

RF Exposure Report

(Part 0: SAR and PD Char Evaluation)

FCC ID : UZ7TC58B1
Equipment : Touch Computer
Brand Name : Zebra
Model Name : TC58B1
Applicant : Zebra Technologies Corporation
1 Zebra Plaza, Holtsville, NY 11742
Standard : FCC 47 CFR Part 2 (2.1093)

We, SPORTON INTERNATIONAL INC., 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., the test report shall not be reproduced except in full.



Approved by: Cona Huang / Deputy Manager



Sporton International Inc.

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan



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History of this test report

| Report No. | Version | Description | Issued Date |
|------------|---------|-------------------------|---------------|
| FA222201C | 01 | Initial issue of report | Jun. 15, 2022 |
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1. Introduction

The FCC 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 FCC 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. Cannot operate without SAR characterization at the device level, beforehand.

This report describes the procedures for the SAR char 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 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 uncertainties. |
| SAR char | P_{limit} for all the technologies/bands for all applicable DSI |

Test Lab Information

| | |
|---------------------------------------|--|
| Test Firm Name | Sporton International Inc. |
| Test Firm Information | No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan TEL: +886-3-327-3456 FAX: +886-3-328-4978 |
| Test Firm Registration Number for FCC | 553509 |
| FCC Designation No. | TW1190 |
| Test Engineers | Steven Chang, Aaron Chen |
| Report Producer | Daisy Peng |



2. Product Description

| Product Feature & Specification | |
|---|---|
| Equipment Name | Touch Computer |
| FCC ID | UZ7TC58B1 |
| Wireless Technology and Frequency Range | GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 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 17: 704 MHz ~ 716 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 42: 3550 MHz ~ 3600 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 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: 3450MHz ~ 3550MHz, 3700 MHz ~ 3980 MHz 5G NR n78: 3450MHz ~ 3550MHz, 3700 MHz ~ 3800 MHz WLAN 2.4 GHz Band: 2400 MHz ~ 2483.5 MHz WLAN 5.2 GHz Band: 5150 MHz ~ 5250 MHz WLAN 5.3 GHz Band: 5250 MHz ~ 5350 MHz WLAN 5.6 GHz Band: 5470 MHz ~ 5725 MHz WLAN 5.8 GHz Band: 5725 MHz ~ 5850 MHz WLAN 6E: 5925 MHz ~ 6425 MHz, 6425 MHz ~ 6525 MHz, 6525 MHz ~ 6875 MHz, 6875 MHz ~ 7125 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz RFID : 13.56 MHz |
| Mode | GSM/GPRS/EGPRS RMC/AMR 12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK, 16QAM, 64QAM, 256QAM 5G NR: DFT-s-OFDM/CP-OFDM, Pi/2 BPSK/QPSK/16QAM/64QAM/256QAM WLAN: 802.11a/b/g/n/ac/ax HT20/HT40/VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE RFID: 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 and uncertainty>

The detail SAR design target relate to each exposure conditions pls refer to operation description

| Band | Config | Antenna | Duty cycle | Device Uncertainty (dB) | Head DS12 | Hotspot DS13 | Body-worn /Extremity DS11 |
|------------------|--------|---------|------------|-------------------------|-----------|--------------|---------------------------|
| GSM850 GPRS 4TX | TX0 | 4 | 50.00% | 1.00 | 0.675 | 0.635 | 0.950 |
| GSM1900 GPRS 4TX | TX0 | 4 | 50.00% | 1.00 | 0.675 | 0.700 | 0.635 |
| WCDMA B2 | TX0 | 2 | 100.00% | 1.00 | 0.675 | 0.635 | 0.635 |
| WCDMA B4 | TX0 | 2 | 100.00% | 1.00 | 0.675 | 0.635 | 0.635 |
| WCDMA B5 | TX0 | 4 | 100.00% | 1.00 | 0.675 | 0.635 | 0.635 |
| LTE B2 | TX0 | 2 | 100.00% | 1.00 | 0.675 | 0.430 | 0.635 |
| LTE B5 | TX0 | 4 | 100.00% | 1.00 | 0.675 | 0.635 | 0.675 |
| LTE B7 | TX0 | 12 | 100.00% | 1.00 | 0.675 | 0.950 | 0.770 |
| LTE B7 | TX1 | 6 | 100.00% | 1.00 | 0.675 | 0.430 | 0.770 |
| LTE B17 | TX0 | 0 | 100.00% | 1.00 | 0.675 | 0.430 | 0.635 |
| LTE B38 PC3 | TX1 | 6 | 63.30% | 1.00 | 0.675 | 0.950 | 0.950 |
| LTE B41 PC3 | TX1 | 6 | 63.30% | 1.00 | 0.675 | 0.950 | 0.950 |
| LTE B41 PC2 | TX1 | 6 | 43.30% | 1.00 | 0.675 | 0.950 | 0.950 |
| LTE B42 | TX0 | 12 | 63.30% | 1.00 | 0.380 | 0.430 | 0.950 |
| LTE B42 | TX1 | 11 | 63.30% | 1.00 | 0.500 | 0.430 | 0.950 |
| LTE B66/4 | TX1 | 2 | 100.00% | 1.00 | 0.675 | 0.635 | 0.635 |
| LTE B71 | TX0 | 0 | 100.00% | 1.00 | 0.675 | 0.635 | 0.635 |
| FR1 n2 | TX0 | 2 | 100.00% | 1.00 | 0.675 | 0.430 | 0.635 |
| FR1 n5 | TX1 | 4 | 100.00% | 1.00 | 0.675 | 0.635 | 0.635 |
| FR1 n7 | TX0 | 12 | 100.00% | 1.00 | 0.675 | 0.950 | 0.950 |
| FR1 n7 | TX1 | 6 | 100.00% | 1.00 | 0.675 | 0.430 | 0.635 |
| FR1 n38 PC3 | TX1 | 6 | 100.00% | 1.00 | 0.675 | 0.430 | 0.675 |
| FR1 n41 PC3 | TX1 | 6 | 100.00% | 1.00 | 0.675 | 0.430 | 0.675 |
| FR1 n41 PC2 | TX1 | 6 | 100.00% | 1.00 | 0.675 | 0.430 | 0.675 |
| FR1 n41 PC3 | TX1 | 12 | 100.00% | 1.00 | 0.675 | 0.430 | 0.675 |
| FR1 n41 PC2 | TX1 | 12 | 100.00% | 1.00 | 0.675 | 0.430 | 0.675 |
| FR1 n41 PC3 | TX1 | 1 | 100.00% | 1.00 | 0.675 | 0.635 | 0.675 |
| FR1 n41 PC2 | TX1 | 1 | 100.00% | 1.00 | 0.675 | 0.635 | 0.675 |
| FR1 n41 PC3 | TX1 | 7 | 100.00% | 1.00 | 0.675 | 0.635 | 0.675 |
| FR1 n41 PC2 | TX1 | 7 | 100.00% | 1.00 | 0.675 | 0.635 | 0.675 |
| FR1 n66 | TX1 | 2 | 100.00% | 1.00 | 0.675 | 0.635 | 0.635 |
| FR1 n71 | TX0 | 0 | 100.00% | 1.00 | 0.675 | 0.635 | 0.635 |
| FR1 n77/78 PC3 | TX0 | 12 | 100.00% | 1.00 | 0.380 | 0.430 | 0.480 |
| FR1 n77/78 PC2 | TX0 | 12 | 100.00% | 1.00 | 0.380 | 0.430 | 0.480 |
| FR1 n77/78 PC3 | TX1 | 11 | 100.00% | 1.00 | 0.380 | 0.340 | 0.480 |
| FR1 n77/78 PC2 | TX1 | 11 | 100.00% | 1.00 | 0.380 | 0.340 | 0.480 |
| FR1 n77/78 SRS | TX1 | 5 | 100.00% | 1.00 | 0.380 | 0.635 | 0.380 |
| FR1 n77/78 SRS | TX1 | 3 | 100.00% | 1.00 | 0.380 | 0.380 | 0.380 |

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

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

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

The max allowed output power is the P_{limit} + 1dB device uncertainty, and if P_{limit} is higher than P_{max}, the device output power will be P_{max} instead.

Ant 3 and Ant 5 dedicated is used for SRS only, different from Tx antennas, then the SAR measurement at P_{limit} for SRS dedicated antenna(s) can be performed using FTM mode with CW modulation with 100% duty cycle(as SRS operates at very low duty cycle in online mode).

| Band | Config | Antenna | Duty cycle | Head P _{limit} DS12 | Hotspot P _{limit} DS13 | Body-worn /Extremity P _{limit} DS11 | P _{max} * |
|--------------------|--------|---------|------------|------------------------------|---------------------------------|--|--------------------|
| GSM850 GPRS 4TX** | TX0 | 4 | 50.00% | 30.40 | 27.70 | 28.20 | 26.50 |
| GSM1900 GPRS 4TX** | TX0 | 4 | 50.00% | 30.50 | 22.00 | 25.70 | 23.50 |
| WCDMA B2 | TX0 | 2 | 100.00% | 29.50 | 22.50 | 25.70 | 24.20 |
| WCDMA B4 | TX0 | 2 | 100.00% | 34.80 | 24.80 | 25.90 | 24.20 |
| WCDMA B5 | TX0 | 4 | 100.00% | 26.10 | 25.70 | 28.40 | 24.20 |
| LTE B2 | TX0 | 2 | 100.00% | 30.40 | 23.30 | 25.80 | 24.20 |
| LTE B5 | TX0 | 4 | 100.00% | 27.00 | 25.60 | 27.10 | 24.20 |
| LTE B7 | TX0 | 12 | 100.00% | 26.60 | 24.20 | 22.30 | 23.00 |
| LTE B7 | TX1 | 6 | 100.00% | 29.30 | 21.30 | 24.60 | 23.00 |
| LTE B17 | TX0 | 0 | 100.00% | 26.20 | 23.10 | 25.80 | 23.70 |
| LTE B38 PC3** | TX1 | 6 | 63.30% | 29.80 | 25.80 | 27.70 | 21.50 |
| LTE B41 PC3** | TX1 | 6 | 63.30% | 29.80 | 25.80 | 27.70 | 22.00 |
| LTE B41 PC2** | TX1 | 6 | 43.30% | 29.80 | 25.80 | 27.70 | 22.40 |
| LTE B42** | TX0 | 12 | 63.30% | 18.10 | 17.50 | 19.80 | 22.00 |
| LTE B42** | TX1 | 11 | 63.30% | 19.30 | 20.60 | 29.30 | 22.00 |
| LTE B66/4 | TX1 | 2 | 100.00% | 34.10 | 23.20 | 24.80 | 24.20 |
| LTE B71 | TX0 | 0 | 100.00% | 27.90 | 24.70 | 25.80 | 23.70 |
| FR1 n2 | TX0 | 2 | 100.00% | 31.40 | 23.40 | 28.00 | 24.20 |
| FR1 n5 | TX1 | 4 | 100.00% | 28.20 | 26.60 | 27.00 | 24.20 |
| FR1 n7 | TX0 | 12 | 100.00% | 26.70 | 24.40 | 24.60 | 23.00 |
| FR1 n7 | TX1 | 6 | 100.00% | 28.20 | 22.20 | 23.90 | 23.00 |
| FR1 n38 PC3 | TX1 | 6 | 100.00% | 29.90 | 20.90 | 25.20 | 23.50 |
| FR1 n41 PC3 | TX1 | 6 | 100.00% | 29.90 | 20.90 | 25.20 | 24.00 |
| FR1 n41 PC2 | TX1 | 6 | 100.00% | 29.90 | 20.90 | 25.20 | 26.00 |
| FR1 n41 PC3 SRS | TX1 | 12 | 100.00% | 23.50 | 23.50 | 24.90 | 24.00 |
| FR1 n41 PC2 SRS | TX1 | 12 | 100.00% | 23.50 | 23.50 | 24.90 | 26.00 |
| FR1 n41 PC3 SRS | TX1 | 1 | 100.00% | 20.40 | 23.40 | 29.20 | 24.00 |
| FR1 n41 PC2 SRS | TX1 | 1 | 100.00% | 20.40 | 23.40 | 29.20 | 26.00 |
| FR1 n41 PC3 SRS | TX1 | 7 | 100.00% | 22.10 | 23.50 | 28.50 | 24.00 |
| FR1 n41 PC2 SRS | TX1 | 7 | 100.00% | 22.10 | 23.50 | 28.50 | 26.00 |
| FR1 n66 | TX1 | 2 | 100.00% | 35.10 | 23.70 | 26.00 | 24.20 |
| FR1 n71 | TX0 | 0 | 100.00% | 28.40 | 26.70 | 27.80 | 23.70 |
| FR1 n77/78 PC3 | TX0 | 12 | 100.00% | 18.20 | 17.80 | 21.00 | 24.00 |
| FR1 n77/78 PC2 | TX0 | 12 | 100.00% | 18.20 | 17.80 | 21.00 | 25.50 |
| FR1 n77/78 PC3 | TX1 | 11 | 100.00% | 15.00 | 17.90 | 21.50 | 24.00 |
| FR1 n77/78 PC2 | TX1 | 11 | 100.00% | 15.00 | 17.90 | 21.50 | 25.50 |
| FR1 n77/78 SRS | TX1 | 5 | 100.00% | 14.90 | 15.80 | 15.80 | 24.00 |
| FR1 n77/78 SRS | TX1 | 3 | 100.00% | 18.80 | 18.50 | 21.20 | 22.00 |