HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

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TEST REPORT

ACCORDING TO: FCC 47 CFR PART 15 subpart C, section 15.249 and RSS-210 issue 8 Annex 2

FOR:

LogiTag Systems Ltd.
One Channel Exciter
Model: LTG2-04
Single Location Unit
Model: LTG2-04-PRF
FCC ID:Z97LTG2-04

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1 Applicant information

Client name:	LogiTag Systems Ltd.
Address:	1st Floor, Building 9, 29 Yad Harutzim street, Poleg Industrial Zone, P.O.B. 8249, Netanya 4250473, Israel
Telephone:	+972 9835 4848
Fax:	+972 9865 6262
E-mail:	golank@Logi-tag.com
Contact name:	Mr. Golan Kormian

2 Equipment under test attributes

Product name:	One Channel Exciter
Model:	LTG2-04
Serial number:	LTG2-04-1312-078
Hardware version:	C01
Software release:	V2.00
Receipt date	7-Apr-14

3 Manufacturer information

Manufacturer name:	LogiTag Systems Ltd.
Address:	1st Floor, Building 9, 29 Yad Harutzim street, Poleg Industrial Zone, P.O.B. 8249, Netanya 4250473, Israel
Telephone:	+972 9835 4848
Fax:	+972 9865 6262
E-Mail:	golank@Logi-tag.com
Contact name:	Mr. Golan Kormian

4 Test details

Project ID:	25494
Location:	Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started:	7-Apr-14
Test completed:	30-Apr-14
Test specification(s):	FCC 47 CFR Part 15, subpart C, §15.249; RSS-210 issue 8 Annex 2

5 Tests summary

Test	Status
Transmitter characteristics	
FCC Section 15.249(a)(d)/RSS-210, Section A2.9, Field strength of emissions	Pass
FCC Section 15.249(d)/RSS-210, Section A2.9, Band edge emissions	Pass
FCC Section 15.207(a)/RSS-Gen, Section 7.2.4, Conducted emission	Pass
FCC Section 15.203/ RSS-Gen, Section 7.1.2, Antenna requirement	Pass
FCC Section 15.215(c) / RSS-Gen, Section 4.6.1, 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. V. Einem, test engineer	May 9, 2014	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	May 20, 2014	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	November 2, 2014	

6 EUT description

6.1 General information

The EUT, One Channel Exciter, has 2 main functions:
- To generate RF field at 125 kHz. The One Channel Exciter carries a unique number as identifier to the location/area where the RF field is operated.
- To communicate with RFID tags and a Base Station unit

The Exciter is a system which generates the RF field at 125 kHz, when RFID tag is within the range of the field, the tag is awaked and communicates with the Exciter via wireless transmitter at frequency of 433 MHz.
The Exciter communicates with the Base Station unit wireless at UHF frequency (902-928 MHz). The Exciter has an internal 125 kHz antenna, and has option to connect to external LF antenna (Ceiling or Door antenna). Only one antenna can transmit.

The EUT has the following features/ports:

1) The 125 kHz antenna driver outputs, 3 kinds of antennas: integrated, Ceiling and Door;
2) Transceivers
   a) Tx/Rx with a base station in 902-928 MHz (UHF4)
   b) Tx/Rx with a tamper tag at 433 MHz (UHF3)
   c) Tx to tag at 433 MHz (UHF1)
   d) Rx from tag at 433 MHz (UHF2);
3) General use relay;
4) USB ports;
5) Digital input.

According to manufacturer's declaration of identity provided in Appendix G of the test report, both One Channel Exciter, model LTG2-04 and Single Location Unit, model LTG2-04-PRF are electronically/electrically/mechanically identical and have only different design of Led lexan and different cover shape. That is why only model LTG2-04 was tested.
The present test report involves the test results for certification of 902-928 MHz transmitter as a part of a composite application for certification.

6.2 Ports and lines

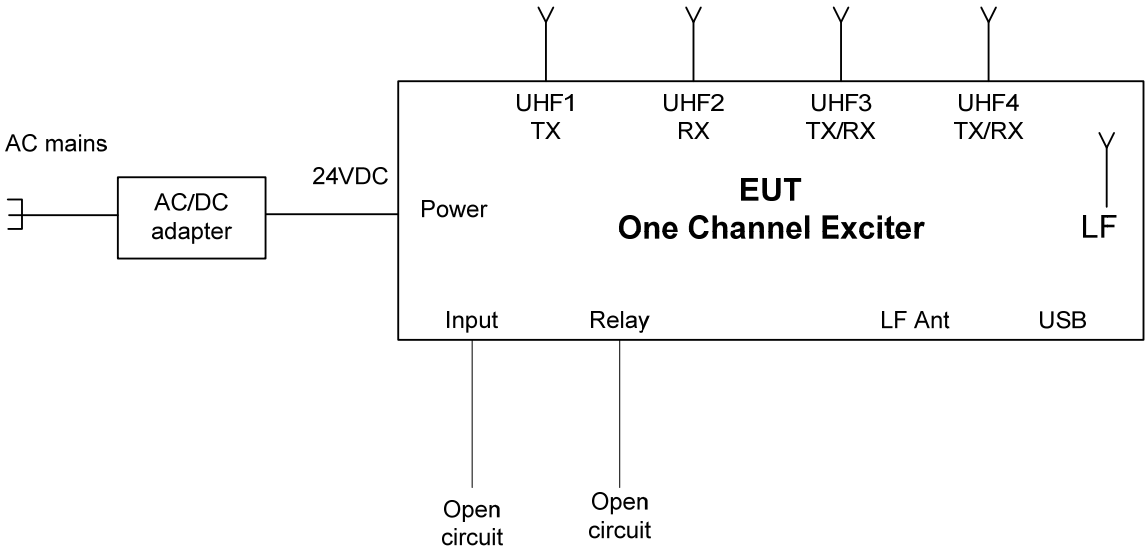
Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length, m
Power	AC power	AC mains	AC/DC adapter	1	Unshielded	1.5
Power	DC	AC/DC adapter	EUT	1	Unshielded	3
Control	Input	EUT	Open circuit	1	Unshielded	3
Control	Relay	EUT	Open circuit	1	Unshielded	3
Control	USB	EUT	No used	1	NA	NA
RF	Antenna	EUT	Antenna	4	NA	NA

6.3 Changes made in the EUT

To withstand the standard requirements the following changes were implemented in the EUT:
1) an inductor of 68 μH was installed instead of L4;
2) a 10 μF/50 V capacitor was added between pins of J5;
3) a 1nF/250 V capacitor was added between the following pins:
   - J8 pin 1 to J1 pin 2
   - J8 pin 2 to J1 pin 2
   - between pins of J1;
4) capacitors C150=1 μF/25 V, C141=1 nF/50 V
5) a toroid p/n 5975004901 with 2x10 turns was connected between J5 and D13.

It is manufacturer responsibility to implement the change in the production version of the EUT. In any case the test report applies to the tested item only.

6.4 Test configuration



6.5 Transmitter characteristics

Type of equipment							
V	Stand-alone (Equipment with or without its own control provisions)						
	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)						
Assigned frequency range	902 - 928 MHz						
Operating frequency range	902.928 – 926.925 MHz						
Maximum field strength	94 dB(µV/m) at 3 m test distance						
Is transmitter output power variable?	**V**	No					
		Yes		continuous variable			
				stepped variable with stepsize, software controlled	dB		
				Maximum field strength	94 dB(µV/m) at 3 m test distance		
Antenna connection							
unique coupling	**V**	standard connector	Integral	**V**	with temporary RF connector		
					without temporary RF connector		

Antenna/s technical characteristics			
Type	Manufacturer	Model number	Gain
External	LINX	ANT-916-CW-HWR-SMA	1.9 dBi

Transmitter aggregate data rate/s	160 kbps						
Type of modulation	GFSK						
Transmitter duty cycle supplied for test	100%						
Transmitter power source							
	Battery	**Nominal rated voltage**		Battery type			
V	DC	**Nominal rated voltage**	24 VDC via AC/DC adapter				
	AC mains	**Nominal rated voltage**		Frequency			
Common power source for transmitter and receiver				**V** yes		no	

Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

7 Transmitter tests according to 47CFR part 15 subpart C and RSS-210 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
902 – 928	NA	NA	94

Table 7.1.2 Harmonics limits

Fundamental frequency, MHz	Field strength at 3 m, dB(μV/m)	
	Peak	Average
902 – 928	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:

$$Lim_{S2} = Lim_{S1} + 40 \log (S_1/S_2),$$

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)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

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 360^0 and the measuring antenna was rotated around its vertical axis.

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

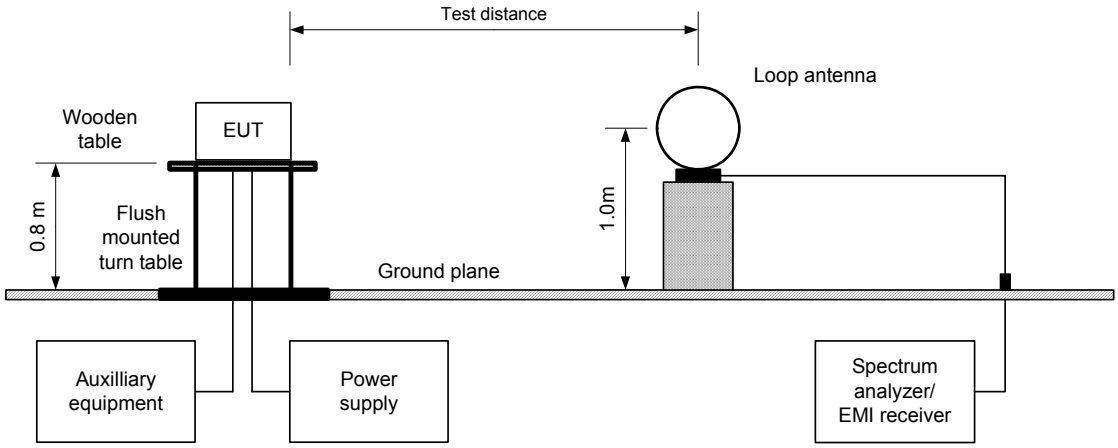
7.1.4 Test procedure for spurious emission field strength measurements above 30 MHz

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 360^0, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

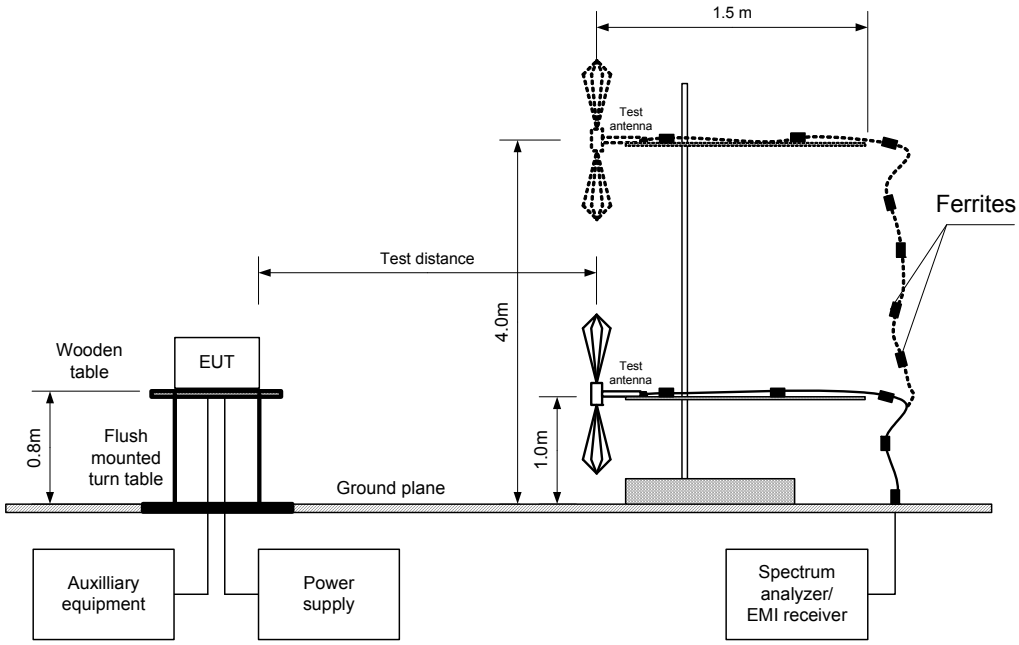
7.1.4.3 The worst test results (the lowest margins) were recorded in the associated tables and shown in the associated plots

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



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

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



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

Table 7.1.4 Field strength of fundamental emission and spurious emissions

TEST DISTANCE:	3 m
EUT POSITION:	Vertical and Horizontal
MODULATION:	GFSK
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
INVESTIGATED FREQUENCY RANGE:	0.009 – 9500 MHz
DETECTOR USED:	Peak, Quasi-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

Frequency, MHz	Antenna		Azimuth, degrees*	Peak emission, dB(μV/m)	Quasi-peak			Verdict
	Pol.	Height, m			Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
902.930	H	1.0	270	94.20	93.8	94	-0.2	Pass
914.928	H	1.0	270	94.31	94.0	94	0	Pass
926.925	H	1.0	270	91.66	91.4	94	-2.6	Pass

Spurious emissions

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**		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
1805.94	V	1.0	20	39.2	74	-34.80	NA	32.28	54	-21.72	Pass
3611.71	H	1.0	350	44.77	74	-29.23	NA	38.82	54	-15.18	
5417.56	V	1.0	20	50.06	74	-23.94	NA	45.27	54	-8.73	
6320.39	V	1.1	30	48.94	74	-25.06	NA	41.98	54	-12.02	
1829.87	V	1.0	30	40.53	74	-33.47	NA	35.54	54	-18.46	
3659.70	H	1.0	345	45.72	74	-28.28	NA	39.73	54	-14.27	
5489.55	V	1.0	22	49.81	74	-24.19	NA	44.23	54	-9.77	
6404.41	V	1.1	25	48.16	74	-25.84	NA	40.65	54	-13.35	
1853.81	V	1.0	30	38.67	74	-35.33	NA	31.46	54	-22.54	
3707.80	H	1.0	340	44.83	74	-29.17	NA	38.73	54	-15.27	
5561.53	V	1.0	10	50.2	74	-23.80	NA	45.13	54	-8.87	
6488.45	V	1.2	50	47.55	74	-26.45	NA	41.12	54	-12.88	

*- EUT front panel refers to 0 degrees position of turntable.
**- Margin, dB =Measured (calculated) value, dB(μV/m)-Limit, dB(μV/m).

Reference numbers of test equipment used

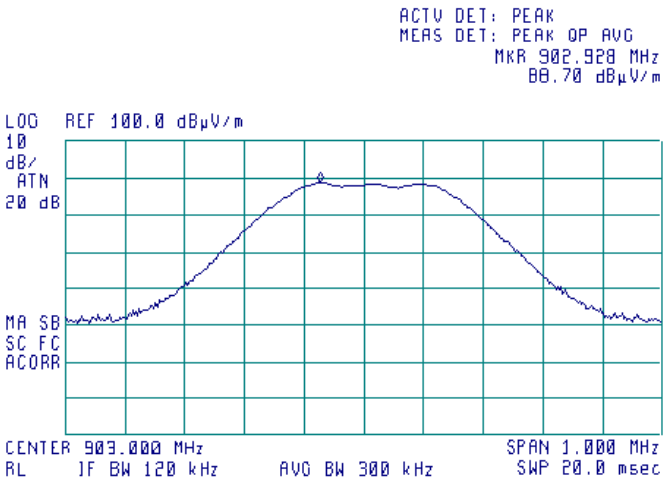
HL 0446	HL 0604	HL 1984	HL 2780	HL 2871	HL 4160	HL 4353	

Full description is given in Appendix A.

Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

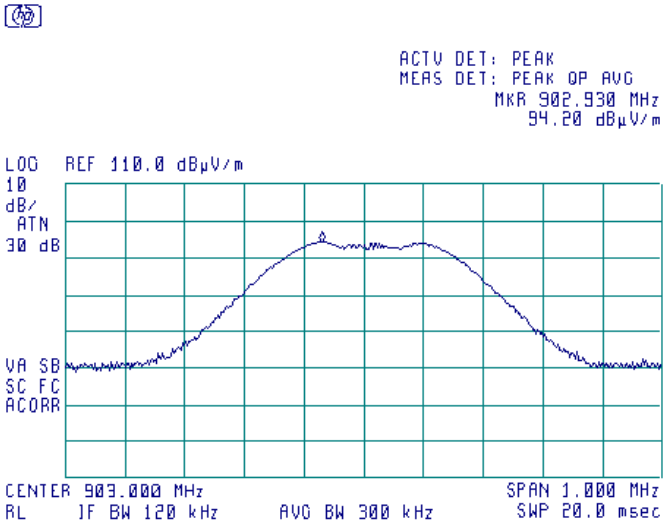
Plot 7.1.1 Radiated emission measurements at the low fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Horizontal



Plot 7.1.2 Radiated emission measurements at the low fundamental frequency

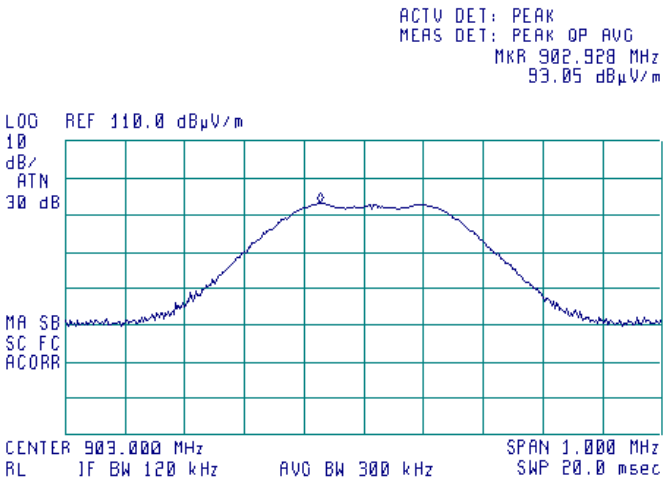
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

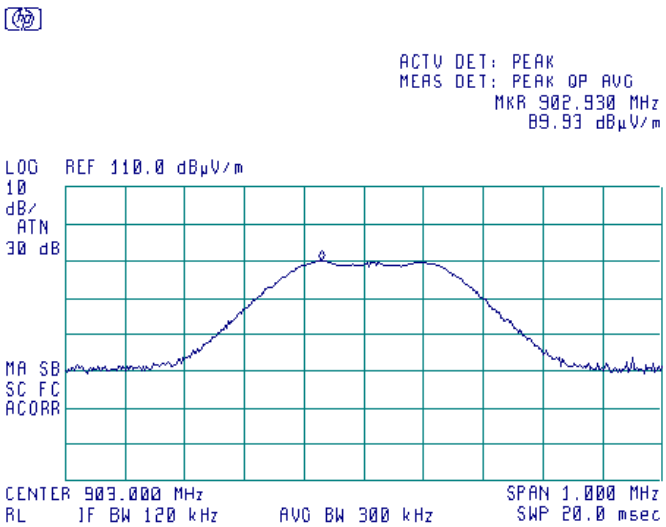
Plot 7.1.3 Radiated emission measurements at the low fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Vertical



Plot 7.1.4 Radiated emission measurements at the low fundamental frequency

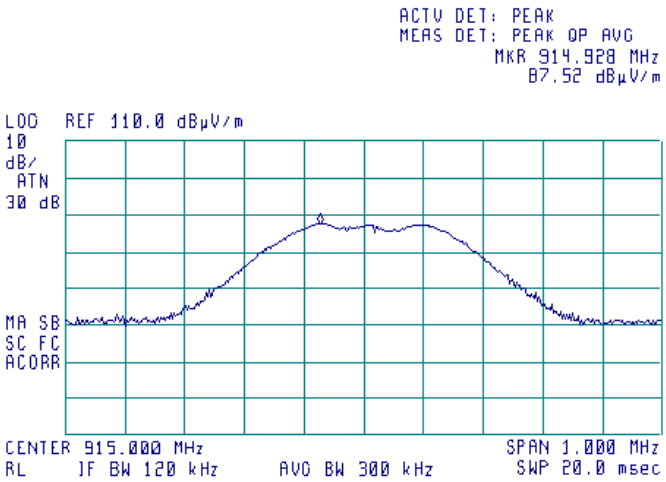
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Vertical



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

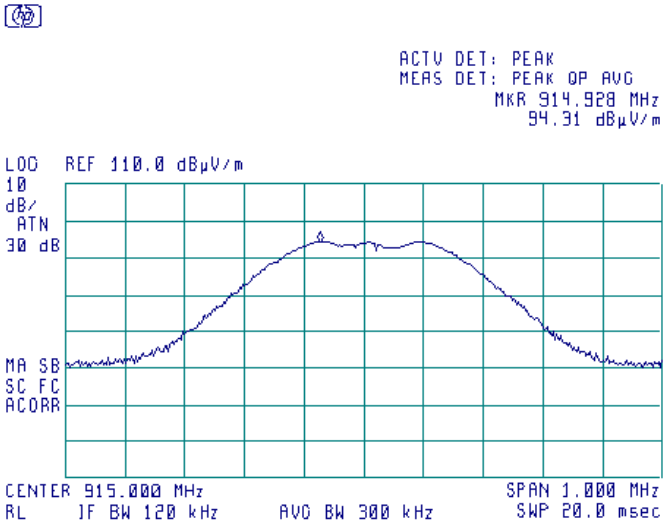
Plot 7.1.5 Radiated emission measurements at the mid fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Horizontal



Plot 7.1.6 Radiated emission measurements at the mid fundamental frequency

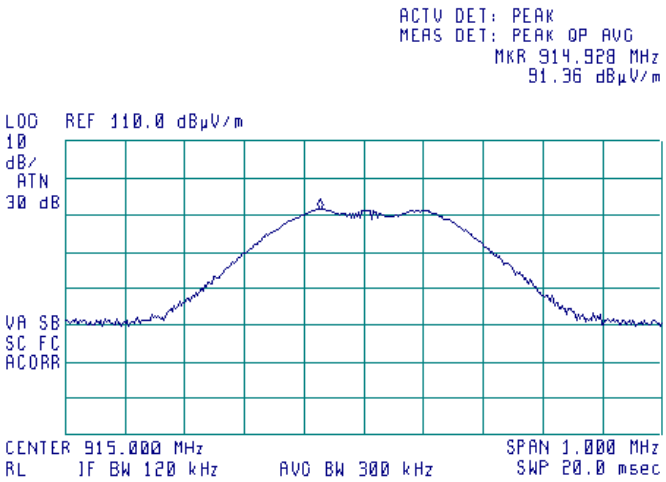
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

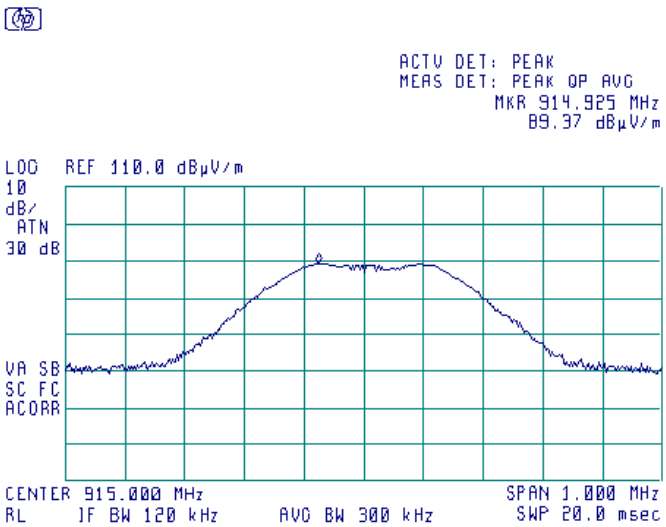
Plot 7.1.7 Radiated emission measurements at the mid fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Vertical



Plot 7.1.8 Radiated emission measurements at the mid fundamental frequency

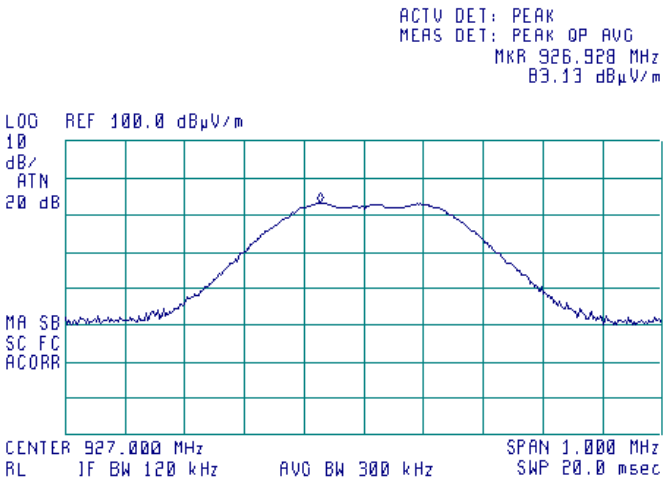
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Vertical



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

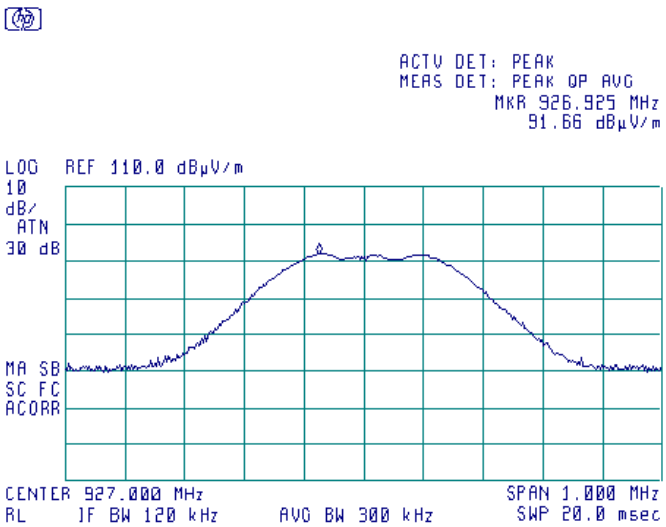
Plot 7.1.9 Radiated emission measurements at the high fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Horizontal



Plot 7.1.10 Radiated emission measurements at the high fundamental frequency

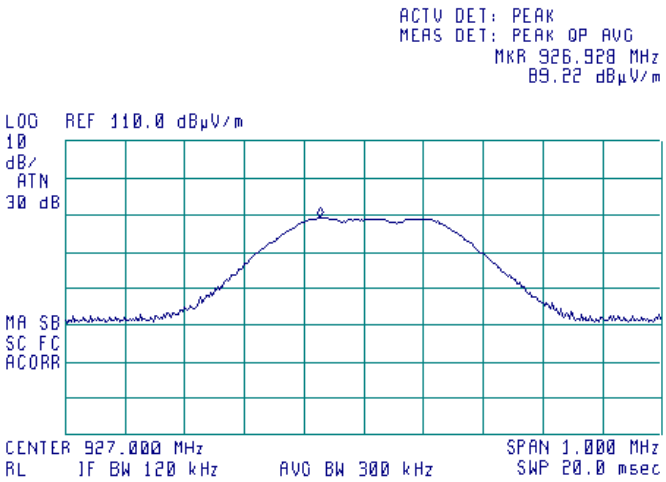
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

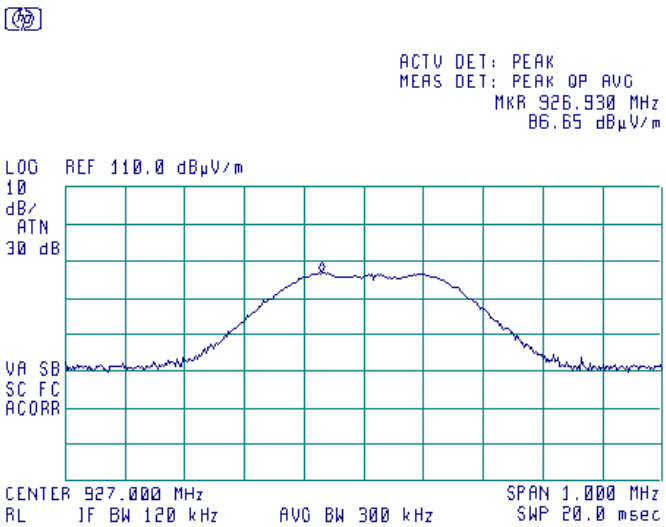
Plot 7.1.11 Radiated emission measurements at the high fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Vertical



Plot 7.1.12 Radiated emission measurements at the high fundamental frequency

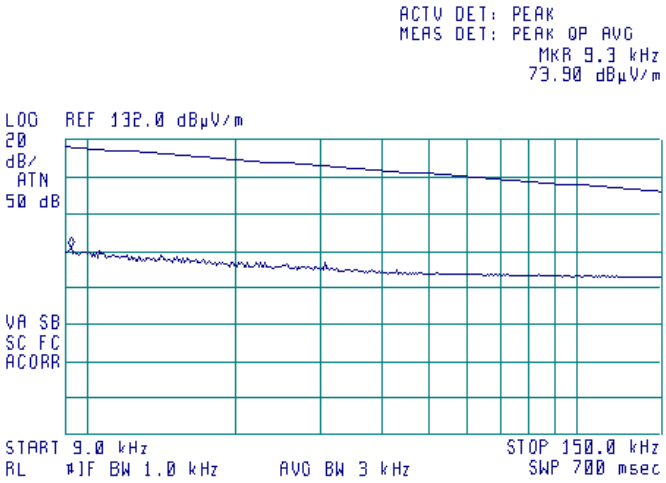
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Vertical



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

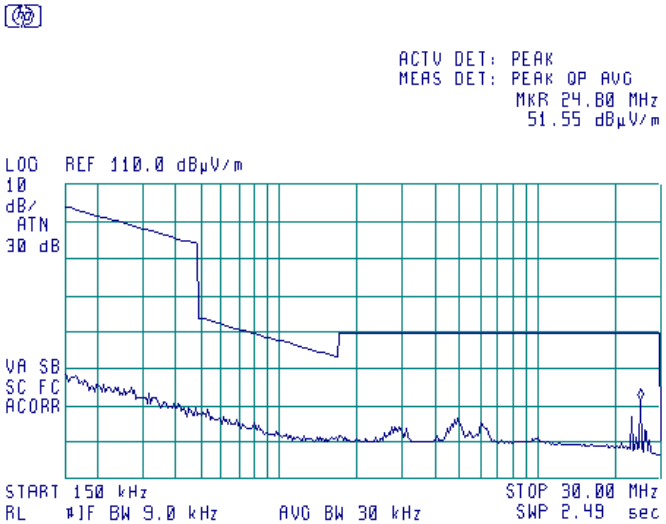
Plot 7.1.13 Radiated emission measurements from 9 to 150 kHz at low, mid, high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.1.14 Radiated emission measurements from 150 to 30 MHz at low, mid, high frequency

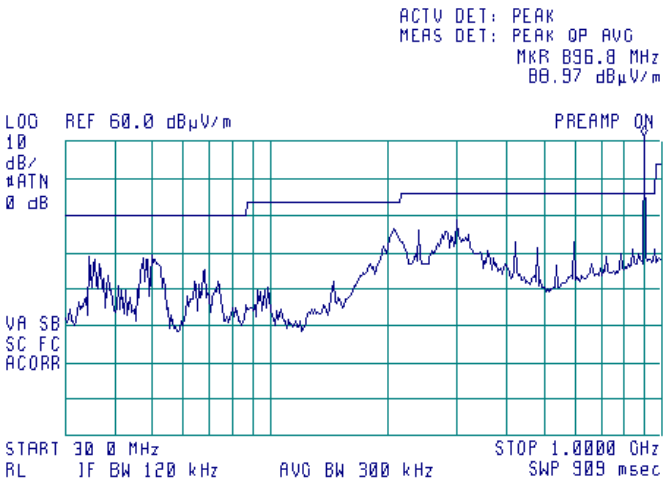
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

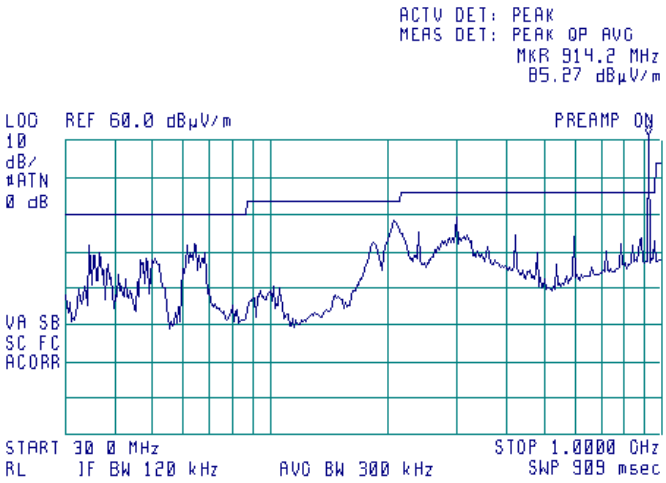
Plot 7.1.15 Radiated emission measurements from 30 to 1000 MHz at low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Vertical and Horizontal



Plot 7.1.16 Radiated emission measurements from 30 to 1000 MHz at mid frequency

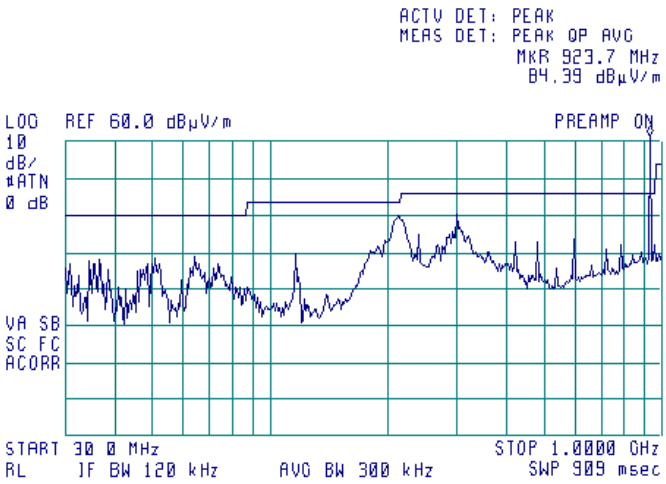
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Vertical and Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

Plot 7.1.17 Radiated emission measurements from 30 to 1000 MHz at high frequency

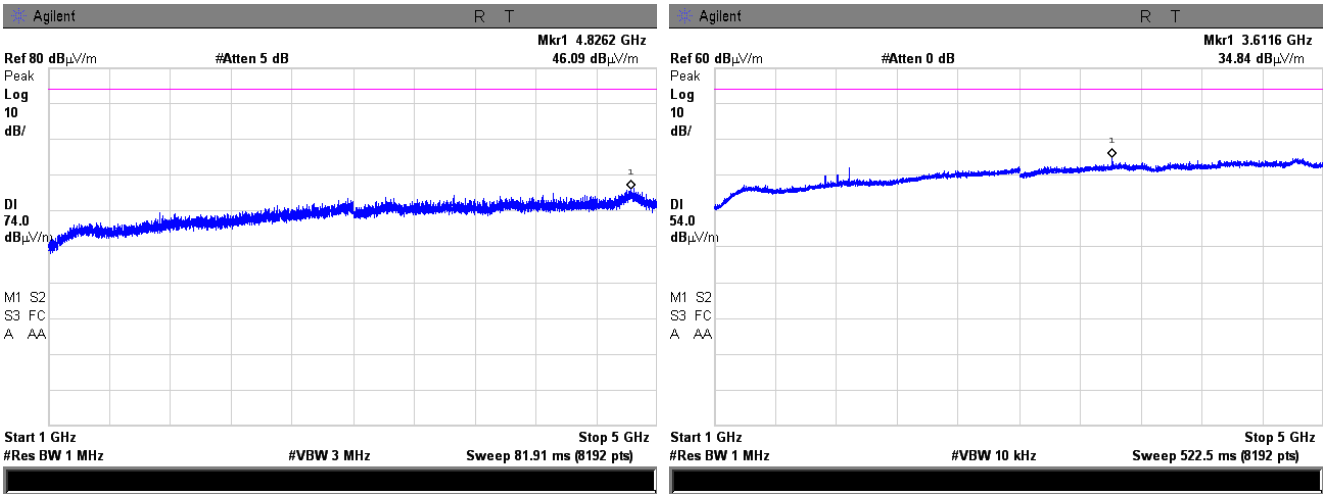
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
EUT POSITION:	Vertical and Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

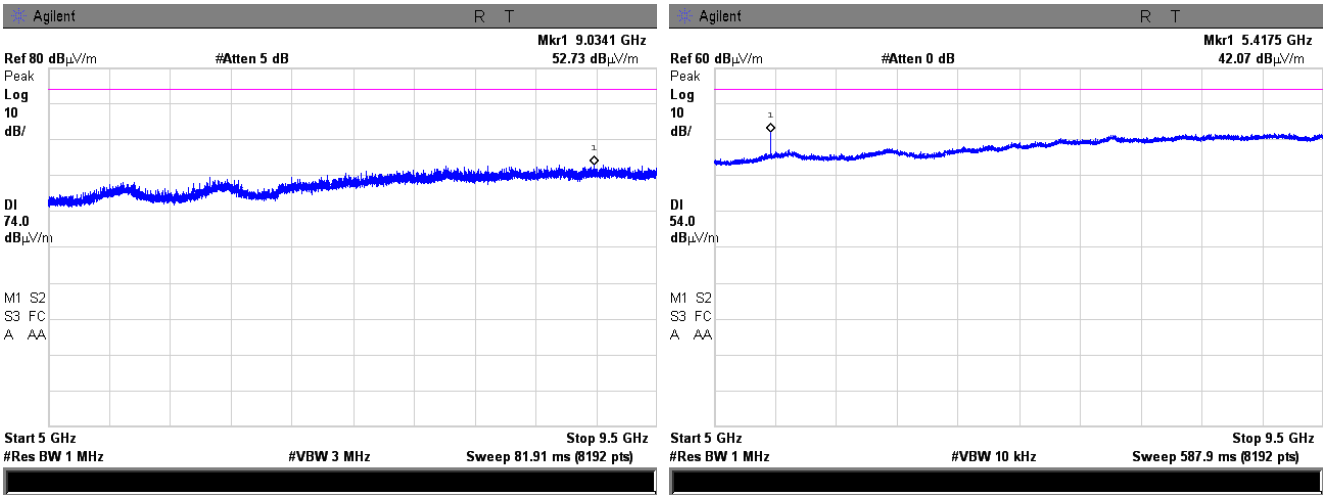
Plot 7.1.18 Radiated emission measurements from 1.0 to 5 MHz at low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Vertical and Horizontal



Plot 7.1.19 Radiated emission measurements from 5 to 9.5 GHz at low frequency

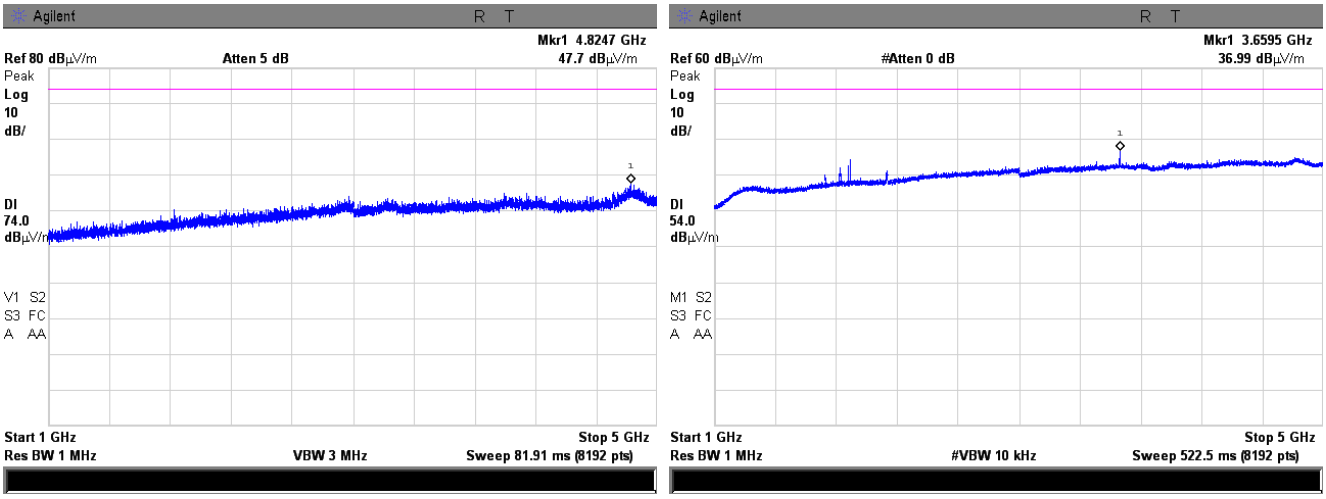
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Vertical and Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

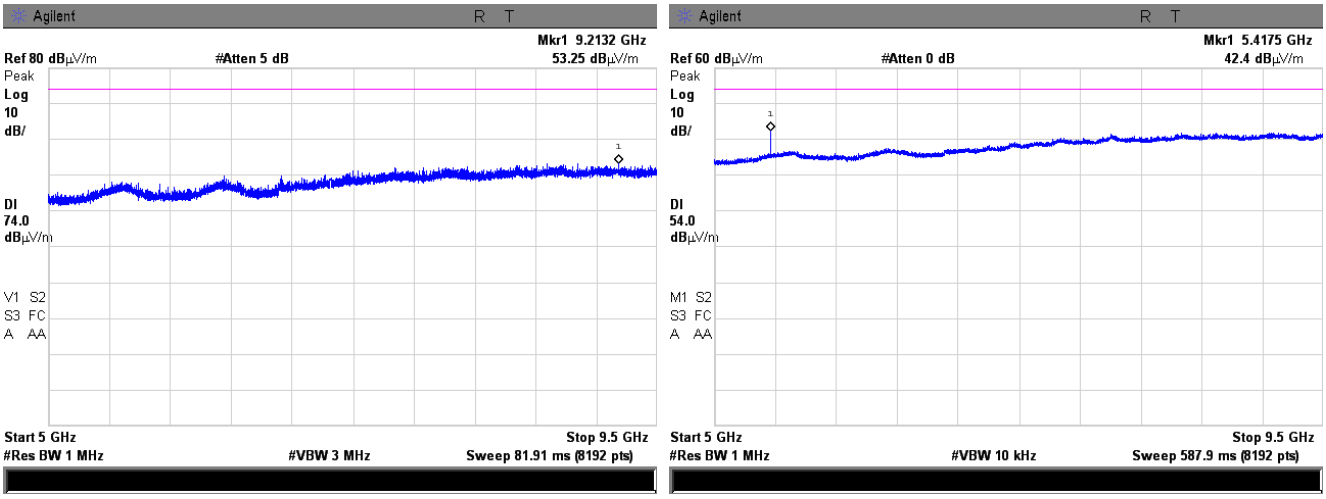
Plot 7.1.20 Radiated emission measurements from 1.0 to 5 MHz at mid frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Vertical and Horizontal



Plot 7.1.21 Radiated emission measurements from 5 to 9.5 GHz at mid frequency

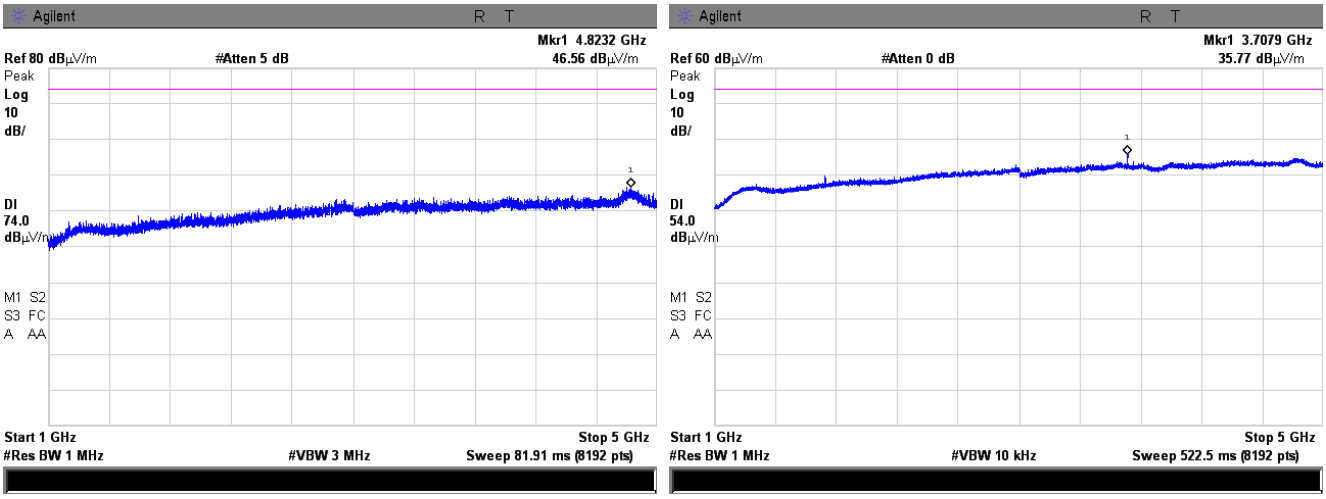
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Vertical and Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

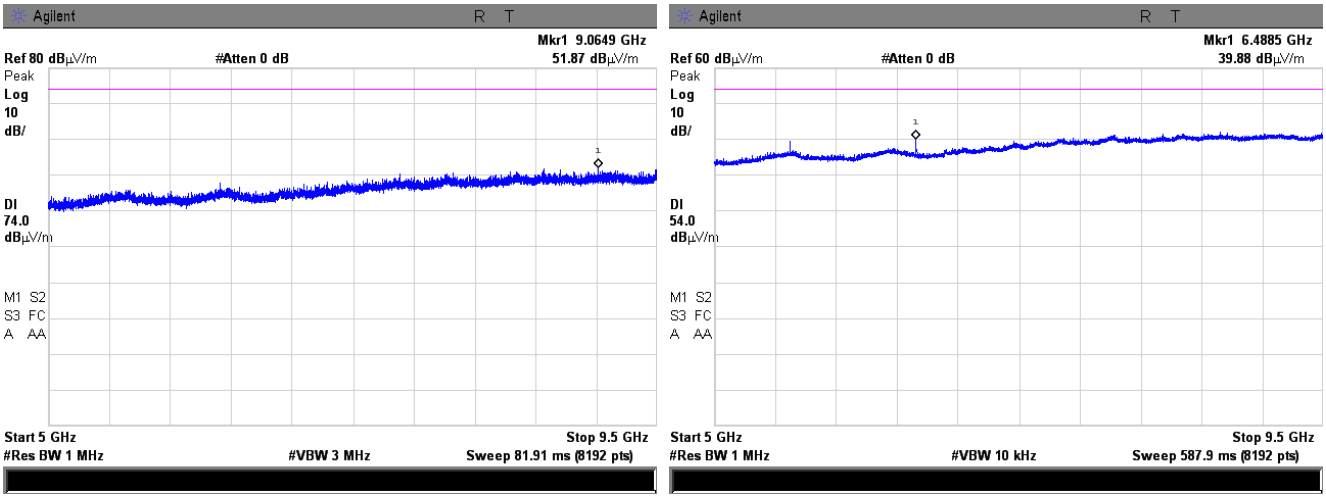
Plot 7.1.22 Radiated emission measurements from 1.0 to 5 MHz at high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Vertical and Horizontal



Plot 7.1.23 Radiated emission measurements from 5 to 9.5 GHz at high frequency

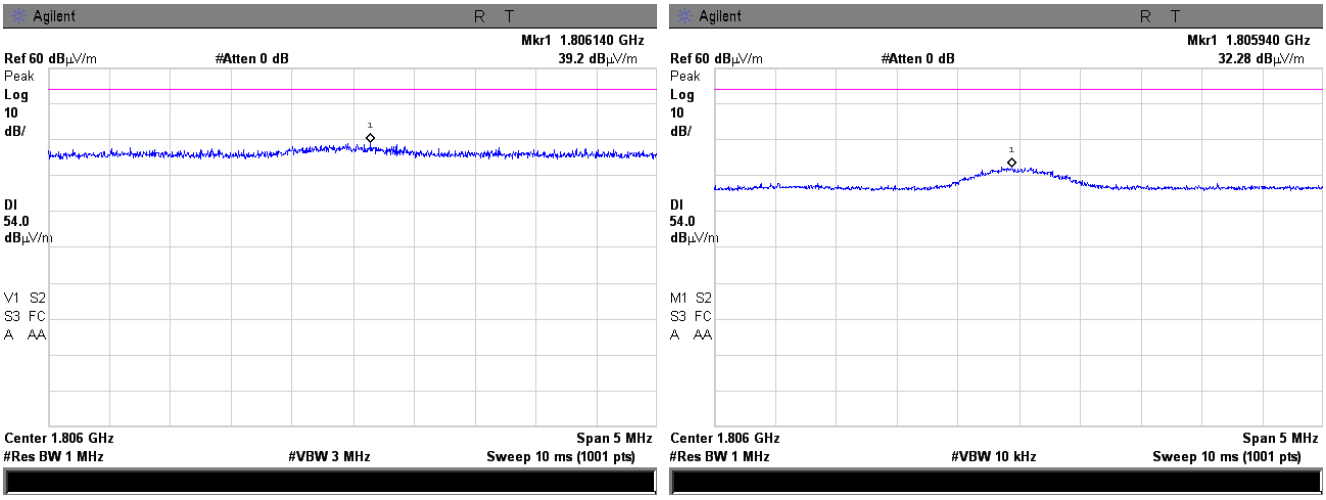
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Vertical and Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

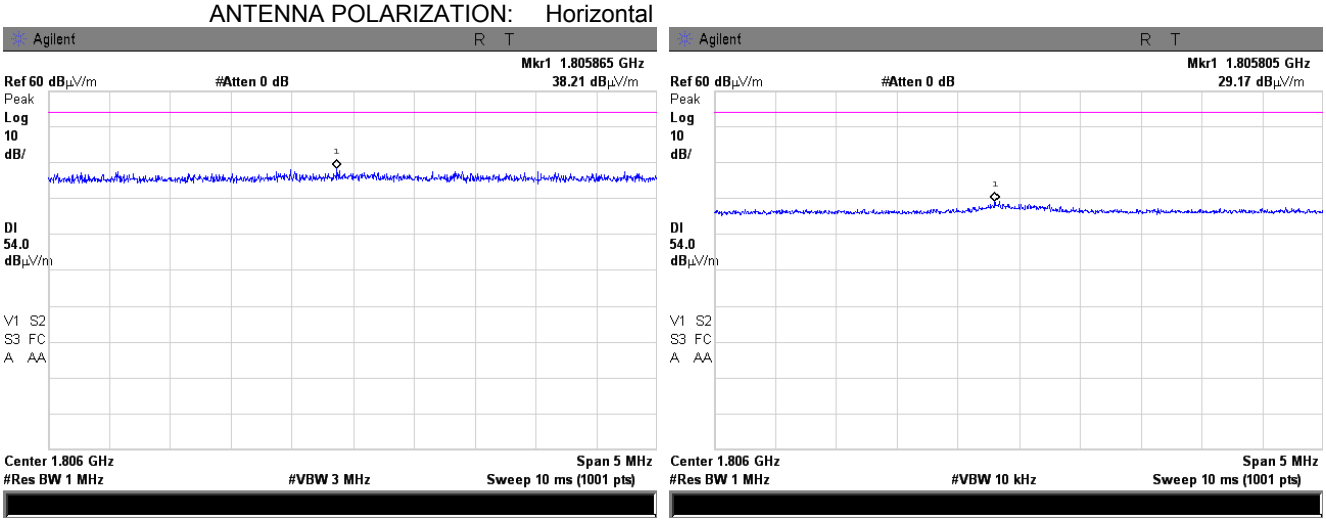
Plot 7.1.24 Radiated emission measurements at the second harmonic frequency at low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.1.25 Radiated emission measurements at the second harmonic frequency at low frequency

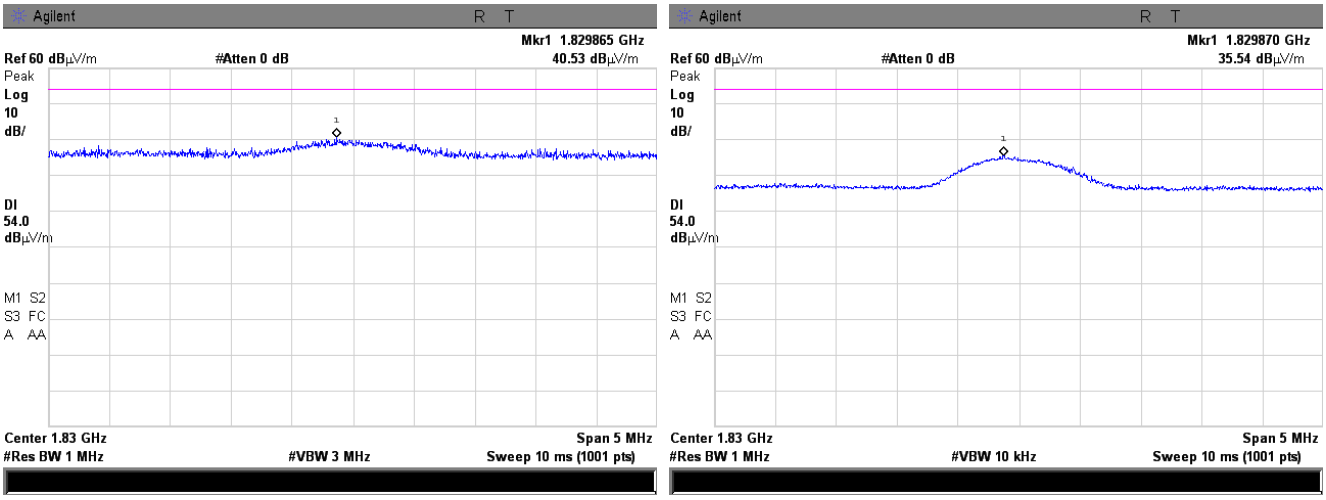
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

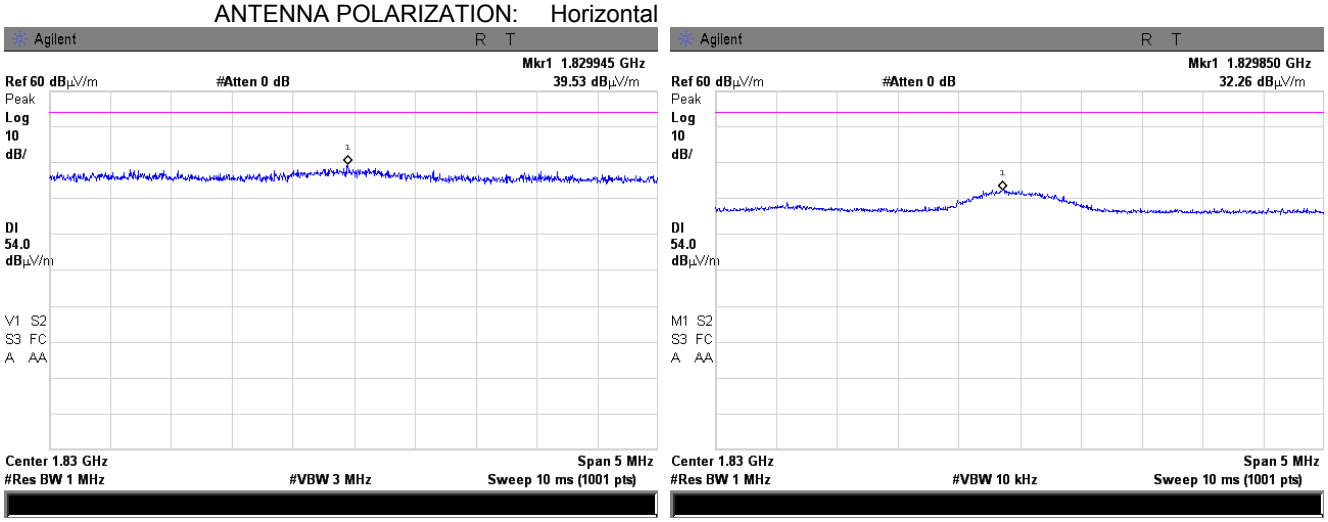
Plot 7.1.26 Radiated emission measurements at the second harmonic frequency at mid frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.1.27 Radiated emission measurements at the second harmonic frequency at mid frequency

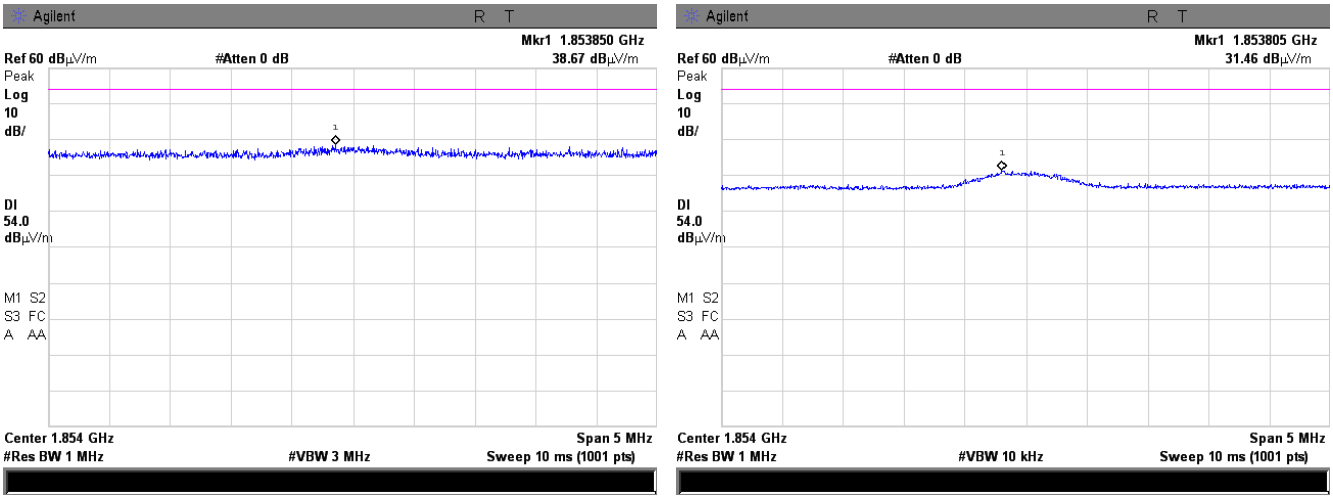
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

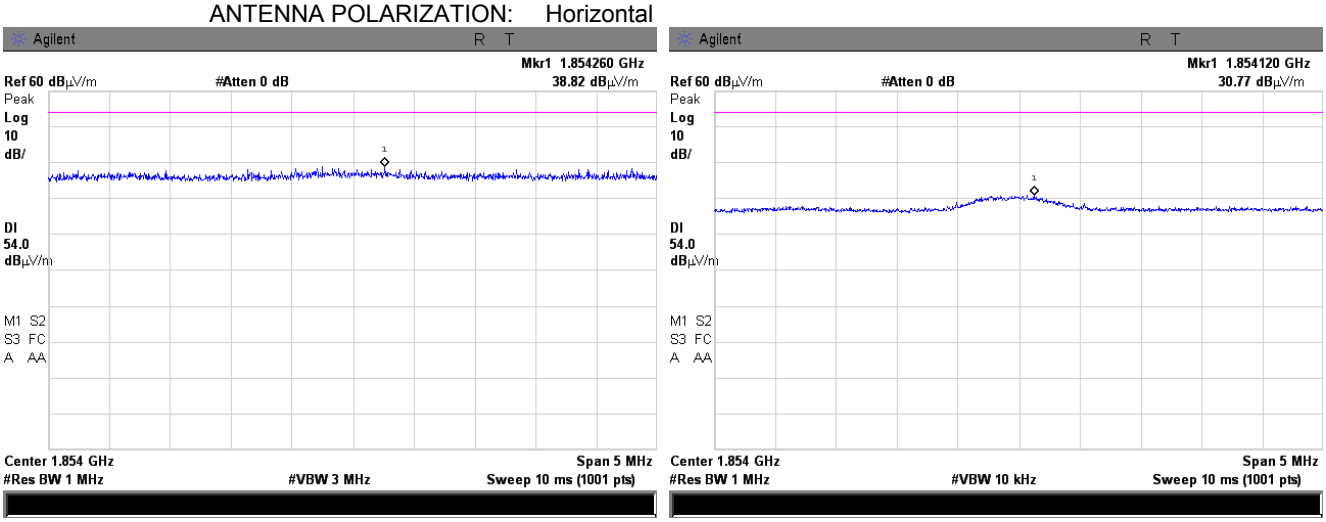
Plot 7.1.28 Radiated emission measurements at the second harmonic frequency at high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.1.29 Radiated emission measurements at the second harmonic frequency at high frequency

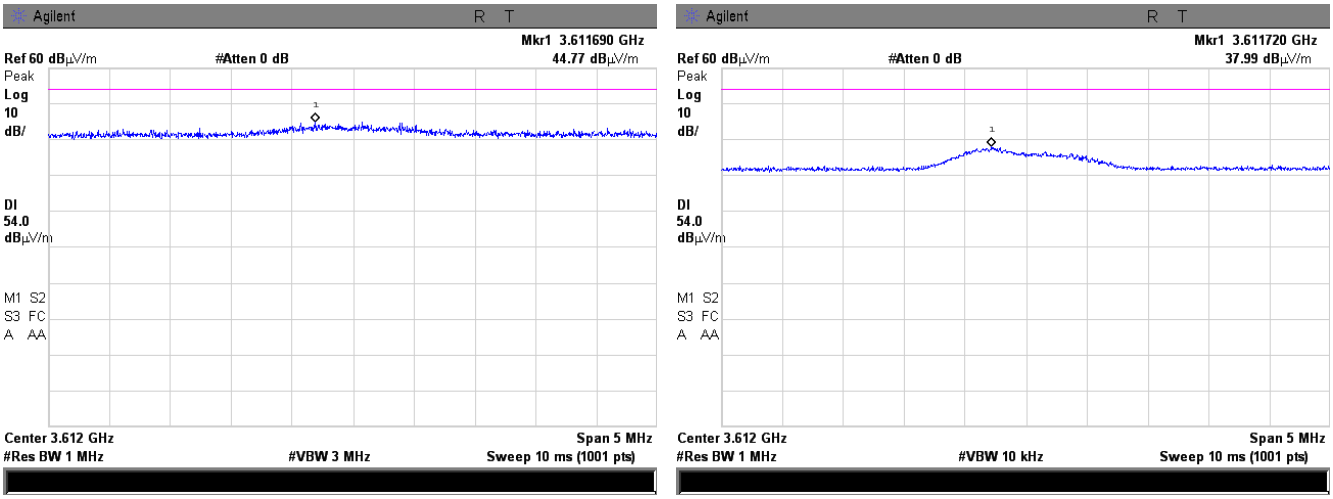
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

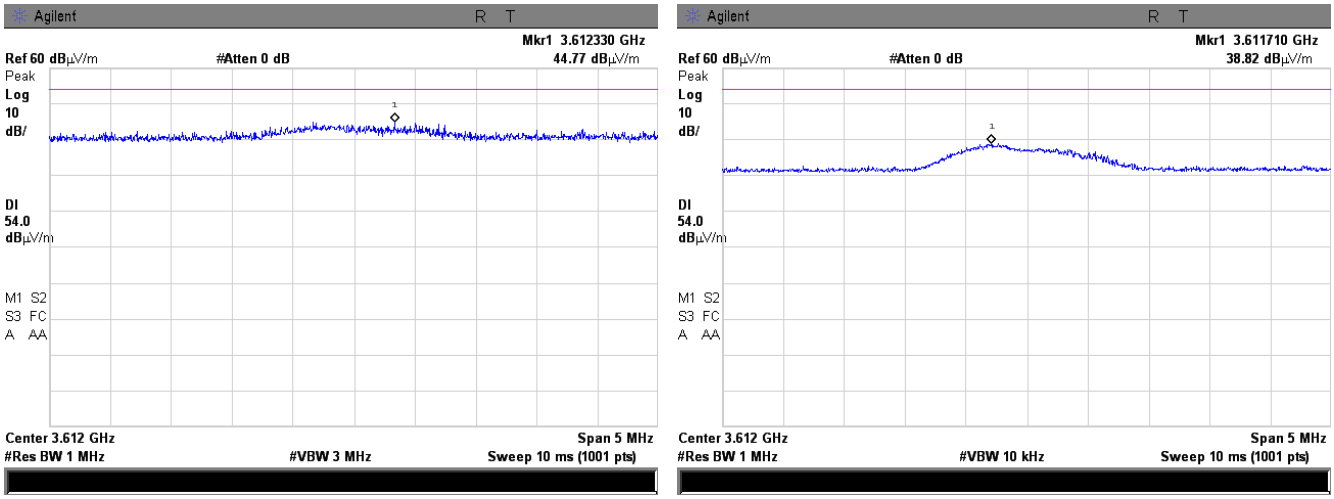
Plot 7.1.30 Radiated emission measurements at the fourth harmonic frequency at low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.1.31 Radiated emission measurements at the fourth harmonic frequency at low frequency

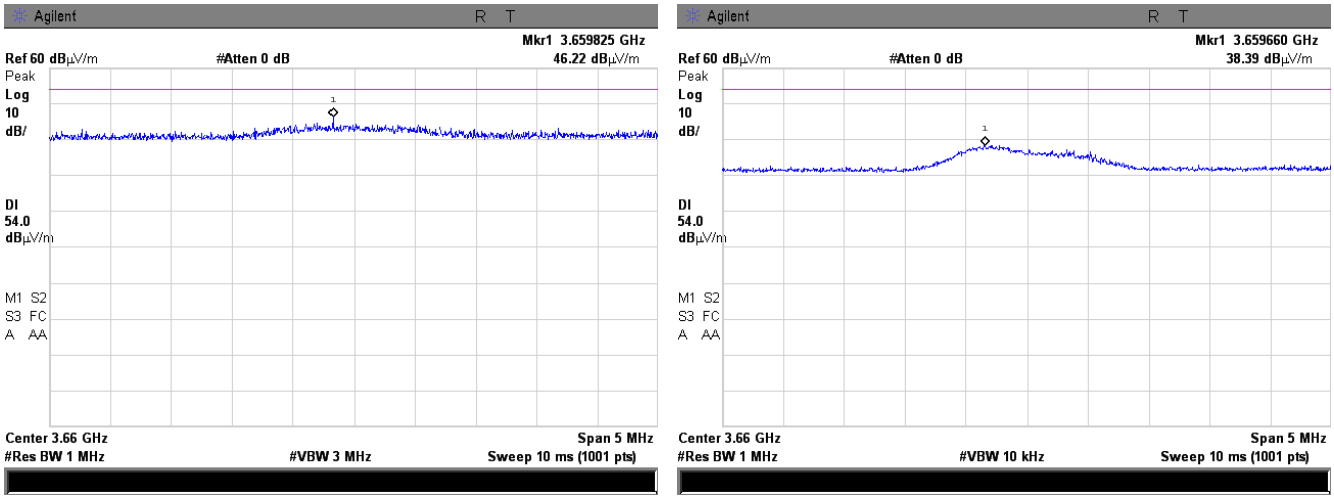
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

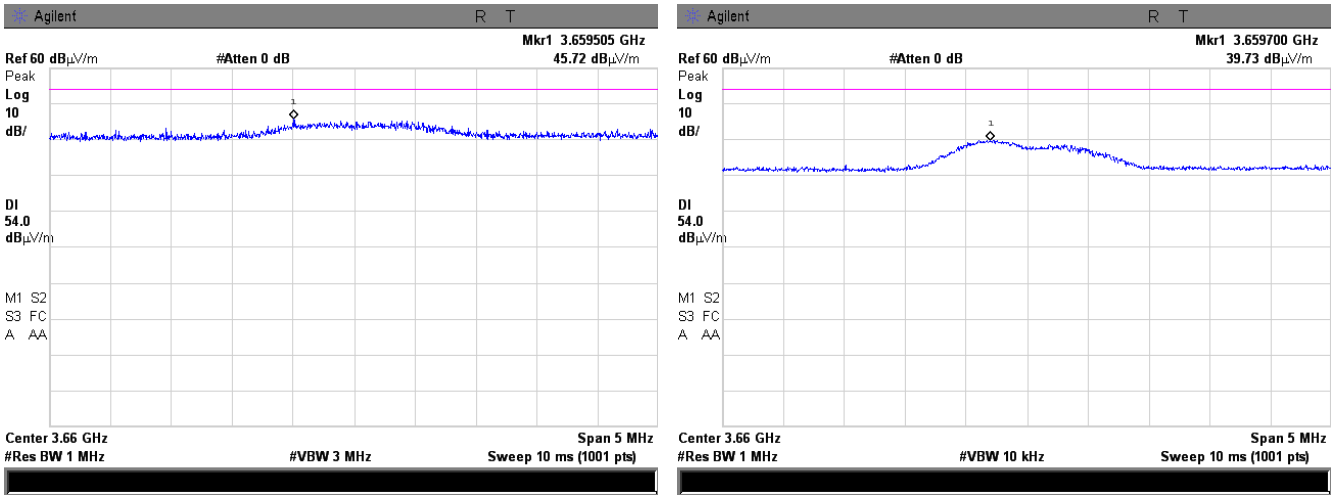
Plot 7.1.32 Radiated emission measurements at the fourth harmonic frequency at mid frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.1.33 Radiated emission measurements at the fourth harmonic frequency at mid frequency

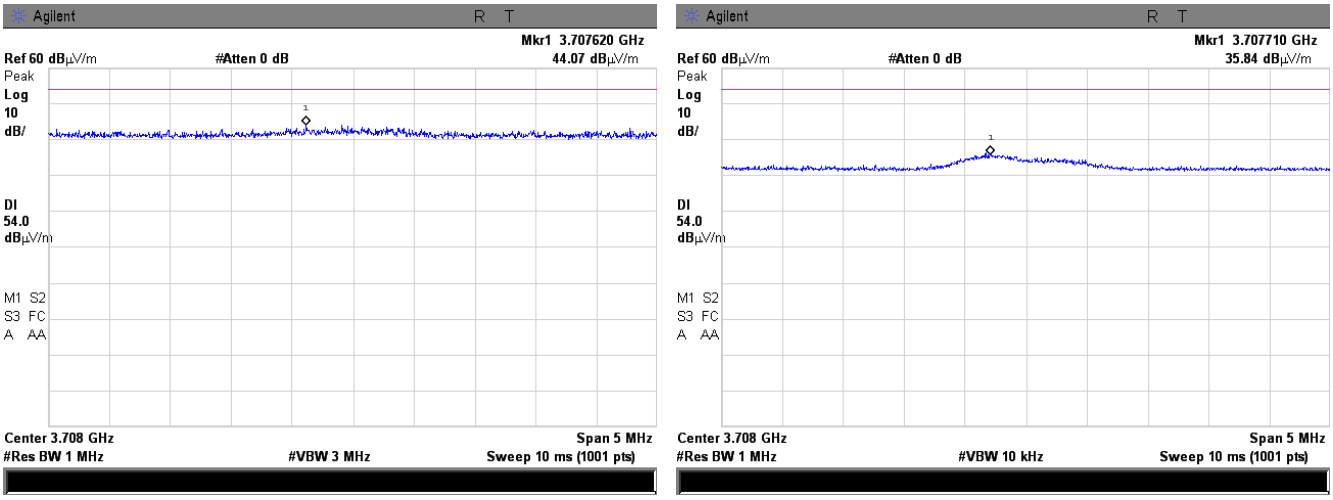
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

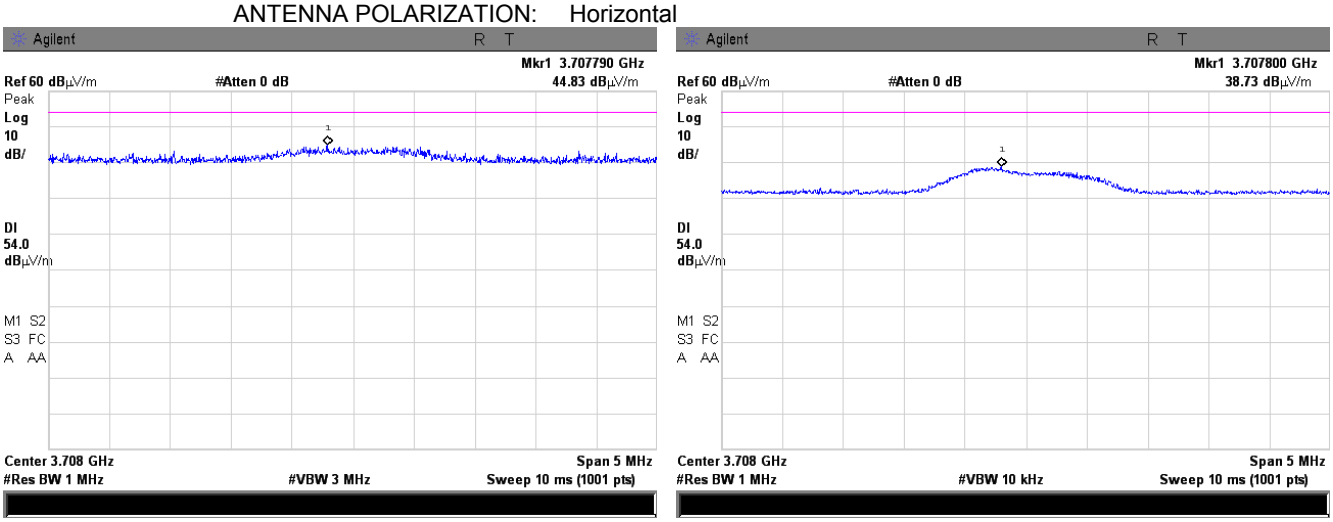
Plot 7.1.34 Radiated emission measurements at the fourth harmonic frequency at high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.1.35 Radiated emission measurements at the fourth harmonic frequency at high frequency

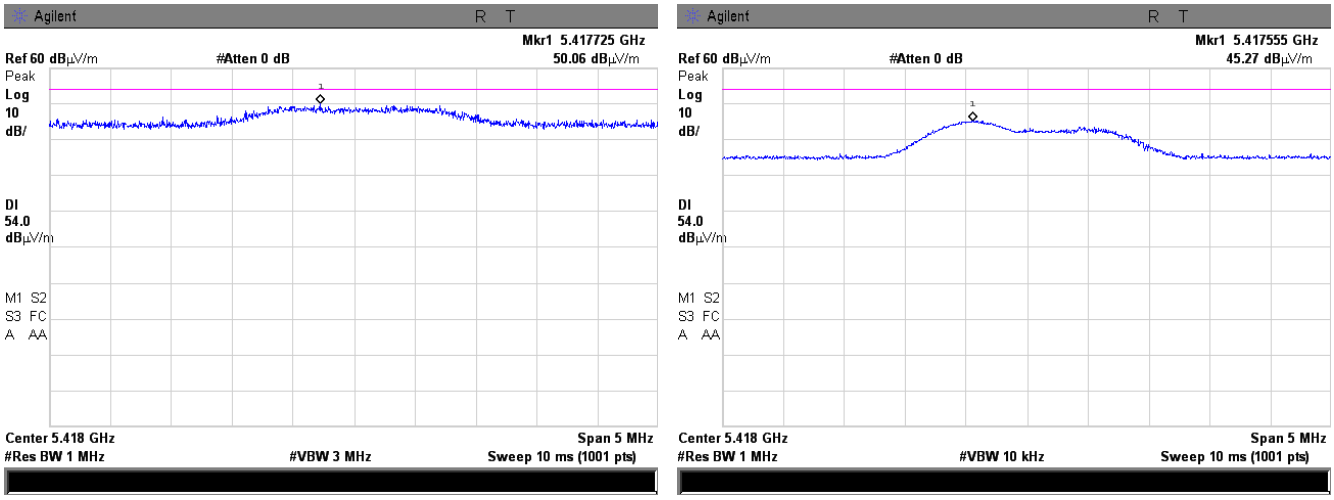
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

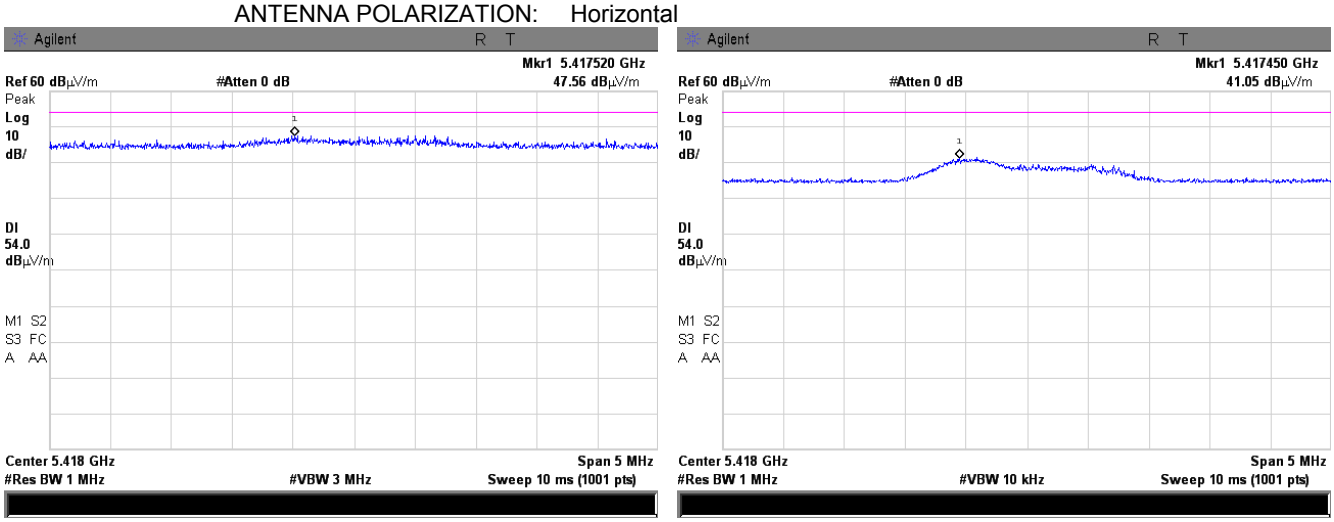
Plot 7.1.36 Radiated emission measurements at the sixth harmonic at low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.1.37 Radiated emission measurements at the sixth harmonic at low frequency

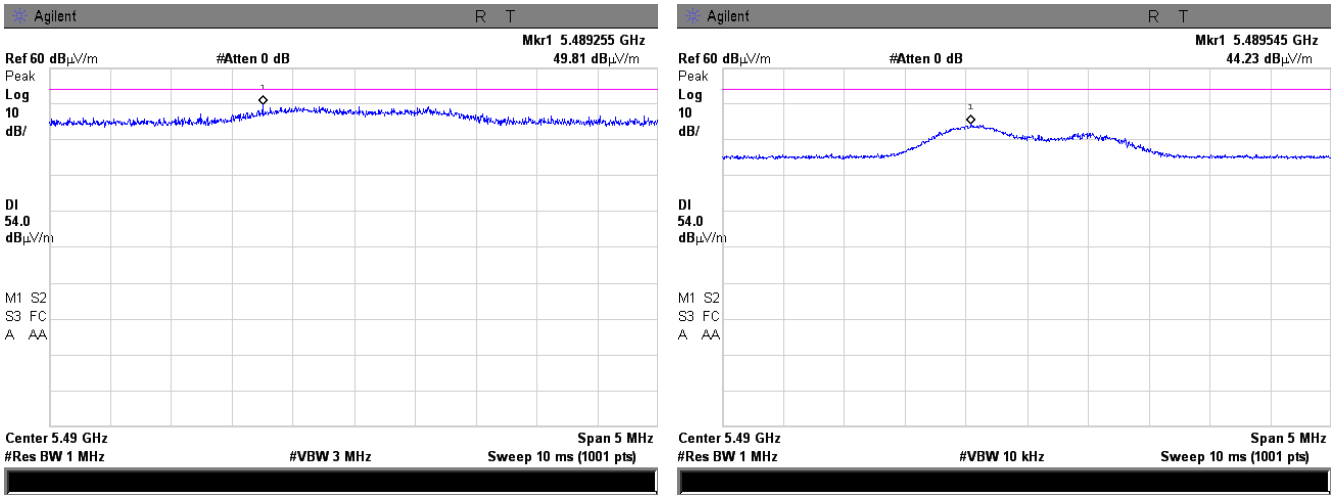
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

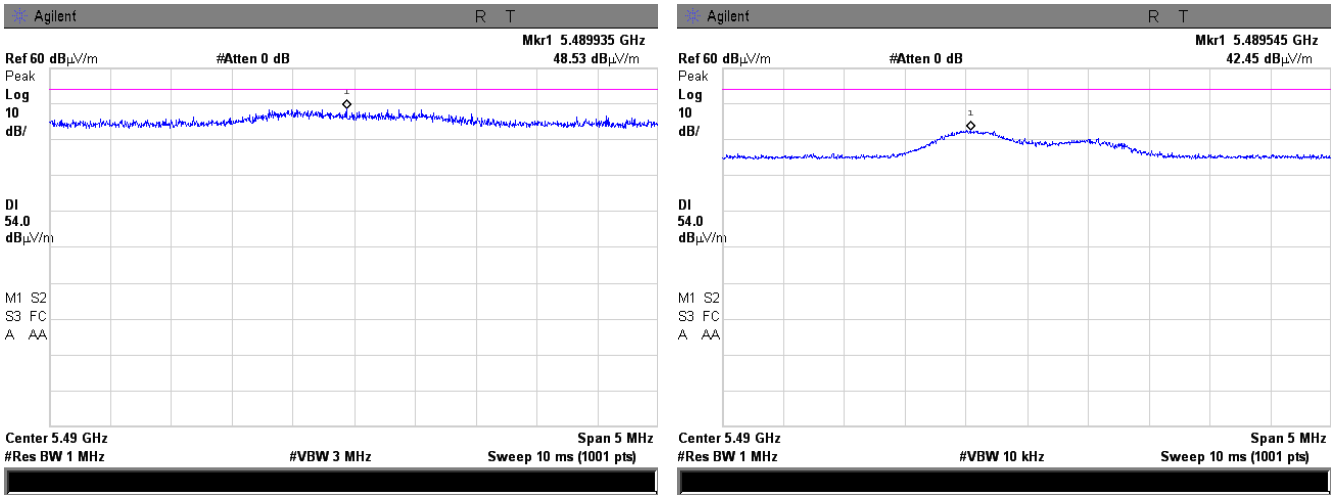
Plot 7.1.38 Radiated emission measurements at the sixth harmonic at mid frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.1.39 Radiated emission measurements at the sixth harmonic at mid frequency

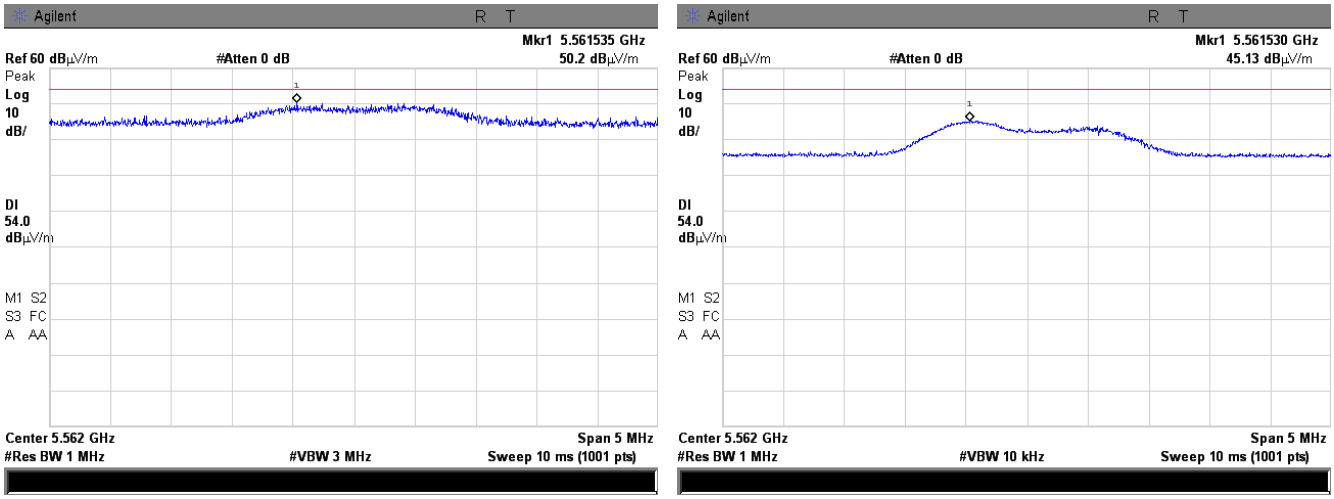
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

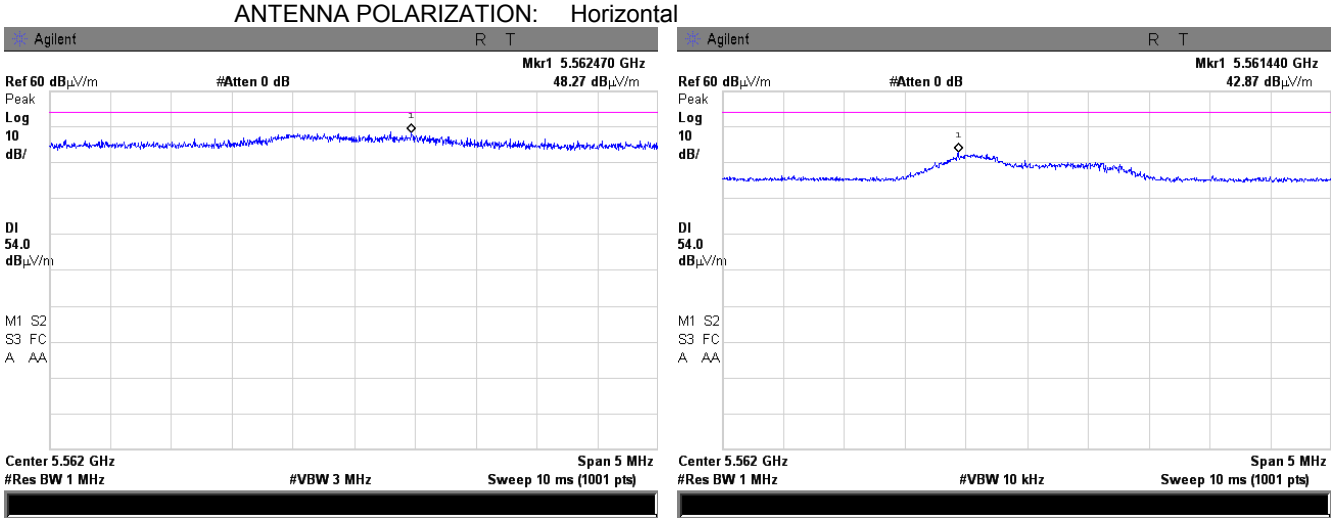
Plot 7.1.40 Radiated emission measurements at the sixth harmonic at high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.1.41 Radiated emission measurements at the sixth harmonic at high frequency

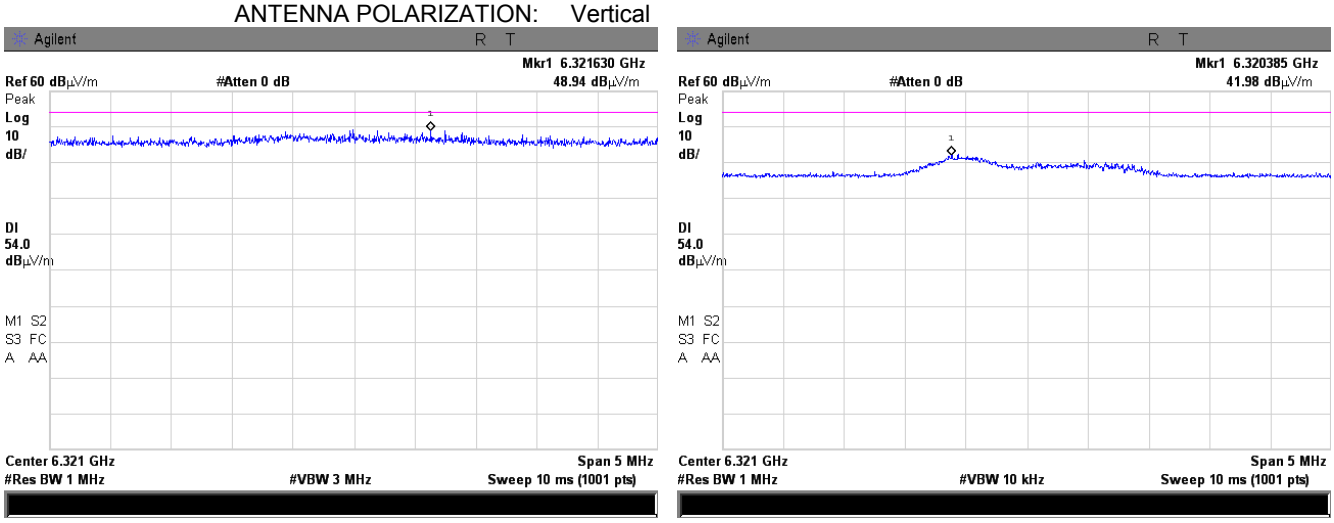
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

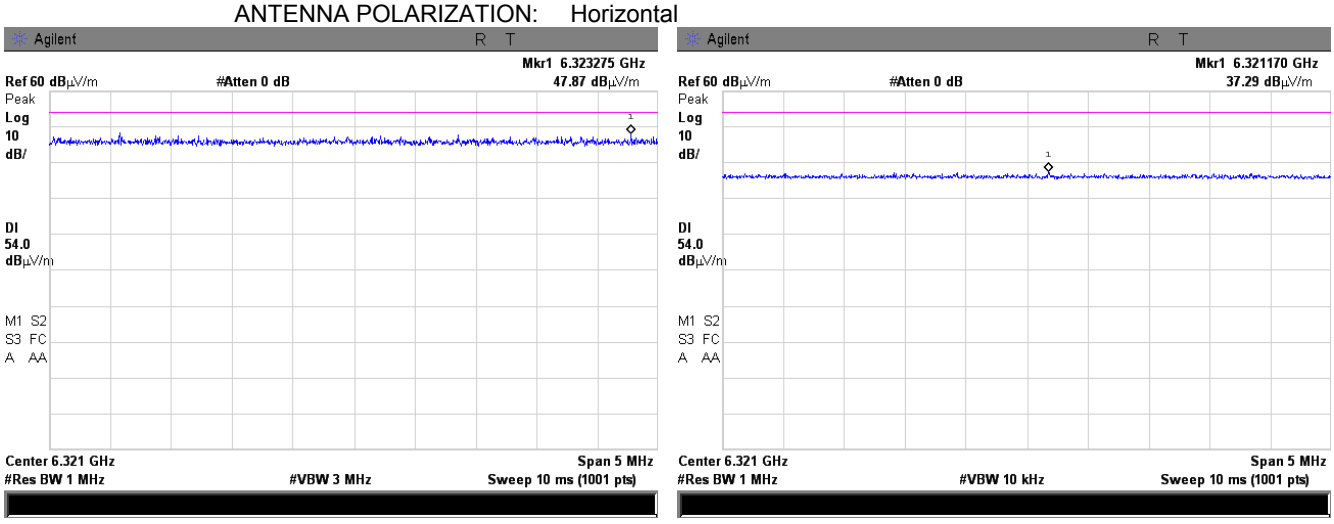
Plot 7.1.42 Radiated emission measurements at the seventh harmonic at low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.1.43 Radiated emission measurements at the seventh harmonic at low frequency

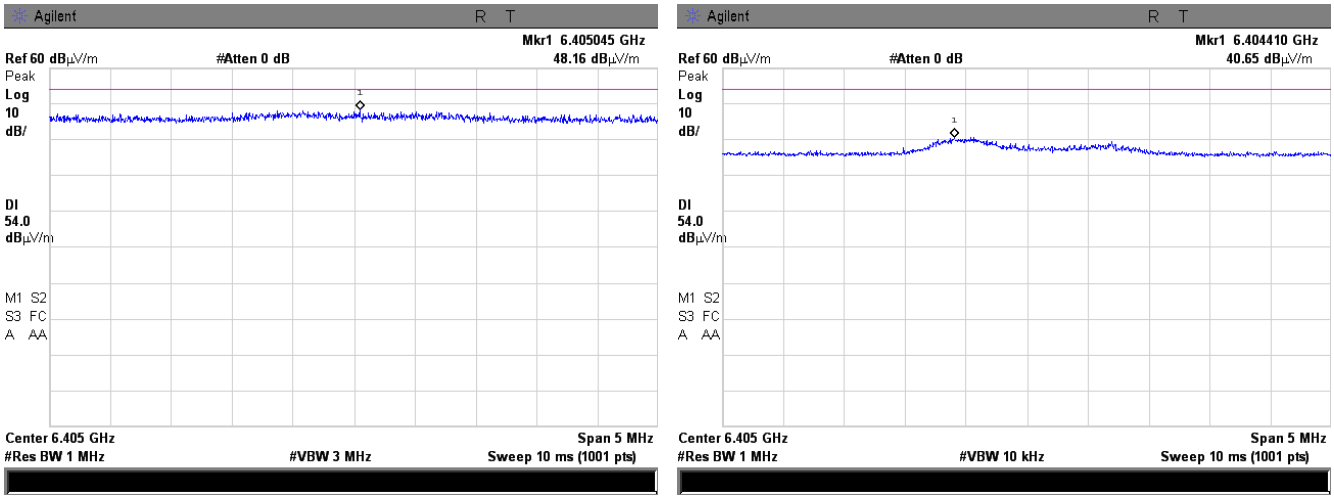
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

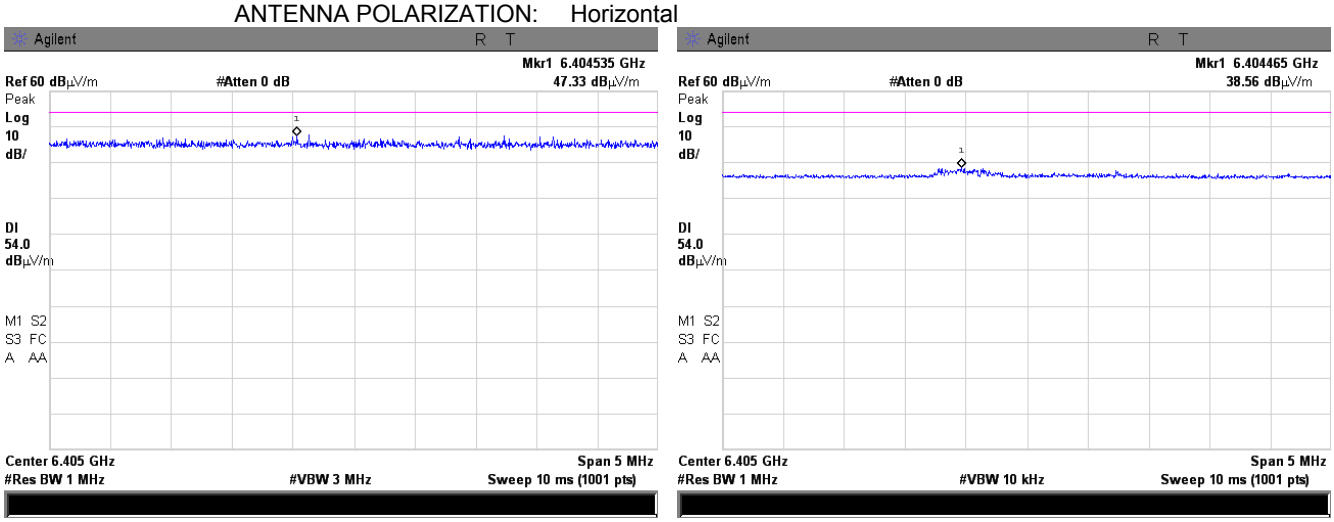
Plot 7.1.44 Radiated emission measurements at the seventh harmonic at mid frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.1.45 Radiated emission measurements at the seventh harmonic at mid frequency

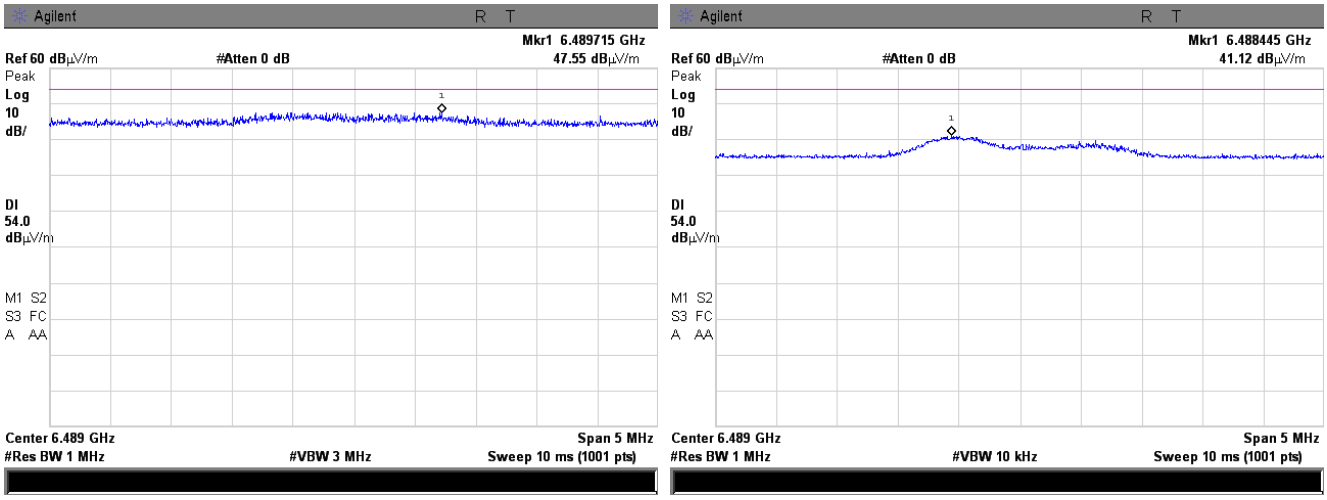
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 23-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 47 %	Power Supply: 24 VDC
Remarks:			

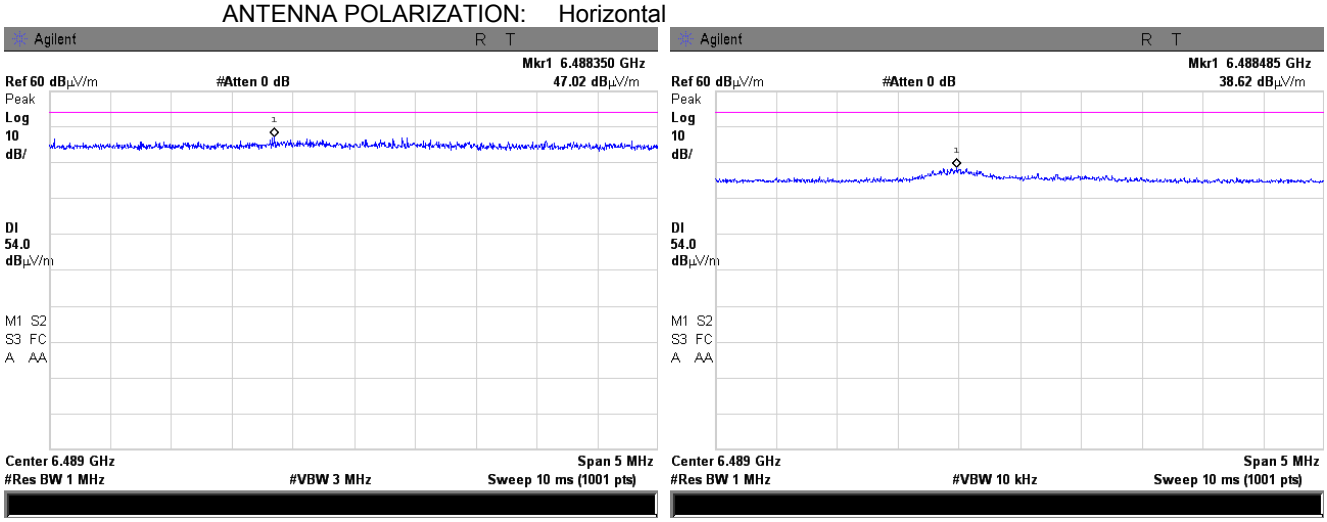
Plot 7.1.46 Radiated emission measurements at the seventh harmonic at high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.1.47 Radiated emission measurements at the seventh harmonic at high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.249(d)/RSS-210, section A2.9, Band edge emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 08-Apr-14		
Temperature: 23 ºC	Air Pressure: 1011 hPa	Relative Humidity: 46 %	Power Supply: 24 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, dBµV/m		Attenuation below carrier, dBc
	Peak	QP	
902.000 - 928.000	NA	46.0	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.

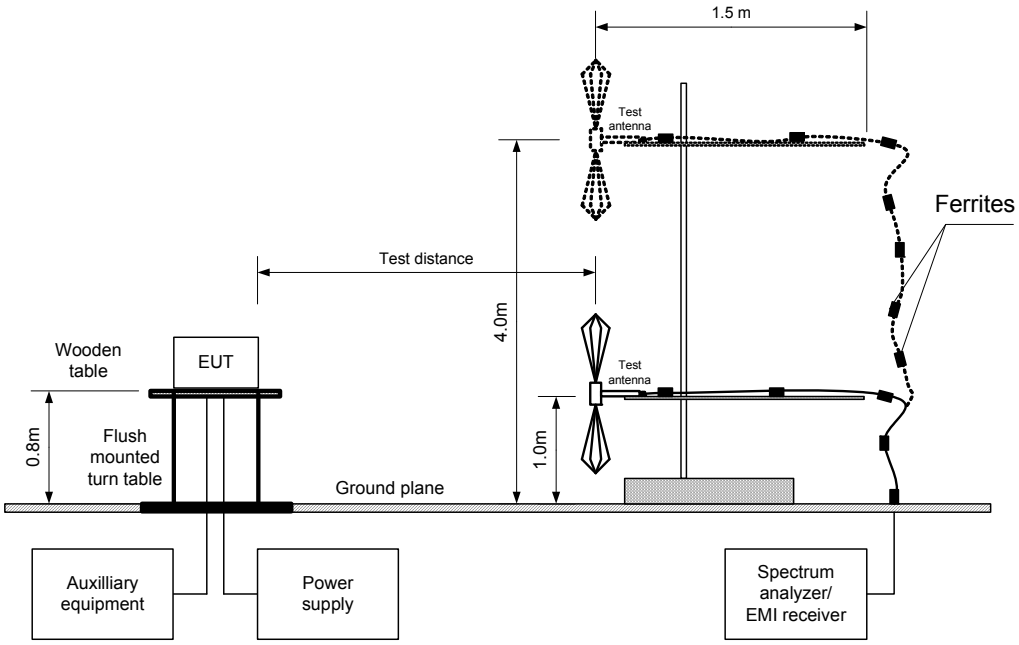
7.2.2.2 The spectrum analyzer frequency span was set to capture all major modulation sidebands of emission and sweep time was set sufficiently slow to ensure peak measurements. Spectrum analyzer was set in peak hold mode and time sufficient for trace stabilization was allowed.

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)/RSS-210, section A2.9, Band edge emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 08-Apr-14		
Temperature: 23 ºC	Air Pressure: 1011 hPa	Relative Humidity: 46 %	Power Supply: 24 VDC
Remarks:			

Figure 7.2.1 Band edge emission measurement set up



Test specification:	**Section 15.249(d)/RSS-210, section A2.9, Band edge emissions**		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	07-Apr-14 - 08-Apr-14		
Temperature: 23 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 46 %	**Power Supply:** 24 VDC
Remarks:			

Table 7.2.2 Band edge emission test results

OPERATING FREQUENCY RANGE: 902-928 MHz
DETECTOR USED: Peak hold
RESOLUTION BANDWIDTH: 120 kHz
VIDEO BANDWIDTH: 300 kHz
MODULATION: GFSK
BIT RATE: 160 kbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Modulation envelope		**Measured peak emission, dBµV/m**	**Measured QP emission, dBµV/m**	**QP limit, dBµV/m**	**Margin, dB ***	**Verdict**
Edge	**Frequency, MHz**					
Low	901.980	41.14	NA	46	-4.86	Pass
High	928.013	39.47	NA	46	-6.53	Pass

* - Margin = measured value– limit

Reference numbers of test equipment used

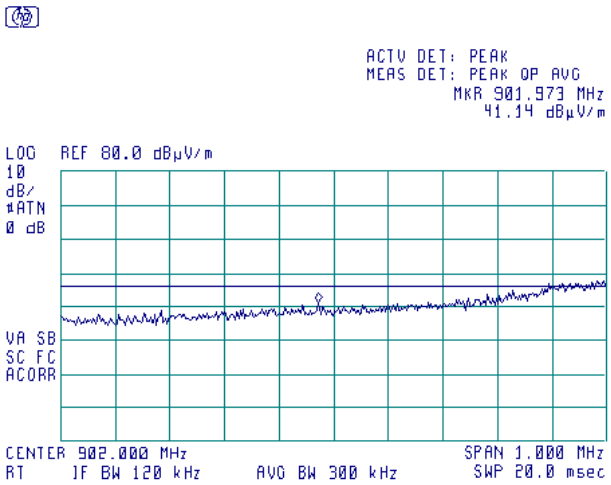
HL 0521	HL 0604	HL 2871	HL 4353				

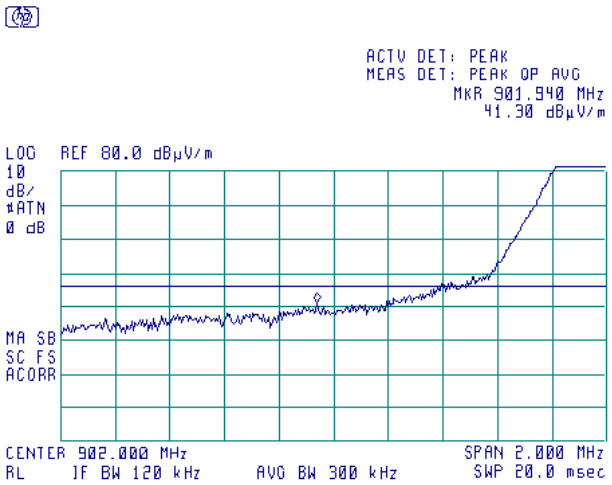
Full description is given in Appendix A.

Test specification:	Section 15.249(d)/RSS-210, section A2.9, Band edge emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 08-Apr-14		
Temperature: 23 ºC	Air Pressure: 1011 hPa	Relative Humidity: 46 %	Power Supply: 24 VDC
Remarks:			

Plot 7.2.1 Low band edge emission test result at low frequency

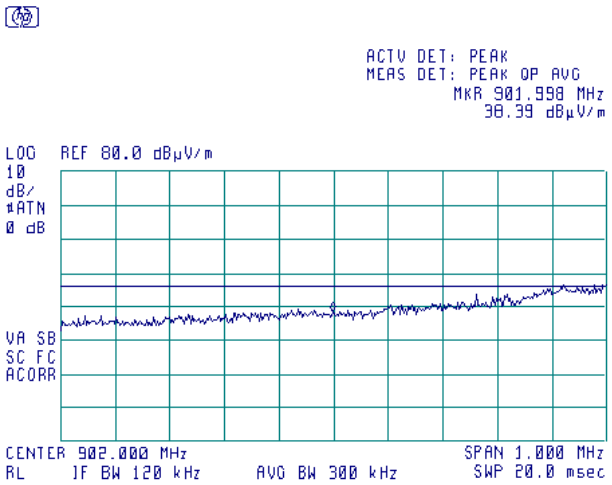
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal and Vertical
EUT POSITION: Typical (Horizontal)

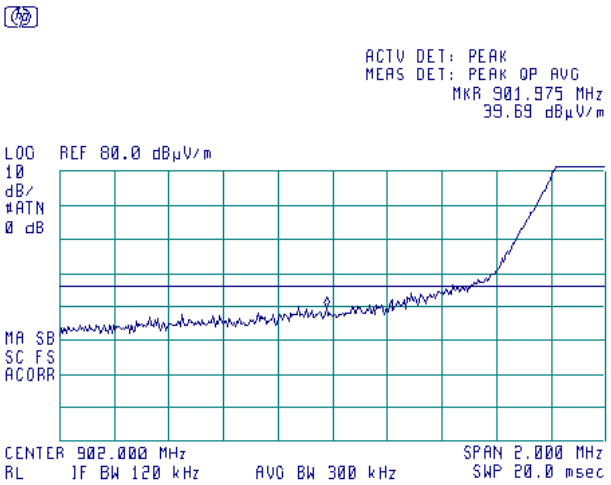




Plot 7.2.2 Low band edge emission test result at low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal and Vertical
EUT POSITION: Typical (Vertical)

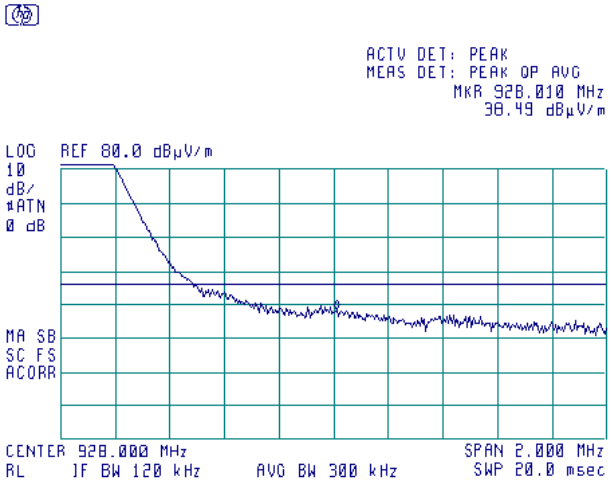


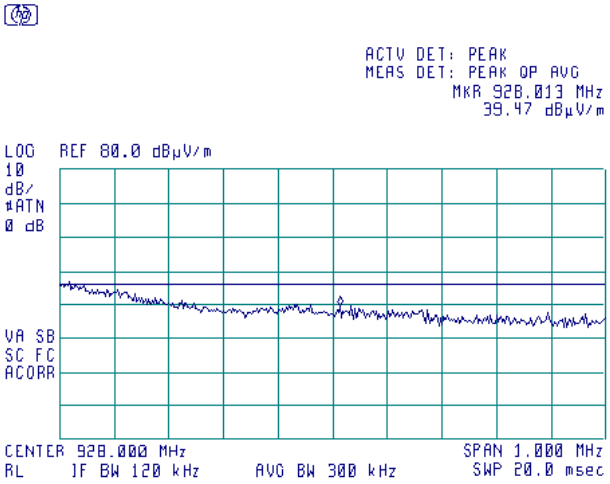


Test specification:	Section 15.249(d)/RSS-210, section A2.9, Band edge emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Apr-14 - 08-Apr-14		
Temperature: 23 ºC	Air Pressure: 1011 hPa	Relative Humidity: 46 %	Power Supply: 24 VDC
Remarks:			

Plot 7.2.3 High band edge emission test result

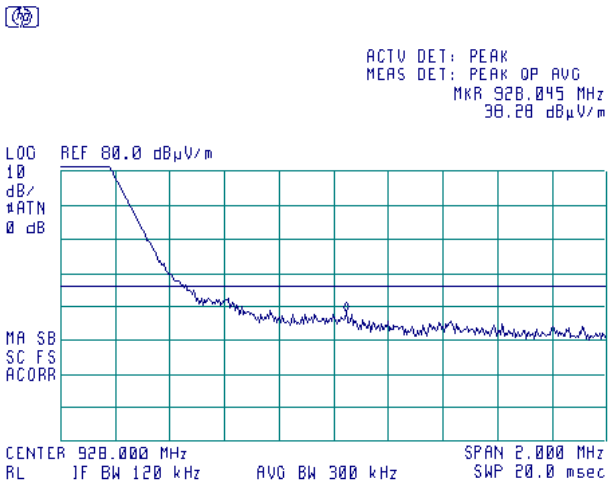
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal and Vertical
EUT POSITION: Typical (Horizontal)

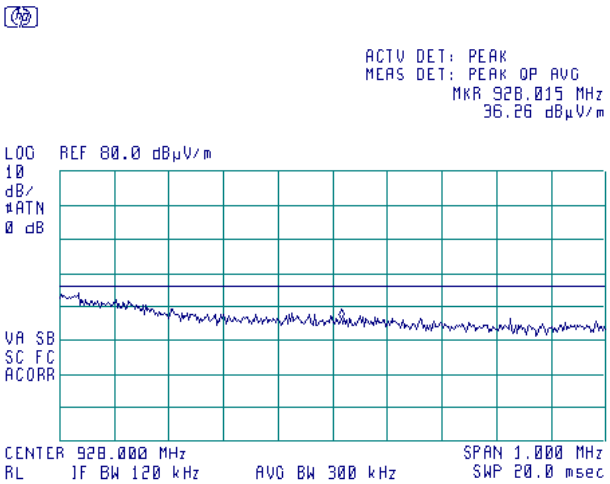




Plot 7.2.4 High band edge emission test result

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal and Vertical
EUT POSITION: Typical (Vertical)





Test specification:	Section 15.207(a)/RSS-Gen, section 7.2.4, Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	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 EUT power port. The specification test limits are given in Table 7.3.1.

Table 7.3.1 Limits for conducted emissions

Frequency, MHz	Class B limit, dB(μV)	
	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

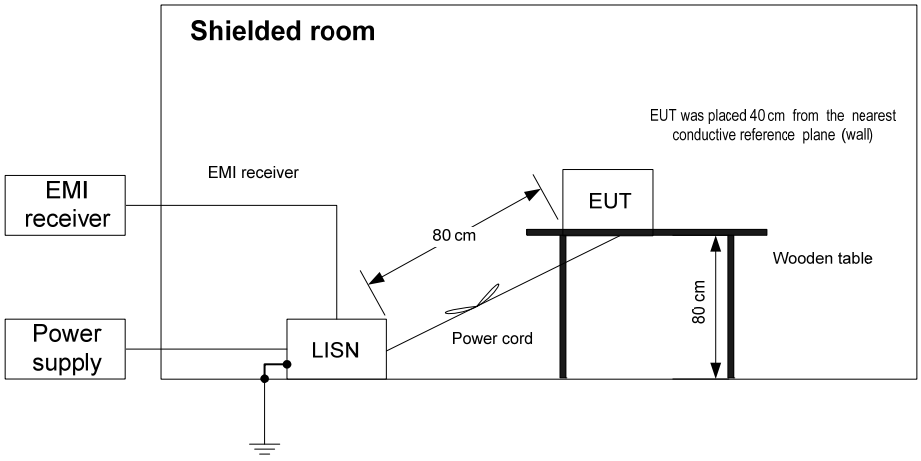
7.3.2.1 The EUT was set up as shown in Figure 7.3.1 and the associated photographs, energized and the EUT performance was checked.

7.3.2.2 The measurements were performed at the EUT power terminals with the LISN, connected to the EMI receiver in the frequency range referred to in Table 7.3.2. The unused coaxial connector of the LISN was terminated with 50 Ohm.

7.3.2.3 The position of the EUT cables was varied to find the highest emission.

7.3.2.4 The worst test results with respect to the limits were recorded in Table 7.3.2 and shown in the associated plots.

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



Test specification:	**Section 15.207(a)/RSS-Gen, section 7.2.4, Conducted emission**		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	30-Apr-14		
Temperature: 24 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 41 %	**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*		
0.194963	41.76	38.48	63.85	-25.37	27.94	53.85	-25.91	L1	Pass
0.352538	44.21	41.96	58.96	-17.00	25.70	48.96	-23.26		
0.423950	49.38	46.32	57.42	-11.10	29.03	47.42	-18.39		
0.444825	45.06	42.06	57.03	-14.97	24.27	47.03	-22.76		
0.508600	44.08	41.59	56.00	-14.41	24.45	46.00	-21.55		
0.989000	45.52	42.60	56.00	-13.40	27.47	46.00	-18.53		
0.354010	46.51	43.81	58.93	-15.12	25.45	48.93	-23.48	L2	Pass
0.415030	50.70	47.59	57.59	-10.00	33.47	47.59	-14.12		
0.444875	45.90	43.07	57.03	-13.96	24.26	47.03	-22.77		
0.759580	45.66	38.90	56.00	-17.10	25.59	46.00	-20.41		
0.919675	46.47	41.97	56.00	-14.03	25.43	46.00	-20.57		
1.074950	45.22	40.67	56.00	-15.33	31.70	46.00	-14.30		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

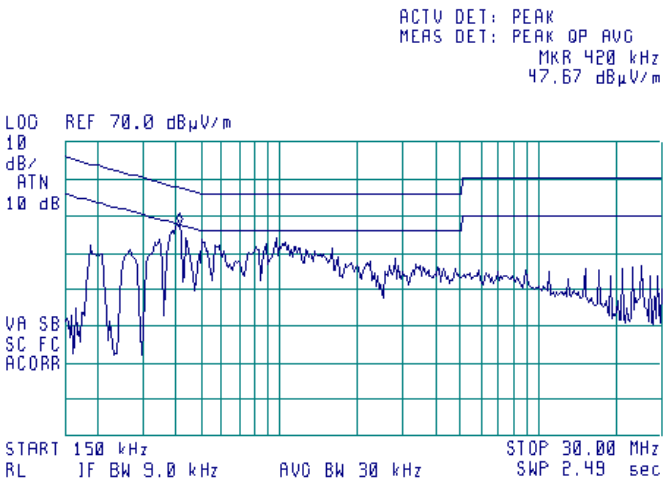
HL 0447	HL 0787	HL 1425	HL 1513	HL 3612			

Full description is given in Appendix A.

Test specification:	Section 15.207(a)/RSS-Gen, section 7.2.4, Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

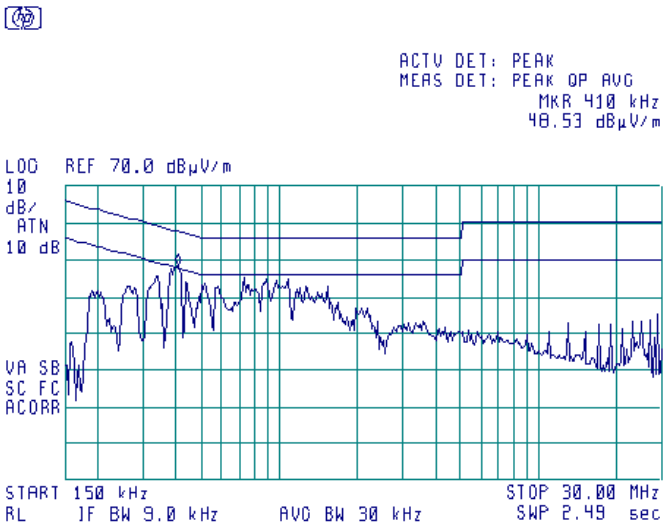
Plot 7.3.1 Conducted emission measurements

LINE: L1
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 7.3.2 Conducted emission measurements

LINE: L2
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Section 15.203 / RSS-Gen, section 7.1.2, Antenna requirement		
Test procedure:	Visual inspection / supplier declaration		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 24 VDC
Remarks:			

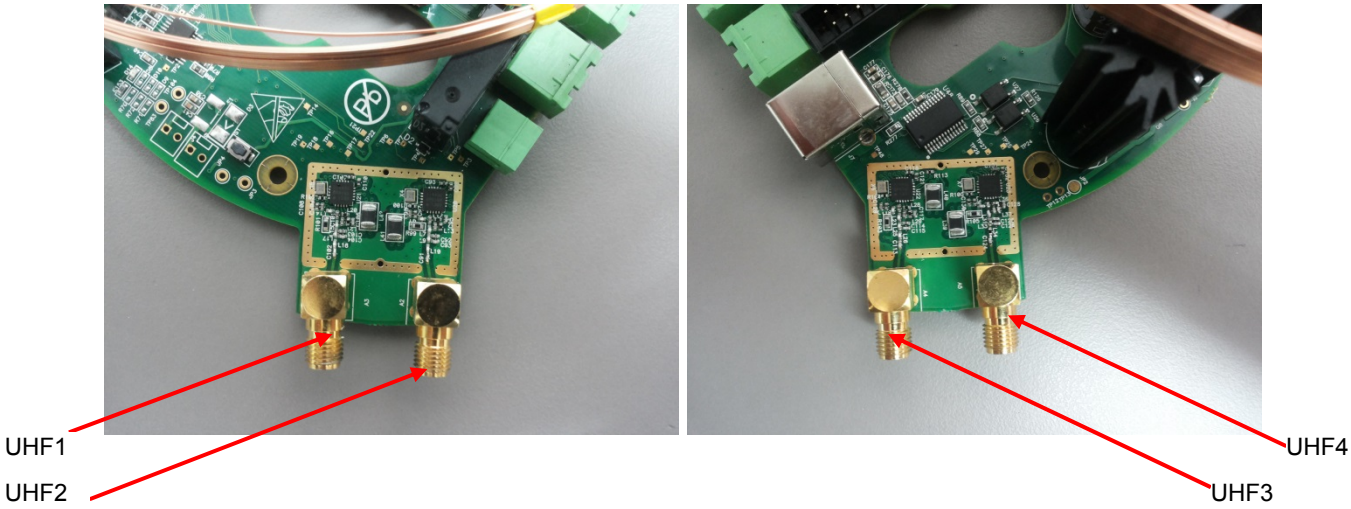
7.4 Antenna requirements

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	NA	Comply
The transmitter employs a unique antenna connector	NA	
The transmitter requires professional installation	Supplier declaration provided in the User manual exhibit	

Photograph 7.4.1 Antenna assembly



Test specification:	Section 15.215(c) / RSS-Gen, Section 4.6, Occupied bandwidth		
Test procedure:	ANSI C63.4, Section 13.1.7		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 24 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

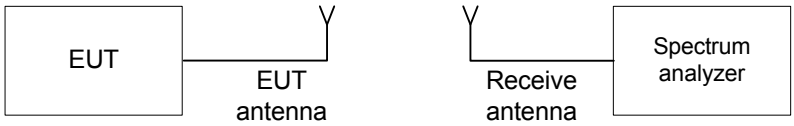
7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked.

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) / RSS-Gen, Section 4.6, Occupied bandwidth**		
Test procedure:	ANSI C63.4, Section 13.1.7		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	30-Apr-14		
Temperature: 24 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 41 %	**Power Supply:** 24 VDC
Remarks:			

Table 7.5.2 Occupied bandwidth test results

ASSIGNED FREQUENCY BAND	902-928 MHz
DETECTOR USED:	Peak hold
RESOLUTION BANDWIDTH:	10 kHz
VIDEO BANDWIDTH:	30 kHz
MODULATION ENVELOPE REFERENCE POINTS:	20 dBc and 99%
MODULATION:	GFSK

Band edge	20 dBc OBW, kHz	99% OBW kHz	Cross point frequency, MHz	Assigned band edge, MHz	Verdict
Low	335.0	319.2	902.8375	902	Pass
High	293.0	319.4	927.1725	928	Pass

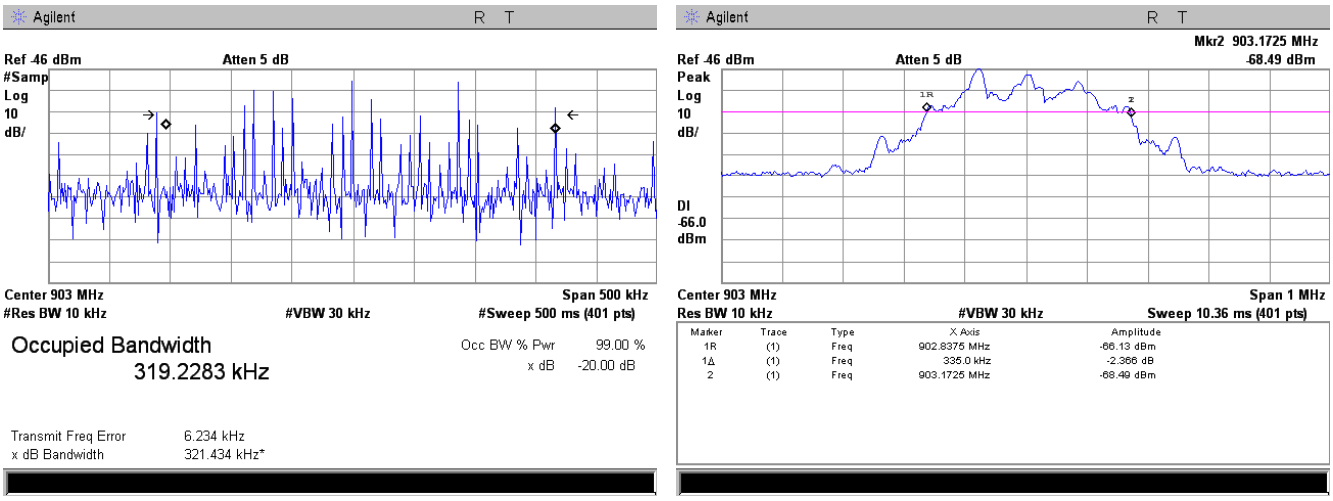
Reference numbers of test equipment used

HL 2909								

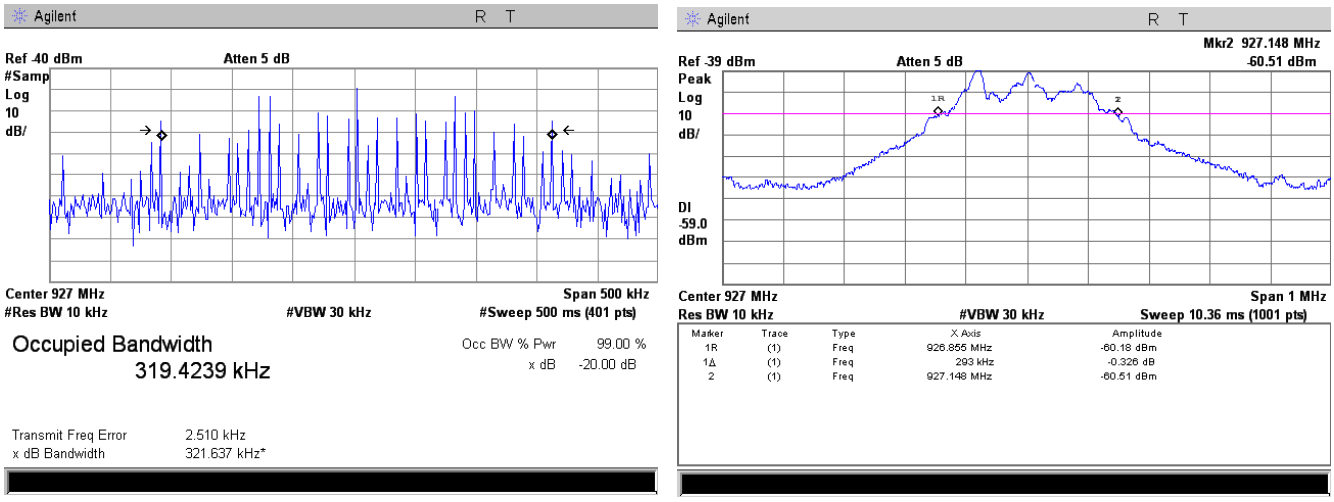
Full description is given in Appendix A.

Test specification:	Section 15.215(c) / RSS-Gen, Section 4.6, Occupied bandwidth		
Test procedure:	ANSI C63.4, Section 13.1.7		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Apr-14		
Temperature: 24 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 24 VDC
Remarks:			

Plot 7.5.1 Occupied bandwidth test result at low frequency



Plot 7.5.2 Occupied bandwidth test result at high frequency



8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	21-Jan-14	21-Jan-15
0447	LISN, 16/2, 300V RMS, 50 Ohm/50 uH + 5 Ohm, STD CISPR 16-1	Hermon Laboratories	LISN 16 - 1	066	23-Oct-13	23-Oct-14
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	28-Oct-13	28-Oct-14
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	04-Jun-13	04-Jun-14
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard	11947A	3107A018 77	13-Oct-13	13-Oct-14
1425	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1426, HL1427	Agilent Technologies	8542E	3710A002 22, 3705A002 04	25-Oct-13	25-Dec-14
1513	Cable RF, 8 m, BNC/BNC	Belden	M17/167 MIL-C-17	1513	05-Nov-13	05-Nov-14
1791	Laboratory DC Power Supply, Dual Tracking Output	RACOM	PS-404	8800692	13-Oct-13	13-Oct-14
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	03-Jan-14	03-Jan-15
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY451024 62	10-Jul-13	10-Jul-14
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155-00	2871	04-Dec-13	04-Dec-14
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY414447 62	23-Dec-13	23-Dec-14
3612	Cable RF, 17.5 m, N type-N type	Teldor	RG-214/U	NA	05-Dec-13	05-Dec-14
4160	Preamplifier, 0.1 to 18 GHz, Gain 25 dB, N-type(f) in, N-type(m) out.	Agilent Technologies	87405C	MY470105 94	11-Aug-13	11-Aug-14
4353	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29-N1N1-244	12025101 003	16-Mar-14	16-Mar-15

9 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 10 m measuring distance Horizontal polarization Vertical polarization	 Biconilog antenna: ± 5.0 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.1 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 5.5 dB Biconical antenna: ± 5.5 dB Log periodic antenna: ± 5.6 dB Double ridged horn antenna: ± 5.8 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
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
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Occupied bandwidth	± 8.0 %

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: 2013	Radio Frequency Devices
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
RSS-210 Issue 8: 2010	Low Power Licence- Exempt Radiocommunication Devices
RSS-Gen Issue 3: 2010	General Requirements and Information for the Certification of Radiocommunication Equipment

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.

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

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

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
Low Loss Armored Test Cable, MegaPhase, 18 GHz, 6.2 m, N type-M/N type-M,
NC29-N1N1-244S/N 12025101 003,
HL 4353

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
50	0.20	9000	2.71
100	0.27	9500	2.81
300	0.47	10000	2.90
500	0.61	10500	2.97
1000	0.87	11000	3.06
1500	1.07	11500	3.13
2000	1.24	12000	3.20
2500	1.39	12500	3.26
3000	1.53	13000	3.34
3500	1.65	13500	3.39
4000	1.77	14000	3.47
4500	1.89	14500	3.54
5000	1.99	15000	3.62
5500	2.07	15500	3.69
6000	2.20	16000	3.76
6500	2.30	16500	3.83
7000	2.39	17000	3.86
7500	2.51	17500	3.94
8000	2.58	18000	4.02
8500	2.65		

13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
dB(μA)	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
μs	microsecond
NA	not applicable
OATS	open area test site
Ω	Ohm
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

END OF TEST REPORT

14 APPENDIX G Manufacturer's declaration of identity

Declaration of Identity

We, the undersigned,

Company: LOGITAG SYSTEMS

Address: Hamelach 2 Ntanya

Country: Israel

Telephone number: 972-9-8354848

Fax number: 972-9-8656262

Declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
One Channel Exciter	LTG2-04	Exciter and transceiver console for active RFID transponders

is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

Brand/Item	Type/Model	Short Product description
Single Location Unit	LTG2-04-PRF	Exciter and transceiver console for active RFID transponders

The reason for name change is: different design of Led lexan

…28/05/2014……

(date)

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www.logi-tag.com

... Golan Kormian.....

(signature)

.....

(printed name)

Logitag systems.....

... Engineering manager.....

(company stamp) (position)

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