

# RF Exposure Report

## (Part 0: SAR Char Evaluation)

FCC ID : UZ7MC345A  
Equipment : Mobile Computer  
Brand Name : ZEBRA  
Model Name : MC345A  
Applicant : Zebra Technologies Corporation  
3 Overlook Point, Lincolnshire, IL 60069 USA  
Manufacturer : Zebra Technologies Corporation  
3 Overlook Point, Lincolnshire, IL 60069 USA  
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

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## History of this test report

| Report No. | Version | Description             | Issued Date   |
|------------|---------|-------------------------|---------------|
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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. 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

|                    |                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Plimit             | The time-averaged RF power which corresponds to SAR_design_target.                                                                                  |
| Pmax               | 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           | Plimit for all the technologies/bands for all applicable DSI                                                                                        |

### Test Lab Information

|                       |                                                                                                            |
|-----------------------|------------------------------------------------------------------------------------------------------------|
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| FCC Designation No.   | TW1190                                                                                                     |
| Test Engineers        | Steven Chang, Aaron Chen                                                                                   |
| Report Producer       | Paula Chen                                                                                                 |

## **2. 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  $f < 6\text{GHz}$ .

## 2.1 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                       | Antenna | Duty Cycle | WLAN OFF<br>(P limit) |                                         | WLAN ON<br>(P limit) | Power Back off for<br>WLAN ON           |
|----------------------------|---------|------------|-----------------------|-----------------------------------------|----------------------|-----------------------------------------|
|                            |         |            | Free Space Mode       | Body-worn 1g SAR<br>/ Extremity 10g SAR | Hotspot 1g SAR       | Body-worn 1g SAR<br>/ Extremity 10g SAR |
|                            |         |            | DSI0                  | DSI1                                    | DSI3                 | DSI1                                    |
| WCDMA II                   | 1       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| WCDMA IV                   | 1       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| WCDMA V                    | 1       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| LTE B7                     | 5       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| LTE B12/17                 | 1       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| LTE B13                    | 1       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| LTE B14                    | 1       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| LTE B25/2                  | 1       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| LTE B26/5                  | 1       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| LTE B30                    | 5       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| LTE B66/4                  | 1       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| LTE B71                    | 1       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| LTE B41/38 PC3             | 5       | 63.30%     | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| LTE B48                    | 8       | 63.30%     | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n7                         | 5       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n12                        | 1       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n13                        | 1       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n14                        | 1       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n25/2                      | 1       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n26/5                      | 1       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n30                        | 5       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n66                        | 1       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n71                        | 1       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n41/38 PC3                 | 5       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n41 PC2                    | 5       | 50.00%     | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n41 PC3 SRS                | 2       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n41 PC3 SRS                | 3       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n41 PC3 SRS                | 4       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n48                        | 8       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n77/78_Part 27O/27Q/96 PC3 | 9       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n77/78_Part 27O/27Q PC2    | 9       | 50.00%     | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n77/78_Part 27O/27Q PC3    | 8       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n77/78_Part 27O/27Q PC2    | 8       | 50.00%     | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n77/78_Part 96 PC3         | 8       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n77/78_Part 27O/27Q PC3    | 3       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n77/78_Part 96 PC3 SRS     | 3       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n77/78_Part 27O/27Q PC3    | 4       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |
| n77/78_Part 96 PC3 SRS     | 4       | 100.00%    | 0.840                 | 0.84/2.26                               | 0.422                | 0.422/1.13                              |

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

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

## 2.2 SAR Char Table

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

\*P<sub>max</sub> is used for RF tune up procedure. The maximum allowed output power is equal to P<sub>max</sub> + 1.5dB uncertainty.

\*\*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).

The max allowed output power is the P<sub>limit</sub> + 1.5dB 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.

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

| Band                       | Config | Antenna | Duty Cycle | P <sub>max</sub> | WLAN OFF<br>(P <sub>limit</sub> )<br>(dBm) |                          | WLAN ON<br>(P <sub>limit</sub> )<br>(dBm) | Power Back off for<br>WLAN ON<br>(dB) |                          |
|----------------------------|--------|---------|------------|------------------|--------------------------------------------|--------------------------|-------------------------------------------|---------------------------------------|--------------------------|
|                            |        |         |            |                  | Free Space<br>Mode                         | Body-worn<br>/ Extremity | Hotspot                                   | Free<br>Space<br>Mode                 | Body-worn<br>/ Extremity |
|                            |        |         |            | DSI0             | DSI0                                       | DSI1                     | DSI3                                      | DSI0                                  | DSI1                     |
| WCDMA II                   | TX0    | 1       | 100.00%    | 23.0             | 36.2                                       | 22.4                     | 19.5                                      |                                       | 2.9                      |
| WCDMA IV                   | TX0    | 1       | 100.00%    | 23.5             | 36.7                                       | 21.8                     | 19.0                                      |                                       | 2.8                      |
| WCDMA V                    | TX0    | 1       | 100.00%    | 23.5             | 30.7                                       | 24.1                     | 21.5                                      |                                       | 2.0                      |
| LTE B7                     | TX0    | 5       | 100.00%    | 24.2             | 33.0                                       | 25.2                     | 21.0                                      |                                       | 1.9                      |
| LTE B12/17                 | TX0    | 1       | 100.00%    | 24.2             | 33.3                                       | 28.2                     | 24.2                                      |                                       |                          |
| LTE B13                    | TX0    | 1       | 100.00%    | 24.2             | 31.6                                       | 26.0                     | 23.4                                      |                                       | 0.8                      |
| LTE B14                    | TX0    | 1       | 100.00%    | 24.2             | 31.7                                       | 25.9                     | 23.4                                      |                                       | 0.8                      |
| LTE B25/2                  | TX0    | 1       | 100.00%    | 24.2             | 36.1                                       | 23.2                     | 20.5                                      |                                       | 2.7                      |
| LTE B26/5                  | TX0    | 1       | 100.00%    | 24.2             | 30.9                                       | 25.4                     | 22.0                                      |                                       | 2.2                      |
| LTE B30                    | TX0    | 5       | 100.00%    | 24.2             | 32.1                                       | 24.8                     | 21.6                                      |                                       | 2.6                      |
| LTE B66/4                  | TX0    | 1       | 100.00%    | 24.2             | 36.0                                       | 21.1                     | 19.1                                      |                                       | 2.0                      |
| LTE B71                    | TX0    | 1       | 100.00%    | 23.5             | 34.9                                       | 30.3                     | 23.5                                      |                                       |                          |
| LTE B41/38 PC3             | TX0    | 5       | 63.30%     | 21.5             | 32.6                                       | 24.4                     | 20.0                                      |                                       |                          |
| LTE B48                    | TX0    | 8       | 63.30%     | 20.8             | 29.1                                       | 24.3                     | 19.0                                      |                                       |                          |
| n7                         | TX0    | 5       | 100.00%    | 24.2             | 33.2                                       | 24.2                     | 21.0                                      |                                       | 3.2                      |
| n12                        | TX0    | 1       | 100.00%    | 24.2             | 34.2                                       | 28.3                     | 24.2                                      |                                       |                          |
| n13                        | TX0    | 1       | 100.00%    | 24.2             | 39.3                                       | 26.4                     | 23.3                                      |                                       | 0.9                      |
| n14                        | TX0    | 1       | 100.00%    | 24.2             | 31.7                                       | 26.2                     | 23.3                                      |                                       | 0.9                      |
| n25/2                      | TX0    | 1       | 100.00%    | 24.2             | 36.4                                       | 22.4                     | 20.0                                      |                                       | 2.3                      |
| n26/5                      | TX0    | 1       | 100.00%    | 24.2             | 30.4                                       | 24.4                     | 21.0                                      |                                       | 3.2                      |
| n30                        | TX0    | 5       | 100.00%    | 24.2             | 32.0                                       | 24.6                     | 21.0                                      |                                       | 3.2                      |
| n66                        | TX0    | 1       | 100.00%    | 24.2             | 36.6                                       | 21.3                     | 18.8                                      |                                       | 2.5                      |
| n71                        | TX0    | 1       | 100.00%    | 23.5             | 34.5                                       | 31.2                     | 23.5                                      |                                       |                          |
| n41/38 PC3                 | TX0    | 5       | 100.00%    | 24.2             | 32.3                                       | 24.4                     | 20.5                                      |                                       | 2.2                      |
| n41 PC2                    | TX0    | 5       | 50.00%     | 23.0             |                                            |                          |                                           |                                       |                          |
| n41 PC3 SRS                | TX1    | 2       | 100.00%    | 21.5             | 32.4                                       | 23.4                     | 21.5                                      |                                       |                          |
| n41 PC3 SRS                | MIMO0  | 3       | 100.00%    | 21.0             | 36.2                                       | 33.6                     | 21.0                                      |                                       |                          |
| n41 PC3 SRS                | MIMO1  | 4       | 100.00%    | 21.0             | 35.6                                       | 27.1                     | 21.0                                      |                                       |                          |
| n48                        | TX0    | 8       | 100.00%    | 22.8             | 30.3                                       | 25.6                     | 19.0                                      |                                       | 2.0                      |
| n77/78_Part 27O/27Q/96 PC3 | TX0    | 9       | 100.00%    | 20.0             | 32.8                                       | 23.1                     | 17.0                                      |                                       |                          |
| n77/78_Part 27O/27Q PC2    | TX0    | 9       | 50.00%     | 20.0             |                                            |                          |                                           |                                       |                          |
| n77/78_Part 27O/27Q PC3    | TX1    | 8       | 100.00%    | 23.5             | 30.4                                       | 21.8                     | 17.0                                      |                                       | 3.0                      |
| n77/78_Part 27O/27Q PC2    | TX1    | 8       | 50.00%     | 23.0             |                                            |                          |                                           |                                       |                          |
| n77/78_Part 96 PC3         | TX1    | 8       | 100.00%    | 21.9             |                                            |                          |                                           |                                       |                          |
| n77/78_Part 27O/27Q PC3    | MIMO0  | 3       | 100.00%    | 20.5             | 32.8                                       | 22.3                     | 19.2                                      |                                       |                          |
| n77/78_Part 96 PC3 SRS     | MIMO0  | 3       | 100.00%    | 18.9             |                                            |                          |                                           |                                       |                          |
| n77/78_Part 27O/27Q PC3    | MIMO1  | 4       | 100.00%    | 20.5             | 36.6                                       | 17.7                     | 14.8                                      |                                       | 2.9                      |
| n77/78_Part 96 PC3 SRS     | MIMO1  | 4       | 100.00%    | 18.9             |                                            |                          |                                           |                                       |                          |