

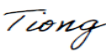
 MOTOROLA SOLUTIONS	
DECLARATION OF COMPLIANCE: MPE ASSESSMENT for PCII Filing	
Motorola Solutions, Inc. EME Test Laboratory Motorola Solutions Malaysia Sdn Bhd (Innoplex) Plot 2A, Medan Bayan Lepas, Mukim 12 SWD 11900 Bayan Lepas Penang, Malaysia.	Date of Report: 10/01/2016 Report Revision: B
Responsible Engineer: Tiong Nguk Ing Report Author: Tiong Nguk Ing Assessment Date(s): 9/5/2016 Manufacturer: Reynosa, Mexico DUT Description: VML750 R4.0 LTE Vehicular Subscriber Modem (SKU4) Test TX mode(s): WiFi 802.11 b/g/n, UMTS and LTE Max. Power output: <u>Baseline:</u> WiFi 802.11 b/g/n 50mW; <u>Module LM63S1</u> (FCC ID: 2AAGMLM63S1) <u>Module MC7455</u> (FCC ID: N7NMC7455); For full description of max powers for each transmission mode refer to Table 4. Tx Frequency Bands: <u>Baseline:</u> WiFi 802.11 b/g/n 2401-2473 MHz; <u>Module LM63S1</u> (FCC ID: 2AAGMLM63S1): LTE BC13, LTE BC14 <u>Module MC7455</u> (FCC ID: N7NMC7455): UMTS BC2, UMTS BC4, UMTS BC5; LTE BC2, LTE BC4, LTE BC5, LTE BC12, LTE BC13, LTE BC25, LTE BC26 For full description of specific transmit frequencies, refer to Table 4. Signaling type: 4G LTE (OFDM) ; 3G UMTS (QPSK); WiFi 802.11 b/g/n (OFDM with BPSK, DBPSK QPSK, DQPSK, CCK, 16QAM, and 64QAM) Model(s) Tested: SKU4 - F0025A (FLN5060A) Model(s) Certified: SKU4 - F0025A (FLN5060A) Classification: Occupational / Controlled Environment FCC ID: AZ492FT7058 – Include modules FCC ID: 2AAGMLM63S1 and N7NMC7455	
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.	
 Tiong Nguk Ing Deputy Technical Manager Approval Date: 10/01/2016	Certification Date: 9/6/2016 Certification No.: L1160903

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Report Revision History

Date	Revision	Comments
09/6/2016	A	Initial release
10/1/2016	B	Include KDB 996369 D01 in referenced standards and Guidelines

1.0 Introduction

This report contains calculated Maximum Permissible Exposure (MPE) results for product model F0025A (FLN5060A). This product contains modules FCC ID: 2AAGMLM63S1 and N7NMC7455.

2.0 MPE Summary

Table 1

Technologies	Frequency (MHz)	Max. Power Density (with respect to MPE limits)* (mW/cm ²)	% of FCC Limit	Simultaneous TX
WiFi 802.11 b/g/n	2401-2473	0.099	9.95 %	52.61 %
UMTS / LTE	LTE BC12 (699-716)	0.199	42.66 %	

*Results are based on highest percentage of limit.

3.0 Abbreviations / Definitions

BPSK: Binary phase-shift keying
 DBPSK: Differential binary phase-shift keying
 DQPSK: Differential Quadrature Phase Shift Keying
 DUT: Device Under Test
 EME: Electromagnetic Energy
 LTE: Long Term Evolution
 OFDM: Orthogonal Frequency-Division Multiplexing
 QAM: Quadrature Amplitude Modulation
 QPSK: Quadrature Phase Shift Keying
 MPE: Maximum Permissible Exposure

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
- FCC KDB – 447498 D01 General RF Exposure Guidance v06
- FCC KDB – 865664 D02 RF Exposure Reporting v01r02
- FCC KDB – 996369 D01 Module Equipment Authorization Guide v02

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
10 - 20			
20 – 48			
30 – 300	1.0		
48 – 100			
10 – 400			
100 – 300		1.0	10.0
100 – 6,000			
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
6,000 – 15,000			
15000 – 150,000			
150000 – 300,000			

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
10 - 20			
20 – 48			
30 – 300	0.2		
48 – 300			
10 – 400			
100 – 300		0.2	
100 – 400			2.0
300 – 1,500	f/1,500		
300 – 6000			
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			
6,000 – 15,000			
15,000 – 150,000			
150,000 - 300,000			

6.0 Product and System Description

VML750 Model F0025A (FLN5060A) is a data modem for vehicular applications. The modem consists of WiFi 802.11 b/g/n, modules MC7455 and 2AAGMLM63S which supports LTE and UMTS bands. The maximum duty cycles are 100% for WiFi, UMTS and LTE. Simultaneous transmission is possible between WiFi and one of the other transmission bands at any given time.

Table 4 below summarizes the technologies, Uplink bands, maximum duty cycles and maximum output powers. Maximum output powers are defined as upper limit of the production line final test station.

Table 4

Technologies	Transmit Bands (MHz)	Transmission Type	Duty Cycle (%)	Max Power (mW)
Baseline				
WiFi 802.11 b/g/n	2401-2473	OFDM with BPSK, DBPSK QPSK, DQPSK, CCK, 16QAM, and 64QAM	100	50
Module MC7455 (FCC ID : N7NMC7455)				
UMTS BC2	1850-1910	QPSK	100	225
UMTS BC4	1710-1755	QPSK	100	249
UMTS BC5	824-849	QPSK	100	250
LTE BC2	1850-1910	OFDM	100	225
LTE BC4	1710-1755	OFDM	100	249
LTE BC5	824-849	OFDM	100	250
LTE BC12	699-716	OFDM	100	251
LTE BC13	777-787	OFDM	100	247
LTE BC25	1850-1915	OFDM	100	251
LTE BC26	814-849	OFDM	100	250
Module LM63S1 (FCC ID : 2AAGMLM63S1)				
LTE BC13	777-787	OFDM	100	240
LTE BC14	788-798	OFDM	100	220

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

MPE assessments on model F0025A (FLN5060A) with maximum antennas gain allowable from each module (WiFi, LM63S1 and MC7455).

Table 5 summarized the highest MPE calculation for each standalone transmitter bands.

When LM63S1 and MC7455 modules co-transmits with WiFi, per KDB 447498 D01, simultaneous transmission MPE test exclusion applies when the sum of MPE ratios for all simultaneous transmitting antennas incorporated in a host device is ≤ 1.0 , according to calculated/estimated, numerically modeled, or measured field strengths or power density.

The evaluation here considers a WiFi transmitter and UMTS/LTE transmitter are transmitting simultaneously. The sum of MPE percentage to the limit is calculated as follows:

$$\begin{aligned}\sum MPE &= \text{Highest \% of Limit(WiFi)} + \text{Highest \% of Limit(UMTS, LTE)} \\ &= 9.95\% + 42.66\% = 52.61\% \leq 100\%\end{aligned}$$

Table 5: MPE Assessment with maximum antennas gain

Technologies	Transmit Bands (MHz)	Max Antenna Gain (dBi)	Max Calc. MPE (mW/cm2)	Highest % of FCC limit
Baseline				
WiFi 802.11 b/g/n	2401-2473	10	0.099	9.95
Module MC7455				
UMTS BC2	1850-1910	6	0.178	17.82
UMTS BC4	1710-1755	6	0.197	19.72
UMTS BC5	824-849	6	0.198	36.04
LTE BC2	1850-1910	6	0.178	17.82
LTE BC4	1710-1755	6	0.197	19.72
LTE BC5	824-849	6	0.198	36.04
LTE BC12	699-716	6	0.199	42.66
LTE BC13	777-787	6	0.196	37.77
LTE BC25	1850-1915	6	0.199	19.88
LTE BC26	814-849	6	0.198	36.49
Module LM63S1				
LTE BC13	777-787	6	0.190	36.70
LTE BC14	788-798	6	0.174	33.17

9.0 Conclusion

The MPE assessment presented in this report concludes that model F0025A (FLN5060A) when transmitting either in standalone or simultaneously, are compliant to the FCC General Population/Uncontrolled RF exposure limits in OET Bulletin 65, provided antenna gain for each frequency band and operating mode do not exceed maximum antenna gain in Table 5.

Table 6: Maximum MPE RF Exposure Summary

Technologies	Frequency (MHz)	Max. Power Density (with respect to MPE limits)* (mW/cm ²)	% of FCC Limit	Simultaneous TX
WiFi 802.11 b/g/n	2401-2473	0.099	9.95 %	52.61 %
UMTS / LTE	LTE BC12 (699-716)	0.199	42.66 %	

*Results are based on highest percentage of limit.

Appendix A

MPE Calculation Results

Table 7: MPE calculation for stand-alone transmission

Tx Frequency (MHz)	Max Power (W)	Duty Cycle (%)	Max Allowed Antenna Gain (dBi)	Cable Loss, L (dB)	Dist., d (cm)	Max Calc. MPE (mW/cm ²)	MPE Spec Limit (mW/cm ²)	
							FCC	% To FCC Spec Limit
WLAN (2401-2473 MHz , 50 mW)								
2401	0.050	100%	10.00	0.00	20	0.099	1.00	9.95
2437	0.050	100%	10.00	0.00	20	0.099	1.00	9.95
2473	0.050	100%	10.00	0.00	20	0.099	1.00	9.95
Module MC7455								
UMTS B2 (1850-1910 MHz , 225 mW)								
1850	0.225	100%	6.00	0.00	20	0.178	1.00	17.82
1880	0.225	100%	6.00	0.00	20	0.178	1.00	17.82
1910	0.225	100%	6.00	0.00	20	0.178	1.00	17.82
UMTS B4 (1710-1755 MHz , 249 mW)								
1710	0.249	100%	6.00	0.00	20	0.197	1.00	19.72
1733	0.249	100%	6.00	0.00	20	0.197	1.00	19.72
1755	0.249	100%	6.00	0.00	20	0.197	1.00	19.72
UMTS B5 (824-849 MHz , 250 mW)								
824	0.250	100%	6.00	0.00	20	0.198	0.55	36.04
837	0.250	100%	6.00	0.00	20	0.198	0.56	35.51
849	0.250	100%	6.00	0.00	20	0.198	0.57	34.98
LTE B2 (1850-1910 MHz , 225 mW)								
1850	0.225	100%	6.00	0.00	20	0.178	1.00	17.82
1880	0.225	100%	6.00	0.00	20	0.178	1.00	17.82
1910	0.225	100%	6.00	0.00	20	0.178	1.00	17.82
LTE B4 (1710-1755 MHz , 249 mW)								
1710	0.249	100%	6.00	0.00	20	0.197	1.00	19.72
1733	0.249	100%	6.00	0.00	20	0.197	1.00	19.72
1755	0.249	100%	6.00	0.00	20	0.197	1.00	19.72
LTE B5 (824-849 MHz , 250 mW)								
824	0.250	100%	6.00	0.00	20	0.198	0.55	36.04
837	0.250	100%	6.00	0.00	20	0.198	0.56	35.51
849	0.250	100%	6.00	0.00	20	0.198	0.57	34.98
LTE B12 (699-716 MHz , 251 mW)								
699	0.251	100%	6.00	0.00	20	0.199	0.47	42.66
708	0.251	100%	6.00	0.00	20	0.199	0.47	42.15
716	0.251	100%	6.00	0.00	20	0.199	0.48	41.65
LTE B13 (777-787 MHz , 247 mW)								
777	0.247	100%	6.00	0.00	20	0.196	0.52	37.77
782	0.247	100%	6.00	0.00	20	0.196	0.52	37.52
787	0.247	100%	6.00	0.00	20	0.196	0.52	37.29
LTE B25 (1850-1915 MHz , 251 mW)								
1850	0.251	100%	6.00	0.00	20	0.199	1.00	19.88
1883	0.251	100%	6.00	0.00	20	0.199	1.00	19.88
1915	0.251	100%	6.00	0.00	20	0.199	1.00	19.88
LTE B26 (814-849 MHz , 250 mW)								
814	0.250	100%	6.00	0.00	20	0.198	0.54	36.49
832	0.250	100%	6.00	0.00	20	0.198	0.55	35.72
849	0.250	100%	6.00	0.00	20	0.198	0.57	34.98

Table 7 continued: MPE calculation for stand-alone transmission

Tx Frequency (MHz)	Max Power (W)	Duty Cycle (%)	Max Allowed Antenna Gain (dBi)	Cable Loss, L (dB)	Dist., d (cm)	Max Calc. MPE (mW/cm ²)	MPE Spec Limit (mW/cm ²)	
							FCC	% To FCC Spec Limit
Module LM63S1								
LTE B13 (777-787 MHz , 240 mW)								
777	0.240	100%	6.00	0.00	20	0.190	0.52	36.70
782	0.240	100%	6.00	0.00	20	0.190	0.52	36.46
787	0.240	100%	6.00	0.00	20	0.190	0.52	36.23
LTE B14 (788-798 MHz , 220 mW)								
788	0.220	100%	6.00	0.00	20	0.174	0.53	33.17
793	0.220	100%	6.00	0.00	20	0.174	0.53	32.96
798	0.220	100%	6.00	0.00	20	0.174	0.53	32.75

Table 8: MPE calculation for simultaneous transmission (WiFi and module MC7455)

Frequency Band/Mode/Option	Highest Max Calc. MPE	% of Spec Limit	Combined % results of spec limit for Simultaneous Tx									
			WLAN + UMTS B2	WLAN + UMTS B4	WLAN + UMTS B5	WLAN + LTE B2	WLAN + LTE B4	WLAN + LTE B5	WLAN + LTE B12	WLAN + LTE B13	WLAN + LTE B25	WLAN + LTE B26
Baseline												
WLAN	0.099	9.95										
Module MC7455												
UMTS B2	0.178	17.82	27.77									
UMTS B4	0.197	19.72		29.67								
UMTS B5	0.198	36.04			45.99							
LTE B2	0.178	17.82				27.77						
LTE B4	0.197	19.72					29.67					
LTE B5	0.198	36.04						45.99				
LTE B12	0.199	42.66							52.61			
LTE B13	0.196	37.77								47.71		
LTE B25	0.199	19.88									29.83	
LTE B26	0.198	36.49										46.43

Table 9: MPE calculation for simultaneous transmission (WiFi and module LM63S1)

Frequency Band/Mode/Option	Highest Max Calc. MPE	% of Spec Limit	Combined % results of spec limit for Simultaneous Tx	
			WLAN + LTE B13	WLAN + LTE B14
Baseline				
WLAN	0.099	9.95		
Module LM63S1				
LTE B13	0.190	36.70	46.64	
LTEB14	0.174	33.17		43.12