**3GPP TSG RAN WG1 #108-e R1-220xxxx**

**e-Meeting, February 21st – March 3rd, 2022**

**Agenda item:** 8.15.1

**Source:** Moderator (Qualcomm Incorporated)

**Title:** Summary of 108-e-R17-LTE-5G-Bcast-01

**Document for:** Discussion and Decision

# Introduction

In RAN1#108-e, the following contribution was submitted to propose updates to TR 36.976 and TS 36.300:

* [R1-2201655](file:///C%3A%5CUsers%5Calbertor%5CAppData%5CLocal%5CDocs%5CR1-2201655.zip) Updates to 36.976 and 36.300 Qualcomm Incorporated

The objective of this email discussion is to agree on text proposals for the above specifications.

# Issue#1: Update to 36.976

In x1655, the following TP is provided:

======================================Start TP1======================================

4.3 Enhancements targeting LTE terrestrial broadcast

In Release 14, the following key RAN enhancements were made to the specifications to enable LTE terrestrial broadcast:

- MBMS-dedicated cell [3];

- MBSFN subframes using *Δf* = 1.25 kHz [8], with a cyclic prefix duration of 200µs and a symbol duration of 1ms;

- New information blocks on PBCH and PDSCH of CAS [3], [6]:

- *MIB-MBMS* is transmitted with a 40ms periodicity and updated every 160 ms; and

- *SIB1-MBMS* is transmitted with an 80ms periodicity and updated every 160 ms, containing information relevant for receiving MBMS service and, optionally, the scheduling of other system information blocks;

- *MBMSInterestIndication* RRC signalling procedure (see clause 4.1).

NOTE: For upper layer enhancements, see TS 23.246 [4] Annex D and E, TS 24.116 [7], TS 24.117 [12] and TS 26.346 [5] (ROM service aspects).

In Release 16, the following RAN enhancements were made to address the use cases described in clause 4.2:

- MBSFN subframes using *Δf* = 0.37 kHz, with a cyclic prefix duration of 300µs and a symbol duration of 3ms, for the support of large ISD;

- MBSFN subframes using *Δf* = 2.5 kHz, with a cyclic prefix duration of 100µs and a symbol duration of 0.5ms, for the support of high mobility;

- The following enhancements on the CAS:

- PDCCH enhancements:

- CFI indication in MIB [6] to avoid the need to decode PCFICH; and

- New aggregation level 16;

- Repetition of PBCH to increase its robustness.

In Release 17, the following RAN enhancement was introduced to enable deployment of LTE-based 5G terrestrial broadcast in broadcast UHF spectrum, where the channelization is 6/7/8MHz (depending on the geography):

- PMCH bandwidth of 30, 35 and 40 PRBs (corresponding to 6/7/8MHz), applicable for CAS bandwidth of 15 or 25 PRBs (corresponding to 3 and 5MHz).

======================================End TP1======================================

Table 1 Comments on TP1 (TR 36.976)

|  |  |
| --- | --- |
| Company | Comment |
| NTT DOCOMO | We support the proposed TP for TR36.976. |
| Huawei, HiSilicon | TR36.976 was created for Release 16 LTE-based 5G broadcast study item. The proposed TP is the feature introduced in Rel-17 starting from WI directly and the specification is complete. Why does this R16 TR need to update? Is it complying with 3GPP procedures? Is there precedent for that?  |
| ZTE | We have similar question as Huawei. The motivation to update the TR is not clear. |
| Qualcomm | To ZTE and Huawei: Note that in Rel-16 there were two TRs:1. TR 36.776: This is the typical TR for a study item (of course we don’t intend to update this TR).
2. TR 36.976: This is an external TR with the overall description of the technology.

One example for an update of a “900 series TR” is 37.985 (external TR describing V2X), which was recently updated in R1-2112989. Hope this clarifies the situation and we can proceed with endorsing the TP. |
| ZTE | Thanks for the clarification. We are ok to update the TR. |
| Huawei, HiSilicon | With this clarification (thanks), the update is fine.  |

# Issue #2: Update to 36.300

In x1655, the following TP is provided:

======================================Start TP2======================================

5.1.1b (new) Basic transmission scheme based on OFDM for MBMS-dedicated cells

The downlink transmission scheme for MBMS-dedicated cells is as described in clause 5.1.1, with the differences that the PMCH bandwidth can be indicated to be larger than the carrier bandwidth. In particular, a PMCH bandwidth of 30, 35 and 40 PRBs (corresponding to 6/7/8MHz) can be indicated when the carrier bandwidth is 15 or 25 PRBs (corresponding to 3 and 5MHz).

======================================Start TP2======================================

======================================Start TP2v2======================================

5.1.1 Basic transmission scheme based on OFDM

The downlink transmission scheme is based on conventional OFDM using a cyclic prefix. The OFDM sub-carrier spacing is *Δf* = 15 kHz. 12 consecutive sub-carriers during one slot correspond to one downlink *resource block*. In the frequency domain, the number of resource blocks, NRB, can range from NRB-min = 6 to NRB-max = 110 per CC or per Cell in case of CA or DC.

In addition, there are also four reduced sub-carrier spacings, *Δflow* = 7.5 kHz, *Δflow1* = 2.5 kHz, *Δflow2* = 1.25 kHz and *Δflow3* ≈ 0.37 kHz for both MBMS-dedicated cell and MBMS/Unicast-mixed cell.

In case of 15 kHz sub-carrier spacing there are two cyclic-prefix lengths, corresponding to seven and six OFDM symbols per slot respectively.

- Normal cyclic prefix: TCP = 160×Ts (OFDM symbol #0) , TCP = 144×Ts (OFDM symbol #1 to #6)

- Extended cyclic prefix: TCP-e = 512×Ts (OFDM symbol #0 to OFDM symbol #5)

where Ts = 1/ (2048 × Δf)

In case of 7.5 kHz sub-carrier spacing, there is only a single cyclic prefix length TCP-low = 1024×Ts, corresponding to 3 OFDM symbols per slot.

In case of 2.5 kHz sub-carrier spacing, there is only a single cyclic prefix length TCP-low1 = 3072×Ts, corresponding to 1 OFDM symbol per slot.

In case of 1.25 kHz sub-carrier spacing, there is only a single cyclic prefix length TCP-low2 = 6144×Ts, corresponding to 1 OFDM symbol per subframe.

In case of 0.37 kHz sub-carrier spacing, there is only a single cyclic prefix length TCP-low3 = 9216×Ts, corresponding to 1 OFDM symbol per 3 ms slot as defined in TS 36.211 [4], clause 4.1.

For MBMS-dedicated cells, the PMCH bandwidth can be indicated to be larger than the carrier bandwidth. In particular, a PMCH bandwidth of 30, 35 and 40 PRBs (corresponding to 6/7/8MHz) can be indicated when the carrier bandwidth is 15 or 25 PRBs (corresponding to 3 and 5MHz).

In case of FDD, operation with half duplex from UE point of view is supported.

======================================Start TP2v2======================================

Table 2 Comments on TP1 (TS 36.300)

|  |  |
| --- | --- |
| Company | Comment |
| NTT DOCOMO | We support the proposed TP for TS36.300. |
| Huawei, HiSilicon | There has been stage-2 description under clause 5.1.1 regarding the MBMS dedicated cell. The only difference is the bandwidth for PMCH. A couple of sentence under clause 5.1.1 might be sufficient and also compatible with the numerologies defined for MBMS under clause 5.1.1 |
| ZTE | We are ok with either the above TP or directly updating clause 5.1.1. |
| Moderator (Qualcomm) | We tried to capture what Huawei suggested in TP2v2. |
| ZTE | Ok with TP2v2. |
| Huawei, HiSilicon | TP2v2 looks ok. Thanks. |

# Conclusions

<To be filled after discussion is completed>