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Electrical

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RADIO TEST REPORT

according to 47CFR parts 2, 21 and part 15, subpart B
for

Airspan Networks (Israel) Ltd.

EQUIPMENT UNDER TEST:

Outdoor radio unit
Model: BSR/SPR 2.5 GHz TDD

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1 Project information

EUT attributes

Test item	Outdoor radio unit
Types (Models)	BSR/SPR 2.5 GHz TDD
Equipment FCC code	TNB

Applicant information

Applicant's responsible person	Mr. Zion Levi, compliance & testing engineer
Applicant/Manufacturer	Airspan Networks (Israel) Ltd.
Address	1, Harava street, "Unitronics" building
P.O.B.	199
City	Airport City
Postal code	70100
Country	Israel
Telephone number	+972 3977 7444
Telefax number	+972 3977 7400

Test details

Project number	15862
Location	Hermon Laboratories
Test started	March 17, 2004
Test completed	March 28, 2004
Purpose of test	Apparatus compliance verification in accordance with emission requirements
Test specifications	47CFR parts 2, 21,15 subpart B

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2 Summary of tests and signatures

The tests listed in the table below were performed.
The EUT was found complying with the limits of 47CFR Parts 2, 21, 15 subpart B.

Test description	Specification reference	Limits			Test report paragraph	Verdict
Intentional radiation						
Peak output power at RF antenna connector	2.1046, 21.904	Frequency, GHz	Limit, dBm		4.1	Pass
			Conducted power	EIRP, dBm		
		F_{low} = 2.501	EIRP-15 dBi (max antenna gain)	63.0 (total in 6 MHz) 45.2 (in any 100 kHz)		
		F_{mid} = 2.595				
		F_{high} = 2.685				
Frequency stability	2.1055, 21.101	Temperature, °C	Voltave, V	Limit, ppm	4.2	Pass
		-30	U_{nom}	±50		
		-20	U_{nom}			
		-10	U_{nom}			
		0	U_{nom}			
		10	U_{nom}			
		20	0.85 U_{nom}			
		20	U_{nom}	reference		
		20	1.15 U_{nom}	±50		
		30	U_{nom}			
		40	U_{nom}			
		50	U_{nom}			
Occupied bandwidth	2.1049	Frequency, GHz		Attenuation versus carrier,dBc	4.3	Pass
		F_{low} = 2.501		26		
		F_{mid} = 2.595				
		F_{high} = 2.685				
Modulation characteristics (emission mask)	2.1047, 21.905, 21.908(a)	Frequency		Attenuation versus carrier,dBc	4.4	Pass
		at 6 MHz channel edges		25		
		at 250 kHz beyond the nearest channel edge		25 –40 (linear slope)		
		at 3 MHz above the upper and below the lower channel edges		40 – 60 (linear slope)		
Spurious emissions RF antenna connector	2.1051, 21.908(a)	Frequency		Attenuation versus carrier,dBc	4.5	Pass
		9 kHz – 27 GHz		60		
Spurious emissions (radiated)	2.1053, 21.908(a)	Frequency		Attenuation versus carrier,dBc	4.6	Pass
		9 kHz – 27 GHz		60		

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Test description	Specification reference	Limits			Test report paragraph	Verdict
Unintentional radiation						
Conducted emissions at AC power port	15.107	Frequency, MHz	Class B limit, dBuV		4.7	Pass
			QP	AVR		
		0.15 – 0.5	66 – 56	56 – 46		
		0.5 – 5.0	56	46		
		5.0 – 30	60	50		
Radiated emissions	15.109	Frequency, MHz	Class B limit dBuV/m		4.8	Pass
		30 – 88	40.0			
		88 – 216	43.5			
		216 – 960	46.0			
		960 – 2200 (2^{nd} harmonic of LO)	54.0			

Test report prepared by:

Mrs. M. Cherniavsky, MScEE, certification engineer _____

Test report approved by:

Mr. Michael Nikishin, MScEE, group leader _____

Mr. Edward Usoskin, PhD, C.E.O. _____

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3 EUT description

3.1 General information

The outdoor radio unit, models BSR 2.5 GHz TDD and SPR 2.5 GHz TDD, is a part of the WipLL broadband fixed cellular wireless access system. The system provides a radio link between an end-user (a subscriber) and a network itself to give high-speed data access. The EUT is a transceiver (FSK digital modulation, data rate 1, 2, 3 Mbps or 1.33, 4 Mbps), operating in 2501 MHz to 2685 MHz range. The BSR is equipped with an 11 dBi gain, the SPR - with a 15 dBi gain internal antenna. The unit is installed outside a base station or subscriber site and typically is mounted on a pole. The SPR transmits and receives traffic to and from the base station (i.e., BSR), respectively. The transceiver provides subscribers with "always-on" Internet, high-speed data-only, or data and voice (VoIP) services and is configured with a unique BSR reference number, preventing the SPR from relocating to another subscriber premises without authorization.
The SPR has the same PCB components and differs from BSR only in the software and chassis dimensions.
The EUT is powered via a subscriber data adapter (SDA), which provides 48 V DC power.

3.2 EUT test configuration

The EUT ports and lines description is given in Table 3.2.1 and system/test configuration is shown in Figures 3.2.1, 3.2.2, 3.2.3.
The device operating frequencies generated by clocks and oscillators are provided in Table 3.2.2.

Table 3.2.1

EUT ports and lines

Port type	Port description	Connector type	Quantity	Cable type	Cable length, m	Indoor / outdoor	Connected to
Data + DC	48 VDC + Ethernet	D type 15 pin	2	Cat. 5 – 4x2 twisted pair	15	Outdoor	SDA
Antenna	RF output / input	N type to 7/16	1	RG-58	1.5	Outdoor	External antenna

Table 3.2.2

EUT operating frequencies

Frequency, MHz	Identification
350	IF1
6	IF2
20	Oscillator
48	Oscillator
2151	LO1 (F_{low} - IF1)
2245	LO1 (F_{mid} - IF1)
2335	LO1 (F_{high} - IF1)

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Figure 3.2.1

General WipLL system configuration

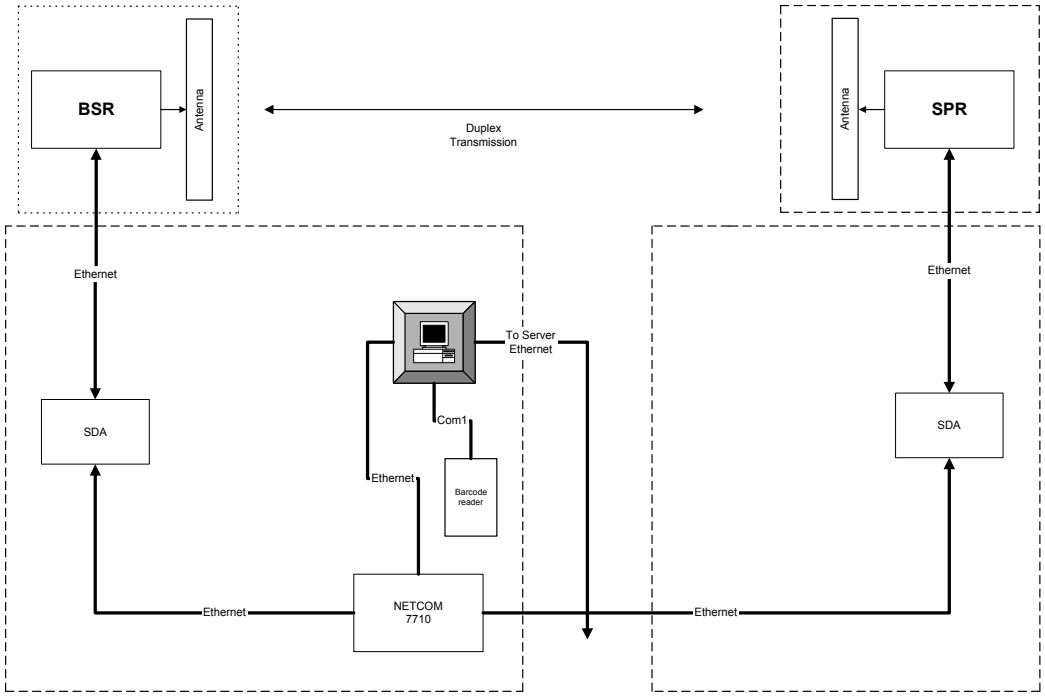

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Figure 3.2.2

SPR test configuration for conducted emission at AC line and radiated emission measurements in receive mode

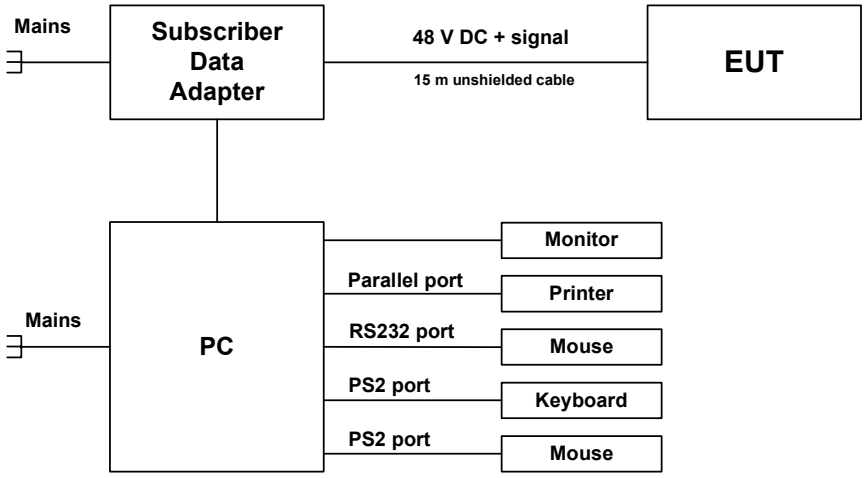
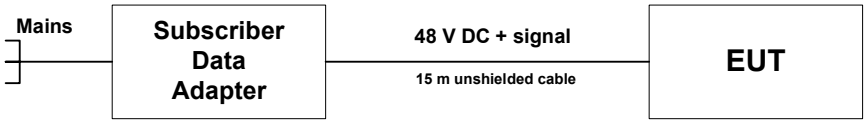


Figure 3.2.3

BSR test configuration for conducted emission at AC line measurements



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4 Test results

4.1 Peak output power test

4.1.1 General

This test was performed to measure the peak output power at RF antenna connector. Specification test limits are given in Table 4.1.1. The test results are provided in Table 4.1.2 and associated plots.

Table 4.1.1

Peak output power limits

Assigned frequency range, MHz	EIRP limit, dBm		Conducted power limit*, dBm	
	total in 6 MHz	in any 100 kHz	total in 6 MHz	in any 100 kHz
2500 - 2686	63.0	45.2	48.0	30.2

* Conducted power limit was calculated for 15 dBi antenna gain.

4.1.2 Test procedure

4.1.2.1 The EUT was set up as shown in Figure 4.1.1, energized and its proper operation was checked.

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

4.1.2.3 The peak output power was measured with spectrum analyzer at low, mid and high channel frequencies as provided in Table 4.1.2 and associated plots.

Figure 4.1.1

Peak output power test setup

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Table 4.1.2

Peak output power test results

DATE of TEST:	March 28, 2004
AMBIENT TEMPERATURE:	24°C
RELATIVE HUMIDITY:	52 %
AIR PRESSURE:	1011 hPa
OPERATING FREQUENCY RANGE:	2501 – 2685 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	2 MHz
VIDEO BANDWIDTH:	3 MHz
MODULATION:	Unmodulated
MODULATING SIGNAL:	NA
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum

Carrier frequency, MHz	Peak output power, total in 6 MHz, dBm		Output power in any 100 kHz, dBm		Verdict
	Measured	Limit*	Measured	Limit**	
2501	28.67	48	25.50	30.2	Pass
2595	28.67	48	25.33	30.2	Pass
2685	27.67	48	24.17	30.2	Pass

*Calculated limit = EIRP limit (dBm) – antenna gain (dBi) = 63 dBm – 15 dBi = 48 dBm
**Calculated limit = EIRP limit (dBm) – antenna gain (dBi) = 45.2 dBm – 15 dBi = 30.2 dBm

Reference numbers of test equipment used

HL 1424	HL 1650	HL 1651	HL 2254				

Full description is given in Appendix A.

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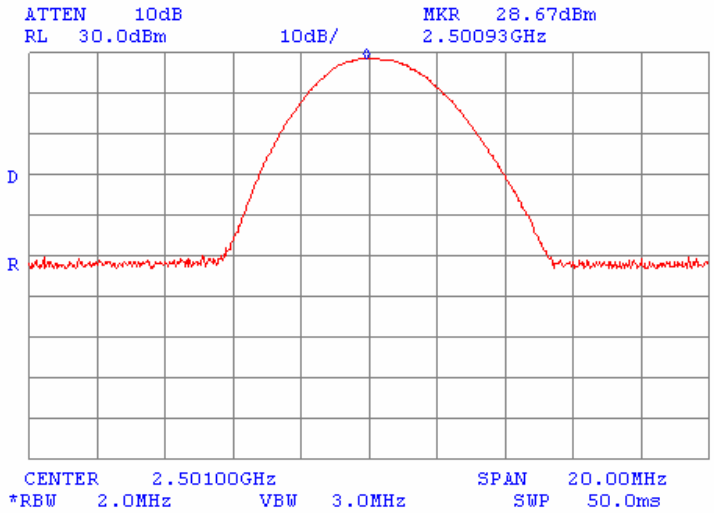
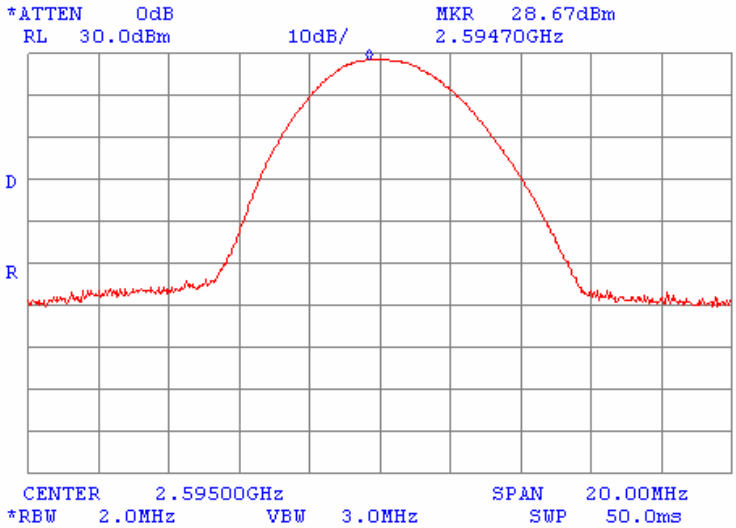
Plot 4.1.1 Peak output power test results at low frequency



External attenuator (40 dB) and cable loss (0.6 dB) included to measured result.
Output power=28.67 dBm=736.2 mW

Plot 4.1.2 Peak output power test results at mid frequency



External attenuator (40 dB) and cable loss (0.6 dB) included to measured result.
Output power=28.67 dBm=736.2 mW

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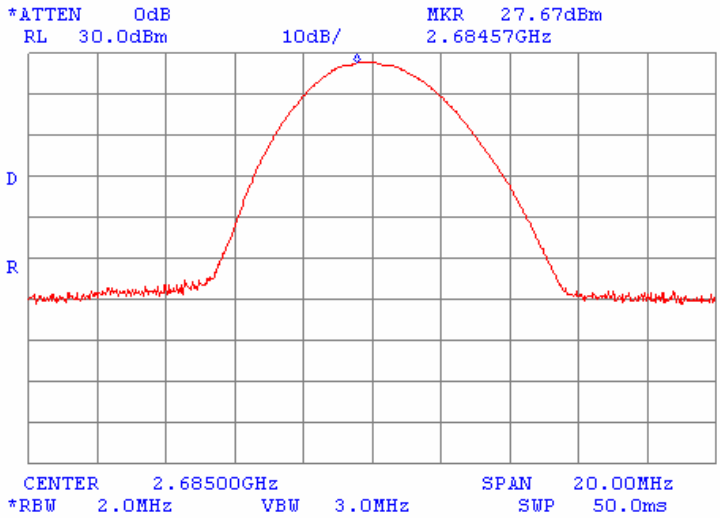
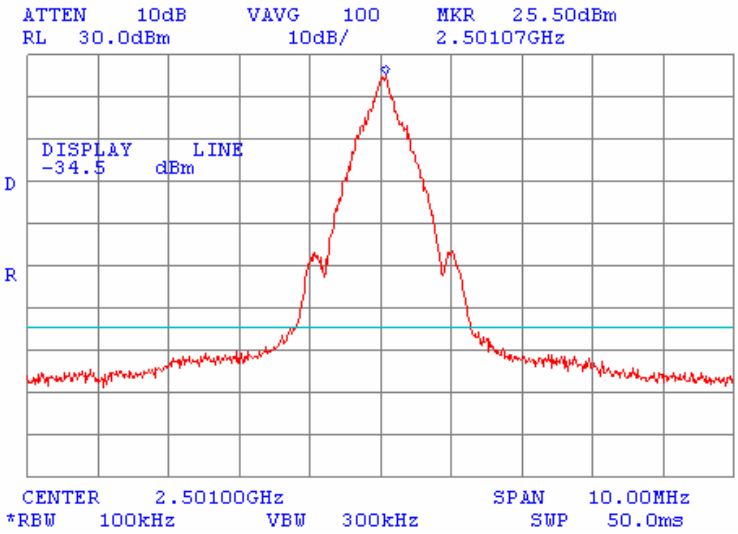
Plot 4.1.3 Peak output power test results at high frequency



External attenuator (40 dB) and cable loss (0.6 dB) included to measured result.
Output power=27.67 dBm=584.8 mW

Plot 4.1.4 Output power test results in any 100 kHz at low frequency



External attenuator (40 dB) and cable loss (0.6 dB) included to measured result

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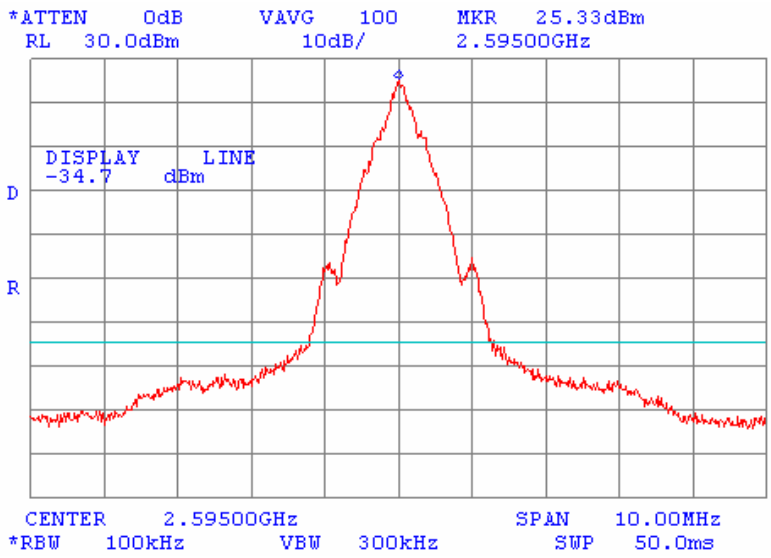
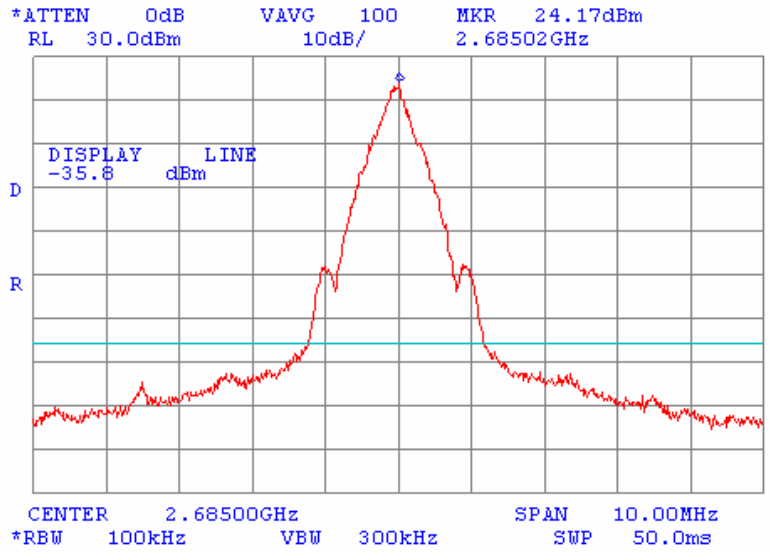
Plot 4.1.5 Output power test results in any 100 kHz at mid frequency



External attenuator (40 dB) and cable loss (0.6 dB) included to measured result

Plot 4.1.6 Output power test results in any 100 kHz at high frequency



External attenuator (40 dB) and cable loss (0.6 dB) included to measured result

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4.2 Frequency stability test

4.2.1 General

This test was performed to measure frequency stability of transmitter RF carrier. Specification test limits are given in Table 4.2.1. The test results are provided in Table 4.2.2.

Table 4.2.1

Frequency stability limits

Assigned frequency, MHz	Maximum allowed frequency displacement	
	ppm	Hz
2501	±50	125050
2595		129750
2685		134250

4.2.2 Test procedure

4.2.2.1 The EUT was set up as shown in Figure 4.2.1, energized and its proper operation was checked.

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

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

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

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

4.2.2.6 Frequency displacement was calculated as provided in Table 4.2.2.

Figure 4.2.1

Frequency stability test setup

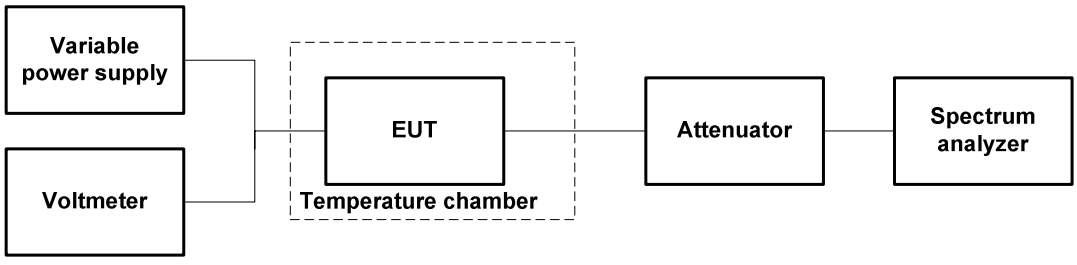

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Table 4.2.2

Frequency stability test results

DATE of TEST:	March 23, 2004
AMBIENT TEMPERATURE:	22°C
RELATIVE HUMIDITY:	35 %
AIR PRESSURE:	1020 hPa
OPERATING FREQUENCY:	2500-2686 MHz
NOMINAL POWER VOLTAGE:	120 V AC
TEMPERATURE STABILIZATION PERIOD:	1 min
POWER DURING TEMPERATURE TRANSITION:	Off
RESOLUTION BANDWIDTH:	1 kHz
VIDEO BANDWIDTH:	3 kHz
MODULATION:	Unmodulated

T, ºC	Voltage, V	Frequency, MHz							Max frequency drift, Hz		Limit, Hz	Margin, Hz	Verdict
		Start up	1st min	2nd min	3rd min	4th min	5th min	10th min	Positive	Negative			
Low frequency 2501 MHz													
-30	nominal	2500.986	2500.987	2500.988	2500.988	2500.989	2500.989	2500.990	0	-26000	125050	99050	Pass
-20	nominal	2501.003	2501.004	NA	NA	NA	NA	NA	0	-9000		116050	Pass
-10	nominal	2501.011	2501.012	NA	NA	NA	NA	NA	0	-1000		124050	Pass
0	nominal	2501.015	2501.015	2501.015	2501.015	2501.015	2501.015	2501.015	3000	0		122050	Pass
10	nominal	2501.014	2501.014	NA	NA	NA	NA	NA	2000	0		123050	Pass
20	102	2501.012	2501.012	NA	NA	NA	NA	NA	0	0		125050	Pass
20	nominal (120)	2501.012	2501.012*	NA	NA	NA	NA	NA	0	0		125050	Pass
20	138	2501.012	2501.012	NA	NA	NA	NA	NA	0	0		125050	Pass
30	nominal	2501.007	2501.007	2501.007	2501.007	2501.007	2501.007	2501.007	0	-5000		120050	Pass
40	nominal	2501.004	2501.004	NA	NA	NA	NA	NA	0	-8000		117050	Pass
50	nominal	2501.003	2501.003	NA	NA	NA	NA	NA	0	-9000		116050	Pass
Mid frequency 2595 MHz													
-30	nominal	2594.988	2594.989	2594.990	2594.990	2594.990	2594.991	2594.991	0	-26000	129750	103750	Pass
-20	nominal	2595.005	2595.006	NA	NA	NA	NA	NA	0	-9000		120750	Pass
-10	nominal	2595.013	2595.014	NA	NA	NA	NA	NA	0	-1000		128750	Pass
0	nominal	2595.017	2595.017	2595.017	2595.017	2595.017	2595.017	2595.017	3000	0		126750	Pass
10	nominal	2595.016	2595.016	NA	NA	NA	NA	NA	2000	0		127750	Pass
20	102	2595.014	2595.014	NA	NA	NA	NA	NA	0	0		129750	Pass
20	nominal (120)	2595.014	2595.014*	NA	NA	NA	NA	NA	0	0		129750	Pass
20	138	2595.014	2595.014	NA	NA	NA	NA	NA	0	0		129750	Pass
30	nominal	2595.010	2595.009	2595.009	2595.009	2595.009	2595.009	2595.009	0	-5000		124750	Pass
40	nominal	2595.006	2595.006	NA	NA	NA	NA	NA	0	-8000		121750	Pass
50	nominal	2595.005	2595.005	NA	NA	NA	NA	NA	0	-9000		120750	Pass
High frequency 2685 MHz													
-30	nominal	2684.986	2684.987	2684.988	2684.988	2684.989	2684.989	2684.990	0	-27000	134250	107250	Pass
-20	nominal	2685.004	2685.005	NA	NA	NA	NA	NA	0	-9000		125250	Pass
-10	nominal	2685.012	2685.013	NA	NA	NA	NA	NA	0	-1000		133250	Pass
0	nominal	2685.016	2685.016	2685.016	2685.016	2685.016	2685.016	2685.016	3000	0		131250	Pass
10	nominal	2685.016	2685.016	NA	NA	NA	NA	NA	3000	0		131250	Pass
20	102	2685.014	2685.013	NA	NA	NA	NA	NA	1000	0		133250	Pass
20	nominal (120)	2685.013	2685.013*	NA	NA	NA	NA	NA	0	0		134250	Pass
20	138	2685.013	2685.013	NA	NA	NA	NA	NA	0	0		134250	Pass
30	nominal	2685.009	2685.009	2685.009	2685.009	2685.009	2685.009	2685.009	0	-4000		130250	Pass
40	nominal	2685.006	2685.006	NA	NA	NA	NA	NA	0	-7000		127250	Pass
50	nominal	2685.004	2685.004	NA	NA	NA	NA	NA	0	-9000		125250	Pass

* - Reference frequency

Reference numbers of test equipment used

HL 0025	HL 0057	HL 0493	HL 1204	HL 1481	HL 2171		

Full description is given in Appendix A.

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4.3 Occupied bandwidth test

4.3.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 4.3.1. The test results are provided in Table 4.3.2 and associated plots.

Table 4.3.1

Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc
2501	26
2595	
2685	

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

4.3.2 Test procedure

4.3.2.1 The EUT was set up as shown in Figure 4.3.1, energized and its proper operation was checked.

4.3.2.2 The device was set to transmit unmodulated carrier and reference peak power level was measured.

4.3.2.3 Then the EUT was set to transmit modulated carrier.

4.3.2.4 The transmitter occupied bandwidth was measured with spectrum analyzer at low, mid and high channel frequencies as frequency delta between reference points on modulation envelope and provided in Table 4.3.2 and associated plots.

Figure 4.3.1

Occupied bandwidth test setup

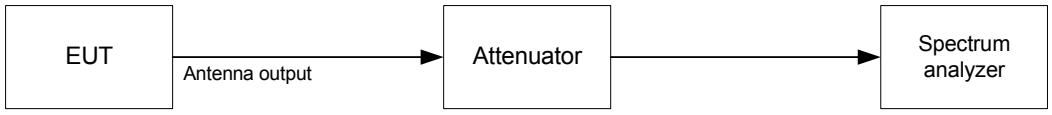

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Table 4.3.2

Occupied bandwidth test results

DATE of TEST:	March 22, 2004
AMBIENT TEMPERATURE:	23°C
RELATIVE HUMIDITY:	35 %
AIR PRESSURE:	1020 hPa
DETECTOR USED:	Peak hold
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 kHz
MODULATION ENVELOPE REFERENCE POINTS:	26 dBc
MODULATION:	FSK
MODULATING SIGNAL:	PRBS

Carrier frequency, MHz	Bit rate, Mbps	Occupied bandwidth, MHz
2501	1	1.313
	4	1.763
2595	1	1.338
	4	1.800
2685	1	1.325
	2	1.325
	3	1.325
	1.33	1.788
	4	1.788

Reference numbers of test equipment used

HL 0057	HL 1430	HL 2254					

Full description is given in Appendix A.

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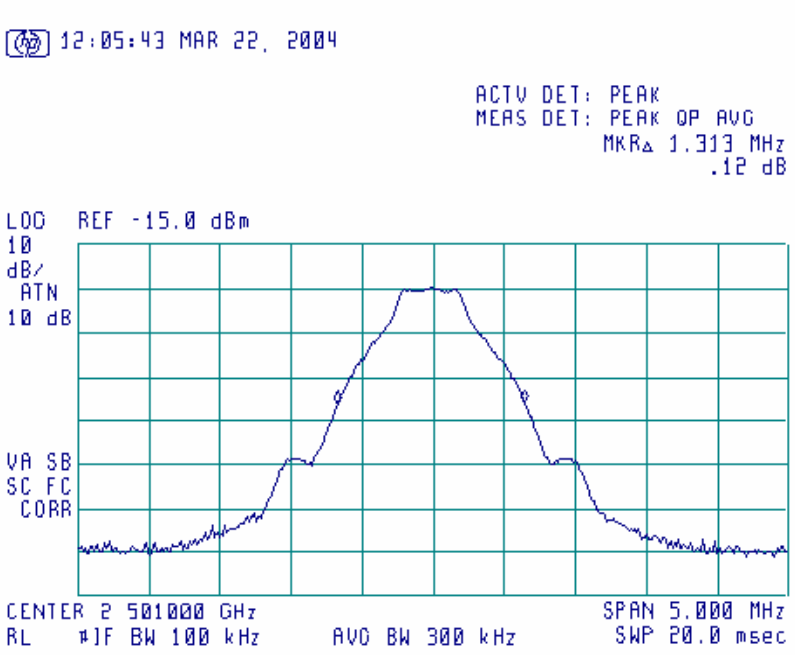
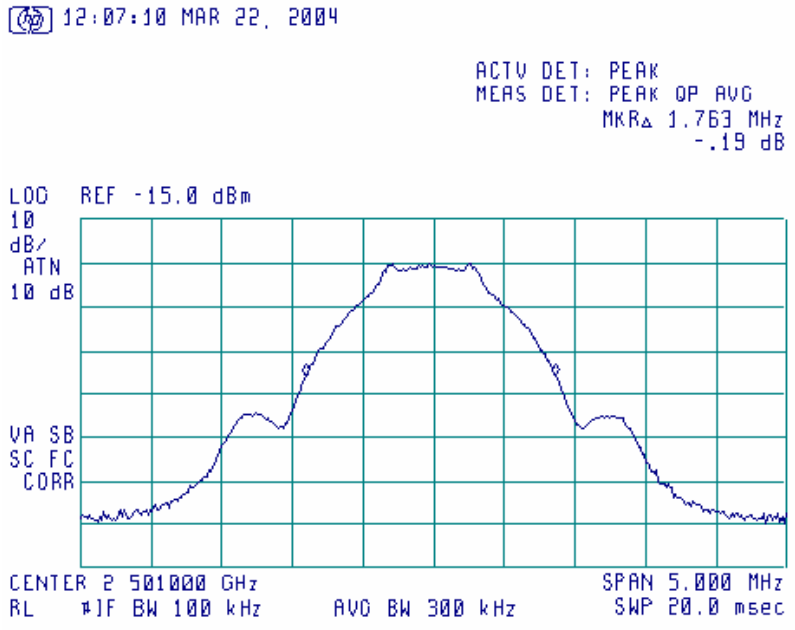
Plot 4.3.1 Occupied bandwidth test results at low frequency and 1 Mbps bit rate



Plot 4.3.2 Occupied bandwidth test results at low frequency and 4 Mbps bit rate



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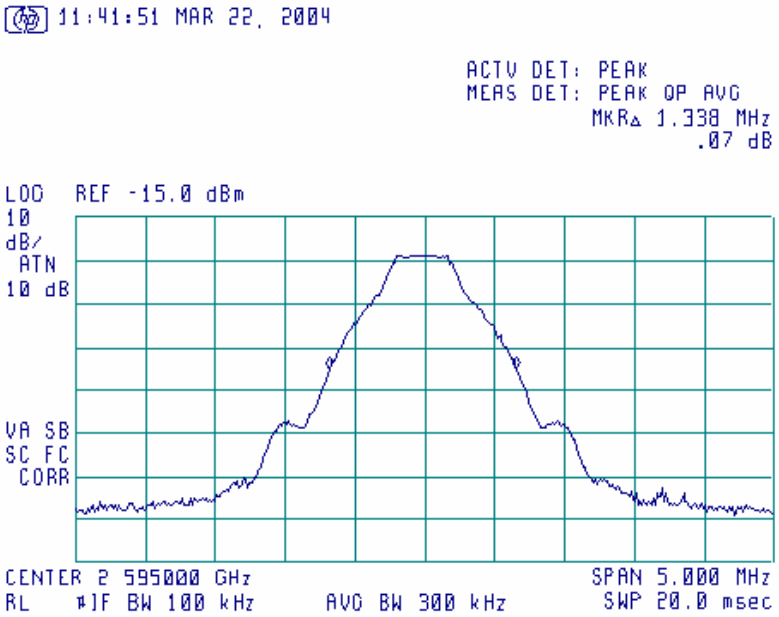
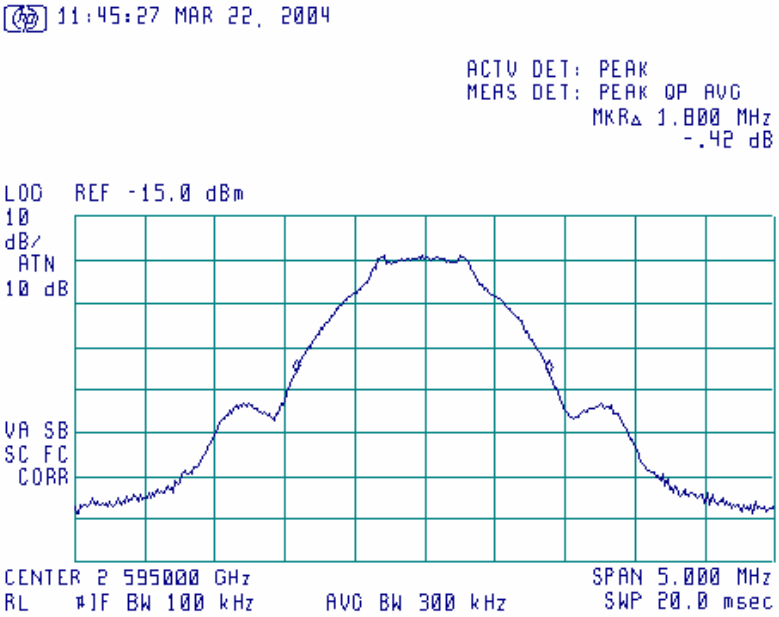
Plot 4.3.3 Occupied bandwidth test results at mid frequency and 1 Mbps bit rate



Plot 4.3.4 Occupied bandwidth test results at mid frequency and 4 Mbps bit rate



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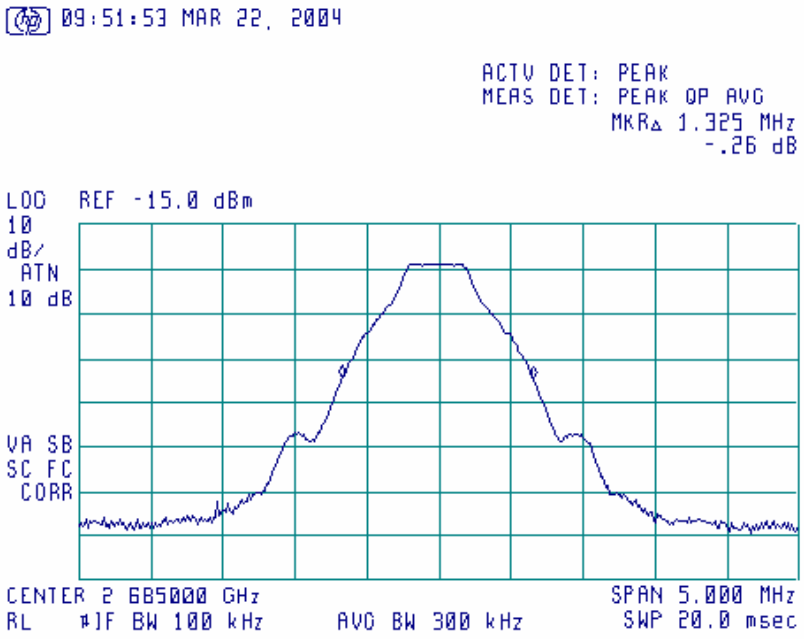
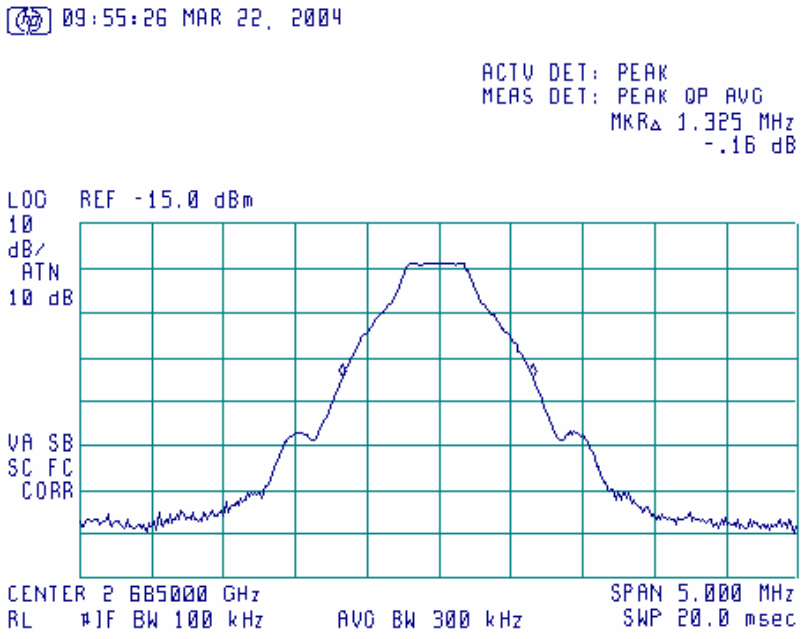
Plot 4.3.5 Occupied bandwidth test results at high frequency and 1 Mbps bit rate



Plot 4.3.6 Occupied bandwidth test results at high frequency and 2 Mbps bit rate



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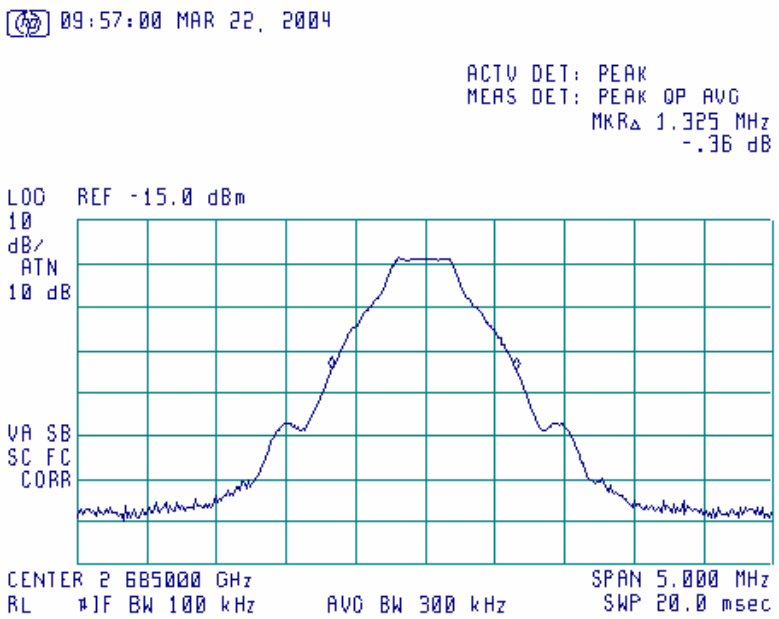
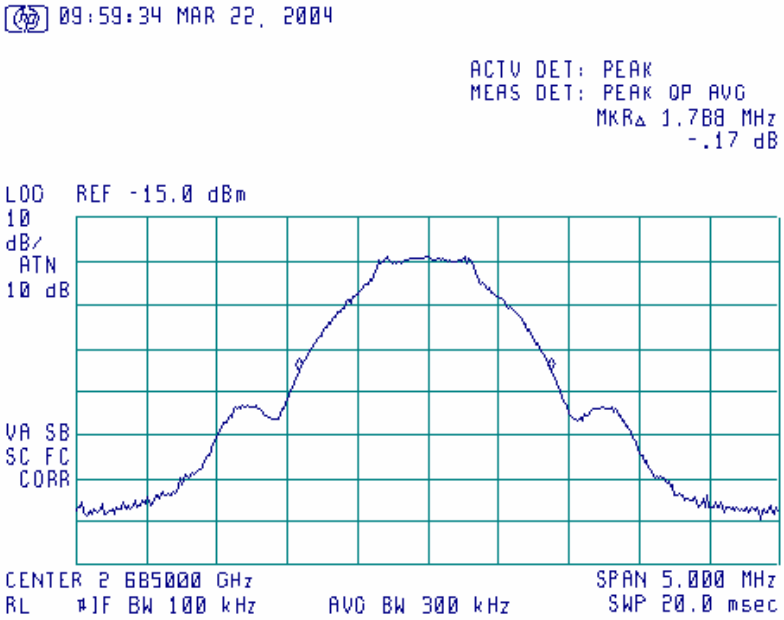
Plot 4.3.7 Occupied bandwidth test results at high frequency and 3 Mbps bit rate



Plot 4.3.8 Occupied bandwidth test results at high frequency and 1.33 Mbps bit rate



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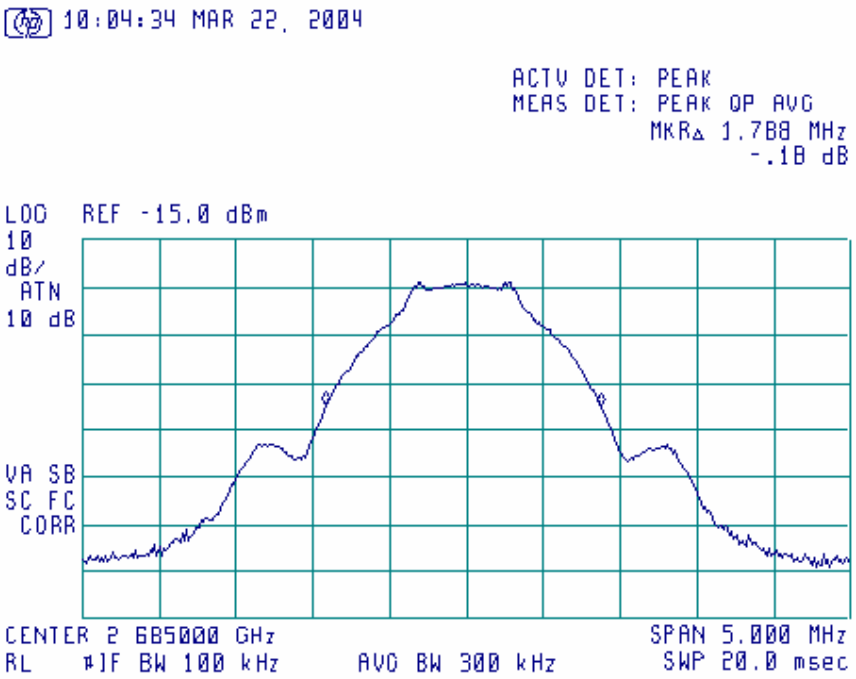
Plot 4.3.9 Occupied bandwidth test results at high frequency and 4 Mbps bit rate



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4.4 Emission mask test

4.4.1 General

This test was performed to measure emission mask at RF antenna connector. Specification test limits are given in Table 4.4.1. The test results are provided in the associated plots.

Table 4.4.1

Emission mask limits

Frequency displacement from carrier	Attenuation below carrier, dBc
at 6 MHz channel edges	25
at 250 kHz beyond the nearest channel edge	25 –40 (linear slope)
at 3 MHz above the upper and below the lower channel edges	40 – 60 (linear slope)

4.4.2 Test procedure

4.4.2.1 The EUT was set up as shown in Figure 4.4.1, energized and its proper operation was checked.

4.4.2.2 The emission mask was measured with spectrum analyzer at low, mid and high channel frequencies as provided in the associated plots. The measurements were performed at 3 Mbit/s – max bit rate for 1 Msymbol/s symbol rate and at 4 Mbit/s – max bit rate for 1.33 Msymbol/s symbol rate.

Figure 4.4.1

Emission mask test setup

Reference numbers of test equipment used

HL 1424	HL 1650	HL 1651	HL 2254				

Full description is given in Appendix A.

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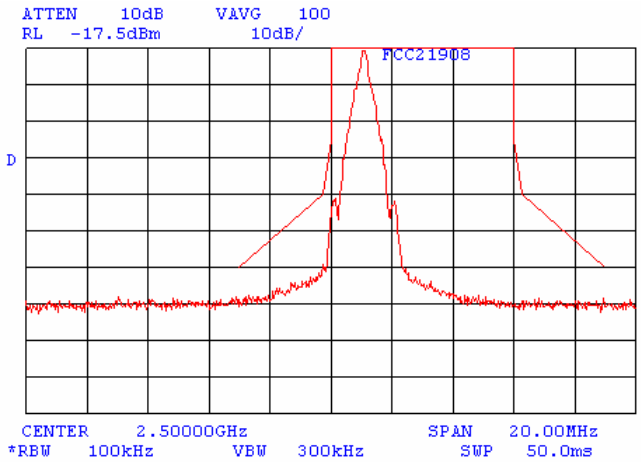
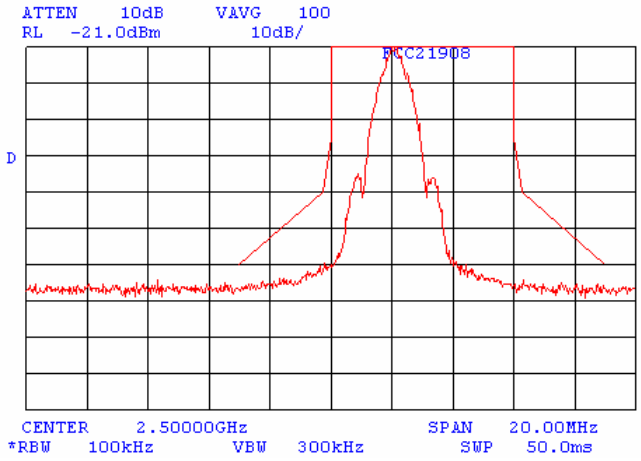
Plot 4.4.1 Emission mask test results at 2501 MHz carrier frequency

OPERATING FREQUENCY RANGE:	2501 – 2685 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 kHz
MODULATING SIGNAL:	PRBS
BIT RATE:	3 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Plot 4.4.2 Emission mask test results at 2502 MHz carrier frequency

OPERATING FREQUENCY RANGE:	2501 – 2685 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 kHz
MODULATING SIGNAL:	PRBS
BIT RATE:	4 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



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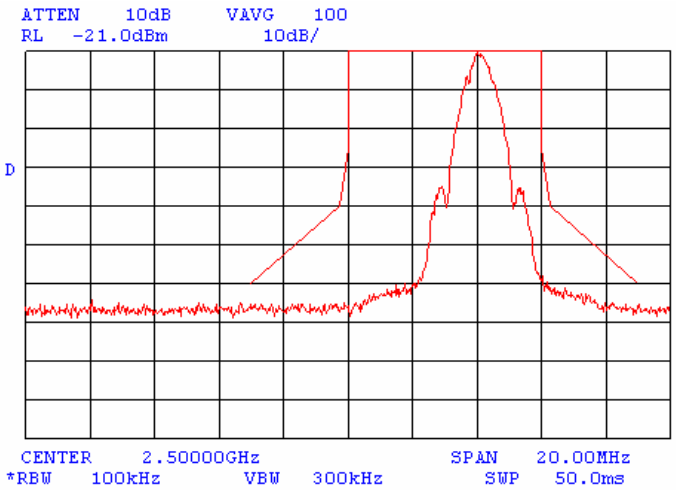
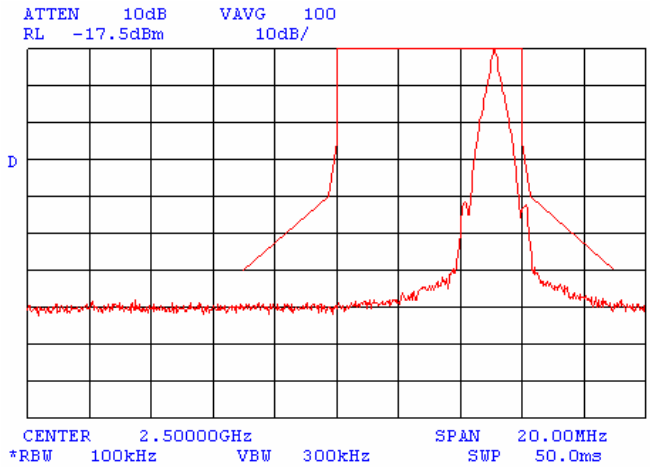
Plot 4.4.3 Emission mask test results at 2504 MHz carrier frequency

OPERATING FREQUENCY RANGE:	2501 – 2685 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 kHz
MODULATING SIGNAL:	PRBS
BIT RATE:	4 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Plot 4.4.4 Emission mask test results at 2505 MHz carrier frequency

OPERATING FREQUENCY RANGE:	2501 – 2685 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 kHz
MODULATING SIGNAL:	PRBS
BIT RATE:	3 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



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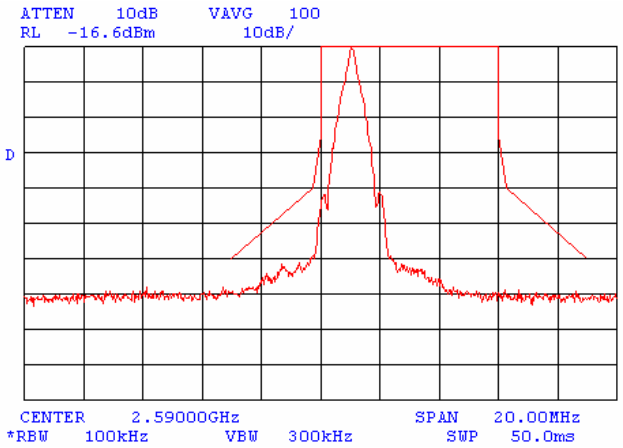
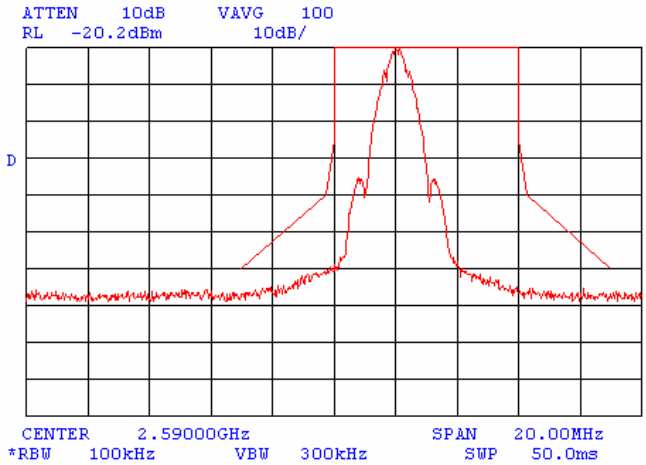
Plot 4.4.5 Emission mask test results at 2591 MHz carrier frequency

OPERATING FREQUENCY RANGE:	2501 – 2685 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 kHz
MODULATING SIGNAL:	PRBS
BIT RATE:	3 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Plot 4.4.6 Emission mask test results at 2592 MHz carrier frequency

OPERATING FREQUENCY RANGE:	2501 – 2685 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 kHz
MODULATING SIGNAL:	PRBS
BIT RATE:	4 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



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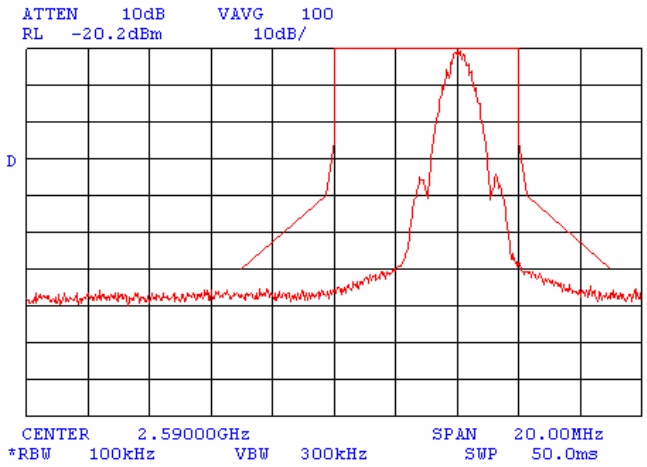
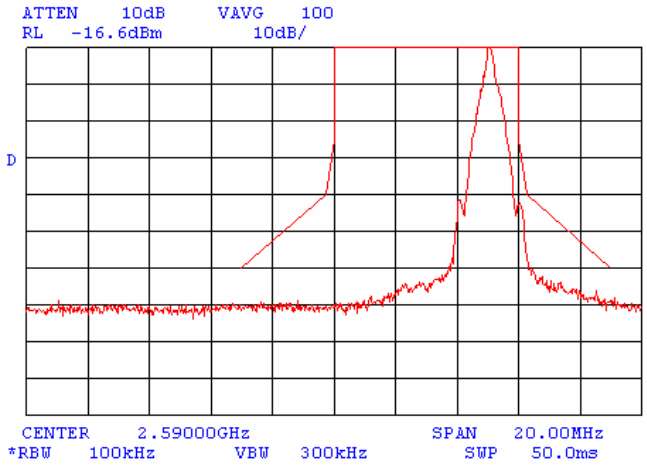
Plot 4.4.7 Emission mask test results at 2594 MHz carrier frequency

OPERATING FREQUENCY RANGE:	2501 – 2685 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 kHz
MODULATING SIGNAL:	PRBS
BIT RATE:	4 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Plot 4.4.8 Emission mask test results at 2595 MHz carrier frequency

OPERATING FREQUENCY RANGE:	2501 – 2685 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 kHz
MODULATING SIGNAL:	PRBS
BIT RATE:	3 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



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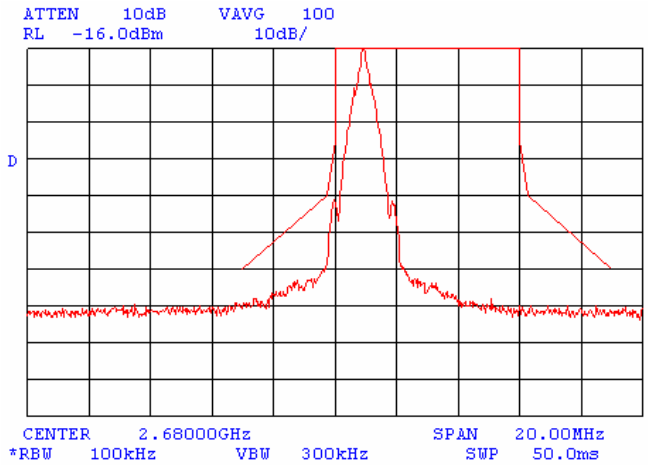
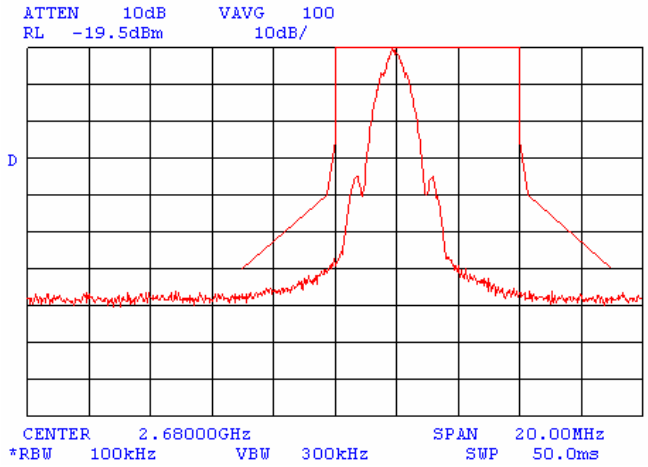
Plot 4.4.9 Emission mask test results at 2681 MHz carrier frequency

OPERATING FREQUENCY RANGE:	2501 – 2685 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 kHz
MODULATING SIGNAL:	PRBS
BIT RATE:	3 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Plot 4.4.10 Emission mask test results at 2682 MHz carrier frequency

OPERATING FREQUENCY RANGE:	2501 – 2685 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 kHz
MODULATING SIGNAL:	PRBS
BIT RATE:	4 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



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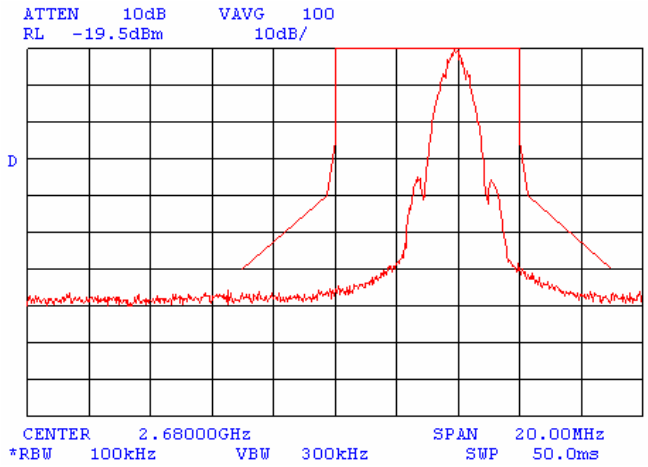
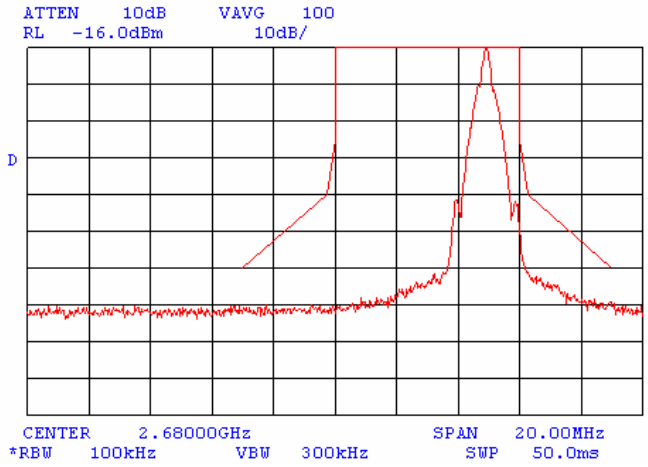
Plot 4.4.11 Emission mask test results at 2684 MHz carrier frequency

OPERATING FREQUENCY RANGE:	2501 – 2685 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 kHz
MODULATING SIGNAL:	PRBS
BIT RATE:	4 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Plot 4.4.12 Emission mask test results at 2685 MHz carrier frequency

OPERATING FREQUENCY RANGE:	2501 – 2685 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 kHz
MODULATING SIGNAL:	PRBS
BIT RATE:	3 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



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4.5 Spurious emissions at RF antenna connector test

4.5.1 General

This test was performed to measure spurious emissions at RF antenna connector. Specification test limits are given in Table 4.5.1. The test results are provided in Table 4.5.2 and associated plots.

Table 4.5.1

Spurious emission limits

Frequency, MHz*	Attenuation below carrier, dBc
0.009 – 10th harmonic	60

* The limit was not applied to emissions within frequency band tested for compliance with emission mask.

4.5.2 Test procedure

4.5.2.1 The EUT was set up as shown in Figure 4.5.1, energized and its proper operation was checked.

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

4.5.2.3 The spurious emission was measured with spectrum analyzer at low, mid and high channel frequencies as provided in Table 4.5.2 and associated plots.

Figure 4.5.1

Spurious emission test setup

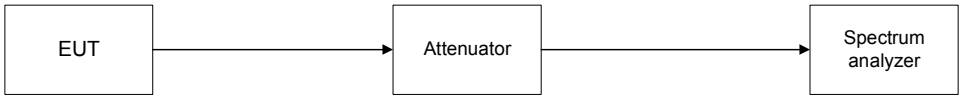

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Table 4.5.2

Spurious emission at RF connector test results

DATE of TEST:	March 22, 2004
AMBIENT TEMPERATURE:	23°C
RELATIVE HUMIDITY:	35 %
AIR PRESSURE:	1020 hPa
ASSIGNED FREQUENCY RANGE:	2501 – 2685 MHz
INVESTIGATED FREQUENCY RANGE:	0.009 – 2685 MHz
DETECTOR USED:	Peak
VIDEO BANDWIDTH:	≥ Resolution bandwidth
MODULATION:	Unmodulated
BIT RATE:	1 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum

Average signal power flat top measurements for 3 channels are shown in plots 4.5.1, 4.5.16, 4.5.32.

Frequency, MHz	RBW, kHz	Spurious emission, dBm	Limit, dBm	Margin, dB*	Verdict
Low channel					
0.068	1	-121.51	-109.73	11.78	Pass
2.110	10	-120.35	-99.73	20.62	Pass
1909.00	100	-101.17	-89.73	11.44	Pass
2479.89	100	-104.18	-89.73	14.45	Pass
2487.09	100	-102.96	-89.73	13.23	Pass
2492.04	100	-103.90	-89.73	14.17	Pass
Mid channel					
0.068	1	-120.72	-108.83	11.89	Pass
2.110	10	-122.34	-98.83	23.51	Pass
1891.00	100	-100.29	-88.83	11.46	Pass
2587.50	100	-104.80	-88.83	15.97	Pass
High channel					
0.068	1	-119.99	-107.93	12.06	Pass
934.425	100	-105.70	-87.93	17.77	Pass
1049.49	100	-91.01	-87.93	3.08	Pass

*- Margin = Spurious emission – specification limit.

For full test results refer to plots 4.5.1- 4.5.8, 4.5.16 – 4.5.23, 4.5.32 – 4.5.40.

Reference numbers of test equipment used

HL 1430	HL 1650	HL 1651	HL 2254	HL 2524			

Full description is given in Appendix A.

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DATE of TEST:	March 28, 2004
AMBIENT TEMPERATURE:	24°C
RELATIVE HUMIDITY:	52 %
AIR PRESSURE:	1011 hPa
ASSIGNED FREQUENCY RANGE:	2501 – 2685 MHz
INVESTIGATED FREQUENCY RANGE:	2500 – 27000 MHz
DETECTOR USED:	Peak
VIDEO BANDWIDTH:	≥ Resolution bandwidth
MODULATION:	Unmodulated
BIT RATE:	1 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum

Average signal power flat top measurements for 3 channels are shown in plots 4.5.9, 4.5.24, 4.5.41.

Frequency, MHz	RBW, kHz	Spurious emission, dBm	Limit, dBm	Margin, dB*	Verdict
Low channel					
2522.00	100	-40.83	-34.5	6.33	Pass
2512.96	100	-50.17	-34.5	15.67	Pass
7555.00	100	-41.50	-34.5	7.00	Pass
14732.0	100	-48.17	-34.5	13.67	Pass
25680.0	100	-44.33	-34.5	9.83	Pass
Mid channel					
2607.00	100	-51.50	-34.7	16.80	Pass
2665.98	100	-47.67	-34.7	12.97	Pass
7523.00	100	-42.67	-34.7	7.97	Pass
10379.40	100	-54.67	-34.7	19.97	Pass
25560.00	100	-44.17	-34.7	9.47	Pass
High channel					
2696.96	100	-51.50	-35.8	15.70	Pass
2720.87	100	-51.00	-35.8	15.20	Pass
7575.00	100	-41.83	-35.8	6.03	Pass
10739.47	100	-55.33	-35.8	19.53	Pass
25580.0	100	-44.50	-35.8	8.70	Pass

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

For full test results refer to plots 4.5.9- 4.5.15, 4.5.24 – 4.5.31, 4.5.41– 4.5.48.

Reference numbers of test equipment used

HL 1424	HL 1650	HL 1651	HL 2254	HL 2524			

Full description is given in Appendix A.

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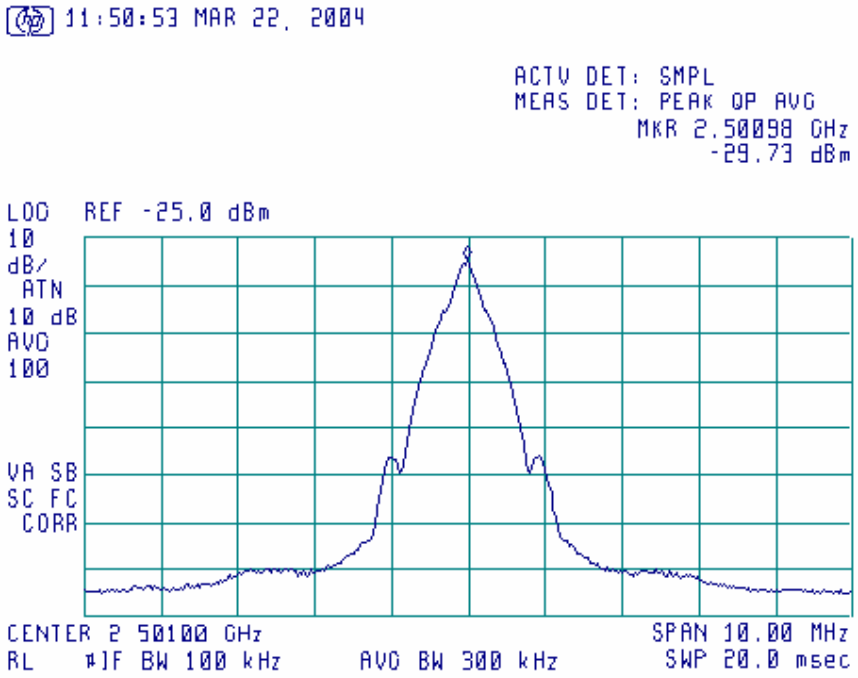
Plot 4.5.1 Average signal power measurement at RF antenna connector, low channel



Average signal power flat top measurement: -29.73 dBm
Limit for average signal power of spurious emissions=-89.73 dBm (when measured with 100 kHz resolution bandwidth).

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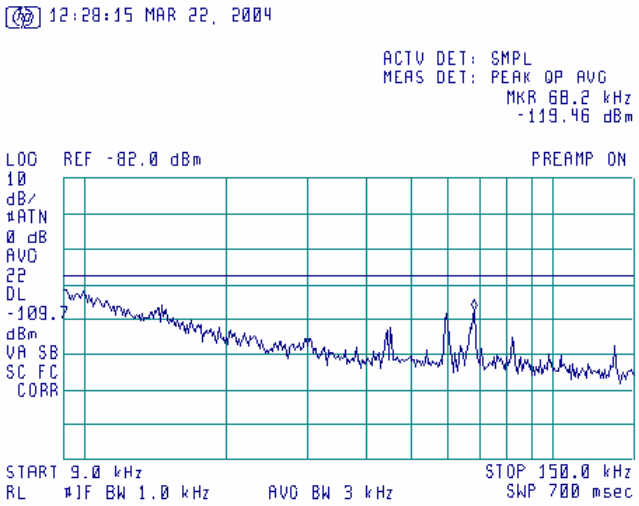
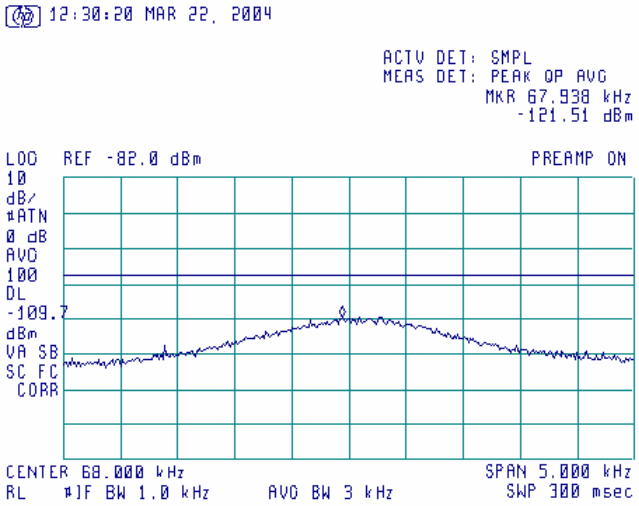
Plot 4.5.2 Conducted spurious emission measurements in 9 - 150 kHz range at low carrier frequency



Plot 4.5.3 Conducted spurious emission measurements at low carrier frequency



Limit for average signal power of spurious emissions:
-89.73 dBm-10log(100kHz/1kHz)=-109.73 dBm (when measured with 1 kHz resolution bandwidth).

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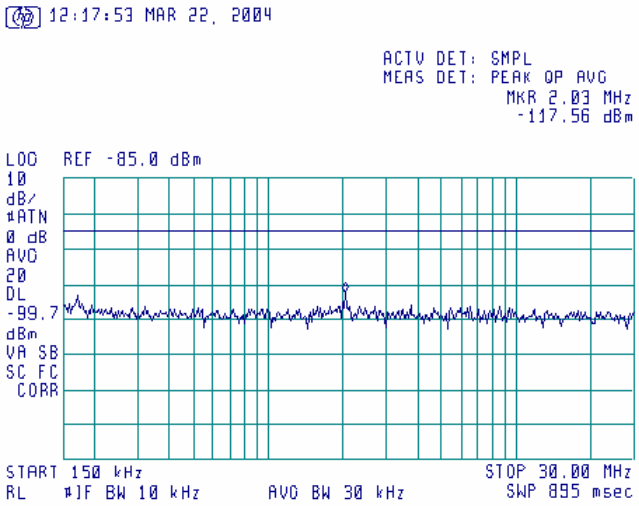
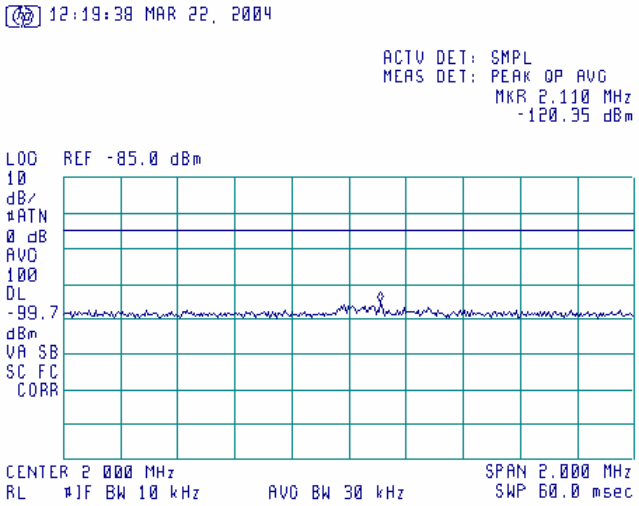
Plot 4.5.4 Conducted spurious emission measurements in 150 kHz – 30 MHz range at low carrier frequency



Plot 4.5.5 Conducted spurious emission measurements at low carrier frequency



Limit for average signal power of spurious emissions:
-89.73 dBm-10log(100kHz/10kHz)=-99.73 dBm (when measured with 10 kHz resolution bandwidth).

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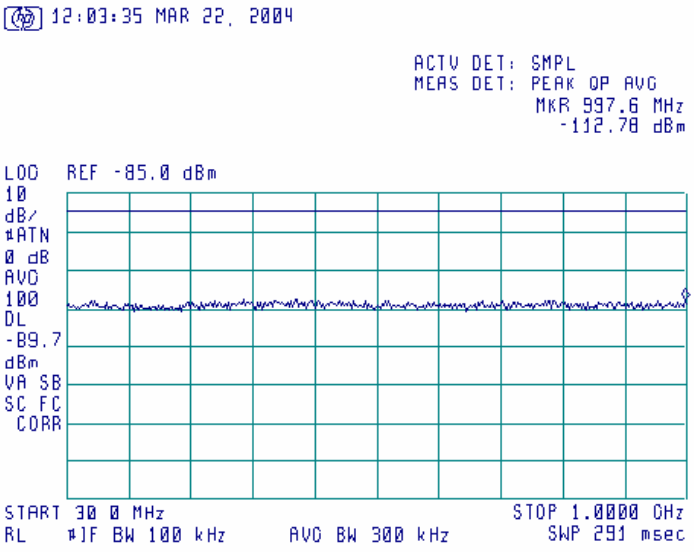
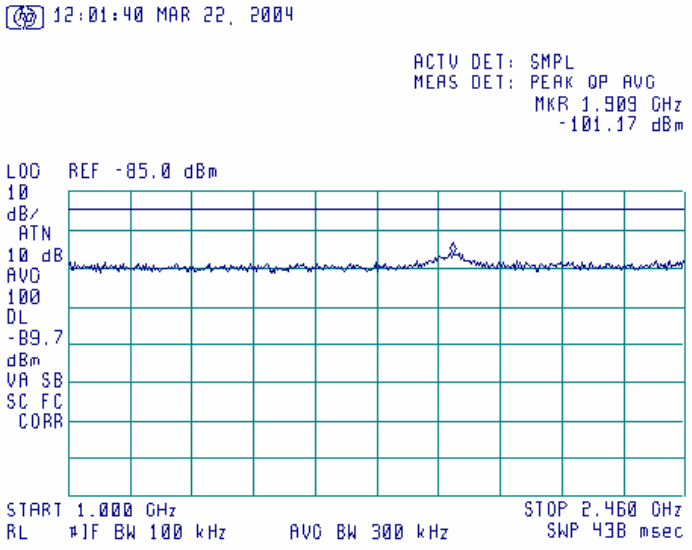
Plot 4.5.6 Conducted spurious emission measurements in 30 MHz – 1000 MHz range at low carrier frequency



Plot 4.5.7 Conducted spurious emission measurements in 1000 MHz – 2460 MHz range at low carrier frequency



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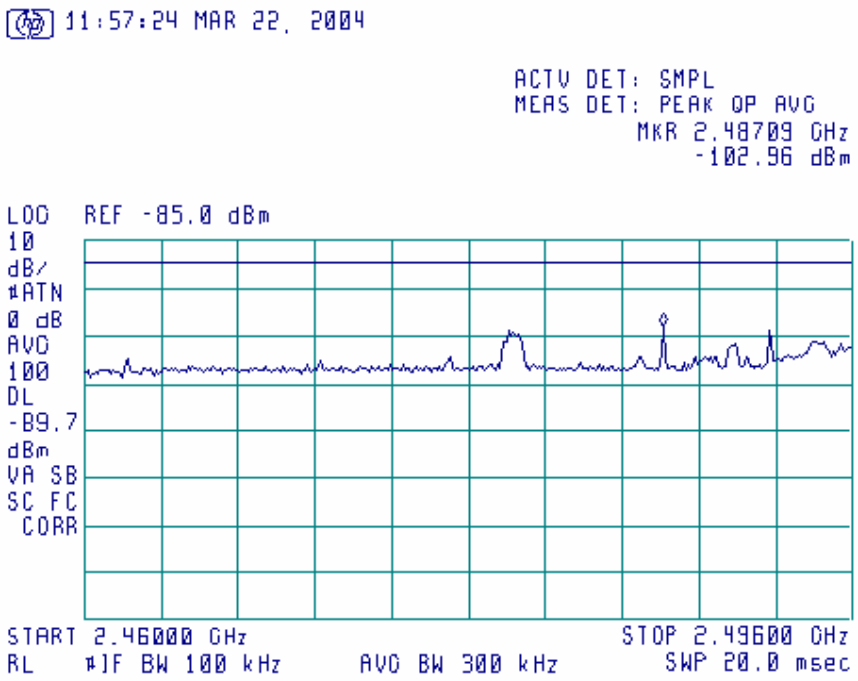
Plot 4.5.8 Conducted spurious emission measurements in 2460 MHz - 2496 MHz range at low carrier frequency



2479.89 MHz	-104.18 dBm
2487.09 MHz	-102.96 dBm
2492.04 MHz	-103.9 dBm

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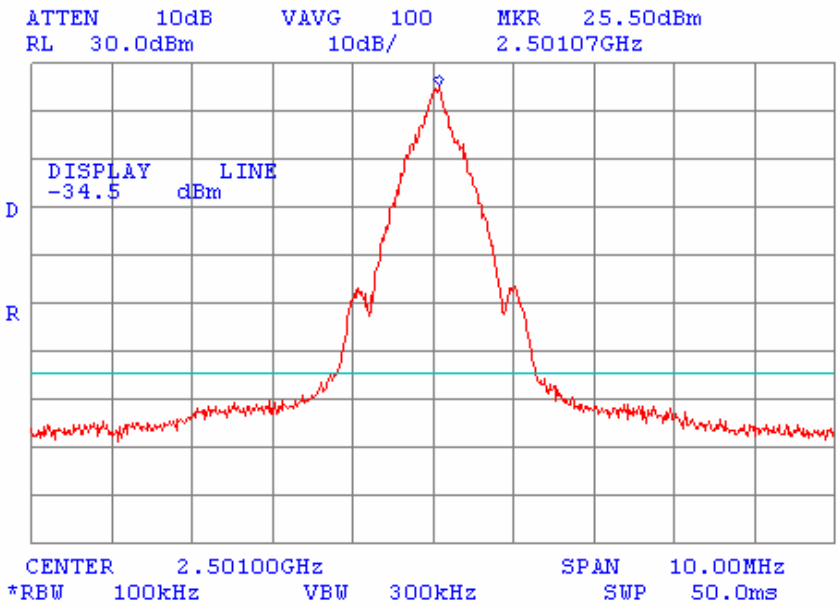
Plot 4.5.9 Average signal power measurement at RF antenna connector, low channel



External attenuator (40 dB) and cable loss (0.6 dB) included to measured result.
Average signal power flat top measurement: 25.5 dBm
Limit for average signal power of spurious emissions = -34.5 dBm (when measured with 100 kHz resolution bandwidth).

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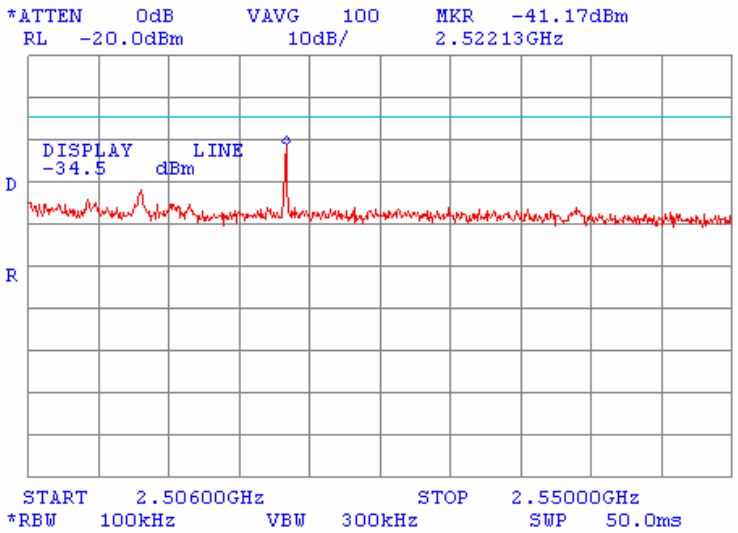
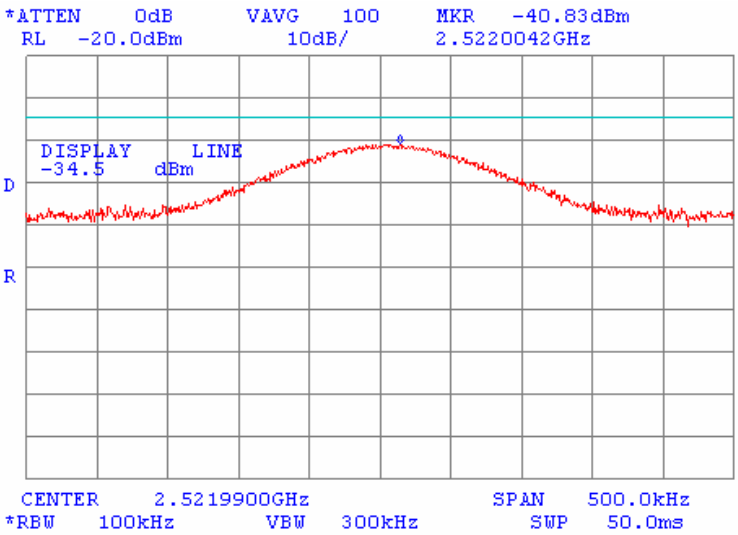
Plot 4.5.10 Conducted spurious emission measurements in 2506 MHz – 2550 MHz range at low carrier frequency



Plot 4.5.11 Conducted spurious emission measurements at low carrier frequency



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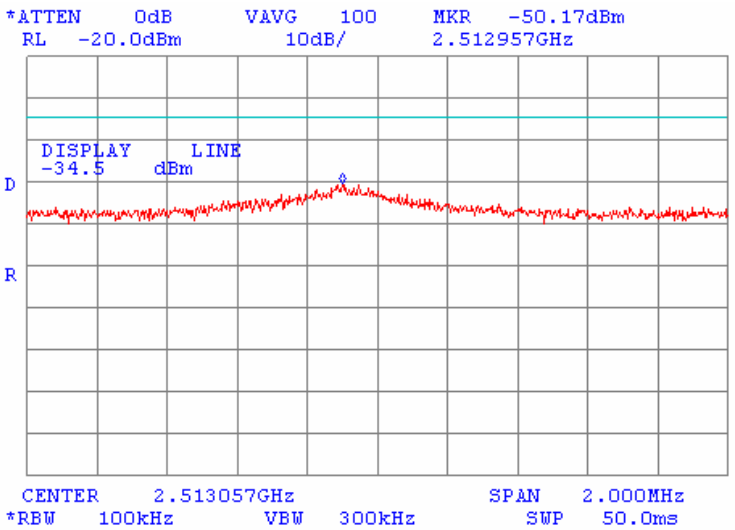
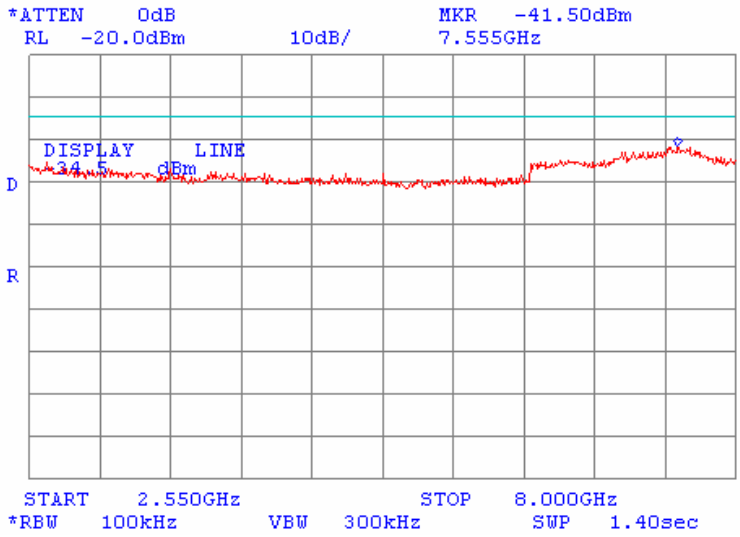
Plot 4.5.12 Conducted spurious emission measurements at low carrier frequency



Plot 4.5.13 Conducted spurious emission measurements in 2550 MHz – 8000 MHz range at low carrier frequency



The 2nd and 3rd harmonics were investigated and not found.

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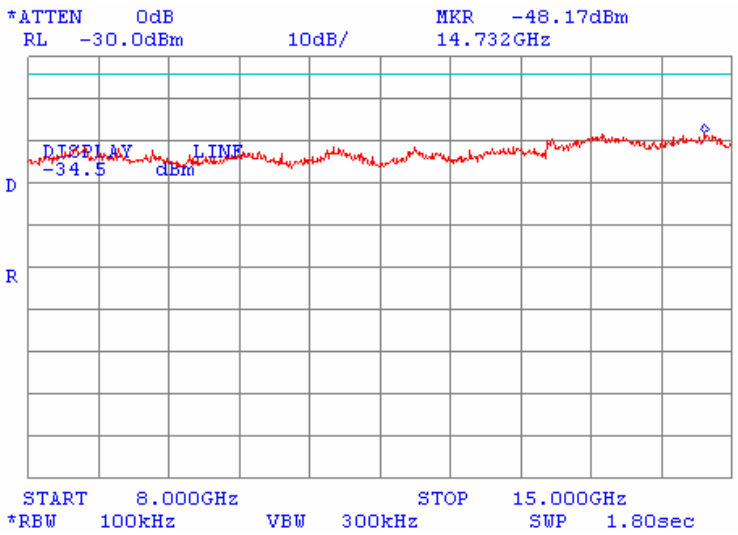
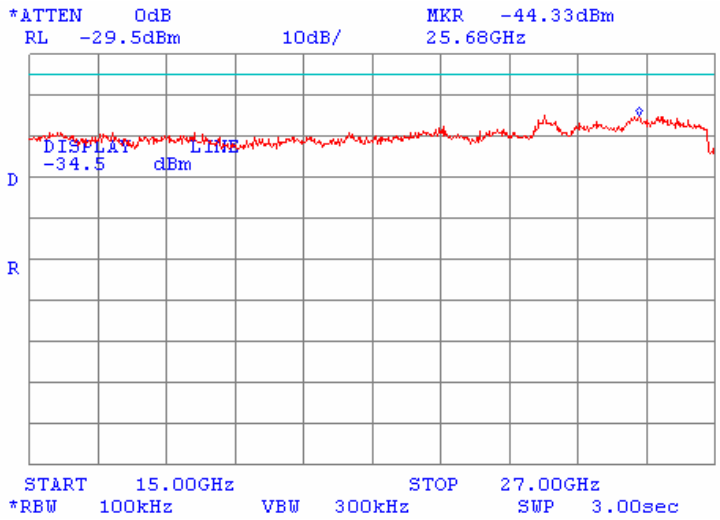
Plot 4.5.14 Conducted spurious emission measurements in 8000 MHz – 15000 MHzrange at low carrier frequency



External attenuator (30 dB) and cable loss (1.5 dB) included to measured result.
The 4th and 5th harmonics were investigated and not found.

Plot 4.5.15 Conducted spurious emission measurements in 15000 MHz – 27000 MHz range at low carrier frequency



External attenuator (30 dB) and cable loss (2 dB) included in test result.
Harmonics 6-10 were investigated and not found.

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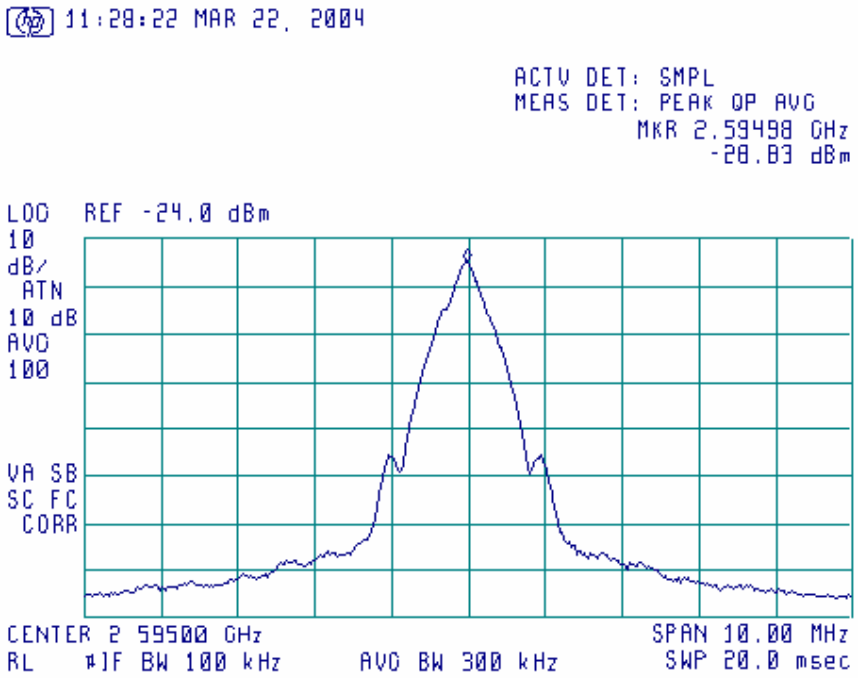
Plot 4.5.16 Average signal power measurement at RF antenna connector, mid channel



Average signal power flat top measurement: -28.83 dBm
Limit for average signal power of spurious emissions=-88.83 dBm (when measured with 100 kHz resolution bandwidth).

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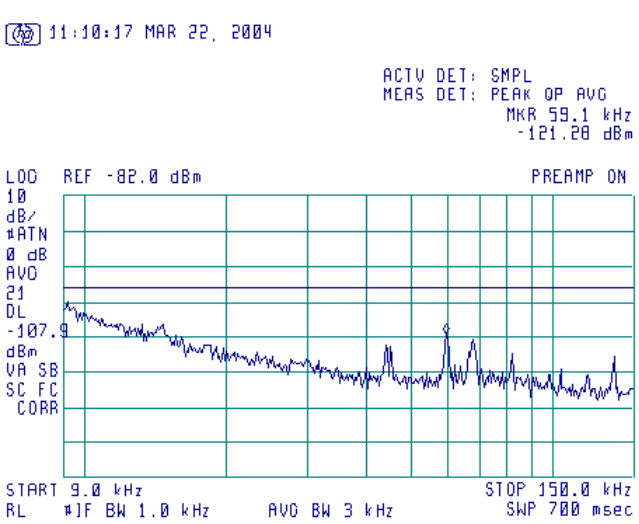
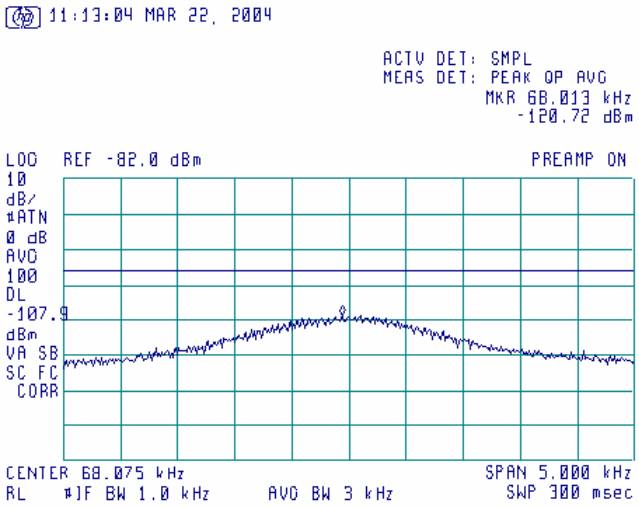
Plot 4.5.17 Conducted spurious emission measurements in 9 - 150 kHz range at mid carrier frequency



Plot 4.5.18 Conducted spurious emission measurements at mid carrier frequency



Limit for average signal power of spurious emissions:
-88.83 dBm-10log(100kHz/1kHz)=-108.83 dBm (when measured with 1 kHz resolution bandwidth).

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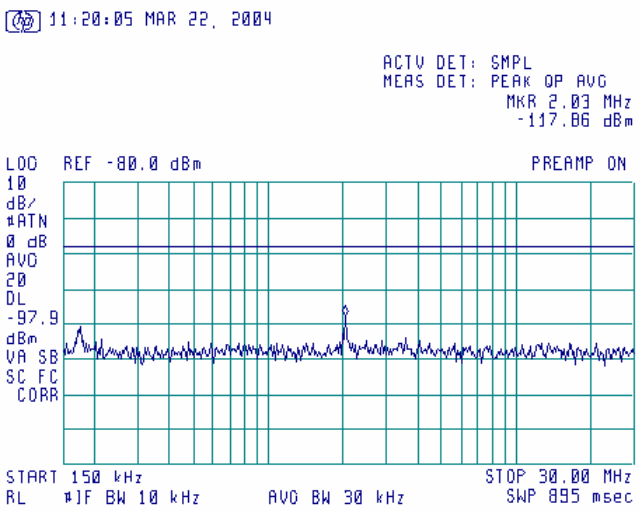
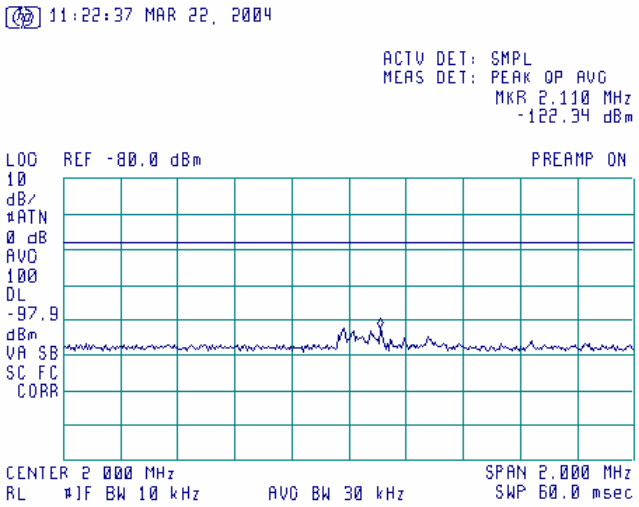
Plot 4.5.19 Conducted spurious emission measurements in 150 kHz – 30 MHz range at mid carrier frequency



Plot 4.5.20 Conducted spurious emission measurements at mid carrier frequency



Limit for average signal power of spurious emissions:
-88.83 dBm-10log(100kHz/10kHz)=-98.83 dBm (when measured with 10 kHz resolution bandwidth).

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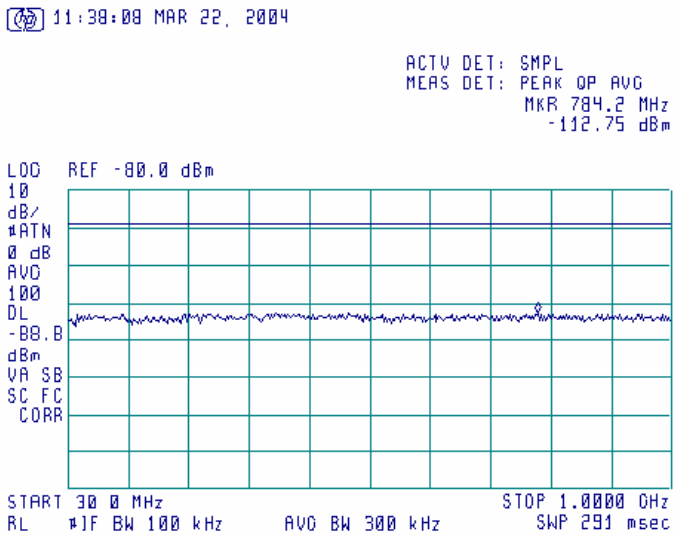
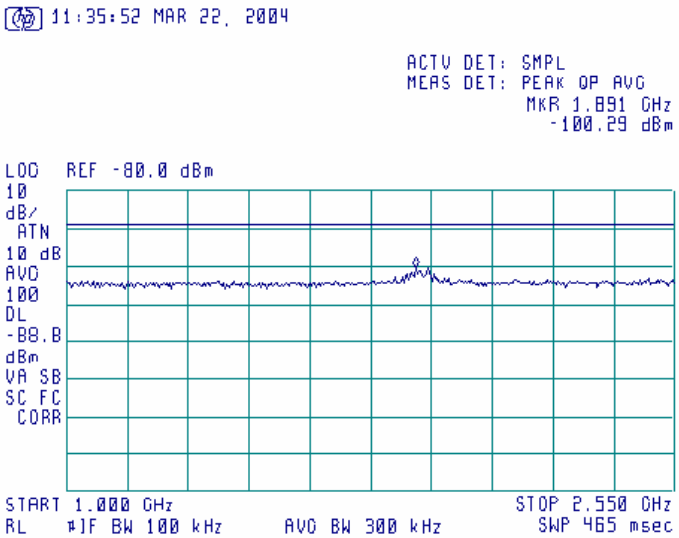
Plot 4.5.21 Conducted spurious emission measurements in 30 MHz – 1000 MHz range at mid carrier frequency



Plot 4.5.22 Conducted spurious emission measurements in 1000 MHz – 2550 MHz range at mid carrier frequency



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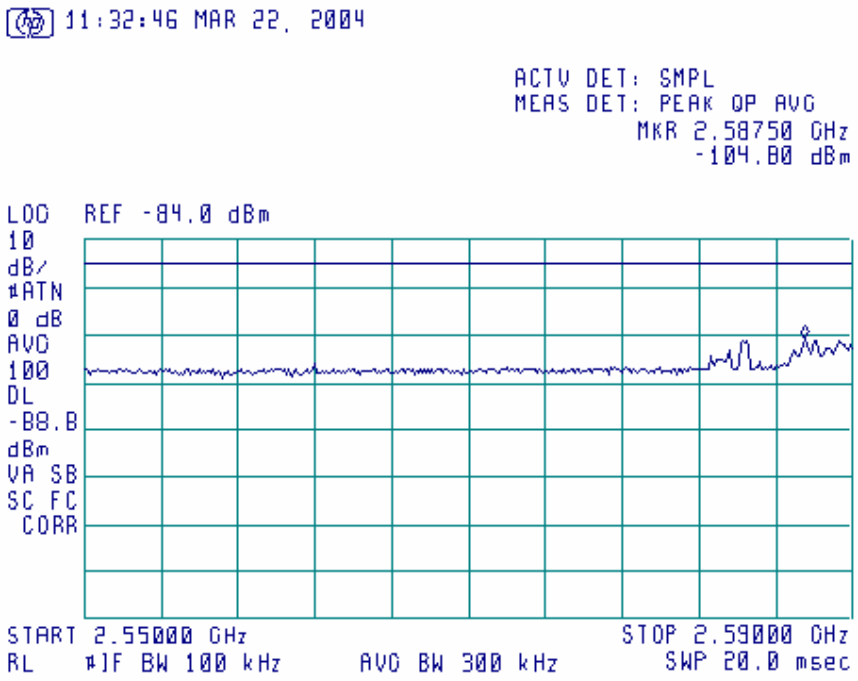
Plot 4.5.23 Conducted spurious emission measurements in 2550 MHz - 2590 MHz range at mid carrier frequency



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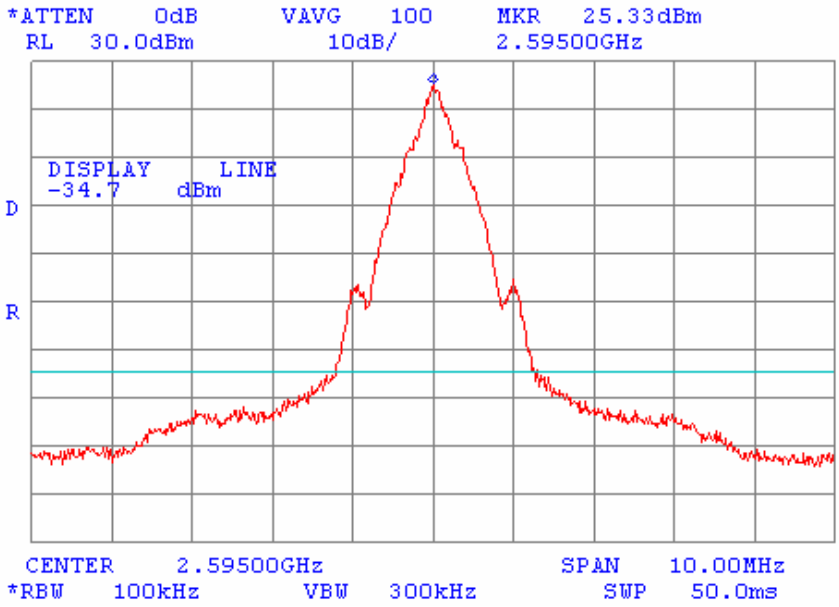
Plot 4.5.24 Average signal power measurement at RF antenna connector, mid channel



External attenuator (40 dB) and cable loss (0.6 dB) included to measured result.
Average signal power flat top measurement: 25.3 dBm
Limit for average signal power of spurious emissions=-34.7 dBm (when measured with 100 kHz resolution bandwidth).

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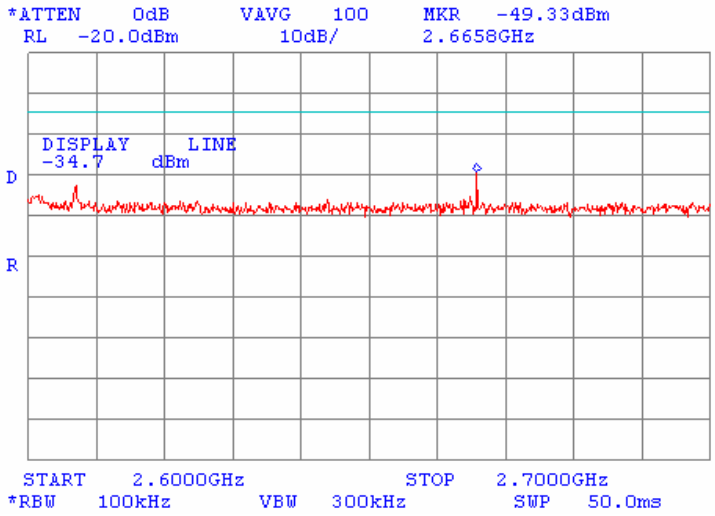
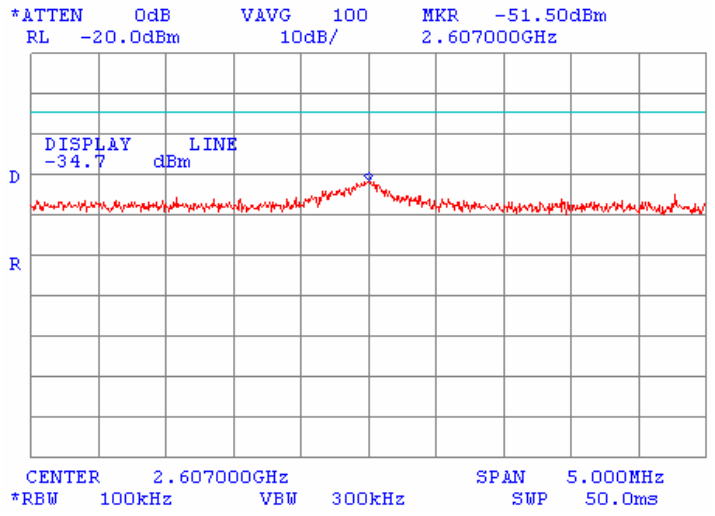
Plot 4.5.25 Conducted spurious emission measurements in 2600 MHz – 2700 MHz range at mid carrier frequency



Plot 4.5.26 Conducted spurious emission measurements at mid carrier frequency



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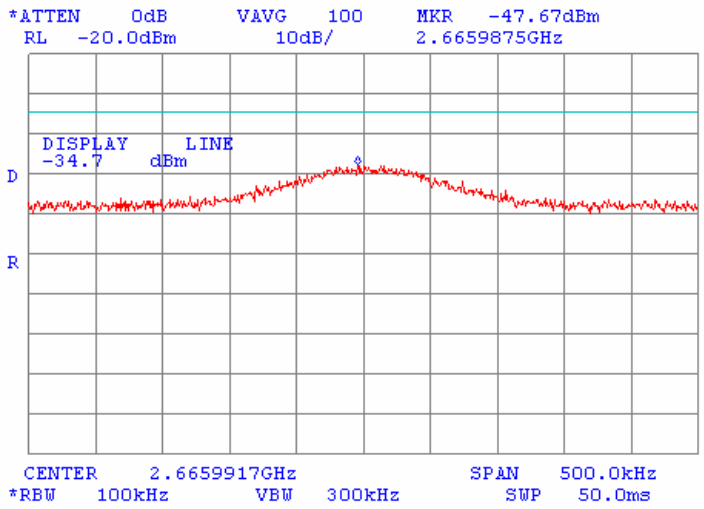
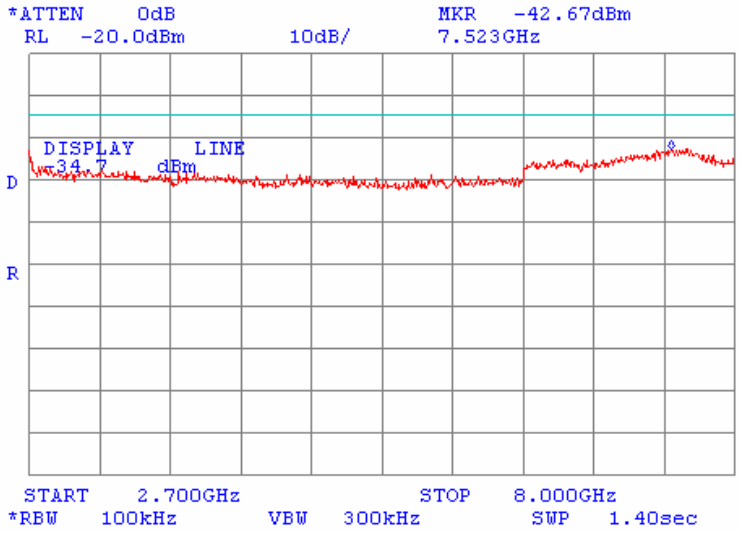
Plot 4.5.27 Conducted spurious emission measurements at mid carrier frequency



Plot 4.5.28 Conducted spurious emission measurements in 2700 MHz – 8000 MHz range at mid carrier frequency



The 2nd and 3rd harmonics were investigated and not found.

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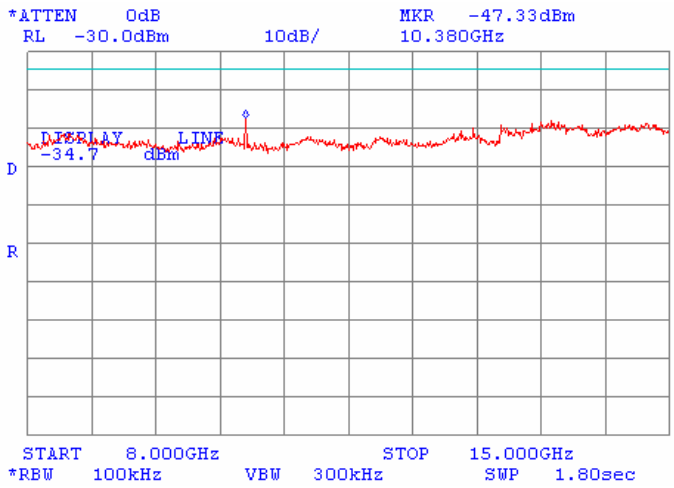
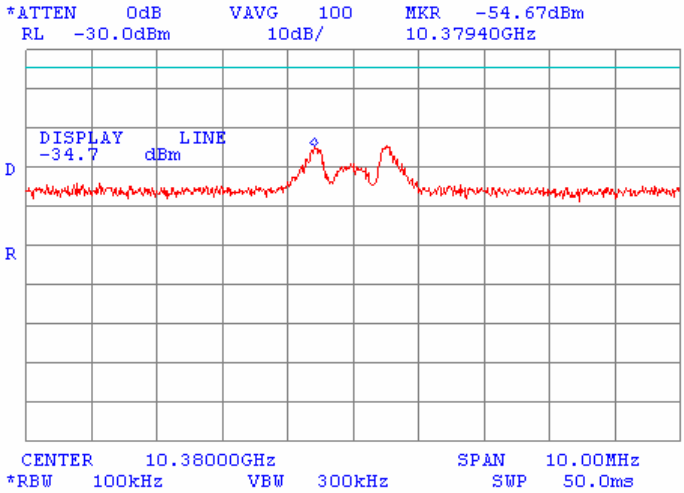
Plot 4.5.29 Conducted spurious emission measurements in 8000 MHz – 15000 MHz range at mid carrier frequency



Maximum hold mode.
External attenuator (30 dB) and cable loss (1.5 dB) included in test result.
The 5th harmonic were investigated and not found.

Plot 4.5.30 Conducted spurious emission measurements at mid carrier frequency



The 4th harmonic of fundamental
Averaging mode.

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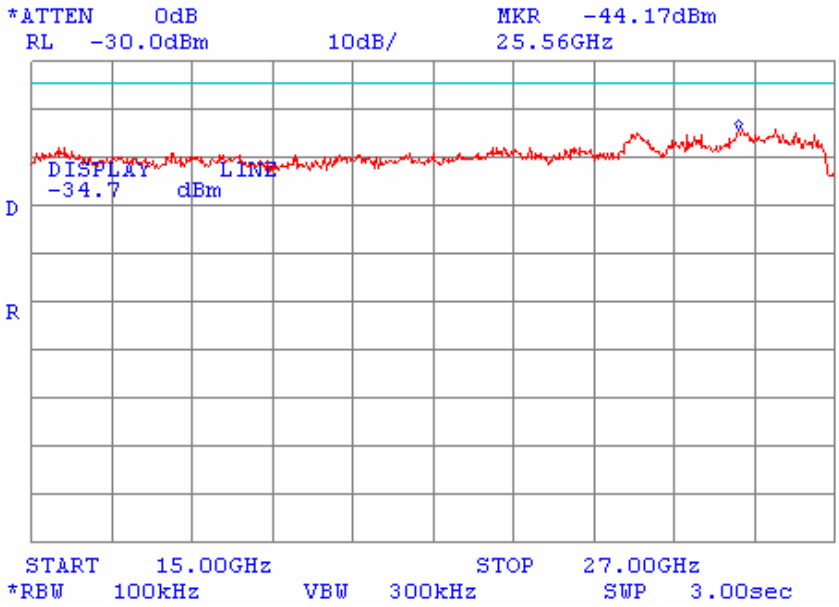
Plot 4.5.31 Conducted spurious emission measurements in 15000 MHz – 27000 MHz range at mid carrier frequency



External attenuator (30 dB) and cable loss (2 dB) included in test result.
The harmonics 6-10 were investigated and not found.

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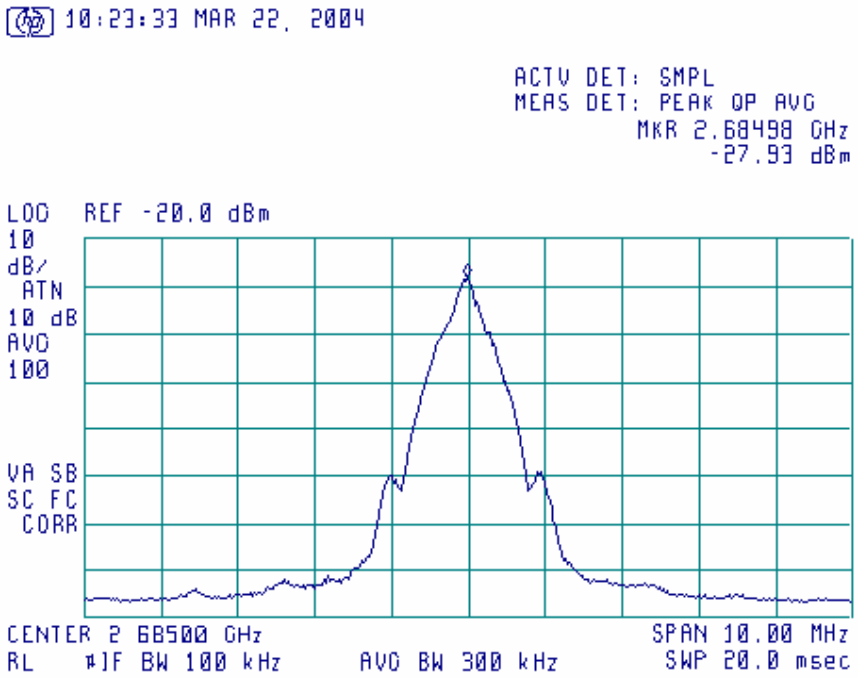
Plot 4.5.32 Average signal power measurement at RF antenna connector, high channel



Average signal power flat top measurement: -27.93 dBm
Limit for average signal power of spurious emissions=-87.93 dBm (when measured with 100 kHz resolution bandwidth).

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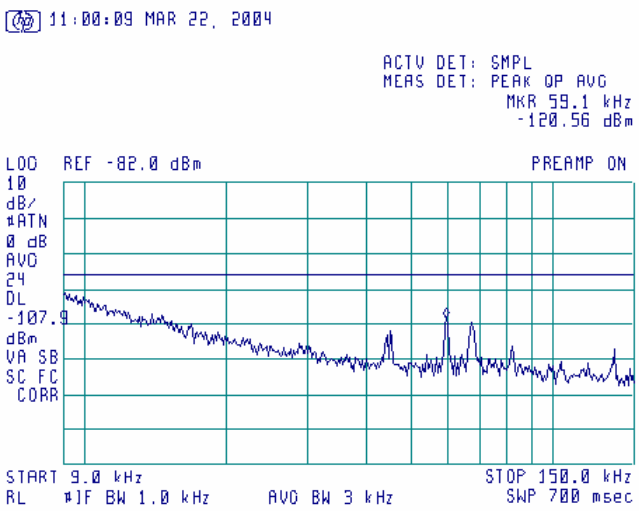
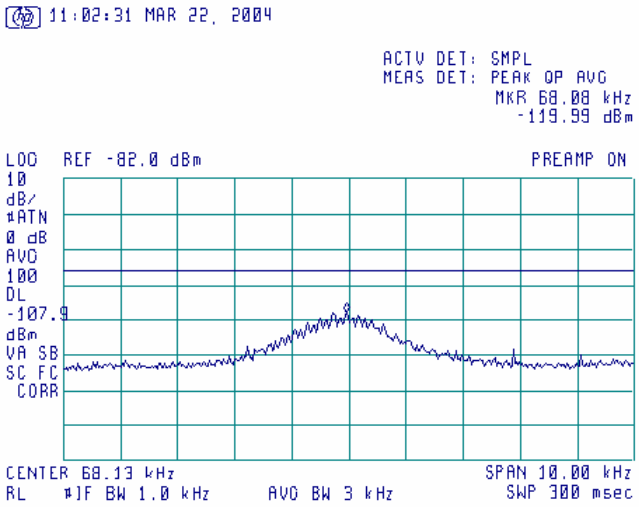
Plot 4.5.33 Conducted spurious emission measurements in 9 - 150 kHz range at high carrier frequency



Plot 4.5.34 Conducted spurious emission measurements at high carrier frequency



Limit for average signal power of spurious emissions:
-87.93 dBm-10log(100kHz/1kHz)=-107.93 dBm (when measured with 1 kHz resolution bandwidth).

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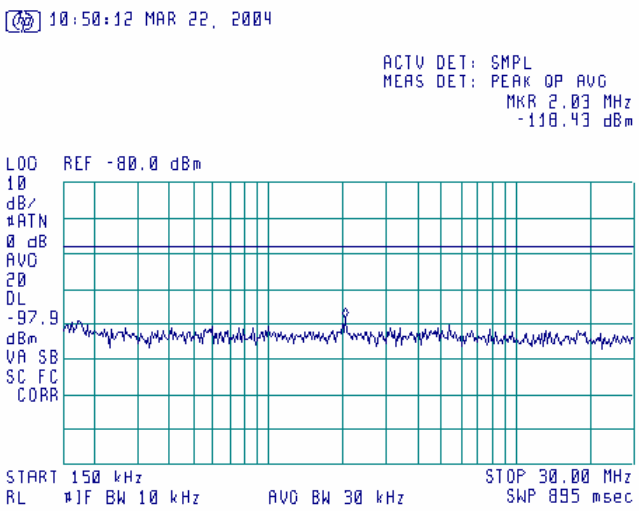
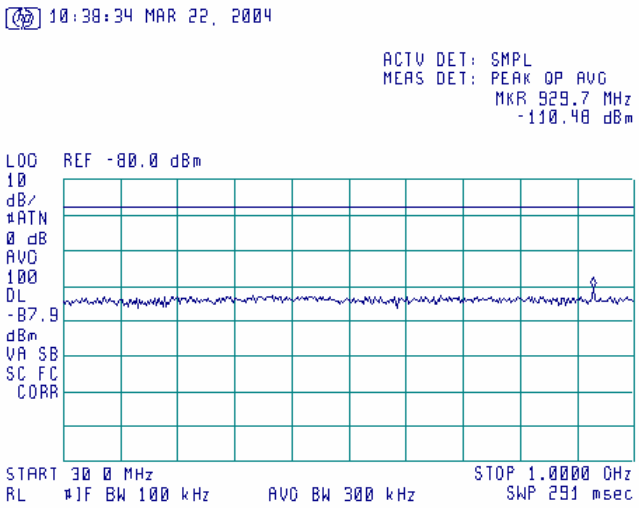
Plot 4.5.35 Conducted spurious emission measurements in 150 kHz – 30 MHz range at high carrier frequency



Limit for average signal power of spurious emissions:
-87.93 dBm-10log(100kHz/10kHz)=-97.93 dBm (when measured with 10 kHz resolution bandwidth).

Plot 4.5.36 Conducted spurious emission measurements in 30 MHz – 1000 MHz range at high carrier frequency



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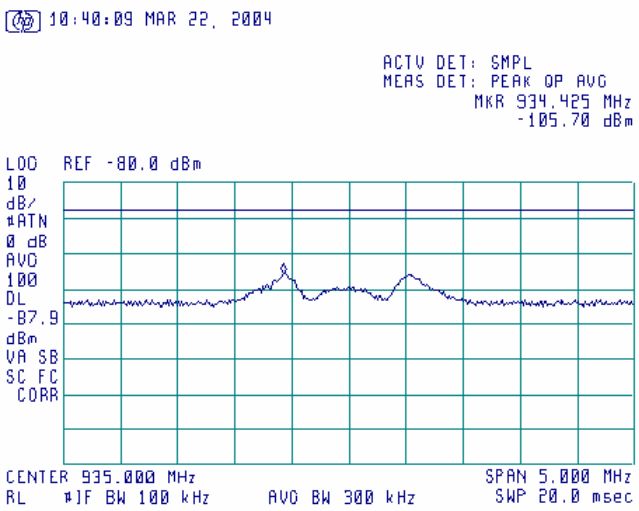
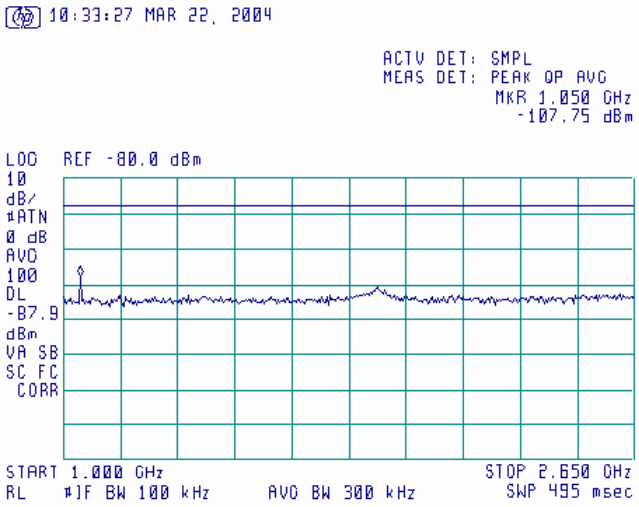
Plot 4.5.37 Conducted spurious emission measurements at high carrier frequency



Plot 4.5.38 Conducted spurious emission measurements in 1000 MHz – 2650 MHz range at high carrier frequency



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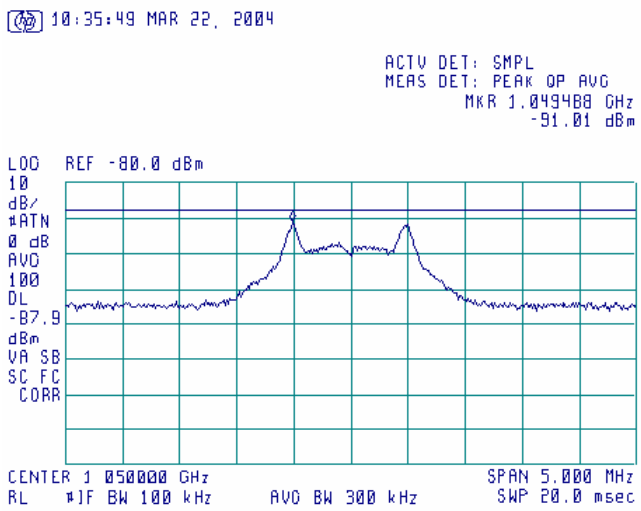
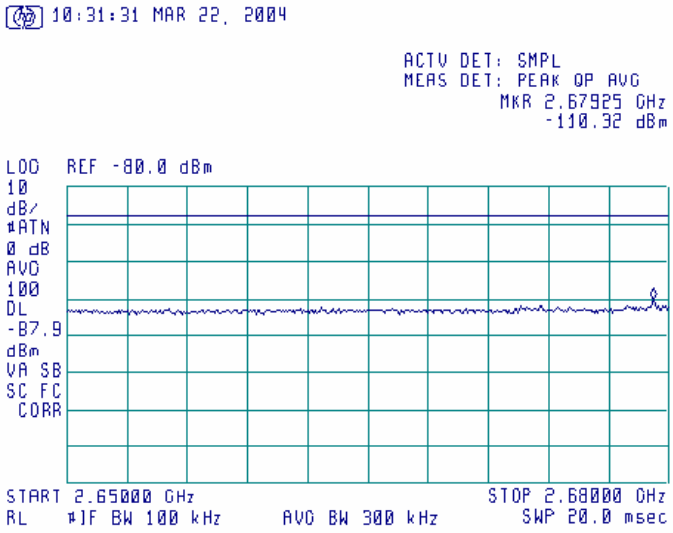
Plot 4.5.39 Conducted spurious emission measurements at high carrier frequency



The 3rd harmonic of the first IF (350 MHz).

Plot 4.5.40 Conducted spurious emission measurements in 2650 MHz - 2680 MHz range at high carrier frequency



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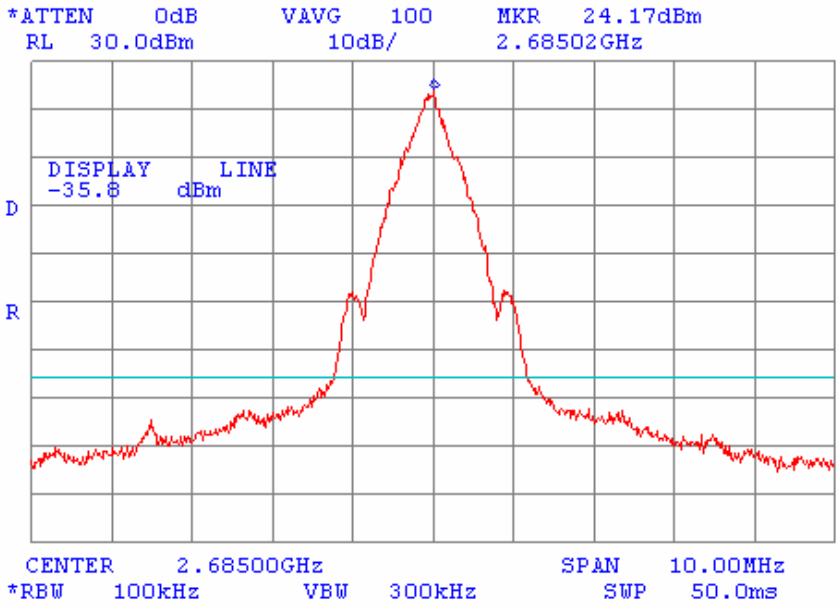
Plot 4.5.41 Average signal power measurement at RF antenna connector, high channel



External attenuator (40 dB) and cable loss (0.6 dB) included to measured result.
Average signal power flat top measurement: 24.2 dBm
Limit for average signal power of spurious emissions=-35.8 dBm (when measured with 100 kHz resolution bandwidth).

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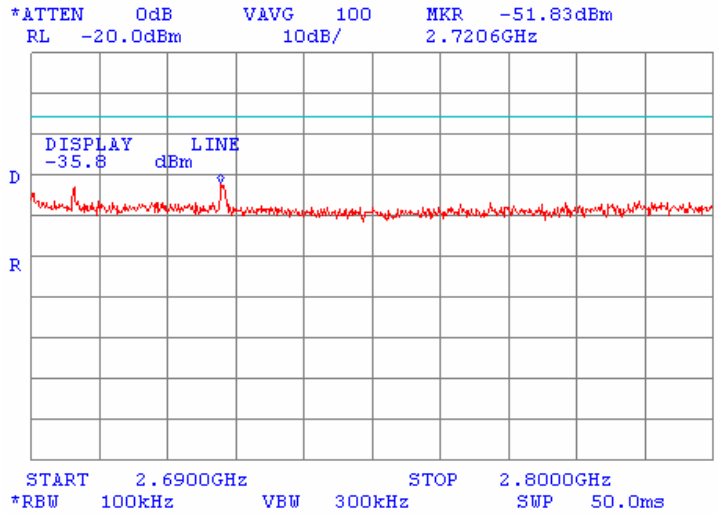
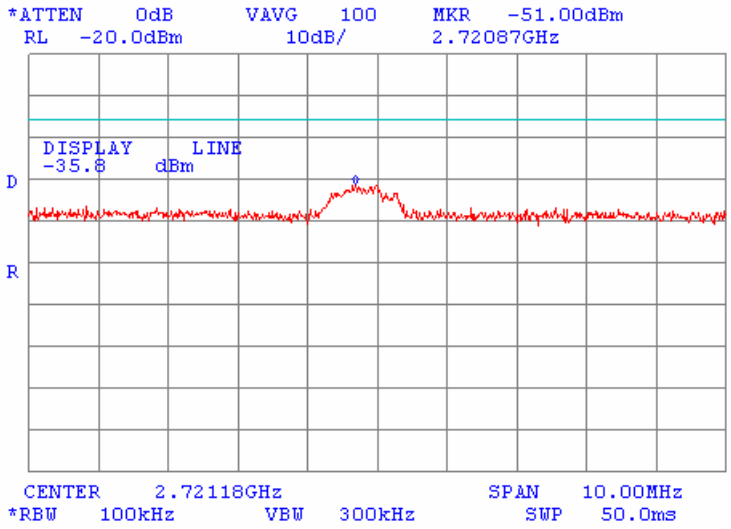
Plot 4.5.42 Conducted spurious emission measurements in 2690 MHz – 2800 MHz range at high carrier frequency



Plot 4.5.43 Conducted spurious emission measurements at high carrier frequency



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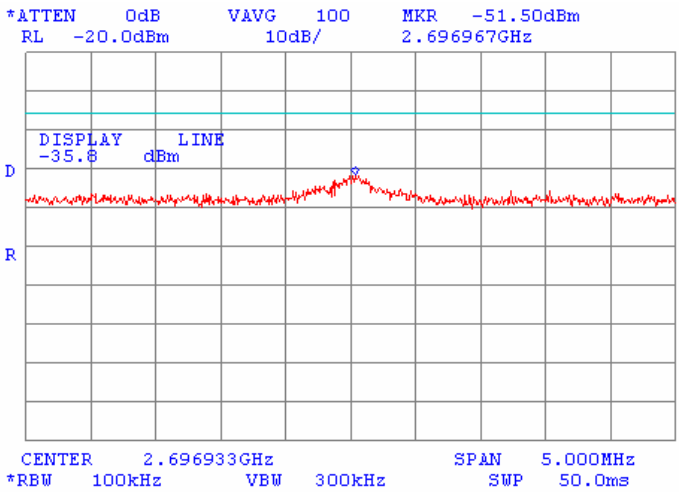
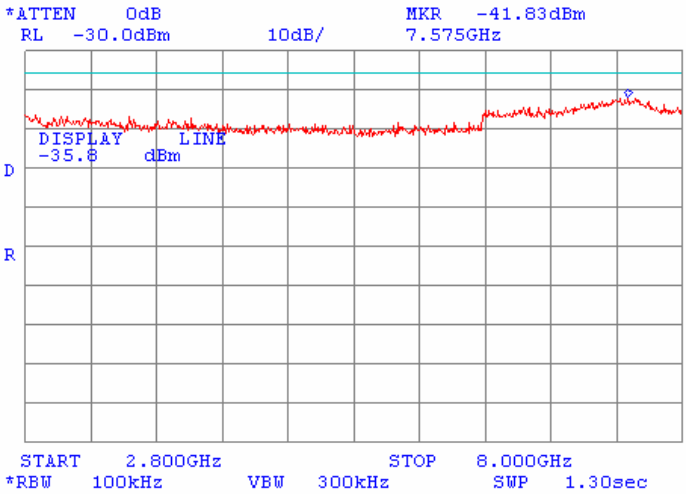
Plot 4.5.44 Conducted spurious emission measurements at high carrier frequency



Plot 4.5.45 Conducted spurious emission measurements in 2800 MHz – 8000 MHz range at high carrier frequency



The 2nd harmonic was investigated and not found.

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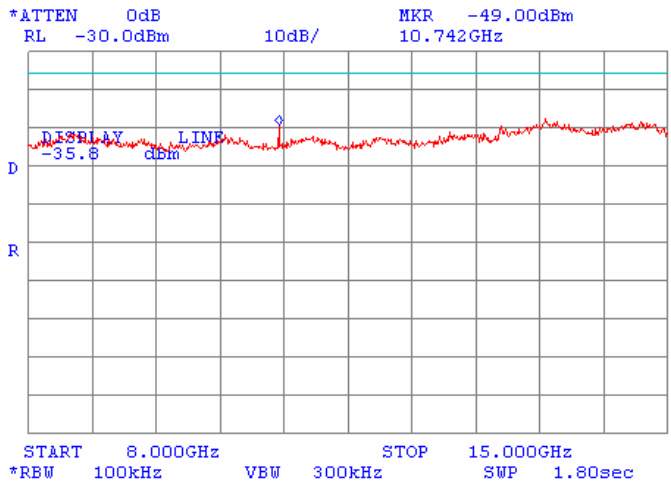
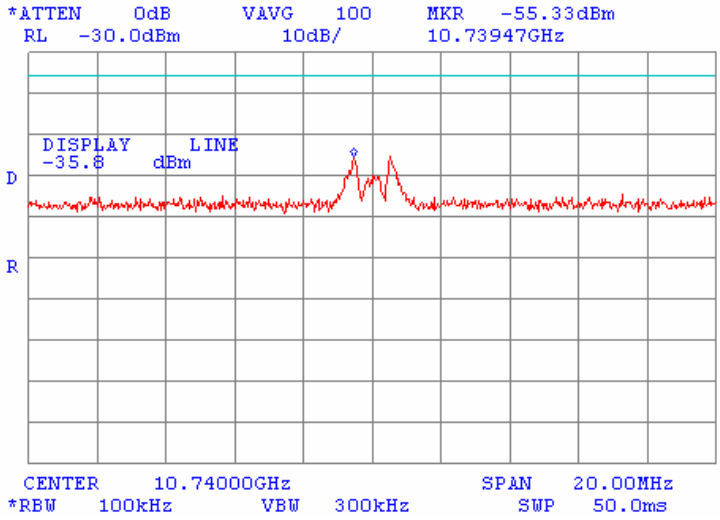
Plot 4.5.46 Conducted spurious emission measurements in 8000 MHz – 15000 MHz range at high carrier frequency



Maximum hold mode
External attenuator (30 dB) and cable loss (1.5 dB) included in test result.
The 5th harmonic was investigated and not found.

Plot 4.5.47 Conducted spurious emission measurements at high carrier frequency



The 4th harmonic of fundamental
Averaging mode.

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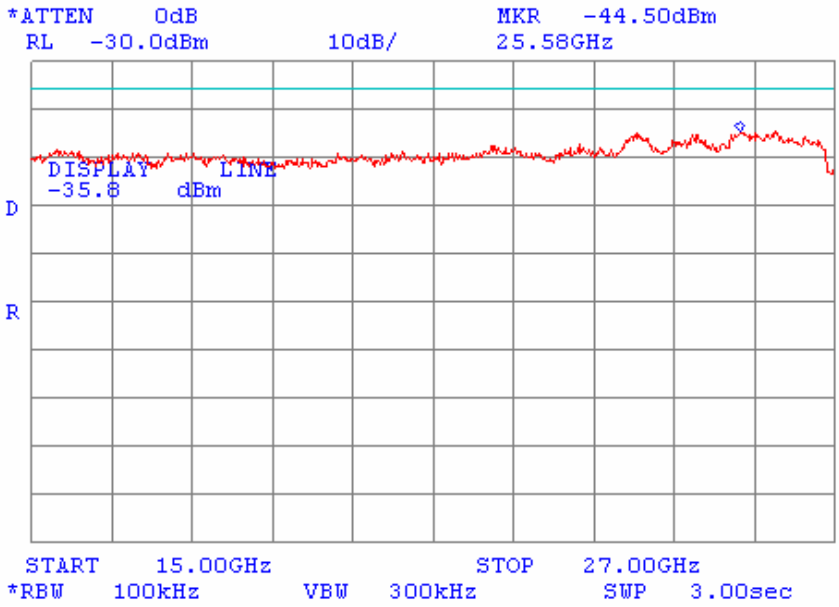
Plot 4.5.48 Conducted spurious emission measurements in 15000 MHz – 27000 MHz range at high carrier frequency



External attenuator (30 dB) and cable loss (2 dB) included in test result.
The harmonics 6-10 were investigated and not found.

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4.6 Radiated spurious emission measurements

4.6.1 General

This test was performed to measure radiated spurious emissions from the EUT enclosure with antenna connector terminated with 50 Ohm dummy load.
Specification test limits are given in Table 4.6.1.

Table 4.6.1

Radiated spurious emission test limits

Frequency, MHz*	Attenuation below carrier, dBc
0.009 – 10th harmonic	60

* excluding frequency band tested for compliance with emission mask.

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

4.6.2.1 The EUT was set up as shown in Figure 4.6.1, energized and the performance check was conducted.

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

4.6.2.3 The test results were recorded in Table 4.6.2 and shown in the associated plots.

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

4.6.3.1 The EUT was set up as shown in Figures 4.6.2, 4.6.3, energized and the performance check was conducted.

4.6.3.2 The specified frequency range was investigated with antennas connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal, polarizations.

4.6.3.3 The worst test results (the lowest margins) were recorded in Table 4.6.2 and shown in the associated plots.

4.6.4 Test procedure for substitution ERP measurements of spurious

4.6.4.1 The test equipment was set up as shown in Figure 4.6.4 and energized.

4.6.4.2 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.

4.6.4.3 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.

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

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

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

4.6.4.7 The worst test results (the lowest margins) were recorded in Table 4.6.3 and shown in the associated plots.

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Figure 4.6.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz band

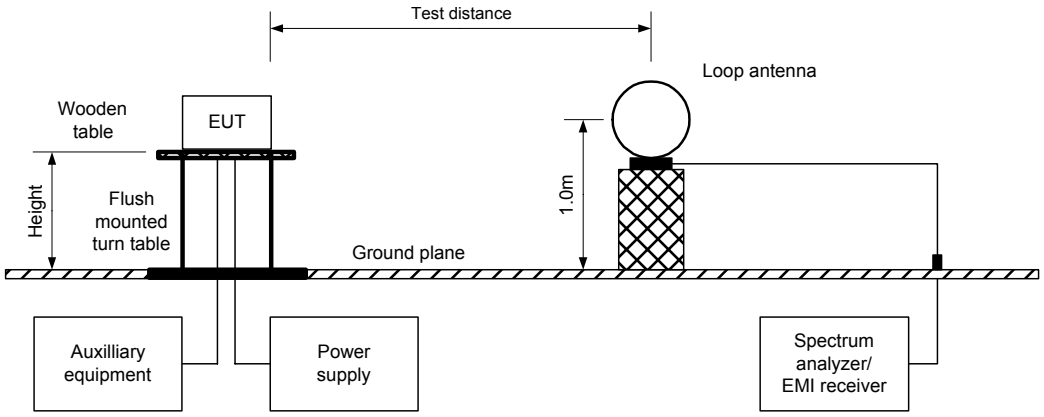

Figure 4.6.2 Setup for spurious emission field strength measurements in 30 MHz to 6.5 GHz band

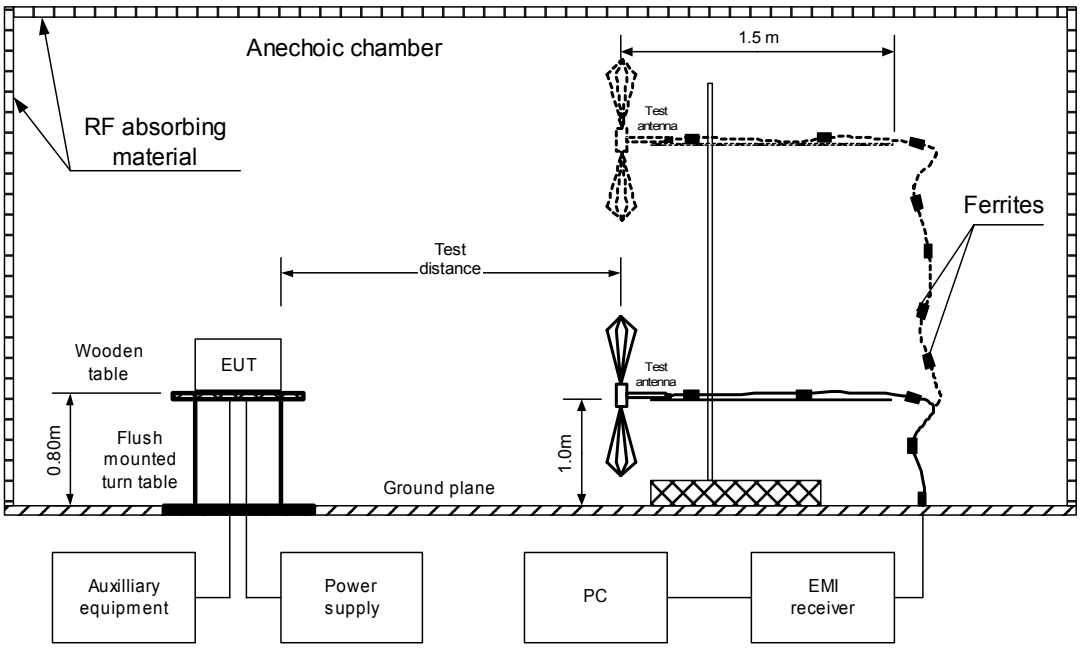

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Figure 4.6.3 Setup for spurious emission field strength measurements in 6.5 to 27 GHz band

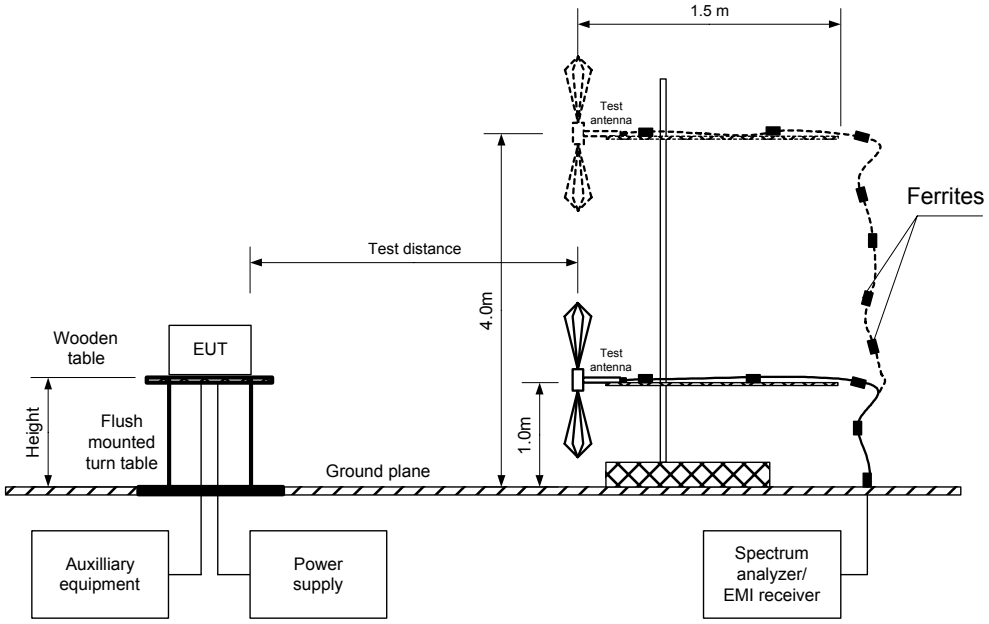

Figure 4.6.4 Setup for substitution ERP measurements of spurious

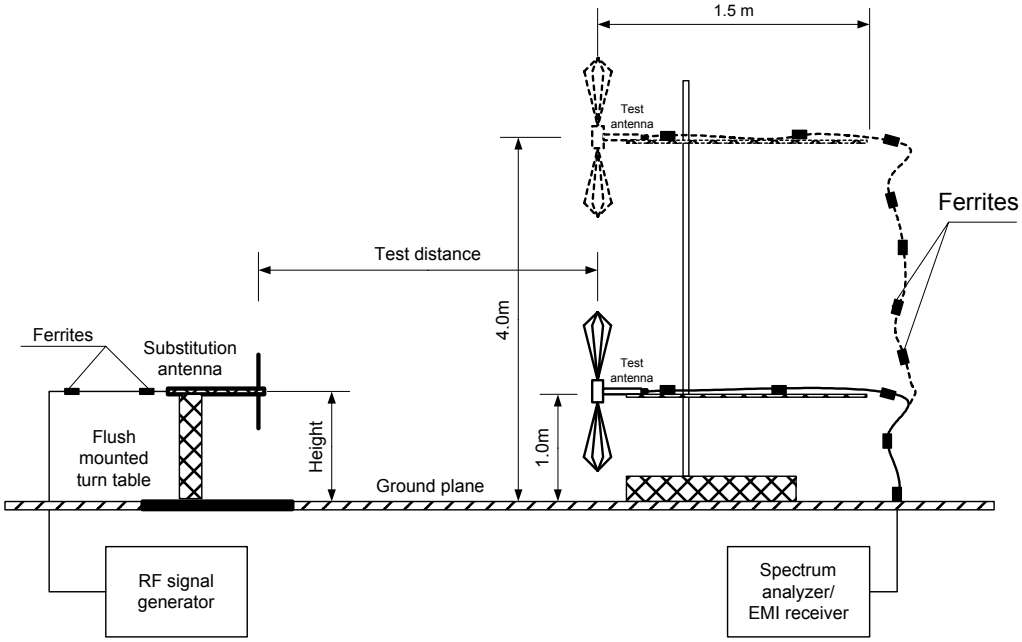

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Table 4.6.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE:	2501 – 2685 MHz
TEST DISTANCE:	3 m
EUT HEIGHT:	0.8 m
INVESTIGATED FREQUENCY RANGE:	0.009 – 27000 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:	Unmodulated
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
TRANSMITTER OUTPUT POWER (P_{out}):	28.67 dBm at low frequency 28.67 dBm at mid frequency 27.67 dBm at high frequency

BSR

Frequency, MHz	Antenna polarization	RBW, kHz	Field strength, dB(µV/m)	Calculated limit, dB(µV/m)	Margin, dB*	Verdict
Low carrier frequency						
0.009 - 30	All radiated spurious emissions were found more than 20 dB below the limit					Pass
30 - 1000	All radiated spurious emissions were found more than 20 dB below the limit					Pass
7502.87	Vertical	1000	57.50	74.9	17.40	Pass
10004.07	Vertical	1000	63.33	74.9	11.57	Pass
Mid carrier frequency						
0.009 - 30	All radiated spurious emissions were found more than 20 dB below the limit					Pass
30 - 1000	All radiated spurious emissions were found more than 20 dB below the limit					Pass
12974.92	Vertical	1000	61.17	74.9	13.73	Pass
High carrier frequency						
0.009 - 30	All radiated spurious emissions were found more than 20 dB below the limit					Pass
30 - 1000	All radiated spurious emissions were found more than 20 dB below the limit					Pass
7004.97	Horizontal	1000	57.17	73.9	16.73	Pass

*- Margin = Calculated field strength limit - field strength of spurious.

Calculation of equivalent field strength limit and EIRP limit for spurious emissions

1) L_{spur} (dBm) = $EIRP_{carrier}$ (dBm) – 60 dB
2) $EIRP_{carrier}$ (dBm) = P_{out} (dBm) + G_{ant} (dBi), where P_{out} is the transmitter output power, G_{ant} is the transmitter antenna gain
3) Equivalent field strength limit E_{lim} = L_{spur} (dBm)
+ 95.2 dB

BSR:
For transmitter output power 28.67 dBm and the 11 dBi gain antenna:
$EIRP_{carrier}$ = 39.67 dBm,
L_{spur} (dBm) = 39.67 dBm – 60 dB = -20.33 dBm
the field strength limit E_{lim} is 74.9 dB(µV/m) – low and mid channels,
for transmitter output power 27.67 dBm and the 11 dBi gain antenna:
L_{spur} (dBm) = -21.33 dBm, the limit E_{lim} is 73.9 dB(µV/m) – high channel.

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SPR

Frequency, MHz	Antenna polarization	RBW, kHz	Field strength, dB(µV/m)	Calculated limit, dB(µV/m)	Margin, dB*	Verdict
Low carrier frequency						
0.009 - 30	All radiated spurious emissions were found more than 20 dB below the limit					Pass
30 - 1000	All radiated spurious emissions were found more than 20 dB below the limit					Pass
10003.93	Horizontal	1000	60.50	78.9	18.40	Pass
Mid carrier frequency						
0.009 - 30	All radiated spurious emissions were found more than 20 dB below the limit					Pass
30 - 1000	All radiated spurious emissions were found more than 20 dB below the limit					Pass
12974.92	Horizontal	1000	71.00	78.9	7.90	Pass
High carrier frequency						
0.009 - 30	All radiated spurious emissions were found more than 20 dB below the limit					Pass
30 - 1000	All radiated spurious emissions were found more than 20 dB below the limit					Pass
13424.87	Horizontal	1000	67.33	77.9	10.57	Pass

*- Margin = Calculated field strength limit - field strength of spurious.

Equivalent field strength limit for spurious calculation

1) L_{spur} (dBm) = $EIRP_{carrier}$ (dBm) – 60 dB
2) $EIRP_{carrier}$ (dBm) = P_{out} (dBm) + G_{ant} (dBi), where P_{out} is the transmitter output power, G_{ant} is the transmitter antenna gain
3) Equivalent field strength limit E_{lim} = $EIRP_{carrier}$ (dBm) – 60 dB + 95.2 dB

SPR: For transmitter output power 28.67 dBm and the 15 dBi antenna:
$EIRP_{carrier}$ = 43.67 dBm,
L_{spur} (dBm) = $EIRP_{carrier}$ (dBm) – 60 dB = -16.33 dBm
the limit E_{lim} is 78.9 dB(µV/m) – low and mid channels,
for transmitter output power 27.67 dBm and the 15 dBi antenna:
L_{spur} (dBm) = -17.33 dBm, the limit E_{lim} is 77.9 dB(µV/m) – high channel.

Reference numbers of test equipment used

HL 0038	HL 0091	HL 0287	HL 0446	HL 0465	HL 0521	HL 0589	HL 0592
HL 0593	HL 0594	HL 0604	HL 0768	HL 1004	HL 1424	HL 1942	HL 1947
HL 1984	HL 2009	HL 2259	HL 2260	HL 2387	HL 2399		

Full description is given in Appendix A.

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Table 4.6.3 Substitution EIRP of spurious emissions test results

ASSIGNED FREQUENCY RANGE:	2501 – 2685 MHz
TRANSMITTER OUTPUT POWER:	28.67 dBm at low frequency 28.67 dBm at mid frequency 27.67 dBm at high frequency
TEST SITE:	OATS
TEST DISTANCE:	3 m
SUBSTITUTION ANTENNA HEIGHT:	0.8 m
DETECTOR USED:	Peak
VIDEO BANDWIDTH:	≥ Resolution bandwidth
RESOLUTION BANDWIDTH:	1 MHz
SUBSTITUTION ANTENNA TYPE:	Double ridged guide

BSR

Frequency, MHz	Antenna polarization	Field strength, dB(µV/m)	RF generator output, dBm	Antenna gain, dBi	Cable loss, dB	EIRP spurious result**, dBm	Spurious limit, dBm	Margin, dB*	Verdict
Low carrier frequency									
7502.87	Vertical	57.50	-46.9	10.4	1.6	-38.1	-20.33	17.77	Pass
10004.07	Vertical	63.33	-44.5	11.5	1.9	-34.9	-20.33	14.57	Pass
Mid carrier frequency									
12974.92	Vertical	61.17	-46.0	12.0	2.1	-36.1	-20.33	15.77	Pass
High carrier frequency									
7004.97	Horizontal	57.17	-47.7	10.8	1.5	-38.4	-21.33	17.07	Pass

SPR

Frequency, MHz	Antenna polarization	Field strength, dB(µV/m)	RF generator output, dBm	Antenna gain, dBi	Cable loss, dB	EIRP spurious result**, dBm	Spurious limit, dBm	Margin, dB*	Verdict
Low carrier frequency									
10003.93	Horizontal	60.50	-47.3	11.5	1.9	-37.7	-16.33	21.37	Pass
Mid carrier frequency									
12974.92	Horizontal	71.00	-36.2	12.0	2.1	-26.3	-16.33	9.97	Pass
High carrier frequency									
13424.87	Horizontal	67.33	-41.2	12.0	2.2	-31.4	-17.33	14.07	Pass

*- Margin = Specification limit - spurious emission.
** ERP = P_{gen} – CL + G_{ant}, where
P_{gen} - signal generator output power in dBm
CL - cable loss in dB
G_{ant} - antenna gain in dBi

Reference numbers of test equipment used

HL 0038	HL 0091	HL 0287	HL 0446	HL 0465	HL 0521	HL 0589	HL 0592
HL 0593	HL 0594	HL 0604	HL 0768	HL 1004	HL 1424	HL 1942	HL 1947
HL 1984	HL 2009	HL 2259	HL 2260	HL 2387	HL 2399		

Full description is given in Appendix A.

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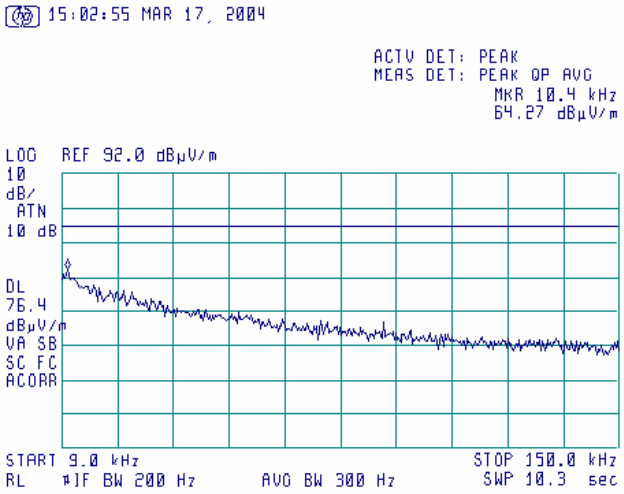
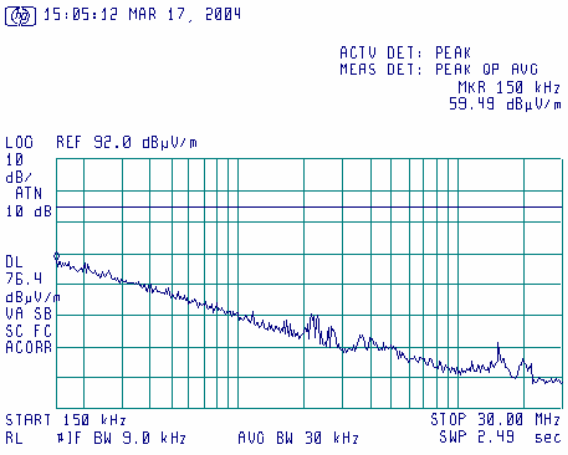
Plot 4.6.1 Radiated emission measurements in 9 - 150 kHz range

EUT:	BSR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	74.9 dB(µV/m)



Plot 4.6.2 Radiated emission measurements in 0.15 - 30 MHz range

EUT:	BSR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	74.9 dB(µV/m)



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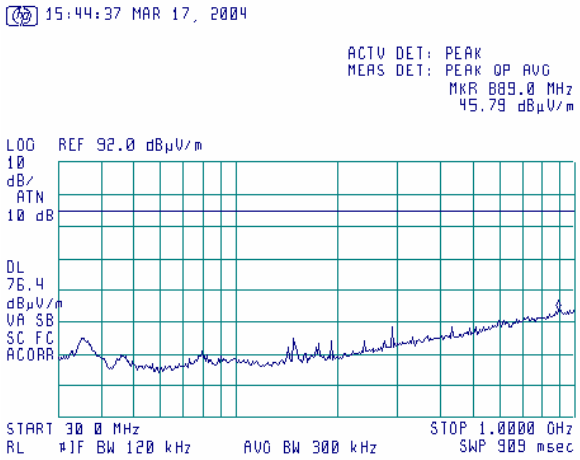
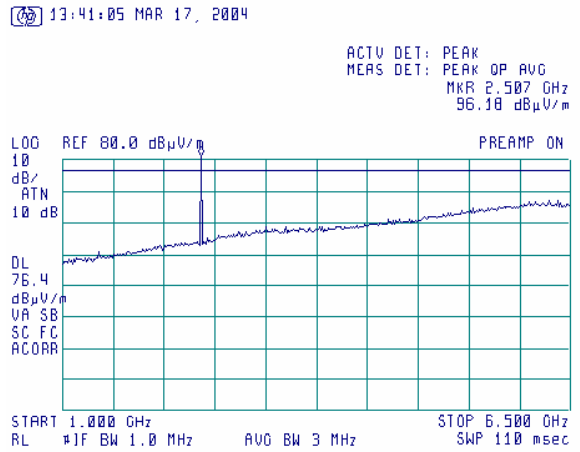
Plot 4.6.3 Radiated emission measurements in 30 - 1000 MHz range

EUT:	BSR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit	74.9 dB(µV/m)



Plot 4.6.4 Radiated emission measurements in 1 – 6.5 GHz range

EUT:	BSR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit	74.9 dB(µV/m)



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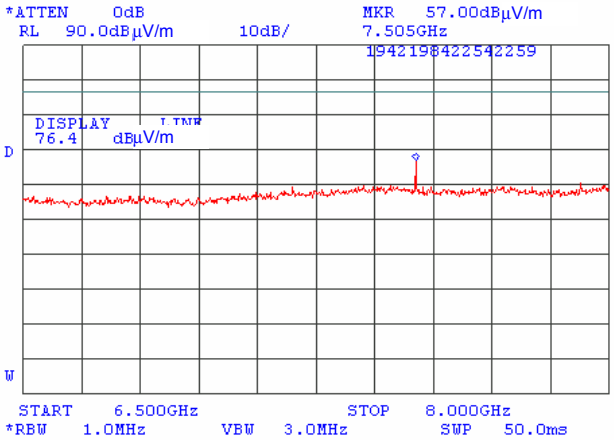
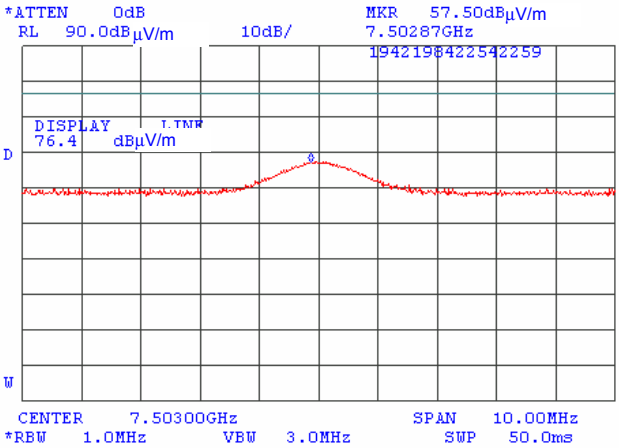
Plot 4.6.5 Radiated emission measurements in 6.5 – 8 GHz range

EUT:	BSR
TEST SITE:	OATS
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	74.9 dB(µV/m)



Plot 4.6.6 Radiated emission measurements at the 3rd harmonic

EUT:	BSR
TEST SITE:	OATS
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	74.9 dB(µV/m)



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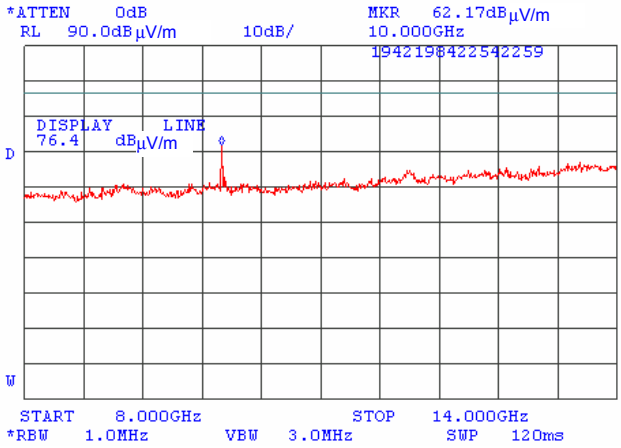
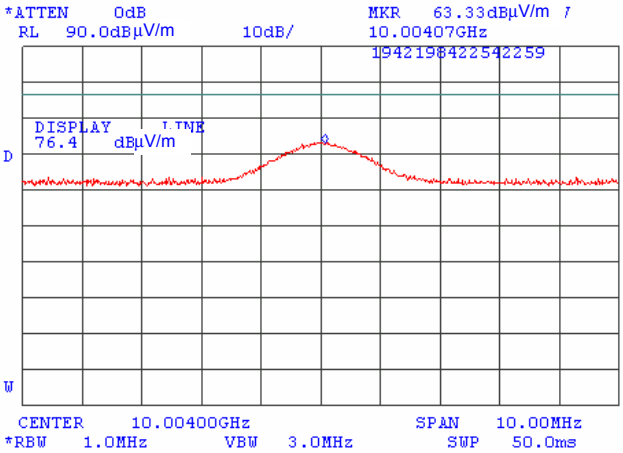
Plot 4.6.7 Radiated emission measurements in 8 – 14 GHz range

EUT:	BSR
TEST SITE:	OATS
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	74.9 dB(µV/m)



Plot 4.6.8 Radiated emission measurements at the 4th harmonic

EUT:	BSR
TEST SITE:	OATS
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	74.9 dB(µV/m)



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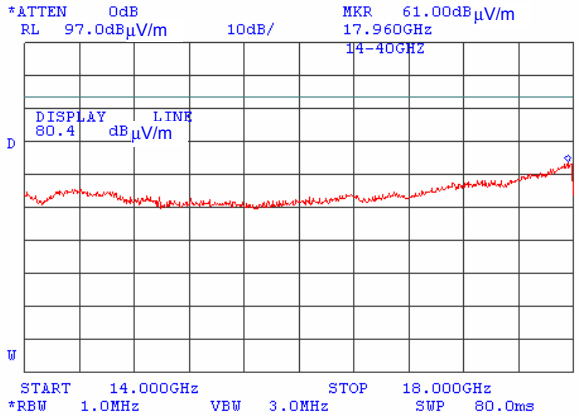
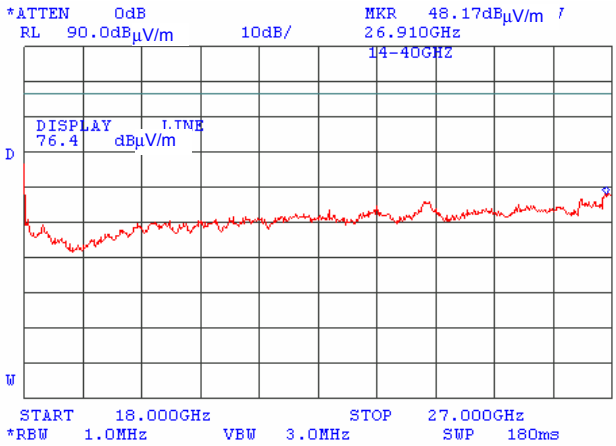
Plot 4.6.9 Radiated emission measurements in 14 – 18 GHz range

EUT:	BSR
TEST SITE:	OATS
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit:	74.9 dB(µV/m)



Plot 4.6.10 Radiated emission measurements in 18 – 27 GHz range

EUT:	BSR
TEST SITE:	OATS
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit:	74.9 dB(µV/m)



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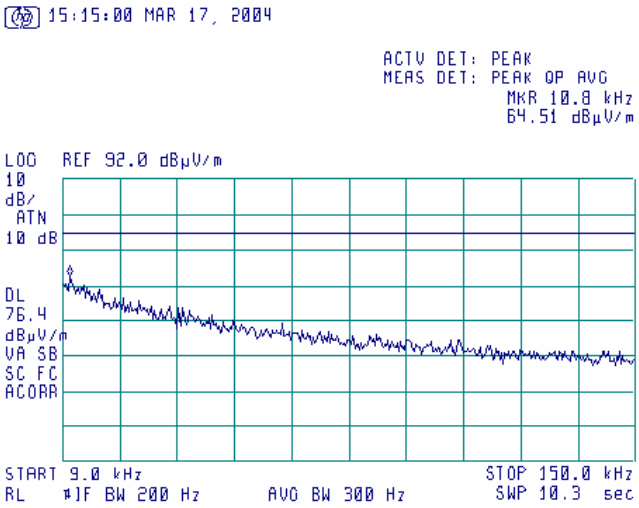
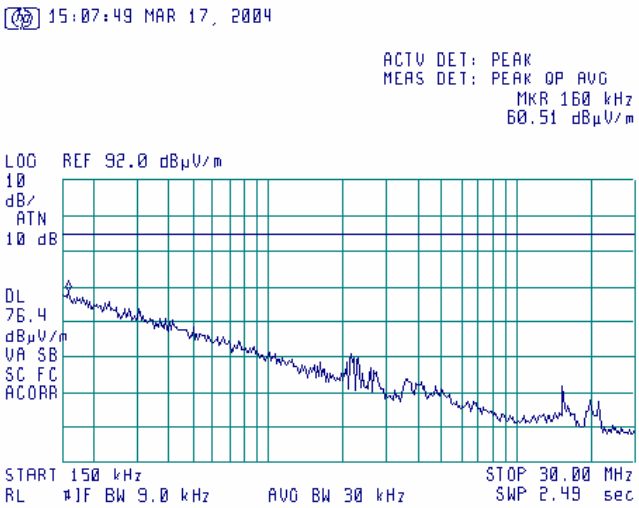
Plot 4.6.11 Radiated emission measurements in 9 - 150 kHz range

EUT:	BSR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	74.9 dB(µV/m)



Plot 4.6.12 Radiated emission measurements in 0.15 - 30 MHz range

EUT:	BSR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	74.9 dB(µV/m)



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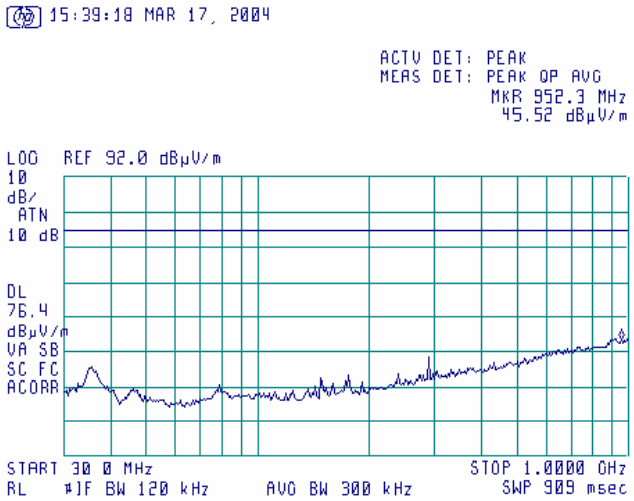
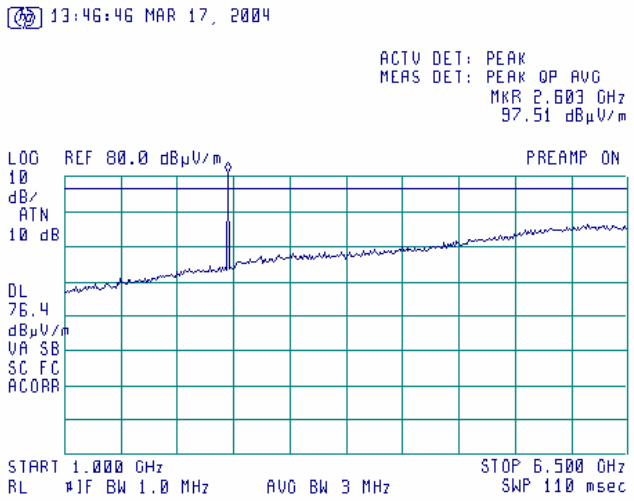
Plot 4.6.13 Radiated emission measurements in 30 - 1000 MHz range

EUT:	BSR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit	74.9 dB(µV/m)



Plot 4.6.14 Radiated emission measurements in 1 – 6.5 GHz range

EUT:	BSR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit	74.9 dB(µV/m)



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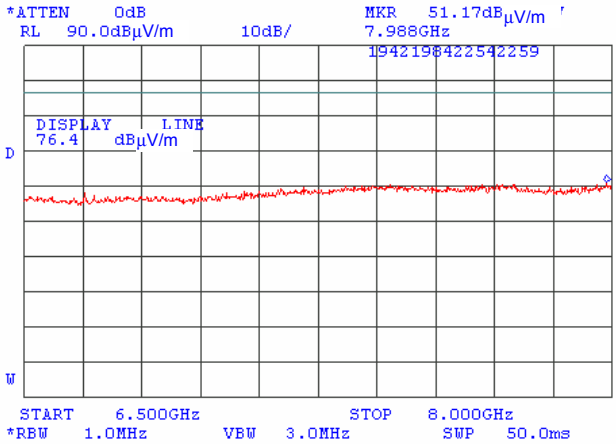
Plot 4.6.15 Radiated emission measurements in 6.5 – 8 GHz range

EUT:	BSR
TEST SITE:	OATS
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	74.9 dB(µV/m)



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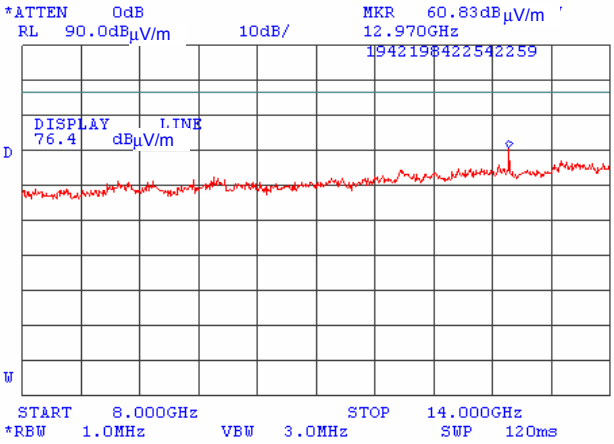
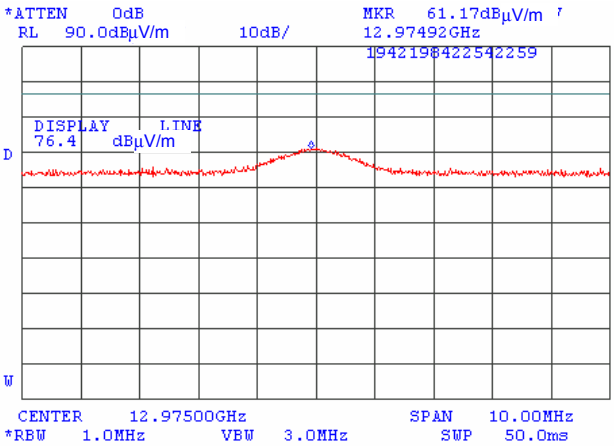
Plot 4.6.16 Radiated emission measurements in 8 – 14 GHz range

EUT:	BSR
TEST SITE:	OATS
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	74.9 dB(µV/m)



Plot 4.6.17 Radiated emission measurements at the 5th harmonic

EUT:	BSR
TEST SITE:	OATS
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	74.9 dB(µV/m)



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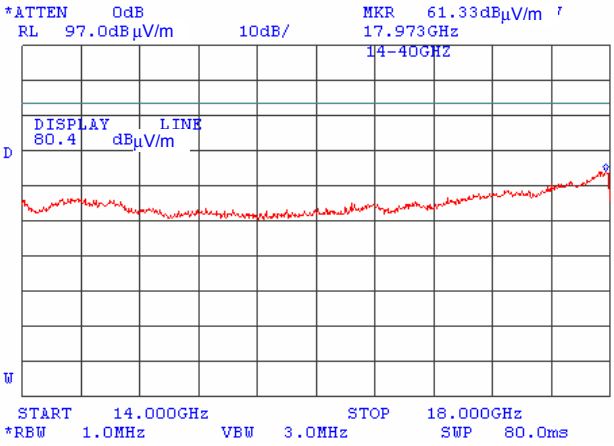
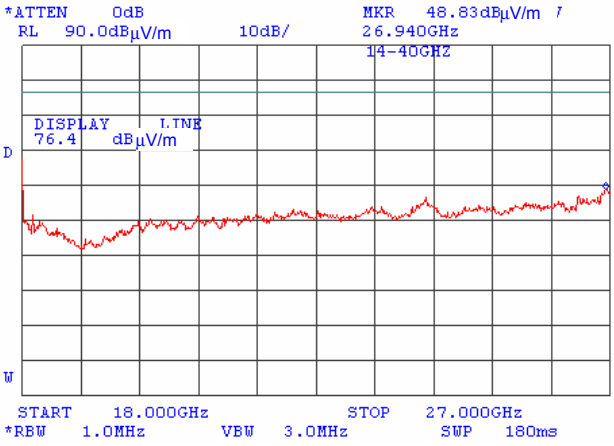
Plot 4.6.18 Radiated emission measurements in 14 – 18 GHz range

EUT:	BSR
TEST SITE:	OATS
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit:	74.9 dB(µV/m)



Plot 4.6.19 Radiated emission measurements in 18 – 27 GHz range

EUT:	BSR
TEST SITE:	OATS
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit:	74.9 dB(µV/m)



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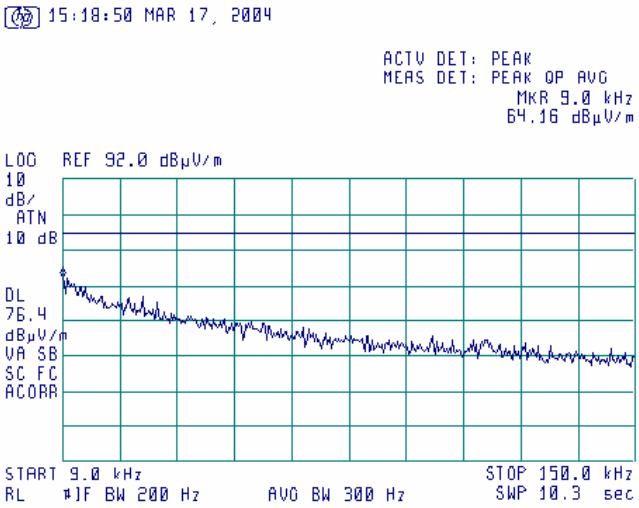
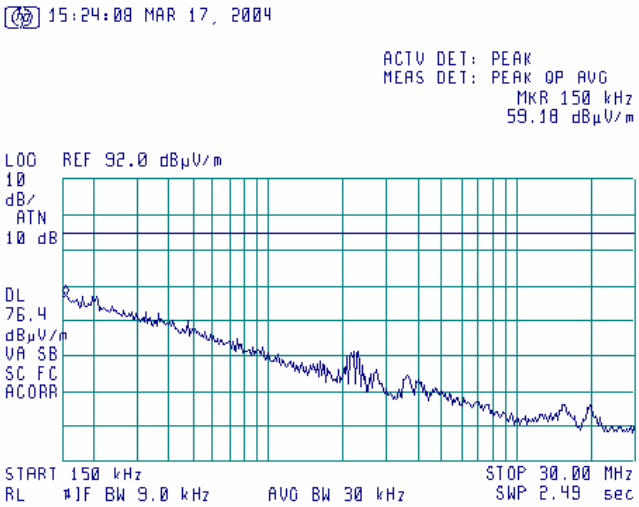
Plot 4.6.20 Radiated emission measurements in 9 - 150 kHz range

EUT:	BSR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	73.9 dB(µV/m)



Plot 4.6.21 Radiated emission measurements in 0.15 - 30 MHz range

EUT:	BSR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	73.9 dB(µV/m)



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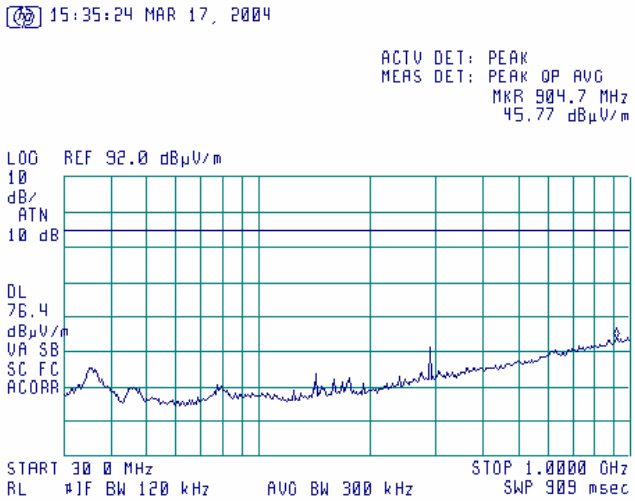
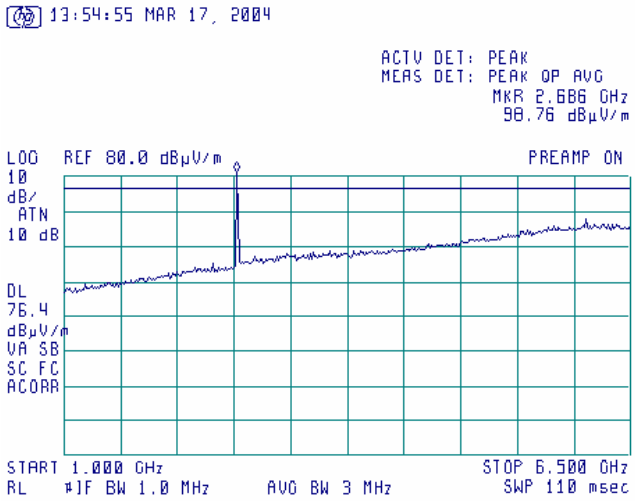
Plot 4.6.22 Radiated emission measurements in 30 - 1000 MHz range

EUT:	BSR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit	73.9 dB(µV/m)



Plot 4.6.23 Radiated emission measurements in 1 – 6.5 GHz range

EUT:	BSR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit	73.9 dB(µV/m)



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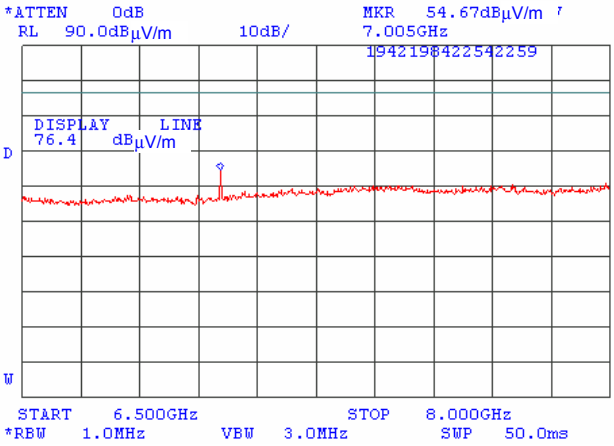
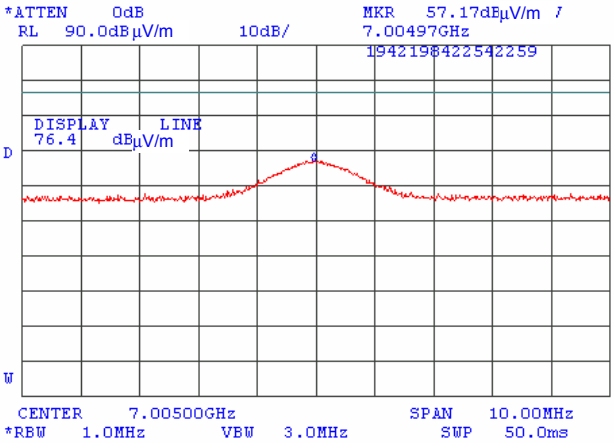
Plot 4.6.24 Radiated emission measurements in 6.5 – 8 GHz range

EUT:	BSR
TEST SITE:	OATS
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	73.9 dB(µV/m)



Plot 4.6.25 Radiated emission measurements

EUT:	BSR
TEST SITE:	OATS
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	73.9 dB(µV/m)



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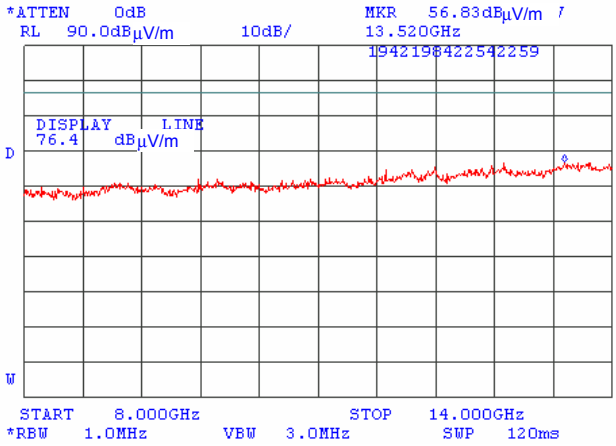
Plot 4.6.26 Radiated emission measurements in 8 – 14 GHz range

EUT:	BSR
TEST SITE:	OATS
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	73.9 dB(µV/m)



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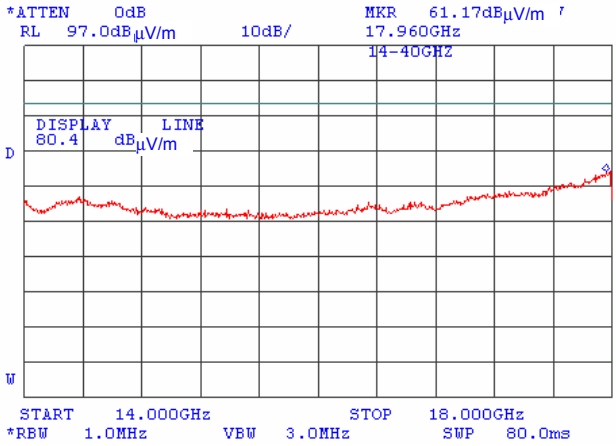
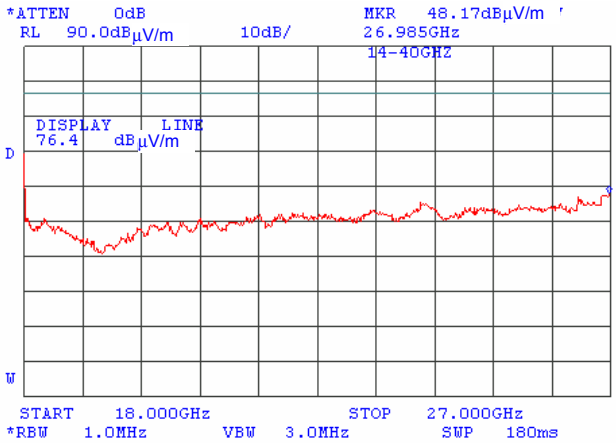
Plot 4.6.27 Radiated emission measurements in 14 – 18 GHz range

EUT:	BSR
TEST SITE:	OATS
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit:	73.9 dB(µV/m)



Plot 4.6.28 Radiated emission measurements in 18 – 27 GHz range

EUT:	BSR
TEST SITE:	OATS
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit:	73.9 dB(µV/m)



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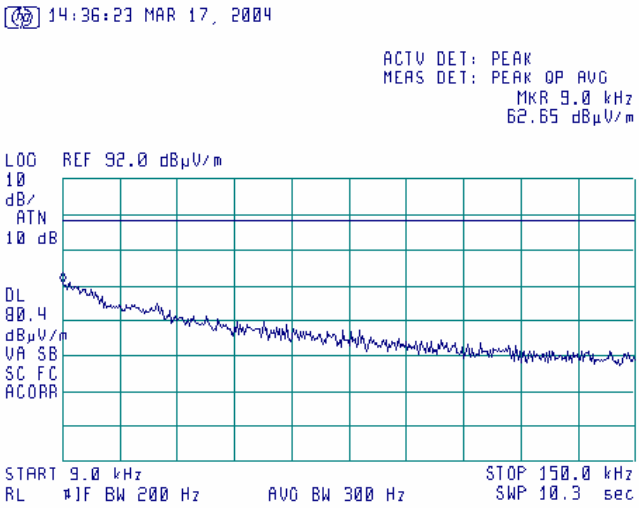
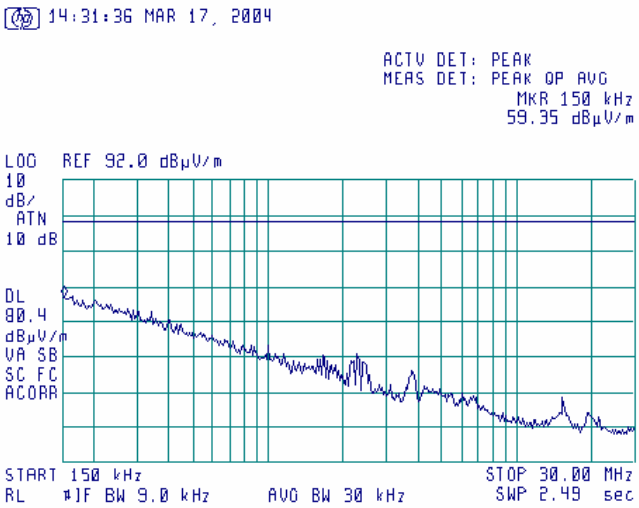
Plot 4.6.29 Radiated emission measurements in 9 - 150 kHz range

EUT:	SPR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	78.9 dB(µV/m)



Plot 4.6.30 Radiated emission measurements in 0.15 - 30 MHz range

EUT:	SPR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	78.9 dB(µV/m)



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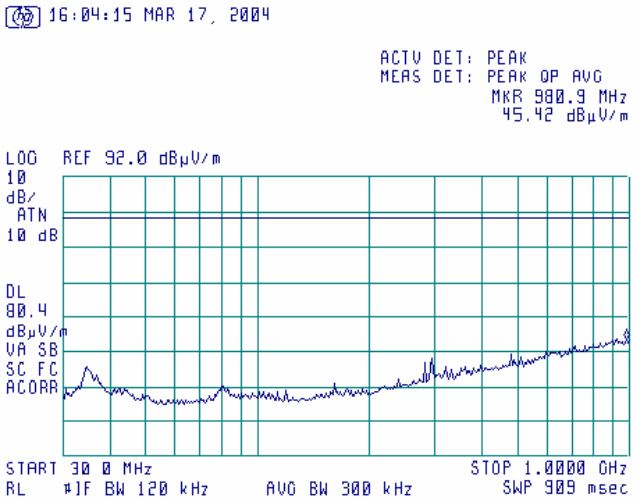
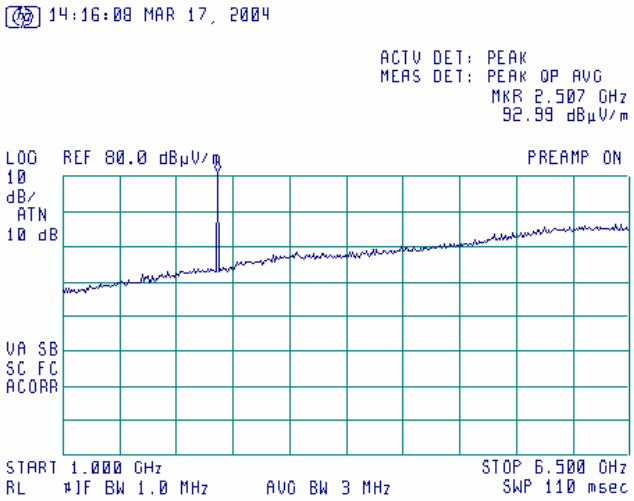
Plot 4.6.31 Radiated emission measurements in 30 - 1000 MHz range

EUT:	SPR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit	78.9 dB(µV/m)



Plot 4.6.32 Radiated emission measurements in 1 – 6.5 GHz range

EUT:	SPR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit	78.9 dB(µV/m)



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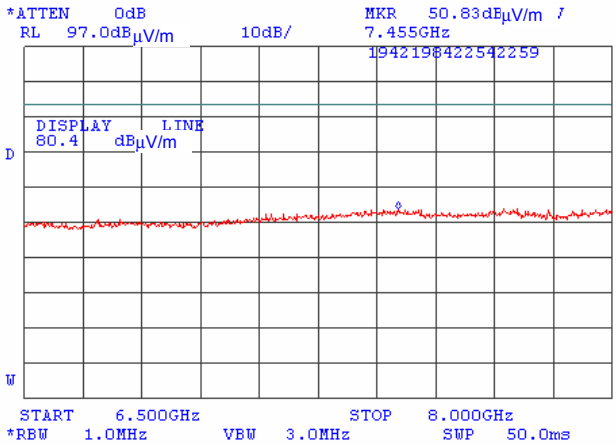
Plot 4.6.33 Radiated emission measurements in 6.5 – 8 GHz range

EUT:	SPR
TEST SITE:	OATS
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	78.9 dB(µV/m)



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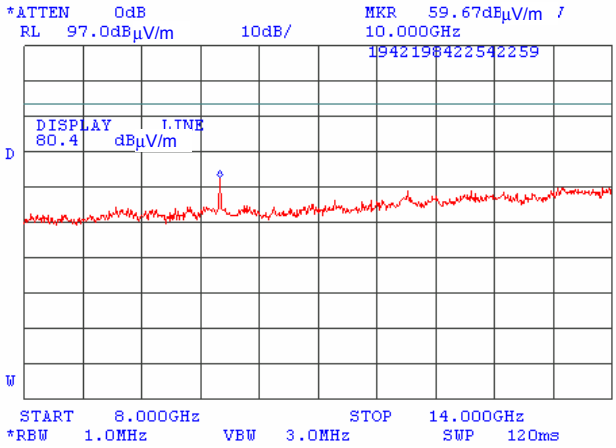
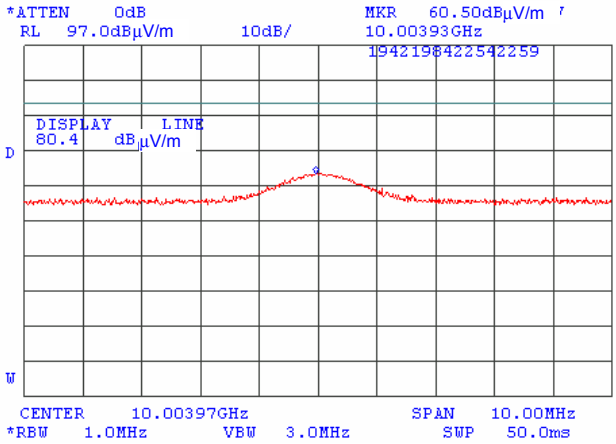
Plot 4.6.34 Radiated emission measurements in 8 – 14 GHz range

EUT:	SPR
TEST SITE:	OATS
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	78.9 dB(µV/m)



Plot 4.6.35 Radiated emission measurements at the 4th harmonic

EUT:	SPR
TEST SITE:	OATS
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Horizontal
TEST DISTANCE:	3 m
Limit	78.9 dB(µV/m)



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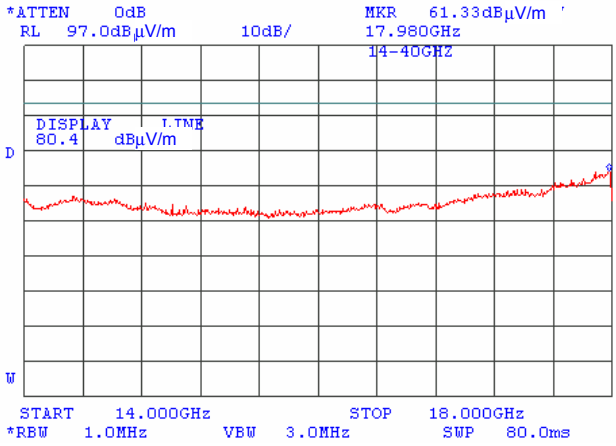
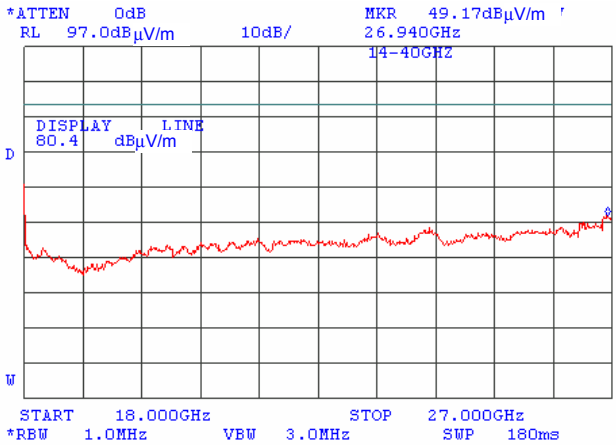
Plot 4.6.36 Radiated emission measurements in 14 – 18 GHz range

EUT:	SPR
TEST SITE:	OATS
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit:	78.9 dB(µV/m)



Plot 4.6.37 Radiated emission measurements in 18 – 27 GHz range

EUT:	SPR
TEST SITE:	OATS
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit:	78.9 dB(µV/m)



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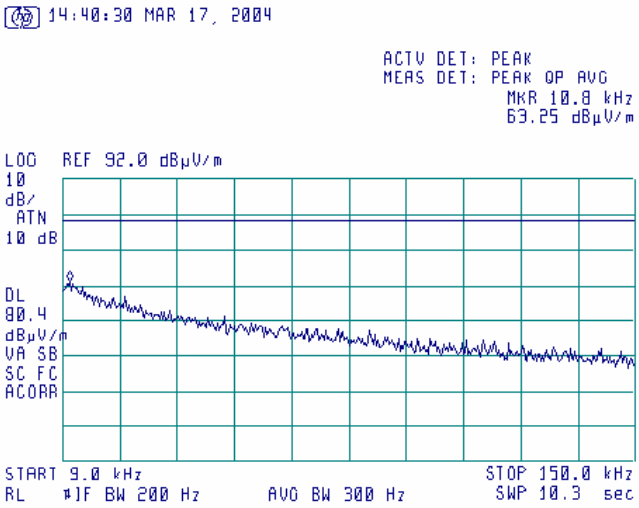
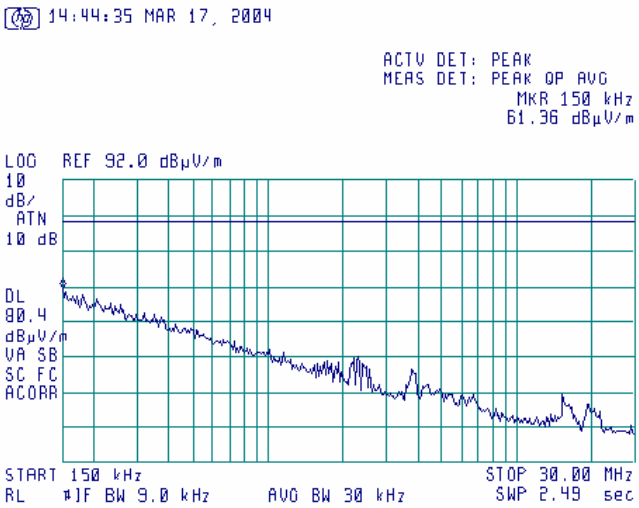
Plot 4.6.38 Radiated emission measurements in 9 - 150 kHz range

EUT:	SPR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	78.9 dB(µV/m)



Plot 4.6.39 Radiated emission measurements in 0.15 - 30 MHz range

EUT:	SPR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	78.9 dB(µV/m)



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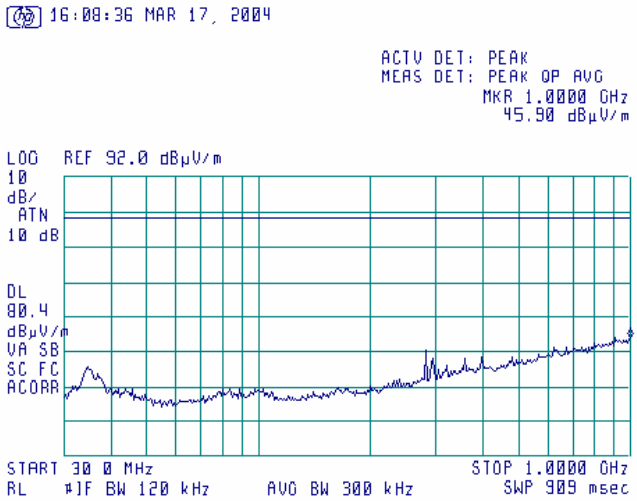
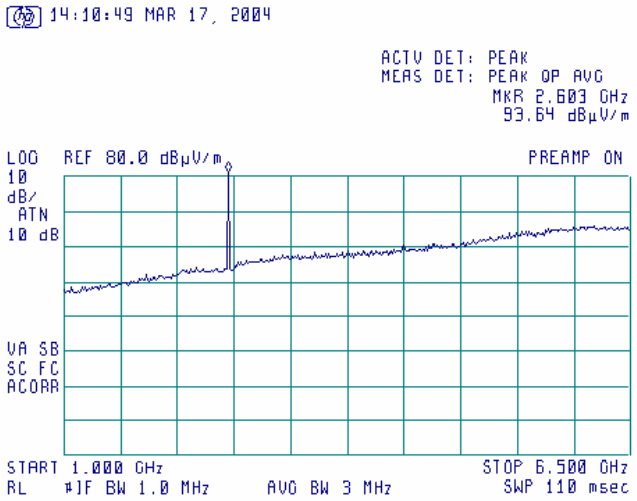
Plot 4.6.40 Radiated emission measurements in 30 - 1000 MHz range

EUT:	SPR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit	78.9 dB(µV/m)



Plot 4.6.41 Radiated emission measurements in 1 – 6.5 GHz range

EUT:	SPR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit	78.9 dB(µV/m)



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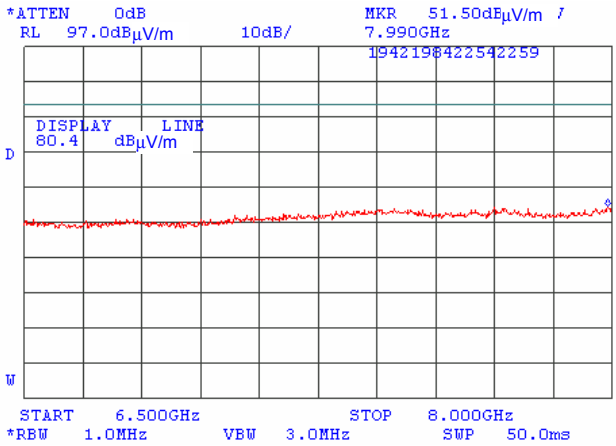
Plot 4.6.42 Radiated emission measurements in 6.5 – 8 GHz range

EUT:	SPR
TEST SITE:	OATS
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	78.9 dB(µV/m)



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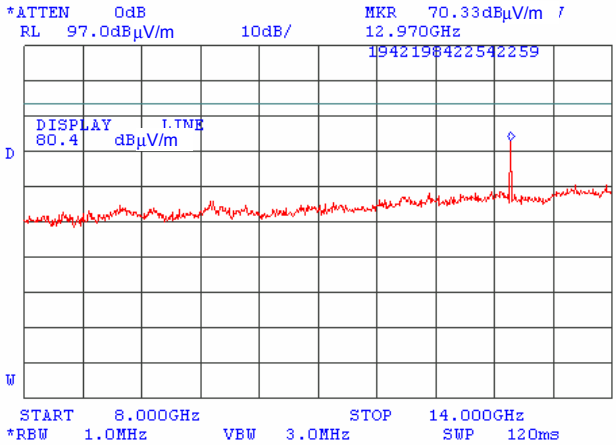
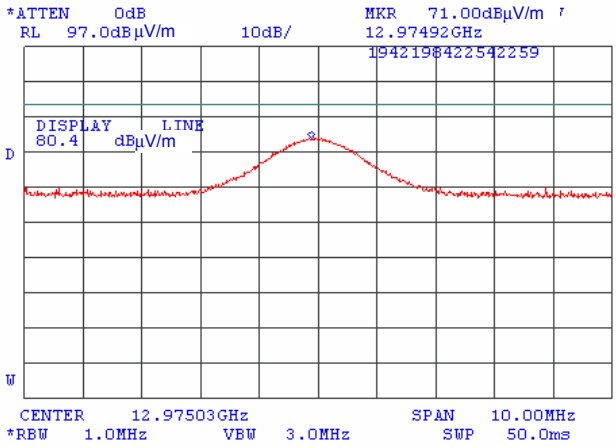
Plot 4.6.43 Radiated emission measurements in 8 – 14 GHz range

EUT:	SPR
TEST SITE:	OATS
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	78.9 dB(µV/m)



Plot 4.6.44 Radiated emission measurements at the 5th harmonic

EUT:	SPR
TEST SITE:	OATS
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Horizontal
TEST DISTANCE:	3 m
Limit	78.9 dB(µV/m)



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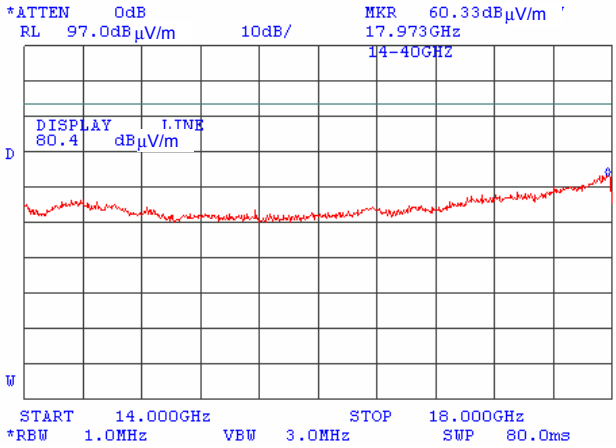
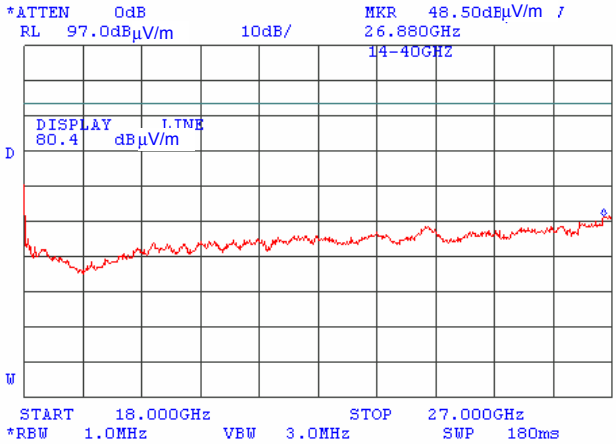
Plot 4.6.45 Radiated emission measurements in 14 – 18 GHz range

EUT:	SPR
TEST SITE:	OATS
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit:	78.9 dB(µV/m)



Plot 4.6.46 Radiated emission measurements in 18 – 27 GHz range

EUT:	SPR
TEST SITE:	OATS
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit:	78.9 dB(µV/m)



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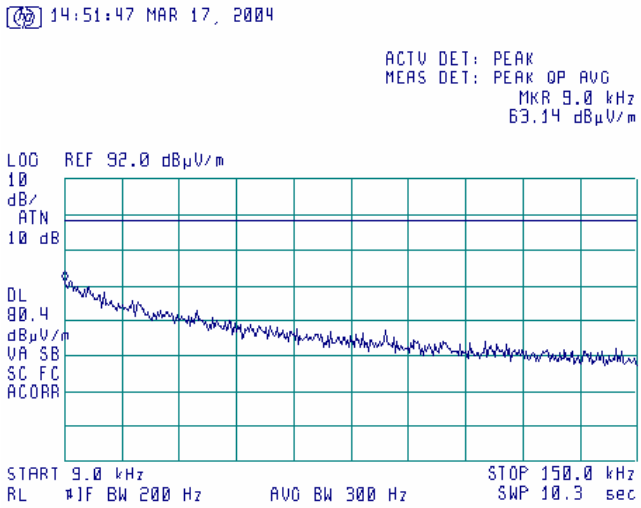
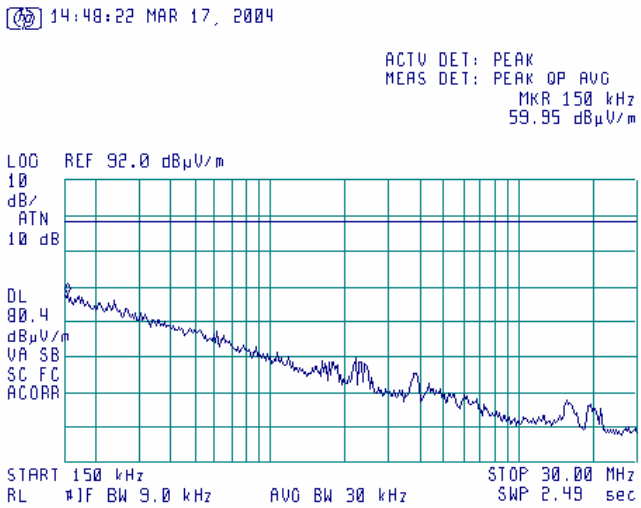
Plot 4.6.47 Radiated emission measurements in 9 - 150 kHz range

EUT:	SPR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	77.9 dB(µV/m)



Plot 4.6.48 Radiated emission measurements in 0.15 - 30 MHz range

EUT:	SPR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	77.9 dB(µV/m)



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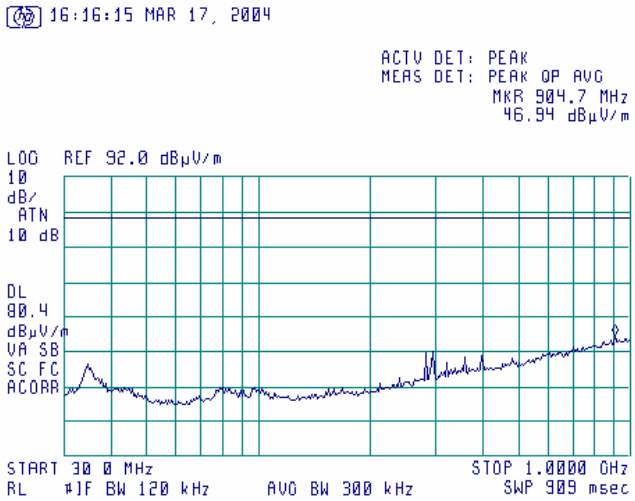
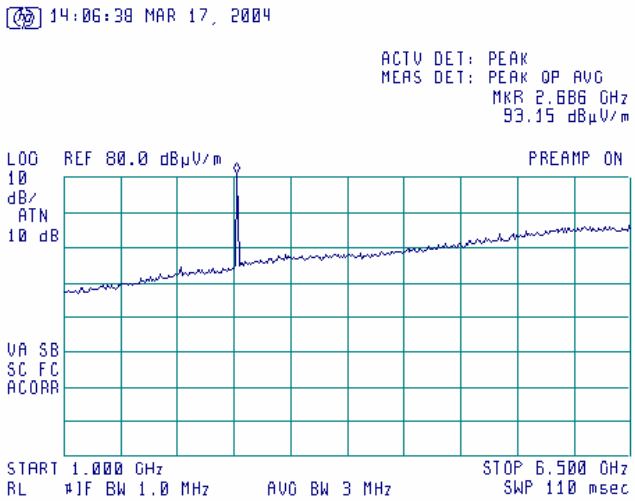
Plot 4.6.49 Radiated emission measurements in 30 - 1000 MHz range

EUT:	SPR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit	77.9 dB(µV/m)



Plot 4.6.50 Radiated emission measurements in 1 – 6.5 GHz range

EUT:	SPR
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit	77.9 dB(µV/m)



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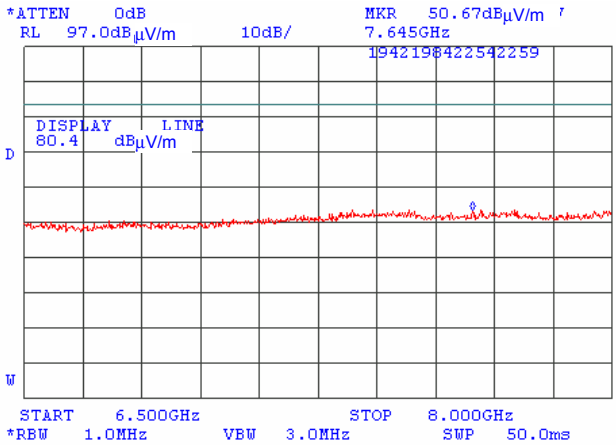
Plot 4.6.51 Radiated emission measurements in 6.5 – 8 GHz range

EUT:	SPR
TEST SITE:	OATS
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	77.9 dB(µV/m)



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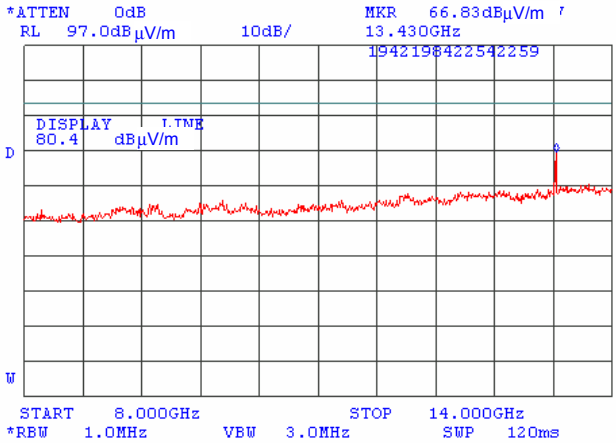
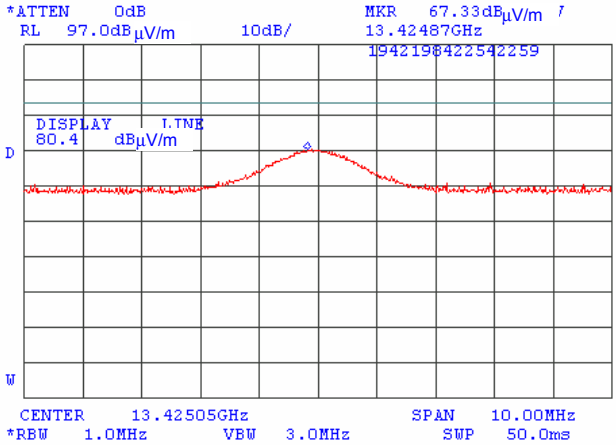
Plot 4.6.52 Radiated emission measurements in 8 – 14 GHz range

EUT:	SPR
TEST SITE:	OATS
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
Limit	77.9 dB(µV/m)



Plot 4.6.53 Radiated emission measurements at the 5th harmonic

EUT:	SPR
TEST SITE:	OATS
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Horizontal
TEST DISTANCE:	3 m
Limit	77.9 dB(µV/m)



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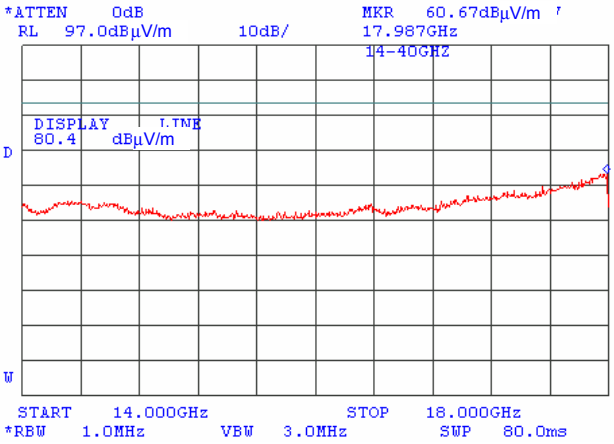
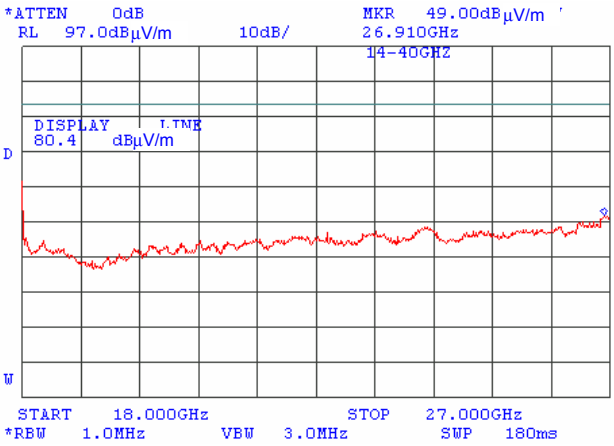
Plot 4.6.54 Radiated emission measurements in 14 – 18 GHz range

EUT:	SPR
TEST SITE:	OATS
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit:	77.9 dB(µV/m)



Plot 4.6.55 Radiated emission measurements in 18 – 27 GHz range

EUT:	SPR
TEST SITE:	OATS
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and horizontal
TEST DISTANCE:	3 m
Limit:	77.9 dB(µV/m)



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4.7 Conducted emissions

4.7.1 General

This test was performed to measure common mode conducted emissions at the power ports. The EUT antenna connector was terminated with 50 Ohm dummy load.
Specification test limits are given in Table 4.7.1. The worst test results (the lowest margins) were recorded in Tables 4.7.2, 4.7.3 and shown in the associated plots.

Table 4.7.1

Limits for conducted emissions

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

The limit decreases linearly with the logarithm of frequency.

4.7.2 Test procedure

4.7.2.1 The EUT was set up as shown in Figure 4.7.1, energized and the performance check was conducted.

4.7.2.2 The measurements were performed at SDA power terminals of BSR unit and at SDA power terminals and PC power terminals of SPR unit with the LISN, connected to a spectrum analyzer in the frequency range referred to in Tables 4.7.2, 4.7.3, 4.7.4. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

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

Figure 4.7.1 Setup for conducted emission measurements, table-top equipment

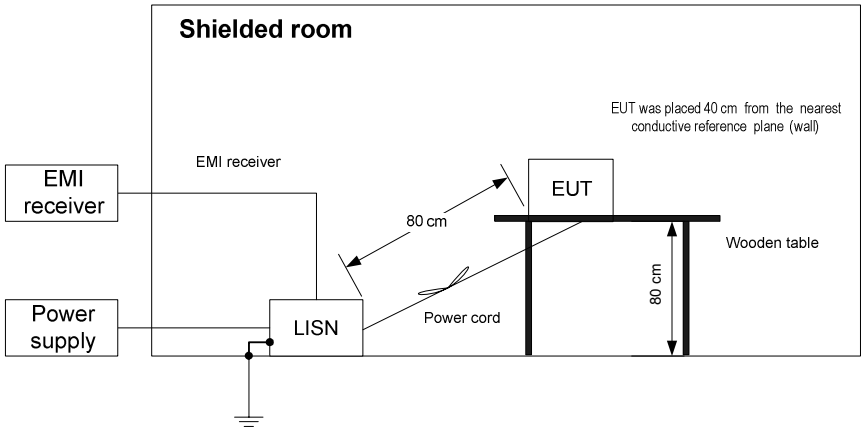

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Table 4.7.2

Conducted emission test results at the BSR power terminal

DATE of TEST:	March 22, 2004
AMBIENT TEMPERATURE:	23°C
RELATIVE HUMIDITY:	34 %
AIR PRESSURE:	1020 hPa
LINE:	AC mains
EUT OPERATING MODE:	Receive
EUT SET UP:	TABLE-TOP
TEST SITE:	SHIELDED ROOM
DETECTORS USED:	PEAK / QUASI-PEAK / AVERAGE
FREQUENCY RANGE:	150 kHz - 30 MHz
RESOLUTION BANDWIDTH:	9 kHz

Frequency, MHz	Peak emission, dB(µV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*	Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*		
0.185950	38.44	36.47	64.25	27.78	34.48	54.25	19.77	L2	Pass
0.231496	38.58	37.08	62.44	25.36	36.88	52.44	15.56	L1	
0.278177	36.83	35.79	60.93	25.14	31.33	50.93	19.60	L1	
0.604375	34.30	32.78	56.00	23.22	29.94	46.00	16.06	L1	
0.652115	34.16	32.69	56.00	23.31	29.10	46.00	16.90	L1	
0.882063	33.66	32.04	56.00	23.96	28.52	46.00	17.48	L1	

*- Margin = Specification limit - measured emission.

Reference numbers of test equipment used

HL 0163	HL 0672	HL 0787	HL 1204	HL 1430	HL 1502	HL 1510	

Full description is given in Appendix A.

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Table 4.7.3

Conducted emission test results at the SPR SDA power terminal

DATE of TEST:	March 22, 2004
AMBIENT TEMPERATURE:	23°C
RELATIVE HUMIDITY:	34 %
AIR PRESSURE:	1020 hPa
LINE:	AC mains
EUT OPERATING MODE:	Receive
EUT SET UP:	TABLE-TOP
TEST SITE:	SHIELDED ROOM
DETECTORS USED:	PEAK / QUASI-PEAK / AVERAGE
FREQUENCY RANGE:	150 kHz - 30 MHz
RESOLUTION BANDWIDTH:	9 kHz

Frequency, MHz	Peak emission, dB(µV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*	Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*		
0.15 - 30	All emissions were found more than 20 dB below the average limit							L2	Pass
0.185950	38.44	36.47	64.25	27.78	34.48	54.25	19.77	L1	Pass
0.235375	38.37	37.02	62.29	25.27	32.84	52.29	19.45		
0.278177	36.83	35.79	60.93	25.14	31.33	50.93	19.60		
0.604375	34.30	32.78	56.00	23.22	29.94	46.00	16.06		
0.652115	34.16	32.69	56.00	23.31	29.10	46.00	16.90		
0.882063	33.66	32.04	56.00	23.96	28.52	46.00	17.48		

*- Margin = Specification limit - measured emission.

Reference numbers of test equipment used

HL 0163	HL 0447	HL 0672	HL 0787	HL 1204	HL 1430	HL 1502	HL 1510

Full description is given in Appendix A.

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Table 4.7.4

Conducted emission test results at the SPR PC power terminal

DATE of TEST:	March 22, 2004
AMBIENT TEMPERATURE:	23°C
RELATIVE HUMIDITY:	34 %
AIR PRESSURE:	1020 hPa
LINE:	AC mains
EUT OPERATING MODE:	Receive
EUT SET UP:	TABLE-TOP
TEST SITE:	SHIELDED ROOM
DETECTORS USED:	PEAK / QUASI-PEAK / AVERAGE
FREQUENCY RANGE:	150 kHz - 30 MHz
RESOLUTION BANDWIDTH:	9 kHz

Frequency, MHz	Peak emission, dB(μV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*	Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*		
0.178856	47.58	45.86	64.59	18.73	42.04	54.59	12.55	L1	Pass
0.421375	39.63	37.52	57.47	19.95	31.56	47.47	15.91		
1.125590	37.85	37.19	56.00	18.81	35.25	46.00	10.75		
1.688910	38.07	37.09	56.00	18.91	35.12	46.00	10.88		
2.392745	38.40	37.32	56.00	18.68	35.45	46.00	10.55		
3.236988	38.15	36.50	56.00	19.50	33.74	46.00	12.26		
0.280625	43.26	41.84	60.86	19.02	39.37	50.86	11.49	L2	Pass

*- Margin = Specification limit - measured emission.

Reference numbers of test equipment used

HL 0163	HL 0447	HL 0672	HL 0787	HL 1204	HL 1430	HL 1502	HL 1510

Full description is given in Appendix A.

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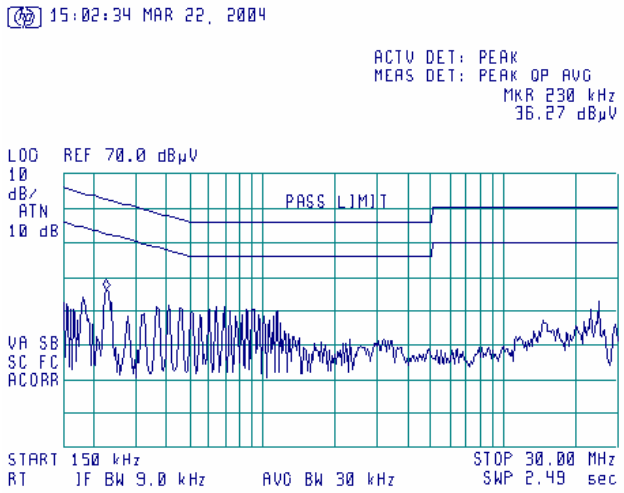
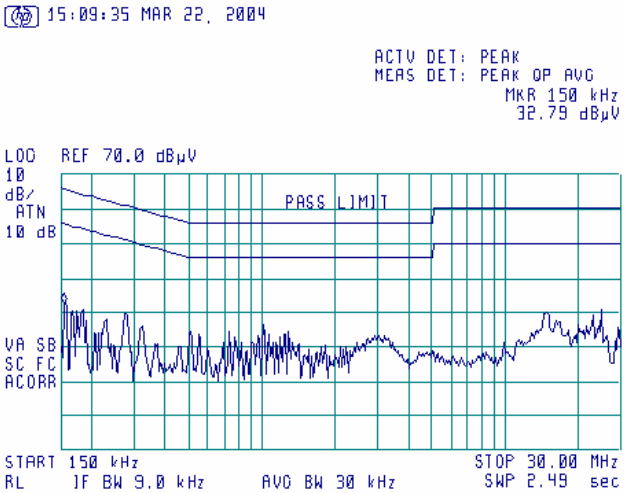
Plot 4.7.1 Conducted emission measurements at the BSR power terminal

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



Plot 4.7.2 Conducted emission measurements at the BSR power terminal

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



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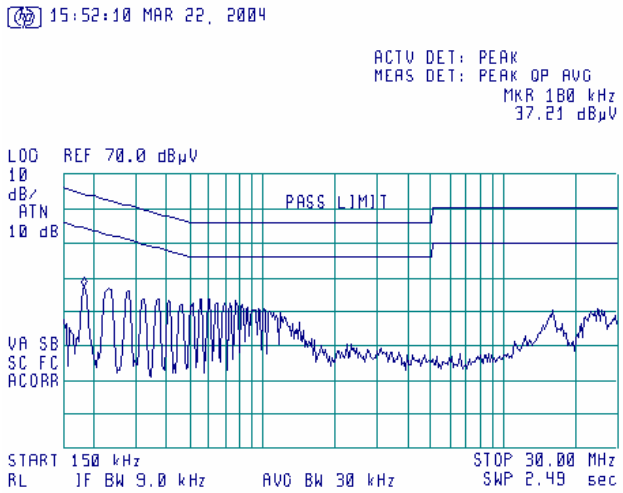
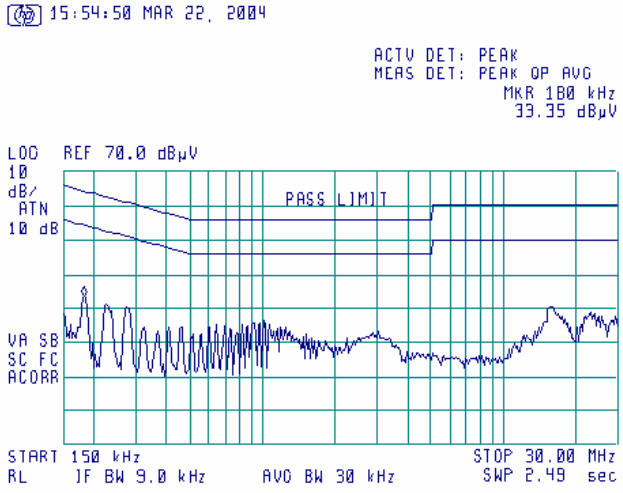
Plot 4.7.3 Conducted emission measurements at the SPR SDA power terminal

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



Plot 4.7.4 Conducted emission measurements at the SPR SDA power terminal

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



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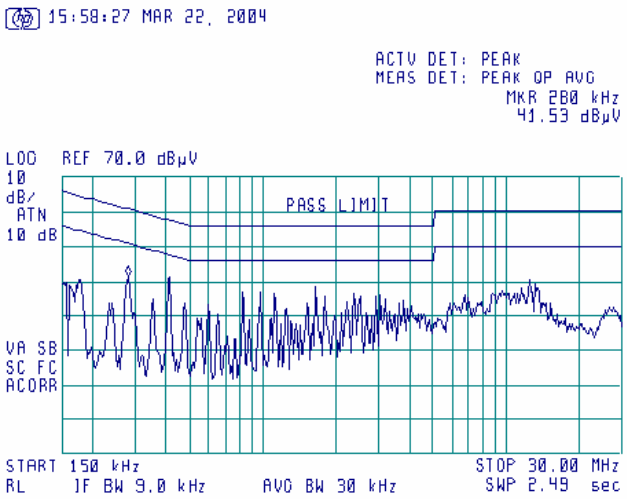
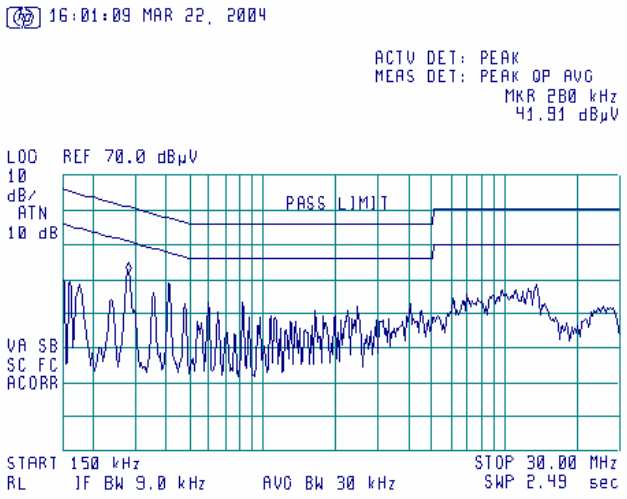
Plot 4.7.5 Conducted emission measurements at the SPR PC power terminal

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



Plot 4.7.6 Conducted emission measurements at the SPR PC power terminal

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



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4.8 Radiated emission measurements

4.8.1 General

This test was performed to measure radiated emissions from the EUT enclosure with antenna connector terminated with 50 Ohm dummy load. Specification test limits are given in Table 4.8.1.

Table 4.8.1

Radiated emission test limits

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

4.8.2 Test procedure for measurements in semi-anechoic chamber

4.8.2.1 The EUT was set up as shown in Figure 4.8.1, energized and the performance check was conducted.

4.8.2.2 The specified frequency range was investigated with biconilog and double ridged waveguide horn antennas connected to EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal and the EUT cables position was varied.

4.8.2.3 The worst test results (the lowest margins) were recorded in Tables 4.8.2, 4.8.3 and shown in the associated plots.

Figure 4.8.1

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

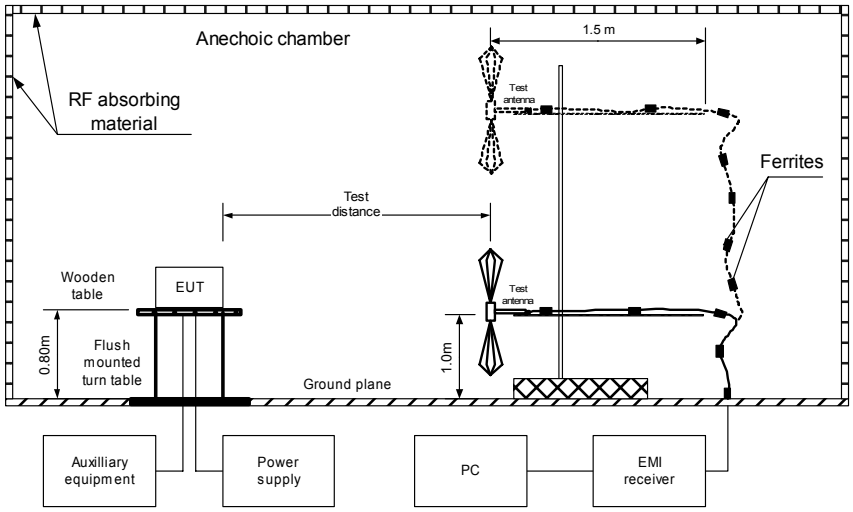

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Table 4.8.2

Radiated emission test results for BSR unit

DATE of TEST:	March 17, 2004
AMBIENT TEMPERATURE:	20°C
RELATIVE HUMIDITY:	41 %
AIR PRESSURE:	1018 hPa
EUT SET UP:	TABLE-TOP
LIMIT:	Class B
EUT OPERATING MODE:	Receive
TEST SITE:	SEMI ANECHOIC CHAMBER
TEST DISTANCE:	3 m

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

Frequency, MHz	Peak emission, dB(µV/m)	Quasi-peak			Turntable position**, degrees	Verdict
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*		
36.124	35.59	31.76	40.00	8.24	59	Pass
125.012	35.54	34.19	43.50	9.31	310	
144.002	38.60	34.73	43.50	8.77	310	
150.012	36.62	34.41	43.50	9.09	329	
288.012	37.06	35.78	46.00	10.22	272	
432.004	40.06	37.91	46.00	8.09	280	

The recorded test results were obtained throughout measurements with biconilog antenna in vertical polarization at 1 m height.

DETECTORS USED:	PEAK / AVERAGE
FREQUENCY RANGE:	1 – 5 GHz
RESOLUTION BANDWIDTH:	1 MHz

Frequency, MHz	Peak emission, dB(µV/m)	Average			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*				
1200.000	46.56	38.50	54.00	15.50	Vertical	1.2	185	Pass

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

Reference numbers of test equipment used

HL 0465	HL 0521	HL 0589	HL 0592	HL 0593	HL 0594	HL 0604	HL 1004
HL 1947	HL 1984	HL 2009					

Full description is given in Appendix A.

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Table 4.8.3

Radiated emission test results for SPR unit

DATE of TEST:	March 18, 2004
AMBIENT TEMPERATURE:	23°C
RELATIVE HUMIDITY:	43 %
AIR PRESSURE:	1016 hPa
EUT SET UP:	TABLE-TOP
LIMIT:	Class B
EUT OPERATING MODE:	Receive
TEST SITE:	SEMI ANECHOIC CHAMBER
TEST DISTANCE:	3 m

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

Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*			
120.004	35.64	32.75	43.50	10.75	Vertical	87	Pass
280.007	43.98	42.72	46.00	3.28	Horizontal	204	
320.010	42.56	40.60	46.00	5.40	Horizontal	211	
360.013	45.49	43.64	46.00	2.36	Horizontal	191	
400.000	45.45	40.60	46.00	5.40	Horizontal	304	
800.100	46.43	41.41	46.00	4.59	Vertical	270	

The recorded test results were obtained throughout measurements with biconilog antenna at 1 m height.

DETECTORS USED:	PEAK / AVERAGE
FREQUENCY RANGE:	1 – 5 GHz
RESOLUTION BANDWIDTH:	1 MHz

Frequency, MHz	Peak emission, dB(μV/m)	Average			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
1440.000	48.49	39.60	54.00	14.40	Vertical	1.0	358	Pass

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

Reference numbers of test equipment used

HL 0465	HL 0521	HL 0589	HL 0592	HL 0593	HL 0594	HL 0604	HL 1004
HL 1947	HL 1984	HL 2009					

Full description is given in Appendix A.

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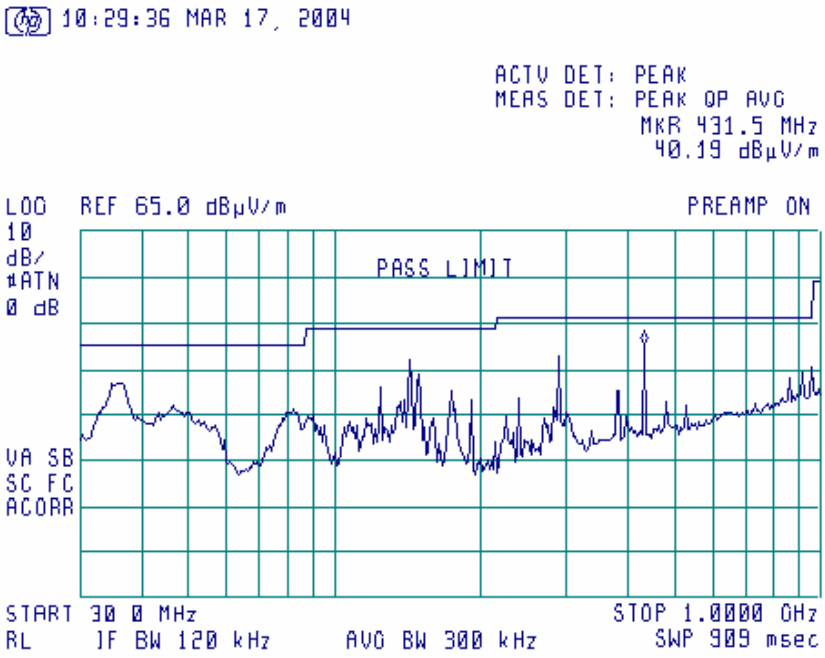
Plot 4.8.1
Radiated emission measurements in 30- 1000 MHz range, vertical & horizontal antenna polarization

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



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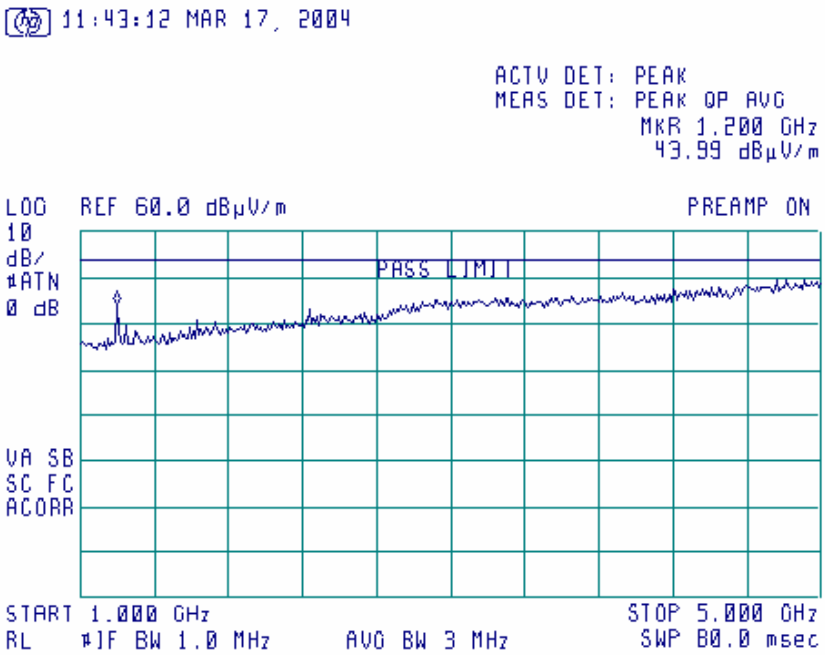
Plot 4.8.2
Radiated emission measurements in 1- 5 GHz range, vertical & horizontal antenna polarization

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



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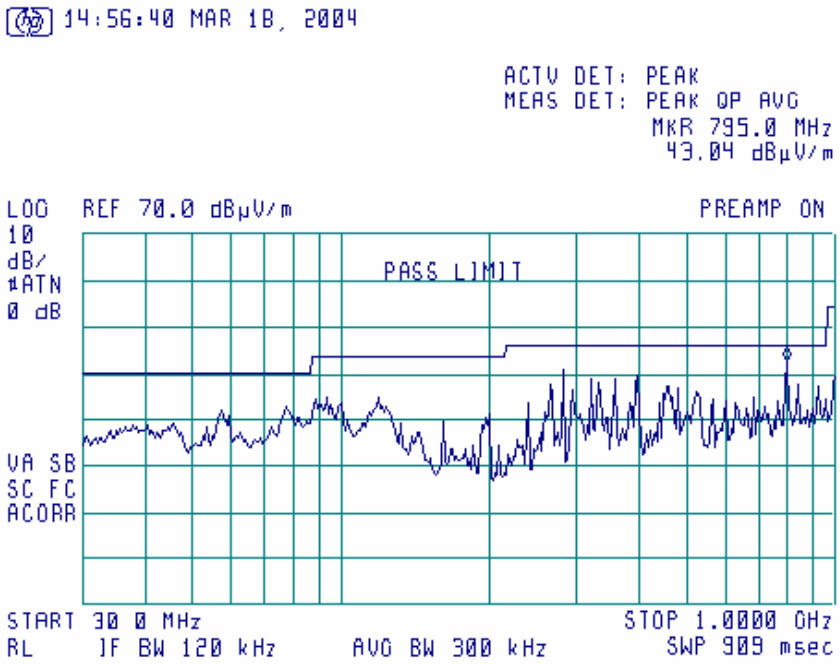
Plot 4.8.3
Radiated emission measurements in 30- 1000 MHz range, vertical & horizontal antenna polarization

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



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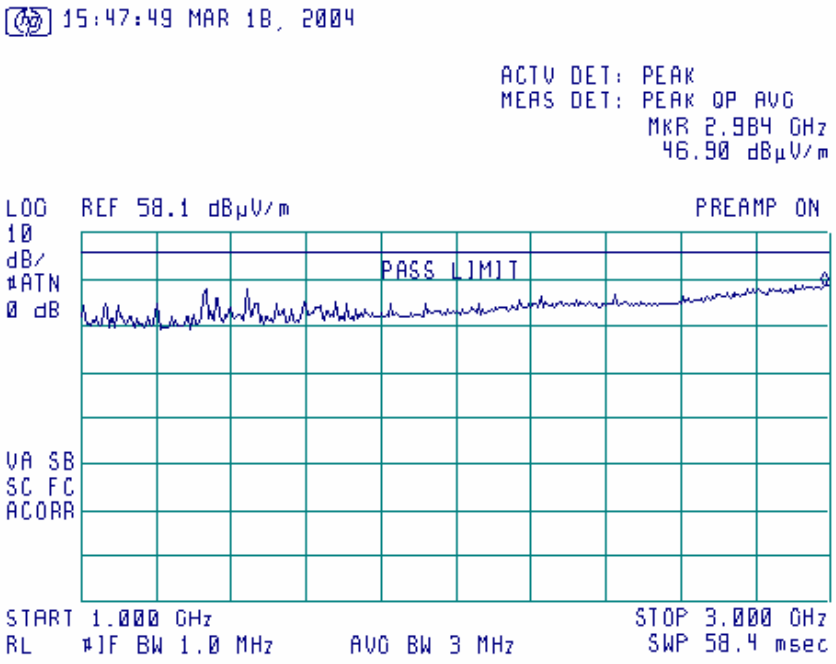
Plot 4.8.4
Radiated emission measurements in 30- 1000 MHz range, vertical & horizontal antenna polarization

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



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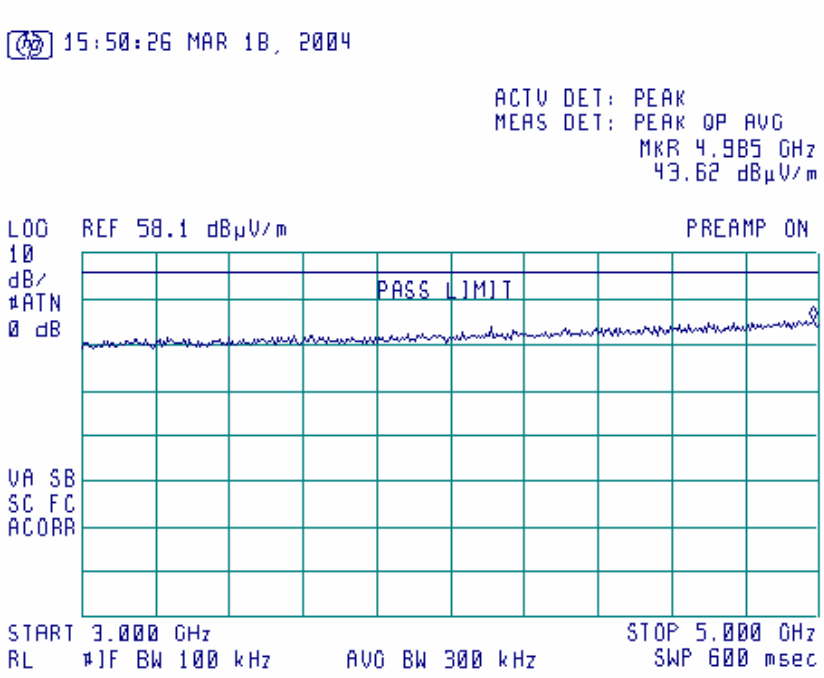
Plot 4.8.5
Radiated emission measurements in 30- 1000 MHz range, vertical & horizontal antenna polarization

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



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APPENDIX A Test equipment used for tests

HL Serial No.	Description	Manufacturer information			Due calibration Month/ year
		Name	Model No.	Serial No.	
0025	Spectrum analyzer, 10 kHz-23 GHz	Anritsu	MS-710C	5837	10/04
0038	Antenna Mast, 1-4 m	Hermon Labs	AM-1	028	2/05 check
0057	Attenuator, 50 Ohm, 2W, 0-18 GHz, 30 dB	Hewlett Packard	8492A	129	3/05
0091	Position controller for antenna mast + turntable, OFTS	Hermon Labs	CRL-2	NA	4/04 check
0163	LISN FCC/VDE/MIL -STD	Electro-Metrics	ANS-25/2	1314	10/04
0287	Turntable, motorized diameter, 2 m	Hermon Labs	TMD-2	042	11/04 check
0446	Active loop antenna 10 kHz-30 MHz	Electro-Mechanics	6502	2857	10/04
0447	LISN, 16/2, 300 V RMS	Hermon Labs	LISN 16-1	0447	11/04
0465	Anechoic chamber 9 (L) x 6.5 (W) x 5.5 (H) m	Hermon Labs	AC-1	023	10/05
0493	Oven temperature	Thermotron	S-1.2 Mini-Max	4016	9/04
0521	Spectrum analyzer with RF filter section (EMI receiver 9 kHz - 6.5 GHz)	Hewlett Packard	8546A	0319	7/04
0589	Cable coaxial, GORE A2POL118.2, 3m	Hermon Labs	GORE-3	589	11/04
0592	Position controller	Hermon Labs	L2-SR3000	100	5/04 check
0593	Antenna mast, 1-4 m/ 1-6 m Pneumatic	Hermon Labs	AM-F1	101	2/05 check
0594	Turntable for anechoic chamber, flush mounted, d=1.2 m, pneumatic	Hermon Labs	WDC1	102	1/05 check
0604	Antenna biconilog log-periodic/T bow-tie, 26 - 2000 MHz	EMCO	3141	9611-1011	1/05
0672	Shielded room 4.6(L) x 4.2(W) x 2.4(H) m	Hermon Labs	SR-3	027	11/04 check
0768	Antenna standard gain horn 18 - 26.5 GHz, WR-42, K-band, gain – 25 dB	Quinstar Technology	QWH-4200-BA	110	7/04 check
0787	Transient limiter	Hewlett Packard	11947A-8ZE	3107A01877	11/04
1004	Cable coaxial, ANDREW PSWJ4, 6 m	Hermon Labs	ANDREW-6	163	12/04
1204	One phase voltage regulator, 2kVA, 0-250V	Hermon Labs	TDGC-2	99	6/04 check
1424	Spectrum analyzer, 30 Hz - 40 GHz	Agilent Technologies	8564EC	3946A00219	8/04
1430	EMI receiver system, 9 kHz - 2.9 GHz	Agilent Technologies	8542E	3807A00262	9/04

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HL Serial No.	Description	Manufacturer information			Due calibration Month/ year
		Name	Model No.	Serial No.	
1481	Cable 1 m	Harbour Industries	MIL 17/60-RG142	1481	9/04
1502	Cable RF, 6 m	Belden	M17/167 MIL-C-17	1502	12/04 check
1510	Cable RF, 8 m	Belden	M17/167 MIL-C-17	1510	12/04 check
1650	Attenuators set (2, 3, 5, 20 dB), DC – 18 GHz	M/A –COM	2082	1650	3/05
1651	Attenuators set (2, 3, 5, 20 dB), DC – 18 GHz	M/A –COM	2082	1651	3/05
1942	Cable 18 GHz, 4 m, blue	Rhophase Microwave Ltd	SPS-1803A-4000-NPS	T4658	10/04
1947	Cable 18 GHz, 6.5 m, blue	Rhophase Microwave Ltd	NPS-1803A-6500-NPS	T4974	10/04
1984	Antenna, double ridged waveguide horn, 1-18 GHz, 300W, N-type	EMC Test Systems	3115	9911-5964	3/05
2009	Cable RF, 8 m	Alpha Wire	RG-214	2009	12/04
2171	Multimeter	Fluke	Fluke 177	79960418	7/04
2254	Cable 40GHz, 0.8 m, blue	Rhophase Microwave Limited	KPS-1503A-800-KPS	W4907	11/04
2259	Amplifier low noise 2-20 GHz	Sophia Wireless	LNA0220-C	0223	11/04
2260	Amplifier Low Noise 14-33 GHz	Sophia Wireless	LNA28-B	0233	11/04
2387	Filter bandpass, 8 – 14 GHz	Hermon Labs	FBP8-14	2387	6/04
2399	Cable 40 GHz, 1.5 m, blue	Rhophase Microwave Ltd.	KPS-1503A-1500-KPS	X2945	6/04
2524	Attenuator, 10 dB, DC-18 GHz	Midwest Microwave	263-10	2524	3/05

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APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization	 Biconilog antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB
Vertical polarization	Double ridged horn antenna: ± 6.0 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 %
Frequency stability	± 168 Hz (0.56 ppm)

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

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APPENDIX C Test facility description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility. Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47) and by Industry Canada for electromagnetic emissions (file numbers IC 2186-1 for OATS and IC 2186-2 for anechoic chamber), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, C-845 for conducted emissions site), assessed by TNO Certification EP&S (Netherlands) for a number of EMC, telecommunications, environmental, safety standards, and by AMTAC (UK) for safety of medical devices. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01).

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Person for contact: Mr. Alex Usoskin, QA manager.

APPENDIX D Specification references

47CFR part 2	Frequency allocations and radio treaty matters; general rules and regulations
47CFR part 21	Domestic public fixed radio services
47CFR part 15 subpart B: 2003	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: 2001	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

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APPENDIX E Abbreviations and acronyms

A	ampere
AC	alternating current
AVRG	average (detector)
BB	broadband
BSR	base station radio unit
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
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
kHz	kilohertz
LISN	line impedance stabilization network
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μs	microsecond
NA	not applicable
NB	narrowband
OATS	open area test site
Ω	Ohm
ppm	part per million (10^{-6})
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
SDA	subscriber data adapter
SPR	subscriber premises radio unit
T	temperature
TDD	time division duplex
Tx	transmit
V	volt
VA	volt-ampere
WB	wideband

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APPENDIX F Test equipment correction factors

Antenna factor
Active loop antenna
Model 6502, S/N 2857, HL 0446

Frequency, MHz	Magnetic antenna factor, dB	Electric antenna factor, dB
0.009	-32.8	18.7
0.010	-33.8	17.7
0.020	-38.3	13.2
0.050	-41.1	10.4
0.075	-41.3	10.2
0.100	-41.6	9.9
0.150	-41.7	9.8
0.250	-41.6	9.9
0.500	-41.8	9.8
0.750	-41.9	9.7
1.000	-41.4	10.1
2.000	-41.5	10.0
3.000	-41.4	10.2
4.000	-41.4	10.1
5.000	-41.5	10.1
10.000	-41.9	9.6
15.000	-41.9	9.6
20.000	-42.2	9.3
25.000	-42.8	8.7
30.000	-44.0	7.5

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

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Antenna factor
Biconilog antenna EMCO, model 3141,
serial number1011

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

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

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Antenna factor
Double-ridged wave guide horn antenna
Model 3115, S/N 9911-5964, HL1984

Frequency, MHz	Antenna factor, dB(1/m)
1000.0	24.7
1500.0	25.7
2000.0	27.6
2500.0	28.9
3000.0	31.2
3500.0	32.0
4000.0	32.5
4500.0	32.7
5000.0	33.6
5500.0	35.1
6000.0	35.4
6500.0	34.9
7000.0	36.1
7500.0	37.8
8000.0	38.0
8500.0	38.1
9000.0	39.1
9500.0	38.3
10000.0	38.6
10500.0	38.2
11000.0	38.7
11500.0	39.5
12000.0	40.0
12500.0	40.4
13000.0	40.5
13500.0	41.1
14000.0	41.6
14500.0	41.7
15000.0	38.7
15500.0	38.2
16000.0	38.8
16500.0	40.5
17000.0	42.5
17500.0	45.9
18000.0	49.4

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

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Correction factor
Line impedance stabilization network
Model ANS-25/2
Electro-Metrics

Frequency, MHz	Correction factor, dB
0.01	4.7
0.02	2.1
0.03	1.1
0.04	0.7
0.05	0.5
0.1	0.2
0.2	0.1
0.4	0.1
0.6	0.1
0.8	0.1
1	0.1
2	0.1
3	0.1
4	0.1
6	0.1
10	0.1
12	0.1
16	0.1
18	0.1
20	0.1
25	0.1
28	0.1
30	0.1

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

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

Frequency, MHz	Correction factor, dB
0.01	5.0
0.02	2.2
0.03	1.1
0.04	0.7
0.05	0.5
0.1	0.2
0.2	0.1
0.4	0.1
0.6	0.1
0.8	0.1
1	0.1
2	0.1
3	0.1
4	0.1
6	0.2
10	0.3
12	0.4
16	0.5
18	0.6
20	0.7
25	0.9
28	1.2
30	1.3

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

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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		

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Cable loss
Cable MIL 17/60-RG142, HL 1481

Frequency, GHz	Cable loss, dB
2	1
2.2	1.1
2.4	1.1
2.6	1.2
2.8	1.2
3	1.2
3.2	1.3
3.4	1.3
3.6	1.5
3.8	1.5
4	1.6
4.2	1.7
4.4	1.8
4.6	1.9
4.8	2
5	2
5.2	2
5.4	2.1
5.6	2.1
5.8	2.2
6	2.2
6.2	2.2
6.4	2.3
6.6	2.3
6.8	2.3
7	2.4
7.2	2.4
7.4	2.5
7.6	2.5
7.8	2.6
8	2.7
8.2	2.8
8.4	3.1
8.6	3.3
8.8	3.5
9	4

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

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

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

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

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Cable loss
Cable 18 GHz, 4 m, blue, model: SPS-1803A-4000-NPS, serial number T4658, HL 1942

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

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

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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

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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		

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Cable loss
Cable 40 GHz, 0.8 m, blue, model: KPS-1503A-800-KPS, serial number W4907 (HL 2254)

Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB
0.03	0.04	5.10	0.80	15.00	1.49
0.05	0.07	5.30	0.83	15.50	1.49
0.10	0.09	5.50	0.83	16.00	1.46
0.20	0.15	5.70	0.84	16.50	1.47
0.30	0.19	5.90	0.87	17.00	1.50
0.40	0.25	6.10	0.86	17.50	1.57
0.50	0.29	6.30	0.89	18.00	1.63
0.60	0.33	6.50	0.90	18.50	1.57
0.70	0.37	6.70	0.89	19.00	1.63
0.80	0.41	6.90	0.93	19.50	1.65
0.90	0.44	7.10	0.92	20.00	1.64
1.00	0.45	7.30	0.95	20.50	1.75
1.10	0.48	7.50	0.96	21.00	1.72
1.20	0.51	7.70	0.97	21.50	1.78
1.30	0.53	7.90	1.01	22.00	1.76
1.40	0.54	8.10	1.00	22.50	1.72
1.50	0.57	8.30	1.05	23.00	1.83
1.60	0.59	8.50	1.04	23.50	1.80
1.70	0.04	8.70	1.07	24.00	1.90
1.80	0.07	8.90	1.11	24.50	1.81
1.90	0.09	9.10	1.09	25.00	1.98
2.00	0.15	9.30	1.14	25.50	1.91
2.10	0.19	9.50	1.12	26.00	2.02
2.20	0.25	9.70	1.15	26.50	1.92
2.30	0.29	9.90	1.16	27.00	1.97
2.40	0.33	10.10	1.16	28.00	2.02
2.50	0.37	10.30	1.19	29.00	1.95
2.60	0.41	10.50	1.14	30.00	1.94
2.70	0.44	10.70	1.19	31.00	2.11
2.80	0.45	10.90	1.17	32.00	2.17
2.90	0.48	11.10	1.13	33.00	2.27
3.10	0.61	11.30	1.20	34.00	2.27
3.30	0.64	11.50	1.13	35.00	2.29
3.50	0.65	11.70	1.20	36.00	2.35
3.70	0.68	11.90	1.18	37.00	2.37
3.90	0.69	12.10	1.14	38.00	2.40
4.10	0.71	12.40	1.19	39.00	2.57
4.30	0.73	13.00	1.34	40.00	2.36
4.50	0.75	13.50	1.33		
4.70	0.77	14.00	1.48		
4.90	0.79	14.50	1.45		

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

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