

 MOTOROLA SOLUTIONS	    MS ISO/IEC 17025 TESTING SAMM No. 0826 CERTIFICATE 2518.05																						
DECLARATION OF COMPLIANCE: MPE ASSESSMENT Report																							
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: 08/04/2022 Report Revision: B																						
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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 Health Canada Safety Code 6 (2015). Limits of Human Exposure to Radio frequency Electromagnetic Energy in the Frequency Range from 3 kHz 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: 8/9/2022																							

Document Revision History

Date	Revision	Comments
04/10/2022	A	Initial release
08/04/2022	B	Update the Model Name

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1.0 Introduction

This report details the Maximum Permissible Exposure (MPE) test results for the system comprising the APX 6500 8/900 mobile radio and the vehicle-mounted LTE data modem.

2.0 FCC MPE Summary

Table 1

Devices		Passenger	Bystander
		Percentage of the General Population/ Uncontrolled MPE Limit (%)	Percentage of the General Population/ Uncontrolled MPE Limit (%)
Mobile Radio	APX6500 8/900MHz	40.7 %	21.7 %
Data Modem	VML750	5.0 %	4.4%
	GX450	5.1%	4.6%
	MP70	3.0%	2.6%
	MG90	2.6 %	2.3%
	RV55	2.6%	2.3%
Simultaneous (Highest Combined Percentage of Limit)		45.8 %	26.3 %

3.0 Abbreviations / Definitions

BT: Bluetooth

EME: Electromagnetic Energy

MPE: Maximum Permissible Exposure

LMR: Land Mobile Radio

LTE: Long Term Evolution

WLAN: Wireless Local Area Network

WWAN: Wireless Wide Area Network

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.
- Institute of Electrical and Electronics Engineers (IEEE) C95.1-2019, where applicable.
- 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). Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields (up to 300 GHz), 1998, where applicable.
- 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.

5.0 Power Density Limits

Table 2 – Occupational / Controlled Exposure Limits

Frequency Range (MHz)	FCC OET Bulletin 65 / 47CFR § 1.1310	ICNIRP	IEEE C95.1 2019	RSS-102 Issue 5 2015
	mW/cm ²	W/m ²	W/m ²	W/m ²
10 – 20				10.0
20 – 48				$44.72 / f^{0.5}$
30 – 300	1.0			
48 – 100				6.455
10 – 400		10.0		
100 – 400			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 / 47CFR § 1.1310	ICNIRP	IEEE C95.1 2019	RSS-102 Issue 5 2015
	mW/cm ²	W/m ²	W/m ²	W/m ²
400 – 2,000		f/40	f/40	
1,500 – 100,000	5.0			
2,000 – 300,000		50.0	50.0	
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 / 47CFR § 1.1310	ICNIRP	IEEE C95.1 2019	RSS-102 Issue 5 2015
	mW/cm ²	W/m 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				
100 – 400			2.0	
300 – 1,500	f/1,500			
300 – 6000				$0.02619 f^{0.6834}$
400 – 2,000		f/200	f/200	
1,500 – 100,000	1.0			
2,000 – 300,000		10.0	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 Product and System Description

APX 6500 8/900MHz mobile radio connected to a broadband 2G/3G/4G cellular networks using the Data Modem Tethering feature. This feature allows the APX 6500 8/900MHz mobile radio to offload data to cellular or public safety broadband network. The Table below summarizes the technologies supported by the system comprising the APX 6500 8/900MHz mobile radio and LTE Data Modems.

Table 4

Devices		Technologies
Mobile	APX 6500	LMR (8/900MHz band), WLAN 2.4 GHz, WLAN 5 GHz, Bluetooth
Data Modem	VML750	WWAN, WLAN 2.4 GHz
	GX450	WWAN, WLAN 2.4 GHz
	MP70	WWAN, WLAN 2.4 GHz, WLAN 5GHz
	MG90	WWAN, WLAN 2.4 GHz, WLAN 5GHz, Bluetooth
	RV55	WWAN, WLAN 2.4 GHz, WLAN 5GHz, Bluetooth

In this application, the APX 6500 8/900MHz mobile radio can be paired and simultaneously transmit with any one of the Data Modems. Table 5 lists the simultaneous transmission conditions.

Table 5 – Simultaneous transmission conditions

Simultaneous transmission conditions	Mobile	Data Modem				
	APX 6500 8/900MHz	VML750	GX450	MP70	MG90	RV55
APX 6500 + VML750	x	x				
APX 6500 + GX450	x		x			
APX 6500 + MP70	x			x		
APX 6500 + MG90	x				x	
APX 6500 + RV55	x					x

The system will be sold to employers, such as public safety agencies, e.g. police, fire and emergency medical agencies, and used by employees solely for work-related functions.

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

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

7.0 MPE Test Results

7.1 MPE Test Results for the APX 6500 Mobile Radio

MPE measurements were performed with the mobile radio installed in the test vehicle, at the specified distances and test locations indicated in the APX 6500 mobile vehicle report with 60 cm test distance from antennas for bystander configurations, and 85 cm from trunk-mount antennas for back-seat passenger configurations.

Table 6 summarizes the highest MPE levels for bystander and passenger configurations, expressed in percentage of the applicable General Population/Uncontrolled MPE limit, on file with FCC, US and ISED, Canada.

Designator	Highest Percentage of the General Population/Uncontrolled MPE Limit	
	Passenger	Bystander
FCC US	40.7 %	21.7 %
ISED Canada	85.9 %	45.5 %

7.2 MPE Test Results for Data Modem

MPE calculations were carried out to determine the peak power density for these lower power transmitters. 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 (1) is generally accurate in far-field of an antenna, while it may overestimate the power density in the radiating near-field since the formula implies a diverging power density approaching the point source.

$$S = \frac{P_t G}{4\pi d^2} \quad (1)$$

In Eq. (1):
 S = power density
 P_t = maximum output power scaled by the maximum duty cycle of the signal
 G = antenna gain in the direction of interest relative to an isotropic radiator
 d = distance from the antenna

Equation (1) accounts for the maximum duty cycle of the signal, and the factor, F, to provide a conservative power density prediction per FCC OET Bulletin 65, Edition 97-01 1997.

The Data Modem operates as a system together with the APX 6500 mobile radio, refer to Appendix B for antennas location and distance.

Regarding the passenger exposure:

- The distance between the APX 6500 8/900MHz antenna location on the trunk lid and the back seat passengers must be at least 85 cm. Therefore, MPE testing is conducted with the antenna installed on the trunk at 85 cm from back seat passengers head rests.
- The WWAN antennas locations are at the peripheral corners of the trunk, maintaining a separation distance no less than 85 cm from the back seat passengers, thus the 85 cm distance is assumed for conservative MPE calculations of back seat passenger exposure.

Regarding the bystanders exposure, the Safety Manual of the APX 6500 8/900MHz mobile radio requires minimum 60 cm lateral distance of bystanders from the vehicle body. Conservative MPE calculations of bystander exposure were conducted assuming 60 cm distance from antennas rather than the vehicle body.

Table 8 summarizes the highest MPE levels for bystander and passenger configurations, expressed in percentage of the applicable MPE limit, for each data modem. Refer to Appendix A for detail MPE calculations for each data modem.

Table 8

Designator	Data Modem	Highest Percentage of the General Population/Uncontrolled MPE Limit	
		Passenger	Bystander
FCC US	VML750	5.0 %	4.4%
	GX450	5.1%	4.6%
	MP70	3.0%	2.6%
	MG90	2.6 %	2.3%
	RV55	2.6%	2.3%
ISED Canada	GX450	10%	8.8%
	MP70	5.5%	4.9%
	MG90	5.2%	4.6%
	RV55	5.2%	4.6%

Note: Data modem VML750 not offered in Canada.

7.3 Simultaneous Transmission for Mobile APX 6500 and Data Modem

Per KDB 447498 D01, the simultaneous transmission MPE test exclusion applies when the sum of MPE ratios (i.e., the percentages of the respective MPE limits) for all simultaneous transmitters in a host device is ≤ 1.0 , according to calculated/estimated, numerically modeled, or measured squared field strengths or power density.

The APX 6500 mobile radio can simultaneously transmit with the associated Data Modem. Therefore, the highest combined exposure (sum of the MPE ratios, expressed in percentages of unit) for simultaneous transmission is reported in Table 9 below:

Table 9

Designator	Simultaneous Transmission Scenario	Highest Combined Percentage of the General Population/Uncontrolled MPE Limit	
		Passenger	Bystander
FCC US	APX 6500 + VML750	45.7 %	26.1 %
	APX 6500 + GX450	45.8 %	26.3 %
	APX 6500 + MP70	43.7 %	24.3 %
	APX 6500 + MG90	43.3 %	24.0 %
	APX 6500 + RV55	43.3 %	24.0 %
ISED Canada	APX 6500 + GX450	95.9 %	54.3 %
	APX 6500 + MP70	91.4 %	50.4 %
	APX 6500 + MG90	91.1 %	50.1 %
	APX 6500 + RV55	91.1 %	50.1 %

These combined results demonstrate compliance to the FCC US and ISED Canada General Population/Uncontrolled MPE limits. Consequently, compliance with the corresponding Occupational/Controlled MPE limits, which are higher, is also demonstrated.

8.0 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 60 cm from the vehicle Body.

Appendix A – Data Modems MPE calculation

Appendix A.1 - MPE Calculation for Data Modem (VML750)

VML750 Motorola Solutions LTE Vehicle Modem (FCC ID: AZ492FT7058) consists of WWAN modules (module LM63S with FCC ID: 2AAGMLM63S1, module MC7354 with FCC ID: N7NMC7355), and WLAN transmitters. VML750 offered with Motorola antennas AN000036A01 (WLAN), FTN7686A and FTN0073A (WWAN), the antennas gain listed in the table for each given frequency band and operating mode.

The MPE evaluation here considers sum of simultaneous transmission of WWAN and WLAN transmitters.

Sum of simultaneous transmission of (% To FCC Limit):

a) Bystander

$$= \text{Max (WWAN \% to FCC Limit)} + \text{Max (WLAN \% to FCC Limit)}$$

$$= 3.9\% + 0.5\% = 4.4\%$$

b) Passenger

$$= \text{Max (WWAN \% to FCC Limit)} + \text{Max (WLAN \% to FCC Limit)}$$

$$= 4.4\% + 0.6\% = 5.0\%$$

Bystander

Operating Mode	Transmit Frequency Range (MHz)		Max Power (dBm)	Max Power (W)	Duty Cycle (%)	Antenna Gain (dBi)	EIRP (W)	Dist., d (cm)	Max Calc. MPE (mW/cm²)	MPE Spec Limit (mW/cm2)	
	Start	Stop								FCC Limit	% To FCC Spec Limit
Module LM63S1 (FCC ID: 2AAGMLM63S1)											
LTE Band 13	777	787	24	0.25	100%	5	0.79	90	0.008	0.52	1.50
LTE Band 4	1710	1755	24	0.25	100%	6	1	90	0.01	1.00	1.00
LTE Band 14	788	798	24	0.25	100%	5	0.79	90	0.008	0.53	1.50
Module MC7354 (FCC ID: N7NMC7355)											
LTE Band 17	704	716	23.4	0.22	100%	9	1.75	90	0.017	0.47	3.70
LTE Band 13	777	787	23.6	0.23	100%	5	0.72	90	0.007	0.52	1.40
LTE Band 2	1850	1910	23.5	0.22	100%	3	0.45	90	0.004	1.00	0.40
EVDO BC10	816	832	24.4	0.28	100%	6.5	1.23	90	0.012	0.54	2.20
GPRS 850	824	849	32.9	1.96	25%	6.5	2.19	90	0.021	0.55	3.90
LTE Band 5	824	849	23.6	0.23	100%	6.5	1.02	90	0.01	0.55	1.80
LTE Band 25	1810	1915	23.4	0.22	100%	3	0.44	90	0.004	1.00	0.40
3G BC2	1850	1910	23.1	0.21	100%	3	0.41	90	0.004	1.00	0.40
3G BC5	824	849	23.4	0.22	100%	6.5	0.97	90	0.01	0.55	1.70
EVDO BC0	824	849	24.4	0.28	100%	6.5	1.23	90	0.012	0.55	2.20
EDGE 850	824	849	26.3	0.43	37.50%	6.5	0.72	90	0.007	0.55	1.30
LTE Band 4	1710	1755	23.5	0.23	100%	6	0.9	90	0.009	1.00	0.90
3G BC4	1710	1755	23.5	0.22	100%	6	0.88	90	0.009	1.00	0.90
EVDO BC1	1850	1910	24.4	0.28	100%	3	0.55	90	0.005	1.00	0.50
EDGE 1900	1850	1910	25.9	0.39	37.50%	3	0.29	90	0.003	1.00	0.30
GPRS 1900	1850	1910	30.6	1.16	25%	3	0.58	90	0.006	1.00	0.60
Baseline WLAN											
2.4 GHz	2400	2500	17.0	0.05	100%	10.00	0.50	90	0.005	1.00	0.50

Passenger

Operating Mode	Transmit Frequency Range (MHz)		Max Power (dBm)	Max Power (W)	Duty Cycle (%)	Antenna Gain (dBi)	EIRP (W)	Dist., d (cm)	Max Calc. MPE (mW/cm ²)	MPE Spec Limit (mW/cm2)	
	Start	Stop								FCC Limit	% To FCC Spec Limit
Module LM63S1 (FCC ID: 2AAGMLM63S1)											
LTE Band 13	777	787	24	0.25	100%	5	0.79	85	0.009	0.52	1.7
LTE Band 4	1710	1755	24	0.25	100%	6	1	85	0.011	1.00	1.1
LTE Band 14	788	798	24	0.25	100%	5	0.79	85	0.009	0.53	1.7
Module MC7354 (FCC ID: N7NMC7355)											
LTE Band 17	704	716	23.4	0.22	100%	9	1.75	85	0.019	0.47	4.1
LTE Band 13	777	787	23.6	0.23	100%	5	0.72	85	0.008	0.52	1.5
LTE Band 2	1850	1910	23.5	0.22	100%	3	0.45	85	0.005	1.00	0.5
EVDO BC10	816	832	24.4	0.28	100%	6.5	1.23	85	0.014	0.54	2.5
GPRS 850	824	849	32.9	1.96	25%	6.5	2.19	85	0.024	0.55	4.4
LTE Band 5	824	849	23.6	0.23	100%	6.5	1.02	85	0.011	0.55	2.0
LTE Band 25	1810	1915	23.4	0.22	100%	3	0.44	85	0.005	1.00	0.5
3G BC2	1850	1910	23.1	0.21	100%	3	0.41	85	0.005	1.00	0.5
3G BC5	824	849	23.4	0.22	100%	6.5	0.97	85	0.011	0.55	1.9
EVDO BC0	824	849	24.4	0.28	100%	6.5	1.23	85	0.014	0.55	2.5
EDGE 850	824	849	26.3	0.43	37.50%	6.5	0.72	85	0.008	0.55	1.4
LTE Band 4	1710	1755	23.5	0.23	100%	6	0.9	85	0.010	1.00	1.0
3G BC4	1710	1755	23.5	0.22	100%	6	0.88	85	0.010	1.00	1.0
EVDO BC1	1850	1910	24.4	0.28	100%	3	0.55	85	0.006	1.00	0.6
EDGE 1900	1850	1910	25.9	0.39	37.50%	3	0.29	85	0.003	1.00	0.3
GPRS 1900	1850	1910	30.6	1.16	25%	3	0.58	85	0.006	1.00	0.6
Baseline WLAN											
2.4 GHz	2400	2500	17.0	0.05	100%	10.00	0.50	85	0.006	1.00	0.6

Appendix A.2 - MPE Calculation for Data Modem (GX450)

GX450 Sierra Wireless Mobile Gateway contains WWAN module (FCC ID: N7NMC7355) and WLAN (FCC ID: N7NEC4501). Reference to MPE evaluation for WWAN module (FCC ID: N7NMC7355), when WWAN module transmitting simultaneously with WLAN transmitters, the antenna gains shall not exceed the limit listed in the table for each given frequency band and operating mode.

The MPE evaluation here considers sum of simultaneous transmission of WWAN and WLAN transmitters.

Sum of simultaneous transmission of (% To FCC Limit):**a) Bystander**

$$\begin{aligned} &= \text{Max (WWAN \% to FCC Limit)} + \text{Max (WLAN \% to FCC Limit)} \\ &= 2.1\% + 2.5\% = 4.6\% \end{aligned}$$

b) Passenger

$$\begin{aligned} &= \text{Max (WWAN \% to FCC Limit)} + \text{Max (WLAN \% to FCC Limit)} \\ &= 2.3\% + 2.8\% = 5.1\% \end{aligned}$$

Sum of simultaneous transmission of (% To ISED Limit):**a) Bystander**

$$\begin{aligned} &= \text{Max (WWAN \% to ISED Limit)} + \text{Max (WLAN \% to ISED Limit)} \\ &= 4.2\% + 4.6\% = 8.8\% \end{aligned}$$

b) Passenger

$$\begin{aligned} &= \text{Max (WWAN \% to ISED Limit)} + \text{Max (WLAN \% to ISED Limit)} \\ &= 4.8\% + 5.2\% = 10\% \end{aligned}$$

Operating Mode	Transmit Frequency Range (MHz)		Max Power (dBm)	Max Power (W)	Duty Cycle (%)	Antenna Gain (dBi)	EIRP (W)	Dist., d (cm)	Max Calc. MPE (mW/cm ²)	MPE Spec Limit (mW/cm2)			
	Start	Stop								FCC Limit	% To FCC Spec Limit	ISED Limit	% To ISED Spec Limit
WWAN Module (FCC ID: N7NMC7355)													
GPRS 2 UL	824	849	33.0	2.00	25.0%	3.00	1.00	90	0.010	0.55	1.80	0.26	3.80
EDGE 2 UL	824	849	28.0	0.63	25.0%	3.00	0.31	90	0.003	0.55	0.60	0.26	1.20
EDGE 3 UL	824	849	26.2	0.42	37.5%	3.00	0.31	90	0.003	0.55	0.60	0.26	1.20
EDGE 4 UL	824	849	25.0	0.32	50.0%	3.00	0.32	90	0.003	0.55	0.60	0.26	1.20
GPRS 2 UL	1850	1910	30.0	1.00	25.0%	3.00	0.50	90	0.005	1.00	0.50	0.45	1.10
EDGE 2 UL	1850	1910	27.0	0.50	25.0%	3.00	0.25	90	0.002	1.00	0.20	0.45	0.50
EDGE 3 UL	1850	1910	25.2	0.33	37.5%	3.00	0.25	90	0.002	1.00	0.20	0.45	0.50
EDGE 4 UL	1850	1910	24.0	0.25	50.0%	3.00	0.25	90	0.002	1.00	0.20	0.45	0.50
CDMA BC0	824	849	25.0	0.32	100.0%	3.00	0.63	90	0.006	0.55	1.10	0.26	2.40
CDMA BC1	1850	1910	25.0	0.32	100.0%	3.00	0.63	90	0.006	1.00	0.60	0.45	1.40
CDMA BC10	817	824	25.0	0.32	100.0%	3.00	0.63	90	0.006	0.54	1.10	0.26	2.40
UMTS Band 5	824	849	24.0	0.25	100.0%	3.00	0.50	90	0.005	0.55	0.90	0.26	1.90
UMTS Band 4	1710	1755	24.0	0.25	100.0%	6.00	1.00	90	0.010	1.00	1.00	0.42	2.30
UMTS Band 2	1850	1910	24.0	0.25	100.0%	3.00	0.50	90	0.005	1.00	0.50	0.45	1.10
LTE Band 17	704	716	24.0	0.25	100.0%	6.00	1.00	90	0.010	0.47	2.10	0.23	4.20
LTE Band 13	777	787	24.0	0.25	100.0%	6.00	1.00	90	0.010	0.52	1.90	0.25	4.00
LTE Band 5	824	849	24.0	0.25	100.0%	3.00	0.50	90	0.005	0.55	0.90	0.26	1.90
LTE Band 4	1710	1755	24.0	0.25	100.0%	6.00	1.00	90	0.010	1.00	1.00	0.42	2.30
LTE Band 2	1850	1910	24.0	0.25	100.0%	3.00	0.50	90	0.005	1.00	0.50	0.45	1.10
LTE Band 25	1850	1915	24.0	0.25	100.0%	3.00	0.50	90	0.005	1.00	0.50	0.45	1.10
WLAN (FCC ID: N7NEC4501)													
2.4 GHz	2400	2500	29.0	0.79	100.0%	5.00	2.51	90	0.025	1.00	2.50	0.53	4.60

Passenger

Operating Mode	Transmit	Max	Max	Duty	Antenna	EIRP	Dist.,	Max Calc.	MPE Spec Limit (mW/cm ²)
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	Frequency Range (MHz)		Power (dBm)	Power (W)	Cycle (%)	Gain (dBi)	(W)	d (cm)	MPE (mW/cm²)				
	Start	Stop								FCC Limit	% To FCC Spec Limit	ISED Limit	% To ISED Spec Limit
WWAN Module (FCC ID: N7NMC7355)													
GPRS 2 UL	824	849	33.0	2.00	25.0%	3.00	1.00	85	0.011	0.55	2.0	0.26	4.3
EDGE 2 UL	824	849	28.0	0.63	25.0%	3.00	0.31	85	0.003	0.55	0.6	0.26	1.3
EDGE 3 UL	824	849	26.2	0.42	37.5%	3.00	0.31	85	0.003	0.55	0.6	0.26	1.3
EDGE 4 UL	824	849	25.0	0.32	50.0%	3.00	0.32	85	0.003	0.55	0.6	0.26	1.3
GPRSGPRS 2 UL	1850	1910	30.0	1.00	25.0%	3.00	0.50	85	0.005	1.00	0.5	0.45	1.2
EDGE 2 UL	1850	1910	27.0	0.50	25.0%	3.00	0.25	85	0.003	1.00	0.3	0.45	0.6
EDGE 3 UL	1850	1910	25.2	0.33	37.5%	3.00	0.25	85	0.003	1.00	0.3	0.45	0.6
EDGE 4 UL	1850	1910	24.0	0.25	50.0%	3.00	0.25	85	0.003	1.00	0.3	0.45	0.6
CDMA BC0	824	849	25.0	0.32	100.0%	3.00	0.63	85	0.007	0.55	1.3	0.26	2.7
CDMA BC1	1850	1910	25.0	0.32	100.0%	3.00	0.63	85	0.007	1.00	0.7	0.45	1.6
CDMA BC10	817	824	25.0	0.32	100.0%	3.00	0.63	85	0.007	0.54	1.3	0.26	2.7
UMTS Band 5	824	849	24.0	0.25	100.0%	3.00	0.50	85	0.006	0.55	1.0	0.26	2.1
UMTS Band 4	1710	1755	24.0	0.25	100.0%	6.00	1.00	85	0.011	1.00	1.1	0.42	2.6
UMTS Band 2	1850	1910	24.0	0.25	100.0%	3.00	0.50	85	0.006	1.00	0.6	0.45	1.2
LTE Band 17	704	716	24.0	0.25	100.0%	6.00	1.00	85	0.011	0.47	2.3	0.23	4.8
LTE Band 13	777	787	24.0	0.25	100.0%	6.00	1.00	85	0.011	0.52	2.1	0.25	4.5
LTE Band 5	824	849	24.0	0.25	100.0%	3.00	0.50	85	0.006	0.55	1.0	0.26	2.1
LTE Band 4	1710	1755	24.0	0.25	100.0%	6.00	1.00	85	0.011	1.00	1.1	0.42	2.6
LTE Band 2	1850	1910	24.0	0.25	100.0%	3.00	0.50	85	0.006	1.00	0.6	0.45	1.2
LTE Band 25	1850	1915	24.0	0.25	100.0%	3.00	0.50	85	0.006	1.00	0.6	0.45	1.2
WLAN (FCC ID: N7NEC4501)													
2.4 GHz	2400	2500	29.0	0.79	100.0%	5.00	2.51	85	0.028	1.00	2.8	0.53	5.2

Appendix A.3 - MPE Calculation for Data Modem (MP70)

MP70 Sierra Wireless High performance Vehicle Router contains WWAN module (FCC ID: N7NMC7455) and WLAN module (FCC ID: TK4WLE900VX). Reference to MPE evaluation for WWAN module (FCC ID: N7NMC7455), when WWAN module transmitting simultaneously with WLAN transmitters, the antenna gains and EIRP shall not exceed the limit listed in the table for each given frequency band and operating mode.

The MPE evaluation here considers sum of simultaneous transmission of WWAN and WLAN transmitters.

Sum of simultaneous transmission of (% To FCC Limit):

a) Bystander

$$\begin{aligned} &= \text{Max (WWAN \% to FCC Limit)} + \text{Max (WLAN \% to FCC Limit)} \\ &= 2.1\% + 0.5\% = 2.6\% \end{aligned}$$

b) Passenger

$$\begin{aligned} &= \text{Max (WWAN \% to FCC Limit)} + \text{Max (WLAN \% to FCC Limit)} \\ &= 2.4\% + 0.6\% = 3.0\% \end{aligned}$$

Sum of simultaneous transmission of (% To ISED Limit):

a) Bystander

$$\begin{aligned} &= \text{Max (WWAN \% to ISED Limit)} + \text{Max (WLAN \% to ISED Limit)} \\ &= 4.3\% + 0.6\% = 4.9\% \end{aligned}$$

b) Passenger

$$\begin{aligned} &= \text{Max (WWAN \% to ISED Limit)} + \text{Max (WLAN \% to ISED Limit)} \\ &= 4.8\% + 0.7\% = 5.5\% \end{aligned}$$

Bystander

Operating Mode	Transmit Frequency Range (MHz)		Max Power (dBm)	Max Power (W)	Duty Cycle (%)	Antenna Gain (dBi)	EIRP (W)	Dist., d (cm)	Max Calc. MPE (mW/cm ²)	MPE Spec Limit (mW/cm2)			
	Start	Stop								FCC Limit	% To FCC Spec Limit	ISED Limit	% To ISED Spec Limit
WWAN Module (FCC ID: N7NMC7455)													
WCDMA Band II / LTE Band 2	1850	1910	24.0	0.25	100%	6.00	1.00	90	0.010	1.00	1.00	0.45	2.20
WCDMA Band IV / LTE Band 4	1710	1755	24.0	0.25	100%	6.00	1.00	90	0.010	1.00	1.00	0.42	2.30
WCDMA Band V / LTE Band 5	824	849	24.0	0.25	100%	6.00	1.00	90	0.010	0.55	1.80	0.26	3.80
LTE Band 7	2500	2570	23.0	0.20	100%	9.00	1.58	90	0.016	1.00	1.60	0.55	2.80
LTE Band 12	699	716	24.0	0.25	100%	6.00	1.00	90	0.010	0.47	2.10	0.23	4.30
LTE Band 13	777	787	24.0	0.25	100%	6.00	1.00	90	0.010	0.52	1.90	0.25	4.00
LTE Band 25	1850	1915	24.0	0.25	100%	6.00	1.00	90	0.010	1.00	1.00	0.45	2.20
LTE Band 26	814	849	24.0	0.25	100%	6.00	1.00	90	0.010	0.54	1.80	0.26	3.80
LTE Band 30	2305	2315	23.0	0.20	100%	1.00	0.25	90	0.002	1.00	0.20	0.52	0.50
LTE Band 41	2496	2690	23.0	0.20	100%	9.00	1.58	90	0.016	1.00	1.60	0.55	2.80
WLAN module (FCC ID: TK4WLE900VX)													
2.4 GHz	2400	2500					0.32	90	0.003	1.00	0.30	0.53	0.60
5 GHz	5150	5850					0.50	90	0.005	1.00	0.50	0.90	0.50

Passenger

Operating Mode	Transmit Frequency Range (MHz)		Max Power (dBm)	Max Power (W)	Duty Cycle (%)	Antenna Gain (dBi)	EIRP (W)	Dist., d (cm)	Max Calc. MPE (mW/cm ²)	MPE Spec Limit (mW/cm2)			
	Start	Stop								FCC Limit	% To FCC Spec Limit	ISED Limit	% To ISED Spec Limit
WWAN Module (FCC ID: N7NMC7455)													
WCDMA Band II / LTE Band 2	1850	1910	24.0	0.25	100%	6.00	1.00	85	0.011	1.00	1.1	0.45	2.5
WCDMA Band IV / LTE Band 4	1710	1755	24.0	0.25	100%	6.00	1.00	85	0.011	1.00	1.1	0.42	2.6
WCDMA Band V / LTE Band 5	824	849	24.0	0.25	100%	6.00	1.00	85	0.011	0.55	2.0	0.26	4.3
LTE Band 7	2500	2570	23.0	0.20	100%	9.00	1.58	85	0.017	1.00	1.7	0.55	3.2
LTE Band 12	699	716	24.0	0.25	100%	6.00	1.00	85	0.011	0.47	2.4	0.23	4.8
LTE Band 13	777	787	24.0	0.25	100%	6.00	1.00	85	0.011	0.52	2.1	0.25	4.5
LTE Band 25	1850	1915	24.0	0.25	100%	6.00	1.00	85	0.011	1.00	1.1	0.45	2.5
LTE Band 26	814	849	24.0	0.25	100%	6.00	1.00	85	0.011	0.54	2.0	0.26	4.3
LTE Band 30	2305	2315	23.0	0.20	100%	1.00	0.25	85	0.003	1.00	0.3	0.52	0.5
LTE Band 41	2496	2690	23.0	0.20	100%	9.00	1.58	85	0.017	1.00	1.7	0.55	3.2
WLAN module (FCC ID: TK4WLE900VX)													
2.4 GHz	2400	2500					0.32	85	0.003	1.00	0.3	0.53	0.7
5 GHz	5150	5850					0.50	85	0.006	1.00	0.6	0.90	0.6

Appendix A.4 - MPE Calculation for Data Modem (MG90)

MG90 Sierra Wireless High performance Multi-Network Vehicle Router contains WWAN module (FCC ID: N7NEM75S), WLAN module (FCC ID: TK4WLE900VX) and BT module (FCC ID: T7V1316). Reference to MPE evaluation for WWAN module (FCC ID: N7NEM75S), when WWAN module transmitting simultaneously with WLAN and Bluetooth transmitters, the antenna gains and EIRP shall not exceed the limit listed in the table for each given frequency band and operating mode.

The MPE evaluation here considers sum of simultaneous transmission of WWAN, WLAN and Bluetooth transmitters.

Sum of simultaneous transmission of (% To FCC Limit):

c) Bystander

$$= \text{Max (WWAN \% to FCC Limit)} + \text{Max (WLAN \% to FCC Limit)} + \text{Max (BT \% to FCC Limit)}$$

$$= 1.3\% + 1.0\% + 0.0\% = 2.3\%$$

d) Passenger

$$= \text{Max (WWAN \% to FCC Limit)} + \text{Max (WLAN \% to FCC Limit)} + \text{Max (BT \% to FCC Limit)}$$

$$= 1.5\% + 1.1\% + 0.0\% = 2.6\%$$

Sum of simultaneous transmission of (% To ISED Limit):

c) Bystander

$$= \text{Max (WWAN \% to ISED Limit)} + \text{Max (WLAN \% to ISED Limit)} + \text{Max (BT \% to ISED Limit)}$$

$$= 2.7\% + 1.8\% + 0.1\% = 4.6\%$$

d) Passenger

$$= \text{Max (WWAN \% to ISED Limit)} + \text{Max (WLAN \% to ISED Limit)} + \text{Max (BT \% to ISED Limit)}$$

$$= 3.0\% + 2.1\% + 0.1\% = 5.2\%$$

Bystander

Operating Mode	Transmit Frequency Range (MHz)		Max Power (dBm)	Max Power (W)	Duty Cycle (%)	Antenna Gain (dBi)	EIRP (W)	Dist., d (cm)	Max Calc. MPE (mW/cm ²)	MPE Spec Limit (mW/cm2)			
	Start	Stop								FCC Limit	% To FCC Spec Limit	ISED Limit	% To ISED Spec Limit
WWAN Module (FCC ID: N7NEM75)													
WCDMA Band II / LTE Band 2	1850	1910	24.0	0.25	100%	4.00	0.63	90	0.006	1.00	0.60	0.45	1.40
WCDMA Band IV / LTE Band 4	1710	1755	24.0	0.25	100%	4.00	0.63	90	0.006	1.00	0.60	0.42	1.50
LTE Band 66	1710	1780	24.0	0.25	100%	4.00	0.63	90	0.006	1.00	0.60	0.42	1.50
LTE Band 30	2305	2315	23.0	0.20	100%	1.00	0.25	90	0.002	1.00	0.20	0.52	0.50
LTE Band 41	2496	2690	23.8	0.24	100%	4.00	0.60	90	0.006	1.00	0.60	0.55	1.10
LTE Band 7	2500	2570	23.8	0.24	100%	4.00	0.60	90	0.006	1.00	0.60	0.55	1.10
LTE Band 48	3550	3700	23.0	0.20	100%	0.00	0.20	90	0.002	1.00	0.20	0.70	0.30
WCDMA Band V / LTE Band 5	824	849	24.0	0.25	100%	4.00	0.63	90	0.006	0.55	1.10	0.26	2.40
LTE Band 12	699	716	24.0	0.25	100%	4.00	0.63	90	0.006	0.47	1.30	0.23	2.70
LTE Band 13	777	787	24.0	0.25	100%	4.00	0.63	90	0.006	0.52	1.20	0.25	2.50
LTE Band 26	814	849	24.0	0.25	100%	4.00	0.63	90	0.006	0.54	1.10	0.26	2.40
LTE Band 14	788	798	24.0	0.25	100%	0.00	0.25	90	0.002	0.53	0.50	0.25	1.00
WLAN module (FCC ID: TK4WLE900VX)													
2.4 GHz	2400	2500					1.00	90	0.010	1.00	1.00	0.53	1.80
5 GHz	5150	5850					1.00	90	0.010	1.00	1.00	0.90	1.10
BT module (FCC ID: T7V1316)													
BT	2400	2500					0.04	90	0.000	1.00	0.00	0.53	0.10

Passenger

Operating Mode	Transmit Frequency Range (MHz)		Max Power (dBm)	Max Power (W)	Duty Cycle (%)	Antenna Gain (dBi)	EIRP (W)	Dist., d (cm)	Max Calc. MPE (mW/cm ²)	MPE Spec Limit (mW/cm2)			
	Start	Stop								FCC Limit	% To FCC Spec Limit	ISED Limit	% To ISED Spec Limit
WWAN Module (FCC ID: N7NEM75)													
WCDMA Band II / LTE Band 2	1850	1910	24.0	0.25	100%	4.00	0.63	85	0.007	1.00	0.7	0.45	1.6
WCDMA Band IV / LTE Band 4	1710	1755	24.0	0.25	100%	4.00	0.63	85	0.007	1.00	0.7	0.42	1.6
LTE Band 66	1710	1780	24.0	0.25	100%	4.00	0.63	85	0.007	1.00	0.7	0.42	1.6
LTE Band 30	2305	2315	23.0	0.20	100%	1.00	0.25	85	0.003	1.00	0.3	0.52	0.5
LTE Band 41	2496	2690	23.8	0.24	100%	4.00	0.60	85	0.007	1.00	0.7	0.55	1.2
LTE Band 7	2500	2570	23.8	0.24	100%	4.00	0.60	85	0.007	1.00	0.7	0.55	1.2
LTE Band 48	3550	3700	23.0	0.20	100%	0.00	0.20	85	0.002	1.00	0.2	0.70	0.3
WCDMA Band V / LTE Band 5	824	849	24.0	0.25	100%	4.00	0.63	85	0.007	0.55	1.3	0.26	2.7
LTE Band 12	699	716	24.0	0.25	100%	4.00	0.63	85	0.007	0.47	1.5	0.23	3.0
LTE Band 13	777	787	24.0	0.25	100%	4.00	0.63	85	0.007	0.52	1.3	0.25	2.8
LTE Band 26	814	849	24.0	0.25	100%	4.00	0.63	85	0.007	0.54	1.3	0.26	2.7
LTE Band 14	788	798	24.0	0.25	100%	0.00	0.25	85	0.003	0.53	0.5	0.25	1.1
WLAN module (FCC ID: TK4WLE900VX)													
2.4 GHz	2400	2500					1.00	85	0.011	1.00	1.1	0.53	2.1
5 GHz	5150	5850					1.00	85	0.011	1.00	1.1	0.90	1.2
BT module (FCC ID: T7V1316)													
BT	2400	2500					0.04	85	0.0004	1.00	0.0	0.53	0.1

Appendix A.5 - MPE Calculation for Data Modem (RV55)

RV55 Sierra Wireless Rugged LTE-A Pro Router contains WWAN module (FCC ID: N7NEM75S), WLAN and Bluetooth module (FCC ID: N6C-SDPAC). Reference to MPE evaluation for WWAN module (FCC ID: N7NEM75S), when WWAN module transmitting simultaneously with WLAN and Bluetooth transmitters, the antenna gains and EIRP shall not exceed the limit listed in the table for each given frequency band and operating mode.

The MPE evaluation here considers sum of simultaneous transmission of WWAN, WLAN and Bluetooth transmitters.

Sum of simultaneous transmission of (% To FCC Limit):

a) Bystander

$$= \text{Max (WWAN \% to FCC Limit)} + \text{Max (WLAN \% to FCC Limit)} + \text{Max (BT \% to FCC Limit)}$$

$$= 1.3\% + 1.0\% + 0.0\% = 2.3\%$$

Passenger

$$= \text{Max (WWAN \% to FCC Limit)} + \text{Max (WLAN \% to FCC Limit)} + \text{Max (BT \% to FCC Limit)}$$

$$= 1.5\% + 1.1\% + 0.0\% = 2.6\%$$

Sum of simultaneous transmission of (% To ISED Limit):

a) Bystander

$$= \text{Max (WWAN \% to ISED Limit)} + \text{Max (WLAN \% to ISED Limit)} + \text{Max (BT \% to ISED Limit)}$$

$$= 2.7\% + 1.8\% + 0.1\% = 4.6\%$$

b) Passenger

$$= \text{Max (WWAN \% to ISED Limit)} + \text{Max (WLAN \% to ISED Limit)} + \text{Max (BT \% to ISED Limit)}$$

$$= 3.0\% + 2.1\% + 0.1\% = 5.2\%$$

Bystander

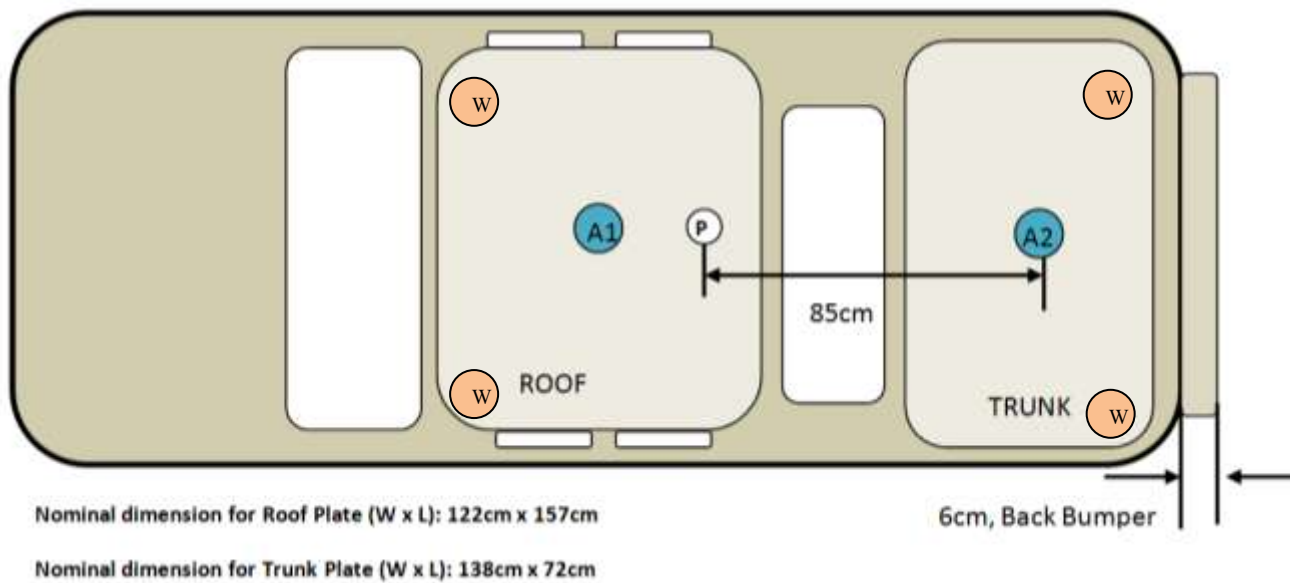
Operating Mode	Transmit Frequency Range (MHz)		Max Power (dBm)	Max Power (W)	Duty Cycle (%)	Antenna Gain (dBi)	EIRP (W)	Dist., d (cm)	Max Calc. MPE (mW/cm ²)	MPE Spec Limit (mW/cm2)			
	Start	Stop								FCC Limit	% To FCC Spec Limit	ISED Limit	% To ISED Spec Limit
WWAN Module (FCC ID: N7NEM75)													
WCDMA Band II / LTE Band 2	1850	1910	24.0	0.25	100%	4.00	0.63	90	0.006	1.00	0.60	0.45	1.40
WCDMA Band IV / LTE Band 4	1710	1755	24.0	0.25	100%	4.00	0.63	90	0.006	1.00	0.60	0.42	1.50
LTE Band 66	1710	1780	24.0	0.25	100%	4.00	0.63	90	0.006	1.00	0.60	0.42	1.50
LTE Band 30	2305	2315	23.0	0.20	100%	1.00	0.25	90	0.002	1.00	0.20	0.52	0.50
LTE Band 41	2496	2690	23.8	0.24	100%	4.00	0.60	90	0.006	1.00	0.60	0.55	1.10
LTE Band 7	2500	2570	23.8	0.24	100%	4.00	0.60	90	0.006	1.00	0.60	0.55	1.10
LTE Band 48	3550	3700	23.0	0.20	100%	0.00	0.20	90	0.002	1.00	0.20	0.70	0.30
WCDMA Band V / LTE Band 5	824	849	24.0	0.25	100%	4.00	0.63	90	0.006	0.55	1.10	0.26	2.40
LTE Band 12	699	716	24.0	0.25	100%	4.00	0.63	90	0.006	0.47	1.30	0.23	2.70
LTE Band 13	777	787	24.0	0.25	100%	4.00	0.63	90	0.006	0.52	1.20	0.25	2.50
LTE Band 26	814	849	24.0	0.25	100%	4.00	0.63	90	0.006	0.54	1.10	0.26	2.40
LTE Band 14	788	798	24.0	0.25	100%	0.00	0.25	90	0.002	0.53	0.50	0.25	1.00
WLAN & BT module (FCC ID: N6C-SDPAC)													
2.4 GHz	2400	2500					1.00	90	0.010	1.00	1.00	0.53	1.80
5 GHz	5150	5850					1.00	90	0.010	1.00	1.00	0.90	1.10
BT	2400	2500					0.04	90	0.000	1.00	0.00	0.53	0.10

Passenger

Operating Mode	Transmit Frequency Range (MHz)		Max Power (dBm)	Max Power (W)	Duty Cycle (%)	Antenna Gain (dBi)	EIRP (W)	Dist., d (cm)	Max Calc. MPE (mW/cm ²)	MPE Spec Limit (mW/cm2)			
	Start	Stop								FCC Limit	% To FCC Spec Limit	ISED Limit	% To ISED Spec Limit
WWAN Module (FCC ID: N7NEM75)													
WCDMA Band II / LTE Band 2	1850	1910	24.0	0.25	100%	4.00	0.63	85	0.007	1.00	0.7	0.45	1.6
WCDMA Band IV / LTE Band 4	1710	1755	24.0	0.25	100%	4.00	0.63	85	0.007	1.00	0.7	0.42	1.6
LTE Band 66	1710	1780	24.0	0.25	100%	4.00	0.63	85	0.007	1.00	0.7	0.42	1.6
LTE Band 30	2305	2315	23.0	0.20	100%	1.00	0.25	85	0.003	1.00	0.3	0.52	0.5
LTE Band 41	2496	2690	23.8	0.24	100%	4.00	0.60	85	0.007	1.00	0.7	0.55	1.2
LTE Band 7	2500	2570	23.8	0.24	100%	4.00	0.60	85	0.007	1.00	0.7	0.55	1.2
LTE Band 48	3550	3700	23.0	0.20	100%	0.00	0.20	85	0.002	1.00	0.2	0.70	0.3
WCDMA Band V / LTE Band 5	824	849	24.0	0.25	100%	4.00	0.63	85	0.007	0.55	1.3	0.26	2.7
LTE Band 12	699	716	24.0	0.25	100%	4.00	0.63	85	0.007	0.47	1.5	0.23	3.0
LTE Band 13	777	787	24.0	0.25	100%	4.00	0.63	85	0.007	0.52	1.3	0.25	2.8
LTE Band 26	814	849	24.0	0.25	100%	4.00	0.63	85	0.007	0.54	1.3	0.26	2.7
LTE Band 14	788	798	24.0	0.25	100%	0.00	0.25	85	0.003	0.53	0.5	0.25	1.1
WLAN & BT module (FCC ID: N6C-SDPAC)													
2.4 GHz	2400	2500					1.00	85	0.011	1.00	1.1	0.53	2.1
5 GHz	5150	5850					1.00	85	0.011	1.00	1.1	0.90	1.2
BT	2400	2500					0.04	85	0.0004	1.00	0.0	0.53	0.1

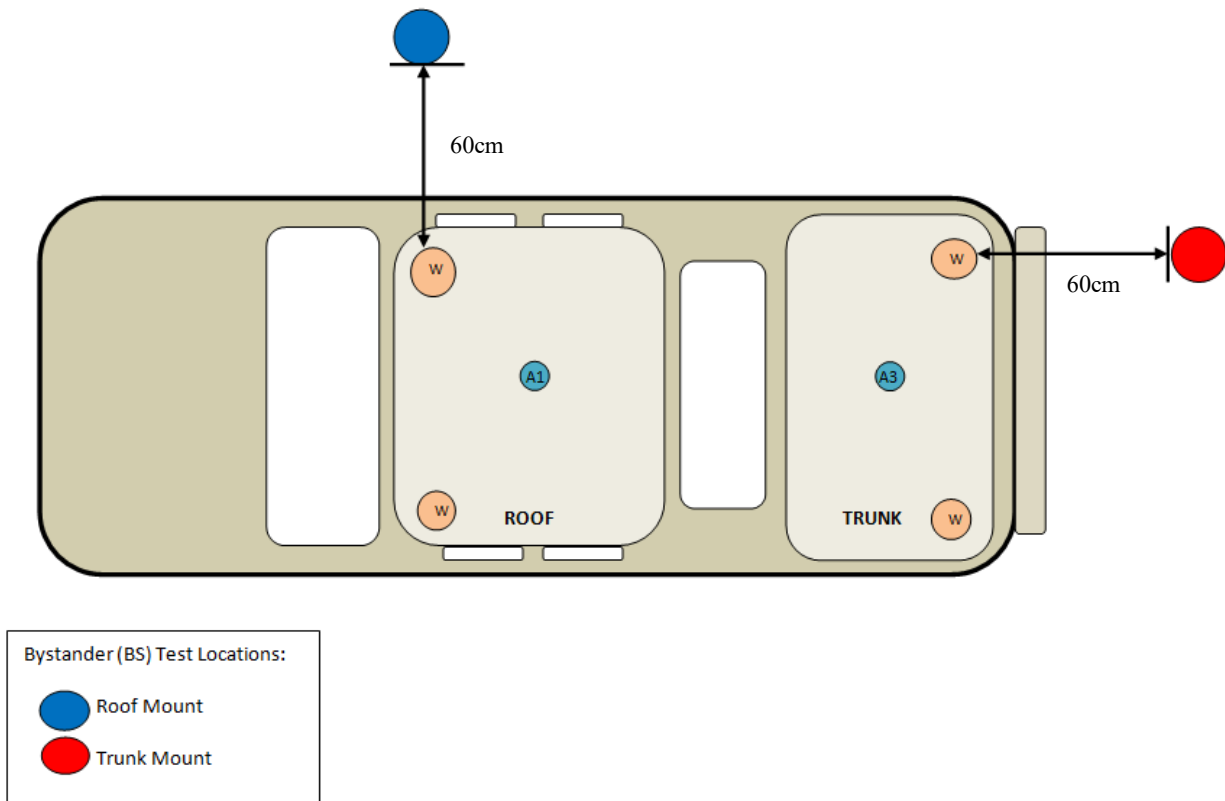
Appendix B – Antenna Locations, Test Distance

Passenger Antenna mounting



- 1.) Antenna location A1: APX 6500 mobile radio roof antenna mounting locations for front and back passenger testing
- 2.) Antenna location A2: APX 6500 mobile trunk antenna mounting locations for front and back passenger testing
- 3.) Minimum distance between trunk mount antenna and the head rests of the back seat passengers (P) is 85cm.
- 4.) Antenna locations W: Four total locations identified for BT/WLAN/WWAN antenna mounting. (if LMR antennas installed at trunk, BT/WLAN/WWAN antennas should be installed on the roof and vice versa).

Bystander Antenna mounting



- 1) Antenna location A1: APX 6500 mobile radio roof antenna mounting location.
- 2) Antenna location A3: APX 6500 mobile radio trunk antenna mounting location.
- 3) Antenna locations W: Four total locations identified for BT/WLAN/WWAN antenna mounting. (If LMR antennas installed at trunk, BT/WLAN/WWAN antennas should be installed on the roof and vice versa).