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Testing of

Electromagnetic Emissions

per

USA:	**CFR Title 47, Part 2.1091;2.1093**	(Exposure)
USA:	**CFR Title 47, Part 15.519**	(Emissions)
Canada:	**ISED RSS-220**	(Emissions)
Canada:	**ISED RSS-102**	(Exposure)

are herein reported for

Lear Corporation
SAT

Test Report No.: 20170330-RPTWAC0100056Ar2

Applicant/Provider:
Lear Corporation
21557 Telegraph Road Building 100, Southfield Michigan 48033 USA
Phone: +1 (248) 447-1357, Fax: +1 (248) 447-1683
Contact Person: Jason Summerford; jsummerford@lear.com

Data Recorded by: Dr. Joseph Brunett, EMC-002790-NE

Reviewed by: Dr. Joseph Brunett, EMC-002790-NE

Prepared by: Dr. Joseph Brunett, EMC-002790-NE

Date of Issue: March 31, 2017

Results of testing completed on (or before) March 30, 2017 are as follows.

Emissions: The transmitter intentional emissions **COMPLY** with the regulatory limit(s) by no less than 1.0 dB. Transmit chain spurious or harmonic emissions **COMPLY** by no less than 4.7 dB.

Revision History

Rev. No.	Date	Details	Revised By
r0	March 31, 2017	Initial Release.	J. Brunett
r1	April 23, 2017	Include Plots of GPS Restricted Band Data.	J. Brunett
r2	May 28, 2017	Include Additional Plots.	J. Brunett

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1 Test Report Scope and Limitations

1.1 Laboratory Authorization

Test Facility description and attenuation characteristics are on file with the FCC Laboratory, Columbia, Maryland (FCC Reg. No: 688478) and with ISED Canada, Ottawa, ON (File Ref. No: IC8719A-1 and IC22227-1).

1.2 Report Retention

For equipment verified to comply with the regulations herein, the manufacturer is obliged to retain this report with the product records for the life of the product, and no less than ten years. A copy of this Report will remain on file with this laboratory until March 2027.

1.3 Subcontracted Testing

This report does not contain data produced under subcontract.

1.4 Limitation of Results

The test results contained in this report relate only to the item(s) tested. Any electrical or mechanical modification made to the test item subsequent to the test date shall invalidate the data presented in this report. Any electrical or mechanical modification made to the test item subsequent to this test date shall require reevaluation.

1.5 Copyright

1.6 Endorsements

This report shall not be used to claim product endorsement by any accrediting, regulatory, or governmental agency.

1.7 Test Location

The EUT was fully tested by **Willow Run (WR) Test Labs, Inc.**, 7117 Fieldcrest Dr., Brighton, Michigan 48116 USA. Table 1 lists all sites employed herein. Specific test sites utilized are also listed in the test results sections of this report.

Table 1: Test Site List.

Description	Location	Quality Num.
OATS (3 meter)	8501 Beck Rd. Bldg 2227, Belleville MI 48111	OATSA

1.8 Traceability and Equipment Used

Pertinent test equipment used for measurements at this facility is listed in Table 2. The quality system employed at Willow Run (WR) Test Labs, Inc. has been established to ensure all equipment has a clearly identifiable classification, calibration expiry date, and that all calibrations are traceable to the SI through NIST, other recognized national laboratories, accepted fundamental or natural physical constants, ratio type of calibration, or by comparison to consensus standards.

Table 2: Equipment List.

Description	Manufacturer/Model	SN	Quality Num.	Last Cal By / Date Due
Spectrum Analyzer	Rohde & Schwarz / FSV30	101660	RSFSV30001	RS / May-2018
Spectrum Analyzer	Rohde & Schwarz / FSV4	101222	RSFSV4001	RS / Mar-2018
Spectrum Analyzer	Agilent / 7504A	MY45111009	SPAHWPK101	Techmaster / Nov-2017
Biconical	EMCO / 93110B	9802-3039	BICEMCO01	Lib. Labs / Aug-2017
Log Periodic Antenna	EMCO / 3146	9305-3614	LOGEMCO01	Lib. Labs / Aug-2017
Quad Ridge Horn	ETS Lind. / 3164-04	00066988	HRNQR316401	Lib. Labs / Aug-2017
Quad Ridge Horn	Singer / A6100	C35200	HQR2TO18S01	Lib. Labs / Aug-2017
K-Band Horn	JEF / NRL Std.	001	HRNK01	WRTL / Jul-2017
Harmonic Mixer	Hewlett Packard / 11970A	MY3003A1226	MIX26TO4001	Keysight / Mar-2019
Ka-Band Horn	JEF / NRL Std.	001	HRNKA001	WRTL / Jul-2017

2 Test Specifications and Procedures

2.1 Test Specification and General Procedures

The ultimate goal of Lear Corporation is to demonstrate that the Equipment Under Test (EUT) complies with the Rules and/or Directives below. Detailed in this report are the results of testing the Lear Corporation SAT for compliance to:

Country/Region	**Rules or Directive**	**Referenced Section(s)**
United States	Code of Federal Regulations	CFR Title 47, Part 15.519
Canada	ISED Canada	ISED RSS-220

It has been determined that the equipment under test is subject to the rules and directives above at the date of this testing. In conjunction with these rules and directives, the following specifications and procedures are followed herein to demonstrate compliance (in whole or in part) with these regulations.

ANSI C63.4:2014	"Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"
ANSI C63.10:2013 (USA)	"American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices"
CFR 47 2.1091/1093	"447498 D01 General RF Exposure Guidance v06: RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices"
ISED Canada	"The Measurement of Occupied Bandwidth"
ISED Canada RSS-102	"Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)"
ISED Canada SPR-002	"Supplementary Procedure for Assessing Compliance with RSS-102 Nerve Stimulation Exposure Limits."

3 Configuration and Identification of the Equipment Under Test

3.1 Description and Declarations

The equipment under test is an automotive UWB Transceiver. The EUT is approximately 4 x 4 x 1.5 cm in dimension, and is depicted in Figure 1. It is powered by 13.4 VDC vehicle power system. In use, this device is permanently installed in a motor vehicle. Table 3 outlines provider declared EUT specifications.

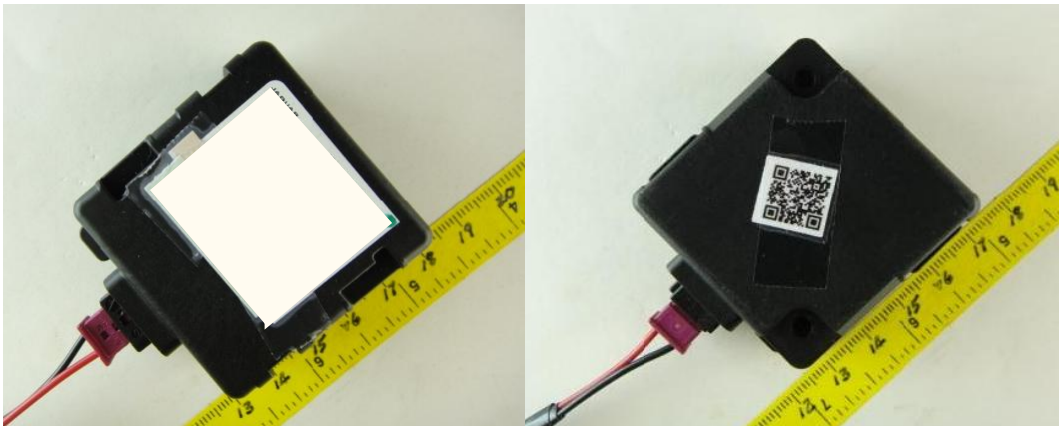


Figure 1: Photos of EUT.

Table 3: EUT Declarations.

General Declarations			
Equipment Type:	UWB Transceiver	**Country of Origin:**	Spain
Nominal Supply:	13.4 VDC	**Oper. Temp Range:**	-40^{o}C to $+85^{o}$C
Frequency Range:	$3615 - 4337$ MHz	**Antenna Dimension:**	3 cm
Antenna Type:	Integral	**Antenna Gain:**	Integral
Number of Channels:	1	**Channel Spacing:**	Not Applicable
Alignment Range:	Not Declared	**Type of Modulation:**	PPM
United States			
FCC ID Number:	KOBJXU18A	**Classification:**	UWB
Canada			
IC Number:	3521A-JXU18A	**Classification:**	Ultra-Wideband (UWB) Device

3.1.1 EUT Configuration

The EUT is configured for testing as depicted in Figure 2.

3.1.2 Modes of Operation

There is only a single mode of operation for this device, as a UWB transceiver used to triangulate position of a paired keyfob. In normal operation the EUT will only send a single PPM UWB frame as an acknowledgement response to a paired UWB keyfob. When paired in normal operation, only two UWB acknowledgements transmissions occur spaced approximately 20 ms apart due to remote manual activate inquiry by the keyfob

3.1.3 Variants

There is only a single variant of the EUT, as tested.

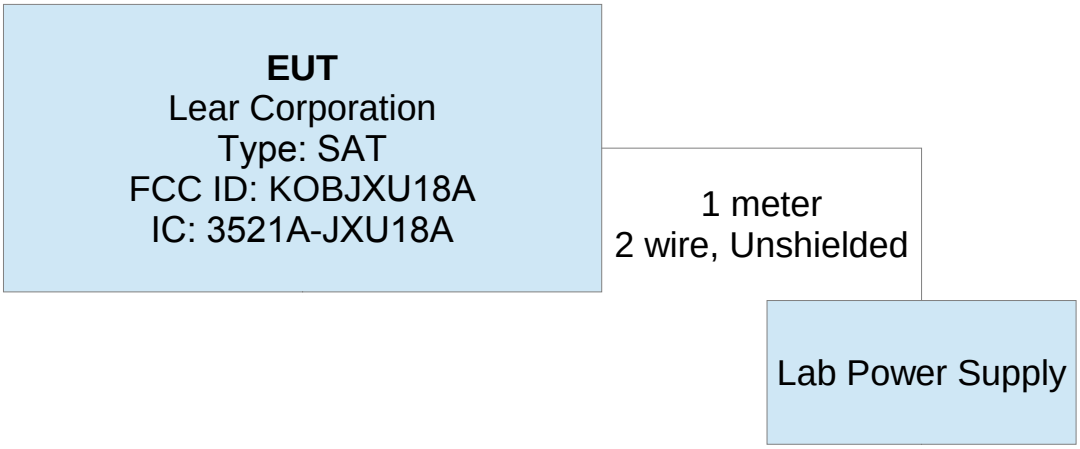


Figure 2: EUT Test Configuration Diagram.

3.1.4 Test Samples

Two samples of the EUT were provided for testing. One normal operating sample paired with a corresponding UWB keyfob for encoding testing, and one software modified sample that transmitted repeatedly at a higher than normal rate (once every 10 ms) when power is applied.

3.1.5 Functional Exerciser

EUT functionality was verified by observation of transmitted signal.

3.1.6 Modifications Made

There were no modifications made to the EUT by this laboratory.

3.1.7 Production Intent

The EUT appears to be a production ready sample.

3.1.8 Declared Exemptions and Additional Product Notes

The EUT is permanently installed in a transportation vehicle. As such, digital emissions are exempt from US and Canadian digital emissions regulations (per FCC 15.103(a) and IC correspondence on ICES-003).

4 Emissions

4.1 General Test Procedures

4.1.1 Radiated Test Setup and Procedures

Radiated electromagnetic emissions from the EUT are first pre-scanned in our shielded anechoic chamber or GTEM test cell. Spectrum and modulation characteristics of all emissions are recorded. Instrumentation, including spectrum analyzers and other test equipment as detailed in Section 1.7 are employed. After pre-scan, emission measurements are made on the test site of record. If the EUT connects to auxiliary equipment and is table or floor standing, the configurations prescribed in relevant test standards are followed. Alternatively, a layout closest to normal use (as declared by the provider) is employed if the resulting emissions appear to be worst-case in such a configuration. See Figure 3. All intentionally radiating elements that are not fixed-mounted in use are placed on the test table lying flat, on their side, and on their end (3-axes) and the resulting worst case emissions are recorded. If the EUT is fixed-mounted in use, measurements are made with the device oriented in the manner consistent with installation and then emissions are recorded.

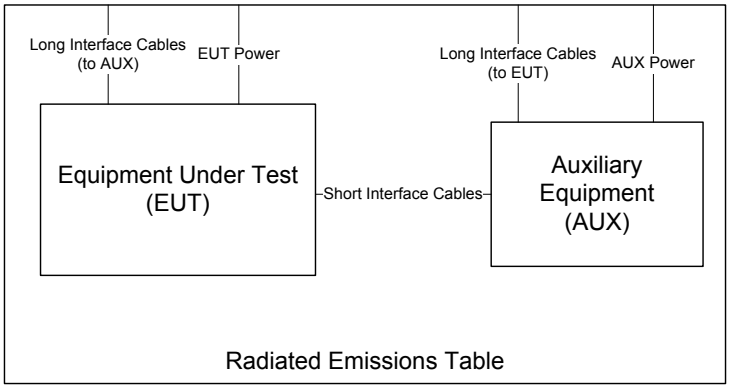


Figure 3: Radiated Emissions Diagram of the EUT.

If the EUT exhibits spurious emissions due to internal receiver circuitry, such emissions are measured with an appropriate carrier signal applied. For devices with intentional emissions below 30 MHz, a shielded loop antenna is used. It is placed at a 1 meter receive height. Emissions between 30 MHz and 1 GHz are measured using tuned dipoles and/or calibrated broadband antennas. For both horizontal and vertical polarizations, the test antenna is raised and lowered from 1 to 4 m in height until a maximum emission level is detected. The EUT is then rotated through 360^o in azimuth until the highest emission is detected. The test antenna is then raised and lowered one last time from 1 to 4 m and the worst case value is recorded. Emissions above 1 GHz are characterized using standard gain horn or broadband ridge-horn antennas on our OATS with a 4×5 m rectangle of H-4 absorber placed over the ground screen covering the OATS ground screen. Care is taken to ensure that test receiver resolution and video bandwidths meet the regulatory requirements, and that the emission bandwidth of the EUT is not reduced. Photographs of the test setup employed are depicted in Figure 4.

Where regulations allow for direct measurement of field strength, power values (dBm) measured on the test receiver / analyzer are converted to dBμV/m at the regulatory distance, using

$$E_{dist} = 107 + P_R + K_A - K_G + K_E - C_F$$

where P_R is the power recorded on spectrum analyzer, in dBm, K_A is the test antenna factor in dB/m, K_G is the combined pre-amplifier gain and cable loss in dB, K_E is duty correction factor (when applicable) in dB, and C_F is a distance conversion (employed only if limits are specified at alternate distance) in dB. This field strength value is then compared with the regulatory limit. If effective isotropic radiated power (EIRP) is computed, it is computed as

$$EIRP(dBm) = E_{3m}(dB\mu V/m) - 95.2.$$

When presenting data at each frequency, the highest measured emission under all possible EUT orientations (3-axes) is reported.

When microwave measurements are made at a range different than the regulatory distance or made at close-range to improve receiver sensitivity, the reading is corrected back to the regulatory distance. This is done using a 20 dB/decade field behavior as dictated by the test procedures. When measurements are made in the near-field, the near-field/far-field boundary (N/F) is reported. It is computed as

$$N/F = 2D^2/\lambda$$

where D is the maximum dimension of the transmitter or receive antenna, and λ is the wavelength at the measurement frequency. Typically for high frequency measurements the receive antenna is connected to test receiver / analyzer through an external mixer. In this case, cable loss, IF amplifier gain, and mixer conversion losses are corrected for in the data table, or directly in the spectrum analyzer.

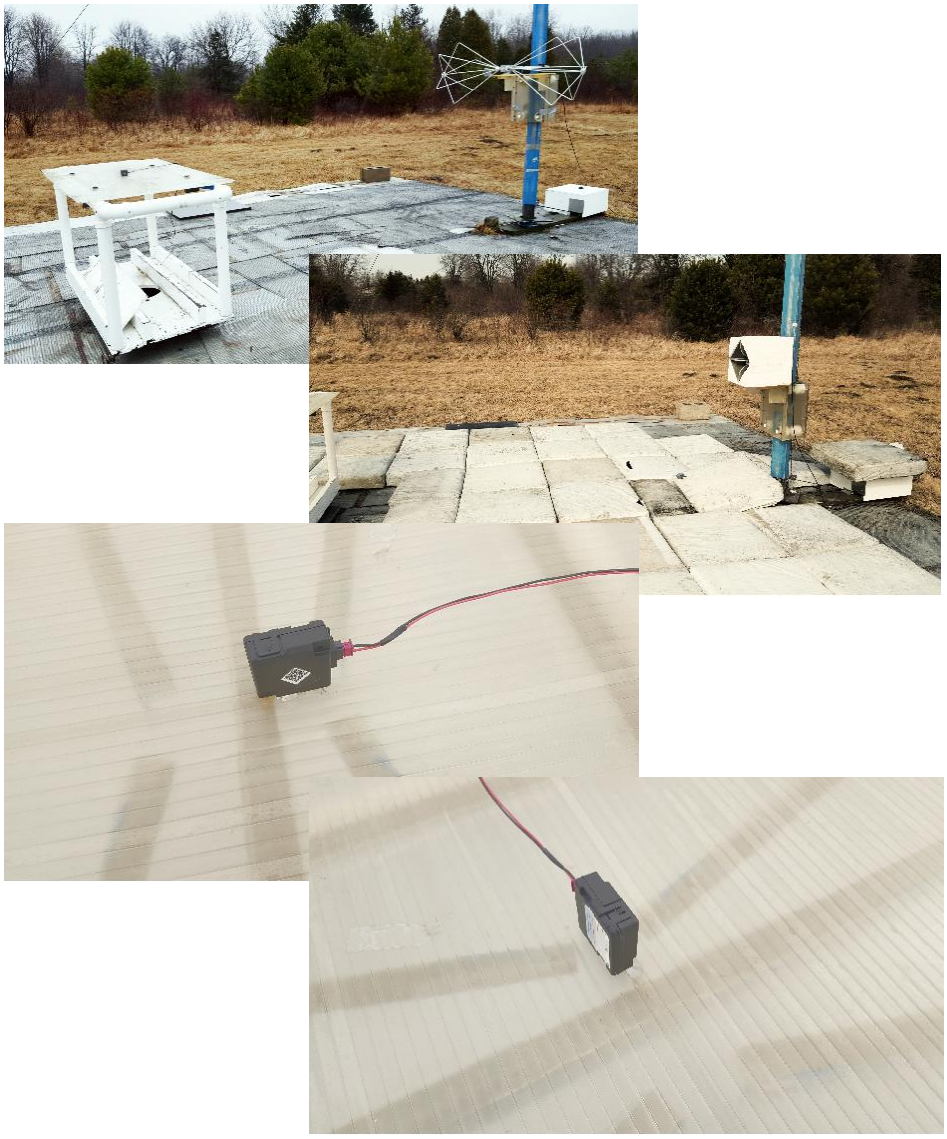


Figure 4: Radiated Emissions Test Setup Photograph(s).

4.1.2 Conducted Emissions Test Setup and Procedures

4.1.3 Power Supply Variation

Tests at extreme supply voltages are made if required by the the procedures specified in the test standard, and results of this testing are detailed in this report.

4.1.4 Thermal Variation

Tests at extreme temperatures were not performed for this device.

4.2 Intentional Emissions

4.2.1 Fundamental Emission Pulsed Operation

Test Setup & Procedure The test equipment and facilities were setup in accordance with the standards and procedures listed in Section 2.1. Environmental conditions were set at the appropriate temperature and thermal balance was checked with a thermocouple based probe. Duty cycle is measured using the maximum possible receiver IFBW for the purpose of computing RF exposure compliance and documenting the encoding employed by the EUT. The test equipment employed includes RSFSV30001, HRNQR316401.

Measurement Results The details and results of testing the EUT are summarized in Table 4. Plots showing the measurements made to obtain these values are provided in Figure 5.

Table 4: Fundamental Emission Pulsed Operation.

Frequency Range	**Det**	**IFBW**	**VBW**		
f > 1 000 MHz	Pk	28 MHz	28 MHz	**Test Date:**	23-Mar-17
				Test Engineer:	Joseph Brunett
				EUT	Normal Operating
				Meas. Distance:	60 cm

Pulsed Operation / Duty Cycle

Transmit Mode	Symbol Rate (Msym/s)	Data Rate* (Mbps)	Voltage (V)	Oper. Freq (MHz)	Min. Cycle Time (ms)	On-Time (ms)	Worst Case Duty Cycle (%)	Field Strength Duty Correction** (dB)	Exposure Duty Correction*** (dB)
PPM (Normal)	-	-	13.4	3993.6	20.80	0.32	1.548	36.2	18.1

** E-field duty cycle correction (due to burst-modulated carrier) computed as 20*Log(On-Time/ Min Cycle-Time). This duty is not applied in demonstrating compliance with the regulations.

*** Worst-case Exposure duty cycle correction (due to burst-modulated carrier) computed as 10*Log(On-Time/ Min Cycle-Time). Overestimate due to finite transmission length of only two frames in the actual paired use system.

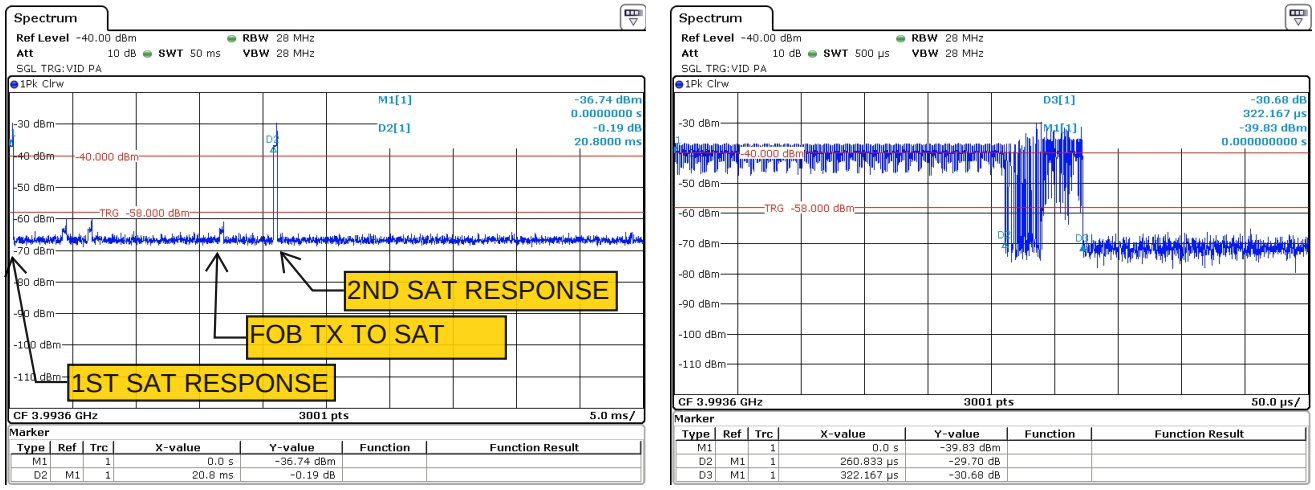


Figure 5: Fundamental Emission Pulsed Operation.

4.2.2 Fundamental Emission Bandwidth

Test Setup & Procedure The test equipment and facilities were setup in accordance with the standards and procedures listed in Section 2.1. Environmental conditions were set at the appropriate temperature and thermal balance was checked with a thermocouple based probe. Emission bandwidth (EBW) of the EUT is measured following the UWB measurement procedures in ANSI C63.10:2013/RSS-220. The test equipment employed includes RSFSV30001, HRNQR316401.

Measurement Results The details and results of testing the EUT are summarized in Table 5. Plots showing the measurements made to obtain these values are provided in Figure 6.

Table 5: Fundamental Emission Bandwidth.

Frequency Range	Det	IFBW	VBW	Span		
f > 1 000 MHz	Pk	1 MHz	3 MHz	1 GHz	**Test Date:**	23-Mar-17
					Test Engineer:	Joseph Brunett
					EUT	Normal Operating
					Meas. Distance:	60 cm

Occupied Bandwidth													
Transmit Mode	Symbol Rate (Msym/s)	Data Rate (Mbps)	Voltage (V)	Oper. Freq (MHz)	99% OBW (MHz)	10 dB EBW (MHz)	10 dB EBW Limit (MHz)	fL (MHz)	fL Limit (MHz)	fH (MHz)	fH Limit (MHz)	fmax (MHz)	Pass/Fail
Normal PPM	-	-	13.4	3993.6	799.7	721.4	500.0	3615.4	3100.0	4336.8	10600.0	3837.7	Pass

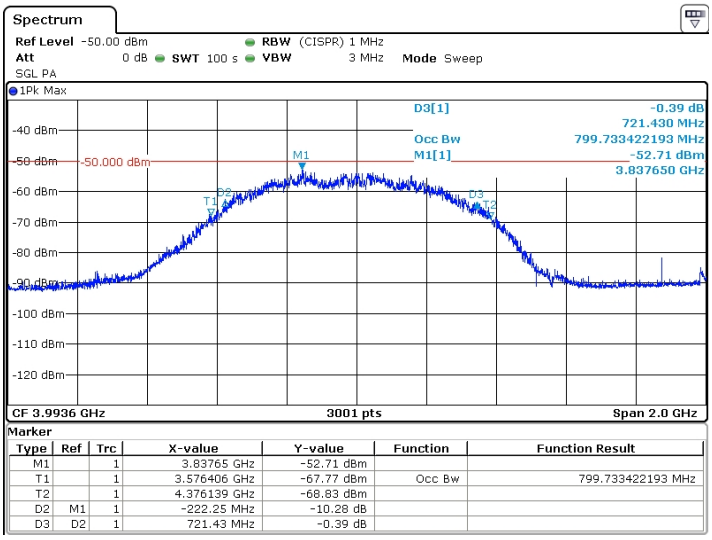


Figure 6: Fundamental Emission Bandwidth.

4.2.3 Fundamental Emission Field Strength

Test Setup & Procedure The test equipment and facilities were setup in accordance with the standards and procedures listed in Section 2.1. Environmental conditions were set at the appropriate temperature and thermal balance was checked with a thermocouple based probe. The fundamental emission is measured at the regulatory distance on our OATS following the UWB measurement procedures in ANSI C63.10:2013/RSS-220. The test equipment employed includes RSFSV30001, HRNQR316401.

Measurement Results The details and results of testing the EUT are summarized in Table 6.

Table 6: Fundamental Emission Field Strength.

Frequency Range	Det	IF Bandwidth	Video Bandwidth	Test Date:	22-Mar-17
f > 1 000 MHz	Pk/RMS	1 MHz	3 MHz	Test Engineer:	Joseph Brunett
				EUT:	LEAR SAT
				Mode:	10ms Rep Pulses
				Meas. Distance:	3m

FCC/IC

	RX BW		Frequency Band		Antenna + Cable***					Rx. Power		Range Correction*				E-Field @ DR		EIRP**						
	IFBW	VBW	Start	Stop	Quality	Pol.	Dim.	Ka	Kg	Pk	RMS	MR	DR	N/F	CF	Pk	RMS	Pk	RMS	50 MHz Pk Lim	FCC RMS Lim.	ISED RMS Lim.	Pass	
#	(MHz)	(MHz)	MHz	MHz	Number	H/V	cm	dB/m	dB	dBuV/m		m	m	m	dB	dBuV/m		dBm		dBm	dBm	dBm	dB	Comments
1	- PEAK Power (Pk Detector, 1 GHz Span, 1001 Freq Samples, 1 sec sweep, Max-Held)																							
2	28	28.0	3837.0	3837.0	HRNQR316401	H/V	22.0	40.1	17.3			3.0	3.0	1.2	0.0	85.3								
3	50	50.0	3837.0	3837.0	HRNQR316401	H/V	22.0	40.1	17.3			3.0	3.0	1.2	0.0			-4.9		.0			**4.9**	max all
4																								
5	- RMS Power (RMS Detector, 1 GHz Span, 1001 Freq Samples, 1 sec sweep, Max Held)																							
6	20	13.4	3837.0	3837.0	HRNQR316401	H/V	22.0	40.1	17.3			3.0	3.0	1.2	0.0		52.9		-42.3		-41.3	-41.3****	**1.0**	max all
7																								
	Env.		Frequency Band		Antenna + Cable***					Rx. Power		Range Correction*				E-Field @ DR		EIRP**						
	Temp.	Volt.	Start	Stop	Quality	Pol.	Dim.	Ka	Kg	Pk	RMS	MR	DR	N/F	CF	Pk	RMS	Pk	RMS	50 MHz Pk Lim	FCC RMS Lim.	ISED RMS Lim.	Pass	
#	(C)	(V)	MHz	MHz	Number	H/V	cm	dB/m	dB	dBuV/m		m	m	m	dB	dBuV/m		dBm		dBm	dBm	dBm	dB	Comments
11	20	11.4	3837.0	3837.0	HRNQR316401	H/V	22.0	40.1	17.3			3.0	3.0	1.2	0.0	85.4								
12	20	13.4	3837.0	3837.0	HRNQR316401	H/V	22.0	40.1	17.3			3.0	3.0	1.2	0.0	85.3								
13	20	15.4	3837.0	3837.0	HRNQR316401	H/V	22.0	40.1	17.3			3.0	3.0	1.2	0.0	85.3								
14																								
15																								

* CF is computed assuming a 20 dB/decade Decay Rate. DR is the regulatory Desired Range measurement distance. MR is Measurement Range, which is reduced from DR to achieve necessary SNR.

** EIRP is computed from field strength at 3 meter distance.

*** Dimension of antenna is taken to be larger of the test antenna and the EUT antenna; EUT antenna is 3cm in dimension.

**** ISED Correspondence regarding this product was granted use at proposed avg power rating under RSS-220 Hand-Held Regulations. See correspondence included in this application.

Equipment Used: RSFSV30001

EIRP Peak (50 MHz) = EIRP Pk (28 MHz) + 20 Log10(50 Mhz / 28 MHz)

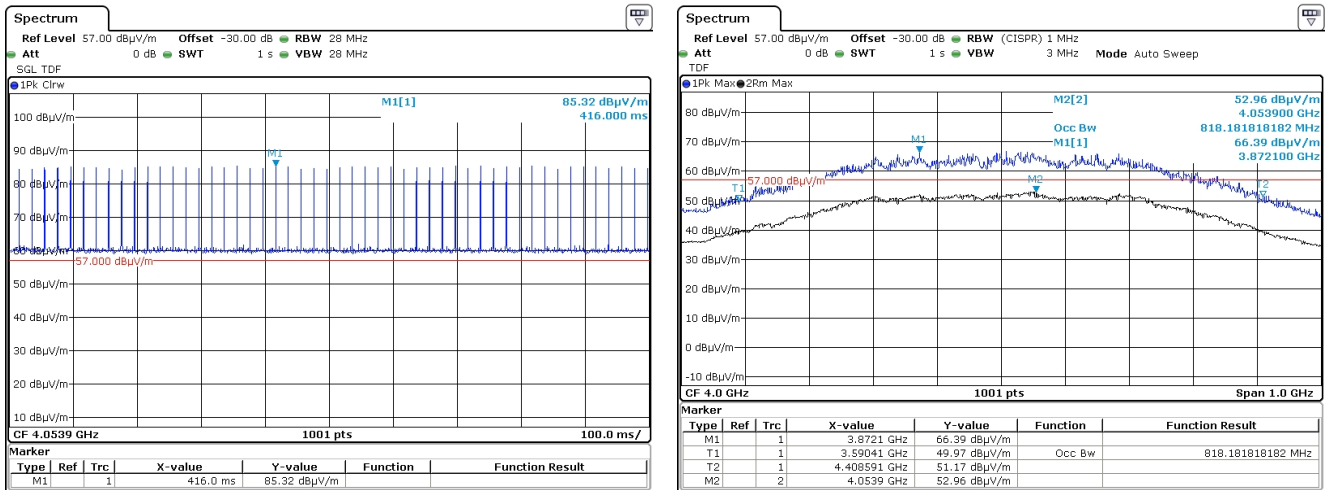


Figure 7: Fundamental Emission Example Plots

4.2.4 Exposure and Potential Health Hazard

To demonstrate compliance with with regulations that place limitations on human electromagnetic field exposure for both the general public and for workers, we compute EIRP from measured emission data. These levels are compared with limits placed by the directives and recommendations detailed in Section 2.1. Table 7 details the results of these computations.

Table 7: Electromagnetic Field Exposure.

USA REF: 1.1310, 2.1091/1093, 447498 D01 General RF Exposure Guidance v06
IC REF: RSS-102 Issue 5, Safety Code 6
Min. Sep. Distance: <5 mm (Portable)

Test Date: 22-Mar-17
Test Engineer: Joseph Brunett
EUT: LEAR SAT
EUT Mode: LEAR SAT
Meas. Distance: 3m

	Frequency Band		E-Field	EIRP	H-Field	Canada ISED RSS-102 MPE			USA FCC 1.1310 MPE		
Mode	Start MHz	Stop MHz	@ 3m (Avg) dBuV/m	(Avg) mW	@ MSP (Avg) dBuA/m	SC6 Limit @ MSP dBuV/m	SC6 Limit @ MSP dBuA/m	MPE Ratio	SAR Threshold	SAR Threshold Limit	Worst Case MPE Ratio
Other											
	Frequency Band		Pk EIRP + Duty	E-Field	Pwr Density	EIRP + Duty	EIRP			Minimum	
Mode	Start MHz	Stop MHz	(RMS) dBm	@20cm (RMS) dBuV/m	@20cm (RMS)* mW/cm2	(RMS) mW	Exemption Limit @ MSP mW	MPE Ratio	SAR Threshold	1g / 10g SAR Threshold Limit	MPE Ratio
UWB	3615.40	4336.83	-23.0	95.8	0.00000	0.00505	1.5	0.00337	0.00020	3	0.00007
IF SUM OF ALL MPE RATIOS IS > 1, THEN THE EUT MUST UNDERGO SAR TESTING PER FCC AND ISED (IC) REGULATIONS.							MPE RATIO Total (<1):	**.003**		MPE RATIO Total (<1):	**.000**
							REQUIRES SAR TESTING	No		REQUIRES SAR TESTING	No

* EIRP (mW) = S (mW/cm^2) x 4 x PI x 20cm^2

4.3 Unintentional Emissions

4.3.1 Transmit Chain Spurious Emissions

Test Setup & Procedure The test equipment and facilities were setup in accordance with the standards and procedures listed in Section 2.1. Environmental conditions were set at the appropriate temperature and thermal balance was checked with a thermocouple based probe. Spurious radiated emissions measurements are made following the UWB measurement procedures in ANSI C63.10:2013/RSS-220 up to 40 GHz. The test equipment employed includes RSFSV30001, BICEMCO01, LOGEMCO01, HRNQR316401, HQR2TO18S01, HRNK01, HRNKA01.

Measurement Results The details and results of testing the EUT are summarized in Table 8.

Table 8(a): Transmit Chain Spurious Emissions.

Frequency Range	Det	IF Bandwidth	Video Bandwidth		
F < 960 MHz	Pk/QPk	120 kHz	300 kHz	**Test Date:**	22-Mar-17
F > 960 MHz	RMS Detector: 1 GHz Span / 1001 Freq Samples; 1 sec sweep/GHz Span (i.e. 1ms RMS integration time per bin); Max Held			**Test Engineer:**	Joseph Brunett
	Pk Detector: 1 GHz Span / 1001 Freq Samples; 1 sec sweep/GHz Span (i.e. 1ms RMS integration time per bin); Max Held			**EUT:**	LEAR SAT
				Mode:	10ms Rep Pulses
				Meas. Distance:	As Noted

FCC/IC

	Env.		Frequency Band		Antenna + Cable***					Rx. Power		Range Correction*				E-Field @ DR*****				E-Field Limit			
	Temp.	Volt.	Start	Stop	Quality	Pol.	Dim.	Ka	Kg	Pk	RMS	MR	DR	N/F	CF	Pk	Qpk				Pk	Qpk	Pass
#	(C)	(V)	MHz	MHz	Number	H/V	cm	dB/m	dB	dBuV/m		m	m	m	dB	dBuV/m					dBuV/m		dB	Comments
1	20	13.4	30.0	88.0	BICEMCO01	H/V	22.0	16.9	35.0			3.0	3.0	0.0	0.0	31.2						40.0	8.8	background
2	20	13.4	88.0	216.0	BICEMCO01	H/V	22.0	16.9	35.0			3.0	3.0	0.1	0.0	34.7						43.5	8.8	background
3	20	13.4	216.0	960.0	LOGEMCO01	H/V	22.0	20.1	29.9			3.0	3.0	0.3	0.0	38.1						46.0	7.9	background
	Env.		Frequency Band		Antenna + Cable***					Rx. Power		Range Correction*				E-Field @ DR*****		EIRP**					
	Temp.	Volt.	Start	Stop	Quality	Pol.	Dim.	Ka	Kg	Pk	RMS	MR	DR	N/F	CF	Pk	Qpk	Pk	RMS	1MHz Pk Lim	FCC RMS Lim.	ISED RMS Lim.	Pass
#	(C)	(V)	MHz	MHz	Number	H/V	cm	dB/m	dB	dBuV/m		m	m	m	dB	dBuV/m		dBm		dBm	dBm	dBm	dB	Comments
4	GPS Restricted Band Emissions																							
5	20	13.4	1164.0	1240.0	HRNQR316401	H/V	22.0	25.2	-0.4			0.6	3.0	0.4	14.0	-3.2		-98.4			-85.3	-85.3	13.1	max all, noise
6	20	13.4	1559.0	1610.0	HRNQR316401	H/V	22.0	21.9	-0.4			0.6	3.0	0.5	14.0	-0.8		-96.0			-85.3	-85.3	10.7	max all, noise
7																								
8	Harmonic / Spurious UWB Emissions																							
9	20	13.4	960.0	1610.0	HRNQR316401	H/V	22.0	27.6	19.3			0.6	3.0	0.5	14.0	19.3	10.1	-75.9	-85.1	-34.0	-75.3	-75.3	9.8	max all, noise
10	20	13.4	1610.0	1990.0	HRNQR316401	H/V	22.0	21.7	19.1			0.6	3.0	0.6	14.0	24.5	14.4	-70.7	-80.8	-34.0	-63.3	-70.0	10.8	max all, noise
11	20	13.4	1990.0	3100.0	HRNQR316401	H/V	22.0	20.6	18.2			0.6	3.0	1.0	14.0	30.6	20.4	-64.6	-74.8	-34.0	-61.3	-70.0	4.8	max all, noise
12	20	13.4	3100.0	3615.0	HRNQR316401	H/V	22.0	27.4	18.0			0.6	3.0	1.2	14.0	54.9	42.9	-40.3	-52.3	-34.0	-41.3	-41.3****	6.3	max all
13	20	13.4	4337.0	4750.0	HRNQR316401	H/V	22.0	52.5	17.3			0.6	3.0	1.5	14.0	54.9	42.9	-40.3	-52.3	-34.0	-41.3	-41.3****	6.3	max all
14	20	13.4	4750.0	10600.0	HQR2TO18S01	H/V	15.0	35.3	29.1			0.6	3.0	1.6	14.0	23.2	13.5	-72.0	-81.7	-34.0	-41.3	-41.3	38.0	max all, noise
15	20	13.4	10600.0	18000.0	HQR2TO18S01	H/V	15.0	34.3	23.5			0.6	3.0	2.7	14.0	25.2	14.0	-70.0	-81.2	-34.0	-61.3	-61.3	19.9	max all, noise
16	20	13.4	18000.0	26500.0	HRNK001	H/V	10.2	33.7	36.5			0.3	3.0	1.8	20.0	33.7	24.1	-61.5	-71.1	-34.0	-61.3	-61.3	9.8	max all, noise
17	20	13.4	26500.0	40000.0	HRNKA001	H/V	9.2	37.2	12.5	39	28	0.2	3.0	2.3	23.5	40.2	29.2	-55.0	-66.0	-34.0	-61.3	-61.3	**4.7**	max all, noise
18																								

* CF is computed assuming a 20 dB/decade Decay Rate. DR is the regulatory Desired Range measurement distance. MR is Measurement Range, which is reduced from DR to achieve necessary SNR.

** EIRP is computed from field strength at 3 meter distance.

*** Dimension of antenna is taken to be larger of the test antenna and the EUT antenna; EUT antenna is 3cm in dimension.

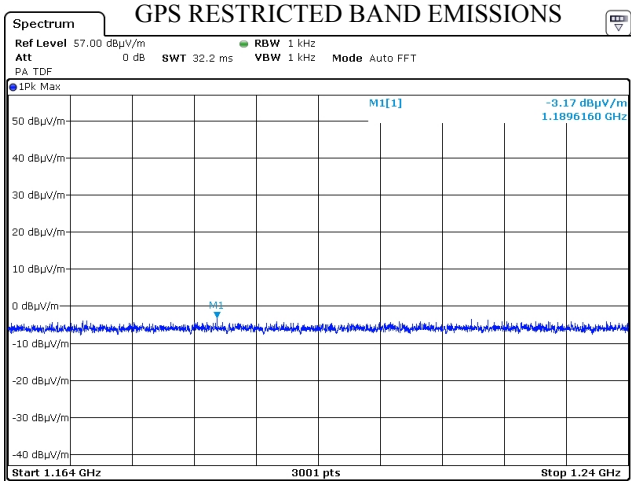
**** ISED Correspondence regarding this particular product permitted use at proposed power rating under RSS-220 Hand-Held Regulations. See correspondence included in this application.

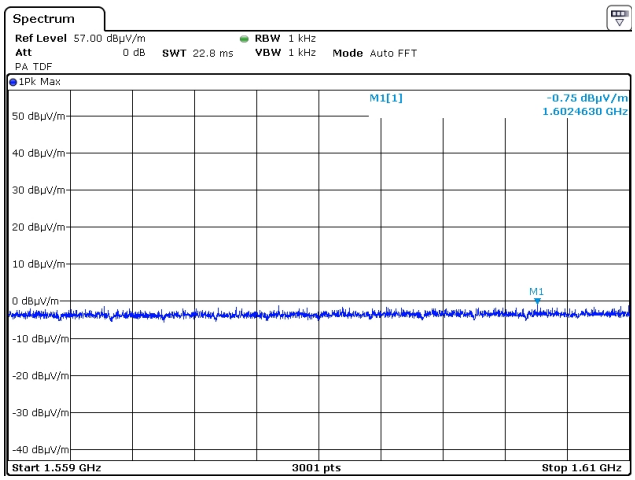
***** When E-field or EIRP is reported directly from Spectrum Analyzer, Antenna Factors and Cable losses are included directly in SA settings and Pr is not reported.

Equipment Used: RSFSV30001, SAHWPK101, MIX26TO4001

Table 8(b): Transmit Chain Spurious Emissions.

GPS RESTRICTED BAND EMISSIONS





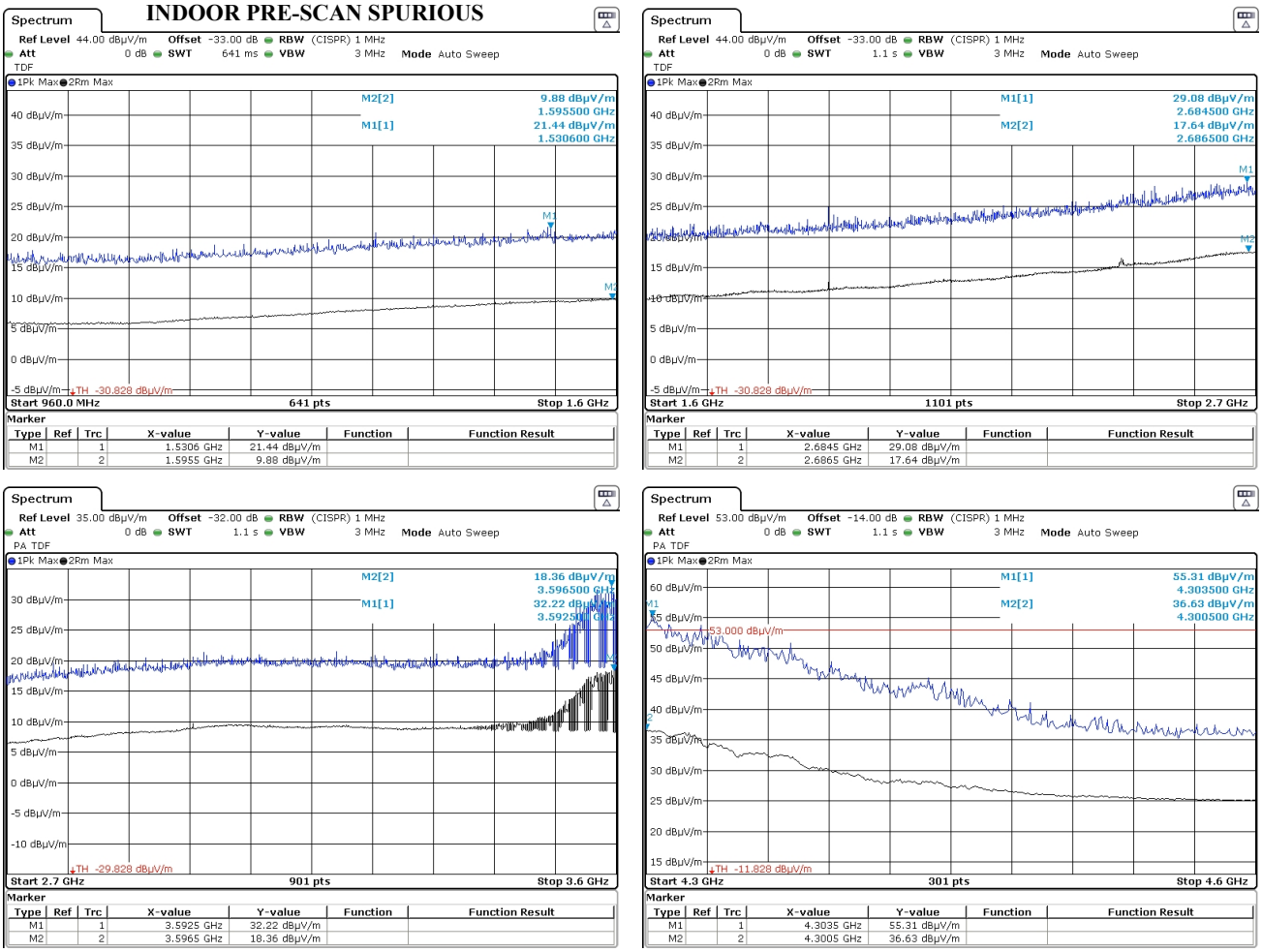


Figure 8(a): Transmit Chain Spurious Emissions Pre-Scan Plots.

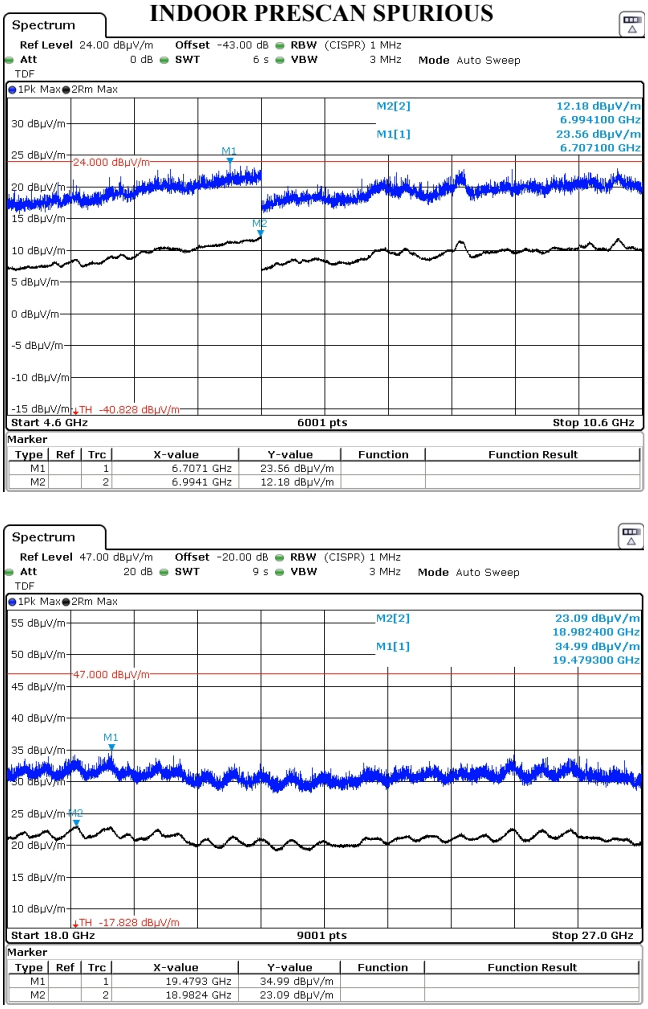


Figure 8(b): Transmit Chain Spurious Emissions Pre-Scan Plots.

INDOOR PRESCAN SPURIOUS (TOP PK DET, BOTTOM RMS DET)

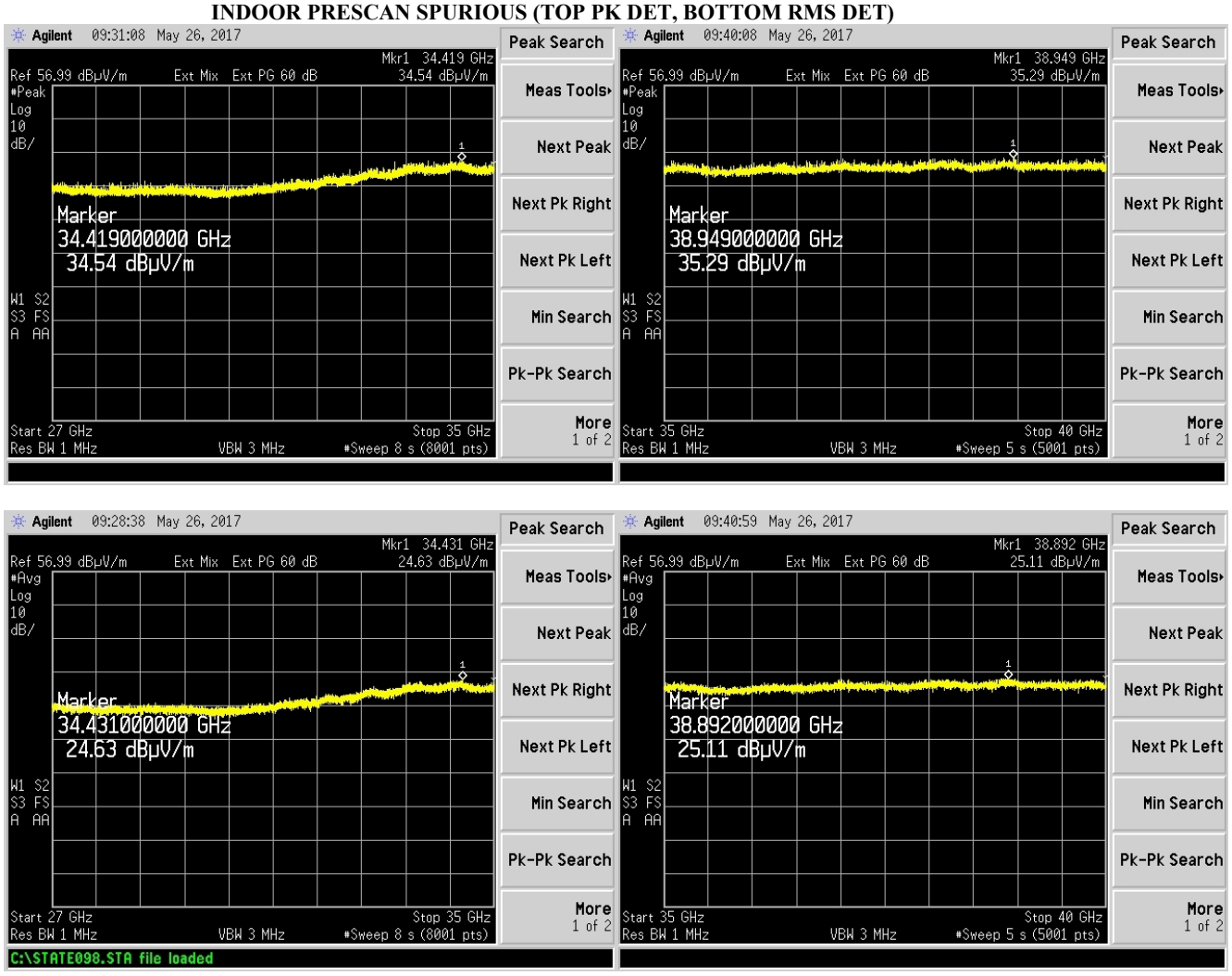


Figure 8(c): Transmit Chain Spurious Emissions Pre-Scan Plots.

5 Measurement Uncertainty

The maximum values of measurement uncertainty for the laboratory test equipment and facilities associated with each test are given in the table below. This uncertainty is computed for a 95.45% confidence level based on a coverage factor of $k = 2$.

Table 9: Measurement Uncertainty.

Measured Parameter	**Measurement Uncertainty**[†]
Radio Frequency	$\pm(f_{Mkr}/10^7 + RBW/10 + (SPN/(PTS-1))/2 + 1\,\text{Hz})$
Conducted Emm. Amplitude	$\pm 1.8\,\text{dB}$
Radiated Emm. Amplitude $(30 - 200\,\text{MHz})$	$\pm 2.7\,\text{dB}$
Radiated Emm. Amplitude $(200 - 1000\,\text{MHz})$	$\pm 2.5\,\text{dB}$
Radiated Emm. Amplitude $(f > 1000\,\text{MHz})$	$\pm 3.7\,\text{dB}$
DC and Low Frequency Voltages	$\pm 2\%$
Temperature	$\pm 0.5°\text{C}$
Humidity	$\pm 5\%$

[†]Ref: CISPR 16-4-2:2011+A1:2014