Certification Test Report

FCC ID: ODB-LANCER450044

FCC Rule Part: 15.247

ACS Report Number: 12-2168.W03.1B

Manufacturer: ValidFill, LLC
Model: HD011SA003

Test Begin Date: **December 27, 2012**
Test End Date: **January 13, 2013**

Report Issue Date: April 15, 2013

FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER AT-1533

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

Project Manager:

Thierry Jean-Charles
EMC Engineer
Advanced Compliance Solutions, Inc.

Reviewed by:

Kirby Munroe
Director, Wireless Certifications
Advanced Compliance Solutions, Inc.

This report contains 31 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.

1.2 Manufacturer Information

ValidFill, LLC
6222 Tower Lane, Suite B-7
Sarasota, FL 34240

1.3 Product description

The ValidFill Lancer 4500 44, Model HD011SA003, is soda dispensing machine which includes a 900 MHz RFID transceiver.

Technical Parameters:

Band of Operation:	902.75 - 927.25 MHz
Number of Channels:	50
Mode of Operation:	FHSS
Antenna Type/Gain:	PCB Loop Antenna, 0.55 dBi
Operating Voltage:	120V / 60 Hz

Model Number: HD011SA003

Test Sample Serial Number(s): 854562H1237MN9TRA

Test Sample Condition: The samples were in good conditions with no observable physical damages.

1.4 Test Methodology and Considerations

The HD011SA003 includes one 900 MHz radio with one RF output. The RF output is then connected to a 12 channel multiplexer connected to 12 loop antennas. Preliminary evaluations were performed on the 12 multiplexer ports and the data is reported for the configuration leading to the highest emissions.

For the RF conducted emissions evaluation, the measurements were collected at the output of the multiplexer ports.

The power line conducted emissions evaluations were performed with the 900 MHz radio constantly hopping.

The unit was also evaluated for compliance to the unintentional emissions requirements in accordance with the Class A limits. The results are documented separately in a Verification test report.

2 TEST FACILITIES

2.1 Location

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

Advanced Compliance Solutions, Inc.
3998 FAU Blvd, Suite 310
Boca Raton, Florida 33431
Phone: (561) 961-5585
Fax: (561) 961-5587
www.acstestlab.com

FCC Test Firm Registration #: 475089
Industry Canada Lab Code: 4175C

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board under their ACLASS program and has been issued certificate number AT-1533 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.

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 floor.

The turntable is driven by pneumatic motor, which is capable of supporting a 2000 lb. load. The turntable is flushed with the chamber floor which it is connected to, around its circumference, with a continuous metallic loaded spring. An EMCO Model 1050 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:

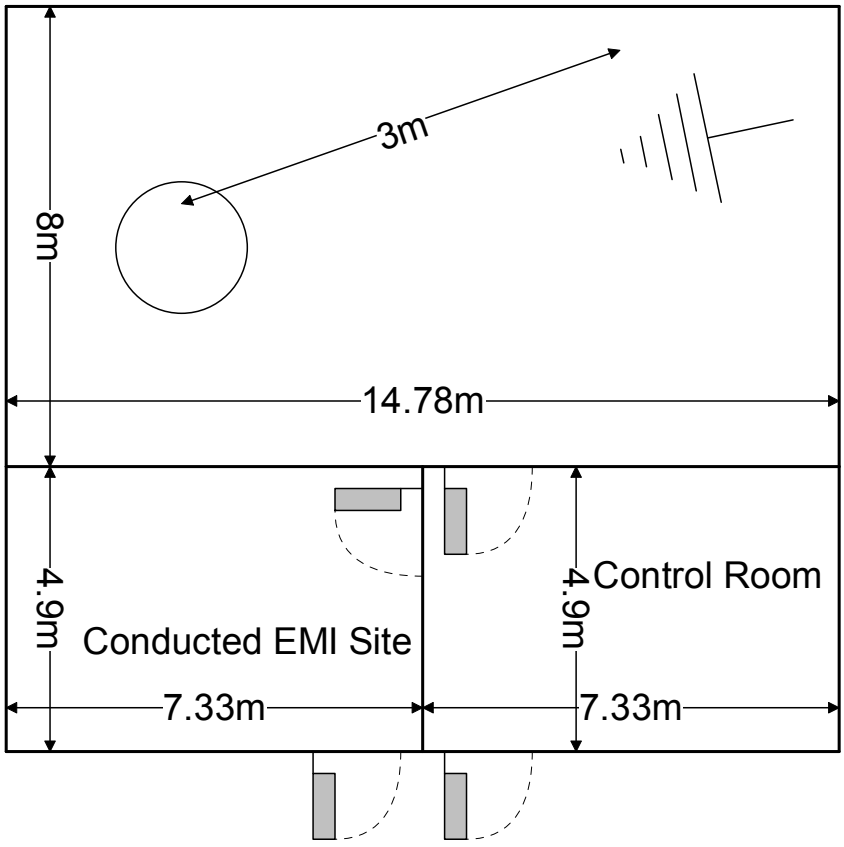

Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

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. As per ANSI C63.4 2003 requirements, the data were taken using two LISNs; a Solar Model 8028-50 50 Ω/50 µH and an EMCO Model 3825, which are installed as shown in Photograph 3. For 220 V, 50 Hz, a Polarad LISN (S/N 879341/048) is used in conjunction with a 1 kVA, 50 Hz/220 V EDGAR variable frequency generator, Model 1001B, to filter conducted noise from the generator.

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

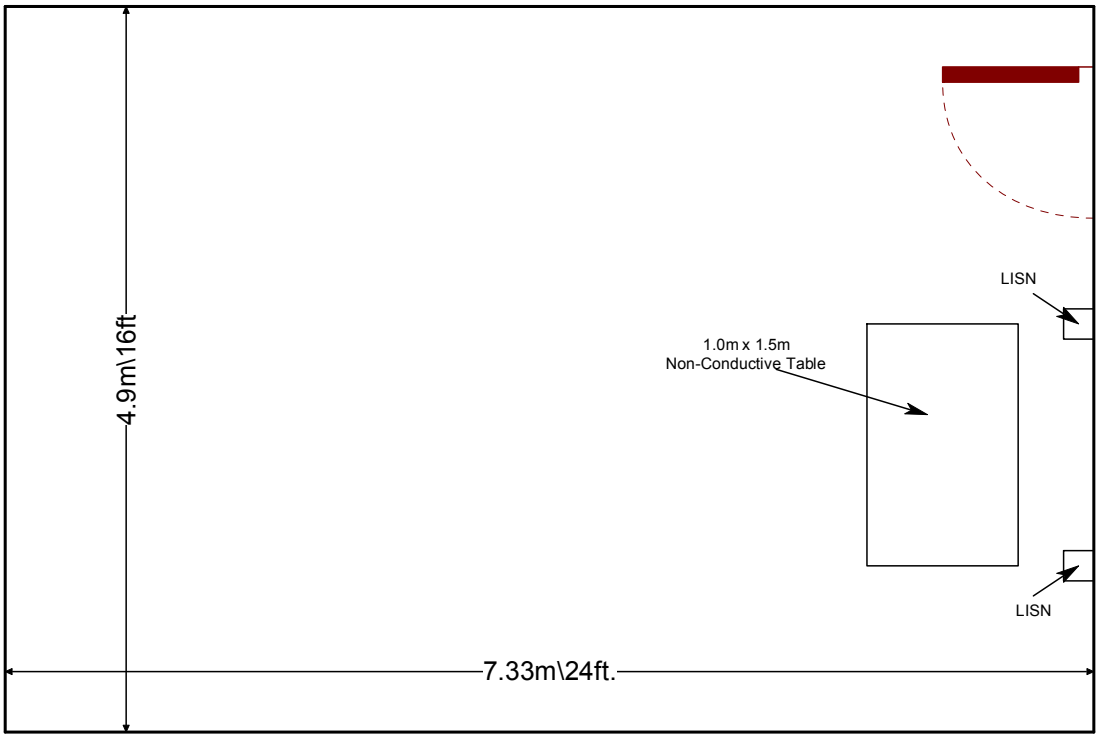

Figure 2.3.2-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2012
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2012
- FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems, March 30, 2000

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

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
523	Agilent	E7405	Spectrum Analyzers	MY45103293	1/5/2011	1/5/2013
523	Agilent	E7405	Spectrum Analyzers	MY45103293	1/8/2013	1/8/2015
524	Chase	CBL6111	Antennas	1138	1/7/2011	1/7/2013
524	Chase	CBL6111	Antennas	1138	1/7/2013	1/7/2015
2006	EMCO	3115	Antennas	2573	3/2/2011	3/2/2013
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	1/2/2012	1/2/2013
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	12/31/2012	12/31/2013
2022	EMCO	LISN3825/2R	LISN	1095	8/19/2011	8/19/2013
2037	ACS Boca	Chamber EMI Cable Set	Cable Set	2037	1/2/2012	1/2/2013
2037	ACS Boca	Chamber EMI Cable Set	Cable Set	2037	1/1/2013	1/1/2014
2044	QMI	N/A	Cables	2044	1/2/2012	1/2/2013
2044	QMI	N/A	Cables	2044	12/31/2012	12/31/2013
2045	ACS Boca	Conducted Cable Set	Cable Set	2045	1/2/2012	1/2/2013
2045	ACS Boca	Conducted Cable Set	Cable Set	2045	12/31/2012	12/31/2013
2064	CIR Q-TEL	FHT/22-10K-13/50-3A/3A	Filter	9	12/30/2011	12/30/2012
2064	CIR Q-TEL	FHT/22-10K-13/50-3A/3A	Filter	9	12/31/2012	12/31/2013
2071	Trilithic, Inc.	4HC1400-1-KK	Filter	9643263	1/19/2012	1/19/2013
2071	Trilithic, Inc.	4HC1400-1-KK	Filter	9643263	12/31/2012	12/31/2013
2097	Alpha Wire	9055B	Cables	2097	6/29/2012	6/29/2013
2075	Hewlett Packard	8495B	Attenuators	2626A11012	1/2/2012	1/2/2013
2075	Hewlett Packard	8495B	Attenuators	2626A11012	12/31/2012	12/31/2013
2076	Hewlett Packard	HP5061-5458	Cables	2076	1/2/2012	1/2/2013
2076	Hewlett Packard	HP5061-5458	Cables	2076	12/29/2012	12/29/2013
RE587	Fairview Microwave Inc.	SA3N511-15	Attenuators	RE587	4/18/2012	4/18/2013
2089	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00214	12/20/2012	12/20/2013
2091	Agilent Technologies, Inc.	8573A	Spectrum Analyzers	2407A03233	12/12/2011	12/12/2013
2095	ETS Lindgren	TILE4! - Version 4.2.A	Software	85242	NCR	NCR

NCR=No Calibration Required

5 EQUIPMENT UNDER TEST AND SUPPORT EQUIPMENT

Table 5-1: EUT and Support Equipment Description

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	ValidFill	HD011SA003	854562H1237MN9TRA

Note: The EUT is a stand-alone equipment with no support for external accessories.

Table 5.2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	Power Cord	2m	No	EUT to AC Mains

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

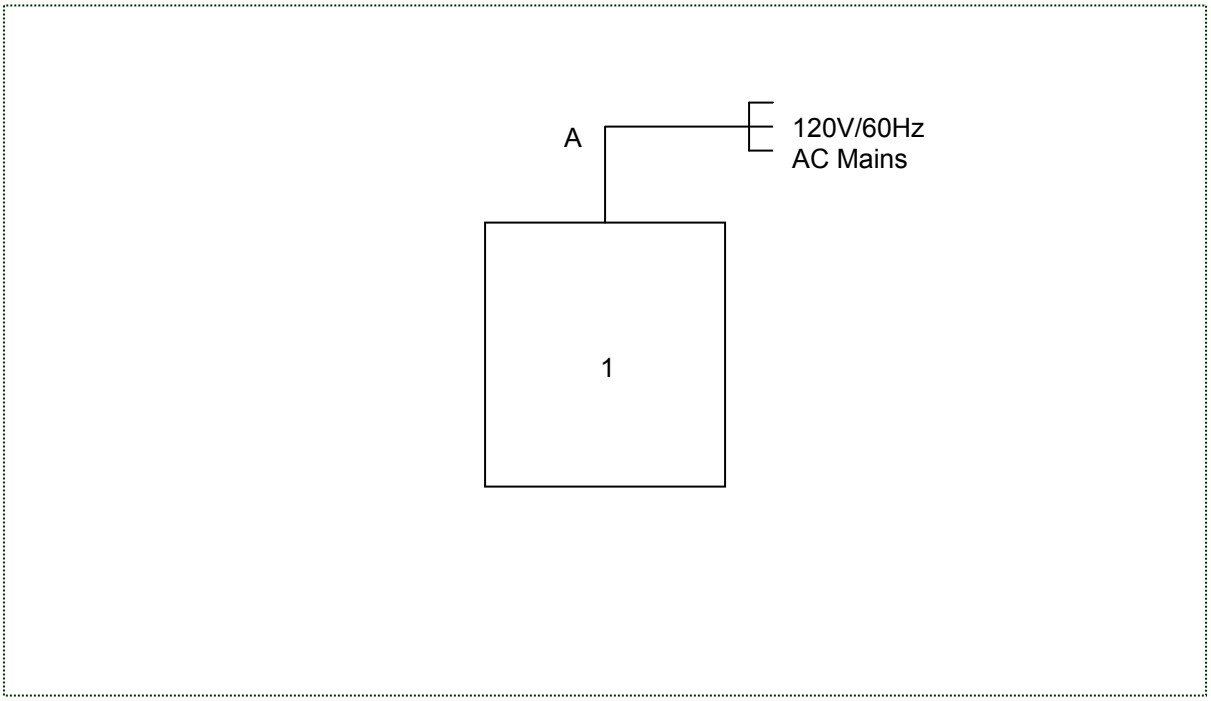

Figure 6-1: Test Set Up

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: Section 15.203

The EUT uses internal loop antennas which are not easily accessible to the end-user, thus meeting the requirements of 15.203.

7.2 Power Line Conducted Emissions – FCC: Section 15.207

7.2.1 Measurement Procedure

ANSI C63.4 sections 6 and 7 were the guiding documents 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

7.2.2 Measurement Results

Results are shown below.

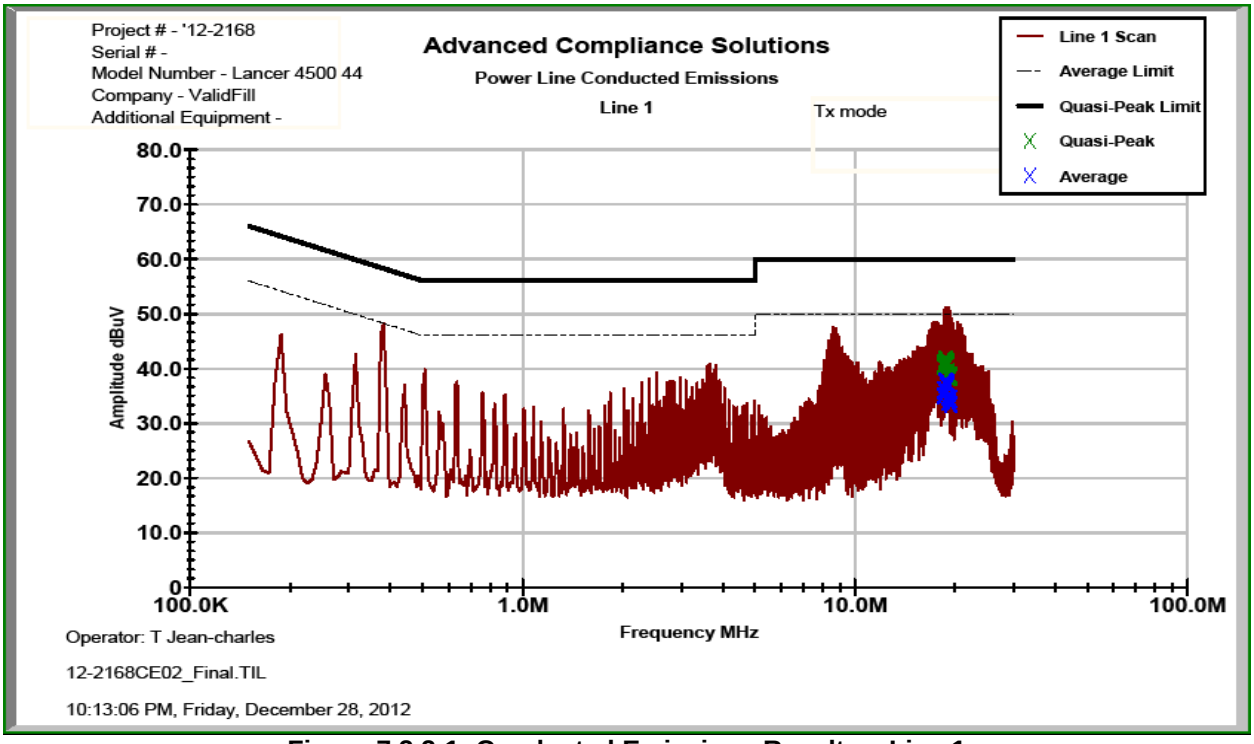

Figure 7.2.2-1: Conducted Emissions Results – Line 1

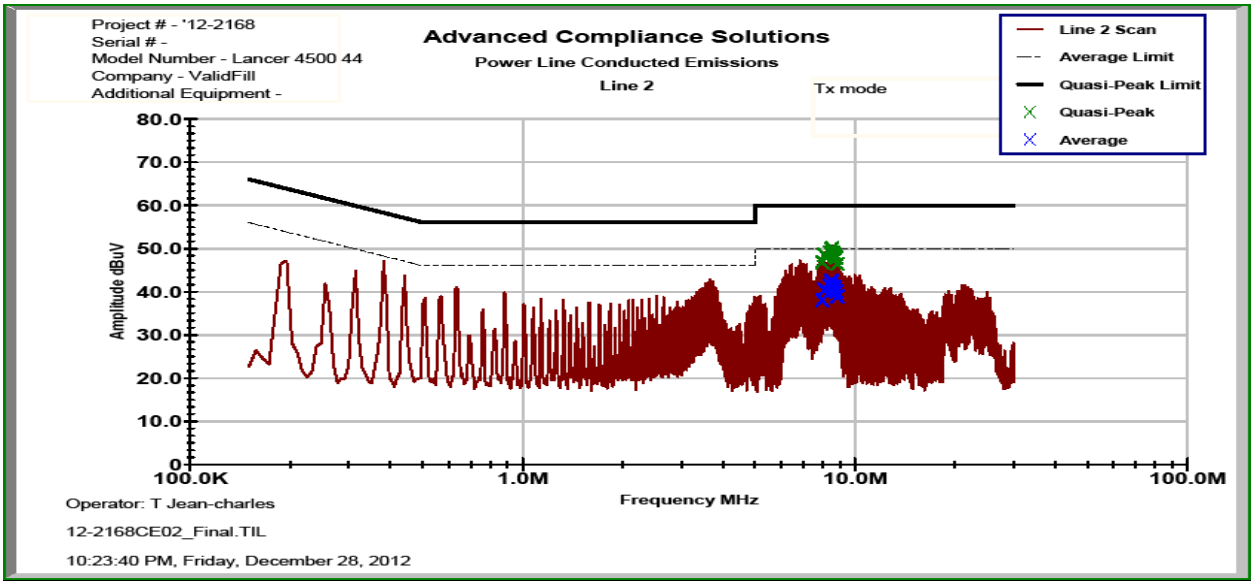

Figure 7.2.2-2: Conducted Emissions Results – Line 2

Table 7.2.2-1: Conducted EMI Results

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

Plot Number: 12-2168CE02
Power Supply Description: N/A

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									
0.3813	50.26	41.3	0.66	50.92	41.96	58.25	48.25	7.3	6.3
8.5818	45.99	35.19	1.02	47.01	36.21	60.00	50.00	13.0	13.8
8.7061	45.89	33.66	1.03	46.92	34.69	60.00	50.00	13.1	15.3
18.5594	38.46	33.568	2.34	40.80	35.91	60.00	50.00	19.2	14.1
18.6856	39.158	35.05	2.34	41.50	37.39	60.00	50.00	18.5	12.6
18.8743	38.796	34.858	2.35	41.14	37.21	60.00	50.00	18.9	12.8
18.9371	38.311	34.335	2.35	40.66	36.69	60.00	50.00	19.3	13.3
19.0043	36.816	32.273	2.35	39.17	34.63	60.00	50.00	20.8	15.4
19.1312	35.816	31.397	2.36	38.17	33.75	60.00	50.00	21.8	16.2
19.2525	36.266	31.933	2.36	38.63	34.29	60.00	50.00	21.4	15.7
Line 2									
0.3782	50.51	41.88	0.67	51.18	42.55	58.32	48.32	7.1	5.8
3.6599	42.61	40.5	0.54	43.15	41.04	56.00	46.00	12.8	5.0
6.5637	46.77	37.23	0.90	47.67	38.13	60.00	50.00	12.3	11.9
6.8149	46.16	35.48	0.94	47.10	36.42	60.00	50.00	12.9	13.6
8.45927	48.72	41.238	1.00	49.72	42.24	60.00	50.00	10.3	7.8
8.52168	48.85	41.145	1.01	49.86	42.16	60.00	50.00	10.1	7.8
8.58549	47.875	40.001	1.02	48.90	41.02	60.00	50.00	11.1	9.0
8.64879	47.123	39.724	1.03	48.15	40.76	60.00	50.00	11.8	9.2
8.71229	47.238	39.69	1.04	48.28	40.73	60.00	50.00	11.7	9.3
8.7747	46.543	38.705	1.05	47.59	39.75	60.00	50.00	12.4	10.2

* Note: Results are reported for the EUT configuration leading to the worst case emissions.

7.3 Peak Output Power - FCC Section 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 the spectrum analyzer. The display values were corrected for cable and external attenuation.

7.3.2 Measurement Results

Results are shown below.

Table 7.3.2-1: RF Output Power

Frequency (MHz)	Power (dBm)
902.75	18.53
915.25	18.25
927.25	17.08

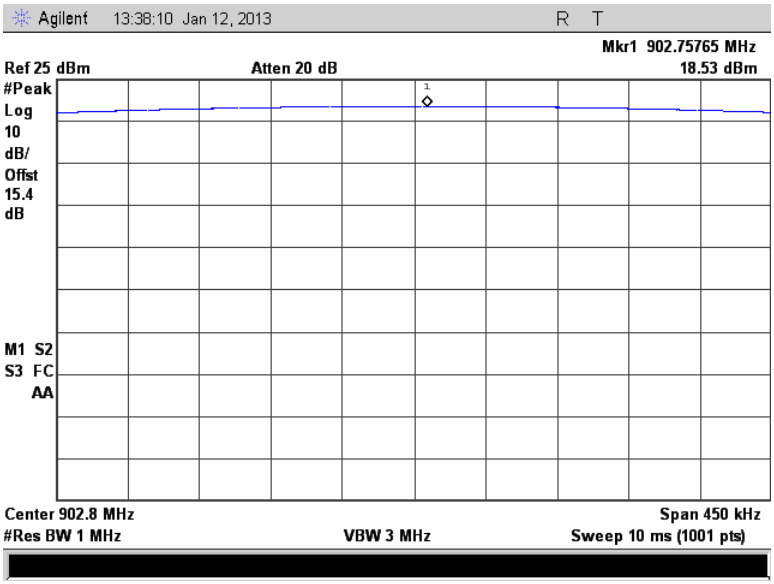

Figure 7.3.2-1: RF Output Power - Low Channel

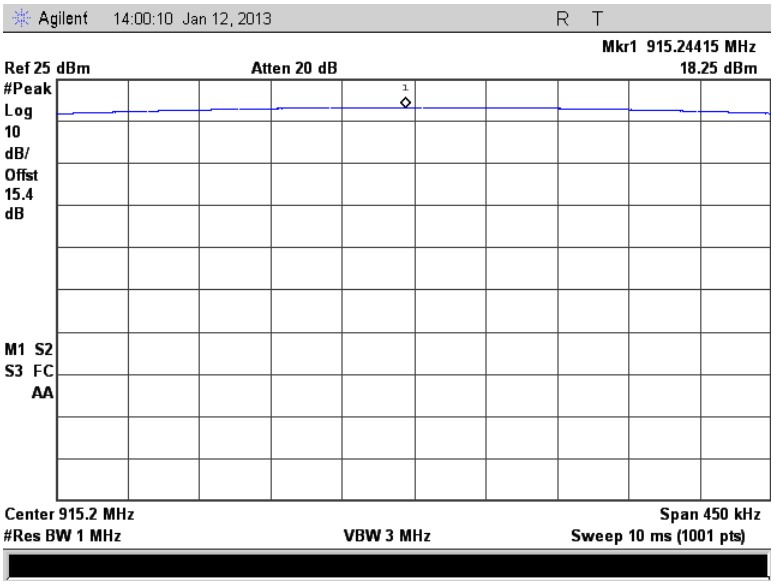

Figure 7.3.2-2: RF Output Power - Middle Channel

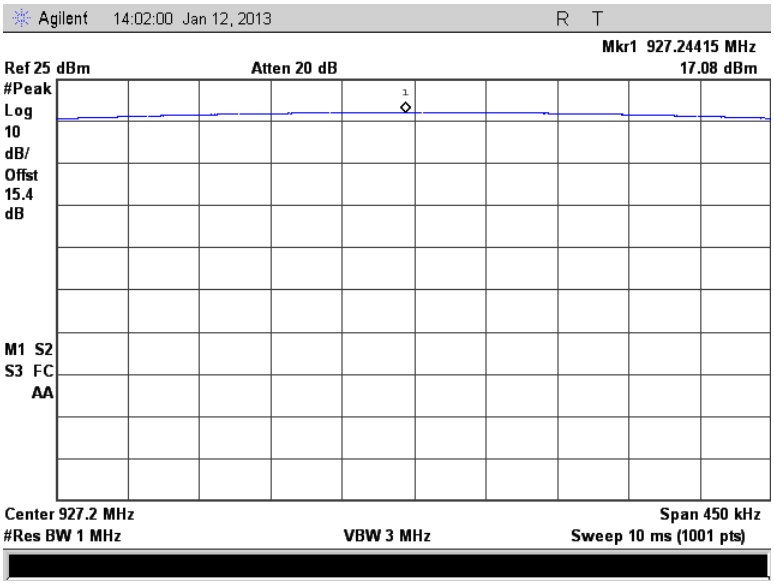

Figure 7.3.2-3: RF Output Power - High Channel

7.4 Channel Usage Requirements

7.4.1 Carrier Frequency Separation – FCC: Section 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. The span of the spectrum analyzer was set wide enough to capture two adjacent peaks and the RBW and VBW were set to ≥ 1% of the span.

7.4.1.2 Measurement Results

Results are shown below.

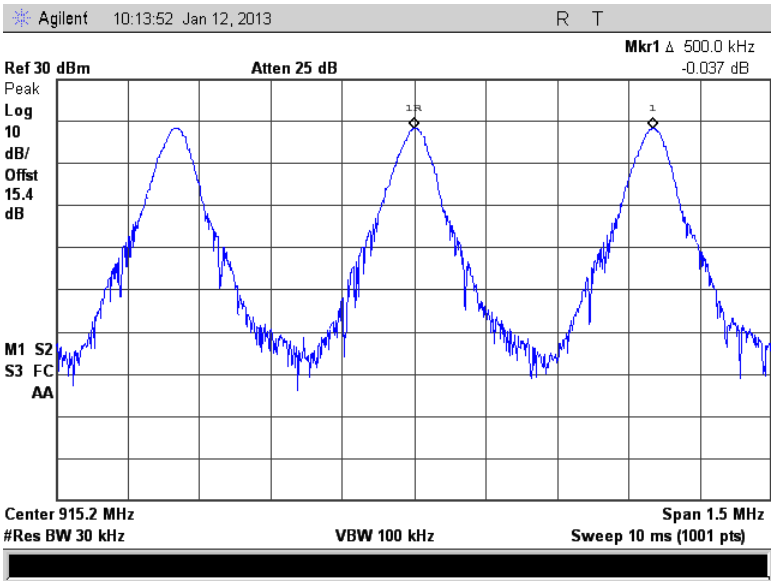

Figure 7.4.1.2-1: Carrier Frequency Separation

7.4.2 Number of Hopping Channels – FCC: Section 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 through suitable attenuation. 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.

7.4.2.2 Measurement Results

Results are shown below.

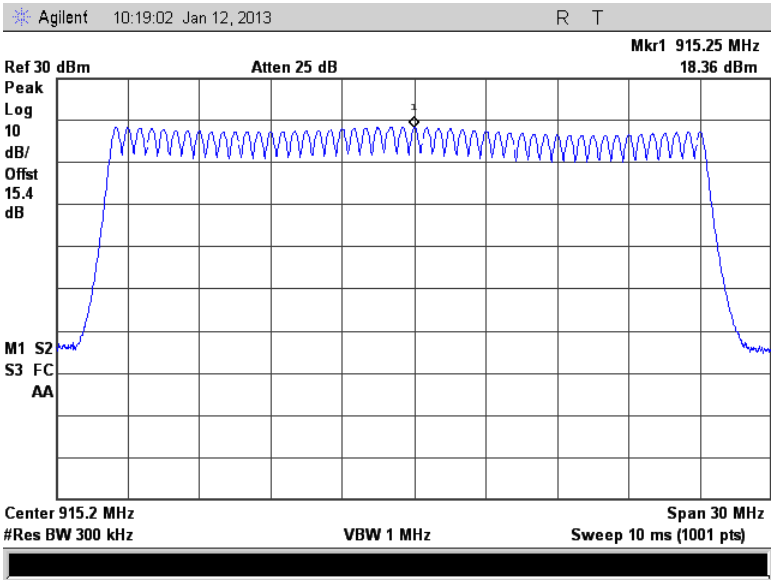

Figure 7.4.2.2-1: Number of Hopping Channels

7.4.3 Channel Dwell Time – FCC: Section 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. The span of the spectrum analyzer was set 0 Hz centered on a hopping channel. The RBW was set to 1 MHz and the sweep time adjusted to capture the entire dwell time per channel with peak detector max hold function.

7.4.3.2 Measurement Results

Results are shown below.

Table 7.4.3.2-1 Dwell Time on a 20 Second Cycle

Number of Hops Per Sec. (NHPS)	Number of Hops per Channel Per Sec. (NHPCPS)	Number of hops on a 20 s Cycle (NHPC)	Measured Dwell Times (ms)	Dwell Times on a 20 s Cycle (ms)	Limit (ms)	Status
2.5	0.05	1	400.000	400.00	400	PASS

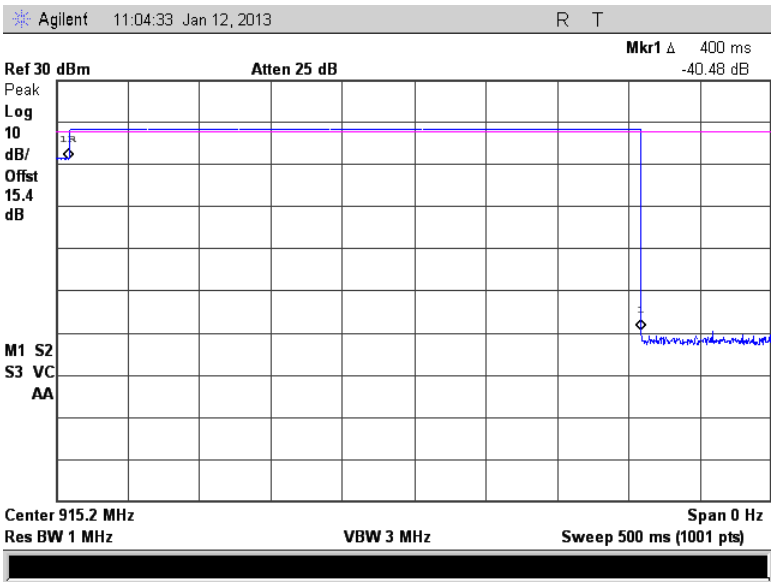

Figure 7.4.3.2-1: Channel Dwell Time

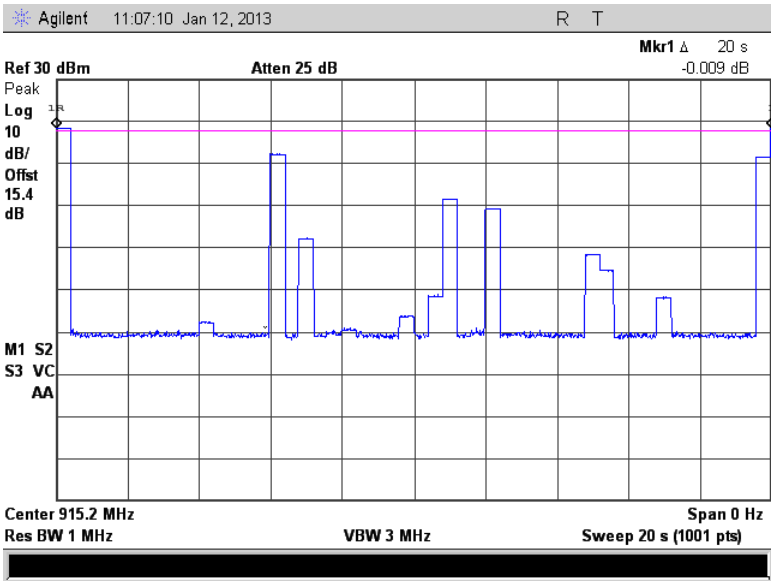

Figure 7.4.3.2-2: Channel Dwell Time – 20 seconds

Note: The emissions below the triggering levels are generated by the channels adjacent to the one evaluated.

7.4.4 20dB / 99% Bandwidth - FCC: Section 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. The spectrum analyzer span was set to 2 to 3 times the estimated bandwidth of the emission. The RBW was to ≥ 1% 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 emission.

The 99% occupied bandwidth was measured with the spectrum analyzer span set to fully display the emission, including the emissions skirts. The RBW was to 1% of the span. . The occupied 99% bandwidth was measured by using a delta marker at the lower and upper frequencies leading to 0.5% of the total power.

7.4.4.2 Measurement Results

Results are shown below.

Table 7.4.4.2-1: 20dB / 99% Bandwidth

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
902.75	86.50	79.5
915.25	86.75	80.1
927.25	86.75	79.5

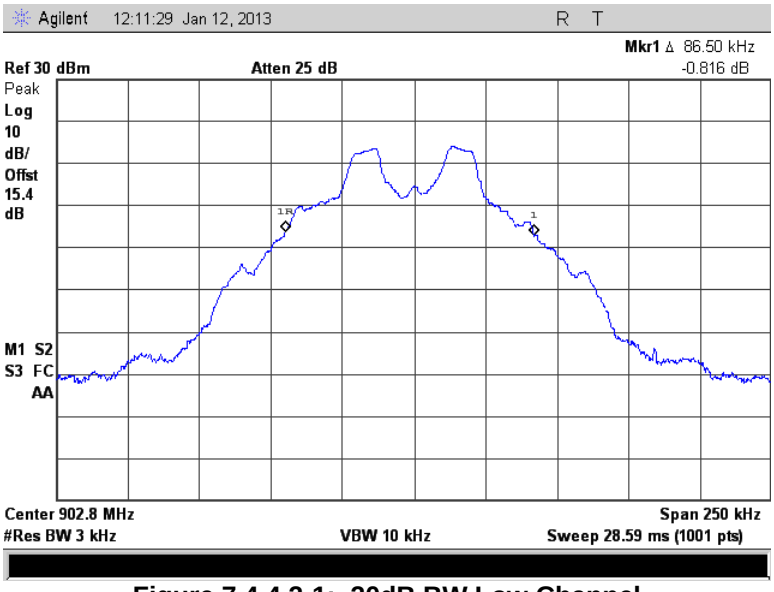

Figure 7.4.4.2-1: 20dB BW Low Channel

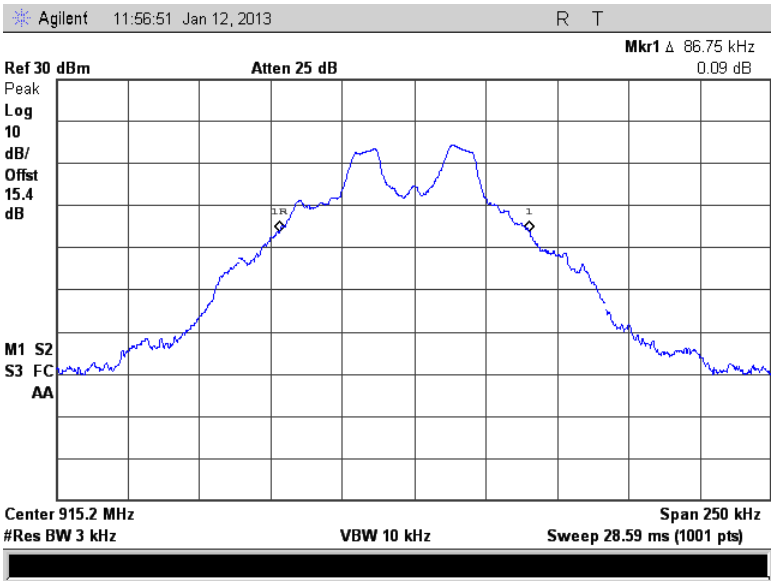

Figure 7.4.4.2-2: 20dB BW Middle Channel

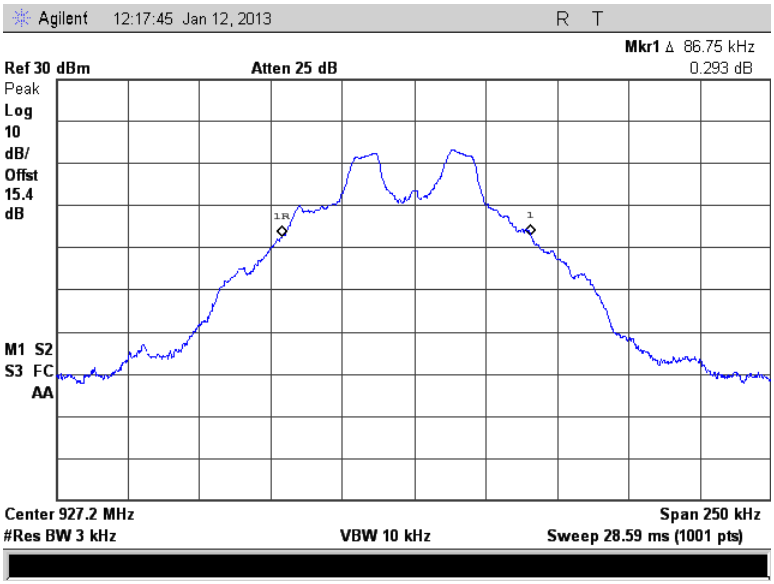

Figure 7.4.4.2-3: 20dB BW High Channel

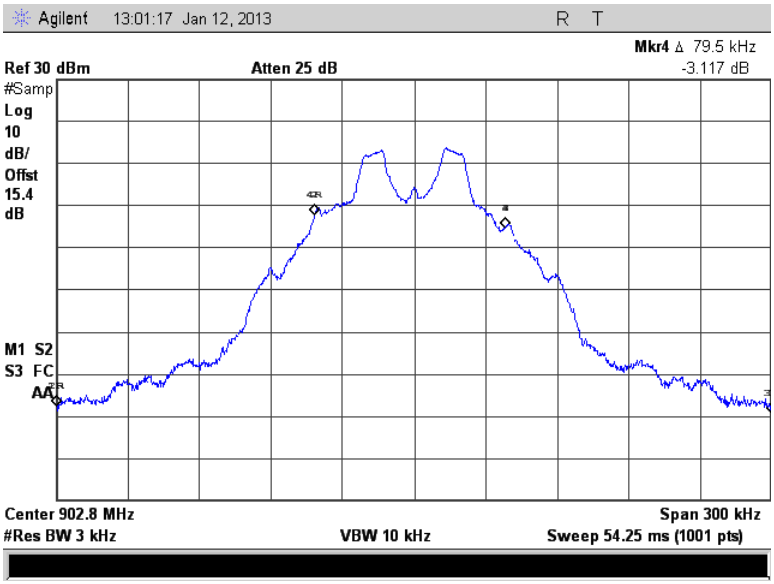

Figure 7.4.4.2-4: 99% OBW Low Channel

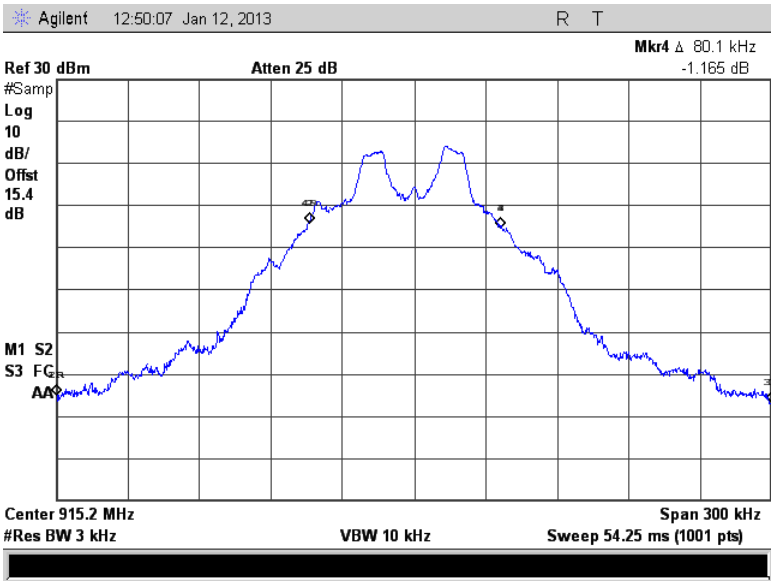

Figure 7.4.4.2-5: 99% OBW Middle Channel

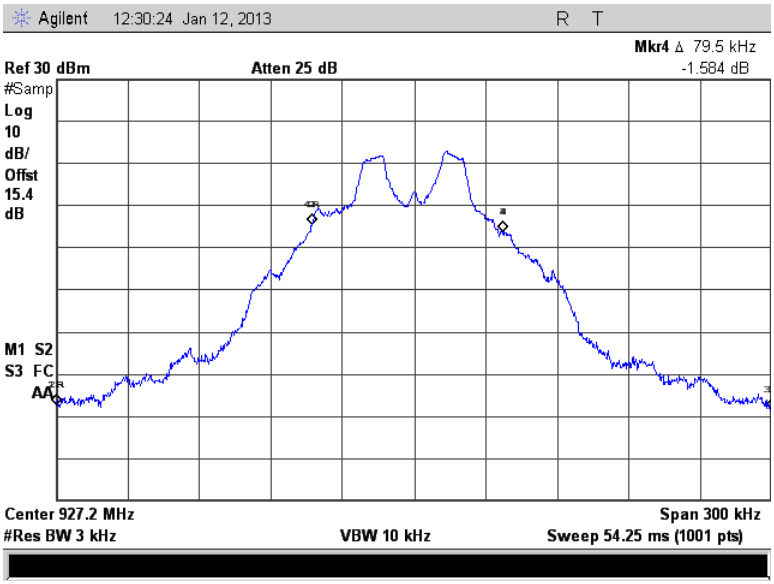

Figure 7.4.4.2-6: 99% OBW High Channel

7.5 Band-Edge Compliance and Spurious Emissions-FCC 15.247(d)

7.5.1 Band-Edge Compliance of RF Conducted Emissions

7.5.1.1 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.

7.5.1.2 Measurement Results

Results are shown below.

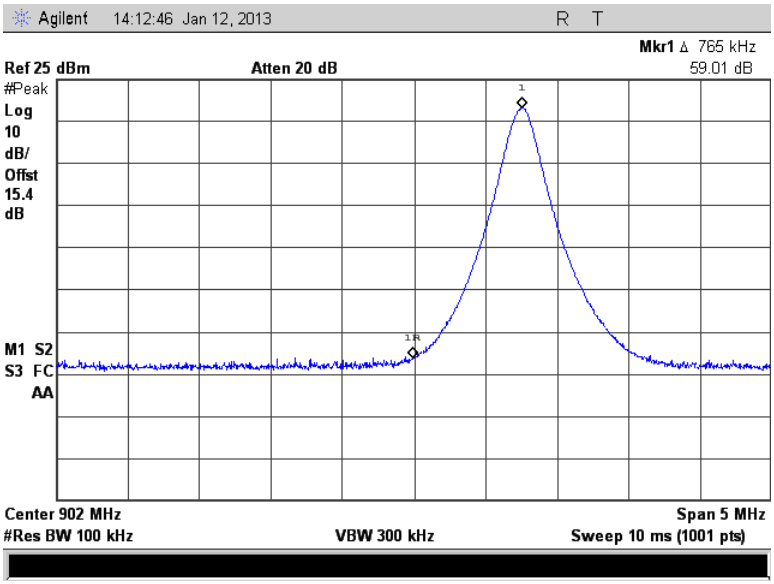

Figure 7.5.1.2-1: Lower Band-edge – Single Channel Mode

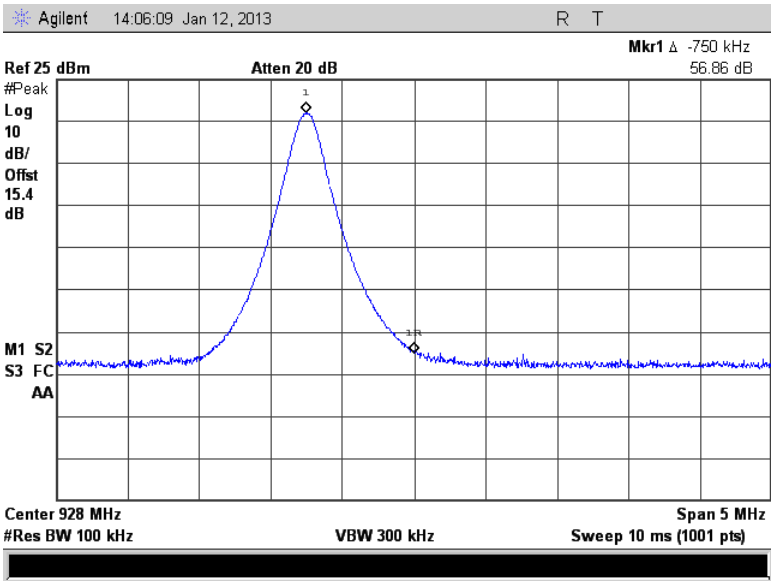

Figure 7.5.1.2-2: Upper Band-edge – Single Channel Mode

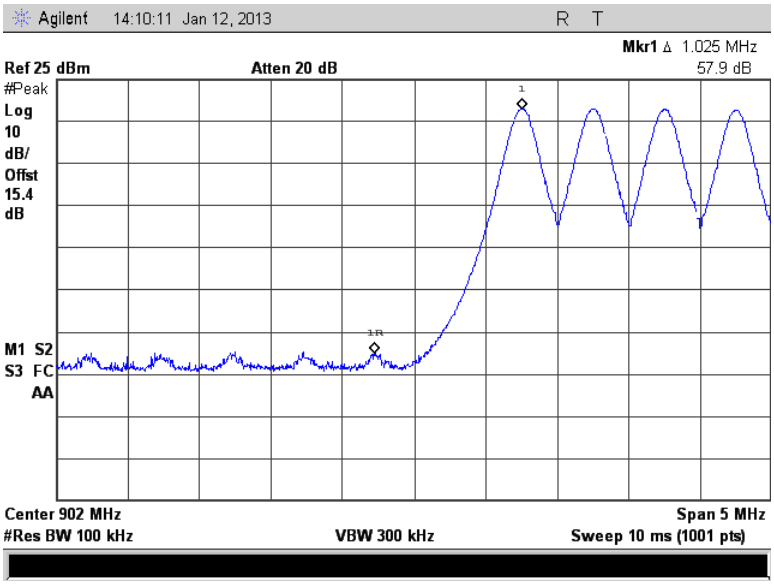

Figure 7.5.1.2-3: Lower Band-edge – Hopping Mode

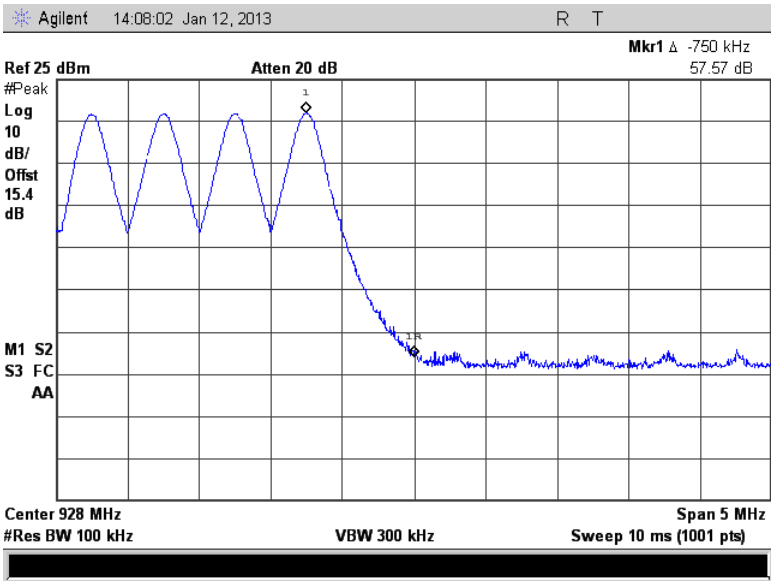

Figure 7.5.1.2-4: Upper Band-edge – Hopping Mode

7.5.2 RF Conducted Spurious Emissions

7.5.2.1 Measurement Procedure

The RF output port of the EUT was connected to the spectrum analyzer input using a 15 dB attenuator. The EUT was investigated for conducted spurious emissions from 30MHz 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. A peak detector function was used with the trace set to max hold. The levels were corrected for cable and attenuator losses.

7.5.2.2 Measurement Results

Results are shown below.

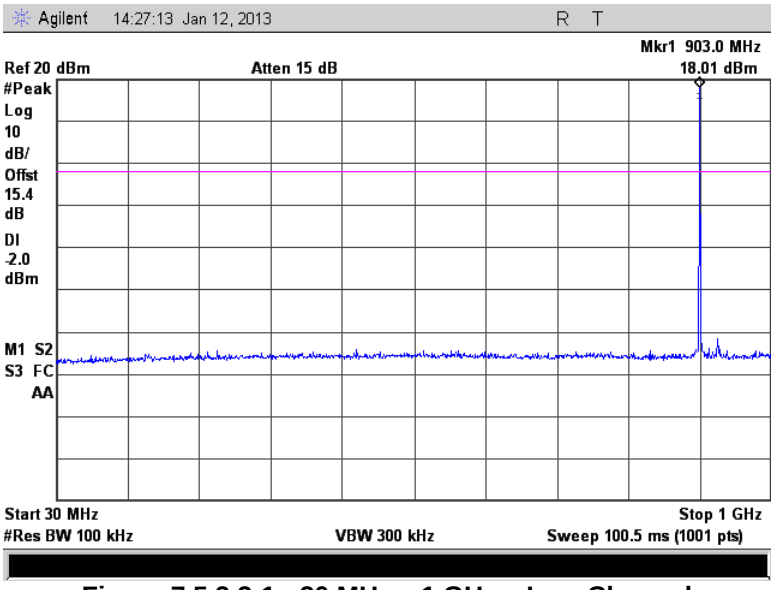

Figure 7.5.2.2-1: 30 MHz – 1 GHz – Low Channel

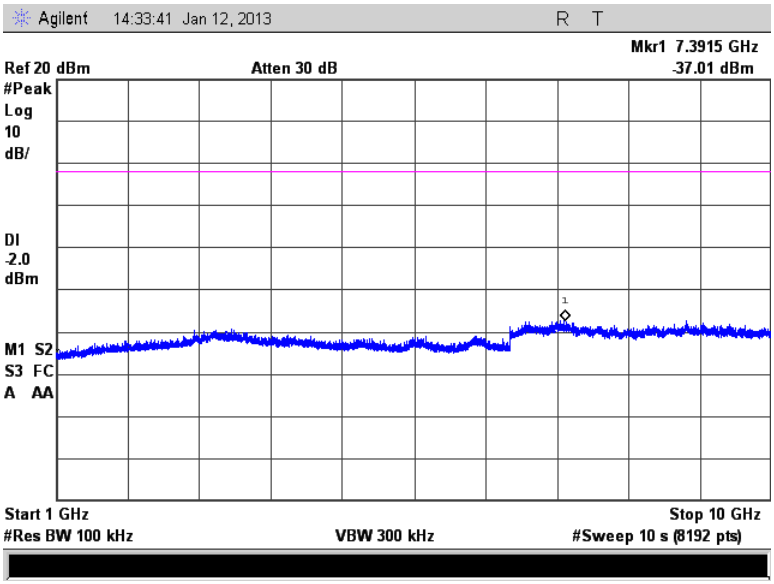

Figure 7.5.2.2-2: 1 GHz –10 GHz – Low Channel

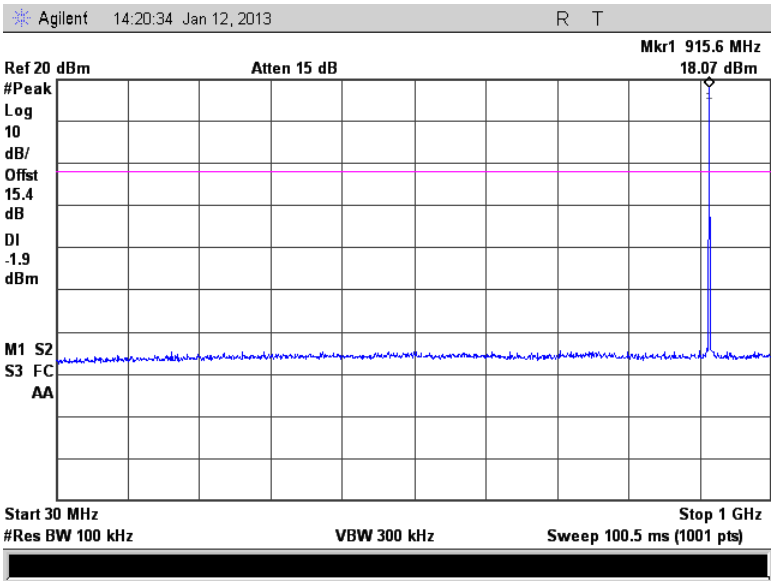

Figure 7.5.2.2-3: 30 MHz – 1 GHz – Middle Channel

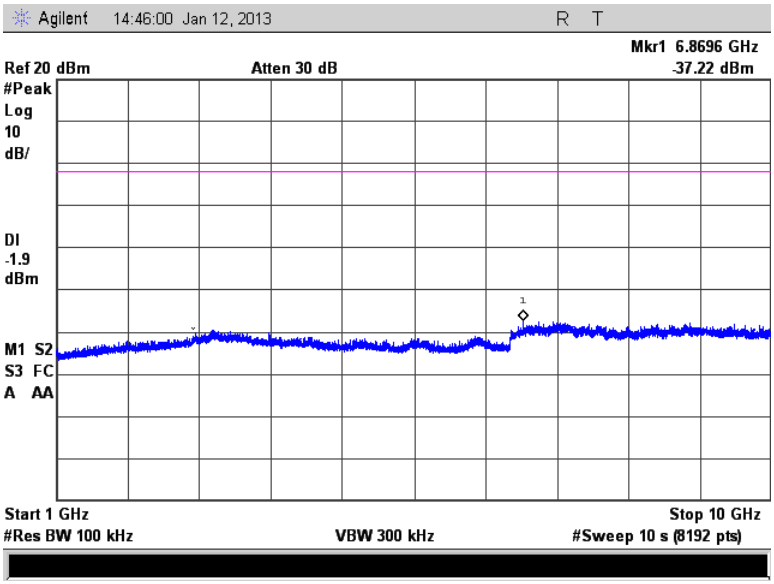

Figure 7.5.2.2-4: 1 GHz –10 GHz – Middle Channel

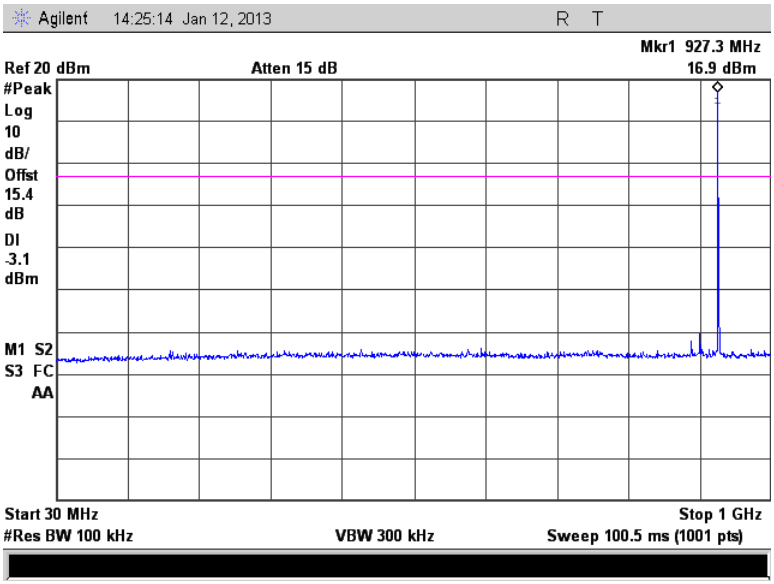

Figure 7.5.2.2-5: 30 MHz – 1 GHz – High Channel

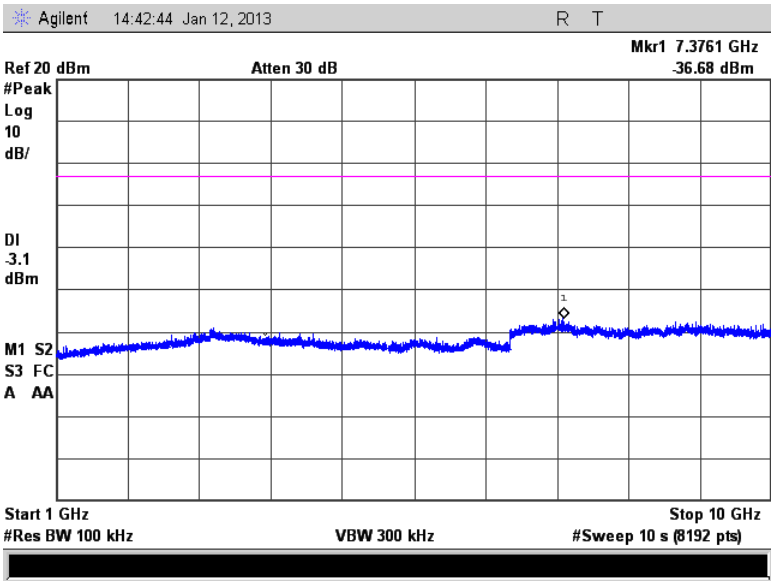

Figure 7.5.2.2-6: 1 GHz –10 GHz – High Channel

7.5.3 Radiated Spurious Emissions - FCC Section 15.205

7.5.3.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 30 MHz to 10 GHz, 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 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000 MHz, peak and average measurements made with RBW and VBW of 1 MHz and 3 MHz respectively.

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

7.5.3.2 Measurement Results

Radiated spurious emissions found in the band of 30MHz to 10GHz are reported in the tables below.

Table 7.5.3.2-1: Radiated Spurious Emissions Tabulated Data

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	48.90	37.76	H	-7.43	41.47	30.33	74.0	54.0	32.5	23.7
2708.25	47.95	35.00	V	-7.43	40.52	27.57	74.0	54.0	33.5	26.4
3611	47.59	36.16	H	-4.20	43.39	31.96	74.0	54.0	30.6	22.0
3611	46.58	34.78	V	-4.20	42.38	30.58	74.0	54.0	31.6	23.4
4513.75	45.73	32.83	H	-2.89	42.84	29.94	74.0	54.0	31.2	24.1
4513.75	45.76	32.61	V	-2.89	42.87	29.72	74.0	54.0	31.1	24.3
5416.5	45.66	32.93	H	-0.36	45.30	32.57	74.0	54.0	28.7	21.4
5416.5	45.65	32.49	V	-0.36	45.29	32.13	74.0	54.0	28.7	21.9
Middle Channel (915.25 MHz)										
1450	56.31	48.88	H	-13.35	42.96	35.53	74.0	54.0	31.0	18.5
1450	57.30	47.36	V	-13.35	43.95	34.01	74.0	54.0	30.0	20.0
3661	47.49	36.98	H	-4.02	43.47	32.96	74.0	54.0	30.5	21.0
3661	47.46	35.95	V	-4.02	43.44	31.93	74.0	54.0	30.6	22.1
4576.25	45.28	32.63	H	-2.73	42.55	29.90	74.0	54.0	31.4	24.1
4576.25	45.37	32.61	V	-2.73	42.64	29.88	74.0	54.0	31.4	24.1
7322	45.73	34.01	H	2.65	48.38	36.66	74.0	54.0	25.6	17.3
7322	46.65	33.79	V	2.65	49.30	36.44	74.0	54.0	24.7	17.6
High Channel (927.25 MHz)										
3709	47.01	35.49	H	-3.85	43.16	31.64	74.0	54.0	30.8	22.4
3709	46.56	34.93	V	-3.85	42.71	31.08	74.0	54.0	31.3	22.9
7418	47.15	34.13	H	2.98	50.13	37.11	74.0	54.0	23.9	16.9
7418	46.82	33.90	V	2.98	49.80	36.88	74.0	54.0	24.2	17.1

* Notes:
All emissions above 7418 MHz were attenuated below the limits and the noise floor of the measurement equipment.

7.5.3.3 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: 48.9+ (-7.43) = 41.47dBµV/m
Margin: 74 dBuV/m – 41.47dBµV/m = 32.5dB

Example Calculation: Average
Corrected Level: 37.76 + (-7.43) = 30.33dBµV/m
Margin: 54 dBuV/m – 30.33dBµV/m = 23.7dB

8 CONCLUSION

In the opinion of ACS, Inc., the HD011SA003 manufactured by ValidFill, LLC meets the requirements of FCC Part 15 subpart C.

END REPORT