

TEST REPORT

ACCORDING TO: FCC 47 CFR PART 15 subpart C, section 15.249

FOR:

Aplica Technologies Ltd.
RF Sensor Module
Model number: 500-09898A

This report is in conformity with ISO/ IEC 17025. The "A2LA Accredited" symbol endorsement applies only to the tests and calibrations that are listed in the scope of Hermon Laboratories accreditation. The test results relate only to the items tested. This test report shall not be reproduced in any form except in full with the written approval of Hermon Laboratories Ltd.

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1 Applicant information

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Fax: +972 3924 9394
E-mail: shayb@aplicatech.com
Contact name: Mr. Shay Ben Harush

2 Equipment under test attributes

Product name: RF sensor module
Product type: Transceiver
Model number: 500-09898A
Serial number: 2
Hardware version: V0
Receipt date: 10/13/2010

3 Manufacturer information

Manufacturer name: Aplica Technologies Ltd.
Address: P.O.Box 7291, Petach-Tikva 49170, Israel
Telephone: +972 3924 9393
Fax: +972 3924 9394
E-Mail: shayb@aplicatech.com
Contact name: Mr. Shay Ben Harush




4 Test details

Project ID: 20520
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 10/13/2010
Test completed: 1/02/2011
Test specification(s): FCC 47 CFR Part 15, subpart C, §15.249

5 Tests summary

Test	Status
Transmitter characteristics	
Section 15.249(a)(d), Field strength of emissions	Pass
Section 15.249(d), Band edge emissions	Pass
Section 15.207(a), Conducted emission	Pass
Section 15.203, Antenna requirement	Pass
Section 15.215(c), Occupied bandwidth	Pass

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.
The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

	Name and Title	Date	Signature
Tested by:	Mr. S. Samokha, test engineer	January 2, 2011	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	January 10, 2011	
Approved by:	Mr. M. Nikishin, EMC and radio group manager	January 11, 2011	

6 EUT description

6.1 General information

The EUT is an RF Sensor Module constructed of a SoC (System of Chip), including a microcontroller and an RF transceiver operating in 2.4 – 2.48 GHz ISM band. The EUT has an integral antenna printed on the PCB and is powered from 3.3 – 12 VDC.

6.2 Ports and lines

Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length	Indoor / outdoor
Power	DC power	EUT	Power supply	1	Unshielded	1.2 m	Indoor
Signal	RS-232	EUT	Laptop	1	Unshielded	2.0 m	Indoor
Signal	I/O	EUT	Open circuit	1	Unshielded	0.1 m	Indoor

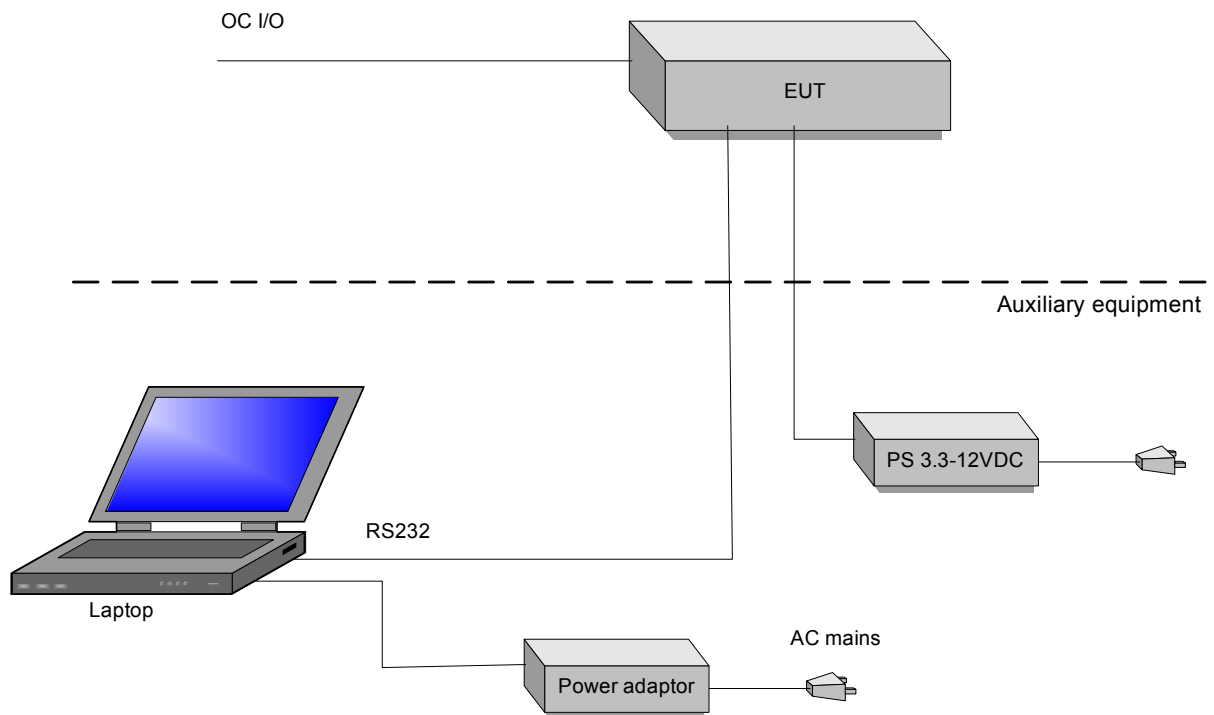
6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
Laptop	DELL	Latitude D-630	5ZYVB3J
AC/DC adaptor	DELL	HA65NS1-00	7AR-C155
Power supply	Any CUS Listed	MS-10US09-A-2	NA

6.4 Changes made in EUT

No changes were performed in the EUT.

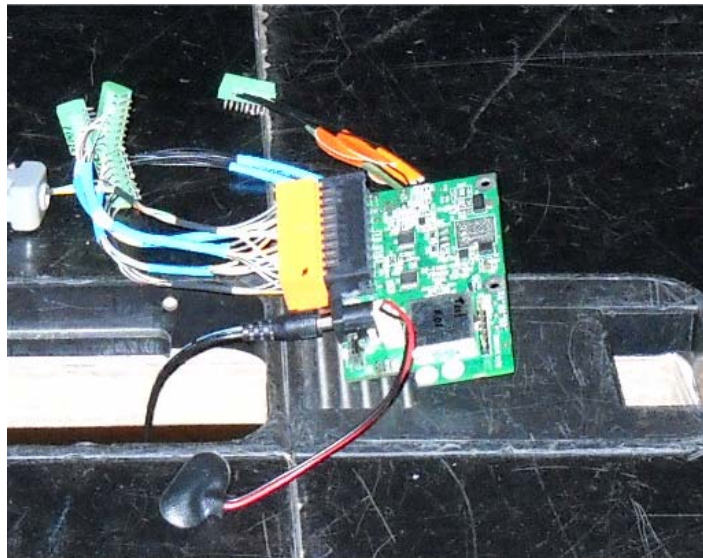
6.5 Test configuration



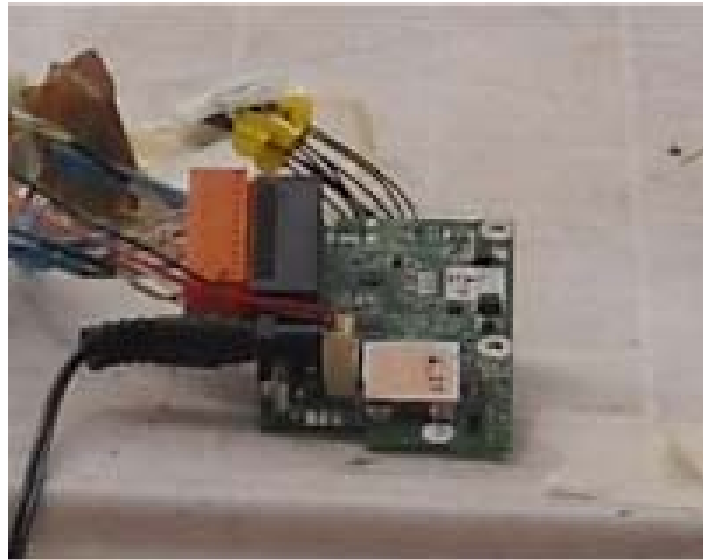
Photograph 6.5.1 EUT X-axis orthogonal position



Photograph 6.5.2 EUT Y-axis orthogonal position



Photograph 6.5.3 EUT Z-axis orthogonal position



6.6 Transmitter characteristics

Type of equipment					
Stand-alone (Equipment with or without its own control provisions)					
V Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)					
Plug-in card (Equipment intended for a variety of host systems)					
Intended use		Condition of use			
Fixed		Always at a distance more than 2 m from all people			
V mobile		Always at a distance more than 20 cm from all people			
portable		May operate at a distance closer than 20 cm to human body			
Assigned frequency range		2400 – 2483.5 MHz			
Operating frequency range		2400.89 – 2479.82 MHz			
RF channel spacing		1 MHz			
Maximum field strength of carrier		91.56 dBµV/m at 3 m distance			
Is transmitter output power variable?		V No		continuous variable	
		Yes		stepped variable with stepsize	
				dB	
				minimum RF power	
				dBm	
				maximum RF power	
				dBm	
Antenna connection					
unique coupling		standard connector		V Integral	
				V with temporary RF connector	
				without temporary RF connector	
Antenna/s technical characteristics					
Type		Manufacturer		Model number	
Integral		Aplica		Printed	
				Gain	
				5.5 dBi	
Transmitter aggregate data rate/s		250 kbps			
Type of modulation		FSK			
Modulating test signal (baseband)		PRBS			
Maximum transmitter duty cycle in normal use		6.5%			
Transmitter duty cycle supplied for test		13.0%		Tx ON time	6.5 ms
				Period	50.0 ms
Transmitter power source					
		Nominal rated voltage		Battery type	
V DC		3.3-12 V			
AC mains		Nominal rated voltage		Frequency	
				Hz	

Test specification:	Section 15.249(a)(d), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	11/08/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

7 Transmitter tests according to 47CFR part 15 subpart C requirements

7.1 Field strength of emissions

7.1.1 General

This test was performed to measure field strength of fundamental and spurious emissions from the EUT. Specification test limits are given in Table 7.1.1, Table 7.1.2 and Table 7.1.3.

Table 7.1.1 Radiated fundamental emission limits

Fundamental frequency, MHz	Field strength at 3 m, dB(μV/m)		
	Peak	Average	Quasi-Peak
2400 – 2483.5	114.0	94.0	NA

Table 7.1.2 Harmonics limits

Fundamental frequency, MHz	Field strength at 3 m, dB(μV/m)	
	Peak	Average
2400 – 2483.5	74.0	54.0

Table 7.1.3 Radiated spurious emissions limits (other than harmonics)

Frequency, MHz	Field strength at 3 m, dB(μV/m)*			
	Peak	Quasi Peak	Average	Attenuation below carrier
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	50 dBc (whichever is the less stringent)
0.090 – 0.110	NA	108.5 – 106.8**	NA	
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**	
0.490 – 1.705	NA	73.8 – 63.0**	NA	
1.705 – 30.0*		69.5		
30 – 88		40.0		
88 – 216		43.5		
216 – 960		46.0		
960 - 1000		54.0		
Above 1000	74.0	NA	54.0	

*- The limit for 3 m test distance was calculated using the inverse square distance extrapolation factor as follows:

$$\text{Lim}_{S_2} = \text{Lim}_{S_1} + 40 \log (S_1/S_2),$$

where S_1 and S_2 – standard defined and test distance respectively in meters.

** - The limit decreases linearly with the logarithm of frequency.

Note: The above field strength limits applied from the lowest radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency but not exceeding 40 GHz for intentional radiators operated below 10 GHz and up to the fifth harmonic of the highest fundamental frequency but not exceeding 100 GHz for intentional radiators operated above 10 GHz.

Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

7.1.2 Test procedure for fundamental field strength measurements

7.1.2.1 The EUT was set up as shown in Figure 7.1.2, energized and the performance check was conducted.

7.1.2.2 The measurements were performed in three EUT orthogonal positions.

7.1.2.3 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

7.1.2.4 The worst test results (the lowest margins) were found in the EUT X-axis orthogonal position, recorded in Table 7.1.4 and shown in the associated plots.

7.1.3 Test procedure for spurious emission field strength measurements in 9 kHz to 30 MHz band

7.1.3.1 The EUT was set up as shown in Figure 7.1.1, energized and the performance check was conducted.

7.1.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360° and the measuring antenna was rotated around its vertical axis.

7.1.3.3 The worst test results (the lowest margins) were recorded in Table 7.1.4 and shown in the associated plots.

7.1.4 Test procedure for spurious emission field strength measurements above 30 MHz

7.1.4.1 The EUT was set up as shown in Figure 7.1.2, energized and the performance check was conducted.

7.1.4.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

7.1.4.3 The worst test results (the lowest margins) were recorded in Table 7.1.4 and shown in the associated plots.

Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

Figure 7.1.1 Setup for spurious emission field strength measurements below 30 MHz

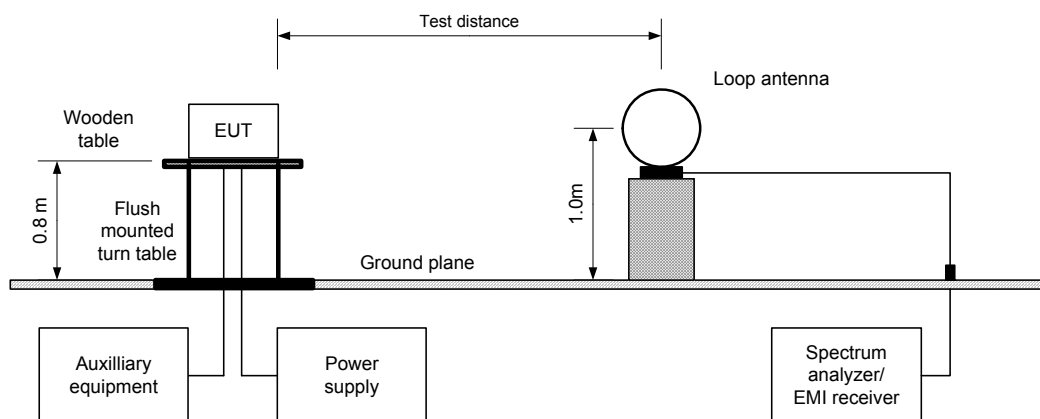
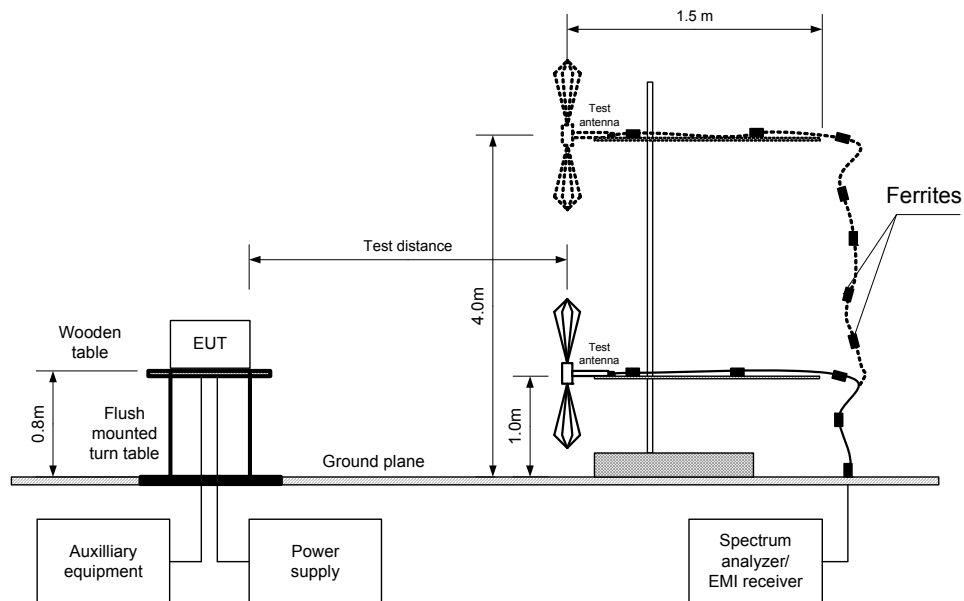


Figure 7.1.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:	Section 15.249(a)(d), Field strength of emissions			
Test procedure:	ANSI C63.4, Section 13.1.4			
Test mode:	Compliance	Verdict:		PASS
Date:	11/08/2010			
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC	
Remarks:				

Table 7.1.4 Field strength of fundamental emission and spurious emissions

TEST DISTANCE: 3 m
EUT POSITION: 3 orthogonal X / Y / Z
MODULATION: MSK
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
INVESTIGATED FREQUENCY RANGE: 0.009 – 25000 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1.0 kHz (9 kHz – 150 kHz)
9.0 kHz (150 kHz – 30 MHz)
120 kHz (30 MHz – 1000 MHz)
1.0 MHz (above 1000 MHz)
VIDEO BANDWIDTH: ≥ Resolution bandwidth
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)

Fundamental emission

F, MHz	Antenna		Azimuth, degrees*	Peak field strength			Avr factor, dB	Average field strength			Verdict
	Pol.	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**		Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
2400.89	H	1.15	15	91.56	114.0	-22.44	-17.89	73.67	94	-20.33	Pass
2439.82	H	1.15	13	90.52	114.0	-23.48	-17.89	72.63	94	-21.37	
2479.82	H	1.15	13	88.16	114.0	-25.84	-17.89	70.27	94	-23.73	

The recorded values were obtained in X-axis orthogonal position

Spurious emissions

F, MHz	Antenna		Azimuth, degrees*	Peak field strength			Average field strength				Verdict
	Pol.	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
Low frequency 2400.89 MHz											
2399.80	V	1.0	100	60.41	74	-13.59	46.40	28.51	54.0	-25.49	Pass
Mid frequency 2439.82 MHz											
No emissions were found											Pass
High frequency 2479.82 MHz											
2483.58	V	1.0	100	64.56	74.0	-9.44	47.55	29.66	54.0	-24.34	Pass

*- EUT front panel refers to 0 degrees position of turntable.

** - Margin = dB below (negative if above) specification limit.

Calculated field strength = Measured field strength + Average factor

Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

Table 7.1.5 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
12.75	100.1	NA	NA	NA	-17.89

*- Average factor was calculated as follows

for pulse train shorter than 100 ms:

$$\text{Average factor} = 20 \times \log_{10} \left(\frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{Burst duration}}{\text{Train duration}} \times \text{Number of bursts within pulse train} \right)$$

for pulse train longer than 100 ms:

$$\text{Average factor} = 20 \times \log_{10} \left(\frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{Burst duration}}{100 \text{ ms}} \times \text{Number of bursts within 100 ms} \right)$$

Reference numbers of test equipment used

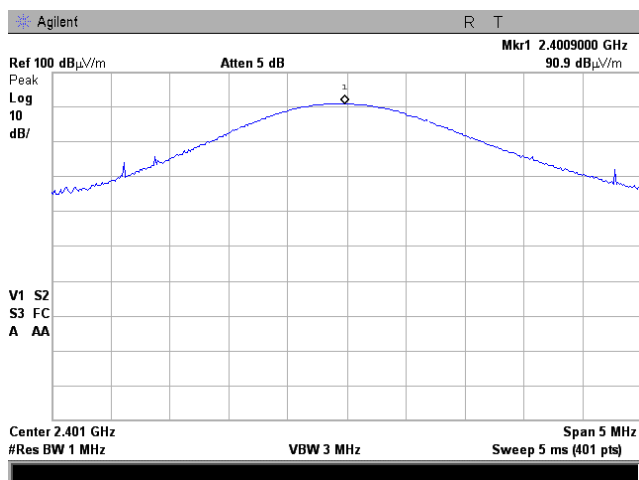
HL 0446	HL 0521	HL 0604	HL 0768	HL 1430	HL 2780	HL 2871	HL 2909
HL 3533	HL 3622	HL 3883	HL 3901				

Full description is given in Appendix A.

Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

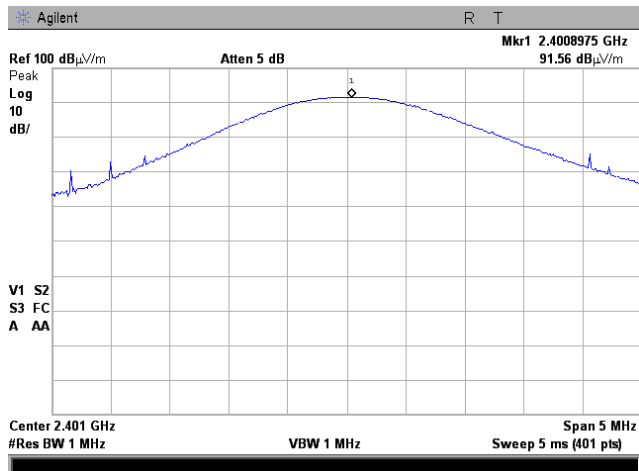
Plot 7.1.1 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: X-axis
INPUT VOLTAGE: Unom = 9 V
FREQUENCY: Fmin=2401 MHz



Plot 7.1.2 Radiated emission measurements at the fundamental frequency

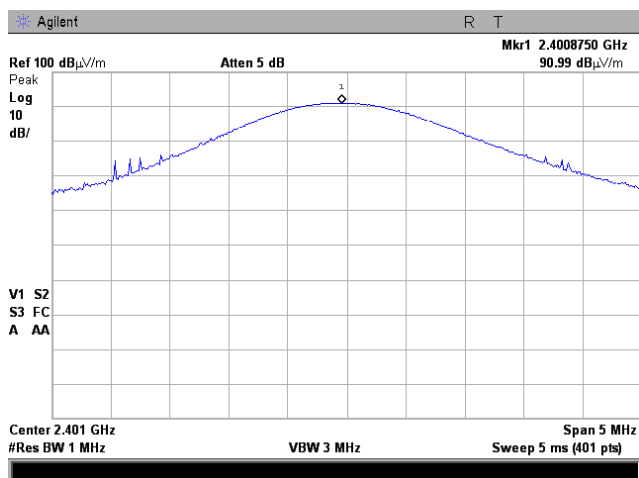
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: X-axis
INPUT VOLTAGE: Unom = 9 V
FREQUENCY: Fmin=2401 MHz



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

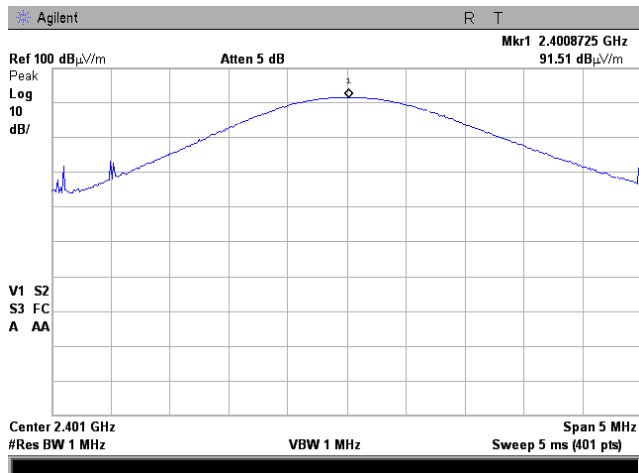
Plot 7.1.3 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: X-axis
INPUT VOLTAGE: Umax = 12 V
FREQUENCY: Fmin=2401 MHz



Plot 7.1.4 Radiated emission measurements at the fundamental frequency

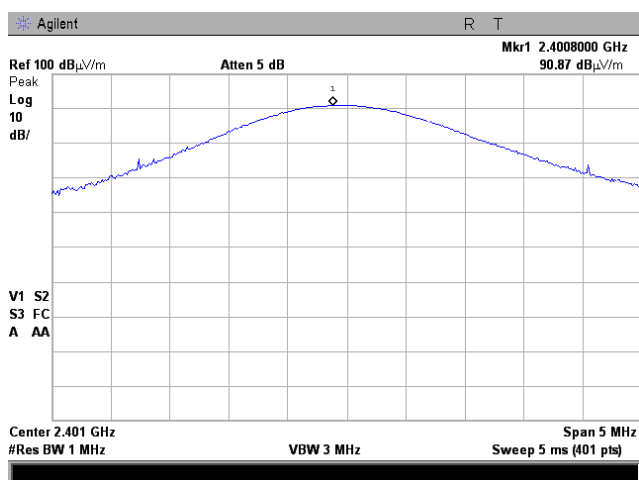
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: X-axis
INPUT VOLTAGE: Umax = 12 V
FREQUENCY: Fmin=2401 MHz



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

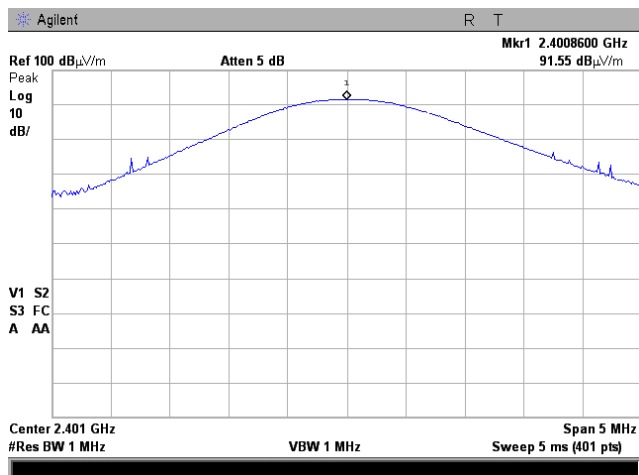
Plot 7.1.5 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: X-axis
INPUT VOLTAGE: Umin = 3.3 V
FREQUENCY: Fmin=2401 MHz



Plot 7.1.6 Radiated emission measurements at the fundamental frequency

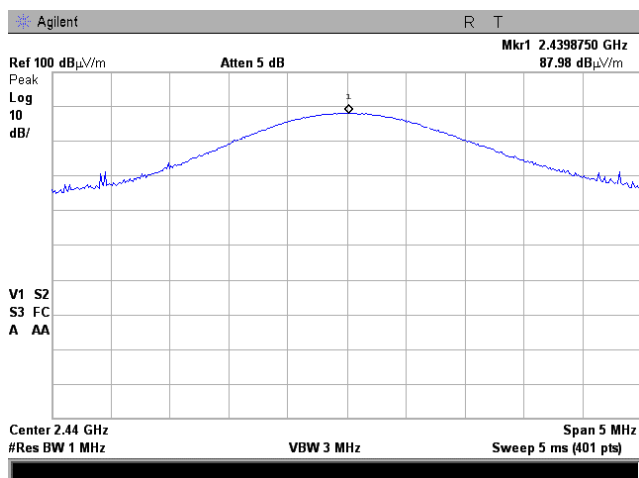
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: X-axis
INPUT VOLTAGE: Umin = 3.3 V
FREQUENCY: Fmin=2401 MHz



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

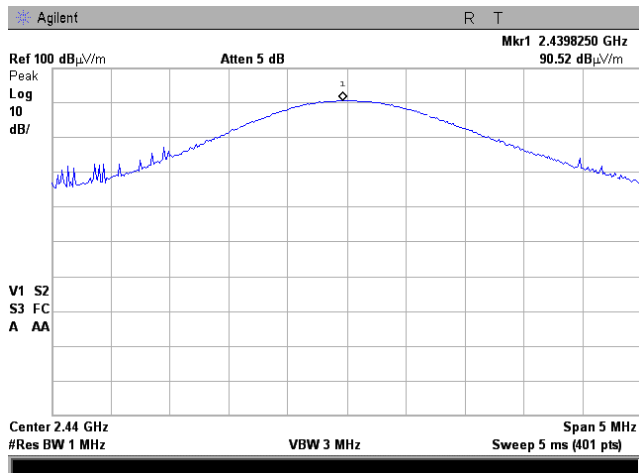
Plot 7.1.7 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: X-axis
INPUT VOLTAGE: Unom = 9 V
FREQUENCY: Fmid=2440 MHz



Plot 7.1.8 Radiated emission measurements at the fundamental frequency

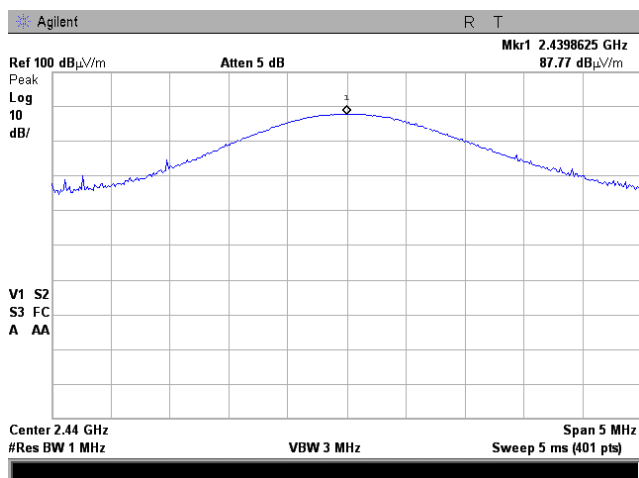
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: X-axis
INPUT VOLTAGE: Unom = 9 V
FREQUENCY: Fmid=2440 MHz



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

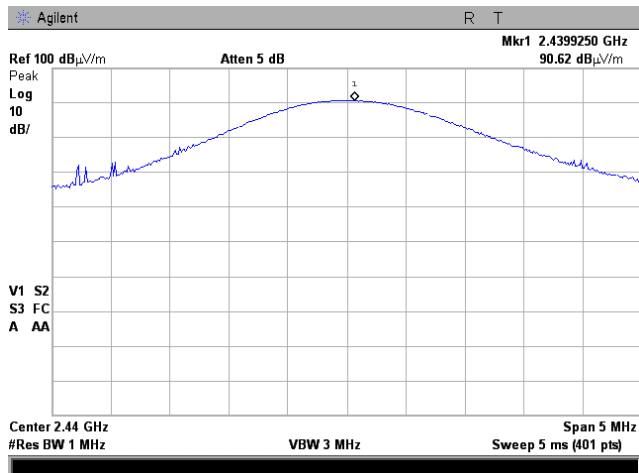
Plot 7.1.9 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: X-axis
INPUT VOLTAGE: Umax = 12 V
FREQUENCY: Fmid=2440 MHz



Plot 7.1.10 Radiated emission measurements at the fundamental frequency

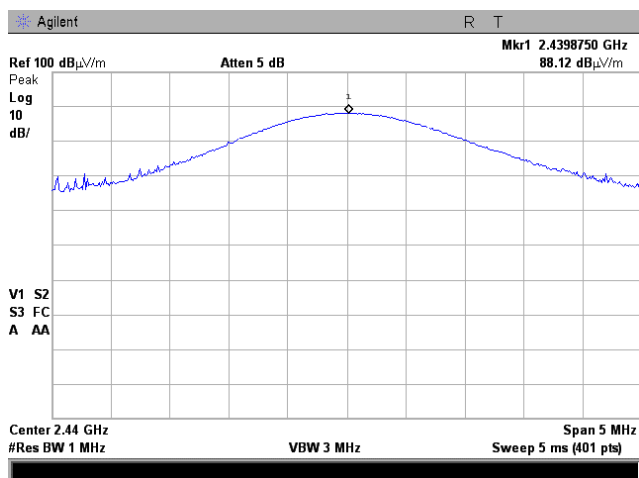
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: X-axis
INPUT VOLTAGE: Umax = 12 V
FREQUENCY: Fmid=2440 MHz



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

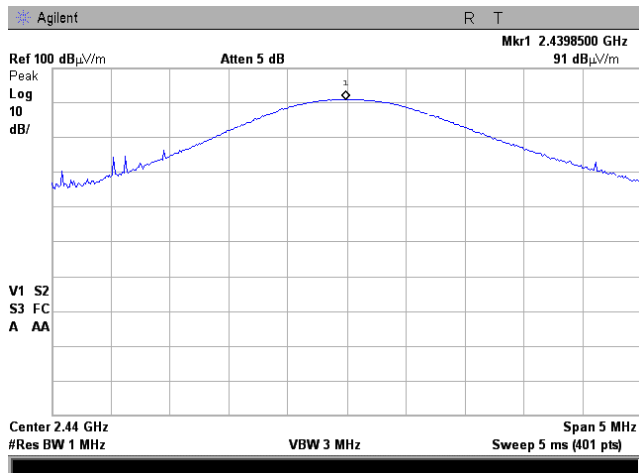
Plot 7.1.11 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: X-axis
INPUT VOLTAGE: Umin = 3.3 V
FREQUENCY: Fmid=2440 MHz



Plot 7.1.12 Radiated emission measurements at the fundamental frequency

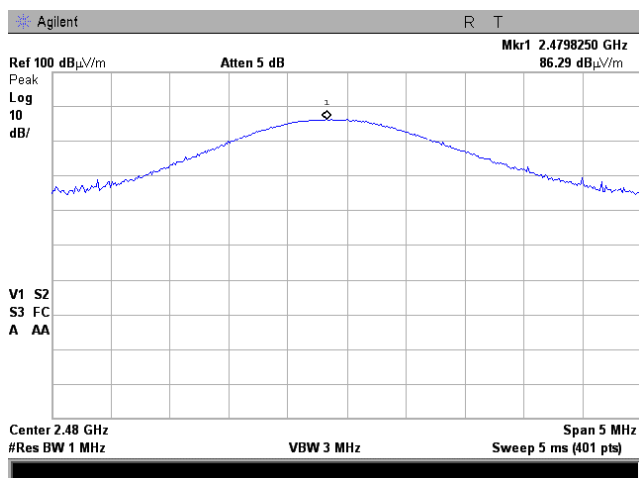
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: X-axis
INPUT VOLTAGE: Umin = 3.3 V
FREQUENCY: Fmid=2440 MHz



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

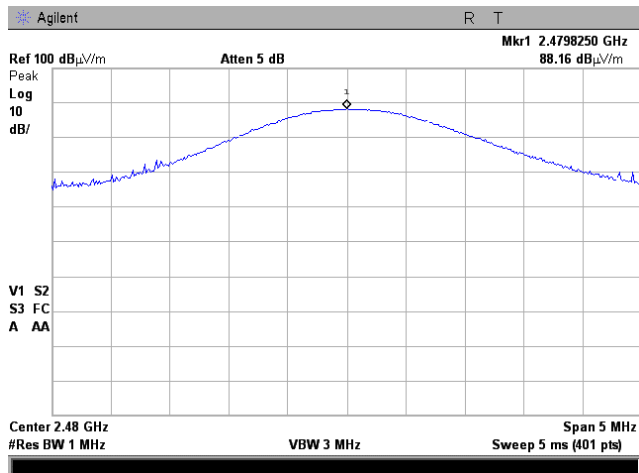
Plot 7.1.13 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: X-axis
INPUT VOLTAGE: Unom = 9 V
FREQUENCY: Fmax=2480.0 MHz



Plot 7.1.14 Radiated emission measurements at the fundamental frequency

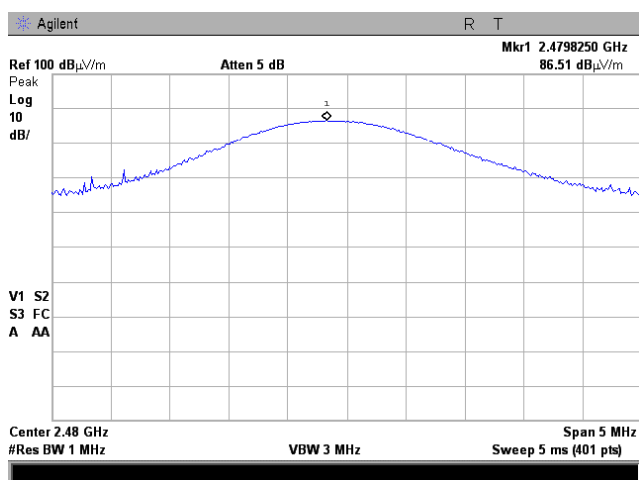
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: X-axis
INPUT VOLTAGE: Unom = 9 V
FREQUENCY: Fmax=2480.0 MHz



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

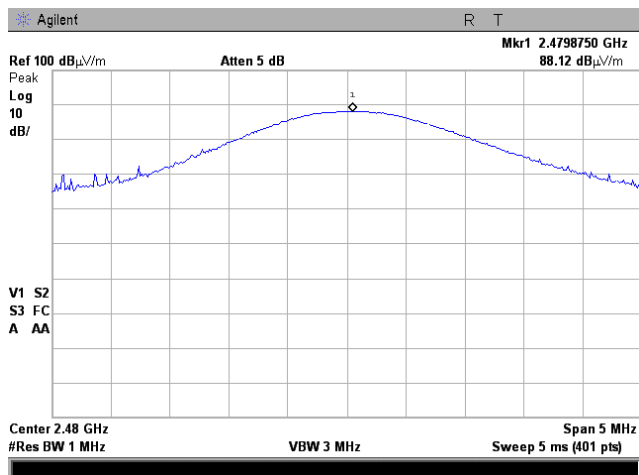
Plot 7.1.15 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: X-axis
INPUT VOLTAGE: Umax = 12 V
FREQUENCY: Fmax=2480.0 MHz



Plot 7.1.16 Radiated emission measurements at the fundamental frequency

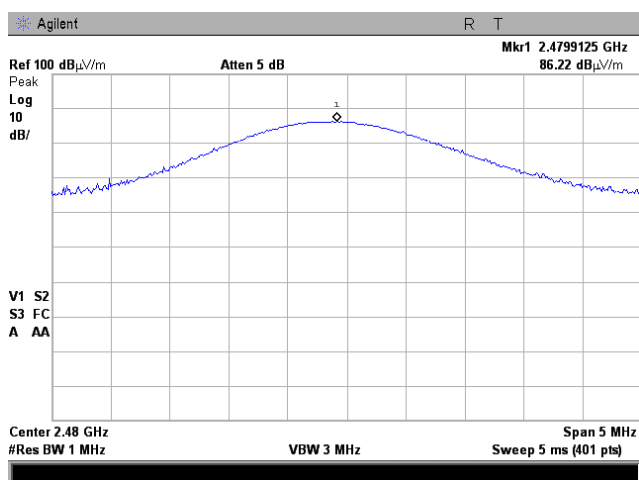
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: X-axis
INPUT VOLTAGE: Umax = 12 V
FREQUENCY: Fmax=2480.0 MHz



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

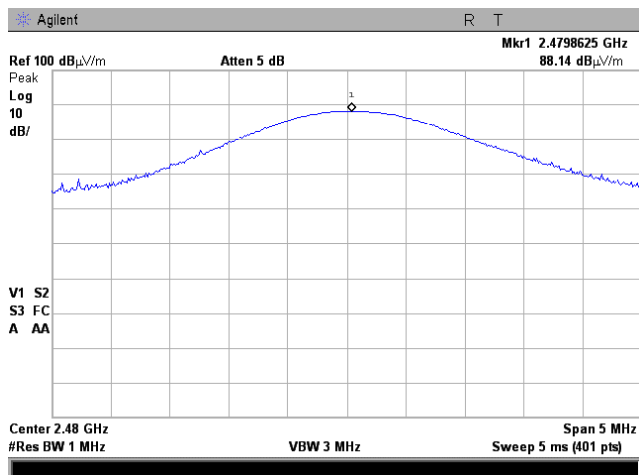
Plot 7.1.17 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: X-axis
INPUT VOLTAGE: Umin = 3.3 V
FREQUENCY: Fmax=2480.0 MHz



Plot 7.1.18 Radiated emission measurements at the fundamental frequency

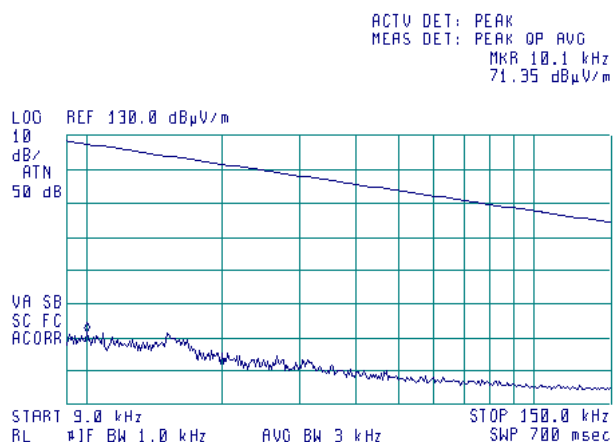
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: X-axis
INPUT VOLTAGE: Umin = 3.3 V
FREQUENCY: Fmax=2480.0 MHz



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

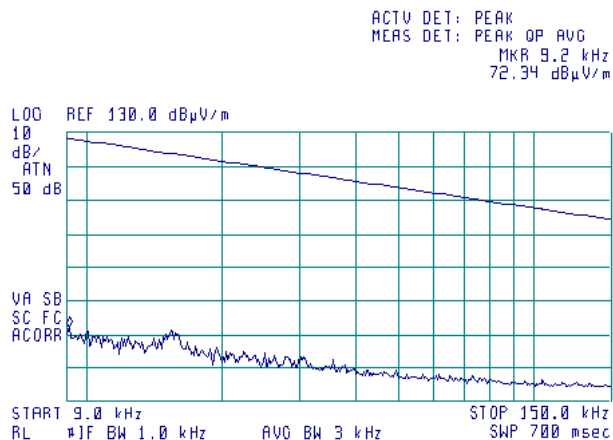
Plot 7.1.19 Radiated emission measurements from 9 to 150 kHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
FREQUENCY F min = 2401 MHz
EUT POSITION: X-axis



Plot 7.1.20 Radiated emission measurements from 9 to 150 kHz

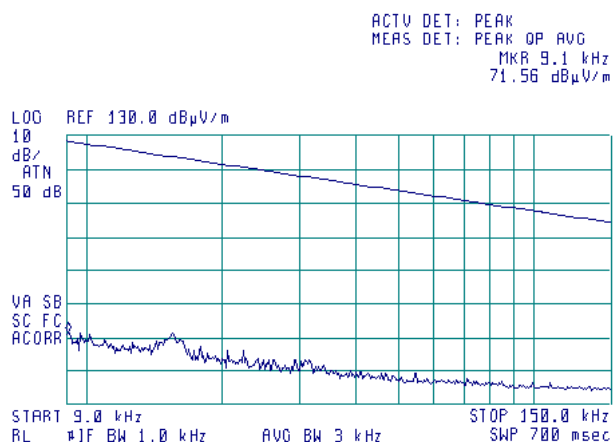
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
FREQUENCY F mid = 2440 MHz
EUT POSITION: X-axis



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

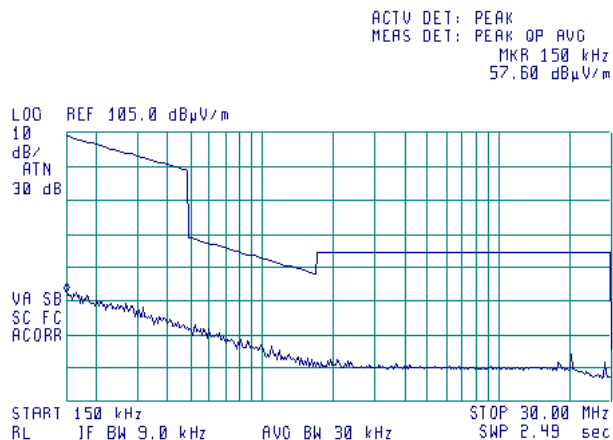
Plot 7.1.21 Radiated emission measurements from 9 to 150 kHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
FREQUENCY F max=2480 MHz
EUT POSITION: X-axis



Plot 7.1.22 Radiated emission measurements from 0.15 to 30 MHz

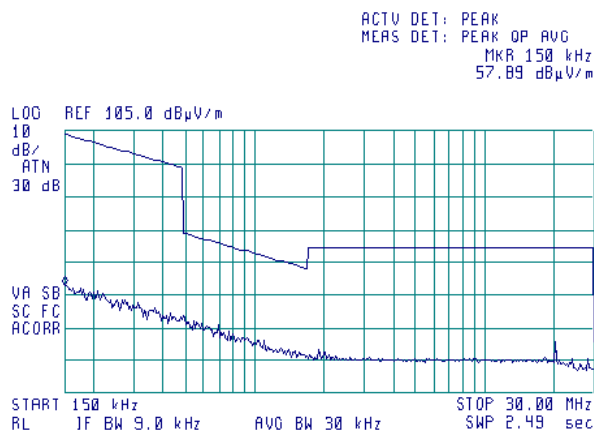
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
FREQUENCY F min = 2401 MHz
EUT POSITION: X-axis



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

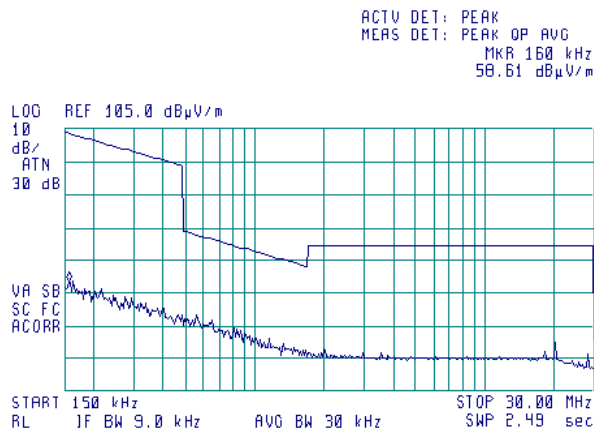
Plot 7.1.23 Radiated emission measurements from 0.15 to 30 MHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
FREQUENCY F mid = 2440 MHz
EUT POSITION: X-axis



Plot 7.1.24 Radiated emission measurements from 0.15 to 30 MHz

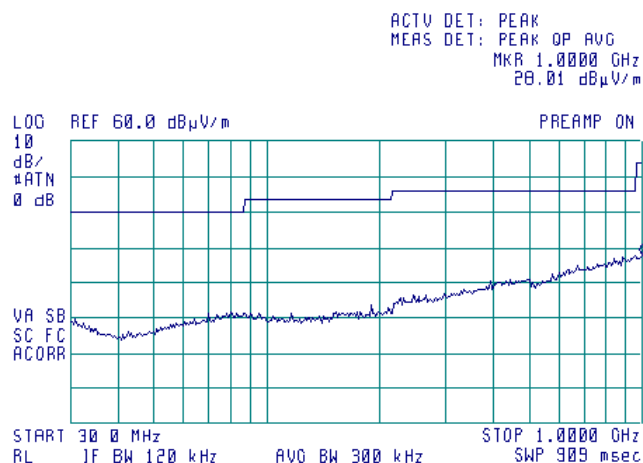
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
FREQUENCY F max=2480 MHz
EUT POSITION: X-axis



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

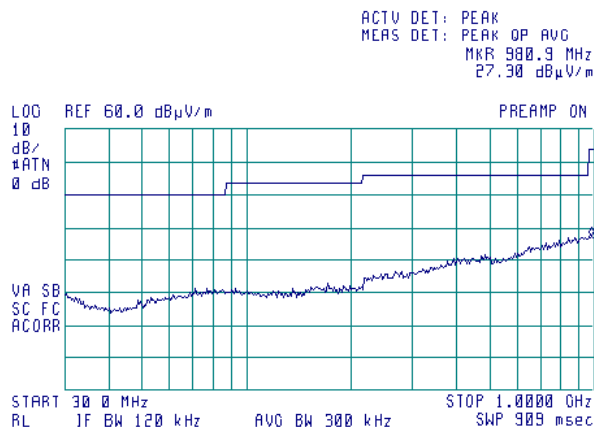
Plot 7.1.25 Radiated emission measurements from 30 to 1000 MHz

TEST SITE: Semi anechoic chamber
FREQUENCY: F min = 2401 MHz
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: X-axis



Plot 7.1.26 Radiated emission measurements from 30 to 1000 MHz

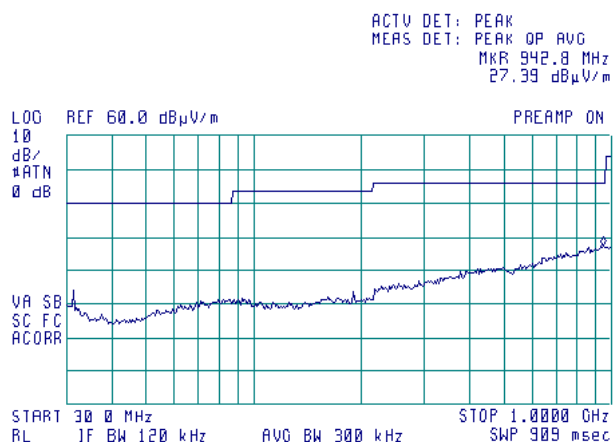
TEST SITE: Semi anechoic chamber
FREQUENCY: F mid = 2440 MHz
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: X-axis



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

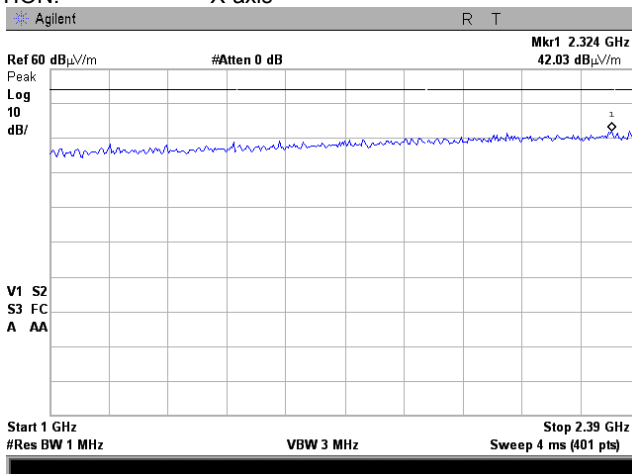
Plot 7.1.27 Radiated emission measurements from 30 to 1000 MHz

TEST SITE: Semi anechoic chamber
FREQUENCY: F max=2480 MHz
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: X-axis



Plot 7.1.28 Radiated emission measurements from 1.0 to 2.39 GHz

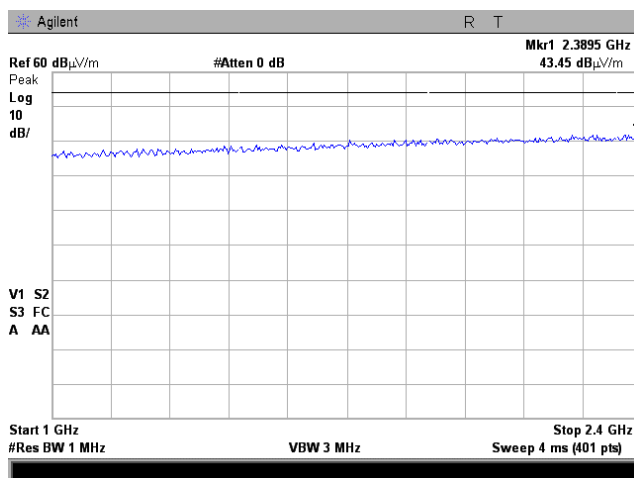
TEST SITE: Anechoic chamber
FREQUENCY: F min=2401 MHz
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: X-axis



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

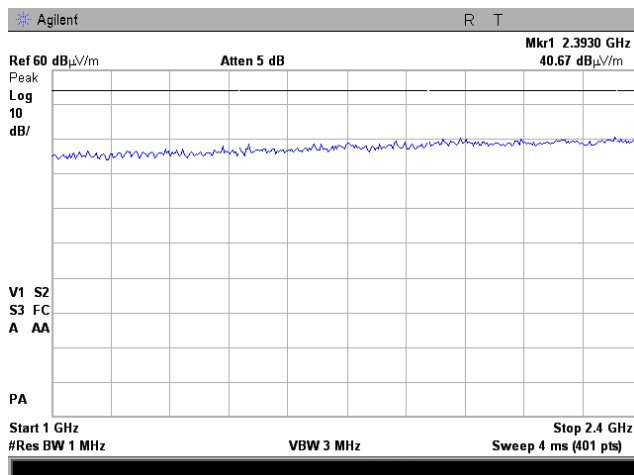
Plot 7.1.29 Radiated emission measurements from 1.0 to 2.4 GHz

TEST SITE: Anechoic chamber
FREQUENCY: F mid=2440 MHz
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: X-axis



Plot 7.1.30 Radiated emission measurements from 1.0 to 2.4 GHz

TEST SITE: Anechoic chamber
FREQUENCY: F max=2480 MHz
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: X-axis

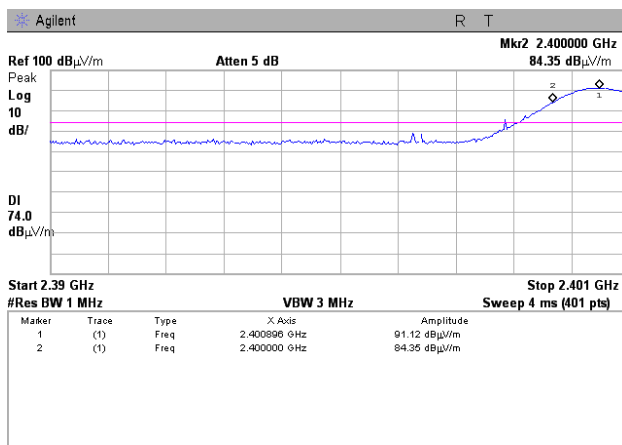


Test specification:	Section 15.249(a)(d), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	11/08/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

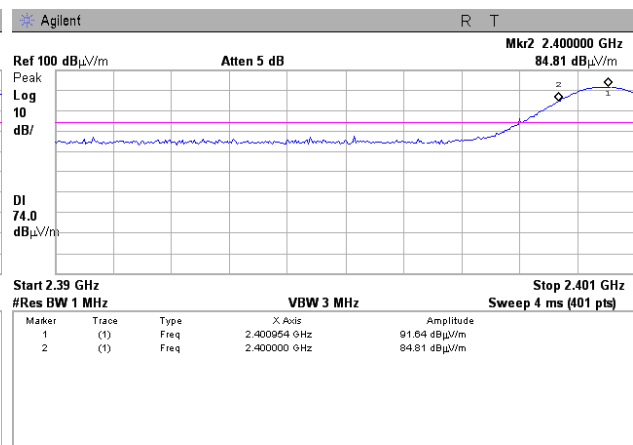
Plot 7.1.31 Radiated emission measurements from 2.39 to 2.4 GHz

TEST SITE:
FREQUENCY
TEST DISTANCE:
ANTENNA POLARIZATION: Vertical
EUT POSITION:

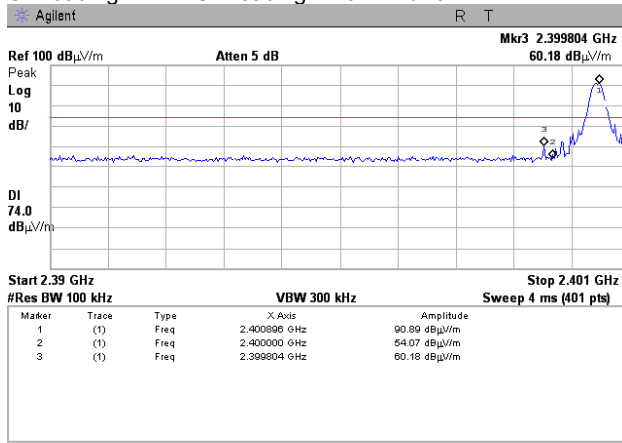
Anechoic chamber
F min=2401 MHz
3 m
ANTENNA POLARIZATION: Horizontal
X-axis



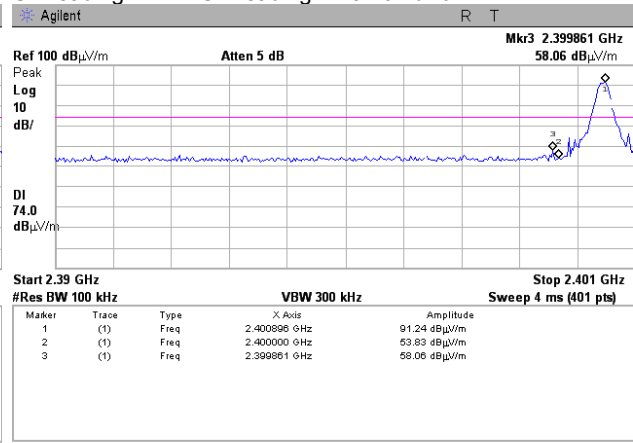
SA reading Mkr1= SA reading1 = 91.12 dBuV



SA reading Mkr1= SA reading1 = 91.64 dBuV



SA reading Mkr1= SA reading2 = 90.89 dBuV;
SA reading Mkr2= SA reading3 = 60.18 dBuV



SA reading Mkr1= SA reading2 = 91.24 dBuV;
SA reading Mkr2= SA reading3 = 58.06 dBuV

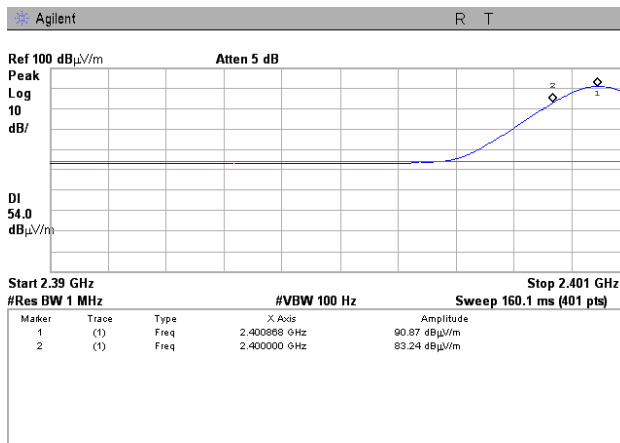
Test result 1 = SA reading1 – (SA reading2 - SA reading3) = 91.12 – (90.89 – 60.18) = 60.41dBuV
Test result 2 = SA reading1 – (SA reading2 - SA reading3) = 91.64 – (91.24 – 58.06) = 58.46dBuV

Test specification:	Section 15.249(a)(d), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	11/08/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

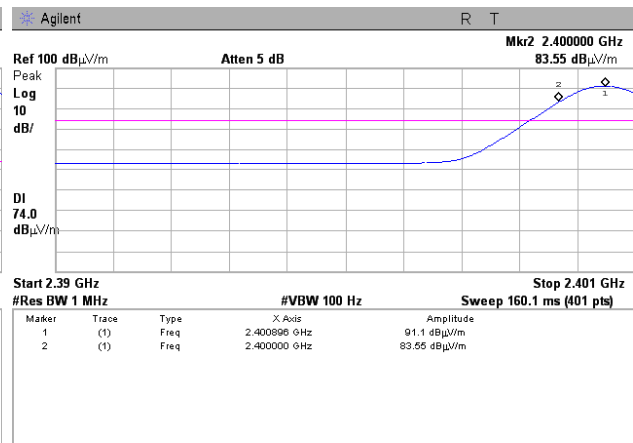
Plot 7.1.32 Radiated emission measurements from 2.39 to 2.4 GHz

TEST SITE:
FREQUENCY
TEST DISTANCE:
ANTENNA POLARIZATION: Vertical
EUT POSITION:

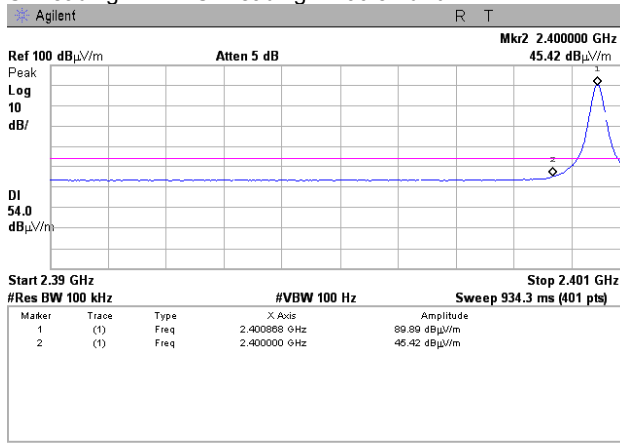
Anechoic chamber
F min=2401 MHz
3 m
ANTENNA POLARIZATION: Horizontal
X-axis



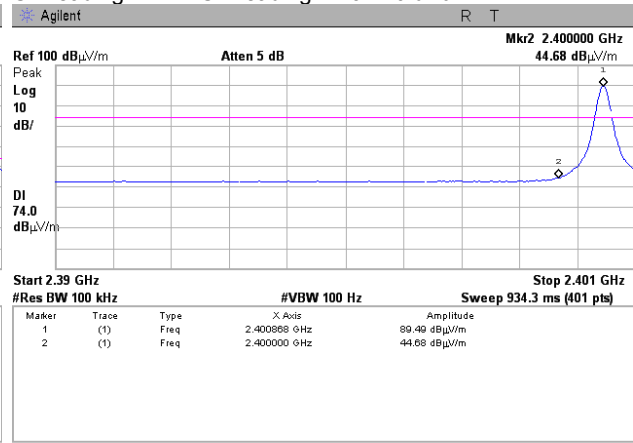
SA reading Mkr1= SA reading1 = 90.87 dBuV



SA reading Mkr1= SA reading1 = 91.10 dBuV



SA reading Mkr1= SA reading2 = 89.89 dBuV;
SA reading Mkr2= SA reading3 = 45.42 dBuV



SA reading Mkr1= SA reading2 = 89.49 dBuV;
SA reading Mkr2= SA reading3 = 44.68 dBuV

Test result 1 = SA reading1 – (SA reading2 - SA reading3) = 90.87 – (89.89 – 45.42) = 46.40 dBuV

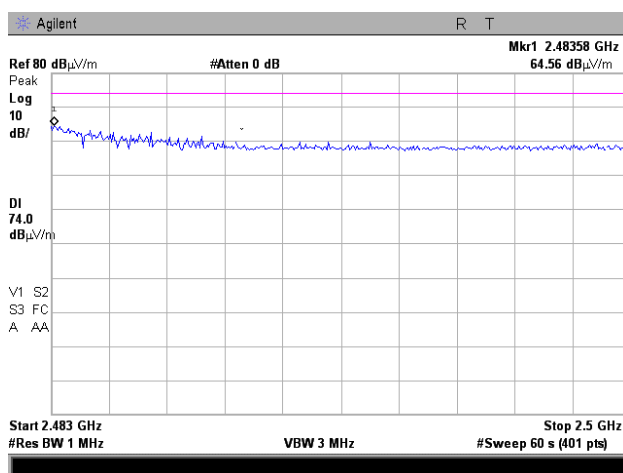
Test result 2 = SA reading1 – (SA reading2 - SA reading3) = 91.10 – (89.49 – 44.68) = 46.29 dBuV

Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

Plot 7.1.33 Radiated emission measurements from 2.4835 to 2.5 GHz

TEST SITE:
FREQUENCY
TEST DISTANCE:
EUT POSITION:
ANTENNA POLARIZATION:

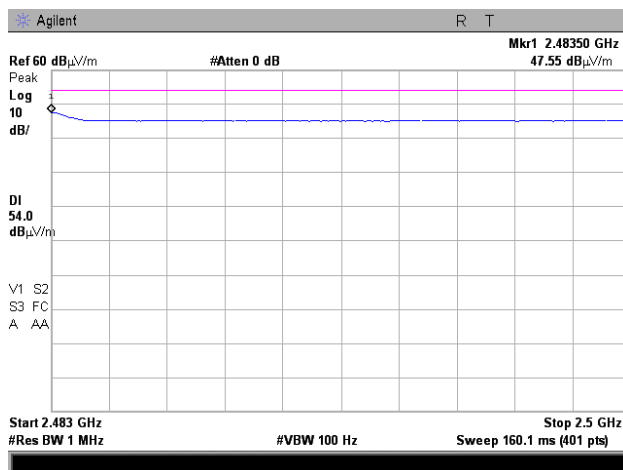
Anechoic chamber
F max=2480 MHz
3 m
X-axis
Vertical and Horizontal



Plot 7.1.34 Radiated emission measurements from 2.4835 to 2.5 GHz

TEST SITE:
FREQUENCY
TEST DISTANCE:
ANTENNA POLARIZATION:
EUT POSITION:

Anechoic chamber
F max=2480 MHz
3 m
Vertical and Horizontal
X-axis

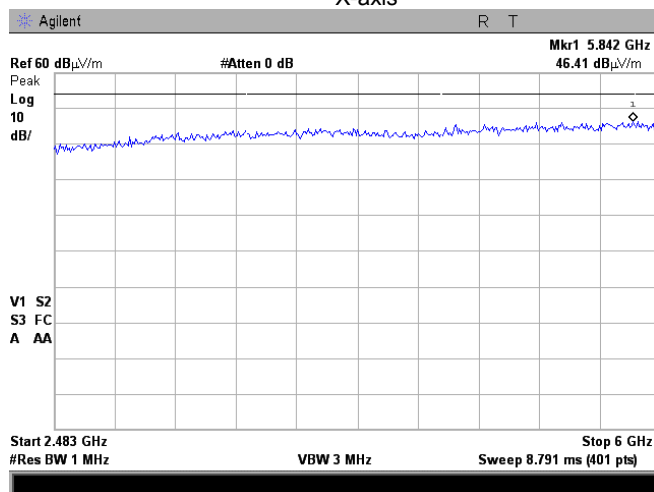


Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

Plot 7.1.35 Radiated emission measurements from 2.483 to 6.0 GHz

TEST SITE:
FREQUENCY
TEST DISTANCE:
ANTENNA POLARIZATION:
EUT POSITION:

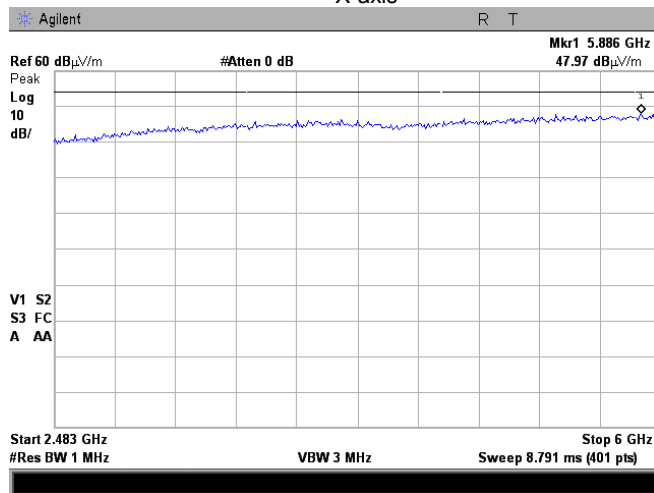
Anechoic chamber
F min=2401 MHz
3 m
Vertical and Horizontal
X-axis



Plot 7.1.36 Radiated emission measurements from 2.483 to 6.0 GHz

TEST SITE:
FREQUENCY
TEST DISTANCE:
ANTENNA POLARIZATION:
EUT POSITION:

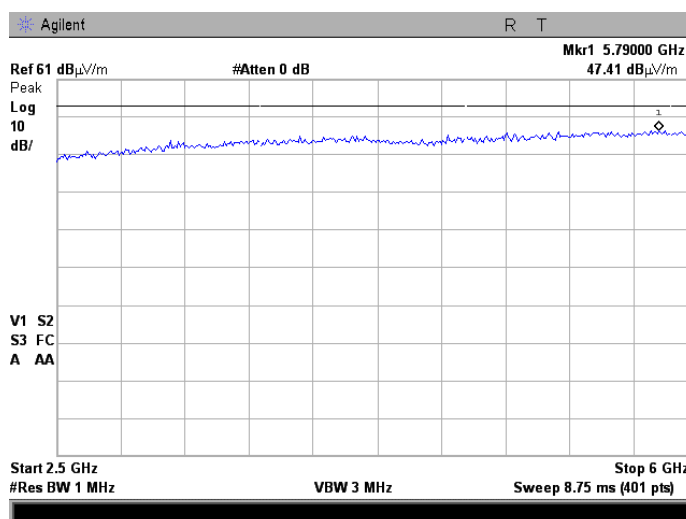
Anechoic chamber
F mid=2440 MHz
3 m
Vertical and Horizontal
X-axis



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

Plot 7.1.37 Radiated emission measurements from 2.5 to 6.0 GHz

TEST SITE:	Anechoic chamber
FREQUENCY	F max=2480 MHz
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
EUT POSITION:	X-axis

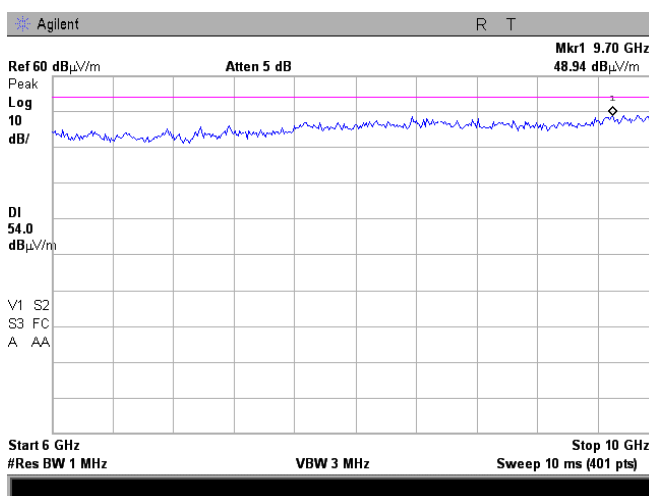


Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

Plot 7.1.38 Radiated emission measurements from 6.0 to 10.0 GHz

TEST SITE:
FREQUENCY
TEST DISTANCE:
ANTENNA POLARIZATION:
EUT POSITION:

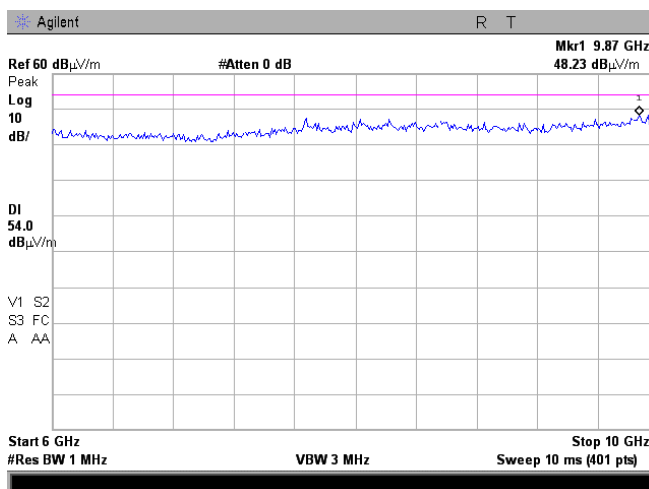
Anechoic chamber
F min=2401 MHz
3 m
Vertical and Horizontal
X-axis



Plot 7.1.39 Radiated emission measurements from 6.0 to 10.0 GHz

TEST SITE:
FREQUENCY
TEST DISTANCE:
ANTENNA POLARIZATION:
EUT POSITION:

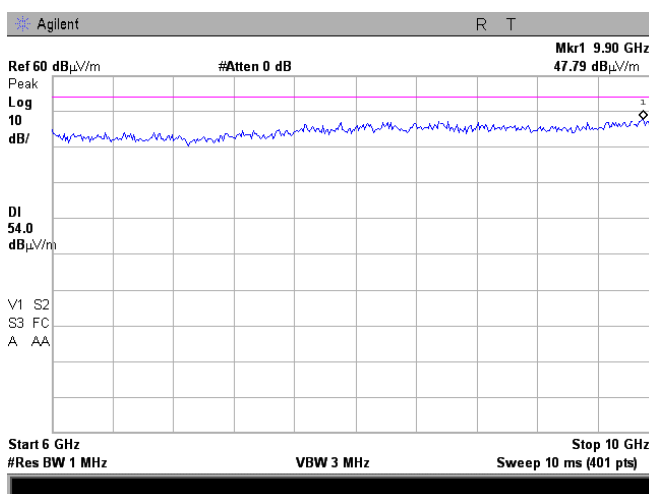
Anechoic chamber
F mid=2440 MHz
3 m
Vertical and Horizontal
X-axis



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

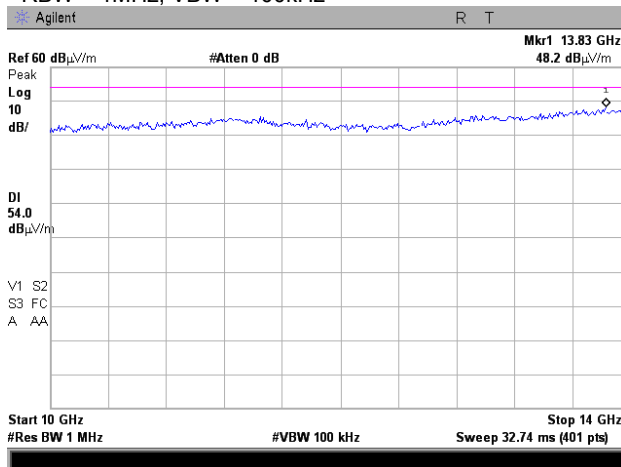
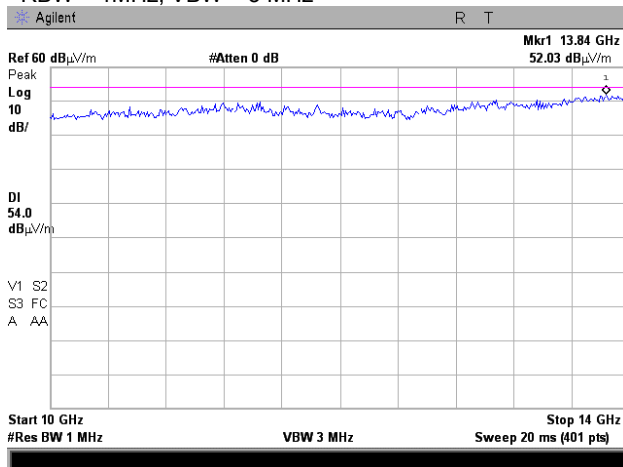
Plot 7.1.40 Radiated emission measurements from 6.0 to 10.0 GHz

TEST SITE: Anechoic chamber
FREQUENCY: F max=2480 MHz
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: X-axis



Plot 7.1.41 Radiated emission measurements from 10.0 to 14.0 GHz

TEST SITE: Anechoic chamber
FREQUENCY: F min=2401 MHz
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: X-axis
RBW = 1MHz, VBW = 3 MHz

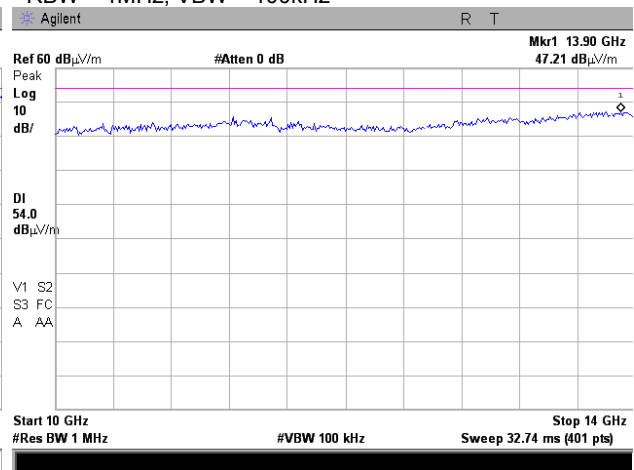
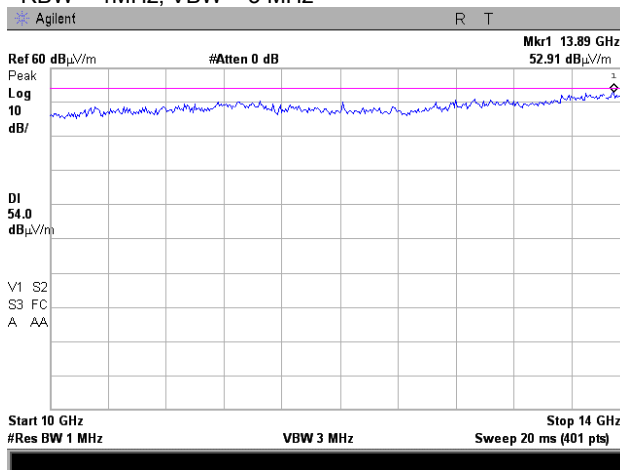


Test specification:	Section 15.249(a)(d), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	11/08/2010		
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

Plot 7.1.42 Radiated emission measurements from 10.0 to 14.0 GHz

TEST SITE:
FREQUENCY
TEST DISTANCE:
ANTENNA POLARIZATION:
EUT POSITION:
RBW = 1MHz, VBW = 3 MHz

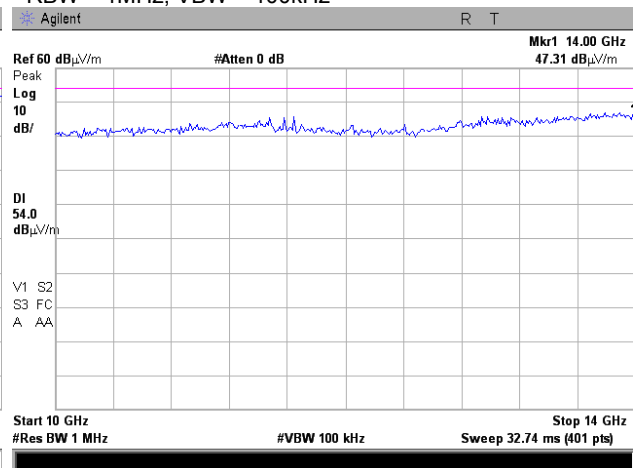
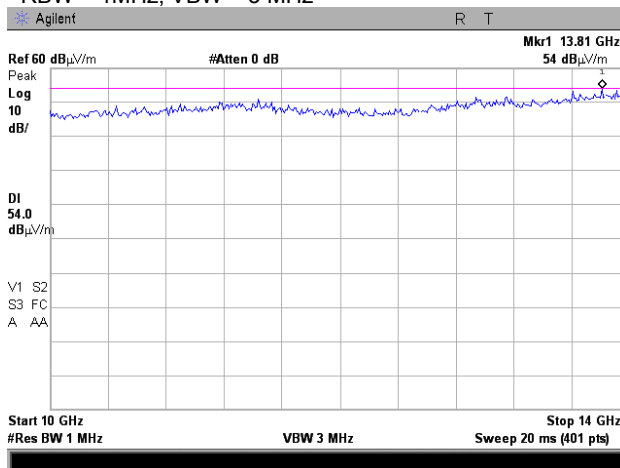
Anechoic chamber
F mid=2440 MHz
3 m
Vertical and Horizontal
X-axis
RBW = 1MHz, VBW = 100kHz



Plot 7.1.43 Radiated emission measurements from 10.0 to 14.0 GHz

TEST SITE:
FREQUENCY
TEST DISTANCE:
ANTENNA POLARIZATION:
EUT POSITION:
RBW = 1MHz, VBW = 3 MHz

Anechoic chamber
F max=2480 MHz
3 m
Vertical and Horizontal
X-axis
RBW = 1MHz, VBW = 100kHz

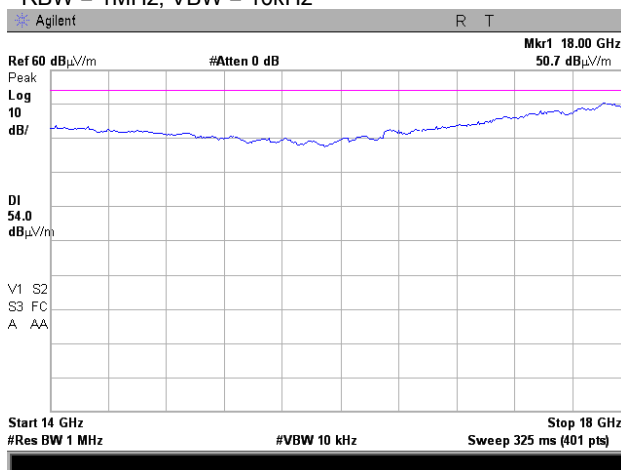
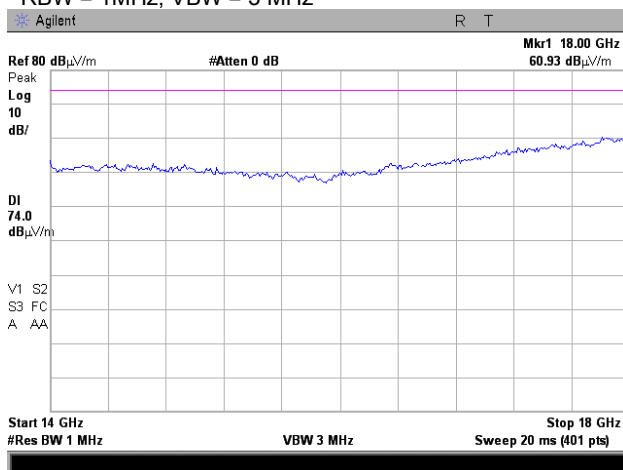


Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

Plot 7.1.44 Radiated emission measurements from 14.0 to 18.0 GHz

TEST SITE:
FREQUENCY
TEST DISTANCE:
ANTENNA POLARIZATION:
EUT POSITION:
RBW = 1MHz, VBW = 3 MHz

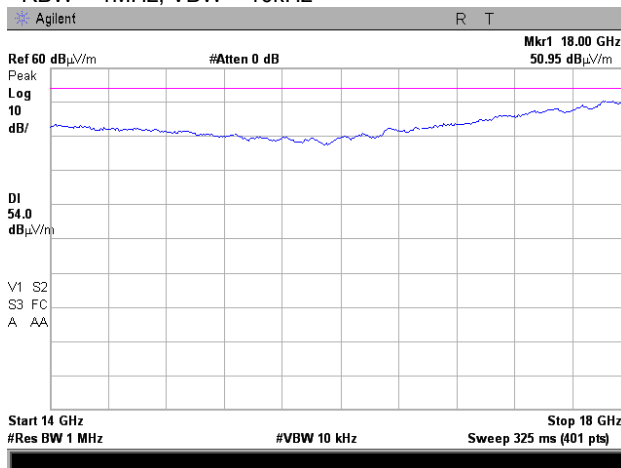
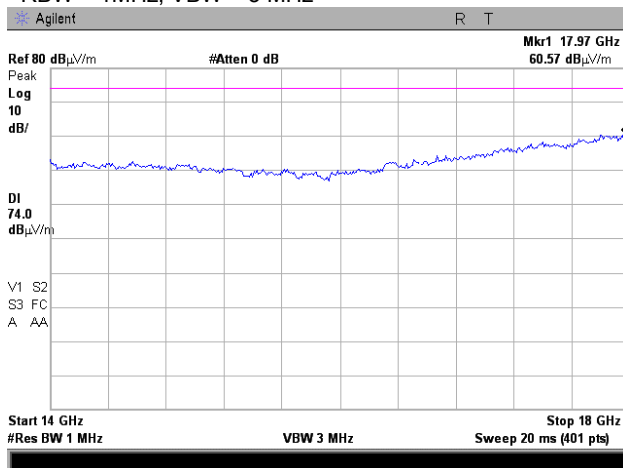
Anechoic chamber
F min=2401 MHz
3 m
Vertical and Horizontal
X-axis
RBW = 1MHz, VBW = 10kHz



Plot 7.1.45 Radiated emission measurements from 14.0 to 18.0 GHz

TEST SITE:
FREQUENCY
TEST DISTANCE:
ANTENNA POLARIZATION:
EUT POSITION:
RBW = 1MHz, VBW = 3 MHz

Anechoic chamber
F mid=2440 MHz
3 m
Vertical and Horizontal
X-axis
RBW = 1MHz, VBW = 10kHz

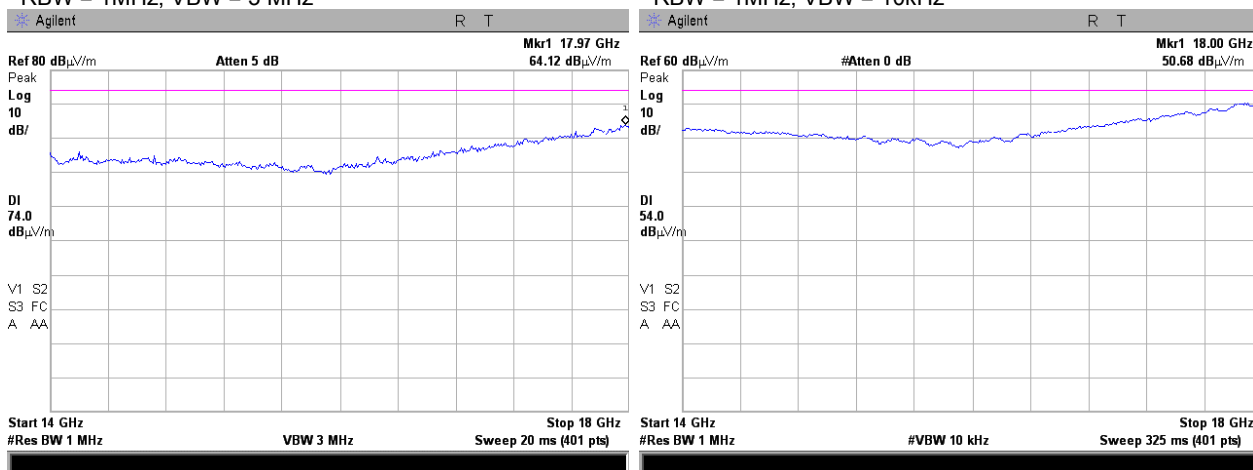


Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

Plot 7.1.46 Radiated emission measurements from 14.0 to 18.0 GHz

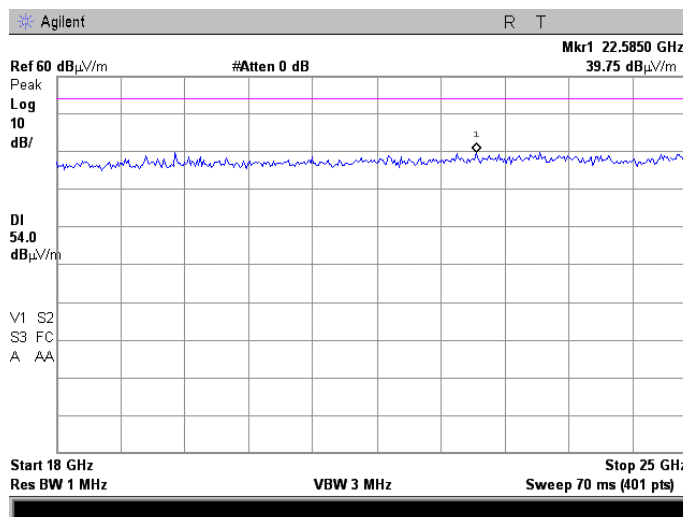
TEST SITE:
FREQUENCY
TEST DISTANCE:
ANTENNA POLARIZATION:
EUT POSITION:
RBW = 1MHz, VBW = 3 MHz

Anechoic chamber
F max=2480 MHz
3 m
Vertical and Horizontal
X-axis
RBW = 1MHz, VBW = 10kHz



Plot 7.1.47 Radiated emission measurements from 18.0 to 25.0 GHz

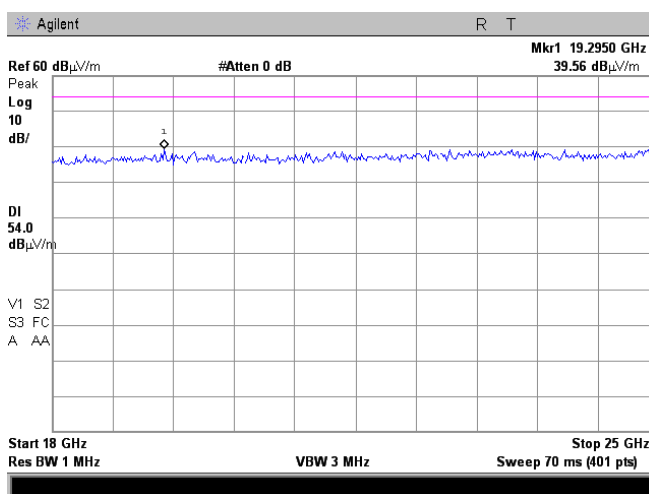
TEST SITE: OATS
FREQUENCY F min=2401 MHz
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: X-axis



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

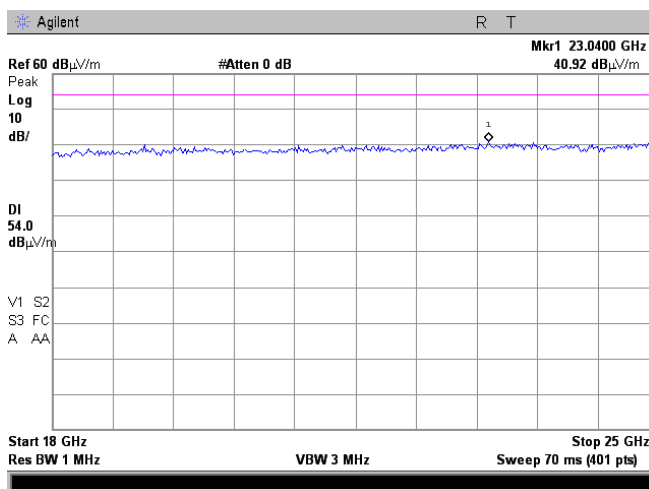
Plot 7.1.48 Radiated emission measurements from 18.0 to 25.0 GHz

TEST SITE: OATS
FREQUENCY: F mid=2440 MHz
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: X-axis



Plot 7.1.49 Radiated emission measurements from 18.0 to 25.0 GHz

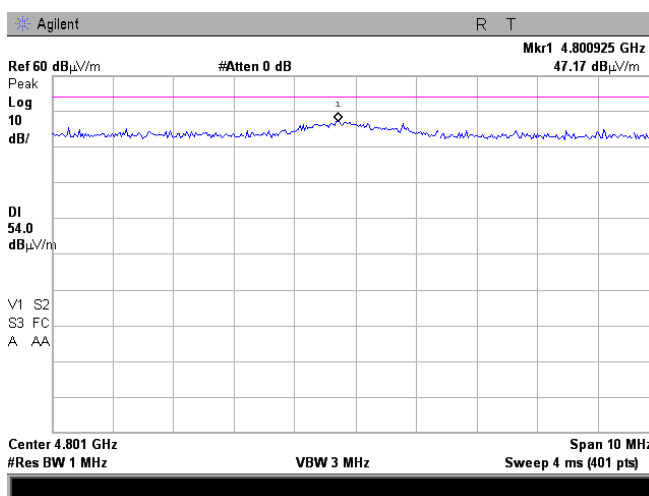
TEST SITE: OATS
FREQUENCY: F max=2480 MHz
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: X-axis



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

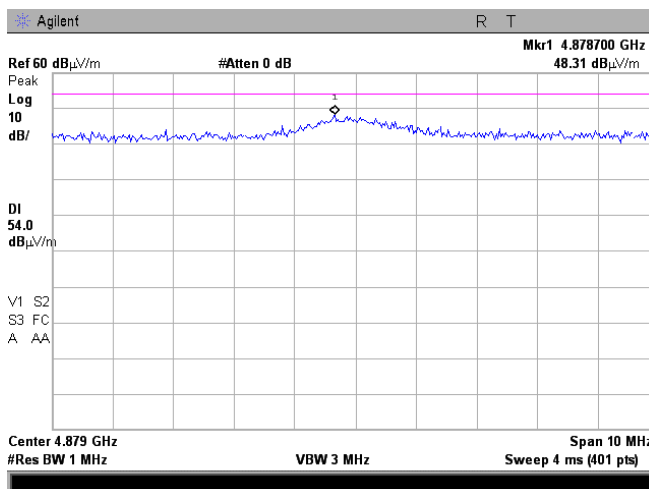
Plot 7.1.50 Radiated emission measurements at the second harmonic frequency

TEST SITE: Anechoic chamber
FREQUENCY: F min=2401 MHz
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: X-axis



Plot 7.1.51 Radiated emission measurements at the second harmonic frequency

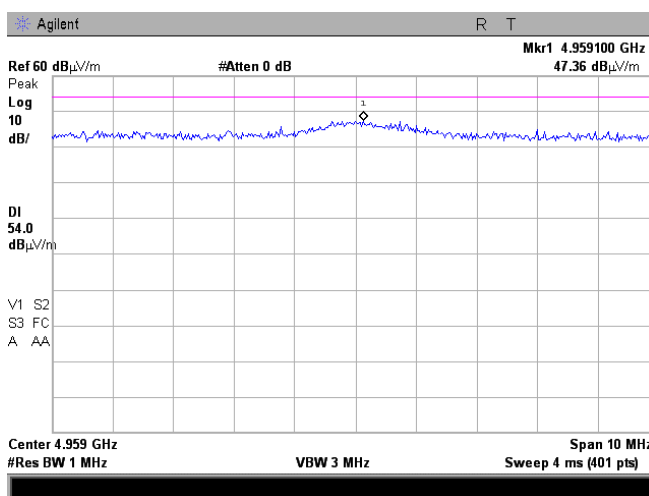
TEST SITE: Anechoic chamber
FREQUENCY: F middle=2440 MHz
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: X-axis



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

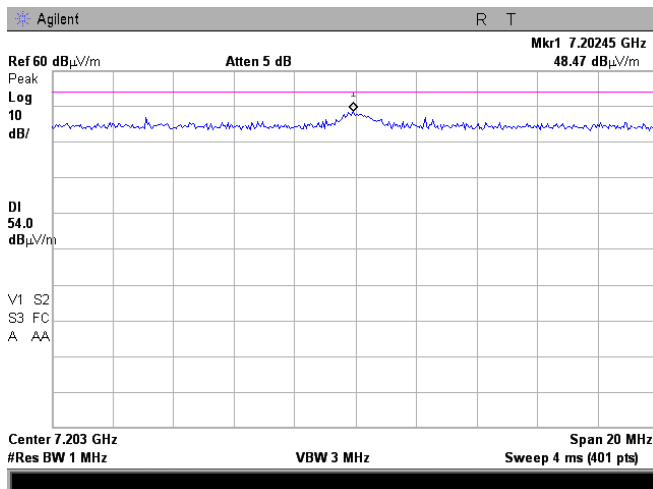
Plot 7.1.52 Radiated emission measurements at the second harmonic frequency

TEST SITE: OATS
FREQUENCY: F max=2483 MHz
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: X-axis



Plot 7.1.53 Radiated emission measurements at the third harmonic frequency

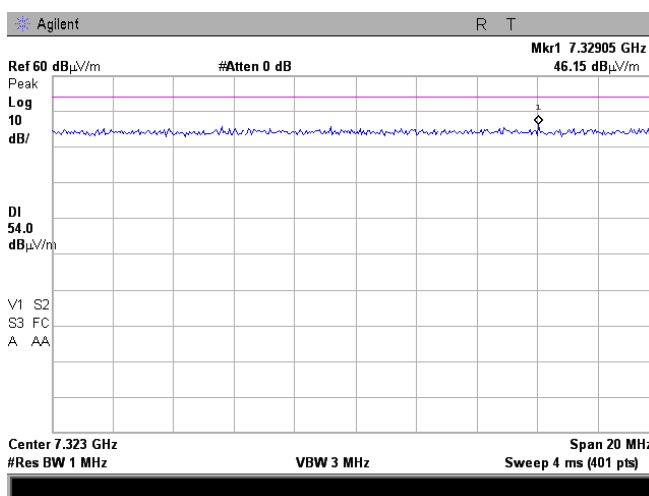
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
FREQUENCY: F min=2401 MHz
EUT POSITION: X-axis



Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

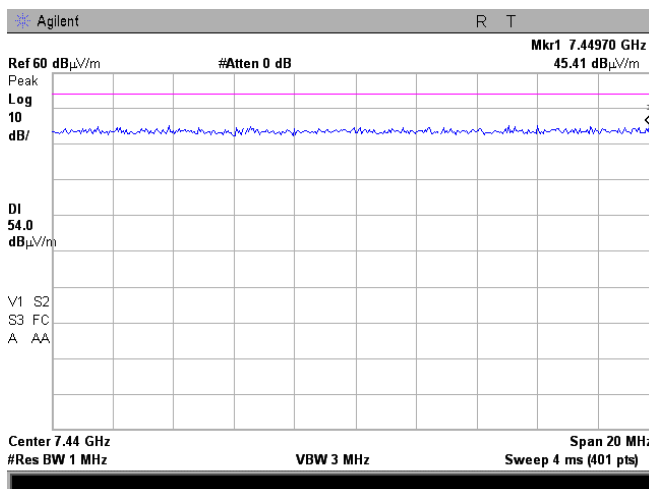
Plot 7.1.54 Radiated emission measurements at the third harmonic frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
Frequency Fmid=2440 MHz
EUT POSITION: X-axis



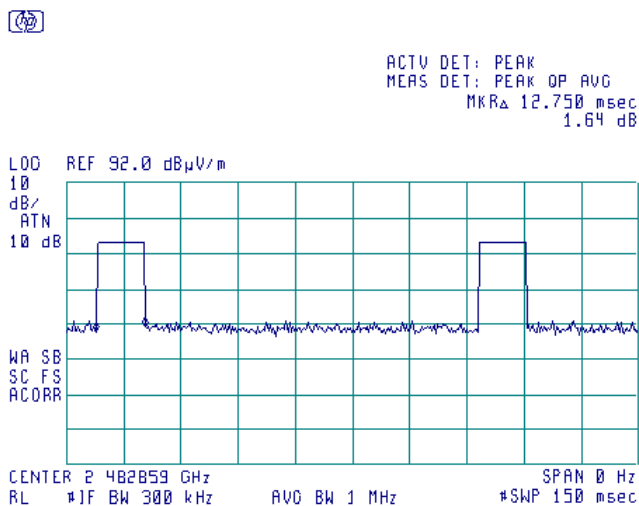
Plot 7.1.55 Radiated emission measurements at the third harmonic frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
Frequency Fmax=2483.0 MHz
EUT POSITION: X-axis

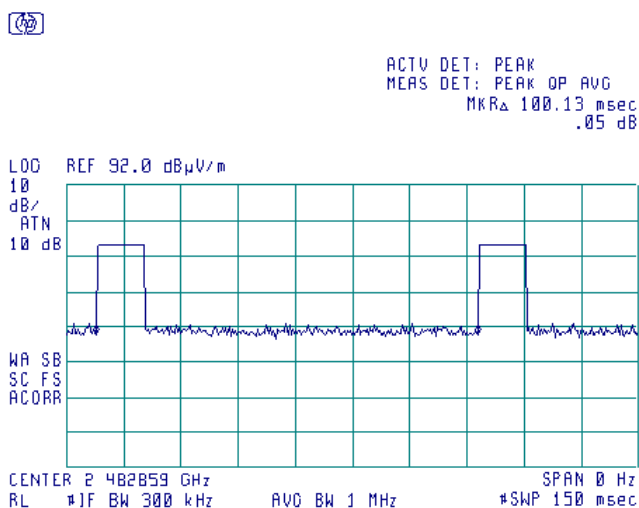


Test specification:		Section 15.249(a)(d), Field strength of emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/08/2010	
Temperature: 23.4 °C	Air Pressure: 1015 hPa	Relative Humidity: 45 %	Power Supply: 9 VDC
Remarks:			

Plot 7.1.56 Transmission pulse duration



Plot 7.1.57 Transmission pulse period



Test specification:		Section 15.249(d), Band edge emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/3/2010	
Temperature: 23.6 °C	Air Pressure: 1009 hPa	Relative Humidity: 42 %	Power Supply: 9 VDC
Remarks:			

7.2 Band edge emission

7.2.1 General

This test was performed to verify the EUT band edge emission including all associated side bands was attenuated at least 50 dB below the unmodulated carrier level or below the general spurious emission limit. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Band edge emission limits

Frequency band, MHz	Field strength limit at 3 m, dB μ V/m		Attenuation below carrier, dBc
	Peak	Average	
2400 – 2483.5	74.0	54.0	50

7.2.2 Test procedure

7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and the performance check was conducted.

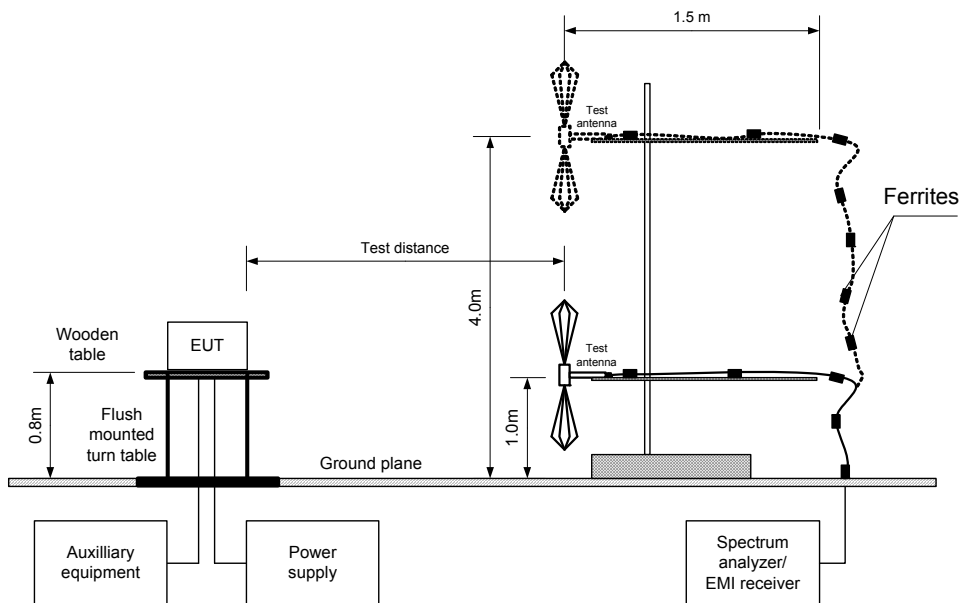
7.2.2.2 The spectrum analyzer frequency span was set to capture all major modulation sidebands of emission and sweep time was set sufficiently slow to ensure peak measurements. Spectrum analyzer was set in peak hold mode and time sufficient for trace stabilization was allowed.

7.2.2.3 The frequency of modulation envelope points beyond which power level drops below the band edge emission limit was measured.

7.2.2.4 The test results were recorded in Table 7.2.2 and shown in the associated plots.

Test specification:		Section 15.249(d), Band edge emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/3/2010	
Temperature: 23.6 °C	Air Pressure: 1009 hPa	Relative Humidity: 42 %	Power Supply: 9 VDC
Remarks:			

Figure 7.2.1 Band edge emission measurement set up



Test specification:		Section 15.249(d), Band edge emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/3/2010	
Temperature: 23.6 °C	Air Pressure: 1009 hPa	Relative Humidity: 42 %	Power Supply: 9 VDC
Remarks:			

Table 7.2.2 Band edge emission test results

OPERATING FREQUENCY RANGE: 2400.0 – 2483.5 MHz
DETECTOR USED: Peak hold
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: FSK
MODULATING SIGNAL: NA
BIT RATE: 250 kbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Modulation envelope		Band edge limit, MHz	Margin, kHz**	Verdict
Edge	Frequency, MHz*			
Peak Detector Limit				
Low	2400.504	2400.0	-504.0	Pass
High	2481.427	2483.5	2073.0	Pass
Average Detector Limit				
Low	2400.460	2400.0	-460.0	Pass
High	2482.947	2483.5	553.0	Pass

* - Measured frequency beyond which the emission dropped 50 dB below the carrier emission or below the field strength limit whichever was a less stringent

** - Margin = Band edge limit – Band edge frequency

Reference numbers of test equipment used

HL 0521	HL 1984	HL 2870	HL 2871				
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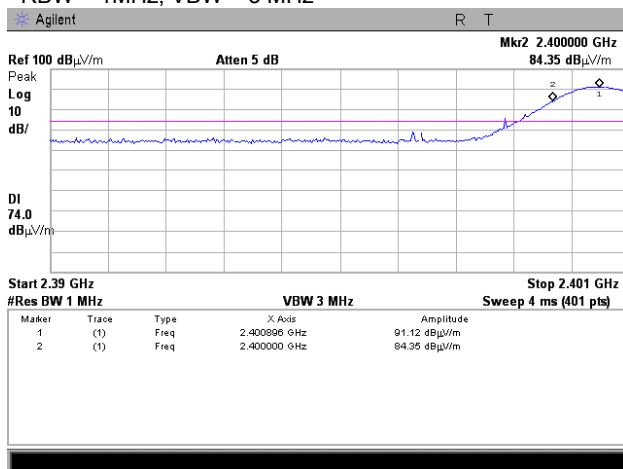
Full description is given in Appendix A.

Test specification:		Section 15.249(d), Band edge emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/3/2010	
Temperature: 23.6 °C	Air Pressure: 1009 hPa	Relative Humidity: 42 %	Power Supply: 9 VDC
Remarks:			

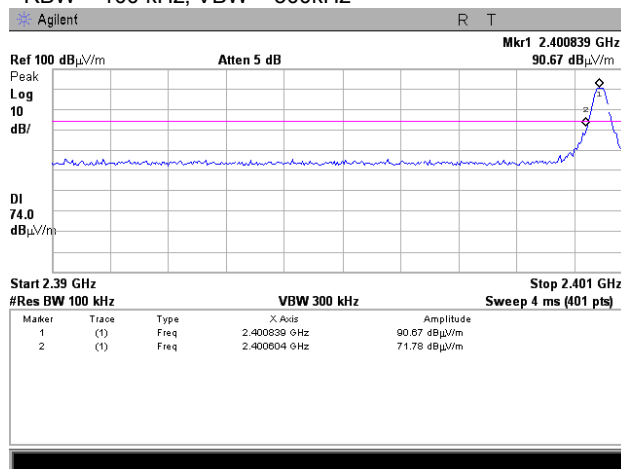
Plot 7.2.1 Low band edge emission test result

TEST SITE:
FREQUENCY
TEST DISTANCE:
ANTENNA POLARIZATION:
EUT POSITION:
RBW = 1MHz, VBW = 3 MHz

Anechoic chamber
F min=2401 MHz
3 m
Vertical
X-axis
RBW = 100 kHz, VBW = 300kHz



SA reading1 = SA reading Mkr1= 91.12 dBuV



SA reading2 = SA reading Mkr1 = 90.67 dBuV;
SA reading3 = SA reading Mkr2= 71.78 dBuV

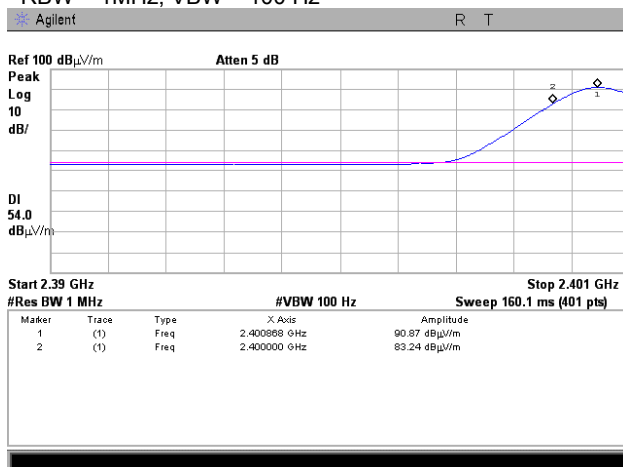
Test result = SA reading1 – (SA reading2 - SA reading3) = 91.12 – (90.67 – 71.78) = 72.23dBuV

Test specification:		Section 15.249(d), Band edge emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/3/2010	
Temperature: 23.6 °C	Air Pressure: 1009 hPa	Relative Humidity: 42 %	Power Supply: 9 VDC
Remarks:			

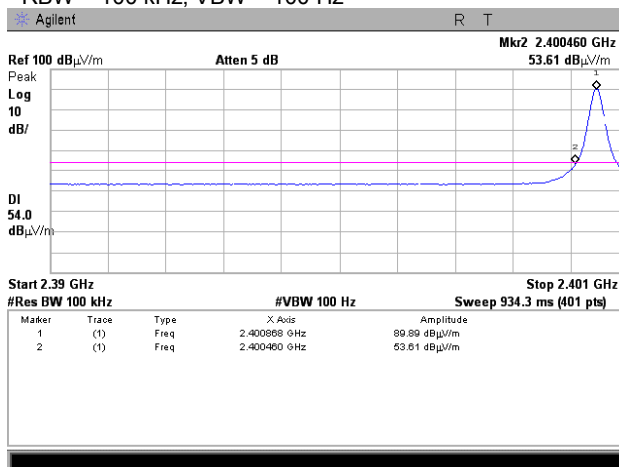
Plot 7.2.2 Low band edge emission test result

TEST SITE:
FREQUENCY
TEST DISTANCE:
ANTENNA POLARIZATION:
EUT POSITION:
RBW = 1MHz, VBW = 100 Hz

Anechoic chamber
F min=2401 MHz
3 m
Vertical
X-axis
RBW = 100 kHz, VBW = 100 Hz



SA reading1 = SA reading Mkr1= 90.87 dBuV



SA reading2 = SA reading Mkr1= 89.89 dBuV;
SA reading3 = SA reading Mkr2= 53.51 dBuV

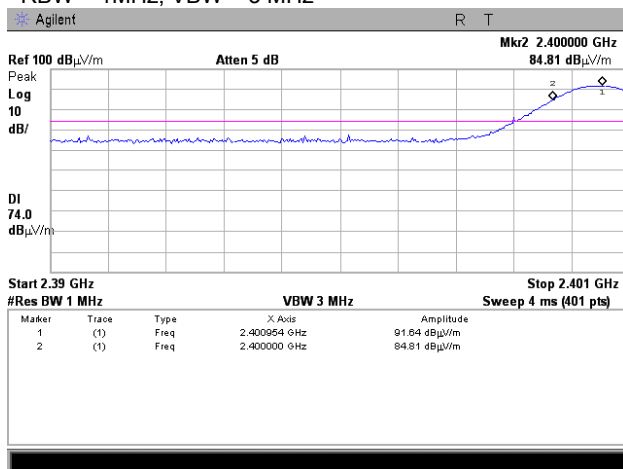
Test result = SA reading1 – (SA reading2 - SA reading3) = 90.87 – (89.89 – 53.51) = 54.49 dBuV

Test specification:		Section 15.249(d), Band edge emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/3/2010	
Temperature: 23.6 °C	Air Pressure: 1009 hPa	Relative Humidity: 42 %	Power Supply: 9 VDC
Remarks:			

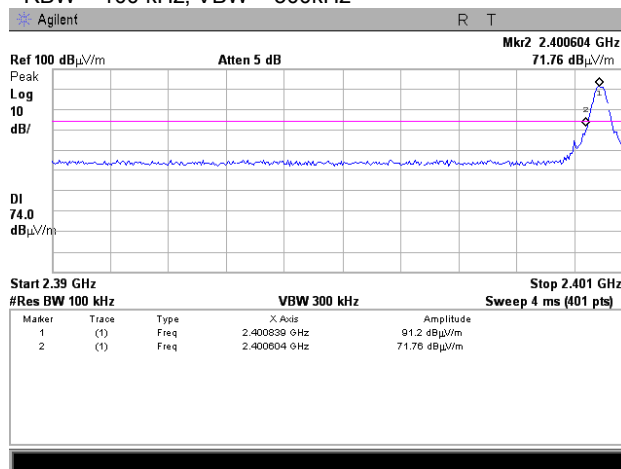
Plot 7.2.3 Low band edge emission test result

TEST SITE:
FREQUENCY
TEST DISTANCE:
ANTENNA POLARIZATION:
EUT POSITION:
RBW = 1MHz, VBW = 3 MHz

Anechoic chamber
F min=2401 MHz
3 m
Horizontal
X-axis
RBW = 100 kHz, VBW = 300kHz



SA reading1 = SA reading Mkr1= 91.64 dBuV



SA reading2 = SA reading Mkr1= 91.20 dBuV;
SA reading3 = SA reading Mkr2= 71.75 dBuV

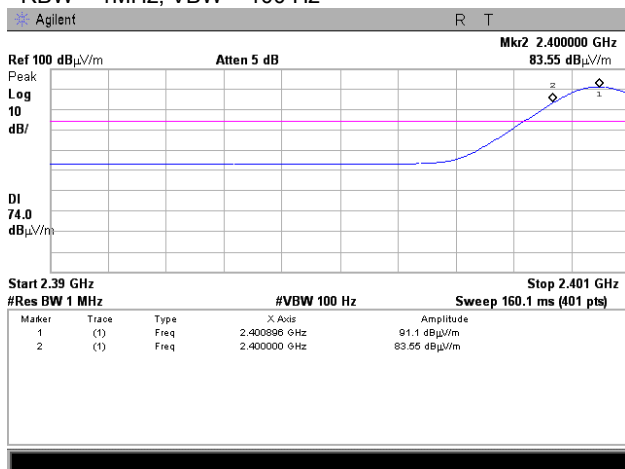
Test result = SA reading 1 – (SA reading 2 - SA reading3) = 91.64 – (91.20 – 71.75) = 72.19 dBuV

Test specification:		Section 15.249(d), Band edge emissions	
Test procedure:		ANSI C63.4, Section 13.1.4	
Test mode:		Compliance	Verdict: PASS
Date:		11/3/2010	
Temperature: 23.6 °C	Air Pressure: 1009 hPa	Relative Humidity: 42 %	Power Supply: 9 VDC
Remarks:			

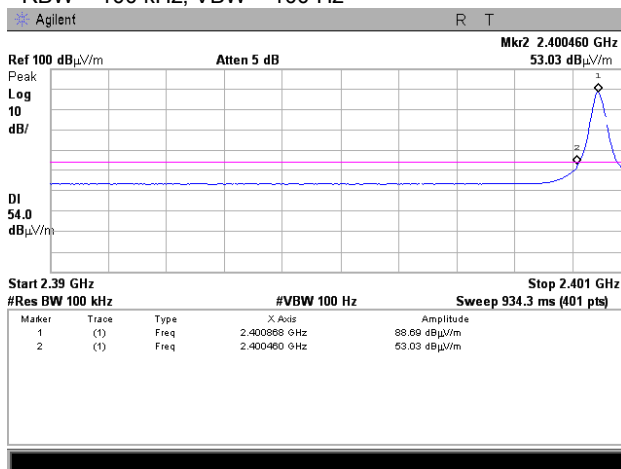
Plot 7.2.4 Low band edge emission test result

TEST SITE:
FREQUENCY
TEST DISTANCE:
ANTENNA POLARIZATION:
EUT POSITION:
RBW = 1MHz, VBW = 100 Hz

Anechoic chamber
F min=2401 MHz
3 m
Horizontal
X-axis
RBW = 100 kHz, VBW = 100 Hz



SA reading1 = SA reading Mkr1= 91.10 dBuV



SA reading2 = SA reading Mkr1= 88.69 dBuV;
SA reading3 = SA reading Mkr2= 53.03 dBuV

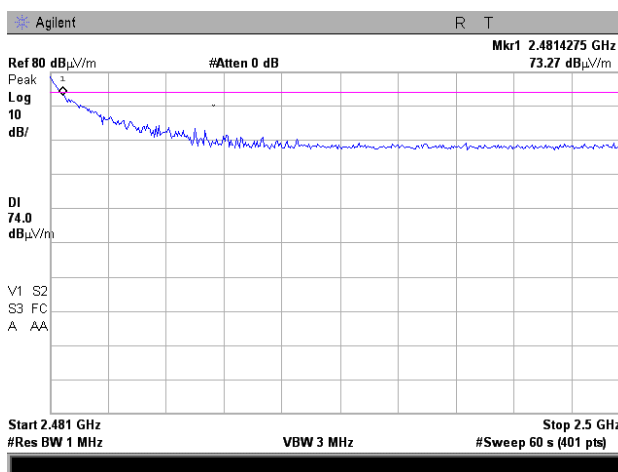
Test result = SA reading 1 – (SA reading 2 - SA reading3) = 91.10 – (88.69 – 53.03) = 55.44 dBuV

Test specification:	Section 15.249(d), Band edge emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	11/3/2010		
Temperature: 23.6 °C	Air Pressure: 1009 hPa	Relative Humidity: 42 %	Power Supply: 9 VDC
Remarks:			

Plot 7.2.5 High band edge emission test result

TEST SITE:
FREQUENCY
TEST DISTANCE:
EUT POSITION:
ANTENNA POLARIZATION:

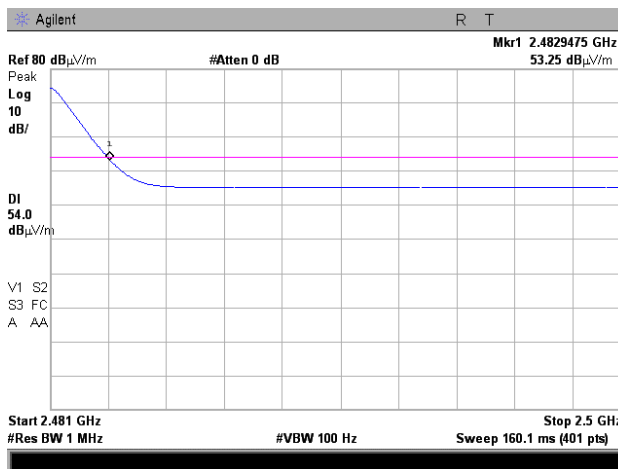
Anechoic chamber
F max=2480 MHz
3 m
X-axis
Vertical and Horizontal



Plot 7.2.6 High band edge emission test result

TEST SITE:
FREQUENCY
TEST DISTANCE:
ANTENNA POLARIZATION:
EUT POSITION:

Anechoic chamber
F max=2480 MHz
3 m
Vertical and Horizontal
X-axis



Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date:	10/13/2010		
Temperature: 24.3 °C	Air Pressure: 1015 hPa	Relative Humidity: 42 %	Power Supply: 120 VAC
Remarks:			

7.3 Conducted emissions

7.3.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Limits for conducted emissions

Frequency, MHz	Class B limit, dB(μ V)	
	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5.0	56	46
5.0 - 30	60	50

* The limit decreases linearly with the logarithm of frequency.

7.3.2 Test procedure

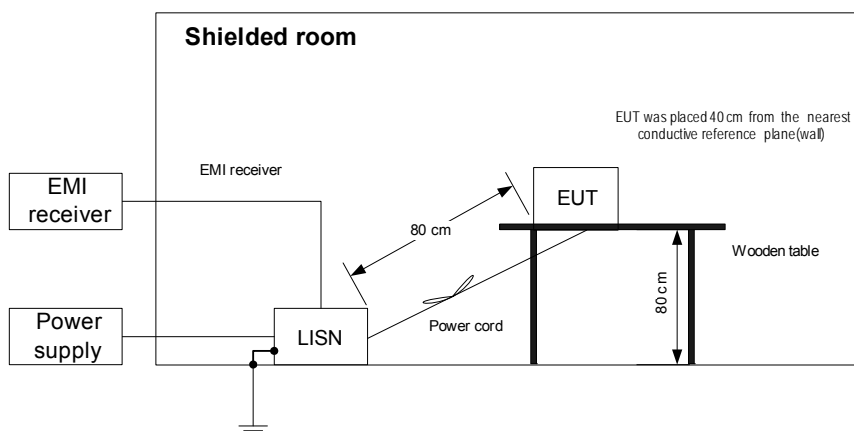
7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and the performance check was conducted.

7.3.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 7.3.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

7.3.2.3 The position of the device cables was varied to determine maximum emission level.

7.3.2.4 The worst test results (the lowest margins) were recorded in Table 7.3.2 and shown in the associated plots.

Figure 7.3.1 Setup for conducted emission measurements, table-top equipment



Test specification:		Section 15.207(a), Conducted emission	
Test procedure:		ANSI C63.4, Section 13.1.3	
Test mode:		Compliance	Verdict: PASS
Date:		10/13/2010	
Temperature: 24.3 °C	Air Pressure: 1015 hPa	Relative Humidity: 42 %	Power Supply: 120 VAC
Remarks:			

Table 7.3.2 Conducted emission test results

LINE: AC mains
 EUT OPERATING MODE: Transmit
 EUT SET UP: TABLE-TOP
 TEST SITE: SHIELDED ROOM
 DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE
 FREQUENCY RANGE: 150 kHz - 30 MHz
 RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(μV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*	Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*		
0.159100	55.96	47.54	65.56	-18.02	20.38	55.56	-35.18	L1	Pass
0.182500	54.35	50.16	64.41	-14.25	29.57	54.41	-24.84		
0.230250	50.61	44.82	62.49	-17.67	21.15	52.49	-31.34		
0.251825	48.53	44.81	61.73	-16.92	24.80	51.73	-26.93		
0.370000	44.45	39.02	58.55	-19.53	16.87	48.55	-31.68		
0.460000	46.89	39.66	56.75	-17.09	22.52	46.75	-24.23		
0.162830	56.72	52.06	65.37	-13.31	33.95	55.37	-21.42	L2	Pass
0.190250	53.99	50.36	64.04	-13.68	34.58	54.04	-19.46		
0.210000	50.69	46.69	63.27	-16.58	28.29	53.27	-24.98		
0.250000	48.56	44.78	61.79	-17.01	27.30	51.79	-24.49		
0.324000	45.20	40.33	59.64	-19.31	19.77	49.64	-29.87		
0.460000	45.43	41.35	56.75	-15.40	28.75	46.75	-18.00		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

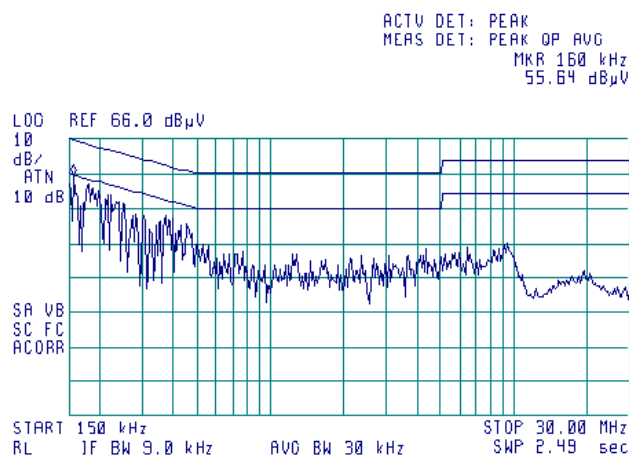
HL 0447	HL 0787	HL 1513	HL 2888	HL 3612			
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Full description is given in Appendix A.

Test specification:		Section 15.207(a), Conducted emission	
Test procedure:		ANSI C63.4, Section 13.1.3	
Test mode:		Compliance	Verdict: PASS
Date:		10/13/2010	
Temperature: 24.3 °C	Air Pressure: 1015 hPa	Relative Humidity: 42 %	Power Supply: 120 VAC
Remarks:			

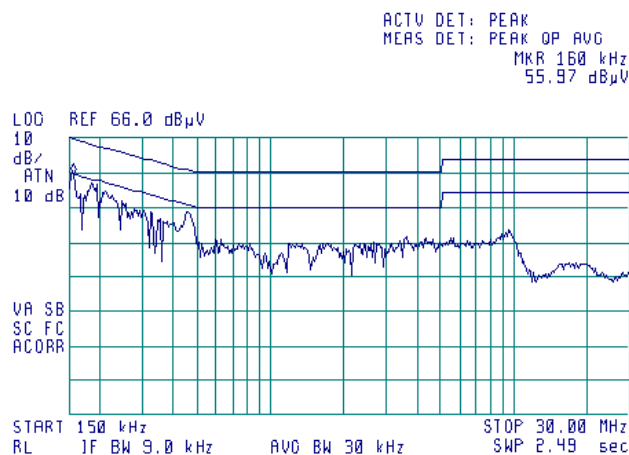
Plot 7.3.1 Conducted emission measurements

LINE: L1
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 7.3.2 Conducted emission measurements

LINE: L2
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Section 15.203, Antenna requirement		
Test procedure:	Visual inspection / supplier declaration		
Test mode:	Compliance	Verdict:	PASS
Date:	11/8/2010		
Temperature: 24.2 °C	Air Pressure: 1015 hPa	Relative Humidity: 43 %	Power Supply: 9 VDC
Remarks:			

7.4 Antenna requirements

The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed for use with the EUT. This requirement does not apply to professionally installed transmitters.

The rationale for compliance with the above requirements was either visual inspection results or supplier declaration. The summary of results is provided in Table 7.4.1.

Table 7.4.1 Antenna requirements

Requirement	Rationale	Verdict
The transmitter antenna is permanently attached	Visual inspection	Comply
The transmitter employs a unique antenna connector	NA	
The transmitter requires professional installation	NA	

Test specification:		Section 15.215(c), Occupied bandwidth	
Test procedure:		ANSI C63.4, Section 13.1.7	
Test mode:		Compliance	Verdict: PASS
Date:		11/8/2010	
Temperature: 24.2 °C	Air Pressure: 1015 hPa	Relative Humidity: 43 %	Power Supply: 9 VDC
Remarks:			

7.5 Occupied bandwidth test

7.5.1 General

This test was performed to verify that the 20 dB bandwidth of the emissions was contained within the standard specified frequency band according to FCC §15.215 requirements. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc
902 - 928	20.0
2400 – 2483.5	
5725 – 5875	
24000 – 24250	

*- Modulation envelope reference points provided in terms of attenuation below modulated carrier.

7.5.2 Test procedure

- 7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked.
- 7.5.2.2 The spectrum analyzer sweep time and bandwidth were set to capture all major modulation sidebands of emission and sweep time was set sufficiently slow to ensure peak measurements. Spectrum analyzer was set in peak hold mode and time sufficient for trace stabilization was allowed.
- 7.5.2.3 The peak of emission was measured. The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.5.2 and associated plot.
- 7.5.2.4 Modulation bandwidth was calculated by adding of the negative frequency drift to the lower measured frequency and the positive frequency drift to the higher measured frequency. The obtained modulation bandwidth was verified to be within the allowed frequency range.

Figure 7.5.1 Occupied bandwidth test setup



Test specification:		Section 15.215(c), Occupied bandwidth			
Test procedure:		ANSI C63.4, Section 13.1.7			
Test mode:		Compliance		Verdict: PASS	
Date:		11/8/2010			
Temperature: 24.2 °C		Air Pressure: 1015 hPa		Relative Humidity: 43 %	
Remarks:		Power Supply: 9 VDC			

Table 7.5.2 Occupied bandwidth test results

ASSIGNED FREQUENCY BAND: 2400 - 2483.5 MHz
DETECTOR USED: Peak hold
RESOLUTION BANDWIDTH: 10 kHz
VIDEO BANDWIDTH: 30 kHz
MODULATION ENVELOPE REFERENCE POINTS: 20 dBc
MODULATION: FSK
MODULATING SIGNAL: Enable

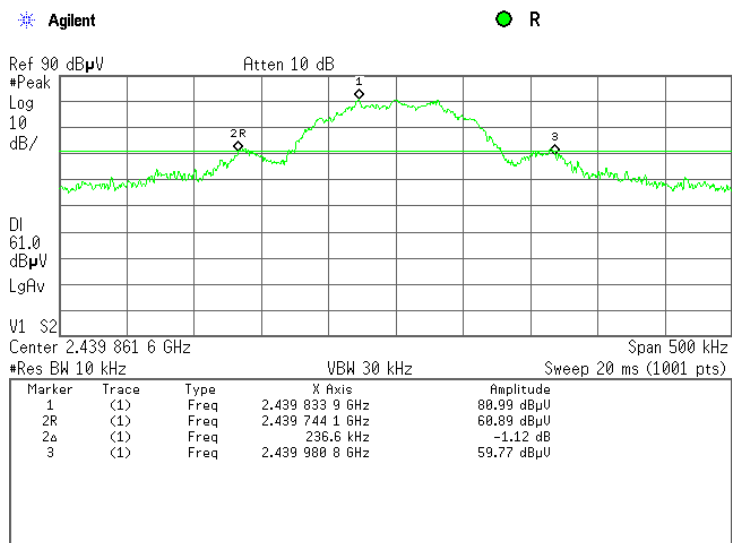
Band edge	Cross point frequency, MHz	Frequency drift, kHz		Modulation band edge, MHz	Assigned band edge, MHz	Verdict
		Negative	Positive			
Low	2400.746	NA	NA	2400.746	2400.0	Pass
High	2479.980	NA	NA	2479.980	2483.5	Pass

Reference numbers of test equipment used

HL 0337	HL 3818							
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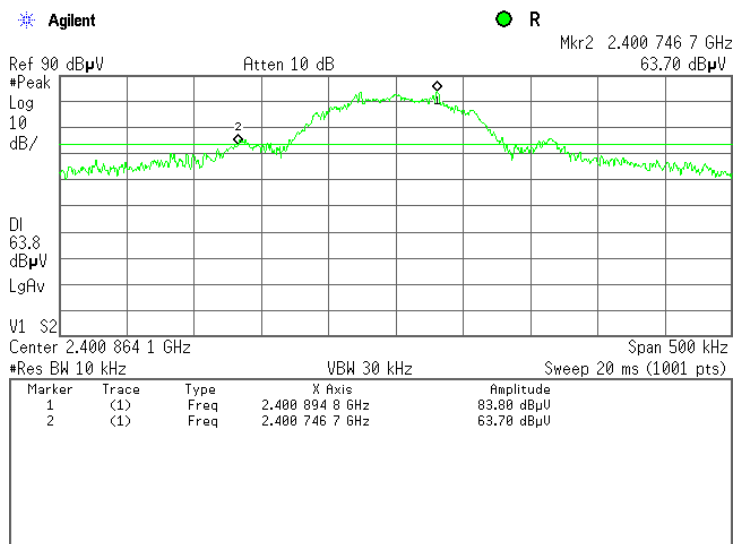
Full description is given in Appendix A.

Plot 7.5.1 Occupied bandwidth test result

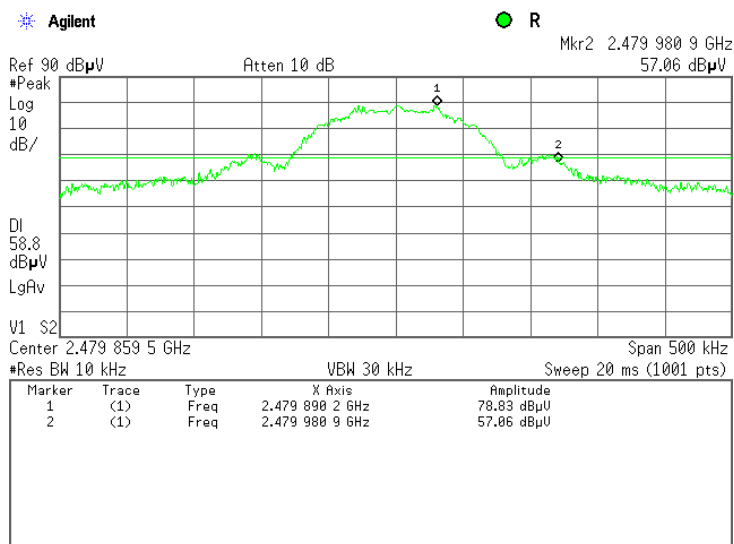


Test specification:		Section 15.215(c), Occupied bandwidth	
Test procedure:		ANSI C63.4, Section 13.1.7	
Test mode:		Compliance	Verdict: PASS
Date:		11/8/2010	
Temperature: 24.2 °C	Air Pressure: 1015 hPa	Relative Humidity: 43 %	Power Supply: 9 VDC
Remarks:			

Plot 7.5.2 Occupied bandwidth test result, modulation bandwidth



Plot 7.5.3 Occupied bandwidth test result, modulation bandwidth



8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0337	Probe Set, Hand held, 5 probes	Electro-Metrics	EHFP-30	238	08-Jun-10	08-Jun-11
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	29-Jun-10	29-Jun-11
0447	LISN, 16/2, 300V RMS, 50 Ohm/50 uH + 5 Ohm, STD CISPR 16-1	Hermon Laboratories	LISN 16 - 1	066	26-Oct-10	26-Oct-11
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	25-Aug-10	25-Aug-11
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	11-Jan-10	11-Jan-11
0768	Antenna Standard Gain Horn, 18-26.5 GHz, WR-42, 25 dB gain	Quinstar Technology	QWH-4200-BA	110	23-Dec-08	23-Dec-11
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard	11947A	3107A018 77	18-Oct-10	18-Oct-11
1430	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL1432	Agilent Technologies	8542E	3807A002 62,3705A0 0217	31-Aug-10	31-Aug-11
1513	Cable RF, 8 m, BNC/BNC	Belden	M17/167 MIL-C-17	1513	01-Sep-10	01-Sep-11
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	11-Jun-10	11-Jun-11
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY451024 62	07-Jul-10	07-Jul-11
2870	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-9155-00	2870	01-Jan-11	01-Jan-12
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155-00	2871	14-Sep-10	14-Sep-11
2888	LISN Two-line V-Network 50 Ohm / 50 uH + 5 Ohm, 16A, MIL STD 461E, CISPR 16-1	Rolf Heine	NNB-2/16Z	02/10018	07-Jul-10	07-Jul-11
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY414447 62	07-May-10	07-May-11
3533	Amplifier, low noise, 6 to 18 GHz	Quinstar Technology	QLJ-06184040-J0	111590010 01	23-Dec-10	23-Dec-11
3612	Cable RF, 17.5 m, N type-N type	Teldor	RG-214/U	NA	01-Dec-10	01-Dec-11
3622	Cable RF, 6.0 m, N type-N type, DC-6.5 GHz	Alpha Wire	RG 214/U	NA	27-May-10	27-May-11
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY482502 88	26-Sep-10	26-Sep-11
3883	Preamplifier, 0.1 to 18 GHz, Gain 25 dB, N-type (f) in, N-type (m) out.	Agilent Technologies	87405C	MY470104 06	13-Jan-10	13-Jan-11
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFLE X 102A	1225/2A	07-Feb-10	07-Feb-11

9 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Conducted carrier power at RF antenna connector	Below 12.4 GHz: ± 1.7 dB 12.4 GHz to 40 GHz: ± 2.3 dB
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: ± 2.6 dB 2.9 GHz to 6.46 GHz: ± 3.5 dB 6.46 GHz to 13.2 GHz: ± 4.3 dB 13.2 GHz to 22.0 GHz: ± 5.0 dB 22.0 GHz to 26.8 GHz: ± 5.5 dB 26.8 GHz to 40.0 GHz: ± 4.8 dB
Occupied bandwidth	± 8.0 %
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization Vertical polarization	Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB

Hermon Laboratories is accredited by A2LA for calibration according to present requirements of ISO/IEC 17025 and NCSL Z540-1. The accreditation is granted to perform calibration of parameters that are listed in the Scope of Hermon Laboratories Accreditation.

Hermon Laboratories calibrates its reference and transfer standards by calibration laboratories accredited to ISO/IEC 17025 by a mutually recognized Accreditation Body or by a recognized national metrology institute. All reference and transfer standards used in the calibration system are traceable to national or international standards.

In-house calibration of all test and measurement equipment is performed on a regular basis according to Hermon Laboratories calibration procedures, manufacturer calibration/verification procedures or procedures defined in the relevant standards. The Hermon Laboratories test and measurement equipment is calibrated within the tolerances specified by the manufacturers and/or by the relevant standards.

10 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility.

Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47), Registration Numbers 90624 for OATS and 90623 for the anechoic chamber; by Industry Canada for electromagnetic emissions (file numbers IC 2186A-1 for OATS, IC 2186A-2 for anechoic chamber, IC 2186A-3 for full-anechoic chamber for RE measurements above 1 GHz), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-27 for full-anechoic chamber for RE measurements above 1 GHz, C-845 for conducted emissions site, T-1606 for conducted emissions at telecommunication ports), has a status of a Telefication - Listed Testing Laboratory, Certificate No. L138/00. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01). The FCC Designation Number is US1003.

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Person for contact: Mr. Alex Usoskin, CEO.

11 APPENDIX D Specification references

FCC 47CFR part 15: 2009	Radio Frequency Devices
Public notice DA 00- 705: 2000	Filing and measurement guidelines for frequency hopping spread spectrum systems.
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications
ANSI C63.4: 2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

12 APPENDIX E Test equipment correction factors

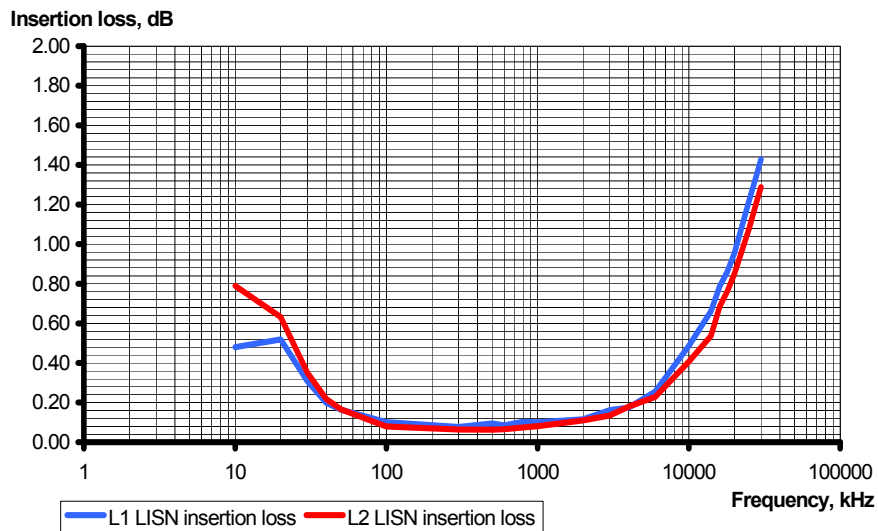
Correction factor
Line impedance stabilization network
Model LISN 16 - 1
Hermon Laboratories, HL 0447

Frequency, kHz	Correction factor, dB
10	4.9
15	2.86
20	1.83
25	1.25
30	0.91
35	0.69
40	0.53
50	0.35
60	0.25
70	0.18
80	0.14
90	0.11
100	0.09
125	0.06
150	0.04

The correction factor in dB is to be added to meter readings of an interference analyzer or a spectrum analyzer.

Correction factor
Line impedance stabilization network
Model NNB-2/16Z, Rolf Heine, HL 2888

Frequency, kHz	Insertion loss, dB		Measurement Uncertainty, dB
	L1	N	
10	0.48	0.79	±0.6
20	0.52	0.63	
30	0.31	0.35	
40	0.20	0.22	
50	0.16	0.17	
100	0.10	0.08	
300	0.08	0.06	
500	0.10	0.06	
600	0.09	0.07	
800	0.10	0.07	
1000	0.10	0.08	
2000	0.12	0.11	
3000	0.16	0.14	
4000	0.17	0.18	
6000	0.26	0.23	
10000	0.49	0.41	
14000	0.66	0.54	
16000	0.79	0.69	
18000	0.86	0.76	
20000	0.96	0.85	
25000	1.22	1.08	
28000	1.35	1.21	
30000	1.43	1.29	



Antenna factor
Active loop antenna
Model 6502, S/N 2857, HL 0446

Frequency, MHz	Magnetic antenna factor, dB	Electric antenna factor, dB
0.009	-32.8	18.7
0.010	-33.8	17.7
0.020	-38.3	13.2
0.050	-41.1	10.4
0.075	-41.3	10.2
0.100	-41.6	9.9
0.150	-41.7	9.8
0.250	-41.6	9.9
0.500	-41.8	9.8
0.750	-41.9	9.7
1.000	-41.4	10.1
2.000	-41.5	10.0
3.000	-41.4	10.2
4.000	-41.4	10.1
5.000	-41.5	10.1
10.000	-41.9	9.6
15.000	-41.9	9.6
20.000	-42.2	9.3
25.000	-42.8	8.7
30.000	-44.0	7.5

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μ V) to convert it into field intensity in dB(μ V/m).

Antenna factor
Standard gain horn antenna
Quinstar Technology
Model QWH
Ser.No.110, HL 0768

Frequency min, GHz	Frequency max, GHz	Antenna factor, dB(1/m)
18.000	26.500	32.01
26.500	40.000	35.48
40.000	60.000	39.03
60.000	90.000	42.55
90.000	140.000	46.23
140.000	220.000	50.11

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μ V) to convert it into field intensity in dB(μ V/m).

Antenna factor
Biconilog antenna EMCO Model 3141
Ser.No.1011, HL 0604

Frequency, MHz	Antenna Factor, dB(1/m)	Frequency, MHz	Antenna Factor, dB(1/m)
26	7.8	940	24.0
28	7.8	960	24.1
30	7.8	980	24.5
40	7.2	1000	24.9
60	7.1	1020	25.0
70	8.5	1040	25.2
80	9.4	1060	25.4
90	9.8	1080	25.6
100	9.7	1100	25.7
110	9.3	1120	26.0
120	8.8	1140	26.4
130	8.7	1160	27.0
140	9.2	1180	27.0
150	9.8	1200	26.7
160	10.2	1220	26.5
170	10.4	1240	26.5
180	10.4	1260	26.5
190	10.3	1280	26.6
200	10.6	1300	27.0
220	11.6	1320	27.8
240	12.4	1340	28.3
260	12.8	1360	28.2
280	13.7	1380	27.9
300	14.7	1400	27.9
320	15.2	1420	27.9
340	15.4	1440	27.8
360	16.1	1460	27.8
380	16.4	1480	28.0
400	16.6	1500	28.5
420	16.7	1520	28.9
440	17.0	1540	29.6
460	17.7	1560	29.8
480	18.1	1580	29.6
500	18.5	1600	29.5
520	19.1	1620	29.3
540	19.5	1640	29.2
560	19.8	1660	29.4
580	20.6	1680	29.6
600	21.3	1700	29.8
620	21.5	1720	30.3
640	21.2	1740	30.8
660	21.4	1760	31.1
680	21.9	1780	31.0
700	22.2	1800	30.9
720	22.2	1820	30.7
740	22.1	1840	30.6
760	22.3	1860	30.6
780	22.6	1880	30.6
800	22.7	1900	30.6
820	22.9	1920	30.7
840	23.1	1940	30.9
860	23.4	1960	31.2
880	23.8	1980	31.6
900	24.1	2000	32.0
920	24.1		

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μ V) to convert it into field intensity in dB(μ V/m).

Antenna factor
Double-ridged wave guide horn antenna
Model 3115, S/N 9911-5964, HL1984

Frequency, MHz	Antenna factor, dB(1/m)
1000.0	24.7
1500.0	25.7
2000.0	27.6
2500.0	28.9
3000.0	31.2
3500.0	32.0
4000.0	32.5
4500.0	32.7
5000.0	33.6
5500.0	35.1
6000.0	35.4
6500.0	34.9
7000.0	36.1
7500.0	37.8
8000.0	38.0
8500.0	38.1
9000.0	39.1
9500.0	38.3
10000.0	38.6
10500.0	38.2
11000.0	38.7
11500.0	39.5
12000.0	40.0
12500.0	40.4
13000.0	40.5
13500.0	41.1
14000.0	41.6
14500.0	41.7
15000.0	38.7
15500.0	38.2
16000.0	38.8
16500.0	40.5
17000.0	42.5
17500.0	45.9
18000.0	49.4

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μ V) to convert it into field intensity in dB(μ V/m).

Cable loss
Cable coaxial, Huber-Suhner, 18 GHz, 6.4 m, SMA - SMA, model 198-9155-00,
HL 2870

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.09	5750	2.49	12000	3.71
30	0.17	6000	2.53	12250	3.81
100	0.32	6250	2.58	12500	3.84
250	0.49	6500	2.64	12750	3.88
500	0.70	6750	2.69	13000	3.92
750	0.86	7000	2.75	13250	3.96
1000	1.00	7250	2.80	13500	3.98
1250	1.11	7500	2.87	13750	4.01
1500	1.23	7750	2.93	14000	4.03
1750	1.34	8000	2.94	14250	4.09
2000	1.41	8250	3.00	14500	4.08
2250	1.51	8500	3.04	14750	4.10
2500	1.59	8750	3.08	15000	4.15
2750	1.68	9000	3.14	15250	4.22
3000	1.76	9250	3.16	15500	4.31
3250	1.83	9500	3.22	15750	4.42
3500	1.91	9750	3.26	16000	4.48
3750	1.97	10000	3.36	16250	4.54
4000	2.05	10250	3.41	16500	4.56
4250	2.11	10500	3.46	16750	4.57
4500	2.18	10750	3.50	17000	4.59
4750	2.24	11000	3.54	17250	4.66
5000	2.30	11250	3.58	17500	4.70
5250	2.36	11500	3.63	17750	4.76
5500	2.43	11750	3.66	18000	4.72

Cable loss
Cable coaxial, Huber-Suhner, 18 GHz, 6.4 m, SMA - SMA, model 198-8155-00,
HL 2871

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.12	5750	2.34	12000	3.55
30	0.14	6000	2.39	12250	3.61
100	0.27	6250	2.46	12500	3.67
250	0.45	6500	2.52	12750	3.74
500	0.63	6750	2.58	13000	3.79
750	0.76	7000	2.64	13250	3.82
1000	0.89	7250	2.68	13500	3.83
1250	1.01	7500	2.73	13750	3.83
1500	1.12	7750	2.78	14000	3.88
1750	1.23	8000	2.83	14250	3.93
2000	1.32	8250	2.88	14500	3.96
2250	1.41	8500	2.94	14750	4.01
2500	1.49	8750	2.97	15000	4.00
2750	1.58	9000	3.02	15250	4.01
3000	1.66	9250	3.07	15500	4.00
3250	1.73	9500	3.13	15750	4.13
3500	1.80	9750	3.18	16000	4.22
3750	1.87	10000	3.21	16250	4.29
4000	1.93	10250	3.26	16500	4.29
4250	2.01	10500	3.30	16750	4.32
4500	2.06	10750	3.36	17000	4.37
4750	2.12	11000	3.39	17250	4.45
5000	2.17	11250	3.44	17500	4.49
5250	2.24	11500	3.48	17750	4.53
5500	2.29	11750	3.52	18000	4.55

Cable loss
Cable coaxial, RG-214/U, N type-N type, 17 m
Teldor, HL 3612

Frequency, MHz	Cable loss, dB
0.1	0.05
0.5	0.07
1	0.10
3	0.22
5	0.29
10	0.39
30	0.68
50	0.90
100	1.27
150	1.58
200	1.80
250	2.12
300	2.36
350	2.60
400	2.82
450	2.99
500	3.23
550	3.40
600	3.56
650	3.71
700	3.90
750	4.04
800	4.23
850	4.39
900	4.55
950	4.65
1000	4.79

Cable loss
Cable coaxial, RG-214/U, N type-N type, 6 m
Alpha Wire, HL 3622

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.13	2100	2.95	4400	4.99
30	0.24	2200	2.99	4500	5.00
50	0.32	2300	3.11	4600	5.17
100	0.47	2400	3.16	4700	5.18
200	0.70	2500	3.31	4800	5.33
300	0.88	2600	3.36	4900	5.34
400	1.05	2700	3.46	5000	5.50
500	1.21	2800	3.52	5100	5.56
600	1.36	2900	3.65	5200	5.76
700	1.49	3000	3.70	5300	5.76
800	1.63	3100	3.82	5400	5.85
900	1.72	3200	3.88	5500	5.88
1000	1.84	3300	3.99	5600	5.96
1100	1.96	3400	4.08	5700	6.02
1200	2.06	3500	4.19	5800	6.06
1300	2.15	3600	4.28	5900	6.14
1400	2.28	3700	4.42	6000	6.17
1500	2.35	3800	4.40	6100	6.28
1600	2.43	3900	4.51	6200	6.36
1700	2.57	4000	4.62	6300	6.47
1800	2.62	4100	4.70	6400	6.51
1900	2.75	4200	4.78	6500	6.65
2000	2.80	4300	4.83		

Cable loss
Microwave Cable Assembly, Huber-Suhner, 40 GHz, 3.5 m, SMA-SMA, S/N 1225/2A
HL 3901

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.09	9500	4.29	21000	6.67
100	0.41	10000	4.40	22000	6.92
500	0.93	10500	4.52	23000	7.00
1000	1.33	11000	4.64	24000	7.18
1500	1.63	11500	4.76	25000	7.29
2000	1.90	12000	4.87	26000	7.55
2500	2.12	12500	4.99	27000	7.70
3000	2.33	13000	5.11	28000	7.88
3500	2.50	13500	5.20	29000	8.02
4000	2.67	14000	5.31	30000	8.15
4500	2.82	14500	5.42	31000	8.35
5000	2.99	15000	5.51	32000	8.40
5500	3.16	15500	5.58	33000	8.62
6000	3.32	16000	5.68	34000	8.73
6500	3.51	16500	5.78	35000	8.78
7000	3.65	17000	5.91	36000	8.94
7500	3.79	17500	5.99	37000	9.21
8000	3.92	18000	6.07	38000	9.37
8500	4.04	19000	6.36	39000	9.45
9000	4.18	20000	6.49	40000	9.52

13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μ V)	decibel referred to one microvolt
dB(μ V/m)	decibel referred to one microvolt per meter
dB(μ A)	decibel referred to one microampere
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
k	kilo
kHz	kilohertz
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μ s	microsecond
NA	not applicable
NB	narrow band
OATS	open area test site
Ω	Ohm
PM	pulse modulation
PS	power supply
ppm	part per million (10^{-6})
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
WB	wideband

END OF DOCUMENT