

**MOTOROLA SOLUTIONS**

CERTIFICATE 2518.05

DECLARATION OF COMPLIANCE: MPE ASSESSMENT**Motorola Solutions Inc.
EME Test Laboratory**Motorola Solutions Malaysia Sdn Bhd
Plot 2A, Medan Bayan Lepas,

Mukim 12 SWD 11900 Bayan Lepas Penang, Malaysia.

Date of Report: 3/10/2022
Report Revision: C

Responsible Engineer: Puteri Alifah Ilyana Binti Nor Rahim (EME Engineer)
Report author: Puteri Alifah Ilyana Binti Nor Rahim (EME Engineer)
Date(s) Tested: 3/1/2021-3/14/2021, 12/9/2021-12/13/2021
Manufacturer: Motorola Solutions Inc.
Date submitted for test: 02/22/2021
DUT Description: APX 6500 UHF R2 - Multiple HW Encryption WiFi Interoperability Data Modem Tethering via WiFi or Cable
Test TX mode(s): CW
Max. Power output: 54W (450-485 MHz); 48W (485-512 MHz); 30W (512-520 MHz); 11.2 mW (Bluetooth); 6.3 mW (Bluetooth LE); 39.8 mW (WLAN 2.4GHz 802.11b), 15.8 mW (WLAN 2.4GHz 802.11g), 12.6mW (WLAN 2.4GHz 802.11n); 15.8mW (WLAN 5GHz 802.11a/n/ac)
TX Frequency Bands: 450-520 MHz; WLAN 2412-2462 MHz; WLAN 5180-5825 MHz; BT 2402-2480 MHz
Signaling type: FM, TDMA, FHSS (Bluetooth / Bluetooth LE), 802.11b/g/n (WLAN 2.4 GHz), 802.11 a/n/ac (WLAN 5 GHz)
Model(s) Tested: M25SSS9PW1BN (PMUE5756A)
Model(s) Certified: M25SSS9PW1BN (PMUE5756A), M22SSS9PW1BN (PMUE5756A), M24SSS9PW1BN (PMUE5756A), M36SSS9PW1BN (PMUE5756A)
Serial Number(s): 471TXD0188
Classification: Occupational/Controlled Environment
FCC ID: AZ492FT4967
 450-520 MHz, 2402-2480 MHz, 2412-2462 MHz; 5180-5825 MHz
 This report contains results that are immaterial for FCC equipment approval, which are clearly identified.
ISED: 109U-92FT4967
 This report contains results that are immaterial for ISED Canada equipment approval, which are clearly identified.

The MPE results clearly demonstrate compliance with FCC Occupational/Controlled RF Exposure limits. FCC rules require compliance for Passengers and Bystanders to the FCC General Population/Uncontrolled limits. The test results clearly demonstrate compliance with ICNIRP Guidelines for limiting exposure in time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz).

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 (no deviation from standard methods). 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.


Saw Sun Hock (Approved Signatory)
Approval Date: 3/10/2022

Document Revision History

Date	Revision	Comments
12/15/2021	A	Initial release
1/28/2022	B	Update the model number
3/10/2022	C	Amend the Table 12

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	N _c Test Channels.....	7
7.0	Measurement Equipment	7
8.0	Measurement System Uncertainty Levels.....	8
9.0	Product and System Description	8
10.0	Additional Options and Accessories	10
11.0	Test Set-Up Description.....	10
12.0	Method of Measurement with trunk mounted antenna(s).....	10
12.1	External/Bystander vehicle MPE measurements.....	10
12.2	Internal/Passenger vehicle MPE measurements	11
13.0	Method of Measurement with roof mounted antenna(s).....	12
13.1	External/Bystander vehicle MPE measurements.....	12
13.2	Internal/Passenger vehicle MPE measurements	12
14.0	MPE Variability Requirement for External/Bystander vehicle MPE measurement	13
15.0	MPE Calculations	13
16.0	Antenna Summary.....	14
17.0	Test Results Summary	15
17.1	MPE Test Results Summary for LMR	15
17.2	MPE Test Results for Bluetooth and WLAN	21
17.3	Simultaneous Transmission.....	23
18.0	Conclusion	24
19.0	User Instructions Considerations	25
	Appendix A - Antenna Locations, Test Distances, and Cable Losses	26
	Appendix B - Probe Calibration Certificates	31
	Appendix C - Photos of Assessed Antennas.....	51
	Appendix D - MPE Measurement Results.....	52

1.0 Introduction

This report details the test setup, test equipment and test results of Maximum Permissible Exposure (MPE) performed at Motorola Solutions' outside test site for product model M25SSS9PW1BN (PMUE5756A).

2.0 FCC MPE Summary

Table 1

Equipment Class	Frequency band (MHz)	Trunk Mounted Antennas				Roof Mounted Antennas			
		Passenger		Bystander		Passenger		Bystander	
		Power Density (mW/cm ²)	Percentage of Limit (%)	Power Density (mW/cm ²)	Percentage of Limit (%)	Power Density (mW/cm ²)	Percentage of Limit (%)	Power Density (mW/cm ²)	Percentage of Limit (%)
TNB	450-520 (LMR UHF2)	0.332	110.70	0.175	56.00	0.054	17.30	0.113	36.70
DTS	2412 – 2462 (WLAN 2.4 GHz)	0.018	1.77	0.018	1.77	0.018	1.77	0.018	1.77
NII	5180 - 5825 (WLAN 5 GHz)	0.007	0.67	0.007	0.67	0.007	0.67	0.007	0.67
DSS	2402-2480 (Bluetooth)	0.005	0.50	0.005	0.50	0.005	0.50	0.005	0.50
Simultaneous (Highest Combined Percentage of Limit)			112.47		57.77		19.07		38.47

3.0 Abbreviations / Definitions

BT: Bluetooth
 CNR: Calibration Not Required
 CW: Continuous Wave
 DUT: Device Under Test
 EME: Electromagnetic Energy
 FHSS: Frequency Hopping Spread Spectrum
 FM: Frequency Modulation
 MPE: Maximum Permissible Exposure
 GPS: Global Positioning System
 LMR: Land Mobile Radio
 NA: Not Applicable
 BS: Bystander
 PB: Passenger Back seat
 PF: Passenger Front seat
 PTT: Push to Talk
 WLAN: Wireless Local Area Network
 TDMA: Time Division Multiple Access

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
- 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 Radio communication Apparatus (All Frequency Bands)
- FCC KDB – 447498 D01 General RF Exposure Guidance v06
- FCC KDB – 865664 D02 RF Exposure Reporting v01r02
- EN 62311:2008 Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz – 300 GHz).

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 5 2015
	mW/cm ²	W/m ²	mW/cm ²	W/m ²	W/m ²
10 – 20					10.0
20 – 48					$44.72 / f^{0.5}$
30 – 300	1.0				
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				

Table 2 – Occupational / Controlled Exposure Limits (Con't.)

Frequency Range (MHz)	FCC OET Bulletin 65	ICNIRP	IEEE C95.1 1992/1999	IEEE C95.1 2005	RSS-102 Issue 5 2015
	mW/cm ²	W/m ²	mW/cm ²	W/m ²	W/m ²
300 – 3,000			f/300	f/30	
400 – 2,000		f/40			
1,500 – 15,000					
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					$3.33 \times 10^{-4} f$

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 5 2015
	mW/cm ²	W/m ²	mW/cm ²	W/m ²	W/m ²
10 – 20					2.0
20 – 48					$8.944 / f^{0.5}$
30 – 300	0.2				
48 – 300					1.291
10 – 400		2.0			
100 – 300			0.2		
100 – 400				2.0	
300 – 1,500	f/1,500				
300 – 6000					$0.02619 f^{0.6834}$
400 – 2,000		f/200		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		10.0			
6,000 – 15,000					10.0
15,000 – 150,000					10.0
150,000 – 300,000					$6.67 \times 10^{-5} f$

6.0 N_c Test Channels

The number of test channels is determined by using Equation 1 below. This equation is available in FCC's KDB 447498. The test channels are appropriately spaced across the antenna's frequency range.

Equation 1 – Number of test channels

$$N_c = \text{Round} \{ [100(f_{\text{high}} - f_{\text{low}})/f_c]^{0.5} \times (f_c / 100)^{0.2} \}$$

where N_c is the number of test channels, f_{high} and f_{low} are the highest and lowest frequencies within the transmission band, f_c is the mid-band frequency, and frequencies are in MHz.

7.0 Measurement Equipment

Table 4 – Equipment

Equipment Type	Model #	SN	Calibration Date	Calibration Due Date
Automobile	Volvo 240-1988	NA	NA	NA
*Survey Meter *Probe – E-Field	ETS Model HI-2200 ETS Model E100	00086887 00224511	05/06/2020	05/06/2021
*Survey Meter *Probe – H-Field	ETS Model HI-2200 ETS Model H200	00086887 00224521	05/06/2020	05/06/2021
Survey Meter Probe – E-Field	ETS Model HI-2200 ETS Model E100	00086316 00206767	06/21/2021	06/21/2022
Survey Meter Probe – H-Field	ETS Model HI-2200 ETS Model H200	00086316 00206937	06/21/2021	06/21/2022

E-field measurements are in mW/cm².

Note: “*” Equipment is replaced with other before the due date.

8.0 Measurement System Uncertainty Levels

Table 5 – Uncertainty Budget for Near Field Probe Measurements

	Tol. (± %)	Prob. Dist.	Divisor	u_i (± %)		v_i
Measurement System						
Probe Calibration	7.1	N	1.00	7.1	50.4	∞
Survey Meter Calibration	0.0	N	1.00	0.0	0.0	¥
Hemispherical Isotropy	8.0	R	1.73	4.6	21.33	∞
Linearity	5.0	R	1.73	2.9	8.33	∞
Pulse Response	1.0	R	1.73	0.6	0.33	∞
RF Ambient Noise	3.0	R	1.73	1.7	3.00	∞
RF Reflections	8.0	R	1.73	4.6	21.33	∞
Probe Positioning	10.0	R	1.73	5.8	33.333	∞
Test sample Related					0.00	
Antenna Positioning	3.0	N	1.00	3.0	9.0	∞
Power drift	5.0	R	1.73	2.9	8.33	∞
Bystander measurement uncertainty	4.8	N	1.00	4.8	23.04	∞
Passenger measurement uncertainty	8.1	N	1.00	8.1	65.61	∞
Combined Standard Uncertainty		RSS		15.6	15.6	∞
Expanded Uncertainty (95% CONFIDENCE LEVEL)		$k=2$		31	31	

9.0 Product and System Description

This mobile device operates in the LMR bands using either frequency modulation (FM) with 100% transmit duty cycle or TDMA signals with maximum of 50% transmit duty cycle. For conservative assessment, FM signal was tested. A duty factor of 50% applies for PTT operation mode.

This device also incorporates a Class 1 Bluetooth device which is a Frequency Hopping Spread Spectrum (FHSS) technology. The Bluetooth radio modem is used to wireless link audio accessories. The maximum actual transmission duty cycle is imposed by the Bluetooth standard. The maximum duty cycle for BT is 100%. Bluetooth Low Energy (BT LE) intended to reduce power consumption.

This device also contains WLAN technology for data capabilities over 802.11b/g/n 2.4 GHz and 802.11 a/n/ac 5 GHz wireless networks.

Table 6 below summarizes the technologies, bands, maximum duty cycles and maximum output powers. Maximum output powers are defined as upper limit of the production line final test station.

Table 6

Technologies	Bands (MHz)	Duty Cycle (%)	Max Power (W)
LMR	450-520 (UHF2)	50 (PTT)	54 (450-485 MHz) 48 (485-512 MHz) 30 (512-520 MHz)
BT	2402-2480	100	0.0112
BT LE	2402-2480	100	0.0063
WLAN	2400 – 2462 (802.11b/g/n)	100	0.0398 (802.11b)
			0.0158 (802.11g)
			0.0126 (802.11n)
	5180-5825 (802.11 a/n/ac)	100	0.0158

This device will be marketed to and used by employees solely for work-related operations, such as public safety agencies, e.g. police, fire and emergency medical. User training is the responsibility of these agencies which can be expected to employ the usage instructions, safety information and operational cautions set forth in the user's manual, instructional sessions or other means.

Accordingly this product is classified as Occupational/Controlled Exposure. However, in accordance with FCC requirements, the passengers inside the vehicle and the bystanders external to the vehicle are evaluated to the General Population/Uncontrolled Exposure Limits.

(Note that “Bystanders” as used herein are people other than operator)

10.0 Additional Options and Accessories

Not available.

11.0 Test Set-Up Description

Assessments were performed with mobile radio installed in the test vehicle, at the specified distances and test locations indicated in sections 12.0, 13.0 and Appendix A.

All antennas described in Table 7 were considered in order to develop the test plan for this product. Antennas were installed and tested per their appropriate mount locations (Roof / Trunk) and defined test channels.

The system was tested using a low-loss 16' Teflon RG58A/U cable attaching the radio to the transmit antenna. This cable is shorter and lower attenuation than the 17' RG58A/U cables supplied in the customer kits for connecting the radio to the transmit antenna. The cable used in the test setup also has lower attenuation over the test frequency range than the cable provided in the customer kits. The use of a shorter cable with lower attenuation in the test setup ensures that the test data is more conservative with regards to the actual installation. Cable losses are reported in Appendix A.

12.0 Method of Measurement with trunk mounted antenna(s)

12.1 External/Bystander vehicle MPE measurements

Initially the antenna is located at the center of the trunk. Refer to Appendix A for antenna location and distance.

MPE measurements for bystander (BS) conditions are determined by taking the average of (10) measurements in a 2 m vertical line for each of the (3) bystander test locations indicated in Appendix A with 20 cm height increments, with the distance between the antenna and the geometric center of the probe sensor equal to 90 cm (for UHF band). The measurement probe is positioned orthogonal to antenna (typically parallel to ground with a vertically mounted antenna) and aimed directly at the antenna's axis. These measurements are representative of persons other than the operator standing next to the vehicle.

Each of the offered antennas mounted at the center of the trunk were assessed at the rear of the vehicle while maintaining a minimum of twenty (20) centimeter separation distance between the probe sensor and vehicle body. The worst case antenna was then tested at a 45° radial at the corner of the trunk, and 90° radial at the side of the trunk.

Tests for the 90° radial direction were conducted with the antenna displaced towards the "bystander on the side of the trunk" test location in order to attain 90 cm (12 cm antenna displacement) distances from that test location. In this way, the antenna is closer to the test location, and the MPE is higher, than it would be if the antenna was left at the center of the trunk

12.2 Internal/Passenger vehicle MPE measurements

Antenna is located toward the center of the trunk at a minimum 85 cm from backseat passenger. Users are instructed, per installation manual, to mount antennas on the roof only if a minimum 85cm cannot be achieved. Refer to Appendix A for antenna location and distance.

MPE measurements for passenger front seat (PF) and backseat (PB) conditions are determined by taking the average of the (3) measurements (Head, Chest, and Lower Trunk) inside the vehicle for both the front and back seats.

The backseat is a bench seat and therefore each position (Head, Chest & Lower Trunk) were scanned across (horizontally) the seat starting from the middle of the seat to the edge of the seat stopping 20 cm from the vehicle door. Similar process was used in the front bucket seat.

The probe handle is oriented parallel (horizontal) to the ground and pointed towards the back of the vehicle. The probe handle is not oriented normal to the seat surface. The probe head (incorporating the field sensors) is scanned continuously (using the max-hold function available in the meter) along three test axes which are parallel to the seat angle (intended as the line determined by the intersection of the plane of the seat and the plane of the backrest) and are 20 cm from the seat surface. One test axis is at the Head height, another is at the Chest height, and another is at the Lower Trunk height. The maximum field level value recorded for each test axis is logged. The MPE is determined by averaging these three maximum values regardless of the geometrical location where they were observed. For instance, the locations of the three maxima may lie on different vertical (relative to ground) lines.

This approach leads to results that are representative of the exposure of vehicle occupants since it is based on an average across the body portions closest to the antenna for both trunk and roof mount positions, and is conservatively biased because the highest results for each test axis are combined, e.g. the highest head exposure could be in the middle of the seat while the highest lower trunk exposure could be closer to the door.

13.0 Method of Measurement with roof mounted antenna(s)

13.1 External/Bystander vehicle MPE measurements

Antenna is located at the center of the roof. Refer to Appendix A for antenna location and distance.

MPE measurements for bystander (BS) conditions are determined by taking the average of (10) measurements in a 2m vertical line for the test location indicated in Appendix A with 20 cm height increments, with the distance between the antenna and the geometric center of the probe sensor equal to 90 cm (for UHF band). The measurement probe is positioned orthogonal to antenna (typically parallel to ground with a vertically mounted antenna) and aimed directly at the antenna's axis. These measurements are representative of persons other than the operator standing next to the vehicle.

13.2 Internal/Passenger vehicle MPE measurements

Antenna is located at the center of the roof. Refer to Appendix A for antenna location and distance.

MPE measurements for passenger front seat (PF) and backseat (PB) conditions are determined by taking the average of the (3) measurements (Head, Chest, and Lower Trunk) inside the vehicle for both the front and back seats.

The backseat is a bench seat and therefore each position (Head, Chest & Lower Trunk) were scanned across (horizontally) the seat starting from the middle of the seat to the edge of the seat stopping 20 cm from the vehicle door. Similar process was used in the front bucket seat.

The probe handle is oriented parallel (horizontal) to the ground and pointed towards the back of the vehicle. The probe handle is not oriented normal to the seat surface. The probe head (incorporating the field sensors) is scanned continuously (using the max-hold function available in the meter) along three test axes which are parallel to the seat angle (intended as the line determined by the intersection of the plane of the seat and the plane of the backrest) and are 20 cm from the seat surface. One test axis is at the Head height, another is at the Chest height, and another is at the Lower Trunk height. The maximum field level value recorded for each test axis is logged. The MPE is determined by averaging these three maximum values regardless of the geometrical location where they were observed. For instance, the locations of the three maxima may lie on different vertical (relative to ground) lines.

This approach leads to results that are representative of the exposure of vehicle occupants since it is based on an average across the body portions closest to the antenna for both trunk and roof mount positions, and is conservatively biased because the highest results for each test axis are combined, e.g. the highest head exposure could be in the middle of the seat while the highest lower trunk exposure could be closer to the door.

14.0 MPE Variability Requirement for External/Bystander vehicle MPE measurement

If all the MPE bystander measurements for a particular antenna are below 50% of the FCC MPE limit, no variability testing for that antenna is required.

If one or more MPE bystander measurements for a particular is between 50-80% of the FCC MPE limit, with no results > 80%, variability testing shall be done on the single worst case for that antenna.

For any MPE bystander measurement above 80% of the MPE limit, variability testing shall be done for all of such configuration. When SAR simulation is performed for a particular antenna configuration to determine compliance, variability measurements are not required for that antenna configuration.

15.0 MPE Calculations

The final MPE results for this mobile radio are presented in section 16.0. These results are based on 50% duty cycle for PTT for LMR bands.

Below is an explanation of how the MPE results are calculated. Refer to Appendix D for MPE measurement results and calculations for LMR band.

External to vehicle (Bystander) - 10 measurements are averaged over the body (*Avg_over_body*).
Internal to vehicle (Passengers) - 3 measurements are averaged over the body (*Avg_over_body*).

The Average over Body test methodology is consistent with IEEE/ANSI C95.3-2002 guidelines.

Therefore;

Equation 2 – Power Density Calculation (*Calc._P.D.*)

$$\text{Calc._P.D.} = (\text{Avg_over_body}) * (\text{probe_frequency_cal_factor}) * (\text{duty_cycle})$$

Note 1: The highest “average” cal factors from the calibration certificates were selected for the applicable frequency range. Linear interpretation was used to determine “probe_frequency_cal_factor” for the specific test frequencies.

Note 2: The E-field probe calibration certificate’s frequency cal factors were determined by measuring V/m. The survey meter’s results were measured in power density (mW/cm²) and therefore the “probe_frequency_cal_factor” was squared in equation 2 to account for these results.

Note 3: The H-field probe calibration certificate’s frequency cal factors were determined by measuring A/m. The survey meter’s results were measured in A/m and therefore the “Avg_over_body” A/m results were converted to power density (mW/cm²) using the equation 3. H-field measurements are only applicable to frequencies below 300MHz.

Equation 3 – Converting A/m to mW/cm²

$$\text{mW/cm}^2 = (\text{A/m})^2 * 37.699$$

Equation 4 – Power Density Maximum Calculation

$$Max_Calc._P.D. = P.D._calc * \frac{max_output_power}{initial_output_power}$$

Note 4: For initial output power > max_output_power; max_output_power / initial output power = 1

16.0 Antenna Summary

Table below summarizes the tested or evaluated antennas and their descriptions, mount location (roof/trunk), overlap of FCC bands, number of test channels per FCC KDB 447498 (FCC N_c) and actual number of tested channels (Actual N_c). This information was used to determine the test configurations presented in this report.

Table 7

Antenna No.	Antenna Model	Frequency Range (MHz)	Physical Length (cm)	Gain (dBi)	Remarks	Mount Location (Roof/ Trunk)	Overlap FCC Bands (MHz)	FCC N _c	Actual N _c
1	HAE4003A	450-470	16	2.15	1/4 wave	R	450-470	3	3
2	HAE4011A	450-470	73.2	5.65	1/2 wave	R/T	450-470	3	3
3	HAE6013A	380-470	29	4.15	1/2 wave	R/T	406.1-470	3	3
4	HAE6016A	450-512	8.3	2.15	1/4 wave	R	450-470	5	5
5	*RAE4016ARB	494-512	85.7 (494.9875 MHz) 83.6 (503 MHz) 83.3 (511.9875 MHz)	7.15	5/8 wave	R	450-512	3	3
6	HAE6031A	380-520	28	4.15	1/2 wave	R/T	406.1-512	5	6
7	*RAE4014ARB	445-470	92.7 (450.0125 MHz) 90.5 (460 MHz) 89.0 (469.9875 MHz)	7.15	5/8 Wave	R/T	445-470	3	3
BT/WLAN									
7	PMAN5100A	2400-2500	5.7 (L) x 1.9 (W)	3.0		Glass mount	2412-2462	3	3
8	PMAN5101A	2400-2500 / 4900-5900	5.4 (L) x 1.32 (W)	2.7 / 0.2		Glass mount	2412-2462 ; 5180-5825	3	3
9	AN000163A01	2400-2500 / 4900-5900	7	3.5 / 3.3	Monopole	Roof/ Trunk	2412-2462 ; 5180-5825	3	3
10	AN000163A05	2400-2500 / 4900-5900	7	2.5 / 1.6	Monopole	Roof/ Trunk	2412-2462 ; 5180-5825	3	3

Note:* Antenna length trimmed to frequency.

17.0 Test Results Summary

17.1 MPE Test Results Summary for LMR

Table 8

MPE assessment for LMR UHF2 - trunk mounted antenna – Bystander

Notes:

Blue fonts: Frequencies not regulated by FCC.

Results highlighted in yellow are configurations with highest percentage of limits

Trunk/ Roof	Test Position	E/H Field	Angle (Degree)	Antenna Model	Max Pwr (W)	Initial Pwr (W)	Tx Freq (MHz)	Max Calc. P.D. (mW/ cm^2)	FCC Limit	% To FCC Spec Limit	ICNIRP Limit	% To ICNIRP Spec Limit	ISED Limit	% To ISED Spec Limit
Trunk	BS	E	0	HAE4011A, 1/2 Wave, (450-470MHz)	54	52.4	450.0125	0.08	0.30	27.7	0.23	37.0	0.17	48.8
						53.3	460.0000	0.12	0.31	39.2	0.23	52.2	0.17	69.5
						53.5	469.9875	0.11	0.31	34.3	0.23	45.8	0.18	61.3
				HAE6013A, 1/2 Wave, (380-470MHz)	54	52.4	450.0125	0.14	0.30	47.2	0.23	63.0	0.17	83.2
						53.3	460.0000	0.15	0.31	48.7	0.23	64.9	0.17	86.3
						53.5	469.9875	0.16	0.31	50.7	0.23	67.6	0.18	90.6
				HAE6031A, 1/2 Wave, (380-520MHz)	54	52.4	450.0125	0.14	0.30	46.9	0.23	62.5	0.17	82.6
						53.5	469.9875	0.17	0.31	53.6	0.23	71.4	0.18	95.6
						53.8	482.5000	0.16	0.32	48.3	0.24	64.3	0.18	NA
						47.5	496.5000	0.13	0.33	37.9	0.25	50.5	0.18	NA
						47.6	511.9875	0.11	0.34	31.1	0.26	41.4	0.19	NA
						29.9	519.9875	0.11	0.35	31.6	0.26	42.2	0.19	NA
				RAE4014AR, 5/8 Wave, (445-470MHz)	54	52.4	450.0125	0.09	0.30	28.4	0.23	37.9	0.17	50.0
						53.3	460.0000	0.10	0.31	34.1	0.23	45.4	0.17	60.4
						53.5	469.9875	0.11	0.31	34.7	0.23	46.3	0.18	62.0
				RAE4016AR, 5/8 Wave, (494-512MHz)	48	47.1	494.9875	0.07	0.33	22.1	0.25	29.4	0.18	NA
						47.8	503.0000	0.07	0.34	20.6	0.25	27.5	0.18	NA
						47.6	511.9875	0.09	0.34	25.5	0.26	34.0	0.19	NA
			45	HAE6031A, 1/2 Wave, (380-520MHz)	54	53.5	469.9875	0.18	0.31	56.0	0.23	74.6	0.18	99.9
			90	HAE6031A, 1/2 Wave, (380-520MHz)	54	53.5	469.9875	0.12	0.31	37.1	0.23	49.4	0.18	66.2

Table 9**MPE assessment for LMR UHF2 - roof mounted antenna – Bystander**

Notes:

Blue fonts: Frequencies not regulated by FCC.

Results highlight in yellow are configurations with highest percentage of limits

Trunk/ Roof	Test Position	E/H Field	Angle (Degree)	Antenna Model	Max Pwr (W)	Initial Pwr (W)	Tx Freq (MHz)	Max Calc. P.D. (mW/ cm^2)	FCC Limit	% To FCC Spec Limit	ICNIRP Limit	% To ICNIRP Spec Limit	ISED Limit	% To ISED Spec Limit
Roof	BS	E	0	HAE4003A, 1/4 Wave, (450-470MHz)	54	52.4	450.0125	0.10	0.30	34.9	0.23	46.5	0.17	61.5
						53.3	460.0000	0.11	0.31	36.7	0.23	49.0	0.17	65.1
						53.5	469.9875	0.09	0.31	29.9	0.23	39.9	0.18	53.4
				HAE4011A, 5/8 Wave, (450-470MHz)	54	52.4	450.0125	0.05	0.30	16.2	0.23	21.6	0.17	28.5
						53.3	460.0000	0.08	0.31	24.8	0.23	33.1	0.17	44.0
						53.5	469.9875	0.06	0.31	17.6	0.23	23.4	0.18	31.4
				HAE6013A, 1/2 Wave, (380-470MHz)	54	52.4	450.0125	0.09	0.30	29.0	0.23	38.7	0.17	51.2
						53.3	460.0000	0.11	0.31	35.4	0.23	47.2	0.17	62.8
						53.5	469.9875	0.09	0.31	29.3	0.23	39.1	0.18	52.4
				HAE6016A, 1/4 Wave, (450-512MHz)	54	52.4	450.0125	0.06	0.30	18.5	0.23	24.7	0.17	32.6
						53.5	469.9875	0.10	0.31	30.9	0.23	41.3	0.18	55.2
						53.8	482.5000	0.11	0.32	32.8	0.24	43.7	0.18	NA
						47.5	496.5000	0.07	0.33	22.1	0.25	29.5	0.18	NA
						47.6	511.9875	0.08	0.34	21.9	0.26	29.2	0.19	NA
				HAE6031A, 1/2 Wave, (380-520MHz)	54	52.4	450.0125	0.11	0.30	35.2	0.23	46.9	0.17	61.9
						53.5	469.9875	0.10	0.31	31.7	0.23	42.3	0.18	56.7
						53.8	482.5000	0.10	0.32	31.0	0.24	41.4	0.18	NA
						47.5	496.5000	0.09	0.33	27.3	0.25	36.5	0.18	NA
						47.6	511.9875	0.09	0.34	26.7	0.26	35.6	0.19	NA
						29.9	519.9875	0.05	0.35	14.3	0.26	19.0	0.19	NA
				RAE4014AR, 5/8 Wave, (445-470MHz)	54	52.4	450.0125	0.05	0.30	17.2	0.23	23.0	0.17	30.4
						53.3	460.0000	0.07	0.31	22.4	0.23	29.9	0.17	39.7
						53.5	469.9875	0.06	0.31	17.8	0.23	23.7	0.18	31.8
				RAE4016AR, 5/8 Wave, (494-512MHz)	48	47.1	494.9875	0.06	0.33	18.3	0.25	24.4	0.18	NA
						47.8	503.0000	0.06	0.34	18.7	0.25	24.9	0.18	NA
						47.6	511.9875	0.06	0.34	17.8	0.26	23.8	0.19	NA

Table 10**MPE assessment for LMR UHF2 - trunk mounted antenna – Passenger Back**

Notes:

Blue fonts: Frequencies not regulated by FCC.

Results highlight in yellow are configurations with highest percentage of limits

*Configuration required SAR simulation

Trunk/ Roof	Test Position	E/H Field	Angle (Degree)	Antenna Model	Max Pwr (W)	Initial Pwr (W)	Tx Freq (MHz)	Max Calc. P.D. (mW/ cm^2)	FCC Limit	% To FCC Spec Limit	ICNIRP Limit	% To ICNIRP Spec Limit	ISED Limit	% To ISED Spec Limit
Trunk	PB	E	0	HAE4011A, 5/8 Wave, (450-470MHz)	54	52.4	450.0125	0.12	0.30	41.1	0.23	54.7	0.17	72.3
						53.3	460.0000	0.15	0.31	50.4	0.23	67.2	0.17	89.4
						53.5	469.9875	0.13	0.31	41.3	0.23	55.1	0.18	73.7
				HAE6013A, 1/2 Wave, (380-470MHz)	54	52.4	450.0125	0.27	0.30	90.6	0.23	*120.8	0.17	*159.6
						53.3	460.0000	0.24	0.31	79.7	0.23	*106.2	0.17	*141.3
						53.5	469.9875	0.27	0.31	87.5	0.23	*116.6	0.18	*156.2
				HAE6031A, 1/2 Wave, (380-520MHz)	54	52.4	450.0125	0.33	0.30	*110.7	0.23	*147.6	0.17	*194.9
						53.5	469.9875	0.31	0.31	99.1	0.23	*132.1	0.18	*176.9
						53.8	482.5000	0.34	0.32	*104.4	0.24	*139.2	0.18	NA
						47.5	496.5000	0.26	0.33	77.0	0.25	102.7	0.18	NA
						47.6	511.9875	0.27	0.34	77.9	0.26	103.9	0.19	NA
						29.9	519.9875	0.23	0.35	67.2	0.26	89.6	0.19	NA
				RAE4014ARB, 5/8 Wave, (445-470MHz)	54.0	52.4	450.0125	0.06	0.30	19.7	0.23	26.2	0.17	34.7
						53.3	460.0000	0.11	0.31	34.3	0.23	45.7	0.17	60.8
						53.5	469.9875	0.13	0.31	42.6	0.23	56.8	0.18	76.0
				RAE4016AR, 5/8 Wave, (494-512MHz)	48	47.1	494.9875	0.04	0.33	13.3	0.25	17.8	0.18	NA
						47.8	503.0000	0.08	0.34	24.0	0.25	32.0	0.18	NA
						47.6	511.9875	0.09	0.34	24.9	0.26	33.2	0.19	NA

Table 11**MPE assessment for LMR UHF2 - roof mounted antenna – Passenger Back**

Notes:

Blue fonts: Frequencies not regulated by FCC.

Results highlight in yellow are configurations with highest percentage of limits

Trunk/ Roof	Test Position	E/H Field	Angle (Degree)	Antenna Model	Max Pwr (W)	Initial Pwr (W)	Tx Freq (MHz)	Max Calc. P.D. (mW/ cm ²)	FCC Limit	% To FCC Spec Limit	ICNIRP Limit	% To ICNIRP Spec Limit	ISED Limit	% To ISED Spec Limit
Roof	PB	E	0	HAE4003A, 1/4 Wave, (450-470MHz)	54	52.4	450.0125	0.04	0.30	14.5	0.23	19.3	0.17	25.5
						53.3	460.0000	0.04	0.31	14.0	0.23	18.6	0.17	24.7
						53.5	469.9875	0.04	0.31	13.7	0.23	18.2	0.18	24.4
				HAE4011A, 5/8 Wave, (450-470MHz)	54	52.4	450.0125	0.00	0.30	1.3	0.23	1.8	0.17	2.4
						53.3	460.0000	0.00	0.31	1.5	0.23	2.0	0.17	2.6
						53.5	469.9875	0.01	0.31	1.9	0.23	2.5	0.18	3.3
				HAE6013A, 1/2 Wave, (380-470MHz)	54	52.4	450.0125	0.05	0.30	16.3	0.23	21.7	0.17	28.7
						53.3	460.0000	0.05	0.31	16.6	0.23	22.1	0.17	29.4
						53.5	469.9875	0.05	0.31	15.0	0.23	20.1	0.18	26.9
				HAE6016A, 1/4 Wave, (450-512MHz)	54	52.4	450.0125	0.04	0.30	13.0	0.23	17.3	0.17	22.9
						53.5	469.9875	0.03	0.31	10.8	0.23	14.3	0.18	19.2
						53.8	482.5000	0.05	0.32	15.7	0.24	20.9	0.18	NA
						47.5	496.5000	0.02	0.33	5.0	0.25	6.6	0.18	NA
						47.6	511.9875	0.01	0.34	3.7	0.26	5.0	0.19	NA
				HAE6031A, 1/2 Wave, (380-520MHz)	54	52.4	450.0125	0.05	0.30	16.5	0.23	21.9	0.17	29.0
						53.5	469.9875	0.05	0.31	17.3	0.23	23.1	0.18	30.9
						53.8	482.5000	0.05	0.32	16.5	0.24	22.0	0.18	NA
						47.5	496.5000	0.03	0.33	7.4	0.25	9.9	0.18	NA
						47.6	511.9875	0.02	0.34	5.0	0.26	6.6	0.19	NA
						29.9	519.9875	0.01	0.35	3.4	0.26	4.5	0.19	NA
				RAE4014ARB, 5/8 Wave, (445-470MHz)	54	52.4	450.0125	0.00	0.30	1.3	0.23	1.8	0.17	2.4
						53.3	460.0000	0.01	0.31	3.5	0.23	4.7	0.17	6.3
						53.5	469.9875	0.01	0.31	2.4	0.23	3.2	0.18	4.3
				RAE4016AR, 5/8 Wave, (494-512MHz)	48	47.1	494.9875	0.00	0.33	0.8	0.25	1.1	0.18	NA
						47.8	503.0000	0.00	0.34	1.2	0.25	1.5	0.18	NA
						47.6	511.9875	0.00	0.34	0.7	0.26	1.0	0.19	NA

Table 12**MPE assessment for LMR UHF2 - trunk mounted antenna – Passenger Front**

Notes:

Blue fonts: Frequencies not regulated by FCC.

Results highlight in yellow are configurations with highest percentage of limits

Trunk/ Roof	Test Position	E/H Field	Angle (Degree)	Antenna Model	Max Pwr (W)	Initial Pwr (W)	Tx Freq (MHz)	Max Calc. P.D. (mW/ cm^2)	FCC Limit	% To FCC Spec Limit	ICNIRP Limit	% To ICNIRP Spec Limit	ISED Limit	% To ISED Spec Limit
Trunk	PF	E	0	HAE4011A, 5/8 Wave, (450-470MHz)	54	52.4	450.0125	0.05	0.30	16.5	0.23	22.0	0.17	29.1
						53.3	460.0000	0.06	0.31	20.7	0.23	27.6	0.17	36.7
						53.5	469.9875	0.06	0.31	18.0	0.23	24.1	0.18	32.2
				HAE6013A, 1/2 Wave, (380-470MHz)	54	52.4	450.0125	0.13	0.30	42.6	0.23	56.8	0.17	75.0
						53.3	460.0000	0.10	0.31	33.1	0.23	44.1	0.17	58.7
						53.5	469.9875	0.07	0.31	23.4	0.23	31.2	0.18	41.8
				HAE6031A, 1/2 Wave, (380-520MHz)	54	52.4	450.0125	0.11	0.30	37.3	0.23	49.7	0.17	65.7
						53.5	469.9875	0.08	0.31	24.6	0.23	32.9	0.18	44.0
						53.8	482.5000	0.11	0.32	35.1	0.24	46.8	0.18	NA
						47.5	496.5000	0.06	0.33	19.4	0.25	25.9	0.18	NA
						47.6	511.9875	0.09	0.34	25.0	0.26	33.4	0.19	NA
						29.9	519.9875	0.05	0.35	15.8	0.26	21.1	0.19	NA
				RAE4014ARB, 5/8 Wave, (445-470MHz)	54	52.4	450.0125	0.06	0.33	17.2	0.25	22.9	0.18	NA
						53.3	460.0000	0.05	0.34	14.5	0.25	19.4	0.18	NA
						53.5	469.9875	0.06	0.34	16.7	0.26	22.2	0.19	NA
				RAE4016AR, 5/8 Wave, (494-512MHz)	48	47.1	494.9875	0.04	0.30	13.2	0.23	17.7	0.17	23.3
						47.8	503.0000	0.04	0.31	12.2	0.23	16.3	0.17	21.7
						47.6	511.9875	0.04	0.31	12.0	0.23	16.0	0.18	21.5

Table 13**MPE assessment for LMR UHF2 - roof mounted antenna – Passenger Front**

Notes:

Blue fonts: Frequencies not regulated by FCC.

Results highlight in yellow are configurations with highest percentage of limits

Trunk/ Roof	Test Position	E/H Field	Angle (Degree)	Antenna Model	Max Pwr (W)	Initial Pwr (W)	Tx Freq (MHz)	Max Calc. P.D. (mW/ cm^2)	FCC Limit	% To FCC Spec Limit	ICNIRP Limit	% To ICNIRP Spec Limit	ISED Limit	% To ISED Spec Limit
Roof	PF	E	0	HAE4003A, 1/4 Wave, (450-470MHz)	54	52.4	450.0125	0.02	0.30	8.1	0.23	10.8	0.17	14.2
						53.3	460.0000	0.02	0.31	5.7	0.23	7.6	0.17	10.1
						53.5	469.9875	0.02	0.31	6.5	0.23	8.7	0.18	11.7
				HAE4011A, 5/8 Wave, (450-470MHz)	54	52.4	450.0125	0.00	0.30	1.2	0.23	1.5	0.17	2.0
						53.3	460.0000	0.00	0.31	0.6	0.23	0.9	0.17	1.1
						53.5	469.9875	0.00	0.31	0.9	0.23	1.2	0.18	1.5
				HAE6013A, 1/2 Wave, (380-470MHz)	54	52.4	450.0125	0.02	0.30	6.3	0.23	8.3	0.17	11.0
						53.3	460.0000	0.02	0.31	6.7	0.23	8.9	0.17	11.9
						53.5	469.9875	0.03	0.31	8.3	0.23	11.1	0.18	14.9
				HAE6016A, 1/4 Wave, (450-512MHz)	54	52.4	450.0125	0.02	0.30	5.0	0.23	6.7	0.17	8.9
						53.5	469.9875	0.02	0.31	6.1	0.23	8.2	0.18	10.9
						53.8	482.5000	0.02	0.32	7.2	0.24	9.6	0.18	NA
						47.5	496.5000	0.01	0.33	4.3	0.25	5.8	0.18	NA
						47.6	511.9875	0.02	0.34	6.2	0.26	8.3	0.19	NA
				HAE6031A, 1/2 Wave, (380-520MHz)	54	52.4	450.0125	0.02	0.30	5.0	0.23	6.7	0.17	8.9
						53.5	469.9875	0.03	0.31	9.9	0.23	13.2	0.18	17.7
						53.8	482.5000	0.02	0.32	6.7	0.24	9.0	0.18	12.1
						47.5	496.5000	0.02	0.33	7.0	0.25	9.4	0.18	NA
						47.6	511.9875	0.02	0.34	6.1	0.26	8.1	0.19	NA
						29.9	519.9875	0.01	0.35	3.5	0.26	4.6	0.19	6.4
				RAE4014ARB, 5/8 Wave, (445-470MHz)	54	52.4	450.0125	0.00	0.30	0.9	0.23	1.2	0.17	1.6
						53.3	460.0000	0.00	0.31	0.7	0.23	0.9	0.17	1.3
						53.5	469.9875	0.00	0.31	1.2	0.23	1.5	0.18	2.1
				RAE4016AR, 5/8 Wave, (494-512MHz)	48	47.1	494.9875	0.00	0.33	0.9	0.25	1.2	0.18	NA
						47.8	503.0000	0.00	0.34	1.5	0.25	2.0	0.18	NA
						47.6	511.9875	0.00	0.34	1.5	0.26	2.1	0.19	NA

17.2 MPE Test Results for Bluetooth and WLAN

Antenna PMAN5100A and PMAN5101A was intended for mounting on the windshield of the vehicle. These antennas should be installed close to the top, and on the front windshield only. Antennas AN000163A01 and AN000163A05 support WLAN 2.4 GHz / 5 GHz should be installed at roof or trunk of the vehicle. WLAN 2.4 GHz and 5 GHz will not transmit simultaneously.

MPE calculation was use to determine power density for these transmitters due to lower power. 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. Equation (5) is generally accurate in far-field of an antenna.

Equation 5 – Power Density Calculation

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

Equation (5) 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
- 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
- d = distance from antenna
- F = Enhancement factor [1 or 2.56 for predicting ground-level field strength]

Table 14 summarized the MPE calculation for each standalone transmitter bands, Bluetooth and WLAN.

Table 14

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)	MPE Spec Limit (mW/cm ²)					
									FCC	% To FCC Spec Limit	ICNIRP	% To ICNIRP Spec Limit	ISED limit	% To ISED Spec Limit
WLAN 2.4 GHz														
AN000163A01	0.040	100%	2412.0	3.50	0.00	20	1.00	0.018	1.00	1.77	1.00	1.77	0.54	3.30
AN000163A01	0.040	100%	2437.0	3.50	0.00	20	1.00	0.018	1.00	1.77	1.00	1.77	0.54	3.28
AN000163A01	0.040	100%	2462.0	3.50	0.00	20	1.00	0.018	1.00	1.77	1.00	1.77	0.54	3.26
AN000163A05	0.040	100%	2412.0	2.50	0.00	20	1.00	0.014	1.00	1.41	1.00	1.41	0.54	2.62
AN000163A05	0.040	100%	2437.0	2.50	0.00	20	1.00	0.014	1.00	1.41	1.00	1.41	0.54	2.61
AN000163A05	0.040	100%	2462.0	2.50	0.00	20	1.00	0.014	1.00	1.41	1.00	1.41	0.54	2.59
PMAN5100A	0.040	100%	2412.0	3.00	0.00	20	1.00	0.016	1.00	1.58	1.00	1.58	0.54	2.94
PMAN5100A	0.040	100%	2437.0	3.00	0.00	20	1.00	0.016	1.00	1.58	1.00	1.58	0.54	2.92
PMAN5100A	0.040	100%	2462.0	3.00	0.00	20	1.00	0.016	1.00	1.58	1.00	1.58	0.54	2.90
PMAN5101A	0.040	100%	2412.0	2.70	0.00	20	1.00	0.015	1.00	1.47	1.00	1.47	0.54	2.75
PMAN5101A	0.040	100%	2437.0	2.70	0.00	20	1.00	0.015	1.00	1.47	1.00	1.47	0.54	2.73
PMAN5101A	0.040	100%	2462.0	2.70	0.00	20	1.00	0.015	1.00	1.47	1.00	1.47	0.54	2.71
WLAN 5 GHz														
AN000163A01	0.016	100%	5180.0	3.30	0.00	20	1.00	0.007	1.00	0.67	1.00	0.67	0.90	0.75
AN000163A01	0.016	100%	5502.5	3.30	0.00	20	1.00	0.007	1.00	0.67	1.00	0.67	0.94	0.71
AN000163A01	0.016	100%	5825.0	3.30	0.00	20	1.00	0.007	1.00	0.67	1.00	0.67	0.98	0.69
AN000163A05	0.016	100%	5180.0	1.60	0.00	20	1.00	0.005	1.00	0.46	1.00	0.46	0.90	0.50
AN000163A05	0.016	100%	5502.5	1.60	0.00	20	1.00	0.005	1.00	0.46	1.00	0.46	0.94	0.48
AN000163A05	0.016	100%	5825.0	1.60	0.00	20	1.00	0.005	1.00	0.46	1.00	0.46	0.98	0.46
PMAN5101A	0.016	100%	5180.0	0.20	0.00	20	1.00	0.003	1.00	0.33	1.00	0.33	0.90	0.36
PMAN5101A	0.016	100%	5502.5	0.20	0.00	20	1.00	0.003	1.00	0.33	1.00	0.33	0.94	0.35
PMAN5101A	0.016	100%	5825.0	0.20	0.00	20	1.00	0.003	1.00	0.33	1.00	0.33	0.98	0.34
Bluetooth 2.4 GHz														
AN000163A01	0.011	100%	2402.0	3.50	0.00	20	1.00	0.005	1.00	0.50	1.00	0.50	0.54	0.93
AN000163A01	0.011	100%	2441.0	3.50	0.00	20	1.00	0.005	1.00	0.50	1.00	0.50	0.54	0.92
AN000163A01	0.011	100%	2480.0	3.50	0.00	20	1.00	0.005	1.00	0.50	1.00	0.50	0.55	0.91
AN000163A05	0.011	100%	2402.0	2.50	0.00	20	1.00	0.004	1.00	0.40	1.00	0.40	0.54	0.74
AN000163A05	0.011	100%	2441.0	2.50	0.00	20	1.00	0.004	1.00	0.40	1.00	0.40	0.54	0.73
AN000163A05	0.011	100%	2480.0	2.50	0.00	20	1.00	0.004	1.00	0.40	1.00	0.40	0.55	0.73
PMAN5100A	0.011	100%	2402.0	3.00	0.00	20	1.00	0.004	1.00	0.45	1.00	0.45	0.54	0.83
PMAN5100A	0.011	100%	2441.0	3.00	0.00	20	1.00	0.004	1.00	0.45	1.00	0.45	0.54	0.82
PMAN5100A	0.011	100%	2480.0	3.00	0.00	20	1.00	0.004	1.00	0.45	1.00	0.45	0.55	0.81
PMAN5101A	0.011	100%	2402.0	2.70	0.00	20	1.00	0.004	1.00	0.42	1.00	0.42	0.54	0.78
PMAN5101A	0.011	100%	2441.0	2.70	0.00	20	1.00	0.004	1.00	0.42	1.00	0.42	0.54	0.77
PMAN5101A	0.011	100%	2480.0	2.70	0.00	20	1.00	0.004	1.00	0.42	1.00	0.42	0.55	0.76

Notes:

- 1) Distance from antenna (d), 20cm for more conservative estimation.
- 2) Cable loss (L), all cable loss include in antenna gain, so should be 0 dB.
- 3) Enhancement Factor (F), 1 (Ground reflection already factor in during antenna characterization)

17.3 Simultaneous Transmission

LMR bands can transmit simultaneously with Bluetooth or WLAN 2.4 GHz or WLAN 5 GHz. Bluetooth and WLAN 2.4 GHz or WLAN 5 GHz transmitters cannot transmit at the same time.

The highest percentage of limit for each standalone transmitters indicated in Table 15.

Table 15

Transmitters	Frequency Band (MHz)	Highest Percentage of Limit (%)		
		Passenger, Front Seat (PF)	Passenger, Back Seat (PB)	Bystander (BS)
FCC US				
LMR UHF2	450-512	42.6 %	110.7 %	56.0 %
Bluetooth	2402 - 2480	0.50 %	0.50 %	0.50 %
WLAN 2.4 GHz	2412 - 2462	1.77 %	1.77 %	1.77 %
WLAN 5 GHz	5180 - 5825	0.67 %	0.67 %	0.67 %
ISED Canada				
LMR UHF2	450-470	75.0 %	194.9 %	99.9 %
Bluetooth	2402 - 2480	0.93 %	0.93 %	0.93 %
WLAN 2.4 GHz	2412 - 2462	3.30 %	3.30 %	3.30 %
WLAN 5 GHz	5180 - 5825	0.75 %	0.75 %	0.75 %
ICNIRP				
LMR UHF2	450-520	56.8 %	147.6 %	74.6 %
Bluetooth	2402 - 2480	0.50 %	0.50 %	0.50 %
WLAN 2.4 GHz	2412 - 2462	1.77 %	1.77 %	1.77 %
WLAN 5 GHz	5180 - 5825	0.67 %	0.67 %	0.67 %

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.

Calculated Maximum Power density for WLAN 2.4 GHz is greater than WLAN 5 GHz and Bluetooth. WLAN 2.4 GHz, WLAN 5 GHz and Bluetooth transmitters cannot transmit at the same time. Thus, WLAN 2.4 GHz will be used to evaluate simultaneous transmission test exclusion. The highest combined power density percentage for simultaneous transmission indicated in Table 16.

Table 16

Designator	Simultaneous Transmission Scenario	Highest Combined Percentage of Limit (%)		
		Passenger, Front Seat (PF)	Passenger, Back Seat (PB)	Bystander (BS)
FCC	LMR UHF2 and WLAN	44.37 %	112.47 %	57.77 %
ISED Canada	LMR UHF2 and WLAN	78.30 %	198.20 %	103.2 %
ICNIRP	LMR UHF2 and WLAN	58.57 %	149.37 %	76.37 %

18.0 Conclusion

The assessments for this device were performed with an output power range as indicated in section 17.1 (for LMR) and 17.2 (for BT/WLAN). The maximum allowable output power is equal to the upper limit of the final test factory transmit power specification listed in Table 6. The highest power density results for LMR and BT/WLAN transmitters scaled to maximum allowable power output are indicated in Table 17 and 18 for internal/passenger to the vehicle, and external/bystander to the vehicle.

Table 17: Maximum MPE RF Exposure Summary (LMR)

Designator	Transmitters	Frequency Band (MHz)	Passenger (mW/cm ²)	Bystander (mW/cm ²)
FCC	LMR UHF2	450-512	0.332	0.175
ISED Canada	LMR UHF2	450-470	0.332	0.175
ICNIRP	LMR UHF2	450-520	0.332	0.175

Table 18: Maximum MPE RF Exposure Summary (BT/WLAN)

Designator	Transmitters	Frequency Band (MHz)	Passenger (mW/cm ²)	Bystander (mW/cm ²)
FCC / ISED Canada / ICNIRP	Bluetooth	2402-2480	0.005	0.005
	WLAN	2412-2462	0.018	0.018
	WLAN	5180-5825	0.007	0.007

These MPE results herein demonstrate compliance to the FCC, ISED Canada and ICNIRP Occupational/Controlled Exposure limit. FCC rules require compliance for Passengers and Bystanders to the FCC General Population/Uncontrolled limits.

Although MPE is a convenient method of demonstrating RF Exposure requirements, SAR is recognized as the “basic restriction”. For those configurations in Table 10 with ‘*’, compliance to the General Population / Uncontrolled SAR 1g limit of 1.6 W/kg is demonstrated through SAR computational analysis.

The computational results show that this device, when used with the offered antennas in accordance with the user manual instructions, exhibits the maximum peak average SAR values indicated in the Table below for the configurations requiring SAR analysis.

Table 19

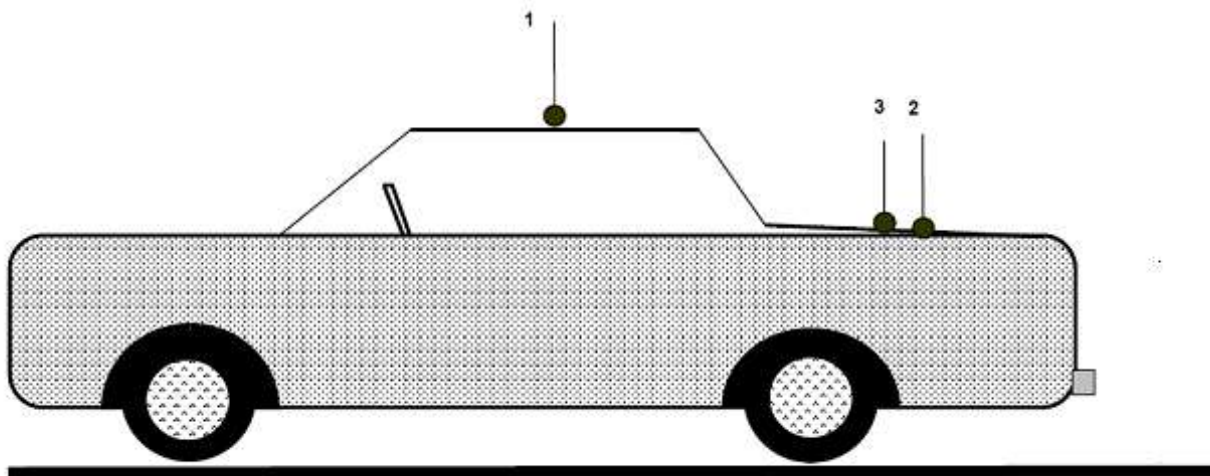
Exposure Conditions	Maximum peak average SAR (1g)
Passenger	0.73 W/kg
Bystander	0.34 W/kg

19.0 User Instructions Considerations

In order to facilitate the task of professional users, the Safety Manual for this radio requires that bystanders be kept at least 3 ft (90 cm) from the vehicle Body.

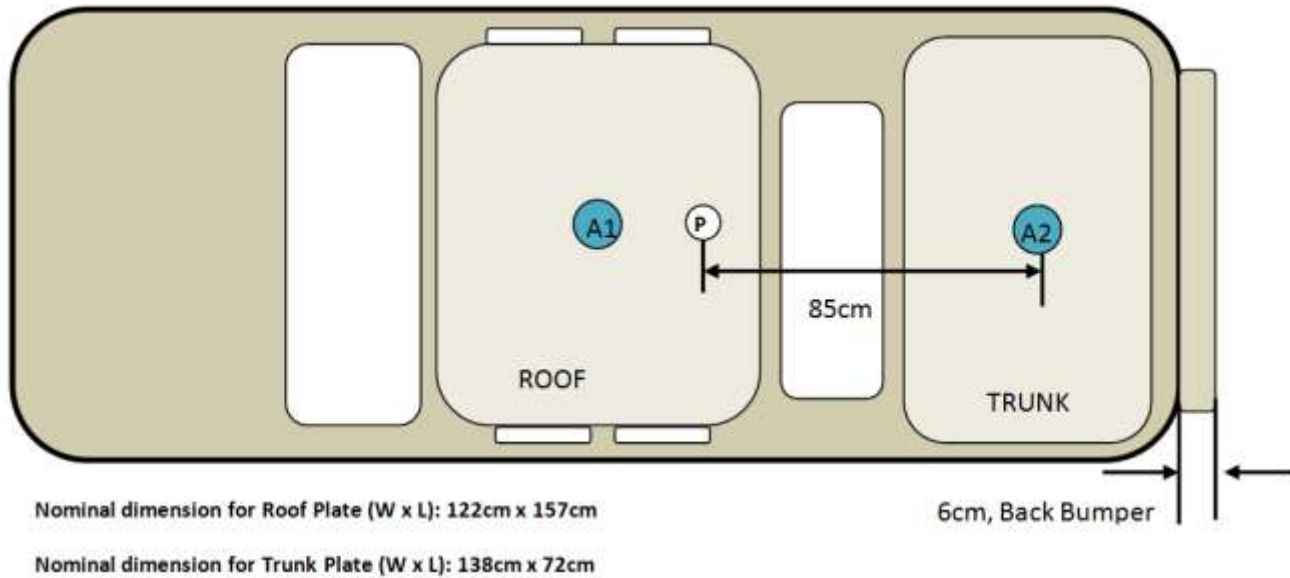
Appendix A - Antenna Locations, Test Distances, and Cable Losses

Antenna locations



1. Roof (20cm from center)
2. Trunk (85cm from back of the back seat)
3. Trunk (center)

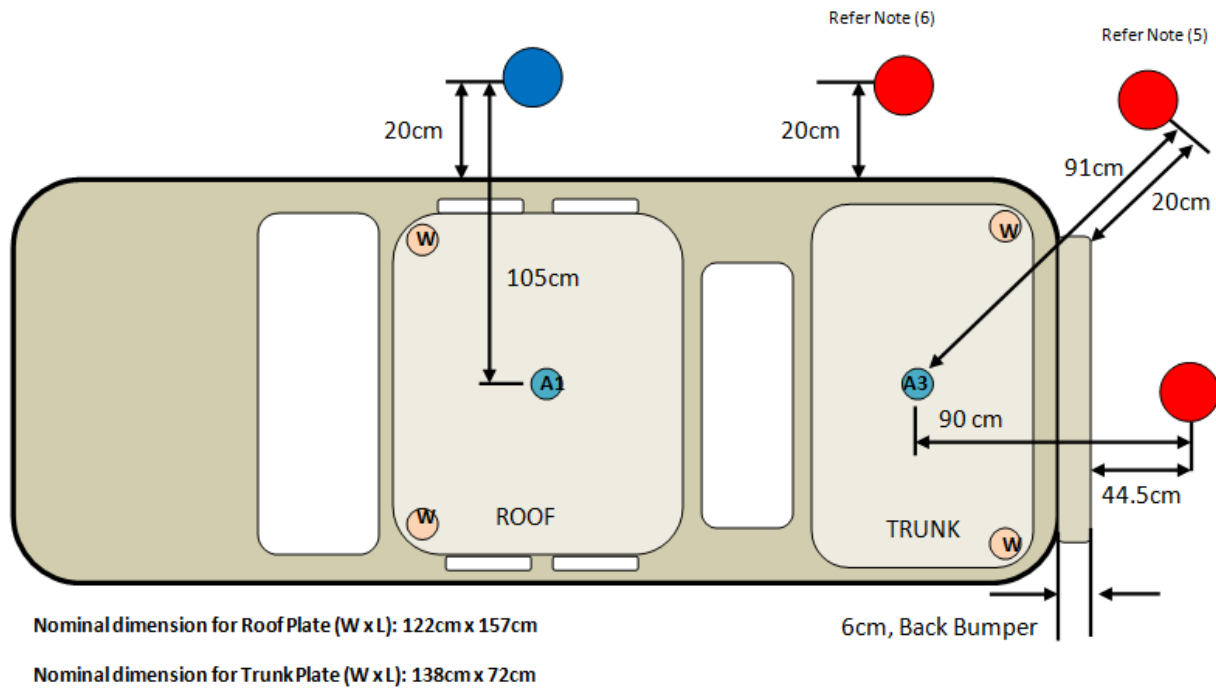
Passenger Antenna mounting (UHF2)



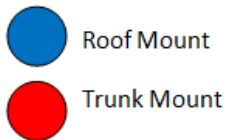
Notes:

- 1.) Antenna location A1: APX mobile radio roof antenna mounting locations for passenger back and front testing (UHF2)
- 2.) Antenna location A2: APX mobile trunk antenna mounting locations for passenger back and front testing (UHF2)
- 3.) Total distance between trunk mount antenna and rear passenger is 85cm

Bystander Antenna mounting (UHF2)



By-Stander (BS) Test Locations:



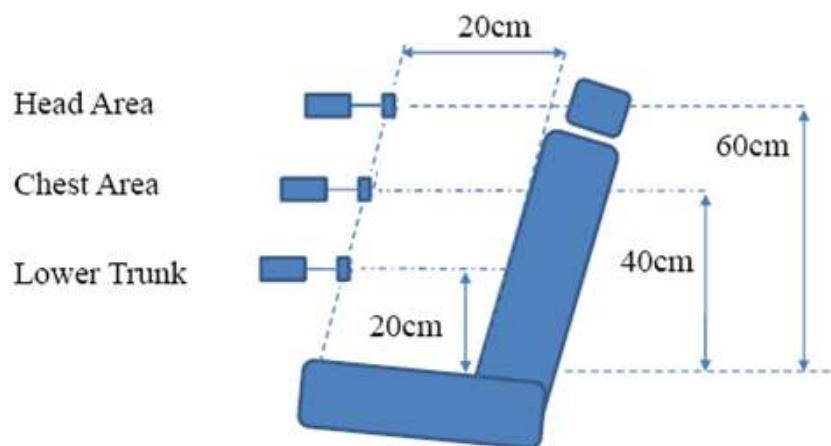
Notes:

- 1) Antenna location A1: LMR antennas roof mount
- 2) Antenna location A3: LMR antennas trunk mount for bystander testing.
- 3) Antenna location W: Total 4 locations identified for BT/WLAN antenna mounting. (If LMR antennas installed at trunk, BT/WLAN should install at roof and vice versa).
- 4) Total distance between Bystander 45 degree angles from the centered-trunk mount antenna is 91cm to maintain a minimum 20cm separation between probe sensor and vehicle body.
- 5) Total distance between Bystander 90 degree angle from the centered-trunk mount antenna is 90cm (by moving antenna location A3 12cm from center of the trunk).

Seat scan areas
(Applicable to both front and back seats)

Meter - Probe

Probe diameter is 5.5cm



Cable Losses

Test Cable

Teflon RG58A/U Loss Per 100 Feet

160 MHz - 5 dB

450 MHz - 9 dB

1 GHz - 13.8 dB

Customer Cable

RG-58A/U Loss Per 100 Feet (For LMR)

136 MHz – 5.5 dB

450 MHz – 9.6 dB

900 MHz – 13.9 dB

PFP 240 Loss Per 100 Feet (For BT/WLAN)

2500 MHz - 12.9 dB

5800 MHz -20.4 dB

Appendix B - Probe Calibration Certificates



Cert I.D.: 134651



1301 Arrow Point Drive
Cedar Park, Texas 78613
(512) 531-6400



Certificate of Calibration Conformance

Page 1 of 3

The instrument identified below has been individually calibrated in compliance with the following standard(s):

IEEE 1309 - 2013, Institute of Electrical and Electronics Engineers, Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas from 9 kHz to 40 GHz

Environment: Laboratory MTE is maintained in a temperature controlled environment with ambient conditions from 18 to 28 C, relative humidity less than 90%. The instrument under test has been calibrated in a suitable environment using an EMCO TEM Cell 5101C, GTEM 5305/5402 and an RF Shielded EMC Chamber which is conducive to maintaining accurate and reliable measurement quality.

Manufacturer:	ETS-Lindgren	Operating Range:	100kHz - 5GHz
Model Number:	E100	Instrument Type:	Isotropic Probe > 1 GHz
Serial Number/ ID:	00224511	Date Code:	
Tracking Number:	S 000048638	Alternate ID:	MS10428
Date Completed:	06-May-20	Customer:	Motorola Solutions Malaysia Sdn Bhd - Plot 2A, Medan Bayan Lepas, Mukim 12 S.W.D. - Bayan Lepas - Penang 11900 - Malaysia
Test Type:	Standard Field, Field Strength		

Calibration Uncertainty: Std Field Method 100kHz - 6 GHz, +/-0.64 dB, Linearity +/- 0.95 dB, Isotropy +/- 0.86
k=2, (95% Confidence Level)

Test Remarks: Probe received in tolerance thus before and after data are the same. Calibration performed with customer's HI-2200 sn 00086887.

Calibration Traceability: All Measuring and Test Equipment (MTE) identified below are traceable to the SI units through the National Institute for Standards and Technology (NIST) or other recognized National Metrology Institute. Calibration Laboratory and Quality System controls are compliant with ISO/IEC 17025-2017 and ANSI/NCCL Z540-1-1994.

Standards and Equipment Used:

Make / Model / Name / S/N / Calibration Date

HP	8648C	Signal Generator	3836U02236	04-May-21
Keysight	E9304A	Power Sensor	MY56100039	16-Apr-21
Hewlett Packard	E4422B	Signal Generator	US40050591	09-Aug-20
Agilent	E9304A	Power Sensor	MY41499013	16-Apr-21
Agilent	E9304A	Power Sensor	MY41499012	16-Apr-21
Rohde & Schwarz	NRP-Z91	Power Sensor	100733	06-Mar-21
Agilent	E4419B	Power Meter	MY40510693	08-Aug-20
Agilent	N1913A	Power Meter	MY50000415	16-Mar-21
Marconi	2024	Signal Generator	112343/043	04-May-21
Rohde & Schwarz	NRVD	Power Meter	828110/019	09-Jan-21
Hewlett Packard	E4419B	Power Meter	US39250717	14-Aug-20
Keysight	E9304A	Power Sensor	MY56100005	16-Apr-21
Rohde & Schwarz	NRV-Z55	Thermal Power Sensor	100352	20-Sep-20
Rohde & Schwarz	NRV-Z55	Thermal Power Sensor	100037	22-Oct-20
Rohde & Schwarz	NRP-Z91	Power Sensor	100734	01-Aug-20
Keysight	N5183B	MXG Analog Signal Gener	MY53270789	08-Feb-21

Condition of Instrument

Upon Receipt:

In Tolerance to Internal Quality Standards

On Release:

In Tolerance to Internal Quality Standards

Calibration Completed By
Julio A. Aquino, Calibration Technician

Attested and Issued on 06-May-20
George Cisneros, Calibration Supervisor

This document provides traceability of measurements to recognized national standards using controlled procedures at the ETS-Lindgren Calibration Laboratory. Uncertainties listed are derived from the methods described by NIST Tech Note 1297. This certificate and report may not be reproduced, except in full, without the written approval of ETS-Lindgren Calibration Laboratory in accordance with ISO/IEC 17025-2017 and ANSI/NCCL Z540-1-1994. The results in this document relate only to the item(s) listed and should not be considered representative of a population unless otherwise noted. QAF 1127 (03/11)

CALIBRATION REPORT

Electric Field Sensor

Model	S/N
E100	00224511
HI-2200	00086887

Date: 06 May 2020

New Instrument
 _ Other
 _ Out of Tolerance
 X Within Tolerance

Frequency Response

Frequency Response	MHz	Nominal Field V/m	Cal Factor [*] (Applied/Indicated)	Deviation dB
1	0.1	20	1.45	-3.22
2	0.5	20	1.12	-1.01
3	1	20	1.05	-0.43
4	3	20	1.00	-0.03
5	15	20	1.00	0.00
6	27.12	20	1.01	-0.05
7	30	20	1.00	-0.04
8	75	20	1.01	-0.07
9	100	20	1.01	-0.11
10	150	20	1.01	-0.10
11	200	20	1.00	-0.03
12	250	20	1.00	-0.04
13	300	20	0.99	0.08
14	400	20	1.01	-0.05
15	500	20	1.05	-0.46
16	600	20	1.05	-0.43
17	700	20	1.08	-0.65
18	800	20	1.10	-0.81
19	900	20	1.05	-0.39
20	1000	20	1.00	0.00
21	2000	20	1.04	-0.32
22	2450	20	1.04	-0.38
23	3000	20	0.96	0.39
24	3500	20	0.90	0.91
25	4000	20	0.99	0.10
26	5000	20	1.01	-0.08
27	5500	20	1.25	-1.93
28	6000	20	1.33	-2.47

* Corrected electric field values (V/m) can be obtained by multiplying the Cal Factor with the indicated E field readings.

Linearity

maximum linearity deviation is 0.42 dB

(measurements taken from 0.3 V/m to 800 V/m at 27.12 MHz)

Test Conditions

Calibration performed at ambient room temperature: 23 ±3°C



PROBE ROTATIONAL RESPONSE

Model E100
S/N 00224511
Report S00048638
Date Date of Calibration 06 May 2020
Time 08:45:13 AM
Isotropy * + 0.308 dB/ -0.308 dB

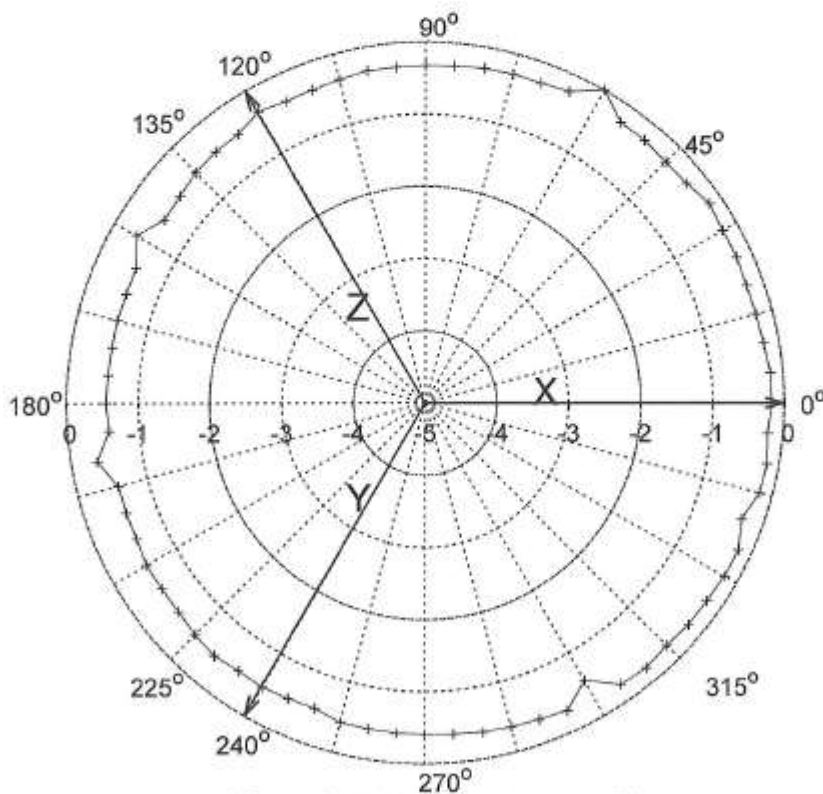


Figure 1: Probe Isotropic Response Chart.

Isotropic response is measured in a 20 V/m field at 400 MHz

*Isotropy is the maximum deviation from the geometric mean as defined by IEEE 1309-2013.



Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994
Certificate Number 210607-142845-cd4f83



Model Number H200; HI-2200
Manufacturer ETS - Lindgren
Description Field Probe
Serial Number 00206937; 00086316
Customer Asset No. MSI0208; MSI0206

Customer
Motorola Solutions Malaysia Sdn Bhd
Plot 2A Medan Bayan Lepas Technoplex
Industrial Park Mukim 12 SWD
Bayan Lepas, Penang 11900
MALAYSIA

Date of Calibration 06/21/2021
Temperature 23°C
Humidity 48% RH

Location of Calibration
Keysight Technologies Inc.
1346 Yellowwood Road
Kimballton, IA 51543
United States

This certifies that the equipment has been calibrated using applicable Keysight Technologies procedures and in compliance with ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994 (R2002). The quality management system is registered to ISO 9001:2015.

Calibration Standard(s)	Calibration Method(s)	Calibration Procedure(s)
IEEE Std 1309-2013 Section 4.1	Substitution	287330
IEEE Std 1309-2013 Section 5		
IEEE Std 1309-2013 Section 8.2		
IEEE Std 1309-2013 Section Annex A		
IEEE Std 1309-2013 Section A.3		

Calibration Software
N/A

As Received Conditions
The measured values of the equipment were observed in specification at the points tested.

Action Taken
No action was taken.

As Completed Conditions
The measured values of the equipment were observed in specification at the points tested.

Calibration Due
Based on the customer's request, the next calibration is due on 21 Jun 2022

Remarks or Special Requirements
Client declined isotropic response testing. A probe position document is included with this certificate. This calibration is valid only for the alignment/mounting position specified in this report.

This calibration report shall not be reproduced, except in full. The documented results relate to the equipment calibrated only.

The test limits stated in the report correspond to the published specifications of the equipment, at the points tested.

Keysight Technologies, Inc.
1346 Yellowwood Road
Kimballton, IA 51543
United States
Issue Date 28 Jun 2021


 Brandt Langer Iowa Service Center Manager
 Page 1 of 5



Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994
Certificate Number 210607-142845-cd4f83



Traceability Information

Technician Name Dennis Bissen

Measurements are traceable to the International System of Units (SI) via national metrology institutes (www.keysight.com/find/NMI) that are signatories to the CIPM Mutual Recognition Arrangement.

Calibration Equipment Used

Manufacturer	Model Number	Model Description	Equipment ID	Cal Due Date	Certificate Number
AR	00W1000B	Amp	11546	NA	
EMCO	5302	G/TEM	10223	NA	2003121915
Hewlett-Packard	8648B	Signal Generator	10272	11/12/2021	201111-094600-5d28cd
IFI	CC 104	TEM	011521	NA	
AR	FI7000	Interface	11015	NA	700516
AR	FL7006	Isotropic Probe	10946	07/17/2021	2018030428-1
Holaday	HI-4422	Isotropic Probe	10022	10/06/2022	2020070063-1

Compliance with Specification

Unless otherwise noted, the calibration results are reported without factoring in the effect of uncertainty on the assessment of compliance/specification.

In Specification/Out of Specification Explanation

The standard criteria to determine the "In Specification/Out of Specification" status is based on one or more of the following conditions, as requested by the client:

1. If the manufacturer has a specified specification for the item being calibrated, then the calibration values are compared to this specification, and the values must fall within the manufacturer's specification. The specification may be obtained from the manufacturer's web site, data sheets, equipment manuals, etc.
2. Where specifications are called out in a published standard, the calibration results are compared to this specification, and the measured values must fall within the standard's specification.
3. In cases where the manufacturer, standard, or client does not identify any relevant specifications, applicable calibration results are compared to historical data with a +/- 3 dB specification.

Uncertainty of Measurement

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008(GUM). The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95%. This probability corresponds to a coverage factor of $k=2$ for a normal distribution.

Parameter	Range	MU (+/-)
RF Isotropic E-Field Probes - GTEM Cell - Frequency Response	10 kHz to 1000 MHz	0.97 dB
RF Isotropic E-Field Probes - TEM Cell - Linearity	5 kHz to 800 MHz	0.91 dB

2021_Frequency Response.txt

Date of Calibration: 21-June-2021
Date Printed: Monday, June 21, 2021
Customer Name: Motorola Solutions Malaysia Sdn Bhd
Probe Manufacturer: ETS - Lindgren
Probe Model: H200; HI-2200
Probe Serial No.: 00206937; 00086316
Temperature (Deg C): 23
Humidity (%): 48
Notes:
CAL CERT #: 210607-142845-cd4f83

Correction Factors

Freq in MHz	Mult	dB
5	1.87	5.45
6	1.80	5.10
7	1.77	4.98
8	1.76	4.90
9	1.75	4.88
10	1.76	4.89
13.6	1.75	4.87
15	1.75	4.86
20	1.72	4.72
27.1	1.66	4.39
30	1.62	4.18
40	1.48	3.42
50	1.34	2.53
60	1.22	1.70
70	1.11	0.91
75	1.06	0.51
80	1.01	0.05
90	0.91	-0.78
100	0.87	-1.23
150	0.76	-2.35
175	0.77	-2.30
200	0.80	-1.93
250	0.74	-2.62
300	0.76	-2.40

2021_Linearity.txt

Date of Calibration: 21-June-2021
Date Printed: Monday, June 21, 2021
Customer Name: Motorola Solutions Malaysia Sdn Bhd
Probe Manufacturer: ETS - Lindgren
Probe Model: H200; HI-2200
Probe Serial No.: 00206937; 00086316
Temperature (Deg C): 23
Humidity (%): 48
Notes:
CAL CERT #: 210607-142845-cd4f83

Linearity

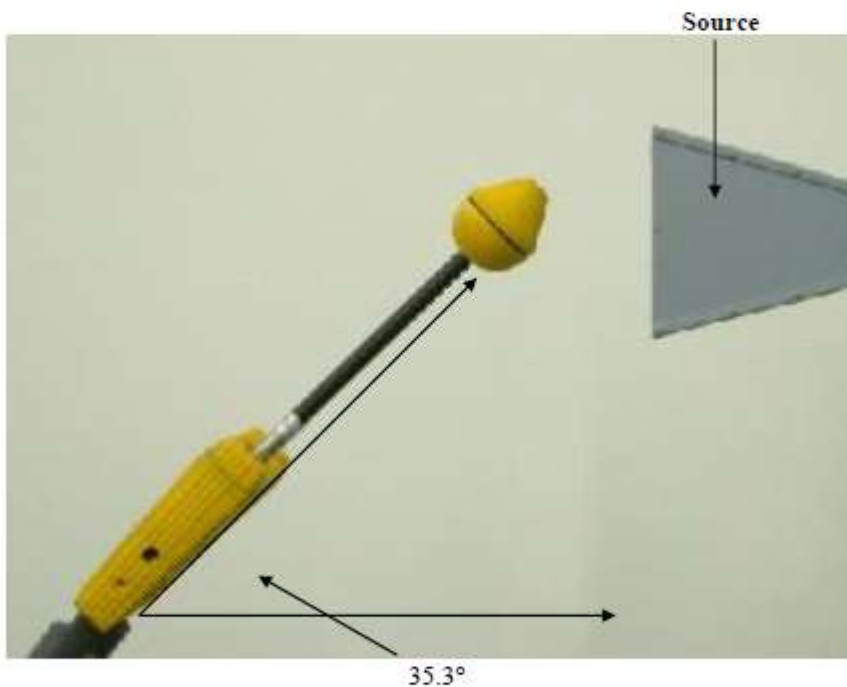
Freq	Applied Field	Indicated Field	Max Dev
MHz	A/m	A/m	dB
27.12	0.04	0.042	-0.43
27.12	0.05	0.056	-0.48
27.12	0.08	0.086	-0.54
27.12	0.13	0.147	-0.85
27.12	0.17	0.189	-0.81
27.12	0.27	0.296	-0.87
27.12	0.33	0.364	-0.76
27.12	0.54	0.584	-0.74
27.12	0.67	0.728	-0.77
27.12	0.80	0.876	-0.81
27.12	0.93	1.019	-0.82
27.12	1.07	1.178	-0.86
27.12	1.20	1.331	-0.92
27.12	1.33	1.498	-1.05
27.12	1.46	1.666	-1.16
27.12	1.60	1.851	-1.27

Probe Alignment/Mounting Position

The alignment/mounting position of the probe is critical. The correction factors given with calibration are valid only for the indicated alignment/mounting position. Deviation from indicated alignment/mounting position of calibration can produce errors in excess of 6 dB.

The probe was positioned with the probe wand at a 35.3° angle position with the probe head centered in front of the field source. The picture below is for probe positioning reference only. The equipment shown does not necessarily indicate the equipment used for calibration.

Side View





Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994
Certificate Number 210607-143843-bf7150



Model Number E100; HI-2200
Manufacturer ETS - Lindgren
Description Field Probe
Serial Number 00206767; 00086316
Customer Asset No. N/A; MSI0206

Customer
 Motorola Solutions Malaysia Sdn Bhd
 Plot 2A Medan Bayan Lepas Technoplex
 Industrial Park Mukim 12 SWD
 Bayan Lepas, Penang 11900
 MALAYSIA

Date of Calibration 06/21/2021
Temperature 23°C
Humidity 48% RH

Location of Calibration
 Keysight Technologies Inc.
 1346 Yellowwood Road
 Kimballton, IA 51543
 United States

This certifies that the equipment has been calibrated using applicable Keysight Technologies procedures and in compliance with ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994 (R2002). The quality management system is registered to ISO 9001:2015.

Calibration Standard(s)	Calibration Method(s)	Calibration Procedure(s)
IEEE Std 1309-2013 Section 4.1	Calculated, Substitution	287330
IEEE Std 1309-2013 Section 5		
IEEE Std 1309-2013 Section 8.2		
IEEE Std 1309-2013 Section Annex A		
IEEE Std 1309-2013 Section A.3		

Calibration Software
 Probe Calculated Method 3.14

As Received Conditions
 The measured values of the equipment were observed in specification at the points tested.

Action Taken
 No action was taken.

As Completed Conditions
 The measured values of the equipment were observed in specification at the points tested.

Calibration Due
 Based on the customer's request, the next calibration is due on 21 Jun 2022

Remarks or Special Requirements
 A probe position document is included with this certificate. This calibration is valid only for the alignment/mounting position specified in this report.

This calibration report shall not be reproduced, except in full. The documented results relate to the equipment calibrated only.

The test limits stated in the report correspond to the published specifications of the equipment, at the points tested.

Keysight Technologies, Inc.
 1346 Yellowwood Road
 Kimballton, IA 51543
 United States
 Issue Date 28 Jun 2021


 Brandt Langer Iowa Service Center Manager
 Page 1 of 7



Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NC SL Z540.1-1994
Certificate Number 210607-143843-bf7150



Traceability Information

Technician Name Dennis Bissen

Measurements are traceable to the International System of Units (SI) via national metrology institutes (www.keysight.com/find/NMI) that are signatories to the CIPM Mutual Recognition Arrangement.

Calibration Equipment Used

Manufacturer	Model Number	Model Description	Equipment ID	Cal Due Date	Certificate Number
AR	00W1000B	Amp	11546	NA	
AR	15T4G18	Amp	10888	NA	NA
EMCO	5302	G/TEM	10223	NA	2003121915
AR	75A250	Amp	10560	NA	N/A
Hewlett-Packard	83640L	Signal Generator	10039	11/18/2021	201111-115732-9e01be
Hewlett-Packard	8487A	Power Sensor	10577	12/09/2021	201207-122604-3951e9
Hewlett-Packard	8648B	Signal Generator	10272	11/12/2021	201111-094600-5d28cd
Schwarzbeck Mess-Elektronik	BBHA 9120D	Horn	10194	11/17/2022	201111-115541-0b3b6c
IFI	CC 104	TEM	011521	NA	
AR	DC7420	Directional Coupler	011173	10/01/2021	201001-095800-f9bab9
Agilent Technologies, Inc.	E4419B	EPM Series Power Meter	10458	10/06/2021	201001-100416-a7b5fd
AR	FI7000	Interface	11015	NA	700516
AR	FL7006	Isotropic Probe	10946	07/17/2021	2018030428-1
Holaday	HI-4422	Isotropic Probe	10022	10/06/2022	2020070063-1

Compliance with Specification

Unless otherwise noted, the calibration results are reported without factoring in the effect of uncertainty on the assessment of compliance/specification.

In Specification/Out of Specification Explanation

The standard criteria to determine the "In Specification/Out of Specification" status is based on one or more of the following conditions, as requested by the client:

1. If the manufacturer has a specified specification for the item being calibrated, then the calibration values are compared to this specification, and the values must fall within the manufacturer's specification. The specification may be obtained from the manufacturer's web site, data sheets, equipment manuals, etc.
2. Where specifications are called out in a published standard, the calibration results are compared to this specification, and the measured values must fall within the standard's specification.
3. In cases where the manufacturer, standard, or client does not identify any relevant specifications, applicable calibration results are compared to historical data with a ± 3 dB specification.

Uncertainty of Measurement

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95%. This probability corresponds to a coverage factor of $k=2$ for a normal distribution.



Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994

Certificate Number 210607-143843-bf7150



Parameter	Range	MU (+/-)
RF Isotropic E-Field Probes - GTEM Cell - Isotropic	10 kHz to 1000 MHz	0.97 dB
RF Isotropic E-Field Probes - Anechoic Chamber - Frequency Response	(450 to 18,000) MHz	1.1 dB
RF Isotropic E-Field Probes - GTEM Cell - Frequency Response	10 kHz to 1000 MHz	0.97 dB
RF Isotropic E-Field Probes - TEM Cell - Linearity	5 kHz to 800 MHz	0.91 dB

2021_Frequency Response.txt

Date of Calibration: 21-June-2021
 Date Printed: Monday, June 21, 2021
 Customer Name: Motorola Solutions Malaysia Sdn Bhd
 Probe Manufacturer: ETS - Lindgren
 Probe Model: E100; HI-2200
 Probe Serial No.: 00206767; 00086316
 Temperature (Deg C): 23
 Humidity (%): 48
 Notes:
 CAL CERT #: 210607-143843-bf7150

Correction Factors		
Frequency in MHz	Multiplier	20V/m dB
0.1	1.47	3.34
0.5	1.27	2.11
1	1.17	1.40
3	1.07	0.62
15	1.07	0.63
27.12	1.09	0.72
30	1.09	0.77
75	1.13	1.09
100	1.14	1.12
150	1.15	1.25
200	1.17	1.37
250	1.19	1.48
300	1.21	1.63
400	0.93	-0.59
500	1.16	1.27
600	1.15	1.22
700	1.26	2.03
800	0.88	-1.08
900	1.08	0.65
1000	0.92	-0.70
2000	0.92	-0.70
2450	0.87	-1.26
3000	0.79	-2.06
3500	0.87	-1.17
4000	0.88	-1.10
5000	0.96	-0.36
5500	0.98	-0.21
6000	1.12	1.01

2021_Isotropic Response.txt

Date of Calibration: 21-June-2021
Date Printed: Monday, June 21, 2021
Customer Name: Motorola Solutions Malaysia Sdn Bhd
Probe Manufacturer: ETS - Lindgren
Probe Model: E100; HI-2200
Probe Serial No.: 00206767; 00086316
Temperature (Deg C): 23
Humidity (%): 48
Notes:
CAL CERT # 210607-143843-bf7150

Isotropic Response at 400 MHz at 20V/m

Deg	Response dB
0	0.00
45	-0.04
90	-0.04
135	-0.09
180	-0.04
225	-0.13
270	-0.17
315	-0.17
360	-0.09

Max Dev. 0.17

2021_Linearity.txt

Date of Calibration: 21-June-2021
 Date Printed: Monday, June 21, 2021
 Customer Name: Motorola Solutions Malaysia Sdn Bhd
 Probe Manufacturer: ETS - Lindgren
 Probe Model: E100; HI-2200
 Probe Serial No.: 00206767; 00086316
 Temperature (Deg C): 23
 Humidity (%): 48
 Notes:
 CAL CERT #: 210607-143843-bf7150

Linearity

Freq MHz	Applied Field V/m	Indicated Field V/m	Max Dev dB
27.12	0.51	0.62	-1.70
27.12	1.01	1.15	-1.13
27.12	2.10	2.67	-2.09
27.12	4.02	4.60	-1.17
27.12	8.08	9.15	-1.08
27.12	15.08	15.80	-0.41
27.12	20.00	20.90	-0.38
27.12	30.50	31.80	-0.36
27.12	50.30	52.60	-0.39
27.12	65.00	68.40	-0.44
27.12	101.10	106.00	-0.41
27.12	125.90	132.00	-0.41
27.12	202.30	213.00	-0.45
27.12	251.30	265.00	-0.46
27.12	301.00	318.00	-0.48
27.12	350.00	368.00	-0.44
27.12	402.60	425.00	-0.47
27.12	451.70	481.00	-0.55
27.12	500.90	540.00	-0.65
27.12	550.10	601.00	-0.77
27.12	603.50	672.00	-0.93

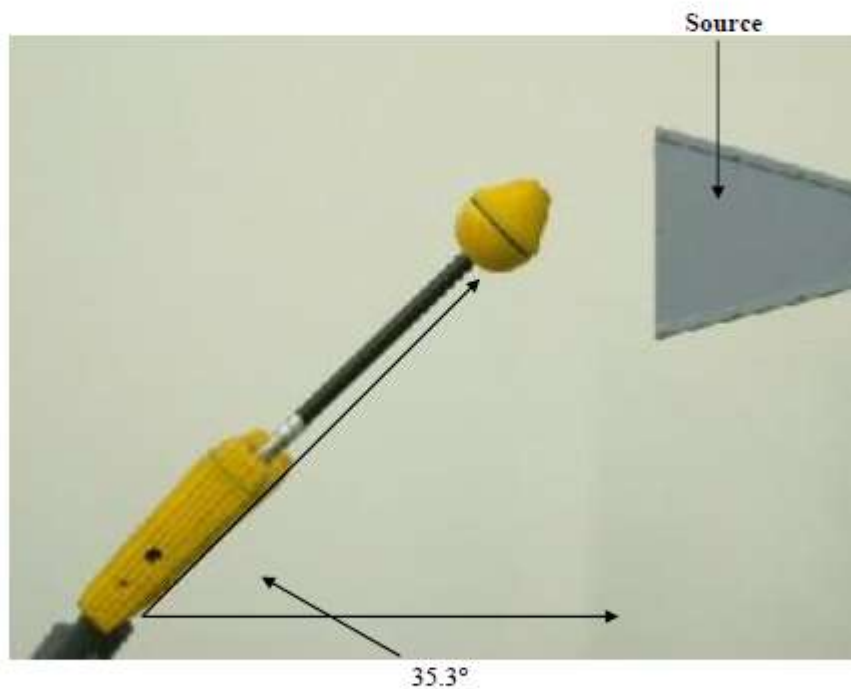
W&G_critical_angle.doc

Probe Alignment/Mounting Position

The alignment/mounting position of the probe is critical. The correction factors given with calibration are valid only for the indicated alignment/mounting position. Deviation from indicated alignment/mounting position of calibration can produce errors in excess of 6 dB.

The probe was positioned with the probe wand at a 35.3° angle position with the probe head centered in front of the field source. The picture below is for probe positioning reference only. The equipment shown does not necessarily indicate the equipment used for calibration.

Side View





Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994

Certificate Number 210607-142845-cd4f83



Model Number H200; HI-2200
 Manufacturer ETS - Lindgren
 Description Field Probe
 Serial Number 00206937; 00086316
 Customer Asset No. MSI0208; MSI0206

Customer
 Motorola Solutions Malaysia Sdn Bhd
 Plot 2A Medan Bayan Lepas Technoplex
 Industrial Park Mukim 12 SWD
 Bayan Lepas, Penang 11900
 MALAYSIA

Date of Calibration 06/21/2021
 Temperature 23°C
 Humidity 48% RH

Location of Calibration
 Keysight Technologies Inc.
 1346 Yellowwood Road
 Kimballton, IA 51543
 United States

This certifies that the equipment has been calibrated using applicable Keysight Technologies procedures and in compliance with ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994 (R2002). The quality management system is registered to ISO 9001:2015.

Calibration Standard(s)	Calibration Method(s)	Calibration Procedure(s)
IEEE Std 1309-2013 Section 4.1	Substitution	287330
IEEE Std 1309-2013 Section 5		
IEEE Std 1309-2013 Section 8.2		
IEEE Std 1309-2013 Section Annex A		
IEEE Std 1309-2013 Section A.3		

Calibration Software
 N/A

As Received Conditions
 The measured values of the equipment were observed in specification at the points tested.

Action Taken
 No action was taken.

As Completed Conditions
 The measured values of the equipment were observed in specification at the points tested.

Calibration Due
 Based on the customer's request, the next calibration is due on 21 Jun 2022

Remarks or Special Requirements
 Client declined isotropic response testing. A probe position document is included with this certificate. This calibration is valid only for the alignment/mounting position specified in this report.

This calibration report shall not be reproduced, except in full. The documented results relate to the equipment calibrated only.

The test limits stated in the report correspond to the published specifications of the equipment, at the points tested.

Keysight Technologies, Inc.
 1346 Yellowwood Road
 Kimballton, IA 51543
 United States
 Issue Date 28 Jun 2021


 Brandt Langer Iowa Service Center Manager
 Page 1 of 5



Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994
Certificate Number 210607-142845-cd4f83



Traceability Information

Technician Name Dennis Bissen

Measurements are traceable to the International System of Units (SI) via national metrology institutes (www.keysight.com/find/NMI) that are signatories to the CIPM Mutual Recognition Arrangement.

Calibration Equipment Used

Manufacturer	Model Number	Model Description	Equipment ID	Cal Due Date	Certificate Number
AR	00W1000B	Amp	11546	NA	
EMCO	5302	G/TEM	10223	NA	2003121915
Hewlett-Packard	8648B	Signal Generator	10272	11/12/2021	201111-094600-5d28cd
IFI	CC 104	TEM	011521	NA	
AR	FI7000	Interface	11015	NA	700516
AR	FL7006	Isotropic Probe	10946	07/17/2021	2018030428-1
Holaday	HI-4422	Isotropic Probe	10022	10/06/2022	2020070063-1

Compliance with Specification

Unless otherwise noted, the calibration results are reported without factoring in the effect of uncertainty on the assessment of compliance/specification.

In Specification/Out of Specification Explanation

The standard criteria to determine the "In Specification/Out of Specification" status is based on one or more of the following conditions, as requested by the client:

1. If the manufacturer has a specified specification for the item being calibrated, then the calibration values are compared to this specification, and the values must fall within the manufacturer's specification. The specification may be obtained from the manufacturer's web site, data sheets, equipment manuals, etc.
2. Where specifications are called out in a published standard, the calibration results are compared to this specification, and the measured values must fall within the standard's specification.
3. In cases where the manufacturer, standard, or client does not identify any relevant specifications, applicable calibration results are compared to historical data with a ± 3 dB specification.

Uncertainty of Measurement

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008(GUM). The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95%. This probability corresponds to a coverage factor of $k=2$ for a normal distribution.

Parameter	Range	MU (+/-)
RF Isotropic E-Field Probes - GTEM Cell - Frequency Response	10 kHz to 1000 MHz	0.97 dB
RF Isotropic E-Field Probes - TEM Cell - Linearity	5 kHz to 800 MHz	0.91 dB

2021_Frequency Response.txt

Date of Calibration: 21-June-2021
Date Printed: Monday, June 21, 2021
Customer Name: Motorola Solutions Malaysia Sdn Bhd
Probe Manufacturer: ETS - Lindgren
Probe Model: H200; HI-2200
Probe Serial No.: 00206937; 00086316
Temperature (Deg C): 23
Humidity (%): 48
Notes:
CAL CERT #: 210607-142845-cd4f83

Correction Factors

Freq in MHz	Mult	dB
5	1.87	5.45
6	1.80	5.10
7	1.77	4.98
8	1.76	4.90
9	1.75	4.88
10	1.76	4.89
13.6	1.75	4.87
15	1.75	4.86
20	1.72	4.72
27.1	1.66	4.39
30	1.62	4.18
40	1.48	3.42
50	1.34	2.53
60	1.22	1.70
70	1.11	0.91
75	1.06	0.51
80	1.01	0.05
90	0.91	-0.78
100	0.87	-1.23
150	0.76	-2.35
175	0.77	-2.30
200	0.80	-1.93
250	0.74	-2.62
300	0.76	-2.40

Page 3 of 5

2021_Linearity.txt

Date of Calibration: 21-June-2021
Date Printed: Monday, June 21, 2021
Customer Name: Motorola Solutions Malaysia Sdn Bhd
Probe Manufacturer: ETS - Lindgren
Probe Model: H200; HI-2200
Probe Serial No.: 00206937; 00086316
Temperature (Deg C): 23
Humidity (%): 48
Notes:
CAL CERT #: 210607-142845-cd4f83

Linearity

Freq	Applied Field	Indicated Field	Max Dev
MHz	A/m	A/m	dB
27.12	0.04	0.042	-0.43
27.12	0.05	0.056	-0.48
27.12	0.08	0.086	-0.54
27.12	0.13	0.147	-0.85
27.12	0.17	0.189	-0.81
27.12	0.27	0.296	-0.87
27.12	0.33	0.364	-0.76
27.12	0.54	0.584	-0.74
27.12	0.67	0.728	-0.77
27.12	0.80	0.876	-0.81
27.12	0.93	1.019	-0.82
27.12	1.07	1.178	-0.86
27.12	1.20	1.331	-0.92
27.12	1.33	1.498	-1.05
27.12	1.46	1.666	-1.16
27.12	1.60	1.851	-1.27

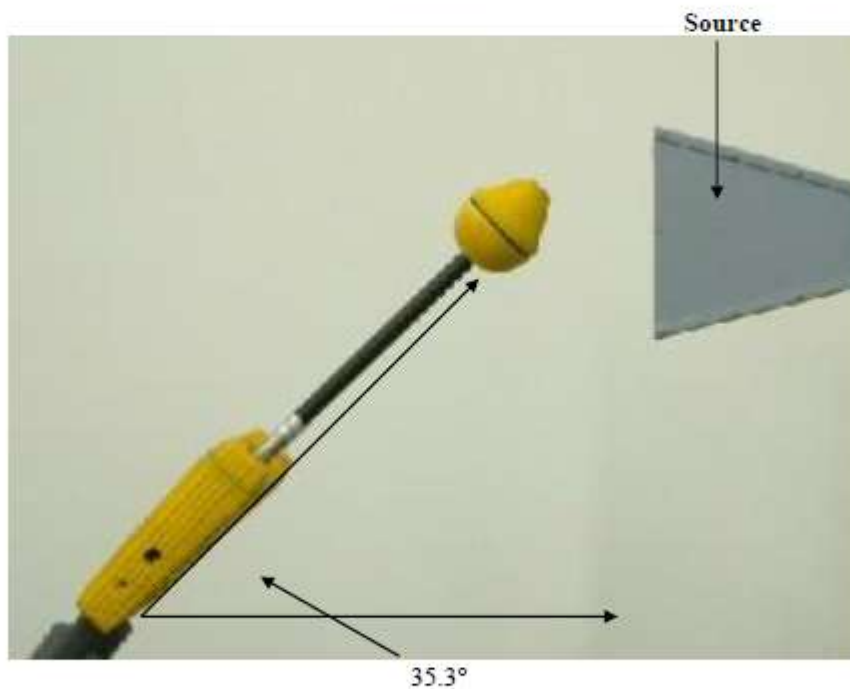
W&G_critical_angle.doc

Probe Alignment/Mounting Position

The alignment/mounting position of the probe is critical. The correction factors given with calibration are valid only for the indicated alignment/mounting position. Deviation from indicated alignment/mounting position of calibration can produce errors in excess of 6 dB.

The probe was positioned with the probe wand at a 35.3° angle position with the probe head centered in front of the field source. The picture below is for probe positioning reference only. The equipment shown does not necessarily indicate the equipment used for calibration.

Side View



Appendix C - Photos of Assessed Antennas
(Refer to Exhibit 7B)

Appendix D - MPE Measurement Results

Table D.1

MPE measurement data for Bystander

D.U.T. Info.								Probe Info.		(5) Test Pos.	MPE Measurements										DUT Max. TX Factor	Avg. over Body (mW/ cm2)	Calc. P.D. (mW/ cm2)	Max Calc. P.D. (mW/ cm2)	
(2)Ant Loc.	Ant. Model/ Desc.	Ant. Gain (dBi)	Ant. Meas. Dist. (cm)	Tx Freq (MHz)	(3) Max Pwr (W)	Initial Pwr (W)	Test Mode	E/H Field	(4) Probe Cal. Factor		(6) Meas. Unit	Bystander (BS) Positions													
												20 cm	40 cm	60 cm	80 cm	100 cm	120 cm	140 cm	160 cm	180 cm					200 cm
Roof	HAE4003A, 450 MHz - 470 MHz	2.15	90(Actual 105 cm)	450.0125	54.0	52.4	CW	E	1.060	BS	2	0.014	0.019	0.027	0.048	0.072	0.137	0.276	0.423	0.463	0.436	0.5	0.203	0.102	0.100
Roof	HAE4003A, 450 MHz - 470 MHz	2.15	90(Actual 105 cm)	460.0000	54.0	53.3	CW	E	1.070	BS	2	0.005	0.009	0.031	0.060	0.096	0.137	0.276	0.460	0.549	0.456	0.5	0.222	0.111	0.110
Roof	HAE4003A, 450 MHz - 470 MHz	2.15	90(Actual 105 cm)	469.9875	54.0	53.5	CW	E	1.080	BS	2	0.015	0.010	0.020	0.042	0.067	0.147	0.274	0.378	0.407	0.363	0.5	0.186	0.093	0.090
Roof	HAE4011A, 450 MHz - 470 MHz	5.65	90(Actual 105 cm)	450.0125	54.0	52.4	CW	E	1.060	BS	2	0.000	0.001	0.002	0.004	0.013	0.034	0.092	0.210	0.298	0.234	0.5	0.094	0.047	0.050
Roof	HAE4011A, 450 MHz - 470 MHz	5.65	90(Actual 105 cm)	460.0000	54.0	53.3	CW	E	1.070	BS	2	0.000	0.000	0.003	0.006	0.016	0.033	0.117	0.324	0.491	0.414	0.5	0.150	0.075	0.080
Roof	HAE4011A, 450 MHz - 470 MHz	5.65	90(Actual 105 cm)	469.9875	54.0	53.5	CW	E	1.080	BS	2	0.000	0.000	0.002	0.004	0.006	0.016	0.071	0.226	0.358	0.329	0.5	0.109	0.055	0.060
Roof	HAE6013A, 380 MHz - 470 MHz	4.15	90(Actual 105 cm)	450.0125	54.0	52.4	CW	E	1.060	BS	2	0.008	0.009	0.017	0.047	0.071	0.132	0.252	0.370	0.377	0.311	0.5	0.169	0.085	0.090
Roof	HAE6013A, 380 MHz - 470 MHz	4.15	90(Actual 105 cm)	460.0000	54.0	53.3	CW	E	1.070	BS	2	0.005	0.010	0.031	0.071	0.097	0.144	0.310	0.471	0.494	0.372	0.5	0.214	0.107	0.110
Roof	HAE6013A, 380 MHz - 470 MHz	4.15	90(Actual 105 cm)	469.9875	54.0	53.5	CW	E	1.080	BS	2	0.008	0.008	0.021	0.040	0.066	0.134	0.301	0.408	0.388	0.317	0.5	0.182	0.091	0.090

MPE calculations are defined in section 15.0.

Table D.1 (Continued)**MPE measurement data for Bystander**

D.U.T. Info.								Probe Info.				MPE Measurements										DUT Max. TX Factor	Avg. over Body (mW/ cm2)	Calc. P.D. (mW/ cm2)	Max Calc. P.D. (mW/ cm2)		
⁽²⁾ Ant Loc.	Ant. Model/ Desc.	Ant. Gain (dBi)	Ant. Meas. Dist. (cm)	Tx Freq (MHz)	⁽³⁾ Max Pwr (W)	Initial Pwr (W)	Test Mode	E/H Field	⁽⁴⁾ Probe Cal. Factor			⁽⁵⁾ Test Pos.	⁽⁶⁾ Meas. Unit	Bystander (BS) Positions													
														20 cm	40 cm	60 cm	80 cm	100 cm	120 cm	140 cm	160 cm					180 cm	200 cm
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90(Actual 105 cm)	450.0125	54.0	52.4	CW	E	1.060	BS	2	0.004	0.005	.009'	0.023	0.036	0.063	0.132	0.196	0.233	0.222	0.5	0.108	0.054	0.060		
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90(Actual 105 cm)	469.9875	54.0	53.5	CW	E	1.080	BS	2	0.006	0.009	0.017	0.041	0.060	0.146	0.295	0.389	0.417	0.403	0.5	0.192	0.096	0.100		
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90(Actual 105 cm)	482.5000	54.0	53.8	CW	E	1.090	BS	2	0.005	0.007	0.012	0.035	0.078	0.152	0.273	0.396	0.484	0.489	0.5	0.210	0.105	0.110		
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90(Actual 105 cm)	496.5000	48.0	41.3	CW	E	1.100	BS	2	0.014	0.005	0.010	0.043	0.081	0.113	0.174	0.252	0.338	0.382	0.5	0.155	0.078	0.090		
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90(Actual 105 cm)	511.9875	48.0	41.4	CW	E	1.100	BS	2	0.002	0.006	0.012	0.051	0.069	0.084	0.121	0.215	0.315	0.298	0.5	0.129	0.065	0.070		
Roof	HAE6031A, 380-520MHz	4.15	90(Actual 105 cm)	450.0125	54.0	52.4	CW	E	1.060	BS	2	0.010	0.013	0.022	0.058	0.090	0.159	0.310	0.439	0.451	0.378	0.5	0.205	0.102	0.110		
Roof	HAE6031A, 380-520MHz	4.15	90(Actual 105 cm)	469.9875	54.0	53.5	CW	E	1.080	BS	2	0.010	0.014	0.020	0.048	0.064	0.154	0.325	0.435	0.425	0.334	0.5	0.197	0.099	0.100		
Roof	HAE6031A, 380-520MHz	4.15	90(Actual 105 cm)	482.5000	54.0	53.8	CW	E	1.090	BS	2	0.007	0.009	0.011	0.027	0.072	0.170	0.310	0.424	0.434	0.365	0.5	0.199	0.099	0.100		
Roof	HAE6031A, 380-520MHz	4.15	90(Actual 105 cm)	496.5000	48.0	41.3	CW	E	1.100	BS	2	0.004	0.009	0.010	0.046	0.091	0.129	0.206	0.285	0.323	0.299	0.5	0.154	0.077	0.090		

MPE calculations are defined in section 15.0.

Table D.1 (Continued)**MPE measurement data for Bystander**

D.U.T. Info.								Probe Info.			MPE Measurements	DUT Max. TX Factor	Avg. over Body (mW/ cm2)	Calc. P.D. (mW/ cm2)	Max Calc. P.D. (mW/ cm2)												
⁽²⁾ Ant Loc.	Ant. Model/ Desc.	Ant. Gain (dBi)	Ant. Meas. Dist. (cm)	Tx Freq (MHz)	⁽³⁾ Max Pwr (W)	Initial Pwr (W)	Test Mode	E/H Field	⁽⁴⁾ Probe Cal. Factor							⁽⁵⁾ Test Pos.	⁽⁶⁾ Meas. Unit	Bystander (BS) Positions									
																		20 cm	40 cm	60 cm	80 cm	100 cm	120 cm	140 cm	160 cm	180 cm	200 cm
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90(Actual 105 cm)	450.0125	54.0	52.4	CW	E	1.060	BS	2	0.004	0.005	.009'	0.023	0.036	0.063	0.132	0.196	0.233	0.222	0.5	0.108	0.054	0.060		
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90(Actual 105 cm)	469.9875	54.0	53.5	CW	E	1.080	BS	2	0.006	0.009	0.017	0.041	0.060	0.146	0.295	0.389	0.417	0.403	0.5	0.192	0.096	0.100		
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90(Actual 105 cm)	482.5000	54.0	53.8	CW	E	1.090	BS	2	0.005	0.007	0.012	0.035	0.078	0.152	0.273	0.396	0.484	0.489	0.5	0.210	0.105	0.110		
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90(Actual 105 cm)	496.5000	48.0	41.3	CW	E	1.100	BS	2	0.014	0.005	0.010	0.043	0.081	0.113	0.174	0.252	0.338	0.382	0.5	0.155	0.078	0.090		
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90(Actual 105 cm)	511.9875	48.0	41.4	CW	E	1.100	BS	2	0.002	0.006	0.012	0.051	0.069	0.084	0.121	0.215	0.315	0.298	0.5	0.129	0.065	0.070		
Roof	HAE6031A, 380-520MHz	4.15	90(Actual 105 cm)	450.0125	54.0	52.4	CW	E	1.060	BS	2	0.010	0.013	0.022	0.058	0.090	0.159	0.310	0.439	0.451	0.378	0.5	0.205	0.102	0.110		
Roof	HAE6031A, 380-520MHz	4.15	90(Actual 105 cm)	469.9875	54.0	53.5	CW	E	1.080	BS	2	0.010	0.014	0.020	0.048	0.064	0.154	0.325	0.435	0.425	0.334	0.5	0.197	0.099	0.100		
Roof	HAE6031A, 380-520MHz	4.15	90(Actual 105 cm)	482.5000	54.0	53.8	CW	E	1.090	BS	2	0.007	0.009	0.011	0.027	0.072	0.170	0.310	0.424	0.434	0.365	0.5	0.199	0.099	0.100		
Roof	HAE6031A, 380-520MHz	4.15	90(Actual 105 cm)	496.5000	48.0	41.3	CW	E	1.100	BS	2	0.004	0.009	0.010	0.046	0.091	0.129	0.206	0.285	0.323	0.299	0.5	0.154	0.077	0.090		
Roof	HAE6031A, 380-520MHz	4.15	90(Actual 105 cm)	511.9875	48.0	41.4	CW	E	1.100	BS	2	0.004	0.008	0.014	0.067	0.092	0.103	0.168	0.269	0.314	0.257	0.5	0.143	0.071	0.080		

MPE calculations are defined in section 15.0.

Table D.1 (Continued)**MPE measurement data for Bystander**

D.U.T. Info.								Probe Info.		(5) Test Pos.	(6) Meas. Unit	MPE Measurements										DUT Max. TX Factor	Avg. over Body (mW/ cm2)	Calc. P.D. (mW/ cm2)	Max Calc. P.D. (mW/ cm2)
(2) Ant Loc.	Ant. Model/ Desc.	Ant. Gain (dBi)	Ant. Meas. Dist. (cm)	Tx Freq (MHz)	(3) Max Pwr (W)	Initial Pwr (W)	Test Mode	E/H Field	(4) Probe Cal. Factor			Bystander (BS) Positions													
												20 cm	40 cm	60 cm	80 cm	100 cm	120 cm	140 cm	160 cm	180 cm	200 cm				
Roof	HAE6031A, 380-520MHz	4.15	90(Actual 105 cm)	519.9875	30.0	29.9	CW	E	1.100	BS	2	0.004	0.007	0.016	0.026	0.027	0.061	0.123	0.213	0.230	0.188	0.5	0.099	0.049	0.050
Roof	RAE4016AR B, 494 MHz - 512MHz	7.15	90(Actual 105 cm)	494.9875	48.0	41.0	CW	E	1.100	BS	2	0.001	0.003	0.005	0.014	0.014	0.010	0.035	0.161	0.364	0.375	0.5	0.108	0.054	0.060
Roof	RAE4016AR B, 494 MHz - 512MHz	7.15	90(Actual 105 cm)	503.0000	48.0	41.5	CW	E	1.100	BS	2	0.001	0.002	0.004	0.006	0.005	0.007	0.038	0.135	0.320	0.302	0.5	0.090	0.045	0.050
Roof	RAE4016AR B, 494 MHz - 512MHz	7.15	90(Actual 105 cm)	511.9875	48.0	41.4	CW	E	1.100	BS	2	0.003	0.003	0.002	0.010	0.011	0.009	0.046	0.178	0.318	0.269	0.5	0.094	0.047	0.050
Roof	RAE4014AR B, 445 - 470 MHz	7.15	90(Actual 105 cm)	450.0125	54.0	52.4	CW	E	1.060	BS	2	0.003	0.003	0.006	0.004	0.007	0.006	0.033	0.160	0.339	0.385	0.5	0.100	0.050	0.050
Roof	RAE4014AR B, 445 - 470 MHz	7.15	90(Actual 105 cm)	460.0000	54.0	53.3	CW	E	1.070	BS	2	0.002	0.002	0.006	0.010	0.011	0.013	0.065	0.262	0.468	0.430	0.5	0.136	0.068	0.070
Roof	RAE4014AR B, 445 - 470 MHz	7.15	90(Actual 105 cm)	469.9875	54.0	53.5	CW	E	1.080	BS	2	0.002	0.005	0.006	0.010	0.006	0.016	0.062	0.207	0.363	0.348	0.5	0.110	0.055	0.060
Trunk	HAE4011A, 450 MHz - 470 MHz	5.65	90	450.0125	54.0	52.4	CW	E	1.060	BS	2	0.005	0.006	0.007	0.031	0.159	0.377	0.471	0.269	0.083	0.114	0.5	0.161	0.081	0.080
Trunk	HAE4011A, 450 MHz - 470 MHz	5.65	90	460.0000	54.0	53.3	CW	E	1.070	BS	2	0.011	0.009	0.011	0.073	0.203	0.615	0.681	0.364	0.094	0.157	0.5	0.237	0.119	0.120
Trunk	HAE4011A, 450 MHz - 470 MHz	5.65	90	469.9875	54.0	53.5	CW	E	1.080	BS	2	0.010	0.005	0.007	0.030	0.234	0.489	0.649	0.340	0.103	0.111	0.5	0.213	0.107	0.110
Trunk	HAE6013A, 380 MHz - 470 MHz	4.15	90	450.0125	54.0	52.4	CW	E	1.060	BS	2	0.100	0.092	0.126	0.159	0.410	0.513	0.512	0.351	0.207	0.122	0.5	0.275	0.137	0.140
Trunk	HAE6013A, 380 MHz - 470 MHz	4.15	90	460.0000	54.0	53.3	CW	E	1.070	BS	2	0.094	0.067	0.141	0.166	0.424	0.651	0.613	0.366	0.152	0.083	0.5	0.295	0.147	0.150

MPE calculations are defined in section 15.0.

Table D.1 (Continued)**MPE measurement data for Bystander**

D.U.T. Info.								Probe Info.			Test Pos.	MPE Measurements										DUT Max. TX Factor	Avg. over Body (mW/cm2)	Calc. P.D. (mW/cm2)	Max Calc. P.D. (mW/cm2)	
(2) Ant Loc.	Ant. Model/ Desc.	Ant. Gain (dBi)	Ant. Meas. Dist. (cm)	Tx Freq (MHz)	(3) Max Pwr (W)	Initial Pwr (W)	Test Mode	E/H Field	(4) Probe Cal. Factor			(6) Meas. Unit	Bystander (BS) Positions													
													20 cm	40 cm	60 cm	80 cm	100 cm	120 cm	140 cm	160 cm	180 cm					200 cm
Trunk	HAE6013A, 380 MHz - 470 MHz	4.15	90	469.9875	54.0	53.5	CW	E	1.080	BS	2	0.067	0.048	0.097	0.199	0.458	0.678	0.623	0.424	0.232	0.097	0.5	0.315	0.157	0.160	
Trunk	HAE6031A, 380-520MHz	4.15	90	450.0125	54.0	52.4	CW	E	1.060	BS	2	0.100	0.091	0.120	0.153	0.360	0.566	0.516	0.341	0.213	0.113	0.5	0.273	0.136	0.140	
Trunk	HAE6031A, 380-520MHz	4.15	90	469.9875	54.0	53.5	CW	E	1.080	BS	2	0.068	0.050	0.126	0.216	0.490	0.677	0.658	0.451	0.253	0.097	0.5	0.332	0.166	0.170	
Trunk	HAE6031A, 380-520MHz	4.15	90	482.5000	54.0	53.8	CW	E	1.090	BS	2	0.065	0.067	0.133	0.228	0.424	0.601	0.580	0.403	0.238	0.104	0.5	0.309	0.155	0.160	
Trunk	HAE6031A, 380-520MHz	4.15	90	496.5000	48.0	41.3	CW	E	1.100	BS	2	0.047	0.065	0.100	0.136	0.326	0.423	0.308	0.187	0.117	0.054	0.5	0.194	0.097	0.110	
Trunk	HAE6031A, 380-520MHz	4.15	90	511.9875	48.0	41.4	CW	E	1.100	BS	2	0.039	0.062	0.073	0.164	0.315	0.410	0.334	0.213	0.112	0.066	0.5	0.197	0.099	0.110	
Trunk	HAE6031A, 380-520MHz	4.15	60	519.9875	30.0	29.9	CW	E	1.100	BS	2	0.013	0.068	0.058	0.226	0.411	0.474	0.324	0.195	0.145	0.069	0.5	0.219	0.109	0.110	
Trunk	RAE4016AR B, 494 MHz - 512MHz	7.15	90	494.9875	48.0	41.0	CW	E	1.100	BS	2	0.022	0.021	0.015	0.006	0.074	0.252	0.332	0.234	0.094	0.082	0.5	0.124	0.062	0.070	
Trunk	RAE4016AR B, 494 MHz - 512MHz	7.15	90	503.0000	48.0	41.5	CW	E	1.100	BS	2	0.017	0.021	0.014	0.014	0.084	0.259	0.328	0.174	0.037	0.040	0.5	0.109	0.054	0.060	
Trunk	RAE4016AR B, 494 MHz - 512MHz	7.15	90	511.9875	48.0	41.4	CW	E	1.100	BS	2	0.016	0.022	0.023	0.026	0.141	0.330	0.420	0.260	0.100	0.034	0.5	0.151	0.076	0.090	
Trunk	RAE4014AR B, 445 - 470 MHz	7.15	90	450.0125	54.0	52.4	CW	E	1.060	BS	2	0.037	0.023	0.023	0.009	0.038	0.244	0.469	0.438	0.196	0.082	0.5	0.165	0.083	0.090	
Trunk	RAE4014AR B, 445 - 470 MHz	7.15	90	460.0000	54.0	53.3	CW	E	1.070	BS	2	0.032	0.021	0.024	0.013	0.135	0.464	0.620	0.442	0.118	0.059	0.5	0.206	0.103	0.100	
Trunk	RAE4014AR B, 445 - 470 MHz	7.15	90	469.9875	54.0	53.5	CW	E	1.080	BS	2	0.035	0.018	0.024	0.041	0.187	0.496	0.592	0.429	0.145	0.035	0.5	0.216	0.108	0.110	

MPE calculations are defined in section 15.0.

Table D.1 (Continued)**MPE measurement data for Bystander**

D.U.T. Info.								Probe Info.		(5) Test Pos.	MPE Measurements											DUT Max. TX Factor	Avg. over Body (mW/ cm2)	Calc. P.D. (mW/ cm2)	Max Calc. P.D. (mW/ cm2)
(2) Ant Loc.	Ant. Model/ Desc.	Ant. Gain (dBi)	Ant. Meas. Dist. (cm)	Tx Freq (MHz)	(3) Max Pwr (W)	Initial Pwr (W)	Test Mode	E/H Field	(4) Probe Cal. Factor		(6) Meas. Unit	Bystander (BS) Positions													
												20 cm	40 cm	60 cm	80 cm	100 cm	120 cm	140 cm	160 cm	180 cm	200 cm				
Trunk	HAE6031A, 380-520MHz	4.15	90	469.9875	54.0	53.5	CW	E	1.080	BS	2	0.068	0.050	0.126	0.216	0.490	0.677	0.658	0.451	0.253	0.097	0.5	0.332	0.166	0.170
Trunk	HAE6031A, 380-520MHz	4.15	90	469.9875	54.0	53.5	CW	E	1.080	BS	2	0.068	0.050	0.126	0.216	0.490	0.677	0.658	0.451	0.253	0.097	0.5	0.332	0.166	0.170
45 degrees																									
Trunk	HAE6031A, 380-520MHz	4.15	90	469.9875	54.0	53.5	CW	E	1.080	BS	2	0.049	0.080	0.139	0.340	0.560	0.692	0.638	0.408	0.217	0.101	0.5	0.347	0.174	0.175
90 degrees																									
Trunk	HAE6031A, 380-520MHz	4.15	90	469.9875	54.0	53.5	CW	E	1.080	BS	2	0.049	0.080	0.139	0.340	0.560	0.692	0.638	0.408	0.217	0.101	0.5	0.347	0.174	0.175

MPE calculations are defined in section 15.0.

Table D.2
MPE measurement data for Passenger

D.U.T. Info.								Probe Info.			⁽⁶⁾ Meas. Unit								
⁽²⁾ Ant Loc.	Ant. Model/ Desc.	Ant. Gain (dBi)	Ant. Meas. Dist. (cm)	Tx Freq (MHz)	⁽³⁾ Max Pwr (W)	Initial Pwr (W)	Test Mode	E/H Field	⁽⁴⁾ Probe Cal. Factor		Test Pos.	MPE Measurements							
													Head/ Top 1/3	Chest/ Middle 1/3					Lower Trunk/ Bottom 1/3
Roof	HAE4003A, 450 MHz - 470 MHz	2.15	90	450.0125	54.0	52.4	CW	E	1.060	PB	2	0.043	0.072	0.123	0.5	0.084	0.042	0.040	
Roof	HAE4003A, 450 MHz - 470 MHz	2.15	90	460.0000	54.0	53.3	CW	E	1.070	PB	2	0.043	0.085	0.109	0.5	0.084	0.042	0.040	
Roof	HAE4003A, 450 MHz - 470 MHz	2.15	90	469.9875	54.0	53.5	CW	E	1.080	PB	2	0.051	0.080	0.105	0.5	0.085	0.042	0.040	
Roof	HAE4011A, 450 MHz - 470 MHz	5.65	NA	450.0125	54.0	52.4	CW	E	1.060	PB	2	0.012	0.006	0.004	0.5	0.008	0.004	0.000	
Roof	HAE4011A, 450 MHz - 470 MHz	5.65	NA	460.0000	54.0	53.3	CW	E	1.070	PB	2	0.010	0.008	0.007	0.5	0.009	0.004	0.000	
Roof	HAE4011A, 450 MHz - 470 MHz	5.65	NA	469.9875	54.0	53.5	CW	E	1.080	PB	2	0.015	0.008	0.009	0.5	0.011	0.006	0.010	
Roof	HAE6013A, 380 MHz - 470 MHz	4.15	NA	450.0125	54.0	52.4	CW	E	1.060	PB	2	0.075	0.079	0.114	0.5	0.095	0.047	0.050	
Roof	HAE6013A, 380 MHz - 470 MHz	4.15	NA	460.0000	54.0	53.3	CW	E	1.070	PB	2	0.057	0.084	0.141	0.5	0.101	0.050	0.050	
Roof	HAE6013A, 380 MHz - 470 MHz	4.15	NA	469.9875	54.0	53.5	CW	E	1.080	PB	2	0.062	0.086	0.112	0.5	0.093	0.047	0.050	
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90	450.0125	54.0	52.4	CW	E	1.060	PB	2	0.060	0.065	0.089	0.5	0.076	0.038	0.040	
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90	469.9875	54.0	53.5	CW	E	1.080	PB	2	0.047	0.047	0.092	0.5	0.067	0.033	0.030	
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90	482.5000	54.0	53.8	CW	E	1.090	PB	2	0.101	0.079	0.097	0.5	0.100	0.050	0.050	
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90	496.5000	48.0	41.3	CW	E	1.100	PB	2	0.036	0.023	0.027	0.5	0.032	0.016	0.020	
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90	511.9875	48.0	41.4	CW	E	1.100	PB	2	0.025	0.027	0.040	0.5	0.034	0.017	0.020	
Roof	HAE6031A, 380-520MHz	4.15	NA	450.0125	54.0	52.4	CW	E	1.060	PB	2	0.093	0.076	0.102	0.5	0.096	0.048	0.050	
Roof	HAE6031A, 380-520MHz	4.15	NA	469.9875	54.0	53.5	CW	E	1.080	PB	2	0.080	0.085	0.134	0.5	0.107	0.054	0.050	
Roof	HAE6031A, 380-520MHz	4.15	NA	482.5000	54.0	53.8	CW	E	1.090	PB	2	0.091	0.085	0.115	0.5	0.106	0.053	0.050	
Roof	HAE6031A, 380-520MHz	4.15	NA	496.5000	48.0	41.3	CW	E	1.100	PB	2	0.053	0.034	0.031	0.5	0.043	0.022	0.030	

MPE calculations are defined in section 15.0.

Table D.2 (Continued)**MPE measurement data for Passenger**

D.U.T. Info.								Probe Info.		(5) Test Pos.	(6) Meas. Unit				DUT Max. TX Factor	Avg. over Body (mW/ cm2)	Calc. P.D. (mW/ cm2)	Max Calc. P.D. (mW/ cm2)
(2) Ant Loc.	Ant. Model/ Desc.	Ant. Gain (dBi)	Ant. Meas. Dist. (cm)	Tx Freq (MHz)	(3) Max Pwr (W)	Initial Pwr (W)	Test Mode	E/H Field	(4) Probe Cal. Factor		MPE Measurements	Head/ Top 1/3	Chest/ Middle 1/3	Lower Trunk/ Bottom 1/3				
Roof	HAE6031A, 380-520MHz	4.15	NA	511.9875	48.0	41.4	CW	E	1.100	PB	2	0.030	0.028	0.047	0.5	0.039	0.019	0.020
Roof	HAE6031A, 380-520MHz	4.15	NA	519.9875	30.0	29.9	CW	E	1.100	PB	2	0.026	0.019	0.018	0.5	0.023	0.012	0.010
Roof	RAE4016ARB, 494 MHz - 512MHz	7.15	NA	494.9875	48.0	41.0	CW	E	1.100	PB	2	0.004	0.003	0.005	0.5	0.004	0.002	0.000
Roof	RAE4016ARB, 494 MHz - 512MHz	7.15	NA	503.0000	48.0	41.5	CW	E	1.100	PB	2	0.008	0.006	0.006	0.5	0.007	0.004	0.000
Roof	RAE4016ARB, 494 MHz - 512MHz	7.15	NA	511.9875	48.0	41.4	CW	E	1.100	PB	2	0.004	0.002	0.004	0.5	0.004	0.002	0.000
Roof	RAE4014ARB, 445 - 470 MHz	7.15	NA	450.0125	54.0	52.4	CW	E	1.060	PB	2	0.004	0.007	0.011	0.5	0.008	0.004	0.000
Roof	RAE4014ARB, 445 - 470 MHz	7.15	NA	460.0000	54.0	53.3	CW	E	1.070	PB	2	0.011	0.017	0.032	0.5	0.021	0.011	0.010
Roof	RAE4014ARB, 445 - 470 MHz	7.15	NA	469.9875	54.0	53.5	CW	E	1.080	PB	2	0.009	0.012	0.021	0.5	0.015	0.008	0.010
Trunk	HAE4011A, 450 MHz - 470 MHz	5.65	NA	450.0125	54.0	52.4	CW	E	1.060	PB	2	0.362	0.176	0.138	0.5	0.239	0.120	0.120
Trunk	HAE4011A, 450 MHz - 470 MHz	5.65	NA	460.0000	54.0	53.3	CW	E	1.070	PB	2	0.400	0.250	0.206	0.5	0.305	0.153	0.150
Trunk	HAE4011A, 450 MHz - 470 MHz	5.65	NA	469.9875	54.0	53.5	CW	E	1.080	PB	2	0.365	0.186	0.163	0.5	0.256	0.128	0.130
Trunk	HAE6013A, 380 MHz - 470 MHz	4.15	NA	450.0125	54.0	52.4	CW	E	1.060	PB	2	0.626	0.416	0.450	0.5	0.528	0.264	0.270
Trunk	HAE6013A, 380 MHz - 470 MHz	4.15	NA	460.0000	54.0	53.3	CW	E	1.070	PB	2	0.595	0.402	0.356	0.5	0.482	0.241	0.240
Trunk	HAE6013A, 380 MHz - 470 MHz	4.15	NA	469.9875	54.0	53.5	CW	E	1.080	PB	2	0.670	0.369	0.473	0.5	0.543	0.272	0.270
Trunk	HAE6031A, 380-520MHz	4.15	NA	450.0125	54.0	52.4	CW	E	1.060	PB	2	0.836	0.488	0.498	0.5	0.644	0.322	0.332
Trunk	HAE6031A, 380-520MHz	4.15	NA	469.9875	54.0	53.5	CW	E	1.080	PB	2	0.740	0.464	0.509	0.5	0.615	0.308	0.310
Trunk	HAE6031A, 380-520MHz	4.15	NA	482.5000	54.0	53.8	CW	E	1.090	PB	2	0.900	0.464	0.482	0.5	0.669	0.335	0.340
Trunk	HAE6031A, 380-520MHz	4.15	NA	496.5000	48.0	41.3	CW	E	1.100	PB	2	0.606	0.444	0.395	0.5	0.530	0.265	0.310

MPE calculations are defined in section 15.0.

Table D.2 (Continued)**MPE measurement data for Passenger**

D.U.T. Info.								Probe Info.		⁽⁵⁾ Test Pos.	⁽⁶⁾ Meas. Unit				DUT Max. TX Factor	Avg. over Body (mW/ cm2)	Calc. P.D. (mW/ cm2)	Max Calc. P.D. (mW/ cm2)
⁽²⁾ Ant Loc.	Ant. Model/ Desc.	Ant. Gain (dBi)	Ant. Meas. Dist. (cm)	Tx Freq (MHz)	⁽³⁾ Max Pwr (W)	Initial Pwr (W)	Test Mode	E/H Field	⁽⁴⁾ Probe Cal. Factor		MPE Measurements							
												Head/ Top 1/3	Chest/ Middle 1/3	Lower Trunk/ Bottom 1/3				
Trunk	HAE6031A, 380-520MHz	4.15	NA	511.9875	48.0	41.4	CW	E	1.100	PB	2	0.557	0.431	0.374	0.5	0.501	0.250	0.290
Trunk	HAE6031A, 380-520MHz	4.15	NA	519.9875	30.0	29.9	CW	E	1.100	PB	2	0.456	0.428	0.380	0.5	0.465	0.232	0.230
Trunk	RAE4016ARB, 494 MHz - 512MHz	7.15	NA	494.9875	48.0	41.0	CW	E	1.100	PB	2	0.154	0.049	0.075	0.5	0.102	0.051	0.060
Trunk	RAE4016ARB, 494 MHz - 512MHz	7.15	NA	503.0000	48.0	41.5	CW	E	1.100	PB	2	0.210	0.086	0.105	0.5	0.147	0.074	0.090
Trunk	RAE4016ARB, 494 MHz - 512MHz	7.15	NA	511.9875	48.0	41.4	CW	E	1.100	PB	2	0.240	0.148	0.111	0.5	0.183	0.092	0.110
Trunk	RAE4014ARB, 445 - 470 MHz	7.15	NA	450.0125	54.0	52.4	CW	E	1.060	PB	2	0.146	0.090	0.088	0.5	0.115	0.057	0.060
Trunk	RAE4014ARB, 445 - 470 MHz	7.15	NA	460.0000	54.0	53.3	CW	E	1.070	PB	2	0.217	0.167	0.198	0.5	0.207	0.104	0.110
Trunk	RAE4014ARB, 445 - 470 MHz	7.15	NA	469.9875	54.0	53.5	CW	E	1.080	PB	2	0.334	0.210	0.192	0.5	0.264	0.132	0.130

MPE calculations are defined in section 15.0.

Table D.2 (Continued)**MPE measurement data for Passenger**

D.U.T. Info.								Probe Info.		(5) Test Pos.	(6) Meas. Unit				DUT Max. TX Factor	Avg. over Body (mW/ cm2)	Calc. P.D. (mW/ cm2)	Max Calc. P.D. (mW/ cm2)
(2) Ant Loc.	Ant. Model/ Desc.	Ant. Gain (dBi)	Ant. Meas. Dist. (cm)	Tx Freq (MHz)	(3) Max Pwr (W)	Initial Pwr (W)	Test Mode	E/H Field	(4) Probe Cal. Factor		MPE Measurements	(6) Meas. Unit		Lower Trunk/ Bottom 1/3				
												Head/ Top 1/3	Chest/ Middle 1/3					
Roof	HAE4003A, 450 MHz - 470 MHz	2.15	90	450.0125	54.0	52.4	CW	E	1.060	PF	2	0.030	0.053	0.050	0.5	0.047	0.024	0.020
Roof	HAE4003A, 450 MHz - 470 MHz	2.15	90	460.0000	54.0	53.3	CW	E	1.070	PF	2	0.011	0.039	0.047	0.5	0.035	0.017	0.020
Roof	HAE4003A, 450 MHz - 470 MHz	2.15	90	469.9875	54.0	53.5	CW	E	1.080	PF	2	0.030	0.045	0.038	0.5	0.041	0.020	0.020
Roof	HAE4011A, 450 MHz - 470 MHz	5.65	NA	450.0125	54.0	52.4	CW	E	1.060	PF	2	0.006	0.008	0.005	0.5	0.007	0.003	0.000
Roof	HAE4011A, 450 MHz - 470 MHz	5.65	NA	460.0000	54.0	53.3	CW	E	1.070	PF	2	0.002	0.005	0.004	0.5	0.004	0.002	0.000
Roof	HAE4011A, 450 MHz - 470 MHz	5.65	NA	469.9875	54.0	53.5	CW	E	1.080	PF	2	0.005	0.006	0.004	0.5	0.005	0.003	0.000
Roof	HAE6013A, 380 MHz - 470 MHz	4.15	NA	450.0125	54.0	52.4	CW	E	1.060	PF	2	0.023	0.039	0.041	0.5	0.036	0.018	0.020
Roof	HAE6013A, 380 MHz - 470 MHz	4.15	NA	460.0000	54.0	53.3	CW	E	1.070	PF	2	0.013	0.048	0.053	0.5	0.041	0.020	0.020
Roof	HAE6013A, 380 MHz - 470 MHz	4.15	NA	469.9875	54.0	53.5	CW	E	1.080	PF	2	0.032	0.059	0.053	0.5	0.052	0.026	0.030
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90	450.0125	54.0	52.4	CW	E	1.060	PF	2	0.034	0.018	0.031	0.5	0.029	0.015	0.020
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90	469.9875	54.0	53.5	CW	E	1.080	PF	2	0.040	0.017	0.049	0.5	0.038	0.019	0.020
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90	482.5000	54.0	53.8	CW	E	1.090	PF	2	0.055	0.020	0.052	0.5	0.046	0.023	0.020
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90	496.5000	48.0	41.3	CW	E	1.100	PF	2	0.028	0.022	0.027	0.5	0.028	0.014	0.020
Roof	HAE6016A, 450 MHz - 512 MHz	2.15	90	511.9875	48.0	41.4	CW	E	1.100	PF	2	0.055	0.025	0.046	0.5	0.046	0.023	0.030
Roof	HAE6031A, 380-520MHz	4.15	NA	450.0125	54.0	52.4	CW	E	1.060	PF	2	0.027	0.036	0.020	0.5	0.029	0.015	0.020
Roof	HAE6031A, 380-520MHz	4.15	NA	469.9875	54.0	53.5	CW	E	1.080	PF	2	0.056	0.065	0.050	0.5	0.061	0.031	0.030
Roof	HAE6031A, 380-520MHz	4.15	NA	482.5000	54.0	53.8	CW	E	1.090	PF	2	0.040	0.048	0.031	0.5	0.043	0.022	0.020
Roof	HAE6031A, 380-520MHz	4.15	NA	496.5000	48.0	41.3	CW	E	1.100	PF	2	0.029	0.031	0.027	0.5	0.032	0.016	0.020
Roof	HAE6031A, 380-520MHz	4.15	NA	511.9875	48.0	41.4	CW	E	1.100	PF	2	0.028	0.042	0.028	0.5	0.036	0.018	0.020
Roof	HAE6031A, 380-520MHz	4.15	NA	519.9875	30.0	29.9	CW	E	1.100	PF	2	0.026	0.026	0.013	0.5	0.024	0.012	0.010

MPE calculations are defined in section 15.0.

Table D.2 (Continued)**MPE measurement data for Passenger**

D.U.T. Info.								Probe Info.		(5) Test Pos.	(6) Meas. Unit				DUT Max. TX Factor	Avg. over Body (mW/ cm2)	Calc. P.D. (mW/ cm2)	Max Calc. P.D. (mW/ cm2)
(2) Ant Loc.	Ant. Model/ Desc.	Ant. Gain (dBi)	Ant. Meas. Dist. (cm)	Tx Freq (MHz)	(3) Max Pwr (W)	Initial Pwr (W)	Test Mode	E/H Field	(4) Probe Cal. Factor		MPE Measurements	Head/ Top 1/3	Chest/ Middle 1/3	Lower Trunk/ Bottom 1/3				
Roof	RAE4016ARB, 494 MHz - 512MHz	7.15	NA	494.9875	48.0	41.0	CW	E	1.100	PF	2	0.003	0.002	0.004	0.5	0.003	0.002	0.000
Roof	RAE4016ARB, 494 MHz - 512MHz	7.15	NA	503.0000	48.0	41.5	CW	E	1.100	PF	2	0.006	0.003	0.008	0.5	0.006	0.003	0.000
Roof	RAE4016ARB, 494 MHz - 512MHz	7.15	NA	511.9875	48.0	41.4	CW	E	1.100	PF	2	0.005	0.003	0.004	0.5	0.004	0.002	0.000
Roof	RAE4014ARB, 445 - 470 MHz	7.15	NA	450.0125	54.0	52.4	CW	E	1.060	PF	2	0.002	0.005	0.004	0.5	0.005	0.003	0.000
Roof	RAE4014ARB, 445 - 470 MHz	7.15	NA	460.0000	54.0	53.3	CW	E	1.070	PF	2	0.003	0.005	0.004	0.5	0.004	0.002	0.000
Roof	RAE4014ARB, 445 - 470 MHz	7.15	NA	469.9875	54.0	53.5	CW	E	1.080	PF	2	0.006	0.008	0.006	0.5	0.007	0.004	0.000
Trunk	HAE4011A, 450 MHz - 470 MHz	5.65	NA	450.0125	54.0	52.4	CW	E	1.060	PF	2	0.099	0.102	0.071	0.5	0.096	0.048	0.050
Trunk	HAE4011A, 450 MHz - 470 MHz	5.65	NA	460.0000	54.0	53.3	CW	E	1.070	PF	2	0.119	0.150	0.083	0.5	0.125	0.063	0.060
Trunk	HAE4011A, 450 MHz - 470 MHz	5.65	NA	469.9875	54.0	53.5	CW	E	1.080	PF	2	0.119	0.132	0.061	0.5	0.112	0.056	0.060
Trunk	HAE6013A, 380 MHz - 470 MHz	4.15	NA	450.0125	54.0	52.4	CW	E	1.060	PF	2	0.265	0.129	0.307	0.5	0.248	0.124	0.130
Trunk	HAE6013A, 380 MHz - 470 MHz	4.15	NA	460.0000	54.0	53.3	CW	E	1.070	PF	2	0.185	0.156	0.221	0.5	0.200	0.100	0.100
Trunk	HAE6013A, 380 MHz - 470 MHz	4.15	NA	469.9875	54.0	53.5	CW	E	1.080	PF	2	0.142	0.133	0.130	0.5	0.145	0.073	0.070
Trunk	HAE6031A, 380-520MHz	4.15	NA	450.0125	54.0	52.4	CW	E	1.060	PF	2	0.156	0.251	0.207	0.5	0.217	0.109	0.110
Trunk	HAE6031A, 380-520MHz	4.15	NA	469.9875	54.0	53.5	CW	E	1.080	PF	2	0.125	0.184	0.117	0.5	0.153	0.076	0.080
Trunk	HAE6031A, 380-520MHz	4.15	NA	482.5000	54.0	53.8	CW	E	1.090	PF	2	0.130	0.258	0.232	0.5	0.225	0.112	0.110
Trunk	HAE6031A, 380-520MHz	4.15	NA	496.5000	48.0	41.3	CW	E	1.100	PF	2	0.064	0.099	0.084	0.5	0.091	0.045	0.050
Trunk	HAE6031A, 380-520MHz	4.15	NA	511.9875	48.0	41.4	CW	E	1.100	PF	2	0.091	0.162	0.076	0.5	0.121	0.060	0.070
Trunk	HAE6031A, 380-520MHz	4.15	NA	519.9875	30.0	29.9	CW	E	1.100	PF	2	0.105	0.153	0.039	0.5	0.109	0.055	0.050
Trunk	RAE4016ARB, 494 MHz - 512MHz	7.15	NA	494.9875	48.0	41.0	CW	E	1.100	PF	2	0.025	0.066	0.065	0.5	0.057	0.029	0.030
Trunk	RAE4016ARB, 494 MHz - 512MHz	7.15	NA	503.0000	48.0	41.5	CW	E	1.100	PF	2	0.040	0.067	0.069	0.5	0.065	0.032	0.040

MPE calculations are defined in section 15.0.

Table D.2 (Continued)
MPE measurement data for Passenger

D.U.T. Info.								Probe Info.		(5) Test Pos.	(6) Meas. Unit				DUT Max. TX Factor	Avg. over Body (mW/ cm2)	Calc. P.D. (mW/ cm2)	Max Calc. P.D. (mW/ cm2)
(2) Ant Loc.	Ant. Model/ Desc.	Ant. Gain (dBi)	Ant. Meas. Dist. (cm)	Tx Freq (MHz)	(3) Max Pwr (W)	Initial Pwr (W)	Test Mode	E/H Field	(4) Probe Cal. Factor		MPE Measurements							
												Head/ Top 1/3	Chest/ Middle 1/3	Lower Trunk/ Bottom 1/3				
Trunk	RAE4016ARB, 494 MHz - 512MHz	7.15	NA	511.9875	48.0	41.4	CW	E	1.100	PF	2	0.030	0.045	0.047	0.5	0.045	0.022	0.030
Trunk	RAE4014ARB, 445 - 470 MHz	7.15	NA	450.0125	54.0	52.4	CW	E	1.060	PF	2	0.100	0.040	0.078	0.5	0.077	0.039	0.040
Trunk	RAE4014ARB, 445 - 470 MHz	7.15	NA	460.0000	54.0	53.3	CW	E	1.070	PF	2	0.079	0.045	0.084	0.5	0.074	0.037	0.040
Trunk	RAE4014ARB, 445 - 470 MHz	7.15	NA	469.9875	54.0	53.5	CW	E	1.080	PF	2	0.081	0.064	0.063	0.5	0.075	0.037	0.040

MPE calculations are defined in section 15.0.

Table D.3
LMR UHF2 MPE Results for FCC

Note:

Blue fonts: Frequencies not regulated by FCC.

Pmax (W)	54	P initial (W)											
	48	FCC Limit (mW/cm ²)											
	30	52.4	53.3	53.5	53.8	47.1	47.5	47.8	47.6	29.9			
		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4			
Test Pos	Angle	Trunk/ Roof	E/H Field	Antenna no.	f1	f2	f3	f4	f5	f6	f7	f8	f9
BS	0	Roof	E	1	450.0125	460.0000	469.9875	482.5000	494.9875	496.5000	503.0000	511.9875	519.9875
BS	0	Roof	E	2	0.105	0.113	0.094						
BS	0	Roof	E	3	0.049	0.076	0.055						
BS	0	Roof	E	4	0.087	0.109	0.092						
BS	0	Roof	E	5	0.056		0.097	0.105		0.073		0.075	
BS	0	Roof	E	6	0.106		0.099	0.1		0.091		0.091	0.05
BS	0	Roof	E	7	0.052	0.069	0.056						
BS	0	Roof	E	2					0.06		0.063	0.061	
BS	0	Trunk	E	2	0.083	0.12	0.108						
BS	0	Trunk	E	3	0.142	0.149	0.159						
BS	0	Trunk	E	5	0.141		0.168	0.155		0.125		0.106	0.11
BS	45	Trunk	E	5			0.175						
BS	90	Trunk	E	5			0.116						
BS	0	Trunk	E	6	0.085	0.104	0.109						
BS	0	Trunk	E	7					0.073		0.069	0.087	
PB	0	Roof	E	1	0.043	0.043	0.043						
PB	0	Roof	E	2	0.004	0.005	0.006						
PB	0	Roof	E	3	0.049	0.051	0.047						
PB	0	Roof	E	4	0.039		0.034	0.05		0.016		0.013	
PB	0	Roof	E	5	0.049		0.054	0.053		0.025		0.017	0.012
PB	0	Roof	E	6	0.004	0.011	0.008						
PB	0	Roof	E	7					0.003		0.004	0.003	
PB	0	Trunk	E	2	0.123	0.155	0.129						
PB	0	Trunk	E	3	0.272	0.244	0.274						
PB	0	Trunk	E	5	0.332		0.31	0.336		0.255		0.266	0.233
PB	0	Trunk	E	6	0.059	0.105	0.133						
PB	0	Trunk	E	7					0.044		0.08	0.085	
PF	0	Roof	E	1	0.024	0.018	0.02						
PF	0	Roof	E	2	0.003	0.002	0.003						
PF	0	Roof	E	3	0.019	0.021	0.026						
PF	0	Roof	E	4	0.015		0.019	0.023		0.014		0.021	
PF	0	Roof	E	5	0.015		0.031	0.022		0.023		0.021	0.012
PF	0	Roof	E	6	0.003	0.002	0.004						
PF	0	Roof	E	7					0.003		0.005	0.005	
PF	0	Trunk	E	2	0.05	0.064	0.057						
PF	0	Trunk	E	3	0.128	0.101	0.073						
PF	0	Trunk	E	5	0.112		0.077	0.113		0.064		0.085	0.055
PF	0	Trunk	E	6	0.04	0.038	0.038						
PF	0	Trunk	E	7					0.057		0.049	0.057	

Table D.5
LMR UHF2 MPE Variability Test (FCC)

Note:

Bystander measurement at initial mounting location
Bystander measurement at 10cm antenna offset from initial mounting location

Trunk / Roof	Test Post.	E/H Field	Antenna Model	Max Pwr (W)	Initial Pwr (W)	Tx Freq (MHz)	Max Calc. P.D. (mW/cm ²)	FCC Limit	% To FCC Spec Limit	MPE Variability (%)
Trunk	BS (0 Degree)	E	HAE6013A, 380-470MHz	54.0	53.5	469.9875	0.16	0.31	50.7	
					53.5	469.9875	0.14	0.31	44.0	-13.20
	BS (0 Degree)	E	HAE6031A, 380-520MHz	54.0	53.5	469.9875	0.17	0.31	53.6	
					53.5	469.9875	0.15	0.31	48.4	-9.70
	BS (45 Degree)	E	HAE6031A, 380-520MHz	54.0	53.5	469.9875	0.18	0.31	56.0	
					53.5	469.9875	0.16	0.31	51.2	-8.57