Underwriters Laboratories Inc.
333 Pfingsten Rd.
Northbrook, IL 60062

www.ul.com/emc
(847) 272-8800

Job Number:	1001099121
Project Number	09CA17942B
File Number:	MC15947
Date:	May 22, 2009
Model:	ITCS-A-102
FCC ID:	WFQITCSA102

Electromagnetic Compatibility Test Report

For

RF Controls LLC

Test Report Details

Tests Performed By:	**Underwriters Laboratories Inc.** **333 Pfingsten Rd.** **Northbrook, IL 60062**
Tests Performed For:	**RF Controls LLC** 1141 S. 7th St. St. Louis, MO 63104-3623
Applicant Contact: Phone: E-mail:	**Mr. Chris Turner** 314-571-6200 turner.c@virgin.net
Test Report Date:	**May 22, 2008**
Product Type:	**900MHz RF ID Frequency Hopping Transmitter**
Product standards	47 CFR Part 15.247, Subpart C
Model Number:	**ITCS-A-102**
EUT Category:	**Unlicensed Transmitter**
Testing Start Date:	**April 21, 2009**
Date Testing Complete:	**May 3, 2009**
Overall Results:	**Compliant**

Underwriters Laboratories Inc. reports apply only to the specific samples tested under stated test conditions. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. Underwriters Laboratories Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from Underwriters Laboratories Inc. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or endorsement by NVLAP, A2LA, or any agency of the US government.

This report may contain test results that are not covered by the NVLAP or A2LA accreditation. The scope of accreditation is limited to the specific tests that are listed on the NVLAP and/or A2LA websites referenced at the end of this report.

Report Directory

Report Revision History

Revision Date	Description	Revised By	Revision Reviewed By
none			

1.0 G E N E R A L - Product Description

1.1 Equipment Description

The Signal Acquisition and Source Locator (SASL) is a phased array antenna for UHF RFID applications. The SASL is an electronically steerable phased array antenna coupled to a off-the shelf certified RFID reader. The SASL is designed to determine angle of arrival of UHF RFID tag signals. The SASL is part of the Inventory Tracking and Control System that uses two SASL's for locating UHF RFID tags in 3 dimensions.

1.2 Device Configuration During Test

1.2.1 Equipment Used During Test:

Use	Product Type	Manufacturer	Model	Comments
EUT	RF ID Reader	RF Controls LLC	ITCS-A-102	None
AE	Laptop Used	IBM	Lenovo T61	S/N L3-AP313
SIM	Software Used	RF Controls LLC	Manual Panel	Java Test UI

Note: **EUT** - Equipment Under Test, **AE** - Auxiliary/Associated Equipment, or **SIM** - Simulator (Not Subjected to Test)

1.2.2 Input/Output Ports:

Port #	Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
0	Enclosure	N/E	—	—	None
1	Mains	AC	N	N	None
2	Ethernet	TP	Y	N	None

Note:
AC = AC Power Port DC = DC Power Port N/E = Non-Electrical
I/O = Signal Input or Output Port (Not Involved in Process Control)
TP = Telecommunication Ports

1.2.3 Power Interface:

Mode # /Rated	Voltage (V)	Frequency (DC/AC-Hz)	Phases (#)	Comments
1	120	AC-60	1	None

1.3 EUT Configurations

Mode #	Description
1	Configured in Semi-Anechoic chamber on 80cm support.
2	Open lab area, radio connected directly to S/A input with attenuation between.
3	Configured on 80cm table connected to LISNs and set to transmit and receive.

1.4 EUT Operation Modes

Mode #	Description
1	Transmitting and Receiving Per ISO-18000-6C/EPC GEN2 FCC Dense Reader Mode
2	Receiving

2.0 Summary

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by Underwriters Laboratories Inc. in accordance with the procedures stated in each test requirement and specification. The applicant determined the list of tests performed were applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

2.1 Deviations from standard test methods

None

2.2 Device Modifications Necessary for Compliance

All changes were required only for the digital part of the EUT. The intentional radiator part of the EUT is not effected by the changes.

Changes to Array Controller (ArCon)

1. Add all standoffs (pillars) for TS-7300 to ArCon box
2. Filter PCB for power connector
   There will be a small PCB on the power connector (J109) on the 11001-405 cable to hold the ferrite bead described above as well as the filter capacitors. The filter bank is a parallel of 1nF, 100pF and 22pF capacitors. Add a wound ferrite bead (fair-rite PN 2461666661) to the hot power lead of the 11001-405 cable. This will be integrated in the filter PCB. As part of this design a small metal part will need to be created to connect from the chassis ground to the filter PCB.
3. Delete Sirit power connector (and since the power supply is a y-cable)
4. Add EMI shield to ground Ethernet connectors to box

Changes to the Input Ethernet cable

Three ferrites need to be added to the input (host) Ethernet connection. An input Ethernet cable with a plug and a jack that the user will plug their connector to was added. This cable has three ferrites (qty 2 Fair-Rite PN 2646540002 and one Fair-Rite PN 2661540202) on it (at 4" intervals).

Changes to the RFID Reader Ethernet cable

The Ethernet cable to the Sirit reader needs to be a shielded cable with a Fair-Rite clip on ferrite on it (PN 0461164281). The cable will be routed below the RFID reader, away from the mounting bracket.

Changes to the power supply assembly

The power supply assembly will now be a "Y" cable. The power supply will have one connection that connects to the ArCon, and one that connects to the Sirit. The connection to the ArCon requires a ferrrite (Fair-Rite PN 2643540002)

Changes to Input Power Cord

Use of a ferrite (Fair-Rite PN 0431164181) with one turn on the input power cord is required for operation at 230Vac.

2.3 Reference Standards

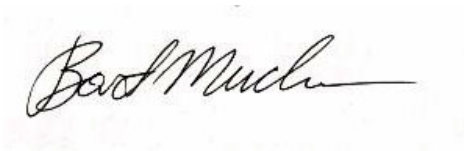
Standard Number	Standard Name	Standard Date
FCC Part 15, Subpart C	Code of Federal Regulations, Part 15, Radio Frequency Devices	2008
RSS-210, Issue 7	Low-Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment	June 2007
RSS-Gen, Issue 2	General Requirements and Information for the Certification of Radiocommunication Equipment	June 2007

*In addition to the above standards, FCC DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems was used.

2.4 Results Summary

Requirement – Test	Requirement – Test	Result (Compliant / Non-Compliant)*
Conducted Emissions	47 CFR Part 15.207 RSS-Gen 7.2.2	Compliant
Carrier Frequency Separation	47 CFR Part 15.247(a)(1) RSS-210 A8.1(b)	Compliant
20dB Bandwidth	47 CFR Part 15.247(a)(1)(i) RSS-210 A8.1(c)	Compliant
Number of Hopping Frequency	47 CFR Part 15.247(a)(1)(i) RSS-210 A8.1(c)	Compliant
Dwell Time	47 CFR Part 15.247(a)(1)(i) RSS-210 A8.1(c)	Compliant
Maximum Peak Output Power	47 CFR Part 15.247(b)(2) RSS-210 A8.4(1)	Compliant
Band Edge Compliance	47 CFR Part 15.247(d) RSS-210 A8.5	Compliant
Spurious Emissions	47 CFR Part 15.247(d) RSS-210 A8.5 RSS-Gen 7.2.1 and 7.2.3	Compliant
99% Occupied Bandwidth	RSS-Gen 4.6.1	Compliant

Test Engineer:



Bartlomiej Mucha (Ext.41216)
Senior Project Engineer
International EMC Services
Conformity Assessment Services-

Reviewer:

Michael Ferrer (Ext.41312)
Senior Project Engineer
International EMC Services
Conformity Assessment Services

3.0 Calibration of Equipment Used for Measurement

All test equipment and test accessories are calibrated on a regular basis. The maximum time between calibrations is one year or the manufacturers' recommendation, whichever is less.

All test equipment calibrations are traceable to the National Institute of Standards and Technology (NIST); therefore, all test data recorded in this report is traceable to NIST.

4.0 EMISSIONS TEST RESULTS

The emissions tests were performed according to following regulations:

---------- United States ----------

Code of Federal Regulations Title 47	Part 15, Subpart C, Radio Frequency Devices

---------- Canada ----------

Spectrum Management and Telecommunications - Radio Standards Specification	RSS-210, Issue 7: Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment
Spectrum Management and Telecommunications - Radio Standards Specification	RSS-Gen, Issue 2: General Requirements and Information for the Certification of Radiocommunication Equipment

Unless specified otherwise in the individual Methods, the tests shall be conducted under the following ambient conditions. Confirmation of these conditions shall be verified at the time the test is conducted.

Ambient Temperature, °C	22.5 ± 2.5	Relative Humidity, %	45 ± 15	Barometric Pressure, mBar	950 ± 150

4.1 Test Conditions and Results – MAINS TERMINAL – CONDUCTED EMISSIONS

Test Description	Measurements were made on a ground plane. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.

Basic Standard	FCC Part 15, Subpart C, 15.207 RSS-Gen 7.2.2	
UL LPG	80-EM-S0026	
	Frequency range on each side of line	Measurement Point
Fully configured sample scanned over the following frequency range	150kHz to 30MHz	Mains

Limits - Class B

Frequency (MHz)	Limit (dBµV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

Supplementary information: **Only Model ITCS-A-100 was tested for conducted emissions. All models (ITCS-A-102 and ITCS-A-104) use the same power supply, the same computer, the same radio and all other electronics therefore testing one representative mode was considered sufficient to show compliance.**

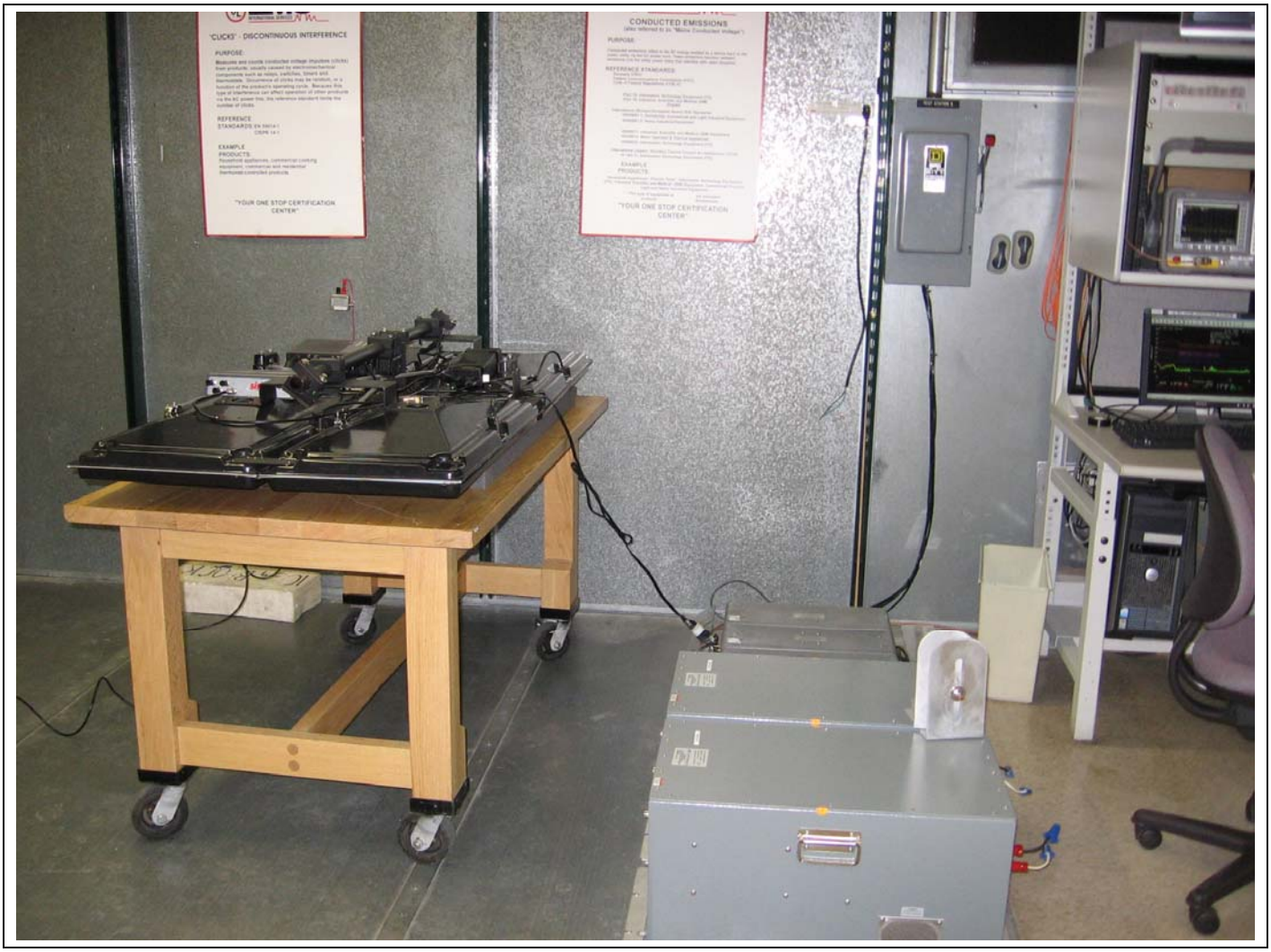
Table 1 Conducted Emissions EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	3	1 and 2
Supplementary information: None		

Table 2 Conducted Emissions Test Equipment

Description	Manufacturer	Model	Identifier
Spectrum Analyzer	Agilent	E7405A	EMC4242
Transient Limiter	Electro-Metrics	EM7600-2	EMC4224
HighPass Filter	Solar Electronics	2803-150	885551
Attenuator	HP	8494B	2831A00838
LISN - L1	Solar	8602-50-TS-50-N	EMC4052
LISN - L2	Solar	8602-50-TS-50-N	EMC4064

Figure 1 Test Setup for Conducted Emissions



*Representative Configuration Shown.

Figure 2 Conducted Emissions Graph – TX Middle Channel

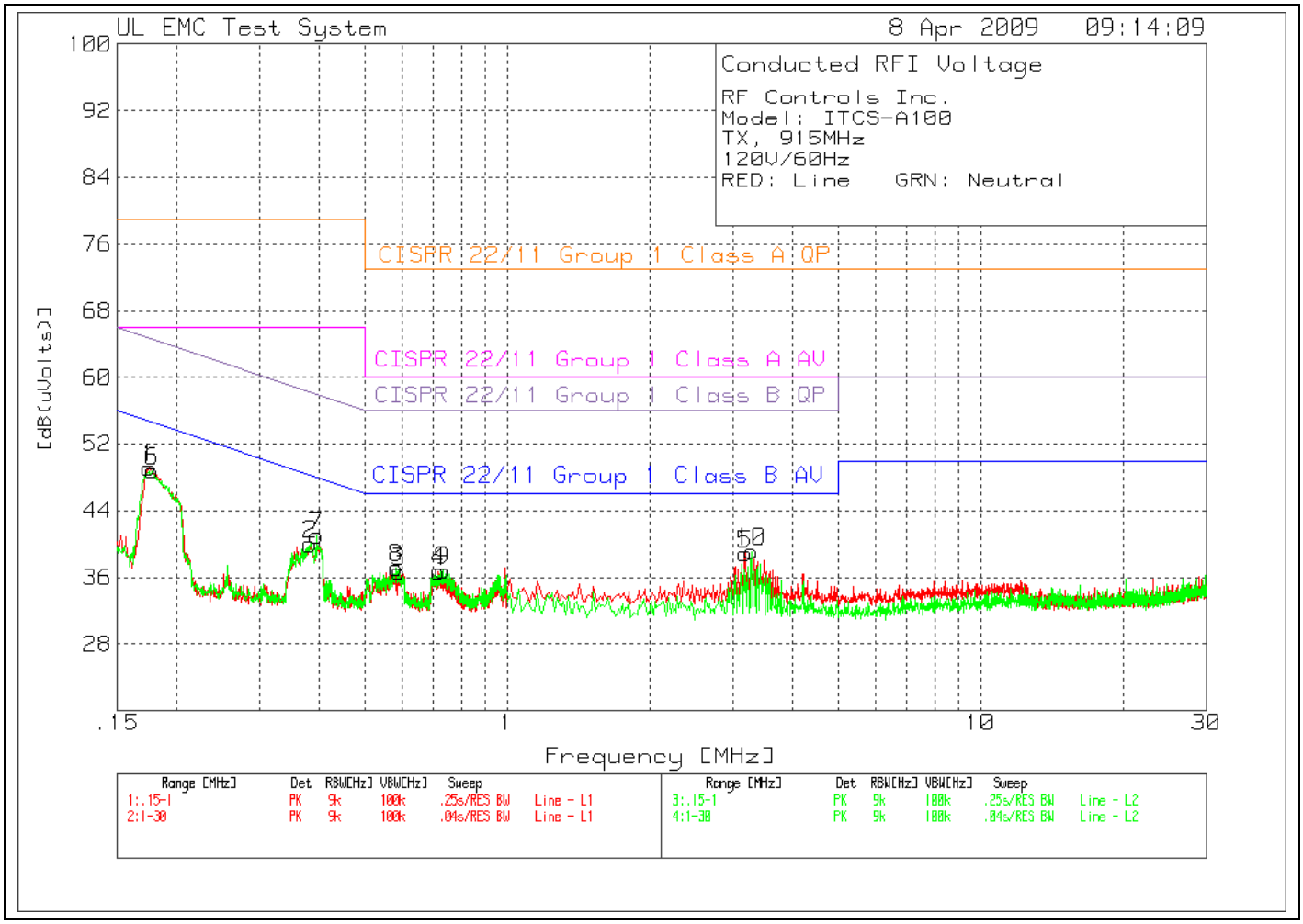


Table 3 Conducted Emissions Data Points – TX Middle Channel

RF Controls Inc.
Model: ITCS-A100
TX, 915MHz
120V/60Hz
RED: Line GRN: Neutral

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit:1	2	3	4	5	6
Line											
1	.17546	35.16 pk	12.5	1.5	49.16	79	66	64.7	54.7	-	-
				Margin [dB]		-29.84	-16.84	-15.54	-5.54	-	-
2	.38407	28.8 pk	10.7	.5	40	79	66	58.2	48.2	-	-
				Margin [dB]		-39	-26	-18.2	-8.2	-	-
3	.59127	25.91 pk	10.5	.3	36.71	73	60	56	46	-	-
				Margin [dB]		-36.29	-23.29	-19.29	-9.29	-	-
4	.71714	25.92 pk	10.5	.3	36.72	73	60	56	46	-	-
				Margin [dB]		-36.28	-23.28	-19.28	-9.28	-	-
5	3.18513	28.07 pk	10.6	.2	38.87	73	60	56	46	-	-
				Margin [dB]		-34.13	-21.13	-17.13	-7.13	-	-
Neutral											
6	.17829	35.12 pk	12.3	1.4	48.82	79	66	64.6	54.6	-	-
				Margin [dB]		-30.18	-17.18	-15.78	-5.78	-	-
7	.3968	29.93 pk	10.7	.4	41.03	79	66	57.9	47.9	-	-
				Margin [dB]		-37.97	-24.97	-16.87	-6.87	-	-
8	.58419	26.38 pk	10.5	.3	37.18	73	60	56	46	-	-
				Margin [dB]		-35.82	-22.82	-18.82	-8.82	-	-
9	.7334	26.15 pk	10.5	.2	36.85	73	60	56	46	-	-
				Margin [dB]		-36.15	-23.15	-19.15	-9.15	-	-
10	3.28643	28.43 pk	10.6	.1	39.13	73	60	56	46	-	-
				Margin [dB]		-33.87	-20.87	-16.87	-6.87	-	-

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector

LIMIT 1: CISPR 22/11 Group 1 Class A QP
LIMIT 2: CISPR 22/11 Group 1 Class A AV
LIMIT 3: CISPR 22/11 Group 1 Class B QP
LIMIT 4: CISPR 22/11 Group 1 Class B AV

RF Controls Inc.
Model: ITCS-A100
TX, 915MHz
120V/60Hz
RED: Line GRN: Neutral

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit:1	2	3	4	5	6
Line										
.17486	32.8 qp	12.6	1.5	46.9	79	66	64.7	54.7	-	-
			Margin [dB]:		-32.1	-19.1	-17.8	-7.8	-	-
.38405	24.96 qp	10.7	.5	36.16	79	66	58.2	48.2	-	-
			Margin [dB]:		-42.84	-29.84	-22.04	-12.04	-	-
.59443	17.17 qp	10.5	.3	27.97	73	60	56	46	-	-
			Margin [dB]:		-45.03	-32.03	-28.03	-18.03	-	-
.71524	17.58 qp	10.5	.3	28.38	73	60	56	46	-	-
			Margin [dB]:		-44.62	-31.62	-27.62	-17.62	-	-
3.12682	21.24 qp	10.6	.2	32.04	73	60	56	46	-	-
			Margin [dB]:		-40.96	-27.96	-23.96	-13.96	-	-
Neutral										
.17476	32.42 qp	12.6	1.5	46.52	79	66	64.7	54.7	-	-
			Margin [dB]:		-32.48	-19.48	-18.18	-8.18	-	-
.39947	24.47 qp	10.7	.4	35.57	79	66	57.9	47.9	-	-
			Margin [dB]:		-43.43	-30.43	-22.33	-12.33	-	-
.58748	16.82 qp	10.5	.3	27.62	73	60	56	46	-	-
			Margin [dB]:		-45.38	-32.38	-28.38	-18.38	-	-
.73295	16.97 qp	10.5	.2	27.67	73	60	56	46	-	-
			Margin [dB]:		-45.33	-32.33	-28.33	-18.33	-	-
3.34297	10.58 qp	10.6	.1	21.28	73	60	56	46	-	-
			Margin [dB]:		-51.72	-38.72	-34.72	-24.72	-	-

NOTE: "+" - Indicates an emission level in excess of the applicable limit (s).

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector

LIMIT 1: CISPR 22/11 Group 1 Class A QP
LIMIT 2: CISPR 22/11 Group 1 Class A AV
LIMIT 3: CISPR 22/11 Group 1 Class B QP
LIMIT 4: CISPR 22/11 Group 1 Class B AV

Figure 3 Conducted Emissions Graph - RX Mode

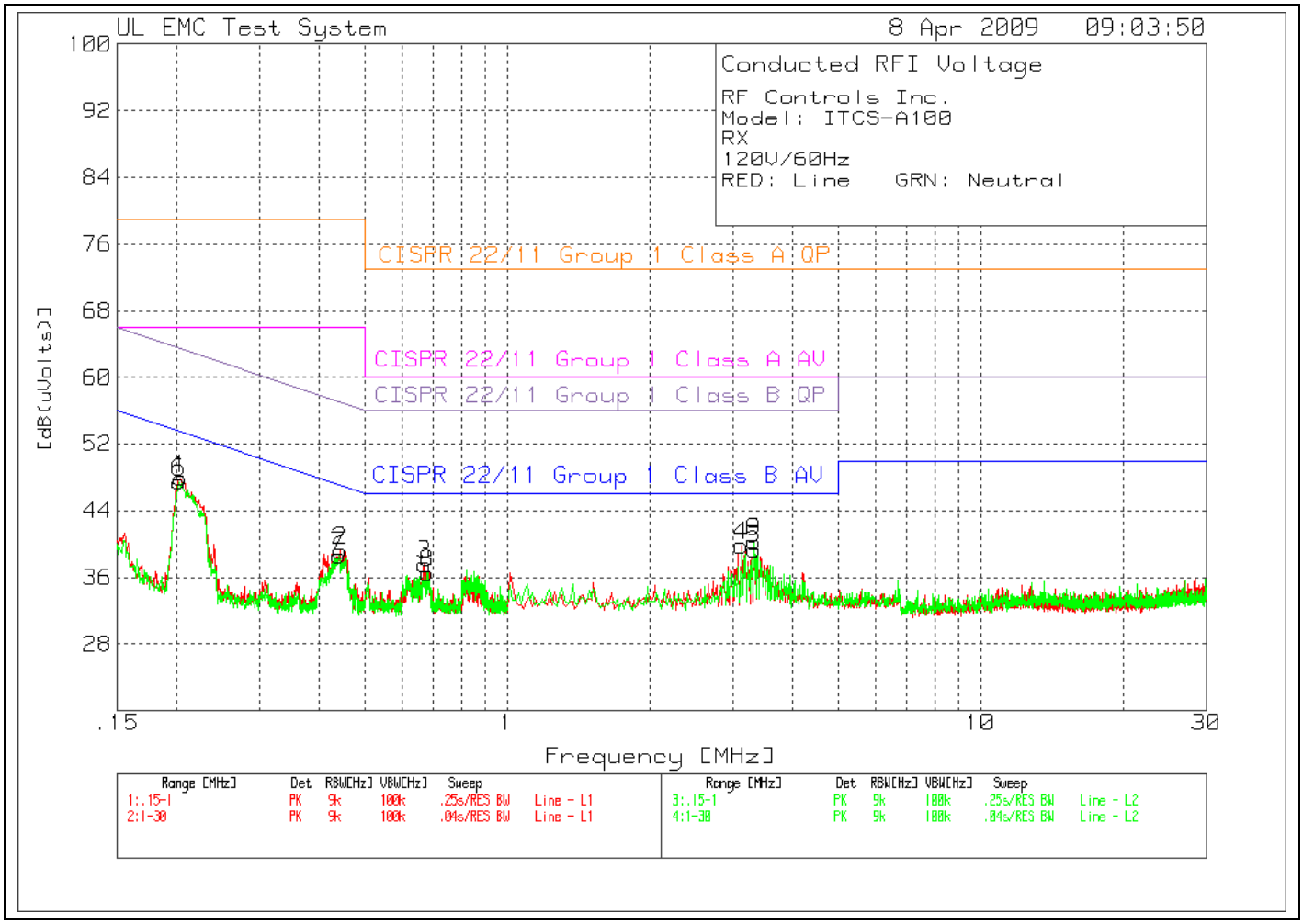


Table 4 Conducted Emissions Data Points

RF Controls Inc.
Model: ITCS-A100
RX
120V/60Hz
RED: Line GRN: Neutral

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit:1	2	3	4	5	6
Line											
1	.20445	35.3 pk	11.4	1.2	47.9	79	66	63.4	53.4	-	-
				Margin [dB]		-31.1	-18.1	-15.5	-5.5	-	-
2	.44488	28.23 pk	10.6	.4	39.23	79	66	57	47	-	-
				Margin [dB]		-39.77	-26.77	-17.77	-7.77	-	-
3	.67047	26.76 pk	10.5	.3	37.56	73	60	56	46	-	-
				Margin [dB]		-35.44	-22.44	-18.44	-8.44	-	-
4	3.12725	29.04 pk	10.6	.2	39.84	73	60	56	46	-	-
				Margin [dB]		-33.16	-20.16	-16.16	-6.16	-	-
5	3.32984	28.58 pk	10.6	.2	39.38	73	60	56	46	-	-
				Margin [dB]		-33.62	-20.62	-16.62	-6.62	-	-
Neutral											
6	.20304	34.88 pk	11.4	1.2	47.48	79	66	63.5	53.5	-	-
				Margin [dB]		-31.52	-18.52	-16.02	-6.02	-	-
7	.44135	27.63 pk	10.6	.4	38.63	79	66	57	47	-	-
				Margin [dB]		-40.37	-27.37	-18.37	-8.37	-	-
8	.67966	25.84 pk	10.5	.2	36.54	73	60	56	46	-	-
				Margin [dB]		-36.46	-23.46	-19.46	-9.46	-	-
9	3.32984	29.56 pk	10.6	.1	40.26	73	60	56	46	-	-
				Margin [dB]		-32.74	-19.74	-15.74	-5.74	-	-

LIMIT 1: CISPR 22/11 Group 1 Class A QP
LIMIT 2: CISPR 22/11 Group 1 Class A AV
LIMIT 3: CISPR 22/11 Group 1 Class B QP
LIMIT 4: CISPR 22/11 Group 1 Class B AV

RF Controls Inc.
Model: ITCS-A100
RX
120V/60Hz
RED: Line GRN: Neutral

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit:1	2	3	4	5	6
Line										
.20432	32.56 qp	11.4	1.2	45.16	79	66	63.4	53.4	-	-
			Margin [dB]:		-33.84	-20.84	-18.24	-8.24	-	-
.44199	23.17 qp	10.6	.4	34.17	79	66	57	47	-	-
			Margin [dB]:		-44.83	-31.83	-22.83	-12.83	-	-
.66769	16.76 qp	10.5	.3	27.56	73	60	56	46	-	-
			Margin [dB]:		-45.44	-32.44	-28.44	-18.44	-	-
3.12637	25.2 qp	10.6	.2	36	73	60	56	46	-	-
			Margin [dB]:		-37	-24	-20	-10	-	-
3.33161	24.81 qp	10.6	.2	35.61	73	60	56	46	-	-
			Margin [dB]:		-37.39	-24.39	-20.39	-10.39	-	-
Neutral										
.20577	32.02 qp	11.4	1.2	44.62	79	66	63.4	53.4	-	-
			Margin [dB]:		-34.38	-21.38	-18.78	-8.78	-	-
.43978	23.32 qp	10.6	.4	34.32	79	66	57.1	47.1	-	-
			Margin [dB]:		-44.68	-31.68	-22.78	-12.78	-	-
.67628	16.11 qp	10.5	.2	26.81	73	60	56	46	-	-
			Margin [dB]:		-46.19	-33.19	-29.19	-19.19	-	-
3.32984	24.13 qp	10.6	.1	34.83	73	60	56	46	-	-
			Margin [dB]:		-38.17	-25.17	-21.17	-11.17	-	-

NOTE: "+" - Indicates an emission level in excess of the applicable limit (s).

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector

LIMIT 1: CISPR 22/11 Group 1 Class A QP
LIMIT 2: CISPR 22/11 Group 1 Class A AV
LIMIT 3: CISPR 22/11 Group 1 Class B QP
LIMIT 4: CISPR 22/11 Group 1 Class B AV

4.2 Test Conditions and Results – Carrier Frequency Separation

Test Description	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.
Basic Standard	47 CFR Part 15.247(a)(1) RSS-210, A8.1(b)
Supplementary Information: Data provided for this test is from previously tested EUT covered under project number 08CA25749 (FCC ID: WFQITCSA100). The previously tested EUT utilizes the same radio as this unit therefore re-running this test was considered not required.	

Table 5 Carrier Frequency Separation Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	2	1
Supplementary information: Separation frequencies were measured for each channel and then averaged.		

Table 6 Carrier Frequency Separation Test Equipment

Test Equipment Used			
Description	Manufacturer	Model	Identifier
Spectrum Analyzer	Rhode & Schwartz	FSEK	EMC4182
Attenuator	Pasternek with Cable	PE7019-30	None

Table 7 Carrier Frequency Separation Results

Mode	Channel	Carrier Frequency Separation Limit	Channel Separation
TX Hopping	Low Side	> 20dB Bandwidth (aprx. 123kHz)	903.2484MHz – 902.749MHz 499.4kHz
	Middle		915.7568MHz – 915.2549MHz 501.9kHz
	High Side		927.2511MHz – 926.7596MHz 491.5kHz

Figure 4 Test Setup for Carrier Frequency Separation

*Representative Configuration Shown

Figure 5 Carrier Frequency Separation Graphs

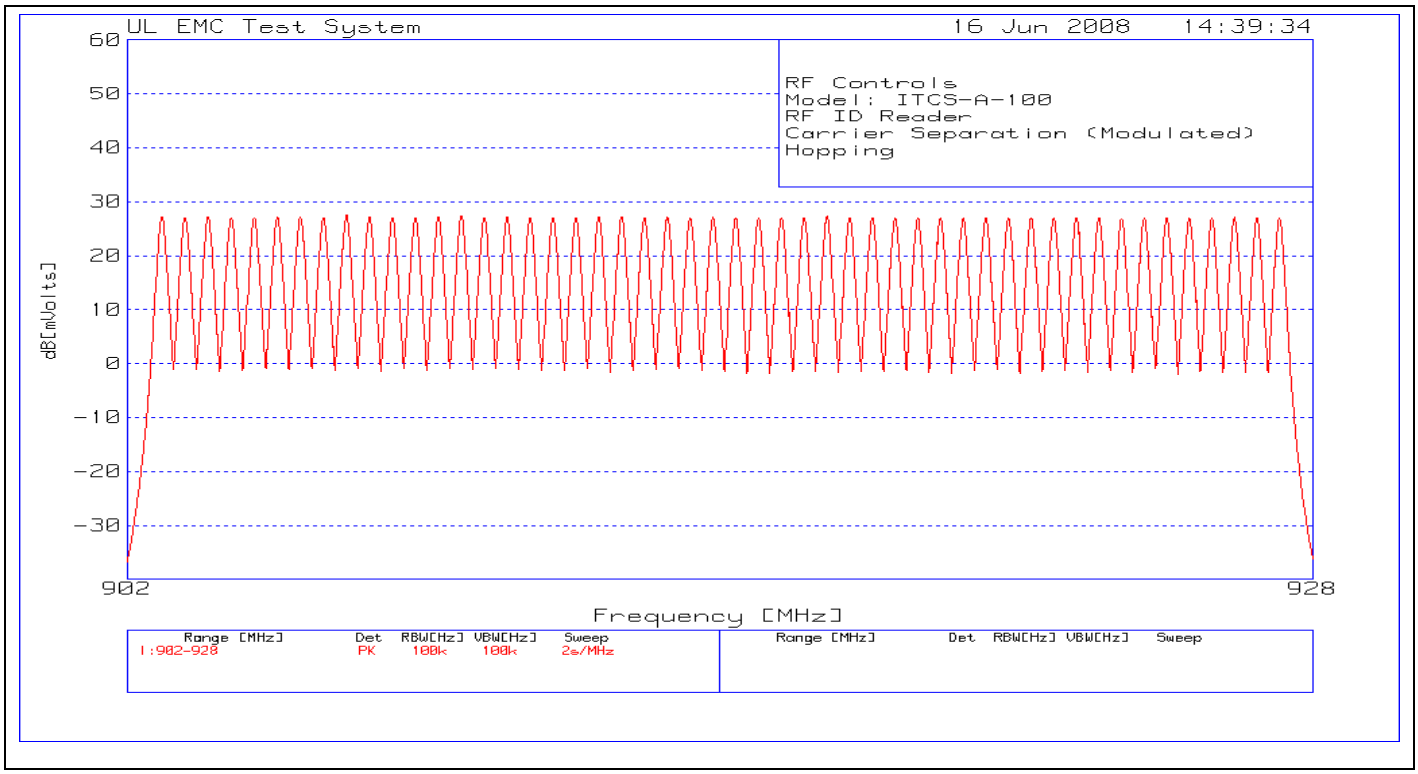


Table 8 Carrier Frequency Separation (Frequency List)

#	Frequency MHz	#	Frequency MHz	#	Frequency MHz	#	Frequency MHz	#	Frequency MHz
1	902.749	11	907.755	21	912.7506	31	917.754	41	922.7626
2	903.2483	12	908.2517	22	913.2446	32	918.2559	42	923.2567
3	903.7528	13	908.751	23	913.7439	33	918.7552	43	923.7586
4	904.2521	14	909.2529	24	914.2537	34	919.2545	44	924.2553
5	904.7514	15	909.7548	25	914.7582	35	919.759	45	924.7546
6	905.2507	16	910.2567	26	915.2549	36	920.2609	46	925.2539
7	905.75	17	910.7534	27	915.7568	37	920.755	47	925.7532
8	906.2493	18	911.2553	28	916.2509	38	921.2595	48	926.2577
9	906.7486	19	911.752	29	916.7554	39	921.7536	49	926.7596
10	907.2557	20	912.2539	30	917.2547	40	922.2581	50	927.2511

Test Conditions and Results – 20dB Bandwidth

Test Description	For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
Basic Standard	47 CFR Part 15.247(a)(1)(i) RSS-210, A8.1(b)
Supplementary Information: Data provided for this test is from previously tested EUT covered under project number 08CA25749 (FCC ID: WFQITCSA100). The previously tested EUT utilizes the same radio as this unit therefore re-running this test was considered not required.	

Table 9 20dB Bandwidth Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	2	1
Supplementary information: None		

Table 10 20dB Bandwidth Test Equipment

Description	Manufacturer	Model	Identifier
Spectrum Analyzer	Rhode & Schwartz	FSEK	EMC4182
Attenuator	Pasternek with Cable	PE7019-30	None

Table 11 20dB Bandwidth Results

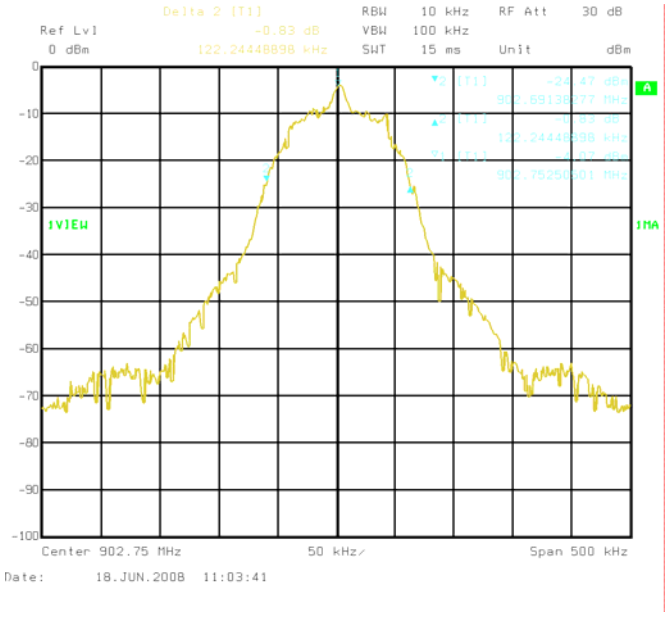
Mode	Channel	20dB Bandwidth
TX Hopping	Low	122.24kHz
	Middle	124.25kHz
	High	123.24kHz

Figure 6 Test Setup for 20dB Bandwidth

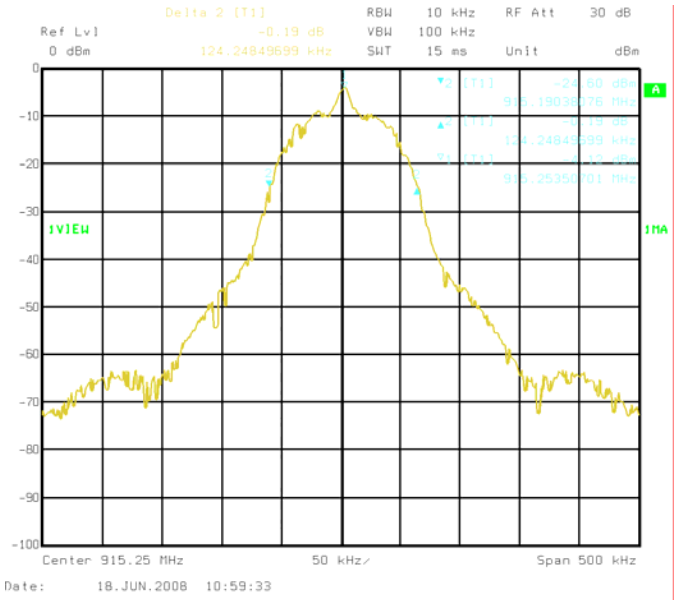
*Representative Configuration Shown

Figure 7 20dB Bandwidth Graphs

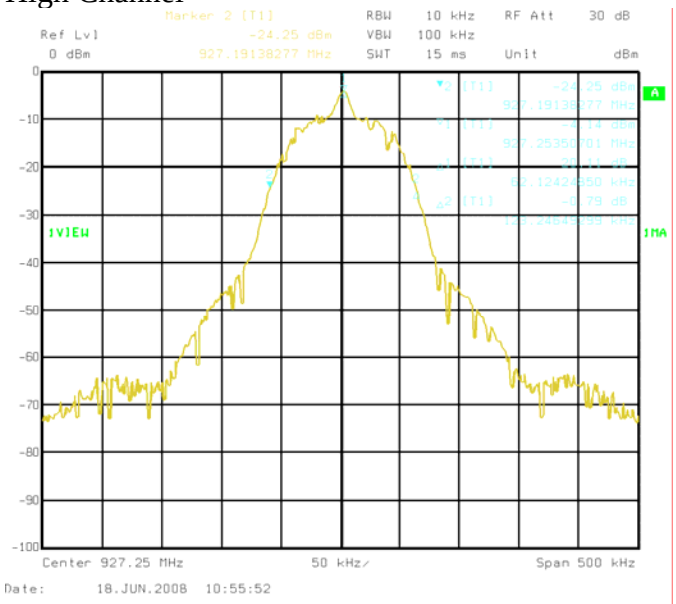
Low Channel



Middle Channel



High Channel



4.3 Test Conditions and Results – Number of Hopping Frequencies

Test Description	For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
Basic Standard	47 CFR Part 15.247(a)(1)(i) RSS-210, A8.1(d)
Supplementary Information: Data provided for this test is from previously tested EUT covered under project number 08CA25749 (FCC ID: WFQITCSA100). The previously tested EUT utilizes the same radio as this unit therefore re-running this test was considered not required.	

Table 12 Number of Hopping Frequencies Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	2	1
Supplementary information: None		

Table 13 Number of Hopping Frequencies Test Equipment

Test Equipment Used			
Description	Manufacturer	Model	Identifier
Spectrum Analyzer	Rhode & Schwartz	FSEK	EMC4182
Attenuator	Pasternek with Cable	PE7019-30	None

Table 14 Number of Hopping Frequencies Results

Mode	Number of Channels	Minimum Number Required
TX, Hopping	50	50

Figure 8 Test Setup for Number of Hopping Frequencies

*Representative Configuration Shown

Figure 9 Number of Hopping Frequencies Graphs

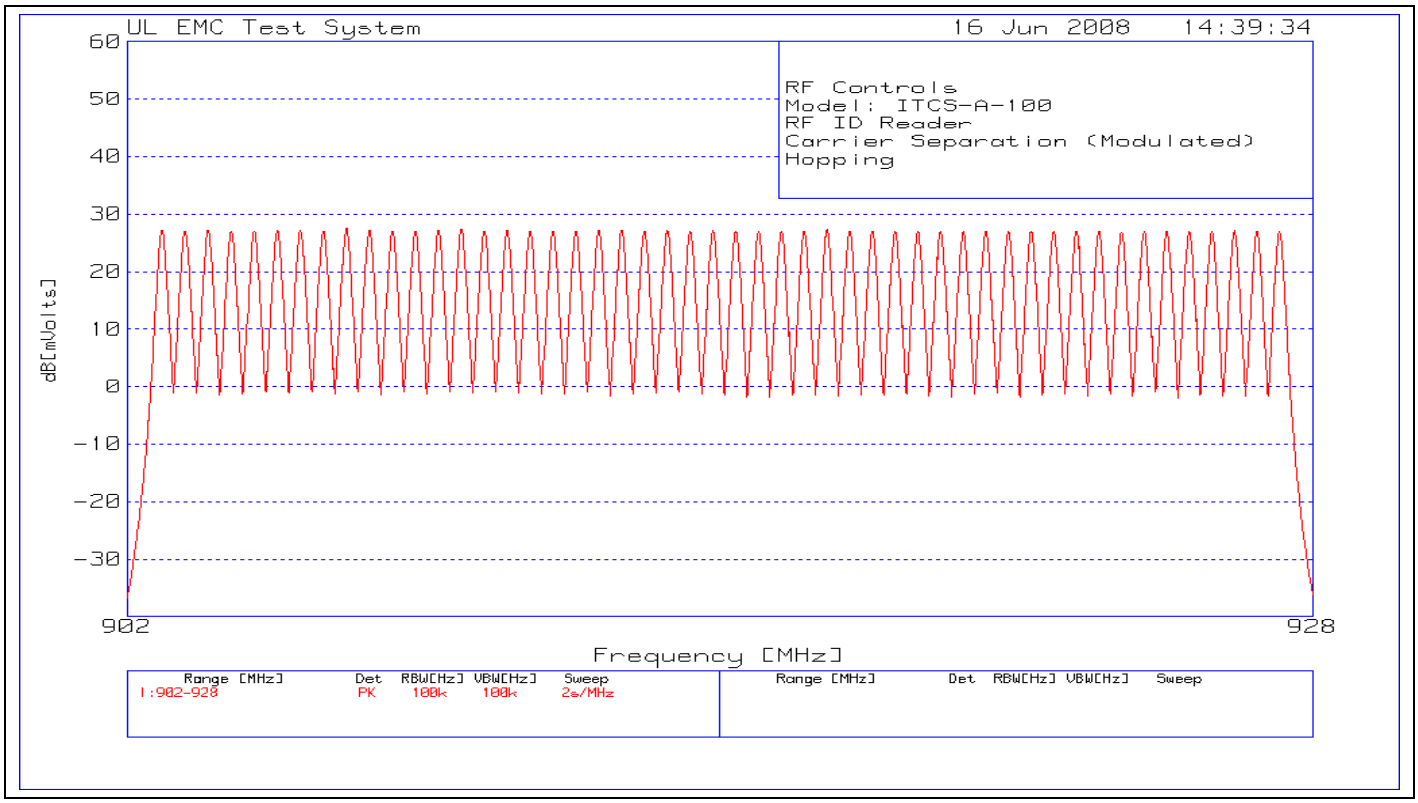


Table 15 Number of Hopping Channels (Frequency List)

#	Frequency MHz	#	Frequency MHz	#	Frequency MHz	#	Frequency MHz	#	Frequency MHz
1	902.749	11	907.755	21	912.7506	31	917.754	41	922.7626
2	903.2483	12	908.2517	22	913.2446	32	918.2559	42	923.2567
3	903.7528	13	908.751	23	913.7439	33	918.7552	43	923.7586
4	904.2521	14	909.2529	24	914.2537	34	919.2545	44	924.2553
5	904.7514	15	909.7548	25	914.7582	35	919.759	45	924.7546
6	905.2507	16	910.2567	26	915.2549	36	920.2609	46	925.2539
7	905.75	17	910.7534	27	915.7568	37	920.755	47	925.7532
8	906.2493	18	911.2553	28	916.2509	38	921.2595	48	926.2577
9	906.7486	19	911.752	29	916.7554	39	921.7536	49	926.7596
10	907.2557	20	912.2539	30	917.2547	40	922.2581	50	927.2511

4.4 Test Conditions and Results – Dwell Time

Test Description	For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
Basic Standard	47 CFR Part 15.247(a)(1)(i) RSS-210, A8.1(d)
Supplementary Information: Data provided for this test is from previously tested EUT covered under project number 08CA25749 (FCC ID: WFQITCSA100). The previously tested EUT utilizes the same radio as this unit therefore re-running this test was considered not required.	

Table 16 Dwell Time Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	2	1
Supplementary information: Duty cycle also measured/calculated for use in radiated spurious measurements Data provided for this test is from previously tested EUT covered under project number 08CA25749 (FCC ID: WFQITCSA100). The previously tested EUT utilizes the same radio as this unit therefore re-running this test was considered not required.		

Table 17 Dwell Time Test Equipment

Test Equipment Used			
Description	Manufacturer	Model	Identifier
Spectrum Analyzer	Rhode & Schwartz	FSEK	EMC4182
Attenuator	Pasternek	PE7019-30	None

Table 18 Dwell Time Results

15.247(a)(1)(i) states that system using 50 hopping frequencies shall not have average time of occupancy on any frequency greater then 0.4 seconds within 20 second period. This when converted to percentage over 50 channels it indicates that each channel can not be ON for overall more then 2% of the total time.

Mode	Number of Channels	Maximum Time Allowed	Measured Dwell Time
TX Hopping Low Channel	50	2% of total time	(0.2993s x 20pulses)/300s 2%
TX Hopping Middle Channel	50	2% of total time	(0.2996s x 21pulses)/300s 2%

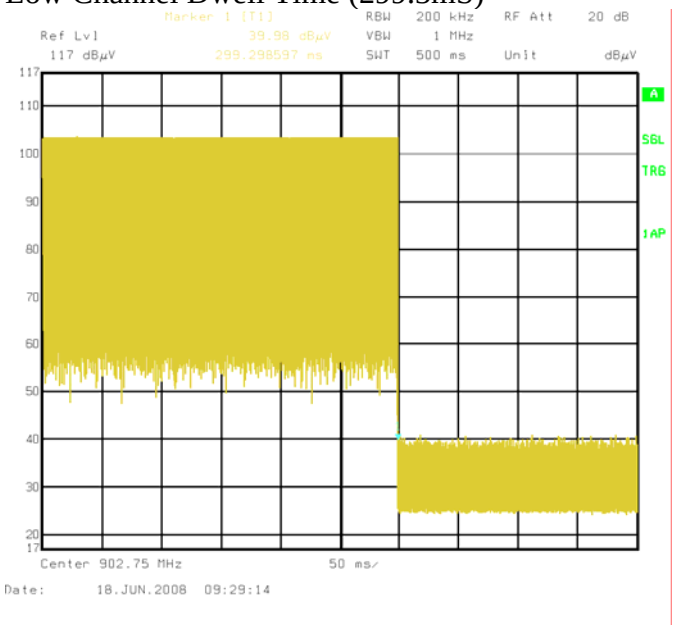
Mode	Number of Channels	Maximum Time Allowed	Measured Dwell Time
TX Hopping High Channel	50	2% of total time	(0.2996s x 20pulses)/300s 2%

Figure 10 Test Setup for Dwell Time

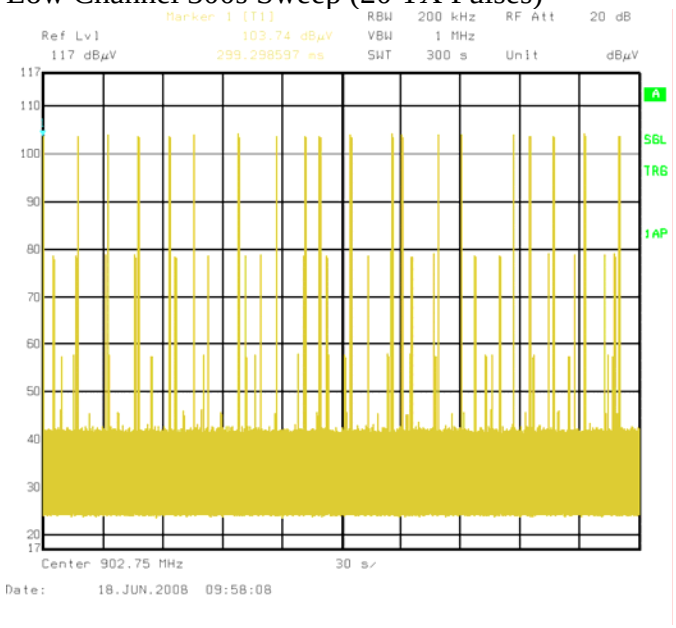
*Representative Configuration Shown

Figure 11 Dwell Time Graphs

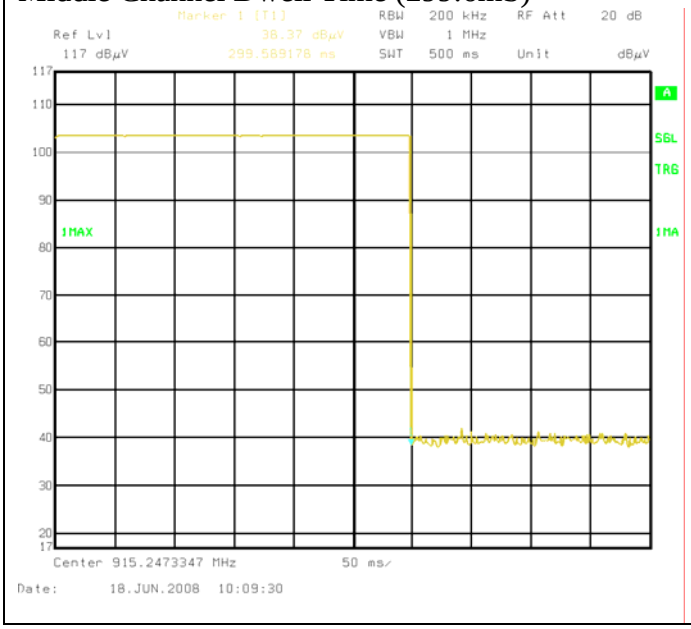
Low Channel Dwell Time (299.3mS)



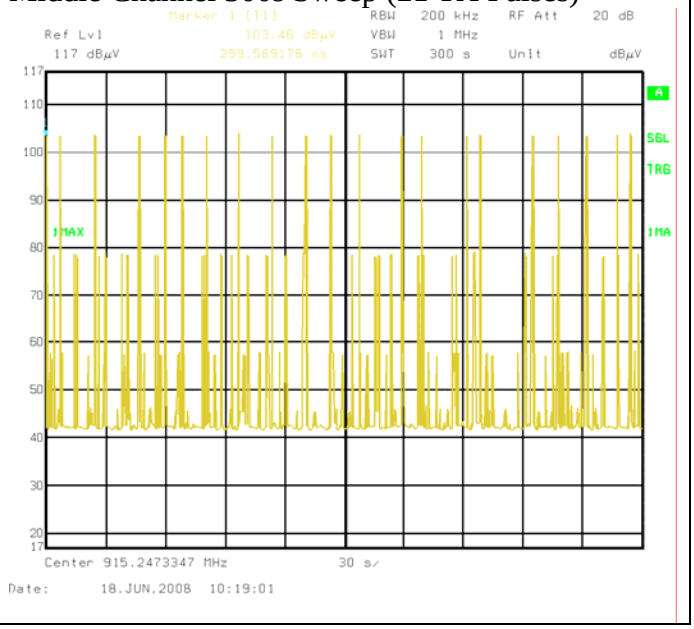
Low Channel 300s Sweep (20 TX Pulses)



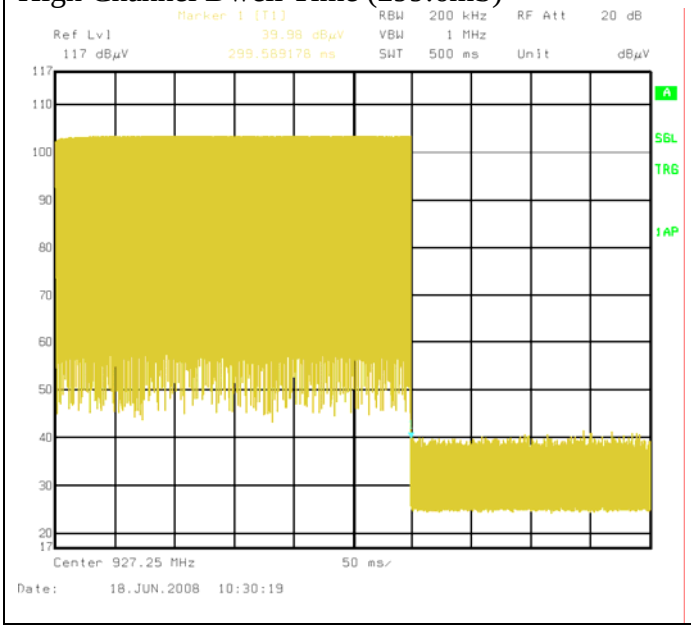
Middle Channel Dwell Time (299.6mS)



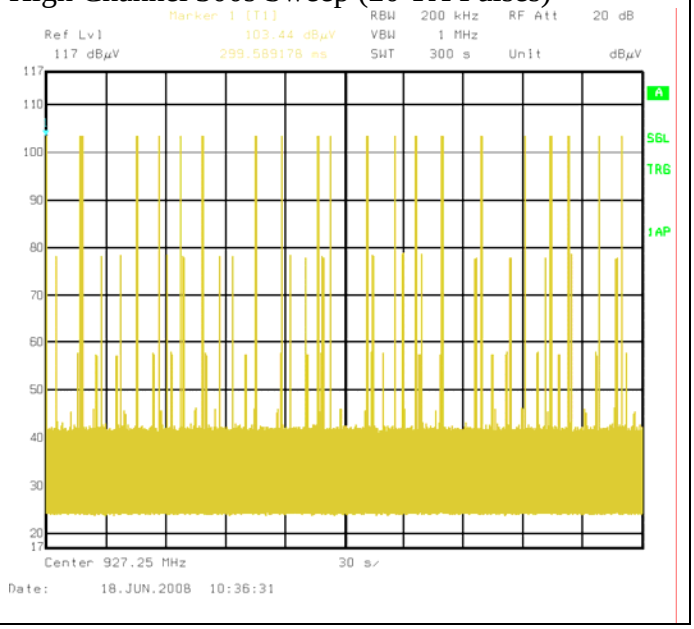
Middle Channel 300s Sweep (21 TX Pulses)



High Channel Dwell Time (299.6mS)



High Channel 300s Sweep (20 TX Pulses)



4.5 Test Conditions and Results – Maximum Peak Output Power

Test Description	For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.	
Basic Standard	47 CFR Part 15.247(b)(2) RSS-210, A8.4(2)	
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	902MHz – 928MHz	Antenna Conducted
Limits		
Frequency (MHz)	Limit mW	
	Peak	
902 - 928	1000 (30dBm – gain of Antenna over 6dBi)	
Supplementary information: None		

Table 19 Maximum Peak Output Power EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	2	1
Supplementary information: None		

Table 20 Maximum Peak Output Power Test Equipment

Description	Manufacturer	Model	Identifier
Spectrum Analyzer	Rhode & Schwartz	FSEK	EMC4182
Attenuator	Pasternek	PE7019-30	None

Table 21 Maximum Peak Output Power Results

Channel	Declared Antenna Gain	Limit (30dBm-1.5dB)	Power dBm	Power W
Low Channel	7.5dBi	28.5dBm	28.35	0.6839
Middle Channel	7.5dBi	28.5dBm	28.41	0.6934
High Channel	7.5dBi	28.5dBm	28.36	0.6855

Figure 12 Test setup for Maximum Peak Output Power

Representative Configuration Shown

Figure 13 Maximum Peak Output Power Graph

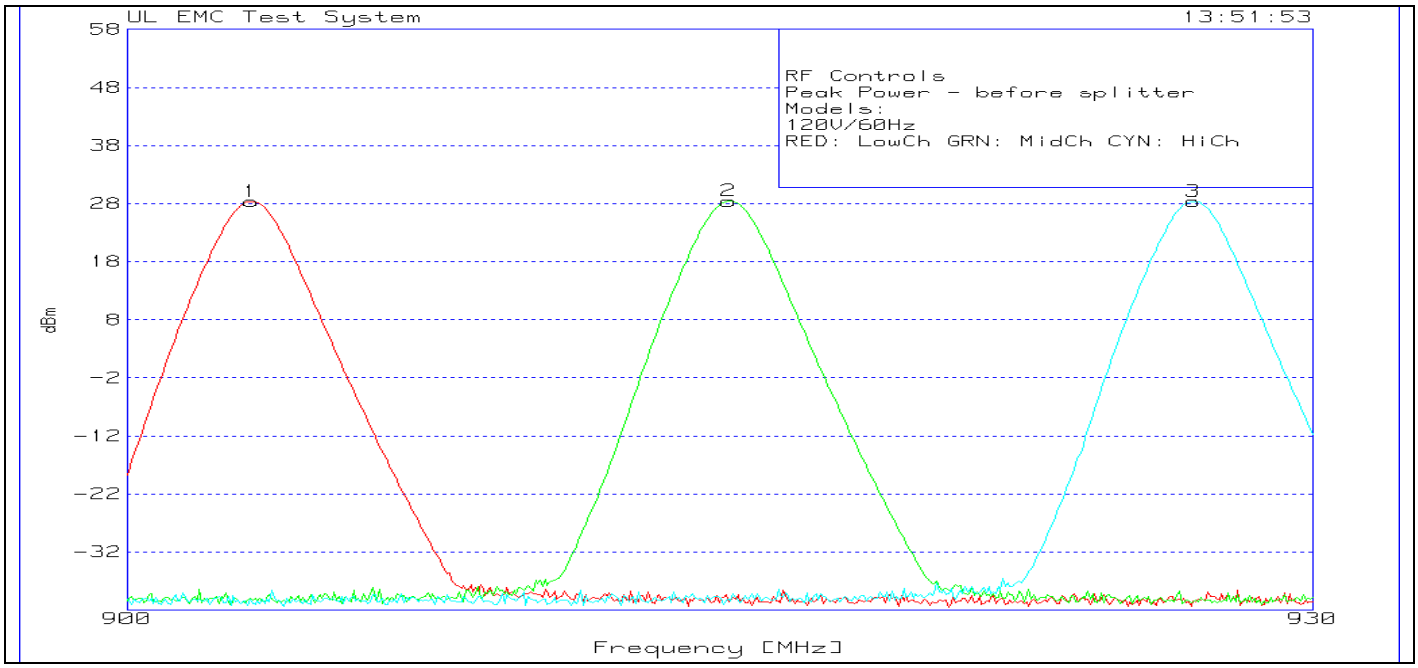


Table 22 Maximum Peak Output Power Emissions Data Points

RF Controls
Peak Power - before splitter
Models:
120V/60Hz
RED: LowCh GRN: MidCh CYN: HiCh

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]		Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dBm	Limit:1	2	3	4	5	6
1	903.0962	103.35	pk	32	-107	28.35	-	-	-	-	-	-
					Margin [dB]		-	-	-	-	-	-
2	915.0902	103.41	pk	32	-107	28.41	-	-	-	-	-	-
					Margin [dB]		-	-	-	-	-	-
3	926.9339	103.36	pk	32	-107	28.36	-	-	-	-	-	-
					Margin [dB]		-	-	-	-	-	-

pk - Peak detector
qp - Quasi-Peak detector

4.6 Test Conditions and Results – Band Edge Compliance

Test Description	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section15.205(c)).

Basic Standard	47 CFR Part 15.247(d) RSS-210, A8.5	
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	852MHz – 978MHz	Antenna Conducted

Limits	
Frequency (MHz)	Limits
	Antenna Conducted – 20dB below the fundamental
Below 902MHz and Above 928MHz	Aprox.7.5dBm (See Data Table Below)

Supplementary information: Only Antenna Conducted Measurements required. No restricted bands close to the allocated frequency band.

Data provided for this test is from previously tested EUT covered under project number 08CA25749 (FCC ID: WFQITCSA100). The previously tested EUT utilizes the same radio as this unit therefore re-running this test was considered not required.

Table 23 Band Edge Compliance EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	2	1
Supplementary information: None		

Table 24 Band Edge Compliance Test Equipment

Description	Manufacturer	Model	Identifier
Spectrum Analyzer	Rhode & Schwartz	FSEK	EMC4182
Attenuator	Pasternek	PE7019-30	None

Figure 14 Test setup for Band Edge Compliance – Conducted

***Representative Configuration Shown**

Figure 15 Conducted Band Edge Compliance Graph

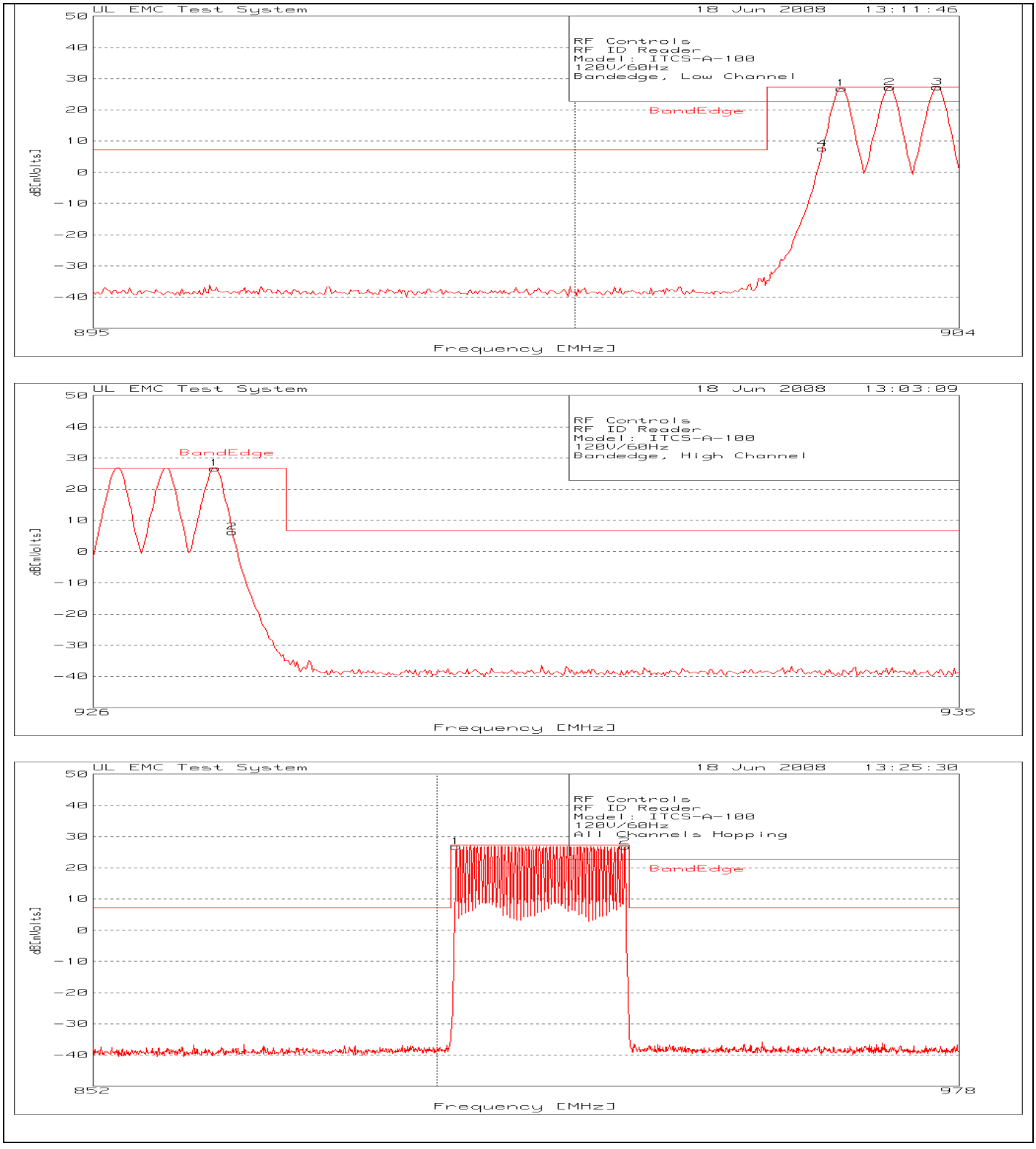


Table 25 Band Edge Compliance Data Points

RF Controls
RF ID Reader
Model: ITCS-A-100
120V/60Hz
Bandedge, Low Channel

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[mVolts]	Limit 1	Margin 1[dB]
1	902.7735	103.14	pk	30.7	-107	26.84	NA	NA
2	903.2786	103.46	pk	30.7	-107	27.16	NA	NA
3	903.7746	103.53	pk	30.7	-107	27.23	NA	NA
4	902.5752	83.88	pk	30.7	-107	7.58	27.2	-19.62

LIMIT 1: BandEdge

pk - Peak detector

RF Controls
RF ID Reader
Model: ITCS-A-100
120V/60Hz
Bandedge, High Channel

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[mVolts]	Limit 1	Margin 1[dB]
1	927.2625	102.87	pk	30.8	-107	26.67	NA	NA
2	927.4429	82.43	pk	30.8	-107	6.23	NA	NA

LIMIT 1: BandEdge

pk - Peak detector

4.7 Test Conditions and Results – SPURIOUS EMISSIONS (Antenna Conducted and Radiated)

Test Description	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section15.205(c)).

Basic Standard	47 CFR Part 15.247(d) RSS-210, A8.5 RSS-Gen 7.2.1 and 7.2.3	
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 1GHz	10 meter or 3 meter as noted And antenna port
Fully configured sample scanned over the following frequency range	1GHz – 10GHz	3 meter measurement distance and antenna port

Limits (Antenna Conducted)

All emissions must be 20dB below the level of the fundamental frequency.

Limits (Radiated)

Frequency (MHz)	Limit (dBµV/m)		
	Quasi-Peak	Average	
	General Emissions	Fundamental	Spurious
30 – 88	29.54	-	-
88 – 216	33.06	-	-
216-960	35.56	-	-
960-1000	43.52	-	-
1,000-25,000	-	-	54

Supplementary information: Below 1GHz, spectrum was checked and there were no emissions related to the transmitter recorded. For emissions caused by the digital part please refer to the next section of this report.

Table 26 SPURIOUS EMISSIONS EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1 and 2	1 and 2
Supplementary information: None		

Table 27 SPURIOUS EMISSIONS Test Equipment – Antenna Conducted

Description	Manufacturer	Model	Identifier
Spectrum Analyzer	Rhode & Schwartz	FSEK	EMC4182
Attenuator	Pasternek	PE7019-30	None

Table 28 SPURIOUS EMISSIONS Test Equipment – Radiated

Description	Manufacturer	Model	Identifier
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323
Bicon Antenna	Chase	VBA6106A	EMC4078
Log-P Antenna	Chase	UPA6109	EMC4258
Spectrum Analyzer	Rhode & Schwartz	FSEK	EMC4182
Antenna Array	UL	BOMS	EMC4276

Figure 16 Test setup for SPURIOUS EMISSIONS – Antenna conducted

Figure 17 Test setup for SPURIOUS EMISSIONS – Radiated

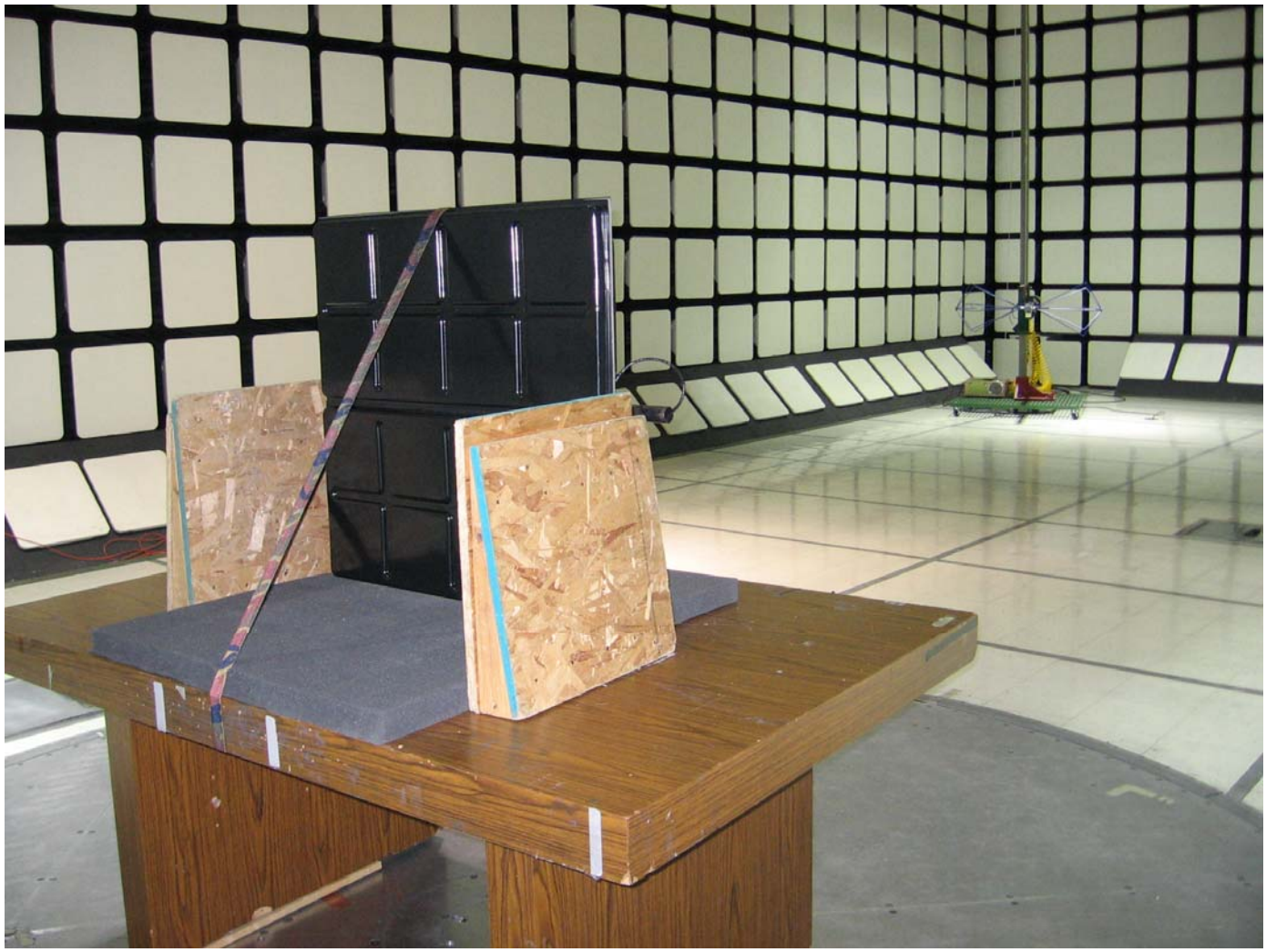
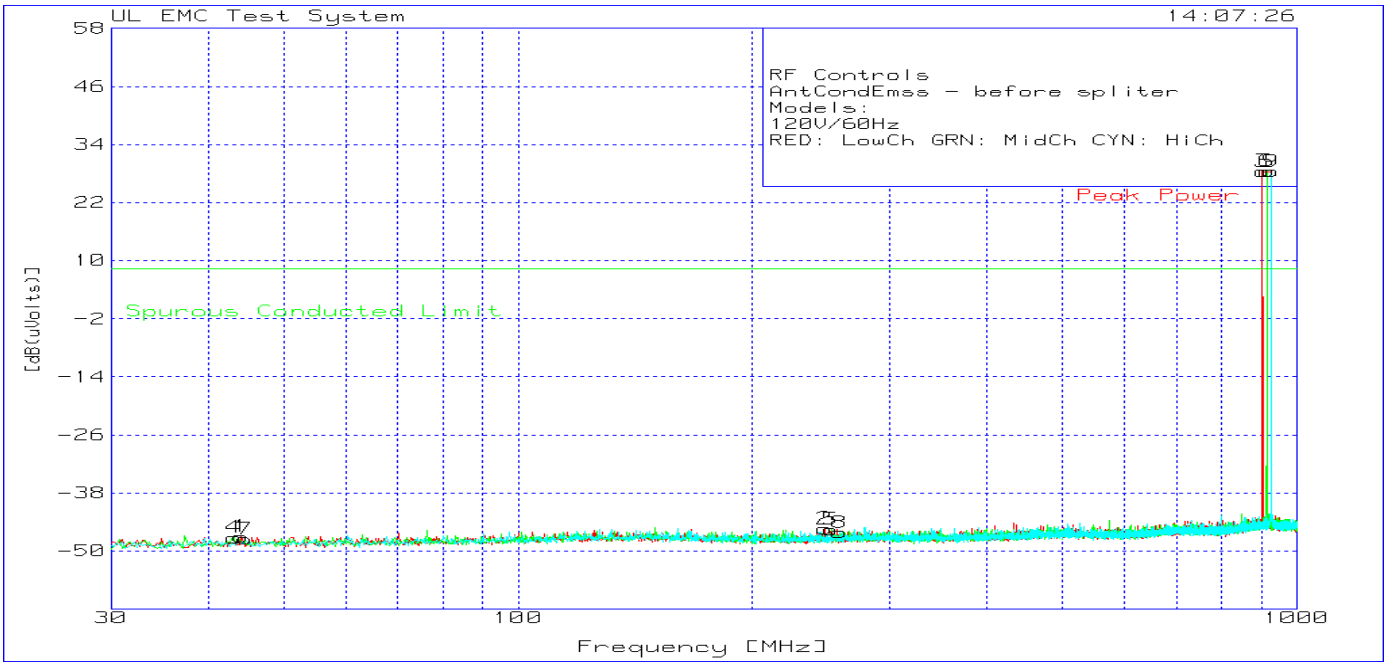
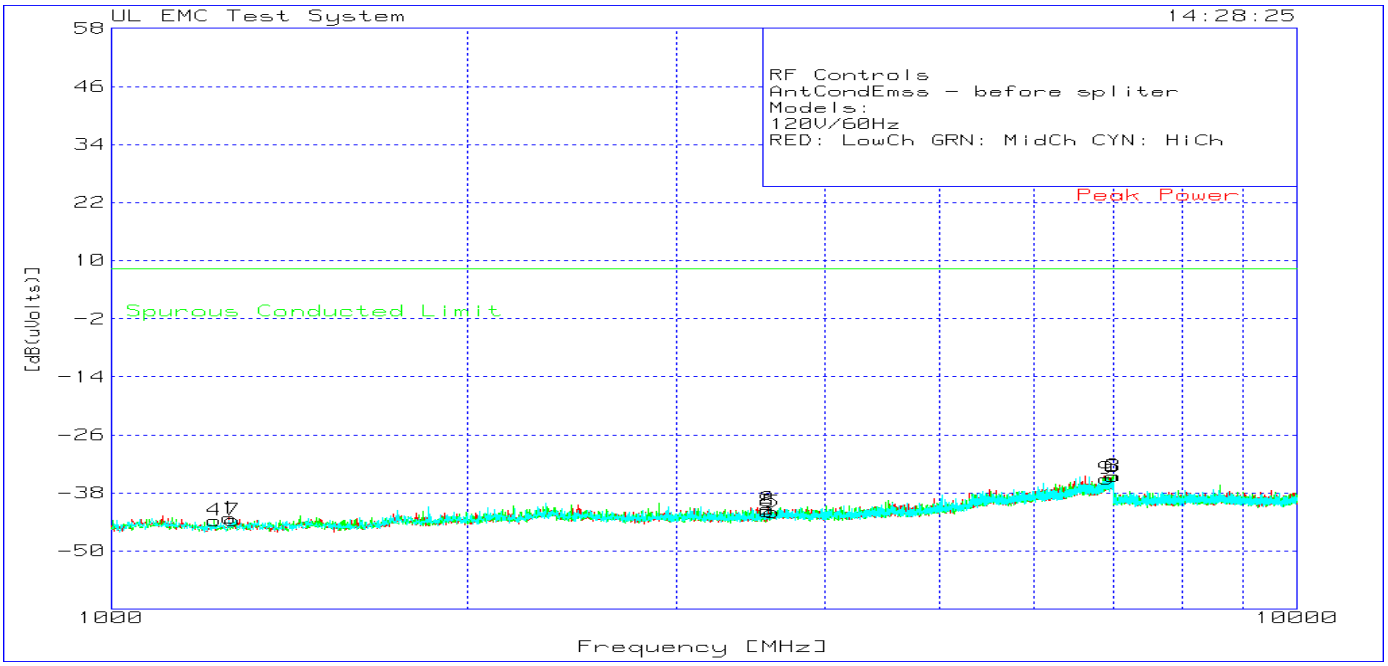


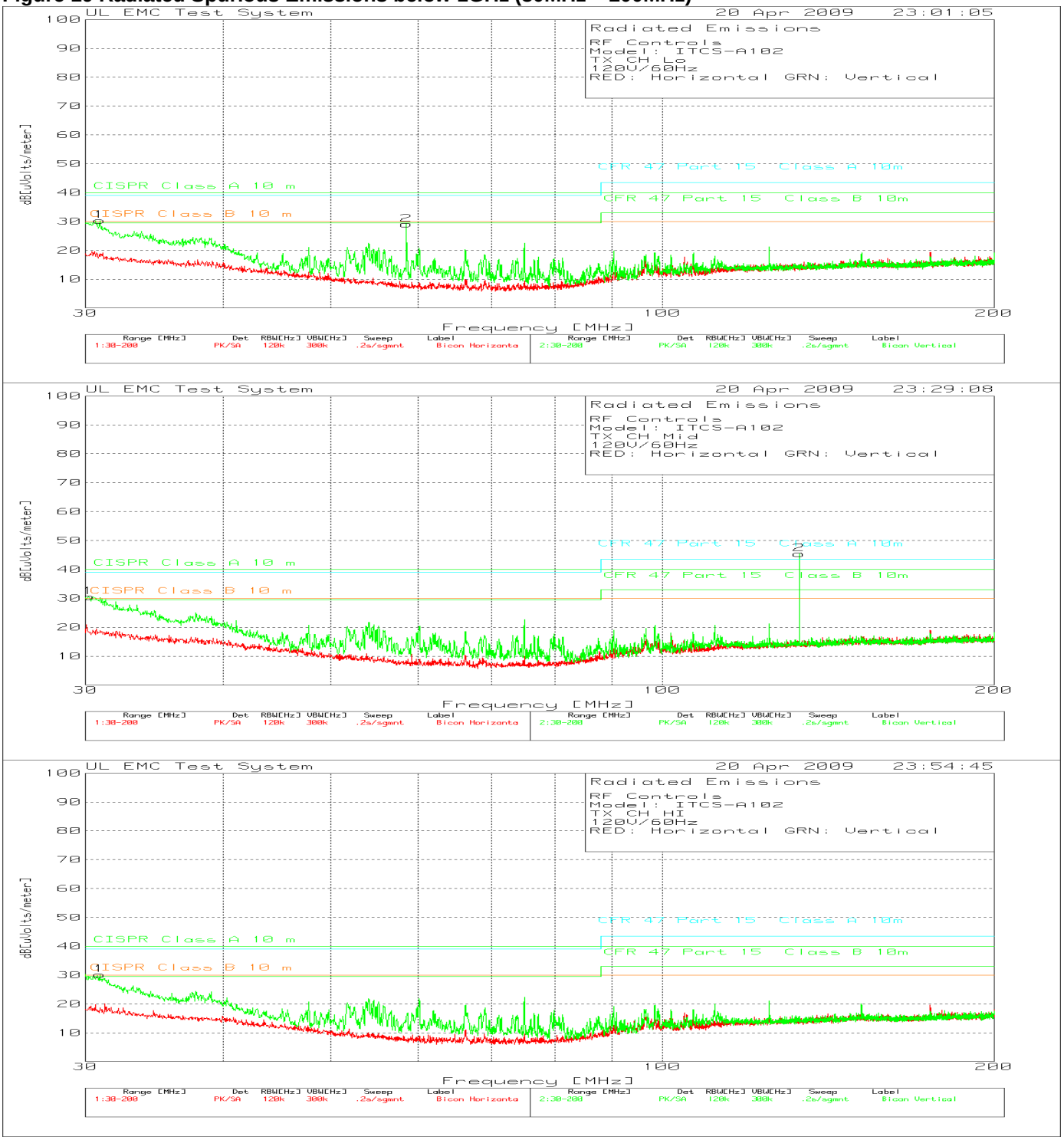
Figure 18 Antenna Port Spurious Emissions Plots TX Mode, Low, Middle and High Channels





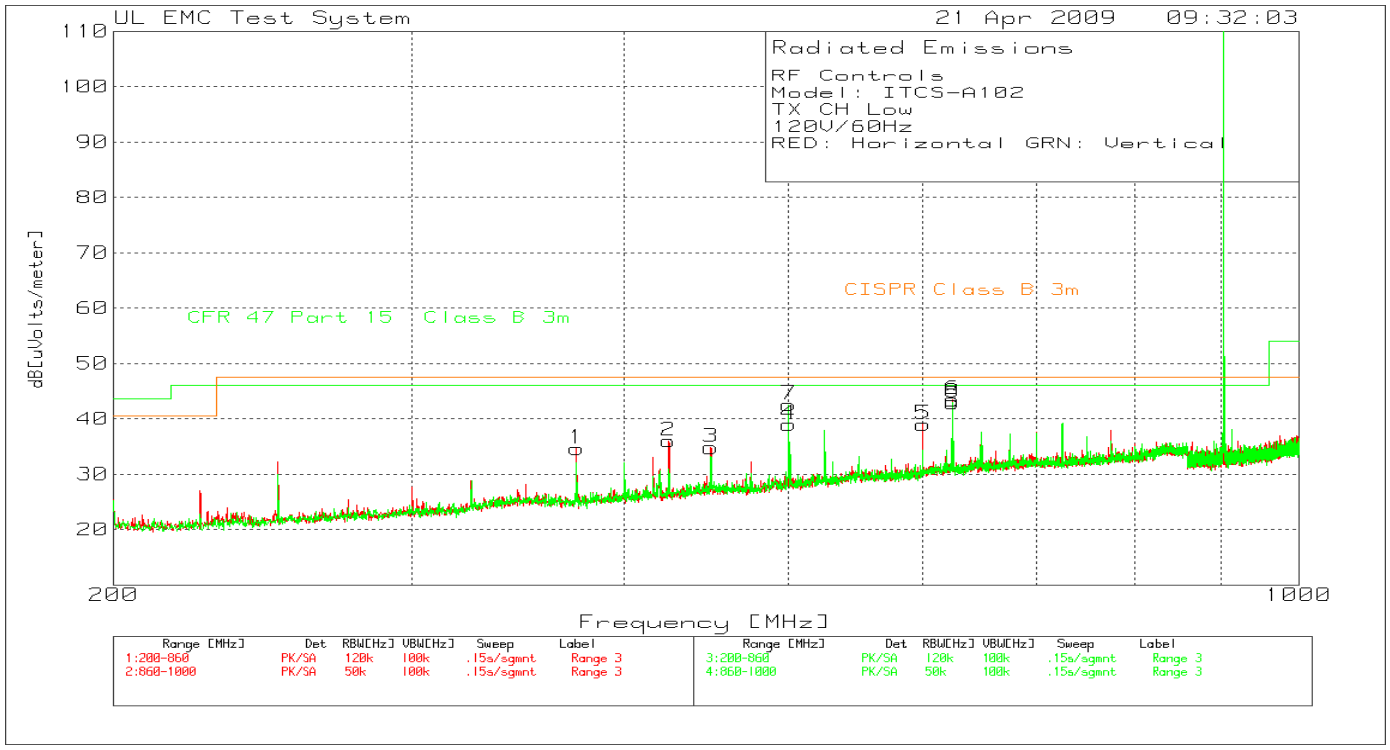
No emissions other the fundamental recorded.

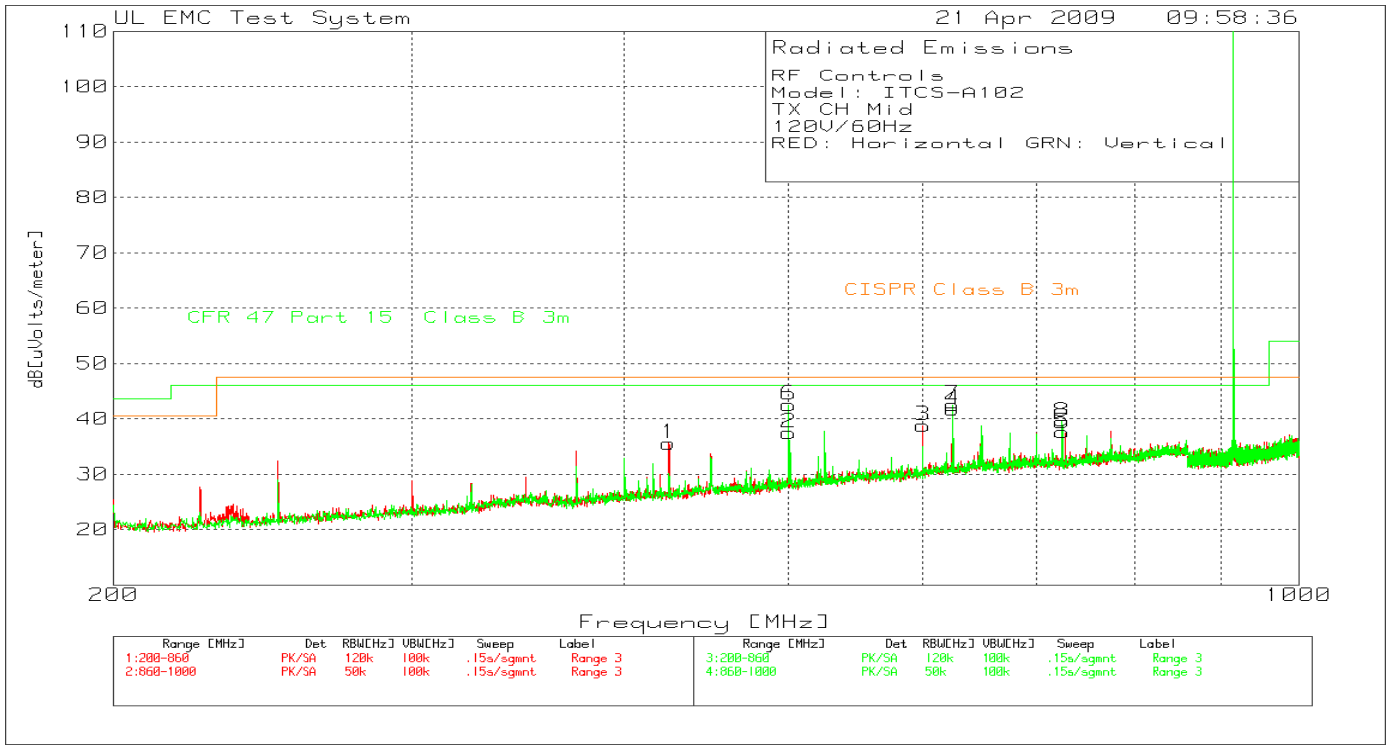
Figure 19 Radiated Spurious Emissions below 1GHz (30MHz – 200MHz)

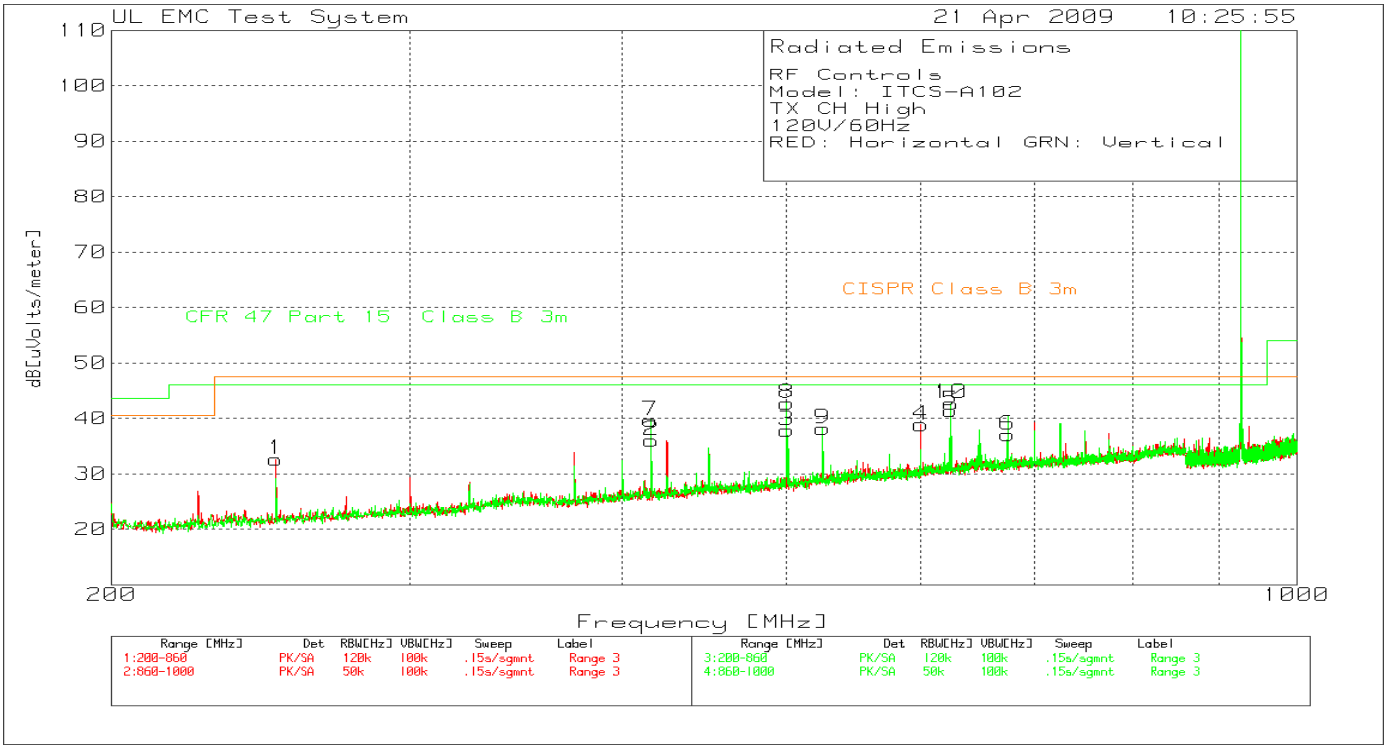


Peak #2 on low channel and #2 on middle channel was found to be a random click. All other emissions are related to the digital part of the EUT and are not caused by the radio or internal radio components. See next section of the report.

Figure 20 Radiated Spurious Emissions below 1GHz (200MHz – 1000MHz)



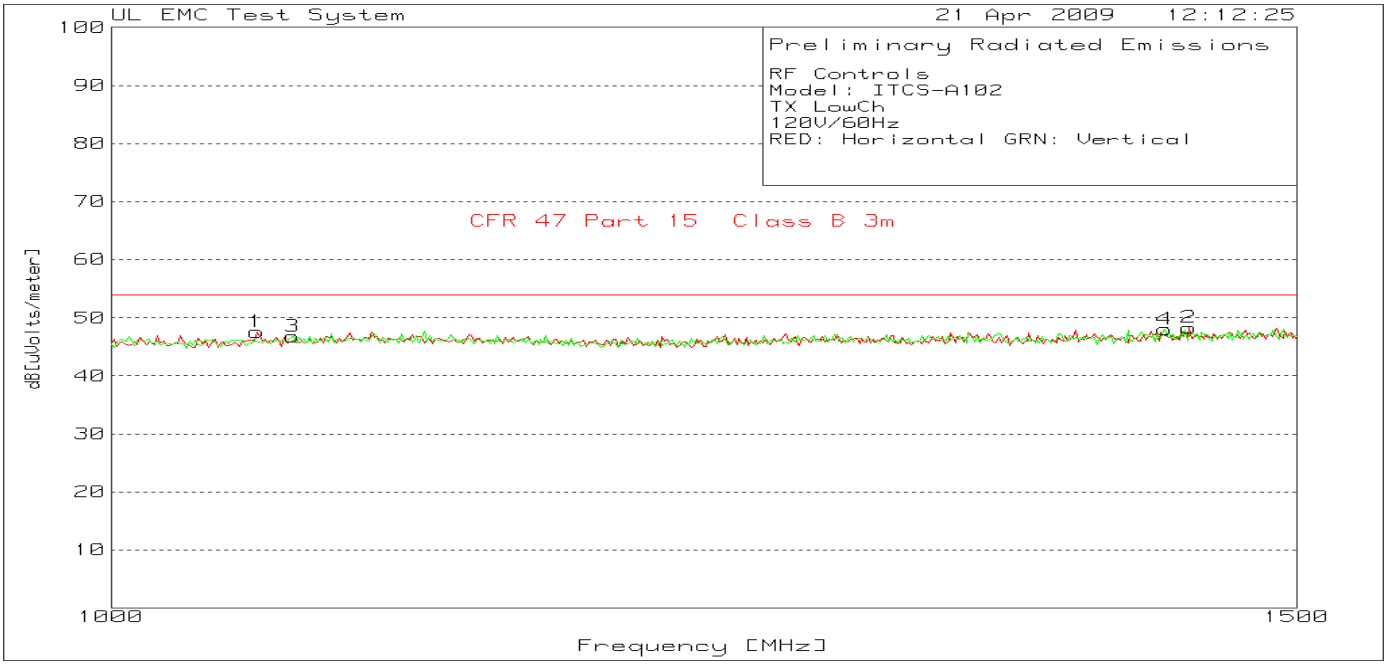


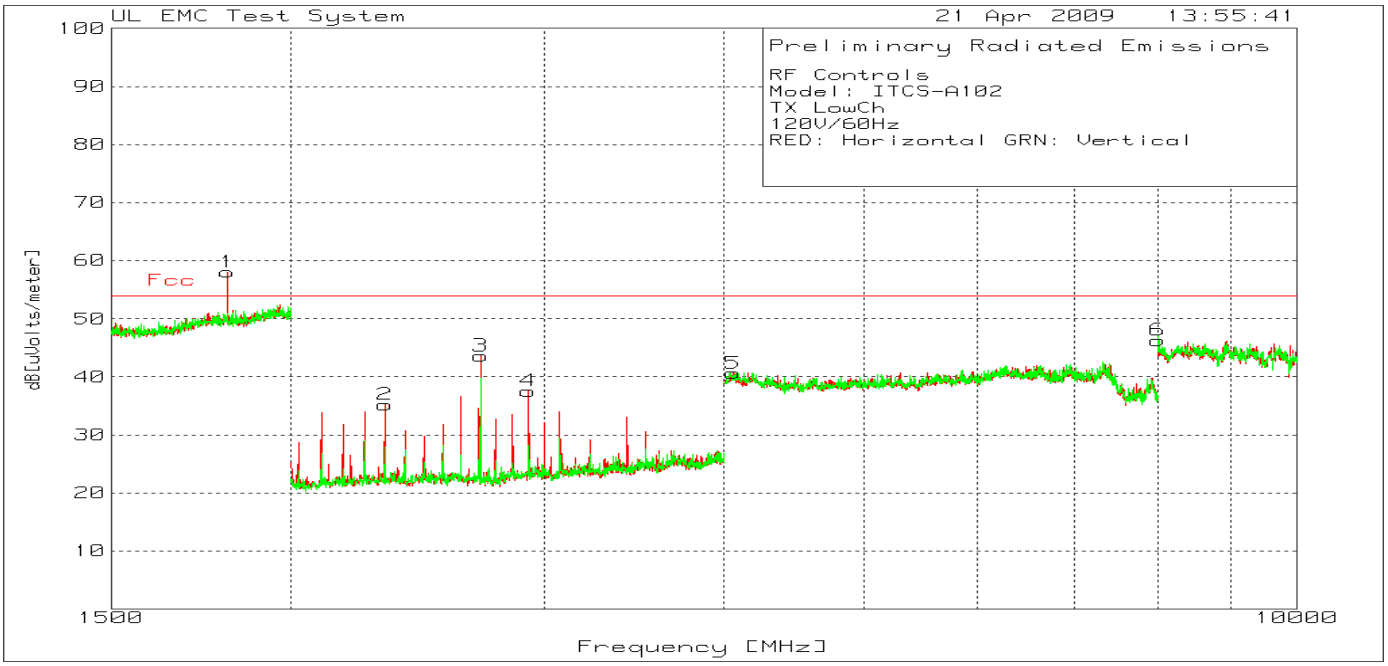


Above pre-scans were conducted at 3m distance. Between 860MHz – 1GHz the RBW was reduced to 50kHz in order to minimize the effect of the fundamental frequency in the frequency range mentioned above. There were no spurious emissions related to the radio recorded below 1GHz.

Figure 21 Radiated Spurious Emissions above 1GHz (1000MHz – 10000MHz)

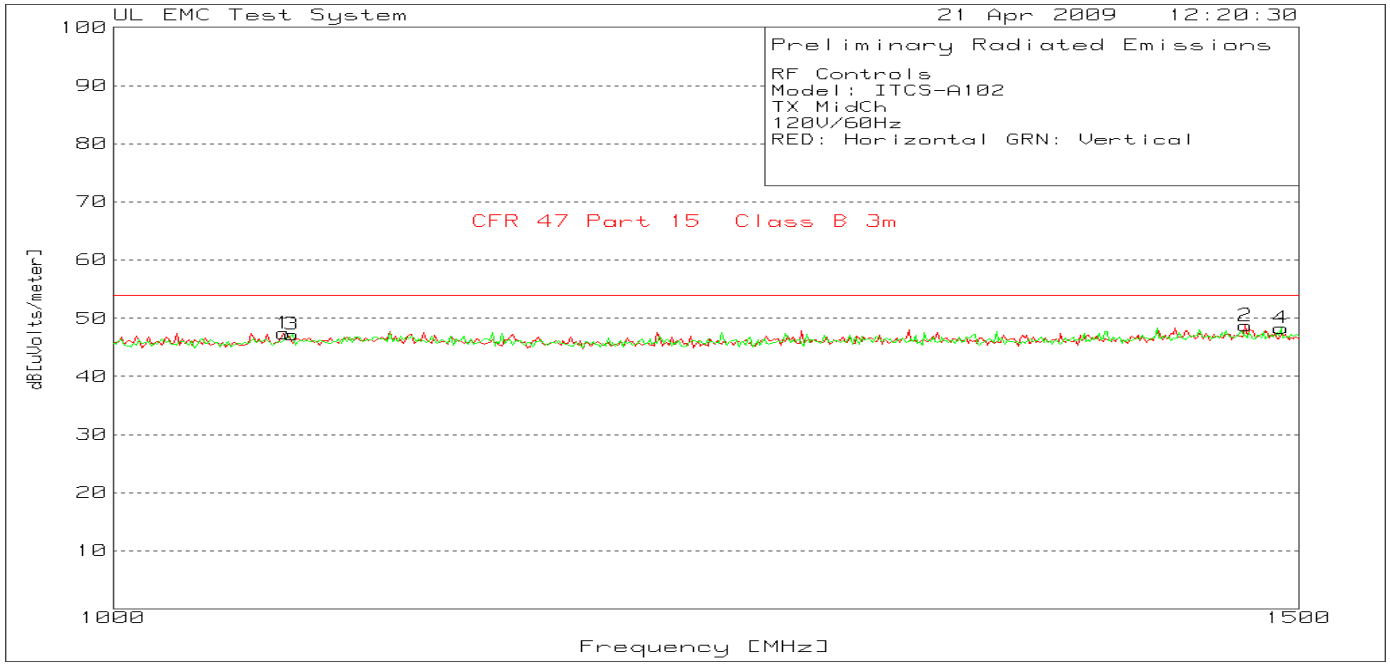
Low Channel

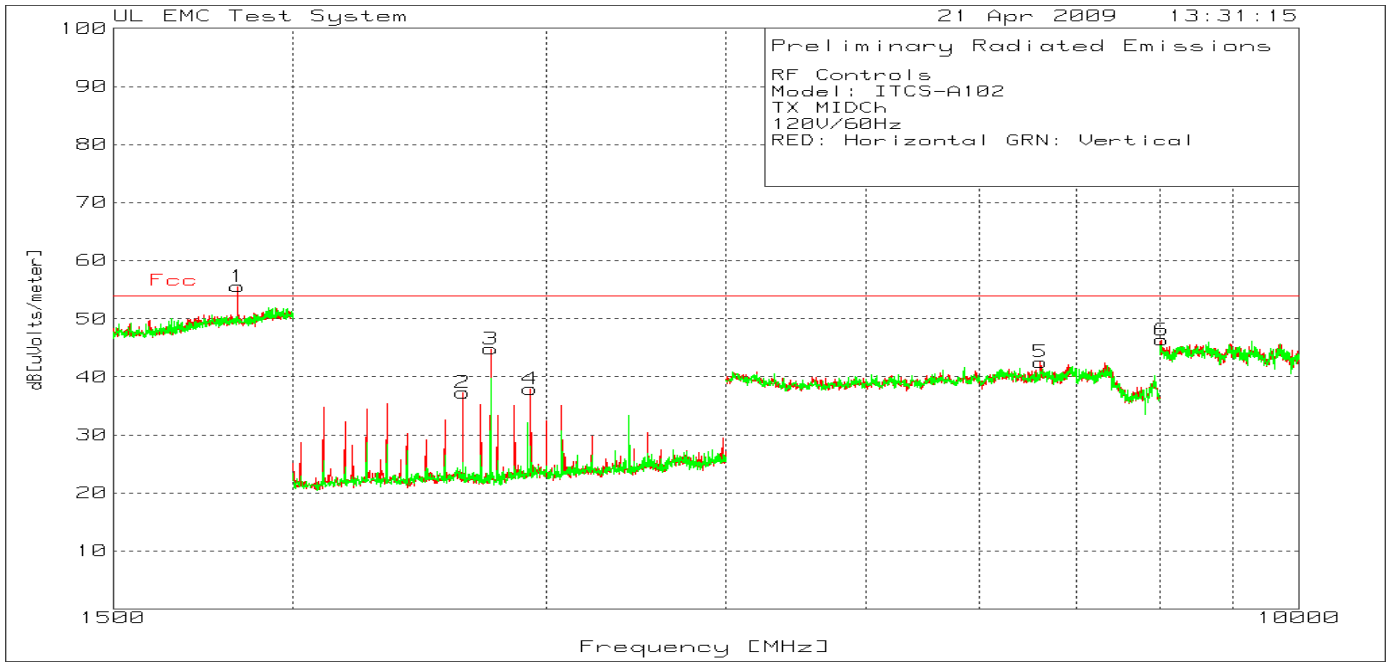




Second Harmonic is not in restricted band therefore there are no limits applicable.

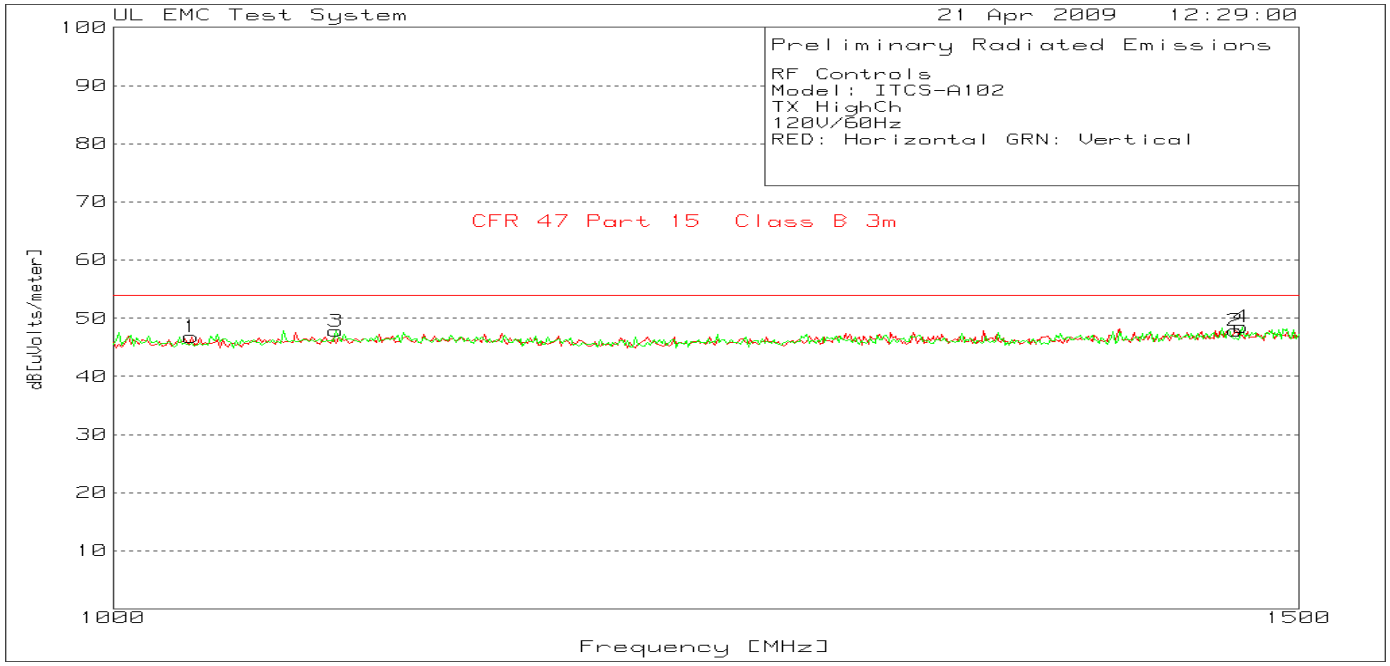
Middle Channel

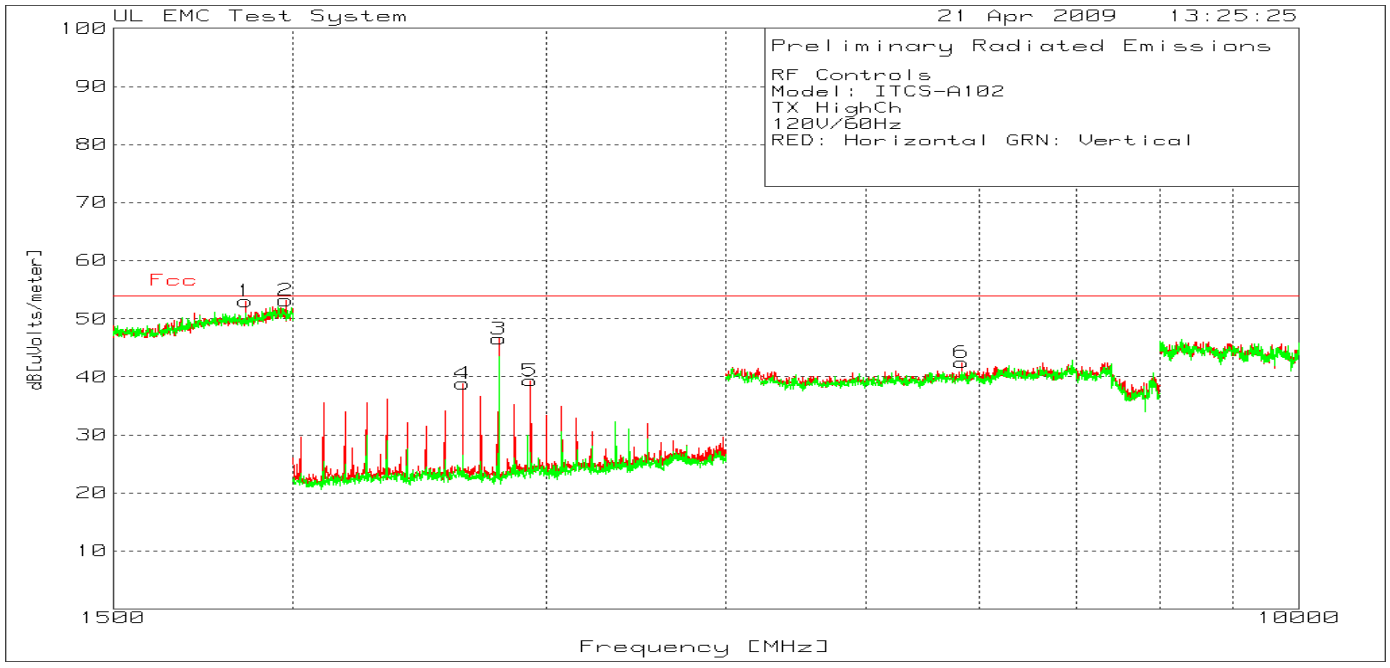




Second Harmonic is not in restricted band therefore there are no limits applicable.

High Channel





Second Harmonic is not in restricted band therefore there are no limits applicable.

4.8 Test Conditions and Results – Radiated Emissions – Digital / Receiver

Test Description	Measurements were made in a 10-meter semi-anechoic chamber that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10-meter below 1GHz and 3 meters above 1GHz. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4-meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.

Basic Standard	47 CFR Part 15.209 RSS-Gen 7.2.1 and 7.2.3	
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 1GHz	(10 meter measurement distance)
Fully configured sample scanned over the following frequency range	1GHz – 10GHz	(3 meter measurement distance)

Limits

Frequency (MHz)	Limit (dBµV/m)		
	Quasi-Peak	Average	
	General Emissions	Fundamental	Spurious
30 – 88	39.08	-	-
88 – 216	43.52	-	-
216-960	46.44	-	
960 - 1000	49.54	-	-
1,000-25,000	-	-	54

Supplementary information: None

Table 29 SPURIOUS EMISSIONS EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	2

Supplementary information: None

Table 30 SPURIOUS EMISSIONS Test Equipment

Description	Manufacturer	Model	Identifier
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323
Bicon Antenna	Chase	VBA6106A	EMC4078
Log-P Antenna	Chase	UPA6109	EMC4258
Spectrum Analyzer	Rhode & Schwartz	FSEK	EMC4182
Antenna Array	UL	BOMS	EMC4276

Figure 22 Test setup for SPURIOUS EMISSIONS

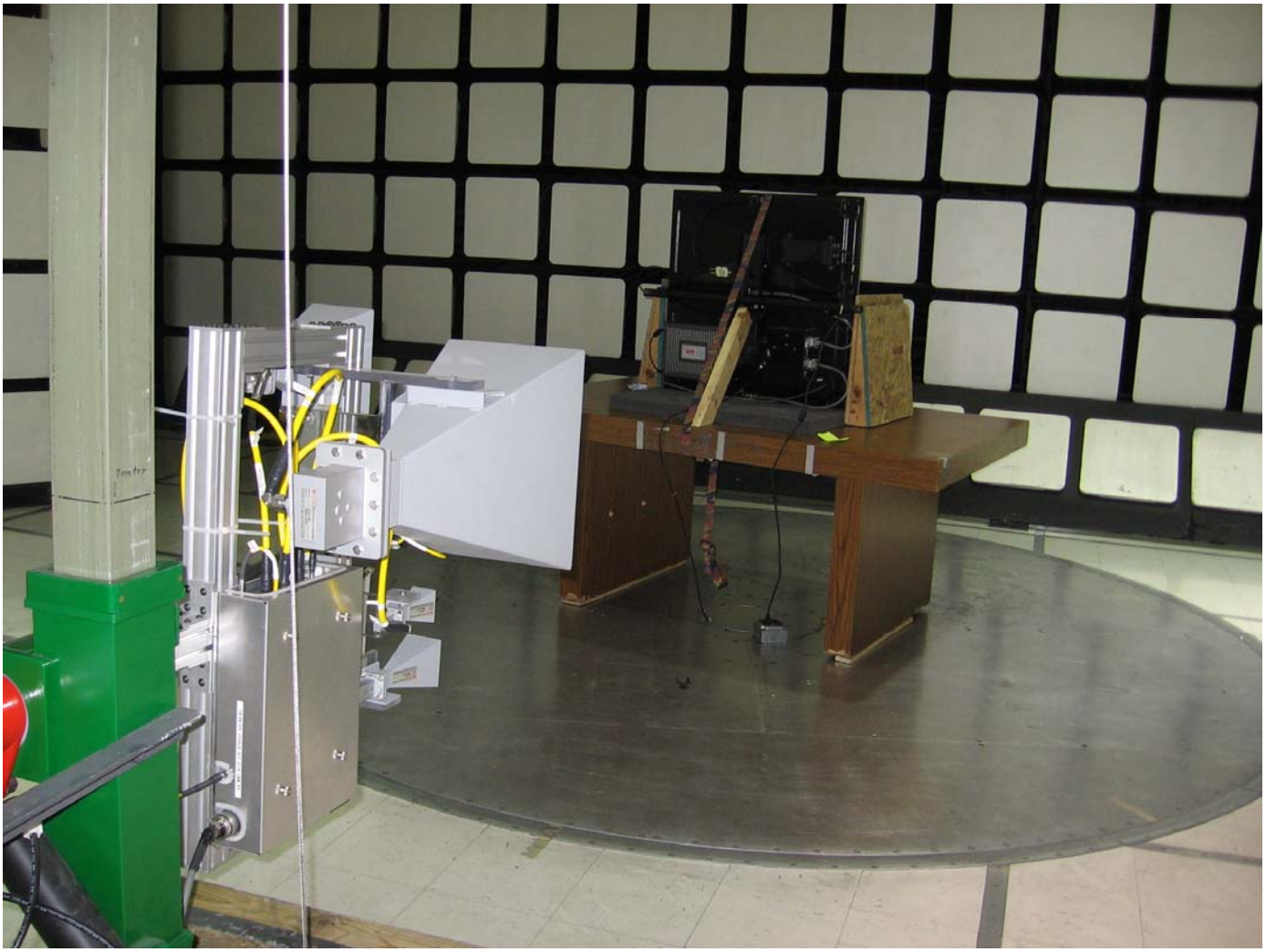


Figure 23 Radiated Emissions Graph 30MHz – 1GHz

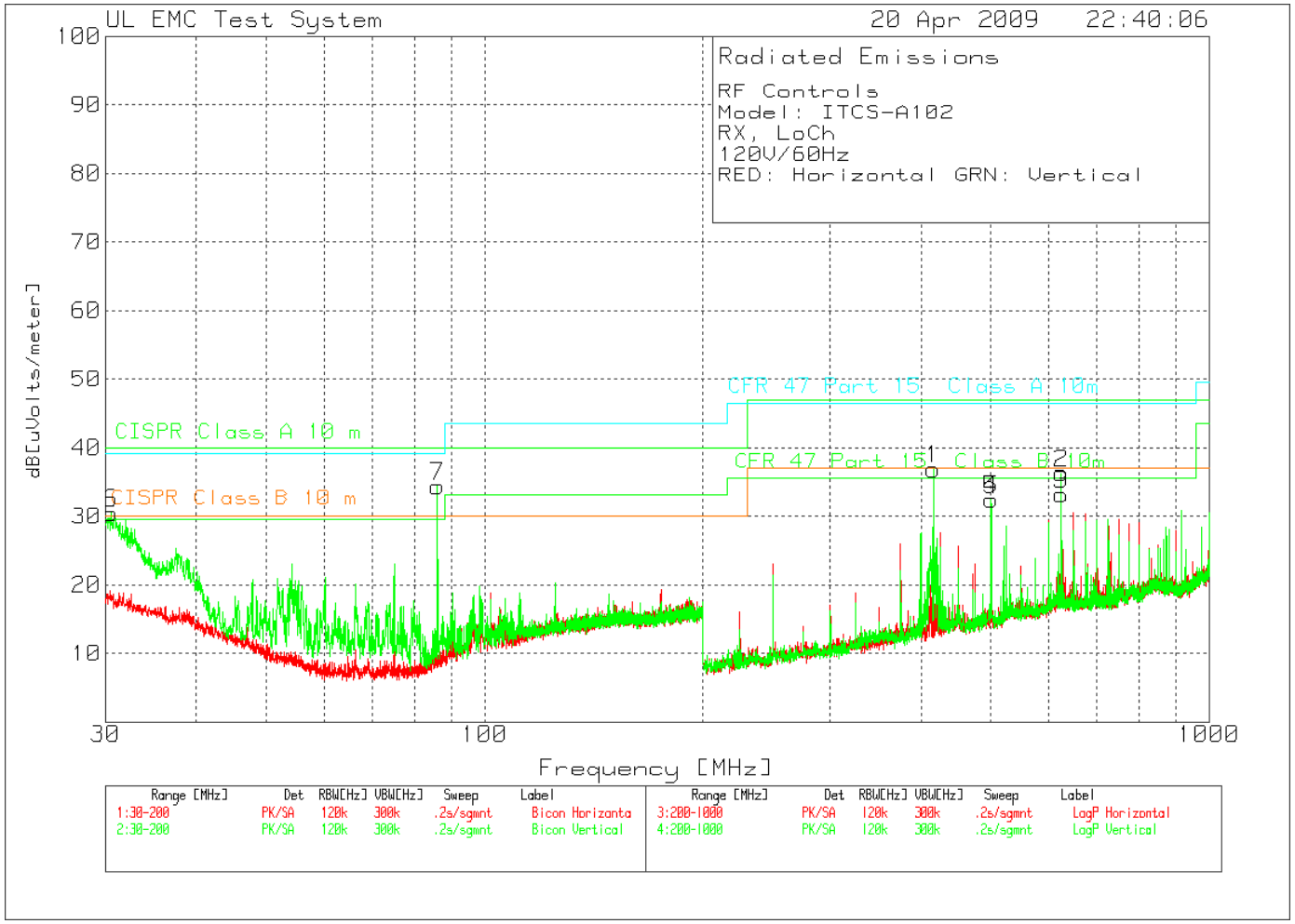


Table 31 Radiated Emissions Data Points 30MHz – 1GHz

RF Controls
Model: ITCS-A102
RX, LoCh
120V/60Hz
RED: Horizontal GRN: Vertical

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4	5	6
6	30.5096	43.14 pk	-30.4	17.7	30.44	40	30	39.1	29.6	-	-
		Height:100 Vert		Margin [dB]		-9.56	.44	-8.66	.84	-	-
This noise could not be found during final measurement – see data below											
7	86.058	56.25 pk	-30.2	8.3	34.35	40	30	39.1	29.6	-	-
		Height:300 Vert		Margin [dB]		-5.65	4.35	-4.75	4.75	-	-
3	625.0812	44.56 pk	-31.3	19.9	33.16	47	37	46.4	35.6	-	-
		Height:100 Horz		Margin [dB]		-13.84	-3.84	-13.24	-2.44	-	-
4	499.975	46.91 pk	-32	17.5	32.41	47	37	46.4	35.6	-	-
		Height:100 Horz		Margin [dB]		-14.59	-4.59	-13.99	-3.19	-	-
1	416.038	53.44 pk	-32.4	15.8	36.84	47	37	46.4	35.6	-	-
		Height:302 Vert		Margin [dB]		-10.16	-.16	-9.56	1.24	-	-
2	625.0812	47.61 pk	-31.3	19.9	36.21	47	37	46.4	35.6	-	-
		Height:203 Vert		Margin [dB]		-10.79	-.79	-10.19	.61	-	-
5	499.975	46.88 pk	-32	17.5	32.38	47	37	46.4	35.6	-	-
		Height:302 Vert		Margin [dB]		-14.62	-4.62	-14.02	-3.22	-	-

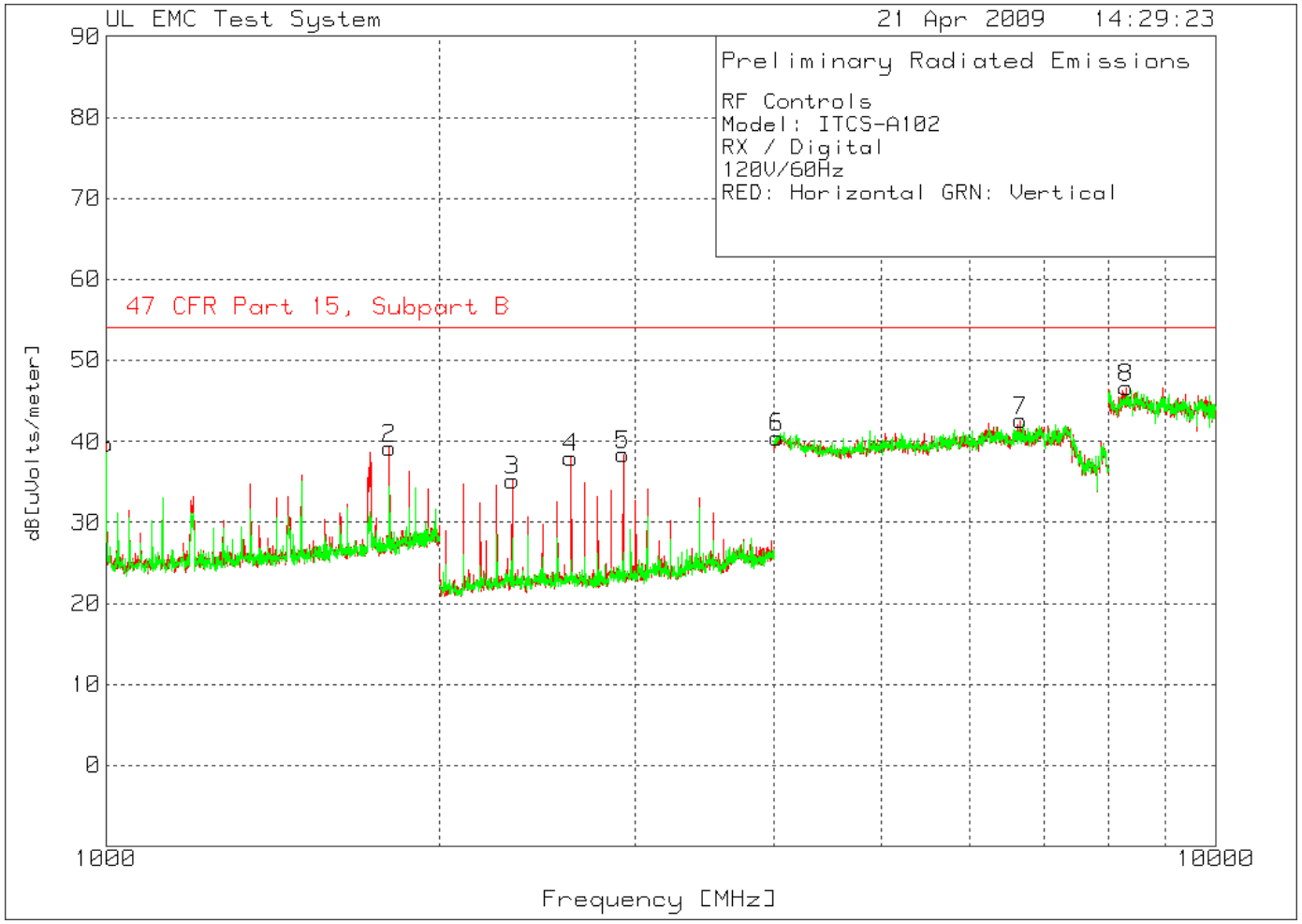
RF Controls
Model: ITCS-A102
RX, LoCh
120V/60Hz
RED: Horizontal GRN: Vertical

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4	5	6
30.894	38.04 qp	-30.4	17.5	25.14	40	30	39.1	29.6	-	-
Azimuth: 103	Height:103 Vert		Margin [dB]:		-14.86	-4.86	-13.96	-4.46	-	-
86.035	29.24 qp	-30.2	8.3	7.34	40	30	39.1	29.6	-	-
Azimuth: 359	Height:299 Vert		Margin [dB]:		-32.66	-22.66	-31.76	-22.26	-	-
625.0381	42.94 qp	-31.3	19.9	31.54	47	37	46.4	35.6	-	-
Azimuth: 101	Height:125 Horz		Margin [dB]:		-15.46	-5.46	-14.86	-4.06	-	-
500.0306	46.3 qp	-32	17.5	31.8	47	37	46.4	35.6	-	-
Azimuth: 42	Height:152 Horz		Margin [dB]:		-15.2	-5.2	-14.6	-3.8	-	-
500.0306	47.54 qp	-32	17.5	33.04	47	37	46.4	35.6	-	-
Azimuth: 12	Height:249 Vert		Margin [dB]:		-13.96	-3.96	-13.36	-2.56	-	-
415.9968	49.6 qp	-32.4	15.8	33	47	37	46.4	35.6	-	-
Azimuth: 329	Height:397 Vert		Margin [dB]:		-14	-4	-13.4	-2.6	-	-
625.0377	45.25 qp	-31.3	19.9	33.85	47	37	46.4	35.6	-	-
Azimuth: 22	Height:170 Vert		Margin [dB]:		-13.15	-3.15	-12.55	-1.75	-	-

LIMIT 1: CISPR Class A 10 m
LIMIT 2: CISPR Class B 10 m
LIMIT 3: CFR 47 Part 15 Class A 10m
LIMIT 4: CFR 47 Part 15 Class B 10m

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector

Figure 24 Radiated Emissions Graph 1GHz – 10GHz



No emissions close to the limit recorded, final measurements not required.

4.9 Test Conditions and Results – 99% Bandwidth

Test Description	When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.	
Basic Standard	RSS-Gen 4.6.1	
UL LPG	None	
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	902 MHz – 928 MHz	Antenna Port Conducted
Supplementary information: Data provided for this test is from previously tested EUT covered under project number 08CA25749 (FCC ID: WFQITCSA100). The previously tested EUT utilizes the same radio as this unit therefore re-running this test was considered not required.		

Table 32 99% Bandwidth EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	2	1
Supplementary information: None		

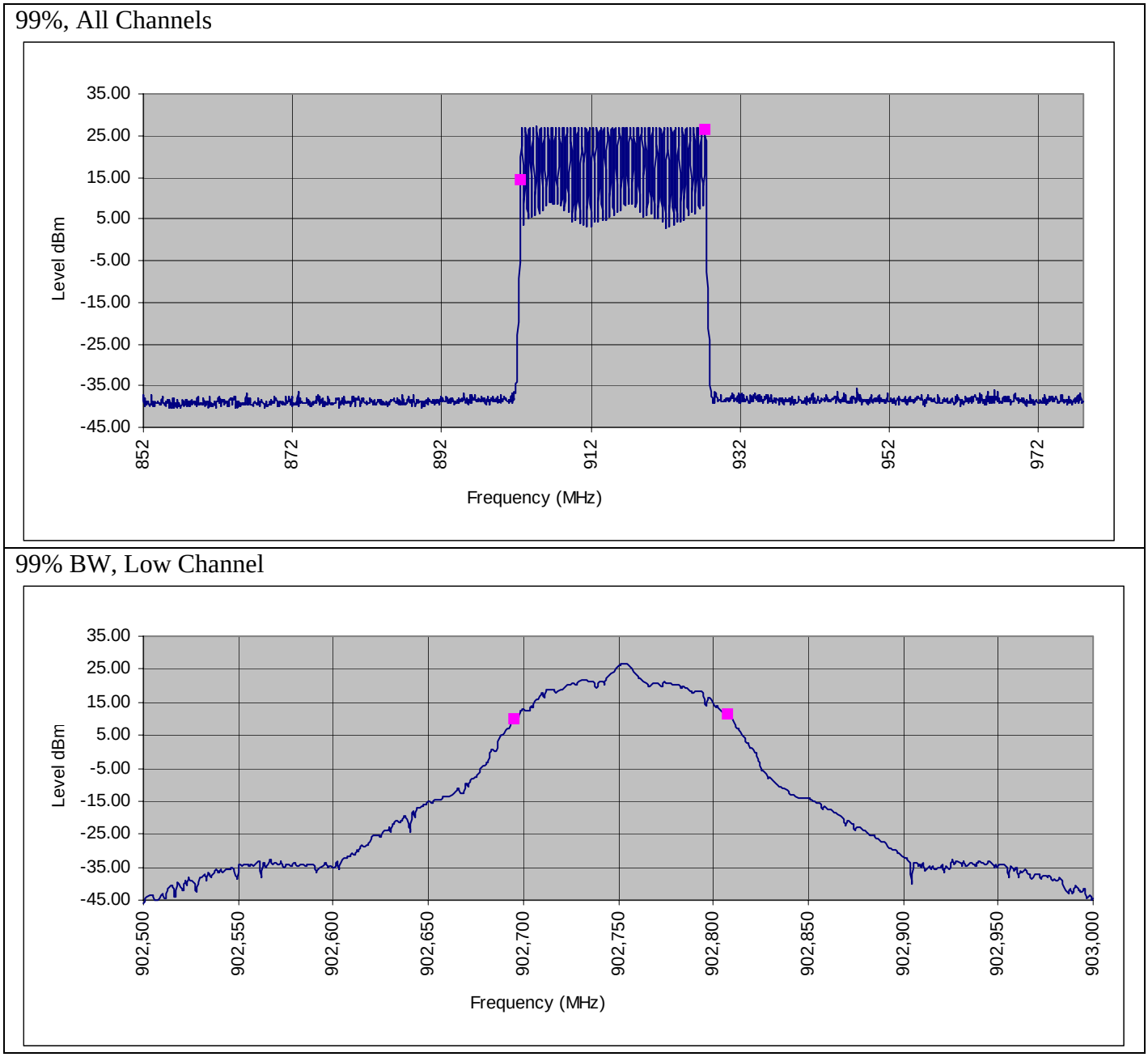
Table 33 99% Bandwidth Test Equipment

Description	Manufacturer	Model	Identifier
Spectrum Analyzer	Rhode & Schwartz	FSEK	EMC4182
Attenuator	Pasternek	PE7019-30	None

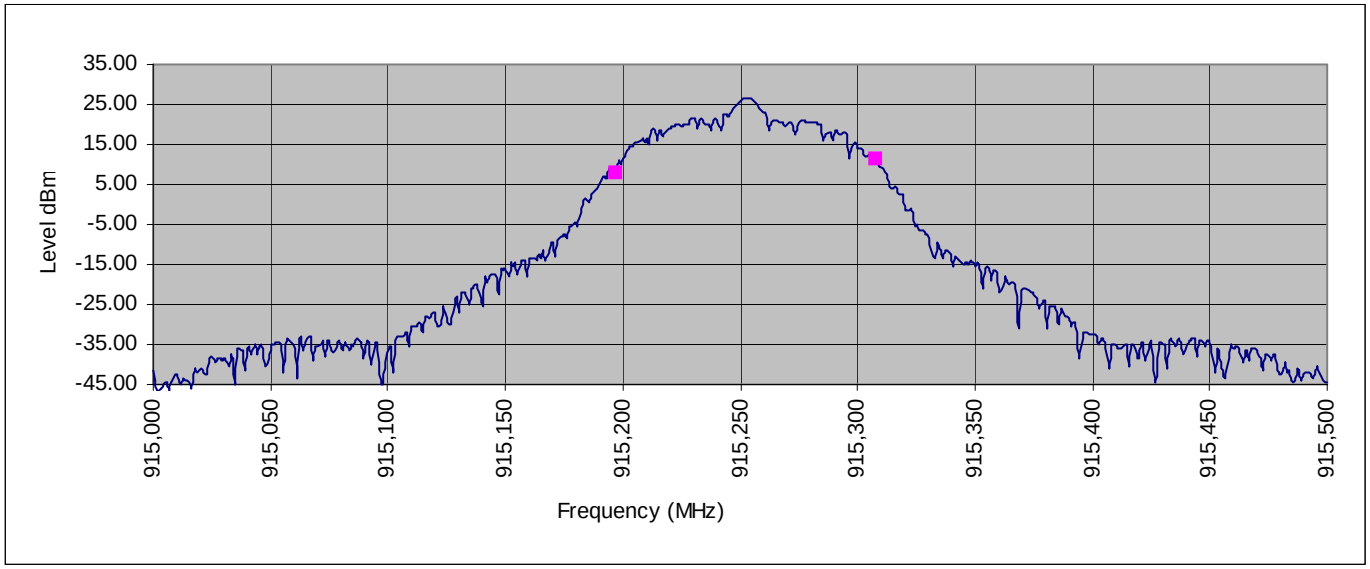
Table 34 99% Bandwidth Results

Modulation Mode	99% Bandwidth
All Channels	24,628.419kHz
Low Channel	112.224kHz
Middle Channel	111.222kHz
High Channel	111.222kHz

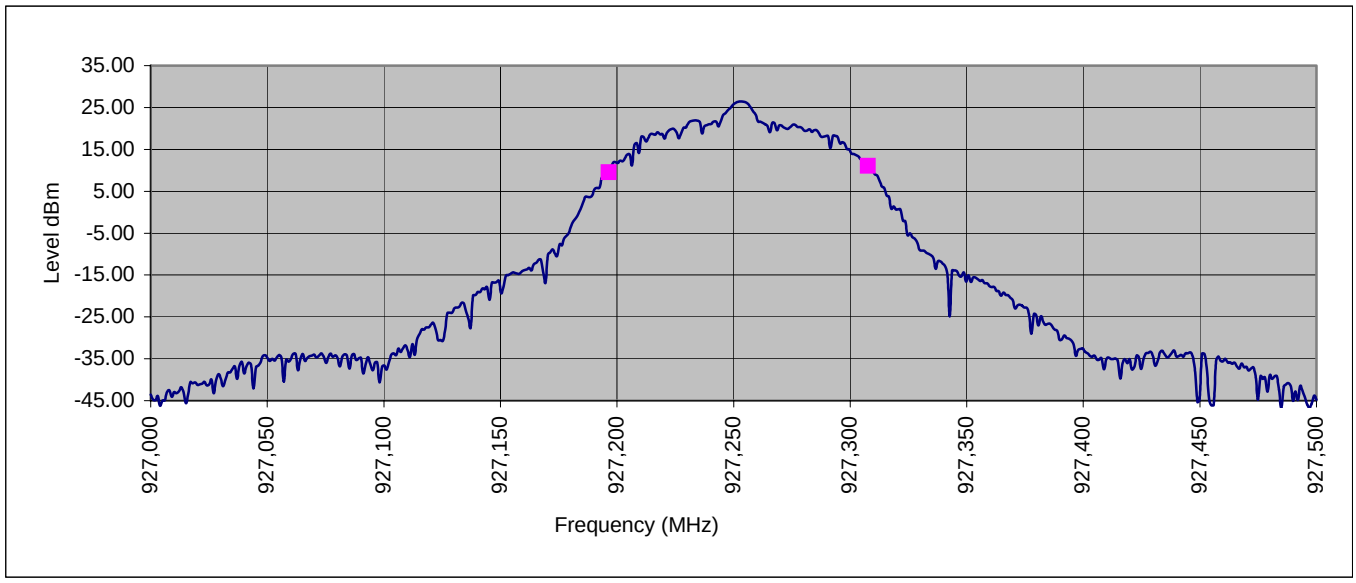
Figure 25 99% Band Width



99% BW, Middle Channel



99% BW, High Channel



4.10 RF Exposure / SAR Statement

RF Controls LLC declares that Model: ITCS-A-102 complies with FCC radiation exposure requirement specified in the FCC rules 2.1091. The ITCS-A-102 has 693.4mW of conducted Peak Output power and 3.899 W EIRP. This equipment is considered as mobile. The Following calculation is the reference data for 20cm distance.

The following information provides the minimum separation distance for t he antenna provided with the ITCS-A-104 as calculated from FCC OET Bulleting 65, Appendix A, Table A Limits for Occupational / Controlled Exposure. This calculation is based on the highest EIRP possible from the system, considering maximum power used and antenna gain, and considering a 3.0mW/cm^2 controlled exposure limit. The following formula was used.

$S = (P*G)/(4*PI*r^2)$

P = 693.4mW (28.41dBm)
G = 5.62 (7.5dBi)
r = 20cm

from the above: S = 0.775mW/cm^2

5.0 IMMUNITY TEST RESULTS

The immunity tests were not performed nor required:

Appendix A

Accreditations and Authorizations

NVLAP Lab code: 100414-0

NVLAP: Recognized under the National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC EN17025 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987) as suppliers of calibration or test results. For a full scope listing see http://ts.nist.gov/ts/htdocs/210/214/scopes/1004140.htm

FCC: Details of the measurement facilities used for these tests have been filed with the Federal Communications Commission's Laboratory in Columbia, Maryland (Ref. No. 91044).

Industry Canada Industrie Canada

Industry of Canada: Accredited by Industry Canada for performance of radiated measurements. Our test site complies with RSP 100, Issue 7, Section 3.3. File #: IC 2180

VCCI: Accepted as an Associate Member to the VCCI. The measurement facilities detailed in this test report have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. Registration Nos.: Radiated Emissions R-621, Conducted Emissions C-642.

ICASA: ICASA (Independent Communications Authority of South Africa) has appointed UL as a Designated Test Laboratory to test Telecommunications equipment for type approval in compliance with CISPR 22 to assist in fulfilling its mandate under section 54(1) of the Telecommunications Act, 1996 (Act 103 of 1996).

NIST/CAB: Validated by the European Commission as a U.S. Conformity Assessment Body (CAB) of the U.S.-EU Mutual Recognition Agreement (MRA) for the Electromagnetic Compatibility - Council Directive 89/336/EEC, Article 10 (2). Also validated for the Telecommunication Equipment-Council Directive 99/5/EC, Annex III and IV, Identification Number: 0983.
NIST/CAB: Provisioned to act as a U.S. Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the Asia Pacific Economic Cooperation (APEC) MRA between the American Institute in Taiwan (AIT) and the United States. Our laboratory is considered qualified to test equipment subject to the applicable EMC regulations of the Chinese Taipei Bureau of Standards, Metrology and Inspection (BSMI) which require testing to CNS 13438 (CISPR 22).
NIST/CAB: Recognized by the Infocomm Development Authority of Singapore (IDA) under the Asia Pacific Economic Cooperation Mutual Recognition Agreement (APEC MRA). Our laboratory is provisionally designated to act as a Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the APEC MRA. Our scope of designation includes IDA TS EMC (CISPR 22), IEC 61000-4-2, -4-3, -4-4, -4-5, and -4-6