**3GPP TSG RAN WG1 #107-e R1-211xxxx**

**e-Meeting, November 11th – 19th, 2021**

**Agenda item:** 8.16.15

**Source:** Moderator (NTT DOCOMO, INC.)

**Title:** [draft] Summary on UE features for LTE based 5G terrestrial broadcast

**Document for:** Discussion and Decision

# **Introduction**

This document summarizes contributions submitted to AI 8.16.15 regarding UE features for LTE based 5G terrestrial broadcast and captures the following email discussion.

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| [107-e-R17-UE-features-LTE-Bcast-01] Email discussion UE features for LTE based 5G terrestrial broadcast – Shinya (DOCOMO)   * 1st check point: November 15 * Final check point: November 19 |

In the updated RAN1 UE features list for Rel-17 LTE after RAN1 #106bis-e [1], there is following feature group for LTE based 5G terrestrial broadcast.

* 3-1 Support of new channel bandwidth for PMCH

In this round of the discussion, companies are requested to provide comments on the proposals and questions tagged FL2.

# **3-1: Support of new channel bandwidth for PMCH**

In [1], FG 3-1 is captured as below.

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| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the eNB to know if the feature is supported | [Need for the UE to know if the feature is supported (only for V2X WI, where the PC5-RRC capability signalling is delivered between the UEs)] | **Consequence if the feature is not supported by the UE** | **Type**  **(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Capability interpretation for mixture of FDD/TDD | Note | Mandatory/Optional |
| 3. LTE\_terr\_bcast\_bands\_part1 | 3-1 | Support of new channel bandwidth for PMCH | [TBD: whether separate components are neded for different bandwidths] | Support of dedicated MBMS cells | Yes |  | UE cannot receive MBMS in the corresponding MBSFN area | Per band | N/A | N/A |  | Optional with capability signaling |

Following feedbacks are provided in contributions for the RAN1#107-e meeting.

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| [2] | Huawei, HiSilicon | Regarding whether separate components are needed for different bandwidths, as agreed the supported system bandwidth indicated in MIB is set to 5 MHz or 3 MHz, for which PMCH can be configured with 6/7/8 MHz.  From the perspective of UE implementation capability, a single UE capability supporting flexible bandwidth of 6/7/8 MHz is sufficient. The component of the feature could be written to support the feature of flexible bandwidth for PMCH with system bandwidth limited to 5 or 3 MHz. However, there is worry from other company that UE that is targeting a single region shall implement the bandwidths for the other regions with the corresponding potential different RF requirements if a common capability is defined. With this regard taken into account, separate UE capabilities corresponding to different bandwidth is also acceptable.  Per-band reporting and optional with capability signaling is acceptable.  ***Proposal 1:***   * ***The component of the feature can be written as:*** * ***Support flexible PMCH bandwidth (6/7/8MHz) allocation for the system bandwidth indicated in MIB set to 5 MHz or 3 MHz.*** * ***Alternatively, define separate UE capabilities corresponding to different bandwidth (6/7/8 MHz).***   ***Proposal 2: The capability of the feature is per band.*** |
| [3] | ZTE | Based on our understanding, one remaining issue is whether to have separate components for different bandwidths. The main concern from companies on a joint UE capability for different bandwidths is that, it may complicate the UE test issue. However, from our perspective, if different bands have different particular bandwidth and the current UE capability is per band, it seems sufficient to have one UE capability to cover 6/7/8MHz without further separating them.  Based on the above understanding, we have the following proposal.  ***Proposal 1****: Support one UE capability (FG3-1) to* *cover 6/7/8MHz for PMCH without further separating them.* |
| [4] | Nokia, Nokia Shanghai Bell | * **3-1:**   Regarding TBD on listing separate components for different bandwidths, it should be noted that components cannot be individually supported/not supported. Moreover, from RAN1 point of view there is no reason for separate indication of bandwidths, and hence this FG should be a simple supported/not supported indication for all bandwidths. |
| [5] | Qualcomm Incorporated | The main remaining issue is whether the UE needs to support all the bandwidths (6/7/8MHz) in a given band.  The support of different channel bandwidths is due to the different channelization for broadcast UHF spectrum in different regions. At this stage, it is unclear how RAN4 will decide on the band plan for broadcast UHF, but it is possible that different regions reuse the same band number, but use different channel bandwidth. In this case, it would be necessary for a UE to be able to support only a subset of the bandwidths. Otherwise, there will be additional UE complexity (due to having to implement bandwidths that the UE may not use), and potential lack of IODT opportunities (e.g. if some of the regions do not deploy 5G broadcast). Thus, we make the following proposal:  **Proposal 1: FG 3-1 has separate components for different bandwidths, and their support is separately indicated** |

## **Discussion**

**[FL1] Question 2-1:**

* **Companies are encouraged to provide views on whether** **separate FGs 3-1x are necessary for different bandwidths for PMCH, e.g.,**
  + **FG 3-1a: Support of new channel bandwidth of 6 MHz for PMCH**
  + **FG 3-1b: Support of new channel bandwidth of 7 MHz for PMCH**
  + **FG 3-1c: Support of new channel bandwidth of 8 MHz for PMCH**
  + **Note that components in an FG cannot be individually supported/not supported as pointed out by [4]**
    - Necessary: Qualcomm
      * Can live with this option: Huawei, HiSilicon
    - Not necessary: Huawei, HiSilicon, ZTE, Nokia, NSB

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| --- | --- |
| Company | Comment |
| ZTE | Our main concern for separate FGs for 6MHz, 7MHz and 8MHz is that, if a band can be configured with either 6MHz, 7MHz or 8MHz, however different UEs support different bandwidths, e.g., UE1 only supports 6MHz while UE2 only supports 7MHz, it would be a disaster for network to handle this case. Network may have to configure multiple MBSFN areas with different PMCH bandwidths each.  Maybe one compromised solution from our perspective is as following.  1) Support separate FGs for 6MHz, 7MHz and 8MHz for PMCH;  2) UE has to indicate support for all the allowed bandwidths among 6MHz, 7MHz and 8MHz for PMCH for a certain band as defined by RAN4.  This can give the flexibility of supporting different bandwidths for different bands or regions, also it can alleviate the concern from network side. |
| Qualcomm | We have a quite strong view to indicate support of different bandwidths. Let us try to elaborate a bit more, especially related to ZTE’s 2nd point.  At this stage, we do not know how RAN4 will define the band plan for different geographies. In general, we think it is impossible that in a given geography more than one channel bandwidth is supported, given the current broadcast allocation.  Thus, RAN4 may decide to take different approaches:   1. RAN4 will define different band numbers for different channel bandwidths (= different geographies). In this case, the differentiation of bandwidth is implicit in the band number, and it would not be needed. 2. RAN4 will define a common band number for different channel bandwidths (= different geographies). For example, a single band may cover the whole broadcast UHF spectrum in the whole world, and that band will support 3 channel bandwidths. Then, depending on the regulation in an area, a broadcaster will deploy the corresponding channel bandwidth.   Our point is to explicitly avoid the case where RAN4 goes with 2), but RAN1 forces the UE to implement all the channel bandwidths even when there may not be any network in the whole world supporting that bandwidth. If an OEM/UE wants to support a feature in a given country (e.g. broadcast in China) it will implement the corresponding bandwidth (e.g. 8MHz). |
| NTT DOCOMO | Given the strong view on the separate indication for the support of different PMCH bandwidths, we are fine to have separate FGs i.e., 3-1a/b/c as in FL’s question 2-1. As we (and Nokia) commented at the last meeting, support or not support for each component within a FG cannot be individually indicated. Therefore, if we go to support separate indication for the support of different PMCH bandwidths, separate FGs (3-1a/b/c) are necessary and original 3-1 may not be necessary in such case. |
| Nokia, NSB | Considering the example from Qualcomm, the concerns raised from ZTE would arise indeed if RAN4 goes for option 2) and RAN1 defines separate FGs for different BWs. If RAN4 goes for approach 1) then defining separate FGs in RAN1 would be equivalent to defining RAN1 FGs to indicate support to bands defined by RAN4. Perhaps the best way forward is to stop second guessing what RAN4 may or may not define and proceed as follows: define the FG in a manner that makes sense from RAN1 point of view and explain in an LS to RAN2 and RAN4 what are the assumptions behind it, requesting us to let us know if there is any deviation. |
| FL2 | Summary of companies view   * + - Necessary: Qualcomm       * Can live with this option: Huawei, HiSilicon, DOCOMO     - Not necessary: Huawei, HiSilicon, ZTE, Nokia, NSB       * Compromised proposal from ZTE         + Support separate FGs for 6MHz, 7MHz and 8MHz for PMCH         + UE has to indicate support for all the allowed bandwidths among 6MHz, 7MHz and 8MHz for PMCH for a certain band as defined by RAN4   Also it was suggested by Nokia that not guessing what RAN4 may or may not define. Instead, define the FG in a manner that makes sense from RAN1 point of view and clarify the intention in the LS to RAN2/4.  Given the above, companies are invited to provide further input what the preferred approach is from RAN1 perspective |
| ZTE2 | Thanks for the discussion and summary.  Now it seems we understand the concerns from both sides. Network vendors’ concern is that different UEs indicate different bandwidths for the same base station; UE vendors’ concern is that UE has to indicate support and test for unnecessary bandwidth for a certain country or region.  Considering this, we can go with Nokia’s suggestion.  Alternative, we can modify our previous compromised solution a little bit (adding “for a certain region”) to address Qualcomm’s concern as following.   * + - * Compromised proposal from ZTE         + Support separate FGs for 6MHz, 7MHz and 8MHz for PMCH         + Add note in these FGs: UE has to indicate support for all the allowed bandwidths among 6MHz, 7MHz and 8MHz for PMCH for a certain band ~~as defined by RAN4~~ for a certain region |
| Qualcomm | We still think the easiest way forward would be to just keep the separate components. To reply to Nokia and ZTE:  @Nokia: The issue is that the band plan for broadcast UHF will be defined in Rel-18 timeframe, so we really will not know about the band definitions until after Rel-17 ASN.1 is frozen.  @ZTE: Your suggestion sounds reasonable, but we do not know how it will be written in the specification. Could you elaborate? |

# **Conclusions**

TBD

# **References**

[1] R1-2110588 Updated RAN1 UE features list for Rel-17 LTE after RAN1 #106bis-e Moderators (AT&T, NTT DOCOMO, INC.)

[2] R1-2110871 Rel-17 UE features for LTE based 5G terrestrial broadcast Huawei, HiSilicon

[3] R1-2110930 Discussion on Rel-17 UE features for LTE based 5G terrestrial broadcast ZTE

[4] R1-2111165 On UE features for LTE based 5G terrestrial broadcast Nokia, Nokia Shanghai Bell

[5] R1-2112260 UE features for LTE-based 5G terrestrial broadcast Qualcomm Incorporated