**3GPP TSG-RAN WG4 Meeting # 98-e R4-21xxxxx**

**Electronic Meeting, Jan. 25-Feb. 5, 2021**

**Agenda item: 11.6.3**

**Source:** Moderator (CMCC)

**Title:** Email discussion summary for [98e][328] NR\_HST\_Demod\_UE

**Document for:** Information

# Introduction

This email discussion focuses on UE demodulation for Rel-17 NR HST, including agenda 11.6.3.1~11.6.3.3. Two topics are included in total, including PDSCH requirements for CA scenarios and enhanced transmission schemes.

The targets of email discussion for 1st round and 2nd round are:

* 1st round: discuss the open issues and strive to minimize the open issues
* 2nd round: according to 1st round discussion, discuss left open issues for 2nd round, and strive to minimize the open issues, and strive to approve the WF.

# Topic #1: PDSCH requirements for CA scenarios

*Agenda 11.6.3.2*

## Companies’ contributions summary

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| --- | --- | --- | --- |
| **TDoc** | **Title** | **Source** | **Proposals/ Observations** |
| [R4-2100858](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2100858.zip) | General discussion on NR HST UE demodulation for FR1 CA scenario | CMCC | Proposal 1: for HST-SFN conditions, both HST-SFN joint transmission and DPS transmission are considered to support CA.  Proposal 2: both 2RX and 4RX are considered to support CA for HST.  Proposal 3: the CA combinations specified in Rel-16 WI on NR performance requirement enhancement can be reused for NR FR1 HST CA, the detailed CA combinations are:  • FDD 15 kHz + TDD 30 kHz CA  • FDD 15 kHz + TDD 15 kHz CA  • TDD 15 kHz + TDD 30 kHz CA  • FDD 15 kHz + FDD 15 kHz CA  • TDD 30 kHz + TDD 30 kHz CA  Proposal 4: to support HST CA, PDSCH requirements on single carrier of following bandwidth need to be specified:  • for 15KHz SCS, specify PDSCH requirements on single carrier of BW of {5, 10, 15, 20, 25, 30, 40, 50} MHz  • for 30KHz SCS, specify PDSCH requirements on single carrier of BW of {5, 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100} MHz  Proposal 5: for CA scenario, reuse the modulation format and code rate adopted for PDSCH requirements specification in Rel-16 NR HST WI, the details are:  • for HST-SFN joint transmission, 16QAM, 0.48 is used  • for DPS, 64QAM, 0.43 is used |
| [R4-2101260](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101260.zip) | Views on NR HST CA PDSCH performance requirements | Intel Corporation | Proposal #1: For HST PDSCH CA tests use same framework for CA configuration selection as defined for normal PDSCH CA tests.  Proposal #2: Define HST PDSCH CA requirements only for the following CA duplex modes:  • FDD 15 kHz + FDD 15 kHz  • TDD 30 kHz + TDD 30 kHz  • FDD 15 kHz + TDD 30 kHz  Proposal #3: For HST PDSCH CA tests reuse CA CQI applicability rule on CA duplex modes for testing: If UE supports both FDD 15 kHz + TDD 30 kHz and FDD 15 kHz + FDD 15 kHz CA duplex modes, apply requirements only to the first one.  Proposal #4: Define HST PDSCH CA requirements for all supported in Rel-15 channel bandwidths.  Proposal #5: Make HST PDSCH CA requirements release independent from Rel-15.  Proposal #6: Define HST CA requirements only for HST-SFN JT and HST-SFN DPS with one active TCI state. Further discuss applicability rule to reduce the test efforts.  Proposal #7: Use same PDSCH, PDSCH DMRS, MCS, Rank, CSI-RS configurations, TDD pattern and channel model parameters for HST CA requirements as in corresponding single carrier requirements.  Proposal #8: Reuse HARQ process number and k1 values for HST CA requirements as in normal CA requirements.  Proposal #9: Use same applicability rule for Pcell configuration for HST CA requirements as in normal CA requirements. |
| [R4-2101308](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101308.zip) | Discussion on PDSCH CA scenarios for NR UE HST FR1 performance requirements | Huawei, HiSilicon | Proposal 1: Only define 500km/h performance requirements for CA.  − Reuse Maximum Doppler shift and corresponding configuration from Rel-16 HST-SFN requirements.  − Reuse SNR for FDD 10MHz/15kHz and TDD 40MHz/30kHz SCS and run simulation for other cases.  Proposal 2: Others parameters such as PUCCH format for HARQ-ACK feedback, number of HARQ process, K1 values for different CCs, and applicability rule for different CA configurations and bandwidth combination sets can be reused from NR Rel-16 normal CA.  Proposal 3: Define HST FR1 CA requirements based on the following simulation assumption.   |  |  | | --- | --- | | Parameter | Value | | Antenna configuration | 2x2; 2x4 | | DMRS type | type 1 | | Number of DMRS symbols | DMRS 1+1+1 | | TDD pattern | DDDSU, S: 10D+2G+2U for 15 kHz SCS;  7DS2U, S: 6D+4G+4U for 30 kHz SCS | | MCS | MCS 13 based on 64QAM table | | Propagation condition | HST-SFN | | TRS periodicity | 10 ms, 2 slot pattern | | PDSCH mapping | Type A, Start symbol 2, Duration 12 | | Ds and Dmin | Ds = 700m, Dmin = 150m | | Rank | Rank = 2 | | Bandwidth & SCS | 5, 10,15,20,30,40,50MHz for FDD and TDD 15 kHz SCS;  5, 10,15,20,30,40,50,60,70,80,90,100MHz for TDD 30 kHz SCS | | Maximum Doppler shift | 870 Hz for 15 kHz SCS; 1667 Hz for 30 kHz SCS | | Testing metric | SNR @ 70% of maximum throughput | |
| [R4-2101370](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101370.zip) | Views on HST CA tests for FR1 | NTT DOCOMO, INC. | Proposal 1: For FDD, consider at least FDD 15kHz  Proposal 2: For TDD, consider at least TDD 30kHz  Proposal 3: Target maximum Doppler frequency under HST-SFN scenario in the tests are as follows.  – For FDD 15kHz : 870Hz  – For TDD 30kHz : 1667Hz |
| [R4-2101439](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101439.zip) | PDSCH demodulation requirements for CA with HST-SFN scenario | Ericsson | Proposal 1: Define PDSCH CA demodulation requirements with HST-SFN scenario (joint transmission) with the combination of following component carriers:  • CBW=5, 10, 15, 20, 25, 30, 40, and 50MHz for FDD SCS=15kHz  • CBW=5, 10, 15, 20, 25, 30, 35, 40, 50, 60, 80, 90, and 100MHz for TDD SCS=30kHz  • RAN4 will discuss whether to define TDD SCS=15kHz or not.  Proposal 2: Apply the Rel-16 HST-SFN channel model parameters to PDSCH CA demodulation requirements with HST-SFN:   |  |  |  | | --- | --- | --- | | Parameters | SCS=15kHz | SCS=30kHz | | **Ds (inter-RRH distance)** | **700 m** | **700 m** | | **Dmin (distance between RRH and UE)** | **150 m** | **150 m** | | **v (UE velocity)** | **500 km/h** | **500 km/h** | | **fd (maximum Doppler shift)** | **870 Hz** | **1667 Hz** |   Proposal 3: Reuse the test setup of Rel-16 single carrier HST-SFN requirements for CA scenario.  • Antenna configuration: 2x2 and 2x4  • MCS: 13 (64QAM table)  • Rank 2  • DMRS Type 1 and 2 additional DM-RS symbols  • For TDD, use TDD pattern of 7D1S2U with S=6DL:4GP:4UL  o No PDSCH data transmission in the special slots  • TRS periodicity: 10ms  Proposal 4: Introduce new UE capability of demodulationEnhancement for SCell.  Proposal 5: Introduce new network-assisted signalling highSpeedDemodFlag to inform HST-SFN deployment for SCell. |

## Open issues summary

### Test parameters for CA scenario

**Issue 1-1-1: Target speed**

* Proposals in RAN4#98e meeting:
  + *Option 1 (Huawei):* Only define 500km/h performance requirements for CA.
* ***Reuse Maximum Doppler shift and corresponding configuration from Rel-16 HST-SFN requirements.(*** ***870 Hz for 15 kHz SCS; 1667 Hz for 30 kHz SCS)***
* ***Reuse SNR for FDD 10MHz/15kHz and TDD 40MHz/30kHz SCS and run simulation for other cases.***
  + *Option 2 (DOCOMO, Ericsson):* Target maximum Doppler frequency under HST-SFN scenario in the tests are as follows.
* ***For FDD 15kHz : 870Hz***
* ***For TDD 30kHz : 1667Hz***
* Recommended WF
  + Can we agree with the following recommended WF?
    - Reuse Maximum Doppler shift and corresponding configuration from Rel-16 HST-SFN requirements.( 870 Hz for 15 kHz SCS; 1667 Hz for 30 kHz SCS)
    - Reuse SNR for FDD 10MHz/15kHz and TDD 40MHz/30kHz SCS and run simulation for other cases.

**Issue 1-1-2: Transmission schemes**

* Proposals in RAN4#98e meeting:
  + *Option 1 (CMCC): for HST-SFN conditions, both HST-SFN joint transmission and DPS transmission need to be considered to support CA*
  + *Option 2 (Intel):* *Define HST CA requirements only for HST-SFN JT and HST-SFN DPS with one active TCI state. Further discuss applicability rule to reduce the test efforts.*
  + *Option 3 (Ericsson): Define PDSCH CA demodulation requirements with HST-SFN scenario (joint transmission).*
* Recommended WF
  + Define HST CA requirements for HST-SFN joint transmission
  + Define HST CA requirements for HST-SFN DPS with one active TCI state.
  + Further discuss on how to define CA requirements for HST-SFN DPS with two active TCI states
  + Further discuss on the applicability rule.

**Issue 1-1-3: Antenna configurations**

* Proposals in RAN4#98e meeting:
  + *Option 1 (CMCC, Huawei, Ericsson): 2x2 and 2x4*
* Recommended WF
  + Can we agree with the following recommended WF?
    - Antenna configuration: 2x2 and 2x4

**Issue 1-1-4: SCS configurations**

* Proposals in RAN4#98e meeting:
  + *Option 1 (CMCC): Same as Rel-16 CA normal demodulation*
* ***FDD 15 kHz + TDD 30 kHz CA***
* ***FDD 15 kHz + TDD 15 kHz CA***
* ***TDD 15 kHz + TDD 30 kHz CA***
* ***FDD 15 kHz + FDD 15 kHz CA***
* ***TDD 30 kHz + TDD 30 kHz CA***
  + *Option 2 (Intel): Same as Rel-16 CA CQI*
* FDD 15 kHz + FDD 15 kHz
* TDD 30 kHz + TDD 30 kHz
* FDD 15 kHz + TDD 30 kHz
  + *Option 3 (Ericsson): RAN4 will discuss whether to define TDD SCS=15kHz or not.*
* Recommended WF
  + 3 companies discuss this issue. 1 company propose to keep the same configuration as Rel-16 CA normal demodulation (option 1), 1 company propose to keep the same configuration as Rel-16 CA CQI test (Option 2). More discussion is needed.

**Issue 1-1-5: Bandwidth combination configurations**

* Proposals in RAN4#98e meeting:
  + *Option 1 (CMCC, Huawei, Intel, Ericsson):*
* ***for 15KHz SCS, specify PDSCH requirements on single carrier of BW of {5, 10, 15, 20, 25, 30, 40, 50} MHz***
* ***for 30KHz SCS, specify PDSCH requirements on single carrier of BW of {5, 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100} MHz***
* Recommended WF
  + Can we agree with the following bandwidth combination configurations for CA HST-SFN?
    - for 15KHz SCS, specify PDSCH requirements on single carrier of BW of {5, 10, 15, 20, 25, 30, 40, 50} MHz
    - for 30KHz SCS, specify PDSCH requirements on single carrier of BW of {5, 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100} MHz

**Issue 1-1-6: HARQ process**

* Proposals in RAN4#98e meeting:
  + *Option 1 (Intel, Huawei):*
* ***Reuse HARQ process number and k1 values for HST CA requirements as in normal CA requirements.***
* Recommended WF
  + Can we agree to reuse HARQ process number and k1 values for HST CA requirements as in normal CA requirements?

**Issue 1-1-7: MCS and Rank, and other test setp**

* Proposals in RAN4#98e meeting:
  + *Option 1 (Intel, Huawei, Ericsson, CMCC):*
* ***Use same PDSCH, PDSCH DMRS, MCS, Rank, CSI-RS configurations, TDD pattern and channel model parameters for HST CA requirements as in corresponding single carrier requirements.***
* Recommended WF
  + Use the following test setup as the baseline for further discussion

|  |  |
| --- | --- |
| Parameter | Value |
| DMRS type | type 1 |
| Number of DMRS symbols | DMRS 1+1+1 |
| TDD pattern | DDDSU, S: 10D+2G+2U for 15 kHz SCS;  7DS2U, S: 6D+4G+4U for 30 kHz SCS |
| MCS | For JT: MCS 13 based on 64QAM table  For DPS:MCS 17 based on 64QAM table |
| TRS periodicity | 10 ms, 2 slot pattern |
| PDSCH mapping | Type A, Start symbol 2, Duration 12 |
| Ds and Dmin | Ds = 700m, Dmin = 150m |
| Rank | Rank = 2 |
| Testing metric | SNR @ 70% of maximum throughput |

### Applicabiliy rule

**Issue 1-2-1: Applicability rule for SCS configuration**

* Proposals in RAN4#98e meeting:
  + *Option 1 (Intel): For HST PDSCH CA tests reuse CA CQI applicability rule on CA duplex modes for testing: If UE supports both FDD 15 kHz + TDD 30 kHz and FDD 15 kHz + FDD 15 kHz CA duplex modes, apply requirements only to the first one.*
* Recommended WF
  + This issue is related to the SCS configurations for CA. Suggest to discuss later when we reach agreements on the SCS configurations

**Issue 1-2-2: Applicability rule for PCell configuration**

* Proposals in RAN4#98e meeting:
  + *Option 1 (Intel, Huawei): Use same applicability rule for Pcell configuration for HST CA requirements as in normal CA requirements.*
* Recommended WF
  + Can we agree with the following recommended WF?
    - Use same applicability rule for Pcell configuration for HST CA requirements as in normal CA requirements.

### Release independent

**Issue 1-3-1: release independent**

* Proposals in RAN4#98e meeting:
  + *Option 1 (Intel): Make HST PDSCH CA requirements release independent from Rel-15.*
* Recommended WF
  + HST SFN single carrier requirements are release independent from Rel-15 as well as normal PDSCH CA requirements. Can we agree with HST PDSCH CA requirements are release independent from Rel-15?

### UE capability and network-assisted signalling

**Issue 1-4-1: UE capability and network-assisted signalling**

* Proposals in RAN4#98e meeting:
  + *Option 1 (Ericsson): UE capability and network assisted signalling defined in Rel-16 are only applicable for NR Pcell or NR PScell. UE needs additional capability to support the advanced receiver for HST-SFN joint transmission in SCell .*
    - *Introduce new UE capability of demodulationEnhancement for SCell.*
    - *Introduce new network-assisted signalling highSpeedDemodFlag to inform HST-SFN deployment for SCell.*
* Recommended WF
  + More discussion is needed

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
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### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR tdoc number** | **Comments collection** |
|  |  |
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## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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| --- | --- |
|  | **Status summary** |
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| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
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*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

## Discussion on 2nd round (if applicable)

### Open issues summary

### Open issues

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| **Company** | **Comments** |
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## Summary on 2nd round (if applicable)

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| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
|  |  |

# Topic #2: Enhanced transmisison schemes

*Agenda 11.6.3.3*

## Companies’ contributions summary

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| --- | --- | --- | --- |
| **TDoc** | **Title** | **Source** | **Proposals/ Observations** |
| [**R4-2100859**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2100859.zip) | Discussion on NR HST UE demodulation for enhanced transmission scheme | CMCC | Observation 1: transmission scheme 2 will improve the throughput, and it is possible deployment for the high speed train scenario.  Observation 2: The PDSCH demodulation requirements specified in Rel-16 eMIMO WI cannot be applied to high speed scenario.  Proposal 1: It is necessary to specify the PDSCH requirements for transmission scheme 2 in HST scenario to guarantee the performance. |
| [**R4-2101261**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101261.zip) | Views on NR HST PDSCH performance requirements for multi-DCI based Tx scheme | Intel Corporation |  |
| [**R4-2101309**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101309.zip) | Discussion on enhanced transmission schemes for NR HST demodulation | Huawei, HiSilicon | Proposal 1: To determine whether to specify the PDSCH requirements for NC-JT, RAN4 evaluate performance difference between NC-JT and DPS with the following assumption.  Proposal 2: C-JT requirements, the following test setup can be considered.  − For UE support 2 active TCI, MAC-CE based TCI switching, interruption exists  − Two RRHs of RRH#(2k) and RRH#(2k+1) are assumed, and SSB#(k mod 2) is transmitted from TRP#(2k), where k=0,1, 2, …  − UE is configured with TCI#(2k mod 4) and TCI#((2k+1) mod 4) that are associated with TRS#(2k mod 4) and TRS#((2k+1) mod 4) transmitted from RRH#(2k) and RRH#(2k+1) respectively by RRC signalling tci-StatesToAddModList in the PDSCH-Config and tci-PresentInDCI is not configured;  − All the configured TCI states are known to UE. UE is configured with NZP-CSI-RS resource for L1-RSRP measurements by RRC signaling nzp-CSI-RS-ResourceSet within the CSI-ResourceConfig and periodic CSI reporting by setting reportConfigType to periodic and reportQuantity to cri-RSRP (Note: reported L1-RSRP mesurements are not tested)  − At slot#(k\*n), TE actives TCI#(k mod 4) and TCI#(k+1 mod 4) for PDCCH with coresetPoolIndex#(k mod 2) and coresetPoolIndex#(k+1 mod 2) transmitted from RRH#(k) and RRH#(k+1) by “TCI State Indication for UE-specific PDCCH MAC CE” command with the field of CORESET ID set to 0 and 1 respectively, where n is the number of slots between two RRH  − PDSCH associated with TCI #(k mod 4) is transmitted from RRH#(k mod 4) in slot from max((k-1)n + 1 + HARQ needed time + 3ms + first TRS + TRS processing time, 0) to (k+1)n + HARQ needed time + 3ms.  − For UE supports more than 2 active TCI, MAC-CE based TCI switching, no interruption exists  − Two RRHs of RRH#(2k) and RRH#(2k+1) are assumed, and SSB#(k mod 2) is transmitted from TRP#(2k), where k=0,1, 2, …  − UE is configured with TCI#(2k mod 4) and TCI#((2k+1) mod 4) that are associated with TRS#(2k mod 4) and TRS#((2k+1) mod 4) transmitted from RRH#(2k) and RRH#(2k+1) respectively by RRC signalling tci-StatesToAddModList in the PDSCH-Config and tci-PresentInDCI is not configured;  − All the configured TCI states are known to UE. UE is configured with NZP-CSI-RS resource for L1-RSRP measurements by RRC signaling nzp-CSI-RS-ResourceSet within the CSI-ResourceConfig and periodic CSI reporting by setting reportConfigType to periodic and reportQuantity to cri-RSRP (Note: reported L1-RSRP mesurements are not tested)  − At slot#(k\*n), TE activates TCI#(k mod 4), TCI#(k+1 mod 4) and TCI#(k+2 mod 4) for PDSCH at the same time by “TCI States Activation/Deactivation for UE-specific PDSCH MAC CE” and actives TCI#(k mod 4) and TCI#(k+1 mod 4) for PDCCH with coresetPoolIndex#(k mod 2) and coresetPoolIndex#(k+1 mod 2) transmitted from RRH#(k) and RRH#(k+1) by “TCI State Indication for UE-specific PDCCH MAC CE” command with the field of CORESET ID set to 0 and 1 respectively, where n is the number of slots between two RRH;  − PDSCH associated with TCI #(k mod 4) is transmitted from RRH#(k mod 4) in slot from max((k-1)n + 1 + HARQ needed time + 3ms + first TRS + TRS processing time, 0) to (k+1)n + HARQ needed time + 3ms. |
| [**R4-2101440**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101440.zip) | PDSCH demodulation requirements with enhanced transmission schemes in HST scenario | Ericsson | Proposal 1: Define multi-DCI PDSCH transmission requirement with HST-SFN deployment scenario. |

## Open issues summary

**Issue 2-1: Whether to specify PDSCH requirements for transmission scheme 2**

* Proposals in RAN4#98e meeting:
  + *Option 1 (CMCC, Ericsson): Specify the PDSCH requirements for transmission scheme 2 in HST scenario to guarantee the performance.*
  + *Option 3 (Huawei): To determine whether to specify the PDSCH requirements for NC-JT, RAN4 evaluate performance difference between NC-JT and DPS with the following assumption.*
* Recommended WF
  + It seems that more evaluation is needed before we make the decision. More discussion is needed

**Issue 2-2: Channel model**

* Proposals in RAN4#98e meeting:
  + *Option 1 (Intel):* 
    - *Adopt HST-SFN propagation conditions (Doppler, delay, power profiles) as independent channel models to explicitly model multi-RRH Tx.*
    - *Use same HST-SFN channel model parameters as used for Rel-16 HST requirements for multi-DCI Tx scheme analysis: Ds = 700m; Dmin=150m; max Doppler frequency 870 Hz and 1667 Hz for 15 kHz and 30 kHz SCS respectively.*
  + *Option 2 (Ericsson, Huawei): reuse the HST-SFN channel model (TS38.101-4 B.3.2) and parameters for multi-DCI based PDSCH transmission requirements, where the number of visible RRHs are 2.*

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| --- | --- | --- |
| Parameters | SCS=15kHz | SCS=30kHz |
| Ds (inter-RRH distance) | 700 m | 700 m |
| Dmin (distance between RRH and UE) | 150 m | 150 m |
| v (UE velocity) | 500 km/h | 500 km/h |
| fd (maximum Doppler shift) | 870 Hz | 1667 Hz |

* Recommended WF
  + Ds=700m, Dmin=150m, max Doppler frequency: 870Hz for 15KHz, 1667Hz for 30KHz
  + More discussion is needed on the channel model

**Issue 2-3: Time/frequency errors and assumptions on UE synchronization**

* Proposals in RAN4#98e meeting:
  + *Option 1 (Intel):* 
    - *Single FFT operation should be assumed as baseline UE implementation.*
    - *Non-ideal synchronization between RRHs should be considered as a baseline assumption.*
* Recommended WF
  + More discussion is needed

**Issue 2-4: Reference performance for comparison**

* Proposals in RAN4#98e meeting:
  + *Option 1 (Intel): Consider JT and DPS Tx schemes as a reference performance for comparison.*
  + *Option 2 (Huawei): RAN4* evaluate performance difference between NC-JT and DPS.
* Recommended WF
  + More discussion is needed.

**Issue 2-5: PDSCHs allocations between different RRHs**

* Proposals in RAN4#98e meeting:
  + *Option 1 (Intel): Consider overlapped and non-overlapped PDSCHs allocations between different RRHs*
  + *Option 2 (Ericsson, Huawei): reuse the same PRB allocation as Rel-16 eMIMO multi-DCI based transmission, i.e., overlapped in time domain but not overlapped in frequency domain.*
* Recommended WF
  + More discussion is needed

**Issue 2-6: MCS**

* Proposals in RAN4#98e meeting:
  + *Option 1 (Intel): Consider MCS 4, 13 and 17 as a baseline assumption for further evaluations.*
  + *Option 2 (Ericsson, Huawei): MCS: 17 (64QAM table)*
* Recommended WF
  + More discussion is needed

**Issue 2-7: Other parameters**

* Proposals in RAN4#98e meeting:
  + *Option 1 (Intel, Huawei):* 
    - *Antenna configuration: 2x2 and 2x4*
    - *Rank 2*
      * *DMRS ports 1000/1001 from TRP #(2i)*
      * *DMRS ports 1002/1003 from TRP #(2i+1)*
    - *DMRS Type 1 and 2 additional DM-RS symbols*
    - *For TDD, use TDD pattern of 7D1S2U with S=6DL:4GP:4UL*
      * *No PDSCH data transmission in the special slots*
    - *TRS periodicity: 10ms*
* Recommended WF
  + More discussion is needed

**Issue 2-8: Link adaptation and statistic calculation**

* Proposals in RAN4#98e meeting:
  + *Option 1 (Intel): Bring performance results collecting at different train positions:*

*1. Near the one RRH*

*2. In the middle region between RRHs*

*3. On the half of the track*

* Recommended WF
  + More discussion is needed

**Issue 2-9: Test setup for transmission scheme 2**

* Proposals in RAN4#98e meeting:
  + *Option 1 (Huawei): If RAN4 agree to define NC-JT requirements, the following test setup can be considered.*
    - *For UE support 2 active TCI, MAC-CE based TCI switching, interruption exists*
      * *Two RRHs of RRH#(2k) and RRH#(2k+1) are assumed, and SSB#(k mod 2) is transmitted from TRP#(2k), where k=0,1, 2, …*
      * *UE is configured with TCI#(2k mod 4) and TCI#((2k+1) mod 4) that are associated with TRS#(2k mod 4) and TRS#((2k+1) mod 4) transmitted from RRH#(2k) and RRH#(2k+1) respectively by RRC signalling tci-StatesToAddModList in the PDSCH-Config and tci-PresentInDCI is not configured;*
      * *All the configured TCI states are known to UE. UE is configured with NZP-CSI-RS resource for L1-RSRP measurements by RRC signaling nzp-CSI-RS-ResourceSet within the CSI-ResourceConfig and periodic CSI reporting by setting reportConfigType to periodic and reportQuantity to cri-RSRP (Note: reported L1-RSRP mesurements are not tested)*
      * *At slot#(k\*n), TE actives TCI#(k mod 4) and TCI#(k+1 mod 4) for PDCCH with coresetPoolIndex#(k mod 2) and coresetPoolIndex#(k+1 mod 2) transmitted from RRH#(k) and RRH#(k+1) by “TCI State Indication for UE-specific PDCCH MAC CE” command with the field of CORESET ID set to 0 and 1 respectively, where n is the number of slots between two RRH*
      * *PDSCH associated with TCI #(k mod 4) is transmitted from RRH#(k mod 4) in slot from max((k-1)n + 1 + HARQ needed time + 3ms + first TRS + TRS processing time, 0) to (k+1)n + HARQ needed time + 3ms.*
    - *For UE supports more than 2 active TCI, MAC-CE based TCI switching, no interruption exists*
      * *Two RRHs of RRH#(2k) and RRH#(2k+1) are assumed, and SSB#(k mod 2) is transmitted from TRP#(2k), where k=0,1, 2, …*
      * *UE is configured with TCI#(2k mod 4) and TCI#((2k+1) mod 4) that are associated with TRS#(2k mod 4) and TRS#((2k+1) mod 4) transmitted from RRH#(2k) and RRH#(2k+1) respectively by RRC signalling tci-StatesToAddModList in the PDSCH-Config and tci-PresentInDCI is not configured;*
      * *All the configured TCI states are known to UE. UE is configured with NZP-CSI-RS resource for L1-RSRP measurements by RRC signaling nzp-CSI-RS-ResourceSet within the CSI-ResourceConfig and periodic CSI reporting by setting reportConfigType to periodic and reportQuantity to cri-RSRP (Note: reported L1-RSRP mesurements are not tested)*
      * *At slot#(k\*n), TE activates TCI#(k mod 4), TCI#(k+1 mod 4) and TCI#(k+2 mod 4) for PDSCH at the same time by “TCI States Activation/Deactivation for UE-specific PDSCH MAC CE” and actives TCI#(k mod 4) and TCI#(k+1 mod 4) for PDCCH with coresetPoolIndex#(k mod 2) and coresetPoolIndex#(k+1 mod 2) transmitted from RRH#(k) and RRH#(k+1) by “TCI State Indication for UE-specific PDCCH MAC CE” command with the field of CORESET ID set to 0 and 1 respectively, where n is the number of slots between two RRH;*
      * *PDSCH associated with TCI #(k mod 4) is transmitted from RRH#(k mod 4) in slot from max((k-1)n + 1 + HARQ needed time + 3ms + first TRS + TRS processing time, 0) to (k+1)n + HARQ needed time + 3ms.*
* Recommended WF
  + Suggest discussing later after RAN4 reach agreements on whether to define transmission 2 requirements.

**Issue 2-10: Applicability and capability signalling**

* Proposals in RAN4#98e meeting:
  + *Option 1 (Ericsson): For the multi-DCI based transmission requirements in HST-SFN,* 
    - *UE does not require to be capable of demodulationEnhancement and gNB does not need to configure highSpeedDemodFlag.*
    - *UE should be capable of multiDCI-MultiTRP.*
    - *No new UE capability signaling and network assigned signaling are necessary.*
* Recommended WF
  + More discussion is needed.

## Companies views’ collection for 1st round

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |

### CRs/TPs comments collection

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
|  |  |
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*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

## Summary on 2nd round (if applicable)

### Open issues summary

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |

## Summary on 2nd round (if applicable)

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| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
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