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839.01
Electrical

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TEST REPORT

**ACCORDING TO: FCC Part 90 Subpart I, Part 15 subpart B class B;
RSS-137 Issue 2, ICES-003 class B**

FOR:

Telematics Wireless Ltd.

Mobile transponder

Model: FP101TB

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1 Applicant information

Client name:	Telematics Wireless Ltd.
Address:	26 Hamelaha street, POB 1911, Holon, 58117, Israel
Telephone:	+972 3557 5706
Fax:	+972 3557 5703
E-mail:	itsikk@tlmw.com
Contact name:	Mr. Itsik Kanner

2 Equipment under test attributes

Product name:	Mobile transponder
Product type:	Transceiver
Model(s):	FP101TB
Hardware version:	7.20
Receipt date	1/29/2009

3 Manufacturer information

Manufacturer name:	Telematics Wireless Ltd.
Address:	26 Hamelaha street, POB 1911, Holon, 58117, Israel
Telephone:	+972 3557 5706
Fax:	+972 3557 5703
E-Mail:	itsikk@tlmw.com
Contact name:	Mr. Itsik Kanner

4 Test details

Project ID:	19423
Location:	Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started:	1/29/2009
Test completed:	2/09/2009
Test specification(s):	FCC part 90 subpart I, part 15 subpart B class B; RSS-137 issue 2, ICES_003 class B

5 Tests summary

Test	Status
Transmitter characteristics	
FCC Section 90.205/ RSS-137 Section 6.4, Maximum output power	Pass
FCC Section 90.209/ RSS-137 Section 6.1.2, Occupied bandwidth	Pass
FCC Section 90.210/RSS-137 Section 6.5.3, Emission mask	Pass
FCC Section 90.210/RSS-137 Section 6.5, Radiated spurious emissions	Pass
FCC Section 90.213/RSS-137 Section 6.3, Frequency stability	Tested without limit
FCC Section 90.214, Transient frequency behaviour	Not required
FCC Section 2.1091/RSS-Gen Section 5.5, RF radiation exposure evaluation	Pass, the exhibit attached to application
Unintentional emissions	
FCC Section 15.107/ ICES-003 Section 5.3 Class B, Conducted emission at AC power port	Not required
FCC Section 15.109/ RSS-137 Section 6.6/ ICES-003 Section 5.5 Class B, Radiated emission	Pass
FCC Section 15.111/ ICES-003, Conducted emission at receiver antenna port	Not required

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.

This test report replaces the previously issued test report identified by Doc ID:TELRAD_FCC.19423.

	Name and Title	Date	Signature
Tested by:	Mr. S. Samokha, test engineer	February 9, 2009	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	March 8, 2009	
Approved by:	Mr. M. Nikishin, EMC and radio group leader	March 9, 2009	

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6 EUT description

6.1 General information

The EUT is small LMS transponder, operating @915 MHz with unipolar ASK modulation. The FP101TB transmits data from a vehicle utilizing an internal antenna.

6.2 Support equipment used for EUT initialization

Description	Manufacturer	Model number	Serial number
Laptop	IBM ThinkPad	T41	99-A5H5F
AC/DC Adaptor	IBM	078KP202	R45V6UG
Converter USB/RS232	Telematics Wireless Ltd.	U232-P9	NA
Converter RS232	Telematics Wireless Ltd.	NA	NA

6.3 Operating frequencies

Source	Frequency, MHz	
Tx	915	
Clock	8.0	0.032768

6.4 Changes made in the EUT

No changes were implemented.

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6.5 EUT configuration

Photograph 6.5.1 EUT typical configuration in 0° orientation position

Photograph 6.5.2 EUT typical configuration in 180° orientation position

6.6 Transmitter characteristics

Type of equipment								
	Stand-alone (Equipment with or without its own control provisions)							
X	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)							
	Plug-in card (Equipment intended for a variety of host systems)							

Intended use		**Condition of use**
	fixed	Always at a distance more than 2 m from all people
X	mobile	Always at a distance more than 20 cm from all people
	portable	May operate at a distance closer than 20 cm to human body

Assigned frequency range	902-928 MHz
Operating frequency range	915 MHz

Maximum rated output power	At transmitter 50 Ω RF output connector	NA
	Effective radiated power (for equipment with no RF connector)	2.7 dBm

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

Antenna/s technical characteristics			
Type	Manufacturer	Model number	Gain
Integral	Telematics Wireless Ltd.	Printed antenna	0 dBi

Transmitter aggregate data rate/s	500 kbps		
Transmitter aggregate symbol (baud) rate/s	NA		
Type of modulation	ASK		
Maximum transmitter duty cycle in normal use	15%		
Transmitter duty cycle supplied for test	100%	**Tx ON time**	**Period**

Transmitter power source						
X	Battery	**Nominal rated voltage**	3.6VDC	Battery type	Lithium
	DC	**Nominal rated voltage**	VDC		
	AC mains	**Nominal rated voltage**	VAC	Frequency	Hz

Common power source for transmitter and receiver	X	yes		no

Test specification:	FCC Section 90.205/ RSS-137 Section 6.4, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 7:19:06 PM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

7 Transmitter tests according to 47CFR part 90 and RSS-137 requirements

7.1 Effective radiated power of carrier

7.1.1 General

This test was performed to measure effective radiated power emanated by transmitter at carrier frequency. Specification test limits are given in Table 7.1.1.

Table 7.1.1 Effective radiated power limit

Assigned frequency band, MHz	ERP		Equivalent field strength limit @ 3m, dB(μV/m)*
	W	dBm	
902.0 – 928.0	30	44.7	142.1

* - Equivalent field strength limit was calculated from maximum allowed ERP as follows: E=sqrt(30×P×1.64)/r, where P is ERP in Watts, 1.64 is numeric gain of ideal dipole and r is antenna to EUT distance in meters

7.1.2 Test procedure for field strength measurements

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 field strength of the EUT carrier frequency was measured with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna height was swept throughout the range, specified in Table 7.1.2, in both vertical and horizontal polarizations.

7.1.2.3 The worst test results (the lowest margins) were recorded in Table 7.1.2 and shown in the associated plots.

7.1.3 Test procedure for substitution ERP measurements

7.1.3.1 The test equipment was set up as shown in Figure 7.1.2 and energized.

7.1.3.2 RF signal generator was set to the EUT carrier frequency and the RF output level was preliminary adjusted to produce the same field strength as it was measured from the EUT.

7.1.3.3 The test antenna height was swept throughout the specified in Table 7.1.2 range to find maximum emission from substitution antenna and RF signal generator output was fine adjusted to produce the same field strength as it was measured from the EUT.

7.1.3.4 The ERP was calculated as a sum of signal generator output power in dBm and antenna gain in dBd reduced by cable loss in dB.

7.1.3.5 The above procedure was performed in both horizontal and vertical polarizations of the test antenna.

7.1.3.6 The worst test results (the lowest margins) were recorded in Table 7.1.3 and shown in the associated plots.

Test specification:	FCC Section 90.205/ RSS-137 Section 6.4, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 7:19:06 PM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

Figure 7.1.1 Setup for carrier field strength measurements

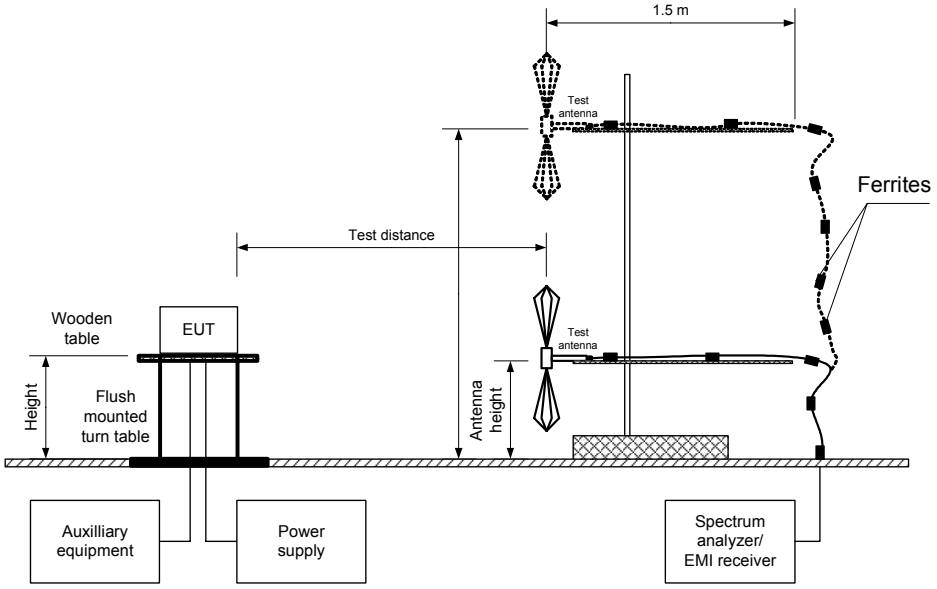
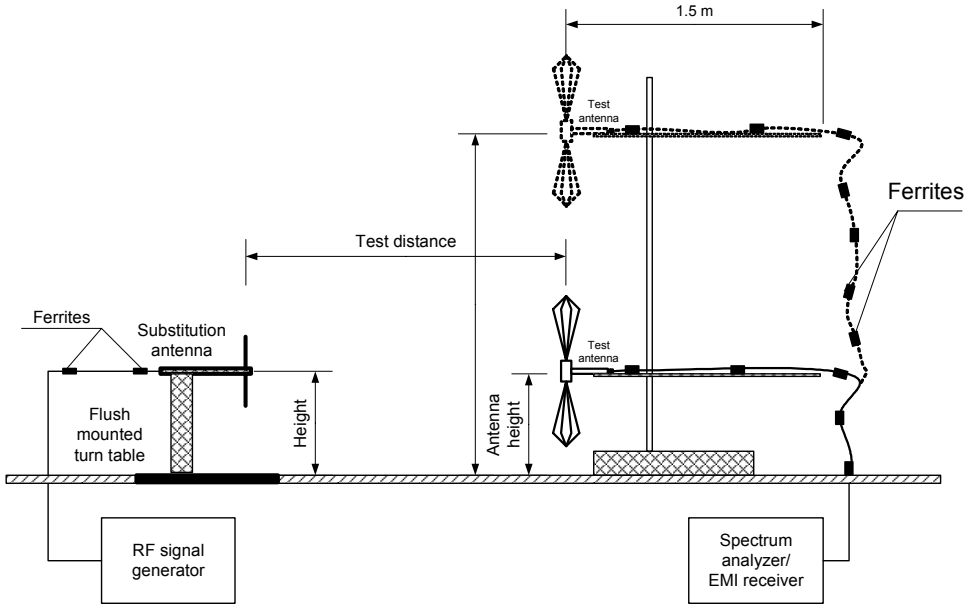


Figure 7.1.2 Setup for substitution ERP measurements



Test specification:	FCC Section 90.205/ RSS-137 Section 6.4, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 7:19:06 PM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

Table 7.1.2 Transmitter carrier field strength

ASSIGNED FREQUENCY RANGE: 902 - 928 MHz
TEST SITE: OATS
TEST DISTANCE: 3 m
EUT HEIGHT: 0.8 m
EUT POSITION: Typical
TEST ANTENNA HEIGHTS RANGE: 1.0 – 4.0 m
DETECTOR USED: Peak
VIDEO BANDWIDTH: > Resolution bandwidth
TEST ANTENNA TYPE: Biconical
MODULATION: ASK
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Field strength, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	RBW, kHz	Antenna polarization	Antenna height, m	Turn-table position***, degrees
915.11	99.25	142.1	-42.85	3000	Vertical	1.2	300
915.11	103.10*	142.1	-39.00		Horizontal	1.5	200

*- the maximum test result was obtained in the EUT typical configuration in 0° orientation

**- Margin = Field strength – calculated field strength limit.
***- EUT front panel refers to 0 degrees position of turntable.

Table 7.1.3 Transmitter carrier ERP

TEST DISTANCE: 3 m
SUBSTITUTION ANTENNA HEIGHT: 0.8 m
TEST ANTENNA HEIGHTS RANGE: 1.0 – 4.0 m
DETECTOR USED: Peak
VIDEO BANDWIDTH: > Resolution bandwidth
SUBSTITUTION ANTENNA TYPE: Tunable dipole

Frequency, MHz	Field strength, dB(μV/m)	RBW, kHz	Antenna polarization	RF generator output, dBm	Ant gain, dBd	Cable loss, dB	ERP, dBm	Limit, dBm	Margin, dB*	Verdict
915.11	99.25	3000	Vertical	2.25	-1.3	2.12	-1.18	44.70	-45.88	Pass
915.11	103.10		Horizontal	6.10	-1.3	2.12	2.67	44.70	-42.03	Pass

*- Margin = ERP – specification limit.

Reference numbers of test equipment used

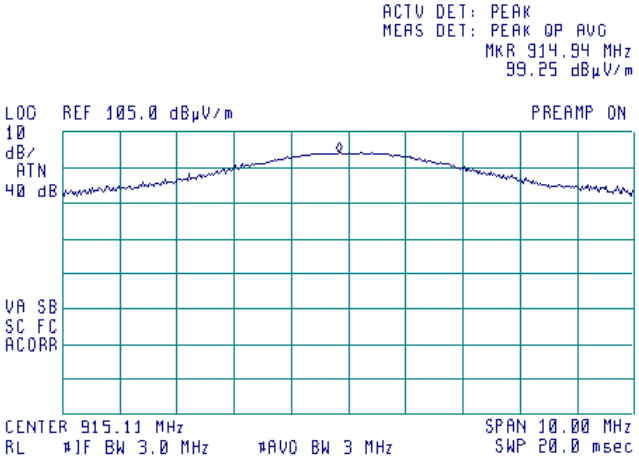
HL 0415	HL 0569	HL 0661	HL 0812	HL 1430	HL 1565	HL 3207	HL 3634

Full description is given in Appendix A.

Test specification:	FCC Section 90.205/ RSS-137 Section 6.4, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 7:19:06 PM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

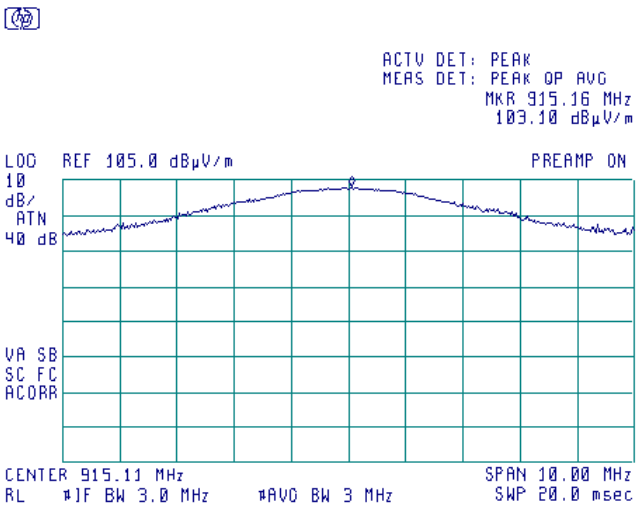
Plot 7.1.1 Transmitter carrier field strength at carrier frequency in vertical antenna polarization

EUT POSITION: Vertical (typical)
EUT ORIENTATION: 0°



Plot 7.1.2 Transmitter carrier field strength at carrier frequency in horizontal antenna polarization.

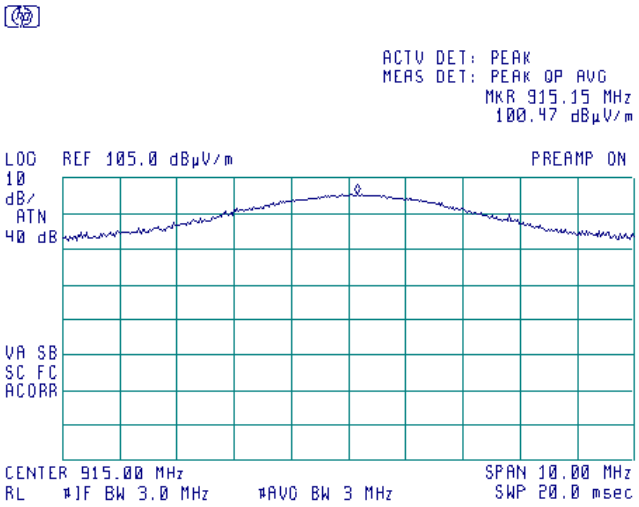
EUT POSITION: Vertical (typical)
EUT ORIENTATION: 0°



Test specification:	FCC Section 90.205/ RSS-137 Section 6.4, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 7:19:06 PM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

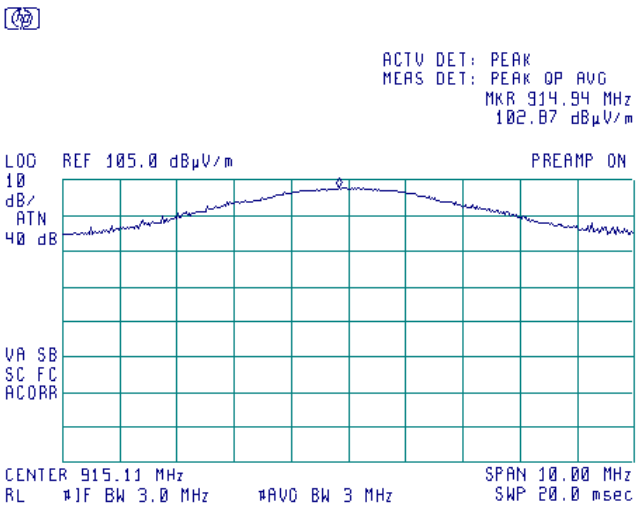
Plot 7.1.3 Transmitter carrier field strength at carrier frequency in vertical antenna polarization

EUT POSITION: Vertical (typical)
EUT ORIENTATION: 180°



Plot 7.1.4 Transmitter carrier field strength at carrier frequency in horizontal antenna polarization

EUT POSITION: Vertical (typical)
EUT ORIENTATION: 180°



Test specification:	FCC Section 90.209/ RSS-137 Section 6.1.2, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 10:27:26 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
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

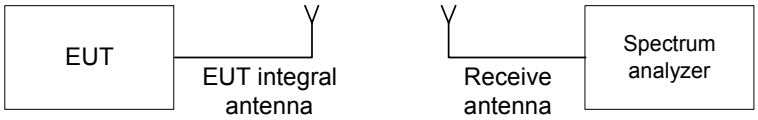
Assigned frequency, MHz	Modulation envelope reference points*, dBc	Maximum allowed bandwidth, MHz
902.0 – 928.0	26	12.0

* - Modulation envelope reference points are provided in terms of attenuation below the unmodulated 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 the unmodulated carrier and the reference peak power level was measured.
7.2.2.3 The EUT was set to transmit the normally modulated carrier.
7.2.2.4 The transmitter occupied bandwidth was measured with spectrum analyzer as a frequency delta between the reference points on modulation envelope and provided in Table 7.2.2 and the associated plots.

Figure 7.2.1 Occupied bandwidth test setup



Test specification:	FCC Section 90.209/ RSS-137 Section 6.1.2, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 10:27:26 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

Table 7.2.2 Occupied bandwidth test results

DETECTOR USED:	Peak hold
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 KHz
MODULATION ENVELOPE REFERENCE POINTS:	26 dBc
MODULATION:	ASK
BIT RATE:	500 kbps

Carrier frequency, MHz	Occupied bandwidth, MHz	Limit, MHz	Margin, MHz	Verdict
915.15	6.60	12.0	-5.40	Pass

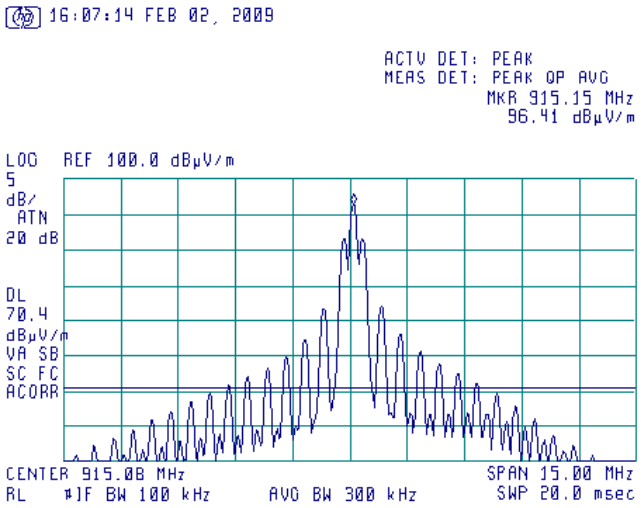
Reference numbers of test equipment used

HL 0521	HL 0604	HL 3123	HL 3615				

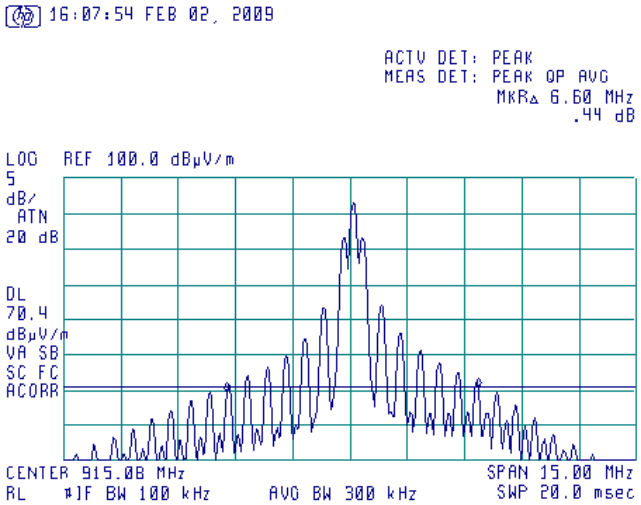
Full description is given in Appendix A.

Test specification:	FCC Section 90.209/ RSS-137 Section 6.1.2, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 10:27:26 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

Plot 7.2.1 Occupied bandwidth test result at carrier frequency, Reference Level



Plot 7.2.2 Occupied bandwidth test result at carrier frequency



Test specification:	FCC Section 90.210/RSS-137 Section 6.5.3, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 10:14:14 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

7.3 Emission mask test

7.3.1 General

This test was performed to measure emission mask at RF antenna connector. Specification test limits are given in Table 7.3.1. The test results are provided in the associated plots.

Table 7.3.1 Emission mask limits

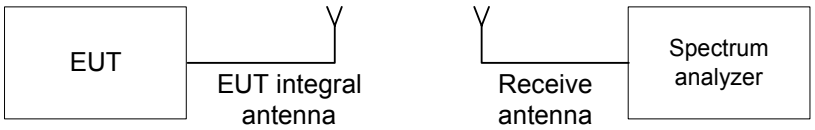
Frequency displacement from carrier	Attenuation below carrier, dBc
FCC section 90.210 emission mask K/RSS-137 section 6.5.3 emission mask C	
909.75 – 921.75 MHz	0
Below 909.75 MHz	55+10logP(W)
Above 921.75 MHz	55+10logP(W)

* - linearly increase with frequency
** - emission mask includes carrier modulation envelope within ± 250 % of the authorized bandwidth; the frequency range removed beyond ± 250 % of the authorized bandwidth from carrier was investigated as spurious emission

7.3.2 Test procedure

7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and its proper operation was checked.
7.3.2.2 The emission mask was measured with spectrum analyzer as provided in the associated plots.

Figure 7.3.1 Emission mask test setup



Test specification:	**FCC Section 90.210/RSS-137 Section 6.5.3, Emission mask**		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	2/9/2009 10:14:14 AM		
Temperature: 21ºC	**Air Pressure:** 1018 hPa	**Relative Humidity:** 50 %	**Power Supply:** Battery
Remarks:			

Table 7.3.2 Emission mask test results

ASSIGNED FREQUENCY RANGE: 902.0 – 928.0 MHz
DETECTOR USED: Peak
MODULATION: ASK
BIT RATE: 500 bps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Field strength, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	RBW, kHz
Carrier frequency 915.1 MHz				
909.336	63.08	72.38	-9.30	100
921.833	57.40	72.38	-14.98	100

*- Margin = Field strength of spurious – calculated field strength limit.

Table 7.3.3 Substitution ERP of emission mask test results

ASSIGNED FREQUENCY RANGE: 902.0 – 928.0 MHz
TRANSMITTER CARRIER ERP: 2.67 dBm at carrier frequency
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
SUBSTITUTION ANTENNA HEIGHT: 0.8 m
DETECTOR USED: Peak
VIDEO BANDWIDTH: > Resolution bandwidth
SUBSTITUTION ANTENNA TYPE: Tunable dipole (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)

Frequency MHz	Field strength, dB(μV/m)	RBW, kHz	RF generator output, dBm	Ant gain, dBd	Cable loss dB	ERP, dBm	Limit, dBm	Margin dB*	Verdict
Carrier frequency 915.1 MHz									
909.336	63.08	100	-34.69	-1.38	1.73	-37.80	-25.00	-12.80	Pass
921.833	57.40	100	-40.28	-1.26	1.73	-43.27	-25.00	-18.27	Pass

*- Margin = Spurious emission – specification limit.

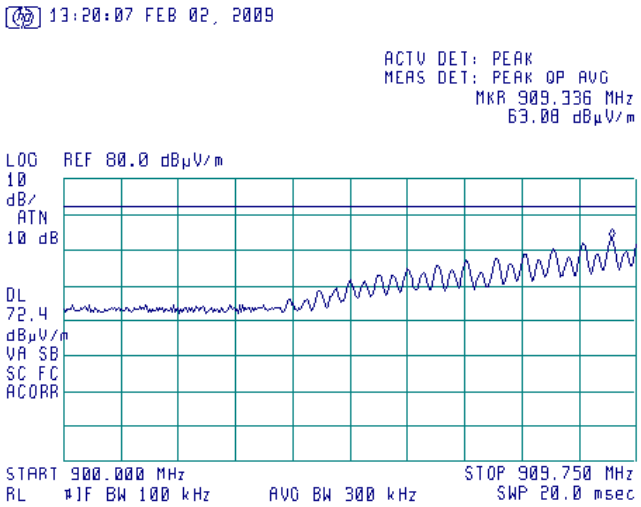
Reference numbers of test equipment used

HL 0521	HL 0604	HL 3123	HL 3615					

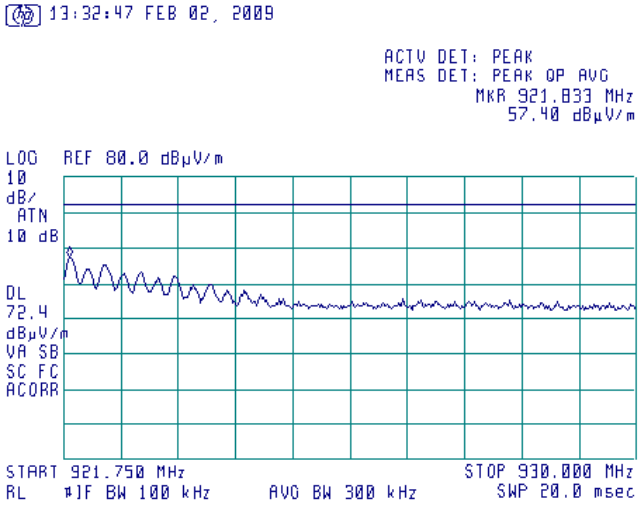
Full description is given in Appendix A.

Test specification:	FCC Section 90.210/RSS-137 Section 6.5.3, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 10:14:14 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

Plot 7.3.1 Band edge emission test results at carrier frequency, low band edge



Plot 7.3.2 Band edge emission test results at carrier frequency, high band edge



Test specification:	FCC Section 90.210/RSS-137 Section 6.5, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:42:34 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

7.4 Radiated spurious emission measurements

7.4.1 General

This test was performed to measure radiated spurious emissions from the EUT. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Radiated spurious emission test limits

Frequency, MHz	Attenuation below carrier dBc	ERP of spurious, dBm	Equivalent field strength limit @ 3m, dB(μV/m)**
0.009 – 10th harmonic*	55+10logP**	-25	72.4

* - Excluding the in band emission within ± 250 % of the authorized bandwidth from the carrier
** - P is transmitter output power in Watts
*** - Equivalent field strength limit was calculated from maximum allowed ERP of spurious as follows: E=sqrt(30×P×1.64)/r, where P is ERP in Watts, 1.64 is numeric gain of ideal dipole and r is antenna to EUT distance in meters

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

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and the performance check was conducted.
7.4.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna was rotated around its vertical axis.
7.4.2.3 The worst test results (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

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

7.4.3.1 The EUT was set up as shown in Figure 7.4.2, energized and the performance check was conducted.
7.4.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal, polarizations.
7.4.3.3 The worst test results (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

7.4.4 Test procedure for substitution ERP measurements of spurious

7.4.4.1 The test equipment was set up as shown in Figure 7.4.3 and energized.
7.4.4.2 RF signal generator was set to the frequency of investigated spurious emission and the RF output level was preliminary adjusted to produce the same field strength as it was measured from the EUT.
7.4.4.3 The test antenna height was swept from 1 to 4 m to find maximum emission from substitution antenna and RF signal generator output was fine adjusted to produce the same field strength as it was measured from the EUT.
7.4.4.4 The above procedure was performed in both, horizontal and vertical, polarizations of the test and substitution antennas.
7.4.4.5 The ERP of spurious emissions was calculated as a sum of signal generator output power in dBm and antenna gain in dBd reduced by cable loss in dB.
7.4.4.6 The above procedure was repeated at the rest of investigated frequencies.
7.4.4.7 The worst test results (the lowest margins) were recorded in Table 7.4.3 and shown in the associated plots.

Test specification:	FCC Section 90.210/RSS-137 Section 6.5, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:42:34 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

Figure 7.4.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz band

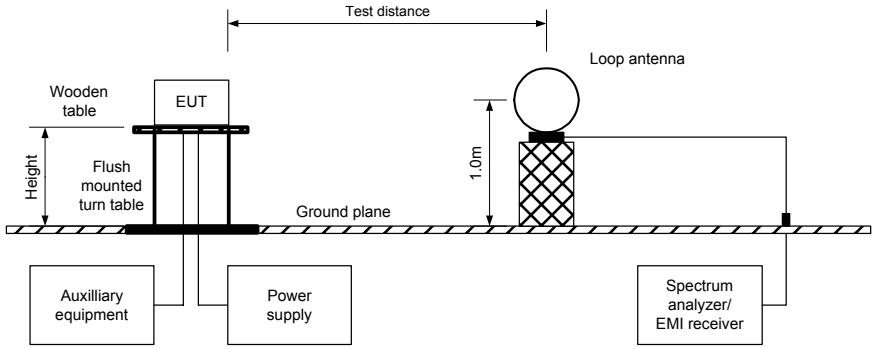
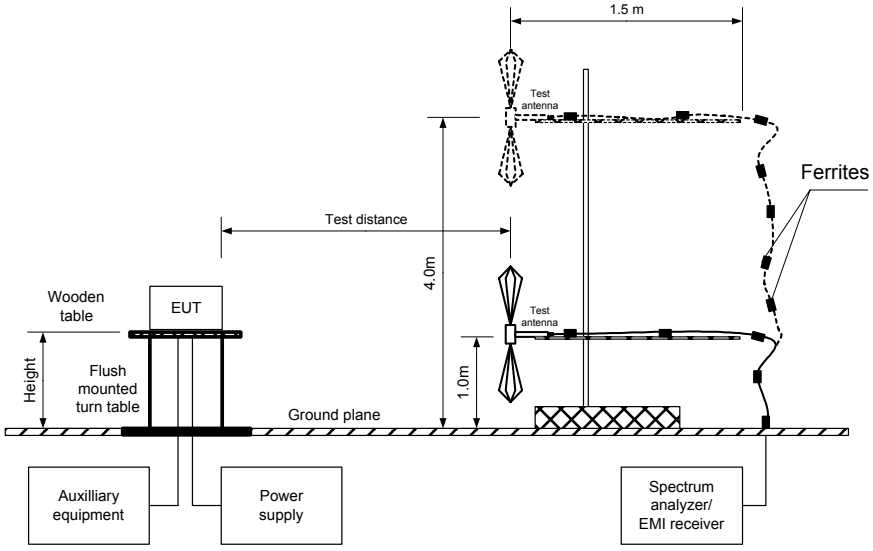
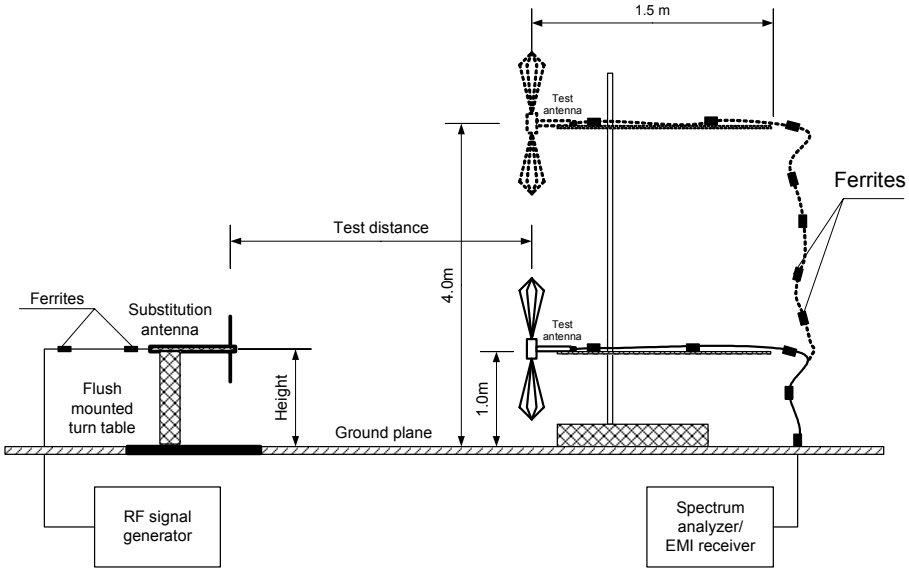


Figure 7.4.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:	FCC Section 90.210/RSS-137 Section 6.5, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:42:34 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

Figure 7.4.3 Setup for substitution ERP measurements of spurious



Test specification:	**FCC Section 90.210/RSS-137 Section 6.5, Radiated spurious emissions**		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	2/9/2009 11:42:34 AM		
Temperature: 21ºC	**Air Pressure:** 1018 hPa	**Relative Humidity:** 50 %	**Power Supply:** Battery
Remarks:			

Table 7.4.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 902.0 – 928.0 MHz
TEST DISTANCE: 3 m
TEST SITE: OATS
EUT HEIGHT: 0.8 m
INVESTIGATED FREQUENCY RANGE: 0.009 – 9500 MHz
DETECTOR USED: Peak
VIDEO BANDWIDTH: > Resolution bandwidth
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
Biconical (30 MHz – 200 MHz)
Log periodic (200 MHz – 1000 MHz)
Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)
MODULATION: ASK
BIT RATE: 500 kbps
TRANSMITTER OUTPUT POWER: Maximum

Frequency, MHz	Field strength, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	RBW, kHz	Antenna polarization	Antenna height, m	Turn-table position**, degrees
Carrier frequency 915.1 MHz							
1830.237	58.38	72.38	-14.00	100	Vert	1.3	178
2745.110	57.39	72.38	-14.99	100	Vert	1.2	182
3660.484	56.60	72.38	-15.78	100	Hor	1.0	181
5490.718	53.40	72.38	-18.98	100	Hor	1.25	335
6405.845	60.83	72.38	-11.55	100	Hor	1.25	340
7320.970	56.78	72.38	-15.60	100	Vert	1.2	10

*- Margin = Field strength of spurious – calculated field strength limit.
**- EUT front panel refers to 0 degrees position of turntable.

Table 7.4.3 Substitution ERP of spurious test results

ASSIGNED FREQUENCY RANGE: 902.0 – 928.0 MHz
TEST SITE: OATS
TEST DISTANCE: 3 m
SUBSTITUTION ANTENNA HEIGHT: 0.8 m
DETECTOR USED: Peak
VIDEO BANDWIDTH: > Resolution bandwidth
SUBSTITUTION ANTENNA TYPE: Double ridged guide (above 1000 MHz)

Frequency MHz	Field strength, dB(μV/m)	RBW, kH	Antenna polarizatio	RF generator output, dBm	Ant gain, dBd	Cable loss dB	ERP, dBm	Limit, dBm	Margin, dB*	Verdict
1830.237	58.38	100	Vertical	-42.70	6.45	1.46	-37.70	-25.00	-12.70	Pass
2745.110	57.39	100	Horizontal	-47.33	5.27	1.21	-43.27	-25.00	-18.27	Pass
3660.484	56.60	100	Vertical	-50.59	6.36	1.37	-45.61	-25.00	-20.61	Pass
5490.718	53.40	100	Horizontal	-45.78	-0.01	1.75	-47.54	-25.00	-22.54	Pass
6405.845	60.83	100	Vertical	-39.47	0.89	1.92	-40.50	-25.00	-15.50	Pass
7320.970	56.78	100	Vertical	-44.15	2.12	2.03	-44.06	-25.00	-19.06	Pass

*- Margin = Spurious emission – specification limit.

Reference numbers of test equipment used

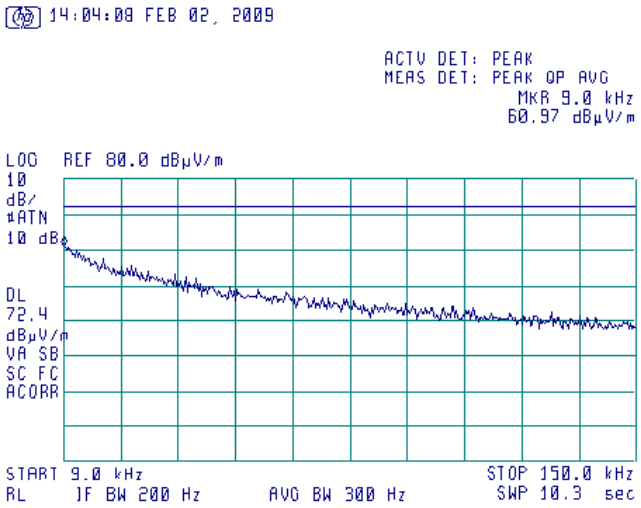
HL 0446	HL 0521	HL 0554	HL 0604	HL 0661	HL 1984	HL 2432	HL 2780
HL 2883	HL 3122	HL 3123	HL 3385	HL 3615			

Full description is given in Appendix A.

Test specification:	FCC Section 90.210/RSS-137 Section 6.5, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:42:34 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

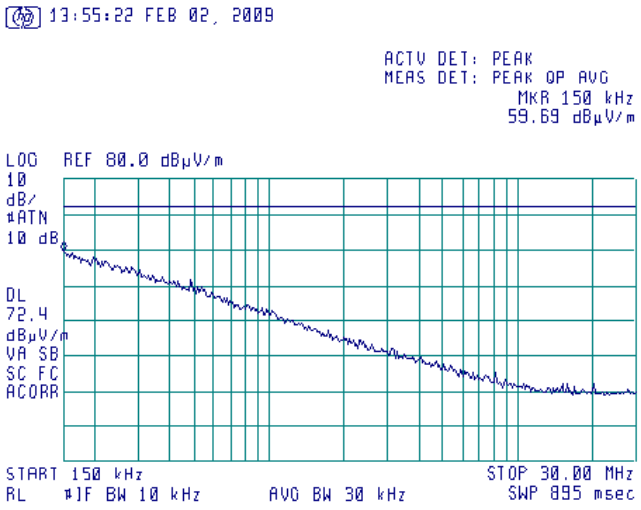
Plot 7.4.1 Radiated emission measurements in 9 - 150 kHz range

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



Plot 7.4.2 Radiated emission measurements in 0.15 - 30 MHz range

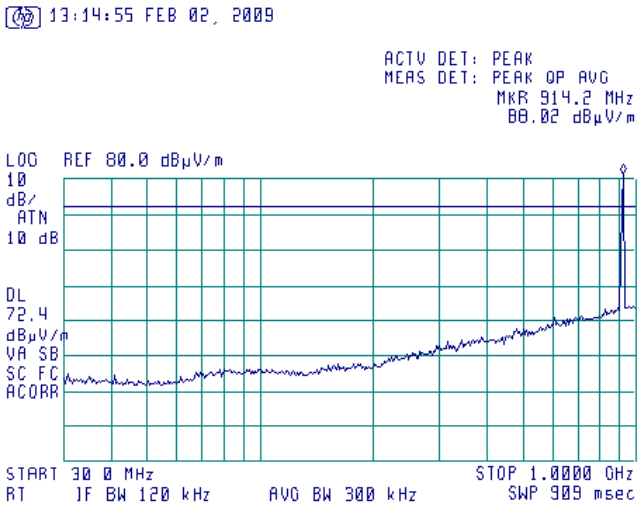
TEST SITE: Semi anechoic chamber
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Test specification:	FCC Section 90.210/RSS-137 Section 6.5, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:42:34 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

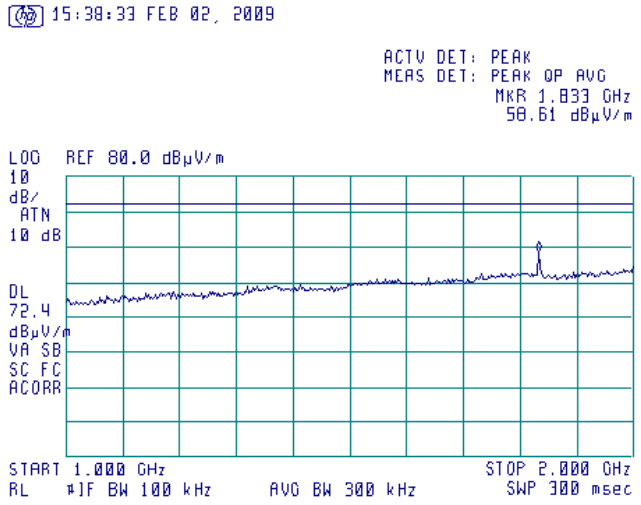
Plot 7.4.3 Radiated emission measurements in 30 - 1000 MHz range

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



Plot 7.4.4 Radiated emission measurements in 1000 – 2000 MHz range

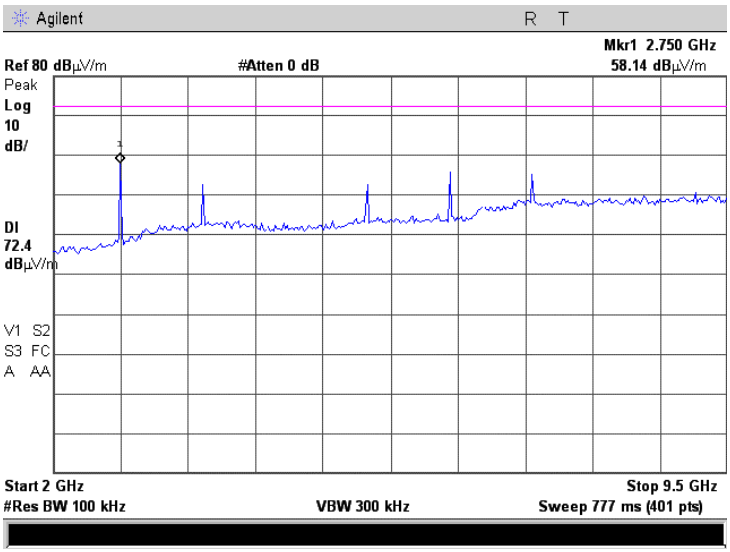
TEST SITE: Semi anechoic chamber
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC Section 90.210/RSS-137 Section 6.5, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:42:34 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

Plot 7.4.5 Radiated emission measurements in 2000 – 9500 MHz range

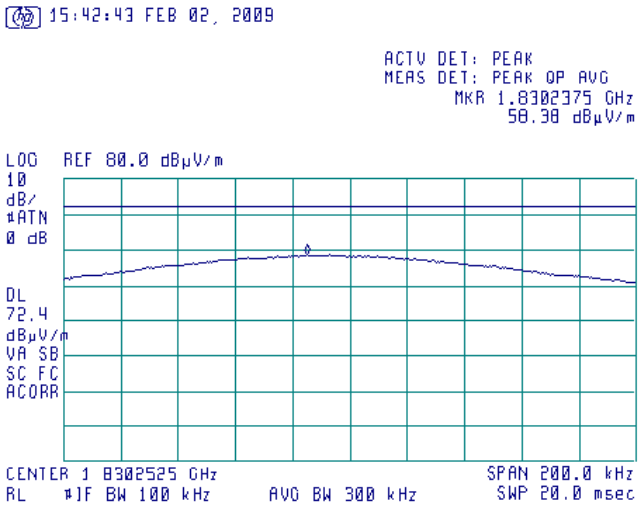
TEST SITE:	Semi anechoic chamber
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	FCC Section 90.210/RSS-137 Section 6.5, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:42:34 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

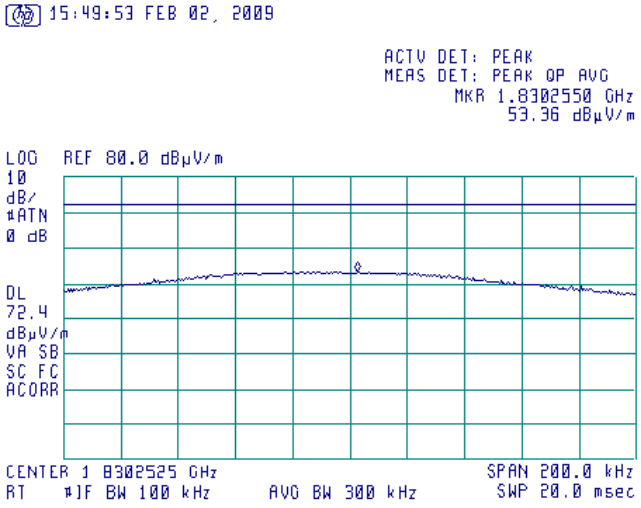
Plot 7.4.6 Radiated emission measurements at the 2nd harmonic

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



Plot 7.4.7 Radiated emission measurements at the 2nd harmonic

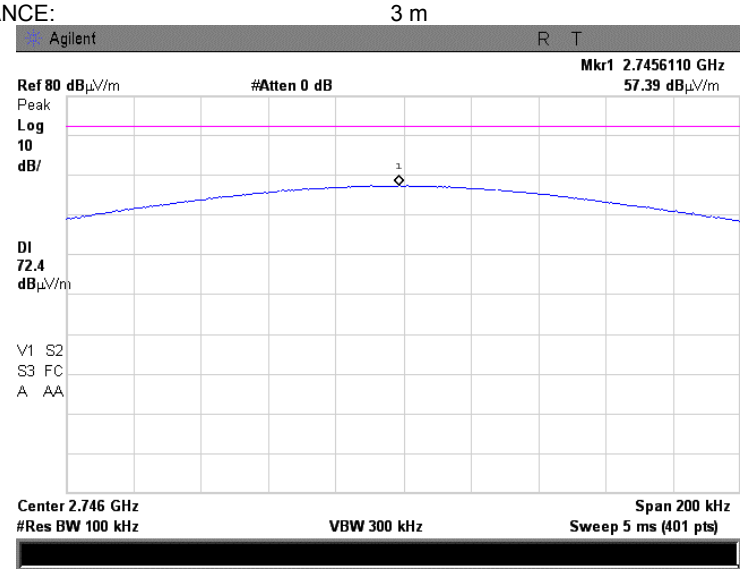
TEST SITE: Semi anechoic chamber
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC Section 90.210/RSS-137 Section 6.5, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:42:34 AM		
Temperature: 21°C	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

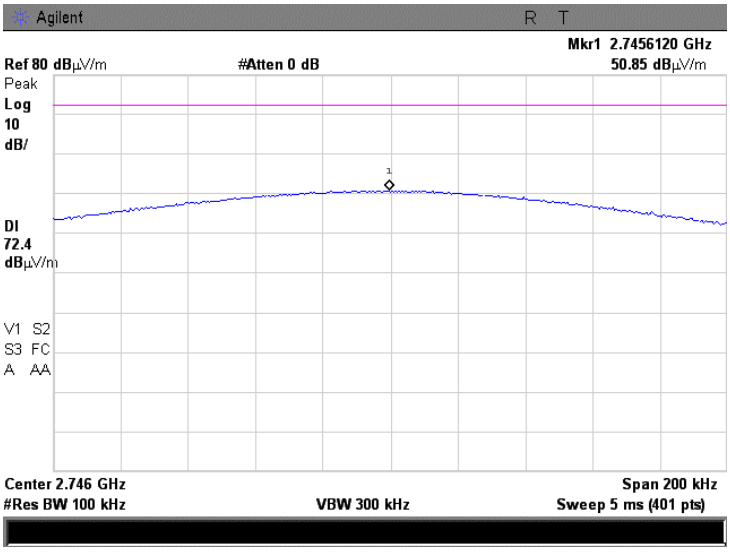
Plot 7.4.8 Radiated emission measurements at the 3rd harmonic

TEST SITE: OATS
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Plot 7.4.9 Radiated emission measurements at the 3rd harmonic

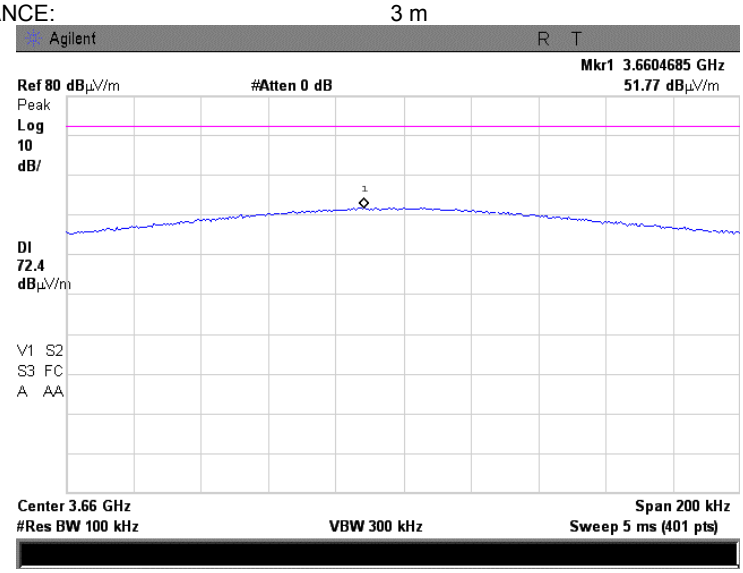
TEST SITE: OATS
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC Section 90.210/RSS-137 Section 6.5, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:42:34 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

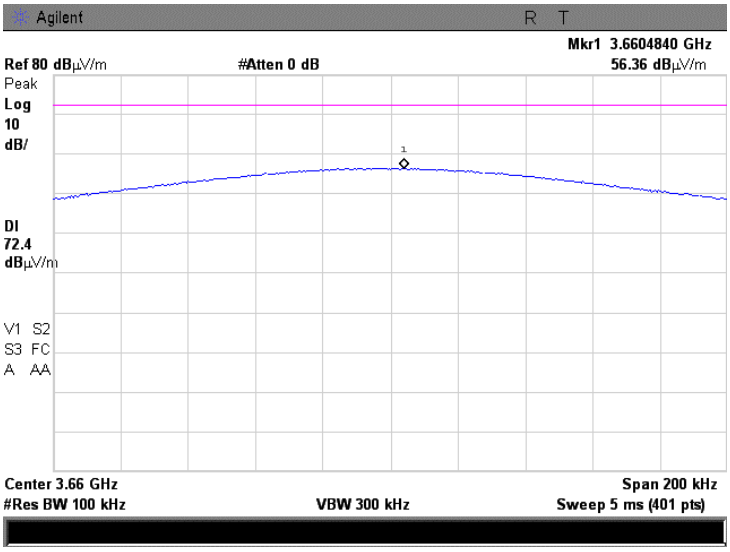
Plot 7.4.10 Radiated emission measurements at the 4th harmonic

TEST SITE: OATS
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Plot 7.4.11 Radiated emission measurements at the 4th harmonic

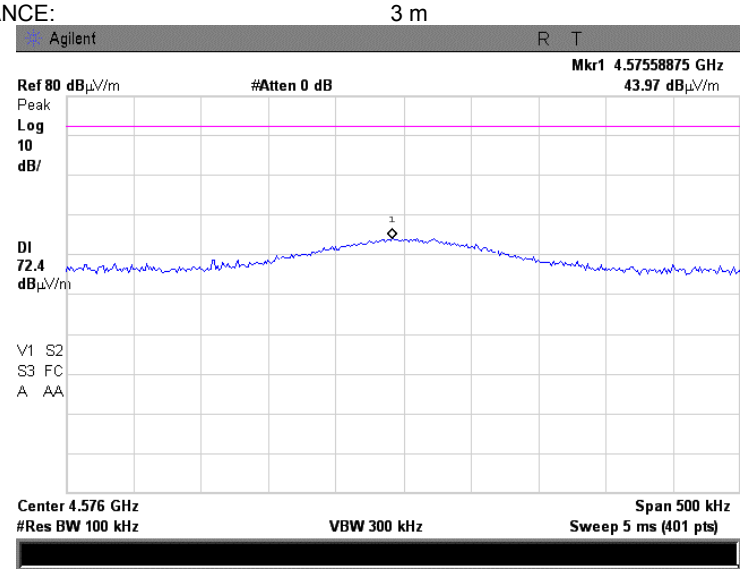
TEST SITE: OATS
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC Section 90.210/RSS-137 Section 6.5, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:42:34 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

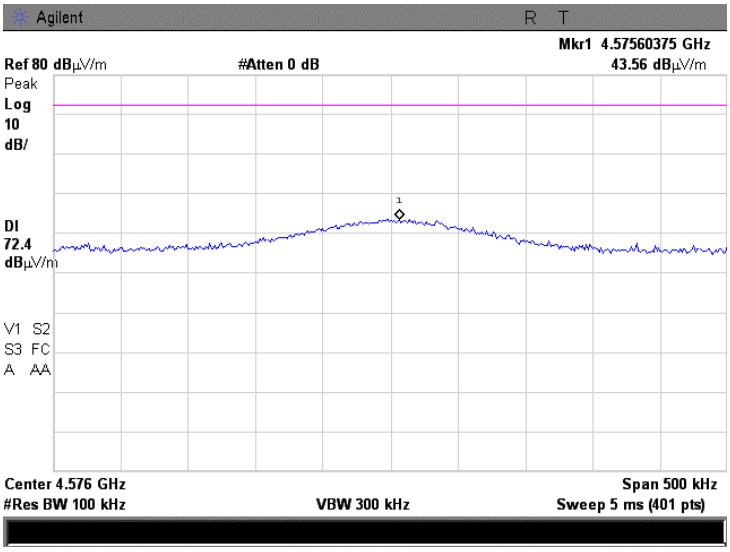
Plot 7.4.12 Radiated emission measurements at the 5th harmonic

TEST SITE: OATS
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Plot 7.4.13 Radiated emission measurements at the 5th harmonic

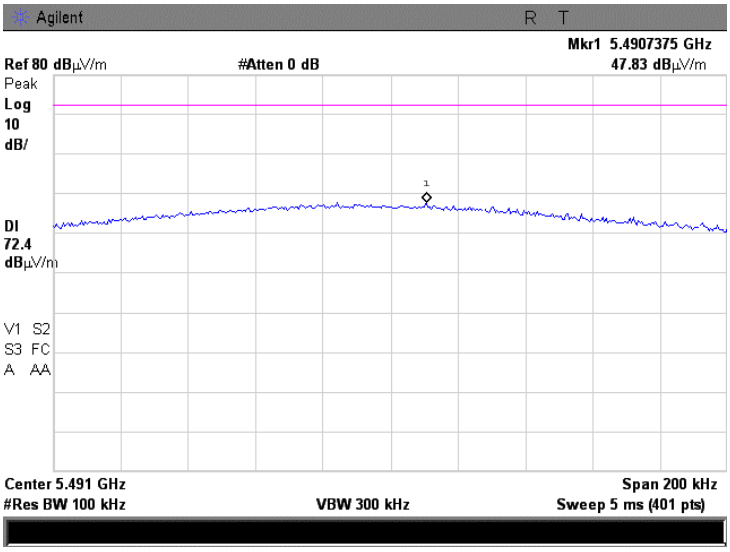
TEST SITE: OATS
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC Section 90.210/RSS-137 Section 6.5, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:42:34 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

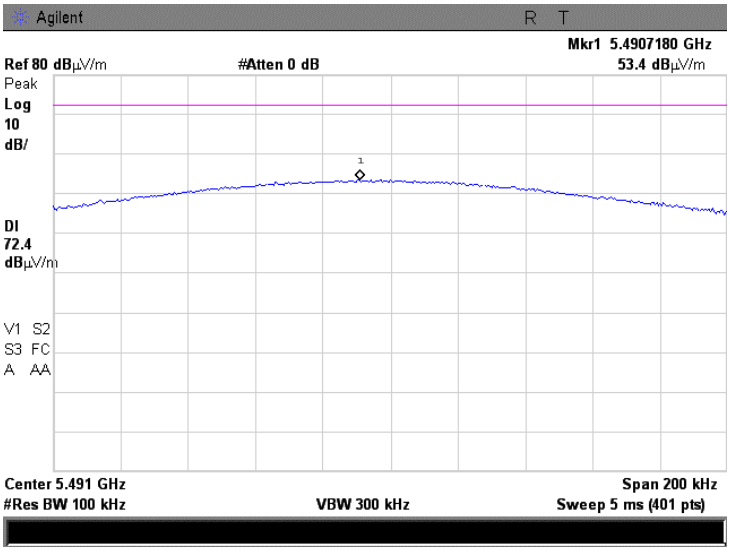
Plot 7.4.14 Radiated emission measurements at the 6th harmonic

TEST SITE: OATS
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Plot 7.4.15 Radiated emission measurements at the 6th harmonic

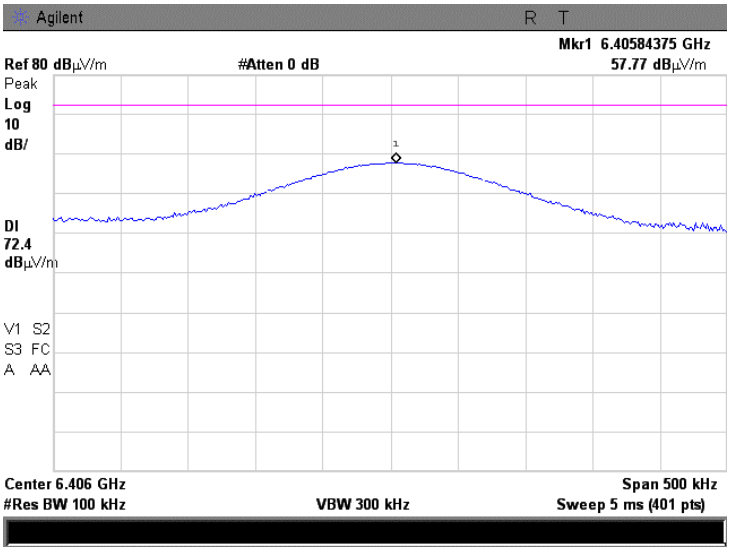
TEST SITE: OATS
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC Section 90.210/RSS-137 Section 6.5, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:42:34 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

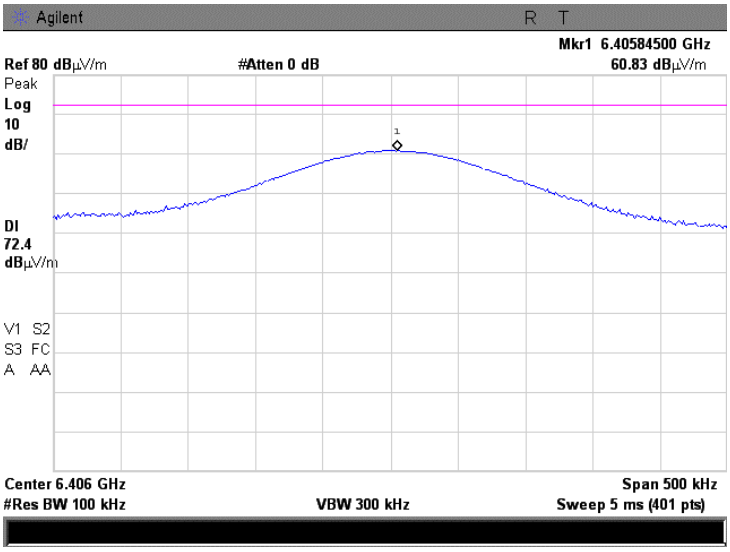
Plot 7.4.16 Radiated emission measurements at the 7th harmonic

TEST SITE: OATS
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Plot 7.4.17 Radiated emission measurements at the 7th harmonic

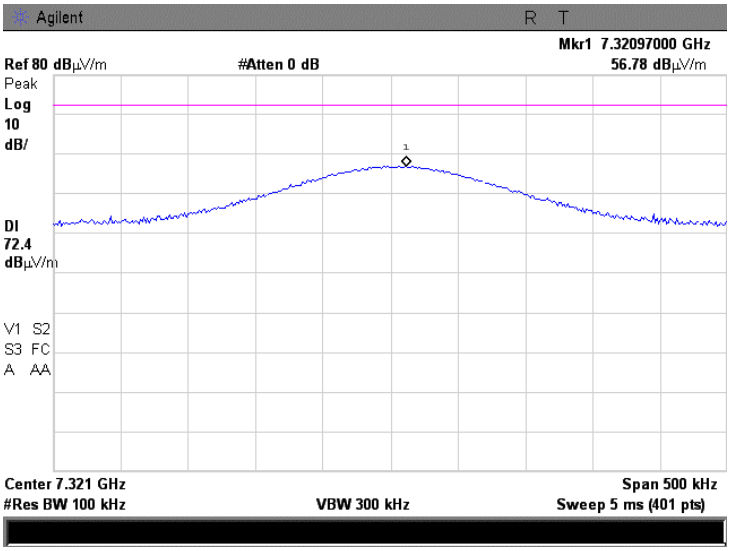
TEST SITE: OATS
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC Section 90.210/RSS-137 Section 6.5, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:42:34 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

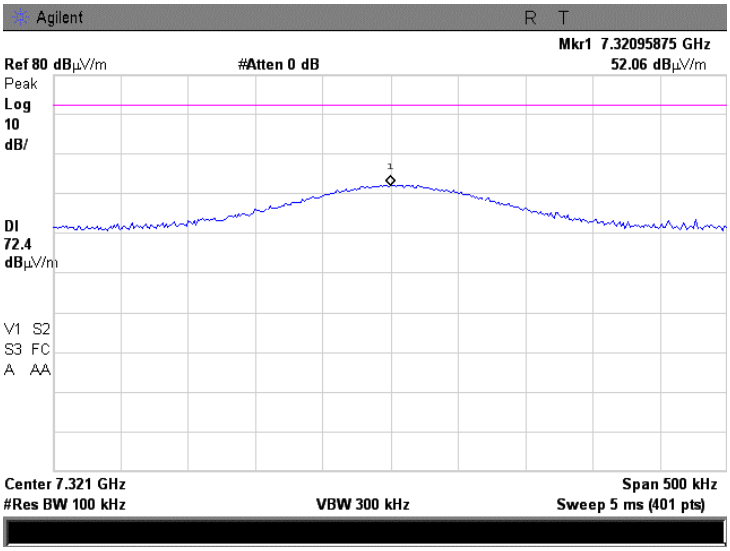
Plot 7.4.18 Radiated emission measurements at the 8th harmonic

TEST SITE: OATS
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Plot 7.4.19 Radiated emission measurements at the 8th harmonic

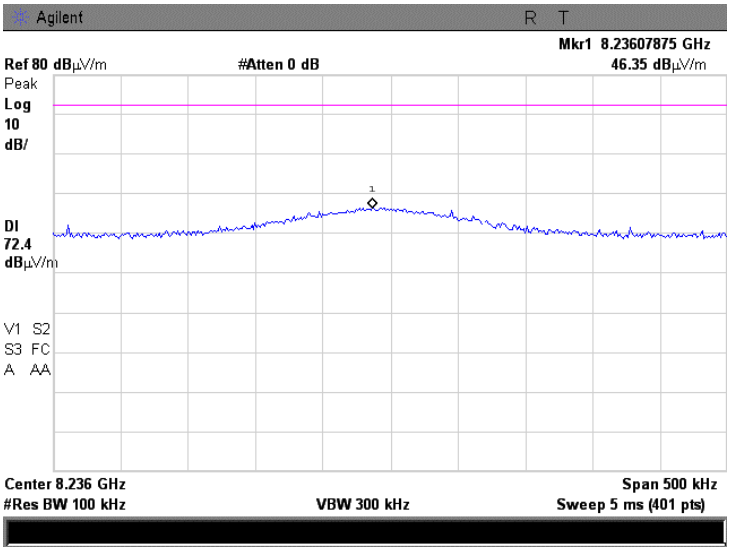
TEST SITE: OATS
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC Section 90.210/RSS-137 Section 6.5, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:42:34 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

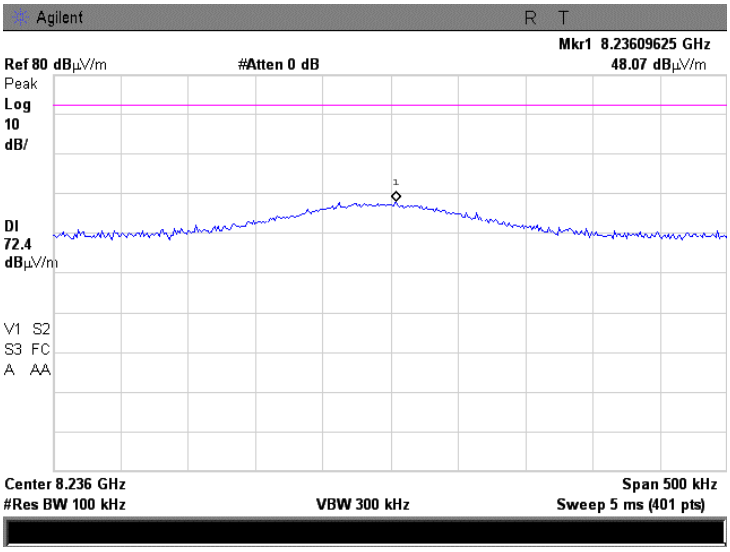
Plot 7.4.20 Radiated emission measurements at the 9th harmonic

TEST SITE: OATS
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Plot 7.4.21 Radiated emission measurements at the 9th harmonic

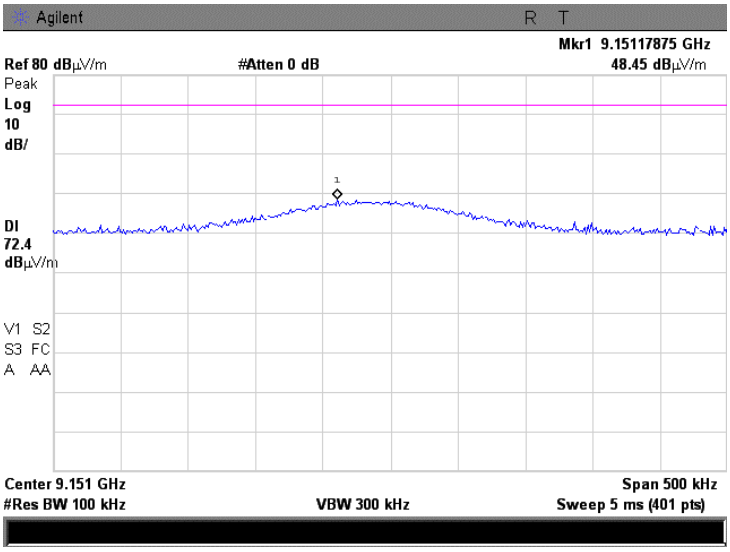
TEST SITE: OATS
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC Section 90.210/RSS-137 Section 6.5, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:42:34 AM		
Temperature: 21°C	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

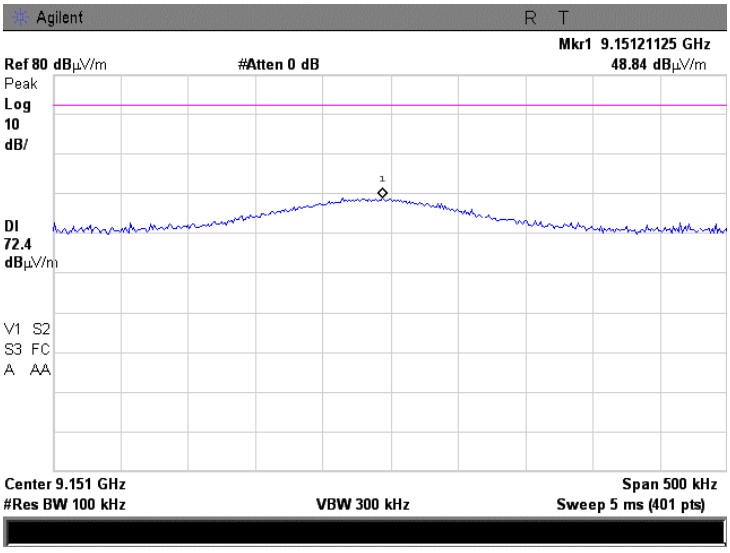
Plot 7.4.22 Radiated emission measurements at the 10th harmonic

TEST SITE: OATS
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Plot 7.4.23 Radiated emission measurements at the 10th harmonic

TEST SITE: OATS
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC Section 90.213/RSS-137 Section 6.3, Frequency stability		
Test procedure:	47 CFR, Section 2.1055; TIA/EIA-603-A Section 2.2.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 6:34:33 PM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

7.5 Frequency stability test

7.5.1 General

This test was performed to measure frequency stability of transmitter RF carrier. Specification test limits are given in Table 7.5.1. The test results are provided in Table 7.5.2.

Table 7.5.1 Frequency stability limits

Assigned frequency, MHz	Maximum allowed frequency displacement	
	ppm	Hz
915	2.5	2287.5*

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 EUT power was turned off. Temperature within test chamber was set to +30˚C and a period of time sufficient to stabilize all of the oscillator circuit components was allowed.

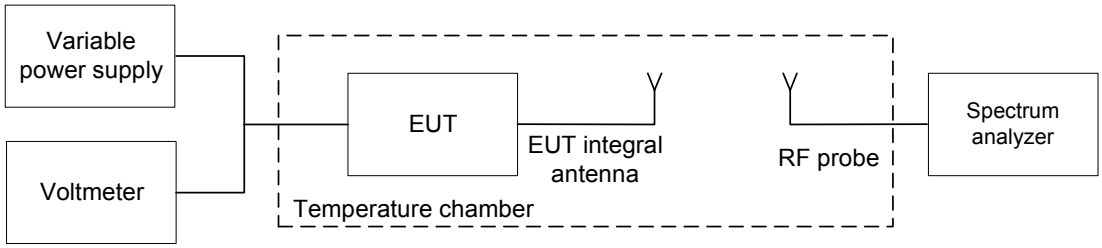
7.5.2.3 The EUT was powered on and carrier frequency was measured at start up moment and then every minute until frequency had been stabilized or 10 minutes elapsed whichever reached the last. The EUT was powered off.

7.5.2.4 The above procedure was repeated at 0˚C and at the lowest test temperature.

7.5.2.5 The EUT was powered on and carrier frequency was measured at start up moment and at the end of stabilization period at the rest of test temperatures and voltages. The EUT was powered off.

7.5.2.6 Frequency displacement was calculated and compared with the limit as provided in Table 7.5.2.

Figure 7.5.1 Frequency stability test setup



Test specification:	**FCC Section 90.213/RSS-137 Section 6.3, Frequency stability**		
Test procedure:	47 CFR, Section 2.1055; TIA/EIA-603-A Section 2.2.2		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	2/9/2009 6:34:33 PM		
Temperature: 21ºC	**Air Pressure:** 1018 hPa	**Relative Humidity:** 50 %	**Power Supply:** Battery
Remarks:			

Table 7.5.2 Frequency stability test results

OPERATING FREQUENCY: 915 MHz
NOMINAL POWER VOLTAGE: 3.6 VDC
TEMPERATURE STABILIZATION PERIOD: 20 min
POWER DURING TEMPERATURE TRANSITION: Off
SPECTRUM ANALYZER MODE: Counter
RESOLUTION BANDWIDTH: 100Hz
VIDEO BANDWIDTH: 100Hz
MODULATION: Unmodulated

Temp. ºC	Voltage V	Frequency, MHz							Max frequency drift, Hz		Limit, Hz	Margin, Hz
		Start up	1st min	2nd min	3rd min	4th min	5th min	10th min	ositiv	legati e		
-30	nominal	914.998434	914.999180	914.999176	914.998854	914.998900	914.998468	914.997180	0	115620	2287.5**	NA
-20	nominal	915.036488	NA	NA	NA	NA	NA	915.035226	0	77574		NA
-10	nominal	915.062372	NA	NA	NA	NA	NA	915.062886	0	50428		NA
0	nominal	915.088136	915.088924	915.088754	915.088766	915.088715	915.088465	915.000000	0	112800		NA
10	nominal	915.107136	NA	NA	NA	NA	NA	915.105942	0	6858		NA
20	+15%	915.111800	NA	NA	NA	NA	NA	915.111900	0	1000		NA
20	nominal	915.112800	NA	NA	NA	NA	NA	915.112800*	0	0		NA
20	-15%	915.112200	NA	NA	NA	NA	NA	915.112100	0	700		NA
30	nominal	915.112700	915.112700	915.112400	915.112800	915.112900	915.113000	915.113284	484	400		NA
40	nominal	915.110180	NA	NA	NA	NA	NA	915.109308	0	3492		NA
50	nominal	915.099200	NA	NA	NA	NA	NA	915.097608	0	15192		NA

* - Reference frequency
** - Limit for information only, the EUT is a mobile transponder.

Reference numbers of test equipment used

HL 0493	HL 0808	HL 1459	HL 3180	HL 3233			

Full description is given in Appendix A.

Test specification:	FCC part 15 section 15.109/ RSS-137 section 6.6, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:44:08 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

8 Unintentional emissions tests

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 8.1.1, Table 8.1.2.

Table 8.1.1 Radiated emission test limits according to FCC part 15 section 15.109 and RSS-Gen section 7.2.3.2

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

* 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 disturbance test limits according to ICES-003 section 5.5

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 - 230	30.0	40.5*	40.0	50.5*
230 - 1000	37.0	47.5*	47.0	57.5*

* 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.

8.1.2 Test procedure

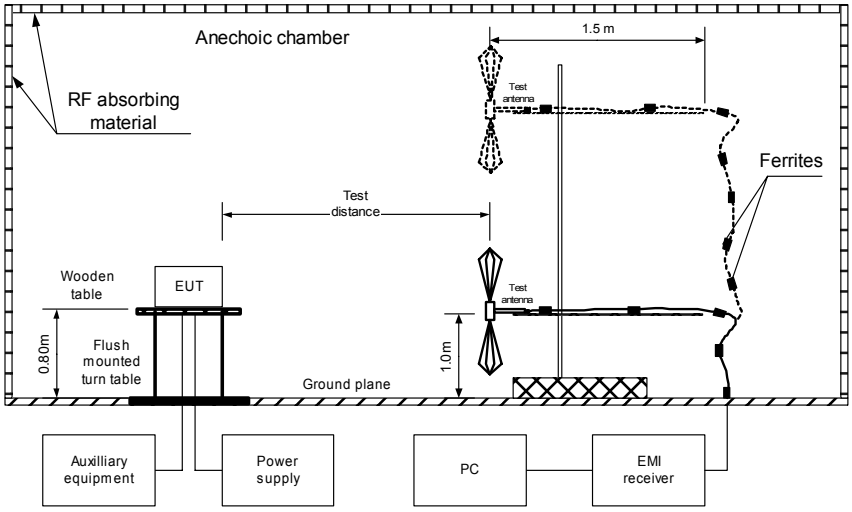
8.1.2.1 The EUT was set up as shown in Figure 8.1.1, energized and the performance check was conducted.

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 recorded in Table 8.1.3 and shown in the associated plots.

Test specification:	FCC part 15 section 15.109/ RSS-137 section 6.6, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:44:08 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

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



Test specification:	**FCC part 15 section 15.109/ RSS-137 section 6.6, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	2/9/2009 11:44:08 AM		
Temperature: 21ºC	**Air Pressure:** 1018 hPa	**Relative Humidity:** 50 %	**Power Supply:** Battery
Remarks:			

Table 8.1.3 Radiated emission test results according to FCC part 15 section 15.109 and RSS-Gen section 7.2.3.2

EUT SET UP: TABLE-TOP
LIMIT: Class B
EUT OPERATING MODE: 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*				
Emissions were not found								Pass

DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 MHz – 5000 MHz
RESOLUTION BANDWIDTH: 1000 kHz

Frequency, MHz	Peak emission, dB(µV/m)	Average			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*				
Emissions were not found								Pass

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

Reference numbers of test equipment used

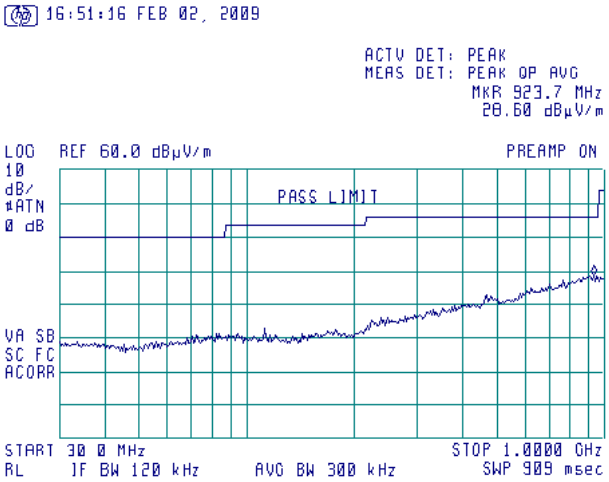
HL 0521	HL 0604	HL 2432	HL 3123	HL 3615			

Full description is given in Appendix A.

Test specification:	FCC part 15 section 15.109/ RSS-137 section 6.6, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:44:08 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

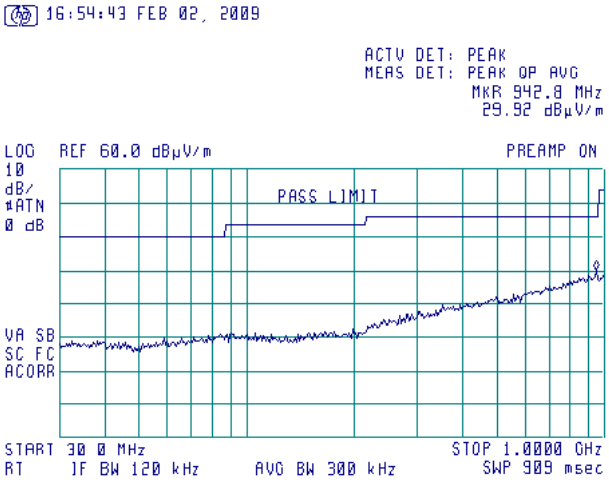
Plot 8.1.1 Radiated emission measurements in 30 - 1000 MHz range, vertical antenna polarization

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



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

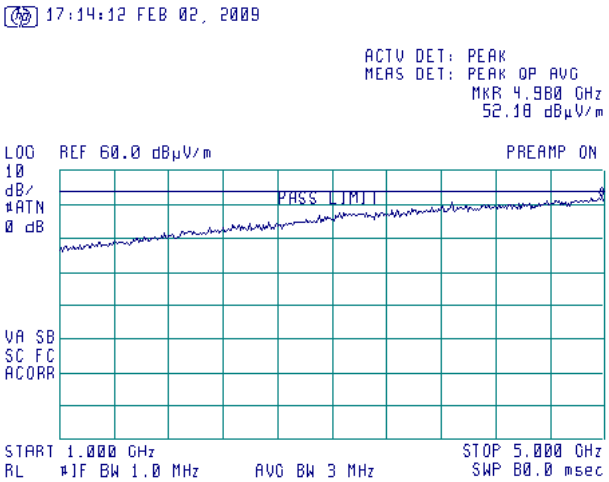
TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive



Test specification:	FCC part 15 section 15.109/ RSS-137 section 6.6, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:44:08 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

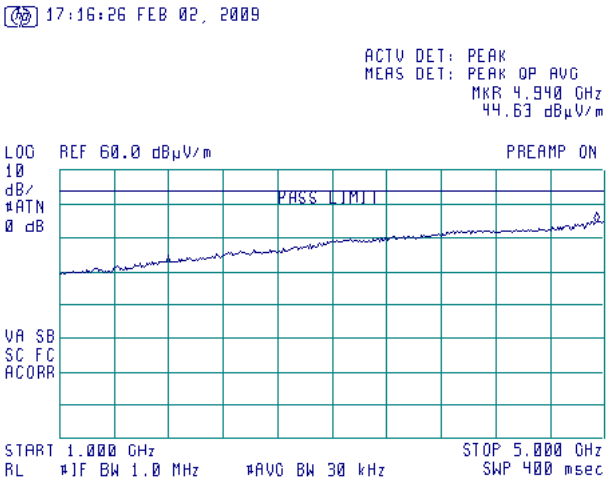
Plot 8.1.3 Radiated emission measurements in 1000 MHz – 5000 MHz, vertical antenna polarization

TEST SITE:	Semi anechoic chamber
LIMIT:	Class B
TEST DISTANCE:	3 m
EUT OPERATING MODE:	Receive
DETECTOR:	Peak



Plot 8.1.4 Radiated emission measurements in 1000 MHz – 5000 MHz, vertical antenna polarization

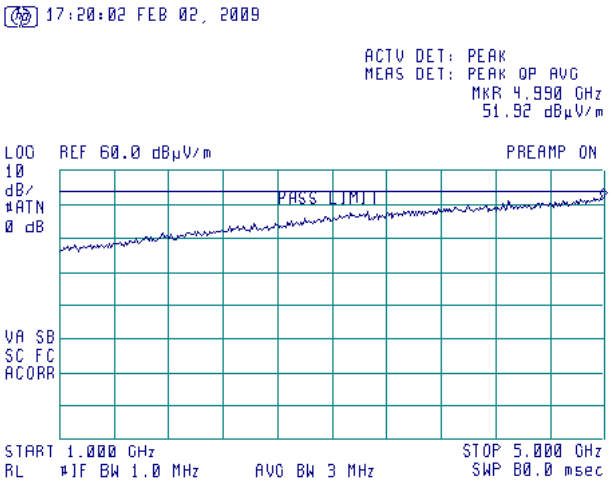
TEST SITE:	Semi anechoic chamber
LIMIT:	Class B
TEST DISTANCE:	3 m
EUT OPERATING MODE:	Receive
DETECTOR:	Average



Test specification:	FCC part 15 section 15.109/ RSS-137 section 6.6, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:44:08 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

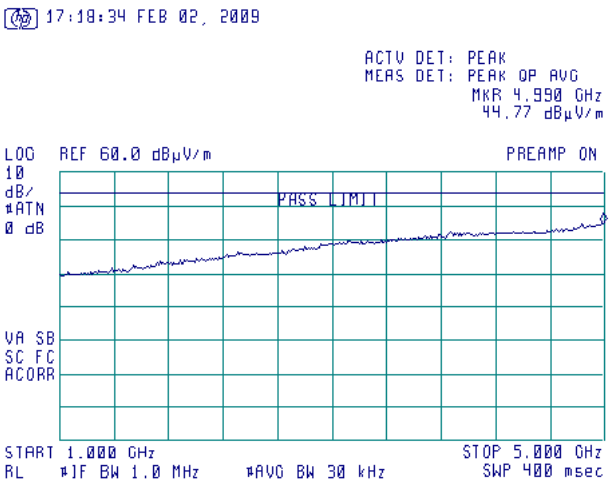
Plot 8.1.5 Radiated emission measurements in 1000 MHz – 5000 MHz, horizontal antenna polarization

TEST SITE:	Semi anechoic chamber
LIMIT:	Class B
TEST DISTANCE:	3 m
EUT OPERATING MODE:	Receive
DETECTOR:	Peak



Plot 8.1.6 Radiated emission measurements in 1000 MHz – 5000 MHz, horizontal antenna polarization

TEST SITE:	Semi anechoic chamber
LIMIT:	Class B
TEST DISTANCE:	3 m
EUT OPERATING MODE:	Receive
DETECTOR:	Average



Test specification:	**ICES-003, Section 5.5 Class B, Radiated disturbance measurements**		
Test procedure:	CAN/CSA-CEI/IEC CISPR 22, Section 6		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	2/9/2009 11:39:53 AM		
Temperature: 21ºC	**Air Pressure:** 1018 hPa	**Relative Humidity:** 50 %	**Power Supply:** Battery
Remarks:			

Table 8.1.4 Radiated disturbance test results according to ICES-003 section 5.5

EUT SET UP:	TABLE-TOP
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***				
Emissions were no found								Pass

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

Reference numbers of test equipment used

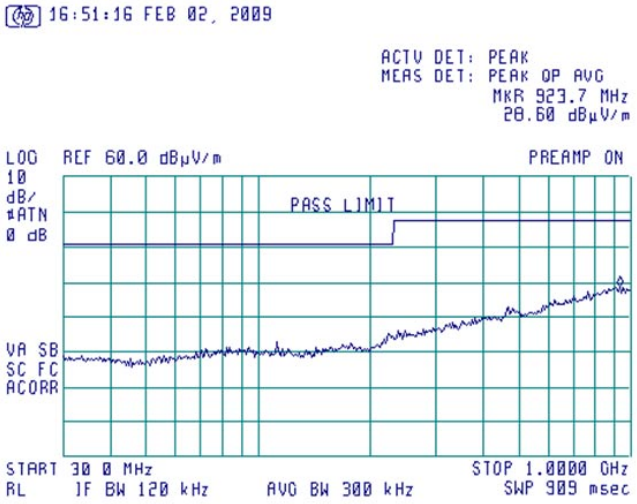
HL 0521	HL 0604	HL 1984	HL 3123	HL 3616			

Full description is given in Appendix A.

Test specification:	ICES-003, Section 5.5 Class B, Radiated disturbance measurements		
Test procedure:	CAN/CSA-CEI/IEC CISPR 22, Section 6		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/9/2009 11:39:53 AM		
Temperature: 21ºC	Air Pressure: 1018 hPa	Relative Humidity: 50 %	Power Supply: Battery
Remarks:			

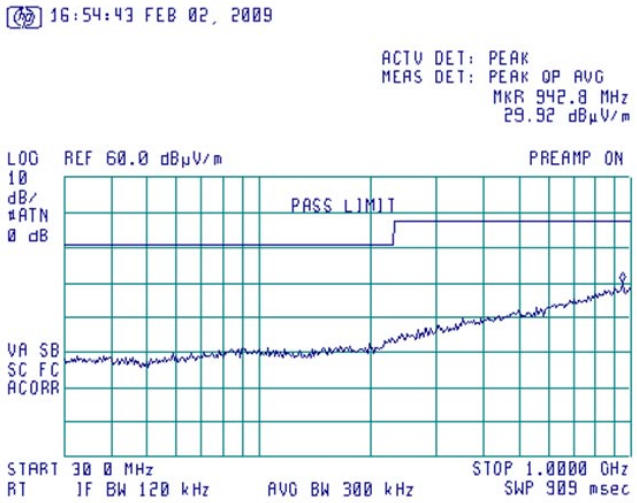
Plot 8.1.7 Radiated disturbance measurements in 30 - 1000 MHz range, vertical antenna polarization

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Plot 8.1.8 Radiated disturbance measurements in 30 - 1000 MHz range, horizontal antenna polarization

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



9 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0415	Cable, Coax, RF, RG-214	Hermon Laboratories	CC-3	056	02-Dec-08	02-Dec-09
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	29-Jun-08	29-Jun-09
0493	Temperature Chamber -45…175 deg C	Thermotron	S-1.2 Mini-Max	14016	19-May-08	19-May-09
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard Co	8546A	3617A 00319, 3448A002 53	29-Aug-08	29-Aug-09
0554	Amplifier, 2-18 GHz RF	Miteq	AFD4	104300	28-Feb-08	28-Feb-09
0569	Antenna, Log Periodic, 200 - 1000 MHz	Electro-Metrics	LPA 25/30	1953	25-Sep-08	25-Sep-10
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	11-Jan-09	11-Jan-10
0661	Generator Swept Signal, 10 MHz to 40 GHz, + 10 dBm	HP	83640B	3614A002 66	17-Sep-08	17-Sep-09
0808	Analyzer, Spectrum, 100 Hz to 2.2 GHz	Anritsu	MS2601B	M178731	27-Mar-07	27-Mar-09
0812	Cable Coax, RG-214, 11.5 m, N-type connectors	Hermon Laboratories	C214-11	148	02-Dec-08	02-Dec-09
1430	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL1432	Agilent Technologies	8542E	3807A002 62,3705A0 0217	31-Aug-08	31-Aug-09
1459	Cable, 1 m, N/N-type	Harbour Industries	MIL 17/60-RG142	1459	08-Sep-08	08-Sep-09
1565	Antenna, Dipole, Tunable 500 - 1000 MHz	Electro-Metrics	TDS-30-2	334	29-Jan-09	29-Jan-10
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	23-Jan-09	23-Jan-10
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	23-Jan-09	23-Jan-10
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY451024 6	11-Jun-07	11-Jun-09
2883	Cable, 18 GHz N-type, M-F, 3 m	Bird	TC-MNFN-3.0	211539 003	07-Dec-08	07-Dec-09
3122	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-9155-00	3122	07-Dec-08	07-Dec-09
3123	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-9155-00	3123	30-Dec-08	30-Dec-09
3180	Attenuator, N-type, 20 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N20W5+	0651	07-May-08	07-May-09
3207	Cable 40 GHz, 1.2 m	Gore	GOR245	05118337	10-Jun-08	10-Jun-09
3233	Multimeter	Fluke	115C	93771523	15-Jul-08	15-Jul-09
3385	Microwave Cable Assembly, 18.0 GHz, 1.0 m, N type/N type	Suhner Sucoflex	104EA	3385	07-Dec-08	07-Dec-09
3615	Cable RF, 6.5 m, N type-N type, DC-6 GHz	Suhner Switzerland	RG 214/U	NA	07-Dec-08	07-Dec-09

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
3616	Cable RF, 6.5 m, N type-N type, DC-6.5 GHz	Suhner Switzerland	Rg 214/U	NA	07-Dec-08	07-Dec-09
3634	Cable RF, 5.5 m, N type-N type, DC-6.5 GHz	Alpha Wire	RG 214/U	NA	17-Dec-08	17-Dec-09

10 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Transmitter tests	
Carrier power conducted at antenna connector	± 1.7 dB
Carrier power radiated (substitution method)	± 4.5 dB
Occupied bandwidth	±8%
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
Spurious emissions radiated 30 MHz – 40 GHz (substitution method)	± 4.5 dB
Frequency error	30 – 300 MHz: ± 50.5 Hz (1.68 ppm) 300 – 1000 MHz: ± 168 Hz (0.56 ppm)
Transient frequency behaviour	187 Hz ± 13.9 %
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Unintentional radiator tests	
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization Vertical polarization	 Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB

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

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

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

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) and by Industry Canada for electromagnetic emissions (file numbers IC 2186A-1 for OATS and IC 2186A-2 for anechoic chamber), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, C-845 for conducted emissions site), assessed by TNO Certification EP&S (Netherlands) for a number of EMC, telecommunications, environmental, safety standards, and by AMTAC (UK) for safety of medical devices. 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).

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12 APPENDIX D Specification references

FCC 47CFR part 90: 2008	Private land mobile radio services
FCC 47CFR part 2: 2008	Frequency allocations and radio treaty matters; general rules and regulations
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.
ANSI/TIA/EIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
RSS-137 Issue 2:2009	Location and monitoring services (902-928 MHz)
RSS-Gen issue 2:2007	General Requirements and Information for the Certification of Radiocommunication Equipment
ICES-003 Issue 4:2004	Digital Apparatus

13 APPENDIX E Test equipment correction factors

Antenna Factor
Active Loop Antenna
EMC Test Systems, model 6502, S/N 2857, HL 0446

Frequency, MHz	Magnetic Antenna Factor, dB(S/m)	Electric Antenna Factor, dB(1/m)
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	9.7
0.750	-41.9	9.6
1.000	-41.4	10.1
2.000	-41.5	10.0
3.000	-41.4	10.1
4.000	-41.4	10.1
5.000	-41.5	10.0
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(S/m) is to be added to receiver meter reading in dB(μV) to convert it into field intensity in dB(μA/m).
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
Electro-Metrics, model LPA-25/30
Ser.No.1953, HL 0569

Frequency MHz	Antenna Factor dB(1/m)	Frequency MHz	Antenna Factor dB(1/m)
200	15.2	625	25.2
225	15.1	650	25.8
250	16.3	675	27.2
275	17.2	700	27.6
300	19.6	725	27.6
325	18.4	750	27.6
350	19.0	775	28.0
375	20.0	800	28.2
400	20.9	825	29.4
425	21.3	850	29.9
450	22.1	875	30.0
475	22.7	900	30.4
500	23.2	925	30.6
525	23.9	950	30.8
550	24.2	975	31.6
575	24.6	1000	32.1
600	24.7		

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

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 wave guide horn antenna
Model 3115, S/N 9911-5964, HL 1984

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 guide horn antenna
Model 3115, serial number: 00027177, HL 2432

Frequency, MHz	Antenna factor. dB(1/m)
1000.0	24.7
1500.0	25.7
2000.0	27.8
2500.0	28.9
3000.0	30.7
3500.0	31.8
4000.0	33.0
4500.0	32.8
5000.0	34.2
5500.0	34.9
6000.0	35.2
6500.0	35.4
7000.0	36.3
7500.0	37.3
8000.0	37.5
8500.0	38.0
9000.0	38.3
9500.0	38.3
10000.0	38.7
10500.0	38.7
11000.0	38.9
11500.0	39.5
12000.0	39.5
12500.0	39.4
13000.0	40.5
13500.0	40.8
14000.0	41.5
14500.0	41.3
15000.0	40.2
15500.0	38.7
16000.0	38.5
16500.0	39.8
17000.0	41.9
17500.0	45.8
18000.0	49.1

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, RG-58/RG-214, s/n 056, HL 0415
+ Cable Coaxial, RG-214, 11.5m, s/n 148, HL 0812

No.	Frequency, MHz	Cable loss, dB	Measured uncertainty, dB
1	20	0.73	±0.12
2	30	0.91	
3	50	1.2	
4	80	1.56	
5	100	1.76	
6	200	2.59	
7	300	3.26	
8	400	3.93	
9	500	4.42	
10	600	4.92	
11	700	5.36	
12	800	5.88	
13	900	6.41	
14	1000	6.71	
15	1500	8.63	
16	2000	10.39	

Cable loss
Cable coaxial, Bird, 18 GHz, N-type, M-F, model TC-MNFN-3.0, S/N 211539 003
HL 2883

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.06	5750	1.70	12000	2.46
30	0.12	6000	1.75	12250	2.48
100	0.21	6250	1.80	12500	2.52
250	0.34	6500	1.81	12750	2.50
500	0.47	6750	1.86	13000	2.54
750	0.59	7000	1.86	13250	2.48
1000	0.67	7250	1.92	13500	2.63
1250	0.76	7500	1.96	13750	2.65
1500	0.84	7750	1.98	14000	2.72
1750	0.92	8000	2.02	14250	2.67
2000	0.98	8250	2.03	14500	2.70
2250	1.05	8500	2.05	14750	2.72
2500	1.12	8750	2.11	15000	2.79
2750	1.17	9000	2.17	15250	2.80
3000	1.22	9250	2.17	15500	2.83
3250	1.27	9500	2.20	15750	2.75
3500	1.33	9750	2.19	16000	2.82
3750	1.38	10000	2.22	16250	2.85
4000	1.42	10250	2.25	16500	2.90
4250	1.46	10500	2.30	16750	2.89
4500	1.51	10750	2.28	17000	2.88
4750	1.54	11000	2.32	17250	2.85
5000	1.59	11250	2.34	17500	2.96
5250	1.62	11500	2.39	17750	3.04
5500	1.65	11750	2.42	18000	3.04

Cable loss
Microwave Cable Assembly, 18 GHz, 6.4 m, SMA – SMA, Huber-Suhner, model 198-9155-00
HL 3122

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.11	3600	2.08	7400	3.07	11200	3.92	15100	4.61
30	0.17	3700	2.12	7500	3.09	11300	3.95	15200	4.58
50	0.23	3800	2.15	7600	3.14	11400	3.93	15300	4.62
100	0.32	3900	2.18	7700	3.15	11500	3.93	15400	4.62
200	0.47	4000	2.21	7800	3.19	11600	3.94	15500	4.65
300	0.58	4100	2.24	7900	3.22	11700	3.97	15600	4.66
400	0.66	4200	2.27	8000	3.20	11800	3.98	15700	4.66
500	0.74	4300	2.31	8100	3.21	11900	4.08	15800	4.72
600	0.81	4400	2.31	8200	3.24	12000	4.03	15900	4.78
700	0.88	4500	2.36	8300	3.27	12100	4.06	16000	4.89
800	0.95	4600	2.37	8400	3.32	12200	4.05	16100	4.95
900	1.00	4700	2.40	8500	3.35	12300	4.16	16200	4.92
1000	1.06	4800	2.43	8600	3.35	12400	4.18	16300	4.95
1100	1.11	4900	2.45	8700	3.33	12500	4.20	16400	5.02
1200	1.16	5000	2.50	8800	3.37	12600	4.22	16500	5.04
1300	1.21	5100	2.51	8900	3.39	12700	4.23	16600	5.06
1400	1.26	5200	2.55	9000	3.45	12800	4.28	16700	5.17
1500	1.31	5300	2.56	9100	3.46	12900	4.26	16800	5.16
1600	1.35	5400	2.59	9200	3.47	13000	4.28	16900	5.19
1700	1.39	5500	2.62	9300	3.46	13100	4.28	17000	5.23
1800	1.44	5600	2.65	9400	3.50	13200	4.28	17100	5.30
1900	1.47	5700	2.67	9500	3.50	13300	4.29	17200	5.26
2000	1.52	5800	2.71	9600	3.53	13400	4.34	17300	5.30
2100	1.55	5900	2.72	9700	3.52	13500	4.31	17400	5.30
2200	1.60	6000	2.73	9800	3.54	13600	4.35	17500	5.36
2300	1.63	6100	2.76	9900	3.56	13700	4.36	17600	5.40
2400	1.67	6200	2.78	10000	3.57	13800	4.37	17700	5.47
2500	1.70	6300	2.81	10100	3.60	13900	4.41	17800	5.56
2600	1.74	6400	2.85	10200	3.69	14000	4.42	17900	5.45
2700	1.78	6500	2.87	10300	3.69	14100	4.45	18000	5.47
2800	1.83	6600	2.87	10400	3.67	14200	4.49		
2900	1.85	6700	2.90	10500	3.70	14300	4.55		
3000	1.89	6800	2.91	10600	3.70	14400	4.62		
3100	1.92	6900	2.96	10700	3.76	14600	4.54		
3200	1.96	7000	2.99	10800	3.88	14700	4.58		
3300	1.99	7100	3.01	10900	3.88	14800	4.57		
3400	2.03	7200	3.04	11000	3.85	14900	4.65		
3500	2.06	7300	3.08	11100	3.85	15000	4.64		

Cable loss
Microwave Cable Assembly, 18 GHz, 6.4 m, SMA – SMA, Huber-Suhner, model 198-9155-00
HL 3123

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.11	3600	1.97	7400	3.12	11200	3.90	15100	4.74
30	0.17	3700	1.97	7500	3.13	11300	3.93	15200	4.70
50	0.25	3800	2.03	7600	3.16	11400	3.88	15300	4.73
100	0.32	3900	2.04	7700	3.18	11500	3.87	15400	4.78
200	0.46	4000	2.10	7800	3.20	11600	3.90	15500	4.75
300	0.58	4100	1.97	7900	3.23	11700	3.86	15600	4.76
400	0.65	4200	1.97	8000	3.25	11800	3.88	15700	4.75
500	0.74	4300	2.03	8100	3.26	11900	3.86	15800	4.78
600	0.82	4400	2.04	8200	3.28	12000	3.89	15900	4.79
700	0.89	4500	2.10	8300	3.31	12100	3.94	16000	4.73
800	0.95	4600	1.97	8400	3.31	12200	3.92	16100	4.78
900	1.01	4700	1.97	8500	3.32	12300	3.96	16200	4.84
1000	1.07	4800	2.03	8600	3.34	12400	4.01	16300	4.90
1100	1.11	4900	2.04	8700	3.35	12500	4.07	16400	4.87
1200	1.17	5000	2.10	8800	3.37	12600	4.08	16500	4.90
1300	1.22	5100	2.53	8900	3.39	12700	4.17	16600	4.98
1400	1.27	5200	2.55	9000	3.42	12800	4.26	16700	5.05
1500	1.29	5300	2.60	9100	3.43	12900	4.16	16800	5.04
1600	1.35	5400	2.61	9200	3.51	13000	4.21	16900	5.02
1700	1.40	5500	2.64	9300	3.52	13100	4.24	17000	5.09
1800	1.44	5600	2.70	9400	3.54	13200	4.27	17100	5.07
1900	1.51	5700	2.67	9500	3.63	13300	4.31	17200	5.10
2000	1.49	5800	2.71	9600	3.61	13400	4.33	17300	5.13
2100	1.55	5900	2.74	9700	3.71	13500	4.25	17400	5.23
2200	1.58	6000	2.80	9800	3.66	13600	4.27	17500	5.21
2300	1.62	6100	2.79	9900	3.77	13700	4.33	17600	5.22
2400	1.72	6200	2.81	10000	3.75	13800	4.33	17700	5.36
2500	1.76	6300	2.83	10100	3.77	13900	4.31	17800	5.35
2600	1.78	6400	2.86	10200	3.80	14000	4.30	17900	5.45
2700	1.80	6500	2.88	10300	3.79	14100	4.30	18000	5.43
2800	1.86	6600	2.90	10400	3.87	14200	4.31		
2900	1.90	6700	2.92	10500	3.83	14300	4.37		
3000	1.90	6800	2.98	10600	3.88	14400	4.35		
3100	1.97	6900	2.98	10700	3.86	14600	4.53		
3200	1.97	7000	3.00	10800	3.87	14700	4.50		
3300	2.03	7100	3.02	10900	3.90	14800	4.62		
3400	2.04	7200	3.04	11000	3.84	14900	4.65		
3500	2.10	7300	3.06	11100	3.88	15000	4.79		

Cable loss
Cable coaxial, GORE-TEX, GOR245, 40 GHz, 1.2 m, SMA-SMA, S/N 05118337
HL 3207

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss,dB	Frequency, MHz	Cable loss,dB
10	0.17	5000	1.54	10200	2.26	15500	2.77	31500	4.07
30	0.14	5100	1.54	10300	2.26	15600	2.78	32000	4.03
50	0.16	5200	1.56	10400	2.24	15700	2.81	32500	3.93
100	0.22	5300	1.59	10500	2.23	15800	2.81	33000	4.00
200	0.30	5400	1.60	10600	2.25	15900	2.84	33500	4.09
300	0.38	5500	1.61	10700	2.31	16000	2.91	34000	4.08
400	0.44	5600	1.63	10800	2.34	16100	2.92	34500	4.13
500	0.48	5700	1.66	10900	2.38	16200	2.88	35000	4.15
600	0.54	5800	1.68	11000	2.38	16300	2.90	35500	4.18
700	0.58	5900	1.68	11100	2.38	16400	2.93	36000	4.22
800	0.62	6000	1.71	11200	2.37	16500	2.92	36500	4.25
900	0.65	6100	1.71	11300	2.38	16600	2.97	37000	4.26
1000	0.69	6200	1.73	11400	2.40	16700	3.02	37500	4.40
1100	0.73	6300	1.75	11500	2.41	16800	3.02	38000	4.40
1200	0.76	6400	1.76	11600	2.44	16900	3.01	38500	4.52
1300	0.78	6500	1.78	11700	2.44	17000	3.04	39000	4.54
1400	0.81	6600	1.77	11800	2.44	17100	3.08	39500	4.36
1500	0.85	6700	1.79	11900	2.45	17200	3.05	40000	4.48
1600	0.87	6800	1.80	12000	2.46	17300	3.06		
1700	0.90	6900	1.83	12100	2.45	17400	3.06		
1800	0.93	7000	1.84	12200	2.45	17500	3.07		
1900	0.96	7100	1.86	12300	2.48	17600	3.08		
2000	0.95	7200	1.88	12400	2.49	17700	3.09		
2100	0.98	7300	1.86	12500	2.51	17800	3.12		
2200	1.00	7400	1.87	12600	2.53	17900	3.09		
2300	1.02	7500	1.90	12700	2.51	18000	3.08		
2400	1.04	7600	1.91	12800	2.52	18500	3.11		
2500	1.06	7700	1.95	12900	2.54	19000	3.14		
2600	1.08	7800	1.98	13000	2.56	19500	3.20		
2700	1.11	7900	1.99	13100	2.56	20000	3.24		
2800	1.14	8000	1.98	13200	2.59	20500	3.31		
2900	1.15	8100	1.98	13300	2.59	21000	3.38		
3000	1.17	8200	2.00	13400	2.60	21500	3.44		
3100	1.19	8300	2.01	13500	2.65	22000	3.45		
3200	1.20	8400	2.05	13600	2.71	22500	3.45		
3300	1.24	8500	2.07	13700	2.71	23000	3.47		
3400	1.26	8600	2.08	13800	2.69	23500	3.47		
3500	1.27	8700	2.09	13900	2.67	24000	3.54		
3600	1.28	8800	2.09	14000	2.68	24500	3.62		
3700	1.32	8900	2.10	14100	2.68	25000	3.73		
3800	1.32	9000	2.12	14200	2.74	25500	3.77		
3900	1.35	9100	2.12	14300	2.77	26000	3.71		
4000	1.36	9200	2.15	14400	2.80	26500	3.73		
4100	1.39	9300	2.13	14600	2.74	27000	3.73		
4200	1.40	9400	2.16	14700	2.73	27500	3.78		
4300	1.41	9500	2.17	14800	2.75	28000	3.81		
4400	1.43	9600	2.17	14900	2.75	28500	3.81		
4500	1.47	9700	2.18	15000	2.77	29000	3.80		
4600	1.46	9800	2.16	15100	2.76	29500	3.81		
4700	1.49	9900	2.17	15200	2.76	30000	3.89		
4800	1.50	10000	2.20	15300	2.77	30500	4.03		
4900	1.52	10100	2.22	15400	2.79	31000	4.01		

14 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
BB	broad band
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
dBΩ	decibel referred to one Ohm
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
NB	narrow band
NT	not tested
OATS	open area test site
Ω	Ohm
QP	quasi-peak
PCB	printed circuit board
PM	pulse modulation
PS	power supply
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
VA	volt-ampere

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