



Qualcomm Technologies, Inc.

ZJY Myra SUB6 mmW Power Density Simulation Report

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Qualcomm
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ffware@zjynetsys.com

For additional information or to submit technical questions, go to: <https://createpoint.qti.qualcomm.com>

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Qualcomm Technologies, Inc.
5775 Morehouse Drive
San Diego, CA 92121
U.S.A.

Revision history

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Qualcomm
2021-08-21 06:16:10 UTC
ffware@zjynetsys.com

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1 Electromagnetic simulation method for power density

1.1 EM simulation

1.1.1 EM simulation tool description

The mmWave power density (PD) simulation method for calculating PD (Power Density) for mobile phones with mmWave antenna modules is available in ANSYS Electromagnetics suite HFSS ver. 21.1 (2021 R1) is used. ANSYS HFSS is one of several commercial tools for 3D full-wave electromagnetic simulation used for antenna and RF structure design of high frequency component. ANSYS Electromagnetics suite HFSS ver. 21.1 (2021 R1) is implemented based on Finite Element Method (FEM), which operates in the frequency domain.

1.1.2 Mesh and convergence criteria

ANSYS Electromagnetic suite HFSS ver. 21.1 (2021 R1) uses the Finite Element Method (FEM) to solve the structure for 3D EM simulations to analyze power density. The volume area containing the simulated object should be subdivided into electrically small parts called finite elements with unknown functions. To subdivide system, the adaptive mesh technique in ANSYS Electromagnetics suite HFSS ver. 21.1 (2021 R1) is used. ANSYS Electromagnetics suite HFSS ver. 21.1 (2021 R1) starts to refine the initial mesh based on wavelength and calculate the error to iterative process for adaptive mesh refinement. The determination parameter of the number of iterations in ANSYS Electromagnetics suite HFSS ver. 21.1 (2021 R1) is defined as convergence criteria, delta S, and the iterative adaptive mesh process repeats until the delta S is met. In ANSYS Electromagnetics suite HFSS ver. 21.1 (2021 R1), the accuracy of converged results depends on the delta S. Figure 1 is an example of final adaptive mesh of the device (cross-section of top view).

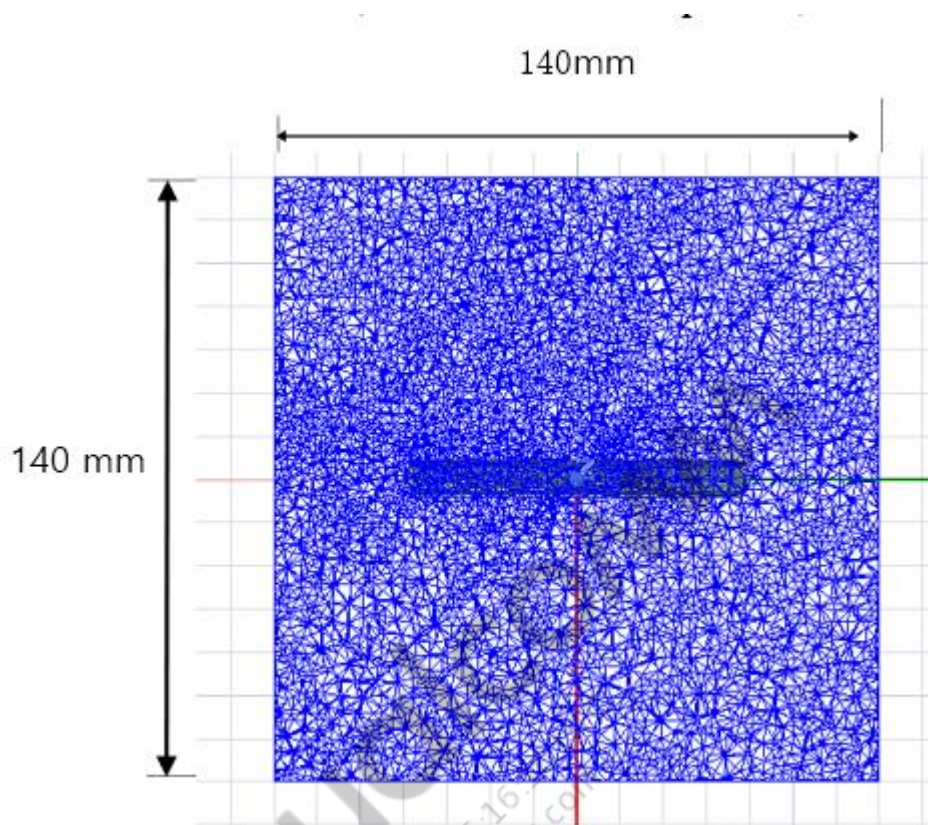


Figure 1-1: Example of HFSS mesh in a model of the device (Top view)

1.1.3 Time-averaged power density calculation

It is possible to get various kinds of physical quantities can be obtained after finishing 3D full-wave electromagnetic simulation. To calculate PD evaluation, two physical quantities, an electric field (\vec{E}) and a magnetic field (\vec{H}) are needed. The actual consumption power can be expressed as the real term of the time-averaged Poynting vector (\mathcal{S}) from the cross product of \vec{E} and complex conjugation of H^* as shown below:

(S) can be expressed as point power density based on a peak value of each spatial point on mesh grids and obtained directly from ANSYS Electromagnetics suite HFSS ver. 21.1 (2021 R1).

$$\vec{S} = \text{Re}\left(\frac{1}{2}\vec{E} \times \vec{H}^*\right)$$

From the point power density(S), the spatial-averaged power density (PD_{av}) on an evaluated area (A) can be derived as shown below:

$$PD_{av} = \frac{1}{A} \int_A \vec{S} \cdot d\vec{s} = \frac{1}{2A} \int_A |\text{Re}(\vec{E} \times \vec{H}^*)| \cdot ds$$

1.2 Simulation setup

1.2.1 Modeling for simulation

The simulation approach to perform PD assessment for a smartphone requires accurate modeling for mmWave antenna module as well as the smartphone itself. Figure 2 shows the simulation model which is mounted two mmWave antenna modules. The simulation modeling includes most of the entire structure of device itself such as PCB, metal frame, battery, cables, and legacy antennas as well as mmWave antenna modules called as QMT0# and QMT1#. On the front side view, QMT0# is placed at the left side and antennas are facing the left side of the device. QMT1# is placed on the right side and antennas are facing the right side.

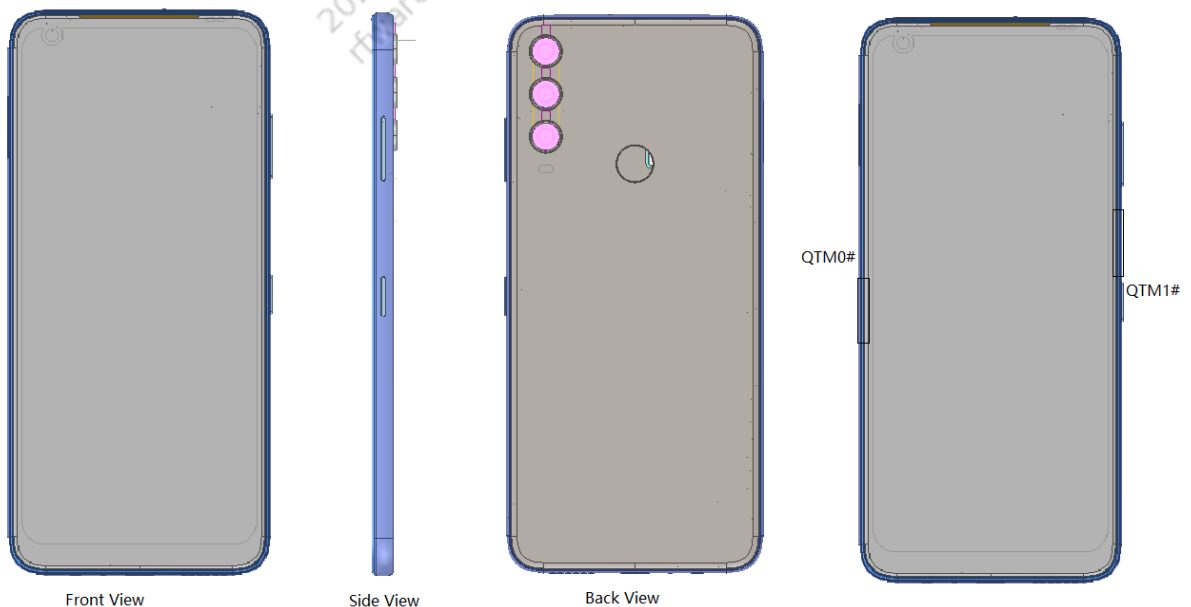


Figure 1-2: HFSS simulation model which is mounted two mmWave antenna modules

1.2.2 PD evaluation surfaces

Figure 1-3 shows the PD evaluation planes and truncation area of the simulation model to find worst case surfaces for evaluation. Table 1-1 shows the surfaces selected for PD evaluation planes for QTM#0 and QTM#1.

Please note that the “right” and “left” edge of mentioned in this report are defined from the perspective of looking at the device from the front side.

Table 1-1: PD evaluation surfaces

	Front	Back	Left From Front View	Right From Front View	Top	Bottom
	S1	S2	S3	S4	S5	S6
QTM#0	√	√	√	√	√	√
QTM#1	√	√	√	√	√	√

1.2.3 Radiation boundary condition

For radiation boundary, the 2nd order absorbing boundary condition (ABC) is used for all simulations in this report. This radiation boundary simulates an electrically open surface that allows waves to radiate infinitely far into space. The system absorbs the wave via the 2nd order radiation boundary, essentially ballooning the boundary infinitely far away from the structure and into space. The radiation boundaries may also be placed relatively close to a structure and can be of arbitrary shape.

Per ANSYS recommendations for their simulation tool, the radiation boundary plane must be located at least a quarter wavelength from strongly radiating structure, or at least a tenth of a wavelength from a weakly radiating structure. In this simulation report, about two or three wavelengths spacing from the device surfaces in all main beam directions are applied to ensure convergence.

By changing convergence error (i.e., maximum magnitude delta S) from 2% to 4% and moving the radiation boundary closer towards the device by 20%, the combined influence in PD value is < 0.04 dB which confirms that the simulation model is reliable using this setup.

1.2.4 Source excitation condition

Each of the three 5G mmWave array modules is the same part containing a 1x4 element array of dual-polarization patch antennas. The number of antenna ports of QTM#0 and QTM#1 for source excitation is equal to 16. The port of each patch antenna is separated in frequency and polarization. That is, the ports of each patch antenna are divided into a feed for 28 GHz and a feed for 39 GHz, and a vertical polarity feed and a horizontal polarity feed are divided.

Figure 1-3 shows the QTM#1 module structure and surrounding structure. The QTM#1 module is encrypted in the ANSYS Electromagnetics suite (HFSS) and can only check the feeding position

is encrypted in the ANSYS Electromagnetics suite (HFSS) and can only check the feeding position.

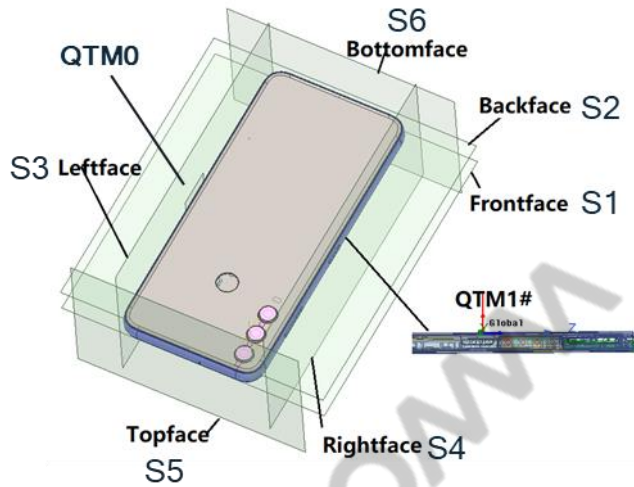


Figure 1-3: EUT simulation model

After finishing 3D full wave electromagnetic simulation of modeling structure, the magnitude and phase information can be loaded for each port by using “Edit Sources” function in ANSYS Electromagnetics suite (HFSS). Figure 4 shows an example of antenna port excitations.

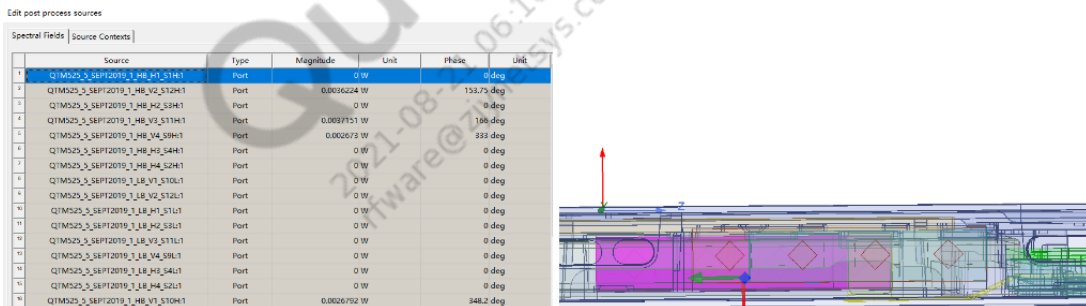


Figure 1-4: An example of port excitation (QTM#1)

Since ANSYS Electromagnetics suite (HFSS) uses FEM solver based on frequency domain analysis method, the input source for the port excitation applies sinusoidal waveform for each frequency.

1.2.5 Condition of simulation completion

The simulation completion condition of ANSYS Electromagnetics suite (HFSS) is defined as delta S. The ANSYS Electromagnetics suite (HFSS) calculates the S-parameter for the mesh conditions of each step and determines whether to proceed with the operation of the next step by comparing the difference between the S-parameters in the previous step. A difference between the previous step and the current step of S-parameter is expressed as delta S, and the delta S generally sets 0.02. The simulation result of this report is the result of setting delta S to 0.02.

2 Codebook

The codebook supported by this EUT is shown in Table 2-1 below.

Table 2-1: EUT codebook

- N261 codebook

Band	Beam_ID	Module	Ant_Type	Ant_Feed	Paired_With
261	0	1	PATCH	1	128
261	1	0	PATCH	1	129
261	2	1	PATCH	1	130
261	3	0	PATCH	1	131
261	4	0	PATCH	1	132
261	5	1	PATCH	2	133
261	6	1	PATCH	2	134
261	7	1	PATCH	2	135
261	8	1	PATCH	2	136
261	9	0	PATCH	2	137
261	10	0	PATCH	2	138
261	11	0	PATCH	2	139
261	12	0	PATCH	2	140
261	13	1	PATCH	2	141
261	14	1	PATCH	2	142
261	15	1	PATCH	2	143
261	16	0	PATCH	2	144
261	17	0	PATCH	2	145
261	18	0	PATCH	2	146
261	19	1	PATCH	4	147
261	20	1	PATCH	4	148
261	21	1	PATCH	4	149
261	22	1	PATCH	4	150
261	23	1	PATCH	4	151
261	24	0	PATCH	4	152
261	25	0	PATCH	4	153

261	26	0	PATCH	4	154
261	27	0	PATCH	4	155
261	28	0	PATCH	4	156
261	29	1	PATCH	4	157
261	30	1	PATCH	4	158
261	31	1	PATCH	4	159
261	32	1	PATCH	4	160
261	33	0	PATCH	4	161
261	34	0	PATCH	4	162
261	35	0	PATCH	4	163
261	36	0	PATCH	4	164
261	128	1	PATCH	1	0
261	129	0	PATCH	1	1
261	130	1	PATCH	1	2
261	131	0	PATCH	1	3
261	132	0	PATCH	1	4
261	133	1	PATCH	2	5
261	134	1	PATCH	2	6
261	135	1	PATCH	2	7
261	136	1	PATCH	2	8
261	137	0	PATCH	2	9
261	138	0	PATCH	2	10
261	139	0	PATCH	2	11
261	140	0	PATCH	2	12
261	141	1	PATCH	2	13
261	142	1	PATCH	2	14
261	143	1	PATCH	2	15
261	144	0	PATCH	2	16
261	145	0	PATCH	2	17
261	146	0	PATCH	2	18
261	147	1	PATCH	4	19
261	148	1	PATCH	4	20
261	149	1	PATCH	4	21
261	150	1	PATCH	4	22
261	151	1	PATCH	4	23
261	152	0	PATCH	4	24

261	153	0	PATCH	4	25
261	154	0	PATCH	4	26
261	155	0	PATCH	4	27
261	156	0	PATCH	4	28
261	157	1	PATCH	4	29
261	158	1	PATCH	4	30
261	159	1	PATCH	4	31
261	160	1	PATCH	4	32
261	161	0	PATCH	4	33
261	162	0	PATCH	4	34
261	163	0	PATCH	4	35
261	164	0	PATCH	4	36

- N260 codebook

Band	Beam_ID	Module	Ant_Type	Ant_Feed	Paired_With
260	0	1	PATCH	1	128
260	1	0	PATCH	1	129
260	2	1	PATCH	1	130
260	3	0	PATCH	1	131
260	4	0	PATCH	1	132
260	5	0	PATCH	1	133
260	6	1	PATCH	2	134
260	7	1	PATCH	2	135
260	8	1	PATCH	2	136
260	9	1	PATCH	2	137
260	10	0	PATCH	2	138
260	11	0	PATCH	2	139
260	12	0	PATCH	2	140
260	13	0	PATCH	2	141
260	14	1	PATCH	2	142
260	15	1	PATCH	2	143
260	16	1	PATCH	2	144
260	17	0	PATCH	2	145
260	18	0	PATCH	2	146
260	19	0	PATCH	2	147

260	20	1	PATCH	4	148
260	21	1	PATCH	4	149
260	22	1	PATCH	4	150
260	23	1	PATCH	4	151
260	24	1	PATCH	4	152
260	25	0	PATCH	4	153
260	26	0	PATCH	4	154
260	27	0	PATCH	4	155
260	28	0	PATCH	4	156
260	29	0	PATCH	4	157
260	30	1	PATCH	4	158
260	31	1	PATCH	4	159
260	32	1	PATCH	4	160
260	33	1	PATCH	4	161
260	34	0	PATCH	4	162
260	35	0	PATCH	4	163
260	36	0	PATCH	4	164
260	37	0	PATCH	4	165
260	128	1	PATCH	1	0
260	129	0	PATCH	1	1
260	130	1	PATCH	1	2
260	131	0	PATCH	1	3
260	132	0	PATCH	1	4
260	133	0	PATCH	1	5
260	134	1	PATCH	2	6
260	135	1	PATCH	2	7
260	136	1	PATCH	2	8
260	137	1	PATCH	2	9
260	138	0	PATCH	2	10
260	139	0	PATCH	2	11
260	140	0	PATCH	2	12
260	141	0	PATCH	2	13
260	142	1	PATCH	2	14
260	143	1	PATCH	2	15
260	144	1	PATCH	2	16
260	145	0	PATCH	2	17

260	146	0	PATCH	2	18
260	147	0	PATCH	2	19
260	148	1	PATCH	4	20
260	149	1	PATCH	4	21
260	150	1	PATCH	4	22
260	151	1	PATCH	4	23
260	152	1	PATCH	4	24
260	153	0	PATCH	4	25
260	154	0	PATCH	4	26
260	155	0	PATCH	4	27
260	156	0	PATCH	4	28
260	157	0	PATCH	4	29
260	158	1	PATCH	4	30
260	159	1	PATCH	4	31
260	160	1	PATCH	4	32
260	161	1	PATCH	4	33
260	162	0	PATCH	4	34
260	163	0	PATCH	4	35
260	164	0	PATCH	4	36
260	165	0	PATCH	4	37

3 Simulation verification

The beams selected for simulation verification are highlighted in yellow in Table 2-1. Input power level used for comparison is listed in Table 3-1.

Table 3-1: Input power used in simulation validation

Mode/Band	Antenna	Input Power (dBm)	
		SISO	MIMO
5G NR n261 (28 GHz)	QTM#0 Patch	6	6
	QTM#1 Patch	6	6
5G NR n260 (39 GHz)	QTM#0 Patch	6	6
	QTM#1 Patch	6	6

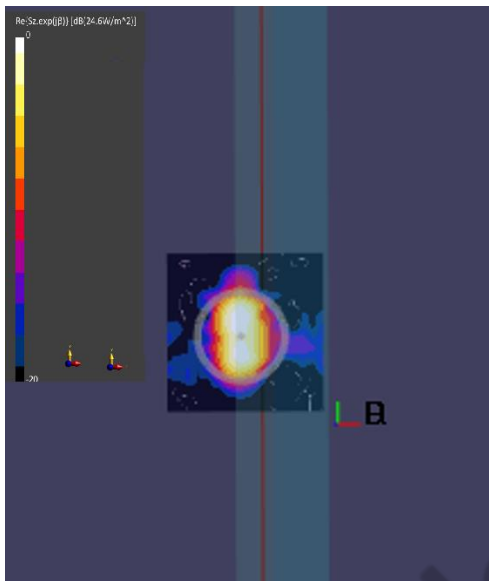
The simulation and measurement were performed at 2mm evaluation distance. The simulated and measured 4cm² averaged PD results are shown in Table 3-2.

Table 3-2: Simulated and measured 4cm² averaged PD comparison

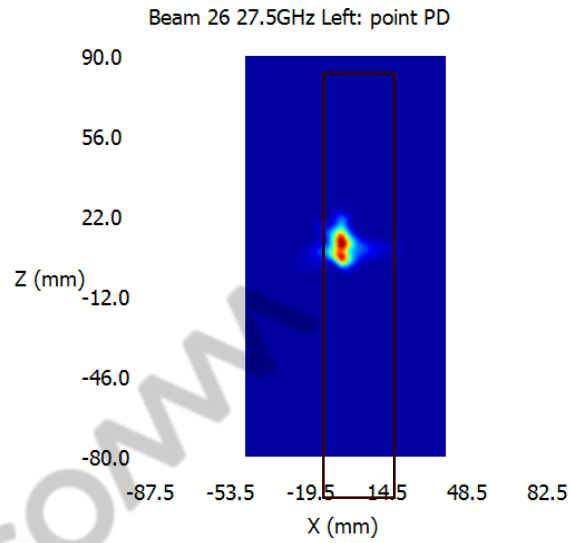
measured PD / simulated PD at 6dBm input power									
Band	Ant Type	Module	Ant Pol	beam ID	Surface	Channel	Measured	Simulated	Delta (dB) (Simulated-Measured)
n261	Patch	QTM0	AG0(V)	26	Leftface	Low	8.57	18	3.2
					Frontface	Low	3.8	7.71	3.1
					Backface	Low	5.73	7.9	1.4
			AG1(H)	155	Leftface	Mid	8.8	16.99	2.9
					Frontface	Mid	4.06	7.51	2.7
					Backface	Mid	6.14	7.16	0.7
		QTM1	AG0(V)	30	Rightface	Low	8.42	17.08	3.1
					Frontface	Low	3.13	8.36	4.1
					Backface	Low	3.65	6.83	3.4
			AG1(H)	158	RightFace	Mid	8.53	15.36	2.6
					Frontface	Mid	4.16	6.97	2.2
					Backface	Mid	3.75	6.36	2.3
n260	Patch	QTM0	AG0(V)	29	Leftface	Mid	9.17	18.31	3.0
					Frontface	Mid	2.54	4.95	2.9
					Backface	Mid	2.65	5.67	3.3
			AG1(H)	157	Leftface	Mid	6.4	16.69	4.2
					Frontface	Mid	2.65	4.85	2.6
					Backface	Mid	4.96	5.15	0.2
		QTM1	AG0(V)	24	Rightface	Mid	8.63	15.46	2.5
					Frontface	Mid	2.79	5.55	3.0
					Backface	Mid	2.64	5.61	3.3
			AG1(H)	161	Rightface	Mid	6.47	14.52	3.5
					Frontface	Mid	2.74	4.77	2.4
					Backface	Mid	3.92	5.17	1.2

Below Figures show Measured and simulated PD distributions for selected beams. As can be seen, the Simulated point PD distribution and Measured point PD distribution have good correlation on all surfaces evaluated.

- N261 QTM0: Low channel, Beam26, Left face, Point PD

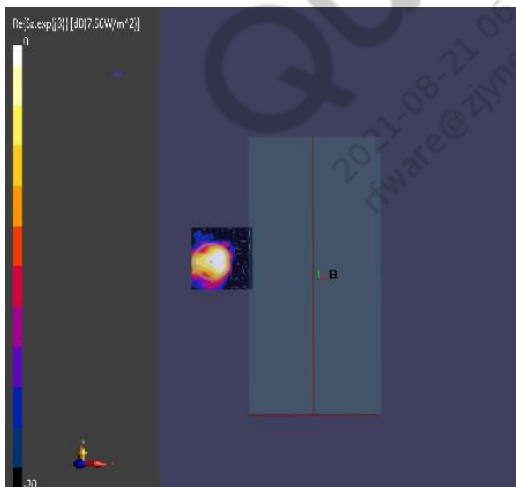


(a) Measurement

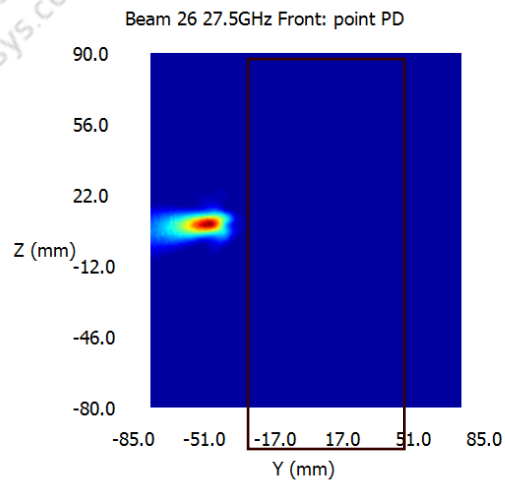


(b) Simulation

- N261 QTM0: Low channel, Beam26, Front face, Point PD

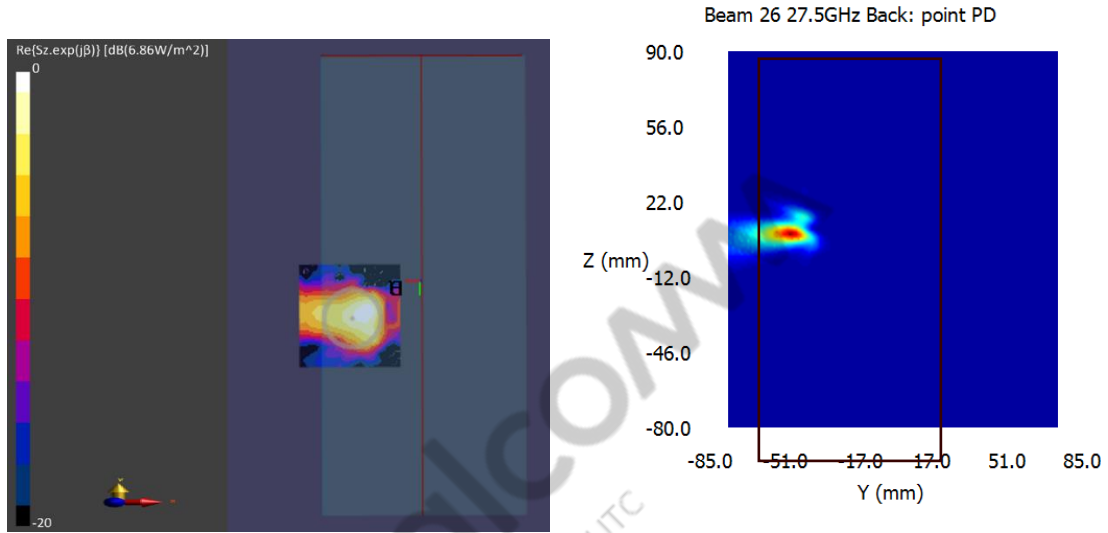


(a) Measurement



(b) Simulation

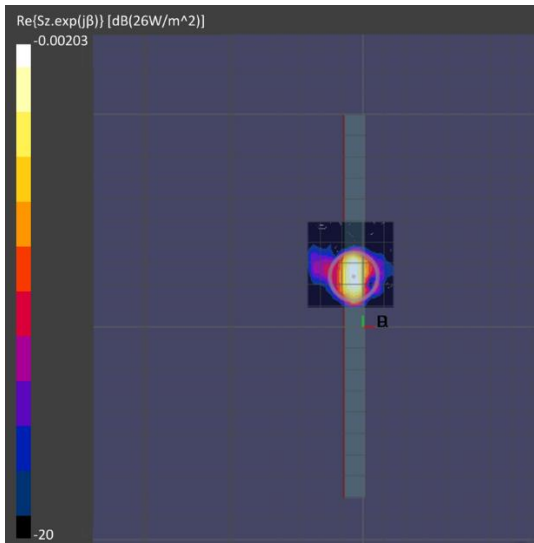
N261 QTM0: Low channel, Beam26, Back face, Point PD



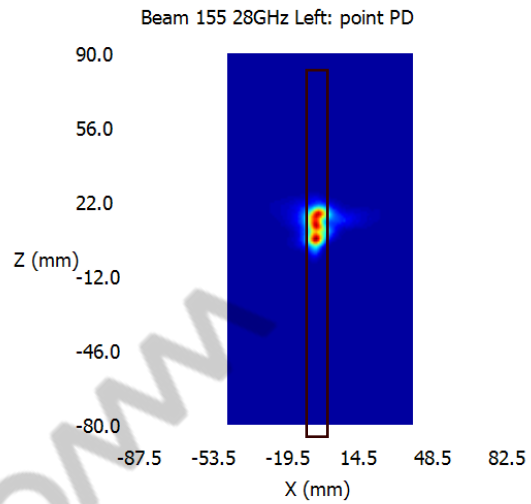
(a) Measurement

(b) Simulation

- N261 QTM0: Middle channel, Beam155, Left face, Point PD

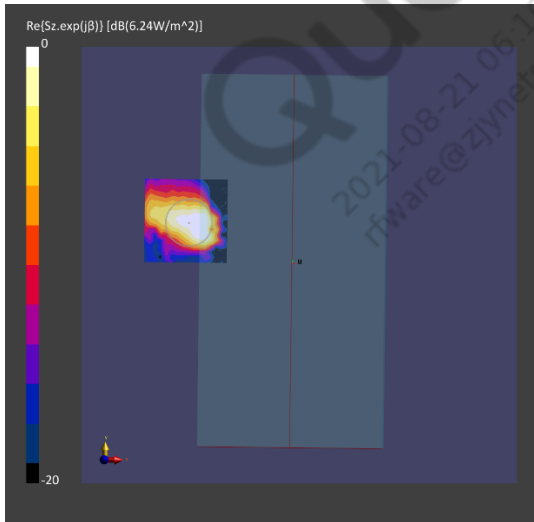


(a) Measurement

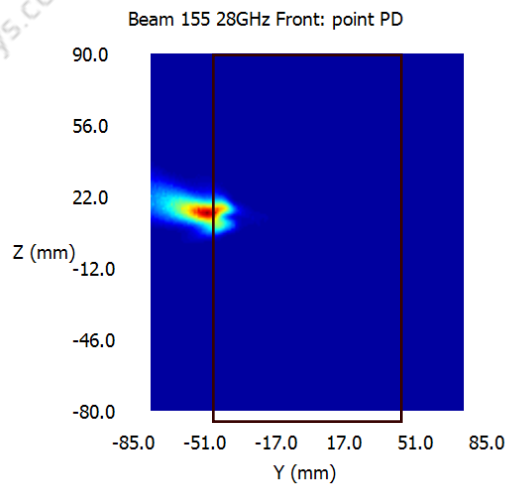


(b) Simulation

- N261 QTM0: Middle channel, Beam155, Front face, Point PD

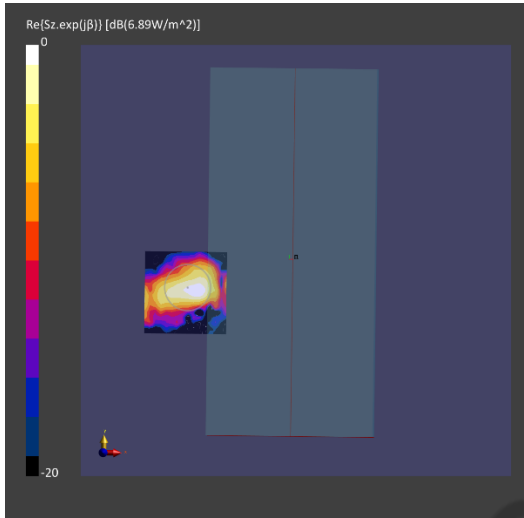


(a) Measurement

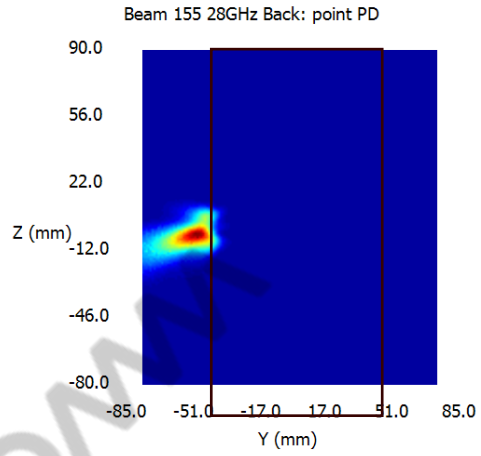


(b) Simulation

- N261 QTM0: Middle channel, Beam155, Back face, Point PD



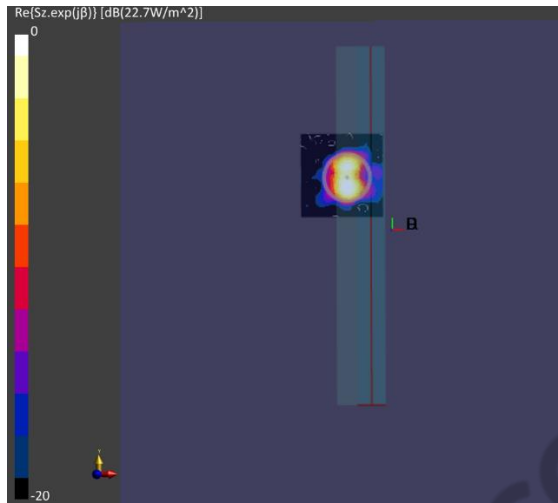
(a) Measurement



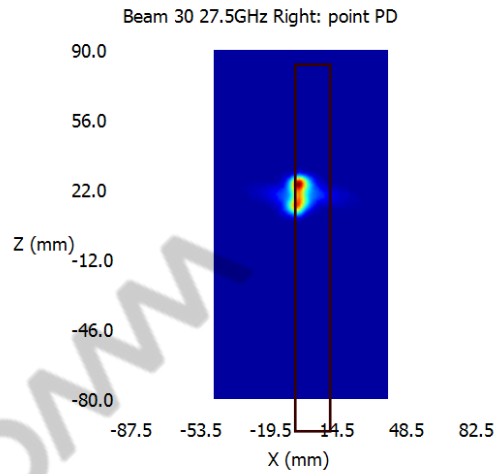
(b) Simulation

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- N261 QTM1: Low channel, Beam30, right face, Point PD

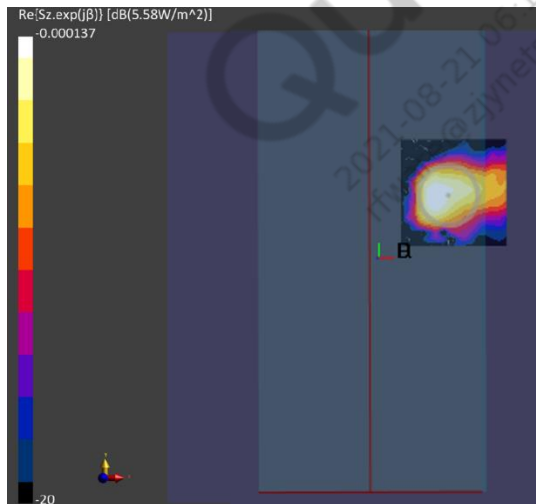


(a) Measurement

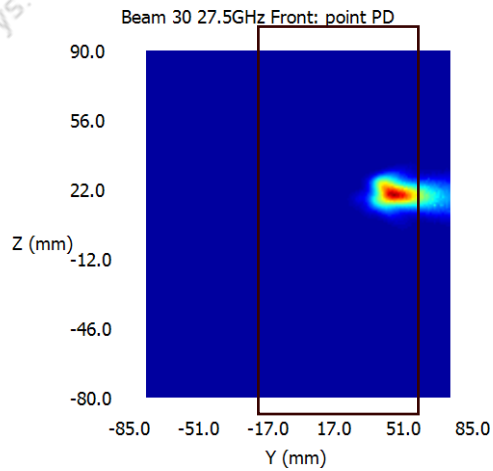


(b) Simulation

- N261 QTM1: Low channel, Beam30, Front face, Point PD

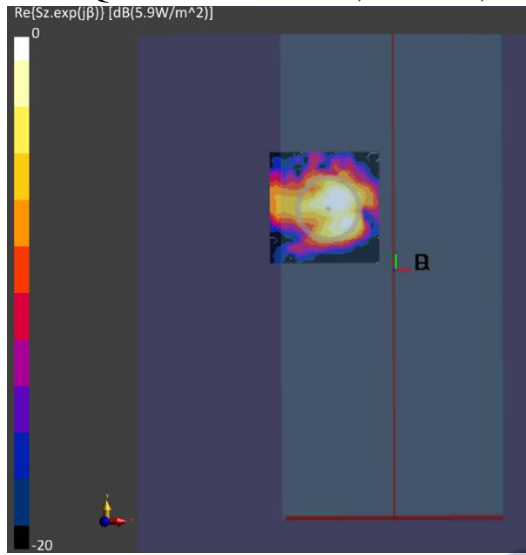


(a) Measurement

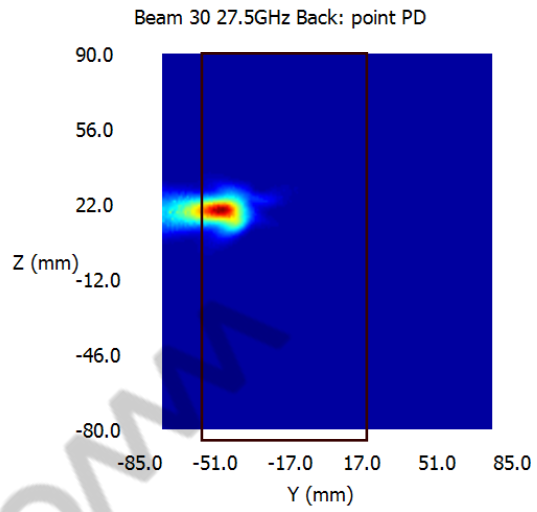


(b) Simulation

- N261 QTM1: Low channel, Beam30, Back face, Point PD



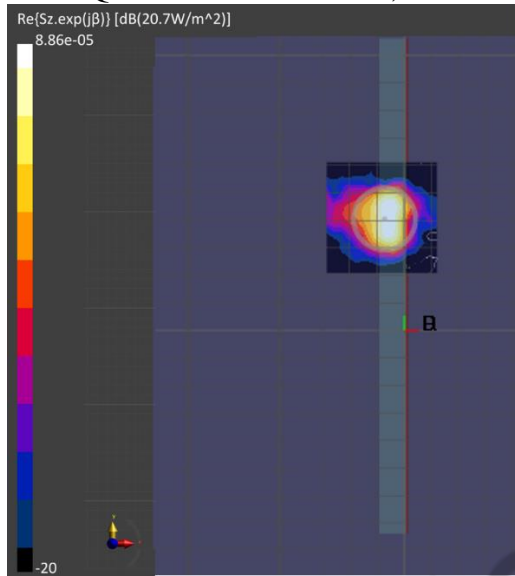
(a) Measurement



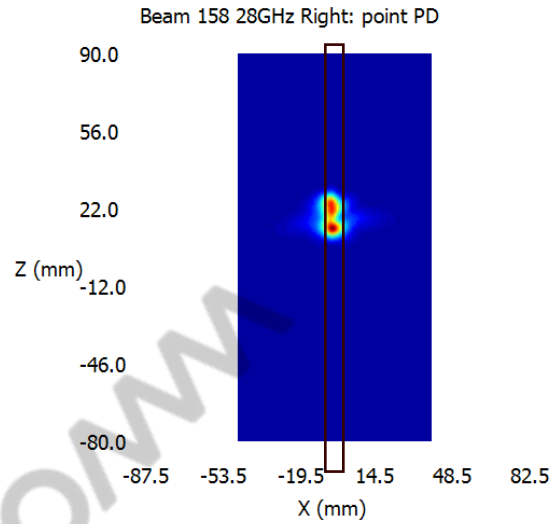
(b) Simulation

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- N261 QTM1: Middle channel, Beam158, Right face, Point PD

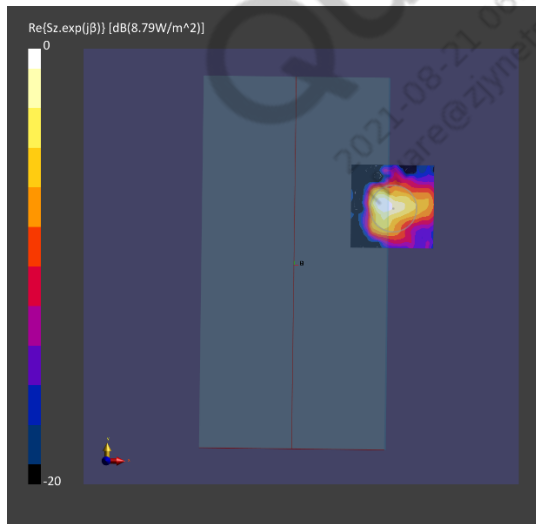


(a) Measurement

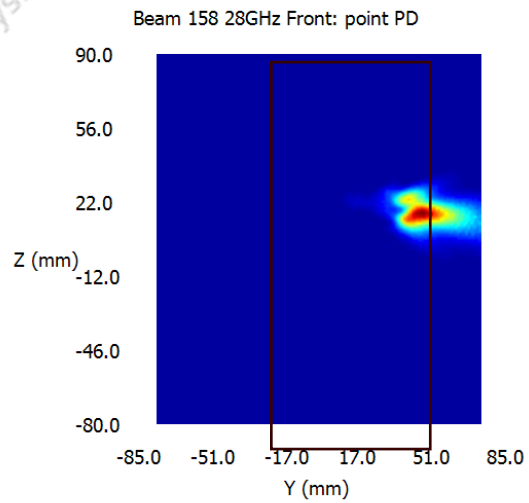


(b) Simulation

- N261 QTM1: Middle channel, Beam158, Front face, Point PD

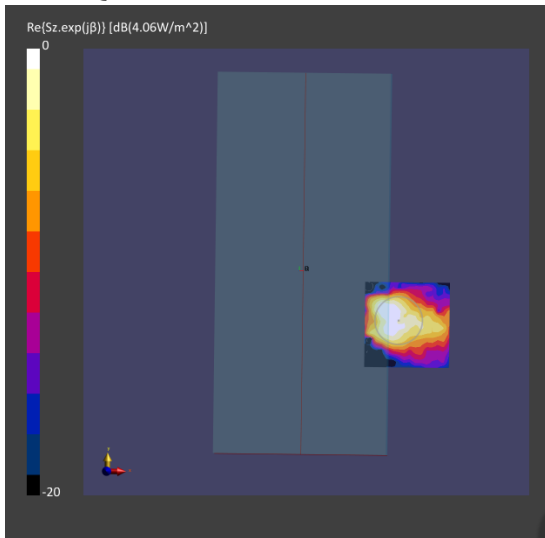


(a) Measurement

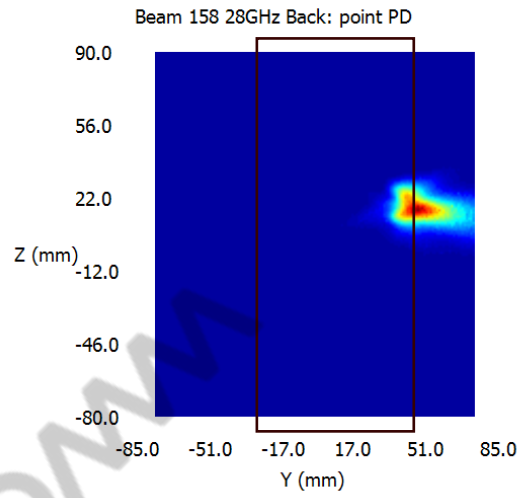


(b) Simulation

- N261 QTM1: Middle channel, Beam158, Back face, Point PD



(a) Measurement



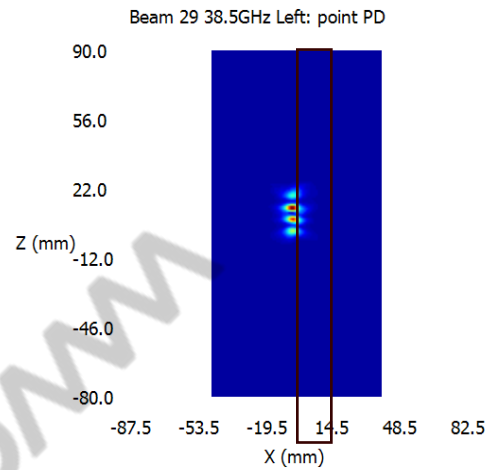
(b) Simulation

Qualcomm
2021-08-21 06:16:10 UTC
rfware@zjynetsys.com

- N260 QTM0: Middle channel, Beam29, Left face, Point PD

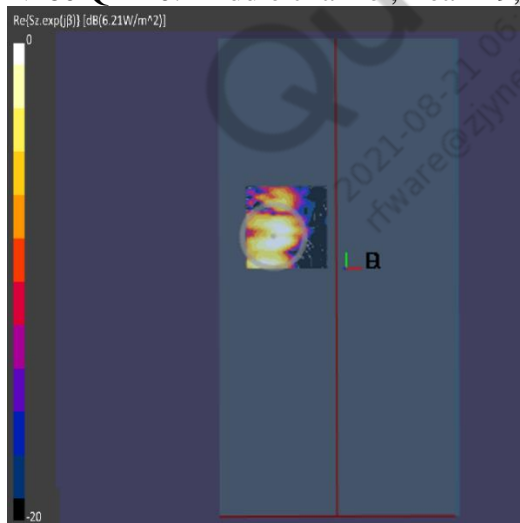


(a) Measurement

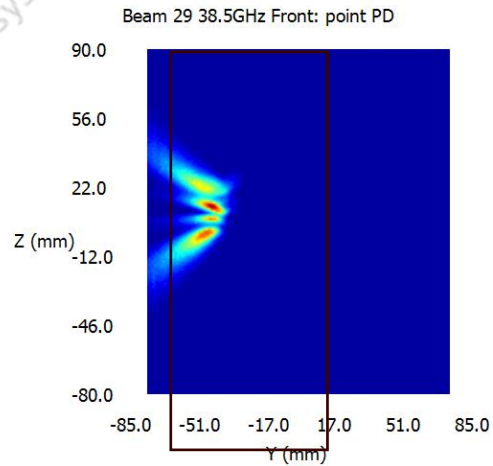


(b) Simulation

- N260 QTM0: Middle channel, Beam29, Front face, Point PD

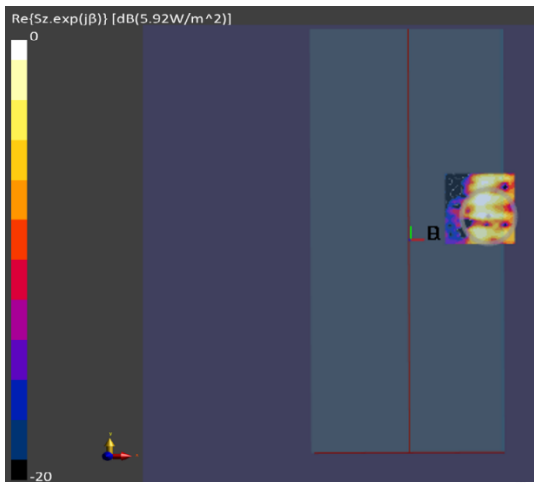


(a) Measurement

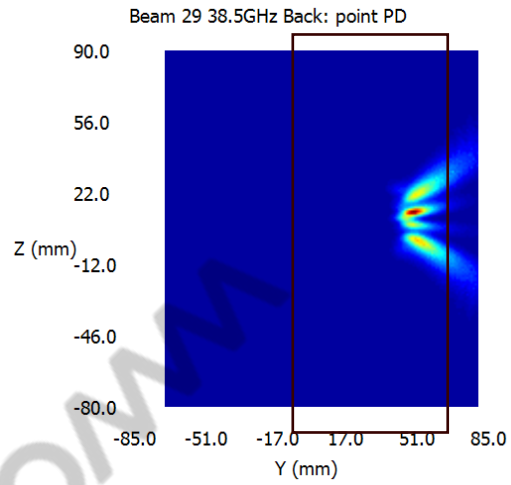


(b) Simulation

- N260 QTM0: Middle channel, Beam29, Back face, Point PD



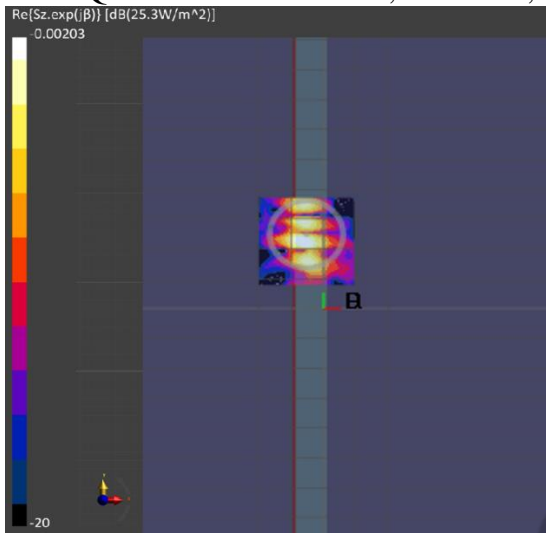
(a) Measurement



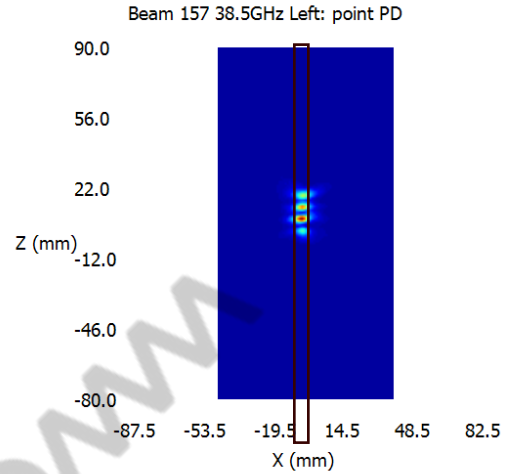
(b) Simulation

Qualcomm
2021-08-21 06:16:10 UTC
rfware@zjynetsys.com

- N260 QTM0: Middle channel, Beam157, Left face, Point PD

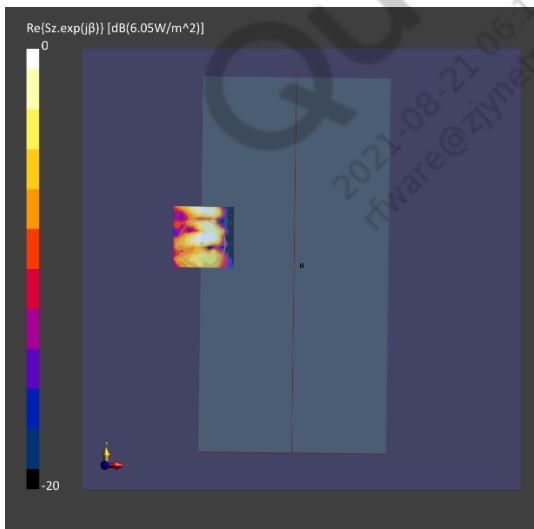


(a) Measurement

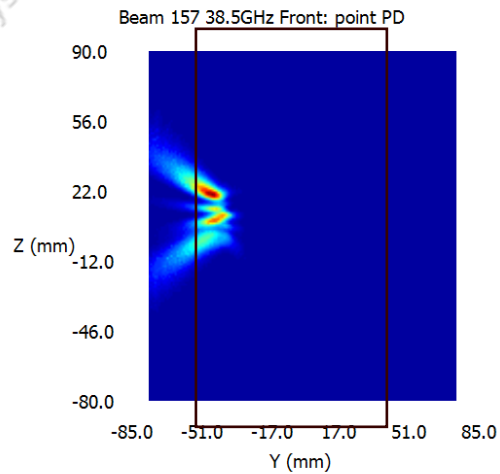


(b) Simulation

- N260 QTM0: Middle channel, Beam157, Front face, Point PD

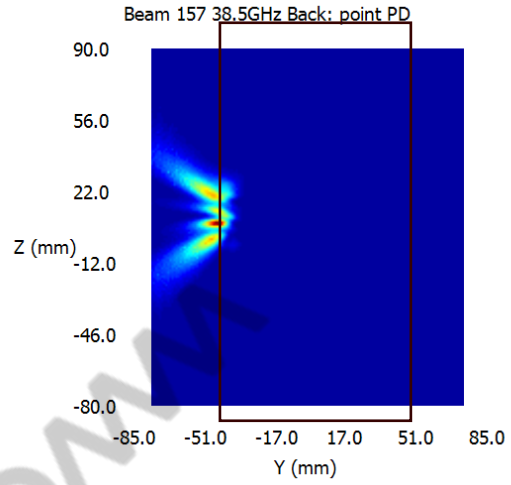
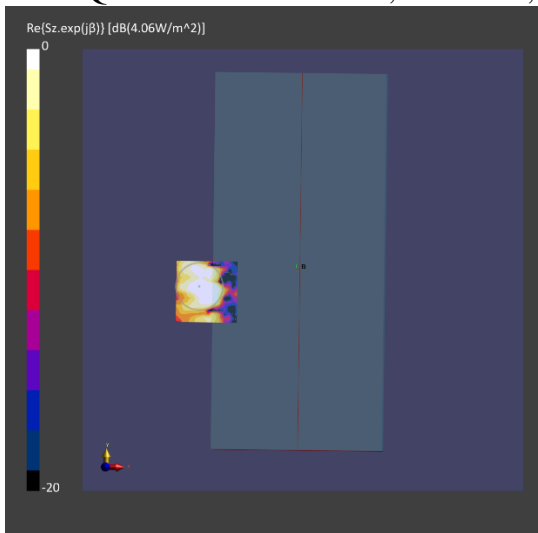


(a) Measurement



(b) Simulation

- N260 QTM0: Middle channel, Beam157, Back face, Point PD

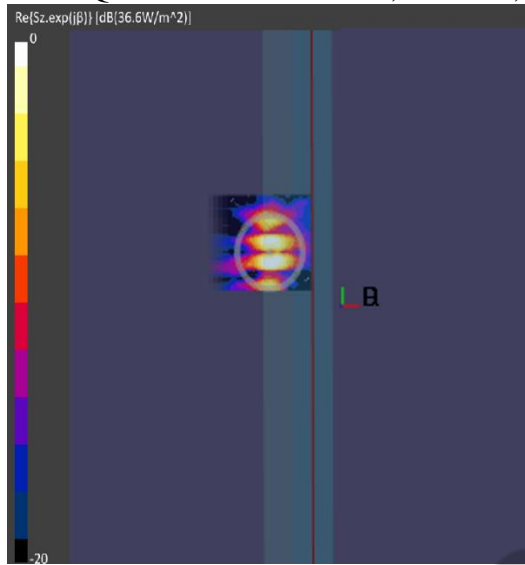


Qualcomm

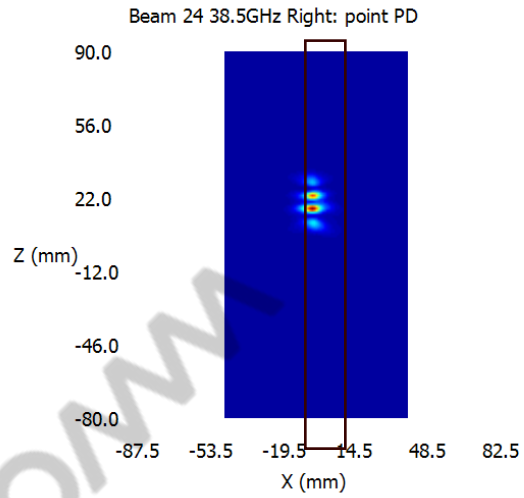
2021-08-21 06:16:10 UTC

rfware@zjynetsys.com

- N260 QTM1: Middle channel, Beam24, Right face, Point PD

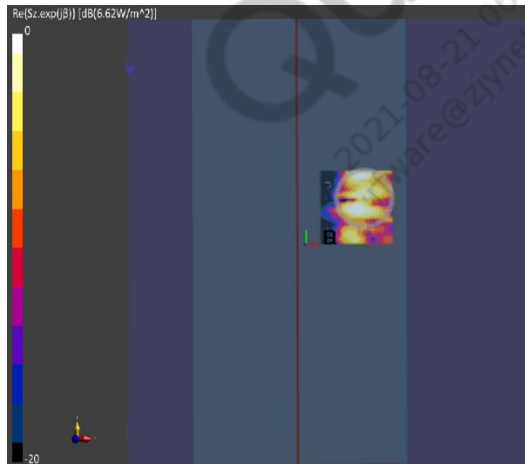


(a) Measurement

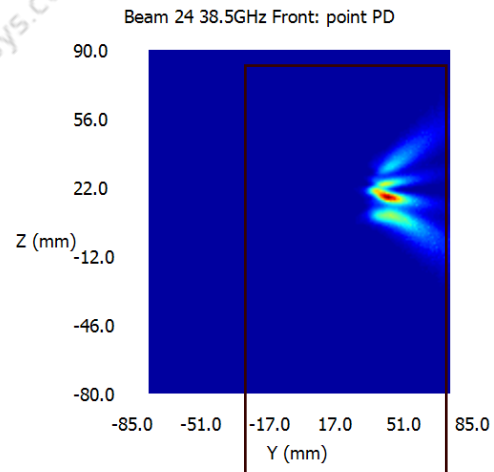


(b) Simulation

- N260 QTM1: Middle channel, Beam24, Front face, Point PD

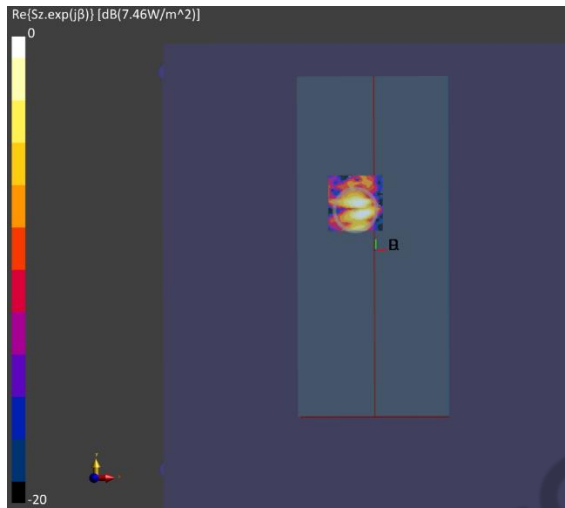


(a) Measurement

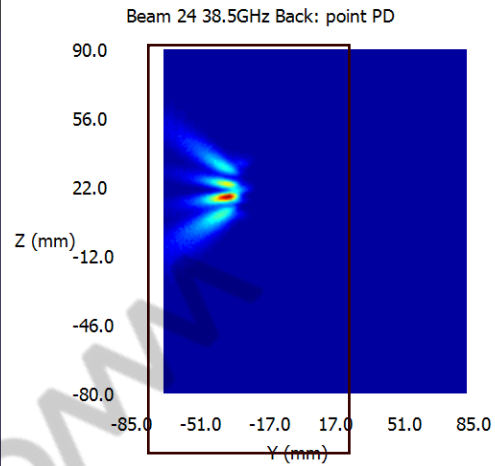


(b) Simulation

- N260 QTM1: Middle channel, Beam24, Back face, Point PD



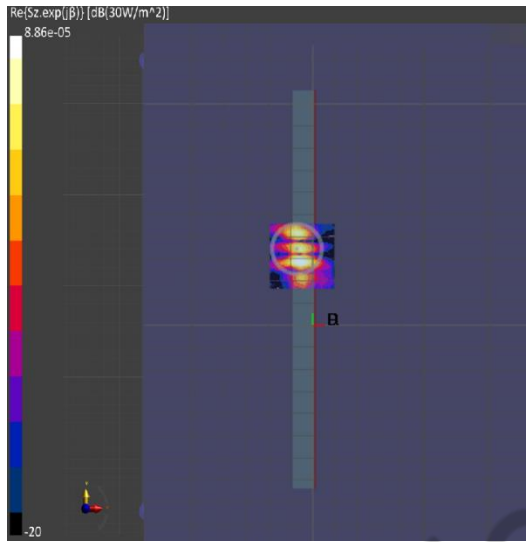
(a) Measurement



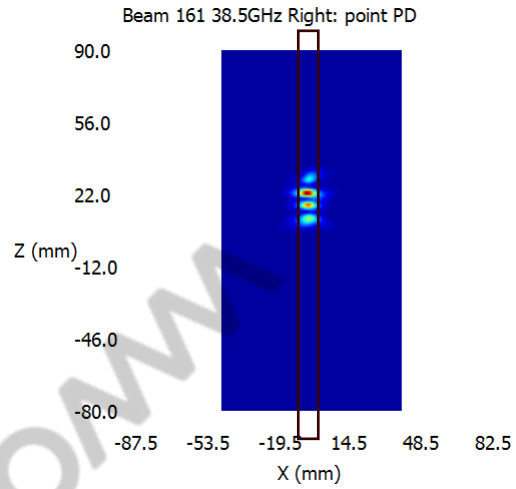
(b) Simulation

Qualcomm
2021-08-21 06:16:10 UTC
rfware@zjynetsys.com

- N260 QTM1: Middle channel, Beam161, Right face, Point PD

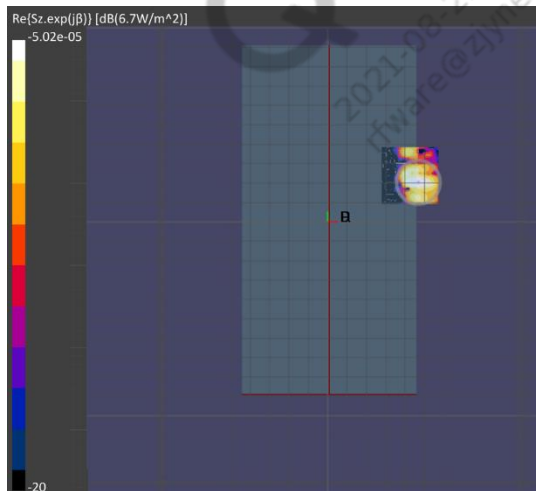


(a) Measurement

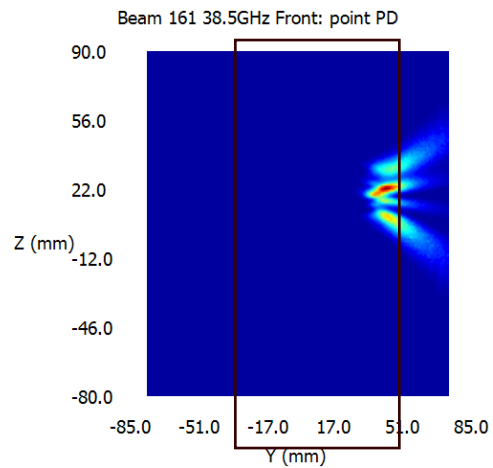


(b) Simulation

- N260 QTM1: Middle channel, Beam161, Front face, Point PD

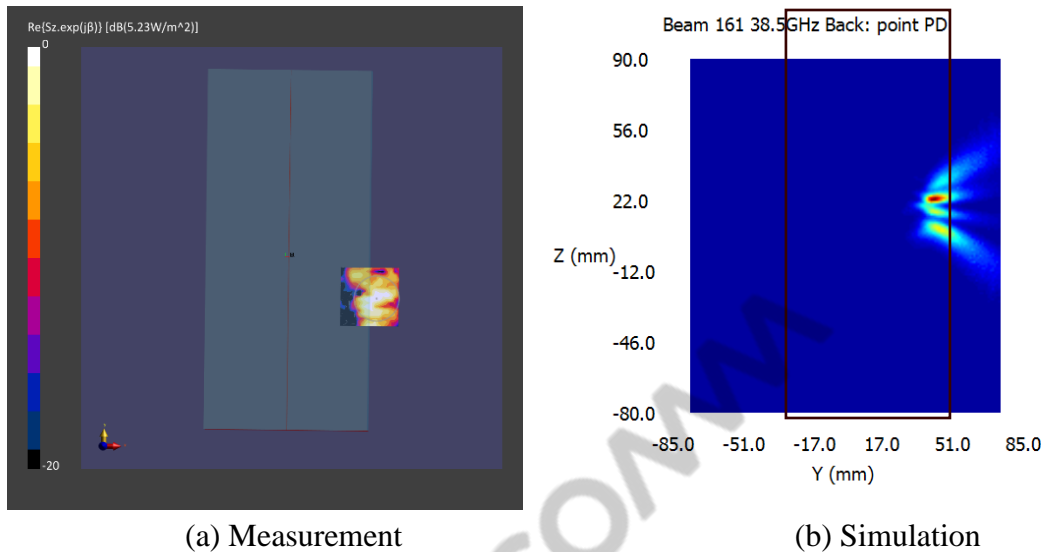


(a) Measurement



(b) Simulation

N260 QTM1: Middle channel, Beam161, Back face, Point PD



4 Simulation Result

The model is validated in Section 3, the PD exposure of EUT can be reliably assessed using the validated simulation approach. The PD simulation was performed at n261 and n260. The simulated PD results are reported in this section. The Ratio of PD exposure from front surface to the worst surface at 2mm, and the ratio of PD exposure from 2mm to 10mm evaluation distance for each beam are also reported for simultaneous transmission analysis in Part 1.

The relative phase between beam pairs is not controlled in the chipset design. Therefore, the relative phase between each beam pair was considered mathematically to identify the worst-case conditions, the below PD result for each MIMO beam represents the highest PD value after sweeping the relative phase between two SISO beams with a '5 degree' step interval from 0 degree to 360 degree.

4.1 PD for Low/Mid/High Channel at n261 and n260

Below Tables show the PD simulation evaluation of QTM0 at N261 and N260 for all surfaces as shown in Figure 1-3.

■ QTM0 N261 Low channel SISO

											Max Ratio											Max Ratio					
											0.516	0.002	0.454	0.014	0.009							0.240	0.214	0.572	0.002	0.014	0.008
n261 MIMO ch. (27.5GHz)											4cm2 PD(W/m2) at 2mm evaluation surfaces @6dBm					4cm2 PD(W/m2) at 10mm evaluation surfaces @6dBm											
relative phase worst PD for MIMO											Ratio					Ratio											
Band	Beam_ID	Ant module	Ant Type	Mumers of Feeds	relative phase worst PD for MIMO						Front/ (worst surface)	Right (worst surface)	back (worst surface)	TOP (worst surface)	Bottom (worst surface)	relative phase worst PD for MIMO						Front/ surface 10mm/2mm	back surface 10mm/2mm	left surface 10mm/2mm	Right surface 10mm/2mm	TOP surface 10mm/2mm	Bottom surface 10mm/2mm
					Front	Back	Left	Right	Top	Bottom						Front	Back	Left	Right	Top	Bottom						
N261	1	0	Patch	1	1.27	1.45	3.77	0	0.02	0.01	0.337	0.000	0.385	0.005	0.003	0.46	0.57	1.73	0.000	0.020	0.010	0.12202	0.15119	0.45889	0.000	0.005	0.003
N261	3	0	Patch	1	1.91	1.74	5.2	0	0.02	0.01	0.367	0.000	0.335	0.004	0.002	0.68	0.68	2.33	0.000	0.020	0.010	0.13077	0.13077	0.44808	0.000	0.004	0.002
N261	4	0	Patch	1	1.72	1.76	4.88	0.01	0.01	0.02	0.352	0.002	0.361	0.002	0.004	0.67	0.65	2.09	0.000	0.010	0.020	0.1373	0.1332	0.42828	0.000	0.002	0.004
N261	9	0	Patch	2	2.33	2.44	7.75	0.01	0.05	0.04	0.301	0.001	0.315	0.006	0.005	0.84	1.06	2.99	0.000	0.040	0.030	0.10839	0.13677	0.38581	0.000	0.005	0.004
N261	10	0	Patch	2	2.72	3.57	8.44	0.01	0.03	0.03	0.322	0.001	0.423	0.004	0.004	1.11	1.59	4.15	0.010	0.020	0.020	0.13152	0.18839	0.49171	0.001	0.002	0.002
N261	11	0	Patch	2	4.28	4.03	10.13	0.01	0.02	0.02	0.423	0.001	0.398	0.002	0.002	1.87	1.73	5.47	0.010	0.020	0.020	0.1846	0.17078	0.53998	0.001	0.002	0.002
N261	12	0	Patch	2	4.06	3.26	9.37	0.01	0.05	0.01	0.433	0.001	0.348	0.005	0.001	1.8	1.38	4.72	0.010	0.050	0.010	0.1921	0.14728	0.50374	0.001	0.005	0.001
N261	16	0	Patch	2	3.71	3.52	9.74	0.01	0.04	0.03	0.381	0.001	0.361	0.004	0.003	1.63	1.49	4.75	0.010	0.040	0.020	0.16735	0.15298	0.48768	0.001	0.004	0.002
N261	17	0	Patch	2	4.48	4.44	10.63	0.01	0.01	0.01	0.421	0.001	0.418	0.001	0.001	1.95	1.9	5.91	0.010	0.010	0.010	0.18344	0.19784	0.55597	0.001	0.001	0.001
N261	18	0	Patch	2	4.05	3.7	9.54	0.01	0.04	0.01	0.425	0.001	0.388	0.004	0.001	1.77	1.59	5.09	0.010	0.040	0.010	0.18553	0.16667	0.53354	0.001	0.004	0.001
N261	24	0	Patch	2	4.5	4.19	11.98	0.02	0.09	0.11	0.376	0.002	0.350	0.008	0.009	2.08	1.68	5.28	0.020	0.090	0.090	0.17362	0.14023	0.44073	0.002	0.008	0.008
N261	25	0	Patch	4	6.35	7.27	16.71	0.02	0.04	0.04	0.380	0.001	0.435	0.002	0.002	3.04	3.31	8.81	0.020	0.040	0.030	0.18193	0.19808	0.52723	0.001	0.002	0.002
N261	26	0	Patch	4	7.71	7.9	18	0.02	0.03	0.01	0.428	0.001	0.439	0.002	0.001	3.98	3.68	10.26	0.020	0.020	0.010	0.22111	0.20444	0.57	0.001	0.001	0.001
N261	27	0	Patch	4	7.33	7.75	17.77	0.02	0.03	0.01	0.412	0.001	0.436	0.002	0.001	3.73	3.79	10.02	0.010	0.030	0.010	0.2099	0.21328	0.56387	0.001	0.002	0.001
N261	28	0	Patch	4	7.35	5.34	15.74	0.02	0.1	0.04	0.461	0.001	0.339	0.006	0.003	3.53	2.61	7.69	0.010	0.100	0.040	0.22427	0.16582	0.48856	0.001	0.006	0.003
N261	33	0	Patch	4	5.6	5.72	14.42	0.03	0.06	0.06	0.388	0.002	0.397	0.004	0.004	2.63	2.53	7.27	0.020	0.060	0.050	0.18239	0.17545	0.50416	0.001	0.004	0.003
N261	34	0	Patch	4	7.06	8.12	17.89	0.03	0.04	0.03	0.395	0.002	0.454	0.002	0.002	3.5	3.82	9.78	0.020	0.030	0.030	0.19564	0.21353	0.54667	0.001	0.002	0.002
N261	35	0	Patch	4	7.59	7.73	17.6	0.02	0.01	0.01	0.431	0.001	0.439	0.001	0.001	3.89	3.7	10.07	0.010	0.010	0.010	0.22102	0.21023	0.57216	0.001	0.001	0.001
N261	36	0	Patch	4	7.48	6.8	17.36	0.02	0.03	0.02	0.431	0.001	0.392	0.002	0.001	3.74	3.32	9.45	0.010	0.030	0.020	0.21544	0.19124	0.54435	0.001	0.002	0.001
N261	129	0	Patch	1	1.81	1.17	4.18	0.01	0.05	0.01	0.433	0.002	0.280	0.012	0.002	0.69	0.43	1.61	0.010	0.050	0.010	0.16507	0.10287	0.38517	0.002	0.012	0.002
N261	131	0	Patch	1	1.77	1.63	4.66	0	0.02	0.01	0.380	0.000	0.350	0.004	0.002	0.68	0.58	2.18	0.000	0.020	0.010	0.14592	0.12446	0.46781	0.000	0.004	0.002
N261	132	0	Patch	2	1.79	1.51	4.63	0	0.01	0.01	0.387	0.000	0.326	0.002	0.002	0.67	0.58	2.08	0.000	0.010	0.010	0.14471	0.12527	0.44924	0.000	0.002	0.002
N261	137	0	Patch	2	2.99	1.87	7.31	0.01	0.1	0.04	0.409	0.001	0.256	0.014	0.005	1.25	0.73	2.75	0.010	0.100	0.040	0.171	0.09986	0.3762	0.001	0.014	0.005
N261	138	0	Patch	2	4.3	2.49	8.34	0.02	0.04	0.02	0.516	0.002	0.299	0.005	0.002	1.97	1	4.33	0.010	0.040	0.020	0.23621	0.1199	0.51918	0.001	0.005	0.002
N261	139	0	Patch	2	3.96	3.98	9.71	0.01	0.02	0.02	0.408	0.001	0.410	0.002	0.002	1.78	1.72	5.36	0.010	0.020	0.020	0.18332	0.17714	0.55201	0.001	0.002	0.002
N261	140	0	Patch	2	2.35	2.33	7.57	0.01	0.03	0.03	0.310	0.001	0.308	0.004	0.004	0.97	0.98	3.16	0.000	0.030	0.030	0.12814	0.12946	0.41744	0.000	0.004	0.004
N261	144	0	Patch	2	3.91	3.39	9.09	0.01	0.02	0.02	0.430	0.001	0.373	0.002	0.002	1.72	1.38	4.76	0.000	0.020	0.020	0.18922	0.15182	0.52365	0.000	0.002	0.002
N261	145	0	Patch	2	4.72	3.07	9.34	0.02	0.01	0.01	0.505	0.002	0.329	0.001	0.001	2.19	1.24	5.17	0.010	0.010	0.010	0.23448	0.13276	0.55353	0.001	0.001	0.001
N261	146	0	Patch	2	3.71	3.4	9.4	0.01	0.07	0.02	0.395	0.001	0.362	0.007	0.002	1.63	1.48	4.41	0.010	0.070	0.020	0.1734	0.15745	0.46915	0.001	0.007	0.002
N261	152	0	Patch	2	6.72	4.08	13.02	0.02	0.07	0.08	0.516	0.002	0.313	0.005	0.006	2.93	1.72	6.14	0.010	0.070	0.070	0.22504	0.1321	0.47158	0.001	0.005	0.005
N261	153	0	Patch	4	7.55	5.03	15.28	0.02	0.05	0.03	0.494	0.001	0.329	0.003	0.002	3.67	2.19	8.01	0.020	0.040	0.030	0.24018	0.14332	0.52421	0.001	0.003	0.002
N261	154	0	Patch	4	8.05	6.78	17.28	0.03	0.01	0.01	0.466	0.002	0.392	0.001	0.001	4.05	3.19	9.79	0.020	0.010	0.010	0.23438	0.18461	0.56655	0.001	0.001	0.001
N261	155	0	Patch	4	8	7.44	17.92	0.03	0.04	0.01	0.446	0.002	0.415	0.002	0.001	4.02	3.52	10.21	0.030	0.040	0.010	0.22433	0.19643	0.56975	0.002	0.002	0.001
N261	156	0	Patch	4	5.63	5.4	13.99	0.02	0.08	0.06	0.402	0.001	0.386	0.006	0.004	2.72	2.46	7.26	0.020	0.080	0.050	0.19442	0.17584	0.51894	0.001	0.006	0.004
N261	161	0	Patch	4	7.21	4.59	14.15	0.02	0.05	0.06	0.510	0.001	0.324	0.004	0.004	3.27	1.96	7.02	0.010	0.050	0.050	0.2311	0.13852	0.49611	0.001	0.004	0.004
N261	162	0	Patch	4	7.73	5.84	16.43	0.03	0.04	0.02	0.470	0.002	0.355	0.002	0.001	3.87	2.66	8.99	0.020	0.040	0.020	0.23554	0.1619	0.54717	0.001	0.002	0.001
N261	163	0	Patch	4	8.19	7.01	17.49	0.04	0.02	0	0.468	0.002	0.401	0.001	0.000	4.14	3.3	9.98	0.030	0.020	0.000	0.23671	0.18868	0.57061	0.002	0.001	0.000
N261	164	0	Patch	4	6.75	7.14	16.37	0.02	0.05	0.03	0.412	0.001	0.436	0.003	0.002	3.25	3.3	9.3	0.020	0.050	0.030	0.19853	0.20159	0.56811	0.001	0.003	0.002

■ QTM0 N261 Low channel MIMO

											Max Ratio																Max Ratio					
											0.499	0.002	0.462	0.016	0.009												0.249	0.212	0.625	0.002	0.015	0.008
N261	129	1	0	Patch	2	3.78	3.32	8.77	0.02	0.12	0.02	0.431	0.002	0.379	0.014	0.002	1.390	1.350	3.680	0.010	0.110	0.020	0.158	0.154	0.420	0.001	0.013	0.002				
N261	131	3	0	Patch	2	4.66	4.4	10.49	0.01	0.05	0.05	0.444	0.001	0.419	0.005	0.005	1.750	1.720	4.720	0.010	0.050	0.040	0.167	0.164	0.450	0.001	0.005	0.004				
N261	132	4	0	Patch	2	4.55	4.32	10.09	0.02	0.04	0.05	0.451	0.002	0.428	0.004	0.005	1.780	1.670	4.340	0.010	0.040	0.050	0.176	0.166	0.430	0.001	0.004	0.005				
N261	137	9	0	Patch	4	6.49	5.72	16.61	0.03	0.26	0.12	0.391	0.002	0.344	0.016	0.007	2.710	2.610	6.320	0.020	0.250	0.110	0.163	0.157	0.380	0.001	0.015	0.007				
N261	138	10	0	Patch	4	8.4	8.15	17.65	0.04	0.																						

QTM1 N261 Low channel SISO

Table with columns for Band, Beam ID, Ant module, Ant Type, Meters of Feeds, relative phase worst PD for MIMO, and Max Ratio. It contains simulation data for SISO configuration across various beam IDs and frequencies.

QTM1 N261 Low channel MIMO

Table with columns for Band, Beam ID, Ant module, Ant Type, Meters of Feeds, relative phase worst PD for MIMO, and Max Ratio. It contains simulation data for MIMO configuration across various beam IDs and frequencies.

QTM0 N261 Middle channel SISO

Table with columns for Band, Beam_ID, Ant module, Ant Type, Number of Feeds, and various Max Ratio values (0.501, 0.003, 0.461, 0.014, 0.009, 0.236, 0.216, 0.567, 0.003, 0.013, 0.009). Rows list antenna configurations for N261.

QTM0 N261 Middle channel MIMO

Table with columns for Band, Beam_ID, Ant module, Ant Type, Number of Feeds, and various Max Ratio values (0.504, 0.003, 0.494, 0.014, 0.009, 0.257, 0.227, 0.623, 0.002, 0.013, 0.008). Rows list antenna configurations for N261.

QTM1 N261 Middle channel SISO

Table with columns for Band, Beam_ID, Ant module, Ant Type, Numers of Feeds, and various Max Ratio values (0.541, 0.005, 0.499, 0.021, 0.009, 0.261, 0.227, 0.003, 0.575, 0.020, 0.008). Rows include antenna configurations like N261 0 1 Patch 1 and N261 160 1 Patch 4.

QTM1 N261 Middle channel MIMO

Table with columns for Band, Beam_ID, Ant module, Ant Type, Numers of Feeds, and various Max Ratio values (0.534, 0.005, 0.475, 0.014, 0.007, 0.269, 0.218, 0.003, 0.613, 0.013, 0.007). Rows include antenna configurations like N261 128 0 1 Patch 2 and N261 160 32 1 Patch 8.

QTM0 N261 High channel SISO

Table with columns for Band, Beam_ID, Ant module, Ant Type, Murners of Feeds, and Max Ratio. It contains simulation data for various beams (N261) across different frequencies and phases.

QTM0 N261 High channel MIMO

Table with columns for Band, Beam_ID, Ant module, Ant Type, Murners of Feeds, and Max Ratio. It contains simulation data for various beams (N261) across different frequencies and phases, specifically for MIMO configurations.

QTM1 N261 High channel SISO

Table with columns for Band, Beam_ID, Ant module, Ant Type, Murners of Feeds, and various Max Ratio values (0.546, 0.005, 0.506, 0.020, 0.010, 0.263, 0.263, 0.004, 0.580, 0.019, 0.009) for 4cm2 PD(Wind) at 2mm and 10mm evaluation surfaces.

QTM1 N261 High channel MIMO

Table with columns for Band, Beam_ID, Ant module, Ant Type, Murners of Feeds, and various Max Ratio values (0.551, 0.005, 0.468, 0.013, 0.007, 0.266, 0.266, 0.003, 0.617, 0.012, 0.007) for 4cm2 PD(Wind) at 2mm and 10mm evaluation surfaces.

QTM0 N260 LOW channel SISO

Table with columns for Band, Beam_ID, Ant module, Ant Type, Num of ant, and Max Ratio (0.420, 0.001, 0.516, 0.014, 0.009) and Max Ratio (0.211, 0.262, 0.580, 0.001, 0.013, 0.008). Rows include antenna IDs from N260 1 to 165.

QTM0 N260 LOW channel MIMO

Table with columns for Band, Beam_ID, Ant module, Ant Type, Num of ant, and Max Ratio (0.390, 0.001, 0.485, 0.015, 0.009) and Max Ratio (0.193, 0.243, 0.604, 0.001, 0.014, 0.008). Rows include antenna IDs from N260 129 to 165.

QTM1 N260 LOW channel SISO

Table with columns for Band, Beam_ID, Ant module, Ant Type, Meters of Feeds, and Max Ratio (0.448, 0.002, 0.451, 0.014, 0.007). It lists simulation results for various N260 beams.

QTM1 N260 LOW channel MIMO

Table with columns for Band, Beam_ID, Ant module, Ant Type, Meters of Feeds, and Max Ratio (0.467, 0.002, 0.459, 0.015, 0.007). It lists simulation results for various N260 beams in MIMO configuration.

■ QTM0 N260 Middle channel SISO

Table with columns for Max Ratio (0.392, 0.001, 0.511, 0.013, 0.007) and Max Ratio (0.193, 0.251, 0.574, 0.001, 0.012, 0.006). Rows include antenna IDs (N260 1-165) and various parameters like Band, Beam_ID, Ant module, Ant Type, Num. of antenna feeds, and relative phase worst PD for MIMO.

■ QTM0 N260 Middle channel MIMO

Table with columns for Max Ratio (0.394, 0.001, 0.504, 0.014, 0.008) and Max Ratio (0.195, 0.248, 0.606, 0.001, 0.014, 0.007). Rows include antenna IDs (N260 129-165) and various parameters like Band, Beam_ID, Ant module, Ant Type, Num. of antenna feeds, and relative phase worst PD for MIMO.

QTM1 N260 Middle channel SISO

										Max Ratio																Max Ratio					
										0.470	0.002	0.480	0.011	0.005												0.233	0.233	0.001	0.580	0.011	0.005
n260 Mid ch. (38.5GHz)										4cm2 PD(W/W2) at 2mm evaluation surfaces @6dbm					4cm2 PD(W/W2) at 1mm evaluation surfaces @6dbm											Ratio					
										relative phase worst PD for MIMO					Ratio											Ratio					
Band	Beam_ID	Ant module	Ant Type	Num of Feed	Numers of Feeds	Front	Back	Left	Right	Top	Bottom	Front/ (worst surface)	Left (worst surface)	back (worst surface)	TOP (worst surface)	Bottom (worst surface)	Front	Back	Left	Right	Top	Bottom	Front/ surface 1mm/2mm	back surface 1mm/2mm	left surface 1mm/2mm	Right surface 1mm/2mm	TOP surface 1mm/2mm	Bottom surface 1mm/2mm			
N260	0	1	Patch	1	1	1.7	1.91	0	5.03	0.02	0.01	0.338	0.000	0.380	0.004	0.002	0.61	0.61	0	2.37	0.02	0.01	0.12127	0.12127	0	0.47117	0.00398	0.00199			
N260	2	1	Patch	1	1	1.73	1.62	0	4.75	0.02	0.01	0.364	0.000	0.341	0.004	0.002	0.53	0.52	0	2.16	0.02	0.01	0.11158	0.10947	0	0.45474	0.00421	0.00211			
N260	6	1	Patch	2	2	3.19	2.8	0.01	8.89	0.06	0.02	0.359	0.001	0.315	0.007	0.002	1.36	1.19	0.01	3.84	0.05	0.01	0.15298	0.13386	0.00112	0.43195	0.00562	0.00112			
N260	7	1	Patch	2	2	2.83	2.52	0.01	6.84	0.06	0	0.414	0.001	0.368	0.009	0.000	1.23	1.12	0.01	3.58	0.06	0	0.17982	0.16374	0.00146	0.52339	0.00877	0			
N260	8	1	Patch	2	2	2.75	3.15	0	8.81	0.01	0.03	0.312	0.000	0.358	0.001	0.003	1.22	1.47	0	3.87	0.01	0.03	0.13848	0.16686	0	0.49327	0.00114	0.00341			
N260	9	1	Patch	2	2	2.7	3.37	0.01	9.19	0.05	0.02	0.294	0.001	0.367	0.005	0.002	0.94	1.4	0	3.65	0.04	0.02	0.10225	0.15234	0	0.39717	0.00218	0.00118			
N260	14	1	Patch	2	2	3.06	3.2	0.01	8.97	0.06	0	0.341	0.001	0.357	0.007	0.000	1.43	1.3	0	4.1	0.06	0	0.15719	0.14493	0	0.45708	0.00669	0			
N260	15	1	Patch	2	2	3.38	3.87	0.01	9.07	0.04	0.03	0.373	0.001	0.427	0.004	0.003	1.47	1.69	0	4.59	0.03	0.02	0.16207	0.18633	0	0.50606	0.00331	0.00221			
N260	16	1	Patch	2	2	3.35	3.2	0	10.32	0.04	0.02	0.325	0.000	0.310	0.004	0.002	1.09	1.24	0	4.18	0.04	0.02	0.15652	0.12016	0	0.40504	0.00388	0.00194			
N260	20	1	Patch	4	4	5.57	5.77	0.01	15.28	0.11	0.04	0.365	0.001	0.378	0.007	0.003	2.26	2.1	0.01	7.12	0.11	0.03	0.14791	0.13743	0.00065	0.46597	0.00654	0.00196			
N260	21	1	Patch	4	4	6.38	6.61	0.02	15.14	0.12	0.01	0.421	0.001	0.437	0.008	0.001	3.04	3.04	0.01	8.78	0.11	0.01	0.20079	0.20079	0.00066	0.57992	0.00727	0.00606			
N260	22	1	Patch	4	4	5.35	5.56	0.01	13.06	0.05	0.04	0.430	0.001	0.426	0.004	0.003	2.43	2.6	0.01	6.9	0.04	0.04	0.18606	0.19908	0.00077	0.52833	0.00306	0.00306			
N260	23	1	Patch	4	4	5.11	6.56	0.01	15.05	0.01	0.08	0.340	0.001	0.436	0.001	0.005	2.26	3.01	0.01	7.77	0.11	0.08	0.15017	0.2	0.00066	0.51628	0.00066	0.00532			
N260	24	1	Patch	4	4	5.55	5.61	0.01	15.46	0.12	0.03	0.359	0.001	0.363	0.008	0.002	2.25	2.02	0.01	6.97	0.11	0.11	0.14554	0.13066	0.00065	0.45084	0.00712	0.00129			
N260	30	1	Patch	4	4	6.75	6.34	0.02	15.39	0.15	0.02	0.439	0.001	0.412	0.010	0.001	3.06	2.76	0.02	8.51	0.15	0.02	0.19883	0.17934	0.0013	0.55296	0.00785	0.0013			
N260	31	1	Patch	4	4	4.54	5.5	0.02	12.37	0.09	0.02	0.367	0.002	0.445	0.007	0.002	2.05	2.35	0.01	6.67	0.08	0.02	0.16572	0.18998	0.00081	0.53921	0.00647	0.00162			
N260	32	1	Patch	4	4	5.51	7.23	0.01	15.05	0.02	0.06	0.366	0.001	0.480	0.001	0.004	2.52	3.5	0.01	8.39	0.02	0.05	0.16744	0.23256	0.00066	0.55748	0.00133	0.00332			
N260	33	1	Patch	4	4	4.99	5.78	0.01	15.2	0.04	0.07	0.328	0.001	0.390	0.003	0.005	1.7	2.22	0.01	6.89	0.04	0.07	0.11184	0.14605	0.00066	0.45329	0.00263	0.00461			
N260	128	1	Patch	1	1	1.56	1.65	0	4.45	0.02	0.01	0.351	0.000	0.371	0.004	0.002	0.49	0.58	0	2.1	0.02	0.01	0.10113	0.13034	0	0.47191	0.00449	0.00225			
N260	130	1	Patch	1	1	1.3	1.67	0	4.25	0.02	0.01	0.306	0.000	0.393	0.005	0.002	0.41	0.54	0	1.9	0.02	0.01	0.09547	0.12706	0	0.44706	0.00471	0.00235			
N260	134	1	Patch	2	2	3.19	2.73	0.01	9.19	0.04	0.02	0.347	0.001	0.297	0.004	0.002	1.35	1.02	0.01	3.53	0.04	0.02	0.1469	0.11099	0.00101	0.38411	0.00435	0.00218			
N260	135	1	Patch	2	2	2.91	3.38	0	7.89	0.06	0.01	0.369	0.000	0.428	0.008	0.001	1.22	1.44	0	4.06	0.06	0.01	0.15463	0.18251	0	0.51458	0.0076	0.00127			
N260	136	1	Patch	2	2	2.71	2.54	0	7.44	0.01	0.02	0.364	0.000	0.341	0.001	0.003	1.27	1.22	0	3.57	0.01	0.02	0.1707	0.16388	0	0.47984	0.00134	0.00269			
N260	137	1	Patch	2	2	3.15	2.91	0.01	9.25	0.06	0.01	0.341	0.001	0.315	0.006	0.001	1.09	1.14	0	3.69	0.06	0.01	0.11784	0.12324	0	0.39892	0.00134	0.00108			
N260	142	1	Patch	2	2	2.82	3.29	0	8.6	0.06	0.02	0.328	0.000	0.383	0.007	0.002	1.2	1.38	0	3.92	0.06	0.01	0.13953	0.16047	0	0.45581	0.00698	0.00116			
N260	143	1	Patch	2	2	3.01	2.7	0.01	7.6	0.01	0.04	0.396	0.001	0.355	0.001	0.005	1.36	1.13	0.01	3.67	0.01	0.04	0.17893	0.14868	0.00132	0.48289	0.00132	0.00526			
N260	144	1	Patch	2	2	2.45	3.03	0.01	8.28	0.04	0.02	0.296	0.001	0.366	0.005	0.002	0.92	1.26	0	3.2	0.04	0.02	0.11111	0.15217	0	0.38647	0.00483	0.00242			
N260	148	1	Patch	4	4	4.94	6.05	0.01	14.58	0.16	0.01	0.339	0.001	0.415	0.011	0.001	1.98	2.6	0.01	7.11	0.15	0.01	0.13358	0.17833	0.00069	0.48765	0.01029	0.00669			
N260	149	1	Patch	4	4	5.45	6.1	0.02	13.61	0.12	0.01	0.400	0.001	0.448	0.009	0.001	2.5	2.97	0.01	7.33	0.12	0.01	0.18369	0.21822	0.00073	0.5857	0.00882	0.00773			
N260	150	1	Patch	4	4	5.05	4.99	0.01	11.73	0.02	0.04	0.431	0.001	0.485	0.002	0.003	2.49	2.43	0.01	6.53	0.02	0.04	0.21283	0.20716	0.00083	0.55669	0.00173	0.00396			
N260	151	1	Patch	4	4	5.86	4.98	0.01	14.27	0.02	0.07	0.411	0.001	0.349	0.001	0.005	2.69	2.26	0.01	7.19	0.02	0.07	0.12851	0.15837	0.0007	0.50585	0.0014	0.00491			
N260	152	1	Patch	4	4	4.68	5.53	0.01	14.54	0.12	0.02	0.322	0.001	0.380	0.008	0.001	1.85	2.23	0.01	6.31	0.11	0.02	0.12724	0.15337	0.00069	0.43398	0.00757	0.00138			
N260	158	1	Patch	4	4	5.04	6.55	0.02	14.66	0.16	0.01	0.344	0.001	0.447	0.011	0.001	2.22	3.04	0.01	7.57	0.16	0.01	0.15143	0.20737	0.00068	0.51637	0.01091	0.00368			
N260	159	1	Patch	4	4	4.89	4.57	0.02	11.99	0.08	0.03	0.429	0.002	0.401	0.007	0.003	2.21	2.19	0.01	5.86	0.08	0.03	0.19403	0.19227	0.00088	0.51409	0.00702	0.00263			
N260	160	1	Patch	4	4	6.59	5.28	0.01	14.01	0.03	0.07	0.470	0.001	0.377	0.002	0.005	3.27	2.5	0.01	7.86	0.03	0.06	0.23403	0.17844	0.00071	0.56103	0.00214	0.00428			
N260	161	1	Patch	4	4	4.77	5.17	0.01	14.52	0.08	0.03	0.329	0.001	0.356	0.006	0.002	1.96	1.8	0.01	5.89	0.07	0.03	0.13499	0.12397	0.00069	0.40565	0.00482	0.00207			

QTM1 N260 Middle channel MIMO

										Max Ratio																Max Ratio					
										0.479	0.001	0.497	0.014	0.006												0.240	0.247	0.001	0.589	0.013	0.006
N260	128	0	1	Patch	2	4.03	4.67	0.01	10.26	0.05	0.03	0.393	0.001	0.455	0.005	0.003	1.38	1.56	0.01	4.91	0.04	0.03	0.1345	0.15205	0.00097	0.47856	0.0039	0.00292			
N260	130	2	1	Patch	2	3.77	4.27	0.01	9.8	0.06	0.04	0.385	0.001	0.436	0.006	0.004	1.17	1.36	0	4.51	0.06	0.03	0.11939	0.13878	0	0.4602	0.00612	0.00306			
N260	134	6	1	Patch	4	6.05	5.52	0.02	15.34	0.14	0.05	0.394	0.001	0.360	0.009	0.003	2.46	2.01	0.01	7.59	0.13	0.05	0.16037	0.13103	0.00065	0.49478	0.00847	0.00326			
N260	135	7	1	Patch	4	6.05	6.6	0.01	14.71	0.18	0.02	0.411	0.001	0.449	0.012	0.001	2.54	2.9	0.01	7.75	0.17	0.02	0.12767	0.19714	0.00068	0.52885	0.01156	0.00136			
N260	136	8	1	Patch	4	7.89	8.13	0.01	18.1	0.03	0.08	0.436	0.001	0.449	0.002	0.004	3.77	4.03	0.01	9.87	0.03	0.08	0.20829	0.22265	0.00055	0.5453	0.00166	0.00442			
N260	137	9	1	Patch	4	7.58	8	0.02	20.08	0.14	0.03	0.377	0.001	0.398	0.007	0.001	2.89	2.69	0.01	8.58	0.14	0.03	0.14392	0.13396	0.0006	0.42					

■ QTM0 N260 High channel SISO

											Max Ratio						Max Ratio																	
											0.408	0.002	0.468	0.010	0.006							0.201	0.231	0.555	0.001	0.010	0.006							
n260 high ch. (39.95GHz)											4cm2 PD(W/m2) at 2mm evaluation surfaces @6dbm						4cm2 PD(W/m2) at 10mm evaluation surfaces @6dbm						Ratio											
											relative phase worst PD for MIMO						Ratio						relative phase worst PD for MIMO						Ratio					
Band	Beam_ID	Ant module	Ant Type	Num of Feed	Num of Feeds	Front	Back	Left	Right	Top	Bottom	Front (worst surface)	Right (worst surface)	back (worst surface)	TOP (worst surface)	Bottom (worst surface)	Front (worst surface)	Back (worst surface)	Left (worst surface)	Right (worst surface)	Top (worst surface)	Bottom (worst surface)	Front surface 10mm/2mm	back surface 10mm/2mm	left surface 10mm/2mm	Right surface 10mm/2mm	TOP surface 10mm/2mm	Bottom surface 10mm/2mm						
N260	1	0	Patch	1	1	1.19	1.64	4.62	0	0.02	0.01	0.258	0.000	0.355	0.004	0.002	0.45	0.54	1.8	0	0.02	0.01	0.0974	0.11688	0.38961	0	0.00433	0.00216						
N260	3	0	Patch	1	1.56	2.06	5.37	0	0.01	0.01	0.01	0.291	0.000	0.384	0.002	0.02	0.52	0.76	2.37	0	0.01	0.01	0.09683	0.14153	0.44134	0	0.00186	0.00093						
N260	4	0	Patch	1	1.9	1.66	5.23	0	0.02	0.01	0.01	0.363	0.000	0.317	0.004	0.002	0.66	0.52	2.38	0	0.02	0.01	0.1262	0.09943	0.45507	0	0.00382	0.00191						
N260	5	0	Patch	2	1.3	1.25	4.26	0	0.01	0.01	0.01	0.305	0.000	0.293	0.002	0.02	0.41	0.39	1.64	0	0.01	0.01	0.09624	0.09155	0.38498	0	0.00235	0.00117						
N260	10	0	Patch	2	3.39	2.87	9.7	0.01	0.02	0.04	0.349	0.001	0.296	0.002	0.04	1.54	1.29	4.14	0	0.02	0.04	0.15876	0.13299	0.4368	0	0.00206	0.00102							
N260	11	0	Patch	2	3.68	3.51	10.37	0	0.03	0.02	0.02	0.355	0.000	0.338	0.003	0.02	1.52	1.52	4.77	0	0.03	0.02	0.14658	0.14658	0.45998	0	0.00289	0.00144						
N260	12	0	Patch	2	2.88	3.14	9.08	0.01	0.02	0.04	0.317	0.001	0.346	0.002	0.04	1.32	1.41	4.01	0.01	0.02	0.03	0.14537	0.15529	0.44163	0.0011	0.0022	0.0011							
N260	13	0	Patch	2	3.33	3.06	10.71	0.01	0.04	0.02	0.311	0.001	0.286	0.004	0.02	1.21	1.06	3.99	0	0.04	0.02	0.11298	0.09897	0.37255	0	0.00373	0.00187							
N260	17	0	Patch	2	2.28	3.88	9.98	0	0.04	0.01	0.01	0.228	0.000	0.389	0.004	0.01	0.93	1.73	4.2	0	0.04	0.01	0.09319	0.17335	0.42084	0	0.00401	0.00201						
N260	18	0	Patch	2	2.84	2.74	7.27	0.01	0.03	0.03	0.391	0.001	0.377	0.004	0.04	1.29	1.17	3.8	0	0.03	0.03	0.17744	0.16094	0.5227	0	0.00413	0.00207							
N260	19	0	Patch	2	2.69	3.25	10.32	0	0.01	0.04	0.01	0.261	0.000	0.315	0.001	0.04	1.29	1.19	3.81	0	0.01	0.04	0.125	0.11531	0.36919	0	0.00297	0.00148						
N260	25	0	Patch	4	5.84	5.5	16.52	0.01	0.03	0.07	0.354	0.001	0.333	0.002	0.04	2.68	2.35	7.65	0.01	0.03	0.06	0.16223	0.14225	0.46308	0.00061	0.00182	0.00091							
N260	26	0	Patch	4	6	6.65	15.55	0.01	0.16	0.01	0.336	0.001	0.428	0.010	0.01	2.88	3.09	8.43	0.01	0.15	0.01	0.18521	0.19871	0.54211	0.00064	0.00185	0.00094							
N260	27	0	Patch	4	4.15	5.92	12.65	0.02	0.06	0.05	0.329	0.002	0.468	0.005	0.04	1.88	2.85	6.66	0.01	0.06	0.05	0.14862	0.2235	0.52646	0.00079	0.00214	0.00095							
N260	28	0	Patch	4	6.22	6.52	16.21	0.01	0.03	0.1	0.384	0.001	0.402	0.002	0.06	3.01	3.14	8.54	0.04	0.03	0.09	0.1858	0.19388	0.52716	0.00062	0.00185	0.00096							
N260	29	0	Patch	4	4.77	5.63	17.51	0.01	0.07	0.03	0.322	0.001	0.322	0.004	0.02	2.05	2.18	7.04	0.04	0.06	0.03	0.11708	0.1245	0.40206	0.00057	0.00143	0.00071							
N260	34	0	Patch	4	5.06	6.5	16.86	0.01	0.15	0.01	0.300	0.001	0.386	0.009	0.01	2.31	2.7	8	0	0.14	0.01	0.13701	0.16014	0.4745	0	0.0083	0.00059							
N260	35	0	Patch	4	5.36	6.54	14.03	0.01	0.06	0.02	0.382	0.001	0.466	0.004	0.01	2.56	3.24	7.76	0.01	0.06	0.02	0.18247	0.23093	0.5531	0.00071	0.00248	0.00143							
N260	36	0	Patch	4	4.98	5.83	13.92	0.01	0.06	0.08	0.358	0.001	0.419	0.004	0.06	2.34	2.74	7.33	0.01	0.06	0.08	0.1681	0.19684	0.52658	0.00072	0.00431	0.00075							
N260	37	0	Patch	1	6.13	6.26	16.93	0.01	0.05	0.08	0.362	0.001	0.370	0.003	0.05	2.89	2.82	8.25	0.01	0.04	0.07	0.1707	0.16657	0.4875	0.00059	0.00236	0.00143							
N260	129	0	Patch	1	1.86	1.42	5.04	0	0.02	0.01	0.01	0.369	0.000	0.282	0.004	0.02	0.68	0.44	1.97	0	0.02	0.01	0.13492	0.0873	0.39087	0	0.00397	0.00198						
N260	131	0	Patch	2	1.68	1.79	4.93	0	0.01	0.01	0.01	0.341	0.000	0.363	0.002	0.02	0.57	0.63	2.3	0	0.01	0.01	0.11562	0.12779	0.46653	0	0.00209	0						
N260	132	0	Patch	2	1.22	1.71	4.41	0	0.01	0	0.01	0.277	0.000	0.388	0.002	0.00	0.38	0.61	1.97	0	0.01	0	0.08617	0.13832	0.44671	0	0.00227	0						
N260	133	0	Patch	2	0.96	1.2	3.71	0	0.01	0.01	0.01	0.259	0.000	0.323	0.003	0.03	0.35	0.38	1.35	0	0.01	0.01	0.09344	0.10245	0.36388	0	0.00217	0.00127						
N260	138	0	Patch	2	3.65	2.97	10.07	0.01	0.02	0.03	0.362	0.001	0.295	0.002	0.03	1.36	1.31	3.89	0	0.02	0.02	0.13093	0.13009	0.3863	0	0.00199	0.00099							
N260	139	0	Patch	2	2.64	3.7	8.54	0	0.03	0.01	0.01	0.309	0.000	0.433	0.004	0.01	1.1	1.69	4.23	0	0.03	0.01	0.12881	0.19789	0.49532	0	0.00351	0.00117						
N260	140	0	Patch	2	2.97	3.72	8.72	0.01	0.02	0.02	0.341	0.001	0.427	0.002	0.02	1.4	1.59	4.37	0	0.02	0.02	0.16055	0.18234	0.50115	0	0.00249	0.00129							
N260	141	0	Patch	2	3.94	2.45	10.27	0.01	0.05	0.01	0.384	0.001	0.239	0.005	0.01	1.51	0.91	3.96	0.01	0.04	0.01	0.14703	0.08861	0.38559	0.00097	0.00389	0.00097							
N260	145	0	Patch	2	2.31	2.7	8.82	0.01	0.05	0.01	0.262	0.001	0.306	0.006	0.01	1.08	1.13	3.36	0	0.05	0	0.12245	0.12812	0.38095	0	0.00567	0							
N260	146	0	Patch	2	3.01	3.67	8.44	0	0.03	0.02	0.257	0.000	0.435	0.004	0.02	1.3	1.59	4.34	0	0.03	0.01	0.15403	0.18839	0.51422	0	0.00355	0.00118							
N260	147	0	Patch	4	2.14	3.21	8.41	0	0.02	0.02	0.354	0.000	0.382	0.002	0.02	0.96	1.44	3.48	0	0.02	0.02	0.11415	0.17122	0.41378	0	0.00238	0.00128							
N260	153	0	Patch	4	4.79	5.95	15.24	0.01	0.02	0.07	0.314	0.001	0.390	0.001	0.05	2.05	2.58	7.04	0.01	0.02	0.06	0.13451	0.16929	0.46194	0.00066	0.00131	0.00094							
N260	154	0	Patch	4	5.85	5.68	14.86	0.01	0.11	0.02	0.394	0.001	0.382	0.007	0.01	2.91	2.78	7.76	0.01	0.1	0.02	0.19583	0.18708	0.52221	0.00067	0.00673	0.00135							
N260	155	0	Patch	4	4.37	6.05	13.03	0.01	0.07	0.03	0.335	0.001	0.464	0.005	0.02	1.97	2.97	6.83	0.01	0.07	0.02	0.15119	0.22794	0.52417	0.00077	0.00537	0.00153							
N260	156	0	Patch	4	5.93	6.56	15.02	0.01	0.04	0.05	0.395	0.001	0.437	0.003	0.03	2.94	3.1	7.89	0.01	0.04	0.04	0.19574	0.20639	0.52523	0.00077	0.00266	0.00126							
N260	157	0	Patch	4	5	4.68	16.21	0.01	0.05	0.02	0.308	0.001	0.289	0.003	0.01	2.01	1.94	6.17	0.01	0.05	0.02	0.124	0.11968	0.38063	0.00062	0.00308	0.00123							
N260	162	0	Patch	4	5.48	4.82	15.74	0.01	0.13	0.01	0.348	0.001	0.306	0.008	0.01	2.62	2.36	6.95	0.01	0.11	0.01	0.16645	0.14994	0.44155	0.00064	0.00699	0.00064							
N260	163	0	Patch	4	4.96	5.8	13.65	0.01	0.11	0.02	0.363	0.001	0.425	0.008	0.01	2.42	2.85	7.23	0.01	0.1	0.02	0.17729	0.20879	0.52967	0.00073	0.00733	0.00147							
N260	164	0	Patch	4	5.72	6.27	14.02	0.01	0.05	0.04	0.408	0.001	0.447	0.004	0.03	2.82	2.96	7.78	0.01	0.05	0.03	0.20114	0.21113	0.55492	0.00071	0.00357	0.00214							
N260	165	0	Patch	4	5.11	6.09	15.66	0.01	0.02	0.06	0.326	0.001	0.389	0.001	0.04	2.4	2.85	7.3	0.01	0.02	0.05	0.15326	0.18199	0.46616	0.00064	0.00128	0.00319							

■ QTM0 N260 High channel MIMO

											Max Ratio						Max Ratio											
											0.437	0.001	0.498	0.016	0.008							0.208	0.243	0.545	0.001	0.015	0.007	
N260	129	1	0	Patch	2	3.93	4.08	9.94	0.01	0.08	0.03	0.395	0.001	0.410	0.008	0.03	1.44	1.47	4.13	0.01	0.08	0.02	0.14487	0.14789	0.41549	0.00101	0.00805	0.00201
N260	131	3	0	Patch	2	4.58	5.41	10.92	0.01	0.03	0.03	0.419	0.001	0.495	0.003	0.03	1.56	2.01	5.12	0	0.03	0.02	0.14286	0.18407	0.46886	0	0.00275	0.00183
N260	132	4	0	Patch	2	4.41	5	10.09	0	0.06	0.03	0.437	0.000	0.496	0.006	0.03	1.49	1.77	4.79	0	0.05	0.02	0.14767					

QTM1 N260 High channel SISO

											Max Ratio																Max Ratio									
											0.482	0.002	0.507	0.014	0.009												0.217	0.248	0.002	0.546	0.014	0.009				
n260 high ch.(40GHz)											4cm2 PD(W/m2) at 2mm evaluation surfaces @6dbm										4cm2 PD(W/m2) at 19mm evaluation surfaces @6dbm										Ratio					
											relative phase worst PD for MIMO										relative phase worst PD for MIMO										Ratio					
Band	Beam_ID	Ant module	Ant Type	Num of Feed	Number of Feeds	Front	Back	Left	Right	Top	Bottom	Front (worst surface)	Left (worst surface)	back (worst surface)	TOP (worst surface)	Bottom (worst surface)	Front	Back	Left	Right	Top	Bottom	Front surface 6mm/2mm	back surface 6mm/2mm	left surface 6mm/2mm	Right surface 6mm/2mm	TOP surface 6mm/2mm	Bottom surface 6mm/2mm								
N260	0	1	Patch	1	1	1.27	1.52	0	3.86	0.02	0.01	0.329	0.000	0.394	0.005	0.003	0.45	0.5	0	1.7	0.02	0.01	0.11658	0.12953	0	0.44041	0.00518	0.00259								
N260	2	1	Patch	1	1	1.41	1.06	0	3.56	0.01	0.01	0.396	0.000	0.298	0.003	0.003	0.46	0.36	0	1.54	0.01	0.01	0.12921	0.10112	0	0.43258	0.00281	0.00281								
N260	6	1	Patch	2	2	2.71	2.07	0.01	7.36	0.04	0.01	0.368	0.001	0.281	0.005	0.001	1.19	0.91	0	2.92	0.04	0.01	0.16168	0.12364	0	0.39674	0.00543	0.00136								
N260	7	1	Patch	2	2	1.83	1.49	0.01	4.47	0.04	0	0.409	0.002	0.333	0.009	0.000	0.79	0.65	0.01	2.12	0.04	0	0.17673	0.14541	0.00224	0.47427	0.00895	0								
N260	8	1	Patch	2	2	2.69	2.31	0	7.43	0.01	0.02	0.362	0.000	0.311	0.001	0.003	1.12	1.02	0	3.11	0.01	0.02	0.15074	0.13728	0	0.41857	0.00125	0.00269								
N260	9	1	Patch	2	2	2.32	3.29	0.01	8.24	0.04	0.01	0.282	0.001	0.399	0.005	0.001	0.88	1.28	0	3.34	0.04	0.01	0.10687	0.15534	0	0.40534	0.00485	0.00121								
N260	14	1	Patch	2	2	2.54	3.08	0.01	7.73	0.07	0	0.329	0.001	0.398	0.009	0.000	1.15	1.16	0.01	3.43	0.07	0	0.14877	0.15006	0.00129	0.44373	0.00926	0								
N260	15	1	Patch	2	2	2.94	2.24	0.01	6.69	0.01	0.02	0.439	0.001	0.335	0.001	0.003	1.21	0.93	0	3.09	0.01	0.02	0.18087	0.13901	0	0.46588	0.00149	0.00299								
N260	16	1	Patch	2	2	2.6	2.45	0	7.84	0.03	0.01	0.332	0.000	0.313	0.004	0.001	0.92	0.92	0	3.17	0.02	0.01	0.11738	0.11735	0	0.40434	0.00285	0.00128								
N260	20	1	Patch	4	4	4.78	4.74	0.01	12.85	0.07	0.03	0.372	0.001	0.369	0.005	0.002	2	1.79	0.01	6.08	0.06	0.03	0.15564	0.1399	0.00078	0.47315	0.00467	0.00233								
N260	21	1	Patch	4	4	3.97	5.52	0.02	11.73	0.16	0.01	0.338	0.002	0.471	0.014	0.001	1.85	2.49	0.01	6.25	0.15	0.01	0.15772	0.21228	0.00085	0.53282	0.01279	0.00085								
N260	22	1	Patch	4	4	4.56	3.17	0.02	9.46	0.03	0.04	0.482	0.002	0.335	0.003	0.004	2.05	1.45	0.02	6.65	0.03	0.04	0.2167	0.15328	0.00211	0.49154	0.00317	0.00423								
N260	23	1	Patch	4	4	4.63	5.37	0.01	12.88	0.02	0.05	0.359	0.001	0.417	0.002	0.004	2.11	2.46	0.01	6.58	0.02	0.05	0.16382	0.19099	0.00078	0.51087	0.00155	0.00388								
N260	24	1	Patch	4	4	4.97	4.67	0.01	13.07	0.07	0.02	0.380	0.001	0.357	0.005	0.002	2.12	1.73	0.01	6.96	0.07	0.02	0.1622	0.13236	0.00077	0.46366	0.00536	0.00153								
N260	30	1	Patch	4	4	4.91	6.06	0.01	13.13	0.12	0.03	0.374	0.001	0.462	0.009	0.002	2.1	2.58	0.01	6.09	0.11	0.02	0.15994	0.19065	0.00076	0.51087	0.00388	0.00152								
N260	31	1	Patch	4	4	3.5	3.58	0.02	8.95	0.1	0.01	0.391	0.002	0.400	0.011	0.001	1.56	1.48	0.02	4.25	0.1	0.01	0.1743	0.16536	0.00228	0.47486	0.01117	0.00112								
N260	32	1	Patch	4	4	5.08	4.58	0.01	11.81	0.02	0.06	0.430	0.001	0.388	0.002	0.005	2.4	2.16	0.01	6.17	0.02	0.05	0.20322	0.1829	0.00085	0.52244	0.00169	0.00423								
N260	33	1	Patch	4	4	2.23	5.03	0.01	12.89	0.03	0.04	0.328	0.001	0.390	0.002	0.003	1.53	1.97	0.01	6.1	0.02	0.04	0.1107	0.15283	0.00075	0.47324	0.00153	0.0031								
N260	128	1	Patch	1	1	1.34	1.16	0	3.31	0.02	0.01	0.405	0.000	0.350	0.006	0.003	0.43	0.38	0	1.45	0.02	0.01	0.12991	0.1148	0	0.43807	0.00624	0.00302								
N260	130	1	Patch	1	1	0.89	1.38	0	3.27	0.02	0.01	0.272	0.000	0.422	0.006	0.003	0.27	0.47	0	1.46	0.02	0.01	0.08527	0.14373	0	0.44648	0.00612	0.00306								
N260	134	1	Patch	2	2	3.24	2.19	0.01	7.84	0.03	0.02	0.413	0.001	0.279	0.004	0.003	1.32	0.78	0.01	3.03	0.02	0.01	0.16837	0.09949	0.00128	0.38648	0.00255	0.00128								
N260	135	1	Patch	2	2	2.45	2.24	0.01	5.97	0.06	0.01	0.410	0.002	0.375	0.010	0.002	0.9	0.93	0	2.73	0.06	0.01	0.15075	0.15578	0	0.40579	0.00105	0.00168								
N260	136	1	Patch	2	2	1.94	2.53	0	6.17	0.01	0.02	0.314	0.000	0.410	0.002	0.003	0.88	1.16	0	2.9	0.01	0.02	0.14223	0.18801	0	0.47002	0.00162	0.00321								
N260	137	1	Patch	2	2	3.45	2.42	0.01	8.26	0.05	0.01	0.418	0.001	0.293	0.006	0.001	1.22	1.05	0	3.28	0.05	0.01	0.14777	0.12712	0	0.39709	0.00605	0.00124								
N260	142	1	Patch	2	2	2.65	2.04	0	6.62	0.06	0.01	0.400	0.000	0.308	0.009	0.002	0.93	0.81	0	2.82	0.06	0.01	0.14048	0.12236	0	0.42598	0.00906	0.00151								
N260	143	1	Patch	2	2	2.32	2.05	0.01	5.89	0.03	0.04	0.394	0.002	0.348	0.005	0.007	0.95	0.82	0.01	2.61	0.03	0.03	0.16129	0.13922	0.00117	0.44312	0.00509	0.00509								
N260	144	1	Patch	2	2	2.05	2.68	0.01	7.15	0.04	0.02	0.287	0.001	0.375	0.006	0.003	0.69	1.08	0	2.83	0.03	0.01	0.0965	0.15105	0	0.3958	0.0042	0.0014								
N260	148	1	Patch	4	4	4.64	4.87	0.01	12.3	0.1	0.01	0.377	0.001	0.396	0.008	0.001	1.65	2.09	0.01	5.93	0.1	0.01	0.13415	0.16992	0.00081	0.48211	0.00813	0.00081								
N260	149	1	Patch	4	4	5.21	3.65	0.01	10.84	0.15	0.02	0.481	0.001	0.337	0.014	0.002	2.15	1.66	0.01	5.17	0.15	0.02	0.19834	0.15314	0.00092	0.47694	0.00184	0.00185								
N260	150	1	Patch	4	4	2.61	4.16	0.01	8.21	0.02	0.07	0.318	0.001	0.597	0.002	0.009	1.23	2.04	0.01	4.27	0.02	0.07	0.14982	0.24948	0.00127	0.5201	0.0024	0.00853								
N260	151	1	Patch	4	4	5.1	4.56	0.01	12.27	0.01	0.04	0.416	0.001	0.372	0.001	0.001	2.42	2.05	0.01	6.34	0.01	0.03	0.19723	0.16707	0.00081	0.51571	0.00281	0.00244								
N260	152	1	Patch	4	4	4.25	4.72	0.01	12.35	0.08	0.01	0.394	0.001	0.382	0.006	0.001	1.74	2.01	0.01	5.47	0.07	0.01	0.14089	0.16275	0.00081	0.44291	0.00567	0.00081								
N260	158	1	Patch	4	4	4.9	5.06	0.01	12.38	0.13	0.01	0.396	0.001	0.409	0.011	0.001	1.94	2.26	0.01	6.22	0.12	0.01	0.1567	0.18255	0.00081	0.50242	0.00969	0.00081								
N260	159	1	Patch	4	4	4.14	3.14	0.02	8.93	0.11	0.02	0.464	0.002	0.352	0.012	0.002	1.56	1.49	0.01	4.08	0.11	0.02	0.17469	0.16685	0.00112	0.45689	0.01232	0.00224								
N260	160	1	Patch	4	4	4.64	4.88	0.01	11.11	0.02	0.06	0.418	0.001	0.439	0.002	0.005	2.3	2.4	0.01	6.07	0.02	0.05	0.20702	0.21602	0.0009	0.54635	0.0018	0.0045								
N260	161	1	Patch	4	4	4.43	4.43	0.01	12.32	0.05	0.02	0.360	0.001	0.360	0.004	0.002	1.94	1.71	0.01	5.24	0.04	0.01	0.15747	0.1388	0.00081	0.42532	0.00325	0.00081								

QTM1 N260 High channel MIMO

											Max Ratio																Max Ratio					
											0.487	0.002	0.502	0.015	0.009												0.216	0.243	0.001	0.557	0.015	0.008
N260	128	0	1	Patch	2	3.63	3.75	0.01	7.57	0.04	0.02	0.480	0.001	0.495	0.005	0.003	1.22	1.90	0	3.960	0.04	0.020	0.16316	0.17041	0	0.47028	0.00528	0.00264				
N260	130	2	1	Patch	2	3.29	3.61	0.01	7.38	0.08	0.02	0.446	0.001	0.489	0.005	0.003	1.05	1.250	0	3.560	0.04	0.010	0.14228	0.16938	0	0.48238	0.00542	0.00136				
N260	134	6	1	Patch	4	6.13	4.4	0.01	13.27	0.11	0.04	0.462	0.001	0.332	0.008	0.003	2.34	1.90	0.01	6.650	0.1	0.030	0.17634	0.11982	0.00075	0.50113	0.00754	0.00226				
N260	135	7	1	Patch	4	5.97	4.71	0.02	12.26	0.18	0.02	0.487	0.002	0.384	0.015	0.002	2.35	2.100	0.01	6.060	0.18	0.020	0.19168	0.17129	0.00085	0.49429	0.01468	0.00163				
N260	136	8	1	Patch	4	6.73	7.44	0.02	14.82	0.04	0.05	0.454	0.001	0.502	0.003	0.003	3.04	3.480	0.01	7.100	0.04	0.050	0.20513	0.23482	0.00067	0.47908	0.0027	0.00337				
N260	137	9	1	Patch	4	7.66	7.44	0.02	17.85	0.09	0.03	0.429	0.001	0.417	0.005	0.002	2.7	2.770	0.01	7.670	0.08	0.030	0.15126	0.15518	0							

5 Power Density Characterization

5.1 PD design target

For Qualcomm SDX55/QTM525, the total device uncertainty for mmW radio is 2.1dB.

To account for the total design related uncertainty, PD_design_target needs to be:

$$PD_design_target < PD_{regulatory_limit} \times 10^{\frac{-total\ uncertainty}{10}}$$

With FCC 4cm2-averaged PD requirement of 10 W/m2 and the declared 2.1 dB device design related uncertainty, the PD_design_target for the EUT is determined as:

$$PD_design_target = 6\ W/m^2$$

5.2 Worst-case housing influence determination

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 location as shown in Figure 1-3, only material/housing surrounded has impact on EM field propagation, in turn impact on power density. Therefore, only adjacent surfaces for each QTM (as listed in Table 3-2) were used to evaluate the worst-case housing influence for each frequency band. For this EUT, when comparing a simulated 4cm2-averaged PD and measured 4 cm2-averaged PD, the worst error introduced for each antenna module operating at each band when using the estimated material property in the simulation is highlighted yellow in Table 3-2. Thus, the worst-case housing influence, denoted as $\Delta min = Sim.PD - Meas.PD$, is determined as:

Table 5-1: Δmin for QTM0 and QTM1

Band	QTM	Δmin (dB)
N261	0	0.7
	1	2.2
N260	0	0.2
	1	1.2

Δmin represents the worst case where RF exposure is underestimated the most in simulation when using the estimated material property for glass/plastics of the housing. For conservative

assessment, the Δmin is used as the worst-case factor and applied to all the beams in the corresponding beam group to determine input power limits in PD char for compliance.

5.3 PD Char of the EUT

This section describes the PD Char generation that complies with the PD_design_target determined in Section 5.1 and is in compliance with the regulatory power density limit.

5.3.1 Scaling factor for SISO beams

Determine scaling factor for low, mid, high channel, $s(i)_{low_or_mid_or_high}$ by:

$$s(i)_{low_or_mid_or_high} = \frac{PD\ design\ target}{sim.PD_{surface}(i)}, i \in SISO\ beams$$

Then finalize scaling factor, $s(i)$, by using equation below:

$$s(i) = \min\{slow(i), smid(i), shigh(i)\}, i \in SISO\ beams$$

and this scaling factor, $s(i)$, is applied to the input power at each antenna port to determine *input.power.limit* for SISO beams.

5.3.2 Scaling factor for MIMO beams

The relative phase between beam pair is not controlled in the EUT and could vary from run to run. Therefore, for beam pair, based on the simulation results, the worst-case scaling factor needs to be determined mathematically to ensure the compliance.

For beam pair, extract the E-fields and H-fields from the corresponding single beams at low, mid and high channel for each supported band and for all identified surfaces of the EUT.

For a given beam pair containing *beam_a* and *beam_b*, and for a given channel, let relative phase between *beam_a* and *beam_b* = \varnothing , and the total PD of the beam pair can be expressed as:

$$\begin{aligned} total\ PD(\varnothing) &= \frac{1}{2} \sqrt{Re\{PD_x(\varnothing)\}^2 + Re\{PD_y(\varnothing)\}^2 + Re\{PD_z(\varnothing)\}^2} \\ &= \frac{1}{2} Re\left\{\left(\overline{E_a} + \overline{E_b e^{j\omega\varnothing}}\right) \times \left(\overline{H_a} + \overline{H_b e^{j\omega\varnothing}}\right)^*\right\} \quad (4) \end{aligned}$$

where, $PD_x(\varnothing)$, $PD_y(\varnothing)$ and $PD_z(\varnothing)$ are the three components of the *total PD* (\varnothing); E_a and H_a are the extracted E-fields and H-fields of *beam_a*, while E_b and H_b are the extracted E-fields and H-fields of *beam_b*. Sweep \varnothing with a 5° step from 0° to 360° to determine the worst-case, $\varnothing_{worstcase}$, which results in the highest *total PD* (\varnothing) among all identified surfaces for this MIMO beam at this channel.

Follow the above procedure to determine $\varnothing_{worstcase}$ for all three channels of all bands supported, and obtain the scaling factor given by the below equation for low, mid and high channels:

$$s(i)_{low_or_mid_or_high} = \frac{PD \text{ design target}}{total \text{ PD } (\emptyset(i)_{worstcase})}, i \in MIMO \text{ beams}$$

Similar to SISO beam, the worst-case scaling factor, $s(i)$, for MIMO beam i is determined as:

$$s(i) = \min\{s_{low}(i), s_{mid}(i), s_{high}(i)\}, i \in MIMO \text{ beams}$$

and this scaling factor, $s(i)$, is applied to the input power at each antenna port to determine *input.power.limit* for MIMO beams.

5.3.3 Input power limit when only mmW radio is ON

When only mmW radio is on, the power limit specifies the power level (denoted as *input.power.limit*) at antenna port that corresponds to PD_design_target for all the beams. The reference power used in simulation is 6dBm and denoted as *Pref*.

The logic to determine *input.power.limit* is as shown below:

If -TxAGC uncertainty at reference power level < Δmin < TxAGC uncertainty at reference power level, then

$$input.power.limit(i) = Pref + 10 * \log(s(i)), i \in all \text{ beams} \quad (1)$$

else if Δmin < -TxAGC uncertainty at reference power level,

$$input.power.limit(i) = Pref + 10 * \log(s(i)) + (\Delta min + TxAGC \text{ uncertainty at reference power level}), i \in all \text{ beams} \quad (2)$$

else if Δmin > TxAGC uncertainty at reference power level,

$$input.power.limit(i) = Pref + 10 * \log(s(i)) + (\Delta min - TxAGC \text{ uncertainty at reference power level}), i \in all \text{ beams} \quad (3)$$

Following above logic, the *input.power.limit* for this EUT can be calculated as:

Table 5-2: power.limit calculation

Band#	QTM #	Δmin (dB)	<i>input.power.limit</i> (dBm)	Notes
N261	0	0.7	6dBm + 10log(s(i)) + (0.7-0.5)	Using Eq.3
	1	2.2	6dBm + 10log(s(i)) + (2.2-0.5)	Using Eq.3
N260	0	0.2	6dBm + 10log(s(i))	Using Eq.1
	1	1.2	6dBm + 10log(s(i)) + (1.2-0.5)	Using Eq.3

Note the Δmin (dB) used is the minimum of Hpol and Vpol per QTM per band (see Table 3-2).

Resulted *input.power.limit* for all beams is listed in Table below:

Table 5-3: *input.power.limit*

N261			N260		
(Beam Pair)	Beam ID	Input.power.limit	(Beam Pair)	Beam ID	input.power.limit
NA	0	9.04	NA	0	7.37
	1	8.12		1	7.04
	2	8.88		2	7.61
	3	6.72		3	6.28
	4	7		4	6.07
	5	7.16		5	7.33
	6	6.31		6	4.89
	7	6.62		7	6.03
	8	7.18		8	4.93
	9	4.99		9	4.75
	10	4.62		10	3.62
	11	3.83		11	3.22
	12	4.16		12	4.1
	13	6.25		13	3.33
	14	5.62		14	4.85
	15	6.56		15	4.81
	16	4		16	4.24
	17	3.62		17	3.69
	18	4.08		18	4.52
	19	4.01		19	3.54
20	3.1	20	2.54		
21	3.11	21	2.58		
22	3.47	22	3.22		
23	5.28	23	2.6		
24	3.1	24	2.49		
25	1.65	25	1.24		
26	1.33	26	1.63		
27	1.38	27	2.66		
28	1.91	28	1.46		
29	3.47	29	1.05		
30	3.06	30	2.51		
31	3.23	31	3.46		
32	4.1	32	2.61		
33	2.29	33	2.56		
34	1.36	34	1.27		
35	1.43	35	2.21		
36	1.49	36	2.13		
128	9.09	37	1.19		
129	7.67	128	7.9		
130	9.33	129	6.66		
131	7.2	130	8.1		
132	7.22	131	6.49		
133	7.03	132	6.99		
134	6.02	133	7.86		
135	5.88	134	4.75		
136	7.1	135	5.41		
137	5.24	136	5.67		
138	4.67	137	4.72		
139	4.01	138	3.62		
140	5.09	139	4.16		
141	6.6	140	4.19		
142	5.94	141	3.56		
143	6.25	142	5.03		
144	4.29	143	5.58		
145	4.18	144	5.2		
146	4.15	145	4.23		
147	4.87	146	4.33		
148	3.55	147	4.29		
149	3.54	148	2.74		
150	3.76	149	3.04		
151	4.48	150	3.69		
152	2.73	151	2.84		
153	2.04	152	2.76		
154	1.5	153	1.66		
155	1.35	154	1.93		
156	2.42	155	2.53		
157	4.05	156	1.64		
158	3.38	157	1.46		
159	3.81	158	2.72		
160	3.94	159	3.81		
161	2.37	160	2.92		
162	1.73	161	2.76		
163	1.45	162	1.65		
164	1.74	163	2.33		
		164	1.99		
		165	1.59		

N261			N260		
(Beam Pair)	Beam ID	input.power.limit	(Beam Pair)	Beam ID	input.power.limit
129	1	4.45	129	1	3.71
131	3	3.68	131	3	3.19
132	4	3.84	132	4	3.29
137	9	1.68	133	5	4.23
138	10	1.41	138	10	1.2
139	11	0.72	139	11	0.49
140	12	1.9	140	12	0.98
144	16	0.93	141	13	1.09
145	17	0.84	145	17	1.53
146	18	0.77	146	18	1.39
152	24	-1.12	147	19	1.52
153	25	-1.3	153	25	-1.92
154	26	-1.87	154	26	-1.55
155	27	-2.04	155	27	-1.16
156	28	-1.25	156	28	-1.82
161	33	-1.18	157	29	-2.09
162	34	-1.84	162	34	-1.95
163	35	-1.85	163	35	-1.37
164	36	-1.58	164	36	-1.45
128	0	5.81	165	37	-1.87
130	2	5.87	128	0	4.27
133	5	3.71	130	2	4.47
134	6	2.76	134	6	2.52
135	7	3.1	135	7	2.71
136	8	3.81	136	8	1.8
141	13	3.02	137	9	1.35
142	14	2.6	142	14	1.78
143	15	3.25	143	15	2.13
147	19	0.92	144	16	1.59
148	20	-0.19	148	20	-0.69
149	21	-0.13	149	21	-0.26
150	22	0.31	150	22	0.28
151	23	0.99	151	23	-0.62
157	29	0.64	152	24	-0.78
158	30	-0.25	158	30	-0.58
159	31	-0.01	159	31	0.04
160	32	0.75	160	32	-0.49
			161	33	-0.69

5.3.4 Further limitation and power backoff consideration

This EUT will use the Legacy power backoff solution to limit mmW transmit power from all the beams. The mechanism in legacy power backoff solution can only control the transmit power per QTM per band per SISO or MIMO beam, therefore, in order to ensure compliance all times, for each band, the minimum of input.power.limit out of all SISO beams and minimum of input.power.limit out of all MIMO beams needs to be determined and applied via legacy backoff solution accordingly.

The minimum power limit, min.power.limit, is determined based on Table 5-3 and listed in Table 5-4. Note the min.power.limit data rounded to one decimal place.

Table 5-4: SISO and MIMO min.power.limit for each band

N261	min.power.limit
min input.power.limit out of all SISO beams from QTM0 (dBm)	1.3
min input.power.limit out of all MIMO beams from QTM0 (dBm)	-2.0
min input.power.limit out of all SISO beams from QTM1 (dBm)	3.1
min input.power.limit out of all MIMO beams from QTM1 (dBm)	-0.3
N260	min.power.limit
min input.power.limit out of all SISO beams from QTM0 (dBm)	1.1
min input.power.limit out of all MIMO beams from QTM0 (dBm)	-2.1
min input.power.limit out of all SISO beams from QTM1 (dBm)	2.5
min input.power.limit out of all MIMO beams from QTM1 (dBm)	-0.8

Furthermore, the additional power backoff needs to be added in order to comply with TER requirement when mmW NR, LTE and WLAN MIMO transmit simultaneously. The maximum allowed PD budget is provided based on simultaneous transmission *reported* SAR in Part 1 report. For a given exposure scenario, if the maximum PD contribution ratio is higher than the corresponding maximum allowed PD budget, then the additional power backoff for TER requirement is determined using equation:

$$\text{additional power backoff (dB)} = 10 * \log \left(\frac{\text{maximum PD contribution ratio (in linear)}}{\text{maximum allowed PD budget (in linear)}} \right)$$

Examples for n261:

1. For head exposure, the maximum allowed PD budget is 0.44, the maximum PD contribution from left surface (QTM0) at 2mm to front surface at 2mm out of all SISO beams of QTM0 is 0.516, then the additional power backoff is 0.9dB ($=10*\log(0.516/0.44)$) for all SISO beams of QTM0.
2. For hotspot exposure where SAR measured at 10mm separation distance from front surface, the maximum allowed PD budget is 0.72, the maximum PD contribution from left surface (QTM0) at 2mm to front surface at 10mm out of all SISO beams of QTM0 is 0.240, then no additional power backoff is needed.

Following the similar steps described in the above examples, all additional power backoff required for TER requirement is listed in Table 5-5.

Table 5-5: Additional power backoff required for TER requirement

n261							dB				
RF Exposure Position	SAR Test Distance (mm)	Max allowed PD budget (in linear)	max PD contribution ratio out of all SISO beams from QTM0 (left)	max PD contribution ratio out of all MIMO beams from QTM0 (left)	max PD contribution ratio out of all SISO beams from QTM1 (right)	max PD contribution ratio out of all MIMO beams from QTM1 (right)	Additional backoff needed for QTM0 SISO beams	Additional backoff needed for QTM0 MIMO beams	Additional backoff needed for QTM1 SISO beams	Additional backoff needed for QTM1 MIMO beams	
Head_worst-case (front)	0	0.44	0.516	0.505	0.546	0.551	0.7	0.6	0.9	0.9	
Flat phantom	10	Front	0.72	0.240	0.259	0.263	0.269	0.0	0.0	0.0	0.0
		Back	0.58	0.232	0.259	0.263	0.266	0.0	0.0	0.0	0.0
		Left	0.92	0.572	0.626	0.004	0.003	0.0	0.0	0.0	0.0
		Right	0.75	0.003	0.002	0.580	0.617	0.0	0.0	0.0	0.0
		Top	0.70	0.014	0.015	0.022	0.015	0.0	0.0	0.0	0.0
		Bottom	0.97	0.010	0.008	0.009	0.007	0.0	0.0	0.0	0.0
n260											
RF Exposure Position	SAR Test Distance (mm)	Max allowed PD budget (in linear)	max PD contribution ratio out of all SISO beams from QTM0 (left)	max PD contribution ratio out of all MIMO beams from QTM0 (left)	max PD contribution ratio out of all SISO beams from QTM1 (right)	max PD contribution ratio out of all MIMO beams from QTM1 (right)	Additional backoff needed for QTM0 SISO beams	Additional backoff needed for QTM0 MIMO beams	Additional backoff needed for QTM1 SISO beams	Additional backoff needed for QTM1 MIMO beams	
Head_worst-case	0	0.44	0.420	0.437	0.482	0.487	0.00	0.00	0.36	0.40	
Flat phantom	10	Front	0.72	0.211	0.208	0.233	0.240	0.00	0.00	0.00	0.00
		Back	0.58	0.262	0.248	0.248	0.247	0.00	0.00	0.00	0.00
		Left	0.92	0.580	0.606	0.002	0.002	0.00	0.00	0.00	0.00
		Right	0.75	0.001	0.001	0.580	0.600	0.00	0.00	0.00	0.00
		Top	0.70	0.013	0.015	0.014	0.015	0.00	0.00	0.00	0.00
		Bottom	0.97	0.008	0.008	0.009	0.008	0.00	0.00	0.00	0.00

5.3.5 PD char

Based on Table 5-4 and Table 5-5, the PD char for compliance via legacy power backoff solution can be finalized listed as Table 5-6 and will be implemented in production units.

Table 5-6: Final PD Char

n261		
QTM/beam type	additional backoff (dB) for TER	Final input.power.limit
QTM0 SISO beam	0.7	0.7
QTM0 MIMO beam	0.6	-2.6
QTM1 SISO beam	0.9	2.2
QTM1 MIMO beam	0.9	-1.2
n260		
QTM/beam type	additional backoff (dB) for TER	Final input.power.limit
QTM0 SISO beam	0	0.7
QTM0 MIMO beam	0	-2.4
QTM1 SISO beam	0.36	2.1
QTM1 MIMO beam	0.4	-1.2