Excellence in Compliance Testing

Certification Test Report

FCC ID: R7PNG6R1S1
IC: 5294A-NG6R1S1

FCC Rule Part: 15.247
IC Radio Standards Specification: RSS-210

ACS Report Number: 11-0082.W06.11.B

Manufacturer: Cellnet Technology, Inc.
Models: Collector C6400, Collector C6420, Collector C6430

Test Begin Date: May 18, 2011
Test End Date: November 10, 2011

Report Issue Date: November 10, 2011

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report is not be used to claim certification, approval, or endorsement by NVLAP, NIST or any government agency.

Reviewed by: _____
Kirby Munroe
Director, Wireless Certifications
ACS, Inc.

This report contains 26 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 and Industry Canada's Radio Standards Specification RSS-210 for Certification.

1.2 Product description

The Collector C6400, Collector C6420 and Collector C6430 are fixed (i.e. pole mounted) two-way radio frequency devices that transmit data over a mesh network in the unlicensed 902-928 MHz frequency range for utility applications. The differences in model variants are described below. All variants are electrically identical with respect to the RF circuitry and differ only in the backhaul or secondary communication methods.

Collector C6400: Ethernet only embedded GSM/GPRS or CDMA/EVDO wireless backhaul modem modules not populated.
Collector C6420: Features embedded GSM/GPRS wireless backhaul modem FCC ID: AU792U09G17826 (modular approved).
Collector C6430: Features embedded CDMA/EVDO wireless backhaul modem FCC ID: AU792U10E06831 (modular approved).

1.2.1 Technical Details

The Collector C6400, Collector C6420 and Collector C6430 provide 3 distinct frequency hopping modes of operation as outlined below.

Mode of Operation	Frequency Range (MHz)	Number of Channels	Channel Separation (kHz)	Data Rates Supported (kbps)
Wide Mode	902.3 - 927.8	86	300	9.6, 19.2, 38.4, 115.2
Narrow Mode	904.0 - 927.9	240	100	9.6, 19.2, 38.4
Full Narrow Mode	902.3 - 927.8	256	100	9.6, 19.2, 38.4
SUN Mode	902.2 – 927.8	129	200	50.0

Modulation: FSK / GFSK
Operating Voltage: 120 VAC
Antenna Type / Gain: Omni-directional collinear whip antenna, +5.5 dBi
RF Connector: N-Type

Manufacturer Information:
Cellnet Technology, Inc.
30000 Mill Creek Ave., Suite 100
Alpharetta, GA 30022

Test Sample Serial Numbers: LT-80735324, LT-807352FE

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. The data presented in this report represents the worst case where applicable. In most instances data was collected at frequencies representing the lowest and highest available for all modes of operation.

Models Collector C6420 and Collector C6430 can transmit simultaneously with embedded modem modules FCC ID: AU792U09G17826 (GSM/GPRS) and FCC ID: AU792U10E06831 (CDMA/EVDO) therefore radiated inter-modulation products were evaluated for every simultaneous transmit combination. All inter-modulation products were found to be in compliance.

The EUT is provided with (2) mounting hardware options, pole mount and arm mount. These hardware options determine the placement of the pre-approved modem module antennas therefore both hardware options were evaluated for radiated, including inter-modulation products, and AC power line conducted emissions.

For radiated and AC power line conducted emissions, the EUT was placed on the test table in an orientation representative of final installation. The setup required the EUT chassis to sit above the test table such that the EUT was at or just above table height.

2 TEST FACILITIES

2.1 Location

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

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 200612-0. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

FCC Registration Number: 511277
Industry Canada Lab Code: IC 4175A-1
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm 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 3/4" stainless steel braided cable.

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 range. 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 during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 – 4" PVC chases 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:

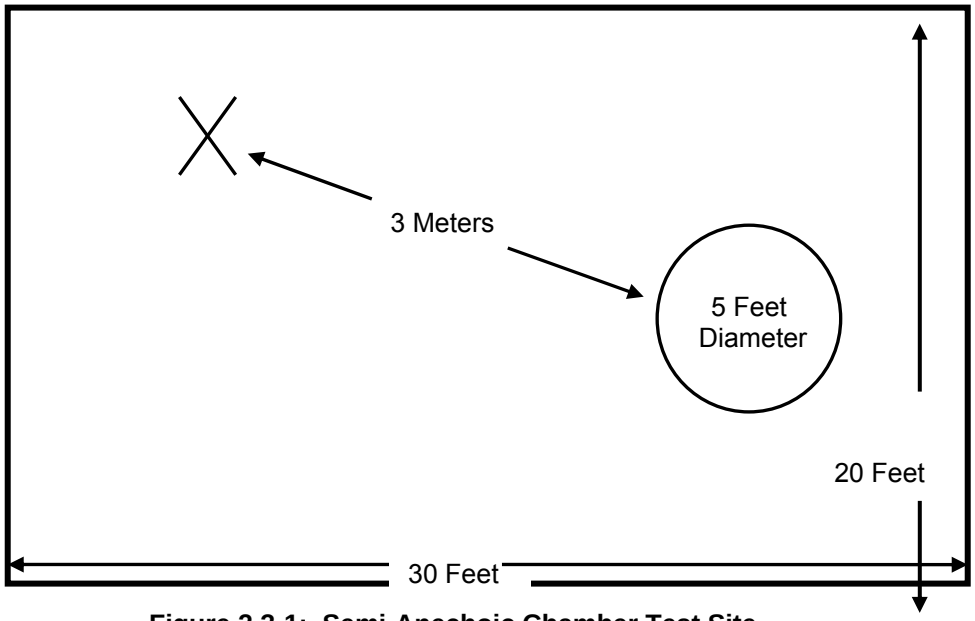

Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.3.2 Open Area Tests Site (OATS)

The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 – 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. 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 during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 – 4" PVC chases from the pit to the control room 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. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

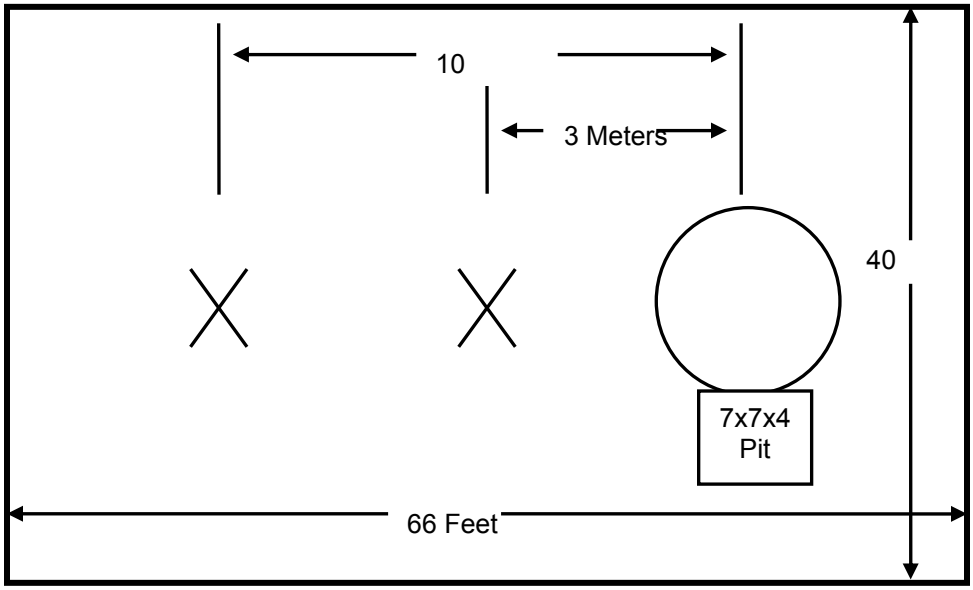

Figure 2.3-2: Open Area Test Site

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 8' solid aluminum horizontal group reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

The site is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.4.

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

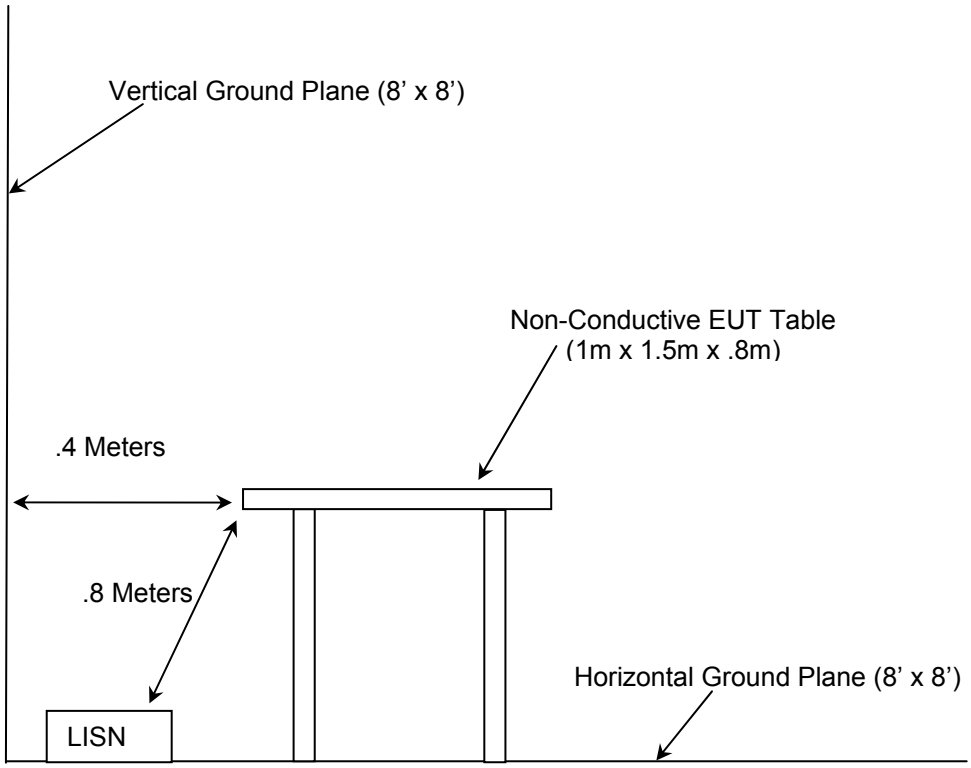

Figure 2.4-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: 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, 2011
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2011
- FCC Public Notice DA 00-705 – Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems, March 30, 2000
- Industry Canada Radio Standards Specification: RSS-210 – Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 8, December 2010
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue 3, December 2010.

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
1	Rohde & Schwarz	ESMI - Display	Spectrum Analyzers	833771/007	9/23/2010	9/23/2012
2	Rohde & Schwarz	ESMI-Receiver	Spectrum Analyzers	839587/003	9/23/2010	9/23/2012
22	Hewlett Packard	8449B	Amplifiers	3008A00526	9/2/2010	8/30/2011
25	Chase	CBL6111	Antennas	1043	9/13/2010	9/13/2012
30	Spectrum Technologies	DRH-0118	Antennas	970102	4/27/2011	4/27/2013
73	Agilent	8447D	Amplifiers	2727A05624	3/21/2011	3/21/2012
152	EMCO	3825/2	LISN	9111-1905	11/2/2010	11/2/2012
153	EMCO	3825/2	LISN	9411-2268	1/13/2011	1/13/2012
167	ACS	Chamber EMI Cable Set	Cable Set	167	1/26/2011	1/26/2012
168	Hewlett Packard	11947A	Attenuators	44829	2/4/2011	2/4/2012
267	Agilent	N1911A	Meters	MY45100129	11/2/2010	11/2/2011
268	Agilent	N1921A	Sensors	MY45240184	12/2/2010	12/2/2011
283	Rohde & Schwarz	FSP40	Spectrum Analyzers	1000033	8/31/2010	8/31/2011
283	Rohde & Schwarz	FSP40	Spectrum Analyzers	1000033	8/26/2011	8/26/2012
291	Florida RF Cables	SMRE-200W-12.0-SMRE	Cables	None	12/7/2010	12/7/2011
292	Florida RF Cables	SMR-290AW-480.0-SMR	Cables	None	4/11/2011	4/11/2012
324	ACS	Belden	Cables	8214	7/9/2010	7/9/2011
337	Microwave Circuits	H1G513G1	Filters	282706	7/16/2010	7/16/2011
339	Aeroflex/Weinschel	AS-18	Attenuators	7142	7/1/2010	7/1/2011
340	Aeroflex/Weinschel	AS-20	Attenuators	7136	10/5/2010	10/5/2011
340	Aeroflex/Weinschel	AS-20	Attenuators	7136	8/29/2011	8/29/2012
422	Florida RF	SMS-200AW-72.0-SMR	Cables	805	12/29/2010	12/29/2011
RE40	Agilent	E7405A	Spectrum Analyzers	US39150132	7/20/2010	7/20/2011

Note: All testing was completed from May 18, 2011 to June 1, 2011 with the exception of additional RF conducted measurements on 50kbps data rate (SUN Mode). That testing was started and completed November 10, 2011 using only assets 283 and 340. Calibration dates for those assets are listed to show the equipment was in calibration for all test dates.

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	Ethernet Hub	Hawking Technology	HFS8T	HCMCFS80805 00391
2	Power Supply	DVE	DV-0751AS	N/A

Table 5-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	Power Cable	150 cm	No	EUT - AC
B	Ethernet Cable	762 cm	No	EUT - 1
C	Power Cable	150 cm	No	1 - 2

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

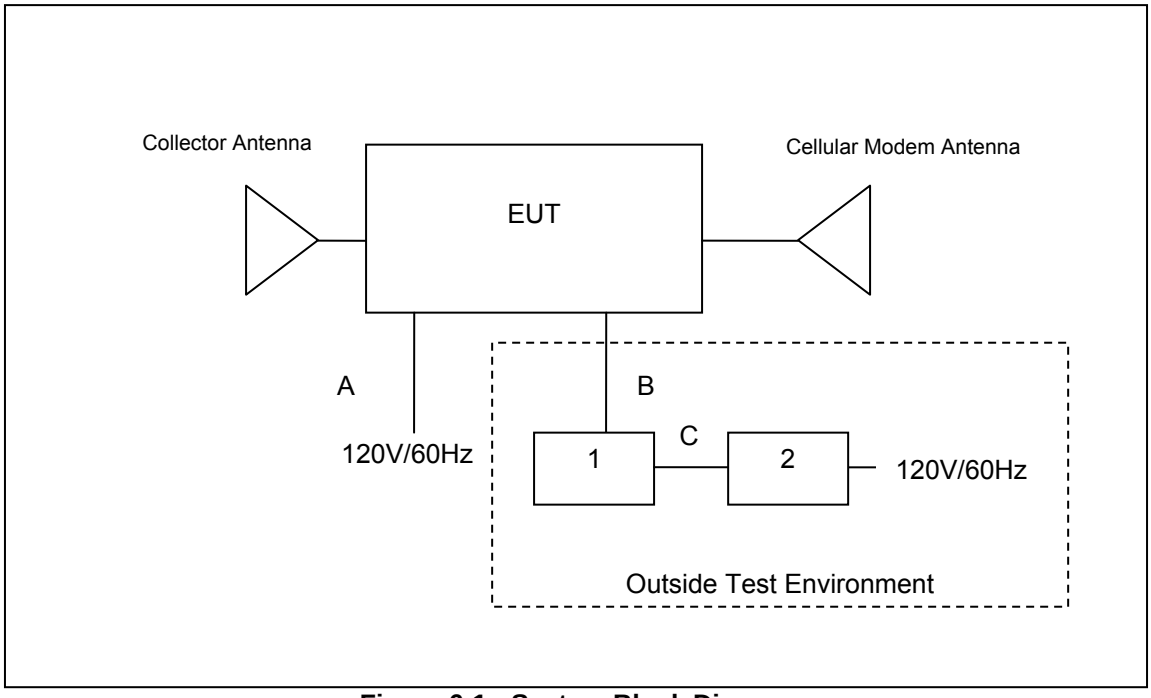

Figure 6-1: System Block Diagram

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: Section 15.203

The antenna is an omni-directional collinear whip antenna with a maximum gain of +5.5 dBi. The antenna coupling is N-Type therefore professional installation is required.

7.2 Power Line Conducted Emissions – FCC: Section 15.207 IC: RSS-Gen 7.2.4

7.2.1 Measurement Procedure

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

Results of the test are shown below in and Tables 7.2.2-1 to 7.2.2-2.

Table 7.2.2-1: Conducted EMI Results – Pole Mount

Frequency (MHz)	Uncorrected Reading (dBuV)		Total Correction Factor (dB)	Corrected Level (dBuV)		Limit (dBuV)		Margin (dB)		Line
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average	
Line 1										
0.154	33.85	15.16	10.09	43.94	25.25	65.78	55.78	21.8	30.5	GND
0.183	28.27	8.89	10.08	38.35	18.97	64.35	54.35	26.0	35.4	GND
0.284	17.61	6.45	10.02	27.63	16.47	60.70	50.70	33.1	34.2	GND
7.92	25.17	22.04	10.20	35.37	32.24	60.00	50.00	24.6	17.8	GND
16.17	31.65	32.81	10.50	42.15	43.31	60.00	50.00	17.9	6.7	GND
17.39	24.73	26.89	10.52	35.25	37.41	60.00	50.00	24.8	12.6	GND
Line 2										
0.181	29.34	7.91	10.08	39.42	17.99	64.44	54.44	25.0	36.4	GND
0.253	21.19	5.86	10.02	31.21	15.88	61.66	51.66	30.5	35.8	GND
0.371	13.69	5.28	10.19	23.88	15.47	58.48	48.48	34.6	33.0	GND
0.423	11.39	2.91	10.00	21.39	12.91	57.39	47.39	36.0	34.5	GND
16.17	33.21	31.74	10.50	43.71	42.24	60.00	50.00	16.3	7.8	GND
17.39	27.06	26.54	10.52	37.58	37.06	60.00	50.00	22.4	12.9	GND

Table 7.2.2-2: Conducted EMI Results – Arm Mount

Frequency (MHz)	Uncorrected Reading (dBuV)		Total Correction Factor (dB)	Corrected Level (dBuV)		Limit (dBuV)		Margin (dB)		Line
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average	
Line 1										
0.151	32.2	11.87	10.09	42.29	21.96	65.94	55.94	23.7	34.0	GND
0.862	10.94	4.04	10.61	21.55	14.65	56.00	46.00	34.4	31.3	GND
3.922	16.06	7.92	10.12	26.18	18.04	56.00	46.00	29.8	28.0	GND
16.17	31.9	30.78	10.50	42.40	41.28	60.00	50.00	17.6	8.7	GND
17.39	26.19	26.73	10.52	36.71	37.25	60.00	50.00	23.3	12.8	GND
22.88	23.38	22.86	10.97	34.35	33.83	60.00	50.00	25.7	16.2	GND
Line 2										
0.153	32.46	13.77	10.09	42.55	23.86	65.84	55.84	23.3	32.0	GND
0.521	13.9	8.9	10.00	23.90	18.90	56.00	46.00	32.1	27.1	GND
4.262	17.08	7.1	10.13	27.21	17.23	56.00	46.00	28.8	28.8	GND
16.106	24.33	23.04	10.50	34.83	33.54	60.00	50.00	25.2	16.5	GND
17.388	27.66	28.78	10.52	38.18	39.30	60.00	50.00	21.8	10.7	GND
22.884	26.14	25.54	10.97	37.11	36.51	60.00	50.00	22.9	13.5	GND

7.3 Peak Output Power - FCC Section 15.247(b)(2) IC: RSS-210 A8.4(1)

7.3.1 Measurement Procedure (Conducted Method)

The RF output port of the EUT was directly connected to the input of a power meter. The device employs >50 channels therefore the power is limited to 1 Watt.

7.3.2 Measurement Results

Results are shown below in Table 7.3.2-1 below:

Table 7.3.2-1: RF Output Power

Frequency [MHz]	Level [dBm]
902.2	28.48
902.3	28.46
904.0	28.44
915.0	28.15
927.8	27.88
927.9	27.84

7.4 Channel Usage Requirements

7.4.1 Carrier Frequency Separation – FCC: Section 15.247(a)(1) IC: RSS-210 A8.1(b)

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.

Carrier frequency separation was measured for all modes of operation (i.e. wide mode, narrow/full narrow mode and SUN mode) and data presented in section 7.4.1.2 below.

7.4.1.2 Measurement Results

The adjacent channel separation was measured to be 100 kHz for narrow (240 channels) and full narrow (256 channels) modes, 300kHz for wide mode (86 channels) and 200kHz for Sun Mode (129 channels). Results are shown below in Figures 7.4.1.2-1 to 7.4.1.2-3.

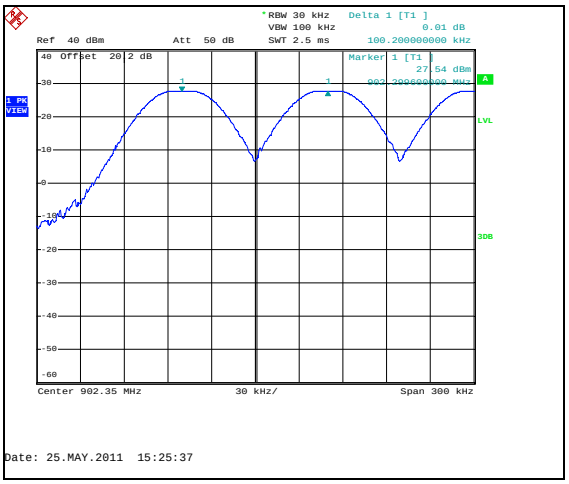

Figure 7.4.1.2-1: Narrow / Full Narrow Modes

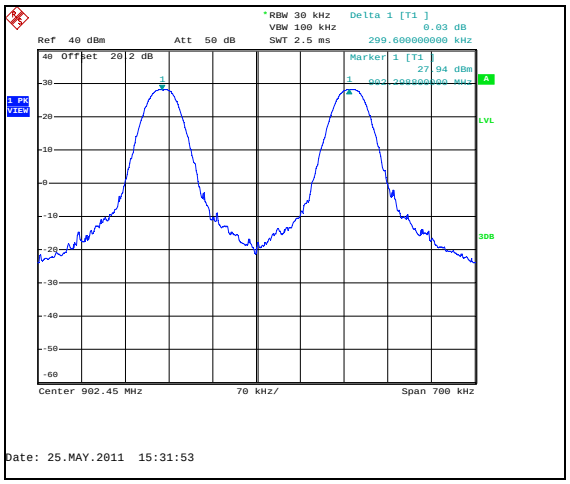

Figure 7.4.1.2-2: Wide Mode

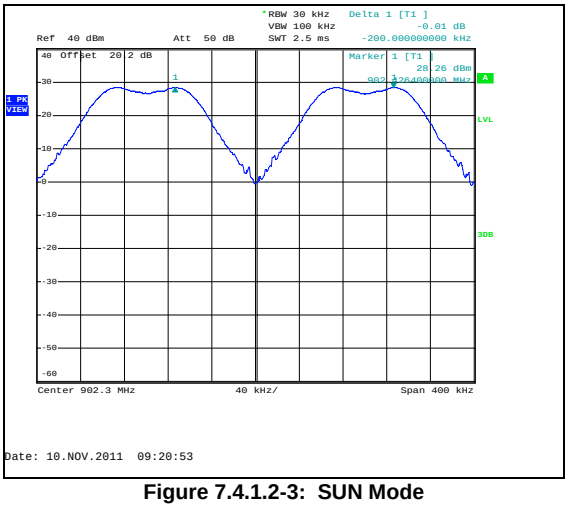

Figure 7.4.1.2-3: SUN Mode

7.4.2 Number of Hopping Channels – FCC: Section 15.247(a)(1)(i) IC: RSS-210 A8.1(c)

The 20dB bandwidth of the device is less than and greater than 250 kHz based on data rate. The device employs > 50 hopping channels under all modes and data rates. Results are shown below in Figures 7.4.2-1 to 7.4.2-11.

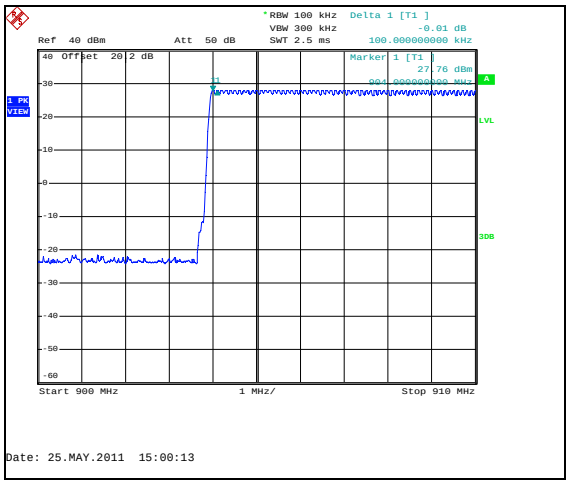

Figure 7.4.2-1: Narrow Mode (240 Channels)

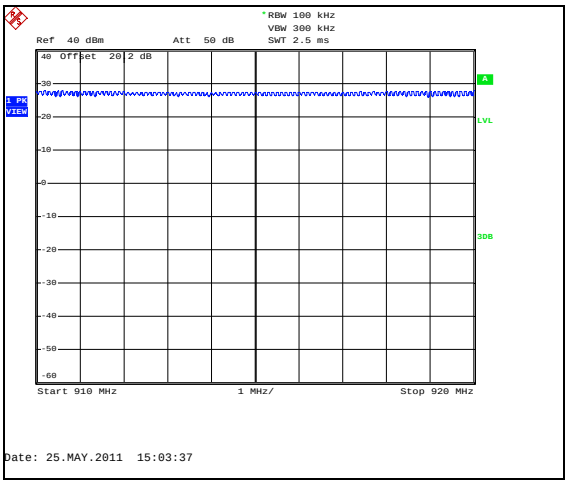

Figure 7.4.2-2: Narrow Mode (240 Channels)

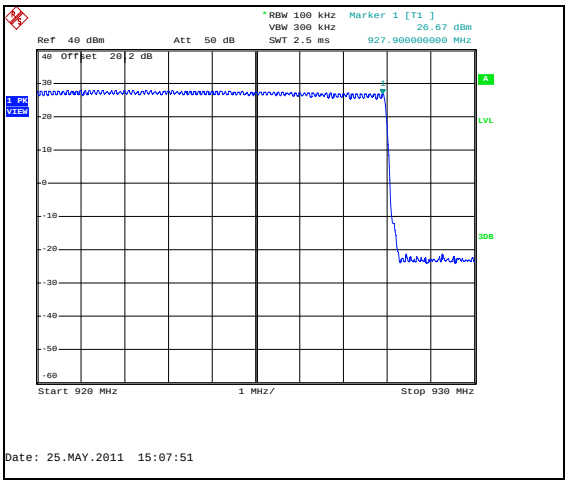

Figure 7.4.2-3: Narrow Mode (240 Channels)

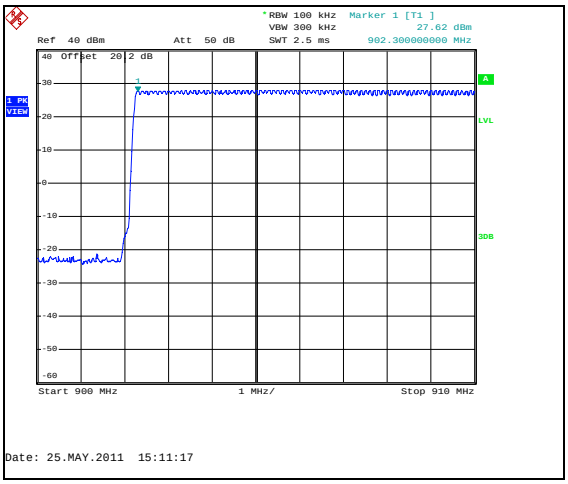

Figure 7.4.2-4: Full Narrow Mode (256 Channels)

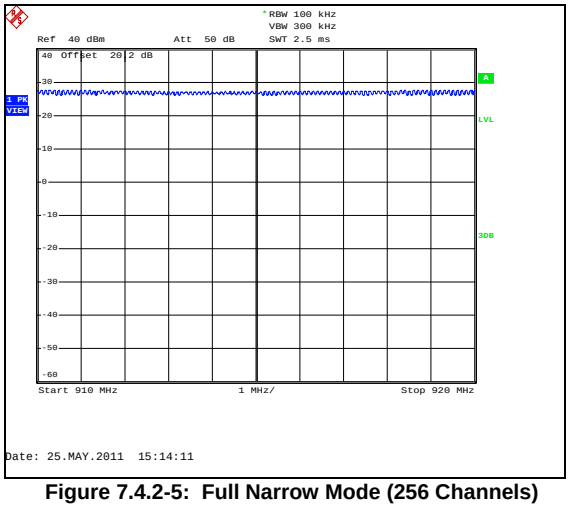

Figure 7.4.2-5: Full Narrow Mode (256 Channels)

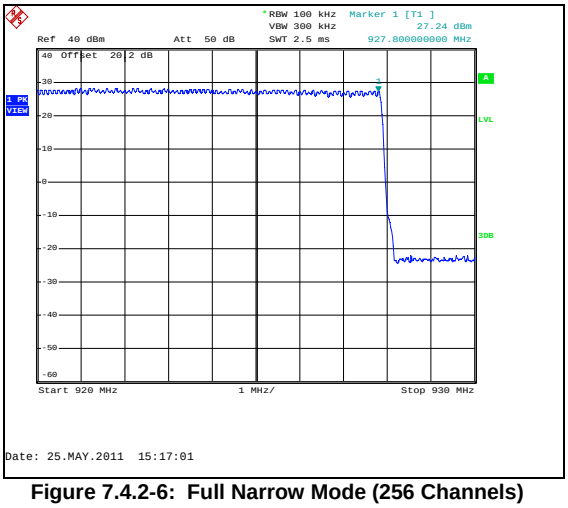

Figure 7.4.2-6: Full Narrow Mode (256 Channels)

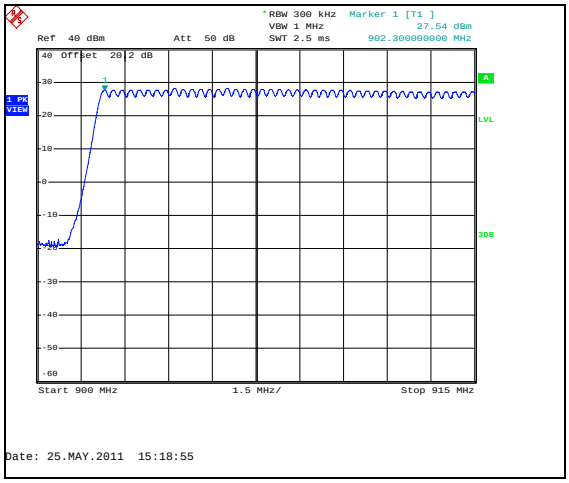

Figure 7.4.2-7: Wide Mode (86 Channels)

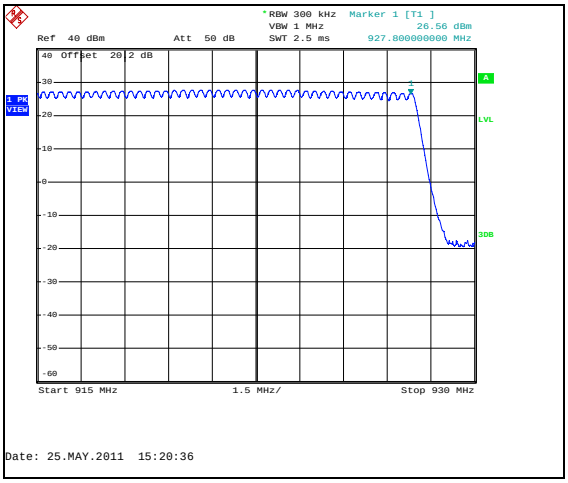

Figure 7.4.2-8: Wide Mode (86 Channels)

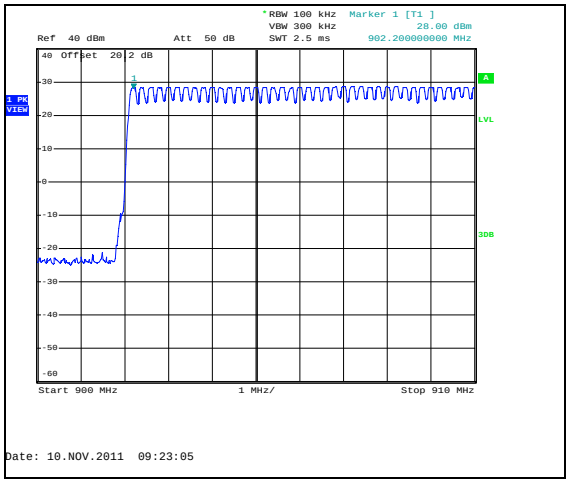

Figure 7.4.2-9: SUN Mode (129 Channels)

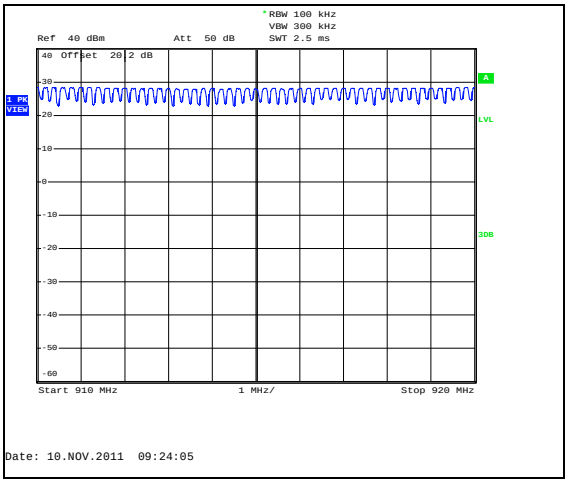

Figure 7.4.2-10: SUN Mode (129 Channels)

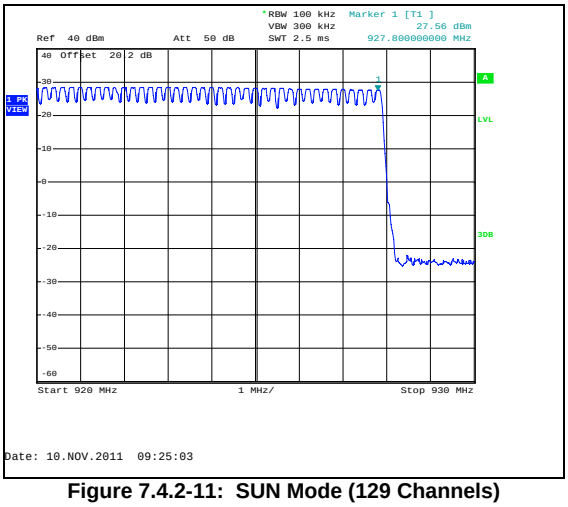

Figure 7.4.2-11: SUN Mode (129 Channels)

7.4.3 Channel Dwell Time – FCC: Section 15.247(a)(1)(i) IC: RSS-210 A8.1(c)

7.4.3.1 Measurement Procedure

The EUT test mode does not generate a worst case channel dwell time therefore a detailed engineering analysis is provided in the theory of operation.

As described in the theory of operation, the maximum channel transmitter dwell time is < 400ms per channel hop with the minimum period of 700ms between hops. Therefore the maximum time of occupancy on any one channel with a 10s period is <400ms for all modes of operation.

7.4.4 20dB / 99% Bandwidth - FCC: Section 15.247(a)(1)(i) IC: RSS-210 A8.1(c)

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 and approximately 20dB below the peak level. The RBW was for 1% to 3% of the approximate emission width. The trace was set to max hold with a sample detector active. The occupied bandwidth measurement function of the analyzer was used for the 99% bandwidth.

7.4.4.2 Measurement Results

Results are shown below in Table 7.4.4.2-1 and Figures 7.4.4.2-1 through 7.4.4.2-30.

Table 7.4.4.2-1: 20dB / 99% Bandwidth

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]	Data Rate (kbps)
902.3	23.4	22.8	9.6
902.3	48.0	48.2	19.2
902.3	94.4	88.4	38.4
902.2	105.0	100.5	50.0
902.3	276.0	265.2	115.2
915.0	23.6	23.1	9.6
915.0	47.0	48.2	19.2
915.0	94.4	89.6	38.4
915.0	104.5	100.5	50.0
915.0	277.2	274.8	115.2
927.9	23.5	22.8	9.6
927.9	47.4	51.0	19.2
927.9	95.6	92.4	38.4
927.8	107.0	104.0	50.0
927.8	292.8	303.6	115.2

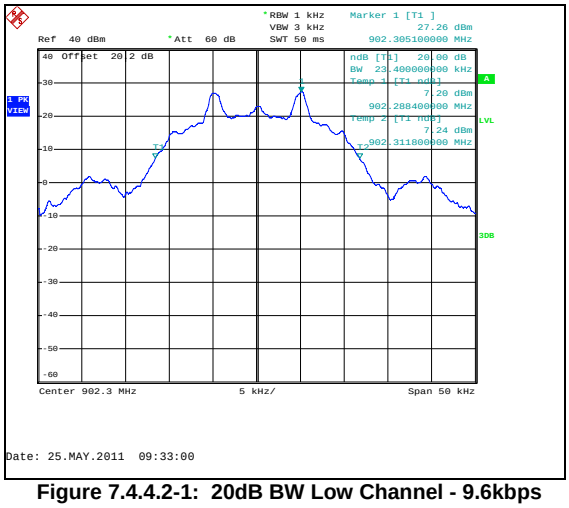

Figure 7.4.4.2-1: 20dB BW Low Channel - 9.6kbps

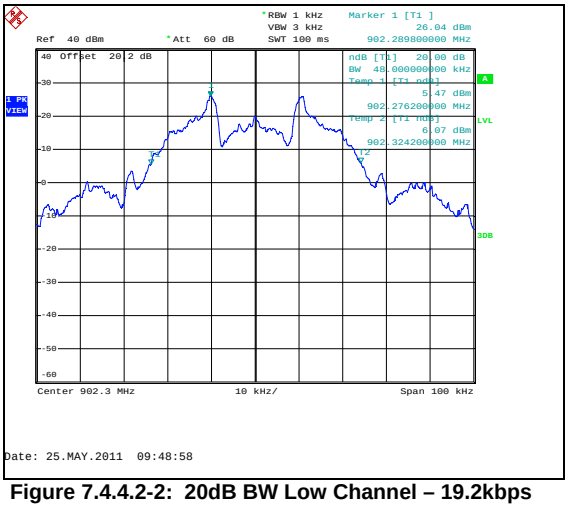

Figure 7.4.4.2-2: 20dB BW Low Channel – 19.2kbps

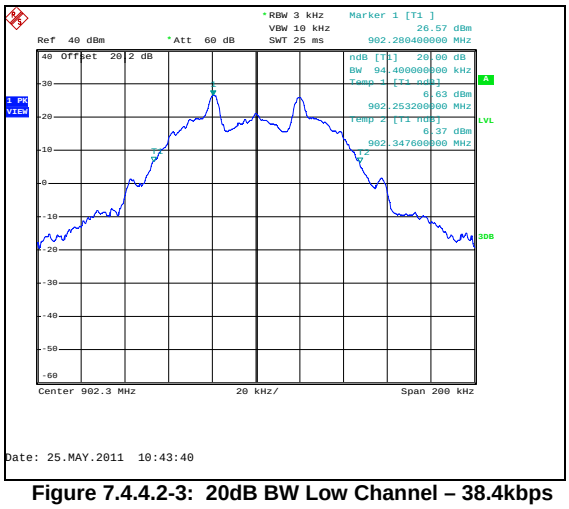

Figure 7.4.4.2-3: 20dB BW Low Channel – 38.4kbps

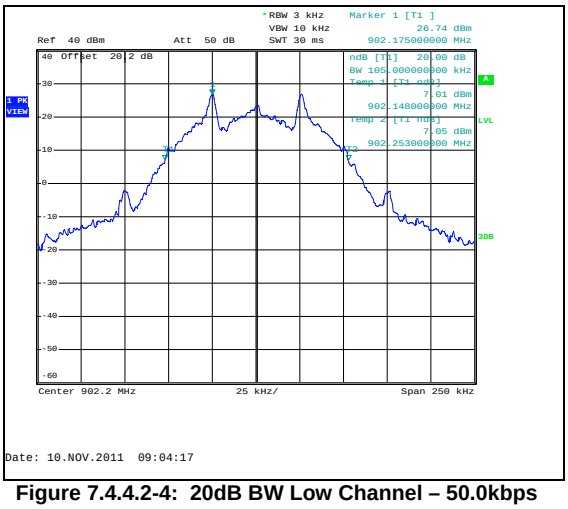

Figure 7.4.4.2-4: 20dB BW Low Channel – 50.0kbps

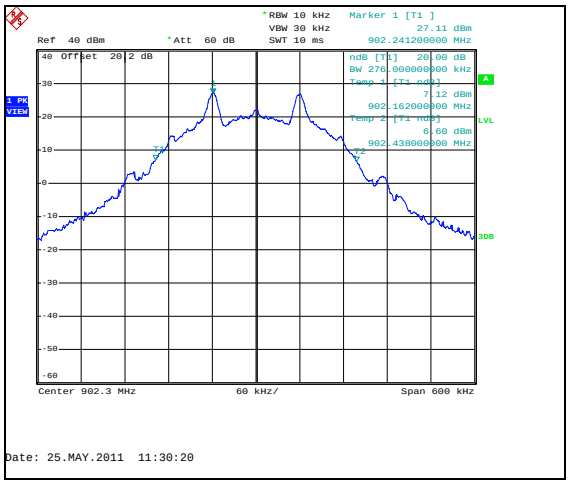

Figure 7.4.4.2-5: 20dB BW Low Channel – 115.2kbps

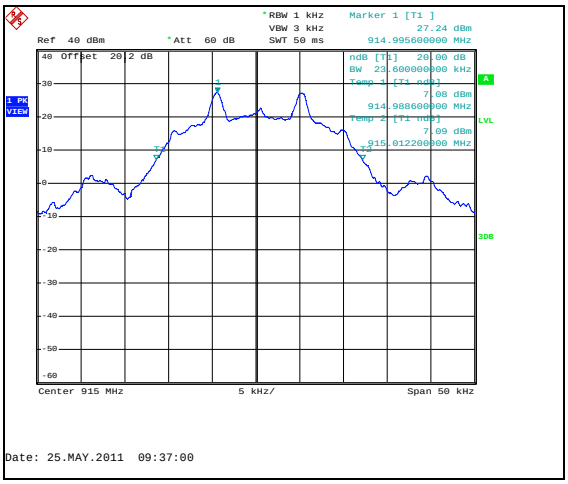

Figure 7.4.4.2-6: 20dB BW Mid Channel - 9.6kbps

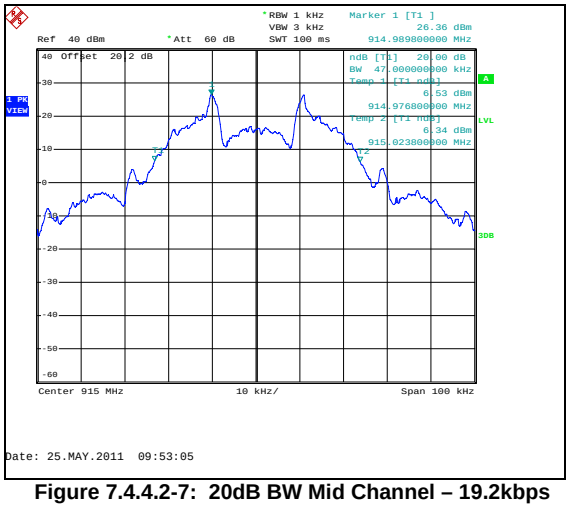

Figure 7.4.4.2-7: 20dB BW Mid Channel – 19.2kbps

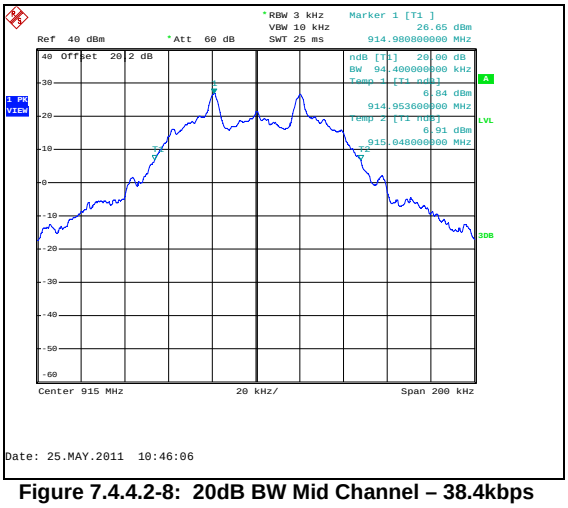

Figure 7.4.4.2-8: 20dB BW Mid Channel – 38.4kbps

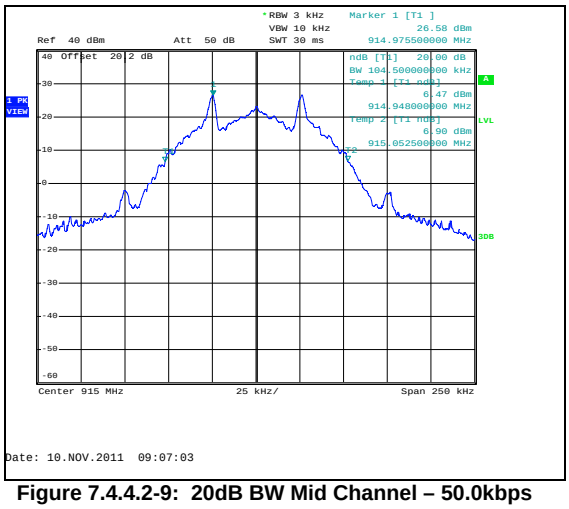

Figure 7.4.4.2-9: 20dB BW Mid Channel – 50.0kbps

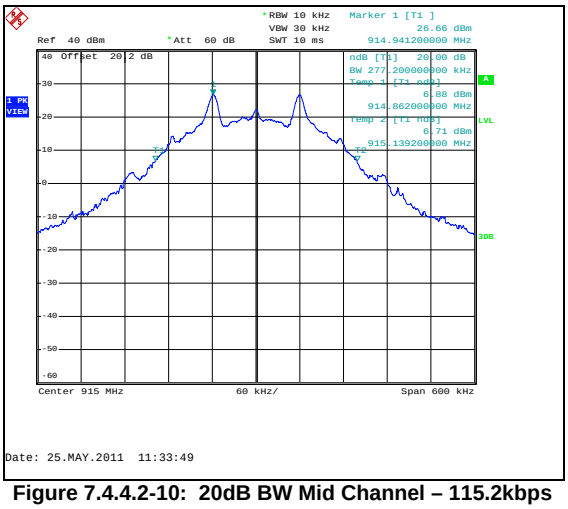

Figure 7.4.4.2-10: 20dB BW Mid Channel – 115.2kbps

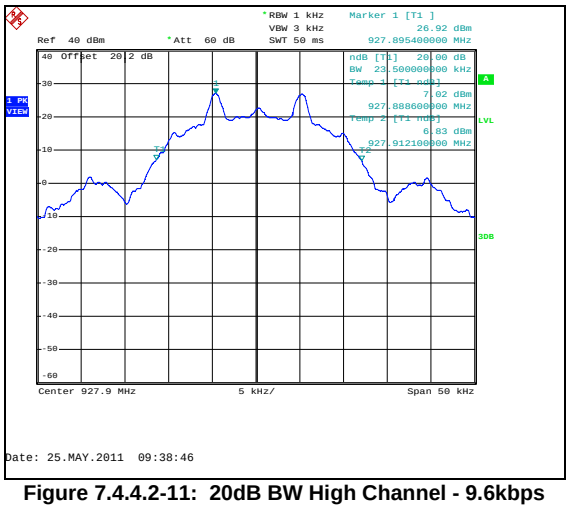

Figure 7.4.4.2-11: 20dB BW High Channel - 9.6kbps

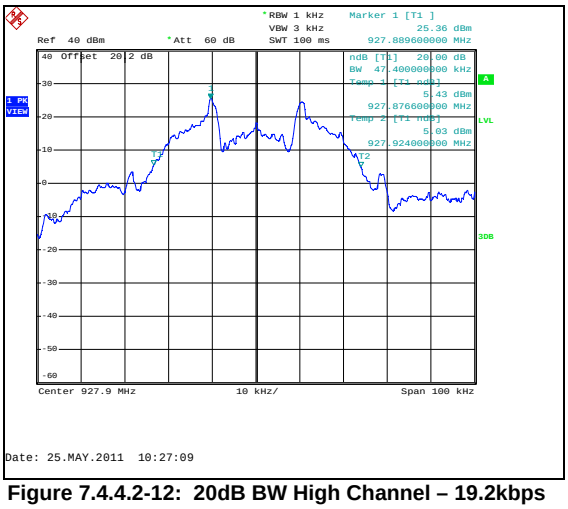

Figure 7.4.4.2-12: 20dB BW High Channel – 19.2kbps

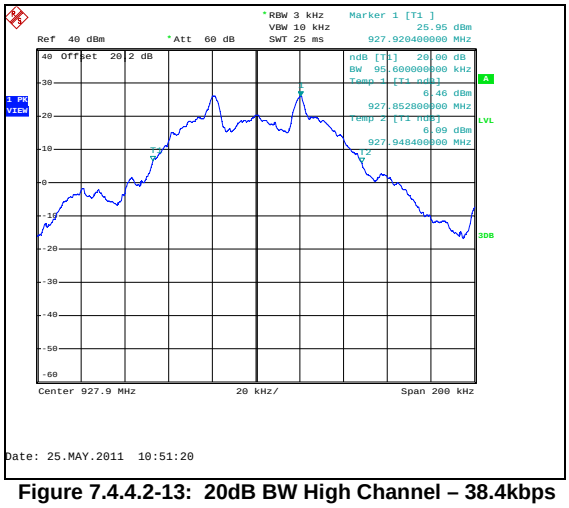

Figure 7.4.4.2-13: 20dB BW High Channel – 38.4kbps

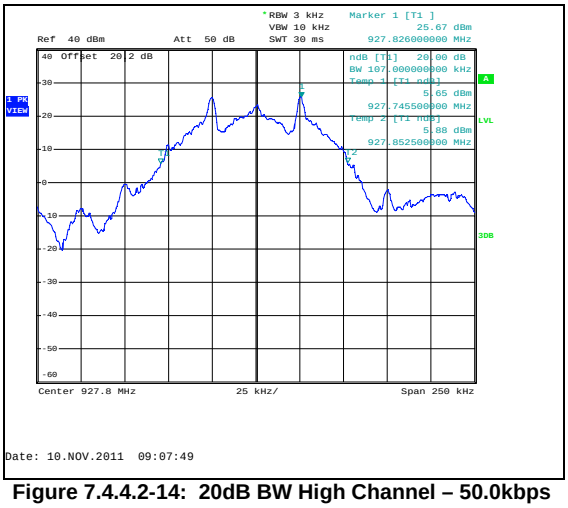

Figure 7.4.4.2-14: 20dB BW High Channel – 50.0kbps

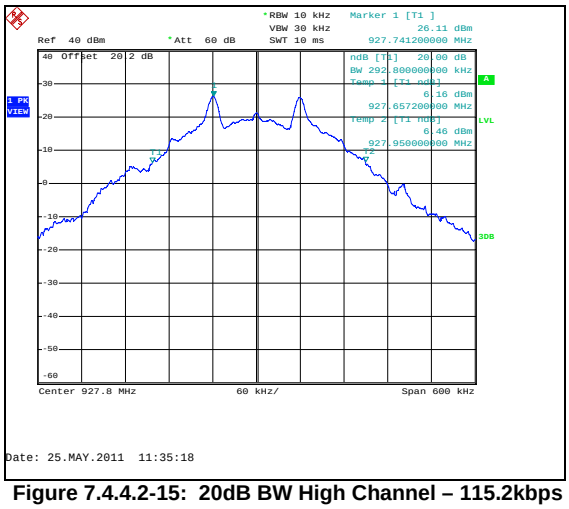

Figure 7.4.4.2-15: 20dB BW High Channel – 115.2kbps

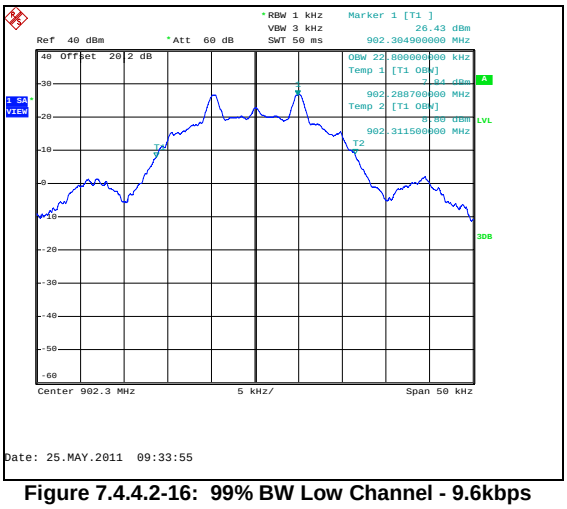

Figure 7.4.4.2-16: 99% BW Low Channel - 9.6kbps

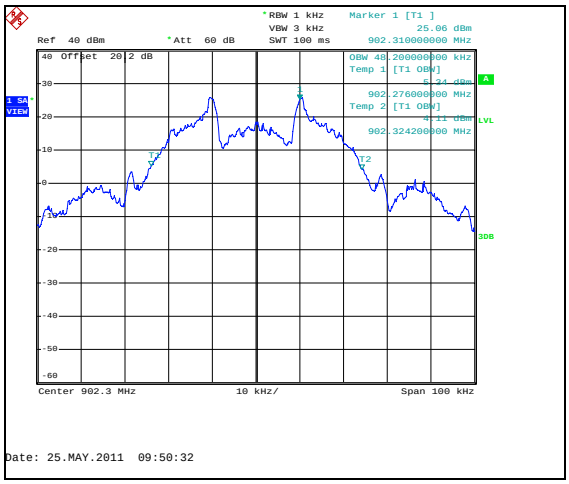

Figure 7.4.4.2-17: 99% BW Low Channel – 19.2kbps

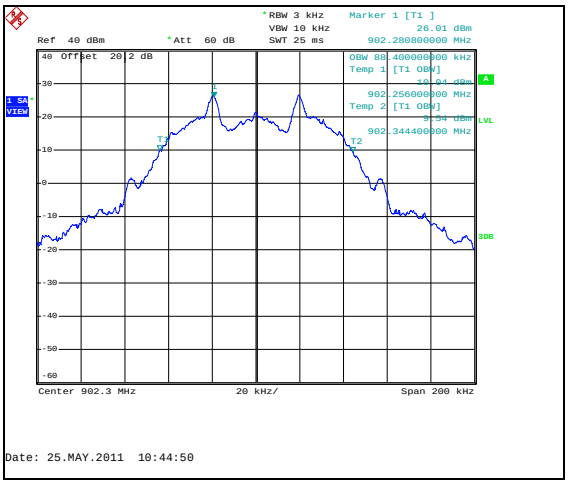

Figure 7.4.4.2-18: 99% BW Low Channel – 38.4kbps

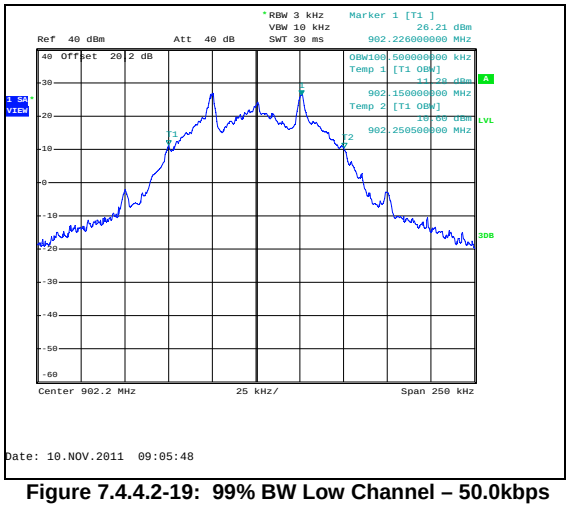

Figure 7.4.4.2-19: 99% BW Low Channel – 50.0kbps

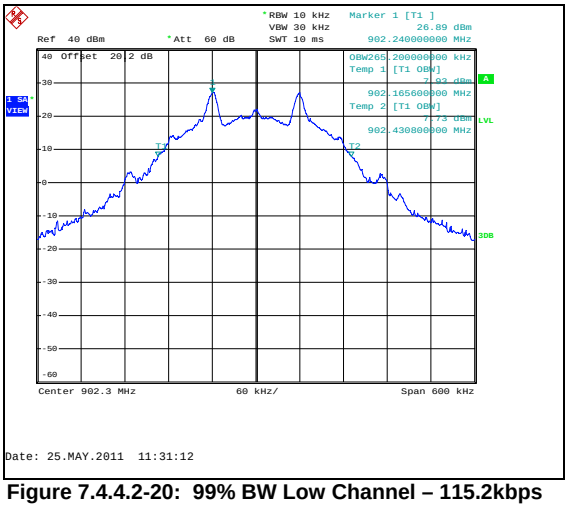

Figure 7.4.4.2-20: 99% BW Low Channel – 115.2kbps

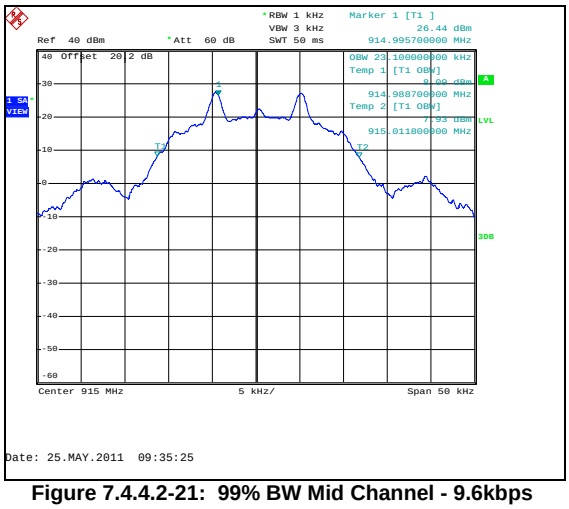

Figure 7.4.4.2-21: 99% BW Mid Channel - 9.6kbps

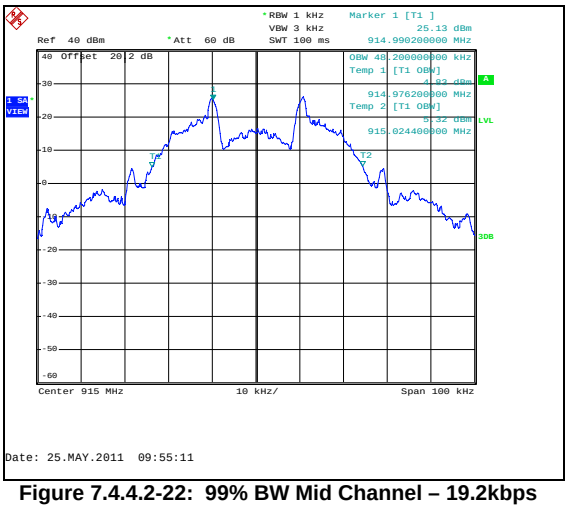

Figure 7.4.4.2-22: 99% BW Mid Channel – 19.2kbps

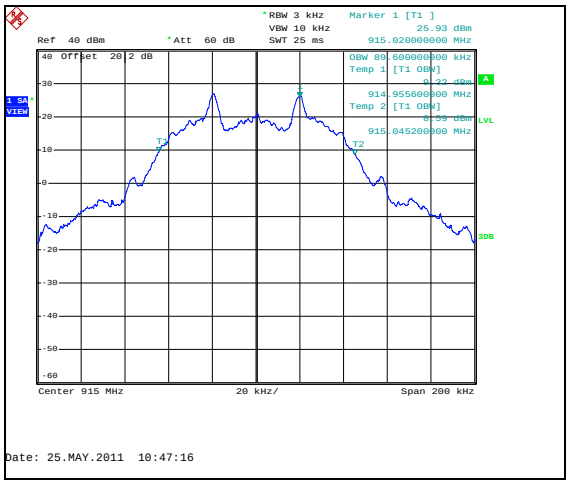

Figure 7.4.4.2-23: 99% BW Mid Channel – 38.4kbps

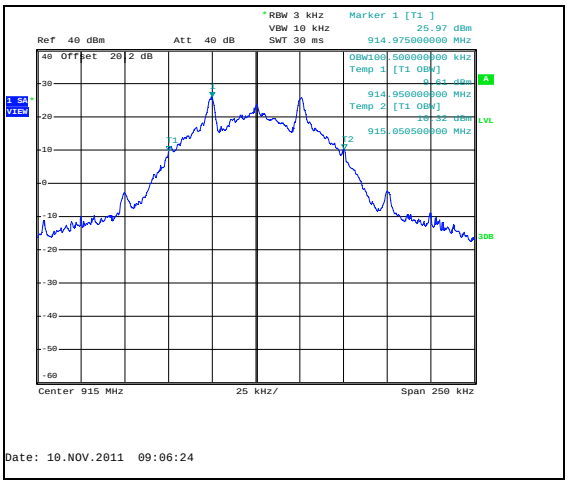

Figure 7.4.4.2-24: 99% BW Mid Channel – 50.0kbps

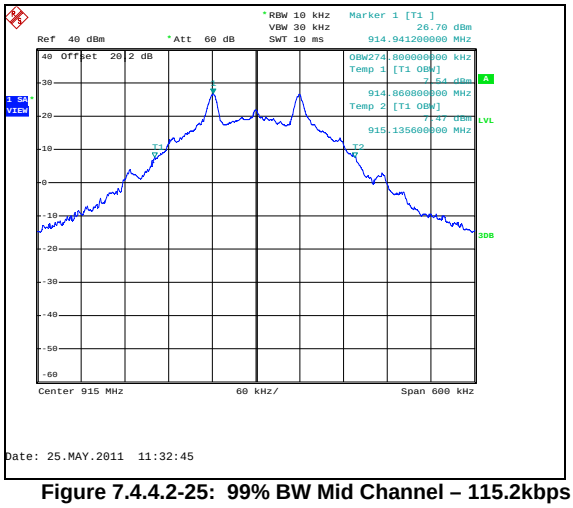

Figure 7.4.4.2-25: 99% BW Mid Channel – 115.2kbps

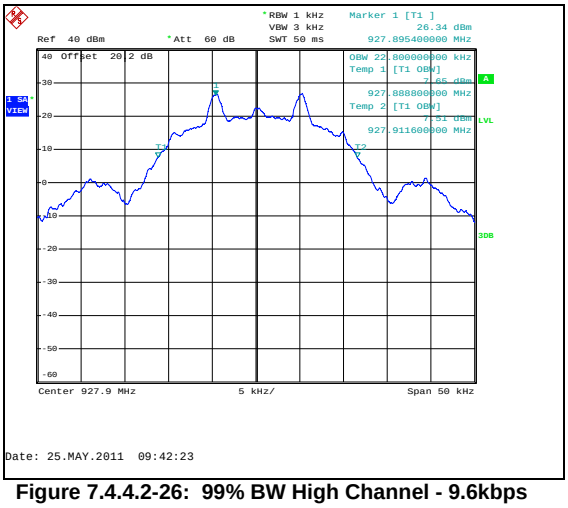

Figure 7.4.4.2-26: 99% BW High Channel - 9.6kbps

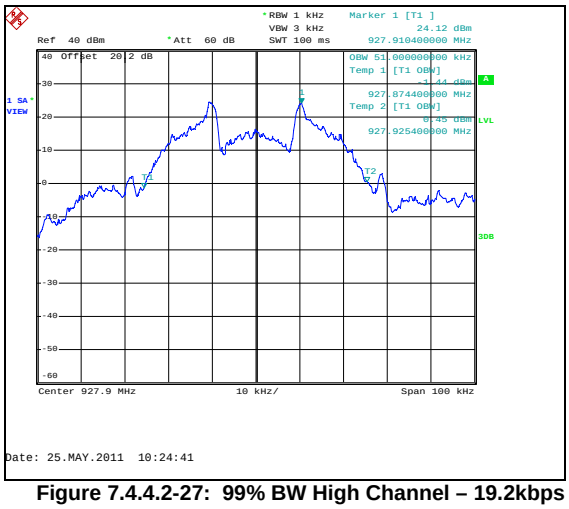

Figure 7.4.4.2-27: 99% BW High Channel – 19.2kbps

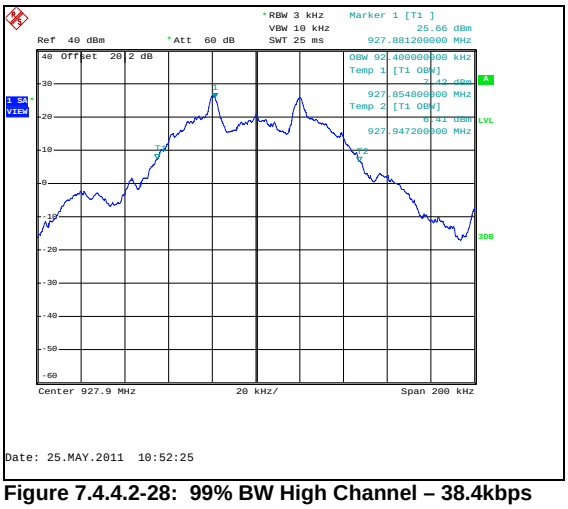

Figure 7.4.4.2-28: 99% BW High Channel – 38.4kbps

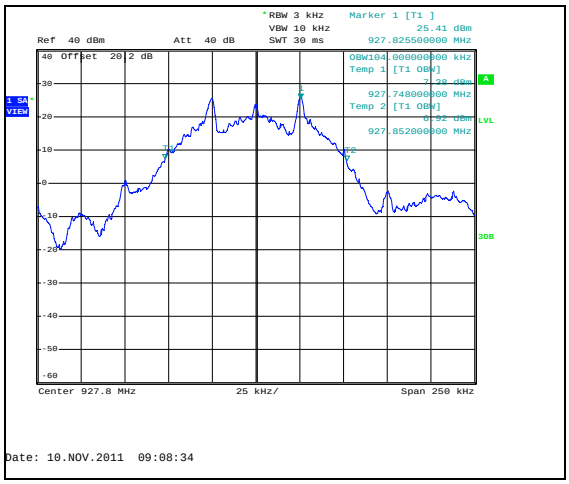

Figure 7.4.4.2-29: 99% BW High Channel – 50.0kbps

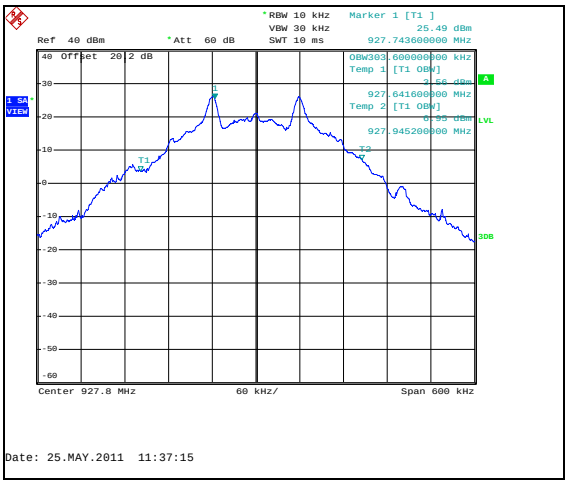

Figure 7.4.4.2-30: 99% BW High Channel – 115.2kbps

7.5 Band-Edge Compliance and Spurious Emissions-FCC 15.247(d) IC: RSS-210 A8.5

7.5.1 Band-Edge Compliance of RF Conducted Emissions

7.5.1.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. 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 30 kHz, which is ≥ 1% of the span, and the VBW was set to 100kHz.

Band-edge was evaluated for all combinations of operating modes and data rates with worst case data provided. Worst case reported utilized 38.4kbps in Narrow Mode, 50.0kbps in Sun Mode, and 115.2kbps in Wide Mode.

7.5.1.2 Measurement Results

Results are shown in the figures 7.5.1.2-1 to 7.5.1.2-8 below.

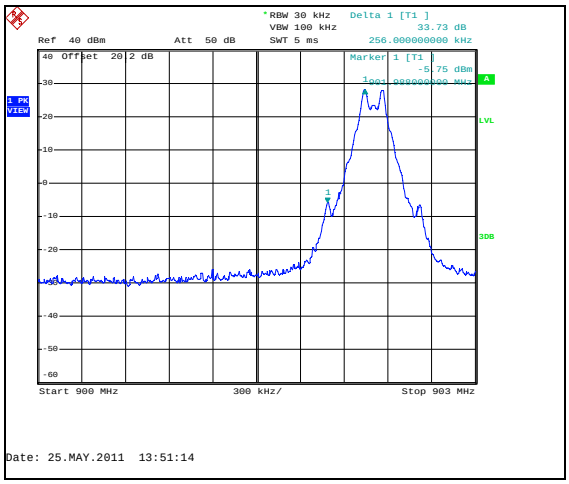

Figure 7.5.1.2-1: Lower Band-edge – Wide Mode

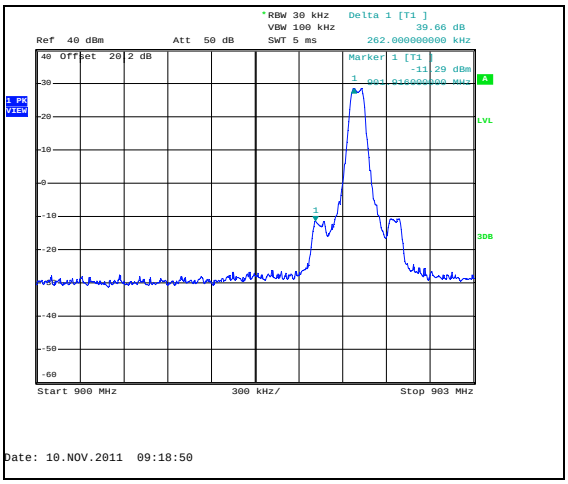

Figure 7.5.1.2-2: Lower Band-edge – SUN Mode

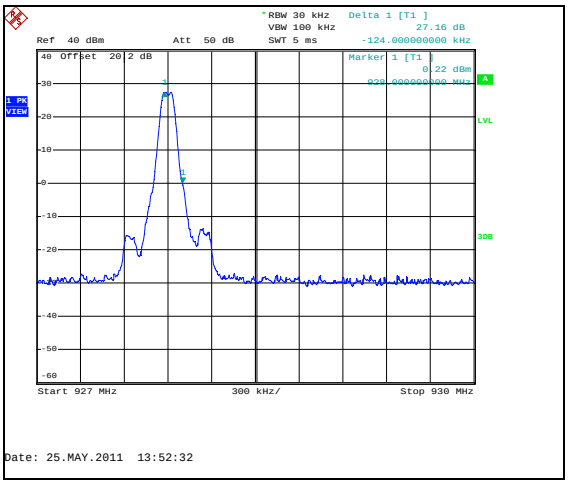

Figure 7.5.1.2-3: Upper Band-edge - Narrow Mode

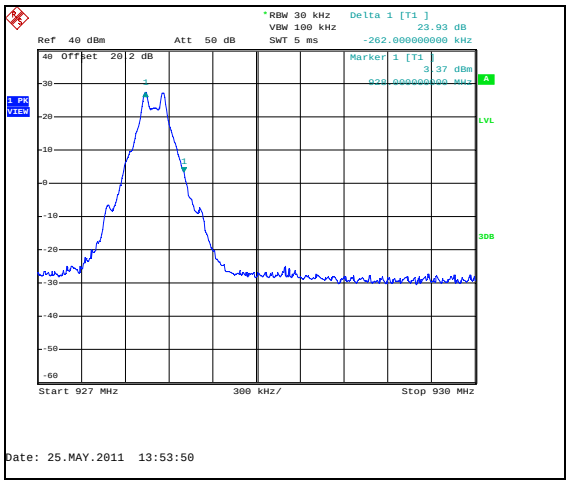

Figure 7.5.1.2-4: Upper Band-edge - Wide Mode

HOPPING MODE:

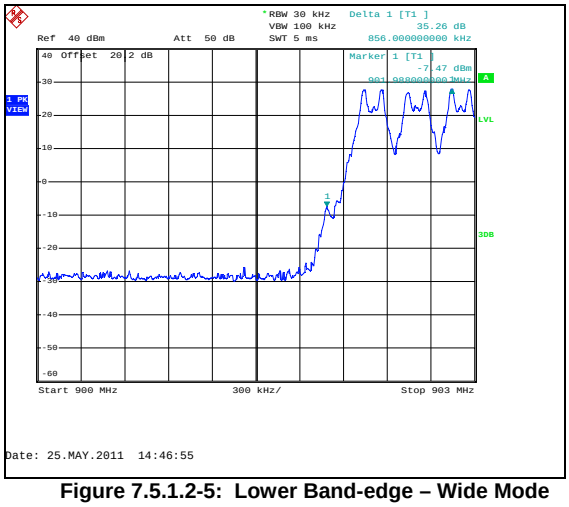

Figure 7.5.1.2-5: Lower Band-edge – Wide Mode

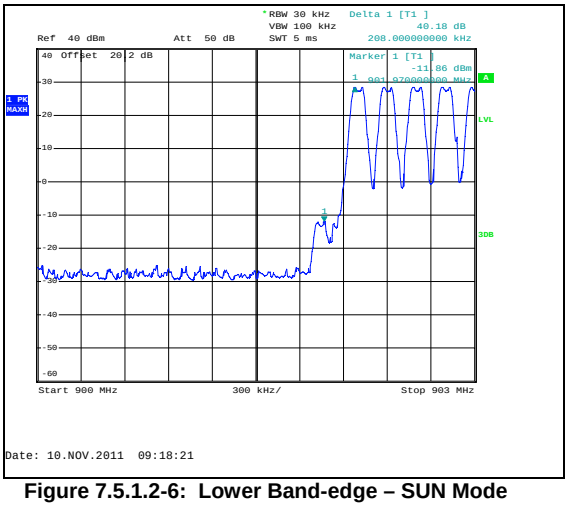

Figure 7.5.1.2-6: Lower Band-edge – SUN Mode

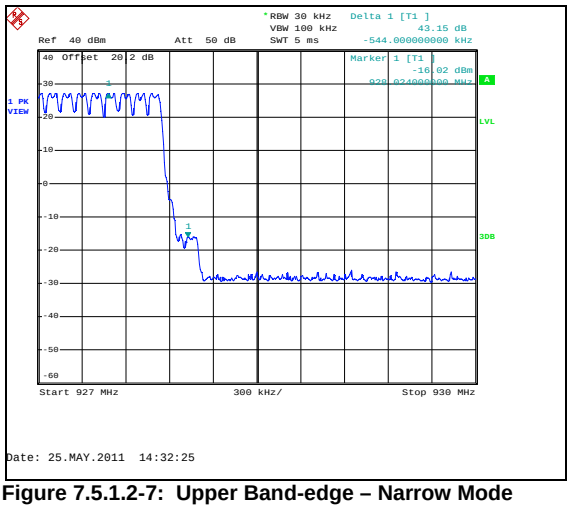

Figure 7.5.1.2-7: Upper Band-edge – Narrow Mode

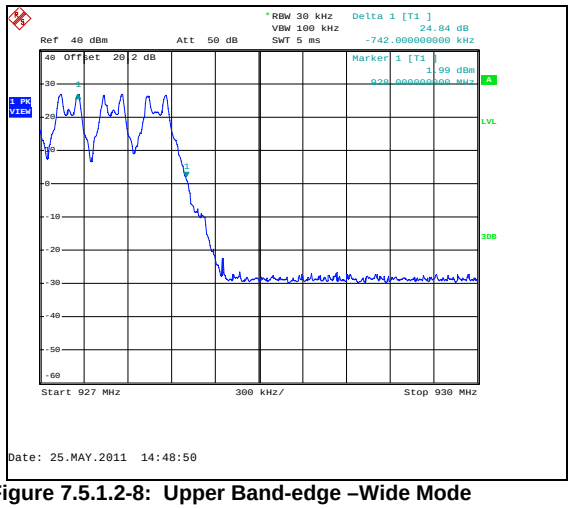

Figure 7.5.1.2-8: Upper Band-edge –Wide Mode

7.5.2 RF Conducted Spurious Emissions

7.5.2.1 Measurement Procedure

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

RF conducted spurious emissions were evaluated for all combinations of operating modes and data rates with worst case data provided. Worst case report utilized 9.6kbps in Full Narrow Mode.

7.5.2.2 Measurement Results

Results are shown below in Figures 7.5.2.2-1 to 7.5.2.2-6:

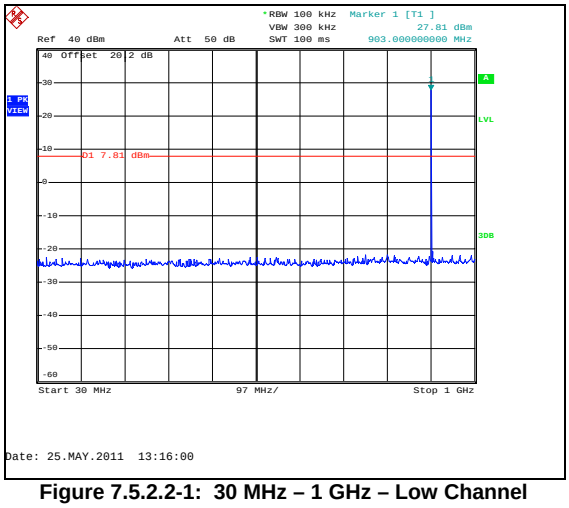

Figure 7.5.2.2-1: 30 MHz – 1 GHz – Low Channel

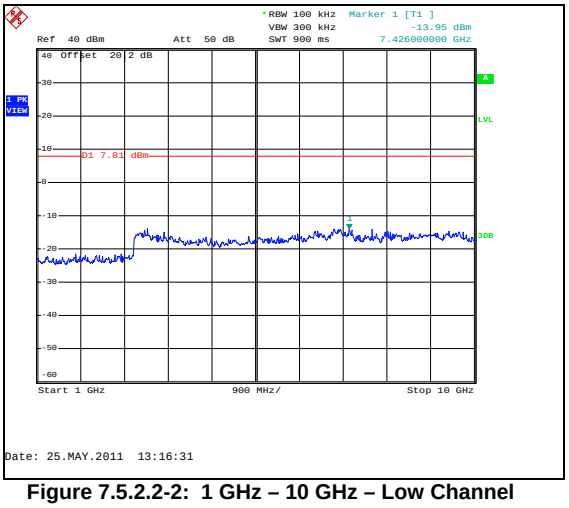

Figure 7.5.2.2-2: 1 GHz – 10 GHz – Low Channel

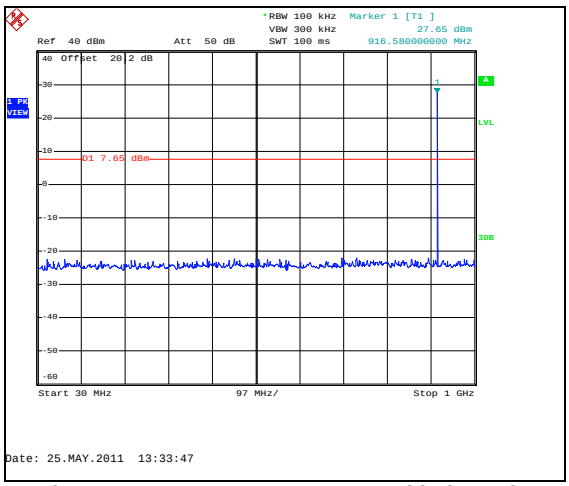

Figure 7.5.2.2-3: 30 MHz – 1 GHz –Mid Channel

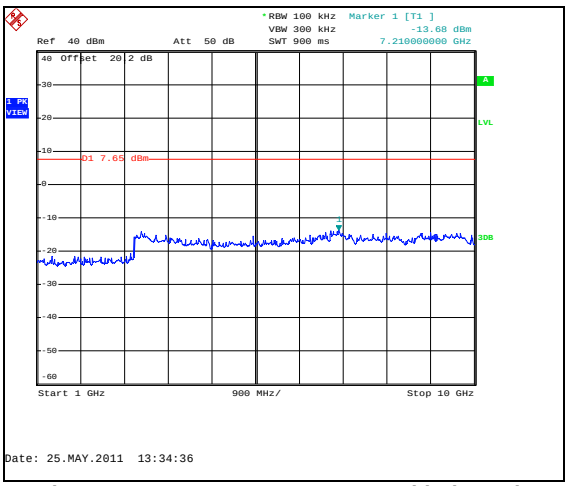

Figure 7.5.2.2-4: 1 GHz – 10 GHz – Mid Channel

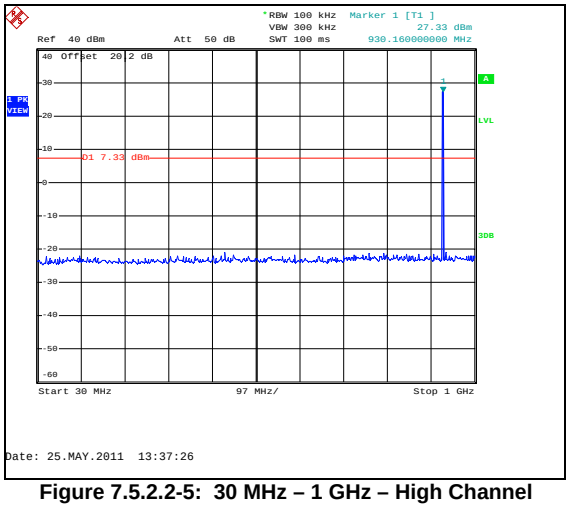

Figure 7.5.2.2-5: 30 MHz – 1 GHz – High Channel

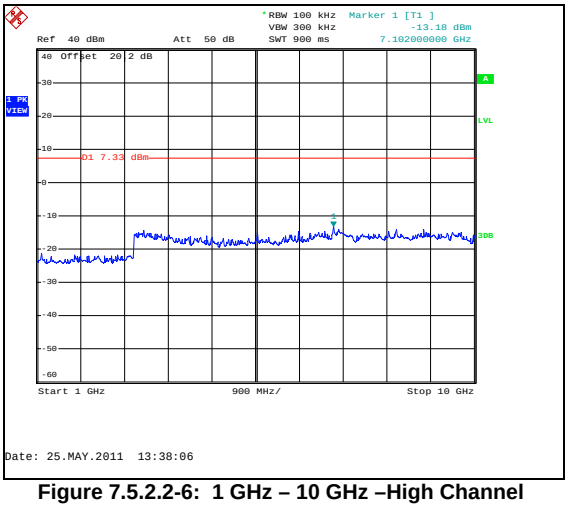

Figure 7.5.2.2-6: 1 GHz – 10 GHz –High Channel

7.5.3 Radiated Spurious Emissions - FCC Section 15.205 IC: RSS-210 2.6

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

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

Radiated spurious emissions were evaluated for all combinations of operating modes and data rates with worst case data provided. Worst case report utilized 9.6kbps in Full Narrow Mode.

The EUT was evaluated with both arm mount and pole mount hardware configurations.

7.5.3.2 Measurement Results

Radiated spurious emissions found in the band of 30MHz to 10GHz are reported in the Tables 7.5.3.2-1 to 7.5.3.2-2 below.

Table 7.5.3.2-1: Radiated Spurious Emissions Tabulated Data – Arm Mount

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Antenna Height	Turntable Position	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(cm)	(o)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel												
2706.9	42.36	35.36	H	110	340	2.15	44.51	37.51	74.0	54.0	29.5	16.5
2706.9	46.14	41.28	V	100	255	2.15	48.29	43.43	74.0	54.0	25.7	10.6
3609.2	44.54	38.03	H	110	73	5.50	50.04	43.53	74.0	54.0	24.0	10.5
3609.2	45.19	39.55	V	104	198	5.50	50.69	45.05	74.0	54.0	23.3	8.9
Middle Channel												
2745	45.19	40.41	H	110	175	2.30	47.49	42.71	74.0	54.0	26.5	11.3
2745	47.53	43.94	V	133	158	2.30	49.83	46.24	74.0	54.0	24.2	7.8
3660	45.37	39.14	H	110	80	5.68	51.05	44.82	74.0	54.0	22.9	9.2
3660	45.02	39.47	V	133	17	5.68	50.70	45.15	74.0	54.0	23.3	8.8
High Channel												
2783.7	43.14	36.48	V	100	116	2.45	45.59	38.93	74.0	54.0	28.4	15.1
3711.6	43.16	36.30	H	112	200	5.86	49.02	42.16	74.0	54.0	25.0	11.8
3711.6	43.10	36.60	V	104	83	5.86	48.96	42.46	74.0	54.0	25.0	11.5

* Note: All emissions not reported were attenuated below the noise floor of the receiver.

Table 7.5.3.2-2: Radiated Spurious Emissions Tabulated Data – Pole Mount

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Antenna Height	Turntable Position	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(cm)	(o)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel												
2706.9	43.13	36.53	H	175	198	2.15	45.28	38.68	74.0	54.0	28.7	15.3
2706.9	45.32	39.85	V	127	272	2.15	47.47	42.00	74.0	54.0	26.5	12.0
3609.2	45.14	40.13	H	110	78	5.50	50.64	45.63	74.0	54.0	23.4	8.4
3609.2	48.16	43.92	V	131	271	5.50	53.66	49.42	74.0	54.0	20.3	4.6
Middle Channel												
2745	42.38	35.13	H	110	29	2.30	44.68	37.43	74.0	54.0	29.3	16.6
2745	44.13	38.20	V	138	295	2.30	46.43	40.50	74.0	54.0	27.6	13.5
3660	45.19	39.35	H	112	204	5.68	50.87	45.03	74.0	54.0	23.1	9.0
3660	45.98	40.59	V	134	258	5.68	51.66	46.27	74.0	54.0	22.3	7.7
High Channel												
2783.7	43.29	36.50	H	127	353	2.45	45.74	38.95	74.0	54.0	28.3	15.1
2783.7	43.11	37.11	V	100	5	2.45	45.56	39.56	74.0	54.0	28.4	14.4
3711.6	45.13	36.86	H	111	244	5.86	50.99	42.72	74.0	54.0	23.0	11.3
3711.6	44.32	38.56	V	177	0	5.86	50.18	44.42	74.0	54.0	23.8	9.6

* Note: All emissions not reported were attenuated below the noise floor of the receiver.

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: 42.36 + 2.15 = 44.51dBuV/m
Margin: 74dBuV/m – 44.51dBuV/m = 29.5dB

Example Calculation: Average
Corrected Level: 35.36 + 2.15 – 0 = 37.51dBuV
Margin: 54dBuV – 37.51dBuV = 16.5dB

8 CONCLUSION

In the opinion of ACS, Inc. Collector C6400, Collector C6420 and Collector C6430, manufactured by Cellnet Technology Inc. meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT