3GPP TSG-RAN WG2 Meeting #127bis R2-240xxxx

Hefei, China, 14th – 29th October, 2024

**Agenda item: 7.25.1**

**Source: ZTE**

**Title: Report of [AT127bis][11][less5MHz] 331 CR (ZTE)**

**WID/SID: NR\_FR1\_lessthan\_5MHz\_BW-Core**

**Document for: Discussion and Decision**

# Introduction

This is the report for the following offline:

* [AT127bis][11][less5MHz] 331 CR (ZTE)

**Intended outcome: discuss option 1 vs. option 2. Review and agree to CR by email**

**Deadline: 10-17-24**

# Background

[R2-2408399](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_127b\Docs\R2-2408399.zip) Consideration on Supporting 3M Channel Bandwidth ZTE Corporation discussion Rel-18 NR\_FR1\_lessthan\_5MHz\_BW-Core

* Option 1: Only consider the single CC case and add the exceptional description to Note of the field description of the channelBWs-DL/UL;*

* Option 2: Introduce new per FSPC level capability or extend the supportedMinBandwidthDL/UL to include 3M.*

- Samsung and Qualcomm would prefer option 2, but since it is not agreable we can go with option 1. Tmobile thinks that option 2 is the way to go and it should be done in a clean way.

- Samsung and ZTE are a bit concerned as we don’t know what RAN4 is going to agree so it is risky to go with option 2.

* Noted

[R2-2408400](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_127b\Docs\R2-2408400.zip) Clarification on the Channel Bandwidth for the 3M ZTE Corporation CR Rel-18 38.306 18.3.0 1169 - F NR\_FR1\_lessthan\_5MHz\_BW-Core

- Ericsson thinks that this makes some sense and we made the wrong decision for Rel-18 so we have to be careful for R19,

* Continue in offline discussion
* [AT127bis][11][less5MHz] 331 CR (ZTE)

Intended outcome: discuss option 1 vs. option 2. Review and agree to CR by email

Deadline: 10-17-24

In the current spec, the less than 5M capabilities would be reported by the below 2 elements for both the symmetric and asymmetric case.

| ***support3MHz-ChannelBW-Asymmetric-r18***  Indicates whether the UE supports 3 MHz channel bandwidth in uplink with larger than 3 MHz channel BW in DL, including short RACH preamble formats with 15kHz SCS, and long PRACH formats with 1.25kHz SCS.  This feature is supported for 15kHz SCS only. It is applicable only to single-carrier operation and applies to bands where the UE indicates support for *asymmetricBandwidthCombinationSet* with 3 MHz UL according to clause 5.3.6 of TS 38.101-1 [2].  This feature is not applicable to UEs indicating *supportOfRedCap-r17* or *supportOfERedCap-r18*.  NOTE 1: The UE supporting this feature supports configuration of 15 PRB UL BWP operation.  NOTE 2: If the UE indicates support in *asymmetricBandwidthCombinationSet* for a 3MHz UL in a band according to clause 5.3.6 of 38.101-1 [2], this feature shall be indicated for the band. | Band | No | FDD only | FR1 only |
| --- | --- | --- | --- | --- |
| ***support3MHz-ChannelBW-Symmetric-r18***  Indicates whether the UE supports 3 MHz symmetric channel bandwidth in DL and UL, including the following functional components:  *-* Reception of 12 PRB PBCH based on RB-level puncturing;  *-* Short RACH preamble formats with 15kHz SCS, and long PRACH formats with 1.25kHz SCS;  *-* Reception of 15 PRB CORESET0.  This feature is supported for 15kHz SCS only. It is applicable only to single-carrier operation and when an associated SS/PBCH block is located according to Table 5.4.3.3-2 in TS 38.101-1 [2].  This feature is not applicable to UEs indicating *supportOfRedCap-r17* or *supportOfERedCap-r18*.  NOTE: The UE supporting this capability supports configuration of 15 PRB BWP operation in DL and UL. | Band | No | FDD only | FR1 only |

For the bandwidth (other than less than 5M) determination, in the current spec, the NW would refer to the per FSPC capability (e.g *supportedBandwidthDL/UL), per band capability (e.g. channelBWs-DL/UL), and per BC capability (e.g. supportedBandwidthCombinationSet)* as in the Annex*.*

# Discussions

## Option 1 vs Option 2

In this discussion chapter, we’d like to give the spec impact on the option 1 and option 2:

* Option 1: Only consider the single CC case and add the exceptional description to Note of the field description of the channelBWs-DL/UL;
* Option 2: Introduce new per FSPC level capability or extend the supportedMinBandwidthDL/UL to include 3M.

For the option 1, the impact has been included in the corresponding CR [1], only add one sentence clarificaition to the *channelBWs-DL/UL.*Then the drawback is that it would have no farward compatibility for the R19 CA case. According to the feedback from the companies, more companies show preference for the option 2, so we’d like to discuss some detail issues for the option 2 first.

For the option 2, there would be 3 issues to be discussed:

**Issue 1: How to indicate supporting 3M with the FSPC level?**

In the current spec, there are 2 methods to add new FSPC level capability:

* Method 1: Extend the *supportedBandwidthDL/UL*
* Method 2: Add an indication for a 3M bandwidth (e.g. similar to the channelBW-90mhz)

The problem for the method 1 is that the current *supportedBandwidthDL/UL*is used to indicate the maximum bandwidth, then for a CC, if the UE supported maximum bandwidth is larger than the 3M, the UE will not report 3M with *supportedBandwidthDL/UL*, at last whether it supports the 3M would still be determined by the per band capabilities.

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| --- |
| ***supportedBandwidthUL, supportedBandwidthUL-v1710, supportedBandwidthUL-v1780***  Indicates maximum UL channel bandwidth supported for a given SCS that UE supports within a single CC (and in case of DAPS handover for the source or target cell), which is defined in Table 5.3.5-1 in TS 38.101-1 [2] for FR1 and Table 5.3.5-1 in TS 38.101-2 [3] for FR2.  For FR1, all the bandwidths listed in TS 38.101-1 [2], Table 5.3.5-1 for each band shall be mandatory with a single CC unless indicated optional. |

The method 1 would only work for the case that the supported maximum bandwidth is 3M, however according to the latest 38101-1(Table 5.3.5-1), except band n106, the other bands that support 3M can also support some other larger change bandwidth.

To solve this issue, if we intends to go to the per FSPC level reporting, the method 2 can be considered.

**Proposal 1: If we go to the Option 2, to support FSPC level reporting for the 3M, do you agree that to go with the method 2 (i.e. Add an indication for a 3M bandwidth (e.g. similar to the channelBW-90mhz))**

**Q1: Do you support the Proposal 1?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Support p1 (Yes/No/See comment)** | **Comment (potential clarifications etc... )** |
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**Issue 2: Whether to indicate the 3M in the channelBWs-DL/UL.**

If the method 2 (i.e. Add an indication for a 3M bandwidth (e.g. similar to the channelBW-90mhz)) was agreed, do you agree that there is no need to indicate the 3M in the channelBWs-DL/UL as the 90M has done?

**Q2: If the method 2 was agreed, do you agree that there is no need to indicate the 3M in the channelBWs-DL/UL as the 90M has done?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comment (potential clarifications etc... )** |
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**Issue 3: Whether to dummy the *support3MHz-ChannelBW-Asymmetric-r18/ support3MHz-ChannelBW-Symmetric-r18?***

Considering that these two new capabilities includes more information besides the bandwidth, then we may need to copy related description to somewhere (e.g. the newly added per FSPC capability)*,* and we need different description for the symmetric and asymmetric cases, which is quite complex.

| ***support3MHz-ChannelBW-Asymmetric-r18***  Indicates whether the UE supports 3 MHz channel bandwidth in uplink with larger than 3 MHz channel BW in DL, including short RACH preamble formats with 15kHz SCS, and long PRACH formats with 1.25kHz SCS.  This feature is supported for 15kHz SCS only. It is applicable only to single-carrier operation and applies to bands where the UE indicates support for *asymmetricBandwidthCombinationSet* with 3 MHz UL according to clause 5.3.6 of TS 38.101-1 [2].  This feature is not applicable to UEs indicating *supportOfRedCap-r17* or *supportOfERedCap-r18*.  NOTE 1: The UE supporting this feature supports configuration of 15 PRB UL BWP operation.  NOTE 2: If the UE indicates support in *asymmetricBandwidthCombinationSet* for a 3MHz UL in a band according to clause 5.3.6 of 38.101-1 [2], this feature shall be indicated for the band. | Band | No | FDD only | FR1 only |
| --- | --- | --- | --- | --- |
| *support3MHz-ChannelBW-Symmetric-r18*  Indicates whether the UE supports 3 MHz symmetric channel bandwidth in DL and UL, including the following functional components:  *-* Reception of 12 PRB PBCH based on RB-level puncturing;  *-* Short RACH preamble formats with 15kHz SCS, and long PRACH formats with 1.25kHz SCS;  *-* Reception of 15 PRB CORESET0.  This feature is supported for 15kHz SCS only. It is applicable only to single-carrier operation and when an associated SS/PBCH block is located according to Table 5.4.3.3-2 in TS 38.101-1 [2].  This feature is not applicable to UEs indicating *supportOfRedCap-r17* or *supportOfERedCap-r18*.  NOTE: The UE supporting this capability supports configuration of 15 PRB BWP operation in DL and UL. | Band | No | FDD only | FR1 only |

**Q3: If the method 2 (i.e. Add an indication for a 3M bandwidth (e.g. similar to the channelBW-90mhz)) was agreed, do you agree to dummy the *support3MHz-ChannelBW-Asymmetric-r18/ support3MHz-ChannelBW-Symmetric-r18*? If agree, whether and where to specify the related information (i.e. the information other than the bandwidth info in the current field description of the *support3MHz-ChannelBW-Asymmetric-r18/ support3MHz-ChannelBW-Symmetric-r18)?***

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| **Company** | **Dummy or not** | **Comment (potential clarifications etc... )** |
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Let’s have a F2F discussion this afternoon, at the coffee break 4:30~5:00 of the main room.

# Conclusion

In this discussion, we have the following outcomes:

**Proposal 1: ...**

**Proposal 2: ...**

# Reference

[1] [R2-2408400](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_127b\Docs\R2-2408400.zip) Clarification on the Channel Bandwidth for the 3M ZTE Corporation CR Rel-18 38.306 18.3.0 1169 - F NR\_FR1\_lessthan\_5MHz\_BW-Core

# Annex

* ***Per FSPC level***

| ***supportedBandwidthDL, supportedBandwidthDL-v1710, supportedBandwidthDL-v1780***  Indicates maximum DL channel bandwidth supported for a given SCS that UE supports within a single CC (and in case of DAPS handover for the source or target cell), which is defined in Table 5.3.5-1 in TS 38.101-1 [2] for FR1 and Table 5.3.5-1 in TS 38.101-2 [3] for FR2.  For FR1, all the bandwidths listed in TS 38.101-1 [2], Table 5.3.5-1 for each band shall be mandatory with a single CC unless indicated optional. For FR2, the set of mandatory CBW is 50, 100, 200 MHz. When this field is included in a band combination with a single band entry and a single CC entry (i.e. non-CA band combination), the UE shall indicate the maximum channel bandwidth for the band according to TS 38.101-1 [2] and TS 38.101-2 [3].For FR2, *supportedBandwidthDL-v1710* is included if the maximum DL channel bandwidth supported by the UE within a single CC is greater than 400MHz. When the *supportedBandwidthDL* and the *supportedBandwidthDL-v1710* are reported together for a CC, the network which is able to decode the *supportedBandwidthDL-v1710* ignores the *supportedBandwidthDL*.  The UE may report a *supportedBandwidthDL* wider than the *channelBWs-DL*; this *supportedBandwidthDL* may not be included in the Table 5.3.5-1 of TS 38.101-1 [2]/TS 38.101-2[3] for the case that the UE is unable to report the actual supported bandwidth according to the Table 5.3.5-1 of TS 38.101-1 [2]/TS 38.101-2 [3]. For each band, (e)RedCap UEs shall indicate its maximum channel bandwidth, which is the maximum of those channel bandwidths that are less than or equal to 20 MHz for FR1 and less than or equal to 100 Mhz for FR2, taking restrictions in TS 38.101-1 [2] and TS 38.101-2 [3] into consideration.  The *supportedBandwidthDL-v1780* is only applicable to Bandwidth Combination Set 5 (BCS5) of FR1 NR CA (including NR CA part of (NG)EN-DC and NE-DC) and FR1 NR-DC. If the UE reports *supportedAggBW-FR1-r17*, the UE shall report *supportedBandwidthDL-v1780*.  NOTE: See the note in the field decription of *channelBWs-DL* for the determination of supported DL channel bandwidth. | FSPC | CY | N/A | N/A |
| --- | --- | --- | --- | --- |

| ***supportedBandwidthUL, supportedBandwidthUL-v1710, supportedBandwidthUL-v1780***  Indicates maximum UL channel bandwidth supported for a given SCS that UE supports within a single CC (and in case of DAPS handover for the source or target cell), which is defined in Table 5.3.5-1 in TS 38.101-1 [2] for FR1 and Table 5.3.5-1 in TS 38.101-2 [3] for FR2.  For FR1, all the bandwidths listed in TS 38.101-1 [2], Table 5.3.5-1 for each band shall be mandatory with a single CC unless indicated optional. For FR2, the set of mandatory CBW is 50, 100, 200 MHz. When this field is included in a band combination with a single band entry and a single CC entry (i.e. non-CA band combination), the UE shall indicate the maximum channel bandwidth for the band according to TS 38.101-1 [2] and TS 38.101-2 [3].For FR2, *supportedBandwidthUL-v1710* is included if the maximum UL channel bandwidth supported by the UE within a single CC is greater than 400MHz. When the *supportedBandwidthUL* and the *supportedBandwidthUL-v1710* are reported together for a CC, the network which is able to decode the *supportedBandwidthUL-v1710* ignores the *supportedBandwidthUL*.  The UE may report a *supportedBandwidthUL* wider than the *channelBWs-UL*; this *supportedBandwidthUL* may not be included in the Table 5.3.5-1 of TS 38.101-1 [2]/TS 38.101-2 [3] for the case that the UE is unable to report the actual supported bandwidth according to the Table 5.3.5-1 of TS 38.101-1 [2]/TS 38.101-2 [3]. For each band, (e)RedCap UEs shall indicate its maximum channel bandwidth, which is the maximum of those channel bandwidths that are less than or equal to 20 MHz for FR1 and less than or equal to 100 Mhz for FR2, taking restrictions in TS 38.101-1 [2] and TS 38.101-2 [3] into consideration.  The *supportedBandwidthUL-v1780* is only applicable to Bandwidth Combination Set 5 (BCS5) of FR1 NR CA (including NR CA part of (NG)EN-DC and NE-DC) and FR1 NR-DC. If the UE reports *supportedAggBW-FR1-r17*, the UE shall report *supportedBandwidthUL-v1780*.  NOTE: See the note in the field decription of *channelBWs-UL* for the determination of supported UL channel bandwidth. | FSPC | CY | N/A | N/A |
| --- | --- | --- | --- | --- |

* ***Per BC level***

| ***supportedBandwidthCombinationSet***  Defines the supported bandwidth combination set for a band combination as defined in TS 38.101-1 [2], TS 38.101-2 [3] and TS 38.101-3 [4]. For NR SA CA, NR-DC, inter-band (NG)EN-DC without intra-band (NG)EN-DC component, inter-band NE-DC without intra-band NE-DC component and intra-band (NG)EN-DC/NE-DC with additional inter-band NR CA component, the field defines the bandwidth combinations for the NR part of the band combination. For intra-band (NG)EN-DC/NE-DC without additional inter-band NR and LTE CA component, the field indicates the supported bandwidth combination set applicable to intra-band (NG)EN-DC/NE-DC band combination. This field is not applicable to source and target cells in intra-frequency DAPS handover.  Field encoded as a bit map, where bit N is set to "1" if UE supports Bandwidth Combination Set N for this band combination as defined in the TS 38.101-1 [2], TS 38.101-2 [3] and TS 38.101-3 [4]. The leading / leftmost bit (bit 0) corresponds to the Bandwidth Combination Set 0, the next bit corresponds to the Bandwidth Combination Set 1 and so on. It is mandatory if  - the band combination has more than one NR carrier (at least one SCell in an NR cell group);  - or is an intra-band (NG)EN-DC/NE-DC combination without additional inter-band NR and LTE CA component;  - or both.  The corresponding bits of Bandwidth Combination Set 4 and Bandwidth Combination Set 5 shall not both be set to "1" for the same band combination. | BC | CY | N/A | N/A |
| --- | --- | --- | --- | --- |

* ***Per Band level***

| ***channelBWs-DL***  Indicates for each subcarrier spacing the UE supported channel bandwidths. Absence of the *channelBWs-DL* (without suffix) for a band or absence of specific scs-XXkHz entry for a supported subcarrier spacing means that the UE supports the channel bandwidths among [5, 10, 15, 20, 25, 30, 40, 50, 60, 80, 100] and [50, 100, 200] that were defined in clause 5.3.5 of TS 38.101-1 version 15.7.0 [2] and TS 38.101-2 version 15.7.0 [3] for the given band or the specific SCS entry. For IAB-MT, to determine whether the IAB-MT supports a channel bandwidth of 100 MHz, the network checks c*hannelBW-DL-IAB-r16*. For NCR-MT, to determine whether the NCR-MT supports a channel bandwidth of 100 MHz, the network checks c*hannelBW-DL-NCR-r18*.  For FR1, the bits in *channelBWs-DL* (without suffix) starting from the leading / leftmost bit indicate 5, 10, 15, 20, 25, 30, 40, 50, 60 and 80MHz. For FR2, the bits in *channelBWs-DL* (without suffix) starting from the leading / leftmost bit indicate 50, 100 and 200MHz. The third / rightmost bit (for 200MHz) shall be set to 1. For IAB-MT and NCR-MT, the third / rightmost bit (for 200MHz) is ignored. To determine whether the IAB-MT supports a channel bandwidth of 200 MHz, the network checks *channelBW-DL-IAB-r16*. To determine whether the NCR-MT supports a channel bandwidth of 200 MHz, the network checks c*hannelBW-DL-NCR-r18*.  For FR1, the leading/leftmost bit in *channelBWs-DL-v1590* indicates 70MHz, the second leftmost bit indicates 45MHz, the third leftmost bit indicates 35MHz, the fourth leftmost bit indicates 100MHz and all the remaining bits in *channelBWs-DL-v1590* shall be set to 0. The fourth leftmost bit (for 100MHz) is not applicable for bands n41, n48, n77, n78, n79 and n90 as defined in TS 38.101-1 [2]. For each band, (e)RedCap UEs shall indicate supporting the maximum of those channel bandwidths that are less than or equal to 20 MHz for FR1 and less than or equal to 100 Mhz for FR2, taking restrictions in TS 38.101-1 [2] and TS 38.101-2 [3] into consideration. For each band, NTN capable UEs shall indicate the supported channel bandwidths for FR1, taking restrictions in TS 38.101-5 [34] into consideration.  This feature is applicable only for FR1 and FR2-1 band, otherwise it is absent.  NOTE: To determine whether the UE supports a specific SCS for a given band, the network validates the *supportedSubCarrierSpacingDL* and the *scs-60kHz*. To determine whether the UE supports a channel bandwidth of 90 MHz for the band combination with other bandwidth combination set than BCS5, the network may ignore this capability and validate instead the *channelBW-90mhz*, the *supportedBandwidthCombinationSet*, the *supportedBandwidthCombinationSetIntraENDC*, and *supportedBandwidthCombinationSetIntraENDC-v1790*. To determine whether the UE supports a channel bandwidth of 90 MHz for the band combination with BCS5, the network may ignore this capability and validate instead the *channelBW-90mhz*, the *supportedBandwidthCombinationSet*, the *supportedBandwidthCombinationSetIntraENDC*, *supportedAggBW-FR1-r17*, and *supportedBandwidthCombinationSetIntraENDC-v1790*. To determine whether the UE supports a channel bandwidth of 400 MHz, the network may ignore this capability and validate the *supportedBandwidthCombinationSet*, the *supportedBandwidthCombinationSetIntraENDC*, the *supportedBandwidthDL*, and *supportedBandwidthCombinationSetIntraENDC-v1790*. For serving cell(s) with other channel bandwidths:  - If *supportedAggBW-FR1-r17* is reported, the network validates the *channelBWs-DL*, the *supportedBandwidthCombinationSet*, the *supportedBandwidthCombinationSetIntraENDC*, the *asymmetricBandwidthCombinationSet* (for a band supporting asymmetric channel bandwidth as defined in clause 5.3.6 of TS 38.101-1 [2]), *supportedBandwidthDL-v1780*, *supportedMinBandwidthDL*, *supportedAggBW-FR1-r17*, and *supportedBandwidthCombinationSetIntraENDC-v1790.*  - Otherwise, the network validates the *channelBWs-DL*, the *supportedBandwidthCombinationSet*, the *supportedBandwidthCombinationSetIntraENDC*, the *asymmetricBandwidthCombinationSet* (for a band supporting asymmetric channel bandwidth as defined in clause 5.3.6 of TS 38.101-1 [2]), *supportedBandwidthDL/supportedBandwidthDL-v1710,* *supportedMinBandwidthDL*, *supportedAggBW-FR2-r17*, and *supportedBandwidthCombinationSetIntraENDC-v1790.* | Band | Yes | N/A | N/A |
| --- | --- | --- | --- | --- |

Table 5.3.5-1 Channel bandwidths for each NR band (38101-1)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band | SCS (kHz) | UE Channel bandwidth (MHz) | | | | | | | | | | | | | | | |
| 3 | **5** | **10** | **15** | **20** | **25** | **30** | **35** | **40** | **45** | **50** | **60** | **70** | **80** | **90** | **100** |
| n1 | 15 |  | 5 | 10 | 15 | 20 | 25 | 30 |  | 40 | 45 | 50 |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 | 45 | 50 |  |  |  |  |  |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 | 45 | 50 |  |  |  |  |  |
| n2 | 15 |  | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 |  |  |  |  |  |  |  |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 |  |  |  |  |  |  |  |
| n3 | 15 |  | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |  |  |  |  |  |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |  |  |  |  |  |
| n5 | 15 |  | 5 | 10 | 15 | 20 | 253 |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 253 |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n7 | 15 |  | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |  | 50 |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 |  | 50 |  |  |  |  |  |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 |  | 50 |  |  |  |  |  |
| n8 | 15 |  | 5 | 10 | 15 | 20 | 253 | 303 | 353 |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 253 | 303 | 353 |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n12 | 15 |  | 5 | 10 | 15 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n13 | 15 |  | 5 | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n1410 | 15 |  | 5 | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n18 | 15 |  | 5 | 10 | 15 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n20 | 15 |  | 5 | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n24 | 15 |  | 5 | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n25 | 15 |  | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 453 |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 453 |  |  |  |  |  |  |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 453 |  |  |  |  |  |  |
| n26 | 15 | 34 | 5 | 10 | 15 | 20 | 253 | 303 |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 253 | 303 |  |  |  |  |  |  |  |  |  |
| n28 | 15 | 34 | 5 | 10 | 15 | 207 | 257 | 307 |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 207 | 257 | 307 |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n29 | 15 |  | 5 | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n30 | 15 |  | 5 | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n31 | 15 | 3 | 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n34 | 15 |  | 5 | 10 | 15 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  | 10 | 15 |  |  |  |  |  |  |  |  |  |  |  |  |
| n3810 | 15 |  | 5 | 10 | 15 | 20 | 25 | 30 |  | 40 |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 |  |  |  |  |  |  |  |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 |  |  |  |  |  |  |  |
| n39 | 15 |  | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 |  |  |  |  |  |  |  |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 |  |  |  |  |  |  |  |
| n40 | 15 |  | 55 | 10 | 15 | 20 | 25 | 30 |  | 40 |  | 50 |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 |  | 50 | 60 | 70 | 80 | 90 | 100 |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 |  | 50 | 60 | 70 | 80 | 90 | 100 |
| n41 | 15 |  | 54,11 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 | 90 | 100 |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 | 90 | 100 |
| n46 | 15 |  |  | 105 |  | 20 |  |  |  | 40 |  |  |  |  |  |  |  |
|  | 30 |  |  | 105 |  | 20 |  |  |  | 40 |  |  | 60 |  | 80 |  | 1004 |
|  | 60 |  |  | 105 |  | 20 |  |  |  | 40 |  |  | 60 |  | 80 |  | 1004 |
| n4710 | 15 |  |  | 10 |  | 20 |  | 30 |  | 40 |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 |  | 20 |  | 30 |  | 40 |  |  |  |  |  |  |  |
|  | 60 |  |  | 10 |  | 20 |  | 30 |  | 40 |  |  |  |  |  |  |  |
| n48 | 15 |  | 55 | 10 | 15 | 20 |  | 30 |  | 40 |  | 506 |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 |  | 30 |  | 40 |  | 506 | 606 | 706 | 806 | 906 | 1006 |
|  | 60 |  |  | 10 | 15 | 20 |  | 30 |  | 40 |  | 506 | 606 | 706 | 806 | 906 | 1006 |
| n50 | 15 |  | 55 | 10 | 15 | 20 |  | 30 |  | 40 |  | 50 |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 |  | 30 |  | 40 |  | 50 | 60 |  | 803 |  |  |
|  | 60 |  |  | 10 | 15 | 20 |  | 30 |  | 40 |  | 50 | 60 |  | 803 |  |  |
| n51 | 15 |  | 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n53 | 15 |  | 5 | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n54 | 15 |  | 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n65 | 15 |  | 5 | 10 | 15 | 20 |  |  |  |  |  | 50 |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 |  |  |  |  |  | 50 |  |  |  |  |  |
|  | 60 |  |  | 10 | 15 | 20 |  |  |  |  |  | 50 |  |  |  |  |  |
| n66 | 15 |  | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |  |  |  |  |  |  |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |  |  |  |  |  |  |
| n67 | 15 |  | 5 | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n70 | 15 |  | 5 | 10 | 15 | 203 | 253 |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 203 | 253 |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  | 10 | 15 | 203 | 253 |  |  |  |  |  |  |  |  |  |  |
| n71 | 15 |  | 5 | 10 | 15 | 20 | 2512 | 3012 | 3512 |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 2512 | 3012 | 3512 |  |  |  |  |  |  |  |  |
| n72 | 15 | 3 | 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n74 | 15 |  | 5 | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |  |  |
| n75 | 15 |  | 5 | 10 | 15 | 20 | 25 | 30 |  | 40 |  | 50 |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 |  | 50 |  |  |  |  |  |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 |  | 50 |  |  |  |  |  |
| n76 | 15 |  | 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n77 | 15 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 |  | 50 |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 |  | 50 | 60 | 70 | 80 | 90 | 100 |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 |  | 50 | 60 | 70 | 80 | 90 | 100 |
| n78 | 15 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 |  | 50 |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 |  | 50 | 60 | 70 | 80 | 90 | 100 |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 |  | 50 | 60 | 70 | 80 | 90 | 100 |
| n7910 | 15 |  |  | 10 |  | 20 |  | 30 |  | 40 |  | 50 |  |  |  |  |  |
|  | 30 |  |  | 10 |  | 20 |  | 30 |  | 40 |  | 50 | 60 | 704 | 80 | 90 | 100 |
|  | 60 |  |  | 10 |  | 20 |  | 30 |  | 40 |  | 50 | 60 | 704 | 80 | 90 | 100 |
| n80 | 15 |  | 5 | 10 | 15 | 20 | 25 | 30 |  | 40 |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 |  |  |  |  |  |  |  |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 |  |  |  |  |  |  |  |
| n81 | 15 |  | 5 | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n82 | 15 |  | 5 | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n83 | 15 |  | 5 | 10 | 15 | 207 | 257 | 307 |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 207 | 257 | 307 |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n84 | 15 |  | 5 | 10 | 15 | 20 | 25 | 30 |  | 40 |  | 50 |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 |  | 50 |  |  |  |  |  |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 |  | 50 |  |  |  |  |  |
| n85 | 15 | 34 | 5 | 10 | 15 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n86 | 15 |  | 5 | 10 | 15 | 20 |  |  |  | 40 |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 |  |  |  | 40 |  |  |  |  |  |  |  |
|  | 60 |  |  | 10 | 15 | 20 |  |  |  | 40 |  |  |  |  |  |  |  |
| n89 | 15 |  | 5 | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n90 | 15 |  | 54 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 | 90 | 100 |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 | 90 | 100 |
| n91 | 15 |  | 5 | 108 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n92 | 15 |  | 5 | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n93 | 15 |  | 5 | 108 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n94 | 15 |  | 5 | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n95 | 15 |  | 5 | 10 | 15 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  | 10 | 15 |  |  |  |  |  |  |  |  |  |  |  |  |
| n96 | 15 |  |  |  |  | 20 |  |  |  | 40 |  |  |  |  |  |  |  |
|  | 30 |  |  |  |  | 20 |  |  |  | 40 |  |  | 60 |  | 80 |  | 1004 |
|  | 60 |  |  |  |  | 20 |  |  |  | 40 |  |  | 60 |  | 80 |  | 1004 |
| n97 | 15 |  | 5 | 10 | 15 | 20 | 25 | 30 |  | 40 |  | 50 |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 |  | 50 | 60 | 70 | 80 | 90 | 100 |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 |  | 40 |  | 50 | 60 | 70 | 80 | 90 | 100 |
| n98 | 15 |  | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 |  |  |  |  |  |  |  |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 |  |  |  |  |  |  |  |
| n99 | 15 |  | 5 | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n100 | 15 | 34 | 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n101 | 15 |  | 5 | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n102 | 15 |  |  |  |  | 20 |  |  |  | 40 |  |  |  |  |  |  |  |
|  | 30 |  |  |  |  | 20 |  |  |  | 40 |  |  | 60 |  | 80 |  | 1004 |
|  | 60 |  |  |  |  | 20 |  |  |  | 40 |  |  | 60 |  | 80 |  | 1004 |
| n104 | 15 |  |  |  |  | 20 |  | 30 |  | 40 |  | 50 |  |  |  |  |  |
|  | 30 |  |  |  |  | 20 |  | 30 |  | 40 |  | 50 | 60 | 70 | 80 | 90 | 100 |
|  | 60 |  |  |  |  | 20 |  | 30 |  | 40 |  | 50 | 60 | 70 | 80 | 90 | 100 |
| n105 | 15 |  | 5 | 10 | 15 | 20 | 253 | 303 | 353 |  |  |  |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 253 | 303 | 353 |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n106 | 15 | 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n109 | 15 |  | 5 | 10 | 15 | 20 | 25 | 30 |  | 403 |  | 503 |  |  |  |  |  |
|  | 30 |  |  | 10 | 15 | 20 | 25 | 30 |  | 403 |  | 503 |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| NOTE 1: Void.  NOTE 2: Void.  NOTE 3: This UE channel bandwidth is applicable only to downlink.  NOTE 4: This UE channel bandwidth is optional in this release of the specification.  NOTE 5: For this bandwidth, the minimum requirements are restricted to operation when carrier is configured as an SCell part of DC or CA configuration.  NOTE 6: For this bandwidth, the minimum requirements are restricted to operation when carrier is configured as a downlink SCell part of CA configuration.  NOTE 7: For the 20 MHz bandwidth, the minimum requirements are specified for NR UL carrier frequencies confined to either 713-723 MHz or 728-738 MHz. For the 25 MHz bandwidth, the minimum requirements are specified for NR UL carrier frequencies confined to either 715.5-720.5 MHz or 730.5-735.5 MHz. For the 30MHz bandwidth, the minimum requirements are specified for NR UL transmission bandwidth configuration confined to either 703-733 or 718-748 MHz.  NOTE 8: This UE channel bandwidth is applicable only to uplink.  NOTE 9: Void.  NOTE 10: For this band, UE channel bandwidths which are applicable to sidelink operation are specified in Table 5.3E.1-1.  NOTE 11: Not all frequency positions of 5 MHz carriers are possible due limitations of the SSB position relative to the 5 MHz channels. 5 MHz channels with Fc such that 2499+N\*1.2 ≤Fc<2499.3+N\*1.2MHz for 0≤N<157 are not compatible with SSB positions and cannot be used for 5 MHz n41.  NOTE 12: This UE channel Bandwidth is optional for uplink in this release of the specification. | | | | | | | | | | | | | | | | | |