

Agreement between the Communications Authorities of:

Finland,

Norway

and

Sweden

concerning the land use of the following frequency bands:

700 MHz

800 MHz

900 MHz

1500 MHz

1800 MHz

2100 MHz

2300 MHz

2600 MHz

3600 MHz

for wideband systems capable of providing terrestrial electronic communications services in the border areas of the respective countries

May 2021

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1. Introduction

- 1.1. The agreement describes the procedures of co-ordination of civil mobile wideband communication networks operating in the border areas of Finland, Norway and Sweden vis-à-vis any service or application in the above mentioned countries. The agreement does not concern use of GSM technology and preferential GSM-frequency assignments, these can continue to be operated according to existing agreements.
- 1.2. The Communication Authority of Finland is Finnish Transport and Communications Agency (Traficom).
- 1.3. The Communication Authority of Norway is Norwegian Communications Authority (Nkom).
- 1.4. The Communication Authority of Sweden is Swedish Post and Telecom Authority (PTS).

2. Principles and definitions

- 2.1. Wideband systems include e.g.: UMTS, LTE, LTE-MTC (LTE Machine Type Communication), LTE-eMTC (evolved MTC), LTE in-band NB-IoT, LTE guard-band NB-IoT and NR (New Radio).
- 2.2. The 700 MHz frequency band, as referred to in this agreement, covers the frequencies from 703 MHz to 733 MHz paired with 758 MHz to 788 MHz for the Frequency Division Duplex (FDD) arrangement and from 738 MHz to 758 MHz for Supplemental Downlink (SDL), as defined in ECC Decision(15)01.
- 2.3. The 800 MHz frequency band, as referred to in this agreement, covers the frequencies from 791 MHz to 821 MHz paired with 832 MHz to 862 MHz for the FDD arrangement, as defined in ECC Decision (09)03.
- 2.4. The 900 MHz frequency band, as referred to in this agreement, covers the frequencies from 880 MHz to 915 MHz paired with 925 MHz to 960 MHz for the FDD arrangement, as defined in ECC Decision (06)13 amended March 2019.
- 2.5. The 1500 MHz frequency band, as referred to in this agreement, covers the frequencies from 1427 MHz to 1518 MHz, for SDL, as defined in ECC Decision (13)03 amended March 2018 and ECC Decision (17)06 corrected March 2018.
- 2.6. The 1800 MHz frequency band, as referred to in this agreement, covers the frequencies from 1710 MHz to 1785 MHz paired with 1805 MHz to 1880 MHz for the FDD arrangement, as defined in ECC Decision (06)13 amended March 2019.
- 2.7. The 2100 MHz frequency band, as referred to in this agreement, covers the frequencies from 1920 MHz to 1980 MHz paired with 2110 MHz to 2170 MHz for the FDD arrangement, as defined in ECC Decision (06)01 amended March 2019.

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- 2.8. The 2300 MHz frequency band, as referred to in this agreement, covers the frequencies from 2300 MHz to 2400 MHz, with the TDD arrangement, as defined in ECC Decision (14)02.
- 2.9. The 2600 MHz frequency band, as referred to in this agreement, covers the frequencies from 2500 MHz to 2570 MHz paired with 2620 MHz to 2690 MHz for the FDD arrangement and 2570 MHz to 2620 MHz for SDL or TDD, as defined in ECC Decision (05)05 amended July 2019.
- 2.10. The 3600 MHz band, as referred to in this agreement, covers the frequencies from 3400 MHz to 3800 MHz, with the TDD arrangement, as defined in ECC Decision (11)06 amended October 2018.
- 2.11. This agreement is based on the concept of electric field strength levels and preferential Physical-layer Cell Identities (PCIs, when LTE or 5G NR is used) and preferential Scrambling Codes (SCs, when UMTS is used) as defined in Annex 1. Preferential PCI/SC shall be used in border areas to improve coverage and service when channel centre frequencies are aligned.
- 2.12. The synchronised operation of TDD networks requires a common phase clock reference (i.e. a reference clock with consistent time offsets relatively to a common UTC-based time reference to ensure full alignment of transmissions) and a compatible frame structure, to be used on both side of the border, to avoid simultaneous UL/DL transmissions.
- 2.13. This agreement is based on the following country types for the use of preferential PCI/SCs as defined in Annex 1:
Finland – country type 1,
Norway – country type 4,
Sweden – country type 3
- 2.14. As far as possible the latest version of any relevant decision and recommendation may be used to assist co-ordination.
- 2.15. This Agreement covers the co-ordination of base stations, including repeaters. User equipment, or terminals, are allowed to be used on non-interfering basis, in accordance with ITU RR 4.4.

3. Use of frequencies in the border areas

3.1. The co-ordination threshold in this agreement is based on the concept of electric field strength level of 5 MHz block assignment.

3.2. In case of other frequency block sizes, a value of

$$A = 10 * \log_{10} \left(\frac{\text{frequency block size [MHz]}}{5 \text{ MHz}} \right) \text{ [dB]}$$

should be added to the electric field strength threshold values.

3.3. For electric field strength calculations the latest version of Recommendation ITU-R P.1546 "Method for point-to-area predictions for terrestrial services in

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the frequency range 30-4000 MHz" with 10% of the time and 50% of the locations shall be used.

- 3.4. The electric field strength values in this agreement are based on a receiving antenna height of 3 m above ground (mean sea level where applicable).
- 3.5. The wideband systems may be used without coordination between the countries being party to this agreement if the predicted electric field strength produced by a base station¹ does not exceed the threshold at and beyond the reference lines specified in Annex 2 for the respective band given in the table below²:

Frequency band [MHz]	Threshold @ X km reference line and beyond, electric field strength [dBµV/m/5 MHz]		
	Centre frequencies aligned		Centre frequencies not aligned
	Preferential PCIs / SCs	Non- preferential PCIs / SCs	All PCIs / SCs
700 FDD	59 @ 0 km and 41 @ 6 km	41 @ 0 km	59 @ 0 km and 41 @ 6 km
700 SDL	59 @ 0 km and 41 @ 6 km	41 @ 0 km	59 @ 0 km and 41 @ 6 km
800 FDD	59 @ 0 km and 41 @ 6 km	41 @ 0 km	59 @ 0 km And 41 @ 6 km
900 FDD	59 @ 0 km and 41 @ 6 km	41 ³ @ 0 km	59 @ 0 km and 41 @ 6 km
1500 SDL	65 @ 0 km and 47 @ 6 km	47 @ 0 km	65 @ 0 km and 47 @ 6 km
1800 FDD	65 @ 0 km and 47 @ 6 km	47 ³ @ 0 km	65 @ 0 km and 47 @ 6 km

¹ The values in the table are only valid if the centre frequencies of the stations of the MFCN systems are not aligned on both sides of the borderline or with centre frequencies aligned using preferential PCI codes for LTE and 5G NR systems or SC's for UMTS systems as given in Annex 1

² Based on: ECC Recommendation (15)01 amended Feb 2020 (700 MHz, 1.5 GHz, 3.6 GHz), ECC Recommendation (08)02 amended Feb 2019 (900 MHz and 1800 MHz), ECC Recommendation (11)04 amended Feb 2017 (800 MHz), ERC Recommendation (01)01 revised 2016 (2100 MHz, with modifications for @ 6 km and non-preferential PCIs/SCs), ECC Recommendation (14)04 (2300 MHz), ECC Recommendation (11)05 amended Feb 2017 (2600 MHz)

³ Also valid to protect GSM in neighbouring country

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Frequency band [MHz]	Threshold @ X km reference line and beyond, electric field strength [dB μ V/m/5 MHz]		
	Centre frequencies aligned		Centre frequencies not aligned
	Preferential PCIs / SCs	Non- preferential PCIs / SCs	All PCIs / SCs
2100 FDD	65 @ 0 km and 47 @ 6 km	47 @ 0 km	65 @ 0 km and 47 @ 6 km
2300 TDD synchronised	65 @ 0 km and 49 @ 6 km	30 @ 0 km	65 @ 0 km and 49 @ 6 km
2300 TDD non synchronised	30 @ 0 km	30 @ 0 km	30 @ 0 km
2600 FDD	65 @ 0 km and 49 @ 6 km	49 @ 0 km	65 @ 0 km and 49 @ 6 km
2600 TDD synchronised	65 @ 0 km and 49 @ 6 km	49 @ 0 km	65 @ 0 km and 49 @ 6 km
2600 TDD non synchronised	30 @ 0 km	30 @ 0 km	30 @ 0 km
3600 TDD synchronised ⁴	67 @ 0 km and 49 @ 6 km	49 @ 0 km	67 @ 0 km and 49 @ 6 km
3600 TDD non synchronised	Preferential frequencies		Non-preferential frequencies
	Preferential PCIs / SCs	Non- preferential PCIs / SCs	All PCIs / SCs
	45 @ 0 km and 27 @ 6 km	27 @ 0 km	27 @ 0 km

- 3.6. The frame structure DDDSU with parameters as defined in the ECC Recommendation (20)03 (Table 1, Frame A), shall be used as a default in the 3600 MHz band for synchronization in the border areas.
- 3.7. Establishment of arrangements between operators shall be encouraged to the extent possible. Subject to agreement between operators other technical characteristics than those listed in sections 3.5 and 3.6 can be used, e.g. other threshold values or propagation models, or synchronization of 5G frame

⁴ Note that in Finland the operators can agree on which frame structure to use and currently they have agreed to use the frame structure DDDSU, which is planned to be the mandatory frame structure in Norway (auction to be held in September 2021), and in Sweden the operators can agree on which frame structure to use but the fallback is DDDSU.

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structure, if deemed necessary. Agreements between operators shall be brought to the attention of the concerned authority.

- 3.8. If the field strength of an intended base station exceeds the values specified in section 3.5 without an agreement referred to in section 3.7, then agreement needs to be sought from the affected Authority before the base station can be brought into operation. The affected Authority shall give its reply within 45 days from the date of the receipt of a written request and 20 days after a reminder. A request shall be sent by e-mail to the official e-mail address of the affected Authority. If no reply is received after 65 days after the initial request, the affected Authority is considered to have given its agreement to the operation of the base station.
- 3.9. Any case of interference shall as far as possible be resolved among the operators concerned. If not resolved, assistance can be sought from the Authorities. Authorities shall take all possible steps in order to eliminate the interference.
- 3.10. Any case of interference from mobile operators towards broadcast reception operating in the frequency band 470-694 MHz in the neighbouring country should be brought to attention of respective Authorities and resolved by the operator causing harmful interference. Affected Authorities should be informed about the necessary solution and timeframe to reduce harmful interference taken by operator causing such interference.

4. Status of existing co-ordination agreements

- 4.1. From the date of entering into the force this Agreement replaces all existing coordination Agreements, or parts of Agreements, for wideband systems capable of providing terrestrial electronic communications services in the border areas of the respective countries in the included frequency bands. Existing coordination Agreements for GSM technology or those parts of existing coordination Agreements dealing with GSM technology stay in force.

5. Revision and cancellation

- 5.1. This Agreement may be revised or cancelled without notice, if understanding is reached between the Authorities.
- 5.2. Any Authority listed in this document is entitled to withdraw from this Agreement with a notice of at least six months.

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6. Entry into force

- 6.1. This Agreement shall enter into force from the 1. September 2021
- 6.2. This Agreement has been drawn up in 3 (three) identical copies, one for each Authority.

For the Communication Authority of
Finland

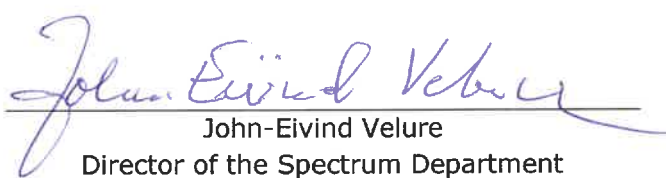
Place Helsinki Date 2.7.21



Jenni Eskola
Deputy Director-General

For the Communication Authority of
Norway

Place Lillehammer Date 27.5.21



John-Eivind Velure
Director of the Spectrum Department

For the Communication Authority of
Sweden

Place Stockholm Date 9.6.21



Anders Palmberg
Acting Head of section Spectrum development

ANNEX 1 – Preferential PCIs (for LTE and NR) and SCs (for UMTS)

1. PREFERENTIAL PHYSICAL-LAYER CELL IDENTITIES (PCI) FOR LTE and NR

For each type of country, the following tables and figure describe the sharing of the PCI's with its neighbouring countries, with the following conventions of writing:

	Preferential PCI
	Preferential PCI, relevant for this agreement
	non-preferential PCI

The 504 (LTE) /1007 (NR) physical-layer cell-identities should be divided into the following 6 sub-sets when the carrier frequencies are aligned in border areas:

PCI	Set A	Set B	Set C	Set D	Set E	Set F	PCI	Set A	Set B	Set C	Set D	Set E	Set F
Country 1 Finland	0..83 504-587	84..167 588..671	168..251 672..755	252..335 756..839	336..419 840..923	420..503 924..1007	Country 2	0..83 504-587	84..167 588..671	168..251 672..755	252..335 756..839	336..419 840..923	420..503 924..1007
Border 1-2							Border 2-1						
Zone 1-2-3							Zone 2-3-1						
Border 1-3							Border 2-3						
Zone 1-2-4							Zone 2-1-4						
Border 1-4							Border 2-4						
Zone 1-3-4							Zone 2-3-4						

PCI	Set A	Set B	Set C	Set D	Set E	Set F	PCI	Set A	Set B	Set C	Set D	Set E	Set F
Country 3 Sweden	0..83 504-587	84..167 588..671	168..251 672..755	252..335 756..839	336..419 840..923	420..503 924..1007	Country 4 Norway	0..83 504-587	84..167 588..671	168..251 672..755	252..335 756..839	336..419 840..923	420..503 924..1007
Border 3-2							Border 4-1						
Zone 3-1-2							Zone 4-1-2						
Border 3-1							Border 4-2						
Zone 3-1-4							Zone 4-2-3						
Border 3-4							Border 4-3						
Zone 3-2-4							Zone 4-3-1						

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2. PREFERENTIAL SCRAMBLING CODES FOR UMTS (UTRA FDD)

For each type of country, the following tables and figure describe the sharing of the scrambling codes (SC) with its neighbouring countries, with the following conventions of writing:

	Preferential SC
	Preferential SC, relevant for this agreement
	non-preferential SC

For the FDD mode; 3GPP TS 25.213 defines 64 « scrambling code groups » in §5.2.3, numbered {0..63}, which are organised into six sets A-F.

	Set A	Set B	Set C	Set D	Set E	Set F
Country 1 Finland	0..10	11..20	21..31	32..42	43..52	53..63
Border 1-2						
Zone 1-2-3						
Border 1-3						
Zone 1-2-4						
Border 1-4						
Zone 1-3-4						

	Set A	Set B	Set C	Set D	Set E	Set F
Country 2	0..10	11..20	21..31	32..42	43..52	53..63
Border 2-1						
Zone 2-3-1						
Border 2-3						
Zone 2-1-4						
Border 2-4						
Zone 2-3-4						

	Set A	Set B	Set C	Set D	Set E	Set F
Country 3 Sweden	0..10	11..20	21..31	32..42	43..52	53..63
Border 3-2						
Zone 3-1-2						
Border 3-1						
Zone 3-1-4						
Border 3-4						
Zone 3-2-4						

	Set A	Set B	Set C	Set D	Set E	Set F
Country 4 Norway	0..10	11..20	21..31	32..42	43..52	53..63
Border 4-1						
Zone 4-1-2						
Border 4-2						
Zone 4-2-3						
Border 4-3						
Zone 4-3-1						

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ANNEX 2 – Reference lines

1. In Finland

The land border between Sweden and Finland as well as the land border between Norway and Finland.

The coastline of Finland.

At Ahvenanmaa/Åland:

- A line between Norrskär (60° 32' 24" N, 20° 12' 30" E), Ådskär (60° 21' 03" N, 19° 31' 17" E), Västerön (60° 14' 17" N, 19° 28' 30" E), Askö (59° 59' 20" N, 19° 59' 19" E) and Kalskär (59° 47' 51" N, 20° 57' 50" E)

At Vaasa/Vasa:

- A line between Mickelsöarna (63° 28' 30" N, 21° 44' 40" E), Lappöarna (63° 22' 03" N, 21° 11' 00" E) and Bergö (62° 58' 41" N, 21° 06' 59" E)

At Oulu/Uleåborg:

- Hailuoto (65° 02' 23" N, 24° 33' 04" E)

2. In Sweden

The land border between Finland and Sweden as well as the land border between Norway and Sweden.

The coastline of Sweden.

At the coast of Uppland and Stockholm archipelago:

- A line between Argos grund (60° 37' 42" N, 18° 21' 47" E), Simpnäsklubb (59° 53' 34" N, 19° 04' 46" E), Söderarm (59° 45' 10" N, 19° 24' 21" E), Svenska högarna (59° 26' 38" N, 19° 30' 06" E) and Huvudskär (58° 47' 46" N, 18° 34' 13" E)

Note: Geographical coordinates in WGS 84.



Illustration of Zone S and Zone F

3. In Norway

The land border between Finland and Norway as well as the land border between Sweden and Norway, or a line midway between the Norwegian coastline and the Swedish coastline, due to ratified border agreement between Norway and Sweden.

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