



Engineering Solutions & Electromagnetic Compatibility Services

FCC Part 15.247 & Industry Canada RSS-247 Test Report

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FCC ID/IC	OWDTR-0148-E 3636B-0148	Test Report Date:	March 1, 2017
Platform	N/A	RTL Work Order #	2017070
Model	XL-185P	RTL Quote #	QRTL17-069B
American National Standard Institute	ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
FCC Classification	DTS – Part 15 Digital Transmission System		
FCC Rule Part(s)/Guidance	FCC Rules Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System (10/01/2015)		
Industry Canada	RSS-247 Issue 2 Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices		
Digital Interface Information	Digital Interface was found to be compliant		
Frequency Range (MHz)	Output Power (W)*	Frequency Tolerance	Emission Designator
2402 - 2480	0.0069	N/A	517KF1D

* power is conducted

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from, the applicable parts of FCC Part 2, FCC Part 15, Industry Canada RSS-247, RSS-Gen, and ANSI C63.10.

Signature: 

Date: March 1, 2017

Typed/Printed Name: Desmond A. Fraser

Position: President

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These test(s) are accredited under Rhein Tech Laboratories, Inc. ISO/IEC 17025 accreditation issued by ANAB. Refer to certificate and scope of accreditation AT-1445.

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1 General Information

1.1 Scope

This is an original FCC and Industry Canada certification application report.

Applicable Standards:

- FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.
- RSS-247 Issue 2 Digital Transmission Systems (DTSSs), Frequency Hopping Systems (FHSSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

1.2 Description of EUT

Equipment Under Test	Transceiver
Model	XL-185P
Power Supply	7.5 VDC battery
Modulation Type	FSK
Frequency Range	2402-2480 MHz
Antenna Type & Gain	Chip

1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing.

1.4 Related Submittal(s)/Grant(s)

This report supports a certification application for Harris Corporation Model XL-185P, FCC ID: OWDTR-0148-E, IC: 3636B-0148.

1.5 Modifications

No modifications were made to the equipment during testing in order to achieve compliance with these standards.

2 Test Information

2.1 Description of Test Modes

In accordance with FCC 15.31(m), and because the EUT utilizes an operating band greater than 10 MHz, the following frequencies were tested:

Table 2-1: Channels Tested

Channel	Frequency
Low	2402
Middle	2440
High	2480

2.2 Exercising the EUT

The EUT was supplied with test software instructions to change channels, with a high, mid, and low channel for testing. The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The EUT was provided with software to continuously transmit during testing. The carrier was also checked to verify that information was being transmitted. There were no deviations from the test standard(s) and/or methods. The test results reported relate only to the item tested.

2.3 Test Result Summary

Table 2-2: Test Result Summary – FCC Part 15 Subpart C (Section 15.247) & IC

Test	FCC Reference	IC Reference	Result
AC Power Conducted Emissions	FCC 15.207	RSS-Gen 8.8	Pass
Radiated Emissions	FCC 15.209	RSS-247 5.5 RSS-Gen 6.13/7.1	Pass
Maximum Peak Power Output	FCC 15.247(b)(3)	RSS-247 5.4 RSS-Gen 6.12	Pass
Peak Power Spectral Density	FCC 15.247(e)	RSS-247 5.2	Pass
Antenna Conducted Spurious Emissions	FCC 15.247(d)	RSS-247 5.5 RSS-Gen 6.13	Pass
Band Edge Measurement	FCC 15.247(d)	RSS-247 5.5	Pass
Bandwidth	FCC 15.247(a)(2)	RSS-247 5.2	Pass

2.4 Test System Details

The test samples were received on December 21, 2015. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following table.

Table 2-3: Equipment Under Test

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Transceiver (conducted port)	Harris Corporation	XL-185P	A40300000215	OWDTR-0148-E	N/A	21725
Transceiver	Harris Corporation	XL-185P	A40304000045	OWDTR-0148-E	N/A	21965

Table 2-4: Support Equipment

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Battery Eliminator	Harris Corporation	N/A	N/A	N/A	0.5m unshielded	21553
Power Supply	Alinco	DM-33MVT 32A	1638	N/A	N/A	901124
Audio Breakout	Harris Corporation	12082-7980-01	N/A	N/A	.8m unshielded I/O	20599

2.5 Configuration of Tested System

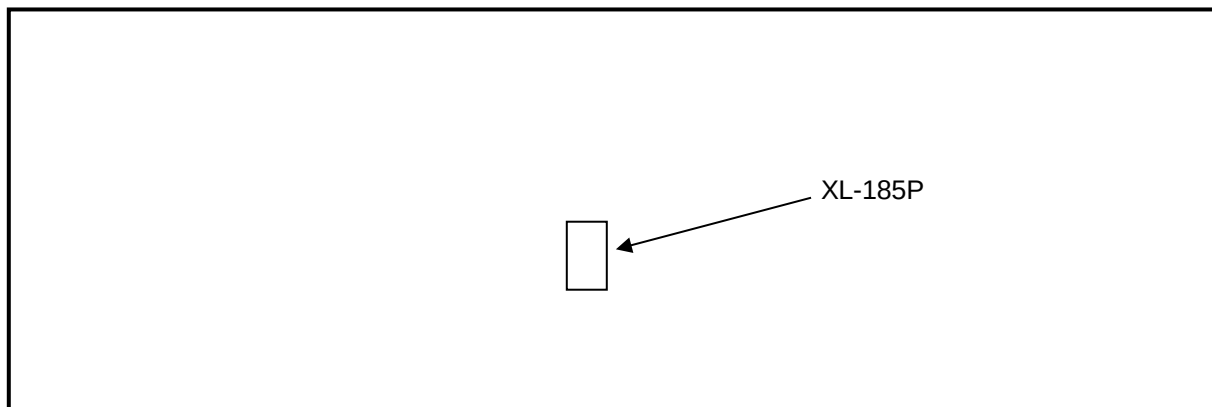


Figure 2-1: Configuration of System Under Test

3 Peak Output Power - 15.247(b)(3); IC RSS-247 5.4(d), RSS-Gen 6.12

3.1 Power Output Test Procedure

A SMA connector provided a port for measurement using the automated channel power measurement on the spectrum analyzer, for the low, mid, and high channels.

Table 3-1: Power Output Test Equipment

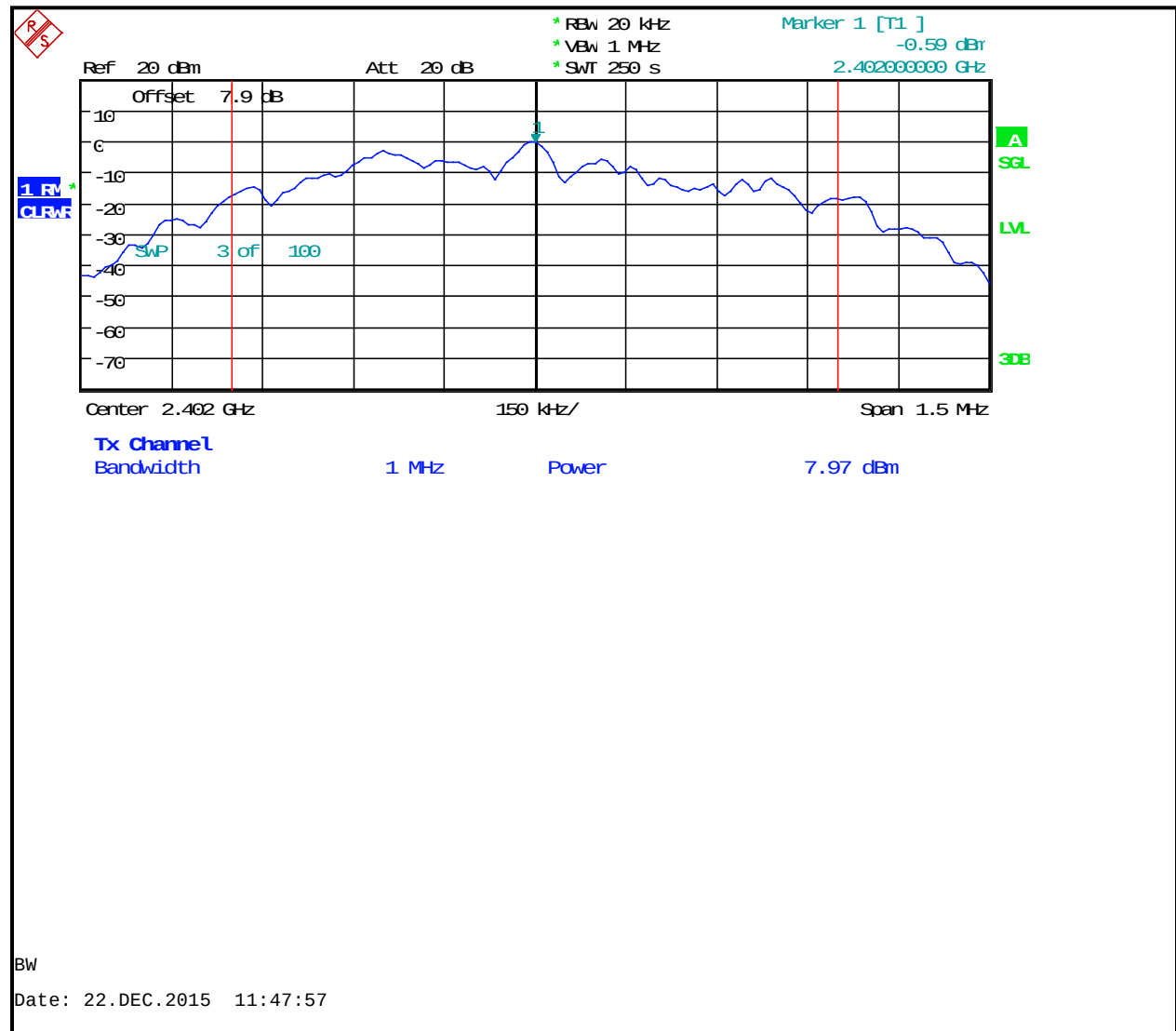
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	11/13/16

3.2 Peak Output Power Test Data

Table 3-2: Peak Output Power Test Data

Emission Frequency (MHz)	Power Measured (dBm)	Power Measured (W)
2402	8.0	0.0063
2440	8.4	0.0069
2480	8.3	0.0068

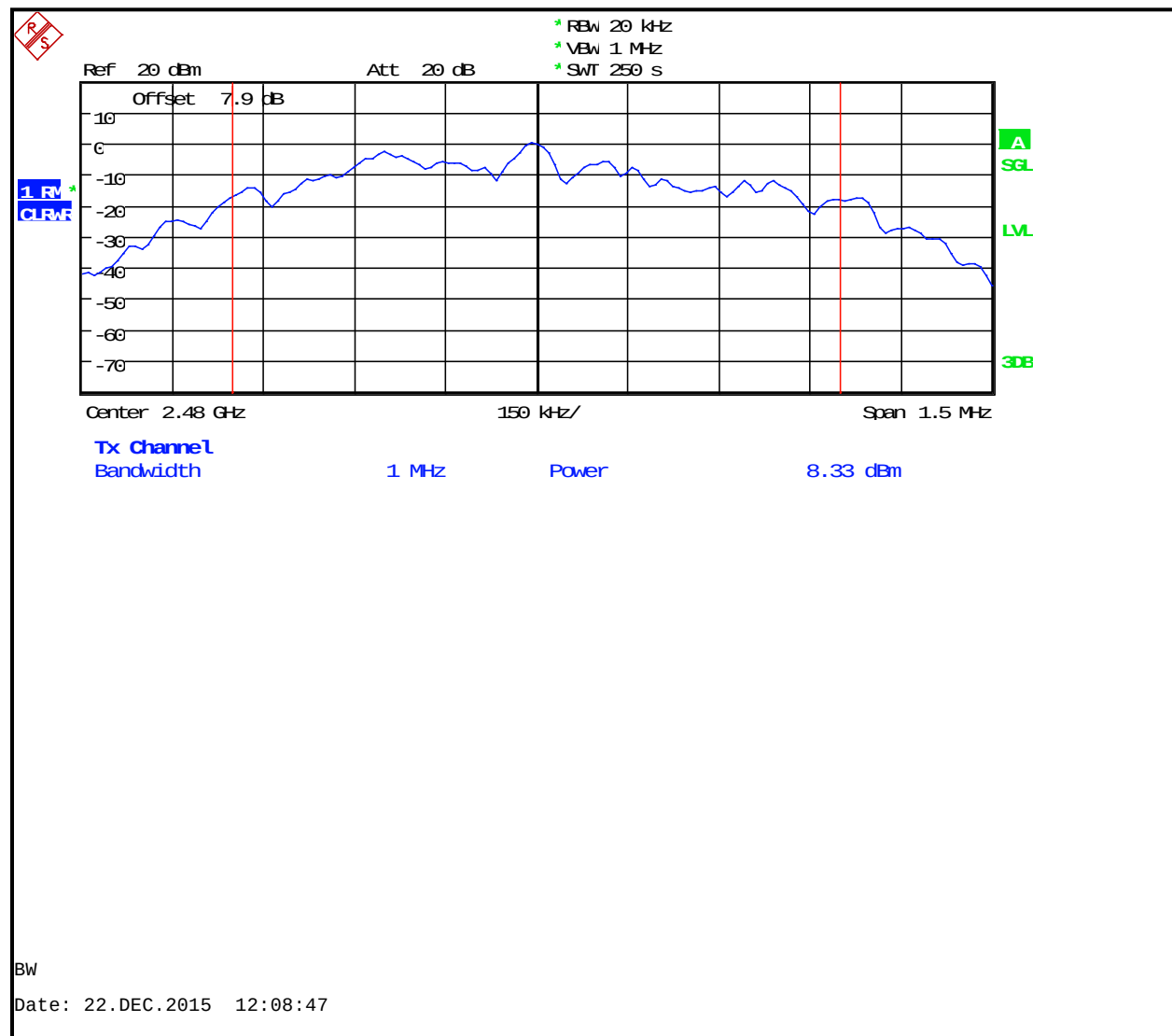
Plot 3-1: Peak Output Power – 2402 MHz



Plot 3-2: Peak Output Power – 2440 MHz



Plot 3-3: Peak Output Power – 2480 MHz



Test Personnel:

Dan Baltzell Test Engineer	 Signature	December 22, 2015 Date of Test
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4 Peak Power Spectral Density – FCC 15.247(e); IC RSS-247 5.2(b)

4.1 Peak Spectral Density Test Procedure

Digitally modulated systems shall have conducted peak power spectral density of 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Table 4-1: Power Spectral Density Test Equipment

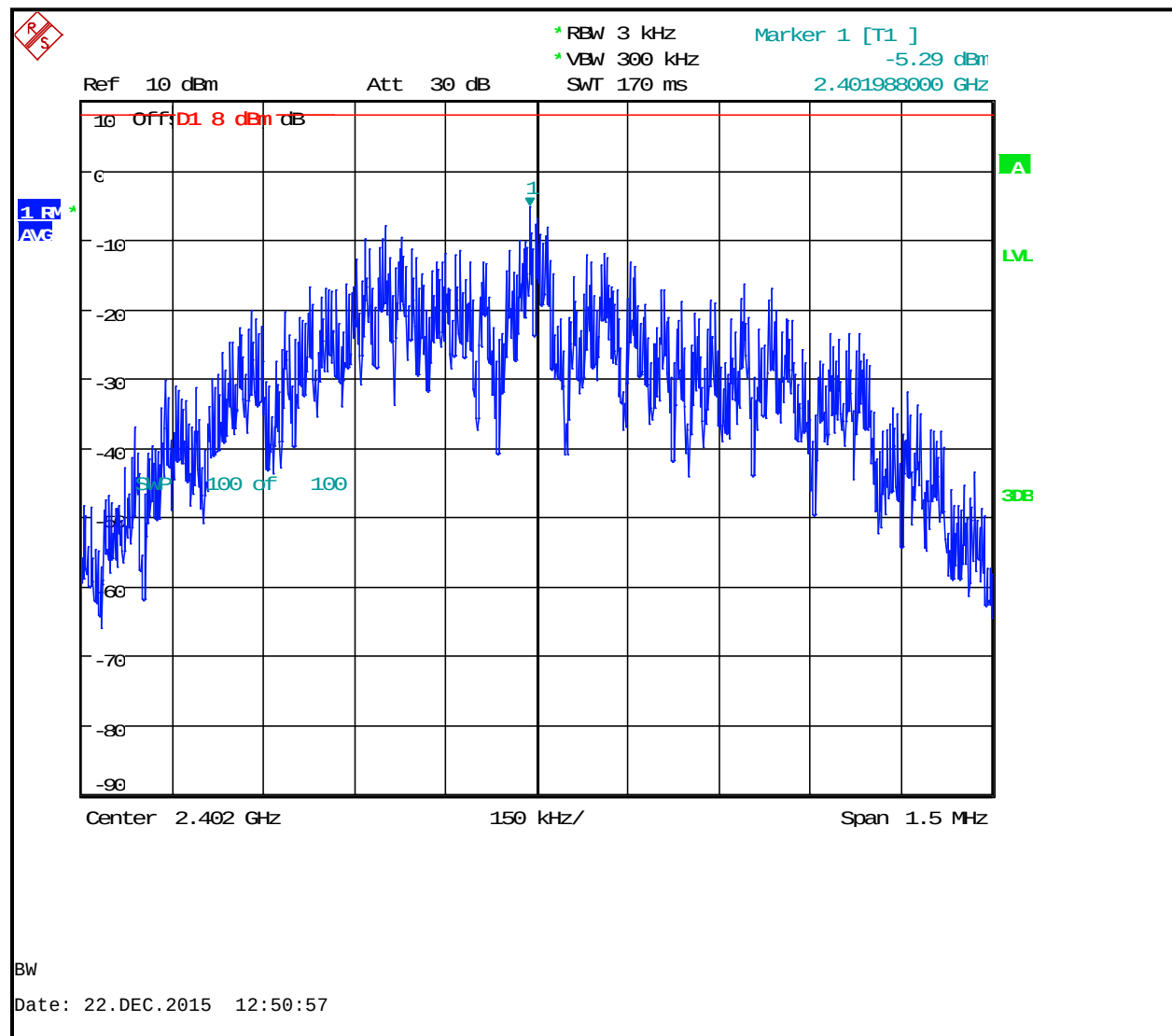
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	11/13/16

4.2 Peak Spectral Density Test Data

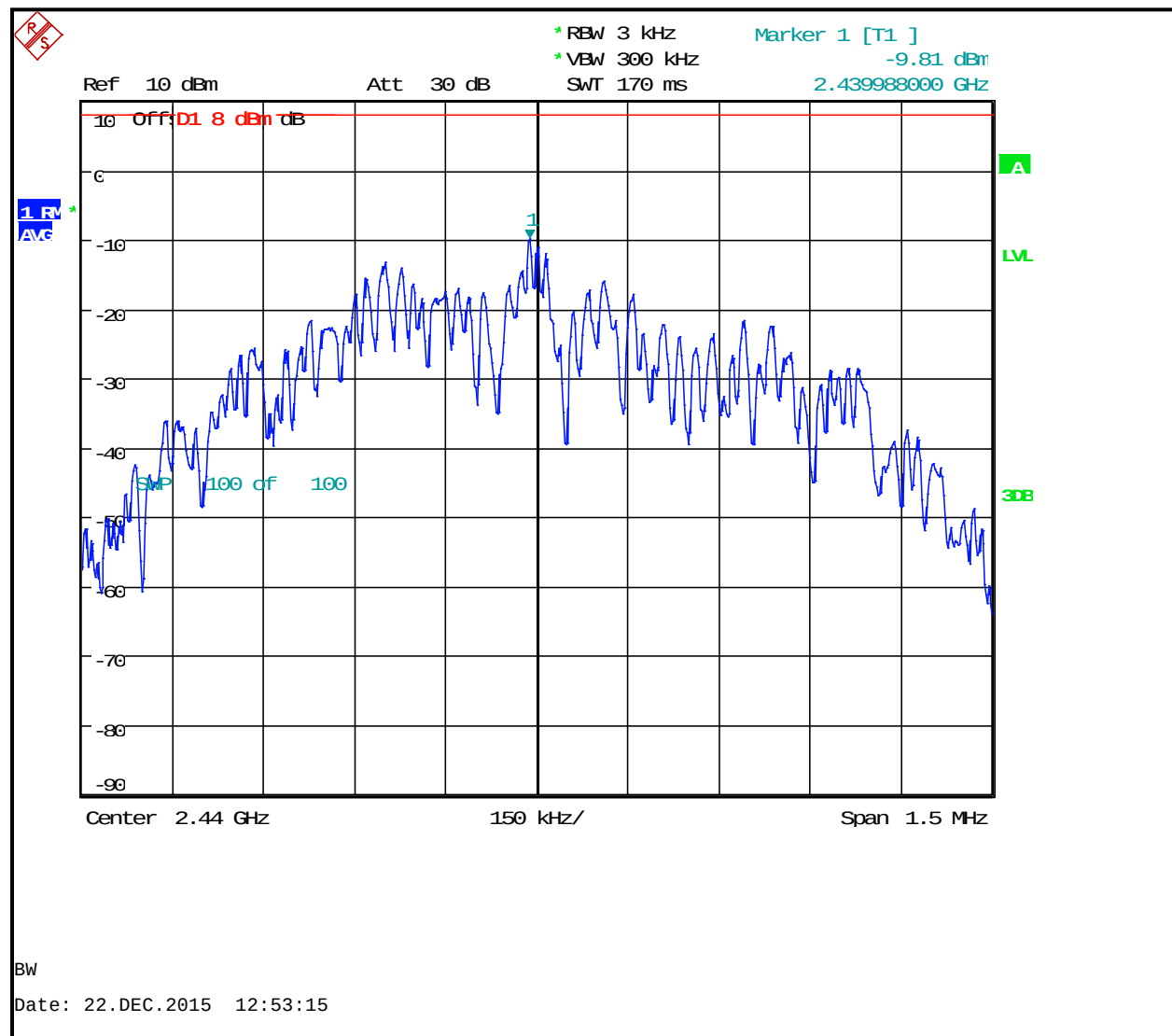
Table 4-2: Peak Spectral Density Test Data

Channels	Frequency (MHz)	Peak Output Power (dBm)
Low	2402	-5.3
Mid	2440	-9.8
High	2480	-10.9

Plot 4-1: Peak Spectral Density – 2402 MHz



Plot 4-2: Peak Spectral Density – 2440 MHz



5 Antenna Conducted Spurious Emissions – FCC 15.247(d), RSS-247 5.5

5.1 Antenna Conducted Spurious Emissions Test Procedure

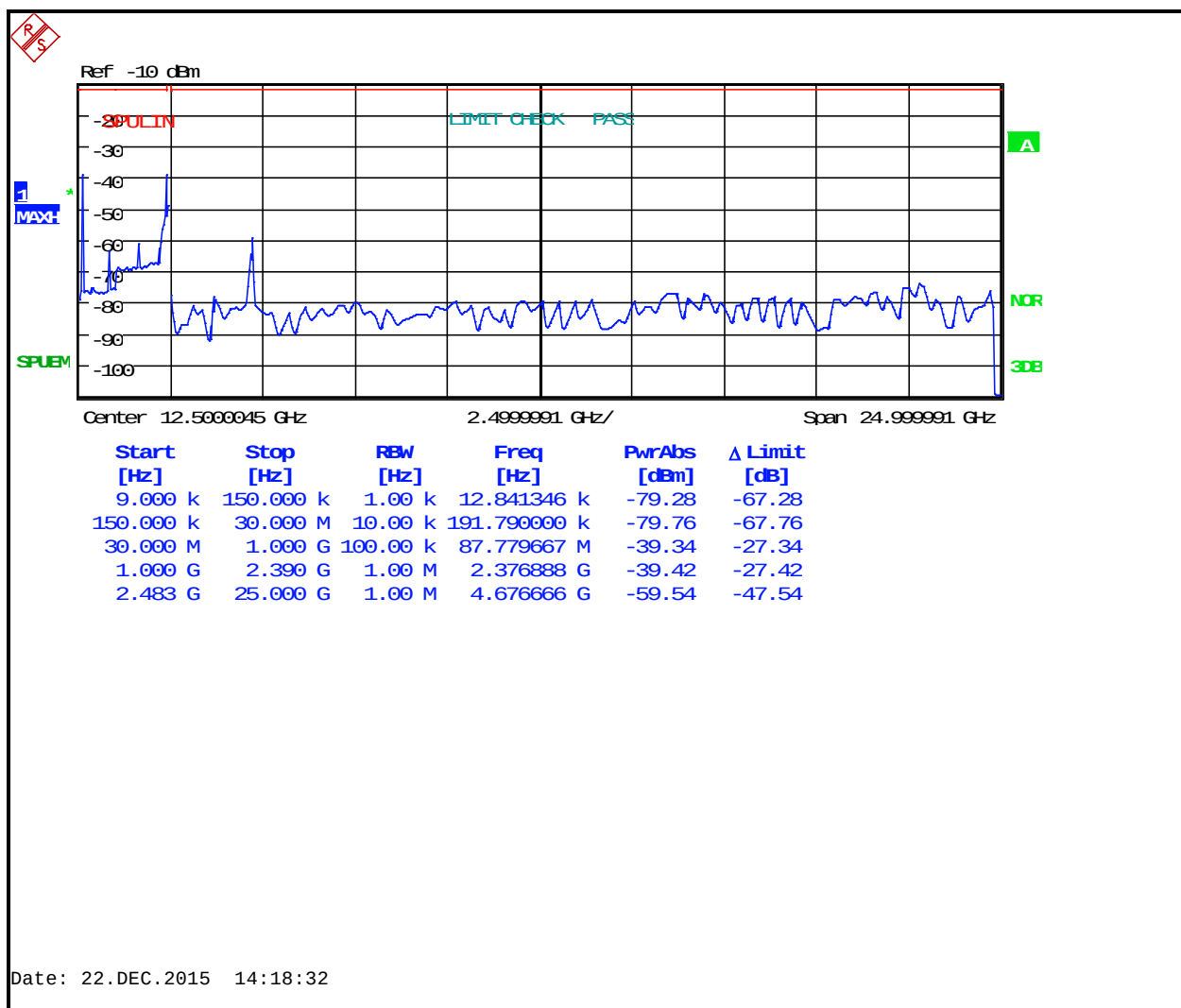
A SMA connector provided a port for measurement from 9 kHz to the 10th harmonic with the spectrum analyzer, for the low, mid, and high channels.

Table 5-1: Antenna Conducted Spurious Emissions Test Equipment

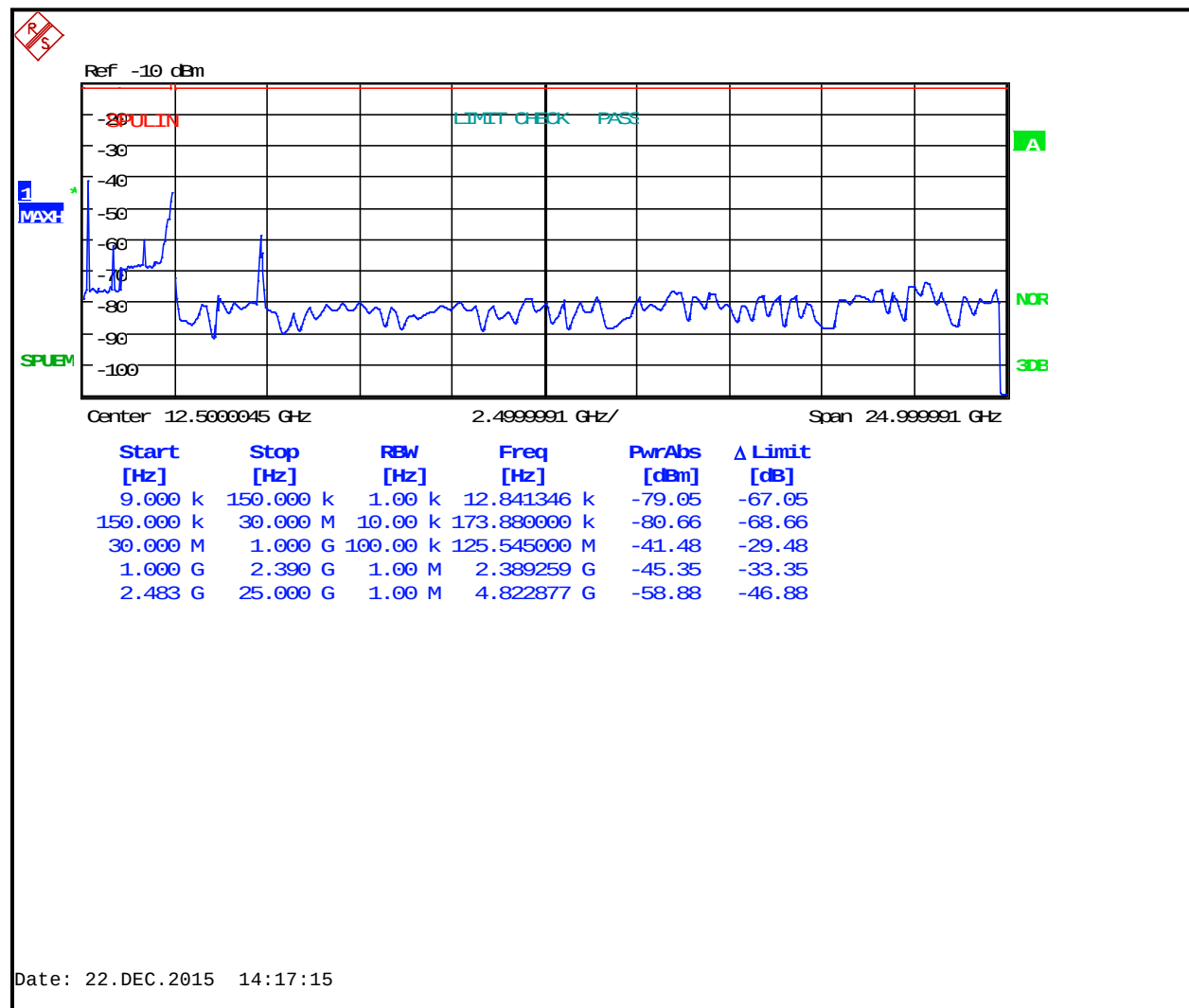
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	11/13/16

5.2 Antenna Conducted Spurious Emissions Test Data

Plot 5-1: Antenna Conducted Spurious Emissions – 2402 MHz



Plot 5-2: Antenna Conducted Spurious Emissions – 2440 MHz



Plot 5-3: Antenna Conducted Spurious Emissions – 2480 MHz



Test Personnel:

Daniel W. Baltzell
EMC Test Engineer

Daniel W. Baltzell

Signature

December 22, 2015
Date of Test

6 Compliance with the Band Edge – FCC 15.247(d); RSS-247 5.5

6.1 Band Edge Test Procedure

Conducted measurements were taken. The span was set wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation. The spectrum analyzer was set to the following:

RBW > = 1 % of span
VBW > = RBW
Sweep = auto
Detector function = peak
Trace = max hold

The trace was allowed to stabilize. The marker was set on the emission at the band edge. The marker-delta was used to show the delta between the maximum in-band emission and the emission at the band edge, and was compared to the 20 dBc requirement of 15.247(d) (when using peak emissions) or restricted band.

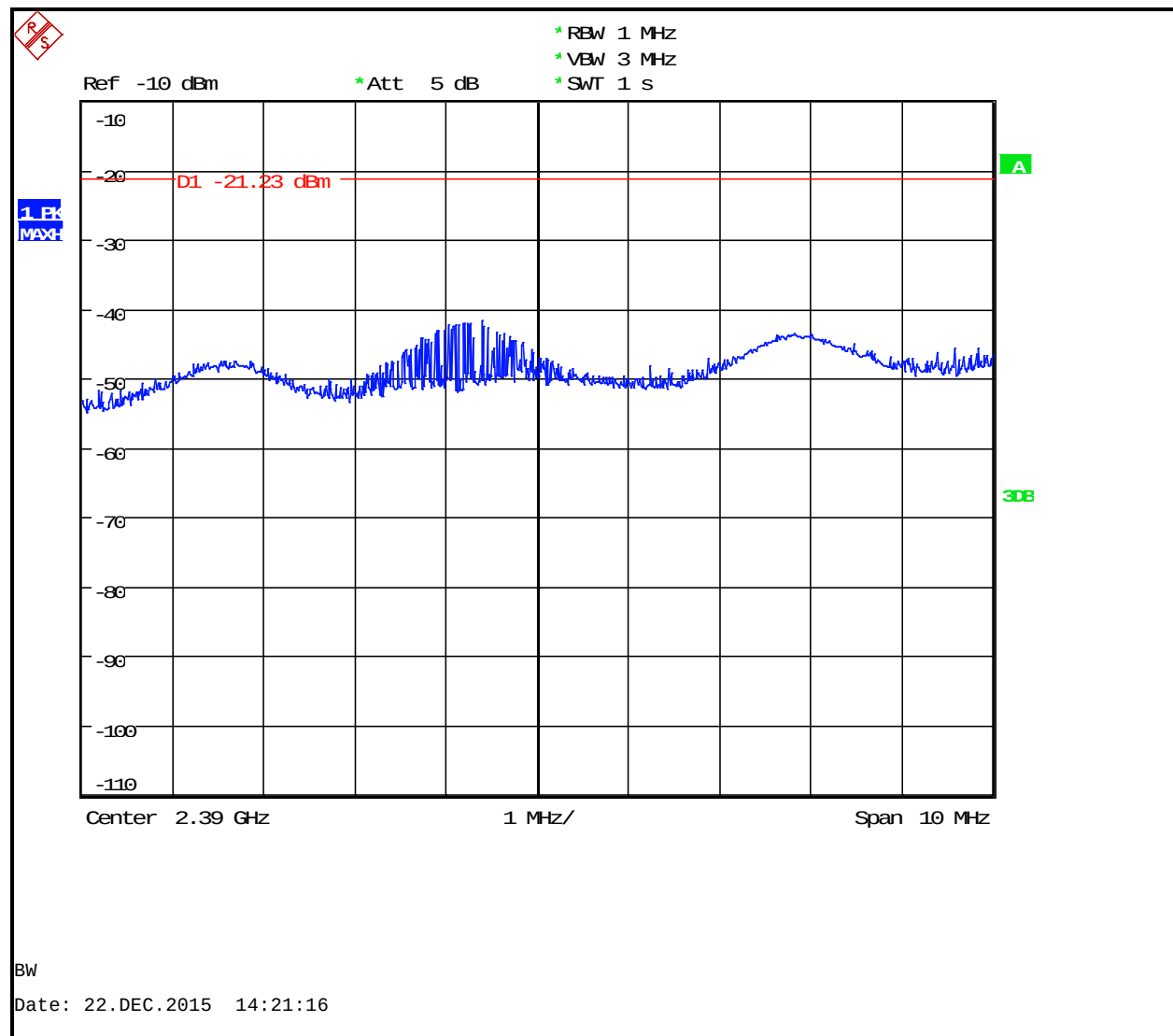
Table 6-1: Band Edge Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	11/13/16

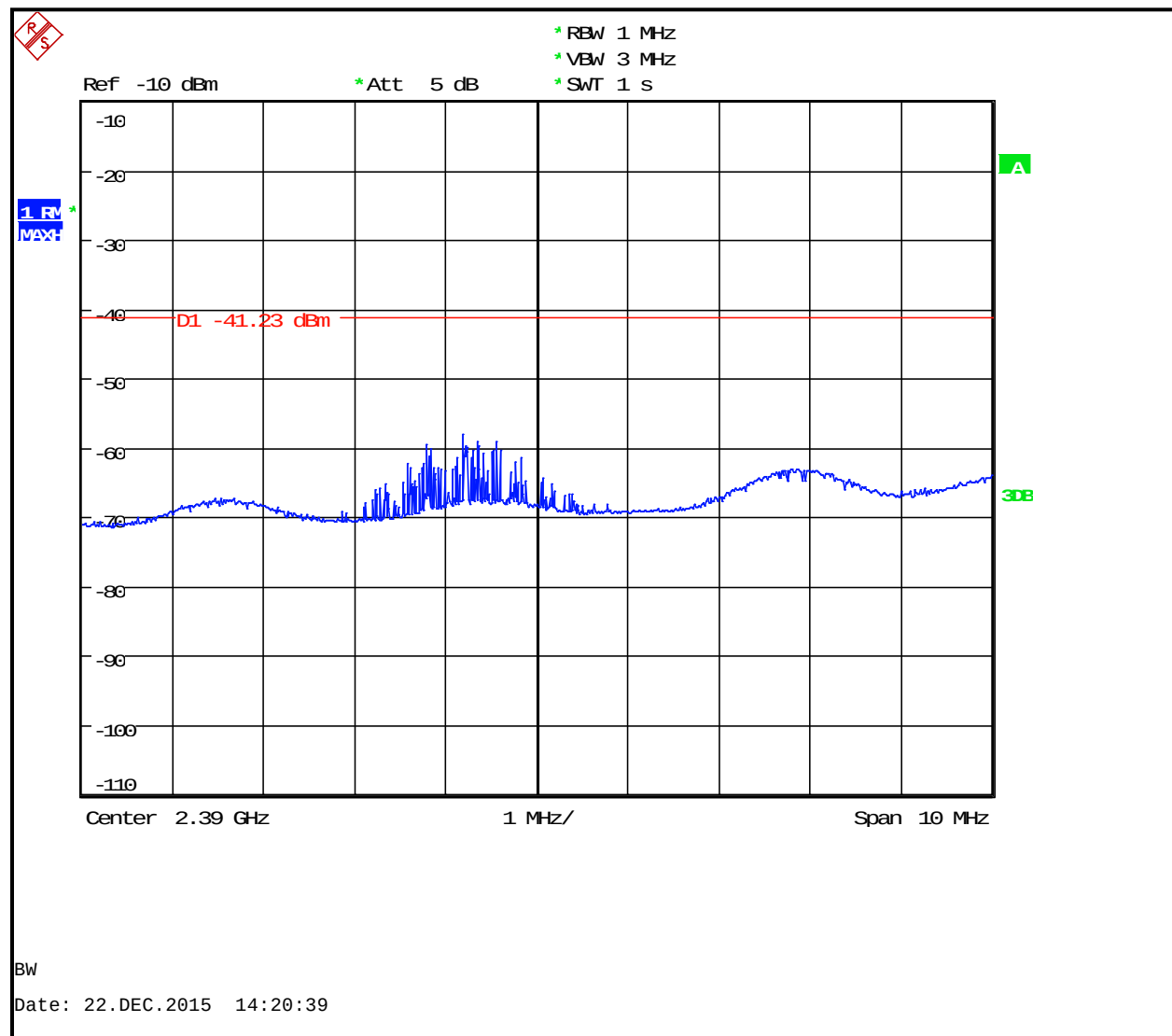
6.2 Band Edge Test Results

6.2.1 Lower Band Edge - Plots

Plot 6-1: Lower Band Edge - Peak



Plot 6-2: Lower Band Edge – Average

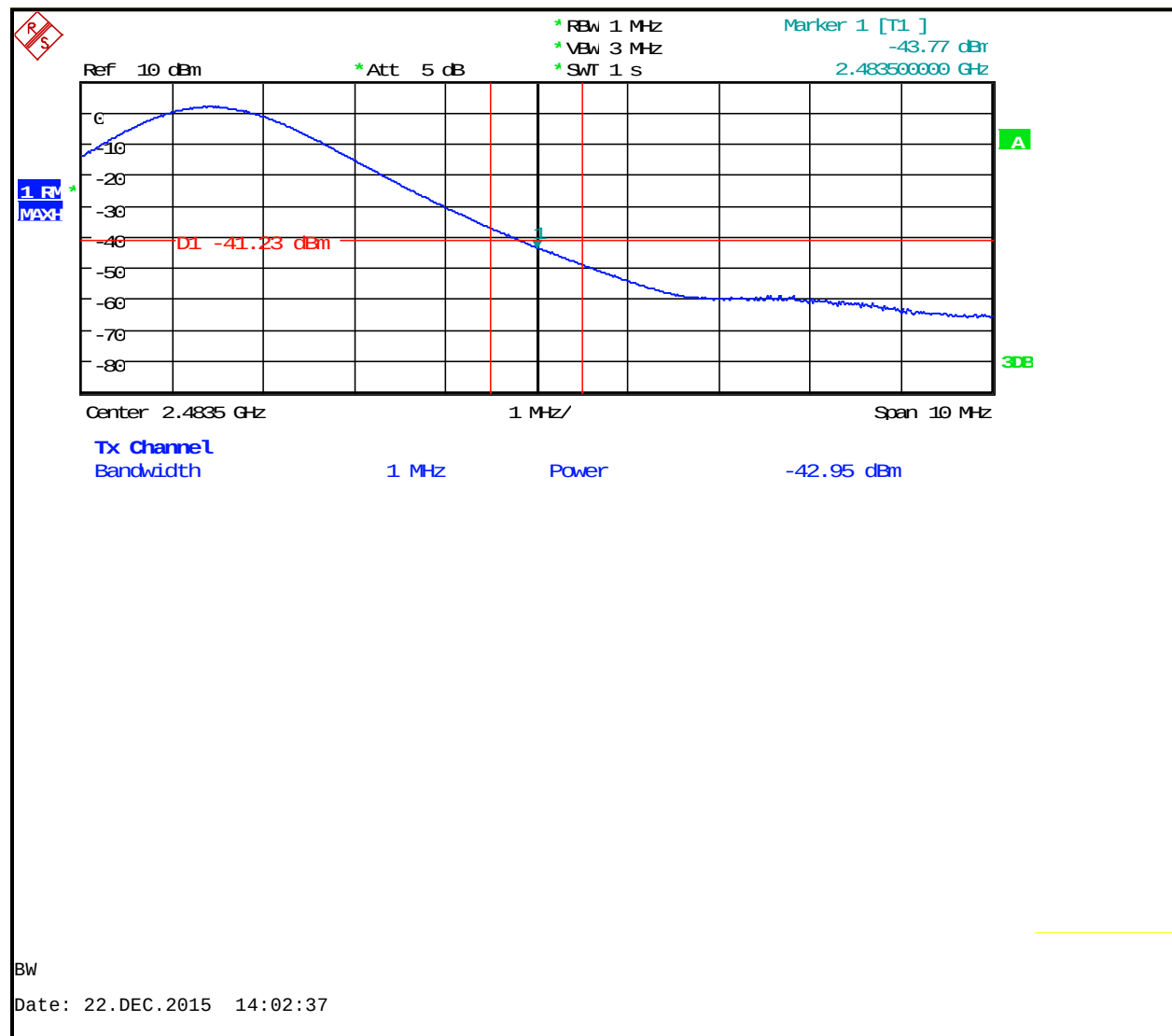


6.2.2 Upper Band Edge Plots

Plot 6-3: Upper Band Edge – Peak



Plot 6-4: Upper Band Edge - Average



Test Personnel:

Dan Baltzell Test Engineer	 Signature	December 22, 2015 Date of Test
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7 Bandwidth – FCC 15.247(a)(2); RSS-247 5.2(a)

7.1 6 dB Bandwidth Test Procedure

The minimum 6 bandwidth per FCC 15.247 (a)(2) and RSS-247 was measured using a 50-ohm spectrum analyzer. The carrier was adjusted on the analyzer so that it was displayed entirely on the spectrum analyzer. The sweep time was set to auto and allowed through several sweeps with the max hold function used in peak detector mode. The resolution bandwidth was set to 100 kHz, and the video bandwidth set at 300 kHz.

Table 7-1: 6 dB Bandwidth Test Equipment

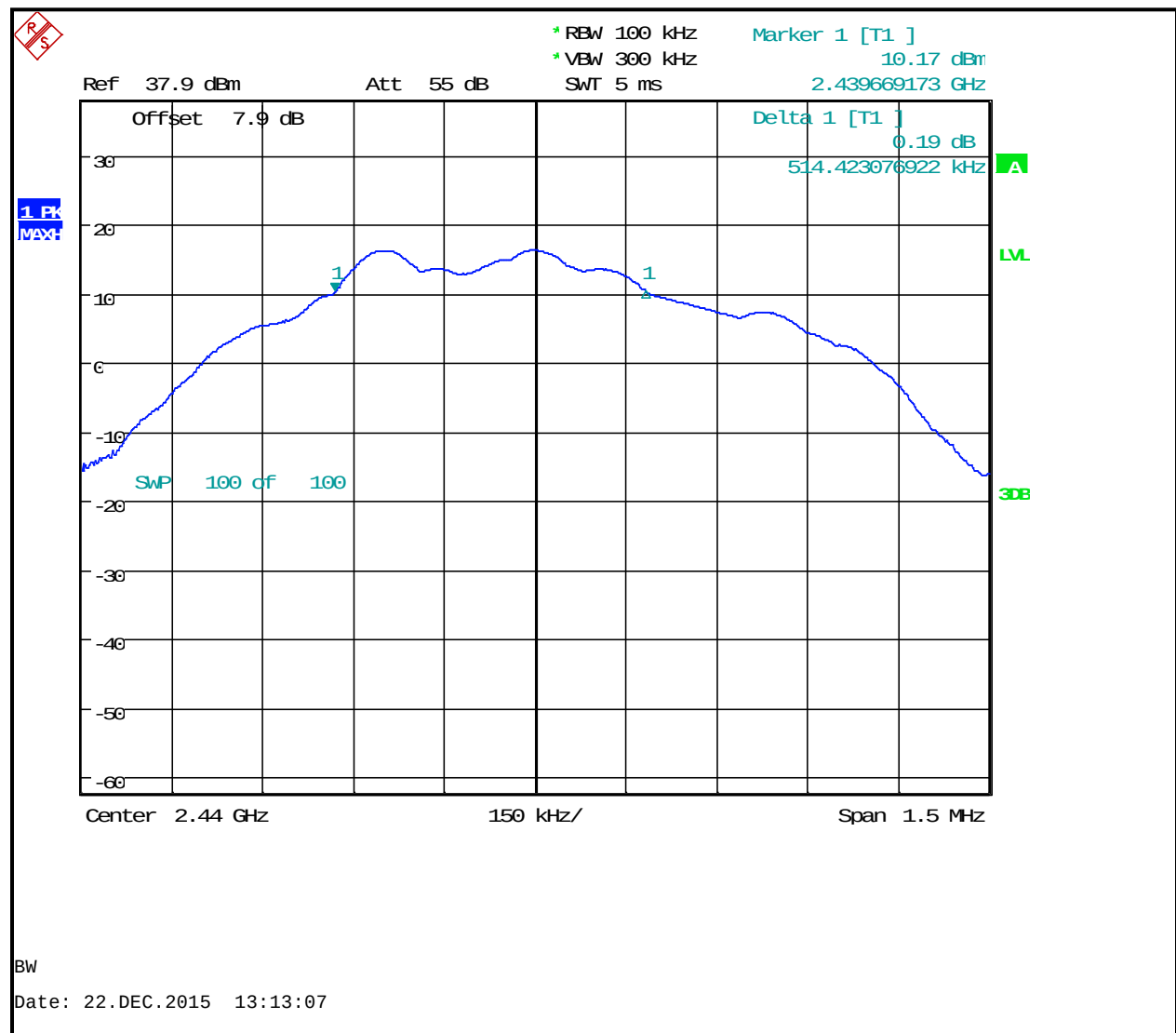
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	11/13/16

7.2 Bandwidth Test Results

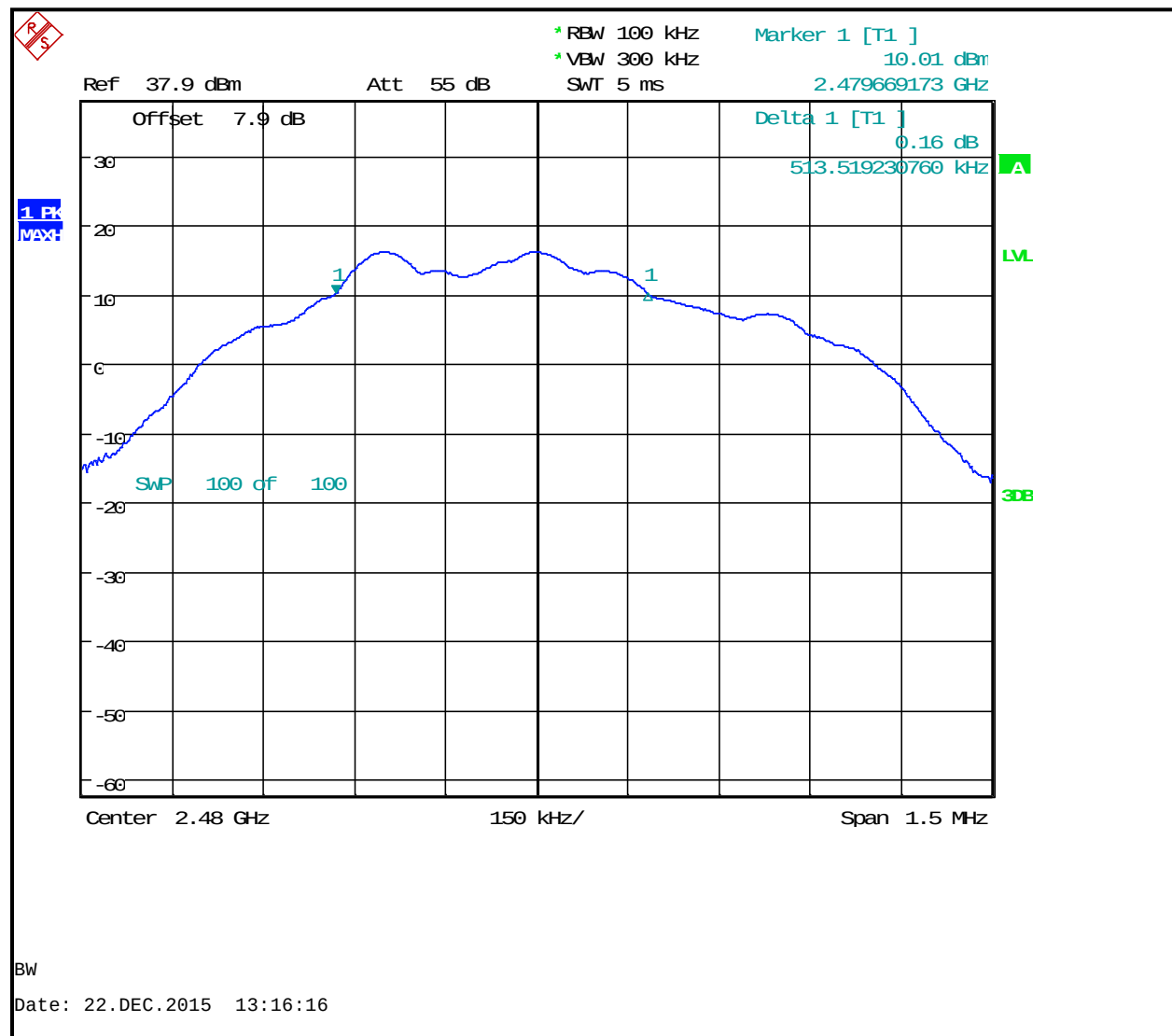
Table 7-2: 6 dB Bandwidth Test Data

Frequency (MHz)	6 dB Bandwidth (kHz)	Limit (MHz)	Pass/Fail
2402	516.5	0.5	Pass
2440	514.4	0.5	Pass
2480	513.5	0.5	Pass

Plot 7-2: 6 dB Bandwidth – 2440 MHz



Plot 7-3: 6 dB Bandwidth – 2480 MHz



Test Personnel:

Dan Baltzell Test Engineer	 Signature	December 22, 2015 Date of Test
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8 Radiated Emissions - 15.209; RSS-247 5.5; RSS-Gen 6.13/7.1

8.1 Limits of Radiated Emissions Measurement

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009-0.490	2400/f (kHz)	300
0.490-1.705	2400/f (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

As shown in 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any circumstances of modulation.

8.2 Radiated Emissions Measurement Test Procedure

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one and three meter distances. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. The spectrum was examined from 9 kHz to the 10th harmonic of the highest fundamental transmitter frequency.

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations. For frequencies between 30 and 1000 MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1000 MHz, emissions are measured using a VBW of 10 Hz, with a minimum resolution bandwidth of 1 MHz. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Table 8-1: Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901592	Insulated Wire Inc.	KPS-1503-3600-KPR	SMK RF Cables 20'	NA	9/3/16
901593	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36"	NA	9/3/16
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	Not Required
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	11/13/16
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	4/9/18
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	4/9/18
900323	EMCO	3160-07	Horn Antenna (8.2 - 12.4 GHz)	9605-1054	4/9/18
900791	Chase	CBL6111B	Bilog Antenna (30 MHz – 2000 MHz)	N/A	6/11/17

8.3 Radiated Emissions Test Results

8.3.1 Unintentional Radiated Emissions Test Data

Table 8-2: Digital Radiated Emissions Test Data

Temperature: 60°F Humidity: 97%							
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
87.8	Qp	3.9	0.3	4.2	40.0	-35.8	Pass
125.8	Qp	-6.1	0.5	-5.6	43.5	-49.1	Pass
166.2	Qp	-6.2	0.6	-5.6	43.5	-49.1	Pass
800.6	Qp	-9.8	2.4	-7.4	46.0	-53.4	Pass
813.3	Qp	-9.5	2.4	-7.1	46.0	-53.1	Pass
826.6	Qp	-9.4	2.4	-7.0	46.0	-53.0	Pass
1601.2	Av	-9.0	3.4	-5.6	54.0	-59.6	Pass
1626.6	Av	-9.3	3.4	-5.9	54.0	-59.9	Pass
1653.3	Av	-8.9	3.4	-5.5	54.0	-59.5	Pass
3202.5	Av	3.4	27.1	30.5	54.0	-23.5	Pass
3253.3	Av	-5.3	27.2	21.9	54.0	-32.1	Pass
3306.6	Av	-5.3	27.3	22.0	54.0	-32.0	Pass
4003.1	Av	0.5	33.9	34.4	54.0	-19.6	Pass
4066.6	Av	-10.2	34.0	23.8	54.0	-30.2	Pass
4133.2	Av	-9.4	33.9	24.5	54.0	-29.5	Pass
5604.3	Av	2.2	34.6	36.8	54.0	-17.2	Pass
5693.2	Av	-9.8	34.7	24.9	54.0	-29.1	Pass
5786.5	Av	-9.4	34.9	25.5	54.0	-28.5	Pass
6404.9	Av	1.1	35.1	36.2	54.0	-17.8	Pass
10746.4	Av	-9.4	42.4	33.0	54.0	-21.0	Pass
11573.1	Av	-9.5	42.8	33.3	54.0	-20.7	Pass
12809.8	Av	0.4	46.5	46.9	54.0	-7.1	Pass
13226.4	Av	-7.2	46.9	39.7	54.0	-14.3	Pass

8.3.2 Spurious/Harmonics Radiated Emissions Test Data

Table 8-3: Peak Radiated Emissions Spurious/Harmonics – 2402 MHz

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Peak Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)
4804.0	11.9	33.8	45.7	74.0	-28.3
12010.0	12.5	43.4	55.9	74.0	-18.1
19216.0	10.4	51.7	62.1	74.0	-11.9

Table 8-4: Average Radiated Emissions Spurious/Harmonics – 2402 MHz

Emission Frequency (MHz)	Average Analyzer Reading (dBuV) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4804.0	6.5	33.8	40.3	54.0	-13.7
12010.0	0.7	43.4	44.1	54.0	-9.9
19216.0	-9.1	51.7	42.6	54.0	-11.4

Table 8-5: Peak Radiated Emissions Spurious/Harmonics - 2440 MHz

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Peak Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)
4880.0	11.1	33.9	45.0	74.0	-29.0
7320.0	12.4	35.6	48.0	74.0	-26.0
12200.0	9.2	43.3	52.5	74.0	-21.5
19520.0	12.0	52.0	64.0	74.0	-10.0

Table 8-6: Average Radiated Emissions Spurious/Harmonics – 2440 MHz

Emission Frequency (MHz)	Average Analyzer Reading (dBuV) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4880.0	5.0	33.9	38.9	54.0	-15.1
7320.0	1.0	35.6	36.6	54.0	-17.4
12200.0	0.1	43.3	43.4	54.0	-10.6
19520.0	-8.5	52.0	43.5	54.0	-10.5

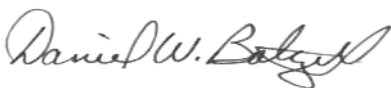
Table 8-7: Peak Radiated Emissions Spurious/Harmonics - 2480 MHz

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/ 3 MHz VBW)	Site Correction Factor (dB/m)	Peak Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)
4960.0	10.6	34.1	44.7	74.0	-29.3
7440.0	12.7	35.8	48.5	74.0	-25.5
12400.0	9.1	43.3	52.4	74.0	-21.6
19840.0	11.9	52.3	64.2	74.0	-9.8
22320.0	11.6	53.4	65.0	74.0	-9.0

Table 8-8: Average Radiated Emissions Spurious/Harmonics – 2480 MHz

Emission Frequency (MHz)	Average Analyzer Reading (dBuV) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4960.0	8.6	34.1	42.7	54.0	-11.3
7440.0	0.6	35.8	36.4	54.0	-17.6
12400.0	0.6	43.3	43.9	54.0	-10.1
19840.0	-8.2	52.3	44.1	54.0	-9.9
22320.0	-7.9	53.4	45.5	54.0	-8.5

Test Personnel:

Daniel W. Baltzell Test Engineer	 Signature	December 23, 2015 Date of Test
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9 Conclusion

The data in this measurement report shows that the EUT as tested, Harris Corporation Model XL-185P, FCC ID: OWDTR-0148-E, IC: 3636B-0148, complies with the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations and Industry Canada RSS-247 and RSS-Gen.