RF Exposure Report

(Part 0: SAR and PD Char Evaluation)

FCC ID	**: IHDT56AE8**
Equipment	**: Mobile Cellular Phone**
Brand Name	**: Motorola**
Model Name	**: XT2205-3**
Applicant	**: Motorola Mobility LLC 222 W,Merchandise Mart Plaza, Chicago IL 60654 USA**
Standard	**: FCC 47 CFR Part 2 (2.1093)**

We, Sporton International Inc. (Shenzhen), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Shenzhen), the test report shall not be reproduced except in full.

Si Zhang

Approved by: Si Zhang

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History of this test report

Report No.	Version	Description	Issued Date
FA240834-01A	01	Initial issue of report	Jun. 23, 2022

1. Introduction

The FCC RF exposure limit is defined based on time-averaged RF exposure. The product implements MediaTek TAS (Time Average SAR) feature which controls the instantaneous transmitting power for WWAN transmitter to ensure the product in compliance with FCC RF exposure limit over a defined time window, for SAR (transmit frequency ≤ 6GHz) and power density (transmit frequency > 6GHz) to control and manage transmitting power in real time and to ensure at all times the time-averaged RF exposure is compliant to the regulation requirement. Cannot operat without SAR and PD characterization at the device level, beforehand.

This report describes the procedures for the SAR char and PD char generation, and the parameters obtained from SAR and PD characterization (reffered to as SAR char and PD char, respectively) will be used as input for TAS. Both SAR char and PD char will be entered via the MediaTek's NV suggestion to enable the TAS Feature.

The compliance test under static transmission and simultaneous transmission are performed and summarized in Part 1 report. The validation of TAS algorithm under the dynamic transmission scenarios are reported in Part 2. Terminologies for this report are listed up in the table below.

P_{limit}	The time-averaged RF power which corresponds to SAR_design_target.
P_{max}	Maximum target power level.
SAR_design_target:	The design target for SAR compliance. It should be less than regulatory power density limit to account for all device design related uncertainties.
SAR char	P_{limit} for all the technologies/bands for all applicable ECI.
PD_design_target:	The design target for PD compliance. It should be less than regulatory power density limit to account for all device design related uncertainties.
input.power.limit	For a PD characterized wireless device, the input power level at antenna port(s) for each beam corresponding to PD_design_target.
PD char	The table that contains input.power.limit fed to antenna port(s) for all supported beams.

2. Product Description

Product Feature & Specification	
Equipment Name	Mobile Cellular Phone
Brand Name	Motorola
Model Name	XT2205-3
FCC ID	IHDT56AE8
Frequency Band	GSM850: 824 MHz ~ 849 MHz GSM1900: 1850 MHz ~ 1910 MHz WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band V: 824 MHz ~ 849 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 48: 3550 MHz ~ 3700 MHz LTE Band 66: 1710 MHz ~ 1780 MHz 5G NR n2 : 1850 MHz ~ 1910 MHz 5G NR n5: 824 MHz ~ 849 MHz 5G NR n48 : 3550 MHz ~ 3700 MHz 5G NR n66: 1710 MHz ~ 1780 MHz 5G NR n77: 3450 MHz ~ 3550 MHz, 3700 MHz ~ 3980 MHz 5G NR n78: 3450 MHz ~ 3550 MHz, 3700 MHz ~ 3800 MHz 5G NR n260 : 37 GHz~40 GHz 5G NR n261 : 27.5 GHz~28.35 GHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5700 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz WLAN 6E U-NII-5: 5925 MHz ~ 6425 MHz WLAN 6E U-NII-6: 6425 MHz ~ 6525 MHz WLAN 6E U-NII-7: 6525 MHz ~ 6875 MHz WLAN 6E U-NII-8: 6875 MHz ~ 7125 MHz Bluetooth: 2402 MHz ~ 2480 MHz WPT: 110 kHz ~ 148 kHz NFC: 13.56 MHz
Mode	GSM/GPRS/EGPRS RMC/AMR 12.2Kbps HSDPA HSUPA DC-HSDPA HSPA+(16QAM uplink is not supported) LTE: QPSK, 16QAM, 64QAM, 256QAM 5GNR FR1: CP-OFDM / DFT-s-OFDM, PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM 5GNR FR2: CP-OFDM / DFT-s-OFDM, PI/2 BPSK, QPSK, 16QAM, 64QAM WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 2.4GHz 802.11ac/ax VHT20/VHT40/HE20/HE40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac/ax VHT20/VHT40/VHT80/HE20/HE40/HE80 WLAN 6GHz 802.11ax HE20/HE40/HE80 Bluetooth BR/EDR/LE WPT: ASK NFC: ASK

3. SAR Characterization

SAR char must be generated to cover all radio configurations and usage scenarios that the wireless device supports for operating at 6 GHz or below. It will then be used as input for TAS to control and manage RF exposure for f < 6 GHz.

3.1 SAR design target and uncertainty

SAR design target:

Band	Antenna	Head ECI 2 Standalone 1g SAR (W/kg)	Body Worn ECI 3 Standalone 1g SAR (W/kg)	Body Worn & Hotspot ECI 7 Simultaneous 1g SAR (W/kg)	Extremely ECI6 Standalone 10g SAR (W/kg)	Body worn Sensor Off ECI4 1g SAR (W/kg)	Extremity Sensor Off ECI4 10g SAR (W/kg)
GSM850 (4 Tx slots)	Ant 0	1.00	1.00	1.00	2.50	0.20	2.80
GSM1900 (4 Tx slots)	Ant 0	1.00	1.00	1.00	2.50	1.00	1.70
WCDMA II	Ant 0	1.00	1.00	1.00	2.50	1.00	2.30
WCDMA V	Ant 0	1.00	1.00	1.00	2.50	0.30	2.80
LTE Band 2	Ant 0	1.00	1.00	1.00	2.50	1.00	2.30
LTE Band 2	Ant 1	0.80	0.80	0.80	1.70	0.80	1.50
LTE Band 4	Ant 0	1.00	1.00	1.00	2.50	1.00	1.60
LTE Band 4	Ant 1	0.80	0.80	0.80	1.70	0.80	1.20
LTE Band 5	Ant 0	1.00	1.00	1.00	2.50	1.00	2.80
LTE Band 5	Ant 1	0.80	0.80	0.80	1.70	0.80	2.80
LTE Band 7	Ant 0	1.00	1.00	1.00	2.50	0.50	2.80
LTE Band 12	Ant 0	1.00	1.00	1.00	2.50	1.00	2.80
LTE Band 12	Ant 1	0.80	0.80	0.80	1.70	0.80	2.80
LTE Band 13	Ant 0	1.00	1.00	1.00	2.50	1.00	2.80
LTE Band 13	Ant 1	0.80	0.80	0.80	1.70	0.80	2.80
LTE Band 66	Ant 0	1.00	1.00	1.00	2.50	1.00	1.60
LTE Band 66	Ant 1	0.80	0.80	0.80	1.70	0.80	1.20
LTE Band 48	Ant 3	0.80	0.80	0.80	1.70	0.60	2.80
LTE Band 48	Ant 4	0.80	0.80	0.80	1.70	0.30	2.80
LTE Band 48	Ant 5	0.80	0.80	0.80	1.70	0.20	2.80
LTE Band 48	Ant 8	0.80	0.80	0.80	1.70	0.80	1.30
5G NR n2	Ant 0	1.00	1.00	1.00	2.50	1.00	2.10
5G NR n2	Ant 1	0.80	0.80	0.80	1.70	0.80	1.80
5G NR n5	Ant 0	1.00	1.00	1.00	2.50	1.00	2.80
5G NR n5	Ant 1	0.80	0.80	0.80	1.70	0.80	2.80
5G NR n66	Ant 0	1.00	1.00	1.00	2.50	1.00	1.80
5G NR n66	Ant 1	0.80	0.80	0.80	1.70	0.80	1.90
5G NR n48	Ant 3	0.80	0.80	0.80	1.70	0.80	2.80
5G NR n48	Ant 4	0.80	0.80	0.80	1.70	0.30	2.80
5G NR n48	Ant 5	0.80	0.80	0.80	1.70	0.50	2.80
5G NR n48	Ant 8	0.80	0.80	0.80	1.70	0.80	2.10
5G NR n77 PC3	Ant 3	0.80	0.80	0.80	1.70	0.50	2.80
5G NR n77 PC3	Ant 4	0.80	0.80	0.80	1.70	0.30	2.80
5G NR n77 PC3	Ant 5	0.80	0.80	0.80	1.70	0.20	2.80
5G NR n77 PC3	Ant 8	0.80	0.80	0.80	1.70	0.80	2.00
5G NR n77 PC2	Ant 3	0.80	0.80	0.80	1.70	0.50	2.80
5G NR n77 PC2	Ant 4	0.80	0.80	0.80	1.70	0.30	2.80
5G NR n77 PC2	Ant 5	0.80	0.80	0.80	1.70	0.20	2.80
5G NR n77 PC2	Ant 8	0.80	0.80	0.80	1.70	0.80	2.00
5G NR n78	Ant 3	0.80	0.80	0.80	1.70	0.50	2.80
5G NR n78	Ant 4	0.80	0.80	0.80	1.70	0.30	2.80
5G NR n78	Ant 5	0.80	0.80	0.80	1.70	0.20	2.80
5G NR n78	Ant 8	0.80	0.80	0.80	1.70	0.80	2.00

Uncertainty:

Item	Uncertainty dB (k=2)
Sub6 radio TPC	1.0
Device to device variation	1.2
Total uncertainty	1.5

To account for total uncertainty, SAR_design_target should be determined as:

$$SAR\_design\_target < SAR_{regulatory\_limit} \times 10^{\frac{-total\ uncertainty}{10}}$$

3.2 SAR Char Table

SAR char must be generated to cover all radio configurations and usage scenarios that the wireless device supports for operating at 6 GHz or below. It will then be used as input for TAS to control and manage RF exposure for f < 6 GHz.

<P_{limit} for supported technologies and bands>

Band	Antenna	Head ECI2 Standalone	Body Worn ECI3 Standalone	Body Worn & Hotspot ECI7 Simultaneous	Extremely ECI6 Standalone	Sensor Off ECI4	Pmax*
GSM850 (4 Tx slots)	Ant 0	31.3	25.3	25.3	29.5	28.2	26.5
GSM1900 (4 Tx slots)	Ant 0	34.2	16.5	16.5	20.2	24.9	23.5
WCDMA II	Ant 0	29.1	12.3	12.3	16.4	23	23
WCDMA V	Ant 0	28.1	21.3	21.3	23.7	24.2	23
LTE Band 2	Ant 0	34.2	15.4	14.3	19	24.5	23
LTE Band 2	Ant 1	15.6	16.2	16	18.1	26.2	23
LTE Band 4	Ant 0	42.1	17.5	16.3	19.5	24.7	23
LTE Band 4	Ant 1	16.5	16.7	16.7	18.9	25.4	23
LTE Band 5	Ant 0	29.4	26.5	26.5	23	23	23
LTE Band 5	Ant 1	20.9	22.6	22.2	23	31.6	23
LTE Band 7	Ant 0	40.4	20.9	16.7	23.9	24.4	23
LTE Band 12	Ant 0	29.1	27.3	27.3	23	23	23
LTE Band 12	Ant 1	22.3	24.5	24.5	23	23	23
LTE Band 13	Ant 0	30.5	24.9	24.9	23	23	23
LTE Band 13	Ant 1	23	25.2	25.2	23	23	23
LTE Band 66	Ant 0	42.1	17.5	16.3	19.5	24.7	23
LTE Band 66	Ant 1	16.5	16.7	16.7	18.9	25.4	23
LTE Band 48	Ant 3	16.9	15.7	15.7	18	23.5	21.0
LTE Band 48	Ant 4	22.4	15.4	15.4	18	22.2	21.0
LTE Band 48	Ant 5	36.4	18.4	18.4	20.7	22.0	20.3
LTE Band 48	Ant 8	32.3	9.2	9.2	15.2	21.8	20.1
5G NR n2	Ant 0	33.3	16.5	15.1	20.4	25.2	23
5G NR n2	Ant 1	16.1	16.9	16.5	19.4	27.2	23
5G NR n5	Ant 0	30.4	23.9	23.9	23	23	23
5G NR n5	Ant 1	20.7	22.5	22.5	23	30.6	23
5G NR n66	Ant 0	33.9	19.3	15.3	19.8	24.7	23.5
5G NR n66	Ant 1	15.8	17.1	15.7	18.3	25.9	23
5G NR n48	Ant 3	18.9	17.7	17.7	22.4	26.8	23
5G NR n48	Ant 4	22.8	16.7	16.7	19.8	23.4	22.4
5G NR n48	Ant 5	30.2	19.5	19.5	20.9	26.3	23
5G NR n48	Ant 8	39.4	10.3	10.3	17	23.5	21.6

5G NR n77 PC3	Ant 3	17.3	17.1	17.1	20	26.7	23
5G NR n77 PC3	Ant 4	20.2	15.4	15.4	17.8	22.5	23
5G NR n77 PC3	Ant 5	34.3	18.4	18.4	20.4	27.6	23
5G NR n77 PC3	Ant 8	32.7	11.4	11.4	16.3	25.8	21.5
5G NR n77 PC2	Ant 3	17.3	17.1	17.1	20	26.7	26
5G NR n77 PC2	Ant 4	20.2	15.4	15.4	17.8	22.5	25.5
5G NR n77 PC2	Ant 5	34.3	18.4	18.4	20.4	27.6	26
5G NR n77 PC2	Ant 8	32.7	11.4	11.4	16.3	25.8	22.5
5G NR n78	Ant 3	17.3	17.1	17.1	20	26.7	23
5G NR n78	Ant 4	20.2	15.4	15.4	17.8	22.5	22.7
5G NR n78	Ant 5	24	18.4	18.4	20.4	27.6	23
5G NR n78	Ant 8	22.4	11.4	11.4	16.3	25.8	21.4

Note:

1) *P_{max} is used for RF tune up procedure. The maximum allowed output power is equal to Pmax + 1.0 dB uncertainty.

2) All P_{limit} power levels entered in the Table correspond to average power levels after accounting for duty cycle in the case TDD modulation schemes (for e.g., GSM& LTE TDD & NR TDD).

3) The max allowed output power is the P_{limit} + 1.0 dB device uncertainty, and if P_{limit} is higher than P_{max}, the device output power will be P_{max} instead.

4) The following table is duty cycle and factor used for calculating time average power.

GSM/FDD/TDD	Duty Cycle	Time average calculation factor(dB)
GSM 1TX	12.50%	-9.0
GSM 2TX	25%	-6.0
GSM 3TX	37.50%	-4.3
GSM 4TX	50%	-3.0
FDD LTE	100%	0.0
TDD LTE	63.30%	-2.0
TDD HPUE	43.30%	-3.6
NR FDD/TDD	100%	0.0

4. Power Density Characterization

PD characterization flow is illustrated in Figure 4.1. At first, PD simulations are performed for all candidate beams and evaluation planes. Afterwards, measurements are conducted to validate the simulations. Measurement data is also used to quantify the housing uncertainty. Lastly, the perbeam power limit is derived.

4.1 PD Char Table

Both AiM1 and AiM2 contain 16 antenna ports: 8 ports for n261 and 8 ports for n260. For both AiM1 and AiM2, 1x4 patch arrays are used for both n260 and n261. For the 8 ports used in each antenna module, 4 ports are used for vertical polarization feeds, and the other 4 ports are used for horizontal polarization feeds. The following figure outlines the PD characterization flow.

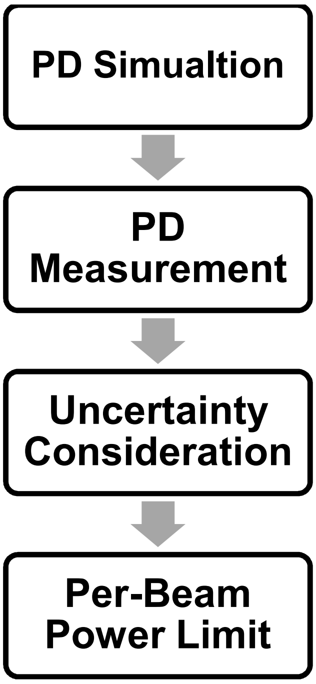


Figure 4.1 PD characterization flow

4.2 Codebook for all beams

For each band, all of the supported beams are indexed in a hierarchical manner, POLARIZATION could be V or H indicating the V polarization or H polarization, Beam pair is used for MIMO transmission. For example, AiM1.V is paired with AiM1.H. For each band, each antenna module, and polarization V or H, the number of full power beams is 16, namely, the number of half power beams is 18, namely, and the number of single-element beams is 2, namely. The codebook for other bands and antenna modules can be produced in the same manner but is omitted for brevity.

Band	Module	Type	Beam ID	Feed No.	Ant Feed
n260	AiM0	Patch	0	4	4V
			1	4	4V
			2	4	4V
			3	4	4V
			4	4	4V
			5	4	4V
			6	4	4V
			7	4	4V
			8	4	4V
			9	4	4V
			10	4	4V
			11	4	4V
			12	4	4V
			13	4	4V
			14	4	4V
			15	4	4V
			16	4	4H
			17	4	4H
			18	4	4H
			19	4	4H
			20	4	4H
			21	4	4H
			22	4	4H
			23	4	4H
			24	4	4H
			25	4	4H
			26	4	4H
			27	4	4H
			28	4	4H
			29	4	4H
			30	4	4H
			31	4	4H
			32	8	4V+4H
			33	8	4V+4H
			34	8	4V+4H
			35	8	4V+4H
			36	8	4V+4H
			37	8	4V+4H
			38	8	4V+4H
			39	8	4V+4H
			40	8	4V+4H
			41	8	4V+4H
			42	8	4V+4H
			43	8	4V+4H
			44	8	4V+4H
			45	8	4V+4H
			46	8	4V+4H

			47	8	4V+4H
			48	2	2V
			49	2	2V
			50	2	2V
			51	2	2V
			52	2	2V
			53	2	2V
			54	2	2V
			55	2	2V
			56	2	2V
			57	2	2V
			58	2	2V
			59	2	2V
			60	2	2V
			61	2	2V
			62	2	2V
			63	2	2V
			64	2	2V
			65	2	2V
			66	2	2H
			67	2	2H
			68	2	2H
			69	2	2H
			70	2	2H
			71	2	2H
			72	2	2H
			73	2	2H
			74	2	2H
			75	2	2H
			76	2	2H
			77	2	2H
			78	2	2H
			79	2	2H
			80	2	2H
			81	2	2H
			82	2	2H
			83	2	2H
			84	4	2V+2H
			85	4	2V+2H
			86	4	2V+2H
			87	4	2V+2H
			88	4	2V+2H
			89	4	2V+2H
			90	4	2V+2H
			91	4	2V+2H
			92	4	2V+2H
			93	4	2V+2H
			94	4	2V+2H
			95	4	2V+2H
			96	4	2V+2H
			97	4	2V+2H
			98	4	2V+2H
			99	4	2V+2H
			100	4	2V+2H
			101	4	2V+2H
			102	1	1V
			103	1	1V
			104	1	1H

			105	1	1H
			106	2	1V+1H
			107	2	1V+1H

Band	Module	Type	Beam ID	Feed No.	Ant Feed
n261	AiM0	Patch	0	4	4V
			1	4	4V
			2	4	4V
			3	4	4V
			4	4	4V
			5	4	4V
			6	4	4V
			7	4	4V
			8	4	4V
			9	4	4V
			10	4	4V
			11	4	4V
			12	4	4V
			13	4	4V
			14	4	4V
			15	4	4V
			16	4	4H
			17	4	4H
			18	4	4H
			19	4	4H
			20	4	4H
			21	4	4H
			22	4	4H
			23	4	4H
			24	4	4H
			25	4	4H
			26	4	4H
			27	4	4H
			28	4	4H
			29	4	4H
			30	4	4H
			31	4	4H
			32	8	4V+4H
			33	8	4V+4H
			34	8	4V+4H
			35	8	4V+4H
			36	8	4V+4H
			37	8	4V+4H
			38	8	4V+4H
			39	8	4V+4H
			40	8	4V+4H
			41	8	4V+4H
			42	8	4V+4H
			43	8	4V+4H
			44	8	4V+4H
			45	8	4V+4H
			46	8	4V+4H
			47	8	4V+4H
			48	2	2V
			49	2	2V
			50	2	2V
			51	2	2V

			52	2	2V
			53	2	2V
			54	2	2V
			55	2	2V
			56	2	2V
			57	2	2V
			58	2	2V
			59	2	2V
			60	2	2V
			61	2	2V
			62	2	2V
			63	2	2V
			64	2	2V
			65	2	2V
			66	2	2H
			67	2	2H
			68	2	2H
			69	2	2H
			70	2	2H
			71	2	2H
			72	2	2H
			73	2	2H
			74	2	2H
			75	2	2H
			76	2	2H
			77	2	2H
			78	2	2H
			79	2	2H
			80	2	2H
			81	2	2H
			82	2	2H
			83	2	2H
			84	4	2V+2H
			85	4	2V+2H
			86	4	2V+2H
			87	4	2V+2H
			88	4	2V+2H
			89	4	2V+2H
			90	4	2V+2H
			91	4	2V+2H
			92	4	2V+2H
			93	4	2V+2H
			94	4	2V+2H
			95	4	2V+2H
			96	4	2V+2H
			97	4	2V+2H
			98	4	2V+2H
			99	4	2V+2H
			100	4	2V+2H
			101	4	2V+2H
			102	1	1V
			103	1	1V
			104	1	1H
			105	1	1H
			106	2	1V+1H
			107	2	1V+1H

Band	Module	Type	Beam ID	Feed No.	Ant Feed
n260	AiM1	Patch	0	4	4V
			1	4	4V
			2	4	4V
			3	4	4V
			4	4	4V
			5	4	4V
			6	4	4V
			7	4	4V
			8	4	4V
			9	4	4V
			10	4	4V
			11	4	4V
			12	4	4V
			13	4	4V
			14	4	4V
			15	4	4V
			16	4	4H
			17	4	4H
			18	4	4H
			19	4	4H
			20	4	4H
			21	4	4H
			22	4	4H
			23	4	4H
			24	4	4H
			25	4	4H
			26	4	4H
			27	4	4H
			28	4	4H
			29	4	4H
			30	4	4H
			31	4	4H
			32	8	4V+4H
			33	8	4V+4H
			34	8	4V+4H
			35	8	4V+4H
			36	8	4V+4H
			37	8	4V+4H
			38	8	4V+4H
			39	8	4V+4H
			40	8	4V+4H
			41	8	4V+4H
			42	8	4V+4H
			43	8	4V+4H
			44	8	4V+4H
			45	8	4V+4H
			46	8	4V+4H
			47	8	4V+4H
			48	2	2V
			49	2	2V
			50	2	2V
			51	2	2V
			52	2	2V
			53	2	2V
			54	2	2V
			55	2	2V

			56	2	2V
			57	2	2V
			58	2	2V
			59	2	2V
			60	2	2V
			61	2	2V
			62	2	2V
			63	2	2V
			64	2	2V
			65	2	2V
			66	2	2H
			67	2	2H
			68	2	2H
			69	2	2H
			70	2	2H
			71	2	2H
			72	2	2H
			73	2	2H
			74	2	2H
			75	2	2H
			76	2	2H
			77	2	2H
			78	2	2H
			79	2	2H
			80	2	2H
			81	2	2H
			82	2	2H
			83	2	2H
			84	4	2V+2H
			85	4	2V+2H
			86	4	2V+2H
			87	4	2V+2H
			88	4	2V+2H
			89	4	2V+2H
			90	4	2V+2H
			91	4	2V+2H
			92	4	2V+2H
			93	4	2V+2H
			94	4	2V+2H
			95	4	2V+2H
			96	4	2V+2H
			97	4	2V+2H
			98	4	2V+2H
			99	4	2V+2H
			100	4	2V+2H
			101	4	2V+2H
			102	1	1V
			103	1	1V
			104	1	1H
			105	1	1H
			106	2	1V+1H
			107	2	1V+1H

Band	Module	Type	Beam ID	Feed No.	Ant Feed
n261	AiM1	Patch	0	4	4V
			1	4	4V
			2	4	4V
			3	4	4V
			4	4	4V
			5	4	4V
			6	4	4V
			7	4	4V
			8	4	4V
			9	4	4V
			10	4	4V
			11	4	4V
			12	4	4V
			13	4	4V
			14	4	4V
			15	4	4V
			16	4	4H
			17	4	4H
			18	4	4H
			19	4	4H
			20	4	4H
			21	4	4H
			22	4	4H
			23	4	4H
			24	4	4H
			25	4	4H
			26	4	4H
			27	4	4H
			28	4	4H
			29	4	4H
			30	4	4H
			31	4	4H
			32	8	4V+4H
			33	8	4V+4H
			34	8	4V+4H
			35	8	4V+4H
			36	8	4V+4H
			37	8	4V+4H
			38	8	4V+4H
			39	8	4V+4H
			40	8	4V+4H
			41	8	4V+4H
			42	8	4V+4H
			43	8	4V+4H
			44	8	4V+4H
			45	8	4V+4H
			46	8	4V+4H
			47	8	4V+4H
			48	2	2V
			49	2	2V
			50	2	2V
			51	2	2V
			52	2	2V
			53	2	2V
			54	2	2V
			55	2	2V

			56	2	2V
			57	2	2V
			58	2	2V
			59	2	2V
			60	2	2V
			61	2	2V
			62	2	2V
			63	2	2V
			64	2	2V
			65	2	2V
			66	2	2H
			67	2	2H
			68	2	2H
			69	2	2H
			70	2	2H
			71	2	2H
			72	2	2H
			73	2	2H
			74	2	2H
			75	2	2H
			76	2	2H
			77	2	2H
			78	2	2H
			79	2	2H
			80	2	2H
			81	2	2H
			82	2	2H
			83	2	2H
			84	4	2V+2H
			85	4	2V+2H
			86	4	2V+2H
			87	4	2V+2H
			88	4	2V+2H
			89	4	2V+2H
			90	4	2V+2H
			91	4	2V+2H
			92	4	2V+2H
			93	4	2V+2H
			94	4	2V+2H
			95	4	2V+2H
			96	4	2V+2H
			97	4	2V+2H
			98	4	2V+2H
			99	4	2V+2H
			100	4	2V+2H
			101	4	2V+2H
			102	1	1V
			103	1	1V
			104	1	1H
			105	1	1H
			106	2	1V+1H
			107	2	1V+1H

4.3 PD_design_target determination

To account for total uncertainty, PD_design_target should meet the criteria:

$$PD\_design\_target < PD\_regulatory\_limit \times 10^{-total\_uncertainty/10}$$

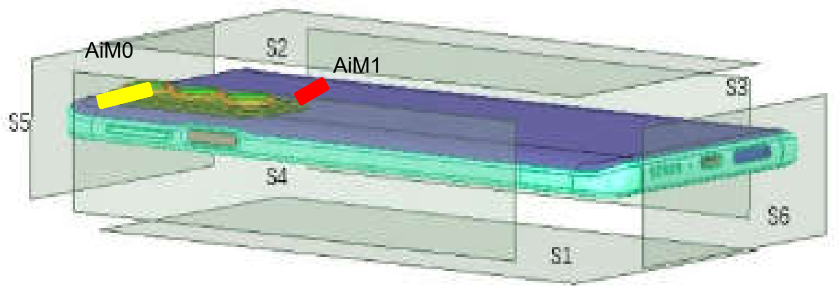
For this EUT, the PD_design_target and the uncertainty value are listed below

n260	PD_design_target	Antenna Module	W/m^2
		AiM0/AiM1	3.25

n261	PD_design_target	Antenna Module	W/m^2
		AiM0/AiM1	3.25

Item	Uncertainty dB (k=2)
total_uncertainty	2.5

4.4 Exposure positions for PD evaluation



Evaluation positions

Front view	Front	Back	Left side	Right side	Top side	Bottom side
	S1	S2	S3	S4	S5	S6
AiM0	-	-	-	-	V	-
AiM1	-	V	-	-	-	-

Remark:

1. Referring to the PD simulation report for the reason of selecting surfaces/edges.

4.5 Simulation and modeling validation

Power density simulations of all beams and surfaces were performed by the manufacturer. Details of these simulations and modeling validation can be found in the Power Density Simulation Report. Following Table includes a summary of the validation results to support worst-case housing influence quantification in power density characterization for this model With an reference power level (P_{ref}) of 0 dBm for n261 and n260 band, PD measurements are conducted for at least one single beam per antenna type and per antenna module (AiM0, AiM1) on worst-surface(s). It is observed from the Power Density Simulated Report that the worst-case beam and plane for vertical and horizontal polarizations; for being conservative take the second highest PD beams for evaluation as well. PD measurements are performed at mid channel of each mmW band and with signal type of CW tone.

1. The NR radio operation is controlled via software tool Modem META mode (Factory mode).
2. PD value will be used to determine worst-case housing influence for conservative assessment

Band	Antenna Module	Beam ID	ANT Feed	Frequency (GHz)	Exposure Surface	Reference power level(dBm)	Test Separation	Signal type	Measured results Savg tot 4cm^2 (W/m2)	Simulated PD (W/m^2), averaged over 4 cm^2	Sim vs meas (dB)
n261	AiM0	0	4V	27.925	Top (S5)	0	2mm	CW	1.71	3.29	2.84
n261	AiM0	14	4V	27.925	Top (S5)	0	2mm	CW	1.58	3.23	3.11
n261	AiM0	27	4H	27.925	Top (S5)	0	2mm	CW	2.03	3.43	2.28
n261	AiM0	23	4H	27.925	Top (S5)	0	2mm	CW	2.2	3.42	1.92
n261	AiM1	1	4V	27.925	Back (S2)	0	2mm	CW	2.34	4.42	2.76
n261	AiM1	6	4V	27.925	Back (S2)	0	2mm	CW	2.48	4.12	2.20
n261	AiM1	18	4H	27.925	Back (S2)	0	2mm	CW	2.66	4.18	1.96
n261	AiM1	16	4H	27.925	Back (S2)	0	2mm	CW	2.65	4.05	1.84
n260	AiM0	0	4V	38.5	Top (S5)	0	2mm	CW	2.42	3.17	1.17
n260	AiM0	1	4V	38.5	Top (S5)	0	2mm	CW	2.04	3.07	1.78
n260	AiM0	23	4H	38.5	Top (S5)	0	2mm	CW	1.38	3.1	3.51
n260	AiM0	18	4H	38.5	Top (S5)	0	2mm	CW	1.73	2.99	2.38
n260	AiM1	11	4V	38.5	Back (S2)	0	2mm	CW	2.4	3.91	2.12
n260	AiM1	12	4V	38.5	Back (S2)	0	2mm	CW	2.16	3.9	2.57
n260	AiM1	26	4H	38.5	Back (S2)	0	2mm	CW	1.8	3.9	3.36
n260	AiM1	19	4H	38.5	Back (S2)	0	2mm	CW	1.74	3.89	3.49

4.6 Housing Influence Consideration

Since the property of non-metal material cannot be precisely characterized, we use measurement results to estimate the housing influence on the PD amplitude. More precisely, housing influence $\Delta_{housing}$ is estimated as: $\Delta_{housing}$ = PD_sim_dB – PD_meas_dB.
Because the housing influence is plane dependent, it is individually estimated for each worst plane. In order to be conservative, we consider the most underestimated housing influence per antenna module over the worst plane(s). In other words, the housing influence Δ_{min} is the minimum of $\Delta_{housing}$ over all worst plane(s).
Δ_{min} is calculated based on simulated and measured PD results in section 4.5, is determined as shown in below Table.

Band	Antenna	**∆min(dB)**	
		V Polarization	**H Polarization**
n260	AiM0	1.17	2.38
	AiM1	2.12	3.36
n261	AiM0	2.84	1.92
	AiM1	2.20	1.84

4.7 PD Characterization

4.7.1 Scaling Factor Considering Total Uncertainty

In order to obtain antenna input power limit, simulations are performed at low, mid, high channels for each of the supported mmWave bands under a given reference input power P_{ref}.

For any given beam x, the scaling factor s(x) is determined by

$$s(x) = \frac{\text{PD\_design\_target}}{\text{PD\_sim\_worst}(x)},$$

where $\text{PD\_sim\_worst}(x)$ is defined as

$$\text{PD\_sim\_worst}(x) = \min_{channel \in \{Low, mid, high\}} PD'(x, channel),$$

and

$$PD'(x, channel) = \min_{s \in S} PD(x, s, channel = mid).$$

For any given beam pair (x, y), the scaling factor s(x, y) is determined as

$$s(x, y) = \frac{\text{PD\_design\_target}}{\text{PD\_sim\_worst}(x, y)},$$

where $\text{PD\_sim\_worst}(x, y)$ is defined as

$$\text{PD\_sim\_worst}(x, y) = \min_{channel \in \{Low, mid, high\}} PD'(x, y, channel),$$

and

$$PD'(x, y, channel) = \min_{s \in S} PD(x, y, s, channel = mid).$$

4.7.2 Correction Factor Considering Housing Influence

Consider the housing influence, the input power limit for any given beam x can be expressed as

$$input\_power\_limit(x) = P_{ref} + 10\log\big(s(x)\big) + \Delta_{min},$$

where Δ_{min} is defined in below table. However, since TPC uncertainty already exists during the process of Δ_{min} determination, this uncertainty should be removed to avoid double counting.

Hence, the input power limit formula can be revised as

$$input\_power\_limit(x) = P_{ref} + 10\log\big(s(x)\big) + c,$$

where c is a correction factor expressed as

$$c = \begin{cases} \Delta_{min} + \text{TPC uncertainty}, & \Delta_{min} < -\text{TPC uncertainty} \\ \Delta_{min} - \text{TPC uncertainty}, & \Delta_{min} > -\text{TPC uncertainty} \\ 0, & \text{otherwise} \end{cases}$$

The input power limit is derived and listed in the below table based on the formula:

V Polarization				
Band	Antenna Module	Δ_{min} (dB)	TPC uncertainty (dB)	Input_power_limit (dBm)
n260	AiM0	1.17	0.7	P_{ref}+10log(s(x)) + c
	AiM1	2.12	0.7	P_{ref}+10log(s(x)) + c
n261	AiM0	2.84	0.7	P_{ref}+10log(s(x)) + c
	AiM1	2.20	0.7	P_{ref}+10log(s(x)) + c

H Polarization				
Band	Antenna Module	Δ_{min} (dB)	TPC uncertainty (dB)	Input_power_limit (dBm)
n260	AiM0	2.38	0.7	P_{ref}+10log(s(x)) + c
	AiM1	3.36	0.7	P_{ref}+10log(s(x)) + c
n261	AiM0	1.92	0.7	P_{ref}+10log(s(x)) + c
	AiM1	1.84	0.7	P_{ref}+10log(s(x)) + c

4.7.3 PD Characterization Table

Combining the information in previous sections, PD characterization table is derived and listed below:

Band	Module	Type	Beam ID	Feed No.	Ant Feed	Input power limit(dBm)
n260	AiM0	Patch	0	4	4V	0.25
			1	4	4V	0.78
			2	4	4V	0.40
			3	4	4V	1.81
			4	4	4V	1.48
			5	4	4V	1.54
			6	4	4V	1.56
			7	4	4V	1.02
			8	4	4V	1.30
			9	4	4V	1.61
			10	4	4V	1.81
			11	4	4V	1.80
			12	4	4V	1.26
			13	4	4V	1.34
			14	4	4V	1.20
			15	4	4V	1.42
			16	4	4H	1.61
			17	4	4H	2.01
			18	4	4H	1.45
			19	4	4H	2.52
			20	4	4H	1.95
			21	4	4H	2.44
			22	4	4H	2.03
			23	4	4H	1.95
			24	4	4H	2.35
			25	4	4H	2.55
			26	4	4H	2.68
			27	4	4H	2.53
			28	4	4H	2.04
			29	4	4H	1.76
			30	4	4H	1.85
			31	4	4H	1.82
			32	8	4V+4H	-2.96
			33	8	4V+4H	-2.90
			34	8	4V+4H	-2.94
			35	8	4V+4H	-2.03
			36	8	4V+4H	-2.68
			37	8	4V+4H	-2.34
			38	8	4V+4H	-2.56
			39	8	4V+4H	-3.08
			40	8	4V+4H	-2.58
			41	8	4V+4H	-1.90
			42	8	4V+4H	-1.99
			43	8	4V+4H	-2.05
			44	8	4V+4H	-2.50
			45	8	4V+4H	-2.77
			46	8	4V+4H	-2.86
			47	8	4V+4H	-2.33
			48	2	2V	2.51
			49	2	2V	2.83
			50	2	2V	2.51

			51	2	2V	3.15
			52	2	2V	3.04
			53	2	2V	3.14
			54	2	2V	3.04
			55	2	2V	3.00
			56	2	2V	3.14
			57	2	2V	3.14
			58	2	2V	3.04
			59	2	2V	3.15
			60	2	2V	3.00
			61	2	2V	2.88
			62	2	2V	2.88
			63	2	2V	3.14
			64	2	2V	2.51
			65	2	2V	3.15
			66	2	2H	3.83
			67	2	2H	3.83
			68	2	2H	3.57
			69	2	2H	3.95
			70	2	2H	3.69
			71	2	2H	4.12
			72	2	2H	3.69
			73	2	2H	4.03
			74	2	2H	4.12
			75	2	2H	4.12
			76	2	2H	3.69
			77	2	2H	3.95
			78	2	2H	4.03
			79	2	2H	3.49
			80	2	2H	3.49
			81	2	2H	4.12
			82	2	2H	3.69
			83	2	2H	3.83
			84	4	2V+2H	-1.20
			85	4	2V+2H	-1.09
			86	4	2V+2H	-1.15
			87	4	2V+2H	-0.54
			88	4	2V+2H	-0.76
			89	4	2V+2H	-0.45
			90	4	2V+2H	-0.76
			91	4	2V+2H	-0.75
			92	4	2V+2H	-0.45
			93	4	2V+2H	-0.45
			94	4	2V+2H	-0.76
			95	4	2V+2H	-0.54
			96	4	2V+2H	-0.75
			97	4	2V+2H	-0.93
			98	4	2V+2H	-0.93
			99	4	2V+2H	-0.45
			100	4	2V+2H	-0.56
			101	4	2V+2H	-0.85
			102	1	1V	6.06
			103	1	1V	5.40
			104	1	1H	6.15
			105	1	1H	7.31
			106	2	1V+1H	2.38
			107	2	1V+1H	1.97

Band	Module	Type	Beam ID	Feed No.	Ant Feed	Input power limit(dBm)
n261	AiM0	Patch	0	4	4V	2.15
			1	4	4V	2.66
			2	4	4V	2.48
			3	4	4V	2.21
			4	4	4V	4.03
			5	4	4V	3.18
			6	4	4V	3.94
			7	4	4V	2.32
			8	4	4V	2.53
			9	4	4V	2.32
			10	4	4V	3.14
			11	4	4V	2.24
			12	4	4V	2.19
			13	4	4V	2.19
			14	4	4V	2.13
			15	4	4V	2.63
			16	4	4H	1.33
			17	4	4H	2.09
			18	4	4H	1.26
			19	4	4H	1.22
			20	4	4H	3.19
			21	4	4H	2.40
			22	4	4H	2.35
			23	4	4H	0.98
			24	4	4H	1.67
			25	4	4H	1.45
			26	4	4H	2.09
			27	4	4H	1.00
			28	4	4H	1.88
			29	4	4H	1.69
			30	4	4H	1.22
			31	4	4H	2.55
			32	8	4V+4H	-2.53
			33	8	4V+4H	-1.65
			34	8	4V+4H	-2.38
			35	8	4V+4H	-2.47
			36	8	4V+4H	-0.25
			37	8	4V+4H	-1.04
			38	8	4V+4H	-0.60
			39	8	4V+4H	-2.76
			40	8	4V+4H	-2.22
			41	8	4V+4H	-1.82
			42	8	4V+4H	-1.17
			43	8	4V+4H	-2.78
			44	8	4V+4H	-1.83
			45	8	4V+4H	-1.98
			46	8	4V+4H	-2.56
			47	8	4V+4H	-1.49
			48	2	2V	4.69
			49	2	2V	5.16
			50	2	2V	4.69
			51	2	2V	4.95
			52	2	2V	5.15
			53	2	2V	5.15

			54	2	2V	5.15
			55	2	2V	4.79
			56	2	2V	4.78
			57	2	2V	4.95
			58	2	2V	5.15
			59	2	2V	4.72
			60	2	2V	5.15
			61	2	2V	5.16
			62	2	2V	4.69
			63	2	2V	4.69
			64	2	2V	4.69
			65	2	2V	5.15
			66	2	2H	3.88
			67	2	2H	4.78
			68	2	2H	4.15
			69	2	2H	4.05
			70	2	2H	4.42
			71	2	2H	4.42
			72	2	2H	4.42
			73	2	2H	3.88
			74	2	2H	4.46
			75	2	2H	4.05
			76	2	2H	4.42
			77	2	2H	3.97
			78	2	2H	4.42
			79	2	2H	4.78
			80	2	2H	4.15
			81	2	2H	4.15
			82	2	2H	3.97
			83	2	2H	4.78
			84	4	2V+2H	0.13
			85	4	2V+2H	0.95
			86	4	2V+2H	0.29
			87	4	2V+2H	0.50
			88	4	2V+2H	0.71
			89	4	2V+2H	0.71
			90	4	2V+2H	0.71
			91	4	2V+2H	0.41
			92	4	2V+2H	0.62
			93	4	2V+2H	0.50
			94	4	2V+2H	0.71
			95	4	2V+2H	0.30
			96	4	2V+2H	0.71
			97	4	2V+2H	0.95
			98	4	2V+2H	0.29
			99	4	2V+2H	0.29
			100	4	2V+2H	0.12
			101	4	2V+2H	0.76
			102	1	1V	7.42
			103	1	1V	7.86
			104	1	1H	7.36
			105	1	1H	6.81
			106	2	1V+1H	3.26
			107	2	1V+1H	3.29

Band	Module	Type	Beam ID	Feed No.	Ant Feed	Input power limit(dBm)
n260	AiM1	Patch	0	4	4V	1.13
			1	4	4V	1.00
			2	4	4V	0.72
			3	4	4V	0.82
			4	4	4V	0.40
			5	4	4V	0.47
			6	4	4V	0.66
			7	4	4V	0.42
			8	4	4V	0.67
			9	4	4V	0.49
			10	4	4V	0.80
			11	4	4V	0.69
			12	4	4V	0.51
			13	4	4V	0.63
			14	4	4V	0.38
			15	4	4V	0.77
			16	4	4H	2.11
			17	4	4H	1.91
			18	4	4H	2.12
			19	4	4H	1.87
			20	4	4H	1.92
			21	4	4H	2.01
			22	4	4H	2.34
			23	4	4H	1.68
			24	4	4H	1.97
			25	4	4H	2.06
			26	4	4H	1.73
			27	4	4H	2.16
			28	4	4H	1.67
			29	4	4H	1.87
			30	4	4H	1.89
			31	4	4H	1.93
			32	8	4V+4H	-2.42
			33	8	4V+4H	-2.44
			34	8	4V+4H	-2.73
			35	8	4V+4H	-2.81
			36	8	4V+4H	-3.08
			37	8	4V+4H	-2.78
			38	8	4V+4H	-2.35
			39	8	4V+4H	-2.95
			40	8	4V+4H	-2.88
			41	8	4V+4H	-2.69
			42	8	4V+4H	-2.93
			43	8	4V+4H	-2.68
			44	8	4V+4H	-2.78
			45	8	4V+4H	-3.00
			46	8	4V+4H	-3.06
			47	8	4V+4H	-2.60
			48	2	2V	3.22
			49	2	2V	3.19
			50	2	2V	2.99
			51	2	2V	2.59
			52	2	2V	2.70
			53	2	2V	2.59

			54	2	2V	2.70
			55	2	2V	2.53
			56	2	2V	2.89
			57	2	2V	2.59
			58	2	2V	2.50
			59	2	2V	3.22
			60	2	2V	2.70
			61	2	2V	3.22
			62	2	2V	3.19
			63	2	2V	3.22
			64	2	2V	3.22
			65	2	2V	2.50
			66	2	2H	4.33
			67	2	2H	4.17
			68	2	2H	4.26
			69	2	2H	3.84
			70	2	2H	4.03
			71	2	2H	3.84
			72	2	2H	4.03
			73	2	2H	3.85
			74	2	2H	3.95
			75	2	2H	3.84
			76	2	2H	3.84
			77	2	2H	4.33
			78	2	2H	4.03
			79	2	2H	4.33
			80	2	2H	4.17
			81	2	2H	4.33
			82	2	2H	3.84
			83	2	2H	4.33
			84	4	2V+2H	-0.43
			85	4	2V+2H	-0.53
			86	4	2V+2H	-0.41
			87	4	2V+2H	-0.85
			88	4	2V+2H	-0.55
			89	4	2V+2H	-0.85
			90	4	2V+2H	-0.55
			91	4	2V+2H	-0.70
			92	4	2V+2H	-0.72
			93	4	2V+2H	-0.85
			94	4	2V+2H	-0.83
			95	4	2V+2H	-0.43
			96	4	2V+2H	-0.55
			97	4	2V+2H	-0.43
			98	4	2V+2H	-0.53
			99	4	2V+2H	-0.43
			100	4	2V+2H	-0.31
			101	4	2V+2H	-0.43
			102	1	1V	5.70
			103	1	1V	5.58
			104	1	1H	6.51
			105	1	1H	7.23
			106	2	1V+1H	2.09
			107	2	1V+1H	2.34

Band	Module	Type	Beam ID	Feed No.	Ant Feed	Input power limit(dBm)
n261	AiM1	Patch	0	4	4V	0.43
			1	4	4V	0.14
			2	4	4V	0.52
			3	4	4V	1.64
			4	4	4V	1.02
			5	4	4V	0.82
			6	4	4V	0.35
			7	4	4V	1.34
			8	4	4V	1.53
			9	4	4V	1.21
			10	4	4V	0.45
			11	4	4V	1.00
			12	4	4V	0.43
			13	4	4V	0.53
			14	4	4V	0.90
			15	4	4V	1.08
			16	4	4H	0.25
			17	4	4H	0.49
			18	4	4H	0.11
			19	4	4H	1.06
			20	4	4H	1.15
			21	4	4H	0.68
			22	4	4H	0.40
			23	4	4H	0.96
			24	4	4H	0.60
			25	4	4H	0.83
			26	4	4H	0.48
			27	4	4H	0.88
			28	4	4H	0.35
			29	4	4H	0.64
			30	4	4H	0.53
			31	4	4H	0.48
			32	8	4V+4H	-3.31
			33	8	4V+4H	-3.57
			34	8	4V+4H	-3.19
			35	8	4V+4H	-2.38
			36	8	4V+4H	-2.74
			37	8	4V+4H	-3.40
			38	8	4V+4H	-3.45
			39	8	4V+4H	-3.15
			40	8	4V+4H	-2.72
			41	8	4V+4H	-2.60
			42	8	4V+4H	-3.10
			43	8	4V+4H	-3.07
			44	8	4V+4H	-3.34
			45	8	4V+4H	-3.37
			46	8	4V+4H	-3.43
			47	8	4V+4H	-3.08
			48	2	2V	3.05
			49	2	2V	2.96
			50	2	2V	3.05
			51	2	2V	3.62
			52	2	2V	3.50
			53	2	2V	3.50

			54	2	2V	3.25
			55	2	2V	3.34
			56	2	2V	3.34
			57	2	2V	3.34
			58	2	2V	3.25
			59	2	2V	3.62
			60	2	2V	3.05
			61	2	2V	3.34
			62	2	2V	3.50
			63	2	2V	3.05
			64	2	2V	3.05
			65	2	2V	3.62
			66	2	2H	2.85
			67	2	2H	2.78
			68	2	2H	2.75
			69	2	2H	2.98
			70	2	2H	3.03
			71	2	2H	3.03
			72	2	2H	2.64
			73	2	2H	2.80
			74	2	2H	2.80
			75	2	2H	2.75
			76	2	2H	2.64
			77	2	2H	2.98
			78	2	2H	2.75
			79	2	2H	2.75
			80	2	2H	3.03
			81	2	2H	2.75
			82	2	2H	2.85
			83	2	2H	3.03
			84	4	2V+2H	-0.63
			85	4	2V+2H	-0.88
			86	4	2V+2H	-0.66
			87	4	2V+2H	-0.71
			88	4	2V+2H	-0.69
			89	4	2V+2H	-0.69
			90	4	2V+2H	-0.61
			91	4	2V+2H	-0.81
			92	4	2V+2H	-0.81
			93	4	2V+2H	-0.67
			94	4	2V+2H	-0.61
			95	4	2V+2H	-0.71
			96	4	2V+2H	-0.66
			97	4	2V+2H	-0.67
			98	4	2V+2H	-0.69
			99	4	2V+2H	-0.66
			100	4	2V+2H	-0.63
			101	4	2V+2H	-0.41
			102	1	1V	6.02
			103	1	1V	6.09
			104	1	1H	5.64
			105	1	1H	5.73
			106	2	1V+1H	2.32
			107	2	1V+1H	1.94