**3GPP TSG-RAN WG4 Meeting #101-bis-e R4-22xxxx**

**Electronic Meeting, January 17th- 25th 2022**

**Agenda item: 6.19.4**

**Source: Intel Corporation**

**Title: WF on demodulation requirement for Enhancement on HST-SFN deployment**

**Document for: Approval**

# Background

This contribution is to capture the agreements and the directions for the further studies of performance requirements definition for Rel-17 HST-SFN enhancements.

The following sub-agenda items from e-mail thread [101-bis-e][320] NR\_FeMIMO\_Demod\_NWM are considered:

* Sub-topic 3-5: Test Scope on Enhancement on HST-SFN deployment
* Sub-topic 3-8: Test setup for demodulation requirement for HST-SFN enhancement

The detailed discussions can be found in the e-mail discussion summary [R4-22xxxx]

# WF on requirements definition for HST-SFN enhancements

## Scope of PDSCH requirements

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| *Tentative agreements:*   * Introduce PDSCH requirements for HST SFN scheme A * FFS on HST SFN scheme B   + Further evaluate impact on UE receive processing for SFN scheme B   + FFS on test design and channel model definition   *Candidate options:*   * Option 1 (Samsung, Huawei, CMCC): Introduce PDSCH requirements for SFN scheme B. * Option 2 (Ericsson, Intel, NTT DoCoMo, Qualcomm, Apple): Introduce only PDSCH requirements for SFN scheme A * Option 3 (CMCC): Do not introduce PDSCH requirements for SFN scheme B and define the following test applicability rule to guarantee performance with this scheme:   + If UE passes the existing test cases (demodulation requirement for HST-SFN with high Doppler shift), the performance of SFN scheme B is guaranteed * Option 5 (Huawei) Introduce PDSCH requirements for both SFN scheme A and SFN scheme B with introduction of the following test applicability rule:   + If UE passes the existing test cases (demodulation requirement for HST-SFN with high Doppler shift), the performance of SFN scheme B is guaranteed |

## Scope of PDCCH requirements

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| *Candidate options:*   * Option 1 (CMCC): Define PDCCH requirements for HST SFN scenario * Option 2 (Ericsson): RAN4 discusses and decides whether to still have PDCCH demodulation requirement if intra-slot PDCCH repetition demodulation requirement is agreed to be introduced * Option 3 (Huawei): Do not define any PDCCH requirements for HST scenario but define PDCCH requirements for Scheme A for non-HST scenario. * Option 4 (Intel): Define test case when both channels (PDSCH/PDCCH) are transmitted using SFN scheme A and verify performance of PDSCH only * Option 5 (Apple, Qualcomm): Do not define PDCCH requirements for HST SFN scenario |

## PDSCH CA requirements

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| *Candidate options:*   * Option 1 (Intel): Define PDSCH CA requirements for HST SFN scenario * Option 2 (Huawei, Qualcomm): Do not define PDSCH CA requirements for HST SFN scenario * Option 3 (Apple, CMCC, Samsung): Define single carrier requirement firstly |

## Test Case design for PDSCH requirement for SFN scheme A with Single Carrier

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| **Test setup**   * Option 1:   + Reuse existing Rel-16 HST-SFN test set-up as a baseline     - PDCCH/PDSCH/ SFN transmitted from two RRHs     - TCI state 1 and TCI state 2 applied for TRP/RRH #2n, #2n+1 separately; TRS 1 and TRS 2 transmitted from TRP#2n, and #2n+1 separately  |  |  |  | | --- | --- | --- | | Parameter | Value | | | FDD 15 kHz SCS | TDD 30 kHz SCS | | CBW | 10 MHz | 40 MHz | | Antenna configuration | 2x2; 2x4 | | | DMRS type | Type 1 | | | Number of DMRS symbols | 1+1+1 | | | TDD pattern |  | 7D1S2U, S: 6D 4G 4U | | TRS configuration | 10ms, 2 slot pattern | | | PDSCH mapping | Type A, Start symbol 2, Duration 12 | | | Ds and Dmin | Ds =700m; Dmin=150m | | | Test metric | SNR @70% of maximum throughput | |  * Other options are not precluded.   **Maximum Doppler shift**   * 15 kHz SCS:   + Option 1: 972 Hz   + Option 2: 870 Hz   + Other options are not precluded * 30 kHz SCS:   + Option 1: 1667 Hz   + Other options are not precluded   **MCS and Rank**   * Option 1 (Huawei, Samsung): MCS 17 with Rank 2 from MCS Table 1 as a starting point * Other options are not precluded   **Channel Model**   * Option 1 (Samsung):   + HST SFN channel model specified in B.3.2 of TS 38.101-4 reused as a baseline   + MCS 13, MCS17 with Rank 2 from MCS Table 1 * Option 2 (Huawei):   + Reusing the existing Rel-16 HST-SFN channel model (Ds=700m, Dmin=150m) with removing the two furthest paths corresponding to the two furthest TRP * Option 3 (Intel)   + HST-SFN for PDSCH, PDCCH, DMRS with 2 RRHs per cell deployment   + Single TRP Tx for TRS * Other options are not precluded (Apple) |

## Test Case design for PDSCH requirement for SFN scheme B with Single Carrier

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| **MCS and Rank**   * MCS 17 with rank 2 as a starting point   **Test setup and Channel Model definition**   * Option 1 (Samsung): Reuse existing Rel-16 HST-SFN test set-up as a baseline   + Two TCI states with QCL A type information, and another one configured QCL type B information     - PDCCH/PDSCH/PBCH SFN transmitted from two RRHs     - TCI state 1 and TCI state 2 applied for for TRP/RRH #2n, #2n+1 separately; TRS 1 and TRS 2 transmitted from TRP#2n, and #2n+1 separately     - HST SFN channel model specified in B.3.2 of TS 38.101-4 reused without modelling Doppler shift * Option 2 (Huawei): Reuse existing Rel-16 HST-SFN test set-up as baseline. Reuse the existing Rel-16 HST-SFN channel model (Ds=700m, Dmin=150m) with removing the two furthest paths corresponding to the two furthest TRP   Select typical network implementation and consider the network implementation as a part of channel model (i.e., specify the function between the time and the pre-compensation value) to make sure TE implementation of pre-compensation has no impact on the UE performance during the test |