3GPP TSG-RAN WG2 Meeting #122***R2-23xxxxx***

Inchon, Korea, May 22 – 26, 2023

**Agenda item:** 7.24.1

**Source:** ZTE Corporation (Rapporteur)

**Title:** 1-symbol PRS CR check

**Document for:**  Discussion

# Introduction

This document is to kick off the following email discussion:

 **[AT122][403][POS] 1-symbol PRS CR check (ZTE)**

      Scope: Check the CRs in R2-2306079 / R2-2306080 / R2-2306081 / R2-2306082 / R2-2306083

      Intended outcome: CRs agreeable in principle

      Deadline: Wednesday 2023-05-24 2000 KST

This document summarizes the following CRs submitted for TEI18 Agenda Item 7.24.1 of 1-symbol PRS enhancement in Rel-18:

1. R2-2306079 Introduction of 1-symbol PRS in 38.331[1symbol\_PRS] ZTE Corporation CR Rel-18 38.331 17.4.0 4014 1 B TEI18 R2-2303498
2. R2-2306080 Introduction of 1-symbol PRS in 37.355[1symbol\_PRS] ZTE Corporation CR Rel-18 37.355 17.4.0 0437 1 B TEI18 R2-2303499
3. R2-2306081 Introduction of UE capability of 1-symbol PRS in 37.355[1symbol\_PRS] ZTE Corporation CR Rel-18 37.355 17.4.0 0453 - B TEI18
4. R2-2306082 Introduction of UE capability of 1-symbol PRS in 38.331[1symbol\_PRS] ZTE Corporation CR Rel-18 38.331 17.4.0 4128 - B TEI18
5. R2-2306083 Introduction of UE capability of 1-symbol PRS in 38.306[1symbol\_PRS] ZTE Corporation CR Rel-18 38.306 17.4.0 0923 - B TEI18

Other references are listed below:

1. [R2-2303498](file:///C:\Users\mtk16923\Documents\3GPP%20Meetings\202304%20-%20RAN2_121bis-e,%20Online\Extracts\R2-2303498%20Correction%20on%201-symbol%20PRS%20in%2038.331.docx) Correction on 1-symbol PRS in 38.331 ZTE Corporation CR Rel-18 38.331 17.4.0 4014 - B NR\_pos\_enh2, TEI18
2. [R2-2303499](file:///C:\Users\mtk16923\Documents\3GPP%20Meetings\202304%20-%20RAN2_121bis-e,%20Online\Extracts\R2-2303499%20Correction%20on%201-symbol%20PRS%20in%2037.355.docx) Correction on 1-symbol PRS in 37.355 ZTE Corporation CR Rel-18 37.355 17.4.0 0437 - B TEI18, NR\_pos\_enh2
3. R1-2304238 Consolidated higher layers parameter list for Rel-18 NR Moderator (Ericsson) discussion Endorsement Rel-18
4. R1-2304282 Initial RAN1 UE features list for Rel-18 NR after RAN1#112bis-e Initial RAN1 UE features list for Rel-18 NR after RAN1#112bis-e discussion Decision Rel-18

# Connect information

Respondents to the email discussion are kindly asked to fill in the following table.

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| Company | Contact: Name (E-mail) |
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# Discussion

## CR in [1] for TS38.331

The RRC CR [1] is the revision of the postponed RRC CR [6] in RAN2#121-bis-e, with the following changes:

* TEI identifier in the CR title as [1symbol\_PRS];
* Change CR title from ‘Correction on xx’ to ‘introduction of xx’.

In last meeting, the RRC CR[6] was postponed since companies have concern that whether 1-symbol PRS can also be applied for PDC(Propagation Delay Compensation) use. We also sent an LS to check with RAN1 on this issue. However according to the latest stable Rel-18 RRC parameter list [8] agreed in RAN1#112-bis-e, the 1-symbol PRS for PDC use is already captured as follows:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **WI code** | **Sub-feature group** | **RAN1 specification** | **Section** | **RAN2 Parent IE** | **RAN2 ASN.1 name** | **Parameter name in the spec** | **New or existing?** | **Parameter name in the text** | **Description** | **Value range** | **Default value aspect** | **Per (UE, cell, TRP, …)** | **UE-specific or Cell-specific** | **Specification** | **Comment** | **Status** |
| TEI18 | Support 1-symbol PRS |  |  | NR-DL-PRS-PDC-ResourceSet | numSymbols | numSymbols | existing |  | In 38.331, NR-DL-PRS-PDC-Info defines downlink PRS configuration for PDC, where 1-symbol PRS is included | n1 |  |  |  | 38.331 |  |  |
|
| TEI18 | Support PRS symbol offset 13 |  |  | NR-DL-PRS-Resource |  | dl-PRS-ResourceSymbolOffset-r18 | new |  | In 38.331, PRS configuration can include the case of PRS symbol offset 13 | 13 |  |  |  | 38.331 |  |  |

Therefore it can be agreed that 1-symbol PRS should be applied to RTT-based PDC use and captured in TS38.331, without waiting for RAN1’s response LS.

The 1st change in [1] is as follows:

***NR-DL-PRS-PDC-Info* information element**

NR-DL-PRS-PDC-ResourceSet-r17 ::= SEQUENCE {

periodicityAndOffset-r17 NR-DL-PRS-Periodicity-and-ResourceSetSlotOffset-r17,

numSymbols-r17 ENUMERATED {n2, n4, n6, n12, n1, spare3, spare2, spare1},

dl-PRS-ResourceBandwidth-r17 INTEGER (1..63),

dl-PRS-StartPRB-r17 INTEGER (0..2176),

resourceList-r17 SEQUENCE (SIZE (1..maxNrofPRS-ResourcesPerSet-r17)) OF NR-DL-PRS-Resource-r17,

repFactorAndTimeGap-r17 RepFactorAndTimeGap-r17 OPTIONAL, -- Need S

...

}

The 2nd change in [1] is as follows:

***NR-DL-PRS-PDC-Info* information element**

NR-DL-PRS-Resource-r17 ::= SEQUENCE {

nr-DL-PRS-ResourceID-r17 NR-DL-PRS-ResourceID-r17,

dl-PRS-SequenceID-r17 INTEGER (0..4095),

dl-PRS-CombSizeN-AndReOffset-r17 CHOICE {

n2-r17 INTEGER (0..1),

n4-r17 INTEGER (0..3),

n6-r17 INTEGER (0..5),

n12-r17 INTEGER (0..11),

...

},

dl-PRS-ResourceSlotOffset-r17 INTEGER (0..maxNrofPRS-ResourceOffsetValue-1-r17),

dl-PRS-ResourceSymbolOffset-r17 INTEGER (0..12),

dl-PRS-QCL-Info-r17 DL-PRS-QCL-Info-r17 OPTIONAL, -- Need N

...,

[[

dl-PRS-ResourceSymbolOffset-v18xx INTEGER (0..13) OPTIONAL -- Need M

]]

}

|  |
| --- |
| ***NR-DL-PRS-Resource field description*** |
| ***dl-PRS-ResourceSymbolOffset***  This field specifies the starting symbol of the DL-PRS Resource within a slot. If *dl-PRS-ResourceSymbolOffset-v18xx* is present, the UE shall ignore *dl-PRS-ResourceSymbolOffset-r17*. |

Based on above, companies are welcomed to answer the following questions:

**Q1: Do companies agree with the CR in [1] for TS38.331?**

|  |  |  |  |
| --- | --- | --- | --- |
| Companies | Yes/No for 1st change | Yes/No for 2nd change | Comments |
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## CR in [2] for TS37.355

RAN2#121-bis-e has made the following agreement:

|  |
| --- |
| Agreements:  RAN2 will introduce 1-symbol PRS in line with the RAN1 agreement.  Reply LS to RAN1 to ask if a PDC change is also needed.  LPP CR is AIP; other CRs to be seen next meeting, evolved from the CRs at this meeting.  Restrictions to the search window can be considered next meeting in LPP.  Capability to be aligned with RAN1 feature list. |

So the LPP CR [2] is the revision of the AIP CR [7] in RAN2#121-bis-e, with the following changes:

* TEI identifier in the CR title as [1symbol\_PRS];
* Change CR title from ‘Correction on xx’ to ‘introduction of xx’;
* Add the restriction to the search window in the field description of *dl-PRS-NumSymbols*.

The 1st change in [2] is as follows:

*– NR-DL-PRS-Info*

NR-DL-PRS-ResourceSet-r16 ::= SEQUENCE {

nr-DL-PRS-ResourceSetID-r16 NR-DL-PRS-ResourceSetID-r16,

dl-PRS-Periodicity-and-ResourceSetSlotOffset-r16

NR-DL-PRS-Periodicity-and-ResourceSetSlotOffset-r16,

dl-PRS-ResourceRepetitionFactor-r16 ENUMERATED {n2, n4, n6, n8, n16, n32, ...}

OPTIONAL, -- Need OP

dl-PRS-ResourceTimeGap-r16 ENUMERATED {s1, s2, s4, s8, s16, s32, ...}

OPTIONAL, -- Cond Rep

dl-PRS-NumSymbols-r16 ENUMERATED {n2, n4, n6, n12, n1,...},

dl-PRS-MutingOption1-r16 DL-PRS-MutingOption1-r16 OPTIONAL, -- Need OP

dl-PRS-MutingOption2-r16 DL-PRS-MutingOption2-r16 OPTIONAL, -- Need OP

dl-PRS-ResourcePower-r16 INTEGER (-60..50),

dl-PRS-ResourceList-r16 SEQUENCE (SIZE (1..nrMaxResourcesPerSet-r16)) OF

NR-DL-PRS-Resource-r16,

...

}

The 2nd change in [2] is as follows:

*– NR-DL-PRS-Info*

NR-DL-PRS-Resource-r16 ::= SEQUENCE {

nr-DL-PRS-ResourceID-r16 NR-DL-PRS-ResourceID-r16,

dl-PRS-SequenceID-r16 INTEGER (0.. 4095),

dl-PRS-CombSizeN-AndReOffset-r16 CHOICE {

n2-r16 INTEGER (0..1),

n4-r16 INTEGER (0..3),

n6-r16 INTEGER (0..5),

n12-r16 INTEGER (0..11),

...

},

dl-PRS-ResourceSlotOffset-r16 INTEGER (0..nrMaxResourceOffsetValue-1-r16),

dl-PRS-ResourceSymbolOffset-r16 INTEGER (0..12),

dl-PRS-QCL-Info-r16 DL-PRS-QCL-Info-r16 OPTIONAL, --Need ON

...,

[[

dl-PRS-ResourcePrioritySubset-r17 DL-PRS-ResourcePrioritySubset-r17 OPTIONAL -- Need ON

]],

[[

dl-PRS-ResourceSymbolOffset-r18 INTEGER (0..13) OPTIONAL -- Need ON

]]

}

|  |
| --- |
| ***dl-PRS-ResourceSymbolOffset***  This field specifies the starting symbol of the DL-PRS Resource within a slot determined by *dl-PRS-ResourceSlotOffset*. If *dl-PRS-ResourceSymbolOffset-r18* is present, the target device shall ignore *dl-PRS-ResourceSymbolOffset-r16*. |

The 3rd change in [2] is as follows:

*– NR-DL-PRS-Info*

|  |
| --- |
| ***dl-PRS-NumSymbols***  This field specifies the number of symbols per DL-PRS Resource within a slot. When *dl-PRS-NumSymbols* equals to 1, the target device shall expect the suitable expected RSTD windows provided by the location server such that peak ambiguity is addressed. |

The 4th change in [2] is as follows:

*– NR-On-Demand-DL-PRS-Information*

NR-On-Demand-DL-PRS-PerFreqLayer-r17 ::= SEQUENCE {

dl-prs-FrequencyRangeReq-r17 ENUMERATED { fr1, fr2, ...},

dl-prs-ResourceSetPeriodicityReq-r17 ENUMERATED { p4, p5, p8, p10, p16, p20, p32, p40,

p64, p80, p160, p320, p640, p1280, p2560,

p5120, p10240, p20480, p40960, p81920, ...}

OPTIONAL,

dl-prs-ResourceBandwidthReq-r17 INTEGER (1..63) OPTIONAL,

dl-prs-ResourceRepetitionFactorReq-r17 ENUMERATED {n2, n4, n6, n8, n16, n32, ...}

OPTIONAL,

dl-prs-NumSymbolsReq-r17 ENUMERATED {n2, n4, n6, n12, n1,...} OPTIONAL,

dl-prs-CombSizeN-Req-r17 ENUMERATED {n2, n4, n6, n12, ...} OPTIONAL,

dl-prs-QCL-InformationReqTRPlist-r17 DL-PRS-QCL-InformationReqTRPlist-r17 OPTIONAL,

...

}

Since the 1st, 2nd and 4th changes are AIP(i.e., no change compared with last meeting), companies are welcomed to answer the following questions:

**Q2: Do companies agree with the CR in [2] for TS37.355?**

|  |  |  |  |
| --- | --- | --- | --- |
| Companies | Yes/No for 1st, 2nd and 4th changes | Yes/No for 3rd change | Comments |
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## UE capability CR in [3] for TS37.355

CR in [3] is the newly provided CR in this meeting. CR [3] captures the LPP UE capability in TS37.355 according to the latest stable Rel-18 UE feature list [9] that agreed in RAN1#112-bis-e, details as follows:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | **Consequence if the feature is not supported by the UE** | **Type**  **(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Mandatory/Optional |
| 55. TEI18 | 55-2a | 1-symbol PRS for MG-based measurement in RRC\_CONNECTED state | 1. Support of 1-symbol PRS with comb sizes from {2, 4, 6, 12}  2. Max number of single-symbol DL PRS resources it can process in a slot inside a MG in RRC\_CONNECTED state  FR1 bands: {1, 2, 4, 6, 8, 12, 16, 24, 32, 48, 64} for each SCS: 15kHz, 30kHz, 60kHz  FR2 bands: {1, 2, 4, 6, 8, 12, 16, 24, 32, 48, 64} for each SCS: 60kHz, 120kHz | 13-1 | No | 1-symbol PRS is not supported for MG-based measurement in RRC\_CONNECTED state | per band | Optional with capability signaling |
| 55. TEI18 | 55-2b | 1-symbol PRS for outside MG in RRC\_CONNECTED state | 1. Support of 1-symbol PRS with comb sizes from {2, 4, 6, 12}  2. Max number of single-symbol DL PRS resources it can process in a slot outside a MG in RRC\_CONNECTED state  FR1 bands: {1, 2, 4, 6, 8, 12, 16, 24, 32, 48, 64} for each SCS: 15kHz, 30kHz, 60kHz  FR2 bands: {1, 2, 4, 6, 8, 12, 16, 24, 32, 48, 64} for each SCS: 60kHz, 120kHz | 27-3-3 | No | 1-symbol PRS is not supported for outside MG in RRC\_CONNECTED state | per band | Optional with capability signaling |
| 55. TEI18 | 55-2c | 1-symbol PRS in RRC\_INACTIVE state | 1. Support of 1-symbol PRS with comb sizes from {2, 4, 6, 12}  2. Max number of single-symbol DL PRS resources it can process in a slot in RRC\_INACTIVE state  FR1 bands: {1, 2, 4, 6, 8, 12, 16, 24, 32, 48, 64} for each SCS: 15kHz, 30kHz, 60kHz  FR2 bands: {1, 2, 4, 6, 8, 12, 16, 24, 32, 48, 64} for each SCS: 60kHz, 120kHz | 27-6 | No | 1-symbol PRS is not supported in RRC\_INACTIVE state | per band | Optional with capability signaling |

The 1st change in [3] of capturing 55-2a is as follows:

*– NR-DL-PRS-ProcessingCapability*

PRS-ProcessingCapabilityPerBand-r16 ::= SEQUENCE {

freqBandIndicatorNR-r16 FreqBandIndicatorNR-r16,

supportedBandwidthPRS-r16 CHOICE {

fr1 ENUMERATED {mhz5, mhz10, mhz20, mhz40,

mhz50, mhz80, mhz100},

fr2 ENUMERATED {mhz50, mhz100, mhz200, mhz400},

...

},

dl-PRS-BufferType-r16 ENUMERATED {type1, type2, ...},

durationOfPRS-Processing-r16 SEQUENCE {

durationOfPRS-ProcessingSymbols-r16 ENUMERATED {nDot125, nDot25, nDot5, n1,

n2, n4, n6, n8, n12, n16, n20, n25,

n30, n32, n35, n40, n45, n50},

durationOfPRS-ProcessingSymbolsInEveryTms-r16

ENUMERATED {n8, n16, n20, n30, n40, n80,

n160,n320, n640, n1280},

...

},

maxNumOfDL-PRS-ResProcessedPerSlot-r16 SEQUENCE {

scs15-r16 ENUMERATED {n1, n2, n4, n8, n16, n24, n32,

n48, n64} OPTIONAL,

scs30-r16 ENUMERATED {n1, n2, n4, n8, n16, n24, n32,

n48, n64} OPTIONAL,

scs60-r16 ENUMERATED {n1, n2, n4, n8, n16, n24, n32,

n48, n64} OPTIONAL,

scs120-r16 ENUMERATED {n1, n2, n4, n8, n16, n24, n32,

n48, n64} OPTIONAL,

...,

[[

scs15-v1690 ENUMERATED {n6, n12} OPTIONAL,

scs30-v1690 ENUMERATED {n6, n12} OPTIONAL,

scs60-v1690 ENUMERATED {n6, n12} OPTIONAL,

scs120-v1690 ENUMERATED {n6, n12} OPTIONAL

]]

},

...,

[[

supportedDL-PRS-ProcessingSamples-RRC-CONNECTED-r17 ENUMERATED { supported } OPTIONAL,

prs-ProcessingWindowType1A-r17 ENUMERATED { option1, option2, option3} OPTIONAL,

prs-ProcessingWindowType1B-r17 ENUMERATED { option1, option2, option3} OPTIONAL,

prs-ProcessingWindowType2-r17 ENUMERATED { option1, option2, option3} OPTIONAL,

prs-ProcessingCapabilityOutsideMGinPPW-r17

SEQUENCE (SIZE(1..3)) OF

PRS-ProcessingCapabilityOutsideMGinPPWperType-r17

OPTIONAL,

dl-PRS-BufferType-RRC-Inactive-r17 ENUMERATED { type1, type2, ... } OPTIONAL,

durationOfPRS-Processing-RRC-Inactive-r17 SEQUENCE {

durationOfPRS-ProcessingSymbols-r17 ENUMERATED {nDot125, nDot25, nDot5, n1,

n2, n4, n6, n8, n12, n16, n20, n25,

n30, n32, n35, n40, n45, n50},

durationOfPRS-ProcessingSymbolsInEveryTms-r17

ENUMERATED {n8, n16, n20, n30, n40, n80,

n160,n320, n640, n1280},

...

} OPTIONAL,

maxNumOfDL-PRS-ResProcessedPerSlot-RRC-Inactive-r17 SEQUENCE {

scs15-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

scs30-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

scs60-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

scs120-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

...

} OPTIONAL,

supportedLowerRxBeamSweepingFactor-FR2-r17 ENUMERATED { n1, n2, n4, n6 } OPTIONAL

]],

[[

supportedDL-PRS-ProcessingSamples-RRC-Inactive-r17 ENUMERATED { supported } OPTIONAL

]],

[[

prs-MeasurementWithoutMG-r17 ENUMERATED {cp, symbolDot25, symbolDot5,

slotDot5} OPTIONAL

]],

[[

maxNumOfOneSymbolPRS-ResProcessedPerSlot-RRC-Connected-r18 SEQUENCE {

scs15-r18 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

scs30-r18 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

scs60-r18 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

scs120-r18 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

...

}

]]

}

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| --- |
| ***maxNumOfOneSymbolPRS-ResProcessedPerSlot-RRC-Connected***  Indicates the maximum number of single-symbol DL-PRS resources that UE can process in a slot inside a measurement gap in RRC\_CONNECTED. SCS: 15 kHz, 30 kHz, 60 kHz are applicable for FR1 bands. SCS: 60 kHz, 120 kHz are applicable for FR2 bands. A UE which supports *maxNumOfOneSymbolPRS-ResProcessedPerSlot-RRC-Connected* shall support single-symbol DL-PRS with the comb sizes from {2,4,6,12}. |

The 2nd change in [3] of capturing 55-2b is as follows:

*– NR-DL-PRS-ProcessingCapability*

PRS-ProcessingCapabilityOutsideMGinPPWperType-r17 ::= SEQUENCE {

prsProcessingType-r17 ENUMERATED { type1A, type1B, type2 },

ppw-dl-PRS-BufferType-r17 ENUMERATED { type1, type2, ... },

ppw-durationOfPRS-Processing1-r17 SEQUENCE {

ppw-durationOfPRS-ProcessingSymbolsN-r17

ENUMERATED { msDot125, msDot25, msDot5, ms1, ms2, ms4,

ms6, ms8, ms12, ms16, ms20, ms25, ms30, ms32, ms35,

ms40, ms45, ms50 },

ppw-durationOfPRS-ProcessingSymbolsT-r17

ENUMERATED { ms1, ms2, ms4, ms8, ms16, ms20, ms30, ms40, ms80,

ms160, ms320, ms640, ms1280 }

} OPTIONAL,

ppw-durationOfPRS-Processing2-r17 SEQUENCE {

ppw-durationOfPRS-ProcessingSymbolsN2-r17

ENUMERATED { msDot125, msDot25, msDot5, ms1, ms2, ms3, ms4, ms5,

ms6, ms8, ms12 },

ppw-durationOfPRS-ProcessingSymbolsT2-r17

ENUMERATED { ms4, ms5, ms6, ms8 }

} OPTIONAL,

ppw-maxNumOfDL-PRS-ResProcessedPerSlot-r17 SEQUENCE {

scs15-r17 ENUMERATED {n1, n2, n4, n6, n8, n12,

n16, n24, n32, n48, n64 }

OPTIONAL,

scs30-r17 ENUMERATED {n1, n2, n4, n6, n8, n12,

n16, n24, n32, n48, n64 }

OPTIONAL,

scs60-r17 ENUMERATED {n1, n2, n4, n6, n8, n12,

n16, n24, n32, n48, n64 }

OPTIONAL,

scs120-r17 ENUMERATED {n1, n2, n4, n6, n8, n12,

n16, n24, n32, n48, n64 }

OPTIONAL,

...

},

...,

[[

ppw-maxNumOfDL-Bandwidth-r17 CHOICE {

fr1 ENUMERATED {mhz5, mhz10, mhz20, mhz40,

mhz50, mhz80, mhz100},

fr2 ENUMERATED {mhz50, mhz100, mhz200, mhz400}

} OPTIONAL

]],

[[

ppw-maxNumOfOneSymbolPRS-ResProcessedPerSlot-r18 SEQUENCE {

scs15-r18 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

scs30-r18 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

scs60-r18 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

scs120-r18 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

...

}

]]

}

|  |
| --- |
| ***prs-ProcessingCapabilityOutsideMGinPPW***  Indicates the DL-PRS Processing Capability outside MG of each of the supported PPW Type in the case the UE supports multiple PPW Types in a band and comprises the following subfields:  - ***prsProcessingType***: Indicates the DL-PRS Processing Window Type for which the *prs-ProcessingCapabilityOutsideMGinPPW* are provided.  - ***ppw-dl-PRS-BufferType***: Indicates DL-PRS buffering capability. Value '*type1'* indicates sub-slot/symbol level buffering and value '*type2'* indicates slot level buffering.  - ***ppw-durationOfPRS-Processing1***: Indicates the duration of DL-PRS symbols N in units of ms a UE can process every T ms assuming maximum DL-PRS bandwidth provided in *ppw-maxNumOfDL-Bandwidth* and comprises the following subfields:  - ***ppw-durationOfPRS-ProcessingSymbolsN***: This field specifies the values for *N*. Enumerated values indicate 0.125, 0.25, 0.5, 1, 2, 4, 6, 8, 12, 16, 20, 25, 30, 32, 35, 40, 45, 50 ms.  - ***ppw-durationOfPRS-ProcessingSymbolsT***: This field specifies the values for *T*. Enumerated values indicate 1, 2, 4, 8, 16, 20, 30, 40, 80, 160, 320, 640, 1280 ms.  - ***ppw-durationOfPRS-Processing2***: Indicates the duration of DL-PRS symbols N2 in units of ms a UE can process inT2 ms assuming maximum DL-PRS bandwidth provided in *ppw-maxNumOfDL-Bandwidth* and comprises the following subfields:  - ***ppw-durationOfPRS-ProcessingSymbolsN2***: This field specifies the values for *N2*. Enumerated values indicate 0.125, 0.25, 0.5, 1, 2, 3, 4, 5, 6, 8, 12 ms.  - ***ppw-durationOfPRS-ProcessingSymbolsT2***: This field specifies the values for *T2*. Enumerated values indicate 4, 5, 6, 8 ms.  - ***ppw-maxNumOfDL-PRS-ResProcessedPerSlot:*** Indicates the maximum number of DL-PRS resources that UE can process in a slot. SCS: 15 kHz, 30 kHz, 60 kHz are applicable for FR1 bands. SCS: 60 kHz, 120 kHz are applicable for FR2 bands.  - ***ppw-maxNumOfDL-Bandwidth:*** Indicates the maximum number of DL PRS bandwidth in MHz, which is supported and reported by UE for PRS measurement outside MG within the PPW.  - ***ppw-maxNumOfOneSymbolPRS-ResProcessedPerSlot:*** Indicates the maximum number of single-symbol DL-PRS resources that UE can process in a slot. SCS: 15 kHz, 30 kHz, 60 kHz are applicable for FR1 bands. SCS: 60 kHz, 120 kHz are applicable for FR2 bands.  The UE can include this field only if the UE supports one of *prs-ProcessingWindowType1A*, *prs-ProcessingWindowType1B* and *prs-ProcessingWindowType2*. Otherwise, the UE does not include this field.  NOTE 5: A UE that supports one of *prs-ProcessingWindowType1A*, *prs-ProcessingWindowType1B* or *prs-ProcessingWindowType2* shall always include the *prs-ProcessingCapabilityOutsideMGinPPW*.  NOTE 6: The (N, T) UE capability in *ppw-durationOfPRS-Processing1* is interpreted as in NOTE 9, and the UE is expected to receive the DL-PRS within the PRS processing window but the processing of the received DL-PRS may be outside a DL-PRS processing window.  NOTE 7: The (N2, T2) UE capability in *ppw-durationOfPRS-Processing2* is interpreted such that the UE is capable of measuring up to N2 ms DL-PRS within a PPW and is capable of completing the DL-PRS processing within the PPW, e.g., if the time duration from the last symbol of the measured DL-PRS resource(s) inside the PPW to the end of PPW is not smaller than T2 ms.  NOTE 8: A UE which supports *prs-ProcessingCapabilityOutsideMGinPPW* shall support either *ppw-durationOfPRS-Processing1* or *ppw-durationOfPRS-Processing2*, but not both for each supported type in a band.  NOTE 9: A UE which supports *ppw-maxNumOfOneSymbolPRS-ResProcessedPerSlot* shall support single-symbol DL-PRS with the comb sizes from {2,4,6,12}. |

The 3rd change in [3] of capturing 55-2c is as follows:

*– NR-DL-PRS-ProcessingCapability*

PRS-ProcessingCapabilityPerBand-r16 ::= SEQUENCE {

freqBandIndicatorNR-r16 FreqBandIndicatorNR-r16,

supportedBandwidthPRS-r16 CHOICE {

fr1 ENUMERATED {mhz5, mhz10, mhz20, mhz40,

mhz50, mhz80, mhz100},

fr2 ENUMERATED {mhz50, mhz100, mhz200, mhz400},

...

},

dl-PRS-BufferType-r16 ENUMERATED {type1, type2, ...},

durationOfPRS-Processing-r16 SEQUENCE {

durationOfPRS-ProcessingSymbols-r16 ENUMERATED {nDot125, nDot25, nDot5, n1,

n2, n4, n6, n8, n12, n16, n20, n25,

n30, n32, n35, n40, n45, n50},

durationOfPRS-ProcessingSymbolsInEveryTms-r16

ENUMERATED {n8, n16, n20, n30, n40, n80,

n160,n320, n640, n1280},

...

},

maxNumOfDL-PRS-ResProcessedPerSlot-r16 SEQUENCE {

scs15-r16 ENUMERATED {n1, n2, n4, n8, n16, n24, n32,

n48, n64} OPTIONAL,

scs30-r16 ENUMERATED {n1, n2, n4, n8, n16, n24, n32,

n48, n64} OPTIONAL,

scs60-r16 ENUMERATED {n1, n2, n4, n8, n16, n24, n32,

n48, n64} OPTIONAL,

scs120-r16 ENUMERATED {n1, n2, n4, n8, n16, n24, n32,

n48, n64} OPTIONAL,

...,

[[

scs15-v1690 ENUMERATED {n6, n12} OPTIONAL,

scs30-v1690 ENUMERATED {n6, n12} OPTIONAL,

scs60-v1690 ENUMERATED {n6, n12} OPTIONAL,

scs120-v1690 ENUMERATED {n6, n12} OPTIONAL

]]

},

...,

[[

supportedDL-PRS-ProcessingSamples-RRC-CONNECTED-r17 ENUMERATED { supported } OPTIONAL,

prs-ProcessingWindowType1A-r17 ENUMERATED { option1, option2, option3} OPTIONAL,

prs-ProcessingWindowType1B-r17 ENUMERATED { option1, option2, option3} OPTIONAL,

prs-ProcessingWindowType2-r17 ENUMERATED { option1, option2, option3} OPTIONAL,

prs-ProcessingCapabilityOutsideMGinPPW-r17

SEQUENCE (SIZE(1..3)) OF

PRS-ProcessingCapabilityOutsideMGinPPWperType-r17

OPTIONAL,

dl-PRS-BufferType-RRC-Inactive-r17 ENUMERATED { type1, type2, ... } OPTIONAL,

durationOfPRS-Processing-RRC-Inactive-r17 SEQUENCE {

durationOfPRS-ProcessingSymbols-r17 ENUMERATED {nDot125, nDot25, nDot5, n1,

n2, n4, n6, n8, n12, n16, n20, n25,

n30, n32, n35, n40, n45, n50},

durationOfPRS-ProcessingSymbolsInEveryTms-r17

ENUMERATED {n8, n16, n20, n30, n40, n80,

n160,n320, n640, n1280},

...

} OPTIONAL,

maxNumOfDL-PRS-ResProcessedPerSlot-RRC-Inactive-r17 SEQUENCE {

scs15-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

scs30-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

scs60-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

scs120-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

...

} OPTIONAL,

supportedLowerRxBeamSweepingFactor-FR2-r17 ENUMERATED { n1, n2, n4, n6 } OPTIONAL

]],

[[

supportedDL-PRS-ProcessingSamples-RRC-Inactive-r17 ENUMERATED { supported } OPTIONAL

]],

[[

prs-MeasurementWithoutMG-r17 ENUMERATED {cp, symbolDot25, symbolDot5,

slotDot5} OPTIONAL

]],

[[

maxNumOfOneSymbolPRS-ResProcessedPerSlot-RRC-Inactive-r18 SEQUENCE {

scs15-r18 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

scs30-r18 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

scs60-r18 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

scs120-r18 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

...

}

]]

}

|  |
| --- |
| ***maxNumOfOneSymbolPRS-ResProcessedPerSlot-RRC-Inactive***  Indicates the maximum number of single-symbol DL-PRS resources that UE can process in a slot in RRC\_INACTIVE. SCS: 15 kHz, 30 kHz, 60 kHz are applicable for FR1 bands. SCS: 60 kHz, 120 kHz are applicable for FR2 bands. A UE which supports *maxNumOfOneSymbolPRS-ResProcessedPerSlot-RRC-Inactive* shall support single-symbol DL-PRS with the comb sizes from {2,4,6,12}. |

Based on above, companies are welcomed to answer the following questions:

**Q3: Do companies agree with the UE capability CR in [3] for TS37.355?**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Companies | Yes/No for 1st change(55-2a) | Yes/No for 2nd change(55-2b) | Yes/No for 3rd change(55-2c) | Comments |
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## UE capability CR in [4] for TS38.331

CR in [4] is the newly provided CR in this meeting. CR [4] captures the RRC UE capability in TS38.331 according to the latest stable Rel-18 UE feature list [9] that agreed in RAN1#112-bis-e, details as follows:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | **Consequence if the feature is not supported by the UE** | **Type**  **(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Mandatory/Optional |
| 55. TEI18 | 55-2d | 1-symbol PRS for PDC | 1. Support of 1-symbol PRS with comb sizes from {2, 4, 6, 12}  2. Max number of single-symbol DL PRS resources it can process in a slot for PDC  FR1 bands: {1, 2, 4, 6, 8, 12, 16, 24, 32, 48, 64} for each SCS: 15kHz, 30kHz, 60kHz  FR2 bands: {1, 2, 4, 6, 8, 12, 16, 24, 32, 48, 64} for each SCS: 60kHz, 120kHz | 25-19a | Yes | 1-symbol PRS is not supported for PDC | per band | Optional with capability signaling |

The 1st change in [4] of capturing 55-2d is as follows:

***FeatureSetDownlink* information element**

<omitted>

FeatureSetDownlink-v1720 ::= SEQUENCE {

-- R1 25-19: RTT-based Propagation delay compensation based on CSI-RS for tracking and SRS

rtt-BasedPDC-CSI-RS-ForTracking-r17 ENUMERATED {supported} OPTIONAL,

-- R1 25-19a: RTT-based Propagation delay compensation based on DL PRS for RTT-based PDC and SRS

rtt-BasedPDC-PRS-r17 SEQUENCE {

maxNumberPRS-Resource-r17 ENUMERATED {n1, n2, n4, n8, n16, n32, n64},

maxNumberPRS-ResourceProcessedPerSlot-r17 SEQUENCE {

scs-15kHz-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24, n32, n48, n64} OPTIONAL,

scs-30kHz-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24, n32, n48, n64} OPTIONAL,

scs-60kHz-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24, n32, n48, n64} OPTIONAL,

scs-120kHz-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24, n32, n48, n64} OPTIONAL

}

} OPTIONAL,

-- R1 33-5-1: SPS group-common PDSCH for multicast on PCell

sps-Multicast-r17 ENUMERATED {supported} OPTIONAL

}

FeatureSetDownlink-v1730 ::= SEQUENCE {

-- R1 25-19b: Support of PRS as spatial relation RS for SRS

prs-AsSpatialRelationRS-For-SRS-r17 ENUMERATED {supported} OPTIONAL

}

FeatureSetDownlink-v18xx ::= SEQUENCE {

-- R1 55-2d: single-symbol DL-PRS used in RTT-based Propagation delay compensation

PDC-maxNumberPRS-ResourceProcessedPerSlot-v18xx SEQUENCE {

scs-15kHz-v18xx ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24, n32, n48, n64} OPTIONAL,

scs-30kHz-v18xx ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24, n32, n48, n64} OPTIONAL,

scs-60kHz-v18xx ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24, n32, n48, n64} OPTIONAL,

scs-120kHz-v18xx ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24, n32, n48, n64} OPTIONAL

}

}

<omitted>

***FeatureSets* information element**

-- ASN1START

-- TAG-FEATURESETS-START

FeatureSets ::= SEQUENCE {

featureSetsDownlink SEQUENCE (SIZE (1..maxDownlinkFeatureSets)) OF FeatureSetDownlink OPTIONAL,

featureSetsDownlinkPerCC SEQUENCE (SIZE (1..maxPerCC-FeatureSets)) OF FeatureSetDownlinkPerCC OPTIONAL,

featureSetsUplink SEQUENCE (SIZE (1..maxUplinkFeatureSets)) OF FeatureSetUplink OPTIONAL,

featureSetsUplinkPerCC SEQUENCE (SIZE (1..maxPerCC-FeatureSets)) OF FeatureSetUplinkPerCC OPTIONAL,

...,

[[

featureSetsDownlink-v1540 SEQUENCE (SIZE (1..maxDownlinkFeatureSets)) OF FeatureSetDownlink-v1540 OPTIONAL,

featureSetsUplink-v1540 SEQUENCE (SIZE (1..maxUplinkFeatureSets)) OF FeatureSetUplink-v1540 OPTIONAL,

featureSetsUplinkPerCC-v1540 SEQUENCE (SIZE (1..maxPerCC-FeatureSets)) OF FeatureSetUplinkPerCC-v1540 OPTIONAL

]],

[[

featureSetsDownlink-v15a0 SEQUENCE (SIZE (1..maxDownlinkFeatureSets)) OF FeatureSetDownlink-v15a0 OPTIONAL

]],

[[

featureSetsDownlink-v1610 SEQUENCE (SIZE (1..maxDownlinkFeatureSets)) OF FeatureSetDownlink-v1610 OPTIONAL,

featureSetsUplink-v1610 SEQUENCE (SIZE (1..maxUplinkFeatureSets)) OF FeatureSetUplink-v1610 OPTIONAL,

featureSetDownlinkPerCC-v1620 SEQUENCE (SIZE (1..maxPerCC-FeatureSets)) OF FeatureSetDownlinkPerCC-v1620 OPTIONAL

]],

[[

featureSetsUplink-v1630 SEQUENCE (SIZE (1..maxUplinkFeatureSets)) OF FeatureSetUplink-v1630 OPTIONAL

]],

[[

featureSetsUplink-v1640 SEQUENCE (SIZE (1..maxUplinkFeatureSets)) OF FeatureSetUplink-v1640 OPTIONAL

]],

[[

featureSetsDownlink-v1700 SEQUENCE (SIZE (1..maxDownlinkFeatureSets)) OF FeatureSetDownlink-v1700 OPTIONAL,

featureSetsDownlinkPerCC-v1700 SEQUENCE (SIZE (1..maxPerCC-FeatureSets)) OF FeatureSetDownlinkPerCC-v1700 OPTIONAL,

featureSetsUplink-v1710 SEQUENCE (SIZE (1..maxUplinkFeatureSets)) OF FeatureSetUplink-v1710 OPTIONAL,

featureSetsUplinkPerCC-v1700 SEQUENCE (SIZE (1..maxPerCC-FeatureSets)) OF FeatureSetUplinkPerCC-v1700 OPTIONAL

]],

[[

featureSetsDownlink-v1720 SEQUENCE (SIZE (1..maxDownlinkFeatureSets)) OF FeatureSetDownlink-v1720 OPTIONAL,

featureSetsDownlinkPerCC-v1720 SEQUENCE (SIZE (1..maxPerCC-FeatureSets)) OF FeatureSetDownlinkPerCC-v1720 OPTIONAL,

featureSetsUplink-v1720 SEQUENCE (SIZE (1..maxUplinkFeatureSets)) OF FeatureSetUplink-v1720 OPTIONAL

]],

[[

featureSetsDownlink-v1730 SEQUENCE (SIZE (1..maxDownlinkFeatureSets)) OF FeatureSetDownlink-v1730 OPTIONAL,

featureSetsDownlinkPerCC-v1730 SEQUENCE (SIZE (1..maxPerCC-FeatureSets)) OF FeatureSetDownlinkPerCC-v1730 OPTIONAL

]],

[[

featureSetsDownlink-v18xx SEQUENCE (SIZE (1..maxDownlinkFeatureSets)) OF FeatureSetDownlink-v18xx OPTIONAL

]]

}

Based on above, companies are welcomed to answer the following question:

**Q4: Do companies agree with the UE capability CR in [4] for TS38.331?**

|  |  |  |
| --- | --- | --- |
| Companies | Yes/No for 1st change(55-2d) | Comments |
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## UE capability CR in [5] for TS38.306

CR in [5] is the newly provided CR in this meeting. CR [5] captures the RRC UE capability in TS38.306 according to the latest stable Rel-18 UE feature list [9] that agreed in RAN1#112-bis-e, details as follows:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | **Consequence if the feature is not supported by the UE** | **Type**  **(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Mandatory/Optional |
| 55. TEI18 | 55-2d | 1-symbol PRS for PDC | 1. Support of 1-symbol PRS with comb sizes from {2, 4, 6, 12}  2. Max number of single-symbol DL PRS resources it can process in a slot for PDC  FR1 bands: {1, 2, 4, 6, 8, 12, 16, 24, 32, 48, 64} for each SCS: 15kHz, 30kHz, 60kHz  FR2 bands: {1, 2, 4, 6, 8, 12, 16, 24, 32, 48, 64} for each SCS: 60kHz, 120kHz | 25-19a | Yes | 1-symbol PRS is not supported for PDC | per band | Optional with capability signaling |

The 1st change in [5] of capturing 55-2d is as follows:

4.2.7.5 *FeatureSetDownlink* parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Definitions for parameters | Per | M | FDD-TDD  DIFF | FR1-FR2  DIFF |

<omitted>

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***pdcch-MonitoringAnyOccasionsWithSpanGap***  Indicates whether the UE supports PDCCH search space monitoring occasions in any symbol of the slot with minimum time separation between two consecutive transmissions of PDCCH with span up to two OFDM symbols for two OFDM symbols or span up to three OFDM symbols for four and seven OFDM symbols. Value set1 indicates the supported value set (X,Y) is (7,3), value set2 indicates the supported value set (X,Y) is (4,3) and (7,3) and value set 3 indicates the supported value set (X,Y) is (2,2), (4,3) and (7,3). | FS | No | N/A | N/A |
| ***pdcch-MonitoringMixed-r16***  Indicates support of Rel-15 monitoring capability and *pdcch-Monitoring-r16* on different serving cells. | FS | No | N/A | N/A |
| ***PDC-maxNumberPRS-ResourceProcessedPerSlot-v18xx***  Indicates the maximum number of single-symbol DL-PRS resources used in RTT-based Propagation delay compensation that UE can process in a slot. SCS: 15 kHz, 30 kHz, 60 kHz are applicable for FR1 bands. SCS: 60 kHz, 120 kHz are applicable for FR2 bands. A UE which supports *PDC-maxNumberPRS-ResourceProcessedPerSlot-v18xx* shall support single-symbol DL-PRS for PDC with the comb sizes from {2,4,6,12}.  A UE supporting this feature shall also indicate support of *rtt-BasedPDC-PRS-r17*. | FS | No | N/A | N/A |
| ***pdsch-ProcessingType1-DifferentTB-PerSlot***  Defines whether the UE capable of processing time capability 1 supports reception of up to two, four or seven unicast PDSCHs for several transport blocks with PDSCH scrambled using C-RNTI, TC-RNTI, MCS-C-RNTI or CS-RNTI in one serving cell within the same slot per CC that are multiplexed in time domain only.  NOTE: PDSCH(s) for Msg.4 is included. | FS | No | N/A | N/A |

<omitted>

Based on above, companies are welcomed to answer the following question:

**Q5: Do companies agree with the UE capability CR in [5] for TS38.306?**

|  |  |  |
| --- | --- | --- |
| Companies | Yes/No for 1st change(55-2d) | Comments |
|  |  |  |
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# Summary

To be added