**3GPP TSG-RAN WG4 Meeting #102-e R4-2207208**

**Electronic Meeting, 21st Feb – 3rd Mar, 2022**

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

**Source:** Intel Corporation

**Agenda item:** 10.19.4

**Document for:** Approval

# Introduction

This WF capture all agreements and open issues for the following topics in [102-e][330] NR\_FeMIMO\_Demod:

* Topic #2: Demodulation requirement for Enhancement on HST-SFN scenario
  + Sub-topic 2-1: Test scope
  + Sub-topic 2-2: Test setup for PDSCH requirement for SFN scheme A with Single Carrier
  + Sub-topic 2-3: Test setup for PDSCH requirement for SFN scheme B with Single Carrier If introduced

The agreed WFs on demodulation performance requirements for enhancement on HST-SFN in the previous meetings:

* R4-2203091, “WF on demodulation requirement for Enhancement on HST-SFN deployment”, Intel, RAN4#101-bis-e

# Topic #2: Demodulation requirement for Enhancement on HST-SFN scenario

## Sub-topic 2-1: Test scope

**Issue 2-1-1: Whether to define PDCCH requirement for HST SFN scenario**

* No PDCCH requirement for Enhancement on HST-SFN scenario.
* Define test case where both channels (PDSCH/PDCCH) are transmitted using SFN scheme and verify performance of PDSCH only

**Issue 2-1-2: Whether to define PDSCH requireemnt with HST-SFN scheme B**

* Option 1: Yes
  + Option 1a: scheme A and scheme B with test applicability rule: If UE pass HST-SFN scheme A test cases, UE can skip HST-SFN scheme B test cases
  + Option 1b: scheme A and scheme B with test applicability rule: If UE supporting both HST SFN scheme A and B and supporting both 15kHz SCS and 30kHz SCS, then UE shall only pass schemeA 15kHz and schemeB 30kHz requirements.
* Option 2: No
* Option 3: 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

**Issue 2-1-3: Whether to define PDSCH CA requirement for Enhancement on HST SFN scnearion**

* No PDSCH CA requirement for Enhancement on HST SFN scenario in Rel-17 FeMIMO WI.

## Sub-topic 2-2: Test setup for PDSCH requirement for SFN scheme A with Single Carrier

**Issue 2-2-1: Common setup for PDSCH requirement**

* Reuse existing Rel-16 HST-SFN test set-up as a baseline
  + PDCCH/PDSCH SFN transmitted from two RRHs

|  |  |  |
| --- | --- | --- |
| 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 | |

**Issue 2-2-2: Number of TCI codepoint for Test**

* Configure 3 TCI code point during test, transmit TRS#i from RRH#3k+i that i = 0, 1, 2 and k = 0, 1, 2, … based on two RRHs
  + Codepoint#0 active when UE receiving PDSCH from RRH#3k and RRH#3k+1 : TCI#0, TCI#1
  + Codepoint#1 active when UE receiving PDSCH from RRH#3k+1 and RRH#3k+2: TCI#1, TCI#2
  + Codepoint#2 active when UE receiving PDSCH from RRH#3k+2 and RRH#3(k+1): TCI#2, TCI#0

**Issue 2-2-3: Maximum Doppler shift**

* Define PDSCH requirement with HST-SFN scheme A with Maximum Doppler shift
  + 30KHz SCS: 1667Hz
  + 15 kHz SCS:
    - Option 1: 972 Hz
    - Option 2: 870 Hz
    - Companies are encouraged to bring simulation results with both option 1 and option 2 to check whether there is performance degradation with option 1, down selection one of them in the next meeting

**Issue 2-2-4: MCS and Rank**

* Define PDSCH requirement with HST-SFN scheme A with MCS 17 and Rank 2 from MCS Table 1

**Issue 2-2-5: Channel Model**

* 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 as baseline
* For PDCCH and PDSCH HST-SFN with 2 nearest RRH, including time varying path power and path delay
  + Path power is normalized assuming only two visible TRPs.
* For TRS, single tap from each RRH, including time varying path power and path delay, apply the same scaling as PDSCH for each TRP for path power, and apply the same delay as PDSCH for each TRP for path delay, and apply the same time-varying Doppler shift from each RRH as PDCCH/PDSCH for Doppler shift

**Issue 2-2-6: Baseline receiver for defining scheme A requirement**

* Rx processing is up to UE implementation

**Issue 2-2-7: UE capabilty**

* FFS: The PDSCH demodulation requirements for HST-SFN Scheme A is applicable for UE capable of ‘SFN Scheme A’.

**Issue 2-2-8: Performance evalution**

* Interested companies can provide the performance evaluation result of HST SNF scheme A over Rel-16 HST SFN. No impact on the Rel-17 HST SFN scheme A performance requirement definition.

## Sub-topic 2-3: Test setup for PDSCH requirement for SFN scheme B with Single Carrier If introduced

**Issue 2-3-1: Common setup for PDSCH requirement**

* Reuse existing Rel-16 HST-SFN test set-up as a baseline

|  |  |  |
| --- | --- | --- |
| 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 | |

**Issue 2-3-2: Modeling of TRP pre-compensation**

* Option 1: For scheme B, BS behaviour can be Doppler Modeling into channel model so that TE implementation of pre-compensation has no impact on the UE performance during the test.
* Other options are not precluded

**Issue 2-3-3: Number of TCI codepoint for Test**

* Configure 3 TCI code point during test, transmit TRS#i from RRH#3k+i that i = 0, 1, 2 and k = 0, 1, 2, … based on two RRHs
  + Codepoint#0 active when UE receiving PDSCH from RRH#3k and RRH#3k+1 : TCI#0, TCI#1
  + Codepoint#1 active when UE receiving PDSCH from RRH#3k+1 and RRH#3k+2: TCI#1, TCI#2
  + Codepoint#2 active when UE receiving PDSCH from RRH#3k+2 and RRH#3(k+1): TCI#2, TCI#0

**Issue 2-3-4: MCS and Rank**

* MCS 17 with Rank 2 as a baseline

**Issue 2-3-5: Channel Model**

* 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 as baseline
* For PDCCH and PDSCH HST-SFN with 2 nearest RRH, including time varying path power and path delay
  + FFS modelling Doppler shift
  + Path power is normalized assuming only two visible TRPs.
* For TRS, single tap from each RRH, including time varying path power and path delay, apply the same scaling as PDSCH for each TRP for path power, and apply the same delay as PDSCH for each TRP for path delay
  + FFS modelling Doppler shift

# Reference

1. R4-2207177, Email discussion summary for [102-e][330] NR\_FeMIMO\_Demod, RAN4#102-e, Samsung