FCC ID: A3LSMX828U

Part 0 Power Density Report
Power Density Characterization

Revision C

August 6, 2024

SAMSUNG ELECTRONICS

Power Density Characterization

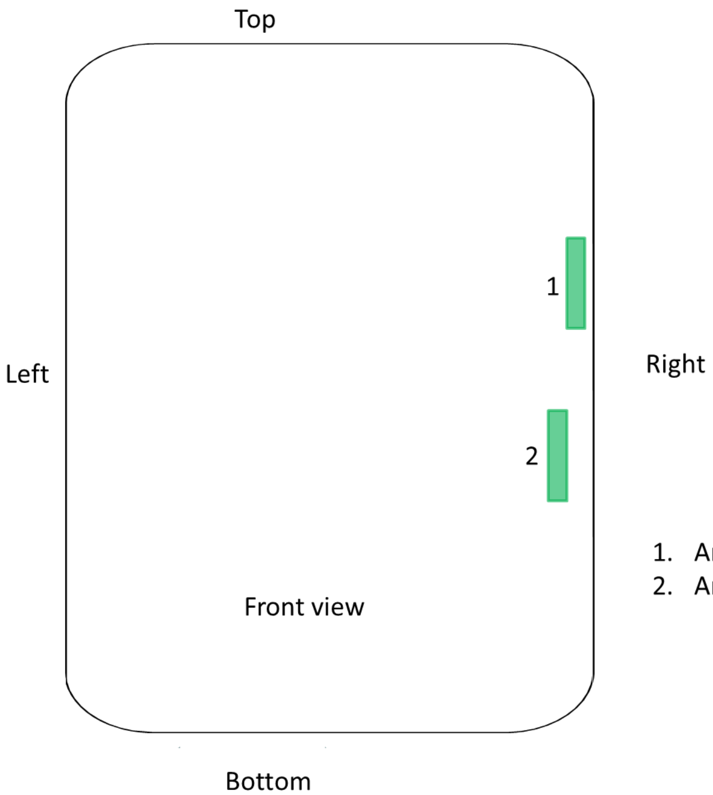
1 Exposure Scenarios

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

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

Table 1
Evaluation Surfaces for PD Characterization

Band/Mode	Antenna Module	Back	Front	Top	Bottom	Right	Left
NR n258	**L**	Yes	Yes	No	No	Yes	No
NR n261	**L**	Yes	Yes	No	No	Yes	No
NR n260	**L**	Yes	Yes	No	No	Yes	No
NR n258	**K**	Yes	Yes	No	No	Yes	No
NR n261	**K**	Yes	Yes	No	No	Yes	No
NR n260	**K**	Yes	Yes	No	No	Yes	No



1. Antenna K (Tx/Rx) NR n257/n258/n261/n260
2. Antenna L (Tx/Rx) NR n257/n258/n261/n260

Figure 1: Location of mmW antenna modules looking from front of the DUT

2 Power Density Characterization Method

Simulation modeling and validation

- Correlate the simulated PD distributions with measured PD distribution for the selected beams to validate simulation model

↓

Uncertainty Budget

- Calculate the total device design uncertainty to include worst case RF tune-up accuracy and device-to-device variation

↓

PD_design_target

Specify a power density design target, which should be less than power density regulatory limit to account for the total device design uncertainties

↓

Worst-case housing material Influence Quantification

- Determine

Δ_{min} = *min{simulated PD@reference_power – measured PD@reference_power}*

to quantify the worst-case housing influence

↓

PD Char Generation

- Use validated simulation approach to determine input power limit for all the beams after accounting for the worst-case housing influence

3 Codebook for all supported beams

Table 2
5G mmW NR Band n258 Antenna L Codebook

Band	Antenna Module	Antenna Type	Beam ID	Feed no.	POL
n258	L	Patch	0	4	V
n258	L	Patch	1	4	V
n258	L	Patch	2	4	V
n258	L	Patch	3	4	V
n258	L	Patch	4	4	V
n258	L	Patch	5	4	V
n258	L	Patch	6	4	V
n258	L	Patch	7	4	V
n258	L	Patch	8	4	V
n258	L	Patch	9	4	V
n258	L	Patch	10	4	V
n258	L	Patch	11	4	V
n258	L	Patch	12	4	V
n258	L	Patch	13	4	V
n258	L	Patch	14	4	V
n258	L	Patch	15	4	V
n258	L	Patch	16	4	H
n258	L	Patch	17	4	H
n258	L	Patch	18	4	H
n258	L	Patch	19	4	H
n258	L	Patch	20	4	H
n258	L	Patch	21	4	H
n258	L	Patch	22	4	H
n258	L	Patch	23	4	H
n258	L	Patch	24	4	H
n258	L	Patch	25	4	H
n258	L	Patch	26	4	H
n258	L	Patch	27	4	H
n258	L	Patch	28	4	H
n258	L	Patch	29	4	H
n258	L	Patch	30	4	H
n258	L	Patch	31	4	H
n258	L	Patch	32	8	V+H
n258	L	Patch	33	8	V+H
n258	L	Patch	34	8	V+H
n258	L	Patch	35	8	V+H
n258	L	Patch	36	8	V+H
n258	L	Patch	37	8	V+H
n258	L	Patch	38	8	V+H
n258	L	Patch	39	8	V+H
n258	L	Patch	40	8	V+H
n258	L	Patch	41	8	V+H
n258	L	Patch	42	8	V+H
n258	L	Patch	43	8	V+H
n258	L	Patch	44	8	V+H
n258	L	Patch	45	8	V+H
n258	L	Patch	46	8	V+H
n258	L	Patch	47	8	V+H
n258	L	Patch	48	2	2V
n258	L	Patch	49	2	2V
n258	L	Patch	50	2	2V
n258	L	Patch	51	2	2V
n258	L	Patch	52	2	2V
n258	L	Patch	53	2	2V
n258	L	Patch	54	2	2V
n258	L	Patch	55	2	2V
n258	L	Patch	56	2	2V
n258	L	Patch	57	2	2V
n258	L	Patch	58	2	2V
n258	L	Patch	59	2	2V
n258	L	Patch	60	2	2V
n258	L	Patch	61	2	2V
n258	L	Patch	62	2	2V
n258	L	Patch	63	2	2V
n258	L	Patch	64	2	2V
n258	L	Patch	65	2	2V
n258	L	Patch	66	2	2H
n258	L	Patch	67	2	2H
n258	L	Patch	68	2	2H
n258	L	Patch	69	2	2H
n258	L	Patch	70	2	2H
n258	L	Patch	71	2	2H
n258	L	Patch	72	2	2H
n258	L	Patch	73	2	2H
n258	L	Patch	74	2	2H
n258	L	Patch	75	2	2H
n258	L	Patch	76	2	2H
n258	L	Patch	77	2	2H
n258	L	Patch	78	2	2H
n258	L	Patch	79	2	2H
n258	L	Patch	80	2	2H
n258	L	Patch	81	2	2H
n258	L	Patch	82	2	2H
n258	L	Patch	83	2	2H
n258	L	Patch	84	4	2V+2H
n258	L	Patch	85	4	2V+2H
n258	L	Patch	86	4	2V+2H
n258	L	Patch	87	4	2V+2H
n258	L	Patch	88	4	2V+2H
n258	L	Patch	89	4	2V+2H
n258	L	Patch	90	4	2V+2H
n258	L	Patch	91	4	2V+2H
n258	L	Patch	92	4	2V+2H
n258	L	Patch	93	4	2V+2H
n258	L	Patch	94	4	2V+2H
n258	L	Patch	95	4	2V+2H
n258	L	Patch	96	4	2V+2H
n258	L	Patch	97	4	2V+2H
n258	L	Patch	98	4	2V+2H
n258	L	Patch	99	4	2V+2H
n258	L	Patch	100	4	2V+2H
n258	L	Patch	101	4	2V+2H
n258	L	Patch	102	1	1V
n258	L	Patch	103	1	1V
n258	L	Patch	104	1	1H
n258	L	Patch	105	1	1H
n258	L	Patch	106	2	V+H
n258	L	Patch	107	2	V+H

Table 3
5G mmW NR Band n261 Antenna L Codebook

Band	Antenna Module	Antenna Type	Beam ID	Feed no.	POL
n261	L	Patch	0	4	V
n261	L	Patch	1	4	V
n261	L	Patch	2	4	V
n261	L	Patch	3	4	V
n261	L	Patch	4	4	V
n261	L	Patch	5	4	V
n261	L	Patch	6	4	V
n261	L	Patch	7	4	V
n261	L	Patch	8	4	V
n261	L	Patch	9	4	V
n261	L	Patch	10	4	V
n261	L	Patch	11	4	V
n261	L	Patch	12	4	V
n261	L	Patch	13	4	V
n261	L	Patch	14	4	V
n261	L	Patch	15	4	V
n261	L	Patch	16	4	H
n261	L	Patch	17	4	H
n261	L	Patch	18	4	H
n261	L	Patch	19	4	H
n261	L	Patch	20	4	H
n261	L	Patch	21	4	H
n261	L	Patch	22	4	H
n261	L	Patch	23	4	H
n261	L	Patch	24	4	H
n261	L	Patch	25	4	H
n261	L	Patch	26	4	H
n261	L	Patch	27	4	H
n261	L	Patch	28	4	H
n261	L	Patch	29	4	H
n261	L	Patch	30	4	H
n261	L	Patch	31	4	H
n261	L	Patch	32	8	V+H
n261	L	Patch	33	8	V+H
n261	L	Patch	34	8	V+H
n261	L	Patch	35	8	V+H
n261	L	Patch	36	8	V+H
n261	L	Patch	37	8	V+H
n261	L	Patch	38	8	V+H
n261	L	Patch	39	8	V+H
n261	L	Patch	40	8	V+H
n261	L	Patch	41	8	V+H
n261	L	Patch	42	8	V+H
n261	L	Patch	43	8	V+H
n261	L	Patch	44	8	V+H
n261	L	Patch	45	8	V+H
n261	L	Patch	46	8	V+H
n261	L	Patch	47	8	V+H
n261	L	Patch	48	2	2V
n261	L	Patch	49	2	2V
n261	L	Patch	50	2	2V
n261	L	Patch	51	2	2V
n261	L	Patch	52	2	2V
n261	L	Patch	53	2	2V
n261	L	Patch	54	2	2V
n261	L	Patch	55	2	2V
n261	L	Patch	56	2	2V
n261	L	Patch	57	2	2V
n261	L	Patch	58	2	2V
n261	L	Patch	59	2	2V
n261	L	Patch	60	2	2V
n261	L	Patch	61	2	2V
n261	L	Patch	62	2	2V
n261	L	Patch	63	2	2V
n261	L	Patch	64	2	2V
n261	L	Patch	65	2	2V
n261	L	Patch	66	2	2H
n261	L	Patch	67	2	2H
n261	L	Patch	68	2	2H
n261	L	Patch	69	2	2H
n261	L	Patch	70	2	2H
n261	L	Patch	71	2	2H
n261	L	Patch	72	2	2H
n261	L	Patch	73	2	2H
n261	L	Patch	74	2	2H
n261	L	Patch	75	2	2H
n261	L	Patch	76	2	2H
n261	L	Patch	77	2	2H
n261	L	Patch	78	2	2H
n261	L	Patch	79	2	2H
n261	L	Patch	80	2	2H
n261	L	Patch	81	2	2H
n261	L	Patch	82	2	2H
n261	L	Patch	83	2	2H
n261	L	Patch	84	4	2V+2H
n261	L	Patch	85	4	2V+2H
n261	L	Patch	86	4	2V+2H
n261	L	Patch	87	4	2V+2H
n261	L	Patch	88	4	2V+2H
n261	L	Patch	89	4	2V+2H
n261	L	Patch	90	4	2V+2H
n261	L	Patch	91	4	2V+2H
n261	L	Patch	92	4	2V+2H
n261	L	Patch	93	4	2V+2H
n261	L	Patch	94	4	2V+2H
n261	L	Patch	95	4	2V+2H
n261	L	Patch	96	4	2V+2H
n261	L	Patch	97	4	2V+2H
n261	L	Patch	98	4	2V+2H
n261	L	Patch	99	4	2V+2H
n261	L	Patch	100	4	2V+2H
n261	L	Patch	101	4	2V+2H
n261	L	Patch	102	1	1V
n261	L	Patch	103	1	1V
n261	L	Patch	104	1	1H
n261	L	Patch	105	1	1H
n261	L	Patch	106	2	V+H
n261	L	Patch	107	2	V+H

Table 4
5G mmW NR Band n260 Antenna L Codebook

Band	Antenna Module	Antenna Type	Beam ID	Feed no.	POL
n260	L	Patch	0	4	V
n260	L	Patch	1	4	V
n260	L	Patch	2	4	V
n260	L	Patch	3	4	V
n260	L	Patch	4	4	V
n260	L	Patch	5	4	V
n260	L	Patch	6	4	V
n260	L	Patch	7	4	V
n260	L	Patch	8	4	V
n260	L	Patch	9	4	V
n260	L	Patch	10	4	V
n260	L	Patch	11	4	V
n260	L	Patch	12	4	V
n260	L	Patch	13	4	V
n260	L	Patch	14	4	V
n260	L	Patch	15	4	V
n260	L	Patch	16	4	H
n260	L	Patch	17	4	H
n260	L	Patch	18	4	H
n260	L	Patch	19	4	H
n260	L	Patch	20	4	H
n260	L	Patch	21	4	H
n260	L	Patch	22	4	H
n260	L	Patch	23	4	H
n260	L	Patch	24	4	H
n260	L	Patch	25	4	H
n260	L	Patch	26	4	H
n260	L	Patch	27	4	H
n260	L	Patch	28	4	H
n260	L	Patch	29	4	H
n260	L	Patch	30	4	H
n260	L	Patch	31	4	H
n260	L	Patch	32	8	V+H
n260	L	Patch	33	8	V+H
n260	L	Patch	34	8	V+H
n260	L	Patch	35	8	V+H
n260	L	Patch	36	8	V+H
n260	L	Patch	37	8	V+H
n260	L	Patch	38	8	V+H
n260	L	Patch	39	8	V+H
n260	L	Patch	40	8	V+H
n260	L	Patch	41	8	V+H
n260	L	Patch	42	8	V+H
n260	L	Patch	43	8	V+H
n260	L	Patch	44	8	V+H
n260	L	Patch	45	8	V+H
n260	L	Patch	46	8	V+H
n260	L	Patch	47	8	V+H
n260	L	Patch	48	2	2V
n260	L	Patch	49	2	2V
n260	L	Patch	50	2	2V
n260	L	Patch	51	2	2V
n260	L	Patch	52	2	2V
n260	L	Patch	53	2	2V
n260	L	Patch	54	2	2V
n260	L	Patch	55	2	2V
n260	L	Patch	56	2	2V
n260	L	Patch	57	2	2V
n260	L	Patch	58	2	2V
n260	L	Patch	59	2	2V
n260	L	Patch	60	2	2V
n260	L	Patch	61	2	2V
n260	L	Patch	62	2	2V
n260	L	Patch	63	2	2V
n260	L	Patch	64	2	2V
n260	L	Patch	65	2	2V
n260	L	Patch	66	2	2H
n260	L	Patch	67	2	2H
n260	L	Patch	68	2	2H
n260	L	Patch	69	2	2H
n260	L	Patch	70	2	2H
n260	L	Patch	71	2	2H
n260	L	Patch	72	2	2H
n260	L	Patch	73	2	2H
n260	L	Patch	74	2	2H
n260	L	Patch	75	2	2H
n260	L	Patch	76	2	2H
n260	L	Patch	77	2	2H
n260	L	Patch	78	2	2H
n260	L	Patch	79	2	2H
n260	L	Patch	80	2	2H
n260	L	Patch	81	2	2H
n260	L	Patch	82	2	2H
n260	L	Patch	83	2	2H
n260	L	Patch	84	4	2V+2H
n260	L	Patch	85	4	2V+2H
n260	L	Patch	86	4	2V+2H
n260	L	Patch	87	4	2V+2H
n260	L	Patch	88	4	2V+2H
n260	L	Patch	89	4	2V+2H
n260	L	Patch	90	4	2V+2H
n260	L	Patch	91	4	2V+2H
n260	L	Patch	92	4	2V+2H
n260	L	Patch	93	4	2V+2H
n260	L	Patch	94	4	2V+2H
n260	L	Patch	95	4	2V+2H
n260	L	Patch	96	4	2V+2H
n260	L	Patch	97	4	2V+2H
n260	L	Patch	98	4	2V+2H
n260	L	Patch	99	4	2V+2H
n260	L	Patch	100	4	2V+2H
n260	L	Patch	101	4	2V+2H
n260	L	Patch	102	1	1V
n260	L	Patch	103	1	1V
n260	L	Patch	104	1	1H
n260	L	Patch	105	1	1H
n260	L	Patch	106	2	V+H
n260	L	Patch	107	2	V+H

Table 5
5G mmW NR Band n258 Antenna K Codebook

Band	Antenna Module	Antenna Type	Beam ID	Feed no.	POL
n258	K	Patch	0	4	V
n258	K	Patch	1	4	V
n258	K	Patch	2	4	V
n258	K	Patch	3	4	V
n258	K	Patch	4	4	V
n258	K	Patch	5	4	V
n258	K	Patch	6	4	V
n258	K	Patch	7	4	V
n258	K	Patch	8	4	V
n258	K	Patch	9	4	V
n258	K	Patch	10	4	V
n258	K	Patch	11	4	V
n258	K	Patch	12	4	V
n258	K	Patch	13	4	V
n258	K	Patch	14	4	V
n258	K	Patch	15	4	V
n258	K	Patch	16	4	H
n258	K	Patch	17	4	H
n258	K	Patch	18	4	H
n258	K	Patch	19	4	H
n258	K	Patch	20	4	H
n258	K	Patch	21	4	H
n258	K	Patch	22	4	H
n258	K	Patch	23	4	H
n258	K	Patch	24	4	H
n258	K	Patch	25	4	H
n258	K	Patch	26	4	H
n258	K	Patch	27	4	H
n258	K	Patch	28	4	H
n258	K	Patch	29	4	H
n258	K	Patch	30	4	H
n258	K	Patch	31	4	H
n258	K	Patch	32	8	V+H
n258	K	Patch	33	8	V+H
n258	K	Patch	34	8	V+H
n258	K	Patch	35	8	V+H
n258	K	Patch	36	8	V+H
n258	K	Patch	37	8	V+H
n258	K	Patch	38	8	V+H
n258	K	Patch	39	8	V+H
n258	K	Patch	40	8	V+H
n258	K	Patch	41	8	V+H
n258	K	Patch	42	8	V+H
n258	K	Patch	43	8	V+H
n258	K	Patch	44	8	V+H
n258	K	Patch	45	8	V+H
n258	K	Patch	46	8	V+H
n258	K	Patch	47	8	V+H
n258	K	Patch	48	2	2V
n258	K	Patch	49	2	2V
n258	K	Patch	50	2	2V
n258	K	Patch	51	2	2V
n258	K	Patch	52	2	2V
n258	K	Patch	53	2	2V
n258	K	Patch	54	2	2V
n258	K	Patch	55	2	2V
n258	K	Patch	56	2	2V
n258	K	Patch	57	2	2V
n258	K	Patch	58	2	2V
n258	K	Patch	59	2	2V
n258	K	Patch	60	2	2V
n258	K	Patch	61	2	2V
n258	K	Patch	62	2	2V
n258	K	Patch	63	2	2V
n258	K	Patch	64	2	2V
n258	K	Patch	65	2	2V
n258	K	Patch	66	2	2H
n258	K	Patch	67	2	2H
n258	K	Patch	68	2	2H
n258	K	Patch	69	2	2H
n258	K	Patch	70	2	2H
n258	K	Patch	71	2	2H
n258	K	Patch	72	2	2H
n258	K	Patch	73	2	2H
n258	K	Patch	74	2	2H
n258	K	Patch	75	2	2H
n258	K	Patch	76	2	2H
n258	K	Patch	77	2	2H
n258	K	Patch	78	2	2H
n258	K	Patch	79	2	2H
n258	K	Patch	80	2	2H
n258	K	Patch	81	2	2H
n258	K	Patch	82	2	2H
n258	K	Patch	83	2	2H
n258	K	Patch	84	4	2V+2H
n258	K	Patch	85	4	2V+2H
n258	K	Patch	86	4	2V+2H
n258	K	Patch	87	4	2V+2H
n258	K	Patch	88	4	2V+2H
n258	K	Patch	89	4	2V+2H
n258	K	Patch	90	4	2V+2H
n258	K	Patch	91	4	2V+2H
n258	K	Patch	92	4	2V+2H
n258	K	Patch	93	4	2V+2H
n258	K	Patch	94	4	2V+2H
n258	K	Patch	95	4	2V+2H
n258	K	Patch	96	4	2V+2H
n258	K	Patch	97	4	2V+2H
n258	K	Patch	98	4	2V+2H
n258	K	Patch	99	4	2V+2H
n258	K	Patch	100	4	2V+2H
n258	K	Patch	101	4	2V+2H
n258	K	Patch	102	1	1V
n258	K	Patch	103	1	1V
n258	K	Patch	104	1	1H
n258	K	Patch	105	1	1H
n258	K	Patch	106	2	V+H
n258	K	Patch	107	2	V+H

Table 6
5G mmW NR Band n261 Antenna K Codebook

Band	Antenna Module	Antenna Type	Beam ID	Feed no.	POL
n261	K	Patch	0	4	V
n261	K	Patch	1	4	V
n261	K	Patch	2	4	V
n261	K	Patch	3	4	V
n261	K	Patch	4	4	V
n261	K	Patch	5	4	V
n261	K	Patch	6	4	V
n261	K	Patch	7	4	V
n261	K	Patch	8	4	V
n261	K	Patch	9	4	V
n261	K	Patch	10	4	V
n261	K	Patch	11	4	V
n261	K	Patch	12	4	V
n261	K	Patch	13	4	V
n261	K	Patch	14	4	V
n261	K	Patch	15	4	V
n261	K	Patch	16	4	H
n261	K	Patch	17	4	H
n261	K	Patch	18	4	H
n261	K	Patch	19	4	H
n261	K	Patch	20	4	H
n261	K	Patch	21	4	H
n261	K	Patch	22	4	H
n261	K	Patch	23	4	H
n261	K	Patch	24	4	H
n261	K	Patch	25	4	H
n261	K	Patch	26	4	H
n261	K	Patch	27	4	H
n261	K	Patch	28	4	H
n261	K	Patch	29	4	H
n261	K	Patch	30	4	H
n261	K	Patch	31	4	H
n261	K	Patch	32	8	V+H
n261	K	Patch	33	8	V+H
n261	K	Patch	34	8	V+H
n261	K	Patch	35	8	V+H
n261	K	Patch	36	8	V+H
n261	K	Patch	37	8	V+H
n261	K	Patch	38	8	V+H
n261	K	Patch	39	8	V+H
n261	K	Patch	40	8	V+H
n261	K	Patch	41	8	V+H
n261	K	Patch	42	8	V+H
n261	K	Patch	43	8	V+H
n261	K	Patch	44	8	V+H
n261	K	Patch	45	8	V+H
n261	K	Patch	46	8	V+H
n261	K	Patch	47	8	V+H
n261	K	Patch	48	2	2V
n261	K	Patch	49	2	2V
n261	K	Patch	50	2	2V
n261	K	Patch	51	2	2V
n261	K	Patch	52	2	2V
n261	K	Patch	53	2	2V
n261	K	Patch	54	2	2V
n261	K	Patch	55	2	2V
n261	K	Patch	56	2	2V
n261	K	Patch	57	2	2V
n261	K	Patch	58	2	2V
n261	K	Patch	59	2	2V
n261	K	Patch	60	2	2V
n261	K	Patch	61	2	2V
n261	K	Patch	62	2	2V
n261	K	Patch	63	2	2V
n261	K	Patch	64	2	2V
n261	K	Patch	65	2	2V
n261	K	Patch	66	2	2H
n261	K	Patch	67	2	2H
n261	K	Patch	68	2	2H
n261	K	Patch	69	2	2H
n261	K	Patch	70	2	2H
n261	K	Patch	71	2	2H
n261	K	Patch	72	2	2H
n261	K	Patch	73	2	2H
n261	K	Patch	74	2	2H
n261	K	Patch	75	2	2H
n261	K	Patch	76	2	2H
n261	K	Patch	77	2	2H
n261	K	Patch	78	2	2H
n261	K	Patch	79	2	2H
n261	K	Patch	80	2	2H
n261	K	Patch	81	2	2H
n261	K	Patch	82	2	2H
n261	K	Patch	83	2	2H
n261	K	Patch	84	4	2V+2H
n261	K	Patch	85	4	2V+2H
n261	K	Patch	86	4	2V+2H
n261	K	Patch	87	4	2V+2H
n261	K	Patch	88	4	2V+2H
n261	K	Patch	89	4	2V+2H
n261	K	Patch	90	4	2V+2H
n261	K	Patch	91	4	2V+2H
n261	K	Patch	92	4	2V+2H
n261	K	Patch	93	4	2V+2H
n261	K	Patch	94	4	2V+2H
n261	K	Patch	95	4	2V+2H
n261	K	Patch	96	4	2V+2H
n261	K	Patch	97	4	2V+2H
n261	K	Patch	98	4	2V+2H
n261	K	Patch	99	4	2V+2H
n261	K	Patch	100	4	2V+2H
n261	K	Patch	101	4	2V+2H
n261	K	Patch	102	1	1V
n261	K	Patch	103	1	1V
n261	K	Patch	104	1	1H
n261	K	Patch	105	1	1H
n261	K	Patch	106	2	V+H
n261	K	Patch	107	2	V+H

Table 7
5G mmW NR Band n260 Antenna K Codebook

Band	Antenna Module	Antenna Type	Beam ID	Feed no.	POL
n260	K	Patch	0	4	V
n260	K	Patch	1	4	V
n260	K	Patch	2	4	V
n260	K	Patch	3	4	V
n260	K	Patch	4	4	V
n260	K	Patch	5	4	V
n260	K	Patch	6	4	V
n260	K	Patch	7	4	V
n260	K	Patch	8	4	V
n260	K	Patch	9	4	V
n260	K	Patch	10	4	V
n260	K	Patch	11	4	V
n260	K	Patch	12	4	V
n260	K	Patch	13	4	V
n260	K	Patch	14	4	V
n260	K	Patch	15	4	V
n260	K	Patch	16	4	H
n260	K	Patch	17	4	H
n260	K	Patch	18	4	H
n260	K	Patch	19	4	H
n260	K	Patch	20	4	H
n260	K	Patch	21	4	H
n260	K	Patch	22	4	H
n260	K	Patch	23	4	H
n260	K	Patch	24	4	H
n260	K	Patch	25	4	H
n260	K	Patch	26	4	H
n260	K	Patch	27	4	H
n260	K	Patch	28	4	H
n260	K	Patch	29	4	H
n260	K	Patch	30	4	H
n260	K	Patch	31	4	H
n260	K	Patch	32	8	V+H
n260	K	Patch	33	8	V+H
n260	K	Patch	34	8	V+H
n260	K	Patch	35	8	V+H
n260	K	Patch	36	8	V+H
n260	K	Patch	37	8	V+H
n260	K	Patch	38	8	V+H
n260	K	Patch	39	8	V+H
n260	K	Patch	40	8	V+H
n260	K	Patch	41	8	V+H
n260	K	Patch	42	8	V+H
n260	K	Patch	43	8	V+H
n260	K	Patch	44	8	V+H
n260	K	Patch	45	8	V+H
n260	K	Patch	46	8	V+H
n260	K	Patch	47	8	V+H
n260	K	Patch	48	2	2V
n260	K	Patch	49	2	2V
n260	K	Patch	50	2	2V
n260	K	Patch	51	2	2V
n260	K	Patch	52	2	2V
n260	K	Patch	53	2	2V
n260	K	Patch	54	2	2V
n260	K	Patch	55	2	2V
n260	K	Patch	56	2	2V
n260	K	Patch	57	2	2V
n260	K	Patch	58	2	2V
n260	K	Patch	59	2	2V
n260	K	Patch	60	2	2V
n260	K	Patch	61	2	2V
n260	K	Patch	62	2	2V
n260	K	Patch	63	2	2V
n260	K	Patch	64	2	2V
n260	K	Patch	65	2	2V
n260	K	Patch	66	2	2H
n260	K	Patch	67	2	2H
n260	K	Patch	68	2	2H
n260	K	Patch	69	2	2H
n260	K	Patch	70	2	2H
n260	K	Patch	71	2	2H
n260	K	Patch	72	2	2H
n260	K	Patch	73	2	2H
n260	K	Patch	74	2	2H
n260	K	Patch	75	2	2H
n260	K	Patch	76	2	2H
n260	K	Patch	77	2	2H
n260	K	Patch	78	2	2H
n260	K	Patch	79	2	2H
n260	K	Patch	80	2	2H
n260	K	Patch	81	2	2H
n260	K	Patch	82	2	2H
n260	K	Patch	83	2	2H
n260	K	Patch	84	4	2V+2H
n260	K	Patch	85	4	2V+2H
n260	K	Patch	86	4	2V+2H
n260	K	Patch	87	4	2V+2H
n260	K	Patch	88	4	2V+2H
n260	K	Patch	89	4	2V+2H
n260	K	Patch	90	4	2V+2H
n260	K	Patch	91	4	2V+2H
n260	K	Patch	92	4	2V+2H
n260	K	Patch	93	4	2V+2H
n260	K	Patch	94	4	2V+2H
n260	K	Patch	95	4	2V+2H
n260	K	Patch	96	4	2V+2H
n260	K	Patch	97	4	2V+2H
n260	K	Patch	98	4	2V+2H
n260	K	Patch	99	4	2V+2H
n260	K	Patch	100	4	2V+2H
n260	K	Patch	101	4	2V+2H
n260	K	Patch	102	1	1V
n260	K	Patch	103	1	1V
n260	K	Patch	104	1	1H
n260	K	Patch	105	1	1H
n260	K	Patch	106	2	V+H
n260	K	Patch	107	2	V+H

4 Simulation and Modeling Validation

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

With an input power of 0 dBm for n258 band, 0 dBm for n261 band, and 0 dBm for n260 band, PD measurements are conducted for at least one single beam per antenna module on worst-surface(s). PD measurements are performed at mid channel of each mmW band and with CW modulation. All measured PD values are listed in table below along with corresponding simulated PD values for the same configuration.

PD value will be used to determine worst-case housing influence for conservative assessment.

Table 8

Band	Antenna	Beam ID	Surface	4cm^2 psPD Measured (mW/cm^2)	4cm^2 psPD Simulated (mW/cm^2)	Delta = Simulated - Measured (dB)
n258	K	7	Front	0.178	0.406	3.59
		1	Right	0.112	0.188	2.25
		22	Front	0.250	0.394	**1.97**
		22	Right	0.109	0.192	2.47
	L	9	Rear	0.182	0.519	**4.55**
		27	Rear	0.159	0.54	5.32
n261	K	11	Front	0.188	0.415	3.43
		11	Right	0.092	0.198	3.33
		27	Front	0.128	0.438	5.34
		21	Right	0.099	0.185	**2.74**
	L	11	Rear	0.234	0.399	2.31
		16	Rear	0.272	0.395	**1.62**
n260	K	12	Front	0.226	0.360	**2.02**
		7	Right	0.090	0.235	4.17
		25	Front	0.151	0.384	4.05
		27	Right	0.100	0.254	4.06
	L	3	Rear	0.232	0.399	**2.36**
		26	Rear	0.227	0.413	2.60

5 PD_design_target

Table 9

PD_design_target	
$PD\_design\_target < PD\_regulatory\_limit\ x\ 10^{\frac{-Total\ Uncertainty}{10}}$	
psPD over 4 cm2 Averaging Area (mW/cm²)	
Total Uncertainty	1.3 dB
PD_regulatory_limit	1.0 mW/cm^2
PD_design_target	0.741 mW/cm^2

6 Δmin

For non-metal material, the material property cannot be accurately characterized at mmW frequencies to date. The estimated material property for the device housing is used in the simulation model, which could influence the accuracy in simulation for PD amplitude quantification. Since the housing influence on PD could vary from surface to surface where the EM field propagates through, the most underestimated surface is used to quantify the worst-case housing influence for conservative assessment.

Since the mmW antenna modules are placed at different locations, only surrounding material/housing has impact on EM field propagation, and in turn power density. Furthermore, depending on the type of antenna array, i.e., dipole antenna array or patch antenna array, the nature of EM field propagation in the near field is different. Therefore, the worst-case housing influence is determined per antenna module and per antenna type.

For this DUT, the below procedure was used to determine worst-case housing influence, Δmin:

1. Based on PD simulation, for each module and antenna type, determine one or more worst-surface(s) that has highest 4cm2 PD for all the single beams per antenna module and per antenna type in the mid channel of each band.
2. For identified worst surface(s) per antenna module and per antenna type group,
    a. First determine Δmin based on identified worst surface(s), and derive input.power.limit
    b. Then prove all other near-by surface(s), i.e., non-selected surface(s), is not required for housing material loss quantification (in other words, these non-evaluated surfaces have no influence on the determined input.power.limit) by:
        i. re-scale all simulated 4cm2 PD values to input.power.limit to identify the worst-PD beam per each non-evaluated surface
        ii. Measure 4cm2 PD at input.power.limit on identified worst-PD beam per each non-evaluated surface
        iii. Demonstrate all measured 4cm2 PD values are below PD_design_target

3. If any of the above surface(s) in Step (2.b.iii) have measured 4cm2 PD ≥ PD_design_target, then those surfaces must be included in the Δmin determination in Step (2.a), and re-evaluate input.power.limit with these added surfaces.

Following above procedure, based on the Samsung PD simulation report, the worst-surface(s) having highest 4cm2 PD for all the single beams per each antenna type and each antenna module group in the mid channel of n258, n261, and n260 bands are identified in the following table:

Table 10

Worst-surface(s)

Band/Mode	Antenna Module	Back	Front	Top	Bottom	Right	Left
NR n258	**L**	Yes	No	No	No	No	No
NR n258	**K**	No	Yes	No	No	Yes	No
NR n261	**L**	Yes	No	No	No	No	No
NR n261	**K**	No	Yes	No	No	Yes	No
NR n260	**L**	Yes	No	No	No	No	No
NR n260	**K**	No	Yes	No	No	Yes	No

Thus, when comparing a simulated 4cm2-averaged PD and measured 4 cm2-averaged PD for the identified worst surface(s), the worst error introduced for each antenna type and each antenna module group when using the estimated material property in the simulation is highlighted in bold numbers in the table below. Thus, the worst-case housing influence, denoted as $\Delta_{min} = \text{Sim. PD} - \text{Meas. PD}$, is determined as

Table 11

$\boldsymbol{\Delta_{min}}$

Band	Antenna	Δmin (dB)
n258	K	**1.97**
n258	L	**4.55**
n261	K	**2.74**
n261	L	**1.62**
n260	K	**2.02**
n260	L	**2.36**

Δ_{min} represents the worst case where RF exposure is underestimated the most in simulation when using the estimated material property of the housing. For conservative assessment, the Δ_{min} is used as the worst-case factor and applied to all the beams in the corresponding antenna type and antenna module group to determine input power limits in PD char for compliance.

The detail input.power.limit derivation is described in Section 7.

Simulated 4cm2 PD values in the Power Density Simulation Report are scaled to input.power.limit and are listed in the tables below for all single beams for all identified surfaces, when assuming the simulation is performed with correct housing influence.

Determine the worst beam for each of non-selected surface(s), identified in the table below:

Table 12

Non-Selected Surface(s)

Band/Mode	Antenna Module	Back	Front	Top	Bottom	Right	Left
NR n258	**K**	No	Yes	No	No	Yes	No
NR n258	**L**	Yes	No	No	No	No	No
NR n261	**K**	No	Yes	No	No	Yes	No
NR n261	**L**	Yes	No	No	No	No	No
NR n260	**K**	No	Yes	No	No	Yes	No
NR n260	**L**	Yes	No	No	No	No	No

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

Table 13

n258/mid channel, Antenna L Patch simulated 4cm2 PD at PD_Design_Target (if simulation performed with correct housing material properties) (Δmin)

Antenna	Beam ID_1	Simulated 4cm^2 PD (mW/cm^2) Corresponding to PD_design_target if the simulation was performed with correct No. Module Type housing material properties					
		S4(Right)	S3(Left)	S5(Top)	S6(Bottom)	S1(Front)	S2(Back)
L	0	0.10911979	0.00108742	4.06853E-05	0.00045537	0.01988896	0.67656389
L	1	0.13441511	0.00055569	0.000132246	0.00124689	0.01312742	0.70810756
L	2	0.09394405	0.0007696	8.31817E-05	0.00066441	0.02229982	0.69287118
L	3	0.11703548	0.00119586	0.000273107	0.00172948	0.0220941	0.67627887
L	4	0.1224138	0.00083052	0.000111202	0.0012225	0.01742482	0.6873519
L	5	0.04406105	0.00014221	0.001442794	0.00823944	0.01644478	0.74131024
L	6	0.09244157	0.00024753	0.000346096	0.00076499	0.01249317	0.72428212
L	7	0.05343222	0.00039222	0.001903872	0.00998454	0.02035473	0.74131024
L	8	0.07182992	0.00023759	8.12425E-05	0.00083675	0.01190119	0.69390858
L	9	0.11841887	0.0001506	0.00034983	0.00044476	0.00817839	0.71465102
L	10	0.05159433	0.00016374	0.001064814	0.00675651	0.01223051	0.73532106
L	11	0.10870879	0.00034484	0.001076884	0.00260292	0.00785518	0.70611462
L	12	0.08807881	0.00022221	0.000130312	0.0007123	0.01923987	0.70659036
L	13	0.04119563	0.00019402	0.001435536	0.00868876	0.01621651	0.74131024
L	14	0.06044202	0.00014498	0.000582085	0.00409978	0.00720037	0.72456063
L	15	0.0707754	0.00023364	8.85403E-05	0.00024465	0.014831	0.70478586
L	16	0.10204954	0.00096509	0.000176245	0.00023622	0.02152285	0.71563627
L	17	0.10776482	0.00040797	0.000184727	0.00165646	0.01724355	0.70573429
L	18	0.10802223	0.00094146	0.000146746	0.00130826	0.01489957	0.72254207
L	19	0.11199712	0.00083864	0.000328948	0.00081391	0.02223903	0.70040864
L	20	0.10628558	0.00057681	0.000143783	0.00072537	0.01975767	0.69513299
L	21	0.05729661	0.00016642	0.002618666	0.01030954	0.01288415	0.74131024
L	22	0.10219419	0.00023819	0.000402679	0.00074066	0.01298607	0.74131024
L	23	0.03441742	0.00015033	0.003141967	0.00969972	0.01280666	0.72664048
L	24	0.11379802	0.00023724	0.000115536	0.0012891	0.01123756	0.70807509
L	25	0.07684384	0.00010936	0.000345776	0.00074595	0.00662475	0.73855638
L	26	0.07448217	0.00037317	0.001846065	0.00989571	0.0116999	0.74131024
L	27	0.06583511	0.00023283	0.001479545	0.00204991	0.00445145	0.73904445
L	28	0.10470686	0.00026822	0.000226083	0.00053679	0.01421152	0.70185388
L	29	0.05399277	0.00021651	0.00271714	0.01142853	0.01491684	0.74035537
L	30	0.09858136	0.00034214	0.00076231	0.00695858	0.00993023	0.72160478
L	31	0.07606007	0.00010485	7.86594E-05	0.0005425	0.01318449	0.70663974
L	32	0.11518015	0.00183882	0.000170845	0.00062128	0.03954392	0.71943875
L	33	0.15336661	0.00077499	0.000236563	0.00195566	0.02769963	0.70231997
L	34	0.11321694	0.00153404	0.000163803	0.00154343	0.03546961	0.72151581
L	35	0.13054363	0.00168371	0.000556049	0.00160708	0.04200013	0.70753068
L	36	0.13811115	0.00119411	0.000217759	0.00115061	0.03527829	0.69527267
L	37	0.0748151	0.00022941	0.003141687	0.0135599	0.02042276	0.74131024
L	38	0.09815552	0.00037631	0.000422615	0.00098492	0.02153946	0.74131024
L	39	0.06816024	0.00044508	0.004217825	0.01567919	0.02403389	0.74131024
L	40	0.13094689	0.00044074	0.000155151	0.00168689	0.01972189	0.70430603
L	41	0.1420252	0.00021947	0.000549885	0.0009842	0.01100059	0.73802402
L	42	0.09600873	0.00033568	0.00226538	0.01198419	0.01869747	0.74131024
L	43	0.13268712	0.0004386	0.00175142	0.0034272	0.0097678	0.7364566
L	44	0.1189648	0.00044211	0.000228432	0.00085415	0.03077803	0.70535933
L	45	0.07043444	0.00029142	0.003151658	0.01438419	0.02415783	0.74131024
L	46	0.12322066	0.00034243	0.001108432	0.00796014	0.01246504	0.73529066
L	47	0.08339958	0.00028716	0.000140844	0.00070254	0.02543947	0.69486944
L	48	0.08262959	0.00049039	6.76453E-05	0.00036165	0.01184474	0.70729854
L	49	0.08324961	0.00052747	0.000254288	0.00095575	0.01029668	0.68789034
L	50	0.08262959	0.00049039	6.76453E-05	0.00036165	0.01184474	0.70729854
L	51	0.08324961	0.00052747	0.000254288	0.00095575	0.01029668	0.68789034
L	52	0.08324961	0.00052747	0.000254288	0.00095575	0.01029668	0.68789034
L	53	0.07523742	0.00020271	0.000887821	0.00374383	0.01296079	0.74131024
L	54	0.07523742	0.00020271	0.000887821	0.00374383	0.01296079	0.74131024
L	55	0.07523742	0.00020271	0.000887821	0.00374383	0.01296079	0.74131024
L	56	0.08041242	0.00034748	9.94585E-05	0.00063559	0.01366022	0.73091546
L	57	0.09733815	0.00031125	0.000835214	0.00346276	0.01174976	0.73708579
L	58	0.04589287	0.00016475	0.000679193	0.00310379	0.01443061	0.74131024
L	59	0.09733815	0.00031125	0.000835214	0.00346276	0.01174976	0.73708579
L	60	0.08262959	0.00049039	6.76453E-05	0.00036165	0.01184474	0.70729854
L	61	0.04589287	0.00016475	0.000679193	0.00310379	0.01443061	0.74131024
L	62	0.04589287	0.00016475	0.000679193	0.00310379	0.01443061	0.74131024
L	63	0.08262959	0.00049039	6.76453E-05	0.00036165	0.01184474	0.70729854
L	64	0.08262959	0.00049039	6.76453E-05	0.00036165	0.01184474	0.70729854
L	65	0.07523742	0.00020271	0.000887821	0.00374383	0.01296079	0.74131024
L	66	0.07405672	0.0004514	0.0003382	0.00063418	0.01089457	0.69485929
L	67	0.07405672	0.0004514	0.0003382	0.00063418	0.01089457	0.69485929
L	68	0.09128728	0.00052055	0.000120287	0.00053537	0.01004829	0.71333118
L	69	0.07405672	0.0004514	0.0003382	0.00063418	0.01089457	0.69485929
L	70	0.07405672	0.0004514	0.0003382	0.00063418	0.01089457	0.69485929
L	71	0.04379153	0.00020684	0.001208643	0.00395688	0.01119037	0.72928175
L	72	0.04379153	0.00020684	0.001208643	0.00395688	0.01119037	0.72928175
L	73	0.04379153	0.00020684	0.001208643	0.00395688	0.01119037	0.72928175
L	74	0.09829028	0.00045665	0.000175419	0.00144656	0.01043431	0.73074774
L	75	0.05343407	0.00026097	0.001078428	0.00289454	0.01195693	0.72452034
L	76	0.07316096	0.00022649	0.001005955	0.00401774	0.01186788	0.74131024
L	77	0.05343407	0.00026097	0.001078428	0.00289454	0.01195693	0.72452034
L	78	0.09128728	0.00052055	0.000120287	0.00053537	0.01004829	0.71333118
L	79	0.07316096	0.00022649	0.001005955	0.00401774	0.01186788	0.74131024
L	80	0.07316096	0.00022649	0.001005955	0.00401774	0.01186788	0.74131024
L	81	0.09128728	0.00052055	0.000120287	0.00053537	0.01004829	0.71333118
L	82	0.09128728	0.00052055	0.000120287	0.00053537	0.01004829	0.71333118
L	83	0.04379153	0.00020684	0.001208643	0.00395688	0.01119037	0.72928175
L	84	0.09820038	0.00084887	0.000288935	0.00081367	0.01922859	0.70686099
L	85	0.09246003	0.00086225	0.000489878	0.00091366	0.0195392	0.70113703
L	86	0.10720499	0.00090902	0.000165568	0.00075953	0.0201928	0.70175009
L	87	0.09246003	0.00086225	0.000489878	0.00091366	0.0195392	0.70113703
L	88	0.09246003	0.00086225	0.000489878	0.00091366	0.0195392	0.70113703
L	89	0.08221449	0.00037105	0.001869114	0.00488032	0.01937133	0.74131024
L	90	0.08221449	0.00037105	0.001869114	0.00488032	0.01937133	0.74131024
L	91	0.08221449	0.00037105	0.001869114	0.00488032	0.01937133	0.74131024
L	92	0.11639932	0.00071843	0.00017082	0.00124813	0.02157605	0.72607981
L	93	0.10218545	0.00047855	0.0016839	0.00383759	0.01853274	0.73140636
L	94	0.08099256	0.00035611	0.001480816	0.00452125	0.02233458	0.74131024
L	95	0.10218545	0.00047855	0.0016839	0.00383759	0.01853274	0.73140636
L	96	0.10720499	0.00090902	0.000165568	0.00075953	0.0201928	0.70175009
L	97	0.08099256	0.00035611	0.001480816	0.00452125	0.02233458	0.74131024
L	98	0.08099256	0.00035611	0.001480816	0.00452125	0.02233458	0.74131024
L	99	0.10720499	0.00090902	0.000165568	0.00075953	0.0201928	0.70175009
L	100	0.10720499	0.00090902	0.000165568	0.00075953	0.0201928	0.70175009
L	101	0.07252903	0.0005269	0.000760202	0.00313482	0.0140433	0.74131024
L	102	0.06746356	0.00054889	0.000467799	0.00181092	0.0129505	0.74131024
L	103	0.0500345	0.00014411	0.000582449	0.00227511	0.01132627	0.73849484
L	104	0.05768613	0.00057527	0.000636012	0.00263583	0.01112821	0.74032399
L	105	0.36135435	0.00131512	0.045443309	0.00904817	0.74131024	0.04235562
L	106	0.36135435	0.001663	0.045443309	0.00904817	0.74131024	0.04235562
L	107	0.36135435	0.001663	0.045443309	0.00904817	0.74131024	0.04235562

Table 14

n261/mid channel, Antenna L Patch simulated 4cm2 PD at PD_Design_Target (if simulation performed with correct housing material properties) (Δmin)

Antenna	Beam ID_1	Simulated 4cm² PD (mW/cm²) Corresponding to PD_design_target if the simulation was performed with correct No. Module Type housing material properties					
		S4(Right)	S3(Left)	S5(Top)	S6(Bottom)	S1(Front)	S2(Back)
L	0	0.12742797	0.00125971	0.000104436	0.00044992	0.03159565	0.72092873
L	1	0.11996723	0.00051863	0.000447296	0.00091583	0.02528104	0.7135939
L	2	0.12725736	0.00098627	0.000232449	0.00028799	0.02968927	0.73303333
L	3	0.110844	0.00024735	0.000255609	0.00154405	0.02399936	0.69963127
L	4	0.12055549	0.00130511	0.000336823	0.00104762	0.02694423	0.72504126
L	5	0.11772994	0.00140137	8.43057E-05	0.00053824	0.02854311	0.7094338
L	6	0.04714665	0.00013327	0.003833428	0.01168843	0.02437127	0.71936987
L	7	0.07380264	0.00018181	0.000365525	0.00133668	0.03851788	0.71198529
L	8	0.04038028	0.00016357	0.003921365	0.01346854	0.02629728	0.69441762
L	9	0.03192028	0.00025855	0.004373759	0.01138115	0.03592626	0.69189434
L	10	0.09519317	0.0005094	0.000484925	0.00449119	0.02219019	0.69946694
L	11	0.09762488	0.00072372	0.00033293	0.00136604	0.04055518	0.72549968
L	12	0.0377289	0.00025843	0.003976859	0.00816381	0.0363611	0.66796364
L	13	0.05628838	8.9942E-05	0.000273917	0.00114565	0.03423177	0.68932083
L	14	0.07245384	0.00069127	0.001489586	0.0106547	0.0214764	0.70466707
L	15	0.09255175	0.00057247	0.001075202	0.00203017	0.02828051	0.74120604
L	16	0.11504835	0.00115355	0.00011733	0.00084219	0.02790339	0.69523392
L	17	0.08126005	0.00041082	0.000555856	0.00261683	0.02686896	0.72620574
L	18	0.09430605	0.00109426	0.000225066	0.00171735	0.02657171	0.72915432
L	19	0.07255492	0.00021743	0.000165105	0.00219762	0.02859991	0.71693914
L	20	0.10221973	0.00116853	0.000307897	0.00172386	0.02485902	0.70577536
L	21	0.10286612	0.00137763	9.09582E-05	0.00027577	0.02494551	0.71136253
L	22	0.04198737	0.00020644	0.002666686	0.01012439	0.02789751	0.63724855
L	23	0.12617333	0.00031163	0.000389567	0.00140654	0.02941411	0.72699657
L	24	0.04640952	0.00023007	0.00329613	0.01205808	0.02817994	0.64640875
L	25	0.07509273	0.0002103	0.003768293	0.00963465	0.02367749	0.72627528
L	26	0.06030731	0.00015189	0.000292849	0.00219633	0.02889661	0.69564928
L	27	0.13983328	0.00068598	0.000240523	0.00184591	0.02834962	0.72550804
L	28	0.09406678	0.00021876	0.003308974	0.00621872	0.01904311	0.74131024
L	29	0.11076884	0.00020654	0.000469515	0.00162126	0.02837472	0.73655832
L	30	0.03910293	0.00030686	0.000863211	0.00588733	0.02478874	0.64139521
L	31	0.0724024	0.00072924	0.000714535	0.00293608	0.02320496	0.72922952
L	32	0.12515996	0.00206662	0.000136154	0.00091803	0.05118923	0.70559752
L	33	0.11409655	0.00071843	0.000508649	0.00217717	0.04056223	0.70242691
L	34	0.11856136	0.00166821	0.000302775	0.00114175	0.04852454	0.70603394
L	35	0.10399626	0.00031345	0.000212855	0.00266617	0.0353621	0.70237701
L	36	0.12452945	0.00204602	0.00048843	0.00146317	0.04645263	0.70288307
L	37	0.12147829	0.00219906	0.000142704	0.00061337	0.04910785	0.70396619
L	38	0.03208206	0.0001236	0.003160177	0.01144543	0.03439799	0.63911818
L	39	0.1142755	0.0003443	0.000513005	0.00182532	0.05533638	0.71336463
L	40	0.02791897	0.00017512	0.003781092	0.01253853	0.03753906	0.63771644
L	41	0.0529326	0.00030931	0.004175537	0.01399983	0.04359227	0.72060803
L	42	0.08715358	0.00031677	0.000391348	0.0039333	0.02892365	0.69464229
L	43	0.13520633	0.00120362	0.000473652	0.00147905	0.05949511	0.70825969
L	44	0.06517977	0.00030691	0.003229842	0.01016264	0.0347063	0.72300126
L	45	0.09772327	0.00022407	0.000532217	0.00211143	0.04667395	0.72337034
L	46	0.05822143	0.00056108	0.001288498	0.00580516	0.02723723	0.67084274
L	47	0.09673833	0.00104899	0.0010903	0.00367164	0.04130803	0.70909985
L	48	0.09600258	0.00085437	8.80712E-05	0.00056721	0.02698769	0.70876035
L	49	0.08059076	0.00034474	0.001245739	0.00221067	0.01424456	0.73475179
L	50	0.09609295	0.00063921	0.000492251	0.00100933	0.01753478	0.72104733
L	51	0.08059076	0.00034474	0.001245739	0.00221067	0.01424456	0.73475179
L	52	0.09609295	0.00063921	0.000492251	0.00100933	0.01753478	0.72104733
L	53	0.09600258	0.00085437	8.80712E-05	0.00056721	0.02698769	0.70876035
L	54	0.06579334	0.00016913	0.001939241	0.00328583	0.01235523	0.73689512
L	55	0.03426093	0.00026118	0.001945303	0.00316995	0.02690947	0.69484422
L	56	0.04793353	0.00017767	0.002247414	0.0036342	0.01663324	0.71949414
L	57	0.04793353	0.00017767	0.002247414	0.0036342	0.01663324	0.71949414
L	58	0.08059076	0.00034474	0.001245739	0.00221067	0.01424456	0.73475179
L	59	0.05636113	0.0005817	0.001183619	0.00234193	0.03428218	0.68876063
L	60	0.04793353	0.00017767	0.002247414	0.0036342	0.01663324	0.71949414
L	61	0.03426093	0.00026118	0.001945303	0.00316995	0.02690947	0.69484422
L	62	0.08059076	0.00034474	0.001245739	0.00221067	0.01424456	0.73475179
L	63	0.06579334	0.00016913	0.001939241	0.00328583	0.01235523	0.73689512
L	64	0.09600258	0.00085437	8.80712E-05	0.00056721	0.02698769	0.70876035
L	65	0.04793353	0.00017767	0.002247414	0.0036342	0.01663324	0.71949414
L	66	0.08860593	0.00049688	6.06359E-05	0.00051511	0.01854723	0.68905617
L	67	0.05698693	0.00025016	0.000698745	0.00296537	0.01046758	0.67750131
L	68	0.07375631	0.00041018	0.000163656	0.00159565	0.01231379	0.67843177
L	69	0.05698693	0.00025016	0.000698745	0.00296537	0.01046758	0.67750131
L	70	0.07375631	0.00041018	0.000163656	0.00159565	0.01231379	0.67843177
L	71	0.08860593	0.00049688	6.06359E-05	0.00051511	0.01854723	0.68905617
L	72	0.03820437	0.00012381	0.001344254	0.0039174	0.01122826	0.67820179
L	73	0.06395293	0.00021919	0.001610079	0.0027854	0.01908855	0.68574021
L	74	0.04055564	0.00011169	0.001728378	0.00387758	0.01351353	0.67654473
L	75	0.04055564	0.00011169	0.001728378	0.00387758	0.01351353	0.67654473
L	76	0.05698693	0.00025016	0.000698745	0.00296537	0.01046758	0.67750131
L	77	0.08212608	0.00039448	0.001046109	0.00141419	0.02342667	0.69817242
L	78	0.04055564	0.00011169	0.001728378	0.00387758	0.01351353	0.67654473
L	79	0.06395293	0.00021919	0.001610079	0.0027854	0.01908855	0.68574021
L	80	0.05698693	0.00025016	0.000698745	0.00296537	0.01046758	0.67750131
L	81	0.03820437	0.00012381	0.001344254	0.0039174	0.01122826	0.67820179
L	82	0.08860593	0.00049688	6.06359E-05	0.00051511	0.01854723	0.68905617
L	83	0.04055564	0.00011169	0.001728378	0.00387758	0.01351353	0.67654473
L	84	0.10183862	0.00112551	0.000129051	0.00095521	0.04005901	0.70193541
L	85	0.06780842	0.00043481	0.001144493	0.00361775	0.01471618	0.69172035
L	86	0.08982657	0.00082529	0.000367025	0.0018995	0.02307102	0.69706034
L	87	0.06780842	0.00043481	0.001144493	0.00361775	0.01471618	0.69172035
L	88	0.08982657	0.00082529	0.000367025	0.0018995	0.02307102	0.69706034
L	89	0.10183862	0.00112551	0.000129051	0.00095521	0.04005901	0.70193541
L	90	0.05252676	0.00020768	0.001901465	0.00488203	0.01203643	0.69094522
L	91	0.04810238	0.00038087	0.002187647	0.00429948	0.03460569	0.68874113
L	92	0.03414123	0.00021021	0.002352513	0.00525184	0.01924633	0.68963862
L	93	0.03414123	0.00021021	0.002352513	0.00525184	0.01924633	0.68963862
L	94	0.06780842	0.00043481	0.001144493	0.00361775	0.01471618	0.69172035
L	95	0.06874868	0.00080625	0.001378624	0.00234435	0.04718429	0.6900738
L	96	0.03414123	0.00021021	0.002352513	0.00525184	0.01924633	0.68963862
L	97	0.04810238	0.00038087	0.002187647	0.00429948	0.03460569	0.68874113
L	98	0.06780842	0.00043481	0.001144493	0.00361775	0.01471618	0.69172035
L	99	0.05252676	0.00020768	0.001901465	0.00488203	0.01203643	0.69094522
L	100	0.0699875	0.00045356	0.00109692	0.00225582	0.01511949	0.68867217
L	101	0.04406807	0.00019981	0.002138442	0.00498081	0.01210902	0.69604183
L	102	0.05706225	0.00050306	0.001052349	0.00091398	0.01904542	0.7169102
L	103	0.06426644	0.00036707	0.001137954	0.00308169	0.02041669	0.69872681
L	104	0.05155026	0.00025025	0.000802479	0.00227928	0.01206128	0.67481031
L	105	0.05444308	0.00028641	0.000852634	0.00177648	0.01838583	0.70054619
L	106	0.04509207	0.00056728	0.001262042	0.00196958	0.02186298	0.69217651
L	107	0.0616366	0.00052132	0.001118746	0.00367352	0.02993222	0.68570844

Table 15
n260/mid channel, Antenna L Patch simulated 4cm2 PD at PD_Design_Target
(if simulation performed with correct housing material properties) (Δmin)

Antenna	Beam ID_1	Simulated 4cm² PD (mW/cm²) Corresponding to PD_design_target if the simulation was performed with correct No. Module Type housing material properties					
		S4(Right)	S3(Left)	S5(Top)	S6(Bottom)	S1(Front)	S2(Back)
L	1	0.08554486	0.00194983	0.000230645	0.00174341	0.02759522	0.72970505
L	2	0.10468837	0.00119179	0.00014638	0.00475483	0.03144618	0.71053785
L	3	0.07918568	0.00219944	0.001404201	0.0021889	0.02550021	0.74131024
L	4	0.04864533	0.0006413	0.001845252	0.00557275	0.02792213	0.74131024
L	5	0.09120936	0.00051858	0.00025734	0.0143089	0.03092058	0.70990127
L	6	0.05283269	0.000428	0.004814316	0.00089132	0.02314774	0.72038934
L	7	0.06904816	0.00031553	0.000765561	0.0036148	0.03682568	0.7280638
L	8	0.10042674	0.00056572	0.000233554	0.01797492	0.02840229	0.70830975
L	9	0.06043831	0.00041433	0.006462632	0.00113545	0.01994734	0.69339416
L	10	0.1185308	0.00040658	0.000375498	0.01848023	0.02128449	0.73817695
L	11	0.08384175	0.00067464	0.000254115	0.00131928	0.03269838	0.72509027
L	12	0.13188995	0.00033956	0.000135057	0.02137292	0.01821153	0.72780803
L	13	0.05537573	0.00034238	0.006610838	0.00109008	0.02257844	0.69129847
L	14	0.09281452	0.00021405	0.000397179	0.00585805	0.04319224	0.70125954
L	15	0.07837899	0.00057419	0.001433355	0.00646952	0.02574223	0.74131024
L	16	0.05202169	0.00066951	0.000998474	0.0019058	0.02487611	0.74131024
L	17	0.11595979	0.00072276	0.00028518	0.0040704	0.0322339	0.69261038
L	18	0.09814735	0.00114049	0.000504579	0.00945832	0.02758107	0.65335486
L	19	0.1259694	0.00055273	0.001019283	0.00234404	0.02868922	0.71454388
L	20	0.07111267	0.00047761	0.001949514	0.00598467	0.01701382	0.73109865
L	21	0.07095235	0.00029534	0.000240531	0.01358827	0.01855302	0.74131024
L	22	0.08407491	0.00041167	0.005205704	0.00088584	0.01695562	0.74131024
L	23	0.05597672	0.0003119	0.000840503	0.00354664	0.02019524	0.74131024
L	24	0.07848189	0.00023861	0.000180911	0.01638035	0.01741316	0.74131024
L	25	0.10681872	0.00053766	0.006747798	0.00180512	0.01714984	0.74131024
L	26	0.07493154	0.00033446	0.000102046	0.01987521	0.0198854	0.74131024
L	27	0.0712423	0.00021677	0.000167642	0.00110013	0.0195838	0.74131024
L	28	0.08300795	0.00055025	0.000144872	0.02222828	0.02013356	0.74131024
L	29	0.10072954	0.00058349	0.007280029	0.00055893	0.01921706	0.74131024
L	30	0.06487117	0.00020362	0.000357317	0.00402099	0.01782634	0.74131024
L	31	0.07083114	0.00037566	0.00140246	0.0064248	0.02657289	0.74131024
L	32	0.06612305	0.00022367	0.001108005	0.00217882	0.02017625	0.74131024
L	33	0.13425617	0.00189004	0.000408939	0.00433065	0.0310037	0.74131024
L	34	0.13816552	0.00176489	0.000321166	0.01078086	0.03687033	0.74131024
L	35	0.13479818	0.0019812	0.001690287	0.00357632	0.02870422	0.74131024
L	36	0.07852436	0.00084998	0.003305829	0.00718985	0.03231348	0.71129704
L	37	0.11004409	0.00058521	0.000282076	0.01788199	0.02940978	0.7150812
L	38	0.08313657	0.00071731	0.0083376	0.00133932	0.03247057	0.72044082
L	39	0.08772432	0.00051861	0.000980011	0.00340461	0.03843308	0.73516163
L	40	0.12303152	0.00044752	0.000211678	0.02236106	0.02547392	0.70507474
L	41	0.10724218	0.0008155	0.011446849	0.00225577	0.02895937	0.71798509
L	42	0.13042454	0.00061185	0.000343009	0.02618786	0.0247865	0.71196852
L	43	0.08052545	0.00056653	0.000205713	0.0014414	0.03386829	0.69653229
L	44	0.15181391	0.00047794	0.000165896	0.03053586	0.02294944	0.73259549
L	45	0.09922512	0.0005952	0.012548135	0.00110964	0.03459651	0.72851262
L	46	0.08781674	0.00025349	0.000458579	0.0055206	0.03848599	0.6999658
L	47	0.10473472	0.00061593	0.002097947	0.00743064	0.04078351	0.74131024
L	48	0.07614375	0.00060061	0.001486029	0.00198554	0.03512549	0.7334394
L	49	0.06352441	0.00146877	0.002323605	0.00443707	0.01714252	0.71488661
L	50	0.07544517	0.00092425	0.000671189	0.00615317	0.02530297	0.70064536
L	51	0.06352441	0.00146877	0.002323605	0.00443707	0.01714252	0.71488661
L	52	0.06023157	0.00042359	0.00196389	0.00239704	0.01964792	0.74131024
L	53	0.07838008	0.00028907	0.000725526	0.00451909	0.02583189	0.73786071
L	54	0.05544416	0.00127738	0.004006258	0.0004456	0.01267053	0.74131024
L	55	0.06023157	0.00042359	0.00196389	0.00239704	0.01964792	0.74131024
L	56	0.08423087	0.00055582	8.95997E-05	0.00611263	0.02858012	0.7284277
L	57	0.05544416	0.00127738	0.004006258	0.0004456	0.01267053	0.74131024
L	58	0.07838008	0.00028907	0.000725526	0.00451909	0.02583189	0.73786071
L	59	0.06023157	0.00042359	0.00196389	0.00239704	0.01964792	0.74131024
L	60	0.08423087	0.00055582	8.95997E-05	0.00611263	0.02858012	0.7284277
L	61	0.06388577	0.00161248	0.003805964	0.00182336	0.01228273	0.74131024
L	62	0.07838008	0.00028907	0.000725526	0.00451909	0.02583189	0.73786071
L	63	0.04415008	0.00081297	0.003243226	0.00074698	0.01531635	0.74131024
L	64	0.04415008	0.00081297	0.003243226	0.00074698	0.01531635	0.74131024
L	65	0.06352441	0.00146877	0.002323605	0.00443707	0.01714252	0.71488661
L	66	0.06023157	0.00042359	0.00196389	0.00239704	0.01964792	0.74131024
L	67	0.10234802	0.00059855	0.002957248	0.00202894	0.02273252	0.71871918
L	68	0.09281572	0.000544	0.001229194	0.00345715	0.0166276	0.72288107
L	69	0.10234802	0.00059855	0.002957248	0.00202894	0.02273252	0.71871918
L	70	0.05126103	0.00033897	0.001574424	0.00284426	0.01442107	0.74131024
L	71	0.06160565	0.0002796	0.000539345	0.00371521	0.01126848	0.74131024
L	72	0.09852375	0.00060856	0.003780645	0.00095312	0.0241605	0.74131024
L	73	0.05126103	0.00033897	0.001574424	0.00284426	0.01442107	0.74131024
L	74	0.08081614	0.00041528	0.000140607	0.00407289	0.01213002	0.74131024
L	75	0.09852375	0.00060856	0.003780645	0.00095312	0.0241605	0.74131024
L	76	0.06160565	0.0002796	0.000539345	0.00371521	0.01126848	0.74131024
L	77	0.05126103	0.00033897	0.001574424	0.00284426	0.01442107	0.74131024
L	78	0.08081614	0.00041528	0.000140607	0.00407289	0.01213002	0.74131024
L	79	0.10867863	0.00055537	0.004021635	0.00085594	0.02579083	0.73232208
L	80	0.06160565	0.0002796	0.000539345	0.00371521	0.01126848	0.74131024
L	81	0.07661688	0.00052527	0.002723223	0.00177676	0.01951659	0.74131024
L	82	0.07661688	0.00052527	0.002723223	0.00177676	0.01951659	0.74131024
L	83	0.05126103	0.00033897	0.001574424	0.00284426	0.01442107	0.74131024
L	84	0.10234802	0.00059855	0.002957248	0.00202894	0.02273252	0.71871918
L	85	0.11562722	0.00132018	0.004313748	0.00321472	0.01801895	0.69108186
L	86	0.11466632	0.00121715	0.001495805	0.0056657	0.01803323	0.71626393
L	87	0.11562722	0.00132018	0.004313748	0.00321472	0.01801895	0.69108186
L	88	0.06880873	0.00067407	0.002781166	0.00384708	0.02428038	0.7081604
L	89	0.0947348	0.00046804	0.000802183	0.00563187	0.02001259	0.70863186
L	90	0.11508338	0.00175452	0.007485874	0.00101168	0.0270472	0.72882031
L	91	0.06880873	0.00067407	0.002781166	0.00384708	0.02428038	0.7081604
L	92	0.11448804	0.00086664	0.000180223	0.00666535	0.01842566	0.72794719
L	93	0.11508338	0.00175452	0.007485874	0.00101168	0.0270472	0.72882031
L	94	0.0947348	0.00046804	0.000802183	0.00563187	0.02001259	0.70863186
L	95	0.06880873	0.00067407	0.002781166	0.00384708	0.02428038	0.7081604
L	96	0.11448804	0.00086664	0.000180223	0.00666535	0.01842566	0.72794719
L	97	0.13098158	0.00185423	0.007270193	0.00162539	0.0209497	0.74131024
L	98	0.0947348	0.00046804	0.000802183	0.00563187	0.02001259	0.70863186
L	99	0.08136268	0.00119423	0.005291293	0.00193716	0.02701654	0.70822527
L	100	0.08136268	0.00119423	0.005291293	0.00193716	0.02701654	0.70822527
L	101	0.06087483	0.00098454	0.003827641	0.0026489	0.02310538	0.7166833
L	102	0.08669032	0.00100137	0.005863104	0.00214151	0.02552423	0.74131024
L	103	0.04411097	0.00135295	0.001593291	0.00246052	0.00727595	0.74131024
L	104	0.05238827	0.00032547	0.002416995	0.00422729	0.028763	0.74131024
L	105	0.06856625	0.00046819	0.001570428	0.00098715	0.00548599	0.74131024
L	106	0.06128741	0.00033641	0.002409245	0.00415344	0.03276695	0.74131024
L	107	0.08369459	0.00130788	0.002914676	0.00248682	0.00855679	0.71737211
L	108	0.07858595	0.0005285	0.004314687	0.00521252	0.03651161	0.72188935

Table 16

n258/mid channel, Antenna K Patch simulated 4cm2 PD at PD_Design_Target (if simulation performed with correct housing material properties) (Δmin)

Antenna	Beam ID_1	Simulated 4cm^2 PD (mW/cm^2) Corresponding to PD_design_target if the simulation was					
		S4(Right)	S3(Left)	S5(Top)	S6(Bottom)	S1(Front)	S2(Back)
K	0	0.32710488	0.00131512	0.000174675	0.00013086	0.74131024	0.01810367
K	1	0.34604817	0.00089865	0.001306253	0.00018048	0.74131024	0.02680142
K	2	0.28775782	0.00100409	0.00164055	0.00039647	0.74131024	0.01648644
K	3	0.12953164	0.00035117	0.042240734	0.00194171	0.74131024	0.010327
K	4	0.19937153	0.00092896	0.004383126	0.00065434	0.72379179	0.01105953
K	5	0.26091979	0.00030964	0.025217061	0.00271315	0.64241195	0.03062312
K	6	0.27813154	0.00101637	0.002050813	0.00065378	0.72631327	0.01387314
K	7	0.15832643	0.00031164	0.018153904	0.00032962	0.70216291	0.01170205
K	8	0.31848488	0.00056809	0.002542038	0.00041562	0.69806336	0.03233509
K	9	0.13984514	0.00027387	0.038286906	0.00120305	0.72399343	0.01279626
K	10	0.13284684	0.00035843	0.045443309	0.0027091	0.73284424	0.01359574
K	11	0.2629741	0.00090741	0.000337531	0.00034657	0.73695124	0.01263956
K	12	0.35090061	0.00083333	0.003279476	0.00011041	0.7363895	0.03095493
K	13	0.13677966	0.00040221	0.030806206	0.00064541	0.70179525	0.01509921
K	14	0.15920931	0.00029948	0.042610093	0.00299393	0.74131024	0.01669117
K	15	0.24208608	0.00037523	0.035598388	0.00312198	0.69015805	0.02561901
K	16	0.31859302	0.00086074	0.000767199	0.0001517	0.74131024	0.01805701
K	17	0.28077977	0.00083853	0.001168589	0.00034294	0.72131421	0.01256804
K	18	0.26019277	0.0009892	0.000974105	4.4303E-05	0.74131024	0.01225651
K	19	0.17974547	0.00014306	0.022028815	0.00803525	0.68498663	0.01702167
K	20	0.32715683	0.00081703	0.002079396	0.0013402	0.74131024	0.03750351
K	21	0.15855333	0.00013472	0.012086676	0.00257674	0.66708825	0.01184519
K	22	0.36135435	0.00085276	0.001387594	0.00083662	0.73919133	0.03081879
K	23	0.3209248	0.00039435	0.007709795	0.00513602	0.70389899	0.04235562
K	24	0.20478266	0.00035955	0.002776886	4.629E-05	0.65729343	0.00944628
K	25	0.2332843	0.00029587	0.021759939	0.00904817	0.7190484	0.02678391
K	26	0.1290106	0.00011093	0.020633136	0.00723401	0.67480555	0.01120238
K	27	0.34028005	0.00069375	0.000312535	0.00041949	0.74062354	0.02987726
K	28	0.26643969	0.00067033	0.002234162	0.00055297	0.69900148	0.01201659
K	29	0.22097898	0.00044147	0.015387023	0.00650793	0.72061479	0.02767252
K	30	0.12527762	0.00017516	0.01763914	0.00523401	0.67181636	0.00865918
K	31	0.15226091	0.00018296	0.01451113	0.0032851	0.68700198	0.00871224
K	32	0.31996776	0.001663	0.000445266	0.00019344	0.73830424	0.02700875
K	33	0.32747788	0.00130808	0.00148197	0.00040011	0.74131024	0.02667591
K	34	0.26770066	0.00153792	0.001954751	0.00024143	0.74131024	0.02070594
K	35	0.18124695	0.00025214	0.040452211	0.00553108	0.74131024	0.01458949
K	36	0.28585985	0.00124617	0.003434182	0.00124699	0.74131024	0.02224861
K	37	0.24453687	0.00022339	0.021021234	0.00356093	0.71644778	0.02196177
K	38	0.33960997	0.00151443	0.002757314	0.00120212	0.74131024	0.02954362
K	39	0.25992357	0.00037572	0.015753323	0.00184183	0.72500141	0.02593207
K	40	0.29535755	0.00057081	0.003250804	0.0002492	0.73993024	0.02224527
K	41	0.21041716	0.00028045	0.036655424	0.00475974	0.74131024	0.01943521
K	42	0.17444354	0.00023636	0.044190661	0.00680668	0.71486333	0.01385564
K	43	0.31145723	0.00124632	0.000460652	0.00060475	0.74131024	0.02646541
K	44	0.32864231	0.00114536	0.003201178	0.00042371	0.74131024	0.02672447
K	45	0.21359209	0.00051681	0.028460808	0.00324361	0.69933054	0.02094145
K	46	0.1815108	0.00031343	0.038239144	0.00563887	0.69509682	0.01484701
K	47	0.22675582	0.00024013	0.029392159	0.00428731	0.71667885	0.01900956
K	48	0.30152883	0.00028721	0.000705189	3.1915E-05	0.74131024	0.01731866
K	49	0.30887031	0.00038189	0.003810789	0.00022094	0.74131024	0.02147415
K	50	0.26592587	0.00018861	0.004105619	0.00014	0.74131024	0.01255272
K	51	0.11573764	0.00022975	0.023166787	0.00114589	0.71219532	0.01478709
K	52	0.15640652	0.00014044	0.019202287	0.00088817	0.71950117	0.01368012
K	53	0.18730862	0.00034058	0.020756816	0.00108469	0.72065593	0.01729306
K	54	0.26592587	0.00018861	0.004105619	0.00014	0.74131024	0.01255272
K	55	0.15640652	0.00014044	0.019202287	0.00088817	0.71950117	0.01368012
K	56	0.26672101	0.00041148	0.012347724	0.00068401	0.73179879	0.02194755
K	57	0.11573764	0.00022975	0.023166787	0.00114589	0.71219532	0.01478709
K	58	0.18730862	0.00034058	0.020756816	0.00108469	0.72065593	0.01729306
K	59	0.26592587	0.00018861	0.004105619	0.00014	0.74131024	0.01255272
K	60	0.26672101	0.00041148	0.012347724	0.00068401	0.73179879	0.02194755
K	61	0.11573764	0.00022975	0.023166787	0.00114589	0.71219532	0.01478709
K	62	0.11573764	0.00022975	0.023166787	0.00114589	0.71219532	0.01478709
K	63	0.11573764	0.00022975	0.023166787	0.00114589	0.71219532	0.01478709
K	64	0.30152883	0.00028721	0.000705189	3.1915E-05	0.74131024	0.01731866
K	65	0.11573764	0.00022975	0.023166787	0.00114589	0.71219532	0.01478709
K	66	0.31842534	0.00039228	0.001361768	0.00035974	0.74131024	0.02131826
K	67	0.24197284	0.00028631	0.003794122	0.00095537	0.6835572	0.01020256
K	68	0.31842534	0.00039228	0.001361768	0.00035974	0.74131024	0.02131826
K	69	0.18813252	0.00018592	0.011468862	0.00220163	0.74131024	0.01732183
K	70	0.25327741	0.00026358	0.008158649	0.0015777	0.74131024	0.02384893
K	71	0.14790126	0.00018536	0.011151541	0.00221334	0.70414449	0.00796162
K	72	0.31842534	0.00039228	0.001361768	0.00035974	0.74131024	0.02131826
K	73	0.25327741	0.00026358	0.008158649	0.0015777	0.74131024	0.02384893
K	74	0.19107149	0.00023719	0.007851732	0.00166776	0.67370531	0.00826378
K	75	0.18813252	0.00018592	0.011468862	0.00220163	0.74131024	0.01732183
K	76	0.14790126	0.00018536	0.011151541	0.00221334	0.70414449	0.00796162
K	77	0.31842534	0.00039228	0.001361768	0.00035974	0.74131024	0.02131826
K	78	0.19107149	0.00023719	0.007851732	0.00166776	0.67370531	0.00826378
K	79	0.18813252	0.00018592	0.011468862	0.00220163	0.74131024	0.01732183
K	80	0.18813252	0.00018592	0.011468862	0.00220163	0.74131024	0.01732183
K	81	0.18813252	0.00018592	0.011468862	0.00220163	0.74131024	0.01732183
K	82	0.29351433	0.00035542	0.000811121	0.00038298	0.71608909	0.01588083
K	83	0.18813252	0.00018592	0.011468862	0.00220163	0.74131024	0.01732183
K	84	0.28860842	0.00036948	0.001092521	0.00022093	0.74131024	0.01972535
K	85	0.28043281	0.00047674	0.004365016	0.00085583	0.74131024	0.02000111
K	86	0.29076327	0.00031259	0.003315988	0.00034541	0.74131024	0.01837421
K	87	0.18496842	0.00023893	0.023084196	0.00235712	0.74131024	0.01218121
K	88	0.2355315	0.00016496	0.018503532	0.00172431	0.74131024	0.01526656
K	89	0.20003503	0.00037357	0.021058079	0.00240556	0.74131024	0.01398237
K	90	0.29076327	0.00031259	0.003315988	0.00034541	0.74131024	0.01837421
K	91	0.2355315	0.00016496	0.018503532	0.00172431	0.74131024	0.01526656
K	92	0.25191556	0.00047194	0.013084673	0.00177389	0.74131024	0.0165806
K	93	0.18496842	0.00023893	0.023084196	0.00235712	0.74131024	0.01218121
K	94	0.20003503	0.00037357	0.021058079	0.00240556	0.74131024	0.01398237
K	95	0.29076327	0.00031259	0.003315988	0.00034541	0.74131024	0.01837421
K	96	0.25191556	0.00047194	0.013084673	0.00177389	0.74131024	0.0165806
K	97	0.18496842	0.00023893	0.023084196	0.00235712	0.74131024	0.01218121
K	98	0.18496842	0.00023893	0.023084196	0.00235712	0.74131024	0.01218121
K	99	0.18496842	0.00023893	0.023084196	0.00235712	0.74131024	0.01218121
K	100	0.25408471	0.00049972	0.012696564	0.00129317	0.70868622	0.01855537
K	101	0.18496842	0.00023893	0.023084196	0.00235712	0.74131024	0.01218121
K	102	0.19445719	0.0001282	0.00822786	0.00058573	0.73109457	0.01235159
K	103	0.19926206	0.00043768	0.013760249	0.00051717	0.70724454	0.0117244
K	104	0.20942274	0.00013998	0.005406943	0.00053195	0.74131024	0.0135628
K	105	0.20599279	0.00041592	0.006047588	0.00183698	0.7227493	0.01236422
K	106	0.18192399	0.0001432	0.009293416	0.00084063	0.74131024	0.01282901
K	107	0.19641486	0.00051992	0.013401365	0.00157268	0.74131024	0.012669

Table 17

n261/mid channel, Antenna K Patch simulated 4cm2 PD at PD_Design_Target (if simulation performed with correct housing material properties) (Δmin)

Antenna	Beam ID_1	Simulated 4cm^2 PD (mW/cm^2) Corresponding to PD_design_target if the simulation was					
		S4(Right)	S3(Left)	S5(Top)	S6(Bottom)	S1(Front)	S2(Back)
K	0	0.35139121	0.000906	0.001596688	0.0002033	0.72815782	0.01706496
K	1	0.34310929	0.00123019	0.000345922	4.2053E-05	0.73908758	0.01347266
K	2	0.2231503	0.00062886	0.001416101	0.00104834	0.72496663	0.00734282
K	3	0.31477167	0.00015979	0.003463177	0.00158706	0.72378933	0.03430119
K	4	0.24111017	0.00014542	0.001426455	0.00047802	0.70571176	0.02357753
K	5	0.15617549	0.00020113	0.001752331	0.00173994	0.72755776	0.0079291
K	6	0.37103023	0.00018071	0.00208005	0.0001417	0.74131024	0.03351188
K	7	0.22371676	0.00034756	0.000554252	0.00037196	0.71463143	0.00847461
K	8	0.24951488	0.00016968	0.003676786	0.00198745	0.70472046	0.0264392
K	9	0.35369848	0.0002019	0.003126575	0.00072858	0.74131024	0.04166306
K	10	0.27342736	0.00091927	0.001415329	0.00045255	0.74131024	0.01006803
K	11	0.35394718	0.00021306	0.002850968	0.00038009	0.74131024	0.04243763
K	12	0.36253883	0.00042413	0.002138258	0.00034218	0.72519817	0.02766185
K	13	0.20189322	0.00019001	0.001134517	0.00073716	0.72709538	0.00812912
K	14	0.13438388	0.00028545	0.002468319	0.00194343	0.73725274	0.00869777
K	15	0.24666193	0.00038246	0.000854568	0.00033976	0.72578113	0.00629745
K	16	0.30225887	0.00163812	0.001188993	0.00011775	0.74131024	0.00966856
K	17	0.3355398	0.00177918	0.000436748	0.00033351	0.73390715	0.01254862
K	18	0.32189537	0.00045213	0.000583249	0.00050694	0.74051256	0.02049083
K	19	0.18107433	0.000414	0.003442988	0.00161449	0.74131024	0.01527174
K	20	0.26155734	0.00040014	0.001897552	0.00012343	0.74131024	0.02394309
K	21	0.33536291	0.00053519	0.002061979	0.0012879	0.70951217	0.03980025
K	22	0.20830784	0.0002674	0.00191763	0.00015059	0.73834406	0.00794356
K	23	0.37069945	0.0005412	0.000921061	0.00034805	0.74131024	0.03028538
K	24	0.24777066	0.00022468	0.004256676	0.00249956	0.68670444	0.02583026
K	25	0.1253193	0.00026955	0.002746267	0.00091158	0.74131024	0.00599649
K	26	0.27882455	0.00076372	0.001407907	0.00180674	0.7108748	0.01273183
K	27	0.13403329	0.00030693	0.002818435	0.00042515	0.74131024	0.00547113
K	28	0.24759406	0.00030764	0.001829721	0.00040393	0.74131024	0.00861037
K	29	0.34607378	0.00049167	0.000851394	0.00026163	0.7381596	0.02967794
K	30	0.30012818	0.00045768	0.003038375	0.00214488	0.69932289	0.03646284
K	31	0.38234301	0.00036769	0.000847633	0.00068167	0.74131024	0.02709025
K	32	0.35750986	0.00215486	0.001467759	0.00023156	0.73247505	0.01874802
K	33	0.35191489	0.00237087	0.000600748	0.00022505	0.73403678	0.01907065
K	34	0.29583578	0.0007907	0.001256102	0.00117517	0.73782917	0.01613303
K	35	0.23738175	0.00035673	0.003859326	0.00207123	0.74131024	0.02326996
K	36	0.23035709	0.00026199	0.002220897	0.00040823	0.73940591	0.01588581
K	37	0.24964525	0.0004173	0.002027844	0.00218963	0.71454366	0.02318604
K	38	0.31821549	0.00016802	0.002458145	0.00020703	0.72633568	0.02073924
K	39	0.32947011	0.00042086	0.001173331	0.00060333	0.72127402	0.02098483
K	40	0.19286207	0.0002244	0.004099502	0.00295515	0.72624172	0.01878288
K	41	0.26078208	0.00018871	0.004139229	0.00105785	0.74131024	0.02695554
K	42	0.28284455	0.00141551	0.001576576	0.00146684	0.74131024	0.01419028
K	43	0.26549842	0.00027367	0.004190862	0.00055521	0.74131024	0.0272979
K	44	0.34398946	0.00061489	0.002356566	0.00058732	0.71500752	0.01870602
K	45	0.30186087	0.00025117	0.000958123	0.00073844	0.72654552	0.01984688
K	46	0.21879809	0.00040572	0.003007643	0.0028179	0.72750393	0.02274033
K	47	0.35690761	0.00048239	0.001360738	0.00083728	0.72655202	0.02053806
K	48	0.31895484	0.000535	0.001822212	9.7975E-05	0.72793318	0.01880508
K	49	0.31602943	0.00064198	0.000724961	0.00025956	0.73545419	0.01407478
K	50	0.22400004	0.00049492	0.001009262	0.00097572	0.74131024	0.00659434
K	51	0.19874817	0.00013198	0.003311726	0.00089402	0.72401467	0.02074454
K	52	0.19874817	0.00013198	0.003311726	0.00089402	0.72401467	0.02074454
K	53	0.16251675	0.00028929	0.002317532	0.00107824	0.73780696	0.01405243
K	54	0.2970017	0.0003782	0.002999352	0.00024717	0.71742236	0.02192389
K	55	0.22400004	0.00049492	0.001009262	0.00097572	0.74131024	0.00659434
K	56	0.19874817	0.00013198	0.003311726	0.00089402	0.72401467	0.02074454
K	57	0.19874817	0.00013198	0.003311726	0.00089402	0.72401467	0.02074454
K	58	0.22400004	0.00049492	0.001009262	0.00097572	0.74131024	0.00659434
K	59	0.25720315	0.0002066	0.003538322	0.00056061	0.71629354	0.02319941
K	60	0.2970017	0.0003782	0.002999352	0.00024717	0.71742236	0.02192389
K	61	0.28023023	0.00064197	0.000543896	0.00064361	0.74131024	0.00994408
K	62	0.16251675	0.00028929	0.002317532	0.00107824	0.73780696	0.01405243
K	63	0.22400004	0.00049492	0.001009262	0.00097572	0.74131024	0.00659434
K	64	0.31602943	0.00064198	0.000724961	0.00025956	0.73545419	0.01407478
K	65	0.19874817	0.00013198	0.003311726	0.00089402	0.72401467	0.02074454
K	66	0.24282461	0.00082658	0.001426704	0.00021058	0.72815407	0.00588816
K	67	0.30474033	0.00096981	0.000675832	0.00020118	0.72666683	0.01139636
K	68	0.32241502	0.0006526	0.000669156	0.00073316	0.70860547	0.02440154
K	69	0.20072768	0.00018552	0.002147846	0.00087345	0.73414184	0.01850403
K	70	0.20072768	0.00018552	0.002147846	0.00087345	0.73414184	0.01850403
K	71	0.28694731	0.00037387	0.001477702	0.00092276	0.73768466	0.02519905
K	72	0.1830225	0.00056783	0.002017653	0.00041938	0.72760784	0.00353096
K	73	0.32241502	0.0006526	0.000669156	0.00073316	0.70860547	0.02440154
K	74	0.20072768	0.00018552	0.002147846	0.00087345	0.73414184	0.01850403
K	75	0.20072768	0.00018552	0.002147846	0.00087345	0.73414184	0.01850403
K	76	0.32241502	0.0006526	0.000669156	0.00073316	0.70860547	0.02440154
K	77	0.13756699	0.00028584	0.002312601	0.00064807	0.72959568	0.00959606
K	78	0.1830225	0.00056783	0.002017653	0.00041938	0.72760784	0.00353096
K	79	0.32517752	0.00089176	0.00034953	0.00042873	0.70147498	0.01890036
K	80	0.28694731	0.00037387	0.001477702	0.00092276	0.73768466	0.02519905
K	81	0.32241502	0.0006526	0.000669156	0.00073316	0.70860547	0.02440154
K	82	0.30474033	0.00096981	0.000675832	0.00020118	0.72666683	0.01139636
K	83	0.20072768	0.00018552	0.002147846	0.00087345	0.73414184	0.01850403
K	84	0.29561849	0.00090559	0.002063999	0.00017664	0.72470455	0.01320364
K	85	0.31904621	0.00122137	0.000747007	0.00032955	0.73109736	0.01523715
K	86	0.29068248	0.00073386	0.001118183	0.00128415	0.73656643	0.0166066
K	87	0.18403947	0.0001896	0.003863727	0.00122107	0.7362069	0.01668682
K	88	0.18403947	0.0001896	0.003863727	0.00122107	0.7362069	0.01668682
K	89	0.22940395	0.00037507	0.002705234	0.00143526	0.74131024	0.01505635
K	90	0.26290591	0.00054546	0.003457571	0.00041571	0.72421198	0.01422283
K	91	0.29068248	0.00073386	0.001118183	0.00128415	0.73656643	0.0166066
K	92	0.18403947	0.0001896	0.003863727	0.00122107	0.7362069	0.01668682
K	93	0.18403947	0.0001896	0.003863727	0.00122107	0.7362069	0.01668682
K	94	0.29068248	0.00073386	0.001118183	0.00128415	0.73656643	0.0166066
K	95	0.22870746	0.00030108	0.004109167	0.00081567	0.72775753	0.01711006
K	96	0.26290591	0.00054546	0.003457571	0.00041571	0.72421198	0.01422283
K	97	0.31709556	0.00111851	0.000611142	0.00080581	0.72359217	0.01592042
K	98	0.22940395	0.00037507	0.002705234	0.00143526	0.74131024	0.01505635
K	99	0.29068248	0.00073386	0.001118183	0.00128415	0.73656643	0.0166066
K	100	0.27896684	0.00094481	0.001318958	0.00080777	0.73587042	0.01306732
K	101	0.21368548	0.00043516	0.00233369	0.00140312	0.73108873	0.01135099
K	102	0.21888061	0.00040118	0.002038032	0.00032243	0.72674089	0.01271675
K	103	0.21471321	0.00051028	0.001787184	0.00085454	0.73243871	0.01295429
K	104	0.21394017	0.0004294	0.001445649	0.0008686	0.73201059	0.01033488
K	105	0.21713645	0.00060174	0.001309436	0.00023813	0.7328121	0.01486869
K	106	0.20007901	0.00065279	0.002434955	0.00083329	0.73983845	0.01045268
K	107	0.20827005	0.00065628	0.002134671	0.00072612	0.73555888	0.01019947

Table 18
n260/mid channel, Antenna K Patch simulated 4cm2 PD at PD_Design_Target (if simulation performed with correct housing material properties) (Δmin)

Antenna	Beam ID_1	Simulated 4cm^2 PD (mW/cm^2) Corresponding to PD_design_target if the simulation was					
		S4(Right)	S3(Left)	S5(Top)	S6(Bottom)	S1(Front)	S2(Back)
K	109	0.46259612	0.00182638	0.000449273	3.4576E-05	0.71479315	0.01257451
K	110	0.4503673	0.00076437	0.000637452	0.00039994	0.71456631	0.01594427
K	111	0.40273162	0.00126236	0.000504737	0.00018264	0.70787572	0.01256214
K	112	0.4379141	0.00167369	0.00028332	8.2441E-05	0.72741867	0.01088847
K	113	0.43448867	0.00054556	0.004069722	0.0005023	0.73045186	0.02666681
K	114	0.37356171	0.00032068	0.001316782	0.00114124	0.68790574	0.01881076
K	115	0.34262312	0.00084036	0.002166322	9.3189E-05	0.68009785	0.03089559
K	116	0.50134825	0.00018552	0.00454062	6.7977E-05	0.74131024	0.03089859
K	117	0.37307428	0.00049007	0.001007709	0.00145428	0.6864247	0.0114737
K	118	0.32118096	0.00019541	0.000851473	0.00047539	0.69665595	0.03049812
K	119	0.38054997	0.00067149	0.00418575	0.00011912	0.68784472	0.02714088
K	120	0.41936626	0.00061198	0.000465057	0.00107073	0.7028021	0.00773242
K	121	0.40741014	0.00025298	0.002192251	0.00035261	0.74131024	0.01902831
K	122	0.38412722	0.00069118	0.003897657	0.00014478	0.69217074	0.03136136
K	123	0.39222705	0.00054733	0.001015248	0.00117397	0.69638272	0.01089221
K	124	0.35274157	0.00019377	0.000621938	0.00107781	0.68702545	0.02312416
K	125	0.43598539	0.00164	0.001339364	0.00012868	0.7344793	0.01211366
K	126	0.46664867	0.00218233	0.001714172	7.3048E-05	0.73695636	0.01233075
K	127	0.45947491	0.00184437	0.001364475	7.9818E-05	0.73411943	0.01218554
K	128	0.50226095	0.001744	0.001952022	0.00034182	0.72725676	0.01671915
K	129	0.39700959	0.00013555	0.002428381	0.00088628	0.73354355	0.02280427
K	130	0.40581581	0.00021535	0.000507804	0.00065919	0.72814172	0.03038704
K	131	0.31374658	0.00018449	0.001506245	0.00016704	0.74131024	0.03077567
K	132	0.39335543	0.000578	0.00546894	0.00019052	0.73147713	0.00959038
K	133	0.46902772	0.00042006	0.000203994	0.00107668	0.73043672	0.02988312
K	134	0.33033899	0.00020028	0.000497343	0.00014502	0.74131024	0.02731128
K	135	0.38386256	0.00031371	0.004604425	0.00025273	0.74131024	0.02259976
K	136	0.53522226	0.00047681	0.001128214	0.00109807	0.73673617	0.02851109
K	137	0.42320568	0.00132177	0.004862235	8.8614E-05	0.74131024	0.00801302
K	138	0.34524257	0.00012203	0.002672279	0.00036242	0.74131024	0.0265768
K	139	0.50845827	0.00024855	0.000330768	0.00129913	0.7249435	0.02955643
K	140	0.40011042	0.00047636	0.000462916	0.00042927	0.74131024	0.02854722
K	141	0.44579503	0.00320585	0.001071792	0.00013719	0.7144821	0.0192226
K	142	0.46427736	0.00236316	0.001696166	0.00035898	0.71346704	0.01937337
K	143	0.44351702	0.00275764	0.001486823	0.0001336	0.70809436	0.0177899
K	144	0.46443947	0.00309492	0.00123834	0.00028604	0.7206302	0.02051119
K	145	0.41309415	0.00043891	0.005743618	0.00120142	0.71232444	0.02235202
K	146	0.42635526	0.00044749	0.001273613	0.00162316	0.72819301	0.02325333
K	147	0.40679986	0.00079867	0.00291244	0.00020165	0.74131024	0.02456092
K	148	0.49187738	0.00050798	0.00889215	0.00018138	0.74131024	0.02405144
K	149	0.46248629	0.00076526	0.000869255	0.00237308	0.74131024	0.02412891
K	150	0.36101058	0.00032027	0.000687209	0.00046266	0.74131024	0.02530471
K	151	0.44444783	0.00075461	0.008042797	0.00026196	0.74131024	0.02182846
K	152	0.51561623	0.00093934	0.001317527	0.00199457	0.74131024	0.02497582
K	153	0.4311286	0.00094631	0.005841428	0.00034644	0.74131024	0.01810305
K	154	0.43556738	0.0005332	0.00573642	0.0003168	0.74131024	0.02384504
K	155	0.49586803	0.00067238	0.001068749	0.00230709	0.74131024	0.02486671
K	156	0.40205851	0.00053591	0.000664942	0.0012954	0.74131024	0.02223465
K	157	0.4514265	0.00101248	0.000813355	0.00039851	0.716874	0.01289244
K	158	0.4514265	0.00101248	0.000813355	0.00039851	0.716874	0.01289244
K	159	0.43893368	0.00071426	0.000168073	0.00058401	0.72828656	0.00954686
K	160	0.43893368	0.00071426	0.000168073	0.00058401	0.72828656	0.00954686
K	161	0.35215757	0.00065203	0.002034948	0.00016446	0.74131024	0.02332047
K	162	0.2960769	0.00040233	0.001789569	0.00035718	0.74131024	0.02226371
K	163	0.35215757	0.00065203	0.002034948	0.00016446	0.74131024	0.02332047
K	164	0.39833407	0.00086449	0.002146688	6.8549E-05	0.74131024	0.02185171
K	165	0.29440481	0.00018232	0.001174827	0.0005435	0.74131024	0.01847274
K	166	0.2960769	0.00040233	0.001789569	0.00035718	0.74131024	0.02226371
K	167	0.39833407	0.00086449	0.002146688	6.8549E-05	0.74131024	0.02185171
K	168	0.37224784	0.000433	0.000493034	0.00063233	0.7397052	0.01286348
K	169	0.4514265	0.00101248	0.000813355	0.00039851	0.716874	0.01289244
K	170	0.35215757	0.00065203	0.002034948	0.00016446	0.74131024	0.02332047
K	171	0.29440481	0.00018232	0.001174827	0.0005435	0.74131024	0.01847274
K	172	0.29440481	0.00018232	0.001174827	0.0005435	0.74131024	0.01847274
K	173	0.4514265	0.00101248	0.000813355	0.00039851	0.716874	0.01289244
K	174	0.2960769	0.00040233	0.001789569	0.00035718	0.74131024	0.02226371
K	175	0.40866468	0.00083957	0.001163304	0.00057608	0.71321343	0.01549262
K	176	0.36321249	0.00104693	0.003424344	0.00012497	0.70827786	0.00693015
K	177	0.41483714	0.00113418	0.002393145	0.00029824	0.70894549	0.0112734
K	178	0.41483714	0.00113418	0.002393145	0.00029824	0.70894549	0.0112734
K	179	0.2722105	0.00015326	0.001653073	0.00041932	0.71132944	0.0175029
K	180	0.32382571	0.00012819	0.000608618	0.00062299	0.71230283	0.01839182
K	181	0.2722105	0.00015326	0.001653073	0.00041932	0.71132944	0.0175029
K	182	0.24264249	0.00042994	0.002835907	0.00018144	0.71096356	0.01427563
K	183	0.37087797	0.00043104	0.000508024	0.00069376	0.71199463	0.01789102
K	184	0.32382571	0.00012819	0.000608618	0.00062299	0.71230283	0.01839182
K	185	0.24264249	0.00042994	0.002835907	0.00018144	0.71096356	0.01427563
K	186	0.40866468	0.00083957	0.001163304	0.00057608	0.71321343	0.01549262
K	187	0.36321249	0.00104693	0.003424344	0.00012497	0.70827786	0.00693015
K	188	0.2722105	0.00015326	0.001653073	0.00041932	0.71132944	0.0175029
K	189	0.37087797	0.00043104	0.000508024	0.00069376	0.71199463	0.01789102
K	190	0.37087797	0.00043104	0.000508024	0.00069376	0.71199463	0.01789102
K	191	0.2722105	0.00015326	0.001653073	0.00041932	0.71132944	0.0175029
K	192	0.41483714	0.00113418	0.002393145	0.00029824	0.70894549	0.0112734
K	193	0.44509675	0.00158854	0.001202987	0.0008267	0.71633609	0.01971322
K	194	0.41156902	0.00186126	0.002872013	0.00031175	0.71206123	0.01578325
K	195	0.43414638	0.00158341	0.001603765	0.00077723	0.72062457	0.01732898
K	196	0.43414638	0.00158341	0.001603765	0.00077723	0.72062457	0.01732898
K	197	0.31673779	0.00065105	0.003051541	0.00049863	0.74131024	0.01569524
K	198	0.29056389	0.00023515	0.00176658	0.00086369	0.74131024	0.01743551
K	199	0.31673779	0.00065105	0.003051541	0.00049863	0.74131024	0.01569524
K	200	0.35415466	0.0011187	0.004012674	0.00019665	0.74131024	0.01488717
K	201	0.34998	0.0004638	0.001160101	0.00111565	0.74131024	0.01746973
K	202	0.29056389	0.00023515	0.00176658	0.00086369	0.74131024	0.01743551
K	203	0.35415466	0.0011187	0.004012674	0.00019665	0.74131024	0.01488717
K	204	0.41845388	0.00102018	0.00127902	0.00112055	0.74131024	0.01726669
K	205	0.41156902	0.00186126	0.002872013	0.00031175	0.71206123	0.01578325
K	206	0.31673779	0.00065105	0.003051541	0.00049863	0.74131024	0.01569524
K	207	0.34998	0.0004638	0.001160101	0.00111565	0.74131024	0.01746973
K	208	0.34998	0.0004638	0.001160101	0.00111565	0.74131024	0.01746973
K	209	0.31179533	0.00028973	0.002361733	0.00088098	0.74131024	0.01381745
K	210	0.36116025	0.00082257	0.003180796	0.00078686	0.74131024	0.01728271
K	211	0.33823057	0.00063959	0.000884481	0.00021037	0.74131024	0.01406098
K	212	0.35734572	0.00041603	0.001494759	0.00050613	0.73076176	0.01543852
K	213	0.2744894	0.00051923	0.002317715	0.00028585	0.70369886	0.00988937
K	214	0.35425901	0.00048675	0.001293242	0.00041303	0.72627931	0.01520187
K	215	0.30330796	0.00107554	0.002600382	0.00041581	0.74131024	0.0103337
K	216	0.35905952	0.00076118	0.002521721	0.00084989	0.74131024	0.01476857

The test results in the table below shows that the all measured 4cm2 PD values are less than PD_design_target of 0.741 mW/cm2, thus, the non-selected surfaces have no influence on the determined Δ_{min} and input.power.limit in Section 7.

Table 19
4cm2 PD of the selected beams measured on the corresponding surfaces that are not selected for Δmin determination

Band	Antenna	Beam ID	Surface	Tested Power Level (dBm)	input.power.limit (dBm)	Meas. 4cm^2 PD (mW/cm^2)
n258	L	35	Front	3.1	3.1	0.012
		33	Right	2.6	2.6	0.116
n261	L	39	Front	0.2	0.2	0.018
		32	Right	0.2	0.2	0.133
n260	L	13	Front	4.6	4.6	0.012
		39	Right	1.1	1.1	0.117
n258	K	23	Rear	4.6	4.6	0.0157
n261	K	11	Rear	4.6	4.6	0.0176
n260	K	25	Rear	4.2	4.2	0.0175

7 PD Char

7.1 Single Beams

To determine the input power limit at each antenna port, simulation was performed at low, mid, and high channel for each mmW band supported, with 0 dBm input power per active port for n258 band, 0 dBm input power per active port for n261 band, and 0 dBm input power per active port for n260 band:

1. Obtained PDsurface value (the worst PD among all identified surfaces of the DUT) at all three channels for all single beams specified in the codebook.
2. Derived a scaling factor at low, mid and high channel, $s(i)_{low\_or\_mid\_or\_high}$, by:

$$s(i)_{low\_or\_mid\_or\_high} = \frac{PD\ design\ target}{sim.PD_{surface}(i)},\ i \in single\ beams \quad (1)$$

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

$$\boldsymbol{s(i)} = min\{s_{low}(i), s_{mid}(i), s_{high}(i)\},\ i \in single\ beams \quad (2)$$

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

7.2 Beam Pairs

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

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

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

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

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

7.3 *Input.Power.Limit* Calculations

The PD Char specifies the limit of input power at antenna port that corresponds to PD_design_target for all the beams.

Ideally, if there is no uncertainty associated with hardware design, the input power limit, denoted as $input.power.limit(i)$, for beam i can be obtained after accounting for the housing influence (Δ_{min}), given by:

- For n258, n261, and n260

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

where 0 dBm is the input power used in simulation for n258, n261 and n260, respectively; $s(i)$ is the scaling factor obtained from Eq. (2) or Eq. (4) for beam i; Δ_{min} is the worst-case housing influence factor for beam i.

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

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

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

Thus, Equation 5 is modified to:

If -TxAGC uncertainty < Δmin < TxAGC uncertainty,

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

else if Δmin < -TxAGC uncertainty,

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

else if Δmin > TxAGC uncertainty,

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

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

Table 20
***input.power.limit* Calculation**

Band	Antenna	Δmin	TxAGC Uncertainty	*input.power.limit*	Notes
n258	L	1.97	0.7	*input.power.limit(i) = sim.power_limit + 1.27*	Using Eq.8
n258	K	4.55	0.7	*input.power.limit(i) = sim.power_limit + 3.85*	Using Eq.8
n261	L	2.74	0.7	*input.power.limit(i) = sim.power_limit + 2.04*	Using Eq.8
n261	K	1.62	0.7	*input.power.limit(i) = sim.power_limit + 0.92*	Using Eq.8
n260	L	2.02	0.7	*input.power.limit(i) = sim.power_limit + 1.32*	Using Eq.8
n260	K	2.36	0.7	*input.power.limit(i) = sim.power_limit + 1.66*	Using Eq.8

Table 21
Permanent backoff applied to calculated input.power.limit

Band	Antenna	backoff (dB)
n258	L	3.6
n261	L	3.6
n260	L	3.6
n258	K	1.1
n261	K	1.1
n260	K	1.1

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

Table 22

5G mmWave NR n258 Antenna L Patch *input.power.limit*

Band	Beam ID 1	Beam ID 2	input.power.limit	Band	Beam ID 1	Beam ID 2	input.power.limit
n258	0		2.6	n258		68	4.9
n258	1		2.2	n258		69	4.7
n258	2		2.8	n258		70	4.7
n258	3		2.8	n258		71	4.6
n258	4		2.4	n258		72	4.6
n258	5		2.7	n258		73	4.6
n258	6		2.6	n258		74	4.8
n258	7		3.3	n258		75	4.6
n258	8		2.0	n258		76	4.7
n258	9		1.6	n258		77	4.6
n258	10		2.6	n258		78	4.9
n258	11		1.7	n258		79	4.7
n258	12		2.5	n258		80	4.7
n258	13		3.1	n258		81	4.9
n258	14		2.0	n258		82	4.9
n258	15		2.1	n258		83	4.6
n258	48		4.8	n258		104	7.4
n258	49		4.7	n258		105	7.8
n258	50		4.8	n258	32	32	-0.5
n258	51		4.7	n258	33	33	-1.0
n258	52		4.7	n258	34	34	-0.4
n258	53		4.8	n258	35	35	-0.5
n258	54		4.8	n258	36	36	-0.7
n258	55		4.8	n258	37	37	-0.8
n258	56		4.8	n258	38	38	-1.0
n258	57		4.7	n258	39	39	-0.2
n258	58		4.8	n258	40	40	-1.3
n258	59		4.7	n258	41	41	-1.6
n258	60		4.8	n258	42	42	-1.0
n258	61		4.8	n258	43	43	-1.8
n258	62		4.8	n258	44	44	-0.7
n258	63		4.8	n258	45	45	-0.5
n258	64		4.8	n258	46	46	-1.4
n258	65		4.8	n258	47	47	-1.1
n258	102		7.5	n258	84	84	1.6
n258	103		7.8	n258	85	85	1.4
n258		16	2.8	n258	86	86	1.7
n258		17	2.3	n258	87	87	1.4
n258		18	2.7	n258	88	88	1.4
n258		19	2.7	n258	89	89	1.4
n258		20	2.5	n258	90	90	1.4
n258		21	3.0	n258	91	91	1.4
n258		22	2.6	n258	92	92	1.6
n258		23	3.0	n258	93	93	1.3
n258		24	1.9	n258	94	94	1.5
n258		25	1.8	n258	95	95	1.3
n258		26	2.7	n258	96	96	1.7
n258		27	1.6	n258	97	97	1.5
n258		28	2.4	n258	98	98	1.5
n258		29	3.3	n258	99	99	1.7
n258		30	2.1	n258	100	100	1.7
n258		31	2.1	n258	101	101	1.6
n258		66	4.7	n258	106	106	4.2
n258		67	4.7	n258	107	107	4.6

Table 23

5G mmWave NR n261 Antenna L Patch *input.power.limit*

Band	Beam ID 1	Beam ID 2	input.power.limit	Band	Beam ID 1	Beam ID 2	input.power.limit
n261	0		0.0	n261		68	2.3
n261	1		0.4	n261		69	2.3
n261	2		0.1	n261		70	2.3
n261	3		0.5	n261		71	2.4
n261	4		0.1	n261		72	2.4
n261	5		0.0	n261		73	2.5
n261	6		0.5	n261		74	2.4
n261	7		0.1	n261		75	2.4
n261	8		0.3	n261		76	2.3
n261	9		0.9	n261		77	2.5
n261	10		0.6	n261		78	2.4
n261	11		-0.1	n261		79	2.5
n261	12		0.8	n261		80	2.3
n261	13		0.1	n261		81	2.4
n261	14		0.4	n261		82	2.4
n261	15		0.4	n261		83	2.4
n261	48		2.4	n261		104	5.1
n261	49		2.3	n261		105	5.3
n261	50		2.4	n261	32	32	-3.4
n261	51		2.3	n261	33	33	-3.5
n261	52		2.4	n261	34	34	-3.5
n261	53		2.4	n261	35	35	-3.9
n261	54		2.2	n261	36	36	-3.3
n261	55		2.2	n261	37	37	-3.4
n261	56		2.2	n261	38	38	-3.7
n261	57		2.2	n261	39	39	-3.4
n261	58		2.3	n261	40	40	-3.6
n261	59		2.2	n261	41	41	-2.9
n261	60		2.2	n261	42	42	-4.2
n261	61		2.2	n261	43	43	-3.5
n261	62		2.3	n261	44	44	-3.4
n261	63		2.2	n261	45	45	-3.5
n261	64		2.4	n261	46	46	-4.4
n261	65		2.2	n261	47	47	-3.2
n261	102		5.0	n261	84	84	-1.0
n261	103		5.2	n261	85	85	-1.8
n261		16	-0.2	n261	86	86	-1.3
n261		17	0.3	n261	87	87	-1.8
n261		18	0.0	n261	88	88	-1.3
n261		19	0.3	n261	89	89	-1.0
n261		20	0.0	n261	90	90	-2.0
n261		21	-0.1	n261	91	91	-1.5
n261		22	0.9	n261	92	92	-1.8
n261		23	0.4	n261	93	93	-1.8
n261		24	0.9	n261	94	94	-1.8
n261		25	1.0	n261	95	95	-1.3
n261		26	0.3	n261	96	96	-1.8
n261		27	0.0	n261	97	97	-1.5
n261		28	0.9	n261	98	98	-1.8
n261		29	0.5	n261	99	99	-2.0
n261		30	0.2	n261	100	100	-1.2
n261		31	0.5	n261	101	101	-1.8
n261		66	2.4	n261	106	106	1.2
n261		67	2.3	n261	107	107	1.4

Table 24

5G mmWave NR n260 Antenna L Patch *input.power.limit*

Band	Beam ID 1	Beam ID 2	input.power.limit	Band	Beam ID 1	Beam ID 2	input.power.limit
n260	0		1.9	n260		68	3.8
n260	1		1.8	n260		69	2.8
n260	2		1.9	n260		70	2.8
n260	3		0.8	n260		71	3.3
n260	4		1.1	n260		72	2.8
n260	5		1.0	n260		73	3.2
n260	6		1.4	n260		74	3.3
n260	7		1.2	n260		75	2.8
n260	8		1.1	n260		76	2.8
n260	9		1.3	n260		77	3.2
n260	10		1.1	n260		78	3.6
n260	11		1.4	n260		79	2.8
n260	12		1.0	n260		80	2.9
n260	13		1.0	n260		81	2.9
n260	14		1.3	n260		82	2.8
n260	15		1.2	n260		83	3.8
n260	48		3.9	n260		104	5.5
n260	49		3.6	n260		105	6.7
n260	50		3.9	n260	32	32	-1.8
n260	51		2.8	n260	33	33	-2.0
n260	52		2.9	n260	34	34	-1.8
n260	53		3.2	n260	35	35	-2.9
n260	54		2.8	n260	36	36	-2.6
n260	55		3.3	n260	37	37	-2.6
n260	56		3.2	n260	38	38	-2.5
n260	57		2.9	n260	39	39	-2.5
n260	58		2.8	n260	40	40	-2.3
n260	59		3.3	n260	41	41	-2.5
n260	60		3.7	n260	42	42	-3.2
n260	61		2.9	n260	43	43	-2.1
n260	62		2.9	n260	44	44	-2.1
n260	63		2.9	n260	45	45	-3.1
n260	64		3.9	n260	46	46	-2.5
n260	65		2.8	n260	47	47	-2.6
n260	102		5.9	n260	84	84	0.2
n260	103		6.4	n260	85	85	0.2
n260		16	2.1	n260	86	86	0.2
n260		17	1.7	n260	87	87	-0.7
n260		18	2.1	n260	88	88	-0.6
n260		19	0.7	n260	89	89	0.1
n260		20	1.0	n260	90	90	-0.7
n260		21	0.9	n260	91	91	-0.1
n260		22	0.9	n260	92	92	0.1
n260		23	1.1	n260	93	93	-0.6
n260		24	1.3	n260	94	94	-0.7
n260		25	1.1	n260	95	95	-0.1
n260		26	0.6	n260	96	96	0.4
n260		27	1.3	n260	97	97	-0.6
n260		28	1.3	n260	98	98	-0.5
n260		29	0.7	n260	99	99	-0.5
n260		30	1.1	n260	100	100	-0.6
n260		31	0.9	n260	101	101	0.1
n260		66	3.8	n260	106	106	2.4
n260		67	3.6	n260	107	107	3.2

Table 25

5G mmWave NR n258 Antenna K Patch *input.power.limit*

Band	Beam ID 1	Beam ID 2	input.power.limit	Band	Beam ID 1	Beam ID 2	input.power.limit
n258	0		2.9	n258		68	5.7
n258	1		2.8	n258		69	5.7
n258	2		3.2	n258		70	5.6
n258	3		3.1	n258		71	5.6
n258	4		3.3	n258		72	5.7
n258	5		3.9	n258		73	5.6
n258	6		2.7	n258		74	5.4
n258	7		2.6	n258		75	5.7
n258	8		3.3	n258		76	5.6
n258	9		3.1	n258		77	5.7
n258	10		4.0	n258		78	5.4
n258	11		2.8	n258		79	5.7
n258	12		3.0	n258		80	5.7
n258	13		3.3	n258		81	5.7
n258	14		3.8	n258		82	5.7
n258	15		4.0	n258		83	5.7
n258	48		5.5	n258		104	8.5
n258	49		5.7	n258		105	8.2
n258	50		5.4	n258	32	32	-0.5
n258	51		5.7	n258	33	33	-0.9
n258	52		5.4	n258	34	34	-0.4
n258	53		5.9	n258	35	35	-1.4
n258	54		5.4	n258	36	36	-1.0
n258	55		5.4	n258	37	37	-1.4
n258	56		6.0	n258	38	38	-0.9
n258	57		5.7	n258	39	39	-1.9
n258	58		5.9	n258	40	40	-1.2
n258	59		5.4	n258	41	41	-1.3
n258	60		6.0	n258	42	42	-0.6
n258	61		5.7	n258	43	43	-1.1
n258	62		5.7	n258	44	44	-1.0
n258	63		5.7	n258	45	45	-1.2
n258	64		5.5	n258	46	46	-1.1
n258	65		5.7	n258	47	47	-1.3
n258	102		8.2	n258	84	84	1.7
n258	103		8.3	n258	85	85	1.8
n258		16	3.0	n258	86	86	1.5
n258		17	3.0	n258	87	87	1.4
n258		18	3.3	n258	88	88	1.2
n258		19	3.8	n258	89	89	1.6
n258		20	3.4	n258	90	90	1.5
n258		21	2.6	n258	91	91	1.2
n258		22	2.9	n258	92	92	1.7
n258		23	3.5	n258	93	93	1.4
n258		24	2.7	n258	94	94	1.6
n258		25	4.3	n258	95	95	1.5
n258		26	3.5	n258	96	96	1.7
n258		27	3.0	n258	97	97	1.4
n258		28	2.8	n258	98	98	1.4
n258		29	3.9	n258	99	99	1.4
n258		30	3.0	n258	100	100	2.5
n258		31	2.7	n258	101	101	1.4
n258		66	5.7	n258	106	106	4.3
n258		67	5.5	n258	107	107	4.3

Table 26

5G mmWave NR n261 Antenna K Patch *input.power.limit*

Band	Beam ID 1	Beam ID 2	input.power.limit
n261	0		4.4
n261	1		4.2
n261	2		4.6
n261	3		4.0
n261	4		4.2
n261	5		3.6
n261	6		4.0
n261	7		4.1
n261	8		4.3
n261	9		3.7
n261	10		4.2
n261	11		3.5
n261	12		4.3
n261	13		3.8
n261	14		3.8
n261	15		4.2
n261	48		6.7
n261	49		6.9
n261	50		6.5
n261	51		6.1
n261	52		6.1
n261	53		6.3
n261	54		6.3
n261	55		6.5
n261	56		6.1
n261	57		6.1
n261	58		6.5
n261	59		6.0
n261	60		6.3
n261	61		6.8
n261	62		6.3
n261	63		6.5
n261	64		6.9
n261	65		6.1
n261	102		9.0
n261	103		9.3
n261		16	4.2
n261		17	4.3
n261		18	4.8
n261		19	3.8
n261		20	4.3
n261		21	3.5
n261		22	3.7
n261		23	4.2
n261		24	4.1
n261		25	3.4
n261		26	4.4
n261		27	3.2
n261		28	4.1
n261		29	3.8
n261		30	3.6
n261		31	4.4
n261		66	6.4
n261		67	6.8
n261		68	6.7
n261		69	6.3
n261		70	6.3
n261		71	6.6
n261		72	6.0
n261		73	6.7
n261		74	6.3
n261		75	6.3
n261		76	6.7
n261		77	6.0
n261		78	6.0
n261		79	6.8
n261		80	6.6
n261		81	6.7
n261		82	6.8
n261		83	6.3
n261		104	9.2
n261		105	9.4
n261	32	32	0.8
n261	33	33	0.9
n261	34	34	1.0
n261	35	35	-0.5
n261	36	36	0.5
n261	37	37	-0.6
n261	38	38	0.1
n261	39	39	0.5
n261	40	40	-0.2
n261	41	41	-0.8
n261	42	42	0.7
n261	43	43	-0.8
n261	44	44	0.6
n261	45	45	0.0
n261	46	46	-0.6
n261	47	47	0.8
n261	84	84	2.9
n261	85	85	3.3
n261	86	86	3.0
n261	87	87	2.3
n261	88	88	2.3
n261	89	89	2.6
n261	90	90	2.4
n261	91	91	3.0
n261	92	92	2.3
n261	93	93	2.3
n261	94	94	3.0
n261	95	95	2.2
n261	96	96	2.4
n261	97	97	3.3
n261	98	98	2.6
n261	99	99	3.0
n261	100	100	3.3
n261	101	101	2.8
n261	106	106	5.5
n261	107	107	5.6

Table 27

5G mmWave NR n260 Antenna K Patch *input.power.limit*

Band	Beam ID 1	Beam ID 2	input.power.limit	Band	Beam ID 1	Beam ID 2	input.power.limit
n260	0		3.5	n260		68	6.0
n260	1		3.4	n260		69	6.0
n260	2		3.3	n260		70	5.2
n260	3		3.5	n260		71	5.3
n260	4		3.5	n260		72	5.2
n260	5		3.3	n260		73	5.2
n260	6		3.1	n260		74	5.5
n260	7		3.5	n260		75	5.3
n260	8		3.2	n260		76	5.2
n260	9		3.1	n260		77	5.9
n260	10		3.3	n260		78	5.8
n260	11		3.4	n260		79	5.2
n260	12		3.4	n260		80	5.5
n260	13		3.2	n260		81	5.5
n260	14		3.3	n260		82	5.2
n260	15		3.1	n260		83	6.0
n260	48		5.9	n260		104	8.0
n260	49		5.9	n260		105	8.7
n260	50		5.7	n260	32	32	0.3
n260	51		5.7	n260	33	33	0.1
n260	52		5.1	n260	34	34	0.1
n260	53		5.0	n260	35	35	0.3
n260	54		5.1	n260	36	36	0.3
n260	55		5.4	n260	37	37	-0.1
n260	56		5.2	n260	38	38	-0.1
n260	57		5.0	n260	39	39	0.2
n260	58		5.4	n260	40	40	0.0
n260	59		5.5	n260	41	41	-0.4
n260	60		5.9	n260	42	42	0.3
n260	61		5.1	n260	43	43	0.1
n260	62		5.2	n260	44	44	0.1
n260	63		5.2	n260	45	45	0.1
n260	64		5.9	n260	46	46	0.1
n260	65		5.0	n260	47	47	-0.2
n260	102		8.1	n260	84	84	2.6
n260	103		8.3	n260	85	85	2.6
n260		16	3.5	n260	86	86	2.6
n260		17	3.6	n260	87	87	2.6
n260		18	3.5	n260	88	88	1.8
n260		19	3.6	n260	89	89	1.7
n260		20	3.8	n260	90	90	1.8
n260		21	3.2	n260	91	91	2.0
n260		22	3.3	n260	92	92	2.0
n260		23	3.7	n260	93	93	1.7
n260		24	3.2	n260	94	94	2.0
n260		25	3.1	n260	95	95	2.4
n260		26	3.8	n260	96	96	2.6
n260		27	3.5	n260	97	97	1.8
n260		28	3.6	n260	98	98	2.0
n260		29	3.6	n260	99	99	2.0
n260		30	3.4	n260	100	100	1.8
n260		31	3.1	n260	101	101	2.4
n260		66	5.9	n260	106	106	4.9
n260		67	5.8	n260	107	107	5.2