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Electrical

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ELECTROMAGNETIC EMISSIONS TEST REPORT
SECTION 1

according to 47CFR Part 15, subpart C and subpart B
for

Radwin Ltd.

EQUIPMENT UNDER TEST:

Wireless point-to-point multiplexer
Model: WinLink 582

Document ID: RADEMC_FCC.15489-1.doc
Date of Issue: May 03

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1 Project information

Description of equipment under test

Test items	: Wireless point-to-point multiplexer, comprising outdoor radio terminal and indoor radio terminal connection box
Manufacturer	: Radwin Ltd.
Types (Models)	: WinLink 582
Serial number	: outdoor radio terminal – TAT58000032 indoor radio terminal connection box – RTCBE100117
Hardware version:	: 01

Applicant information

Applicant's responsible person	: Mr. Ron Kapon, CTO
Company	: Radwin Ltd.
Address	: 34, Habarzel street
Postal code	: 69710
City	: Tel Aviv
Country	: Israel
Telephone number	:+972-3645 5577
Telefax number	:+972-3765 7535

Test performance

Project Number:	: 15489
Location	: Hermon Laboratories
Receipt date	: April 2, 2003
Test started	: April 2, 2003
Test completed	: May 22, 2003
Purpose of test	: Apparatus compliance verification in accordance with emission requirements
Test specification(s)	47CFR Part 15, §15.247, §15.207, §15.107, §15.109

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2 Summary of tests

The tests listed in the table below were performed. The EUT was found complying with the limits of 47CFR Part 15, §15.247 and subpart B.

Parameter	Subclause	C	NC	NT	NA	Tested by	Date tested	Remarks
Transmitter characteristics, §15.247								
Direct sequence systems								
Minimum 6 dB bandwidth	a(2)	**C**				Mrs. E. Pitt, test engineer	April 6, 2003	
Maximum peak output power	b(1)	**C**				Mrs. E. Pitt, test engineer	April 6, 2003	
Exposure compliance requirements	b(4)	**C**						Refer to this test report §4.3.
Spurious emissions (conducted)	c	**C**				Mr. Y. Neuman, Mrs. E. Pitt, test engineers	April 6, 10, 2003	
Spurious emissions (radiated)	c				NA			
Spurious emissions (radiated) in restricted bands	15.209, 15.205 (a, c)	**C**				Mrs. E. Pitt, test engineer	April 14, 2003	
Peak power spectral density	d	**C**				Mrs. E. Pitt, test engineer	April 6, 2003	
Unintentional radiation								
Conducted emissions	15.107, 15.207	**C**				Mr. B. Efros, test engineer	May 22, 2003	
Radiated emissions	15.109	**C**				Mrs. E. Pitt, test engineer	April 2, 2003	

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General conditions under Part 15							
Examined frequencies:		15.31(m)	**C**				
Near the top	5840 MHz						
Near the middle	5790 MHz						
Near the bottom	5730 MHz						
The intentional radiator has permanently attached antenna or antenna that uses a unique coupling to the intentional radiator.		15.203				**NA**	
The intentional radiator has a standard connector and must be professionally installed. To demonstrate that professional installation is required, the following three points must be addressed: (a) the application (or intended use) of the EUT; (b) the installation requirements of the EUT, and (c) the method by which the EUT will be marketed.		15.203	**C**				Standard connector is used, professional installation provided
No antenna other than that furnished by the responsible party can be used with the device.		15.203	**C**				
Antenna technical characteristics, as referred to in "Transmitter description" table in the test report		15.204					
NOTE: C: The parameter is compliant with the requirements. NC: The parameter is not compliant with the requirements. NT: The parameter is not tested. NA: The test of this parameter is not applicable.							

Test report prepared by: Mrs. M. Cherniavsky, certification engineer

Test report approved by: Dr. E. Usoskin, CEO

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3 EUT description

3.1 General description

The EUT, WinLink-582, is a point-to-point multiplexer which employs time division duplex (TDD) transmission. It operates in 5.730 – 5.840 GHz which aggregates E1/T1 and IP traffic over 2.6 Mbps full duplex rate wireless link (5.2 Mbps aggregate rate in both directions), extending data/voice transmission for up to 16 km (10 miles). The device uses direct sequence spread spectrum technology combined with powerful forward error correction to ensure high reliability, supports the UNII 5.740 – 5.810 GHz band*. The WinLink-582 consisting of an outdoor radio terminal (RT) and an indoor radio terminal connection box (RTCB) is powered from mains via AC/DC adapter.
* Measurement test results are brought in test report RADEMC_FCC.15489-2 (section 2).

3.2 EUT test configuration

The EUT ports and lines description is given in Table 3.2.1, the support/test equipment description - in Table 3.2.2, operating frequencies generated by clocks and oscillators are provided in Table 3.2.3 and test configuration - in Figure 3.2.1.
Throughout the testing a shield of the cable between RTCB and RT was not connected to RTCB chassis.

3.2.1 Changes made in the EUT

To withstand the standard requirements the following changes were made in the EUT:
1) local oscillator signal level was reduced by 9 dB;
2) a ferrite-bead P/N 0443164151, manufactured by Fair-Rite, with 3 turns, was installed at the RTCB power input.

Table 3.2.1 EUT ports and lines

Port type	Port description	Connector type	Quantity	Cable type description	Cable length, m	Connected
Power	48 V DC	Terminal block	1	unshielded	0.2	From indoor unit to adapter
Power	AC	Non-detachable	1	unshielded	1	From adapter to mains
Signal (RTCB)	signal	D-type, 25 pin	1	shielded	15	From indoor unit to outdoor unit
Signal (RT)	signal	KRONE	1	Same as above	Same as above	Same as above
Signal	E1/T1 trunk	RJ-45	1	shielded	15	From indoor unit to BER meter
Signal	ethernet	RJ-45	1	UTP	15	From indoor unit to laptop

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Table 3.2.2 EUT support/test equipment

Description	Manufacturer	Model number	Serial number
Laptop	IBM	Think Pad	55692A4
BER meter	TTC	Interceptor 132A	1034141
Indoor radio terminal connection box	Radwin	RTCB	E100113
Outdoor radio terminal	Radwin	RT5800	TAT58000024

Table 3.2.3 EUT operating frequencies

Frequency, MHz	Description
10.00	Clock in digital card
15.357	Clock in digital card
25.00	Clock in digital card
61.44	Clock in digital card
125.00	Clock in digital card
5730	CH1 output frequency
5740	CH2 output frequency
5750	CH3 output frequency
5760	CH4 output frequency
5770	CH5 output frequency
5780	CH6 output frequency
5790	CH7 output frequency
5800	CH8 output frequency
5810	CH9 output frequency
5820	CH10 output frequency
5830	CH11 output frequency
5840	CH12 output frequency

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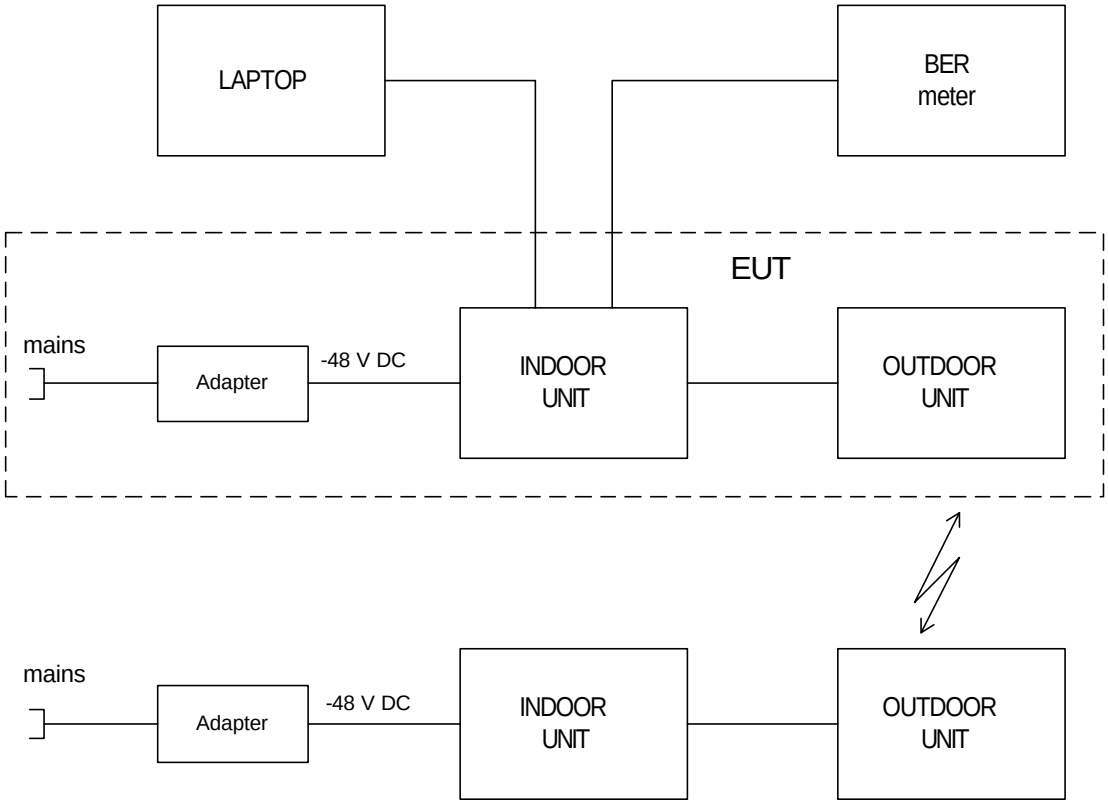
Figure 3.2.1 EUT test configuration



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3.3 EUT technical characteristics

Type of equipment					
X	Stand-alone (Equipment with or without its own control provisions)				
	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)				
	Plug-in card (Equipment intended for a variety of host systems)				
Operating frequency range	5730 - 5840 MHz				
Spread spectrum technique used					
	Frequency hopping (FHSS)				
X	Direct sequence (DSSS)				
	Combined				
Spread spectrum parameters					
X	chip sequence length (bits)	12 kbit			
	spectrum width (MHz)	10			
Transmitter aggregate data rate (bits per second)	5.2 Mbps				
Normal test signal					
Maximum rated output power					
At transmitter permanent external 50 Ω rf output connector (dBm)	+16 dBm (for DSSS)				
Is transmitter output power variable?	X	No			
		Yes		continuous variable	
				stepped variable	
				stepsize :....	
				minimum RF power	
				maximum RF power	
Transmitter power source					
	Battery	**Nominal rated voltage (VDC)**			
	Lithium				
	Other				
X	**DC**	**Nominal rated voltage**	48 V DC		
	AC mains	**Nominal rated voltage (VAC)**			
Is there common power source for transmitter and receiver			X	yes	no

Antenna technical characteristics

	Type	Manufacturer	Model number	Gain, dBi
Integral with temporary RF connector	Flat panel	MTI	MT-485024/C/A	20
Integral with temporary RF connector	Flat panel	MARS	MA-WA58-2X	20

External antenna connection NA

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4 Test results

4.1 Occupied bandwidth for DSSS systems according to § 15.247(a) (2)

METHOD OF MEASUREMENTS	FCC Docket No.96-8; FCC 97-114
DATE:	April 6, 2003
RELATIVE HUMIDITY:	50 %
AMBIENT TEMPERATURE:	22°C
AIR PRESSURE:	1011 hPa
OPERATING FREQUENCY RANGE:	5730 – 5840 GHz
MODULATION TECHNIQUE:	DSSS
BIT RATE:	5.2 Mbps
MEASUREMENT UNCERTAINTY:	±1085 Hz

Carrier frequency, MHz	Measured 6 dB bandwidth, MHz	Reference to Plot in Appendix A
5730	7.15	A1
5790	7.05	A2
5840	7.13	A3

LIMIT

Operating frequency range, MHz	Minimum allowed bandwidth
5725 - 5850	≥ 500 kHz @ 6 dBc

TEST PROCEDURE

The EUT RF output was connected to the spectrum analyzer through 40 dB attenuator (plus 1.4 dB cable loss), the settings are shown in the plots. Spectrum analyzer readings were corrected for external attenuation and cable loss. The measurements were performed in normal (transmitting) mode of operation for carrier (channel) frequency at low and high edges and at the middle of the 5.730 – 5.840 GHz frequency range.

TEST EQUIPMENT USED:

HL 1424	HL 1650	HL 1651	HL 1940			

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4.2 Maximum peak output power test according to §15.247 (b)(3)

METHOD OF MEASUREMENTS	FCC Docket No.96-8; FCC 97-114
DATE:	April 6, 2003
RELATIVE HUMIDITY:	50 %
AMBIENT TEMPERATURE:	22°C
AIR PRESSURE:	1011 hPa
OPERATING FREQUENCY RANGE:	5730 – 5840 GHz
MODULATION TECHNIQUE:	DSSS
BIT RATE:	5.2 Mbps
MEASUREMENT UNCERTAINTY:	±3.5 dB

Carrier frequency, MHz	Peak output power, dBm	Limit, dBm	Margin, dB	Reference to Plots in Appendix A
5730	15.7	30	14.3	A4
5790	15.9		14.1	A5
5840	15.5		14.5	A6

LIMIT

Operating frequency range, MHz	Maximum peak output power*, W
5725 - 5850	1

* Systems operating in the 5725 - 5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power

TEST PROCEDURE

The EUT RF output was connected to the spectrum analyzer through 40 dB attenuator (plus 1.4 dB cable loss), the settings are shown in the plots. Spectrum analyzer readings were corrected for external attenuation and cable loss. The measurements were performed in normal (transmitting) mode of operation for carrier (channel) frequency at low and high edges and at the middle of the 5.730 – 5.840 GHz frequency range.

TEST EQUIPMENT USED:

HL 1424	HL 1650	HL 1651	HL 1940			

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4.3 Exposure limit according to §15.247(b)(5) and §1.1310

Limit for power density for general population/uncontrolled exposure is 1 mW/cm^2 (for 1500 –100,000 MHz frequency range).

The power density **$P\ (mW/cm^2) = P_T / 4\pi r^2$**

P_{T1} is the transmitted power, which is equal to the full transmitter output power 15.9 dBm plus maximum antenna gain 20 dBi, the maximum equivalent isotropically radiated power EIRP is

$$P_{T1} = 15.9\ dBm + 20\ dBi = 35.9\ dBm = 3890\ mW.$$

The minimum safe distance "r", where RF exposure does not exceed FCC permissible limit, is 17.6 cm.

$$r1 = \sqrt{(P_{T1} / (P \times 4\pi))} = \sqrt{(3890 / 12.56)} = 17.6\ cm$$

Conclusion: The public cannot be exposed to dangerous RF level.

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4.4 Out of band conducted emissions test according to §15.247(c)

METHOD OF MEASUREMENTS	ANSI 63.4 §13.1.5
DATE:	April 6, 2003
RELATIVE HUMIDITY:	50 %
AMBIENT TEMPERATURE:	22°C
AIR PRESSURE:	1011 hPa
OPERATING FREQUENCY RANGE:	5730 – 5840 GHz
MODULATION TECHNIQUE	DSSS
BIT RATE:	5.2 Mbps
FREQUENCY RANGE*	9 kHz - 40 GHz
MEASUREMENT UNCERTAINTY:	±4.5 dB

* The frequency spectrum was investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to 40 GHz.
All emissions were found below the specified limit. For test results refer to Plots A10 – A49.

Frequency, MHz	Carrier frequency, MHz	Resolution bandwidth, kHz	Spurious emission level, dB(mV)	Spurious calculated limit, dB(mV)	Margin, dB	Reference to Plots in Appendix A
5725	5730	100	88.83	94.17	5.34	A10, A17
24172	5840	100	72.50	90.83	18.33	A36, A47
25583	5840	100	73.33	90.83	17.5	A48
37400	5840	100	77.67	90.83	13.16	A49

LIMIT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

TEST PROCEDURE
The EUT RF output was connected to the spectrum analyzer, the settings are shown in the plots. Spectrum analyzer readings were corrected for external attenuation and cable loss. The measurements were performed in normal (transmitting) mode of operation for carrier (channel) frequency at low and high edges and at the middle of the 5.730 – 5.840 GHz frequency range.

TEST EQUIPMENT USED:

HL 0025	HL 1299	HL 1424	HL 1650	HL 1651	HL 1874	HL 1940
HL 2254						

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4.5 Radiated emissions which fall in restricted bands test according to §15.247(c) and § 15.205, §15.209(a)

METHOD OF MEASUREMENTS	ANSI 63.4 §13.1.4
DATE:	April 10, 2003
RELATIVE HUMIDITY:	42 %
AMBIENT TEMPERATURE:	25°C
AIR PRESSURE:	1016 hPa
OPERATING FREQUENCY RANGE:	5730 – 5840 GHz
MODULATION TECHNIQUE	DSSS
BIT RATE:	5.2 Mbps
FREQUENCY RANGE*	9 kHz - 40 GHz
MEASUREMENT UNCERTAINTY:	± 4.5 dB

* The frequency spectrum was investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency. All emissions were found below the specified limit. For test results refer to Plots A50 – A100.

LIMIT

Radiated emissions, which fall in the restricted bands, must comply with §15.209(a) limits.

Quasi-peak detector

Frequency, MHz	Antenna type	Antenna height, m	Turntable position, °	Radiated emissions, dB (µV/m)	Limit, dB (µV/m)	Margin, dB	Reference to Plots in Appendix A
37.82	Biconilog	1.0	278	31.9	40.00	8.10	A85
38.11	Biconilog	1.0	278	32.5	40.00	7.50	A85
73.25	Biconilog	1.0	86	35.1	40.00	4.90	A86
73.33	Biconilog	1.0	0	35.85	40.00	4.15	A53
73.74	Biconilog	1.0	0	35.77	40.00	4.23	A69
124.40	Biconical	1.0	189	29.74	43.50	13.76	A56
127.89	Biconical	1.0	0	34.60	43.50	8.90	A87
131.05	Biconical	1.0	0	31.72	43.50	11.78	A87
137.75	Biconical	1.0	0	37.78	43.50	5.72	A87
249.00	Log-periodic	1.2	254	23.68	46.00	22.32	A56
400.0	Log-periodic	1.0	218	34.63	46.00	11.37	A56
1000.00	Log-periodic	1.5	272	44.57	54.00	9.43	A56

The recorded test results were obtained through measurements with antennas in vertical polarization**.**
Turntable position: 0^{o} = EUT front panel faces the receiving antenna

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Peak detector

Frequency, MHz	Radiated emissions, dB (μV/m)	Limit, dB (μV/m)	Margin, dB	Reference to Plots in Appendix A
2365	49.2	74	24.8	A58, retested at OATS
4729.8	49.8	74	24.2	A59, retested at OATS
4790.0	48.7	74	25.3	A76, retested at OATS
4840.0	46.9	74	27.1	A93, retested at OATS
9460	49.80	74	24.2	A60

Average detector

Frequency, MHz	Radiated emissions, dB (μV/m)	Limit, dB (μV/m)	Margin, dB	Reference to Plots in Appendix A
2365	49.2	54	4.8	A58, retested at OATS
4729.8	49.8	54	4.2	A59, retested at OATS
4790.0	48.7	54	5.3	A76, retested at OATS
4840.0	46.9	54	7.1	A93, retested at OATS
9460	37.80	54	16.2	A60

The recorded test results were obtained through measurements with double ridged guide antenna in vertical polarization**.**

Table abbreviations:
Margin = dB below (negative if above) specification limit.
Turntable position: 0^o = EUT front panel faces the receiving antenna

TEST PROCEDURE

The test was performed with transmitter operating at 3 carrier frequencies F_{min} = 5730 MHz, F_{cent} = 5790 MHz, F_{max} = 5840 MHz. The measurements were performed at 3 m test distance from 9 kHz to 40 GHz. The EUT was placed on a wooden 80 cm height turntable.

9 kHz – 30 MHz frequency range. The loop antenna was positioned with its plane horizontal. The loop center was 1 meter above the ground plane. To find maximum radiation the turntable was rotated 360°. Then the loop position was changed to vertical. To find maximum radiation the turntable was rotated 360° and the measuring antenna was rotated about its vertical axis. Plots A50, A67, A84 in Appendix A refer to vertical antenna polarization as the worst case.

30 MHz – 40 GHz frequency range. To find maximum radiation the turntable was rotated 360^o, measuring antenna height was changed from 1 to 4 m, and the antennas polarization was changed from vertical to horizontal.

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TEST EQUIPMENT USED AT OATS:

HL 0025	HL 0038	HL 0091	HL 0142	HL 0275	HL 0287	HL 0410
HL 0763	HL 0769	HL 0770	HL 1200	HL 1295	HL 1424	HL 1940
HL 1989	HL 2117	HL 2258	HL 2259	HL 2260	HL 2261	

TEST EQUIPMENT USED IN ANECHOIC CHAMBER:

HL 0032	HL 0041	HL 0569	HL 1424	HL 1425	HL 1430	HL 1553
HL 1566	HL 1567	HL 1842	HL 1864	HL 1942	HL 2109	HL 2259
HL 2260	HL 2273					

TEST EQUIPMENT USED IN SEMI-ANECHOIC CHAMBER:

HL 0446	HL 0465	HL 0521	HL 0589	HL 0604	HL 1003	HL 1004
HL 2009						

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4.6 Peak power spectral density of DSSS according to § 15.247(d)

METHOD OF MEASUREMENTS	FCC Docket No.96-8; FCC 97-114
DATE:	April 6, 2003
RELATIVE HUMIDITY:	50 %
AMBIENT TEMPERATURE:	22°C
AIR PRESSURE:	1011 hPa
OPERATING FREQUENCY RANGE:	5730 – 5840 GHz
MODULATION TECHNIQUE	DSSS
BIT RATE:	5.2 Mbps
LIMIT FOR PEAK POWER SPECTRAL DENSITY	8 dBm
MEASUREMENT UNCERTAINTY:	± 3.5 dB

Carrier frequency, MHz	Measured peak power spectral density, dBm/3 kHz	Reference to Plots in Appendix A
5730	-8.67	A7(a), (b)
5790	-8.83	A8(a), (b)
5840	-9.50	A9(a), (b)

LIMIT

The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

TEST PROCEDURE

The EUT RF output was connected to the spectrum analyzer through 40 dB attenuator (plus 1.4 dB cable loss), the settings are shown in the plots. Spectrum analyzer readings were corrected for external attenuation and cable loss. The measurements were performed in normal (transmitting) mode of operation for carrier (channel) frequency at low and high edges and at the middle of the 5.740 – 5.810 GHz frequency range by method #1 for peak power spectral density.

TEST EQUIPMENT USED:

HL 1424	HL 1650	HL 1651	HL 1940			

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4.7 Unintentional radiated emissions test according to §15.109

METHOD OF MEASUREMENT:	ANSI 63.4 §11.6 / ANSI 63.4 §12.1.4
DATE	April 2, 2003
TEST PERFROMED AT:	OATS
AMBIENT TEMPERATURE:	22°C
RELATIVE HUMIDITY	50%
AIR PRESSURE:	1015 hPa
DISTANCE BETWEEN ANTENNA AND EUT:	10 m
THE EUT WAS TESTED AS:	Table-top
FREQUECNY RANGE:	30 MHz – 2 GHz
DETECTOR TYPE:	Quasi-peak
RESOLUTION BANDWIDTH:	120 kHz
MEASUREMENT UNCERTAINTY:	± 6 dB max

Frequency, MHz	Antenna polarization	Antenna height, m	Turntable position, (°)	Radiated emissions, dB (mV/m)	Limit, dB (mV/m)	Margin, dB	Pass/ Fail
42.35	Vertical	1.1	272	33.8	39	5.2	Pass
50.10	Vertical	1.2	137	35.8	39	3.2	Pass
51.20	Vertical	1.2	137	37.8	39	1.2	Pass
400.00	Horizontal	1.8	351	31.9	46.5	14.6	Pass
500.00	Horizontal	1.6	354	33.1	46.5	13.4	Pass
1000.00	Horizontal	1.0	218	42.9	49.5	6.6	Pass

The test results recorded in the table were obtained throughout measurements with a biconilog antenna.

Table abbreviations:
Turntable position: 0^{o} = EUT front panel faces the receiving antenna

LIMIT (§ 15.109)

Frequency, MHz	Class A equipment @ 10 m dB(mV/m)
30 - 88	39
88 - 216	43.5
216 - 960	46.5
960 - 5000	49.5

TEST EQUIPMENT USED:

HL 0038	HL 0041	HL 0091	HL 0287	HL 0784	HL 0813	HL 1430
HL 1552	HL 1827	HL 1848	HL 1947			

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4.8 Conducted emissions test according to §15.207, 15.107

METHOD OF MEASUREMENTS	ANSI 63.4 §13.1.3
DATE:	May 22, 2003
RELATIVE HUMIDITY:	46 %
AMBIENT TEMPERATURE:	25 °C
AIR PRESSURE:	1018 hPa
THE EUT WAS TESTED AS:	TABLE-TOP
DETECTOR USED:	QUASI-PEAK
FREQUECNY RANGE:	150 kHz – 30 MHz
RESOLUTION BANDWIDTH:	9 kHz
MEASUREMENT UNCERTAINTY, dB	± 3.9 dB in 9 – 150 kHz ± 3.8 dB in 150 kHz – 30 MHz

Quasi-peak detector

Frequency, MHz	Line identification	Measured emissions, dB (mV)	Specification QP limit, dB (mV)	Margin, dB	Pass/ Fail	Reference to Plots in Appendix A
0.150107	Ph	47.14	65.99	18.85	Pass	A103
0.451870	Ph	41.30	56.90	15.60	Pass	A103
0.904025	Ph	41.66	56.00	14.34	Pass	A103
1.052197	N	42.94	56.00	13.06	Pass	A104
1.054831	Ph	43.04	56.00	12.96	Pass	A103
1.202191	N	42.23	56.00	13.77	Pass	A104
1.205074	Ph	42.81	56.00	13.19	Pass	A103
1.878332	N	43.23	56.00	12.77	Pass	A104
2.029057	N	43.04	56.00	12.96	Pass	A104
2.105036	N	43.80	56.00	12.20	Pass	A104
2.257958	Ph	43.81	56.00	12.19	Pass	A103
3.008317	N	43.43	56.00	12.57	Pass	A104

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Average detector

Frequency, MHz	Line identification	Measured emissions, dB (mV)	Specification AVRG limit, dB (mV)	Margin, dB	Pass/ Fail	Reference to Plots in Appendix A
0.150107	Ph	40.37	55.99	15.62	Pass	A109
0.451870	Ph	39.11	46.90	7.79	Pass	A109
0.904025	Ph	38.30	46.00	7.70	Pass	A109
1.052197	N	41.46	46.00	4.54	Pass	A110
1.054831	Ph	40.06	46.00	5.94	Pass	A109
1.202191	N	38.76	46.00	7.24	Pass	A110
1.205074	Ph	40.12	46.00	5.88	Pass	A109
1.878332	N	39.86	46.00	6.14	Pass	A110
2.029057	N	39.05	46.00	6.95	Pass	A110
2.105036	N	40.39	46.00	5.61	Pass	A110
2.257958	Ph	40.23	46.00	5.77	Pass	A109
3.008317	N	40.09	46.00	5.91	Pass	A110

LIMIT

Frequency, MHz	Class B equipment, dB(mV)	
	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5	56	46
5 - 30	60	50

*The limit decreases linearly with the logarithm of frequency.

TEST PROCEDURE

The measurements were performed at mains terminals by means of LISN, connected to spectrum analyzer in the frequency range as referred to in the table above. The unused coaxial connector of the LISN was terminated with 50 Ω.
The measurements were made with quasi-peak and average detectors as referred to in the tables.
The position of the EUT cables was varied to determine maximum emission level.

TEST EQUIPMENT USED:

HL 0163	HL 0787	HL 1430	HL 1502	HL 1510		

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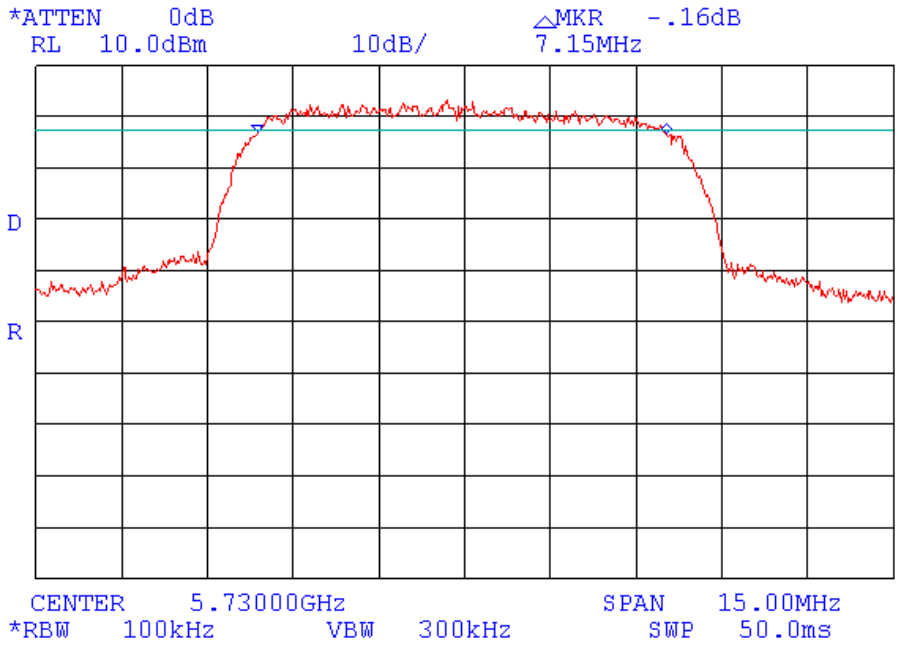
Appendix A Plots

Plot A 1

6 dB bandwidth @ 5.730 GHz

EUT:	WinLink 582
Limit:	>500 kHz
Detector:	Peak
Test Method:	measurement at antenna connector



External attenuator 40 dB
Cable loss 1.4 dB

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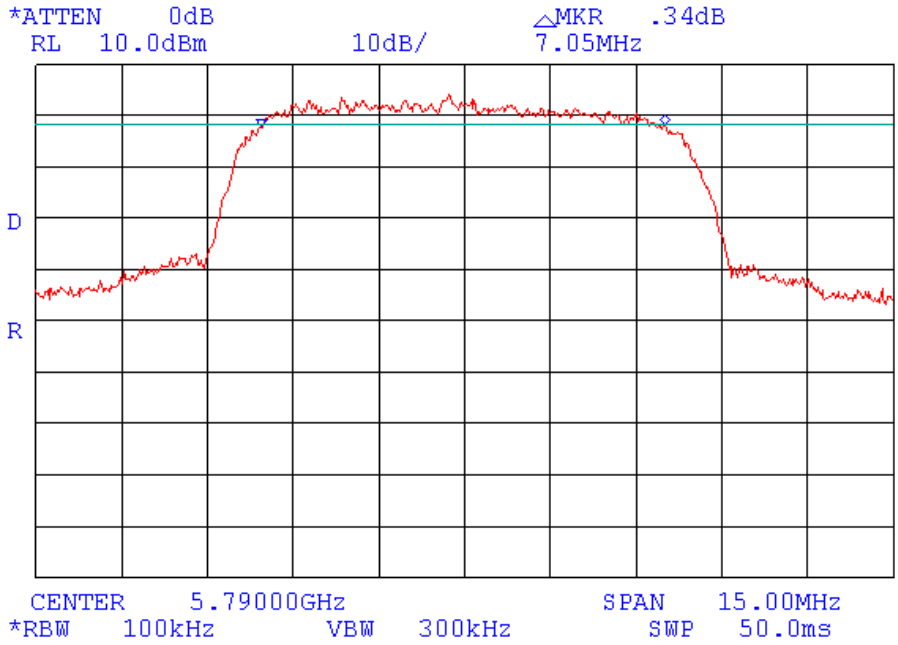
Plot A 2

6 dB bandwidth @ 5.790 GHz

EUT:	WinLink 582
Limit:	>500 kHz
Detector:	Peak
Test Method:	measurement at antenna connector



External attenuator 40 dB
Cable loss 1.4 dB

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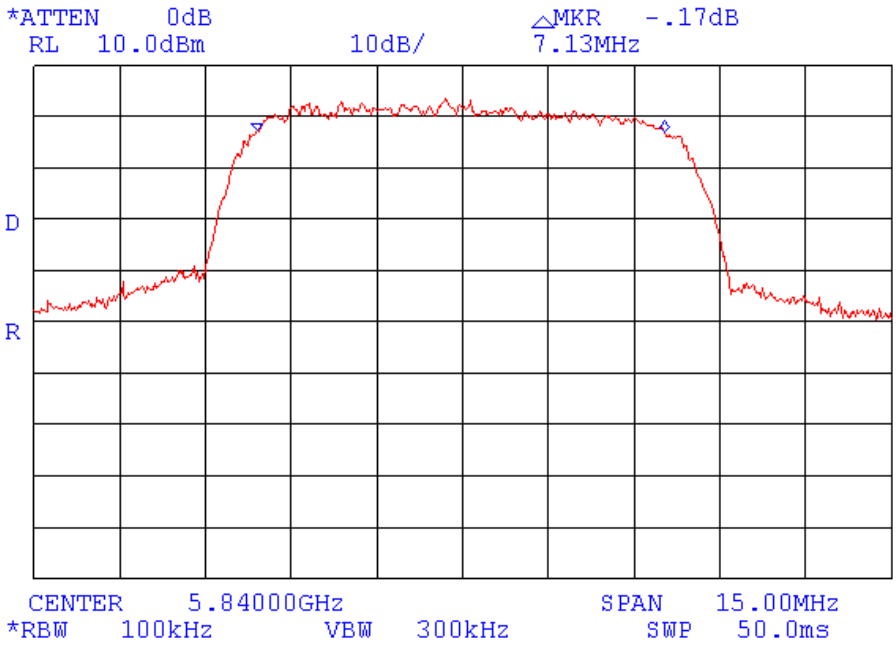
Plot A 3

6 dB bandwidth @ 5.840 GHz

EUT:	WinLink 582
Limit:	>500 kHz
Detector:	Peak
Test Method:	measurement at antenna connector



External attenuator 40 dB
Cable loss 1.4 dB

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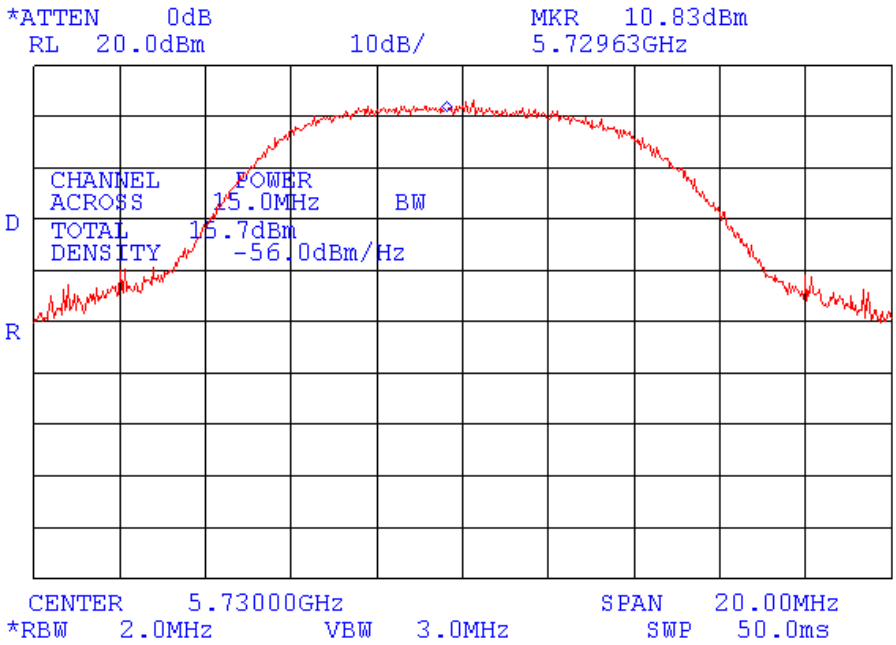
Plot A 4

Peak output power measurements@ 5.730 GHz

EUT: WinLink 582
Detector: Peak
Test Method: measurement at antenna connector



P_{out}=15.7 dBm

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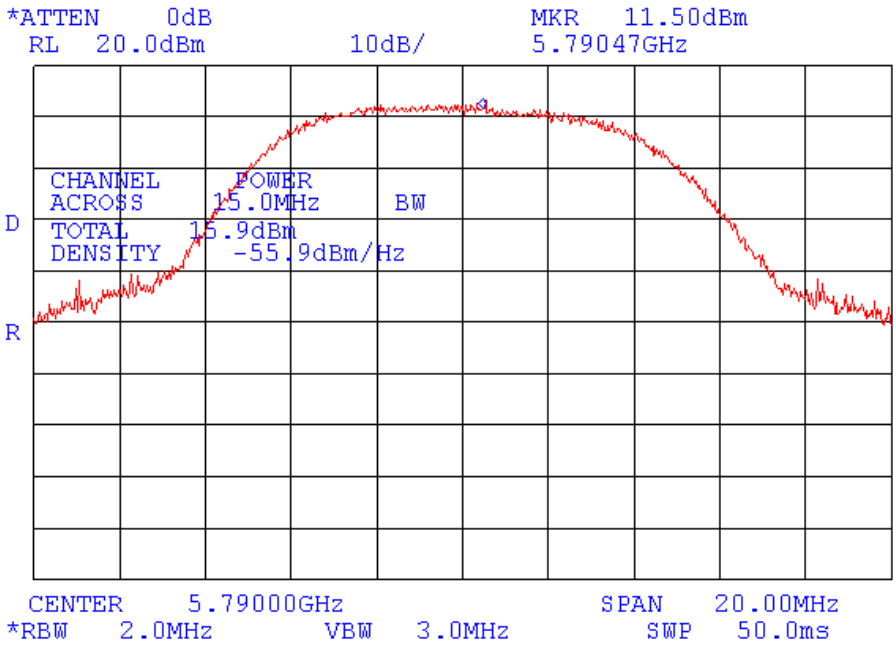
Plot A 5

Peak output power measurements@ 5.790 GHz

EUT: WinLink 582
Detector: Peak
Test Method: measurement at antenna connector



P_{out}=15.9 dBm

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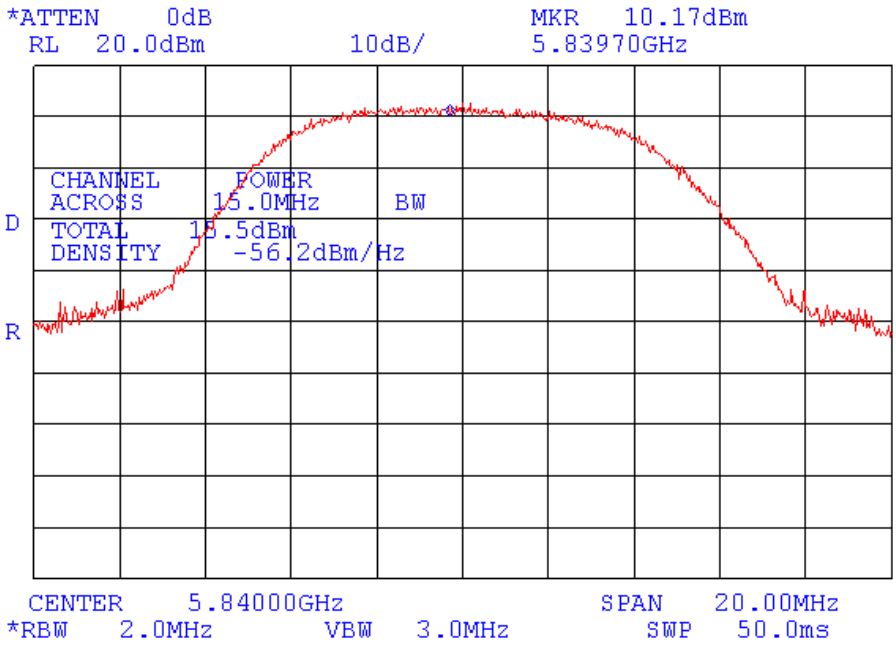
Plot A 6

Peak output power measurements@ 5.840 GHz

EUT: WinLink 582
Detector: Peak
Test Method: measurement at antenna connector



P_{out}=15.5 dBm

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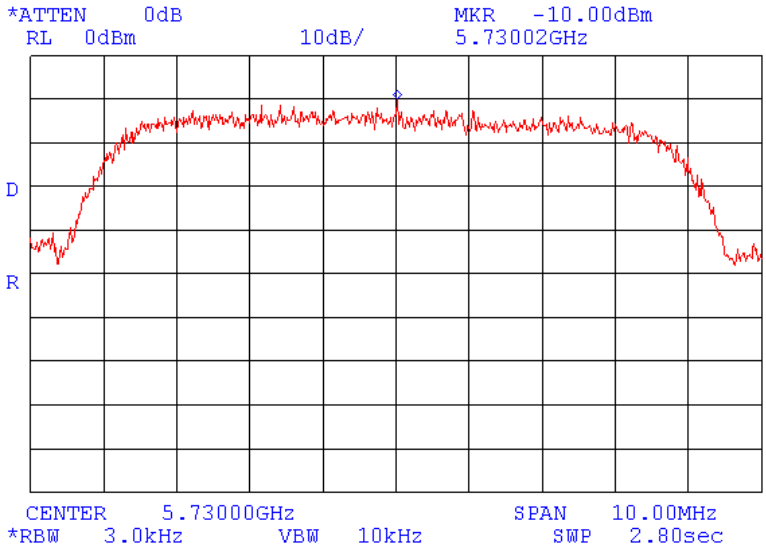
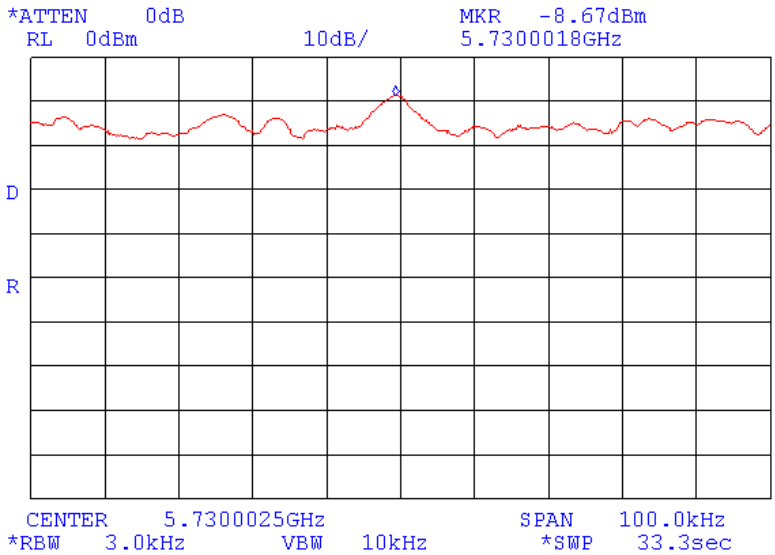
Plot A 7

Peak power spectral density measurements @ 5.730 GHz

a)



b)



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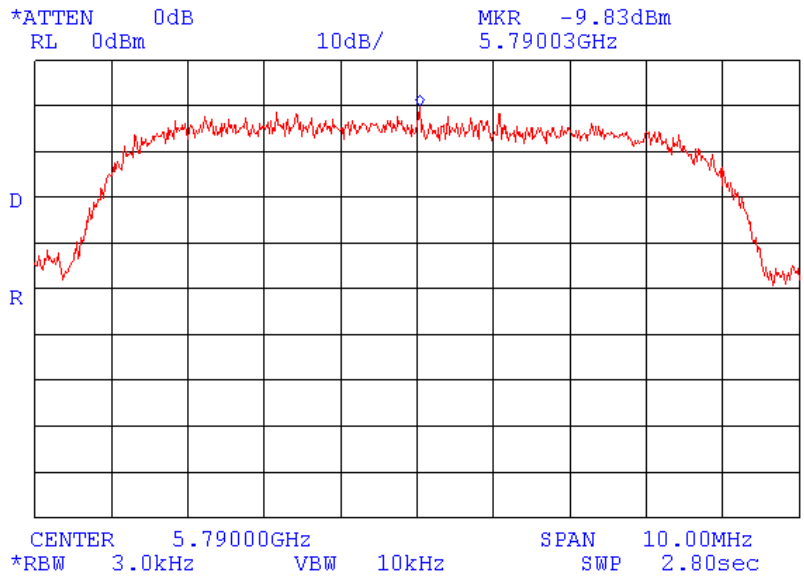
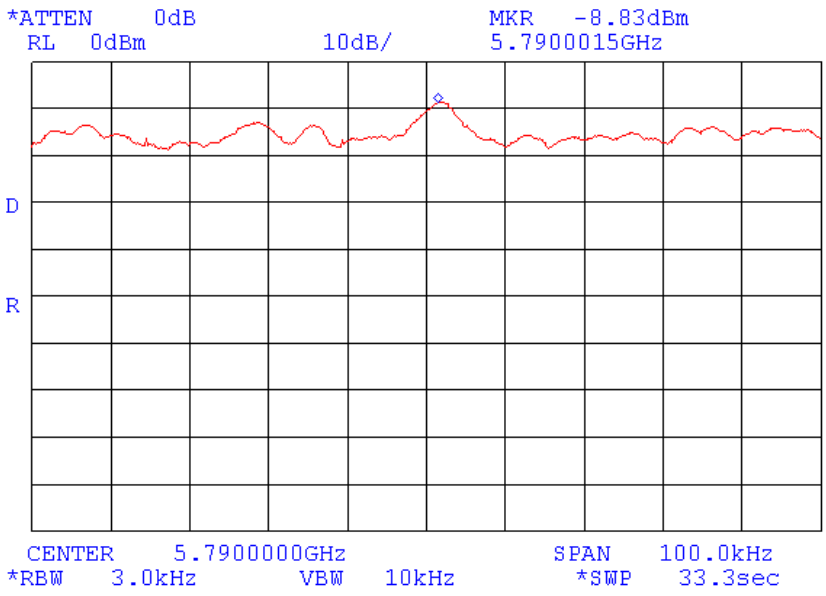
Plot A 8

Peak power spectral density measurements @ 5.790 GHz

a)



b)



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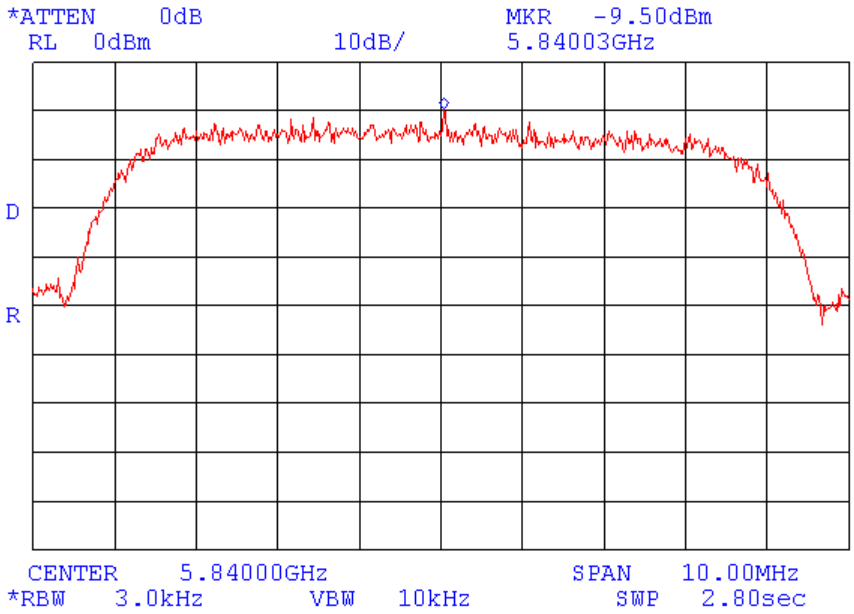
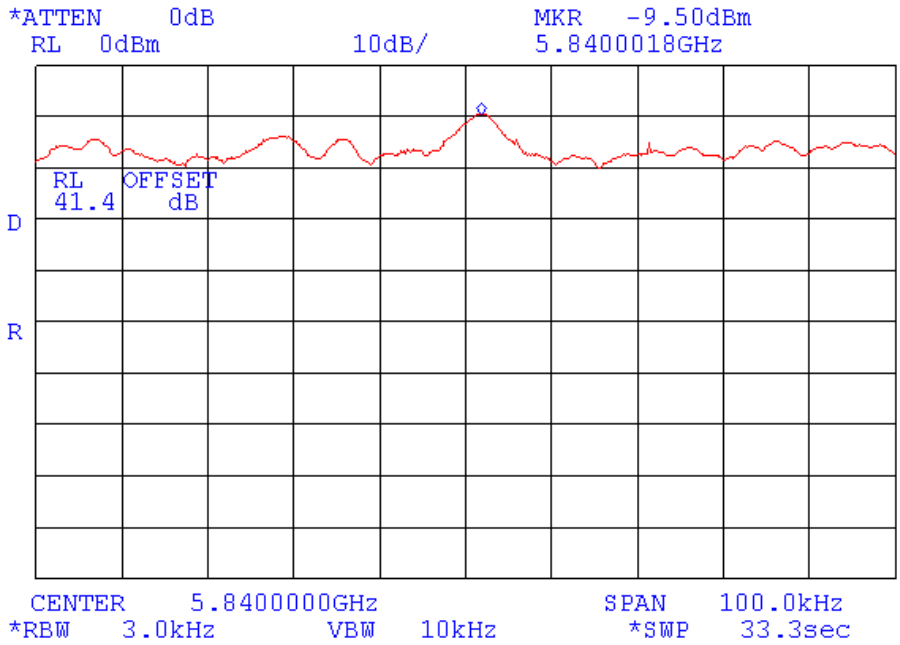
Plot A 9

Peak power spectral density measurements @ 5.840 GHz

a)



b)



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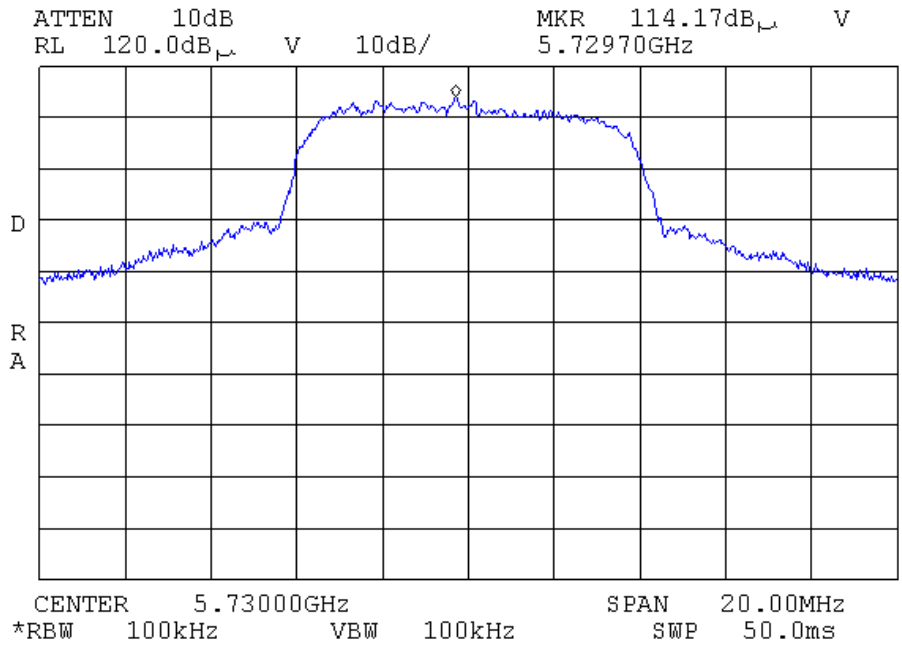
Plot A 10

In-band emission measurements @ 5730 MHz carrier

Detector: Peak
Test Method: measurement at antenna connector



External attenuator 50 dB
Cable loss 2.2 dB
Limit for spurious = 114.17 dBµV – 20 dB = 94.17 dBµV

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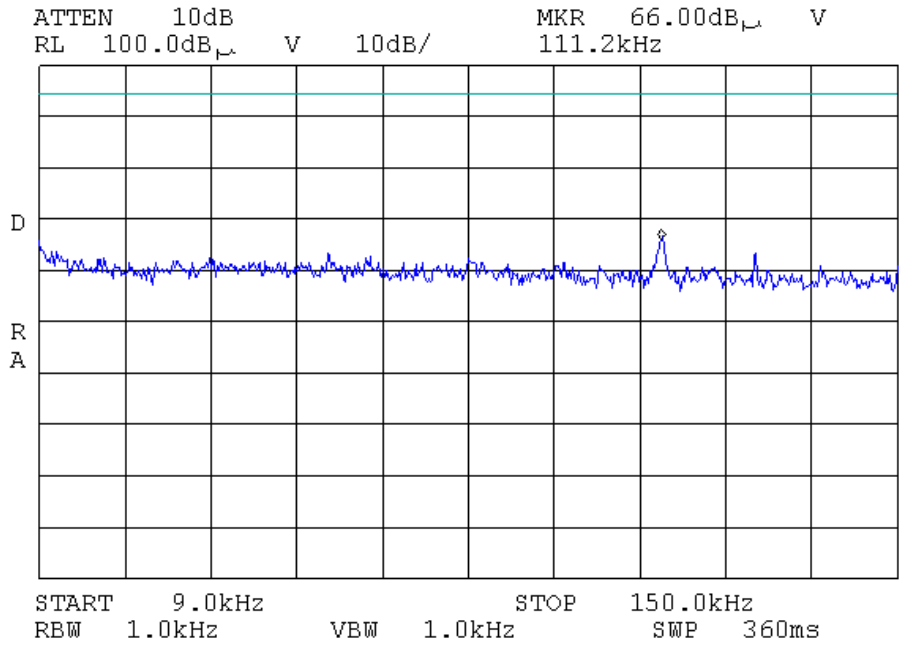
Plot A 11

Conducted spurious emission measurements in 9 kHz – 150 kHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5730 MHz



External attenuator 50 dB
Cable loss 2.2 dB

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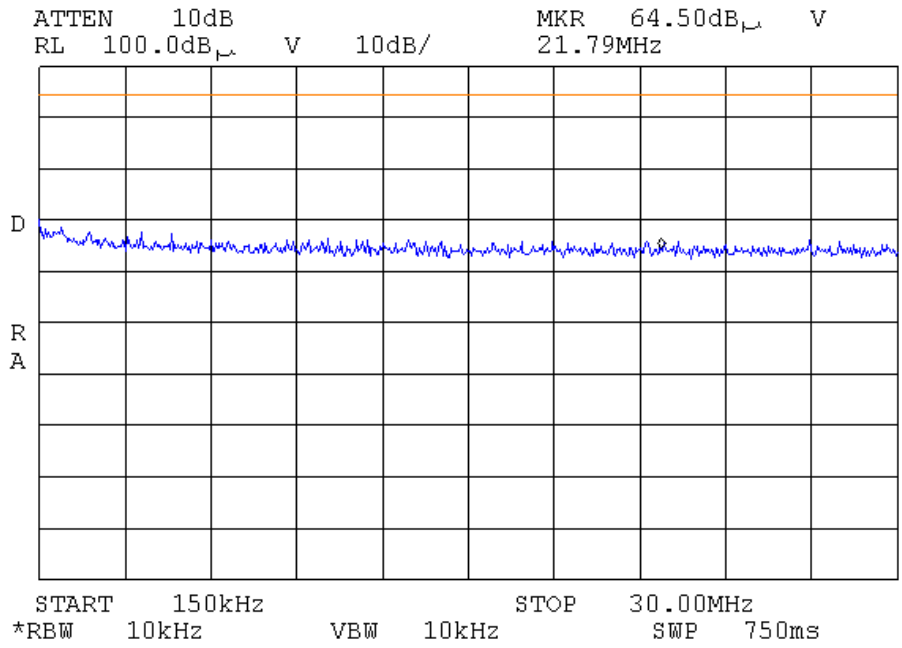
Plot A 12

Conducted spurious emission measurements in 150 kHz – 30 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5730 MHz



External attenuator 50 dB
Cable loss 2.2 dB

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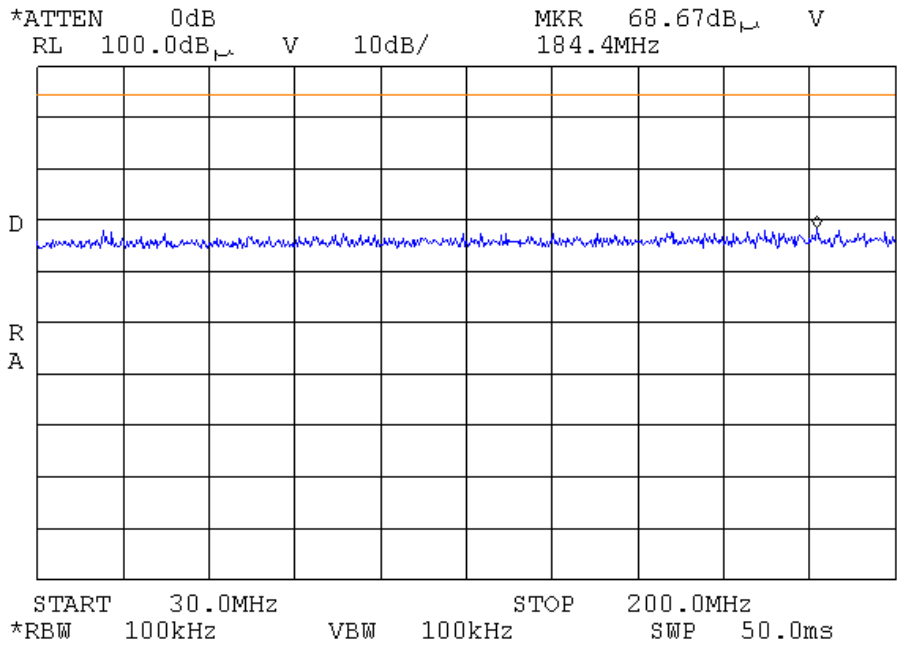
Plot A 13

Conducted spurious emission measurements in 30 MHz – 200 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5730 MHz



External attenuator 50 dB
Cable loss 2.2 dB

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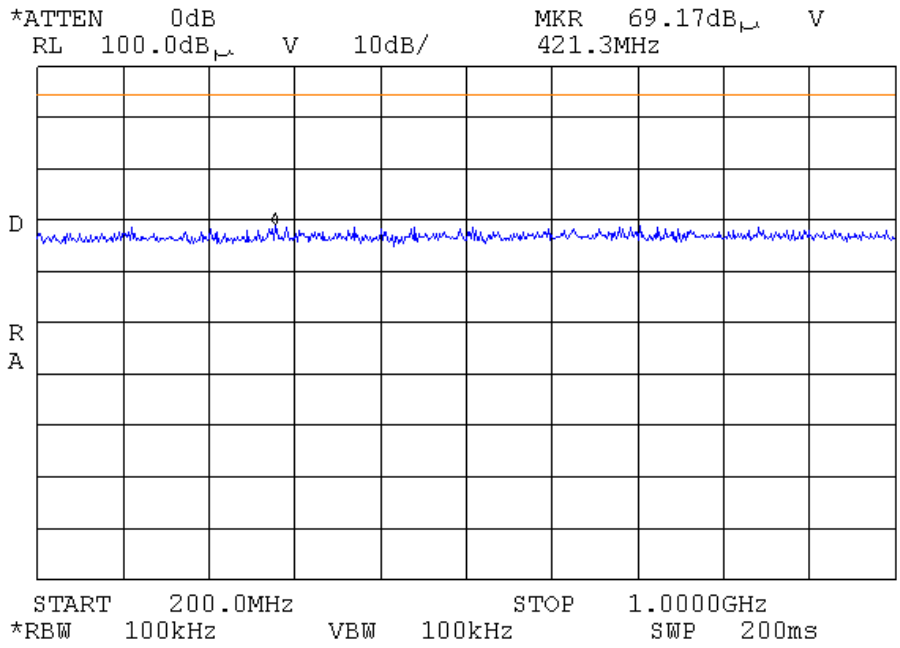
Plot A 14

Conducted spurious emission measurements in 200 MHz – 1000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5730 MHz



External attenuator 50 dB
Cable loss 2.2 dB

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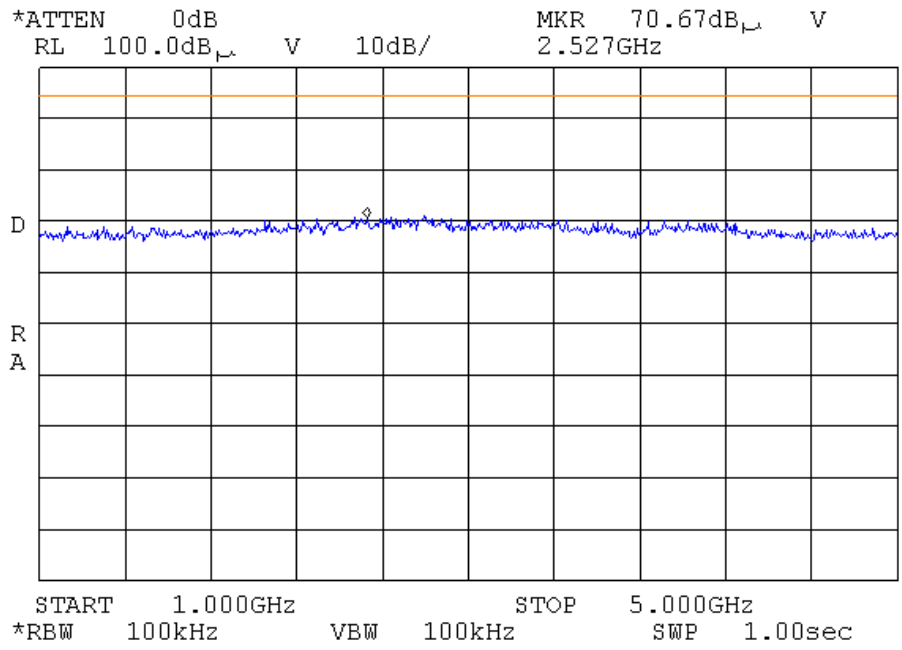
Plot A 15

Conducted spurious emission measurements in 1000 MHz – 5000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5730 MHz



External attenuator 50 dB
Cable loss 2.2 dB

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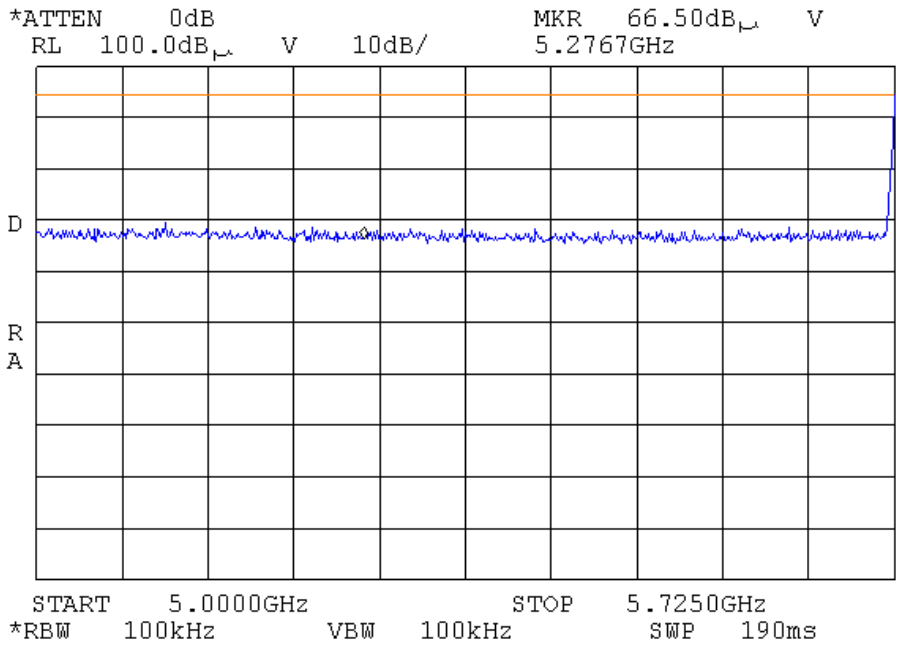
Plot A 16

Conducted spurious emission measurements in 5000 MHz – 5725 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5730 MHz



External attenuator 50 dB
Cable loss 2.2 dB

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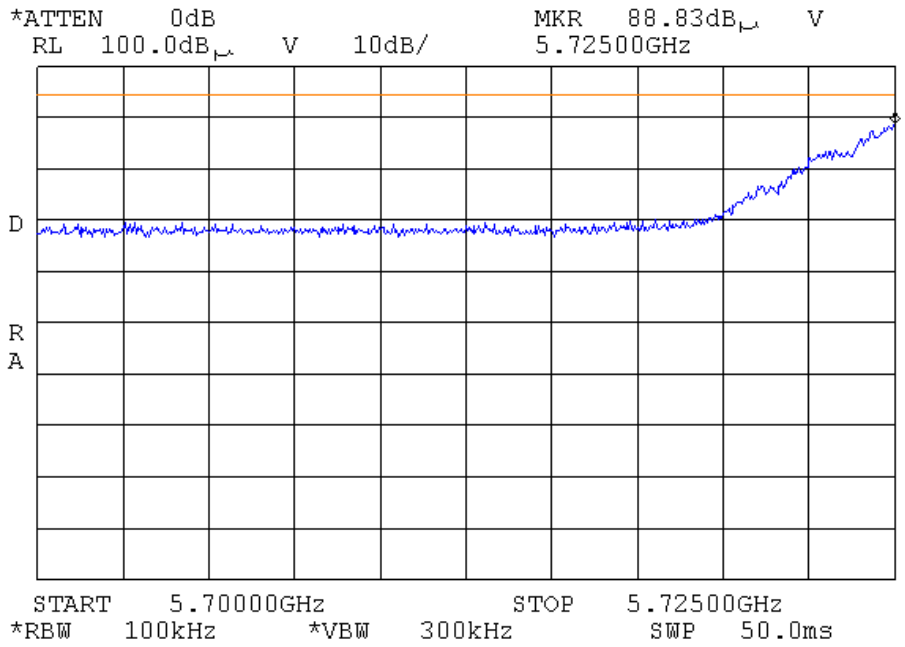
Plot A 17

Conducted spurious emission measurements in 5700 MHz – 5725 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5730 MHz



Limit = 94.2 dBuV
Margin = -5.37 dB
External attenuator 50 dB
Cable loss 2.2 dB

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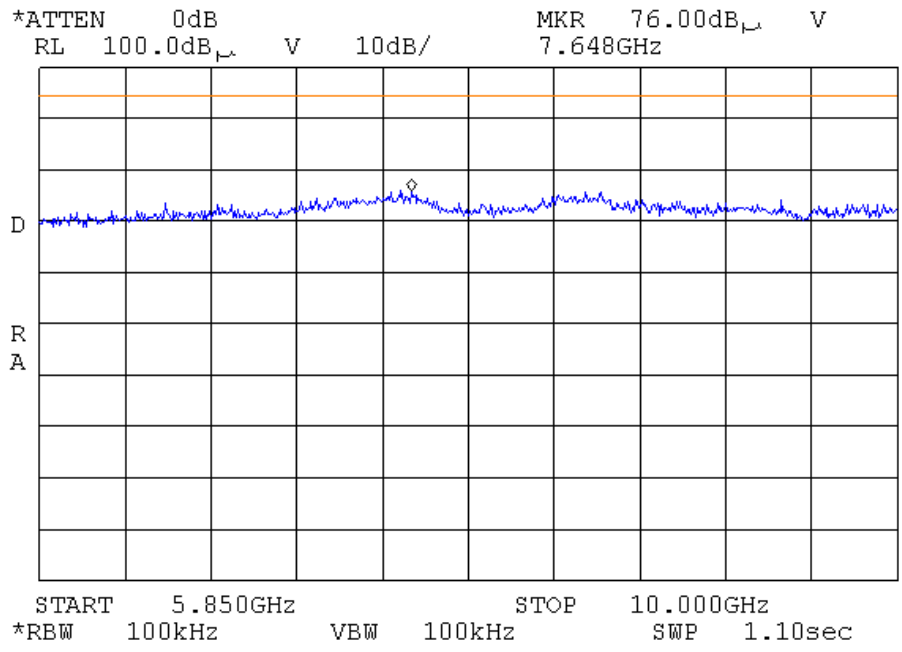
Plot A 18

Conducted spurious emission measurements in 5850 MHz – 10000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5730 MHz



External attenuator 50 dB
Cable loss 2.9 dB

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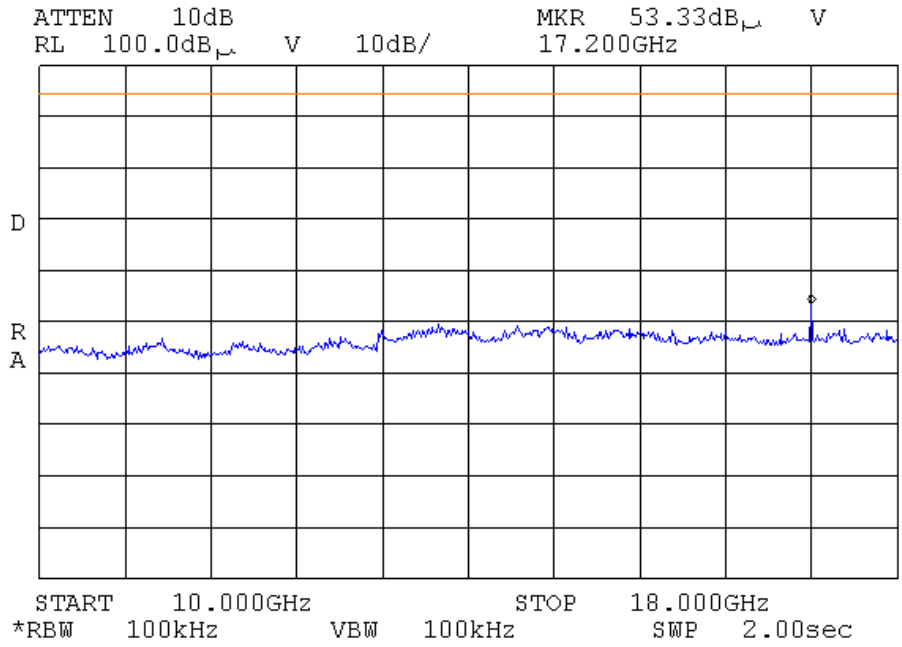
Plot A 19

Conducted spurious emission measurements in 10000 MHz – 18000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5730 MHz



External attenuator 10 dB

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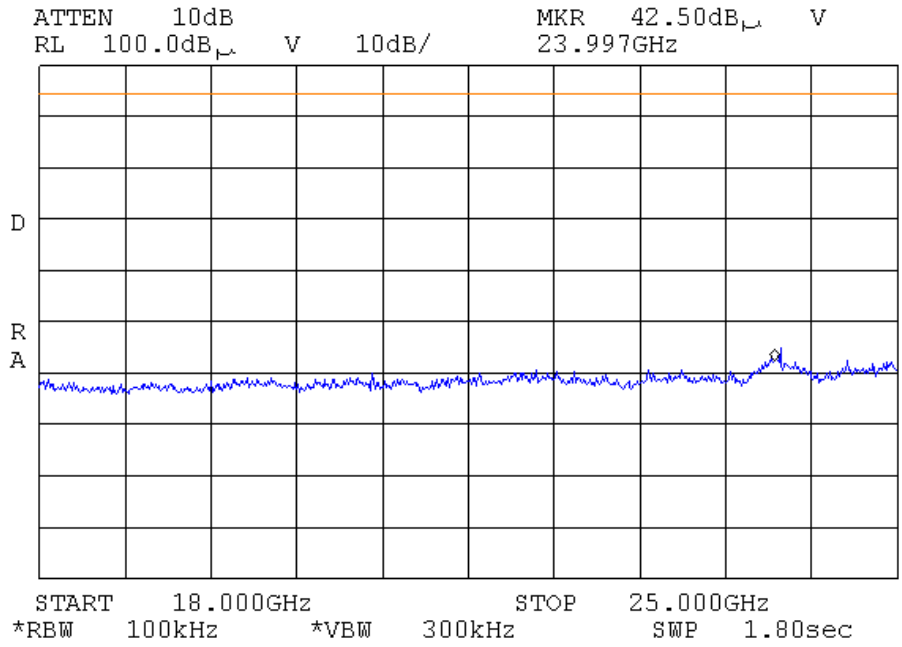
Plot A 20

Conducted spurious emission measurements in 18000 MHz – 25000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5730 MHz



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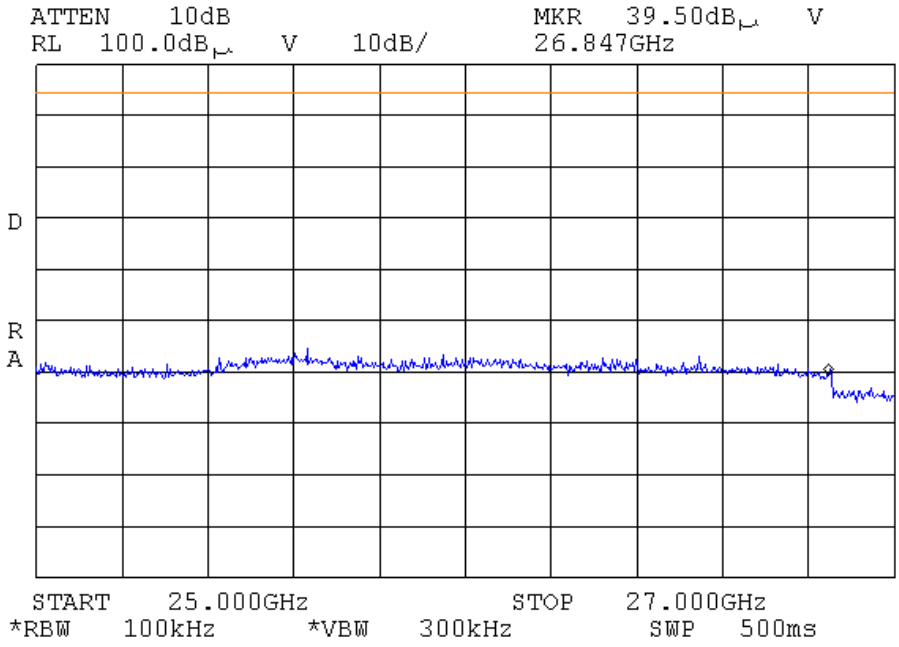
Plot A 21

Conducted spurious emission measurements in 25000 MHz – 27000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5730 MHz



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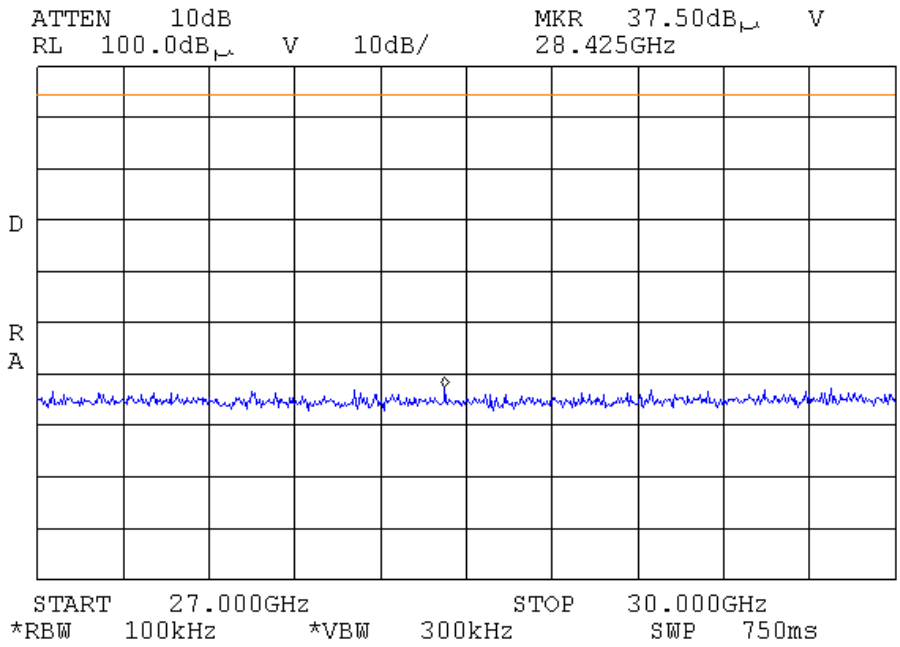
Plot A 22

Conducted spurious emission measurements in 27000 MHz – 30000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5730 MHz



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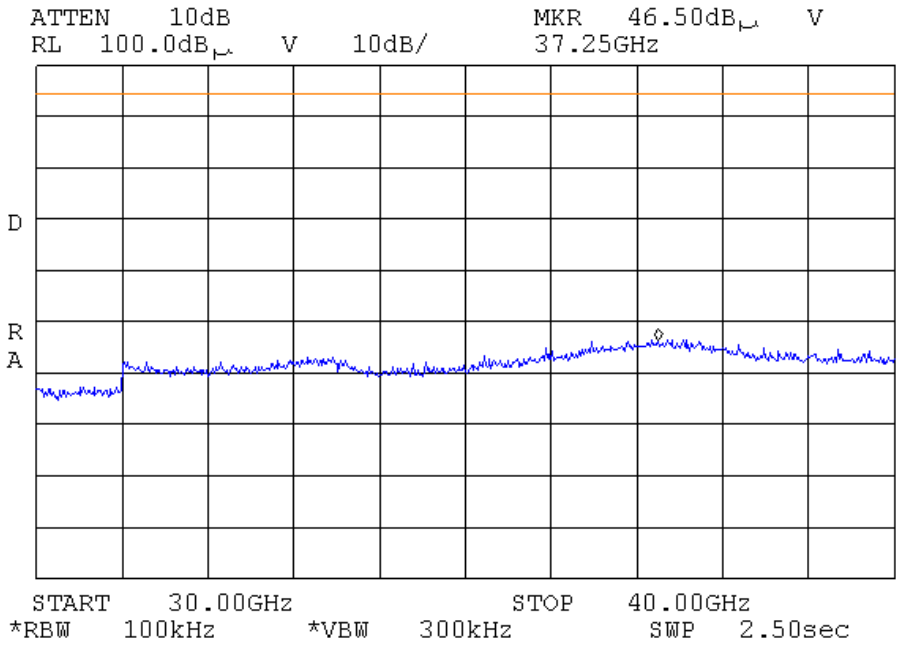
Plot A 23

Conducted spurious emission measurements in 30000 MHz – 40000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5730 MHz



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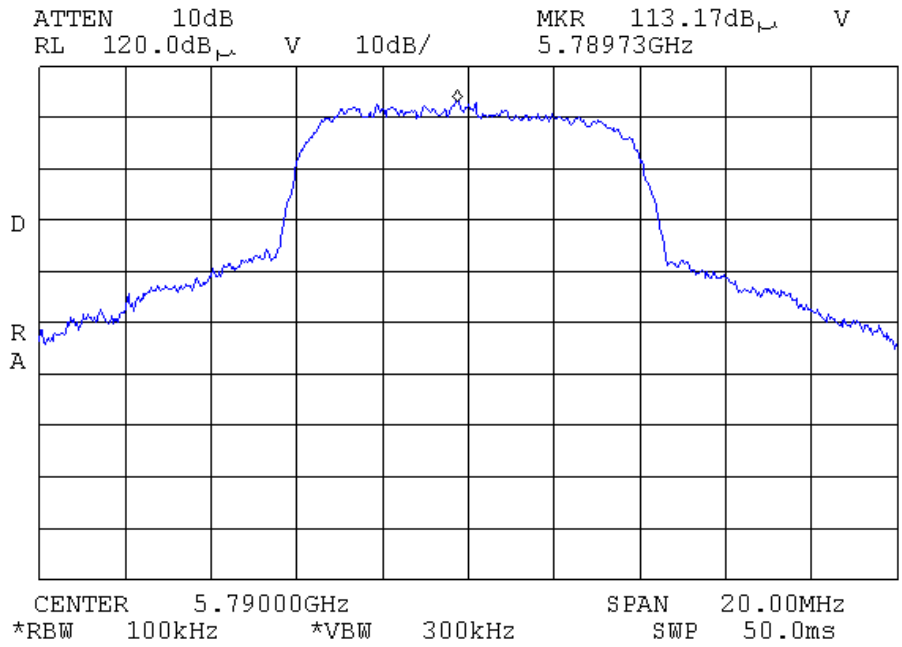
Plot A 24

In-band spurious emission measurements @ 5790 MHz

Detector: Peak
Test Method: measurement at antenna connector



Limit for spurious emissions – 93.17 dBµV

External attenuator 50 dB
Cable loss 2.2 dB

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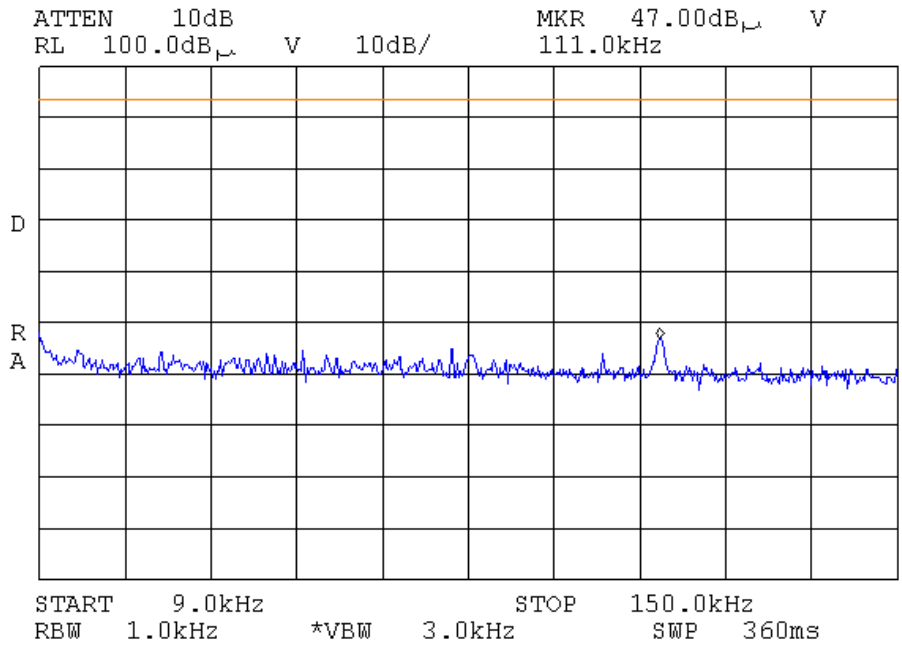
Plot A 25

Conducted spurious emission measurements in 9 kHz – 150 kHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5790 MHz



External attenuator 50 dB
Cable loss 2.2 dB

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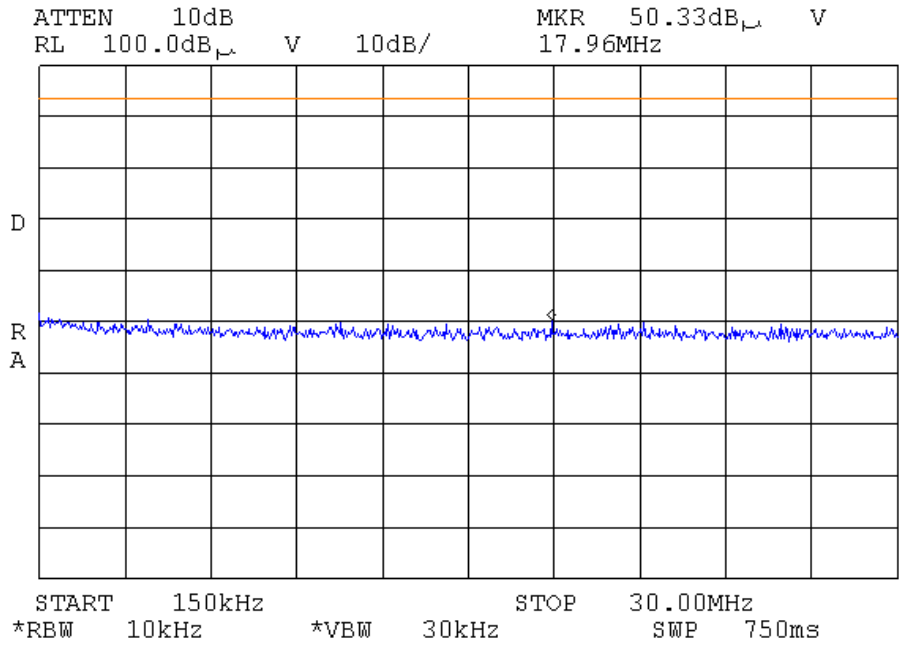
Plot A 26

Conducted spurious emission measurements in 150 kHz – 30 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5790 MHz



External attenuator 50 dB
Cable loss 2.2 dB

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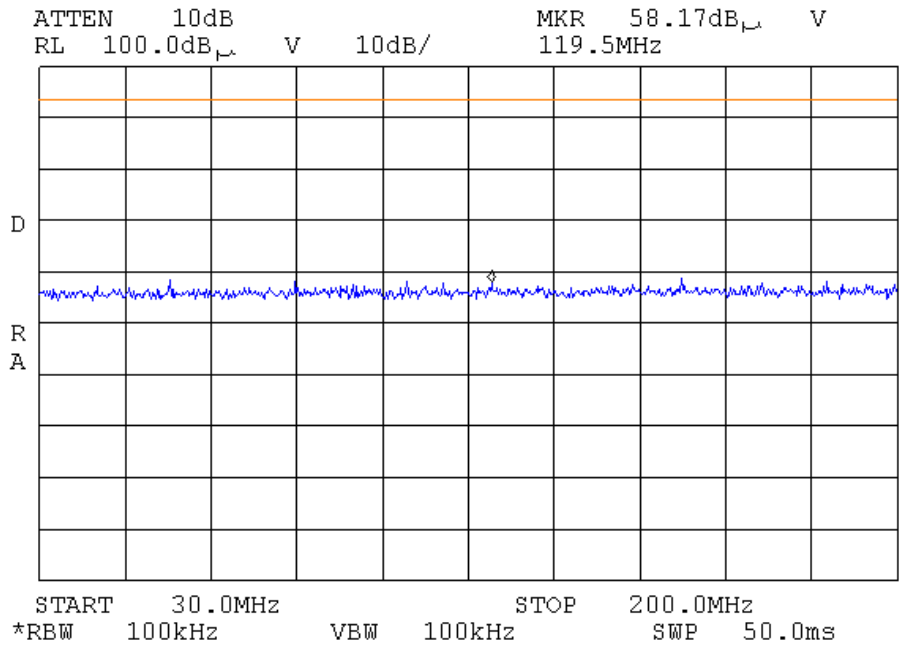
Plot A 27

Conducted spurious emission measurements in 30 MHz – 200 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5790 MHz



External attenuator 50 dB
Cable loss 2.2 dB

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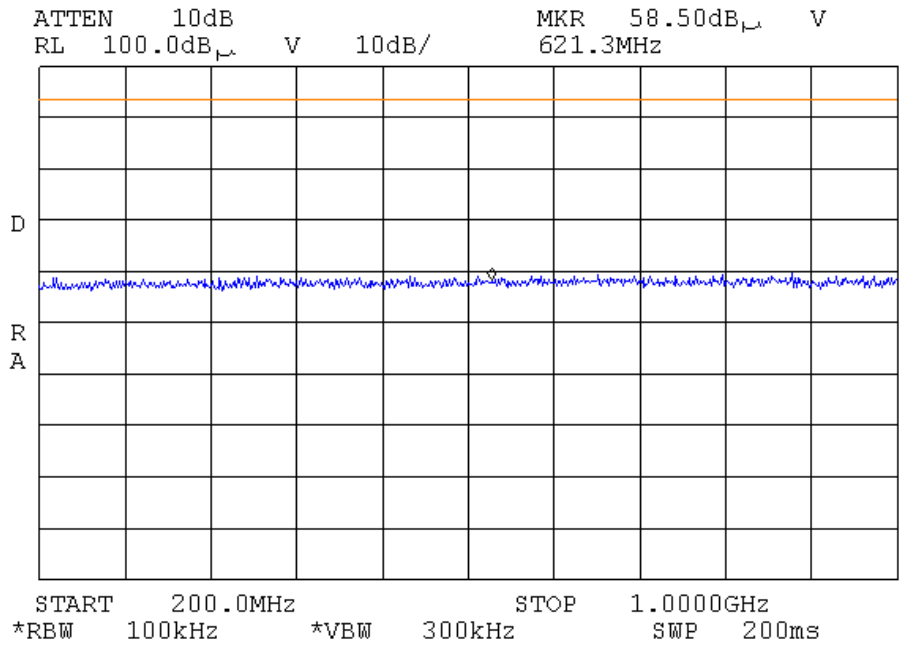
Plot A 28

Conducted spurious emission measurements in 200 MHz – 1000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5790 MHz



External attenuator 50 dB
Cable loss 2.2 dB

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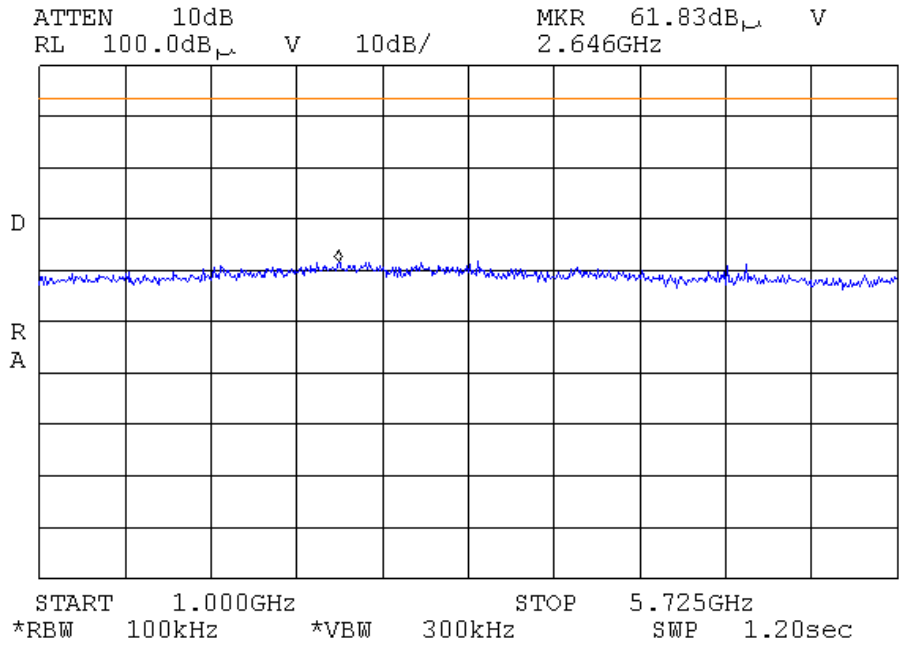
Plot A 29

Conducted spurious emission measurements in 1000 MHz - 5725 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5790 MHz



External attenuator 50 dB
Cable loss 2.2 dB

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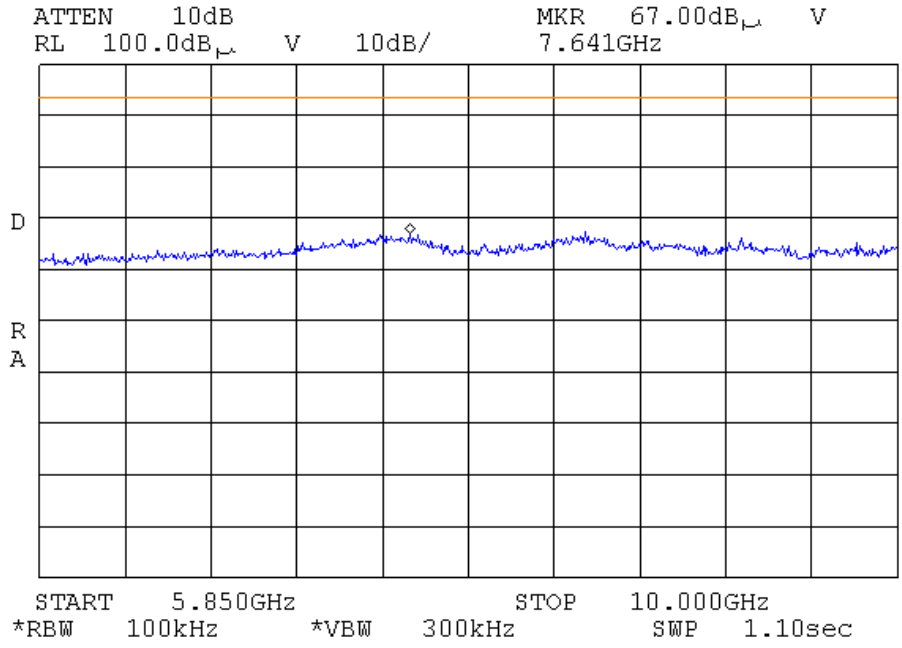
Plot A 30

Conducted spurious emission measurements in 5850 MHz – 10000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5790 MHz



External attenuator 50 dB
Cable loss 2.9 dB

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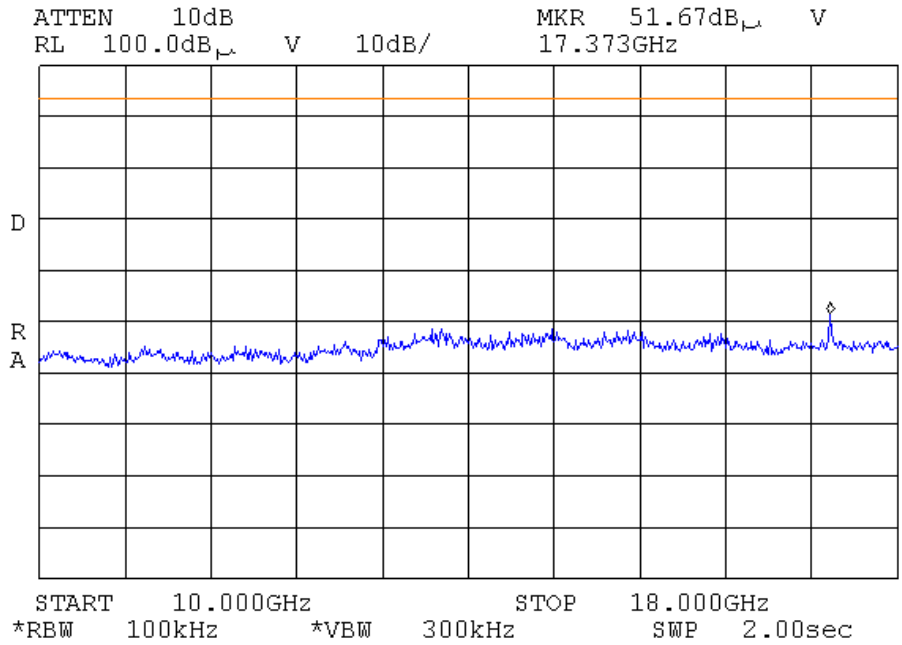
Plot A 31

Conducted spurious emission measurements in 10000 MHz – 18000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5790 MHz



External attenuator 10 dB

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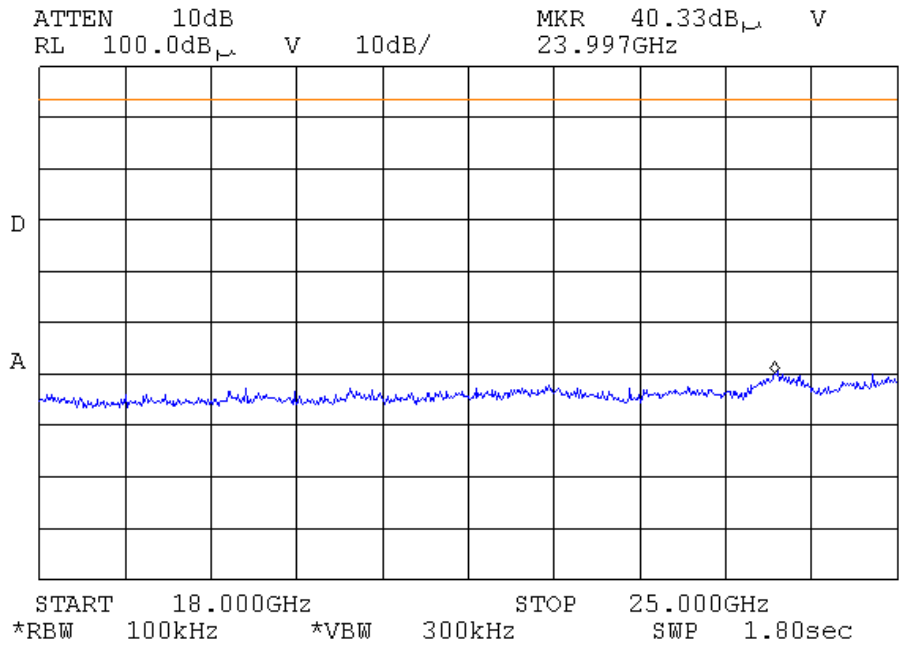
Plot A 32

Conducted spurious emission measurements in 18000 MHz – 25000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5790 MHz



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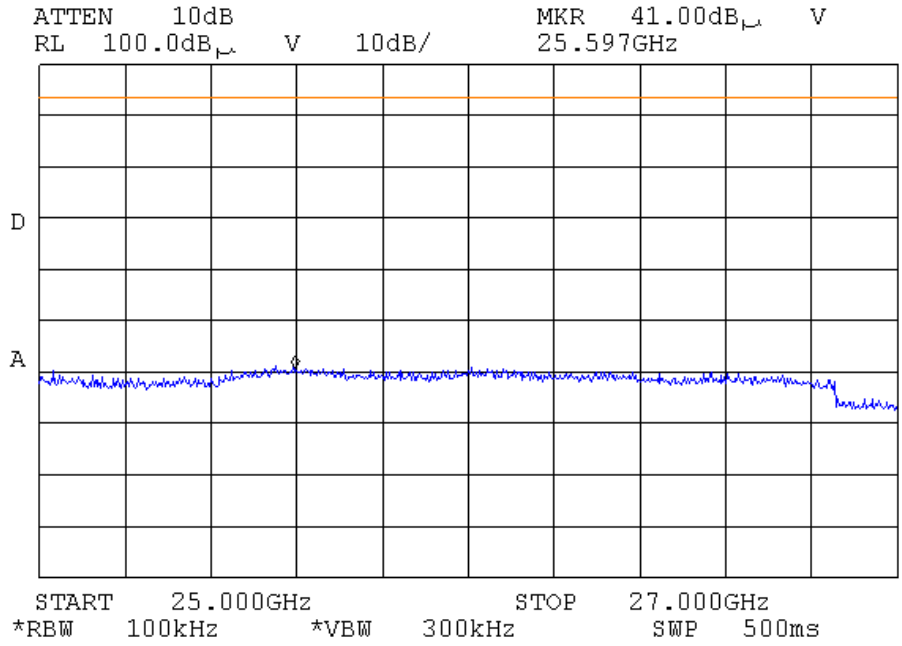
Plot A 33

Conducted spurious emission measurements in 25000 MHz – 27000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5790 MHz



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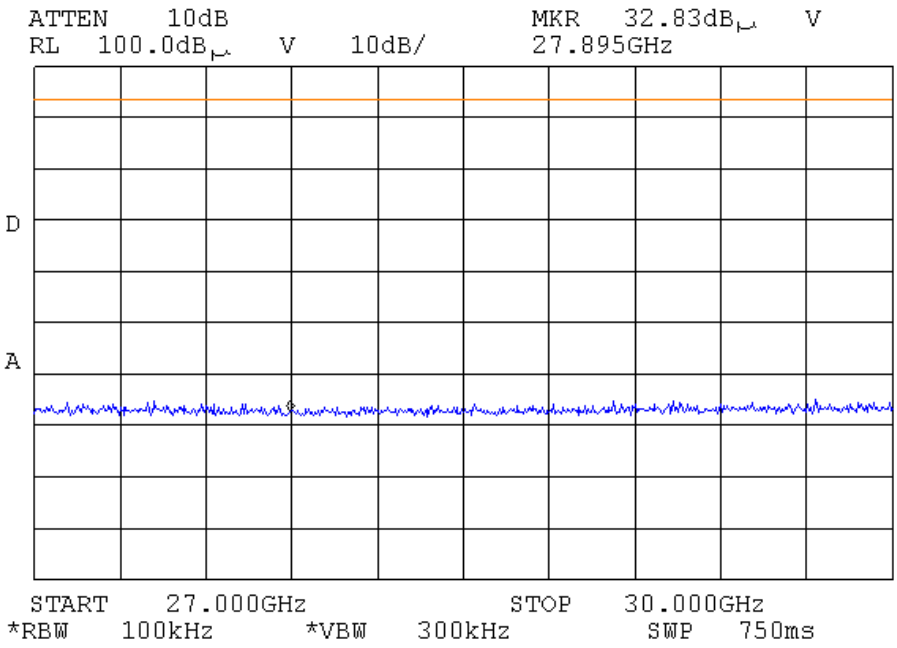
Plot A 34

Conducted spurious emission measurements in 27000 MHz – 30000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5790 MHz



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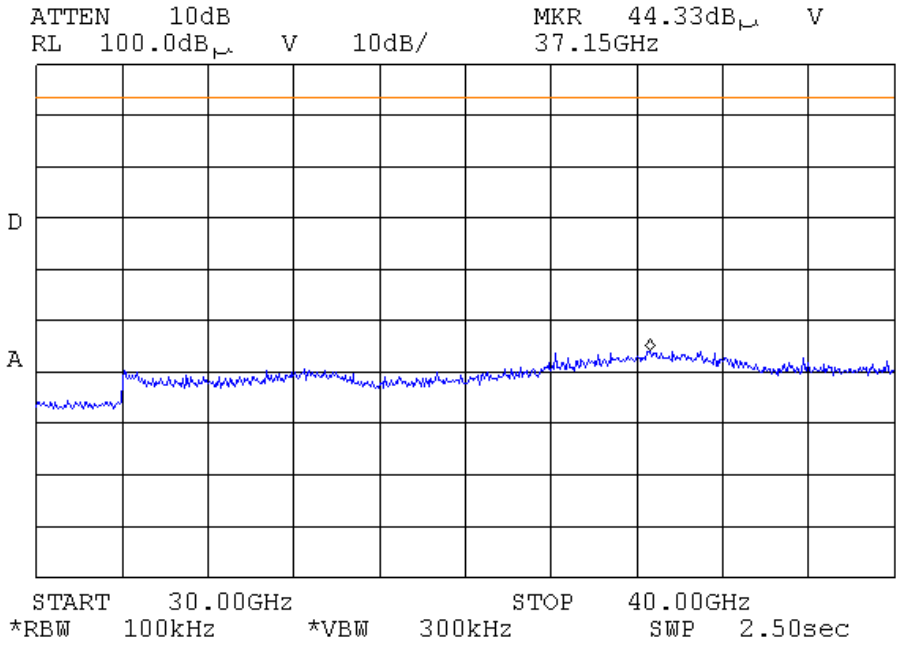
Plot A 35

Conducted spurious emission measurements in 30000 MHz – 40000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5790 MHz



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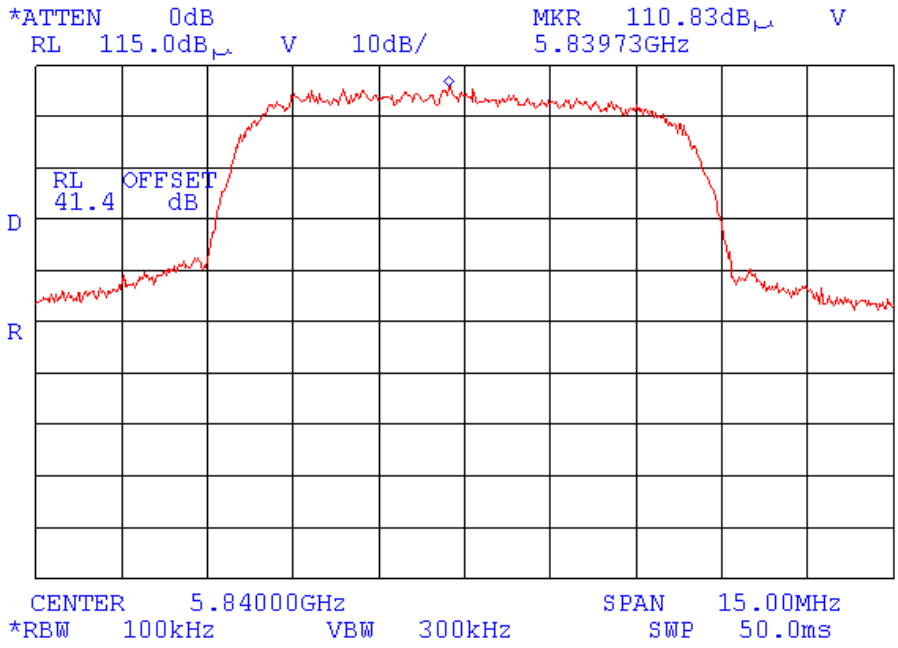
Plot A 36

In-band spurious emission measurements @ 5840 MHz

Detector: Peak
Test Method: measurement at antenna connector



External attenuator 40 dB
Cable loss 1.4 dB
Limit for spurious emissions=110.83 dBµV – 20 dB = 90.83 dBµV

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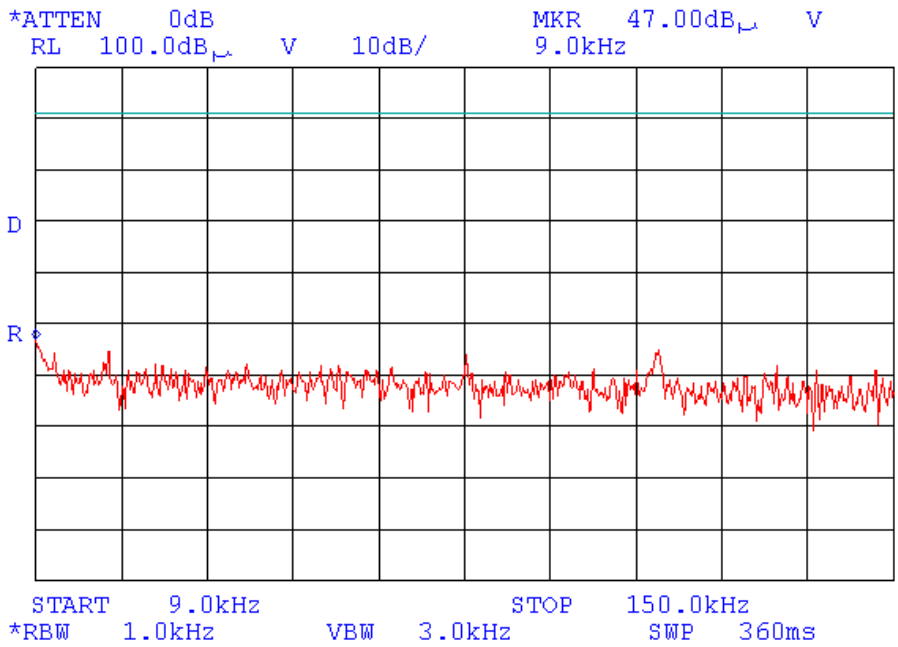
Plot A 37

Conducted spurious emission measurements in 9 kHz – 150 kHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5840 MHz



External attenuator 40 dB
Cable loss 0.1 dB

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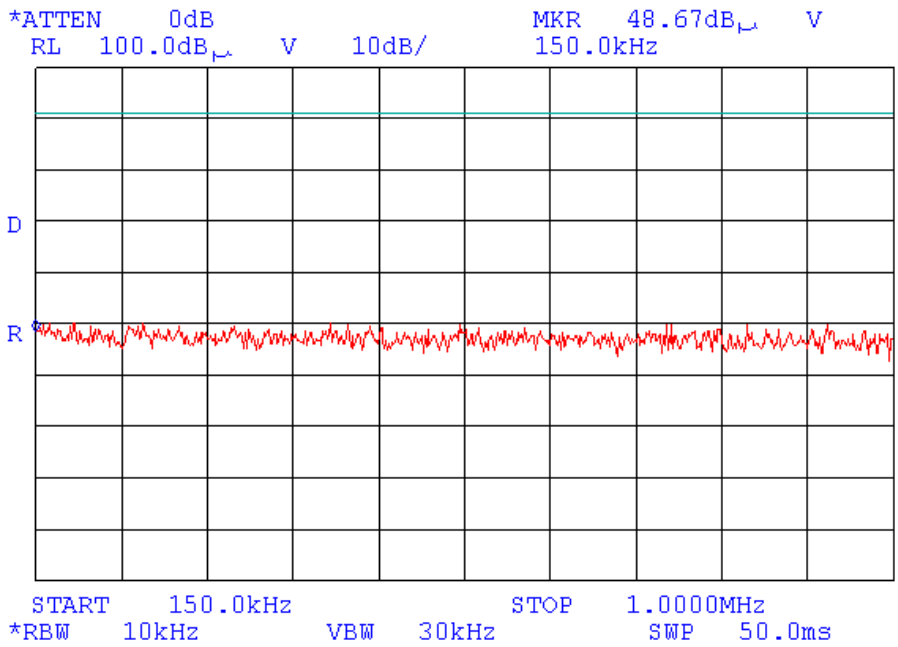
Plot A 38

Conducted spurious emission measurements in 150 kHz – 1 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5840 MHz



External attenuator 40 dB
Cable loss 0.1 dB

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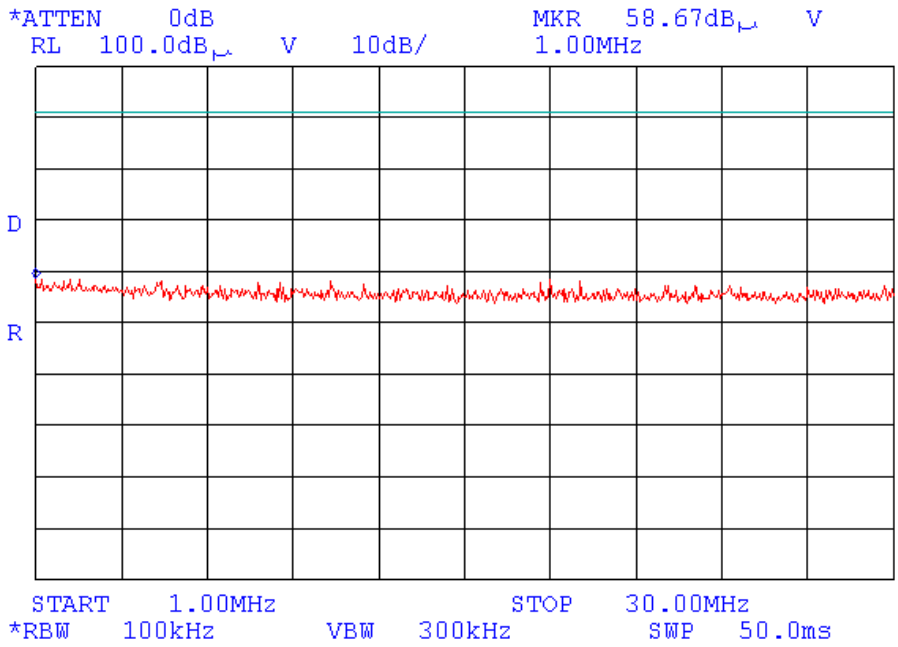
Plot A 39

Conducted spurious emission measurements in 1 MHz – 30 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5840 MHz



External attenuator 40 dB
Cable loss 0.1 dB

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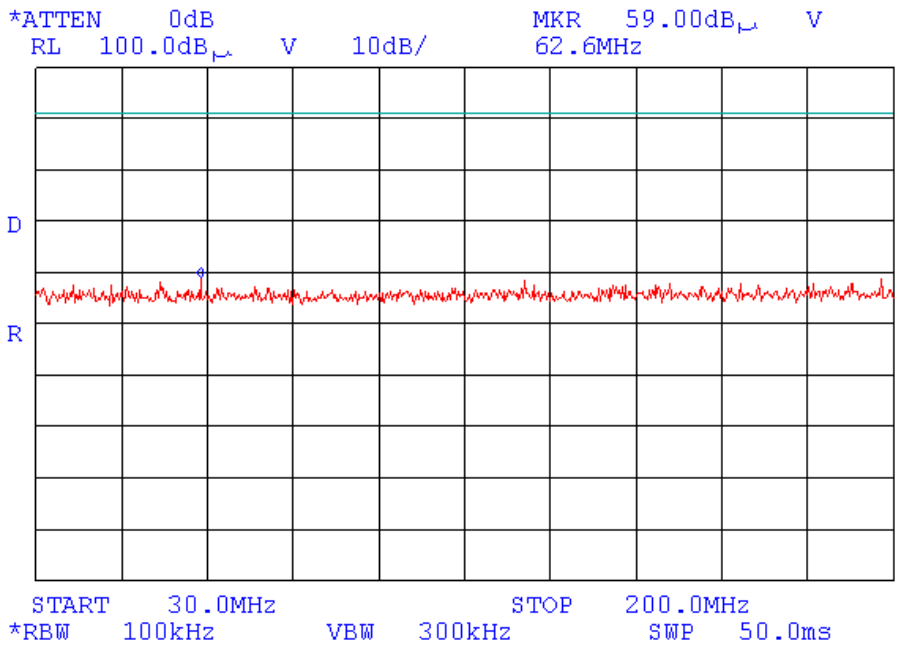
Plot A 40

Conducted spurious emission measurements in 30 MHz – 200 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5840 MHz



External attenuator 40 dB
Cable loss 0.25 dB

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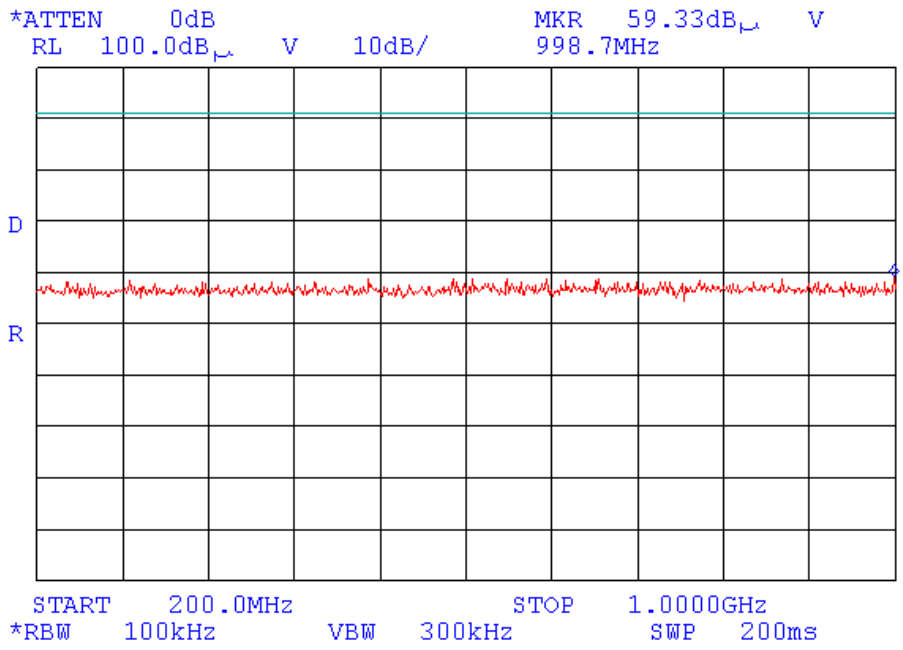
Plot A 41

Conducted spurious emission measurements in 200 MHz – 1000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5840 MHz



External attenuator 40 dB
Cable loss 0.6 dB

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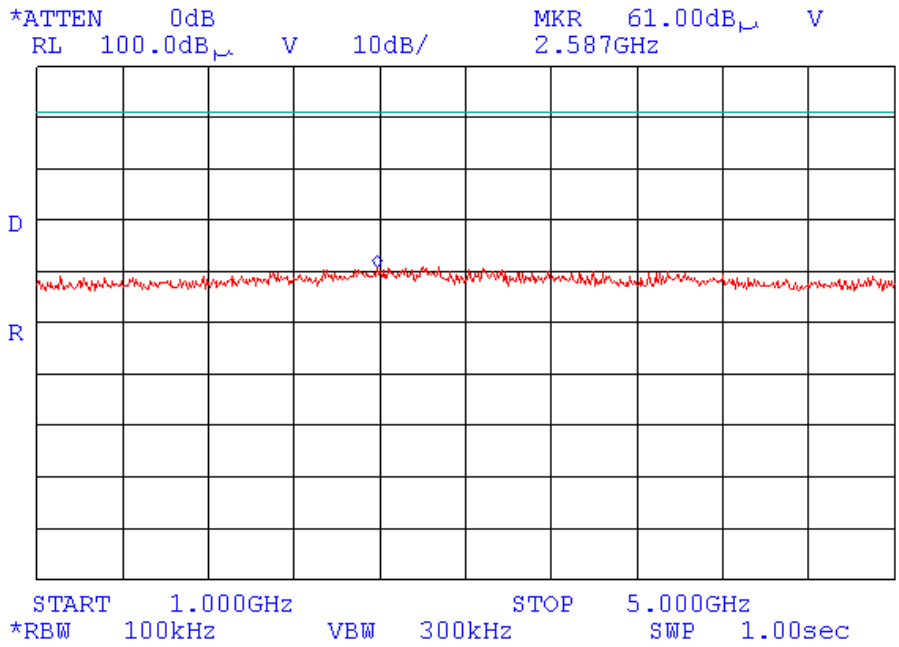
Plot A 42

Conducted spurious emission measurements in 1000 MHz – 5000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5840 MHz



External attenuator 40 dB
Cable loss 1.3 dB

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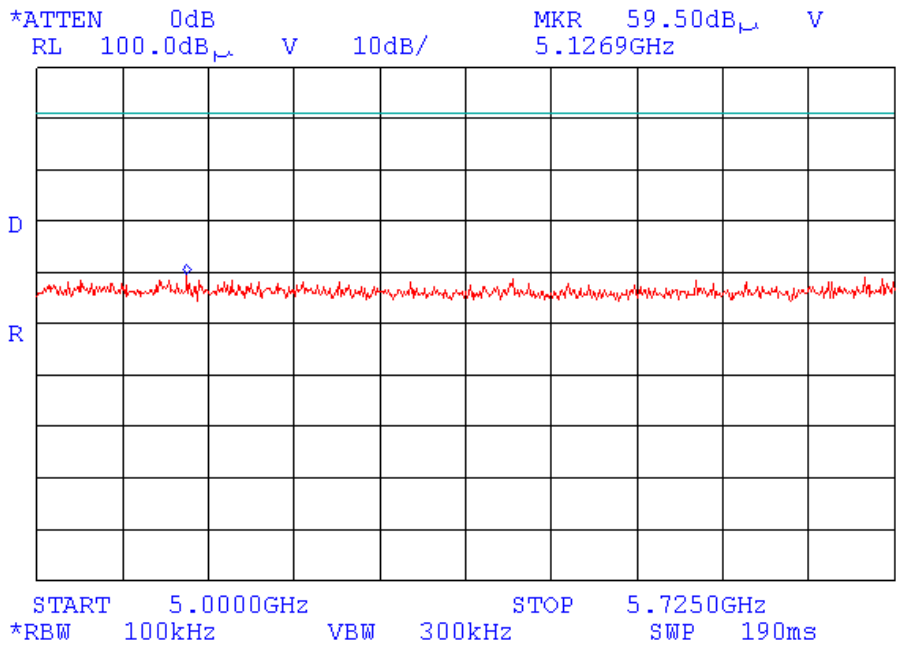
Plot A 43

Conducted spurious emission measurements in 5000 MHz – 5725 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5840 MHz



External attenuator 40 dB
Cable loss 1.4 dB

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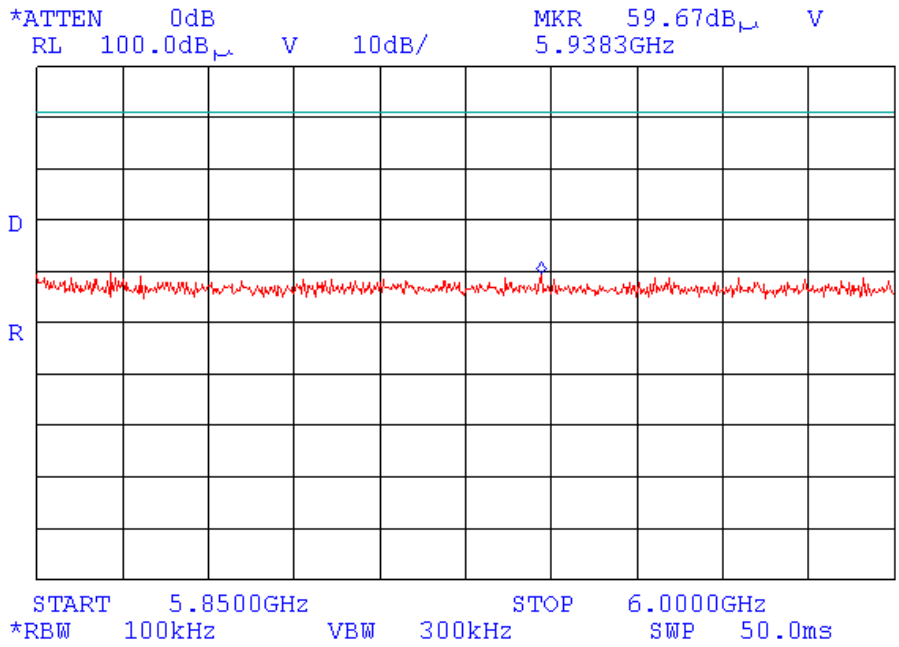
Plot A 44

Conducted spurious emission measurements in 5850 MHz – 6000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5840 MHz



External attenuator 40 dB
Cable loss 1.5 dB

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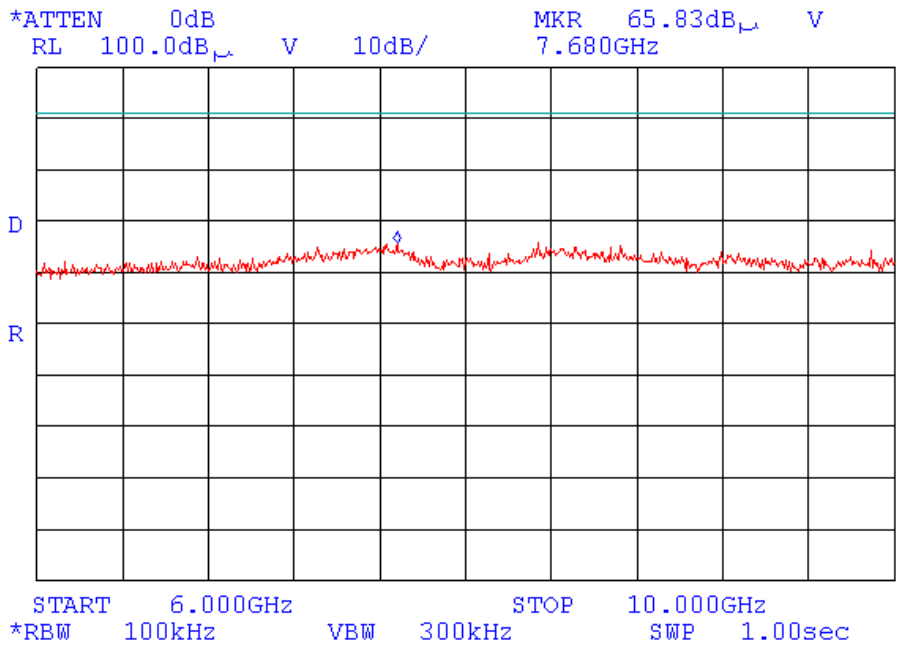
Plot A 45

Conducted spurious emission measurements in 6000 MHz – 10000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5840 MHz



External attenuator 40 dB
Cable loss 1.9 dB

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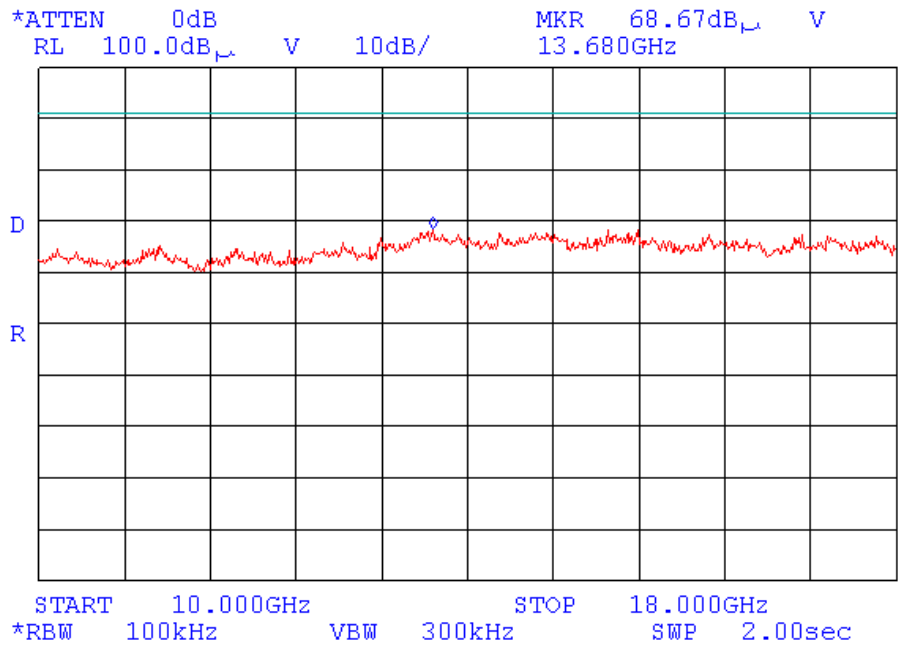
Plot A 46

Conducted spurious emission measurements in 10000 MHz – 18000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5840 MHz



External attenuator 40 dB
Cable loss 2.5 dB

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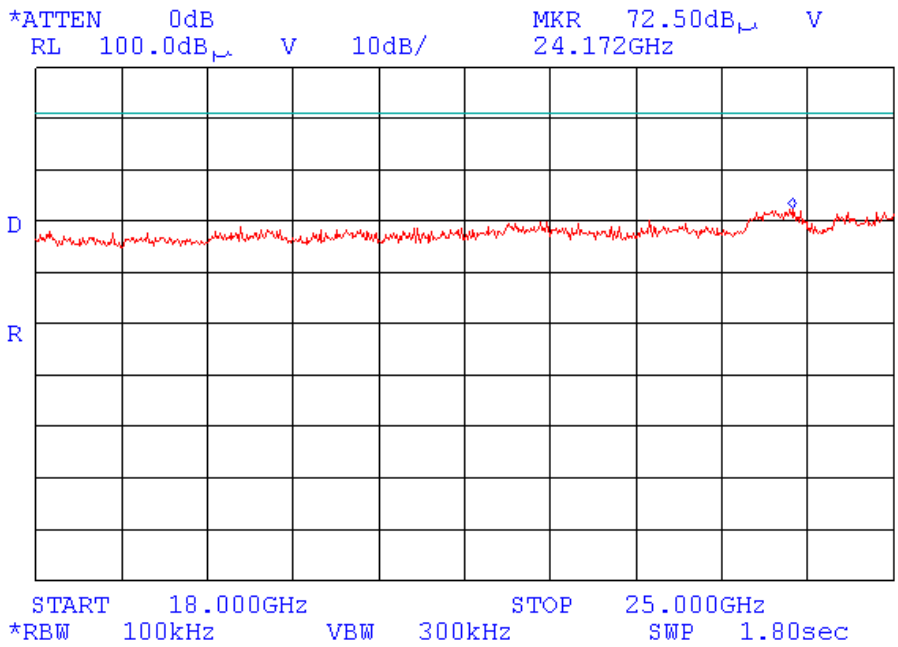
Plot A 47

Conducted spurious emission measurements in 18000 MHz – 25000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5840 MHz



External attenuator 40 dB
Cable loss 2.5 dB

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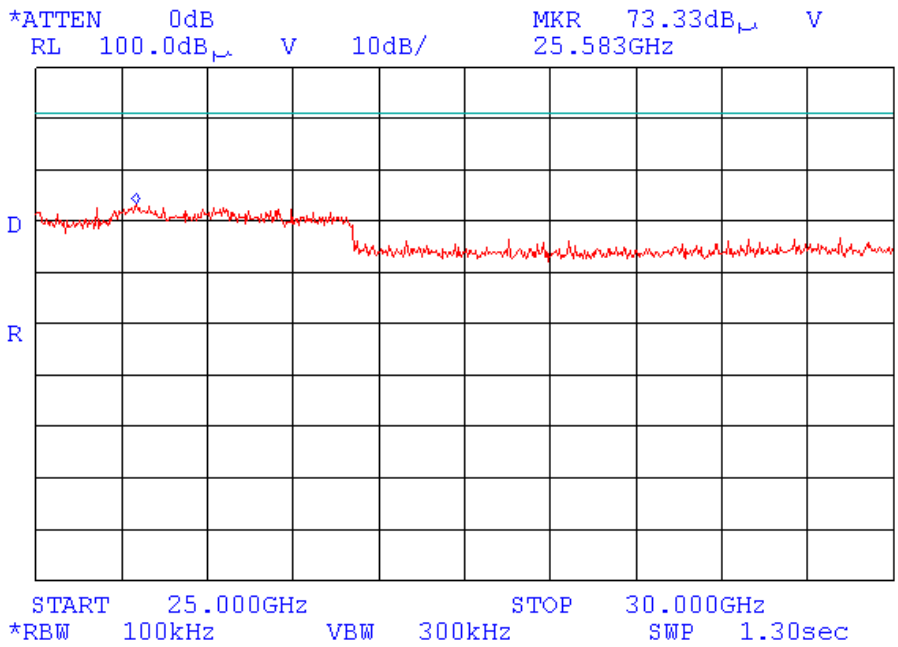
Plot A 48

Conducted spurious emission measurements in 25000 MHz – 30000 MHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5840 MHz



External attenuator 40 dB
Cable loss 3.3 dB

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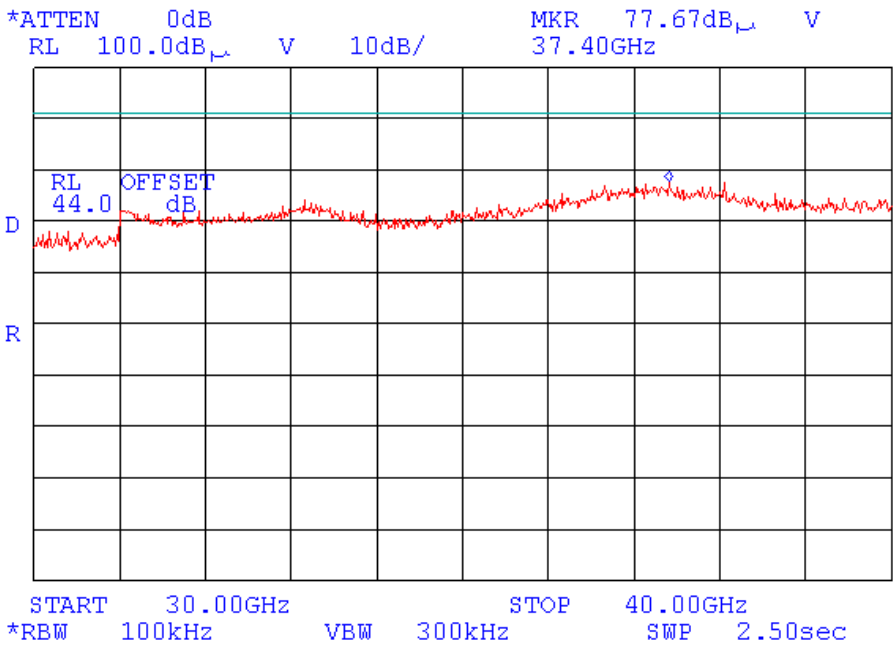
Plot A 49

Conducted spurious emission measurements in 30 GHz – 40 GHz

Limit:	20 dB below the carrier
Detector:	Peak
Test Method:	measurement at antenna connector
Notes:	f(Tx)=5840 MHz



External attenuator 40 dB
Cable loss 4.0 dB

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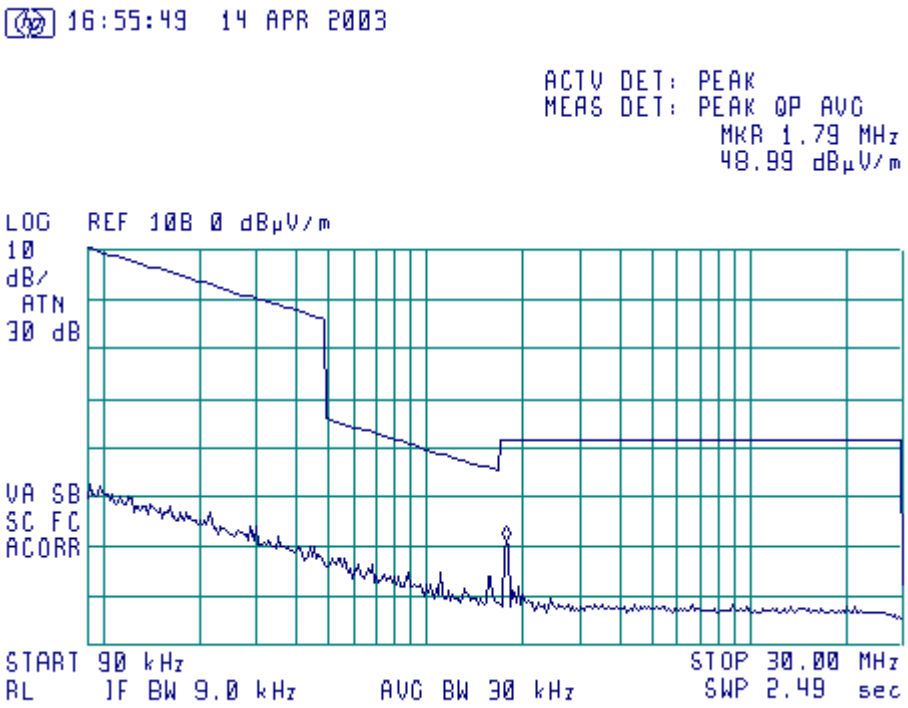
Plot A 50

Radiated spurious emission measurements in the anechoic chamber from 9 kHz to 30 MHz, carrier frequency 5730 MHz



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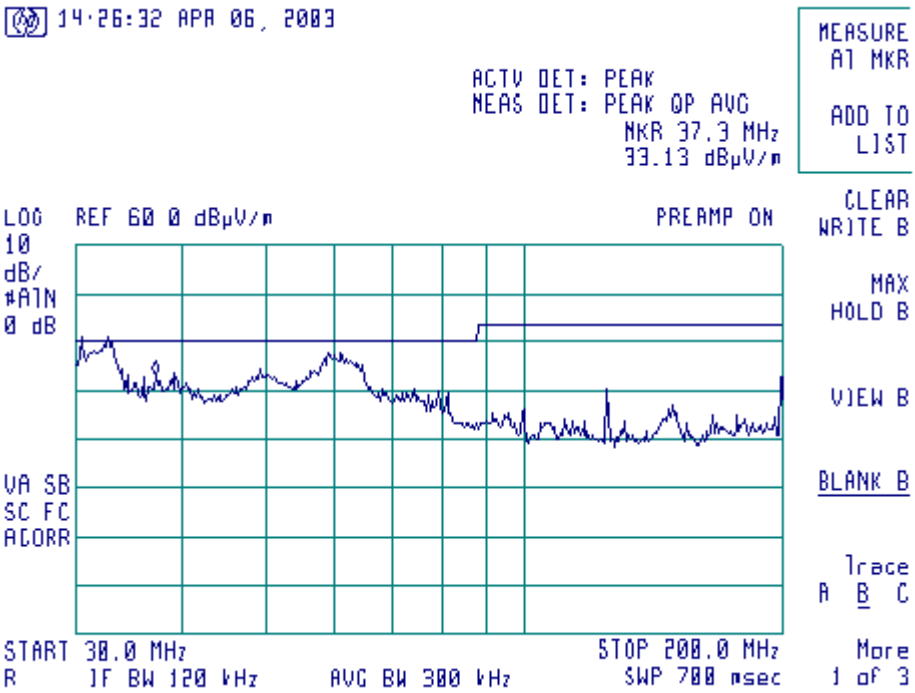
Plot A 51

Radiated spurious emission measurements in the anechoic chamber from 30 kHz to 200 MHz, carrier frequency 5730 MHz



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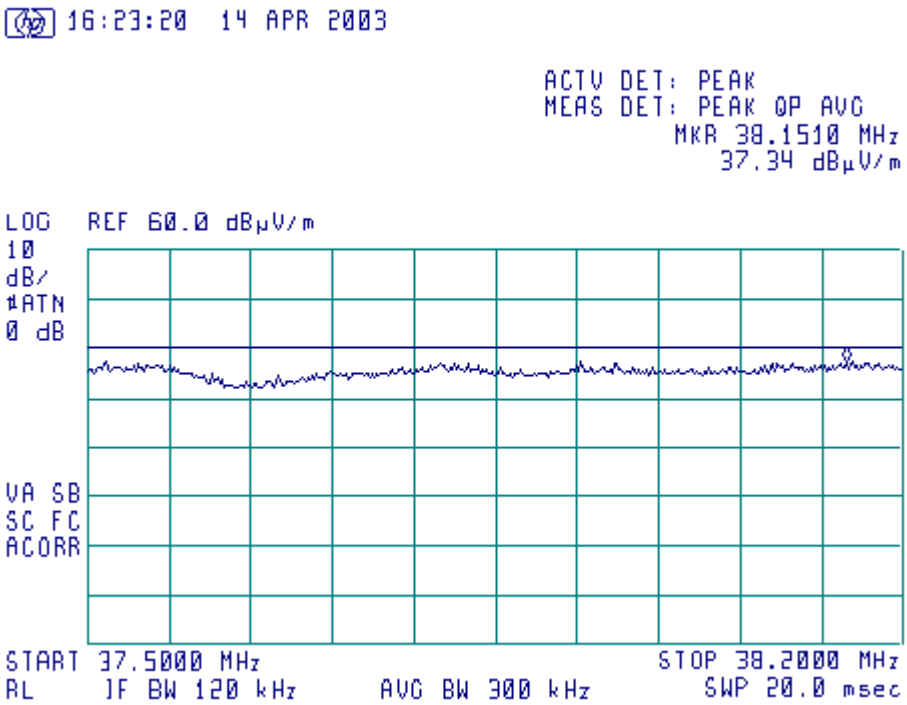
Plot A 52

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5730 MHz



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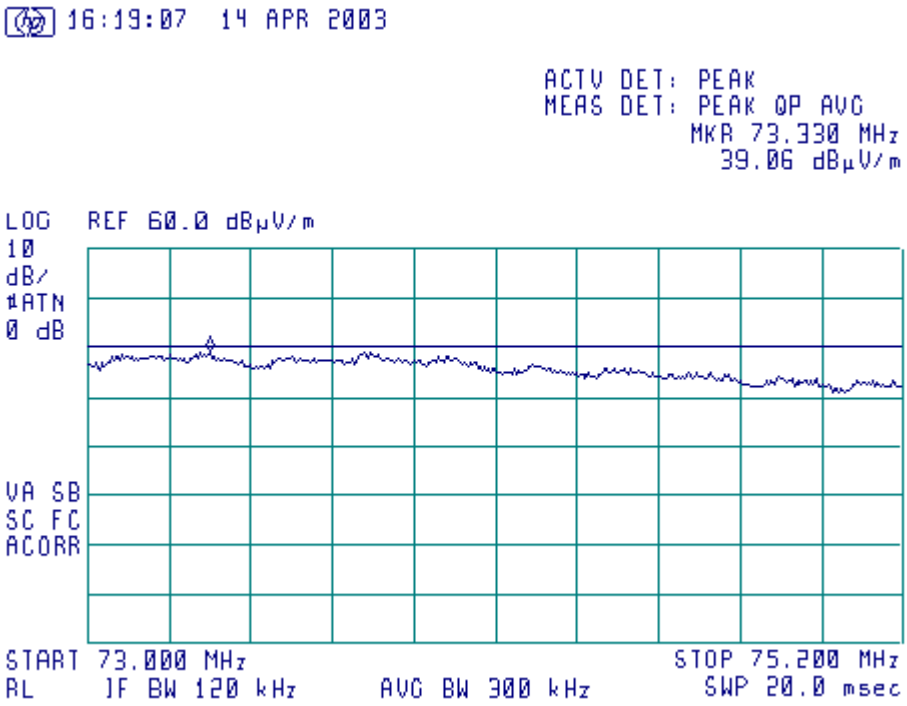
Plot A 53

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5730 MHz



Frequency, MHz	Peak measurement, dB(uV/m)	QP measurement, dB(uV/m)	Limit, dB(uV/m)	Margin, dB
73.331825	39.47	35.85	40.00	4.15

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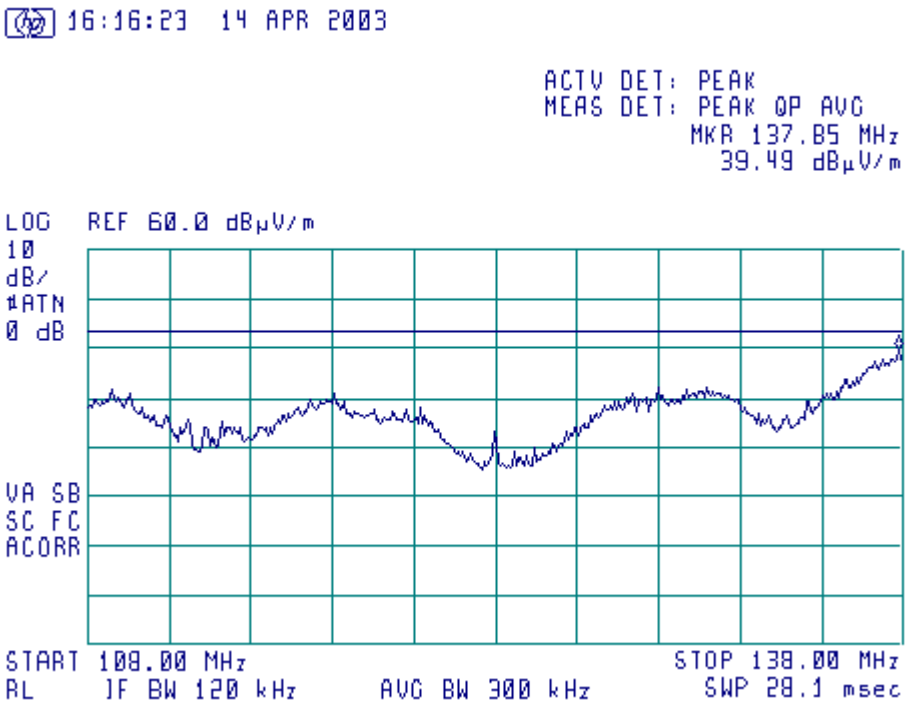
Plot A 54

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5730 MHz



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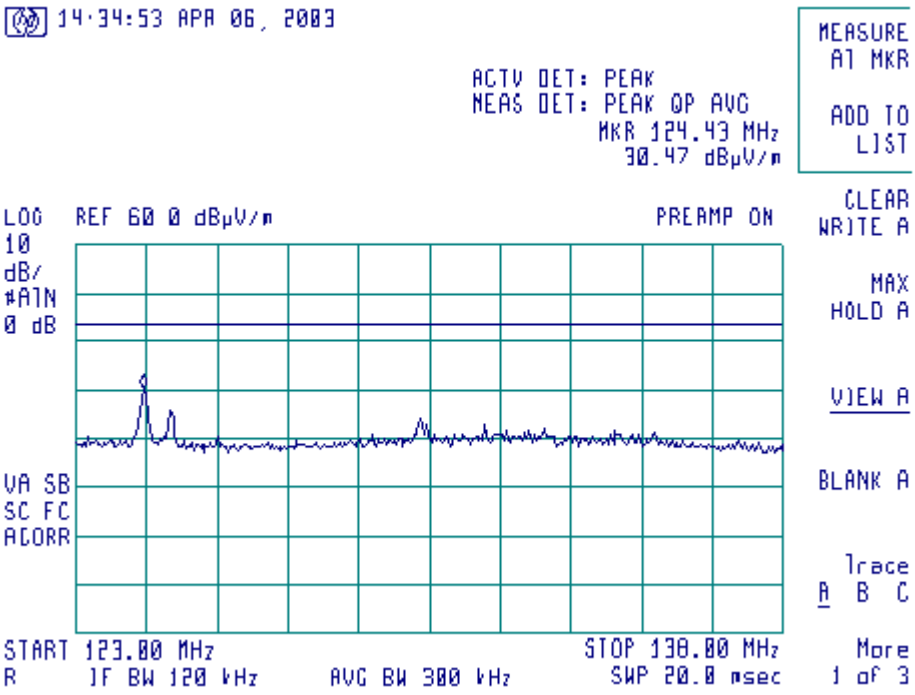
Plot A 55

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5730 MHz



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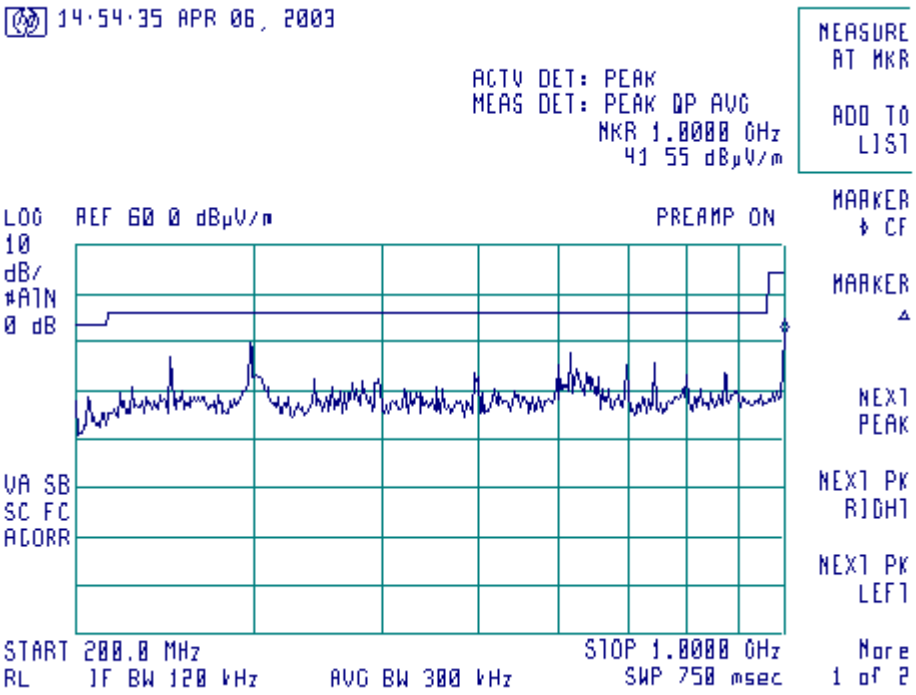
Plot A 56

Radiated spurious emission measurements in the anechoic chamber from 200 to 1000 MHz, carrier frequency 5730 MHz



Frequency, MHz	Peak measurement, dB(uV/m)	QP measurement, dB(uV/m)	Limit, dB(uV/m)	Margin, dB
124.4	30.47	29.74	43.50	13.76
249.0	32.79	23.68	46.00	22.32
400.0	36.51	34.63	46.00	11.37
1000.0	47.34	44.57	54.00	9.43

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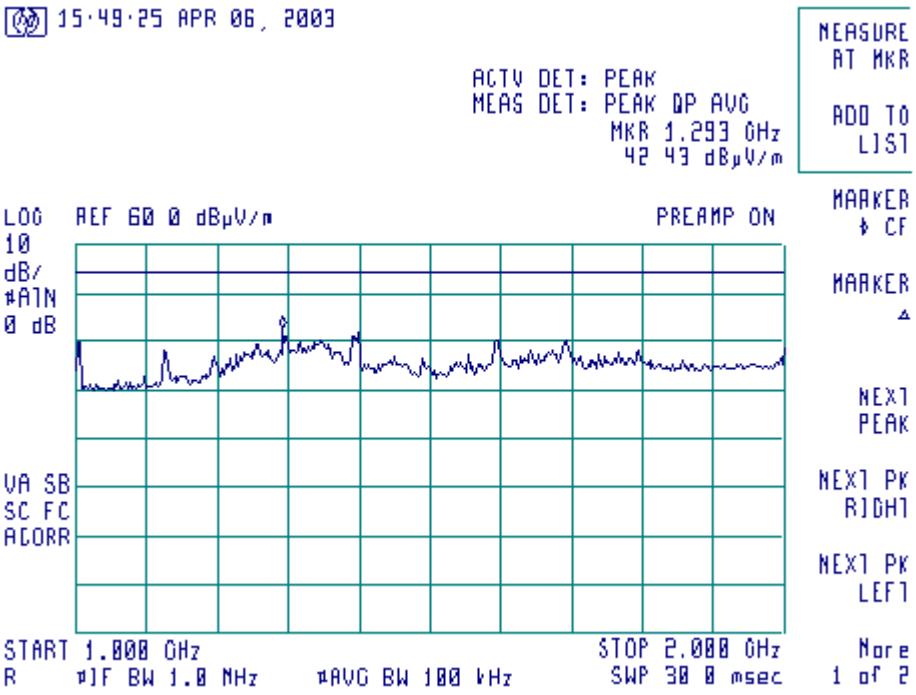
Plot A 57

Radiated spurious emission measurements in the anechoic chamber from 1000 to 2000 MHz, carrier frequency 5730 MHz



Frequency, MHz	Peak measurement, dB(uV/m	Peak limit, dB(uV/m)	Margin, dB	Avg measurement, dB(uV/m)	Avg. limit, dB(uV/m)	Margin, dB
1125	42.19	74.00	31.81	29.66	54.00	24.34
1300	44.84	74.00	29.16	24.90	54.00	29.10
1398	43.05	74.00	30.95	22.66	54.00	31.34
1594	40.39	74.00	33.61	23.15	54.00	30.85

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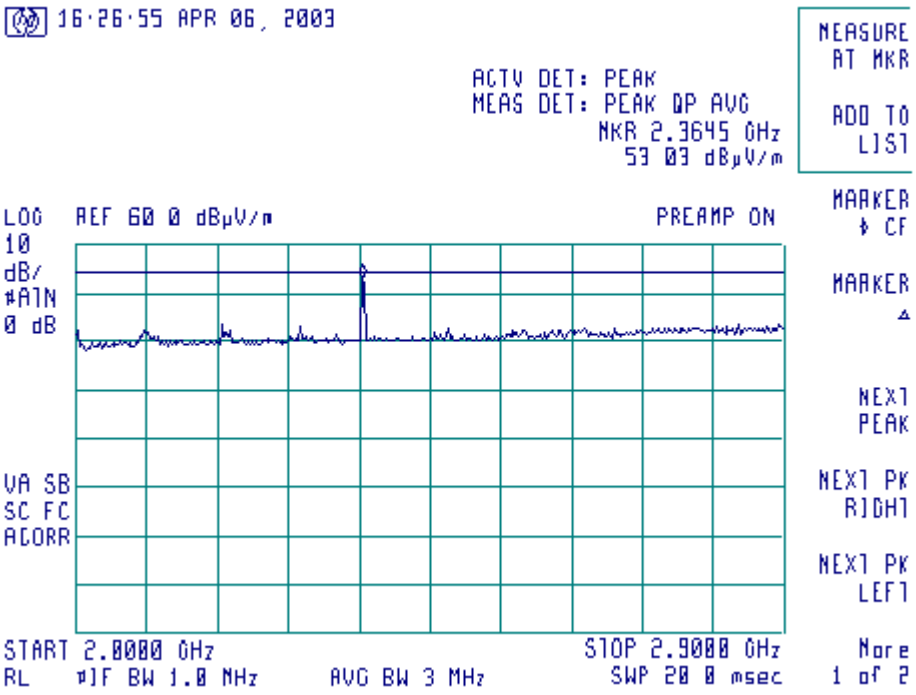
Plot A 58

Radiated spurious emission measurements in the anechoic chamber from 2000 to 2900 MHz, carrier frequency 5730 MHz



Frequency, MHz	Peak measurement, dB(uV/m	Peak limit, dB(uV/m)	Margin, dB	Avg measurement, dB(uV/m)	Avg. limit, dB(uV/m)	Margin, dB
2365	54.50	74.00	19.5	52.50	54.00	1.5

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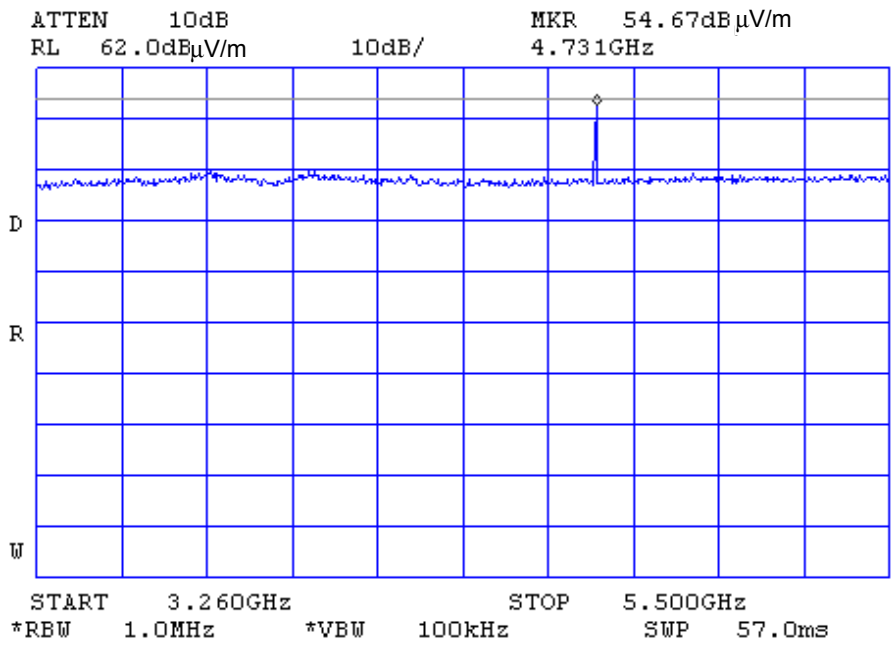
Plot A 59

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5730 MHz



RESTRICTED BAND
2nd harmonic of LO

The maximum was found with vertical polarization of test antenna.

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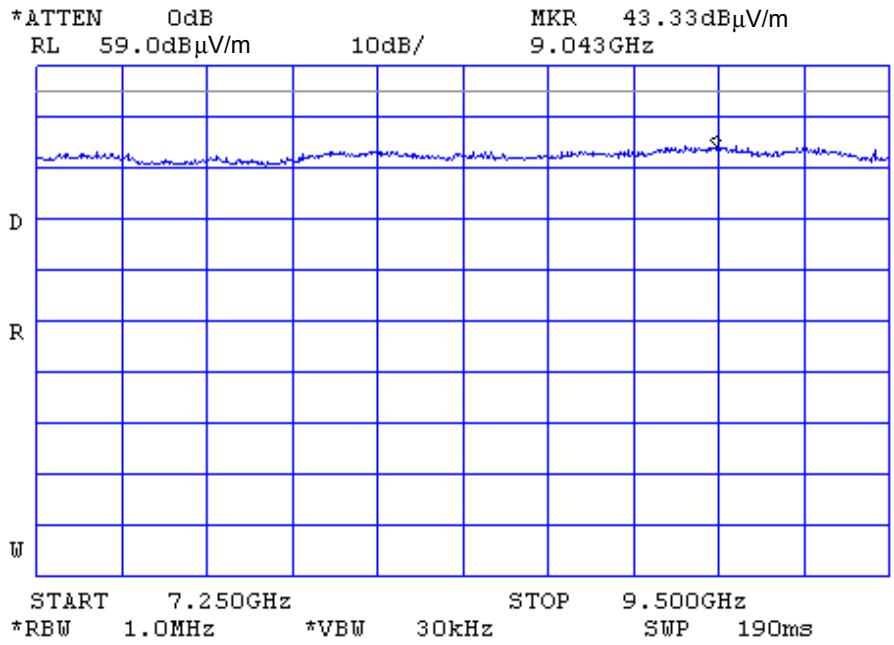
Plot A 60

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5730 MHz



Frequency, MHz	Peak measurement, dB(uV/m	Peak limit, dB(uV/m)	Margin, dB	Avg measurement, dB(uV/m)	Avg. limit, dB(uV/m)	Margin, dB
9460	49.80	74.00	24.2	37.80	54.00	16.2

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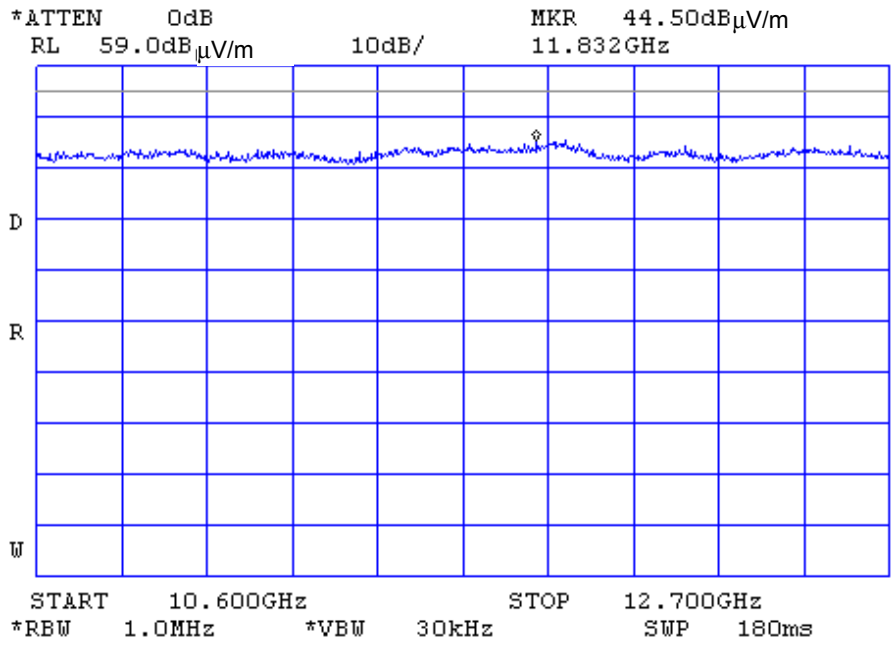
Plot A 61

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5730 MHz



No spurious emissions were found

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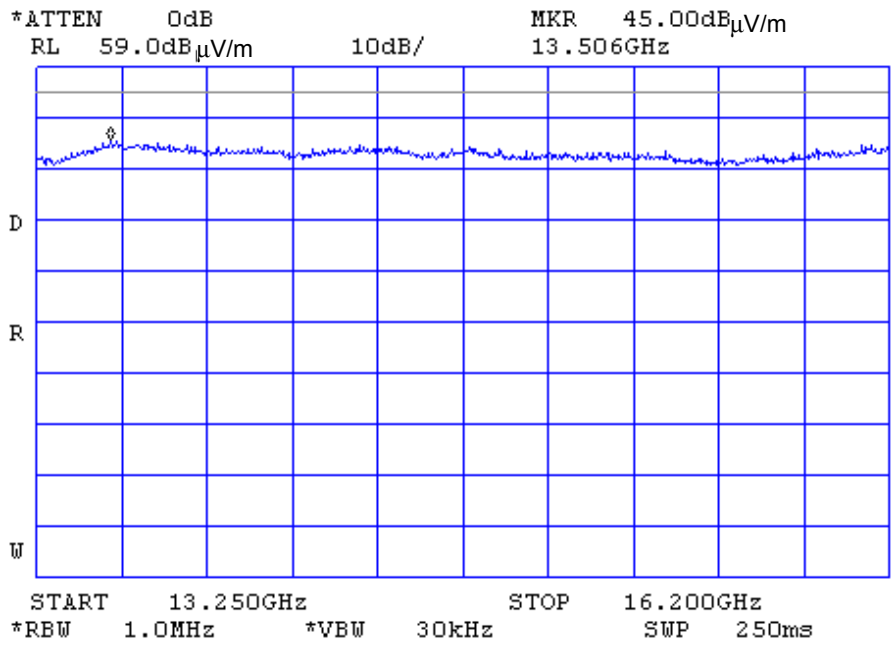
Plot A 62

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5730 MHz



No spurious emissions were found

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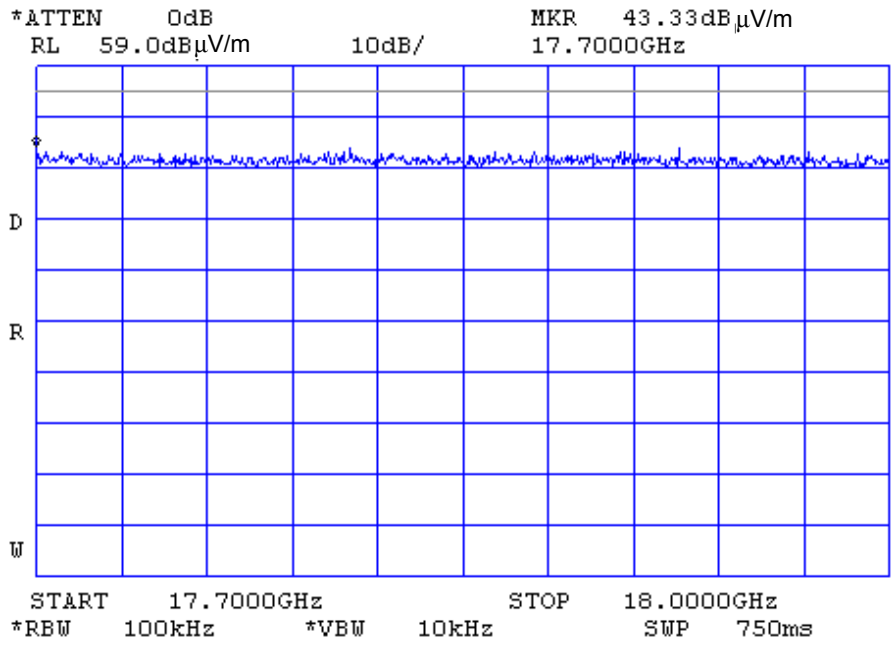
Plot A 63

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5730 MHz



No spurious emissions were found

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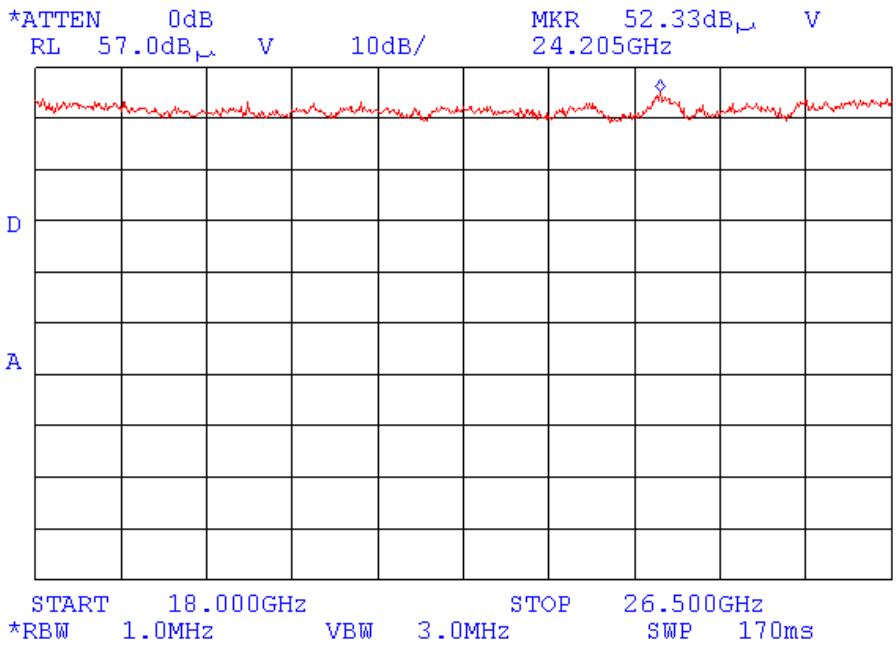
Plot A 64

Radiated spurious emission measurements at the OATS from 18 to 26.5 GHz, carrier frequency 5730 MHz



No spurious emissions were found.
Limit: 54 dB(µV/m)
Noise floor peak value: 52.33 dBµV + 32 dB(1/m) + 3.6 dB – 42.4 dB = 45.53 dB(µV/m), where
Antenna factor = 32 dB(1/m)
Max cable loss = 3.6 dB
Min LNA (low noise amplifier) gain = 42.4 dB

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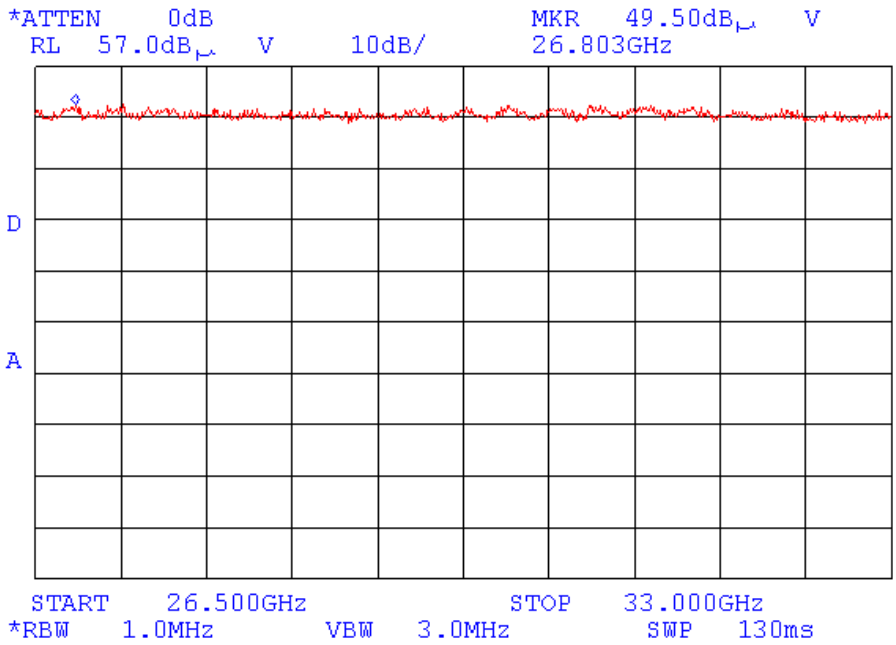
Plot A 65

Radiated spurious emission measurements at the OATS from 26.5 to 33 GHz, carrier frequency 5730 MHz



No spurious emissions were found
Limit: 54 dB(µV/m)
Noise floor peak value: 49.5 dBµV + 35.5 dB(1/m) + 3.7 dB – 40.7 dB = 48.0 dB(µV/m), where

Antenna factor = 35.5 dB(1/m)
Max cable loss = 3.7 dB
Min LNA (low noise amplifier) gain = 40.7 dB

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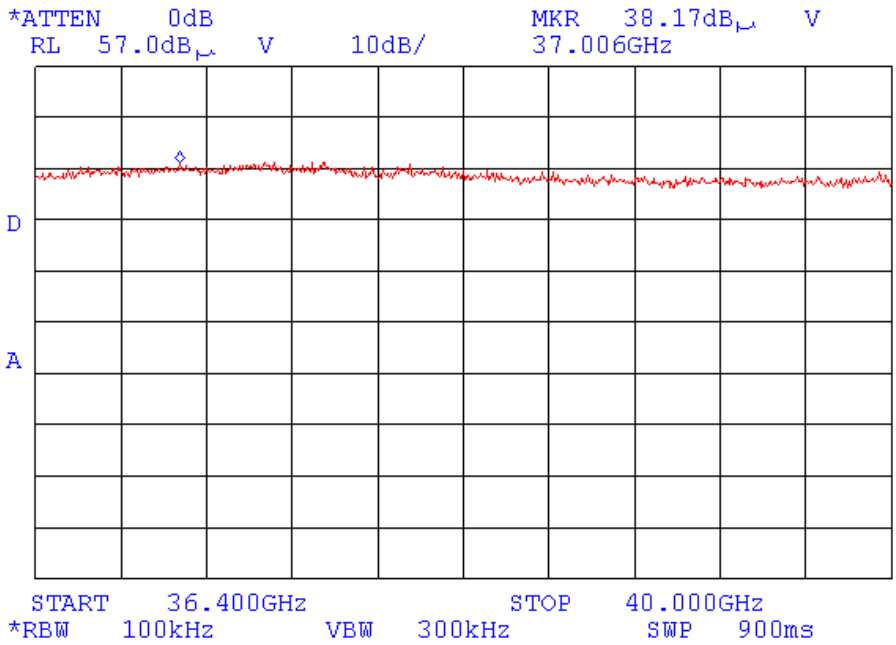
Plot A 66

Radiated spurious emission measurements at the OATS from 36.4 to 40 GHz, carrier frequency 5730 MHz



No spurious emissions were found
Limit: 54 dB(µV/m)
Noise floor peak value: 38.17 dBµV + 35.5 dB(1/m) + 4.2 dB – 35 dB = 42.87 dB(µV/m), where

Antenna factor = 35.5 dB(1/m)
Max cable loss = 4.2 dB
Min LNA (low noise amplifier) gain = 35 dB

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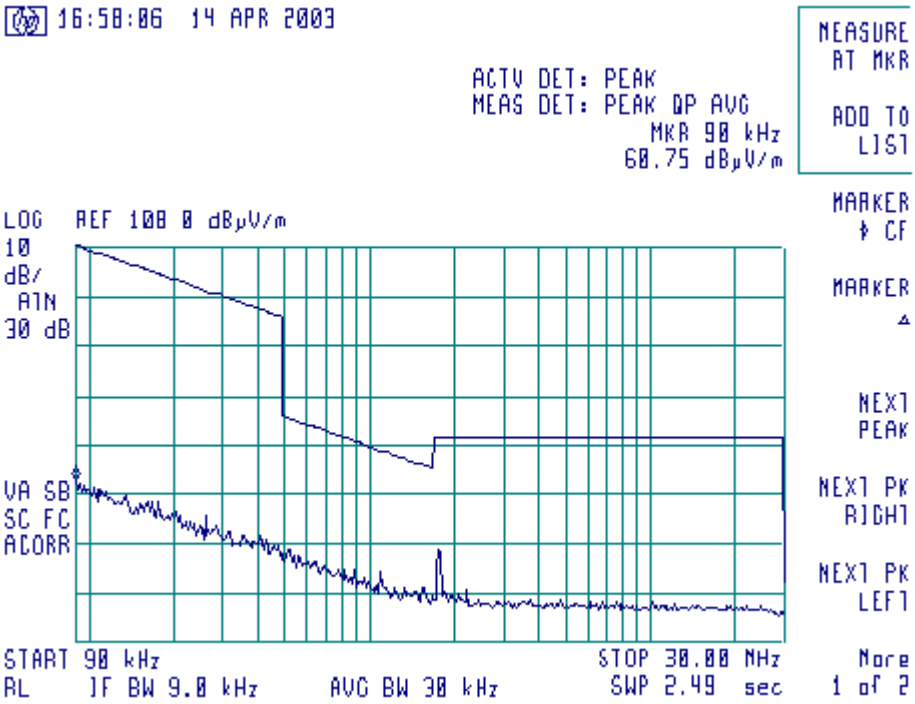
Plot A 67

Radiated spurious emission measurements in the anechoic chamber from 9 kHz to 30 MHz, carrier frequency 5790 MHz



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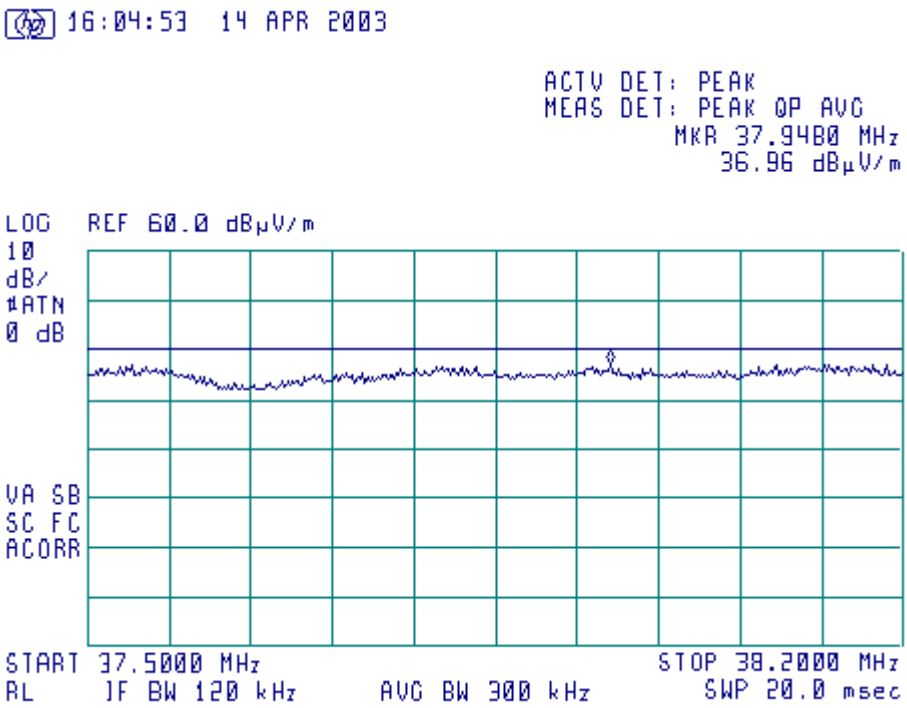
Plot A 68

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5790 MHz



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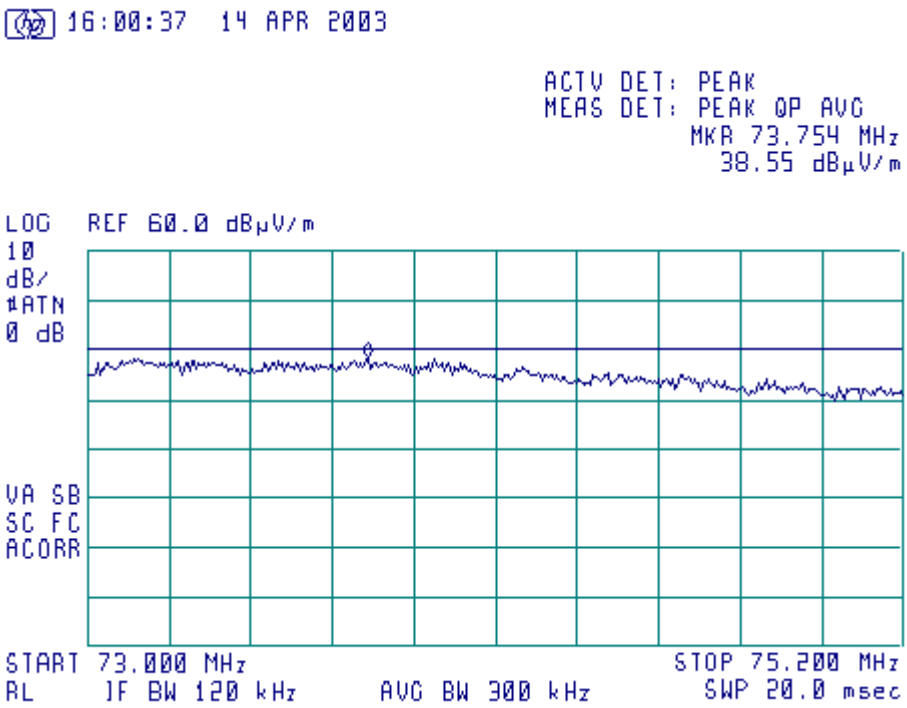
Plot A 69

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5790 MHz



Frequency, MHz	Peak measurement, dB(uV/m)	QP measurement, dB(uV/m)	Limit, dB(uV/m)	Margin, dB
73.737750	39.77	35.77	40.00	4.23

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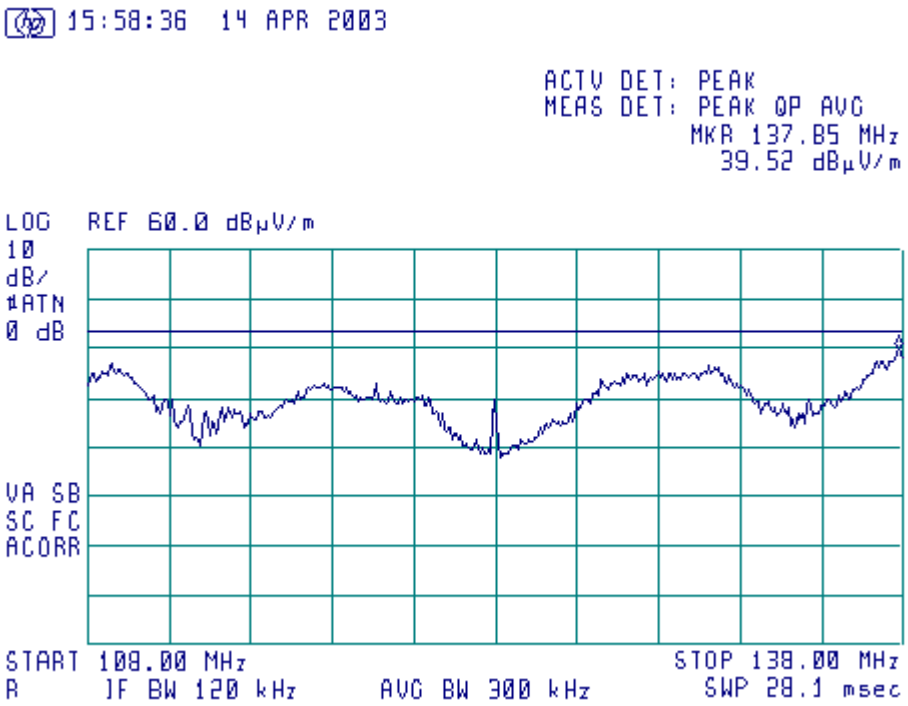
Plot A 70

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5790 MHz



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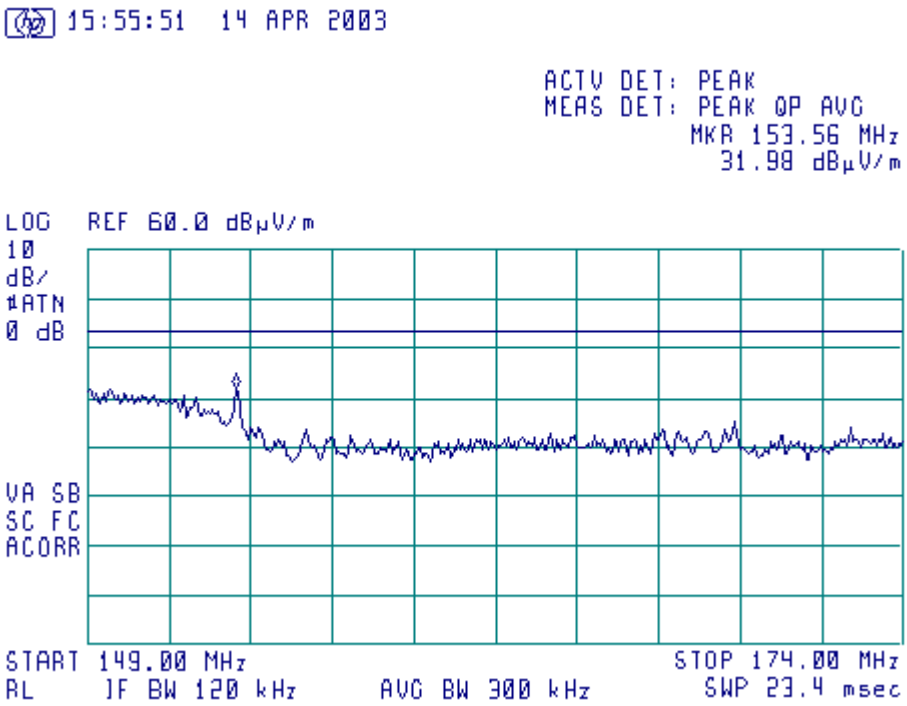
Plot A 71

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5790 MHz



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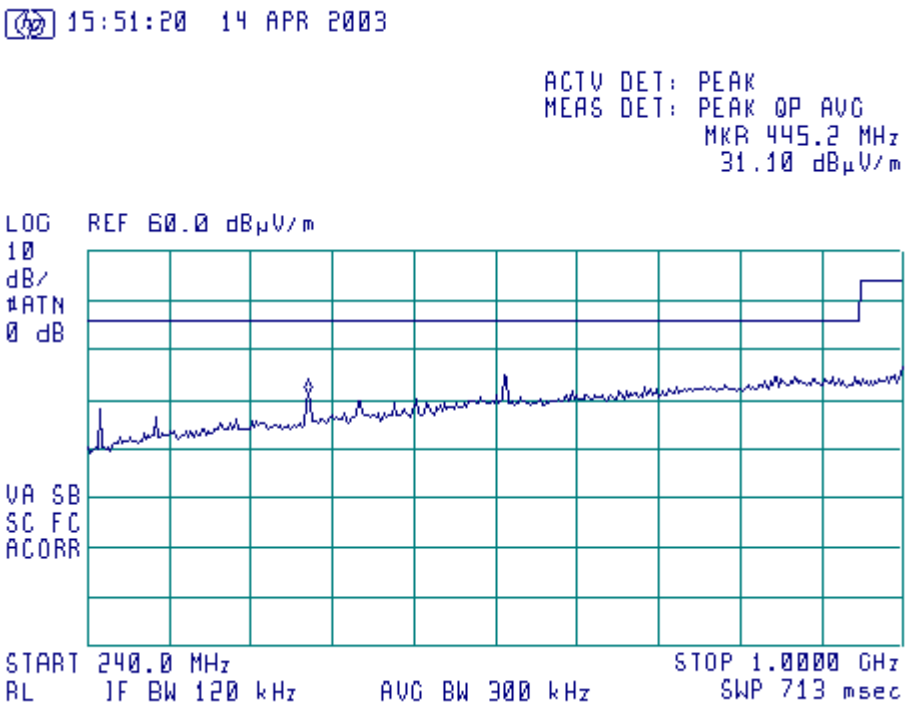
Plot A 72

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5790 MHz



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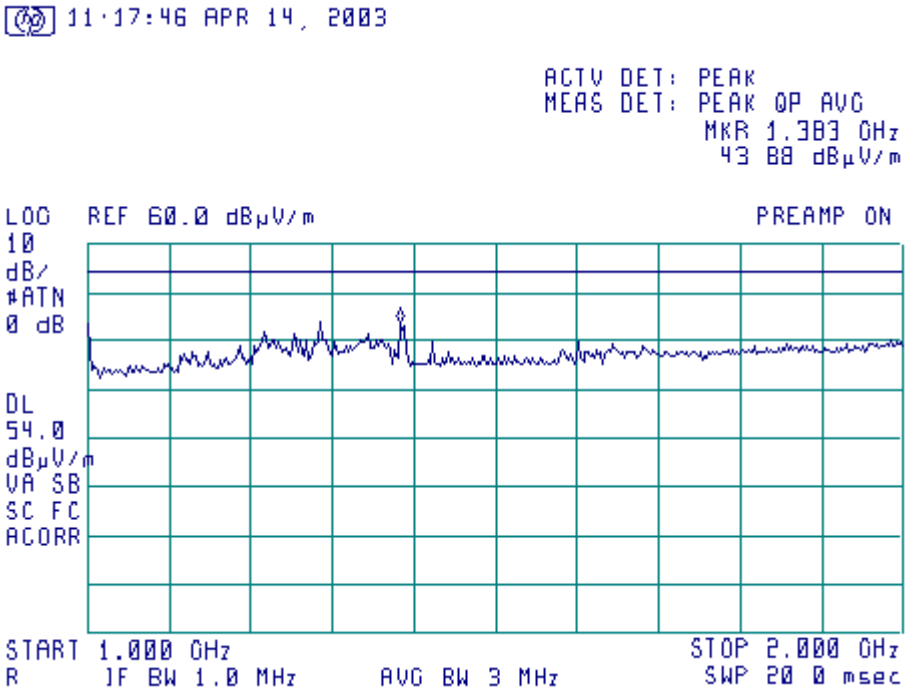
Plot A 73

Radiated spurious emission measurements in the anechoic chamber from 1000 to 2000 MHz, carrier frequency 5790 MHz



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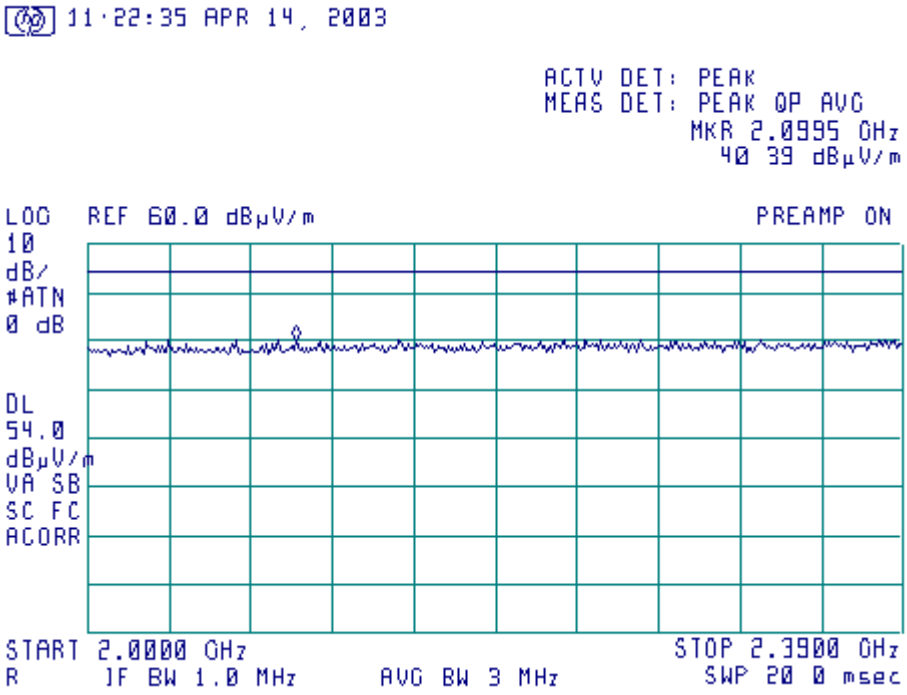
Plot A 74

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5790 MHz



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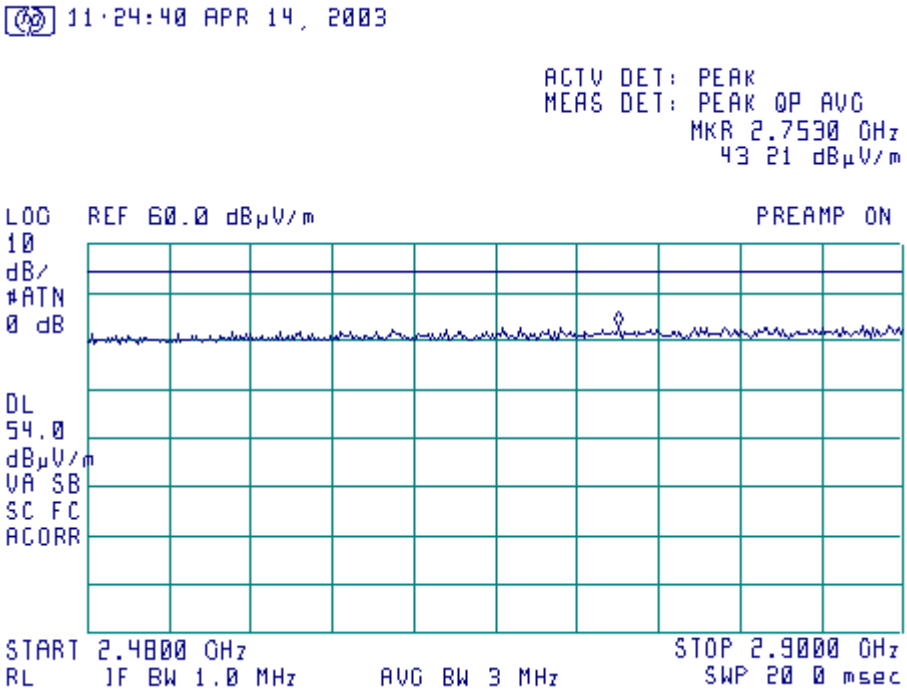
Plot A 75

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5790 MHz



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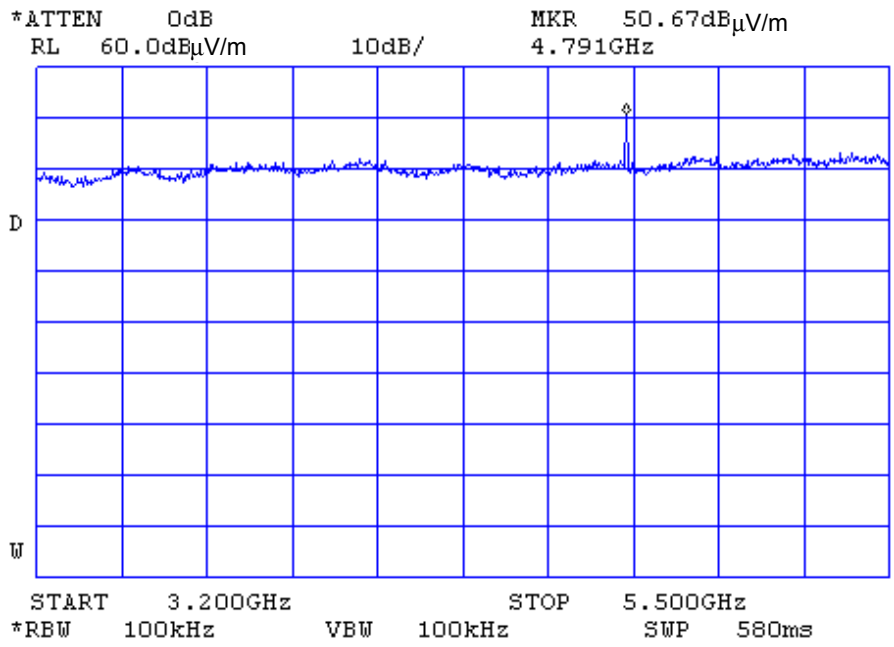
Plot A 76

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5790 MHz



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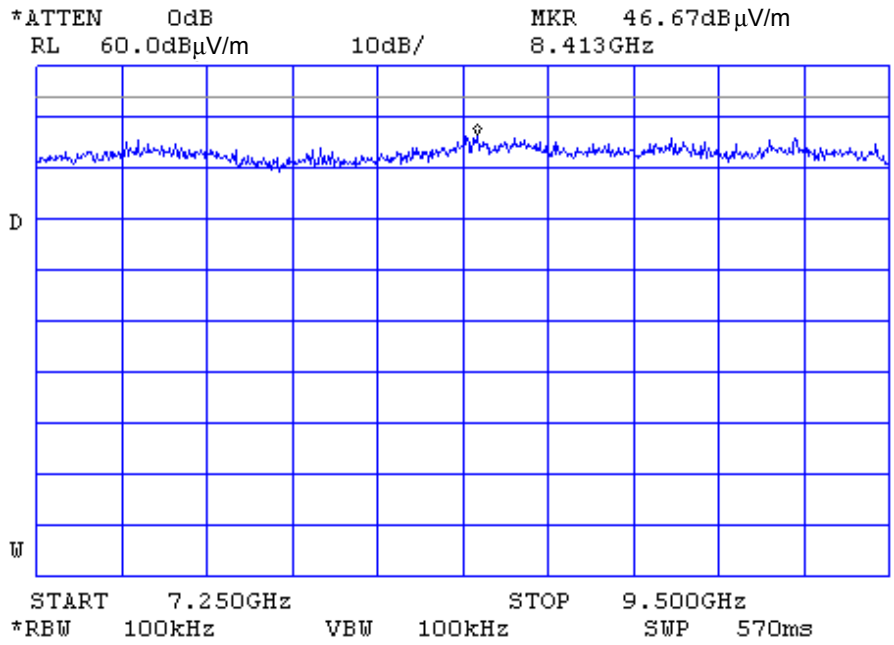
Plot A 77

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5790 MHz



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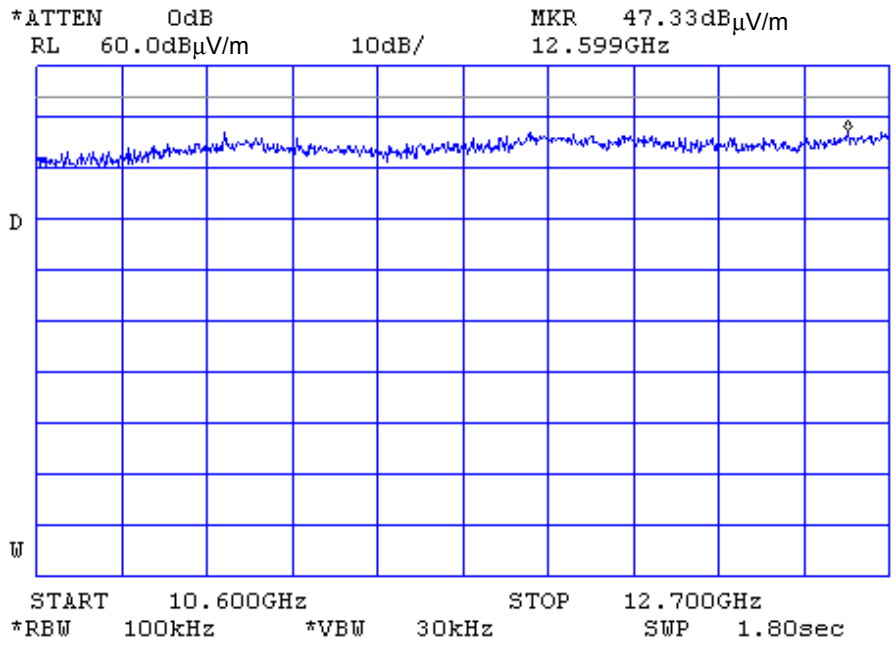
Plot A 78

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5790 MHz



No spurious emissions were found.

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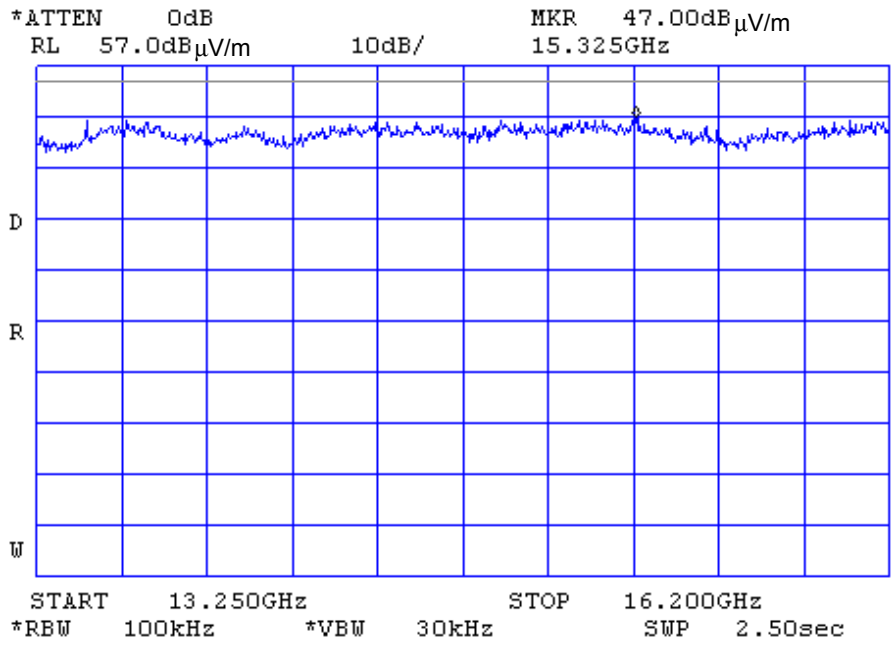
Plot A 79

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5790 MHz



No spurious emissions were found.

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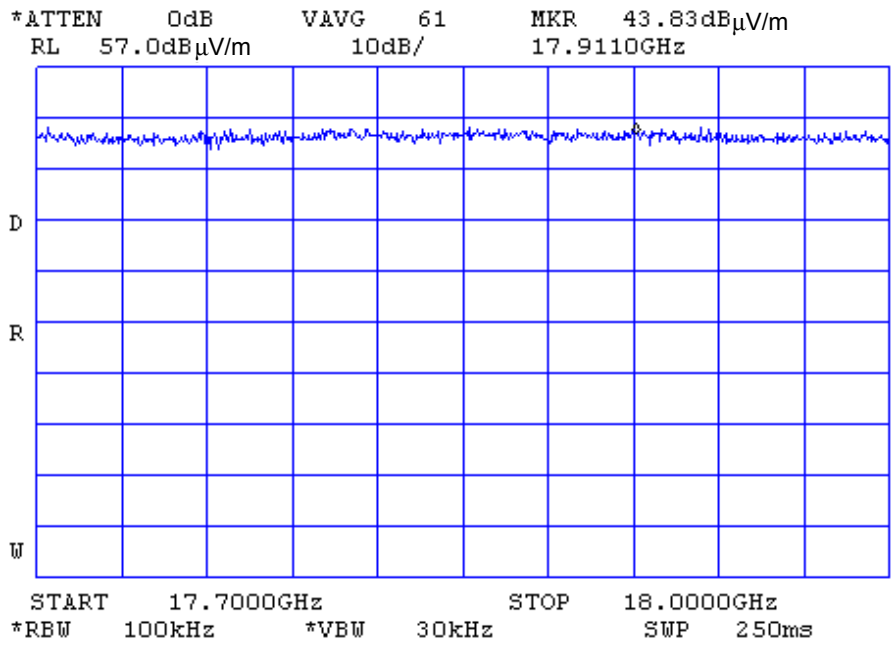
Plot A 80

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5790 MHz



No spurious emissions were found.

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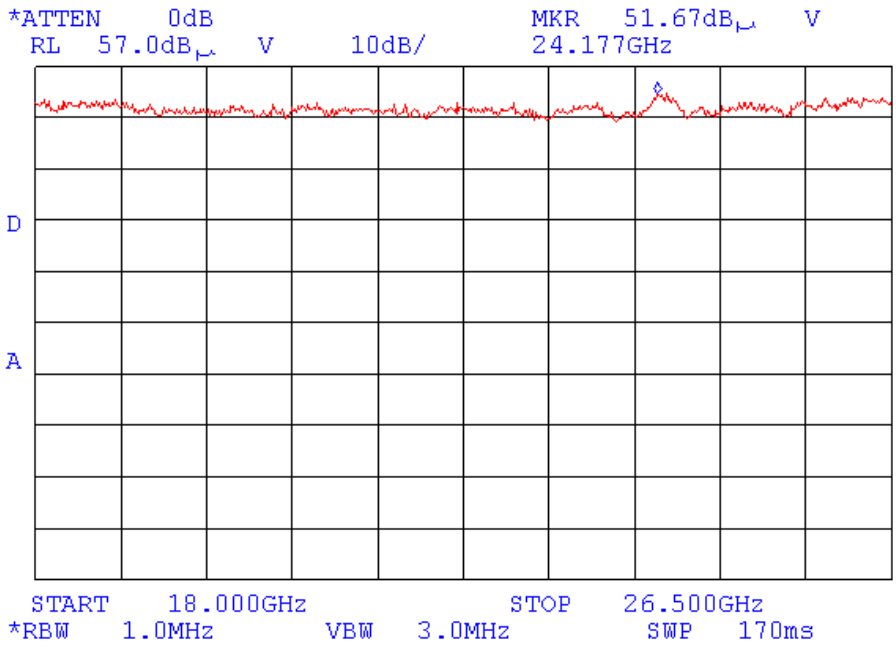
Plot A 81

Radiated spurious emission measurements at the OATS from 18 to 26.5 GHz, carrier frequency 5790 MHz



No spurious emissions were found
Limit: 54 dB(µV/m)
Noise floor peak value: 51.67 dBµV + 32 dB(1/m) + 3.6 dB – 42.4 dB = 44.87 dB(µV/m), where

Antenna factor = 32 dB(1/m)
Max cable loss = 3.6 dB
Min LNA (low noise amplifier) gain = 42.4 dB

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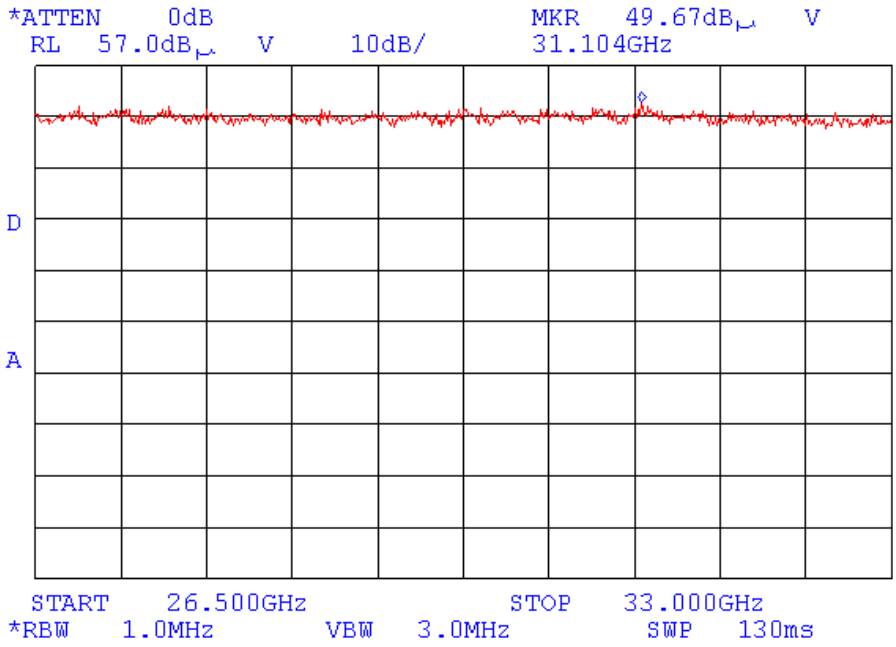
Plot A 82

Radiated spurious emission measurements at the OATS from 26.5 to 33 GHz, carrier frequency 5790 MHz



No spurious emissions were found
Limit: 54 dB(µV/m)
Noise floor peak value: 49.67 dBµV + 35.5 dB(1/m) + 3.7 dB – 40.7 dB = 48.17 dB(µV/m), where

Antenna factor = 35.5 dB(1/m)
Max cable loss = 3.7 dB
Min LNA (low noise amplifier) gain = 40.7 dB

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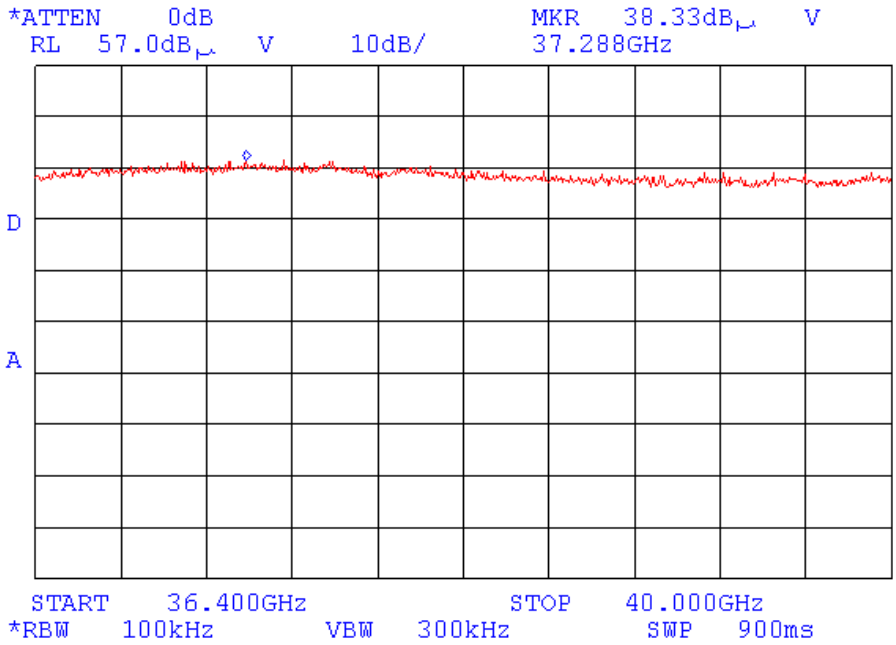
Plot A 83

Radiated spurious emission measurements at the OATS from 36.4 to 40 GHz, carrier frequency 5790 MHz



No spurious emissions were found
Limit: 54 dB(µV/m)
Noise floor peak value: 38.33 dBµV + 35.5 dB(1/m) + 4.2 dB – 35 dB = 43.03 dB(µV/m), where

Antenna factor = 35.5 dB(1/m)
Max cable loss = 4.2 dB
Min LNA (low noise amplifier) gain = 35 dB

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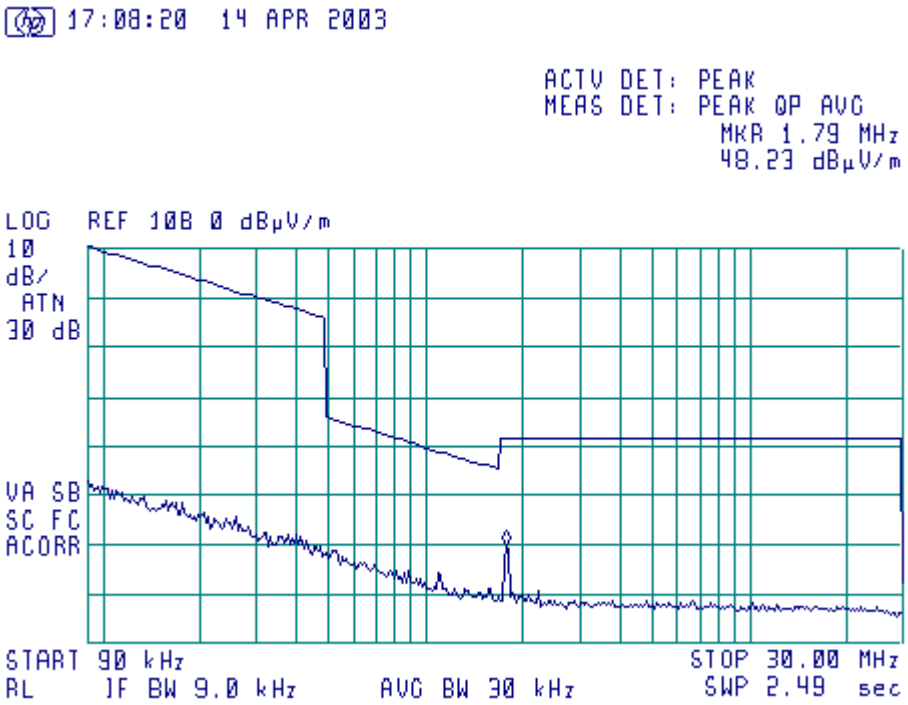
Plot A 84

Radiated spurious emission measurements in the anechoic chamber from 9 kHz to 30 MHz, carrier frequency 5840 MHz



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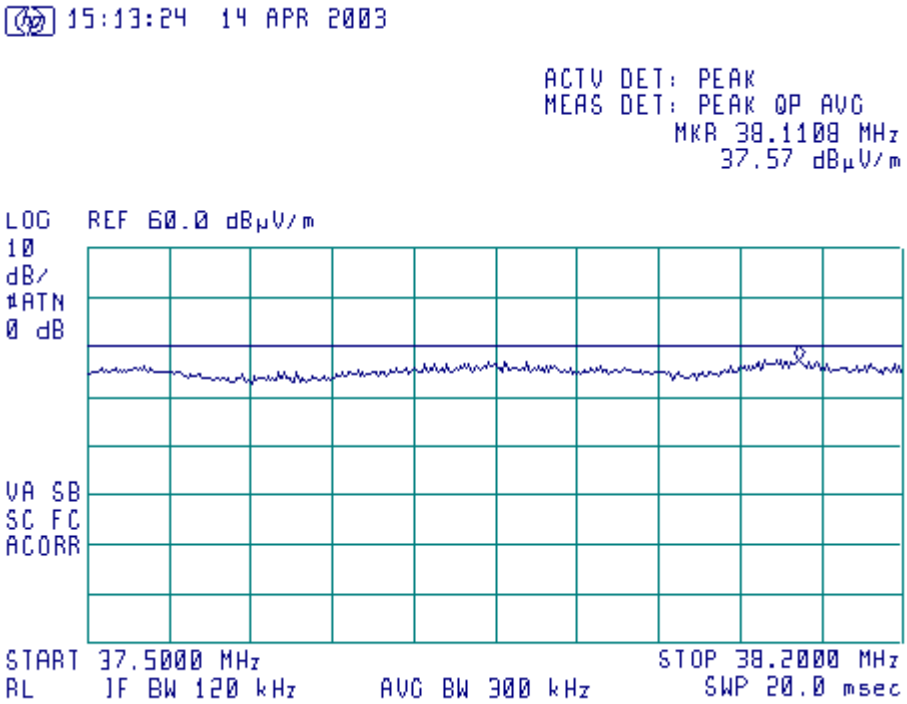
Plot A 85

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5840 MHz



Frequency, MHz	Peak measurement, dB(uV/m)	QP measurement, dB(uV/m)	Limit, dB(uV/m)	Margin, dB
37.82	36.3	31.9	40.00	8.1
38.11	37.6	32.5	40.00	7.5

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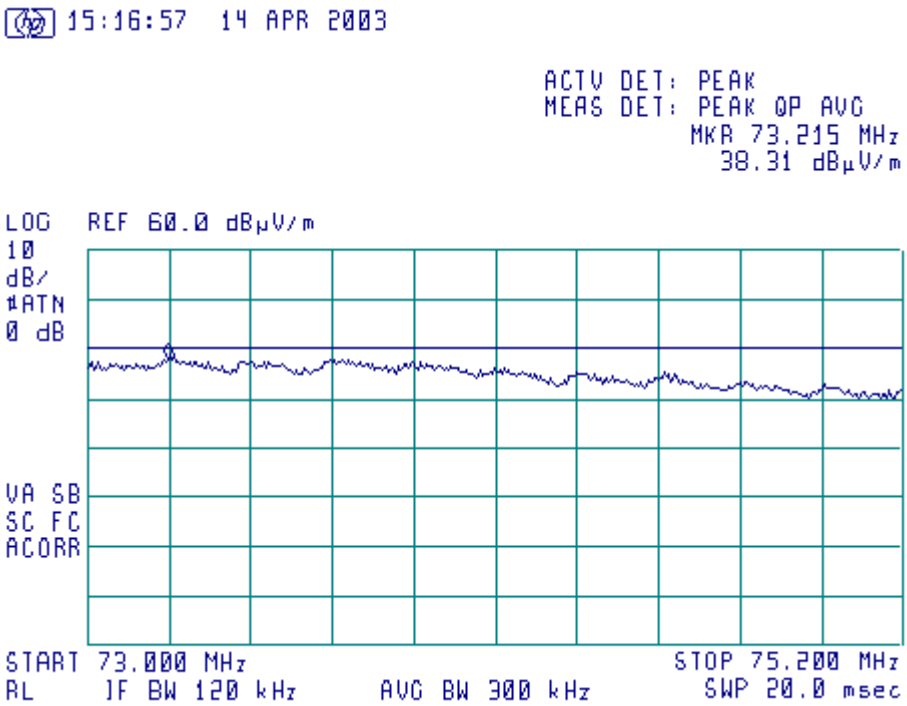
Plot A 86

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5840 MHz



Frequency, MHz	Peak measurement, dB(uV/m)	QP measurement, dB(uV/m)	Limit, dB(uV/m)	Margin, dB
73.25	39.0	35.1	40.00	4.9

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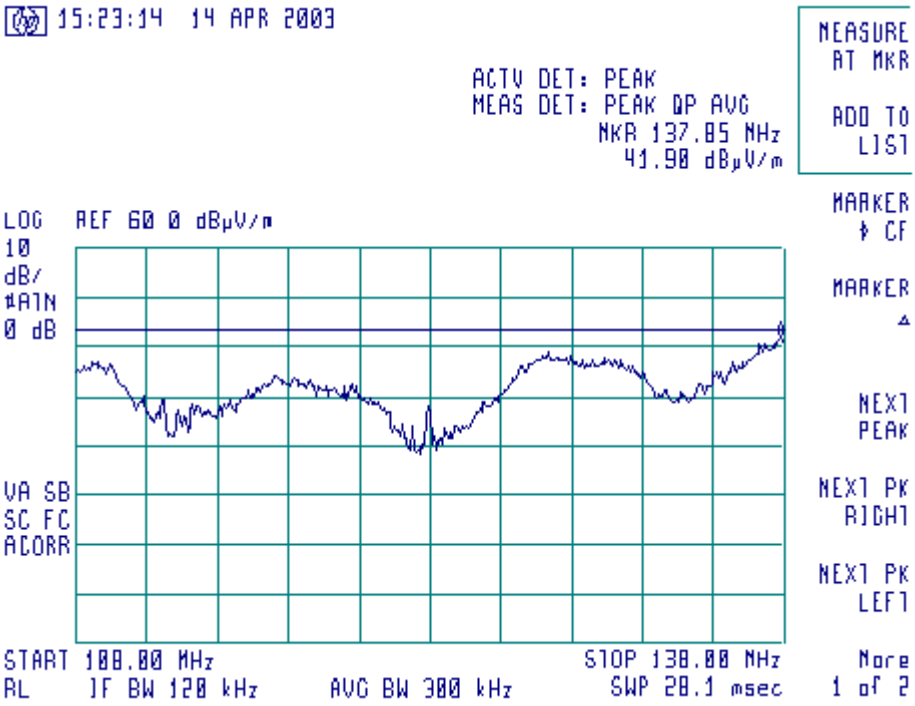
Plot A 87

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5840 MHz



Frequency, MHz	Peak measurement, dB(uV/m)	QP measurement, dB(uV/m)	Limit, dB(uV/m)	Margin, dB
127.89	38.12	34.60	43.50	8.90
131.05	34.69	31.72	43.50	11.78
137.75	41.07	37.78	43.50	5.72

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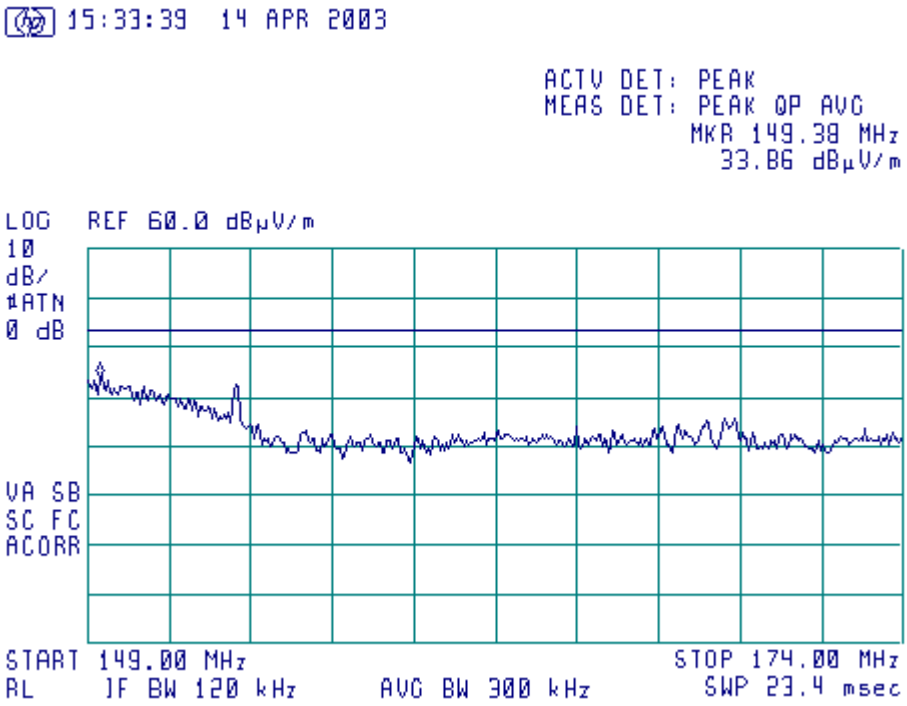
Plot A 88

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5840 MHz



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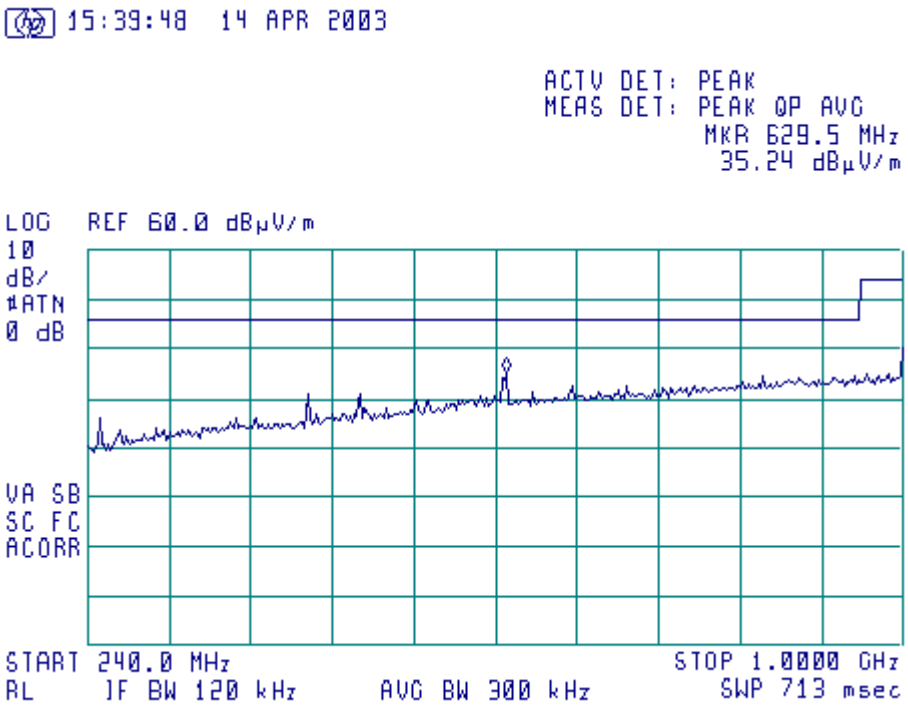
Plot A 89

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5840 MHz



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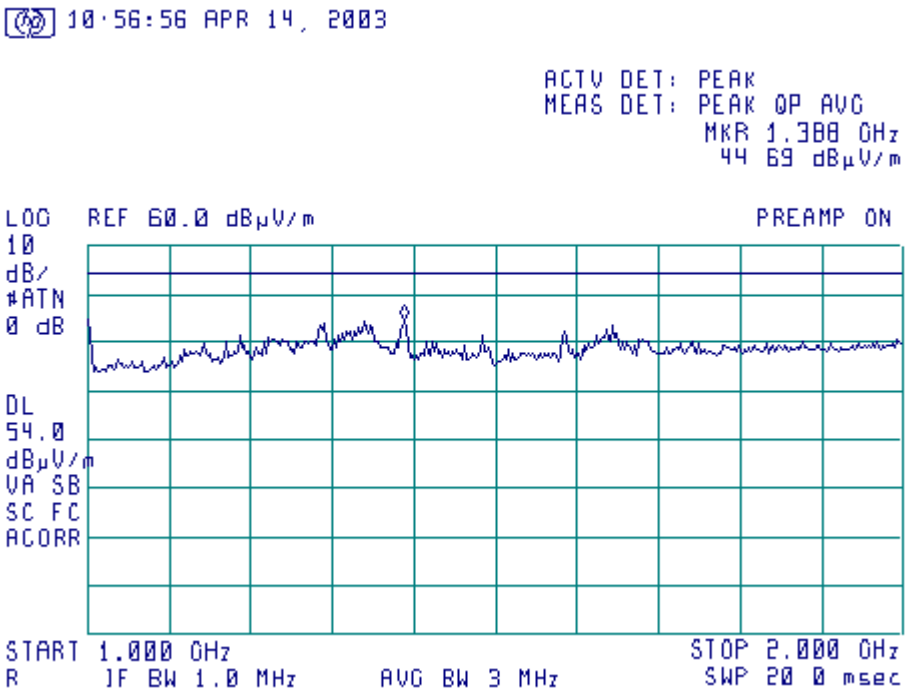
Plot A 90

Radiated spurious emission measurements in the anechoic chamber from 1000 to 2000 MHz, carrier frequency 5840 MHz



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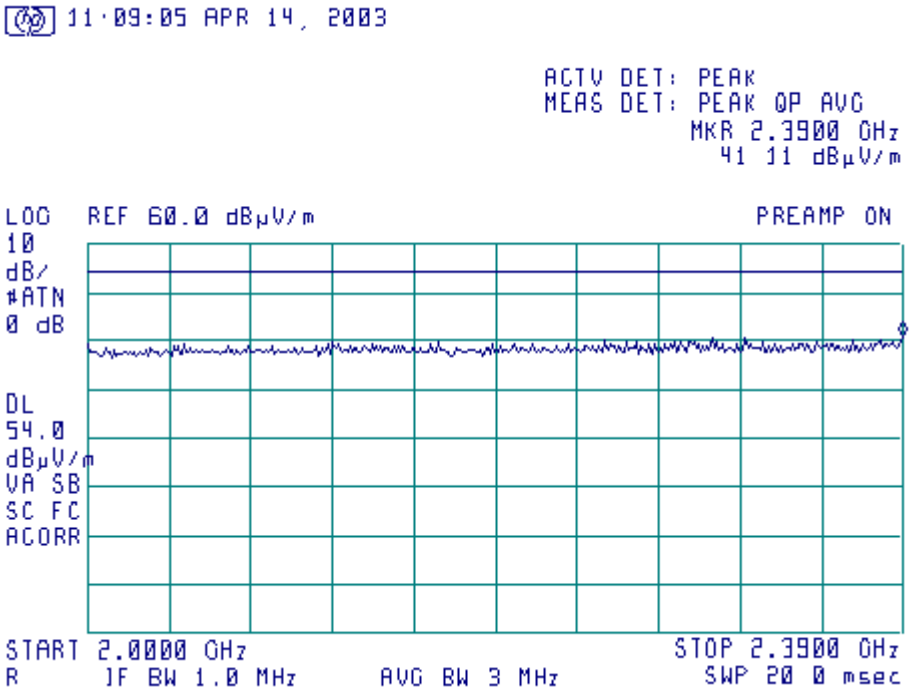
Plot A 91

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5840 MHz



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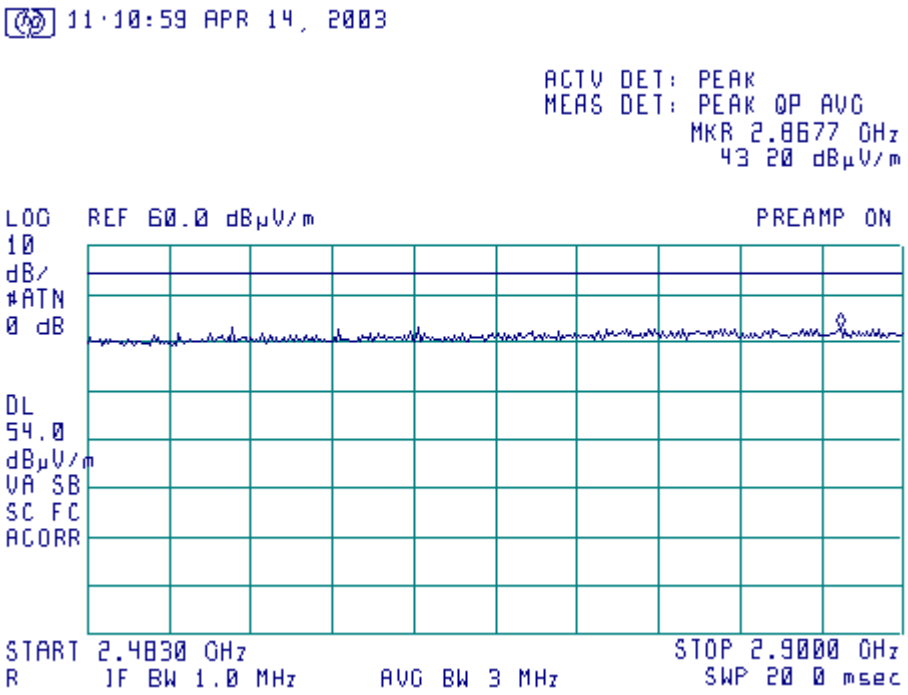
Plot A 92

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5840 MHz



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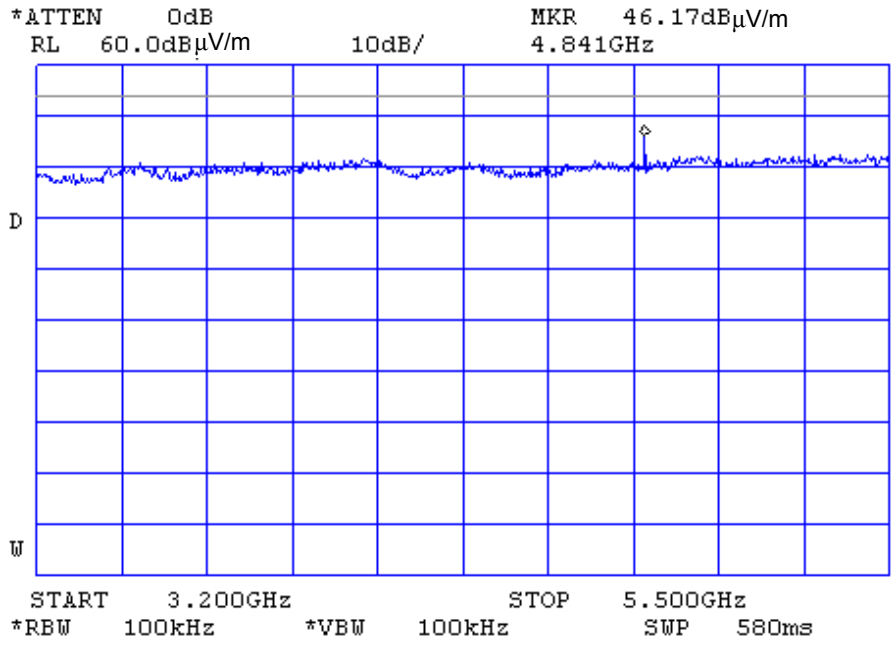
Plot A 93

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5840 MHz



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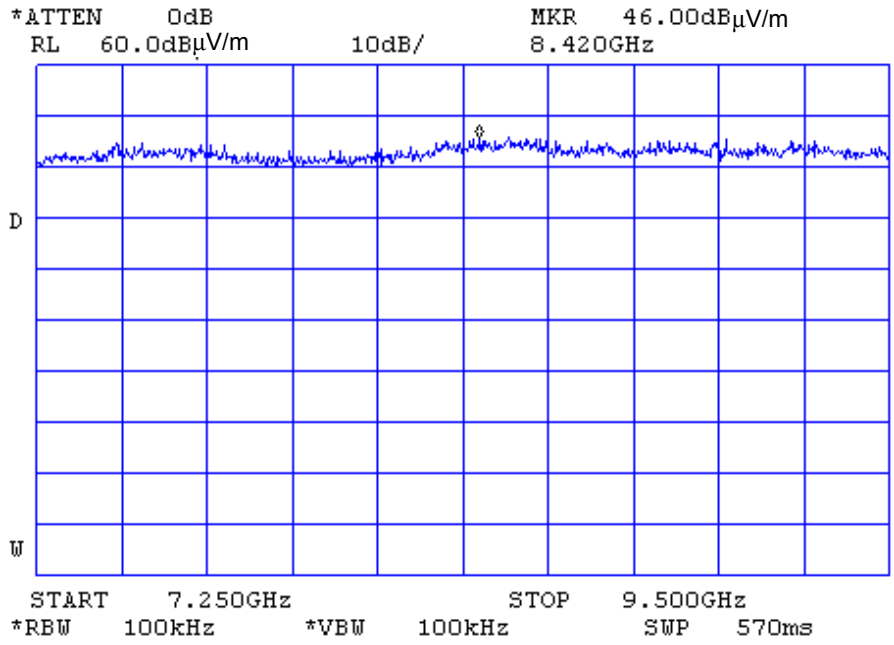
Plot A 94

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5840 MHz



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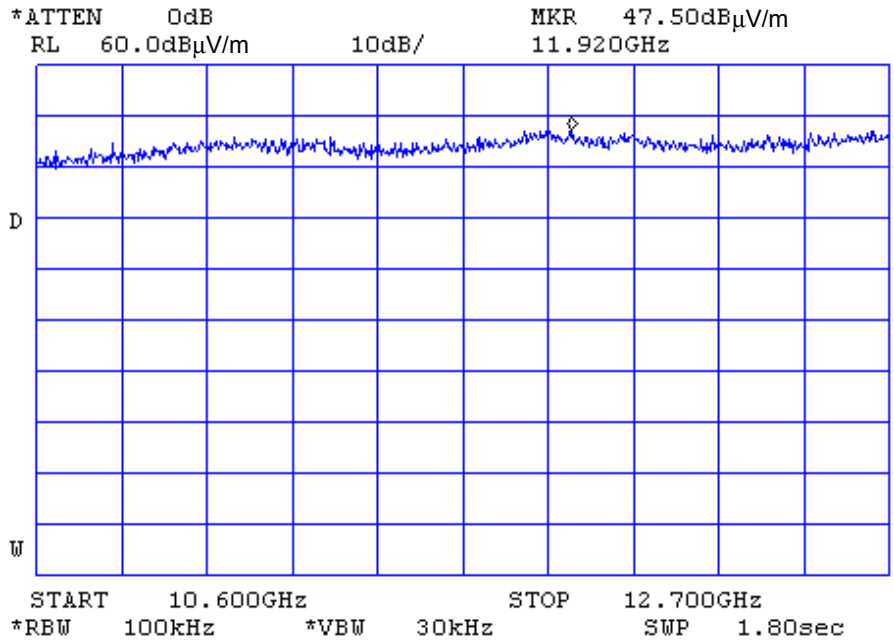
Plot A 95

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5840 MHz



No spurious emissions were found

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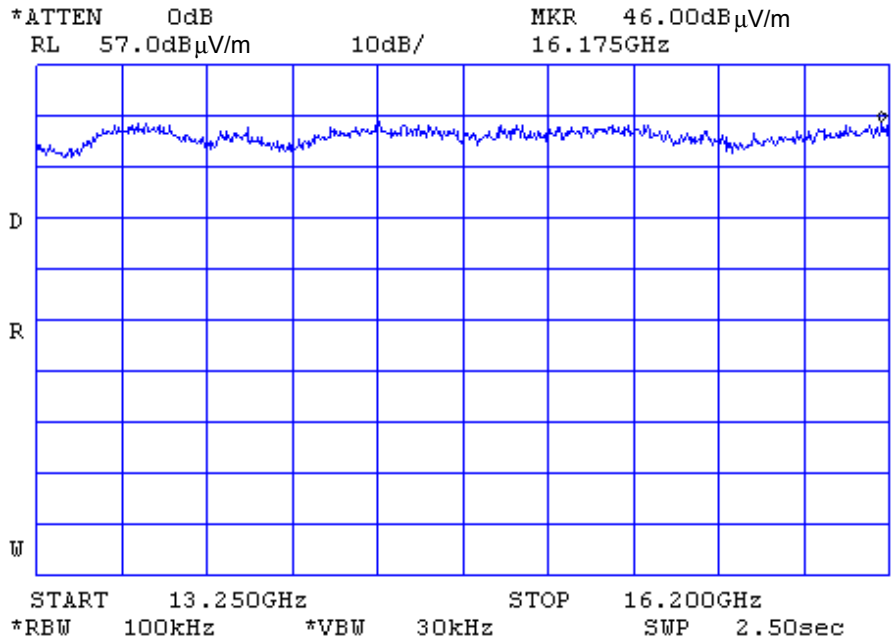
Plot A 96

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5840 MHz



No spurious emissions were found

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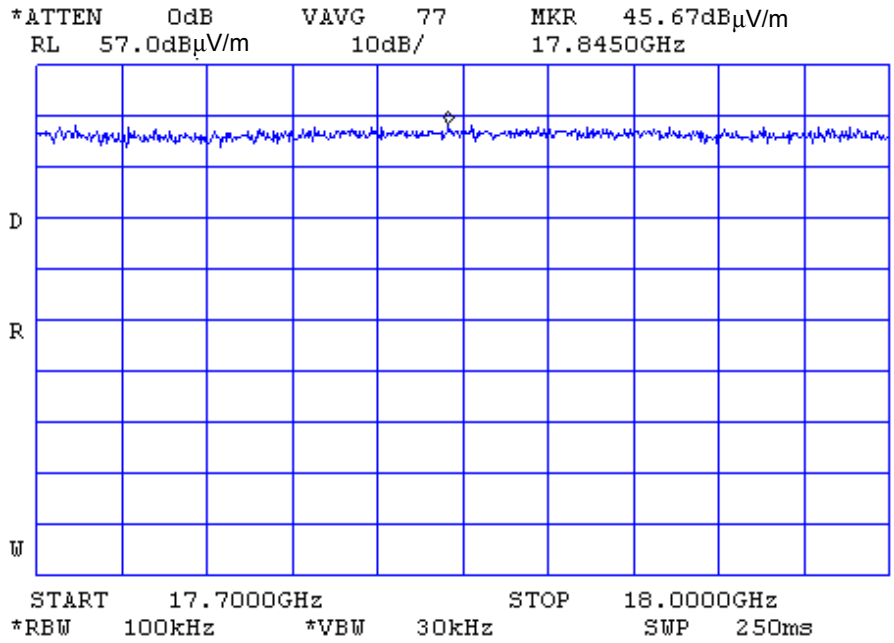
Plot A 97

Radiated spurious emission measurements in restricted bands in the anechoic chamber, carrier frequency 5840 MHz



No spurious emissions were found

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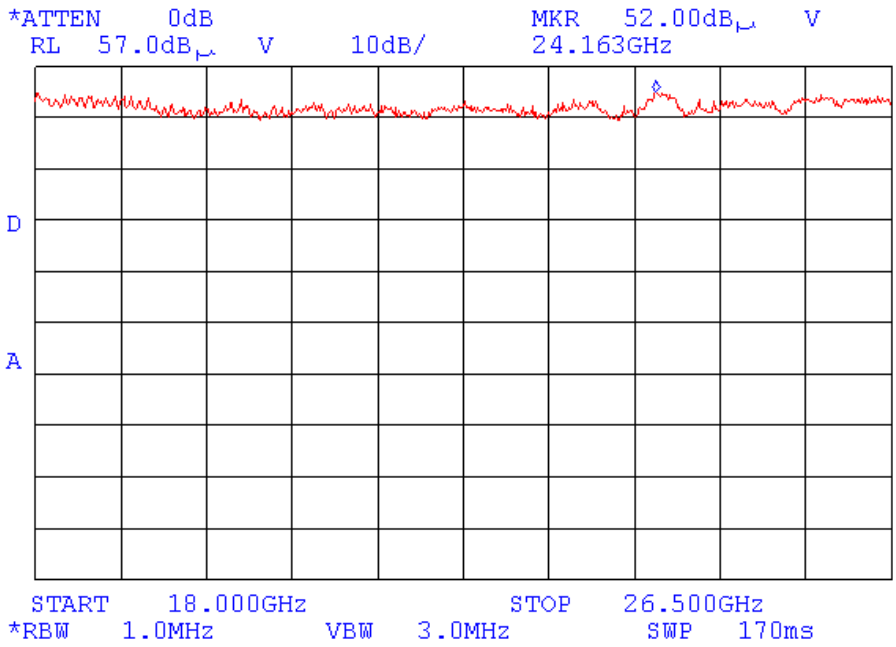
Plot A 98

Radiated spurious emission measurements at the OATS from 18 to 26.5 GHz, carrier frequency 5840 MHz



No spurious emissions were found.
Limit: 54 dB(µV/m)
Noise floor peak value: 52 dBµV + 32 dB(1/m) + 3.6 dB – 42.4 dB = 45.2 dB(µV/m), where
Antenna factor = 32 dB(1/m)
Max cable loss = 3.6 dB
Min LNA (low noise amplifier) gain = 42.4 dB

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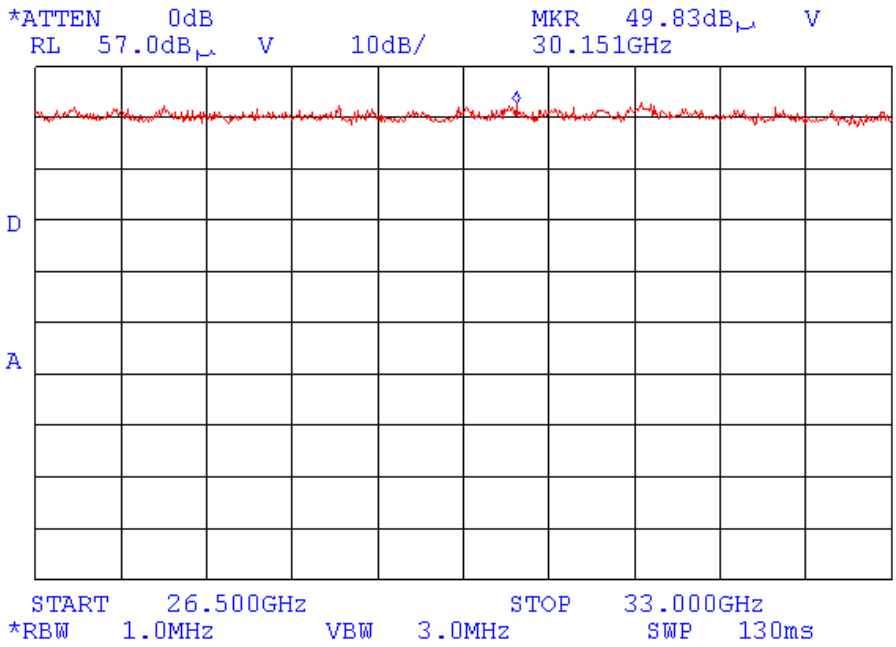
Plot A 99

Radiated spurious emission measurements at the OATS from 26.5 to 33 GHz, carrier frequency 5840 MHz



No spurious emissions were found.
Limit: 54 dB(µV/m)
Noise floor peak value: 49.83 dBµV + 35.5 dB(1/m) + 3.7 dB – 40.7 dB = 48.33 dB(µV/m), where
Antenna factor = 35.5 dB(1/m)
Max cable loss = 3.7 dB
Min LNA (low noise amplifier) gain = 40.7 dB

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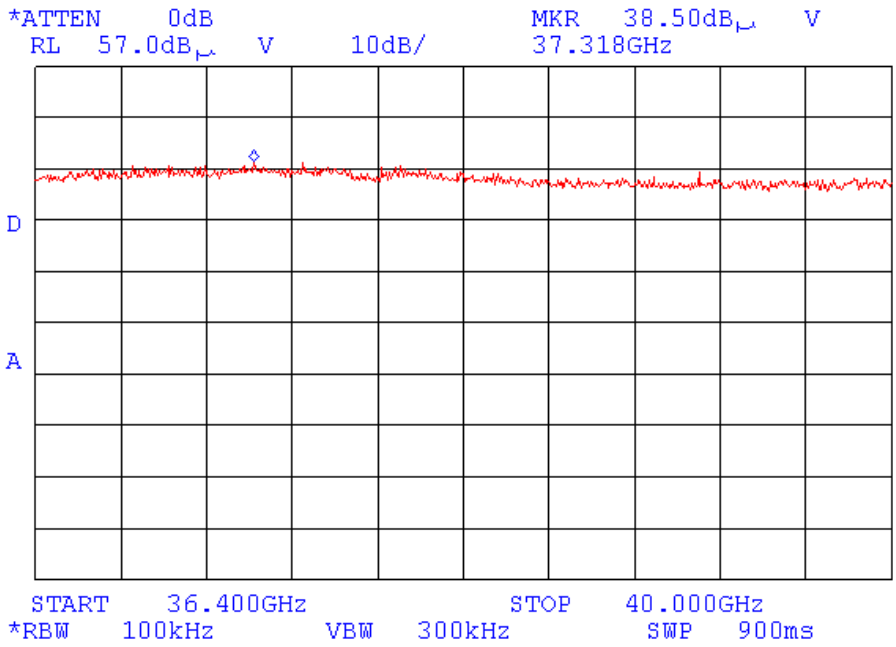
Plot A 100

Radiated spurious emission measurements at the OATS from 36.4 to 40 GHz, carrier frequency 5840 MHz



No spurious emissions were found.
Limit: 54 dB(µV/m)
Noise floor peak value: 38.50 dBµV + 35.5 dB(1/m) + 4.2 dB – 35 dB = 43.2 dB(µV/m), where
Antenna factor = 35.5 dB(1/m)
Max cable loss = 4.2 dB
Min LNA (low noise amplifier) gain = 35 dB

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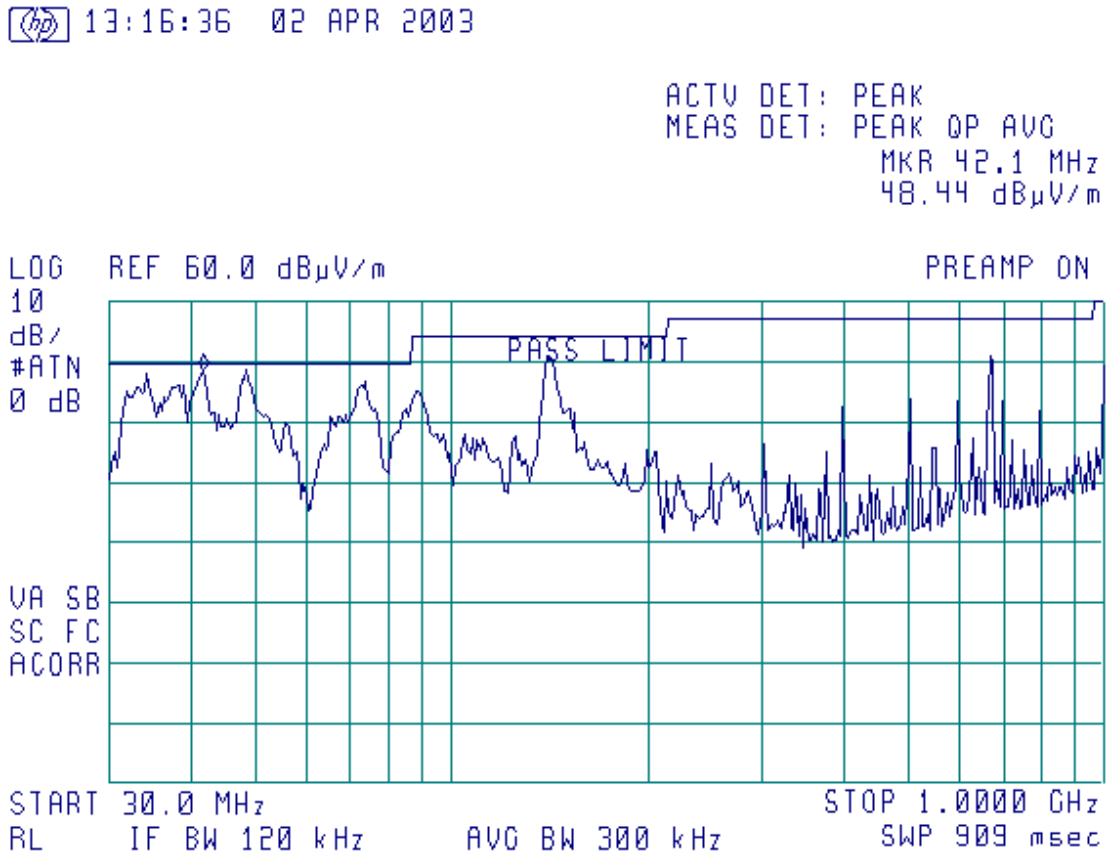
Plot A 101

Radiated emission measurements in the anechoic chamber from 30 MHz to 1 GHz, test distance 10 m, vertical & horizontal antenna polarization



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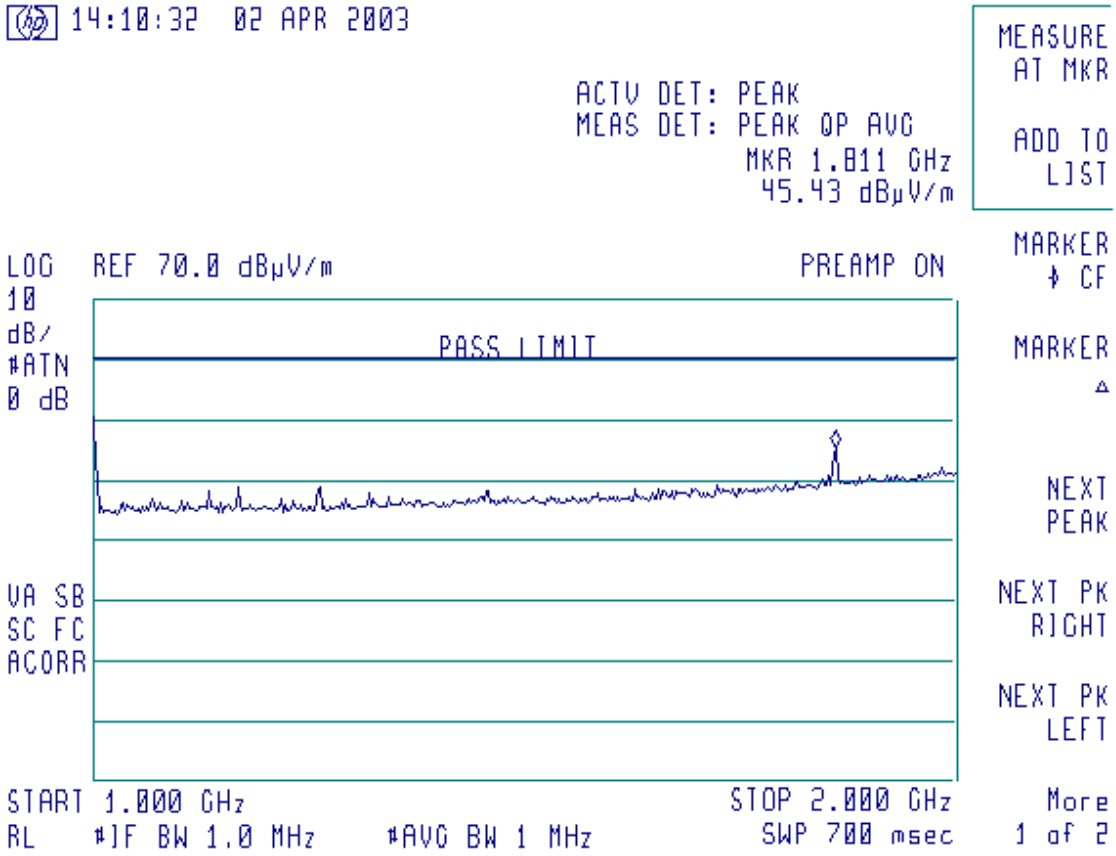
Plot A 102

Radiated emission measurements in the anechoic chamber from 1 to 2 GHz, test distance 10 m, vertical & horizontal antenna polarization



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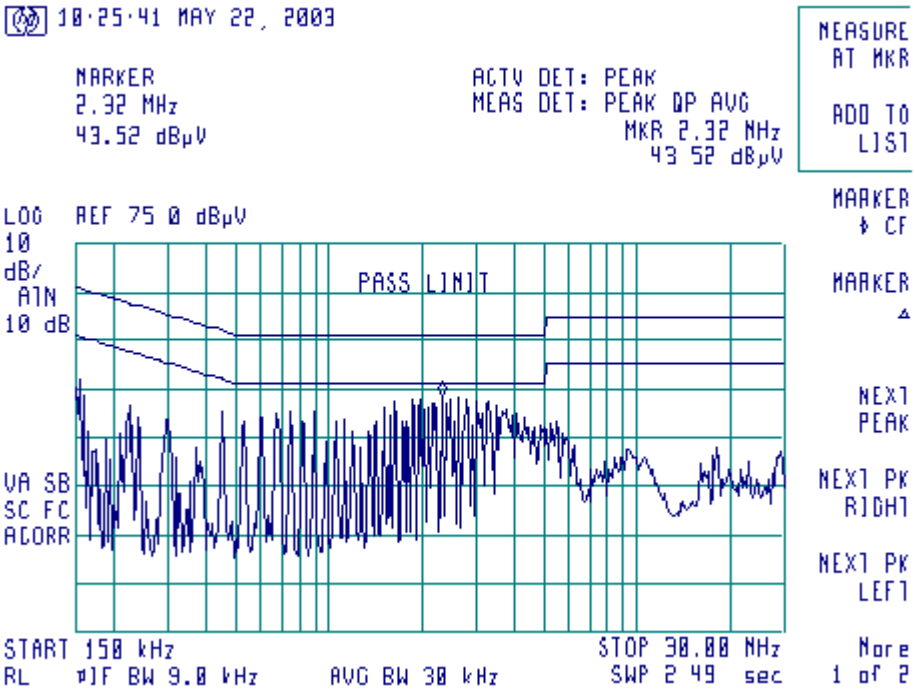
Plot A 103

Conducted emission measurements test results at the phase line



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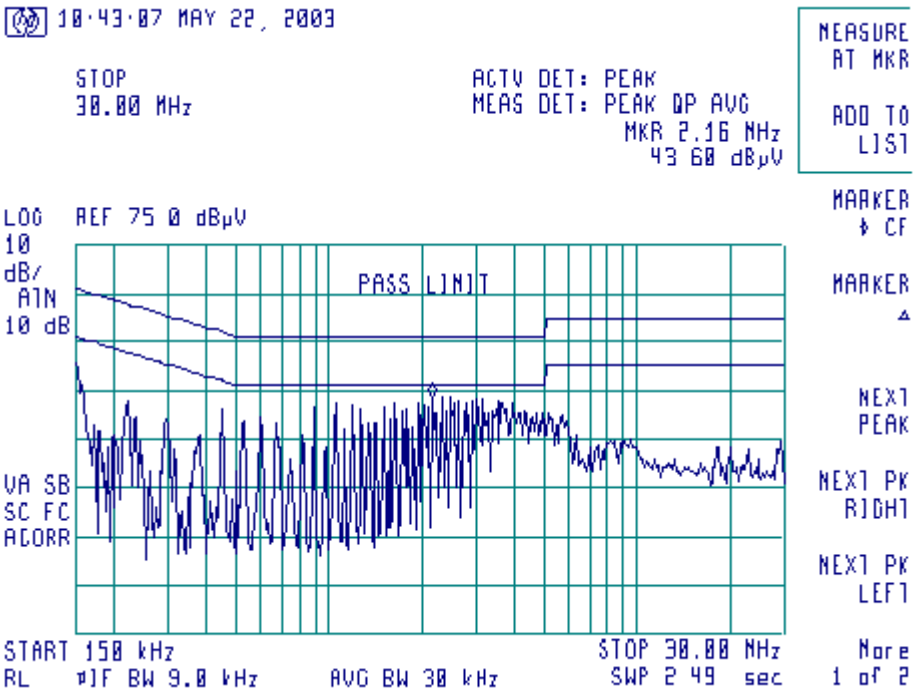
Plot A 104

Conducted emission measurements test results at the neutral line



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Appendix B Test equipment used for tests

HL Serial No.	Description	Manufacturer information			Due Calibr. Month/ year
		Name	Model No.	Serial No.	
0025	Spectrum analyzer, 10 kHz-23 GHz	Anritsu	MS-710C	5837	10/03
0032	Biconical antenna, 20-200 MHz	Electro-Metrics	BIA-25/30	3577	11/03
0038	Antenna Mast, 1-4 m	Hermon Labs	AM-1	028	2/04 Check
0041	Double ridged guide antenna, 1-18 GHz	Electro-Metrics	RGA 50/60	2811	3/04
0091	Position controller for antenna mast + turntable, OFTS	Hermon Labs	CRL-2	NA	4/04 Check
0142	Synthesized signal generator, 10 kHz-180 MHz	Ailtech-Eaton	360D11	363611A12	12/03
0163	LISN FCC/VDE/MIL -STD	Electro-Metrics	ANS-25/2	1314	10/03
0275	Table non-metallic, 1.5 x 1.0 x 0.8 m	Hermon Labs	TNM	040	3/04 Check
0287	Turntable, motorized diameter, 2 m	Hermon Labs	TMD-2	042	11/03 Check
0410	Cable, Coax, Microwave, DC-18 GHz, N-N, 1 m	Gore	PFP01P01039.4	9338767	9/03
0446	Active Loop Antenna, 10 kHz-30 MHz	Electro-Mechanics	6502	2857	10/03
0465	Anechoic chamber 9 (L) x 6.5 (W) x 5.5 (H) m	Hermon Labs	AC-1	023	10/05 check
0521	Spectrum analyzer with RF filter section (EMI receiver 9 kHz - 6.5 GHz)	Hewlett Packard	8546A	0319	9/03
0569	Antenna, Log Periodic, 200-1000 MHz	Electro-Metrics	LPA 25/30	1953	1/04
0589	Cable coaxial, GORE A2POL118.2, 3 m	Hermon Labs	GORE-3	589	11/03
0604	Antenna biconilog log-periodic/T Bow-Tie, 26 - 2000 MHz	EMCO	3141	9611-1011	1/04
0763	Antenna Linear Horn (Optium Gain) 18 - 26.5 GHz	Continental Mictowave & Tool Co.	LHA042	980976-002	6/04 check
0769	Antenna standard gain horn, 26.5 – 40 GHz, WR-42, K-band, gain – 25 dB	Quinstar Technology	QWH-2800-BA	112	7/04 check
0784	Antenna X-WING BILOG 20 MHz – 2 GHz	Schaffner- Chase EMC	CBL6140A	1120	1/04
0787	Transient limiter	Hewlett Packard	11947A-8ZE	3107A01877	11/03
0813	Cable, coax, RG-214, 12 m, N-type connectors	Hermon Labs	C214-12	149	12/03
1003	Cable coaxial, M17/164, 10 m	Hermon Labs	C17164-10	161	11/03
1004	Cable, coaxial ANDREW PSWJ4, 6 m	Hermon Labs	ANDREW-6	163	12/03
1200	Quadruplexer, 1-12 GHz	Elettronica S.p.A.-Roma	UE 84	0240	4/04 check
1295	Adapter, 26.5-40 GHz	Wiltron	35WR28KF	1295	8/03
1299	Transition waveguide	Custom Microwave	ET28S-19R	1299	8/03
1424	Spectrum analyzer, 30 Hz - 40 GHz	Agilent Technologies	8564EC	3946A00219	8/03
1425	EMI Receiver System, 9 kHz - 2.9 GHz	Agilent Technologies	8542E	3710A00222	9/03

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HL Serial No.	Description	Manufacturer information			Due Calibr. Month/ year
		Name	Model No.	Serial No.	
1430	EMI Receiver System, 9 kHz - 2.9 GHz	Agilent Technologies	8542E	3807A00262	9/03
1502	Cable RF, 6 m	Belden	M17/167 MIL-C-17	NA	12/03 check
1510	Cable RF, 8 m	Belden	M17/167 MIL-C-17	1510	12/03
1552	Cable RF, 8 m	Alpha wire	RG-214	1552	5/04
1553	Cable RF, 3.5 m	Alpha wire	RG-214	1553	5/04
1566	Cable RF, 2 m	Huber-Suhner	Sucoflex 104PE	13094/4PE	12/03
1567	Cable RF, 2 m	Huber-Suhner	Sucoflex 104PE	13094/4PE	12/03
1650	Attenuators set (2, 3, 5, 20 dB), DC – 18 GHz	M/A –COM	2082	1650	3/04
1651	Attenuators set (2, 3, 5, 20 dB), DC – 18 GHz	M/A –COM	2082	1651	3/04
1827	Antenna mast position controller (OATS)	Sh. I. Machines	CRL-5	1	5/04 check
1842	Power supply, dual regulated, 18 V, 2 A	Horizon Electronics	DHR 18-2	1842	12/03
1848	Antenna mast 4m/6m with polarity control	Sh.I.Mashines	AM-5	1	4/04 check
1864	Amplifier 6-18 GHz	Avantek	SA81-2416	9643 8442	5/04 check
1874	Attenuator, 50 Ohm, 2W, DC-18 GHz, 10 dB	Omni Spectra	6193-10	1874	5/04
1940	Cable 40 GHz, 1.5 m, blue	Rhophase Microwave Ltd.	KPS-1503A-1500-KPS	T4663	10/03
1942	Cable 18 GHz, 4 m, blue	Rhophase Microwave Ltd	SPS-1803A-4000-NPS	T4658	10/03
1947	Cable 18 GHz, 6.5 m, blue	Rhophase Microwave Ltd	NPS-1803A-6500-NPS	T4974	10/03
1989	Adapter, 18 - 26.5 GHz, WR-42/SMA	Continental Microwave & Tool Co.	WR-42/SMA	1989	8/04
2009	Cable RF, 8 m	Alpha Wire	RG-214	C-56	12/03
2109	Anechoic chamber 6 (L) x 5.5 (W) x 2.95 (H) m	Hermon Labs	AC-2	NA	12/03 check
2254	Cable 40 GHz, 0.8 m, blue	Rhophase Microwave	KPS-1503A-800-KPS	W4907	11/03
2258	Amplifier Low Noise 2-20 GHz	Sophia Wireless	LNA0220-C	0222	11/03
2259	Amplifier Low Noise 2-20 GHz	Sophia Wireless	LNA0220-C	0223	11/03
2260	Amplifier Low Noise 14-33 GHz	Sophia Wireless	LNA28-B	0233	11/03
2261	Amplifier Low Noise 33-40 GHz	Sophia Wireless	LNA38-B	0234	11/03
2273	Power supply 11 V for HL2258, HL2259, HL2260	Hermon Labs	S-11	2273	12/03

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Appendix C Antenna factors and cable loss

Antenna factor
Biconical antenna
Electro-Metrics, model BIA-25/30
Ser.No.3577

Frequency, MHz	Antenna Factor, dB(1/m)	Frequency, MHz	Antenna Factor, dB(1/m)
20	15.1	115	16.7
25	14.6	120	14.1
30	13.7	125	13.1
35	11.8	130	13.0
40	11.4	135	12.9
45	11.7	140	12.7
50	11.4	145	12.5
55	10.5	150	14.3
60	10.3	155	14.8
65	8.9	160	14.7
70	7.6	165	15.1
75	7.3	170	15.6
80	7.3	175	16.5
85	7.8	180	16.7
90	9.4	185	17.3
95	10.6	190	17.9
100	11.8	195	17.6
105	12.5	200	17.9
110	13.7		

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

Antenna factor
Log periodic antenna
Electro-Metrics, model LPA-25/30
Ser.No.1953

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

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

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Antenna factor
Double ridged guide antenna
Model RGA-50/60
S/N 2811

Frequency, MHz	Antenna factor, dB
1000	24.3
1500	25.4
2000	28.4
2500	29.2
3000	30.5
3500	31.6
4000	33.7
4500	32.2
5000	34.5
5500	34.5
6000	34.6
6500	35.3
7000	35.5
7500	35.9
8000	36.6
8500	37.3
9000	37.7
9500	37.7
10000	38.2
10500	38.5
11000	39.0
11500	40.1
12000	40.2
12500	39.3
13000	39.9
13500	40.6
14000	41.1
14500	40.5
15000	39.9
15500	37.8
16000	39.1
16500	41.1
17000	41.7
17500	45.1
18000	44.3

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

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Antenna Factor
Biconilog Antenna EMCO Model 3141
Ser.No.1011

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
Active Loop Antenna
Model 6502
S/N 2857

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

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

Antenna Gain
Waveguide standard gain horn antenna
Continental Microwave & Tool Co., Inc.
P/N LHA 042
Ser.No.980976-002

Frequency, GHz	H-3dB BW degrees	E-3dB BW degrees	Gain, dBi
18.000	10	9	23.3
18.850	10	9	23.6
19.700	10	9	23.7
20.550	9	8	24.1
21.400	9	8	24.3
22.250	9	8	24.3
23.100	8	7	24.5
23.950	8	7	24.5
24.800	8	7	24.8
25.650	7	6	24.9
26.500	7	6	24.9

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
CHASE Model CBL6140A
Serial no: 1120, HL 0784

Frequency, MHz	Antenna factor, dB
30.0	4.3
35.0	7.3
40.0	8.8
45.0	9.3
50.0	9.6
60.0	9.9
70.0	9.2
80.0	7.6
90.0	7.6
100.0	8.8
120.0	7.2
125.0	7.5
140.0	7.7
150.0	7.9
160.0	11.4
175.0	8.6
180.0	8.8
200.0	9.8
250.0	12.5
300.0	12.2
350.0	14.8
400.0	16.1
450.0	16.5
500.0	17.6
550.0	18.3
600.0	18.5
650.0	19.8
700.0	20.1
750.0	20.8
800.0	21.2
850.0	22.0
900.0	22.2
950.0	23.2
1000.0	23.8

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

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

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

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Cable loss
Cable RG-214, HL 0813

No.	Frequency, MHz	Cable loss, dB
1	10	0.15
2	20	0.40
3	30	0.51
4	40	0.61
5	50	0.68
6	60	0.76
7	70	0.80
8	80	0.92
9	90	0.96
10	100	0.99
11	200	1.60
12	300	1.85
13	400	2.25
14	500	2.43
15	600	2.80
16	700	3.14
17	800	3.34
18	900	3.75
19	1000	4.05
20	1200	4.41
21	1400	4.81
22	1600	5.18
23	1800	5.58
24	2000	6.09
25	2500	7.27
26	2900	8.01

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

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

Cable loss
Cable GORE, HL 0410

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

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Cable loss
RF cable 8 m, model RG-214-8m, HL 1552

No.	Frequency, MHz	Cable loss, dB	Measurement uncertainty, dB	Notes
1	0.010	0.01	±0.05	
2	0.1	0.01		
3	1	0.03		
4	10	0.12		
5	20	0.23		
6	30	0.30		
7	40	0.32		
8	50	0.34		
9	60	0.39		
10	70	0.43		
11	80	0.48		
12	90	0.50		
13	100	0.55		
14	200	0.78		
15	300	1.04		
16	400	1.16		
17	500	1.33		
18	600	1.51		
19	700	1.65		
20	800	1.77		
21	900	1.92		
22	1000	2.04		
23	1200	2.26		
24	1400	2.49		
25	1600	2.74		
26	1800	2.94		
27	2000	3.18		
28	2500	3.65		
29	2900	4.08		

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Cable loss
Cable RF, 2 m, model: Sucoflex 104PE, s/n 13095/4PE, HL 1567

No.	Frequency, MHz	Cable loss, dB
1	30	0.09
2	50	0.15
3	100	0.23
4	300	0.31
5	500	0.46
6	800	0.63
7	1000	0.67
8	1500	0.89
9	2000	1.05
10	2500	1.18
11	300	1.26
12	5300	1.51
13	4000	1.66
14	4500	1.61
15	5000	1.67
16	5500	1.91
17	6000	1.98
18	6500	1.91
19	7000	2.04
20	7500	2.36
21	8000	2.36
22	8500	2.61
23	9000	2.69
24	9500	2.62
25	10000	2.73
26	10500	2.83
27	11000	2.84
28	11500	3.22
29	12000	3.17
30	12500	3.17
31	13000	3.18
32	13500	3.49
33	14000	3.43
34	14500	3.57
35	15000	3.76
36	15500	4.20
37	16000	4.10
38	16500	4.49
39	17000	4.53
40	17500	4.46
41	18000	4.47

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Cable loss
Cable 40 GHz, 1.5 m, blue, model: KPS-1503A-1500-KPS, S/N T4663, HL 1940

Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB
0.03	0.13	5.10	1.33	15.00	2.27
0.05	0.14	5.30	1.33	15.50	2.32
0.10	0.19	5.50	1.38	16.00	2.39
0.20	0.25	5.70	1.41	16.50	2.41
0.30	0.31	5.90	1.43	17.00	2.36
0.40	0.37	6.10	1.50	17.50	2.42
0.50	0.41	6.30	1.47	18.00	2.50
0.60	0.46	6.50	1.56	18.50	2.89
0.70	0.49	6.70	1.50	19.00	2.86
0.80	0.53	6.90	1.53	19.50	2.84
0.90	0.56	7.10	1.53	20.00	2.77
1.00	0.59	7.30	1.56	20.50	2.73
1.10	0.62	7.50	1.59	21.00	3.05
1.20	0.65	7.70	1.62	21.50	3.07
1.30	0.68	7.90	1.68	22.00	2.97
1.40	0.70	8.10	1.67	22.50	2.91
1.50	0.73	8.30	1.70	23.00	3.02
1.60	0.76	8.50	1.69	23.50	3.29
1.70	0.77	8.70	1.70	24.00	3.31
1.80	0.80	8.90	1.68	24.50	3.49
1.90	0.82	9.10	1.70	25.00	3.37
2.00	0.84	9.30	1.70	25.50	3.56
2.10	0.85	9.50	1.77	26.00	3.56
2.20	0.87	9.70	1.80	26.50	3.33
2.30	0.88	9.90	1.88	27.00	3.52
2.40	0.90	10.10	1.93	28.00	3.38
2.50	0.91	10.30	1.94	29.00	3.34
2.60	0.93	10.50	1.99	30.00	3.33
2.70	0.95	10.70	1.91	31.00	3.48
2.80	0.97	10.90	2.00	32.00	3.63
2.90	0.98	11.10	1.92	33.00	3.69
3.10	1.02	11.30	1.97	34.00	3.79
3.30	1.05	11.50	1.98	35.00	3.77
3.50	1.09	11.70	1.99	36.00	3.92
3.70	1.12	11.90	2.06	37.00	3.94
3.90	1.15	12.10	2.01	38.00	3.80
4.10	1.18	12.40	2.08	39.00	4.15
4.30	1.21	13.00	2.05	40.00	4.03
4.50	1.24	13.50	2.15		
4.70	1.29	14.00	2.25		
4.90	1.27	14.50	2.26		

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

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

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

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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
Cable coaxial, M17/164, model: C17164-10, s/n 161, HL 1003

No.	Frequency, MHz	Cable loss, dB	Tolerance, dB	Measurement uncertainty, dB
1	30	0.41	12.5	±0.12
2	50	0.52		
3	100	0.75		
4	300	1.45		
5	500	2.01		
6	800	2.71		
7	1000	3.14		
8	1200	3.56		
9	1400	3.93		
10	1600	4.31		
11	1800	4.63		
12	2000	4.97		
13	2200	5.32		
14	2400	5.65		
15	2600	6.01		
16	2800	6.42	12.5	±0.12
17	3000	6.76		
18	3300	7.12		
19	3600	7.53		
20	3900	7.95		
21	4200	8.32		±0.17
22	4500	8.72		
23	4800	9.14		
24	5100	9.59		
25	5400	10.00		
26	5700	10.49		
27	6000	11.07		
28	6500	11.80		

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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
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 RF, 2m, model: Sucoflex 104PE, S/N 13094/4PE, HL 1566

No.	Frequency, MHz	Cable loss, dB	Tolerance, dB	Measurement uncertainty, dB
1	30	0.10	5.0	±0.12
2	50	0.13		
3	100	0.20		
4	300	0.33		
5	500	0.45		
6	800	0.60		
7	1000	0.65		
8	1500	0.91		
9	2000	1.08		
10	2500	1.19		
11	3000	1.28		
12	3500	1.49		
13	4000	1.63		
14	4500	1.63	5.0	±0.17
15	5000	1.66		
16	5500	1.88		
17	6000	1.96		
18	6500	1.93		
19	7000	2.07		
20	7500	2.37		
21	8000	2.34		
22	8500	2.64		
23	9000	2.68		
24	9500	2.64		
25	10000	2.70		
26	10500	2.84		
27	11000	2.88		
28	11500	3.19		
29	12000	3.15		
30	12500	3.20	5.0	±0.26
31	13000	3.22		
32	13500	3.47		
33	14000	3.41		
34	14500	3.59		
35	15000	3.79		
36	15500	4.24		
37	16000	4.12		
38	16500	4.46		
39	17000	4.50		
40	17500	4.49		
41	18000	4.45		

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Cable loss
Cable 40 GHz, 0.8 m, blue, model: KPS-1503A-800-KPS, S/N 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, 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

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

Frequency, kHz	Correction factor, dB
10	4.9
15	2.86
20	1.83
25	1.25
30	0.91
35	0.69
40	0.53
50	0.35
60	0.25
70	0.18
80	0.14
90	0.11
100	0.09
125	0.06
150	0.04

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

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Appendix D General information

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) and approved by Israel Ministry of environmental protection, radiation hazards department (Permit number 1158).

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Abbreviations and acronyms

The following abbreviations and acronyms are applicable to this test report:

AC	alternating current
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
EMC	electromagnetic compatibility
EUT	equipment under test
GHz	gigahertz
H	height
Hz	hertz
kHz	kilohertz
kV	kilovolt
L	length
LNA	low noise amplifier
m	meter
MHz	megahertz
NA	not applicable
QP	quasi-peak
RF	radio frequency
rms	root mean square
s	second
UNII	Unlicensed National Information Infrastructure
V	volt
W	width

Specification references

47CFR part 15: 2002	Radio Frequency Devices
ANSI C63.2:96	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4:92	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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