MOTOROLA SOLUTIONS

MS ISO/IEC 17025
TESTING
SAMM No.0826

DECLARATION OF COMPLIANCE SAR ASSESSMENT

Motorola Solutions Inc.
EME Test Laboratory
Motorola Solutions Malaysia Sdn Bhd (Innoplex)
Plot 2A, Medan Bayan Lepas
Mukim 12 SWD 11900 Bayan Lepas Penang, Malaysia.

Date of Report: 1/5/2018
Report Revision: A

Responsible Engineer:	Tiong Nguk Ing
Report Author:	Tiong Nguk Ing
Assessment Date/s:	1/5/2018
Manufacturer:	Motorola Solutions
DUT Description:	Stun Gun Sensor
TX mode(s):	Bluetooth Low Energy; Inductive coil
Max. Power output:	1 mW
Tx Frequency Bands:	2400 - 2483 MHz (BT LE) ; 735 kHz (Inductive coil sensor)
Signaling type:	GFSK
Model(s) Certified:	PMLN7848A
Classification:	Occupational /Controlled
FCC ID:	AZ489FT6018
IC:	109U-89FT6018
ISED Test Site registration:	109AK
FCC Test Firm Registration Number:	823256

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 FCC 47 CFR § 2.1093

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

Tiong Nguk Ing
Deputy Technical Manager
Approval Date: 1/8/2018

Tiong Nguk Ing Digitally signed by Tiong Nguk Ing Date: 2018.01.08 15:27:49 +08'00'

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Report Revision History

Date	Revision	Comments
1/5/2018	A	Initial release

1.0 Introduction

This report details RF Exposure assessment for Stun Gun Sensor model number PMLN7848A. This device classified as Occupational /Controlled.

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 – 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

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)

This device incorporates Bluetooth Low Energy intended to provide considerable reduce power consumption while maintaining similar communication range, typical maximum range of 50 meters. Bluetooth LE operates at frequency spectrum 2.4 GHz to 2.483 GHz with GFSK schemes with employ 40 channels (20 MHz channel bandwidth). This device contain an inductive coil sensor operates using a sinusoidal waveform at 735 kHz with maximum 12mA rms current.

Table 2 below summarized devices information.

Table 2

Technologies	Antenna Description	Frequency	Max Power (mW)
BT LE	Internal BT antenna; 0.5 dBi gain	2400-2483 MHz	1.0
Inductive Coil Sensing	N/A	735 kHz	1.0

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;

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] *[$\sqrt{F_{(GHz)}}$] = 0.31 W/kg, which is ≤ 3 W/kg (1g)

Where:

Max. Power = 1.0 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 ≤ 5mm is 4 mW.

Bluetooth Low Energy for these devices operates at

Maximum conducted power:
= 1.00 mW or 0 dBm.

Equivalent isotropically radiated power (EIRP):
= Maximum conducted power, dBm + Antenna gain, dBi
= 0 dBm + 0.5 dBi
= 0.5 dBm or 1.12 mW.

Output power level, EIRP 1.12 mW is below the threshold power level 4 mW (at separation distance of ≤ 5mm). Hence SAR test is not required.

6.0 SAR Assessment at 735 kHz, Inductive Coil Sensing

Based on below calculation, SAR test exclusion power threshold at 735 kHz is 743.2mW. Maximum power for Inductive coil sensor is 1.0mW, hence SAR test required.

KDB 447498 4.3.1, b.1) for 100 MHz to 6 GHz and test separation distances > 50 mm, the 1-g test exclusion thresholds are determined by following**:**
For 100 MHz to 1500 MHz:
{[Power allowed at *numeric threshold* for 50 mm at 100 MHz] + [(test separation distance – 50 mm) · ($f_{(MHz)}$/150)]} mW
= **474.3 mW**

Where:

Power allowed at *numeric threshold* for 50 mm at 100 MHz = 474.3 mW
Test separation distance = 50 mm

KDB 447498 4.3.1, c.1) for below 100 MHz and test separation distances >50 mm and <200 mm,
Power threshold at the corresponding test separation distance at 100 MHz in step b) is multiply by [1+log (100/$f_{(MHz)}$)]
= 474.3 mW * [1+log (100/0.735 MHz)]
= 1486.5 mW

Where:
$f_{(MHz)}$= 0.735 MHz

KDB 447498 4.3.1, c.2) for below 100 MHz and test separation distances ≤ 50 mm,
Power threshold determined by equation in c) 1) is multiplied by ½
= 1486.5 mW * 0.5
= **743.2 mW**

7.0 Results Summary

Based on SAR assessments in section 5.0 and 6.0, SAR test is not required.