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Job Number:	963773
Project Number	08CA25749
File Number:	MC15947
Date:	June 19, 2008
Model:	ITCS-A-100

Electromagnetic Compatibility Test Report

For

RF Controls LLC

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Test Report Details

Tests Performed By: **Underwriters Laboratories Inc.**
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Northbrook, IL 60062

Tests Performed For: **RF Controls LLC**
1141 S. 7th St.
St. Louis, MO 63104-3623

Applicant Contact: **Mr. Chris Turner**
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Test Report Date: **June 19, 2008**

Product Type: **900MHz RF ID Frequency Hopping Transmitter**

Product standards	47 CFR Part 15.247, Subpart C
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Model Number: **ITCS-A-100**

EUT Category: **Unlicensed Transmitter**

Testing Start Date: **June 16, 2008**

Date Testing Complete: **June 18, 2008**

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.

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1.0	G E N E R A L - Product Description.....	4
1.1	Equipment Description	4
1.2	Device Configuration During Test	4
1.2.1	Equipment Used During Test:.....	4
1.2.2	Input/Output Ports:.....	4
1.2.3	Power Interface:.....	4
1.3	EUT Configurations	5
1.4	EUT Operation Modes.....	5
2.0	Summary	5
2.1	Deviations from standard test methods.....	5
2.2	Device Modifications Necessary for Compliance	5
2.3	Reference Standards	6
2.4	Results Summary	6
3.0	Calibration of Equipment Used for Measurement	7
4.0	EMISSIONS TEST RESULTS	7
4.1	Test Conditions and Results – MAINS TERMINAL – CONDUCTED EMISSIONS	8
4.2	Test Conditions and Results – Carrier Frequency Separation.....	14
4.3	Test Conditions and Results – Number of Hopping Frequencies	20
4.4	Test Conditions and Results – Dwell Time	23
4.5	Test Conditions and Results – Maximum Peak Output Power	27
4.6	Test Conditions and Results – Band Edge Compliance	30
4.7	Test Conditions and Results – SPURIOUS EMISSIONS (Antenna Conducted and Radiated)	34
4.8	Test Conditions and Results – Radiated Emissions – Digital / Receiver.....	42
4.9	Test Conditions and Results – 99% Bandwidth	53
4.10	RF Exposure / SAR Statement	56
5.0	IMMUNITY TEST RESULTS	57
Appendix A	58
	Accreditations and Authorizations.....	58

Report Revision History

Revision Date	Description	Revised By	Revision Reviewed By
none			

1.0 GENERAL - 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 array antenna coupled to a off-the shelf certified RFID reader that 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-100	None
AE	Laptop Used	IBM	Lenovo T61	S/N L3-R1546
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	-	None

1.3 EUT Configurations

Mode #	Description
1	Configured in Semi-Anechoic chamber on fixed support provided by manufacturer.
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

- 1) Add 3' shielded LAN cable between Array Controller box and Sirit RFID reader
- 2) Applied shielding to Array Controller (ArCon) box in the form of copper tape and gaskets. Paint was removed from the surfaces where the gaskets were to be applied. 1/2" wide gasket: (Schlegel PN: E1119T) was applied on overlapping edges of the box. On non-overlapping edges, "T" gasket: (Schlegel PN: EA953T03937) was applied. Copper tape was applied to the non-overlapping edge to emulate an overlapping edge.
- 3) The LED Assembly was removed.
- 4) Ferrites were attached to cables attached to the Array Controller box.
 - 26HD Data Cables on ArCon end of cable (Fair-Rite PN: 0446167251).
 - Ethernet Cable on ArCon end of cable (Fair-Rite PN: 0461164281).
 - Ethernet Cable from ArCon to Sirit, each end of the cable (Fair-Rite PN: 0461164281).
 - Power Cable from Power Supply to ArCon, ArCon end of cable (Fair-Rite 0446167251).
 - Power Cable from Power Supply to ArCon, Power Supply end of cable (Fair-Rite 0446167281).
 - Power Cable from ArCon to Sirit, ArCon end of cable (Fair-Rite 0446164281)
 - Power Cable from ArCon to Sirit, Sirit end of cable (Fair-Rite 0461167281).

2.3 Reference Standards

Standard Number	Standard Name	Standard Date
FCC Part 15, Subpart C	Code of Federal Regulations, Part 15, Radio Frequency Devices	2007
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

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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
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----- 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
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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: None		

Table 1 Conducted Emissions EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	3	1 and 2
Supplementary information: Testing was conducted with non-filtered power supply.		

Table 2 Conducted Emissions Test Equipment

Description	Manufacturer	Model	Identifier
Spectrum Analyzer / Preselector	Agilent	E7405A	EMC4242
Transient Limiter	Electro-Metrics	EM7600-2	EMC4224
HP Filter	Solar	2803-150	-
Step Attenuator	HP	HP8494B	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



Figure 2 Conducted Emissions Graph – TX Hopping

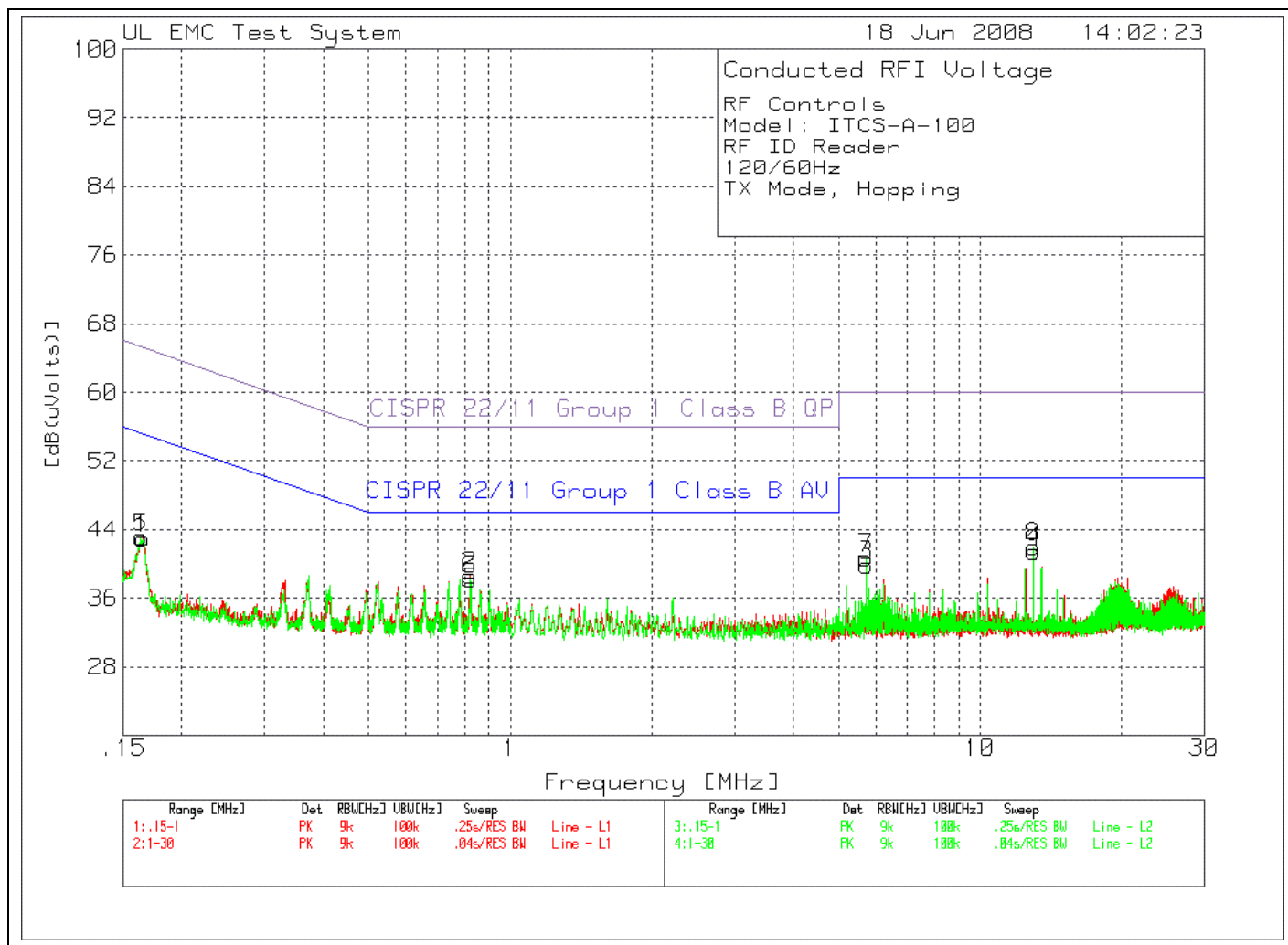


Table 3 Conducted Emissions Data Points – TX Hopping

RF Controls
 Model: ITCS-A-100
 RF ID Reader
 120/60Hz
 TX Mode, Hopping

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	.16485	28.82 pk	12.6	1.5	42.92	-	-	65.2	55.2	-	-
				Margin [dB]		-	-	-22.28	-12.28	-	-
2	.82183	27.81 pk	10.6	.2	38.61	-	-	56	46	-	-
				Margin [dB]		-	-	-17.39	-7.39	-	-
3	5.7203	29.24 pk	10.4	.2	39.84	-	-	60	50	-	-
				Margin [dB]		-	-	-20.16	-10.16	-	-
4	12.99065	30.62 pk	10.6	.2	41.42	-	-	60	50	-	-
				Margin [dB]		-	-	-18.58	-8.58	-	-
Neutral											
5	.16379	28.71 pk	12.7	1.7	43.11	-	-	65.3	55.3	-	-
				Margin [dB]		-	-	-22.19	-12.19	-	-
6	.8213	27.36 pk	10.6	.2	38.16	-	-	56	46	-	-
				Margin [dB]		-	-	-17.84	-7.84	-	-
7	5.71126	30.08 pk	10.4	.2	40.68	-	-	60	50	-	-
				Margin [dB]		-	-	-19.32	-9.32	-	-
8	12.97256	31.11 pk	10.5	.4	42.01	-	-	60	50	-	-
				Margin [dB]		-	-	-17.99	-7.99	-	-

Based on peak scan results, Quasi-Peak and Average Measurements were considered not necessary.

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

pk - peak
 qp - quasi-peak
 av - average

Figure 3 Conducted Emissions Graph - RX Mode

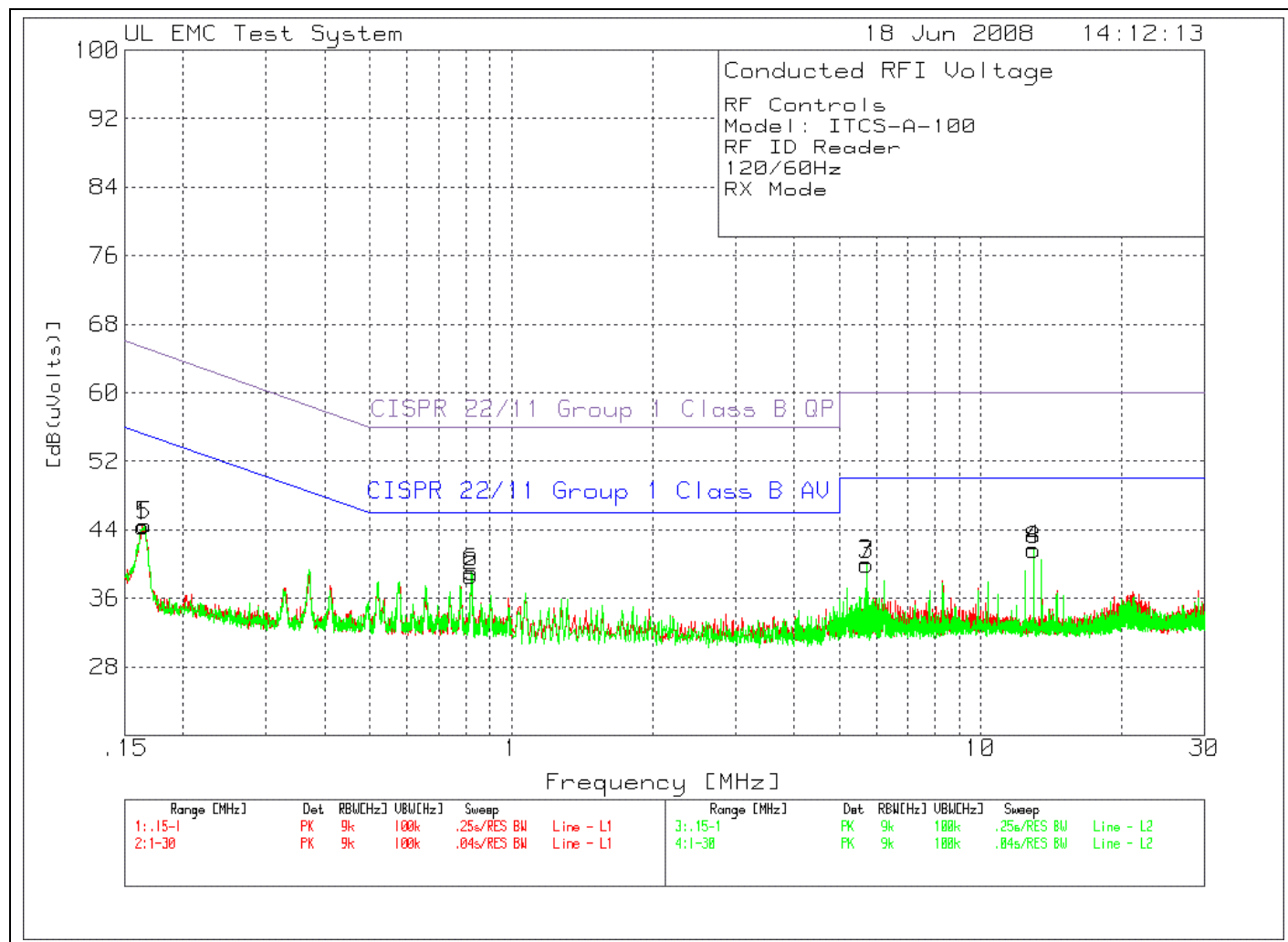


Table 4 Conducted Emissions Data Points

RF Controls
Model: ITCS-A-100
RF ID Reader
120/60Hz
RX Mode

Test No.	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	.16379	30.18 pk	12.7	1.5	44.38	-	-	65.3	55.3	-	-
				Margin [dB]		-	-	-20.92	-10.92	-	-
2	.81971	27.84 pk	10.6	.2	38.64	-	-	56	46	-	-
				Margin [dB]		-	-	-17.36	-7.36	-	-
3	5.70221	29.39 pk	10.4	.2	39.99	-	-	60	50	-	-
				Margin [dB]		-	-	-20.01	-10.01	-	-
4	12.96352	30.81 pk	10.6	.3	41.71	-	-	60	50	-	-
				Margin [dB]		-	-	-18.29	-8.29	-	-
Neutral											
5	.16485	30.19 pk	12.6	1.7	44.49	-	-	65.2	55.2	-	-
				Margin [dB]		-	-	-20.71	-10.71	-	-
6	.82236	28.2 pk	10.6	.2	39	-	-	56	46	-	-
				Margin [dB]		-	-	-17	-7	-	-
7	5.70221	29.33 pk	10.4	.2	39.93	-	-	60	50	-	-
				Margin [dB]		-	-	-20.07	-10.07	-	-
8	12.96352	30.7 pk	10.5	.4	41.6	-	-	60	50	-	-
				Margin [dB]		-	-	-18.4	-8.4	-	-

Based on peak scan results, Quasi-Peak and Average Measurements were considered not necessary.

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

pk - peak
qp - quasi-peak
av - average

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)

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	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



Figure 5 Carrier Frequency Separation Graphs

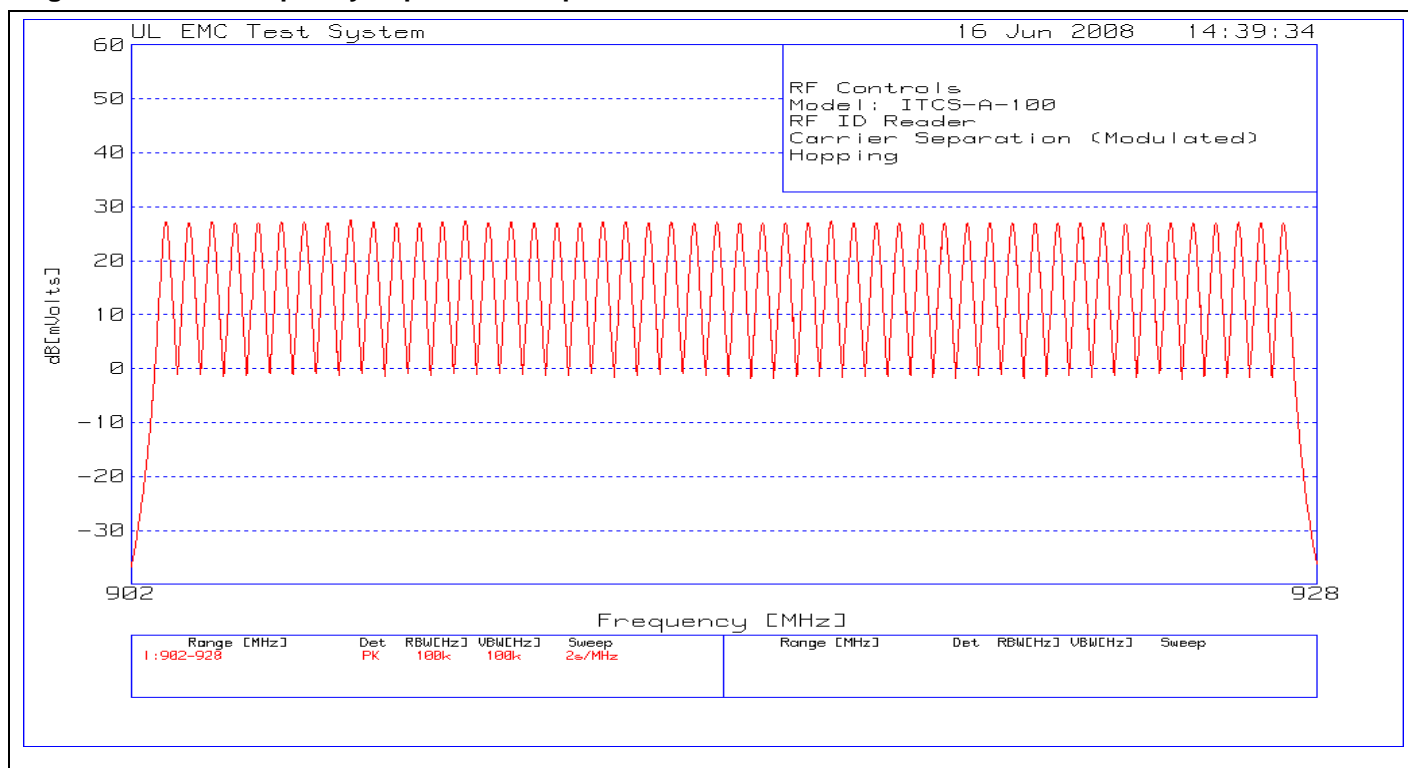


Table 8 Carrier Frequency Separation (Frequency List)

#	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)

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	PE7019-30	None

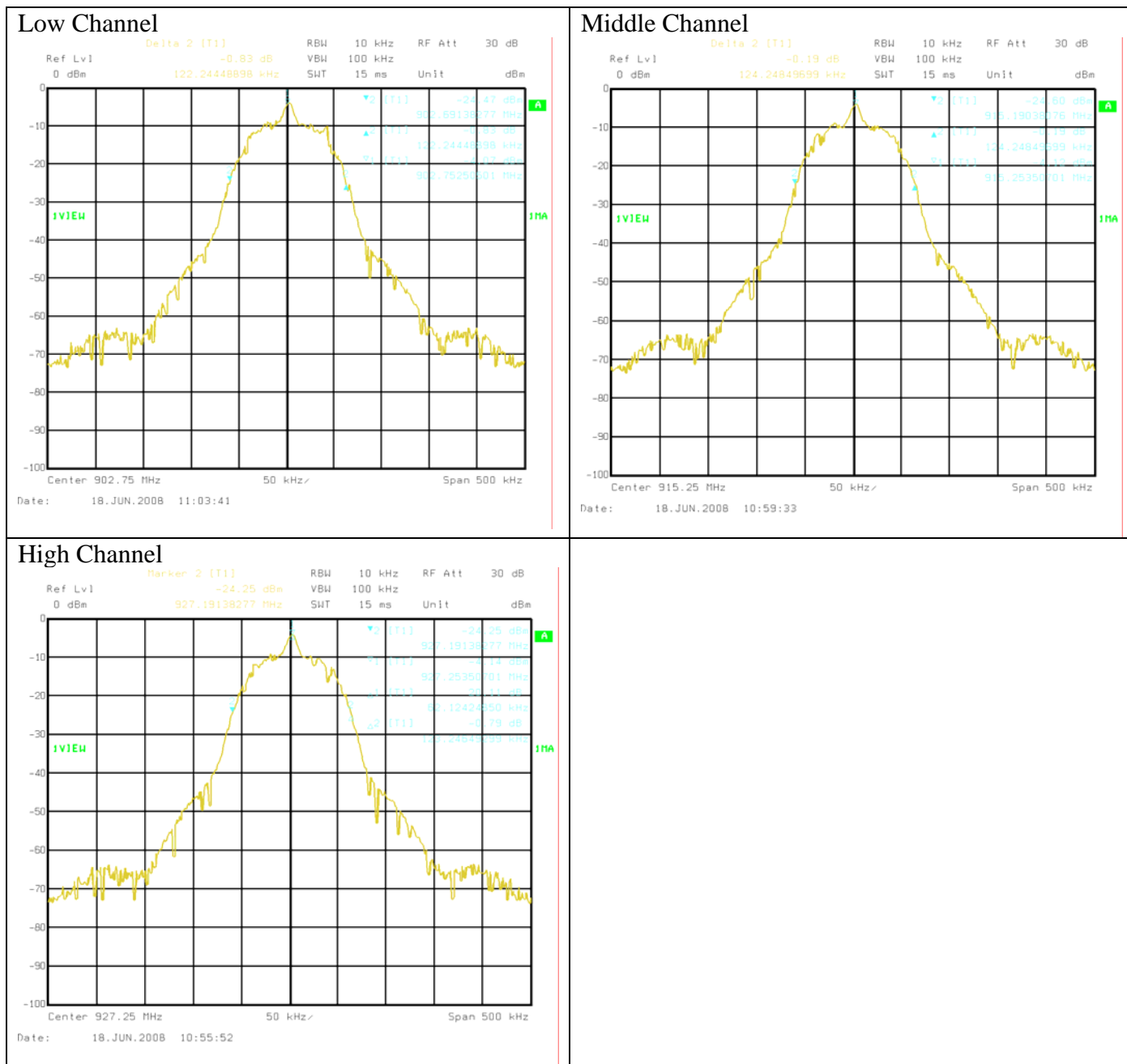
Table 11 20dB Bandwidth Results

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

Figure 6 Test Setup for 20dB Bandwidth



Figure 7 20dB Bandwidth Graphs



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)	

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	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



Figure 9 Number of Hopping Frequencies Graphs

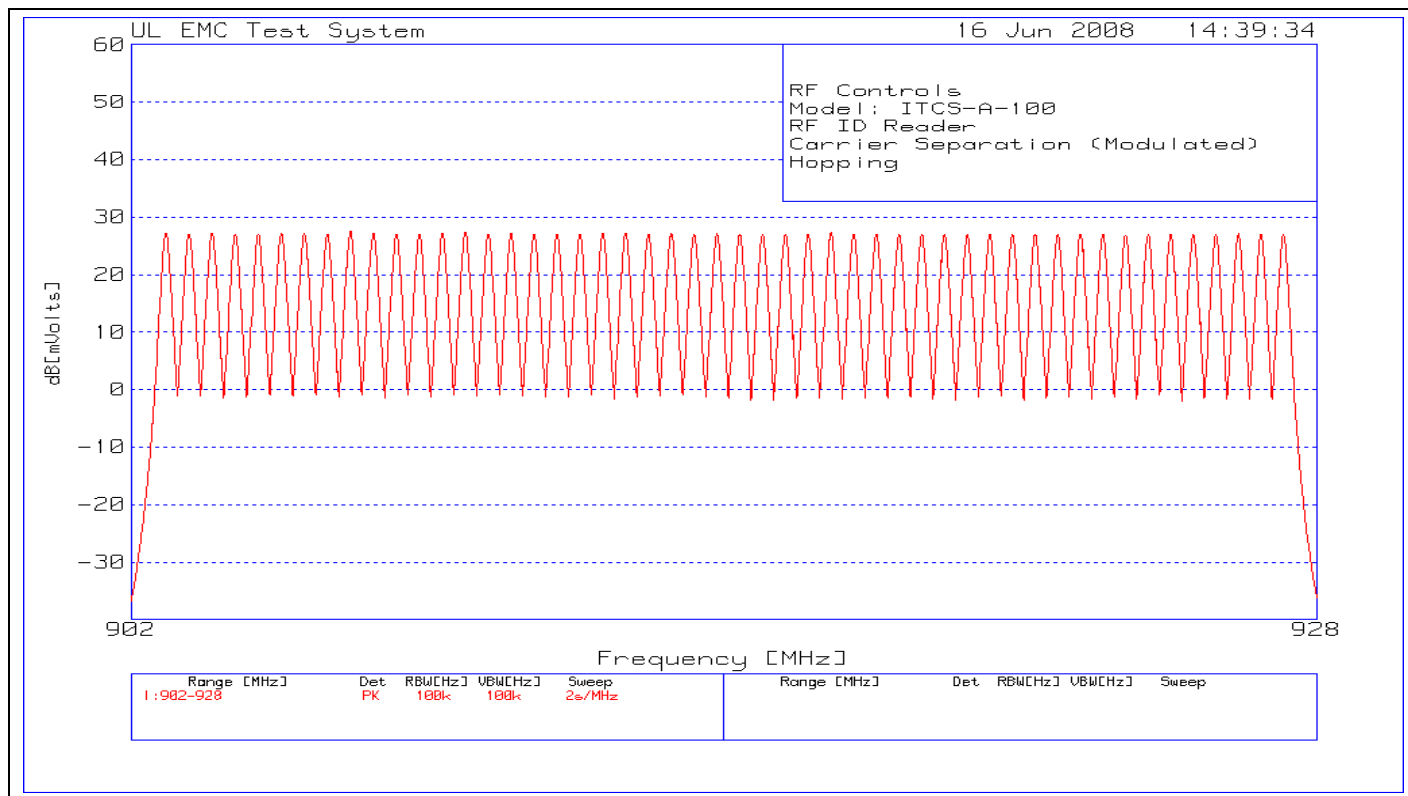


Table 15 Number of Hopping Channels (Frequency List)

#	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)

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		

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

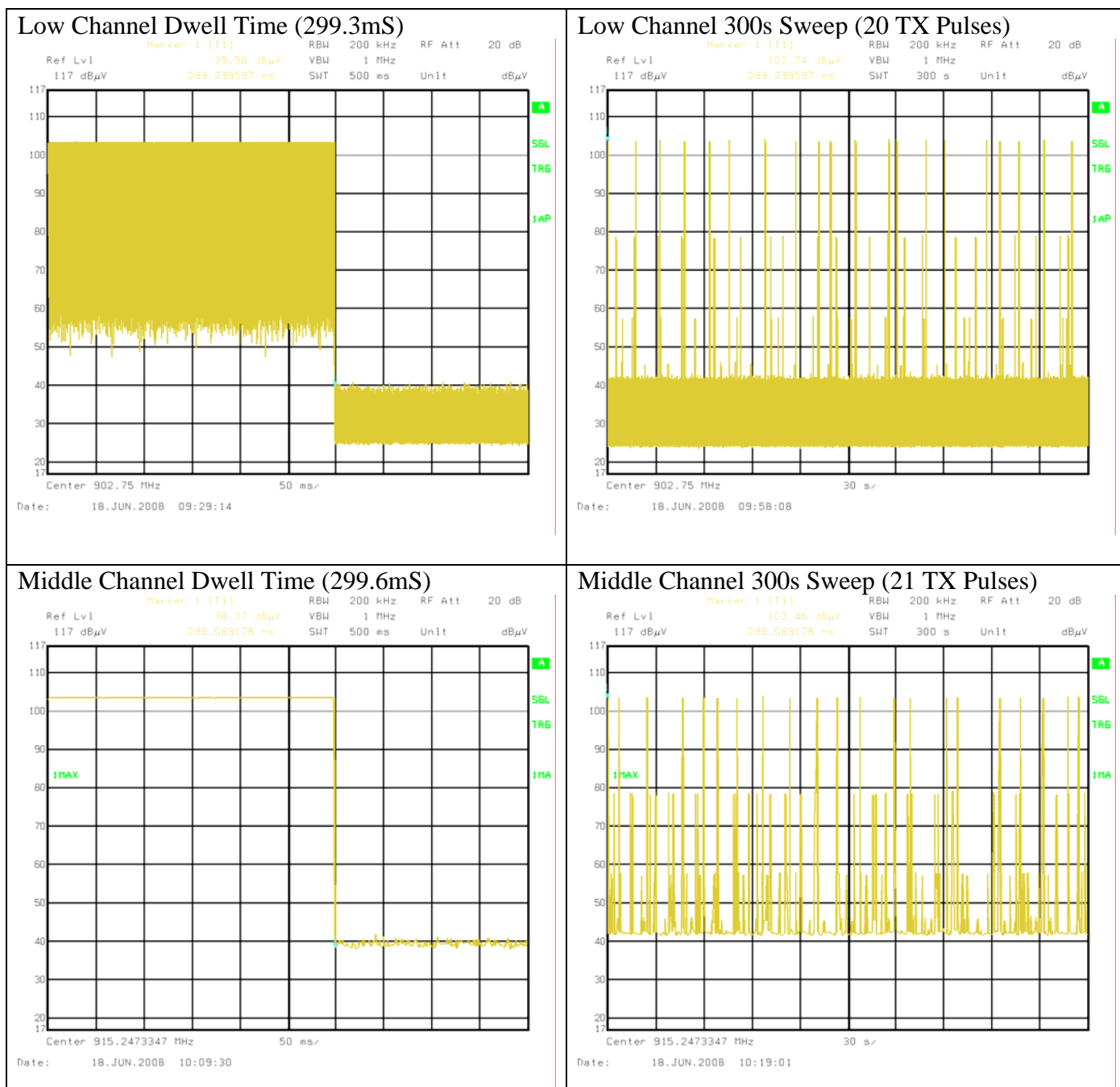
15.247(a)(1)(i) states that system using 50 hopping frequencies shall not have average time of occupancy on any frequency greater then 0.4 seconds within 20 second period. This when converted to percentage over 50 channels it indicates that each channel can not be ON for overall more then 2% of the total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

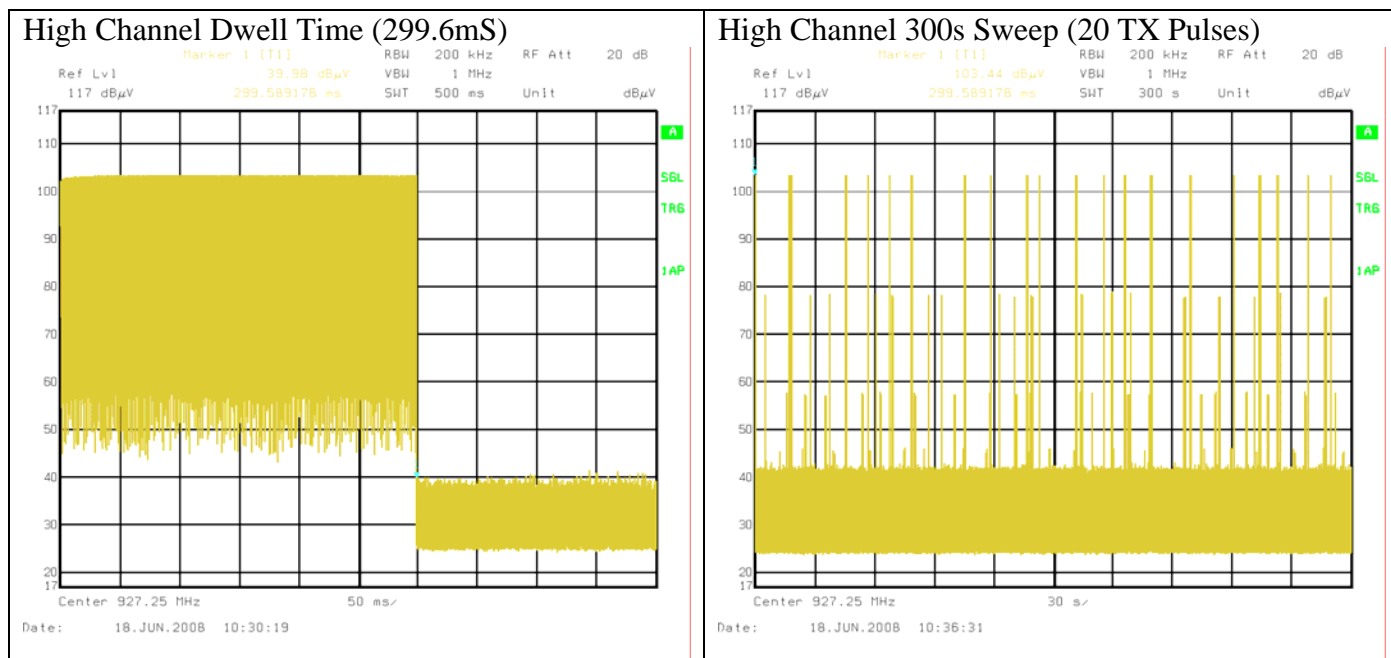
Mode	Number of Channels	Maximum Time Allowed	Measured Dwell Time
TX Hopping Low Channel	50	2% of total time	(0.2993s x 20pulses)/300s 2%
TX Hopping Middle Channel	50	2% of total time	(0.2996s x 21pulses)/300s 2%
TX Hopping High Channel	50	2% of total time	(0.2996s x 20pulses)/300s 2%

Figure 10 Test Setup for Dwell Time



Figure 11 Dwell Time Graphs





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-2.6dB)	Power dBm	Power W
Low Channel	8.6dBi	27.4dBm	27.14	0.5176
Middle Channel	8.6dBi	27.4dBm	27.14	0.5176
High Channel	8.6dBi	27.4dBm	27.00	0.5011

Figure 12 Test setup for Maximum Peak Output Power



Figure 13 Maximum Peak Output Power Graph

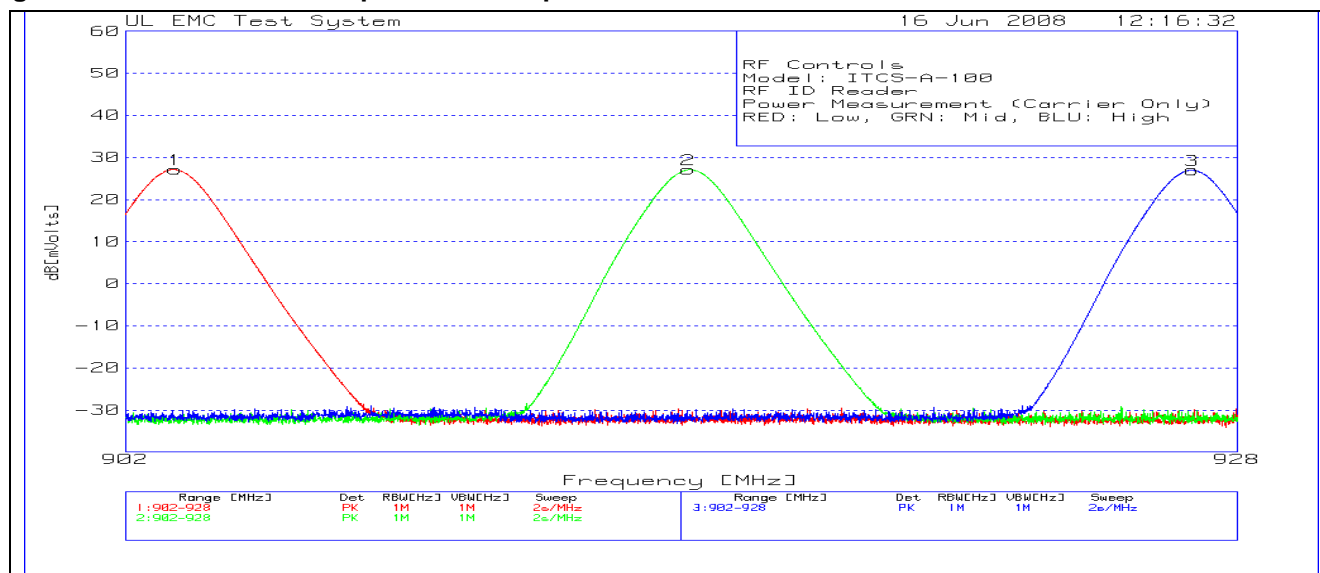


Table 22 Maximum Peak Output Power Emissions Data Points

RF Controls
Model: ITCS-A-100
RF ID Reader
Power Measurement (Carrier Only)
RED: Low, GRN: Mid, BLU: High

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[mVolts]
1	902.75	103.44	pk	30.7	-107	27.14
2	915.25	103.34	pk	30.8	-107	27.14
3	927.25	103.2	pk	30.8	-107	27

4.6 Test [BD8]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.		

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



Figure 15 Conducted Band Edge Compliance Graph

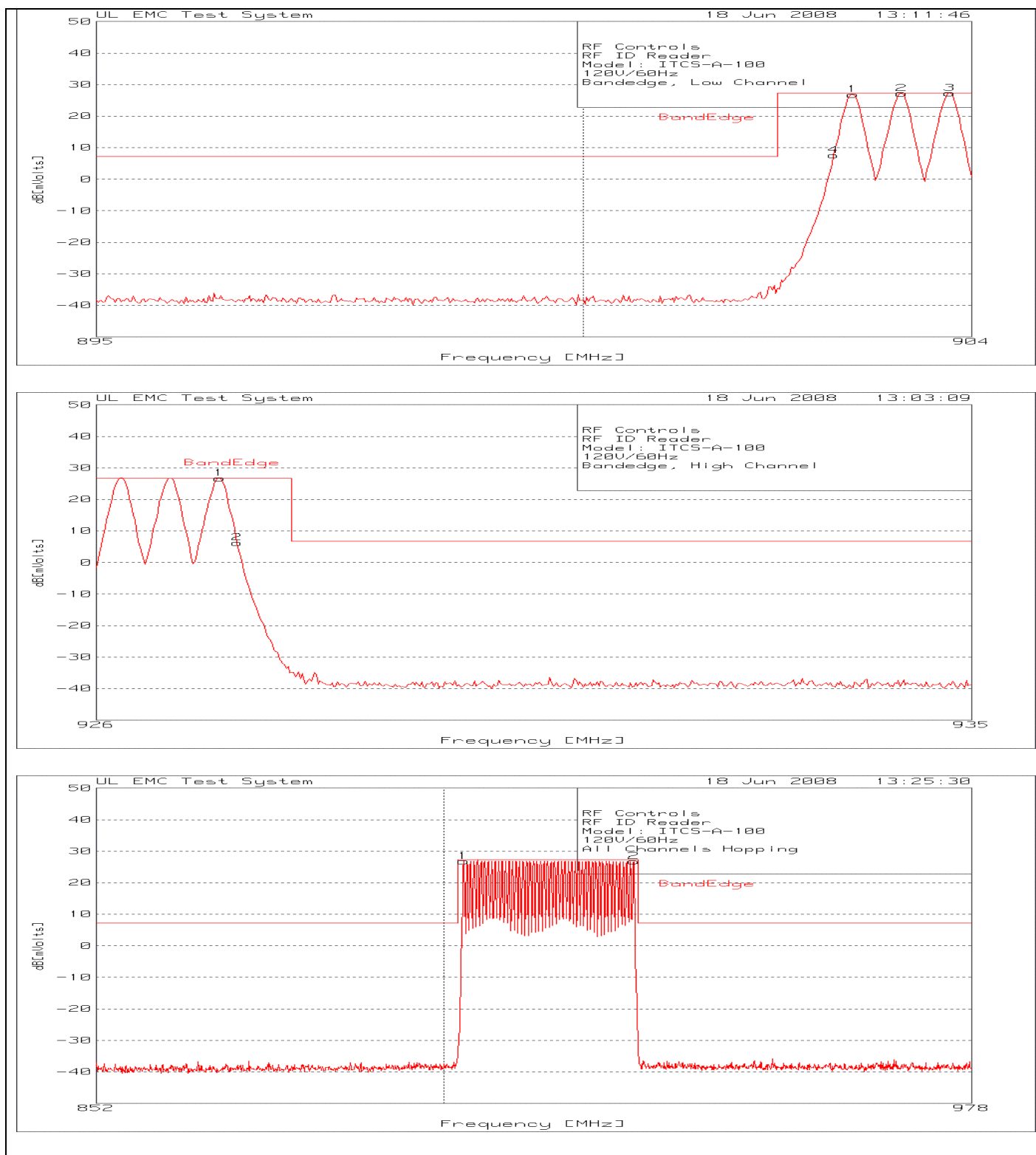


Table 25 Band Edge Compliance Data Points

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 measurement distance 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

Description	Manufacturer	Model	Identifier
Spectrum Analyzer	Rhode & Schwartz	FSEK	EMC4182
Antenna Array	UL	BOMS	EMC4276
Spectrum Analyzer	Rhode & Schwartz	FSEK	EMC4182
Attenuator	Pasternek	PE7019-30	None

Figure 16 Test setup for SPURIOUS EMISSIONS – Antenna conducted



Figure 17 Test setup for SPURIOUS EMISSIONS – Radiated (Portrait Shown)

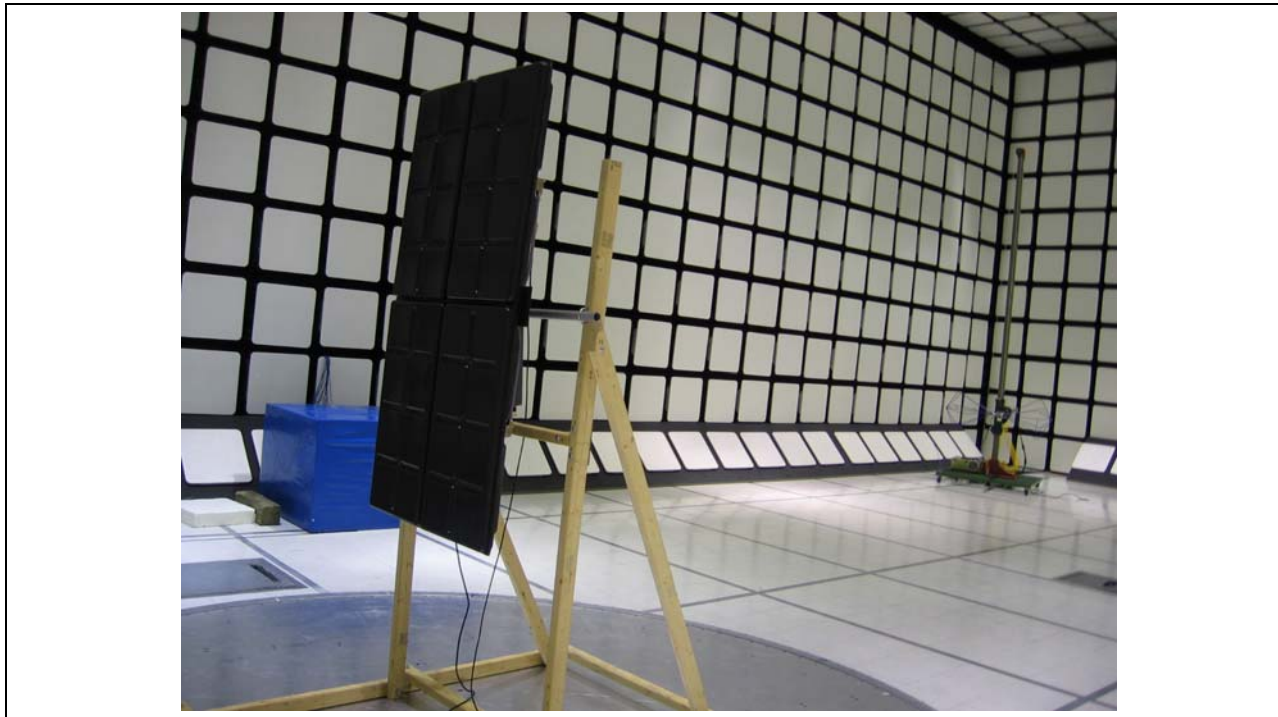
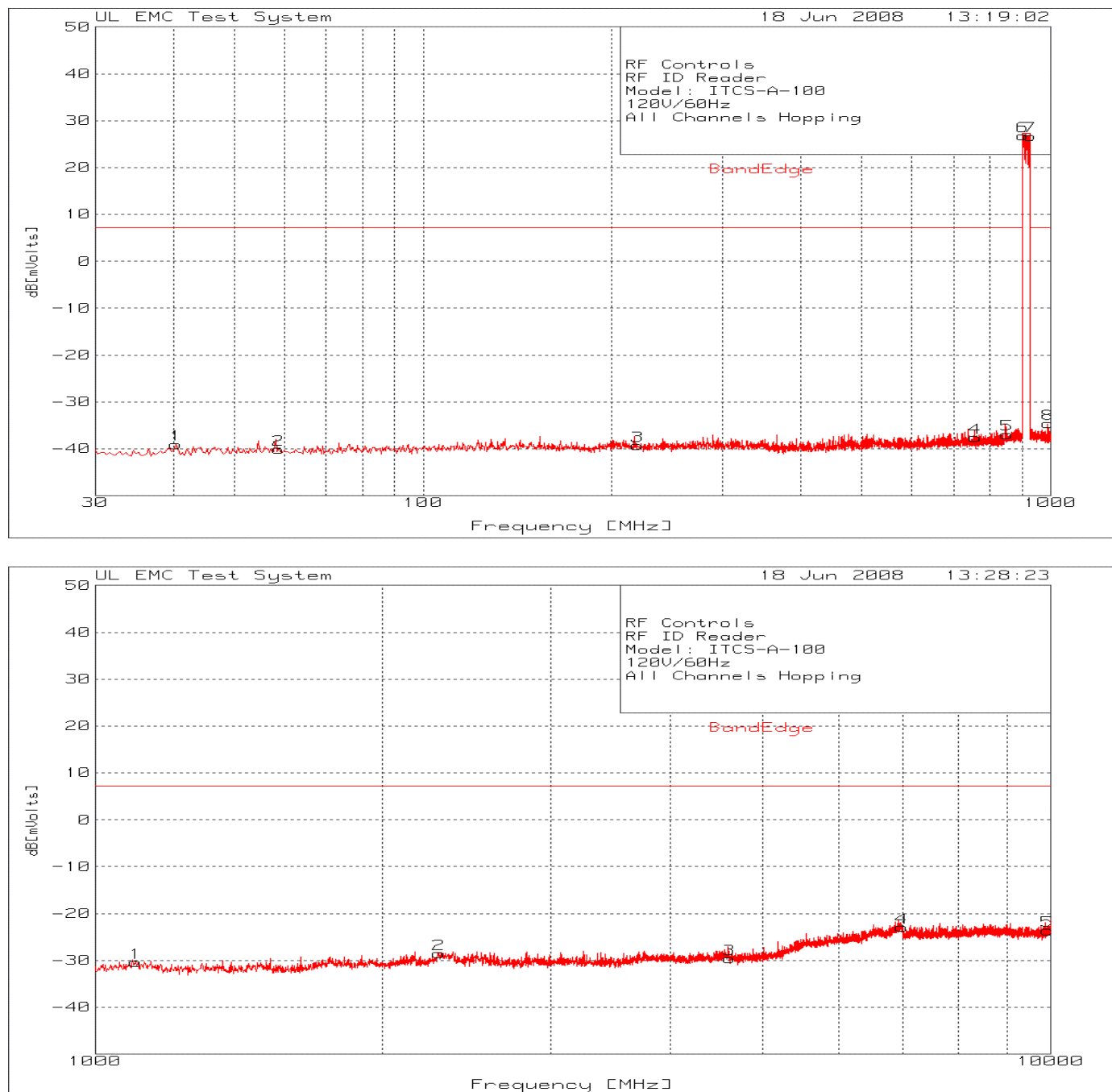


Figure 18 Test setup for SPURIOUS EMISSIONS – Radiated (Portrait - Back)

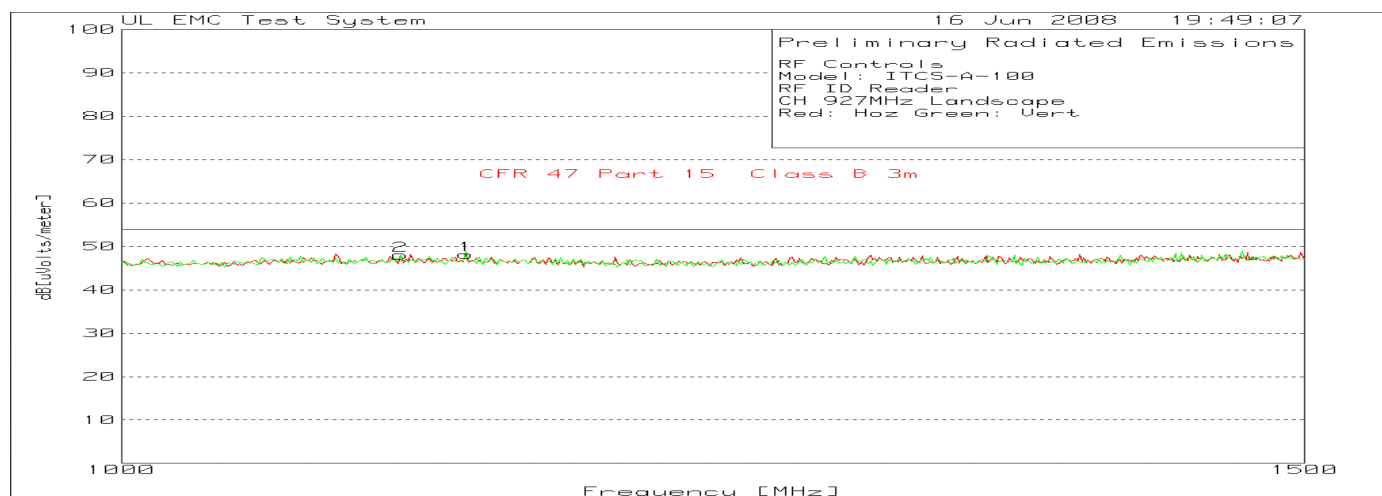
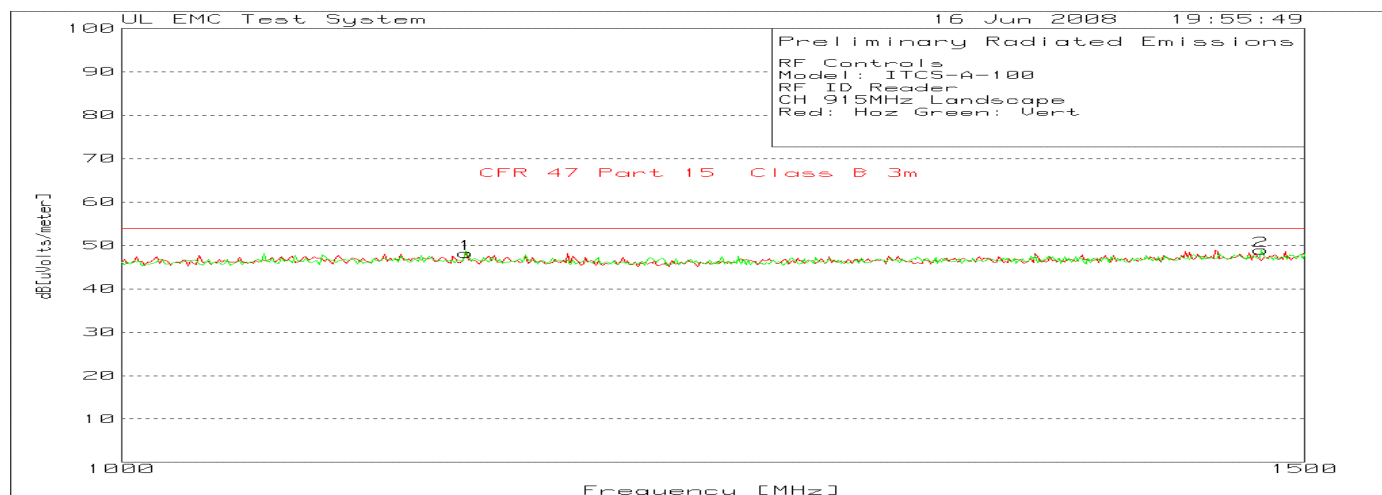
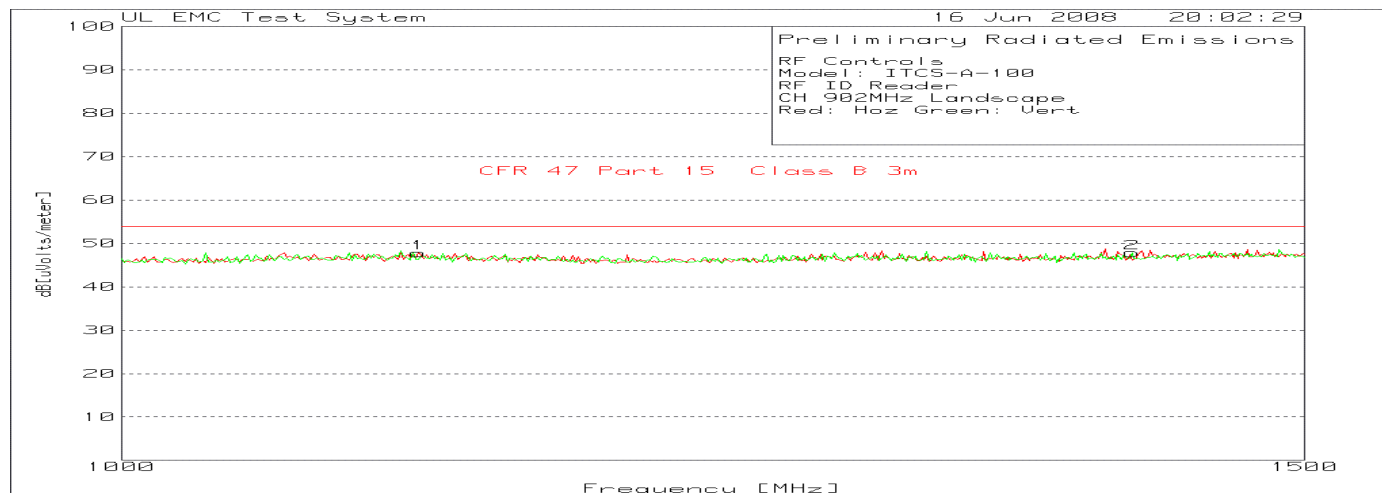


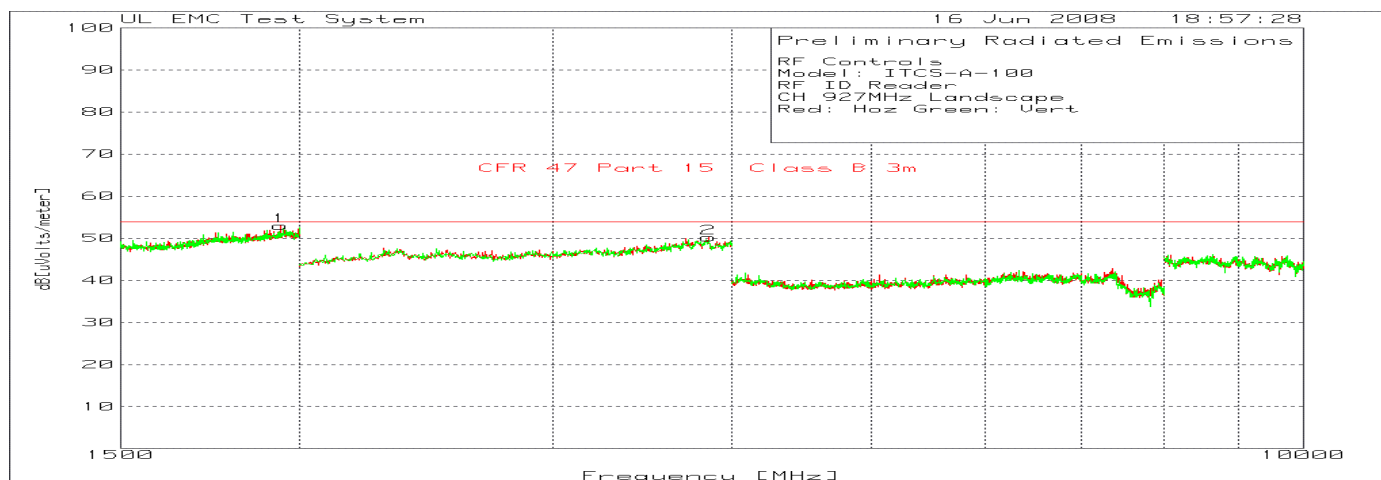
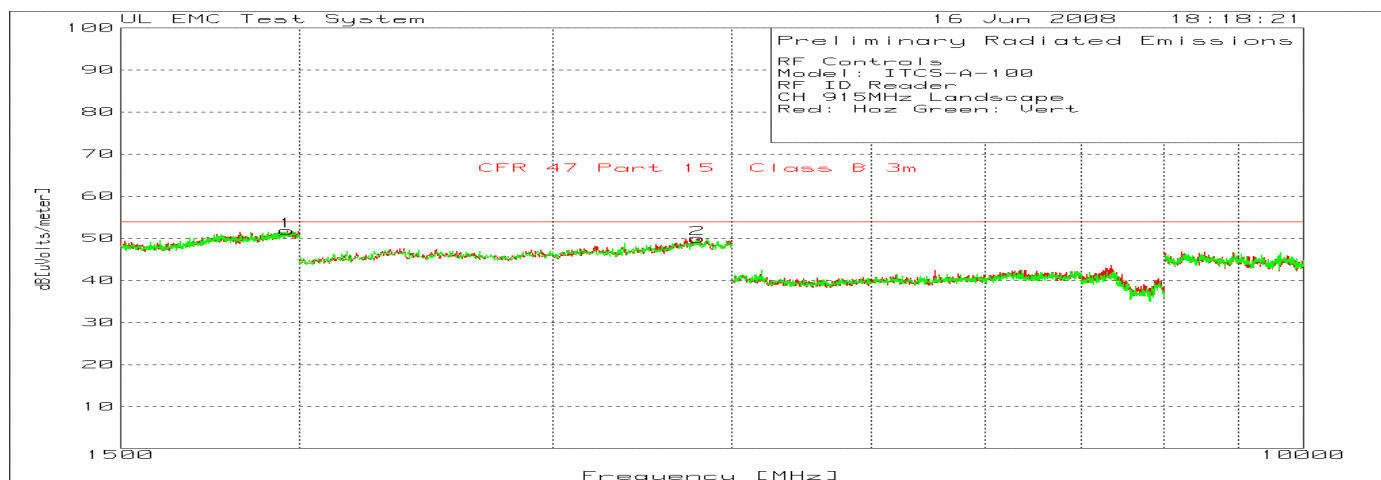
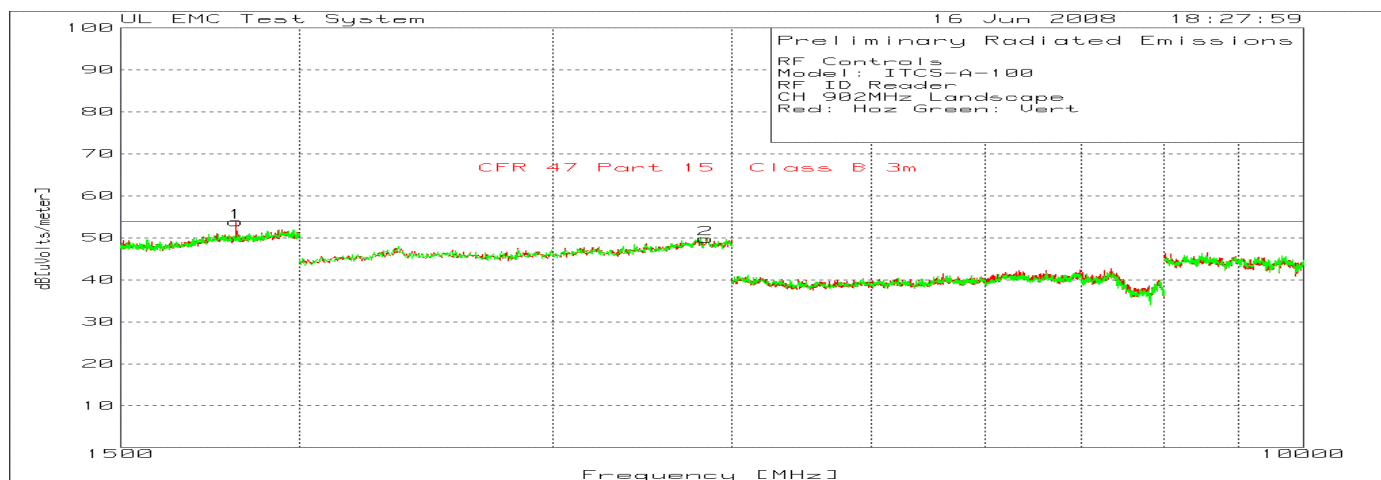
Figure 19 Antenna Port Spurious Emissions Plots TX Mode, Hopping



No emissions other the fundamental recorded.

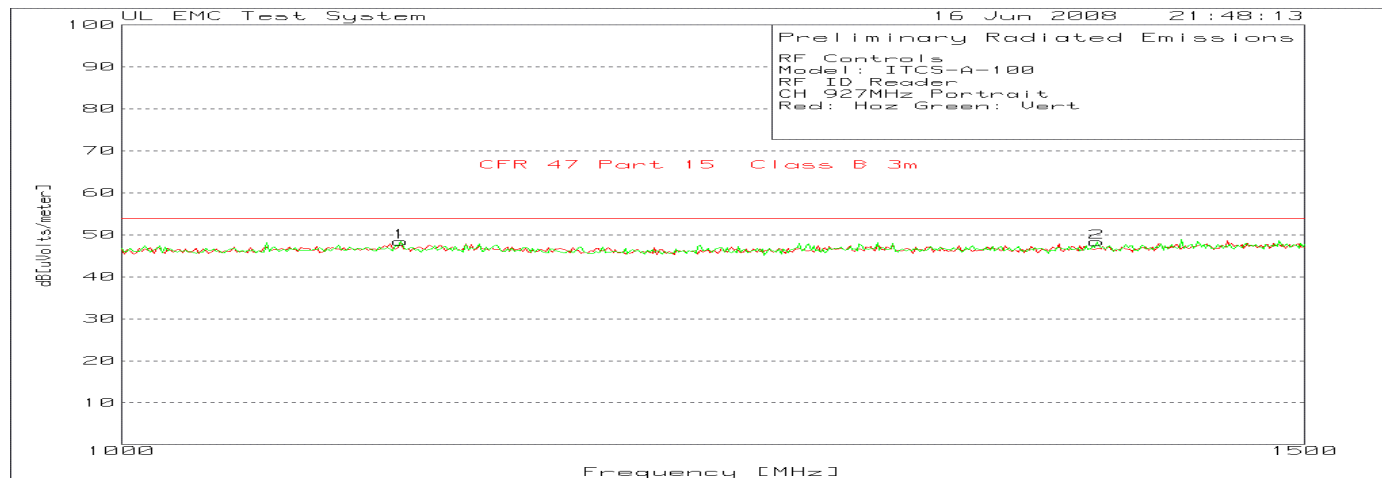
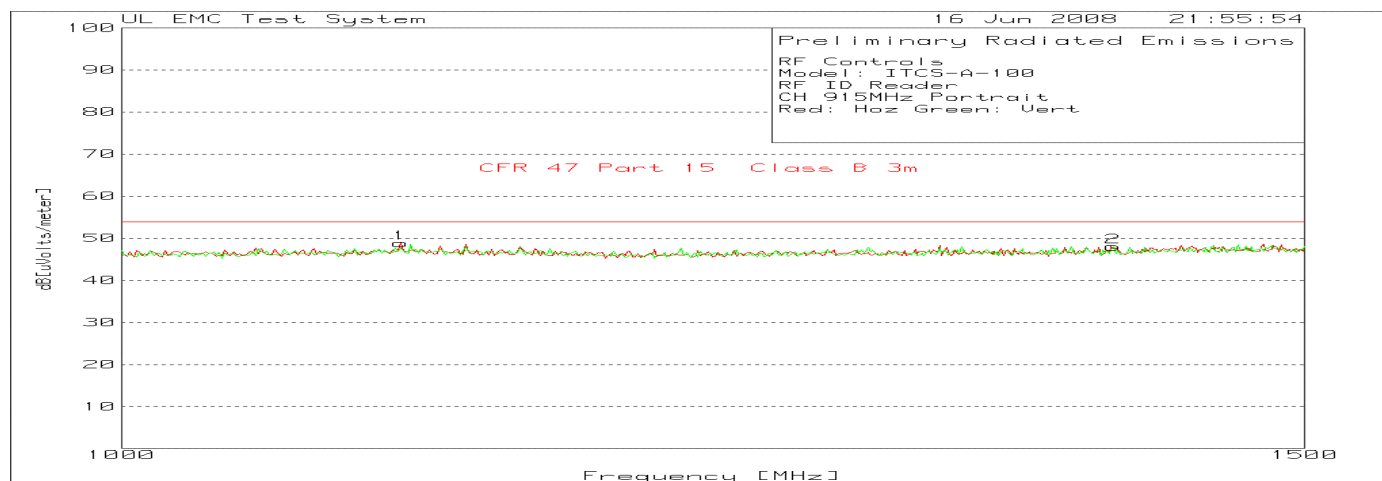
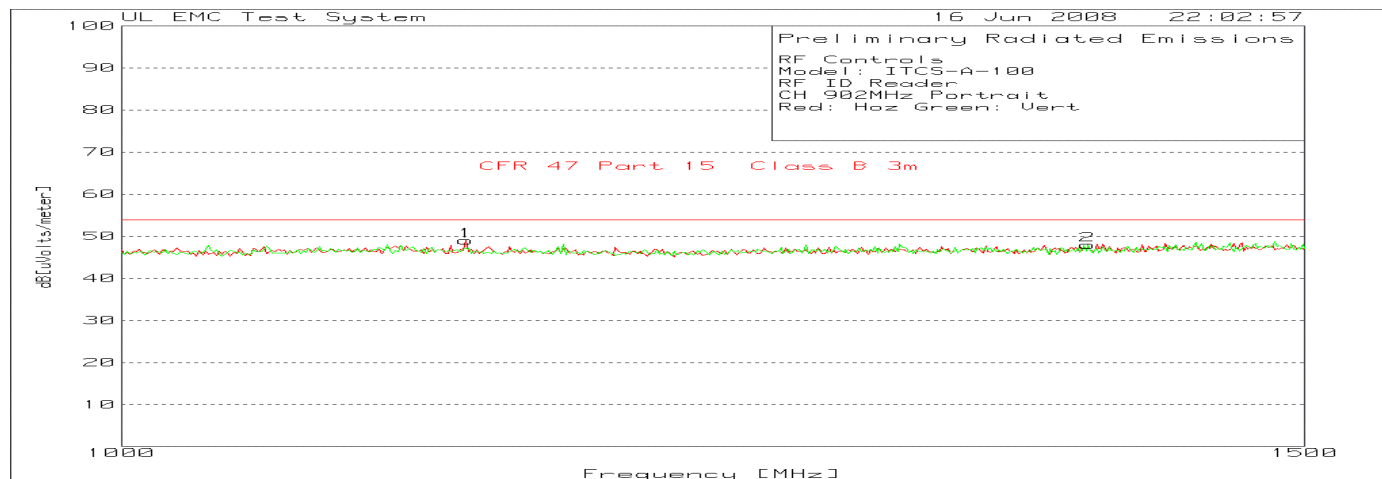
Figure 20 Radiated Spurious Emissions above 1GHz (Landscape)

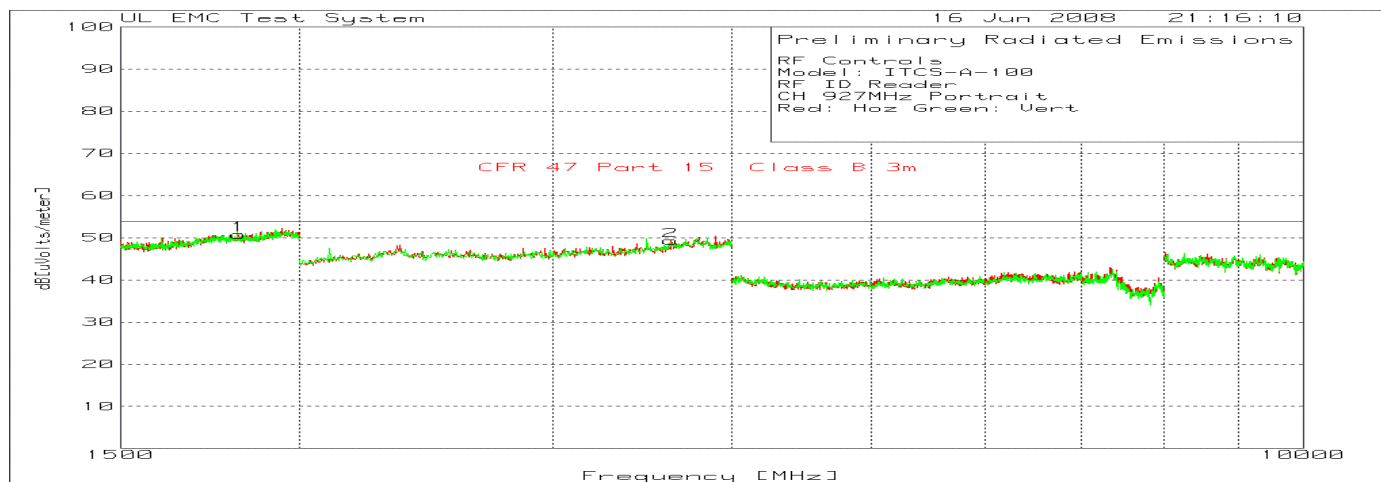
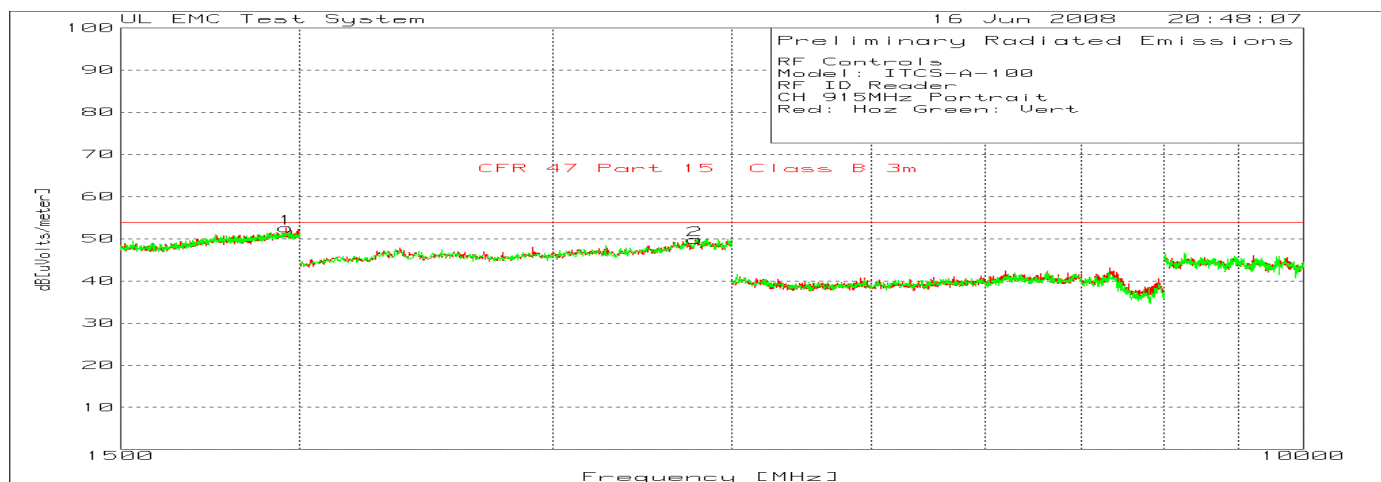
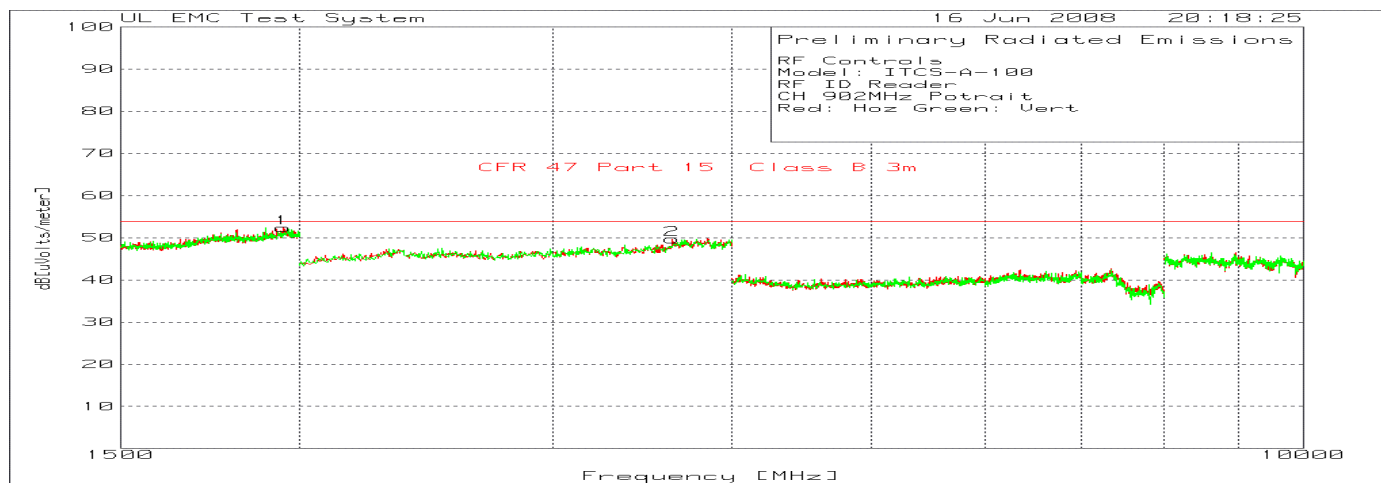




No spurious emissions nor products of the transmitter in restricted bands detected. Measurements are not required.

Figure 21 Radiated Spurious Emissions above 1GHz (Portrait)





No spurious emissions nor products of the transmitter in restricted bands detected. Measurements are not required.

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			

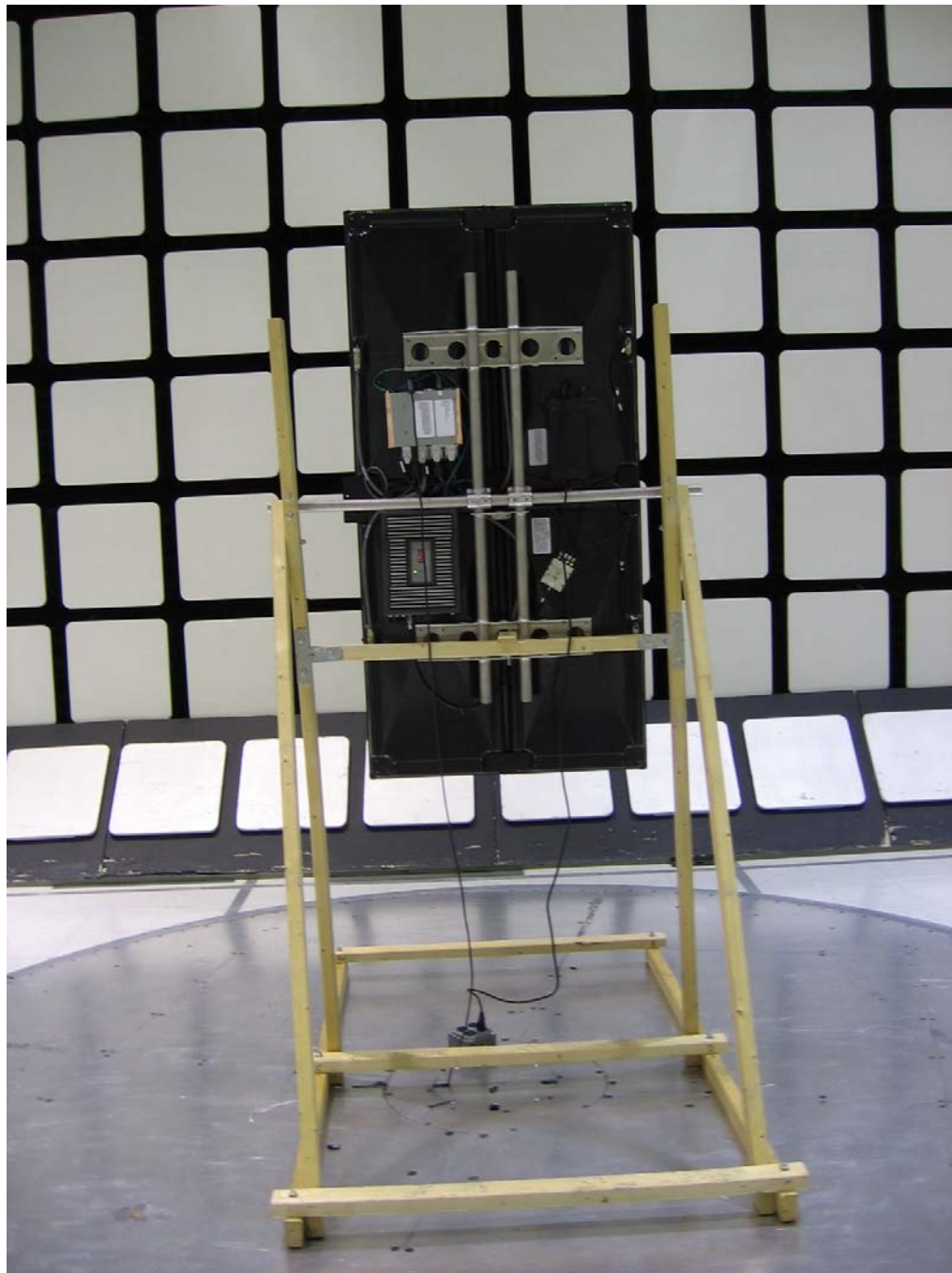
Table 28 SPURIOUS EMISSIONS EUT Configuration Settings

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

Table 29 SPURIOUS EMISSIONS Test Equipment

Description	Manufacturer	Model	Identifier
Spectrum Analyzer	HP	8566B	EMC4085
Quasi-Peak Detector	HP	85650A	EMC4016
Bicon Antenna	Electro-Metrics	EM6912A	EMC4070
Log-P Antenna	Chase	UPA6109	EMC4258
Spectrum Analyzer	Rhode & Schwartz	FSEK	EMC4182
Antenna Array	UL	BOMS	EMC4276

Figure 22 Test setup for SPURIOUS EMISSIONS



Portrait Configuration Shown.

Figure 23 Radiated Emissions Graph 30MHz – 1GHz (Portrait)

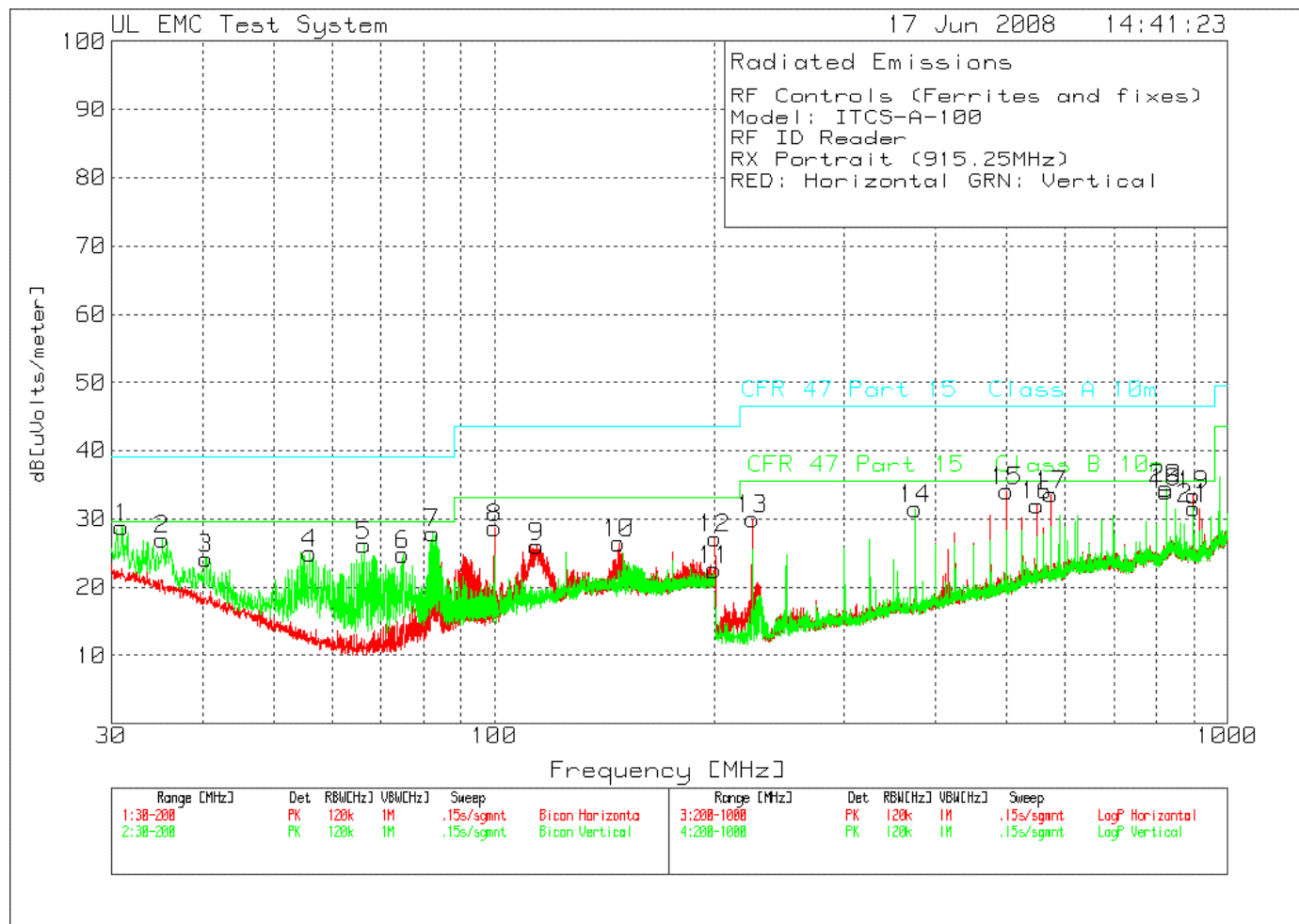


Table 30 Radiated Emissions Data Points 30MHz – 1GHz (Portrait)

RF Controls (Ferrites and fixes)
Model: ITCS-A-100
RF ID Reader
RX Portrait (915.25MHz)
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
8	100.05	48 pk	-30	10.7	28.7	-	-	43.5	33.1	-	-
	Azimuth:232	Height:300	Horz	Margin [dB]		-	-	-14.8	-4.4	-	-
9	114.2072	43.4 pk	-30	12.6	26	-	-	43.5	33.1	-	-
	Azimuth:344	Height:300	Horz	Margin [dB]		-	-	-17.5	-7.1	-	-
10	147.7881	41.8 pk	-30	14.7	26.5	-	-	43.5	33.1	-	-
	Azimuth:328	Height:300	Horz	Margin [dB]		-	-	-17	-6.6	-	-
11	199.3771	36.4 pk	-29.8	16	22.6	-	-	43.5	33.1	-	-
	Azimuth:90	Height:400	Horz	Margin [dB]		-	-	-20.9	-10.5	-	-
1	31.0193	41.7 pk	-30.4	17.5	28.8	-	-	39.1	29.6	-	-
	Azimuth:106	Height:100	Vert	Margin [dB]		-	-	-10.3	-.8	-	-
2	35.2099	41.5 pk	-30.3	15.8	27	-	-	39.1	29.6	-	-
	Azimuth:307	Height:200	Vert	Margin [dB]		-	-	-12.1	-2.6	-	-
3	40.4197	40.7 pk	-30.3	13.8	24.2	-	-	39.1	29.6	-	-
	Azimuth:194	Height:100	Vert	Margin [dB]		-	-	-14.9	-5.4	-	-
4	55.9927	47.6 pk	-30.2	7.6	25	-	-	39.1	29.6	-	-
	Azimuth:144	Height:300	Vert	Margin [dB]		-	-	-14.1	-4.6	-	-
5	66.3558	50.2 pk	-30.2	6.2	26.2	-	-	39.1	29.6	-	-
	Azimuth:307	Height:300	Vert	Margin [dB]		-	-	-12.9	-3.4	-	-
6	75.02	48.4 pk	-30.1	6.5	24.8	-	-	39.1	29.6	-	-
	Azimuth:56	Height:300	Vert	Margin [dB]		-	-	-14.3	-4.8	-	-
7	82.4384	50.4 pk	-30.1	7.6	27.9	-	-	39.1	29.6	-	-
	Azimuth:81	Height:200	Vert	Margin [dB]		-	-	-11.2	-1.7	-	-
12	200	49.3 pk	-33.4	11.3	27.2	-	-	43.5	33.1	-	-
	Azimuth:221	Height:202	Horz	Margin [dB]		-	-	-16.3	-5.9	-	-
13	224.9813	52.6 pk	-33.3	10.7	30	-	-	46.4	35.6	-	-
	Azimuth:221	Height:100	Horz	Margin [dB]		-	-	-16.4	-5.6	-	-
15	499.975	48.5 pk	-31.9	17.5	34.1	-	-	46.4	35.6	-	-
	Azimuth:172	Height:100	Horz	Margin [dB]		-	-	-12.3	-1.5	-	-
16	549.9375	44.7 pk	-31.5	18.8	32	-	-	46.4	35.6	-	-
	Azimuth:338	Height:100	Horz	Margin [dB]		-	-	-14.4	-3.6	-	-
17	574.9188	45.9 pk	-31.5	19.2	33.6	-	-	46.4	35.6	-	-
	Azimuth:70	Height:100	Horz	Margin [dB]		-	-	-12.8	-2	-	-
18	824.9313	43.3 pk	-31.7	22.4	34	-	-	46.4	35.6	-	-
	Azimuth:221	Height:400	Horz	Margin [dB]		-	-	-12.4	-1.6	-	-
19	899.6752	43 pk	-31.8	22.3	33.5	-	-	46.4	35.6	-	-
	Azimuth:108	Height:202	Horz	Margin [dB]		-	-	-12.9	-2.1	-	-
14	375.2685	49 pk	-32.5	15	31.5	-	-	46.4	35.6	-	-
	Azimuth:184	Height:402	Vert	Margin [dB]		-	-	-14.9	-4.1	-	-
20	824.9313	43.8 pk	-31.7	22.4	34.5	-	-	46.4	35.6	-	-
	Azimuth:108	Height:101	Vert	Margin [dB]		-	-	-11.9	-1.1	-	-
21	899.6752	41.1 pk	-31.8	22.3	31.6	-	-	46.4	35.6	-	-
	Azimuth:146	Height:402	Vert	Margin [dB]		-	-	-14.8	-4	-	-

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

Job #: 963773 Project #: 08CA25749 File #: MC15947
 Model Number: ITCS-A-100
 Client Name: RF Controls LLC

Page 47 of 59

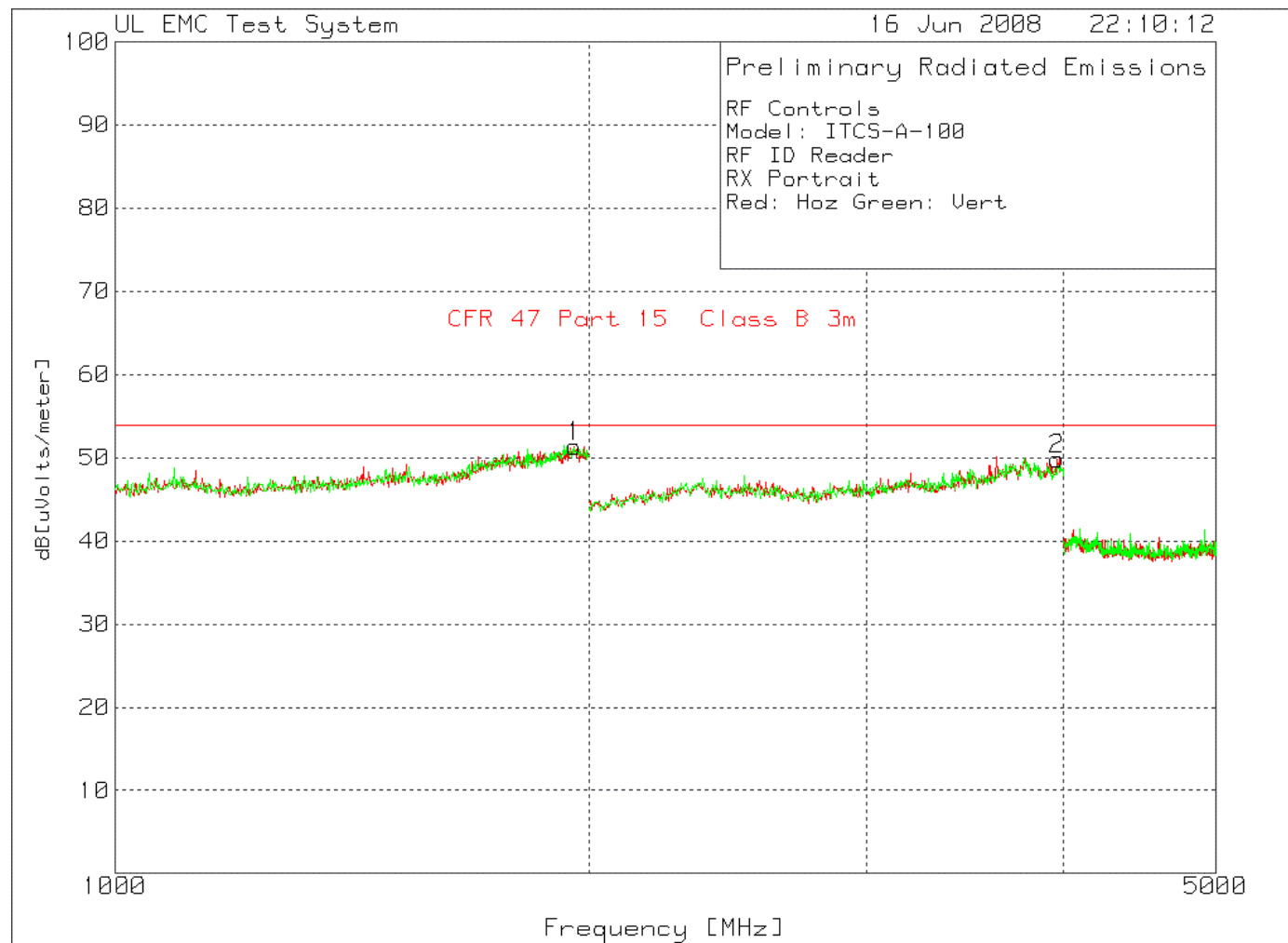
RF Controls (Ferrites and fixes)
 Model: ITCS-A-100
 RF ID Reader
 RX Portrait (915.25MHz)
 RED: Horizontal GRN: Vertical

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
99.9597	46.85 qp	-30	10.6	27.45	-	-	43.5	33.1	-	-
Azimuth: 21	Height:331	Horz	Margin	[dB]:	-	-	-16.05	-5.65	-	-
199.96	42.46 qp	-29.8	16	28.66	-	-	43.5	33.1	-	-
Azimuth: 325	Height:180	Horz	Margin	[dB]:	-	-	-14.84	-4.44	-	-
31.046	39.43 qp	-30.4	17.5	26.53	-	-	39.1	29.6	-	-
Azimuth: 290	Height:100	Vert	Margin	[dB]:	-	-	-12.57	-3.07	-	-
35.1905	38.66 qp	-30.3	15.8	24.16	-	-	39.1	29.6	-	-
Azimuth: 237	Height:102	Vert	Margin	[dB]:	-	-	-14.94	-5.44	-	-
40.3676	37.24 qp	-30.3	13.8	20.74	-	-	39.1	29.6	-	-
Azimuth: 268	Height:104	Vert	Margin	[dB]:	-	-	-18.36	-8.86	-	-
55.9165	44.55 qp	-30.2	7.7	22.05	-	-	39.1	29.6	-	-
Azimuth: 346	Height:239	Vert	Margin	[dB]:	-	-	-17.05	-7.55	-	-
66.291	49.09 qp	-30.2	6.2	25.09	-	-	39.1	29.6	-	-
Azimuth: 286	Height:230	Vert	Margin	[dB]:	-	-	-14.01	-4.51	-	-
74.9335	47.19 qp	-30.1	6.5	23.59	-	-	39.1	29.6	-	-
Azimuth: 269	Height:400	Vert	Margin	[dB]:	-	-	-15.51	-6.01	-	-
82.3597	49.9 qp	-30.1	7.6	27.4	-	-	39.1	29.6	-	-
Azimuth: 331	Height:151	Vert	Margin	[dB]:	-	-	-11.7	-2.2	-	-
200.0003	47.3 qp	-33.4	11.3	25.2	-	-	43.5	33.1	-	-
Azimuth: 4	Height:221	Horz	Margin	[dB]:	-	-	-18.3	-7.9	-	-
224.942	54.22 qp	-33.3	10.7	31.62	-	-	46.4	35.6	-	-
Azimuth: 28	Height:146	Horz	Margin	[dB]:	-	-	-14.78	-3.98	-	-
500.0134	47.66 qp	-31.9	17.5	33.26	-	-	46.4	35.6	-	-
Azimuth: 207	Height:104	Horz	Margin	[dB]:	-	-	-13.14	-2.34	-	-
549.9573	43.07 qp	-31.5	18.8	30.37	-	-	46.4	35.6	-	-
Azimuth: 182	Height:102	Horz	Margin	[dB]:	-	-	-16.03	-5.23	-	-
575.0175	41.69 qp	-31.5	19.2	29.39	-	-	46.4	35.6	-	-
Azimuth: 192	Height:108	Horz	Margin	[dB]:	-	-	-17.01	-6.21	-	-
824.9693	42.73 qp	-31.7	22.4	33.43	-	-	46.4	35.6	-	-
Azimuth: 227	Height:400	Horz	Margin	[dB]:	-	-	-12.97	-2.17	-	-
899.9745	37.39 qp	-31.8	22.3	27.89	-	-	46.4	35.6	-	-
Azimuth: 44	Height:399	Horz	Margin	[dB]:	-	-	-18.51	-7.71	-	-
824.9693	43.37 qp	-31.7	22.4	34.07	-	-	46.4	35.6	-	-
Azimuth: 165	Height:279	Vert	Margin	[dB]:	-	-	-12.33	-1.53	-	-
374.9541	47.62 qp	-32.5	15	30.12	-	-	46.4	35.6	-	-
Azimuth: 233	Height:192	Vert	Margin	[dB]:	-	-	-16.28	-5.48	-	-
899.974	42.31 qp	-31.8	22.3	32.81	-	-	46.4	35.6	-	-
Azimuth: 177	Height:353	Vert	Margin	[dB]:	-	-	-13.59	-2.79	-	-

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 – 5GHz (Portrait)



No emissions recorded, measurements not required.

Figure 25 Radiated Emissions Graph 30MHz – 1GHz (Landscape)

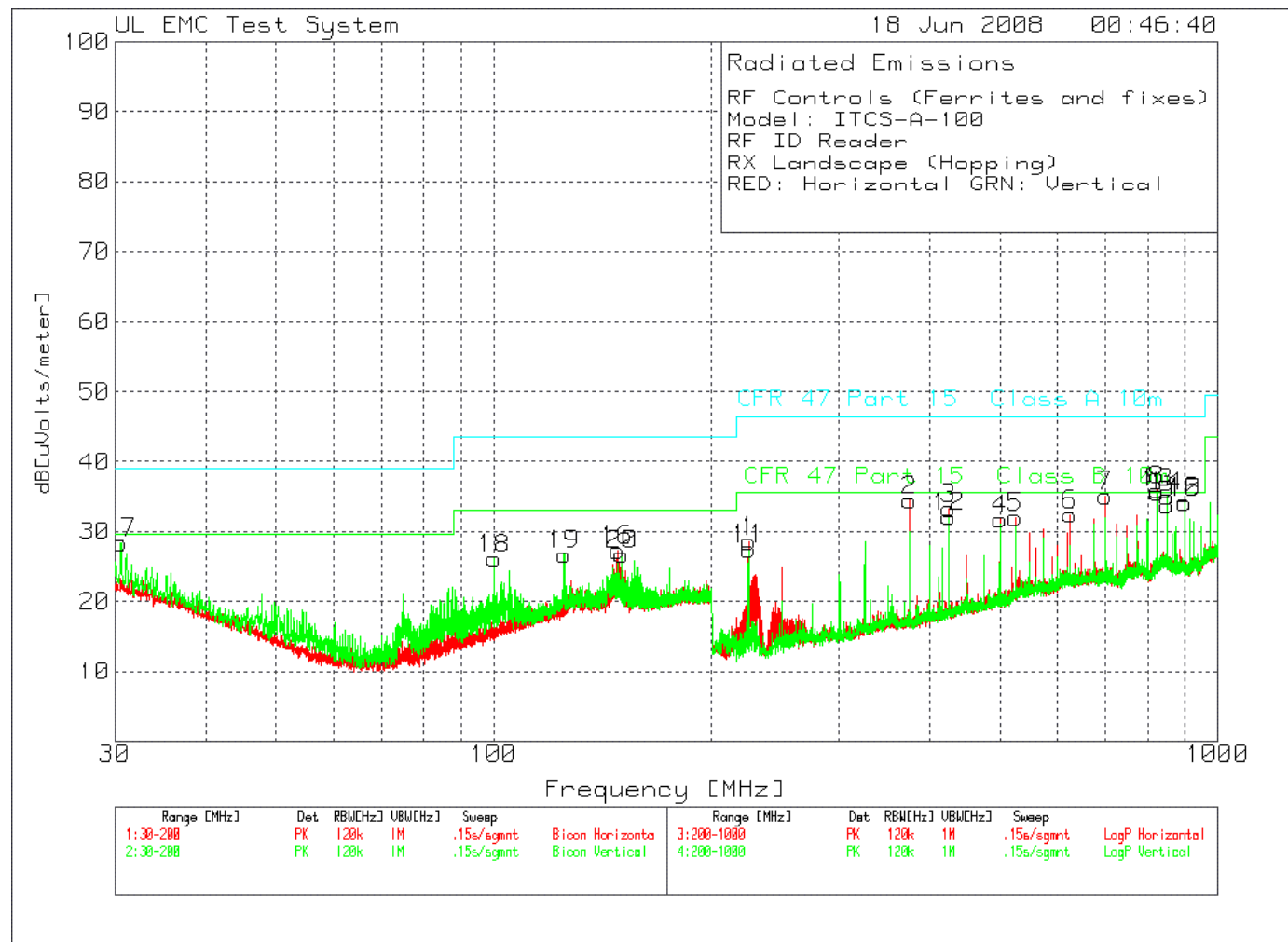


Table 31 Radiated Emissions Data Points 30MHz – 1GHz (Landscape)

RF Controls (Ferrites and fixes)
Model: ITCS-A-100
RF ID Reader
RX Landscape (Hopping)
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
16	148.1464	42.6 pk	-30	14.7	27.3	-	-	43.5	33.1	-	-
	Azimuth:133	Height:300	Horz	Margin [dB]		-	-	-16.2	-5.8	-	-
17	30.5309	41.1 pk	-30.4	17.7	28.4	-	-	39.1	29.6	-	-
	Azimuth:238	Height:100	Vert	Margin [dB]		-	-	-10.7	-1.2	-	-
18	100.1149	45.4 pk	-30	10.7	26.1	-	-	43.5	33.1	-	-
	Azimuth:285	Height:100	Vert	Margin [dB]		-	-	-17.4	-7	-	-
19	125.065	43.1 pk	-30	13.6	26.7	-	-	43.5	33.1	-	-
	Azimuth:240	Height:100	Vert	Margin [dB]		-	-	-16.8	-6.4	-	-
20	150.3123	41.9 pk	-30	14.8	26.7	-	-	43.5	33.1	-	-
	Azimuth:50	Height:100	Vert	Margin [dB]		-	-	-16.8	-6.4	-	-
1	224.9813	51.2 pk	-33.3	10.7	28.6	-	-	46.4	35.6	-	-
	Azimuth:272	Height:202	Horz	Margin [dB]		-	-	-17.8	-7	-	-
2	375.2685	51.9 pk	-32.5	15	34.4	-	-	46.4	35.6	-	-
	Azimuth:172	Height:102	Horz	Margin [dB]		-	-	-12	-1.2	-	-
3	425.0312	49.3 pk	-32.2	16.2	33.3	-	-	46.4	35.6	-	-
	Azimuth:185	Height:102	Horz	Margin [dB]		-	-	-13.1	-2.3	-	-
4	499.975	46.1 pk	-31.9	17.5	31.7	-	-	46.4	35.6	-	-
	Azimuth:222	Height:102	Horz	Margin [dB]		-	-	-14.7	-3.9	-	-
5	524.9563	45.2 pk	-31.6	18.4	32	-	-	46.4	35.6	-	-
	Azimuth:260	Height:102	Horz	Margin [dB]		-	-	-14.4	-3.6	-	-
6	624.8813	43.5 pk	-31.2	20.1	32.4	-	-	46.4	35.6	-	-
	Azimuth:257	Height:102	Horz	Margin [dB]		-	-	-14	-3.2	-	-
7	699.8251	45.3 pk	-31	20.8	35.1	-	-	46.4	35.6	-	-
	Azimuth:244	Height:102	Horz	Margin [dB]		-	-	-11.3	-.5	-	-
8	825.1312	45.2 pk	-31.7	22.4	35.9	-	-	46.4	35.6	-	-
	Azimuth:272	Height:202	Horz	Margin [dB]		-	-	-10.5	.3	-	-
9	849.9126	42.3 pk	-31.7	23.1	33.7	-	-	46.4	35.6	-	-
	Azimuth:222	Height:202	Horz	Margin [dB]		-	-	-12.7	-1.9	-	-
10	899.8751	43.7 pk	-31.8	22.3	34.2	-	-	46.4	35.6	-	-
	Azimuth:197	Height:202	Horz	Margin [dB]		-	-	-12.2	-1.4	-	-
11	224.9813	50.1 pk	-33.3	10.7	27.5	-	-	46.4	35.6	-	-
	Azimuth:271	Height:100	Vert	Margin [dB]		-	-	-18.9	-8.1	-	-
12	425.0312	48.1 pk	-32.2	16.2	32.1	-	-	46.4	35.6	-	-
	Azimuth:297	Height:199	Vert	Margin [dB]		-	-	-14.3	-3.5	-	-
13	825.1312	44.8 pk	-31.7	22.4	35.5	-	-	46.4	35.6	-	-
	Azimuth:271	Height:300	Vert	Margin [dB]		-	-	-10.9	-.1	-	-
14	849.9126	43.6 pk	-31.7	23.1	35	-	-	46.4	35.6	-	-
	Azimuth:296	Height:300	Vert	Margin [dB]		-	-	-11.4	-.6	-	-
15	899.8751	43.6 pk	-31.8	22.3	34.1	-	-	46.4	35.6	-	-
	Azimuth:233	Height:300	Vert	Margin [dB]		-	-	-12.3	-1.5	-	-

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

Model Number: ITCS-A-100

Client Name: RF Controls LLC

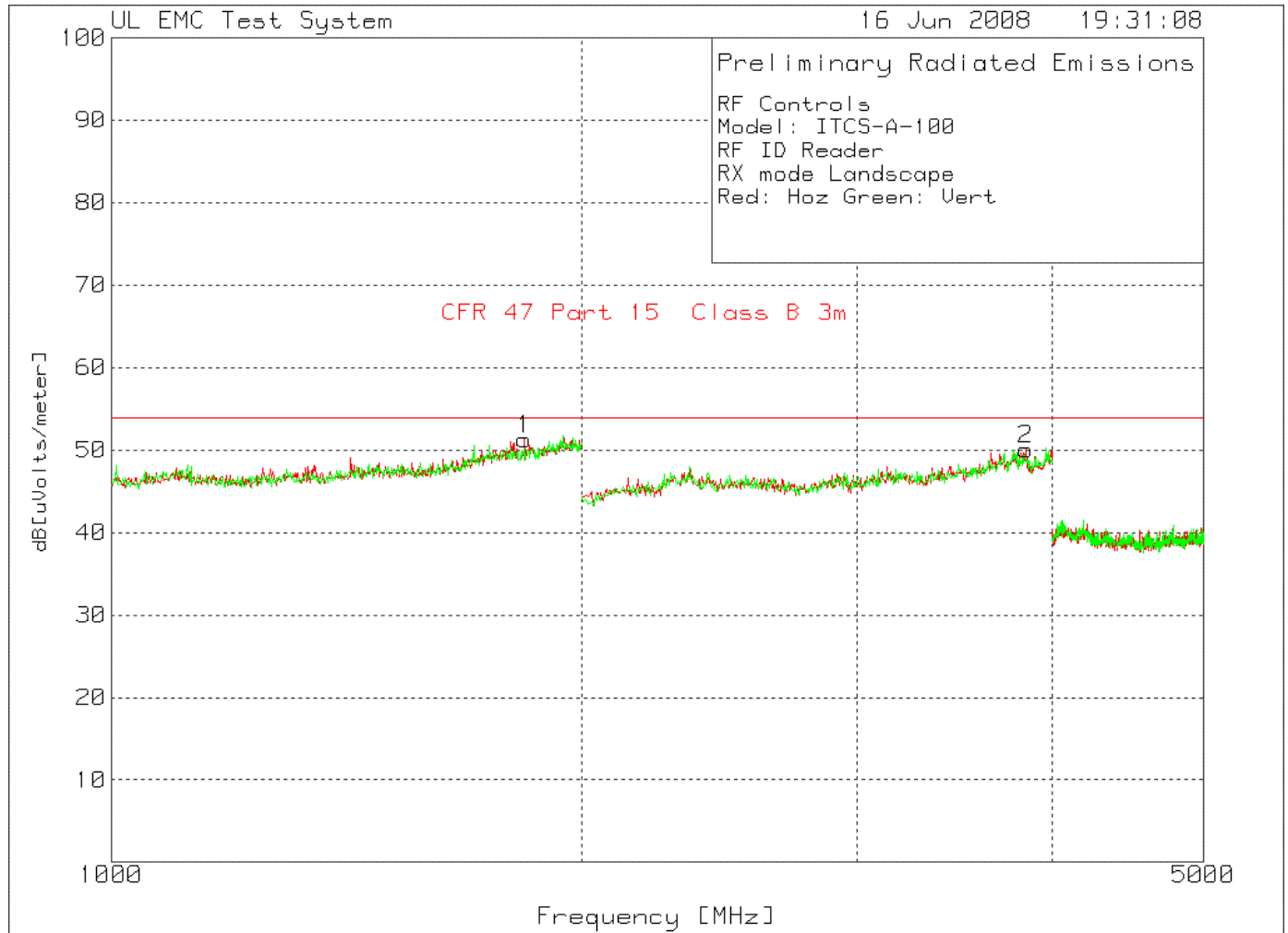
RF Controls (Ferrites and fixes)
 Model: ITCS-A-100
 RF ID Reader
 RX Landscape (Hopping)
 RED: Horizontal GRN: Vertical

Test	Meter	Gain/Loss	Transducer	Level	Limit:1	2	3	4	5	6
Frequency	Reading	Factor	Factor	dB[uVolts/meter]						
[MHz]	[dB(uV)]	[dB]	[dB]							
30.5496	39.47 qp	-30.4	17.7	26.77	-	-	39.1	29.6	-	-
Azimuth: 195	Height:103	Vert	Margin [dB]:		-	-	-12.33	-2.83	-	-
LogP Horizontal 200 - 1000MHz										
824.97	42.68 qp	-31.7	22.4	33.38	-	-	46.4	35.6	-	-
Azimuth: 216	Height:394	Horz	Margin [dB]:		-	-	-13.02	-2.22	-	-
824.97	44.78 qp	-31.7	22.4	35.48	-	-	46.4	35.6	-	-
Azimuth: 211	Height:329	Vert	Margin [dB]:		-	-	-10.92	-1.12	-	-
849.9721	41.06 qp	-31.7	23.1	32.46	-	-	46.4	35.6	-	-
Azimuth: 215	Height:339	Vert	Margin [dB]:		-	-	-13.94	-3.14	-	-
849.9721	42.39 qp	-31.7	23.1	33.79	-	-	46.4	35.6	-	-
Azimuth: 240	Height:329	Horz	Margin [dB]:		-	-	-12.61	-1.81	-	-
899.9756	43.76 qp	-31.8	22.3	34.26	-	-	46.4	35.6	-	-
Azimuth: 243	Height:319	Horz	Margin [dB]:		-	-	-12.14	-1.34	-	-
899.9756	42.46 qp	-31.8	22.3	32.96	-	-	46.4	35.6	-	-
Azimuth: 218	Height:289	Vert	Margin [dB]:		-	-	-13.44	-2.64	-	-
424.953	49.4 qp	-32.2	16.2	33.4	-	-	46.4	35.6	-	-
Azimuth: 209	Height:250	Vert	Margin [dB]:		-	-	-13	-2.2	-	-
424.953	44.57 qp	-32.2	16.2	28.57	-	-	46.4	35.6	-	-
Azimuth: 170	Height:199	Horz	Margin [dB]:		-	-	-17.83	-7.03	-	-
700.0374	44.03 qp	-31	20.8	33.83	-	-	46.4	35.6	-	-
Azimuth: 249	Height:224	Horz	Margin [dB]:		-	-	-12.57	-1.77	-	-
374.9531	48.97 qp	-32.5	15	31.47	-	-	46.4	35.6	-	-
Azimuth: 168	Height:143	Horz	Margin [dB]:		-	-	-14.93	-4.13	-	-
624.9625	43.03 qp	-31.1	20.1	32.03	-	-	46.4	35.6	-	-
Azimuth: 223	Height:105	Horz	Margin [dB]:		-	-	-14.37	-3.57	-	-
524.9581	44.43 qp	-31.6	18.4	31.23	-	-	46.4	35.6	-	-
Azimuth: 228	Height:103	Horz	Margin [dB]:		-	-	-15.17	-4.37	-	-
500.0112	44.74 qp	-31.9	17.5	30.34	-	-	46.4	35.6	-	-
Azimuth: 164	Height:107	Horz	Margin [dB]:		-	-	-16.06	-5.26	-	-

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 26 Radiated Emissions Graph 1GHz – 5GHz (Landscape)



No emissions recorded, 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: None		

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

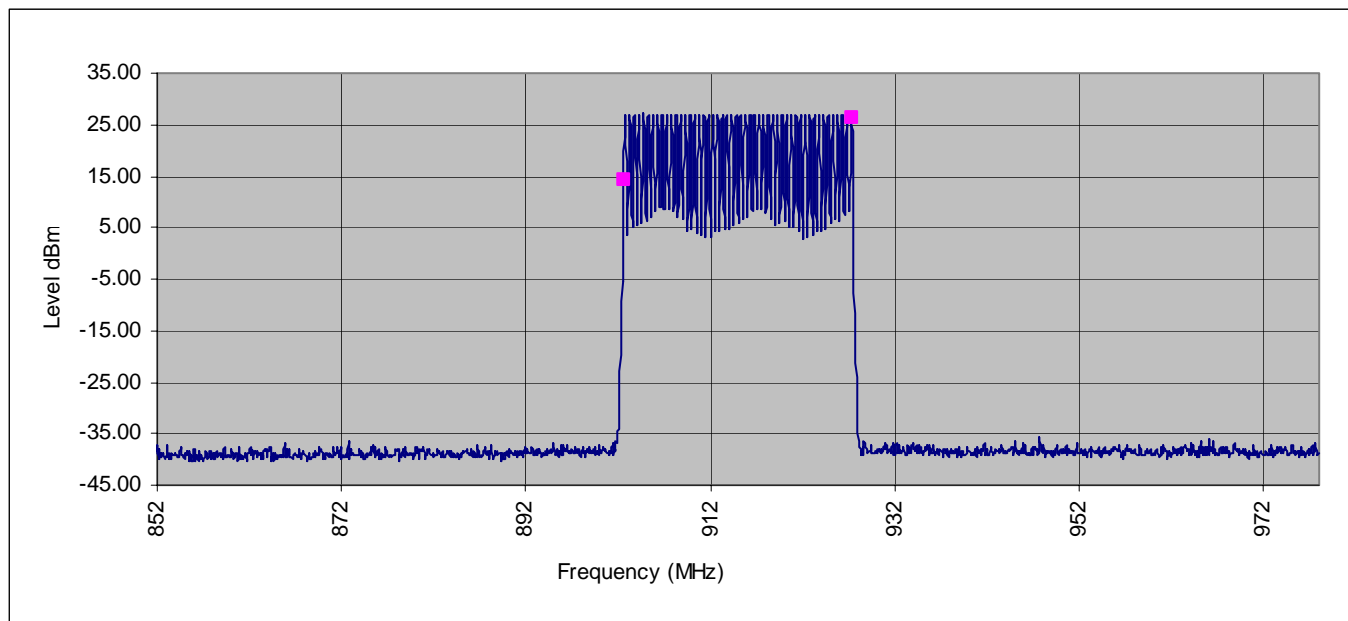
Description	Manufacturer	Model	Identifier
Spectrum Analyzer	Rhode & Schwartz	FSEK	EMC4182
Attenuator	Pasternek	PE7019-30	None

Table 34 99% Bandwidth Results

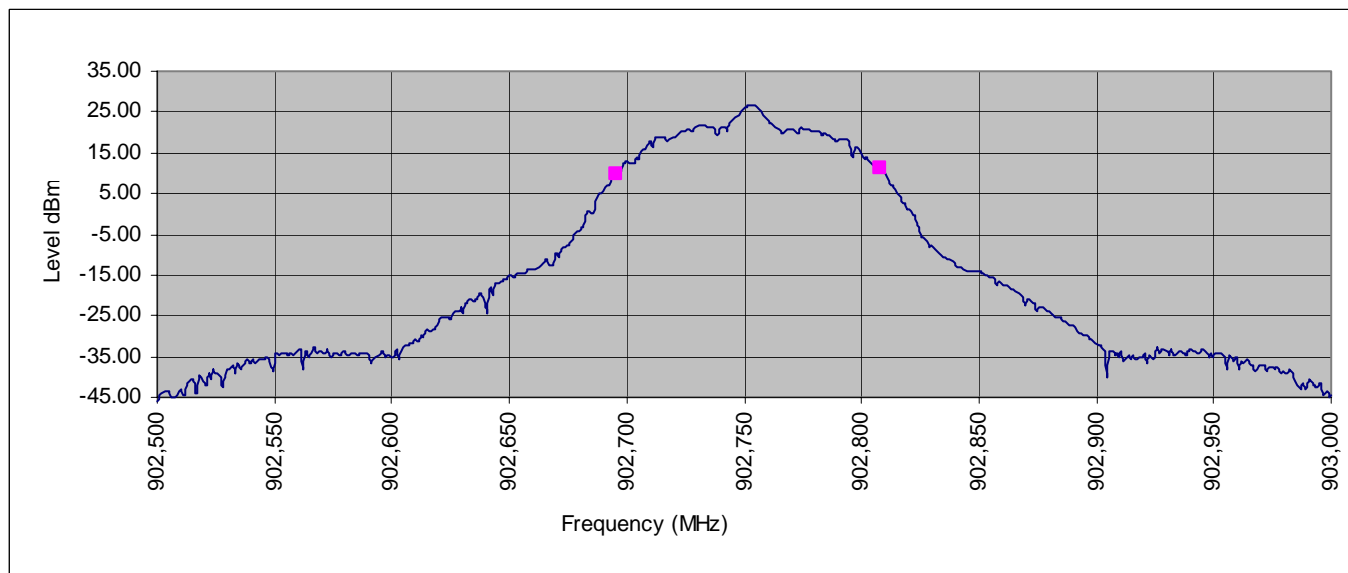
Modulation Mode	99% Bandwidth
All Channels	24,628.419kHz
Low Channel	112.224kHz
Middle Channel	111.222kHz
High Channel	111.222kHz

Figure 27 99% Band Width

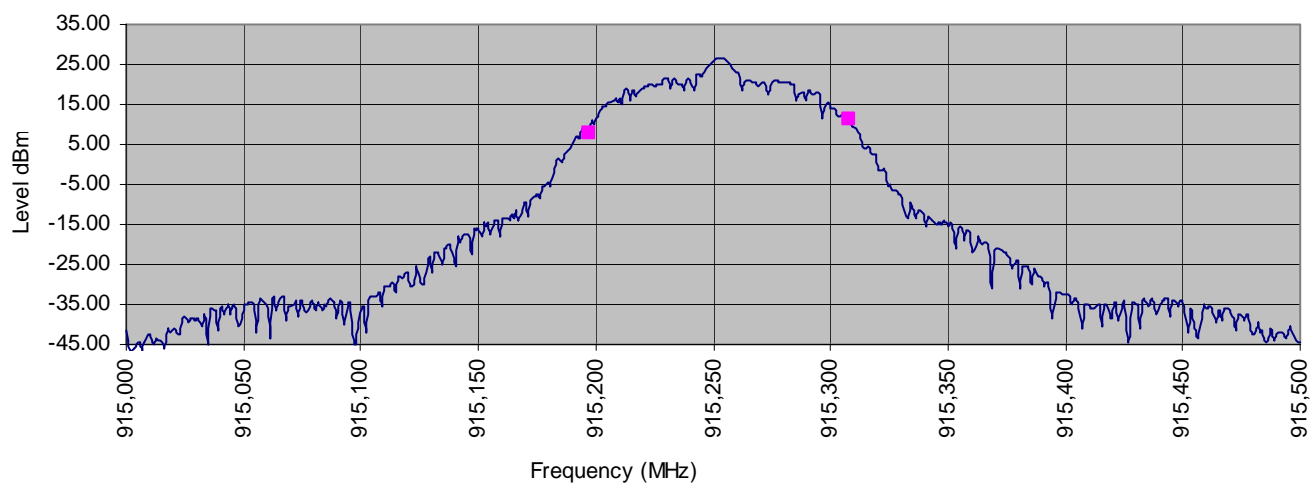
99%, All Channels



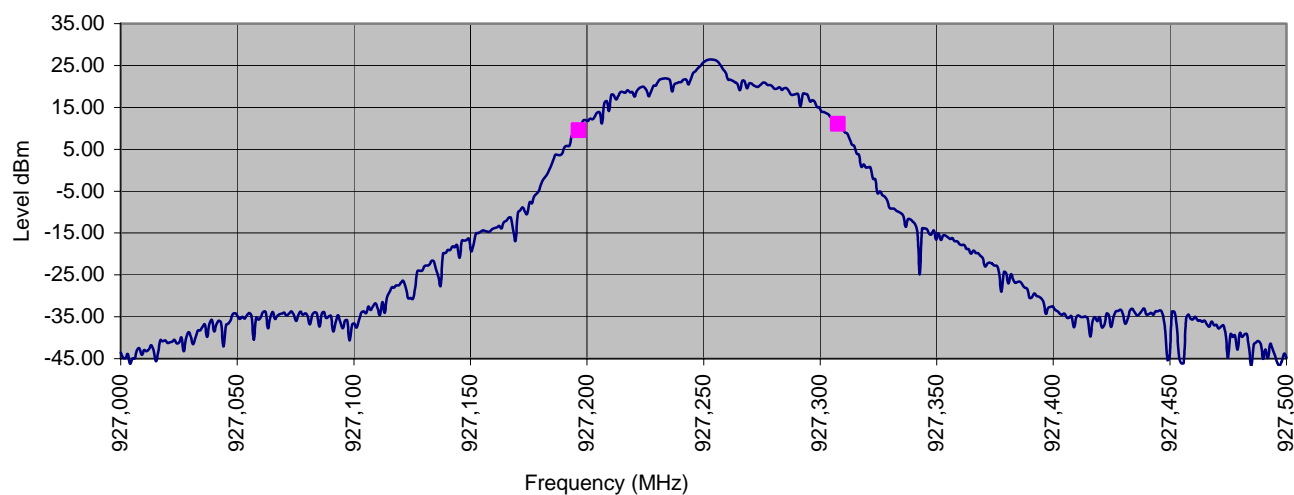
99% BW, Low Channel



99% BW, Middle Channel



99% BW, High Channel



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

