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3980 North Fraser Way
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ELECTROMAGNETIC COMPATIBILITY TEST REPORT

PREPARED FOR ROTHENBUHLER ENGINEERING

BY QAI LABORATORIES

Report Reference Number:	**E**11031-1801_Rothenbuhler_**Rev-1.0**
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Laboratory Accreditations (per ISO/IEC 17025:2005):

American Association for Laboratory Accreditation Certificate Number: 3657.02

This report has been completed in accordance with the requirements of ISO/IEC 17025.
Test results contained in this report are within QAI Laboratories. ISO/IEC 17025 accreditation.

Manufacturer:	Rothenbuhler Engineering.
Address:	524 Rhodes Road, P.O. Box 708 Sedro Woolley, WA 98284, U.S.A
Phone:	(360) 856-0836
Applicable Test Standards:	FCC Title 47 CFR Part 2 & 90 RSS-Gen Issue 5, RSS 119 Issue 12
Equipment Tested	VHF Radios
Model Number:	Model 1100-5, Model 1100-3 and Model 1100-3D
FCC ID:	Original Product: CW21100-5
IC Certification Number:	Original Product: 2758A-110005
Manufacturer:	Rothenbuhler Engineering.

REVISION HISTORY

Date	Report Number	Details	Author's Initials
January 17, 2019	**E**11031-1801_Rothenbuhler_**Rev-1.0**	Final	PS
January 11, 2019	**E**11031-1801_Rothenbuhler_**Rev 0.0**	Initial Release	PS

REPORT AUTHORIZATION

The data documented in this report is for the test equipment provided by Rothenbuhler Engineering for Class II Permissive Change. Tests were conducted on the sample equipment as requested by Rothenbuhler Engineering for the purpose of demonstrating Class II Permissive Change testing for FCC Title 47 CFR Part 2 & 90, RSS-Gen Issue 5 & RSS-119 Issue 12, as agreed upon by Rothenbuhler Engineering as per Quote 18SH11291.

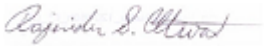
Rothenbuhler Engineering is responsible for the tested product configuration, continued product compliance, and for the appropriate auditing of subsequent products as required. This report may comprise partial list of tests that are required for FCC & IC Declaration of Conformity and can only be produced by the manufacturer.

This is to certify that the following report is true and correct to the best of our knowledge.

Testing Done by
Parminder Singh
Director of EMC
Department

Report Prepared by
Parminder Singh
Director of EMC
Department

Reviewed by
Bruce Balston
RF/EMC Engineer



Approved by
Raj Atwal
EMC Engineering Manager

QAI FACILITIES

Founded in 1994 by a group of experienced certification and testing experts, QAI is an independent third-party testing, inspection and certification organization which serves the building industry, government and individuals with cost effective solutions through our inhouse capabilities / services, and an established world-wide network of qualified affiliates. To help get your product to market, trust the provider that many leading global manufacturers do: QAI.

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QAI EMC ACCREDITATION

QAI EMC is your one-stop regulatory compliance partner for electromagnetic compatibility (EMC) and electromagnetic interference (EMI). Products are tested to the latest and applicable EMC/EMI requirements for domestic and international markets. QAI EMC goes above and beyond being a testing facility—we are your regulatory compliance partner. QAI EMC has the capability to perform RF Emissions and Immunity for all types of electronics manufacturing including Industrial, Scientific, Medical, Information Technology, Telecom, Wireless, Automotive, Marine and Avionics.

EMC Laboratory Location	FCC Designation (3m SAC)	IC Registration (3m SAC)	A2LA Certificate
Burnaby, BC, Canada	CA9543	21146-1	3657.02

Headquarters & EMC Laboratory in
Burnaby, BC

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1.1 Purpose

The purpose of this report is to demonstrate and document the compliance of VHF Radio Device as per Sections 1.2 & 1.3.

1.2 Scope

The information documented in this report is based on the test methods and levels as per Quote 18SH11291:

- CFR Title 47 FCC Part 2 & 90 – Private Land Mobile Radio Services
  - 90.210(d) Field Strength of Spurious Radiation.
- RSS 119 Issue 12 – Land Mobile and Fixed Equipment Operating in the Frequency Range 27.41-960 MHz.
  - 5.8.9.2 Out-of-Band Emission Limits.

The tests documented in this report were performed in accordance ANSI C63.4 and ANSI C63.10.

1.3 Summary of Results

The following tests were performed pursuant to the FCC/IC Unintentional Radiated Emissions, Intentional Radiated Emissions, and Radio Testing Standards:

No.	Test Description	Standard Clause	Result
1	RF Output Peak Power	FCC Title 47 CFR Part 2.1046 & Part 90.205(d) RSS-119 Issue 12 (5.4)	Complies
2	Bandwidth Limitations	FCC Title 47 CFR Part 2.1049 & Part 90.209(b)(5) RSS-119 Issue 12 & RSS - Gen	
3	Spectrum Mask	FCC Title 47 CFR Part 2.1051 & Part 90.210(d) RSS-119 Issue 12 (5.5)	
4	Radiated Spurious Emissions at Antenna Terminals	FCC Title 47 CFR Part 2.1049 & Part 90.210(d) RSS-119 Issue 12 (5.8)	

Section II: GENERAL INFORMATION

2.1 Product Description

The information provided in this section is for the Equipment Under Test (EUT) and the corresponding Auxiliary Equipment needed to perform the tests as a complete system.

Equipment Under Test (EUT) Information

EUT	1100-5 Yarder Transmitter, 1100-3 Carriage Transmitter & 1100-3D Carriage Transmitter
Functional Description	VHF Radios
Operating Frequency	150MHz to 174MHz
FCC ID	Original Product: CW21100-5, Contains: CW21100-5
IC Certification Number	Original Product: 2758A-110005
Manufacturer	Rothenbuhler Engineering

Equipment Under Test (EUT)

Auxiliary Equipment

Auxiliary Equipment	Standard 12VDC Automotive Battery
Model Number	010-2799-4
Serial No.	01606218

2.2 Environmental Conditions

The equipment under test was operated and tested under the following environmental conditions:

Parameter	Conditions
Location	Indoors
Temperature	22-28ºC
Relative Humidity	39.7 - 54.4%

2.3 Measurement Uncertainty

Parameter	Uncertainty
Radiated Emissions, 30MHz-1GHz	± 2.40 dB
Radiated Emissions, 1GHz-40GHz	± 2.48 dB
Radio Frequency	±1.5 x 10-5 MHz
Total RF Power Conducted	±1.36 dB
Spurious Emissions Conducted	±1.36 dB
RF Power Density Conducted	±1.36 dB
Temperature	±1ºC
Humidity	±5 %
DC and low frequency voltages	±3 %

2.4 Worst Test Case

Worst-case orientation was determined during the preliminary testing. The final radiated emissions were performed in the worst-case orientation.

2.5 Sample Calculations of Emissions Data

Radiated and conducted emissions were performed using EMC32 software developed by Rohdes & Schwarz. Transducer factors like Antenna factors, Cable Losses and Amplifier gains were stored in the test templates which are used to perform the emissions measurements. After test is finished, data is generated from the EMC32 consisting of product details, emission plots and final data tables as shown below.

Frequency (MHz)	Q Peak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Ant. Ht. (cm)	Pol	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
42.663900	33.0	1000.000	120.000	100.0	H	70.0	13.2	7.5	40.5

Quasi Peak reading shown in the table above is already corrected by the software using correction factor shown in column "Corr." The correction factor listed under "Corr." table calculated as:

Corr.(dB) = Antenna factor + Cable loss
Or

Corr.(dB) = Antenna factor + Cable Loss - Amp gain (if pre-amplifier was used)

The final Quasi peak reading shown in the data is calculated by the software using following equation:

Corrected Quasi Peak(dBµV/m) = Raw Quasi Peak Reading + Antenna factor + Cable loss

To obtain the final Quasi-Peak or Average reading during power line conducted emissions, transducer factors are included in the final measurement as shown below.

Frequency (MHz)	Q Peak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150	44.3	1000.000	9.000	GND	0.6	21.7	66.0

Frequency (MHz)	Q Peak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150	27.2	1000.000	9.000	GND	0.6	28.8	56.0

Quasi Peak or Average reading shown in above table is already corrected by the software using the correction factor shown in column "Corr." The correction factor listed under "Corr." table calculated as:

Corr.(dB) = Antenna factor + Cable loss

The final Quasi peak or Average reading shown in the data is calculated by the software using following equation:

Corr. Quasi Peak/Average Reading (dBµV) = Raw Quasi Peak/Average Reading + Antenna factor + Cable loss

The allowable margin from the limits, as per the standards, were calculated for both radiated and conducted emissions:

Margin(dB) = Limit – Quasi-Peak or Average reading

2.6 Test Equipment List

The tables below contain all the equipment used by QAI Laboratories in conducting all tests on the Equipment Under Test (EUT) as per Section 1.3.

Emissions Test Equipment

Manufacturer	Model	Description	Serial No.	Last Calibration Date	Calibration Due Date
Sunol Sciences	SM46C	Turntable	051204-2	N/A	N/A
Sunol Sciences	TWR95	Mast	TREML0001	N/A	N/A
Sunol Sciences	JB3	Biconilog Antenna 30MHz – 3GHz	A120106	2017-Sep-24	2020-Sep-24
Sunol Sciences	DRH-118	Horn Antenna 1GHz-18GHz	A050905	2016-Mar-10	2019-Mar-10
Rohde & Schwarz	ESU40	EMI Receiver	100011	2017-Nov-20	2020-Nov-20
ETS Lindgren	S201	5-meter Semi-Anechoic Chamber	1030	N/A	N/A
AH Systems	PAM118	Amplifier 10KHz-18GHz	189	N/A	N/A
EMCO	6502	Loop Antenna	6502	11/13/2017	2020-Nov-13
WEINSCHEL ENGINEERING	44	6db attenuator	665	N/A	N/A
Insulated Wire Inc.	SPS-1753-1140-SPS	Yellow cable, 3m	102395	N/A	N/A
Insulated Wire Inc.	SPS-1753-2400-SPS	Yellow cable, 6m	091096	N/A	N/A

Note: *Equipment marked N/A is verified as a complete signal path with a calibrated instrument.*

Measurement Software List

Manufacturer	Model	Version	Description
Rhode & Schwarz	EMC 32	6.20.0	Emissions Test Software

Section III: TEST RESULTS

3.1 RF Peak Power Output

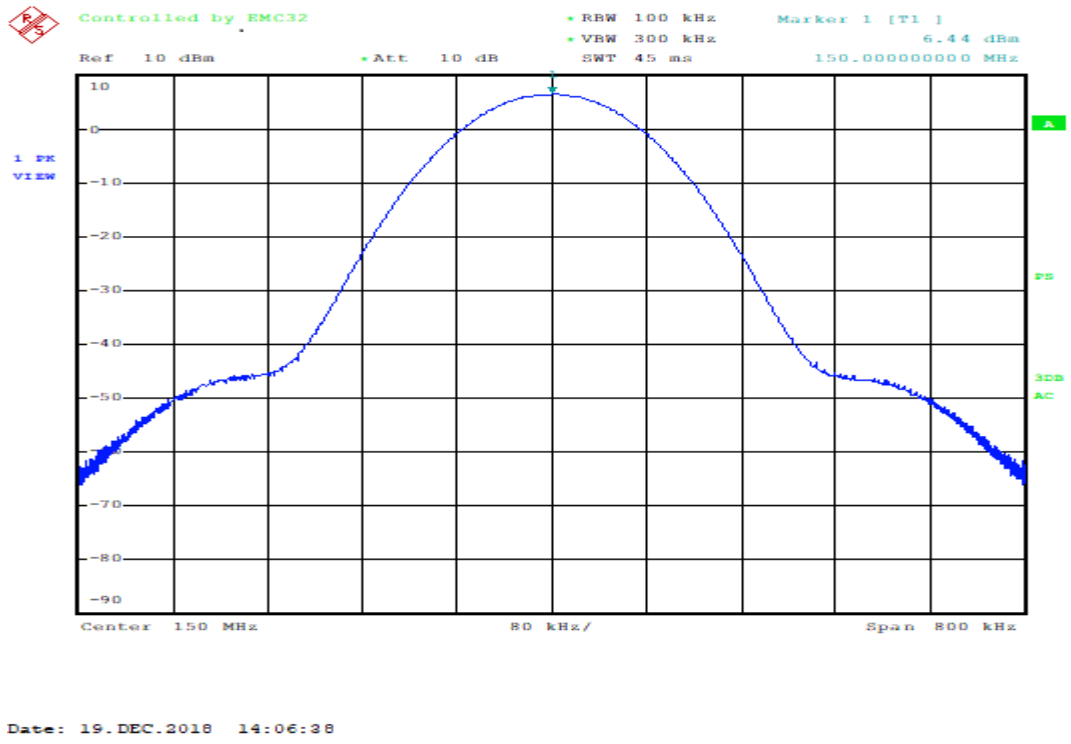
Date Performed: December 19, 2018

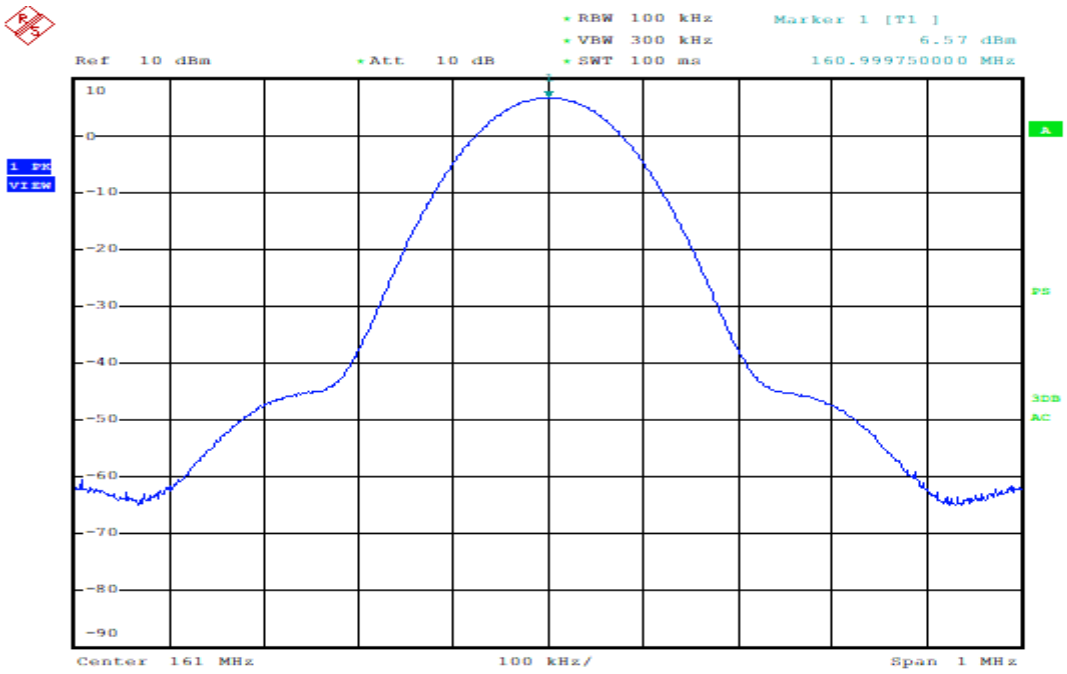
Test Standard: 47 CFR Part 2: Frequency Allocations and Radio Treaty Matters **& 47 CFR Part 90:** Private Land Mobile Radio Service

Measurement Data:

1100-5 Yarder Transmitter

Frequency (MHz)	RF Output Power (dBm)	Limit (Part 90.205)	Result
150.00	26.44	30 dBm	Pass
161.00	26.57	30 dBm	Pass
174.00	26.67	30 dBm	Pass





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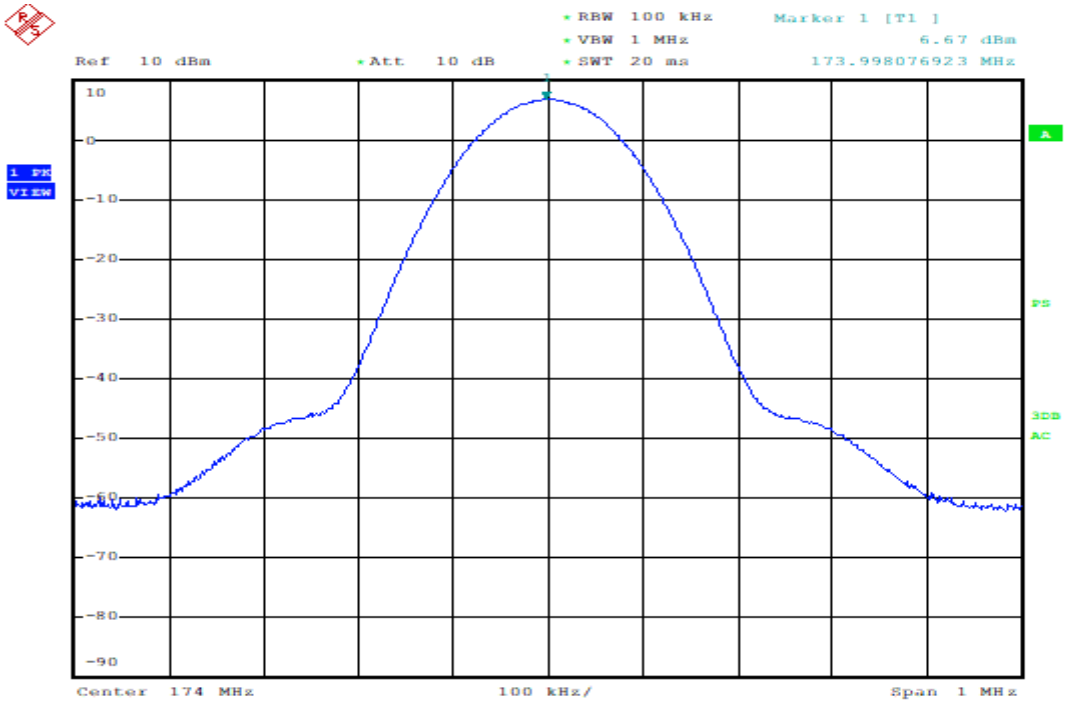

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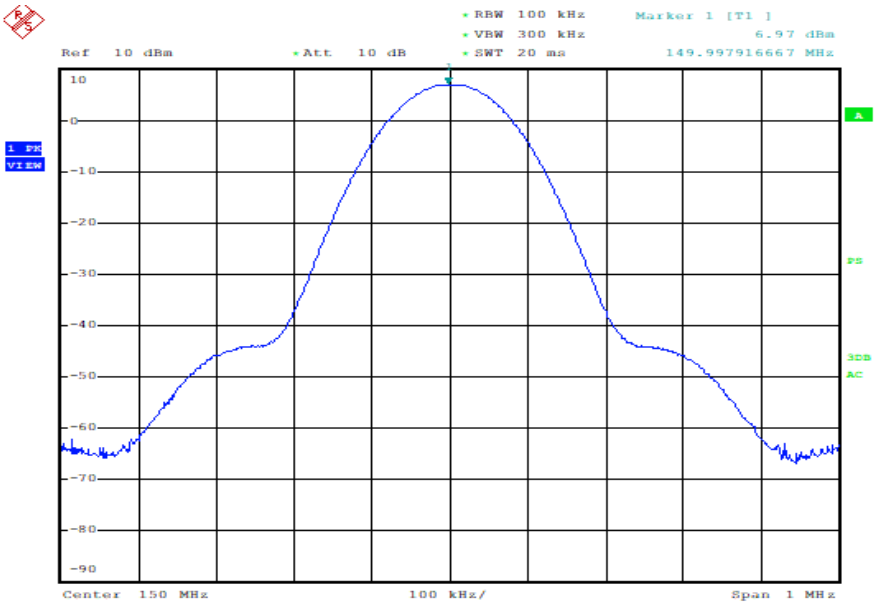
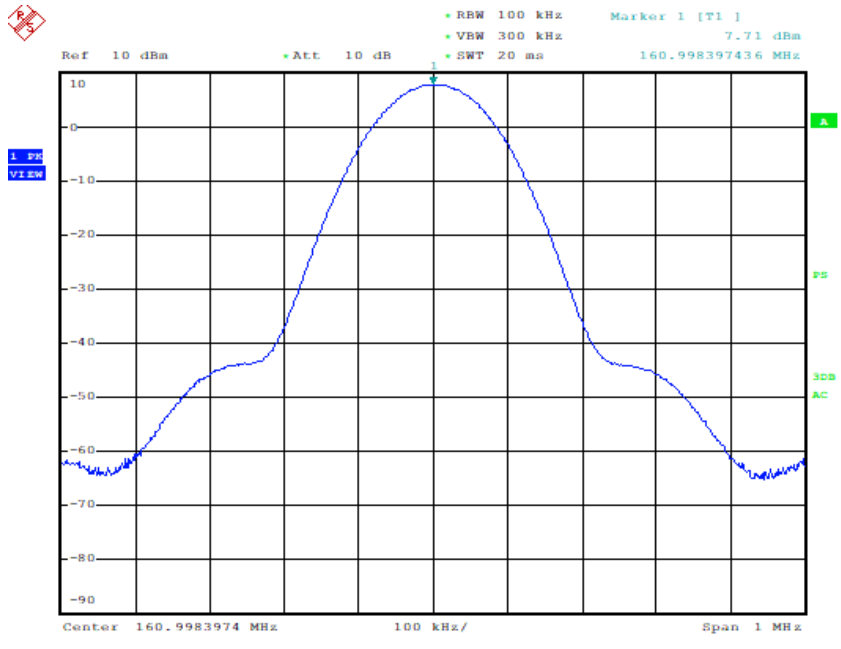
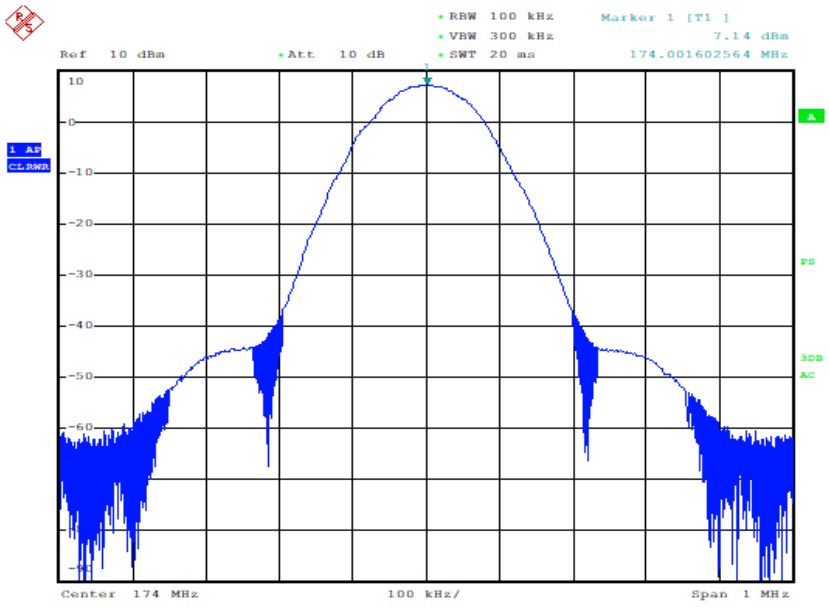
1100-3 Carriage Transmitter

Frequency (MHz)	RF Output Power (dBm)	Limit (Part 90.205)	Result
150.00	26.97	30 dBm	Pass
161.00	27.71	30 dBm	Pass
174.00	27.14	30 dBm	Pass







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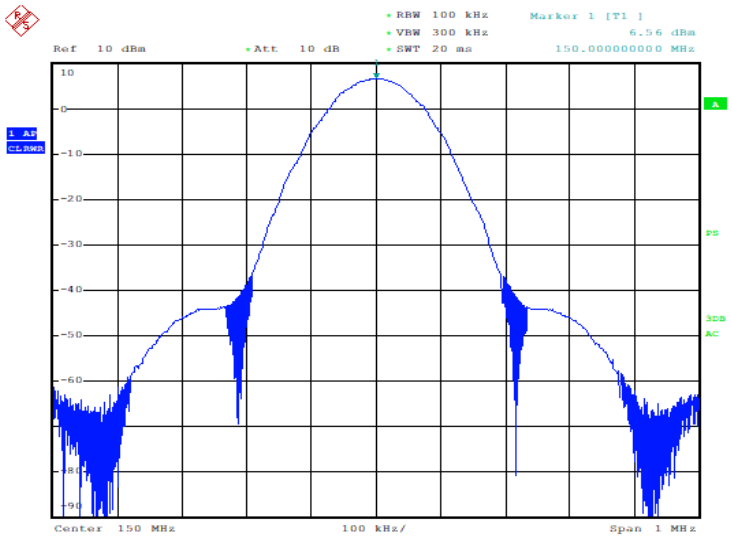
1100-3D Carriage Transmitter

Frequency (MHz)	RF Output Power (dBm)	Limit (Part 90.205) (dBm)	Result
150.00	26.56	30.00	Pass
161.00	26.69	30.00	Pass
174.00	26.60	30.00	Pass



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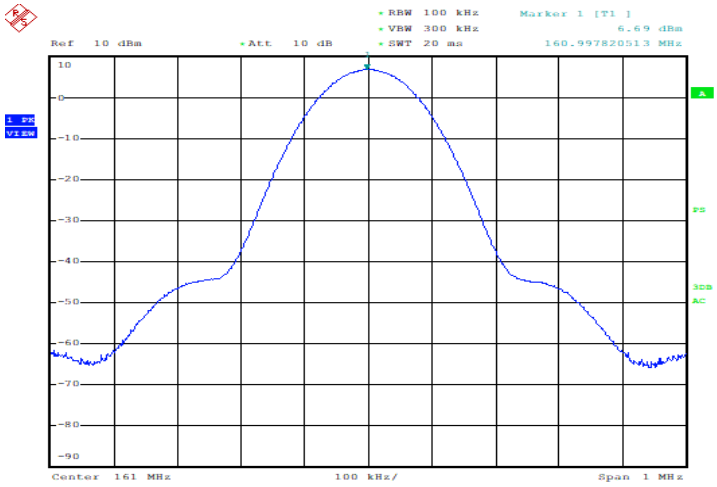

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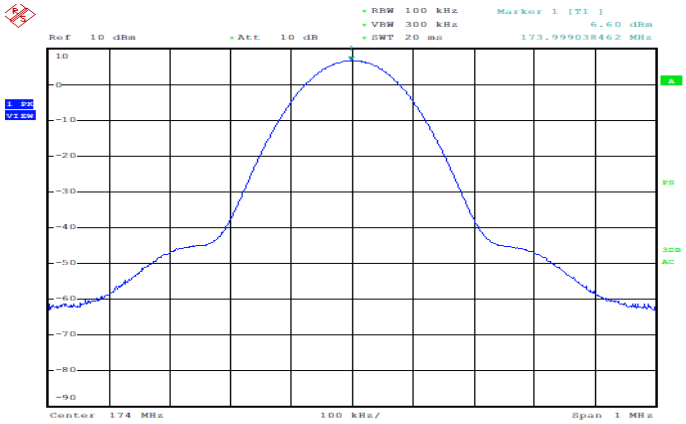

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Comments: For all measurements 20dB attenuation was used before the signal was conductively injected to EMI receiver.

3.2 Bandwidth of Limitations

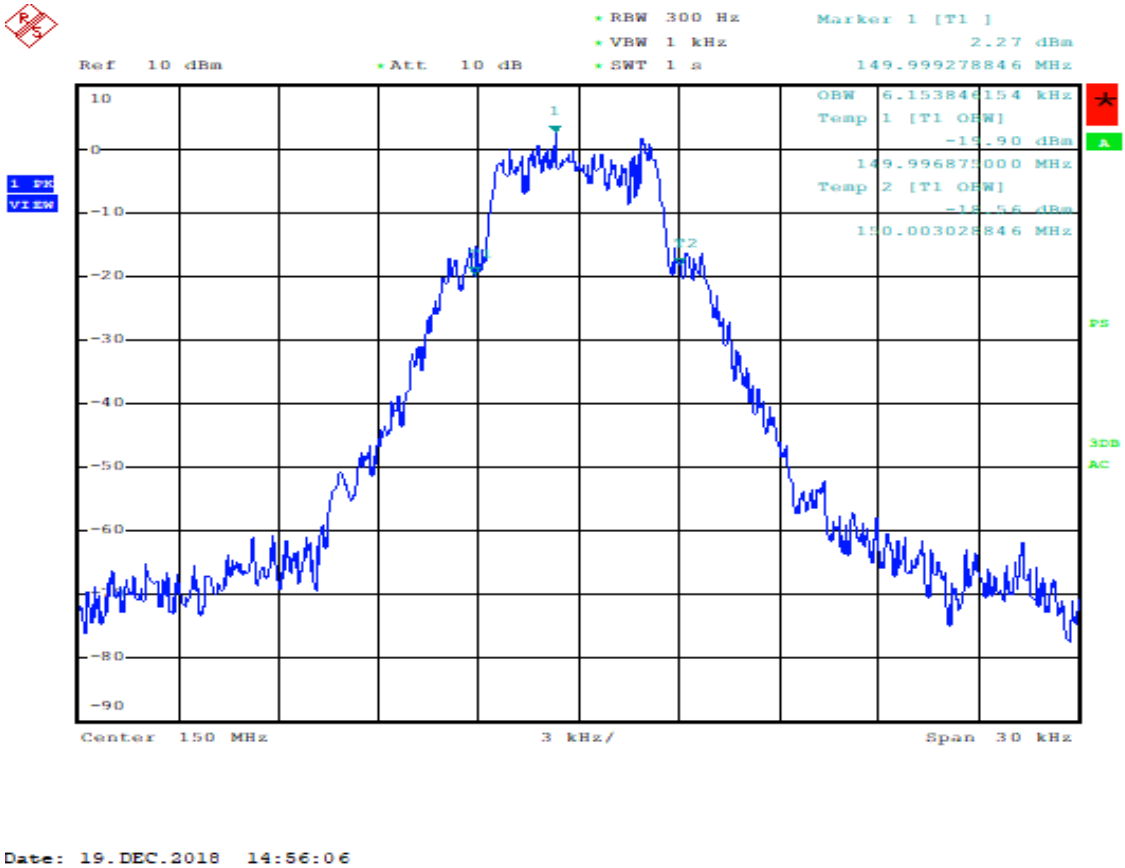
Date Performed: December 19, 2018

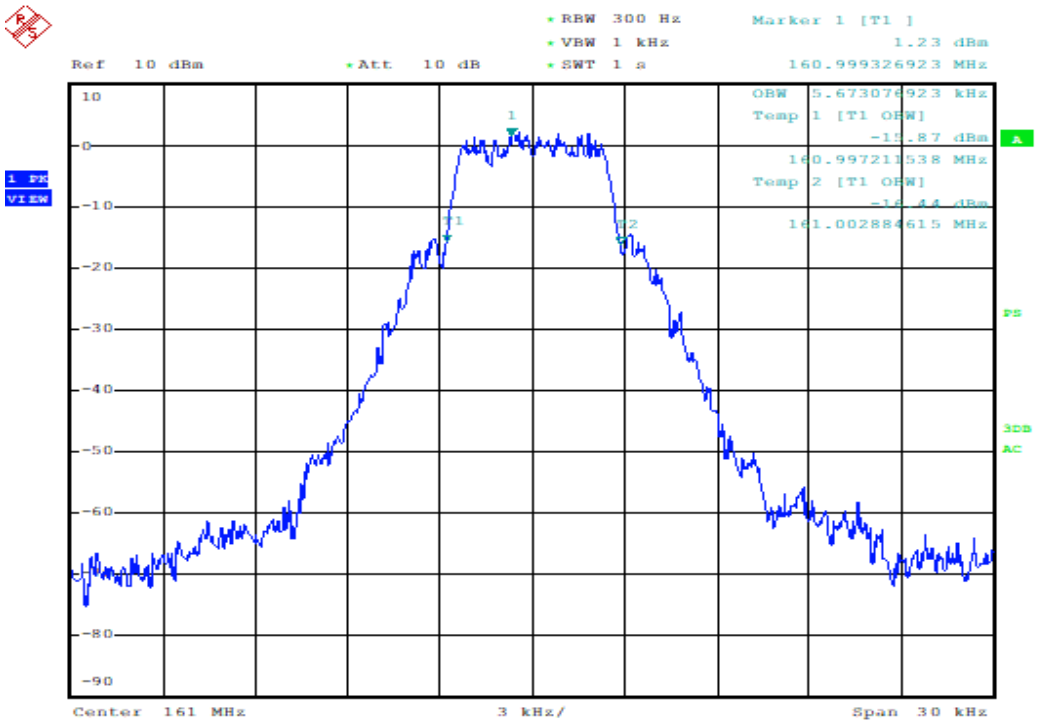
Test Standard: 47 CFR Part 2: Frequency Allocations and Radio Treaty Matters **& 47 CFR Part 90:** Private Land Mobile Radio Service

Measurement Data:

1100-5 Yarder Transmitter

Frequency (MHz)	Bandwidth (20dB) (kHz)	Limit (Part 90.209) (kHz)	Result
150.00	6.15	11.25	Pass
161.00	5.67	11.25	Pass
174.00	5.70	11.25	Pass





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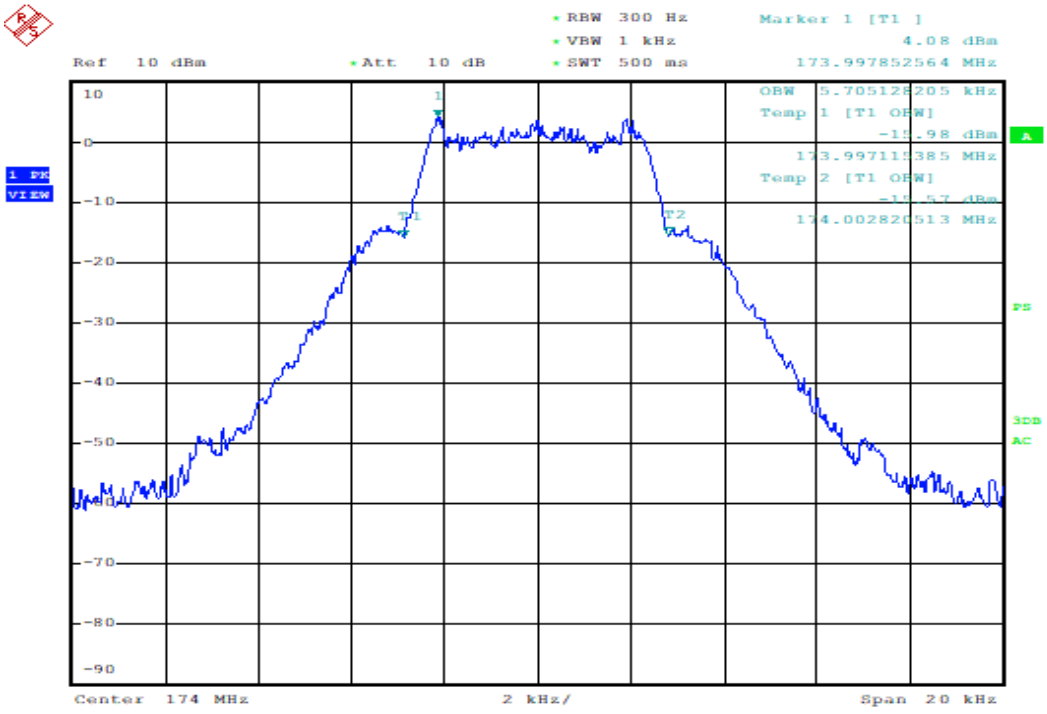

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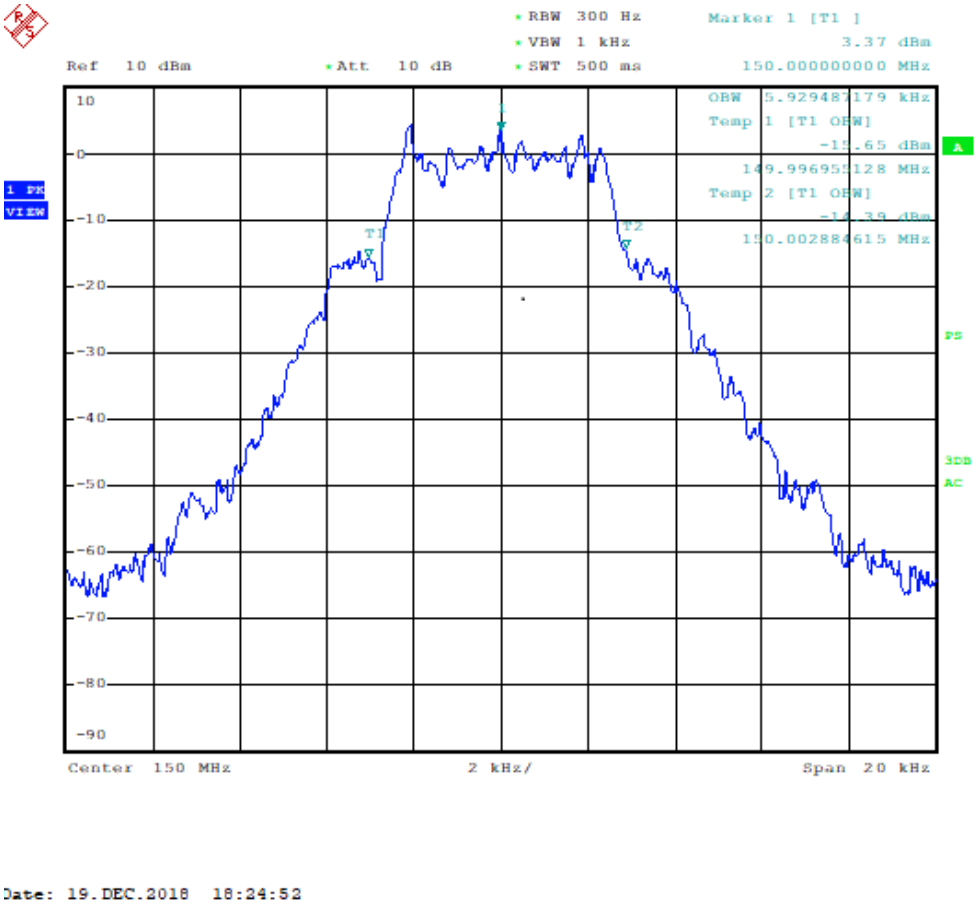
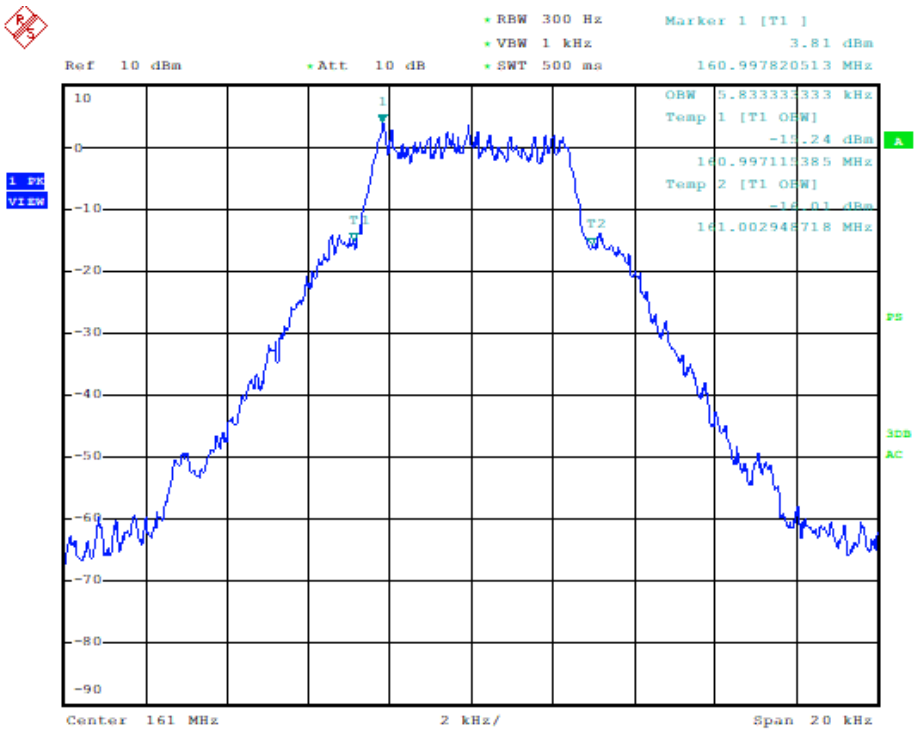
1100-3 Carriage Transmitter

Frequency (MHz)	Bandwidth (20dB) (kHz)	Limit (Part 90.209) (kHz)	Result
150.00	5.93	11.25	Pass
161.00	5.83	11.25	Pass
174.00	5.86	11.25	Pass





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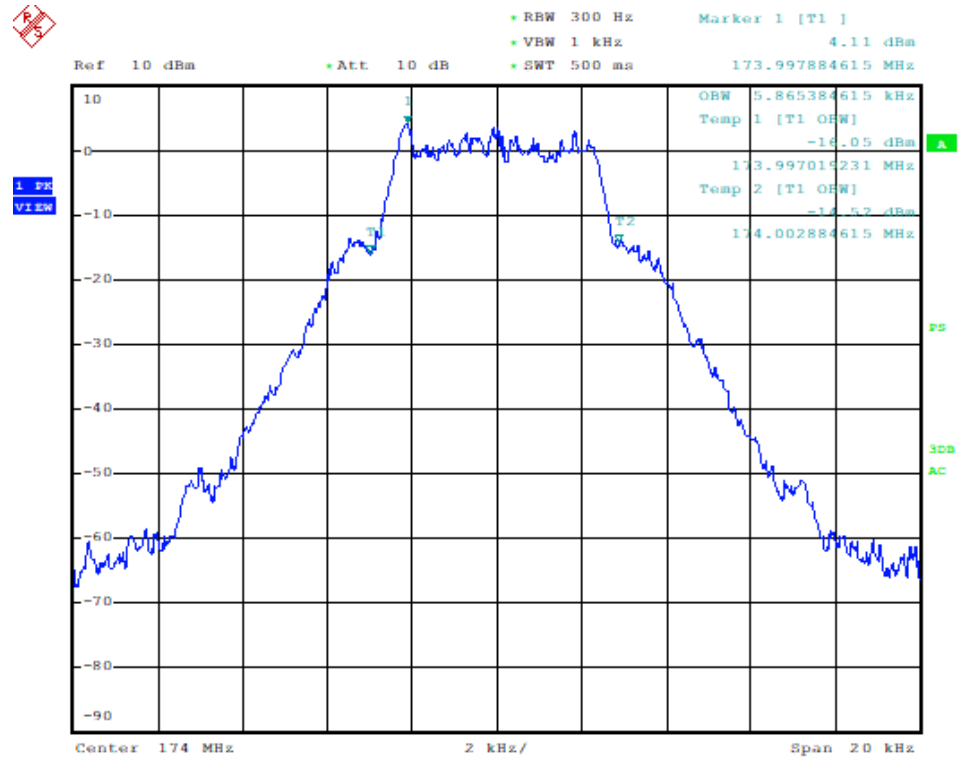
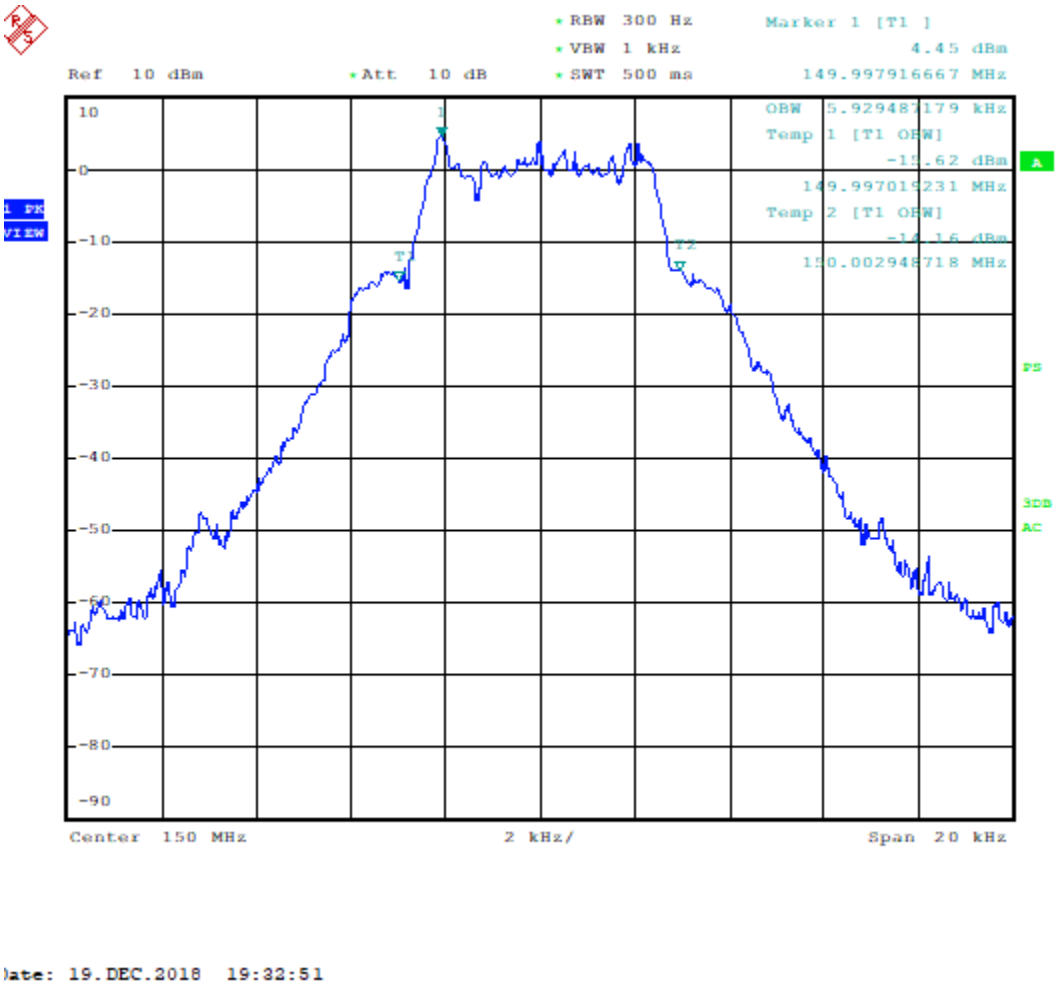
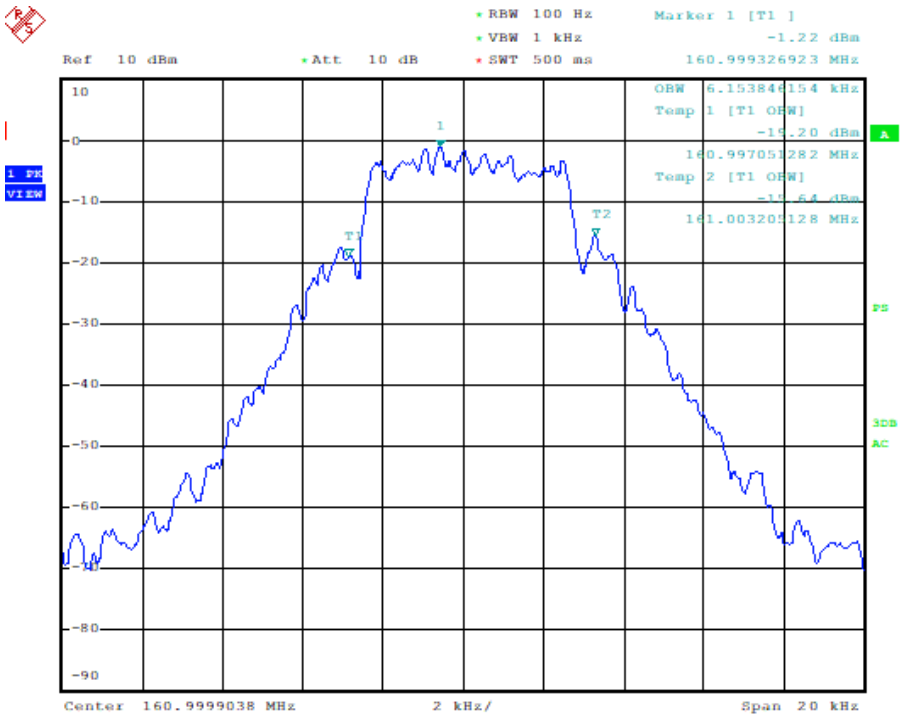


1100-3D Carriage Transmitter

Frequency (MHz)	Bandwidth (20dB) (kHz)	Limit (Part 90.209) (kHz)	Result
150.00	5.93	11.25	Pass
161.00	6.15	11.25	Pass
174.00	5.58	11.25	Pass





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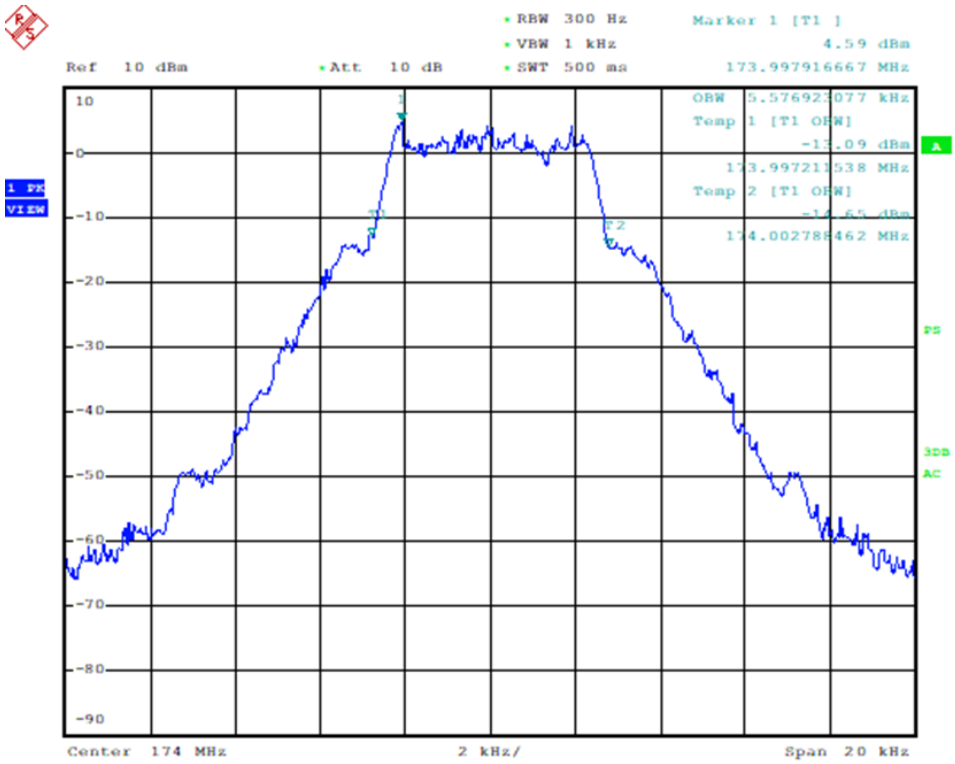

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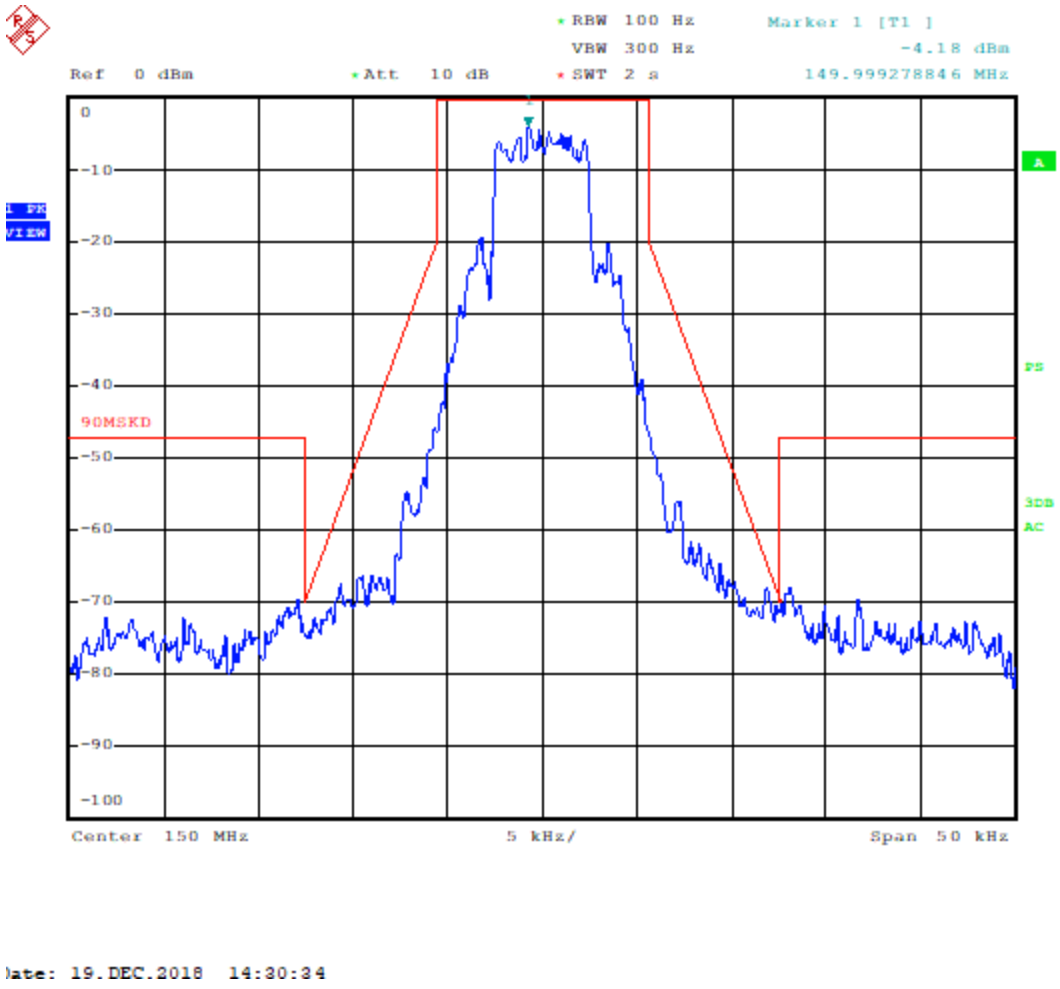
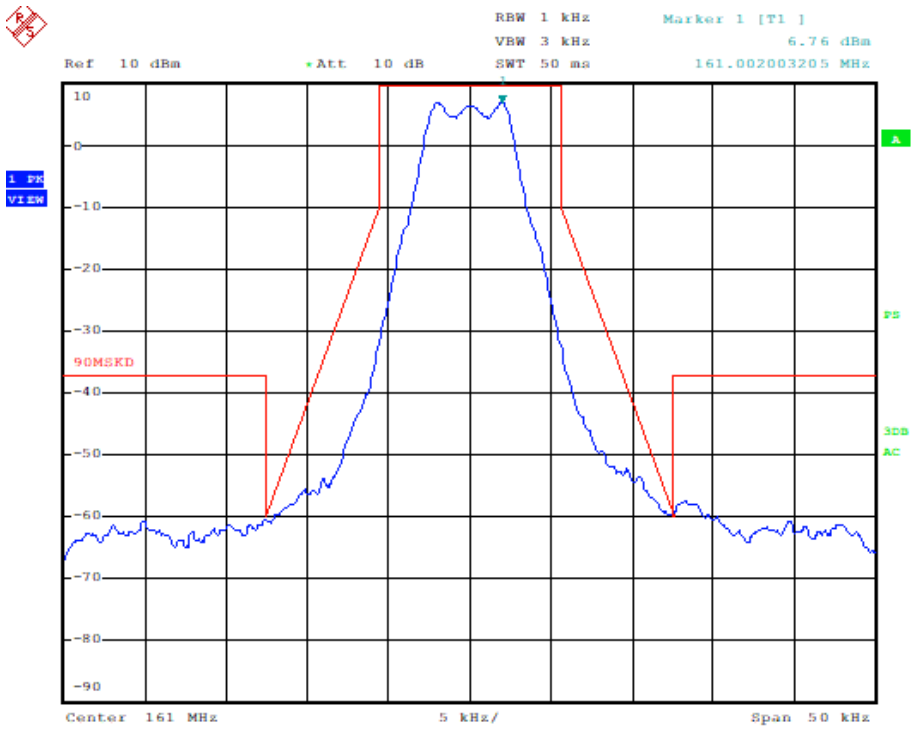
3.3 Spectrum Mask

Date Performed: December 19, 2018

Test Standard: 47 CFR Part 2: Frequency Allocations and Radio Treaty Matters **& 47 CFR Part 90:** Private Land Mobile Radio Service

Measurement Data for Model 1100-5:





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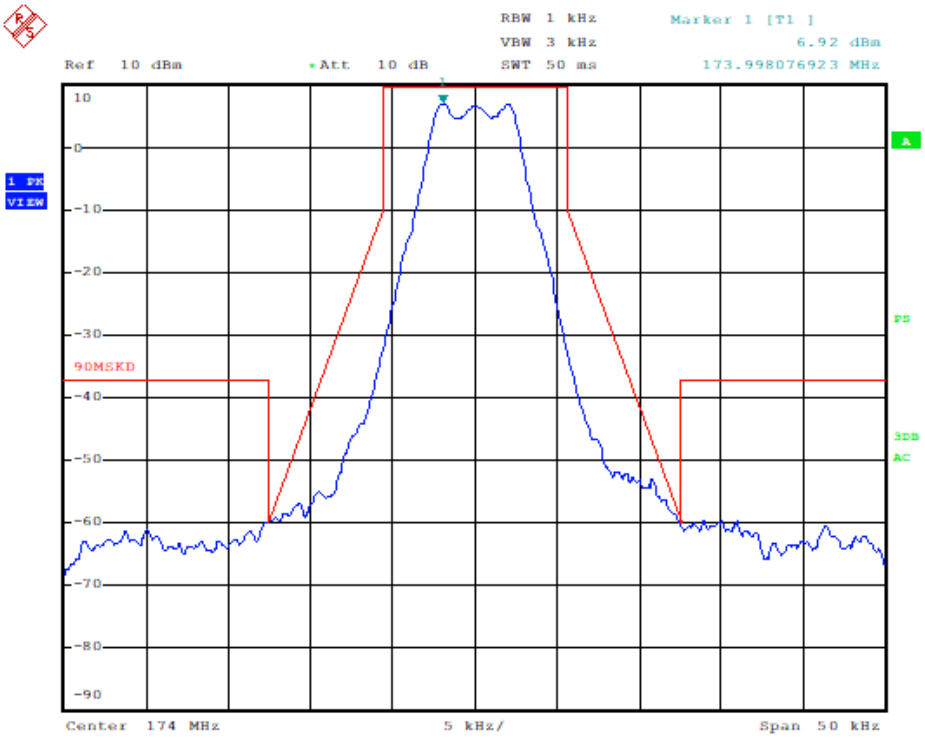

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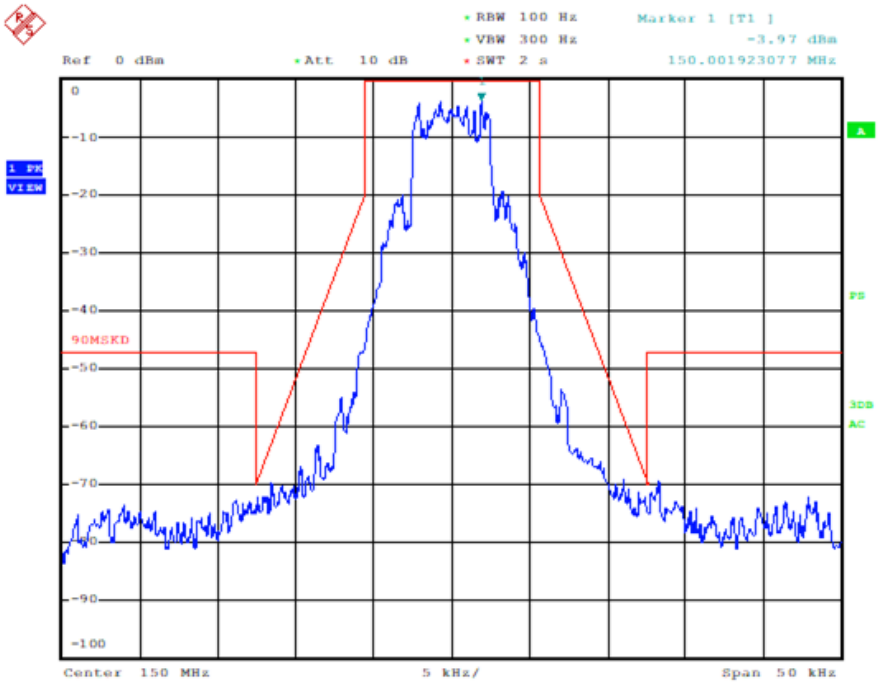
Measurement Data for Model 1100-3



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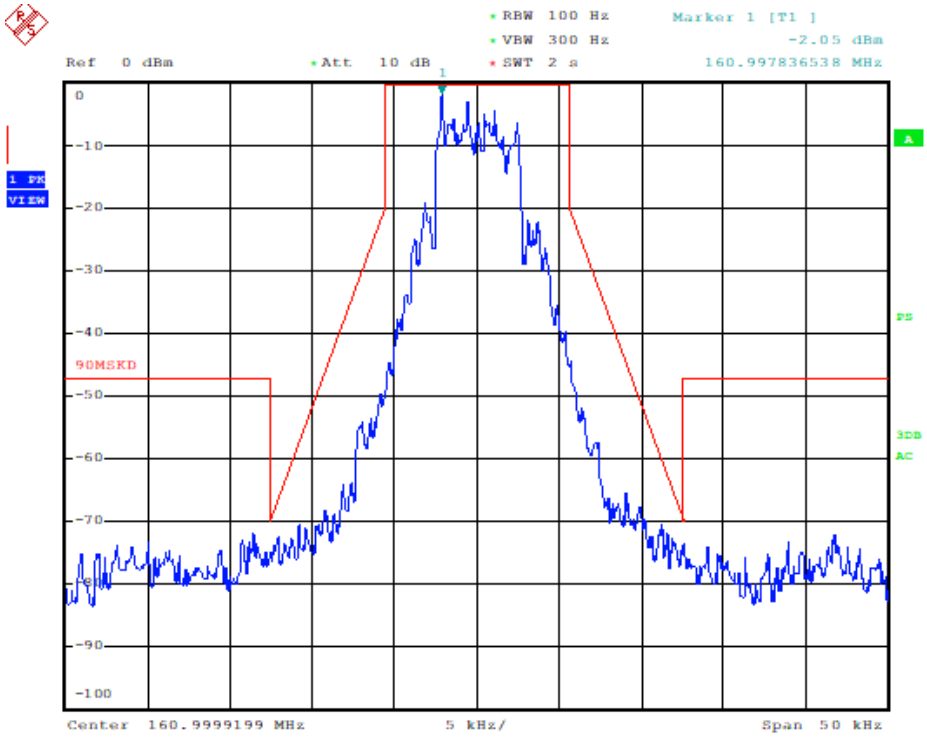

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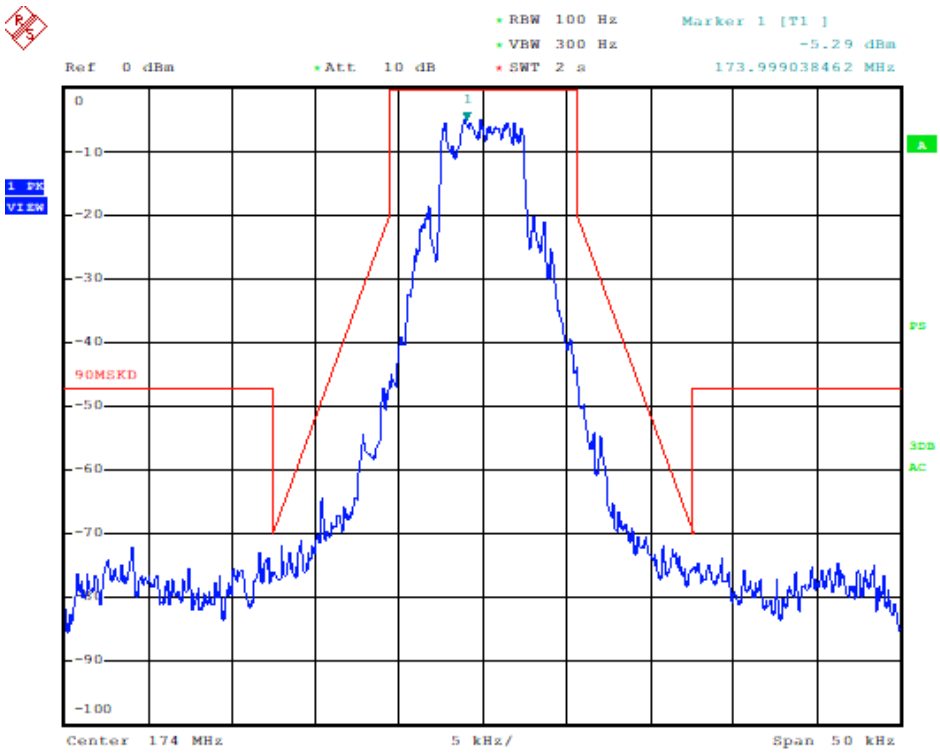
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VBW 300 Hz
SWT 2 s
Marker 1 [T1]
-5.29 dBm
173.999038462 MHz
Ref 0 dBm
Att 10 dB
1 PK
VIEW
90MSKD
A
PS
3DB
AC
Center 174 MHz
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Span 50 kHz
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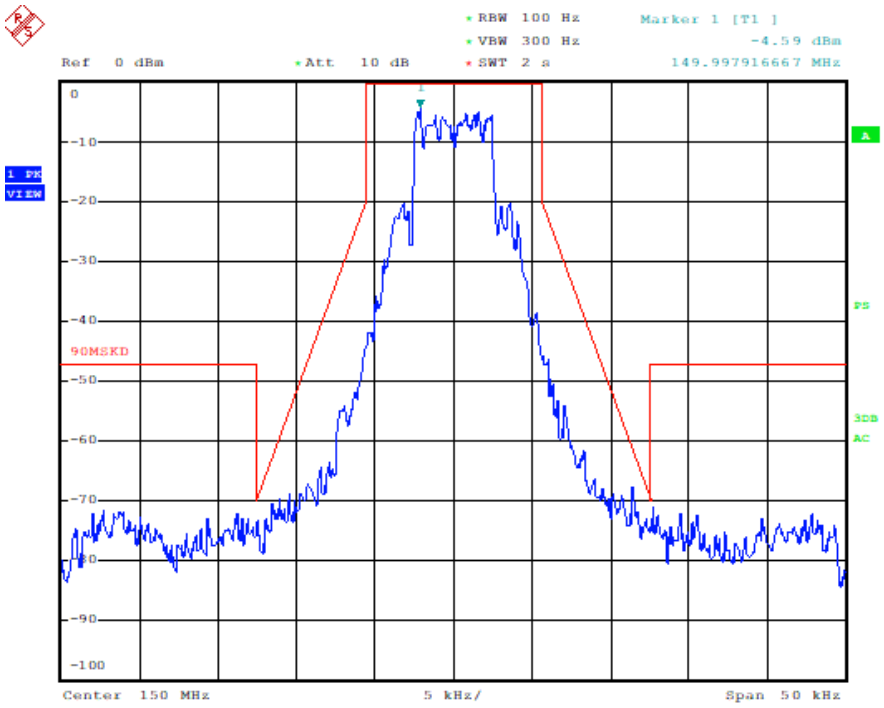
Measurement Data for Model 1100-3D



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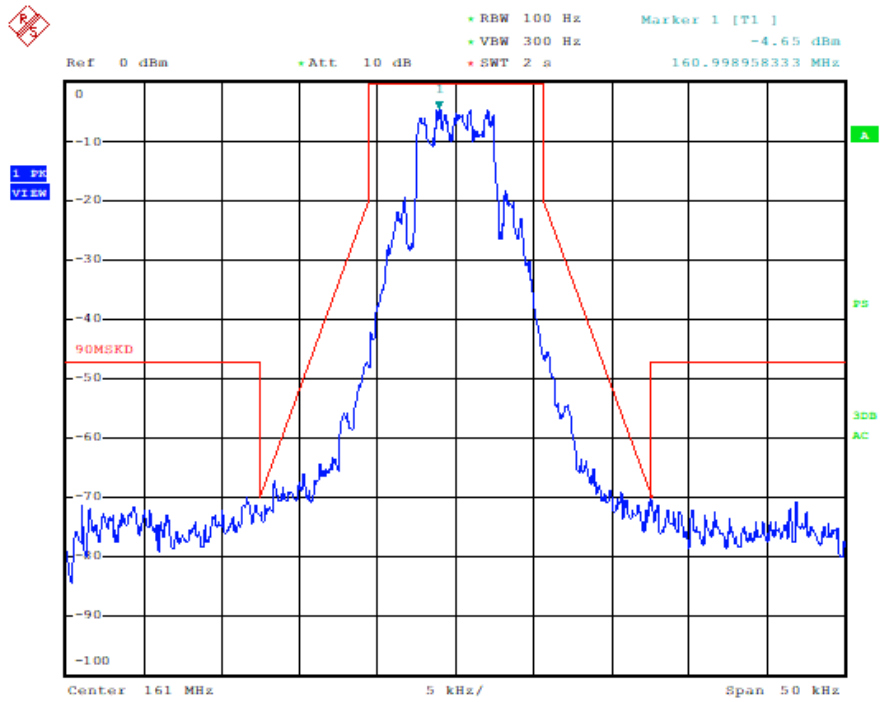

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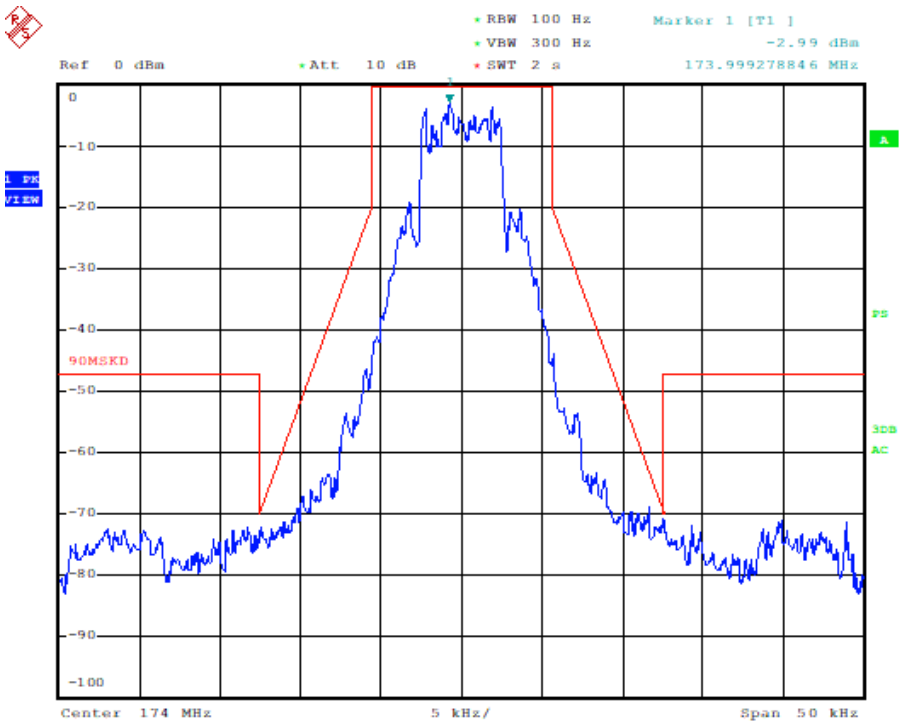
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VBW 300 Hz
SWT 2 s
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-10
-20
-30
-40
90MSKD
-50
-60
-70
-80
-90
-100
Center 174 MHz
5 kHz/
Span 50 kHz
A
PS
3DB
AC
1 PK
VIEW
Date: 19.DEC.2018 19:22:06

3.4 Spurious Emissions

Date Performed: December 19, 2018

Test Standard: 47 CFR Part 2: Frequency Allocations and Radio Treaty Matters **& 47 CFR Part 90:** Private Land Mobile Radio Service

Emissions Limits:

1) Radiated emission limits; general requirements.
The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Limit Calculations	Limit (dBc)	Limit @ 3m (dBuV)
30 – 1000	50+10*Log(P)	47	75.0
Note 1: The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges. Note 2: The emissions limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 990 kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.			

Calculation Example: P = 500mW
= 50+10*Log(P)500mW
= 47dBc

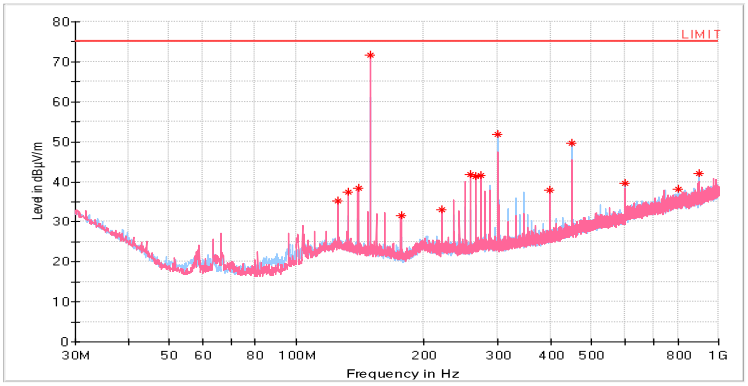
Calculation at 3m
= 107-20log (3m) - 2.15(Gain for dipole))
= 95.2
= -20dBm + 95.2
= 75dBuV at 3m

Method of Measurement:

The EUT was tested in our 3 m SAC and was positioned on the center of the turntable. The transmitter was set for continuous transmission. The operating frequency of the device was measured for all radiated emissions 10 kHz to 4 GHz up to the 10th harmonic of the highest fundamental frequency. The EUT was pre-scanned in 3 different orthogonal orientations and was found to radiate highest when placed flat on the table top as indicated in the test photos.

Result: The EUT complies with the applicable standard.

Measurement Data and Plot: Model 1100-5 (Channel 150 MHz) Powered by external 12 VDC Car battery



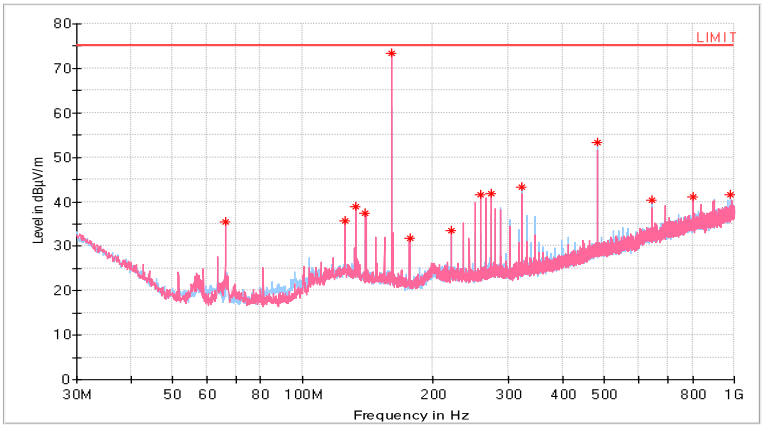
Spurious and Peak Harmonics at 3m

Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
450.010000	49.61	75.0	25.39	1000	120	100.0	H	95.0
805.224000	38.10	75.0	36. 9	1000	120	100.0	H	223.0
299.951000	51.75	75.0	23.25	1000	120	100.0	H	309.0
600.069000	39.70	75.0	35.3	1000	120	150.0	H	147.0
896.016000	42.20	75.0	32.8	1000	120	350.0	H	185.0
140.095000	38.46	75.0	36.54	1000	120	100.0	V	0.0
221.187000	33.09	75.0	41.91	1000	120	100.0	V	81.0
149.989000	Fundamental							
265.419000	41.46	75.0	33.54	1000	120	100.0	V	212.0
258.047000	41.94	75.0	33.06	1000	120	100.0	V	223.0
176.955000	31.55	75.0	43.45	1000	120	100.0	V	275.0
272.791000	41.51	75.0	33.49	1000	120	100.0	V	287.0
132.723000	37.42	75.0	37.58	1000	120	100.0	V	328.0
125.254000	35.35	75.0	39.65	1000	120	100.0	V	337.0
397.727000	37.87	75.0	37.13	1000	120	350.0	V	331.0

Conversion to conducted measurement in dBm

Frequency (MHz)	Max Peak (dBµV/m)	Conversion Factor	Max Sig (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)
450.010000	49.61	95.2	-45.59	-20	25.59	1000	120	100.0
805.224000	38.10	95.2	-57.1	-20	37.1	1000	120	100.0
299.951000	51.75	95.2	-43.45	-20	23.45	1000	120	100.0
600.069000	39.70	95.2	-55.5	-20	35.5	1000	120	150.0
896.016000	42.20	95.2	-53.0	-20	33.0	1000	120	200.0
140.095000	38.46	95.2	-56.74	-20	36.74	1000	120	300.0
221.187000	33.09	95.2	-62.11	-20	42.11	1000	120	350.0
149.989000	Fundamental							
265.419000	41.46	95.2	-53.74	-20	33.74	1000	120	100.0
258.047000	41.94	95.2	-53.26	-20	33.26	1000	120	100.0
176.955000	31.55	95.2	-63.65	-20	43.65	1000	120	100.0
272.791000	41.51	95.2	-53.69	-20	33.69	1000	120	100.0
132.723000	37.42	95.2	-57.78	-20	37.78	1000	120	100.0
125.254000	35.35	95.2	-59.85	-20	39.85	1000	120	100.0
397.727000	37.87	95.2	-57.33	-20	37.33	1000	120	100.0

Measurement Data and Plot: Model 1100-5 (Channel 161 MHz) Powered by external 12 VDC Car battery



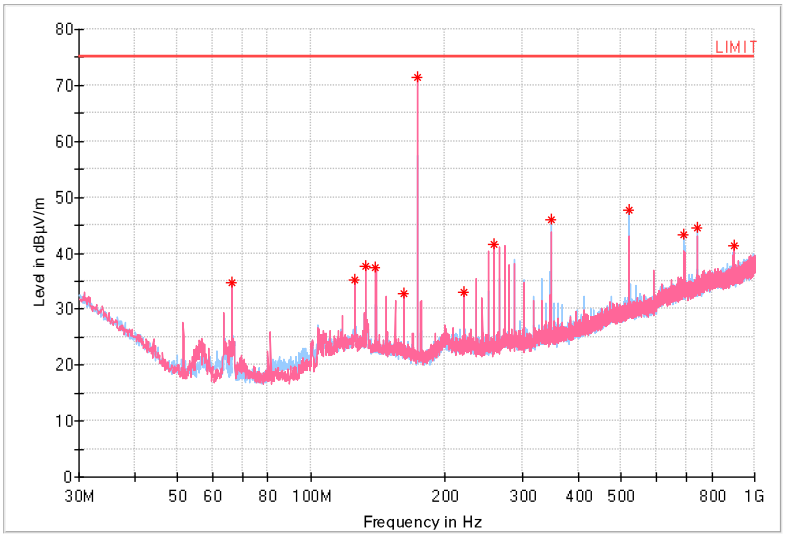
Spurious and Peak Harmonics at 3m

Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
482.990000	53.24	75.0	21.76	1000	120	100.0	H	348.0
644.010000	40.31	75.0	34.69	1000	120	150.0	H	29.0
321.970000	43.42	75.0	31.58	1000	120	150.0	H	266.0
979.048000	41.59	75.0	33.41	1000	120	200.0	H	0.0
805.030000	41.06	75.0	33.94	1000	120	200.0	H	191.0
125.254000	35.76	75.0	39.24	1000	120	100.0	V	0.0
132.626000	38.92	75.0	36.08	1000	120	100.0	V	0.0
176.955000	31.77	75.0	43.23	1000	120	100.0	V	0.0
66.278000	35.56	75.0	39.44	1000	120	100.0	V	1.0
221.187000	33.56	75.0	41.44	1000	120	100.0	V	81.0
160.950000	Fundamental							
139.998000	37.37	75.0	37.63	1000	120	100.0	V	189.0
258.047000	41.52	75.0	33.48	1000	120	100.0	V	219.0
272.791000	41.82	75.0	33.18	1000	120	100.0	V	219.0

Conversion to conducted measurement

Frequency (MHz)	Max Peak (dBµV/m)	Conversion Factor	Max Sig (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)
482.990000	**53.24**	**95.2**	-41.96	-20	21.96	**1000**	**120**	**100.0**
644.010000	**40.31**	**95.2**	-54.89	-20	34.89	1000	120	100.0
321.970000	**43.42**	**95.2**	-51.78	-20	31.78	**1000**	**120**	**100.0**
979.048000	**41.59**	**95.2**	-53.61	-20	33.61	**1000**	**120**	**150.0**
805.030000	**41.06**	**95.2**	-54.14	-20	34.14	1000	120	200.0
125.254000	**35.76**	**95.2**	-59.44	-20	39.44	**1000**	**120**	**300.0**
132.626000	**38.92**	**95.2**	-56.28	-20	36.28	**1000**	**120**	**350.0**
176.955000	**31.77**	**95.2**	-63.43	-20	43.43	**1000**	**120**	**100.0**
66.278000	**35.56**	**95.2**	-59.64	-20	39.64	**1000**	**120**	**100.0**
221.187000	**33.56**	**95.2**	-61.64	-20	41.64	**1000**	**120**	**100.0**
160.950000	**Fundamental**							
139.998000	**37.37**	**95.2**	-57.83	-20	37.83	**1000**	**120**	**100.0**
258.047000	**41.52**	**95.2**	-53.68	-20	33.68	**1000**	**120**	**100.0**
272.791000	**41.82**	**95.2**	-53.38	-20	33.38	**1000**	**120**	**100.0**

Measurement Data and Plot: Model 1100-5 (Channel 174 MHz) Powered by external 12 VDC Car battery



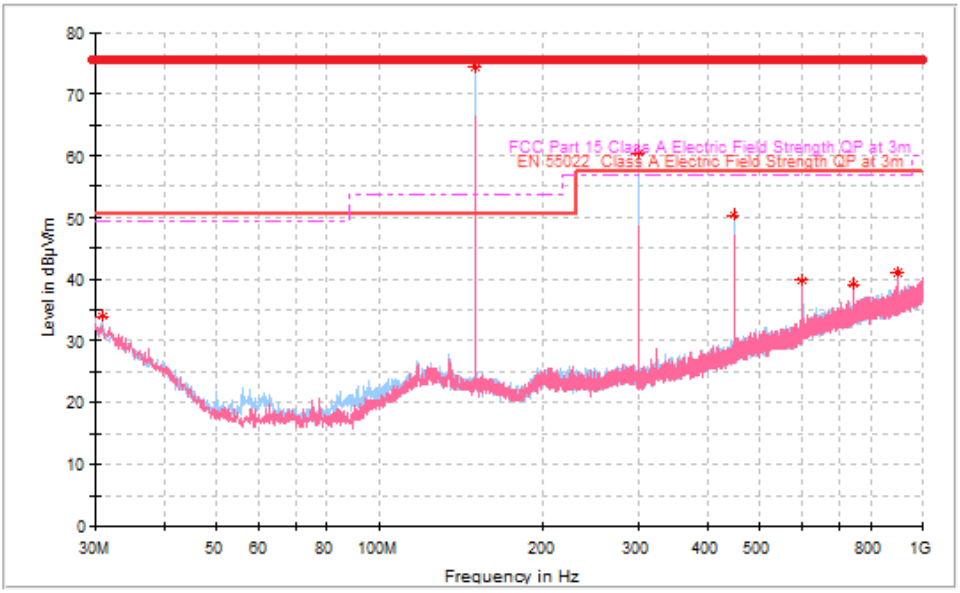
Spurious and Peak Harmonics at 3m

Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
521.984000	47.82	75.0	27.18	1000	120	100.0	H	1.0
741.689000	44.55	75.0	30.45	1000	120	100.0	H	235.0
347.966000	46.11	75.0	28.89	1000	120	100.0	H	289.0
692.219000	43.32	75.0	31.68	1000	120	300.0	H	320.0
132.723000	37.73	75.0	37.27	1000	120	100.0	V	0.0
162.114000	32.78	75.0	42.22	1000	120	100.0	V	5.0
221.187000	33.05	75.0	41.95	1000	120	100.0	V	10.0
125.254000	35.21	75.0	39.79	1000	120	100.0	V	18.0
66.278000	34.66	75.0	40.34	1000	120	100.0	V	159.0
258.047000	41.56	75.0	33.44	1000	120	100.0	V	232.0
173.948000	Fundamental							
139.998000	37.37	75.0	37.63	1000	120	100.0	V	357.0
896.016000	41.34	75.0	33.66	1000	120	250.0	V	50.0

Conversion to conducted measurement

Frequency (MHz)	Max Peak (dBµV/m)	Correction Factor	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
521.984000	47.82	95.2	-47.38	1000	120	100.0	H	1.0
741.689000	44.55	95.2	-50.65	1000	120	100.0	H	235.0
347.966000	46.11	95.2	-49.09	1000	120	100.0	H	289.0
692.219000	43.32	95.2	-51.88	1000	120	300.0	H	320.0
132.723000	37.73	95.2	-57.47	1000	120	100.0	V	0.0
162.114000	32.78	95.2	-62.42	1000	120	100.0	V	5.0
221.187000	33.05	95.2	-62.15	1000	120	100.0	V	10.0
125.254000	35.21	95.2	-59.99	1000	120	100.0	V	18.0
66.278000	34.66	95.2	-60.54	1000	120	100.0	V	159.0
258.047000	41.56	95.2	-53.64	1000	120	100.0	V	232.0
173.948000	Fundamental							
139.998000	37.37	95.2	-57.83	1000	120	100.0	V	357.0
896.016000	41.34	95.2	-53.86	1000	120	250.0	V	50.0

Measurement Data and Plot: Model 1100-3 (Channel 150 MHz) Powered from 14.4 VDC internal batteries



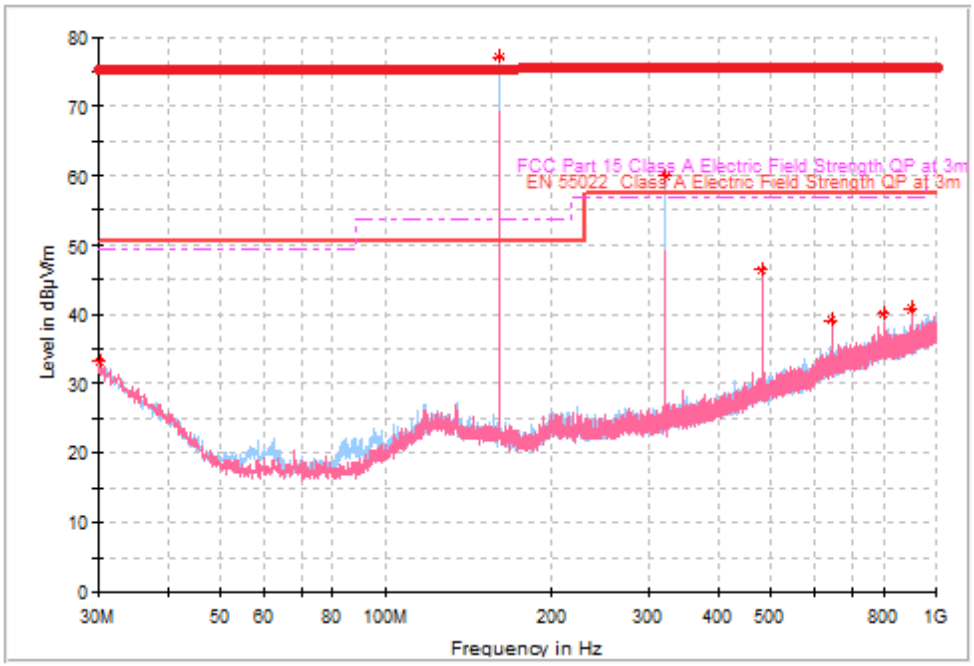
Spurious and Peak Harmonics at 3m

Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
450.010000	50.39	75.0	24.61	1000	120	100.0	H	100.0
299.951000	60.52	75.0	14.48	1000	120	100.0	H	358.0
750.031000	39.14	75.0	35.86	1000	120	150.0	H	112.0
149.989000	Fundamental							
600.069000	39.82	75.0	35.18	1000	120	100.0	V	359.0
896.016000	41.21	75.0	33.79	1000	120	250.0	V	0.0

Conversion to Conducted Measurement

Frequency (MHz)	Max Peak (dBµV/m)	Conversion factor	Max Sig (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
450.010000	50.39	95.2	-44.81	-20	24.81	120	100.0	H	100.0
299.951000	60.52	95.2	-34.68	-20	14.60	120	100.0	H	358.0
750.031000	39.14	95.2	-56.06	-20	36.0	120	150.0	H	112.0
149.989000	Fundamental								
600.069000	39.82	95.2	-55.38	-20	35.38	120	100.0	V	359.0
896.016000	41.21	95.2	-53.99	-20	34.0	120	250.0	V	0.0

Measurement Data and Plot: Model 1100-3 (Channel 161 MHz) Powered from 14.4 VDC internal batteries



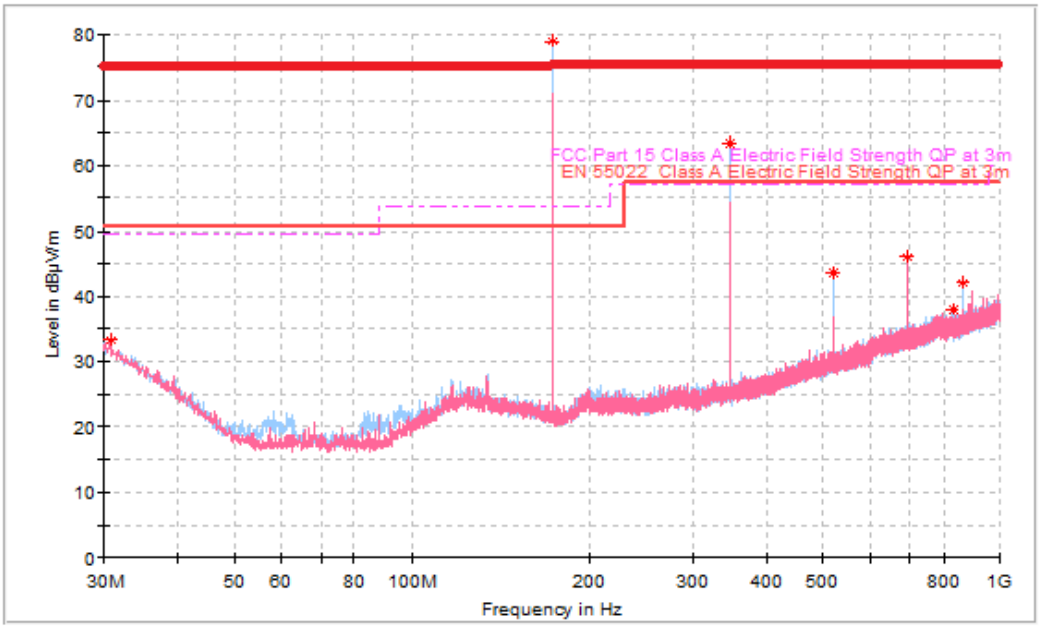
Spurious and Peak Harmonics at 3m

Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
321.970000	59.91	75.0	15.09	1000	120	100.0	H	37.0
160.950000								
896.016000	40.86	75.0	34.14	1000	120	200.0	H	140.0
482.990000	46.45	75.0	28.55	1000	120	200.0	H	258.0
805.030000	40.19	75.0	34.81	1000	120	350.0	H	213.0
644.010000	39.19	75.0	35.81	1000	120	100.0	V	2.0

Field reading to Conductive reading

Frequency (MHz)	Max Peak (dBµV/m)	Conversion factor	Max Sig (dBm)	Limit (dBm))	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
161.00000	Fundamental								
321.970000	59.91	95.2	-35.29	-20	15.29	120	100.0	H	37.0
896.016000	40.86	95.2	-54.34	-20	34.34	120	200.0	H	140.0
482.990000	46.45	95.2	-48.75	-20	28.75	120	200.0	H	258.0
805.030000	40.19	95.2	-55.01	-20	35.01	120	350.0	H	213.0
644.010000	39.19	95.2	-56.01	-20	36.01	120	100.0	V	2.0

Measurement Data and Plot: Model 1100-3 (Channel 174 MHz) Powered from 14.4 VDC internal batteries



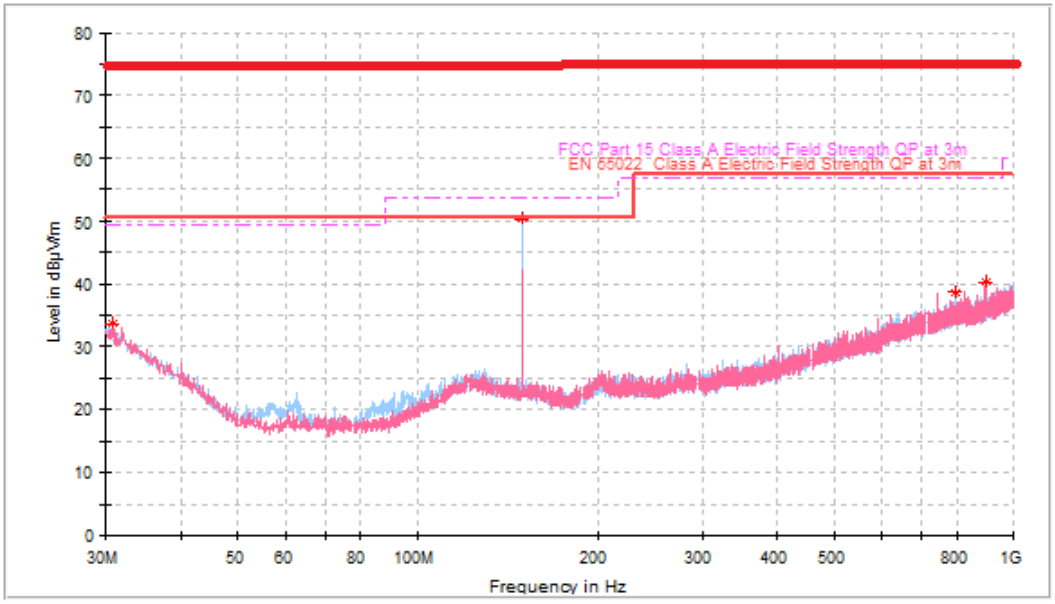
Spurious and Peak Harmonics at 3m

Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
347.966000	63.34	75.0	11.66	1000	120	100.0	H	26.0
521.984000	43.56	75.0	31.44	1000	120	100.0	H	178.0
831.414000	37.87	75.0	37.13	1000	120	100.0	H	295.0
173.948000	Fundamental							
870.020000	42.05	75.0	32.95	1000	120	200.0	H	169.0
696.099000	45.98	75.0	29.02	1000	120	100.0	V	44.0
30.873000	33.19	75.0	41.81	1000	120	400.0	V	224.0

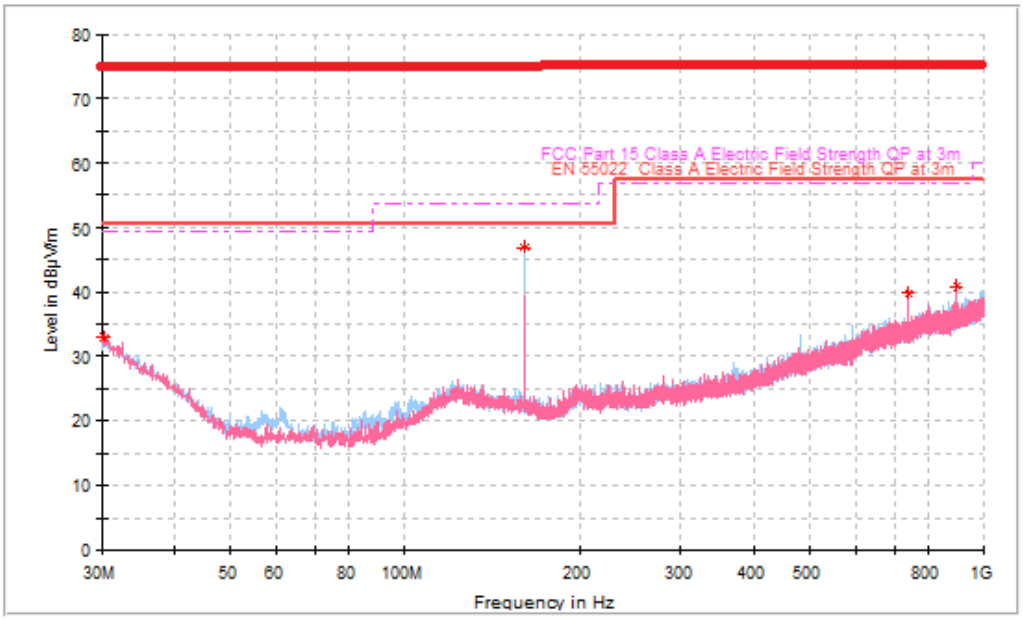
Field reading to Conductive reading

Frequency (MHz)	Max Peak (dBµV/m)	Conversion Factor	Max Peak (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
173.94800	Fundamental								
347.966000	63.34	95.2	-31.86	-20	11.86	120	100.0	H	26.0
521.984000	43.56	95.2	-51.64	-20	31.64	120	100.0	H	178.0
831.414000	37.87	95.2	-57.33	-20	37.33	120	100.0	H	295.0
870.020000	42.05	95.2	-53.15	-20	33.15	120	200.0	H	169.0
696.099000	45.98	95.2	-49.22	-20	29.22	120	100.0	V	44.0

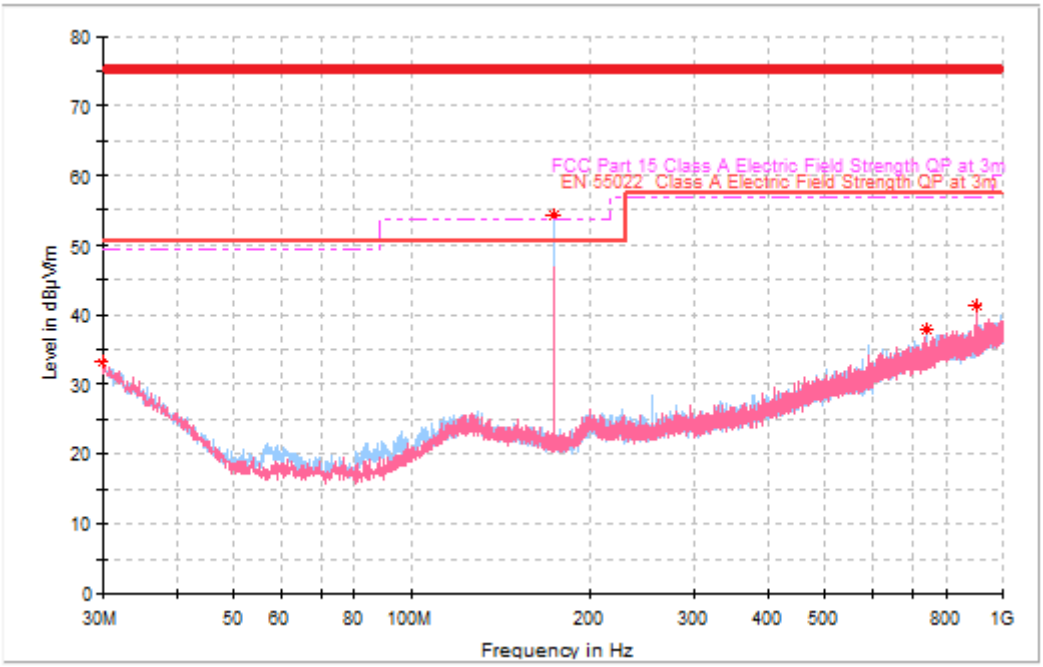
Measurement Data and Plot: Model 1100-3D (Channel 150 MHz) Powered from 14.4 VDC internal batteries



Measurement Data and Plot: Model 1100-3D (Channel 161 MHz) Powered from 14.4 VDC internal batteries



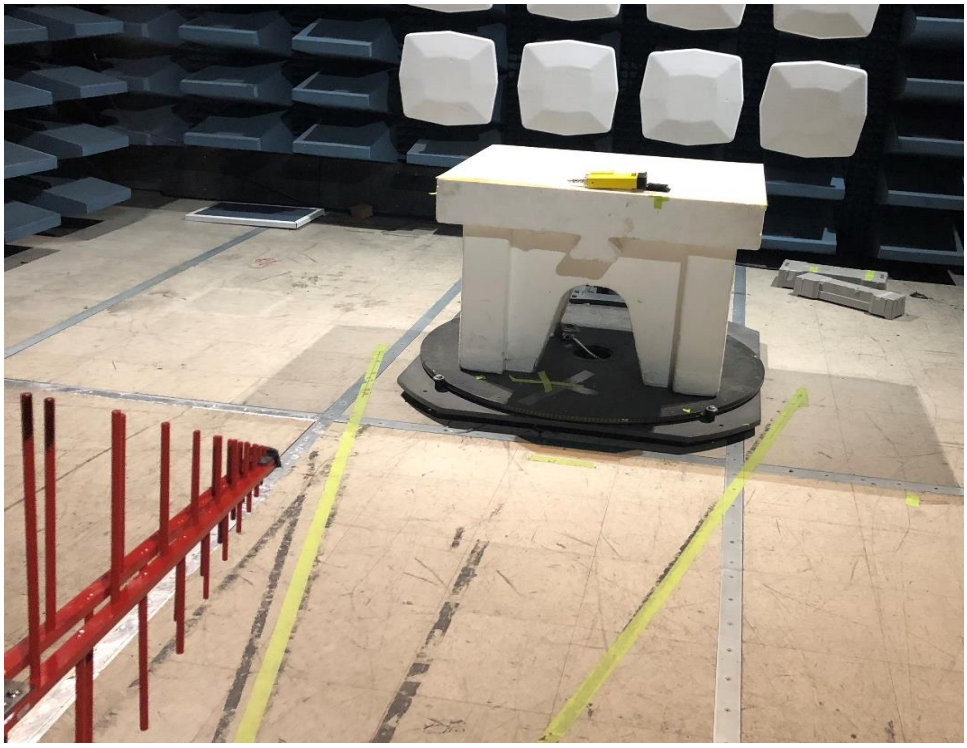
Measurement Data and Plot: Model 1100-3D (Channel 174 MHz) Powered from 14.4 VDC internal batteries



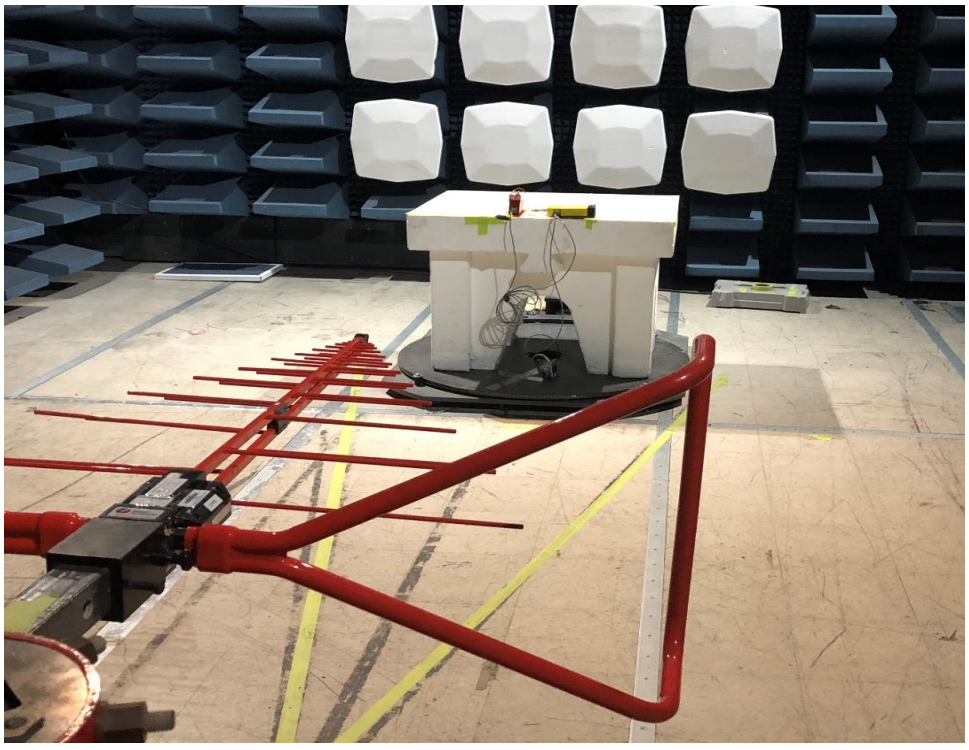
Comments – No data within 20 dB

.

Appendix A: TEST SETUP PHOTOS



Radiated Emissions performed at the 3m SAC, 30MHz – 1GHz



Radiated Emissions performed at the 3m SAC, 30MHz – 1GHz

Conducted Radio Measurement Setup

Conducted Radio Measurement Setup

Appendix B: ABBREVIATIONS

Abbreviation	Definition
AC	Alternating Current
AM	Amplitude Modulation
CISPR	Comité International Spécial des Perturbations Radioélectriques
DC	Direct Current
EMC	Electro Magnetic Compatibility
EMI	Electro Magnetic Interference
EUT	Equipment Under Test
FCC	Federal Communications Commission
IC	Industry Canada
ICES	Interference Causing Equipment Standard
IEC	International Electrotechnical Commission
LISN	Line Impedance Stabilizing Network
OATS	Open Area Test Site
RF	Radio Frequency
RMS	Root-Mean-Square
SAC	Semi-Anechoic Chamber

END OF REPORT