FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 7
INDUSTRY CANADA RSS-310 ISSUE 2

CERTIFICATION TEST REPORT

FOR

GNSS RECEIVER

TOPCON MODEL NUMBER: HiPerII/FH
SOKKIA MODEL: GRX1/FH

FCC ID: LCB-090511
IC: 6050B-090511

REPORT NUMBER: 09J12694-1

ISSUE DATE: AUGUST 4, 2009

Prepared for
TOPCON POSITIONING SYSTEMS, INC.
7400 NATIONAL DRIVE
LIVERMORE, CA 94551 USA

Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	08/04/09	Initial Issue	T. Chan

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: TOPCON POSITIONING SYSTEMS, INC.
7400 NATIONAL DRIVE
LIVERMORE, CA 94551 USA

EUT DESCRIPTION: GNSS RECEIVER

TOPCON MODEL: HiPerII/FH
SOKKIA MODEL: GRX1/FH

SERIAL NUMBER: 20 AND 22

DATE TESTED: JULY 28 –AUGUST 4, 2009

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	Pass
INDUSTRY CANADA RSS-210 Issue 7, Annex 1	Pass
INDUSTRY CANADA RSS-310 Issue 1	Pass
INDUSTRY CANADA RSS-GEN Issue 2	Pass

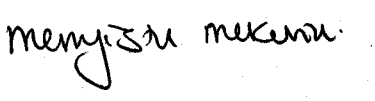
Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For CCS By:

THU CHAN
EMC MANAGER
COMPLIANCE CERTIFICATION SERVICES

Tested By:



MENGISTU MEKURIA
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 2, RSS-210 Issue 7 and RSS-310 Issue 2.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is equipped with GPS, FH915 modem and Bluetooth transceiver. The FH915 modem operates at the frequency of 902-928MHz for frequency hopping operational mode.

The FH915 modem is manufactured by Topcon Positioning System, Inc.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
High Power			
902 - 928	FHSS	29.70	933.25
Low Power			
902 - 928	FHSS	24.03	252.93

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a dipole antenna, with a maximum gain of 2.4 dBi.

5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was Frequency-Hopping 915MHz Terminal, rev. 3.4 GR3.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power. During Test, GPS is activated.

5.6. MODIFICATIONS

No modifications were made during testing.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
LAPTOP	IBM	R40	FX-72609	DoC
LAPTOP DOCK	IBM	2878	98-26600	DoC
AC/DC	IBM	PA-1121-051	11S02K7095Z1Z6C73C1620	DoC
MOUSE	LOGITECH	848a	HCA12502510	DoC

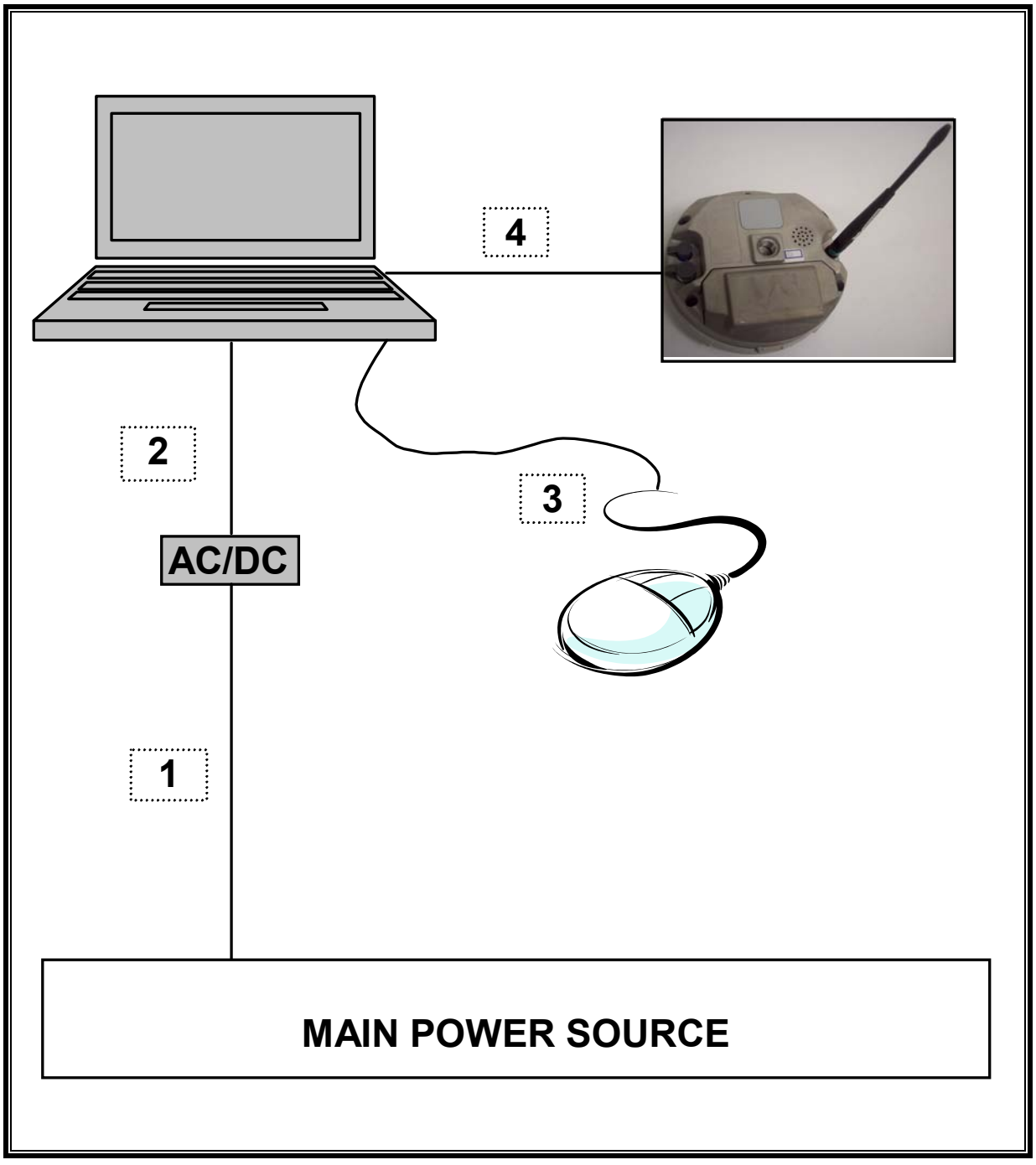
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identica Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	AC	UN-SHIELDED	2.0 m	
2	DC	1	4 PINS DC	UN-SHIELDED	2.0 m	FERRITE AT ONE END
3	DATA	1	RS 232	SHIELDED	2.0 m	
4	MOUSE	1	PS/2	UN-SHIELDED	2.0 m	

TEST SETUP

The EUT is a stand-alone unit and connected to the support laptop computer via calble during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	1/14/2010
Antenna, Horn, 18 GHz	EMCO	3115	C00945	1/29/2010
Antenna, Horn, 18 GHz	EMCO	3115	C00783	1/29/2010
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	12/16/2009
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	2/4/2010
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	2/4/2010
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00986	2/3/2010
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01159	2/7/2010
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	8/6/2009
Highpass Filter, 1.5 GHz	Micro-Tronics	HPM13193	N02688	CNR

7. ANTENNA PORT TEST RESULTS

1000mW OUTPUT POWER

7.1. 20 dB AND 99% BANDWIDTH

LIMIT

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.

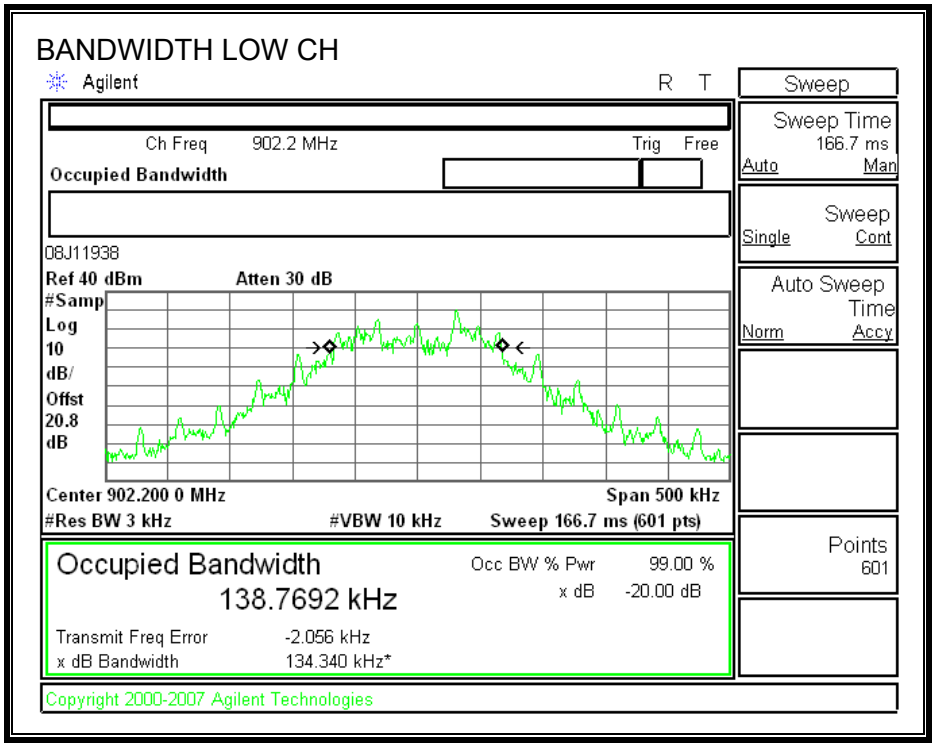
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 20 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

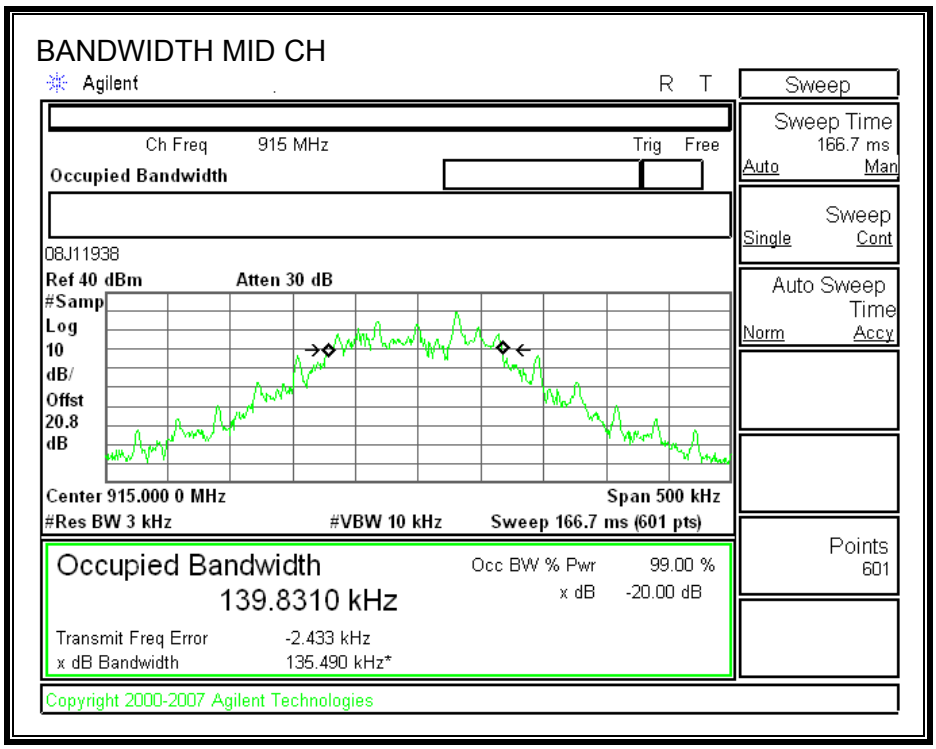
RESULTS

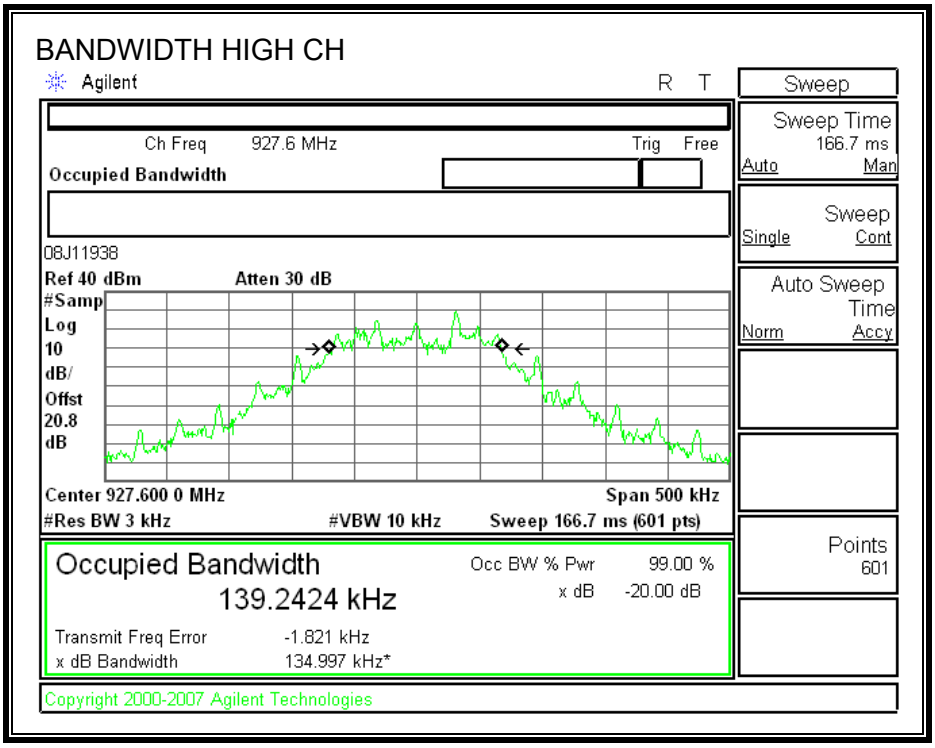
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	902.2	134.340	138.769
Middle	915.0	135.490	139.831
High	927.6	134.997	139.242

BANDWIDTH LOW CH



BANDWIDTH MID CH





7.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)
IC RSS-210 A8.1 (b)
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

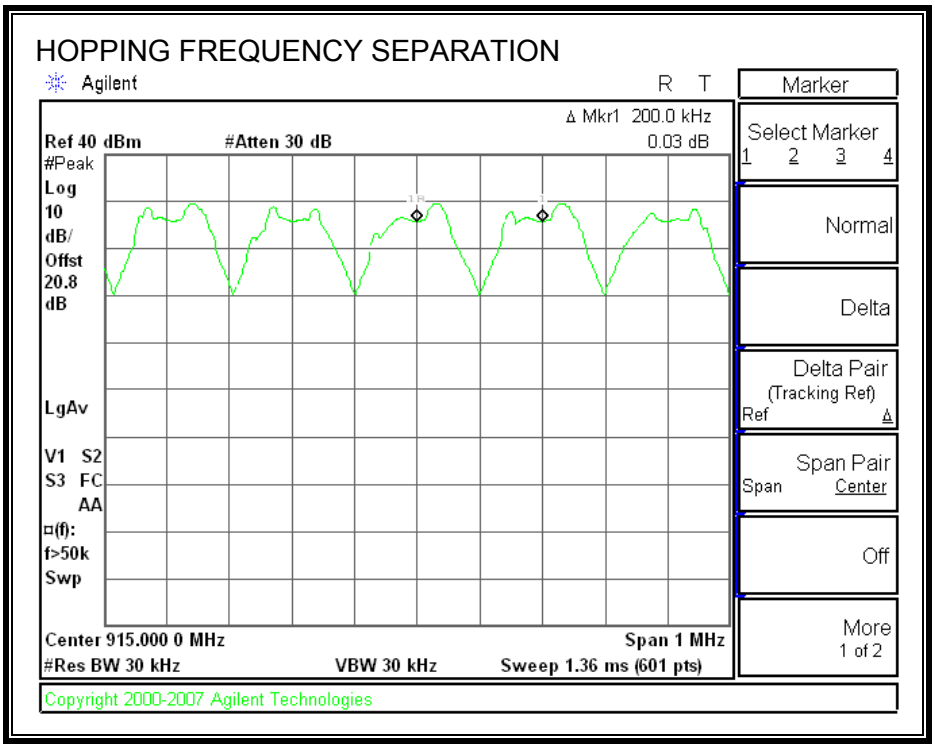
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

RESULTS

Channel	Frequency (MHz)	Hopping Separation (kHz)	>=25kHz or 20 dB BW (kHz)	Margin (kHz)
Mid	915	200	135.49	64.51

HOPPING FREQUENCY SEPARATION



7.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)
IC RSS-210 A8.1 (d)
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.

TEST PROCEDURE

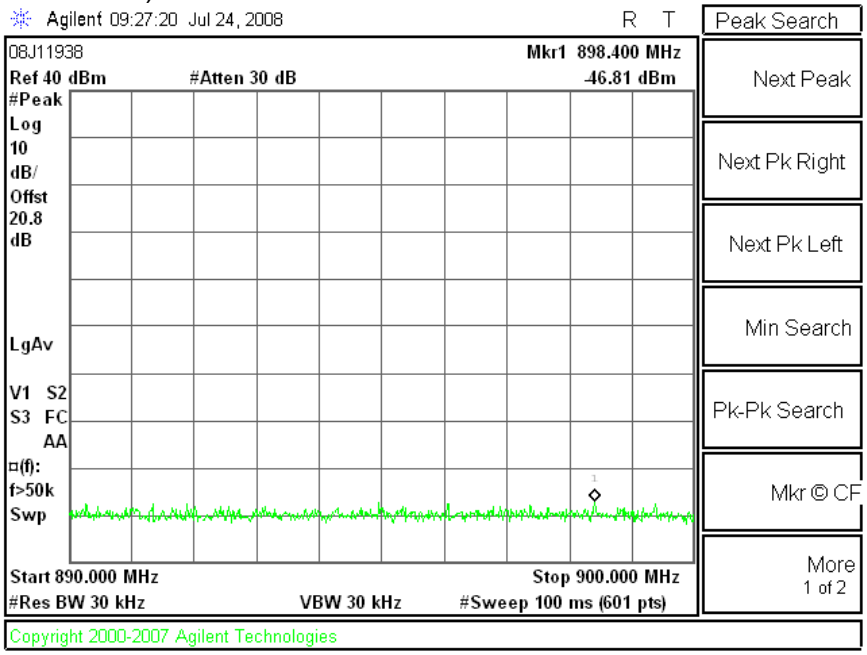
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

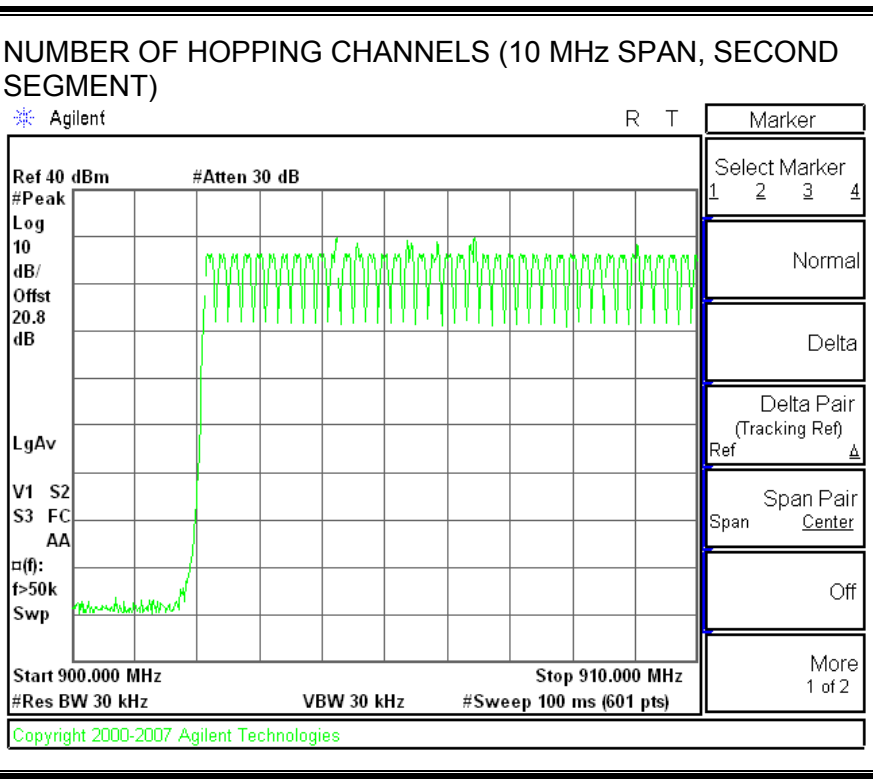
128 Channels observed.

NUMBER OF HOPPING CHANNELS

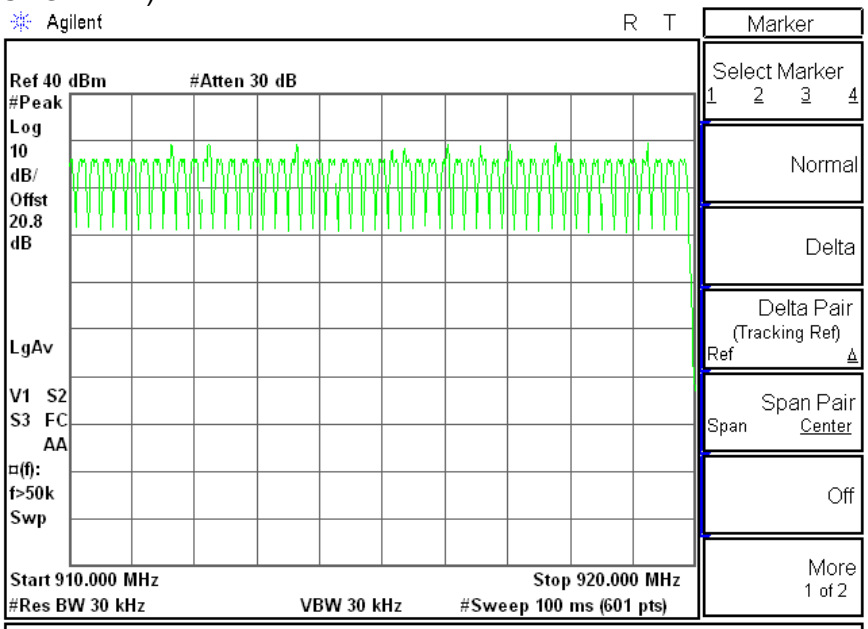
NUMBER OF HOPPING CHANNELS (10 MHz SPAN, FIRST SEGMENT)



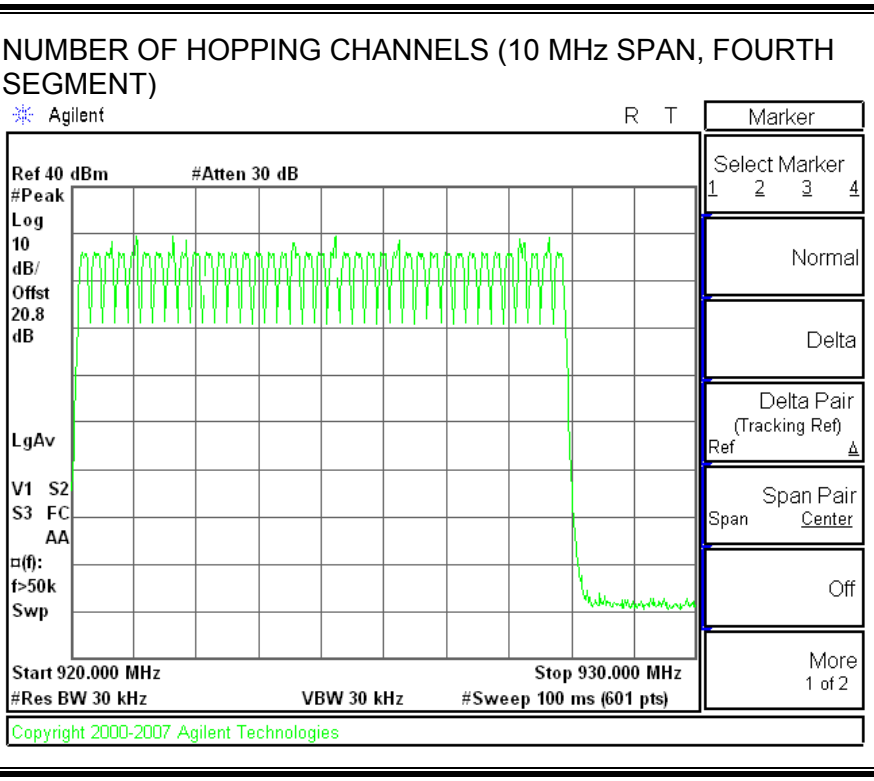
NUMBER OF HOPPING CHANNELS (10 MHz SPAN, SECOND SEGMENT)



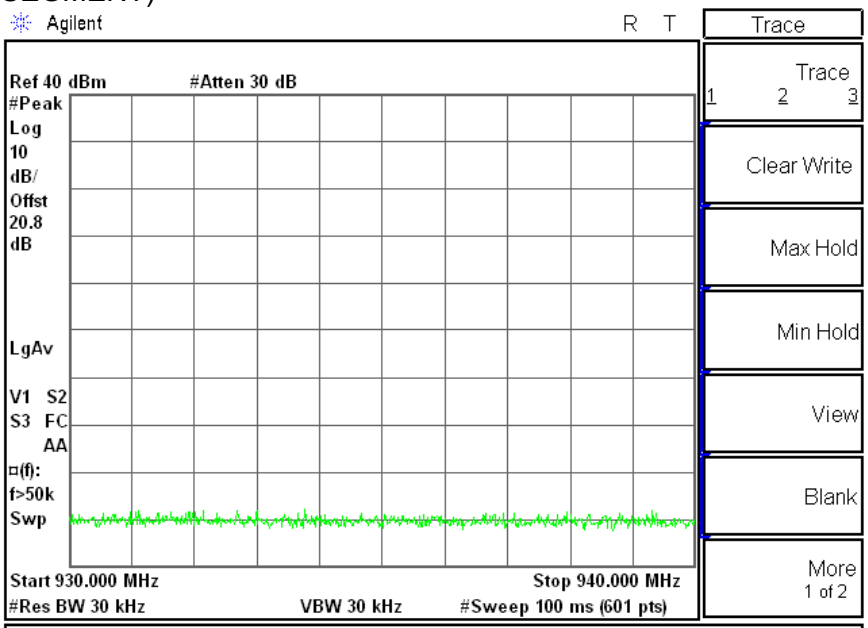
NUMBER OF HOPPING CHANNELS (10 MHz SPAN, THIRD SEGMENT)



NUMBER OF HOPPING CHANNELS (10 MHz SPAN, FOURTH SEGMENT)



NUMBER OF HOPPING CHANNELS (10 MHz SPAN, FIFTH SEGMENT)



7.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)
IC RSS-210 A8.1 (d)

§15.247 (a) (1) (i) 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.

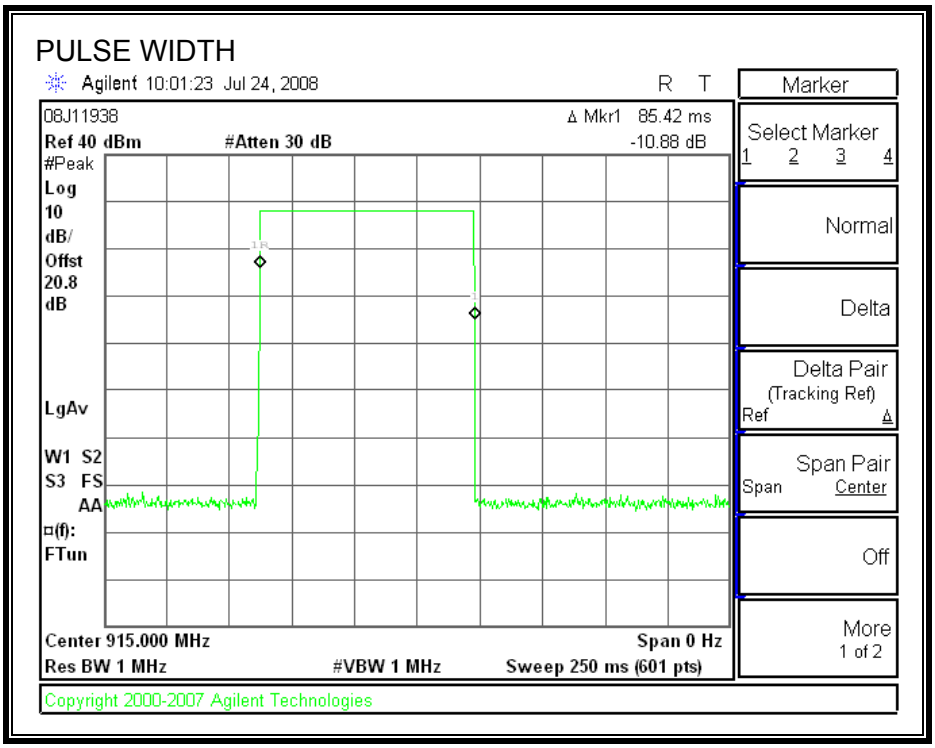
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a slow scan.

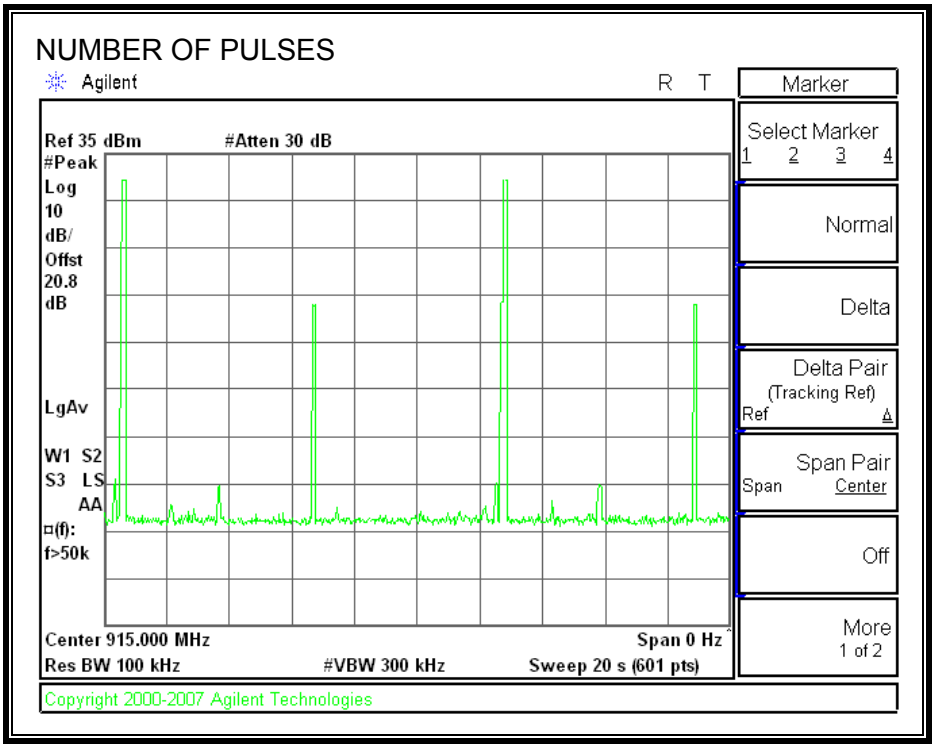
RESULTS

Pulse Width (msec)	Number of Pulses in 10 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
85.42	2	0.171	0.4	0.229

PULSE WIDTH



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



7.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)
RSS-210 Issue 7 Clause A8.4

The maximum peak output power of the intentional radiator shall not exceed the following:

For frequency hopping systems operating in the 902-928 MHz band , employing at least 50 hopping channels: 1 watt; and employing less than 50 hopping channels, but at least 25 hopping channels: 0.25 watt.

Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

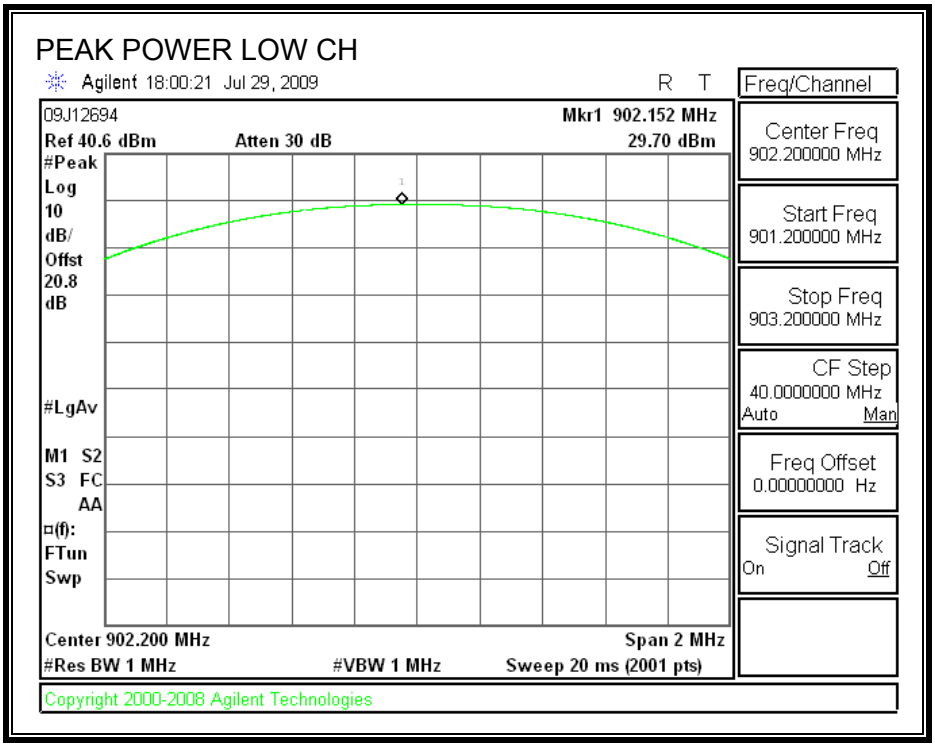
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

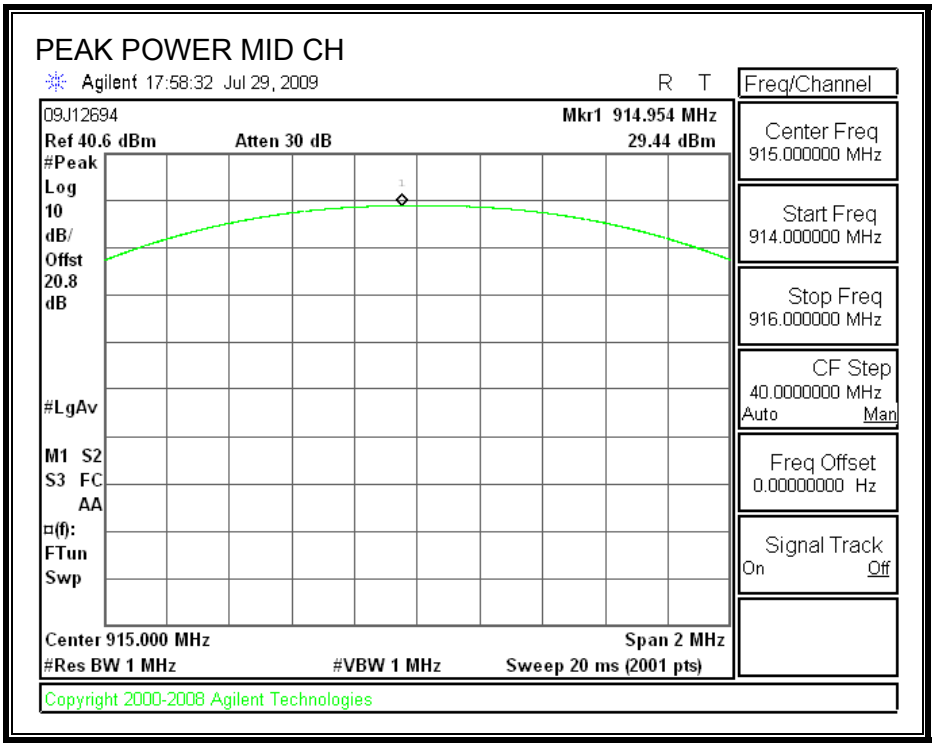
RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	902.2	29.70	30	-0.30
Middle	915.0	29.44	30	-0.56
High	927.6	29.33	30	-0.67

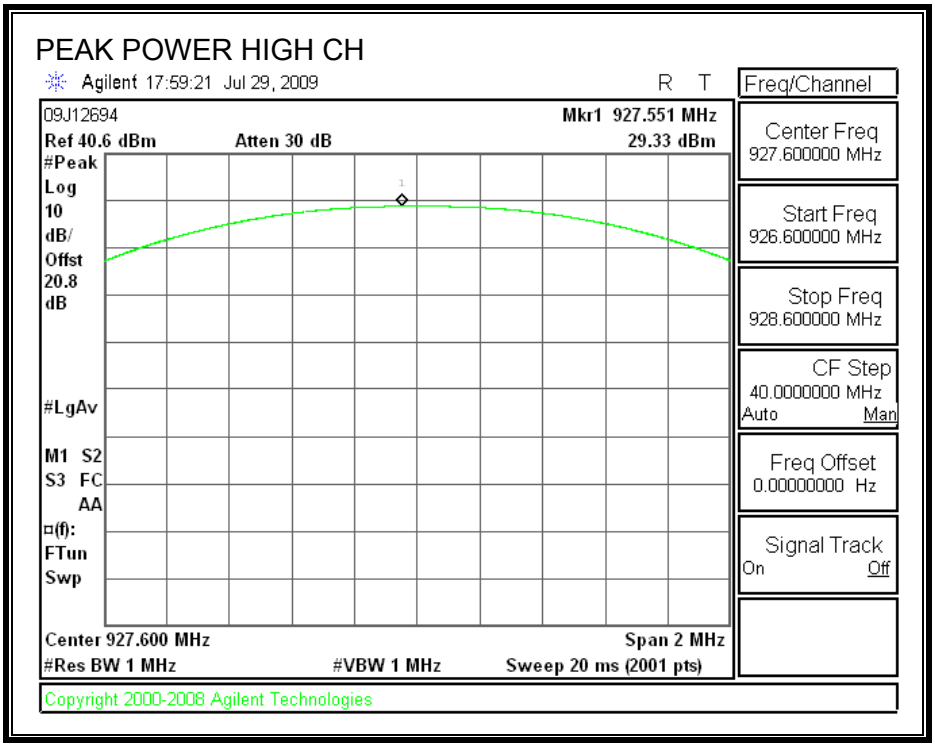
PEAK POWER LOW CH



PEAK POWER MID CH



PEAK POWER HIGH CH



7.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 20.8 dB (including 20 dB pad and 0.8 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	902.20	29.60
Middle	915.00	29.43
High	927.60	29.35

7.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc
\
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in§15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

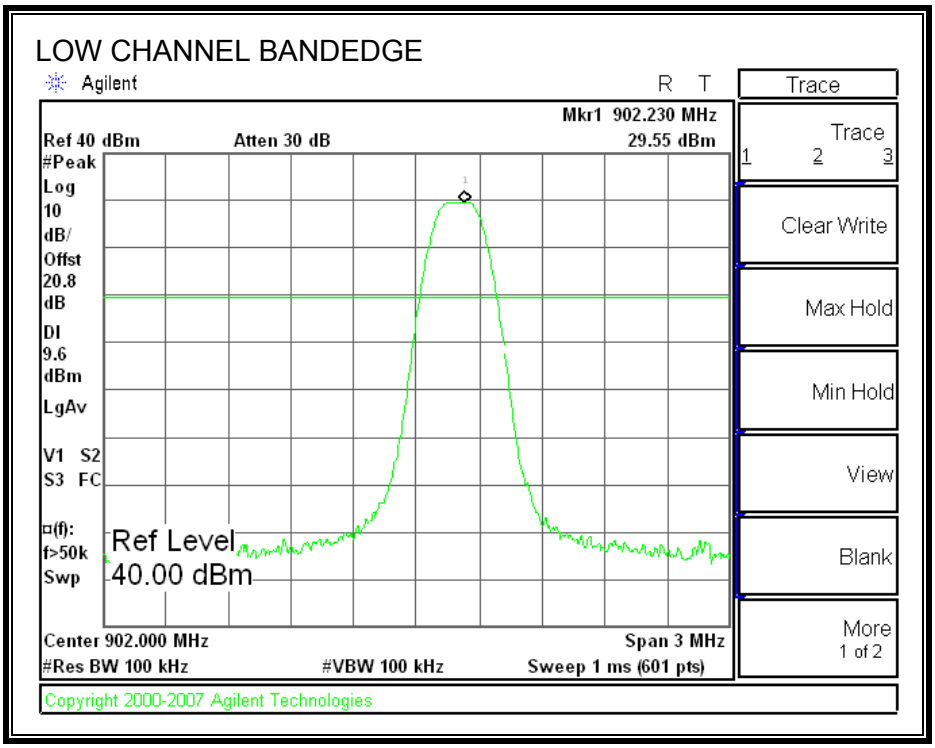
TEST PROCEDURE

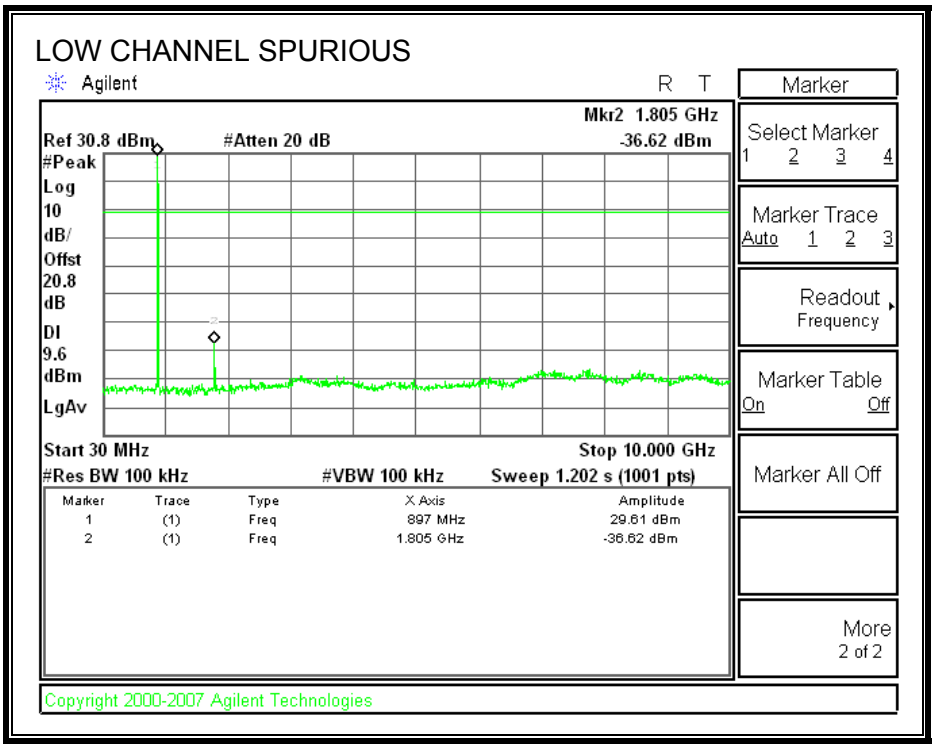
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 10 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

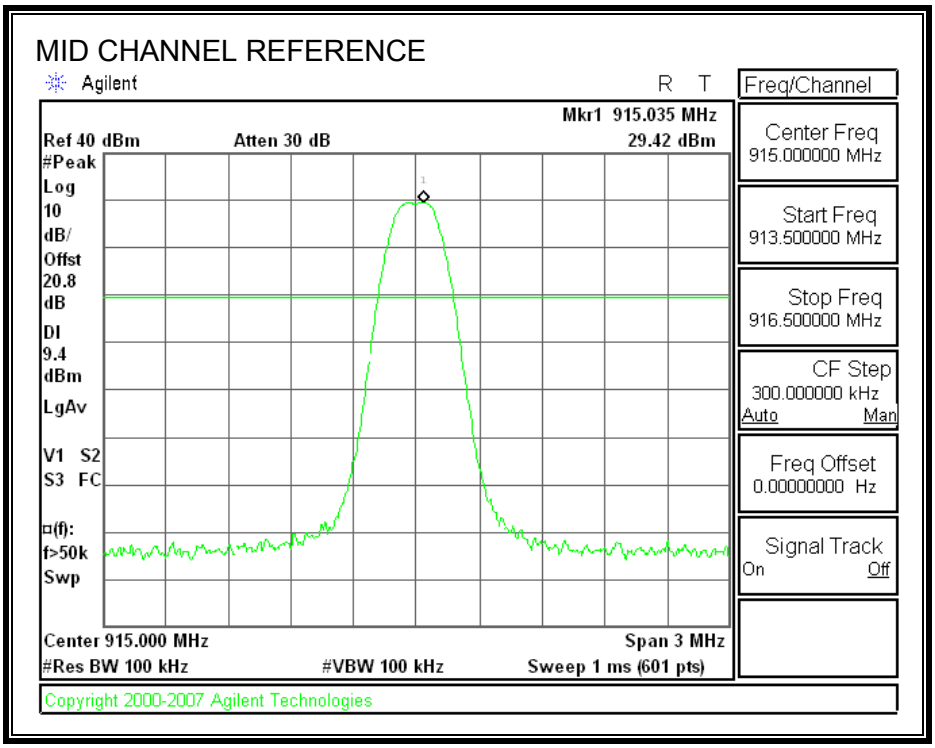
RESULTS

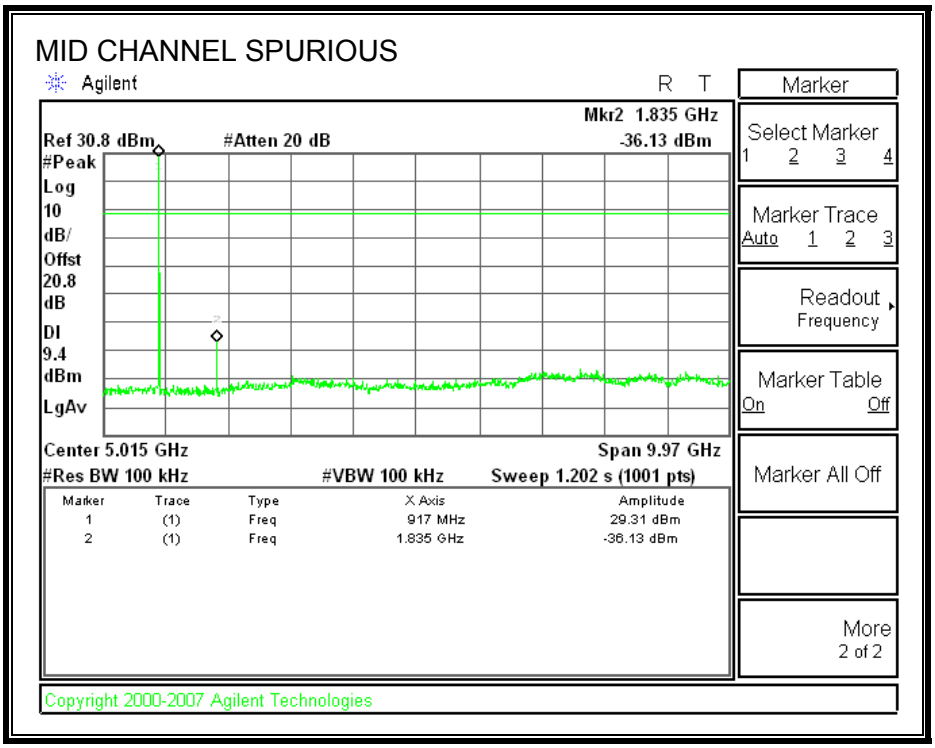
SPURIOUS EMISSIONS, LOW CHANNEL



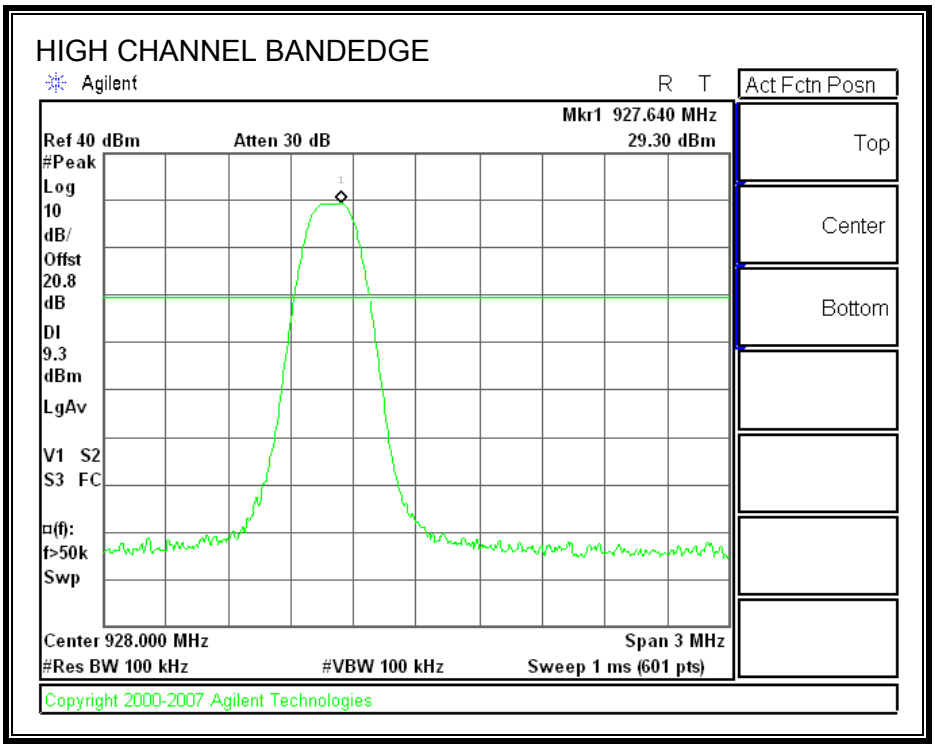


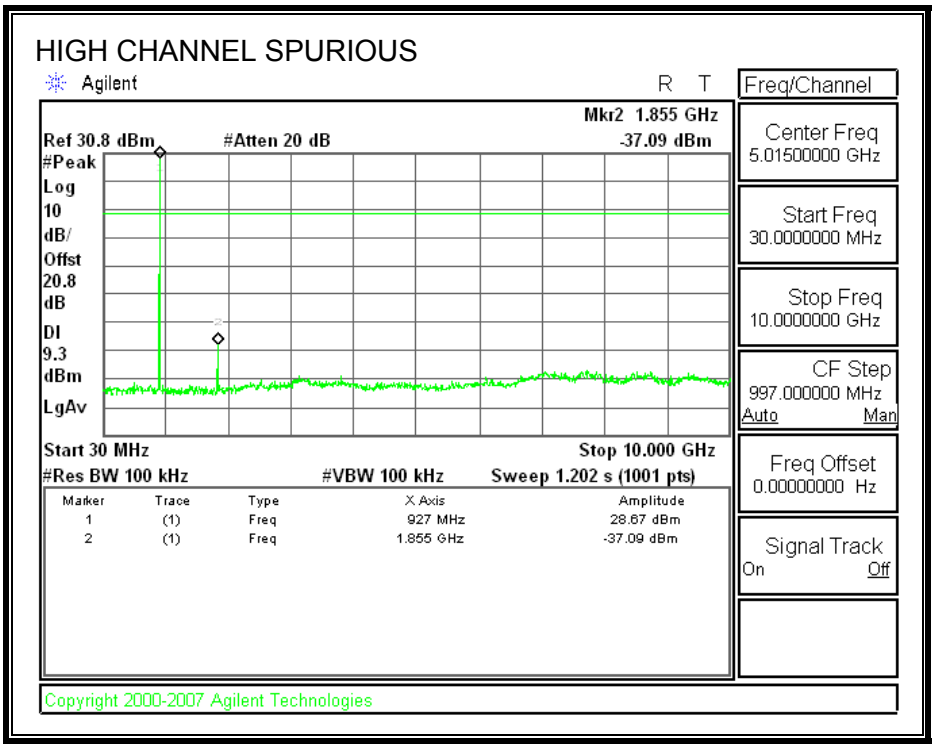
SPURIOUS EMISSIONS, MID CHANNEL





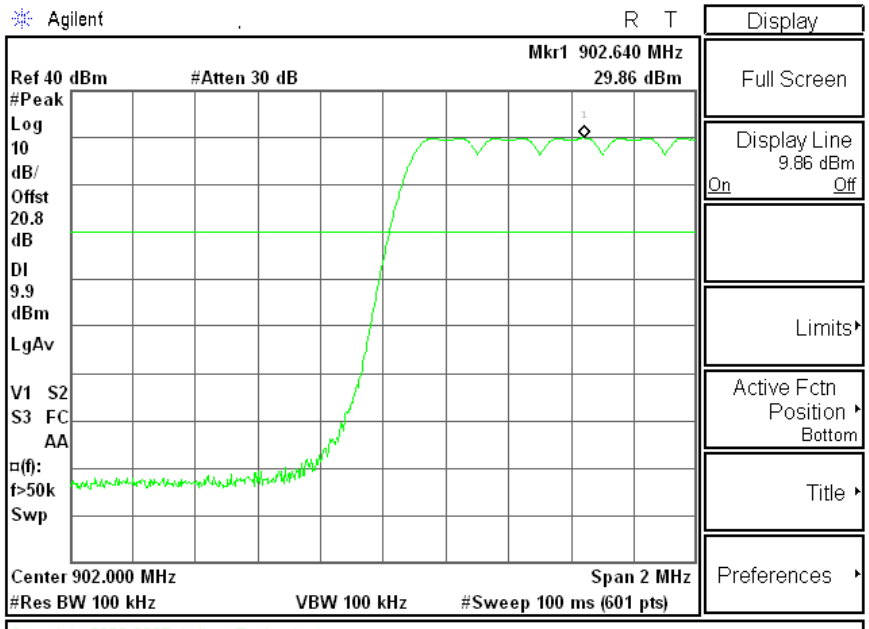
SPURIOUS EMISSIONS, HIGH CHANNEL



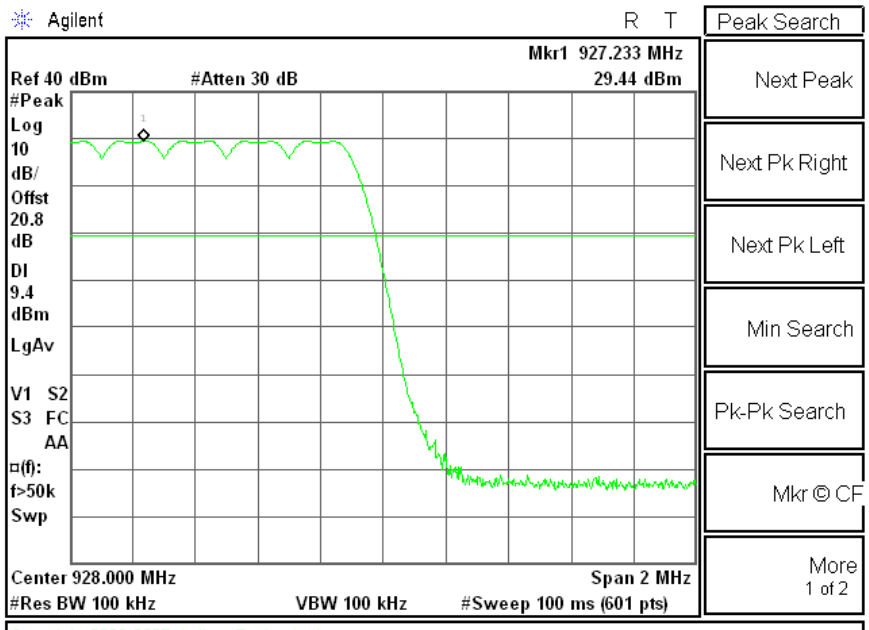


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



250mW OUTPUT POWER

7.8. 20 dB AND 99% BANDWIDTH

LIMIT

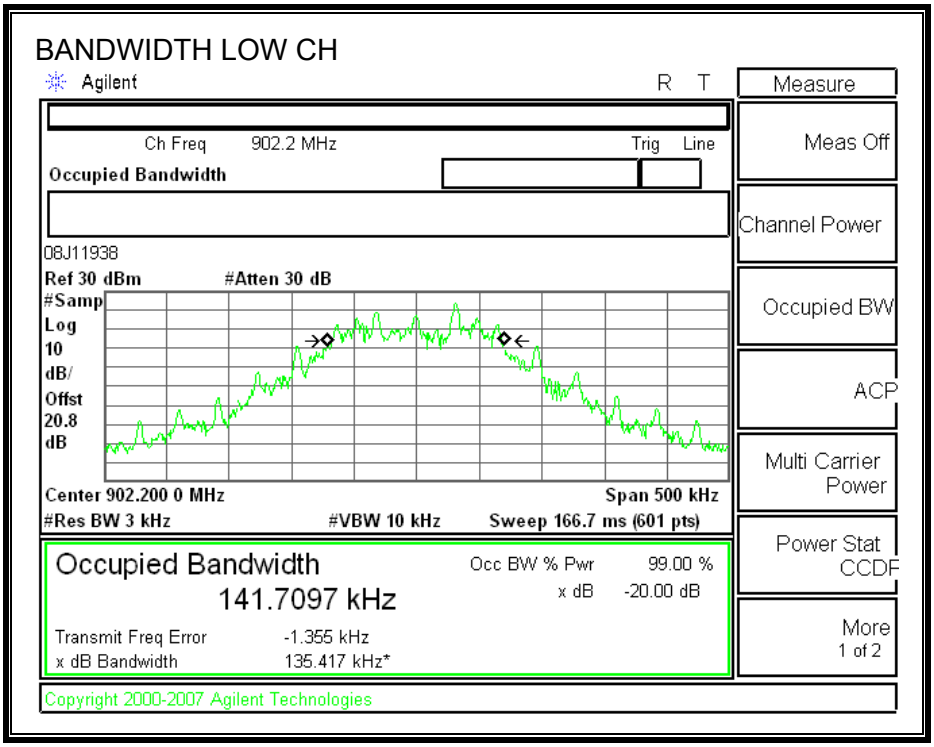
The system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

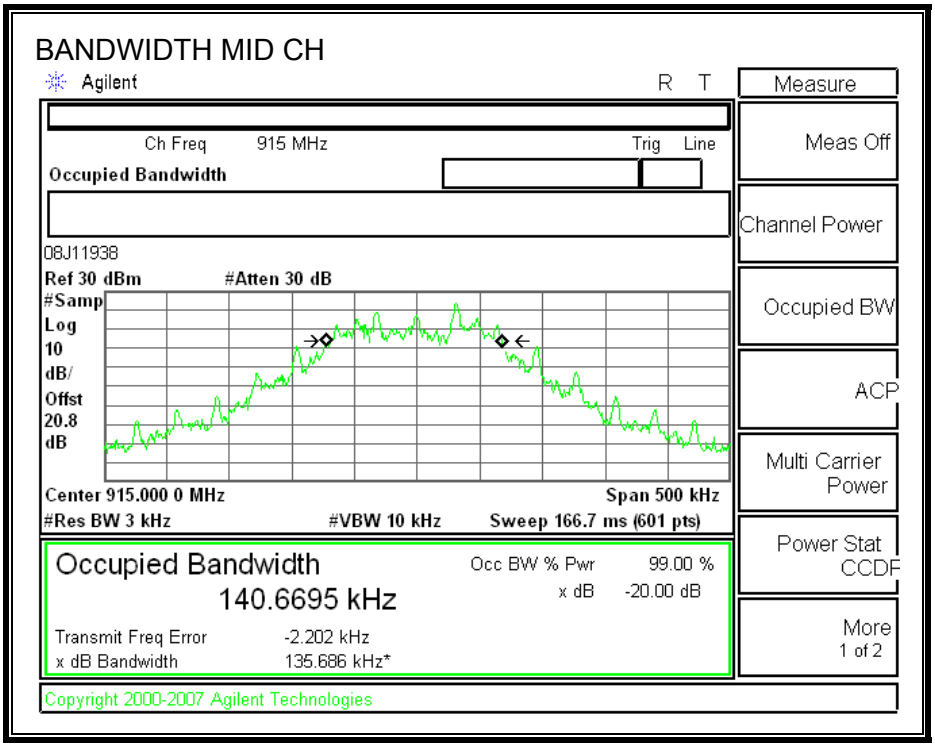
TEST PROCEDURE

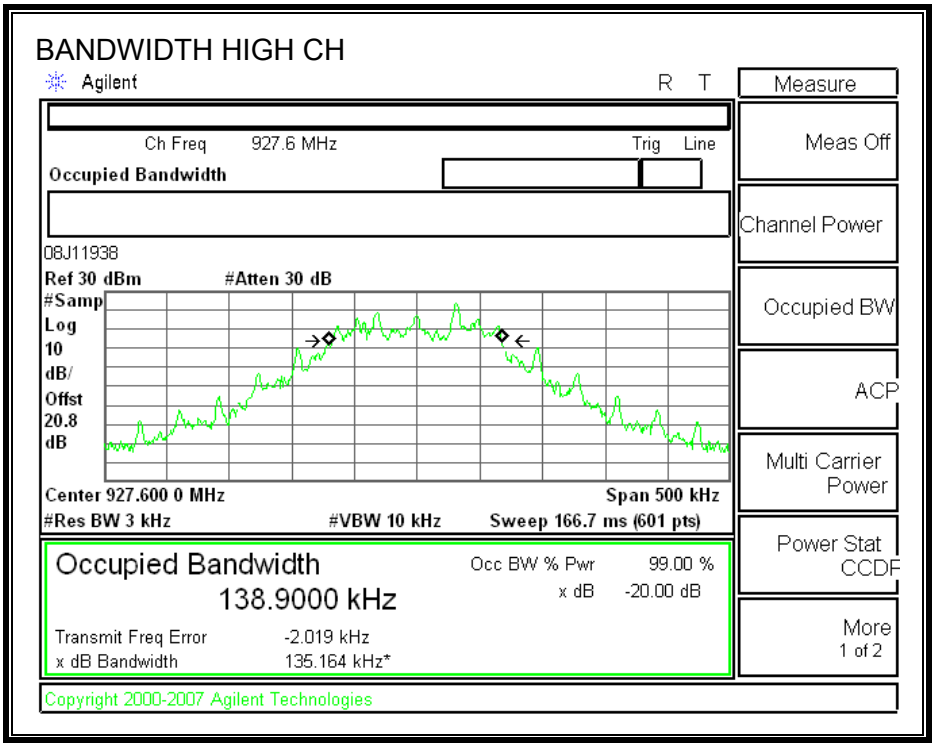
The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 20 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	902.2	135.417	141.710
Middle	915.0	135.686	140.670
High	927.6	135.164	138.900







7.9. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)
IC RSS-210 A8.1 (b)
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

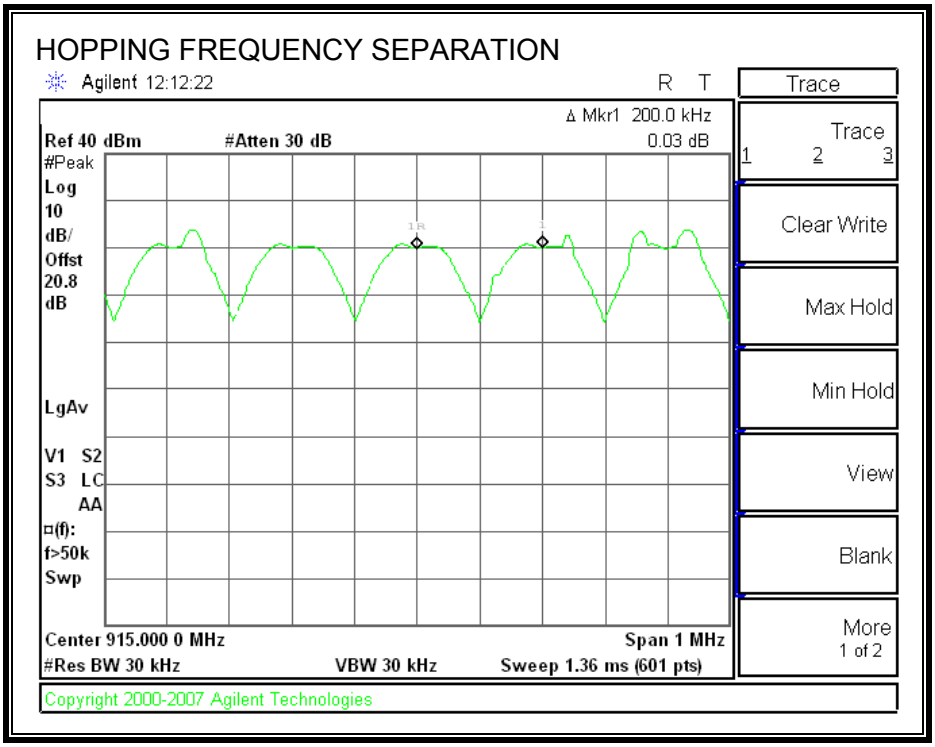
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

RESULTS

Channel	Frequency (MHz)	Hopping Separation (kHz)	>=25kHz or 20 dB BW (kHz)	Margin (kHz)
Mid	915	200	135.686	64.314

HOPPING FREQUENCY SEPARATION



7.10. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)
IC RSS-210 A8.1 (d)
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.

TEST PROCEDURE

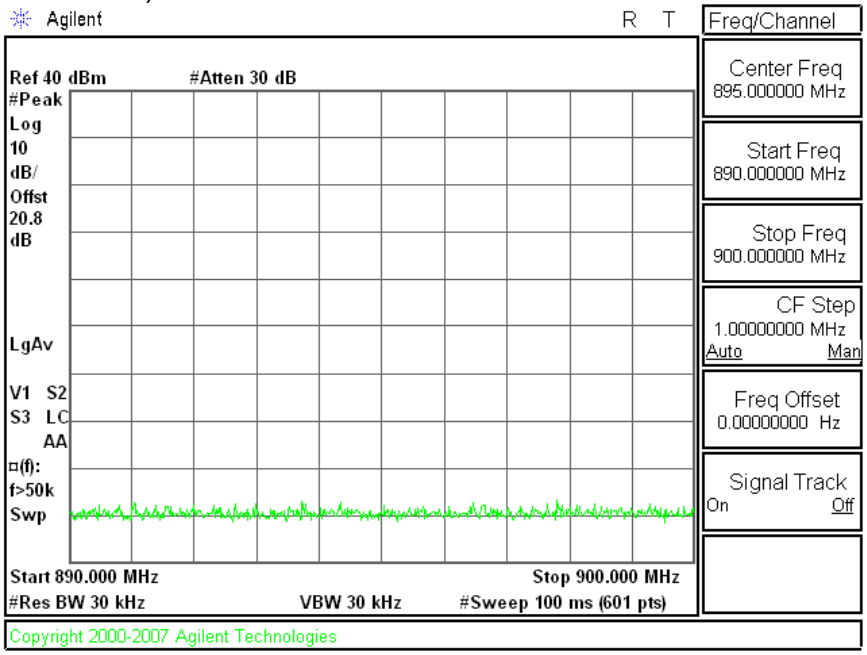
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

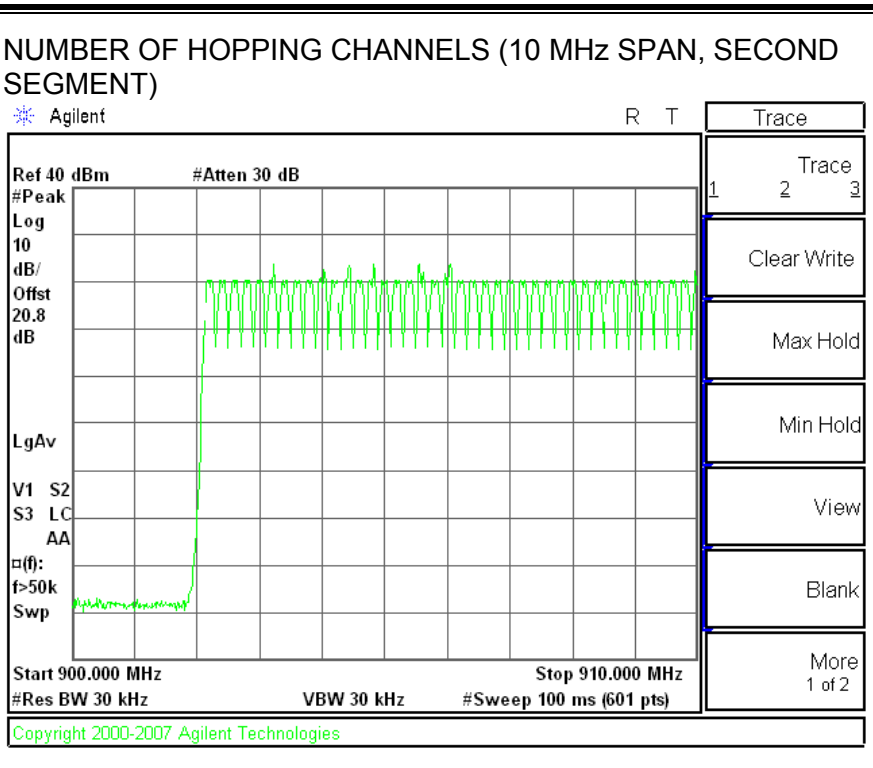
128 Channels observed.

NUMBER OF HOPPING CHANNELS

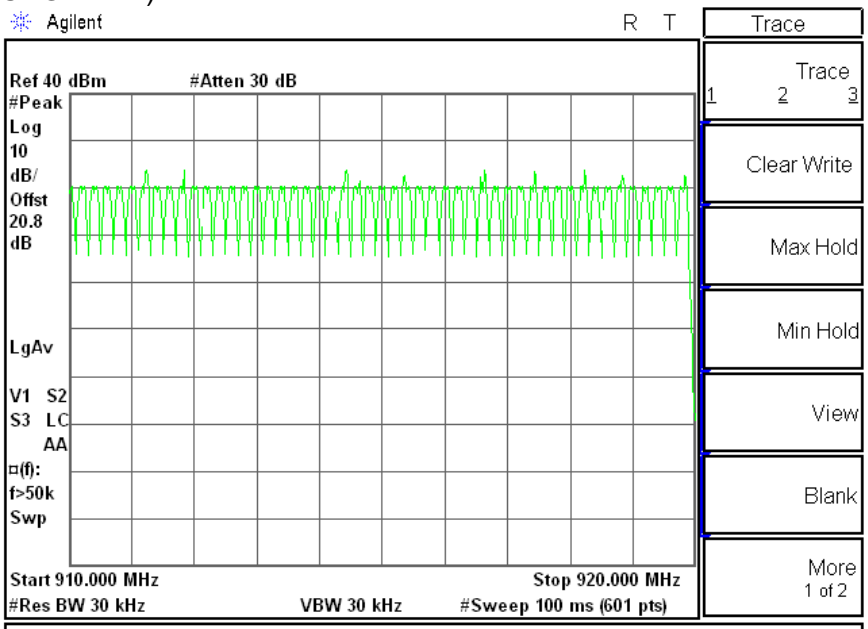
NUMBER OF HOPPING CHANNELS (10 MHz SPAN, FIRST SEGMENT)



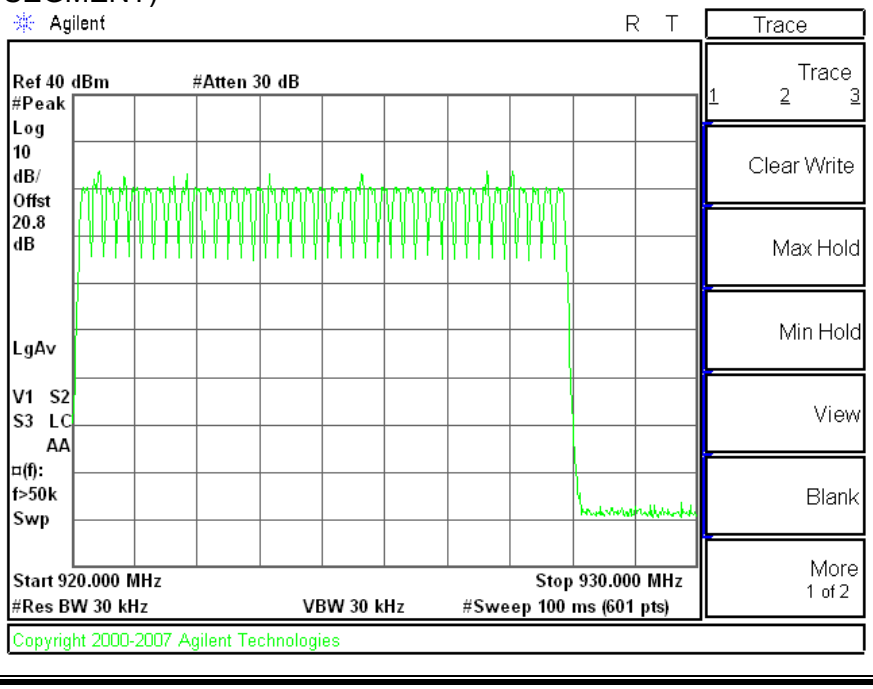
NUMBER OF HOPPING CHANNELS (10 MHz SPAN, SECOND SEGMENT)



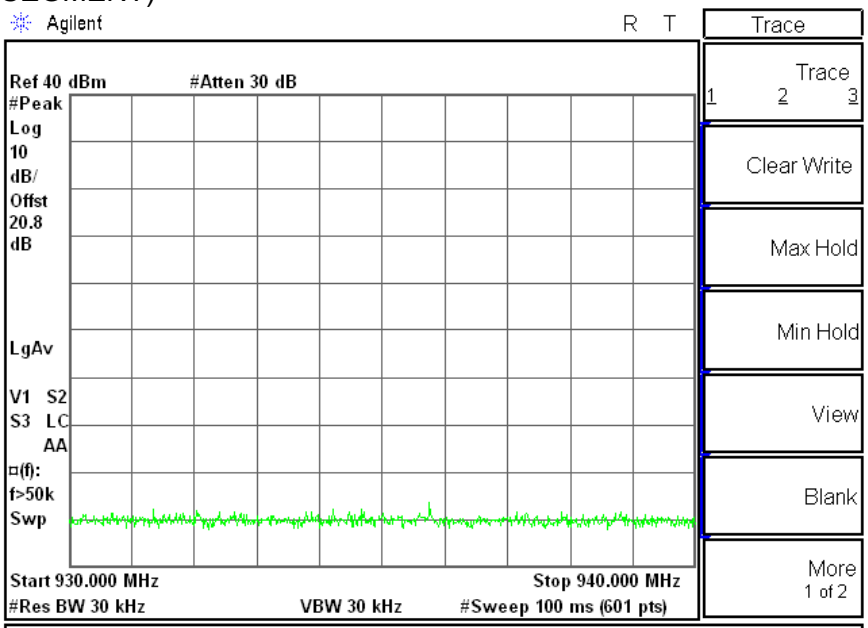
NUMBER OF HOPPING CHANNELS (10 MHz SPAN, THIRD SEGMENT)



NUMBER OF HOPPING CHANNELS (10 MHz SPAN, FOURTH SEGMENT)



NUMBER OF HOPPING CHANNELS (10 MHz SPAN, FIFTH SEGMENT)



7.11. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)
IC RSS-210 A8.1 (d)

§15.247 (a) (1) (i) 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.

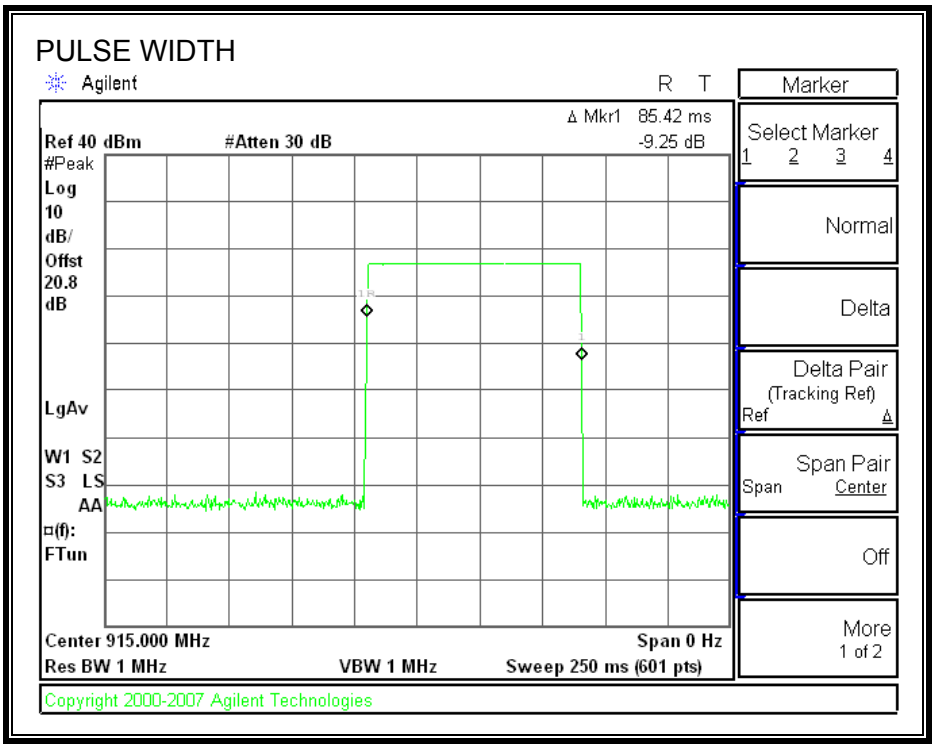
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a slow scan.

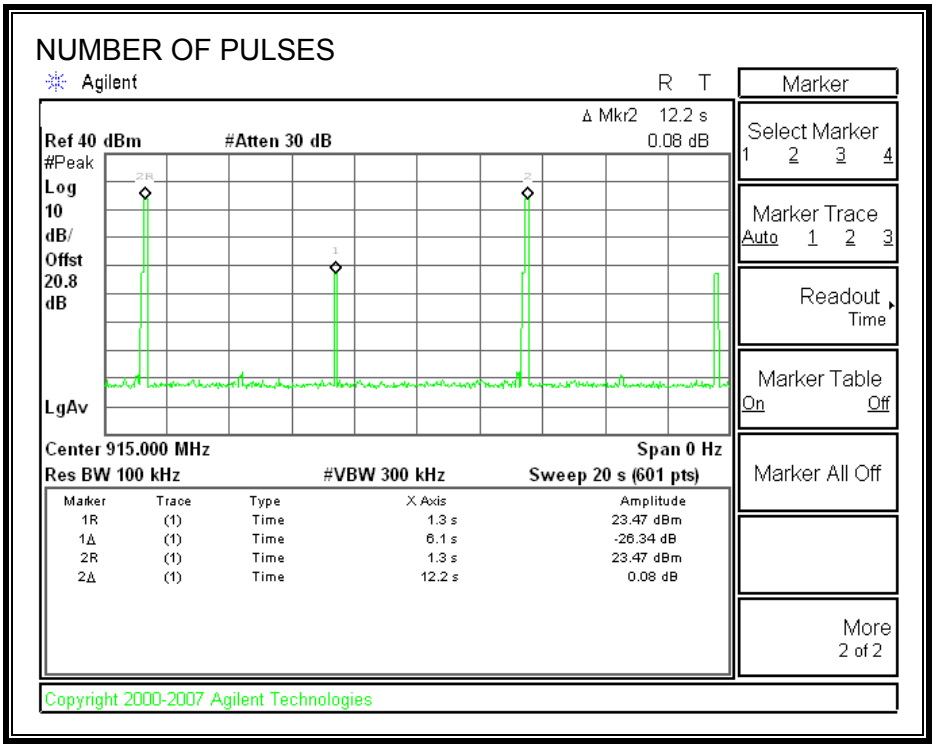
RESULTS

Pulse Width (msec)	Number of Pulses in 10 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
85.42	2	0.171	0.4	0.229

PULSE WIDTH



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



7.12. OUTPUT POWER

LIMIT

§15.247 (b) (1)
RSS-210 Issue 7 Clause A8.4

The maximum peak output power of the intentional radiator shall not exceed the following:

For frequency hopping systems operating in the 902-928 MHz band , employing at least 50 hopping channels: 1 watt; and employing less than 50 hopping channels, but at least 25 hopping channels: 0.25 watt.

Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

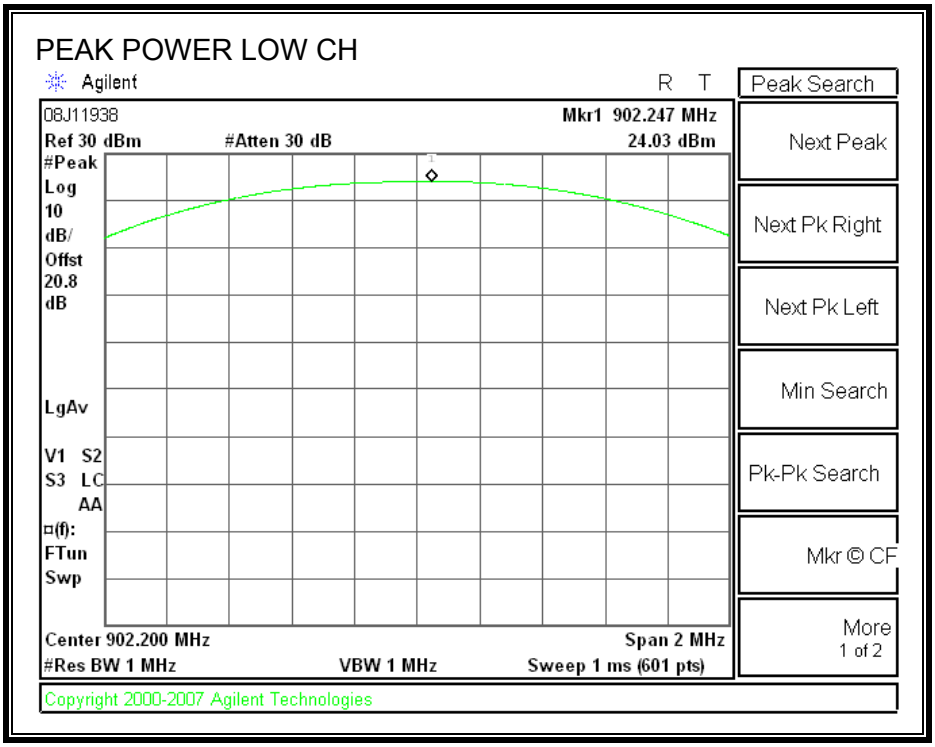
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

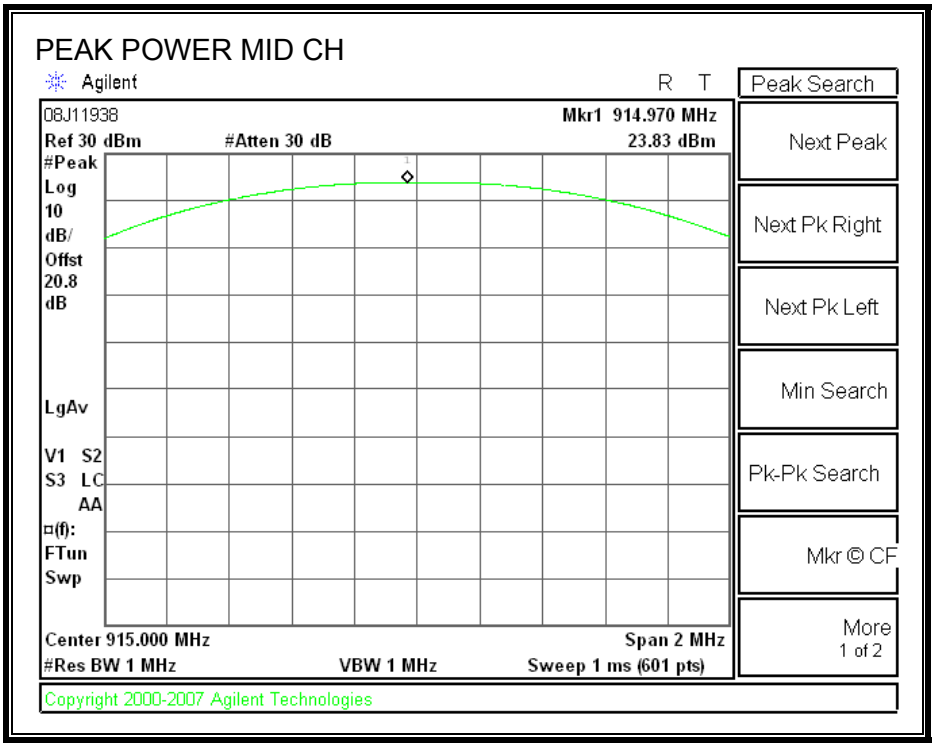
RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	902.2	24.03	30	-5.97
Middle	915.0	23.83	30	-6.17
High	927.6	23.73	30	-6.27

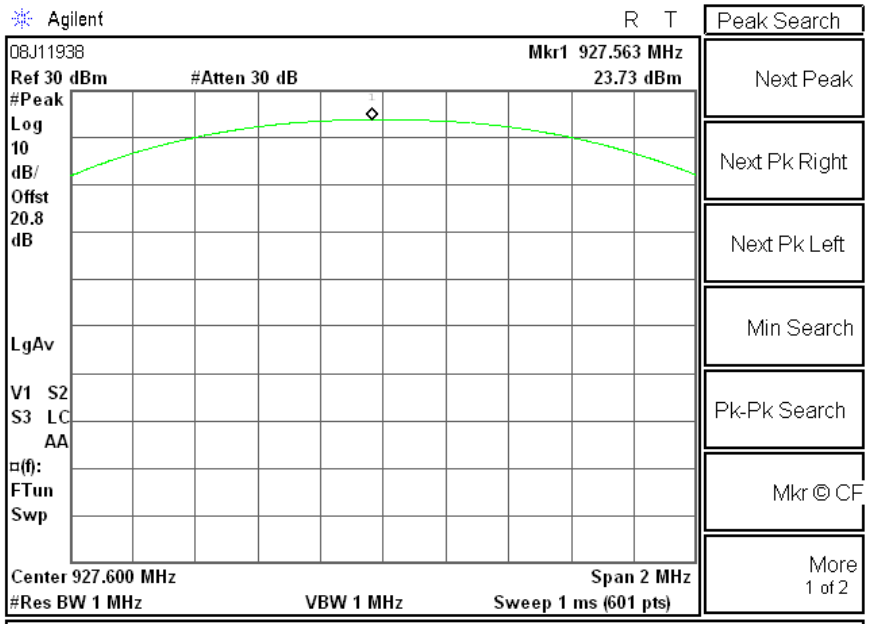
PEAK POWER LOW CH



PEAK POWER MID CH



PEAK POWER HIGH CH



7.13. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 20.8 dB (including 20 dB pad and 0.8 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	902.20	23.29
Middle	915.00	23.23
High	927.60	23.17

7.14. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in§15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

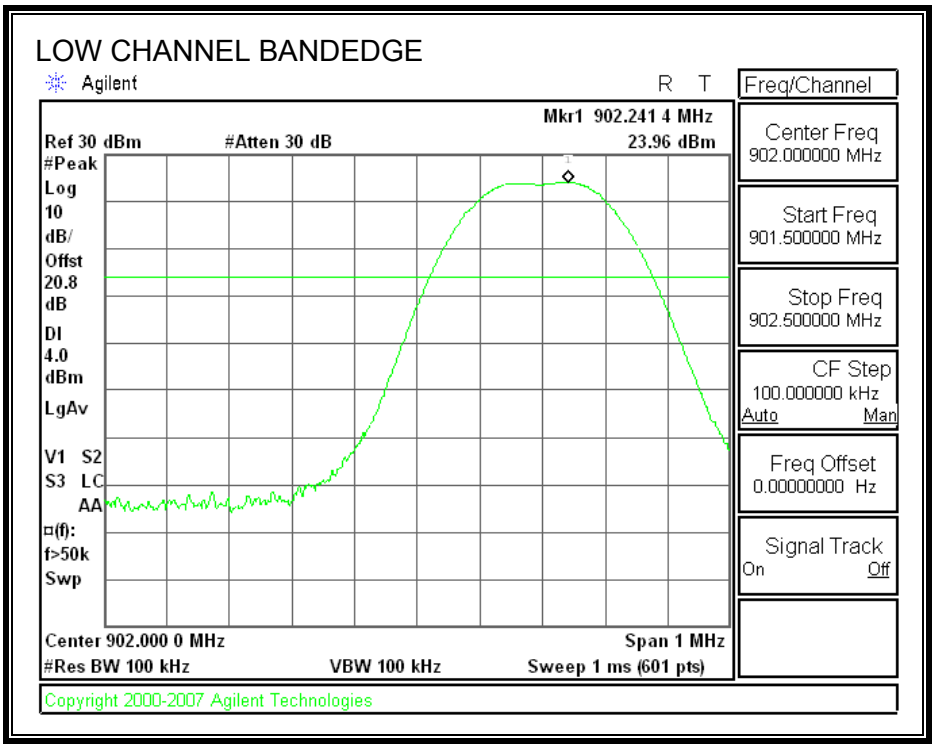
TEST PROCEDURE

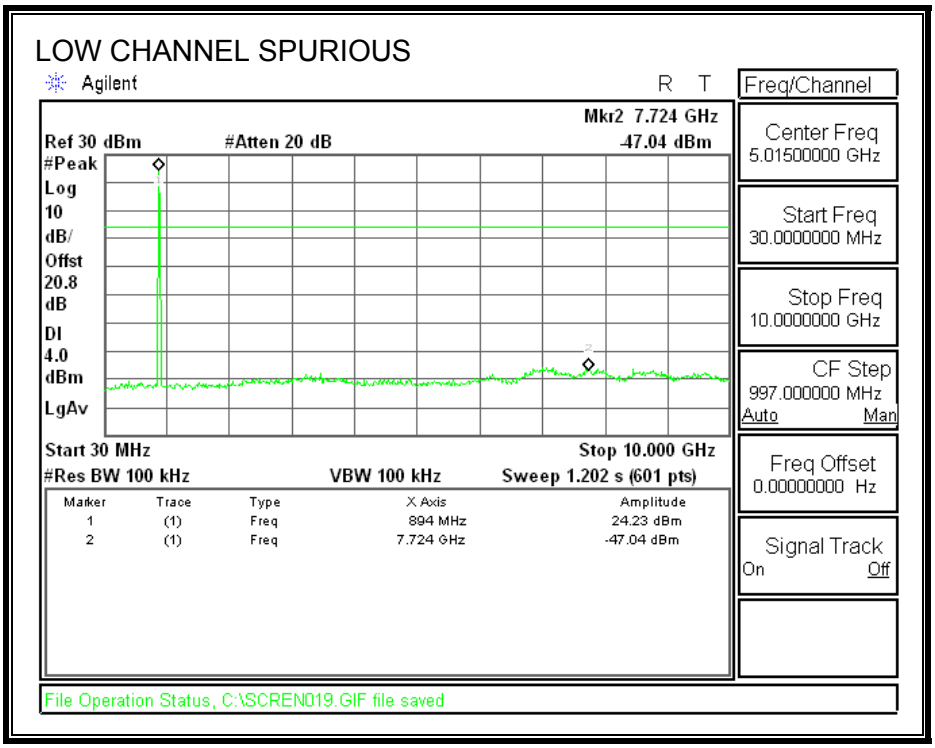
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 10 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

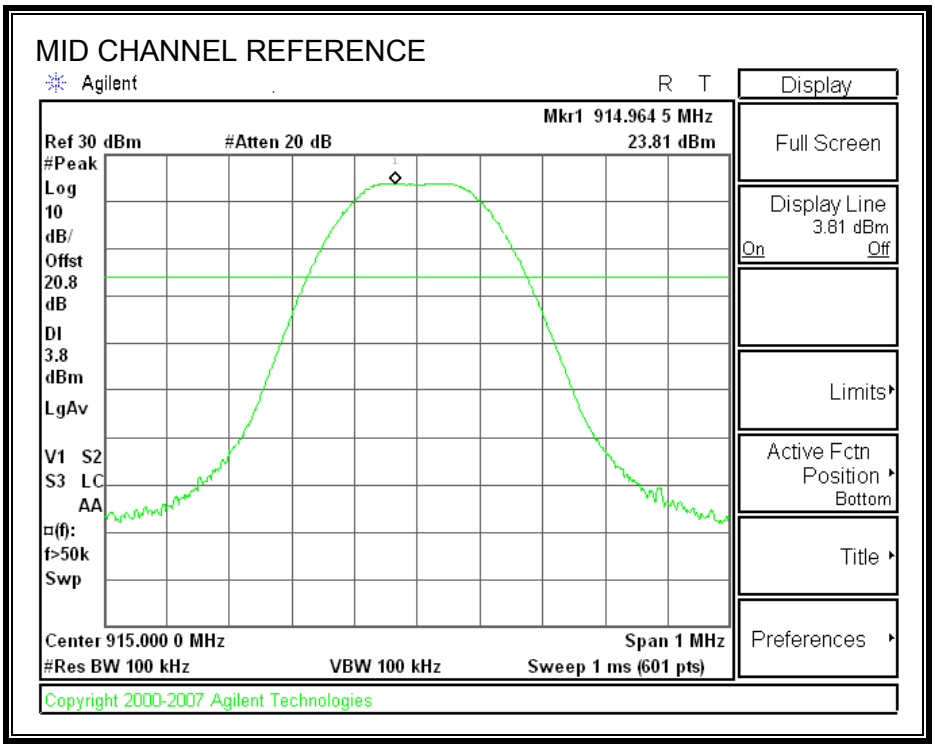
RESULTS

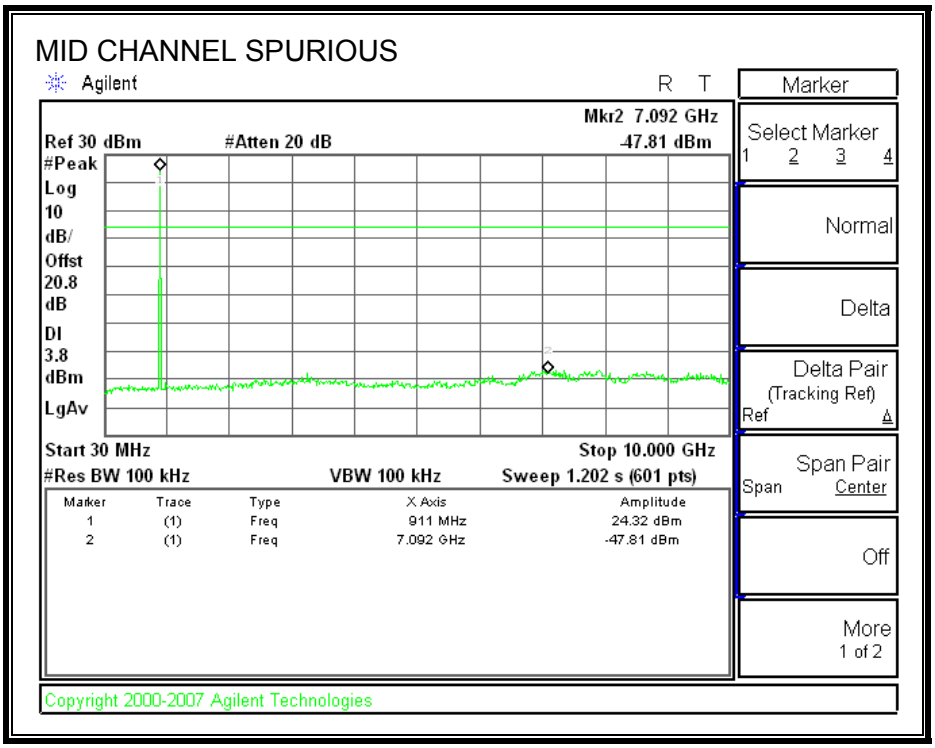
SPURIOUS EMISSIONS, LOW CHANNEL



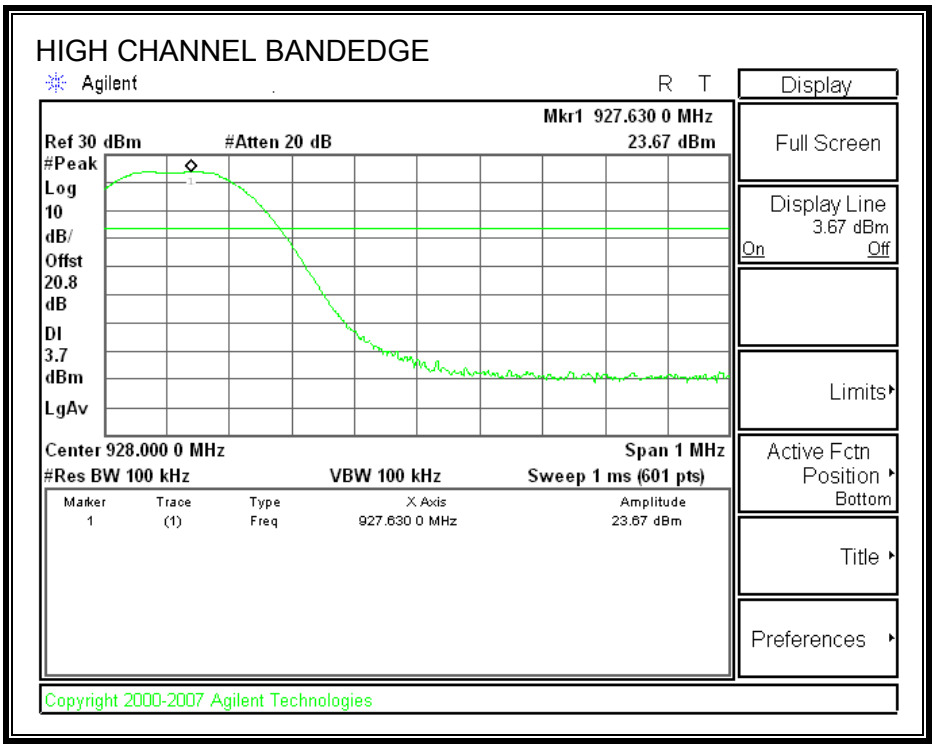


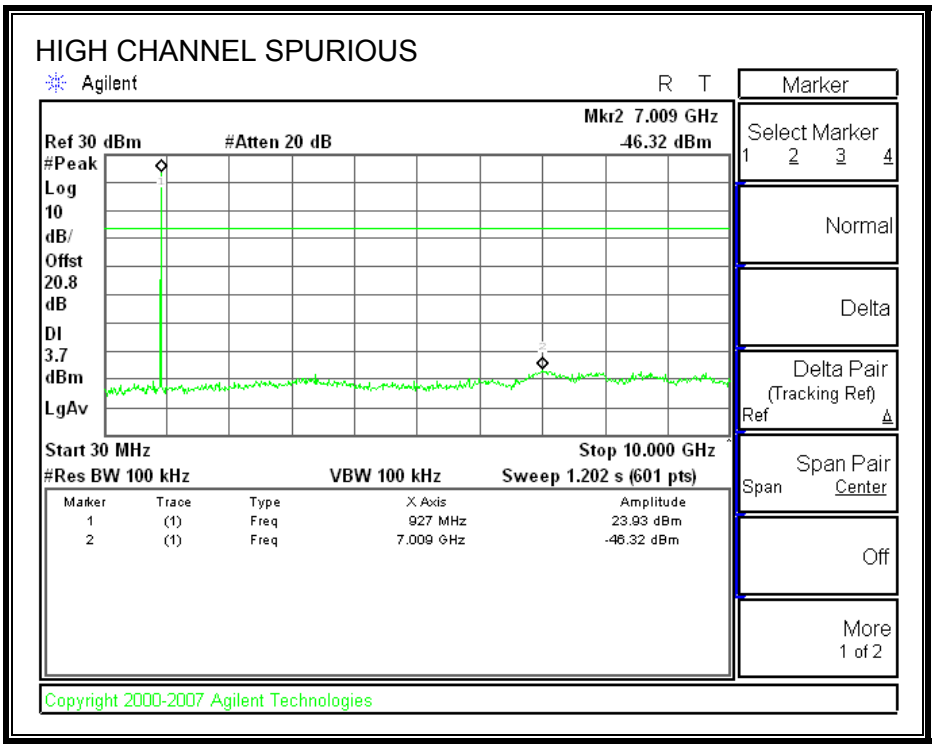
SPURIOUS EMISSIONS, MID CHANNEL





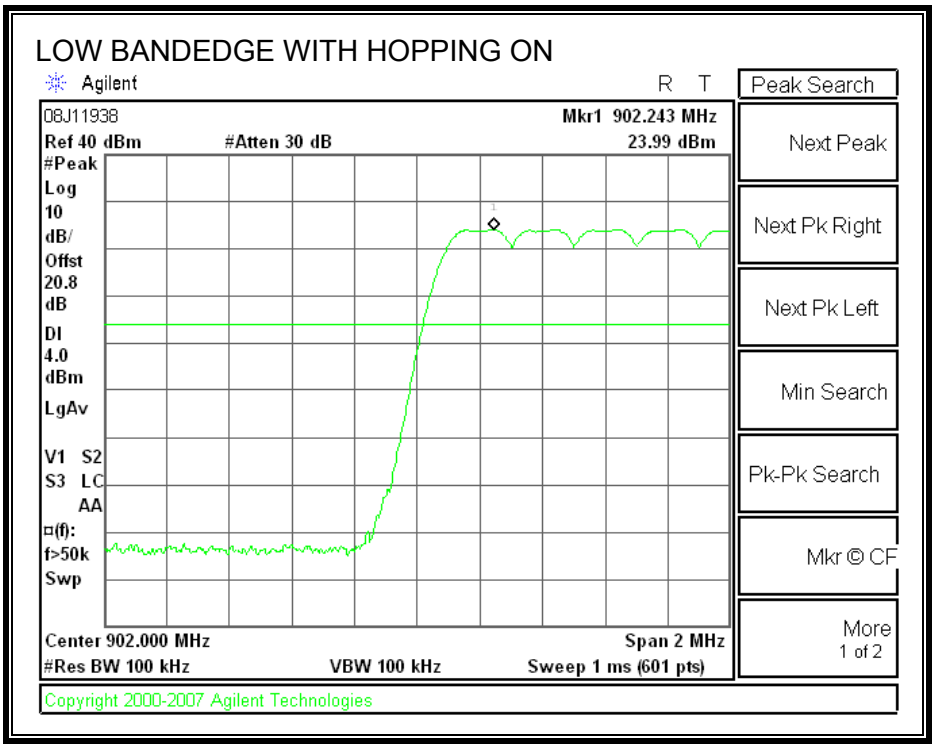
SPURIOUS EMISSIONS, HIGH CHANNEL



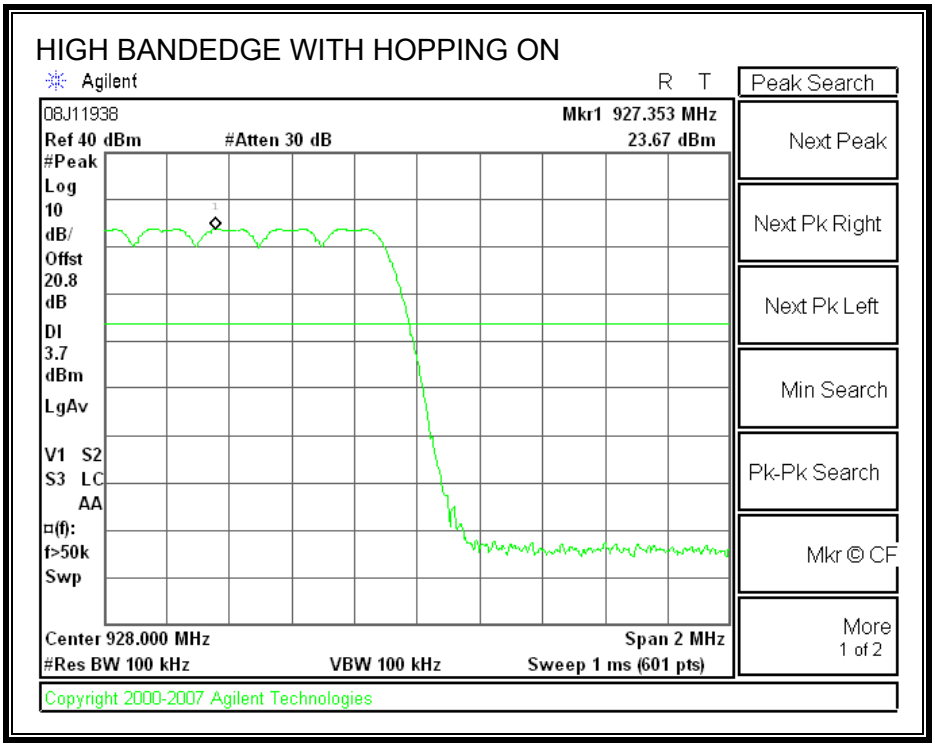


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



8. RADIATED EMISSION TEST RESULTS

8.1. TX RADIATED SPURIOUS EMISSION

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

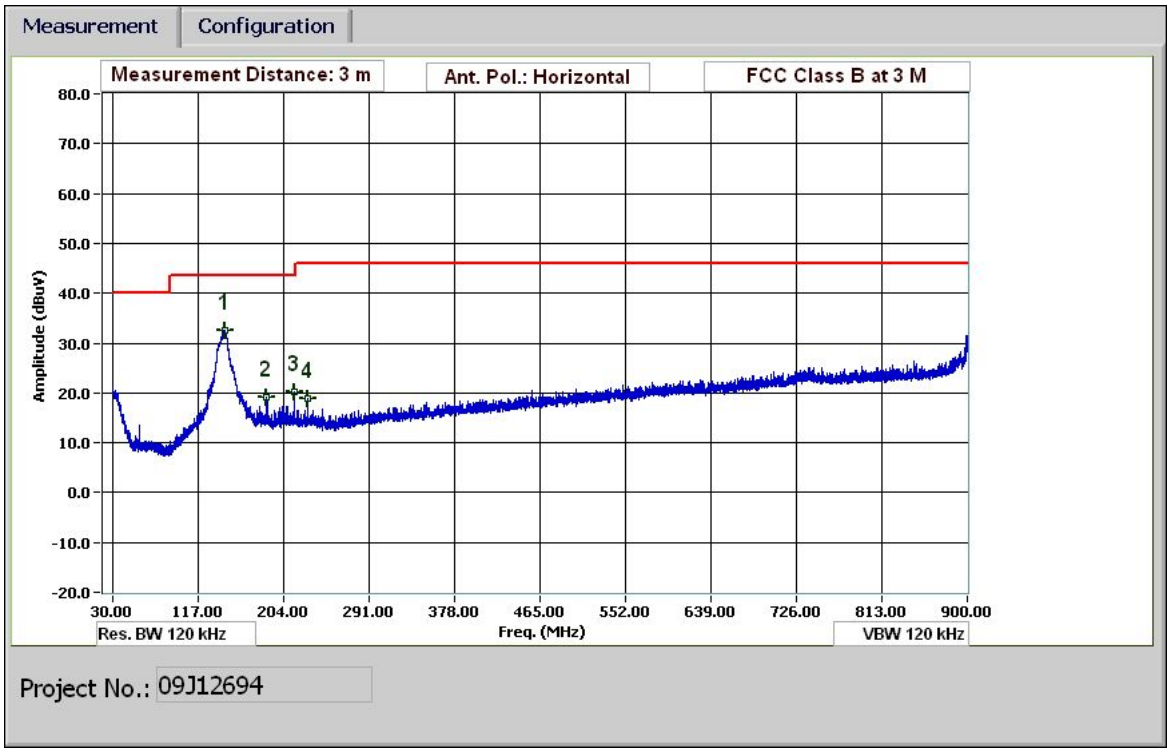
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

RESULTS

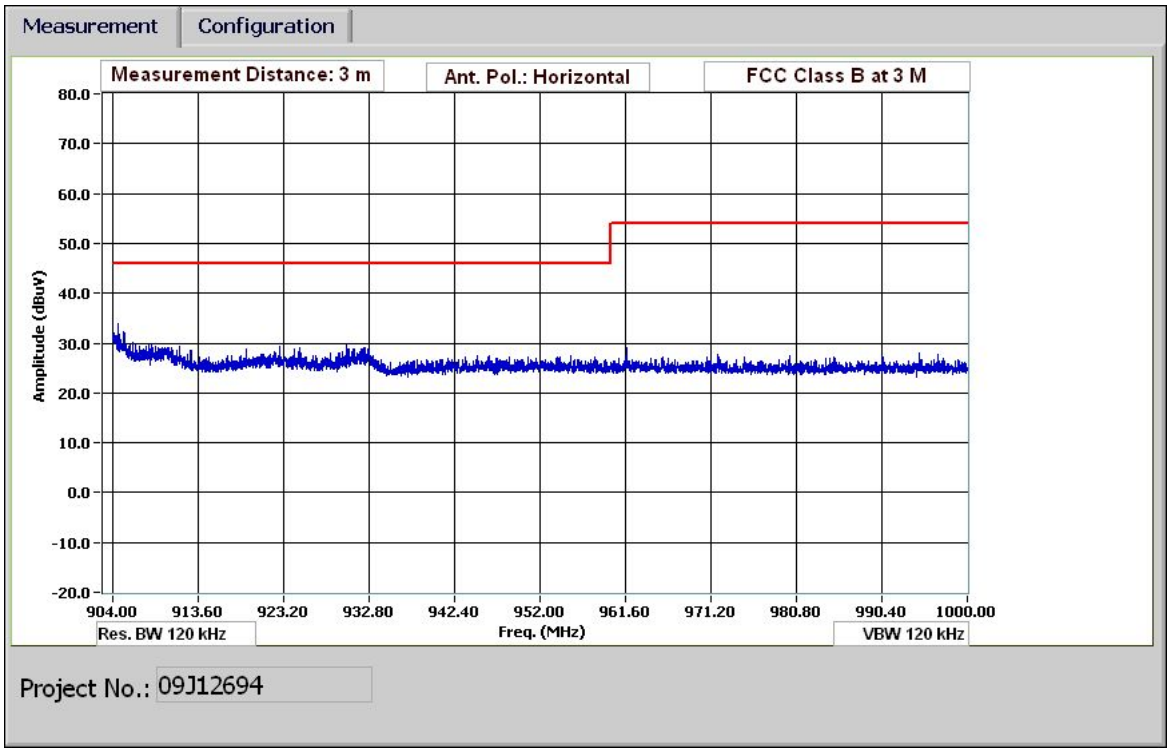
No non-compliance noted:

EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)

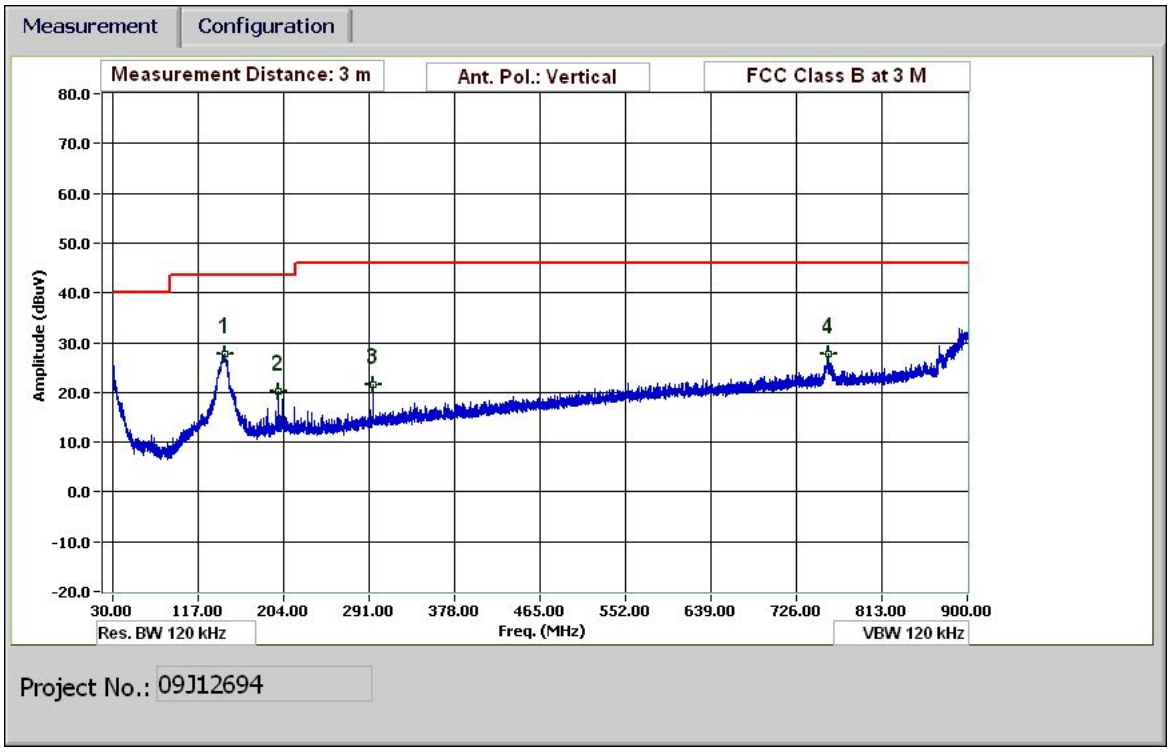
HORIZONTAL PLOT 30-900 MHz



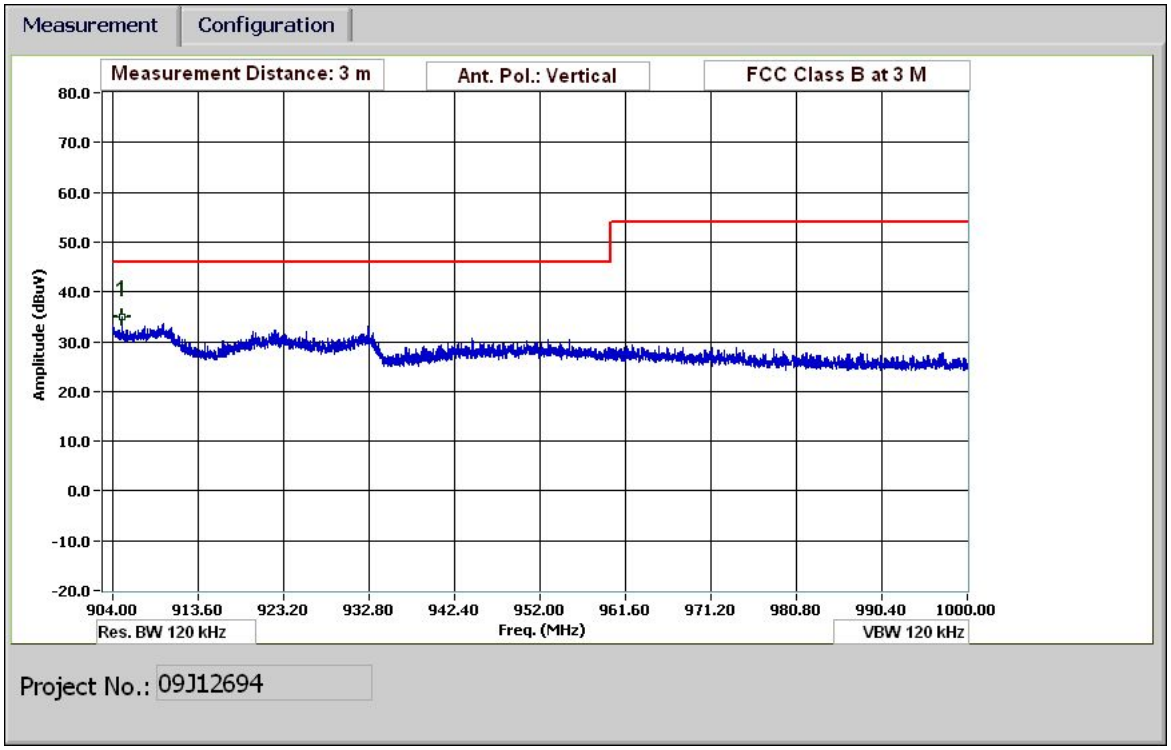
HORZONTAL PLOT 904-1000 MHz



VERTICAL PLOT 30-900 MHz



VERTICAL PLOT 904-1000MHz



HORIZONTAL AND VERTICAL DATA

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Mengistu Mekuria
Date: 07/29/09
Project #: 09J12694
Company: Topcon Positioning Systems
EUT Description: GNSS Receiver
EUT M/N: HyperII/FH
Test Target: FCC PART C
Mode Oper: TX Mode

f	Measurement Frequency	Amp	Preamp Gain	Margin	Margin vs. Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		
Read	Analyzer Reading	Filter	Filter Insert Loss		
AF	Antenna Factor	Corr.	Calculated Field Strength		
CL	Cable Loss	Limit	Field Strength Limit		

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filter dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
144.091	3.0	41.8	13.0	1.1	28.3	0.0	0.0	27.6	43.5	-15.9	V	P	
198.984	3.0	35.2	11.9	1.2	28.2	0.0	0.0	20.1	43.5	-23.4	V	P	
294.886	3.0	34.8	13.2	1.5	28.1	0.0	0.0	21.4	46.0	-24.6	V	P	
758.247	3.0	32.1	20.4	2.6	27.3	0.0	0.0	27.7	46.0	-18.3	V	P	
905.057	3.0	38.0	21.9	2.8	27.8	0.0	0.0	34.9	46.0	-11.1	V	P	
143.876	3.0	46.8	13.0	1.1	28.3	0.0	0.0	32.6	43.5	-10.9	H	P	
186.176	3.0	34.9	11.3	1.2	28.2	0.0	0.0	19.1	43.5	-24.4	H	P	
214.806	3.0	35.3	11.9	1.3	28.2	0.0	0.0	20.3	43.5	-23.2	H	P	
229.122	3.0	33.9	11.9	1.3	28.2	0.0	0.0	18.9	46.0	-27.1	H	P	

Rev. 1.27.09
Note: No other emissions were detected above the system noise floor.

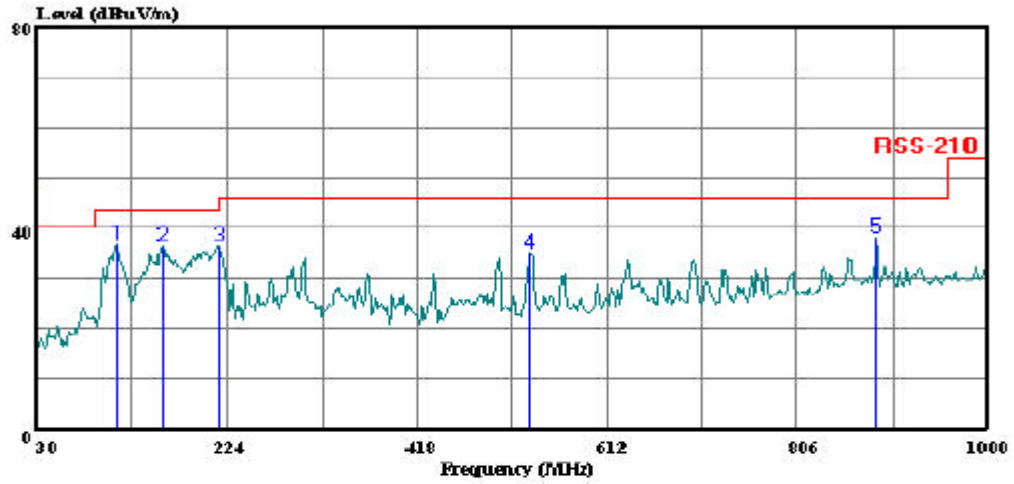
8.2. RECEIVER WORST-CASE BELOW 1 GHz

EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 22 File#: 08J11938.EMI



Trace: 21 Ref Trace:

Condition: RSS-210 HORIZONTAL
Test Operator:: Vien Tran
Project #: : 09J12964
Company: : Topcon
Configuration:: EUT with laptop
Mode : : Rx Worst case
Target: : FCC Class B (RSS-210)

Page: 1

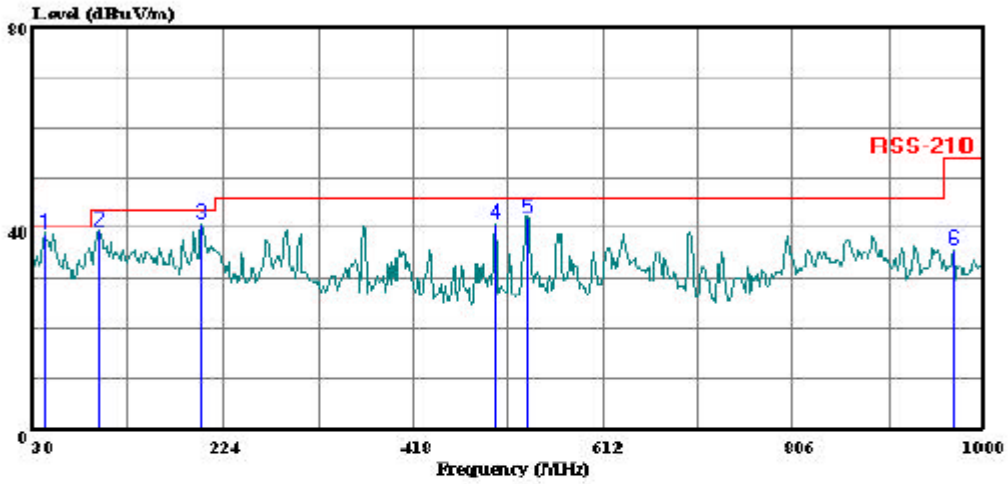
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	111.480	54.36	-17.70	36.66	43.50	-6.84	Peak
2	158.040	54.13	-17.74	36.39	43.50	-7.11	Peak
3	216.240	52.80	-16.39	36.41	46.00	-9.59	Peak
4	533.430	43.02	-8.12	34.90	46.00	-11.10	Peak
5	887.480	39.66	-1.55	38.11	46.00	-7.89	Peak

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 24 File#: 08J11938.EMI



Trace: 23 Ref Trace:

Condition: RSS-210 VERTICAL
Test Operator:: Vien Tran
Project #: : 09J12964
Company: : Topcon
Configuration:: EUT with laptop
Mode : : Rx Worst case
Target: : FCC Class B (RSS-210)

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	42.610	58.69	-19.95	38.73	40.00	-1.27	Peak
2	96.930	60.17	-20.67	39.50	43.50	-4.00	Peak
3	201.690	57.30	-16.39	40.91	43.50	-2.59	Peak
4	502.390	49.51	-8.73	40.78	46.00	-5.22	Peak
5	535.370	50.18	-8.18	41.99	46.00	-4.01	Peak
6	969.930	35.31	0.32	35.63	54.00	-18.37	Peak

8.3. TRANSMITTER ABOVE 1GHz

HARMONICS AND SPURIOUS EMISSIONS (HIGH POWER @ 1 W)

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: TOPCON POSITIONING SYSTEMS
Project #: 09J12694
Date: 7/29/2009
Test Engineer: MENGISTU MEKURIA
Configuration: EUT ALONNE
Mode: TX MODE LOW AND HIGH CHANNELS

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931			FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_1.5GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch. (902.2 MHz)															
2.707	3.0	44.6	35.7	29.1	4.1	-37.4	0.0	0.6	41.0	32.0	74	54	-33.0	-22.0	H
4.511	3.0	41.4	31.6	32.7	5.6	-36.5	0.0	0.6	43.8	33.9	74	54	-30.2	-20.1	H
2.707	3.0	46.3	40.0	29.1	4.1	-37.4	0.0	0.6	42.6	36.4	74	54	-31.4	-17.6	V
4.511	3.0	41.9	33.0	32.7	5.6	-36.5	0.0	0.6	44.3	35.4	74	54	-29.7	-18.6	V
5.413	3.0	38.9	27.1	33.8	6.2	-36.3	0.0	0.5	43.1	31.4	74	54	-30.9	-22.6	V
Hi Ch. (927.6 MHz)															
2.783	3.0	42.7	32.4	29.4	4.2	-37.4	0.0	0.6	39.4	29.1	74	54	-34.6	-24.9	H
3.710	3.0	40.4	29.1	31.6	4.9	-36.8	0.0	0.6	40.7	29.3	74	54	-33.3	-24.7	H
4.638	3.0	41.2	32.2	32.9	5.7	-36.5	0.0	0.6	43.8	34.8	74	54	-30.2	-19.2	H
8.348	3.0	39.2	26.5	36.6	7.8	-36.4	0.0	0.7	48.0	35.3	74	54	-26.0	-18.7	H
2.783	3.0	44.6	37.7	29.4	4.2	-37.4	0.0	0.6	41.3	34.4	74	54	-32.7	-19.6	V
3.710	3.0	41.4	31.0	31.6	4.9	-36.8	0.0	0.6	41.7	31.3	74	54	-32.3	-22.7	V
4.638	3.0	43.4	37.0	32.9	5.7	-36.5	0.0	0.6	46.0	39.6	74	54	-28.0	-14.4	V
8.348	3.0	41.1	32.9	36.6	7.8	-36.4	0.0	0.7	49.9	41.7	74	54	-24.1	-12.3	V

Rev. 11.10.08

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: TOPCON POSITIONING SYSTEMS
Project #: 09J12694
Date: 7/28/2009
Test Engineer: MENGISTU MEKURIA
Configuration: EUT ALONNE
Mode: TX MODE MID CHANNEL

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T59; S/N: 3245 @3m	T145 Agilent 3008A005(			FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_1.5GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Mid Ch. (915.0 MHz)															H
2.745	3.0	45.2	35.9	29.3	4.1	-35.2	0.0	0.6	44.0	34.7	74	54	-30.0	-19.3	H
3.660	3.0	40.9	27.8	31.4	4.9	-34.9	0.0	0.6	42.9	29.7	74	54	-31.1	-24.3	H
4.575	3.0	42.0	33.6	32.6	5.6	-34.8	0.0	0.6	46.0	37.5	74	54	-28.0	-16.5	H
8.235	3.0	38.7	27.3	36.3	7.8	-34.6	0.0	0.7	48.9	37.4	74	54	-25.1	-16.6	H
2.745	3.0	47.2	42.5	29.3	4.1	-35.2	0.0	0.6	46.0	41.2	74	54	-28.0	-12.8	V
3.660	3.0	47.0	28.4	31.4	4.9	-34.9	0.0	0.6	48.9	30.3	74	54	-25.1	-23.7	V
4.575	3.0	41.7	33.0	32.6	5.6	-34.8	0.0	0.6	45.6	37.0	74	54	-28.4	-17.0	V
8.235	3.0	40.8	33.2	36.3	7.8	-34.6	0.0	0.7	51.0	43.3	74	54	-23.0	-10.7	V

Rev. 11.10.08

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

HARMONICS AND SPURIOUS EMISSIONS (HIGH POWER @ 250 mW)

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: TOPCON
Project #: 09J12694
Test Engineer: Chin Pang
Configuration: EUT 2 and Laptop
Mode: TX (low power at 250mw)

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T120; S/N: 29310 @3m	T34 HP 8449B			FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
	Thanh 187215003	C-5m Chamber	HPF_1.5GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch, 902.20 MHz															
2.707	3.0	56.2	53.4	30.9	2.1	-36.1	0.0	0.6	53.6	50.8	74	54	-20.4	-3.2	V
3.609	3.0	47.6	36.8	31.4	2.3	-35.3	0.0	0.6	46.6	35.8	74	54	-27.4	-18.2	V
4.511	3.0	44.0	32.0	32.0	2.5	-34.9	0.0	0.6	44.2	32.2	74	54	-29.8	-21.8	V
5.413	3.0	45.3	34.0	32.7	3.1	-34.7	0.0	0.5	46.9	35.6	74	54	-27.1	-18.4	V
2.707	3.0	54.6	51.8	30.9	2.1	-36.1	0.0	0.6	52.0	49.2	74	54	-22.0	-4.8	H
3.609	3.0	53.2	51.6	31.4	2.3	-35.3	0.0	0.6	52.1	50.6	74	54	-21.9	-3.4	H
4.511	3.0	44.4	33.6	32.0	2.5	-34.9	0.0	0.6	44.6	33.8	74	54	-29.4	-20.2	H
5.413	3.0	45.6	35.5	32.7	3.1	-34.7	0.0	0.5	47.2	37.1	74	54	-26.8	-16.9	H
Mid Ch, 915MHz															
2.745	3.0	56.0	53.4	30.9	2.1	-36.1	0.0	0.6	53.5	50.9	74	54	-20.5	-3.1	V
3.660	3.0	47.3	38.4	31.4	2.3	-35.3	0.0	0.6	46.3	37.4	74	54	-27.7	-16.6	V
4.575	3.0	45.0	32.0	32.1	2.5	-34.9	0.0	0.6	45.3	32.3	74	54	-28.7	-21.7	V
2.745	3.0	53.2	50.5	30.9	2.1	-36.1	0.0	0.6	50.7	48.0	74	54	-23.3	-6.0	H
3.660	3.0	49.5	42.7	31.4	2.3	-35.3	0.0	0.6	48.5	41.7	74	54	-25.5	-12.3	H
4.575	3.0	46.3	38.0	32.1	2.5	-34.9	0.0	0.6	46.6	38.3	74	54	-27.4	-15.7	H
HighCh, 927.6MHz															
2.783	3.0	54.0	50.3	31.0	2.1	-36.1	0.0	0.6	51.6	47.9	74	54	-22.4	-6.1	V
3.710	3.0	49.0	43.8	31.5	2.3	-35.2	0.0	0.6	48.1	42.9	74	54	-25.9	-11.1	V
4.638	3.0	47.0	39.4	32.1	2.5	-34.9	0.0	0.6	47.3	39.7	74	54	-26.7	-14.3	V
2.783	3.0	53.8	50.0	31.0	2.1	-36.1	0.0	0.6	51.4	47.6	74	54	-22.6	-6.4	H
3.710	3.0	48.0	41.6	31.5	2.3	-35.2	0.0	0.6	47.1	40.7	74	54	-26.9	-13.3	H
4.638	3.0	46.7	39.2	32.1	2.5	-34.9	0.0	0.6	47.0	39.5	74	54	-27.0	-14.5	H

Rev. 4.12.7

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

8.4. RECEIVER ABOVE 1 GHz (WORST CASE)

Note: No emissions detected above the system noise floor.

9. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207 (a)
IC RSS-GEN, Section 7.2.2

Frequency of emission (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50
* Decreases with the logarithm of the frequency.		

TEST PROCEDURE

ANSI C63.4

RESULTS

No non-compliance noted:

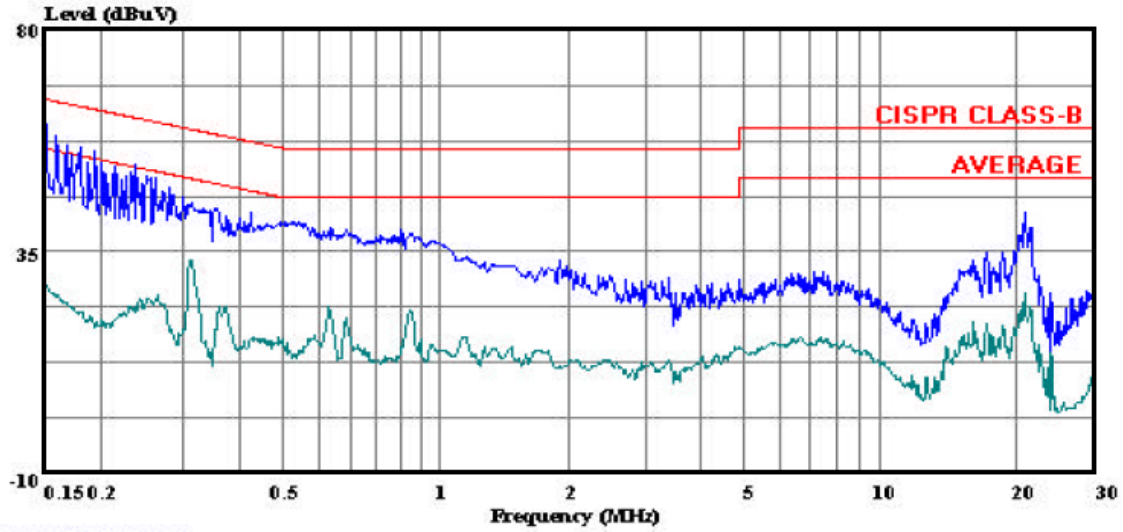
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.15	60.91	--	28.30	0.00	65.89	55.89	-4.98	-27.59	L1
0.16	58.48	--	26.41	0.00	65.52	55.52	-7.04	-29.11	L1
0.18	56.19	--	22.91	0.00	64.49	54.49	-8.30	-31.58	L1
0.18	57.31	--	26.84	0.00	64.63	54.63	-7.32	-27.79	L2
0.35	49.12	--	26.58	0.00	58.87	48.87	-9.75	-22.29	L2
0.51	44.59	--	21.59	0.00	56.00	46.00	-11.41	-24.41	L2
6 Worst Data									

LINE 1 RESULTS

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 21 File#: 09J12694 LC.EMI Date: 07-30-2009 Time: 19:10:35



(Line Conduction)

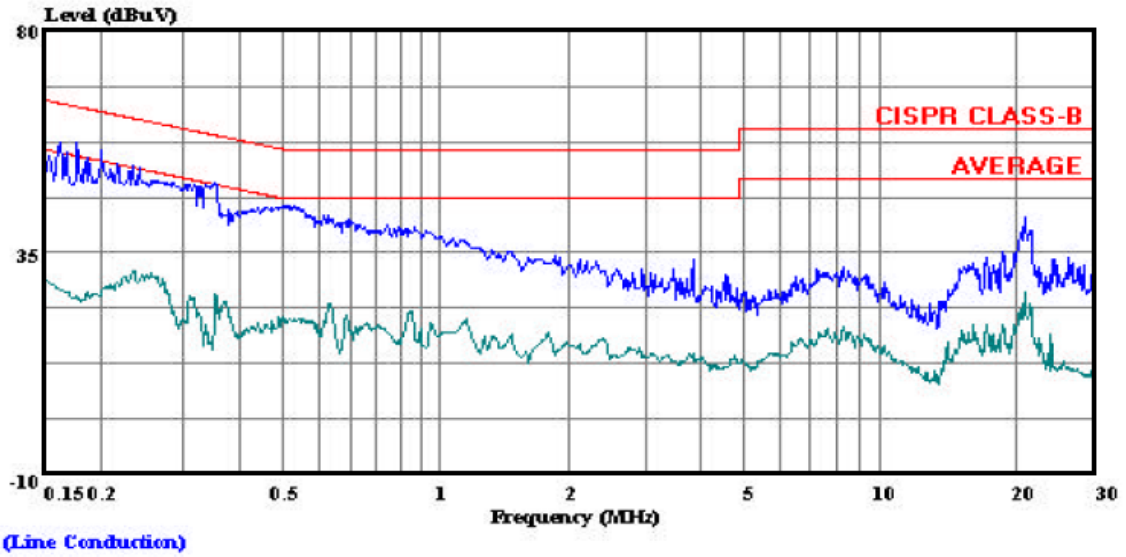
Trace: 19 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Mengistu Mekuria
Project #: : 09J12694
Company: : Topcon Positioning Systems
EUT Description:: GNSS Receiver
Mode: : Tx Mode
Target: : FCC Class B
Voltage: : 115VAC/60Hz
: L1: Peak (Blue) , Average (Green)

LINE 2 RESULTS

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 7 File#: 09J12694 LC.EMI Date: 07-30-2009 Time: 18:01:29



(Line Conduction)

Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Mengistu Mekuria
Project #: : 09J12694
Company: : Topcon Positioning Systems
EUT Description:: GNSS Receiver
Mode: : Tx Mode
Target: : FCC Class B
Voltage: : 115VAC/60Hz
: L2: Peak (Blue) , Average (Green)

10. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

Table 5
Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m^2)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	$280/f$	$2.19/f$		6
10–30	28	$2.19/f$		6
30–300	28	0.073	2*	6
300–1 500	$1.585f^{0.5}$	$0.0042f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616\,000/f^{1.2}$
150 000–300 000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616\,000/f^{1.2}$

* Power density limit is applicable at frequencies greater than 100 MHz.

Notes: 1. Frequency, f, is in MHz.
2. A power density of 10 W/m^2 is equivalent to 1 mW/cm^2.
3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

CALCULATIONS

Given

$E = \sqrt{(30 * P * G)} / d$

and

$S = E ^ 2 / 3770$

where

E = Field Strength in Volts/meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power Density in milliwatts/square centimeter

Combining equations, rearranging the terms to express the distance as a function of the remaining variables, changing to units of Power to mW and Distance to cm, and substituting the logarithmic form of power and gain yields:

$d = 0.282 * 10 ^ ((P + G) / 20) / \sqrt{S}$

where

d = MPE distance in cm
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW/cm^2

Rearranging terms to calculate the power density at a specific distance yields

$S = 0.0795 * 10 ^ ((P + G) / 10) / (d^2)$

The power density in units of mW/cm^2 is converted to units of W/m^2 by multiplying by a factor of 10.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm^2

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m^2

RESULTS

Mode	Band	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	FCC Power Density (mW/cm^2)	IC Power Density (W/m^2)
FHSS	915MHz	20.0	29.70	2.40	0.32	3.22

CO-LOCATED MPE CALCULATIONS

For multiple colocated transmitters operating simultaneously the total power density can be calculated by summing the Power * Gain product (in linear units) of each transmitter.

yields

$$d = 0.282 * \sqrt{((P1 * G1) + (P2 * G2) + ... + (Pn * Pn)) / S)}$$

where

d = distance in cm
Px = Power of transmitter x in mW
Gx = Numeric gain of antenna x
S = Power Density in mW/cm^2

In the table below, Power and Gain are entered in units of dBm and dBi respectively, then converted to their linear forms for the purpose of the calculations.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm^2

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m^2

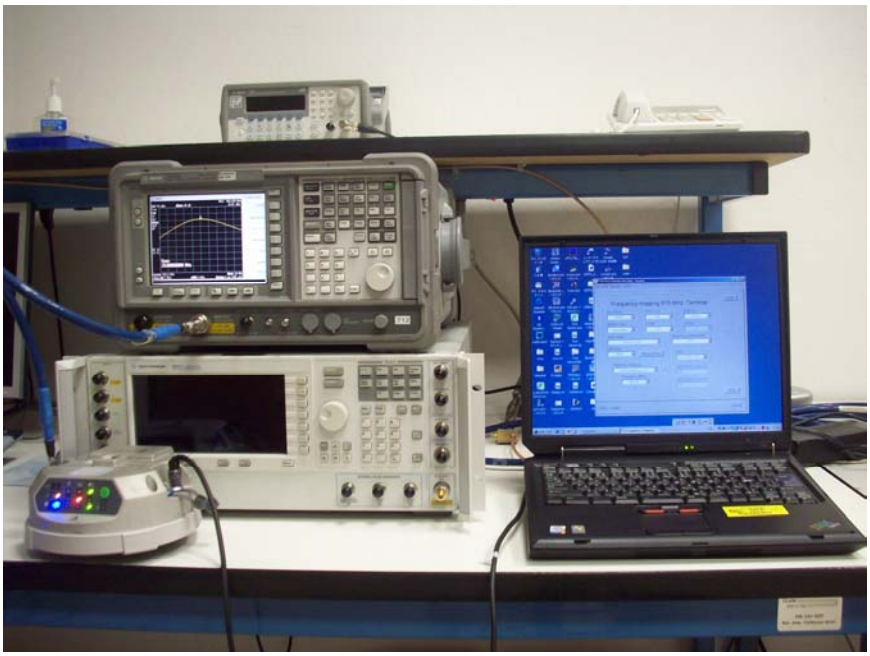
RESULTS

Mode	Band	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)	FCC Power Density (mW/cm^2)	IC Power Density (W/m^2)
Bluetooth	2.4 GHz	11.50	2.14			
FHSS	915MHz	29.70	2.40			
Combined				20.0	0.33	3.27

11. SETUP PHOTOS

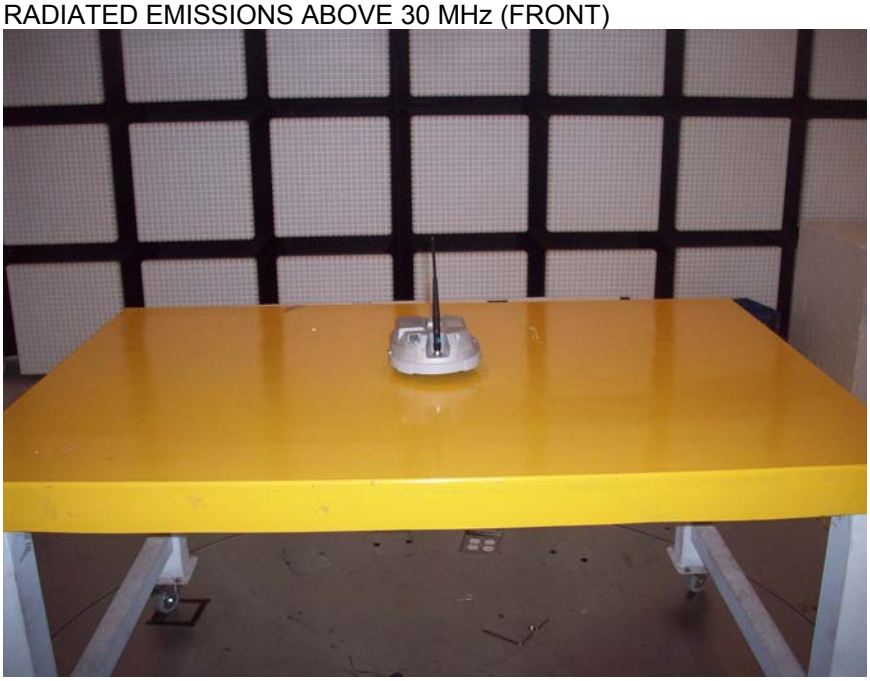
ANTENNA PORT

ANTENNA PORT

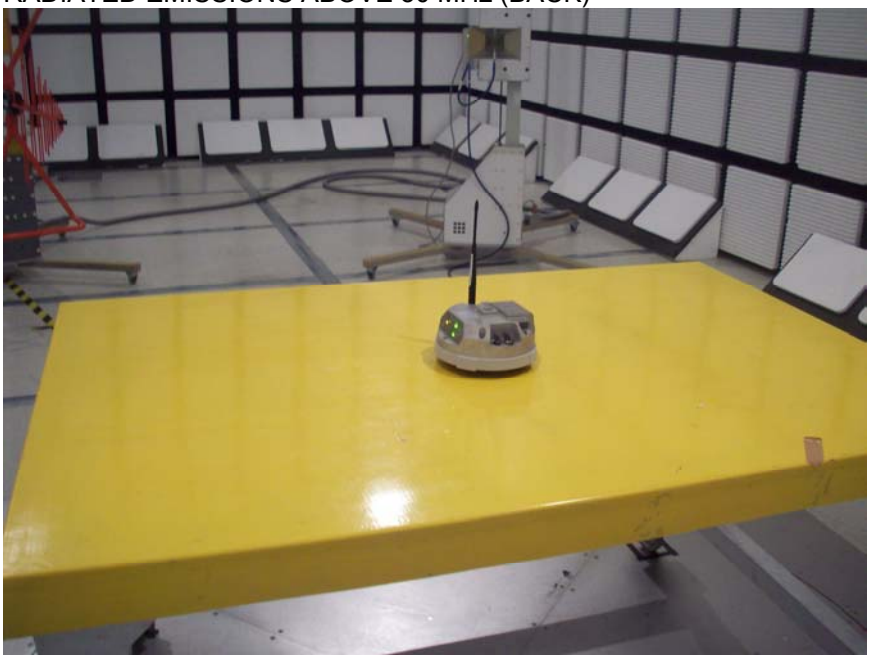


RADIATED EMISSION ABOVE 30 MHz

RADIATED EMISSIONS ABOVE 30 MHz (FRONT)



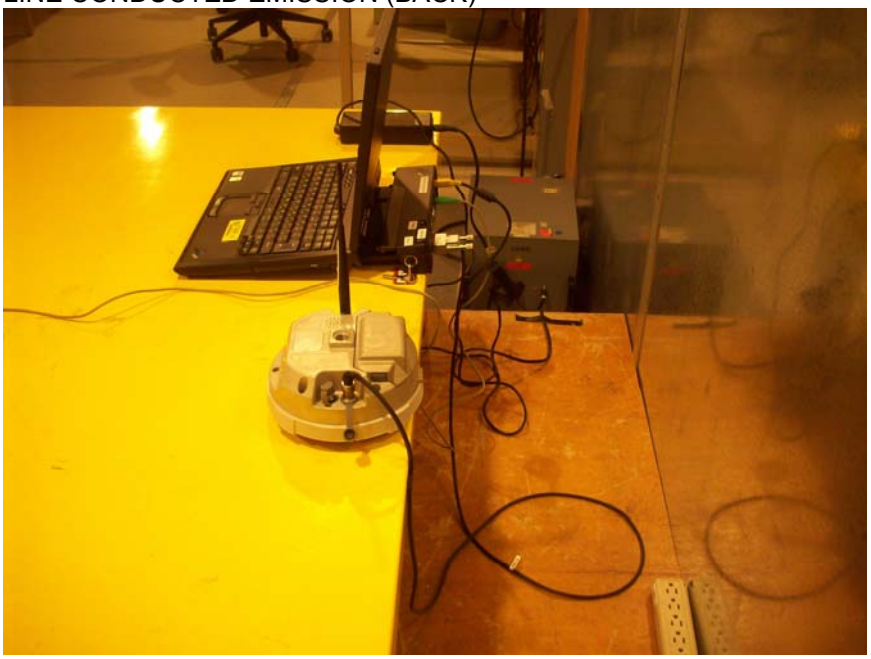
RADIATED EMISSIONS ABOVE 30 MHz (BACK)



AC MAINS LINE CONDUCTED EMISSION

LINE CONDUCTED EMISSION (FRONT)

LINE CONDUCTED EMISSION (BACK)



END OF REPORT