

	
DECLARATION OF COMPLIANCE: MPE ASSESSMENT	
EME Test Laboratory 8000 West Sunrise Blvd Fort Lauderdale, FL. 33322	Date of Report: June 9, 2014 Report Revision: A
<p>Responsible Engineer: William Elliott (Principal Staff EME Test Engineer) Report author: William Elliott (Principal Staff EME Test Engineer) Assessment Date(s): 05/19/2014 Manufacturer/Location: Motorola Solutions Inc., Reynosa Mexico Date submitted: 04/28/2014 DUT Description: VML750 VzW/AT&T LTE VSM - VSM data modem only for public safety vehicular application, includes LTE, 3G, EVDO, WiFi b/g/n and GPS</p> <p>TX mode(s): LTE, 3G, EVDO, and WiFi b/g/n Max. Power output: Baseline: LTE BC13 355 mW; LTE BC14 355 mW; WiFi b/g/n 50 mW; Module: LTE BC2 224 mW; LTE BC4 226 mW; LTE BC5 228 mW; LTE BC17 220 mW; LTE BC13 229 mW; LTE BC25 221 mW; 3G BC2 205 mW; 3G BC5 217 mW; EVDO BC0 275 mW; EVDO BC1 275 mW</p> <p>TX Frequency Bands: Baseline: LTE BC13 777-787 MHz; LTE BC14 788-798 MHz WiFi 2401-2473 MHz; Module: LTE BC2 1850-1910 MHz; LTE BC4 1710-1755 MHz; LTE BC5 824-849 MHz; LTE BC17 704-716 MHz; LTE BC13 777-787 MHz; LTE BC25 1850-1915 MHz 3G BC2 1850-1910 MHz; 3G BC5 824-849 MHz; EVDO BC0 824-849 MHz; EVDO BC1 1850-1910 MHz</p> <p>Signaling type: LTE (3GPP 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), CDMA2000: CDMA 1x, CDMA 1x EVDO (Rev0, RevA)</p> <p>Model(s) Certified: F0025A (FLN1057A) Classification: Occupational/Controlled Environment FCC ID: AZ492FT7060</p>	
<p>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.</p> <p>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>	
 Deanna Zakharia EME Lab Senior Resource Manager and Laboratory Director Approval Date: 6/9/2014	Certification Date: 6/9/2014 Certification No.: L1140609

Document Revision History

Date	Revision	Comments
05/19/2014	O	Initial release
06/09/2014	A	Max power changed for Baseline LTE bands. Frequency range change for WLAN.

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 Power Density Limits 5

6.0 Product and System Description..... 6

7.0 Assessment Method 6

8.0 MPE Assessment 7

9.0 Conclusion 9

1.0 Introduction

This report contains calculated Maximum Permissible Exposure (MPE) results for product VML750 model F0025A (FLN1057A). This product (Baseline) contains module FCC ID: N7NMC7355 (Module).

2.0 FCC MPE Summary

Table 1

Equipment Class	Frequency band (MHz)	Max. Power Density (with respect to MPE limits)* (mW/cm²)	% of FCC MPE Limit
TNB	788-798	.223	43.1%
PCB	704-716, 777-787, 824-849, 1710-1755, 1850-1910, 1850-1915	.348	74.1%
DTS	2401 – 2473	.099	9.9
Simultaneous Results		.447	84%

* Although there may be higher power density levels reported in the data tables, these are the highest with respect to the applicable FCC limit at the test frequency and are therefore reported here.

3.0 Abbreviations / Definitions

- BPSK: Binary Phase-Shift Keying
- CCK: Complementary Code Keying
- CDMA: Code Division Multiple Access
- DBPSK: Differential Binary Phase-Shift Keying
- DQPSK: Differential Quadrature Phase-Shift Keying
- DTS: Digital Transmission System
- DUT: Device Under Test
- EME: Electromagnetic Energy
- EVDO: Evolution-Data Optimized
- 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
- PCB: PCS Licensed Transmitter
- 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

5.0 Power Density Limits

Table 2 – Occupational / Controlled Exposure Limits

Frequency Range (MHz)	FCC OET Bulletin 65	IEEE C95.1 1992/1999	IEEE C95.1 2005
	mW/cm ²	mW/cm ²	W/m ²
30 – 300	1.0		
10 – 400			
100 – 300		1.0	10.0
300 – 1,500	f/300		
300 – 3,000		f/300	f/30
400 – 2,000			
1,500 – 15,000			
1,500 – 100,000	5.0		
2,000 – 300,000			
3,000 – 300,000		10.0	100.0

Table 3 – General Population / Uncontrolled Exposure Limits

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

6.0 Product and System Description

VML750 Model F0025A (FLN1057A) is a data modem for vehicular applications. The modem supports LTE Bands 2 / 4 / 5 / 13 / 14 / 17 and 25 (1850 – 1910 / 1710 – 1755 / 824 – 849 / 777-787 / 788-798 / 704 – 716 / 1850 – 1910 MHz), 3G Bands 2 and 5 (1850 – 1910 / 824 – 849 MHz), EVDO Bands 0 and 1 (824 – 829 / 1850 – 1910 MHz) and WiFi (2401-2473MHz). The maximum duty cycles are 100% for LTE / 3G / EVDO and WiFi. Simultaneous transmission is possible between WiFi and one of the other TX bands at any given time.

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 4 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) (0 dB used as worst case for analysis)
 F = 1.0

8.0 MPE Assessment

Table 4
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	MPE Spec Limit (mW/cm ²)
										FCC
Baseline										
LTE BC13										
FIN7686A	0.355	100%	777.0	5.00	0.00	20	1.00	0.223	43.1	0.52
FIN7686A	0.355	100%	782.0	5.00	0.00	20	1.00	0.223	42.8	0.52
FIN7686A	0.355	100%	787.0	5.00	0.00	20	1.00	0.223	42.6	0.52
LTE BC14										
FIN7686A	0.355	100%	788.0	5.00	0.00	20	1.00	0.223	42.5	0.53
FIN7686A	0.355	100%	793.0	5.00	0.00	20	1.00	0.223	42.2	0.53
FIN7686A	0.355	100%	798.0	5.00	0.00	20	1.00	0.223	42.0	0.53
WLAN										
AN000036A01	0.050	100%	2401.0	10.00	0.00	20	1.00	0.099	9.9	1.00
AN000036A01	0.050	100%	2437.0	10.00	0.00	20	1.00	0.099	9.9	1.00
AN000036A01	0.050	100%	2473.0	10.00	0.00	20	1.00	0.099	9.9	1.00

Table 4 (cont.)

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	MPE Spec Limit (mW/cm ²)
										FCC
Module										
LTE BC2										
FTN0073A	0.224	100%	1850.0	3.0	0.00	20	1.00	0.089	8.9	1.00
FTN0073A	0.224	100%	1880.0	3.0	0.00	20	1.00	0.089	8.9	1.00
FTN0073A	0.224	100%	1910.0	3.0	0.00	20	1.00	0.089	8.9	1.00
LTE BC4										
FTN0073A	0.226	100%	1710.0	6.0	0.00	20	1.00	0.179	17.9	1.00
FTN0073A	0.226	100%	1732.5	6.0	0.00	20	1.00	0.179	17.9	1.00
FTN0073A	0.226	100%	1755.0	6.0	0.00	20	1.00	0.179	17.9	1.00
LTE BC5										
FTN0073A	0.228	100%	824.0	6.5	0.00	20	1.00	0.203	36.9	0.55
FTN0073A	0.228	100%	826.5	6.5	0.00	20	1.00	0.203	36.8	0.55
FTN0073A	0.228	100%	829.0	6.5	0.00	20	1.00	0.203	36.7	0.55
LTE BC13										
FTN0073A	0.229	100%	777.0	9.00	0.00	20	1.00	0.362	69.9	0.52
FTN0073A	0.229	100%	782.0	9.00	0.00	20	1.00	0.362	69.4	0.52
FTN0073A	0.229	100%	787.0	9.00	0.00	20	1.00	0.362	69.0	0.52
LTE BC17										
FTN0073A	0.220	100%	704.0	9.0	0.00	20	1.00	0.348	74.1	0.47
FTN0073A	0.220	100%	710.0	9.0	0.00	20	1.00	0.348	73.4	0.47
FTN0073A	0.220	100%	716.0	9.0	0.00	20	1.00	0.348	72.8	0.48
LTE BC25										
FTN0073A	0.221	100%	1810.0	3.0	0.00	20	1.00	0.088	8.8	1.00
FTN0073A	0.221	100%	1862.5	3.0	0.00	20	1.00	0.088	8.8	1.00
FTN0073A	0.221	100%	1915.0	3.0	0.00	20	1.00	0.088	8.8	1.00
3G BC2										
FTN0073A	0.205	100%	1850.0	3.0	0.00	20	1.00	0.081	8.1	1.00
FTN0073A	0.205	100%	1880.0	3.0	0.00	20	1.00	0.081	8.1	1.00
FTN0073A	0.205	100%	1910.0	3.0	0.00	20	1.00	0.081	8.1	1.00
3G BC5										
FTN0073A	0.217	100%	824.0	6.5	0.00	20	1.00	0.193	35.1	0.55
FTN0073A	0.217	100%	826.5	6.5	0.00	20	1.00	0.193	35.0	0.55
FTN0073A	0.217	100%	829.0	6.5	0.00	20	1.00	0.193	34.9	0.55
EVDO BC0										
FTN0073A	0.275	100%	824.0	6.5	0.00	20	1.00	0.244	44.5	0.55
FTN0073A	0.275	100%	826.5	6.5	0.00	20	1.00	0.244	44.4	0.55
FTN0073A	0.275	100%	829.0	6.5	0.00	20	1.00	0.244	44.2	0.55
EVDO BC1										
FTN0073A	0.275	100%	1850.0	3.0	0.00	20	1.00	0.109	10.9	1.00
FTN0073A	0.275	100%	1880.0	3.0	0.00	20	1.00	0.109	10.9	1.00
FTN0073A	0.275	100%	1910.0	3.0	0.00	20	1.00	0.109	10.9	1.00

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

Table 5
Simultaneous Transmit Condition MPE Evaluation

Frequency Band/Mode/Option	Highest Max Calc. MPE	% of FCC Spec Limit	Combined % results of FCC spec limit for Simultaneous Tx											
			Baseline LTE BC13 + WLAN	Baseline LTE BC14 + WLAN	Module LTE BC2 + WLAN	Module LTE BC4 + WLAN	Module LTE BC5 + WLAN	Module LTE BC13 + WLAN	Module LTE BC17 + WLAN	Module LTE BC25 + WLAN	Module 3G BC2 + WLAN	Module 3G BC5 + WLAN	Module EVDO BC0 + WLAN	Module EVDO BC1 + WLAN
Baseline														
LTEBC13	0.223	43.1												
LTEBC14	0.223	42.5												
WLAN	0.099	9.9	53	52.4	18.8	27.8	46.8	79.8	84.0	18.7	18.0	45.0	54.4	20.8
Module														
LTEBC2	0.081	8.9												
LTEBC4	0.179	17.9												
LTEBC5	0.203	36.9												
LTEBC13	0.144	69.9												
LTEBC17	0.348	74.1												
LTEBC25	0.088	8.8												
3GBC2	0.089	8.1												
3GBC5	0.193	35.1												
EVDO BC0	0.244	44.5												
EVDO BC1	0.109	10.9												

9.0 Conclusion

The MPE results per the assessment in section 8.0 are compliant to the FCC General population/Uncontrolled RF exposure limits per FCC OET Bulletin 65.