


MOTOROLA SOLUTIONS

TESTING CERT # 2518.05
DECLARATION OF COMPLIANCE SAR ASSESSMENT (PCII Report – Adding BT LE)

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Date of Report: 4/7/2016
Report Revision: C

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Manufacturer: Motorola Solutions Inc.
DUT Description: Handheld Portable - Frequency bands; LMR 136-174 MHz, 380-520 MHz, 764-776 MHz, 794-824 MHz & 851-869 MHz; Bluetooth 2.402-2.480 GHz;
 *Bluetooth LE 2.402-2.480 GHz; WLAN 2.400-2.483.5 GHz;
TX mode(s): CW (PTT), Bluetooth, * Bluetooth LE and WLAN 802.11b/g/n
Max. Power output: 6.6 W (VHF), 5.7 W (UHF), 2.99 W (700 MHz band), 3.6 W (800 MHz band), 10 mW (Bluetooth), 63.1 mW (802.11b), 25.1 mW (802.11g/n), *1.55 mW (Bluetooth LE)
Nominal Power: 6.0 W (VHF), 5.0 W (UHF), 2.5 W (700 MHz band), 3.0 W (800 MHz band), 10 mW (Bluetooth), 47.1 mW (802.11b), 19.95 mW (802.11g), 19.63 mW (802.11n), *1.55 mW (Bluetooth LE)
Tx Frequency Bands: LMR 136-174 MHz, 380-520 MHz, 764-805 MHz, 806-870 MHz; Bluetooth 2402-2480 MHz; WLAN 2400-2483.5 MHz ; *Bluetooth LE 2402-2480 MHz
Signaling type: FM, TDMA, FHSS (Bluetooth), *Bluetooth LE (DSSS), 802.11b/g/n (WLAN)
Model(s) Certified: APX8000 - H91TGD9PW5AN, H91TGD9PW6AN, H91TGD9PW7AN;
 APX8000XE- 8000XE1, 8000XE2 and 8000XE3
Classification: Occupational/Controlled
FCC ID: AZ489FT7061
IC: 109U-89FT7061

Note:

- 1) * - information for Bluetooth Low Energy for this PCII filing.
- 2) Refer to original filing SAR report for the rest of the SAR evaluations results.

The test results clearly demonstrate compliance with FCC Occupational/Controlled RF Exposure limits of 8 W/kg averaged over 1 gram per the requirements of OET Bulletin 65. The 10 grams result is not applicable to FCC filing. The test results clearly demonstrate compliance with ICNIRP (1998) Guidelines for limiting exposure in time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz), Health Physics 74, 494-522 RF Exposure limits of 10 W/kg averaged over 10grams of contiguous tissue.

Based on the information and the testing results provided herein, the undersigned certifies that when used as stated in the operating instructions supplied, said product complies with the national and international reference standards and guidelines listed in section 4.0 of this report. This report shall not be reproduced without written approval from an officially designated representative of the Motorola Solutions Inc EME Laboratory. I attest to the accuracy of the data and assume full responsibility for the completeness of these measurements. This reporting format is consistent with the suggested guidelines of the TIA TSB-150 December 2004. The results and statements contained in this report pertain only to the device(s) evaluated.

Tiong
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 Deputy Technical Manager
 Approval Date: 4/7/2016

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Report Revision History

Date	Revision	Comments
3/28/2016	A	Initial release
3/30/2016	B	Update more details
4/7/2016	C	Include RSS-102 requirements

1.0 Introduction

These devices had incorporate new technology – Bluetooth low energy which required PCII filing. There was no change in hardware (schematic and layout) compare to original filing.

The information in this report is to show evidence of Class II permissive change compliance for Bluetooth LE based on general SAR test exclusion guidance as per KDB 447498.

2.0 Referenced Standards and Guidelines

This product is designed to comply with the following applicable national and international standards and guidelines.

- IEC62209-1 (2005) Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)
- Federal Communications Commission, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”, OET Bulletin 65, FCC, Washington, D.C.: 1997.
- IEEE 1528 (2013), Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
- American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE) C95. 1-1992
- Institute of Electrical and Electronics Engineers (IEEE) C95.1-2005
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998
- Ministry of Health (Canada) Safety Code 6 (2015), Limits of Human Exposure to Radio frequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz
- RSS-102 (Issue 5) – Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
- Australian Communications Authority Radio communications (Electromagnetic Radiation - Human Exposure) Standard (2014)
- ANATEL, Brazil Regulatory Authority, Resolution No. 303 of July 2, 2002 "Regulation of the limitation of exposure to electrical, magnetic, and electromagnetic fields in the radio frequency range between 9 kHz and 300 GHz." and “Attachment to resolution # 303 from July 2, 2002”
- IEC62209-2 Edition 1.0 2010-03, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures – Part 2: Procedure to determine the specific absorption rate (SAR) for wireless

communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz).

- FCC KDB – 643646 D01 SAR Test for PTT Radios v01r03
- FCC KDB – 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB – 865664 D02 RF Exposure Reporting v01r02
- FCC KDB – 447498 D01 General RF Exposure Guidance v06
- FCC KDB – 248227 D01 802.11 Wi-Fi SAR v02r02

3.0 SAR Limits

Table 1

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average - ANSI - (averaged over the whole body)	0.08	0.4
Spatial Peak - ANSI - (averaged over any 1-g of tissue)	1.6	8.0
Spatial Peak – ICNIRP/ANSI - (hands/wrists/feet/ankles averaged over 10-g)	4.0	20.0
Spatial Peak - ICNIRP - (Head and Trunk 10-g)	2.0	10.0

4.0 Description of Devices under Test (DUT)

These portable devices operate in the LMR bands using frequency modulation (FM) and TDMA signals incorporating traditional simplex two-way radio transmission protocol. These devices also contain WLAN technology for data capabilities over 802.11b/g/n wireless networks and Bluetooth technology for short range wireless devices.

Time Division Multiple Access (TDMA) is used to allocate portions of the RF signal by dividing time into two slots. Time allocation enables each unit to transmit its voice information without interference from other transmitting units. Transmission from a unit or base station is accommodated during two time-slot lengths of 15 milliseconds with frame length of 60 milliseconds. The TDMA technique requires sophisticated algorithms and a digital signal processor (DSP) to perform voice compressions/decompressions and RF modulation/demodulation. The maximum duty cycle for TDMA 1:2 is 50%.

The LMR bands in these devices operate in a half duplex system. A half duplex system only allows the user to transmit or receive. These devices cannot transmit and receive simultaneously. The user must stop transmitting in order to receive a signal or listen for a response, regardless of PTT button or use of voice activated audio accessories. This type of operation which instructs the user to transmit no more than 50% of the time, justifies the use of 50% duty factor for this device.

These devices also incorporate a Class 1 Bluetooth device which is a Frequency Hopping Spread Spectrum (FHSS) technology. The Bluetooth radio modem is used to wireless link audio accessories. The maximum actual transmission duty cycle is imposed by the Bluetooth standard. The maximum duty cycle for BT is 76.1%.

WLAN 802.11b/g/n operates using Direct Sequence Spread Spectrum (DSSS). These devices work in accordance with the IEEE 802.11b/g/n standard.

Bluetooth Low Energy is new feature introduced to the devices with software upgrade. It intended to provide considerable reduced power consumption while maintaining similar communication range. Tables below list the details for Bluetooth LE for this PCII filing.

Table 2

Technologies	Antenna Model	Antenna Description	Band (MHz)	Max Power (mW)
BT LE	84009370002	Internal BT/WLAN antenna; ; ¼ wave; 2.58 dBi gain	2402-2480	1.55

5.0 SAR Assessment at the Bluetooth Low Energy band

5.1 FCC Requirement

Per guidelines in KDB 447498, the following formula was used to determine the test exclusion for standalone Bluetooth Low Energy transmitter;

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] * [\sqrt{F_{(\text{GHz})}}] = 0.49 \text{ W/kg, which is } \leq 3 \text{ W/kg (1g)}$

Where:

Max. Power = 1.55 mW

Min. test separation distance = 5mm for actual test separation < 5mm

F(GHz) = 2.48 GHz

Per the result from the calculation above, SAR test is not required.

5.2 Industry Canada Requirement

Based on RSS-102 Issue 5, exemption limits for SAR evaluation for controlled devices at Bluetooth Low Energy frequency band with separation distance $\leq 5\text{mm}$ is 20 mW.

Bluetooth Low Energy for these devices operates at

Maximum conducted power:
= 1.55 mW or 1.91 dBm.

Equivalent isotropically radiated power (EIRP):
= Maximum conducted power, dBm + Antenna gain, dBi
= 1.91 dBm + 2.58 dBi
= 4.49 dBm or 2.81 mW.

Output power level, EIRP 2.81 mW is below the threshold power level 20 mW. Hence SAR test is not required.

6.0 Results Summary

Based on SAR assessment at Bluetooth Low energy band in section 5.0, SAR test is not required. Therefore, the numbers found on initial compliance assessment for FCC and IC remain.