

RF Exposure Report

(Part 0: SAR Char Evaluation)

APPLICANT : Motorola Mobility LLC
EQUIPMENT : Mobile Cellular Phone
BRAND NAME : Motorola
MODEL NAME : XT2515-1, XT2515-2, XT2515-3, XT2515V
FCC ID : IHDT56AU5
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.



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Table of Contents

1. Introduction	4
2. Product Description	5
3. SAR Characterization.....	6
3.1 SAR design target and uncertainty.....	6
3.2 SAR Char Table	7

History of this test report

Report No.	Version	Description	Issued Date
FA483010C	01	Initial issue of report	Oct. 17, 2024
FA483010C	02	Updated Plimit in section 3.2. This report is an updated version, replacing the report issued on Oct. 17, 2024.	Nov. 11, 2024

1. Introduction

The RF exposure limit is defined based on time-averaged RF exposure. The product implements MediaTek TA-SAR 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 $\leq$ 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. TA-SAR 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 TA-SAR algorithm. Both SAR char will be entered via the MediaTek's NV suggestion to enable the TA-SAR 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 ECI

2. Product Description

Product Feature & Specification	
Equipment Name	Mobile Cellular Phone
Brand Name	Motorola
Model Name	XT2515-1, XT2515-2, XT2515-3, XT2515V
FCC ID	IHDT56AU5
Wireless Technology and Frequency Range	GSM850: 824 MHz ~ 849 MHz GSM1900: 1850MHz ~ 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 14: 788 MHz ~ 798 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 30: 2305 MHz ~ 2315 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 48: 3550 MHz ~ 3700 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 71: 663 MHz ~ 698 MHz 5G NR n2: 1850 MHz ~ 1910 MHz 5G NR n5: 824 MHz ~ 849 MHz 5G NR n7: 2500 MHz ~ 2570 MHz 5G NR n12: 699 MHz ~ 716 MHz 5G NR n14: 788 MHz ~ 798 MHz 5G NR n25: 1850 MHz ~ 1915 MHz 5G NR n26: 814 MHz ~ 849 MHz 5G NR n30: 2305 MHz ~ 2315 MHz 5G NR n41: 2496 MHz ~ 2690 MHz 5G NR n48: 3550 MHz ~ 3700 MHz 5G NR n66: 1710 MHz ~ 1780 MHz 5G NR n70: 1695 MHz ~ 1710 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 Bluetooth: 2402 MHz ~ 2480 MHz 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: DFT-s-OFDM/CP-OFDM, Pi/2 BPSK/QPSK/16QAM/64QAM/256QAM WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE 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 TA-SAR algorithm to control and manage RF exposure for $f < 6$ GHz.

3.1 SAR design target and uncertainty

SAR design Target:

Exposure Condition	Measure Distance	SAR (W/kg)	
		WWAN 2/3/4/5G Bottom	SAR Limit WWAN 2/3/4/5G Top
Body Worn (1g)	5 mm	1.03	0.71
Hotspot (1g)	5 mm	1.03	0.50
Head (1g)	touch&tilt 15deg	1.03	0.71
Extremity (10g)	0 mm	2.55	1.98

Antenna

Top Antenna	ANT3 & ANT4& ANT5 & ANT7 & ANT10
Bottom Antenna	ANT0 & ANT1& ANT9

Uncertainty:

Item	Uncertainty dB (k=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 TA-SAR algorithm to control and manage RF exposure for $f < 6$ GHz.

<P_{limit} for supported technologies and bands>

Band	Antenna	Head ECI2	Bodyworn ECI3	Hotspot ECI7	Extremity ECI6	Sensor off ECI4	Pmax
GSM850	Ant0	30.6	23.1	23.1	27.4	26.5	26.5
GSM1900	Ant1	29.6	20.9	18.9	23.2	22.5	22.5
WCDMA II	Ant1	29.6	20.0	18.7	21.7	23.0	23.0
WCDMA IV	Ant1	31.6	19.1	18.3	21.8	23.0	23.0
WCDMA V	Ant0	28.7	21.7	21.7	25.5	23.0	23.0
LTE Band 25(2)	Ant1	30.9	20.0	18.9	22.2	23.0	23.0
LTE Band 25(2)	Ant4	14.6	15.9	11.0	16.6	21.0	21.0
LTE Band 25(2) Other PA	Ant4	16.5	17.5	12.5	18.0	23.0	23.0
LTE Band 66(4)	Ant1	30.9	19.8	18.8	22.0	23.0	23.0
LTE Band 66(4)	Ant4	14.9	16.8	12.0	15.7	21.0	21.0
LTE Band 66(4) Other PA	Ant4	16.5	18.5	14.0	19.5	23.0	23.0
LTE Band 26(5)	Ant0	28.5	22.2	22.2	25.0	23.0	23.0
LTE Band 26(5)	Ant4	19.6	19.6	18.1	24.5	23.0	23.0
LTE Band 7	Ant1	28.9	20.8	17.8	19.9	23.0	23.0
LTE Band 7	Ant4	22.5	24.2	18.8	24.8	23.0	23.0
LTE Band 12(17)	Ant0	29.8	23.0	23.0	25.0	23.0	23.0
LTE Band 12(17)	Ant4	19.9	21.6	19.9	26.0	23.0	23.0
LTE Band 13	Ant0	29.0	23.0	23.0	26.0	23.0	23.0
LTE Band 13	Ant4	19.9	21.6	19.9	26.4	23.0	23.0
LTE Band 14	Ant0	29.3	24.2	23.0	25.3	23.0	23.0
LTE Band 14	Ant4	20.6	21.6	20.4	25.9	23.0	23.0
LTE Band 30	Ant1	30.8	23.6	20.7	23.2	23.0	23.0
LTE Band 30 Other PA	Ant4	25.3	26.5	21.7	23.0	23.0	23.0
LTE Band 71	Ant0	30.2	23.9	23.9	26.7	23.0	23.0
LTE Band 71	Ant4	23.8	24.2	23.0	23.0	23.0	23.0
LTE Band 41(38) PC3	Ant1	28.9	20.2	18.9	20.2	22.4	21.0
LTE Band 41 PC2	Ant1	28.9	20.2	18.9	20.2	22.4	22.4
LTE Band 41 PC3	Ant4	16.1	16.1	10.2	20.3	18.4	17.0
LTE Band 41 PC2	Ant4	16.1	16.1	10.2	20.3	18.4	18.4
LTE Band 41 PC3	Ant0	31.1	21.6	21.6	22.6	21.4	20.0
LTE Band 41 PC2	Ant0	31.1	21.6	21.6	22.6	21.4	21.4
LTE Band 41 PC3	Ant10	31.3	16.9	15.5	19.4	19.4	18.0
LTE Band 41 PC2	Ant10	31.3	16.9	15.5	19.4	19.4	19.4
LTE Band 48	Ant3	18.4	13.3	11.1	16.8	21.0	21.0
FR1 n25(2)	Ant1	32.1	22.3	20.8	24.1	23.0	23.0
FR1 n2 Other PA	Ant1	32.1	22.3	20.8	24.1	23.0	23.0
FR1 n25(2)	Ant4	15.0	17.5	13.0	17.5	21.0	21.0
FR1 n25(2) Other PA	Ant4	16.9	18.8	14.1	18.8	23.0	23.0
FR1 n25(2) Other Path	Ant4	16.9	18.8	14.1	18.8	23.0	23.0
FR1 n26(5)	Ant0	30.8	24.2	24.2	23.0	23.0	23.0
FR1 n26(5)	Ant4	21.9	22.0	20.9	27.0	23.0	23.0
FR1 n7	Ant1	29.4	22.2	19.2	21.0	23.0	23.0
FR1 n12	Ant0	32.0	25.3	25.3	23.0	23.0	23.0
FR1 n12	Ant4	22.5	22.5	21.4	23.0	23.0	23.0
FR1 n14	Ant0	31.5	24.6	24.6	23.0	23.0	23.0
FR1 n14	Ant4	22.5	23.1	21.7	23.0	23.0	23.0
FR1 n30	Ant1	33.0	23.7	20.1	22.5	23.0	23.0
FR1 n66	Ant1	32.4	21.5	20.1	23.3	23.0	23.0

FR1 n66	Ant4	15.5	15.5	12.5	18.5	21.0	21.0
FR1 n66 Other PA	Ant4	18.0	17.7	14.6	20.5	23.0	23.0
FR1 n66 Other Path	Ant4	18.0	17.7	14.6	20.5	23.0	23.0
FR1 n70	Ant1	32.5	22.0	20.6	24.0	23.0	23.0
FR1 n70	Ant4	17.0	17.4	15.4	20.5	21.0	21.0
FR1 n71	Ant0	32.0	24.8	24.8	23.0	23.0	23.0
FR1 n71	Ant4	23.3	24.7	23.1	23.0	23.0	23.0
FR1 n41 PC3	Ant1	30.5	20.8	19.8	21.0	26.0	23.0
FR1 n41 PC2	Ant1	30.5	20.8	19.8	21.0	26.0	26.0
FR1 n41 PC3	Ant4	17.0	18.2	12.8	19.9	22.0	19.0
FR1 n41 PC2	Ant4	17.0	18.2	12.8	19.9	22.0	22.0
FR1 n41 PC3	Ant0	30.3	23.1	23.1	24.0	25.0	22.0
FR1 n41 PC2	Ant0	30.3	23.1	23.1	24.0	25.0	25.0
FR1 n41 PC3	Ant10	33.4	19.2	17.6	20.3	20.3	20.0
FR1 n41 PC2	Ant10	33.4	19.2	17.6	20.3	20.3	23.0
FR1 n48	Ant3	18.0	14.3	13.3	17.0	23.0	23.0
FR1 n48	Ant5	19.1	15.9	14.4	23.8	23.8	17.0
FR1 n48	Ant9	29.6	20.3	17.9	21.0	21.0	23.5
FR1 n48	Ant7	19.8	16.5	14.7	22.0	17.0	17.0
FR1 n77(78) PC3	Ant3	16.0	12.7	11.7	16.5	24.5	23.0
FR1 n77(78) PC2	Ant3	16.0	12.7	11.7	16.5	24.5	26.0
FR1 n77(78) PC3	Ant5	19.1	15.6	14.2	23.4	23.4	17.0
FR1 n77(78) PC2	Ant5	19.1	15.6	14.2	23.4	23.4	20.0
FR1 n77(78) PC3	Ant9	29.6	19.2	16.7	19.2	19.2	24.0
FR1 n77(78) PC2	Ant9	29.6	19.2	16.7	19.2	19.2	27.0
FR1 n77(78) PC3	Ant7	17.0	16.3	13.8	21.0	20.0	17.0
FR1 n77(78) PC2	Ant7	17.0	16.3	13.8	21.0	20.0	20.0

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

2) All Plimit 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 Plimit + 1dB device uncertainty, and if Plimit 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