

## **Certification Test Report**

**FCC ID: SK9AMI6**

**IC: 864G-AMI6**

**FCC Rule Part: 15.247**

**IC Radio Standards Specification: RSS-210**

**ACS Report Number: 10-0158.W06.12.A**

**Manufacturer: Itron Electricity Metering, Inc.**

**Model: AMI6**

**Test Begin Date: May 10, 2010**

**Test End Date: May 20, 2010**

**Report Issue Date: June 1, 2010**



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:** \_\_\_\_\_

A handwritten signature in black ink, appearing to read 'Kirby Munroe', is written over a horizontal line.

**Kirby Munroe**  
**Director, Wireless Certifications**  
**ACS, Inc.**

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**This report contains 33 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 of a single limited modular approval.

### 1.2 Product description

The AMI6 module is a utility meter register board designed to be integrated into a variety of electric meter form factors. The AMI6 contains (1) 900 MHz LAN frequency hopping spread spectrum radio and (1) 2.4 GHz direct sequence spread spectrum Zigbee radio.

Manufacturer Information:  
Itron Electricity Metering, Inc.  
313 North Highway 11  
West Union, SC 29696

The AMI6 technical details:

Modulation	Frequency Range (MHz)	Number of Channels	Channel Separation (kHz)	Data Rates Supported (kbps)
FSK	902.25 - 927.75	52	500	19.2
FSK	902.25 - 927.75	52	500	152.3
OOK	909.6 - 921.8	50	200	16.4

Test Sample Serial Number(s):

6060000997-001, 6060001070-001, 6060001151-001, 6060001161-001, 6060001123-001, 6060001054-001

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

### 1.3 Test Methodology and Considerations

This AMI6 is a composite device by definition. The 900 MHz LAN radio and the 2.4 GHz Zigbee radio operate under CFR 47 Part 15.247 and IC RSS-210. This report addresses the 900 MHz LAN radio only. A separate report will be issued to address the 2.4 GHz Zigbee radio.

The AMI6 was integrated into the 1S, 2S, and 12S meter forms for AC power line conducted emissions and radiated emissions.

Both the 900 MHz LAN radio and the 2.4 GHz Zigbee radio can transmit simultaneously therefore radiated inter-modulation products were evaluated and found to be in compliance.

For the purpose of RF conducted measurements, the AMI6 module was modified with a temporary 50 ohm antenna port.

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

## **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**

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. In addition, ACS is compliant to ISO/IEC 17025 as certified by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program. The following certification numbers have been issued in recognition of these accreditations and certifications:

FCC Registration Number: 894540

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

NVLAP Lab Code: 200612-0

### 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:

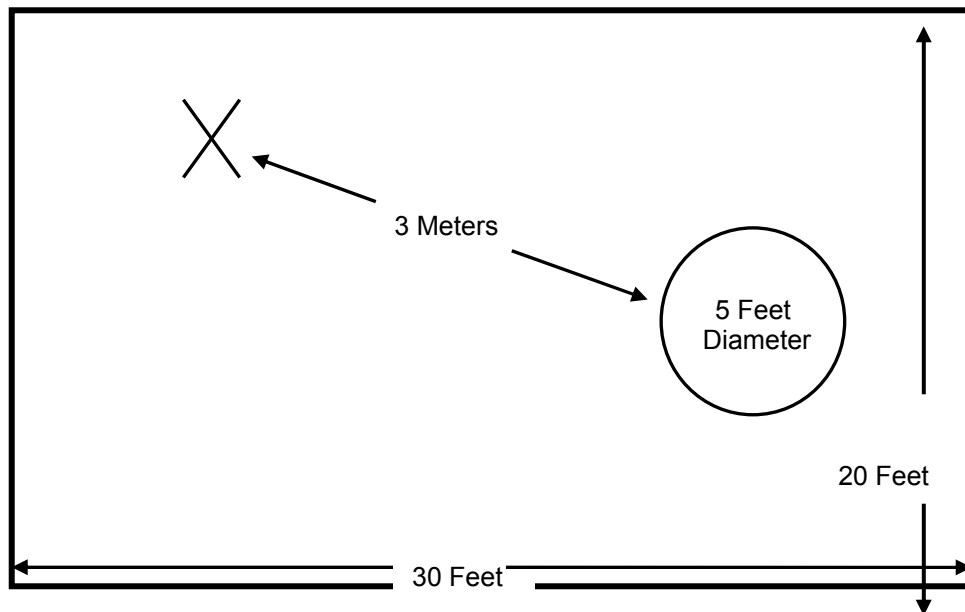


Figure 2.3-1: Semi-Anechoic Chamber Test Site

**2.3.2 Open Area Tests Site (OATS)**

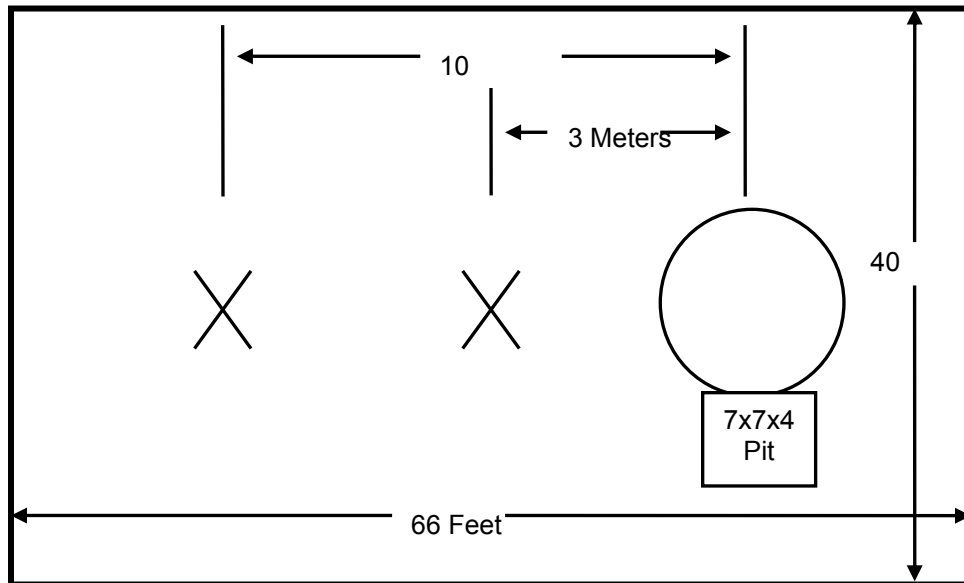
The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide 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 4.1.3-1:

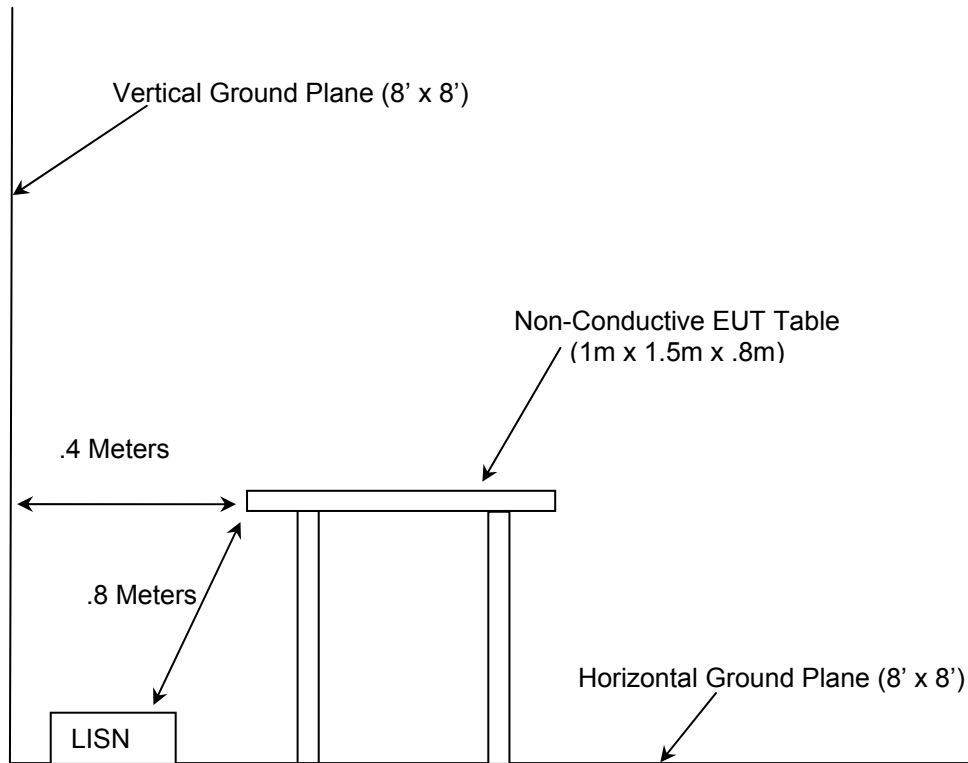


Figure 2.4-1: AC Mains Conducted EMI Site

## 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, 2010
- ❖ US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2010
- ❖ 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 7 June 2007
- ❖ Industry Canada Radio Standards Specification: RSS-GEN - General Requirements and Information for the Certification of Radiocommunication Equipment, Issue2, June 2007.

#### 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**

Equipment Calibration Information					
ACS#	Mfg.	Eq. type	Model	S/N	Cal. Due
1	Rohde & Schwarz	Spectrum Analyzers	ESMI - Display	833771/007	09-21-2010
2	Rohde & Schwarz	Spectrum Analyzers	ESMI - Receiver	839587/003	09-21-2010
3	Rohde & Schwarz	Spectrum Analyzers	ESMI - Display	839379/011	02-02-2011
4	Rohde & Schwarz	Spectrum Analyzers	ESMI - Receiver	833827/003	02-02-2011
22	Agilent	Amplifiers	8449B	3008A00526	09-21-2010
25	Chase	Antennas	CBL6111	1043	09-02-2010
30	Spectrum Technologies	Antennas	DRH-0118	970102	05-08-2011
73	Agilent	Amplifier	8447D	2727A05624	05-26-2011
153	EMCO	LISN	Feb-25	9411-2268	01-11-2011
167	ACS	Cable Set	Chamber EMI Cable Set	167	01-25-2011 (See Note1)
168	Hewlett Packard	Attenuators	11947A	44829	02-04-2011 (See Note2)
193	ACS	Cable Set	OATS cable Set	193	01-05-2011 (See Note1)
211	Eagle	Filters	C7RFM3NFNM	HLC-700	12-21-2010 (See Note1)
213	TEC	Amplifiers	PA 102	44927	12-21-2010
283	Rohde & Schwarz	Spectrum Analyzers	FSP40	1000033	09-21-2010
291	Florida RF Cables	Cables	SMRE-200W-12.0-SMRE	None	11-24-2010 (See Note1)
292	Florida RF Cables	Cables	SMR-290AW-480.0-SMR	None	11-24-2010 (See Note1)
324	ACS	Cables	Belden	8214	07-15-2010 (See Note1)
329	A.H. Systems	Antennas	SAS-571	721	08-04-2011
331	Microwave Circuits	Filters	H1G513G1	31417	07-17-2010 (See Note1)
340	Aeroflex/Weinschel	Attenuators	AS-20	7136	10-16-2010 (See Note2)
343	Florida RF Cables	Cables	SMRE-200W-12.0-SMRE	N/A	04-27-2011 (See Note1)
422	Florida RF	Cables	SMS-200AW-72.0-SMR	805	01-26-2011 (See Note1)
430	RF Cables	Cables	SMS-290AW-480-SMS	N/A	04-27-2011 (See Note1)
432	Microwave Circuits	Filters	H3G020G4	264066	07-17-2010 (See Note1)

**Note1:** Items characterized on an annual cycle. The date shown indicates the next characterization due date.

**Note2:** Items verified on an annual cycle. The date shown indicates the next verification due date.



5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	Electric Meter	Itron Electricity Metering	C2SOD (1S)	300 307 547
2	Electric Meter	Itron Electricity Metering	C2SOD (2S)	300 307 531
3	Electric Meter	Itron Electricity Metering	CN2SOD (12S)	300 307 250
4	Transformer	Sagamo Weston	Type T-6A	325827 002

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

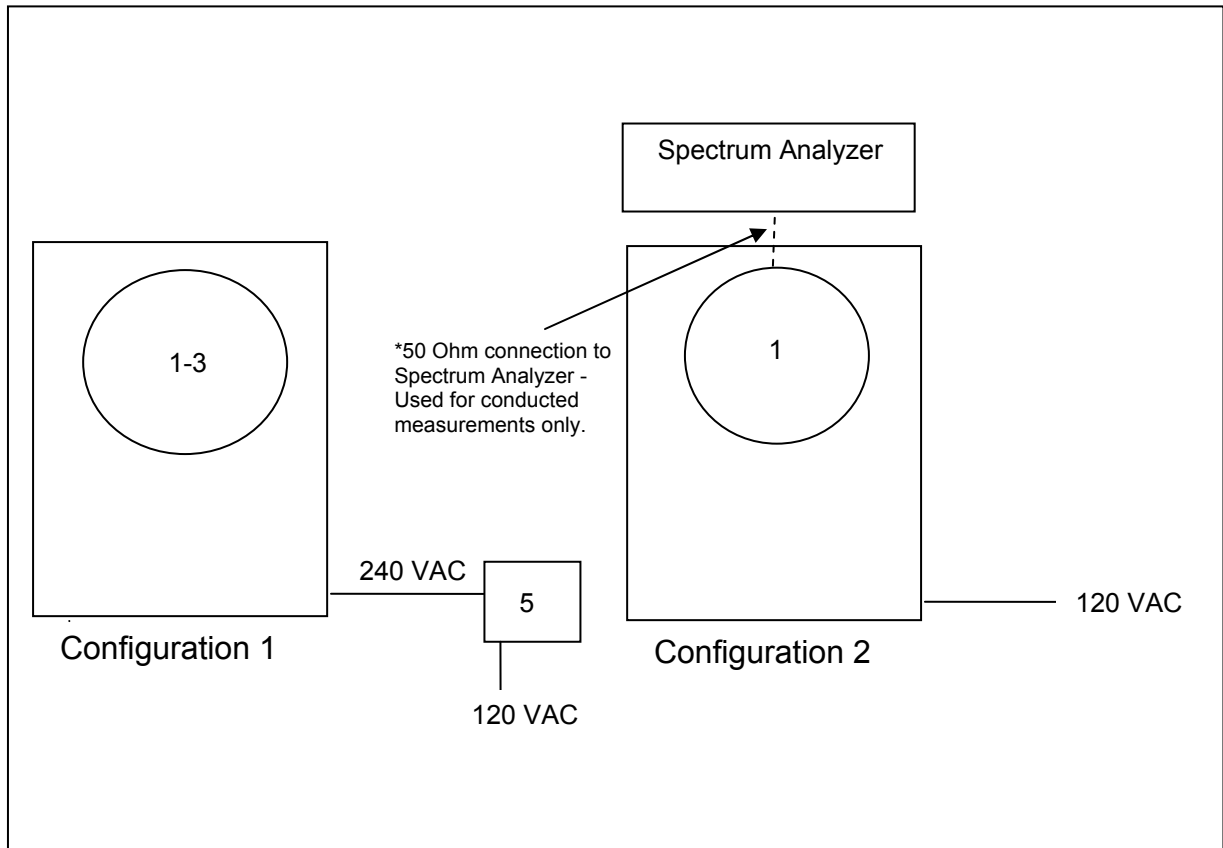


Figure 6-1: EUT Test Setup

Note1: The 1S meter form was utilized to power the AMI6 modules for RF conducted measurements. The AMI6 was also integrated into the 1S, 2S, and 12S meter forms for showing compliance for radiated emissions and AC power line conducted emissions.

Note2: 1S and 12S meter form connects directly to 120vAC and did not use a transformer (5).

## 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 a quarter wave embedded slot antenna in the PWB ground plane with a measured gain of ~2.2dBi.

### 7.2 Power Line Conducted Emissions – FCC: Section 15.207 IC: RSS-Gen 7.2.2

#### 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:

$$\text{Corrected Reading} = \text{Analyzer Reading} + \text{LISN Loss} + \text{Cable Loss}$$

$$\text{Margin} = \text{Applicable Limit} - \text{Corrected Reading}$$

#### 7.2.2 Measurement Results

Results of the test are shown below in and Tables 7.2.2-1 to 7.2.2-6.

**Table 7.2.2-1: Line 1 Conducted EMI Results – 1S Meter**

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.768	10.6	10.1	56	45.5	L1	GND	QP
0.978	11	10	56	45	L1	GND	QP
1.368	10.6	10	56	45.4	L1	GND	QP
1.698	10.5	10	56	45.5	L1	GND	QP
1.824	10.4	10	56	45.6	L1	GND	QP
1.992	10.5	10	56	45.5	L1	GND	QP
2.232	9.7	10	56	46.3	L1	GND	QP
2.886	9.4	9.9	56	46.6	L1	GND	QP
18.702	10.4	9.8	60	49.6	L1	GND	QP
28.794	11.6	9.2	60	48.4	L1	GND	QP
0.816	7.4	10.1	46	38.6	L1	GND	AVG
0.918	7.6	10	46	38.4	L1	GND	AVG
1.458	7.9	10	46	38.1	L1	GND	AVG
1.704	7.2	10	46	38.8	L1	GND	AVG
1.806	7.3	10	46	38.7	L1	GND	AVG
1.98	7.1	10	46	38.9	L1	GND	AVG
2.268	6.8	10	46	39.2	L1	GND	AVG
2.874	6.7	10	46	39.3	L1	GND	AVG
18.666	6.9	9.8	50	43.1	L1	GND	AVG
28.98	7.5	9.2	50	42.5	L1	GND	AVG

Table 7.2.2-2: Line 2 Conducted EMI Results - 1S Meter

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.15	21.1	9.9	66	44.9	L2	GND	QP
0.57	10.5	10	56	45.6	L2	GND	QP
0.804	10.6	10.1	56	45.4	L2	GND	QP
1.026	10.2	10	56	45.8	L2	GND	QP
1.308	10.6	10	56	45.4	L2	GND	QP
1.47	10.6	10	56	45.4	L2	GND	QP
1.752	10.6	10	56	45.4	L2	GND	QP
2.31	9.9	10	56	46.1	L2	GND	QP
3.774	9.6	9.9	56	46.4	L2	GND	QP
3.924	9.5	9.9	56	46.5	L2	GND	QP
0.192	11.5	9.9	54	42.4	L2	GND	AVG
0.576	7.3	10	46	38.7	L2	GND	AVG
0.858	7.3	10	46	38.7	L2	GND	AVG
1.008	7.2	10	46	38.8	L2	GND	AVG
1.29	7.5	10	46	38.5	L2	GND	AVG
1.422	7.9	10	46	38.1	L2	GND	AVG
1.734	7.2	10	46	38.8	L2	GND	AVG
2.34	6.7	10	46	39.3	L2	GND	AVG
3.786	6.7	9.9	46	39.3	L2	GND	AVG
3.936	6.7	9.9	46	39.3	L2	GND	AVG

Table 7.2.2-3: Line 1 Conducted EMI Results – 2S Meter

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.15	33.7	9.9	66	32.3	L1	GND	QP
0.462	20.8	10	57	35.8	L1	GND	QP
0.498	20.7	10	56	35.4	L1	GND	QP
0.72	16.6	10.1	56	39.4	L1	GND	QP
0.87	15.4	10	56	40.6	L1	GND	QP
1.086	14.2	10	56	41.8	L1	GND	QP
1.452	13.4	10	56	42.6	L1	GND	QP
1.554	13.1	10	56	42.9	L1	GND	QP
2.424	11.4	10	56	44.6	L1	GND	QP
2.49	11	10	56	45	L1	GND	QP
0.198	11.6	9.9	54	42.1	L1	GND	AVG
0.456	8.7	10	47	38.1	L1	GND	AVG
0.546	8.4	10	46	37.6	L1	GND	AVG
0.786	8.1	10.1	46	37.9	L1	GND	AVG
0.9	8	10	46	38	L1	GND	AVG
1.008	7.9	10	46	38.1	L1	GND	AVG
1.488	7.5	10	46	38.5	L1	GND	AVG
1.596	7.6	10	46	38.4	L1	GND	AVG
2.484	6.8	10	46	39.2	L1	GND	AVG
2.586	6.9	10	46	39.1	L1	GND	AVG

Table 7.2.2-4: Line 2 Conducted EMI Results - 2S Meter

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.156	33.7	9.9	66	32	L2	GND	QP
0.264	23.1	10	61	38.2	L2	GND	QP
0.39	20.4	10.1	58	37.6	L2	GND	QP
0.456	21.3	10	57	35.5	L2	GND	QP
0.528	21.1	10	56	34.9	L2	GND	QP
0.558	20.2	10	56	35.8	L2	GND	QP
0.678	18.2	10	56	37.8	L2	GND	QP
0.918	14.9	10	56	41.1	L2	GND	QP
0.954	22.1	10	56	33.9	L2	GND	QP
2.19	11.8	10	56	44.2	L2	GND	QP
0.192	13.6	9.9	54	40.4	L2	GND	AVG
0.264	9.1	10	51	42.2	L2	GND	AVG
0.396	8.9	10.1	48	39.1	L2	GND	AVG
0.45	8.7	10	47	38.2	L2	GND	AVG
0.528	8.6	10	46	37.5	L2	GND	AVG
0.582	8.4	10	46	37.6	L2	GND	AVG
0.654	8.6	10	46	37.4	L2	GND	AVG
0.87	7.9	10	46	38.1	L2	GND	AVG
0.942	8.6	10	46	37.4	L2	GND	AVG
2.178	7	10	46	39	L2	GND	AVG

Table 7.2.2-5: Line 1 Conducted EMI Results - 12S Meter

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.48	20.3	10	56	36	L1	GND	QP
0.552	20.1	10	56	35.9	L1	GND	QP
0.648	20	10	56	36	L1	GND	QP
0.804	20.1	10.1	56	35.9	L1	GND	QP
1.194	20.6	10	56	35.4	L1	GND	QP
1.434	21.6	10	56	34.4	L1	GND	QP
1.722	21.2	10	56	34.8	L1	GND	QP
2.178	20.6	10	56	35.4	L1	GND	QP
2.394	20.3	10	56	35.7	L1	GND	QP
2.76	19.4	10	56	36.6	L1	GND	QP
0.48	11.7	10	46	34.6	L1	GND	AVG
0.576	8.9	10	46	37.1	L1	GND	AVG
0.702	8.9	10.1	46	37.1	L1	GND	AVG
0.84	9.1	10	46	36.9	L1	GND	AVG
1.188	9	10	46	37	L1	GND	AVG
1.422	10.6	10	46	35.4	L1	GND	AVG
1.692	9.2	10	46	36.8	L1	GND	AVG
2.166	8.8	10	46	37.2	L1	GND	AVG
2.37	8.7	10	46	37.3	L1	GND	AVG
2.802	8.3	10	46	37.7	L1	GND	AVG

Table 7.2.2-6: Line 2 Conducted EMI Results - 12S Meter

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.462	20.8	10	57	35.9	L2	GND	QP
0.492	20.6	10	56	35.5	L2	GND	QP
0.588	20.4	10	56	35.6	L2	GND	QP
0.624	20.4	10	56	35.6	L2	GND	QP
0.738	20.4	10.1	56	35.6	L2	GND	QP
1.194	20	10	56	36	L2	GND	QP
1.248	20.2	10	56	35.8	L2	GND	QP
1.41	20.5	10	56	35.5	L2	GND	QP
1.764	20.7	10	56	35.3	L2	GND	QP
1.944	20.6	10	56	35.4	L2	GND	QP
0.462	8.8	10	47	37.9	L2	GND	AVG
0.48	11.7	10	46	34.6	L2	GND	AVG
0.552	8.9	10	46	37.2	L2	GND	AVG
0.588	8.9	10	46	37.2	L2	GND	AVG
0.75	9	10.1	46	37.1	L2	GND	AVG
1.194	9	10	46	37	L2	GND	AVG
1.242	9.1	10	46	36.9	L2	GND	AVG
1.404	9.5	10	46	36.5	L2	GND	AVG
1.806	9.2	10	46	36.8	L2	GND	AVG
1.938	9.3	10	46	36.7	L2	GND	AVG

**7.3 Radiated Emissions – FCC: Section 15.109 (Unintentional Radiation) IC: RSS-210 2.6**

**7.3.1 Measurement Procedure**

Radiated emissions tests were performed over the frequency range of 30MHz to 12.5GHz. Measurements of the radiated field strength were made at a distance of 3m from the boundary of the equipment under test (EUT) and the receiving antenna. The antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. Radiated measurements above 30MHz and below 1GHz were made with the Spectrum Analyzer’s resolution bandwidth set to 120 KHz using a Quasi-peak detector. Above 1GHz, peak and average measurements are taken with the RBW and VBW were set to 1MHz and 3MHz respectively.

**7.3.2 Measurement Results**

Results of the test are given in Tables 7.3.2-1 to 7.3.2-3 below:

**Table 7.3.2-1: Radiated Emissions Tabulated Data – 1S Meter**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
30	-----	18.71	V	-6.70	-----	12.01	-----	40.0	-----	28.0
190.05	-----	35.37	V	-15.80	-----	19.57	-----	43.5	-----	23.9
312	-----	36.92	H	-11.20	-----	25.72	-----	46.0	-----	20.3
476	-----	21.28	H	-6.00	-----	15.28	-----	46.0	-----	30.7
697	-----	20.57	H	-1.92	-----	18.65	-----	46.0	-----	27.4
951	-----	20.51	H	2.77	-----	23.28	-----	46.0	-----	22.7
2604.5	44.46	42.43	H	6.34	50.80	48.77	74.0	54.0	23.2	5.2

**Table 7.3.2-2: Radiated Emissions Tabulated Data – 2S Meter**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
30	-----	18.33	V	-6.70	-----	11.63	-----	40.0	-----	28.4
194.51	-----	33.57	V	-15.80	-----	17.77	-----	43.5	-----	25.7
311.986	-----	35.32	H	-11.20	-----	24.12	-----	46.0	-----	21.9
441.982	-----	38.21	V	-6.48	-----	31.73	-----	46.0	-----	14.3
700	-----	20.51	H	-1.80	-----	18.71	-----	46.0	-----	27.3
948	-----	20.36	V	2.54	-----	22.90	-----	46.0	-----	23.1
2604.5	46.18	41.15	H	6.34	52.52	47.49	74.0	54.0	21.5	6.5

**Table 7.3.2-3: Radiated Emissions Tabulated Data – 12S Meter**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
30	-----	21.20	V	-6.70	-----	14.50	-----	40.0	-----	25.5
109.8	-----	23.33	H	-13.80	-----	9.53	-----	43.5	-----	34.0
311.972	-----	38.24	H	-11.20	-----	27.04	-----	46.0	-----	19.0
441.984	-----	40.75	H	-6.48	-----	34.27	-----	46.0	-----	11.7
703	-----	20.26	H	-1.77	-----	18.49	-----	46.0	-----	27.5
946	-----	19.96	V	2.38	-----	22.34	-----	46.0	-----	23.7
2604.5	45.87	40.21	H	6.34	52.21	46.55	74.0	54.0	21.8	7.5

\* Note: All emissions above 2604.5 MHz were attenuated below the permissible limit.

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

### 7.4.1 Measurement Procedure (Conducted Method)

The 20dB bandwidth of the EUT was within the resolution bandwidth of spectrum analyzer, therefore the power measurement was made using the spectrum analyzer method. The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The resolution and video bandwidth were set to > 20 dB bandwidth of the emission measured. The device employs >50 channels therefore the power is limited to 1 Watt.

### 7.4.2 Measurement Results

Results are shown in Table 7.4-1 and Figures 7.4-1 to 7.4-9 below.

**Table 7.4.2-1: RF Output Power**

Frequency [MHz]	Modulation	Data Rate (kbps)	Level [dBm]
902.25	FSK	19.2	24.31
914.75	FSK	19.2	23.86
927.75	FSK	19.2	22.51
902.25	FSK	152.3	24.83
914.75	FSK	152.3	23.88
927.75	FSK	152.3	22.26
909.6	OOK	16.4	21.56
915.8	OOK	16.4	23.70
921.8	OOK	16.4	23.45

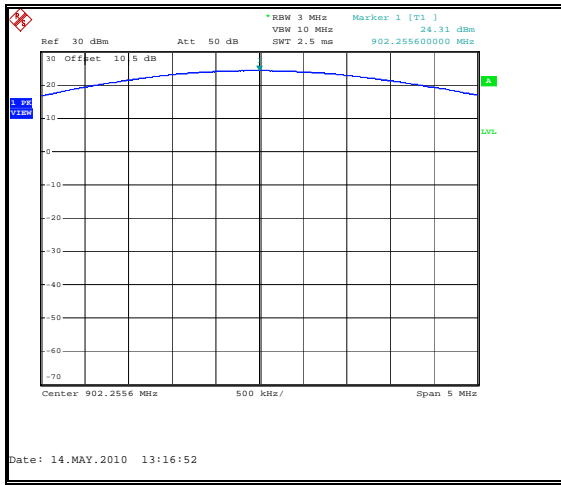


Figure 7.4.2-1: Output Power – LCH - FSK 19.2kbps

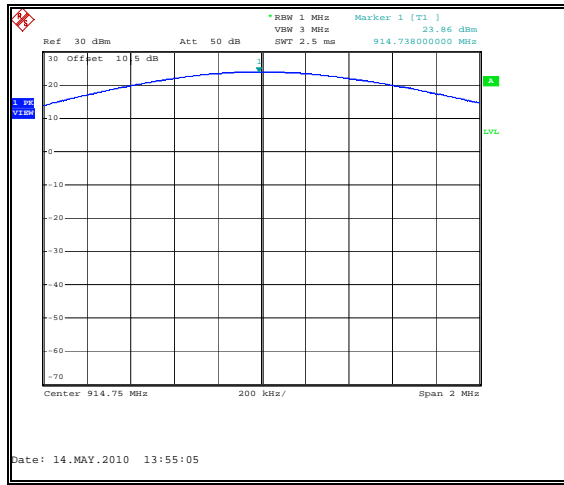


Figure 7.4.2-2: Output Power – MCH - FSK 19.2kbps

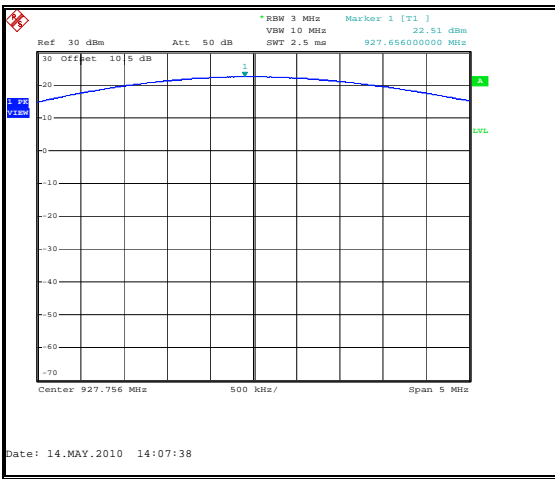


Figure 7.4.2-3: Output Power – HCH - FSK 19.2kbps

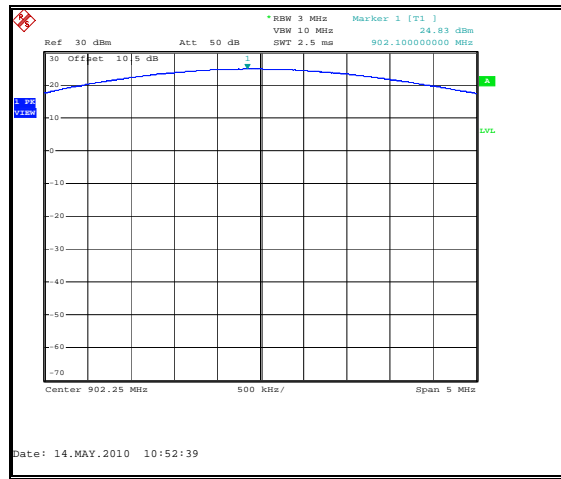


Figure 7.4.2-4: Output Power – LCH - FSK 152.3kbps

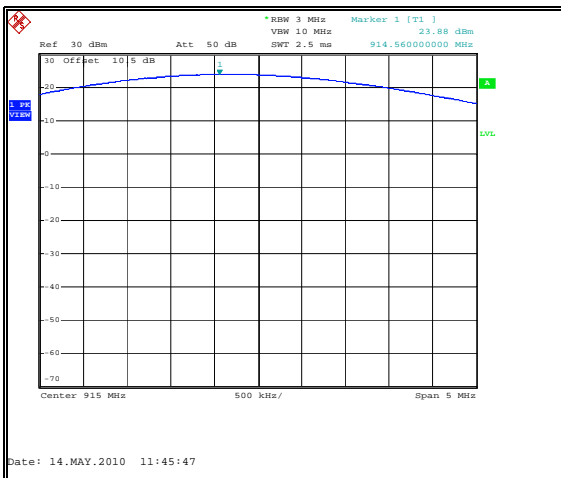


Figure 7.4.2-5: Output Power – MCH - FSK 152.3kbps

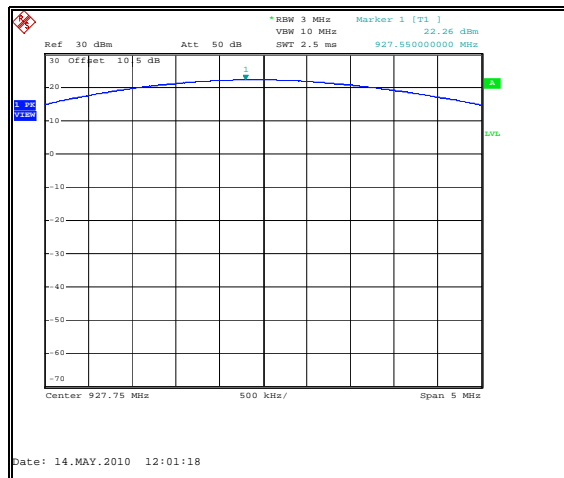


Figure 7.4.2-6: Output Power – HCH - FSK 152.3kbps



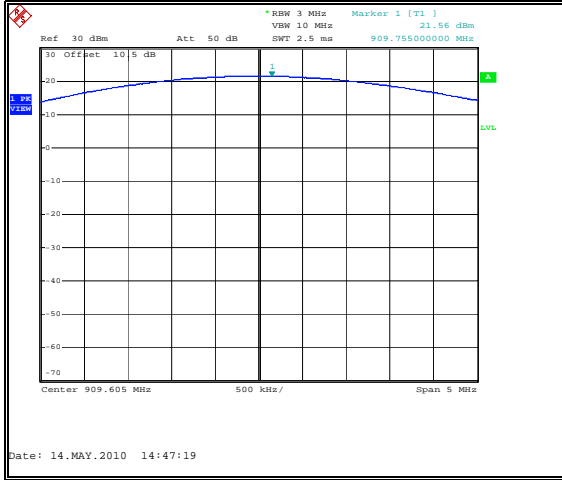


Figure 7.4.2-7: Output Power – LCH - OOK 16.4kbps

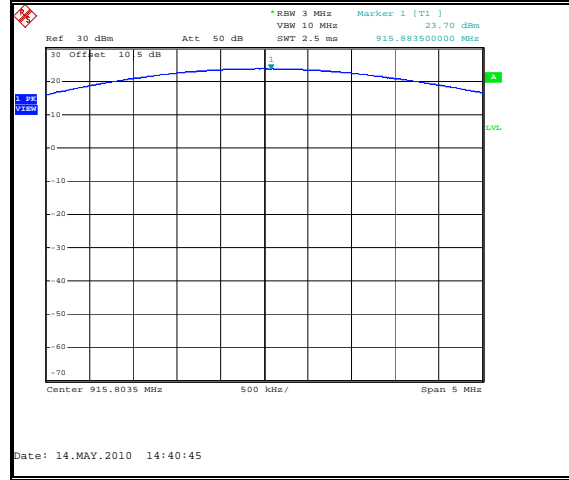


Figure 7.4.2-8: Output Power – MCH - OOK 16.4kbps

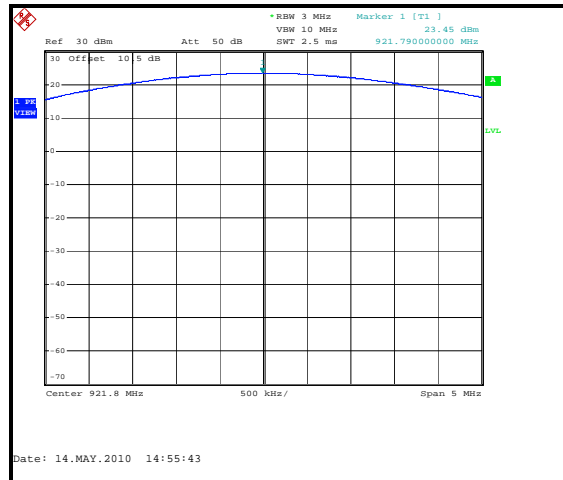


Figure 7.4.2-9: Output Power – HCH - OOK 16.4kbps

### 7.5 Channel Usage Requirements

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

##### 7.5.1.1 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  $\geq 1\%$  of the span.

Carrier frequency separation was measured for all modulations and data presented in section 7.5.1.2 below.

##### 7.5.1.2 Measurement Results

The adjacent channel separation was measured to be 500 kHz for FSK modulation and 200kHz for OOK modulation. Results are shown below in Figures 7.5.1.2-1 to 7.5.1.2-2.

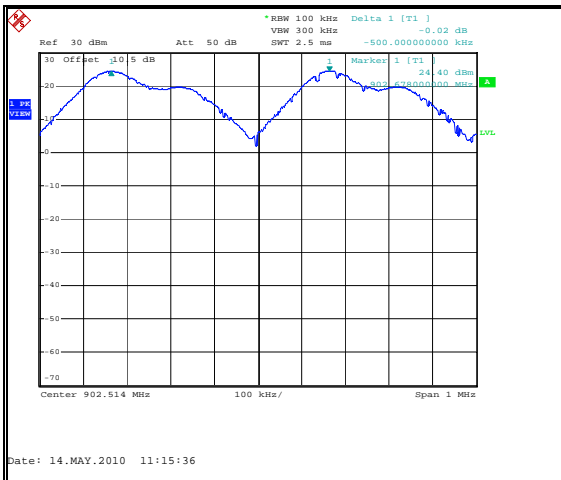


Figure 7.5.1.2-1: FSK Modulation (All Data Rates)

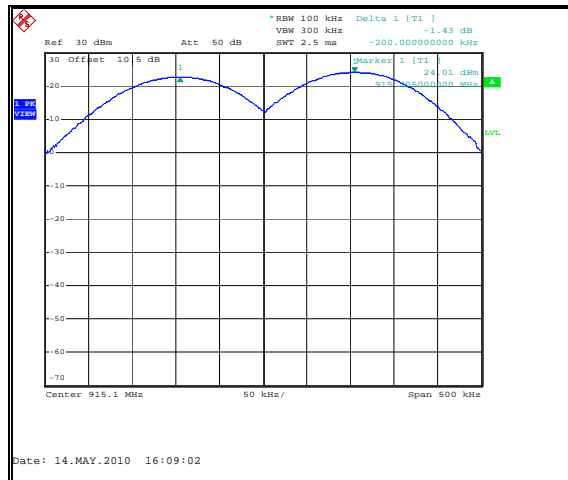


Figure 7.5.1.2-2: OOK Modulation

**7.5.2 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 250 kHz. The device employs > 50 hopping channels as required. Results are shown below in Figures 7.5.2-1 to 7.5.2-2.

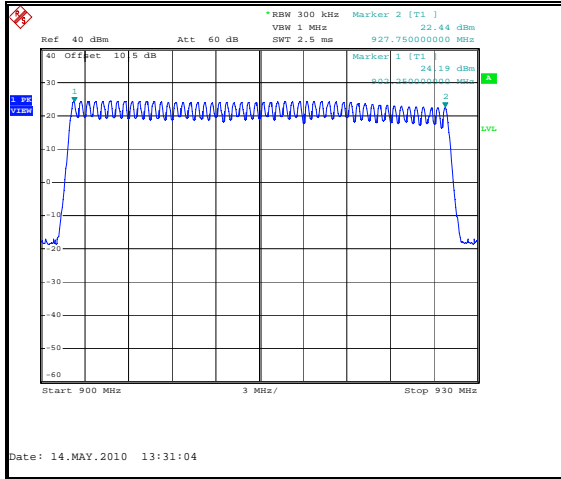


Figure 7.5.2-1: Hopping Channels - FSK Modulation

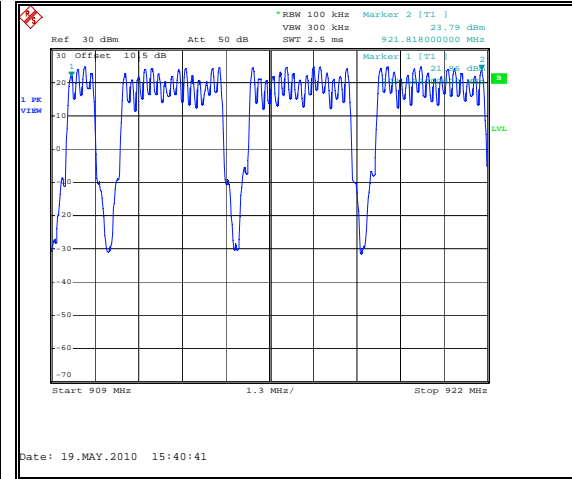


Figure 7.5.2-2: Hopping Channels - OOK Modulation

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

7.5.3.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The hopping channel is centered on the analyzer and the span set to 0 Hz. The RBW was set to 1 MHz and the VBW to 3 MHz. Sweep time was adjusted to capture the burst duration of the emission. The marker –delta function of the analyzer was employed to measure the burst duration.

7.5.3.2 Measurement Results

The duration of the RF transmission was measured as 125.6 ms for FSK modulation using 19.2kbps data rate. The duration of the RF transmission was measured as 87.2 ms for FSK modulation using 152.3 kbps data rate. The duration of the RF transmission was measured as 5.7 ms for OOK modulation. The maximum time of occupancy on any channel in a 20 second period is 125.6ms. A single transmission for each modulation is shown in figures 7.5.3.2-1 to 7.5.3.2-3 below.

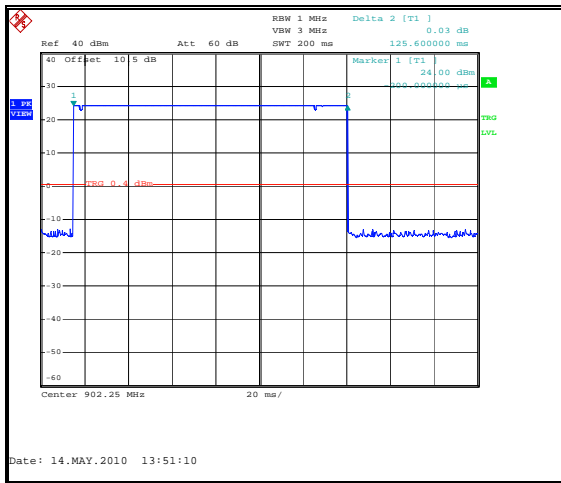


Figure 7.5.3.2-1: Dwell Time - FSK 19.2kbps

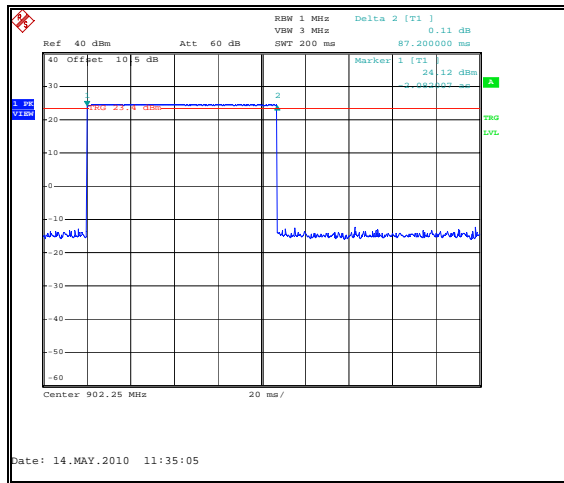


Figure 7.5.3.2-2: Dwell Time - FSK 152.3kbps

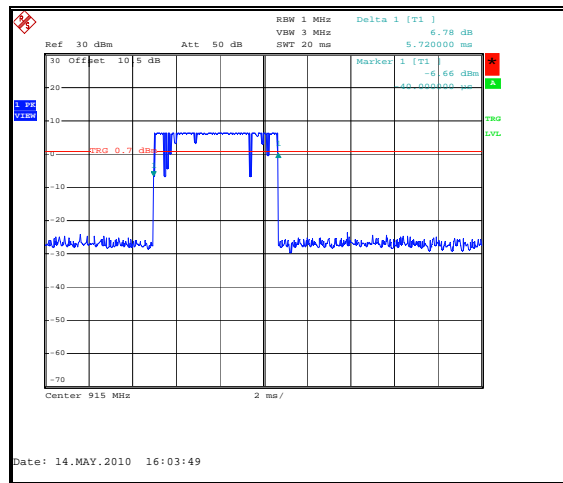


Figure 7.5.3.2-3: Dwell Time – OOK 16.4kbps

**7.5.4 20dB / 99% Bandwidth - FCC: Section 15.247(a)(1)(i) IC: RSS-210 A8.1(c)****7.5.4.1 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  $\geq 1\%$  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 to 1% to 3% of the approximate emission width. The trace was set to max hold with a peak detector active. The occupied bandwidth measurement function of the analyzer was used for the 99% bandwidth.

**7.5.4.2 Measurement Results**

Results are shown below in Table 7.5.4.2-1 and Figures 7.5.4.2-1 through 7.5.4.2-18.

**Table 7.5.4.2-1: 20dB / 99% Bandwidth**

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]	Modulation
902.25	65.7	64.4	FSK (19.2 kbps)
914.75	63.3	64.6	FSK (19.2 kbps)
927.75	63.0	64.4	FSK (19.2 kbps)
902.25	334.0	340.0	FSK (152.3 kbps)
914.75	336.0	341.0	FSK (152.3 kbps)
927.75	332.0	337.0	FSK (152.3 kbps)
909.6	49.8	49.5	OOK (16.4 kbps)
915.8	50.0	49.7	OOK (16.4 kbps)
921.8	49.6	49.5	OOK (16.4 kbps)



Figure 7.5.4.2-1: 20dB BW LCH – FSK 19.2kbps



Figure 7.5.4.2-2: 20dB BW MCH – FSK 19.2kbps

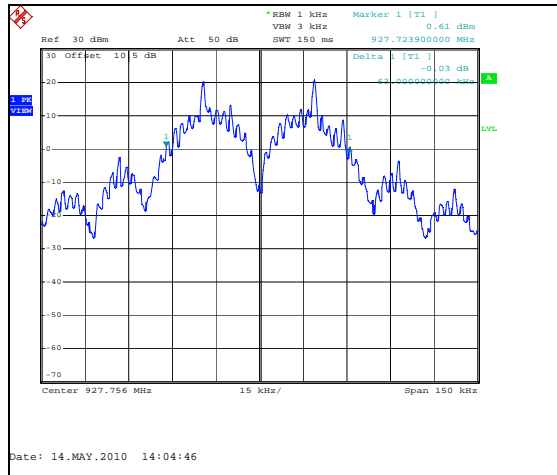


Figure 7.5.4.2-3: 20dB BW HCH – FSK 19.2kbps

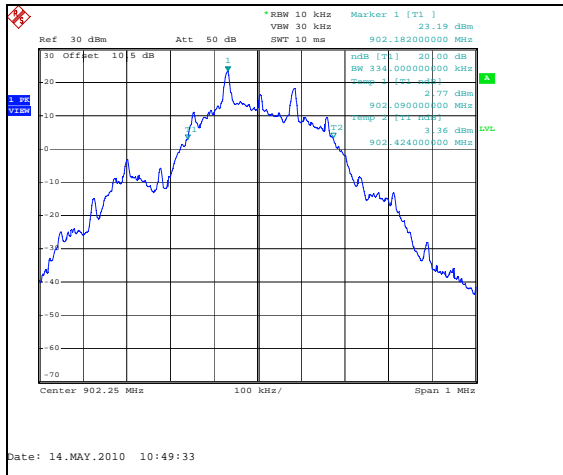


Figure 7.5.4.2-4: 20dB BW LCH – FSK 152.3kbps

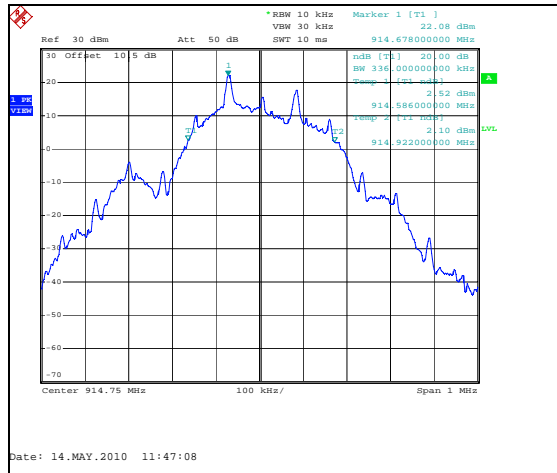


Figure 7.5.4.2-5: 20dB BW MCH – FSK 152.3kbps

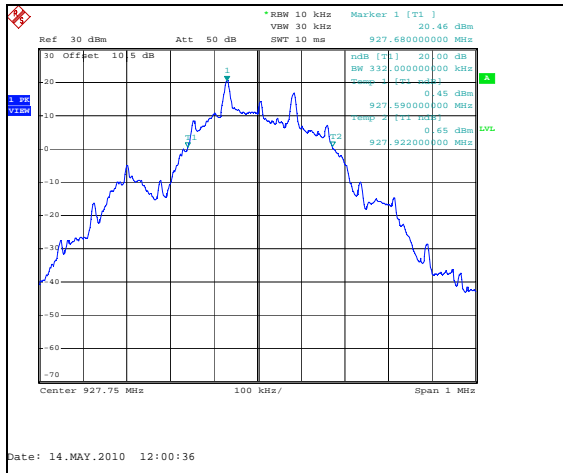


Figure 7.5.4.2-6: 20dB BW HCH – FSK 152.3kbps

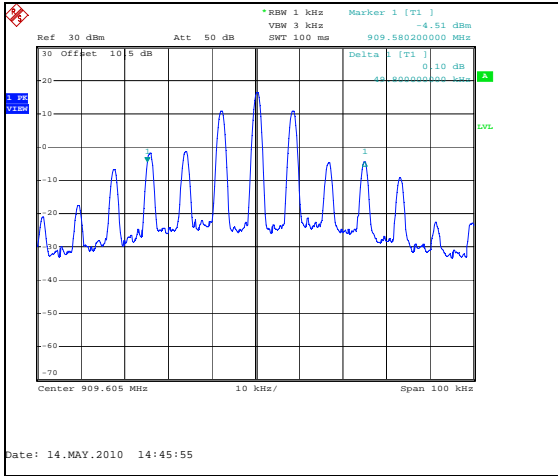


Figure 7.5.4.2-7: 20dB BW LCH – OOK 16.4kbps

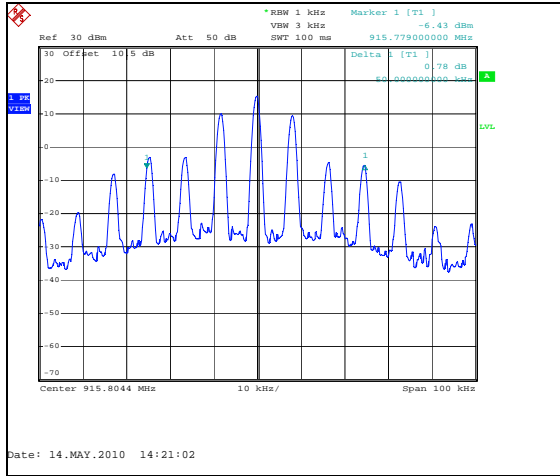


Figure 7.5.4.2-8: 20dB BW MCH – OOK 16.4kbps

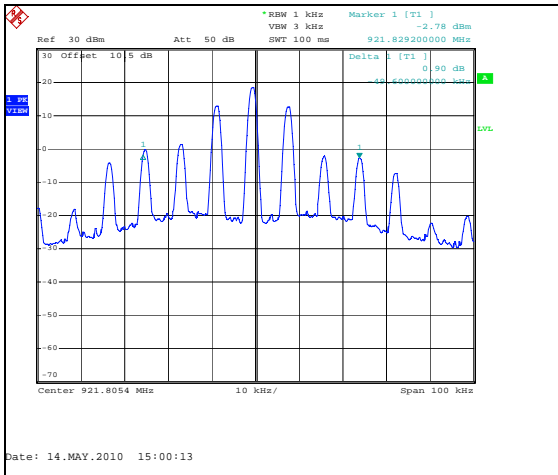


Figure 7.5.4.2-9: 20dB BW HCH – OOK 16.4kbps

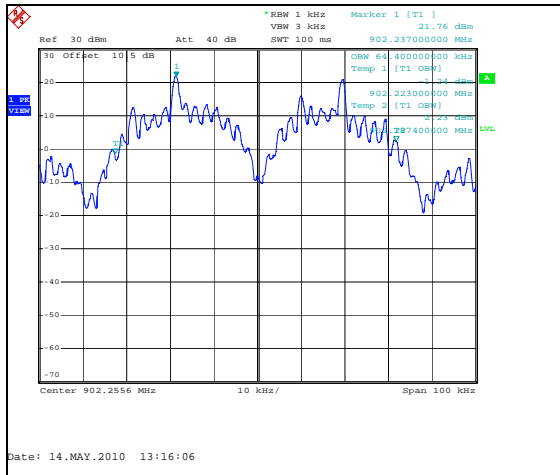


Figure 7.5.4.2-10: 99% BW LCH – FSK 19.2kbps

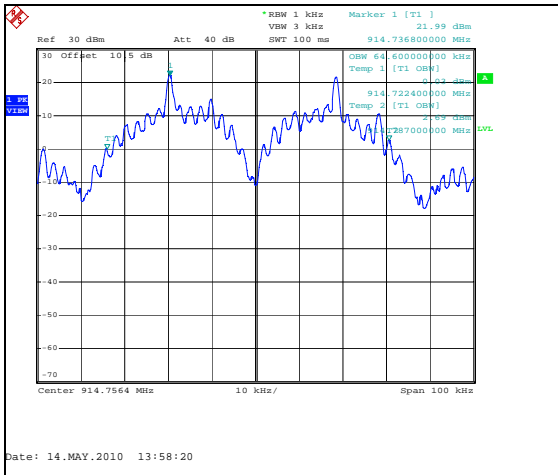


Figure 7.5.4.2-11: 99% BW MCH – FSK 19.2kbps

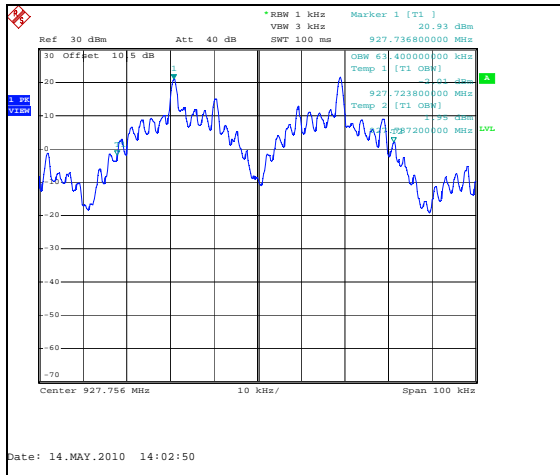


Figure 7.5.4.2-12: 99% BW HCH – FSK 19.2kbps

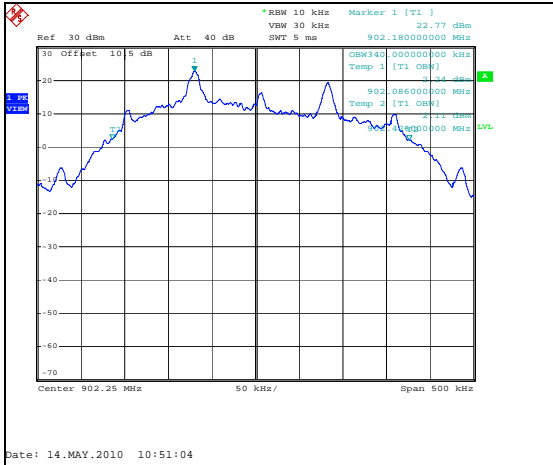


Figure 7.5.4.2-13: 99% BW LCH – FSK 152.3kbps

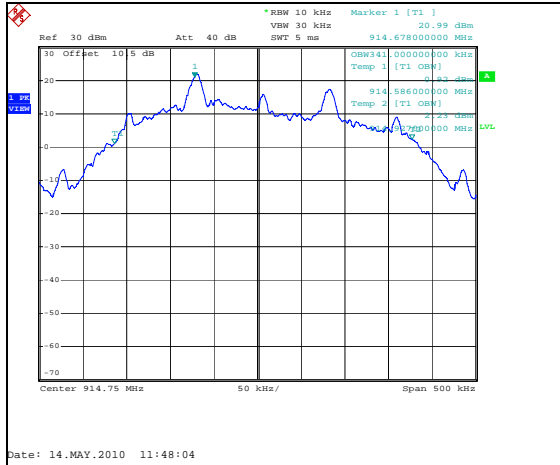


Figure 7.5.4.2-14: 99% BW MCH – FSK 152.3kbps

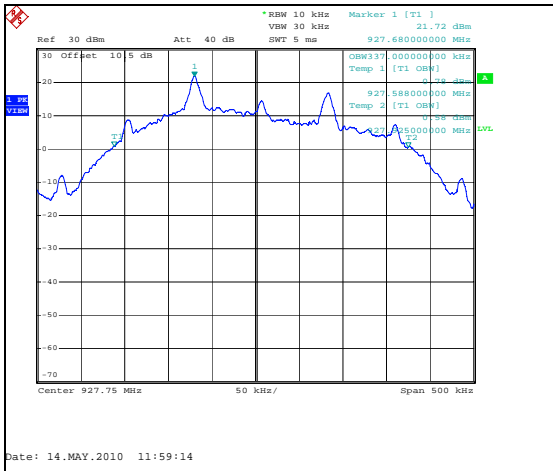


Figure 7.5.4.2-15: 99% BW HCH – FSK 152.3kbps

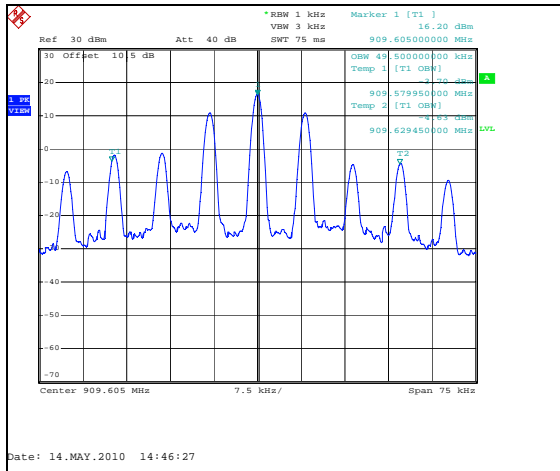


Figure 7.5.4.2-16: 99% BW LCH – OOK 16.4kbps

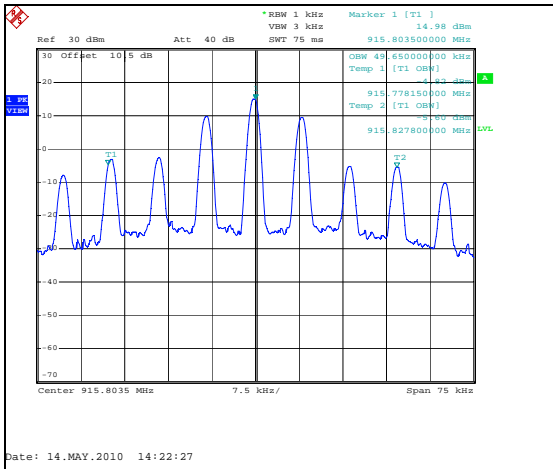


Figure 7.5.4.2-17: 99% BW MCH – OOK 16.4kbps

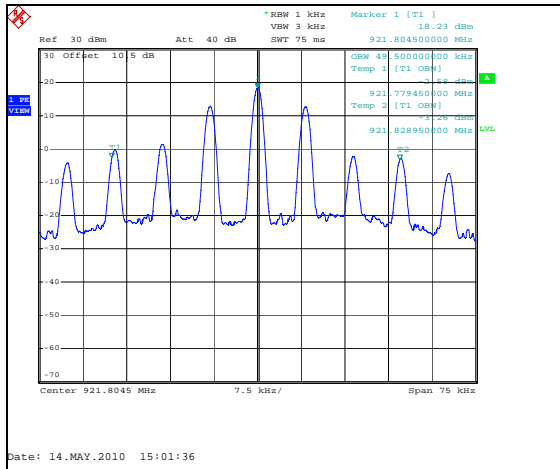


Figure 7.5.4.2-18: 99% BW HCH – OOK 16.4kbps



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

7.6.1 Band-Edge Compliance of RF Conducted Emissions

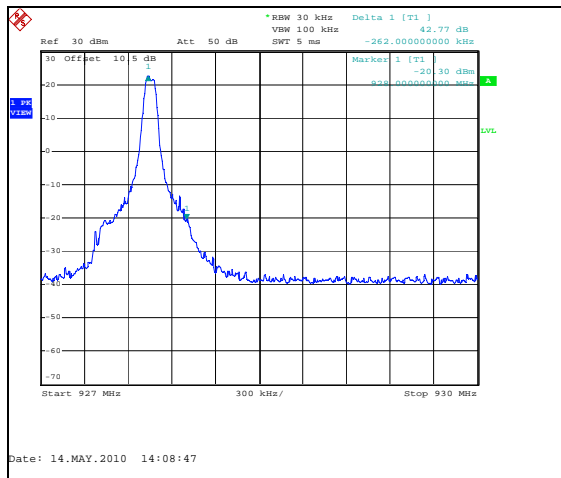
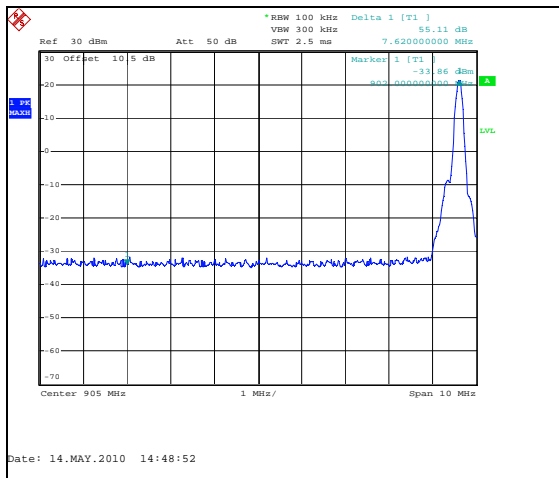
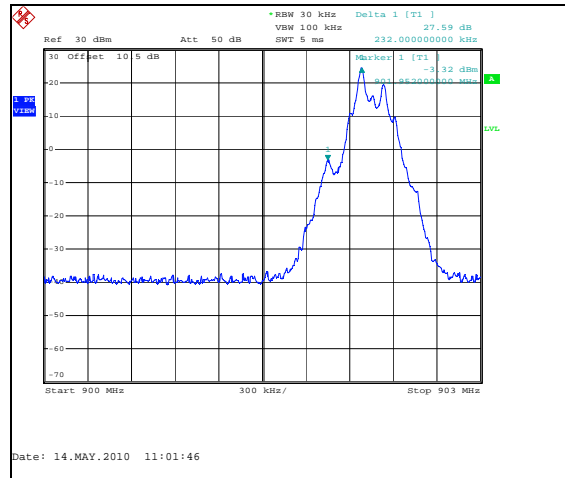
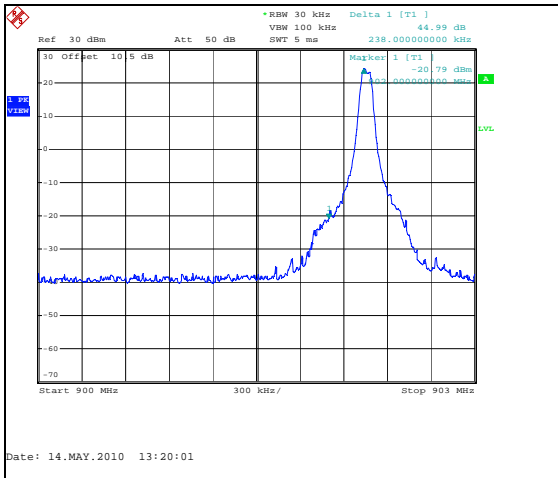
7.6.1.1 Measurement Procedure

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  $\geq 1\%$  of the span, and the VBW was set to  $\geq 3$  times RBW.

Band-edge was evaluated for all combinations of modulations and data rates.

7.6.1.2 Measurement Results

Results are shown in the figures 7.6.1.2-1 to 7.6.1.2.12 below.



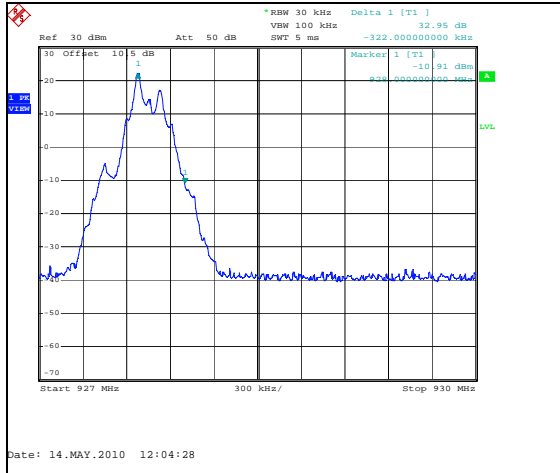


Figure 7.6.1.2-5: Upper Band-edge - FSK 152.3 kbps

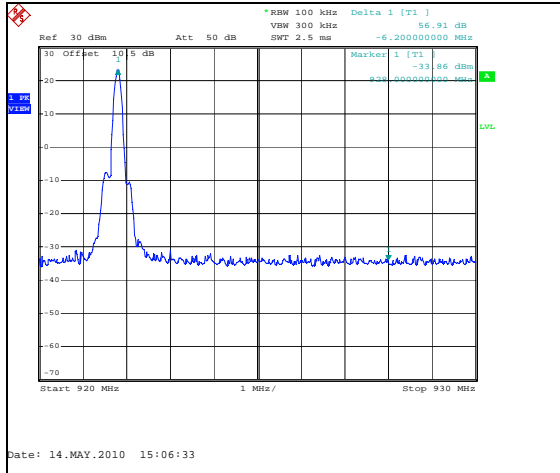


Figure 7.6.1.2-6: Upper Band-edge – OOK 16.4 kbps

**HOPPING MODE:**

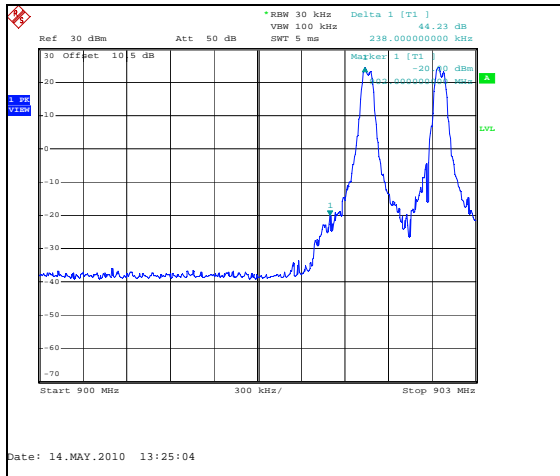


Figure 7.6.1.2-7: Lower Band-edge – FSK 19.2 kbps

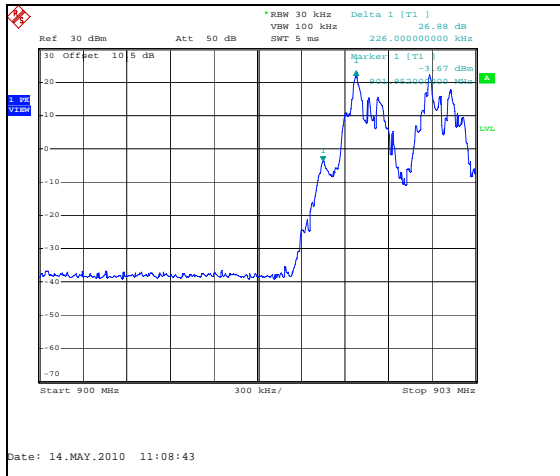


Figure 7.6.1.2-8: Lower Band-edge – FSK 152.3 kbps

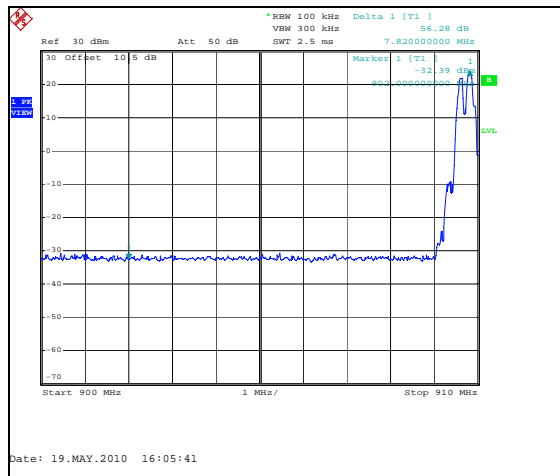


Figure 7.6.1.2-9: Lower Band-edge – OOK 16.4 kbps

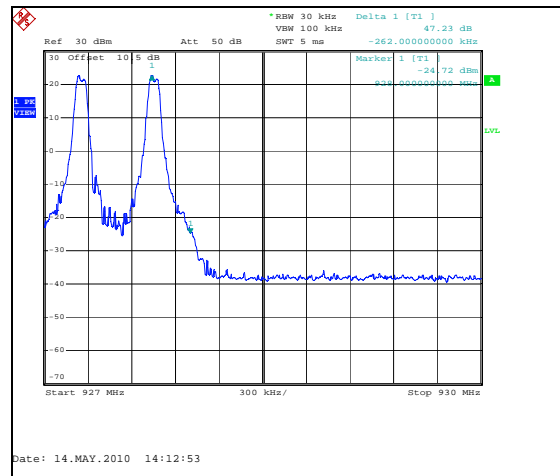


Figure 7.6.1.2-10: Upper Band-edge - FSK 19.2 kbps

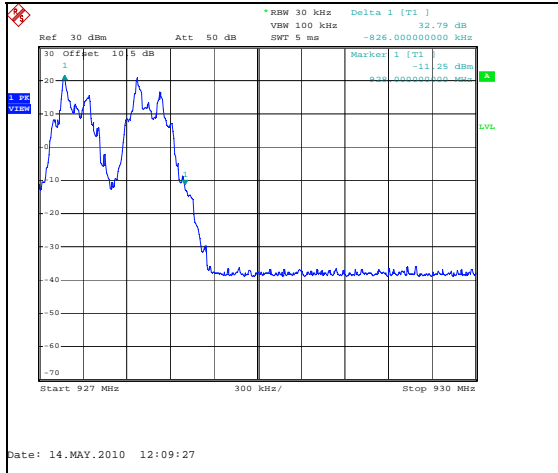


Figure 7.6.1.2-11: Upper Band-edge - FSK 152.3 kbps

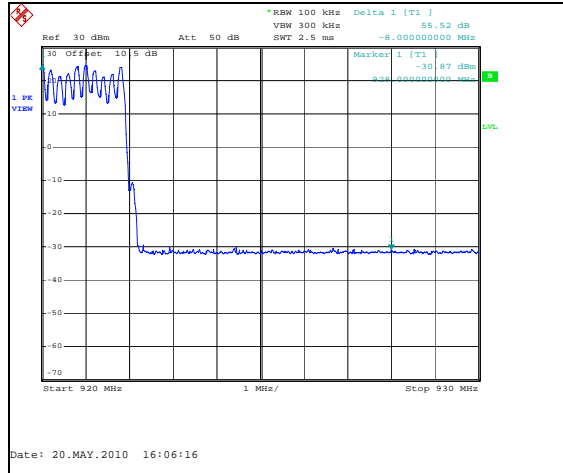


Figure 7.6.1.2-12: Upper Band-edge - OOK 16.4 kbps

## 7.6.2 RF Conducted Spurious Emissions

### 7.6.2.1 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 modulations and data rates.

### 7.6.2.2 Measurement Results

Results are shown below in Figures 7.6.2.2-1 to 7.6.2.2-18:

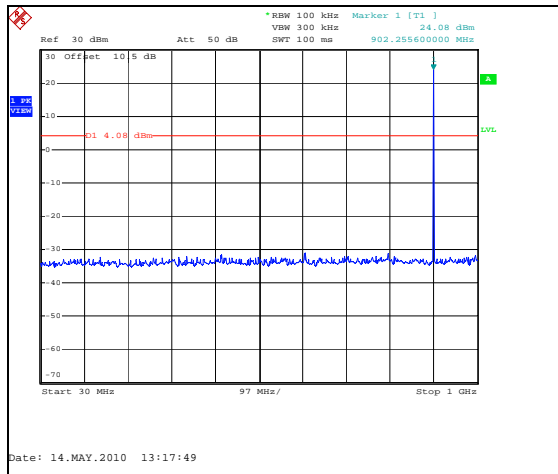


Figure 7.6.2.2-1: LCH - FSK 19.2 kbps

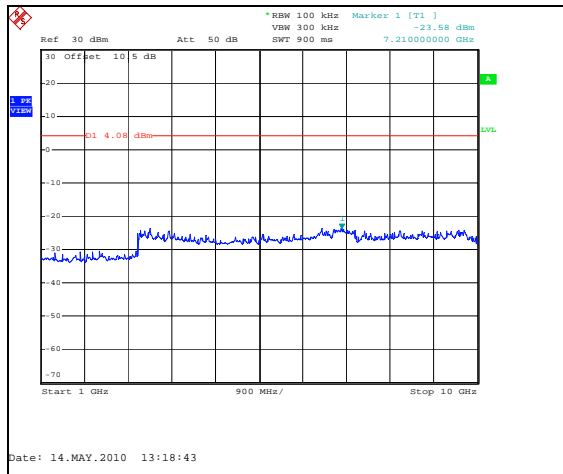


Figure 7.6.2.2-2: LCH - FSK 19.2 kbps

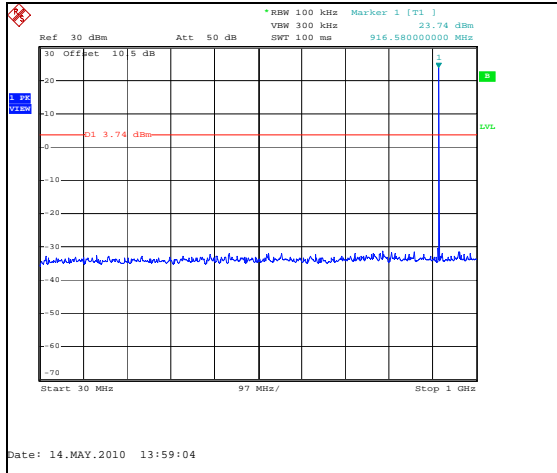


Figure 7.6.2.2-3: MCH – FSK 19.2 kbps

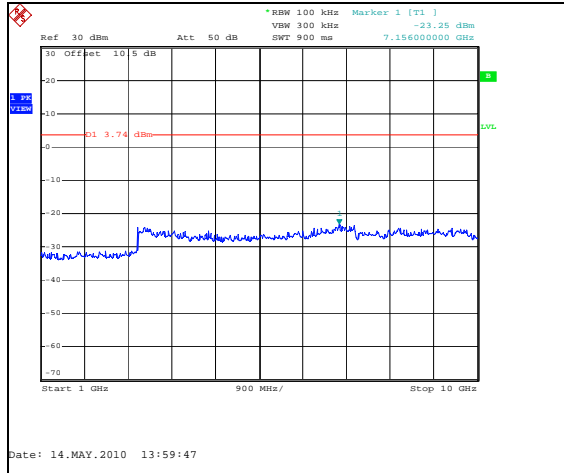


Figure 7.6.2.2-4: MCH – FSK 19.2 kbps

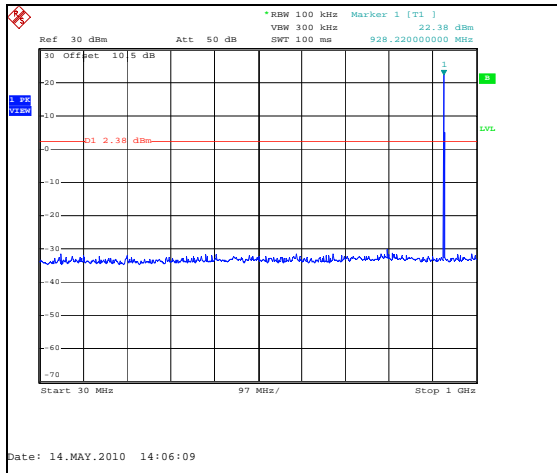


Figure 7.6.2.2-5: HCH – FSK 19.2 kbps

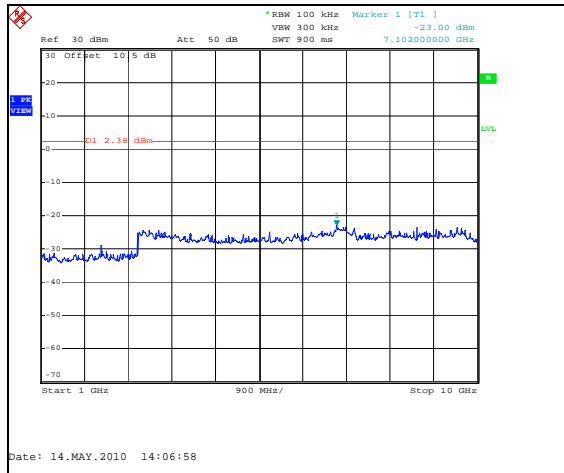


Figure 7.6.2.2-6: HCH – FSK 19.2 kbps

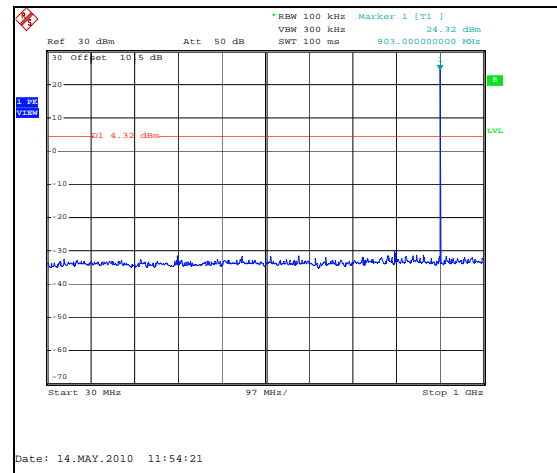


Figure 7.6.2.2-7: LCH – FSK 152.3 kbps

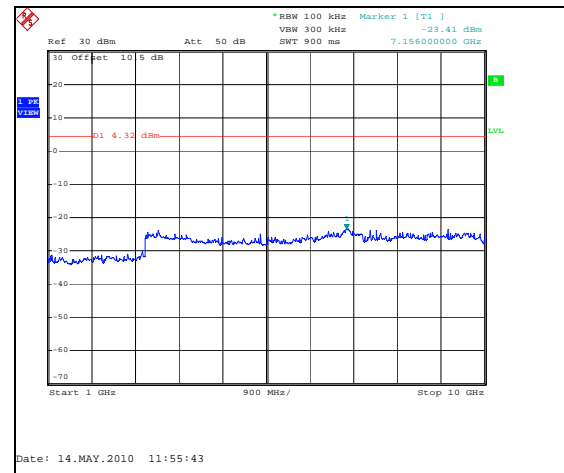


Figure 7.6.2.2-8: LCH – FSK 152.3 kbps

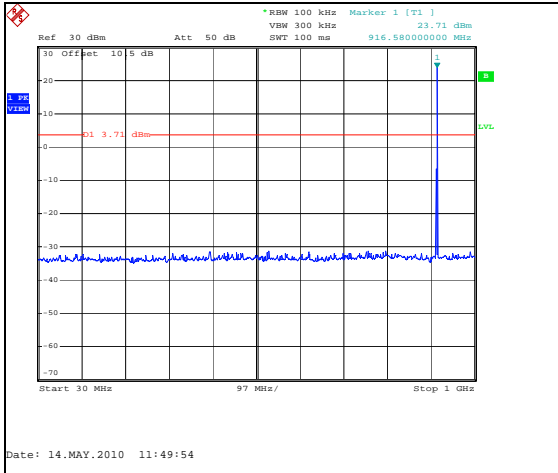


Figure 7.6.2.2-9: MCH – FSK 152.3 kbps

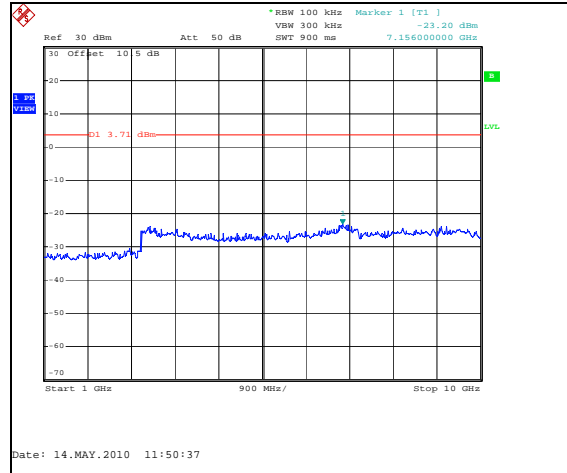


Figure 7.6.2.2-10: MCH – FSK 152.3 kbps

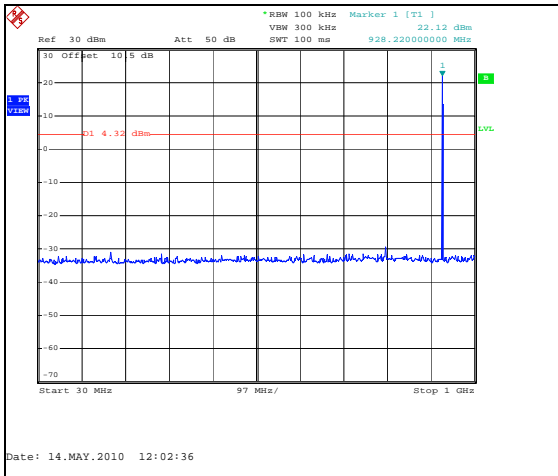


Figure 7.6.2.2-11: HCH – FSK 152.3 kbps

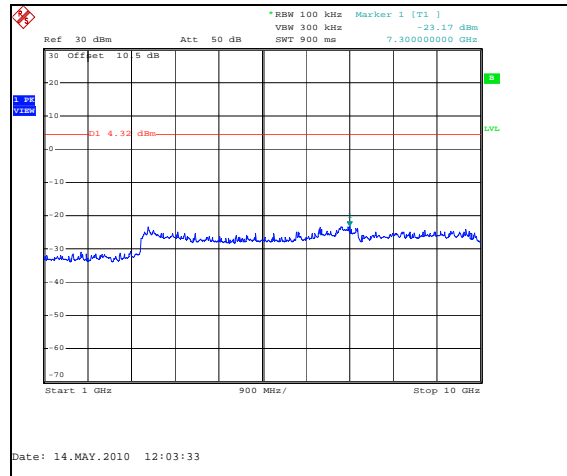


Figure 7.6.2.2-12: HCH – FSK 152.3 kbps

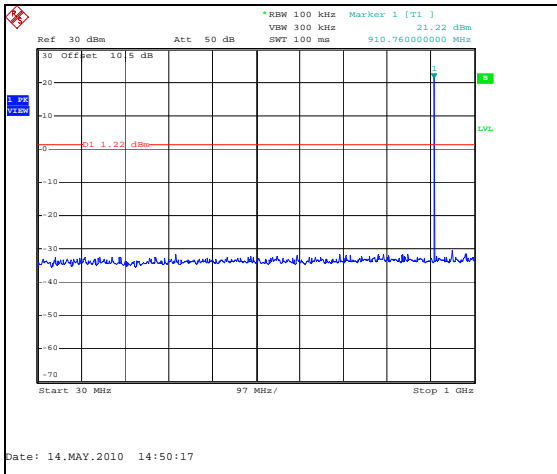


Figure 7.6.2.2-13: LCH – OOK 16.4 kbps

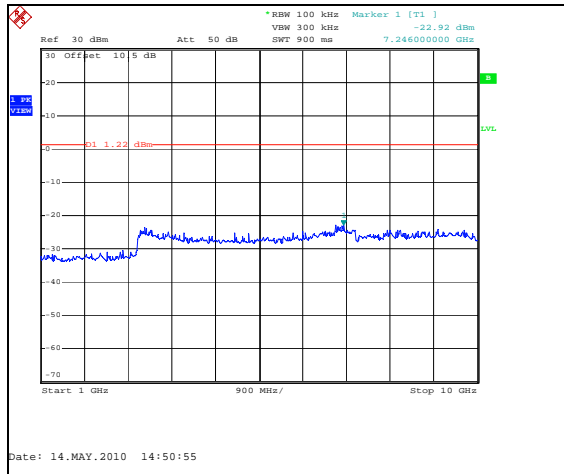


Figure 7.6.2.2-14: LCH – OOK 16.4 kbps

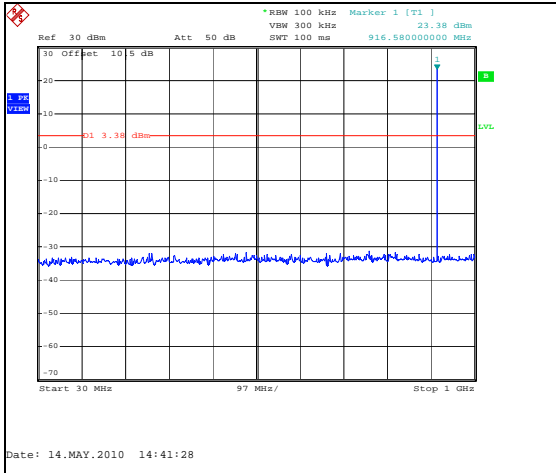


Figure 7.6.2.2-15: MCH – OOK 16.4 kbps

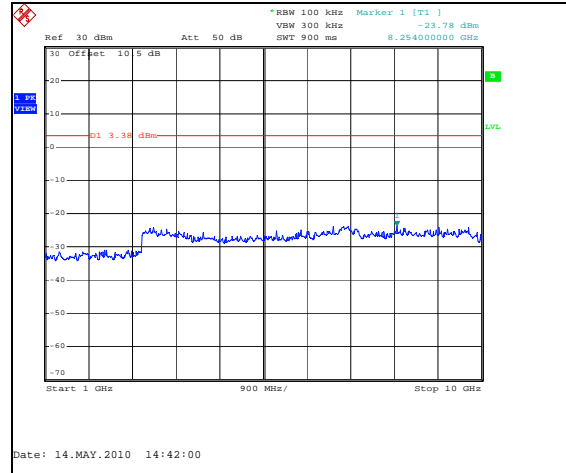


Figure 7.6.2.2-16: MCH – OOK 16.4 kbps

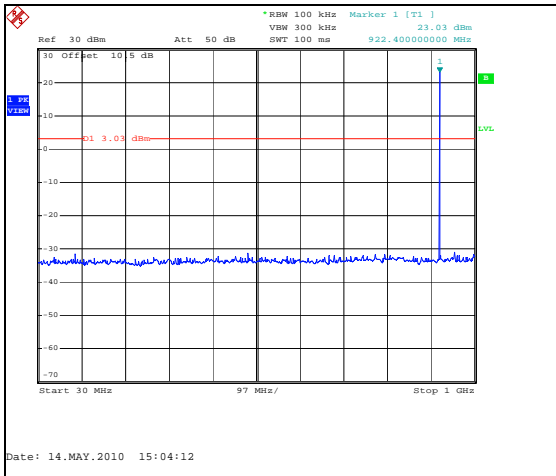


Figure 7.6.2.2-17: HCH – OOK 16.4 kbps

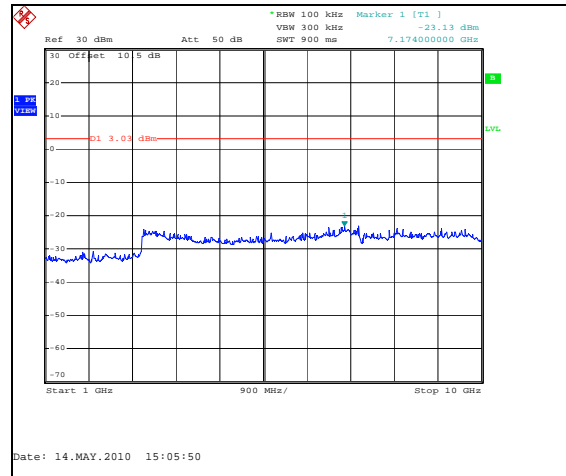


Figure 7.6.2.2-18: HCH – OOK 16.4 kbps

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

#### 7.6.3.1 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 measurements 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 modulations and data rates with worst case data provided. Worst case for FSK modulation was for 19.2 kbps data rate.

#### 7.6.3.2 Measurement Results

Radiated spurious emissions found in the band of 30MHz to 10GHz are reported in the Table 7.6.3.2-1 below.

**Table 7.6.3.2-1: Radiated Spurious Emissions – FSK Modulation - 1S Meter**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
<b>Low Channel</b>										
2706.75	45.36	45.36	H	1.27	46.63	46.63	74.0	54.0	27.4	7.4
4511.25	47.15	47.15	H	5.42	52.57	52.57	74.0	54.0	21.4	1.4
4511.25	46.81	46.81	V	5.42	52.23	52.23	74.0	54.0	21.8	1.8
<b>Middle Channel</b>										
2744.25	44.98	44.98	H	1.37	46.35	46.35	74.0	54.0	27.6	7.6
4573.75	46.55	46.55	H	5.67	52.22	52.22	74.0	54.0	21.8	1.8
4573.75	46.13	46.13	V	5.67	51.80	51.80	74.0	54.0	22.2	2.2
<b>High Channel</b>										
2783.25	43.88	43.88	H	1.49	45.37	45.37	74.0	54.0	28.6	8.6

**Table 7.6.3.2-2: Radiated Spurious Emissions – FSK Modulation - 2S Meter**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
<b>Low Channel</b>										
2706.75	46.57	46.57	H	1.27	47.84	47.84	74.0	54.0	26.2	6.2
4511.25	47.13	47.13	H	5.42	52.55	52.55	74.0	54.0	21.5	1.5
4511.25	46.91	46.91	V	5.42	52.33	52.33	74.0	54.0	21.7	1.7
<b>Middle Channel</b>										
2744.25	44.55	44.55	H	1.37	45.92	45.92	74.0	54.0	28.1	8.1
4573.75	45.97	45.97	H	5.67	51.64	51.64	74.0	54.0	22.4	2.4
4573.75	46.44	46.44	V	5.67	52.11	52.11	74.0	54.0	21.9	1.9
<b>High Channel</b>										
2783.25	44.03	44.03	H	1.49	45.52	45.52	74.0	54.0	28.5	8.5

**Table 7.6.3.2-3: Radiated Spurious Emissions – FSK Modulation - 12S Meter**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
<b>Low Channel</b>										
2706.75	44.87	44.87	H	1.27	46.14	46.14	74.0	54.0	27.9	7.9
4511.25	47.29	47.29	H	5.42	52.71	52.71	74.0	54.0	21.3	1.3
4511.25	45.90	45.90	V	5.42	51.32	51.32	74.0	54.0	22.7	2.7
<b>Middle Channel</b>										
2744.25	45.87	45.87	H	1.37	47.24	47.24	74.0	54.0	26.8	6.8
4573.75	46.06	46.06	H	5.67	51.73	51.73	74.0	54.0	22.3	2.3
4573.75	45.70	45.70	V	5.67	51.37	51.37	74.0	54.0	22.6	2.6
<b>High Channel</b>										
4638.75	40.41	40.41	H	5.93	46.34	46.34	74.0	54.0	27.7	7.7

**Table 7.6.3.2-4: Radiated Spurious Emissions – OOK Modulation - 1S Meter**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
<b>Low Channel</b>										
<b>Noise Floor</b>										
<b>Middle Channel</b>										
4579	42.61	42.61	V	7.43	50.04	50.04	74.0	54.0	24.0	4.0
<b>High Channel</b>										
<b>Noise Floor</b>										

**Table 7.6.3.2-5: Radiated Spurious Emissions – OOK Modulation - 2S Meter**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
<b>Low Channel</b>										
2728.8	41.17	41.17	H	2.13	43.30	43.30	74.0	54.0	30.7	10.7
<b>Middle Channel</b>										
<b>Noise Floor</b>										
<b>High Channel</b>										
2765.4	41.79	41.79	H	2.26	44.05	44.05	74.0	54.0	29.9	9.9

**Table 7.6.3.2-6: Radiated Spurious Emissions – OOK Modulation - 12S Meter**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
<b>Low Channel</b>										
2728.8	43.55	43.55	H	2.13	45.68	45.68	74.0	54.0	28.3	8.3
<b>Middle Channel</b>										
2747.4	41.35	41.35	H	2.20	43.55	43.55	74.0	54.0	30.5	10.5
<b>High Channel</b>										
2765.4	43.24	43.24	H	2.26	45.50	45.50	74.0	54.0	28.5	8.5
2765.4	42.56	42.56	V	2.26	44.82	44.82	74.0	54.0	29.2	9.2



**7.6.3.3 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:  $45.36 + 1.27 = 46.63\text{dBuV/m}$ Margin:  $74\text{dBuV/m} - 46.63\text{dBuV/m} = 27.4\text{dB}$ **Example Calculation: Average**Corrected Level:  $45.36 + 1.27 - 0 = 46.63\text{dBuV}$ Margin:  $54\text{dBuV} - 46.63\text{dBuV} = 7.4\text{dB}$ **8 CONCLUSION**

In the opinion of ACS, Inc. the AMI6, manufactured by Itron Electricity Metering, Inc. meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210

**END REPORT**