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Electrical

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RADIO TEST REPORT

ACCORDING TO 47 CFR Part 15 SUBPART C §15.231, §15.205, §15.209 and SUBPART B

for

ElmoTech Ltd.

EQUIPMENT UNDER TEST:

Home arrest tag

Model: TXS-700

Document ID: ELMRAD_FCC.15352a.doc
Date of Issue: December 2002

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Contents

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1 Project information

Description of equipment under test

Test item	Home arrest tag
Manufacturer	ElmoTech Ltd.
Type (Model)	TXS-700
Software release	1.0
Serial number	00001
Transmitter operating frequency	318 MHz
Equipment FCC code[1]	DSC

Applicant information

Applicant's responsible person	Mr. Natan Halperin, Project Manager
Company	ElmoTech Ltd.
P.O. Box	13236
Address	2, Habarzel street, 5th floor
City	Tel Aviv
Postal code	61132
Country	Israel
Telephone number	+972 36478871
Telefax number	+972 36478872

Test performance

Project number:	15352
Location	Hermon Laboratories
Receipt date	November 21, 2002
Test performed	November 21, 2002
Purpose of test	Apparatus compliance verification in accordance with emission requirements
Test specifications	47CFR Part 15, subpart C, §15.231, §15.205, §15.209, and subpart B §15.109

[1] FCC Equipment codes – see Appendix D

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2 Summary of tests

Parameter	Subclause	C	NC	NT	NA	Tested by	Date tested	Remarks
Transmitter characteristics, §15.231								
Bandwidth of emission	15.231(c)	**X**				Mrs. E. Pitt, test engineer	November 21, 2002	
Field strength of fundamental	15.231(b)(2)	**X**				Mrs. E. Pitt, test engineer	November 21, 2002	
Field strength of spurious radiation	15.231(b)(3) 15.205	**X**				Mrs. E. Pitt, test engineer	November 21, 2002	
Unintentional radiation, §15.107, §15.109								
Conducted emissions	15.107				**X**			
Radiated emissions	15.109	**X**				Mrs. E. Pitt, test engineer	November 21, 2002	

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: Ms. N. Averin, certification engineer

Test report approved by: Mr. M. Nikishin, EMC group leader

Mr. A. Usoskin, QA manager

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3 EUT specification

3.1 General description

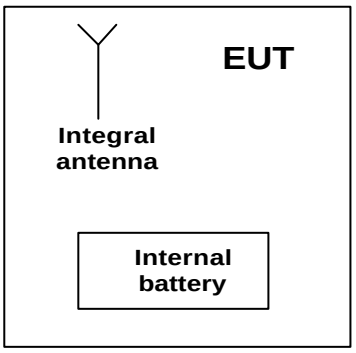
The EUT is a home arrest tag, which is worn by a monitored offender either on his wrist or on his ankle. The tag transmits 5ms identification & status signals. An interval between two transmissions is programmed to be randomly chosen and varies from 18 to 22 s. The transmitter operates at 318 MHz.
The device is powered by 3.5 V lithium battery.

Local oscillator frequencies are: 2 MHz and 14.7456 MHz.

3.2 EUT test configuration

Test configuration is provided in Figure 3.2.1.

Figure 3.2.1 EUT test configuration



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3.3 Transmitter description

Operating frequency:				318 MHz			
Maximum rated output power							
	At transmitter permanent external 50Ω rf output connector (dBm)						
	Effective radiated power (for equipment with integral antenna) (dBm)			-8			
Transmitter duty cycle (worst case)							
	Tx on (seconds)			0.005			
	Tx off (seconds)			> 0.1			
Modulation							
	Amplitude						
	Frequency						
Ú	Other (specify): FSK						
Can the transmitter be operated without modulation					yes	Ú	no
Transmitter power source							
	Battery	**Nominal rated voltage (VDC)**		**3.5**			
	Nickel Cadmium						
Ú	Lithium						
	Other:						
	DC	**Nominal rated voltage (VDC)**					
	AC mains	**Nominal rated voltage (VAC)**					
Is there common power source for transmitter and receiver					yes		no
Antenna type							
Ú	Integral						
	External						
Type of antenna jack[2] - NA							
	standard		connector type		Male		Female
	unique		connector type		Male		Female

[2] Standard antenna jack use is prohibited excluding devices which must be professionally installed

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4 Test results

4.1 Bandwidth of emission according to § 15.231 (c)

METHOD OF MEASUREMENT: ANSI 63.4 §13.1.7
DATE: November 21, 2002
RELATIVE HUMIDITY: 49 %
AMBIENT TEMPERATURE: 22 °C
AIR PRESSURE: 1017 hPa
MODULATION: ON
DETECTOR USED: Peak

Carrier frequency MHz	Occupied bandwidth, kHz	Reference to plot in Annex A
318	470	A1
Measurement uncertainty, ppm	0.2	

Test equipment used:

HL 0465	HL 0521	HL 0589	HL 0604	HL 1004	HL 1019	

Limit (§ 15.231 (c))

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

For 318 MHz the specified limit is 795 kHz

Test procedure

The spectrum trace data around transmitter fundamental frequency was obtained with the spectrum analyzer in “Max Hold” mode. The bandwidth value was determined between two points 20 dBc.

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4.2 Field strength of fundamental, § 15.231

METHOD OF MEASUREMENT:	ANSI 63.4 §13.1.5
DATE:	November 21, 2002
RELATIVE HUMIDITY:	49 %
AMBIENT TEMPERATURE:	22 °C
AIR PRESSURE:	1017 hPa
SITE DESCRIPTION:	ANECHOIC CHAMBER
MODULATION:	ON
DETECTOR USED:	PEAK

	§ 15.231 (b)	§ 15.231 (e)
The EUT complies with the requirements of	X	

Peak detector

Frequency, MHz	Measured field strength, dB(uV/m)	Specification limit, dB(uV/m)	Margin, dB	Reference to plot in Annex A
317.963	86.24	95.8	9.56	A2
Measurement uncertainty, dB		-5.73 dB/ -5.57 dB		

Peak detector + average factor

Frequency, MHz	Measured field strength, dB(uV/m)	Average factor, dB	Calculated result, dB(uV/m)	Specification limit, dB(uV/m)	Reference to plot in Annex A
317.963	86.24	-26	60.24	75.8	A2
Measurement uncertainty, dB			-5.73 dB/ -5.57 dB		

4.2.1 Average factor calculation, §15.35

Tx ON	Duty cycle	Average factor	Reference to plots in Annex A
5 ms	0.05	-26	A3, A4

TEST EQUIPMENT USED:

HL 0465	HL 0521	HL 0589	HL 0604	HL 1004	HL 1019	

Limit § 15.231 (b)

Fundamental frequency, MHz	Field strength of fundamental, mV/m @ 3 m
260 – 470	3,750 to 12,500

The specified average limit for 318 MHz is 75.8 dB(μV/m)
The specified peak limit for 318 MHz is 95.8 dB(μV/m)

Test procedure

The EUT (connected to an artificial hand) was tested, being placed on a wooden 80 cm height turntable in each of three orthogonal planes in turn. To find maximum radiation the turntable was rotated 360°, measuring antenna height was changed from 1 to 4 m, and the antenna polarization was changed from vertical to horizontal.

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4.3 Field strength of spurious radiation, § 15.231, § 15.205

METHOD OF MEASUREMENT:	ANSI 63.4 §13.1.4
TEST PERFROMED IN:	ANECHOIC CHAMBER
DATE:	November 21, 2002
RELATIVE HUMIDITY:	49 %
AMBIENT TEMPERATURE:	22 °C
AIR PRESSURE:	1017 hPa
TEST PERFORMED AT FIELD STRENGTH OF CARRIER:	86.24 dB(μV/m)
MODULATION:	ON
DETECTOR USED:	PEAK
RANGE OF MEASUREMENTS:	9 kHz to 3200 MHz
RESOLUTION BANDWIDTH:	120 kHz below 1 GHz, 1 MHz above 1 GHz
VIDEO BANDWIDTH:	1 MHz
MEASUREMENT UNCERTAINTY:	-5.73 dB/ -5.57 dB

Frequency,	Radiated emissions						Ref. to plot in App. A
	Peak			Average			
MHz	Measured, dB(■V/m)	Limit, dB(■V/m)	Margin, dB	Calculated*, dB(■V/m)	Limit, dB(■V/m)	Margin, dB	
635.920	36.23	75.8	39.57	10.23	55.8	45.57	A8
953.893	59.67	75.8	16.13	33.67	55.8	22.13	A9
1272	49.23	75.8	26.57	23.23	55.8	32.57	A11
1590**	59.70	74	14.30	33.70	54	20.30	A12
1908	61.56	75.8	14.24	35.56	55.8	20.24	A13
2226**	50.73	74	23.27	24.73	54	29.27	A15
2544	46.60	75.8	29.20	20.60	55.8	35.20	A16

For test results refer to Plots A5 to A16.

*** Radiated emission value was calculated: Peak value + Average factor (= -26 dB)**
**** Falls into restricted bands**

Test equipment used:

HL 0041	HL 0446	HL 0465	HL 0521	HL 0589	HL 0604	HL 1004
HL 1019	HL 1947					

Limit § 15.231 (b)

Fundamental frequency, MHz	Field strength of harmonics, dB(■V/m) @ 3 m
318	55.8

Test procedure

The EUT (connected to an artificial hand) was tested, being placed on a wooden 80 cm height turntable in each of three orthogonal planes in turn.

9 kHz – 30 MHz. The loop antenna was positioned with its plane vertical. The loop center was 1 meter above the ground plane. To find maximum radiation the turntable was rotated 360° and the measuring antenna was rotated about its vertical axis.

30 MHz – 3.2 GHz. To find maximum radiation the turntable was rotated 360°, measuring antenna height was changed from 1 to 4 m, and the antennas polarization was changed from vertical to horizontal.

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4.4 Unintentional radiated emissions test according to §15.109

METHOD OF MEASUREMENT:	ANSI 63.4 §11.6 / ANSI 63.4 §12.1.4
TEST PERFORMED IN:	ANECHOIC CHAMBER
DATE:	November 21, 2002
RELATIVE HUMIDITY:	49 %
AMBIENT TEMPERATURE:	22 °C
AIR PRESSURE:	1017 hPa
DISTANCE BETWEEN ANTENNA AND EUT:	3 m
THE EUT WAS TESTED AS:	TABLE-TOP
FREQUENCY RANGE:	30 MHz – 2 GHz
DETECTOR TYPE:	Peak
RESOLUTION BANDWIDTH:	120 kHz

The EUT highest used frequency (including operating frequency), MHz	**Upper frequency of measurement range, MHz**
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

Frequency, MHz	**Antenna polarization**	**Antenna height, m**	**Turntable position, (°)**	**Radiated emissions, dB (μV/m)**	**Specification limit, dB (μV/m)**	**Ref. to plot in App. A**
30 - 2000	**All emissions were found below the limit.**					A17, A18
Measurement uncertainty, dB	-5.73 dB/ -5.57 dB					

Test equipment used:

HL 0465	HL 0521	HL 0589	HL 0604	HL 1004	HL 1019	

Limit (§ 15.109)

Frequency, MHz	**Class A equipment @ 10 m, dB(μV/m)**	**Class B equipment @ 3 m, dB(μV/m)**
30 - 88	39.0	40
88 - 216	43.5	43.5
216 - 960	46.4	46
960 - 5000	49.5	54

Test procedure

The EUT was tested (connected to an artificial hand), being placed on a wooden 80 cm height turntable in each of three orthogonal planes in turn.

The EUT was placed on a wooden 80 cm height turntable. To find maximum radiation the turntable was rotated 360°, measuring antenna height was changed from 1 to 4 m, and the antennas polarization was changed from vertical to horizontal.

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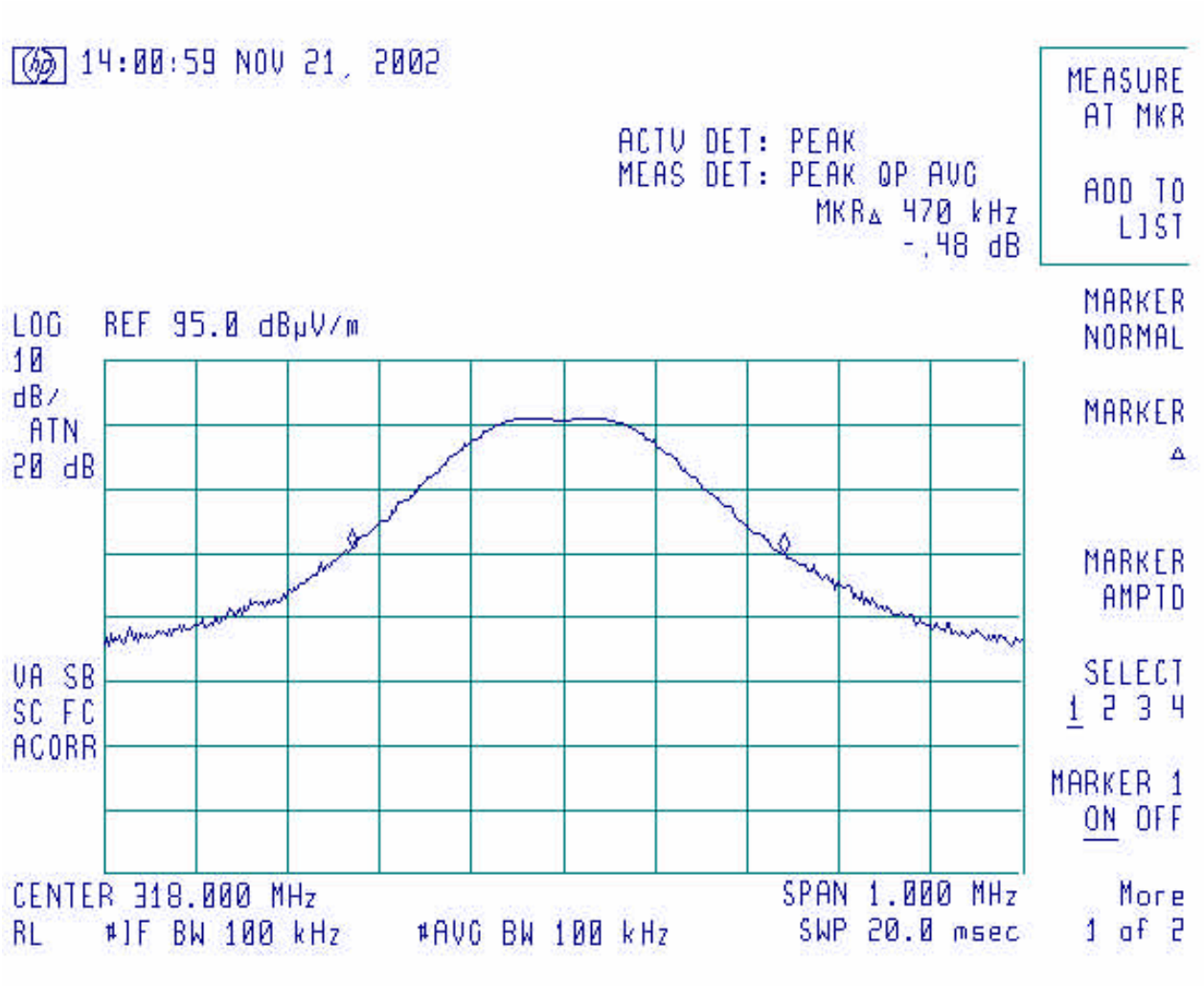
Appendix A Plots

Plot A1

Occupied bandwidth measurements



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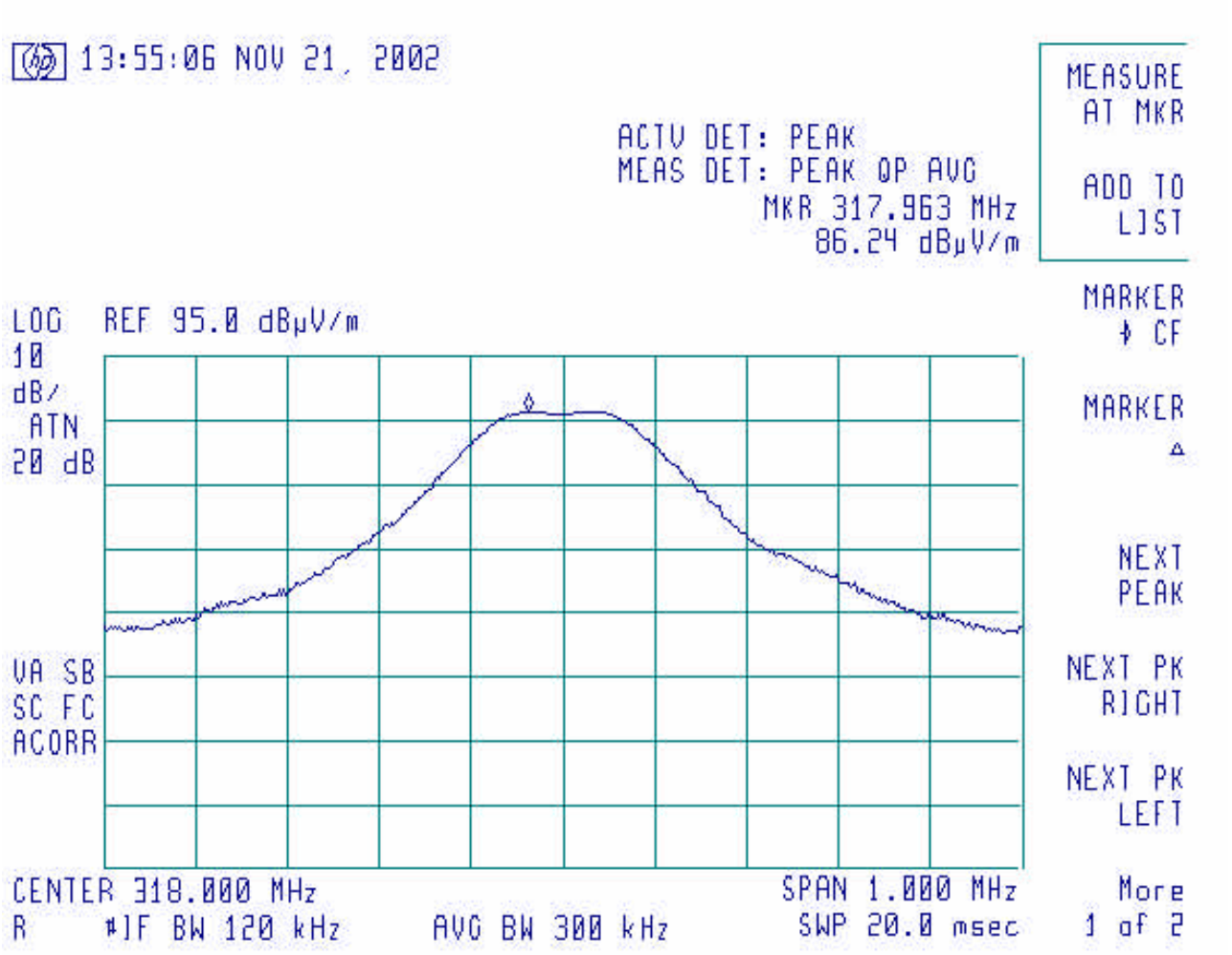
Plot A2

Field strength of fundamental measurements



Average factor = 20log(Tx ON /100) = 20log(5/100) = -26 dB
Average result = peak result + average factor = 86.24 – 26 = 60.24 dBuV/m (Limit$_{AVR}$ = 75.8 dBuV/m @3m)
Peak result = 86.24 dBuV/m (Limit$_{PEAK}$ = 95.8 dBuV/m @3m)

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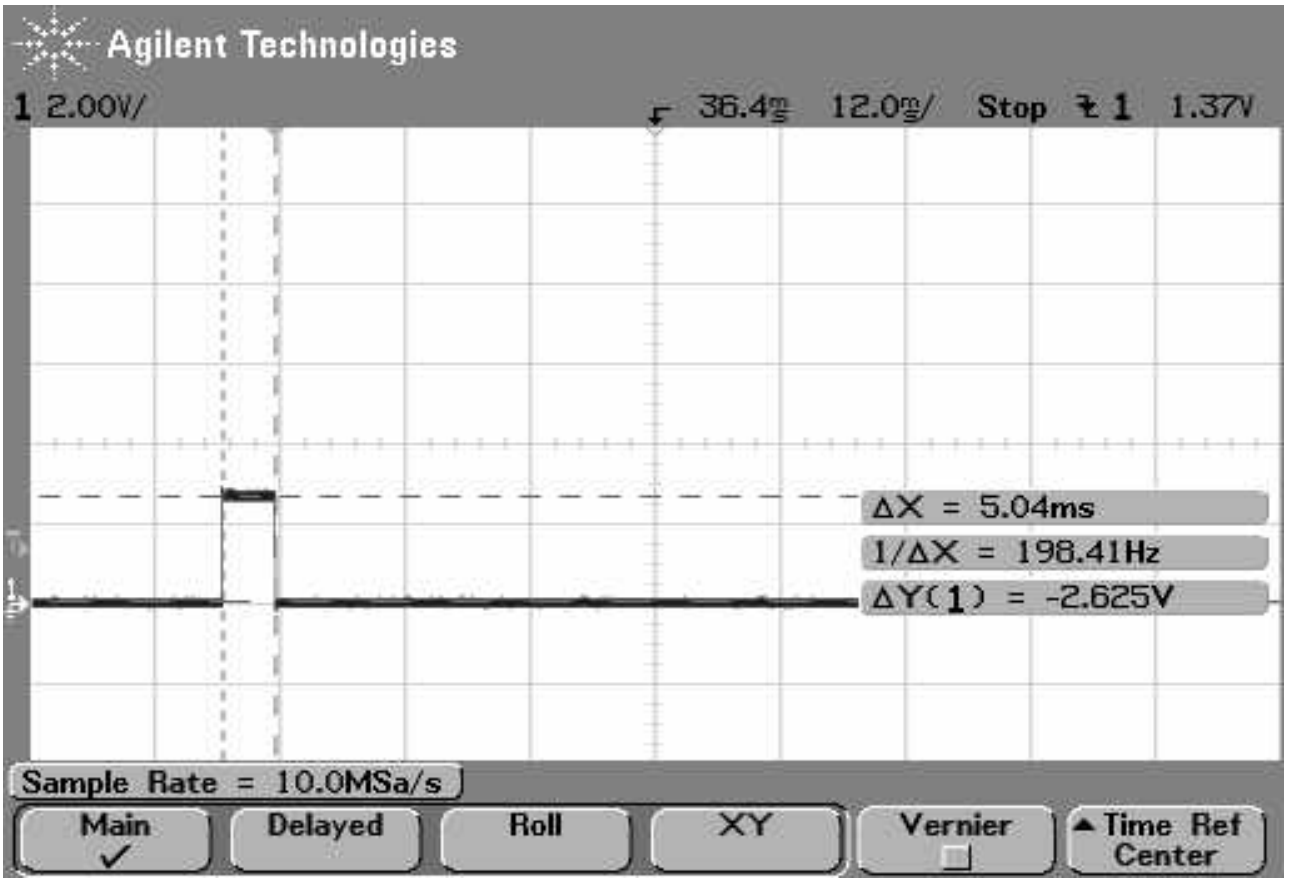
Plot A3

Average factor measurements, 120 ms interval



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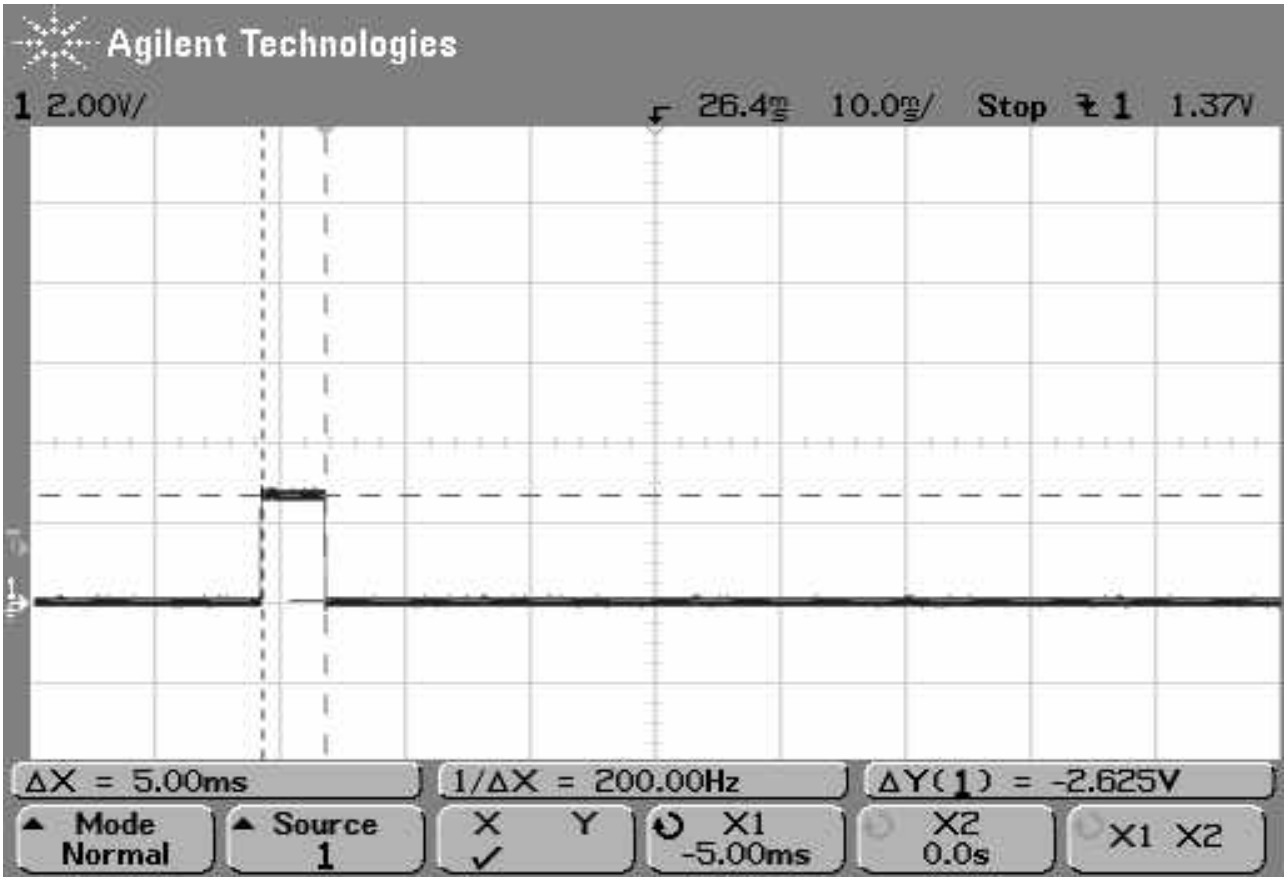
Plot A4

Average factor measurements, 100 ms interval



Average factor = 20log(Tx ON /100) = 20log(5/100) = -26 dB

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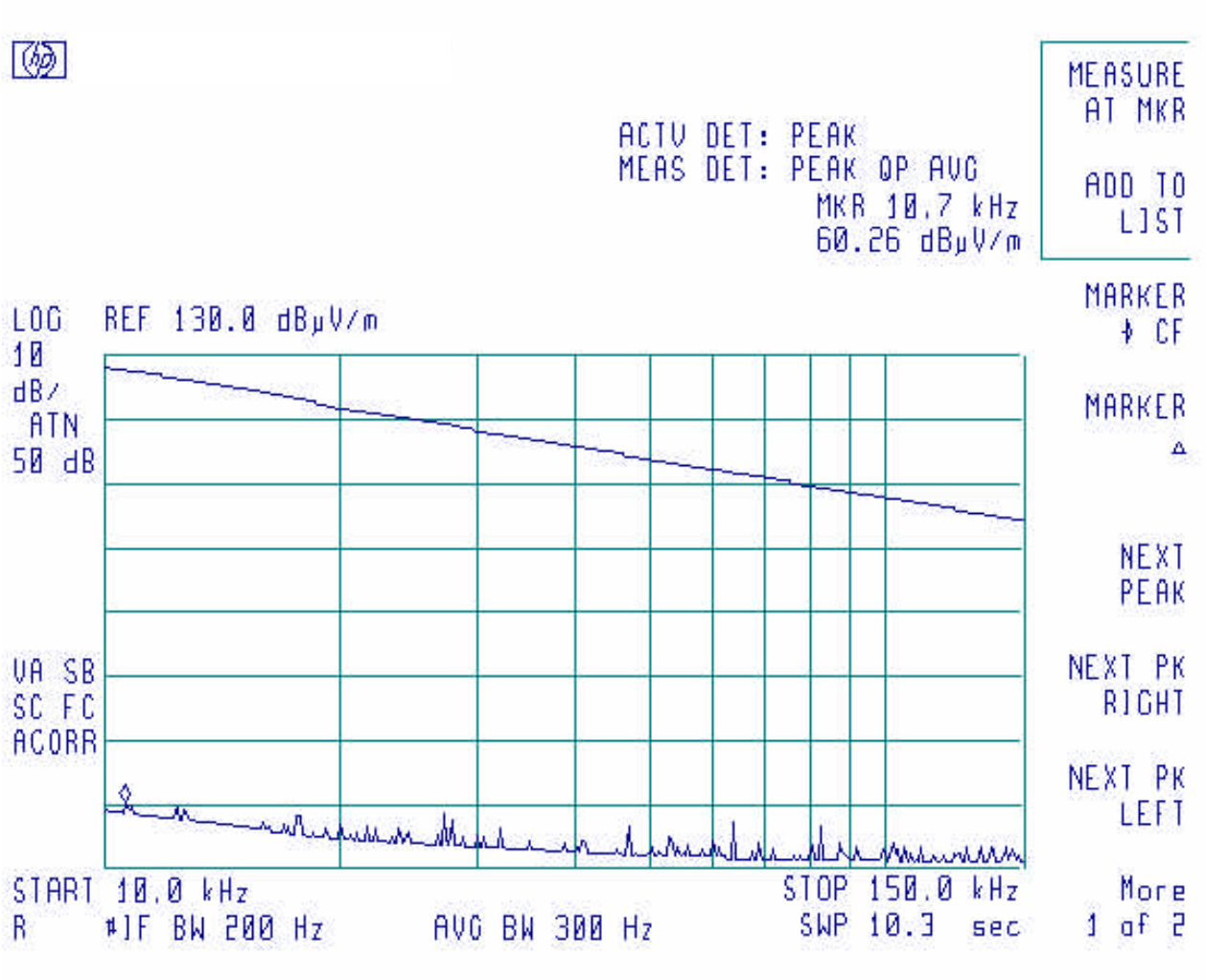
Plot A5

Spurious emission measurements
9 kHz – 150 kHz



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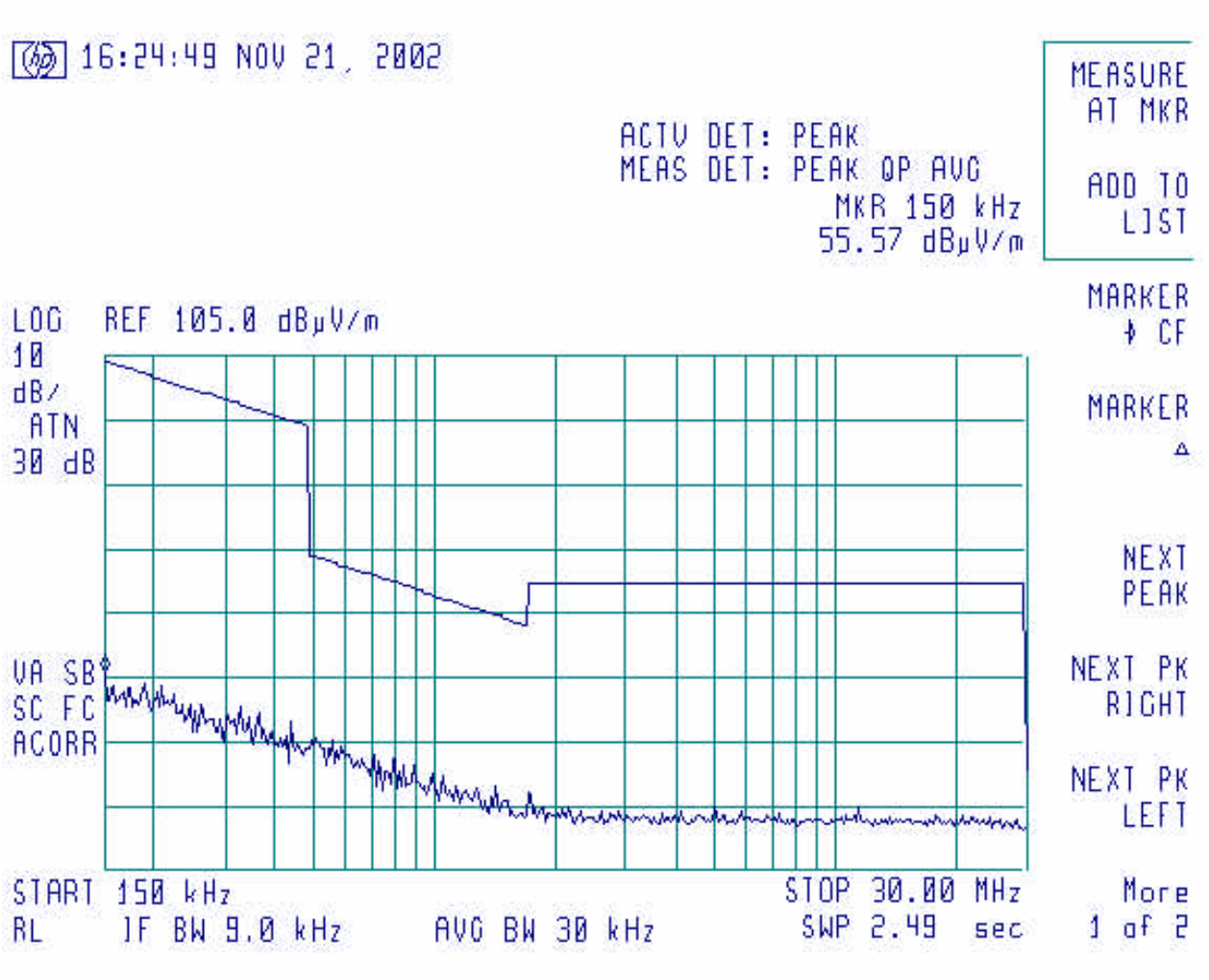
Plot A6

Spurious emission measurements
150 kHz – 30 MHz



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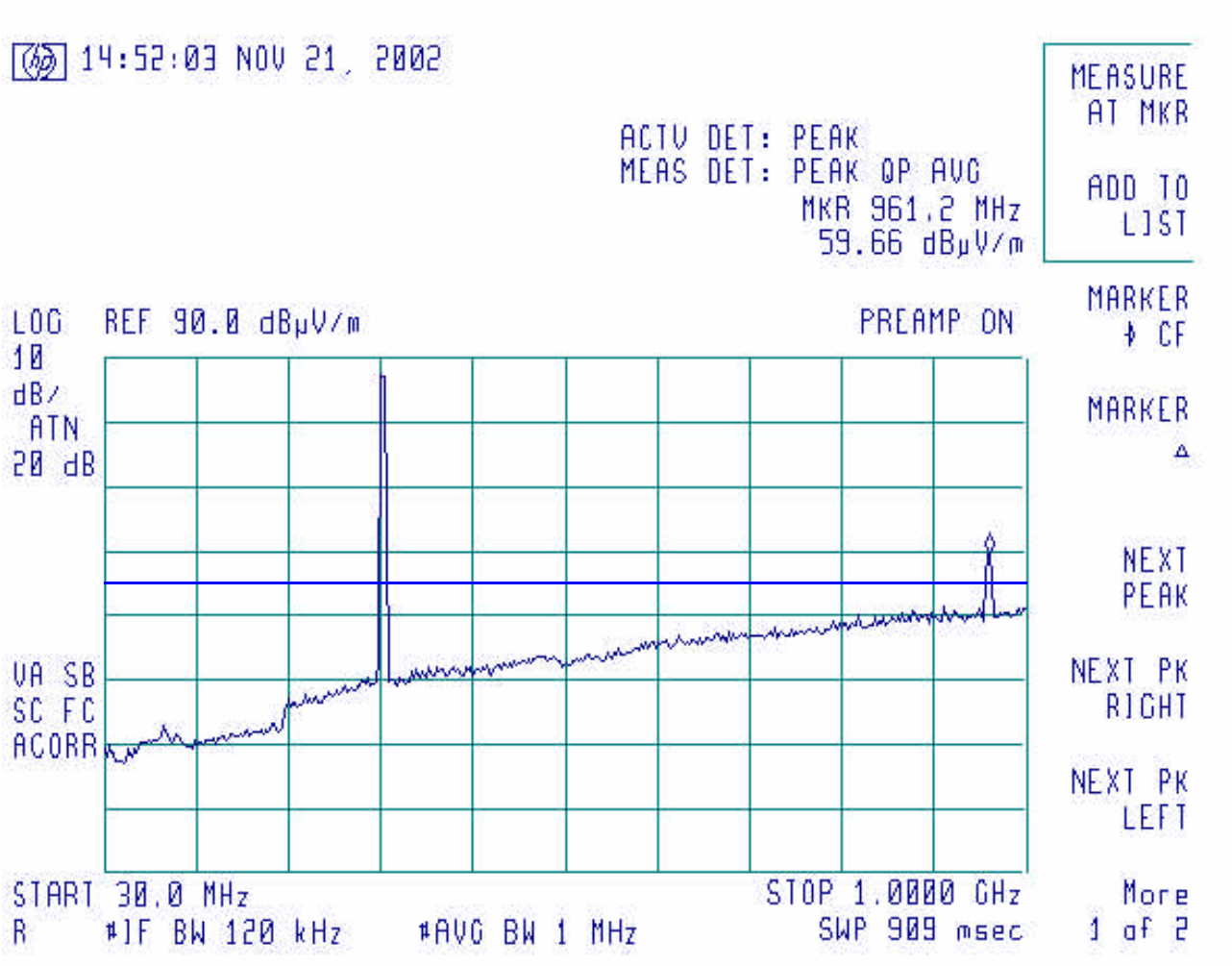
Plot A7

Spurious emission measurements
30 MHz – 1000 MHz



The blue line is spurious radiated emission limit according to § 15.231.

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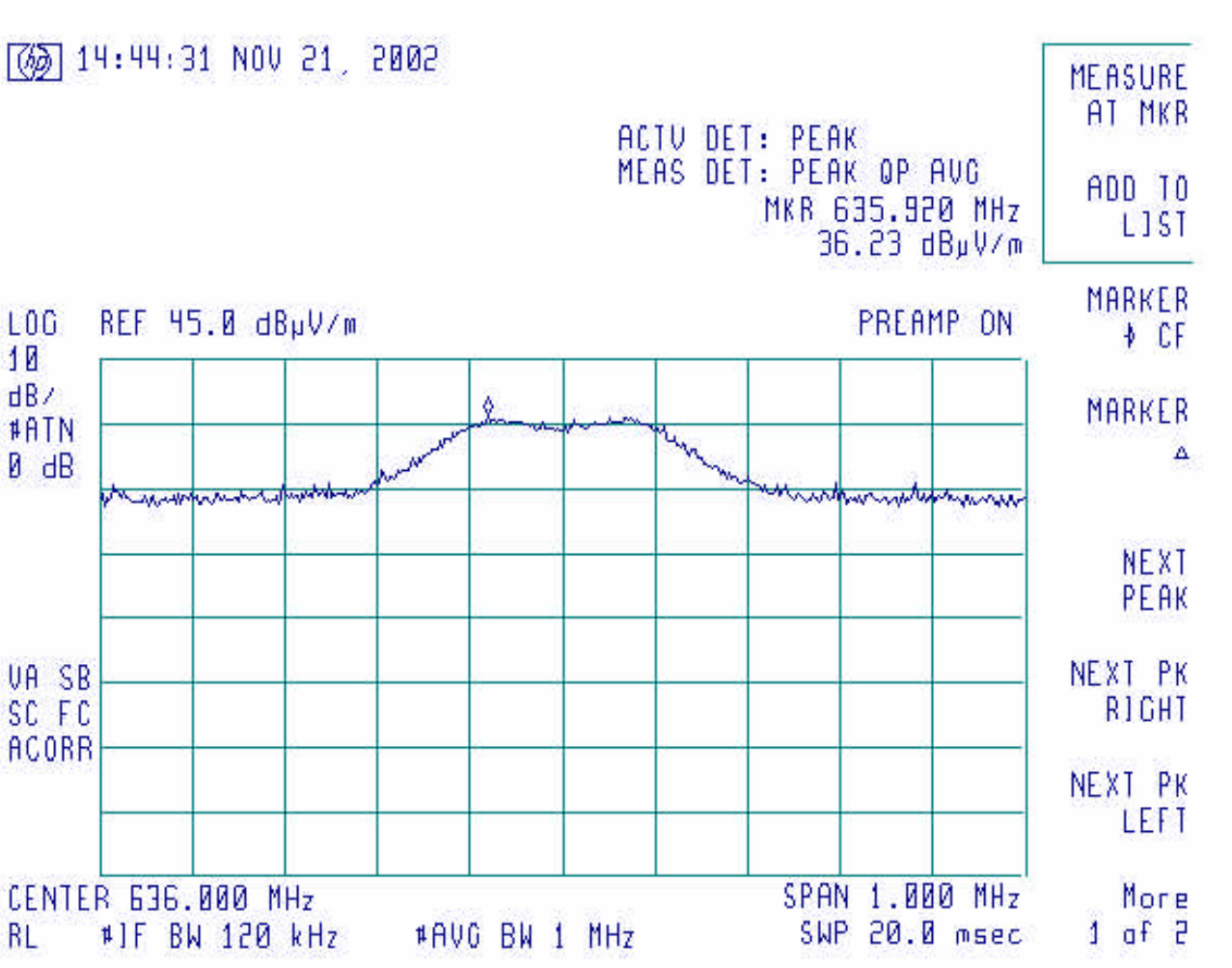
Plot A8

Field strength of 2nd harmonic



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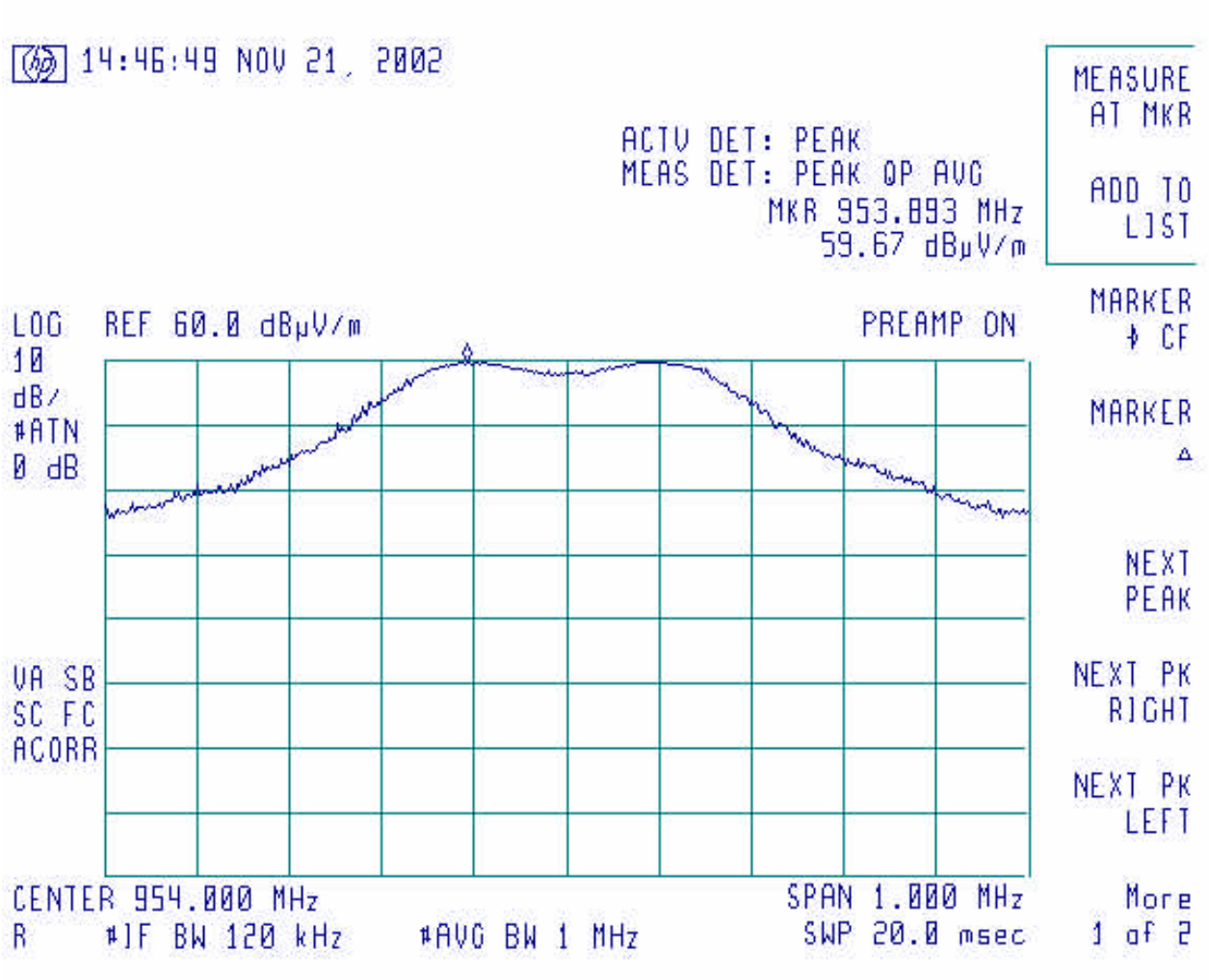
Plot A9

Field strength of 3rd harmonic



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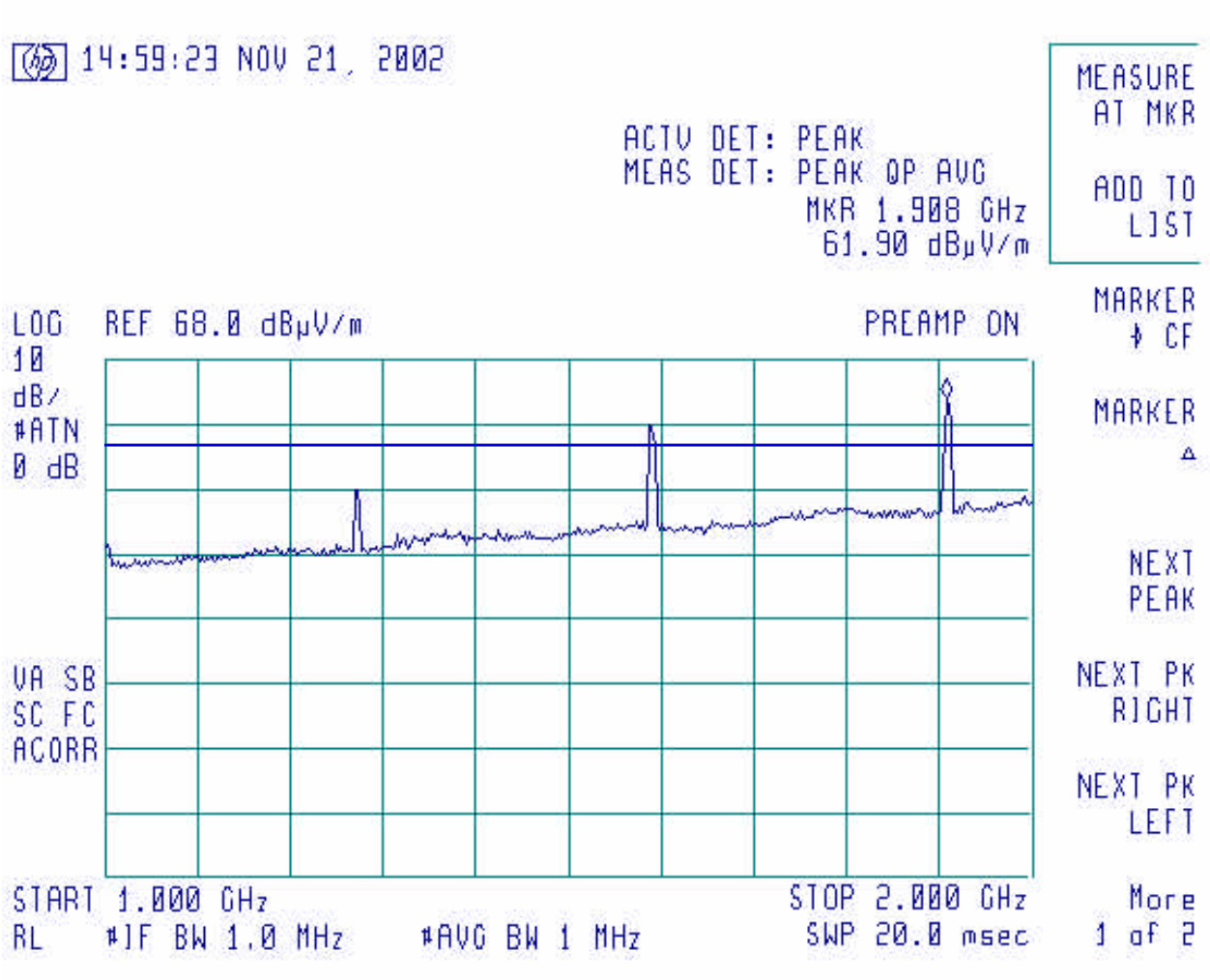
Plot A10

Spurious emission measurements
1 – 2 GHz



The blue line is spurious radiated emission limit according to § 15.231.

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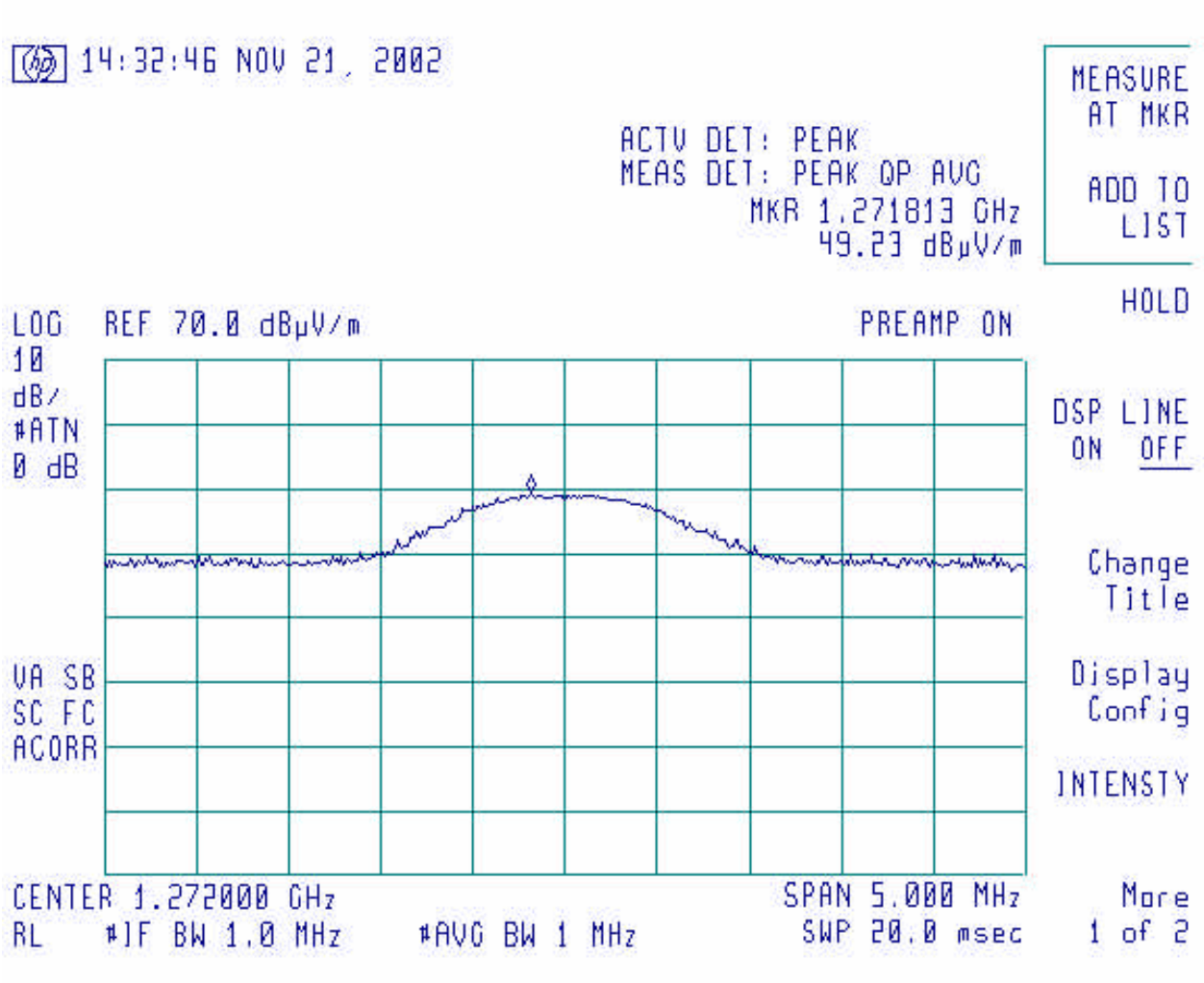
Plot A11

Field strength of 4th harmonic



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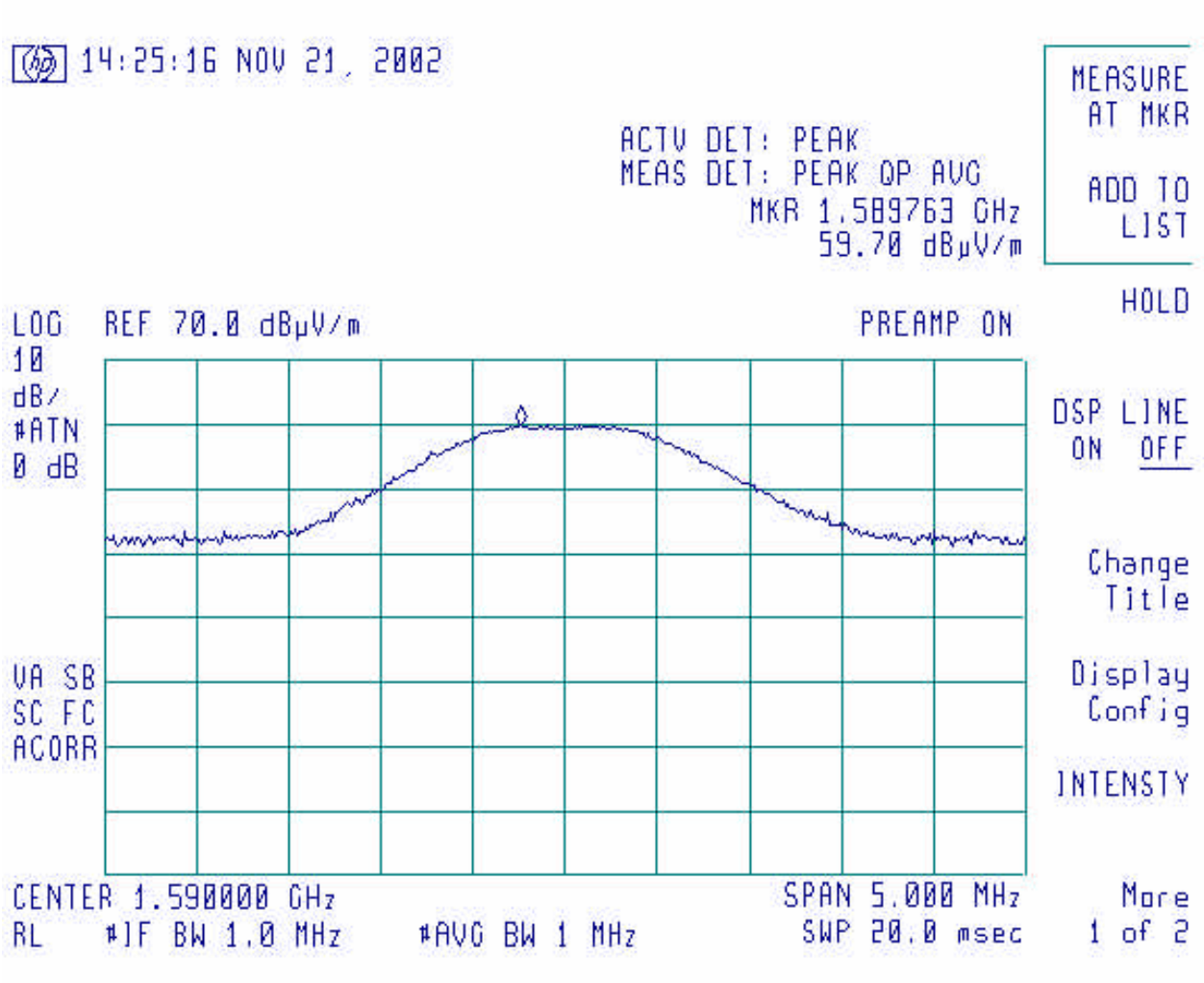
Plot A12

Field strength of 5th harmonic



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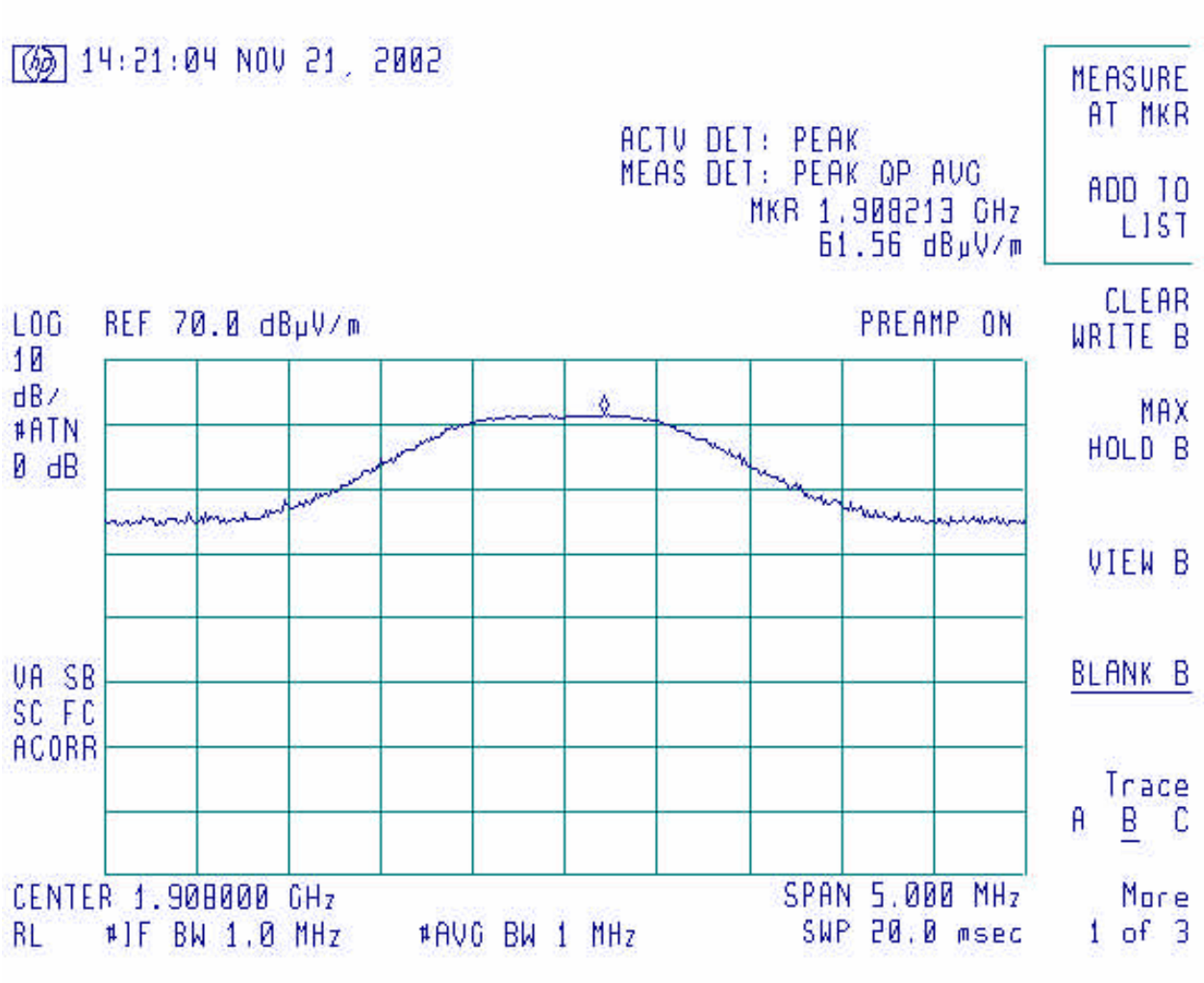
Plot A13

Field strength of 6th harmonic



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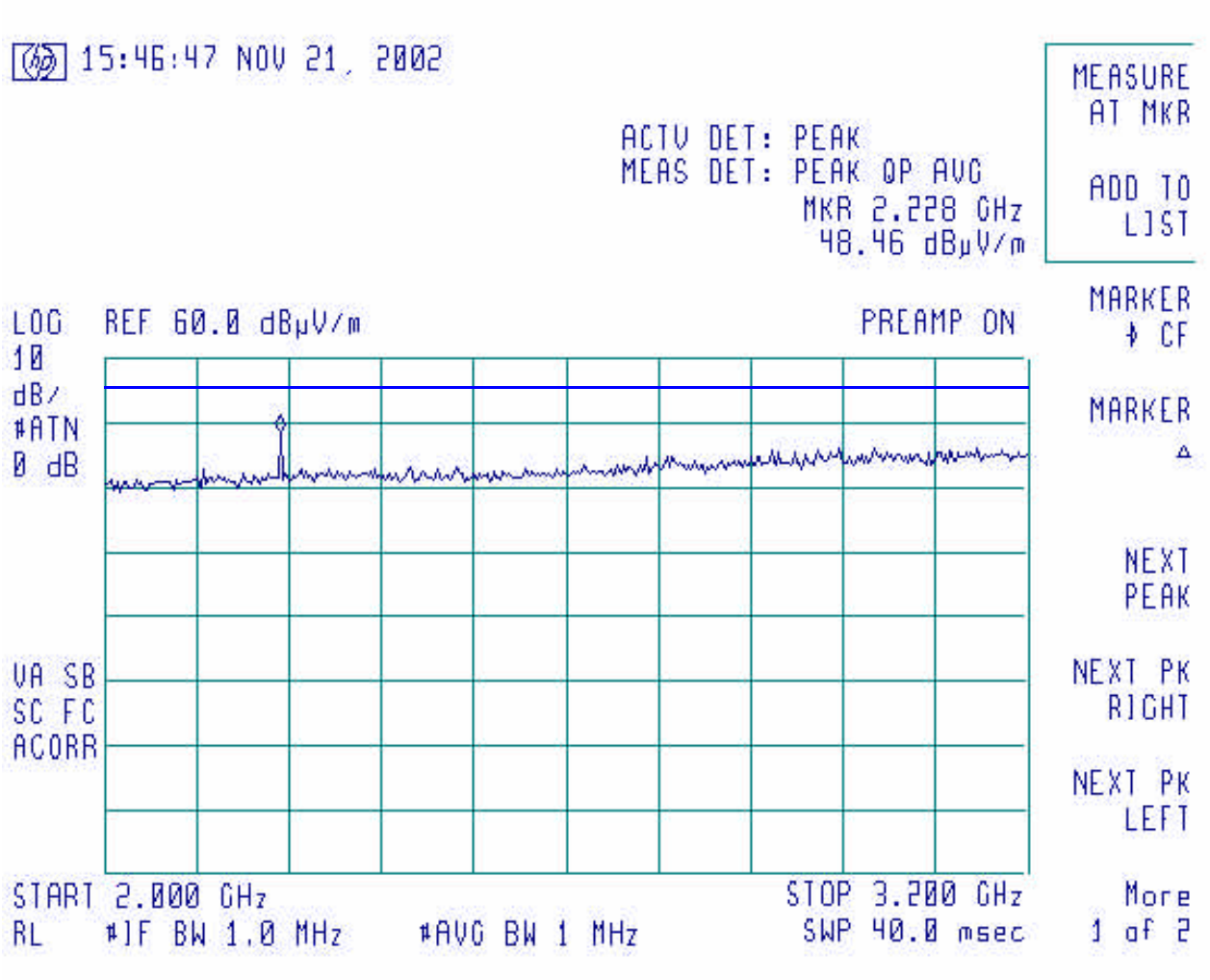
Plot A14

Spurious emission measurements
2 – 3.2 GHz



The blue line is spurious radiated emission limit according to § 15.231.

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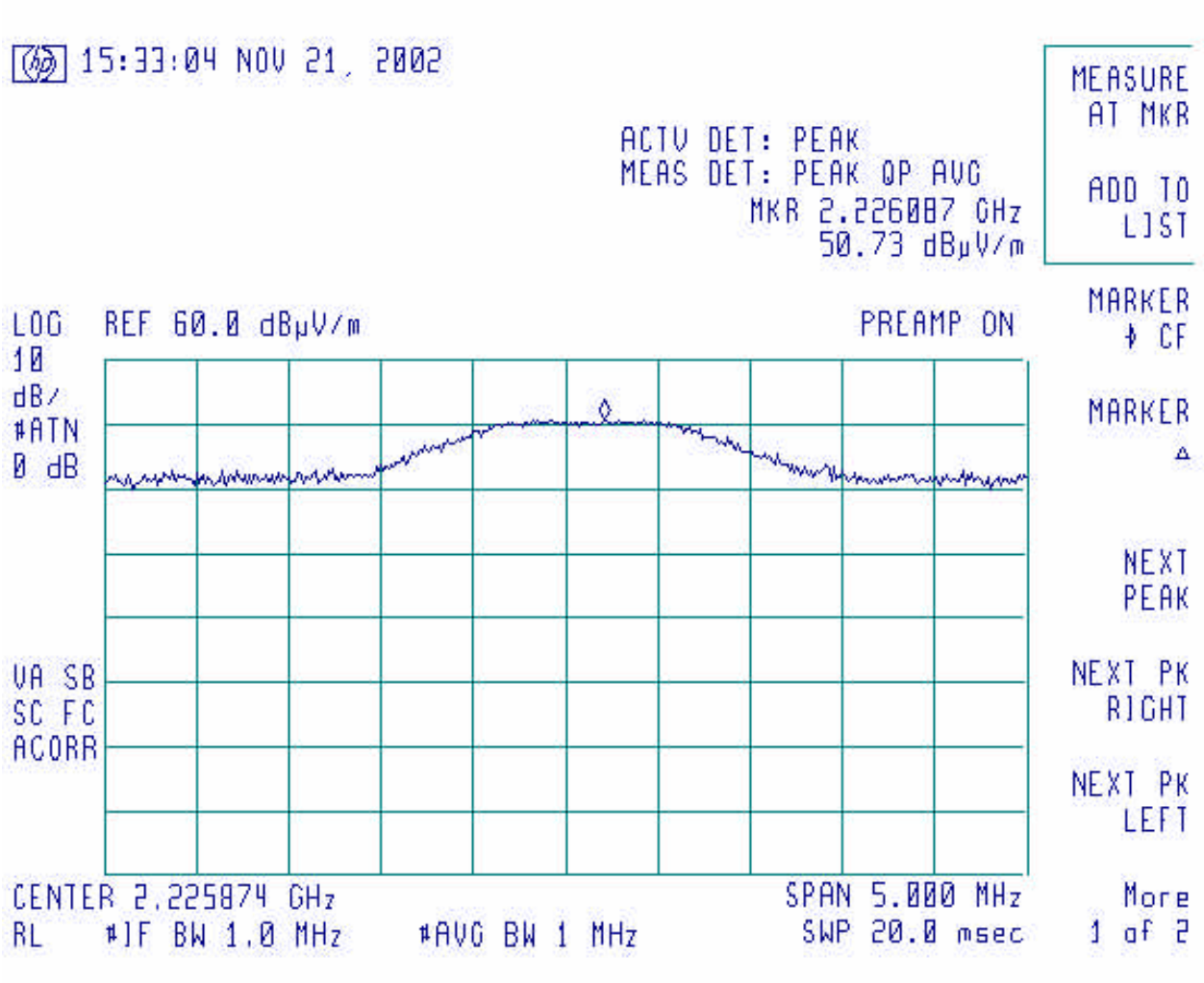
Plot A15

Field strength of 7th harmonic



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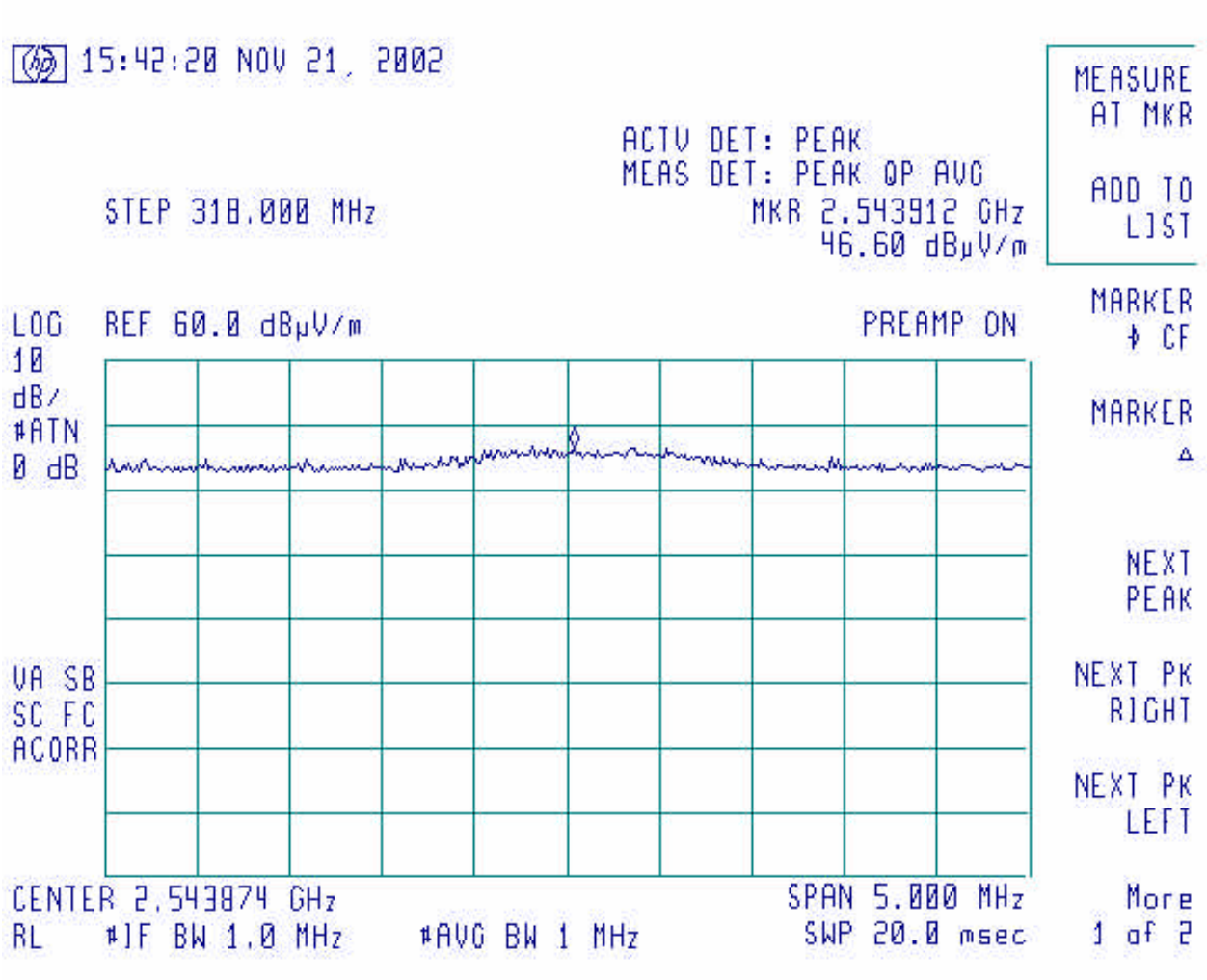
Plot A16

Field strength of 8th harmonic



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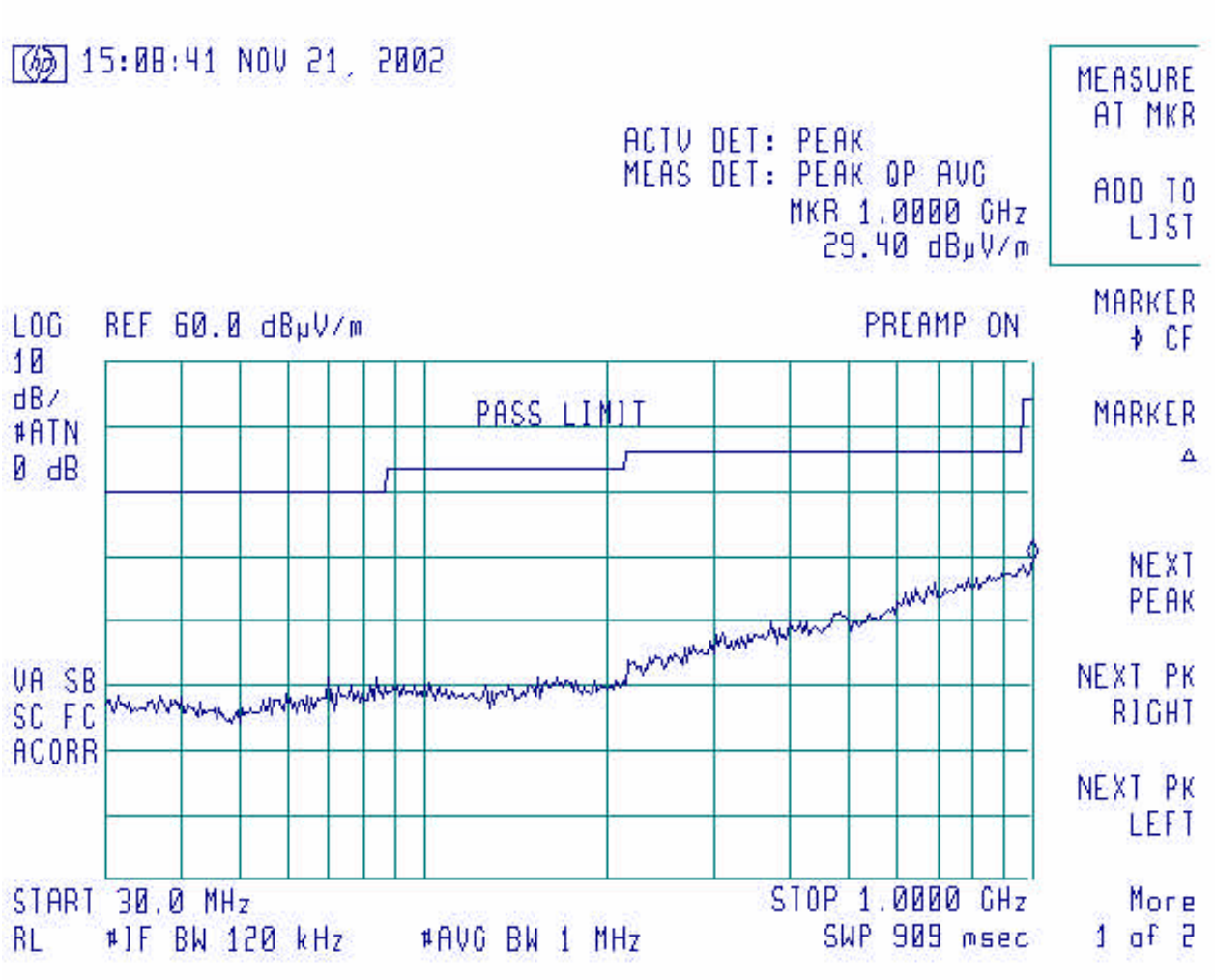
Plot A17

Unintentional emission measurements
30 – 1000 MHz



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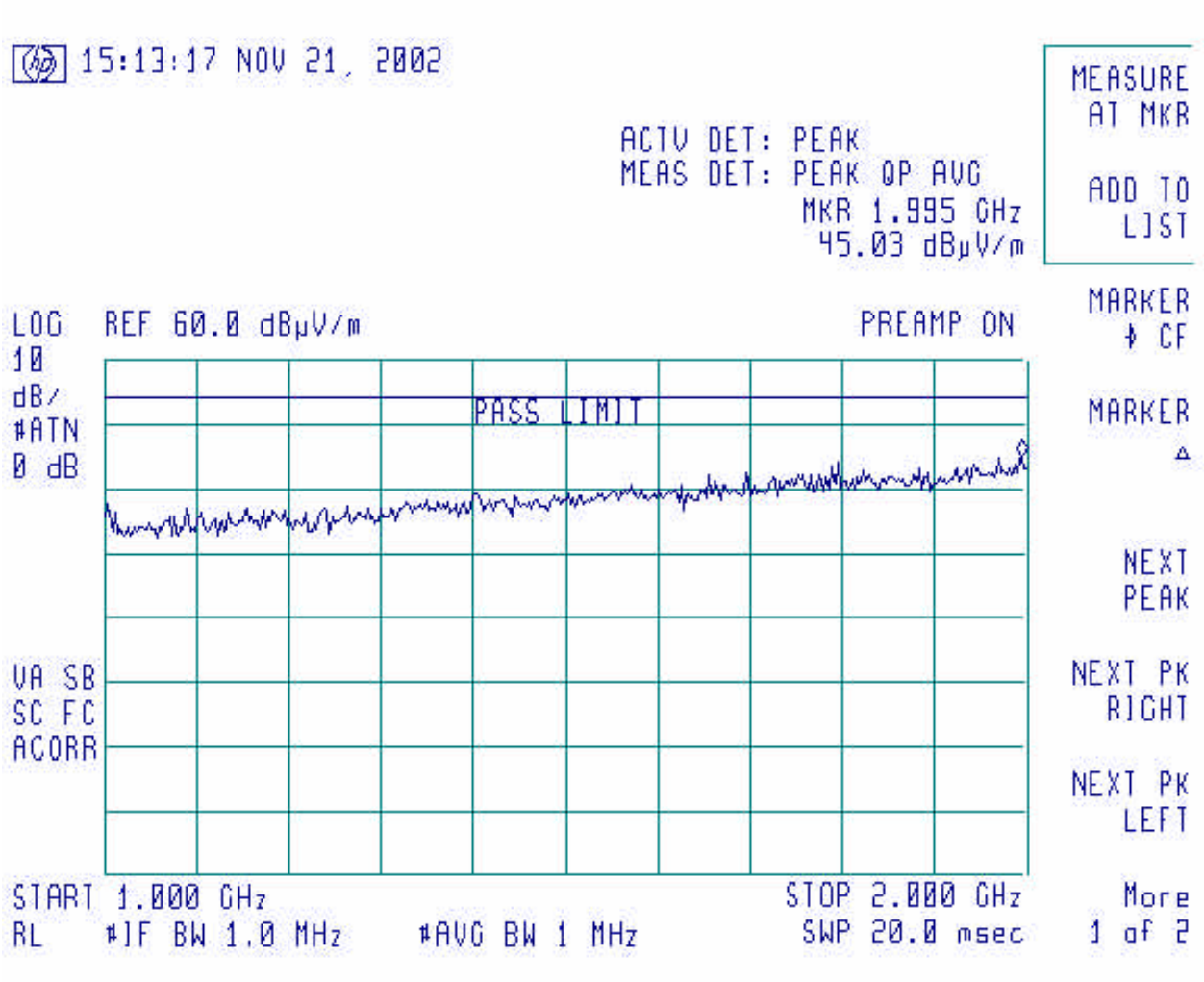
Plot A18

Unintentional emission measurements
1000 – 2000 MHz



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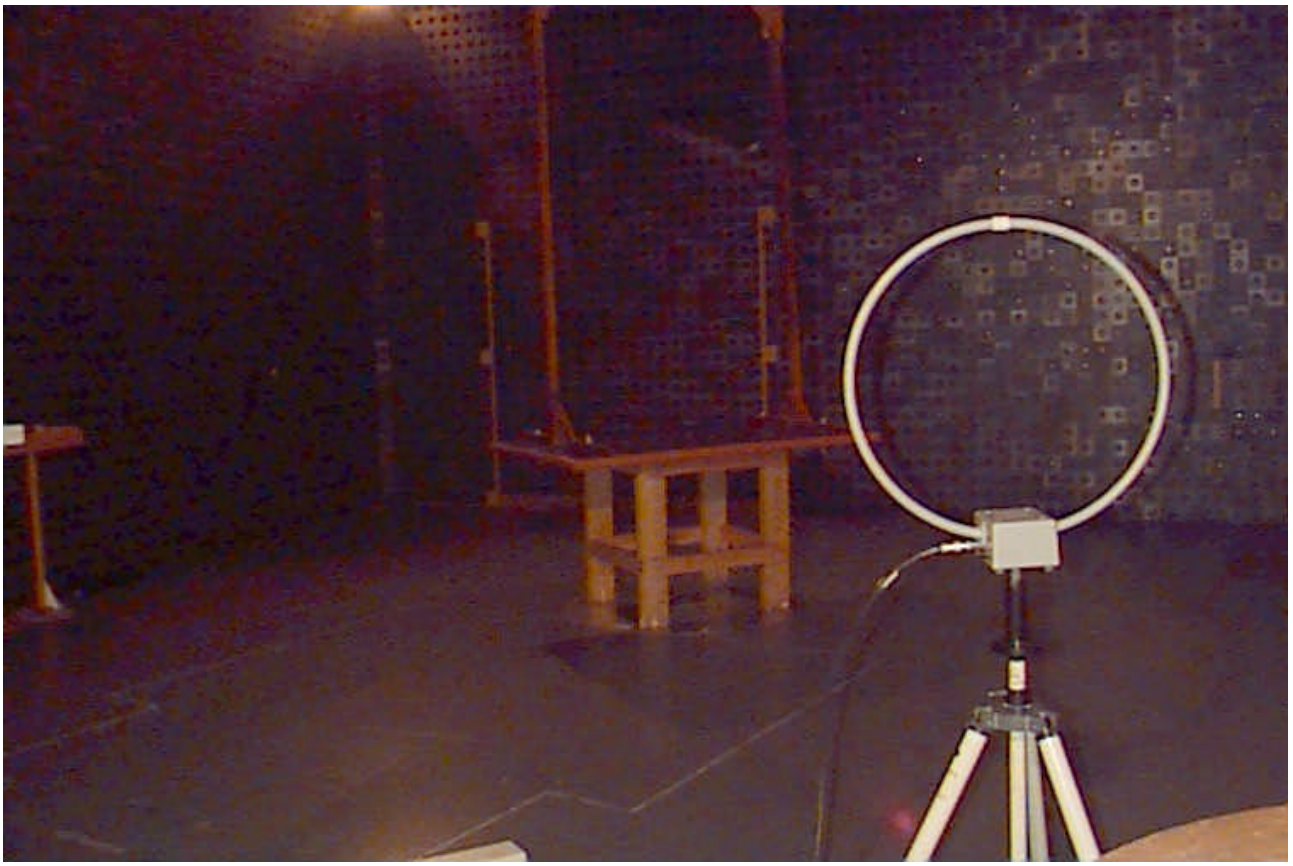
Appendix B Test setup photographs

RADIATED EMISSION MEASUREMENT SETUP, 9 kHz – 30 MHz FREQUENCY RANGE



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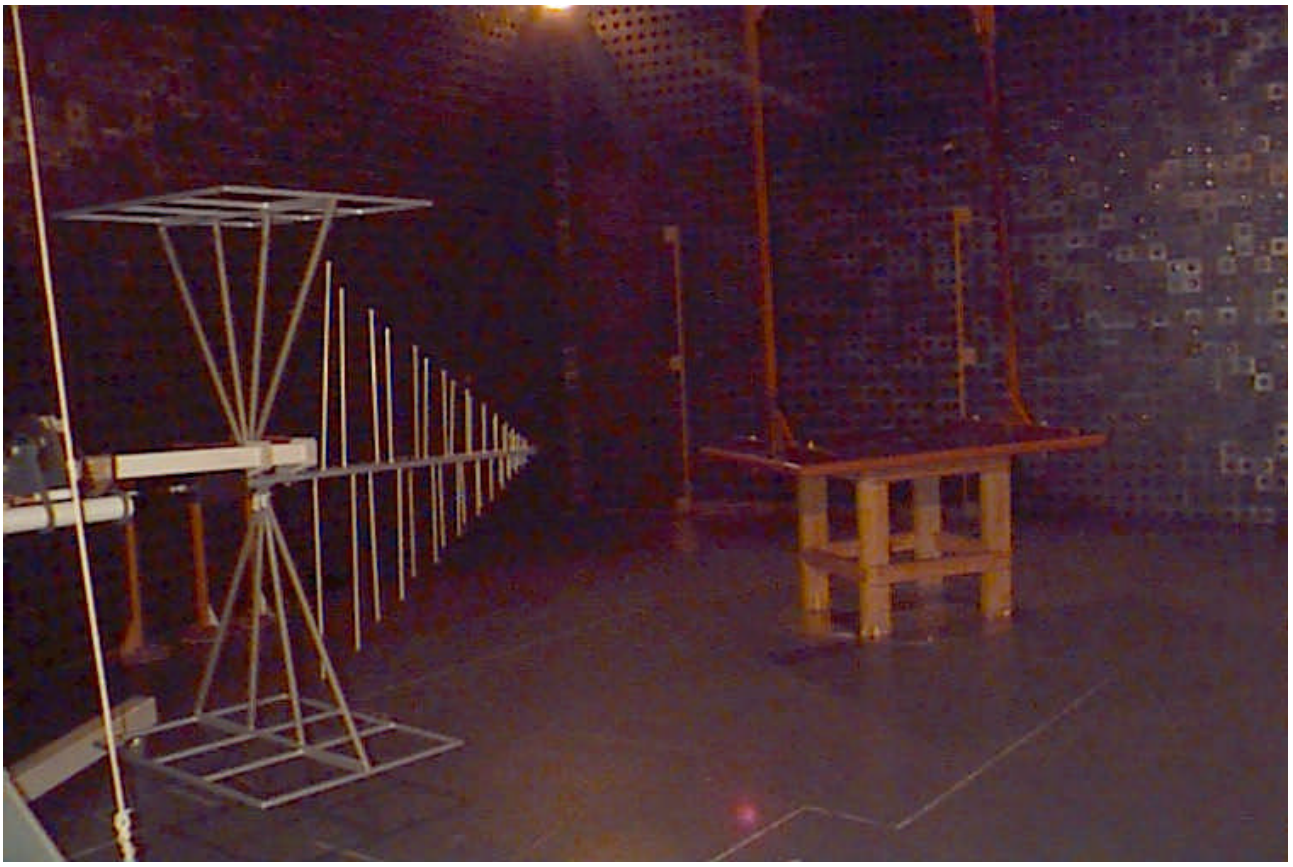
RADIATED EMISSION MEASUREMENT SETUP, 30 – 2000 MHz FREQUENCY RANGE



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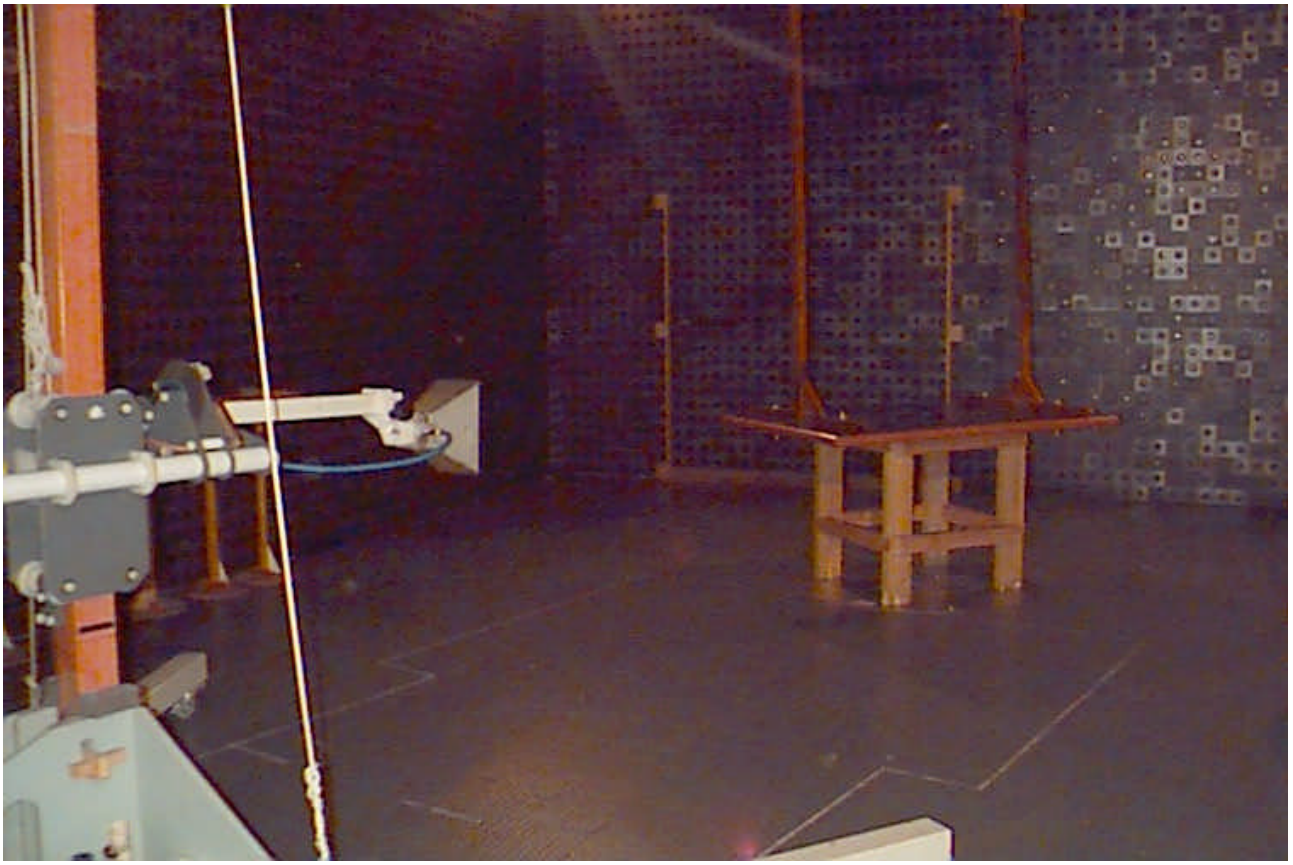
RADIATED EMISSION MEASUREMENT SETUP, 2000 – 3200 MHz FREQUENCY RANGE



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RADIATED EMISSION MEASUREMENTS, THE EUT VIEW

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Appendix C Test equipment used for tests

HL Serial No.	Description	Manufacturer information			Due Calibration Month/ year
		Name	Model No.	Serial No.	
0041	Double ridged guide antenna, 1-18 GHz	Electro-Metrics	RGA 50/60	2811	3/03
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	11/03
0521	Spectrum Analyzer with RF filter section (EMI Receiver 9 kHz - 6.5 GHz)	Hewlett Packard	8546A	0319	7/03
0589	Cable Coaxial, GORE A2POL118.2, 3m	Hermon Labs	GORE-3	589	12/03
0604	Antenna Biconilog Log-Periodic/T Bow-Tie, 26 - 2000 MHz	EMCO	3141	9611-1011	1/03
1004	Cable, coaxial ANDREW PSWJ4, 6 m	Hermon Labs	ANDREW-6	163	12/03
1019	Artificial hand	Hermon Labs	AH-1	173	2/03 Check
1947	Cable 18 GHz, 6.5 m, blue	Rhophase Microwave Ltd	NPS-1803A-6500-NPS	T4974	10/03

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Appendix E Test equipment correction factors

Antenna factor, Active Loop Antenna
Model 6502
S/N 2857

Frequency, MHz	Antenna factor, dB
0.009	-32.8
0.010	-33.8
0.020	-38.3
0.050	-41.1
0.075	-41.3
0.100	-41.6
0.150	-41.7
0.250	-41.6
0.500	-41.8
0.750	-41.9
1.000	-41.4
2.000	-41.5
3.000	-41.4
4.000	-41.4
5.000	-41.5
10.000	-41.9
15.000	-41.9
20.000	-42.2
25.000	-42.8
30.000	-44.0

Antenna factor 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 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 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 Coaxial, GORE A2P01POL118, 2.3 m, model:GORE-3, s/n 176 (HL 0589)
+ Cable Coaxial, ANDREW PSWJ4, 6m, model: ANDREW-6, s/n 163 (HL 1004)
Calibration data

No.	Parameter	Set, MHz	Measured, dB	Deviation, dB	Tolerance (Specification), dB	Meas. uncert., dB
1	Insertion Loss	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	Insertion Loss	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 18GHz, 6.5 m, blue, model: NPS-1803A-6500-NPS, s/n T4974 (HL 1947)
Calibration data

Frequency, GHz	Insertion 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	Insertion 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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Appendix E 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).

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

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
m	meter
MHz	megahertz
NA	not applicable
QP	quasi-peak
RF	radio frequency
RE	radiated emission
s	second
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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FCC Equipment codes and descriptions

CYY	Communications Receiver used w/ P.15 transmitter
DCD	Part 15 Low Power transmitter Below 1705 kHz
DSC	Part 15 Security/Remote Control Transmitter
DSR	Part 15 Remote Control/Security Device Transceiver
DSS	Part 15 Spread Spectrum Transmitter
DXX	Part 15 Low Power Communication Device Transmitter
EAV	Part 15 Automatic Vehicle Identification System
ETB	Part 15 Cordless Telephone Base Transceiver
ETR	Part 15 Cordless Telephone Remote Transceiver
ETS	Part 15 Cordless telephone system
FAP	Part 15 Anti-Pilferage Device
FDS	Part 15 Field Disturbance Sensor
GAT	Part 15 Auditory Assistance Device (Transmitter)
HID	Part 15 TV Interface Device
JBC	Part 15 Class B Computing Device/ Personal Computer
JBP	Part 15 Class B Computing Device Peripheral
PUB	Part 15 Unlicensed PCS base station
PUE	Part 15 Unlicensed PCS portable Tx held to ear
PUF	Part 15 Unlicensed PCS portable Tx held to face
PUT	Part 15 Unlicensed PCS portable Tx worn on body