HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

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TEST REPORT

ACCORDING TO: FCC CFR 47 Part 15 subpart C, section 15.231(a) and RSS-210 issue 8 Annex 1

FOR:

Essence Security International Ltd.
Control Panel
Model: ES6502HC
FCC ID:YXG-ES6502HC
IC:11061A-ES6502HC

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1 Applicant information

Client name:	Essence Security International Ltd.
Address:	12 Abba Eban avenue, Ackerstein Tower Bldg. D, P.O.Box 2073, Herzliya 4612001, Israel
Telephone:	+972 7324 47735
Fax:	+972 9772 9962
E-mail:	ilyafe@essence-grp.com
Contact name:	Mr. Ilya Feldman

2 Equipment under test attributes

Product name:	Control Panel
Product type:	Transceiver
Model(s):	ES6502HC
Serial number:	E349020
Hardware version:	V4
Software release:	2.2.1.230.1.3.5
Receipt date	28-Jul-14

3 Manufacturer information

Manufacturer name:	Essence Security International Ltd.
Address:	12 Abba Eban avenue, Ackerstein Tower Bldg. D, P.O.Box 2073, Herzliya 4612001, Israel
Telephone:	+972 7324 47735
Fax:	+972 9772 9962
E-Mail:	ilyafe@essence-grp.com
Contact name:	Mr. Ilya Feldman

4 Test details

Project ID:	25978
Location:	Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started:	28-Jul-14
Test completed:	28-Jul-14
Test specification(s):	FCC 47CFR part 15, subpart C, §15.231(a)

5 Tests summary

Test	Status
Transmitter characteristics	
FCC Part 15, Section 231(a) / RSS-210, Section A1.1.1, Periodic operation requirements	Not required
FCC Part 15, Section 231(b) / RSS-210, Section A1.1.2, Field strength of emissions	Pass
FCC Part 15, Section 231(c) / RSS-210, Section A1.1.3, Occupied bandwidth	Pass
FCC Part 15, Section 207 / RSS-Gen, Section 7.2.4, Conducted emission	Pass
FCC Part 15, Section 203 / RSS-Gen, Section 7.1.2, Antenna requirements	Not required

The EUT certified by FCC under FCC ID:YXG-ES6502HC and by Industry Canada under IC:11061A-ES6502HC was revised to hardware version V4 with the following changes:

1) new DC/DC converter (BQ70251 type) installed, the output voltage changed from 4.4 VDC to 4.2 VDC;
2) the main PCB layout was slightly changed for voice quality improvement (a new audio amplifier installed, not associated with the RF portion);
3) small mechanical update;
4) value of passive components changed;
5) changes in GSM adapter.

The relevant tests were performed to support Application for Class II permissive changes certification.

The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

This test report supersedes the previously issued test report identified by Doc ID:ESSRAD_FCC.25978.

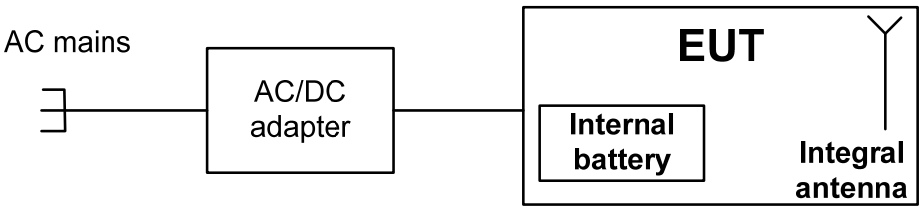
	Name and Title	Date	Signature
Tested by:	Mrs. E. Pitt, test engineer	July 28, 2014	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	August 10, 2014	
Approved by:	Mr. M. Nikishin, EMC and radio group manager	August 17, 2014	

6 EUT description

6.1 General information

The EUT is a Control Panel operating at 916.5 MHz and designed for thegrowing population, disabled and people that suffer from dementia and that wishes to “age peacefully at home”. The EUT includes the WWAN module manufactured by Telit Communications S.p.A., approved by FCC and Industry Canada, FCC ID:RI7HE910NA, IC:5131A-HE910NA.

6.2 Test configuration



6.3 Transmitter characteristics

Type of equipment									
X	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)								
Operating frequency	916.5 MHz								
Maximum rated output power	At transmitter 50 Ω RF output connector	dBm							
	Field strength at 3 m distance	99.52 dB(µV/m) – peak 77.59 dB(µV/m) -average							
Is transmitter output power variable?	X	No							
		Yes		continuous variable					
				stepped variable with stepsize	dB				
				minimum RF power	dBm				
				maximum RF power	dBm				
Antenna connection									
	unique coupling		standard connector		X	integral		with temporary RF connector	
							X	without temporary RF connector	
Type of modulation	2FSK								
Transmitter power source									
	Battery	**Nominal rated voltage**	VDC						
	DC	**Nominal rated voltage**	VDC						
X	AC mains	**Nominal rated voltage**	120 VAC via AC/DC adapter		Frequency 60 Hz				
Common power source for transmitter and receiver				X	yes		no		

Test specification:	FCC Part 15, Section 231(b), RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jul-14		
Temperature: 24 ºC	Air Pressure: 1008 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
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 and Table 7.1.2.

Table 7.1.1 Radiated fundamental emission limits

Fundamental frequency, MHz	Field strength at 3 m, dB(μV/m)	
	Peak	Average
916.5	102	82

Table 7.1.2 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m, dB(μV/m)				
	Within restricted bands			Outside restricted bands	
	Peak	Quasi Peak	Average	Peak	Average
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	82	62
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 1: The fundamental emission limit in dB(μV/m) was calculated as follows:

$$Lim_{AVR} = 20 \times \log(56.81818 \times F - 6136.3636)$$ - within 130 – 174 MHz band;

$$Lim_{AVR} = 20 \times \log(41.6667 \times F - 7083.3333)$$ - within 260 – 470 MHz band,

where F is the carrier frequency in MHz.

The limit for spurious emissions was 20 dB lower than fundamental emission limit.

The above limits provided in terms of average values, peak limit was 20 dB above the average limit.

Note 2: 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.

Test specification:	FCC Part 15, Section 231(b), RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jul-14		
Temperature: 24 ºC	Air Pressure: 1008 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

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

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

7.1.2.2 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.

7.1.2.3 The worst test results (the lowest margins) were recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

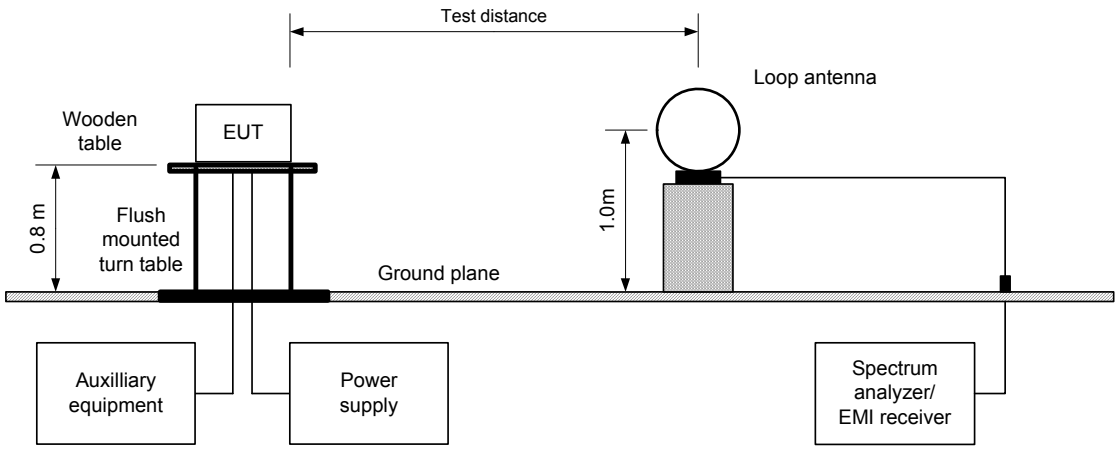
7.1.3 Test procedure for spurious emission field strength measurements above 30 MHz

7.1.3.1 The EUT was set up as shown in Figure 7.1.2, 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, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

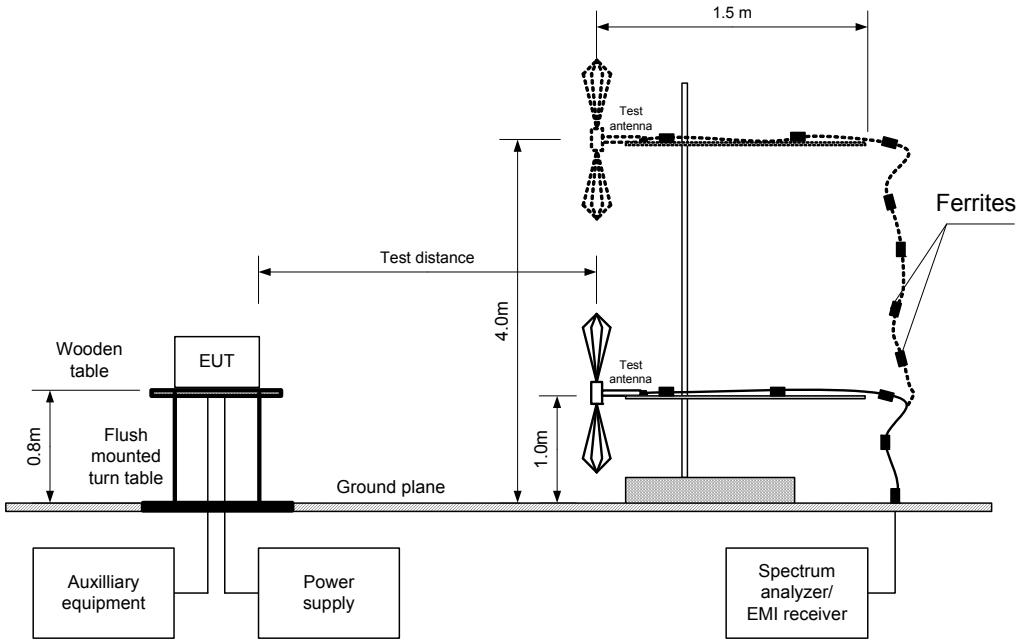
7.1.3.3 The worst test results (the lowest margins) were recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

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



Test specification:	**FCC Part 15, Section 231(b), RSS-210, Section A1.1.2, Field strength of emissions**		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	28-Jul-14		
Temperature: 24 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 46 %	**Power Supply:** 120 VAC
Remarks:			

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



Test specification:	**FCC Part 15, Section 231(b), RSS-210, Section A1.1.2, Field strength of emissions**		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	28-Jul-14		
Temperature: 24 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 46 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.1.3 Field strength of fundamental emission, spurious emissions outside restricted bands and within restricted bands at frequencies above 1 GHz

TEST DISTANCE:	3 m
EUT POSITION:	Typical (Vertical)
MODULATION:	2FSK
BIT RATE:	38.4kbps
INVESTIGATED FREQUENCY RANGE:	0.009 - 9200 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)

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**	
Fundamental emission* **											
916.4850	Vert	1.0	10	99.52	102.0	-2.48	99.52	77.59	82.0	-4.41	Pass
Spurious emissions											
1833.025	Vert	1.2	175	58.06	82.0	-23.94	57.45	35.52	62.0	-26.48	Pass

*****- EUT front panel refers to 0 degrees position of turntable.
******- Margin, dB =Measured (calculated) value, dB(μV/m)-Limit, dB(μV/m)
*** Max value was obtained at Unom input power voltage.

Table 7.1.4 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
8	>100	NA	NA	NA	-21.93

*- Average factor was calculated as follows

for pulse train shorter than 100 ms: $$Average\ factor = 20 \times \log_{10}\left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{Train\ duration} \times Number\ of\ bursts\ within\ pulse\ train\right)$$

for pulse train longer than 100 ms: $$Average\ factor = 20 \times \log_{10}\left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{100\,ms} \times Number\ of\ bursts\ within\ 100\,ms\right)$$

Reference numbers of test equipment used

HL 0521	HL 0583	HL 0604	HL 3818	HL 4114	HL 4160	HL 4353	HL 4847

Full description is given in Appendix A.

Test specification:	**FCC Part 15, Section 231(b), RSS-210, Section A1.1.2, Field strength of emissions**		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	28-Jul-14		
Temperature: 24 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 46 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.1.5 Field strength of emissions below 1 GHz within restricted bands

TEST DISTANCE:	3 m
EUT POSITION:	Typical (Vertical)
MODULATION:	2FSK
BIT RATE:	38.4kbps
INVESTIGATED FREQUENCY RANGE:	0.009 – 1000 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	0.2 kHz (9 kHz – 150 kHz) 9.0 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1000 MHz)
VIDEO BANDWIDTH:	≥ Resolution bandwidth
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconilog (30 MHz – 1000 MHz)

Frequency, MHz	**Peak emission, dB(μV/m)**	**Quasi-peak**			**Antenna polarization**	**Antenna height, m**	**Turn-table position**, degrees**	**Verdict**
		Measured emission, dB(μV/m)	**Limit, dB(μV/m)**	**Margin, dB***				
38.2407	34.6	31.9	40.0	-8.1	Vertical	1.0	0	Pass

*****- Margin = Measured emission – specification limit.
******- EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

HL 0446	HL 0521	HL 0604	HL 4160	HL 4353	HL 4847		

Full description is given in Appendix A.

Test specification:	**FCC Part 15, Section 231(b), RSS-210, Section A1.1.2, Field strength of emissions**		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	28-Jul-14		
Temperature: 24 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 46 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.1.6 Restricted bands according to FCC 15, Section 205

MHz	MHz	MHz	MHz	MHz	GHz
0.09 – 0.11	8.37625 – 8.38675	73 – 74.6	399.9 – 410	2690 – 2900	10.6 – 12.7
0.495 – 0.505	8.41425 – 8.41475	74.8 – 75.2	608 – 614	3260 – 3267	13.25 – 13.4
2.1735 – 2.1905	12.290 – 12.293	108 – 121.94	960 – 1240	3332 – 3339	14.47 – 14.5
4.125 – 4.128	12.51975 – 12.52025	123 – 138	1300 – 1427	3345.8 – 3358	15.35 – 16.2
4.17725 – 4.17775	12.57675 – 12.57725	149.9 – 150.05	1435 – 1626.5	3600 – 4400	17.7 – 21.4
4.20725 – 4.20775	13.36 – 13.41	156.52475 – 156.52525	1645.5 – 1646.5	4500 – 5150	22.01 – 23.12
6.215 – 6.218	16.420 – 16.423	156.7 – 156.9	1660 – 1710	5350 – 5460	23.6 – 24
6.26775 – 6.26825	16.69475 – 16.69525	162.0125 – 167.17	1718.8 – 1722.2	7250 – 7750	31.2 – 31.8
6.31175 – 6.31225	16.80425 – 16.80475	167.72 – 173.2	2200 – 2300	8025 – 8500	36.43 – 36.5
8.291 – 8.294	25.5 – 25.67	240 – 285	2310 – 2390	9000 – 9200	Above 38.6
8.362 – 8.366	37.5 – 38.25	322 – 335.4	2483.5 – 2500	9300 – 9500	

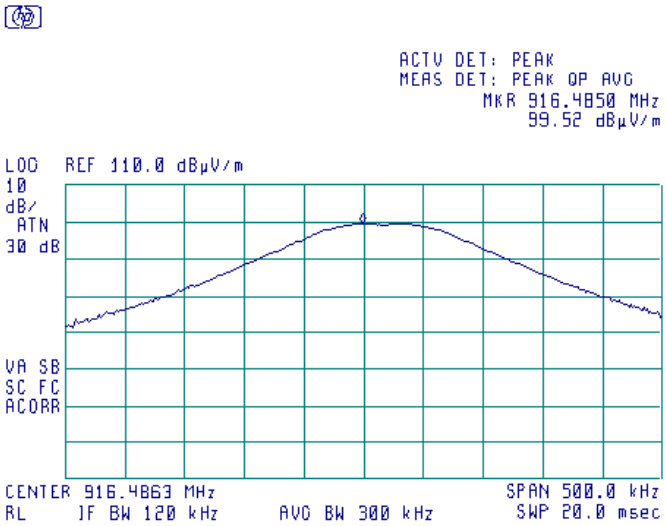
Table 7.1.7 Restricted bands according to RSS-Gen, Table 3

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.291 - 8.294	16.80425 - 16.80475	399.9 - 410	3260 - 3267	10.6 - 12.7
2.1735 - 2.190	8.362 - 8.366	25.5 - 25.67	608 - 614	3332 - 3339	13.25 - 13.4
3.020 - 3.026	8.37625 - 8.38675	37.5 - 38.25	960 - 1427	3345.8 - 3358	14.47 - 14.5
4.125 - 4.128	8.41425 - 8.41475	73 - 74.6	1435 - 1626.5	3500 - 4400	15.35 - 16.2
4.17725 - 4.17775	12.290 - 12.293	74.8 - 75.2	1645.5 - 1646.5	4500 - 5150	17.7 - 21.4
4.20725 - 4.20775	12.51975 - 12.52025	108 - 138	1660 - 1710	5350 – 5460	22.01 - 23.12
5.677 - 5.683	12.57675 - 12.57725	156.52475 - 156.52525	1718.8 - 1722.2	7250 - 7750	23.6 – 24.0
6.215 - 6.218	13.36 - 13.41	156.7 - 156.9	2200 - 2300	8025 - 8500	31.2 - 31.8
6.26775 - 6.26825	16.42 - 16.423	240 - 285	2310 - 2390	9000 - 9200	36.43 - 36.5
6.31175 - 6.31225	16.69475 - 16.69525	322 - 335.4	2655 - 2900	9300 - 9500	Above 38.6

Test specification:	FCC Part 15, Section 231(b), RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jul-14		
Temperature: 24 ºC	Air Pressure: 1008 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

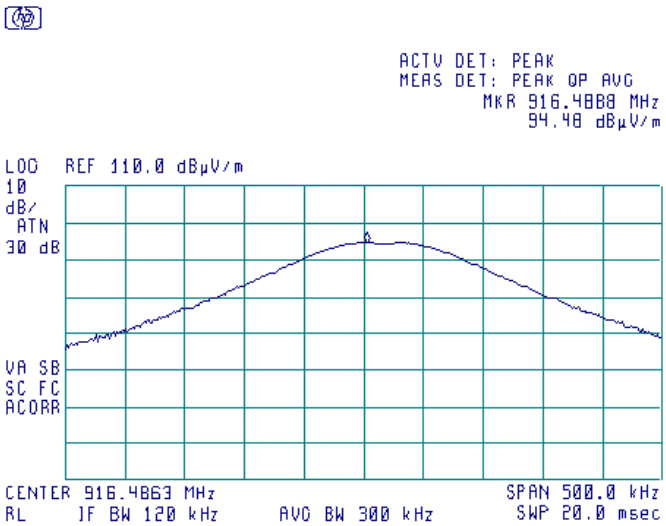
Plot 7.1.1 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Typical (Vertical)
INPUT VOLTAGE: Unom



Plot 7.1.2 Radiated emission measurements at the fundamental frequency

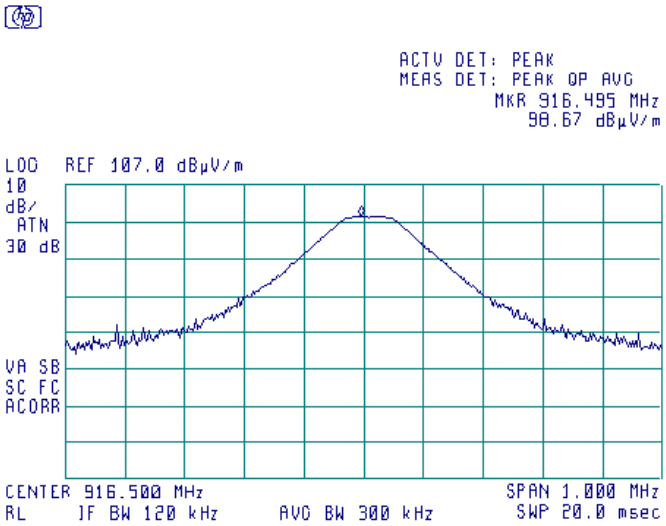
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Typical (Vertical)
INPUT VOLTAGE: Unom



Test specification:	FCC Part 15, Section 231(b), RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jul-14		
Temperature: 24 ºC	Air Pressure: 1008 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

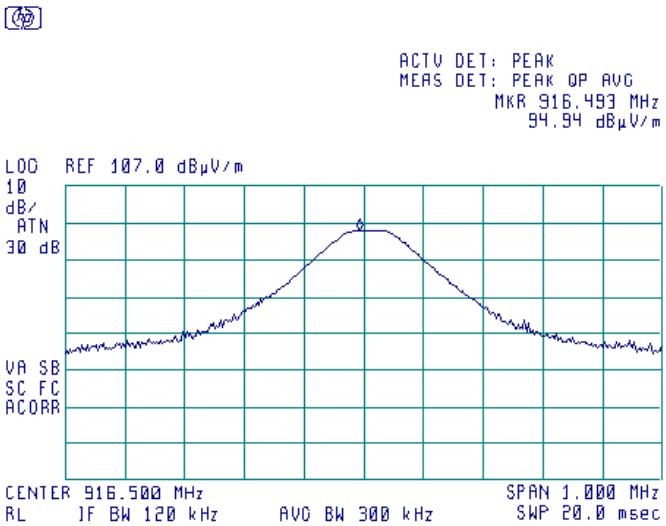
Plot 7.1.3 Radiated emission measurements at the fundamental frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Typical (Vertical)
INPUT VOLTAGE: 115%Unom



Plot 7.1.4 Radiated emission measurements at the fundamental frequency

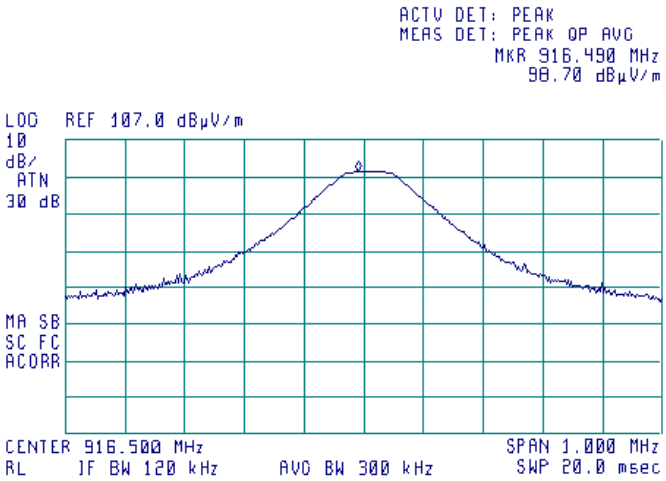
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Typical (Vertical)
INPUT VOLTAGE: 115%Unom



Test specification:	FCC Part 15, Section 231(b), RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jul-14		
Temperature: 24 ºC	Air Pressure: 1008 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

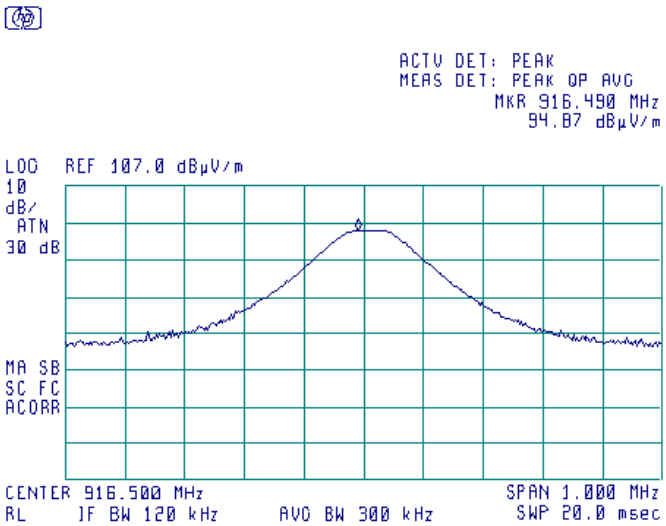
Plot 7.1.5 Radiated emission measurements at the fundamental frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Typical (Vertical)
INPUT VOLTAGE: 85%Unom



Plot 7.1.6 Radiated emission measurements at the fundamental frequency

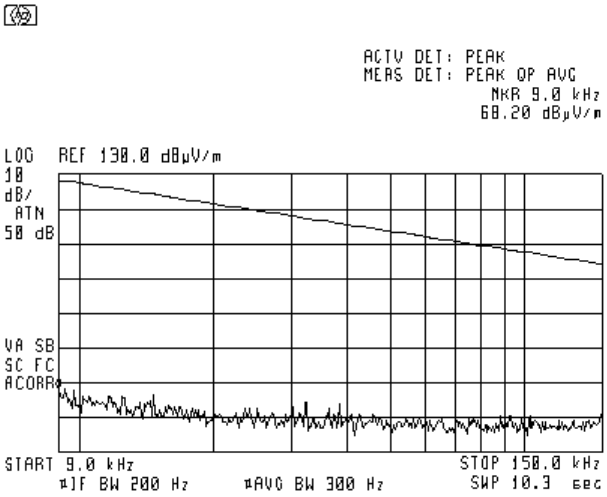
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Typical (Vertical)
INPUT VOLTAGE: 85%Unom



Test specification:	**FCC Part 15, Section 231(b), RSS-210, Section A1.1.2, Field strength of emissions**		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	28-Jul-14		
Temperature: 24 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 46 %	**Power Supply:** 120 VAC
Remarks:			

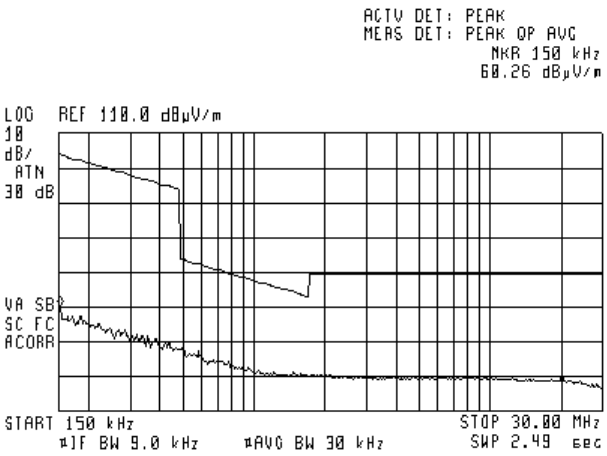
Plot 7.1.7 Radiated emission measurements from 9 to 150 kHz

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



Plot 7.1.8 Radiated emission measurements from 0.15 to 30 MHz

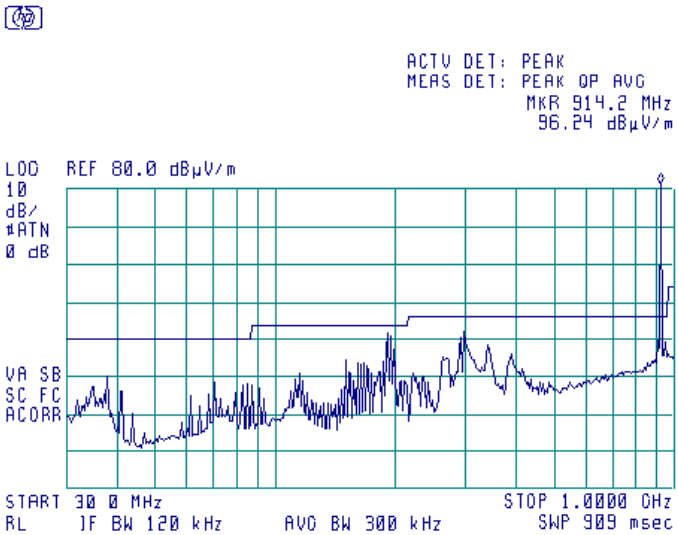
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Typical (Vertical)



Test specification:	FCC Part 15, Section 231(b), RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jul-14		
Temperature: 24 ºC	Air Pressure: 1008 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.9 Radiated emission measurements from 30 to 1000 MHz

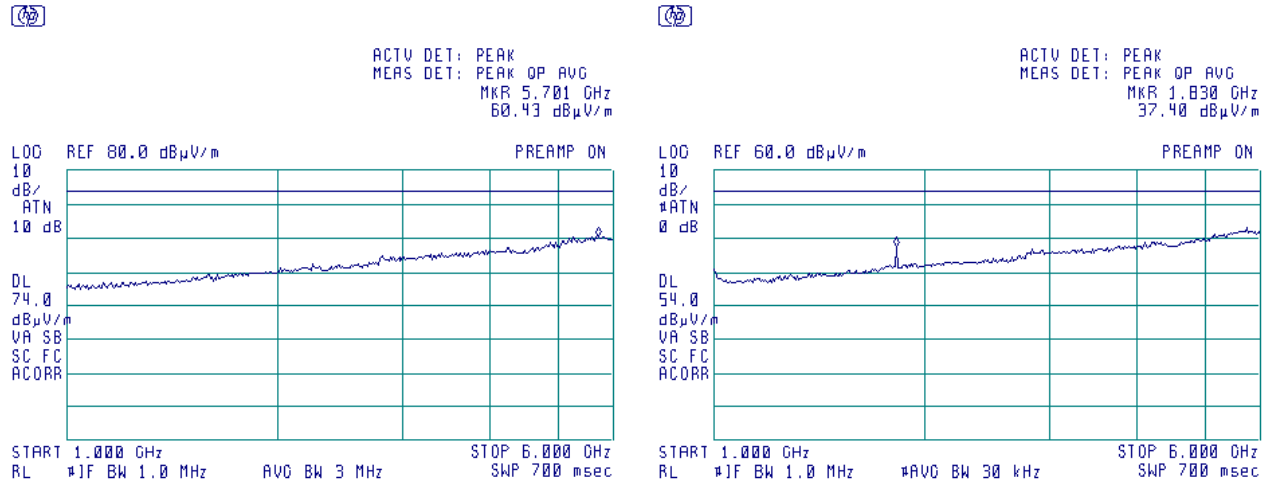
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical&Horizontal
EUT POSITION: Typical (Vertical)



Test specification:	FCC Part 15, Section 231(b), RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jul-14		
Temperature: 24 ºC	Air Pressure: 1008 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

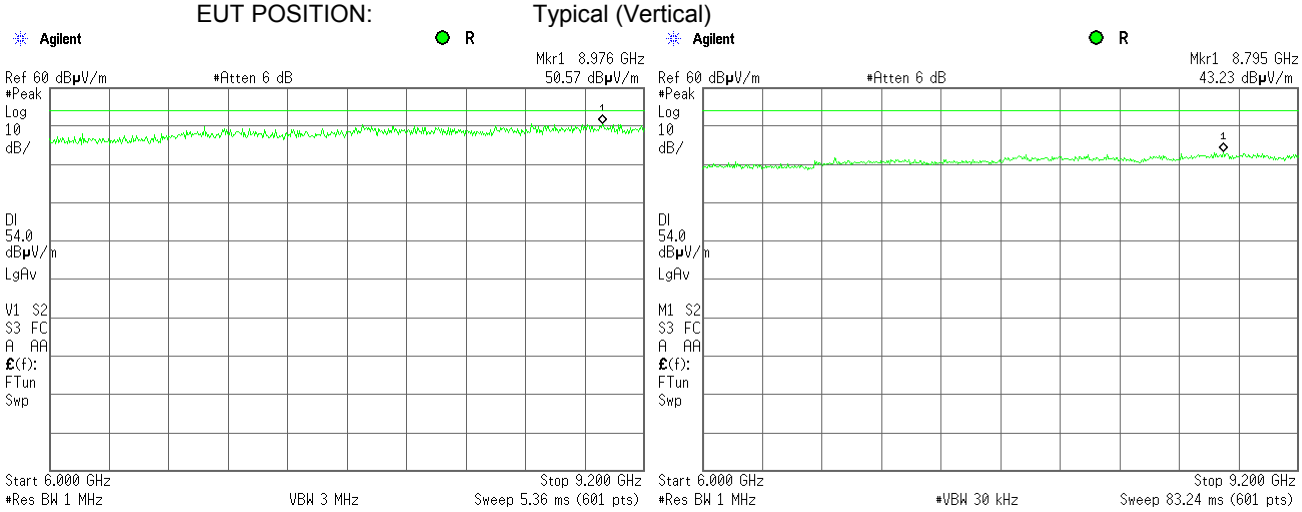
Plot 7.1.10 Radiated emission measurements from 1000 to 6000 MHz

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



Plot 7.1.11 Radiated emission measurements from 6000 to 9500 MHz

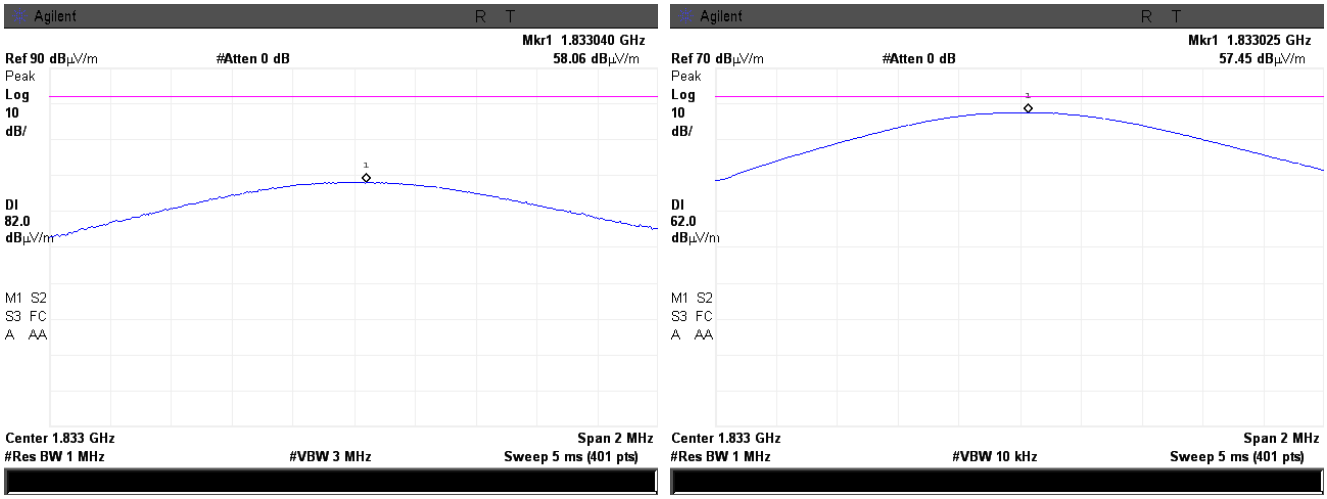
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical&Horizontal
EUT POSITION: Typical (Vertical)



Test specification:	FCC Part 15, Section 231(b), RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jul-14		
Temperature: 24 ºC	Air Pressure: 1008 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

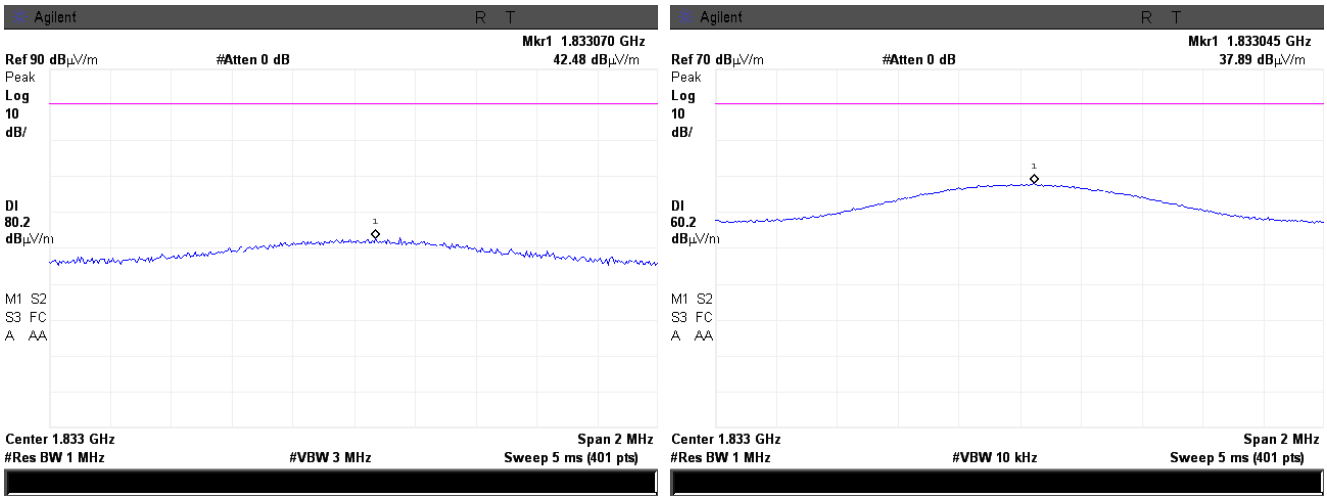
Plot 7.1.12 Radiated emission measurements at the second harmonic frequency

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



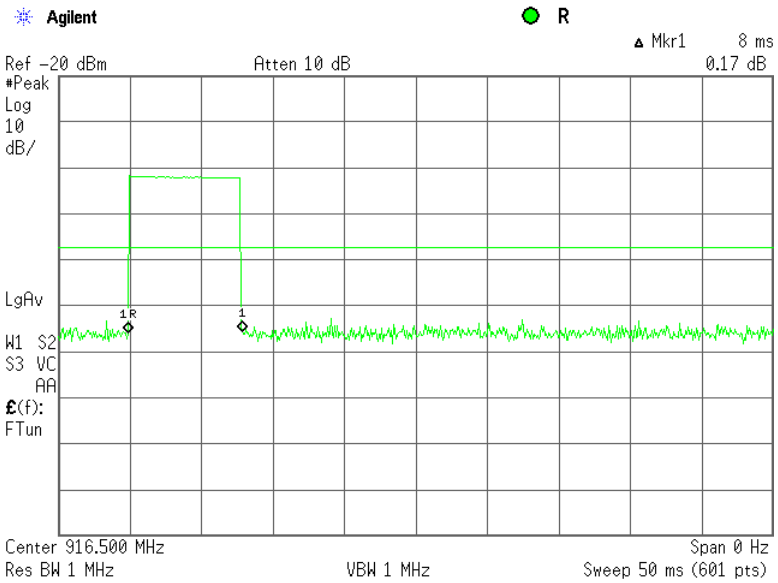
Plot 7.1.13 Radiated emission measurements at the second harmonic frequency

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

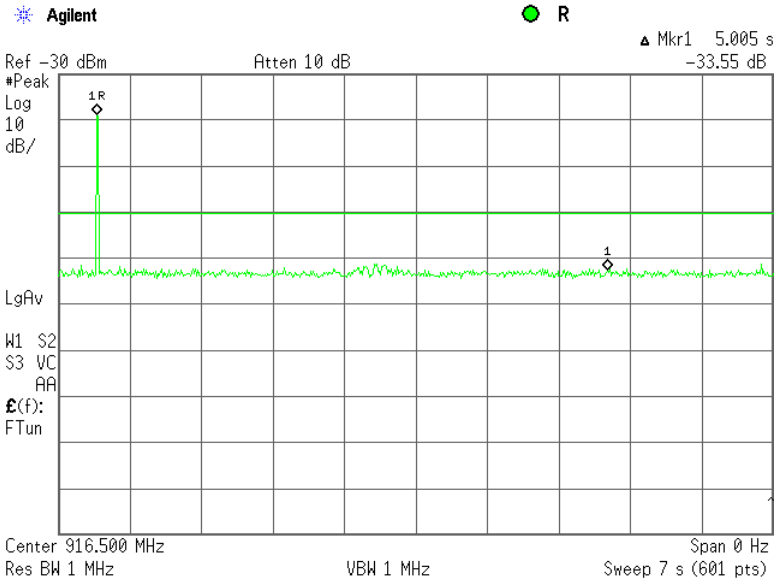


Test specification:	FCC Part 15, Section 231(b), RSS-210, Section A1.1.2, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jul-14		
Temperature: 24 ºC	Air Pressure: 1008 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.14 Transmission pulse duration



Plot 7.1.15 Transmission pulse period



Test specification:	FCC Part 15, Section 231(c), RSS-210, Section A1.1.3, Occupied bandwidth		
Test procedure:	ANSI C63.4, Section 13.1.7		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jul-14		
Temperature: 24 ºC	Air Pressure: 1009 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

7.2 Occupied bandwidth test

7.2.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Maximum allowed bandwidth, % of the carrier frequency
70 – 900	20.0	0.25
Above 900		0.50

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

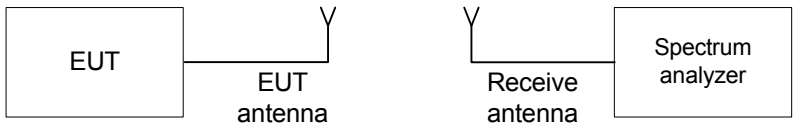
7.2.2 Test procedure

7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.

7.2.2.2 The EUT was set to transmit modulated carrier.

7.2.2.3 The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.2.2 and associated plot.

Figure 7.2.1 Occupied bandwidth test setup



Test specification:	**FCC Part 15, Section 231(c), RSS-210, Section A1.1.3, Occupied bandwidth**		
Test procedure:	ANSI C63.4, Section 13.1.7		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	28-Jul-14		
Temperature: 24 ºC	**Air Pressure:** 1009 hPa	**Relative Humidity:** 46 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.2.2 Occupied bandwidth test results

DETECTOR USED: Peak hold
RESOLUTION BANDWIDTH: 10 kHz
VIDEO BANDWIDTH: 30 kHz
MODULATION ENVELOPE REFERENCE POINTS: 20 dBc
MODULATION: FSK
BIT RATE: 38.4 kbps

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit		Margin, kHz	Verdict
		% of the carrier frequency	kHz		
916.5	88.79	0.5	4582.5	-4493.71	Pass

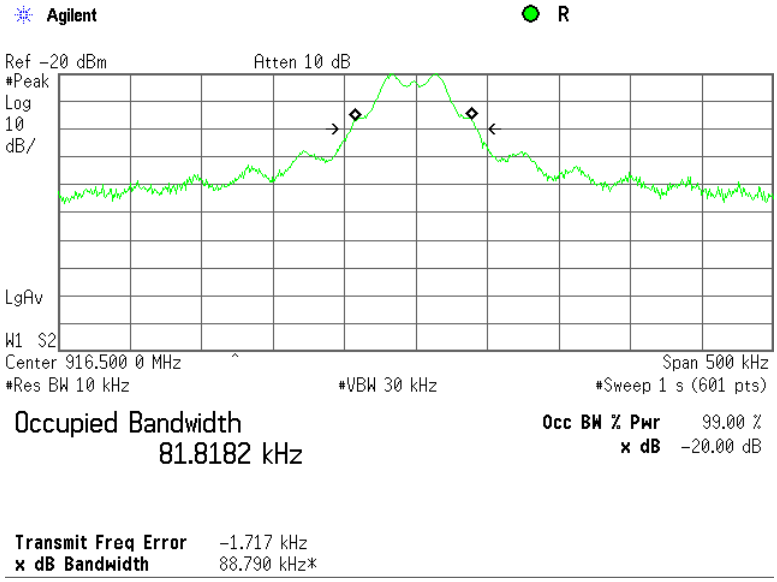
Reference numbers of test equipment used

HL 3818								

Full description is given in Appendix A.

Test specification:	FCC Part 15, Section 231(c), RSS-210, Section A1.1.3, Occupied bandwidth		
Test procedure:	ANSI C63.4, Section 13.1.7		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jul-14		
Temperature: 24 ºC	Air Pressure: 1009 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.1 Occupied bandwidth test result



Test specification:	FCC Part 15, Section 207, RSS-Gen section 7.2.4, Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jul-14		
Temperature: 25 ºC	Air Pressure: 1009 hPa	Relative Humidity: 43 %	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(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

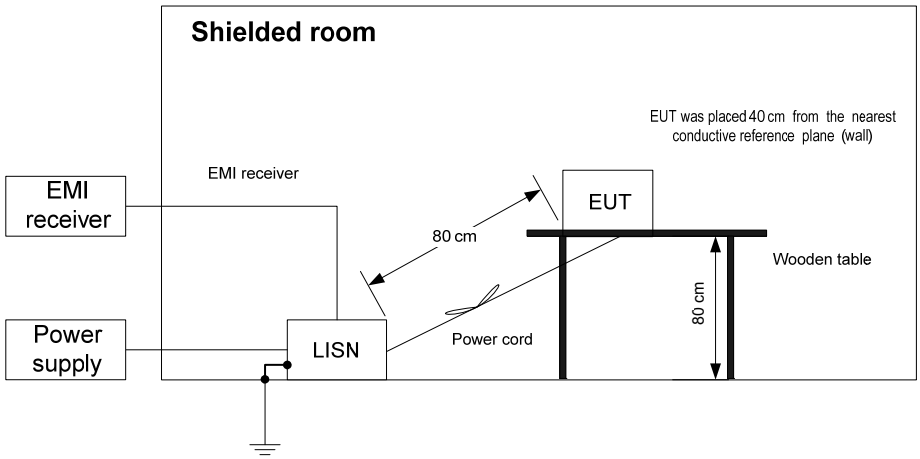
7.3.2.1 The EUT was set up as shown in Figure 7.3.1 and associated photographs, energized and the performance check was conducted.

7.3.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer while unused coaxial connector of the LISN was terminated with 50 Ohm.

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:	**FCC Part 15, Section 207, RSS-Gen section 7.2.4, Conducted emission**		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	28-Jul-14		
Temperature: 25 ºC	**Air Pressure:** 1009 hPa	**Relative Humidity:** 43 %	**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
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*		
0.306585	35.31	33.61	60.07	-26.46	25.19	50.07	-24.88	L1	Pass
0.341650	36.88	35.38	59.22	-23.84	29.17	49.22	-20.05		
0.577210	33.74	30.44	56.00	-25.56	23.33	46.00	-22.67		
1.012368	29.05	26.30	56.00	-29.70	15.98	46.00	-30.02		
0.220000	32.77	29.82	62.88	-33.06	20.46	52.88	-32.42	L2	Pass
0.338233	35.23	33.55	59.30	-25.75	27.88	49.30	-21.42		
0.356173	34.37	32.93	58.88	-25.95	25.33	48.88	-23.55		
0.574685	32.40	29.93	56.00	-26.07	22.87	46.00	-23.13		

*****- Margin = Measured emission – specification limit.

Reference numbers of test equipment used

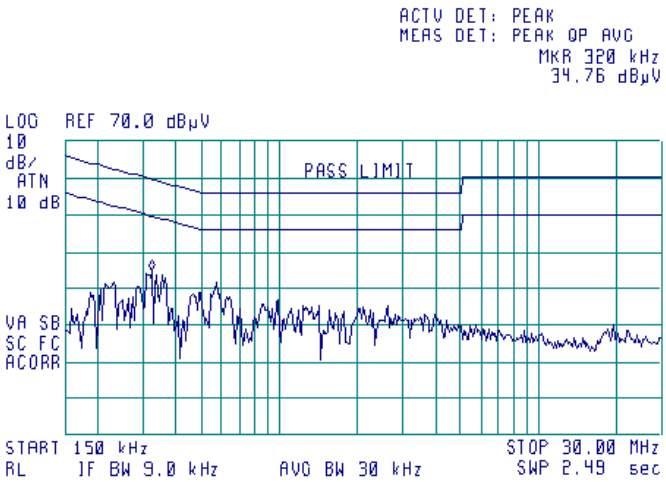
HL 0787	HL 1513	HL 2888	HL 3612	HL 4778			

Full description is given in Appendix A.

Test specification:	FCC Part 15, Section 207, RSS-Gen section 7.2.4, Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jul-14		
Temperature: 25 ºC	Air Pressure: 1009 hPa	Relative Humidity: 43 %	Power Supply: 120 VAC
Remarks:			

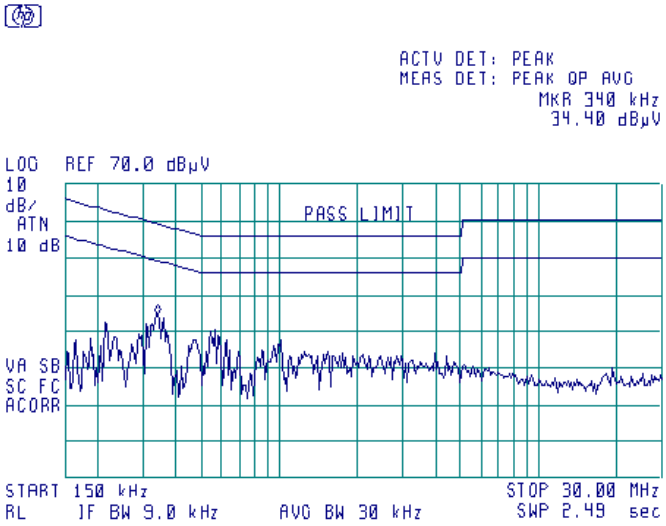
Plot 7.3.1 Conducted emission measurements

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:	FCC Part 15, Section 109 / ICES-003 Class B, RSS-Gen Section 6.1, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4 / RSS-Gen, Section 4.10 / CISPR 22		
Test mode:	Compliance	Verdict:	PASS
Date(s):	6/9/2013		
Temperature: 25.6 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

8 Unintentional emissions

8.1 Radiated emission measurements

8.1.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 8.2.1, Table 8.2.2.

Table 8.1.1 Radiated emission test limits according to FCC Part 15 Section 15.109 and ICES-003 section 6.2

Frequency, MHz	Class B limit, dB(μV/m)		Class A limit, dB(μV/m)	
	10 m distance	3 m distance	10 m distance	3 m distance
30 - 88	29.5*	40.0	39.0	49.5*
88 - 216	33.0*	43.5	43.5	54.0*
216 - 960	35.5*	46.0	46.4	56.9*
Above 960	43.5*	54.0	49.5	60.0*

* The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $Lim_{S2} = Lim_{S1} + 20 \log (S_1/S_2)$,
where S_1 and S_2 – standard defined and test distance respectively in meters.

Table 8.1.2 Radiated emission limits according to RSS-Gen, Section 6.1

Frequency, MHz	Field strength limit at 3 m test distance, dB(μV/m)
30 - 88	40.0
88 - 216	43.5
216 - 960	46.0
960 - 3rd harmonic**	54.0

** - harmonic of the highest frequency the EUT generates, uses, operates or tunes to.

8.1.2 Test procedure

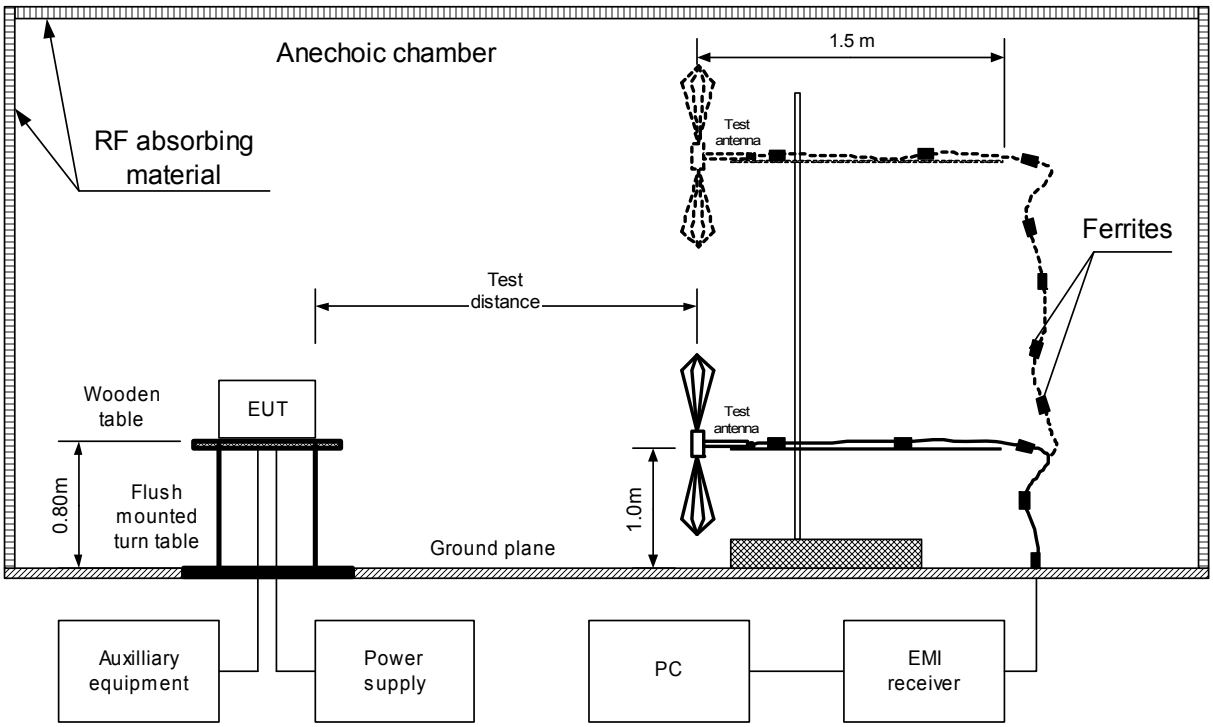
8.1.2.1 The EUT was set up as shown in Figure 8.1.1 and associated photographs, energized and the performance check was conducted.

8.1.2.2 The specified frequency range was investigated with biconilog antenna connected to 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 and the EUT cables position was varied.

8.1.2.3 The worst test results (the lowest margins) were provided in the associated tables and plots.

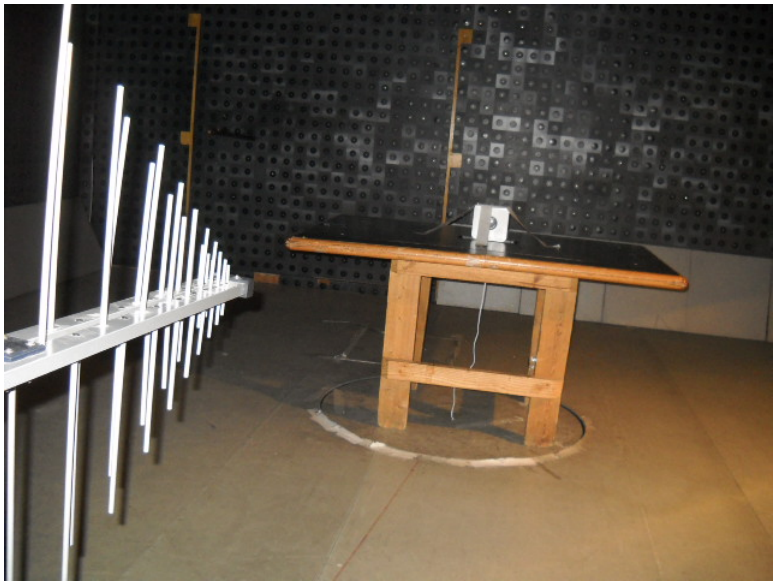
Test specification:	FCC Part 15, Section 109 / ICES-003 Class B, RSS-Gen Section 6.1, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4 / RSS-Gen, Section 4.10 / CISPR 22		
Test mode:	Compliance	Verdict:	PASS
Date(s):	6/9/2013		
Temperature: 25.6 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

Figure 8.1.1 Setup for radiated emission measurements in anechoic chamber, table-top equipment

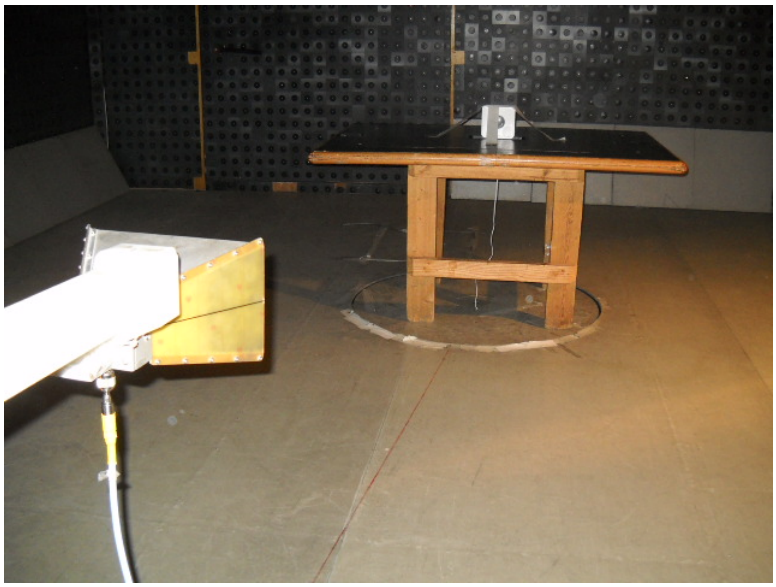


Test specification:	FCC Part 15, Section 109 / ICES-003 Class B, RSS-Gen Section 6.1, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4 / RSS-Gen, Section 4.10 / CISPR 22		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	6/9/2013		
Temperature: 25.6 ºC	**Air Pressure:** 1005 hPa	**Relative Humidity:** 41 %	**Power Supply:** 120 VAC
Remarks:			

Photograph 8.1.1 Setup for radiated emission measurements



Photograph 8.1.2 Setup for radiated emission measurements



Test specification:	**FCC Part 15, Section 109 / ICES-003 Class B, RSS-Gen Section 6.1, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4 / RSS-Gen, Section 4.10 / CISPR 22		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	6/9/2013		
Temperature: 25.6 ºC	**Air Pressure:** 1005 hPa	**Relative Humidity:** 41 %	**Power Supply:** 120 VAC
Remarks:			

Table 8.1.3 Radiated emission test results

EUT SET UP: TABLE-TOP
LIMIT: Class B
EUT OPERATING MODE: Stand-by / Receive
TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m

DETECTORS USED: PEAK / QUASI-PEAK
FREQUENCY RANGE: 30 MHz – 1000 MHz
RESOLUTION BANDWIDTH: 120 kHz

Frequency, MHz	Peak emission, dB(µV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*				
38.2407	34.6	31.9	40.0	-8.1	Vert	1.0	0	Pass
83.2135	33.4	31.3	43.5	-12.2	Vert	1.0	94	
200.0295	43.4	41.4	43.5	-2.1	Vert	1.0	280	
261.8200	42.8	40.4	46.0	-5.6	Vert	1.0	128	
290.1110	43.3	41.4	46.0	-4.6	Vert	1.0	314	
388.2855	42.6	38.9	46.0	-7.1	Vert	1.0	339	

DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 MHz – 4500 MHz
RESOLUTION BANDWIDTH: 1000 kHz

Frequency, MHz	Peak			Average			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
	Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*	Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*				
No emissions were found										Pass

*****- Margin = Measured emission - specification limit.
******- EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

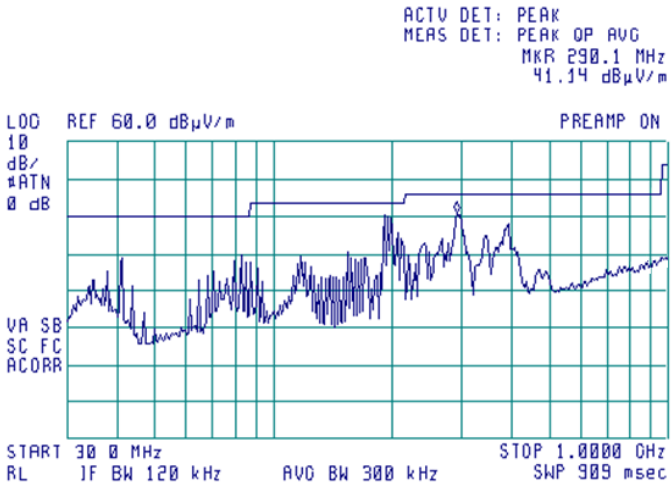
HL 0521	HL 0604	HL1984	HL 3818	HL 4160	HL 4353	HL 4847	

Full description is given in Appendix A.

Test specification:	FCC Part 15, Section 109 / ICES-003 Class B, RSS-Gen Section 6.1, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4 / RSS-Gen, Section 4.10 / CISPR 22		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	6/9/2013		
Temperature: 25.6 ºC	**Air Pressure:** 1005 hPa	**Relative Humidity:** 41 %	**Power Supply:** 120 VAC
Remarks:			

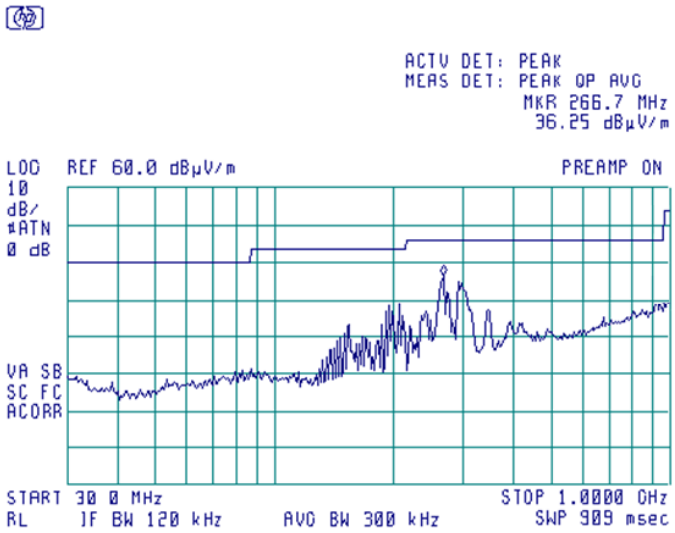
Plot 8.1.1 Radiated emission measurements in 30 - 1000 MHz range, vertical antenna polarization

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Stand-by / Receive



Plot 8.1.2 Radiated emission measurements in 30 - 1000 MHz range, horizontal antenna polarization

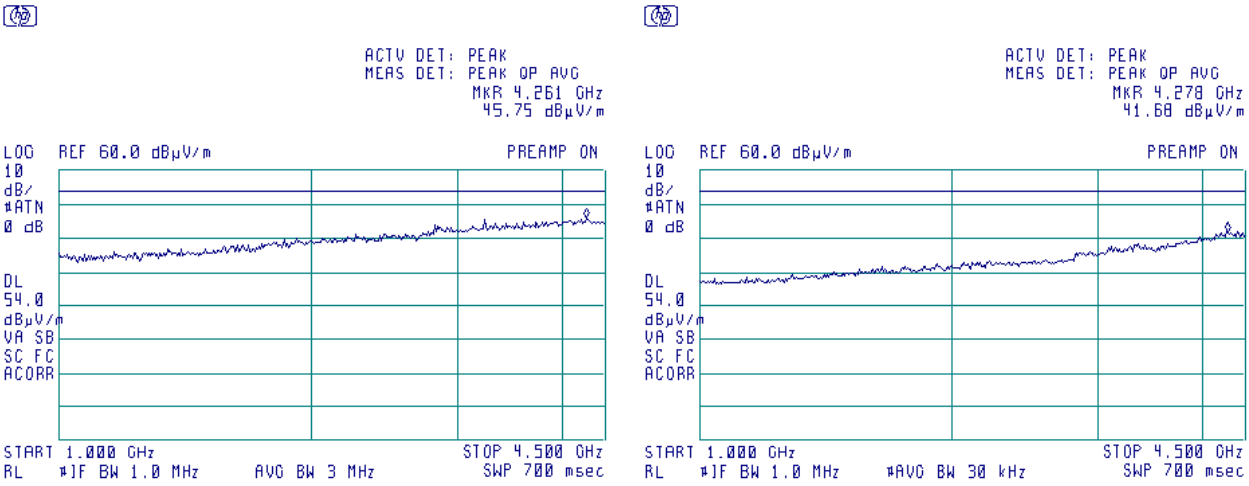
TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Stand-by / Receive



Test specification:	FCC Part 15, Section 109 / ICES-003 Class B, RSS-Gen Section 6.1, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4 / RSS-Gen, Section 4.10 / CISPR 22		
Test mode:	Compliance	Verdict:	PASS
Date(s):	6/9/2013		
Temperature: 25.6 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

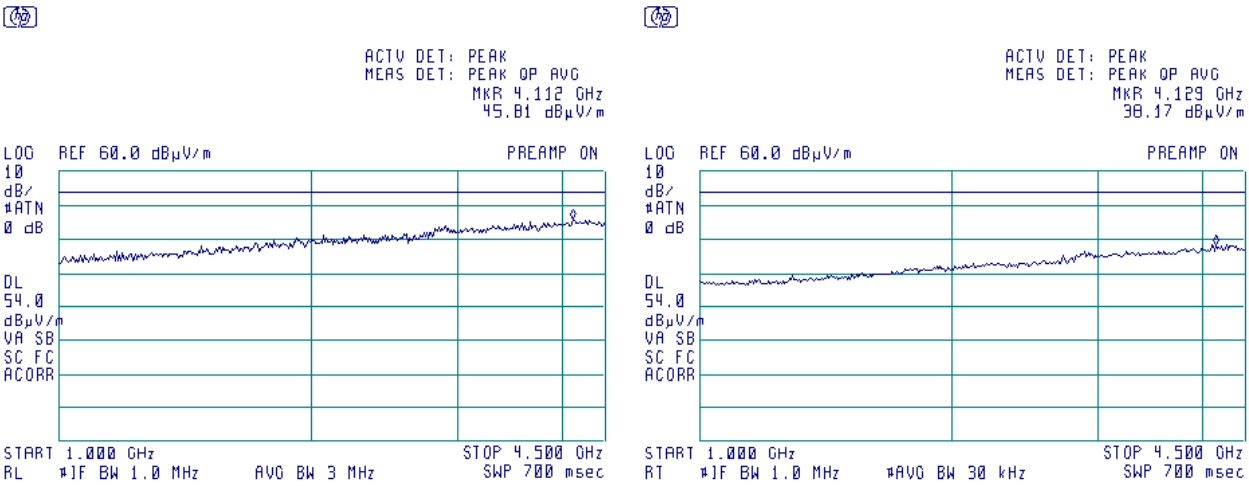
Plot 8.1.3 Radiated emission measurements above 1000 MHz, vertical antenna polarization

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Stand-by



Plot 8.1.4 Radiated emission measurements above 1000 MHz, horizontal antenna polarization

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Stand-by



9 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
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
0583	Antenna, Log Periodic, 200 - 1000 MHz	Hermon Laboratories	LP 200/1000	035	13-May-14	13-May-15
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	22-May-14	22-May-15
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard	11947A	3107A018 77	13-Oct-13	13-Oct-14
1513	Cable RF, 8 m, BNC/BNC	Belden	M17/167 MIL-C-17	1513	05-Nov-13	05-Nov-14
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	03-Jan-14	03-Jan-15
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	24-Mar-14	24-Mar-15
3612	Cable RF, 17.5 m, N type-N type	Teldor	RG-214/U	NA	05-Dec-13	05-Dec-14
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY482502 88	20-May-14	20-May-15
4114	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz	ETS Lindgren	3117	00123515	27-Dec-13	27-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	12-Aug-14	12-Aug-15
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
4778	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL4777	Hewlett Packard	8542E	30807A00 262, 3427A001 23	06-Nov-13	06-Nov-14
4847	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29-N1N1-244	1GVT4 51315201 001	16-Mar-14	16-Mar-15

10 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
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.

11 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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12 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
ICES-003 issue 5:2012	Information Technology Equipment (ITE) – Limits and methods of measurement

13 APPENDIX E Test equipment correction factors

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
Log periodic antenna
Hermon Laboratories, model LP 200/1000
Ser.No.035, HL 0583

Frequency, MHz	Antenna factor, dB(1/m)
200	12.0
250	12.5
300	14.5
350	15.7
400	16.0
450	16.7
500	18.1
550	18.2
600	18.8
650	20.1
700	21.8
750	21.4
800	21.4
850	22.4
900	22.8
950	23.4
1000	24.6

The antenna factor shall be added to receiver reading in dBμV to obtain field strength in dBμV/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).

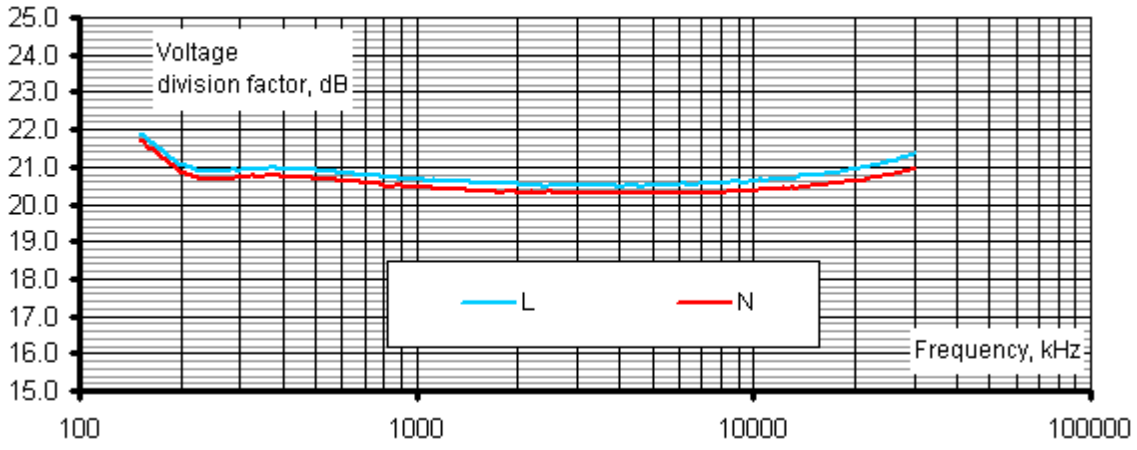
Antenna factor
Double-ridged waveguide horn antenna
ETS Lindgren, Model 3117, serial number: 00123515, HL 4114

Frequency, MHz	Antenna factor, dB/m		
	Measured	Manufacturer	Deviation
1000	28.0	28.4	-0.4
1500	28.0	27.4	0.6
2000	31.2	30.9	0.3
2500	32.5	33.4	-0.9
3000	32.9	32.6	0.3
3500	32.7	32.8	-0.1
4000	33.1	33.4	-0.3
4500	33.8	33.9	-0.1
5000	33.8	34.1	-0.3
5500	34.4	34.5	-0.1
6000	35.0	35.2	-0.2
6500	35.4	35.5	-0.1
7000	35.7	35.7	0.0
7500	35.9	35.7	0.2
8000	35.8	35.8	0.0
8500	35.9	35.8	0.1
9000	36.3	36.2	0.1
9500	36.6	36.6	0.0
10000	37.1	37.1	0.0
10500	37.6	37.5	0.1
11000	37.9	37.7	0.2
11500	38.5	38.1	0.4
12000	39.2	38.7	0.5
12500	39.0	38.9	0.1
13000	39.1	39.1	0.0
13500	38.9	38.8	0.1
14000	39.0	38.8	0.2
14500	39.6	39.9	-0.3
15000	39.9	39.7	0.2
15500	39.9	40.1	-0.2
16000	40.7	40.8	-0.1
16500	41.3	41.8	-0.5
17000	42.5	42.1	0.4
17500	41.3	41.2	0.1
18000	41.4	40.9	0.5

Antenna factor is to be added to receiver meter reading in dB(μV) to convert to field strength in dB(μV/meter)

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

Frequency, kHz	Correction factor, dB	
	L	N
150	21.92	21.74
170	21.52	21.36
200	21.06	20.85
250	20.88	20.68
300	20.92	20.70
350	20.96	20.77
400	20.96	20.74
500	20.92	20.69
600	20.85	20.63
700	20.78	20.58
800	20.73	20.52
900	20.68	20.50
1000	20.67	20.45
1200	20.61	20.43
1500	20.56	20.33
2000	20.54	20.32
2500	20.51	20.33
3000	20.53	20.29
4000	20.46	20.30
5000	20.53	20.33
7000	20.54	20.32
10000	20.62	20.36
15000	20.78	20.49
20000	20.94	20.63
30000	21.37	20.95



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		

14 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 DOCUMENT