HERMON LABORATORIES

839.01
Electrical

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TEST REPORT

ACCORDING TO: FCC parts 22, 24 and RSS-132 issue 2, RSS-133 issue 4

FOR:

Visonic Ltd.

Wireless alarm control system

Model: PowerMaxComplete with GSM module

Table of contents

1 Applicant information

Client name:	Visonic Ltd.
Address:	24 Habarzel street, Tel Aviv 67920, Israel
Telephone:	+972 3645 6789
Fax:	+972 3645 6788
E-mail:	aelshtein@visonic.com
Contact name:	Mr. Arick Elshtein

2 Equipment under test attributes

Product name:	Wireless alarm control system
Product type:	Transceiver
Model(s):	PowerMaxComplete
Receipt date	5/16/2007

3 Manufacturer information

Client name:	Visonic Ltd.
Address:	24 Habarzel street, Tel Aviv 67920, Israel
Telephone:	+972 3645 6789
Fax:	+972 3645 6788
E-mail:	aelshtein@visonic.com
Contact name:	Mr. Arick Elshtein

4 Test details

Project ID:	17939
Location:	Hermon Laboratories Ltd. P.O.Box 23, Binyamina 30500, Israel
Test started:	5/16/2007
Test completed:	3/21/2008
Test specification(s):	FCC 47 CFR parts 22, 24:2007; RSS-102 issue 2:2005, RSS-132 issue 2:2005, RSS-133 issue 4:2008

5 Tests summary

Test	Status
Transmitter characteristics	
Sections 22.913, 24.232, RF output power	Pass
Sections 22.917, 24.238, Spurious emissions at antenna terminal	Pass
Sections 22.917, 24.238, Emissions at band edges	Pass
Sections 22.917, 24.238, Radiated spurious emissions	Pass
Section 2.1091, RSS-102, RF radiation exposure evaluation	Pass, an exhibit attached to Application for certification

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

This test report replaces the previously issued test report identified by Doc ID:VISRAD_FCC.17939_22_24.

	Name and Title	Date	Signature
Tested by:	Mr. S. Samokha, test engineer	March 21, 2008	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	April 6, 2008	
Approved by:	Mr. M. Nikishin, EMC and radio group leader	April 7, 2008	

6 EUT description

6.1 General information

The EUT is a wireless alarm control system. The PowermaxComplete has several states of alertness, such as "armed " and "disarmed", the reactions to each state differs and is explained in the manuals. Those various states are achieved via the on board/ integrated keypad, via the RFID proximity sensor (131 kHz) and via the RF transmitter type MCT 234 operating at 315 MHz.
The product includes GSM modem (FCC certified for modular approval) The EUT transmits alarm messages to Visonic's wireless siren and receives alarm messages from various wireless detectors. The device utilizes integral antennas, separate for each radio. Once event was encountered the system also automatically reports via a public telephone network. The EUT is powered from AC mains and is equipped with a rechargeable backup battery pack.
The GSM module, model name GE863-Quad, manufactured by Telit Communications S.p.A., operates in 824 – 849 MHz and 1850 – 1910 MHz frequency bands.

6.2 Operating frequencies

Source	Frequency, MHz		
Clock	4.19	16.0	NA
Cell 850	824.2	836.4	848.8
PCS 1900	1850.2	1880	1909.8

6.3 Changes made in the EUT

No changes were implemented.

6.4 Transmitter characteristics

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

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

Assigned frequency range	824 – 849 MHz/1850 – 1910 MHz
Operating frequency range	824.2 – 848.8 MHz/1850.2 – 1909.8 MHz
RF channel spacing	200 kHz
Maximum rated output power	800 – 26.7 dBm 1900 –30.6 dBm

Is transmitter output power variable?	X	No		
		Yes		continuous variable
			X	stepped variable with stepsize
				minimum RF power
				maximum RF power

Antenna connection			
unique coupling	standard connector	X integral	with temporary RF connector
			without temporary RF connector

Transmitter 99% power bandwidth	200 kHz
Transmitter aggregate data rate/s	270 kbps
Transmitter aggregate symbol (baud) rate/s	NA
Type of modulation	GSM

Transmitter power source					
X	AC	**Nominal rated voltage**	120 V	Frequency	60 Hz
X	Battery (backup)	**Nominal rated voltage**	9.6 V		

Common power source for transmitter and receiver	X	yes	no

Test specification:	FCC part 22, section 22.913/RSS-132 section 4.4, Peak output power		
Test procedure:	FCC part 22, Section 22.913		
Test mode:	Compliance	Verdict:	PASS
Date:	2/13/2008		
Temperature: 22ºC	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: 9.6 VDC
Remarks:			

7 Transmitter tests according to 47CFR part 22 and RSS-132 requirements

7.1 Peak output power (radiated)

7.1.1 General

This test was performed to measure the maximum peak output power radiated by transmitter. Specification test limits are given in Table 7.1.1, Table 7.1.2.

Table 7.1.1 Peak output power limits according to FCC part 22, section 22.913

Assigned frequency range, MHz	Peak output power		Equivalent field strength limit @ 3m, dB(μV/m)*
	W	dBm	
824 - 849	7.0	38.45	135.83

Table 7.1.2 Peak output power limits according to RSS-132, section 4.4

Assigned frequency range, MHz	Peak output power		Equivalent field strength limit @ 3m, dB(μV/m)*
	W	dBm	
824 - 849	6.3	38	135.38

*- 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.

7.1.2 Test procedure for field strength measurements

7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.

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

7.1.2.3 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.

7.1.2.4 The maximum field strength of the EUT carrier frequency was measured as provided in Table 7.1.3 and associated plots.

7.1.3 Test procedure for substitution power measurements

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

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

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

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

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

7.1.3.6 The worst test results (the lowest margins) were recorded in Table 7.1.4 and shown in the associated plots.

Test specification:	**FCC part 22, section 22.913/RSS-132 section 4.4, Peak output power**		
Test procedure:	FCC part 22, Section 22.913		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks:			

Figure 7.1.1 Setup for carrier field strength measurements

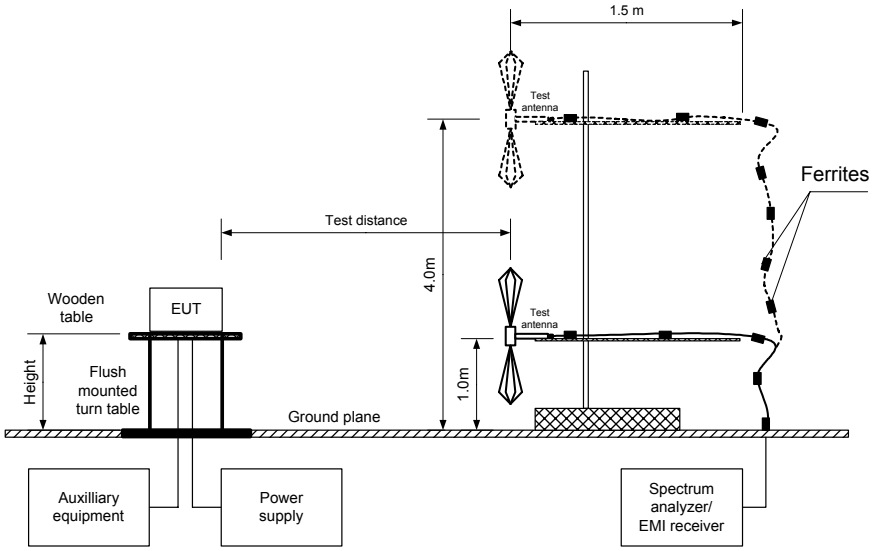
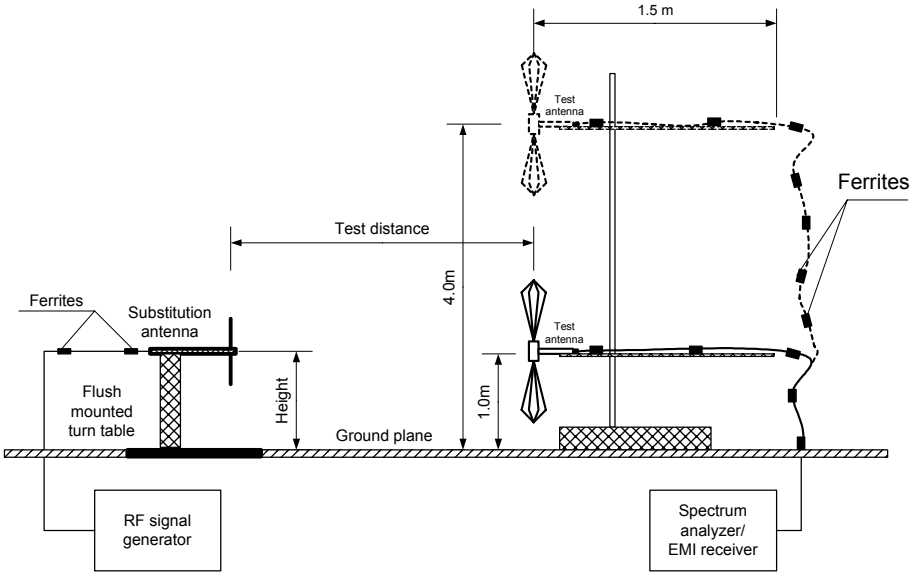


Figure 7.1.2 Setup for substitution peak output power measurements



Test specification:	**FCC part 22, section 22.913/RSS-132 section 4.4, Peak output power**		
Test procedure:	FCC part 22, Section 22.913		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks:			

Table 7.1.3 Field strength measurement of peak output power

ASSIGNED FREQUENCY: 824 - 849 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT HEIGHT: 0.8 m
DETECTOR USED: Peak
TEST ANTENNA TYPE: Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)
MODULATION: GSM
BIT RATE: 270 kbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
RESOLUTION BANDWIDTH: 1 MHz
VIDEO BANDWIDTH: 3 MHz

Frequency, MHz	Field strength, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees
824.2	128.9	135.38	-6.48	V	1.25	0
836.6	128.8	135.38	-6.58	V	1.20	0
848.8	128.7	135.38	-6.68	V	1.20	6

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

Table 7.1.4 Substitution measurement of peak output power

ASSIGNED FREQUENCY RANGE: 824 - 849 MHz
TEST DISTANCE: 3 m
SUBSTITUTION ANTENNA HEIGHT: 0.8 m
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1 MHz
VIDEO BANDWIDTH: 3 MHz
SUBSTITUTION ANTENNA TYPE: Tunable dipole (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)

Frequency MHz	Field strength dB(µV/m)	Antenna polarization	RF generator output, dBm	Antenna gain dBd	Cable loss, dB	Peak output power, ERP dBm	Limit, dBm	Margin, dB*	Verdict
824.2	128.9	V	28.6	-2.13	0.96	25.51	38.50	-12.99	Pass
836.6	128.8	V	29.3	-2.09	0.96	26.25	38.50	-12.25	Pass
848.8	128.7	V	29.6	-1.97	0.96	26.67	38.50	-11.83	Pass

*****- Margin = Peak output power – specification limit.

Reference numbers of test equipment used

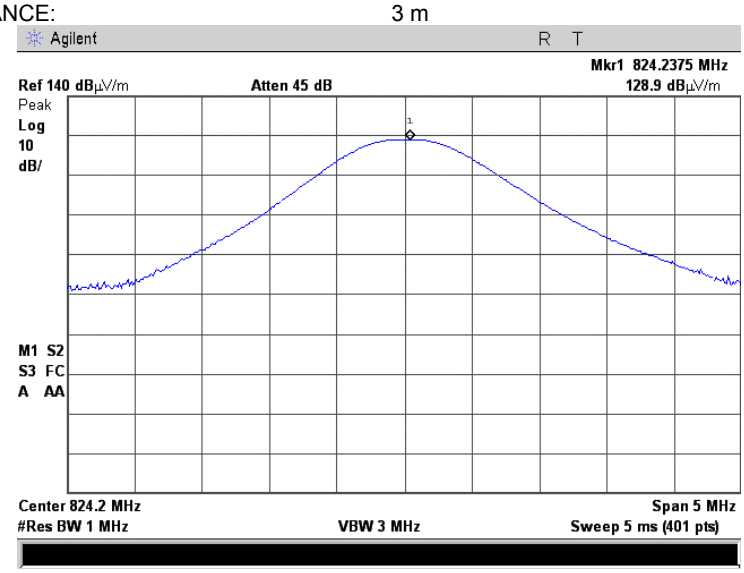
HL 0521	HL 0557	HL 0567	HL 0604	HL 0661	HL 2400		

Full description is given in Appendix A.

Test specification:	**FCC part 22, section 22.913/RSS-132 section 4.4, Peak output power**		
Test procedure:	FCC part 22, Section 22.913		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks:			

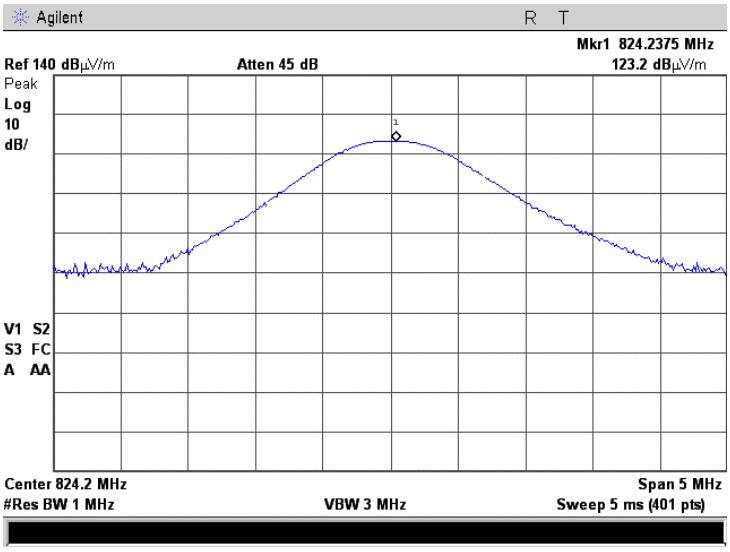
Plot 7.1.1 Field strength of carrier at low frequency

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



Plot 7.1.2 Field strength of carrier at low frequency

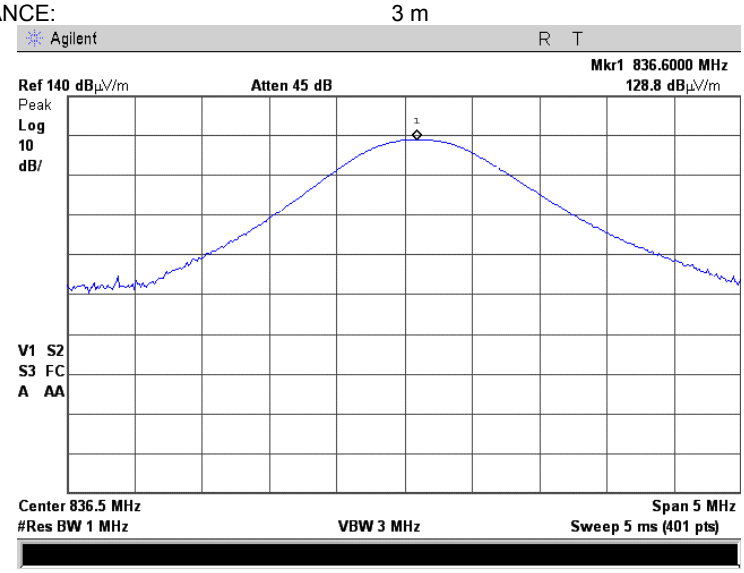
TEST SITE: OATS
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 22, section 22.913/RSS-132 section 4.4, Peak output power**		
Test procedure:	FCC part 22, Section 22.913		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks:			

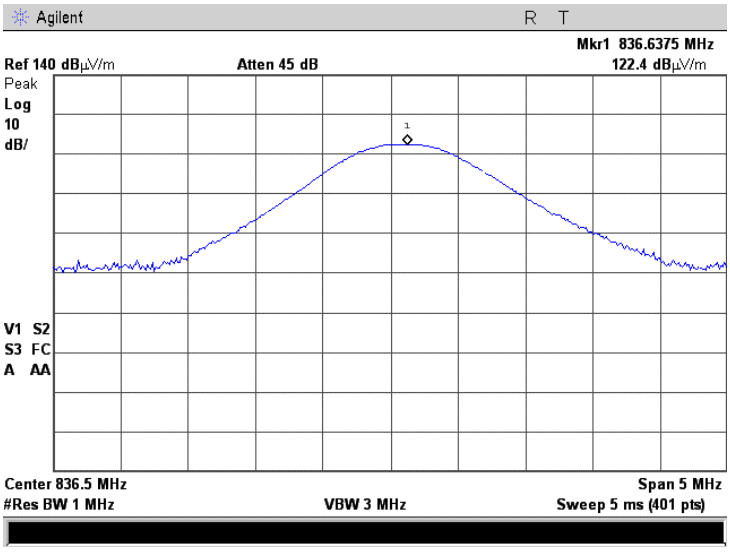
Plot 7.1.3 Field strength of carrier at mid frequency

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



Plot 7.1.4 Field strength of carrier at mid frequency

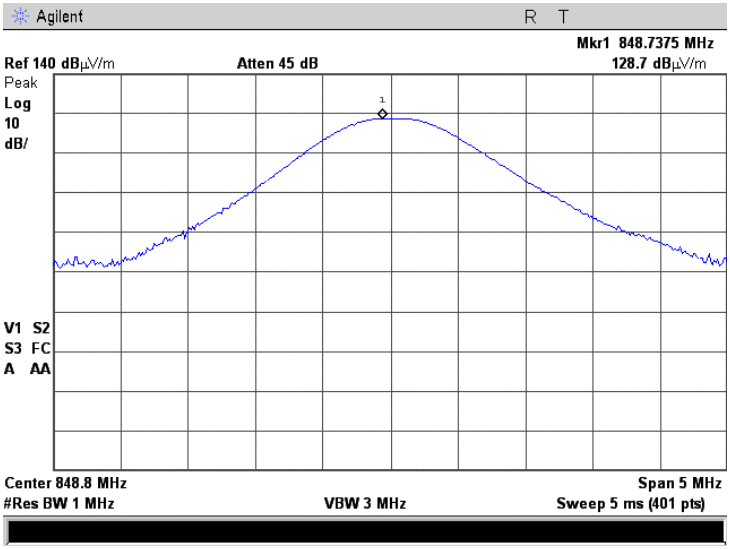
TEST SITE: Semi anechoic chamber
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC part 22, section 22.913/RSS-132 section 4.4, Peak output power		
Test procedure:	FCC part 22, Section 22.913		
Test mode:	Compliance	Verdict:	PASS
Date:	2/13/2008		
Temperature: 22ºC	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: 9.6 VDC
Remarks:			

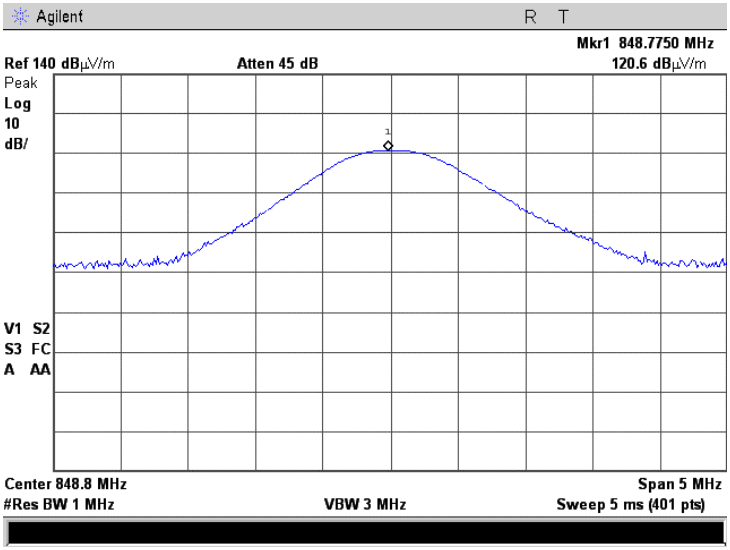
Plot 7.1.5 Field strength of carrier at high frequency

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



Plot 7.1.6 Field strength of carrier at high frequency

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



Test specification:	FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

7.2 Field strength of spurious emissions

7.2.1 General

This test was performed to measure field strength of spurious emissions from the EUT. Specification test limit is given in Table 7.2.1.

Table 7.2.1 Radiated spurious emissions limits

Frequency, MHz	Attenuation below carrier dBc	ERP of spurious, dBm	Equivalent field strength limit @ 3m, dB(µV/m)**
0.009 – 10th harmonic	43+10logP*	-13	84.4

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

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

7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and the performance check was conducted.

7.2.2.2 The 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.

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

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

7.2.3.1 The EUT was set up as shown in Figure 7.2.2, energized and the performance check was conducted.

7.2.3.2 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.

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

7.2.4 Test procedure for substitution ERP measurements of spurious

7.2.4.1 The test equipment was set up as shown in Figure 7.2.3 and energized.

7.2.4.2 RF signal generator was set to the frequency of investigated spurious emission and the RF output level was preliminary adjusted to produce the same field strength as it was measured from the EUT.

7.2.4.3 The test antenna height was swept from 1 to 4 m to find maximum emission from substitution antenna and RF signal generator output was fine adjusted to produce the same field strength as it was measured from the EUT.

7.2.4.4 The above procedure was performed in both, horizontal and vertical, polarizations of the test and substitution antennas.

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

7.2.4.6 The above procedure was repeated at the rest of investigated frequencies.

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

Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

Figure 7.2.1 Setup for spurious emission field strength measurements below 30 MHz

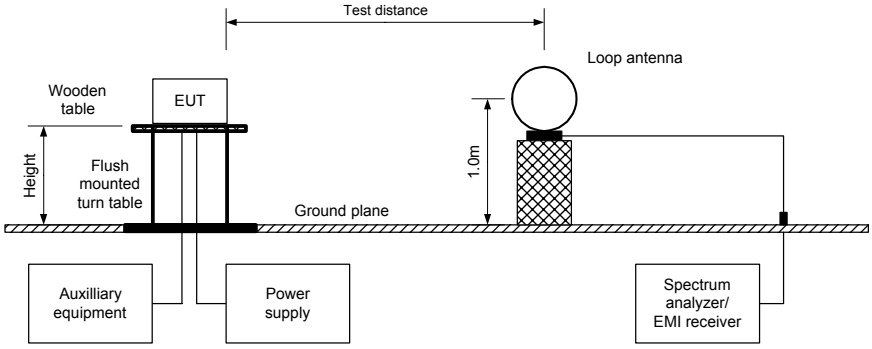
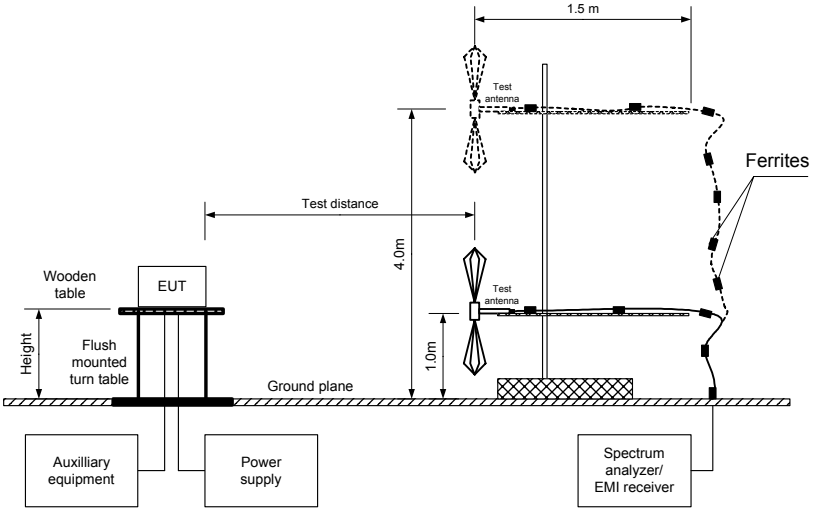
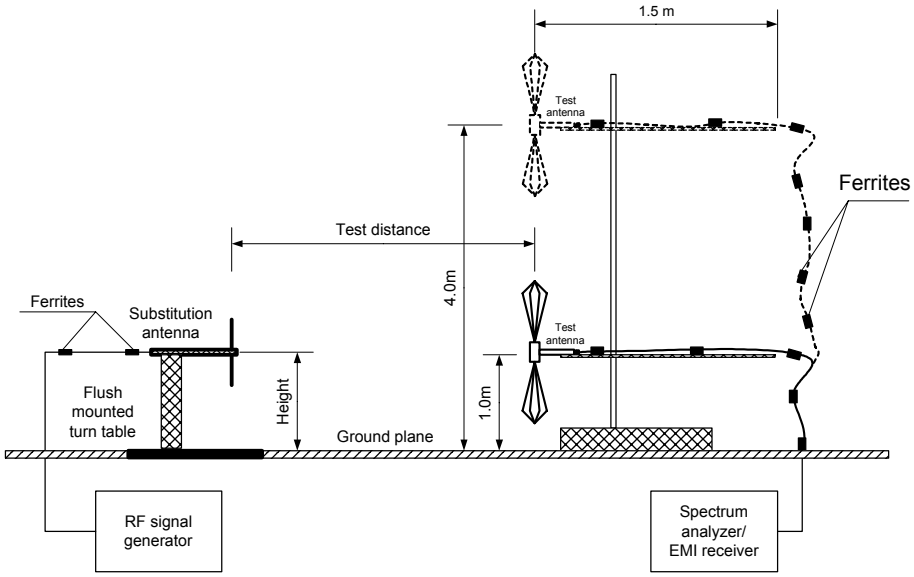


Figure 7.2.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

Figure 7.2.3 Setup for substitution of spurious emission measurements



Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

Table 7.2.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 824-849 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT HEIGHT: 0.8 m
INVESTIGATED FREQUENCY RANGE: 0.009 – 10000 MHz
DETECTOR USED: Peak
VIDEO BANDWIDTH: > Resolution bandwidth
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)
MODULATION: GSM
BIT RATE: 270 kbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Field strength, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*	RBW, kHz	Antenna polarization	Antenna height, m	Turn-table position**, degrees
Low carrier frequency							
1648.38	65.65	84.4	-18.75	1000	Vertical	1.0	173
Mid carrier frequency							
1673.23	68.57	84.4	-15.83	1000	Vertical	1.0	179
High carrier frequency							
1697.73	72.08	84.4	-12.32	1000	Vertical	1.0	168

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

Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

Table 7.2.3 Substitution ERP of spurious test results

ASSIGNED FREQUENCY RANGE: 824-849 MHz
TRANSMITTER CARRIER ERP: 25.51 dBm at low frequency
26.25 dBm at mid frequency
26.67 dBm at high frequency
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
SUBSTITUTION ANTENNA HEIGHT: 0.8 m
DETECTOR USED: Peak
VIDEO BANDWIDTH: > Resolution bandwidth
SUBSTITUTION ANTENNA TYPE: Tunable dipole (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)

Frequency MHz	Field strength dB(µV/m	RBW, kHz	Antenna polarizatio	RF generato output, dBm	Ant gain, dBd	Cable loss dB	Spurious emission, dBm	Limit, dBm	Margin dB*	Verdict
Low carrier frequency										
1648.38	65.65	1000	Vertical	-37.48	6.27	1.35	-32.56	-13.00	-19.56	Pass
Mid carrier frequency										
1673.23	68.57	1000	Vertical	-34.21	6.29	1.36	-29.28	-13.00	-16.28	Pass
High carrier frequency										
1697.73	72.08	1000	Vertical	-31.14	6.32	1.37	-26.19	-13.00	-13.19	Pass

Reference numbers of test equipment used

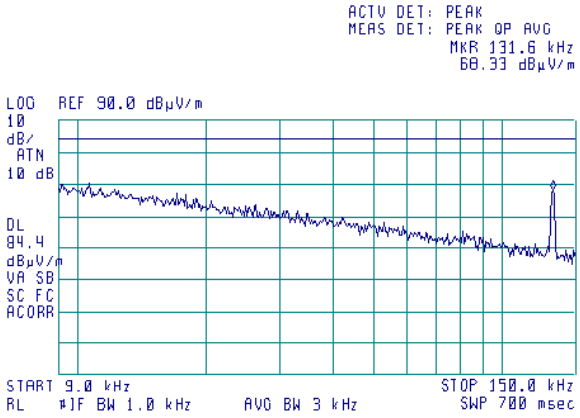
HL 0410	HL 0446	HL 0521	HL 0589	HL 0604	HL 0768	HL 1424	HL 1947
HL 1984	HL 2009	HL 2259	HL 2260	HL 2499	HL 2909	HL 2910	

Full description is given in Appendix A.

Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

Plot 7.2.1 Radiated emission measurements in 9 to 150 kHz range

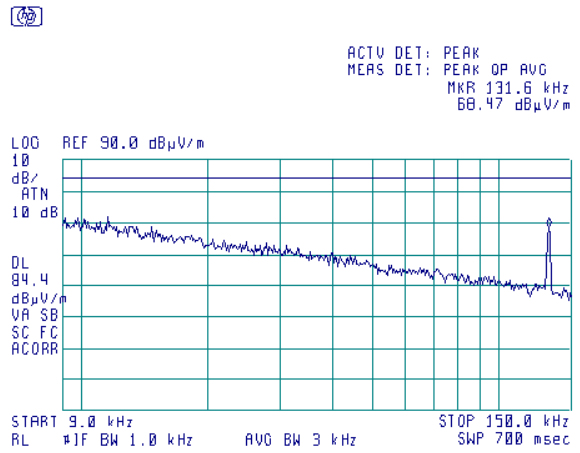
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Note: intentional radiator 131 kHz

Plot 7.2.2 Radiated emission measurements in 9 to 150 kHz range

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

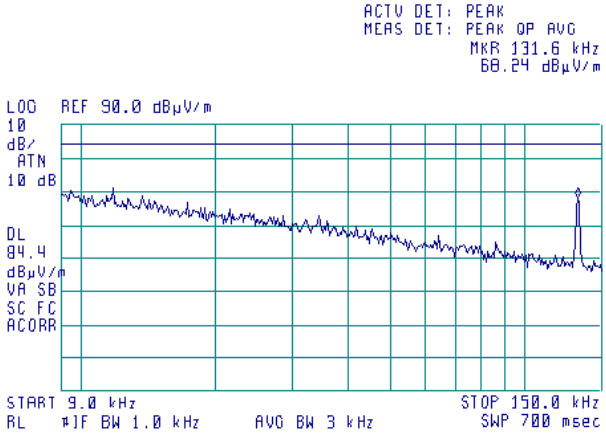


Note: intentional radiator 131 kHz

Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

Plot 7.2.3 Radiated emission measurements in 9 to 150 kHz range

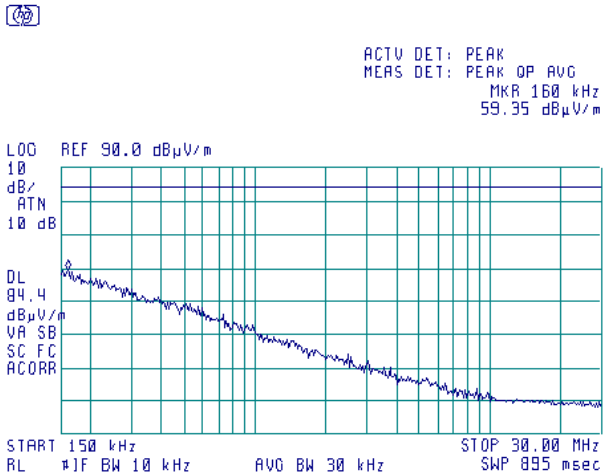
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Note: intentional radiator 131 kHz

Plot 7.2.4 Radiated emission measurements in 0.15 - 30 MHz range

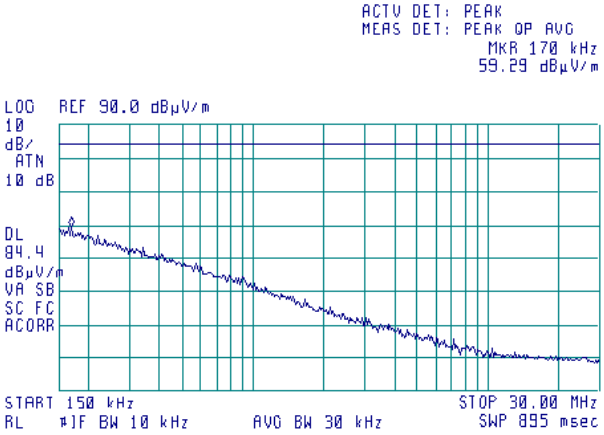
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

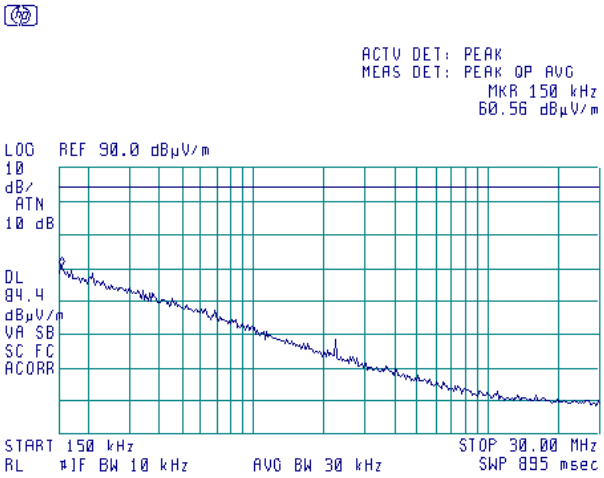
Plot 7.2.5 Radiated emission measurements in 0.15 - 30 MHz range

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



Plot 7.2.6 Radiated emission measurements in 0.15 - 30 MHz range

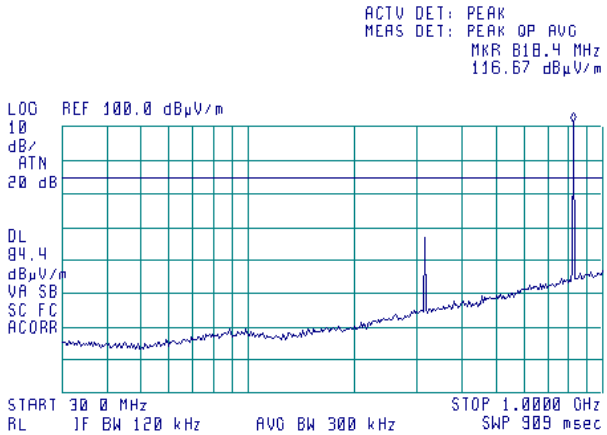
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

Plot 7.2.7 Radiated emission measurements in 30 - 1000 MHz range

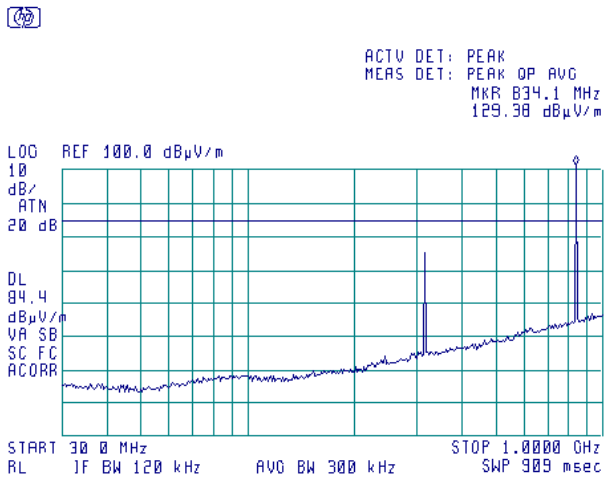
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Note: intentional radiators 315 MHz and 824.2MHz (GSM module)

Plot 7.2.8 Radiated emission measurements in 30 - 1000 MHz range

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

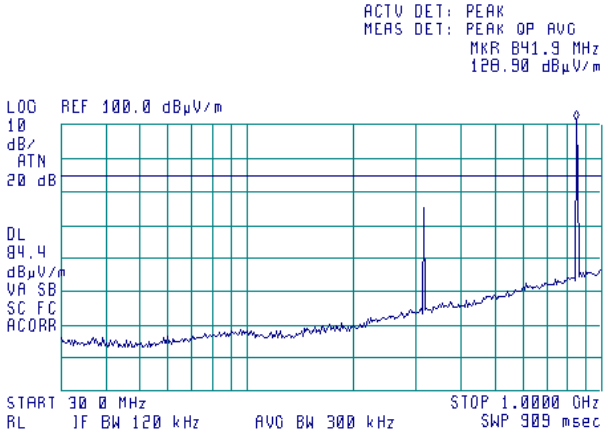


Note: intentional radiators 315 MHz and 836.6 MHz (GSM module)

Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

Plot 7.2.9 Radiated emission measurements in 30 - 1000 MHz range

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

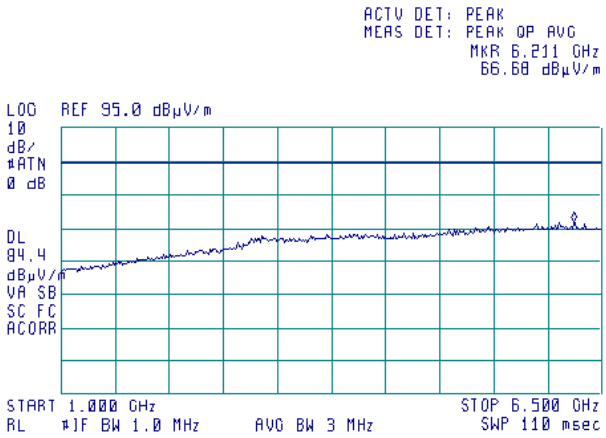


Note: intentional radiators 315 MHz and 848.8 MHz (GSM module)

Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

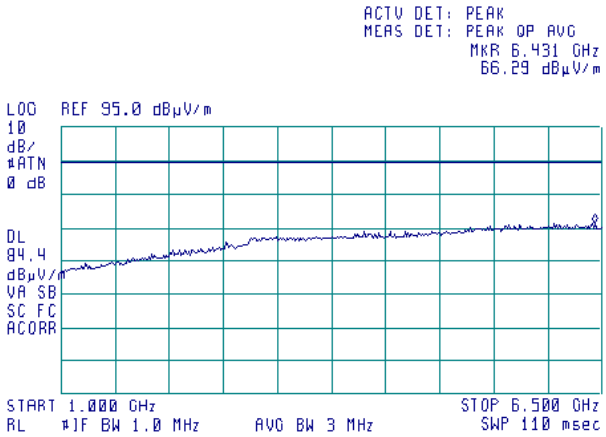
Plot 7.2.10 Radiated emission measurements in 1 – 6.5 GHz range

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



Plot 7.2.11 Radiated emission measurements in 1 – 6.5 GHz range

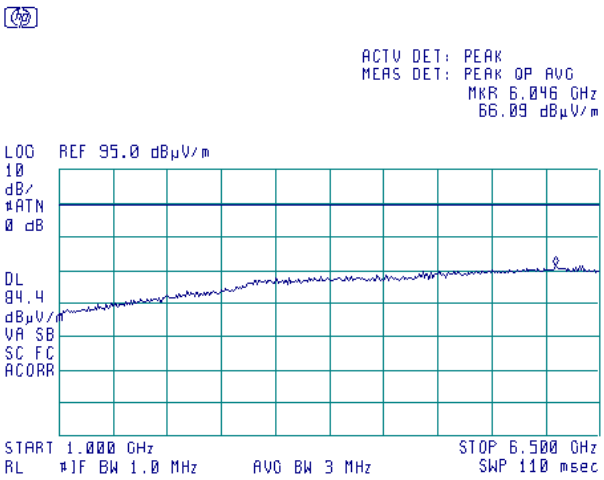
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

Plot 7.2.12 Radiated emission measurements in 1 – 6.5 GHz range

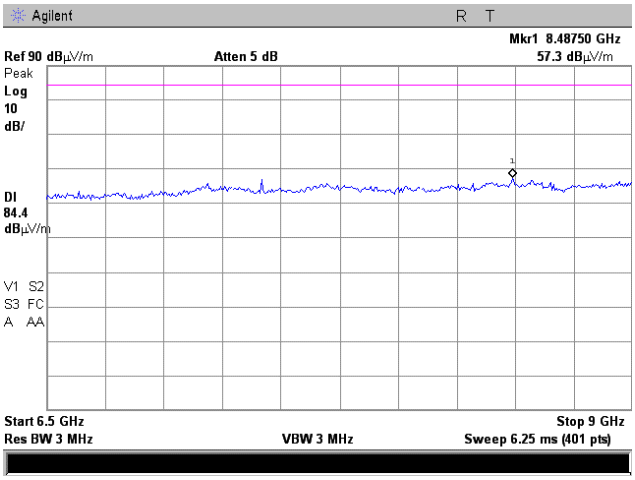
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

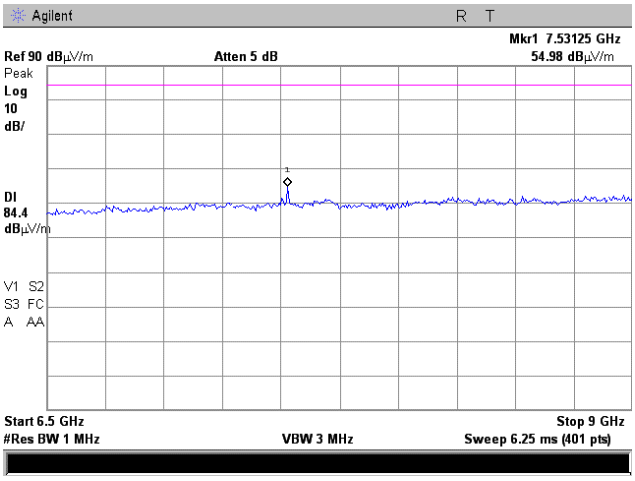
Plot 7.2.13 Radiated emission measurements in 6.5 - 9 GHz range

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



Plot 7.2.14 Radiated emission measurements in 6.5 - 9 GHz range

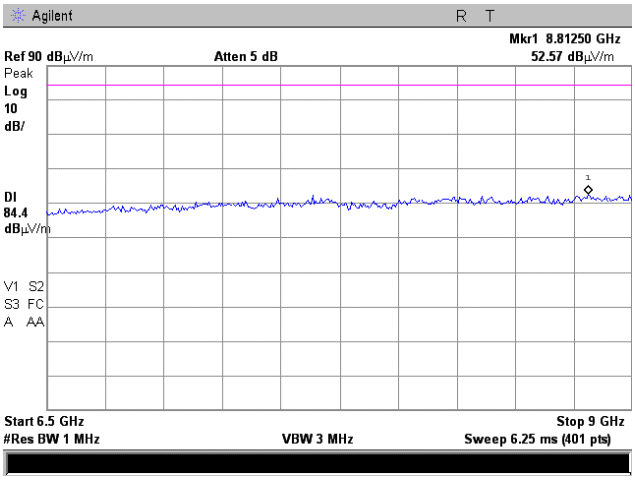
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

Plot 7.2.15 Radiated emission measurements in 6.5 - 9 GHz range

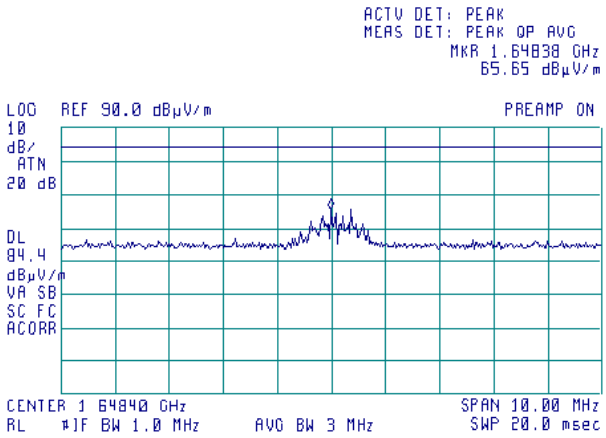
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

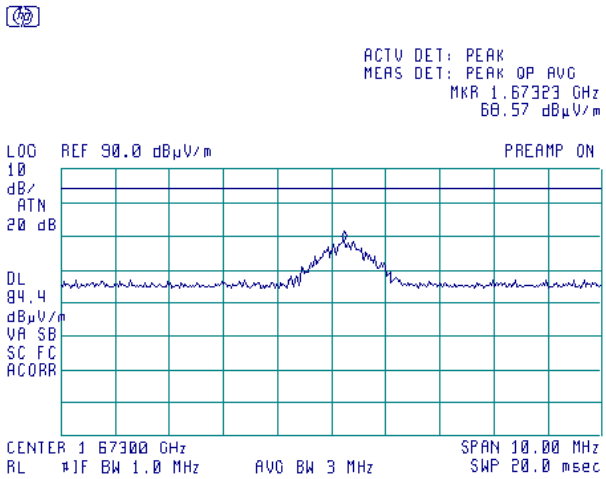
Plot 7.2.16 Radiated emission measurements at the 2nd harmonic

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



Plot 7.2.17 Radiated emission measurements at the 2nd harmonic

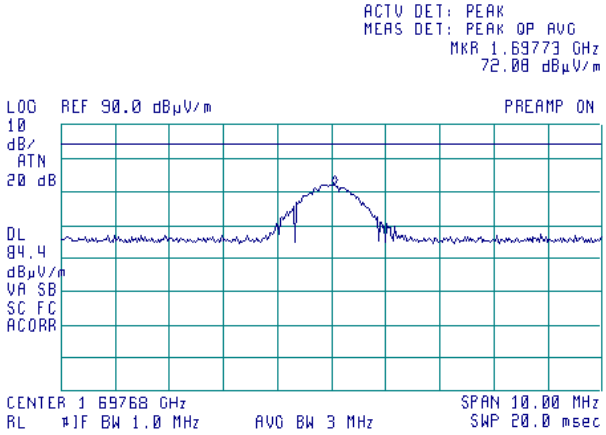
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m



Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

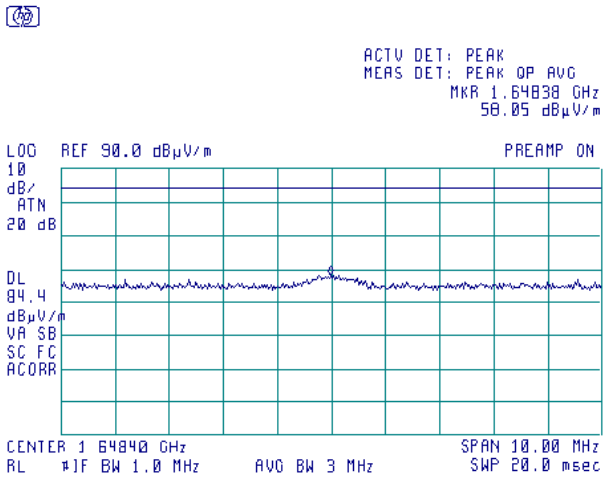
Plot 7.2.18 Radiated emission measurements at the 2nd harmonic

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



Plot 7.2.19 Radiated emission measurements at the 2nd harmonic

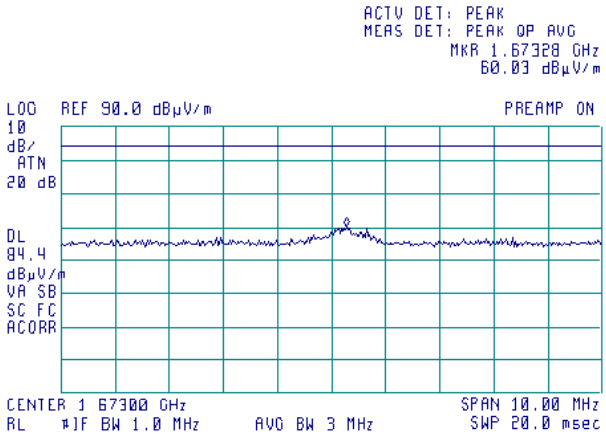
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

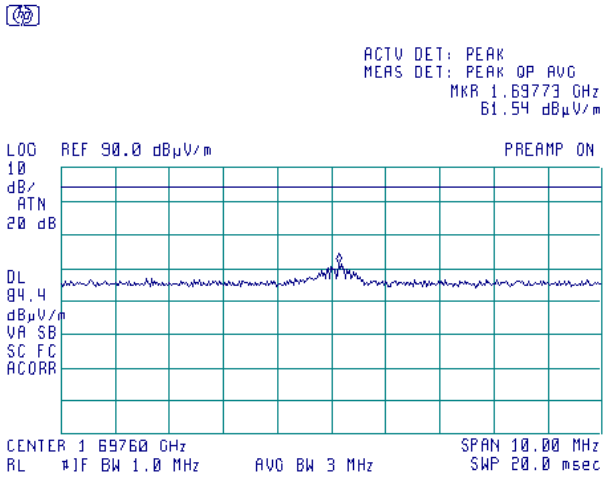
Plot 7.2.20 Radiated emission measurements at the 2nd harmonic

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



Plot 7.2.21 Radiated emission measurements at the 2nd harmonic

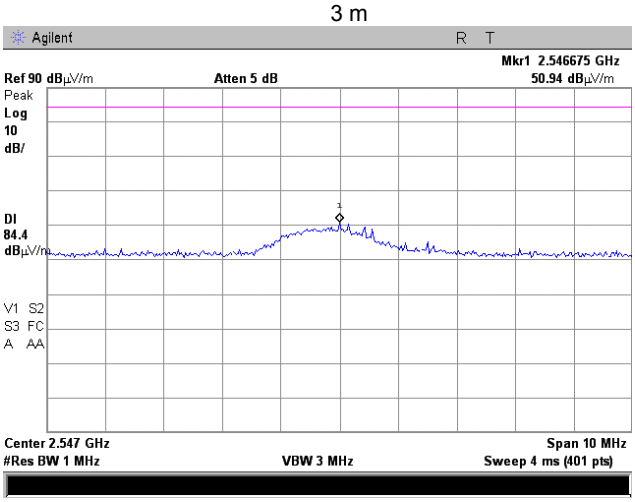
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

Plot 7.2.22 Radiated emission measurements at the 3rd harmonic

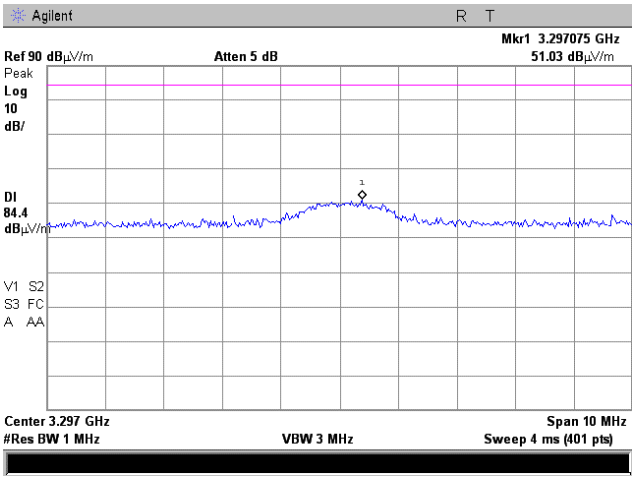
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Horizontal
TEST DISTANCE:	3 m



Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

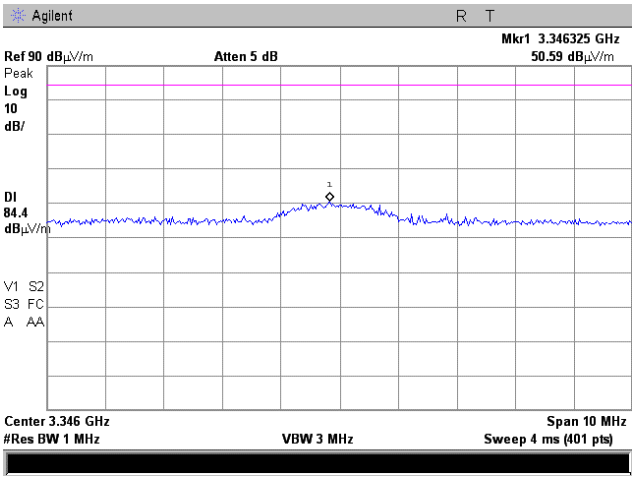
Plot 7.2.23 Radiated emission measurements at the 4th harmonic

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical & Horizontal
TEST DISTANCE: 3 m



Plot 7.2.24 Radiated emission measurements at the 4th harmonic

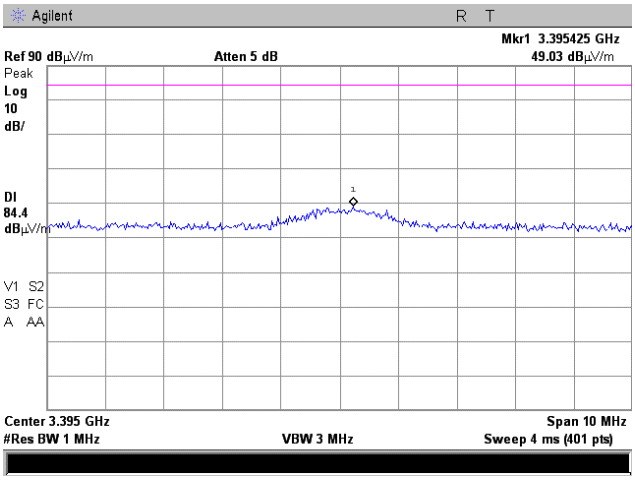
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical & Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

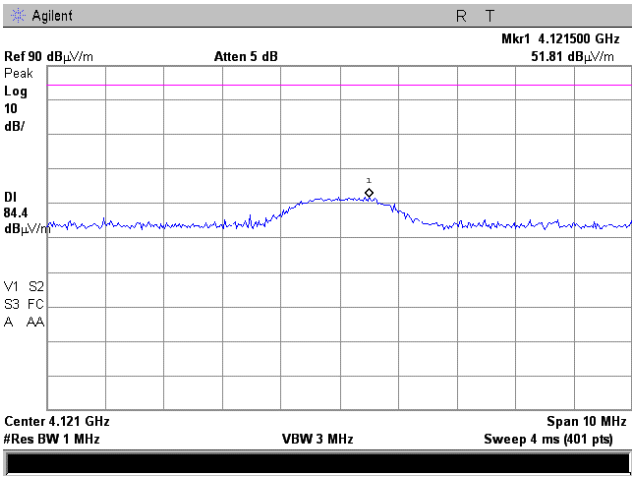
Plot 7.2.25 Radiated emission measurements at the 4th harmonic

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical & Horizontal
TEST DISTANCE: 3 m



Plot 7.2.26 Radiated emission measurements at the 5th harmonic

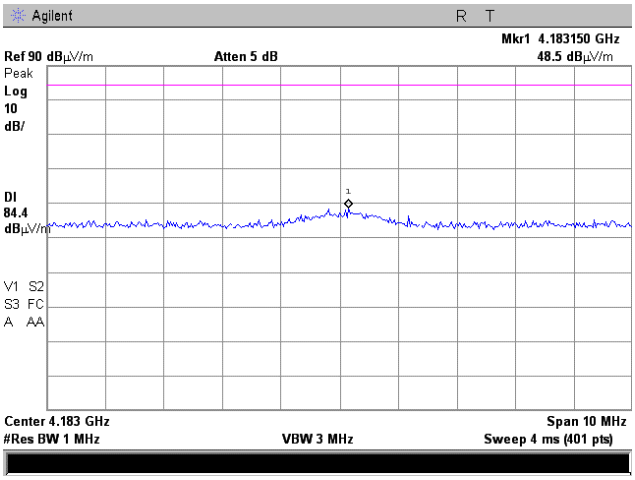
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical & Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

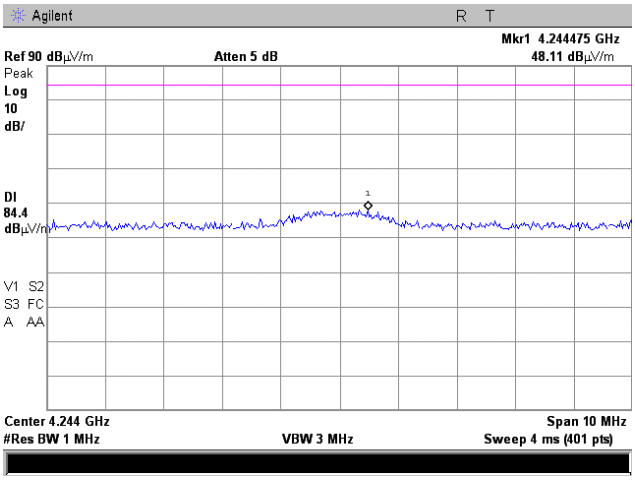
Plot 7.2.27 Radiated emission measurements at the 5th harmonic

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical & Horizontal
TEST DISTANCE: 3 m



Plot 7.2.28 Radiated emission measurements at the 5th harmonic

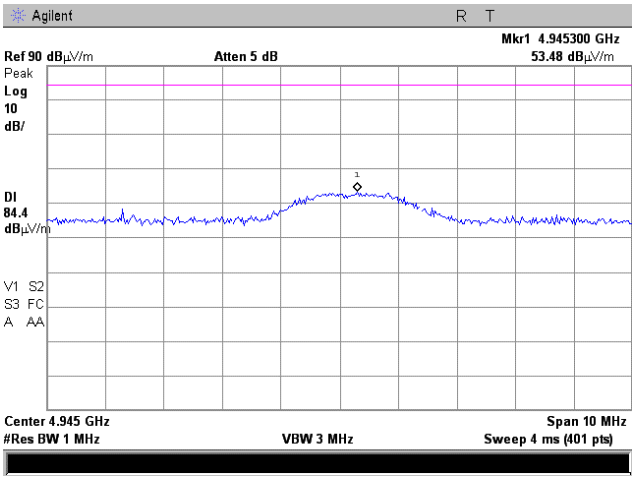
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical & Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

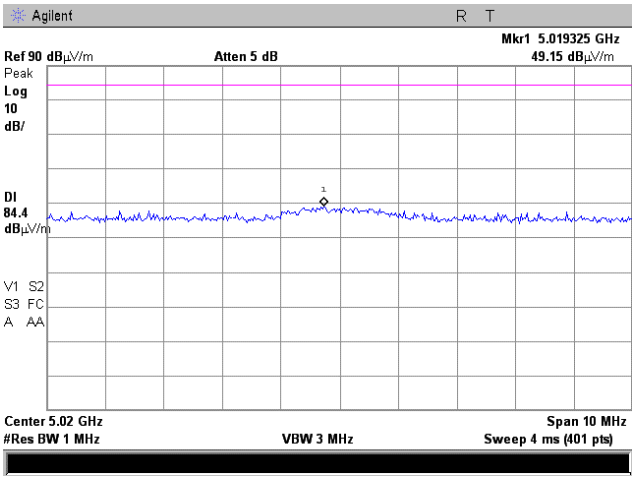
Plot 7.2.29 Radiated emission measurements at the 6th harmonic

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical & Horizontal
TEST DISTANCE: 3 m



Plot 7.2.30 Radiated emission measurements at the 6th harmonic

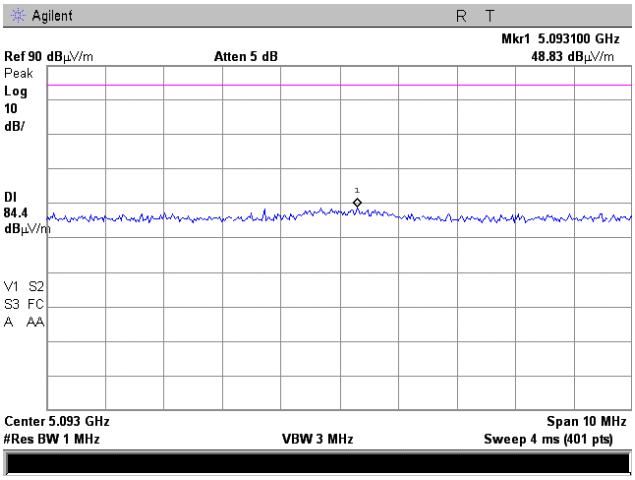
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical & Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

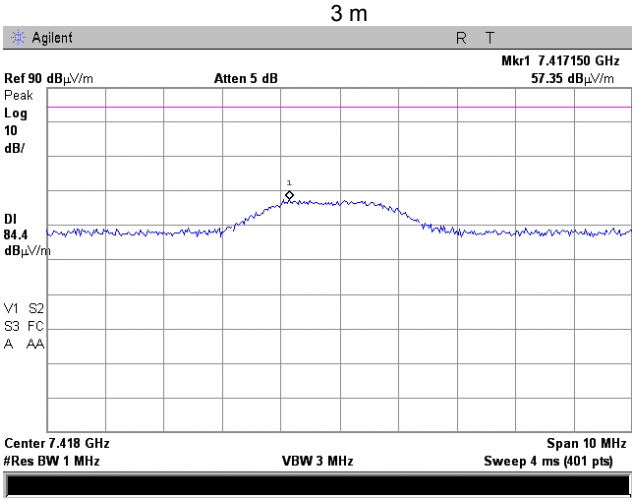
Plot 7.2.31 Radiated emission measurements at the 6th harmonic

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical & Horizontal
TEST DISTANCE: 3 m



Plot 7.2.32 Radiated emission measurements at the 9th harmonic

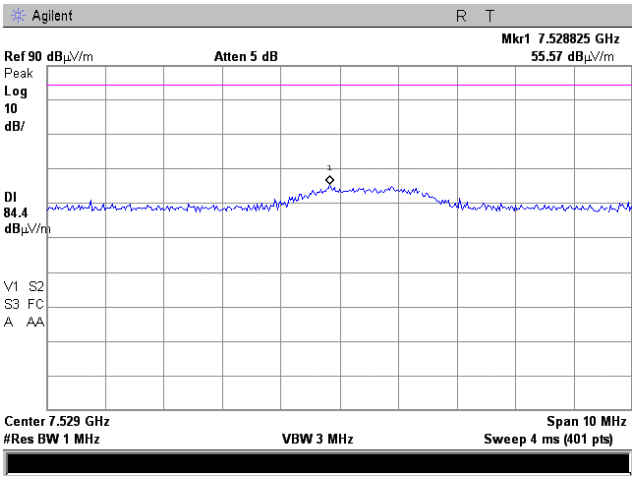
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical & Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 22, section 22.917/RSS-132 section 4.5, Radiated spurious emissions**		
Test procedure:	FCC part 22, Section 22.917		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 824-849 MHz operate simultaneously			

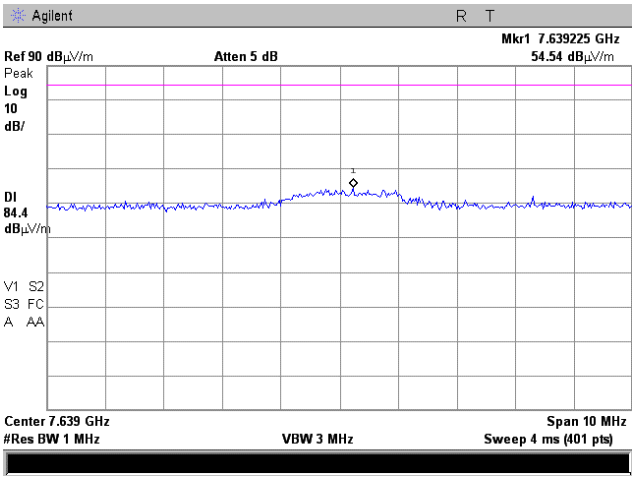
Plot 7.2.33 Radiated emission measurements at the 9th harmonic

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical & Horizontal
TEST DISTANCE: 3 m



Plot 7.2.34 Radiated emission measurements at the 9th harmonic

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical & Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC part 24, section 24.232/RSS-133 section 6.4, Peak output power		
Test procedure:	FCC part 24, Section 24.232		
Test mode:	Compliance	Verdict:	PASS
Date:	2/13/2008		
Temperature: 22ºC	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: 9.6 VDC
Remarks:			

8 Transmitter tests according to 47CFR part 24 and RSS-133 requirements

8.1 Peak output power

8.1.1 General

This test was performed to measure the maximum peak output power radiated by transmitter. Specification test limits are given in Table 8.1.1.

Table 8.1.1 Peak output power limits

Assigned frequency range, MHz	Peak output power		Equivalent field strength limit @ 3m, dB(μV/m)*
	W	dBm	
1850 - 1910	2.0	33.0	128.23

*- 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.

8.1.2 Test procedure for field strength measurements

8.1.2.1 The EUT was set up as shown in Figure 8.1.1, energized and its proper operation was checked.

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

8.1.2.3 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.

8.1.2.4 The maximum field strength of the EUT carrier frequency was measured as provided in Table 8.1.2 and associated plots.

8.1.3 Test procedure for substitution power measurements

8.1.3.1 The test equipment was set up as shown in Figure 8.1.2 and energized.

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

8.1.3.3 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.

8.1.3.4 The maximum peak output power was calculated as a sum of signal generator output power in dBm and substitution antenna gain in dBi reduced by cable loss in dB.

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

8.1.3.6 The worst test results (the lowest margins) were recorded in Table 8.1.3 and shown in the associated plots.

Test specification:	**FCC part 24, section 24.232/RSS-133 section 6.4, Peak output power**		
Test procedure:	FCC part 24, Section 24.232		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks:			

Figure 8.1.1 Setup for carrier field strength measurements

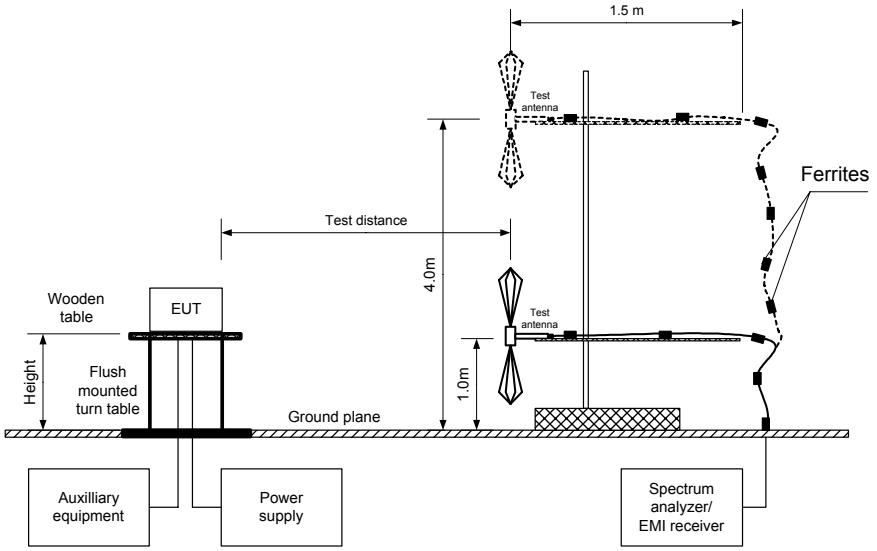
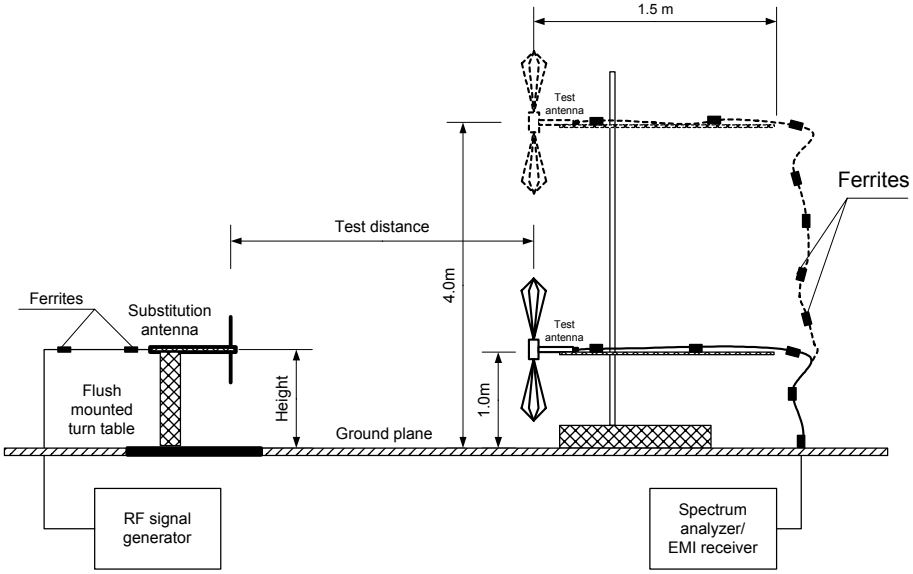


Figure 8.1.2 Setup for substitution peak output power measurements



Test specification:	FCC part 24, section 24.232/RSS-133 section 6.4, Peak output power		
Test procedure:	FCC part 24, Section 24.232		
Test mode:	Compliance	Verdict:	PASS
Date:	2/13/2008		
Temperature: 22ºC	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: 9.6 VDC
Remarks:			

Table 8.1.2 Field strength measurement of peak output power

ASSIGNED FREQUENCY:	1850 – 1910 MHz
TEST DISTANCE:	3 m
TEST SITE:	Semi anechoic chamber
EUT HEIGHT:	0.8 m
DETECTOR USED:	Peak
TEST ANTENNA TYPE:	Biconilog (30 MHz – 1000 MHz) Double ridged guide (above 1000 MHz)
MODULATION:	GSM
BIT RATE:	270 kbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
RESOLUTION BANDWIDTH:	1 MHz
VIDEO BANDWIDTH:	3 MHz

Frequency, MHz	Field strength, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees
1850.2	125.1	128.23	-3.13	V	1.25	349
1879.8	123.7	128.23	-4.53	V	1.25	313
1909.8	126.1	128.23	-2.13	V	1.20	321

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

Table 8.1.3 Substitution measurement of peak output power

ASSIGNED FREQUENCY RANGE:	1850 – 1910 MHz
TEST DISTANCE:	3 m
SUBSTITUTION ANTENNA HEIGHT:	0.8 m
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	1 MHz
VIDEO BANDWIDTH:	3 MHz
SUBSTITUTION ANTENNA TYPE:	Tunable dipole (30 MHz – 1000 MHz) 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	Peak output power,EIRP dBm	Limit, dBm	Margin, dB*	Verdict
1850.2	125.1	V	21.4	8.64	1.41	28.63	33.00	-4.37	Pass
1879.8	123.7	V	20.3	8.78	1.42	27.66	33.00	-5.34	Pass
1909.8	126.1	V	23.1	8.92	1.42	30.60	33.00	-2.40	Pass

*- Margin = Peak output power – specification limit.

Reference numbers of test equipment used

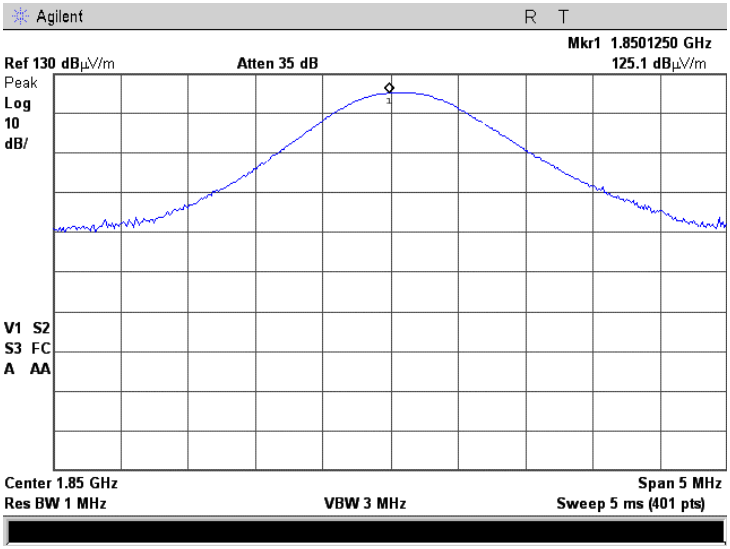
HL 0589	HL 0661	HL 1430	HL 1947	HL 1984	HL 2432	HL 3207	

Full description is given in Appendix A.

Test specification:	FCC part 24, section 24.232/RSS-133 section 6.4, Peak output power		
Test procedure:	FCC part 24, Section 24.232		
Test mode:	Compliance	Verdict:	PASS
Date:	2/13/2008		
Temperature: 22ºC	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: 9.6 VDC
Remarks:			

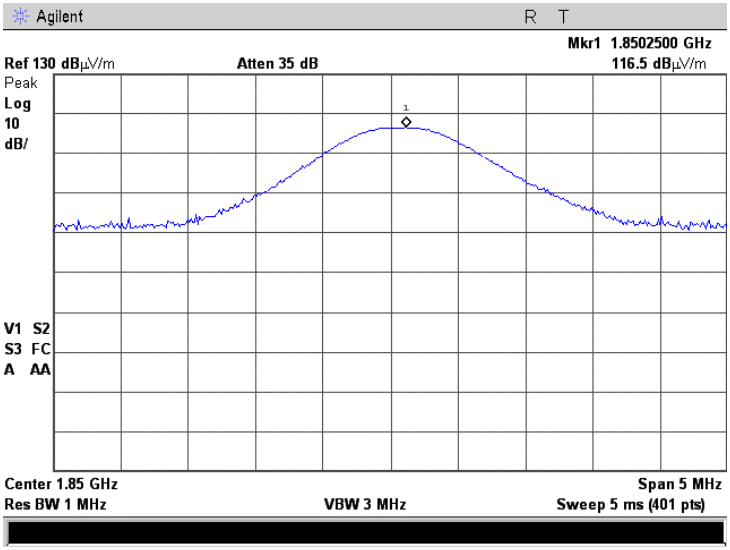
Plot 8.1.1 Field strength of carrier at low frequency

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



Plot 8.1.2 Field strength of carrier at low frequency

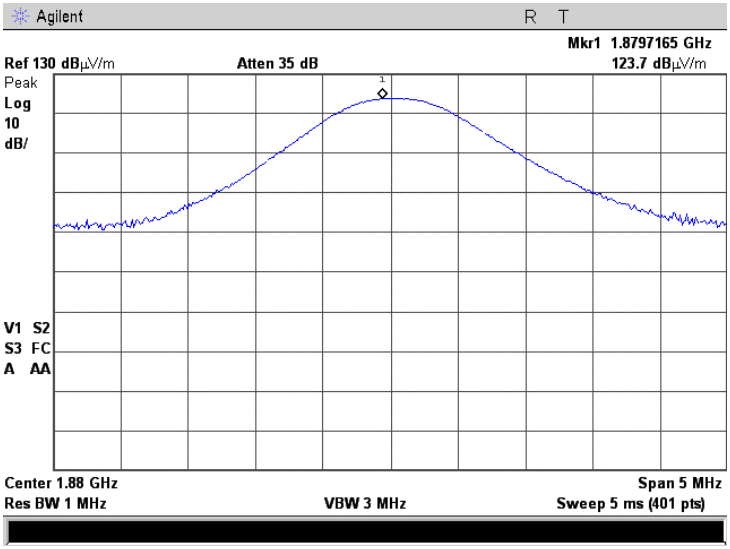
TEST SITE: Semi anechoic chamber
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC part 24, section 24.232/RSS-133 section 6.4, Peak output power		
Test procedure:	FCC part 24, Section 24.232		
Test mode:	Compliance	Verdict:	PASS
Date:	2/13/2008		
Temperature: 22ºC	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: 9.6 VDC
Remarks:			

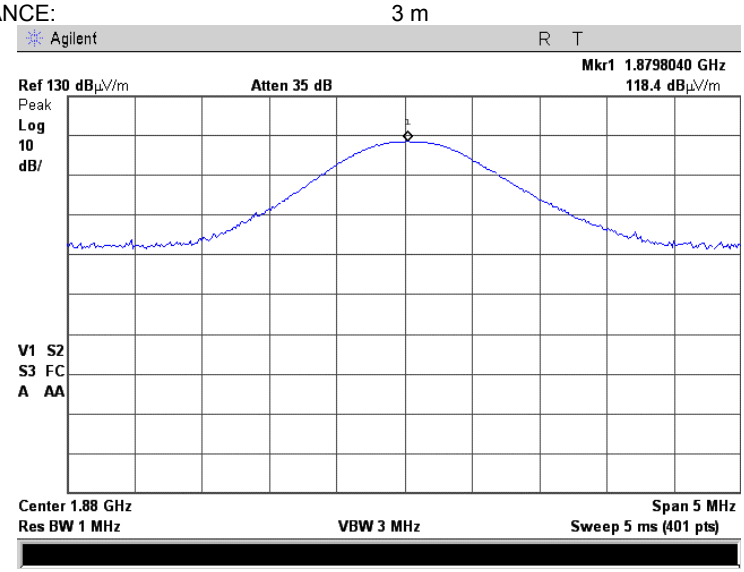
Plot 8.1.3 Field strength of carrier at mid frequency

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



Plot 8.1.4 Field strength of carrier at mid frequency

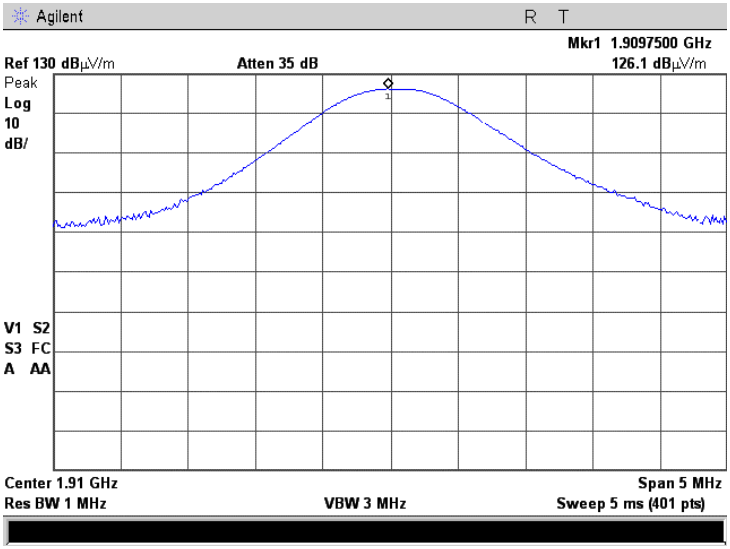
TEST SITE: Semi anechoic chamber
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC part 24, section 24.232/RSS-133 section 6.4, Peak output power		
Test procedure:	FCC part 24, Section 24.232		
Test mode:	Compliance	Verdict:	PASS
Date:	2/13/2008		
Temperature: 22ºC	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: 9.6 VDC
Remarks:			

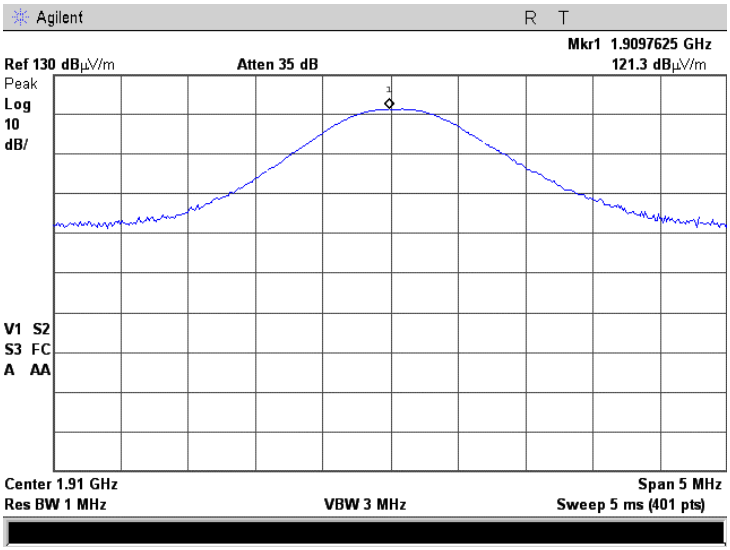
Plot 8.1.5 Field strength of carrier at high frequency

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



Plot 8.1.6 Field strength of carrier at high frequency

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



Test specification:	FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

8.2 Field strength of spurious emissions

8.2.1 General

This test was performed to measure field strength of spurious emissions from the EUT. Specification test limit is given in Table 8.2.1.

Table 8.2.1 Radiated spurious emissions limits

Frequency, MHz	Attenuation below carrier dBc	ERP of spurious, dBm	Equivalent field strength limit @ 3m, dB(µV/m)**
0.009 – 10th harmonic	43+10logP*	-13	84.4

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

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

8.2.2.1 The EUT was set up as shown in Figure 8.2.1, energized and the performance check was conducted.

8.2.2.2 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.

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

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

8.2.3.1 The EUT was set up as shown in Figure 8.2.2, energized and the performance check was conducted.

8.2.3.2 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.

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

8.2.4 Test procedure for substitution EIRP measurements of spurious

8.2.4.1 The test equipment was set up as shown in Figure 8.2.3 and energized.

8.2.4.2 RF signal generator was set to the frequency of investigated spurious emission and the RF output level was preliminary adjusted to produce the same field strength as it was measured from the EUT.

8.2.4.3 The test antenna height was swept from 1 to 4 m to find maximum emission from substitution antenna and RF signal generator output was fine adjusted to produce the same field strength as it was measured from the EUT.

8.2.4.4 The above procedure was performed in both, horizontal and vertical, polarizations of the test and substitution antennas.

8.2.4.5 The ERP of spurious emissions was calculated as a sum of signal generator output power in dBm and antenna gain in dBi reduced by cable loss in dB.

8.2.4.6 The above procedure was repeated at the rest of investigated frequencies.

8.2.4.7 The worst test results (the lowest margins) were recorded in Table 8.2.3 and shown in the associated plots.

Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

Figure 8.2.1 Setup for spurious emission field strength measurements below 30 MHz

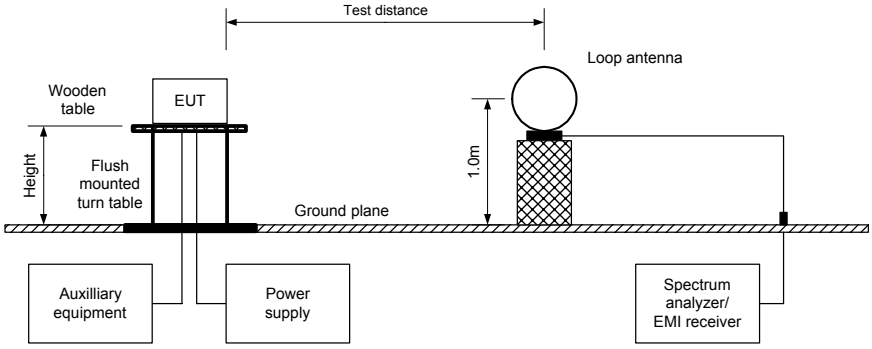
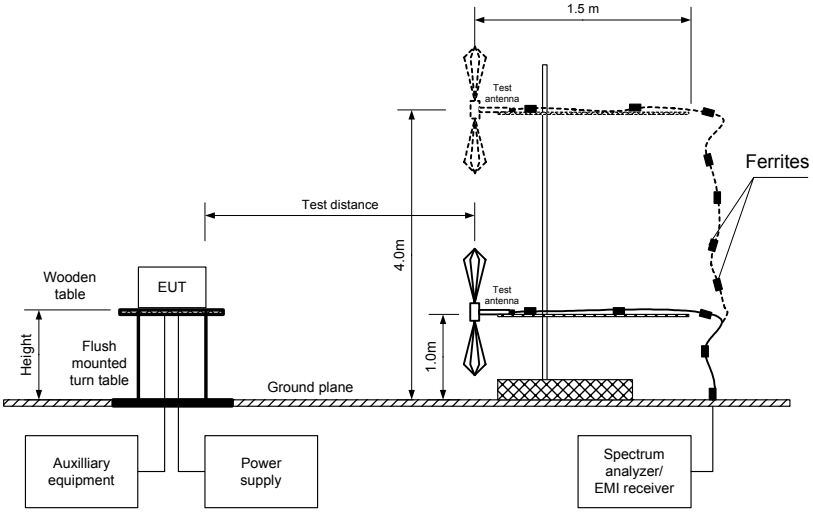
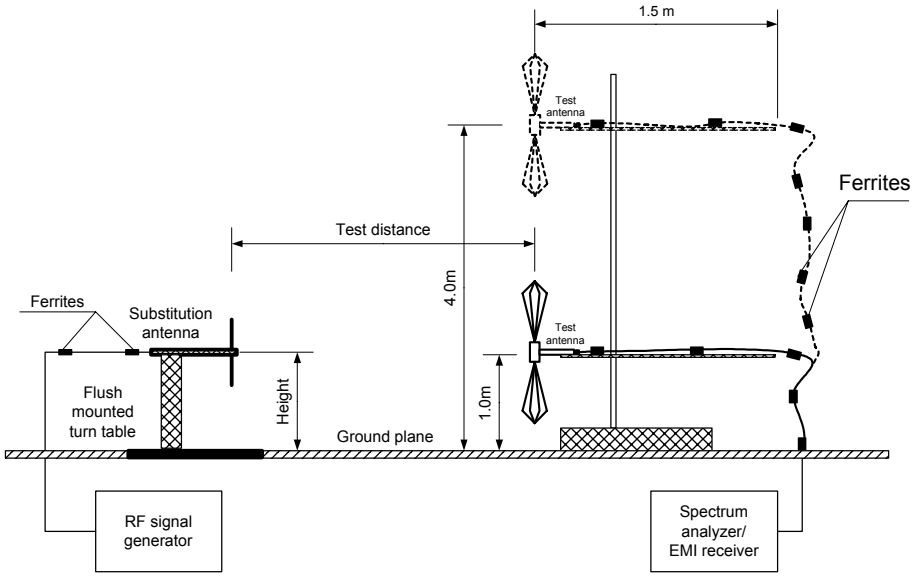


Figure 8.2.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

Figure 8.2.3 Setup for substitution of spurious emission measurements



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

Table 8.2.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 1850-1910 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber / OATS
EUT HEIGHT: 0.8 m
INVESTIGATED FREQUENCY RANGE: 0.009 – 20000 MHz
DETECTOR USED: Peak
VIDEO BANDWIDTH: > Resolution bandwidth
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)
MODULATION: GSM
BIT RATE: 270 kbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Field strength, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*	RBW, kHz	Antenna polarization	Antenna height, m	Turn-table position**, degrees
Low carrier frequency							
5550.320	61.67	84.4	-22.73	1000	Horizontal	1.4	18
14802.208	63.83	84.4	-20.57	1000	Vertical	1.3	10
Mid carrier frequency							
7519.025	59.29	84.4	-25.11	1000	Vertical	1.4	173
15038.450	58.67	84.4	-25.73	1000	Vertical	1.2	18
High carrier frequency							
7639.600	58.28	84.4	-26.12	1000	Vertical	1.4	174

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

Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

Table 8.2.3 Substitution EIRP of spurious test results

ASSIGNED FREQUENCY RANGE: 1850.0 – 1910.0 MHz
TRANSMITTER CARRIER POWER: 28.63 dBm at low frequency
27.66 dBm at mid frequency
30.60 dBm at high frequency
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
SUBSTITUTION ANTENNA HEIGHT: 0.8 m
DETECTOR USED: Peak
VIDEO BANDWIDTH: > Resolution bandwidth
SUBSTITUTION ANTENNA TYPE: Tunable dipole (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)

Frequency MHz	Field strength dB(µV/m	RBW, kHz	Antenna polarizatio	RF generato output, dBm	Ant gain, dBi	Cable loss dB	Spurious emission, dBm	Limit, dBm	Margin dB*	Verdict
Low carrier frequency										
5550.320	61.67	1000	Horizontal	-42.63	10.58	2.30	-34.35	-13.00	-21.35	Pass
14802.208	63.83	1000	Vertical	-41.57	13.44	3.99	-32.12	-13.00	-19.12	Pass
Mid carrier frequency										
7519.025	59.29	1000	Vertical	-45.01	10.91	2.73	-36.83	-13.00	-23.83	Pass
15038.450	58.67	1000	Vertical	-47.93	14.53	4.04	-37.44	-13.00	-24.44	Pass
High carrier frequency										
7639.600	58.28	1000	Vertical	-46.02	10.98	2.76	-37.80	-13.00	-24.80	Pass

Reference numbers of test equipment used

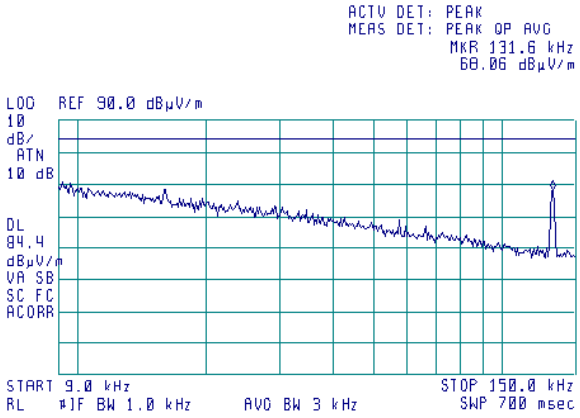
HL 0410	HL 0446	HL 0521	HL 0589	HL 0604	HL 0768	HL 1424	HL 1947
HL 1984	HL 2009	HL 2259	HL 2260	HL 2499	HL 2909	HL 2910	

Full description is given in Appendix A.

Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

Plot 8.2.1 Radiated emission measurements in 9 - 150 kHz range

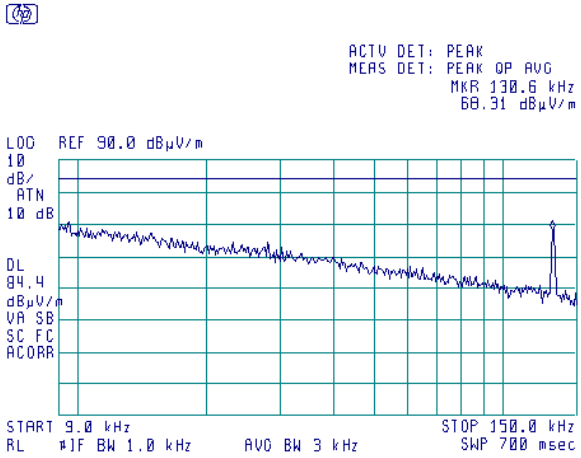
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Note: intentional radiator 131 kHz

Plot 8.2.2 Radiated emission measurements in 9 - 150 kHz range

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

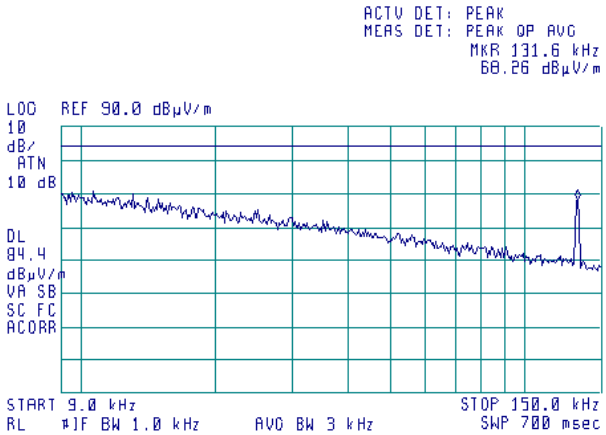


Note: intentional radiator 131 kHz

Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

Plot 8.2.3 Radiated emission measurements in 9 - 150 kHz range

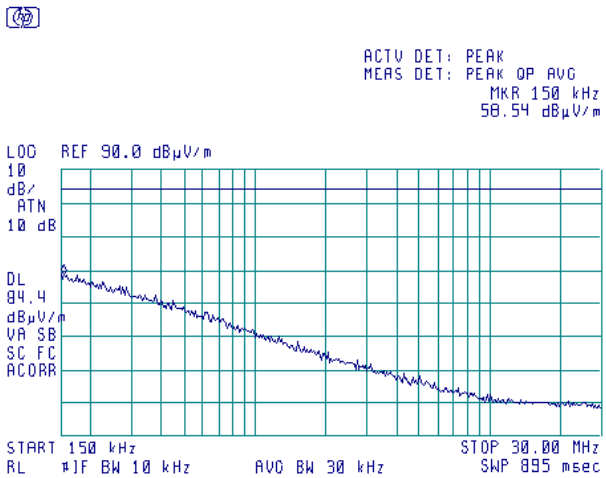
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Note: intentional radiator 131 kHz

Plot 8.2.4 Radiated emission measurements in 0.15 - 30 MHz range

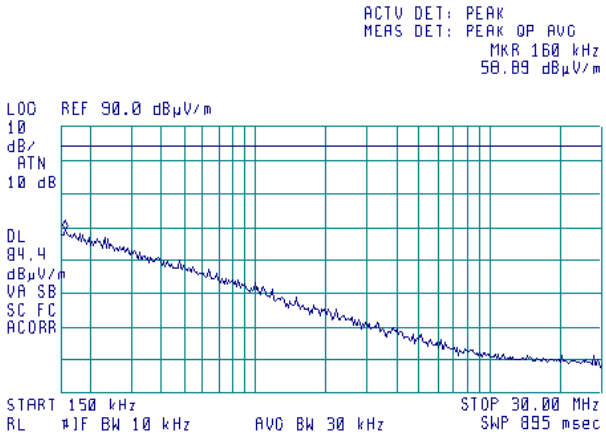
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

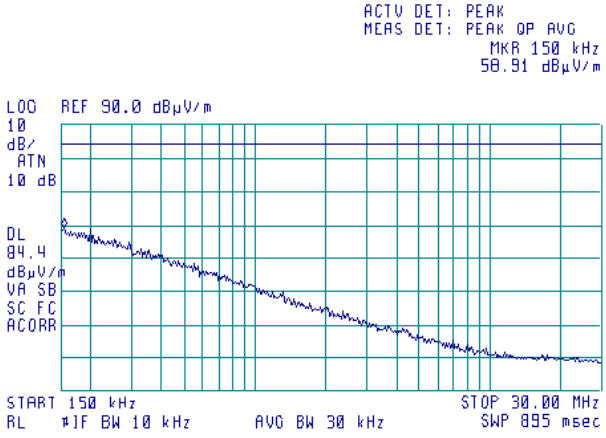
Plot 8.2.5 Radiated emission measurements in 0.15 - 30 MHz range

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



Plot 8.2.6 Radiated emission measurements in 0.15 - 30 MHz range

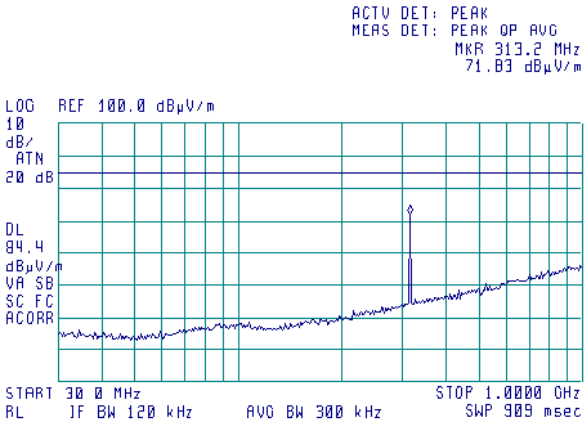
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

Plot 8.2.7 Radiated emission measurements in 30 - 1000 MHz range

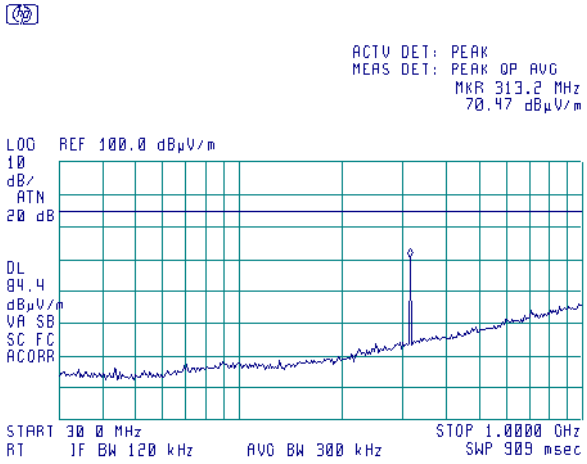
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Note: intentional radiators 315 MHz

Plot 8.2.8 Radiated emission measurements in 30 - 1000 MHz range

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

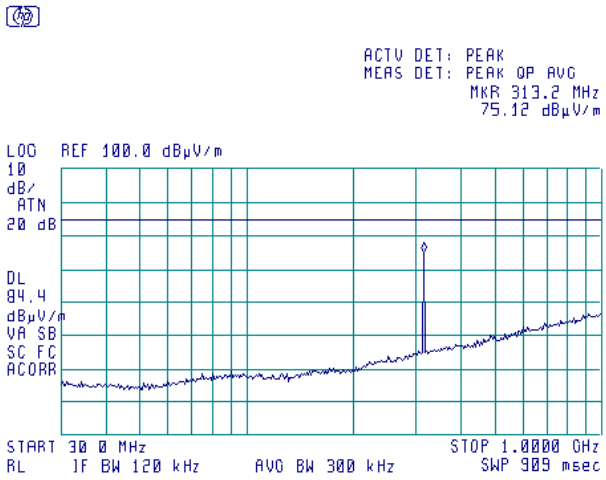


Note: intentional radiators 315 MHz

Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

Plot 8.2.9 Radiated emission measurements in 30 - 1000 MHz range

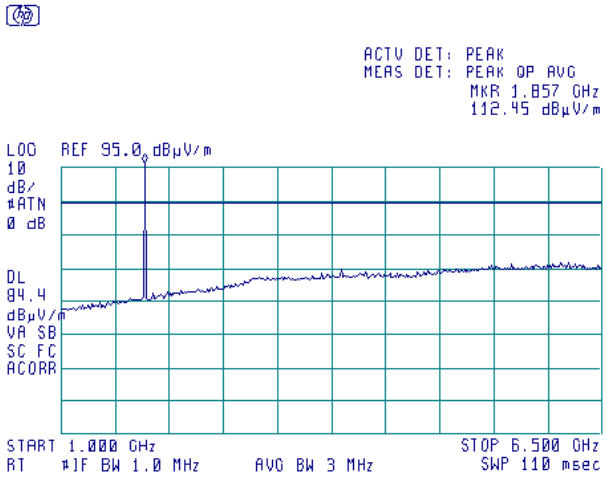
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Note: intentional radiators 315 MHz

Plot 8.2.10 Radiated emission measurements in 1000 – 6500 MHz range

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

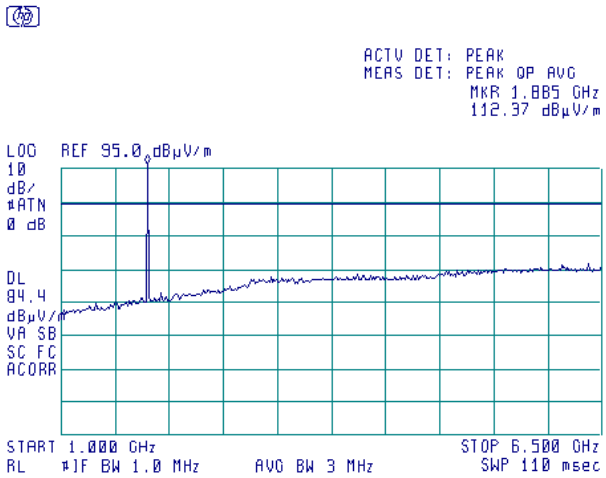


Note: intentional radiators 1850.2 MHz (GSM module)

Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

Plot 8.2.11 Radiated emission measurements in 1000 – 6500 MHz range

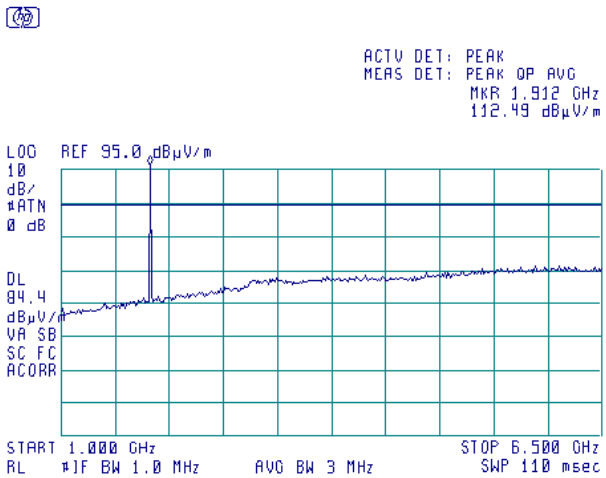
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Note: intentional radiators 1879.8 MHz (GSM module)

Plot 8.2.12 Radiated emission measurements in 1000 – 6500 MHz range

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

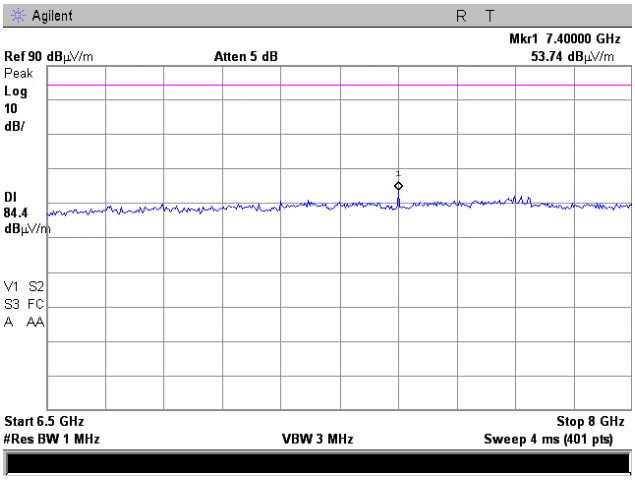


Note: intentional radiators 1909.8 MHz (GSM module)

Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

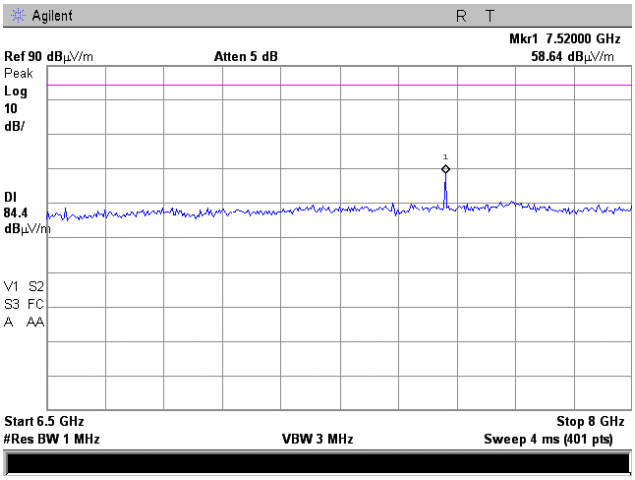
Plot 8.2.13 Radiated emission measurements in 6.5- 8 GHz range

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



Plot 8.2.14 Radiated emission measurements in 6.5- 8 GHz range

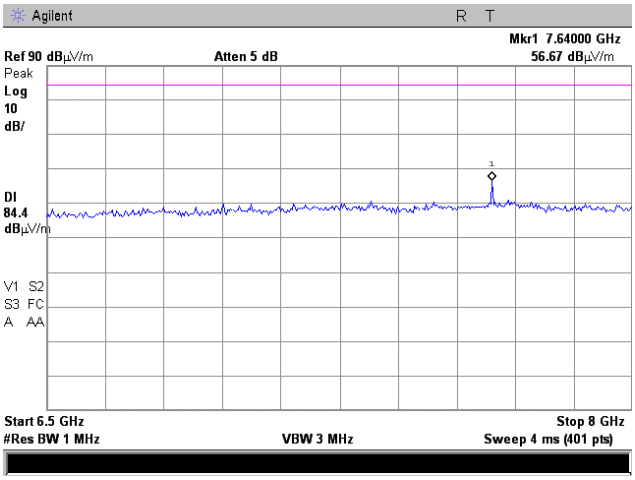
TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

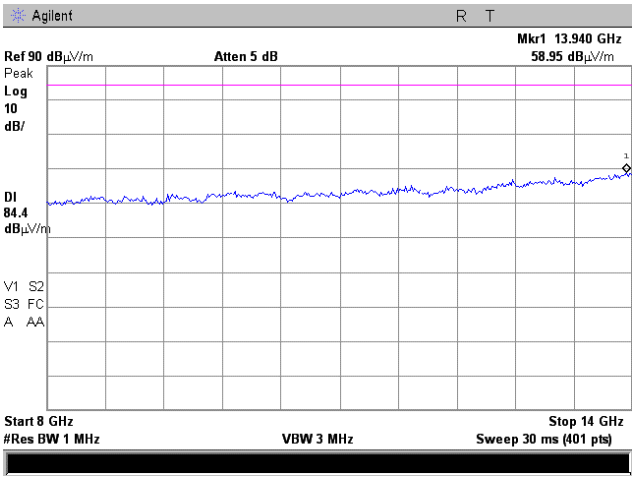
Plot 8.2.15 Radiated emission measurements in 6.5- 8 GHz range

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



Plot 8.2.16 Radiated emission measurements in 8 - 14 GHz range

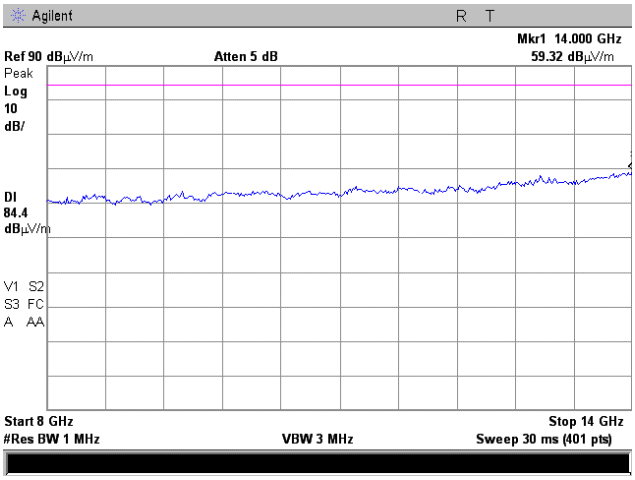
TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

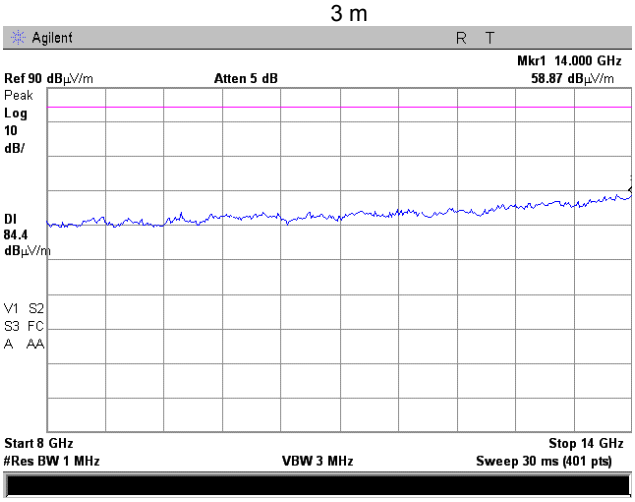
Plot 8.2.17 Radiated emission measurements in 8 - 14 GHz range

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



Plot 8.2.18 Radiated emission measurements in 8 - 14 GHz range

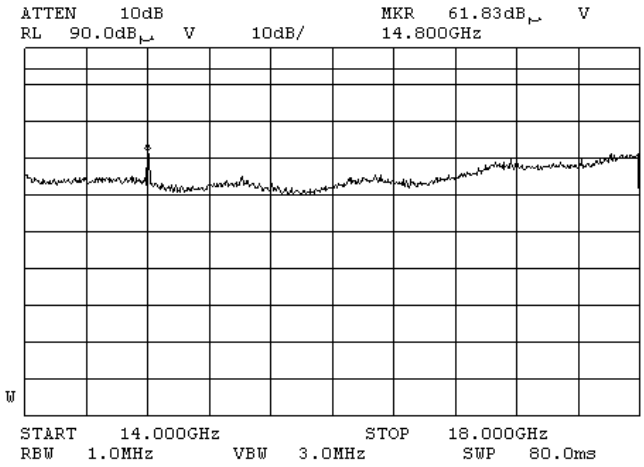
TEST SITE: OATS
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

Plot 8.2.19 Radiated emission measurements in 14 – 18 GHz range

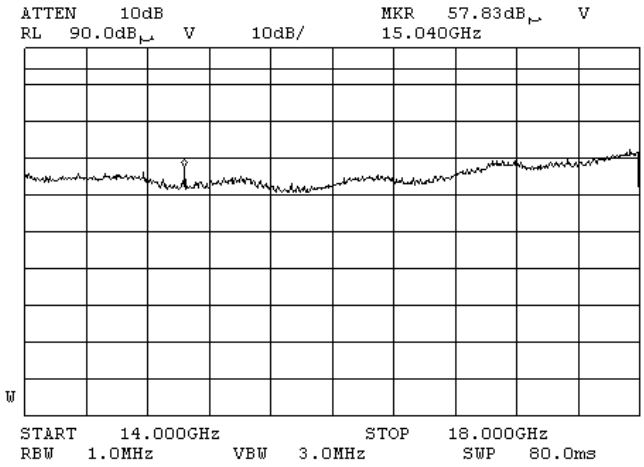
TEST SITE:	OATS
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

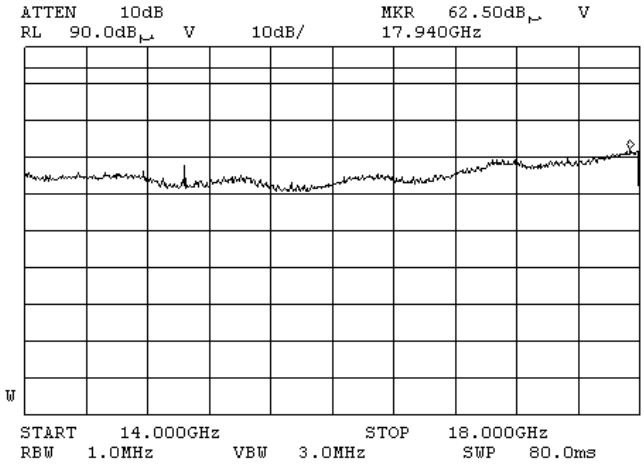
Plot 8.2.20 Radiated emission measurements in 14 – 18 GHz range, first marker reading

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



Plot 8.2.21 Radiated emission measurements in 14 – 18 GHz range, second marker reading

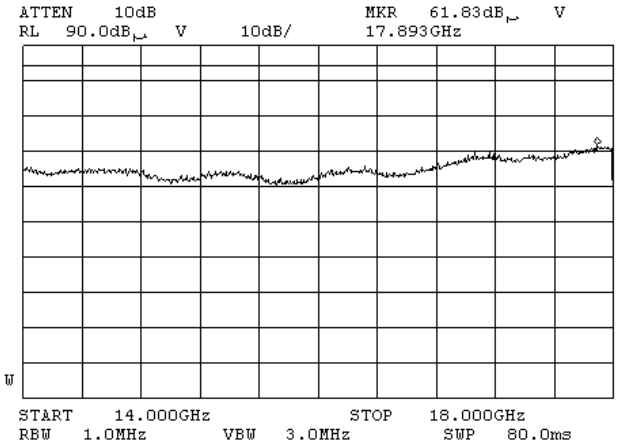
TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

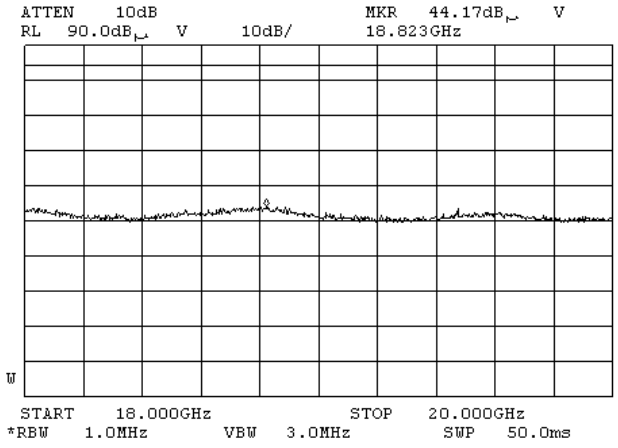
Plot 8.2.22 Radiated emission measurements in 14 – 18 GHz range

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



Plot 8.2.23 Radiated emission measurements in 18 – 20 GHz range

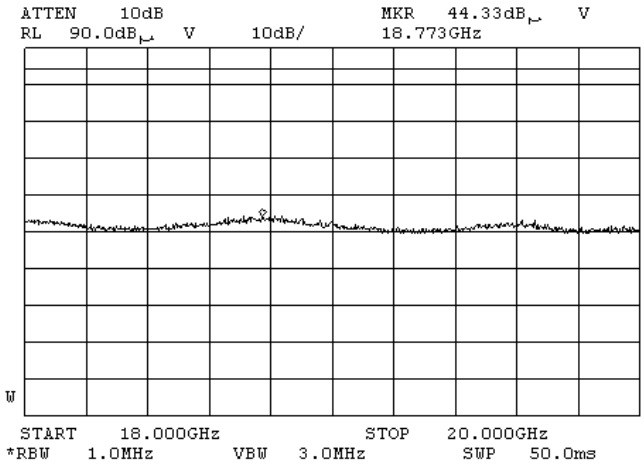
TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

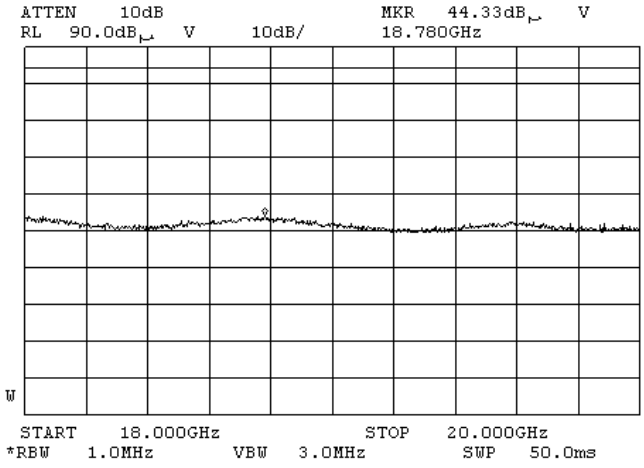
Plot 8.2.24 Radiated emission measurements in 18 – 20 GHz range

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



Plot 8.2.25 Radiated emission measurements in 18 – 20 GHz range

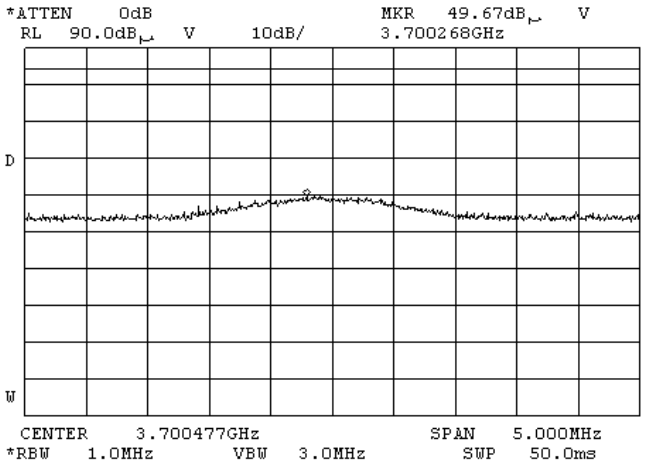
TEST SITE: OATS
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

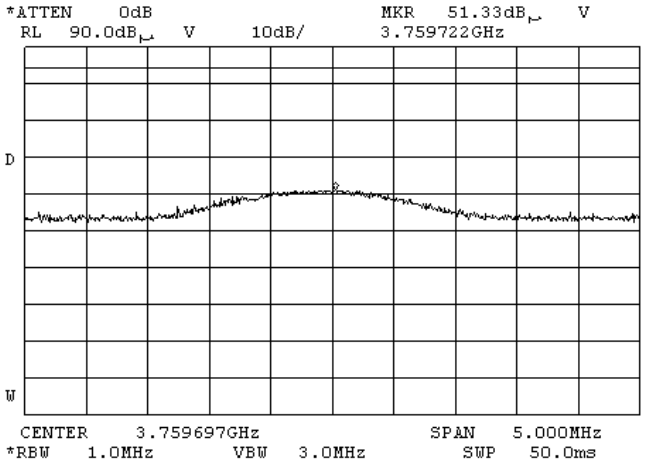
Plot 8.2.26 Radiated emission measurements at the 2nd harmonic

TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Plot 8.2.27 Radiated emission measurements at the 2nd harmonic

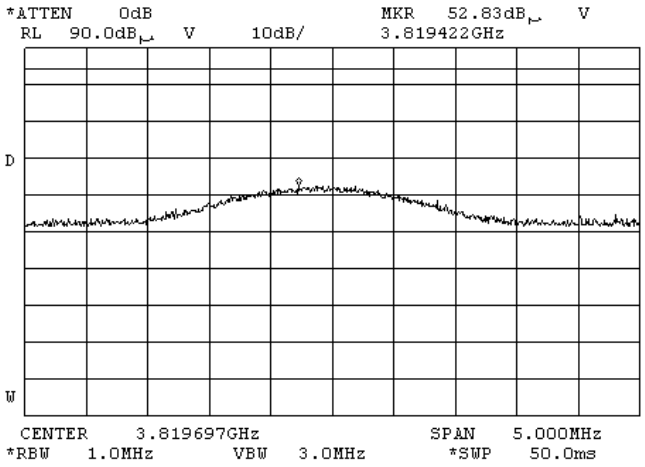
TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

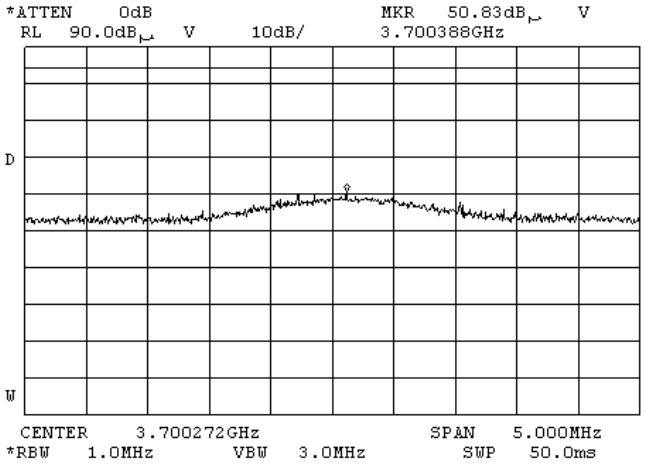
Plot 8.2.28 Radiated emission measurements at the 2nd harmonic

TEST SITE: OATS
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Plot 8.2.29 Radiated emission measurements at the 2nd harmonic

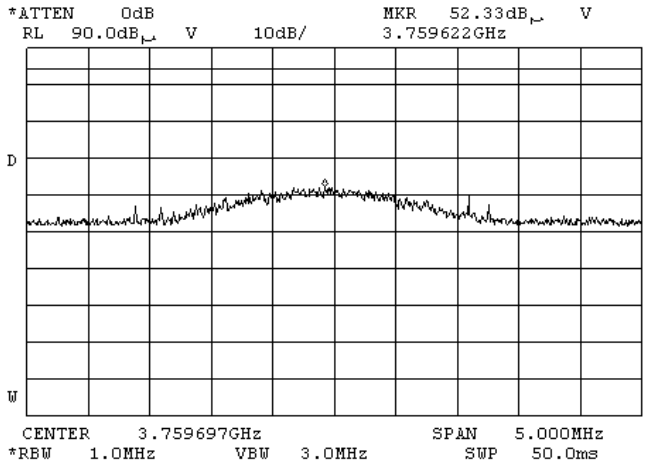
TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

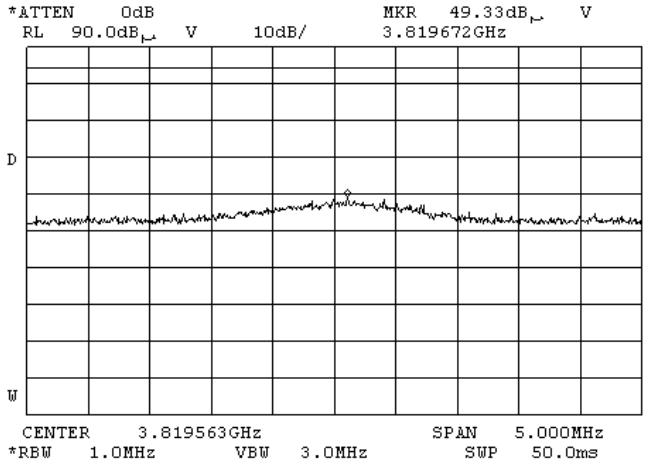
Plot 8.2.30 Radiated emission measurements at the 2nd harmonic

TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Plot 8.2.31 Radiated emission measurements at the 2nd harmonic

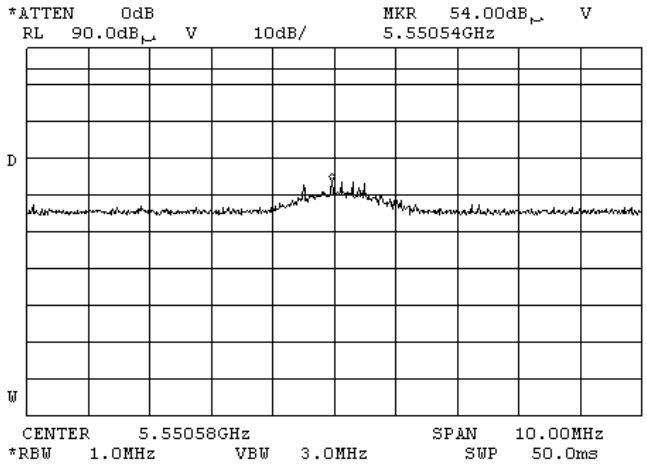
TEST SITE: OATS
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

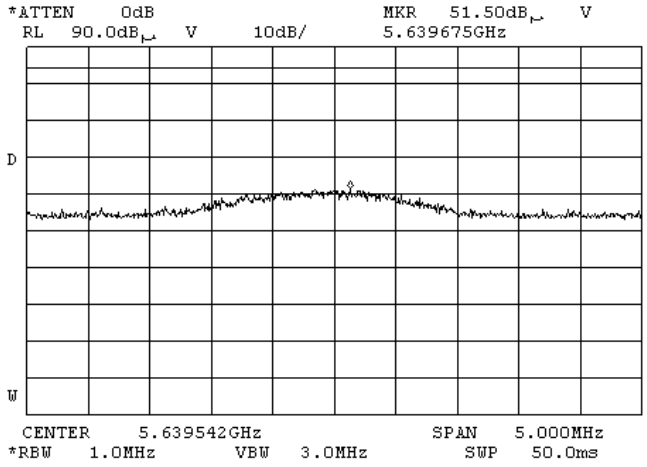
Plot 8.2.32 Radiated emission measurements at the 3rd harmonic

TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Plot 8.2.33 Radiated emission measurements at the 3rd harmonic

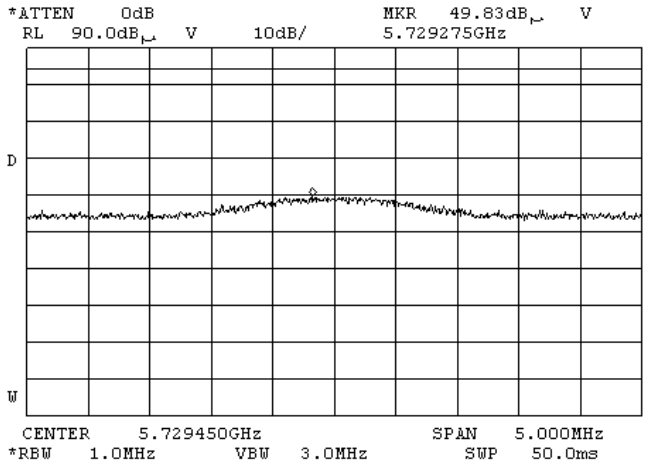
TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

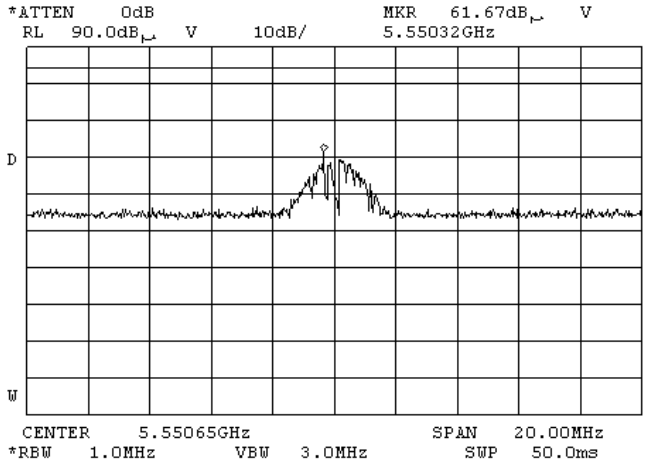
Plot 8.2.34 Radiated emission measurements at the 3rd harmonic

TEST SITE: OATS
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Plot 8.2.35 Radiated emission measurements at the 3rd harmonic

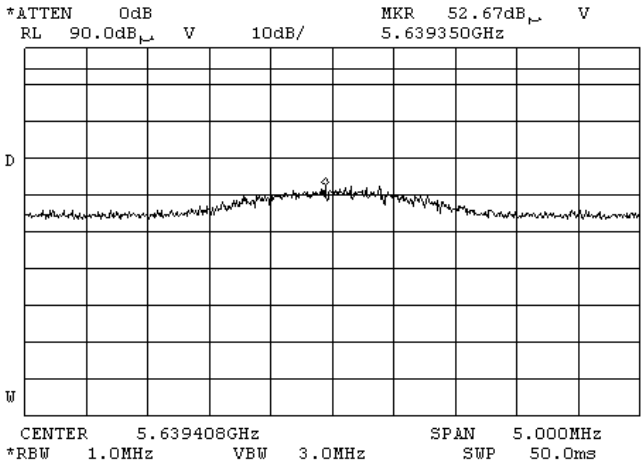
TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

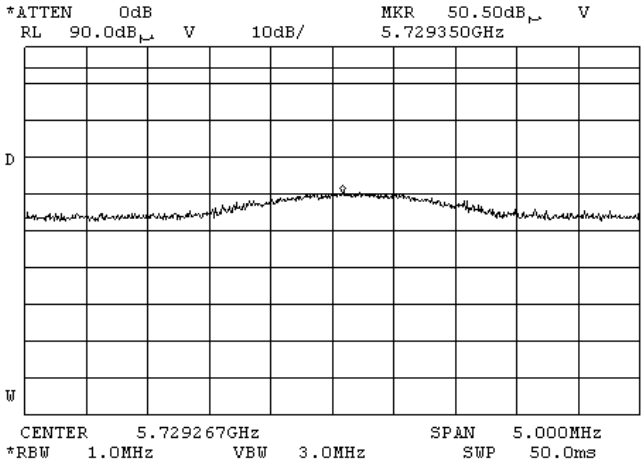
Plot 8.2.36 Radiated emission measurements at the 3rd harmonic

TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Plot 8.2.37 Radiated emission measurements at the 3rd harmonic

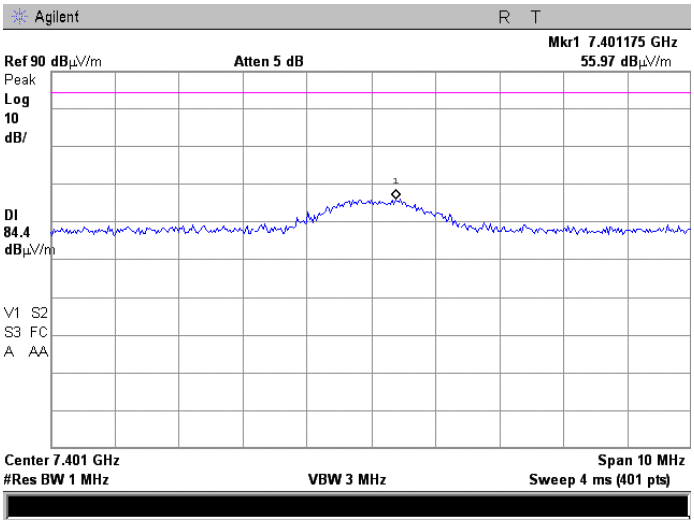
TEST SITE: OATS
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

Plot 8.2.38 Radiated emission measurements at the 4th harmonic

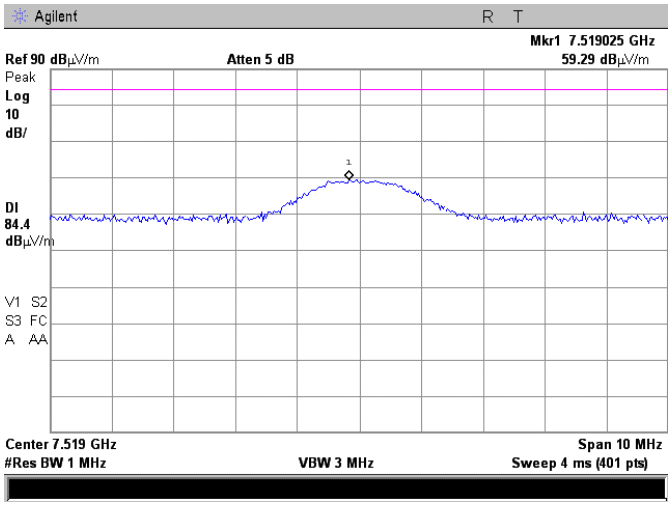
TEST SITE:	OATS
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

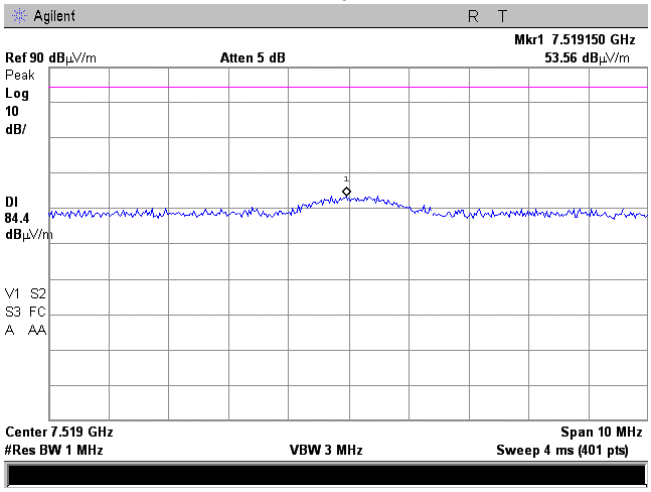
Plot 8.2.39 Radiated emission measurements at the 4th harmonic

TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Plot 8.2.40 Radiated emission measurements at the 4th harmonic

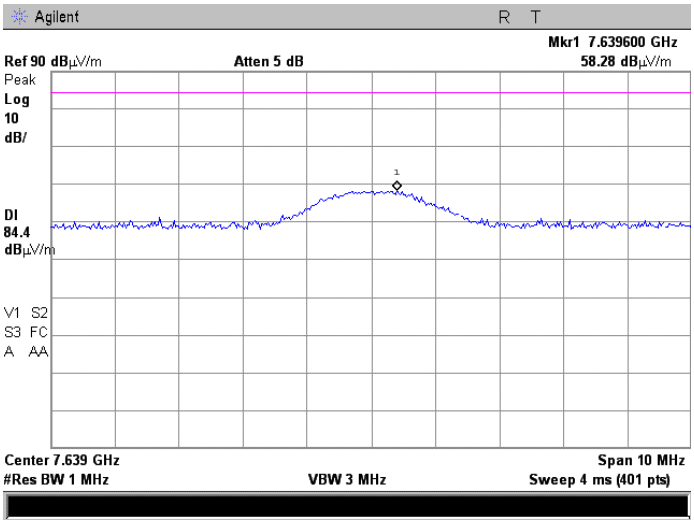
TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

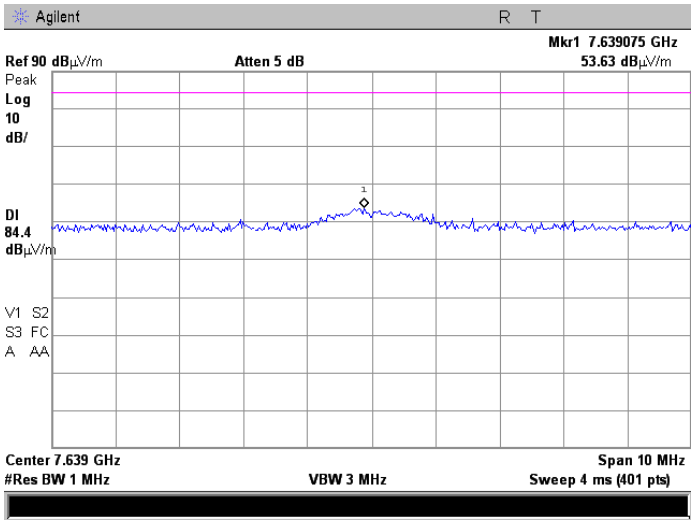
Plot 8.2.41 Radiated emission measurements at the 4th harmonic

TEST SITE: OATS
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Plot 8.2.42 Radiated emission measurements at the 4th harmonic

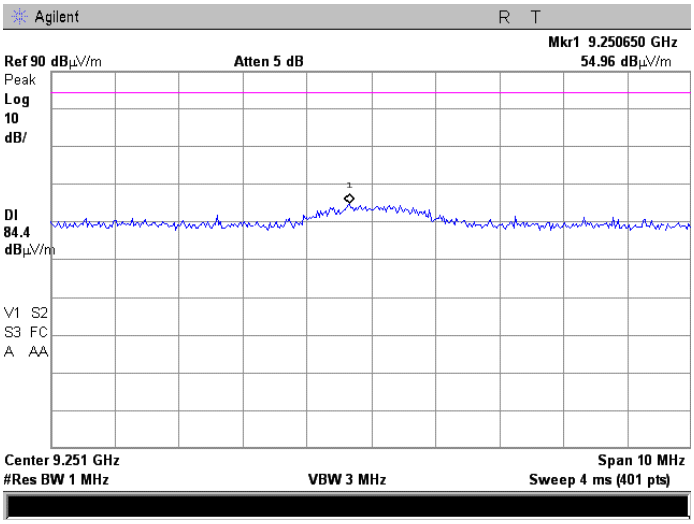
TEST SITE: OATS
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

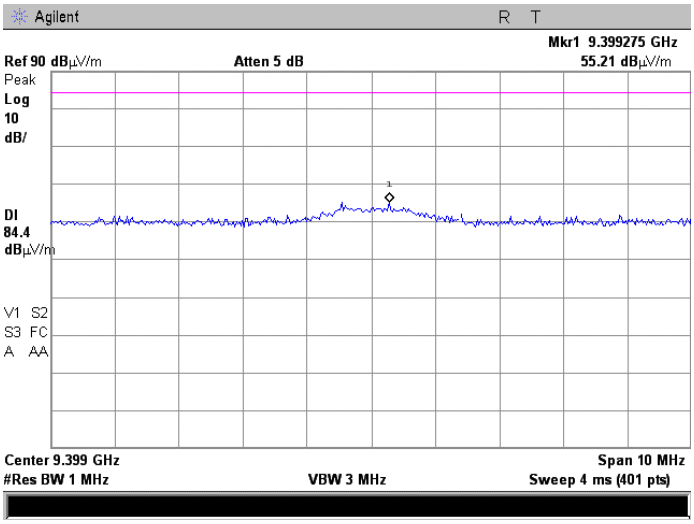
Plot 8.2.43 Radiated emission measurements at the 5th harmonic

TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Plot 8.2.44 Radiated emission measurements at the 5th harmonic

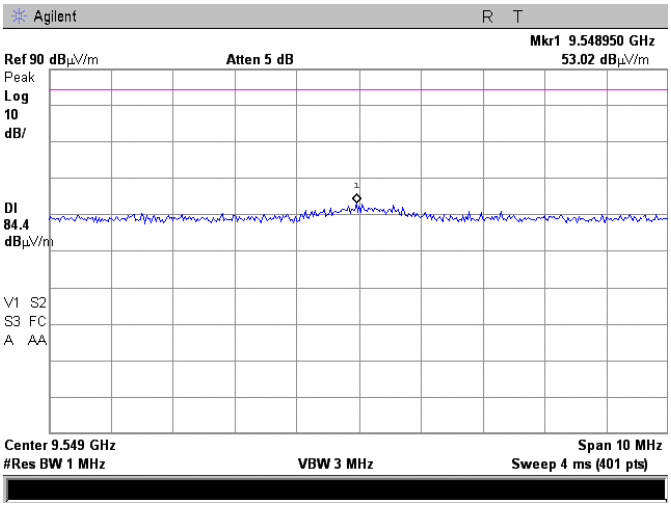
TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

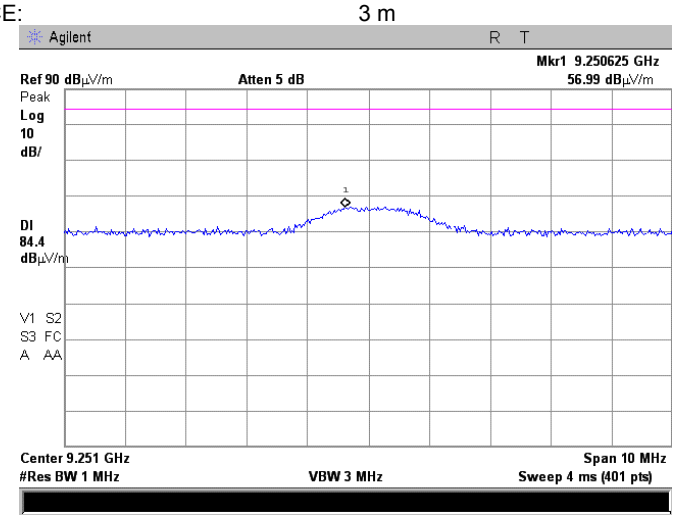
Plot 8.2.45 Radiated emission measurements at the 5th harmonic

TEST SITE: OATS
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Plot 8.2.46 Radiated emission measurements at the 5th harmonic

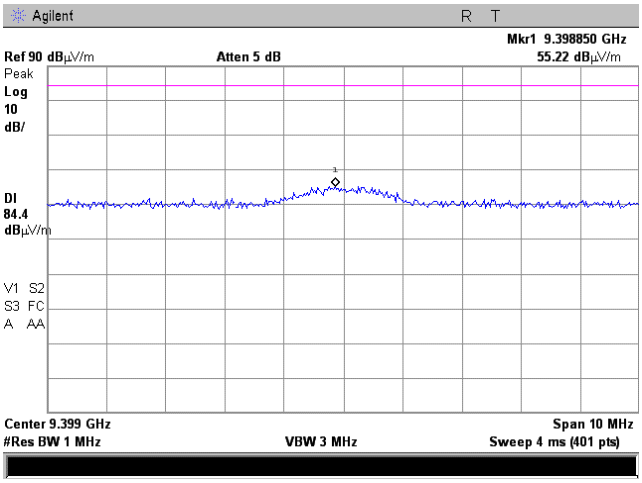
TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

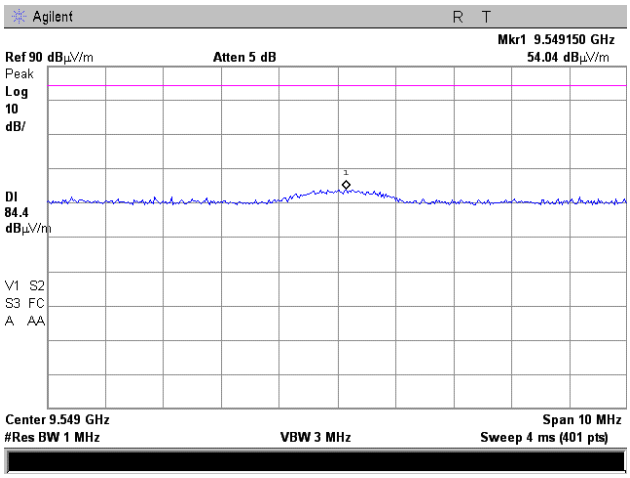
Plot 8.2.47 Radiated emission measurements at the 5th harmonic

TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Plot 8.2.48 Radiated emission measurements at the 5th harmonic

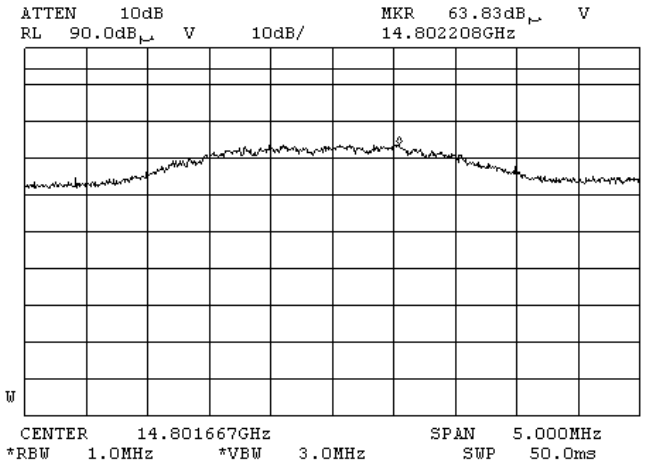
TEST SITE: OATS
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	**FCC part 24, section 24.238/RSS-133 section 6.5, Radiated spurious emissions**		
Test procedure:	Public notice DA 00-705		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/13/2008		
Temperature: 22ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 39 %	**Power Supply:** 9.6 VDC
Remarks: 3 Tx: 315 MHz, 131 MHz and 1850-1910 MHz operate simultaneously			

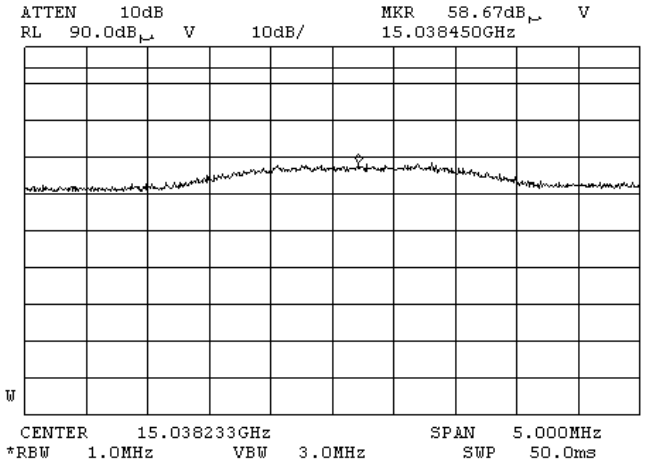
Plot 8.2.49 Radiated emission measurements at the 8th harmonic

TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal 1.3 m 010 deg
TEST DISTANCE: 3 m



Plot 8.2.50 Radiated emission measurements at the 8th harmonic

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



9 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0410	Cable, Coax, Microwave, DC-18 GHz, N-N, 1 m	Gore	PFP01P01039.4	9338767	01-Jan-08	01-Jan-09
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	28-Jun-07	28-Jun-08
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard Co	8546A	3617A00319, 3448A00253	28-Aug-07	28-Aug-08
0557	Generator Signal, 9 KHz - 1.2 GHz	Marconi Instruments	2023	112225/080	13-Feb-08	13-Feb-09
0567	Antenna, Dipole, Tunable, 500 - 1000 MHz	Electro-Metrics	TDS-25/30-2	298	29-Jan-08	29-Jan-09
0589	Cable Coaxial, GORE A2P01POL118, 2.3 m, 6.5 GHz	HL	GORE-3	176	02-Dec-07	02-Dec-08
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	10-Jan-08	10-Jan-09
0661	Generator Swept Signal, 10 MHz to 40 GHz, + 10 dBm	HP	83640B	3614A00266	23-Sep-07	23-Sep-08
0768	Antenna Standard Gain Horn,18-26.5 GHz, WR-42, 25 dB gain	Quinstar Technology	QWH-4200-BA	110	08-Dec-06	08-Dec-08
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies	8564EC	3946A00219	28-Aug-07	28-Aug-08
1430	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL1432	Agilent Technologies	8542E	3807A00262,3705A00217	31-Aug-07	31-Aug-08
1947	Cable 18GHz, 6.5 m, blue	Rhophase Microwave Limited	NPS-1803A-6500-NPS	T4974	05-Oct-07	05-Oct-08
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	03-Mar-08	03-Mar-09
2009	Cable RF, 8 m	Alpha Wire	RG-214	C-56	01-Jan-08	01-Jan-09
2259	Amplifier Low Noise 2-20 GHz	Sophia Wireless	LNA0220-C	0223	01-Jan-08	01-Jan-09
2260	Amplifier Low Noise 14-33 GHz	Sophia Wireless	LNA28-B	0233	05-Nov-07	05-Nov-08
2400	Cable 40GHz, 1.5 m, green	Rhophase Microwave Limited	KPS-1503A-1500-KPS	X2946	01-Jan-08	01-Jan-09
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	03-Mar-08	03-Mar-09
2499	Quadruplexer 1-12 GHz (1-2 GHz; 2-4 GHz; 4-8 GHz; 8-12 GHz)	Elettronica S.p.A. - Roma	UE 84	D/00239	08-Feb-07	08-Feb-09
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY41444762	07-May-07	07-May-08
2910	Cable 18 GHz, 3 m, SMA-SMA	Gore	NA	989370	05-Oct-07	05-Oct-08
3207	Cable 40GHz, 1.2 m	Gore	GOR245	05118337	17-Jun-07	17-Jun-08

10 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

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

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

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

11 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility. Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47) and by Industry Canada for electromagnetic emissions (file numbers IC 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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website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

12 APPENDIX D Specification references

47CFR part 22:2007	Public Mobile Services
47CFR part 24: 2007	Personal Communications Services
47CFR part 15:2007	Radio Frequency Devices
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4: 2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI/TIA/EIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

13 APPENDIX E Test equipment correction factors

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
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
Standard gain horn antenna
Quinstar Technology
Model QWH
Ser.No.110, HL 0768

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).

Antenna factor
Double-ridged guide horn antenna
Model 3115, serial number: 00027177, HL 2432

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

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

Cable loss
Cable GORE, HL 0410

No.	Frequency, GHz	Cable loss, dB
1	0.5	0.16
2	1	0.28
3	2	0.38
4	4	0.55
5	6	0.85
6	8	0.90
7	10	1.07
8	12	1.11
9	14	1.29
10	16	1.41
11	18	1.73

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 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, green, Rhophase Microwave Limited, model: KPS-1503A-1500-KPS, HL 2400

Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB
0.03	0.06	6.5	1.46	15.50	2.34
0.05	0.08	6.7	1.49	16.00	2.34
0.1	0.15	6.9	1.50	16.50	2.40
0.2	0.23	7.1	1.51	17.00	2.46
0.3	0.29	7.3	1.55	17.50	2.54
0.5	0.37	7.5	1.56	18.00	2.61
0.7	0.46	7.7	1.58	18.50	2.59
0.9	0.53	7.9	1.60	19.00	2.59
1.1	0.58	8.1	1.61	19.50	2.67
1.3	0.65	8.3	1.68	20.00	2.62
1.5	0.66	8.5	1.68	20.50	2.73
1.7	0.72	8.7	1.75	21.00	2.71
1.9	0.76	8.9	1.74	21.50	2.78
2.1	0.79	9.1	1.81	22.00	2.83
2.3	0.85	9.3	1.79	22.50	2.81
2.5	0.90	9.5	1.86	23.50	2.91
2.7	0.91	9.7	1.85	24.00	2.97
2.9	0.97	9.9	1.87	24.50	2.98
3.1	0.97	10.1	1.88	25.00	2.97
3.3	1.03	10.30	1.82	25.50	3.03
3.5	1.06	10.50	1.92	26.00	3.04
3.7	1.10	10.70	1.86	26.50	3.11
3.9	1.13	10.90	1.96	27.00	2.97
4.1	1.16	11.10	1.90	28.00	3.15
4.3	1.18	11.30	1.99	29.00	3.07
4.5	1.21	11.50	1.95	30.00	3.13
4.7	1.23	11.70	2.00	31.00	3.13
4.9	1.26	11.90	2.01	32.00	3.18
5.1	1.28	12.10	1.99	33.00	3.31
5.3	1.31	12.40	2.06	34.00	3.32
5.5	1.32	13.00	2.11	35.00	3.37
5.7	1.36	13.50	2.17	36.00	3.36
5.9	1.37	14.00	2.36	37.00	3.46
6.1	1.38	14.50	2.32	39.00	3.49
6.3	1.44	15.00	2.30	40.00	3.52

Cable loss
Cable coaxial, Gore, 18 GHz, 3m, SMA-SMA, S/N 989370
HL 2910

Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB
10	0.07	5750	2.97	12000	5.05
30	0.19	6000	2.91	12250	4.44
100	0.36	6250	3.23	12500	4.82
250	0.53	6500	3.42	12750	5.22
500	0.77	6750	3.17	13000	5.02
750	0.94	7000	3.56	13250	5.00
1000	1.10	7250	3.77	13500	5.09
1250	1.19	7500	3.48	13750	4.70
1500	1.35	7750	3.81	14000	5.03
1750	1.51	8000	3.82	14250	5.17
2000	1.57	8250	3.62	14500	4.92
2250	1.69	8500	3.95	14750	4.91
2500	1.76	8750	4.00	15000	5.03
2750	1.83	9000	3.80	15250	4.93
3000	2.02	9250	4.09	15500	5.28
3250	2.17	9500	4.12	15750	5.60
3500	2.13	9750	4.11	16000	5.16
3750	2.23	10000	4.36	16250	5.45
4000	2.40	10250	4.75	16500	5.78
4250	2.31	10500	4.61	16750	5.47
4500	2.52	10750	4.26	17000	5.21
4750	2.77	11000	4.62	17250	5.53
5000	2.82	11250	4.55	17500	5.53
5250	2.77	11500	4.59	17750	5.71
5500	3.04	11750	5.20	18000	5.77

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

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

14 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
dB(μA)	decibel referred to one microampere
dBΩ	decibel referred to one Ohm
DC	direct current
DTS	digital transmission system
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
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
OATS	open area test site
Ω	Ohm
PM	pulse modulation
ppm	part per million (10^{-6})
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
VA	volt-ampere