

 MOTOROLA SOLUTIONS	 MS ISO/IEC 17025 TESTING SAMM No.0826
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DECLARATION OF COMPLIANCE: MPE ASSESSMENT (PCII report)

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Report author:	Tiong Nguk Ing
Assessment Date(s)	12/20/2018
Manufacturer:	Motorola Solutions Inc.
DUT Description:	APX8500 mobile All Bands (VHF, UHF, 7/800)
Max. Power output:	120W (136-174 MHz), 120 W (380-484 MHz), 48W (485-512 MHz), 30W (512-520 MHz), 36W (764-805 MHz), 42W (806-870 MHz); 63.1 mW (WLAN 2.4 GHz 802.11b), 25 mW (WLAN 2.4 GHz 802.11g/n) ; 31.6 mW (WLAN 5 GHz 802.11 a/n/ac), 10 mW (BT), 2.5 mW (BT LE)
TX Frequency Bands:	136-174 MHz; 380-520 MHz; 764-805 MHz; 806-870 MHz; WLAN 2400-2483.5 MHz; WLAN 5180-5825 MHz; BT 2402-2480 MHz
Model(s) Certified:	M37TXS9PW1AN (HUW1001A)
Classification:	Occupational/Controlled Environment
FCC ID:	AZ492FT7118; 150.8-173.4 MHz, 406.1-512 MHz, 769-775 MHz, 799-824 MHz, 851-869 MHz, 2412-2462 MHz, 5180-5825 MHz, 2402-2480 MHz

The MPE results clearly demonstrate compliance with FCC Occupational/Controlled RF Exposure limits. FCC rules require compliance for Passengers and Bystanders to the FCC General Population/Uncontrolled limits.

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 3.0 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-159 April 2006. The results and statements contained in this report pertain only to the device(s) evaluated herein.

<p align="center">  Tiong Nguk Ing Deputy Technical Manager Approval Date: 12/20/2018 </p>	
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Document Revision History

Date	Revision	Comments
12/20/2018	A	Initial release

Table of Contents

1.0 Introduction..... 4

2.0 FCC MPE Summary 4

3.0 Abbreviations / Definitions..... 4

4.0 Referenced Standards and Guidelines 5

5.0 Assessment for Bluetooth 5

6.0 Simultaneous Transmission 7

1.0 Introduction

This permissive change report is to add Bluetooth and Bluetooth low energy technologies to model M37TXS9PW1AN (HUW1001A), FCC ID #: AZ492FT7118. There is a not hardware change; schematic and layout remain same, only software changes to enable the Bluetooth feature.

2.0 FCC MPE Summary

Table 1

Equipment Class	Frequency band (MHz)	Trunk Mounted Antennas				Roof Mounted Antennas			
		Passenger		Bystander		Passenger		Bystander	
		Power Density (mW/cm ²)	Percentage of Limit (%)	Power Density (mW/cm ²)	Percentage of Limit (%)	Power Density (mW/cm ²)	Percentage of Limit (%)	Power Density (mW/cm ²)	Percentage of Limit (%)
TNB	150.8 – 173.4 (LMR VHF)	NA	NA	NA	NA	0.42	*212.1	0.41	*202.8
	406.1 – 470 (LMR UHF1)	NA	NA	NA	NA	0.12	45.4	0.27	89.9
	450 – 512 (LMR UHF2)	NA	NA	NA	NA	0.11	37.1	0.27	89.9
	769-775; 799-824; 851-869 (LMR 7/800)	0.13	23.6	0.13	22.9	0.04	8.4	0.06	12.1
DTS	2412 – 2462 (WLAN 2.4 GHz)	0.0301	3.01	0.0301	3.01	0.0301	3.01	0.0301	3.01
NII	5180 - 5825 (WLAN 5 GHz)	0.0120	1.20	0.0120	1.20	0.0120	1.20	0.0120	1.20
DSS	2402-2480 (Bluetooth)	0.0048	0.48	0.0048	0.48	0.0048	0.48	0.0048	0.48
Simultaneous (Highest Combined Percentage of Limit)			26.61		25.91		*215.11		*205.81

Note:

* Requires SAR Simulation (refer to initial FCC on filed report).

[New technology added for this Permissive Change filing.](#)

3.0 Abbreviations / Definitions

- BT: Bluetooth
- BT LE: Bluetooth Low Energy
- MPE: Maximum Permissible Exposure
- LMR: Land Mobile Radio
- SAR: Specific Absorption Rate
- BS: Bystander
- PB: Passenger Back seat
- PF: Passenger Front seat
- WLAN: Wireless Local Area Network

4.0 Referenced Standards and Guidelines

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

- United States Federal Communications Commission, Code of Federal Regulations; Rule Part 47CFR § 1.1310, § 2.1091 (d) and § 2.1093 for RF Exposure, where applicable.
- Federal Communications Commission, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”, OET Bulletin 65 (Edition 97-01), FCC, Washington, D.C.: August 1997.
- American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE) C95. 1-1999
- American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE) C95. 1-1992. Specific to FCC rules and regulations.
- Institute of Electrical and Electronics Engineers (IEEE) C95.3-2002
- 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 Radio communication Apparatus (All Frequency Bands)
- FCC KDB – 447498 D01 General RF Exposure Guidance v06
- FCC KDB – 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB – 865664 D02 RF Exposure Reporting v01r02

5.0 Assessment for Bluetooth

Maximum output power for Bluetooth is 10 mW and Bluetooth LE is 2.5 mW. Table below summarized the evaluated antennas for Bluetooth.

Table 2

Antenna Model	Frequency Range (MHz)	Physical Length (cm)	Gain (dBi)	Mount Location (Roof/ Trunk)
PMAN5100A	2400-2500	5.7 (L) x 1.9 (W)	6	Glass mount
PMAN5101A	2400-2500 / 4900-5900	5.4 (L) x 1.32 (W)	6 / 3.2	Glass mount
AN000163A01	2400-2500 / 4900-5900	7	5.15	Trunk
AN000163A05	2400-2500 / 4900-5900	7	5.15	Roof/ Trunk

MPE calculation was used to determine power density for these transmitters due to lower power. According to FCC’s OET Bulletin 65 Edition 97-01 Section 2, calculations can be made to predict RF field strength and power density levels around typical RF sources. Equation (1) is generally accurate in far-field of an antenna.

Equation 1 – Power Density Calculation

$$S = \frac{P_t G}{4\pi d^2} F$$

Equation (1) accounts for the maximum duty cycle of the signal, and the factor, F, to provide a worst-case prediction of power density per FCC OET Bulletin 65, Edition 97-01 1997.

- Where:
- S = power density
 - P_t = maximum output power scaled by the maximum duty cycle of the signal
 - G = power gain of the antenna in the direction of interest relative to an isotropic radiator
 - d = distance from antenna
 - F = Enhancement factor [1 or 2.56 for predicting ground-level field strength]

Bluetooth with maximum output power, 10 mW will be used for the MPE assessment. Table 2 summarizes the MPE calculation for BT.

Table 3

Antenna #	Max Power (W)	Duty Cycle (%)	Tx Frequency (MHz)	Antenna Gain (dBi)	Cable Loss, L (dB)	Dist., d (cm)	Enhance Factor, F	Max Calc. MPE (mW/cm ²)	FCC Limit (mW/cm ²)	% To FCC Spec Limit
Bluetooth 2.4 GHz										
PMAN5100A	0.0100	100.00%	2402.0	6.00	2.20	20	1.00	0.0048	1.00	0.48
PMAN5100A	0.0100	100.00%	2441.0	6.00	2.20	20	1.00	0.0048	1.00	0.48
PMAN5100A	0.0100	100.00%	2480.0	6.00	2.20	20	1.00	0.0048	1.00	0.48
PMAN5101A	0.0100	100.00%	2402.0	6.00	3.00	20	1.00	0.0040	1.00	0.40
PMAN5101A	0.0100	100.00%	2441.0	6.00	3.00	20	1.00	0.0040	1.00	0.40
PMAN5101A	0.0100	100.00%	2480.0	6.00	3.00	20	1.00	0.0040	1.00	0.40
AN000163A01 / AN000163A05	0.0100	100.00%	2402.0	5.15	2.20	20	1.00	0.0039	1.00	0.39
AN000163A01 / AN000163A05	0.0100	100.00%	2441.0	5.15	2.20	20	1.00	0.0039	1.00	0.39
AN000163A01 / AN000163A05	0.0100	100.00%	2480.0	5.15	2.20	20	1.00	0.0039	1.00	0.39

Notes:

- 1) Distance from antenna (d), 20cm for more conservative estimation.
- 2) Cable loss (L),
 - 2.20 dB with 17’ PFP240 cable for 2.4 GHz BT (Antenna PMAN5100A, AN000163A0, AN000163A05)
 - 3.00 dB with 1’ RG316 and 16’ PFP195 cable for 2.4 GHz BT (Antenna PMAN5101A)
- 3) Numeric gain (G), factor in the cable loss with conversion 10^{^(dBi-L)/10}
- 4) Enhancement Factor (F), 1 (Ground reflection already factor in during antenna characterization)

6.0 Simultaneous Transmission

BT, BT LE, WLAN 2.4 GHz or WLAN 5 GHz using single transmitter antenna port, thus only one technology can transmit at once. LMR bands can transmit simultaneously with either one of these technologies - BT, BT LE, WLAN 2.4 GHz or WLAN 5 GHz.

Simultaneous transmission results in initial FCC filing with WLAN 2.4 GHz with higher maximum output power, 63.1 mW still remains as highest combined power density percentage for this device.

Table 3

Simultaneous Transmission Scenario	Highest Combined Percentage of Limit (%)		
	Passenger, Front Seat (PF)	Passenger, Back Seat (PB)	Bystander (BS)
LMR VHF and WLAN	91.01 %	*215.11 %	*205.81 %
LMR UHF1 and WLAN	25.71 %	48.41 %	92.91 %
LMR UHF2 and WLAN	25.61 %	40.11 %	92.91 %
LMR 7/800 and WLAN	23.91 %	26.61 %	25.91 %

* Requires SAR Simulations (refer to initial FCC on filed report).