

 MOTOROLA SOLUTIONS	 TESTING CERT # 2518.01
DECLARATION OF COMPLIANCE: MPE ASSESSMENT	
EME Test Laboratory 8000 West Sunrise Blvd Fort Lauderdale, FL. 33322	Date of Report: June 5, 2014 Report Revision: A
Responsible Engineer: William Elliott (Principal Staff EME Test Engineer) Report author: William Elliott (Principal Staff EME Test Engineer) Assessment Date(s): 05/08/2014 Manufacturer/Location: Motorola Solutions Inc., Reynosa Mexico Date submitted: 04/24/2014 DUT Description: VML750 LTE VSM- VSM data modem only for public safety vehicular application, includes LTE, WiFi b/g/n and GPS. TX mode(s): LTE and WiFi b/g/n Max. Power output: 355mW (LTE) & 50mW (WiFi) TX Frequency Bands: LTE BC13 777-787 MHz; LTE BC14 788-798 MHz; WiFi 2401-2473 MHz Signaling type: LTE (Frequency division duplexing with optional QPSK and 16 QAM), WiFi (WLAN Direct Sequence with seven modulation formats – OFDM with BPSK, DBPSK QPSK, DQPSK, CCK, 16QAM, and 64QAM) Model(s) Certified: F0025A (FLN0058A) Classification: Occupational/Controlled Environment FCC ID: AZ492FT7060 IC: 109U-92FT7060; This report contains results that are immaterial for IC equipment approval, which are identified as LTE band BC14 788-798MHz.	
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-159 April 2006 The results and statements contained in this report pertain only to the device(s) evaluated herein.	
 Deanna Zakharia EME Lab Senior Resource Manager and Laboratory Director Approval Date: 6/6/2014	edc015@m otorolasol utions.com Digitally signed by edc015@motorolasol utions.com DN: cn=edc015@motorolasol utions.com Date: 2014.06.06 10:29:00 -0400 Certification Date: 6/6/2014 Certification No.: L1140606

Document Revision History

Date	Revision	Comments
05/13/2014	O	Initial release
06/05/2014	A	Updated for new max power LTE bands and freq range for WiFi

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1.0 Introduction

This report contains calculated Maximum Permissible Exposure (MPE) results for product VML750 model F0025A (FLN0058A).

2.0 FCC MPE Summary

Equipment Class	Frequency band (MHz)	Max. Power Density (mW/cm ²)	% of FCC Limit
TNB	777-787 / 788-798	0.223	43.1
DTS	2401 – 2473	0.099	9.9
Simultaneous Results		0.322	53

3.0 Abbreviations / Definitions

BPSK – Binary Phase-Shift Keying
 CCK – Complementary Code Keying
 DBPSK – Differential Binary Phase-Shift Keying
 DQPSK – Differential Quadrature Phase-Shift Keying
 DTS: Digital Transmission System
 DUT: Device Under Test
 EME: Electromagnetic Energy
 GPS: Global Positioning System
 LTE: Long Term Evolution
 MPE: Maximum Permissible Exposure
 OFDM – Orthogonal Frequency-Division Multiplexing
 QAM – Quadrature Amplitude Modulation
 QPSK – Quadrature Phase-Shift Keying
 TNB: Licensed Non-Broadcast Station Transmitter
 WLAN: Wireless Local Area Network
 WiFi: Wireless Fidelity

4.0 Referenced Standards and Guidelines

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

- Federal Communications Commission, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”, OET Bulletin 65, FCC, Washington, D.C.: 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 (2009), Limits of Human Exposure to Radio frequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz

5.0 Power Density Limits

Table 1 – Occupational / Controlled Exposure Limits

Frequency Range (MHz)	FCC OET Bulletin 65	ICNIRP	IEEE C95.1 1992/1999	IEEE C95.1 2005	RSS 102 issue 4 - 2010
	mW/cm ²	W/m ²	mW/cm ²	W/m ²	W/m ²
30 - 300	1.0				*10.0
10 - 400		10.0			
100 - 300			1.0	10.0	
300 - 1,500	f/300				f/30
300 - 3,000			f/300	f/30	
400 - 2,000		f/40			
1,500 - 15,000					50.0
1,500 - 100,000	5.0				
2,000 – 300,000		50.0			
3,000 - 300,000			10.0	100.0	

*Power density limit is applicable at frequencies greater than 100MHz

Table 2 – General Population / Uncontrolled Exposure Limits

Frequency Range (MHz)	FCC OET Bulletin 65	ICNIRP	IEEE C95.1 1992/1999	IEEE C95.1 2005	RSS 102 issue 4 – 2010
	mW/cm ²	W/m ²	mW/cm ²	W/m ²	W/m ²
30 – 300	0.2				*2.0
10 – 400		2.0			
100 – 300			0.2		
100 – 400				2.0	
300 – 1,500	f/1,500				f/150
400 – 2,000		f/200		f/200	
300 – 15,000			f/1,500		
1,500 – 15,000					10.0
1,500 – 100,000	1.0				
2,000 – 100,000				10.0	
2,000 – 300,000		10.0			

*Power density limit is applicable at frequencies greater than 100MHz

6.0 Product and System Description

VML750 Model F0025A (FLN0058A) is a data modem for vehicular applications. The modem supports LTE Bands 13 / 14 (777-787 / 788-798 MHz) and WiFi (2401 – 2473 MHz). The maximum duty cycles are 100% for LTE and WiFi. Simultaneous transmission is possible.

This device is capable of operating in the TX frequency range(s), duty cycle(s), maximum output power(s) and antenna gain(s) presented in Table 3 section 7.0 MPE Assessment.

7.0 Assessment Method

MPE calculations were used to determine the RF exposure for this device. 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. For example, in the case of a single radiating antenna, a prediction for power density in the far-field of the antenna can be made by use of the general Equations (1) or (2) below. These equations are generally accurate in the far-field of an antenna but will over-predict power density in the near field, where they could be used for making a "worst case" or conservative prediction. Equation 2 was used to show compliance for this device.

Equation 1

$$S = \frac{PG}{4\pi R^2} = \frac{EIRP}{4\pi R^2}$$

Where:

- S = power density (mW/cm²)
- P = power input to the antenna (mW)
- G = power gain of the antenna in the direction of interest relative to an isotropic radiator (dBi)
- R = distance to center of radiation of the antenna (cm)
- EIRP = equivalent (or effective) isotropically radiated power

Or Equation 2

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

Equation (2) 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 (mW/cm²)
- 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 (dBi)
- d = distance from antenna (cm)
- L = cable loss (dB)
- F = 1.0

8.0 MPE Assessment

Table 3
MPE calculation Results

Antenna #	Max Power (W)	Duty Cycle (%)	Tx Frequency (MHz)	Antenna Gain (dBi)	Cable Loss, L (dB)	Dist., d (cm)	⁽⁴⁾ Enhance Factor, F	Max Calc. MPE (mW/cm ²)	% Result of FCC Spec Limit	% Result of ICNIRP Spec Limit	MPE Spec Limit (mW/cm ²)	
											FCC	ICNIRP
LTE BC13												
FTN7686A	0.355	100%	777.0	5.00	0.00	20	1.00	0.223	43.1	57.5	0.52	0.39
FTN7686A	0.355	100%	782.0	5.00	0.00	20	1.00	0.223	42.8	57.1	0.52	0.39
FTN7686A	0.355	100%	787.0	5.00	0.00	20	1.00	0.223	42.6	56.8	0.52	0.39
LTE BC14												
FTN7686A	0.355	100%	788.0	5.00	0.00	20	1.00	0.223	42.5	56.7	0.53	0.39
FTN7686A	0.355	100%	793.0	5.00	0.00	20	1.00	0.223	42.2	56.3	0.53	0.40
FTN7686A	0.355	100%	798.0	5.00	0.00	20	1.00	0.223	42.0	56.0	0.53	0.40
WLAN												
AN000036A01	0.050	100%	2401.0	10.00	0.00	20	1.00	0.099	9.9	9.9	1.00	1.00
AN000036A01	0.050	100%	2437.0	10.00	0.00	20	1.00	0.099	9.9	9.9	1.00	1.00
AN000036A01	0.050	100%	2473.0	10.00	0.00	20	1.00	0.099	9.9	9.9	1.00	1.00

9.0 Conclusion

The following Table summarizes the highest MPE calculations for each transmit band as well as the direct summation results to evaluate simultaneous transmission condition.

Frequency Band/Mode/Option	Highest Max Calc. MPE	% of FCC Spec Limit	% of ICNIRP Spec Limit	Combined % results of spec limit for Simultaneous Tx			
				LTEBC13 + WLAN [FCC]	LTEBC14 + WLAN [FCC]	LTEBC13 + WLAN [ICNIRP]	LTEBC14 + WLAN [ICNIRP]
LTEBC13	0.223	43.1	57.5				
LTEBC14	0.223	42.5	56.7				
WLAN	0.099	9.9	9.9	53	52.4	67.4	66.6

The MPE results per the assessment in section 7.0 are compliant to the FCC General population/Uncontrolled RF exposure limits per FCC OET Bulletin 65.

The MPE results are also compliant to the ICNIRP General population/Uncontrolled exposure limits, per ICNIRP (1998) Guidelines for limiting exposure in time-varying electric, magnetic, and electromagnetic fields (up to 300GHz) and IEEE C95.1-2005.