HERMON LABORATORIES

839.01
Electrical

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TEST REPORT

ACCORDING TO: FCC CFR 47 PART 90 §90.217(b) and
Industry Canada RSS-119 issue 9, section 5.10

FOR:

Motorola Israel Ltd.

Termination unit

Model:Piccolo-XR-F4614B

FCC ID:AZ489FT4888

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1 Applicant information

Client name:	Motorola Israel Ltd.
Address:	3 Kremenetski street, P.O.B. 25016, 67899 Tel Aviv, Israel
Telephone:	+972 3565 9229
Fax:	+972 3565 9968
E-mail:	alexb@motorola.com
Contact name:	Mr. Babaladze Alex

2 Equipment under test attributes

Product name:	Termination unit
Product type:	Transceiver
Model(s):	Piccolo-XR-F4614B
Radio kit number:	FLE5532A
Serial number:	8708KQ007N
Receipt date	3/11/2009

3 Manufacturer information

Manufacturer name:	Motorola Israel Ltd.
Address:	3 Kremenetski street, P.O.B. 25016, 67899 Tel Aviv, Israel
Telephone:	+972 3565 9229
Fax:	+972 3565 9968
E-Mail:	alexb@motorola.com
Contact name:	Mr. Babaladze Alex

4 Test details

Project ID:	19519
Location:	Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started:	3/11/2009
Test completed:	6/08/2009
Test specification(s):	47CFR part 90, §§90.217(b); RSS-119 issue 9:2007, section 5.10

5 Tests summary

Test	Status
Transmitter characteristics	
FCC/ Section 90.205/ RSS-119 Section 5.4, 5.10, Maximum output power	Pass
FCC Section 90.209/ RSS-119 Section 5.5.1, Occupied bandwidth	Pass
FCC Section 90.213/ RSS-119 Section 5.10, Frequency stability	Pass
FCC Section 90.217/ RSS-119 Section 5.10, Band edge emission	Pass
FCC Section 90.217/ RSS-119 Section 5.10 Radiated spurious emissions	Pass
FCC Section 90.217/ RSS-119 Section 5.10 Conducted spurious emissions	Pass
FCC Section 90.214/ RSS-119 Section 5.9, Transient frequency behaviour	Not required*

* Not required for the transmitter with output power less than 120 mW.

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 “MOTRAD_FCC.19519”.

	Name and Title	Date	Signature
Tested by:	Mrs. E. Pitt, EMC and radio project manager	June 9, 2009	
Reviewed by:	Ms. N. Averin, certification engineer	August 18, 2009	
Approved by:	Mrs. E. Pitt, EMC and radio project manager	August 18, 2009	

6 EUT description

6.1 General information

The EUT, Piccolo-XR-F4614B, is a transceiver which is most commonly used in the fixed installations enclosed with an indoor plastic housing and provides communication and control over 430 to 450 MHz radio link. The EUT is powered from 6 V external battery.

The EUT has 5 options for input/output configuration:

- 1 digital dry contact input / 1 output for solenoid control;
- 2 digital dry contact inputs / 2 outputs for solenoid control;
- 4 digital dry contact inputs / 4 outputs for solenoid control;
- 7 digital dry contact inputs / 1 output for solenoid control;
- 8 digital dry contact inputs.

The EUT option providing 4 digital dry contact inputs / 4 outputs for solenoid control was tested in full as the most populated option; radiated spurious emission and radiated emission tests were repeated in 8 digital dry contact inputs configuration.

The Piccolo-XR-F4614B and PIU-F4604B use the same radio (FLE5532A).

6.2 Ports and lines

Port type	Port description	Connected		Connector type	Qty.	Cable type	Cable length	Indoor / outdoor
		From	To					
Power	6 VDC	EUT	Power supply	D-type 26 pin	1	Unshielded	1.0 m	Outdoor
Control	Input	EUT	Open circuit					
Control	Output	EUT	Solenoids					
Control	Auxiliary input	EUT	Open circuit					
Signal	Communication	EUT	PIU					
GND	PE	EUT	PE			AWG 18	0.5 m	Outdoor

6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
PC	IBM	2373-CTO	L3-4112E
Power Supply	Horizon	DHR 3655D	038535
Host application (ACE3600CPU+PS) Part CPU	Motorola	FLN 3524A	085SHA0206
Part PS	Motorola	FPN 1643A	085SJG00XH
Piccolo interface unit	Motorola	PIU	8708KQ0079

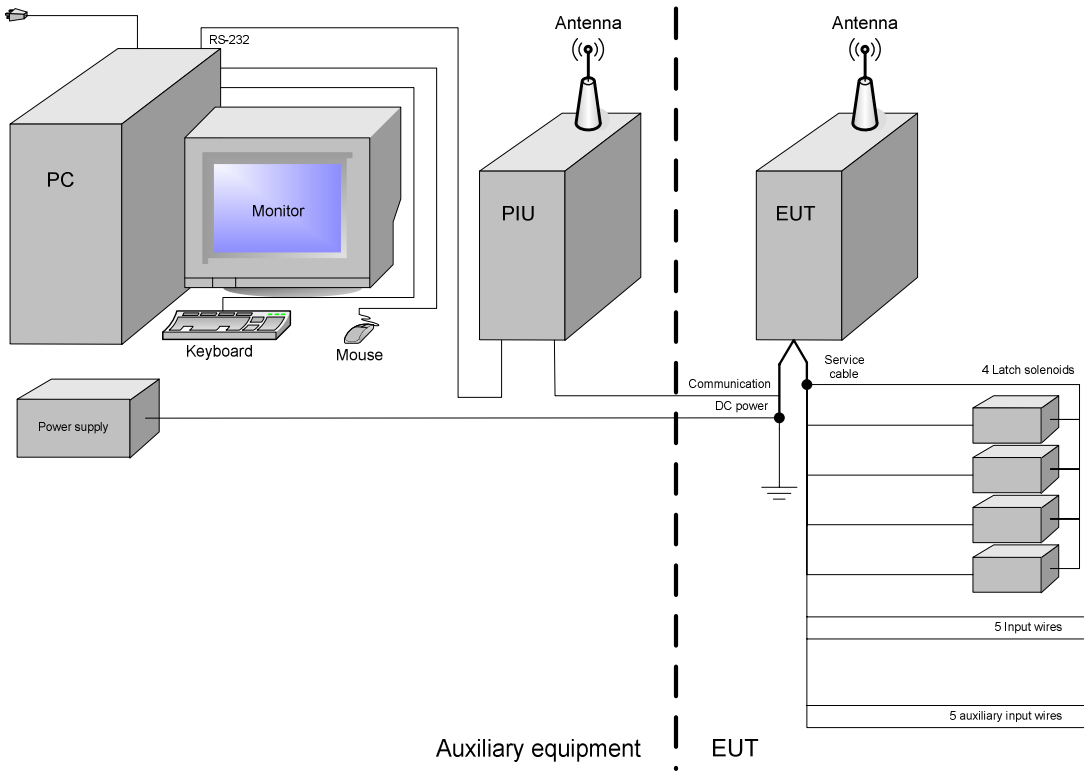
6.4 Operating frequencies

Source	Frequency, MHz		
Clock	8	16.8	2.1
LO	385.15	405.15	

6.5 Changes made in the EUT

No changes were implemented in the EUT.

6.6 Test configuration



6.7 Transmitter characteristics

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

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

Assigned frequency range	430 -450 MHz
Operating frequency range	430.0125 –449.9875 MHz
RF channel spacing	12.5 kHz
Maximum rated output power	At transmitter 50 Ω RF output connector: 20 dBm

Is transmitter output power variable?				
	No			
V	Yes		continuous variable	
		V	stepped variable with stepsize	10 dB
			minimum RF power	10 dBm
			maximum RF power	20 dBm

Antenna connection				
unique coupling	**V**	standard connector SMA type	integral	with temporary RF connector
				without temporary RF connector

Antenna/s technical characteristics

Type	Manufacturer	Model number	Gain
External	Centurion Wireless Technologies, Inc.	EXC450SM	Unity

Transmitter aggregate data rate/s	1200 bps
Transmitter aggregate symbol (baud) rate/s	600 symbols (MBaud) per second
Type of modulation	FM
Type of multiplexing	NA
Modulating test signal (baseband)	PRBS
Maximum transmitter duty cycle in normal use	100%

Transmitter power source

	Battery	**Nominal rated voltage**		Battery type	
V	DC	**Nominal rated voltage**	6.0 V (4.8 – 7.8 V)		
	AC mains	**Nominal rated voltage**	VAC	Frequency	Hz

Common power source for transmitter and receiver	**V**	yes	no
Emission designator	7K45F2D		

Test specification:	FCC Section 90.205/RSS-119, Section 5.4, 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:	5/25/2009 11:10:27 AM		
Temperature: 23ºC	Air Pressure: 1014 hPa	Relative Humidity: 44%	Power Supply: 6 VDC
Remarks:			

7 Transmitter tests according to 47CFR part 90 requirements

7.1 Peak output power test

7.1.1 General

This test was performed to measure the peak output power at RF antenna connector. Specification test limits are given in Table 7.1.1. The test results are provided in Table 7.1.2 and the associated plots.

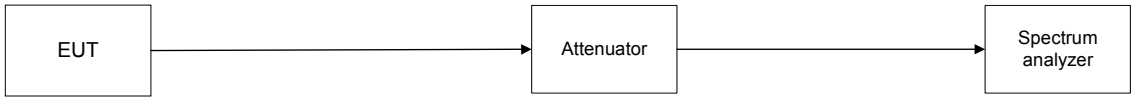
Table 7.1.1 Peak output power limits

Assigned frequency range, MHz	Maximum peak output power	
	W	dBm
430-450	0.12	20.79

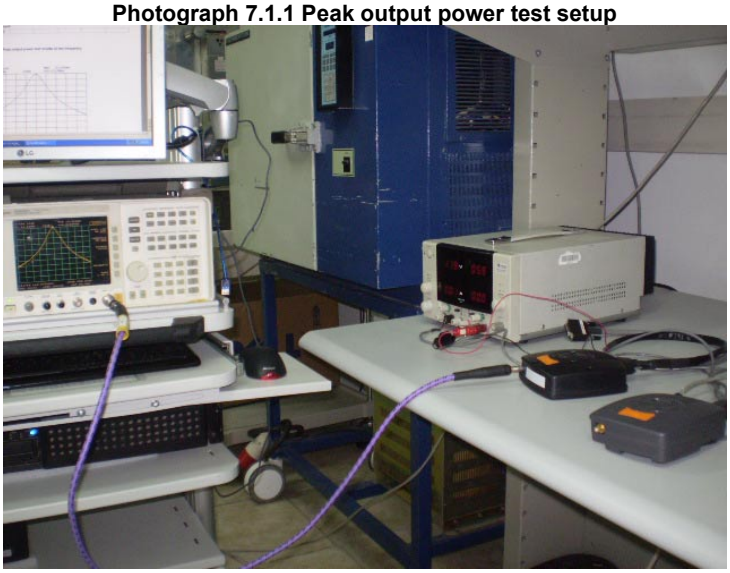
7.1.2 Test procedure

7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.
7.1.2.2 The EUT was adjusted to produce maximum available to the end user RF output power.
7.1.2.3 The peak output power was measured with spectrum analyzer as provided in Table 7.1.2 and associated plots.

Figure 7.1.1 Peak output power test setup



Photograph 7.1.1 Peak output power test setup



Test specification:	**FCC Section 90.205/RSS-119, Section 5.4, 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:	5/25/2009 11:10:27 AM		
Temperature: 23ºC	**Air Pressure:** 1014 hPa	**Relative Humidity:** 44%	**Power Supply:** 6 VDC
Remarks:			

Table 7.1.2 Peak output power test results

ASSIGNED FREQUENCY RANGE:	430-450 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	30kHz
VIDEO BANDWIDTH:	100kHz
MODULATION:	FM
MODULATING SIGNAL:	PRBS
BIT RATE:	1200 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum

Carrier frequency, MHz	Spectrum analyzer reading, dBm	External attenuation, dB	Cable loss, dB	RF output power, dBm	Limit, dBm	Margin, dB	Verdict
430.0125	20.00	Including	Including	20.00	20.79	-0.79	Pass
440.0125	19.83	Including	Including	19.83	20.79	-0.96	Pass
449.9875	20.00	Including	Including	20.00	20.79	-0.79	Pass

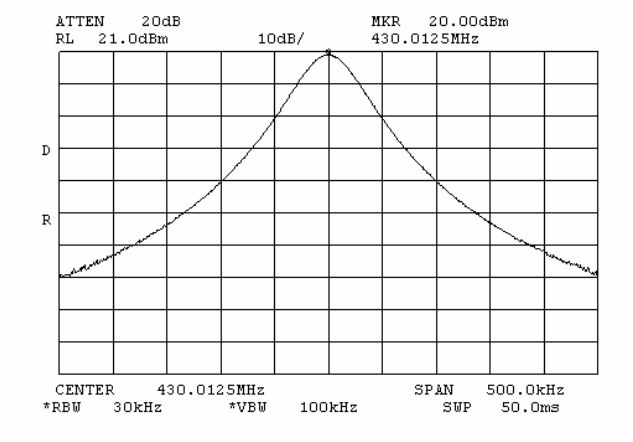
Reference numbers of test equipment used

HL 1424	HL 2953	HL 3440					

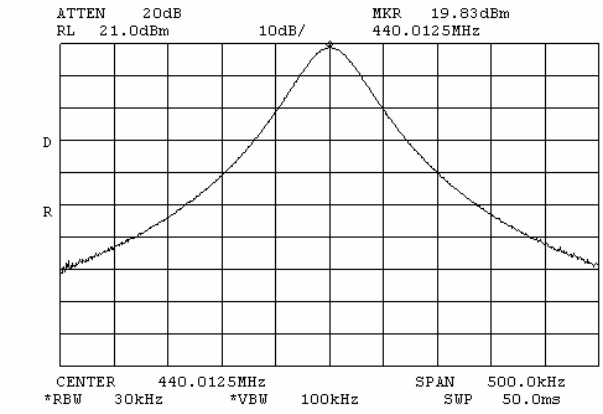
Full description is given in Appendix A.

Test specification:	FCC Section 90.205/RSS-119, Section 5.4, 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:	5/25/2009 11:10:27 AM		
Temperature: 23ºC	Air Pressure: 1014 hPa	Relative Humidity: 44%	Power Supply: 6 VDC
Remarks:			

Plot 7.1.1 Peak output power test results at low frequency

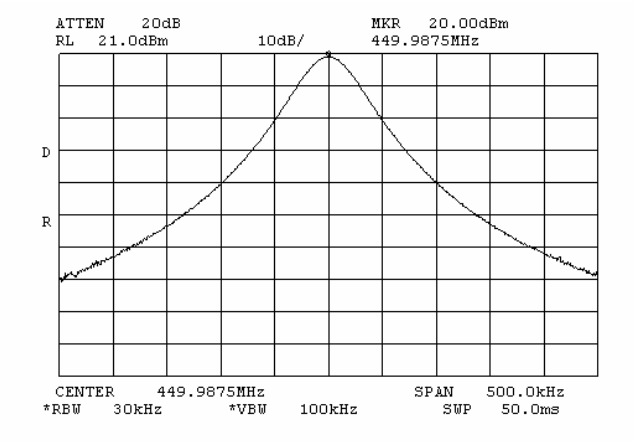


Plot 7.1.2 Peak output power test results at mid frequency



Test specification:	FCC Section 90.205/RSS-119, Section 5.4, 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:	5/25/2009 11:10:27 AM		
Temperature: 23ºC	Air Pressure: 1014 hPa	Relative Humidity: 44%	Power Supply: 6 VDC
Remarks:			

Plot 7.1.3 Peak output power test results at high frequency



Test specification:	FCC Section 90.209/ RSS-119, Section 5.5, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	6/9/2009 8:41:04 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 52%	Power Supply: 6 VDC
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

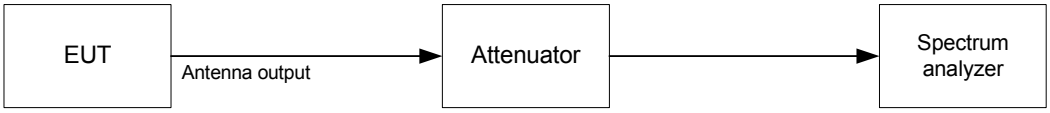
Assigned frequency, MHz	Modulation envelope reference points*, dBc	Maximum allowed bandwidth, kHz
430-450	26	11.25

* - Modulation envelope reference points are provided in terms of attenuation below the unmodulated carrier.

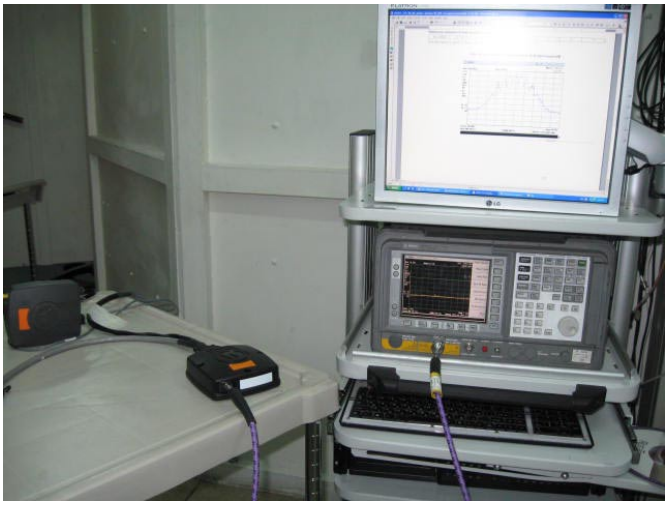
7.2.2 Test procedure

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



Photograph 7.2.1 Occupied bandwidth test setup



Test specification:	**FCC Section 90.209/ RSS-119, Section 5.5, Occupied bandwidth**		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	6/9/2009 8:41:04 AM		
Temperature: 25ºC	**Air Pressure:** 1010 hPa	**Relative Humidity:** 52%	**Power Supply:** 6 VDC
Remarks:			

Table 7.2.2 Occupied bandwidth test results

DETECTOR USED:	Peak hold
RESOLUTION BANDWIDTH:	100 Hz
VIDEO BANDWIDTH:	300 Hz
MODULATION ENVELOPE REFERENCE POINTS:	26 dBc
MODULATION:	FM
MODULATING SIGNAL:	Pseudo random
BIT RATE:	1200 bps

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
430.0125	7.45	11.25	-3.80	Pass
440.0125	7.40	11.25	-3.85	Pass
449.9875	7.40	11.25	-3.85	Pass

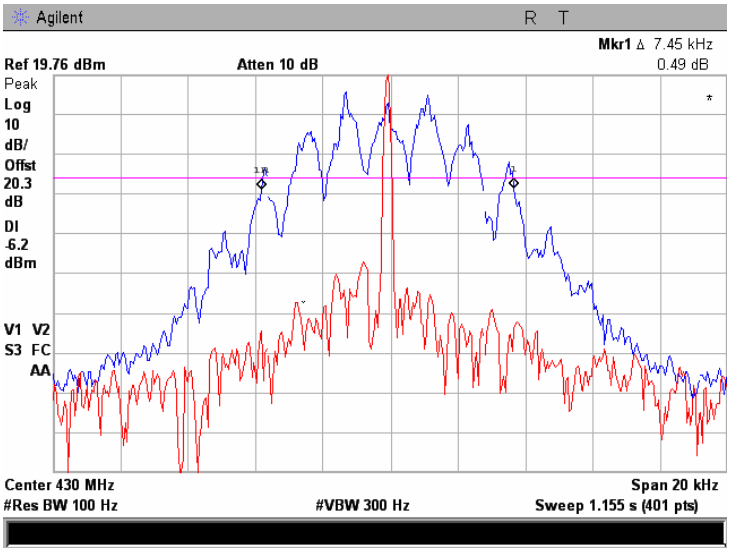
Reference numbers of test equipment used

HL 2780	HL 2952	HL 1650					

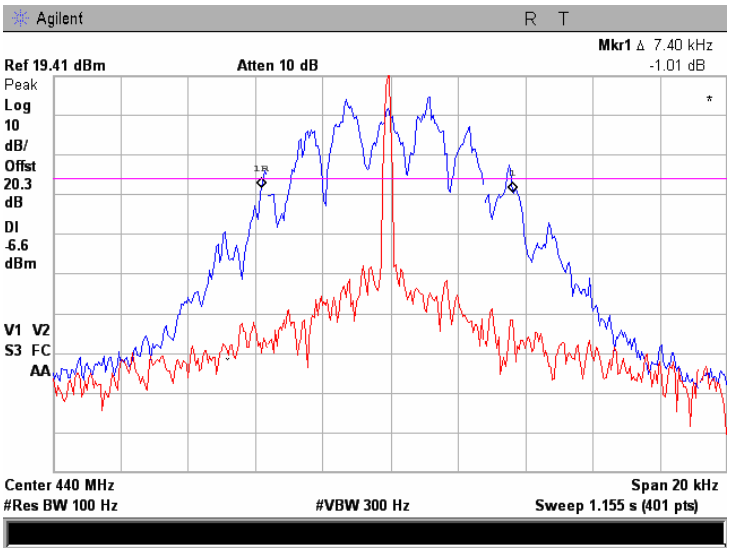
Full description is given in Appendix A.

Test specification:	FCC Section 90.209/ RSS-119, Section 5.5, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	6/9/2009 8:41:04 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 52%	Power Supply: 6 VDC
Remarks:			

Plot 7.2.1 Occupied bandwidth test result at low frequency

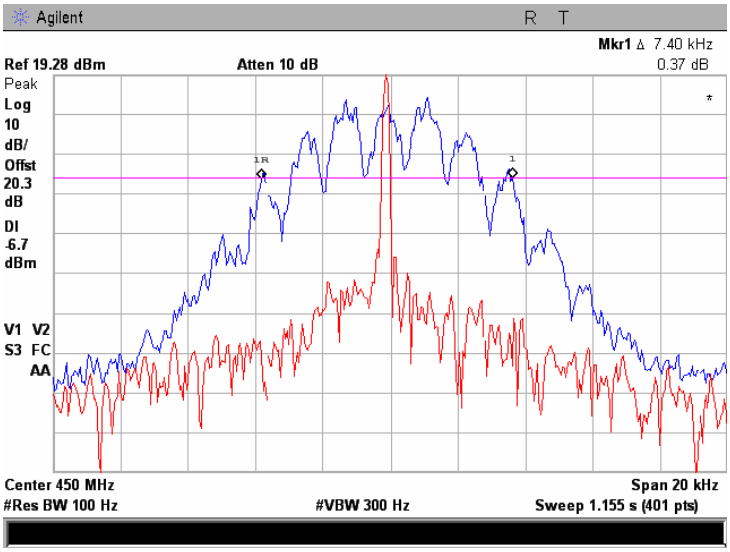


Plot 7.2.2 Occupied bandwidth test result at mid frequency



Test specification:	FCC Section 90.209/ RSS-119, Section 5.5, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	6/9/2009 8:41:04 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 52%	Power Supply: 6 VDC
Remarks:			

Plot 7.2.3 Occupied bandwidth test result at high frequency



Test specification:	FCC Section 90.213/RSS-119 Section 5.10, Frequency stability		
Test procedure:	47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/19/2009 12:04:51 PM		
Temperature: 24ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 6 VDC
Remarks:			

7.3 Frequency stability test

7.3.1 General

This test was performed to measure frequency stability of transmitter RF carrier. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Frequency stability limits

Assigned frequency, MHz	Maximum allowed frequency displacement	
	ppm	Hz
430.0125	1.5	645
440.0125		660
449.9875		675

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 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.

7.3.2.3 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.

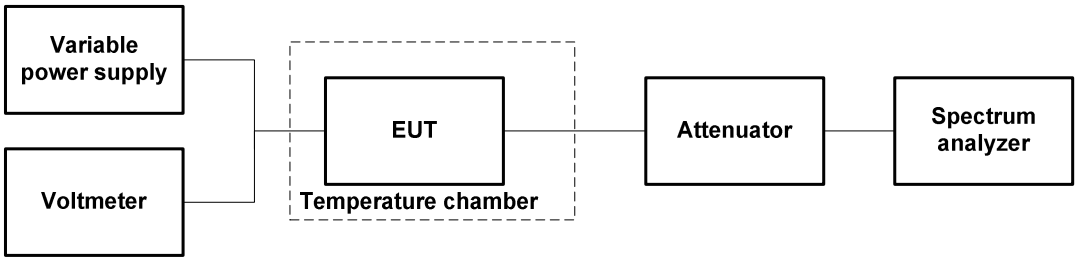
7.3.2.4 The above procedure was repeated at 0˚C and at the lowest test temperature.

7.3.2.5 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.

7.3.2.6 Frequency displacement was calculated and compared with the limit as provided in Table 7.3.2.

Test specification:	FCC Section 90.213/RSS-119 Section 5.10, Frequency stability		
Test procedure:	47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/19/2009 12:04:51 PM		
Temperature: 24ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 6 VDC
Remarks:			

Figure 7.3.1 Frequency stability test setup



Photograph 7.3.1 Frequency stability test setup

Test specification:	**FCC Section 90.213/RSS-119 Section 5.10, Frequency stability**		
Test procedure:	47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	5/19/2009 12:04:51 PM		
Temperature: 24ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 44%	**Power Supply:** 6 VDC
Remarks:			

Table 7.3.2 Frequency stability test results

ASSIGNED FREQUENCY RANGE: 430-450 MHz
NOMINAL POWER VOLTAGE: 6 V
TEMPERATURE STABILIZATION PERIOD: 20 min
POWER DURING TEMPERATURE TRANSITION: Off
SPECTRUM ANALYZER MODE: Counter
RESOLUTION BANDWIDTH: 1 kHz
VIDEO BANDWIDTH: 1 kHz
MODULATION: Unmodulated

T, ºC	Voltage, V	Frequency, MHz							Max frequency drift, Hz		Limit, Hz	Margin, Hz	Verdict
		Start up	1st min	2nd min	3rd min	4th min	5th min	10th min	Positive	Negative			
Low frequency 430.0125													
-30	6.0	430.012176	430.012188	430.012196	430.012204	430.012208	430.012214	430.012220	0	92		-553	Pass
-20	6.0	430.012163	NA	NA	NA	NA	NA	430.012202	0	117		-528	Pass
-10	6.0	430.012178	NA	NA	NA	NA	NA	430.012183	0	102		-543	Pass
0	6.0	430.012030	430.012037	430.012222	430.012209	430.012305	430.012300	430.012301	0	250		-395	Pass
10	6.0	430.011995	NA	NA	NA	NA	NA	430.011974	0	306		-339	Pass
20	6.0	430.012188	NA	NA	NA	NA	NA	430.012280*	0	92	645	-553	Pass
20	6.9	430.012188	NA	NA	NA	NA	NA	430.012280*	0	92		-553	Pass
20	5.1	430.012188	NA	NA	NA	NA	NA	430.012280*	0	92		-553	Pass
30	6.0	430.012282	430.012285	430.012292	430.012294	430.012350	430.012390	430.012415	135	0		-510	Pass
40	6.0	430.012792	NA	NA	NA	NA	NA	430.012818	538	0		-107	Pass
50	6.0	430.012803	NA	NA	NA	NA	NA	430.012826	546	0		-99	Pass
Mid frequency 440.0125													
-30	6.0	440.012155	440.012161	440.012172	440.012185	440.012190	440.012196	440.012208	0	131		-529	Pass
-20	6.0	440.012180	NA	NA	NA	NA	NA	440.012200	0	106		-554	Pass
-10	6.0	440.011908	NA	NA	NA	NA	NA	440.011881	0	405		-255	Pass
0	6.0	440.011932	440.011943	440.011949	440.011952	440.011951	440.011959	440.011960	0	354		-306	Pass
10	6.0	440.011951	NA	NA	NA	NA	NA	440.011969	0	335		-325	Pass
20	6.0	440.012240	NA	NA	NA	NA	NA	440.012286*	0	46	660	-614	Pass
20	6.9	440.012240	NA	NA	NA	NA	NA	440.012286*	0	46		-614	Pass
20	5.1	440.012240	NA	NA	NA	NA	NA	440.012286*	0	46		-614	Pass
30	6.0	440.012548	440.012560	440.012561	440.012575	440.012587	440.012680	440.012700	414	0		-246	Pass
40	6.0	440.012781	NA	NA	NA	NA	NA	440.012816	530	0		-130	Pass
50	6.0	440.012831	NA	NA	NA	NA	NA	440.012838	552	0		-108	Pass
High frequency 449.9875													
-30	6.0	449.986981	449.987044	449.987058	449.987070	449.987105	449.987157	449.987181	0	254		-421	Pass
-20	6.0	449.987165	NA	NA	NA	NA	NA	449.987205	0	133		-542	Pass
-10	6.0	449.987162	NA	NA	NA	NA	NA	449.987177	0	136		-539	Pass
0	6.0	449.987047	449.987051	449.987053	449.987055	449.987053	449.987055	449.987055	0	251		-424	Pass
10	6.0	449.986906	NA	NA	NA	NA	NA	449.986936	0	302		-373	Pass
20	6.0	449.987253	NA	NA	NA	NA	NA	449.987298*	0	45	675	-630	Pass
20	6.9	449.987253	NA	NA	NA	NA	NA	449.987298*	0	45		-630	Pass
20	5.1	449.987253	NA	NA	NA	NA	NA	449.987298*	0	45		-630	Pass
30	6.0	449.987581	449.987585	449.987593	449.987601	449.987611	449.987616	449.987620	328	0		-347	Pass
40	6.0	449.987735	NA	NA	NA	NA	NA	449.987821	523	0		-152	Pass
50	6.0	449.987849	NA	NA	NA	NA	NA	449.987858	560	0		-115	Pass

* - Reference frequency.

Reference numbers of test equipment used

HL 0493	HL 2358	HL 2911	HL 3004	HL 3310	HL 3441		

Full description is given in Appendix A.

Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Band edge emission		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	6/9/2009 9:34:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 52%	Power Supply: 6 VDC
Remarks:			

7.4 Band edge emission

7.4.1 General

This test was performed to verify the EUT band edge emission, including all associated side bands and frequency drift under extreme test conditions, was attenuated at least 30 dB below the unmodulated carrier level. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Band edge emission limits

Band edge frequency shift from carrier, kHz	Channel bandwidth, kHz	Attenuation below carrier, dBc
± 40.0	25.0	30
± 25.0	12.5	30
± 12.5	6.25	30

7.4.2 Test procedure

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and its proper operation was checked.

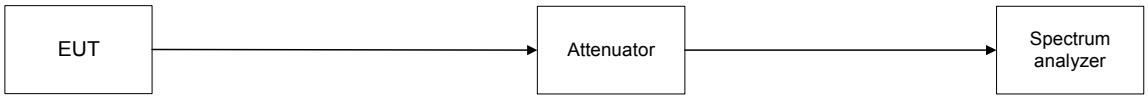
7.4.2.2 The spectrum analyzer sweep time and bandwidth were set to capture all major modulation sidebands of emission and sweep time was set sufficiently slow to ensure the peak measurements. The spectrum analyzer was set in peak hold mode and time sufficient for trace stabilization was allowed.

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

7.4.2.4 The total bandwidth was calculated by adding of the negative frequency drift to the lower measured frequency and the positive frequency drift to the higher measured frequency. The obtained bandwidth was verified to be within the allowed frequency range.

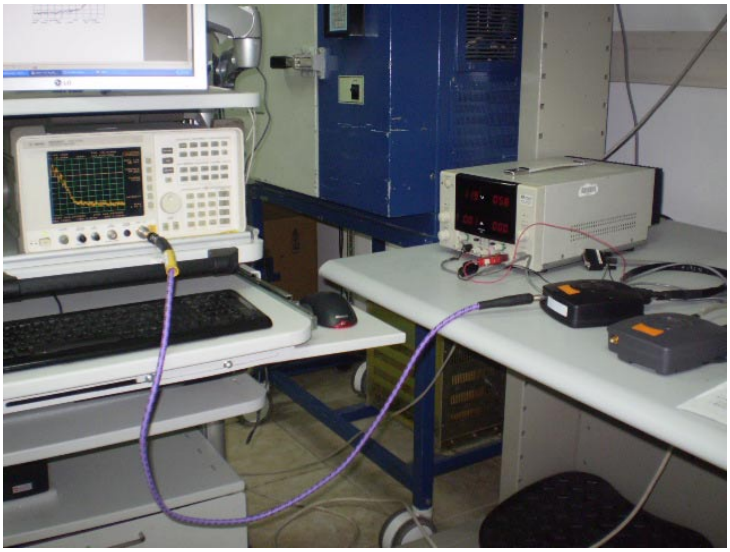
7.4.2.5 The test results were recorded in Table 7.4.2 and shown in the associated plots.

Figure 7.4.1 Band edge emission measurement set up



Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Band edge emission		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	6/9/2009 9:34:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 52%	Power Supply: 6 VDC
Remarks:			

Photograph 7.4.1 Band edge emission measurement set up



Test specification:	**FCC Section 90.217/ RSS-119 Section 5.10, Band edge emission**		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	6/9/2009 9:34:35 AM		
Temperature: 25ºC	**Air Pressure:** 1010 hPa	**Relative Humidity:** 52%	**Power Supply:** 6 VDC
Remarks:			

Table 7.4.2 Band edge emission test results

ASSIGNED FREQUENCY RANGE: 430-450 MHz
DETECTOR USED: Peak hold
RESOLUTION BANDWIDTH: 100 Hz
VIDEO BANDWIDTH: 1000 Hz
MODULATION: FM
MODULATING SIGNAL: PRBS
BIT RATE: 1200 Mbps
TRANSMITTER OUTPUT POWER 20.00 dBm at 430.0125 MHz
19.83 dBm at 440.0125 MHz
20.00 dBm at 449.9875 MHz
ATTENUATION BELOW CARRIER: 30 dBc

Band edge	Measured frequency, MHz*	Frequency drift, kHz		Band edge frequency, MHz**	Band edge limit, MHz	Margin, kHz***	Verdict
		Negative	Positive				
Low carrier frequency							
Low	430.00850	0.360	NA	430.008140	429.9875	-20.640	Pass
High	430.01633	NA	0.546	430.016876	430.0375	-20.624	Pass
Mid carrier frequency							
Low	440.00842	0.405	NA	440.008015	439.9875	-20.515	Pass
High	440.01617	NA	0.552	440.016722	440.0375	-20.972	Pass
High carrier frequency							
Low	449.98346	0.302	NA	449.983158	449.9625	-20.658	Pass
High	449.99117	NA	0.560	449.991730	450.0125	-20.770	Pass

* - Measured frequency beyond which the emission level is attenuated at least 30 dB below the unmodulated carrier
** - Band edge frequency = Measured frequency ± Frequency drift under extreme conditions
*** - Margin = Band edge limit – Band edge frequency

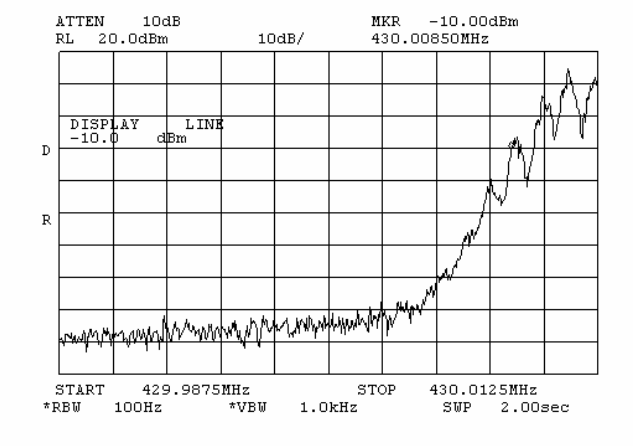
Reference numbers of test equipment used

HL 1424	HL 2953	HL 3440					

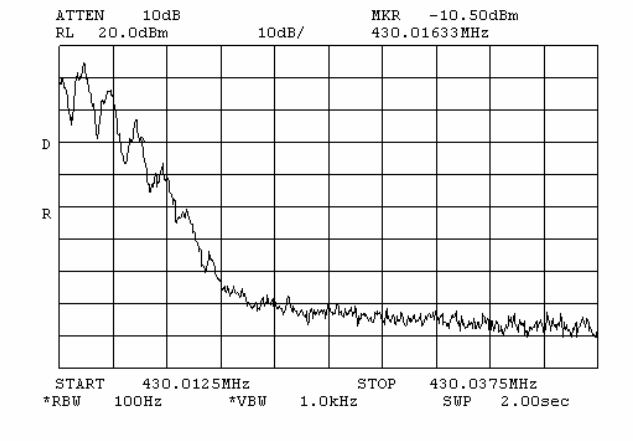
Full description is given in Appendix A.

Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Band edge emission		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	6/9/2009 9:34:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 52%	Power Supply: 6 VDC
Remarks:			

Plot 7.4.1 Band edge emission test results at low carrier frequency low edge

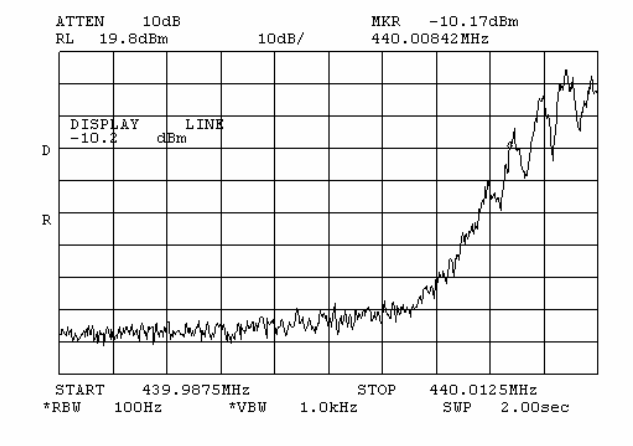


Plot 7.4.2 Band edge emission test results at low carrier frequency high edge

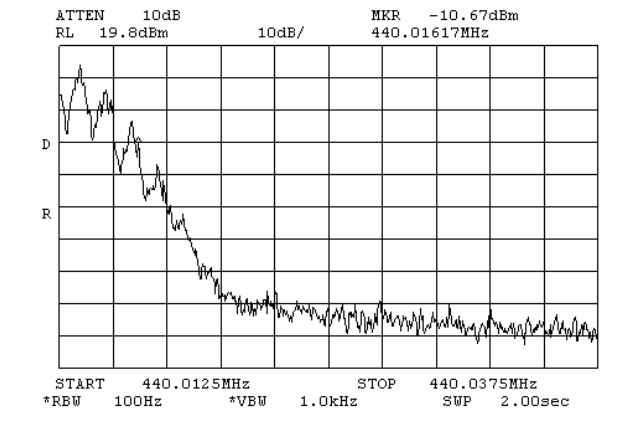


Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Band edge emission		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	6/9/2009 9:34:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 52%	Power Supply: 6 VDC
Remarks:			

Plot 7.4.3 Band edge emission test results at mid carrier frequency low edge

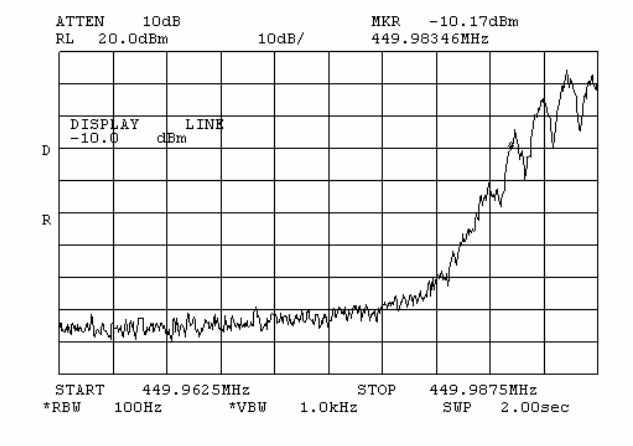


Plot 7.4.4 Band edge emission test results at mid carrier frequency high edge

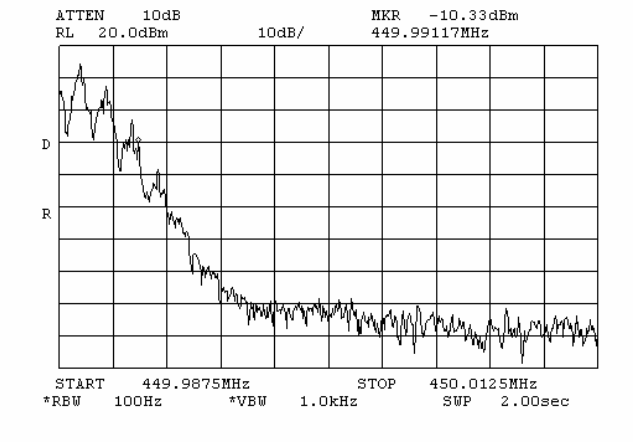


Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Band edge emission		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	6/9/2009 9:34:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 52%	Power Supply: 6 VDC
Remarks:			

Plot 7.4.5 Band edge emission test results at high carrier frequency low edge



Plot 7.4.6 Band edge emission test results at high carrier frequency high edge



Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/25/2009 6:13:13 PM		
Temperature: 23ºC	Air Pressure: 1014 hPa	Relative Humidity: 44%	Power Supply: 6 VDC
Remarks:			

7.5 Spurious emissions at RF antenna connector test

7.5.1 General

This test was performed to measure spurious emissions at RF antenna connector. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Spurious emission limits

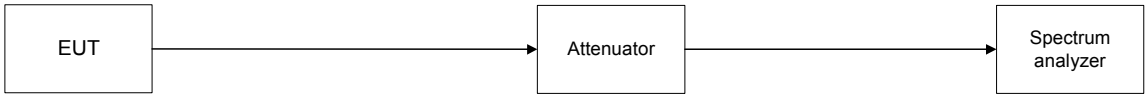
Frequency, MHz	Attenuation below carrier, dBc	Spurious emission, dBm
0.009 – 10th harmonic*	30	-10

* - spurious emission limits do not apply to the in band emission within:
± 40 kHz from the carrier for equipment designed to operate with 25 kHz channel bandwidth
± 25 kHz from the carrier for equipment designed to operate with 12.5 kHz channel bandwidth
± 12.5 kHz from the carrier for equipment designed to operate with 6.25 kHz channel bandwidth

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 was adjusted to produce maximum available for end user RF output power.
7.5.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.5.2 and the associated plots.

Figure 7.5.1 Spurious emission test setup



Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/25/2009 6:13:13 PM		
Temperature: 23ºC	Air Pressure: 1014 hPa	Relative Humidity: 44%	Power Supply: 6 VDC
Remarks:			

Photograph 7.5.1 Spurious emission test setup

Test specification:	**FCC Section 90.217/ RSS-119 Section 5.10, Conducted spurious emissions**		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	5/25/2009 6:13:13 PM		
Temperature: 23ºC	**Air Pressure:** 1014 hPa	**Relative Humidity:** 44%	**Power Supply:** 6 VDC
Remarks:			

Table 7.5.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 430-450 MHz
INVESTIGATED FREQUENCY RANGE: 0.009 – 4500 MHz
DETECTOR USED: Peak
VIDEO BANDWIDTH: ≥ Resolution bandwidth
MODULATION: FM
MODULATING SIGNAL: PRBS
BIT RATE: 1200 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
TRANSMITTER OUTPUT POWER: 20.00 dBm at low frequency
19.83 dBm at mid frequency
20.00 dBm at high frequency

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
Low carrier frequency 430.0125 MHz									
860.025	-39.17	included	included	100	-39.17	59.17	30	-29.17	Pass
1290.04	-33.33	included	included	1000	-33.33	53.09	30	-23.09	Pass
2150.06	-46.50	included	included	1000	-46.50	66.26	30	-36.26	Pass
Mid carrier frequency 440.0125 MHz									
880.028	-41.00	included	included	100	-41.00	60.83	30	-30.83	Pass
1320.04	-33.50	included	included	1000	-33.50	52.91	30	-22.91	Pass
2200.07	-47.17	included	included	1000	-47.17	66.58	30	-36.58	Pass
High carrier frequency 449.9875 MHz									
899.975	-41.33	included	included	100	-41.33	61.33	30	-31.33	Pass
1349.96	-33.33	included	included	1000	-33.33	52.61	30	-22.61	Pass
2249.84	-48.50	included	included	1000	-48.50	67.78	30	-37.78	Pass

*- Margin = Spurious emission – specification limit.

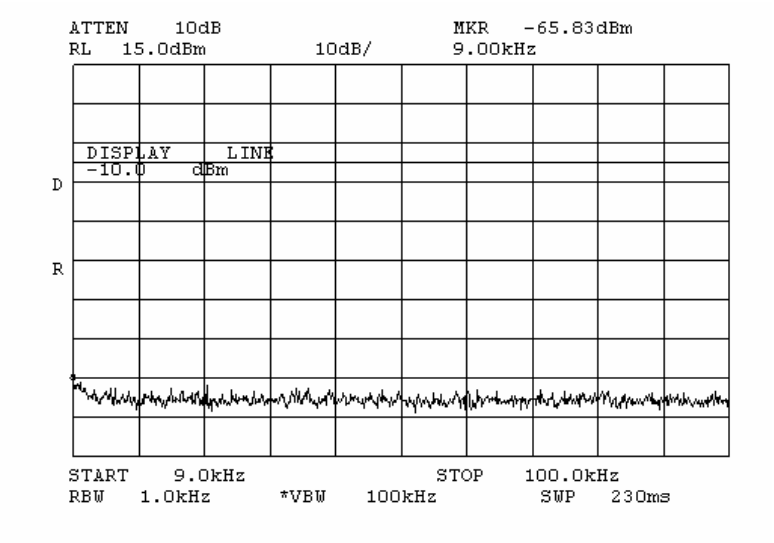
Reference numbers of test equipment used

HL 1424	HL 2953	HL 3440					

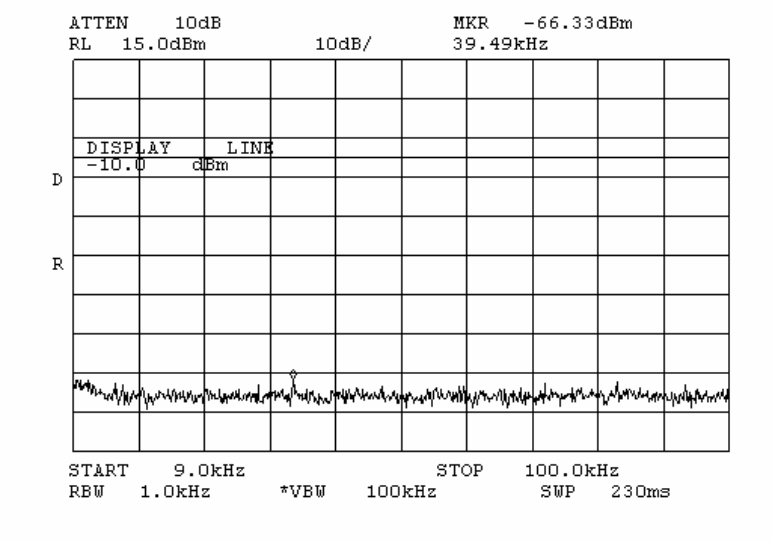
Full description is given in Appendix A.

Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/25/2009 6:13:13 PM		
Temperature: 23ºC	Air Pressure: 1014 hPa	Relative Humidity: 44%	Power Supply: 6 VDC
Remarks:			

Plot 7.5.1 Spurious emission measurements in 9 - 100 kHz range at low carrier frequency

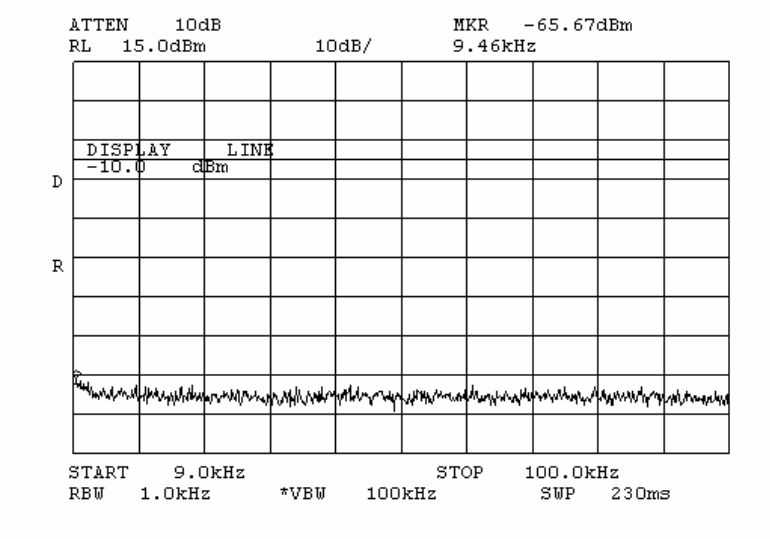


Plot 7.5.2 Spurious emission measurements in 9 - 100 kHz range at mid carrier frequency

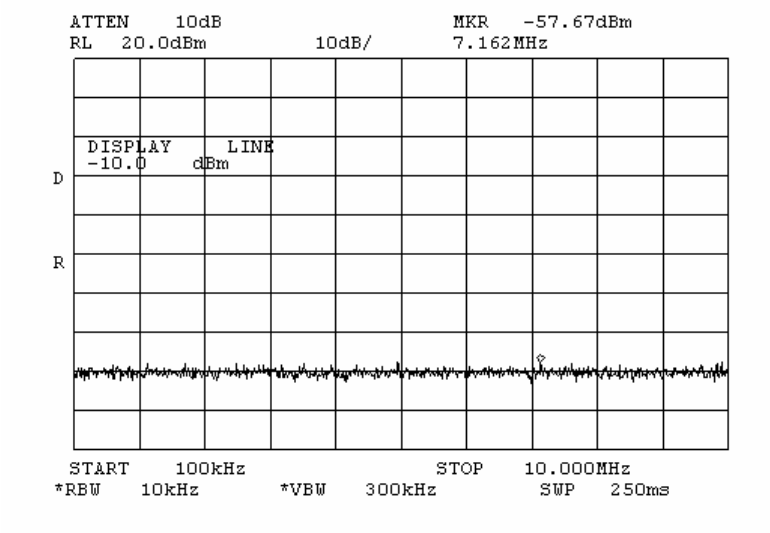


Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/25/2009 6:13:13 PM		
Temperature: 23ºC	Air Pressure: 1014 hPa	Relative Humidity: 44%	Power Supply: 6 VDC
Remarks:			

Plot 7.5.3 Spurious emission measurements in 9 - 100 kHz range at high carrier frequency

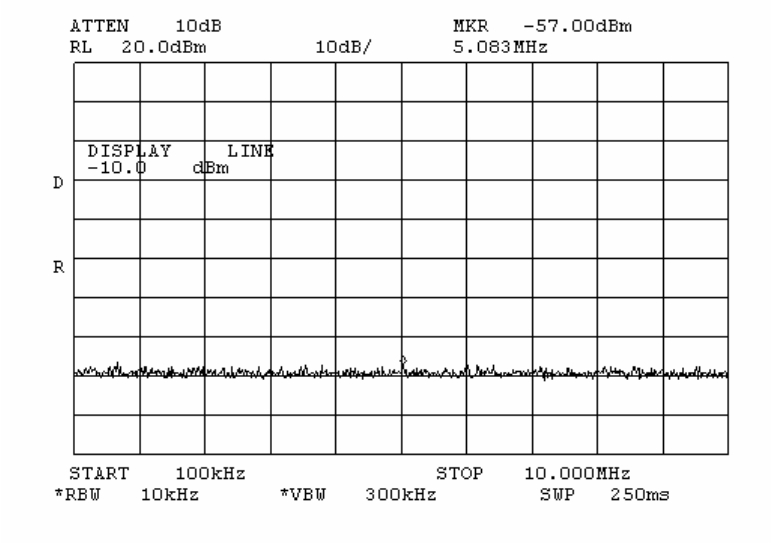


Plot 7.5.4 Spurious emission measurements in 0.10 - 10.0 MHz range at low carrier frequency

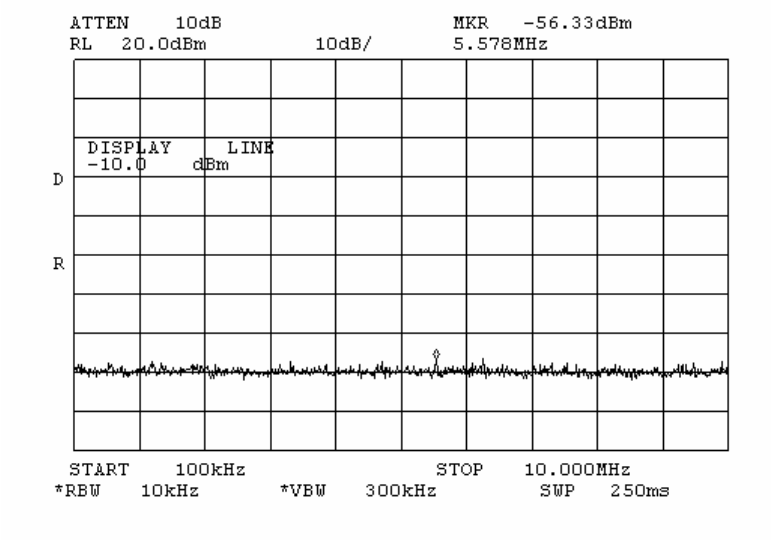


Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/25/2009 6:13:13 PM		
Temperature: 23ºC	Air Pressure: 1014 hPa	Relative Humidity: 44%	Power Supply: 6 VDC
Remarks:			

Plot 7.5.5 Spurious emission measurements in 0.10 - 10.0 MHz range at mid carrier frequency

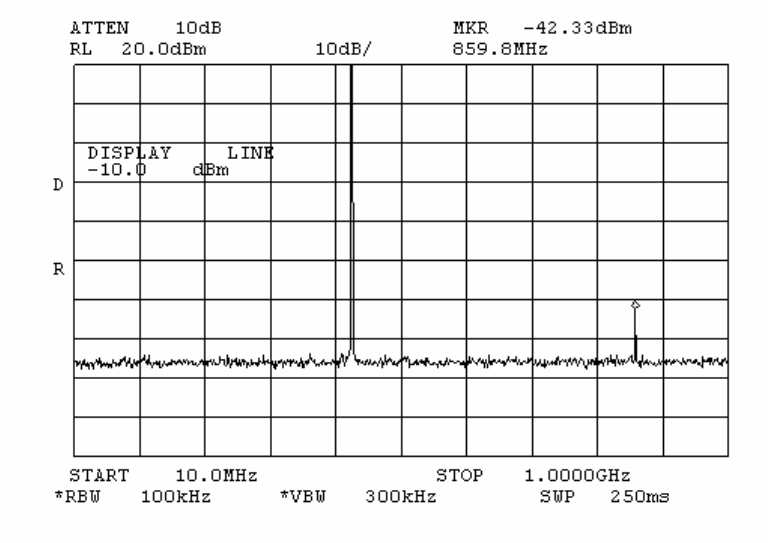


Plot 7.5.6 Spurious emission measurements in 0.10 – 10.0 MHz range at high carrier frequency

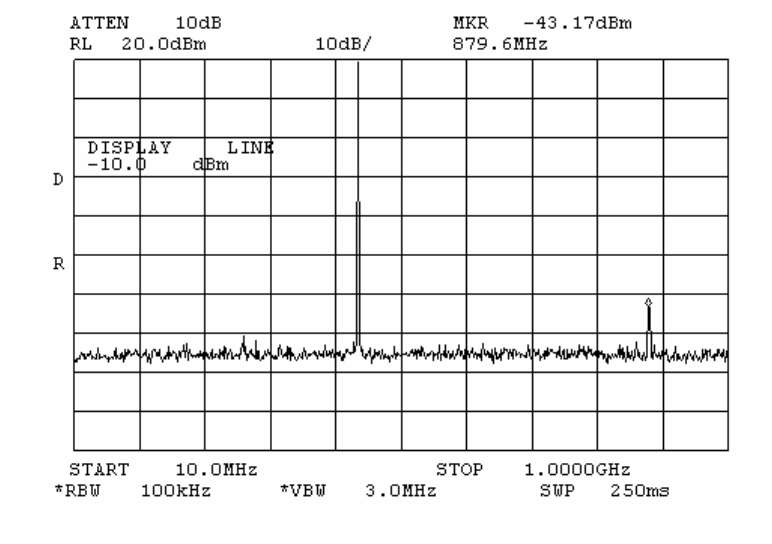


Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/25/2009 6:13:13 PM		
Temperature: 23ºC	Air Pressure: 1014 hPa	Relative Humidity: 44%	Power Supply: 6 VDC
Remarks:			

Plot 7.5.7 Spurious emission measurements in 10.0 - 1000 MHz range at low carrier frequency

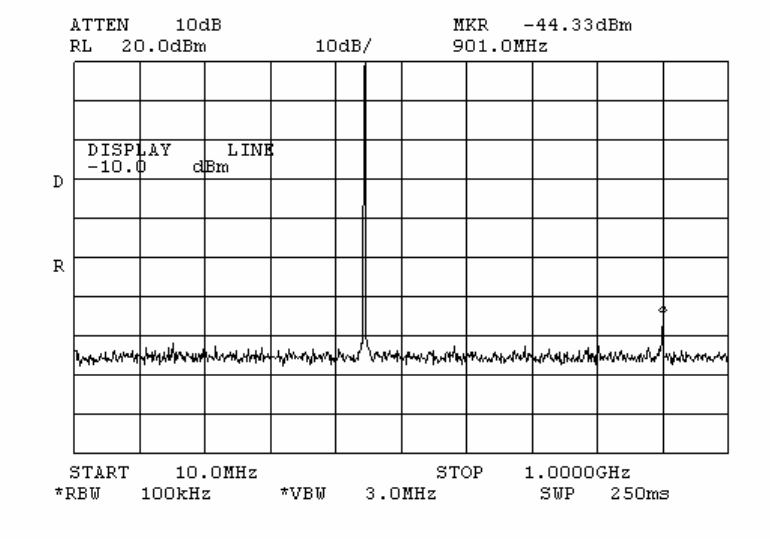


Plot 7.5.8 Spurious emission measurements in 10.0 - 1000 MHz range at mid carrier frequency

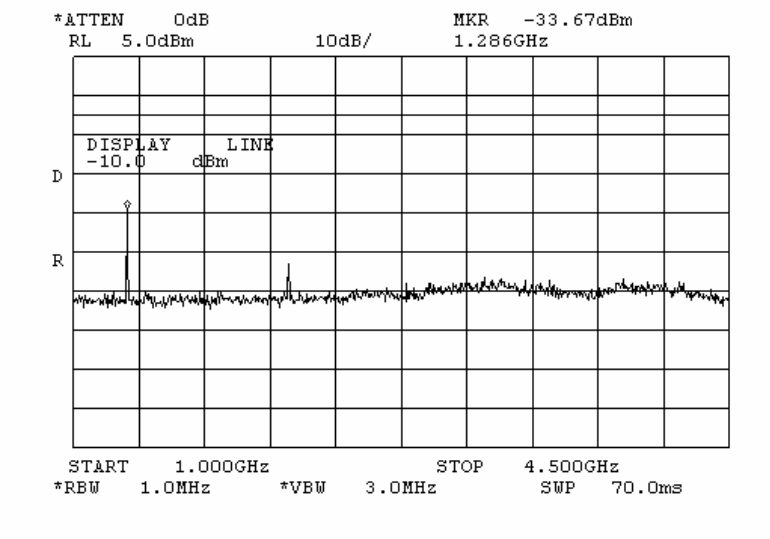


Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/25/2009 6:13:13 PM		
Temperature: 23ºC	Air Pressure: 1014 hPa	Relative Humidity: 44%	Power Supply: 6 VDC
Remarks:			

Plot 7.5.9 Spurious emission measurements in 10.0 - 1000 MHz range at high carrier frequency

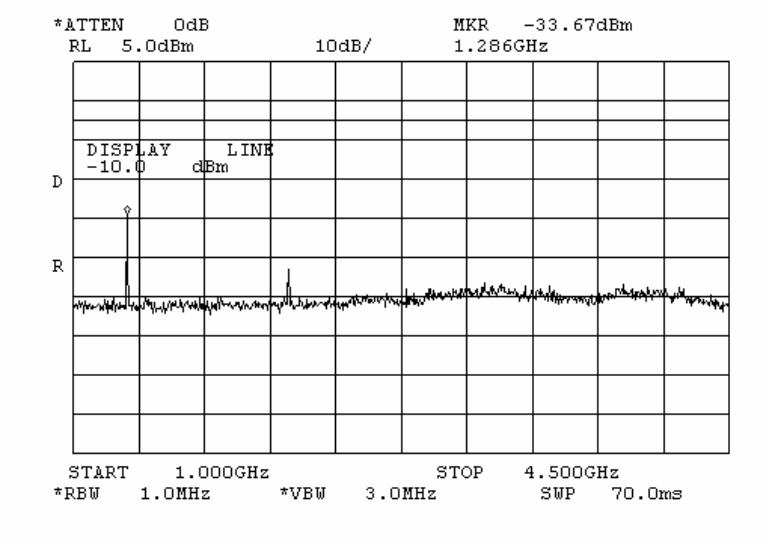


Plot 7.5.10 Spurious emission measurements in 1000 - 4500 MHz range at low carrier frequency

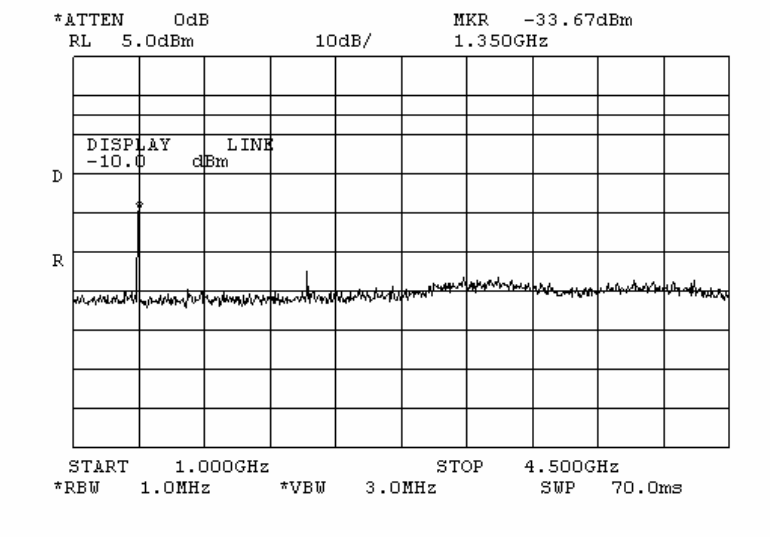


Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/25/2009 6:13:13 PM		
Temperature: 23ºC	Air Pressure: 1014 hPa	Relative Humidity: 44%	Power Supply: 6 VDC
Remarks:			

Plot 7.5.11 Spurious emission measurements in 1000 - 4500 MHz at mid carrier frequency

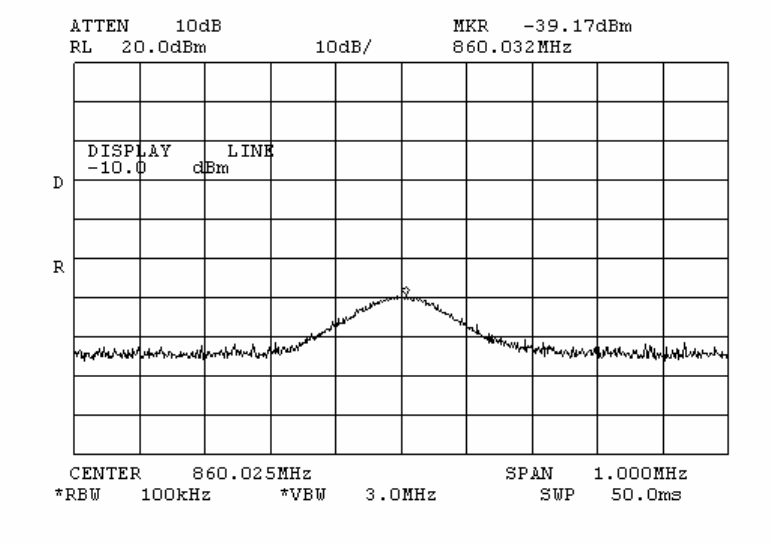


Plot 7.5.12 Spurious emission measurements in 1000 - 4500 MHz at high carrier frequency

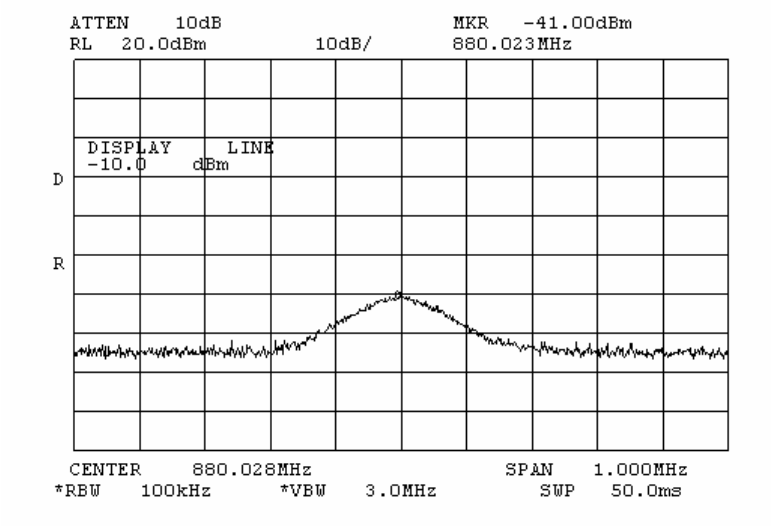


Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/25/2009 6:13:13 PM		
Temperature: 23ºC	Air Pressure: 1014 hPa	Relative Humidity: 44%	Power Supply: 6 VDC
Remarks:			

Plot 7.5.13 Conducted spurious emission measurements at the 2nd harmonic of low carrier frequency

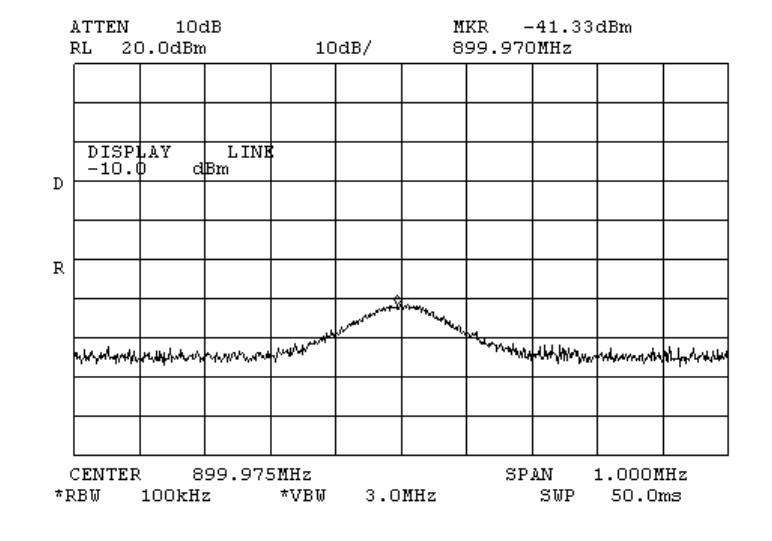


Plot 7.5.14 Conducted spurious emission measurements at the 2nd harmonic of mid carrier frequency

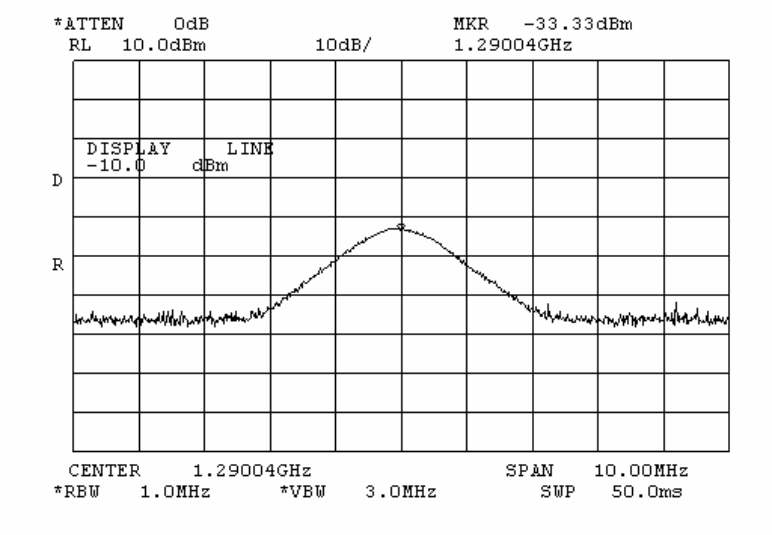


Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/25/2009 6:13:13 PM		
Temperature: 23ºC	Air Pressure: 1014 hPa	Relative Humidity: 44%	Power Supply: 6 VDC
Remarks:			

Plot 7.5.15 Conducted spurious emission measurements at the 2nd harmonic of high carrier frequency

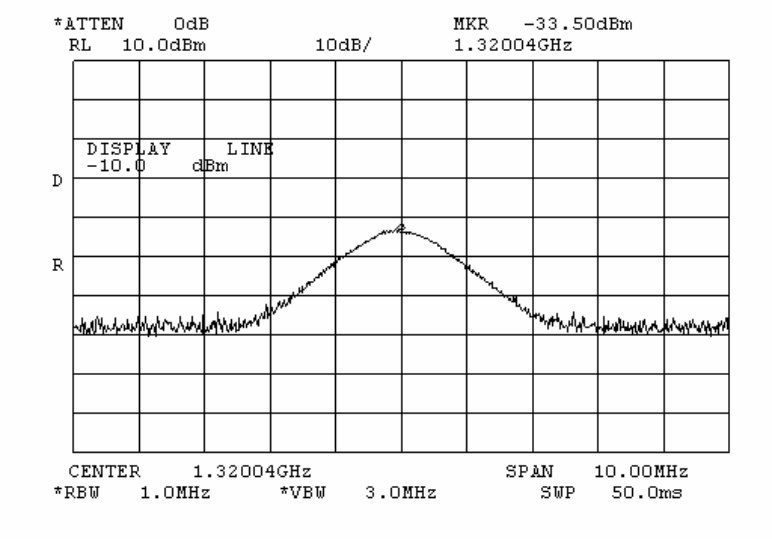


Plot 7.5.16 Conducted spurious emission measurements at the 3rd harmonic of low carrier frequency

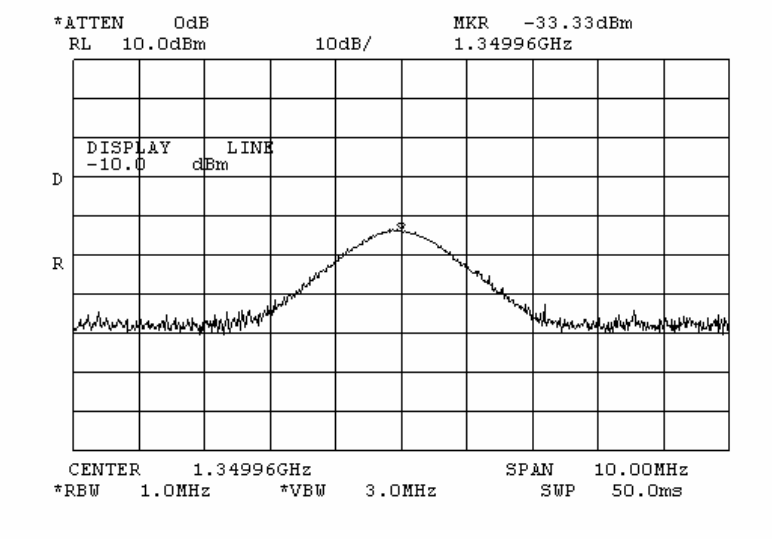


Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/25/2009 6:13:13 PM		
Temperature: 23ºC	Air Pressure: 1014 hPa	Relative Humidity: 44%	Power Supply: 6 VDC
Remarks:			

Plot 7.5.17 Conducted spurious emission measurements at the 3rd harmonic of mid carrier frequency

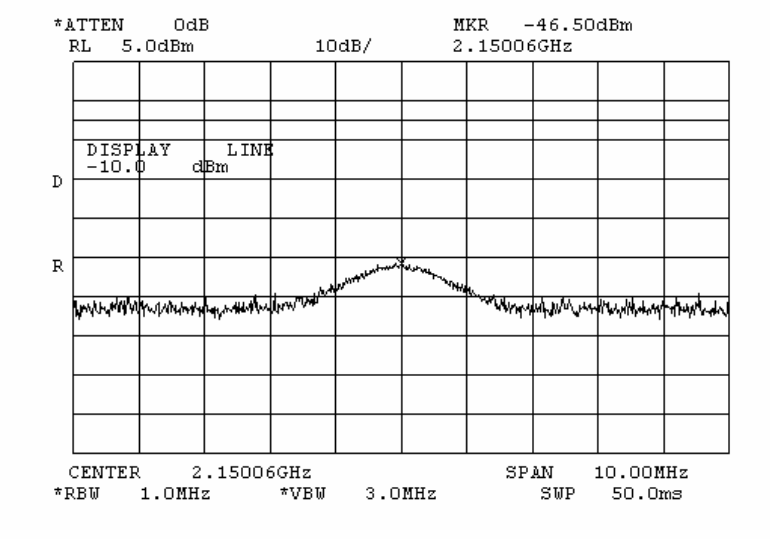


Plot 7.5.18 Conducted spurious emission measurements at the 3rd harmonic of high carrier frequency

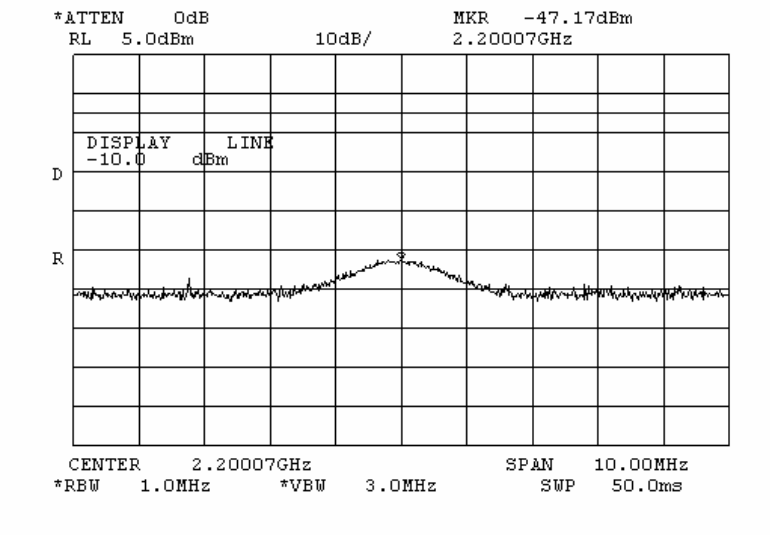


Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/25/2009 6:13:13 PM		
Temperature: 23ºC	Air Pressure: 1014 hPa	Relative Humidity: 44%	Power Supply: 6 VDC
Remarks:			

Plot 7.5.19 Conducted spurious emission measurements at the 5th harmonic of low carrier frequency

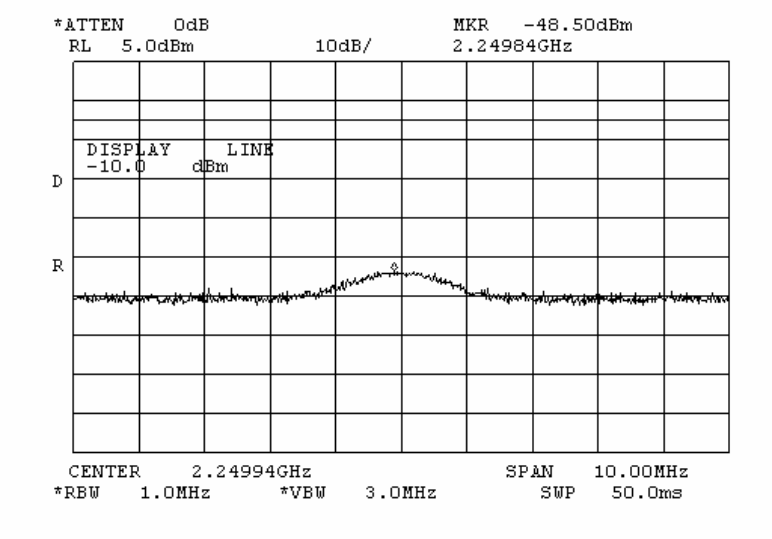


Plot 7.5.20 Conducted spurious emission measurements at the 5th harmonic of mid carrier frequency



Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/25/2009 6:13:13 PM		
Temperature: 23ºC	Air Pressure: 1014 hPa	Relative Humidity: 44%	Power Supply: 6 VDC
Remarks:			

Plot 7.5.21 Conducted spurious emission measurements at the 5th harmonic of high carrier frequency



Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/20/2009 4:34:10 PM		
Temperature: 24ºC	Air Pressure: 1012 hPa	Relative Humidity: 45%	Power Supply: 6 VDC
Remarks:			

7.6 Radiated spurious emission measurements

7.6.1 General

This test was performed to measure radiated spurious emissions from the EUT. Specification test limits are given in Table 7.6.1.

Table 7.6.1 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*	30	-10	87.4

* - 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

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

7.6.2.1 The EUT was set up as shown in Figure 7.6.1, energized and the performance check was conducted.

7.6.2.2 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.

7.6.2.3 The worst test results (the lowest margins) were recorded in Table 7.6.2 and shown in the associated plots.

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

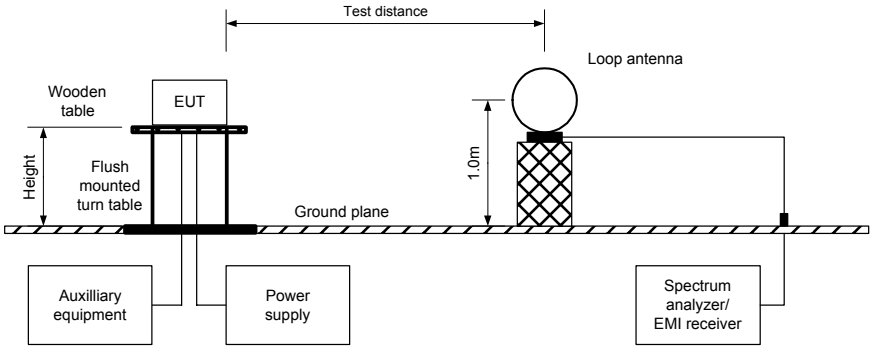
7.6.3.1 The EUT was set up as shown in Figure 7.6.2, energized and the performance check was conducted.

7.6.3.2 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.

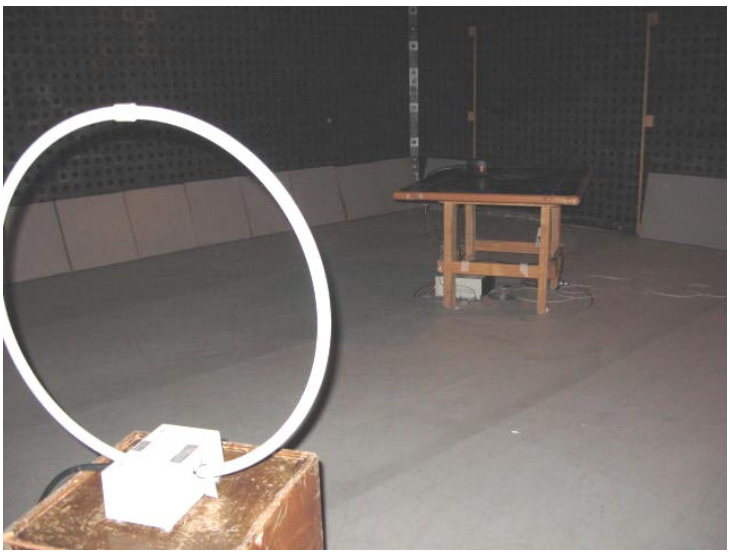
7.6.3.3 The worst test results (the lowest margins) were recorded in Table 7.6.2 and shown in the associated plots.

Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/20/2009 4:34:10 PM		
Temperature: 24ºC	Air Pressure: 1012 hPa	Relative Humidity: 45%	Power Supply: 6 VDC
Remarks:			

Figure 7.6.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz band

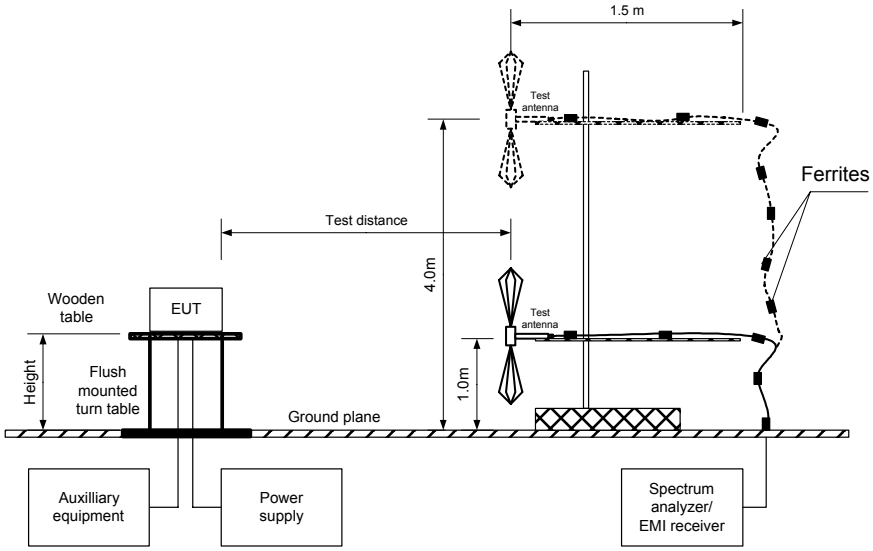


Photograph 7.6.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz band

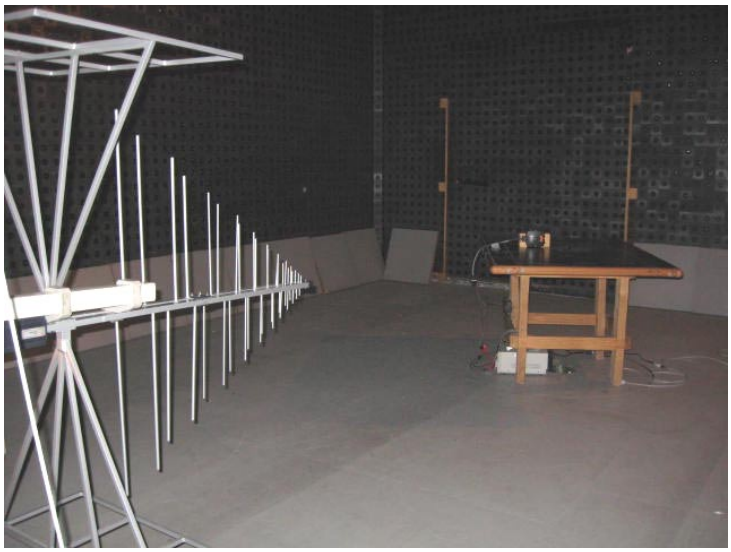


Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/20/2009 4:34:10 PM		
Temperature: 24ºC	Air Pressure: 1012 hPa	Relative Humidity: 45%	Power Supply: 6 VDC
Remarks:			

Figure 7.6.2 Setup for spurious emission field strength measurements above 30 MHz

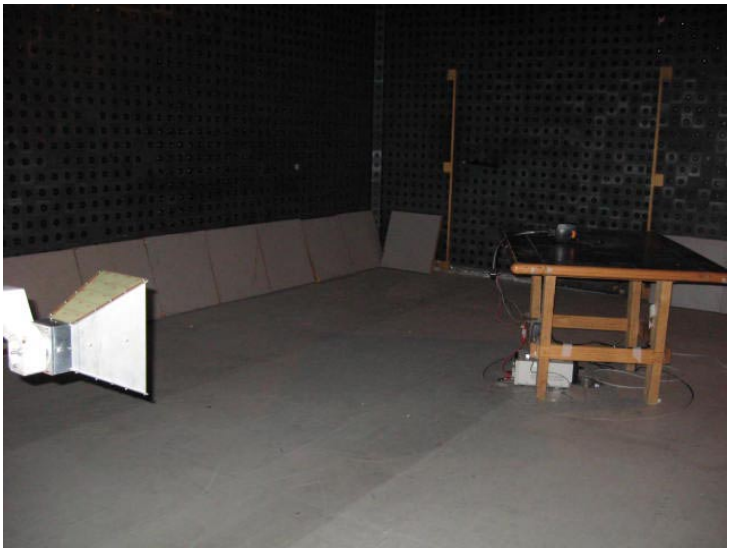


Photograph 7.6.2 Setup for spurious emission field strength measurements in 30 – 1000 MHz



Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/20/2009 4:34:10 PM		
Temperature: 24ºC	Air Pressure: 1012 hPa	Relative Humidity: 45%	Power Supply: 6 VDC
Remarks:			

Photograph 7.6.3 Setup for spurious emission field strength measurements above 1000 MHz



Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/20/2009 4:34:10 PM		
Temperature: 24ºC	Air Pressure: 1012 hPa	Relative Humidity: 45%	Power Supply: 6 VDC
Remarks:			

Table 7.6.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE:	430-450 MHz
TEST DISTANCE:	3 m
TEST SITE:	Semi anechoic chamber
EUT HEIGHT:	0.8 m
INVESTIGATED FREQUENCY RANGE:	0.009 – 4500 MHz
DETECTOR USED:	Peak
VIDEO BANDWIDTH:	> Resolution bandwidth
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconilog (30 MHz – 1000 MHz) Double ridged guide (above 1000 MHz)
MODULATION:	FM
MODULATING SIGNAL:	NA
BIT RATE:	1200 Mbps
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
0.009 – 30	No spurious were found						
30 - 4500	All spurious emissions were found at least 20 dB below limit						

Verdict: Pass

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

Reference numbers of test equipment used

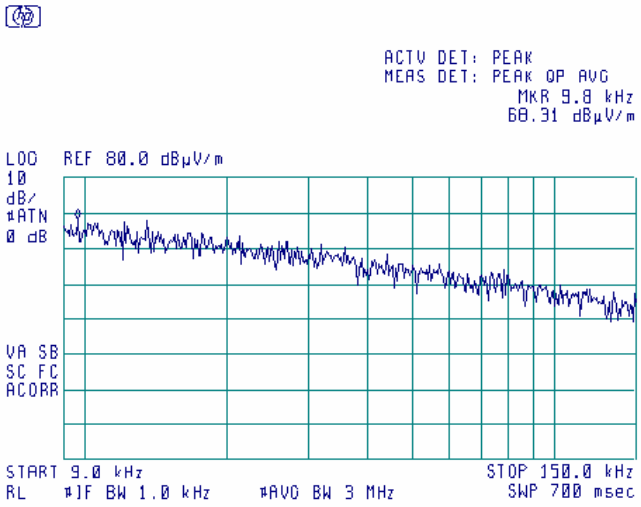
HL 0446	HL 0521	HL 0604	HL 1116	HL 3615	HL 3121		

Full description is given in Appendix A.

Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/20/2009 4:34:10 PM		
Temperature: 24ºC	Air Pressure: 1012 hPa	Relative Humidity: 45%	Power Supply: 6 VDC
Remarks:			

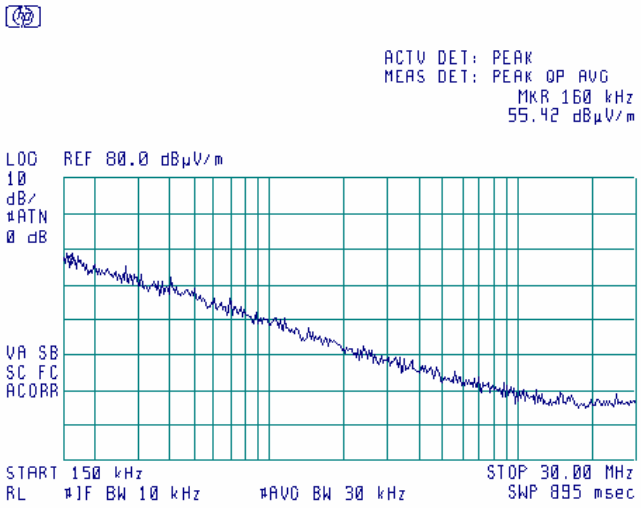
Plot 7.6.1 Radiated emission measurements in 9 - 150 kHz range

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low, Mid, High
TEST DISTANCE: 3 m



Plot 7.6.2 Radiated emission measurements in 0.15 - 30 MHz range

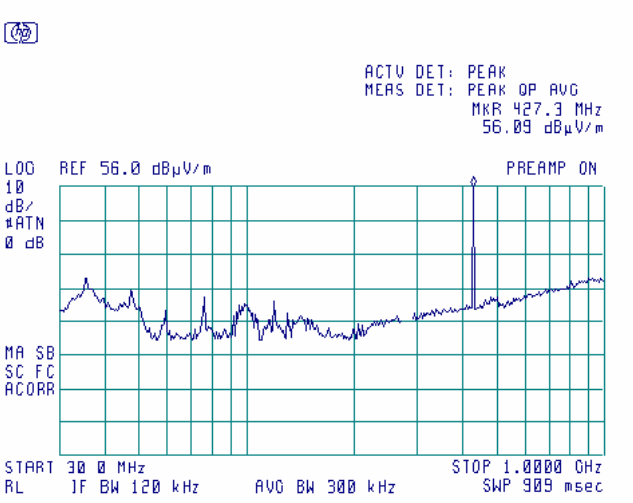
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low, Mid, High
TEST DISTANCE: 3 m



Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/20/2009 4:34:10 PM		
Temperature: 24ºC	Air Pressure: 1012 hPa	Relative Humidity: 45%	Power Supply: 6 VDC
Remarks:			

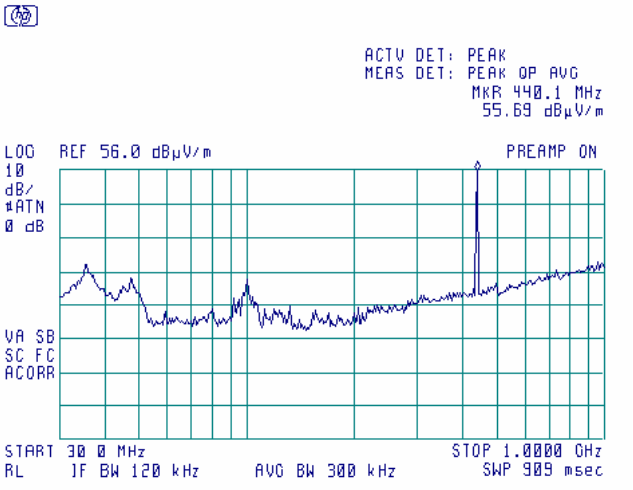
Plot 7.6.3 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE:	Semi Anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Plot 7.6.4 Radiated emission measurements in 30 - 1000 MHz range

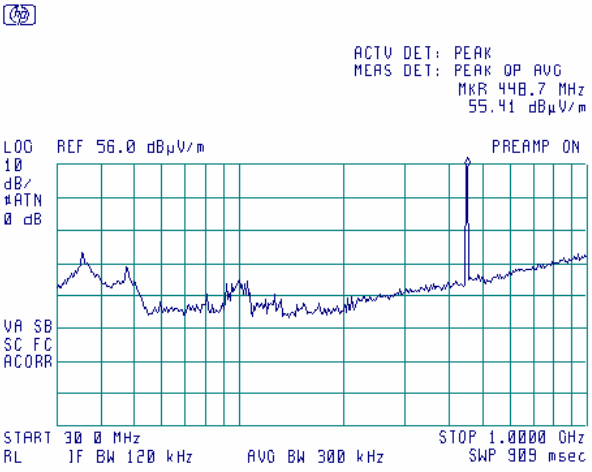
TEST SITE:	Semi Anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	FCC Section 90.217/ RSS-119 Section 5.10, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/20/2009 4:34:10 PM		
Temperature: 24ºC	Air Pressure: 1012 hPa	Relative Humidity: 45%	Power Supply: 6 VDC
Remarks:			

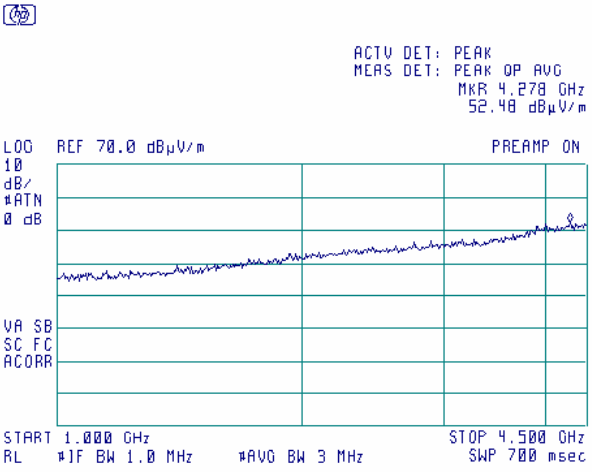
Plot 7.6.5 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE:	Semi Anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Plot 7.6.6 Radiated emission measurements in 1000 – 4500 MHz range

TEST SITE:	Semi Anechoic chamber
CARRIER FREQUENCY:	Low, Mid, High
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	29-Jun-09	29-Jun-10
0493	Temperature Chamber -45…175 deg C	Thermotron	S-1.2 Mini-Max	14016	20-May-09	20-May-10
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
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	11-Jan-09	11-Jan-10
1116	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz	Hermon Laboratories	A1-18	186	23-Jan-09	23-Jan-10
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies	8564EC	3946A002 19	28-Aug-08	28-Aug-09
1560	National Instruments Virtual Bench 2.6	National Instruments	852192F-93	J12X52347	01-Jan-09	01-Jan-10
1650	Attenuators Set (3, 5, 20 dB), DC-18 GHz	M/A-COM	2082	1650	04-Jan-09	04-Jan-10
2358	Power Supply, 2 X 0-36VDC / 5A, 5VDC / 5A	Horizon Electronics	DHR3655 D	767469	08-Mar-09	08-Mar-10
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY451024 6	12-Jun-08	12-Jun-10
2911	Cable 18 GHz, 1.5 m, SMA-SMA	Gore	NA	89386	05-Oct-08	05-Oct-09
2952	Cable, RF, 18 GHz, 1.2 m, SMA-SMA	Gore	10020014	NA	05-Oct-08	05-Oct-09
2953	Cable, RF, 18 GHz, 1.2 m, SMA-SMA	Gore	10020014	NA	05-Oct-08	05-Oct-09
3004	Analyzer, Spectrum, 9.0 kHz - 2.2 GHz	Anritsu	MS2601A	MT09861	27-Mar-09	27-Mar-11
3121	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-9155-00	3121	07-Dec-08	07-Dec-09
3310	Multimeter	Fluke	115C	94321810	29-Jul-09	29-Jul-10
3440	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini-Circuits	BW-S20W5+	NA	08-Mar-09	08-Mar-10
3441	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini-Circuits	BW-S20W5+	NA	08-Mar-09	08-Mar-10
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

9 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 %

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

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

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

10 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility. Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47), Registration Numbers 90624 for OATS and 90623 for the anechoic chamber; by Industry Canada for electromagnetic emissions (file numbers IC 2186A-1 for OATS 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). 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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e-mail: mail@hermonlabs.com
website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

11 APPENDIX D Specification references

FCC 47CFR part 90: 2008	Private land mobile radio services
FCC 47CFR part 1: 2008	Practice and procedure
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-119 Issue 9, June 2007	Land Mobile and Fixed Radio Transmitters and Receivers Operating in the Frequency Range 27.41 – 960 MHz
RSS-Gen Issue 2, June 2007	General Requirements and Information for the Certification of Radiocommunication Equipment

12 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
Biconilog antenna EMCO Model 3141
Ser.No.1011, HL 0604

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

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

Antenna factor
Double ridged guide antenna
Hermon Laboratoriies, model A1-18, S/N 186, HL 1116

Frequency, MHz	Antenna factor. dB(1/m)
1000.0	24.6
1500.0	26.4
2000.0	29.7
2500.0	31.1
3000.0	31.5
3500.0	32.7
4000.0	36.1
4500.0	36.1
5000.0	39.9
5500.0	40.5
6000.0	40.4
6500.0	41.0
7000.0	41.2
7500.0	41.2
8000.0	44.3
8500.0	40.7
9000.0	39.3
9500.0	41.3
10000.0	42.8
10500.0	43.8
11000.0	47.0
11500.0	46.3
12000.0	43.4
12500.0	41.8
13000.0	41.9
13500.0	44.5
14000.0	44.8
14500.0	44.9
15000.0	44.4
15500.0	43.4
16000.0	42.6
16500.0	43.6
17000.0	42.3
17500.0	45.9
18000.0	45.3

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, Gore, 18 GHz, 1.5 m, SMA-SMA, S/N 89386
HL 2911

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.06	5750	1.32	12000	2.04
30	0.09	6000	1.34	12250	2.04
100	0.16	6250	1.41	12500	2.07
250	0.27	6500	1.43	12750	1.96
500	0.38	6750	1.46	13000	1.97
750	0.49	7000	1.49	13250	2.01
1000	0.55	7250	1.52	13500	2.04
1250	0.62	7500	1.56	13750	2.12
1500	0.68	7750	1.66	14000	2.16
1750	0.74	8000	1.69	14250	2.16
2000	0.78	8250	1.78	14500	2.28
2250	0.83	8500	1.73	14750	2.26
2500	0.88	8750	1.71	15000	2.22
2750	0.97	9000	1.72	15250	2.34
3000	1.00	9250	1.74	15500	2.41
3250	1.03	9500	1.76	15750	2.45
3500	1.05	9750	1.80	16000	2.57
3750	1.09	10000	1.89	16250	2.54
4000	1.14	10250	1.94	16500	2.55
4250	1.17	10500	1.99	16750	2.52
4500	1.21	10750	1.92	17000	2.42
4750	1.22	11000	1.96	17250	2.49
5000	1.24	11250	1.97	17500	2.62
5250	1.28	11500	2.02	17750	2.70
5500	1.30	11750	2.07	18000	2.76

Cable loss
Cable coaxial, Gore, 18 GHz, 1.2 m, SMA-SMA, S/N 10020014
HL 2952

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.03	5750	0.97	12000	1.50
30	0.05	6000	1.01	12250	1.45
100	0.11	6250	1.03	12500	1.48
250	0.19	6500	1.06	12750	1.57
500	0.26	6750	1.08	13000	1.51
750	0.32	7000	1.10	13250	1.64
1000	0.38	7250	1.13	13500	1.60
1250	0.43	7500	1.13	13750	1.63
1500	0.47	7750	1.21	14000	1.59
1750	0.53	8000	1.20	14250	1.66
2000	0.55	8250	1.24	14500	1.60
2250	0.59	8500	1.29	14750	1.65
2500	0.63	8750	1.23	15000	1.72
2750	0.66	9000	1.27	15250	1.68
3000	0.69	9250	1.27	15500	1.73
3250	0.72	9500	1.29	15750	1.70
3500	0.75	9750	1.30	16000	1.82
3750	0.78	10000	1.38	16250	1.79
4000	0.82	10250	1.44	16500	1.81
4250	0.84	10500	1.47	16750	1.91
4500	0.86	10750	1.45	17000	1.92
4750	0.90	11000	1.50	17250	1.98
5000	0.91	11250	1.46	17500	2.05
5250	0.94	11500	1.47	17750	2.04
5500	0.96	11750	1.44	18000	2.05

Cable loss
Cable coaxial, Gore, 18 GHz, 1.2 m, SMA-SMA, S/N 989370
HL 2953

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.02	6000	1.02	12250	1.43
30	0.07	6250	0.99	12500	1.70
250	0.18	6500	0.99	12750	1.52
500	0.25	6750	0.96	13000	1.33
750	0.32	7000	1.00	13250	1.58
1000	0.42	7250	1.03	13500	1.27
1250	0.42	7500	1.13	13750	1.48
1500	0.51	7750	1.18	14000	1.62
1750	0.50	8000	1.16	14250	1.59
2000	0.54	8250	1.28	14500	1.60
2250	0.62	8500	1.24	14750	1.49
2500	0.56	8750	1.24	15000	1.42
2750	0.64	9000	1.27	15250	1.56
3000	0.64	9250	1.21	15500	1.61
3250	0.69	9500	1.30	15750	1.79
3500	0.70	9750	1.24	16000	1.94
3750	0.74	10000	1.31	16250	1.57
4000	0.76	10250	1.41	16500	1.56
4250	0.78	10500	1.35	16750	1.42
4500	0.87	10750	1.38	17000	1.45
4750	0.84	11000	1.44	17250	1.69
5000	0.91	11250	1.34	17500	2.01
5250	0.88	11500	1.40	17750	1.78
5500	0.90	11750	1.33	18000	1.93
5750	0.93	12000	1.33		

Cable loss
Microwave Cable Assembly, 18 GHz, 6.4 m, SMA – SMA, Huber-Suhner, model 198-9155-00
HL 3121

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	0.08	3600	2.10	7400	3.08	11200	3.85	15100	4.58
30	0.18	3700	2.14	7500	3.11	11300	3.85	15200	4.60
50	0.26	3800	2.18	7600	3.14	11400	3.86	15300	4.63
100	0.34	3900	2.19	7700	3.16	11500	3.86	15400	4.65
200	0.47	4000	2.25	7800	3.18	11600	3.87	15500	4.71
300	0.59	4100	2.25	7900	3.20	11700	3.85	15600	4.70
400	0.66	4200	2.28	8000	3.22	11800	3.96	15700	4.69
500	0.75	4300	2.35	8100	3.26	11900	3.92	15800	4.71
600	0.83	4400	2.35	8200	3.27	12000	3.92	15900	4.74
700	0.90	4500	2.38	8300	3.29	12100	3.94	16000	4.69
800	0.96	4600	2.43	8400	3.30	12200	3.94	16100	4.72
900	1.02	4700	2.43	8500	3.31	12300	3.99	16200	4.71
1000	1.07	4800	2.45	8600	3.33	12400	4.02	16300	4.74
1100	1.12	4900	2.48	8700	3.35	12500	4.10	16400	4.74
1200	1.15	5000	2.55	8800	3.36	12600	4.09	16500	4.75
1300	1.22	5100	2.54	8900	3.38	12700	4.15	16600	4.78
1400	1.28	5200	2.56	9000	3.40	12800	4.15	16700	4.86
1500	1.29	5300	2.58	9100	3.41	12900	4.08	16800	4.84
1600	1.36	5400	2.61	9200	3.45	13000	4.21	16900	4.83
1700	1.40	5500	2.64	9300	3.48	13100	4.19	17000	4.86
1800	1.45	5600	2.69	9400	3.52	13200	4.29	17100	4.83
1900	1.51	5700	2.67	9500	3.54	13300	4.24	17200	4.90
2000	1.50	5800	2.71	9600	3.59	13400	4.26	17300	4.91
2100	1.56	5900	2.73	9700	3.59	13500	4.26	17400	4.94
2200	1.59	6000	2.75	9800	3.62	13600	4.29	17500	4.93
2300	1.63	6100	2.81	9900	3.70	13700	4.35	17600	4.93
2400	1.73	6200	2.80	10000	3.70	13800	4.31	17700	5.00
2500	1.73	6300	2.82	10100	3.72	13900	4.29	17800	5.01
2600	1.78	6400	2.85	10200	3.73	14000	4.32	17900	5.00
2700	1.84	6500	2.87	10300	3.75	14100	4.33	18000	5.00
2800	1.84	6600	2.90	10400	3.76	14200	4.34		
2900	1.91	6700	2.91	10500	3.77	14300	4.36		
3000	1.91	6800	2.94	10600	3.79	14400	4.38		
3100	1.97	6900	2.96	10700	3.80	14600	4.42		
3200	1.98	7000	2.98	10800	3.81	14700	4.42		
3300	2.04	7100	3.01	10900	3.81	14800	4.55		
3400	2.04	7200	3.02	11000	3.83	14900	4.55		
3500	2.10	7300	3.04	11100	3.84	15000	4.55		

Cable loss
Cable coaxial, RG-214/U, N type-N type, 6.5 m
Suhner Switzerland, HL 3615

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.13	1750	2.47	3550	4.10	5350	5.76
30	0.24	1800	2.53	3600	4.17	5400	5.84
50	0.31	1850	2.59	3650	4.21	5450	5.88
100	0.47	1900	2.61	3700	4.23	5500	5.90
150	0.58	1950	2.66	3750	4.33	5550	5.96
200	0.68	2000	2.74	3800	4.36	5600	6.02
250	0.77	2050	2.76	3850	4.38	5650	6.02
300	0.86	2100	2.80	3900	4.46	5700	6.09
350	0.94	2150	2.84	3950	4.52	5750	6.14
400	1.01	2200	2.89	4000	4.48	5800	6.15
450	1.08	2250	2.94	4050	4.52	5850	6.22
500	1.16	2300	2.98	4100	4.64	5900	6.29
550	1.21	2350	3.03	4150	4.62	5950	6.32
600	1.28	2400	3.07	4200	4.69	6000	6.39
650	1.35	2450	3.11	4250	4.75	6050	6.40
700	1.41	2500	3.15	4300	4.79	6100	6.48
750	1.48	2550	3.21	4350	4.83	6150	6.57
800	1.54	2600	3.25	4400	4.90	6200	6.62
850	1.58	2650	3.29	4450	4.95	6250	6.68
900	1.65	2700	3.33	4500	4.98	6300	6.74
950	1.67	2750	3.39	4550	5.04	6350	6.79
1000	1.74	2800	3.45	4600	5.08	6400	6.82
1050	1.79	2850	3.48	4650	5.12	6450	6.83
1100	1.84	2900	3.51	4700	5.15	6500	6.91
1150	1.91	2950	3.58	4750	5.22		
1200	1.94	3000	3.62	4800	5.26		
1250	1.99	3050	3.65	4850	5.29		
1300	2.06	3100	3.69	4900	5.33		
1350	2.11	3150	3.75	4950	5.36		
1400	2.16	3200	3.77	5000	5.38		
1450	2.21	3250	3.80	5050	5.46		
1500	2.25	3300	3.85	5100	5.49		
1550	2.30	3350	3.90	5150	5.56		
1600	2.35	3400	3.94	5200	5.58		
1650	2.38	3450	4.00	5250	5.64		
1700	2.42	3500	4.03	5300	5.69		

13 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
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
LISN	line impedance stabilization network
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
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

END OF DOCUMENT