

 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: January 26, 2015 Report Revision: 0
--	--

Responsible Engineer: William Elliott (Principal Staff EME Test Engineer)
Report author: William Elliott (Principal Staff EME Test Engineer)
Assessment Date(s): 01/26/2015
Manufacturer/Location: Motorola Solutions Inc., Reynosa Mexico

Date submitted: 01/26/2015
DUT Description: BASELINE VSM DATA MODEM ONLY FOR PUBLIC SAFETY VEHICULAR APPLICATION INCLUDES WIFI B/G/N.
TX mode(s): WiFi b/g/n
Max. Power output: 50mW (WiFi)
TX Frequency Bands: WiFi 2401-2473 MHz
Signaling type: WiFi (WLAN Direct Sequence with seven modulation formats – OFDM with BPSK, DBPSK QPSK, DQPSK, CCK, 16QAM, and 64QAM)

Model(s) Certified: F0025A (FLN2058A)
Classification: Occupational/Controlled Environment
FCC ID: AZ492FT7058
IC: 109U-92FT7058

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: 1/29/2015	Certification Date: 1/29/2015 Certification No.: L1150104
---	--

Document Revision History

Date	Revision	Comments
01/26/2015	O	Initial release

Table of Contents

1.0 Introduction..... 3

2.0 FCC MPE Summary 3

3.0 Abbreviations / Definitions..... 3

4.0 Referenced Standards and Guidelines 3

5.0 Power Density Limits 4

6.0 Product and System Description..... 6

7.0 Assessment Method 6

8.0 MPE Assessment 7

9.0 Conclusion 7

1.0 Introduction

This report contains calculated Maximum Permissible Exposure (MPE) results for product model F0025A (FLN2058A).

2.0 FCC MPE Summary

Table 1

Equipment Class	Frequency band (MHz)	*Power Density (mW/cm ²)	% of FCC MPE Limit
DTS	2401 – 2473	0.099	9.9
Simultaneous Results			NA

*Results are based on highest percentage of limit.

3.0 Abbreviations / Definitions

- DUT: Device Under Test
- EME: Electromagnetic Energy
- MPE: Maximum Permissible Exposure
- WiFi: Wireless Fidelity
- OFDM: Orthogonal Frequency-Division Multiplexing
- BPSK: Binary Phase-Shift Keying
- DBPSK: Differential Binary Phase-Shift Keying
- QPSK: Quadrature Phase-Shift Keying
- DQPSK: Differential Quadrature Phase-Shift Keying
- CCK: Complimentary Code Keying
- QAM: Quadrature Amplitude Modulation

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 (2014), Limits of Human Exposure to Radio frequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz
- Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands), Industry Canada RSS-102 Issue 4, 2010

5.0 Power Density Limits

Table 2 – 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	Health Canada Safety Code 6 (2014)
	mW/cm ²	W/m ²	mW/cm ²	W/m ²	W/m ²	W/m ²
10 - 20						10.0
20 – 48						44.72 / $f^{0.5}$
30 – 300	1.0				*10.0	
48 – 100						6.455
10 – 400		10.0				
100 – 300			1.0	10.0		
100 – 6,000						0.6455 $f^{0.5}$
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		
6,000 – 15,000						50.0
15000 – 150,000						50.0
150000 – 300,000						3.33×10 ⁻⁴ f

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

Table 3 – 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	Health Canada Safety Code 6 (2014)
	mW/cm ²	W/m ²	mW/cm ²	W/m ²	W/m ²	W/m ²
10 - 20						10.0
20 – 48						$44.72 / f^{0.5}$
30 – 300	1.0				*10.0	
48 – 100						6.455
10 – 400		10.0				
100 – 300			1.0	10.0		
100 – 6,000						$0.6455 f^{0.5}$
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		
6,000 – 15,000						50.0
15000 – 150,000						50.0
150000 – 300,000						$3.33 \times 10^{-4} f$

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

6.0 Product and System Description

VML750 Model F0025A (FLN2058A) is a data modem for vehicular applications. The modem supports WiFi (2401 – 2473 MHz) only. The maximum duty cycle is 100% for WiFi.

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.

Since the maximum duty cycle of 100% was used for this assessment, calculations for each modulation format is unnecessary as this covers the worst case.

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 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 New IC Spec Limit	MPE Spec Limit (mW/cm ²)		
										FCC	ICNIRP	New Proposed IC Limits
WLAN												
AN000036A01	0.050	100%	2401.0	10.00	0.00	20	1.00	0.099	18.6	1.00	1.00	0.54
AN000036A01	0.050	100%	2437.0	10.00	0.00	20	1.00	0.099	18.4	1.00	1.00	0.54
AN000036A01	0.050	100%	2473.0	10.00	0.00	20	1.00	0.099	18.2	1.00	1.00	0.55

9.0 Conclusion

The MPE results per the assessment in Table 4 are compliant to the FCC General Population/Uncontrolled RF exposure limits in OET Bulletin 65.. The results per the assessment in Table 5 are compliant to the FCC Occupational/Controlled RF exposure limits in OET Bulletin 65.

The MPE results per the assessment in Table 4 are also compliant to the ICNIRP general public 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. The results per the assessment in Table 5 are compliant to the ICNIRP occupational 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..

Finally, the MPE results per the assessment in Table 4 are compliant with the proposed uncontrolled RF exposure limits found in Health Canada Safety Code 6 (2014). The results per the assessment in Table 5 are compliant with the controlled RF exposure limits found in Health Canada Safety Code 6.

Table 5: Maximum MPE RF Exposure Summary

Designator	Frequency (MHz)	Bystander (mW/cm ²)
Overall	2401 – 2473 MHz	0.099
FCC	2401 – 2473 MHz	0.099
IC	2401 – 2473 MHz 0	0.099