**3GPP TSG-RAN WG4 Meeting # 104-eR4-2215251**

**Electronic Meeting, 15 - 26 August 2022**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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|  |
| ***Title:***  |  |
|  |  |
| ***Source to WG:*** |  |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** | NR\_newRAT-Core |  | ***Date:*** | 2022-08-30 |
|  |  |  |  |  |
| ***Category:*** | A |  | ***Release:*** | Rel-16 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | This big CRs merge the mutiple endorsed draft CRs. The reason for change in each endorsed draft CR is copied below.R4-2211801GSCN in some bands (e.g., n34, n38, n39, n40, n50) are defined according to deployment need instead of using the equations in clause 4.3.1.5, and the the Excel spread sheet ***NR sync raster calculations (2019-06).xlsx*** is not attached to the Technical Report anymore. |
|  |  |
| ***Summary of change:*** | The summary of change in each endorsed draft CR is copied below.R4-2211801Clarify that GSCN in some bands may be defined according to deployment need instead of using the equations in clause 4.3.1.5, and delete the sentence stating the Excel spread sheet ***NR sync raster calculations (2019-06).xlsx*** is attached to the Technical Report. |
|  |  |
| ***Consequences if not approved:*** | The consequences if not approved for each endorsed draft CR are coppied below.R4-2211801Ambiguities remain and would lead to different interpretations of GSCN calculations. |
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| ***Clauses affected:*** | 4.3.1.5 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

**<Start of change>**

4.3.1.5 Calculations of sync raster GSCN per operating band

For each operating band, the GSCN that can be used in the band are tabulated in subclause 5.4.3.3 of TS 38.104 [7], TS 38.101-1 [4] and TS 38.101-2 [5]. Selection of GSCN for Table(s) is done the following way:

- Include GSCN that correspond to SS block that completely fit within the channel bandwidth, accounting for guard bands needed.

- Guard bands are calculated based on the minimum channel BW in table 5.3.5-1 and table 5.3.5-2 of TS 38.104 [7], the SCS for the SS block and the corresponding NRB (spectrum utilization), assuming that the SS block can be in any position within the transmission BW configuration, including at positions adjacent to the edges.

- For GSCN ranges with step size <N>, the GSCN numbers selected should be multiples of N (this ensures that overlapping bands will have the same GSCN sequences)

For specific combinations of minimum channel bandwidth and SS block SCS, the GSCN ranges are down-selected using a step size <N>, as shown in Table 4.3.1.5-1.

**Table 4.3.1.5-1: Down selection factors (step size).**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency range** | **Minimum channel bandwidth** | **SS block SCS** | **Down selection factor (step size)**  |
| 0 – 3.0 GHz | 10 MHz | 15 kHz | <3> |
| 3.0 - 24.25 GHz | 40 MHz | 30 kHz | <16> |
| 24.25 – 100 GHz | 100 MHz | 240 kHz | <2> |

To determine the GSCN range, let *f*min denote the lowest frequency location of the SS block within a band after accounting for the guard band *G* in subclause 5.3.3 of TS 38.104 [7] corresponding to the minimum channel BW and the bandwidth encompassing the width of all subcarriers from RE#0 of RB#0 to the centre of RE#0 of RB#10 of the SS block. Let *f*max denote the high frequency location of the SS block within a band after accounting for the guard band and the bandwidth from the centre of RE#0 of RB#10 and encompassing the width of all subcarriers until RE#11 of RB#19 of the SS block. Let *F*low represent the lowest frequency of the frequency range in subclause 4.3.1.4, Δ*F*raster represent the raster spacing in MHz, Δ*F*shift represent the raster shift in MHz (applicable for the frequency range 0 to 3000MHz).

The lowest frequency location *f*min is computed as

 $f\_{min}=F\_{low}+G+∆f\left(\frac{N\_{RB}^{SS}N\_{RE}^{RB}+1}{2}\right)$

where $∆f$ is the subcarrier spacing, $N\_{RE}^{RB}=12$ is the number of REs per RB, $N\_{RB}^{SS}=20$ is the number of RBs in the SS block.

The highest frequency location *f*max is computed as

 $f\_{max}=F\_{low}+W\_{Band}-G-∆f\left(\frac{N\_{RB}^{SS}N\_{RE}^{RB}-1}{2}\right)$

where *WBand* is the width of the operating band.

The first possible raster location within a band (prior to applying the step size) is given by

 $f\_{min}\leq F\_{low}+N∆F\_{raster}+M∆F\_{shift}$

while the last possible raster location within a band (prior to applying the step size) is given by

 $f\_{max}\geq F\_{low}+N∆F\_{raster}+M∆F\_{shift}$

where Δ*F*shift is defined to be 0 outside the frequency range 0 to 3000MHz and where N (and M) are defined in subclause 4.3.1.4.

For the first possible raster location, *N*min is the smallest integer satisfying

 $N\_{min}\geq \frac{1}{∆F\_{raster}}\left(f\_{min}-F\_{low}-max⁡\left(M\right)∆F\_{shift}\right)$

and the corresponding value of M (if defined and if multiple values are defined)

 $M\geq \frac{1}{∆F\_{shift}}\left(f\_{min}-F\_{low}-N\_{min}∆F\_{raster}\right)$

For the last possible raster location, *N*max is the largest integer satisfying

 $N\_{max}\leq \frac{f\_{max}-F\_{low}-min\left(M\right)∆F\_{shift}}{∆F\_{raster}}$

and the corresponding value of M (if defined and if multiple values are defined)

 $M\leq \frac{f\_{max}-F\_{low}-N\_{max}∆F\_{raster}}{∆F\_{shift}}$

For the frequency ranges in subclause 4.3.1.4, table 4.3.1.5-2 indicates the formulas used to compute the values of N and M (if necessary).

**Table 4.3.1.5-2: Formulas to compute the minimum and maximum values of GSCN**

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | **Parameter** | **Range** | **Formula** |
| For GSCNmin | N (compute first) | 0-3000 MHz | $$N=\left⌈\frac{f\_{min}-F\_{low}-max\left(M\right)∆F\_{shift}}{∆F\_{raster}}\right⌉,Mϵ\left\{\begin{matrix}\left\{1,3,5\right\}&\\\left\{3\right\}&Note\end{matrix}\right.$$ |
| ≥ 3000 MHz | $$N=\left⌈\frac{f\_{min}-F\_{low}}{∆F\_{raster}}\right⌉$$ |
| M | 0-3000 MHz | $$M'=max\left(\left⌈\frac{f\_{min}-F\_{low}-N∆F\_{raster}}{∆F\_{shift}}\right⌉,1\right)$$$$M=M^{'}+\left(M^{'}+1\right)mod2$$ |
| 0-3000 MHz, NOTE | 3 |
| ≥ 3000 MHz | N/A |
| For GSCNmax | N (compute first) | 0-3000 MHz | $$N=\left⌊\frac{f\_{max}-F\_{low}-min\left(M\right)∆F\_{shift}}{∆F\_{raster}}\right⌋,Mϵ\left\{\begin{matrix}\left\{1,3,5\right\}&\\\left\{3\right\}&Note \end{matrix}\right.$$ |
| ≥ 3000 MHz | $$N=\left⌊\frac{f\_{max}-F\_{low}}{∆F\_{raster}}\right⌋$$ |
| M | 0-3000 MHz | $$M=min\left(\left⌊\frac{f\_{max}-F\_{low}-N∆F\_{raster}}{∆F\_{shift}}\right⌋,5\right)$$$$M=M^{'}+\left(M^{'}+1\right)mod2$$ |
| 0-3000 MHz, NOTE | 3 |
| ≥ 3000 MHz | N/A |
| NOTE: Refers to Note in Table 5.4.3.1-1 in TS 38.101-1 [4] for bands with SCS-based raster below 3000 MHz. |

To compute the GSCN ranges with step size <N>, the N and M (when defined) values computed with the formulas in table 4.3.1.5-2 are used to determine GSCNmin′ and GSCNmax′ according to the appropriate raster entry formula from subclause 4.3.1.4. The first entry in the GSCN range, GSCNmin, is determined by

 $GSCNmin=\left〈N\right〉\left⌈{GSCNmin'}/{\left〈N\right〉}\right⌉$

and the last entry in the range, GSCNmax, is determined by

 $GSCNmax=\left〈N\right〉\left⌊{GSCNmax'}/{\left〈N\right〉}\right⌋$.

Note that GSCN in some bands may be defined according to deployment need instead of using the equations in this clause.

**<End of changes>**