ECC Recommendation (YY)XX

Frame structures to facilitate cross-border coordination of outdoor TDD MFCN in the frequency band 3400‑3800 MHz

**DD Month YYYY**

# introduction

The ECC Recommendation (15)01[3], as amended on 14 February 2020, addresses, among other bands, the cross-border coordination of outdoor TDD MFCN in the frequency band 3400-3800 MHz. The synchronisation of outdoor TDD networks in border areas in this frequency band is recommended and elements are provided regarding cross-border coordination in the case of synchronized networks using the same or different frame structures. When different frame structures and a common clock are used, DL symbol blanking feature allows to avoid interference from DL symbol into UL symbol of a base station in a neighbouring country.

DL symbol blanking is not available yet in existing equipment and further studies are being carried out within CEPT. In this regard, the availability of such feature will be fostered by a limited choice of frame structures.

Many CEPT countries have authorized or will authorize soon the frequency band 3400-3800 MHz for MFCN and have engaged in cross-border negotiations with their neighbours in order to enable spectrum efficient deployment at the border.

Therefore, CEPT has identified an urgent need for an ECC recommendation regarding NR frame structures to be used in cross-border coordination in order to facilitate the development of DL symbol blanking feature in due time, as well as the negotiation of cross-border coordination agreements between administrations.

# ECC recommendation of YY(XX) on Frame structures to facilitate cross-border coordination OF TDD MFCN in the frequency band 3400-3800 MHz

“The European Conference of Postal and Telecommunications Administrations, (style: ECC paragraph)

*considering*

1. that ECC Decision (11)06 [1] provides the harmonised conditions for Mobile/Fixed Communications Networks (MFCN) operating in the frequency band 3400-3800 MHz;
2. that ECC report 296 [2] on national synchronisation framework options in 3400-3800 MHz evaluates that minimum distances required between unsynchronised macro-cellular networks could be up to 60 km when operating co-channel and up to 14 km when operating in the adjacent channel without guard bands.
3. that ECC Recommendation (15)01 [3] on cross-border coordination for MFCN in several frequency bands defines a coordination threshold of 0 dBµV/m/5 MHz at the borderline for unsynchronized TDD networks in the frequency band 3400-3800 MHz, which may result in very large distances from the border where neighboring administrations will need to coordinate base stations deployment;
4. that ECC Recommendation (15)01[3] recommends the synchronisation of MFCN TDD networks at the border and provides further guidance on its implementation including examples of frame structure options;
5. that DL symbol blanking would enable, for two networks having a common clock, to switch off transmissions (“blanking”) of some specific DL symbols which may interfere UL symbols of a neighboring country’s network, thus allowing the deployment of different frame structures across borders with some degree of downlink capacity loss;
6. that studies are being carried out within CEPT regarding the DL symbol blanking, whose availability will be fostered by a limited choice of frame structures;
7. that there are legacy networks in some CEPT countries which may constrain the choice of a frame structure at a national level;
8. that 5G allows significantly more flexibility in the frame structure with the ability to configure uplink / downlink / mixed transmission at the symbol level than previous generations of air interface technologies;
9. that in order to develop crossborder coordination agreement, there is a need to identify a proper coordination area in case different frame structures are chosen across the border
10. that ECC report 216 states that "synchronised operation implies configuring compatible frame structures, i.e. setting the length of the frame, the TDD uplink/downlink ratio and guard period in order to align UL/DL switching points, so that the last transmitter stops before the first receiver starts, taking into account the propagation delay (e.g. in LOS non co-sited cases). Frame structures do not need to be exactly identical provided this condition is met", which enables different sizes for the guard period.
11. That the NR Frame B given in annex 1 is compatible with the LTE frame structure configuration n°2, DSUDDDSUDD (10ms periodicity, SCS 15kHz), where different special subframe, “S” are possible such as SS n°6, 9:3:2 or SS n°7, 10:2:2 (number symbols Downlink:Guard Period:Uplink)
12. that cross-border agreement ensures an efficient spectrum usage especially for outdoor network deployments in case of MFCN TDD networks in the 3400-3800 MHz frequency band

recommends

1. that CEPT administrations should use the frame structures defined in Annex 1 for outdoor MFCN TDD networks in the frequency band 3400-3800 MHz in order to facilitate cross-border coordination;
2. that CEPT administrations should retain the flexibility to adapt to national circumstances, e.g. for taking into account legacy networks or new services today;
3. that bilateral/multilateral agreements should address the transition period which may be necessary until DL symbol blanking is available;

*Note:*

*Please check the Office documentation database http://www.ecodocdb.dk for the up to date position on the implementation of this and other ECC Recommendations.*

ANNEX 1: frame structures IN Order to facilitate cross-border coordination OF outdoor TDD MFCN in the frequency band 3400-3800 MHz

Table 1 defines the two NR frame structures (Frame A and Frame B) for outdoor MFCN TDD networks in order to facilitate cross-border coordination in the frequency band 3400-3800 MHz.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **NR Frame A** | | | **NR Frame B** | | |
| DL/UL pattern | DDDSUDDDSU (see note 1) | | | DDDSUUDDDD (see note 1,4) | | |
| Periodicity | 5 ms | | | 5 ms | | |
| Special subframe slot configuration | Downlink | Gap | Uplink | Downlink | Gap (note 5) | Uplink |
| 10 | 2 | 2 | 6 | 4 | 4 |
| 4 | 6 |  |
| Subcarrier spacing | 30 kHz | | | 30 kHz | | |
| Time base (see note 3) | UTC (see note 2) + Offset +/- 1.5 µs | | | UTC (see note 2) + Offset +/- 1.5 µs | | |
| Offset | 0 ms | | | 0 ms | | |

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Table 1: set of NR TDD MFCN frame structures

Note 1: D = downlink ; S = Special subframe ; U = Uplink; X = downlink or uplink

Note 2: UTC = Coordinated Universal Time in accordance with Recommendation ITU-R TF.460. The typical measuring signal is 1 pps (pulse-per-second) signal from the clock device with the rising-edge materializing the exact second epoch.

Note 3: The start of frame (defined as the beginning of the first slot in the UL/DL pattern of the Table 1) has to be phase-synchronised with the time base.

Note 4: the frame B ~~Frames B and C~~ can be implemented in two different ways:

* either as “DDDSUUDDDD”, aligned with the UTC Time Base
* or as “DDDDDDDSUU” with a 3 ms delay with the UTC Time Base

Note 5 : As mentioned in considering (j), different guard period sizes can still be implemented while retaining synchronised operation. It should be noted that the size of the guard period defines a corresponding area where synchronised operation is effective. Increasing this guard period also increases the size of the synchronised area at the expense of some capacity loss, and may contribute to solve some specific interference issues between far-away sites in line-of-sight with exceptional propagation conditions.

**ANNEX 2: LIST OF REFERENCES**

This annex contains the list of relevant reference documents.

[1] ECC/DEC(11)06 Harmonised technical and regulatory conditions for the use of the bands 3400-3600 MHz and 3600-3800 MHz for MFCN

[2] ECC Report 296 National synchronisation regulatory framework options in 3400-3800 MHz: a toolbox for coexistence of MFCNs in synchronised, unsynchronised and semi-synchronised operation in 3400-3800 MHz

[3]