

RF Exposure Report

(Part 0: SAR Char Evaluation)

APPLICANT : Xiaomi Communications Co., Ltd.
EQUIPMENT : Mobile Phone
BRAND NAME : Xiaomi
MODEL NAME : 2210132G
FCC ID : 2AFZZ132G
STANDARD : FCC 47 CFR PART 2 (2.1093)

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB 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. (Kunshan), the test report shall not be reproduced except in full.



Approved by: Si Zhang

Sporton International Inc. (Kunshan)

No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China



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History of this test report

Report No.	Version	Description	Issued Date
FA292001B	01	Initial issue of report	Nov. 11, 2022

1. Introduction

The 2nd generation of Smart Transmit (GEN2) operates based on pre-defined sub6 antenna groups (AG). This Device is enabled with the Qualcomm® Smart Transmit Gen2 feature. The RF exposure limit is defined based on time-averaged RF exposure. The product implements Qualcomm Smart Transmit feature which controls the instantaneous transmitting power for WWAN transmitter to ensure the product in compliance with RF exposure limit over a defined time window, for SAR (transmit frequency $\leq 6\text{GHz}$) 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. Smart Transmit cannot operate without SAR characterization at the device level, beforehand.

This report describes the procedures for the SAR char generation, and the parameters obtained from SAR characterization (referred to as SAR char, respectively) will be used as input for Smart Transmit. Both SAR char will be entered via the Embedded File System (EFS) to enable the Smart Transmit GEN2 Feature.

Terminologies in this report

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 uncertainty.
SAR char	P_{limit} for all the technologies/bands for all applicable DSI



2. Product Description

Product Feature & Specification	
Equipment Name	Mobile Phone
Brand Name	Xiaomi
Model Name	2210132G
FCC ID	2AFZZ132G
Wireless Technology and Frequency Range	GSM850: 824 MHz ~ 849 MHz GSM1900: 1850 MHz ~ 1910 MHz WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band IV: 1710 MHz ~ 1755 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 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 42: 3450 MHz ~ 3550 MHz LTE Band 48: 3550 MHz ~ 3700 MHz LTE Band 66: 1710 MHz ~ 1780 MHz 5G NR n5: 824 MHz ~ 849 MHz 5G NR n7: 2500 MHz ~ 2570 MHz 5G NR n38 : 2570 MHz ~ 2620 MHz 5G NR n41: 2496 MHz ~ 2690 MHz 5G NR n66 : 1710 MHz ~ 1780 MHz 5G NR n71 : 663 MHz ~ 698 MHz 5G NR n77: 3450 MHz ~ 3550 MHz, 3700 MHz ~ 3980 MHz 5G NR n78: 3450 MHz ~ 3550 MHz, 3700 MHz ~ 3800 MHz 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 ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz WLAN 6GHz U-NII-5: 5925 MHz ~ 6425 MHz WLAN 6GHz U-NII-6: 6425 MHz ~ 6525 MHz WLAN 6GHz U-NII-7: 6525 MHz ~ 6875 MHz WLAN 6GHz 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 supported) LTE: QPSK, 16QAM, 64QAM, 256QAM 5G NR : CP-OFDM / DFT-s-OFDM, PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 2.4GHz 802.11ax/be HE20/HE40/EHT20/EHT40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80/VHT160 WLAN 5GHz 802.11ax HE20/HE40/HE80/HE160 WLAN 5GHz 802.11be EHT20/EHT40/EHT80/EHT160 WLAN 6GHz 802.11a/ax HE20/HE40/HE80/HE160 WLAN 6GHz 802.11be EHT20/EHT40/EHT80/EHT160/EHT320 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 Smart Transmit to control and manage RF exposure for $f < 6$ GHz.

3.1 SAR design target and uncertainty

SAR design Target :

Band	Antenna	Head DSI1	Hotspot DSI5	Body Worn DSI4	Sensor On DSI3
GSM850	Ant 0	0.87	0.87	0.87	2.07
GSM850	Ant 1	0.61	0.41	0.78	1.84
GSM1900	Ant 3	0.87	0.87	0.87	2.07
GSM1900	Ant 4	0.49	0.31	0.78	1.84
WCDMA II	Ant 3	0.87	0.53	0.87	2.07
WCDMA II	Ant 4	0.82	0.28	0.87	2.07
WCDMA IV	Ant 3	0.87	0.87	0.87	2.07
WCDMA IV	Ant 5	0.86	0.65	0.25	1.84
WCDMA IV	Ant 4	0.73	0.25	0.87	2.07
WCDMA IV	Ant 6	0.6	0.18	0.19	1.84
WCDMA V	Ant 0	0.87	0.87	0.87	2.07
WCDMA V	Ant 1	0.61	0.38	0.78	1.84
LTE Band 2	Ant 5	0.78	0.39	0.78	2.07
LTE Band 4	Ant 5	0.79	0.67	0.29	2.07
LTE Band 7	Ant 3	0.94	0.50	0.94	2.21
LTE Band 7	Ant 5	0.56	0.59	0.21	2.07
LTE Band 7	Ant 4	0.56	0.20	0.78	1.84
LTE Band 7	Ant 6	0.78	0.30	0.10	1.84
LTE Band 12(17)	Ant 0	0.94	0.94	0.94	2.21
LTE Band 12	Ant 1	0.87	0.53	0.87	2.07
LTE Band 17	Ant 1	0.87	0.53	0.87	2.07
LTE Band 13	Ant 0	0.94	0.94	0.94	2.21
LTE Band 13	Ant 1	0.76	0.57	0.87	2.07
LTE Band 25(2)	Ant 3	0.94	0.60	0.94	2.21
LTE Band 25	Ant 4	0.86	0.32	0.94	2.21
LTE Band 2	Ant 4	0.86	0.32	0.94	2.21
LTE Band 26	Ant 0	0.94	0.94	0.94	2.21
LTE Band 5	Ant 0	0.94	0.94	0.94	2.21
LTE Band 26	Ant 1	0.73	0.40	0.87	2.07
LTE Band 5	Ant 1	0.73	0.40	0.87	2.07
LTE Band 66(4)	Ant 3	0.94	0.78	0.94	2.21
LTE Band 66	Ant 5	0.71	0.67	0.29	2.07
LTE Band 66(4)	Ant 4	0.87	0.30	0.94	2.21
LTE Band 66(4)	Ant 6	0.47	0.31	0.26	1.84
LTE Band 38	Ant 5	0.72	0.64	0.18	2.07
LTE Band 38	Ant 4	0.94	0.16	0.94	2.21
LTE Band 38	Ant 6	0.62	0.44	0.14	1.84
LTE Band 41	Ant 3	0.94	0.56	0.94	2.21
LTE Band 38	Ant 3	0.94	0.56	0.94	2.21
LTE Band 41	Ant 5	0.53	0.50	0.18	2.07



LTE Band 41	Ant 4	0.94	0.13	0.94	2.21
LTE Band 41	Ant 6	0.56	0.47	0.14	1.84
LTE Band 42	Ant 1	0.64	0.31	0.18	1.84
LTE Band 42	Ant 3	0.78	0.78	0.78	1.84
LTE Band 42	Ant 10	0.76	0.13	0.94	2.21
LTE Band 42	Ant 13	0.78	0.56	0.78	1.84
LTE Band 48	Ant 1	0.41	0.20	0.06	1.84
LTE Band 48	Ant 3	0.78	0.58	0.78	1.84
LTE Band 48	Ant 10	0.64	0.20	0.94	2.21
LTE Band 48	Ant 13	0.78	0.33	0.78	1.84
FR1 n5	Ant 0	0.94	0.94	0.94	2.21
FR1 n5	Ant 1	0.31	0.35	0.87	2.07
FR1 n7	Ant 3	0.94	0.57	0.94	2.21
FR1 n7	Ant 5	0.41	0.41	0.19	2.07
FR1 n7	Ant 4	0.94	0.23	0.94	2.21
FR1 n7	Ant 6	0.78	0.37	0.18	1.84
FR1 n66	Ant 3	0.94	0.94	0.94	2.21
FR1 n66	Ant 5	0.87	0.51	0.36	2.07
FR1 n66	Ant 4	0.68	0.23	0.94	2.21
FR1 n66	Ant 6	0.33	0.14	0.14	1.84
FR1 n41(38)	Ant 3	0.94	0.53	0.94	2.21
FR1 n41(38)	Ant 5	0.65	0.44	0.17	2.07
FR1 n41	Ant 4	0.94	0.17	0.94	2.21
FR1 n38	Ant 4	0.94	0.17	0.94	2.21
FR1 n41	Ant 6	0.74	0.35	0.18	1.84
FR1 n38	Ant 6	0.74	0.35	0.18	1.84
FR1 n71	Ant 0	0.94	0.94	0.94	2.21
FR1 n71	Ant 1	0.40	0.47	0.87	2.07
FR1 n77 PC3	Ant 1	0.78	0.36	0.17	1.84
FR1 n77 PC2	Ant 1	0.58	0.31	0.13	1.84
FR1 n77 PC3	Ant 3	0.87	0.48	0.28	2.07
FR1 n77 PC2	Ant 3	0.87	0.42	0.39	2.07
FR1 n77 PC3	Ant 10	0.65	0.36	0.87	1.84
FR1 n77 PC2	Ant 10	0.46	0.33	0.87	1.29
FR1 n77 PC3	Ant 13	0.41	0.41	0.26	1.84
FR1 n77 PC2	Ant 13	0.32	0.22	0.22	1.84
FR1 n78 PC3	Ant 1	0.60	0.41	0.13	1.84
FR1 n78 PC2	Ant 1	0.45	0.30	0.09	1.84
FR1 n78 PC3	Ant 3	0.87	0.78	0.87	2.07
FR1 n78 PC2	Ant 3	0.87	0.42	0.67	2.07
FR1 n78 PC3	Ant 10	0.83	0.46	0.87	1.17
FR1 n78 PC2	Ant 10	0.69	0.43	0.60	1.16
FR1 n78 PC3	Ant 13	0.78	0.56	0.38	1.84
FR1 n78 PC2	Ant 13	0.70	0.36	0.26	1.84

Uncertainty:

Tech	Antenna	Total Uncertainty (dB)	Description	
			Antenna Number	Frequency
GSM	Main	1.00	Ant 0/3	All Frequency
	Aux	1.50	Ant 1/4	All Frequency
WCDMA	Main	1.00	Ant 0/3	All Frequency
	Aux 1	1.00	Ant 4	All Frequency
	Aux 2	1.50	Ant 1/5/6	All Frequency
LTE	Main	0.70	Ant 0/3/10	All Frequency
	Aux 1	1.00	Ant 1	$f < 1\text{GHz}$
		0.70	Ant 4	$1\text{GHz} < f < 3\text{GHz}$
		1.50	Ant 1/3/13	$f \geq 3\text{GHz}$
	Aux 2	1.00	Ant 5	$1\text{GHz} < f < 3\text{GHz}$
	Aux 3	1.50	Ant 6	$1\text{GHz} < f < 3\text{GHz}$
5G NR	Main	0.70	Ant 0/4	$f < 1\text{GHz}$
		0.70	Ant 0/4	$1\text{GHz} < f < 3\text{GHz}$
		1.00	Ant 10	$f \geq 3\text{GHz}$
	Aux 1	1.00	Ant 1	$f < 1\text{GHz}$
		0.70	Ant 3	$1\text{GHz} < f < 3\text{GHz}$
		1.50	Ant 1	$f \geq 3\text{GHz}$
	Aux 2	1.00	Ant 5	$1\text{GHz} < f < 3\text{GHz}$
		1.00	Ant 3	$f \geq 3\text{GHz}$
		1.50	Ant 3	$f \geq 3\text{GHz}$ only for n77 other PA
	Aux 3	1.50	Ant 6/13	$1\text{GHz} < f < 3\text{GHz} \& f \geq 3\text{GHz}$

Band	Antenna			
GSM 850	Main Ant0	AuX Ant1	NA	NA
GSM 1900	Main Ant3	AuX Ant4	NA	NA
WCDMA B5	Main Ant0	AuX2 Ant1	NA	NA
WCDMA B2/4	Main Ant3	AuX1 Ant4	AuX2 Ant5/6	NA
LTE B5/12/13/17/26	Main Ant0	AuX1 Ant1	NA	NA
LTE B42/48	Main Ant10	AuX1 Ant1/3/13	NA	NA
LTE B2/4/7/25/38/40/41/66	Main Ant3	AuX1 Ant4	AuX2 Ant5	AuX3 Ant6
5G NR n5/n71	Main Ant0	AuX1 Ant1	NA	NA
5G NR 7/38/41/66	Main Ant4	AuX1 Ant3	AuX2 Ant5	AuX3 Ant6
5G NR n77/78	Main Ant10	AuX1 Ant1	AuX2 Ant3	AuX3 Ant13

Antenna Group:

Antenna Group 0 (AG0)	ANT1 & ANT4& ANT5& ANT6& ANT10& ANT13
Antenna Group 1 (AG1)	ANT0 & ANT3

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 Smart Transmit to control and manage RF exposure for $f < 6$ GHz.

<P_{limit} for supported technologies and bands (P_{limit} in EFS file)>

Band	Antenna	Head DSI1	Hotspot DSI5	Body Worn DSI4	Sensor On DSI3	Pmax*
GSM850	Ant 0	31.8	28.4	31.0	24.0	24.0
GSM850	Ant 1	21.1	21.1	28.2	24.1	24.1
GSM1900	Ant 3	34.2	22.9	29.5	20.4	20.4
GSM1900	Ant 4	17.3	17.3	27.8	19.3	19.3
WCDMA II	Ant 3	32.0	21.3	28.8	23.3	24.3
WCDMA II	Ant 4	18.7	18.7	28.3	20.7	23.7
WCDMA IV	Ant 3	31.3	21.8	27.8	21.8	23.8
WCDMA IV	Ant 5	21.4	21.4	21.4	21.4	23.4
WCDMA IV	Ant 4	16.5	16.5	25.1	20.5	23.5
WCDMA IV	Ant 6	17.0	17.0	21.5	21.5	22.0
WCDMA V	Ant 0	30.7	27.8	30.2	23.8	23.8
WCDMA V	Ant 1	20.0	20.0	27.5	24.0	24.0
LTE Band 2	Ant 5	20.7	20.7	30.2	24.7	24.7
LTE Band 4	Ant 5	21.3	21.3	22.3	22.3	24.3
LTE Band 7	Ant 3	31.0	19.0	27.3	19.0	25.0
LTE Band 7	Ant 5	17.6	17.6	19.6	19.6	24.6
LTE Band 7	Ant 4	18.8	18.8	29.7	21.8	24.8
LTE Band 7	Ant 6	19.0	18.0	18.0	18.0	24.0
LTE Band 12(17)	Ant 0	32.6	29.4	31.6	24.8	24.8
LTE Band 12	Ant 1	24.0	24.0	30.3	24.5	24.5
LTE Band 17	Ant 1	23.9	23.9	30.3	24.4	24.4
LTE Band 13	Ant 0	33.1	30.2	32.5	24.7	24.7
LTE Band 13	Ant 1	21.7	21.7	27.5	24.2	24.2
LTE Band 25(2)	Ant 3	33.9	23.0	30.5	23.0	25.0
LTE Band 25	Ant 4	18.7	18.7	28.0	21.2	24.7
LTE Band 2	Ant 4	18.4	18.4	28.0	21.4	24.4
LTE Band 26	Ant 0	32.4	28.1	31.2	24.9	24.9
LTE Band 5	Ant 0	32.4	28.1	31.2	24.8	24.8
LTE Band 26	Ant 1	21.2	21.2	28.0	24.2	24.2
LTE Band 5	Ant 1	20.2	20.2	28.0	24.2	24.2
LTE Band 66(4)	Ant 3	32.3	22.0	28.6	23.0	25.0
LTE Band 66	Ant 5	20.9	20.9	22.4	22.4	24.4
LTE Band 66(4)	Ant 4	18.0	18.0	25.0	21.5	25.0
LTE Band 66(4)	Ant 6	18.7	18.7	22.7	22.7	23.7
LTE Band 38	Ant 5	18.7	18.7	19.7	19.7	22.7
LTE Band 38	Ant 4	18.5	18.5	31.2	25.4	23.0
LTE Band 38	Ant 6	18.2	18.2	19.2	19.2	22.2
LTE Band 41	Ant 3	31.9	19.5	27.6	19.5	23.0
LTE Band 38	Ant 3	31.9	19.0	27.6	19.0	23.0
LTE Band 41	Ant 5	17.7	17.7	19.7	19.7	22.7
LTE Band 41	Ant 4	19.0	19.0	31.2	22.0	23.0
LTE Band 41	Ant 6	17.7	17.7	19.2	19.2	22.2
LTE Band 42	Ant 1	19.0	19.0	20.0	20.0	21.0
LTE Band 42	Ant 3	31.3	20.7	23.0	20.0	19.3
LTE Band 42	Ant 10	14.5	14.5	28.8	21.0	23.0
LTE Band 42	Ant 13	26.7	18.9	23.2	20.9	20.9
LTE Band 48	Ant 1	16.5	16.5	16.5	16.5	21.0
LTE Band 48	Ant 3	29.6	16.9	24.0	19.4	19.4
LTE Band 48	Ant 10	12.4	12.4	25.2	18.9	22.9

LTE Band 48	Ant 13	25.4	17.2	24.6	21.2	21.2
FR1 n5	Ant 0	32.6	29.5	31.7	29.1	25.0
FR1 n5	Ant 1	19.5	19.5	28.3	26.1	24.5
FR1 n7	Ant 3	31.8	19.0	27.1	19.0	25.0
FR1 n7	Ant 5	16.7	16.7	18.2	18.2	24.7
FR1 n7	Ant 4	18.5	18.5	30.2	22.0	25.0
FR1 n7	Ant 6	17.2	17.2	18.7	18.7	24.2
FR1 n66	Ant 3	31.3	22.0	28.4	23.0	25.0
FR1 n66	Ant 5	20.5	20.5	22.5	22.5	24.5
FR1 n66	Ant 4	17.0	17.0	25.5	20.0	25.0
FR1 n66	Ant 6	16.0	16.0	20.0	20.0	23.0
FR1 n41(38)	Ant 3	32.1	19.0	26.5	19.0	25.0
FR1 n41(38)	Ant 5	17.7	17.7	18.7	18.7	24.7
FR1 n41	Ant 4	18.0	18.0	30.0	23.0	25.0
FR1 n38	Ant 4	18.0	18.0	30.0	24.0	25.0
FR1 n41	Ant 6	18.2	18.2	19.2	19.2	24.2
FR1 n38	Ant 6	18.2	18.2	19.2	19.2	24.2
FR1 n71	Ant 0	33.3	28.4	32.1	25.0	25.0
FR1 n71	Ant 1	22.9	22.9	30.2	24.4	24.4
FR1 n77 PC3	Ant 1	19.5	19.5	20.5	20.5	24.0
FR1 n77 PC2	Ant 1	19.5	19.5	20.5	20.5	23.0
FR1 n77 PC3-other PA	Ant 3	28.3	17.7	21.2	19.2	24.2
FR1 n77 PC3-other PA	Ant 3	28.3	17.7	21.2	19.2	21.4
FR1 n77 PC3-Main PA	Ant 3	28.3	17.7	21.2	19.2	24.7
FR1 n77 PC3-Main PA	Ant 3	28.3	17.7	21.2	19.2	23
FR1 n77 PC3	Ant 10	14.7	14.7	26.0	21.2	24.7
FR1 n77 PC2	Ant 10	14.7	14.7	26.0	21.2	24.0
FR1 n77 PC3	Ant 13	21.2	15.2	19.2	19.2	24.2
FR1 n77 PC2	Ant 13	21.2	15.2	19.2	19.2	23.0
FR1 n78 PC3	Ant 1	19.5	19.0	19.0	19.0	24.0
FR1 n78 PC2	Ant 1	19.5	19.0	19.0	19.0	23.0
FR1 n78 PC3	Ant 3	31.3	18.7	22.7	19.7	24.7
FR1 n78 PC2	Ant 3	31.3	18.7	22.7	19.7	23.0
FR1 n78 PC3	Ant 10	14.2	14.2	21.7	19.7	24.7
FR1 n78 PC2	Ant 10	14.2	14.2	21.7	19.7	24.0
FR1 n78 PC3	Ant 13	23.2	16.2	19.2	19.2	24.2
FR1 n78 PC2	Ant 13	23.2	16.2	19.2	19.2	23.4

Note:

- *Pmax is used for RF tune up procedure. The maximum allowed output power is equal to Pmax + Total uncertainty.
- 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).
- GSM/WCDMA applies force peak method. If force peak is set to 'x' for a given tech/band/antenna/DSI in the EFS, then the Smart Transmit feature limits the maximum instantaneous Tx power to Plimit for the selected tech/band/antenna /DSI. In other words, with force peak set to 'x', under static condition (i.e., fixed tech/band /antenna/DSI) and in single active Tx scenario, Smart Transmit can guarantee Tx power level of Plimit at all times.
- 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
NR TDD HPUE for n77/78	50%	-3.0