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TEST REPORT

ACCORDING TO: FCC part 15 subpart C, §15.247 and subpart B

FOR:

Motorola Communication Israel Ltd.

Intelligent Mail Device Surface Visibility terminal (IMD SV)

Models:F3124A, F3125A

FCC ID:AZ489FT7015

Report ID: MOTRAD_FCC.16307.doc
Date of Issue: 3/13/2005

Table of contents

1 Applicant information

Client name:	Motorola Communication Israel Ltd.
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E-mail:	byt013@motorola.com
Contact name:	Mr. Yoav Tzafrir

2 Equipment under test attributes

Product name:	Intelligent Mail Device
Product type:	IMD
Model(s):	F3124A, F3125A
Receipt date	2/8/2005

3 Manufacturer information

Manufacturer name:	Motorola Communication Israel Ltd.
Address:	3 Kremenetski street, P.O.B. 25016, 67899 Tel Aviv, Israel
Telephone:	+972 3565 8888
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E-Mail:	byt013@motorola.com
Contact name:	Mr. Yoav Tzafrir

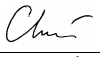
4 Test details

Project ID:	16307
Location:	Hermon Laboratories Ltd. P.O.Box 23, Binyamina 30500, Israel
Test started:	2/8/2005
Test completed:	3/10/2005
Test specification(s):	FCC part 15, subpart C, §15.247(DTS), §15.247(FHSS) and subpart B
Test suite:	FCC_15.247_DTS_without_RF_connector (5/3/2004 5:43:35 PM, modified)

5 Tests summary

Test	Status
Transmitter characteristics according to §15.247 (DTS)	
Section 15.247(a)2, 6 dB bandwidth	Pass
Section 15.247(b)3, Peak output power	Pass
Section 15.247(b)5, RF exposure	Not required
Section 15.247(c), Radiated spurious emissions	Pass
Section 15.247(d), Peak power density	Pass
Section 15.207(a), Conducted emission	Pass
Transmitter characteristics according to §15.247 (FHSS)	
Section 15.247(a)1, (g), (h), Frequency hopping requirements	Pass
Section 15.247(a)1, 20 dB bandwidth	Pass
Section 15.247(a)1, Frequency separation	Pass
Section 15.247(a)1, Number of hopping frequencies	Pass
Section 15.247(a)1, Average time of occupancy	Pass
Section 15.247(b), Peak output power	Pass
Section 15.247(b)5, RF exposure	Not required
Section 15.247(c), Emissions at band edges	Pass
Section 15.247(c), Radiated spurious emissions	Pass
Section 15.203, Antenna requirements	Pass
Section 15.207(a), Conducted emission	Pass
Unintentional emissions	
Section 15.107, Conducted emission at AC power port	Pass
Section 15.109, Radiated emission	Pass

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

	Name and Title	Date	Signature
Tested by:	Mr. M. Lerman, test engineer	March 10, 2005	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	March 13, 2005	
	Mr. M. Nikishin, EMC group leader	March 13, 2005	
Approved by:	Mr. A. Usoskin, CEO	March 13, 2005	

6 EUT description

6.1 General information

The EUT is an Intelligent mail device, which provides the bar code reading feature and ability to communicate with other devices through Wireless LAN or Bluetooth technologies. The EUT model F3124A includes both WLAN and Bluetooth RF modules, the EUT model F3125A - only Bluetooth RF module.

6.2 Ports and lines

Port type	Port description	Connected		Connector type	Qty.	Cable type	Cable length	Indoor / outdoor
		From	To					
Power	AC Mains	PS	AC mains	IEC 320	1	Unshielded	1.5 m	Indoor
Power	DC	EUT	DC PS	2 wires	1	Unshielded	1.5 m	Indoor

6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
Power supply	Nemic Lambda	UP 36-12	NA

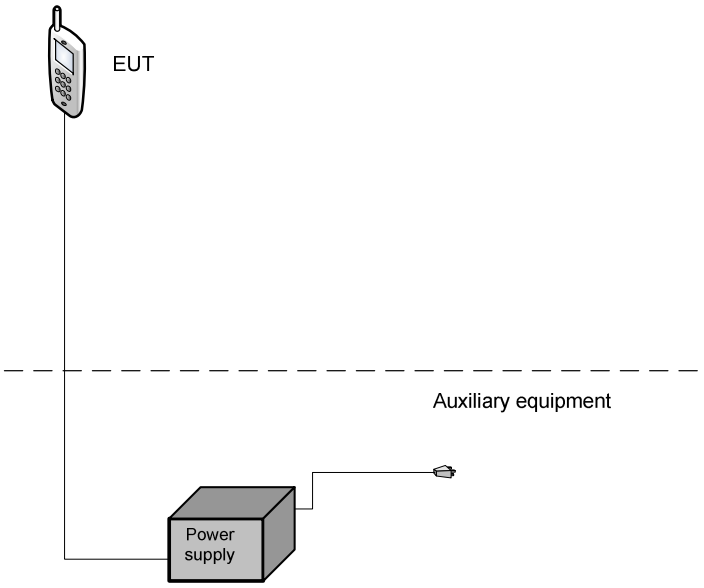
6.4 Operating frequencies

Source	Frequency, MHz			
Digital portion	0.032768	13	15.36	24.576
Processor	416	NA	NA	NA
BUS	104	NA	NA	NA
LCD Controller	6	NA	NA	NA
Receiver	2412 - 2462	2402 - 2480	NA	NA
Transmitter	2412 - 2462	2402 - 2480	NA	NA

6.5 Changes made in the EUT

The output power of WLAN module was software restricted not to exceed +20 dBm. A ferrite, p/n 2661665702, manufactured by Fair-Rite was installed at the power cable with one turn on it, 8 cm apart from the EUT connector.

6.6 Test configuration



6.7 Transmitter characteristics

6.7.1 Wireless LAN module characteristics (module Samsung 2350)

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

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

Assigned frequency range	2400 – 2483.5 MHz			
Operating frequency range	2412 - 2462 MHz			
RF channel spacing	5 MHz			
Maximum rated output power	At transmitter 50 Ω RF output connector			20.0 dBm
	Effective radiated power (for equipment with no RF connector)			22.1 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
Inverted-F PCB printed	Motorola	¼ lambda	+2.1 dBi

Transmitter 99% power bandwidth	1, 2, 5.5 and 11.5 MHz				
Transmitter aggregate data rate/s	1.0, 2.0, 5.5 and 11.0 Mbps				
Transmitter aggregate symbol (baud) rate/s	0.125, 0.25, 06785 and 1.375 Msymbols (MBaud) per second				
Type of modulation	DSSS:1M – DBPSK, 2M – DQPSK and CCK: 5.5M – DQPSK, 11M - QPSK				
Type of multiplexing	TDD				
Modulating test signal (baseband)	PRBS				
Maximum transmitter duty cycle in normal use	1M – 99.9% 2M – 99.8% 5.5M – 99.6 % 11M – 99.3%	**Tx ON time**	18.8 msec 9.5 msec 3.6 msec 1.9 msec	**Period**	18.8126 msec 9.5126 msec 3.6126 msec 1.9126 msec
Transmitter duty cycle supplied for test	100 %	**Tx ON time**	msec	**Period**	msec

Transmitter power source					
X	Battery	**Nominal rated voltage**	7.2 VDC	Battery type	Lithium
X	DC	**Nominal rated voltage**	12.0 – 15.0 VDC		

Common power source for transmitter and receiver	X	yes	no
Emission designator	11M5G1D		

6.7.2 Bluetooth module characteristics (module BCM 2035)

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

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

Assigned frequency range	2400 – 2483.5 MHz		
Operating frequency range	2402 - 2480 MHz		
RF channel spacing	1000 kHz		
Maximum rated output power	At transmitter 50 Ω RF output connector		0.2 dBm
	Effective radiated power (for equipment with no RF connector)		3.4 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
Inverted-F PCB printed	Motorola	¼ lambda	+3.2 dBi

Transmitter 99% power bandwidth	1000 kHz				
Transmitter aggregate data rate/s	1.0 Mbps				
Transmitter aggregate symbol (baud) rate/s	0.125 Msymbols (MBaud) per second				
Type of modulation	GFSK				
Type of multiplexing	TDD				
Modulating test signal (baseband)	PRBS				
Maximum transmitter duty cycle in normal use	35.8 %	**Tx ON time**	0.458 msec	**Period**	1.278 msec
Transmitter duty cycle supplied for test	100 %	**Tx ON time**	msec	**Period**	msec

Transmitter power source					
X	Battery	**Nominal rated voltage**	7.2 VDC	Battery type	Lithium
X	DC	**Nominal rated voltage**	12.0 – 15.0 VDC		

Common power source for transmitter and receiver	X	yes	no

Emission designator	1M00F1D

Spread spectrum parameters for transmitters tested per FCC 15.247 only		
FHSS	total number of hops	79
	dwell time	0.458 msec
	bandwidth per hop	1.0 MHz
	max. separation of hops	1.0 MHz

Test specification:	Section 15.247(a)2, 6 dB bandwidth		
Test procedure:	FR Vol.62, page 26243, Section 15.247(a)2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/13/2005 4:29:35 PM		
Temperature: 19 ºC	Air Pressure: 1017 hPa	Relative Humidity: 23 %	Power Supply: 12 VDC
Remarks:			

7 Transmitter tests according to §15.247 (DTS) requirements

7.1 Minimum 6 dB bandwidth

7.1.1 General

This test was performed to measure 6 dB bandwidth of the EUT carrier frequency. Specification test limits are given in Table 7.1.1.

Table 7.1.1 6 dB bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Minimum bandwidth, kHz
902.0 – 928.0	6.0	500.0
2400.0 – 2483.5		
5725.0 – 5850.0		

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

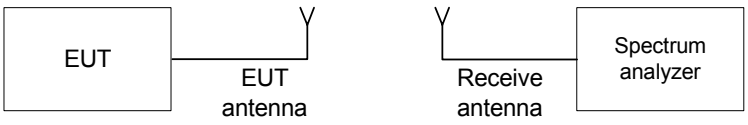
7.1.2 Test procedure

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 set to transmit modulated carrier.

7.1.2.3 The transmitter minimum 6 dB bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.1.2 and associated plot.

Figure 7.1.1 6 dB bandwidth test setup



Test specification:	Section 15.247(a)2, 6 dB bandwidth		
Test procedure:	FR Vol.62, page 26243, Section 15.247(a)2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/13/2005 4:29:35 PM		
Temperature: 19 ºC	Air Pressure: 1017 hPa	Relative Humidity: 23 %	Power Supply: 12 VDC
Remarks:			

Table 7.1.2 6 dB bandwidth test results

ASSIGNED FREQUENCY BAND: 2400 – 2483.5 MHz
DETECTOR USED: Peak
SWEEP MODE: Single
SWEEP TIME: Auto
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 300 kHz
MODULATION ENVELOPE REFERENCE POINTS: 6.0 dBc
MODULATION: DBPSK, DQPSK, DQPSK and QPSK
MODULATING SIGNAL: PRBS
BIT RATE: 1, 2, 5.5 and 11 Mbps

Carrier frequency, MHz	6 dB bandwidth, MHz	Limit, kHz	Margin, MHz	Verdict
Low frequency				
1 MBPS				
2412	12.57	> 500	12.07	Pass
2 MBPS				
2412	12.47	> 500	11.97	Pass
5.5 MBPS				
2412	12.07	> 500	11.57	Pass
11 MBPS				
2412	12.33	> 500	11.83	Pass
Mid frequency				
1 MBPS				
2440	12.13	> 500	11.63	Pass
2 MBPS				
2440	12.60	> 500	12.10	Pass
5.5 MBPS				
2440	12.07	> 500	11.57	Pass
11 MBPS				
2440	12.47	> 500	11.97	Pass
High frequency				
1 MBPS				
2462	12.60	> 500	12.10	Pass
2 MBPS				
2462	12.67	> 500	12.17	Pass
5.5 MBPS				
2462	12.07	> 500	11.57	Pass
11 MBPS				
2462	12.57	> 500	12.07	Pass

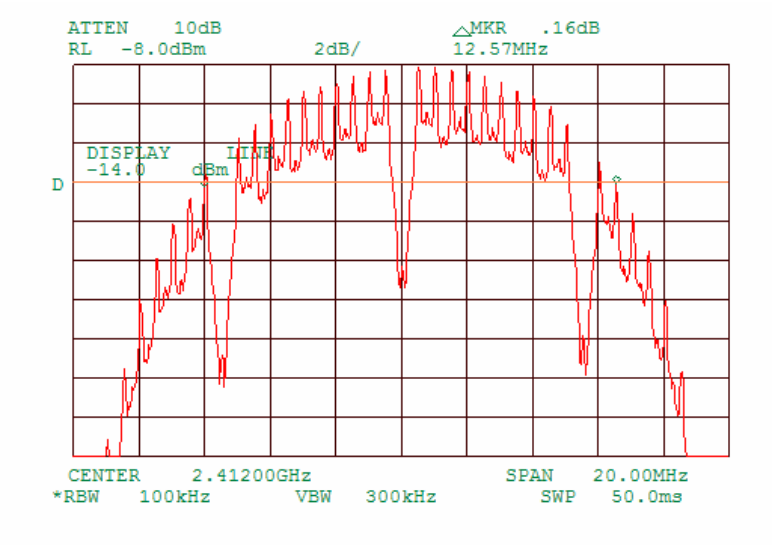
Reference numbers of test equipment used

HL 1424								

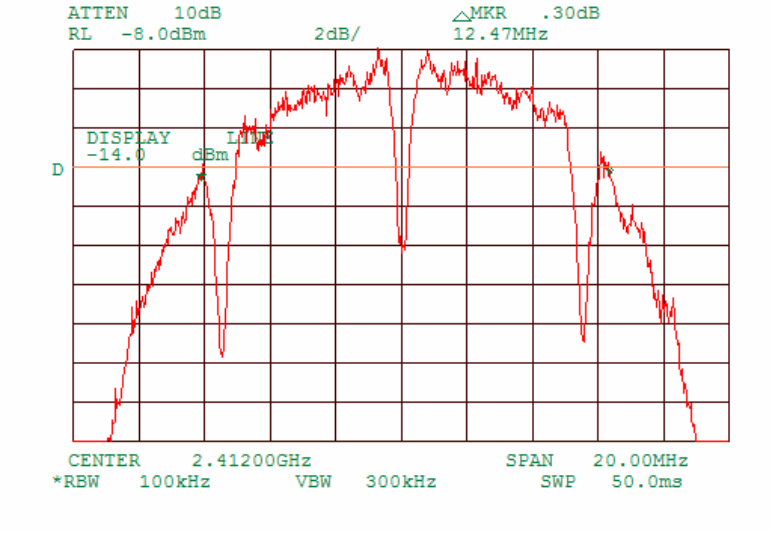
Full description is given in Appendix A.

Test specification:	Section 15.247(a)2, 6 dB bandwidth		
Test procedure:	FR Vol.62, page 26243, Section 15.247(a)2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/13/2005 4:29:35 PM		
Temperature: 19 ºC	Air Pressure: 1017 hPa	Relative Humidity: 23 %	Power Supply: 12 VDC
Remarks:			

Plot 7.1.1 6 dB bandwidth test result at low frequency, 1 MBPS

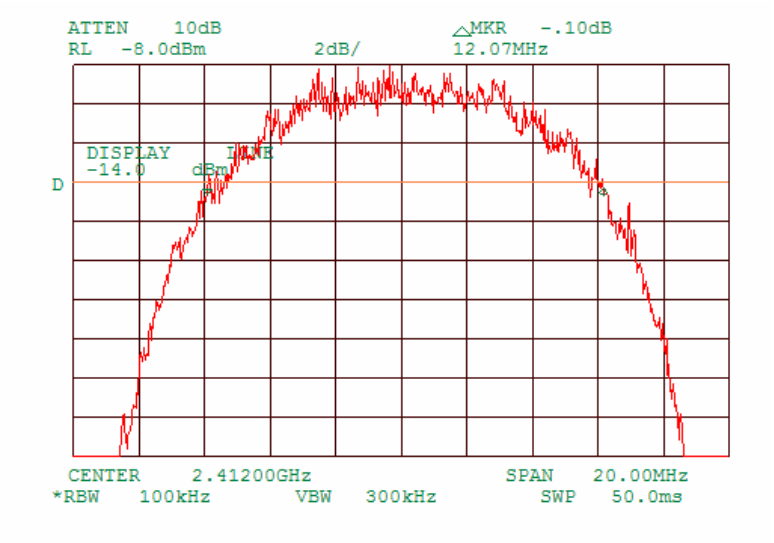


Plot 7.1.2 6 dB bandwidth test result at low frequency, 2 MBPS

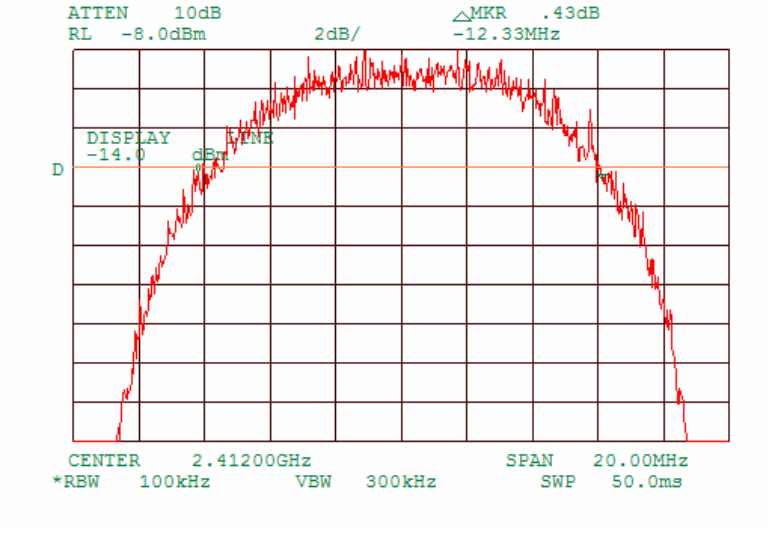


Test specification:	Section 15.247(a)2, 6 dB bandwidth		
Test procedure:	FR Vol.62, page 26243, Section 15.247(a)2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/13/2005 4:29:35 PM		
Temperature: 19 ºC	Air Pressure: 1017 hPa	Relative Humidity: 23 %	Power Supply: 12 VDC
Remarks:			

Plot 7.1.3 6 dB bandwidth test result at low frequency, 5.5 MBPS

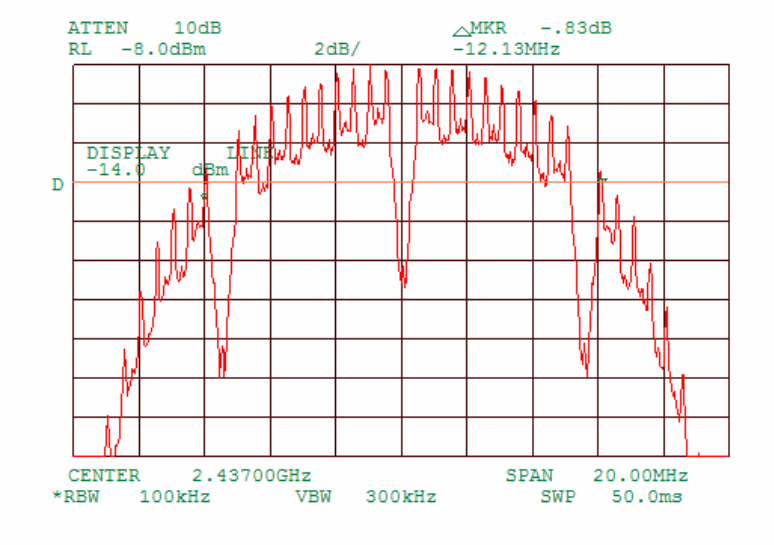


Plot 7.1.4 6 dB bandwidth test result at low frequency, 11 MBPS

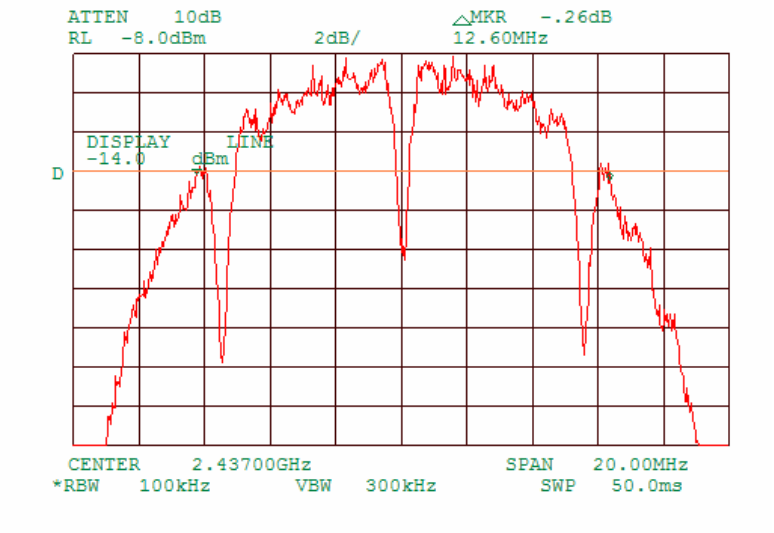


Test specification:	Section 15.247(a)2, 6 dB bandwidth		
Test procedure:	FR Vol.62, page 26243, Section 15.247(a)2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/13/2005 4:29:35 PM		
Temperature: 19 ºC	Air Pressure: 1017 hPa	Relative Humidity: 23 %	Power Supply: 12 VDC
Remarks:			

Plot 7.1.5 6 dB bandwidth test result at mid frequency, 1 MBPS

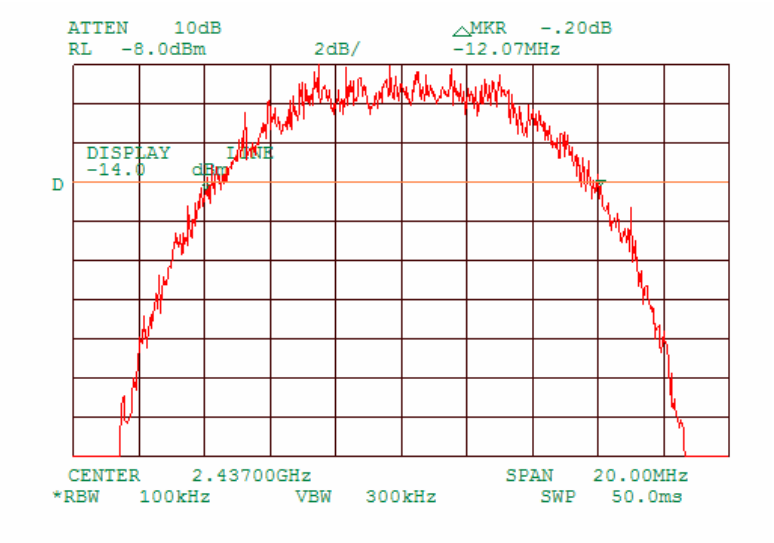


Plot 7.1.6 6 dB bandwidth test result at mid frequency, 2 MBPS

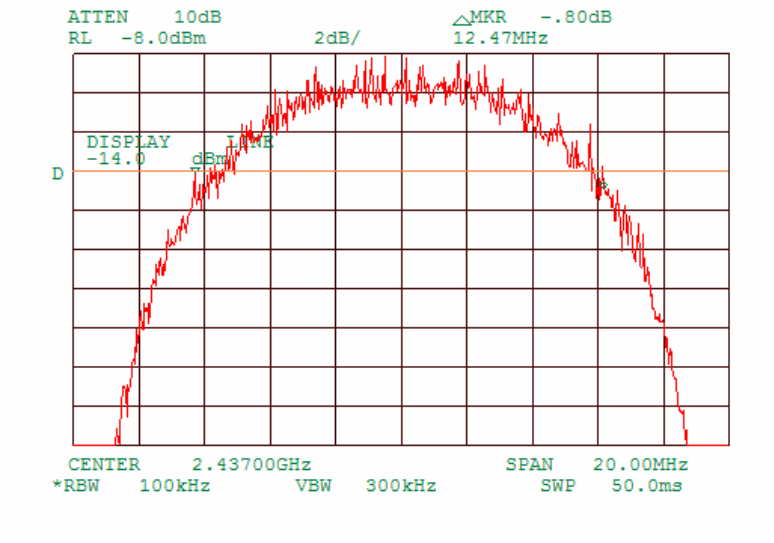


Test specification:	Section 15.247(a)2, 6 dB bandwidth		
Test procedure:	FR Vol.62, page 26243, Section 15.247(a)2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/13/2005 4:29:35 PM		
Temperature: 19 ºC	Air Pressure: 1017 hPa	Relative Humidity: 23 %	Power Supply: 12 VDC
Remarks:			

Plot 7.1.7 6 dB bandwidth test result at mid frequency, 5.5 MBPS

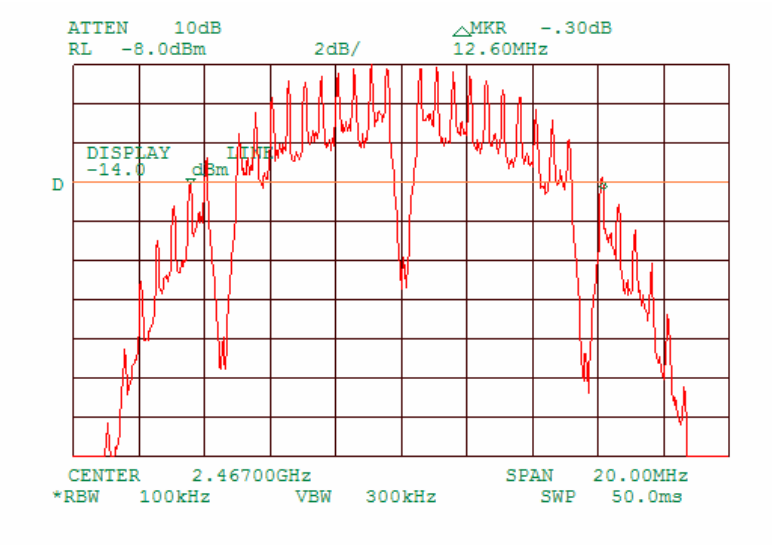


Plot 7.1.8 6 dB bandwidth test result at mid frequency, 11 MBPS

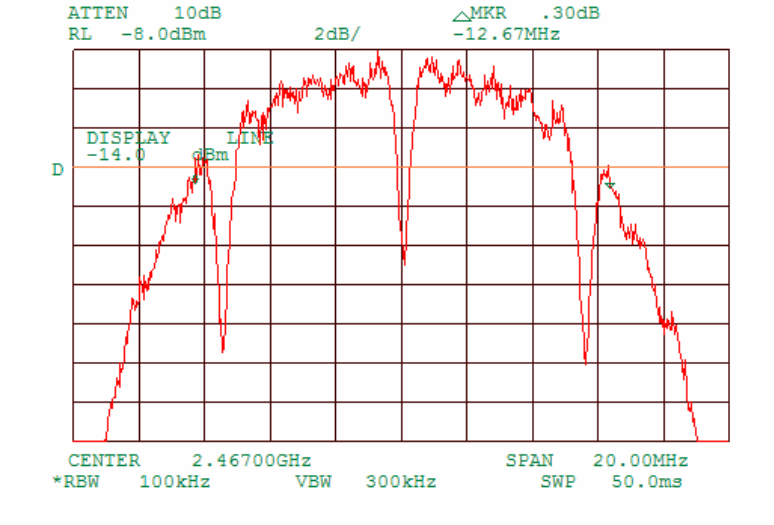


Test specification:	Section 15.247(a)2, 6 dB bandwidth		
Test procedure:	FR Vol.62, page 26243, Section 15.247(a)2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/13/2005 4:29:35 PM		
Temperature: 19 ºC	Air Pressure: 1017 hPa	Relative Humidity: 23 %	Power Supply: 12 VDC
Remarks:			

Plot 7.1.9 6 dB bandwidth test result at high frequency, 1 MBPS

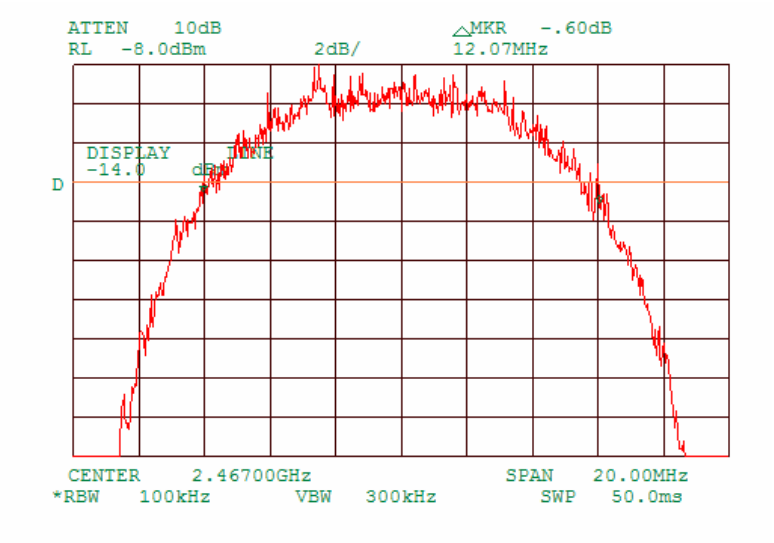


Plot 7.1.10 6 dB bandwidth test result at high frequency, 2 MBPS

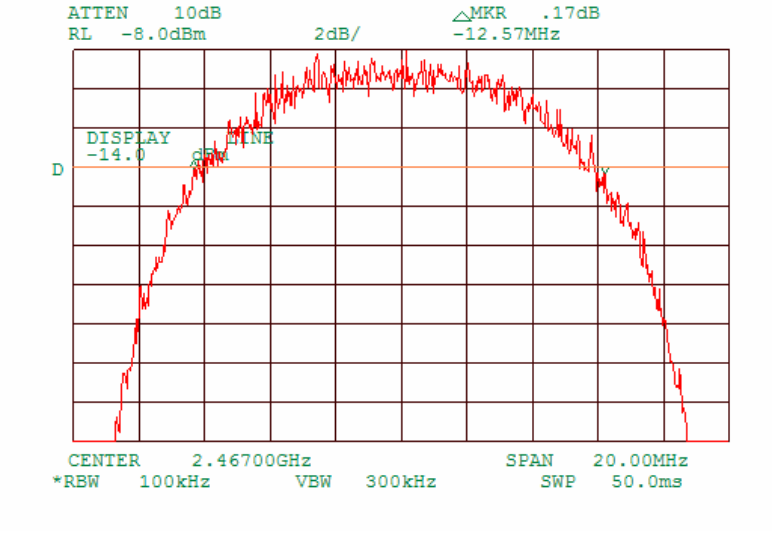


Test specification:	Section 15.247(a)2, 6 dB bandwidth		
Test procedure:	FR Vol.62, page 26243, Section 15.247(a)2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/13/2005 4:29:35 PM		
Temperature: 19 ºC	Air Pressure: 1017 hPa	Relative Humidity: 23 %	Power Supply: 12 VDC
Remarks:			

Plot 7.1.11 6 dB bandwidth test result at high frequency, 5.5 MBPS



Plot 7.1.12 6 dB bandwidth test result at high frequency, 11 MBPS



Test specification:	Section 15.247(b)3, Peak output power		
Test procedure:	FR Vol.62, page 26243, Section 15.247(b)		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 5:56:48 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 12 VDC
Remarks:			

7.2 Peak output power

7.2.1 General

This test was performed to measure the maximum peak output power radiated by transmitter. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Peak output power limits

Assigned frequency range, MHz	Maximum antenna gain, dBi	Peak output power*		Equivalent field strength limit @ 3m, dB(μV/m)**
		W	dBm	
902.0 – 928.0	6.0	1.0	30.0	131.2
2400.0 – 2483.5				
5725.0 – 5850.0				

*- The limit is provided in terms of conducted RF power at the antenna connector. If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power limit shall be reduced below the stated value as follows:

by 1 dB for every 3 dB that the directional gain of antenna exceeds 6 dBi for fixed point-to-point transmitters operate in 2400-2483.5 MHz band;
without any corresponding reduction for fixed point-to-point transmitters operate in 5725-5850 MHz band;
by the amount in dB that the directional gain of antenna exceeds 6 dBi for the rest of transmitters.

**- Equivalent field strength limit was calculated from the peak output power as follows: E=sqrt(30×P×G)/r, where P is peak output power in Watts, r is antenna to EUT distance in meters and G is transmitter antenna gain in dBi.

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 adjusted to produce maximum available to end user RF output power.

7.2.2.3 The resolution bandwidth of spectrum analyzer was set wider than 6 dB bandwidth of the EUT and 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 and the measuring antenna height was swept in both vertical and horizontal polarizations.

7.2.2.4 The maximum field strength of the EUT carrier frequency was measured as provided in Table 7.2.2 and associated plots.

7.2.2.5 The maximum peak output power was calculated from the field strength of carrier as follows:

$$P = (E \times d)^2 / (30 \times G),$$

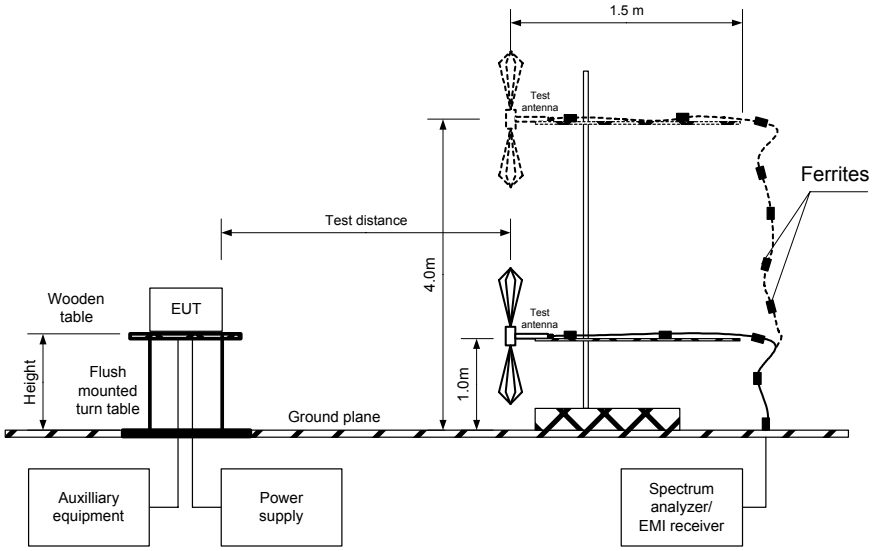
where P is the peak output power in W, E is the field strength in V/m, d is the test distance and G is the transmitter numeric antenna gain over an isotropic radiator.
The above equation was converted in logarithmic units for 3 m test distance:

Peak output power in dBm = Field strength in dB(μV/m) - Transmitter antenna gain in dBi – 95.2 dB

7.2.2.6 The worst test results (the lowest margins) were recorded in Table 7.2.2.

Test specification:	**Section 15.247(b)3, Peak output power**		
Test procedure:	FR Vol.62, page 26243, Section 15.247(b)		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/9/2005 5:56:48 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 45 %	**Power Supply:** 12 VDC
Remarks:			

Figure 7.2.1 Setup for carrier field strength measurements



Test specification:	**Section 15.247(b)3, Peak output power**		
Test procedure:	FR Vol.62, page 26243, Section 15.247(b)		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/9/2005 5:56:48 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 45 %	**Power Supply:** 12 VDC
Remarks:			

Table 7.2.2 Peak output power test results

ASSIGNED FREQUENCY: 2400 – 2483.5 MHz
TEST DISTANCE: 3 m
TEST SITE: OATS
EUT HEIGHT: 0.8 m
DETECTOR USED: Peak
TEST ANTENNA TYPE: Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)
MODULATION: DBPSK, QPSK
MODULATING SIGNAL: PRBS
BIT RATE: 1, 11 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
DETECTOR USED: Peak
EUT 6 dB BANDWIDTH: 12 MHz
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 3000 kHz

Frequency, MHz	Field strength, dB(µV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	EUT antenna gain, dBi	Peak output power, dBm**	Limit, dBm	Margin, dB***	Verdict
1 MBPs									
2412	115.8	H	1.3	236	2.1	18.47	30	-11.53	Pass
2440	116.3	H	1.4	250	2.1	18.97	30	-11.03	Pass
2462	117.3	H	1.2	270	2.1	19.97	30	-10.03	Pass
11 MBPs									
2412	115.8	H	1.3	236	2.1	18.47	30	-11.53	Pass
2440	117.2	H	1.4	250	2.1	19.87	30	-10.13	Pass
2462	116.6	H	1.2	270	2.1	19.27	30	-10.73	Pass

*- EUT front panel refer to 0 degrees position of turntable.
**- Peak output power was calculated from the field strength of carrier as follows: $P = (E \times d)^2 / (30 \times G)$,
where P is the peak output power in W, E is the field strength in V/m, d is the test distance in meters and G is the transmitter numeric antenna gain over an isotropic radiator. The above equation was converted in logarithmic units for 3 m test distance: *Peak output power in dBm = Field strength in dB(µV/m) - Transmitter antenna gain in dBi – 95.2 dB*
***- Margin = Peak output power – specification limit.

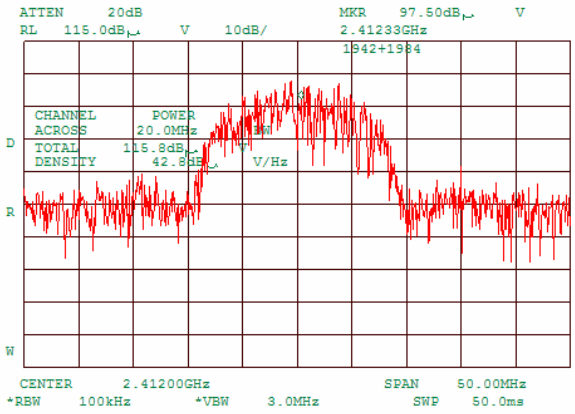
Reference numbers of test equipment used

HL 1424	HL 1942	HL 1984					

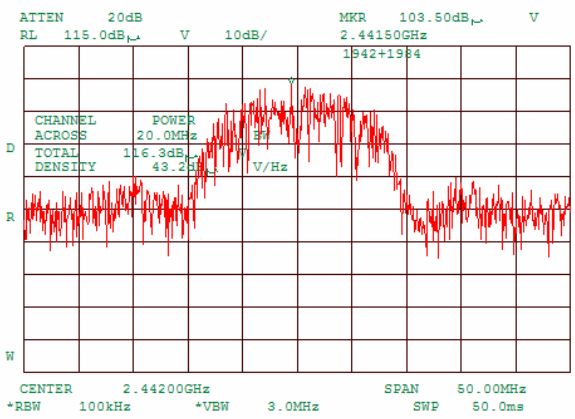
Full description is given in Appendix A.

Test specification:	Section 15.247(b)3, Peak output power		
Test procedure:	FR Vol.62, page 26243, Section 15.247(b)		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 5:56:48 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 12 VDC
Remarks:			

Plot 7.2.1 Field strength of carrier at low frequency, 1 MBPs

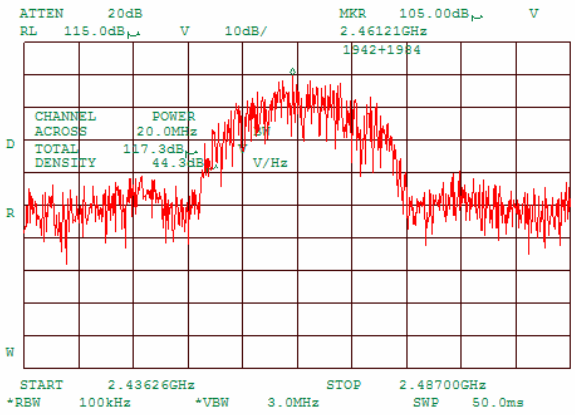


Plot 7.2.2 Field strength of carrier at mid frequency, 1 MBPs



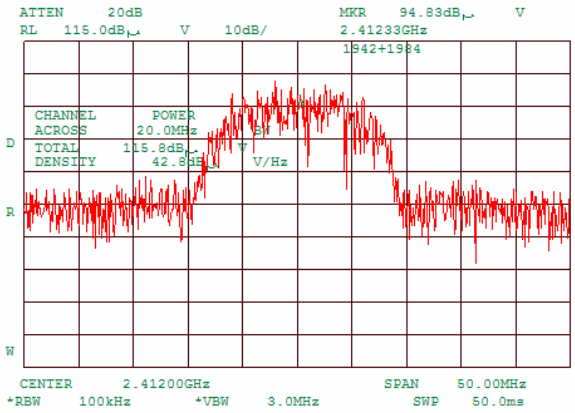
Plot 7.2.3 Field strength of carrier at high frequency, 1 MBPs

Test specification:	**Section 15.247(b)3, Peak output power**		
Test procedure:	FR Vol.62, page 26243, Section 15.247(b)		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/9/2005 5:56:48 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 45 %	**Power Supply:** 12 VDC
Remarks:			

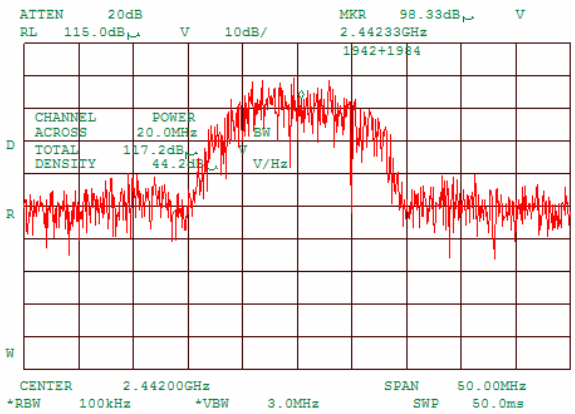


Test specification:	Section 15.247(b)3, Peak output power		
Test procedure:	FR Vol.62, page 26243, Section 15.247(b)		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 5:56:48 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 12 VDC
Remarks:			

Plot 7.2.4 Field strength of carrier at low frequency, 11 MBPs

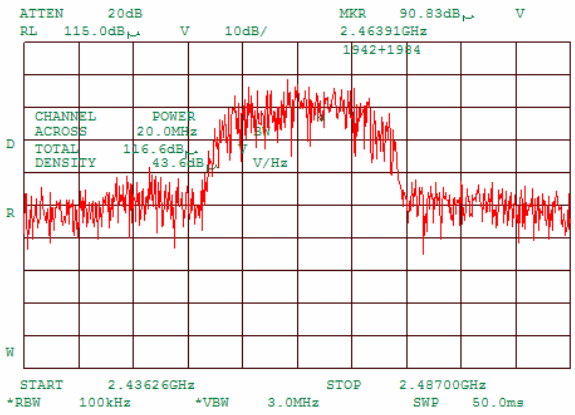


Plot 7.2.5 Field strength of carrier at mid frequency, 11 MBPs



Plot 7.2.6 Field strength of carrier at high frequency, 11 MBPs

Test specification:	**Section 15.247(b)3, Peak output power**		
Test procedure:	FR Vol.62, page 26243, Section 15.247(b)		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/9/2005 5:56:48 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 45 %	**Power Supply:** 12 VDC
Remarks:			



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

7.3 Field strength of spurious emissions

7.3.1 General

This test was performed to measure field strength of spurious emissions from the EUT. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m within restricted bands, dB(μV/m)***			Attenuation of field strength of spurious versus carrier outside restricted bands, dBc***
	Peak	Quasi Peak	Average	
0.009 – 0.490*	NA	128.5 – 93.8**	NA	20.0
0.490 – 1.705*		73.8 – 63.0**		
1.705 – 30.0*		69.5**		
30 – 88		40.0		
88 – 216		43.5		
216 – 960		46.0		
960 - 1000		54.0		
Above 1000	74.0	NA	54.0	

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

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

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

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

*** - The field strength limits applied from the lowest radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency.

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

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

7.3.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna was rotated around its vertical axis.

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

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

7.3.3.1 The EUT was set up as shown in Figure 7.3.2, energized and the performance check was conducted.

7.3.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

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

Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

Figure 7.3.1 Setup for spurious emission field strength measurements below 30 MHz

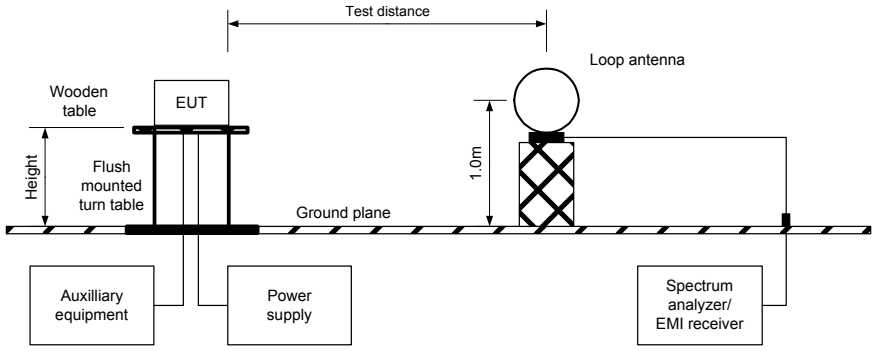
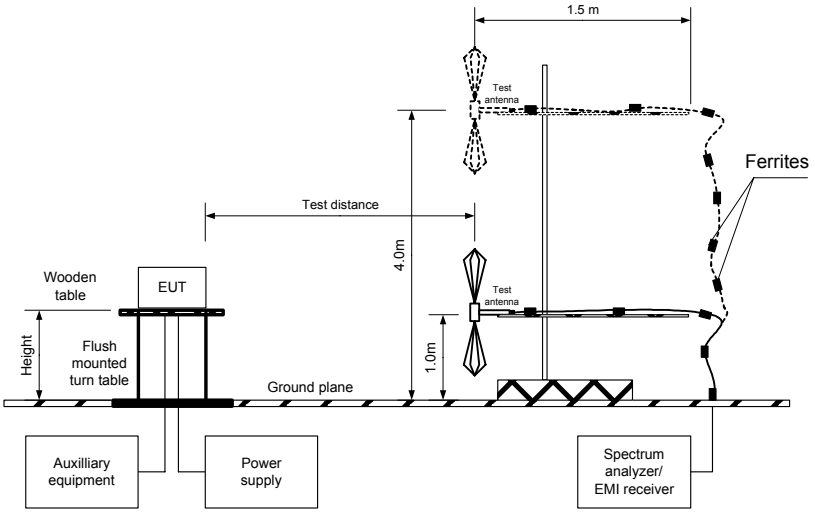


Figure 7.3.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

Table 7.3.2 Field strength of emissions outside restricted bands

ASSIGNED FREQUENCY: 2400 – 2483.5 MHz
INVESTIGATED FREQUENCY RANGE: 0.009 - 25000 MHz
TEST DISTANCE: 3 m
MODULATION: BT: CW, WLAN:DBPSK
MODULATING SIGNAL: PRBS
BIT RATE: 1 Mbps for both transmitters
DUTY CYCLE: 100 %
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 300 kHz
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)
FREQUENCY HOPPING: Disabled

Frequency, MHz	Field strength of spurious, dB(µV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	Field strength of carrier, dB(µV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB**	Verdict
Low carrier frequency									
7206	41.83	V	1.0	220	95.50	53.67	20.0	33.67	Pass
7236	46.00	V	1.1	367		49.50		29.50	
9608	40.77	V	1.2	332		54.73		34.73	
9648	45.47	V	1.1	254		50.03		30.03	
Mid carrier frequency									
9760	41.70	V	1.4	330	90.17	48.47	20.0	28.47	Pass
9748	46.40	V	1.1	235		43.77		23.77	
High carrier frequency									
9868	43.00	V	1.2	215	93.17	50.17	20.0	30.17	Pass

*- EUT front panel refers to 0 degrees position of turntable.
**- Margin = Attenuation below carrier – specification limit.

Test specification:	**Section 15.247(c), Radiated spurious emissions**		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks:			

Table 7.3.3 Field strength of spurious emissions above 1 GHz within restricted bands

ASSIGNED FREQUENCY:	2400 – 2483.5 MHz
INVESTIGATED FREQUENCY RANGE:	1000 – 25000 MHz
TEST DISTANCE:	3 m
MODULATION:	BT: CW, WLAN:DBPSK
MODULATING SIGNAL:	PRBS
BIT RATE:	1 Mbps
DUTY CYCLE:	100 %
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	1000 kHz
TEST ANTENNA TYPE:	Double ridged guide
FREQUENCY HOPPING:	Disabled

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength(VBW=3 MHz)			Average field strength(VBW=10 Hz)				Verdict
	Polarization	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB***	
Low carrier frequency											
4804	V	1.2	335	45.67	74	-28.33	40.83	40.83	54	-13.17	Pass
4824	H	1.1	342	50.17	74	-23.83	48.00	48.00	54	-6.00	
4859	V	1	180	50.50	74	-23.50	47.33	47.33	54	-6.67	
19067	H	1	213	52.17	74	-21.83	42.33	42.33	54	-11.67	
Mid carrier frequency											
4880	V	1.1	176	47.17	74	-26.83	42.83	42.83	54	-11.17	Pass
4874	V	1.4	140	48.00	74	-26.00	44.83	44.83	54	-9.17	
4859	V	1	270	46.83	74	-27.17	41.17	41.17	54	-12.83	
7320	V	1.4	378	51.00	74	-23.00	40.17	40.17	54	-13.83	
7311	V	1.3	221	54.00	74	-20.00	47.17	47.17	54	-6.83	
19067	H	1	213	52.17	74	-21.83	42.33	42.33	54	-11.67	
High carrier frequency											
4960	V	1	210	45.33	74	-28.67	42.00	42.00	54	-12.00	Pass
4934	V	1.7	205	48.67	74	-25.33	46.00	46.00	54	-8.00	
7440	V	1.1	310	48.83	74	-25.17	42.33	42.33	54	-11.67	
7401	V	1.4	220	51.33	74	-22.67	43.67	43.67	54	-10.33	
19067	H	1	213	52.17	74	-21.83	42.33	42.33	54	-11.67	

*- EUT front panel refers to 0 degrees position of turntable.
**- Margin = Measured field strength - specification limit.
***- Margin = Calculated field strength - specification limit,
where Calculated field strength = Measured field strength + average factor.

Table 7.3.4 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
Duty cycle 100%					0

*- Average factor was calculated as follows

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

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

Test specification:	**Section 15.247(c), Radiated spurious emissions**		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks:			

Table 7.3.5 Field strength of spurious emissions below 1 GHz within restricted bands

ASSIGNED FREQUENCY: 2400 – 2483.5 MHz
INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
TEST DISTANCE: 3 m
MODULATION: BT: CW, WLAN:DBPSK
MODULATING SIGNAL: PRBS
BIT RATE: 1 Mbps
DUTY CYCLE: 100 %
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
RESOLUTION BANDWIDTH: 0.2 kHz (9 kHz – 150 kHz)
9.0 kHz (150 kHz – 30 MHz)
120 kHz (30 MHz – 1000 MHz)
VIDEO BANDWIDTH: > Resolution bandwidth
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
Biconilog (30 MHz – 1000 MHz)
FREQUENCY HOPPING: Disabled

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*				
Low carrier frequency								
126.75750	31.83	26.87	43.50	-16.63	Vertical	1.0	318	Pass
165.74400	35.36	30.31	43.50	-13.19	Vertical	2.1	116	
172.24625	34.43	29.39	43.50	-14.11	Vertical	1.9	114	
Mid carrier frequency								
126.74750	31.53	26.58	43.50	-16.92	Vertical	1.0	4	Pass
133.25500	36.02	31.06	43.50	-12.44	Vertical	1.0	348	
165.75250	35.70	30.43	43.50	-13.07	Horizontal	1.6	360	
172.23545	34.24	29.16	43.50	-14.34	Vertical	2.2	115	
328.24500	34.93	29.24	46.00	-16.76	Horizontal	1.0	204	
High carrier frequency								
133.21750	31.17	26.47	43.50	-17.03	Vertical	2.0	360	Pass
172.25142	34.70	29.56	43.50	-13.94	Vertical	1.9	125	
282.74875	32.43	26.93	46.00	-19.07	Vertical	1.3	219	
328.25820	34.90	29.47	46.00	-16.53	Horizontal	1.0	209	

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

Reference numbers of test equipment used

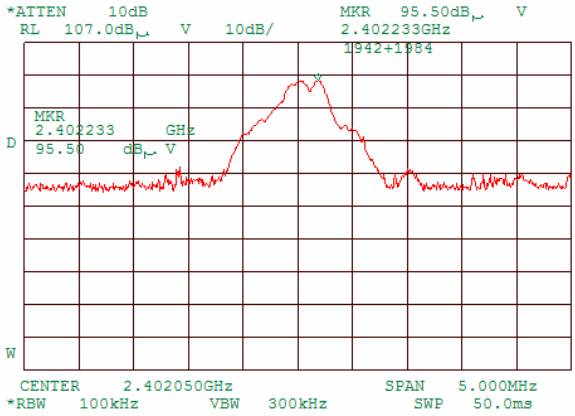
HL 0446	HL 0465	HL 0521	HL 0589	HL 0604	HL 0768	HL 0769	HL 1200
HL 1424	HL 1941	HL 1942	HL 1984	HL 2009	HL 2259	HL 2260	HL 2261
HL 2387	HL 2399						

Full description is given in Appendix A.

Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

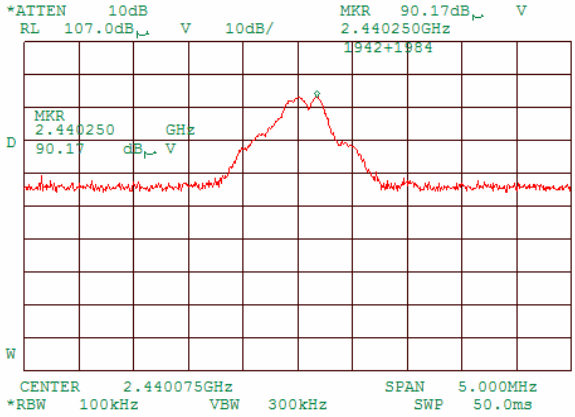
Plot 7.3.1 Radiated emission measurements at the low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
TRANSMITTER: Bluetooth
BIT RATE: 1 MBPs



Plot 7.3.2 Radiated emission measurements at the mid carrier frequency

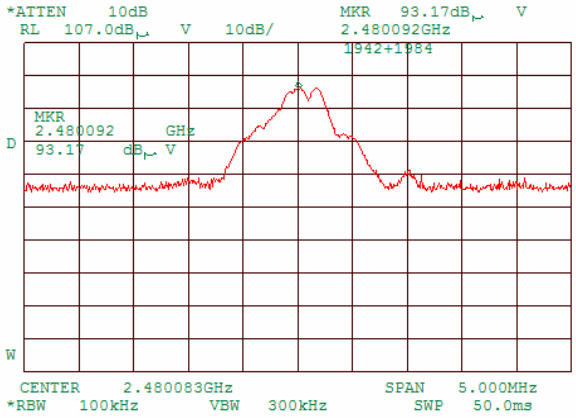
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
TRANSMITTER: Bluetooth
BIT RATE: 1 MBPs



Test specification:	**Section 15.247(c), Radiated spurious emissions**		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks:			

Plot 7.3.3 Radiated emission measurements at the high carrier frequency

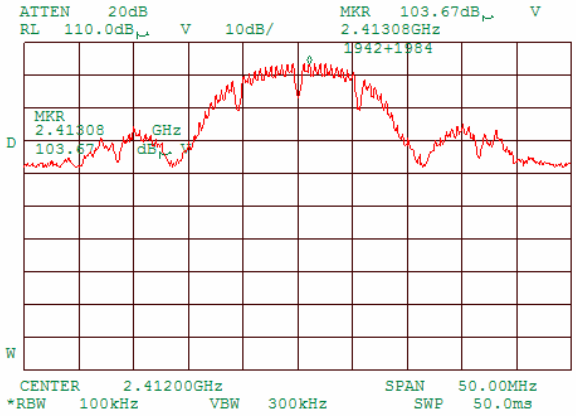
TEST SITE:	OATS
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical
TRANSMITTER:	Bluetooth
BIT RATE:	1 MBPs



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

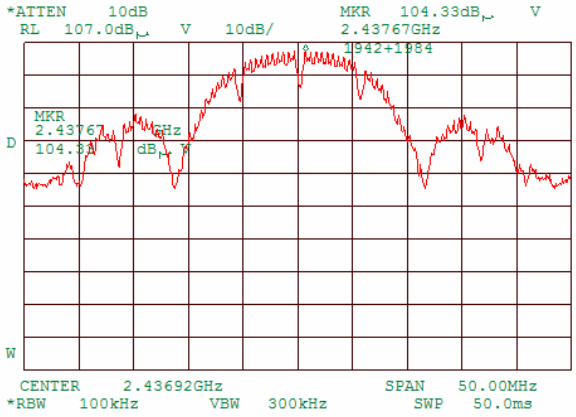
Plot 7.3.4 Radiated emission measurements at the low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
TRANSMITTER: WLAN
BIT RATE: 1 MBPs



Plot 7.3.5 Radiated emission measurements at the mid carrier frequency

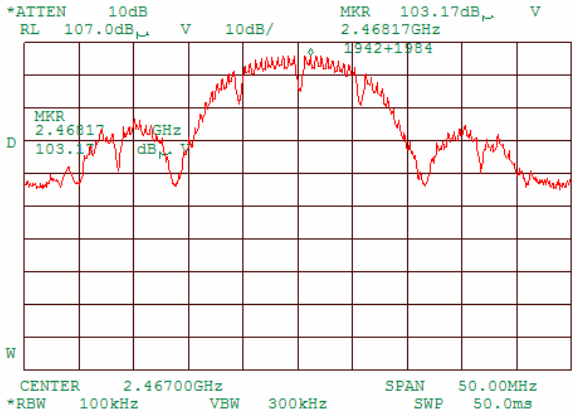
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
TRANSMITTER: WLAN
BIT RATE: 1 MBPs



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

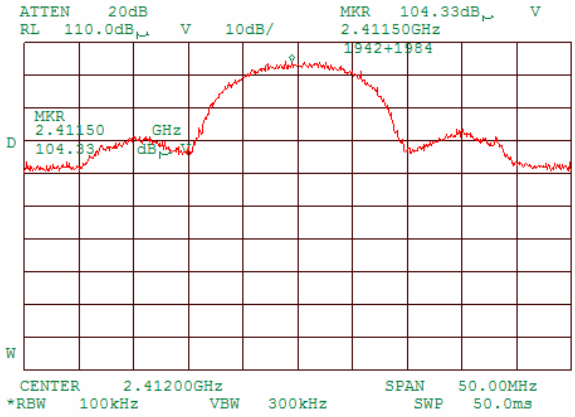
Plot 7.3.6 Radiated emission measurements at the high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
TRANSMITTER: WLAN
BIT ATE: 1 MBPs



Plot 7.3.7 Radiated emission measurements at the low carrier frequency

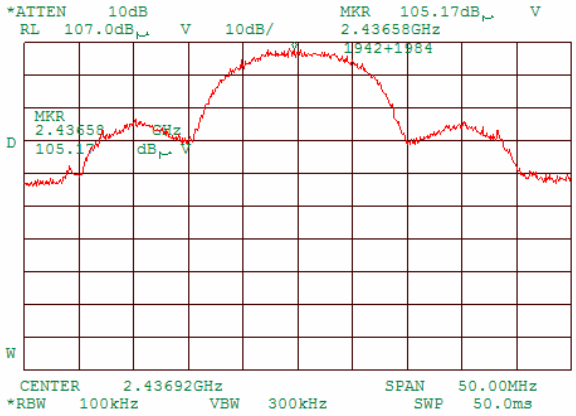
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
TRANSMITTER: WLAN
BIT RATE: 11 MBPs



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

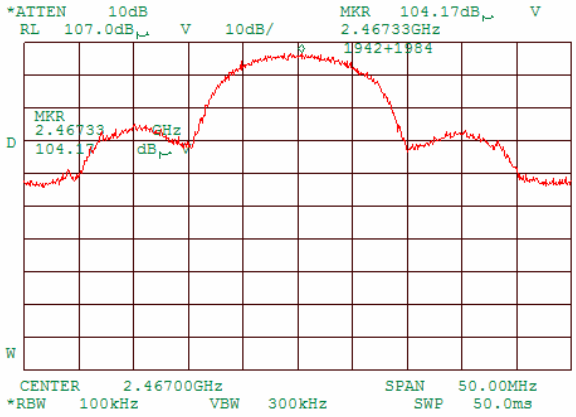
Plot 7.3.8 Radiated emission measurements at the mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
TRANSMITTER: WLAN
BIT RATE: 11 MBPs



Plot 7.3.9 Radiated emission measurements at the high carrier frequency

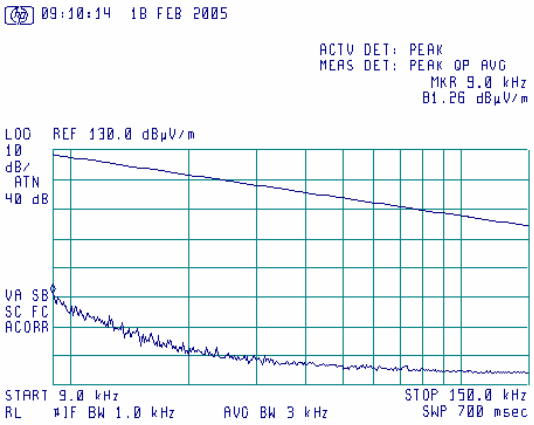
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
TRANSMITTER: WLAN
BIT RATE: 11 MBPs



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

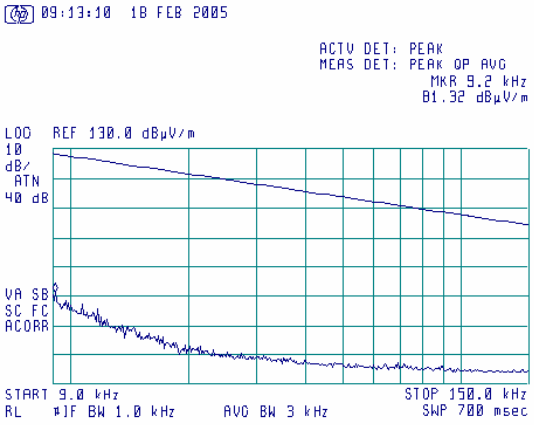
Plot 7.3.10 Radiated emission measurements from 9 to 150 kHz at the low carrier frequency

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



Plot 7.3.11 Radiated emission measurements from 9 to 150 kHz at the mid carrier frequency

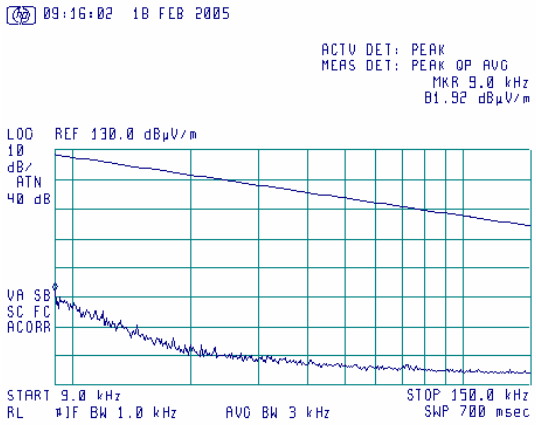
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	**Section 15.247(c), Radiated spurious emissions**		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks:			

Plot 7.3.12 Radiated emission measurements from 9 to 150 kHz at the high carrier frequency

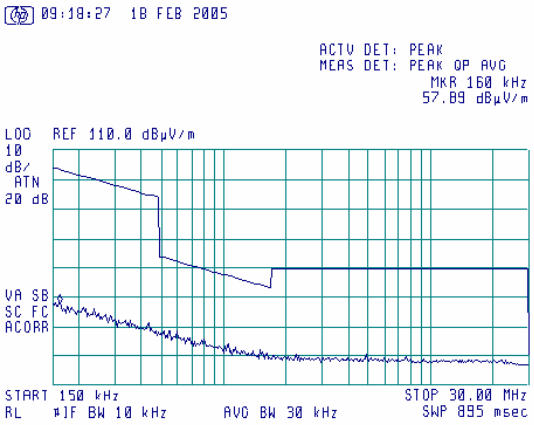
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

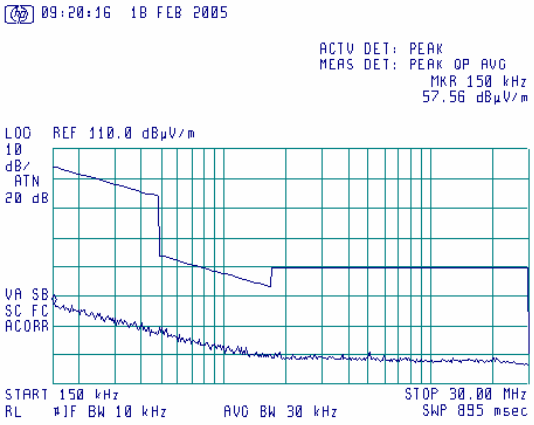
Plot 7.3.13 Radiated emission measurements from 0.15 to 30 MHz at the low carrier frequency

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



Plot 7.3.14 Radiated emission measurements from 0.15 to 30 MHz at the mid carrier frequency

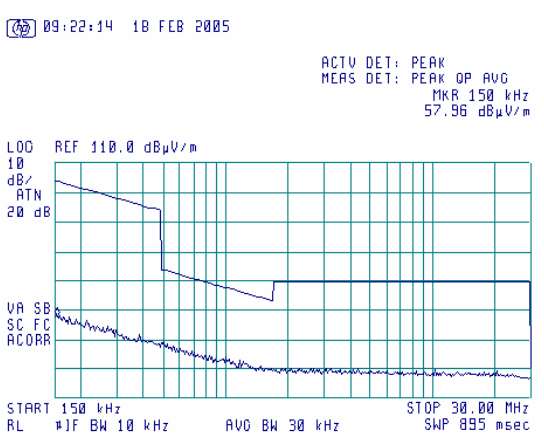
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

Plot 7.3.15 Radiated emission measurements from 0.15 to 30 MHz at the high carrier frequency

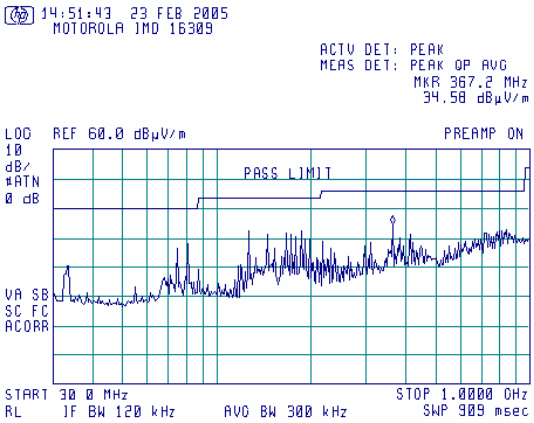
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

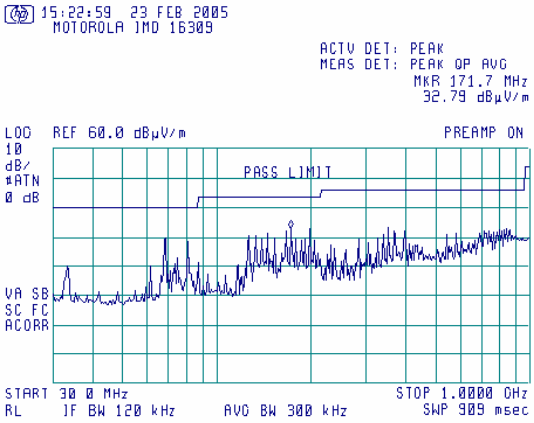
Plot 7.3.16 Radiated emission measurements from 30 to 1000 MHz at the low carrier frequency

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



Plot 7.3.17 Radiated emission measurements from 30 to 1000 MHz at the mid carrier frequency

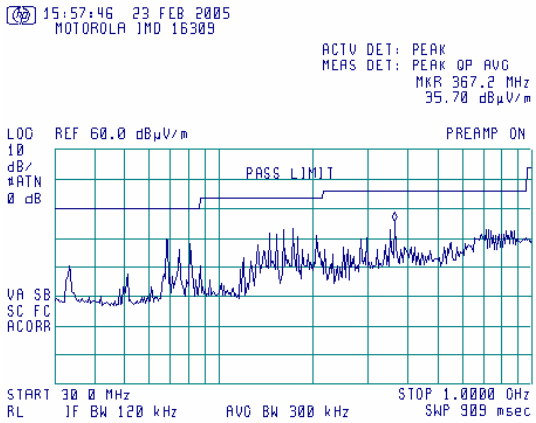
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

Plot 7.3.18 Radiated emission measurements from 30 to 1000 MHz at the high carrier frequency

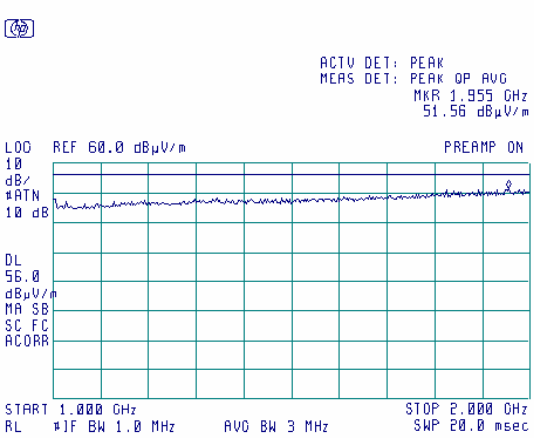
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

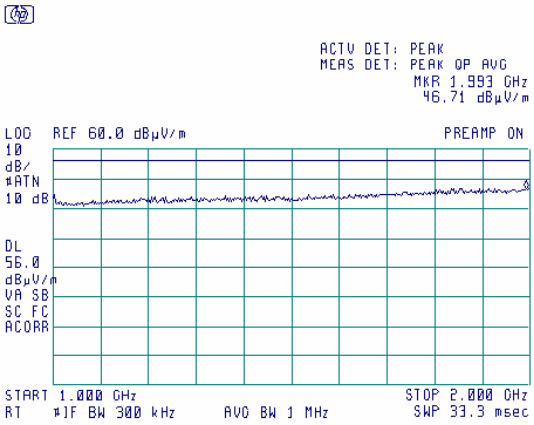
Plot 7.3.19 Radiated emission measurements from 1000 to 2000 MHz at the low carrier frequency

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



Plot 7.3.20 Radiated emission measurements from 1000 to 2000 MHz at the low carrier frequency

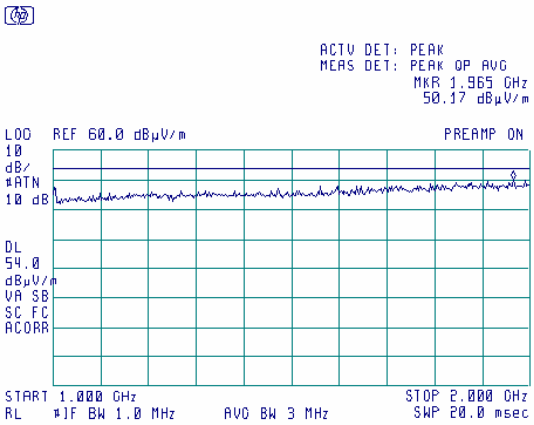
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

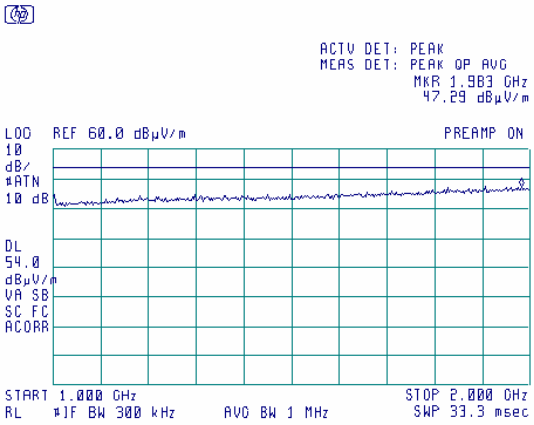
Plot 7.3.21 Radiated emission measurements from 1000 to 2000 MHz at the mid carrier frequency

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



Plot 7.3.22 Radiated emission measurements from 1000 to 2000 MHz at the mid carrier frequency

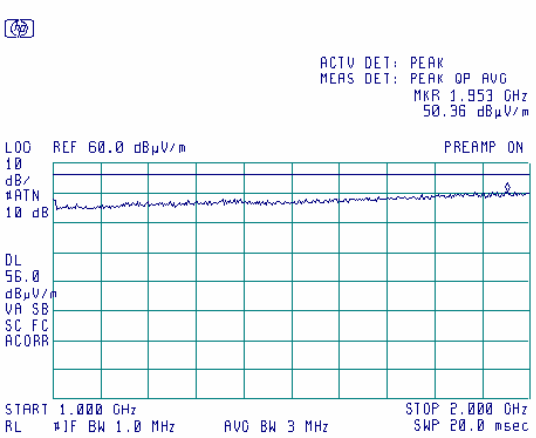
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

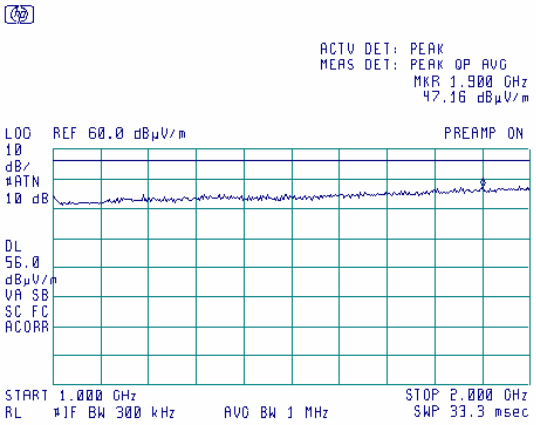
Plot 7.3.23 Radiated emission measurements from 1000 to 2000 MHz at the high carrier frequency

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



Plot 7.3.24 Radiated emission measurements from 1000 to 2000 MHz at the high carrier frequency

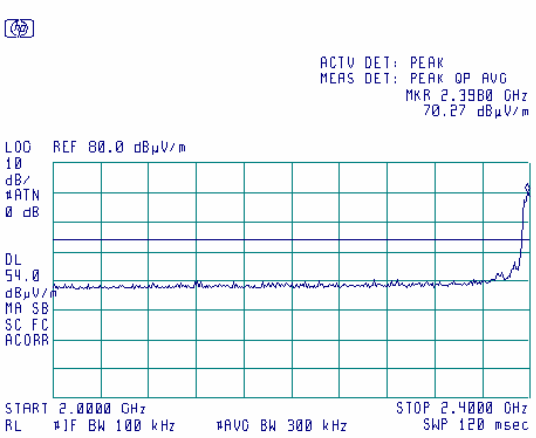
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

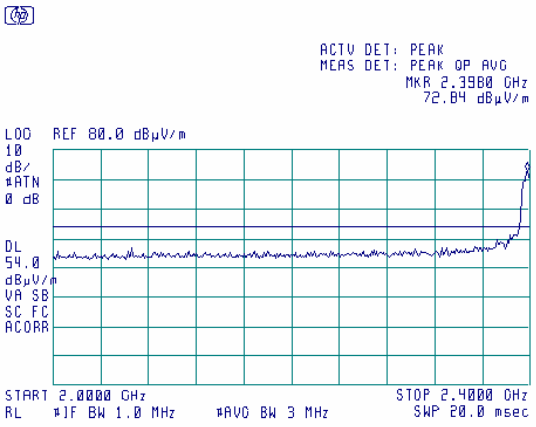
Plot 7.3.25 Radiated emission measurements from 2000 to 2400 MHz at the low carrier frequency

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



Plot 7.3.26 Radiated emission measurements from 2000 to 2400 MHz at the low carrier frequency

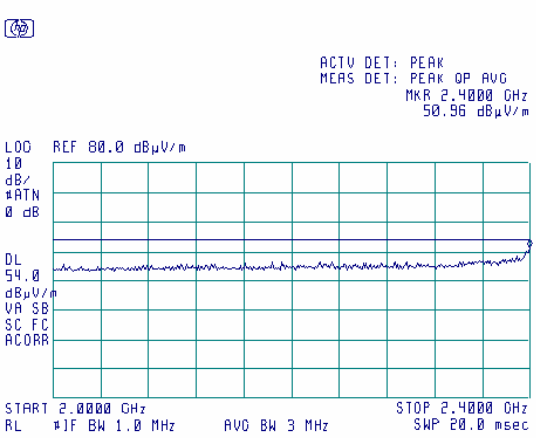
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

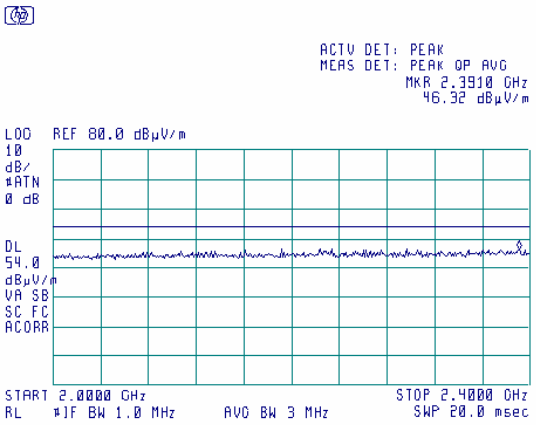
Plot 7.3.27 Radiated emission measurements from 2000 to 2400 MHz at the mid carrier frequency

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



Plot 7.3.28 Radiated emission measurements from 2000 to 2400 MHz at the high carrier frequency

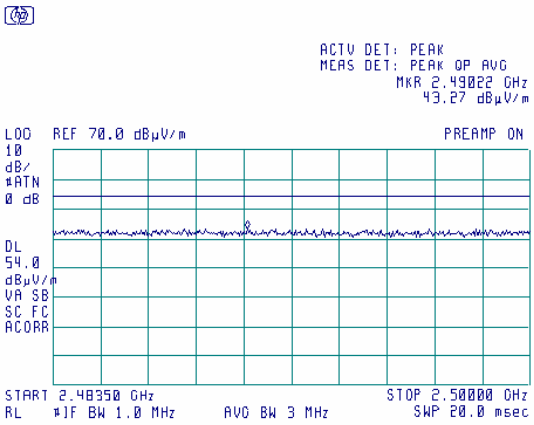
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

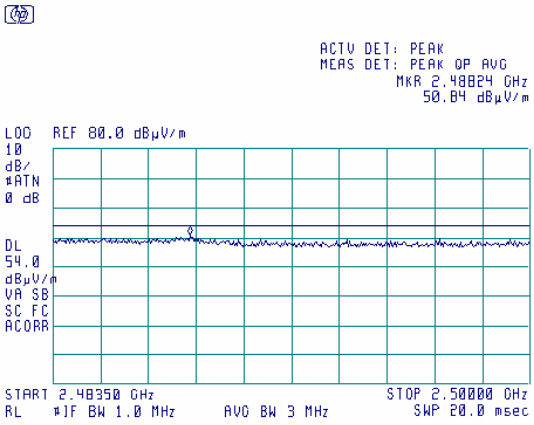
Plot 7.3.29 Radiated emission measurements from 2483.5 to 2500 MHz at the low carrier frequency

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



Plot 7.3.30 Radiated emission measurements from 2483.5 to 2500 MHz at the mid carrier frequency

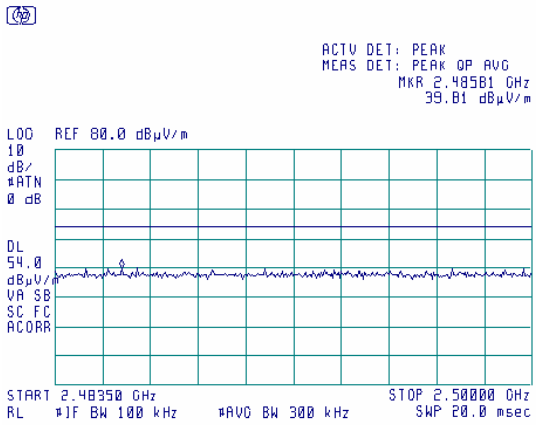
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

Plot 7.3.31 Radiated emission measurements from 2483.5 to 2500 MHz at the mid carrier frequency

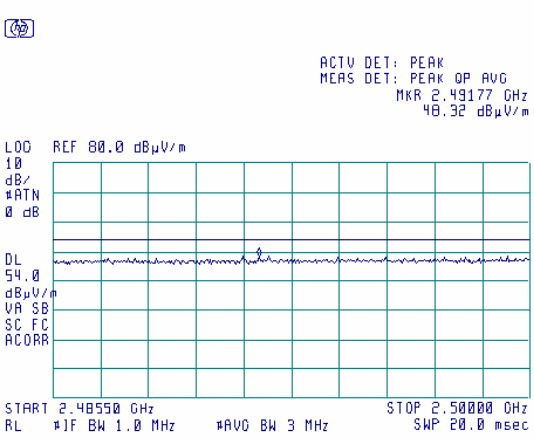
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

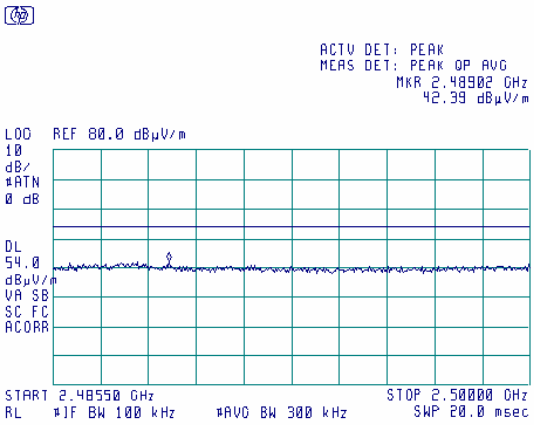
Plot 7.3.32 Radiated emission measurements from 2485.5* to 2500 MHz at the high carrier frequency

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



Plot 7.3.33 Radiated emission measurements from 2485.5* to 2500 MHz at the high carrier frequency

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

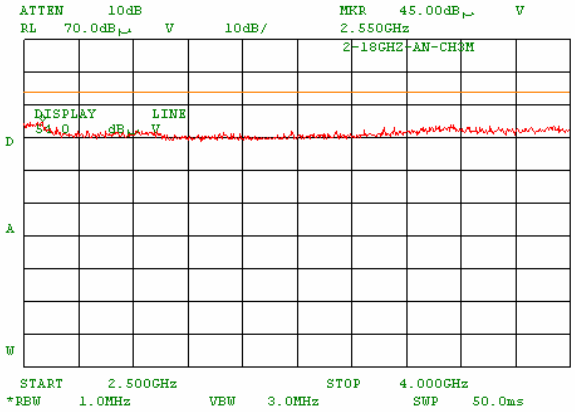


* - 2483.5 to 2485.5 MHz band was investigated in band edge emission as provided in plot 7.3.89 to plot 7.3.98.

Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

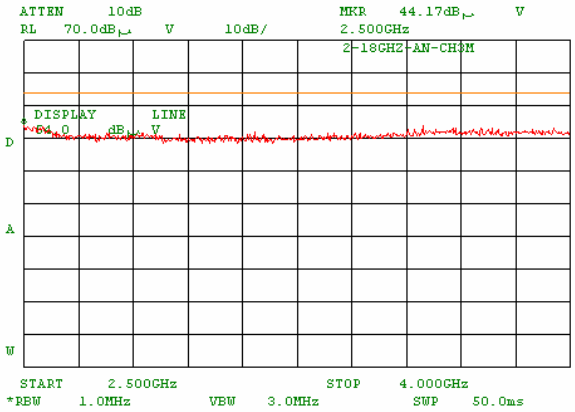
Plot 7.3.34 Radiated emission measurements from 2500 to 4000 MHz at the low carrier frequency

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



Plot 7.3.35 Radiated emission measurements from 2500 to 4000 MHz at the mid carrier frequency

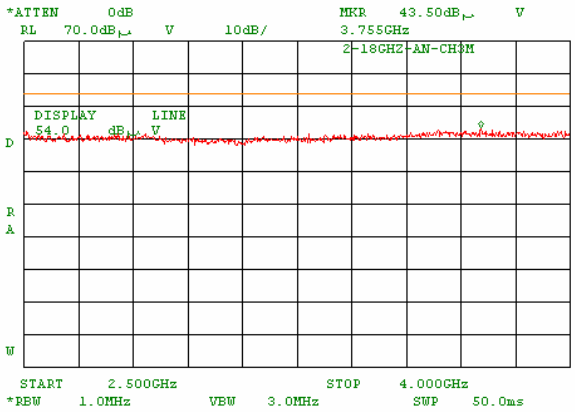
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	**Section 15.247(c), Radiated spurious emissions**		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks:			

Plot 7.3.36 Radiated emission measurements from 2500 to 4000 MHz at the high carrier frequency

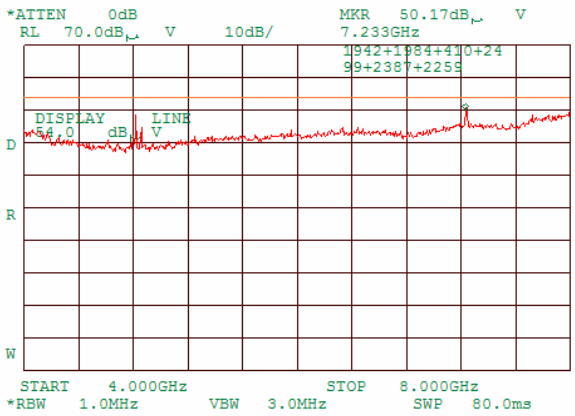
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	**Section 15.247(c), Radiated spurious emissions**		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks:			

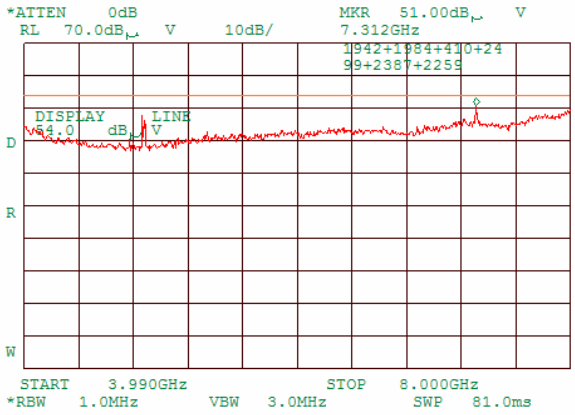
Plot 7.3.37 Radiated emission measurements from 4000 to 8000 MHz at the low carrier frequency

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



Plot 7.3.38 Radiated emission measurements from 4000 to 8000 MHz at the mid carrier frequency

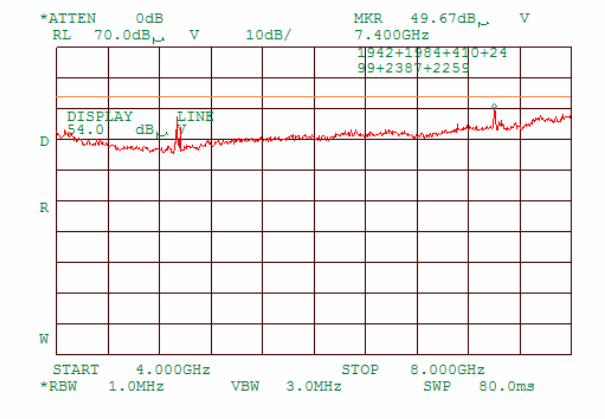
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	**Section 15.247(c), Radiated spurious emissions**		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks:			

Plot 7.3.39 Radiated emission measurements from 4000 to 8000 MHz at the high carrier frequency

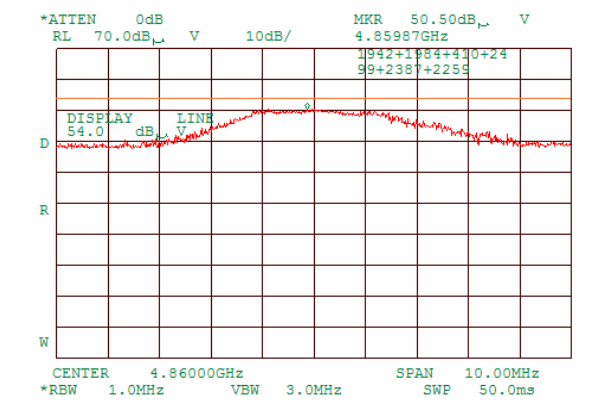
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

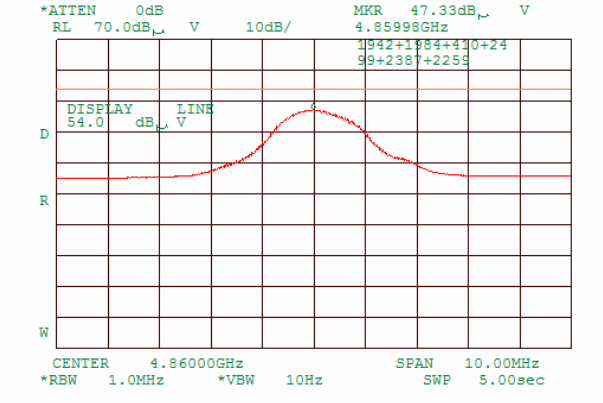
Plot 7.3.40 Radiated emission measurements at the spurious frequency at 4859.98 MHz

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
CARRIER: LOW
DETECTOR: Peak



Plot 7.3.41 Radiated emission measurements at the spurious frequency at 4859.98 MHz

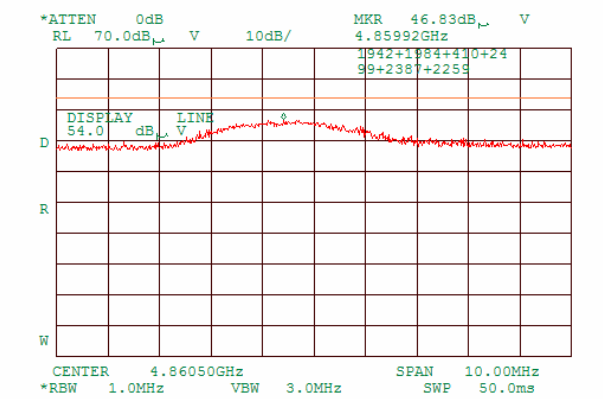
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
CARRIER: LOW
DETECTOR: Average



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

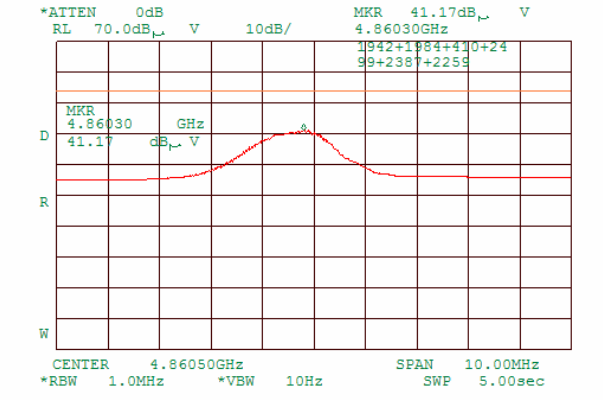
Plot 7.3.42 Radiated emission measurements at the spurious frequency at 4860.30 MHz

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
CARRIER: MID
DETECTOR: Peak



Plot 7.3.43 Radiated emission measurements at the spurious frequency at 4860.30 MHz

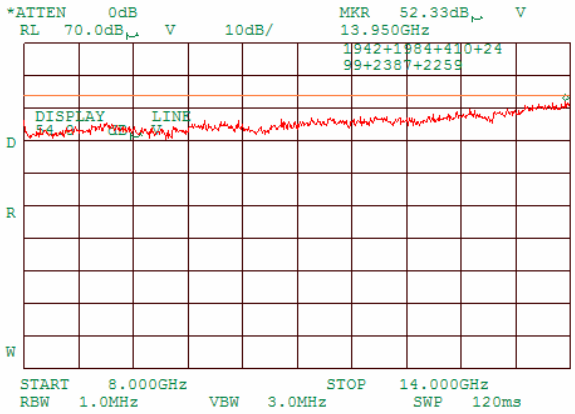
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
CARRIER: MID
DETECTOR: Average



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

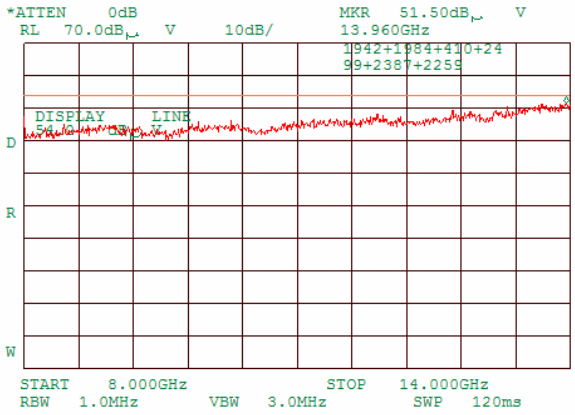
Plot 7.3.44 Radiated emission measurements from 8000 to 14000 MHz at the low carrier frequency

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



Plot 7.3.45 Radiated emission measurements from 8000 to 14000 MHz at the mid carrier frequency

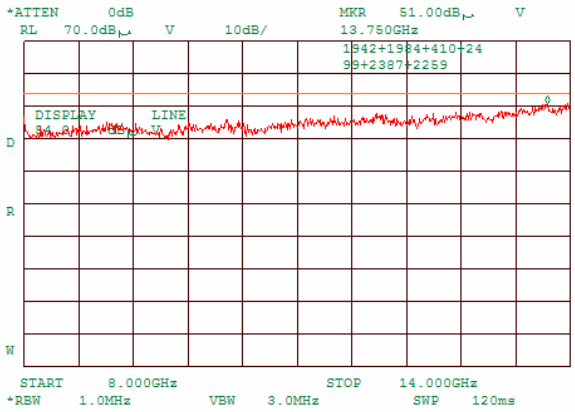
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	**Section 15.247(c), Radiated spurious emissions**		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks:			

Plot 7.3.46 Radiated emission measurements from 8000 to 14000 MHz at the high carrier frequency

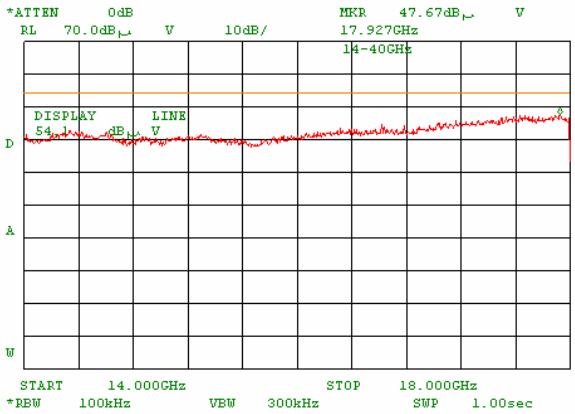
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

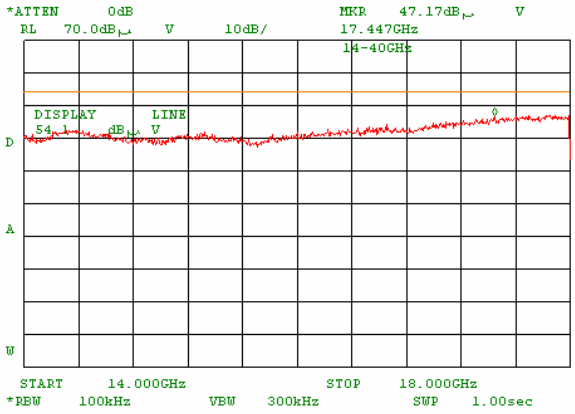
Plot 7.3.47 Radiated emission measurements from 14000 to 18000 MHz at the low carrier frequency

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



Plot 7.3.48 Radiated emission measurements from 14000 to 18000 MHz at the mid carrier frequency

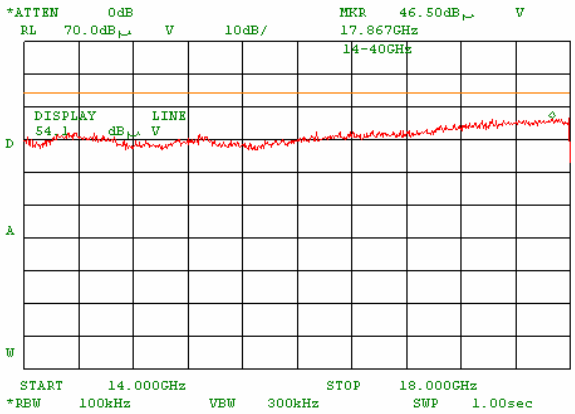
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	**Section 15.247(c), Radiated spurious emissions**		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks:			

Plot 7.3.49 Radiated emission measurements from 14000 to 18000 MHz at the high carrier frequency

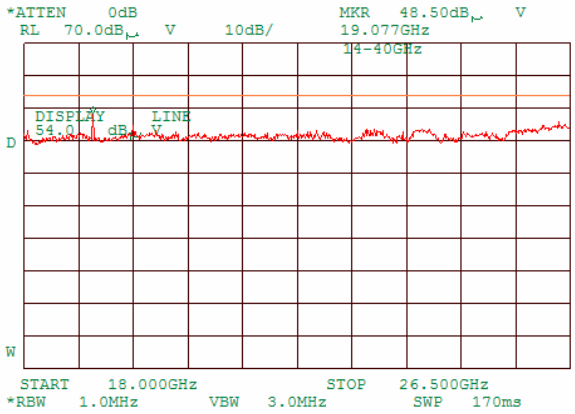
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

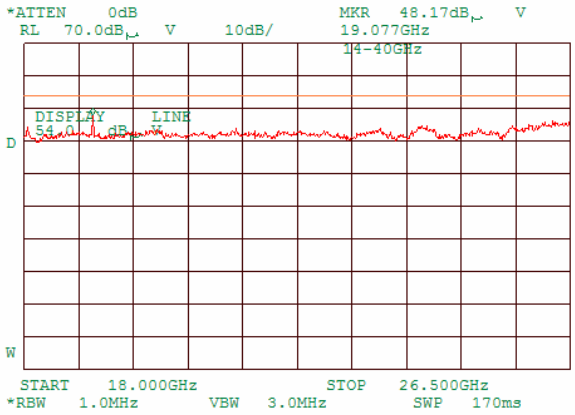
Plot 7.3.50 Radiated emission measurements from 18000 to 26500 MHz at the low carrier frequency

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



Plot 7.3.51 Radiated emission measurements from 18000 to 26500 MHz at the mid carrier frequency

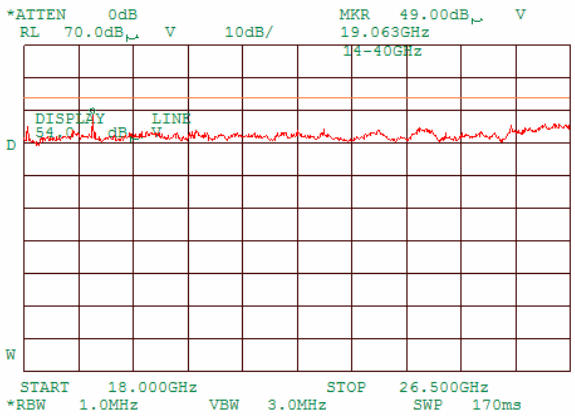
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	**Section 15.247(c), Radiated spurious emissions**		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks:			

Plot 7.3.52 Radiated emission measurements from 18000 to 26500 MHz at the high carrier frequency

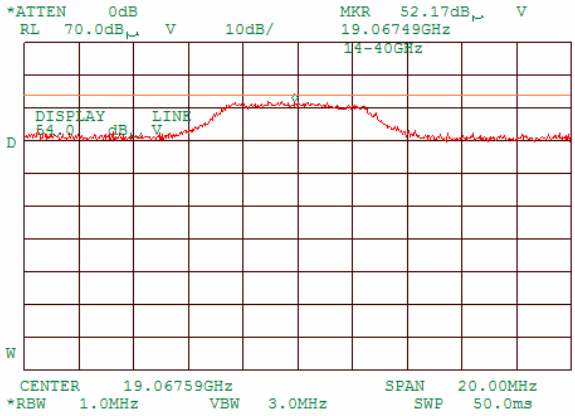
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

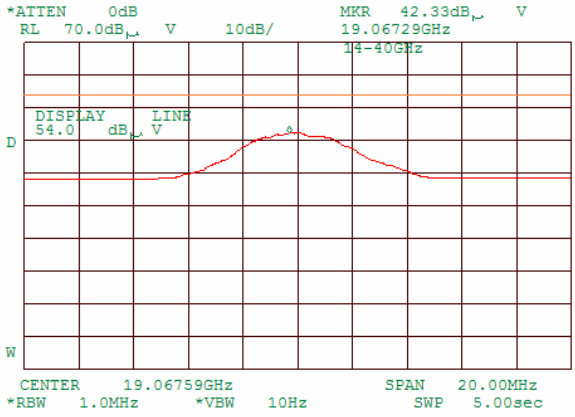
Plot 7.3.53 Radiated emission measurements at the spurious frequency at 19067.59 MHz

TEST SITE:	OATS
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
CARRIER:	ALL
DETECTOR:	Peak



Plot 7.3.54 Radiated emission measurements at the spurious frequency at 19067.59 MHz

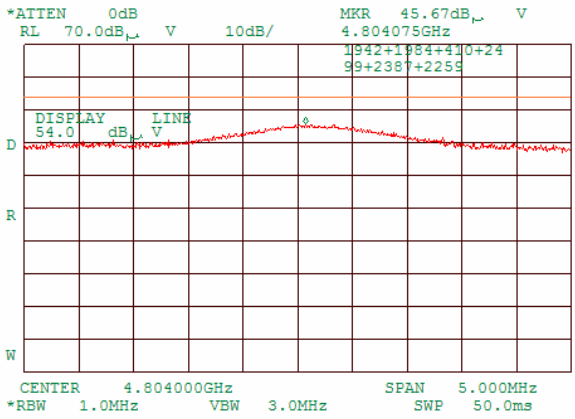
TEST SITE:	OATS
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
CARRIER:	ALL
DETECTOR:	Average



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

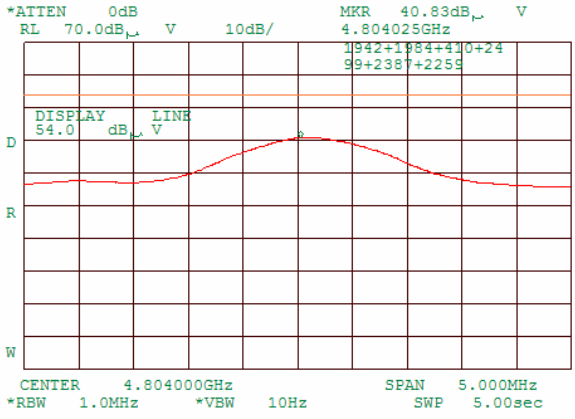
Plot 7.3.55 Radiated emission measurements at the second harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: BLUETOOTH
DETECTOR: Peak



Plot 7.3.56 Radiated emission measurements at the second harmonic of low carrier frequency

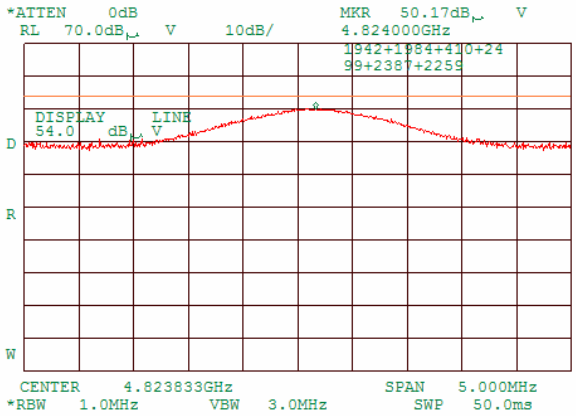
TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: BLUETOOTH
DETECTOR: Average



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

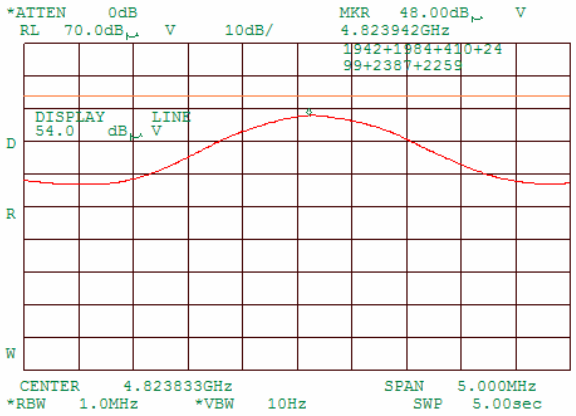
Plot 7.3.57 Radiated emission measurements at the second harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN
DETECTOR: Peak



Plot 7.3.58 Radiated emission measurements at the second harmonic of low carrier frequency

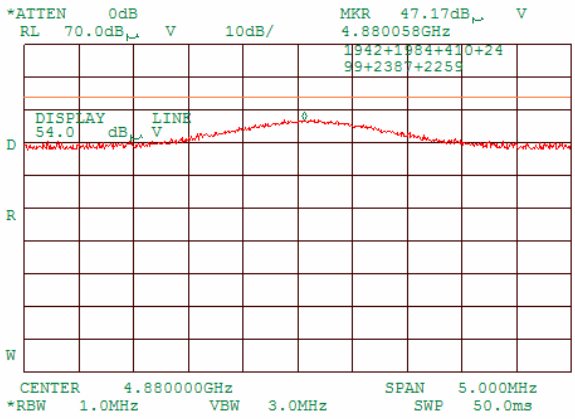
TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN
DETECTOR: Average



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

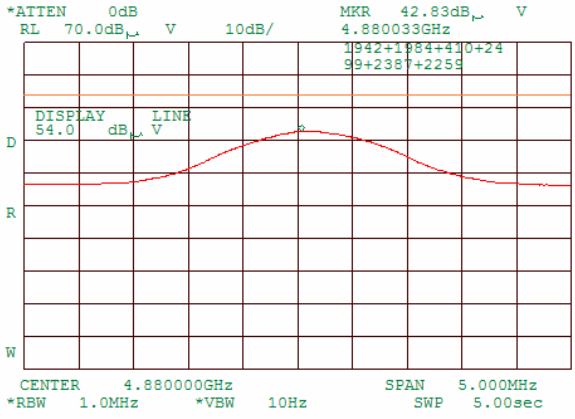
Plot 7.3.59 Radiated emission measurements at the second harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: BLUETOOTH
DETECTOR: Peak



Plot 7.3.60 Radiated emission measurements at the second harmonic of mid carrier frequency

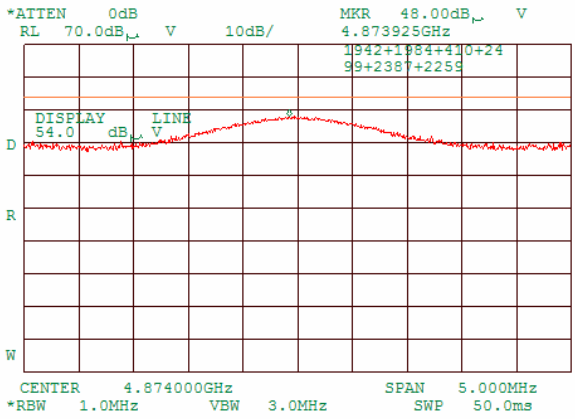
TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: BLUETOOTH
DETECTOR: Average



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

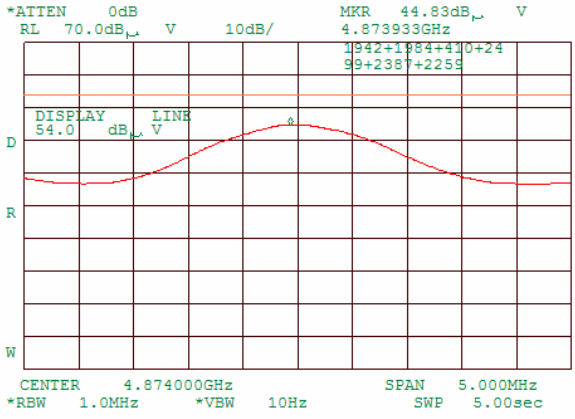
Plot 7.3.61 Radiated emission measurements at the second harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN
DETECTOR: Peak



Plot 7.3.62 Radiated emission measurements at the second harmonic of mid carrier frequency

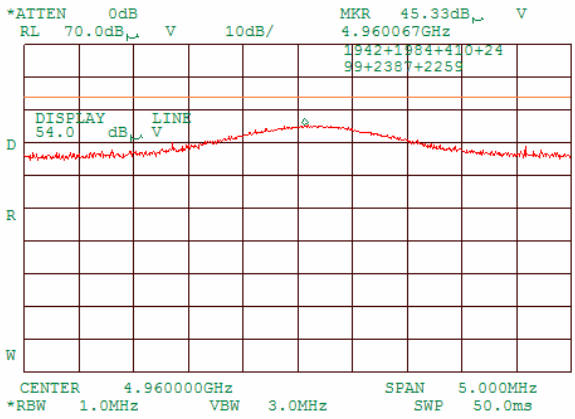
TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN
DETECTOR: Average



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

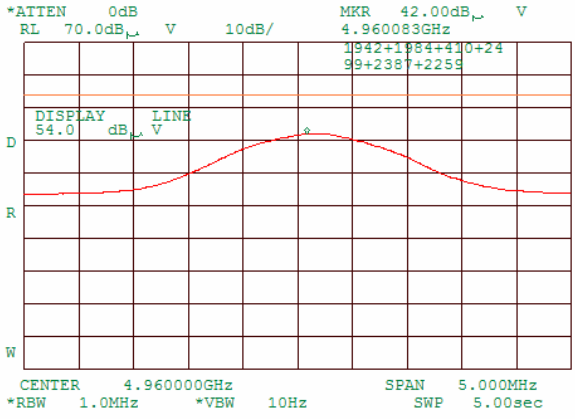
Plot 7.3.63 Radiated emission measurements at the second harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: BLUETOOTH
DETECTOR: Peak



Plot 7.3.64 Radiated emission measurements at the second harmonic of high carrier frequency

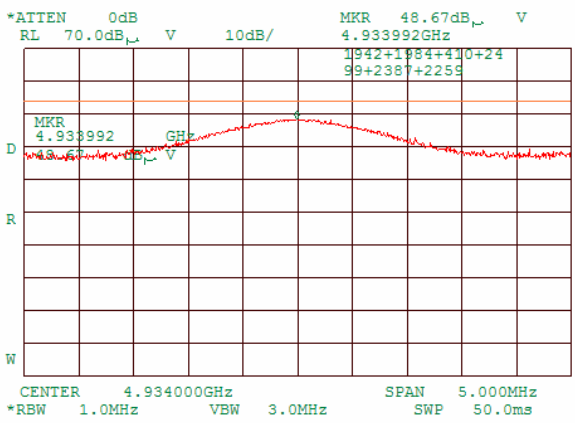
TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: BLUETOOTH
DETECTOR: Average



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

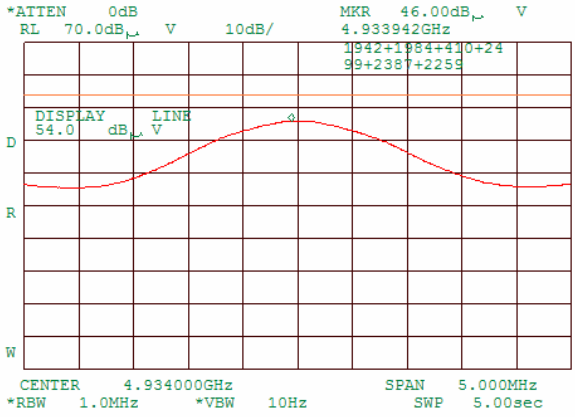
Plot 7.3.65 Radiated emission measurements at the second harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN
DETECTOR: Peak



Plot 7.3.66 Radiated emission measurements at the second harmonic of high carrier frequency

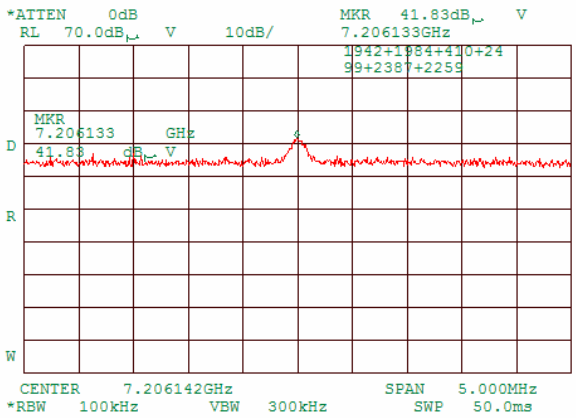
TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN
DETECTOR: Average



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

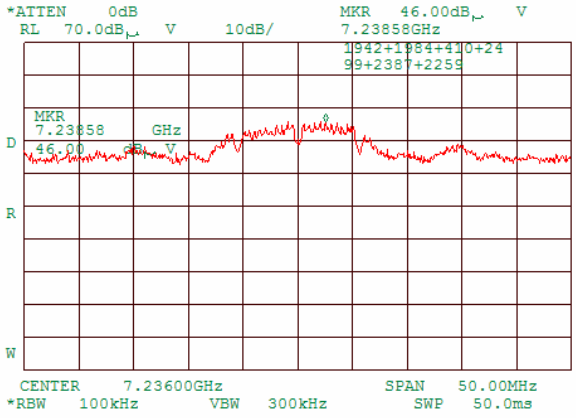
Plot 7.3.67 Radiated emission measurements at the third harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: BLUETOOTH



Plot 7.3.68 Radiated emission measurements at the third harmonic of low carrier frequency

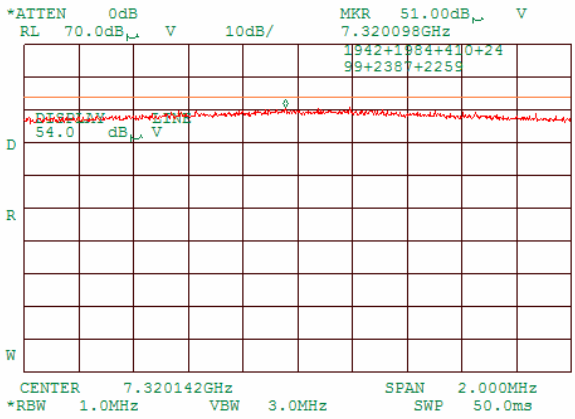
TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

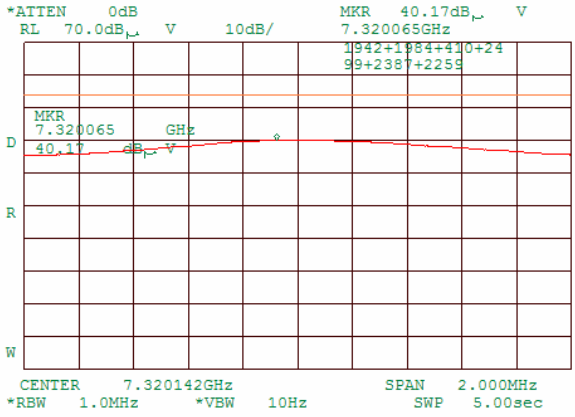
Plot 7.3.69 Radiated emission measurements at the third harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: BLUETOOTH
DETECTOR: Peak



Plot 7.3.70 Radiated emission measurements at the third harmonic of mid carrier frequency

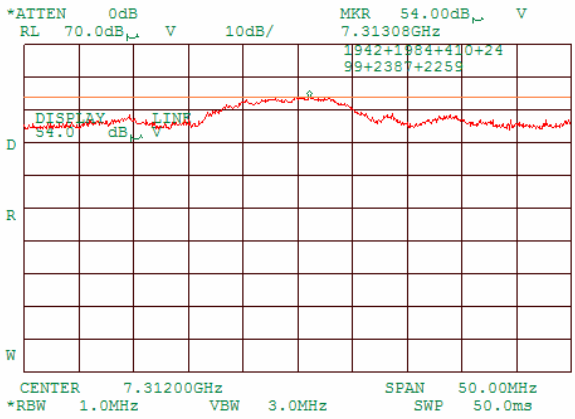
TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: BLUETOOTH
DETECTOR: Average



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

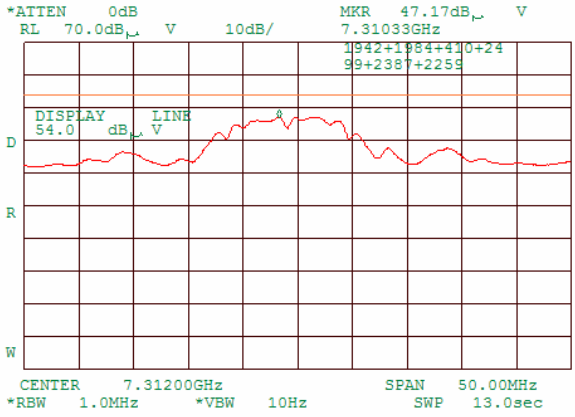
Plot 7.3.71 Radiated emission measurements at the third harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN
DETECTOR: Peak



Plot 7.3.72 Radiated emission measurements at the third harmonic of mid carrier frequency

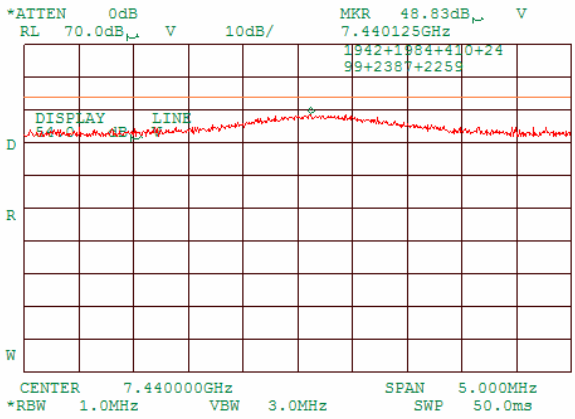
TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN
DETECTOR: Average



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

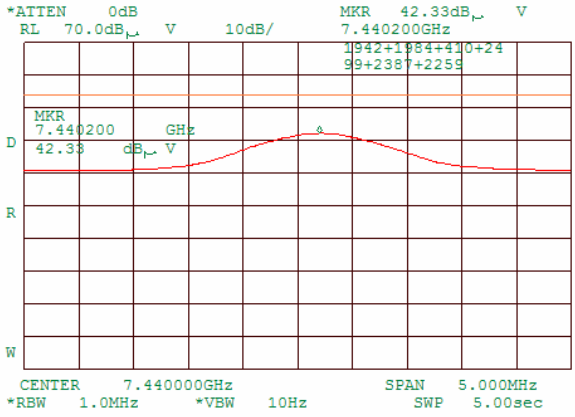
Plot 7.3.73 Radiated emission measurements at the third harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: BLUETOOTH
DETECTOR: Peak



Plot 7.3.74 Radiated emission measurements at the third harmonic of high carrier frequency

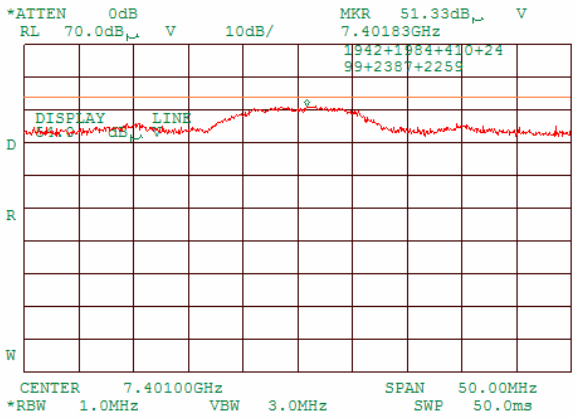
TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: BLUETOOTH
DETECTOR: Average



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

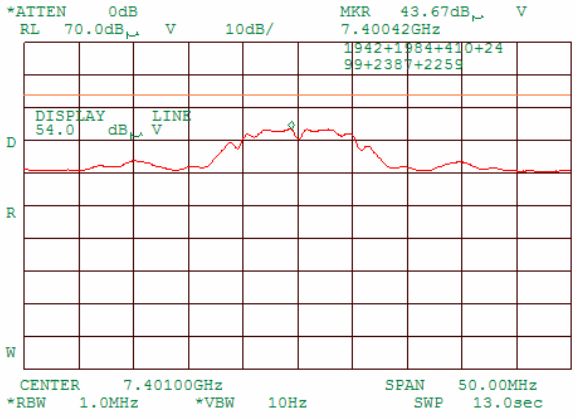
Plot 7.3.75 Radiated emission measurements at the third harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN
DETECTOR: Peak



Plot 7.3.76 Radiated emission measurements at the third harmonic of high carrier frequency

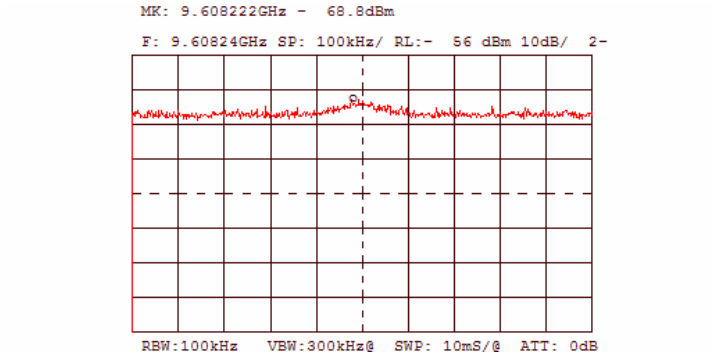
TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN
DETECTOR: Average



Test specification:	**Section 15.247(c), Radiated spurious emissions**		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks:			

Plot 7.3.77 Radiated emission measurements at the forth harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: BLUETOOTH

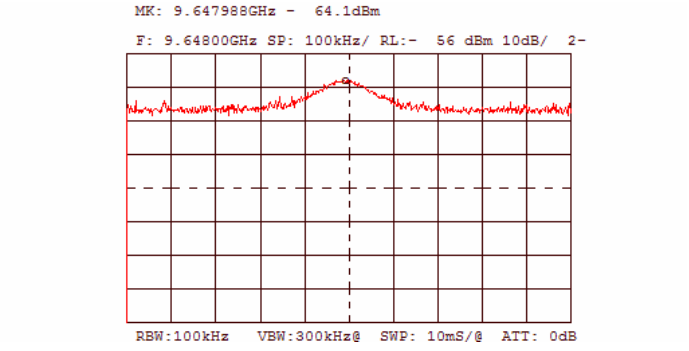


Field strength { dB(μV/m)} =
=SA reading (dBm) + 107 dB – Amplifier gain (dB) + Antenna factor (dB) +Cable loss (dB) + Filter loss (dB)

Frequency, MHz	Cable Loss, dB	Filter Loss, dB	Ant Factor, dB1/m	Amp Gain, dB	Total Loss, dB	Field strength, dB(μV/m)
9608.00	1.20	0.37	38.00	37.00	2.57	40.77

Plot 7.3.78 Radiated emission measurements at the forth harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN

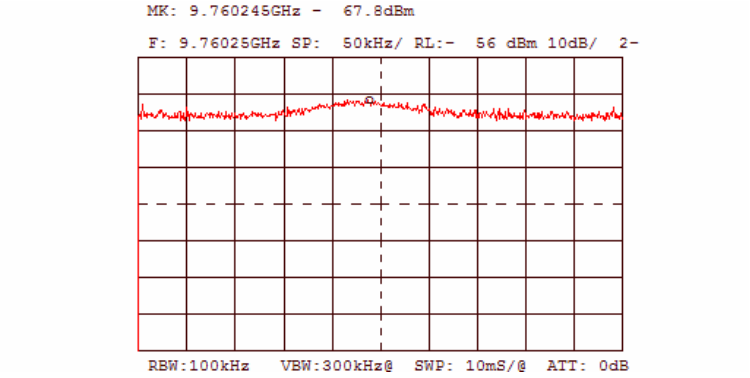


Frequency, MHz	Cable Loss, dB	Filter Loss, dB	Ant Factor, dB1/m	Amp Gain, dB	Total Loss, dB	Field strength, dB(μV/m)
9648.00	1.20	0.37	38.00	37.00	2.57	45.47

Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

Plot 7.3.79 Radiated emission measurements at the forth harmonic of mid carrier frequency

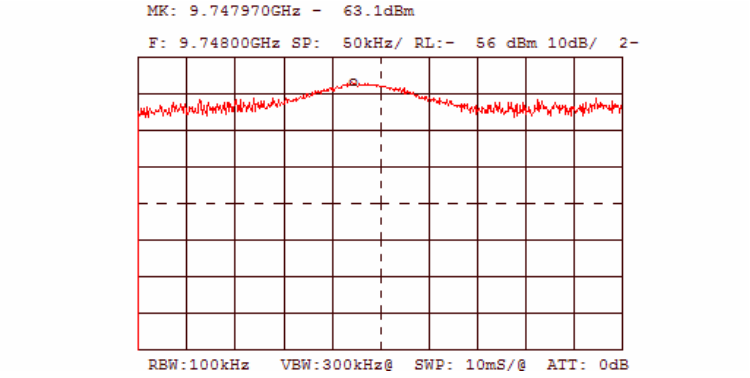
TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: BLUETOOTH



Frequency, MHz	Cable Loss, dB	Filter Loss, dB	Ant Factor, dB1/m	Amp Gain, dB	Total Loss, dB	Field strength, dB(µV/m)
9760.00	1.20	0.30	38.00	37.00	2.50	41.7

Plot 7.3.80 Radiated emission measurements at the forth harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN

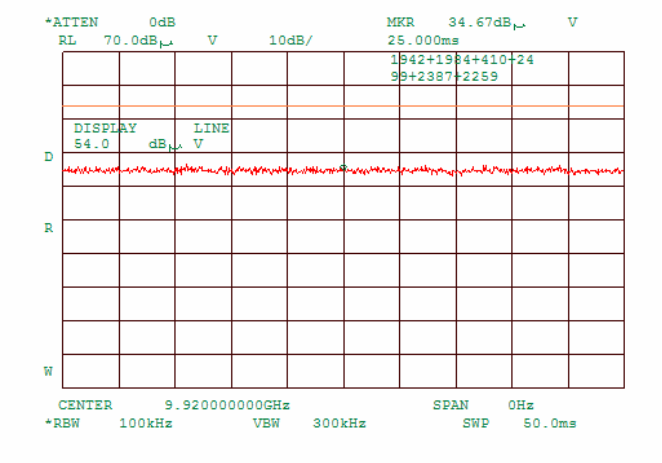


Frequency, MHz	Cable Loss, dB	Filter Loss, dB	Ant Factor, dB1/m	Amp Gain, dB	Total Loss, dB	Field strength, dB(µV/m)
9748.00	1.20	0.30	38.00	37.00	2.50	46.4

Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

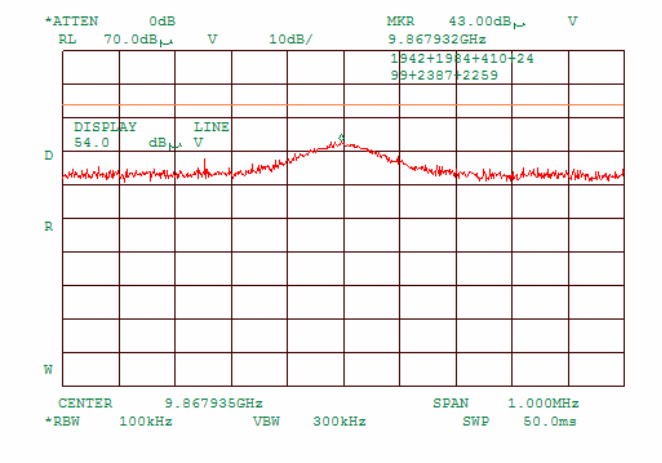
Plot 7.3.81 Radiated emission measurements at the forth harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: BLUETOOTH



Plot 7.3.82 Radiated emission measurements at the forth harmonic of high carrier frequency

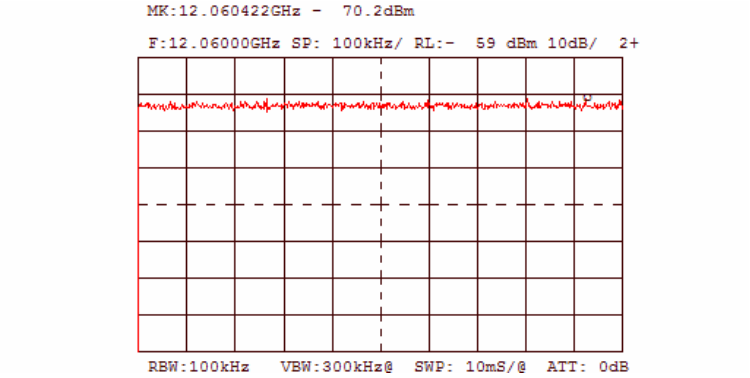
TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

Plot 7.3.83 Radiated emission measurements at the fifth harmonic of low carrier frequency

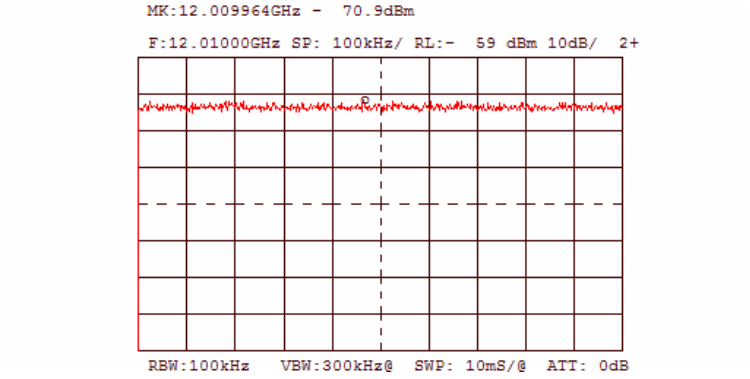
TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: BLUETOOTH



Frequency, MHz	Cable Loss, dB	Filter Loss, dB	Ant Factor, dB1/m	Amp Gain, dB	Total Loss, dB	Field strength, dB(µV/m)
12060.00	1.33	0.30	38.00	34.50	5.13	41.93

Plot 7.3.84 Radiated emission measurements at the fifth harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN

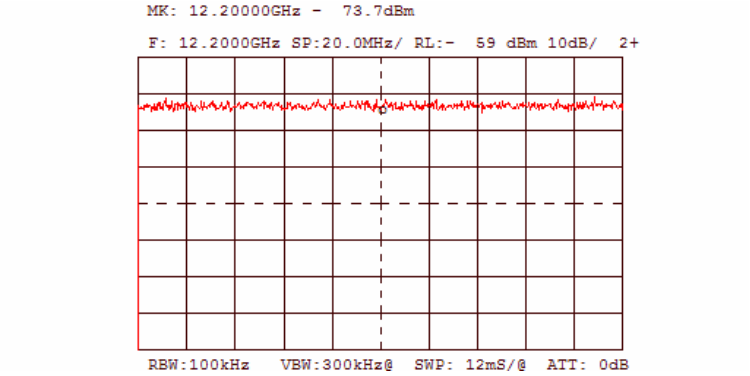


Frequency, MHz	Cable Loss, dB	Filter Loss, dB	Ant Factor, dB1/m	Amp Gain, dB	Total Loss, dB	Field strength, dB(µV/m)
12010.00	1.33	0.30	38.00	34.50	5.13	41.23

Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

Plot 7.3.85 Radiated emission measurements at the fifth harmonic of mid carrier frequency

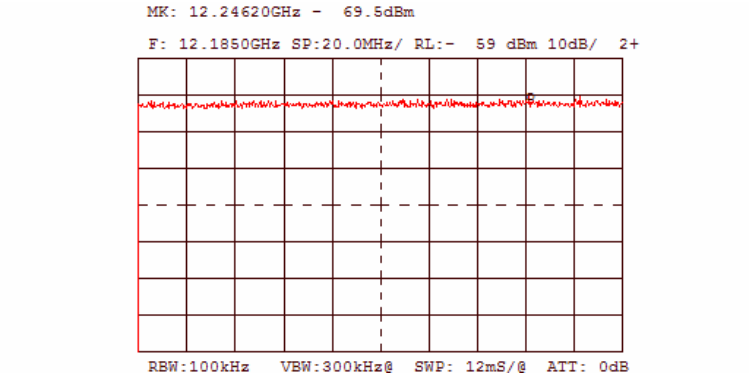
TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: BLUETOOTH



Frequency, MHz	Cable Loss, dB	Filter Loss, dB	Ant Factor, dB1/m	Amp Gain, dB	Total Loss, dB	Field strength, dB(µV/m)
12200.00	1.33	0.30	38.00	34.50	5.13	38.43

Plot 7.3.86 Radiated emission measurements at the fifth harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN

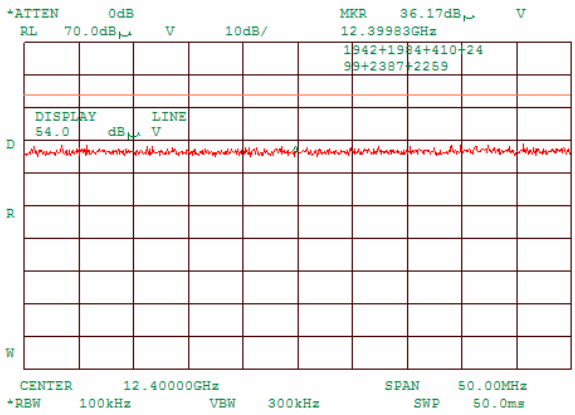


Frequency, MHz	Cable Loss, dB	Filter Loss, dB	Ant Factor, dB1/m	Amp Gain, dB	Total Loss, dB	Field strength, dB(µV/m)
12185.00	1.33	0.30	38.00	34.50	5.13	42.63

Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

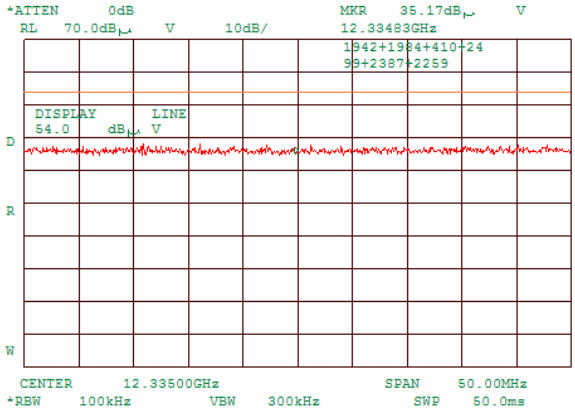
Plot 7.3.87 Radiated emission measurements at the fifth harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: BLUETOOTH



Plot 7.3.88 Radiated emission measurements at the fifth harmonic of high carrier frequency

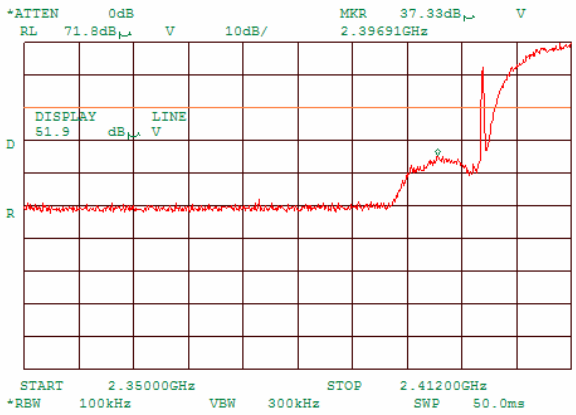
TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

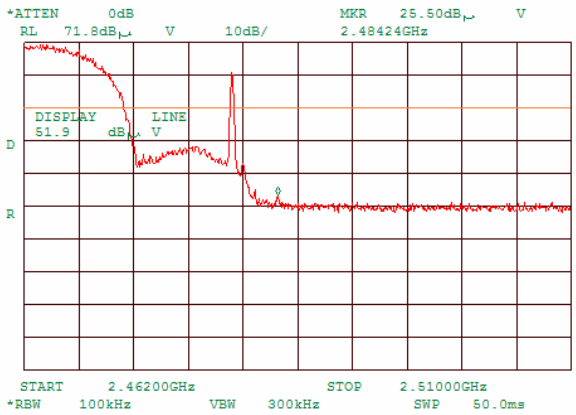
Plot 7.3.89 Radiated emission measurements at left band edge

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN and BLUETOOTH



Plot 7.3.90 Radiated emission measurements at right band edge

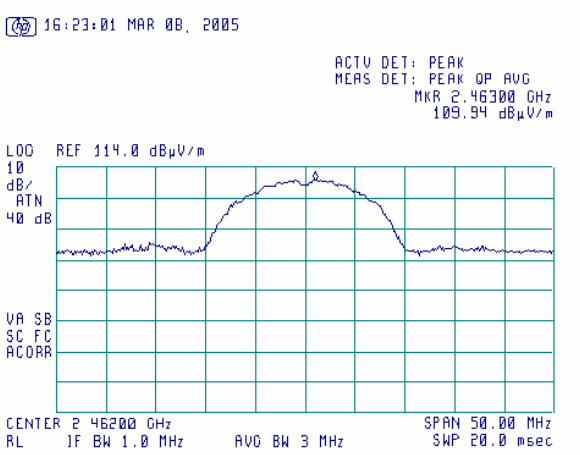
TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN and BLUETOOTH



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

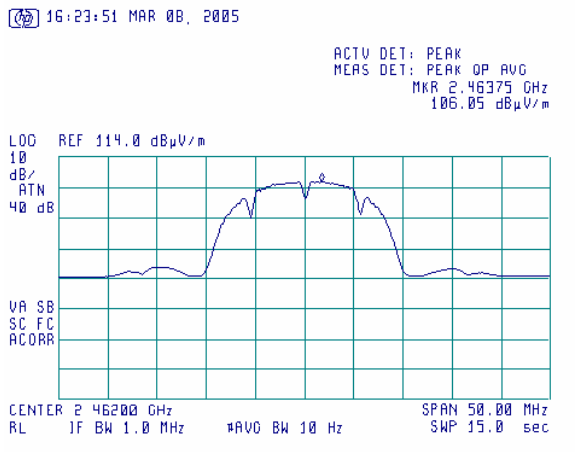
Plot 7.3.91 Radiated emission measurements at carrier, peak

TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN
CHANNEL: 11
BIT RATE: 1 MBPs



Plot 7.3.92 Radiated emission measurements at carrier, average

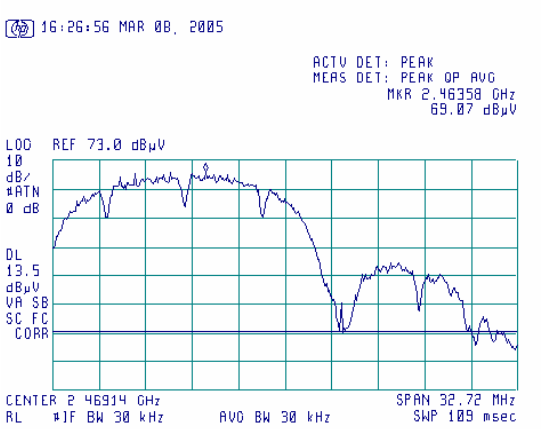
TEST SITE: OATS
TEST DISTANCE: 3 m
TRANSMITTER: WLAN
CHANNEL: 11
BIT RATE: 1 MBPs



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

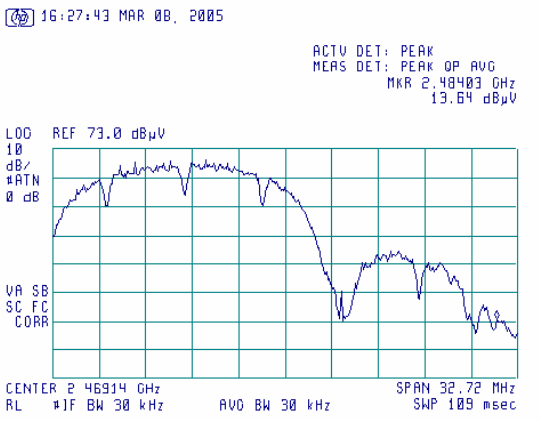
Plot 7.3.93 Radiated emission measurements at carrier, peak

TEST SITE:	OATS
TEST DISTANCE:	3 m
TRANSMITTER:	WLAN
CHANNEL:	11
BIT RATE:	1 MBPs



Plot 7.3.94 Radiated emission measurements at band edge

TEST SITE:	OATS
TEST DISTANCE:	3 m
TRANSMITTER:	WLAN
CHANNEL:	11
BIT RATE:	1 MBPs

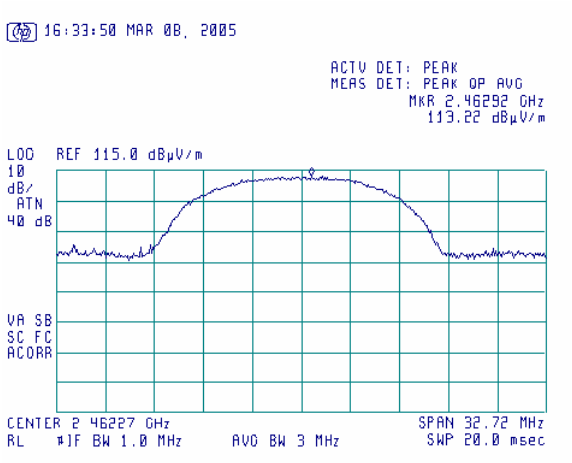


Delta = 69.07 – 13.64 = 55.43 dB
Average = 106.05 dB(µV/m)
Band edge spurious = 106.05 dB(µV/m) – 55.43 dB = 50.62 dB(µV/m)

Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

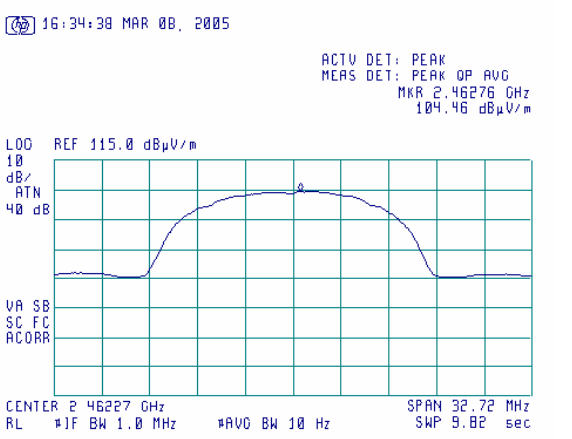
Plot 7.3.95 Radiated emission measurements at carrier, peak

TEST SITE:	OATS
TEST DISTANCE:	3 m
TRANSMITTER:	WLAN
CHANNEL:	11
BIT RATE:	11 MBPs



Plot 7.3.96 Radiated emission measurements at carrier, average

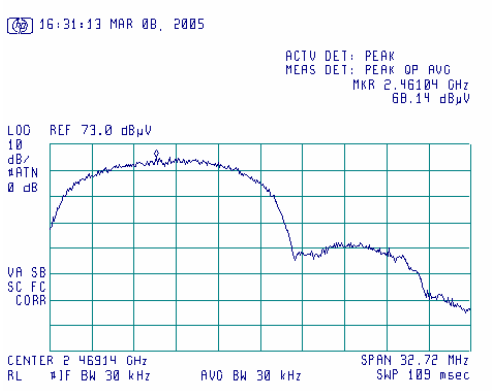
TEST SITE:	OATS
TEST DISTANCE:	3 m
TRANSMITTER:	WLAN
CHANNEL:	11
BIT RATE:	11 MBPs



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:24:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

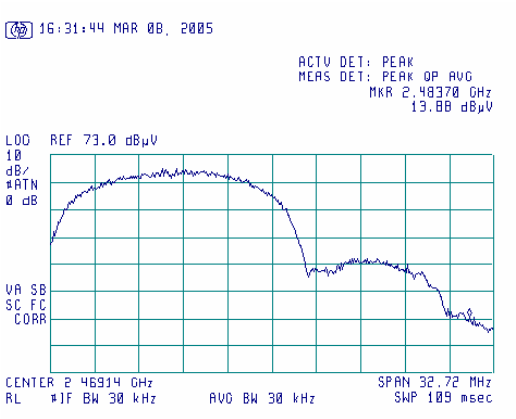
Plot 7.3.97 Radiated emission measurements at carrier, peak

TEST SITE:	OATS
TEST DISTANCE:	3 m
TRANSMITTER:	WLAN
CHANNEL:	11
BIT RATE:	11 MBPs



Plot 7.3.98 Radiated emission measurements at band edge

TEST SITE:	OATS
TEST DISTANCE:	3 m
TRANSMITTER:	WLAN
CHANNEL:	11
BIT RATE:	11 MBPs



Delta = 68.14 – 13.88 = 54.26 dB
Average = 104.46 dB(µV/m)
Band edge spurious = 104.46 dB(µV/m) – 54.26 dB = 50.2 dB(µV/m)

Test specification:	Section 15.247(d), Peak power density		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(d)		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 6:08:43 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 12 VDC
Remarks:			

7.4 Peak spectral power density

7.4.1 General

This test was performed to measure the peak spectral power density radiated by the transmitter RF antenna. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Peak spectral power density limits

Assigned frequency range, MHz	Measurement bandwidth, kHz	Peak spectral power density, dBm	Equivalent field strength limit @ 3m, dB(μV/m)*
902.0 – 928.0	3.0	8.0	103.2
2400.0 – 2483.5			
5725.0 – 5850.0			

* - Equivalent field strength limit was calculated from the peak spectral power density as follows: E=sqrt(30×P)/r, where P is peak spectral power density and r is antenna to EUT distance in meters.

7.4.2 Test procedure for field strength measurements

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 EUT was adjusted to produce maximum available to end user RF output power.

7.4.2.3 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 and the measuring antenna height was swept in both vertical and horizontal polarizations.

7.4.2.4 The frequency span of spectrum analyzer was set to capture the entire 6 dB band of the transmitter, in peak hold mode with resolution bandwidth set to 3.0 kHz, video bandwidth wider than resolution bandwidth, auto sweep time and sufficient number of sweeps was allowed for trace stabilization. The spectrum lines spacing was verified to be wider than 3 kHz. Otherwise the resolution bandwidth was reduced until individual spectrum lines were resolved and the power of individual spectrum lines was integrated over 3 kHz band.

7.4.2.5 The peak of emission was zoomed with span set just wide enough to capture the emission peak area and sweep time was set equal to span width divided by resolution bandwidth. Spectrum analyzer was set in peak hold mode, sufficient number of sweeps was allowed for trace stabilization and peak spectral power density was measured as provided in Table 7.4.2 and associated plots.

7.4.3 Test procedure for substitution power density measurements

7.4.3.1 The test equipment was set up as shown in Figure 7.4.2 and energized.

7.4.3.2 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.

7.4.3.3 The test antenna height was swept 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.

7.4.3.4 The peak spectral power density was calculated as a sum of signal generator output power in dBm and substitution antenna gain in dBi reduced by cable loss in dB and the transmitter antenna gain in dBi.

7.4.3.5 The above procedure was performed in both horizontal and vertical polarizations of the substitution antenna.

7.4.3.6 The worst test results (the lowest margins) were recorded in Table 7.4.3 and shown in the associated plots.

Test specification:	Section 15.247(d), Peak power density		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(d)		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 6:08:43 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 12 VDC
Remarks:			

Figure 7.4.1 Setup for carrier field strength measurements

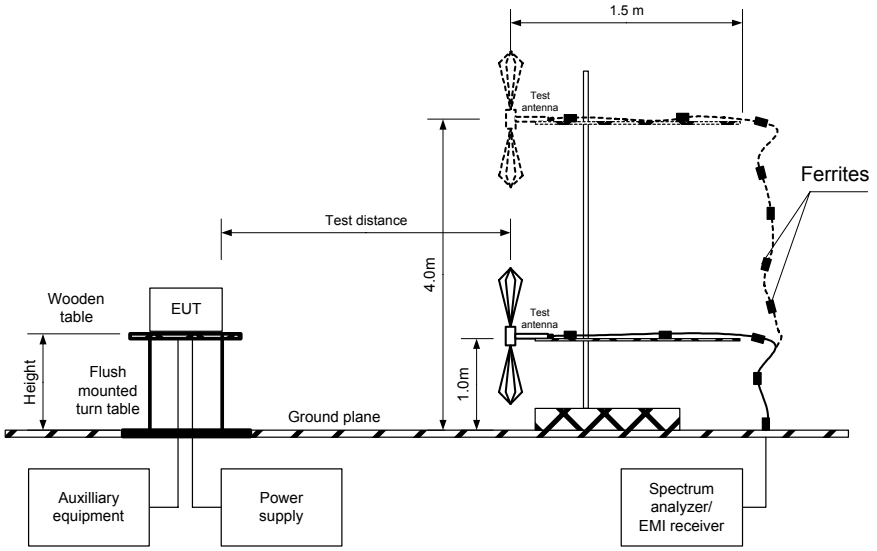
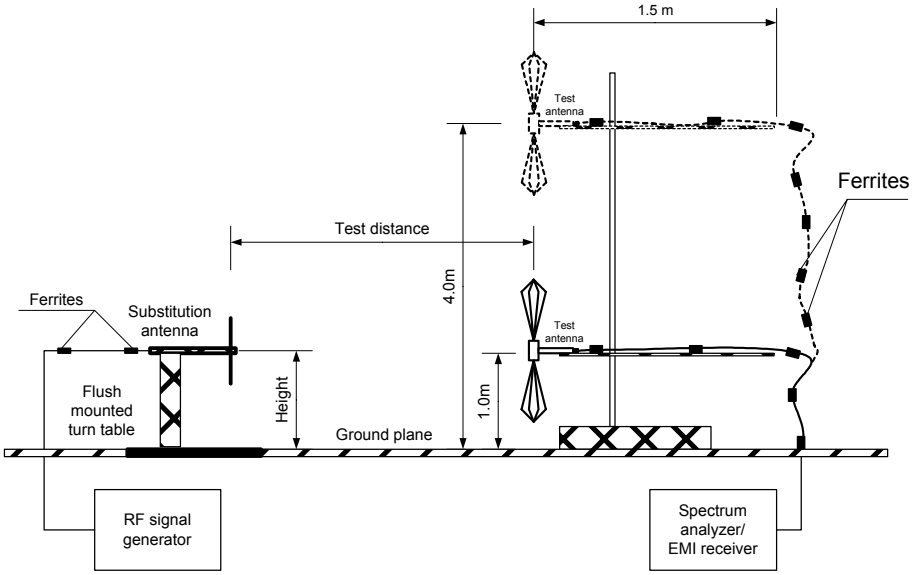


Figure 7.4.2 Setup for substitution power density measurements



Test specification:	**Section 15.247(d), Peak power density**		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(d)		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/9/2005 6:08:43 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 45 %	**Power Supply:** 12 VDC
Remarks:			

Table 7.4.2 Field strength measurement of peak spectral power density

ASSIGNED FREQUENCY: 2400 – 2483.5 MHz
TEST DISTANCE: 3 m
TEST SITE: OATS
EUT HEIGHT: 0.8 m
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 3 kHz
VIDEO BANDWIDTH: 10 kHz
TEST ANTENNA TYPE: Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)
MODULATION: DBPSK, QPSK
MODULATING SIGNAL: PRBS
BIT RATE: 1, 11 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Field strength, dB(µV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees
1 MBPs							
2412	93.33	1	103.2	-10.87	H	1.4	270
2442	96.83	1	103.2	-7.37	H	1.4	275
2462	95.17	1	103.2	-9.03	H	1.3	284
11 MBPs							
2412	91.83	1	103.2	-12.37	H	1.4	270
2442	94.33	1	103.2	-9.87	H	1.4	275
2462	94.17	1	103.2	-10.03	H	1.3	284

*- Margin = Field strength - EUT antenna gain - calculated field strength limit.
**- EUT front panel refer to 0 degrees position of turntable.

Table 7.4.3 Substitution measurement of peak spectral power density

TEST DISTANCE: 3 m
SUBSTITUTION ANTENNA HEIGHT: 0.8 m
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 3 kHz
VIDEO BANDWIDTH: 10 kHz
SUBSTITUTION ANTENNA TYPE: Double ridged guide (above 1000 MHz)

Frequency, MHz	Field strength, dB(µV/m)	Antenna polarization	RF generator output, dBm	Antenna gain, dBi	Cable loss, dB	EUT ant. gain, dBi	Peak power density*, dB(mW/3 kHz)	Limit, dBm	Margin, dB**	Verdict
1 MBPs										
2412	93.33	H	-6.69	6.91	1.13	2.1	-3.01	8	-11.01	Pass
2442	96.83	H	-3.19	6.97	1.35	2.1	0.33	8	-7.67	Pass
2462	95.17	H	-4.85	7.02	1.49	2.1	-1.42	8	-9.42	Pass
11 MBPs										
2412	91.83	H	-8.19	6.91	1.13	2.1	-4.51	8	-12.51	Pass
2442	94.33	H	-5.69	6.97	1.35	2.1	-2.17	8	-10.17	Pass
2462	94.17	H	-5.85	7.02	1.49	2.1	-2.42	8	-10.42	Pass

*- Peak power density provided in terms of conducted power density at antenna connector and was calculated as follows:
Peak power density = RF generator output in dBm – Cable loss in dB + Substitution antenna gain in dBi - Transmitter antenna gain in dBi
**- Margin = Peak power density - EUT antenna gain - specification limit.

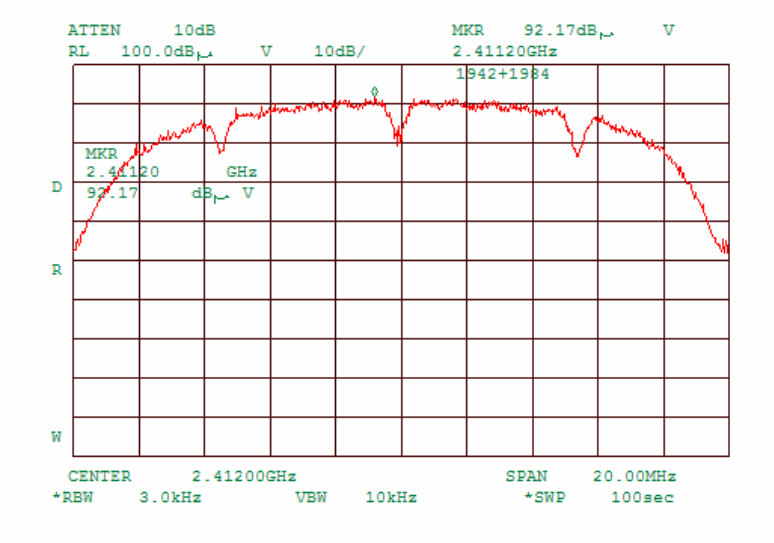
Reference numbers of test equipment used

HL 0610	HL 1941	HL 1947	HL 1984	HL 2432			

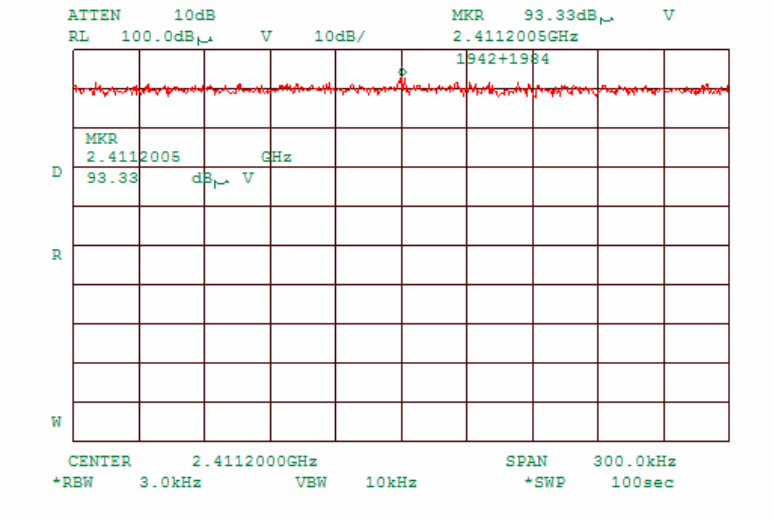
Full description is given in Appendix A.

Test specification:	Section 15.247(d), Peak power density		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(d)		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 6:08:43 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 12 VDC
Remarks:			

Plot 7.4.1 Peak spectral power density at low frequency within 6 dB band, 1 MBPs

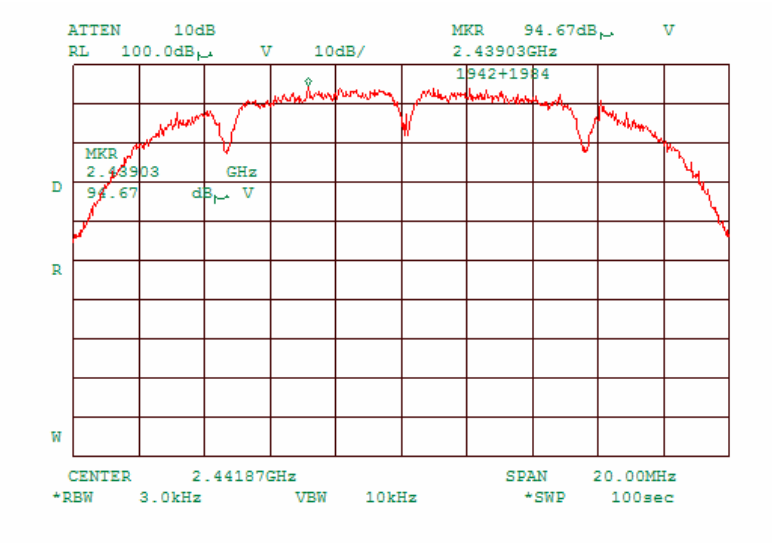


Plot 7.4.2 Peak spectral power density at low frequency zoomed at the peak, 1 MBPs

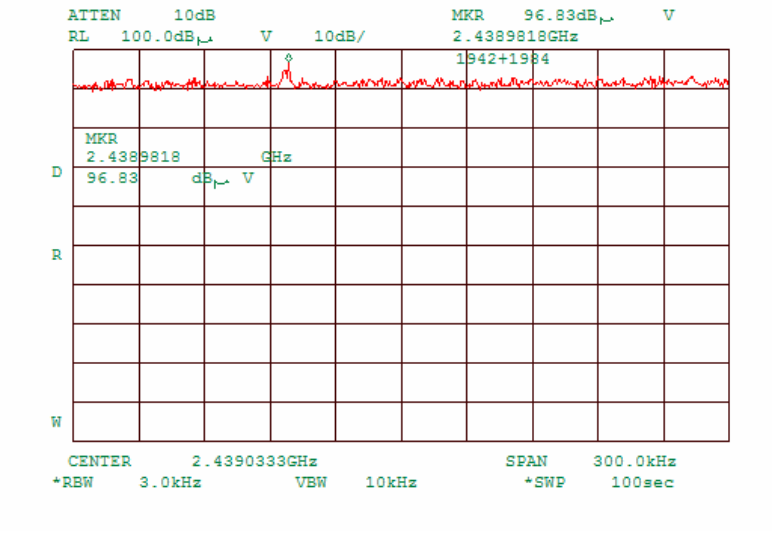


Test specification:	Section 15.247(d), Peak power density		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(d)		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 6:08:43 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 12 VDC
Remarks:			

Plot 7.4.3 Peak spectral power density at mid frequency within 6 dB band, 1 MBPs

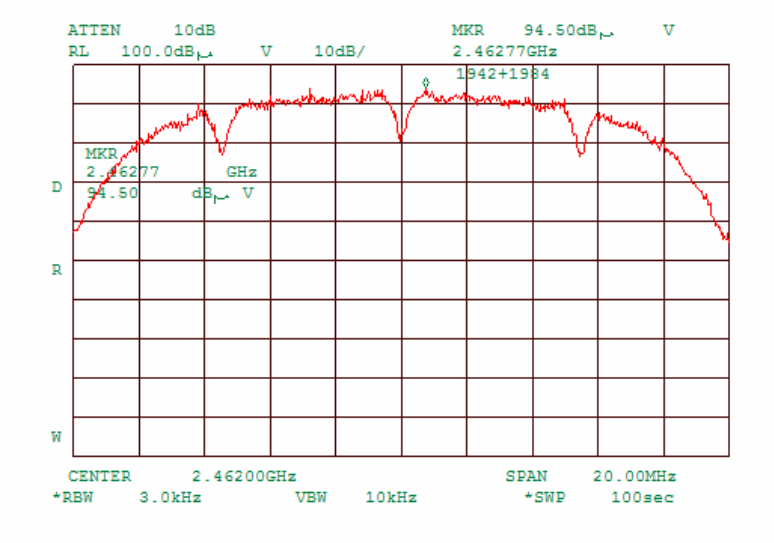


Plot 7.4.4 Peak spectral power density at mid frequency zoomed at the peak, 1 MBPs

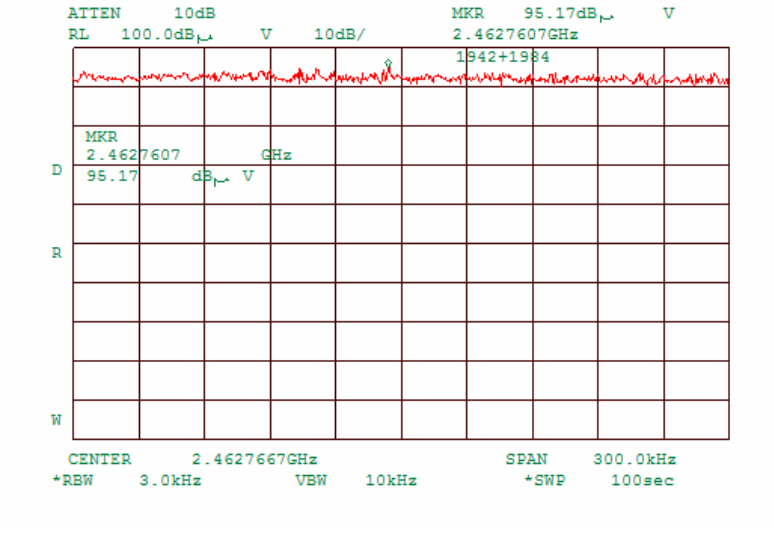


Test specification:	Section 15.247(d), Peak power density		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(d)		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 6:08:43 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 12 VDC
Remarks:			

Plot 7.4.5 Peak spectral power density at high frequency within 6 dB band, 1 MBPs

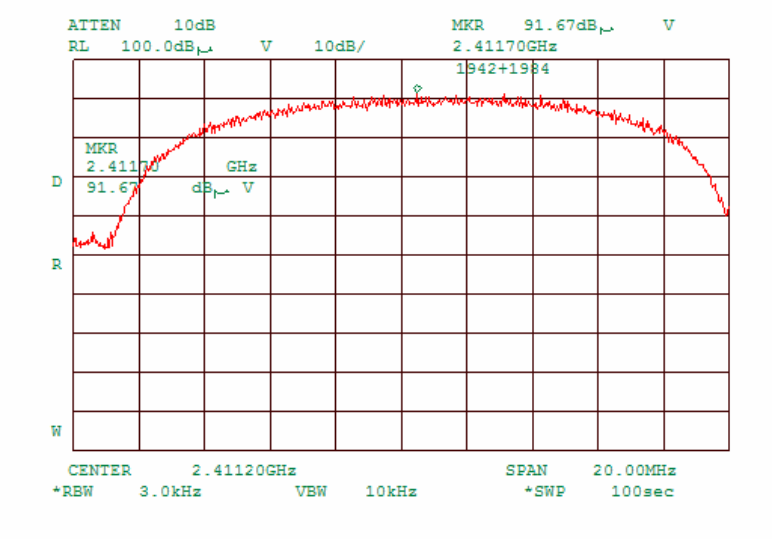


Plot 7.4.6 Peak spectral power density at high frequency zoomed at the peak, 1 MBPs

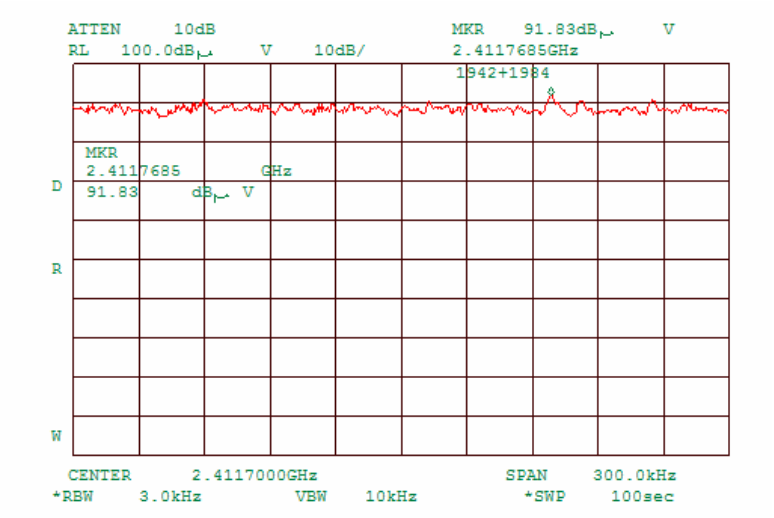


Test specification:	Section 15.247(d), Peak power density		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(d)		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 6:08:43 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 12 VDC
Remarks:			

Plot 7.4.7 Peak spectral power density at low frequency within 6 dB band, 11 MBPs

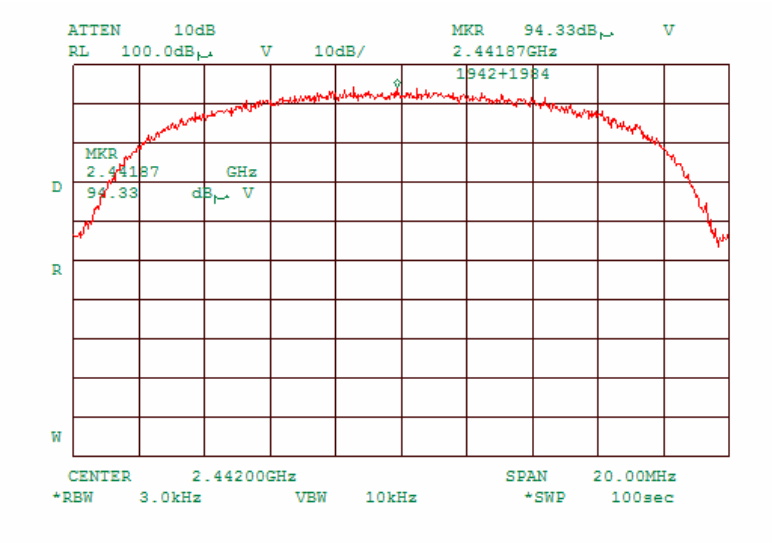


Plot 7.4.8 Peak spectral power density at low frequency zoomed at the peak, 11 MBPs

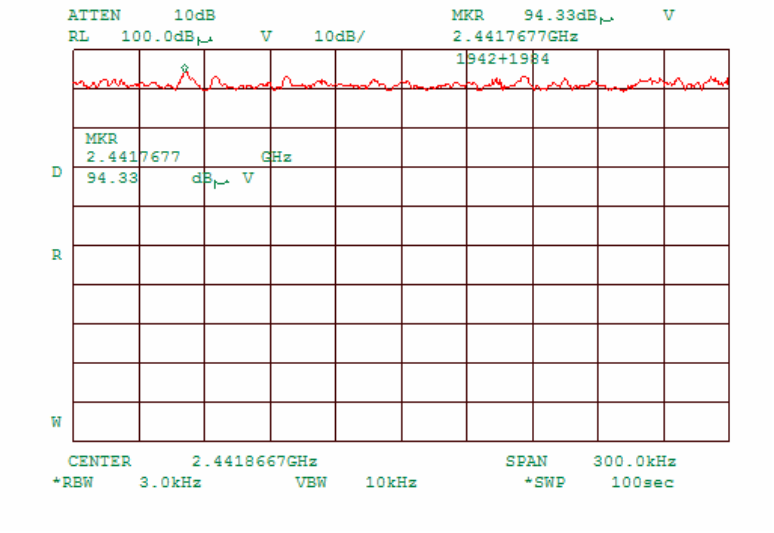


Test specification:	Section 15.247(d), Peak power density		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(d)		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 6:08:43 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 12 VDC
Remarks:			

Plot 7.4.9 Peak spectral power density at mid frequency within 6 dB band, 11 MBPs

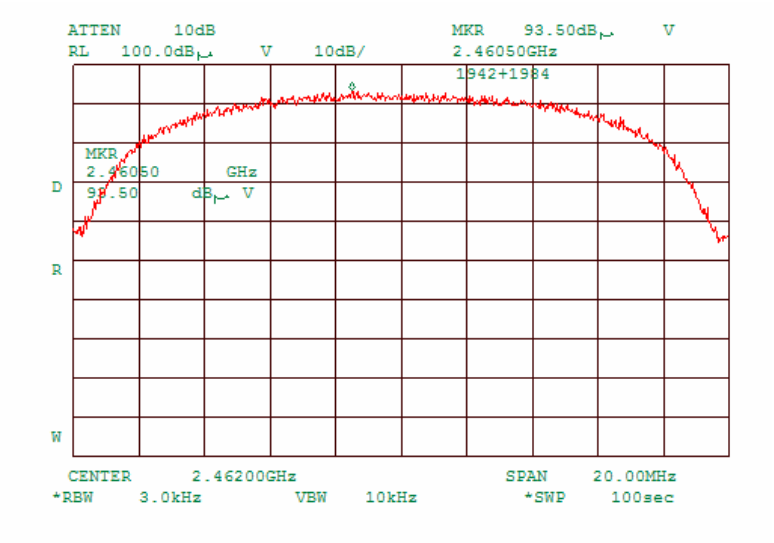


Plot 7.4.10 Peak spectral power density at mid frequency zoomed at the peak, 11 MBPs

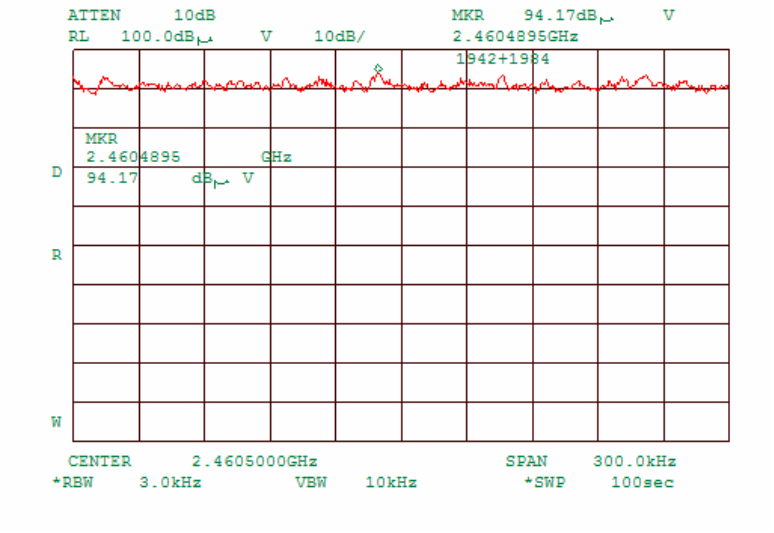


Test specification:	Section 15.247(d), Peak power density		
Test procedure:	FR Vol. 62, page 26243, Section 15.247(d)		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 6:08:43 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 12 VDC
Remarks:			

Plot 7.4.11 Peak spectral power density at high frequency within 6 dB band, 11 MBPs



Plot 7.4.12 Peak spectral power density at high frequency zoomed at the peak, 11 MBPs



Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 8:41:05 AM		
Temperature: 24 ºC	Air Pressure: 1010 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks:			

7.5 Conducted emissions

7.5.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.5.1. The worst test results (the lowest margins) were recorded in Table 7.5.2 and shown in the associated plots.

Table 7.5.1 Limits for conducted emissions

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

* The limit decreases linearly with the logarithm of frequency.

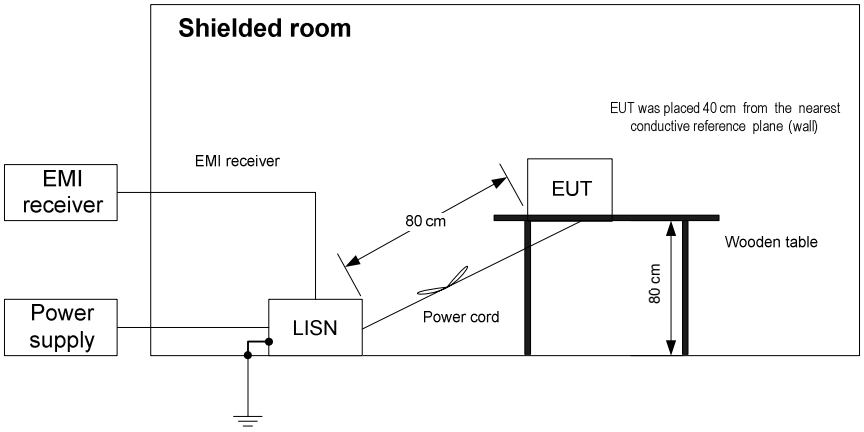
7.5.2 Test procedure

7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and the performance check was conducted.

7.5.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 7.5.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

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

Figure 7.5.1 Setup for conducted emission measurements, table-top equipment



Test specification:	**Section 15.207(a), Conducted emission**		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/10/2005 8:41:05 AM		
Temperature: 24 ºC	**Air Pressure:** 1010 hPa	**Relative Humidity:** 38 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.5.2 Conducted emission test results

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

Frequency, MHz	Peak emission, dB(µV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*	Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*		
29.473984	51.10	44.08	60.00	-15.92	32.70	50.00	-17.30	L1	Pass
29.612098	49.85	43.56	60.00	-16.44	32.74	50.00	-17.26	L2	Pass

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

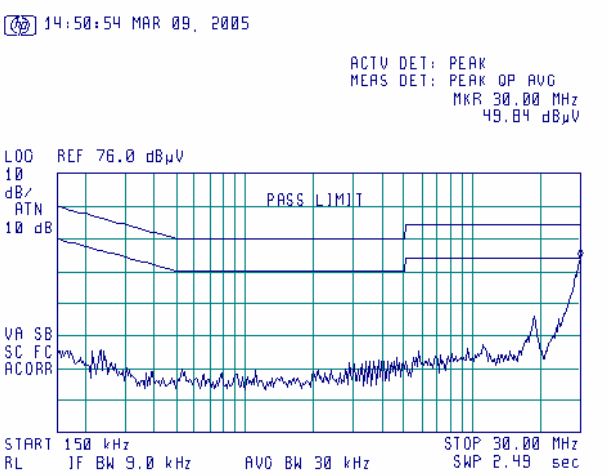
HL 0447	HL 1430	HL 1502	HL 1510				

Full description is given in Appendix A.

Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 8:41:05 AM		
Temperature: 24 ºC	Air Pressure: 1010 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks:			

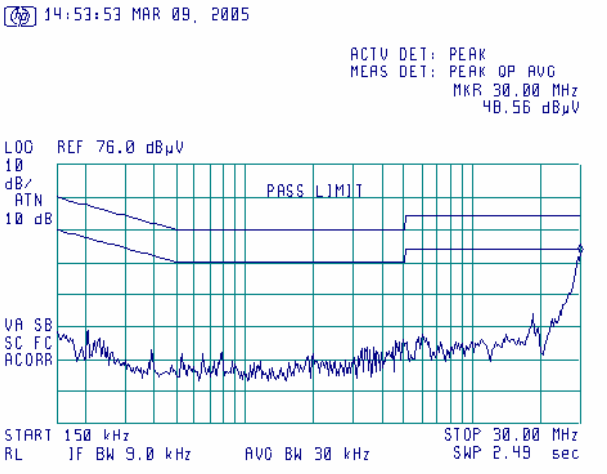
Plot 7.5.1 Conducted emission measurements

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



Plot 7.5.2 Conducted emission measurements

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



Test specification:	Section 15.247(a)1, (g), (h), Frequency hopping requirements		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/13/2005 8:53:24 AM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 12 VDC
Remarks:			

8 Transmitter tests according to §15.247 (FHSS) requirements

8.1 Frequency hopping requirements

The EUT was verified for compliance with frequency hopping requirements listed below:

- The EUT shall hop to channel frequencies that are selected from a pseudorandomly ordered list;
- Each hopping frequency shall be used equally on the average;
- The EUT receiver shall have input bandwidth that match the hopping channel bandwidth of the corresponding transmitter and shall shift frequencies in synchronization with the transmitted signals;
- The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

The rationale for compliance with the above requirements was either test results or supplier declaration. The summary of results is provided in Table 8.1.1.

Table 8.1.1 Frequency hopping requirements

Requirement	Rationale	Verdict
The EUT shall hop to channel frequencies that are selected from a pseudorandomly ordered list	Supplier declaration	Comply
Each hopping frequency shall be used equally on the average	Supplier declaration	Comply
The EUT receiver shall have input bandwidth that match the hopping channel bandwidth of the corresponding transmitter	Supplier declaration	Comply
The EUT receiver shall shift frequencies in synchronization with the transmitted signals	Supplier declaration	Comply
Each transmitter operates independently and there is no synchronization with other transmitters for purposes other than to avoid simultaneous channel occupancy	Supplier declaration	Comply

Test specification:	Section 15.247(a)1, 20 dB bandwidth		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/3/2005 5:36:10 PM		
Temperature: 19 ºC	Air Pressure: 1017 hPa	Relative Humidity: 23 %	Power Supply: 12 VDC
Remarks:			

8.2 20 dB bandwidth

8.2.1 General

This test was performed to measure 20 dB bandwidth of the transmitter hopping channel. Specification test limits are given in Table 8.2.1.

Table 8.2.1 20 dB bandwidth limits

Assigned frequency, MHz	Minimum bandwidth, kHz	Modulation envelope reference points*, dBc
902.0 – 928.0	500	20
2400.0 – 2483.5	NA	
5725.0 – 5850.0	1000	

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

8.2.2 Test procedure

8.2.2.1 The EUT was set up as shown in Figure 8.2.1, energized and its proper operation was checked.

8.2.2.2 The EUT was set to transmit modulated carrier at maximum data rate.

8.2.2.3 The transmitter bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 8.2.2 and associated plot.

8.2.2.4 The test was repeated for each data rate and each modulation format.

Figure 8.2.1 20 dB bandwidth test setup

Test specification:	**Section 15.247(a)1, 20 dB bandwidth**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/3/2005 5:36:10 PM		
Temperature: 19 ºC	**Air Pressure:** 1017 hPa	**Relative Humidity:** 23 %	**Power Supply:** 12 VDC
Remarks:			

Table 8.2.2 20 dB bandwidth test results

ASSIGNED FREQUENCY BAND: 2400 – 2483.5 MHz
DETECTOR USED: Peak
SWEEP TIME: Auto
RESOLUTION BANDWIDTH: ≥ 1% of the 20 dB bandwidth
VIDEO BANDWIDTH: ≥ RBW
MODULATION ENVELOPE REFERENCE POINTS: 20.0 dBc
MODULATING SIGNAL: PRBS
FREQUENCY HOPPING: Disabled

Carrier frequency, MHz	Type of modulation	Data rate, Mbps	Symbol rate, Msymbols/s	20 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
Low frequency							
2402	GFSK	1	1	842	1000	-158	Pass
Mid frequency							
2440	GFSK	1	1	867	1000	-133	Pass
High frequency							
2480	GFSK	1	1	883	1000	-117	Pass

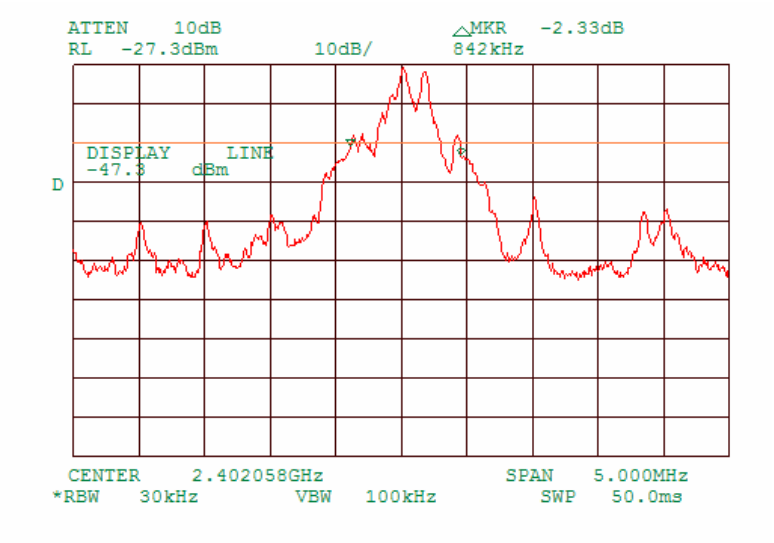
Reference numbers of test equipment used

HL 1424								

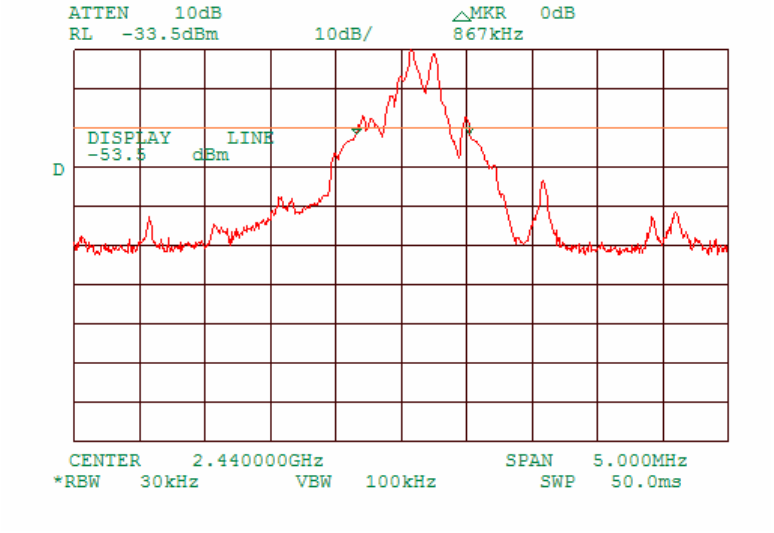
Full description is given in Appendix A.

Test specification:	Section 15.247(a)1, 20 dB bandwidth		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/3/2005 5:36:10 PM		
Temperature: 19 ºC	Air Pressure: 1017 hPa	Relative Humidity: 23 %	Power Supply: 12 VDC
Remarks:			

Plot 8.2.1 20 dB bandwidth test result at low frequency, 1 MBPS

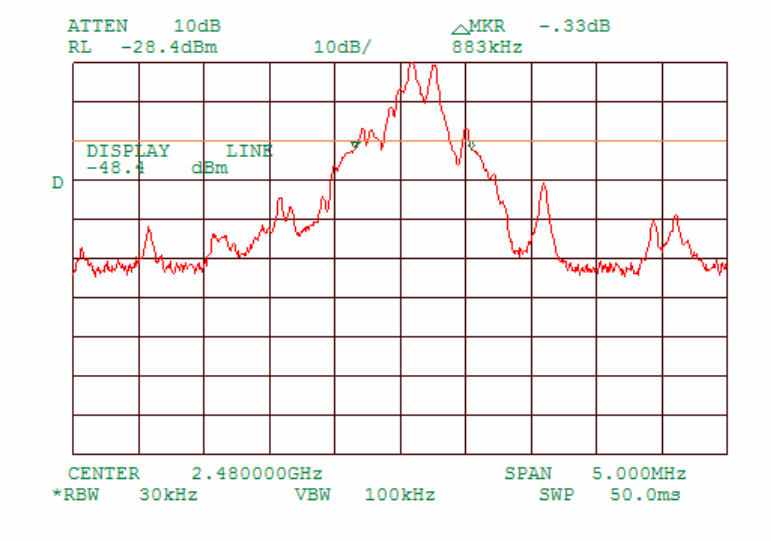


Plot 8.2.2 20 dB bandwidth test result at mid frequency, 1 MBPS



Test specification:	Section 15.247(a)1, 20 dB bandwidth		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/3/2005 5:36:10 PM		
Temperature: 19 ºC	Air Pressure: 1017 hPa	Relative Humidity: 23 %	Power Supply: 12 VDC
Remarks:			

Plot 8.2.3 20 dB bandwidth test result at high frequency, 1 MBPS



Test specification:	Section 15.247(a)1, Frequency separation		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/13/2005 6:41:52 PM		
Temperature: 19 ºC	Air Pressure: 1017 hPa	Relative Humidity: 23 %	Power Supply: 12 VDC
Remarks:			

8.3 Carrier frequency separation

8.3.1 General

This test was performed to measure frequency separation between the peaks of adjacent channels. Specification test limits are given in Table 8.3.1.

Table 8.3.1 Carrier frequency separation limits

Assigned frequency range, MHz	Carrier frequency separation
902.0 – 928.0	25 kHz or 20 dB bandwidth of the hopping channel, whichever is greater
2400.0 – 2483.5	
5725.0 – 5850.0	

8.3.2 Test procedure

8.3.2.1 The EUT was set up as shown in Figure 8.3.1, energized with frequency hopping function enabled and its proper operation was checked.

8.3.2.2 The spectrum analyzer span was set to capture the carrier frequency and both of adjacent channels, the lower and the higher. The resolution bandwidth was set wider than 1 % of the frequency span.

8.3.2.3 The spectrum analyzer was set in max hold mode and allowed trace to stabilize.

8.3.2.4 The frequency separation between the peaks of adjacent channels was measured as provided in Table 8.3.2 and associated plots.

Figure 8.3.1 Carrier frequency separation test setup

Test specification:	Section 15.247(a)1, Frequency separation		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/13/2005 6:41:52 PM		
Temperature: 19 ºC	Air Pressure: 1017 hPa	Relative Humidity: 23 %	Power Supply: 12 VDC
Remarks:			

Table 8.3.2 Carrier frequency separation test results

ASSIGNED FREQUENCY:	2400 – 2483.5 MHz
MODULATION:	GFSK
MODULATING SIGNAL:	PRBS
BIT RATE:	1 Mbps
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	≥ 1% of the span
VIDEO BANDWIDTH:	≥ RBW
FREQUENCY HOPPING:	Enabled
20 dB BANDWIDTH:	1000 kHz

Carrier frequency separation, kHz	Limit, kHz	Margin*, kHz	Verdict
970	883	87	Pass

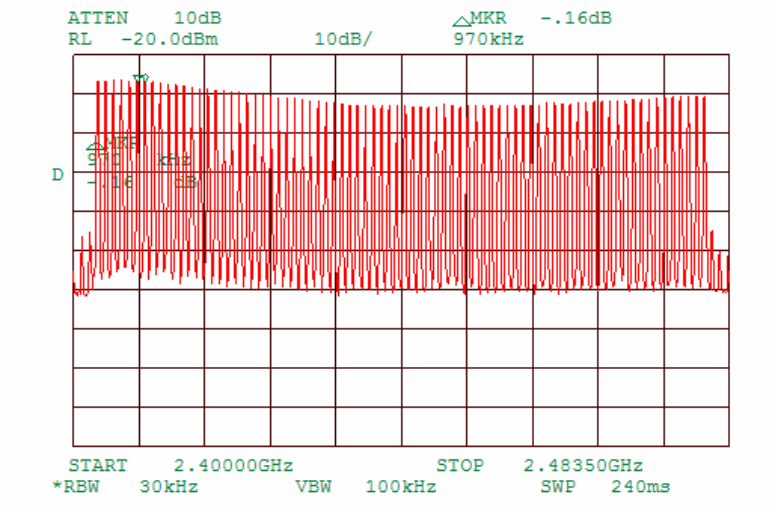
* - Margin = Carrier frequency separation – specification limit.

Reference numbers of test equipment used

HL 1424							

Full description is given in Appendix A.

Plot 8.3.1 Carrier frequency separation



Test specification:	Section 15.247(a)1, Number of hopping frequencies		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/13/2005 7:11:57 PM		
Temperature: 19 ºC	Air Pressure: 1017 hPa	Relative Humidity: 23 %	Power Supply: 12 VDC
Remarks:			

8.4 Number of hopping frequencies

8.4.1 General

This test was performed to calculate the number of hopping frequencies used by the EUT. Specification test limits are given in Table 8.4.1.

Table 8.4.1 Minimum number of hopping frequencies

Assigned frequency range, MHz	Number of hopping frequencies
902.0 – 928.0	50 (if the 20 dB bandwidth is less than 250 kHz) 25 (if the 20 dB bandwidth is 250 kHz or greater)
2400.0 – 2483.5	15
5725.0 – 5850.0	75

8.4.2 Test procedure

8.4.2.1 The EUT was set up as shown in Figure 8.4.1, energized with frequency hopping function enabled and its proper operation was checked.

8.4.2.2 Initially the spectrum analyzer span was set equal to frequency band of operation and the resolution bandwidth was set wider than 1 % of the frequency span. If the separate hopping channels were not clearly resolved the frequency band of operation was broken to sections and the resolution bandwidth was set wider than 1 % of the frequency span of each section.

8.4.2.3 The spectrum analyzer was set in max hold mode and allowed trace to stabilize.

8.4.2.4 The number of frequency hopping channels was calculated as provided in Table 8.4.2 and associated plots.

Figure 8.4.1 Hopping frequencies test setup

Test specification:	Section 15.247(a)1, Number of hopping frequencies		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	2/13/2005 7:11:57 PM		
Temperature: 19 ºC	Air Pressure: 1017 hPa	Relative Humidity: 23 %	Power Supply: 12 VDC
Remarks:			

Table 8.4.2 Hopping frequencies test results

ASSIGNED FREQUENCY:	2400 – 2483.5 MHz
MODULATION:	GFSK
MODULATING SIGNAL:	PRBS
BIT RATE:	1 Mbps
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	≥ 1% of the span
VIDEO BANDWIDTH:	≥ RBW
FREQUENCY HOPPING:	Enabled

Number of hopping frequencies	Minimum number of hopping frequencies	Margin*	Verdict
79	15	64	Pass

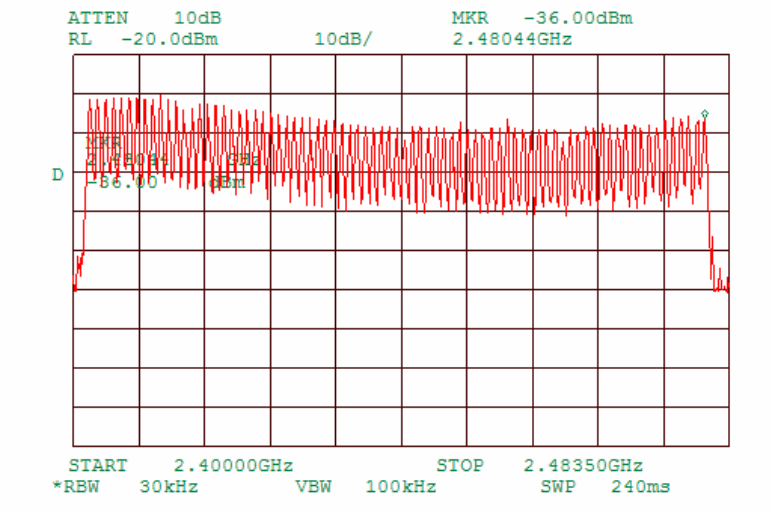
* - Margin = Number of hopping frequencies – Minimum number of hopping frequencies.

Reference numbers of test equipment used

HL 1424							

Full description is given in Appendix A.

Plot 8.4.1 Number of hopping frequencies



Test specification:	Section 15.247(a)1, Average time of occupancy		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 11:39:55 AM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 12 VDC
Remarks:			

8.5 Average time of occupancy

8.5.1 General

This test was performed to calculate the average time of occupancy (dwell time) on any frequency channel of the EUT. Specification test limits are given in Table 8.5.1.

Table 8.5.1 Average time of occupancy limits

Assigned frequency range, MHz	Maximum average time of occupancy, s	Investigated period, s	Number of hopping frequencies
2400.0 – 2483.5	0.4	0.4 × N	N (≥ 15)

8.5.2 Test procedure

8.5.2.1 The EUT was set up as shown in Figure 8.5.1 , energized with frequency hopping function enabled and its proper operation was checked.

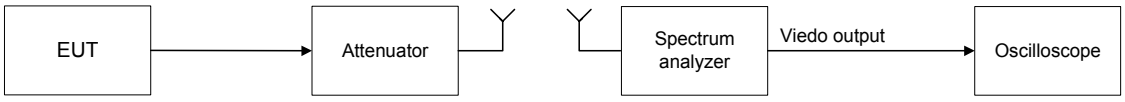
8.5.2.2 The spectrum analyzer span was set to zero centered on a hopping channel.

8.5.2.3 The single transmission duration and period were measured with oscilloscope.

8.5.2.4 The average time of occupancy was calculated as the single transmission time multiplied by the investigated period and divided by the single transmission period.

8.5.2.5 The test was repeated at each data rate and modulation type as provided in Table 8.5.2 and associated plots.

Figure 8.5.1 Average time of occupancy test setup



Test specification:	**Section 15.247(a)1, Average time of occupancy**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/9/2005 11:39:55 AM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 45 %	**Power Supply:** 12 VDC
Remarks:			

Table 8.5.2 Average time of occupancy test results

ASSIGNED FREQUENCY:	2400 – 2483.5 MHz
MODULATION:	GFSK
MODULATING SIGNAL:	1 PRBS
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	1 MHz
VIDEO BANDWIDTH:	3 MHz
NUMBER OF HOPPING FREQUENCIES:	79
MAXIMUM AVERAGE TIME OF OCCUPANCY:	400ms
INVESTIGATED PERIOD:	31.6 s
FREQUENCY HOPPING:	Enabled

Carrier frequency, MHz	Single transmission duration, ms	Single transmission period, ms	Symbol rate, Msymbol/s	Bit rate, Mbps	Average time of occupancy*, s	Limit, s	Margin, s**	Verdict
2402 - 2480	0.458	1.278	1	1	0.143	0.4	-0.256	Pass

* - Average time of occupancy = (Single transmission duration × Maximum average time of occupancy) / Single transmission period.
** - Margin = Average time of occupancy – specification limit.

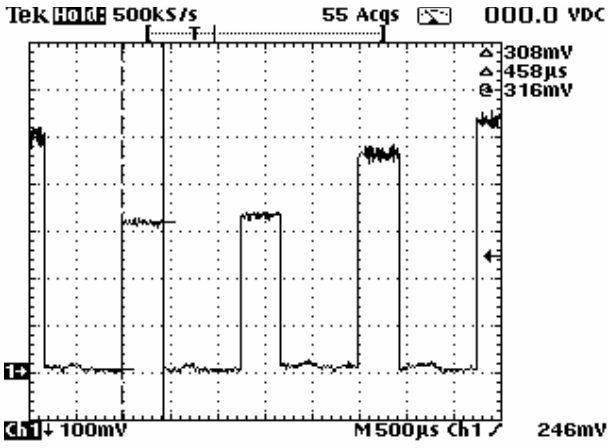
Reference numbers of test equipment used

HL 1562	HL 2227	HL 2259					

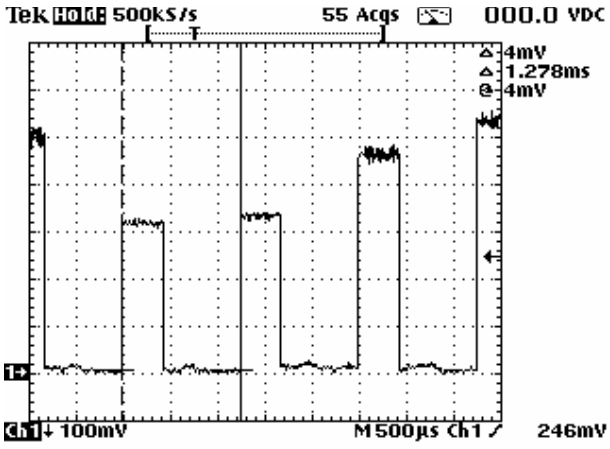
Full description is given in Appendix A.

Test specification:	Section 15.247(a)1, Average time of occupancy		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 11:39:55 AM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 12 VDC
Remarks:			

Plot 8.5.1 Single transmission duration



Plot 8.5.2 Single transmission period



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:32:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 12 VDC
Remarks:			

8.6 Peak output power

8.6.1 General

This test was performed to measure the maximum peak output power radiated by transmitter. Specification test limits are given in Table 8.6.1.

Table 8.6.1 Peak output power limits

Assigned frequency range, MHz	Peak output power*		Equivalent field strength limit @ 3m, dB(μV/m)*	Maximum antenna gain, dBi
	W	dBm		
902.0 – 928.0	0.125	21.0	122.2	6.0*
2400.0 – 2483.5	0.125 (<75 hopping channels) 1.0 (≥75 hopping channels)	21.0(<75 hopping channels) 30.0 (≥75 hopping channels)	122.2 (<75 hopping channels) 131.2 (≥75 hopping channels)	
5725.0 – 5850.0	1.0	30.0	131.2	

*- Equivalent field strength limit was calculated from the peak output power as follows: E=sqrt(30×P×G)/r, where P is peak output power in Watts, r is antenna to EUT distance in meters and G is transmitter antenna gain in dBi.
**- The limit is provided in terms of conducted RF power at the antenna connector. If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power limit shall be reduced below the stated value as follows:

- by 1 dB for every 3 dB that the directional gain of antenna exceeds 6 dBi for fixed point-to-point transmitters operate in 2400-2483.5 MHz band;
- without any corresponding reduction for fixed point-to-point transmitters operate in 5725-5850 MHz band;
- by the amount in dB that the directional gain of antenna exceeds 6 dBi for the rest of transmitters.

8.6.2 Test procedure

8.6.2.1 The EUT was set up as shown in Figure 8.6.1, energized and its proper operation was checked.

8.6.2.2 The EUT was adjusted to produce maximum available to end user RF output power.

8.6.2.3 The frequency span of spectrum analyzer was set approximately 5 times wider than 20 dB bandwidth of the EUT and the resolution bandwidth was set wider than 20 dB bandwidth of the EUT. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept in both vertical and horizontal polarizations.

8.6.2.4 The maximum field strength of the EUT carrier frequency was measured as provided in Table 8.6.2 and associated plots.

8.6.2.5 The maximum peak output power was calculated from the field strength of carrier as follows:

$$P = (E \times d)^2 / (30 \times G),$$

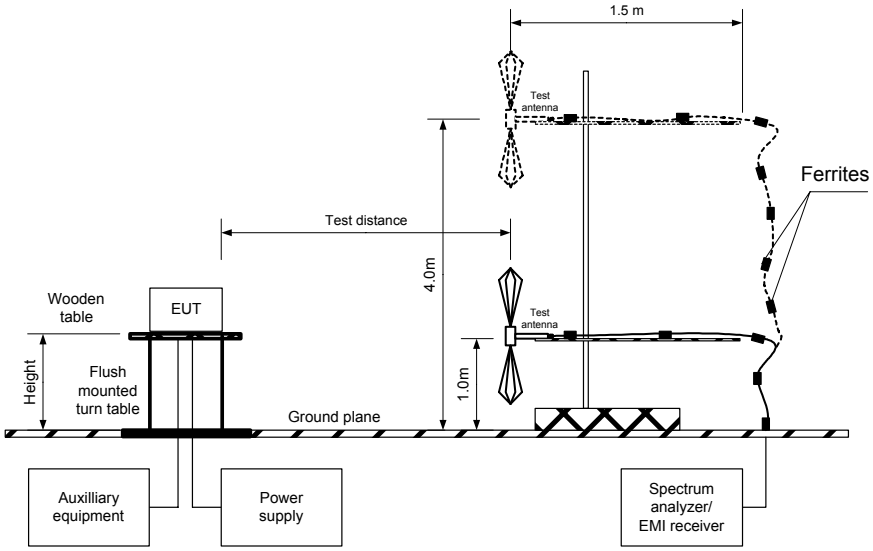
where P is the peak output power in W, E is the field strength in V/m, d is the test distance and G is the transmitter numeric antenna gain over an isotropic radiator.
The above equation was converted in logarithmic units for 3 m test distance:

Peak output power in dBm = Field strength in dB(μV/m) - Transmitter antenna gain in dBi – 95.2 dB

8.6.2.6 The worst test results (the lowest margins) were recorded in Table 8.6.2.

Test specification:	**Section 15.247(b), Peak output power**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/10/2005 5:32:31 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 45 %	**Power Supply:** 12 VDC
Remarks:			

Figure 8.6.1 Setup for carrier field strength measurements



Test specification:	**Section 15.247(b), Peak output power**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/10/2005 5:32:31 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 45 %	**Power Supply:** 12 VDC
Remarks:			

Table 8.6.2 Peak output power test results

ASSIGNED FREQUENCY:	2400 – 2483.5 MHz
TEST DISTANCE:	3 m
TEST SITE:	OATS
EUT HEIGHT:	0.8 m
DETECTOR USED:	Peak
TEST ANTENNA TYPE:	Biconilog (30 MHz – 1000 MHz) Double ridged guide (above 1000 MHz)
MODULATION:	GFSK
MODULATING SIGNAL:	PRBS
BIT RATE:	1 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
DETECTOR USED:	Peak
EUT 20 dB BANDWIDTH:	1 MHz
RESOLUTION BANDWIDTH:	2 MHz
VIDEO BANDWIDTH:	3 MHz
FREQUENCY HOPPING:	Disabled
NUMBER OF FREQUENCY HOPPING CHANNELS:	79

Frequency, MHz	Field strength, dB(µV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	EUT antenna gain, dBi	Peak output power, dBm**	Limit, dBm	Margin, dB***	Verdict
2402	96.00	H	1.5	120	3.2	-2.43	30	-28.23	Pass
2440	93.80	H	1.3	240	3.2	-4.63	30	-30.40	Pass
2480	98.70	H	1.4	210	3.2	0.27	30	-25.56	Pass

*- EUT front panel refer to 0 degrees position of turntable.
**- Peak output power was calculated from the field strength of carrier as follows: $P = (E \times d)^2 / (30 \times G)$,
where P is the peak output power in W, E is the field strength in V/m, d is the test distance in meters and G is the transmitter numeric antenna gain over an isotropic radiator. The above equation was converted in logarithmic units for 3 m test distance: *Peak output power in dBm = Field strength in dB(µV/m) - Transmitter antenna gain in dBi – 95.2 dB*
***- Margin = Peak output power – specification limit.

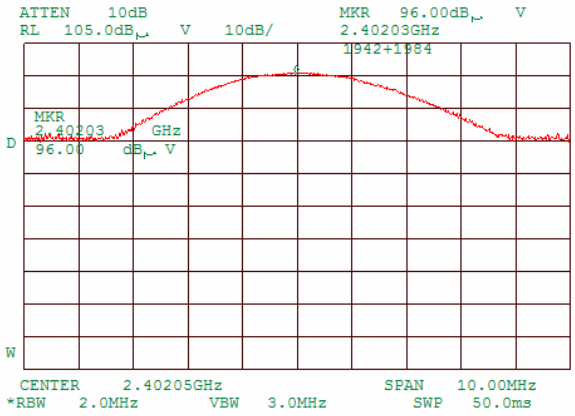
Reference numbers of test equipment used

HL 1424	HL 1942	HL 1984					

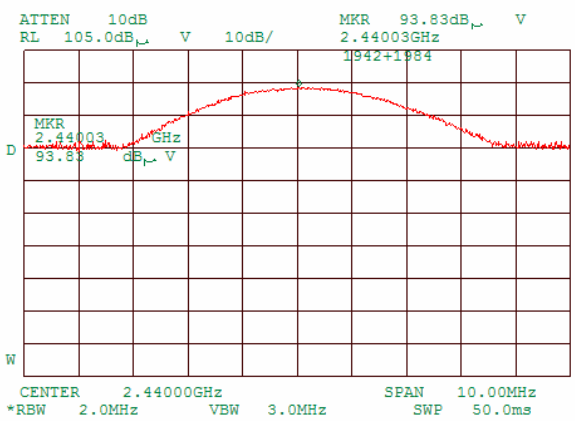
Full description is given in Appendix A.

Test specification:	Section 15.247(b), Peak output power		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:32:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 12 VDC
Remarks:			

Plot 8.6.1 Field strength of carrier at low frequency

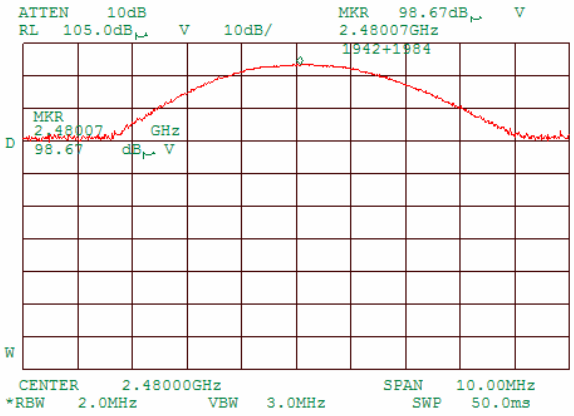


Plot 8.6.2 Field strength of carrier at mid frequency



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 5:32:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 12 VDC
Remarks:			

Plot 8.6.3 Field strength of carrier at high frequency



Test specification:	Section 15.247(c), Emissions at band edges		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 12:34:24 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

8.7 Band edge radiated emissions

8.7.1 General

This test was performed to measure emissions, radiated from the EUT at the assigned frequency band edges. Specification test limits are given in Table 8.7.1.

Table 8.7.1 Band edge emission limits

Assigned frequency, MHz	Attenuation below carrier*, dBc	Field strength at 3 m within restricted bands, dB(µV/m)	
		Peak	Average
902.0 – 928.0	20.0	74.0	54.0
2400.0 – 2483.5			
5725.0 – 5850.0			

* - Band edge emission limit is provided in terms of attenuation below the peak of modulated carrier measured with the same resolution bandwidth.

8.7.2 Test procedure

8.7.2.1 The EUT was set up as shown in Figure 8.7.1, energized normally modulated at the maximum data rate with its hopping function disabled and its proper operation was checked.

8.7.2.2 The EUT was adjusted to produce maximum available to end user RF output power at the lowest carrier frequency.

8.7.2.3 The spectrum analyzer span was set to capture the carrier frequency and associated modulation products. The resolution bandwidth was set wider than 1 % of the frequency span.

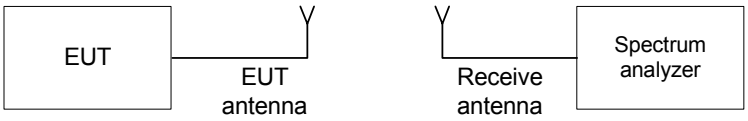
8.7.2.4 The spectrum analyzer was set in max hold mode and allowed trace to stabilize. The highest emission level within the authorized band was measured.

8.7.2.5 The maximum band edge emission and modulation product outside of the band were measured as provided in Table 8.7.2 and associated plots and referenced to the highest emission level measured within the authorized band.

8.7.2.6 The above procedure was repeated with the EUT adjusted to produce maximum RF output power at the highest carrier frequency.

8.7.2.7 The above procedure was repeated with the frequency hopping function enabled.

Figure 8.7.1 Band edge emission test setup



Test specification:	**Section 15.247(c), Emissions at band edges**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/9/2005 12:34:24 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks:			

Table 8.7.2 Band edge emission test results

ASSIGNED FREQUENCY RANGE: 2400 – 2483.5MHz
DETECTOR USED: Peak
MODULATION: DQPSK
MODULATING SIGNAL: PRBS
BIT RATE: 1 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
RESOLUTION BANDWIDTH: ≥ 1% of the span
VIDEO BANDWIDTH: ≥ RBW

Frequency, MHz	Band edge emission, dBm	Emission at carrier, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
Frequency hopping disabled						
2402	-69.39	-28.10	41.29	20.0	21.29	Pass
2480	-71.89	-31.90	39.99		19.99	
Frequency hopping enabled						
2402	-69.22	-28.61	40.61	20.0	20.61	Pass
2480	-70.72	-32.10	38.62		18.62	

*- Margin = Attenuation below carrier – specification limit.

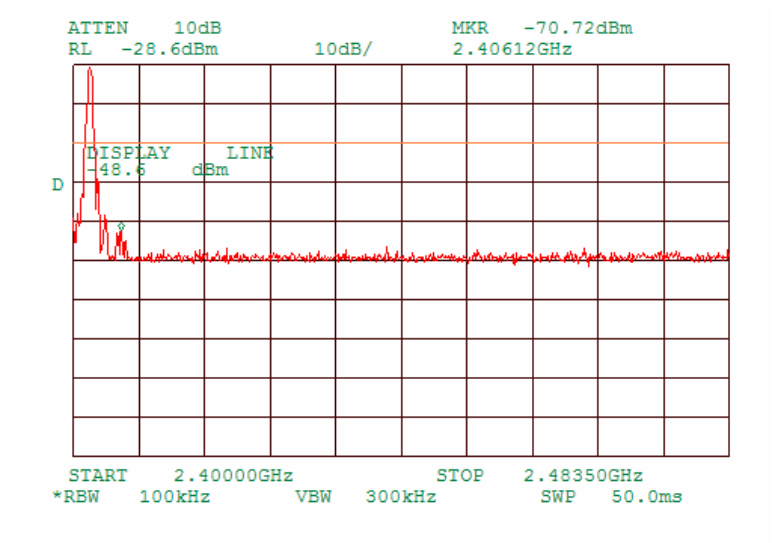
Reference numbers of test equipment used

HL 1424	HL 1941						

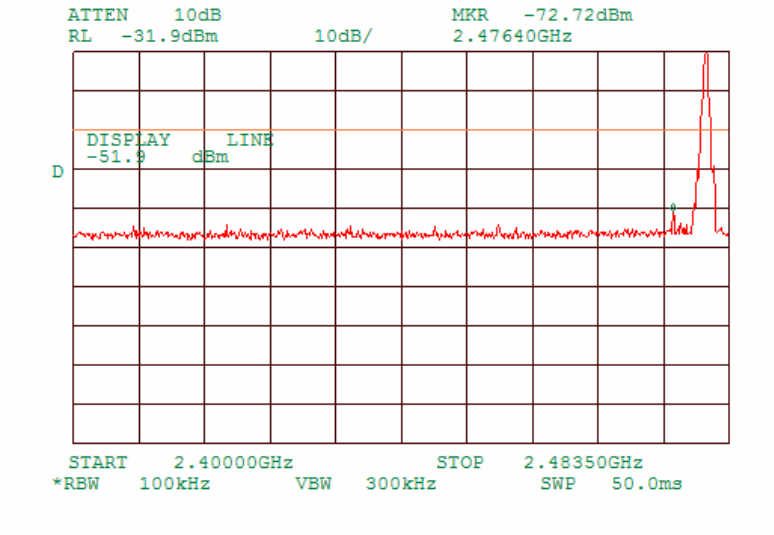
Full description is given in Appendix A.

Test specification:	Section 15.247(c), Emissions at band edges		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 12:34:24 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

Plot 8.7.1 The highest emission level within the assigned band at low carrier frequency

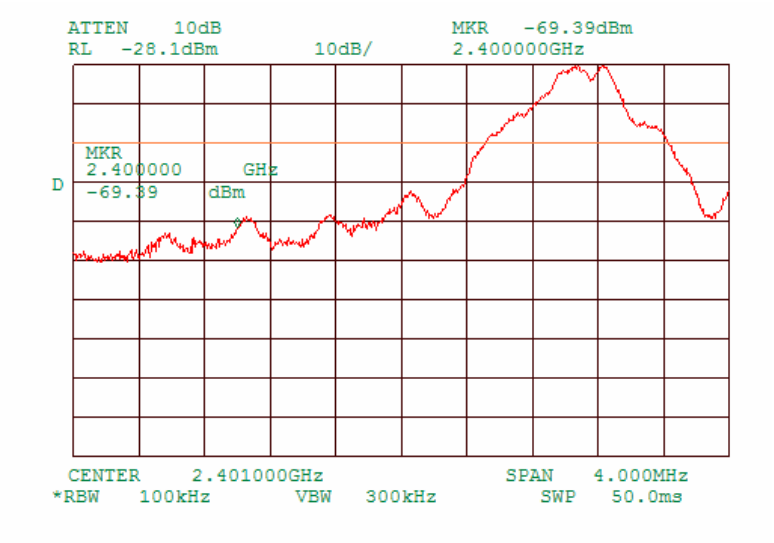


Plot 8.7.2 The highest emission level within the assigned band at high carrier frequency

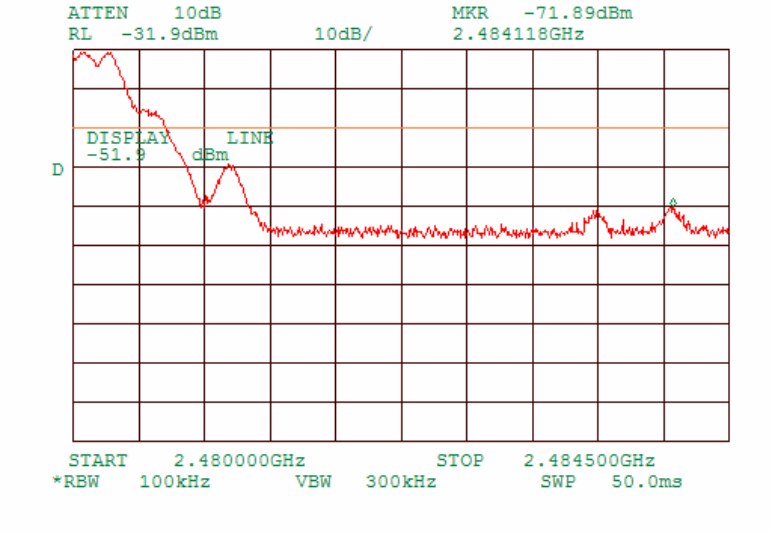


Test specification:	Section 15.247(c), Emissions at band edges		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 12:34:24 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

Plot 8.7.3 The highest band edge emission at low carrier frequency with hopping function disabled

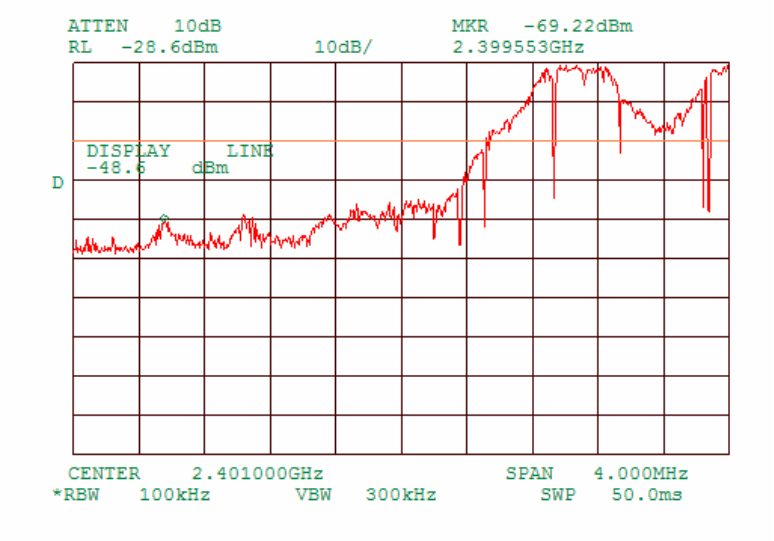


Plot 8.7.4 The highest band edge emission at high carrier frequency with hopping function disabled

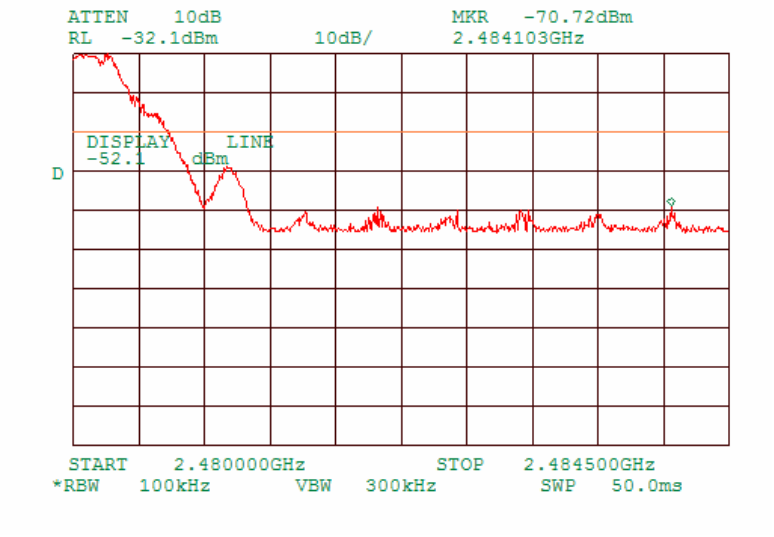


Test specification:	Section 15.247(c), Emissions at band edges		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 12:34:24 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

Plot 8.7.5 The highest band edge emission at low carrier frequency with hopping function enabled



Plot 8.7.6 The highest band edge emission at high carrier frequency with hopping function enabled



Test specification:	**Section 15.203, Antenna requirements**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/13/2005 8:54:50 AM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 45 %	**Power Supply:** 12 VDC
Remarks:			

8.8 Antenna requirements

The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed for use with the EUT. This requirement does not apply to professionally installed transmitters.
The rationale for compliance with the above requirements was either visual inspection results or supplier declaration. The summary of results is provided in Table 8.8.1.

Table 8.8.1 Antenna requirements

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

Test specification:	Section 15.107, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 9:11:33 AM		
Temperature: 24 ºC	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

9 Emission tests according to 47CFR part 15 subpart B requirements

9.1 Conducted emissions

9.1.1 General

This test was performed to measure common mode conducted emissions at the mains power port.
Specification test limits are given in Table 9.1.1. The worst test results (the lowest margins) were recorded in Table 9.1.2 and shown in the associated plots.

Table 9.1.1 Limits for conducted emissions

Frequency, MHz	Class B limit, dB(µV)		Class A limit, dB(µV)	
	QP	AVRG	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*	79	66
0.5 - 5.0	56	46	73	60
5.0 - 30	60	50	73	60

* The limit decreases linearly with the logarithm of frequency.

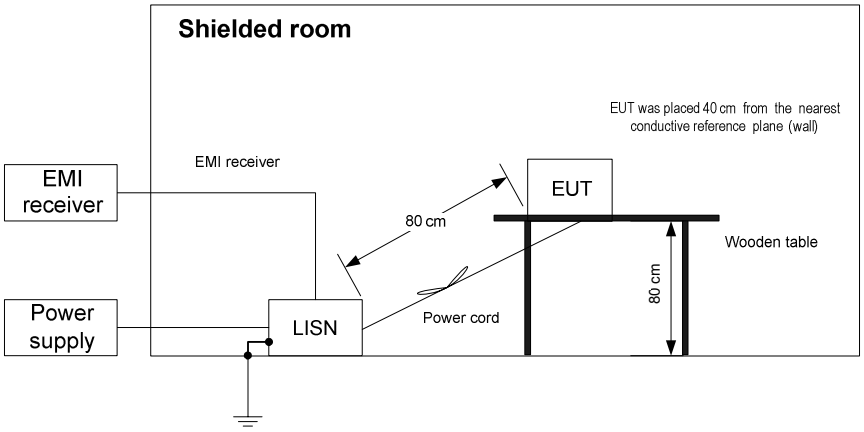
9.1.2 Test procedure

9.1.2.1 The EUT was set up as shown in Figure 9.1.1, energized and the performance check was conducted.

9.1.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 9.1.1. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

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

Figure 9.1.1 Setup for conducted emission measurements, table-top equipment



Test specification:	**Section 15.107, Conducted emission at AC power port**		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/10/2005 9:11:33 AM		
Temperature: 24 ºC	**Air Pressure:** 1010 hPa	**Relative Humidity:** 48 %	**Power Supply:** 120 VAC
Remarks:			

Table 9.1.2 Conducted emission test results

LINE:	AC mains
LIMIT:	Class B
EUT OPERATING MODE:	Receive and Stand-by
EUT SET UP:	TABLE-TOP
TEST SITE:	SHIELDED ROOM
DETECTORS USED:	PEAK / QUASI-PEAK / AVERAGE
FREQUENCY RANGE:	150 kHz - 30 MHz
RESOLUTION BANDWIDTH:	9 kHz

Frequency, MHz	Peak emission, dB(µV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*	Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*		
18.050079	31.27	27.10	60.00	-32.90	20.01	50.00	-29.99	L1	Pass
29.416978	49.88	39.77	60.00	-20.23	30.02	50.00	-19.98		
18.055460	32.73	29.58	60.00	-30.42	20.71	50.00	-29.29	L2	Pass
29.743691	51.34	42.09	60.00	-17.91	30.31	50.00	-19.69		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

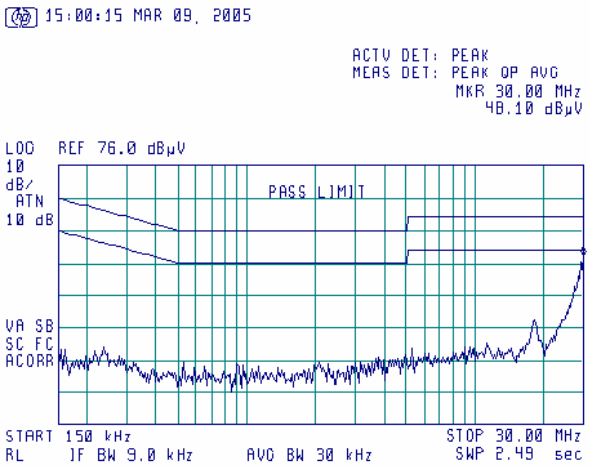
HL 0447	HL 0787	HL 1430	HL 1501	HL 1510			

Full description is given in Appendix A.

Test specification:	Section 15.107, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/10/2005 9:11:33 AM		
Temperature: 24 ºC	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

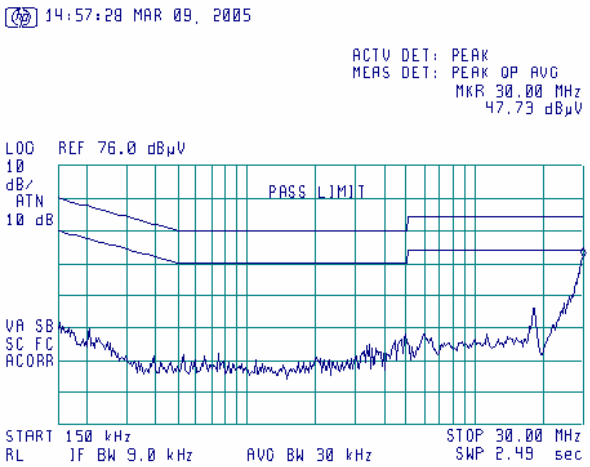
Plot 9.1.1 Conducted emission measurements

LINE: L1
LIMIT: Class B
EUT OPERATING MODE: Receive and Stand-by
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 9.1.2 Conducted emission measurements

LINE: L2
LIMIT: Class B
EUT OPERATING MODE: Receive and Stand-by
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 11:58:20 AM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

9.2 Radiated emission measurements

9.2.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 9.2.1.

Table 9.2.1 Radiated emission test limits

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

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

9.2.2 Test procedure for measurements in semi-anechoic chamber

9.2.2.1 The EUT was set up as shown in Figure 9.2.1, energized and the performance check was conducted.

9.2.2.2 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.

9.2.2.3 The worst test results (the lowest margins) were recorded in Table 9.2.2 and shown in the associated plots.

9.2.3 Test procedure for measurements at OATS

9.2.3.1 The EUT was set up as shown in Figure 9.2.2, energized and the performance check was conducted.

9.2.3.2 Final measurements were performed at the open area test site at 10 m test distance. The EUT wires and cables were arranged to produce maximum emission as it was found during preliminary measurements. The frequencies yield the worst test results (the lowest margins) during preliminary testing were 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 and its polarization was changed from vertical to horizontal. At frequencies where high ambient noise was encountered, the final measurements were taken in the anechoic chamber at 3 m distance.

9.2.3.3 The worst test results (the lowest margins) were recorded in Table 9.2.2 and shown in the associated plots.

Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 11:58:20 AM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

Figure 9.2.1 Setup for radiated emission measurements in anechoic chamber, table-top equipment

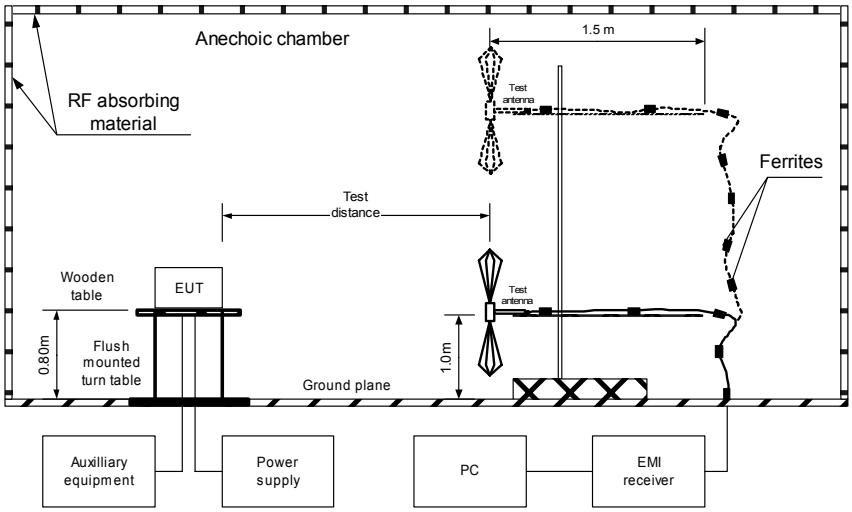
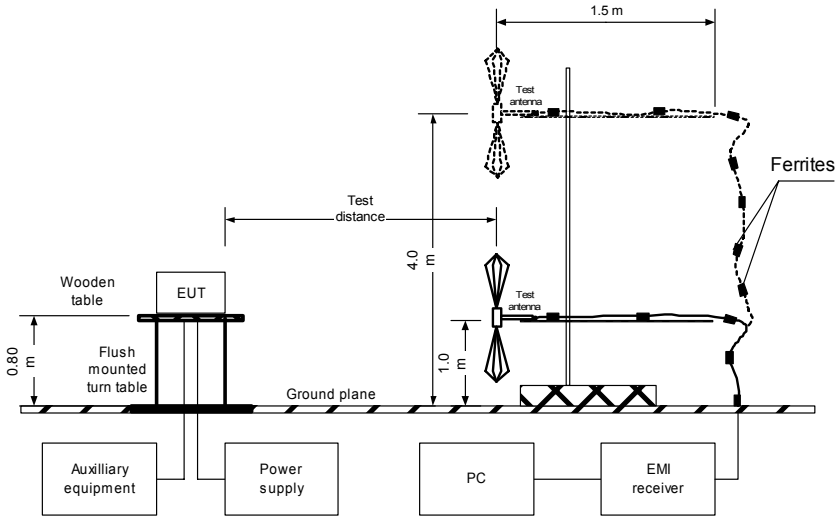


Figure 9.2.2 Setup for radiated emission measurements at OATS, table-top equipment



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/9/2005 11:58:20 AM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks:			

Table 9.2.2 Radiated emission test results

EUT SET UP: TABLE-TOP
LIMIT: Class B
EUT OPERATING MODE: Receive and Stand-by
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*				
68.256250	31.86	27.07	40.00	-12.93	Vertical	1.0	136	Pass
133.247717	33.10	28.29	43.50	-15.21	Horizontal	1.9	360	
139.751250	30.38	25.52	43.50	-17.98	Horizontal	1.0	360	
159.247200	34.99	30.35	43.50	-13.15	Horizontal	1.8	360	
178.750000	35.41	30.71	43.50	-12.79	Horizontal	1.0	203	
308.742500	32.95	27.72	46.00	-18.28	Horizontal	1.1	27	
380.245000	34.19	28.83	46.00	-17.17	Vertical	1.0	149	
399.745000	37.98	32.85	46.00	-13.15	Horizontal	1.0	174	
536.247500	32.25	26.61	46.00	-19.39	Vertical	1.0	148	
708.497500	35.39	31.87	46.00	-14.13	Horizontal	1.0	148	
851.497575	35.92	32.51	46.00	-13.49	Vertical	1.0	16	

TEST SITE: OATS
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 MHz – 13000 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*				
1067.00000	46.76	38.23	54.00	-15.77	Vertical	1.1	145	Pass
1195.00000	44.84	29.55	54.00	-24.45	Vertical	1.0	252	
1332.12500	48.06	33.29	54.00	-20.71	Vertical	1.0	250	
1465.00000	48.68	33.80	54.00	-20.20	Vertical	1.0	362	
1592.93203	47.12	28.67	54.00	-25.33	Vertical	1.0	166	

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

Reference numbers of test equipment used

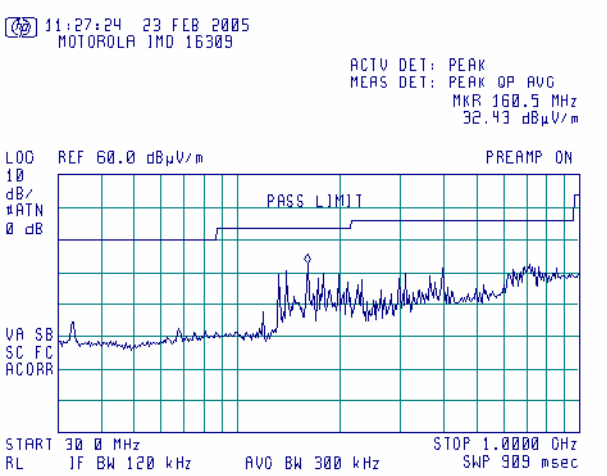
HL 0465	HL 0521	HL 0589	HL 0592	HL 0593	HL 0594	HL 0604	HL 1424
HL 1941	HL 1942	HL 1984	HL 2009	HL 2259	HL 2260		

Full description is given in Appendix A.

Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/9/2005 11:58:20 AM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks:			

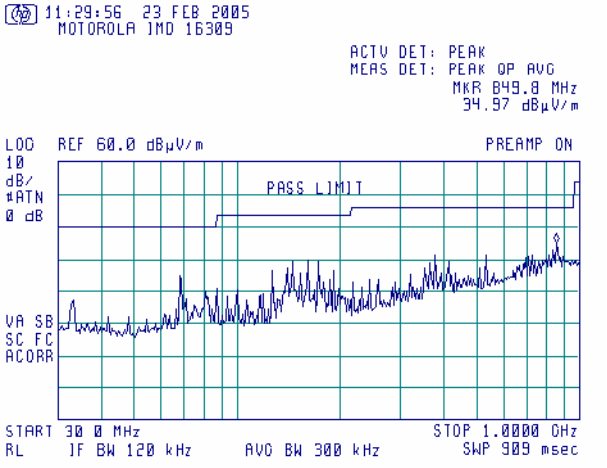
Plot 9.2.1 Radiated emission measurements in 30- 1000 MHz range, vertical antenna polarization

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



Plot 9.2.2 Radiated emission measurements in 30- 1000 MHz range, horizontal antenna polarization

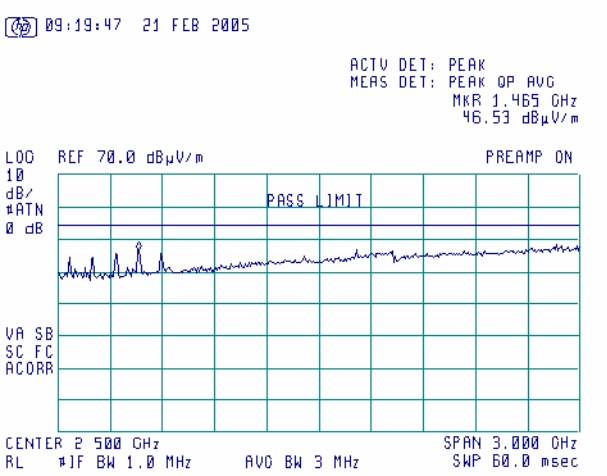
TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive and Stand-by



Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 11:58:20 AM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

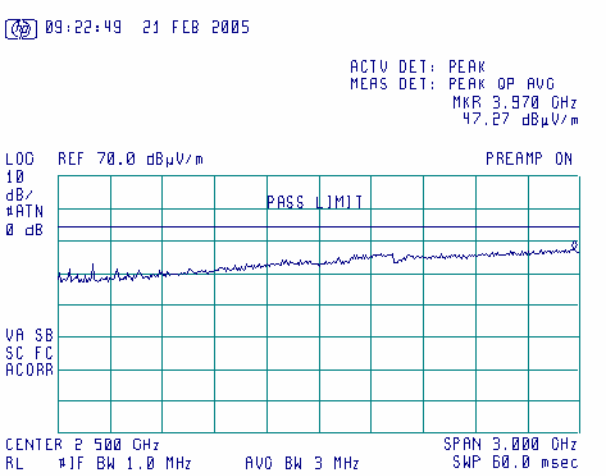
Plot 9.2.3 Radiated emission measurements in 1000 - 4000 MHz range, vertical antenna polarization

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



Plot 9.2.4 Radiated emission measurements in 1000 - 4000 MHz range, horizontal antenna polarization

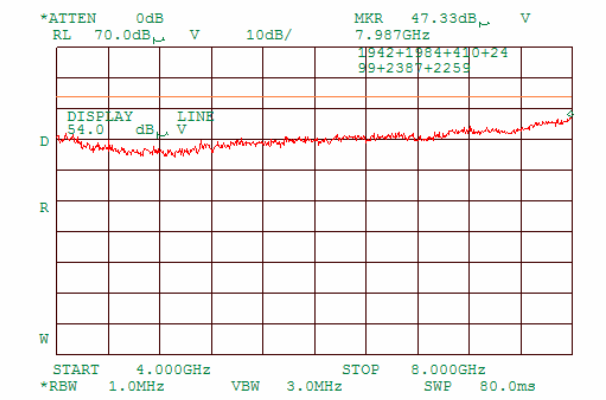
TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive and Stand-by



Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/9/2005 11:58:20 AM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks:			

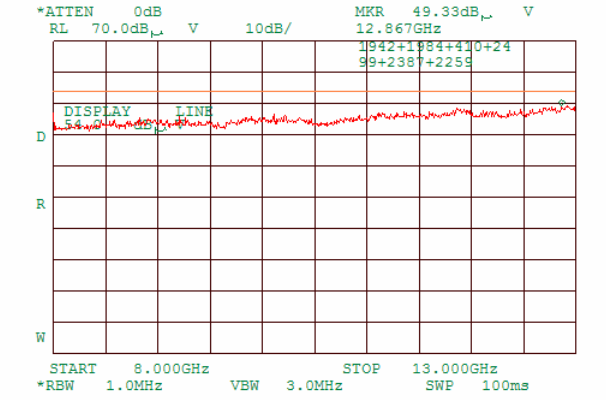
Plot 9.2.5 Radiated emission measurements in 4000 – 8000 MHz, vertical and horizontal antenna polarization

TEST SITE: OATS
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive and Stand-by



Plot 9.2.6 Radiated emission measurements in 8000 – 13000 MHz, vertical antenna polarization

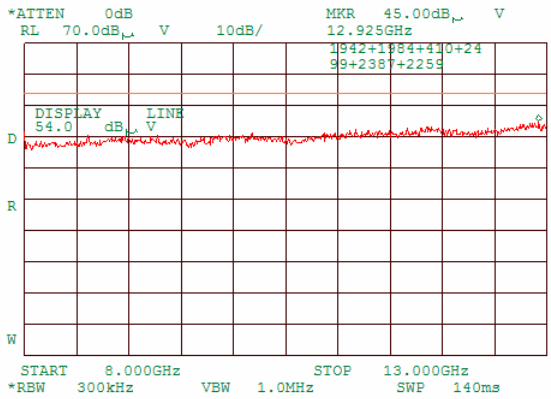
TEST SITE: OATS
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive and Stand-by



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	3/9/2005 11:58:20 AM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks:			

Plot 9.2.7 Radiated emission measurements in 8000 – 13000 MHz, horizontal antenna polarization

TEST SITE: OATS
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive and Stand-by



10 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0446	Antenna, Loop active, 10kHz-30MHz	EMCO	6502	2857	28-Jun-04	28-Jun-05
0447	LISN, 16/2, 300V RMS	HL	LISN 16 - 1	066	03-Nov-04	03-Nov-05
0465	Anechoic Chamber 9(L) x 6.5(W) x 5.5(H) m	HL	AC - 1	023	03-Nov-04	03-Nov-05
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	10-Oct-04	10-Oct-05
0589	Cable Coaxial, GORE A2P01POL118, 2.3 m	HL	GORE-3	176	02-Dec-04	02-Dec-05
0592	Position Controller	HL	L2-SR3000 (HL CRL-3)	100	02-Dec-04	02-Dec-05
0593	Antenna Mast, 1-4 m Pneumatic	Madgesh	AM-F1	101	03-Feb-05	03-Feb-06
0594	Turn Table FOR ANECHOIC CHAMBER flush mount d=1.2 m Pneumatic	HL	TT-WDC1	102	27-Jan-05	27-Jan-06
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE 26 - 2000 MHz	EMCO	3141	9611-1011	27-Jan-05	27-Jan-06
0610	Ampermeter, 0 - 20 A DC	Westinghouse	Type Px4	256 3356	27-Jan-05	27-Jan-06
0768	Antenna Standard Gain Horn,18-26.5 GHz, WR-42, K-band, Gain - 25 dB	Quinstar Technology	QWH-4200-BA	110	21-Jul-04	21-Jul-05
0769	Antenna Standard Gain Horn, 26.5-40 GHz, WR28, Ka band, Gain 25 dB	Quinstar Technology	QWH-2800-BA	112	21-Jul-04	21-Jul-05
0787	Transient Limiter	Hewlett Packard	11947A	3107A018 77	21-Nov-04	21-Nov-05
1200	Quadruplexer 1-12 GHz (1-2 GHz; 2-4GHz;4-8 GHz; 8-12GHz)	Elettronica S.p.A. - Roma	UE 84	D/00240	10-Feb-05	10-Feb-06
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies (HP)	8564EC	3946A002 19	30-Aug-04	30-Aug-05
1430	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL1432	Agilent Technologies (HP)	8542E	3807A002 62,3705A0 0217	01-Sep-04	01-Sep-05
1501	Cable RF, 6 m	Belden	M17/167 MIL-C-17	1501	23-Sep-04	23-Sep-05
1502	Cable RF, 6 m	Belden	M17/167 MIL-C-17	1502	12-Feb-05	12-Feb-06
1510	Cable RF, 8 m	Belden	M17/167 MIL-C-17	1510	02-Dec-04	02-Dec-05
1562	Oscilloscope 100 MHz, DMM	Tektronix	THS720A	B039444	23-Sep-04	23-Sep-05
1941	Cable 18GHz, 4 m, green	Rhophase Microwave Limited	SPS-1803A-4000-NPS	T4657	17-Oct-04	17-Oct-05
1942	Cable 18GHz, 4 m, blue	Rhophase Microwave Limited	SPS-1803A-4000-NPS	T4658	17-Oct-04	17-Oct-05
1947	Cable 18GHz, 6.5 m, blue	Rhophase Microwave Limited	NPS-1803A-6500-NPS	T4974	17-Oct-04	17-Oct-05
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W, N-type	EMC Test Systems	3115	9911-5964	23-Sep-04	23-Sep-05

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
2009	Cable RF, 8 m	Alpha Wire	RG-214	C-56	02-Dec-04	02-Dec-05
2227	Crystal Detector 0.01-18 GHz	Hewlett Packard	8472A	NA	02-Dec-04	02-Dec-05
2259	Amplifier Low Noise 2-20 GHz	Sophia Wireless	LNA0220-C	0223	05-Nov-04	05-Nov-05
2260	Amplifier Low Noise 14-33 GHz	Sophia Wireless	LNA28-B	0233	05-Nov-04	05-Nov-05
2261	Amplifier Low Noise 33-40 GHz	Sophia Wireless	LNA38-B	0234	05-Nov-04	05-Nov-05
2387	Filter Bandpass, 8-14 GHz	HL	FBP8-14	2387	14-Oct-04	14-Oct-05
2399	Cable 40GHz, 1.5 m, blue	Rhophase Microwave Limited	KPS-1503A-1500-KPS	X2945	14-Oct-04	14-Oct-05
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	14-Oct-04	14-Oct-05

11 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

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

The test equipment has been calibrated according to its recommended procedures and is within the manufacturer's published limit of error. The standards and instruments used in the calibration system conform to the present requirements of ISO/IEC 17025 (or alternately ANSI/NCSL Z540-1).
The laboratory calibrates its measurement standards by a third party (traceable to NIST, USA) on a regular basis according to equipment manufacturer requirements. The Hermon Labs EMC measurements uncertainty is given in the table above.

12 APPENDIX C Test facility 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 2186-1 for OATS and IC 2186-2 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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Person for contact: Mr. Alex Usoskin, CEO.

13 APPENDIX D Specification references

47CFR part 15: 2004	Radio Frequency Devices.
FR Vol.62	Federal Register, Volume 62, May 13, 1997
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4: 2001	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.

14 APPENDIX E Abbreviations and acronyms

A	ampere
AC	alternating current
AM	amplitude modulation
AVRG	average (detector)
CCK	Convolution Code Key
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
DBPSK	Differential Bit Phase Shift Key
DC	direct current
DQPSK	Differential Quadrature Phase Shift Key
DSSS	Direct Sequence Spread Spectrum
DTS	digital transmission system
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
FHSS	frequency hopping spread spectrum
GHz	gigahertz
GND	ground
H	height
HL	Hermon Laboratories
Hz	hertz
ITE	information technology equipment
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
NT	not tested
OATS	open area test site
Ω	Ohm
PCB	printed circuit board
PM	pulse modulation
PRBS	Pseudo Random Bit Sequence
PS	power supply
ppm	part per million (10^{-6})
QP	quasi-peak
QPSK	Quadrature Phase Shift Key
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
VA	volt-ampere

15 APPENDIX F Test equipment correction factors

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

Frequency, MHz	Correction factor, dB	Frequency, MHz	Correction factor, dB
0.01	5.0	3.0	0.1
0.02	2.2	4.0	0.1
0.03	1.1	5.0	0.1
0.04	0.7	6.0	0.2
0.05	0.5	10.0	0.3
0.1	0.2	12.0	0.4
0.2	0.1	16.0	0.5
0.4	0.1	18.0	0.6
0.6	0.1	20.0	0.7
0.8	0.1	25.0	0.9
1.0	0.1	28.0	1.2
2.0	0.1	30.0	1.3

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

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
EMC Test Systems, model 3115, serial no: 9911-5964, HL 1984

Frequency, MHz	Antenna gain, dBi	Antenna factor. dB(1/m)
1000.0	5.8	24.5
1500.0	9.0	24.8
2000.0	8.6	27.7
2500.0	9.5	28.7
3000.0	8.9	30.8
3500.0	8.2	32.9
4000.0	9.6	32.7
4500.0	11.2	32.1
5000.0	10.6	33.6
5500.0	9.8	35.3
6000.0	10.1	35.7
6500.0	10.7	35.8
7000.0	10.9	36.2
7500.0	10.5	37.2
8000.0	11.1	37.2
8500.0	10.8	38.1
9000.0	10.7	38.6
9500.0	11.5	38.3
10000.0	11.8	38.4
10500.0	12.3	38.3
11000.0	12.3	38.8
11500.0	11.5	39.9
12000.0	12.2	39.6
12500.0	12.6	39.5
13000.0	12.0	40.5
13500.0	11.7	41.1
14000.0	11.7	41.5
14500.0	12.7	40.8
15000.0	14.2	39.5
15500.0	16.0	38.1
16000.0	16.2	38.1
16500.0	14.5	40.1
17000.0	12.2	42.6
17500.0	9.7	45.4
18000.0	6.6	48.7

Antenna factor 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
EMC Test Systems, model 3115, serial no: 00027177, HL 2432

Frequency, MHz	Antenna gain, dBi	Antenna factor. dB(1/m)
1000.0	5.5	24.7
1500.0	8.0	25.7
2000.0	8.4	27.8
2500.0	9.3	28.9
3000.0	9.0	30.7
3500.0	9.3	31.8
4000.0	9.3	33.0
4500.0	10.4	32.8
5000.0	10.0	34.2
5500.0	10.1	34.9
6000.0	10.6	35.2
6500.0	11.0	35.4
7000.0	10.8	36.3
7500.0	10.4	37.3
8000.0	10.8	37.5
8500.0	10.8	38.0
9000.0	11.0	38.3
9500.0	11.5	38.3
10000.0	11.5	38.7
10500.0	11.9	38.7
11000.0	12.2	38.9
11500.0	11.9	39.5
12000.0	12.3	39.5
12500.0	12.7	39.4
13000.0	12.0	40.5
13500.0	12.0	40.8
14000.0	11.6	41.5
14500.0	12.2	41.3
15000.0	13.6	40.2
15500.0	15.3	38.7
16000.0	15.8	38.5
16500.0	14.8	39.8
17000.0	12.9	41.9
17500.0	9.2	45.8
18000.0	6.2	49.1

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

Antenna Factor
Active Loop Antenna
EMC Test Systems, model 6502, serial number 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).

Standard gain horn antenna
Quinstar Technology
Model QWH
Ser.No.112, HL 0768, 0769, 0770

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

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

Cable loss
Cable Coaxial, GORE A2P01POL118, 2.3 m, model:GORE-3, HL 0589
+ Cable Coaxial, ANDREW PSWJ4, 6m, model: ANDREW-6, HL 1004

No.	Frequency, MHz	Cable loss, dB	Tolerance (Specification), dB	Measurement uncertainty, dB
1	30	0.33	≤ 6.5	±0.12
2	50	0.40		
3	100	0.57		
4	300	0.97		
5	500	1.25		
6	800	1.59		
7	1000	1.81		
8	1200	1.97		
9	1400	2.15		
10	1600	2.28		
11	1800	2.43		
12	2000	2.61		
13	2200	2.75		
14	2400	2.89		
15	2600	2.97		
16	2800	3.21	≤ 6.5	±0.12
17	3000	3.32		
18	3300	3.47		
19	3600	3.62		
20	3900	3.84		
21	4200	3.92		±0.17
22	4500	4.07		
23	4800	4.36		
24	5100	4.62		
25	5400	4.78		
26	5700	5.16		
27	6000	5.67		
28	6500	5.99		

Cable loss
Cable coaxial, 6 m, model: M17/167 MIL-C-17, HL 1502

Frequency, MHz	Cable loss, dB
0.1	0.02
1	0.07
3	0.15
5	0.17
10	0.26
30	0.43
50	0.57
80	0.72
100	0.81
300	1.48
500	2.00
800	2.70
1000	3.09

Cable loss
Cable M17/167 MIL-C-17, HL 1510

No.	Frequency, MHz	Cable loss, dB
1	0.1	0.05
2	1	0.09
3	3	0.16
4	5	0.18
5	10	0.27
6	30	0.44
7	50	0.58
8	80	0.69
9	100	0.82
10	300	1.48
11	500	2.01
12	800	2.65
13	1000	3.12

Cable loss
Cable 18 GHz, 4 m, green, model: SPS-1803A-4000-NPS, S/N T4657, HL 1941

Frequency, GHz	Cable loss, dB
0.03	0.39
0.05	0.49
0.1	0.68
0.2	0.95
0.3	1.30
0.5	1.58
0.7	1.84
0.9	2.08
1.1	2.28
1.3	2.56
1.5	2.91
1.7	2.95
1.9	3.17
2.1	3.22
2.3	3.25
2.5	3.39
2.7	3.51
2.9	3.67
3.1	3.81
3.3	3.92
3.5	4.05
3.7	4.14
3.9	4.30
4.1	4.44
4.3	4.55
4.5	4.68
4.7	4.75
4.9	4.84
5.1	4.86
5.3	4.89
5.5	5.00
5.7	5.05
5.9	5.19
6.1	5.28
7.7	5.58

Frequency, GHz	Cable loss, dB
7.9	5.63
8.1	5.67
8.3	5.70
8.5	5.74
8.7	5.78
8.9	5.84
9.1	5.89
9.3	5.94
9.5	6.02
9.7	6.10
9.9	6.12
10.1	6.09
10.3	6.03
10.5	6.01
10.7	6.05
10.9	6.08
11.1	6.10
11.3	6.18
11.5	6.23
11.7	6.20
11.9	6.16
12.1	6.18
12.4	6.33
13.0	6.51
13.5	6.51
14.0	6.75
14.5	6.82
15.0	6.93
15.5	7.16
16.0	7.10
16.5	7.18
17.0	7.67
17.5	7.71
18.0	7.61

Cable loss
Cable 18 GHz, 4 m, blue, model: SPS-1803A-4000-NPS, S/N T4658, HL 1942

Frequency, GHz	Cable loss, dB
0.03	0.21
0.05	0.26
0.10	0.36
0.20	0.50
0.30	0.61
0.40	0.70
0.50	0.78
0.60	0.85
0.70	0.93
0.80	0.99
0.90	1.04
1.00	1.10
1.10	1.16
1.20	1.22
1.30	1.26
1.40	1.31
1.50	1.35
1.60	1.41
1.70	1.45
1.80	1.49
1.90	1.53
2.00	1.57
2.10	1.61
2.20	1.65
2.30	1.69
2.40	1.72
2.50	1.76
2.60	1.79
2.70	1.83
2.80	1.87
2.90	1.90
3.10	1.97
3.30	2.04
3.50	2.11
3.70	2.18
3.90	2.24
4.10	2.31
4.30	2.38
4.50	2.43
4.70	2.53
4.90	2.53
5.10	2.63
5.30	2.65
5.50	2.72
5.70	2.76
5.90	2.79

Frequency, GHz	Cable loss, dB
6.10	2.88
6.30	2.90
6.50	2.97
6.70	3.02
6.90	3.04
7.10	3.07
7.30	3.12
7.50	3.13
7.70	3.19
7.90	3.24
8.10	3.30
8.30	3.36
8.50	3.45
8.70	3.41
8.90	3.45
9.10	3.42
9.30	3.55
9.50	3.48
9.70	3.58
9.90	3.61
10.10	3.66
10.30	3.68
10.50	3.70
10.70	3.70
10.90	3.75
11.10	3.78
11.30	3.86
11.50	3.98
11.70	4.10
11.90	4.12
12.10	4.09
12.40	4.13
13.00	4.23
13.50	4.35
14.00	4.40
14.50	4.44
15.00	4.57
15.50	4.66
16.00	4.64
16.50	4.66
17.00	4.75
17.50	4.85
18.00	4.93

Cable loss
Cable 18 GHz, 6.5 m, blue, model: NPS-1803A-6500-NPS, S/N T4974, HL 1947

Frequency, GHz	Cable loss, dB
0.03	0.30
0.05	0.38
0.10	0.53
0.20	0.74
0.30	0.91
0.40	1.05
0.50	1.18
0.60	1.29
0.70	1.40
0.80	1.50
0.90	1.59
1.00	1.68
1.10	1.77
1.20	1.86
1.30	1.94
1.40	2.01
1.50	2.08
1.60	2.16
1.70	2.22
1.80	2.29
1.90	2.36
2.00	2.42
2.10	2.48
2.20	2.54
2.30	2.60
2.40	2.66
2.50	2.71
2.60	2.77
2.70	2.83
2.80	2.89
2.90	2.95
3.10	3.06
3.30	3.17
3.50	3.28
3.70	3.39
3.90	3.51
4.10	3.62
4.30	3.76
4.50	3.87
4.70	4.01
4.90	4.10
5.10	4.21
5.30	4.31
5.50	4.43
5.70	4.56
5.90	4.71

Frequency, GHz	Cable loss, dB
6.10	4.87
6.30	4.95
6.50	4.94
6.70	4.88
6.90	4.87
7.10	4.83
7.30	4.85
7.50	4.86
7.70	4.91
7.90	4.96
8.10	5.03
8.30	5.08
8.50	5.13
8.70	5.21
8.90	5.22
9.10	5.34
9.30	5.35
9.50	5.52
9.70	5.51
9.90	5.66
10.10	5.70
10.30	5.78
10.50	5.79
10.70	5.82
10.90	5.86
11.10	5.94
11.30	6.06
11.50	6.21
11.70	6.44
11.90	6.61
12.10	6.76
12.40	6.68
13.00	6.66
13.50	6.81
14.00	6.90
14.50	6.90
15.00	6.97
15.50	7.17
16.00	7.28
16.50	7.27
17.00	7.38
17.50	7.68
18.00	7.92

Cable loss
RF cable 8 m, model RG-214, HL 2009

No.	Frequency, MHz	Cable loss, dB	Tolerance (Specification), dB	Measurement uncertainty, dB
1	1	0.10	NA	±0.12
2	10	0.14		
3	30	0.25		
4	50	0.34		
5	100	0.53		
6	300	0.99		
7	500	1.31		
8	800	1.73		
9	1000	1.98		
10	1100	2.11		
11	1200	2.21		
12	1300	2.35		
13	1400	2.46		
14	1500	2.55		
15	1600	2.68		
16	1700	2.78		
17	1800	2.88		
18	1900	2.98		
19	2000	3.09		

Cable loss
Cable coaxial, 40GHz, 1.5 m, Blue, Rhophase Microwave Limited, model: KPS-1503A-1500-KPS, HL 2399

Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB
0.03	0.07	6.5	1.57	15.50	2.50
0.05	0.10	6.7	1.60	16.00	2.51
0.1	0.16	6.9	1.55	16.50	2.58
0.2	0.26	7.1	1.65	17.00	2.65
0.3	0.33	7.3	1.65	17.50	2.73
0.5	0.38	7.5	1.70	18.00	2.74
0.7	0.41	7.7	1.71	18.50	2.67
0.9	0.58	7.9	1.73	19.00	2.67
1.1	0.64	8.1	1.79	19.50	2.74
1.3	0.70	8.3	1.81	20.00	2.69
1.5	0.75	8.5	1.84	20.50	2.80
1.7	0.79	8.7	1.85	21.00	2.82
1.9	0.83	8.9	1.90	21.50	2.87
2.1	0.88	9.1	1.95	22.00	2.87
2.3	0.93	9.3	1.93	22.50	2.92
2.5	0.97	9.5	1.98	23.50	3.04
2.7	1.01	9.7	1.96	24.00	3.05
2.9	1.04	9.9	2.03	24.50	3.03
3.1	1.08	10.1	1.99	25.00	3.11
3.3	1.14	10.30	2.02	25.50	3.10
3.5	1.17	10.50	2.02	26.00	3.17
3.7	1.21	10.70	2.02	26.50	3.11
3.9	1.24	10.90	2.08	27.00	3.16
4.1	1.26	11.10	2.02	28.00	3.19
4.3	1.26	11.30	2.09	29.00	3.19
4.5	1.29	11.50	2.05	30.00	3.30
4.7	1.34	11.70	2.11	31.00	3.31
4.9	1.34	11.90	2.11	32.00	3.35
5.1	1.40	12.10	2.12	33.00	3.46
5.3	1.43	12.40	2.17	34.00	3.45
5.5	1.45	13.00	2.29	35.00	3.49
5.7	1.47	13.50	2.31	36.00	3.54
5.9	1.40	14.00	2.43	37.00	3.62
6.1	1.53	14.50	2.43	39.00	3.69
6.3	1.55	15.00	2.46	40.00	3.75