

# FCC RF Exposure

**FCC ID: 2AEXY7000TX**

Exposure category: General population/uncontrolled environment (Extremity exposure conditions)

EUT Type: Production Unit

Device Type: Portable Device

Refer Standard: KDB 447498 D01 General RF Exposure Guidance v05r02

FCC Part 2 §2.1093

## Definition

Extremity exposure conditions: Devices that are designed or intended for use on extremities or mainly operated in extremity only exposure conditions; i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation.

## Evaluation method

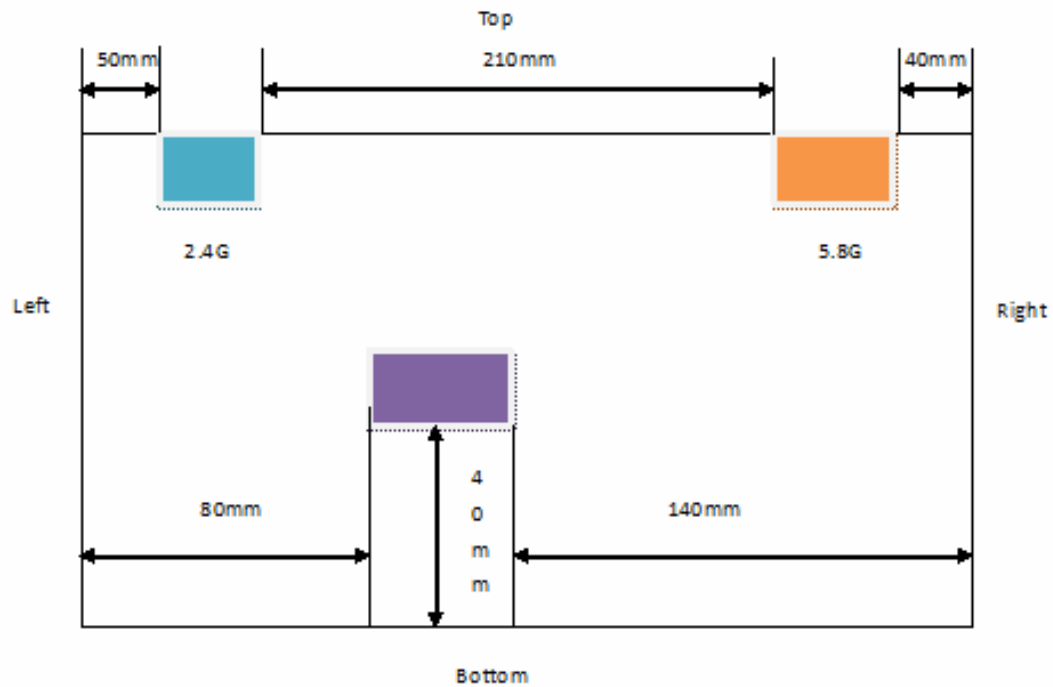
According to KDB447498 D01 General RF Exposure Guidance v05r01Section 4.3.1 Standalone SAR test exclusion considerations:“ Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition, listed below, is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.<sup>22</sup> The minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander (see 5) of section 4.1). To qualify for SAR test exclusion, the test separation distances applied must be fully explained and justified by the operating configurations and exposure conditions of the transmitter and applicable host platform requirements, typically in the SAR measurement or SAR analysis report, according to the required published RF exposure KDB procedures. When no other RF exposure testing or reporting is required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for the SAR test exclusion. When required, the device specific conditions described in the other published RF exposure KDB procedures must be satisfied before applying these SAR test exclusion provisions; for example, handheld PTT two-way radios, handsets, laptops & tablets etc.<sup>23</sup> “

$$\left[ \frac{\text{max. power of channel, including tune-up tolerance, mW}}{(\text{min. test separation distance, mm})} \right] \cdot [\sqrt{f \text{ (GHz)}}] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where:}$$

- $f$  (GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is  $\leq 50$  mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

## Antenna Description



## Conducted Power Results

### WiFi:

| Mode         | Channel | Frequency (MHz) | Average Conducted Output Power (dBm) |
|--------------|---------|-----------------|--------------------------------------|
| 802.11 b     | 1       | 2412            | 15.41                                |
|              | 6       | 2437            | 16.01                                |
|              | 11      | 2462            | 16.40                                |
| 802.11 g     | 1       | 2412            | 15.01                                |
|              | 6       | 2437            | 15.73                                |
|              | 11      | 2462            | 15.96                                |
| 802.11 nHT20 | 1       | 2412            | 15.24                                |
|              | 6       | 2437            | 15.48                                |
|              | 11      | 2462            | 16.04                                |
| 802.11 nHT40 | 3       | 2422            | 15.62                                |
|              | 6       | 2437            | 15.89                                |
|              | 9       | 2452            | 16.00                                |

## Manufacturing tolerance

### WiFi

| 802.11 b (Average)   |           |           |            |
|----------------------|-----------|-----------|------------|
| Channel              | Channel 1 | Channel 6 | Channel 11 |
| Target (dBm)         | 15.5      | 15.5      | 15.5       |
| Tolerance $\pm$ (dB) | 1.0       | 1.0       | 1.0        |
| 802.11 g (Average)   |           |           |            |
| Channel              | Channel 1 | Channel 6 | Channel 11 |
| Target (dBm)         | 15.5      | 15.5      | 15.5       |

|                               |           |           |            |
|-------------------------------|-----------|-----------|------------|
| Tolerance $\pm$ (dB)          | 1.0       | 1.0       | 1.0        |
| <b>802.11 nHT20 (Average)</b> |           |           |            |
| Channel                       | Channel 1 | Channel 6 | Channel 11 |
| Target (dBm)                  | 15.5      | 15.5      | 15.5       |
| Tolerance $\pm$ (dB)          | 1.0       | 1.0       | 1.0        |
| <b>802.11 nHT40 (Average)</b> |           |           |            |
| Channel                       | Channel 3 | Channel 6 | Channel 9  |
| Target (dBm)                  | 15.5      | 15.5      | 15.5       |
| Tolerance $\pm$ (dB)          | 1.0       | 1.0       | 1.0        |

#### 2.4GHz Transceiver:

|                       |      |            |            |
|-----------------------|------|------------|------------|
| <b>GFSK (Average)</b> |      |            |            |
| Frequency (MHz)       | 2410 | Channel 19 | Channel 39 |
| Target (dBm)          | 2.0  | 2.0        | 2.0        |
| Tolerance $\pm$ (dB)  | 1.0  | 1.0        | 1.0        |

#### Evaluation Results

##### Standalone:

| Band/Mode          | f<br>(GHz) | Antenna<br>Distance<br>(mm) | RF output power<br>(including tune-up<br>tolerance) |         | SAR Test<br>Exclusion<br>Threshold | SAR Test<br>Exclusion |
|--------------------|------------|-----------------------------|-----------------------------------------------------|---------|------------------------------------|-----------------------|
|                    |            |                             | dBm                                                 | mW      |                                    |                       |
| WiFi2450           | 2.450      | 80                          | 16.5                                                | 44.6684 | 0.9<7.5                            | Yes                   |
| 2.4GHz Transceiver | 2.450      | 50                          | 3.0                                                 | 1.9953  | 0.1<7.5                            | Yes                   |

#### Simultaneous transmission SAR test exclusion considerations

The WiFi2450 and 2.4GHz Transceiver share difference antenna, WiFi2450 and 2.4GHz Transceiver can transmit simultaneous.

The Simultaneous transmission SAR Exclusion Threshold was sum of Standalone SAR Exclusion Threshold according to KDB 447498 D01;

The Simultaneous transmission SAR Exclusion Threshold was 1.0<7.5; meeting the Simultaneous transmission SAR Exclusion Threshold;

#### Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1093 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB 447498 v05r02.

Evaluation Engineer:



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