0.0.4

Variant of [98-bis-e][324] NR_perf_enh2_Demod_Part2_NWM Version 0.0.3

RAN4

3GPP TSG-RAN WG4 Meeting #98bis-e R4-2106155

Electronic Meeting, Apr. 12th – 20th, 2021

Agenda item: 8.14.3.1

Source: Moderator (Huawei, HiSilicon)

Title: Email discussion summary for [98-bis-e][324] NR_perf_enh2_Demod_Part2_NWM

Document for: Information

1 Introduction

The discussion on the WI NR_demod_enh2-Perf is scheduled to be started from RAN4 #98-bis-e. According to the latest revised WID in RP-210920, BS PUSCH demodulation requirements for FR1 256QAM is one of the objectives of this WI:

BS demodulation requirements:

PUSCH demodulation requirements for FR1 256QAM

- Note 1: low mobility is considered for requirements definition

- Note 2: Realistic phase noise modelling is left up to the contributing entities

2 Topic#1□Test parameters

2.1 Companies' contributions summary

Table 1: Companies' contributions summary

T-doc number	Company	Proposals/Observations

R4-2104483	China Telecommunications	***Proposal 1:*** Cover both 1Tx 1-layer and 2Tx 2-layer transmission with 2/4/8Rx in the 256QAM PUSCH demodulation requirements. **Proposal 2:** Reuse the existing test applicability for different BS supported antenna connectors defined in clause 8.1.2.0 of TS38.141-1. **Proposal 3:** Reuse the existing configuration for Rel-15 2Tx UL transmission scheme, i.e., codebook-based transmission with TPMI index 0 as a start point. **Proposal 4:** Use MCS 24 (R = 841/1024) or MCS25 (R = 885/1024) in MCS Table 2 for NR PUSCH 256QAM test cases. **Proposal 5:** Use TDLA30-10 channel model for NR PUSCH 256QAM test cases. **Proposal 6:** Reuse the other parameters for 64QAM PUSCH demodulation in Table 1. **Table 1.** Proposed Other Parameters for 256QAM PUSCH Demodulation Requirements ***Proposal 7:*** Reuse the existing applicability rules for PUSCH performance requirements for different SCS and CBW defined in 8.1.2.1.1 and 8.1.2.1.2 in TS 38.141-1 if the proposed 'SCS and CBW' configuration in the above Table1 can be agreed. **Proposal 8:** Reuse the existing applicability rules for PUSCH performance requirements for different PUSCH mapping types defined in 8.1.2.1.3 in TS 38.141-1 if the proposed 'time domain resource allocation type' in the above Table1 can be agreed. **Proposal 9:** Reuse the existing applicability rules for PUSCH performance requirements for different TDD UL-DL pattern as defined in clause 8.1.2.1.5 of TS38.141-1. **Proposal 10:** Reuse the existing MU and TT values

R4-2104557	Ericsson	**Proposal 1:** PUSCH demodulation performance requirements for 256QAM is applied for BS manufacturers declaring that 256QAM is supported for uplink. **Proposal 2:** To define the demodulation requirements for 256QAM on FR1 UL, simulation assumptions defined for that for 64QAM can be reused, except that a new corresponding MCS needs to be considered, e.g. MCS#24 in the Rel-15 256QAM-specific MCS table as the starting point. Table 1: Parameters for PUSCH performance requirements for 256QAM

R4-2104608	CMCC	**Proposal 1:** Use both CP-OFDM and DFT-s-OFDM waveform. **Proposal 2:** The test parameters for CP-OFDM can take the following parameters as the starting point For MCS, we propose to down-selection from 256QAM MCS20, 256QAM MCS24 and 256QAM MCS27 for evaluation assumption, and make the final decision based on evaluation results. For propagation condition, we can use TDL-A 30-10 Low as the starting point, further study based on simulation results. **Proposal 3:** The test parameters for DFT-s-OFDM can take the following parameters as the starting point For MCS, we propose to down-selection from 256QAM MCS20, 256QAM MCS24 and 256QAM MCS27 for evaluation assumption, and make the final decision based on evaluation results. For propagation condition, we can use TDLB100-400 Low as the starting point, further study based on simulation results.

R4-2104730	CATT	**Proposal 1:** To adopt CP-OFDM for 256QAM demodulation. **Proposal 2:** To adopt the number of RX antennas 2, 4, 8 for 256QAM demodulation. **Proposal 3:** To adopt the number of TX antennas 1 for 256QAM demodulation. **Proposal 4:** To adopt single symbol DM-RS with pos1 additional DM-RS position for 256QAM demodulation. **Proposal 5:** To adopt 15 kHz SCS: 5MHz, 10MHz, 20MHz and 30 kHz SCS: 10MHz, 20MHz, 40MHz, 100MHz for 256QAM demodulation. **Proposal 6:** To adopt MCS index =24 in Table 5.1.3.1-2: MCS index table 2 for PDSCH in TS 38.214 for 256QAM demodulation. **Proposal 7:** To adopt FRC parameters listed in Table 2-1 for 256QAM demodulation. **Proposal 8:** To adopt the PUSCH time domain resource allocation type: type A and type B for 256QAM demodulation. **Proposal 9:** To adopt TDLA30-10 Low for 256QAM demodulation. **Proposal 10** To adopt other parameters listed in Table 2-2 for 256QAM demodulation.

R4-2105031	Samsung	**Proposal 1:** Define PUSCH requirement with 256QAM : Waveform: CP-OFDM onl Time resource allocation: Mapping type A DMRS configuration: 1+1 Antenna configuration: 1Tx, 1Rx/8Rx SCS&BW: 15 KHz SCS and 5MHz CBW, 30 KHz SCS and 10MHz CBW Channel Model: TDLA30-10 MCS: MCS 24 as starting point Tx EVM: FFS with assumption Tx EVM as 3.5% Phase noise modeling: No explicitly modeling at Rx side PTRS: No PTRS configuration
R4-2106347	NTT DOCOMO, INC.	**Observation 1:** In LTE specification, the performance requirements for PUSCH 256QAM in multipath fading propagation conditions are defined in the same combinations as those of 64QAM except the requirements on propagation condition "EVA 5Hz Low". **Proposal 1:** RAN4 should reuse the test parameters defined in Table 8.2.1.1-1 in TS 38.104 as a baseline for consideration of the requirements for PUSCH 256QAM. **Proposal 2:** Fro 256QAM tests, RAN4 should consider the same combinations of test cases (SCS, CBW and number of TRx) for PUSCH 64QAM defined in clause 8.2.1.2 in TS 38.104. **Proposal 3:** RAN4 consider TDLA 30-10 Low same with 64QAM as the propagation condition for PUSCH FR1 256QAM.

R4-2106428	Intel Corporation	**Proposal 1:** Consider the following assumptions for FR1 PUSCH requirements with 256QAM modulation Waveform: CP-OFDM only CBW/SCS combinations: 15 kHz with 5, 10 MHz and 30 kHz with 10, 40 MHz including existing applicability rule TDD UL/DL configuration: Reuse Rel-15 PUSCH requirements assumptions PUSCH configuration: Type A and B mapping, S = 0, L = 14, Rank 1, MCS 4 DMRS configuration: Type 1, Single symbol, 1 additional DMRS, Number of CDM groups without data = 2 Channel model and antenna configuration: TDLA30-10 and 1x2

R4-2106782	Nokia, Nokia Shanghai Bell	**Proposal 1:** RAN4 to study, if configuration of PT-RS results in a significant demodulation performance improvement in FR1 256QAM PUSCH. **Proposal 2:** Have requirements for MCS 22 (table 2, 754/1024). **Proposal 3**: Have requirements for 1 and 2 layers. **Proposal 4:** Have requirements for 2 Tx and {2, 4, 8} Rx. **Proposal 5:** Have requirements for full slot allocation only. **Proposal 6:** Have requirements with 70% TPUT KPI only. **Proposal 7:** Have requirements for CP-OFDM only. **Proposal 8:** Have requirements for type A PUSCH mapping type only. **Proposal 9:** Have requirements for the TDL A 30-10 Low channel model only. **Proposal 10:** Have requirements for both DM-RS addPos1 and addPos2.

R4-2106835	Huawei, HiSilicon	**Proposal 1:** We propose the following parameters for PUSCH configuration: Mapping type: Type B Starting symbol: 0 Length: 14 PUSCH aggregation factor: 1 **Proposal 2:** Use propagation condition TDLA30-10 for PUSCH 256QAM performance requirements definition. **Proposal 3:** Define PUSCH 256QAM performance requirements for SCS and bandwidth of 15 kHz/10 MHz and 30 kHz/40 MHz **Proposal 4:** We propose to use TDD pattern of 3D1S1U for 15 kHz and 7D1S2U for 30 kHz. **Proposal 5:** We propose to use MCS21. **Proposal 6:** Only consider CP-OFDM waveform for performance requirements definition. **Proposal 7:** Define performance requirements with antenna configuration of 1x2, 1x4 and 1x8 for PUSCH 256QAM. **Proposal 8:** Reuse the configurations of PUSCH 64QAM for the following parameters:

2.2 Open issues summary

In this section, test parameters for PUSCH 256QAM demodulation performance requirements will be discussed.

2.2.1 Issue 1: Applicability for PUSCH 256QAM demodulation performance requirements

Proposals

- Option 1: Only applied for BS manufacturers declaring that uplink 256QAM is supported. (Ericsson,Samsung, Nokia, CTC, CATT, ZTE, CMCC)

- Option 2: Uplink 256QAM minimum performance is mandatory for Rel-17 compliant BSs (Nokia)

Recommended WF: Collect more companies' view

Feedback Form 1: 1 st round comments on Issue 1: Applicability for PUSCH 256QAM demodulation performance requirements

Item	Company	Comments
1	Ericsson Inc.	We support Option 1 to align with LTE since 256QAM is an optional feature for UE. To be more clear in specification, maybe a manufactory declaration is also needed.
2	Nokia	[Nokia, Nokia Shanghai Bell]: We are fine with both making 256QAM support declarable, or making 256QAM minimum performance mandatory for Rel-17 compliant BSs. We agree that LTE had 256QAM PUSCH requirements for supporting BSs only: "The requirements defined based on FRC in Annex A.17 apply to the BS supporting PUSCH with 256QAM."
3	China Telecommunications	[CTC]: Option 1 is ok for us
4	Samsung Electronics Benelux BV	[Samsung]: We prefer option 1: Based on UE feature list, 256QAM is UE optional feature for UL in FR1. Therefore, PUSCH with 256QAM requirement should be optional, whether this requirement will be tested should be based on BS declaration.
5	CATT	Support option 1 to enable 256QAM an optional feature.
6	ZTE Wistron Telecom AB	Option 1
7	China Mobile Com. Corporation	[CMCC] We prefer Option1 to follow the normal procedure which is based on BS declaration

2.2.2 Issue 2: Antenna configurations

Proposals

- Option 1: Both of 1Tx and 2Tx with 2/4/8 Rx. (CTC, CMCC)

- Option 2: 1Tx with 2/4/8 Rx. (Ericsson, CATT, DoCoMo, Huawei)

- Option 3: 1Tx with ~~1~~2/8 Rx (Samsung, Ericsson, Huawei)

- Option 4: 1Tx with 2Rx (Intel, Samsung)

- Option 5: 2Tx with 2/4/8 Rx (Nokia)

Recommended WF: Collect more companies' view and try to make downselection in this meeting.

Feedback Form 2: 1st round comments on Issue 2: Antenna configurations

Item	Company	Comments
1	Ericsson Inc.	Firstly, 2 layer is very critical for 256QAM demodulation which will lead to very high SNR, so it is not typical in real network. Secondly, for 1 layer 256QAM, it's throughput would be lower than 2 layers 64QAM at the same SNR level due to low code rate. In that case, 1 layer 256QAM would not be typical for 2Tx UE. It is suitable for 1Tx UE to check the demodulation performance.
2	Ericsson Inc.	For Rx, we propose Option 2 to aligned with 64QAM, but to reduce test effort, only 2/8 Rx would be also enough. Using applicability rule for the test. 1Rx is not typical.
3	Nokia	[Nokia, Nokia Shanghai Bell]: We can directly agree to have at least 1Tx and come back to the inclusion of 2Tx, once the decision on 2 layer inclusion has been made. In the 2 layer discussion we argue that it should be included, assuming required SNR values stay below 20dB. Concerning the number of Rx, at least 2 and 8 should be included. However, if we keep prior applicability rules, then there is no harm in including 4 as well.
4	Intel Corporation SAS	The purpose of the test is to verify 256QAM reception. Therefore, we think that testing with only Rank 1 or Rank 2 should be sufficient. Rank 1 testing should be fine from SNR operation region for 2 Rx case. As for number of Rx antenna, we are fine to cover 2, 4 and 8. We've suggested to consider 2 Rx case only to reduce simulation effort.
5	China Telecommunications	[CTC]: Option 1. For Tx number, 2Tx with 2-layer transmission can achieve higher data rate, which is the same purpose for introducing UL 256QAM. So, we propose to cover both 1Tx and 2Tx for test requirement. For Rx number, requirements for 2/4/8 Rx are introduced in Rel-15, and we do not see the need to make further down-selection.

Item	Company	Comments
6	Samsung Electronics Benelux BV	[Samsung]: There is a typo for our proposal, the number of Rx should be 2Rx and 8Rx. We prefer option 3 (1Tx with 2/8 Rx) and option 4 (1Tx with 2Rx) In our view, scheduling 256QAM transmission with rank2 is a not typical scenario. In LTE, RAN4 only defines the 256QAM requirement with 1Tx. Similar with LTE and NR PDSCH with FR1 256QAM, we think 1Tx should be enough. Regarding the number of Rx, considering the test effort and test applicablity rule defined in NR Rel-15 for different antenna configurations as " Unless otherwise stated,for a BS supporting different numbers of antenna connectors (for *BS type 1-C*) or *TAB connectors*(for *BS type 1-H*) (see D.37 in table 4.6-1), the tests with low MIMO correlation level shall apply only for the lowest and highest numbers of supported connectors, and the specific connectors used for testing are based on manufacturer declaration" So, we think 2Rx and 8Rx should be enough.
7	HiSilicon Technologies Co. Ltd	[Huawei] We support to only consider 1Tx for 256QAM.
8	CATT	Support option 2. 1Tx is preferred and the limited test cases with less Rx configurations is acceptable to us.
9	ZTE Wistron Telecom AB	[ZTE] Option 2, 1Tx for 256QAM can be concluded in this meeting.
10	China Mobile Com. Corporation	[CMCC] We support Option1 at least in this stage. 256QAM will be used in high SNR scenario, which is also suitable for 2Tx (2Layer). If the the simulation results shows that the SNR is too high to achieve, we can give our compromise to Option2 until then.

2.2.3 Issue 3: Number of layers

Proposals

- Option 1: Both of 1 and 2 layers. (CMCC, Nokia, CTC)

- Option 2: Only 1 layer (Intel, Huawei, Samsung, Ericsson)

Recommended WF: This issue can be discussed after Issue 2: Antenna configuration is finalized.

Item	Company	Comments

Feedback Form 3: 1st round comments on Issue 3: Number of layers

Item	Company	Comments
1	Ericsson Inc.	Based on the analysis above, we prefer Option 2.
2	Nokia	[Nokia, Nokia Shanghai Bell]: We can agree right now to have at least one layer. Two layers should be included, if found that the required SNR values are within practical ranges, e.g., below [20]dB. 256QAM is undoubtedly meant for maximum TPUT, hence the highest TPUT setting (2 layer) should be studied and adopted, if found to be relevant.
3	Intel Corporation SAS	Based on our understanding, verification of 1 layer case should be sufficient from test coverage point of view.
4	China Telecommunications	[CTC]: Option 1. Same as issue 2.
5	Samsung Electronics Benelux BV	[Samsung]: Similar as Issue2, only 1 layer is preferred. Rank2 is not a practical scenario for 256QAM scheduling.
6	CATT	Support option 2. Only 1 layer for 1Tx.
7	ZTE Wistron Telecom AB	[ZTE] Option 2, only 1 layer as in Issue 1.
8	China Mobile Com. Corporation	[CMCC] We support Option1. 2 layers should be included as long as the SNR is within the reasonable range.

2.2.4 Issue 4: UL transmission scheme for 2Tx

Proposals

- Option 1: Codebook-based transmission with TPMI index 0. (CTC, CMCC, DoCoMo, Nokia)

- Option 2:

Recommended WF: This issue can be discussed after Issue 2: Antenna configuration is finalized.

Feedback Form 4: 1st round comments on Issue 4: UL transmission scheme for 2Tx

Item	Company	Comments
1	China Telecommunications	[CTC]: Option 1
2	Samsung Electronics Benelux BV	[Samsung]: Similar as Issue 2, only 1 layer is prefered
3	HiSilicon Technologies Co. Ltd	[Huawei] We prefer to only consider 1 layer.
4	CATT	Prefer to consider 1 layer.
5	ZTE Wistron Telecom AB	[ZTE]: Only 1 layer is considered.
6	China Mobile Com. Corporation	We support the recommended WF. If 2Tx is adopt, Option1 should be considered.

2.2.5 Issue 5: MCS

Proposals

- Option 1: MCS20 (CMCC)

- Option 2: MCS21 (Huawei)

- Option 3: MCS22 (Nokia)

- Option 4: MCS24 (CTC, Ericsson, CMCC, CATT, Samsung, Intel)

- Option 5: MCS25 (CTC)

- Option 6: MCS27 (CMCC)

Recommended WF: Collect more companies' view and try to make downselection in this meeting.

Feedback Form 5: 1st round comments on Issue 5: MCS

Item	Company	Comments
1	Ericsson Inc.	Support Option 4 as the start point. Using MCS24 follows LTE requirement, but lower MCS could be considered if the simulation shows MCS24 is not feasible.
2	Nokia	[Nokia, Nokia Shanghai Bell]: We can accept to start with MCS24, but to fall back to a second simulation campaign with MCS22 in case the observed SNR values are above [20]dB.
3	Intel Corporation SAS	MCS24 is used for UE requirements. We think that it is rather typical MCS for 256QAM. Same time, we are fine to consider other MCSs.
4	China Telecommunications	[CTC]: Option 4 or 5 or 6.
5	Samsung Electronics Benelux BV	[Samsung]: In Rel-15, MCS 24 was selected for PDSCH requirement with 256QAM. The achieved SNR is about 24.6dB. At current stage, we can select MCS24 as a starting point. If the achievable SNR is very high for PUSCH, lower MCS level for 256QAM can be considered. We are open to discuss whether lower MCS level order is needed. While, only one set MCS requirement is defined.
6	HiSilicon Technologies Co. Ltd	[Huawei]: MCS should be considerd based on the simulation results.
7	CATT	Support option 4 as a start point.
8	ZTE Wistron Telecom AB	[ZTE]: If only one MCS is selected, then we can choose a medium one, e.g. Option 4, and if two MCS values are preferred, then we can choose a lower and a higher value, e.g., MCS 20, and MCS 27.
9	China Mobile Com. Corporation	[CMCC] We agree to prioritize Option4 since it is the majority view, and confirm or further adjust the MCS configuration based on simulation results.

2.2.6 Issue 6: Waveform

Proposals

- Option 1: CP-OFDM only. (CTC, Ericsson, CATT, Samsung, DoCoMo, Nokia, Huawei, Intel)

- Option 2: Both of CP-OFDM and DFT-s-OFDM (CMCC)

Recommended WF: Only one company supports Option 2, is it acceptable to agree Option 1?

Feedback Form 6: 1st round comments on Issue 6: Waveform

Item	Company	Comments
1	Ericsson Inc.	Support Option 1.
2	Nokia	[Nokia, Nokia Shanghai Bell]: Option 1, as per our contribution.
3	Intel Corporation SAS	Support Option 1. Based on our understanding, DFT-S-OFDM is not typical configuration for scenarios with strong and stable link (cell center UEs).
4	China Telecommunications	[CTC]: Option 1 is fine for us.
5	Samsung Electronics Benelux BV	[Samsung]: We prefer option 1 The useful scenario of enable 256QAM scheduling is targeting cell-center UE with high SNR condition. DFT-s-OFDM waveform is mainly used for cell-edge scenario.
6	HiSilicon Technologies Co. Ltd	[Huawei]: DFT-s-OFDM is mainly used for coverage issues. In that case, data will not be scheduled with 256QAM.
7	CATT	Support option 1. Share the similar view that DFT-s-OFDM is for coverage increase. Only CP-OFDM is preferred.
8	ZTE Wistron Telecom AB	[ZTE]: Option 1 if considering its typical usage.
9	China Mobile Com. Corporation	We prefer Option2. PUSCH requirement with 256QAM for DFT-s-OFDM has been defined in LTE. In NR, we think it is also necessary to define the requirement for test coverage consideration.

2.2.7 Issue 7: Propagation condition

Proposals

- Option 1: TDLA30-10 Low. (CTC, Ericsson, CMCC, CATT, Nokia, Huawei,Samsung, Intel)

- Option 2: TDLA30-10 Low for CP-OFDM, TDLB100-400 Low for DFT-s-OFDM. (CMCC)

Recommended WF: Depends on the discussion on above Isssue 6 waveform.

Feedback Form 7: 1st round comments on Issue 7: Propagation condition

Item	Company	Comments
1	Ericsson Inc.	Support Option 1. As mentioned above, 256QAM need quite high SNR and TDLB100-400 would be very critical even considering DFT-s-OFDM.
2	Nokia	[Nokia, Nokia Shanghai Bell]: Option 1, as per our contribution. Looking at the Rel-15 64QAM SNR values, we estimate that all other channel models (not TDLA3-10) will break 20dB required SNR for 256QAM.
3	Samsung Electronics Benelux BV	[Samsung]: we prefer option 1: In FR1, different channel models are considered for different MCS requirement, such as TDLB100-400, TDLC300-100, and TDA30-10. As mentioned, the main use case of 256QAM is cell center UE, where the mobility is related low compared cell-edge UE. Also considering in WID, low mobility is noted for requirements definition. In Rel-15 NR UE demodulation for PDSCH requirement with 256QAM, where TDLA30-10 channel model was selected for requirement setup, we prefer to reuse TDLA30-10 for PUSCH 256QAM requirement setup.
4	CATT	Support option 1 by considering low mobility
5	ZTE Wistron Telecom AB	[ZTE] Option 1 as in Issue 6.
6	China Mobile Com. Corporation	[CMCC] We support the recommended WF

2.2.8 Issue 8: SCS and bandwidth

Proposals

15 kHz:

- Option 1: Cover 5MHz, 10MHz and 20MHz. (CTC, Ericsson, CMCC, CATT, DoCoMo, Nokia)

- Option 2: 5MHz (Samsung)

- Option 3: Cover 5MHz and 10MHz (Intel)

- Option 4: 10MHz (Huawei)

30 kHz:

- Option 1: Cover 10MHz, 20MHz, 40MHz and 100MHz. (CTC, Ericsson, CMCC, CATT, DoCoMo, Nokia)

- Option 2: 10MHz (Samsung)

- Option 3: Cover 10MHz and 40MHz. (Intel)

- Option 4: 40MHz (Huawei)

Recommended WF: Further collect companies' view and try to make downselection in this meeting.

Feedback Form 8: 1st round comments on Issue 8: SCS and bandwidth

Item	Company	Comments
1	Ericsson Inc.	Option 1 is to aligned with 64QAM, but we are open for Option 3 to reduce effort.
2	Nokia	[Nokia, Nokia Shanghai Bell]: At least minimum CBW and one representative CBW should be chosen. In high TPUT scenarios, we conjecture that also large CBWs will be used. As such we prefer (both) option 1s, and could compromise to (both) option 3s.
3	Intel Corporation SAS	Options 1 or 3 are fine for us. Option 3 was suggested to reduce the simulation effort and existing applicability rules can be used for testing of BS with different CBW support.
4	China Telecommunications	[CTC]: Option 1 for 15kHz SCS and 30kHz SCS. CBW configuration for Rel-15 should be reused.
5	Samsung Electronics Benelux BV	[Samsung]: We prefer to option2. Considering RAN4 has defined the test applicability rule with different channel bandwidth. To reduce the test efforts and simulation efforts, we prefer to only define requirement with minimum channel bandwidth for each SCS, 15KHz SCS with 5MHz, 30KHz SCS with 10MHz. we are open for option3 to reduce effort.
6	HiSilicon Technologies Co. Ltd	[Huawei]: We prefer to define the requirements with the typical bandwidth (option 4s), by considering the applicability rule for BS requirements with different BW, we can comprimise to option 3s.
7	CATT	To reduce test effort, we can also accept option 3 for 15kHz and option 3 for 30kHz. At least the minimum and typical CBW should be tested.
8	ZTE Wistron Telecom AB	[ZTE] Much longer simulation time is expected for 256QAM compared with 64QAM, so we don't need to have alignment between 256QAM and 64QAM regarding SCS/CBW choices, Option 3 (15kSCS/(5,10M), 30kSCS/(10,40M)) could be a good compromise.
9	China Mobile Com. Corporation	We support Option1 for both 15kHz and 30kHz, there is no additional test effort introduced by Option1.

2.2.9 Issue 9: TDD pattern

Proposals

15 kHz:

- Option 1: 3D1S1U, S=10D:2G:2U (CTC, Ericsson, CMCC, CATT, DoCoMo, Intel, Nokia, Huawei)

30 kHz:

- Option 1: 7D1S2U, S=6D:4G:4U (CTC, Ericsson, CMCC, CATT, DoCoMo, Intel, Nokia, Huawei)

Recommended WF: Agree with Option 1 for both 15kHz SCS and 30kHz SCS.

Feedback Form 9: Comments on the recommended WF for Issue 9: TDD pattern

Item	Company	Comments
1	Nokia	[Nokia, Nokia Shanghai Bell]: Option 1.
2	China Telecommunications	Support the recommended WF.
3	Samsung Electronics Benelux BV	[Samsung]: We are OK with option 1 and recommended WF
4	HiSilicon Technologies Co. Ltd	[Huawei]: The recommended WF is fine for us.
5	Ericsson Inc.	[Ericsson] Support WF.
6	ZTE Wistron Telecom AB	[ZTE] We are fine with Moderator's recommendation.
7	China Mobile Com. Corporation	[CMCC] We support the recommeded WF

2.2.10 Issue 10: PUSCH mapping type

Proposals

- Option 1: Type A and Type B with applicability rule. (CTC, Ericsson, CMCC, CATT, DoCoMo, Intel)

- Option 2: Type A. (Samsung, Nokia)

- Option 3: Type B. (Huawei)

Recommended WF: Further discuss and try to make compromise in this meeting.

Feedback Form 10: 1st round comments on Issue 10: PUSCH mapping type

Item	Company	Comments
1	Ericsson Inc.	Support Option 1 to avoid a BS only support one mapping type situation.
2	Nokia	[Nokia, Nokia Shanghai Bell]: Option 1 can be compromise. However, type B is more suited for short and low latency transmissions. For high TPUT the DM-RS should be more centered (with less symbol to DM-RS distance) and hence option 2 is seen as the only practical solution.
3	Intel Corporation SAS	Support Option 1. Same comment as Ericsson.
4	China Telecommunications	Option 1. Same configuration for Rel-15 should be reused.
5	Samsung Electronics Benelux BV	[Samsung]: we prefer option 2. Both time resource allocation mapping type A and type B were considering for FR1. Based on the exiting results in FR1, the performance gap between different time domain allocations is very small. To reduce the test effort, we prefer to only specify 256 QAM requirement with mapping type A.
6	HiSilicon Technologies Co. Ltd	[Huawei]: We can comprimise to option 1.
7	ZTE Wistron Telecom AB	[ZTE] Option 1, both Type A and B should be covered.
8	China Mobile Com. Corporation	[CMCC] Support the recommeded WF

2.2.11 Issue 11: PUSCH symbol length

Proposals

- Option 1: 14 (CTC, Ericsson, CMCC, CATT, DoCoMo, Intel, Nokia, Huawei)

Recommended WF: Agree L = 14 symbols for PUSCH symbol length

Feedback Form 11: Comments on the recommended WF for Issue 11: PUSCH symbol length

Item	Company	Comments
1	Nokia	[Nokia, Nokia Shanghai Bell]: Option 1.
2	China Telecommunications	Support the recommended WF.
3	Samsung Electronics Benelux BV	[Samsung]: we are ok with option 1 and recommended WF
4	HiSilicon Technologies Co. Ltd	[Huawei]: The recomended WF is fine for us.
5	Ericsson Inc.	[Ericsson] Support WF.
6	ZTE Wistron Telecom AB	[ZTE] Fine with Moderator's recommendation.
7	China Mobile Com. Corporation	[CMCC] Support the recommeded WF

2.2.12 Issue 12: Start symbol

Proposals

- Option 1: 0 (CTC, Ericsson, CMCC, CATT, DoCoMo, Intel, Nokia, Huawei)

Recommended WF: Agree S = 0 for PUSCH start symbol

Feedback Form 12: Comments on the recommended WF for Issue 12: PUSCH start symbol

Item	Company	Comments
1	Huawei Tech.(UK) Co.. Ltd	S=0
2	Nokia	[Nokia, Nokia Shanghai Bell]: Option 1.

Item	Company	Comments
3	China Telecommunications	Support the recommended WF.
4	Samsung Electronics Benelux BV	[Samsung]: we are OK with option 1 and recommended WF
5	HiSilicon Technologies Co. Ltd	[Huawei]: The recommended WF is fine for us.
6	Ericsson Inc.	[Ericsson] Support WF.
7	ZTE Wistron Telecom AB	[ZTE} Fine with WF.
8	China Mobile Com. Corporation	[CMCC] Support the recommeded WF

2.2.13 Issue 13: Frequency domain allocation

Proposals

- Option 1: Full bandwidth (CTC, Ericsson, CMCC, CATT, DoCoMo, Nokia, Huawei)

Recommended WF: Agree full bandwidth frequency domain resource allocation

Feedback Form 13: Comments on the recommended WF for Issue 13: frequency domain allocation

Item	Company	Comments
1	Nokia	[Nokia, Nokia Shanghai Bell]: Option 1.
2	China Telecommunications	Support the recommended WF.
3	Samsung Electronics Benelux BV	[Samsung]: We are ok with option 1 and recommended WF

Item	Company	Comments
4	HiSilicon Technologies Co. Ltd	[Huawei]: The recommended WF is fine for us.
5	Ericsson Inc.	[Ericsson] Support WF.
6	ZTE Wistron Telecom AB	[ZTE] Fine with WF.
7	China Mobile Com. Corporation	[CMCC] Support the recommeded WF

2.2.14 Issue 14: DM-RS Type

Proposals

- Option 1: Type 1 with single-symbol (CTC, Ericsson, CMCC, CATT, DoCoMo, Intel, Nokia, Huawei)

Recommended WF: Agree with Option 1: Type 1 with single-symbol DM-RS

Feedback Form 14: Comments on the recommended WF for Issue 14: DM-RS type

Item	Company	Comments
1	Nokia	[Nokia, Nokia Shanghai Bell]: Option 1.
2	China Telecommunications	Support the recommended WF.
3	Samsung Electronics Benelux BV	[Samsung]: We are ok with option 1 and recommended WF
4	HiSilicon Technologies Co. Ltd	[Huawei]: The recommended WF is fine for us.
5	Ericsson Inc.	[Ericsson] Support WF.

Item	Company	Comments
6	ZTE Wistron Telecom AB	[ZTE] Ok with WF.
7	China Mobile Com. Corporation	[CMCC] Support the recommeded WF

2.2.15 Issue 15: Additional DM-RS (dmrs-AdditionalPosition)

Proposals

- Option 1: pos1 (Ericsson, CMCC, CATT, DoCoMo, Intel, Huawei, CTC, Samsung)

- Option 2: pos1 and pos2 (Nokia)

Recommended WF: Further discussion.

Feedback Form 15: 1st round comments on Issue 15: Additional DM-RS

Item	Company	Comments
1	Ericsson Inc.	Support Option 1. We don't see pos2 DM-RS would give much benefit for FR1 demodulation under a low fading channel.
2	Nokia	[Nokia, Nokia Shanghai Bell]: We can agree to at least addPos=1 right now. We want to keep the option for addPos=2 open for that case, that significantly better performance is observed. It is our goal to study, if PN leads to demodulation problems for 256QAM. If (and only if) yes, then we propose to counter the performance loss either by addPos=2 or by PT-RS usage.
3	Intel Corporation SAS	Based on our understanding, at least we can define requirements for addPos=1 and further study any benefits from introduction of requirements with addPos=2.
4	China Telecommunications	Support option 1. 2 additional DMRS position will need more RE consumption for reference signal, and we think UE performance (channel estimation accuracy) can be assured with pos1 due to high SNR point required by 256QAM transmission, and low mobility scenario as agreed.
5	Samsung Electronics Benelux BV	[Samsung]: We prefer option 1, The main use case of 256QAM should be for cell-canter UE with low mobility, we donot think it is necessary to configure DMRS pattern as Pos 2

Item	Company	Comments
6	HiSilicon Technologies Co. Ltd	[Huawei]: We do not see the necessary for 2 additional DM-RS. For 256QAM requirements, we support only consider 1 additional DM-RS.
7	ZTE Wistron Telecom AB	[ZTE] Option 1. Not much gain possible in a high SNR from more DM-RS.
8	China Mobile Com. Corporation	[CMCC] Support Option1

2.2.16 Issue 16: PT-RS configuration

Proposals

- Option 1: No PT-RS configured (Samsung, CTC)

- Option 2: Further study. (Nokia)

Recommended WF: Further discussion

Feedback Form 16: 1st round comments on Issue 16: PT-RS configuration

Item	Company	Comments
1	Ericsson Inc.	Support Option 1. We don't see much phase noise issue for FR1 cases.
2	Nokia	[Nokia, Nokia Shanghai Bell]: It is our goal to study, if PN leads to demodulation problems for 256QAM. If (and only if) yes, then we propose to counter the performance loss either by addPos=2 or by PT-RS usage. Please correct us, but no contributor has presented PN impact results in this meeting.
3	China Telecommunications	Option 1. No need to configure PT-RS for this FR1 scenario.
4	Samsung Electronics Benelux BV	[Samsung]: We prefer option 1 In FR1, the PRRS configuration is UE optional feature. Meanwhile, the phase noise impact in FR1 is minor, therefore, we prefer to not configure PTRS for PUSCH requirement with 256 QAM.

Item	Company	Comments
5	HiSilicon Technologies Co. Ltd	[Huawei]: We prefer option 1. The phase noise has less effort on the performance when low mobility is considered.
6	CATT	Support option 1 because the phase noise for FR1 is negligible.
7	Ericsson Inc.	[Ericsson] Support Option 1. We don't see it's necessary to configure PT-RS for FR1 case.
8	Intel Corporation SAS	Based on our understanding, phase noise should not be the issue for FR1 operation. Therefore, PT-RS probably is not required. Same time, we are fine to double check PN impact.
9	ZTE Wistron Telecom AB	[ZTE] If we may conjecture that typical usage of 256QAM is for CCU(Cell center UE) with low mobility, then there may not be much gain from PT-RS.
10	China Mobile Com. Corporation	[CMCC] Support Option1

2.2.17 Issue 17: Phase Noise modelling

Proposals

- Option 1: No explicitly modelling at Rx side (Samsung)

- Option 2:

Recommended WF: Not explicitly specify the PN modelling for performance requirements definition. Phase noise impact, up to each company's decision, is either considered in ideal simulations or included in impairment results

Feedback Form 17: 1st comments on Issue 17: Phase Noise modelling

Item	Company	Comments
1	Ericsson Inc.	Support Option 1.
2	Nokia	[Nokia, Nokia Shanghai Bell]: Follow the WID and Rel-15 agreements, i.e., Realistic phase noise modelling is always present (even in "ideal" simulation results), but model implementation is left up to the contributing entities.
3	China Telecommunications	Option 1.

Item	Company	Comments
4	Samsung Electronics Benelux BV	[Samsung]: We prefer option 1 and recommended WF Regarding the phase noise modelling, since the requirement is targeting for FR1, we think the impact of phase noise is minor. Meanwhile, how to modelling phase noise explicitly, it should be implementation dependent. In Rel-15, RAN4 has the similar discussion for FR2 phase noise modelling for PUSCH requirement, where there is no phase noise model.
5	HiSilicon Technologies Co. Ltd	[Huawei]: The recommended WF is fine for us.
6	CATT	OK with the recommended WF.
7	Intel Corporation SAS	Based on our understanding, explicit Rx PN modeling can be considered for study purpose. If impact is defined then companies can include it in impairments results (based on individual assumptions). Same time, for alignment results we can consider no PN modeling.
8	ZTE Wistron Telecom AB	[ZTE] Option 1. Phase noise is covered in implementation margin.
9	China Mobile Com. Corporation	[CMCC] Support the recommeded WF

2.2.18 Issue 18: Number of HARQ transmission with RV sequence

Proposals

- Option 1: 4 with RV sequence {0,2,3,1} (CTC, Ericsson, CMCC, CATT, DoCoMo, Nokia, Huawei)

Recommended WF: Agree 4 HARQ transmission with RV sequence {0,2,3,1}

Feedback Form 18: Comments on the recommended WF for Issue 18: Number of HARQ transmission and RV sequence

Item	Company	Comments
1	Nokia	[Nokia, Nokia Shanghai Bell]: Option 1.
2	China Telecommunications	Support the recommended WF.

Item	Company	Comments
3	Samsung Electronics Benelux BV	[Samsung]: We are OK with option 1 and recommended WF
4	HiSilicon Technologies Co. Ltd	[Huawei]: The recommended WF is fine for us.
5	CATT	Ok with the recommended WF.
6	Ericsson Inc.	[Ericsson] Support WF.
7	ZTE Wistron Telecom AB	[ZTE] Ok with WF.
8	China Mobile Com. Corporation	[CMCC] Support the recommeded WF

2.2.19 Issue 19: Tx EVM

Proposals

- Option 1: FFS on the assumption of Tx EVM with 3.5% (Samsung)

- Option 2:

Recommended WF: Collect more comments.

Feedback Form 19: 1st round comments on Issue 19: Tx EVM

Item	Company	Comments
1	Ericsson Inc.	We tend to support Option 1 to consider EVM assumption on Tx side.
2	Nokia	[Nokia, Nokia Shanghai Bell]: We cannot fully follow what option 1 entails. Does this mean that there is only Tx EVM, but no PN modelling at all? In this case the 3.5% EVM is simply an upper bound on the achievable SNR during the test. Why is it necessary to change the test method only for 256QAM? What is special here to change the test paradigm?

Item	Company	Comments
3	China Telecommunications	No explicit EVM. Same with Rel-15.
4	Samsung Electronics Benelux BV	[Samsung]: Compared with lower modulation, with high modulation, the achievable SNR is very high, which means large transmission power should be considered to fulfil the acceptable performance. In this condition, the nonlinearity of RF unit, such as PA, may result in distortion of transmission signal. In Rel-15 PDSCH demodulation requirement for 256QAM, Tx EVM of 3.5% is used for FR1. As UL, we are open to discuss whether the impact of Tx EVM is needed to be considered for requirement and simulation alignment. Whether additional margin should be considered if no modelling Tx EVM in alignment results.
5	HiSilicon Technologies Co. Ltd	[Huawei]: We prefer to keep the same with Rel-15 PUSCH requirements.
6	Nokia	[Nokia, Nokia Shanghai Bell]: In response to Samsung. We think this topic needs further study. We propose to first see the alignment SNR levels without TxEVM and then get back to the question, if the observed levels necessitate a Tx EVM modelling. Generally, we have the understanding that only the demodulation performance should be tested, i.e., the transmitter/TE should be as close to perfect as possible. But we recognize the need to model the scenario following practically observed input signals to the demodulators.
7	Intel Corporation SAS	We can check the performance difference for scenarios with and without Tx EVM. Based on our understanding, Tx imperfections will be observed on the test equipment side (i.e. non zero Tx EVM will exist during the test) and we need to ensure that defined requirements are feasible for real testing.
8	ZTE Wistron Telecom AB	[ZTE] For demodulation performance requirements, Tx EVM is not relevant.

2.2.20 Issue 20: Test metric

Proposals

- Option 1: 70% of max. throughput (Ericsson, CMCC, Nokia, Huawei)

<u>Recommended WF: Agree with test metric of 70% of max throughput.</u>

Feedback Form 20: Comments on the recommended WF for Issue 20: Test metric

Item	Company	Comments
1	Nokia	[Nokia, Nokia Shanghai Bell]: Option 1.
2	Intel Corporation SAS	Support Option 1.
3	China Telecommunications	Support the recommended WF.
4	Samsung Electronics Benelux BV	[Samsung]: We are ok with option 1 and recommended WF
5	HiSilicon Technologies Co. Ltd	[Huawei]: the recommented WF is fine for us.
6	CATT	OK with the recommended WF.
7	Ericsson Inc.	[Ericsson] Support WF.
8	ZTE Wistron Telecom AB	[ZTE] Ok with WF.
9	China Mobile Com. Corporation	[CMCC] Support the recommeded WF

2.2.21 Issue 21: Applicability rule for different antenna configurations

Proposals

- Option 1: Reusing the existing test applicability rule defined in *cl*ause 8.1.2.0 of TS38.141-1. (CTC)

- Option 2:

Recommended WF: Depends on discussion on Issue 2: Antenna configurations.

Feedback Form 21: 1st round comments on Issue 21: Applicability rule for different antenna configurations

Item	Company	Comments
1	Ericsson Inc.	Support Option 1.
2	Nokia	[Nokia, Nokia Shanghai Bell]: Option 1.
3	Intel Corporation SAS	Support Option 1
4	China Telecommunications	Option 1 if the proposed 'option 1 in issue 2' can be agreed.
5	Samsung Electronics Benelux BV	[Samsung]: We are ok with option 1, as for a BS supporting different numbers of antenna connectors (for *BS type 1-C*) or *TAB connectors* (for *BS type 1-H*) (see D.37 in table 4.6-1), the tests with low MIMO correlation level shall apply only for the lowest and highest numbers of supported connectors, and the specific connectors used for testing are based on manufacturer declaration.
6	HiSilicon Technologies Co. Ltd	[Huawei]: Option 1 is fine for us.
7	ZTE Wistron Telecom AB	[ZTE] Ok with Option 1.
8	China Mobile Com. Corporation	[CMCC] We support Option1 and also OK with recommended WF

2.2.22 Issue 22: Applicability rules for different SCS and CBW

Proposals

- Option 1: Reuse the existing applicability rules defined in 8.1.2.1.1 and 8.1.2.1.2 in TS 38.141-1 (CTC)

Recommended WF: Depends on discussion on Issue 8: SCS and bandwidth.

Item	Company	Comments

Feedback Form 22: 1st round comments on Issue 22: Applicability rules for different SCS and CBW

Item	Company	Comments
1	Ericsson Inc.	Support Option 1.
2	Nokia	[Nokia, Nokia Shanghai Bell]: Option 1.
3	Intel Corporation SAS	Support Option 1
4	China Telecommunications	Option 1 if the proposed 'Option 1 for 15kHz SCS and 30kHz SCS in issue 8' can be agreed'
5	Samsung Electronics Benelux BV	[Samsung]: We are ok with option 1
6	HiSilicon Technologies Co. Ltd	[Huawei]: Option 1 is fine for us.
7	ZTE Wistron Telecom AB	[ZTE] Support Option 1.
8	China Mobile Com. Corporation	[CMCC] We support Option1 and also OK with recommended WF

2.2.23 Issue 23: Applicability rules for different PUSCH mapping types

Proposals

- Option 1: Reuse the existing applicability rules defined in 8.1.2.1.3 in TS 38.141-1 (CTC)

Recommended WF: Depends on discussion on Issue 10: PUSCH mapping type

Feedback Form 23: 1st round comments on Issue 23: Applicability rules for different PUSCH mapping types

Item	Company	Comments
1	Ericsson Inc.	Support Option 1.
2	Nokia	[Nokia, Nokia Shanghai Bell]: Option 1.
3	Intel Corporation SAS	Support Option 1
4	China Telecommunications	Option 1 if the proposed 'option 1 in issue 10' can be agreed.
5	Samsung Electronics Benelux BV	[Samsung]: We prefer to define the PUSCH 256QAM requirement with mapping type A. If RAN4 define the requirement with both type A and type B, we are ok with option 1
6	HiSilicon Technologies Co. Ltd	[Huawei]: option 1 is fine for us.
7	ZTE Wistron Telecom AB	[ZTE] Fine with Option 1.
8	China Mobile Com. Corporation	[CMCC] We support Option1 and also OK with recommended WF

2.2.24 Issue 24: Applicability rules for TDD with different TDD patterns

Proposals

- Option 1: Reuse the existing applicability rules defined in 8.1.2.1.5 in TS 38.141-1 (CTC, Nokia)

Recommended WF: Agree Option 1. the TDD patterns agreed in Issue 9 is default TDD pattern and used to derive the performance requirements.

Feedback Form 24: 1st round comments on Issue 24: Applicability rules for TDD with different TDD patterns

Item	Company	Comments
1	Ericsson Inc.	Support Option 1.

Item	Company	Comments
2	Nokia	[Nokia, Nokia Shanghai Bell]: Option 1, as per our contribution.
3	Intel Corporation SAS	Support Option 1
4	China Telecommunications	Option 1.
5	Samsung Electronics Benelux BV	[Samsung]: We are ok with option 1 and recommended WF
6	HiSilicon Technologies Co. Ltd	[Huawei]: The recommended WF is fine for us.
7	ZTE Wistron Telecom AB	[ZTE] Fine with Option 1.
8	China Mobile Com. Corporation	[CMCC] We support Option1

2.2.25 Issue 25: Other parameters

Proposals

Option 1: (CATT, CTC)

Table 2: Other parameters

Issue 24: Applicability rules forParameter	Value
CP	Normal
SRS	Not configured
DM-RS number of DM-RS CDM group(s) without data	2
DM-RS ratio of PUSCH EPRE to DM-RS EPRE	-3 dB
DM-RS port	{0} or {0,1}

DM-RS sequence generation	N_{ID}^0=0, n_{SCID} =0
FD-RA frequency hopping	Disabled
CBG-based PUSCH transmission	Disabled
Timing offset	0
Frequency offset	0
Limited buffer rate matching	Disabled

Recommended WF: Except the DM-RS port that is related to Issue 4: Number of layers, all other parameters are agreeable

Feedback Form 25: 1st round comments on Issue 25: Other parameters

Item	Company	Comments
1	Nokia	[Nokia, Nokia Shanghai Bell]: Agree with recommended WF.
2	Intel Corporation SAS	Option 1 is fine for us
3	China Telecommunications	Support the recommended WF
4	Samsung Electronics Benelux BV	[Samsung]: We are ok with option 1 and recommended WF
5	HiSilicon Technologies Co. Ltd	[Huawei]: The recommended WF is fine for us.
6	Nokia	[Nokia, Nokia Shanghai Bell]: It seems that Nokia's earlier comments here have been lost. Is this a bug or were lost in a version upgrade (which arguably is also a bug)? We agree with the recommended WF.
7	Nokia	[Nokia, Nokia Shanghai Bell]: The form was populated after we made the previous post (now #6). So please disregard #6 and #7. Though, this seems to be a bug...
8	Ericsson Inc.	[Ericsson] Please remove us from brace in Option 1 since we only propose 1Tx (1 layer) in our contribution.

Item	Company	Comments
9	ZTE Wistron Telecom AB	[ZTE] Ok with WF.
10	China Mobile Com. Corporation	[CMCC] OK with the recommended WF

2.2.26 Issue 26: FRC parameters

Proposals

- Option 1: (CATT R4-2104730)

Table 3: FRC

Reference channel	G-FR1-A6-8	G-FR1-A6-9	G-FR1-A6-10	G-FR1-A6-11	G-FR1-A6-12	G-FR1-A6-13	G-FR1-A6-14
Subcarrier spacing [kHz]	15	15	15	30	30	30	30
Allocated resource blocks	25	52	106	24	51	106	273
CP-OFDM Symbols per slot (Note 1)	12	12	12	12	12	12	12
Modulation	256QAM	256QAM	256QAM	256QAM	256QAM	256QAM	256QAM
Code rate (Note 2)	841/1024	841/1024	841/1024	841/1024	841/1024	841/1024	841/1024
Payload size (bits)	23568	49176	100392	22536	48168	100392	258144
Transport block CRC (bits)	24	24	24	24	24	24	24

Code block CRC size (bits)	24	24	24	24	24	24	24
Number of code blocks - C	3	6	12	3	6	12	31
Code block size including CRC (bits) (Note 2)	7888	8224	8392	7544	8056	8392	8352
Total number of bits per slot	28800	59904	122112	27648	58752	122112	314464
Total symbols per slot	3600	7488	15264	3456	7344	15264	39308

NOTE 1: *DM-RS configuration type* = 1 with *DM-RS duration* = *single-symbol DM-RS* and the number of DM-RS CDM groups without data is 2, *Additional DM-RS position* = *pos1*, l_0= 2 and l =11 for PUSCH mapping type A, l_0= 0 and l =10 for PUSCH mapping type B as per table 6.4.1.1.3-3 of TS 38.211 [5]. NOTE 2: Code block size including CRC (bits) equals to *K'* in clause 5.2.2 of TS 38.212 [15].							

Recommended WF: This can be discussed after the other test parameters are finalized

Feedback Form 26: 1st round comments on Issue 26: FRC

Item	Company	Comments
1	Nokia	[Nokia, Nokia Shanghai Bell]: Agree with recommended WF.
2	China Telecommunications	Discuss after related test parameters including rank, MCS index, DMRS configuration are agreed.
3	Samsung Electronics Benelux BV	[Samsung]: We prefer to discuss the MCS, DMRS pattern, BW firstly.
4	HiSilicon Technologies Co. Ltd	[Huawei]: We support the recommended WF.
5	Ericsson Inc.	[Ericsson] Support WF.
6	CATT	OK with the recommended WF.
7	China Mobile Com. Corporation	[CMCC] OK with the recommneded WF

2.2.27 Issue 27: Test parameters for DFT-s-OFDM (CMCC)

Proposals

Table 4: Test parameters for DFT-s-OFDM

Parameter	Value
Transform precoding	enabled
Number of Tx	1
Number of Rx	2, 4, 8
Number of layers	1
DMRS type	type 1

Number of DMRS symbols	1+1, 1
symbols length	14
start symbol index	0
Time domain resource allocation type	type A
Frequency domain resource	15kHz: 25 PRBs in the middle of the test bandwidth 30kHz: 24 PRBs in the middle of the test bandwidth
MCS index	TBD Down-selection from the following options: 256QAM MCS20 256QAM MCS24 256QAM MCS27
Carrier frequency (GHz)	4
Propagation condition	TBD TDLB100-400 Low as the starting point
SCS and BW	15kHz: 5 MHz; 30kHz: 10 MHz
Default TDD UL-DL pattern	15 kHz SCS: 3D1S1U, S=10D:2G:2U 30 kHz SCS: 7D1S2U, S=6D:4G:4U
PTRS	Not configured
Timing offset	0
Frequency offset	0
Code block group, Frequency hopping, Limited buffer rate matching	Disabled
Number of HARQ transmissions RV sequence	4 0,2,3,1
Testing metric	SNR @70% of maximum throughput

Recommended WF: This can be discussed after Issue 6 waveform is finalized.

Feedback Form 27: 1st round comments on Issue 27: Test parameters for DFT-s-OFDM

Item	Company	Comments
1	Nokia	[Nokia, Nokia Shanghai Bell]: Agree with recommended WF.
2	Samsung Electronics Benelux BV	[Samsung]: We prefer to not define with DFT-s-OFDM waveform for 256QAM The useful scenario of enable 256QAM scheduling is targeting cell-center UE with high SNR condition. DFT-s-OFDM waveform is mainly used for cell-edge scenario
3	CATT	OK with the recommended WF
4	China Mobile Com. Corporation	[CMCC] Agree wtih the recommended WF

2.3 Summary for 1st round

Table 5: Test parameters for PUSCH 256QAM demodulation performance requirements

Sub-topic#	Status summary
1: Applicability for PUSCH 256QAM demodulation performance requirements	*Tentative agreements:* Only applied for BS manufacturers declaring that uplink 256QAM is supported. *Recommendations for 2nd round* No further discussion is needed

2: Antenna configurations, number of layers and UL transmission scheme for 2Tx	*Candidate options:* Number of Tx Option 1: Only 1Tx (Ericsson, Samsung, Huawei, CATT, ZTE) Option 2:Both 1Tx and 2Tx (Nokia, CTC, CMCC) Number of Rx Option 1: 2/8Rx (Ericsson, Nokia, Samsung, Huawei, CATT) Option 2: 2/4/8 Rx (Ericsson, Nokia, Intel, CTC, CATT, ZTE. CMCC) Number of layers Option 1: Only 1 layer (Intel, Huawei, Samsung, Ericsson, CATT, ZTE) Option 2: Both of 1 and 2 layers. (CMCC, Nokia, CTC) *Recommendations for 2nd round:* Further discuss the listed options for the number of Tx, Rx and layer. If 2 layers are included, the UL transmission scheme will be codebook-based transmission with TPMI index 0.
3: MCS	*Tentative agreements:* Company is welcome to check if the following tentative agreement is acceptable? Evaluate {MCS24, MCS22} as starting point for next meeting, based on the simulation results to decide if MCS24 is feasible, otherwise to check lower MCS22 is feasible or not. *Candidate options:* *Recommendations for 2nd round:* *No more discussion. Based on simulation results to decide the MCS for next meeting.*
4: Waveform	*Tentative agreements:* Only 1 out of 10 companies supports Option 2, to move forward, is it acceptable to agree on Option 1? *Candidate options:* Option 1: CP-OFDM only. (CTC, Ericsson, CATT, Samsung, DoCoMo, Nokia, Huawei, Intel, ZTE) Option 2: Both of CP-OFDM and DFT-s-OFDM (CMCC) *Recommendations for 2nd round:* Continue discussion

5: Propagation condition	*Tentative agreements:* Only 1 out of 9 companies supports Option 2, to move forward, is it acceptable to agree Option 1? *Candidate options:* Option 1: TDLA30-10 Low. (CTC, Ericsson, CATT, Nokia, Huawei, Samsung, Intel, ZTE) Option 2: TDLA30-10 Low for CP-OFDM, TDLB100-400 Low for DFT-s-OFDM. (CMCC) *Recommendations for 2nd round:* Continue discussion
6: SCS and bandwidth	*Candidate options:* 15kHz SCS Option 1:5MHz and 10MHz (Intel, Samsung, Nokia, Huawei, CATT, ZTE) Option 2: 5MHz, 10MHz and 20MHz.(Nokia, Intel, CTC, CMCC) 30kHz SCS Option 1:10MHz and 40MHz (Intel, Samsung, Nokia, Huawei, CATT, ZTE) Option 2:10MHz, 20MHz, 40MHz and 100MHz.(Nokia, Intel, CTC, CMCC) *Recommendations for 2nd round:* Continue discussion
7: TDD pattern	*Tentative agreements:* 15kHz SCS: 3D1S1U, S=10D:2G:2U 30kHz SCS: 7D1S2U, S=6D:4G:4U *Recommendations for 2nd round: No further discussion is needed.*
8: PUSCH mapping type	*Candidate options:* Option 1: Only Type A. (Samsung, Nokia) Option 2: Type A and Type B with applicability rule. (CTC, Ericsson, CMCC, CATT, DoCoMo, Intel, Huawei, ZTE, Nokia) *Recommendations for 2nd round:* Continue discussion
9: PUSCH start symbol and symbol length	*Tentative agreements:* *S = 0* *L=14* *Recommendations for 2nd round: No further discussion is needed*

10: Frequency domain allocation	*Tentative agreements:* Full bandwidth frequency domain resource allocation *Recommendations for 2nd round: No further discussion is needed*
11: DM-RS type	*Tentative agreements:* Type 1 with single-symbol DM-RS *Recommendations for 2nd round: No further discussion is needed*
12: Additional DM-RS (*dmrs-AdditionalPosition*)	*Tentative agreements: Two companies would like to further study any benefits from addPos=2.* *- pos1* *- FFS pos2* *Recommendations for 2nd round:* No further discussion in the 2nd round and can decided based on interesting companies' feedback for next meeting
13: PT-RS configuration	*Tentative agreements: Two companies would like to study the PN impact to demodulation for 256QAM, we can discuss and decide to whether to configure PT-RS or not based on interesting companies' feedback in next meeting.* *FFS configure PT-RS* *Recommendations for 2nd round:* No further discussion
14: Phase Noise modelling	*Tentative agreements:* *Realistic phase noise modelling is left up to the contributing entities.* *Phase noise impact can be either considered in ideal simulations or included in impairment results based on further discussion and evaluations.* *Interesting company is welcome to do investigation on the PN impact on 256QAM performance for next meeting.* *Recommendations for 2nd round:* No further discussion
15: Number of HARQ transmission and RV sequence	*Tentative agreements:* *4 HARQ transmission with RV sequence {0,2,3,1}* *Recommendations for 2nd round:* No further discussion

16: Tx EVM	*Tentative agreements:* *Interesting companies are welcome to check the performance difference with and without Tx EVM (3.5% as baseline?) impact considered. RAN4 will discuss and decide whether additional margin should be considered in alignment results if no Tx EVM modelling in next meeting as per the evaluations results.* *Recommendations for 2nd round:* No further discussion
17: Test metric	*Tentative agreements:* *70% max throughput* *Recommendations for 2nd round:* No further discussion
18: Applicability rule for different antenna configurations	*Tentative agreements:* *FFS on reusing the existing test applicability rule defined in clause 8.1.2.0 of TS38.141-1.* *Recommendations for 2nd round:* Will discuss this after Sub-topic#2 for number of Tx, Rx and Layer is finalized.
19: Applicability rules for different SCS and CBW	*Tentative agreements:* *FFS on reusing the existing applicability rules defined in 8.1.2.1.1 and 8.1.2.1.2 in TS 38.141-1* *Recommendations for 2nd round:* Will discuss this issue after Sub-topic#6 for different SCS and bandwidth is finalized.
#20: Applicability rules for different PUSCH mapping types	*Tentative agreements:* *FFS on reusing the existing applicability rules defined in 8.1.2.1.3 in TS 38.141-1 if RAN4 agreed to define performance requirements for both PUSCH mapping type A and type B.* *Recommendations for 2nd round:* Will discuss this issue after Sub-topic#8 for different PUSCH mapping type is finalized.
21: Applicability rules for TDD with different TDD patterns	*Tentative agreements:* *Reuse the existing applicability rules defined in 8.1.2.1.5 in TS 38.141-1* *Recommendations for 2nd round:* No further discussion.

22: Other test parameters	*Agree with the following other test parameters by removing DM-RS port that is related to the number of layers:* - CP: Normal - SRS: Not configured - Number of DM-RS CDM groups with data: 2 - Ratio of PUSCH EPRE to DM-RS EPRE: -3dB - DM-RS sequence generation N_{ID}=0, n_{SCID}=0 - Frequency hopping: Disabled - CBG-based PUSCH transmission: Disabled - Timing offset: 0 - Frequency offset: 0 Limited buffer rate matching: Disabled
23: FRC	*Tentative agreements:* *Discuss the FRC after MCS, DM-RS pattern, BW and Rank firstly* *Recommendations for 2nd round: Focus on the discussion for MCS, DM-RS pattern, CBW and Rank.*
24: Test parameters for DFT-s-OFDM	*Tentative agreements:* *Discuss the specific test parameters for DFT-s-OFDM after RAN4 agrees to introduce requirements for FR1 PUSCH 256QAM with DFT-s-OFDM.* *Recommendations for 2nd round: Focus on the discussion on the waveform*

2.4 Discussion on 2nd round

2.4.1 Issue 1: Antenna configurations, number of layers

Proposals

Number of Tx:

- Option 1: Only 1Tx (Ericsson, Samsung, Huawei, CATT, ZTE)

- Option 2: Both 1Tx and 2Tx (Nokia, CTC, CMCC)

Number of Rx:

- Option 1: 2/8Rx (Ericsson, Nokia, Samsung, Huawei, CATT)

- Option 2: 2/4/8 Rx (Ericsson, Nokia, Intel, CTC, CATT, ZTE. CMCC)

Number of layers:

- Option 1: Only 1 layer (Intel, Huawei, Samsung, Ericsson, CATT, ZTE)

- Option 2: Both of 1 and 2 layers. (CMCC, Nokia, CTC)

Feedback Form 28: 2nd round comments on antenna configurations and number of layers

Item	Company	Comments
1	Nokia	[Nokia, Nokia Shanghai Bell] We maintain that the 2layer/2Tx inclusion question should be treated, after results are shared on the required SNR levels for this configuration. If the levels turn out to be reasonable, the high TPUT target would be a strong argument for the inclusion of 2 layer requirements. Concerning the number of RX antennas, both options are fine for us. However, given the current applicability rules there is no harm in including 4 as well.
2	Ericsson Inc.	[Ericsson] We still believe 1 layer should be enough for 256QAM demodulation requirement. When 64QAM requirements are introduced, it is also used for high throughput scenario but RAN4 finally decided not define 2 layers requirements for PUSCH with 64QAM in Rel-15. LTE also don't consider 2 layers for PUSCH 256QAM. It shows that the 2 layers requirement is not feasible for demodulation test. According to our understanding, it is not a simple SNR issue but the orthogonality between 2 layers. It is quite critical to get good orthogonal between 2 layers at the receiver. The SIR might be the dominate factor for performance, especially for 256QAM. For 1 layer 256QAM implementation, 1TX would be the best choice since 2Tx would use 2 layers 64QAM when SNR is suitable. For Rx, we think 2Rx and 8Rx would be enough for the test, and we could use Rel-15 applicability rule to cover 4Rx.
3	China Telecommunications	Prefer covering both 1T 1layer and 2T 2layer, and test requirements for 2/4/8 Rx should all be defined.
4	HiSilicon Technologies Co. Ltd	[Huawei]: Option 1 for all the issues. By considering the very high required SNR value for 256QAM with 2 layers, we support only define the requirements with 1 layer. The 256QAM with 2 layers is not the typical configuration in real network. For Rx, the applicability rule can cover all the possible configurations and to reduce the simulation efforts, we support to only define 2Rx/8Rx.
5	CATT	For Tx number, Support option 1. For Rx number, both options are OK. For the number of layers, support option 1. We share the similar view with Ericsson.

Item	Company	Comments
6	Samsung Electronics Benelux BV	[Samsung]: Number of Tx: option 1 Number of Layer: option 1 We still prefer 1 Tx for 256QAM requirement. 2 Tx is not a typical schedule for UL 256QAM. we show the simiar view with Ericssion, with 2 layer for256QAM, the interference between 2 layers will reduce the achievabe througput. Number of Rx: option 1 Existing test applicability can guarantee the supported antenna configuration at BS can be tested, The test purpose is to verfiy the high modulation perfomance. The test coveage of different antenna configurations have been verfied in Rel-15
7	NTT DOCOMO INC.	In terms of number of Rx, we support Option 2. 4Rx BS should be considered and captured as general requirements.

2.4.2 Issue 2: Waveform

Proposals:

- Option 1: CP-OFDM only. (CTC, Ericsson, CATT, Samsung, DoCoMo, Nokia, Huawei, Intel, ZTE)

- Option 2: Both of CP-OFDM and DFT-s-OFDM (CMCC)

Feedback Form 29: 2nd round comments on waveform

Item	Company	Comments
1	Nokia	[Nokia, Nokia Shanghai Bell]: Option 1, as per our contribution. We did not notice a reason, why dft-s-ofdm waveform is required in high TPUT use case.
2	Ericsson Inc.	[Ericsson] Support Option 1. DFT-s-OFDM would be used for check coverage case which use low bitrate. We don't think it is reasonable for 256QAM scenario.
3	HiSilicon Technologies Co. Ltd	[Huawei]: Option 1. 256QAM is targeting cell-center users. DFT-s-OFDM waveform is mainly used for cell-edge scenario.
4	China Mobile Com. Corporation	We can comprimise to Option 1 considering of majority's view
5	China Telecommunications	Option 1 is fine for us.
6	CATT	Support option 1.

Item	Company	Comments
7	Samsung Electronics Benelux BV	[Samsung]: opiton 1
8	Intel Corporation SAS	Option 1. Similar comment as for first round.
9	NTT DOCOMO INC.	We support Option 1.

2.4.3 Issue 3: Propagation condition

Proposals

- Option 1: TDLA30-10 Low. (CTC, Ericsson, CATT, Nokia, Huawei, Samsung, Intel, ZTE)

- Option 2: TDLA30-10 Low for CP-OFDM, TDLB100-400 Low for DFT-s-OFDM. (CMCC)

Feedback Form 30: 2nd round comments on propagation condition

Item	Company	Comments
1	Nokia	[Nokia, Nokia Shanghai Bell]: Depends on outcome of Issue 2.
2	Ericsson Inc.	[Ericsson] Support 1 and not consider DFT-s-OFDM.
3	HiSilicon Technologies Co. Ltd	[Huawei]: Option 1. 256QAM is targeting cell-center users. DFT-s-OFDM waveform is mainly used for cell-edge scenario.
4	China Mobile Com. Corporation	[CMCC] Option 1 is fine for us
5	China Telecommunications	Option 1 is fine for us.
6	CATT	Support option 1.
7	Samsung Electronics Benelux BV	[Samsung]: option1

Item	Company	Comments
8	Intel Corporation SAS	Option 1
9	NTT DOCOMO INC.	We support Option 1.

2.4.4 Issue 4: SCS and bandwidth

Proposals

15kHz SCS:

- Option 1:5MHz and 10MHz (Intel, Samsung, Nokia, Huawei, CATT, ZTE)

- Option 2: 5MHz, 10MHz and 20MHz.(Nokia, Intel, CTC, CMCC)

30kHz SCS

- Option 1:10MHz and 40MHz (Intel, Samsung, Nokia, Huawei, CATT, ZTE)

- Option 2:10MHz, 20MHz, 40MHz and 100MHz.(Nokia, Intel, CTC, CMCC)

Feedback Form 31: 2nd round comments on SCS and bandwidth

Item	Company	Comments
1	Nokia	[Nokia, Nokia Shanghai Bell]: All currently proposed options (1&2) are fine for us. The minimum CBW and one ”representative” case is always included. Given the applicability rules, we don’t see a downside in including more CBWs, though.
2	Ericsson Inc.	[Ericsson] We support Option 1 for both SCS to reduce effort.
3	China Mobile Com. Corporation	[CMCC] We support Option2 for both SCS, the requirement should cover the these bandwidth with applicability rules as we did in LTE.
4	China Telecommunications	We still prefer Option 2 for 15kHz and 30kHz SCS. We think typical bandwidth should be covered.
5	HiSilicon Technologies Co. Ltd	[Huawei]: Option 1 for both of 15kHz and 30kHz. By reuseing the existing applicability rule, define the requirements with option 1 can cover all the possible SCS/CBW configurations. Thus, we support option 1 to reduce the simulation effort.

Item	Company	Comments
6	CATT	For 15kHz and 30kHz SCS, both options are OK with us.
7	Samsung Electronics Benelux BV	[Samsung]: option 1 Existing test applicability can guarantee the supported BW at BS can be tested, The test purpose is to verfiy the high modulation perfomance. The test coveage of different BW have been verfied in Rel-15, We prefer to define requirement with typical scenario
8	Intel Corporation SAS	Both options are fine. Option 1 is slightly preferred to reduce simulation effort.
9	NTT DOCOMO INC.	[Docomo]: We prefer Option 2 for both 15kHz SCS and 30kHz SCS align with the same relationship of LTE 64QAM and 256QAM. At least, typical scenario should be covered.
10	NTT DOCOMO INC.	100MHz CBW for 30kHz SCS is also typical scenario in operation. In addition, the candidate SCS and CBW are discussed to reduce the number of combinations at defining Rel-15 requirements. There is no need to repeat the same discussions.

2.4.5 Issue 5: PUSCH mapping type

Proposals

- Option 1: Only Type A. (Samsung, Nokia)

- Option 2: Type A and Type B with applicability rule. (CTC, Ericsson, CMCC, CATT, DoCoMo, Intel, Huawei, ZTE, Nokia)

Feedback Form 32: 2nd round comments on PUSCH mapping type

Item	Company	Comments
1	Nokia	[Nokia, Nokia Shanghai Bell]: We can compromise to both options. Type B is not the practically anticipated use case, but there might be a BS that declares to only support type B.
2	Ericsson Inc.	[Ericsson] Support Option 2 to cover different BS declarations.
3	HiSilicon Technologies Co. Ltd	[Huawei]: Option 2. In our contribution, Mapping Type B was proposed. As a compromise, we can accept to define both of Type A and Type B with applicabiltiy rule.

Item	Company	Comments
4	China Telecommunications	Prefer option 2.
5	CATT	Support option 2.
6	Samsung Electronics Benelux BV	[Samsung]: we can compromise to option 2 based on the majority view
7	NTT DOCOMO INC.	Support Option 2.

2.4.6 Issue 6: Applicability rule for different antenna configurations

Proposals

- Option 1: *Reusethe existing test applicability rule defined in clause 8.1.2.0 of TS38.141-1*

- Other options

Feedback Form 33: 2nd round comments on applicability rule for different antenna configurations

Item	Company	Comments
1	Nokia	[Nokia, Nokia Shanghai Bell]: Option 1. We didn't notice any counter proposals in round 1.
2	Huawei Tech.(UK) Co.. Ltd	[Moderator] Moderator suggested to agree Option 1 in the 1st round, but CTC asked to keep open on this issue before RAN4 makes agreements for Issue 1 during the comment on the 1st round summary, please check the related email.
3	Ericsson Inc.	[Ericsson] Support Option 1.
4	HiSilicon Technologies Co. Ltd	[Huawei]: Option 1.
5	China Telecommunications	Considering the first meeting, we would prefer to keep the oprion here and have more time to check.
6	CATT	Support option 1.

Item	Company	Comments
7	Samsung Electronics Benelux BV	[Samsung]: option 1
8	NTT DOCOMO INC.	We are OK with Option 1.

2.4.7 Issue 7: Applicability rules for different SCS and CBW

Proposals

- Option 1: *Reuse the existing applicability rules defined in 8.1.2.1.1 and 8.1.2.1.2 in TS 38.141-1*

- Other options.

Feedback Form 34: 2nd round comments on applicability rules for different SCS and CBW

Item	Company	Comments
1	Nokia	[Nokia, Nokia Shanghai Bell]: Option 1. We didn't notice any counter proposals in round 1.
2	Huawei Tech.(UK) Co.. Ltd	[Moderator] Moderator suggested to agree Option 1 in the 1st round, but CTC asked to keep open on this issue before RAN4 makes agreements for Issue 4 during the comment on the 1st round summary, please check the related email.
3	Ericsson Inc.	[Ericsson] Support Option 1.
4	HiSilicon Technologies Co. Ltd	[Huawei]: Option 1.
5	China Telecommunications	We can firstly agree to reuse the existing applicability for different SCS since we are reusing the same SCS for Rel-15. For the applicability for different CBW, we would prefer more time to check since this is the first meeting.
6	CATT	Support option 1.
7	Samsung Electronics Benelux BV	[Samsung]: option1
8	NTT DOCOMO INC.	We are OK with Option 1. However, as commented by CTC, shouldn't the agreement be made after the conclusion of SCS and CBW issue?

2.4.8 Issue 8: Applicability rules for different PUSCH mapping types

Proposals

- Option 1: *Reuse the existing applicability rules defined in 8.1.2.1.3 in TS 38.141-1*

- Other options

Feedback Form 35: 2nd round comments on applicability rules for different PUSCH mapping types

Item	Company	Comments
1	Nokia	[Nokia, Nokia Shanghai Bell]: Option 1. We didn't notice any counter proposals in round 1.
2	Huawei Tech.(UK) Co.. Ltd	[Moderator] Moderator suggested to agree Option 1 in the 1st round, but CTC asked to keep open on this issue before RAN4 makes agreements for Issue 8 for different PUSCH mapping type during the comment on the 1st round summary, please check the related email.
3	Ericsson Inc.	[Ericsson] Support Option 1.
4	HiSilicon Technologies Co. Ltd	[Huawei]: Option 1. As companies proposed different Mapping Type, the applicability rule is necessary for making compromises. We agree to reuse the existing applicability rule as it covers the propose of the compromises.
5	China Telecommunications	We are ok with option 1 based on Huawei's comment.
6	CATT	Support option 1.
7	Samsung Electronics Benelux BV	[Samsung]: option 1
8	NTT DOCOMO INC.	We are OK with Option 1.

2.5 Summary for 2nd round

Table 6: Summary for 2nd round

Sub-topic#	Status summary

Sub-topic#1: Antenna configurations, number of layers and UL transmission scheme for 2Tx	*Candidate options:* Number of Tx Option 1: Only 1Tx (Ericsson, Samsung, Huawei, CATT, ZTE) Option 2:Both 1Tx and 2Tx (Nokia, CTC, CMCC) Number of Rx Option 1: 2/8Rx (Ericsson, Nokia, Samsung, Huawei, CATT) Option 2: 2/4/8 Rx (Ericsson, Nokia, Intel, CTC, CATT, ZTE, CMCC, DCM) Number of layers Option 1: Only 1 layer (Intel, Huawei, Samsung, Ericsson, CATT, ZTE) Option 2: Both of 1 and 2 layers. (CMCC, Nokia, CTC) *Recommendations for next meeting:* - Further discussions on introduction of 2 Layers can be based on the evaluations from companies about the required SNR level, the feasibility and other factors for 256QAM with 2 Layers in the next meeting. - If 2 layers are included, the UL transmission scheme will be codebook-based transmission with TPMI index 0. - Number of Rx: companies can share view on possible Option 3: 2/4/8 Rx with Rel-15 test applicability rule that the tests with low MIMO correlation level shall apply only for the lowest and highest numbers of supported connectors in the next meeting
Sub-topic#2: Waveform	*Tentative agreements:* CP-OFDM only
Sub-topic#3: Propagation condition	*Tentative agreements:* TDLA30-10 Low

Sub-topic#4: SCS and bandwidth	*Candidate options:* 15kHz SCS Option 1:5MHz and 10MHz (Intel, Samsung, Nokia, Huawei, CATT, ZTE, Ericsson) Option 2: 5MHz, 10MHz and 20MHz.(Nokia, Intel, CTC, CMCC, CATT, DCM) 30kHz SCS Option 1:10MHz and 40MHz (Intel, Samsung, Nokia, Huawei, CATT, ZTE, Ericsson) Option 2:10MHz, 20MHz, 40MHz and 100MHz.(Nokia, Intel, CTC, CMCC, CATT, DCM) *Recommendations for next meeting:* Continue discussion
Sub-topic#5/8: PUSCH mapping type and Applicability rules for different PUSCH mapping types	*Tentative agreements:* Type A and Type B with reusing the existing applicability rule defined in 8.1.2.1.3 in TS 38.141-1.
Sub-topic#6: Applicability rule for different antenna configurations	*Tentative agreements:* *FFS on reusing the existing test applicability rule defined in clause 8.1.2.0 of TS38.141-1.* *Recommendations for next meeting:* Majority view is ok to reuse the existing test applicability rule, one company prefer to keep it open and have more time to check. Continue discussion in next meeting.
Sub-topic#7: Applicability rules for different SCS and CBW	*Tentative agreements:* *FFS on reusing the existing applicability rules defined in 8.1.2.1.1 and 8.1.2.1.2 in TS 38.141-1* *Recommendations for 2nd round:* Continue discussion in next meeting. Maybe can be discussed by combing with topic about SCS and bandwidth.
Sub-topic#8: FRC	Discuss the FRC after parameters of MCS, DM-RS pattern, BW and Rank are finalized
Sub-topic#9: Test parameters for DFT-s-OFDM	*No discussion is needed considering only CP-OFDM is agreed in sub-topic#2*

2.6 Recommendations for Tdocs

Table 7: Recommendations for Tdocs after the 2nd round discussion

Tdoc number	Title	Source	Recommendation	Comments
R4-2106120	Way forward for FR1 PUSCH 256QAM performance requirements	Huawei, HiSilicon	Agreeable	
R4-2104483	Views on PUSCH FR1 256QAM demodulation requirements	China Telecommunications	Noted	
R4-2104557	Discussion on FR1 PUSCH 256QAM demodulation requirement	Ericsson	Noted	
R4-2104608	Discussion on BS demodulation enhancement for FR1 256QAM	CMCC	Noted	
R4-2104730	Discussion on PUSCH demodulation requirements for FR1 256QAM	CATT	Noted	
R4-2105031	View on PUSCH demodulation requirement with FR1 256QAM	Samsung	Noted	
R4-2106347	Views on FR1 PUSCH 256QAM	NTT DOCOMO, INC.	Noted	
R4-2106428	Discussion on PUSCH requirements for FR1 256QAM	Intel Corporation	Noted	
R4-2106782	On PUSCH demodulation requirements for FR1 256QAM	Nokia, Nokia Shanghai Bell	Noted	

R4-2106835	Discussion on PUSCH demodulation requirements for FR1 256QAM	Huawei, HiSilicon	Noted	