1. Simulation methodology for Power Density (PD)

1.1 Simulation tool

1.1.1 Tool description

For the EM simulation to calculate power density (PD) for mobile hotspot using QTM525 mmWave antenna modules, we use the commercially available ANSYS Electronics Suite 2021.R1(hereafter 'ANSYS HFSS'). ANSYS HFSS is widely used in industry for simulating 3D full-wave electromagnetic fields for antenna and RF radiation problem of high frequency component. ANSYS HFSS is implemented based on the Finite Element Method (FEM) operates in the frequency domain.

1.1.2 Mesh and Convergence criteria

FEM simulations were performed to assess the power density of the EUT with QTM525 modules using ANSYS HFSS. The auto initial mesh defined "lambda refinement" (i.e., ANSYS refines the initial mesh based on the material-dependent wavelength) and 30% maximum refinement per pass are selected as adaptive options in the simulation setup.

ANSYS HFSS computes the error, and the iterative process (solve –> error analysis –> adaptive refinement) repeats until the convergence criteria is met with maximum magnitude of delta S less than 0.02 which is defined by the user. As long as convergence is reached, the converged results are accurate. Fig.1 shows the adaptive mesh setup over a cross section.

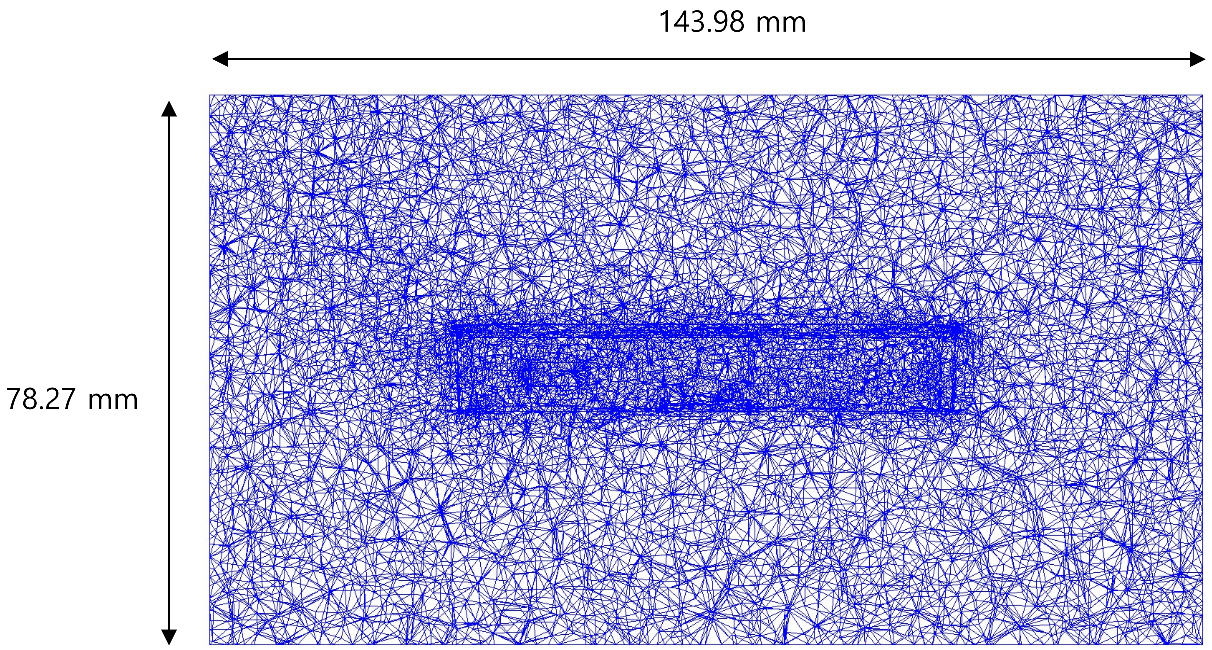


Figure 1. Example of the adaptive mesh technique (Top view)

1.1.3 Power density calculation

After simulation, ANSYS HFSS can generate the electric and magnetic fields in each surface. For power density calculation, the electric field ($\vec{E}$) and magnetic field ($\vec{H}$) are needed. The actual consumption power can be expressed as the real part of the Poynting vector ($\vec{P}$) from the cross product of $\vec{E}$ and the complex conjugation of $\vec{H}$ as shown below:

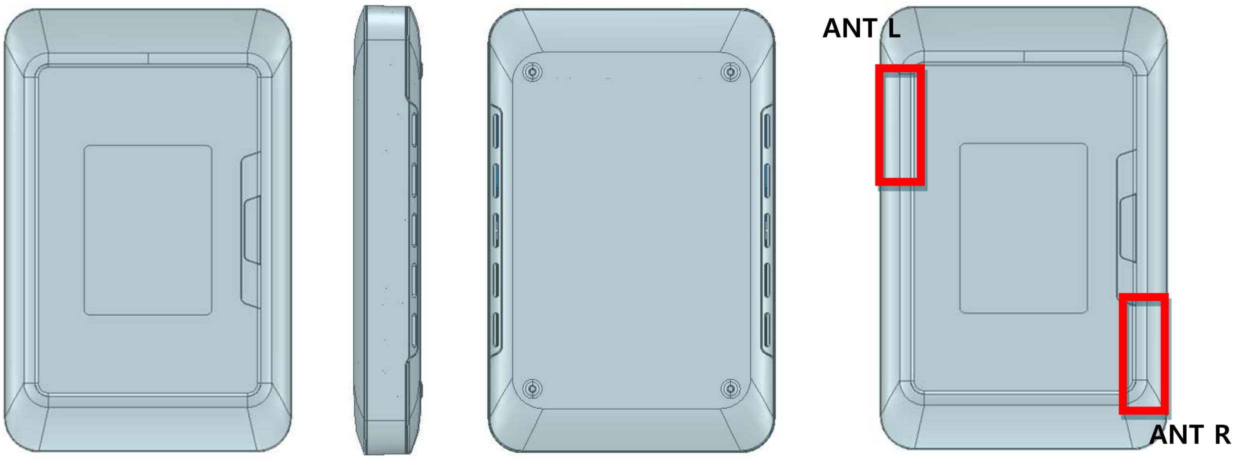
$$\vec{P} = \mathrm{Re}(\frac{1}{2}\vec{E} \times \vec{H}^{*})$$

$\vec{P}$ can be expressed as the localized power density based on a peak value of each spatial point on mesh grids and obtained directly from ANSYS HFSS simulation results. From the localized power density, the average power density can be evaluated over a 4 cm^2 area on any surfaces. The power density is calculated in the relevant plan (10 mm away from the mobile hotspot plastic housing) over a surface of 4 cm^2 area.

1.2 Simulation setup

1.2.1 3D modeling

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 Ant L and Ant R. Ant L is placed on the left side and antennas are facing the left side, and Ant R is placed on the right side and antennas are facing the right side of the device.



(a) Front (b) Side (c) Back (d) Location of mmWave module (front)

Figure 2. Simulation model which is mounted two mmWave antenna modules

1.2.2 PD evaluation planes

Table 1 shows the PD evaluation planes for each antenna module and Figures 3 illustrate the PD evaluation planes of the simulation model which are used to find the worst-case beamforming cases. Each antenna module is individually evaluated for worse case PD using multiple evaluation planes. These planes, S1 through S6, are positioned 10mm away from the mobile hotspot surface. All the material properties used in the simulation model are chosen to be as close to the real device.

Table 1. PD evaluation planes

Module	Front	Back	Left From Front View	Right From Front View	Top	Bottom
	S1	S2	S3	S4	S5	S6
Ant L	O	O	O	O	O	O
Ant R	O	O	O	O	O	O

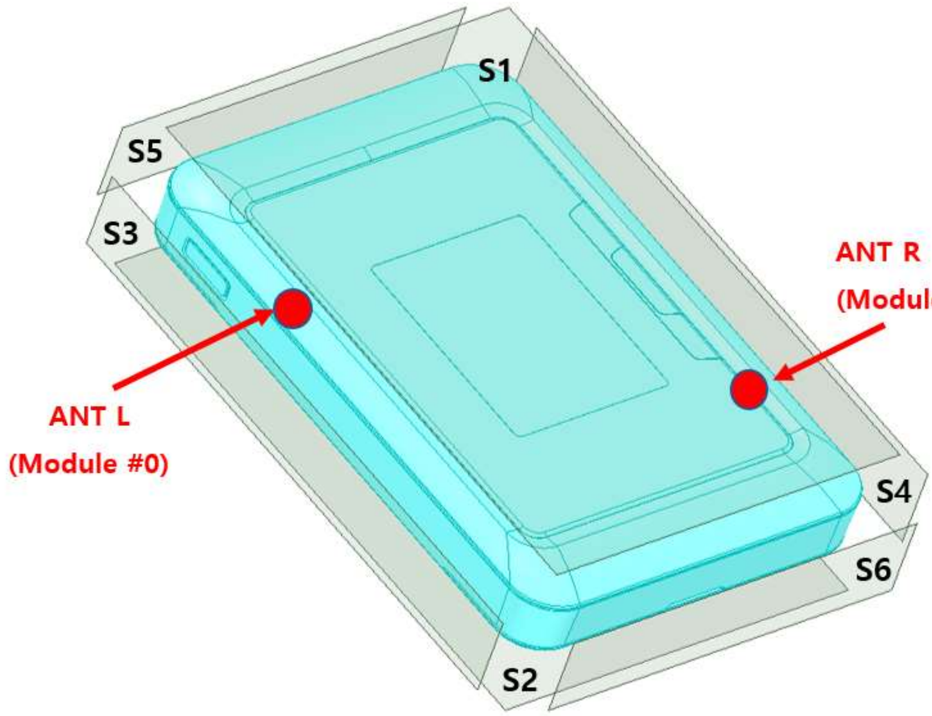


Figure 3. PD evaluation planes

1.2.3 Boundary condition

To simulate electromagnetic tool based on FEM, the boundary condition allows electromagnetic waves to be electrically open at the boundary and radiated far away without reflection. ANSYS HFSS can support the absorbing boundary condition (ABC) for radiation boundary and make normally a quarter wave length from the radiating structure. In this report, to cover all beamforming cases of mmWave antenna modules, the 30mm spacing from the device is used.

The number of antenna ports of the antenna array module consists of 16 ports (4 for each patch antenna), 8 vertically polarized ports and 8 horizontally polarized ports, respectively. The antenna ports are controlled by SW. The phase, polarization and number of ports used can change. The ports are selected per the created "code book" and is custom for each product. The code book lists the phase, polarization, and combinations to be used for beamforming. In the 16 ports available in each patch antenna array, 8 ports are used to excite bands n261, and 8 ports are used to excite band n260.

Figure 4 shows the ANT L module structure and surrounding structure. The ANT L module is encrypted in the ANSYS HFSS and can only check the feeding position.

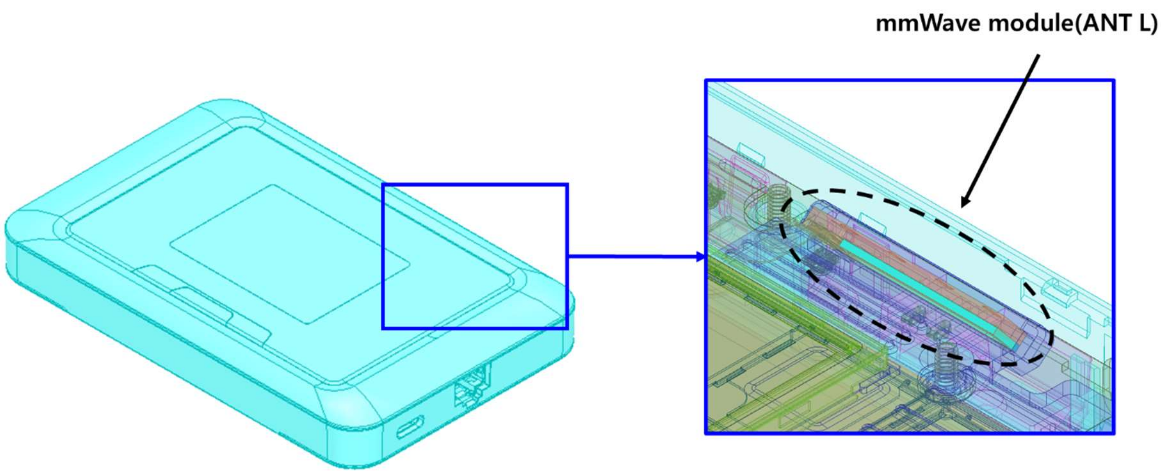


Figure 4. mmWave module (ANT L)

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 HFSS. Figure 5 shows an example of antenna port excitations.

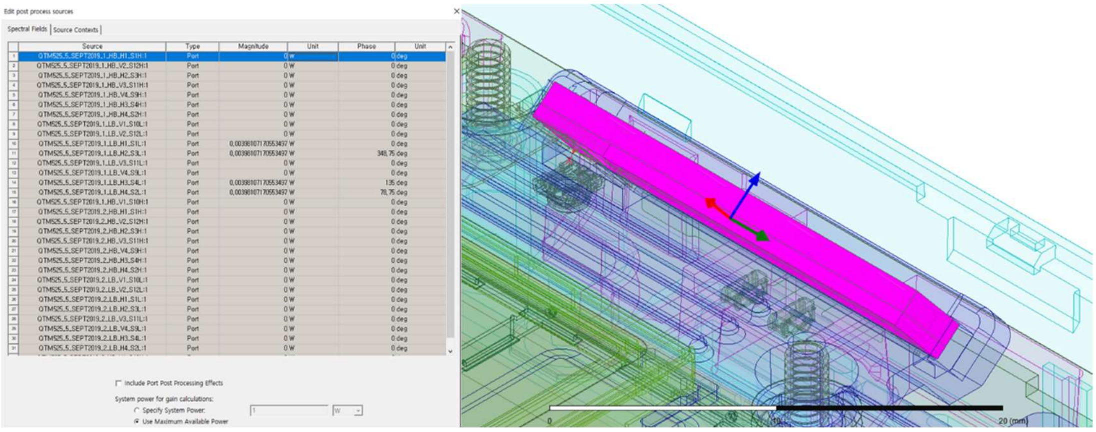


Figure 5. An example of port excitation (ANT L)

Since ANSYS HFSS uses FEM solver based on frequency domain analysis method, the input source for the port excitation applies sinusoidal wave form for each frequency.

1.2.4 Condition of simulation completion

The simulation completion condition of ANSYS HFSS is defined as delta S. The ANSYS 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. Simulation verification

2.1 Spatial-averaged power density

As mentioned in the previous chapter, the Poynting vector ($\vec{P}$) can be obtained through cross product of an electric field ($\vec{E}$) and complex conjugate of a magnetic field ($\vec{H}$). The real term of the Poynting vector can be described as the point power density or peak power density. Using the point power density, the spatial-averaged power density can be obtained by the integral of 4 cm^2 at 2 mm intervals of the point power density result. Figure 6 shows examples of the distribution plot of point power density and the averaged power density.

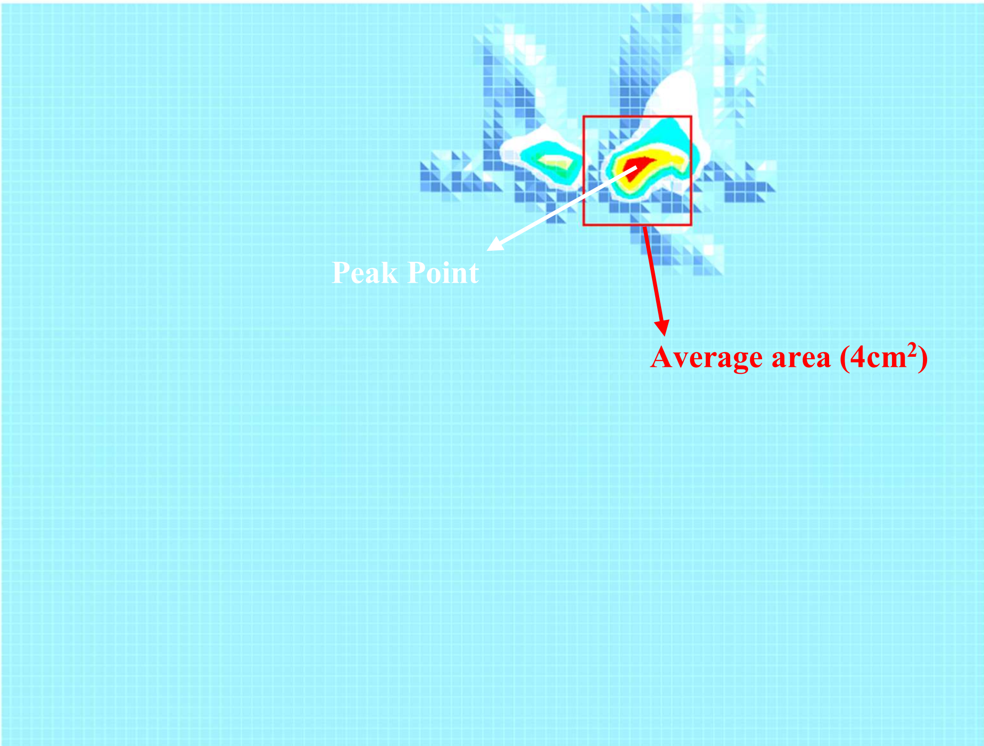


Figure6. Power density distribution (Example)

2.2 Comparison between simulation and measurement

In this section, the simulated-power density distributions and measured-power density distributions are compared to each mmWave antenna.

Based on comparison of power density distributions, simulated power density and measured power density have a good correlation. The discrepancy in amplitude between simulated 4 cm^2 averaged power density and measured 4 cm^2 averaged power density is considered as housing influence and used in determining input power limit for each beam for RF exposure compliance.

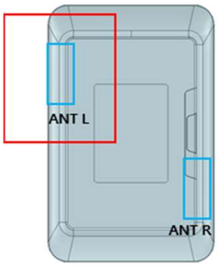
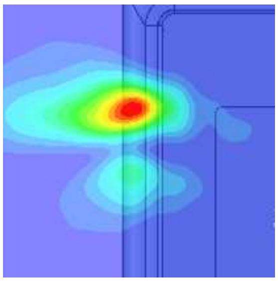
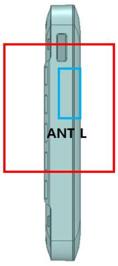
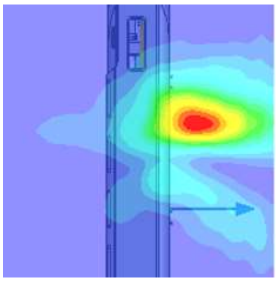
The below table shows the input powers used for each active port for both Simulation and Measurement. For measurements, the mobile hotspot is configured to Factory Test Mode and input power values are entered via SW for each active port. For simulations, these values were entered directly into the ANSYS HFSS setup parameters.

Mode/Band	Antenna	Input Power(dBm) SISO	Input Power(dBm) MIMO
5G NR n261	L Patch	6.0	6.0
	R Patch	6.0	6.0
5G NR n260	L Patch	6.0	6.0
	R Patch	6.0	6.0

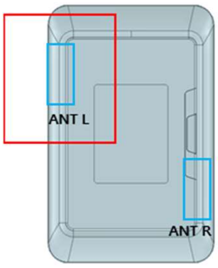
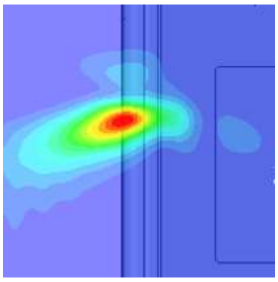
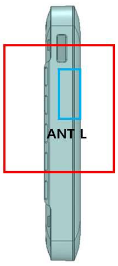
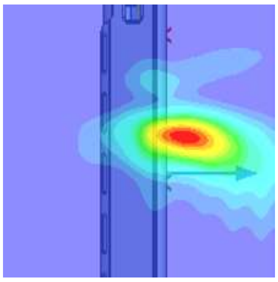
* The below simulation and measurement result were performed at 10mm evaluation distance and 28GHz / 38.5GHz.

Power Density 4 cm^2 avg. PD (mW/cm^2)						
Band	Beam ID	Antenna	Surface	Channel	Meas.	Sim
n261	28	L	Front	Mid Ch		0.554
			Left			0.418
	159		Front			0.669
			Left			0.568
	23	R	Front	Mid Ch		0.495
			Right			0.419
	161		Front			0.648
			Right			0.582
n260	36	L	Front	Mid Ch		0.758
			Left			0.424
	157		Front			0.749
	164		Left			0.506
	22	R	Front	Mid Ch		0.742
	32		Right			0.410
	161		Front			0.777
	160		Right			0.535

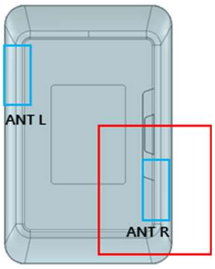
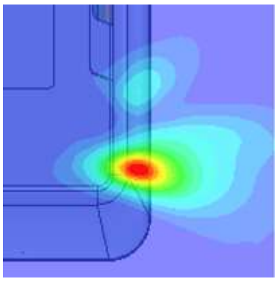
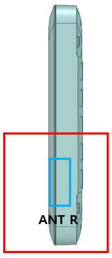
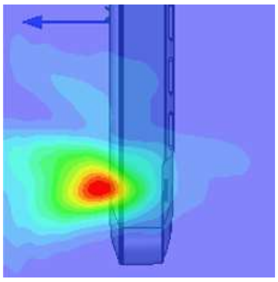
- Table 2-1, n261 ANT L-Patch: Mid Channel, Beam ID 28

Beam ID	Surface	View	Simulated PD	Measured PD
28	S1 (Front)			
	S3 (Left)			

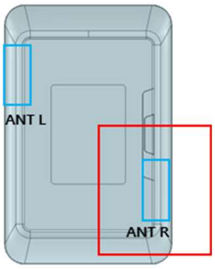
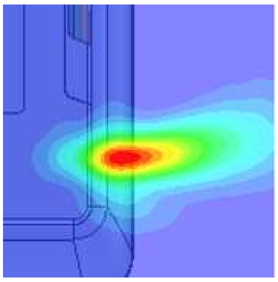
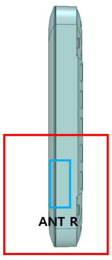
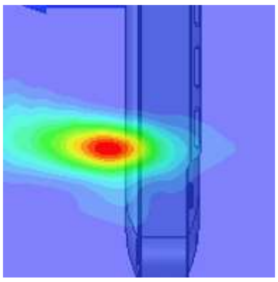
- Table 2-2, n261 ANT L-Patch: Mid Channel, Beam ID 159

Beam ID	Surface	View	Simulated PD	Measured PD
159	S1 (Front)			
	S3 (Left)			

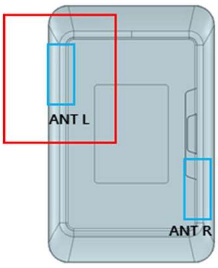
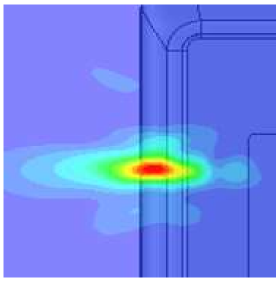
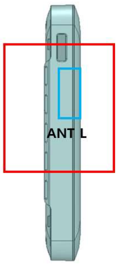
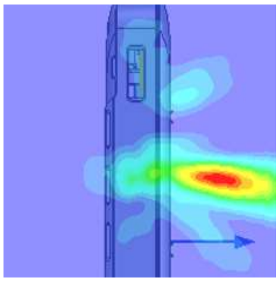
- Table 2-3, n261 ANT R-Patch: Mid Channel, Beam ID 23

Beam ID	Surface	View	Simulated PD	Measured PD
23	S1 (Front)			
	S4 (Right)			

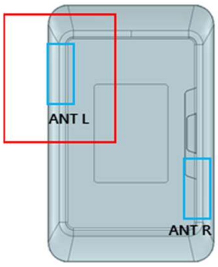
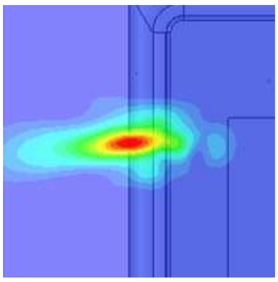
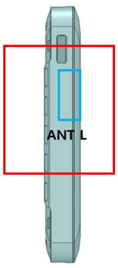
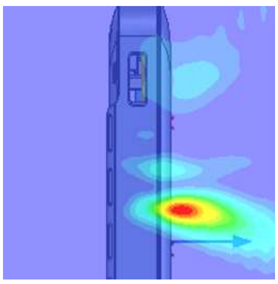
- Table 2-4, n261 ANT R-Patch: Mid Channel, Beam ID 161

Beam ID	Surface	View	Simulated PD	Measured PD
161	S1 (Front)			
	S4 (Right)			

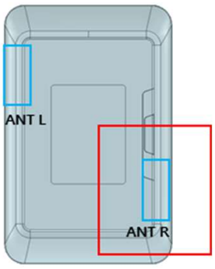
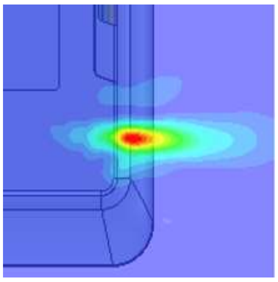
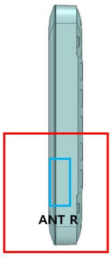
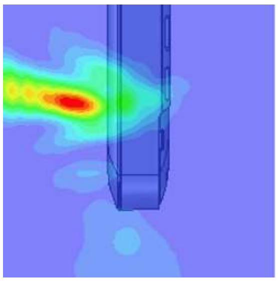
- Table 2-5, n260 ANT L-Patch: Mid Channel, Beam ID 36

Beam ID	Surface	View	Simulated PD	Measured PD
36	S1 (Front)			
	S3 (Left)			

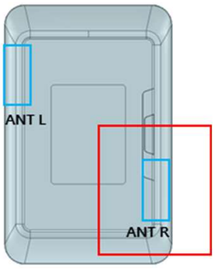
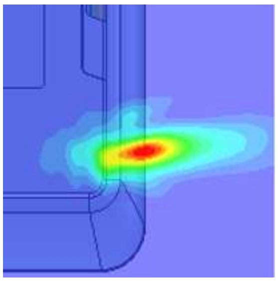
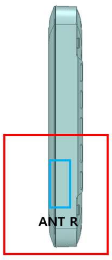
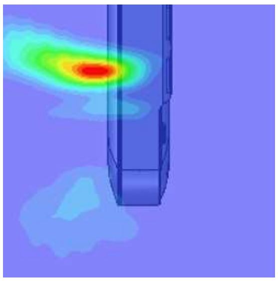
- Table 2-6, n260 ANT L-Patch: Mid Channel, Beam ID 157 for Front and 164 for Left surface

Beam ID	Surface	View	Simulated PD	Measured PD
157	S1 (Front)			
164	S3 (Left)			

- Table 2-7, n260 ANT R-Patch: Mid Channel, Beam ID 22 for Front and 32 for Right surface

Beam ID	Surface	View	Simulated PD	Measured PD
22	S1 (Front)			
32	S4 (Right)			

- Table 2-8, n260 ANT R-Patch: Mid Channel, Beam ID 161 for Front and 160 for Right surface

Beam ID	Surface	View	Simulated PD	Measured PD
161	S1 (Front)			
160	S4 (Right)			

3 Simulation results

This section shows the PD simulation results of Ant L and Ant R at 28GHz and 39GHz for each evaluation plane specified in Table 1 at one separation distances of 10mm.

3.1 PD for Low/Mid/High Channel at 28GHz / 39GHz

3.1.1 Ant L – Patch Antenna

Table 3, Table 4 show the PD simulation evaluation of Ant L patch antenna at 28GHz /39GHz for the corresponding evaluation planes specified in Table1.

Table 3. PD of Ant L – patch antenna (28GHz – n261)

- L – Patch

n261 PD Simulation						(S1) Front Surface			(S2) Rear Surfece			(S3) Left Surface			(S4) Right Surface			(S5) Top Surface			(S6) Bottom Surface		
Ant Module	Ant. Type	SISO/MIMO & Polarization	Feed no.	Beam ID		4cm2 avg. PD (mW/cm2) @ 10mm distance																	
						Channel																	
						Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High
L	Patch	Single Beam V-pol	1	1		0.078	0.079	0.076	0.007	0.008	0.008	0.049	0.050	0.056	0.002	0.001	0.001	0.003	0.002	0.002	0.001	0.001	0.001
			1	3		0.124	0.122	0.107	0.021	0.022	0.021	0.090	0.084	0.090	0.001	0.001	0.001	0.003	0.003	0.003	0.002	0.002	0.002
			1	5		0.136	0.141	0.148	0.014	0.012	0.008	0.093	0.085	0.075	0.001	0.001	0.002	0.006	0.008	0.005	0.002	0.002	0.002
			1	7		0.136	0.141	0.144	0.018	0.015	0.011	0.088	0.086	0.079	0.001	0.002	0.002	0.005	0.005	0.005	0.002	0.002	0.002
			2	12		0.246	0.250	0.254	0.020	0.018	0.016	0.192	0.170	0.153	0.004	0.005	0.006	0.018	0.018	0.016	0.008	0.008	0.007
			2	13		0.365	0.369	0.381	0.056	0.045	0.031	0.273	0.259	0.237	0.002	0.002	0.002	0.007	0.009	0.009	0.002	0.002	0.002
			2	14		0.222	0.209	0.195	0.059	0.055	0.047	0.145	0.137	0.124	0.004	0.003	0.004	0.016	0.013	0.011	0.004	0.003	0.002
			2	15		0.374	0.388	0.398	0.041	0.033	0.025	0.267	0.260	0.238	0.004	0.005	0.005	0.008	0.008	0.006	0.004	0.005	0.005
			2	19		0.261	0.255	0.242	0.048	0.048	0.050	0.183	0.179	0.180	0.004	0.004	0.005	0.005	0.005	0.004	0.002	0.002	0.002
			2	20		0.181	0.177	0.180	0.052	0.045	0.034	0.121	0.112	0.106	0.003	0.002	0.002	0.019	0.021	0.020	0.005	0.005	0.005
			2	21		0.253	0.258	0.235	0.026	0.028	0.027	0.196	0.195	0.198	0.004	0.003	0.003	0.005	0.005	0.005	0.003	0.003	0.003
			4	27		0.264	0.263	0.311	0.042	0.038	0.036	0.249	0.249	0.233	0.004	0.005	0.006	0.033	0.035	0.030	0.009	0.006	0.008
			4	**28**		0.542	**0.554**	0.540	0.077	0.067	0.058	0.449	**0.418**	0.375	0.005	0.005	0.005	0.010	0.009	0.007	0.003	0.004	0.003
			4	29		0.375	0.371	0.358	0.105	0.104	0.091	0.264	0.256	0.251	0.007	0.006	0.005	0.028	0.027	0.028	0.010	0.010	0.008
			4	30		0.254	0.245	0.225	0.066	0.061	0.052	0.116	0.122	0.138	0.007	0.007	0.004	0.037	0.030	0.036	0.009	0.007	0.007
			4	31		0.389	0.398	0.420	0.067	0.056	0.046	0.292	0.277	0.253	0.004	0.004	0.005	0.016	0.018	0.015	0.005	0.004	0.003
			4	36		0.373	0.392	0.401	0.061	0.054	0.051	0.272	0.270	0.252	0.006	0.007	0.007	0.015	0.016	0.012	0.007	0.009	0.008
			4	37		0.553	0.546	0.506	0.076	0.064	0.050	0.449	0.393	0.366	0.006	0.005	0.003	0.010	0.011	0.018	0.006	0.005	0.005
			4	38		0.263	0.252	0.238	0.072	0.068	0.062	0.148	0.149	0.156	0.008	0.008	0.004	0.036	0.028	0.033	0.008	0.009	0.009
			4	39		0.335	0.332	0.306	0.063	0.059	0.052	0.210	0.194	0.204	0.005	0.005	0.006	0.042	0.028	0.024	0.008	0.006	0.007
		Single Beam H-pol	1		129	0.085	0.089	0.097	0.012	0.012	0.012	0.059	0.063	0.063	0.001	0.001	0.001	0.003	0.003	0.003	0.002	0.002	0.002
			1		131	0.138	0.143	0.152	0.016	0.011	0.010	0.094	0.087	0.078	0.001	0.001	0.001	0.005	0.005	0.005	0.002	0.003	0.002
			1		133	0.114	0.109	0.097	0.020	0.017	0.018	0.095	0.090	0.089	0.001	0.001	0.001	0.004	0.004	0.004	0.001	0.001	0.001
			1		135	0.125	0.116	0.104	0.022	0.021	0.019	0.088	0.083	0.082	0.003	0.003	0.003	0.005	0.004	0.004	0.001	0.001	0.001
			2		140	0.160	0.156	0.152	0.049	0.044	0.040	0.096	0.087	0.087	0.003	0.003	0.003	0.009	0.006	0.010	0.006	0.005	0.006
			2		141	0.363	0.330	0.290	0.066	0.064	0.061	0.289	0.278	0.265	0.003	0.004	0.005	0.004	0.003	0.003	0.001	0.001	0.001
			2		142	0.140	0.139	0.151	0.045	0.041	0.036	0.106	0.073	0.074	0.003	0.003	0.003	0.010	0.007	0.011	0.007	0.005	0.005
			2		143	0.285	0.293	0.297	0.019	0.014	0.011	0.198	0.207	0.194	0.003	0.003	0.002	0.011	0.011	0.011	0.003	0.003	0.002
			2		147	0.278	0.260	0.250	0.064	0.042	0.051	0.226	0.205	0.191	0.003	0.003	0.003	0.006	0.005	0.006	0.004	0.005	0.005
			2		148	0.322	0.305	0.272	0.030	0.030	0.029	0.280	0.264	0.247	0.002	0.003	0.003	0.007	0.006	0.006	0.002	0.002	0.002
			2		149	0.190	0.198	0.208	0.027	0.024	0.022	0.147	0.147	0.128	0.004	0.004	0.004	0.012	0.013	0.012	0.006	0.006	0.004
			4		155	0.242	0.242	0.235	0.124	0.109	0.095	0.156	0.146	0.131	0.010	0.010	0.009	0.026	0.025	0.021	0.016	0.016	0.014
			4		156	0.370	0.372	0.387	0.143	0.131	0.109	0.376	0.368	0.343	0.006	0.007	0.005	0.009	0.011	0.009	0.002	0.002	0.004
			4		157	0.664	0.658	0.637	0.055	0.047	0.044	0.558	0.548	0.501	0.009	0.009	0.009	0.017	0.018	0.020	0.003	0.002	0.001
			4		158	0.636	0.649	0.598	0.044	0.038	0.034	0.571	0.557	0.506	0.007	0.007	0.008	0.034	0.033	0.029	0.006	0.006	0.004
			4		**159**	0.667	**0.669**	0.648	0.050	0.044	0.040	0.576	**0.568**	0.518	0.009	0.008	0.009	0.026	0.026	0.025	0.004	0.004	0.003
			4		164	0.484	0.458	0.435	0.187	0.173	0.154	0.332	0.313	0.308	0.010	0.008	0.006	0.021	0.015	0.012	0.009	0.012	0.011
			4		165	0.669	0.654	0.622	0.068	0.069	0.073	0.573	0.533	0.494	0.008	0.007	0.007	0.006	0.007	0.007	0.003	0.002	0.002
			4		166	0.362	0.368	0.370	0.029	0.027	0.025	0.330	0.341	0.320	0.010	0.008	0.006	0.028	0.021	0.016	0.010	0.008	0.007
			4		167	0.554	0.554	0.531	0.035	0.032	0.031	0.506	0.475	0.431	0.006	0.006	0.005	0.033	0.032	0.027	0.007	0.007	0.005
		Paired Beam	2	1	129	0.199	0.200	0.206	0.027	0.028	0.024	0.145	0.156	0.159	0.004	0.005	0.004	0.006	0.006	0.006	0.003	0.003	0.004
			2	3	131	0.266	0.284	0.299	0.055	0.035	0.046	0.245	0.235	0.226	0.002	0.004	0.004	0.013	0.011	0.009	0.006	0.005	0.006
			2	5	133	0.254	0.276	0.296	0.045	0.041	0.037	0.260	0.243	0.225	0.004	0.004	0.005	0.015	0.015	0.015	0.004	0.006	0.004
			2	7	135	0.282	0.291	0.296	0.057	0.050	0.039	0.229	0.218	0.214	0.006	0.007	0.009	0.016	0.016	0.013	0.005	0.004	0.003
			4	12	140	0.477	0.488	0.495	0.095	0.072	0.052	0.322	0.277	0.277	0.011	0.012	0.012	0.035	0.027	0.023	0.019	0.029	0.024
			4	13	141	0.710	0.734	0.752	0.148	0.141	0.135	0.709	0.658	0.618	0.006	0.010	0.011	0.010	0.011	0.013	0.003	0.002	0.002
			4	14	142	0.382	0.394	0.424	0.102	0.081	0.074	0.274	0.256	0.218	0.008	0.007	0.009	0.036	0.029	0.022	0.012	0.011	0.011
			4	15	143	0.468	0.475	0.492	0.063	0.053	0.036	0.362	0.329	0.293	0.005	0.006	0.007	0.019	0.017	0.015	0.012	0.013	0.011
			4	19	147	0.420	0.388	0.389	0.089	0.080	0.065	0.462	0.406	0.398	0.005	0.008	0.009	0.016	0.013	0.011	0.007	0.005	0.005
			4	20	148	0.493	0.493	0.489	0.087	0.090	0.076	0.462	0.439	0.440	0.005	0.006	0.006	0.041	0.040	0.039	0.010	0.012	0.009
			4	21	149	0.384	0.394	0.389	0.053	0.048	0.048	0.313	0.289	0.273	0.007	0.005	0.006	0.020	0.019	0.017	0.012	0.010	0.014
			8	27	155	0.629	0.656	0.708	0.207	0.155	0.134	0.467	0.429	0.430	0.022	0.022	0.022	0.106	0.073	0.059	0.037	0.032	0.038
			8	28	156	1.155	1.121	1.050	0.254	0.239	0.193	1.063	1.028	0.963	0.012	0.016	0.012	0.029	0.029	0.025	0.007	0.005	0.011
			8	29	157	1.158	1.178	1.082	0.219	0.199	0.169	1.000	0.959	0.873	0.017	0.017	0.013	0.081	0.085	0.088	0.014	0.011	0.013
			8	30	158	0.860	0.895	0.859	0.168	0.119	0.104	0.745	0.717	0.656	0.018	0.020	0.018	0.120	0.107	0.095	0.024	0.022	0.016
			8	31	159	1.073	1.038	0.933	0.186	0.164	0.140	0.881	0.899	0.868	0.014	0.017	0.014	0.057	0.054	0.050	0.007	0.009	0.006
			8	36	164	0.957	0.932	0.946	0.330	0.284	0.214	0.768	0.744	0.691	0.019	0.021	0.021	0.045	0.044	0.033	0.030	0.037	0.034
			8	37	165	1.106	1.148	1.161	0.215	0.203	0.173	1.400	1.337	1.189	0.015	0.014	0.013	0.025	0.022	0.025	0.008	0.009	0.009
			8	38	166	0.604	0.586	0.544	0.150	0.132	0.118	0.552	0.472	0.379	0.023	0.024	0.022	0.103	0.080	0.060	0.029	0.027	0.021
			8	39	167	0.888	0.894	0.873	0.159	0.141	0.116	0.793	0.737	0.693	0.015	0.014	0.009	0.106	0.098	0.080	0.024	0.022	0.018

Table 4. PD of Ant L – patch antenna (39GHz – n260)

- L – Patch

n260 PD Simulation						(S1) Front Surface			(S2) Rear Surface			(S3) Left Surface			(S4) Right Surface			(S5) Top Surface			(S6) Bottom Surface		
Ant Module	Ant. Type	SISO/MIMO & Polarization	Feed no.	Beam ID		4cm2 avg. PD (mW/cm2) @ 10mm distance																	
						Channel																	
						Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High
L	Patch	Single Beam V-pol	1	1		0.149	0.152	0.131	0.003	0.006	0.006	0.065	0.056	0.061	0.001	0.001	0.001	0.006	0.005	0.003	0.001	0.002	0.002
			1	3		0.157	0.151	0.122	0.005	0.005	0.004	0.086	0.091	0.081	0.001	0.001	0.001	0.009	0.009	0.009	0.001	0.002	0.002
			1	5		0.159	0.137	0.134	0.005	0.007	0.004	0.069	0.068	0.064	0.001	0.001	0.002	0.007	0.009	0.008	0.001	0.001	0.001
			1	7		0.173	0.182	0.151	0.006	0.006	0.005	0.086	0.098	0.096	0.001	0.002	0.002	0.004	0.007	0.010	0.001	0.002	0.001
			2	12		0.351	0.364	0.318	0.016	0.017	0.013	0.163	0.154	0.142	0.004	0.003	0.004	0.016	0.031	0.026	0.001	0.001	0.001
			2	13		0.368	0.372	0.291	0.011	0.017	0.010	0.224	0.229	0.174	0.003	0.002	0.002	0.017	0.015	0.009	0.004	0.007	0.009
			2	14		0.359	0.317	0.281	0.015	0.011	0.013	0.192	0.186	0.145	0.002	0.001	0.002	0.015	0.023	0.024	0.002	0.004	0.006
			2	15		0.237	0.272	0.235	0.009	0.012	0.019	0.152	0.166	0.147	0.001	0.002	0.002	0.025	0.027	0.019	0.001	0.001	0.002
			2	19		0.308	0.307	0.270	0.014	0.017	0.019	0.186	0.197	0.169	0.001	0.001	0.001	0.021	0.020	0.014	0.002	0.004	0.003
			2	20		0.382	0.370	0.280	0.008	0.015	0.011	0.196	0.220	0.148	0.003	0.002	0.002	0.007	0.007	0.004	0.003	0.005	0.007
			2	21		0.407	0.359	0.315	0.010	0.011	0.009	0.217	0.205	0.161	0.002	0.003	0.003	0.011	0.012	0.015	0.001	0.006	0.006
			4	27		0.664	0.695	0.590	0.028	0.040	0.033	0.373	0.369	0.279	0.005	0.005	0.009	0.016	0.023	0.031	0.002	0.005	0.006
			4	28		0.483	0.518	0.421	0.044	0.037	0.029	0.269	0.281	0.235	0.005	0.004	0.004	0.037	0.042	0.044	0.006	0.007	0.003
			4	29		0.483	0.480	0.370	0.018	0.029	0.012	0.284	0.313	0.259	0.004	0.004	0.004	0.010	0.010	0.010	0.010	0.008	0.015
			4	30		0.426	0.436	0.480	0.048	0.045	0.016	0.200	0.194	0.252	0.003	0.005	0.005	0.044	0.046	0.039	0.006	0.010	0.009
			4	31		0.598	0.580	0.491	0.023	0.021	0.028	0.243	0.243	0.226	0.004	0.006	0.010	0.016	0.026	0.031	0.004	0.003	0.002
			4	**36**		0.738	**0.758**	0.624	0.032	0.044	0.033	0.437	**0.424**	0.314	0.005	0.004	0.008	0.014	0.025	0.027	0.003	0.007	0.010
			4	37		0.531	0.494	0.435	0.020	0.026	0.010	0.288	0.336	0.278	0.006	0.006	0.004	0.029	0.027	0.025	0.011	0.010	0.006
			4	38		0.578	0.472	0.425	0.017	0.031	0.016	0.275	0.267	0.314	0.004	0.005	0.005	0.028	0.013	0.013	0.008	0.013	0.017
			4	39		0.572	0.595	0.473	0.048	0.029	0.028	0.234	0.252	0.218	0.005	0.006	0.009	0.021	0.038	0.051	0.004	0.007	0.006
		Single Beam H-pol	1		129	0.121	0.113	0.098	0.006	0.006	0.004	0.055	0.071	0.075	0.001	0.001	0.000	0.003	0.002	0.002	0.001	0.002	0.002
			1		131	0.167	0.147	0.132	0.007	0.005	0.006	0.069	0.077	0.073	0.001	0.001	0.002	0.005	0.008	0.005	0.001	0.003	0.002
			1		133	0.151	0.139	0.119	0.005	0.005	0.004	0.085	0.085	0.076	0.001	0.001	0.001	0.005	0.009	0.008	0.002	0.003	0.004
			1		135	0.172	0.174	0.157	0.004	0.005	0.008	0.106	0.118	0.115	0.001	0.001	0.001	0.004	0.005	0.004	0.003	0.003	0.002
			2		140	0.225	0.234	0.226	0.014	0.011	0.005	0.161	0.184	0.205	0.003	0.002	0.002	0.012	0.015	0.009	0.002	0.002	0.002
			2		141	0.345	0.283	0.271	0.012	0.011	0.005	0.177	0.179	0.157	0.003	0.002	0.002	0.009	0.012	0.006	0.003	0.006	0.007
			2		142	0.308	0.289	0.237	0.023	0.018	0.006	0.132	0.128	0.098	0.002	0.002	0.002	0.007	0.006	0.003	0.005	0.008	0.008
			2		143	0.353	0.319	0.264	0.013	0.013	0.011	0.202	0.203	0.176	0.002	0.003	0.003	0.012	0.014	0.016	0.003	0.005	0.004
			2		147	0.279	0.246	0.251	0.013	0.010	0.005	0.179	0.199	0.199	0.003	0.002	0.002	0.014	0.018	0.009	0.001	0.002	0.004
			2		148	0.412	0.400	0.316	0.014	0.016	0.023	0.262	0.289	0.272	0.001	0.002	0.002	0.009	0.007	0.011	0.006	0.005	0.006
			2		149	0.285	0.261	0.245	0.020	0.019	0.020	0.221	0.178	0.212	0.001	0.002	0.001	0.005	0.005	0.003	0.008	0.013	0.011
			4		155	0.413	0.412	0.488	0.032	0.028	0.029	0.431	0.444	0.457	0.005	0.003	0.003	0.025	0.021	0.010	0.011	0.006	0.007
			4		156	0.694	0.673	0.540	0.027	0.030	0.019	0.470	0.454	0.380	0.004	0.004	0.004	0.030	0.040	0.041	0.004	0.004	0.006
			4		**157**	0.815	**0.749**	0.657	0.023	0.031	0.023	0.482	0.466	0.420	0.007	0.004	0.003	0.011	0.019	0.023	0.010	0.013	0.010
			4		158	0.612	0.557	0.482	0.067	0.048	0.043	0.375	0.376	0.289	0.003	0.003	0.003	0.007	0.008	0.006	0.022	0.021	0.030
			4		159	0.484	0.483	0.442	0.037	0.029	0.030	0.422	0.440	0.421	0.003	0.003	0.004	0.020	0.024	0.019	0.005	0.007	0.009
			4		**164**	0.660	0.627	0.514	0.034	0.031	0.016	0.502	**0.506**	0.422	0.003	0.003	0.004	0.020	0.043	0.039	0.005	0.005	0.003
			4		165	0.755	0.729	0.625	0.023	0.029	0.021	0.454	0.457	0.419	0.007	0.004	0.004	0.031	0.029	0.026	0.004	0.011	0.009
			4		166	0.763	0.718	0.589	0.046	0.040	0.039	0.479	0.465	0.392	0.005	0.003	0.003	0.004	0.012	0.012	0.009	0.014	0.015
			4		167	0.511	0.457	0.394	0.050	0.042	0.028	0.237	0.291	0.319	0.004	0.004	0.005	0.019	0.018	0.006	0.017	0.019	0.012
		Paired Beam	2	1	129	0.294	0.316	0.251	0.010	0.018	0.016	0.181	0.218	0.219	0.003	0.003	0.002	0.013	0.009	0.006	0.004	0.007	0.009
			2	3	131	0.328	0.349	0.311	0.012	0.012	0.015	0.216	0.261	0.241	0.003	0.005	0.005	0.017	0.020	0.012	0.004	0.005	0.006
			2	5	133	0.316	0.344	0.295	0.012	0.015	0.013	0.200	0.231	0.223	0.004	0.004	0.004	0.021	0.027	0.033	0.004	0.005	0.006
			2	7	135	0.356	0.374	0.299	0.013	0.014	0.012	0.282	0.327	0.340	0.002	0.003	0.003	0.015	0.021	0.025	0.004	0.004	0.004
			4	12	140	0.514	0.481	0.412	0.034	0.027	0.025	0.263	0.286	0.289	0.007	0.006	0.010	0.045	0.056	0.043	0.005	0.004	0.003
			4	13	141	0.719	0.734	0.687	0.024	0.049	0.019	0.607	0.601	0.527	0.007	0.006	0.005	0.036	0.049	0.024	0.011	0.017	0.023
			4	14	142	0.685	0.683	0.688	0.028	0.035	0.020	0.360	0.370	0.292	0.004	0.006	0.005	0.014	0.029	0.030	0.012	0.012	0.015
			4	15	143	0.492	0.713	0.613	0.030	0.020	0.034	0.507	0.534	0.485	0.004	0.006	0.008	0.039	0.073	0.058	0.007	0.009	0.009
			4	19	147	0.615	0.819	0.728	0.030	0.023	0.023	0.580	0.652	0.646	0.005	0.005	0.005	0.060	0.062	0.030	0.005	0.008	0.009
			4	20	148	0.737	0.763	0.560	0.024	0.031	0.029	0.428	0.559	0.392	0.006	0.004	0.005	0.022	0.022	0.019	0.008	0.019	0.020
			4	21	149	0.662	0.650	0.611	0.025	0.022	0.024	0.516	0.517	0.460	0.004	0.004	0.006	0.022	0.023	0.028	0.016	0.021	0.024
			8	27	155	0.976	1.019	1.121	0.052	0.053	0.051	0.849	0.906	0.854	0.009	0.013	0.019	0.057	0.053	0.032	0.015	0.008	0.027
			8	28	156	1.141	1.213	1.128	0.080	0.045	0.054	0.989	1.006	0.916	0.013	0.010	0.010	0.084	0.142	0.150	0.009	0.015	0.008
			8	29	157	1.452	1.378	1.074	0.061	0.088	0.070	0.945	1.179	0.966	0.017	0.011	0.009	0.031	0.041	0.054	0.012	0.017	0.027
			8	30	158	1.306	1.363	1.162	0.096	0.082	0.082	0.762	0.768	0.782	0.012	0.011	0.010	0.065	0.062	0.054	0.025	0.040	0.063
			8	31	159	0.917	1.194	1.184	0.049	0.038	0.032	0.915	0.961	0.853	0.014	0.014	0.021	0.057	0.060	0.054	0.009	0.012	0.010
			8	36	164	1.415	1.443	1.204	0.057	0.039	0.051	0.991	0.979	0.831	0.009	0.012	0.020	0.075	0.085	0.081	0.009	0.019	0.018
			8	37	165	1.379	1.417	1.206	0.061	0.073	0.058	0.937	0.971	0.697	0.014	0.009	0.009	0.063	0.105	0.072	0.023	0.036	0.015
			8	38	166	1.310	1.299	1.242	0.058	0.091	0.107	0.946	1.066	0.885	0.013	0.012	0.008	0.038	0.022	0.046	0.012	0.030	0.056
			8	39	167	1.177	1.131	1.011	0.081	0.073	0.058	0.686	0.752	0.756	0.010	0.016	0.022	0.040	0.057	0.068	0.036	0.038	0.034

3.1.2 Ant R–Patch Antenna

Table 5, Table 6 show the PD simulation evaluation of Ant R patch antenna at 28GHz /39GHz for the corresponding evaluation planes specified in Table1.

Table 5. PD of Ant R – patch antenna (28GHz – n261)

- R – Patch

n261 PD Simulation						(S1) Front Surface			(S2) Rear Surface			(S3) Left Surface			(S4) Right Surface			(S5) Top Surface			(S6) Bottom Surface		
Ant Module	Ant. Type	SISO/MIMO & Polarization	Feed no.	Beam ID		4cm2 avg. PD (mW/cm2) @ 10mm distance																	
						Channel																	
						Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High
R	Patch	Single Beam V-pol	1	0		0.127	0.129	0.134	0.016	0.015	0.011	0.003	0.003	0.003	0.087	0.078	0.075	0.003	0.002	0.002	0.012	0.011	0.011
			1	2		0.136	0.134	0.142	0.013	0.013	0.010	0.003	0.004	0.004	0.097	0.086	0.084	0.002	0.002	0.002	0.013	0.013	0.014
			1	4		0.119	0.115	0.103	0.016	0.015	0.017	0.003	0.003	0.003	0.097	0.096	0.092	0.001	0.001	0.001	0.007	0.009	0.008
			1	6		0.087	0.087	0.083	0.008	0.008	0.007	0.001	0.002	0.002	0.049	0.045	0.044	0.001	0.001	0.001	0.005	0.005	0.005
			2	8		0.297	0.301	0.306	0.020	0.019	0.014	0.005	0.011	0.007	0.239	0.211	0.185	0.006	0.005	0.006	0.046	0.040	0.040
			2	9		0.348	0.342	0.358	0.047	0.043	0.031	0.006	0.007	0.004	0.260	0.231	0.230	0.001	0.001	0.001	0.014	0.017	0.020
			2	10		0.233	0.231	0.226	0.018	0.018	0.019	0.006	0.006	0.006	0.194	0.186	0.172	0.002	0.002	0.002	0.021	0.020	0.020
			2	11		0.127	0.130	0.133	0.029	0.030	0.024	0.003	0.004	0.005	0.090	0.080	0.075	0.008	0.007	0.007	0.050	0.048	0.046
			2	16		0.396	0.373	0.391	0.030	0.030	0.021	0.007	0.011	0.005	0.304	0.263	0.259	0.001	0.001	0.002	0.014	0.012	0.011
			2	17		0.194	0.196	0.202	0.041	0.040	0.032	0.003	0.003	0.004	0.134	0.128	0.114	0.006	0.005	0.005	0.042	0.043	0.039
			2	18		0.207	0.201	0.190	0.042	0.038	0.035	0.005	0.009	0.006	0.152	0.146	0.139	0.002	0.002	0.002	0.031	0.031	0.023
			4	22		0.385	0.386	0.399	0.043	0.040	0.035	0.012	0.013	0.011	0.310	0.283	0.275	0.007	0.008	0.008	0.063	0.049	0.049
			4	**23**		0.515	**0.495**	0.512	0.046	0.049	0.037	0.007	0.011	0.009	0.457	**0.419**	0.383	0.003	0.002	0.004	0.023	0.019	0.017
			4	24		0.445	0.432	0.414	0.068	0.065	0.052	0.012	0.013	0.011	0.296	0.284	0.269	0.005	0.007	0.008	0.040	0.042	0.037
			4	25		0.351	0.348	0.326	0.055	0.055	0.048	0.011	0.014	0.014	0.219	0.210	0.194	0.006	0.005	0.006	0.066	0.057	0.063
			4	26		0.307	0.318	0.329	0.032	0.031	0.022	0.007	0.016	0.013	0.260	0.236	0.223	0.010	0.008	0.008	0.103	0.092	0.075
			4	32		0.462	0.452	0.454	0.047	0.043	0.036	0.008	0.011	0.008	0.374	0.340	0.323	0.005	0.005	0.005	0.038	0.031	0.033
			4	33		0.505	0.493	0.490	0.087	0.086	0.065	0.010	0.012	0.007	0.419	0.376	0.351	0.004	0.003	0.003	0.021	0.028	0.021
			4	34		0.354	0.341	0.313	0.052	0.053	0.048	0.011	0.013	0.015	0.231	0.220	0.202	0.007	0.005	0.006	0.069	0.076	0.073
			4	35		0.414	0.418	0.445	0.040	0.041	0.034	0.014	0.019	0.012	0.317	0.283	0.276	0.005	0.005	0.005	0.071	0.061	0.057
		Single Beam H-pol	1		128	0.113	0.112	0.098	0.016	0.015	0.014	0.004	0.004	0.003	0.095	0.091	0.096	0.002	0.002	0.002	0.012	0.012	0.010
			1		130	0.108	0.106	0.089	0.016	0.015	0.016	0.004	0.005	0.003	0.109	0.102	0.106	0.002	0.001	0.001	0.012	0.012	0.011
			1		132	0.136	0.138	0.142	0.014	0.014	0.008	0.003	0.004	0.003	0.087	0.081	0.071	0.002	0.001	0.001	0.015	0.015	0.014
			1		134	0.088	0.087	0.087	0.006	0.009	0.009	0.001	0.001	0.001	0.054	0.053	0.050	0.001	0.001	0.001	0.005	0.006	0.006
			2		136	0.187	0.177	0.157	0.048	0.047	0.042	0.011	0.013	0.009	0.140	0.142	0.141	0.007	0.004	0.006	0.039	0.029	0.032
			2		137	0.335	0.312	0.282	0.040	0.035	0.032	0.005	0.005	0.005	0.295	0.273	0.258	0.001	0.001	0.001	0.022	0.023	0.024
			2		138	0.234	0.223	0.208	0.018	0.016	0.017	0.004	0.006	0.004	0.235	0.232	0.234	0.006	0.005	0.004	0.022	0.021	0.022
			2		139	0.184	0.195	0.200	0.022	0.024	0.023	0.003	0.002	0.003	0.141	0.126	0.111	0.004	0.004	0.003	0.031	0.033	0.035
			2		144	0.295	0.280	0.233	0.043	0.041	0.043	0.013	0.017	0.008	0.274	0.258	0.267	0.003	0.002	0.002	0.032	0.030	0.026
			2		145	0.273	0.271	0.237	0.024	0.021	0.022	0.005	0.007	0.004	0.276	0.262	0.268	0.005	0.004	0.003	0.020	0.017	0.019
			2		146	0.127	0.134	0.141	0.044	0.040	0.032	0.008	0.012	0.007	0.092	0.103	0.085	0.005	0.004	0.004	0.043	0.040	0.033
			4		150	0.375	0.366	0.336	0.120	0.115	0.110	0.021	0.030	0.019	0.258	0.249	0.247	0.013	0.013	0.014	0.088	0.063	0.049
			4		151	0.636	0.601	0.524	0.087	0.081	0.078	0.014	0.019	0.011	0.564	0.511	0.498	0.001	0.001	0.001	0.011	0.010	0.011
			4		152	0.605	0.593	0.551	0.049	0.047	0.044	0.007	0.009	0.004	0.544	0.520	0.463	0.002	0.002	0.002	0.054	0.056	0.056
			4		153	0.232	0.235	0.217	0.041	0.040	0.021	0.008	0.011	0.009	0.230	0.200	0.202	0.017	0.015	0.012	0.046	0.045	0.040
			4		154	0.526	0.517	0.481	0.032	0.038	0.027	0.006	0.007	0.005	0.491	0.465	0.420	0.004	0.003	0.003	0.068	0.069	0.067
			4		160	0.472	0.448	0.411	0.127	0.115	0.112	0.022	0.029	0.016	0.377	0.346	0.343	0.003	0.004	0.006	0.062	0.045	0.049
			4		**161**	0.661	**0.648**	0.578	0.067	0.056	0.053	0.009	0.014	0.010	0.626	**0.582**	0.559	0.001	0.002	0.001	0.021	0.022	0.021
			4		162	0.453	0.453	0.447	0.033	0.034	0.027	0.004	0.007	0.005	0.404	0.394	0.366	0.013	0.010	0.006	0.062	0.058	0.037
			4		163	0.305	0.313	0.293	0.069	0.061	0.060	0.012	0.013	0.011	0.246	0.240	0.232	0.018	0.017	0.017	0.067	0.060	0.061
		Paired Beam	2	0	128	0.263	0.259	0.268	0.036	0.033	0.023	0.011	0.014	0.009	0.233	0.224	0.203	0.006	0.005	0.005	0.025	0.026	0.023
			2	2	130	0.281	0.242	0.256	0.042	0.039	0.034	0.009	0.016	0.013	0.282	0.257	0.243	0.004	0.004	0.004	0.026	0.031	0.032
			2	4	132	0.246	0.256	0.274	0.053	0.047	0.040	0.009	0.011	0.011	0.240	0.227	0.207	0.004	0.003	0.003	0.037	0.036	0.027
			2	6	134	0.198	0.193	0.190	0.021	0.022	0.019	0.003	0.004	0.004	0.122	0.126	0.123	0.002	0.003	0.002	0.009	0.010	0.009
			4	8	136	0.502	0.545	0.545	0.095	0.080	0.069	0.029	0.046	0.030	0.479	0.448	0.406	0.015	0.014	0.014	0.095	0.076	0.069
			4	9	137	0.781	0.747	0.666	0.111	0.096	0.074	0.012	0.017	0.013	0.724	0.643	0.603	0.003	0.003	0.003	0.061	0.071	0.078
			4	10	138	0.437	0.427	0.399	0.057	0.056	0.055	0.014	0.017	0.015	0.443	0.431	0.418	0.008	0.007	0.007	0.046	0.025	0.036
			4	11	139	0.375	0.385	0.386	0.056	0.060	0.047	0.006	0.008	0.012	0.245	0.225	0.210	0.019	0.015	0.015	0.118	0.127	0.114
			4	16	144	0.675	0.669	0.681	0.083	0.076	0.090	0.033	0.052	0.026	0.793	0.724	0.668	0.005	0.005	0.005	0.052	0.043	0.035
			4	17	145	0.455	0.461	0.475	0.103	0.096	0.085	0.010	0.017	0.012	0.533	0.512	0.474	0.010	0.009	0.008	0.077	0.088	0.091
			4	18	146	0.399	0.384	0.429	0.078	0.064	0.059	0.021	0.038	0.027	0.276	0.279	0.240	0.012	0.011	0.008	0.085	0.081	0.065
			8	22	150	0.842	0.813	0.876	0.242	0.220	0.186	0.046	0.080	0.054	0.704	0.669	0.580	0.027	0.027	0.030	0.169	0.146	0.123
			8	23	151	1.378	1.004	1.006	0.201	0.186	0.155	0.029	0.044	0.029	1.425	1.301	1.227	0.007	0.005	0.005	0.050	0.044	0.036
			8	24	152	0.899	0.896	0.932	0.150	0.184	0.168	0.026	0.034	0.022	1.031	0.945	0.885	0.012	0.012	0.014	0.131	0.147	0.149
			8	25	153	0.691	0.701	0.657	0.100	0.092	0.084	0.028	0.041	0.037	0.449	0.435	0.428	0.026	0.022	0.019	0.147	0.150	0.114
			8	26	154	0.786	0.788	0.725	0.072	0.066	0.067	0.019	0.027	0.021	0.644	0.613	0.488	0.021	0.018	0.017	0.222	0.213	0.172
			8	32	160	1.096	1.044	1.010	0.216	0.204	0.185	0.043	0.063	0.031	0.981	0.917	0.847	0.011	0.012	0.017	0.100	0.092	0.077
			8	33	161	1.489	1.045	1.061	0.217	0.183	0.152	0.031	0.044	0.029	1.507	1.371	1.290	0.006	0.006	0.007	0.041	0.054	0.068
			8	34	162	0.736	0.752	0.784	0.131	0.104	0.094	0.023	0.032	0.032	0.669	0.644	0.555	0.021	0.017	0.012	0.198	0.204	0.173
			8	35	163	0.743	0.742	0.770	0.152	0.137	0.117	0.029	0.050	0.038	0.644	0.590	0.535	0.027	0.024	0.026	0.134	0.116	0.105

Table 6. PD of Ant R – patch antenna (39GHz – n260)

- R – Patch

n260 PD Simulation						(S1) Front Surface			(S2) Rear Surface			(S3) Left Surface			(S4) Right Surface			(S5) Top Surface			(S6) Bottom Surface		
Ant Module	Ant. Type	SISO/MIMO & Polarization	Feed no.	Beam ID		4cm2 avg. PD (mW/cm2) @ 10mm distance																	
						Channel																	
						Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High
R	Patch	Single Beam V-pol	1	0		0.179	0.180	0.168	0.006	0.004	0.004	0.002	0.002	0.002	0.075	0.087	0.093	0.001	0.001	0.001	0.015	0.018	0.032
			1	2		0.156	0.141	0.125	0.005	0.008	0.011	0.002	0.003	0.003	0.065	0.067	0.060	0.001	0.001	0.001	0.017	0.031	0.032
			1	4		0.147	0.148	0.122	0.005	0.005	0.005	0.002	0.002	0.002	0.091	0.089	0.076	0.001	0.001	0.001	0.009	0.020	0.015
			1	6		0.135	0.141	0.126	0.003	0.004	0.004	0.002	0.001	0.002	0.066	0.058	0.053	0.000	0.001	0.001	0.007	0.007	0.005
			2	8		0.387	0.386	0.324	0.018	0.025	0.022	0.004	0.005	0.005	0.159	0.159	0.132	0.001	0.001	0.001	0.058	0.085	0.095
			2	9		0.340	0.339	0.295	0.012	0.011	0.010	0.003	0.004	0.004	0.214	0.213	0.135	0.002	0.002	0.002	0.014	0.021	0.014
			2	10		0.277	0.252	0.286	0.018	0.008	0.007	0.004	0.003	0.004	0.188	0.181	0.210	0.004	0.004	0.003	0.055	0.040	0.057
			2	11		0.337	0.359	0.298	0.012	0.022	0.020	0.004	0.005	0.007	0.111	0.161	0.164	0.001	0.001	0.000	0.062	0.104	0.099
			2	16		0.303	0.301	0.280	0.008	0.009	0.009	0.002	0.003	0.003	0.196	0.199	0.139	0.002	0.001	0.002	0.019	0.033	0.024
			2	17		0.364	0.308	0.350	0.012	0.008	0.009	0.004	0.004	0.003	0.201	0.201	0.206	0.004	0.005	0.004	0.027	0.014	0.034
			2	18		0.376	0.343	0.308	0.013	0.011	0.011	0.005	0.006	0.006	0.217	0.210	0.156	0.001	0.003	0.002	0.026	0.035	0.056
			4	**22**		0.706	**0.742**	0.628	0.043	0.024	0.033	0.007	0.010	0.011	0.398	0.407	0.315	0.002	0.003	0.003	0.057	0.072	0.087
			4	23		0.529	0.478	0.463	0.015	0.018	0.016	0.005	0.006	0.006	0.282	0.294	0.257	0.007	0.004	0.004	0.043	0.096	0.088
			4	24		0.617	0.559	0.402	0.026	0.017	0.013	0.005	0.007	0.005	0.334	0.343	0.150	0.004	0.005	0.005	0.042	0.021	0.048
			4	25		0.511	0.553	0.507	0.040	0.037	0.017	0.007	0.007	0.009	0.231	0.219	0.267	0.006	0.008	0.003	0.100	0.096	0.121
			4	26		0.576	0.567	0.478	0.035	0.023	0.029	0.010	0.007	0.013	0.238	0.276	0.218	0.002	0.002	0.002	0.087	0.089	0.097
			4	**32**		0.692	0.694	0.582	0.049	0.038	0.037	0.006	0.008	0.009	0.407	**0.410**	0.303	0.001	0.002	0.003	0.052	0.107	0.149
			4	33		0.547	0.494	0.472	0.016	0.019	0.016	0.005	0.006	0.006	0.294	0.308	0.265	0.007	0.004	0.004	0.039	0.090	0.084
			4	34		0.556	0.396	0.441	0.017	0.017	0.019	0.007	0.006	0.006	0.264	0.265	0.291	0.003	0.010	0.006	0.097	0.052	0.067
			4	35		0.550	0.600	0.465	0.056	0.033	0.026	0.007	0.009	0.010	0.228	0.213	0.217	0.003	0.003	0.003	0.075	0.122	0.147
		Single Beam H-pol	1		128	0.163	0.176	0.168	0.004	0.005	0.003	0.002	0.002	0.003	0.103	0.086	0.100	0.002	0.003	0.002	0.014	0.019	0.013
			1		130	0.141	0.153	0.127	0.005	0.004	0.008	0.001	0.002	0.003	0.091	0.091	0.079	0.001	0.002	0.002	0.012	0.020	0.023
			1		132	0.155	0.131	0.119	0.007	0.006	0.005	0.002	0.003	0.002	0.071	0.068	0.066	0.001	0.002	0.002	0.008	0.006	0.007
			1		134	0.122	0.114	0.106	0.005	0.004	0.004	0.001	0.001	0.001	0.066	0.079	0.078	0.001	0.001	0.001	0.005	0.005	0.003
			2		136	0.213	0.212	0.248	0.016	0.017	0.009	0.004	0.004	0.003	0.185	0.188	0.181	0.001	0.001	0.001	0.027	0.020	0.017
			2		137	0.322	0.290	0.263	0.015	0.008	0.008	0.003	0.003	0.002	0.195	0.169	0.157	0.002	0.004	0.003	0.017	0.018	0.005
			2		138	0.329	0.352	0.310	0.014	0.012	0.020	0.003	0.003	0.006	0.244	0.229	0.228	0.004	0.009	0.007	0.010	0.015	0.013
			2		139	0.182	0.220	0.214	0.009	0.010	0.009	0.003	0.004	0.004	0.176	0.183	0.182	0.006	0.007	0.004	0.045	0.061	0.045
			2		144	0.305	0.254	0.265	0.012	0.009	0.010	0.004	0.005	0.005	0.223	0.218	0.185	0.002	0.005	0.004	0.028	0.025	0.033
			2		145	0.303	0.291	0.263	0.012	0.010	0.009	0.004	0.004	0.003	0.173	0.162	0.126	0.003	0.004	0.005	0.010	0.011	0.003
			2		146	0.218	0.245	0.234	0.018	0.010	0.007	0.003	0.003	0.003	0.185	0.175	0.153	0.006	0.009	0.006	0.031	0.048	0.032
			4		150	0.470	0.453	0.443	0.026	0.032	0.029	0.007	0.007	0.006	0.469	0.481	0.457	0.006	0.006	0.004	0.065	0.112	0.095
			4		151	0.722	0.732	0.645	0.026	0.034	0.026	0.006	0.008	0.009	0.445	0.457	0.390	0.002	0.006	0.006	0.060	0.067	0.067
			4		152	0.702	0.681	0.565	0.047	0.045	0.045	0.007	0.008	0.008	0.459	0.441	0.358	0.006	0.007	0.015	0.013	0.018	0.015
			4		153	0.590	0.558	0.457	0.057	0.040	0.038	0.005	0.007	0.007	0.338	0.285	0.300	0.007	0.019	0.018	0.029	0.019	0.016
			4		154	0.584	0.537	0.462	0.015	0.019	0.026	0.007	0.007	0.007	0.473	0.480	0.412	0.005	0.008	0.006	0.069	0.088	0.097
			4		**160**	0.683	0.623	0.512	0.023	0.026	0.014	0.007	0.008	0.008	0.537	**0.535**	0.445	0.003	0.004	0.002	0.065	0.100	0.097
			4		**161**	0.738	**0.777**	0.652	0.034	0.039	0.032	0.007	0.008	0.010	0.475	0.482	0.380	0.005	0.011	0.006	0.012	0.035	0.051
			4		162	0.628	0.625	0.528	0.053	0.047	0.047	0.007	0.007	0.008	0.412	0.404	0.336	0.007	0.014	0.020	0.013	0.019	0.015
			4		163	0.423	0.438	0.401	0.046	0.040	0.017	0.007	0.007	0.006	0.328	0.364	0.430	0.009	0.008	0.004	0.071	0.078	0.050
		Paired Beam	2	0	128	0.363	0.379	0.321	0.013	0.014	0.009	0.006	0.005	0.006	0.272	0.308	0.285	0.004	0.005	0.002	0.052	0.072	0.066
			2	2	130	0.300	0.344	0.297	0.012	0.011	0.020	0.005	0.007	0.009	0.233	0.249	0.227	0.002	0.003	0.004	0.046	0.081	0.067
			2	4	132	0.304	0.327	0.303	0.012	0.010	0.014	0.008	0.009	0.008	0.229	0.251	0.229	0.003	0.003	0.005	0.020	0.017	0.025
			2	6	134	0.271	0.292	0.234	0.009	0.011	0.007	0.004	0.004	0.004	0.207	0.232	0.246	0.002	0.002	0.004	0.011	0.012	0.012
			4	8	136	0.543	0.462	0.433	0.039	0.033	0.014	0.006	0.011	0.013	0.239	0.238	0.248	0.002	0.003	0.002	0.096	0.123	0.115
			4	9	137	0.688	0.733	0.688	0.020	0.029	0.033	0.011	0.013	0.011	0.582	0.577	0.518	0.007	0.010	0.011	0.049	0.046	0.028
			4	10	138	0.715	0.843	0.748	0.024	0.021	0.022	0.009	0.011	0.011	0.598	0.651	0.666	0.007	0.012	0.010	0.090	0.078	0.087
			4	11	139	0.626	0.712	0.593	0.031	0.026	0.044	0.012	0.015	0.016	0.475	0.573	0.501	0.010	0.010	0.007	0.183	0.248	0.200
			4	16	144	0.579	0.538	0.562	0.025	0.016	0.031	0.008	0.010	0.011	0.527	0.535	0.495	0.008	0.010	0.007	0.057	0.096	0.092
			4	17	145	0.534	0.491	0.420	0.019	0.022	0.022	0.009	0.007	0.006	0.322	0.298	0.281	0.011	0.009	0.010	0.029	0.048	0.046
			4	18	146	0.623	0.670	0.613	0.018	0.020	0.018	0.008	0.011	0.010	0.440	0.420	0.386	0.010	0.016	0.013	0.048	0.083	0.065
			8	22	150	1.176	1.094	1.146	0.071	0.028	0.032	0.017	0.022	0.021	0.808	0.812	0.749	0.009	0.008	0.009	0.105	0.246	0.261
			8	23	151	1.335	1.502	1.307	0.053	0.071	0.055	0.015	0.020	0.023	0.967	0.992	0.869	0.015	0.012	0.012	0.145	0.332	0.289
			8	24	152	1.474	1.300	1.258	0.055	0.045	0.077	0.018	0.021	0.020	1.053	1.118	0.889	0.012	0.022	0.024	0.060	0.051	0.102
			8	25	153	1.361	1.394	1.113	0.103	0.066	0.073	0.019	0.018	0.022	0.743	0.738	0.828	0.026	0.034	0.034	0.154	0.146	0.144
			8	26	154	1.059	1.031	0.874	0.066	0.048	0.054	0.011	0.018	0.022	0.915	1.022	0.805	0.010	0.010	0.009	0.196	0.273	0.258
			8	32	160	1.383	1.241	0.924	0.069	0.059	0.071	0.008	0.019	0.015	1.012	1.103	0.856	0.005	0.006	0.005	0.238	0.304	0.299
			8	33	161	1.457	1.404	1.217	0.044	0.044	0.057	0.015	0.020	0.022	0.946	0.996	0.874	0.021	0.025	0.016	0.092	0.229	0.255
			8	34	162	1.487	1.407	1.310	0.061	0.043	0.099	0.022	0.020	0.018	0.939	0.919	0.890	0.011	0.026	0.034	0.133	0.116	0.106
			8	35	163	1.028	1.133	1.027	0.087	0.097	0.042	0.024	0.019	0.023	0.782	0.976	0.979	0.021	0.016	0.013	0.144	0.171	0.220