade sites with additional spectrum and make use of improvements in technology such as new standards including carrier aggregation and carrier sharing or extension techniques;
- (f) depending how the above techniques are deployed on a network, this will yield varying benefits in terms of increasing the range of a cell for a given throughput;
- (g) where carrier aggregation is deployed using carriers with similar propagation characteristics (e.g. carriers in the 700 MHz Duplex, 800 MHz Band and 900 MHz Band), the additional bandwidth and resultant throughput gains will be available, to a large extent, for the whole of the cell range;
- (h) where bands with different propagation characteristics are carrier aggregated, the throughput enhancements will be considered over the range of the highest of the frequency bands;

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<sup>32</sup> E.g. mobile virtual network operators ("MVNOs")

- (i) an RSRP base level of -103 dBm will be used as a proxy for 30 Mbit/s SUTP using a 10 MHz downlink carrier. Where capacity increasing techniques are used such as carrier aggregation or deployment of additional bandwidth, or both, a lower RSRP value can be used as follows:
    - i. where additional 10 MHz downlink carriers are added using two or three band carrier aggregation across bands with similar propagation characteristics (e.g. carriers in the 700 MHz Duplex, 800 MHz Band and 900 MHz Band) RSRP levels of -108 dBm and -113 dBm will apply respectively;
  - (j) an RSRP base level of -112 dBm be used as a proxy for 3 Mbit/s SUTP using a 10 MHz downlink carrier. Where capacity increasing techniques are used such as carrier aggregation or deployment of additional bandwidth, or both, a lower RSRP value will be used as follows:
    - i. where additional 10 MHz downlink carriers are added using two or three band carrier aggregation across bands with similar propagation characteristics (e.g. carriers in the 700 MHz Duplex, 800 MHz Band and 900 MHz Band) RSRP levels of -114 dBm and -116 dBm will apply respectively;
  - (k) noting that there may be many different potential combinations of spectrum and deployment techniques that could be used by a New Entrant, the Commission will apply the same principles as identified above in determining the appropriate approach to measuring and monitoring the coverage obligations; and
  - (l) as new technologies or coverage enhancing techniques are rolled out, the Commission will consider proposals from Licensees as to how this could influence meeting the coverage obligations, following which the Commission may determine additional metrics and base levels as a proxy for determining the Licensee's compliance with the coverage levels.
- (2) The Commission will identify a population file for the purposes of measuring and monitoring the population coverage obligation by using the most up to date and appropriate datasets available at the time of conducting the measurement which, at this juncture, the Commission envisages to consist of:
- (a) generating the population dataset by combining information from the CSO and the Eircode datasets; and
  - (b) using the residential addresses in the Eircode database to determine the geographic coordinates of the residential locations and the population statistics for the small areas dataset as provided by the CSO.
- (3) In the absence of manifest error, the population file used by the Commission will be definitive in assessing compliance with the obligation.

#### 4. Reporting of Compliance

- (1) Where the Licensee holds rights of use in the 700 MHz Duplex under this Licence, the Licensee shall measure, or assess, or measure and assess, its outdoor coverage every twelve months.
- (2) Where the Licensee provides a mobile voice or text service, or both, using rights of use in any of the 700 MHz, 2.1 GHz, 2.3 GHz or 2.6 GHz Bands under this Licence, the Licensee shall measure or assess, or measure and assess, Native Wi-Fi availability on its network in those bands every twelve months.
- (3) Where the Licensee is subject to the outdoor coverage or Native Wi-Fi obligations, or both, set out in this section, the Licensee shall submit to the Commission an annual compliance report on its outdoor coverage or Native Wi-Fi deployment, or both as appropriate (“Coverage Compliance Report”), within 30 days of each anniversary of the commencement of the Licence. The Commission reserves the right to publish any information provided by the Licensee, subject to the provisions of the Commission’s guidelines on the treatment of confidential information.
- (4) The information required for the Coverage Compliance Report shall be agreed with the Commission in advance and the compliance report shall have sufficient detail and granularity to allow the Commission to verify the contents of the Licensee’s Coverage Compliance Report.
- (5) The Licensee shall identify in the Coverage Compliance Report whether it has either (a) met the relevant outdoor coverage obligations and indoor Native WiFi coverage obligations specified in its Licence, or (b) failed to meet the said obligations. The Licensee shall identify the outdoor coverage levels obtained at the time of the Coverage Compliance Report. Where the Licensee has failed to meet the relevant coverage obligation, the Licensee shall provide detailed reasons and supporting information for same.
- (6) Failure by the Licensee to submit the Annual Coverage Compliance Report to the Commission within the specified time period shall be deemed to be non-compliance by the Licensee with these reporting obligations.
- (7) Further, failure by the Licensee to submit the Annual Coverage Compliance Report to the Commission within the specified time period in a milestone year where the obligation is to be achieved or any year thereafter shall be deemed to be non-compliance by the Licensee with the relevant outdoor coverage obligations and indoor Native WiFi coverage obligations specified in its Licence.
- (8) The Commission reserves the right to survey the outdoor coverage level claimed by a Licensee, or inspect any Apparatus installed by a Licensee, at any time to ensure that the system is configured and operating in accordance with its Licence conditions. The Licensee shall facilitate any inspections by the Commission within such time as may be specified by the Commission.
- (9) In addition to the provision of the Coverage Compliance Report, the Commission reserves the right to require a Licensee to provide additional material or information in respect of a right of use for radio frequencies as it

deems appropriate in line with its statutory obligations and duties, which may include but is not limited to:

- (a) Maps showing the Licensee’s existing coverage levels; and
- (b) Terminal Stations, Subscriber Identity Modules (SIM) cards or equivalents for measurements and testing as applicable, in sufficient quantity as the Commission shall determine to be necessary for the conduct of such measurements and testing.

## **Section 5: Rollout Requirements**

### **1. Definitions**

The following additional definitions shall apply in this section:

“2.6 GHz FDD Band” means radio frequency spectrum in the range 2500 – 2570 MHz paired with radio frequency spectrum in the range 2620 – 2690 MHz;

“2.6 GHz TDD Band” means radio frequency spectrum in the range 2570-2620 MHz;

“Existing Operator” means an Existing Operator (Mobile) or an Existing Operator (Other);

“Existing Operator (Mobile)” means an Existing MNO as defined in Section 4 above;

“Existing Operator (Other)” means a Licensee that on 1 January 2021 was a holder of a 3.6 GHz Band Liberalised Use Licence for terrestrial systems capable of providing Electronic Communications Services under the Wireless Telegraphy (3.6 GHz Band Licences) Regulations 2016 (S.I. No. 532 of 2016) and is not an Existing Operator (Mobile);

“Network-Controlled Wireless Telegraphy Apparatus” means apparatus which has backhaul capability<sup>33</sup> over a network connection under the control of the Licensee. For the avoidance of doubt, “plug-and-play” type apparatus, such as femto cells, Terminal Stations and repeaters, are not Network-Controlled Wireless Telegraphy Apparatus;

“New Operator” means a Licensee that is not an Existing Operator;

“New Operator (Mobile)” means a New Operator which provides mobile Electronic Communications Services under this Licence;

“New Operator (Other)” means a New Operator which provides Electronic Communications Services other than mobile Electronic Communications Services under this Licence;

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<sup>33</sup> If any of the Performance Bands are used for the provision of backhaul connectivity, even if such Apparatus comprises of multiple hops to the network, this counts as a single Rollout Base Station, provided such backhaul connectivity carries data originating from or destined for multiple customer premises. The connection to individual customer premises equipment is excluded.

“Performance Band” means any of the following: 2.1 GHz Band, 2.3 GHz Band, 2.6 GHz FDD Band or 2.6 GHz TDD Band; and

“Rollout Base Station” means a Network Controlled Wireless Telegraphy Apparatus in any of the Performance Bands, with a minimum spectrum efficiency capability of 4 bits/Hz.

## 2. Base Station minimum rollout requirements

(1) A Licensee that is an Existing Operator and is assigned rights of use to spectrum in a Performance Band under this Licence shall achieve, within 4 years of the earliest commencement date of a Spectrum Block in that band and maintain thereafter, the applicable Rollout Base Station obligation for that band detailed in Table 5 below.

(2) However, where the Licensee is an Existing Operator (Mobile), is assigned rights of use in a Performance Band and can demonstrate to the satisfaction of the Commission that the services that it is providing in that band do not include mobile Electronic Communications Services, then the Rollout Base Station obligation applicable to the Licensee in respect of that band will be the same as that applicable to an Existing Operator (Other) in respect of that band, as detailed in Table 5 below.

**Table 5. Existing Operator Rollout Base Station Obligation**

<b>Number of Rollout Base Stations to be worked and used</b>				
	<b>2.1 GHz Band</b>	<b>2.3 GHz Band</b>	<b>2.6 GHz FDD Band</b>	<b>2.6 GHz TDD Band</b>
Existing Operator (Mobile)	1,200	525	525	525
Existing Operator (Other)	290	290	290	290

(3) A Licensee that is a New Operator and is assigned rights of use to spectrum in a Performance Band under this Licence shall achieve within 5 years of the earliest commencement date of a Spectrum Block in that band and maintain thereafter the applicable Rollout Base Station obligation for that band detailed in Table 6 below.

(4) However, where a Licensee is a New Operator, is assigned rights of use in a Performance Band and is providing both mobile Electronic Communications Services and Electronic Communications Services other than mobile Electronic Communications Services in the band, then the Rollout Base Station obligation applicable to the Licensee in respect of that band will be that applicable to a New Operator (Mobile) in respect of that band, as detailed in Table 6 below.

**Table 6: New Operator Rollout Base Station Obligation**

<b>Number of Rollout Base Stations to be worked and used</b>				
<b>Band</b>	<b>2.1 GHz Band</b>	<b>2.3 GHz Band</b>	<b>2.6 GHz FDD Band</b>	<b>2.6 GHz TDD Band</b>
New Operator (Mobile)	290	290	290	290
New Operator (Other)	80	80	80	80

(5) Rollout Base stations worked and used pursuant to a spectrum leasing arrangement count towards the Rollout Base Station obligation of the Lessor's Licence.

(6) Where a Licensee shares a Rollout Base Station with another Licensee, such Rollout Base Stations can count towards the Rollout Base Station obligation of each Licensee, provided that at least one licensed Spectrum Block of each Licensee is worked and used by the Rollout Base Station.



### 3. Reporting of Compliance

- (1) The Licensee shall submit to the Commission an annual compliance report on its rollout within 30 days of each anniversary of the commencement of the Licence.
- (2) In the annual compliance report the Licensee shall notify the Commission whether or not it has met the applicable rollout obligation(s) (“Annual Rollout Compliance Report”). Where the Licensee has failed to meet the relevant rollout obligation, the Licensee shall provide detailed reasons and supporting information for same.
- (3) The information required for this Annual Rollout Compliance Report shall be agreed with the Commission in advance and the Annual Rollout Compliance Report shall have sufficient detail and granularity to allow the Commission to verify the contents of the Licensee’s Annual Rollout Compliance Report.
- (4) The Commission shall have the right to publish details of these reports subject to the provisions of the Commission’s guidelines on the treatment of confidential information.
- (5) Failure by the Licensee to submit the Annual Rollout Compliance Report to the Commission within the specified time period shall be deemed to be non-compliance by the Licensee with these reporting obligations.
- (6) Further, failure by the Licensee to submit the Annual Rollout Compliance Report to the Commission within the specified time period in a milestone year where the obligation is to be achieved or any year thereafter shall be deemed to be non-compliance by the Licensee with the relevant rollout obligation(s) specified in its Licence.
- (7) The Commission reserves the right to inspect any Rollout Base Station and any associated infrastructure installed by a Licensee at any time to ensure that the system is configured and operating in accordance with its Licence conditions and the Licensee shall facilitate any such inspections by the Commission within such time as may be specified by the Commission.
- (8) In addition to the Annual Rollout Compliance Report as identified above, the Commission reserves the right to require a Licensee to provide additional material or information in respect of a right of use for radio frequencies as it deems appropriate in line with its statutory obligations and duties, which may include but is not limited to, an up-to-date list of the technical capabilities and locations of Base Stations including the Rollout Base Stations covered by the Licence.

## **Section 6: Quality of Service (QoS) Obligations**

### 1. Definitions

The following additional definitions shall apply in this section:

“3GPP” means the 3<sup>rd</sup> Generation Partnership Project.

“Annual QoS Compliance Report” means an annual compliance report on the Licensee’s compliance with quality of service obligations, as described in section 6(5) below.

“Licensed Spectrum Blocks” means the Spectrum Blocks set out in Part 1 of the Licence;

“Maximum Permissible Blocking Rates” means the maximum percentage of total Voice Call attempts which are unsuccessful during the Time Consistent Busy Hour;

“Maximum Permissible Dropped Call Rates” means the maximum percentage of total originating calls which are prematurely released by the Network within 3 minutes of the Voice Call being made;

“Network” means any terrestrial system which uses the Licensed Spectrum Blocks;

“Network Unavailability” means the average number of minutes per six month period for which services on the Network are not available due to a disturbance, failure or scheduled unavailability to a Network;

“Time Consistent Busy Hour” means the period of one-hour starting at the same time each day for which the average voice traffic of the network concerned is greatest over the days under consideration. The time consistent busy hour shall be determined by the Licensee from an analysis of traffic data obtained from the service and be subject to the Commission’s approval;

“Voice Call” means all relevant non-VOIP (Voice over Internet Protocol) and managed VOIP call services<sup>34</sup> which are considered by the Commission to be substitutable with traditional voice call services as may be updated and notified to Licensees from time to time; and

“VoLTE” means voice over LTE which is a managed voice service that benefits from prioritisation over other traffic.

### 2. The Minimum “Availability of the Network” Standard

- (1) “Availability of the Network” shall be measured in terms of Network Unavailability and reported on an annual basis.

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<sup>34</sup> This includes traditional voice call services carried over circuit-switched connections and ‘managed’ packet-switched voice call services (e.g. using VOIP or similar protocols) which can be provided over different technologies (e.g. VoLTE, Native Wi-Fi, etc.).

(2) The Licensee shall ensure that Network Unavailability is less than 35 minutes (based on the weighting factors set out in Table 7 below) per six month period.

**Table 7: Weighting Factors for Network Unavailability tracking all periods of network unavailability**

Network Unavailability, Weighting Factors (divide duration of each network event by weighting factor)			
	Monday to Friday	Saturday	Sunday
For periods between 07:00 and 24:00 hours	1	2	4
For periods between 00:00 and 07:00 hours	4	8	16

(3) The “Availability of the Network” shall be calculated by combining the Network Unavailability measurements of the relevant services provided to the Licensee’s end users and provided to end users of third parties<sup>35</sup>.

(4) The Licensee shall maintain a network log on a per Base Station basis in a manner that can demonstrate to the satisfaction of the Commission that such a network log is an adequate means of assessing whether the Licensee is complying with its “Availability of the Network” licence obligations.

(5) The Licensee shall make available the network log, or part thereof as appropriate, to the Commission upon request by the Commission.

(6) The Licensee shall calculate the Network Unavailability for any period specified by the Commission from the information recorded in the network log, and shall, upon request and within such time as may be specified by the Commission, provide the Commission with the results of those calculations.

### 3. The Minimum Voice Call Standard

(1) Where the Licensee or any third party, or both, by means of a contractual or other arrangement with the Licensee provides a Voice Call service on a terrestrial system using the Licensed Spectrum Blocks, the Licensee shall comply with the minimum Voice Call standard set out in Table 8 below.

<sup>35</sup> For example, MVNOs or other wholesale services.

**Table 8: Minimum Voice Call Standards for each 6 month period for annual reporting**

	Average	Worst Case
Maximum Permissible Blocking Rates <sup>36</sup>	2%	4%
Maximum Permissible Dropped Call Rates	2%	4%
<p>Transmission quality:</p> <p>The Licensee shall ensure that:</p> <ul style="list-style-type: none"> <li>• the speech transmission quality of Voice Calls is as good as or better than the speech quality associated with the relevant ETSI Standard and Technical Specifications; and</li> <li>• appropriate echo treatment equipment is used and that such equipment is properly configured.</li> </ul>		

(2) Where a Voice Call service is provided by the Licensee and any third party via contractual or other arrangements with the Licensee, the minimum Voice Call standard shall be calculated by combining the Voice Call measurements of the Licensee with that of the third party.

#### 4. The “VoLTE Availability” Obligation

(1) Where the Licensee has deployed LTE technology in any of the bands in which it holds rights of use under this Licence and also offers a mobile voice service to consumers using those bands, the Licensee shall:

- (a) enable VoLTE technology on its network and on its Base Stations which use those bands within 1 year;
- (b) make a VoLTE service available to its end users (including MVNO end users) that have a VoLTE-enabled handset within 1 year; and
- (c) deploy and maintain VoLTE across 50% of its LTE Base Stations which use those bands within 1 year and across 100% of such Base Stations within 2 years.

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<sup>36</sup> The blocked call rates are measured for the Time Consistent Busy hour, during each review period (i.e. 6 months).

## 5. Reporting on Compliance

- (1) The Licensee shall maintain a log in respect of the performance of its Network against the Minimum Voice Call Standards in Table 8, according to measuring standards as agreed with the Commission and in such a manner that can demonstrate to the satisfaction of the Commission that its network log is an adequate means of assessing whether the Licensee is complying with these standards.
- (2) Every twelve months, the Licensee shall measure, or assess, or measure and assess, its compliance with each of (a) the Minimum Availability of the Network Standard, (b) the Minimum Voice Call Standard and (c) the VoLTE Availability Obligation set out above, and shall submit to the Commission, within 30 days of each anniversary of the commencement of the Licence, an Annual QoS Compliance Report detailing said compliance.
- (3) the information required for the Annual QoS Compliance Report shall be agreed with the Commission in advance and the Annual QoS Compliance Report shall have sufficient detail and granularity to allow the Commission to verify the results of the Licensee's measurements.
- (4) the Licensee shall identify in the Annual QoS Compliance Report whether it has either (a) met the relevant QoS obligations specified in its Licence, as set out in Section 6(2), Section 6(3) and Section 6(4) above, or (b) failed to meet any of these obligations and, if so, the Licensee shall provide detailed reasons and supporting information for same.
- (5) Failure by the Licensee to submit the Annual QoS Compliance Report to the Commission within the specified time period shall be deemed to be non-compliance by the Licensee with these reporting obligations and also with the Minimum Availability of the Network Standard, the Minimum Voice Call Standard and the VoLTE Availability Obligation.
- (6) The Commission shall have the right to publish details of these reports subject to the provisions of the Commission's guidelines on the treatment of confidential information.
- (7) The Licensee shall, upon request by the Commission<sup>37</sup>, carry out drive test measurements against the Maximum Permissible Blocking Rates and Maximum Permissible Dropped Call Rates standards and submit these results to the Commission. These drive test measurements are to be carried out at the Licensee's own expense and to a standard as agreed with the Commission.
- (8) Failure by the Licensee to carry out and submit the drive tests measurements to the standard agreed with the Commission shall be deemed

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<sup>37</sup> The Commission does not envisage drive test measurements being required on a frequent basis, but notes that such measurements may be appropriate in one or more of the below circumstances where:

- a Licensee is submitting a compliance report on QoS for the first time;
- the Commission's own verification checks, drive test measurements or other information suggests that there may be discrepancies in the compliance report on QoS or the Licensee may not be meeting its QoS obligations.

to be non-compliance by the Licensee with both these reporting obligations and the Maximum Permissible Blocking Rates and Maximum Permissible Dropped Call Rates standards.

(9) The Commission shall have the right to publish details of these measurement results subject to the provisions of the Commission's guidelines on the treatment of confidential information.

(10) In addition to the annual compliance reporting as identified above, the Commission reserves the right to require a Licensee to provide additional material or information in respect of a right of use for radio frequencies as it deems appropriate in line with its statutory obligations and duties, which may include but is not limited to, Terminal Stations, Subscriber Identity Modules (SIM) cards or equivalents for measurements and testing as applicable, in sufficient quantity as the Commission shall determine to be necessary for the conduct of such measurements and testing.