3GPP TSG-RAN WG1 Meeting #106-e R1-21xxxxx

e-Meeting, August 16th – 27th, 2021

Agenda Item: 6

Source: Moderator (Ericsson)

Title: Moderator Summary [106-e-LTE-6CRs-03]

Document for: Discussion and Decision

# 1 Introduction

In [1], it was mentioned that “the higher layer parameter “*operationModeInfo*” has been solely used in some clauses of TS 36.213 [2], letting aside the non-anchor carrier” case.

In relation with the above, the following e-mail discussion has been granted:

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| [106-e-LTE-6CRs-03] Email discussion/approval on Deployment Mode Indicator for anchor and non-anchor carriers ([R1-2108120](file:///D:\\Documents\\3GPP%20documents\\RAN1\\TSGR1_106-e\\Docs\\R1-2108120.zip)) – Gerardo (Ericsson)  Issue 4: Deployment Mode Indicator for anchor and non-anchor carriers  Discussion and decision by 8/18, CR by 8/20, final check by 8/24 |

# 2 Background

In [1], the following was mentioned:

“In Release-13, the higher layer parameter “*operationModeInfo*” was introduced [TS 36.331]:

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| ***operationModeInfo***  Deployment scenario (in-band/guard-band/standalone) and related information. See TS 36.211 [21] and TS 36.213 [23].  *Inband-SamePCI* indicates an in-band deployment and that the NB-IoT and LTE cell share the same physical cell id and have the same number of NRS and CRS ports.  *Inband-DifferentPCI* indicates an in-band deployment and that the NB-IoT and LTE cell have different physical cell id.  *guardband* indicatesa guard-band deployment.  *standalone* indicates a standalone deployment. |

On the other hand, in Release-13 the higher layer parameter “*inbandCarrierInfo*” was also introduced [TS 36.331]:

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| ***inbandCarrierInfo***  Provides the configuration of a non-anchor inband carrier. |

One issue that has been recently identified is that the higher layer parameter “*operationModeInfo*” has been solely used in some clauses of TS 36.213, letting aside the non-anchor carrier.”

The document in [1] identifies “clauses of TS 36.213 where the non-anchor carrier case covered by the higher layer parameter “*inbandCarrierInfo*” has been missed”.

The sections below contain the following information based on [1].

* Section 2.1: Lists four Rel-13 clauses missing the higher layer parameter “*inbandCarrierInfo*”. The fix on the identified clauses will require a Rel-13 CR, and their corresponding Rel-14, Rel-15, and Rel-16 mirror CRs.
* Section 2.2: Lists two clauses that only refer to the higher parameter “*operationModeInfo*”, for which the higher layer parameter “*inbandCarrierInfo*” does not need to be added.

## 2.1 Listing of clauses missing the higher layer parameter “*inbandCarrierInfo*”

### 2.1.1 Rel-13: TS 36.213, clause 16.2.2: Downlink Power Allocation

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| ------------------------------------------------------- Text Start ----------------------------------------------------------- 16.2.2 Downlink power allocation The eNodeB determines the downlink transmit energy per resource element.  For an NB-IoT cell, the UE may assume NRS EPRE is constant across the downlink NB-IoT system bandwidth and constant across all subframes that contain NRS, until different NRS power information is received.  The downlink NRS EPRE can be derived from the downlink narrowband reference-signal transmit power given by *nrs-Power* + *nrs-PowerOffsetNonAnchor,* where the parameter *nrs-Power* is provided by higher layers and *nrs-powerOffsetNonAnchor* is zero if it is not provided by higher layers. The downlink narrowband reference-signal transmit power is defined as the linear average over the power contributions (in [W]) of all resource elements that carry narrowband reference signals within the operating NB-IoT system bandwidth.  A UE may assume the ratio of NPDSCH EPRE to NRS EPRE among NPDSCH REs (not applicable to NPDSCH REs with zero EPRE) is 0 dB for an NB-IoT cell with one NRS antenna port and -3 dB for an NB-IoT cell with two NRS antenna ports.  A UE may assume the ratio of NPBCH EPRE to NRS EPRE among NPBCH REs (not applicable to NPBCH REs with zero EPRE) is 0 dB for an NB-IoT cell with one NRS antenna port and -3 dB for an NB-IoT cell with two NRS antenna ports.  A UE may assume the ratio of NPDCCH EPRE to NRS EPRE among NPDCCH REs (not applicable to NPDCCH REs with zero EPRE) is 0 dB for an NB-IoT cell with one NRS antenna port and -3 dB for an NB-IoT cell with two NRS antenna ports.  If higher layer parameter *operationModeInfo* indicates '00', and when the higher layer parameter *inbandCarrierInfo* is present for a cell, the ratio of NRS EPRE to CRS EPRE is given by the parameter *nrs-CRS-PowerOffset* if the parameter *nrs-CRS-PowerOffset* is provided by higher layers, and the ratio of NRS EPRE to CRS EPRE may be assumed to be 0 dB if the parameter *nrs-CRS-PowerOffset* is not provided by higher layers. If *nrs-CRS-PowerOffset* is provided by higher layers and is a non-integer value, the value of *nrs-Power* is 0.23 dBm higher than indicated.  ------------------------------------------------------- Text End ------------------------------------------------------------ |

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| **Company** | **OK with incorporating *inbandCarrierInfo* in TS 36.213 clause 16.2.2?** | **Comments** |
| Lenovo,MotoM | See comments | We understand the motivation of the CR. Please correct my understanding  NRS EPRE in anchor carriers is deteremined by *nrs-Power.*  NRS EPRE in non-anchor carriers is deteremined by *nrs-Power+ nrs-PowerOffsetNonAnchor.*  In anchor carrier, the ratio of NRS EPRE to CRS EPRE is deteremined by *nrs-CRS-PowerOffset, so the CRS EPRE is nrs-Power+ nrs-CRS-PowerOffset.*  If in non-anchor carrier, the ratio of NRS EPRE to CRS EPRE is deteremined is deteremined by *nrs-CRS-PowerOffset,, so the CRS EPRE is nrs-Power+ nrs-PowerOffsetNonAnchor + nrs-CRS-PowerOffset.*  In inband+inband deployment, do you mean the two CRS has different power configuration?  If so, we can follow the Rel.16 spec as  If higher layer parameter *operationModeInfo* indicates '00' or *samePCI-Indicator* indicates '*samePCI*' for a cell, the ratio of NRS EPRE to CRS EPRE is given by the parameter *nrs-CRS-PowerOffset* if the parameter *nrs-CRS-PowerOffset* is provided by higher layers, and the ratio of NRS EPRE to CRS EPRE may be assumed to be 0 dB if the parameter *nrs-CRS-PowerOffset* is not provided by higher layers. If *nrs-CRS-PowerOffset* is provided by higher layers and is a non-integer value, the value of *nrs-Power* is 0.23 dBm higher than indicated. |
| Qualcomm |  | Probably we need to discuss a bit more. If we have several in-band carriers (same PCI), our understanding is that the CRS EPRE will be constant for the whole set of carriers. Then, if *nrs-PowerOffsetNonAnchor* is configured, the NRS to CRS ratio cannot be constant across carriers. |
| Huawei, HiSilicon | Not OK | Similar to the comments of Lenovo and QC, the power of CRS should be constant within the LTE band, the change seems to be unnecessary. |
| ZTE, Sanechips |  | We show similar view with Qualcomm and a further discussion is needed. From our understanding, the CRS EPRE can be obtained according to *nrs-CRS-PowerOffset +nrs-Power,* and for non-anchor carrier, the power ration between CRS and NRS can be derived by CRS EPRE and NRS EPRE determined by *nrs-Power+nrs-PowerOffsetNonAnchor.*  It is seen that the parameter *nrs-CRS-PowerOffset* is not needed for non-anchor carrier and this parameter can be only applied on anchor carrier. |
| Ericsson | OK + see comment | Thanks for the interesting discussion. We share the same understanding on the scenario mentioned by QC. About the specification text cited by Lenovo, the problem is that it does not cover the “mix mode” case. Moreover, while checking *nrs-CRS-PowerOffset* for non-anchor we realized that is missing in “*inbandCarrierInfo*”.  Thus, in our understanding we need two updates:  1) In TS 36.213 clause 16.2.2, the complementary text proposed in the draft CR above.  2) In TS 36.331, in the Information Element “*inbandCarrierInfo*” we need to add *nrs-CRS-PowerOffset* for non-anchor because is currently missing. |
| Lenovo, MotoM |  | We believe this issue needs further discussion. I don’t think we need to add “*nrs-CRS-PowerOffset*” to “*inbandCarrierInfo*” for inband+inband deployment to avoid the configuration contradiction/[redundancy](http://www.baidu.com/link?url=SJwiz8TLIynRArCkGUN1H0ZEY0RTJsqkSNXtZHIZ_V67RjMxFtfAyqYdGVQZ8hTTuuPx1w9PWq9Y3urMVl5N2bVM12RFxzxDrm4-zRzhNR3).  But if the deployment is guardband (anchor carrier) + inband case, it seems we need this parameter to derive the CRS power (optionally configured). Only for case *inbandCarrierInfo🡪* *samePCI-r13*  inbandCarrierInfo-r13 SEQUENCE  {  samePCI-Indicator-r13 CHOICE  {  samePCI-r13 SEQUENCE  {  indexToMidPRB-r13 INTEGER (-55..54)  },  differentPCI-r13 SEQUENCE  {  eutra-NumCRS-Ports-r13 ENUMERATED {same, four}  }  } OPTIONAL, -- Cond anchor-guardband-or-standalone  eutraControlRegionSize-r13 ENUMERATED {n1, n2, n3}  } |

### 2.1.2 Rel-13: TS 36.213, clause 16.4.1.4 NPDSCH starting position

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| -------------------------------------------------- Text Start -----------------------------------------------------16.4.1.4 NPDSCH starting position The starting OFDM symbol for NPDSCH is given by index  in the first slot in a subframe  and is determined as follows  - if subframe  is a subframe used for receiving SIB1-NB  - if the value of the higher layer parameter *operationModeInfo* is set to ‚00‘ or ‚01‘, and when the higher layer parameter *inbandCarrierInfo* is present  - otherwise  - else  - is given by the higher layer parameter *eutraControlRegionSize* if the value of the higher layer parameter *eutraControlRegionSize* is present  - otherwise  ------------------------------------------------------- Text End ------------------------------------------------------------ |

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| **Company** | **OK with incorporating *inbandCarrierInfo* in TS 36.213 clause 16.4.1.4?** | **Comments** |
| Lenovo,MotoM | See comments | If we want to specify the data start index for anchor carrier and non-anchor carrier separately, the logic AND is not correct. How about the following CR  if the value of the higher layer parameter *operationModeInfo* is set to ‚00‘ or ‚01‘ for carrier on which NPSS/NSSS/NPBCH are detected  if the value of the higher layer parameter *inbandCarrierInfo-r13* indicates ‚*samePCI-Indicator-r13*‘ for a higher layer configured carrier if any |
| Qualcomm |  | Probably the *and* should be *or*. We are not sure of the text from Lenovo, since even for in-band same PCI we should start in the 3rd symbol. Probably a text as follows would work:  if the value of the higher layer parameter *operationModeInfo* is set to ‚00‘ or ‚01‘ for carrier on which NPSS/NSSS/NPBCH are detected  if the value of the higher layer parameter *inbandCarrierInfo-r13* is configured for a higher layer configured carrier if any |
| Huawei, HiSilicon | Not OK | This is for SIB1 transmission, which should be in anchor carrier, therefore, the change is not needed.  if subframe  is a subframe used for receiving SIB1-NB |
| ZTE, Sanechips | N | From our understanding, the description, “if subframe is a subframe used for receiving SIB1-NB”, is used for anchor carrier. Therefore, this text proposal is not needed. |
| Ericsson | See comment | Thanks also for the interesting discussion, and for the wording proposals. Perhaps an impact on this clause can be avoided if we can have as a common view that the non-anchor carrier case can be covered by the “else” statement as to obtain from *eutraControlRegionSize* (which actually includes the value of 3). |
| Nokia, NSB |  | Share similar view as Huawei and ZTE |
| Leonvo, MotoM |  | Assuming the guardband (anchor carrier) + inband deployment   * UE will receive the SIB1 with  in anchor carrier * if UE is configured with non-anchor carrier, UE will switch to non-anchor carrier in connected mode to receive PDSCH with  given by the higher layer parameter *eutraControlRegionSize in inbandCarrierInfo-r13* * however, if UE is in idle mode, UE will switch back to anchor carrier to receive paging message with=0 (this is not used for receiving SIB1-NB)   so we should separately define the  for anchor carrier and non-anchor carrier. |

### 2.1.3 Rel-13: TS 36.213, clause 16.4.1.5.1 Transport blocks not mapped for *SystemInformationBlockType1-NB*

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| -------------------------------------------------- Text Start ----------------------------------------------------- 16.4.1.5.1 Transport blocks not mapped for *SystemInformationBlockType1-NB*  The TBS is given by the (,) entry of Table 16.4.1.5.1-1. For the value of the higher layer parameter *operationModeInfo* set to ‚00‘ or ‚01‘, and when the higher layer parameter *inbandCarrierInfo* is present, .  **Table 16.4.1.5.1-1: Transport block size (TBS) table.**   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  | | | | | | | | | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | | 0 | 16 | 32 | 56 | 88 | 120 | 152 | 208 | 256 | | 1 | 24 | 56 | 88 | 144 | 176 | 208 | 256 | 344 | | 2 | 32 | 72 | 144 | 176 | 208 | 256 | 328 | 424 | | 3 | 40 | 104 | 176 | 208 | 256 | 328 | 440 | 568 | | 4 | 56 | 120 | 208 | 256 | 328 | 408 | 552 | 680 | | 5 | 72 | 144 | 224 | 328 | 424 | 504 | 680 |  | | 6 | 88 | 176 | 256 | 392 | 504 | 600 |  |  | | 7 | 104 | 224 | 328 | 472 | 584 | 680 |  |  | | 8 | 120 | 256 | 392 | 536 | 680 |  |  |  | | 9 | 136 | 296 | 456 | 616 |  |  |  |  | | 10 | 144 | 328 | 504 | 680 |  |  |  |  | | 11 | 176 | 376 | 584 |  |  |  |  |  | | 12 | 208 | 440 | 680 |  |  |  |  |  |   -------------------------------------------------------- Text end ----------------------------------------------------------- |

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| **Company** | **OK with incorporating *inbandCarrierInfo* in TS 36.213 clause 16.4.1.5.1?** | **Comments** |
| Lenovo,MotoM |  | See above comments |
| Qualcomm |  | Same comment as previous question |
| Huawei, HiSilicon | **See comments** | This is a constriction for eNB scheduler, which can be up to implementation. Without the change, it’s not an issue for the network. As Rel-13 has been there for years, the change may result in issues on compability. |
| ZTE, Sanechips |  | The change is kind of clarification and the following modification is more clearer  The TBS is given by the (,) entry of Table 16.4.1.5.1-1. For the value of the higher layer parameter *operationModeInfo* set to ‚00‘ or ‚01‘, or the higher layer parameter *inbandCarrierInfo* is present, . |
| Ericsson | OK + see comment | We can work out the wording if needed. I just want to explain that the reason why we used “, and” is that there are two variants for the description of the parameter “*inbandCarrierInfo*”, the first one introduced in Rel-13 is as follows, for which I believe the “and” seems to be needed as to cover the anchor carrier case and the non-anchor carrier case.  *DL-CarrierConfigCommon-NB In SIB22:*   |  | | --- | | ***inbandCarrierInfo***  Provides the configuration of a non-anchor inband carrier. |   Thereafter the following was introduced touching upon the parameter “*inbandCarrierInfo*”, for which it seems that “or” can be used (since the description cites the “*operationModeInfo*”).  *CarrierConfigDedicated-NB**in msg4*   |  | | --- | | ***inbandCarrierInfo***  Provides the configuration of the anchor/ non-anchor inband carrier. If *operationModeInfo* is set to standalone in the MIB-NB, E-UTRAN only configures this field if the UE supports mixed operation mode. |   We tend to think that if we use “or”, then the description in “*DL-CarrierConfigCommon-NB In SIB22*” would be left aside, since to use “or” it would have at least cite in its description the “*operationModeInfo*”as it happens in “*CarrierConfigDedicated-NB in msg4*” but it doesn’t include it, hence to me “, and” should be used (the comma sign “,” is important) along with the legacy text as to cover both the “DL-CarrierConfigCommon-NB In SIB22” and the “CarrierConfigDedicated-NB in msg4” cases. |
| Nokia, NSB |  | In our view, “or” seems clearer than “and” |
| Lenovo, MotoM |  | In order to make the spec cleaner, we are OK to simply update “and” to “or” from E/// TP. It seems there is no misunderstanding for anchor and non-anchor carrier. |

### 2.1.4 Rel-13: TS 36.213, clause 16.8 UE procedure for acquiring cell-specific reference signal sequence and raster offset

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| -------------------------------------------------- Text Start -----------------------------------------------------16.8 UE procedure for acquiring cell-specific reference signal sequence and raster offset If the higher layer parameter *operationModeInfo* indicates *inband-SamePCI*, and when the higher layer parameter *inbandCarrierInfo* is present for a cell, the UE may derive cell-specific reference signal sequence and raster offset from the higher layer parameter *eutra-CRS-SequenceInfo* according to Table 16.8-1, where E-UTRA PRB index  is defined as .  -------------------------------------------------------- Text end ----------------------------------------------------------- |

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| **Company** | **OK with incorporating *inbandCarrierInfo* in TS 36.213 clause 16.8?** | **Comments** |
| Lenovo,MotoM |  | See above comments |
| Qualcomm |  | Same as above. |
| Huawei, HiSilicon | **See comments** | This section in spec is for the derivation of PRB index and raster offset for anchor carrier. However, for non-anchor carrier, the PRB index is given by the IE *indexToMidPRB-r13,* no need to use the tabel derive it.  And the frequency carrier for a non-anchor carrier is directly given by the following IE, so the raster offset is not needed.  CarrierFreq-NB-r13 ::= SEQUENCE {  carrierFreq-r13 ARFCN-ValueEUTRA-r9,  carrierFreqOffset-r13 ENUMERATED {  v-10, v-9, v-8, v-7, v-6, v-5, v-4, v-3, v-2, v-1, v-0dot5,  v0, v1, v2, v3, v4, v5, v6, v7, v8, v9  } OPTIONAL -- Need ON  } |
| ZTE, Sanechips |  | We agree the comment from Huawei. |
| Ericsson | OK + see comment | We believe an update is needed for the mix mode anchor GB/SA + non-anchor IB case. We can work out the wording if needed, see previous comment. |
| Lenovo, MotoM |  | We are OK to simply update “and” to “or” and this only adopted to samePCI case.  inbandCarrierInfo-r13 SEQUENCE  {  samePCI-Indicator-r13 CHOICE  {  samePCI-r13 SEQUENCE  {  indexToMidPRB-r13 INTEGER (-55..54)  },  differentPCI-r13 SEQUENCE  {  eutra-NumCRS-Ports-r13 ENUMERATED {same, four}  }  } OPTIONAL, -- Cond anchor-guardband-or-standalone  eutraControlRegionSize-r13 ENUMERATED {n1, n2, n3}  } |

## 2.2 Listing of unaffected clauses by not including the higher layer parameter “*inbandCarrierInfo*”

### 2.2.1 Rel-13: TS 36.213, clause 16.1.1: Cell search

According with [1], for clause 16.1.1, the cell search does not need a change to include the higher layer parameter “*inbandCarrierInfo*” as the cell search is only used on the anchor carrier. Thus, the use of the higher layer parameter “*operationModeInfo*” in clause 16.1.1 is sufficient.

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| 16.1.1 Cell search Cell search is the procedure by which a UE acquires time and frequency synchronization with a cell and detects the narrowband physical layer Cell ID.  If the higher layer parameter *operationModeInfo* indicates '*inband-SamePCI*' or *samePCI-Indicator* indicates '*samePCI*'' for a cell, the UE may assume that the physical layer cell ID is same as the narrowband physical layer cell ID for the cell.  The following signals are transmitted in the downlink to facilitate cell search for Narrowband IoT: the narrowband primary and narrowband secondary synchronization signals.  A UE may assume the antenna ports 2000 – 2001 and the antenna port for the narrowband primary/secondary synchronization signals of a serving cell are quasi co-located (as defined in [3]) with respect to Doppler shift and average delay. |

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| **Company** | **OK with no incorporating *inbandCarrierInfo* in TS 36.213 clause 16.1.1?** | **Comments** |
| Lenovo,MotoM | OK |  |
| Ericsson | OK |  |

### 2.2.1 Rel-14: TS 36.213, clause 16.4: Narrowband physical downlink shared channel related procedures

According with [1], for clause 16.4 introduced in Rel-14 [3], the higher layer parameter “*inbandCarrierInfo*” would need to be added if the third bullet in clause 16.4 were not present. Nonetheless, the higher layer parameter “*downlinkBitmapNonAnchor*” is not an optional field (i.e., it will always be present) which covers the non-anchor carrier case making the inclusion of the higher layer parameter “*inbandCarrierInfo*” in the second bullet of clause 16.4 unnecessary.

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| 16.4 Narrowband physical downlink shared channel related procedures A NB-IoT UE shall assume a subframe as a NB-IoT DL subframe if  - the UE determines that the subframe does not contain NPSS/NSSS/NPBCH/ *SystemInformationBlockType1-NB* transmission, and  - for a NB-IoT carrier that a UE receives higher layer parameter *operationModeInfo,* the subframe is configured as NB-IoT DL subframe after the UE has obtained *SystemInformationBlockType1-NB*.  - the subframe is configured as NB-IoT DL subframe by the higher layer parameter *downlinkBitmapNonAnchor*.  For a NB-IoT UE that supports *twoHARQ-Processes-r14*, there shall be a maximum of 2 downlink HARQ processes. |

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| **Company** | **OK with no incorporating *inbandCarrierInfo* in TS 36.213 clause 16.4?** | **Comments** |
| Lenovo,MotoM | OK |  |
| Ericsson | OK |  |

# 5 References

1. [R1-2108120](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_106-e/Docs/R1-2108120.zip), “Deployment Mode Indicator for anchor and non-anchor carriers,” Ericsson, e-Meeting, August 16th – 27th, 2021.
2. [TS 36.213](https://www.3gpp.org/ftp/Specs/archive/36_series/36.213/36213-eg0.zip), Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures, v13.16.0.
3. [TS 36.213](https://www.3gpp.org/ftp/Specs/archive/36_series/36.213/36213-eg0.zip), Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures, v14.16.0.