Wireless Test Report

FCC ID: QZC-MNICI

FCC Rule Part: 15.247

Report Number: RD72124703.200

Manufacturer: Elster Solutions
Model: MNICI

Test Begin Date: March 01, 2017
Test End Date: April 24, 2017

Report Issue Date: May 9, 2017

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code AT-1921

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

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This report contains 30 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 for limited modular approval.

1.2 Product description

The Model MNICI Printed Circuit Board Assembly (PCBA) module contains a frequency hopping spread spectrum (FHSS) radio operating in the 902-928 MHz ISM frequency band. It also contains circuitry for application control and communications with a host product. The MNICI module connects hosts using Advanced Metering Infrastructure (AMI) that utilizes a proprietary network architecture and protocol devised by Elster Electricity LLC.
The 900 MHz radio may operate in two modes: (Mode 1) The Energy Axis (EA) mode or (Mode 2) SynergyNet mode. The EA mode is Elster's legacy mode of operation while the SynergyNet mode is for future use and is compliant with the IEEE 802.15.4g standard for Smart Metering Utility Networks.

Technical Information:

Mode of Operation	Frequency Range (MHz)	Number of Channels	Data Rates Supported (kbps)
1	916 - 927.6	25	35.5, 142.2
2	916 – 927.6	25	200

Modulation Format: FSK
Operating Voltage: 4Vdc
Antenna Type / Gain:

Antenna Type	**Antenna Gain**
Spiral	3dBi
Half-Wave Dipole	5.15dBi
Inverted F	3.49dBi

Manufacturer Information:
Elster Solutions
208 S. Rogers Lane
Raleigh, NC 27610

EUT Serial Numbers: 5D26162G01-1001170600014

Test Sample Condition: The test samples were provided in good working order with no visible defects.

1.3 Test Methodology and Considerations

All modes of operation, including all available data rates were evaluated for each mode. The data presented in this report represents the worst case where applicable.

For radiated emissions, the EUT was evaluated in three orthogonal orientations with the highest gain antenna for each type. The worst-case orientation was the Y-orientation. Based on radiated measurements of all data rates, the worst-case data rate 35.5kbps.

For AC power line conducted emissions the EUT was evaluated with a typical host in EA mode.

Software power settings during test was 24 (Low Channel), 21 (Mid Channel), 19 (High Channel)

2 TEST FACILITIES

2.1 Location

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

TÜV SÜD America Inc.
2320 Presidential Drive, Suite 101
Durham, NC 27703
Phone: (919) 381-4235

2.2 Laboratory Accreditations/Recognitions/Certifications

TÜV SÜD America Inc. is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board under their ANAB program and has been issued certificate number AT-1921 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 Registered Test Site Number: 637011
ISED Canada Test Site Registration Number: 20446

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 18' x 28' x 18' shielded enclosure. The chamber is lined with Samwha Electronics Co. LTD Ferrite Absorber, model number SFA300 (HSN-1). The ferrite tile is 10cm x 10 cm and weighs approximately 1.4lbs. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber. On top of the ferrite tiles is DMAS HT-45 (Dutch Microwave Absorber Solutions) hybrid absorber on all walls except the wall behind the antenna mast which has a shorter DMAS HT-25 absorber.

The turntable is 1.50m in diameter and is located 150cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using short #6 copper wire. The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the turntable. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane.

Behind the turntable is a 2' x 6' x 1.5' deep shielded pit used for support equipment if necessary. The pit is equipped with 2 - 4" PVC chase from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

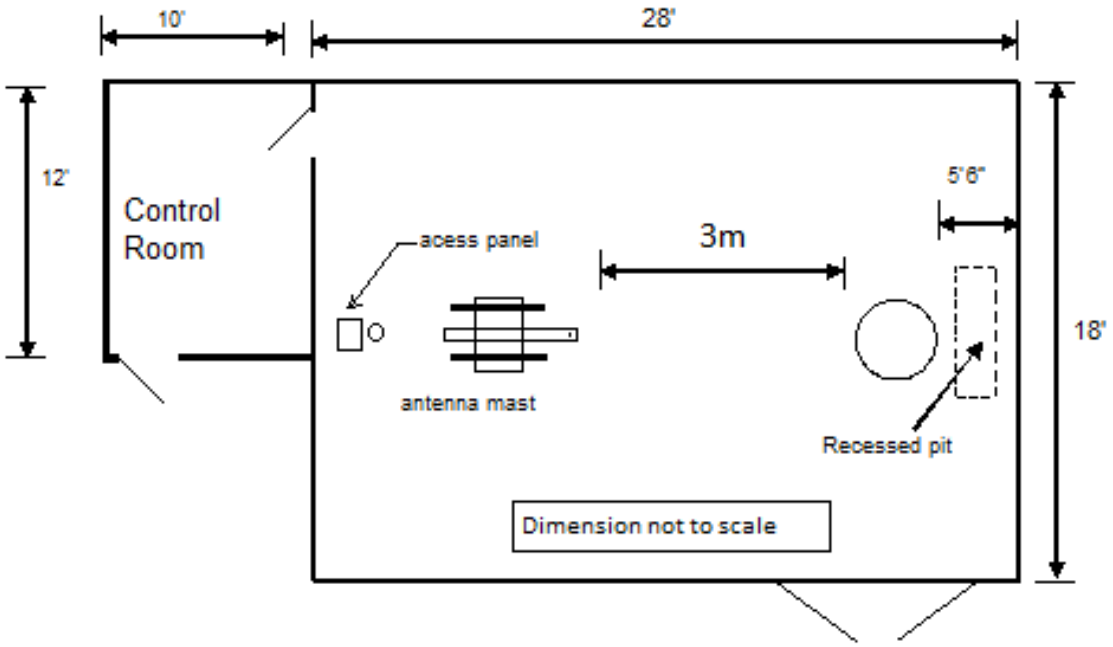


Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8’ x 10’ sheet galvanized steel horizontal ground reference plane (GRP) bonded every 6” to an 8’ X 8’ aluminum vertical ground plane.

A diagram of the room is shown below in figure 2.4-1:

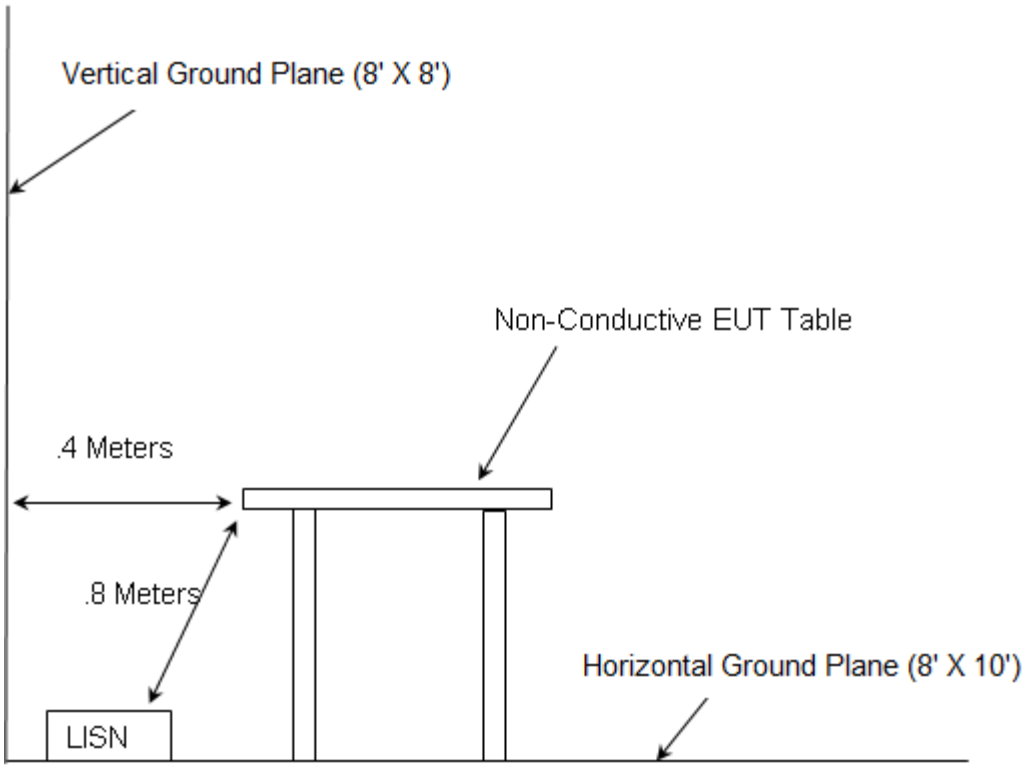


Figure 2.4-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2014: American National Standard for Methods of Measurement of Radio-Noise Emissions from low-voltage electrical and electronic equipment in the range of 9kHz to 40 GHz.
- 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 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2017
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2016

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

Asset ID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
277	EMCO	93146	Antennas	9904-5199	9/12/2016	9/12/2018
731	EMCO	3110B	Antennas	9411-1945	11/09/2016	11/09/2018
3002	Rohde & Schwarz	ESU40	Receiver	100346	1/12/2017	1/12/2018
3006	Rohde & Schwarz	TS-PR18	Amplifiers	122006	1/11/2017	1/11/2018
3008	Rohde & Schwarz	NRP2	Meter	103131	2/6/2017	2/6/2018
3009	Rohde & Schwarz	NRP-Z81	Meter	102397	2/6/2017	2/6/2018
3011	Rohde & Schwarz	ENV216	LISN	3011	1/12/2017	1/12/2018
3012	Rohde & Schwarz	EMC32-EB	Software	100731	NCR	NCR
3016	Fei Teng Wireless Technology	HA-07M18G-NF	Antennas	2013120203	1/26/2016	1/26/2018
3029	Micro-Tronics	HPM50108	Filter	134	1/13/2017	1/13/2018
3036	Hasco, Inc.	HLL142-S1-S1-24	Cables	2450	1/11/2017	1/11/2018
3038	Florida RF Labs	NMSE-290AW-60.0-NMSE	Cable Set	1448	1/3/2017	1/3/2018
3039	Florida RF Labs	NMSE-290AW-396.0-NMSE	Cable Set	1447	1/3/2017	1/3/2018
3049	Aeroflex Inmet	26AH-20	Attenuator	1443	1/11/2017	1/11/2018
3051	Mountain View Cable	BMS-RG400-264.0-BMS	Cables	3051	1/3/2017	1/3/2018
3055	Rohde & Schwarz	3005	Cables	3055	1/3/2017	1/3/2018
3085	Rohde & Schwarz	FSW43	Spectrum Analyzer	103997	8/9/2016	8/9/2017

NCR = No Calibration Required
DMAS MT-25 RF absorber material was used on the floor for all final measurements above 1 GHz.
Asset 3002: Firmware Version: ESU40 is 4.73 SP4
Asset 3012: Software Version: EMC32-B is 9.15
Asset 3085: Instrument Firmware 2.41 SP1

5 SUPPORT EQUIPMENT

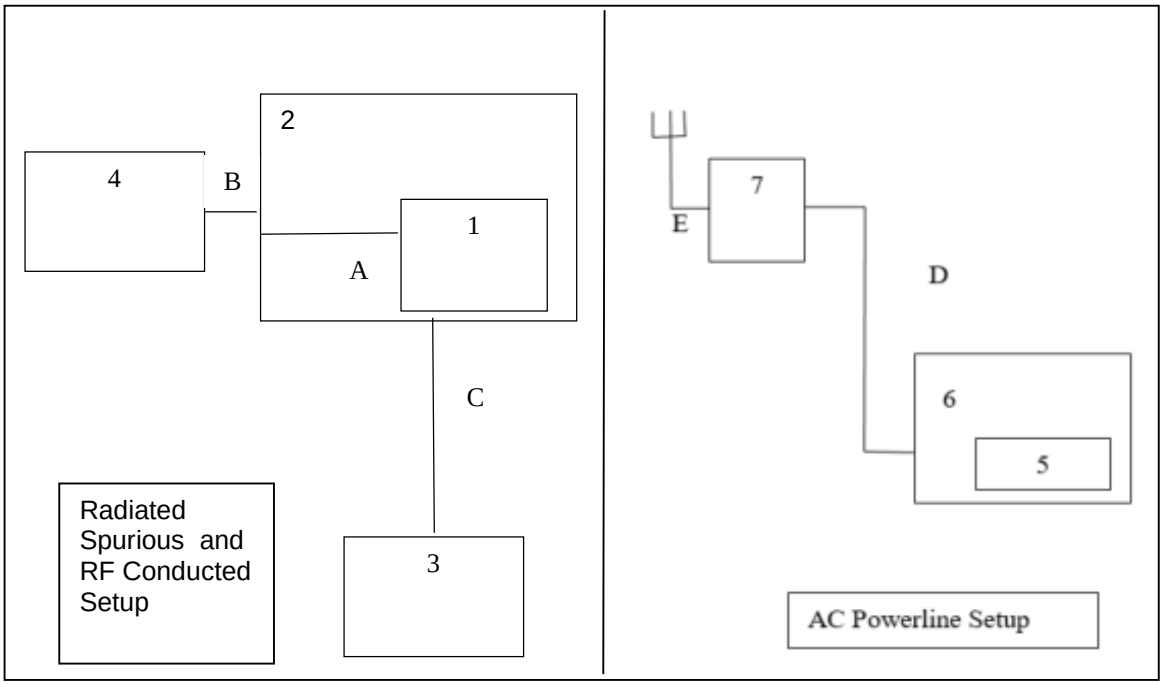
Table 5-1: EUT and Support Equipment Description

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	Elster Solutions	MNICI	5D26162G01 1001170600014
2	Circuit Board	Adaptor Board	N/A	TUV 19
3	Power Supply	Agilent	E3646A	MY54116460
4	Computer	Dell	7510	9T1PRC2
5	EUT	Elster Electricity, LLC	MNICI	1001170600001
6	Electrical Meter	Elster Electricity, LLC	A3RLQ	20626871
7	Isolation transformer	Elster Electricity, LLC	EA-GKWWIC3E	N/A

Table 5-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	Serial to USB	30cm	Yes	2 - 4
B	Ribbon Cable	15cm	No	2 - 1
C	Power	40cm	No	3 - 1
D	Power Cable	1.80 m	No	6 to 7
E	Power Cord	0.90 m	No	7 to AC Mains

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM



Note: Item 4 and A were only used to configure EUT and was removed from setup during radiated measurements

Figure 6-1: Test Setup Block Diagram

7 SUMMARY OF TESTS

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

7.1 Antenna Requirement – FCC: 15.203

The RF Connector is a MCX connector and satifies the requirements in FCC Part 15.203.

7.2 Power Line Conducted Emissions – FCC: 15.207

7.2.1 Measurement Procedure

ANSI C63.10-2013 section 6 was the guiding document for this evaluation. Conducted emissions were performed from 150kHz to 30MHz with the spectrum analyzer's resolution bandwidth set to 9kHz and the video bandwidth set to 30kHz. The calculation for the conducted emissions is as follows:

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

7.2.2 Measurement Results

Table 7.2.2-1: Conducted EMI Results – Line 1

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.194000	---	26.85	53.70	26.85	2000.0	9.000	L1	OFF	9.6
0.194000	39.45	---	63.72	24.27	2000.0	9.000	L1	OFF	9.6
0.704000	---	25.80	46.00	20.20	2000.0	9.000	L1	OFF	9.6
0.704000	26.62	---	56.00	29.38	2000.0	9.000	L1	OFF	9.6
3.664000	---	22.82	46.00	23.18	2000.0	9.000	L1	OFF	9.8
3.664000	34.90	---	56.00	21.10	2000.0	9.000	L1	OFF	9.8
3.880000	---	24.01	46.00	21.99	2000.0	9.000	L1	OFF	9.8
3.880000	36.03	---	56.00	19.97	2000.0	9.000	L1	OFF	9.8
9.606000	---	28.08	50.00	21.92	2000.0	9.000	L1	OFF	9.9
9.606000	36.69	---	60.00	23.31	2000.0	9.000	L1	OFF	9.9
12.122000	---	36.33	50.00	13.67	2000.0	9.000	L1	OFF	10.0
12.122000	44.91	---	60.00	15.09	2000.0	9.000	L1	OFF	10.0
13.798000	---	38.38	50.00	11.62	2000.0	9.000	L1	OFF	10.0
13.798000	46.19	---	60.00	13.81	2000.0	9.000	L1	OFF	10.0
15.046000	---	28.14	50.00	21.86	2000.0	9.000	L1	OFF	10.0
15.046000	36.82	---	60.00	23.18	2000.0	9.000	L1	OFF	10.0
22.602000	---	34.22	50.00	15.78	2000.0	9.000	L1	OFF	10.1
22.602000	42.23	---	60.00	17.77	2000.0	9.000	L1	OFF	10.1
26.578000	---	29.40	50.00	20.60	2000.0	9.000	L1	OFF	10.2
26.578000	38.44	---	60.00	21.56	2000.0	9.000	L1	OFF	10.2

Table 7.2.2-2: Conducted EMI Results – Neutral

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.660000	---	19.22	46.00	26.78	2000.0	9.000	N	OFF	9.6
0.660000	32.28	---	56.00	23.72	2000.0	9.000	N	OFF	9.6
1.300000	---	20.98	46.00	25.02	2000.0	9.000	N	OFF	9.6
1.300000	35.35	---	56.00	20.65	2000.0	9.000	N	OFF	9.6
2.064000	---	20.94	46.00	25.06	2000.0	9.000	N	OFF	9.7
2.064000	37.18	---	56.00	18.82	2000.0	9.000	N	OFF	9.7
3.620000	---	34.67	46.00	11.33	2000.0	9.000	N	OFF	9.7
3.620000	47.88	---	56.00	8.12	2000.0	9.000	N	OFF	9.7
3.836000	---	35.75	46.00	10.25	2000.0	9.000	N	OFF	9.8
3.836000	48.46	---	56.00	7.54	2000.0	9.000	N	OFF	9.8
9.710000	---	35.92	50.00	14.08	2000.0	9.000	N	OFF	9.9
9.710000	45.58	---	60.00	14.42	2000.0	9.000	N	OFF	9.9
11.846000	---	41.57	50.00	8.43	2000.0	9.000	N	OFF	10.0
11.846000	51.11	---	60.00	8.89	2000.0	9.000	N	OFF	10.0
12.942000	---	38.67	50.00	11.33	2000.0	9.000	N	OFF	10.0
12.942000	47.38	---	60.00	12.62	2000.0	9.000	N	OFF	10.0
13.590000	---	41.95	50.00	8.05	2000.0	9.000	N	OFF	10.0
13.590000	50.27	---	60.00	9.73	2000.0	9.000	N	OFF	10.0
22.758000	---	35.63	50.00	14.37	2000.0	9.000	N	OFF	10.1
22.758000	42.69	---	60.00	17.31	2000.0	9.000	N	OFF	10.1

7.3 Peak Output Power – FCC: 15.247(b)(2)

7.3.1 Measurement Procedure (Conducted Method)

The RF output port of the EUT was directly connected to the input of a power meter using suitable attenuation. The device employs < 50 channels at any given time. Therefore, the power is limited to 0.25 Watt.

7.3.2 Measurement Results

Table 7.3.2-1: RF Output Power

Frequency (MHz)	Level (dBm)	Data Rate (kbps)
916	23.779	35.5
916	23.870	142.2
916	23.822	200
922	23.612	35.5
922	23.693	142.2
922	23.804	200
927.6	23.351	35.5
927.6	23.529	142.2
927.6	23.554	200

7.4 Channel Usage Requirements

7.4.1 Carrier Frequency Separation – FCC: 15.247(a)(1)

7.4.1.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer using suitable attenuation. The span of the spectrum analyzer was set wide enough to capture two adjacent peaks. The RBW was set to approximately 30% of the channel spacing and adjusted as necessary to best identify the center of each channel. The VBW was set > RBW.

7.4.1.2 Measurement Results

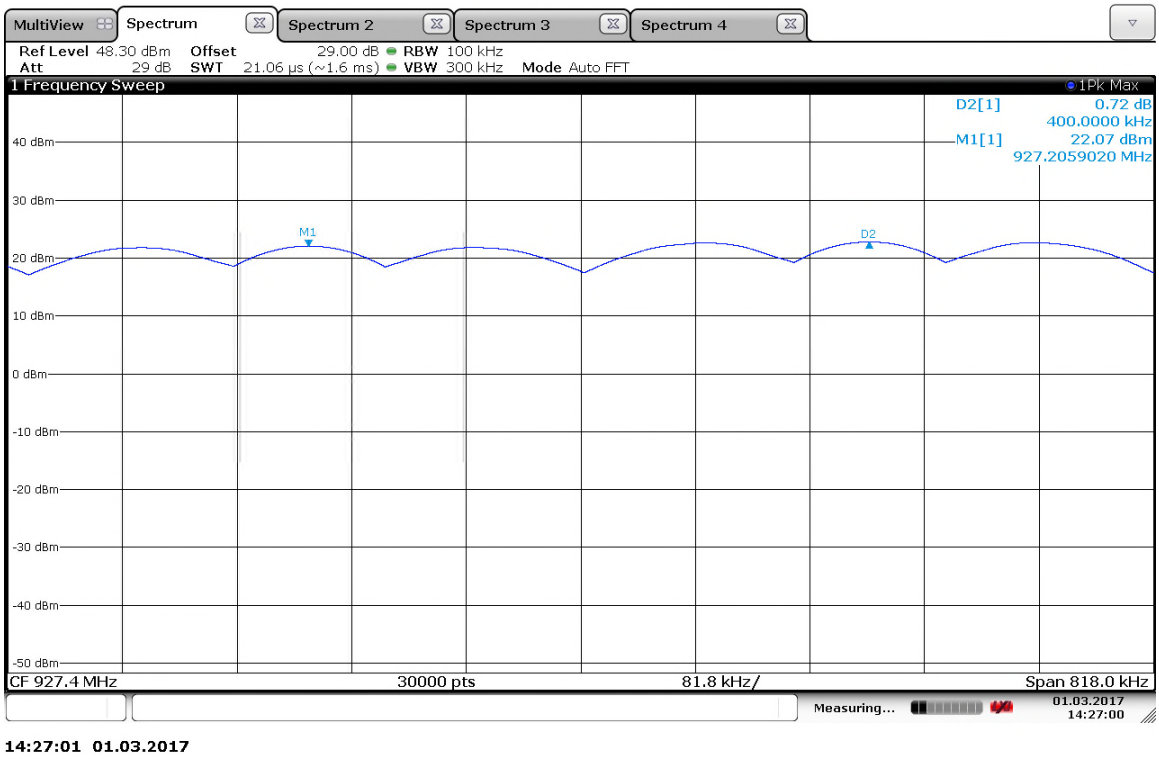


Figure 7.4.1.2-1: Carrier Frequency Separation 35.5kbps

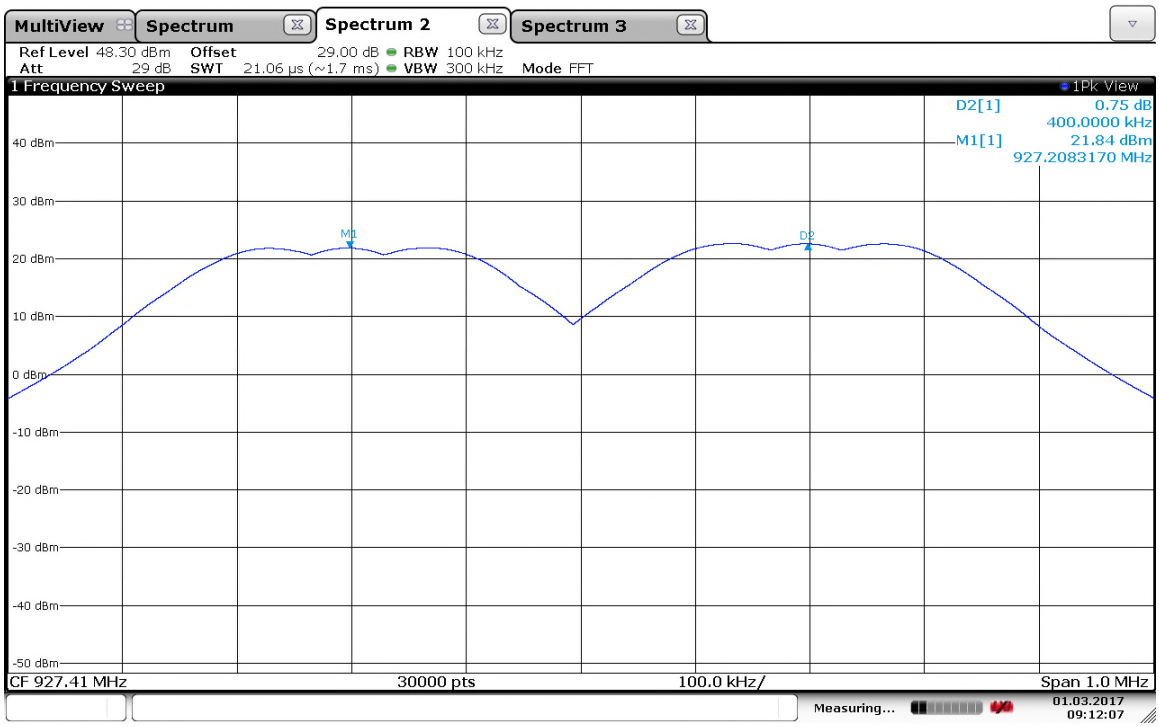


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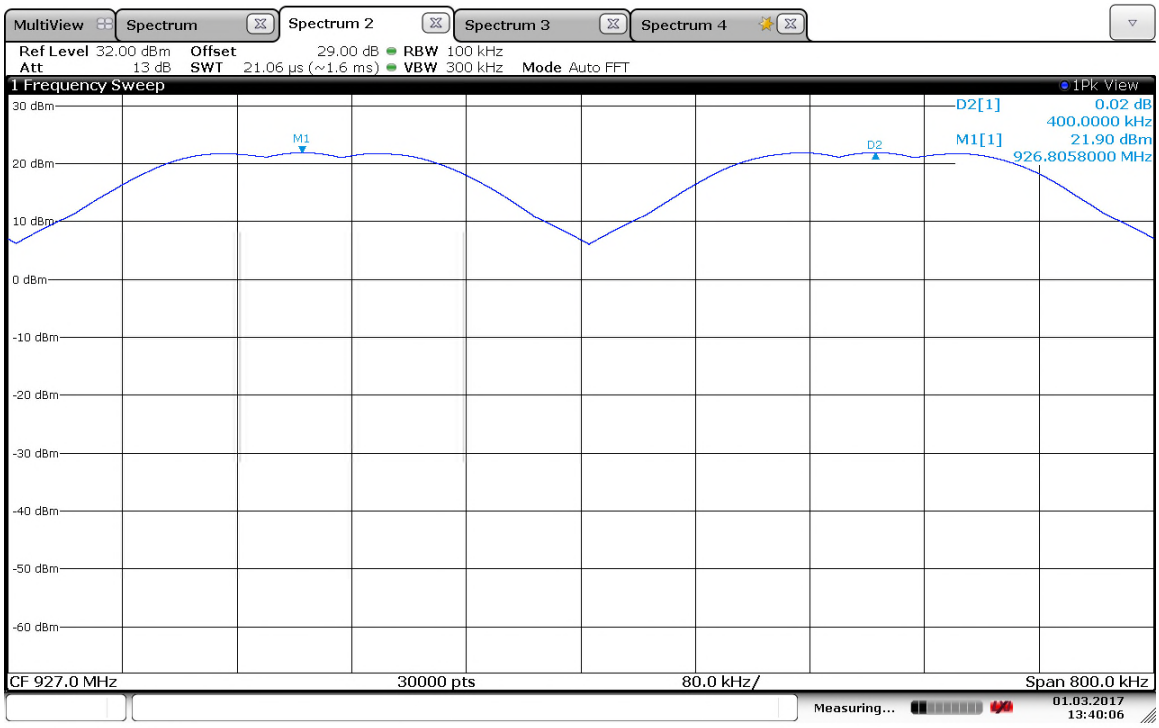
Figure 7.4.1.2-2: Carrier Frequency Separation 142.2kbps



13:40:06 01.03.2017

Figure 7.4.1.2-3: Carrier Frequency Separation 200kbps

7.4.2 Number of Hopping Channels – FCC: 15.247(a)(1)(i)

7.4.2.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer using suitable attenuation. The span of the spectrum analyzer was set wide enough to capture the frequency band of operation. The RBW was set to < 30% of the channel spacing and VBW set to ≥ RBW.

7.4.2.2 Measurement Results

Note: For testing purposes, only the Low, Mid, and High Channel output power was tuned for maximum output.

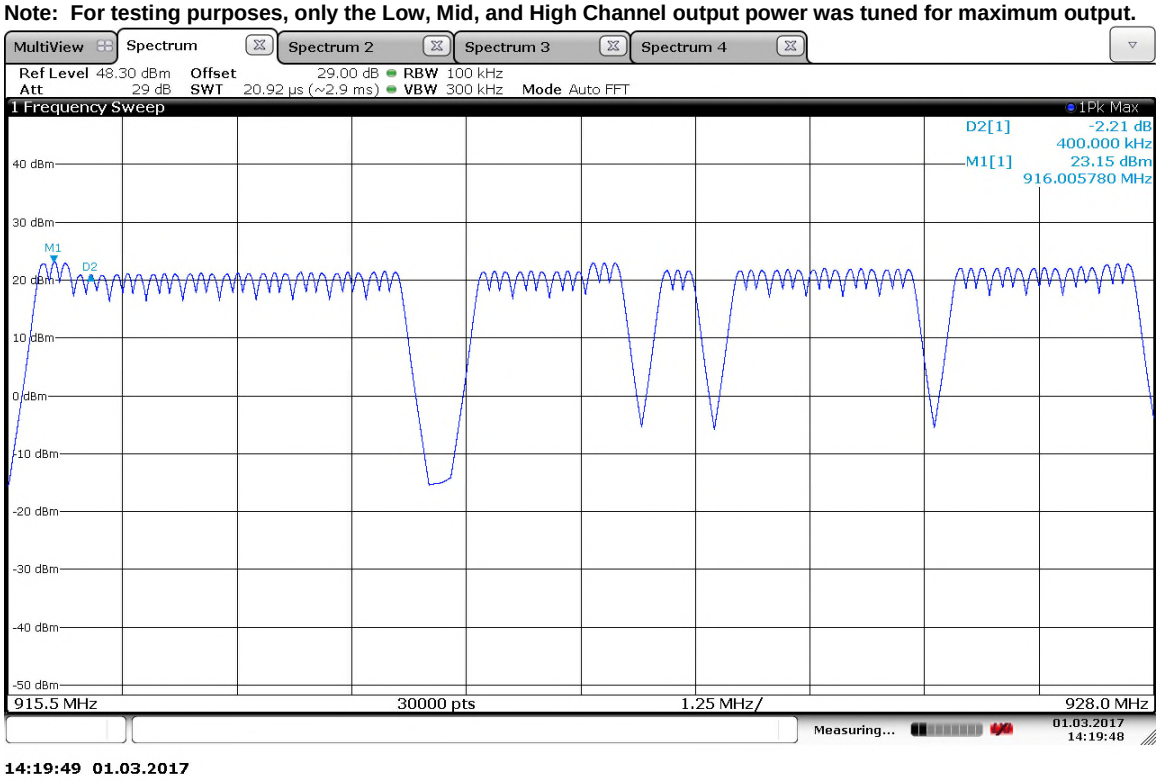
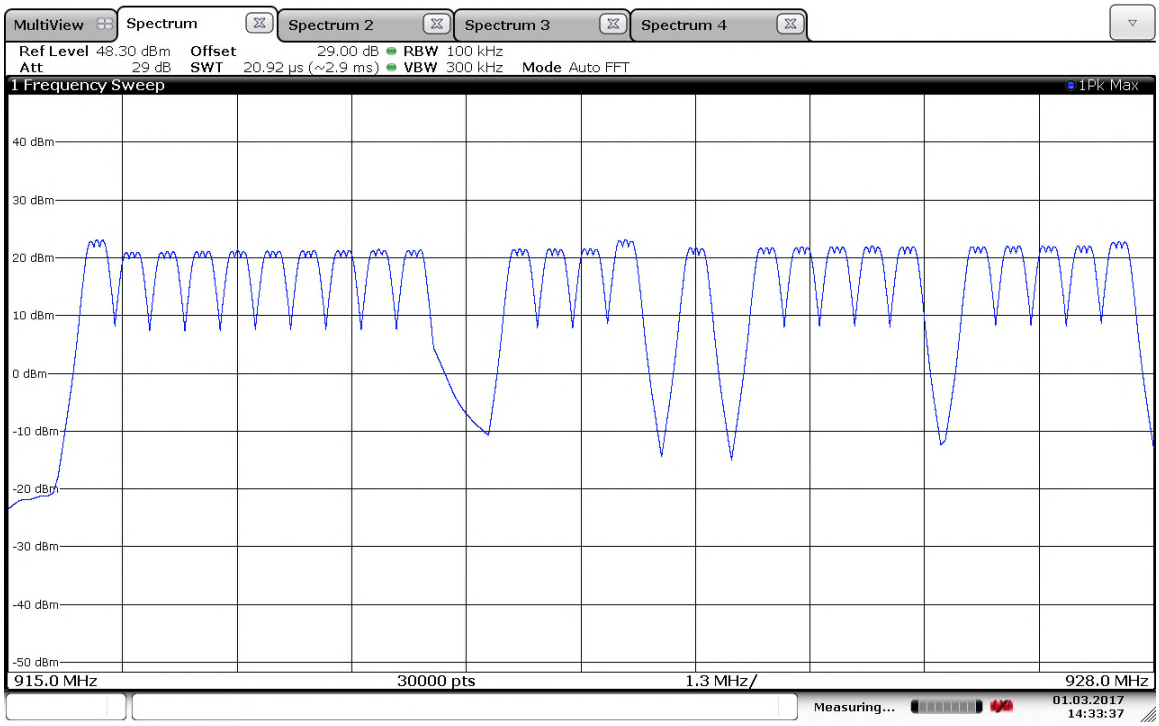
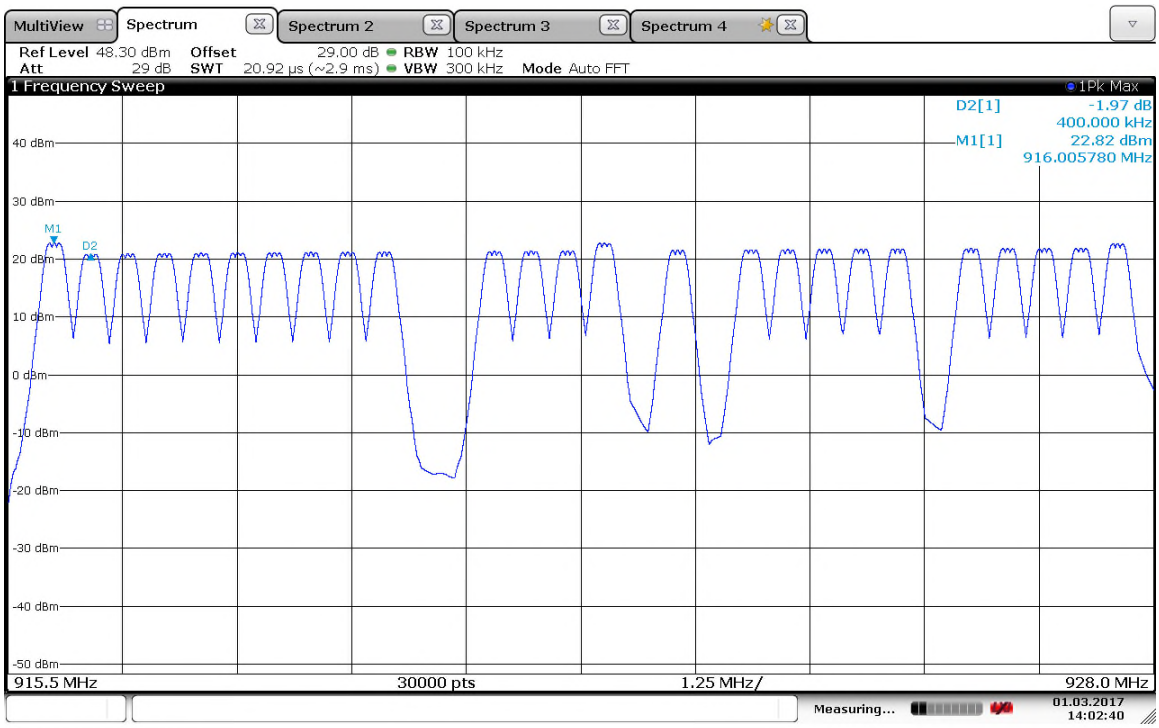


Figure 7.4.2.2-1: Number of Hopping Channels 35.5kbps



14:33:37 01.03.2017

Figure 7.4.2.2-2: Number of Hopping Channels 142.2kbps



14:02:41 01.03.2017

Figure 7.4.2.2-3: Number of Hopping Channels 200kbps

7.4.3 Channel Dwell Time – FCC: 15.247(a)(1)(i)

7.4.3.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer using suitable attenuation. The span of the spectrum analyzer display was set 0 Hz centered on a hopping channel. The RBW of the spectrum analyzer was set to ≤ the EUT channel spacing and VBW set to ≥ RBW. The Marker Delta function of the analyzer was utilized to determine the dwell time.

7.4.3.2 Measurement Results

Table 7.4.3.2-1: Channel Dwell Time (10 Second Sweep)

Mode	Data Rate (kbps)	Single Occurrence (ms)	Number of Occurrences	Total Dwell Time (ms)
1	35.5	103.03	2	206.06
1	142.2	27.44	7	192.08
2	200	25.26	8	202.08

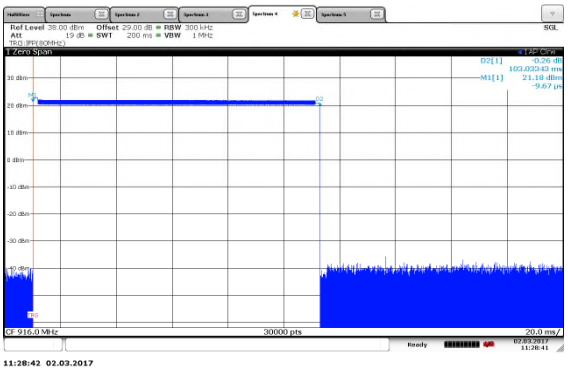


Figure 7.4.3.2-1: Dwell Time 35.5kbps

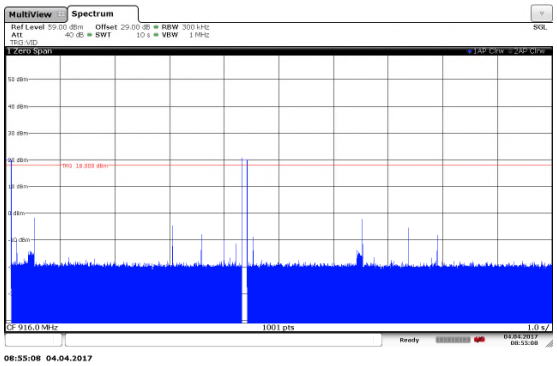


Figure 7.4.3.2-2: Number of Occurrences 35.5kbps

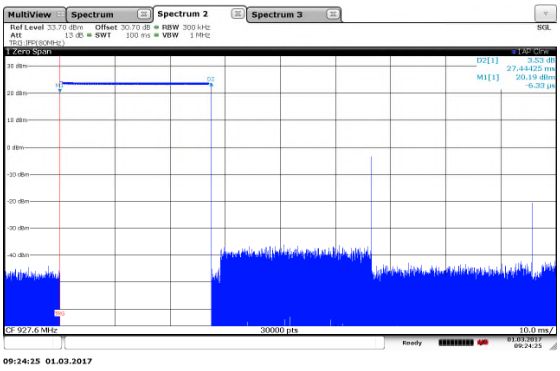


Figure 7.4.3.2-3: Dwell Time 142.2kbps

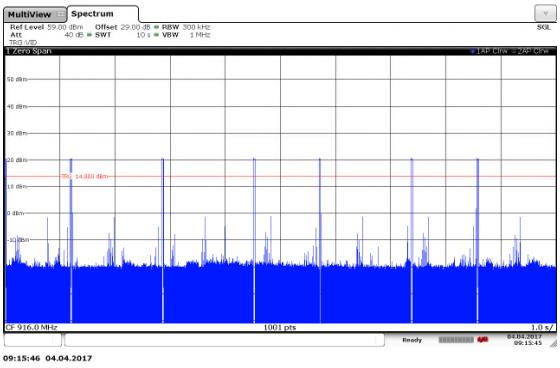


Figure 7.4.3.2-4: Number of Occurrences 142.2kbps

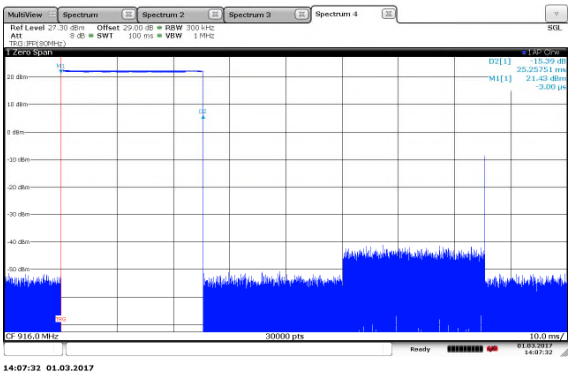


Figure 7.4.3.2-5: Dwell Time 200kbps

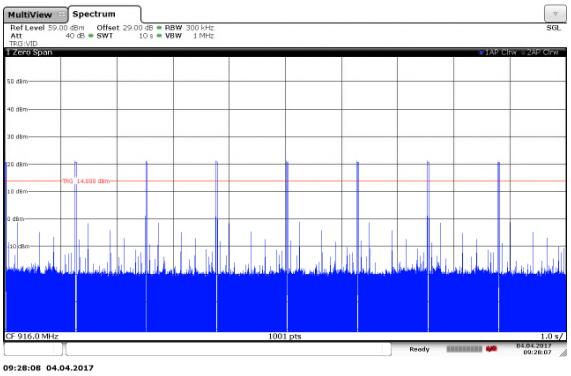


Figure 7.4.3.2-6: Number of Occurrences 200kbps

7.4.4 20dB Bandwidth – FCC: 15.247(a)(1)(i)

7.4.4.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer using suitable attenuation. The span of the spectrum analyzer display was set between two times and five times the occupied bandwidth (OBW) of the emission. The RBW of the spectrum analyzer was set to approximately 1 % to 5 % of the OBW. The trace was set to max hold with a peak detector active. The marker delta measurement function of the analyzer was utilized to determine the 20 dB bandwidth of the emission.

7.4.4.2 Measurement Results

Table 7.4.4.2-1: 20dB Bandwidth

Frequency (MHz)	20dB Bandwidth (kHz)	Data Rate (kbps)
916.0	359.97	35.5
922.0	361.17	35.5
927.6	319.00	35.5
916.0	337.77	142.2
922.0	335.30	142.2
927.6	338.17	142.2
916.0	264.83	200
922.0	254.60	200
927.6	270.57	200

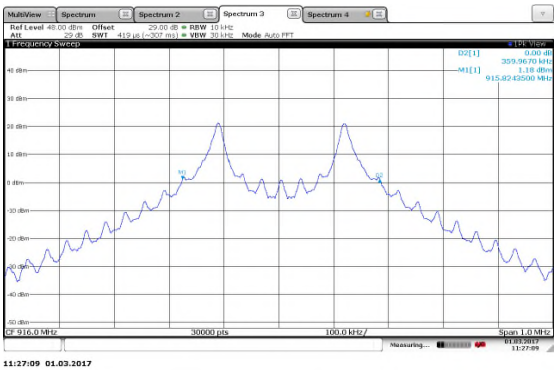


Figure 7.4.4.2-1: 20dB BW Low Channel 35.5kbps

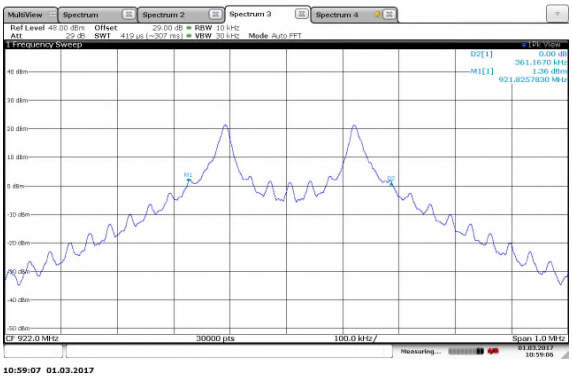


Figure 7.4.4.2-2: 20dB BW Mid Channel 35.5kbps

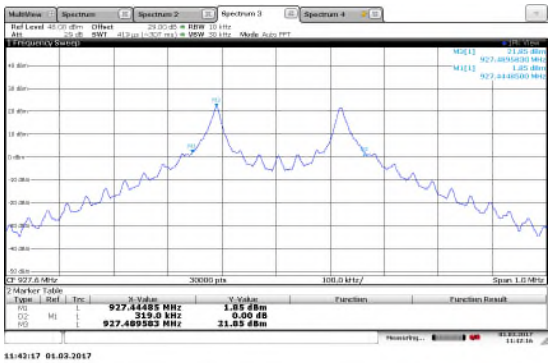


Figure 7.4.4.2-3: 20dB BW High Channel 35.5kbps

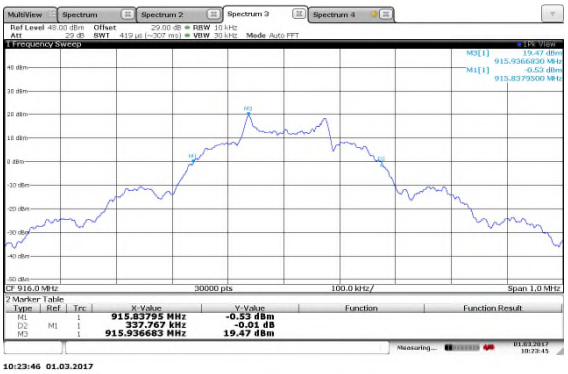


Figure 7.4.4.2-4: 20dB BW Low Channel 142.2kbps

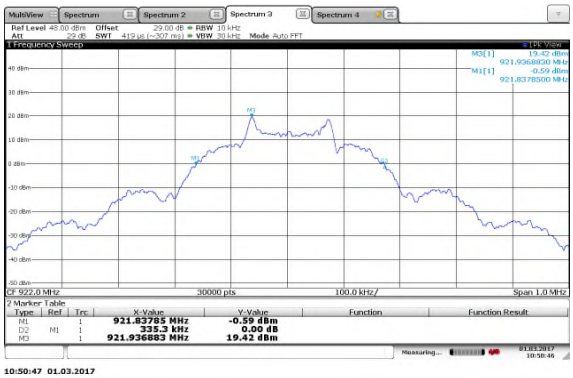


Figure 7.4.4.2-5: 20dB BW Mid Channel 142.2kbps

Figure 7.4.4.2-6: 20dB BW High Channel 142.2kbps

Figure 7.4.4.2-7: 20dB BW Low Channel 200kbps

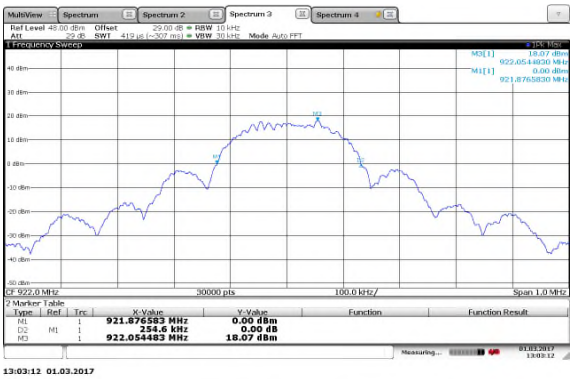


Figure 7.4.4.2-8: 20dB BW Mid Channel 200kbps

Figure 7.4.4.2-9: 20dB BW High Channel 200kbps

7.5 Band-Edge Compliance and Spurious Emissions

7.5.1 Band-Edge Compliance of RF Conducted Emissions – FCC: 15.247(d)

7.5.1.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer using 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, and the VBW was set to 300 kHz.

7.5.1.2 Measurement Results

NON-HOPPING MODE:

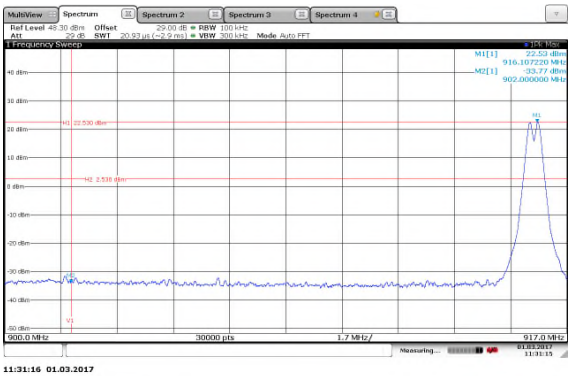


Figure 7.5.1.2-1: Lower Band-edge 35.5kbps

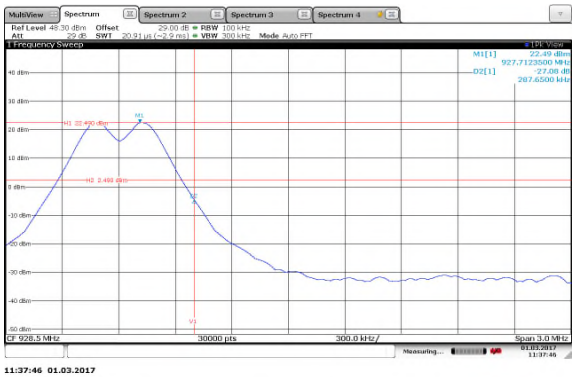


Figure 7.5.1.2-2: Upper Band-edge 35.5kbps

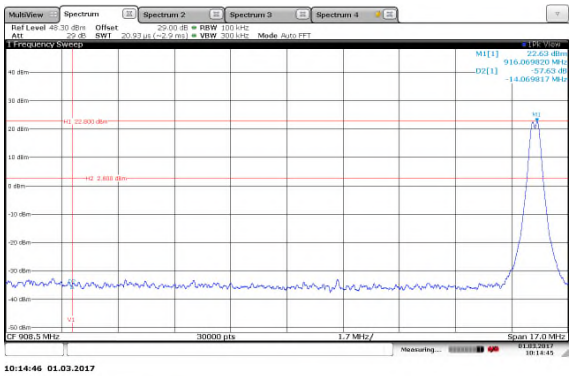


Figure 7.5.1.2-3: Lower Band-edge 142.2kbps

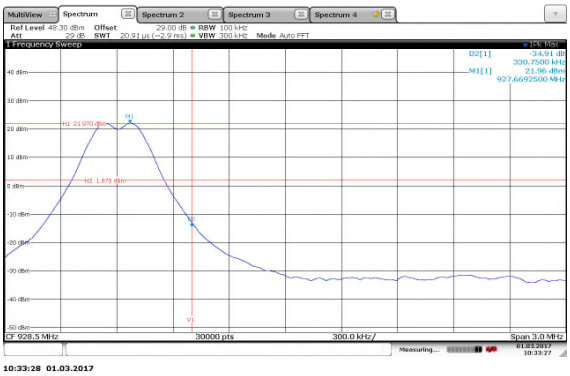


Figure 7.5.1.2-4: Upper Band-edge 142.2kbps

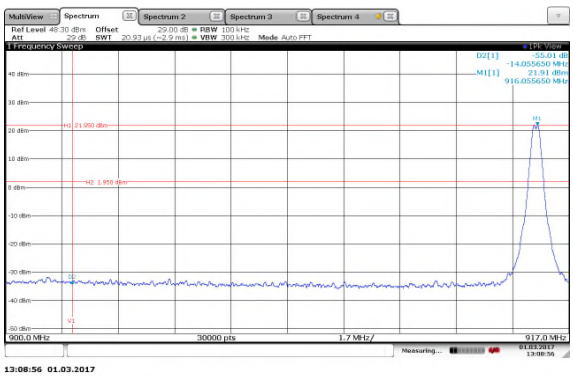


Figure 7.5.1.2-5: Lower Band-edge 200kbps

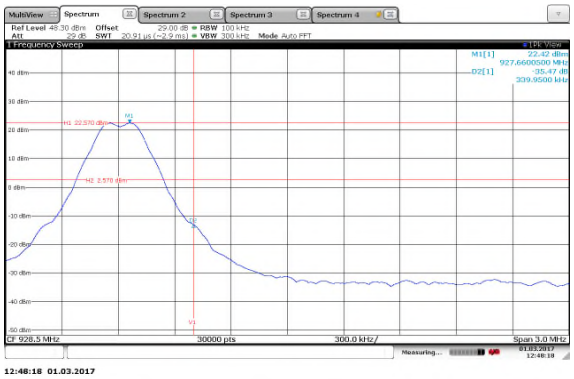


Figure 7.5.1.2-6: Upper Band-edge 200kbps

HOPPING MODE:

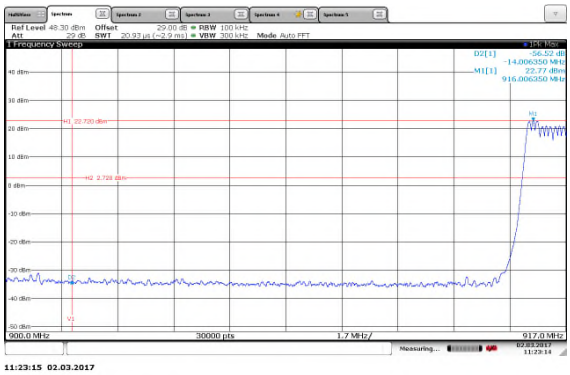


Figure 7.5.1.2-7: Lower Band-edge 35.5kbps

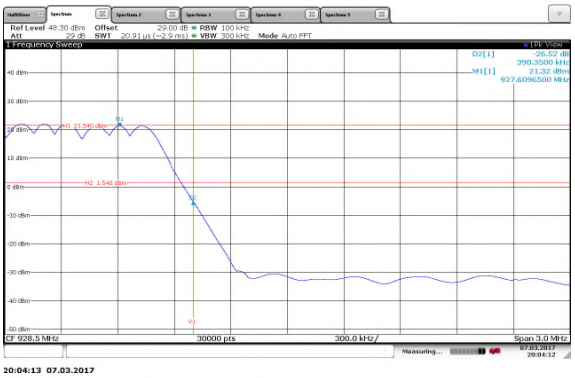


Figure 7.5.1.2-8: Upper Band-edge 35.5kbps

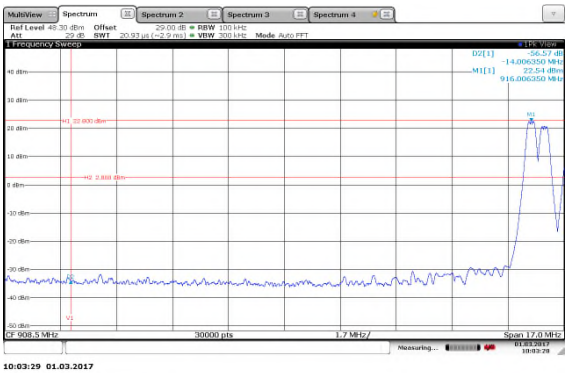


Figure 7.5.1.2-9: Lower Band-edge 142.2kbps

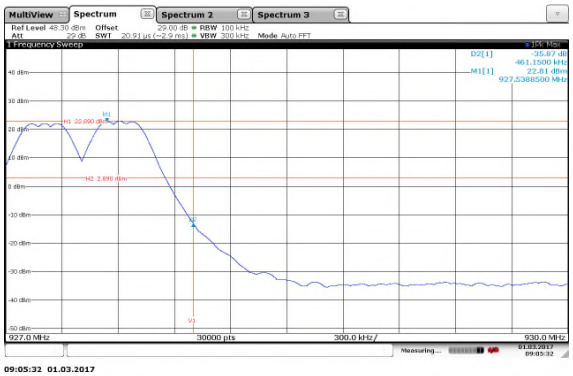


Figure 7.5.1.2-10: Upper Band-edge 142.2kbps

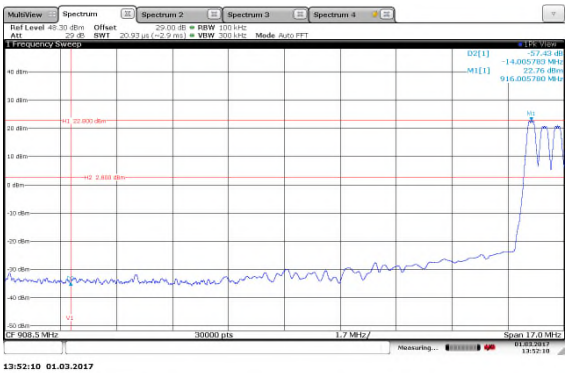


Figure 7.5.1.2-11: Lower Band-edge 200kbps

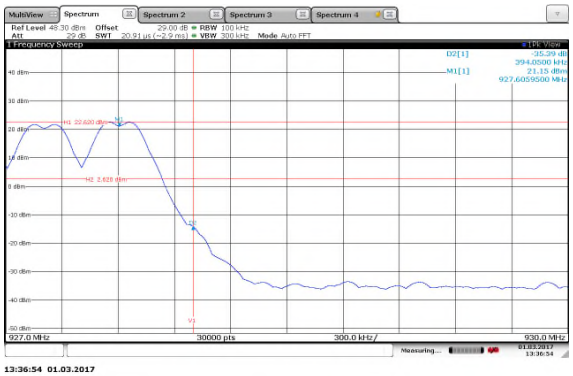


Figure 7.5.1.2-12: Upper Band-edge 200kbps

7.5.2 RF Conducted Spurious Emissions – FCC: 15.247(d)

7.5.2.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer using suitable attenuation. The EUT was investigated for conducted spurious emissions from 30MHz to 10GHz, 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 100kHz. A peak detector function was used with the trace set to max hold.

7.5.2.2 Measurement Results

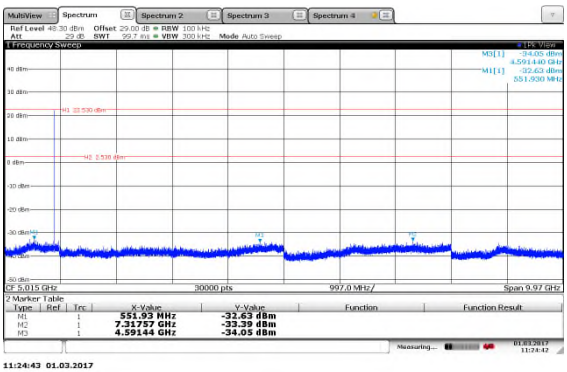


Figure 7.5.2.2-1: 30MHz–10GHz Low Channel 35.5kbps

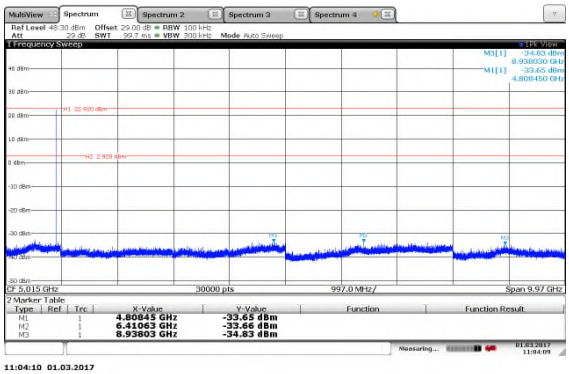


Figure 7.5.2.2-2: 30MHz–10GHz Mid Channel 35.5kbps

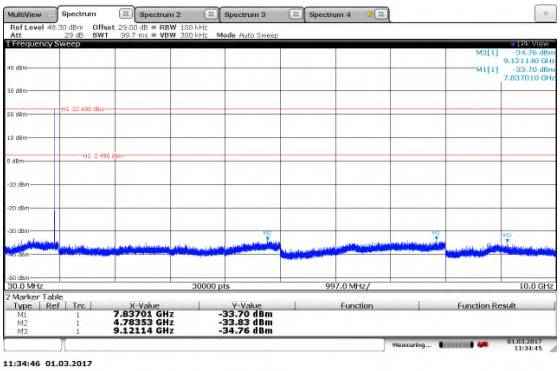


Figure 7.5.2.2-3: 30MHz–10GHz High Channel 35.5kbps

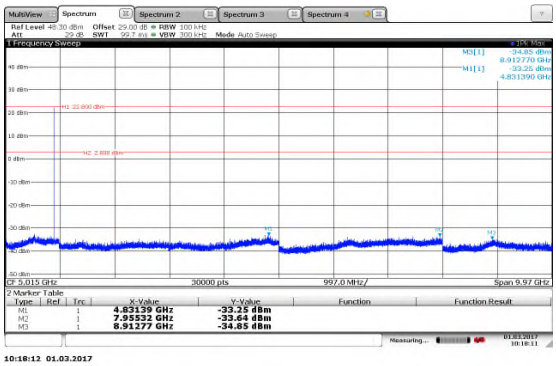


Figure 7.5.2.2-4: 30MHz–10GHz Low Channel 142.2kbps

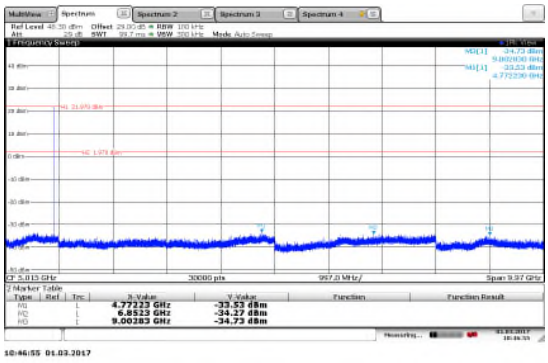


Figure 7.5.2.2-5: 30MHz–10GHz Mid Channel 142.2kbps

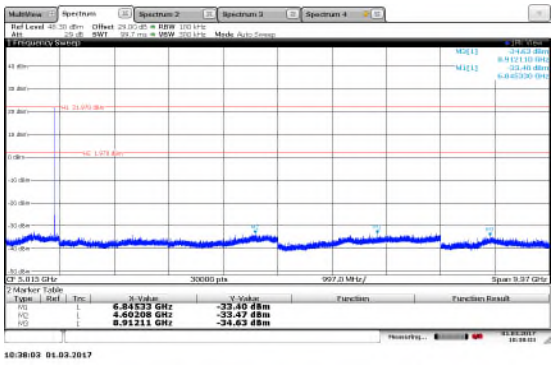
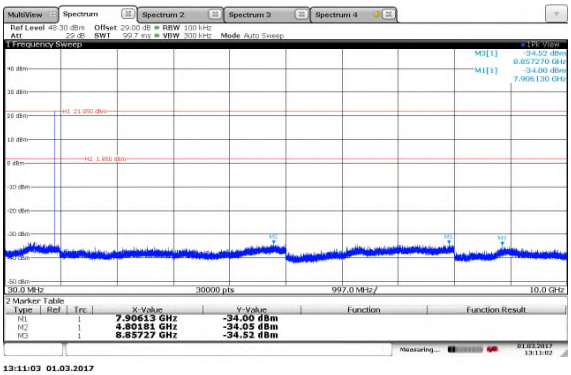
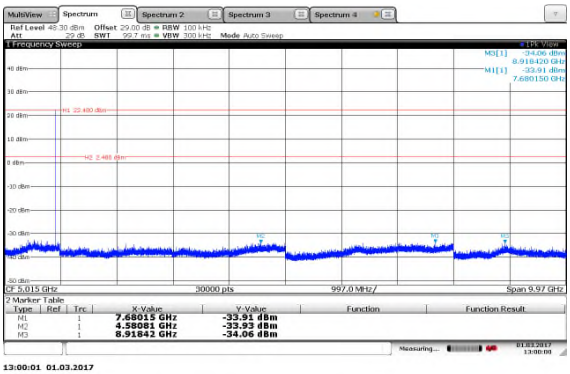


Figure 7.5.2.2-6: 30MHz–10GHz High Channel 142.2kbps



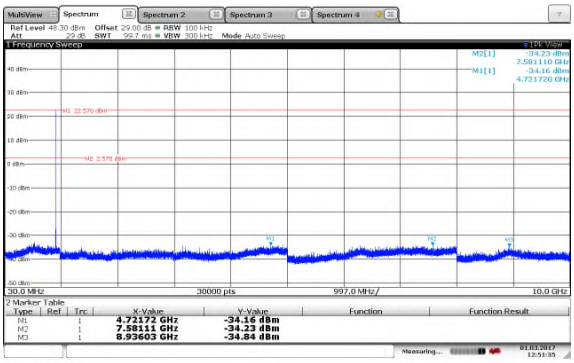
13:11:03 01.03.2017

Figure 7.5.2.2-7: 30MHz–10GHz Low Channel 200kbps



13:00:01 01.03.2017

Figure 7.5.2.2-8: 30MHz–10GHz Mid Channel 200kbps



12:51:36 01.03.2017

Figure 7.5.2.2-9: 30MHz–10GHz High Channel 200kbps

7.5.3 Radiated Spurious Emissions – FCC: 15.205, 15.209

7.5.3.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 30MHz to 10GHz, 10 times the highest fundamental frequency.

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 1000MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120kHz and a video bandwidth VBW of 300kHz. For frequencies above 1000MHz, peak and average measurements were made with RBW and VBW of 1MHz and 3MHz respectively.

The EUT was caused to generate a continuous modulated carrier on the hopping channel.

Each emission found to be in a restricted band was compared to the applicable radiated emission limits.

7.5.3.2 Duty Cycle Correction

The Duty Cycle Correction was not required.

7.5.3.3 Measurement Results

Table 7.5.3.3-1: Radiated Spurious Emissions Tabulated Data (Spiral Antenna)

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										
2748	42.00	33.20	H	-2.34	39.66	30.86	74.0	54.0	34.3	23.1
2748	46.40	41.10	V	-2.34	44.06	38.76	74.0	54.0	29.9	15.2
3664	39.00	25.50	H	1.10	40.10	26.60	74.0	54.0	33.9	27.4
3664	40.30	28.90	V	1.10	41.40	30.00	74.0	54.0	32.6	24.0
4580	46.90	37.50	H	3.54	50.44	41.04	74.0	54.0	23.6	13.0
4580	45.50	35.70	V	3.54	49.04	39.24	74.0	54.0	25.0	14.8
Middle Channel										
2766	41.80	33.30	H	-2.29	39.51	31.01	74.0	54.0	34.5	23.0
2766	44.90	38.40	V	-2.29	42.61	36.11	74.0	54.0	31.4	17.9
3688	40.40	29.40	H	1.17	41.57	30.57	74.0	54.0	32.4	23.4
3688	40.90	29.40	V	1.17	42.07	30.57	74.0	54.0	31.9	23.4
4610	45.20	34.90	H	3.53	48.73	38.43	74.0	54.0	25.3	15.6
4610	45.10	34.60	V	3.53	48.63	38.13	74.0	54.0	25.4	15.9
High Channel										
2782.8	42.00	33.00	H	-2.24	39.76	30.76	74.0	54.0	34.2	23.2
2782.8	44.90	38.60	V	-2.24	42.66	36.36	74.0	54.0	31.3	17.6
3710.4	40.30	28.10	H	1.23	41.53	29.33	74.0	54.0	32.5	24.7
3710.4	40.30	28.50	V	1.23	41.53	29.73	74.0	54.0	32.5	24.3
4638	42.50	30.50	H	3.52	46.02	34.02	74.0	54.0	28.0	20.0
4638	43.70	32.90	V	3.52	47.22	36.42	74.0	54.0	26.8	17.6

Table 7.5.3.3-2: Radiated Spurious Emissions Tabulated Data (Inverted F Antenna)

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										
2748	44.40	37.00	H	-2.34	42.06	34.66	74.0	54.0	31.9	19.3
2748	45.60	38.60	V	-2.34	43.26	36.26	74.0	54.0	30.7	17.7
3664	43.60	31.80	H	1.10	44.70	32.90	74.0	54.0	29.3	21.1
3664	45.50	36.20	V	1.10	46.60	37.30	74.0	54.0	27.4	16.7
4580	48.70	38.20	H	3.54	52.24	41.74	74.0	54.0	21.8	12.3
4580	46.50	34.50	V	3.54	50.04	38.04	74.0	54.0	24.0	16.0
Middle Channel										
2766	43.60	35.3	H	-2.29	41.31	33.0	74.0	54.0	32.7	21.0
2766	45.60	39.2	V	-2.29	43.31	36.9	74.0	54.0	30.7	17.1
3688	43.60	30.9	H	1.17	44.77	32.1	74.0	54.0	29.2	21.9
3688	44.20	33.9	V	1.17	45.37	35.1	74.0	54.0	28.6	18.9
4610	46.50	35.4	H	3.53	50.03	38.9	74.0	54.0	24.0	15.1
4610	45.20	32.9	V	3.53	48.73	36.4	74.0	54.0	25.3	17.6
High Channel										
2782.8	43.70	34.50	H	-2.24	41.46	32.26	74.0	54.0	32.5	21.7
2782.8	44.20	36.80	V	-2.24	41.96	34.56	74.0	54.0	32.0	19.4
3710.4	43.70	34.50	H	1.23	44.93	35.73	74.0	54.0	29.1	18.3
3710.4	44.20	33.40	V	1.23	45.43	34.63	74.0	54.0	28.6	19.4
4638	44.50	32.10	H	3.52	48.02	35.62	74.0	54.0	26.0	18.4
4638	44.00	31.40	V	3.52	47.52	34.92	74.0	54.0	26.5	19.1

Table 7.5.3.3-3: Radiated Spurious Emissions Tabulated Data (Half-Wave Dipole Antenna)

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										
2748	42.00	30.20	H	-2.34	39.66	27.86	74.0	54.0	34.3	26.1
2748	44.90	37.20	V	-2.34	42.56	34.86	74.0	54.0	31.4	19.1
3664	43.30	30.60	H	1.10	44.40	31.70	74.0	54.0	29.6	22.3
3664	44.80	32.60	V	1.10	45.90	33.70	74.0	54.0	28.1	20.3
4580	49.10	38.70	H	3.54	52.64	42.24	74.0	54.0	21.4	11.8
4580	47.60	36.40	V	3.54	51.14	39.94	74.0	54.0	22.9	14.1
Middle Channel										
2766	42.00	29.50	H	-2.29	39.71	27.21	74.0	54.0	34.3	26.8
2766	43.40	34.40	V	-2.29	41.11	32.11	74.0	54.0	32.9	21.9
3688	43.00	30.10	H	1.17	44.17	31.27	74.0	54.0	29.8	22.7
3688	43.30	30.20	V	1.17	44.47	31.37	74.0	54.0	29.5	22.6
4610	47.50	36.50	H	3.53	51.03	40.03	74.0	54.0	23.0	14.0
4610	46.80	35.60	V	3.53	50.33	39.13	74.0	54.0	23.7	14.9
High Channel										
2782.8	41.80	31.00	H	-2.24	39.56	28.76	74.0	54.0	34.4	25.2
2782.8	44.10	34.60	V	-2.24	41.86	32.36	74.0	54.0	32.1	21.6
3710.4	42.70	29.60	H	1.23	43.93	30.83	74.0	54.0	30.1	23.2
3710.4	42.70	29.30	V	1.23	43.93	30.53	74.0	54.0	30.1	23.5
4638	45.60	33.90	H	3.52	49.12	37.42	74.0	54.0	24.9	16.6
4638	45.30	32.70	V	3.52	48.82	36.22	74.0	54.0	25.2	17.8

7.5.3.4 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: 41.80 - 2.24 = 39.56dBuV/m
Margin: 74dBuV/m – 39.56dBuV/m = 34.4dB

Example Calculation: Average

Corrected Level: 31.00 - 2.24 = 28.76dBuV
Margin: 54dBuV – 28.76dBuV = 25.2dB

8 CONCLUSION

In the opinion of TÜV SÜD America Inc. the MNICI, manufactured by Elster Solutions meets the requirements of FCC Part 15 Subpart C for the tests documented herein.

END REPORT