3GPP TSG-SA WG2#160-Ad Hoc-e S2-2400101R01

Electronic Meeting, 22-29 January 2024 (was S2-240xxxx)

**Source: Qualcomm Incorporated**

**Title: New KI on No-Transmit Zones**

**Document for: Discussion/Approval**

**Agenda Item: 19.10**

**Work Item / Release: FS\_UAS\_Ph3**

*Abstract of the contribution: the P-CR introduces a new KI on no-transmit zones.*

# 1. Discussion

FS\_UAS\_Ph3 SID WT#3 “Study how to support no-transmit zones for UAVs” was triggered based on the CEPT Decision 22(07) of November 18, 2022, titled “Harmonised technical conditions for the usage of aerial UE for communications based on LTE and 5G NR in the bands 703-733 MHz, 832-862 MHz, 880-915 MHz, 1710-1785 MHz, 1920-1980 MHz, 2500-2570 MHz and 2570-2620 MHz harmonised for MFCN,” which introduced operational restrictions in the form no-transmit zones (NTZs).

## 1.1 Incoming LS and the CEPT Decision Extract

An LS from sent by ETSI TC MSG/TFES to RAN regarding the ECC decision, and subsequently questions were asked by RAN to SA2 regarding the decision. Here is an extract of the key points from the decision:

- there is the need to define some spectrum operational restrictions. This can be done using “no-transmit zones”, which should be defined at national level as a geographical area where aerial UE are not allowed to operate in a certain frequency band.

- The requirement may apply to aerial UE according to their operational frequency band, e.g. aerial UE operating in a specific band or specific channel (see no-fly zone definition set out in ECC Report 309, in this Decision referred to as “no-transmit zone”).

- In some cases, operation of aerial UE also requires respective cross-border coordination agreements.

- a no-transmit zone in the decision is defined as a geographical area where aerial UE are not allowed to transmit for spectrum compatibility purposes in a given harmonised MFCN band or part of it.

- national studies are needed, as appropriate, to define no-transmit zones for spectrum compatibility purposes, for aerial UE operating in the relevant frequency bands.

- a mechanism is necessary to ensure that aerial UE respect no-transmit zones.

## 1.2 Open Questions

### 1.2.1 Expected UE Behaviour

From the CEPT decision technical details, it is clear that in the NTZ the UE would not be allowed to operate in specific frequency bands. However, what does this mean exactly wrt UE 3GPP functionality, and what is the impact on idle mode mobility mechanisms of a 3GPP UE?

* Would a UE need to be considered in limited service state when the UE cannot find any suitable cells like e.g. is normally the case in non-allowed areas?
* Would there be exceptions for high priority MPX UEs like e.g. is normally the case in non-allowed areas?
* Would a UE be able to behave as a regular limited service state UE when no suitable cells exist, i.e. perform emergency services as per current mechanisms?
* Or would the UE be completely banned from any services, including emergency services, when no suitable cells can be found?

It is essential to understand the exact requirements from CEPT because this would have impact on basic functionality of the UE and, if the behavior required is different from a regular limited service state UE, this needs to be defined clearly.

**Observation 1: it is not clear what the expected behavior of the UE is in the NTZ when no suitable cells are found.**

**Proposal 1: capture an EN in the Key Issue definition and send a LS to CEPT for clarification.**

### 1.2.2 Size of NTZs

Looking at the CEPT decision, here’s an extract of Annex 1:

* 1. *Operational conditions*

*The operational conditions to be defined and implemented at national level provide additional measures to the technical conditions in order to protect other services.*

***703-733 MHz: Protection of DTT receivers and RAS sites***

* Aerial UE operating in 703-733 MHz should not transmit when less than 30 m above ground level to avoid interference to DTT receivers;
* Nationally determined no-transmit zones are required **around RAS sites** operating in 1400-1427 MHz for aerial UE operating in the 703-718 MHz frequency band, as appropriate.

***832-837 MHz: Protection of RAS sites***

* Nationally determined no-transmit zones are required **around RAS sites** operating in 1660-1670 MHz for aerial UE operating in the 832-837 MHz frequency band, as appropriate.

***2500-2570 MHz/2570-2620 MHz: Protection of RAS sites and radars***

* Nationally determined no-transmit zones are required **around RAS sites** operating in 2690-2700 MHz for aerial UE operating in the 2500-2570 MHz or 2570-2620 MHz frequency band, as appropriate;
* Nationally determined no-transmit zones might be required **around radars** operating in 2700-2900 MHz for aerial UE operating in the 2500-2570 MHz or 2570-2620 MHz frequency band.

It appears that NTZs may be defined not precisely to match a specific site or location, but nationally defined to be “around” a certain area. This would mean that a multitude of cells may be impacted

**Observation 2: it is not clear what the expectation from regulators are wrt the area related to an NTZ.**

**Proposal 2: ask in the LS what is the expectation wrt the use of the term “around”.**

### 1.2.3 NTZs versus cellular coverage

Based n the CEPT decision, it seems NTZs may be mostly be “spots” in the overall coverage of cellular networks, i.e. limited to one or few cells for each NTZ. However, since NTZs may be defined at national level, we could expect that specific frequencies may be banned in larger areas within a country.

**Observation 3: we should cater for the definition of NTZs of different sizes.**

**Observation 4: we should not restrict the solutions to “spotty” NTZs.**

**Proposal 3: define the KI in such a way to enable for different sizes of NTZs and cater for mechanisms that enable any size of NTZs.**

# 2. Text proposal

It is proposed to agree the following changes vs. TS 23.700-59:

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# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

…

[X] CEPT Decision 22(07), November 18, 2022: “Harmonised technical conditions for the usage of aerial UE for communications based on LTE and 5G NR in the bands 703-733 MHz, 832-862 MHz, 880-915 MHz, 1710-1785 MHz, 1920-1980 MHz, 2500-2570 MHz and 2570-2620 MHz harmonised for MFCN”.

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## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

NTZ No-Transmit Zone

# 4 Architectural Assumptions and Requirements

## 4.1 Architectural Assumptions

Editor’s note: This clause provides list of architectural assumptions, if needed.

### 4.1.X Support of No-Transmit Zone

The following assumptions apply to the support of NTZ:

- NTZ may be defined according to regional/national requirements and may consist of one or more cells of a mobile network

- an NTZ may map to a fraction of a cell or overlap different cells

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5 Key Issues

5.x Key Issue #x: Support of No Transmit Zones

5.X.1 Description

This key issue relates to the introduction by CEPT decision 22(07) [X] of No Transmit Zones for aerial UEs. The ECC Decision asserts that a mechanism is necessary to ensure that aerial UE respect no-transmit zones in order to protect incumbent radio systems from potential interference from aerial UEs.

This key issue addresses the following aspects:

- How to ensure an aerial UE respects no-transmit zones. This includes the following:

- mobile network cells overlapping completely or partially with the NTZ and using the restricted frequency bands of the NTZ

- NTZ of any size are possible, depending on regional requirements

- Whether and how the UAV obtains the no-transmit zone related information

- Whether the AUE needs to indicate its capability to support of NTZ to network and how the AUE would do so

- What is aerial UE behavior when the AUE approaches, enters, or exits the NTZ, e.g. whether the UAV can receive any data, whether emergency services are allowed, etc.

- How to enable the definition of non-transmit zones and configuration of aerial UE or the mobile network or both with no-transmit zones

- How to allow the enforcement for both aerial UEs in connected mode and aerial UEs in idle mode.

- Whether and how idle mode mobility of aerial UEs is impacted by NTZs will be discussed during the study

- Whether and how the network is responsible for monitoring the AUEs location wrt NTZs, and whether and how the network can enforces the specific behavior of the AUEs wrt NTZs.

Editor’s Note: the expected behavior of a UE when entering a NTZ with respect to idle mode mobility is TBD and needs to be clarified wrt the CEPT decision.

Editor’s Note: the expected behavior of a UE when near a NTZ (in which case it may cause interference to the NTZ) is TBD and needs to be clarified wrt the CEPT decision.

Editor’s Note: Whether it is acceptable to block access to large cells which may contain small NTZs is acceptable or not is TBD and needs to be clarified wrt the CEPT decision.

Since the ECC Decision does not identify any specific RAT, NTZs shall be supported by both LTE and NR.

NOTE: Any potential solutions developed shall be coordinated with RAN WGs or progressed together with RAN WGs input.

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Annex X (informative):
Background Information

## X.1 CEPT Decision 22(07)

This is an extract of the CEPT Decision 22(07) for No Transmit Zones. In November 2022, CEPT made Decision 22(07) on Harmonised technical conditions for the usage of aerial UE for communications based on LTE and 5G NR in several bands harmonized for MFCN. The decision assumes multiple technical conditions and requirements to support aerial UEs in mobile systems (both LTE and NR). Two notable ones are no-transmit zone (NTZ) and out-of-band emission (OOBE) requirements, as shown in the following excerpt from the Decision (further details are in the Appendix):

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| In addition to the already harmonised technical conditions for MFCN bands and for spectrum compatibility purposes, there is the need to define some spectrum operational restrictions. This can be done using “no-transmit zones”, which should be defined at national level as a geographical area where aerial UE are not allowed to operate in a certain frequency band. Another measure to achieve coexistence is to define additional OOB emission limits specific to aerial UE (to avoid interference to other services in some other bands (e.g. to protect MetSat at 1675-1710 MHz) . The requirement may apply to aerial UE according to their operational frequency band, e.g. aerial UE operating in a specific band or specific channel (see no-fly zone definition set out in ECC Report 309, in this Decision referred to as “no-transmit zone”). In some cases, operation of aerial UE also requires respective cross-border coordination agreements.…**ECC Decision of 18 november 2022 on Harmonised technical conditions for the usage of aerial UE for communications based on LTE and 5g NR in the 703-733 MHz, 832-862 MHz, 880-915 MHz ,1710-1785 MHz, 1920-1980 MHz, 2500-2570 MHz and 2570-2620 MHz MFCN harmonised bands (ECC decision (22)07)**“The European Conference of Postal and Telecommunications Administrations,*Considering**…*1. that a no-transmit zone in this Decision is defined as a geographical area where aerial UE are not allowed to transmit for spectrum compatibility purposes in a given harmonised MFCN band or part of it;
2. that national studies are needed, as appropriate, to define no-transmit zones for spectrum compatibility purposes, for aerial UE operating in the relevant frequency bands;
3. that a mechanism is necessary to ensure that aerial UE respect no-transmit zones;

…*DECIDES**….*that no-transmit zones as described in this Decision should be defined and implemented at national level and where necessary coordinated with neighbouring countries; |

Some further details on no-transmit zones from the ECC Decision 22(07)

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| **A1.2 Operational conditions** The operational conditions to be defined and implemented at national level provide additional measures to the technical conditions in order to protect other services.**703-733 MHz: Protection of DTT receivers and RAS sites**Aerial UE operating in 703-733 MHz should not transmit when less than 30 m above ground level to avoid interference to DTT receivers;Nationally determined no-transmit zones are required around RAS sites operating in 1400-1427 MHz for aerial UE operating in the 703-718 MHz frequency band, as appropriate.**832-837 MHz: Protection of RAS sites**Nationally determined no-transmit zones are required around RAS sites operating in 1660-1670 MHz for aerial UE operating in the 832-837 MHz frequency band, as appropriate.**2500-2570 MHz/2570-2620 MHz: Protection of RAS sites and radars**Nationally determined no-transmit zones are required around RAS sites operating in 2690-2700 MHz for aerial UE operating in the 2500-2570 MHz or 2570-2620 MHz frequency band, as appropriate;Nationally determined no-transmit zones might be required around radars operating in 2700-2900 MHz for aerial UE operating in the 2500-2570 MHz or 2570-2620 MHz frequency band. |

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