Certification Test Report

FCC ID: ODB-PS015SA001
IC: 11016A-PS015SA001

FCC Rule Part: 15.247
ISED Canada's Radio Standards Specification: RSS-247

Report Number: BO72135446.100

Applicant: ValidFill, LLC

Model(s): PS015SA001

Test Begin Date: **February 13, 2018**
Test End Date: **March 15, 2018**

Report Issue Date: May 2, 2018

FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER 2955.15

This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, ANSI, or any agency of the Federal Government.

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This report contains 48 pages

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1 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations Section 15.247 and Innovation Science and Economic Development Canada's Radio Standards Specification RSS-247 for the tests documented herein.

1.2 Applicant Information

ValidFill, LLC
4914 Lena Road, Suite 106
Bradenton, FL 34211

1.3 Product Description

The ValidFill, LLC model PS015SA001 is an RFID Enabled desktop Point of Sale device. It has a color graphical LCD screen with a touch enable user interface. The Device utilizes a Quad Core CPU with an integrated RFID Reader and Antenna. The RFID Reader is used to "read and write" RFID Tags at "Point of Sale" cashier locations

Technical Details

Mode of Operation:	900 MHz ISM RFID
Frequency Range:	902.75 MHz - 927.25 MHz
Number of Channels:	50
Channel Separation:	500 kHz
Modulations:	ASK
Antenna Type/Gain:	Segmented Magnetic Antenna, 1 dBi
Input Power:	120V/60Hz

Model Number: PS015SA001

Test Sample Serial Number(s): 00001

Test Sample Condition: The test sample was in good operating condition without any physical damages.

1.4 Test Methodology and Considerations

The main PCB of the EUT includes a Wi-Fi module and a USB port. Per the equipment manufacturer, the Wi-Fi module is not enabled and cannot transmit simultaneously with the RFID reader. Additoinally, the manufacter has declared the USB port is a maintenance port used for servicing the product. It is not intended to be used in the field and therefore was not populated during the evaluation.

The equipment was evaluated for radiated emissions, power line conducted emissions and RF conducted measurements. The EUT was set to a software power seting of 25 dBm.

The EUT provides two antenna ports. The antenna port selection is performed via a multiplexer. Only one antenna is transmitting at the time per the manufacturer. The evaluation was performed on each antenna individually. The test results are provided for both antenna ports.

The EUT was also evaluated for compliance to the unintentional emissions. The equipment was modified to meet the unintentional emissions requirements with ferrites on the RF and power cables as depicted in the block diagram. The test results and equipment modifications are described in greater detail in the Supplier's Declaration of Conformity test report.

2 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

TÜV SÜD America, Inc.
3998 FAU Blvd, Suite 310
Boca Raton, Florida 33431
Phone: (561) 961-5585
Fax: (561) 961-5587
http://www.tuv-sud-america.com

2.2 Laboratory Accreditations/Recognitions/Certifications

TÜV SÜD America, Inc. is accredited to ISO/IEC 17025 by American Association for Laboratory Accreditation (A2LA) and has been issued certificate number 2955.15 in recognition of this accreditation. Unless otherwise specified, all test methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

FCC Test Firm Registration #: 160606
Innovation, Science and Economic Development Canada Lab Code: 4175C

2.3 Radiated & Conducted Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The EMC radiated test facility consists of an RF-shielded enclosure. The interior dimensions of the indoor semi-anechoic chamber are approximately 48 feet (14.6 m) long by 36 feet (10.8 m) wide by 24 feet (7.3 m) high and consist of rigid, 1/8 inch (0.32 cm) steel-clad, wood core modular panels with steel framing. In the shielded enclosure, the faces of the panels are galvanized, and the chamber is self-supporting. 8-foot RF absorbing cones are installed on 4 walls and the ceiling. The steel-clad ground plane is covered with vinyl flooring.

The turntable is driven by pneumatic motor, which can support a 2000 lb. load. The turntable is flush with the chamber floor which it is connected to, around its circumference, with a continuous metallic loaded spring. An EMCO Model 1060 Multi-device controller controls the turntable position.

A pneumatic motor is used to control antenna polarizations and height relative to the ground. The height information is displayed on the control unit EMCO Model 1050.

The control room is an RF shielded enclosure attached to the semi-anechoic chamber with two bulkhead panels for connecting RF, and control cables. The dimension of the room is 7.3 m x 4.9 m x 3 m high and the entrance doors of both control and conducted rooms are 3 feet (0.91 m) by 7 feet (2.13 m).

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3.1-1 below:

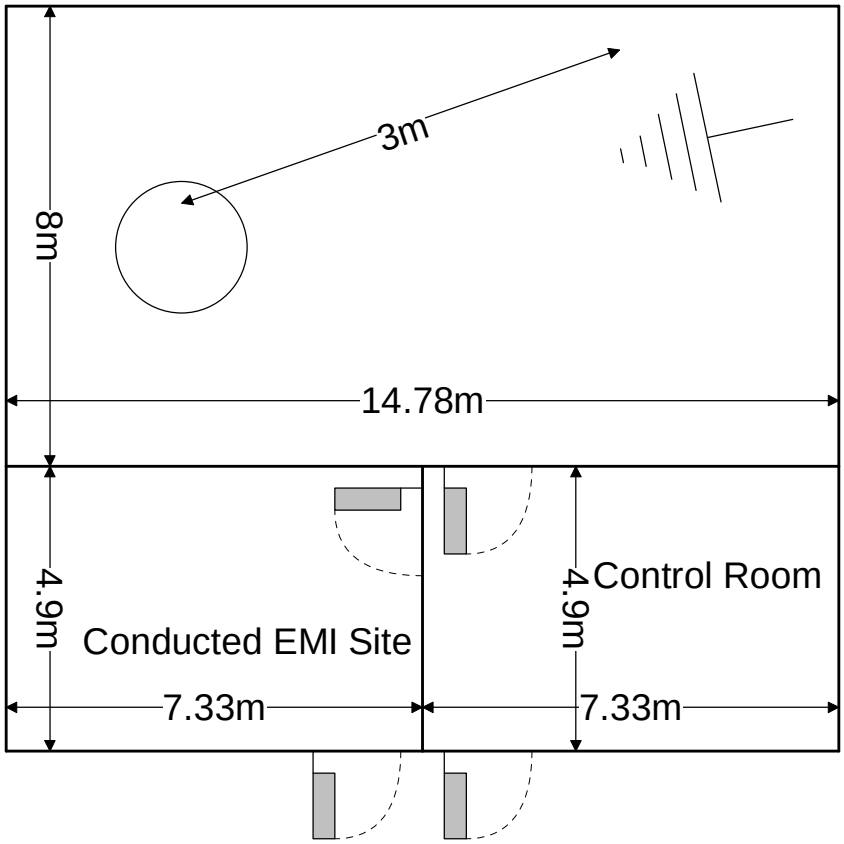


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 m^3. The power line conducted emission site includes two LISNs: a Solar Model 8028-50 50 Ω/50 µH and an EMCO Model 3825/2R, which are installed as shown in the figure below. For evaluations requiring 230 V, 50 Hz AC input, a Polarad LISN (S/N 879341/048) is used in conjunction with a California Instruments signal generator Model 2001RP-OP1.

A diagram of the room is shown below in figure 2.3.2-1:

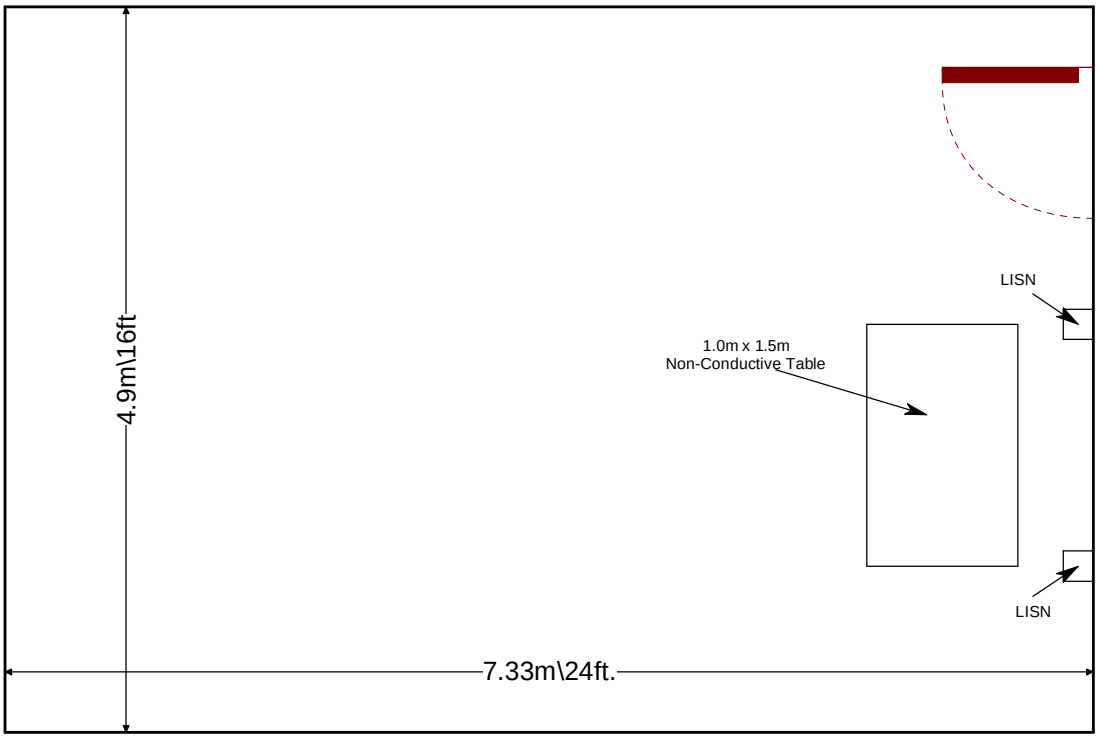


Figure 2.3.2-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2018.
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2018
- Innovation, Science and Economic Development Canada Radio Standards Specification: RSS-247 — Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices, Issue 2, February 2017.
- Innovation, Science and Economic Development Canada Radio Standards Specification: RSS-GEN – General Requirements for Compliance of Radio Apparatus, Issue 4, Amendment 1, March 2018.

4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment List

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
BEMC00078	EMCO	6502	Active Loop Antenna	9104-2608	5/11/2016	5/11/2018
BEMC00283	Rohde & Schwarz	FSP40	Spectrum Analyzer	1000033	11/28/2017	11/28/2019
BEMC00523	Agilent	E7405	9kHz-26.5GHz EMC analyzer/HYZ	MY45103293	12/9/2016	12/9/2018
BEMC02002	EMCO	3108	30 MHz to 200 MHz Biconical Antenna	2147	11/28/2017	11/30/2019
BEMC02004	EMCO	3146	200 MHz to 1 GHz Log Periodic Antenna	1385	12/27/2017	12/27/2019
BEMC02006	EMCO	3115	Linear Polarized Horn antenna, 1-18 GHz	2573	4/7/2017	4/7/2019
BEMC02022	EMCO	LISN3825/2R	Line Impedence Stabilization Network	1095	9/28/2017	9/28/2019
BEMC02045	ACS Boca	Conducted Cable Set	Conducted Cable Set	2045	10/26/2017	10/27/2018
BEMC02069	Trilithic, Inc.	7NM867/122-X1-AA	Notch Filter	200315126	2/28/2018	2/28/2019
BEMC02071	Trilithic, Inc.	4HC1400-1-KK	High Pass Filter	9643263	10/28/2017	10/28/2018
BEMC02095	ETS Lindgren	TILE4! - Version 4.2.A	Tile Automation Software	85242	NCR	NCR
BEMC02111	Aeroflex Inmet	40AH2W-20	Attenuator 20dB, 2.9 mm-M/F, DC-40GHz 2 W	2111	7/20/2017	7/20/2018
BEMC02112	Teledyne Storm Products	921-0101-036	Duratest High Frequency Cable	12-06-698	10/27/2017	10/27/2018
BEMC02121	Teledyne Storm Products	A81-0303	Radiated Cable Set	2121	7/31/2017	7/31/2018
BEMC02138	Hewlett Packard	8449B	Pre-Amplifier	3008A00320	12/1/2017	12/1/2018
TEMC00153	Rhode & Schwarz Vertrieb München	ESH3-Z5	Voltage Network	894785/012	9/27/2017	9/27/2018

Notes:

- **NCR=No Calibration Required**
- **The assets were only used during the active period of the calibration cycle.**

5 SUPPORT EQUIPMENT

Table 5-1: EUT and Support Equipment Description

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	ValidFill, LLC	PS015SA001	00001
2	24 VDC Power Supply	FSP Group Inc.	FSP060-DAAN2	H7441000481
3	UHF RFID Antenna	ValidFill, LLC	AA000RF013	N/A
4	Ethernet Switch	LinkSys	BEFSR41 Ver 4.2	C2171G508151
5	9 VAC Power Supply	LinkSys	AD 9/1C	2102-10091000R
6	Ferrite	FAIR-RITE	0431164951	N/A
7	Ferrite	FAIR-RITE	0431173951	N/A

Table 5-2: Cable Description – Radiated Emissions

Cable #	Cable Type	Length	Shield	Termination
A	Power	1.5 m	No	24 VDC Power Supply to EUT
B	Power	1.8 m	No	Power Supply to AC Mains
C	Coaxial	0.6 m	Yes	Antenna to EUT
D	Ethernet	10 m	No	EUT to Ethernet Router
E	Power	1.86 m	No	Power Supply to Ethernet Switch

Table 5-3: Cable Description – Power Line Emissions

Cable #	Cable Type	Length	Shield	Termination
A	Power	1.5 m	No	24 VDC Power Supply to EUT
B	Power	1.8 m	No	Power Supply to AC Mains
C	Coaxial	0.6 m	Yes	Antenna to EUT
D	Ethernet	2 m	No	EUT to Ethernet Router
E	Power	1.86 m	No	Power Supply to Ethernet Switch

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

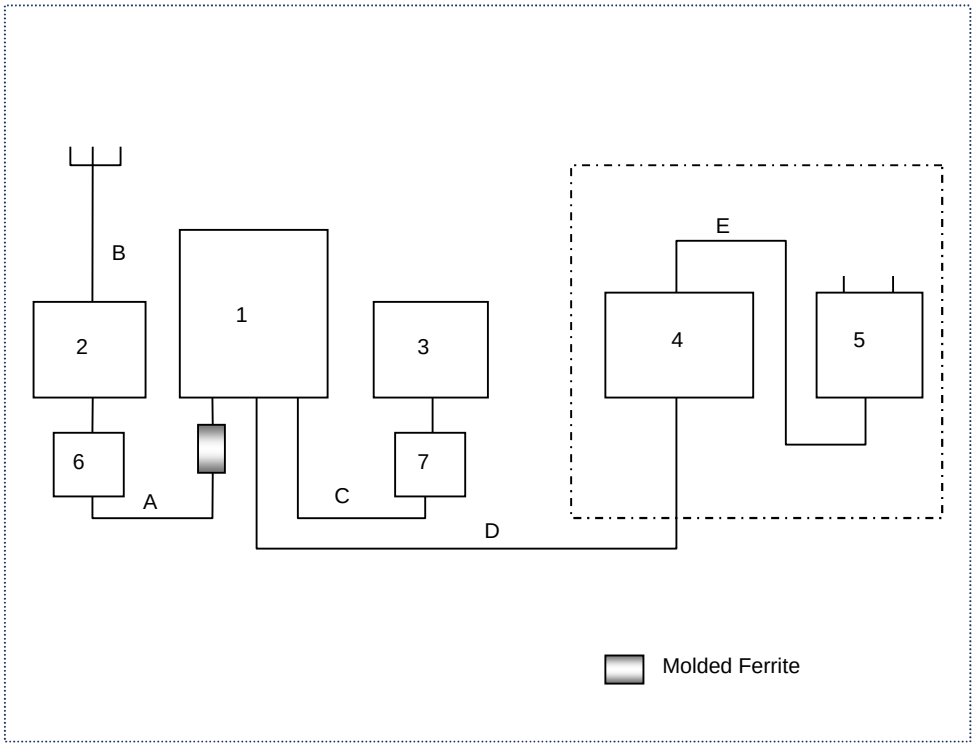


Figure 6-1: EUT and Support Equipment Block Diagram

Note: The equipment within the dotted area was setup outside of the radiated test chamber for the radiated emissions evaluation.

7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

Table 7-1: Summary of Tests

Test Description	FCC 47 CFR Rule Part	ISED Canada RSS Section	Test Results
Antenna Requirements	FCC: Section 15.203		Compliant
Peak Output Power	FCC Section 15.247(b)(2)	ISED Canada: RSS-247 5.4(a)	Compliant
Carrier Frequency Separation	FCC: Section 15.247(a)(1)	ISED Canada: RSS-247 5.1(b)	Compliant
Number of Hopping Channels	FCC: Section 15.247(a)(1)(i)	ISED Canada: RSS-247 5.1(c)	Compliant
Channel Dwell Time	FCC: Section 15.247(a)(1)(i)	ISED Canada: RSS-247 5.1(c)	Compliant
20dB / 99% Bandwidth	FCC: Section 15.247(a)(1)(i)	ISED Canada: RSS-247 5.1(c)	Compliant
Band-Edge Compliance and Spurious Emissions	FCC 15.247(d)	ISED Canada: RSS-247 5.5	Compliant
Radiated Spurious Emissions into Restricted Frequency Bands	FCC: Sections 15.205, 15.209	ISED Canada: RSS-Gen 8.9, 8.10	Compliant
Power Line Conducted Emissions	FCC: Section 15.207	ISED Canada: RSS-Gen 8.8	Compliant

7.1 Antenna Requirement – FCC: Section 15.203

The EUT uses a 1 dBi segmented magnetic antenna for near-field UHF RFID with FAKRA SMB connectors. The SMB connector type on the PCB and antenna cables are considered unique and therefore meet the requirements of FCC Section 15.203.

7.2 Peak Output Power - FCC Section 15.247(b)(2); ISED Canada: RSS-247 5.4(a)

7.2.1 Measurement Procedure (Conducted Method)

The RF output port of the EUT was directly connected to the input of the spectrum analyzer through suitable attenuation.

7.2.2 Measurement Results

Performed by: Thierry Jean-Charles

Table 7.2.2-1: RF Output Power - Antenna port 0

Frequency (MHz)	Power (dBm)
902.75	26.07
915.25	25.47
927.25	25.08

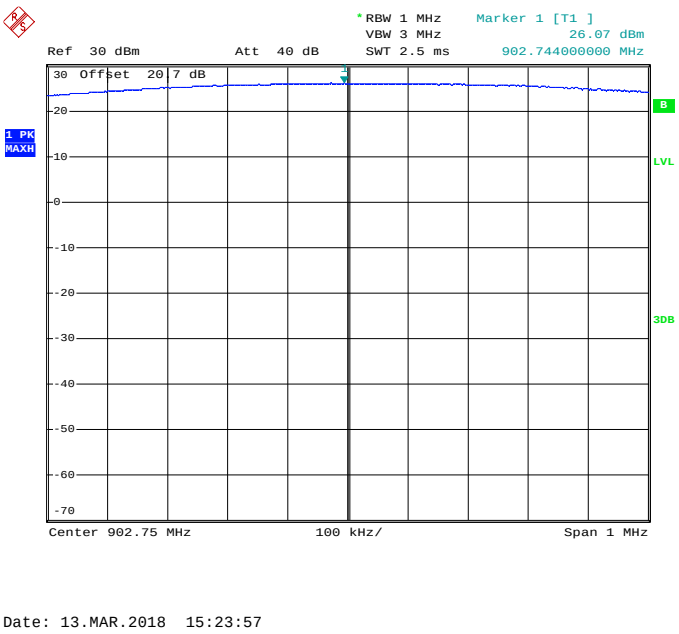


Figure 7.2.2-1: RF Output Power - Low Channel - Antenna port 0

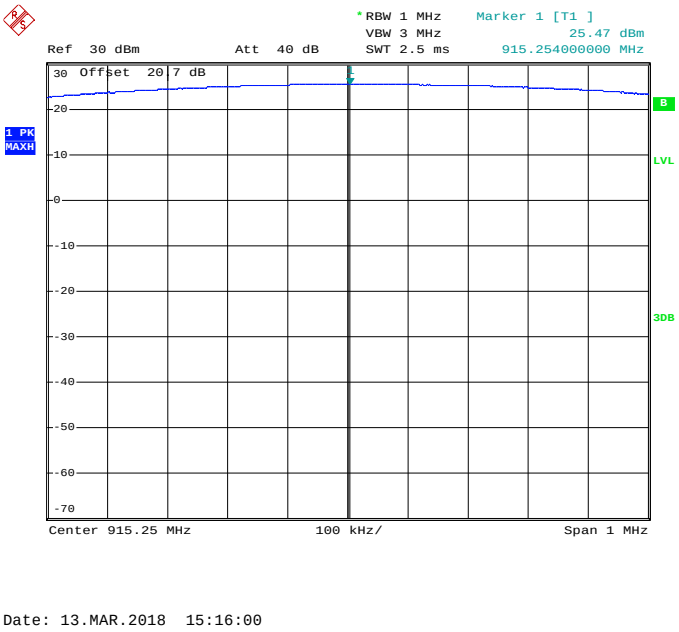


Figure 7.2.2-2: RF Output Power - Middle Channel - Antenna port 0

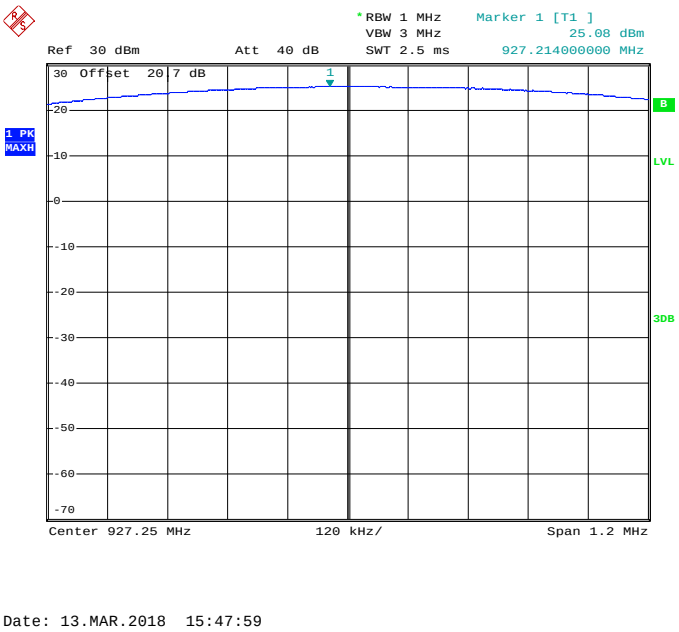


Figure 7.2.2-3: RF Output Power - High Channel - Antenna port 0

Table 7.2.2-2: RF Output Power - Antenna port 1

Frequency (MHz)	Power (dBm)
902.75	25.91
915.25	25.22
927.25	24.74

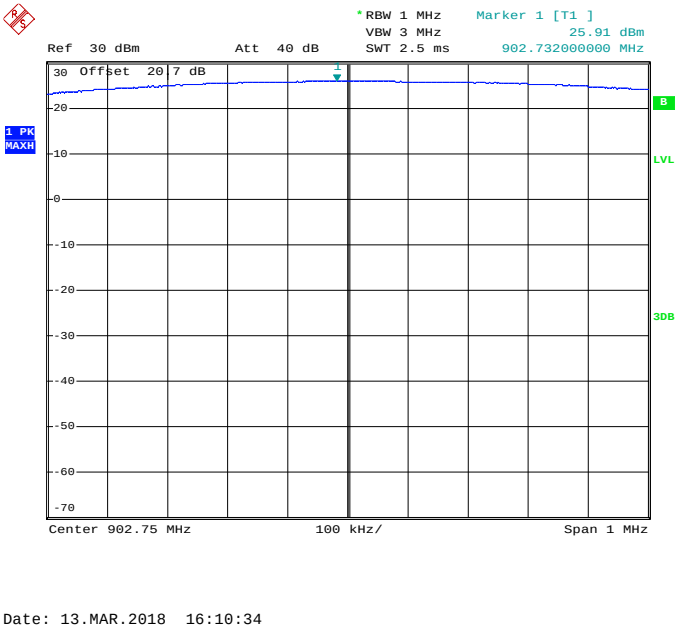


Figure 7.2.2-4: RF Output Power - Low Channel - Antenna port 1

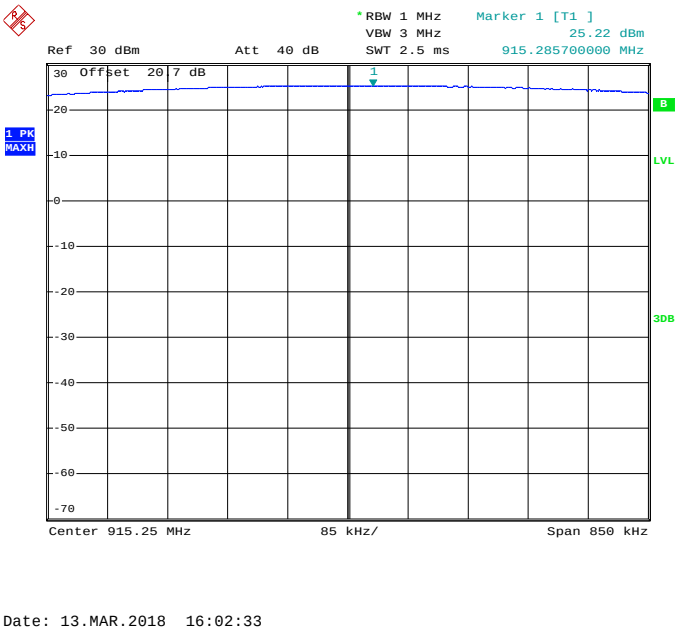
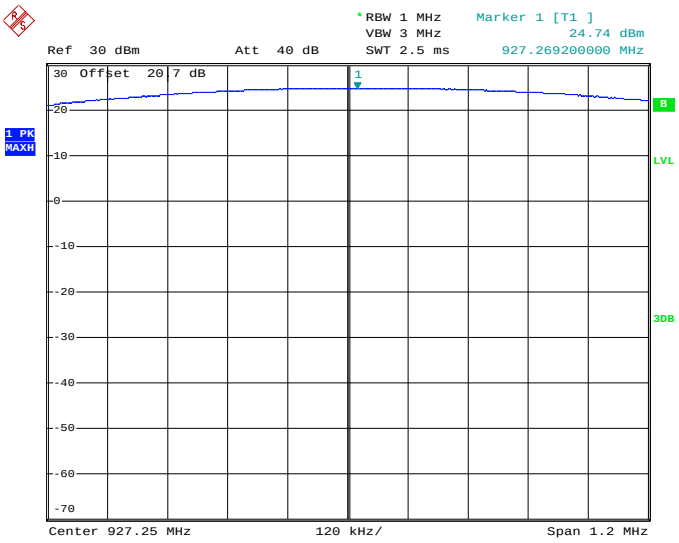


Figure 7.2.2-5: RF Output Power - Middle Channel - Antenna port 1



Date: 13.MAR.2018 15:45:47

Figure 7.2.2-6: RF Output Power - High Channel - Antenna port 1

7.3 Channel Usage Requirements

7.3.1 Carrier Frequency Separation – FCC: Section 15.247(a)(1); ISED Canada: RSS-247 5.1(b)

7.3.1.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The span of the spectrum analyzer was set wide enough to capture two adjacent peaks and the RBW and VBW were set to approximately 30% of the channel spacing.

7.3.1.2 Measurement Results

Performed by: Thierry Jean-Charles

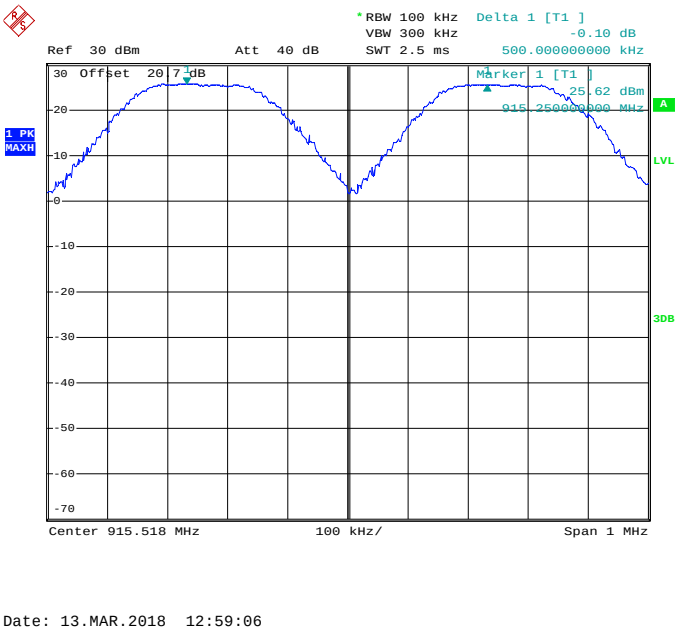


Figure 7.3.1.2-1: Carrier Frequency Separation – Antenna Port 0

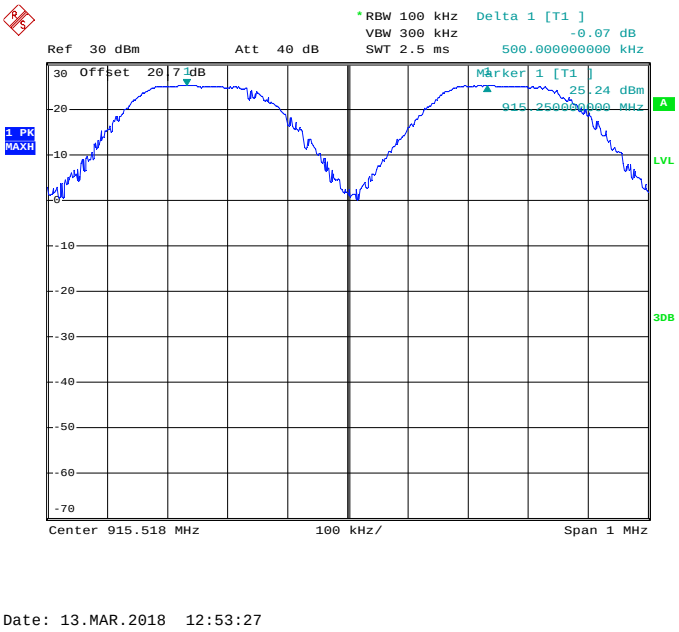


Figure 7.3.1.2-2: Carrier Frequency Separation – Antenna Port 1

7.3.2 Number of Hopping Channels – FCC: Section 15.247(a)(1)(I); ISEDCanada: RSS-247 5.1(c)

7.3.2.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The span of the spectrum analyzer was set wide enough to capture the number of hopping channels. The peak detector max hold function was enabled for the measurements.

7.3.2.2 Measurement Results

Performed by: Thierry Jean-Charles

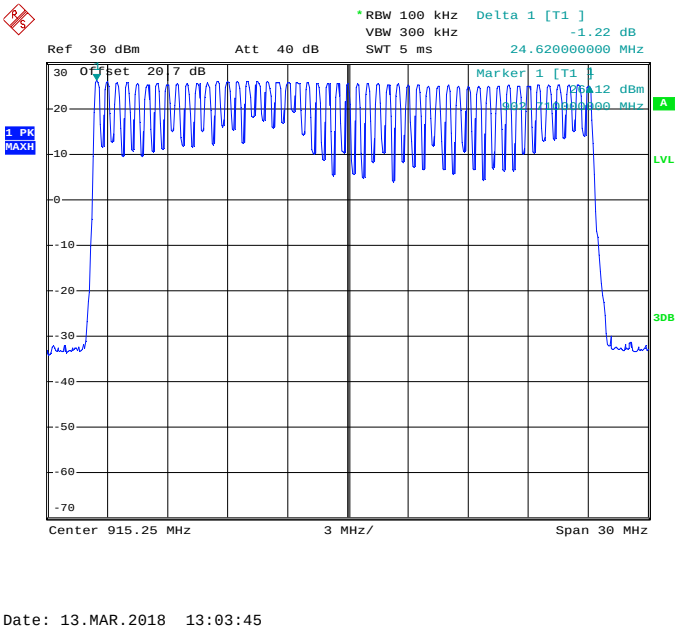
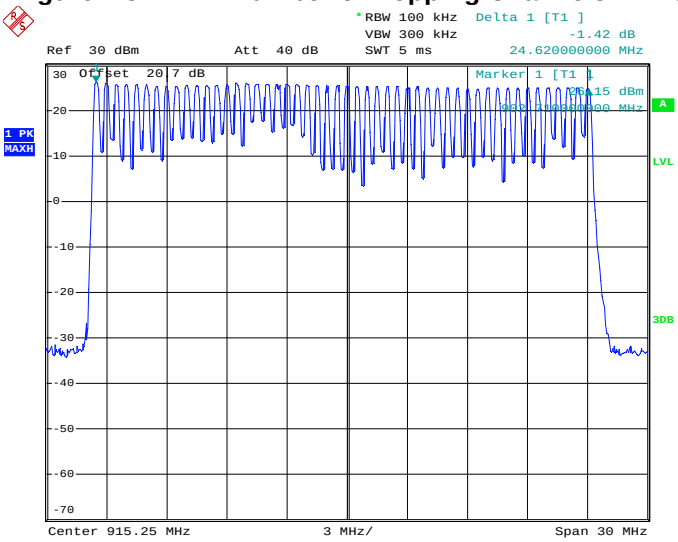


Figure 7.3.2.2-1: Number of Hopping Channels – Antenna 0

Figure 7.3.2.2-2: Number of Hopping Channels – Antenna



Date: 13.MAR.2018 13:07:37

1

7.3.3 Channel Dwell Time – FCC: Section 15.247(a)(1)(I); ISED Canada: RSS-247 5.1(c)

7.3.3.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The span of the spectrum analyzer was set 0 Hz centered on a hopping channel. The RBW was set to less than 30% of the channel spacing and the sweep time adjusted to capture the entire dwell time per channel with peak detector max hold function.

7.3.3.2 Measurement Results

Performed by: Thierry Jean-Charles

Table 7.3.3.2-1: Dwell Time on a 20 Second Cycle

Antenna Port	Number of Hops Per Sec. (NHPS)	Number of Hops per Channel Per Sec. (NHPCPS)	Number of Hop on a 20 s Cycle (NHPC)	Measured Dwell Times (ms)	Dwell Time on a 20 s Cycle (ms)	Limit (ms)	Status
0	5	0.10	2	199.500	399.00	400	PASS
1	5	0.10	2	200.000	400.00	400	PASS

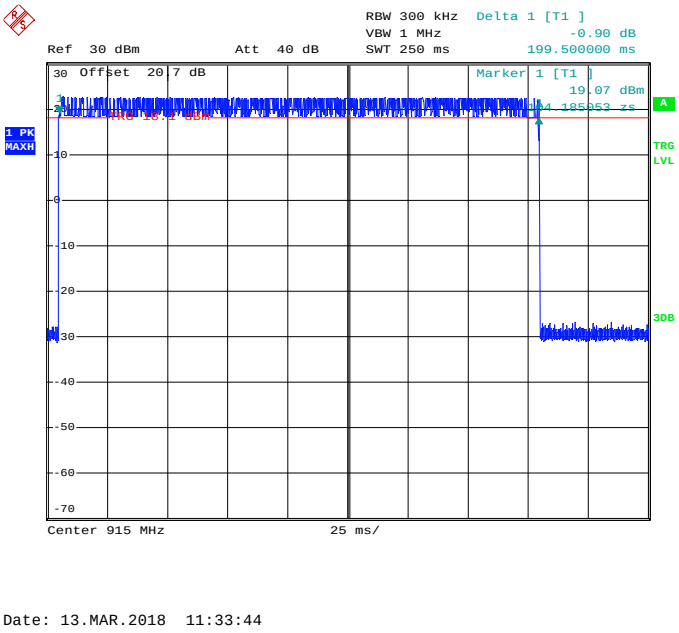


Figure 7.3.3.2-1: Dwell Time – Single Transmission – Antenna port 0

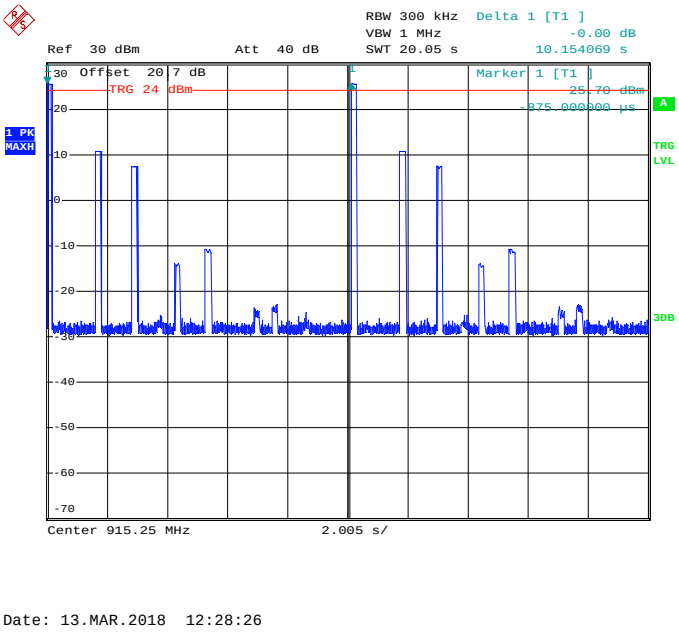


Figure 7.3.3.2-2: Dwell Time – 20 Seconds – Antenna port 0

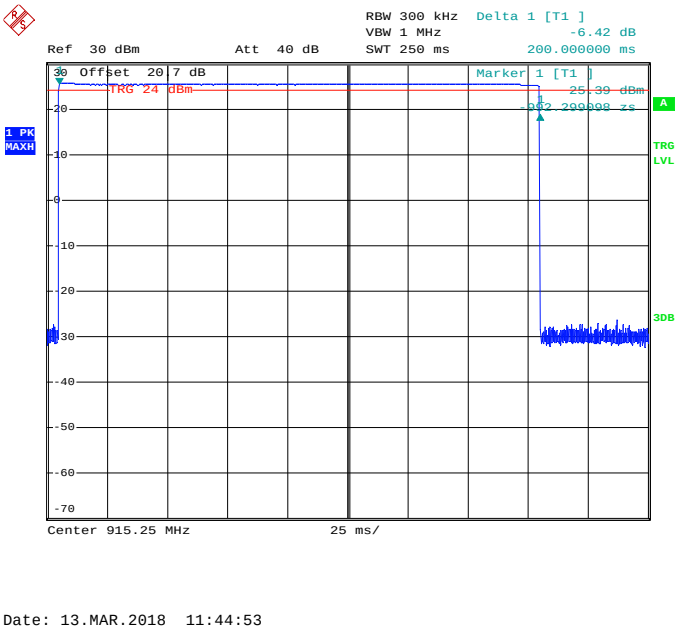


Figure 7.3.3.2-3: Dwell Time – Single Transmission – Antenna port 1

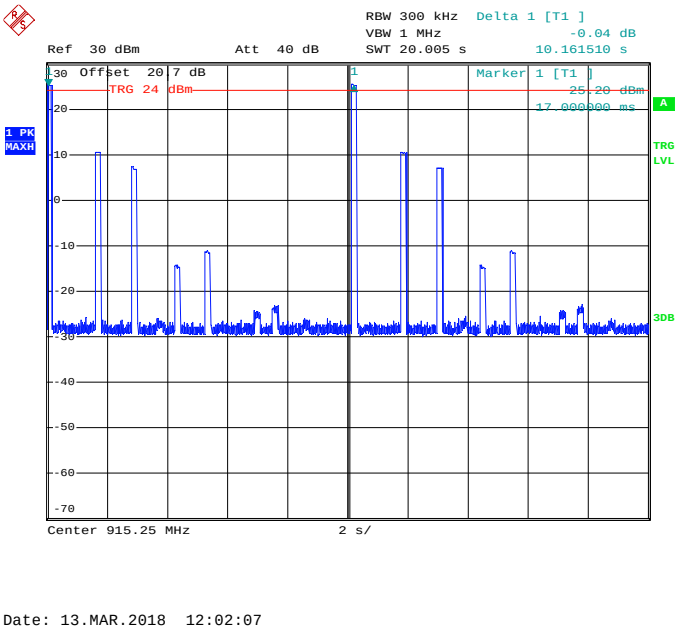


Figure 7.3.3.2-4: Dwell Time – 20 Seconds – Antenna port 1

7.3.4 20dB / 99% Bandwidth - FCC: Section 15.247(a)(1)(i); ISED Canada: RSS-247 5.1(c)

7.3.4.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The spectrum analyzer span was set to 2 to 5 times the estimated bandwidth of the emission. The RBW was set to 1% to 5% of the estimated emission bandwidth. The trace was set to max hold with a peak detector active. The Delta function of the analyzer was utilized to determine the 20-dB bandwidth of the emissions.

The 99% occupied bandwidth was measured with the spectrum analyzer span set to fully display the emission. The RBW was set to 1% to 5% of the approximated bandwidth. The occupied 99% bandwidth was measured by using the 99% bandwidth equipment function of the spectrum analyzer.

7.3.4.2 Measurement Results

Performed by: Thierry Jean-Charles

Table 7.3.4.2-1: 20dB / 99% Bandwidth - Antenna port 0

Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
902.75	204.688	224.000
915.25	182.250	202.000
927.25	245.500	288.000

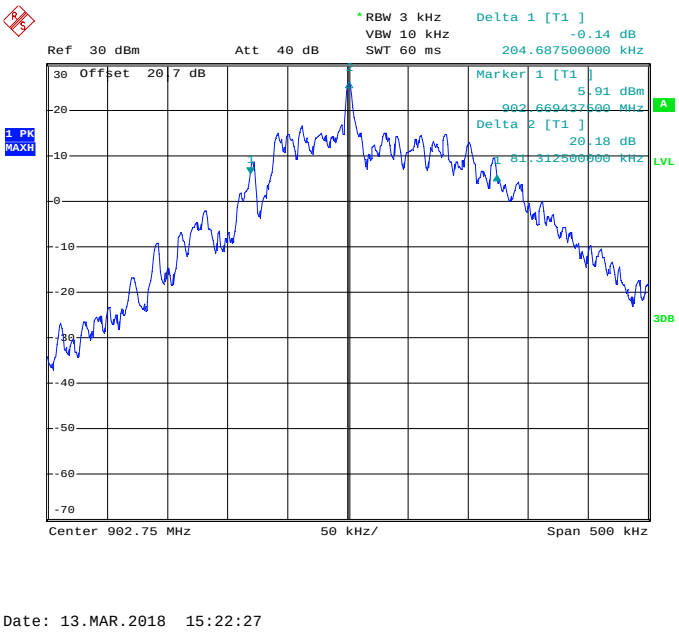


Figure 7.3.4.2-1: 20 dB BW – Low Channel - Antenna port 0

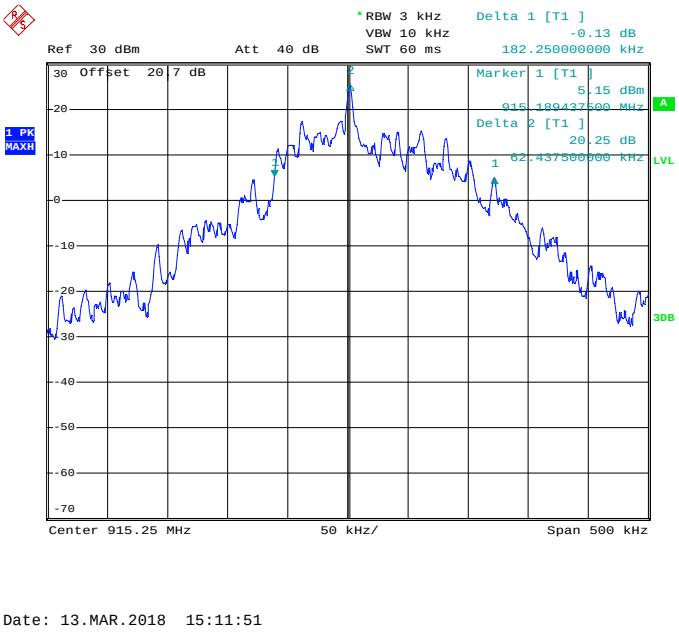


Figure 7.3.4.2-2: 20 dB BW – Middle Channel - Antenna port 0

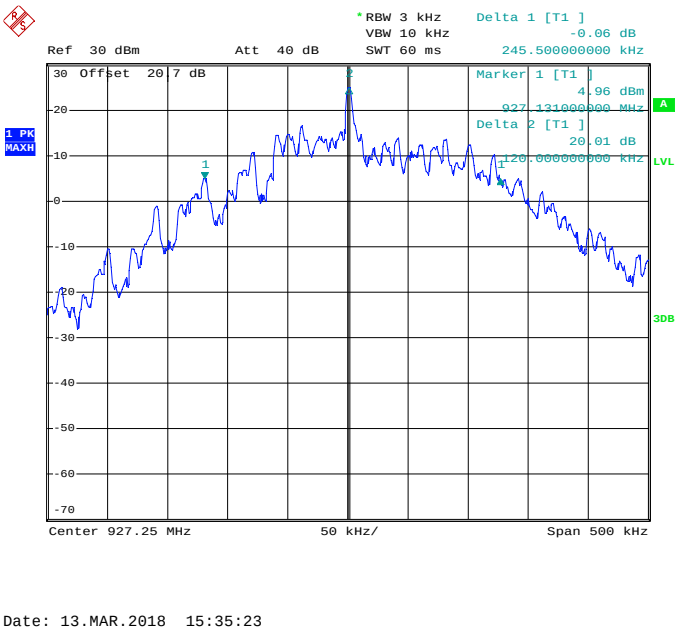
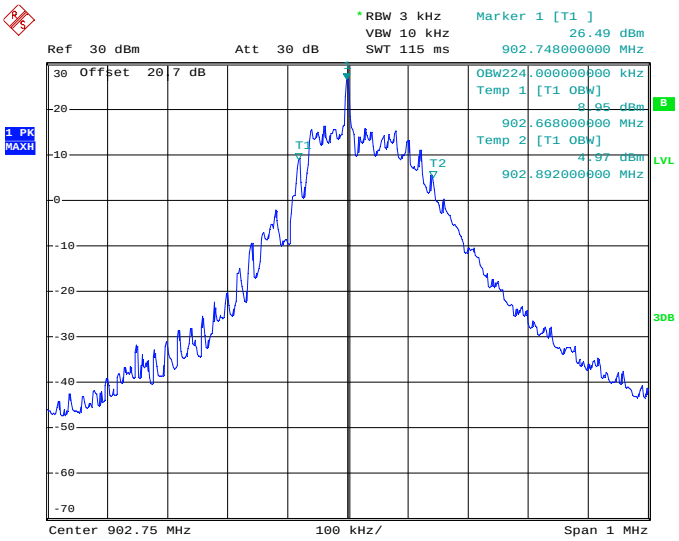
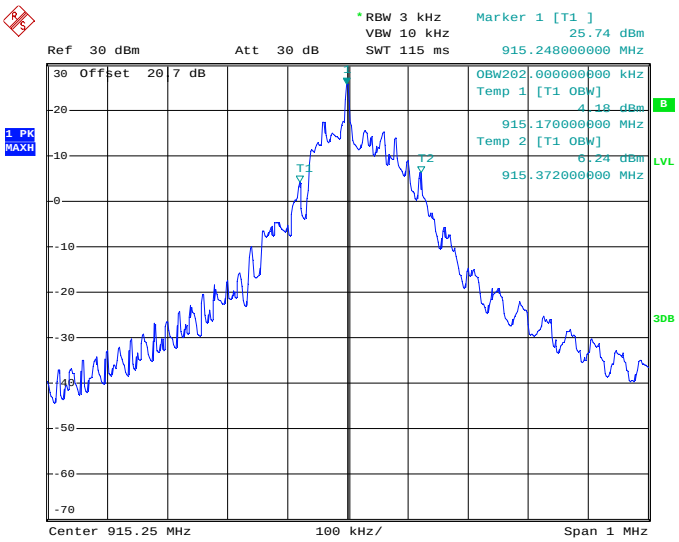


Figure 7.3.4.2-3: 20 dB BW – High Channel - Antenna port 0



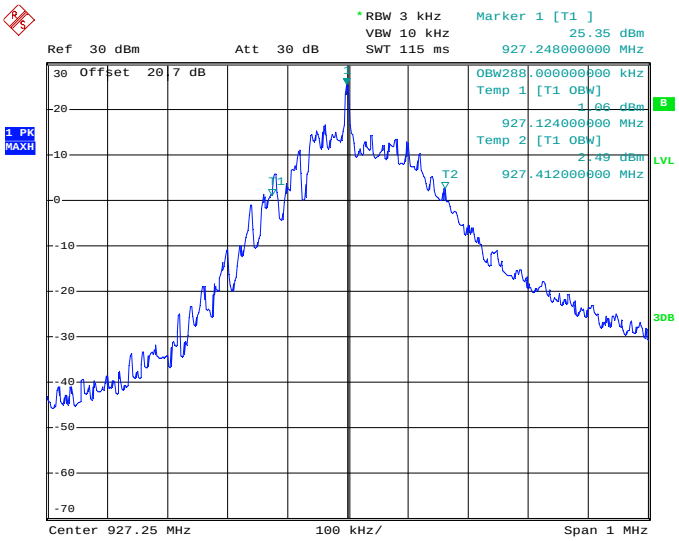
Date: 13.MAR.2018 16:42:20

Figure 7.3.4.2-4: 99% BW – Low Channel - Antenna port 0



Date: 13.MAR.2018 16:36:18

Figure 7.3.4.2-5: 99% BW – Middle Channel - Antenna port 0

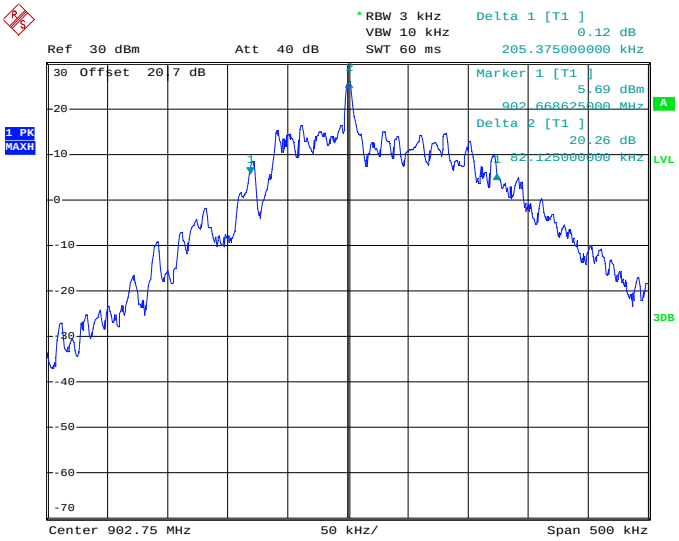


Date: 13.MAR.2018 16:30:10

Figure 7.3.4.2-6: 99% BW – High Channel - Antenna port 0

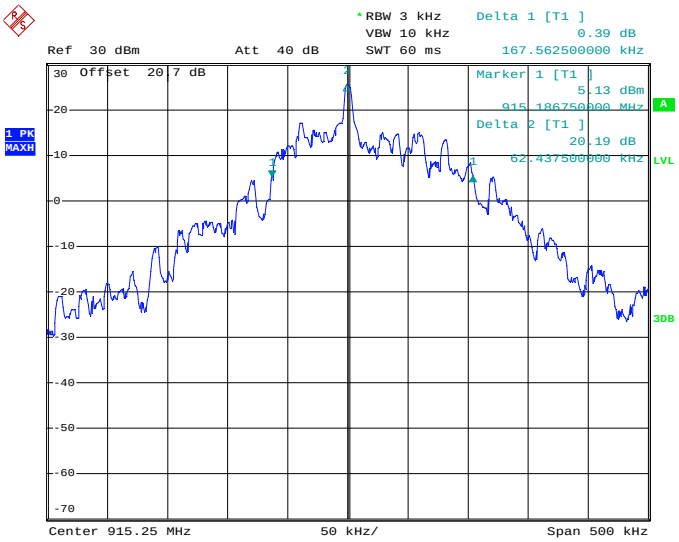
Table 7.3.4.2-2: 20dB / 99% Bandwidth - Antenna port 1

Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
902.75	205.375	226.000
915.25	167.563	202.000
927.25	244.875	288.000



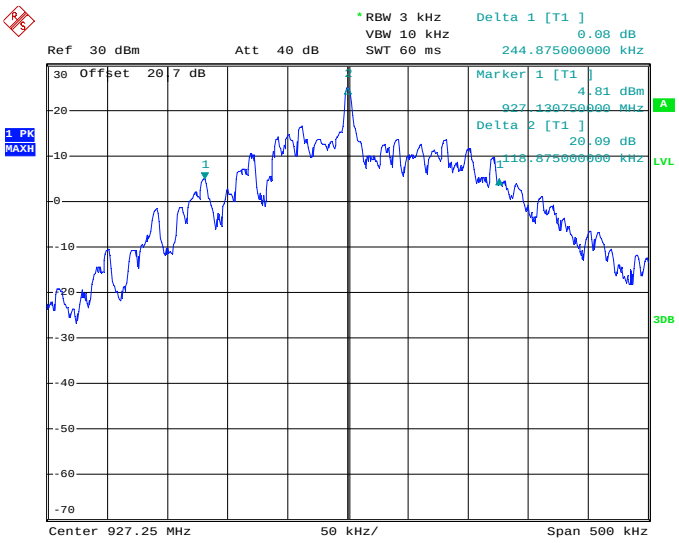
Date: 13.MAR.2018 16:08:43

Figure 7.3.4.2-7: 20 dB BW – Low Channel - Antenna port 1



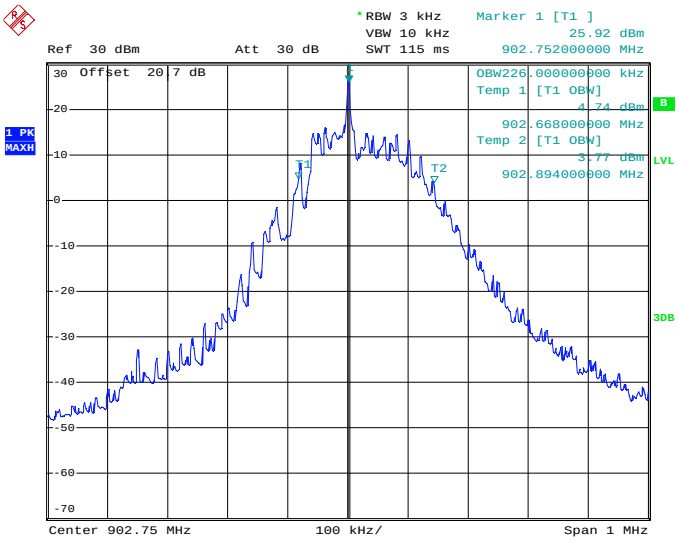
Date: 13.MAR.2018 16:01:07

Figure 7.3.4.2-8: 20 dB BW – Middle Channel - Antenna port 1



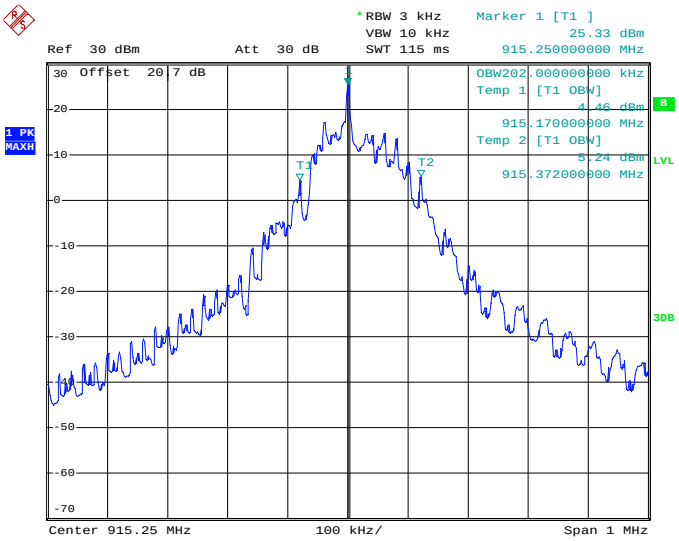
Date: 13.MAR.2018 15:44:05

Figure 7.3.4.2-9: 20 dB BW – High Channel - Antenna port 1



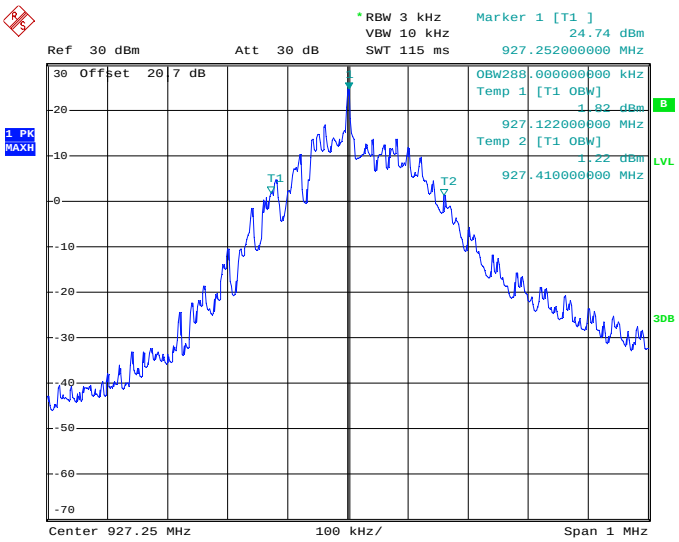
Date: 13.MAR.2018 16:14:40

Figure 7.3.4.2-10: 99% BW – Low Channel - Antenna port 1



Date: 13.MAR.2018 16:16:53

Figure 7.3.4.2-11: 99% BW – Middle Channel - Antenna port 1



Date: 13.MAR.2018 16:26:59

Figure 7.3.4.2-12: 99% BW – High Channel - Antenna port 1

7.4 Band-Edge Compliance and Spurious Emissions-FCC 15.247(d); ISED Canada: RSS-247 5.5

7.4.1 Band-Edge Compliance of RF Conducted Emissions

7.4.1.1 Measurement Procedure

The RF output port of the EUT was connected to the input of the spectrum analyzer through suitable attenuation. The EUT was investigated at the lowest and highest channel available to determine band-edge compliance. For each measurement the spectrum analyzer's RBW was set to 100 kHz, which is ≥ 1% of the span, and the VBW was set to >= 300 kHz.

7.4.1.2 Measurement Results

Performed by: Thierry Jean-Charles

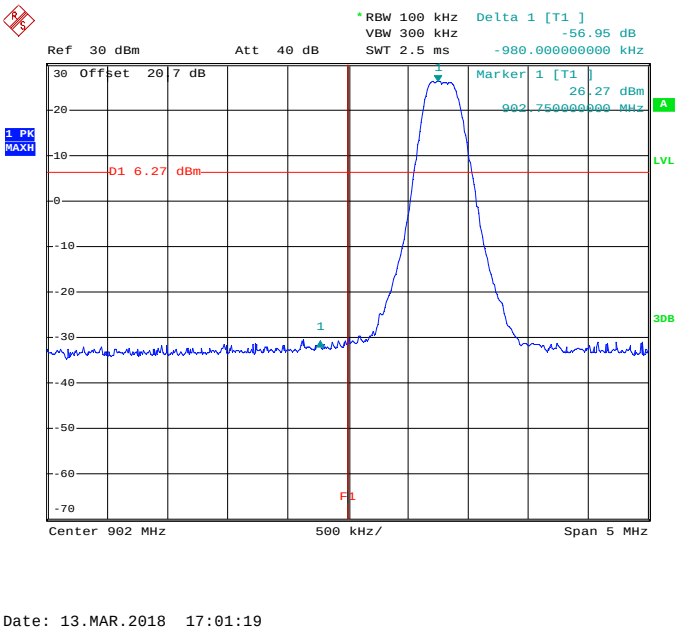


Figure 7.4.1.2-1: Lower Band-edge - Antenna port 0

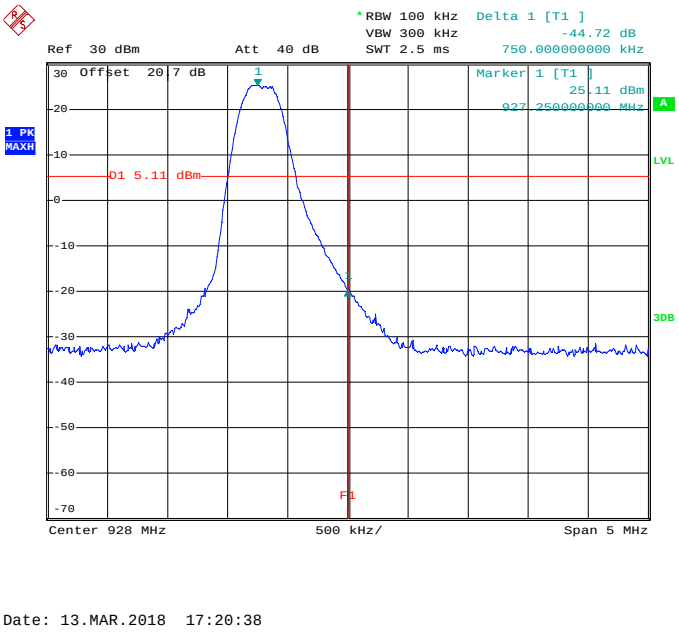


Figure 7.4.1.2-2: Upper Band-edge - Antenna port 0

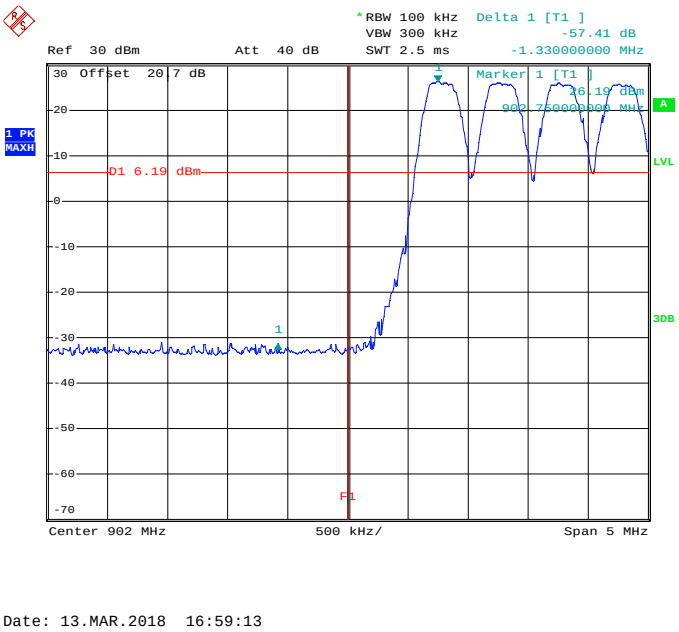


Figure 7.4.1.2-3: Lower Band-edge – Hopping Mode - Antenna port 0

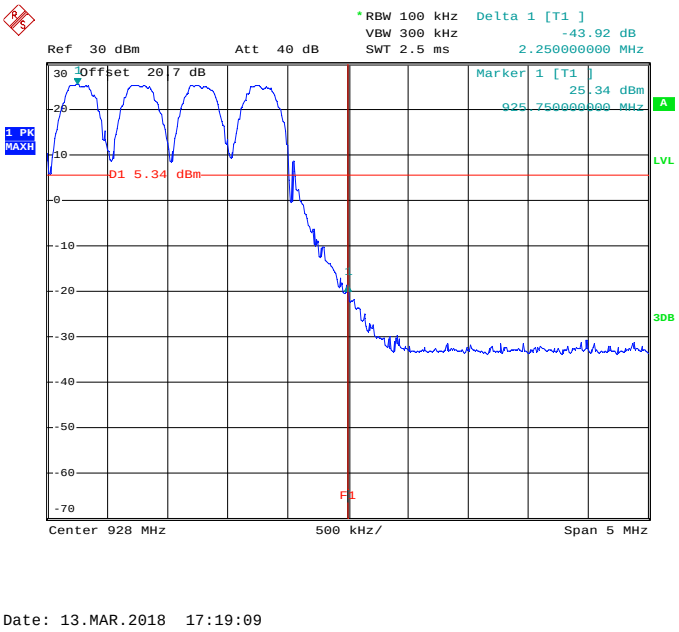


Figure 7.4.1.2-4: Upper Band-edge – Hopping Mode - Antenna port 0

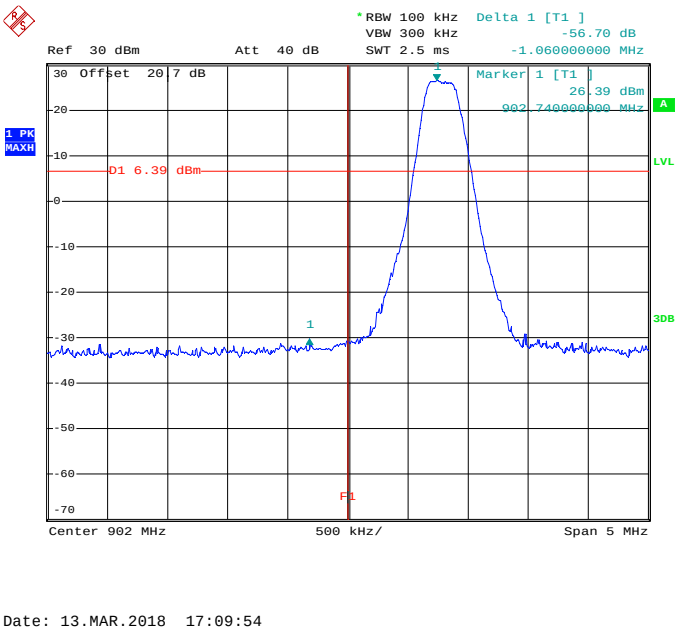


Figure 7.4.1.2-5: Lower Band-edge - Antenna port 1

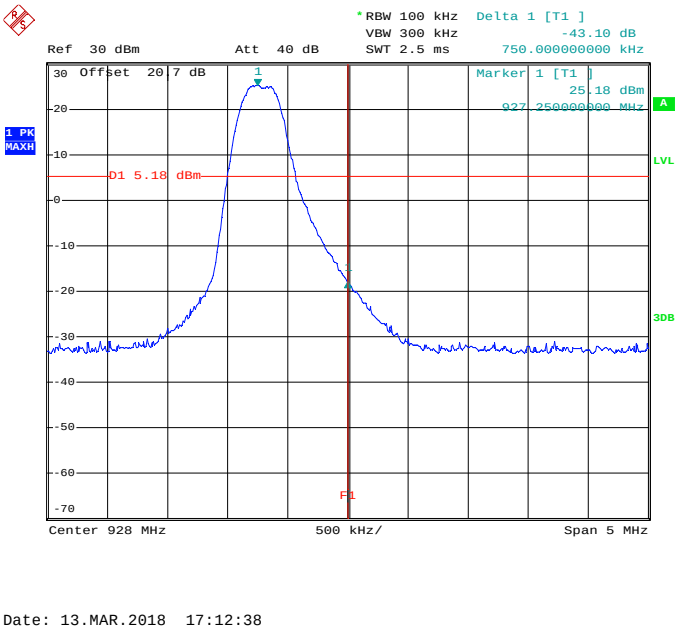


Figure 7.4.1.2-6: Upper Band-edge - Antenna port 1

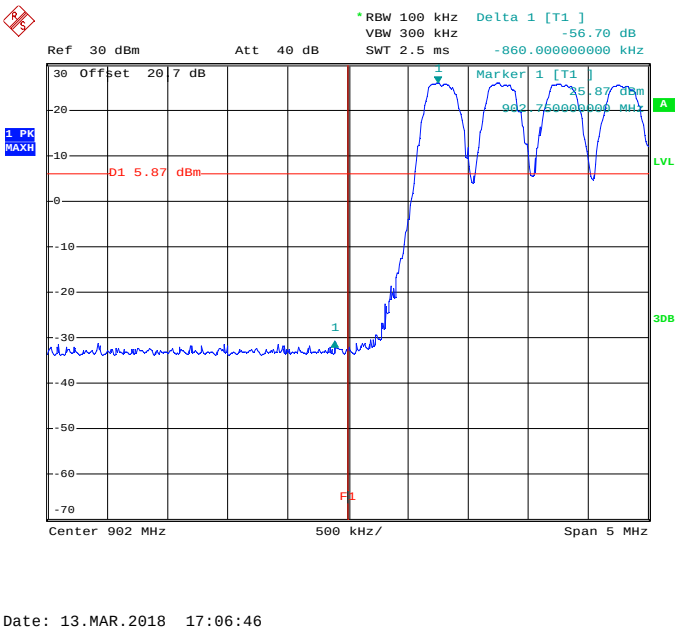


Figure 7.4.1.2-7: Lower Band-edge – Hopping Mode - Antenna port 1

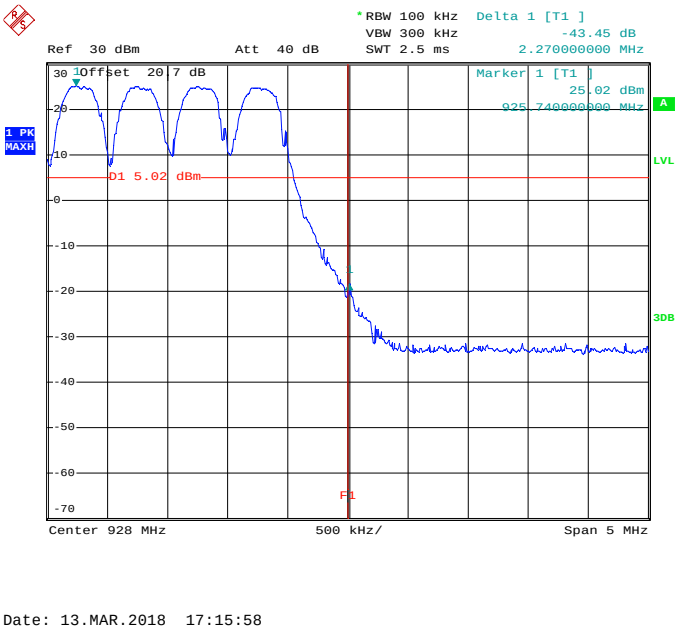


Figure 7.4.1.2-8: Upper Band-edge – Hopping Mode - Antenna port 1

7.4.2 RF Conducted Spurious Emissions – FCC: Section 15.247(d); ISED Canada: RSS-247 5.5

7.4.2.1 Measurement Procedure

The RF Conducted Spurious Emissions were measured in accordance with ANSI C63.10 Section 7.8.8. The RF output port of the equipment under test was directly connected to the input of the spectrum analyzer. The EUT was investigated for conducted spurious emissions from 30 MHz to 10 GHz, 10 times the highest fundamental frequency. Measurements were made at the low, center and high channels of the EUT. For each measurement, the spectrum analyzer's RBW was set to 100 kHz and the VBW was set to 300 kHz. The peak Max Hold function of the analyzer was utilized.

7.4.2.2 Measurement Results

Performed by: Thierry Jean-Charles

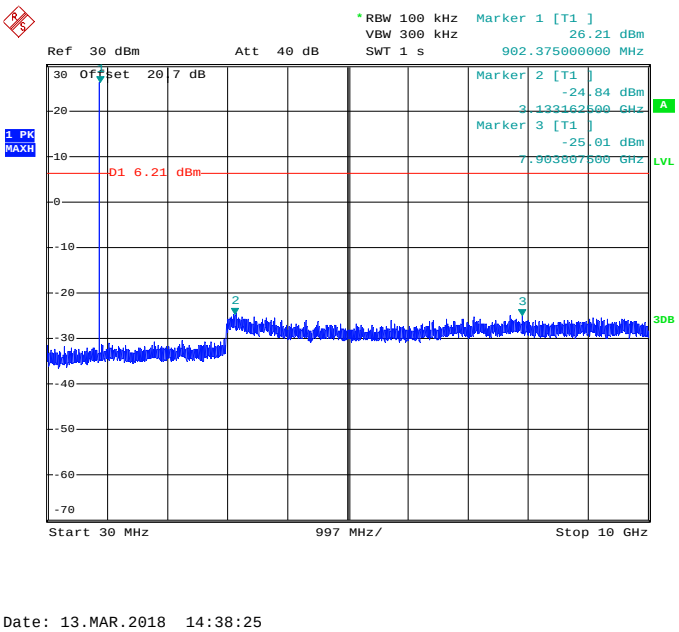


Figure 7.4.2.2-1: 30 MHz – 10 GHz – Low Channel - Antenna port 0

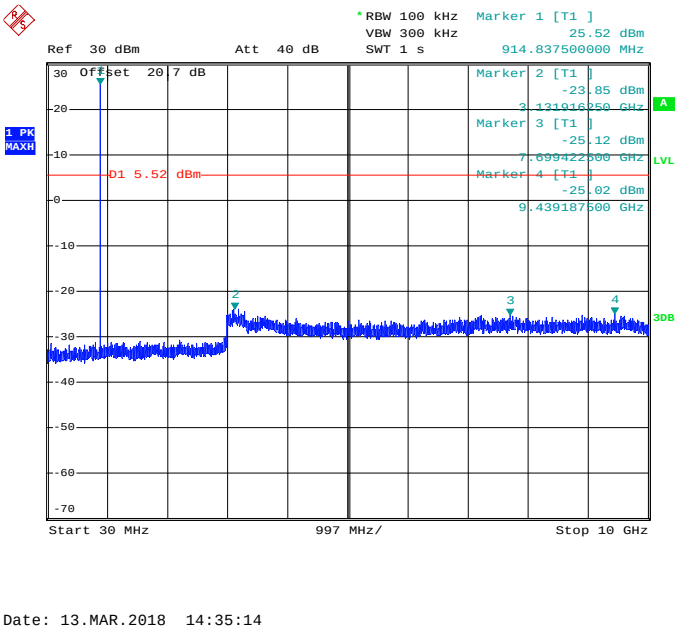


Figure 7.4.2.2-2: 30 MHz – 10 GHz – Middle Channel - Antenna port 0

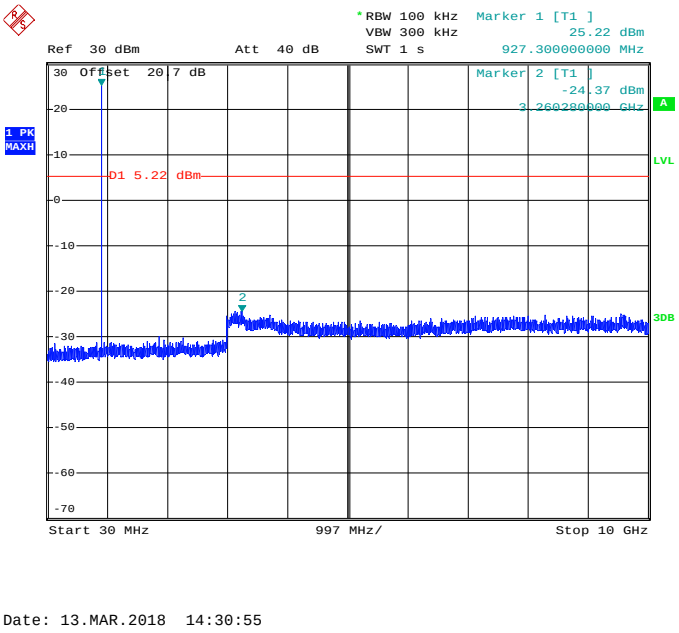


Figure 7.4.2.2-3: 30 MHz – 10 GHz – High Channel - Antenna port 0

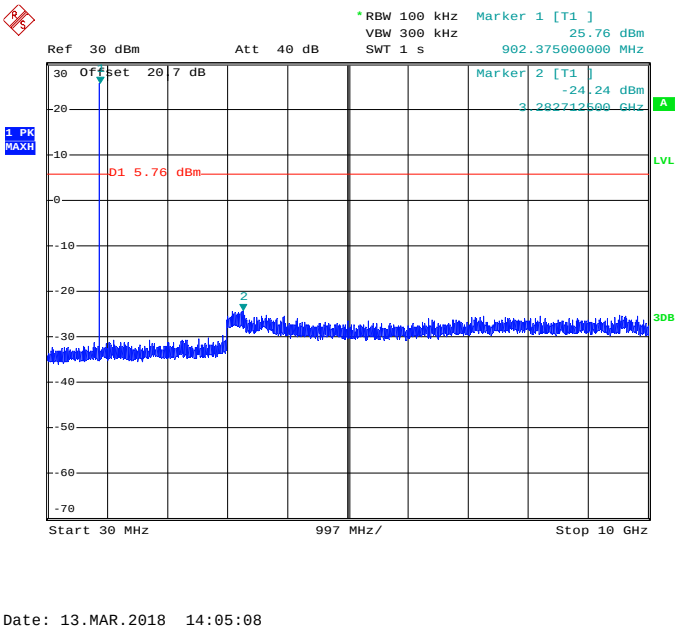


Figure 7.4.2.2-4: 30 MHz – 10 GHz – Low Channel - Antenna port 1

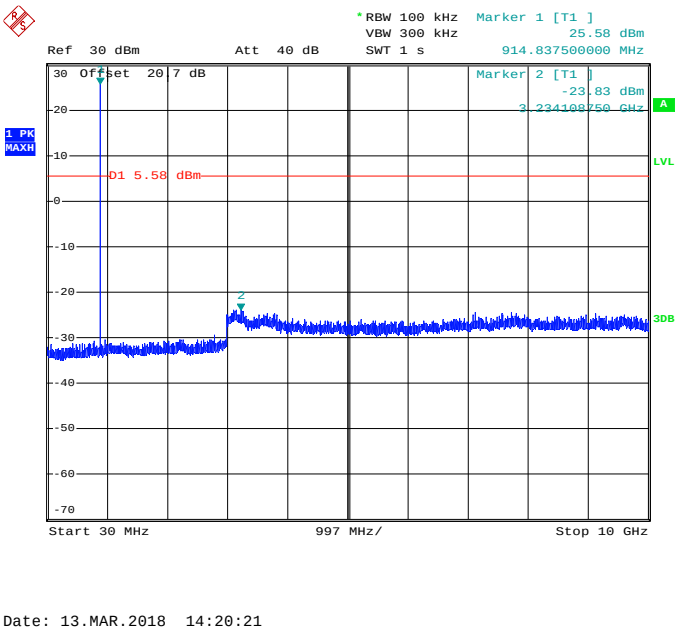


Figure 7.4.2.2-5: 30 MHz – 10 GHz – Middle Channel - Antenna port 1

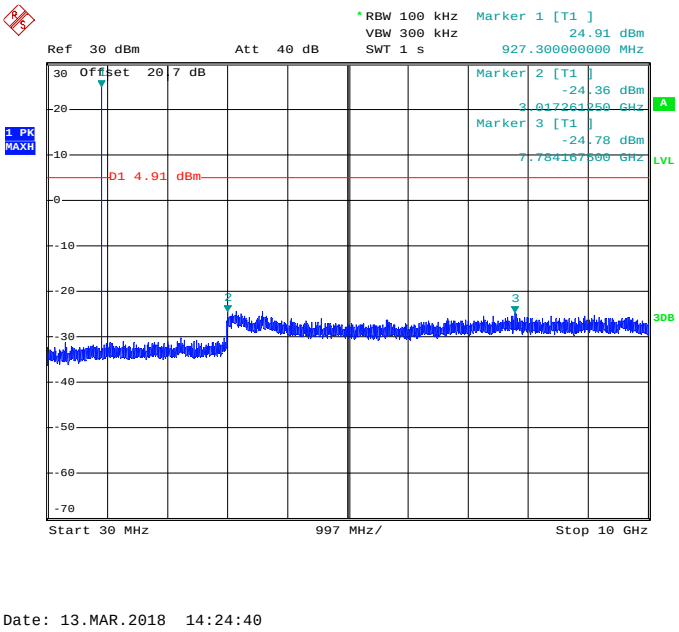


Figure 7.4.2.2-6: 30 MHz – 10 GHz – High Channel - Antenna port 1

7.4.3 Radiated Spurious Emissions into Restricted Frequency Bands – FCC: Sections 15.205, 15.209; ISED Canada: RSS-Gen 8.9, 8.10

7.4.3.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 9 kHz to 10 GHz, 10 times the highest fundamental frequency. Each emission found to be in a restricted band as defined by section 15.205, including any emission at the operational band-edge, was compared to the radiated emission limits as defined in Section 15.209.

For measurements below 30 MHz, the receive antenna height was set to 1m and the EUT was rotated through 360 degrees. The resolution bandwidth was set to 200 Hz below 150 kHz and to 9 kHz above 150 kHz.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000 MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000 MHz, peak measurements are made with RBW of 1 MHz and VBW of 3 MHz. Average measurements are performed in the linear scale using VBW of 30 Hz.

7.4.3.2 Measurement Results

Performed by: Jean Rene

Radiated band-edge and spurious emissions found in the restricted frequency bands of 9 kHz to 10 GHz are reported in the tables below.

Table 7.4.3.2-1: Radiated Spurious Emissions Tabulated Data - Antenna port 0

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel = 902.75 MHz										
2708.25	52.62	50.35	H	2.32	54.94	52.67	74.0	54.0	19.1	1.3
2708.25	48.59	44.72	V	2.32	50.91	47.04	74.0	54.0	23.1	7.0
3611	43.64	38.12	H	5.89	49.53	44.01	74.0	54.0	24.5	10.0
3611	42.28	33.92	V	5.89	48.17	39.81	74.0	54.0	25.8	14.2
4513.75	43.33	37.68	H	7.87	51.20	45.55	74.0	54.0	22.8	8.4
4513.75	41.87	33.09	V	7.87	49.74	40.96	74.0	54.0	24.3	13.0
5416.5	38.13	24.43	H	10.58	48.71	35.01	74.0	54.0	25.3	19.0
5416.5	37.10	24.01	V	10.58	47.68	34.59	74.0	54.0	26.3	19.4
8124.75	40.00	26.99	H	15.04	55.04	42.03	74.0	54.0	19.0	12.0
8124.75	40.10	27.16	V	15.04	55.14	42.20	74.0	54.0	18.9	11.8
Middle Channel = 915.25 MHz										
2745.75	51.50	48.52	H	2.49	53.99	51.01	74.0	54.0	20.0	3.0
2745.75	47.11	42.20	V	2.49	49.60	44.69	74.0	54.0	24.4	9.3
3661	43.58	37.46	H	6.10	49.68	43.56	74.0	54.0	24.3	10.4
3661	41.46	32.44	V	6.10	47.56	38.54	74.0	54.0	26.4	15.5
4576.25	39.64	29.57	H	8.08	47.72	37.65	74.0	54.0	26.3	16.3
4576.25	38.07	26.45	V	8.08	46.15	34.53	74.0	54.0	27.8	19.5
7322	40.91	27.37	H	14.08	54.99	41.45	74.0	54.0	19.0	12.5
7322	40.62	26.84	V	14.08	54.70	40.92	74.0	54.0	19.3	13.1
8237.25	39.30	25.92	H	15.16	54.46	41.08	74.0	54.0	19.5	12.9
8237.25	39.37	25.56	V	15.16	54.53	40.72	74.0	54.0	19.5	13.3
High Channel = 927.25 MHz										
2781.75	53.00	50.43	H	2.66	55.66	53.09	74.0	54.0	18.3	0.9
2781.75	48.38	44.24	V	2.66	51.04	46.90	74.0	54.0	23.0	7.1
3709	43.03	36.78	H	6.29	49.32	43.07	74.0	54.0	24.7	10.9
3709	41.95	31.76	V	6.29	48.24	38.05	74.0	54.0	25.8	15.9
4636.25	43.85	38.21	H	8.29	52.14	46.50	74.0	54.0	21.9	7.5
4636.25	40.07	30.78	V	8.29	48.36	39.07	74.0	54.0	25.6	14.9
7418	41.07	27.16	V	14.36	55.43	41.52	74.0	54.0	18.6	12.5
8345.25	40.20	28.75	H	15.28	55.48	44.03	74.0	54.0	18.5	10.0
8345.25	39.79	27.40	V	15.28	55.07	42.68	74.0	54.0	18.9	11.3

Notes:

All emissions above 8.35 GHz were attenuated below the limits and the noise floor of the measurement equipment.

Table 7.4.3.2-2: Radiated Spurious Emissions Tabulated Data - Antenna port 1

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel = 902.75 MHz										
2708.25	53.28	50.79	H	2.32	55.60	53.11	74.0	54.0	18.4	0.9
2708.25	49.86	45.94	V	2.32	52.18	48.26	74.0	54.0	21.8	5.7
3611	45.64	37.24	H	5.89	51.53	43.13	74.0	54.0	22.5	10.9
3611	43.67	33.61	V	5.89	49.56	39.50	74.0	54.0	24.4	14.5
4513.75	44.39	37.01	H	7.87	52.26	44.88	74.0	54.0	21.7	9.1
4513.75	42.96	33.74	V	7.87	50.83	41.61	74.0	54.0	23.2	12.4
5416.5	38.32	24.70	H	10.58	48.90	35.28	74.0	54.0	25.1	18.7
5416.5	37.69	24.14	V	10.58	48.27	34.72	74.0	54.0	25.7	19.3
8124.75	40.52	26.80	H	15.04	55.56	41.84	74.0	54.0	18.4	12.2
8124.75	39.68	27.33	V	15.04	54.72	42.37	74.0	54.0	19.3	11.6
Middle Channel = 915.25 MHz										
2745.75	51.03	48.16	H	2.49	53.52	50.65	74.0	54.0	20.5	3.3
2745.75	46.49	42.13	V	2.49	48.98	44.62	74.0	54.0	25.0	9.4
3661	42.71	36.67	H	6.10	48.81	42.77	74.0	54.0	25.2	11.2
3661	41.93	33.71	V	6.10	48.03	39.81	74.0	54.0	26.0	14.2
4576.25	40.14	31.34	H	8.08	48.22	39.42	74.0	54.0	25.8	14.6
4576.25	38.81	28.12	V	8.08	46.89	36.20	74.0	54.0	27.1	17.8
7322	40.93	27.13	H	14.08	55.01	41.21	74.0	54.0	19.0	12.8
7322	41.31	26.86	V	14.08	55.39	40.94	74.0	54.0	18.6	13.1
8237.25	39.13	25.82	H	15.16	54.29	40.98	74.0	54.0	19.7	13.0
8237.25	37.97	25.40	V	15.16	53.13	40.56	74.0	54.0	20.9	13.4
High Channel = 927.25 MHz										
2781.75	53.80	50.65	H	2.66	56.46	53.31	74.0	54.0	17.5	0.7
2781.75	47.50	44.36	V	2.66	50.16	47.02	74.0	54.0	23.8	7.0
3709	43.05	35.56	H	6.29	49.34	41.85	74.0	54.0	24.7	12.1
3709	41.50	32.31	V	6.29	47.79	38.60	74.0	54.0	26.2	15.4
4636.25	44.61	38.80	H	8.29	52.90	47.09	74.0	54.0	21.1	6.9
4636.25	42.27	35.32	V	8.29	50.56	43.61	74.0	54.0	23.4	10.4
7418	40.89	26.63	H	14.36	55.25	40.99	74.0	54.0	18.8	13.0
7418	41.10	26.81	V	14.36	55.46	41.17	74.0	54.0	18.5	12.8
8345.25	40.54	29.71	H	15.28	55.82	44.99	74.0	54.0	18.2	9.0
8345.25	40.38	27.81	V	15.28	55.66	43.09	74.0	54.0	18.3	10.9

Notes:

All emissions above 8.35 GHz were attenuated below the limits and the noise floor of the measurement equipment.

7.4.4 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

Example Calculation: Peak
Corrected Level: 52.62+ 2.32 = 54.94 dBµV/m
Margin: 74 dBµV/m – 54.94 dBµV/m = 19.1 dB

Example Calculation: Average
Corrected Level: 50.35 + 2.32 = 52.67dBµV/m
Margin: 54 dBµV/m – 52.67 dBµV/m = 1.3 dB

7.5 Power Line Conducted Emissions – FCC: Section 15.207; ISED Canada: RSS-Gen 8.8

7.5.1 Measurement Procedure

ANSI C63.10 section 6.2 was the guiding document for this evaluation. Conducted emissions were performed from 150 kHz to 30 MHz with the spectrum analyzer's resolution bandwidth set to 9 kHz and the video bandwidth set to 30 kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss
Margin = Applicable Limit - Corrected Reading

7.5.2 Measurement Results

Performed by: Thierry Jean-Charles

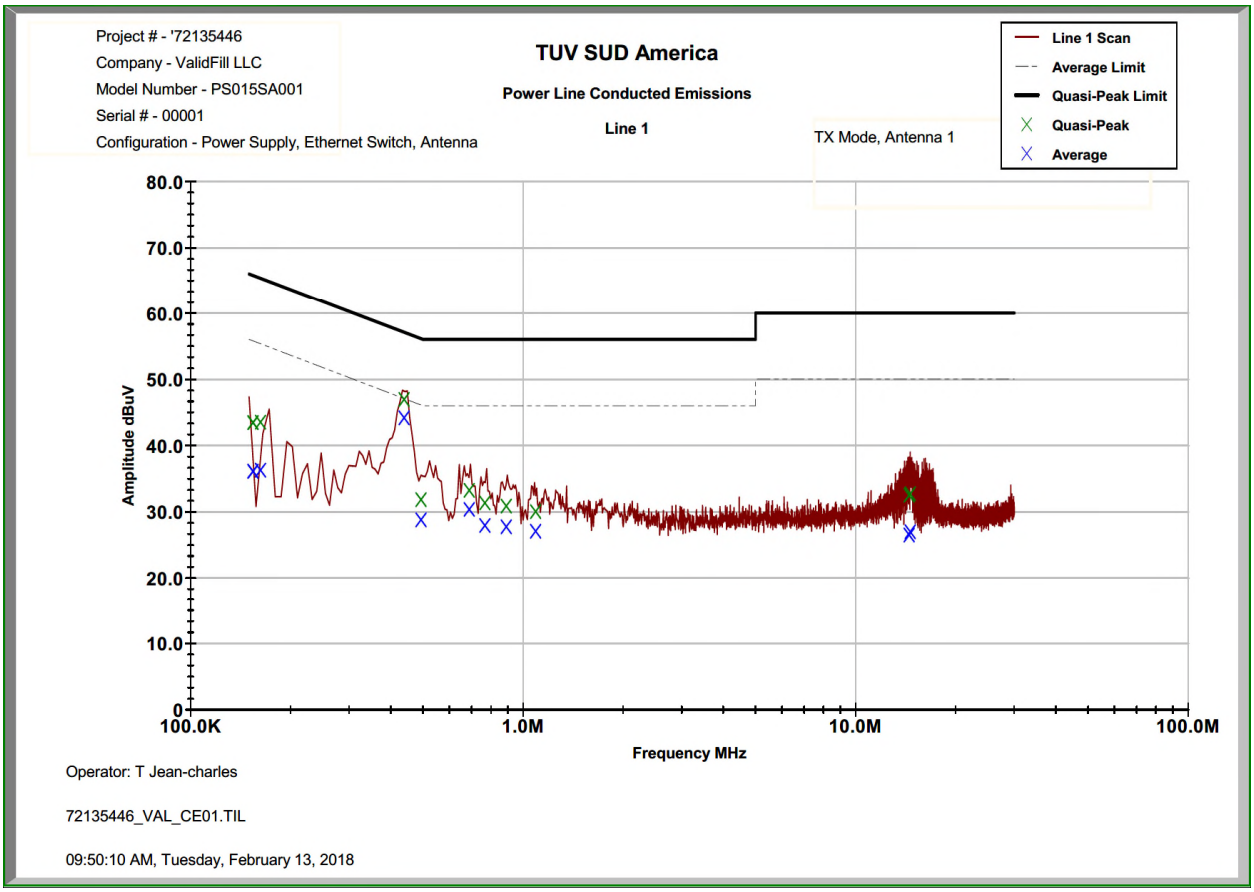


Figure 7.5.2-1: Conducted Emissions Results – Line 1

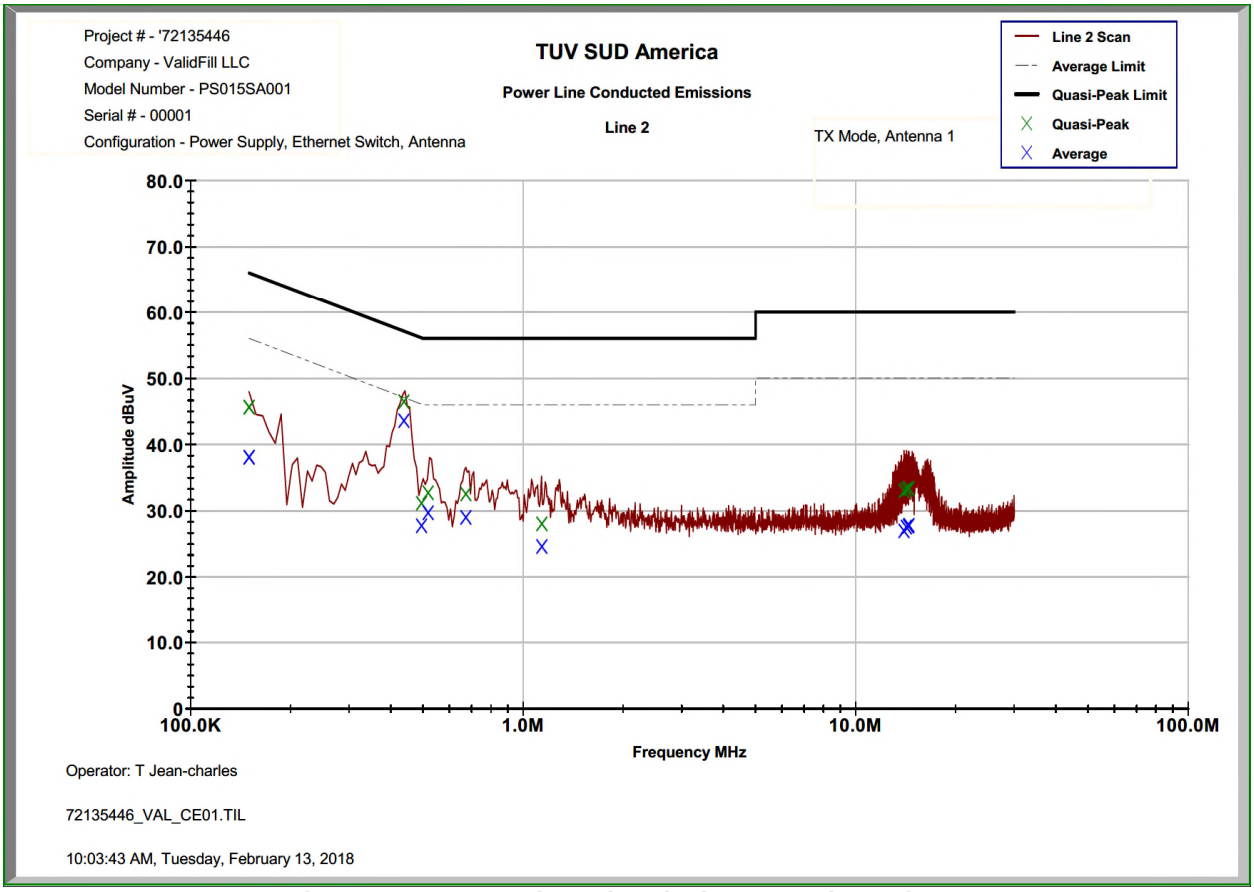


Figure 7.5.2-2: Conducted Emissions Results – Line 2

Table 7.5.2-1: Conducted EMI Results

☒ Line 1 ☒ Line 2 ☐ Line 3
☐ Line 4
☒ To Ground ☐ Floating
☐ Telecom Port _____
☒ dBµV ☐ dBµA

Plot Number:
72135446_VAL_CE01
Power Supply Description:
24VDC FSP Group, Inc. Power Supply

Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
Line 1									
0.154026	33.45	26.084	10.01	43.46	36.10	65.78	55.78	22.3	19.7
0.162338	33.519	26.264	10.01	43.53	36.28	65.34	55.34	21.8	19.1
0.438875	36.93	34.148	10.04	46.97	44.19	57.08	47.08	10.1	2.9
0.492999	21.824	18.747	10.04	31.87	28.79	56.12	46.12	24.2	17.3
0.689013	23.195	20.295	10.05	33.25	30.35	56.00	46.00	22.8	15.7
0.766999	21.267	17.865	10.06	31.33	27.93	56.00	46.00	24.7	18.1
0.890299	20.801	17.665	10.07	30.87	27.73	56.00	46.00	25.1	18.3
1.09016	19.92	16.96	10.09	30.01	27.05	56.00	46.00	26.0	18.9
14.487	21.081	15.099	11.29	32.37	26.39	60.00	50.00	27.6	23.6
14.5835	21.284	15.576	11.30	32.58	26.87	60.00	50.00	27.4	23.1
Line 2									
0.150047	35.562	28.018	10.06	45.63	38.08	66.00	56.00	20.4	17.9
0.438137	36.379	33.52	10.08	46.46	43.60	57.10	47.10	10.6	3.5
0.495099	21.062	17.664	10.08	31.15	27.75	56.08	46.08	24.9	18.3
0.518475	22.627	19.616	10.08	32.71	29.70	56.00	46.00	23.3	16.3
0.672675	22.445	18.913	10.09	32.54	29.00	56.00	46.00	23.5	17.0
1.1387	17.87	14.448	10.13	28.00	24.58	56.00	46.00	28.0	21.4
13.9704	21.758	15.709	11.15	32.91	26.86	60.00	50.00	27.1	23.1
14.2035	21.966	16.299	11.16	33.13	27.46	60.00	50.00	26.9	22.5
14.4035	22.134	16.418	11.18	33.31	27.60	60.00	50.00	26.7	22.4
14.4692	22.04	16.529	11.18	33.22	27.71	60.00	50.00	26.8	22.3

8 MEASUREMENT UNCERTAINTIES

The expanded laboratory measurement uncertainty figures (U_{Lab}) provided below correspond to an expansion factor (coverage factor) k = 1.96 which provide confidence levels of 95%.

Table 8-1: Measurement Uncertainties

Parameter	U_{lab}
Occupied Channel Bandwidth	± 0.009 %
RF Conducted Output Power	± 1.15 dB
Power Spectral Density	± 1.15 dB
Antenna Port Conducted Emissions	± 1.15 dB
Radiated Emissions ≤ 1GHz	± 5.86 dB
Radiated Emissions > 1GHz	± 4.65 dB
Temperature	± 0.860 °C
Radio Frequency	$\pm 2.832 \times 10^{-8}$
AC Power Line Conducted Emissions	±3.72 dB

9 CONCLUSION

In the opinion of TÜV SÜD America, Inc. the models PS015SA001 , manufactured by ValidFill, LLC, meet the requirements of FCC Part 15.247 and Industry Canada's Radio Standards Specification RSS-247 for the tests documented herein.

END REPORT