

FCC ID: A3LSMS931U

Part 0 Power Density Report

Revision B

October 31, 2024

SAMSUNG ELECTRONICS

## Power Density Characterization

### 1. Exposure Scenario

At frequencies > 6 GHz, the total peak spatial averaged power density (psPD) is required to be assessed for all antenna configurations (beams) from all mmW antenna modules installed inside the device. This device has 2 patch antenna arrays.

As showed in Figure 1, the surfaces near-by each mmW antenna module for PD characterization are identified and listed in Table 1.

Table 1: 5G mmWave NR Device Surfaces

| Band    | Antenna | Rear (S2) | Front (S1) | Left (S3) | Right (S4) | Bottom (S6) | Top (S5) |
|---------|---------|-----------|------------|-----------|------------|-------------|----------|
| NR n261 | Patch M | Yes       | No         | Yes       | No         | No          | No       |
| NR n260 | Patch M | Yes       | No         | Yes       | No         | No          | No       |
| NR n258 | Patch M | Yes       | No         | Yes       | No         | No          | No       |

Note: All test configurations are based on front position view.

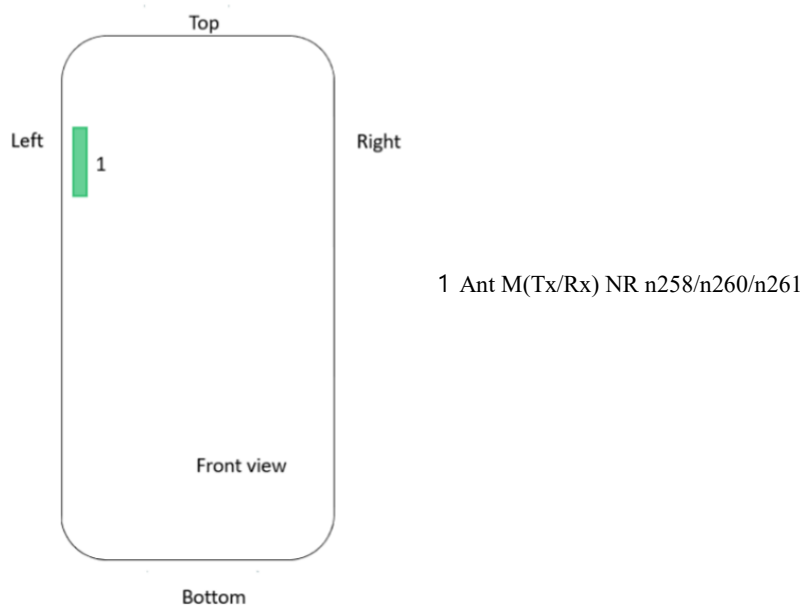
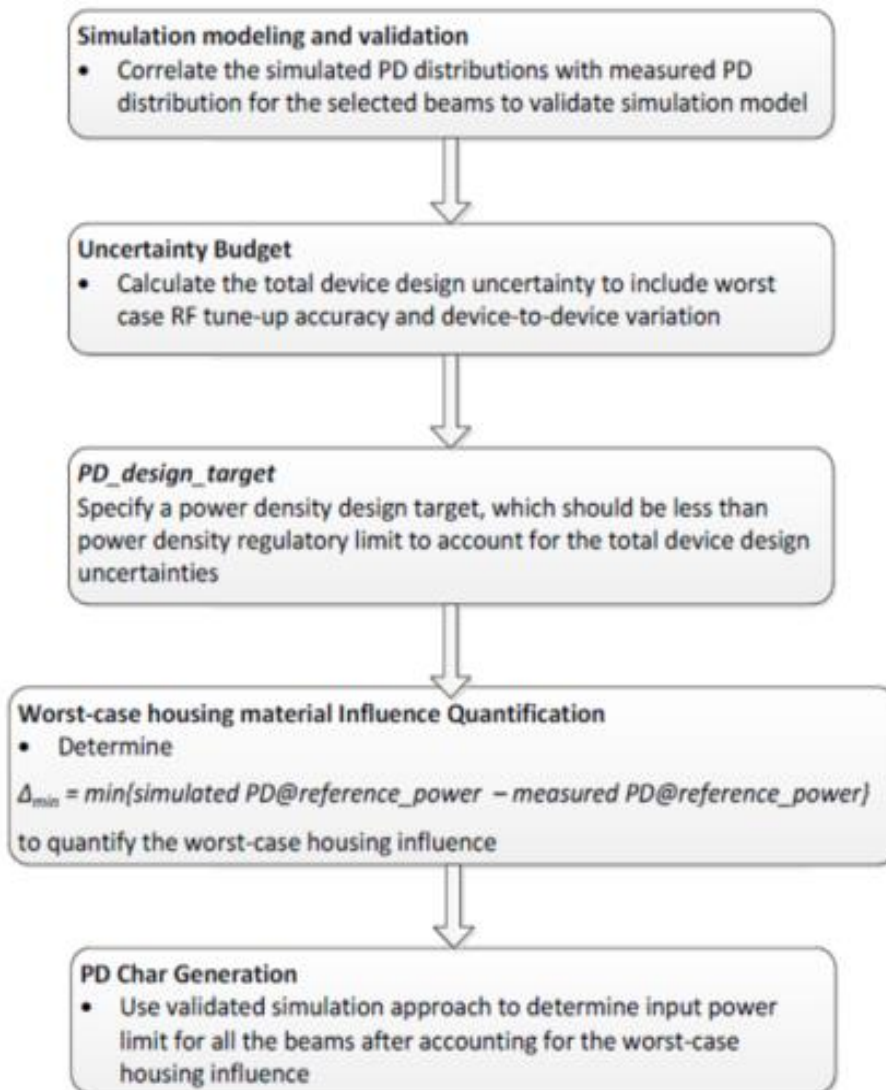


Figure 1 Location of mmWave antenna modules

## 2. Power Density Characterization Method



### 3. Codebook for all supported beams

| Band | Beam_ID | Module | Ant_Group | Subarray | Ant_Type | Paired_With |
|------|---------|--------|-----------|----------|----------|-------------|
| 258  | 0       | 0      | 0         | 1        | PATCH    | 256         |
| 258  | 1       | 0      | 0         | 1        | PATCH    | 257         |
| 258  | 2       | 0      | 0         | 1        | PATCH    | 258         |
| 258  | 3       | 0      | 0         | 1        | PATCH    | 259         |
| 258  | 4       | 0      | 0         | 1        | PATCH    | 260         |
| 258  | 5       | 0      | 0         | 1        | PATCH    | 261         |
| 258  | 6       | 0      | 0         | 1        | PATCH    | 262         |
| 258  | 7       | 0      | 0         | 1        | PATCH    | 263         |
| 258  | 8       | 0      | 0         | 1        | PATCH    | 264         |
| 258  | 9       | 0      | 0         | 1        | PATCH    | 265         |
| 258  | 10      | 0      | 0         | 1        | PATCH    | 266         |
| 258  | 11      | 0      | 0         | 1        | PATCH    | 267         |
| 258  | 12      | 0      | 0         | 1        | PATCH    | 268         |
| 258  | 13      | 0      | 0         | 1        | PATCH    | 269         |
| 258  | 14      | 0      | 0         | 1        | PATCH    | 270         |
| 258  | 15      | 0      | 0         | 1        | PATCH    | 271         |
| 258  | 16      | 0      | 0         | 1        | PATCH    | 272         |
| 258  | 17      | 0      | 0         | 1        | PATCH    | 273         |
| 258  | 18      | 0      | 0         | 1        | PATCH    | 274         |
| 258  | 19      | 0      | 0         | 1        | PATCH    | 275         |
| 258  | 20      | 0      | 0         | 1        | PATCH    | 276         |
| 258  | 256     | 0      | 1         | 0        | PATCH    | 0           |
| 258  | 257     | 0      | 1         | 0        | PATCH    | 1           |
| 258  | 258     | 0      | 1         | 0        | PATCH    | 2           |
| 258  | 259     | 0      | 1         | 0        | PATCH    | 3           |
| 258  | 260     | 0      | 1         | 0        | PATCH    | 4           |
| 258  | 261     | 0      | 1         | 0        | PATCH    | 5           |
| 258  | 262     | 0      | 1         | 0        | PATCH    | 6           |
| 258  | 263     | 0      | 1         | 0        | PATCH    | 7           |
| 258  | 264     | 0      | 1         | 0        | PATCH    | 8           |
| 258  | 265     | 0      | 1         | 0        | PATCH    | 9           |
| 258  | 266     | 0      | 1         | 0        | PATCH    | 10          |
| 258  | 267     | 0      | 1         | 0        | PATCH    | 11          |
| 258  | 268     | 0      | 1         | 0        | PATCH    | 12          |
| 258  | 269     | 0      | 1         | 0        | PATCH    | 13          |
| 258  | 270     | 0      | 1         | 0        | PATCH    | 14          |
| 258  | 271     | 0      | 1         | 0        | PATCH    | 15          |
| 258  | 272     | 0      | 1         | 0        | PATCH    | 16          |
| 258  | 273     | 0      | 1         | 0        | PATCH    | 17          |
| 258  | 274     | 0      | 1         | 0        | PATCH    | 18          |
| 258  | 275     | 0      | 1         | 0        | PATCH    | 19          |
| 258  | 276     | 0      | 1         | 0        | PATCH    | 20          |

| Band | Beam_ID | Module | Ant_Group | Subarray | Ant_Type | Paired_With |
|------|---------|--------|-----------|----------|----------|-------------|
| 260  | 0       | 0      | 0         | 3        | PATCH    | 256         |
| 260  | 1       | 0      | 0         | 3        | PATCH    | 257         |
| 260  | 2       | 0      | 0         | 3        | PATCH    | 258         |
| 260  | 3       | 0      | 0         | 3        | PATCH    | 259         |
| 260  | 4       | 0      | 0         | 3        | PATCH    | 260         |
| 260  | 5       | 0      | 0         | 3        | PATCH    | 261         |
| 260  | 6       | 0      | 0         | 3        | PATCH    | 262         |
| 260  | 7       | 0      | 0         | 3        | PATCH    | 263         |
| 260  | 8       | 0      | 0         | 3        | PATCH    | 264         |
| 260  | 9       | 0      | 0         | 3        | PATCH    | 265         |
| 260  | 10      | 0      | 0         | 3        | PATCH    | 266         |
| 260  | 11      | 0      | 0         | 3        | PATCH    | 267         |
| 260  | 12      | 0      | 0         | 3        | PATCH    | 268         |
| 260  | 13      | 0      | 0         | 3        | PATCH    | 269         |
| 260  | 14      | 0      | 0         | 3        | PATCH    | 270         |
| 260  | 15      | 0      | 0         | 3        | PATCH    | 271         |
| 260  | 16      | 0      | 0         | 3        | PATCH    | 272         |
| 260  | 17      | 0      | 0         | 3        | PATCH    | 273         |
| 260  | 18      | 0      | 0         | 3        | PATCH    | 274         |
| 260  | 19      | 0      | 0         | 3        | PATCH    | 275         |
| 260  | 20      | 0      | 0         | 3        | PATCH    | 276         |
| 260  | 256     | 0      | 1         | 2        | PATCH    | 0           |
| 260  | 257     | 0      | 1         | 2        | PATCH    | 1           |
| 260  | 258     | 0      | 1         | 2        | PATCH    | 2           |
| 260  | 259     | 0      | 1         | 2        | PATCH    | 3           |
| 260  | 260     | 0      | 1         | 2        | PATCH    | 4           |
| 260  | 261     | 0      | 1         | 2        | PATCH    | 5           |
| 260  | 262     | 0      | 1         | 2        | PATCH    | 6           |
| 260  | 263     | 0      | 1         | 2        | PATCH    | 7           |
| 260  | 264     | 0      | 1         | 2        | PATCH    | 8           |
| 260  | 265     | 0      | 1         | 2        | PATCH    | 9           |
| 260  | 266     | 0      | 1         | 2        | PATCH    | 10          |
| 260  | 267     | 0      | 1         | 2        | PATCH    | 11          |
| 260  | 268     | 0      | 1         | 2        | PATCH    | 12          |
| 260  | 269     | 0      | 1         | 2        | PATCH    | 13          |
| 260  | 270     | 0      | 1         | 2        | PATCH    | 14          |
| 260  | 271     | 0      | 1         | 2        | PATCH    | 15          |
| 260  | 272     | 0      | 1         | 2        | PATCH    | 16          |
| 260  | 273     | 0      | 1         | 2        | PATCH    | 17          |
| 260  | 274     | 0      | 1         | 2        | PATCH    | 18          |
| 260  | 275     | 0      | 1         | 2        | PATCH    | 19          |
| 260  | 276     | 0      | 1         | 2        | PATCH    | 20          |

| Band | Beam_ID | Module | Ant_Group | Subarray | Ant_Type | Paired_With |
|------|---------|--------|-----------|----------|----------|-------------|
| 261  | 0       | 0      | 0         | 3        | PATCH    | 256         |
| 261  | 1       | 0      | 0         | 3        | PATCH    | 257         |
| 261  | 2       | 0      | 0         | 3        | PATCH    | 258         |
| 261  | 3       | 0      | 0         | 3        | PATCH    | 259         |
| 261  | 4       | 0      | 0         | 3        | PATCH    | 260         |
| 261  | 5       | 0      | 0         | 3        | PATCH    | 261         |
| 261  | 6       | 0      | 0         | 3        | PATCH    | 262         |
| 261  | 7       | 0      | 0         | 3        | PATCH    | 263         |
| 261  | 8       | 0      | 0         | 3        | PATCH    | 264         |
| 261  | 9       | 0      | 0         | 3        | PATCH    | 265         |
| 261  | 10      | 0      | 0         | 3        | PATCH    | 266         |
| 261  | 11      | 0      | 0         | 3        | PATCH    | 267         |
| 261  | 12      | 0      | 0         | 3        | PATCH    | 268         |
| 261  | 13      | 0      | 0         | 3        | PATCH    | 269         |
| 261  | 14      | 0      | 0         | 3        | PATCH    | 270         |
| 261  | 15      | 0      | 0         | 3        | PATCH    | 271         |
| 261  | 16      | 0      | 0         | 3        | PATCH    | 272         |
| 261  | 17      | 0      | 0         | 3        | PATCH    | 273         |
| 261  | 18      | 0      | 0         | 3        | PATCH    | 274         |
| 261  | 19      | 0      | 0         | 3        | PATCH    | 275         |
| 261  | 20      | 0      | 0         | 3        | PATCH    | 276         |
| 261  | 256     | 0      | 1         | 2        | PATCH    | 0           |
| 261  | 257     | 0      | 1         | 2        | PATCH    | 1           |
| 261  | 258     | 0      | 1         | 2        | PATCH    | 2           |
| 261  | 259     | 0      | 1         | 2        | PATCH    | 3           |
| 261  | 260     | 0      | 1         | 2        | PATCH    | 4           |
| 261  | 261     | 0      | 1         | 2        | PATCH    | 5           |
| 261  | 262     | 0      | 1         | 2        | PATCH    | 6           |
| 261  | 263     | 0      | 1         | 2        | PATCH    | 7           |
| 261  | 264     | 0      | 1         | 2        | PATCH    | 8           |
| 261  | 265     | 0      | 1         | 2        | PATCH    | 9           |
| 261  | 266     | 0      | 1         | 2        | PATCH    | 10          |
| 261  | 267     | 0      | 1         | 2        | PATCH    | 11          |
| 261  | 268     | 0      | 1         | 2        | PATCH    | 12          |
| 261  | 269     | 0      | 1         | 2        | PATCH    | 13          |
| 261  | 270     | 0      | 1         | 2        | PATCH    | 14          |
| 261  | 271     | 0      | 1         | 2        | PATCH    | 15          |
| 261  | 272     | 0      | 1         | 2        | PATCH    | 16          |
| 261  | 273     | 0      | 1         | 2        | PATCH    | 17          |
| 261  | 274     | 0      | 1         | 2        | PATCH    | 18          |
| 261  | 275     | 0      | 1         | 2        | PATCH    | 19          |
| 261  | 276     | 0      | 1         | 2        | PATCH    | 20          |

#### 4. Simulation and modeling validation

Power density simulations of all beams and surfaces were performed. Details of these simulations and modeling validation can be found in the Power Density Simulation Report. Table below includes a summary of the validation results to support worst-case housing influence quantification in power density characterization for this model.

With an input power of 6 dBm for n258 band, 6 dBm for n261 band, and 6 dBm for n260 band, PD measurements are conducted for at least one single beam per antenna module on worst-surface(s). PD measurements are performed at mid channel of each mmW band and with CW modulation. All measured PD values are listed in table below along with corresponding simulated PD values for the same configuration. PD value will be used to determine worst-case housing influence for conservative assessment

4cm<sup>2</sup>

| Band | Channel                        | Module | Type(P or D) | Side | Beam ID | PLS (10 dBm) | Sim. PD (mW/cm <sup>2</sup> ) | Meas. PD (mW/cm <sup>2</sup> ) * Circle Avg |
|------|--------------------------------|--------|--------------|------|---------|--------------|-------------------------------|---------------------------------------------|
| n261 | Mid Ch. 2077915 (27924.96 MHz) | M      | Patch        | Rear | 20      | 60           | 0.933                         | 0.218                                       |
|      |                                |        |              | Left |         |              | 1.634                         | 0.869                                       |
|      |                                |        |              | Rear | 276     |              | 1.276                         | 0.625                                       |
| n260 | Mid Ch. 2254165 (38499.96 MHz) | M      | Patch        | Left | 16      | 60           | 1.726                         | 0.637                                       |
|      |                                |        |              | Rear | 274     |              | 0.618                         | 0.162                                       |
|      |                                |        |              | Left | 269     |              | 1.258                         | 0.645                                       |
| n258 | Mid Ch. 2025833 (24800.04 MHz) | M      | Patch        | Rear | 16      | 60           | 0.978                         | 0.420                                       |
|      |                                |        |              | Left | 19      |              | 1.370                         | 0.852                                       |
|      |                                |        |              | Rear | 271     |              | 1.349                         | 0.688                                       |

## 5. PD\_design\_target

| PD_design_target                                                 |                          |
|------------------------------------------------------------------|--------------------------|
| PD_design_target < PD_regulatory_limit x 10-Total Uncertainty/10 |                          |
| psPD over 4cm <sup>2</sup> Averaging Area (mW/cm <sup>2</sup> )  |                          |
| <i>Total Uncertainty</i>                                         | 1.4 dB                   |
| <i>PD_regulatory_limit</i>                                       | 1.0 mW/cm <sup>2</sup>   |
| <i>PD_design_target</i>                                          | 0.724 mW/cm <sup>2</sup> |

## 6. $\Delta_{min}$

For non-metal material, the material property cannot be accurately characterized at mmW frequencies to date. The estimated material property for the device housing is used in the simulation model, which could influence the accuracy in simulation for PD amplitude quantification. Since the housing influence on PD could vary from surface to surface where the EM field propagates through, the most underestimated surface is used to quantify the worst-case housing influence for conservative assessment. Since the mmW antenna modules are placed at different locations, only surrounding material/housing has impact on EM field propagation, and in turn power density. Furthermore, depending on the type of antenna array, i.e., dipole antenna array or patch antenna array, the nature of EM field propagation in the near field is different. Therefore, the worst-case housing influence is determined per antenna module and per antenna type.

For this DUT, the below procedure was used to determine worst-case housing influence,  $\Delta_{min}$ :

1. Based on PD simulation, for each module and antenna type, determine one or more worst-surface(s) that has highest  $4\text{cm}^2\text{PD}$  for all the single beams per antenna module and per antenna type in the mid channel of each band.

2. For identified worst surface(s) per antenna module and per antenna type group,

- a. First determine  $\Delta_{min}$  based on identified worst surface(s), and derive `input.power.limit`
- b. Then prove all other near-by surface(s), i.e., non-selected surface(s), is not required for housing material loss quantification (in other words, these non-evaluated surfaces have no influence on the determined `input.power.limit`) by:
  - i. re-scale all simulated  $4\text{cm}^2$  PD values to `input.power.limit` to identify the worst-PD beam per each non-evaluated surface
  - ii. Measure  $4\text{cm}^2$  PD at `input.power.limit` on identified worst-PD beam per each non-evaluated surface
  - iii. Demonstrate all measured  $4\text{cm}^2$  PD values are below `PD_design_target`.

3. If any of the above surface(s) in Step (2.b.iii) have measured  $4\text{cm}^2$  PD  $\geq$  `PD_design_target`, then those surfaces must be included in the  $\Delta_{min}$  determination in Step (2.a), and re-evaluate `input.power.limit` with these added surfaces.

Following above procedure, based on the Samsung PD simulation report, the worst-surface(s) having highest  $4\text{cm}^2$  PD for all the single beams per each antenna type and each antenna module group in the mid channel of n258, n261, and n260 bands are identified in the following table.

Table 8: Worst-surface(s) for Ant M

| Band    | Antenna | Rear (S2) | Front (S1) | Left (S3) | Right (S4) | Bottom (S6) | Top (S5) |
|---------|---------|-----------|------------|-----------|------------|-------------|----------|
| NR n261 | Patch M | Yes       | No         | Yes       | No         | No          | No       |
| NR n260 | Patch M | Yes       | No         | Yes       | No         | No          | No       |
| NR n258 | Patch M | Yes       | No         | Yes       | No         | No          | No       |

Note: All test configurations are based on front position view.

Thus, when comparing a simulated 4cm<sup>2</sup>-averaged PD and measured 4 cm<sup>2</sup>-averaged PD for the identified worst surface(s), the worst error introduced for each antenna type and each antenna module group when using the estimated material property in the simulation is highlighted in bold numbers in the table below. Thus, the worst-case housing influence, denoted as  $\Delta_{\min} = \text{Sim. PD} - \text{Meas. PD}$ , is determined as

Table 9:  $\Delta_{\min}$  for Ant M

| Band    | Antenna | $\Delta_{\min}[\text{dB}]$ |
|---------|---------|----------------------------|
| NR n261 | Patch M | 2.74                       |
| NR n260 | Patch M | 2.90                       |
| NR n258 | Patch M | 2.06                       |

Table 9  $\Delta_{\min}$  for Ant M represents the worst case where RF exposure is underestimated the most in simulation when using the estimated material property of the housing. For conservative assessment, the  $\Delta_{\min}$  is used as the worst-case factor and applied to all the beams in the corresponding antenna type and antenna module group to determine input power limits in PD char for compliance. The detail input.power.limit derivation is described in Section 7. Simulated 4cm<sup>2</sup> PD values in the Power Density Simulation Report are scaled to input.power.limit and are listed in the tables below for all single beams for all identified surfaces, when assuming the simulation is performed with correct housing influence. Determine the worst beam for each of non-selected surface(s), identified in the table below:

Table 10: Non-Selected Surface Validation

| Band | Channel         | Module | Type(P or D) | Side  | Beam ID    | PLS (10 dBm) | Meas. PD (mW/cm <sup>2</sup> ) |
|------|-----------------|--------|--------------|-------|------------|--------------|--------------------------------|
| n261 | Mid Ch. 2077915 | M      | Patch        | Left  | <b>256</b> | 16.6         | 0.153                          |
|      |                 |        |              | Front | <b>14</b>  | 5.3          | 0.257                          |
|      |                 |        |              | Top   | <b>12</b>  | 7.0          | 0.186                          |
| n260 | Mid Ch. 2254165 | M      | Patch        | Rear  | <b>1</b>   | 13.4         | 0.400                          |
|      |                 |        |              | Front | <b>272</b> | 7.0          | 0.237                          |
|      |                 |        |              | Top   | <b>17</b>  | 5.0          | 0.196                          |
| n258 | Mid Ch. 2025833 | M      | Patch        | Left  | <b>260</b> | 14.7         | 0.260                          |
|      |                 |        |              | Front | <b>19</b>  | 4.8          | 0.220                          |
|      |                 |        |              | Top   | <b>18</b>  | 8.4          | 0.184                          |

Then perform PD measurement for all determined worst-case beams, highlighted in orange in the tables below, on the corresponding surface. Measurement is performed in the mid channel of each band with CW modulation. The evaluation distance is at 2 mm.

| n261, Ant M, Scaled-up Power Density with Sim.power.limit |           |          |         |            |           |          |                              |
|-----------------------------------------------------------|-----------|----------|---------|------------|-----------|----------|------------------------------|
| Beam ID                                                   | S4(Right) | S3(Left) | S5(Top) | S6(Bottom) | S1(Front) | S2(Rear) | Sim.power.<br>limit<br>(dBm) |
| 0                                                         | 0.005     | 0.678    | 0.027   | 0.002      | 0.206     | 0.396    | 9.89                         |
| 1                                                         | 0.012     | 0.601    | 0.092   | 0.004      | 0.179     | 0.625    | 12.00                        |
| 2                                                         | 0.005     | 0.719    | 0.031   | 0.005      | 0.214     | 0.293    | 10.07                        |
| 3                                                         | 0.005     | 0.708    | 0.038   | 0.002      | 0.186     | 0.360    | 9.77                         |
| 4                                                         | 0.011     | 0.663    | 0.037   | 0.005      | 0.168     | 0.404    | 10.27                        |
| 5                                                         | 0.008     | 0.689    | 0.063   | 0.003      | 0.210     | 0.445    | 7.48                         |
| 6                                                         | 0.005     | 0.693    | 0.029   | 0.001      | 0.222     | 0.417    | 6.88                         |
| 7                                                         | 0.005     | 0.713    | 0.010   | 0.001      | 0.229     | 0.412    | 6.86                         |
| 8                                                         | 0.011     | 0.687    | 0.049   | 0.003      | 0.194     | 0.470    | 7.95                         |
| 9                                                         | 0.008     | 0.631    | 0.067   | 0.002      | 0.186     | 0.546    | 7.80                         |
| 10                                                        | 0.009     | 0.680    | 0.041   | 0.003      | 0.267     | 0.322    | 7.67                         |
| 11                                                        | 0.006     | 0.686    | 0.033   | 0.005      | 0.171     | 0.395    | 6.97                         |
| 12                                                        | 0.010     | 0.637    | 0.150   | 0.002      | 0.166     | 0.589    | 4.71                         |
| 13                                                        | 0.009     | 0.678    | 0.062   | 0.002      | 0.242     | 0.353    | 2.82                         |
| 14                                                        | 0.005     | 0.724    | 0.011   | 0.002      | 0.269     | 0.393    | 3.06                         |
| 15                                                        | 0.005     | 0.714    | 0.007   | 0.001      | 0.249     | 0.416    | 2.56                         |
| 16                                                        | 0.007     | 0.724    | 0.030   | 0.005      | 0.213     | 0.433    | 3.15                         |
| 17                                                        | 0.006     | 0.628    | 0.083   | 0.002      | 0.203     | 0.382    | 3.50                         |
| 18                                                        | 0.010     | 0.688    | 0.025   | 0.001      | 0.248     | 0.373    | 2.60                         |
| 19                                                        | 0.005     | 0.724    | 0.007   | 0.001      | 0.257     | 0.431    | 2.68                         |
| 20                                                        | 0.006     | 0.724    | 0.016   | 0.003      | 0.244     | 0.414    | 2.47                         |
| 256                                                       | 0.021     | 0.410    | 0.041   | 0.007      | 0.150     | 0.724    | 14.35                        |
| 257                                                       | 0.020     | 0.225    | 0.051   | 0.003      | 0.037     | 0.699    | 10.48                        |
| 258                                                       | 0.020     | 0.231    | 0.040   | 0.003      | 0.053     | 0.708    | 11.18                        |
| 259                                                       | 0.023     | 0.302    | 0.043   | 0.007      | 0.093     | 0.648    | 11.22                        |
| 260                                                       | 0.022     | 0.334    | 0.053   | 0.009      | 0.127     | 0.659    | 12.43                        |
| 261                                                       | 0.019     | 0.357    | 0.061   | 0.004      | 0.105     | 0.635    | 8.81                         |
| 262                                                       | 0.019     | 0.268    | 0.054   | 0.005      | 0.055     | 0.676    | 8.38                         |
| 263                                                       | 0.027     | 0.265    | 0.016   | 0.004      | 0.088     | 0.646    | 7.53                         |
| 264                                                       | 0.026     | 0.239    | 0.014   | 0.004      | 0.058     | 0.694    | 7.43                         |
| 265                                                       | 0.025     | 0.284    | 0.066   | 0.003      | 0.079     | 0.651    | 8.15                         |
| 266                                                       | 0.025     | 0.302    | 0.027   | 0.001      | 0.078     | 0.645    | 7.69                         |
| 267                                                       | 0.023     | 0.228    | 0.020   | 0.004      | 0.038     | 0.705    | 6.79                         |
| 268                                                       | 0.013     | 0.327    | 0.129   | 0.004      | 0.098     | 0.711    | 5.25                         |
| 269                                                       | 0.034     | 0.268    | 0.078   | 0.002      | 0.044     | 0.678    | 3.84                         |
| 270                                                       | 0.035     | 0.259    | 0.029   | 0.002      | 0.065     | 0.641    | 3.35                         |
| 271                                                       | 0.049     | 0.233    | 0.011   | 0.002      | 0.059     | 0.681    | 3.44                         |
| 272                                                       | 0.043     | 0.248    | 0.022   | 0.005      | 0.093     | 0.717    | 4.05                         |
| 273                                                       | 0.021     | 0.310    | 0.094   | 0.004      | 0.056     | 0.710    | 4.59                         |
| 274                                                       | 0.035     | 0.263    | 0.066   | 0.002      | 0.054     | 0.669    | 3.62                         |
| 275                                                       | 0.046     | 0.253    | 0.014   | 0.002      | 0.063     | 0.628    | 3.44                         |
| 276                                                       | 0.045     | 0.239    | 0.012   | 0.002      | 0.062     | 0.722    | 3.52                         |

| n260, Ant M, Scaled-up Power Density with Sim.power.limit |           |          |         |            |           |          |                       |
|-----------------------------------------------------------|-----------|----------|---------|------------|-----------|----------|-----------------------|
| Beam ID                                                   | S4(Right) | S3(Left) | S5(Top) | S6(Bottom) | S1(Front) | S2(Rear) | Sim.power.limit (dBm) |
| 0                                                         | 0.006     | 0.665    | 0.018   | 0.003      | 0.239     | 0.216    | 10.76                 |
| 1                                                         | 0.006     | 0.709    | 0.064   | 0.003      | 0.219     | 0.394    | 11.02                 |
| 2                                                         | 0.004     | 0.599    | 0.061   | 0.008      | 0.176     | 0.232    | 9.21                  |
| 3                                                         | 0.005     | 0.642    | 0.057   | 0.005      | 0.197     | 0.240    | 9.59                  |
| 4                                                         | 0.005     | 0.646    | 0.051   | 0.005      | 0.224     | 0.226    | 10.05                 |
| 5                                                         | 0.005     | 0.724    | 0.079   | 0.009      | 0.189     | 0.263    | 6.61                  |
| 6                                                         | 0.007     | 0.598    | 0.088   | 0.004      | 0.262     | 0.292    | 8.45                  |
| 7                                                         | 0.008     | 0.636    | 0.057   | 0.008      | 0.231     | 0.278    | 6.55                  |
| 8                                                         | 0.006     | 0.658    | 0.051   | 0.004      | 0.185     | 0.278    | 6.97                  |
| 9                                                         | 0.006     | 0.719    | 0.095   | 0.006      | 0.206     | 0.245    | 6.93                  |
| 10                                                        | 0.012     | 0.558    | 0.054   | 0.006      | 0.251     | 0.308    | 7.65                  |
| 11                                                        | 0.005     | 0.690    | 0.075   | 0.007      | 0.192     | 0.247    | 5.91                  |
| 12                                                        | 0.003     | 0.724    | 0.116   | 0.010      | 0.191     | 0.281    | 2.20                  |
| 13                                                        | 0.005     | 0.608    | 0.125   | 0.004      | 0.277     | 0.261    | 4.62                  |
| 14                                                        | 0.011     | 0.488    | 0.030   | 0.003      | 0.237     | 0.266    | 3.98                  |
| 15                                                        | 0.010     | 0.681    | 0.090   | 0.011      | 0.246     | 0.316    | 3.08                  |
| 16                                                        | 0.003     | 0.724    | 0.120   | 0.010      | 0.188     | 0.283    | 2.23                  |
| 17                                                        | 0.004     | 0.724    | 0.135   | 0.005      | 0.212     | 0.250    | 2.54                  |
| 18                                                        | 0.011     | 0.581    | 0.107   | 0.007      | 0.241     | 0.374    | 5.88                  |
| 19                                                        | 0.005     | 0.612    | 0.039   | 0.003      | 0.233     | 0.285    | 3.28                  |
| 20                                                        | 0.009     | 0.724    | 0.127   | 0.018      | 0.208     | 0.357    | 2.77                  |
| 256                                                       | 0.008     | 0.537    | 0.019   | 0.003      | 0.259     | 0.219    | 10.27                 |
| 257                                                       | 0.004     | 0.692    | 0.026   | 0.002      | 0.184     | 0.348    | 9.40                  |
| 258                                                       | 0.013     | 0.446    | 0.027   | 0.002      | 0.247     | 0.241    | 9.25                  |
| 259                                                       | 0.011     | 0.539    | 0.024   | 0.009      | 0.280     | 0.200    | 9.43                  |
| 260                                                       | 0.011     | 0.613    | 0.024   | 0.005      | 0.312     | 0.227    | 10.22                 |
| 261                                                       | 0.006     | 0.605    | 0.033   | 0.002      | 0.228     | 0.215    | 5.86                  |
| 262                                                       | 0.014     | 0.522    | 0.013   | 0.003      | 0.187     | 0.349    | 7.06                  |
| 263                                                       | 0.004     | 0.588    | 0.029   | 0.002      | 0.196     | 0.278    | 6.71                  |
| 264                                                       | 0.003     | 0.576    | 0.037   | 0.003      | 0.167     | 0.247    | 6.47                  |
| 265                                                       | 0.005     | 0.593    | 0.035   | 0.003      | 0.187     | 0.247    | 6.57                  |
| 266                                                       | 0.007     | 0.650    | 0.012   | 0.001      | 0.263     | 0.333    | 7.37                  |
| 267                                                       | 0.011     | 0.463    | 0.034   | 0.004      | 0.264     | 0.182    | 6.37                  |
| 268                                                       | 0.017     | 0.641    | 0.066   | 0.008      | 0.319     | 0.310    | 4.40                  |
| 269                                                       | 0.009     | 0.537    | 0.015   | 0.003      | 0.263     | 0.243    | 2.30                  |
| 270                                                       | 0.013     | 0.547    | 0.016   | 0.008      | 0.201     | 0.323    | 3.96                  |
| 271                                                       | 0.007     | 0.583    | 0.053   | 0.006      | 0.307     | 0.215    | 2.80                  |
| 272                                                       | 0.018     | 0.628    | 0.087   | 0.007      | 0.345     | 0.266    | 4.55                  |
| 273                                                       | 0.007     | 0.569    | 0.031   | 0.005      | 0.296     | 0.267    | 2.88                  |
| 274                                                       | 0.012     | 0.663    | 0.022   | 0.002      | 0.273     | 0.349    | 3.52                  |
| 275                                                       | 0.005     | 0.473    | 0.014   | 0.004      | 0.232     | 0.200    | 2.75                  |
| 276                                                       | 0.015     | 0.576    | 0.084   | 0.007      | 0.333     | 0.201    | 3.90                  |

| n258, Ant M, Scaled-up Power Density with Sim.power.limit |           |          |         |            |           |          |                       |
|-----------------------------------------------------------|-----------|----------|---------|------------|-----------|----------|-----------------------|
| Beam ID                                                   | S4(Right) | S3(Left) | S5(Top) | S6(Bottom) | S1(Front) | S2(Rear) | Sim.power.limit (dBm) |
| 0                                                         | 0.012     | 0.675    | 0.062   | 0.012      | 0.253     | 0.488    | 12.17                 |
| 1                                                         | 0.010     | 0.672    | 0.062   | 0.003      | 0.108     | 0.646    | 11.14                 |
| 2                                                         | 0.018     | 0.711    | 0.119   | 0.013      | 0.208     | 0.601    | 12.45                 |
| 3                                                         | 0.012     | 0.703    | 0.028   | 0.003      | 0.267     | 0.276    | 10.87                 |
| 4                                                         | 0.013     | 0.724    | 0.058   | 0.004      | 0.196     | 0.480    | 12.48                 |
| 5                                                         | 0.009     | 0.724    | 0.035   | 0.002      | 0.276     | 0.374    | 7.85                  |
| 6                                                         | 0.009     | 0.679    | 0.108   | 0.005      | 0.174     | 0.626    | 8.55                  |
| 7                                                         | 0.007     | 0.672    | 0.023   | 0.003      | 0.204     | 0.370    | 7.66                  |
| 8                                                         | 0.012     | 0.694    | 0.063   | 0.008      | 0.167     | 0.528    | 8.84                  |
| 9                                                         | 0.008     | 0.673    | 0.060   | 0.005      | 0.196     | 0.575    | 7.96                  |
| 10                                                        | 0.012     | 0.714    | 0.030   | 0.005      | 0.295     | 0.342    | 7.09                  |
| 11                                                        | 0.013     | 0.686    | 0.045   | 0.010      | 0.121     | 0.724    | 8.09                  |
| 12                                                        | 0.010     | 0.709    | 0.109   | 0.004      | 0.182     | 0.607    | 4.37                  |
| 13                                                        | 0.008     | 0.698    | 0.032   | 0.004      | 0.264     | 0.435    | 3.59                  |
| 14                                                        | 0.011     | 0.724    | 0.024   | 0.006      | 0.158     | 0.552    | 3.59                  |
| 15                                                        | 0.012     | 0.711    | 0.024   | 0.005      | 0.202     | 0.512    | 3.91                  |
| 16                                                        | 0.015     | 0.724    | 0.034   | 0.009      | 0.134     | 0.596    | 3.85                  |
| 17                                                        | 0.009     | 0.694    | 0.066   | 0.003      | 0.225     | 0.481    | 3.66                  |
| 18                                                        | 0.019     | 0.576    | 0.193   | 0.010      | 0.153     | 0.711    | 6.85                  |
| 19                                                        | 0.012     | 0.723    | 0.013   | 0.003      | 0.303     | 0.337    | 3.22                  |
| 20                                                        | 0.010     | 0.724    | 0.028   | 0.007      | 0.146     | 0.577    | 3.80                  |
| 256                                                       | 0.009     | 0.203    | 0.022   | 0.004      | 0.082     | 0.423    | 12.35                 |
| 257                                                       | 0.013     | 0.180    | 0.039   | 0.005      | 0.015     | 0.673    | 10.11                 |
| 258                                                       | 0.019     | 0.147    | 0.049   | 0.004      | 0.023     | 0.675    | 11.77                 |
| 259                                                       | 0.023     | 0.155    | 0.059   | 0.007      | 0.023     | 0.715    | 11.18                 |
| 260                                                       | 0.010     | 0.241    | 0.067   | 0.010      | 0.067     | 0.724    | 13.11                 |
| 261                                                       | 0.015     | 0.134    | 0.087   | 0.002      | 0.026     | 0.686    | 8.08                  |
| 262                                                       | 0.016     | 0.124    | 0.037   | 0.001      | 0.013     | 0.701    | 6.66                  |
| 263                                                       | 0.011     | 0.174    | 0.017   | 0.005      | 0.033     | 0.606    | 6.85                  |
| 264                                                       | 0.011     | 0.184    | 0.013   | 0.007      | 0.038     | 0.579    | 7.21                  |
| 265                                                       | 0.012     | 0.146    | 0.035   | 0.002      | 0.025     | 0.633    | 6.68                  |
| 266                                                       | 0.021     | 0.130    | 0.020   | 0.001      | 0.022     | 0.698    | 7.17                  |
| 267                                                       | 0.016     | 0.190    | 0.020   | 0.008      | 0.025     | 0.693    | 8.15                  |
| 268                                                       | 0.017     | 0.129    | 0.094   | 0.002      | 0.035     | 0.683    | 3.96                  |
| 269                                                       | 0.023     | 0.138    | 0.041   | 0.001      | 0.026     | 0.695    | 3.21                  |
| 270                                                       | 0.014     | 0.233    | 0.047   | 0.014      | 0.033     | 0.612    | 4.70                  |
| 271                                                       | 0.025     | 0.147    | 0.012   | 0.002      | 0.016     | 0.679    | 3.02                  |
| 272                                                       | 0.017     | 0.166    | 0.010   | 0.007      | 0.021     | 0.589    | 2.80                  |
| 273                                                       | 0.017     | 0.134    | 0.064   | 0.001      | 0.030     | 0.690    | 3.48                  |
| 274                                                       | 0.027     | 0.133    | 0.007   | 0.004      | 0.020     | 0.680    | 3.18                  |
| 275                                                       | 0.026     | 0.159    | 0.033   | 0.003      | 0.018     | 0.650    | 3.76                  |
| 276                                                       | 0.021     | 0.153    | 0.008   | 0.003      | 0.018     | 0.642    | 2.86                  |

## 7. PD Char

### 7.1 single beam

To determine the input power limit at each antenna port, simulation was performed at low, mid, and high channel for each mmW band supported, with 6 dBm input power per active port for n258 band, 6 dBm input power per active port for n261 band and 6 dBm input power per active port for n260 band:

1. Obtained PD<sub>surface</sub> value (the worst PD among all identified surfaces of the DUT) at all three channels for all single beams specified in the codebook.

2. Derived a scaling factor at low, mid and high channel,  $s(i)_{low\_or\_mid\_or\_high}$ , by

$$s(i)_{low\_or\_mid\_or\_high} = PD\_design\_target / Sim.PD\ surface(i), \quad i = \text{single beams} \quad (1)$$

3. Determined the worst-case scaling factor,  $s(i)$ , among low, mid and high channels:

$$s(i) = \min\{S_{low}(i), S_{mid}(i), S_{high}(i)\}, \quad i = \text{single beams} \quad (2)$$

and this scaling factor applies to the input power at each antenna port.

### 7.2 Beam Pairs

Per the manufacturer, the relative phase between beam pair is not controlled in the chipset design and could vary from run to run. Therefore, for each beam pair, based on the simulation results, the worst case scaling factor was determined mathematically to ensure the compliance. The worst-case PD for MIMO operations was found by sweeping the relative phase for all possible angles to ensure a conservative assessment. The power density simulation report contains the worst-case power density for each surface after sweeping through all relative phases between beams.

Once the power density was determined for the worst-case  $\varnothing$ , the scaling factor was obtained by the below equation for low, mid and high channels

$$s(i)_{low\_or\_mid\_or\_high} = \frac{PD\ design\ target}{total\ PD\ (\varnothing(i)_{worstcase})}, \quad i \in \text{beam pairs} \quad (3)$$

The Total PD( $\varnothing$  worstcase) varies with channel and beam pair, the lowest scaling factor among all three channels,  $s(i)$ , is determined for the beam pair  $i$ :

$$s(i) = \min\{s_{low}(i), s_{mid}(i), s_{high}(i)\}, \quad i \in \text{beam pairs} \quad (4)$$

### 7.3 Input.Power.Limit Calculations

The PD Char specifies the limit of input power at antenna port that corresponds to PD\_design\_target for all the beams. Ideally, if there is no uncertainty associated with hardware design, the input power limit, denoted as Input.power.limit(i), for beam i can be obtained after accounting for the housing influence ( $\Delta_{min}$ ) given by:

For n258, n260 and n261

$$input.power.limit(i) = sim.power_{limit} + 10 * \log(s(i)) + \Delta_{min}, i \in all\ beams \quad (5)$$

where 6 dBm is the input power used in simulation for n258, n261 and n260, respectively;  $s(i)$  is the scaling factor obtained from Eq. (2) or Eq. (4) for beam i;

$\Delta_{min}$  is the worst-case housing influence factor for beam i.

If simulation overestimates the housing influence, then  $\Delta_{min}$  (= simulated PD –measured PD) is negative, which means that the measured PD would be higher than the simulated PD. The input power to antenna elements determined via simulation must be decreased for compliance.

Similarly, if simulation underestimates the loss, then  $\Delta_{min}$  is positive (measured PD would be lower than the simulated value). Input power to antenna elements determined via simulation can be increased and still be PD compliant.

In reality the hardware design has uncertainty which must be properly considered. The device design related uncertainty is embedded in the process of  $\Delta_{min}$  determination. Since the device uncertainty is already accounted for in PD\_design\_target, it needs to be removed to avoid double counting this uncertainty.

Thus, Equation 5 is modified to:

**If** -TxAGC uncertainty <  $\Delta_{min}$  < TxAGC uncertainty,

$$input.power.limit(i) = sim.power_{limit}(i), i \in all\ beams, \text{ for n258, n261, and n260} \quad (6)$$

**else if**  $\Delta_{min}$  < -TxAGC uncertainty,

$$input.power.limit(i) = sim.power_{limit}(i) + (\Delta_{min} + TxAGC\ uncertainty), \\ i \in all\ beams, \text{ for n258, n261, and n260} \quad (7)$$

**else if**  $\Delta_{min}$  > TxAGC uncertainty,

$$input.power.limit(i) = sim.power_{limit}(i) + (\Delta_{min} - TxAGC\ uncertainty), \\ i \in all\ beams, \text{ for n258, n261, and n260} \quad (8)$$

Following above logic, the input.power.limit for this DUT can be calculated using Equations (6), (7), and (8), i.e.

Table 20: Input.power.limit calculation

| Band | Antenna | $\Delta_{min}$<br>(dB) | TxAGC Uncertainty | <i>input.power.limit</i>                    | Notes       |
|------|---------|------------------------|-------------------|---------------------------------------------|-------------|
|      |         |                        | (dB)              | (dBm)                                       |             |
| n261 | Patch M | 2.74                   | 0.47              | input.power.limit (i)=sim.power.limit+2.27  | Using Eq. 8 |
| N250 | Patch M | 2.90                   | 0.47              | input.power.limit (i)= sim.power.limit+2.43 | Using Eq. 8 |
| n258 | Patch M | 2.06                   | 0.47              | input.power.limit (i)= sim.power.limit+1.59 | Using Eq. 8 |

Table 21: Permanent back-off applied to calculated input.power.limit

| Band | Antenna | Permanent back-off (dB) |
|------|---------|-------------------------|
| N260 | Patch M | 0.5                     |
| N260 | Patch M | 0.5                     |
| N258 | Patch M | 0.5                     |

Note: The above back-off values have been permanently applied to the input.power.limits calculated from the equations above. The final input.power.limits implemented in the EFS are in the tables below

### 5G NR n258 M Patch input.power.limit

| Antenna | Beam ID_1 | Beam ID_2 | Input.power.limit(dBm) |
|---------|-----------|-----------|------------------------|
| M Patch | 0         |           | 13.3                   |
|         | 1         |           | 12.3                   |
|         | 2         |           | 13.6                   |
|         | 3         |           | 12.0                   |
|         | 4         |           | 13.6                   |
|         | 5         |           | 9.0                    |
|         | 6         |           | 9.7                    |
|         | 7         |           | 8.8                    |
|         | 8         |           | 10.0                   |
|         | 9         |           | 9.1                    |
|         | 10        |           | 8.2                    |
|         | 11        |           | 9.2                    |
|         | 12        |           | 5.5                    |
|         | 13        |           | 4.7                    |
|         | 14        |           | 4.7                    |
|         | 15        |           | 5.1                    |
|         | 16        |           | 5.0                    |
|         | 17        |           | 4.8                    |
|         | 18        |           | 8.0                    |
|         | 19        |           | 4.4                    |
|         | 20        |           | 4.9                    |
|         | 256       |           | 13.5                   |
|         | 257       |           | 11.3                   |
|         | 258       |           | 12.9                   |
|         | 259       |           | 12.3                   |
|         | 260       |           | 14.3                   |
|         | 261       |           | 9.2                    |
|         | 262       |           | 7.8                    |
|         | 263       |           | 8.0                    |
|         | 264       |           | 8.4                    |
|         | 265       |           | 7.8                    |
|         | 266       |           | 8.3                    |
|         | 267       |           | 9.3                    |
|         | 268       |           | 5.1                    |
|         | 269       |           | 4.4                    |
|         | 270       |           | 5.8                    |
|         | 271       |           | 4.2                    |
|         | 272       |           | 3.9                    |
|         | 273       |           | 4.6                    |
|         | 274       |           | 4.3                    |
|         | 275       |           | 4.9                    |
|         | 276       |           | 4.0                    |
|         | 0         | 256       | 9.9                    |
|         | 1         | 257       | 8.5                    |
|         | 2         | 258       | 9.5                    |
|         | 3         | 259       | 10.4                   |
|         | 4         | 260       | 11.4                   |
|         | 5         | 261       | 7.1                    |
|         | 6         | 262       | 5.5                    |
|         | 7         | 263       | 5.3                    |
|         | 8         | 264       | 5.4                    |
|         | 9         | 265       | 4.5                    |
|         | 10        | 266       | 6.1                    |
|         | 11        | 267       | 6.4                    |
|         | 12        | 268       | 1.5                    |
|         | 13        | 269       | 1.7                    |
|         | 14        | 270       | 1.7                    |
|         | 15        | 271       | 1.5                    |
|         | 16        | 272       | 0.7                    |
|         | 17        | 273       | 1.6                    |
|         | 18        | 274       | 2.8                    |
|         | 19        | 275       | 3.1                    |
|         | 20        | 276       | 1.0                    |

### 5G NR n261 M Patch input.power.limit

| Antenna | Beam ID_1 | Beam ID_2 | Input.power.limit(dBm) |
|---------|-----------|-----------|------------------------|
| M Patch | 0         |           | 11.7                   |
|         | 1         |           | 13.8                   |
|         | 2         |           | 11.9                   |
|         | 3         |           | 11.6                   |
|         | 4         |           | 12.1                   |
|         | 5         |           | 9.3                    |
|         | 6         |           | 8.7                    |
|         | 7         |           | 8.7                    |
|         | 8         |           | 9.8                    |
|         | 9         |           | 9.6                    |
|         | 10        |           | 9.5                    |
|         | 11        |           | 8.8                    |
|         | 12        |           | 6.5                    |
|         | 13        |           | 4.6                    |
|         | 14        |           | 4.9                    |
|         | 15        |           | 4.4                    |
|         | 16        |           | 5.0                    |
|         | 17        |           | 5.3                    |
|         | 18        |           | 4.4                    |
|         | 19        |           | 4.5                    |
|         | 20        |           | 4.3                    |
|         | 256       |           | 16.2                   |
|         | 257       |           | 12.3                   |
|         | 258       |           | 13.0                   |
|         | 259       |           | 13.0                   |
|         | 260       |           | 14.3                   |
|         | 261       |           | 10.6                   |
|         | 262       |           | 10.2                   |
|         | 263       |           | 9.4                    |
|         | 264       |           | 9.3                    |
|         | 265       |           | 10.0                   |
|         | 266       |           | 9.5                    |
|         | 267       |           | 8.6                    |
|         | 268       |           | 7.1                    |
|         | 269       |           | 5.7                    |
|         | 270       |           | 5.2                    |
|         | 271       |           | 5.3                    |
|         | 272       |           | 5.9                    |
|         | 273       |           | 6.4                    |
|         | 274       |           | 5.4                    |
|         | 275       |           | 5.3                    |
|         | 276       |           | 5.3                    |
|         | 0         | 256       | 10.5                   |
|         | 1         | 257       | 10.0                   |
|         | 2         | 258       | 10.2                   |
|         | 3         | 259       | 10.2                   |
|         | 4         | 260       | 10.6                   |
|         | 5         | 261       | 7.3                    |
|         | 6         | 262       | 7.2                    |
|         | 7         | 263       | 7.7                    |
|         | 8         | 264       | 6.7                    |
|         | 9         | 265       | 7.4                    |
|         | 10        | 266       | 7.4                    |
|         | 11        | 267       | 7.5                    |
|         | 12        | 268       | 3.5                    |
|         | 13        | 269       | 2.9                    |
|         | 14        | 270       | 3.5                    |
|         | 15        | 271       | 3.1                    |
|         | 16        | 272       | 3.2                    |
|         | 17        | 273       | 3.1                    |
|         | 18        | 274       | 2.9                    |
|         | 19        | 275       | 3.1                    |
|         | 20        | 276       | 3.0                    |

### 5G NR n260 M Patch input.power.limit

| Antenna | Beam ID_1 | Beam ID_2 | Input.power.limit(dBm) |
|---------|-----------|-----------|------------------------|
| M Patch | 0         |           | 12.7                   |
|         | 1         |           | 13.0                   |
|         | 2         |           | 11.2                   |
|         | 3         |           | 11.6                   |
|         | 4         |           | 12.0                   |
|         | 5         |           | 8.6                    |
|         | 6         |           | 10.4                   |
|         | 7         |           | 8.5                    |
|         | 8         |           | 9.0                    |
|         | 9         |           | 8.9                    |
|         | 10        |           | 9.6                    |
|         | 11        |           | 7.9                    |
|         | 12        |           | 4.2                    |
|         | 13        |           | 6.6                    |
|         | 14        |           | 6.0                    |
|         | 15        |           | 5.1                    |
|         | 16        |           | 4.2                    |
|         | 17        |           | 4.5                    |
|         | 18        |           | 7.9                    |
|         | 19        |           | 5.3                    |
|         | 20        |           | 4.8                    |
|         | 256       |           | 12.3                   |
|         | 257       |           | 11.4                   |
|         | 258       |           | 11.2                   |
|         | 259       |           | 11.4                   |
|         | 260       |           | 12.2                   |
|         | 261       |           | 7.8                    |
|         | 262       |           | 9.0                    |
|         | 263       |           | 8.7                    |
|         | 264       |           | 8.5                    |
|         | 265       |           | 8.5                    |
|         | 266       |           | 9.4                    |
|         | 267       |           | 8.3                    |
|         | 268       |           | 6.4                    |
|         | 269       |           | 4.3                    |
|         | 270       |           | 5.9                    |
|         | 271       |           | 4.8                    |
|         | 272       |           | 6.5                    |
|         | 273       |           | 4.9                    |
|         | 274       |           | 5.5                    |
|         | 275       |           | 4.7                    |
|         | 276       |           | 5.9                    |
|         | 0         | 256       | 8.9                    |
|         | 1         | 257       | 8.2                    |
|         | 2         | 258       | 7.6                    |
|         | 3         | 259       | 7.8                    |
|         | 4         | 260       | 8.6                    |
|         | 5         | 261       | 4.3                    |
|         | 6         | 262       | 6.4                    |
|         | 7         | 263       | 5.6                    |
|         | 8         | 264       | 5.4                    |
|         | 9         | 265       | 7.0                    |
|         | 10        | 266       | 6.0                    |
|         | 11        | 267       | 4.6                    |
|         | 12        | 268       | 1.7                    |
|         | 13        | 269       | 1.1                    |
|         | 14        | 270       | 2.3                    |
|         | 15        | 271       | 1.3                    |
|         | 16        | 272       | 1.8                    |
|         | 17        | 273       | 1.2                    |
|         | 18        | 274       | 2.5                    |
|         | 19        | 275       | 1.2                    |
|         | 20        | 276       | 1.8                    |