

# RF Exposure Report

## (Part 0: SAR Char Evaluation)

APPLICANT : Motorola Mobility LLC  
EQUIPMENT : Mobile Cellular Phone  
BRAND NAME : Motorola  
MODEL NAME : XT2347-1  
FCC ID : IHDT56AN1  
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 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. (Shenzhen), the test report shall not be reproduced except in full.



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## History of this test report

| Report No. | Version | Description             | Issued Date   |
|------------|---------|-------------------------|---------------|
| FA352602C  | 01      | Initial issue of report | Jul. 17, 2023 |
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## **1. Introduction**

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 GEN1 Feature.

Terminologies in this report

|                    |                                                                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| $P_{\text{limit}}$ | The time-averaged RF power which corresponds to SAR_design_target.                                                                                |
| $P_{\text{max}}$   | 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           | $P_{\text{limit}}$ for all the technologies/bands for all applicable DSI                                                                          |

## 2. Product Description

| Product Feature & Specification         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Equipment Name                          | Mobile Cellular Phone                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Brand Name                              | Motorola                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Model Name                              | XT2347-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| FCC ID                                  | IHDT56AN1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Wireless Technology and Frequency Range | GSM850: 824 MHz ~ 849 MHz<br>GSM1900: 1850 MHz ~ 1910 MHz<br>WCDMA Band II: 1850 MHz ~ 1910 MHz<br>WCDMA Band IV: 1710 MHz ~ 1755 MHz<br>WCDMA Band V: 824 MHz ~ 849 MHz<br>LTE Band 2: 1850 MHz ~ 1910 MHz<br>LTE Band 4: 1710 MHz ~ 1755 MHz<br>LTE Band 5: 824 MHz ~ 849 MHz<br>LTE Band 7: 2500 MHz ~ 2570 MHz<br>LTE Band 12: 699 MHz ~ 716 MHz<br>LTE Band 13: 777 MHz ~ 787 MHz<br>LTE Band 17: 704 MHz ~ 716 MHz<br>LTE Band 25: 1850 MHz ~ 1915 MHz<br>LTE Band 26: 814 MHz ~ 849 MHz<br>LTE Band 38: 2570 MHz ~ 2620 MHz<br>LTE Band 41: 2496 MHz ~ 2690 MHz<br>LTE Band 42: 3450 MHz ~ 3550 MHz<br>LTE Band 66: 1710 MHz ~ 1780 MHz<br>5G NR n2 : 1850 MHz ~ 1910 MHz<br>5G NR n5: 824 MHz ~ 849 MHz<br>5G NR n7: 2500 MHz ~ 2570 MHz<br>5G NR n26 : 814 MHz ~ 849 MHz<br>5G NR n66: 1710 MHz ~ 1780 MHz<br>5G NR n38 : 2570 MHz ~ 2620 MHz<br>5G NR n41 : 2496 MHz ~ 2690 MHz<br>5G NR n78: 3450 MHz ~ 3550 MHz<br>WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz<br>WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz<br>WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz<br>WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz<br>WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz<br>Bluetooth: 2402 MHz ~ 2480 MHz<br>NFC: 13.56 MHz |
| Mode                                    | GSM/GPRS/EGPRS<br>RMC/AMR 12.2Kbps<br>HSDPA<br>HSUPA<br>HSPA+(16QAM uplink is supported)<br>LTE: QPSK, 16QAM, 64QAM, 256QAM<br>5G NR : CP-OFDM / DFT-s-OFDM, PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM<br>WLAN 2.4GHz 802.11b/g/n HT20/HT40<br>WLAN 2.4GHz 802.11ac VHT20/VHT40<br>WLAN 5GHz 802.11a/n HT20/HT40<br>WLAN 5GHz 802.11ac VHT20/VHT40/VHT80<br>Bluetooth BR/EDR/LE<br>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 :**

| FCC SAR         | Measure Distance | SAR (W/kg)           |                   |
|-----------------|------------------|----------------------|-------------------|
|                 |                  | WWAN 2/3/4/5G Bottom | WWAN 2/3/4/5G Top |
| Body Worn (1g)  | 5 mm             | 1.03                 | 0.74              |
| Hotspot (1g)    | 5 mm             | 1.03                 | 0.50              |
| Head (1g)       | touch&tilt 15deg | 1.03                 | 0.74              |
| Extremity (10g) | 0 mm             | 2.55                 | 1.98              |

**Uncertainty:**

| Item              | Uncertainty dB (k=2) |
|-------------------|----------------------|
| Total uncertainty | 1.5                  |

To account for total uncertainty, SAR\_design\_target should be determined as:

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

#### **Antenna**

|             |                           |
|-------------|---------------------------|
| UAT Antenna | ANT2 & ANT4 & ANT5 & ANT8 |
| LAT Antenna | ANT0 & ANT1               |

### 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<sub>limit</sub> for supported technologies and bands (P<sub>limit</sub> in EFS file)>

| Band                   | Antenna | Head | Body-Worn | Sensor off | Extremity | Hotspot | P <sub>max</sub> * |
|------------------------|---------|------|-----------|------------|-----------|---------|--------------------|
|                        |         | DSI2 | DSI3      | DSI4       | DSI6      | DSI7    |                    |
| GSM850**               | Ant 0   | 27.1 | 22.0      | 24.5       | 24.5      | 22.0    | 24.5               |
| GSM1900**              | Ant 0   | 28.4 | 17.0      | 21.0       | 21.0      | 16.5    | 21.0               |
| WCDMA V                | Ant 0   | 26.8 | 21.2      | 23.0       | 23.0      | 21.2    | 23.0               |
| WCDMA IV               | Ant 0   | 32.1 | 18.0      | 23.0       | 21.0      | 16.5    | 23.0               |
| WCDMA II               | Ant 0   | 28.2 | 16.5      | 23.0       | 20.0      | 15.0    | 23.0               |
| LTE Band 12/17         | Ant 4   | 23.6 | 25.5      | 23.0       | 23.0      | 25.5    | 23.0               |
| LTE Band 12/17         | Ant 0   | 27.8 | 23.0      | 23.0       | 23.8      | 23.0    | 23.0               |
| LTE Band 13            | Ant 4   | 26.6 | 25.4      | 23.0       | 23.0      | 25.4    | 23.0               |
| LTE Band 13            | Ant 0   | 23.3 | 23.0      | 23.0       | 23.6      | 23.0    | 23.0               |
| LTE Band 26/5          | Ant 4   | 21.2 | 23.0      | 23.0       | 23.0      | 21.7    | 23.0               |
| LTE Band 26/5          | Ant 0   | 27.2 | 22.2      | 23.0       | 23.0      | 22.2    | 23.0               |
| LTE Band 66/4          | Ant 4   | 17.0 | 18.5      | 23.0       | 20.0      | 15.5    | 23.0               |
| LTE Band 66/4          | Ant 0   | 32.9 | 18.5      | 23.0       | 21.0      | 17.0    | 23.0               |
| LTE Band 25/2          | Ant 4   | 17.0 | 19.0      | 23.0       | 20.5      | 16.0    | 23.0               |
| LTE Band 25/2          | Ant 0   | 29.8 | 17.0      | 23.0       | 20.5      | 15.5    | 23.0               |
| LTE Band 7             | Ant 1   | 25.7 | 18.5      | 23.0       | 20.0      | 18.5    | 23.0               |
| LTE Band 41/38 (PC3)** | Ant 4   | 15.0 | 16.0      | 21.0       | 20.0      | 13.5    | 21.0               |
| LTE Band 41/38 (PC3)** | Ant 1   | 24.4 | 18.5      | 21.0       | 18.5      | 18.5    | 21.0               |
| LTE Band 42            | Ant 5   | 13.5 | 14.0      | 21.0       | 18.0      | 12.0    | 21.0               |
| FR1 n26/5              | Ant 4   | 22.0 | 23.4      | 23.0       | 23.0      | 22.0    | 23.0               |
| FR1 n26/5              | Ant 0   | 28.3 | 22.5      | 23.0       | 24.2      | 22.5    | 23.0               |
| FR1 n66                | Ant 4   | 17.0 | 19.0      | 23.0       | 20.5      | 16.0    | 23.0               |
| FR1 n66                | Ant 0   | 33.2 | 19.5      | 23.0       | 22.0      | 17.5    | 23.0               |
| FR1 n2                 | Ant 4   | 16.5 | 18.5      | 23.0       | 20.0      | 15.5    | 23.0               |
| FR1 n2                 | Ant 0   | 31.3 | 17.0      | 23.0       | 20.5      | 15.5    | 23.0               |
| FR1 n7                 | Ant 4   | 13.5 | 15.0      | 23.0       | 18.5      | 11.5    | 23.0               |
| FR1 n7                 | Ant 1   | 25.7 | 19.0      | 23.0       | 19.0      | 19.0    | 23.0               |
| FR1 n41/38 (PC3)       | Ant 4   | 13.5 | 14.5      | 23.0       | 18.5      | 12.0    | 23.0               |
| FR1 n78 (PC3)          | Ant 5   | 12.5 | 13.0      | 23.0       | 18.5      | 11.5    | 23.0               |
| FR1 n78 (PC3)          | Ant 2   | 27.7 | 11.5      | 15.0       | 15.0      | 10.0    | 22.5               |
| FR1 n78 (PC3)          | Ant 8   | 28.2 | 14.5      | 20.0       | 20.0      | 12.5    | 21.5               |
| FR1 n78 (PC3)          | Ant 1   | 25.3 | 16.5      | 21.5       | 18.0      | 16.5    | 21.5               |

Note: 1) \*P<sub>max</sub> is used for RF tune up procedure. The maximum allowed output power is equal to P<sub>max</sub> + 1dB uncertainty.

2) \*\*All P<sub>limit</sub> 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<sub>limit</sub> + device uncertainty, and if P<sub>limit</sub> is higher than P<sub>max</sub>, the device output power will be P<sub>max</sub> 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                                |
| NR FDD/TDD  | 100%       | 0.0                                 |