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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

HomeFree Systems Ltd.

EQUIPMENT UNDER TEST:

Personal watcher

Model: VST 800

Document ID: HOMRAD_FCC.15299.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	Personal watcher
Manufacturer	ElmoTech Ltd.
Type (Model)	VST 800
Transmitter operating frequency	318 MHz
Equipment FCC code[1]	DSC

Applicant information

Applicant's responsible person	Mr. Alex Rachman, Project Manager
Company	HomeFree Systems 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:	15299
Location	Hermon Laboratories
Receipt date	October 7, 2002
Test started	October 7, 2002
Test completed	October 27, 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**				Mr. Y. Neuman, test engineer	October 13, 2002	
Field strength of fundamental	15.231(b)(2)	**X**				Mr. Y. Neuman, test engineer	October 8, 2002	
Field strength of spurious radiation	15.231(b)(3)	**X**				Mr. Y. Neuman, test engineer	October 10, 13, and 23, 2002	
Unintentional radiation, §15.107, §15.109								
Conducted emissions	15.107				**X**			
Radiated emissions	15.109	**X**				Mr. Y. Neuman, test engineer	October 10 and 13, 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

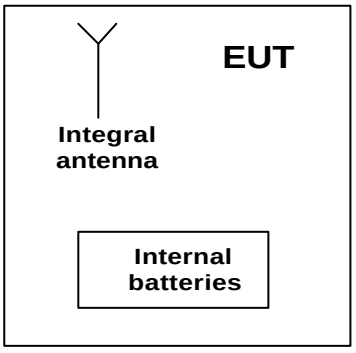
3.1 EUT description

The EUT is a wristwatch, which contains an integral transmitter. It is used to monitor patient status within an area covered by a local positioning system. The device in active mode transmits 5ms identification & status signals with interval about 10 s. The device in panic alert mode transmits six 5ms messages within 1 s with 50-200 ms intervals between these transmissions.
The EUT is powered by two 3.0 V lithium batteries, connected in series.

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)			-5			
Transmitter duty cycle (worst case)							
	Tx on (seconds)			0.011			
	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)**		**3.0 x 2**			
	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:	October 13, 2002
RELATIVE HUMIDITY:	42 %
AMBIENT TEMPERATURE:	24 °C
AIR PRESSURE:	1010 hPa
MODULATION:	ON
DETECTOR USED:	Peak
MEASUREMENT UNCERTAINTY:	0.2 ppm

Carrier frequency MHz	Occupied bandwidth, kHz	Reference to plot in Annex A
318	455	A1

TEST EQUIPMENT USED:

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

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 a modulated carrier.

For 318 MHz frequency 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: October 8, 2002
RELATIVE HUMIDITY: 42 %
AMBIENT TEMPERATURE: 29 °C
AIR PRESSURE: 1012 hPa
SITE DESCRIPTION: OATS
MODULATION: ON
DETECTOR USED: PEAK
MEASUREMENT UNCERTAINTY: -5.73 dB/ -5.57 dB

	§ 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
318.010000	90.06	95.8	5.74

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)	Margin, dB
318.010000	90.06	-18.98	71.08	75.8	4.72

4.2.1 Average factor calculation, §15.35

Tx ON	Duty cycle	Average factor	Reference to plot in Annex A
11.24 ms	0.1124	-18.98	A2

TEST EQUIPMENT USED:

HL 0034	HL 0038	HL 0415	HL 0554	HL 0812	HL 1019	HL 1365
HL 1424	HL 1430	HL 1938	HL 1947			

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 frequency is 75.8 dB(■V/m)
The specified peak limit for 318 MHz frequency is 95.8 dB(■V/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^{o}, 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:	October 10, 13 and 23, 2002
RELATIVE HUMIDITY:	42 %
AMBIENT TEMPERATURE:	24 °C
AIR PRESSURE:	1010 hPa
TEST PERFORMED AT FIELD STRENGTH OF CARRIER:	90.06 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:	300 kHz below 1 GHz, 3 MHz above 1 GHz
MEASUREMENT UNCERTAINTY:	-5.73 dB/ -5.57 dB

Frequency,	Radiated emissions					
	Peak			Average		
MHz	Measured, dB(■V/m)	Limit, dB(■V/m)	Margin, dB	Calculated*, dB(■V/m)	Limit, dB(■V/m)	Margin, dB
308.063325	41.96	75.8	33.84	22.98	55.8	32.82
327.938500**	39.31	74	34.69	20.33	54	33.67
953.933750	46.47	75.8	29.33	27.49	55.8	28.31
1907.972000	51.47	75.8	24.33	32.49	55.8	23.31

For test results refer to Plots A3 to A9.

*** Radiated emission value was calculated: Peak value + Average factor (= -18.98 dB)**
**** Falls into restricted bands**

TEST EQUIPMENT USED:

HL 0041	HL 0446	HL 0465	HL 0521	HL 0589	HL 0592	HL 0593
HL 0594	HL 0604	HL 1004	HL 1019	HL 2009		

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 frequency range. 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 frequency range. 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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METHOD OF MEASUREMENT:	ANSI 63.4 §13.1.4
TEST PERFROMED AT:	OATS
DATE:	October 10 and 13, 2002
RELATIVE HUMIDITY:	42 %
AMBIENT TEMPERATURE:	24 °C
AIR PRESSURE:	1010 hPa
TEST PERFORMED AT FIELD STRENGTH OF CARRIER:	90.06 dB(μV/m)
MODULATION:	ON
DETECTOR USED:	PEAK
RANGE OF MEASUREMENTS:	200 to 3200 MHz
RESOLUTION BANDWIDTH:	120 kHz below 1 GHz, 1 MHz above 1 GHz
VIDEO BANDWIDTH:	300 kHz below 1 GHz, 3 MHz above 1 GHz
MEASUREMENT UNCERTAINTY:	-5.73 dB/ -5.57 dB

Frequency, MHz	Radiated emissions					
	Peak			Average		
	Measured, dB(■V/m)	Limit, dB(■V/m)	Margin, dB	Calculated*, dB(■V/m)	Limit, dB(■V/m)	Margin, dB
636.017250	53.98	75.8	21.82	35.00	55.8	20.80
1272.060000	42.32	75.8	33.48	23.34	55.8	32.46
1589.980000**	43.10	74	30.90	24.12	54	29.88
2226.020000**	51.92	74	22.08	32.94	54	21.06

*** Radiated emission value was calculated: Peak value + Average factor (= -18.98 dB)**
**** Falls into restricted bands**

TEST EQUIPMENT USED:

HL 0034	HL 0038	HL 0041	HL 0415	HL 0554	HL 0812	HL 1019
HL 1200	HL 1365	HL 1424	HL 1430	HL 1938	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.

200 MHz – 3.2 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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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:	October 10 and 13, 2002
RELATIVE HUMIDITY:	42 %
AMBIENT TEMPERATURE:	24 °C
AIR PRESSURE:	1010 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 (30 – 100 MHz range) 1 MHz (1000 – 2000 MHz range)
MEASUREMENT UNCERTAINTY:	-5.73 dB/ -5.57 dB

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 (^{o})	Radiated emissions, dB (μV/m)	Specification limit, dB (μV/m)	Reference to plots in Annex A
30 - 2000	**The limit for unintentional radiated emission, class B was used throughout spurious emission measurements in Tx mode. All emissions except carrier, 2nd and 3rd harmonics were found below the limit.**					A5-A9

Table abbreviations:
Antenna polarization: V = vertical, H = horizontal
Turntable position: 0^o = EUT front panel faces the receiving antenna

TEST EQUIPMENT USED:

HL 0465	HL 0521	HL 0589	HL 0592	HL 0593	HL 0594	HL 0604	HL 1004	HL 1019	HL 2009

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^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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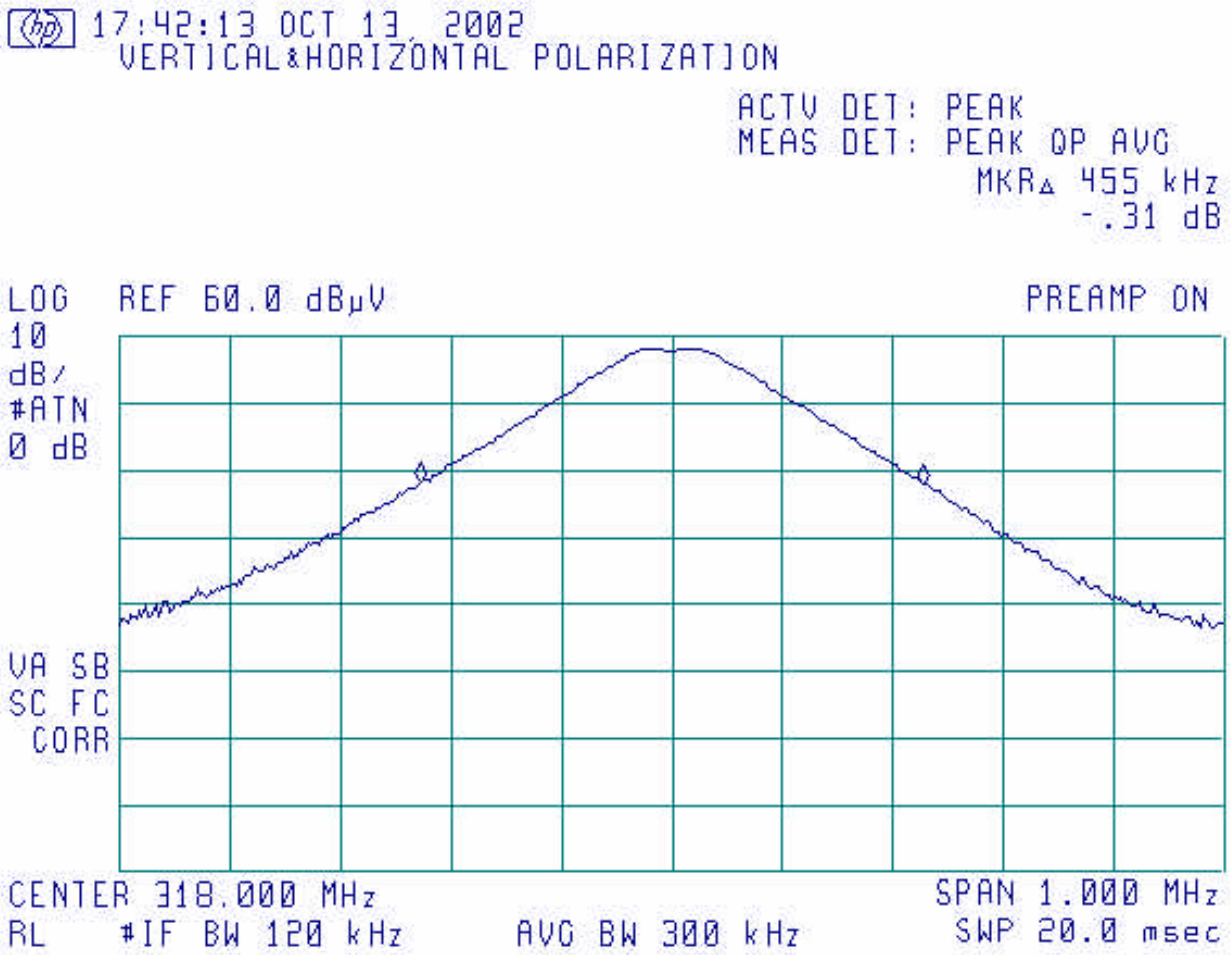
Appendix A Plots

Plot A1

Occupied bandwidth measurements



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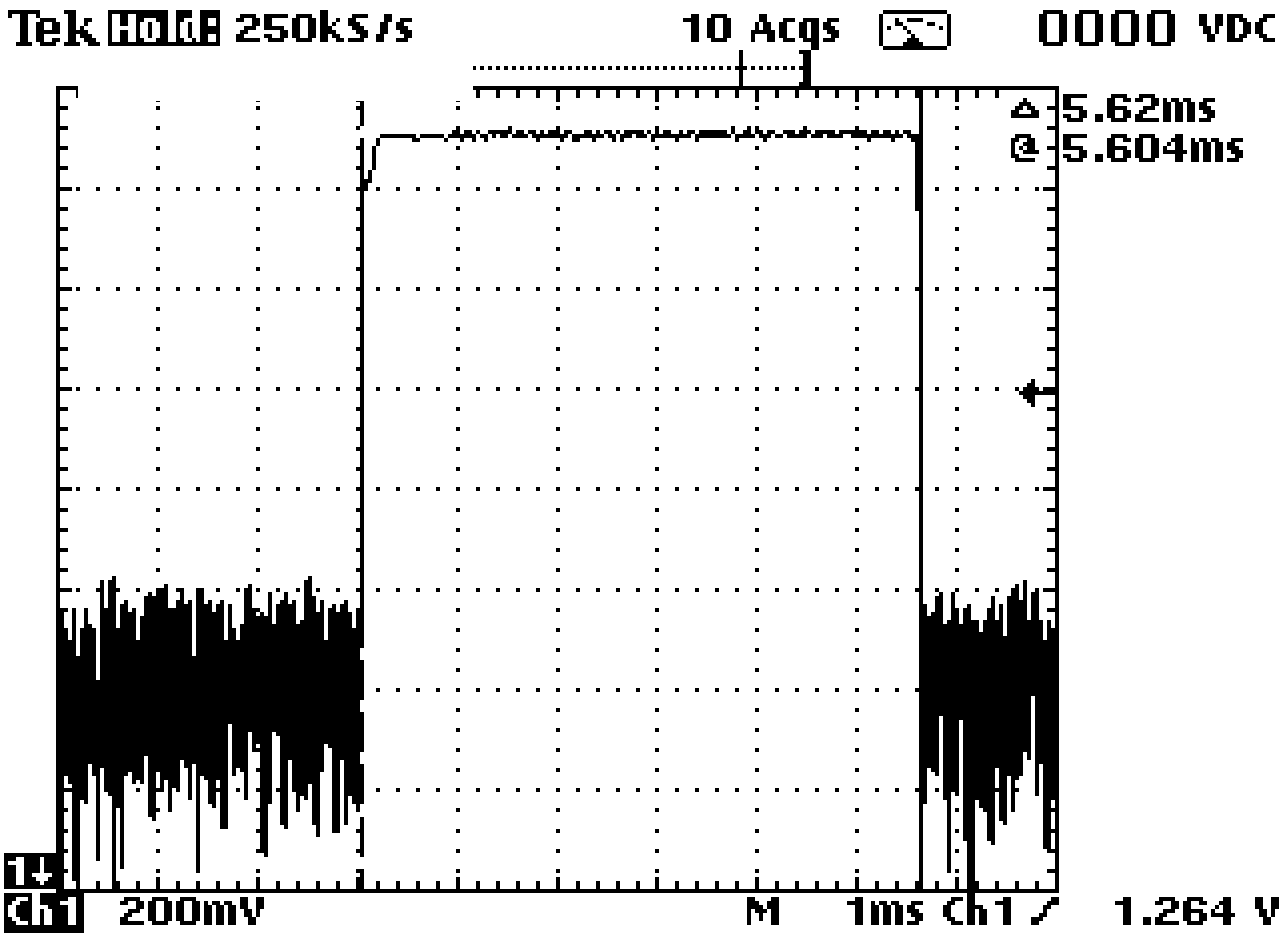
Plot A2

Average factor measurements



The worst case is when two panic alert messages are transmitted within 100 ms.

Average factor = 20log(Tx ON /100) = 20log(11.24/100) = -18.98 dB

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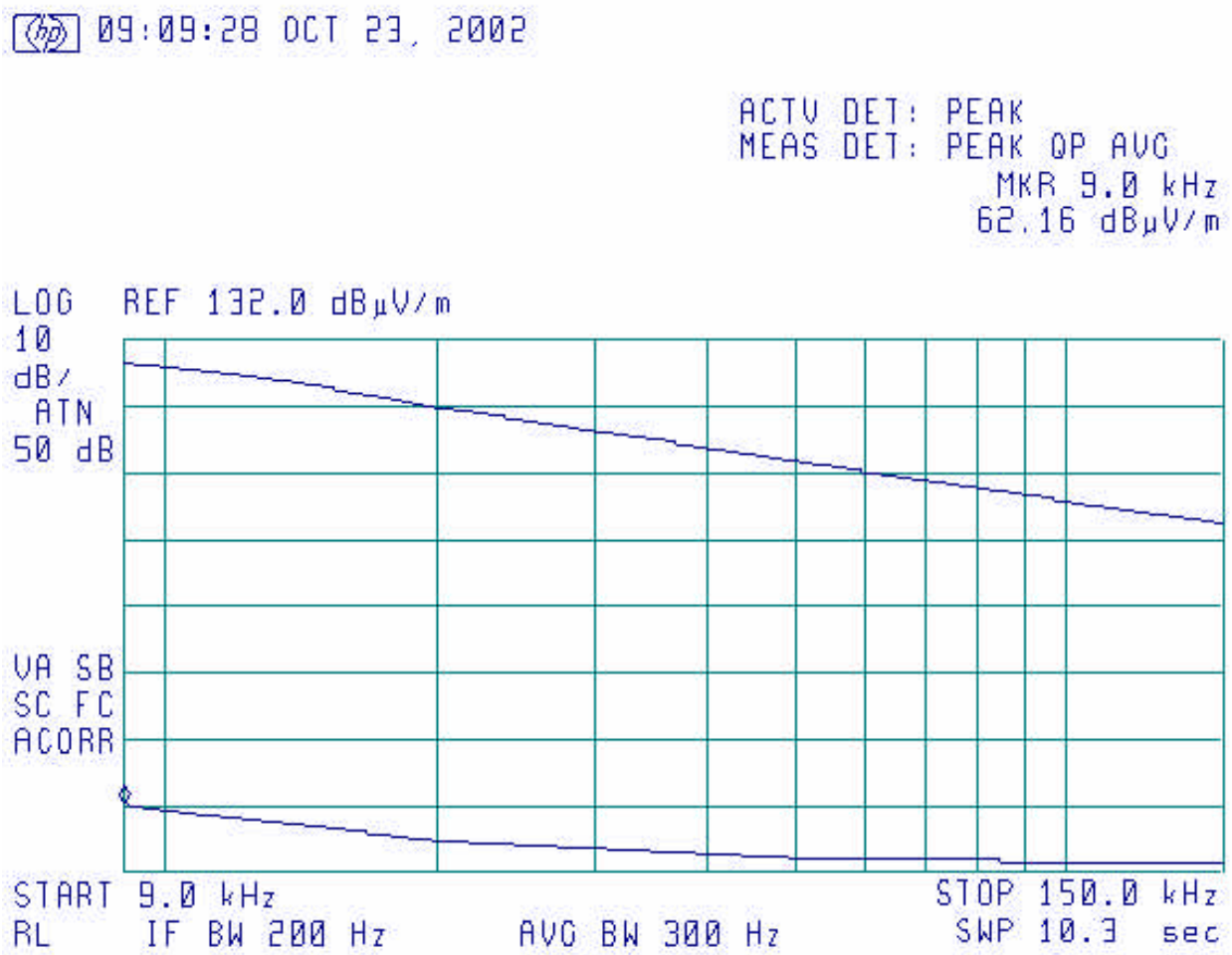
Plot A3

Spurious emission measurements
9 kHz – 150 kHz range



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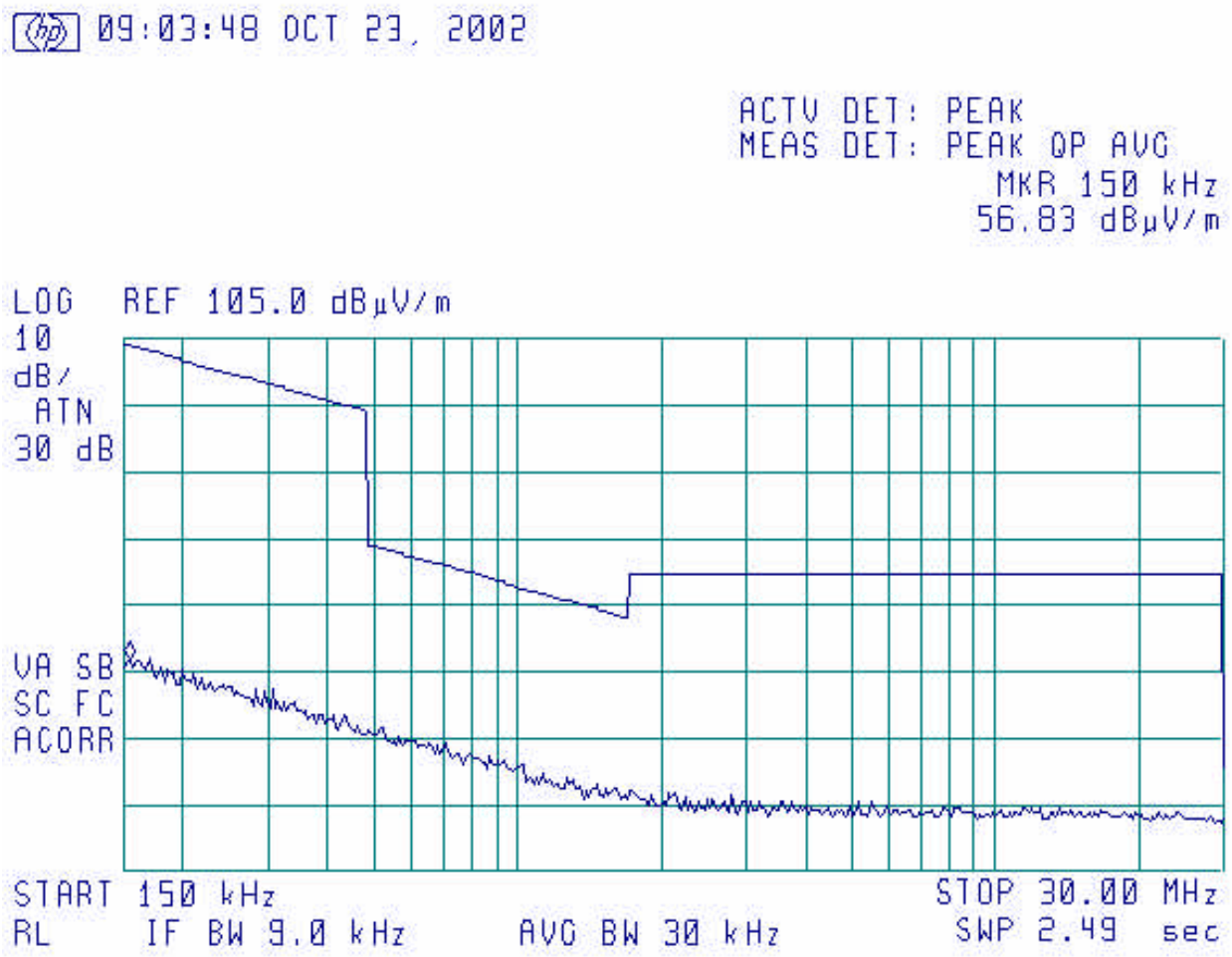
Plot A4

Spurious emission measurements
150 kHz – 30 MHz range



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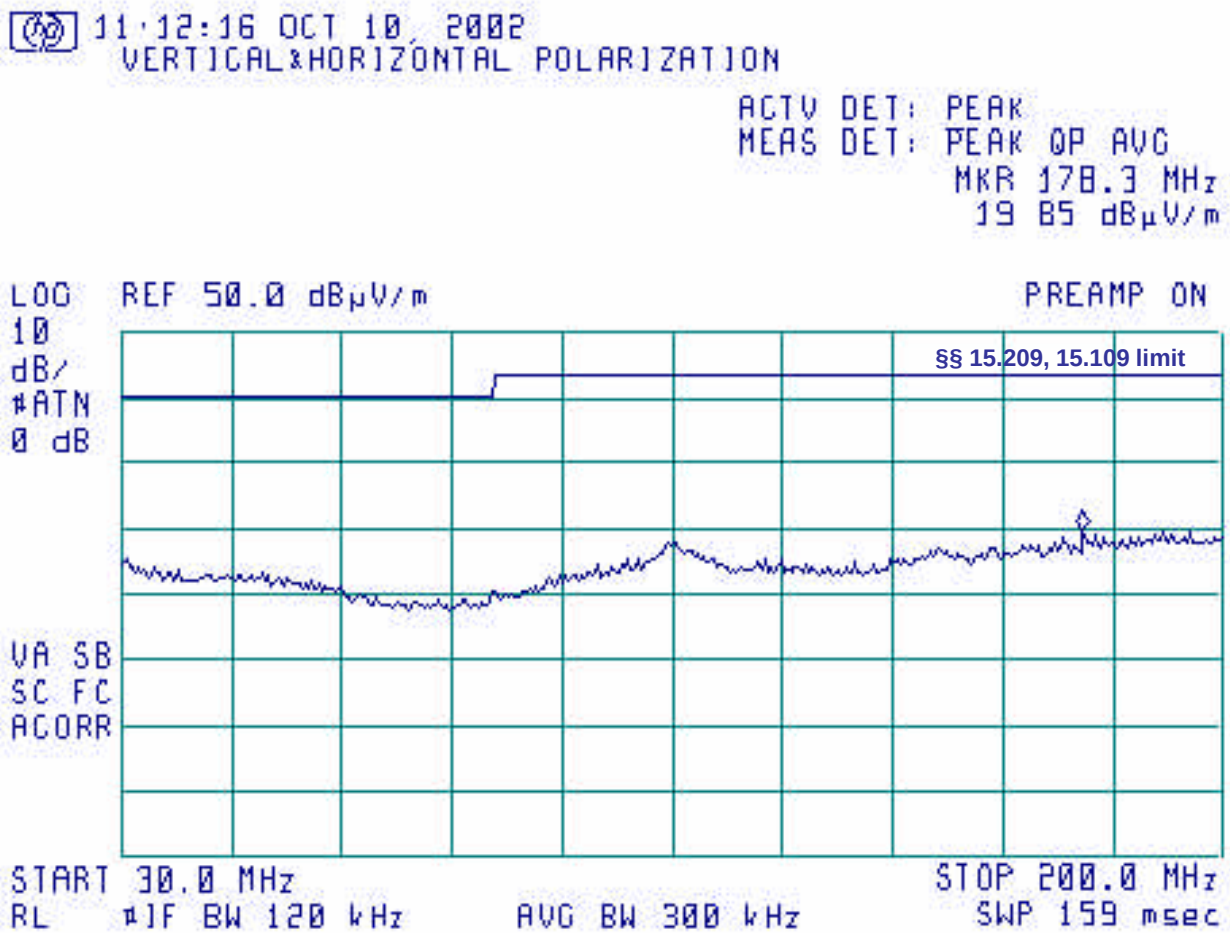
Plot A5

Spurious emission measurements
30 – 200 MHz range



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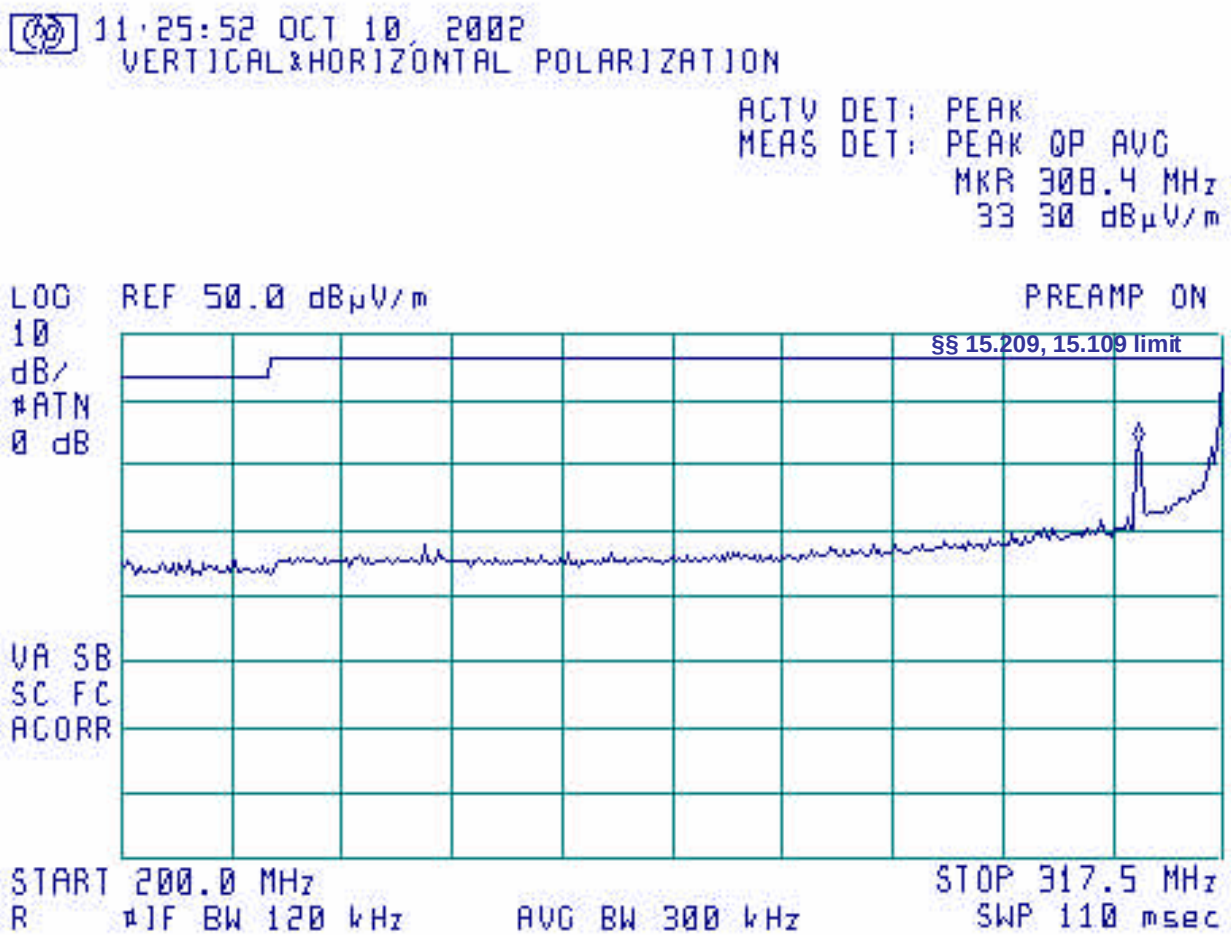
Plot A6

Spurious emission measurements
200 – 317.5 MHz range



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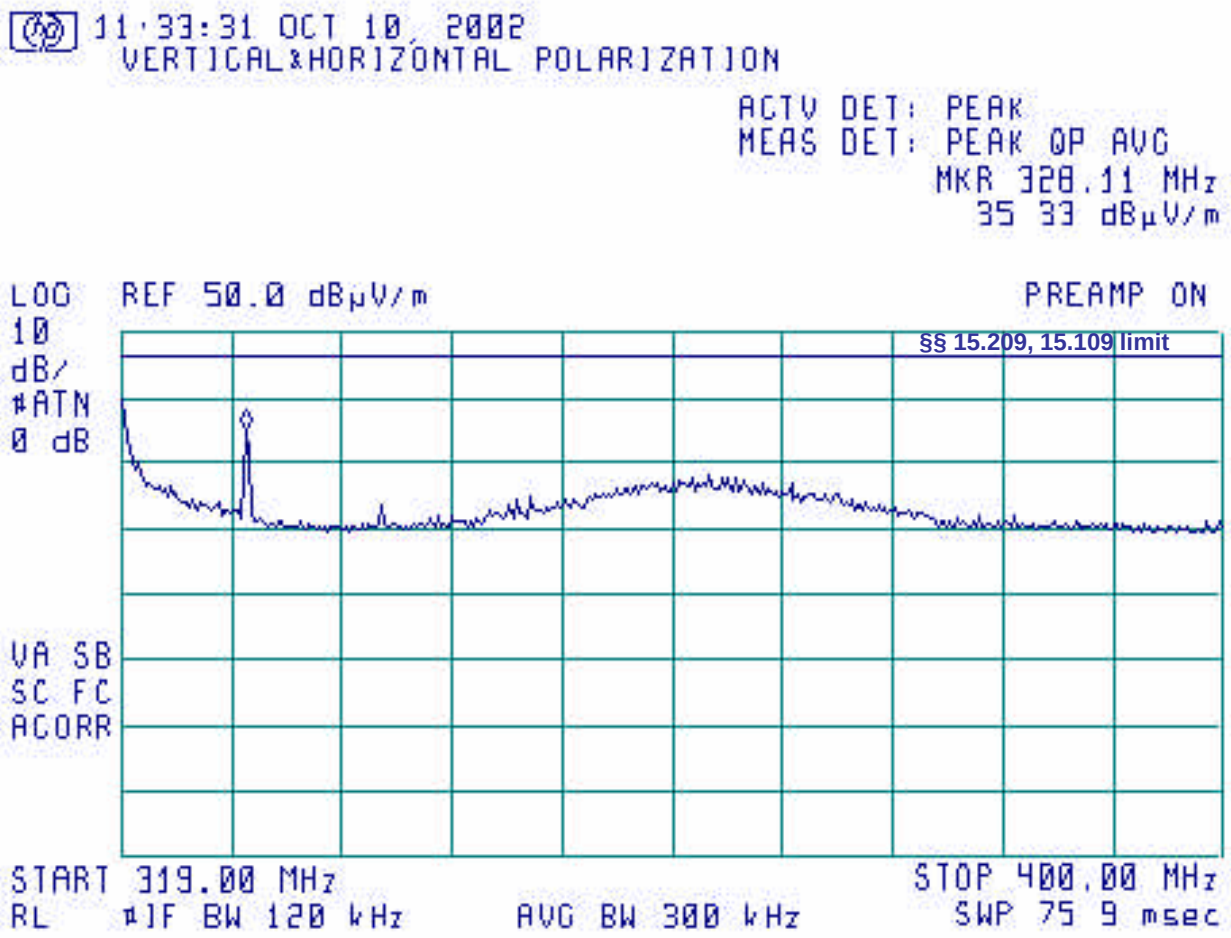
Plot A7

Spurious emission measurements
319 – 400 MHz range



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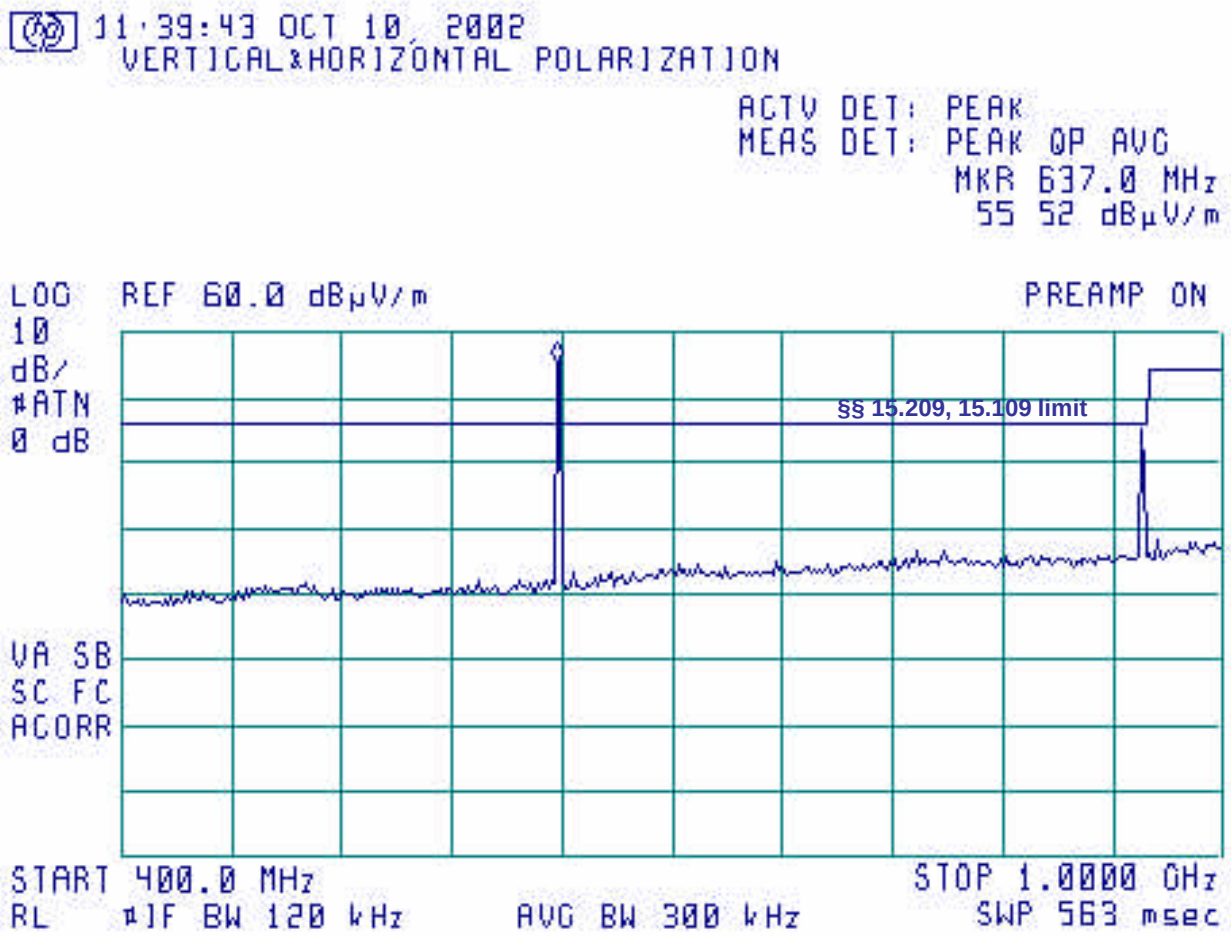
Plot A8

Spurious emission measurements
400 – 1000 MHz range



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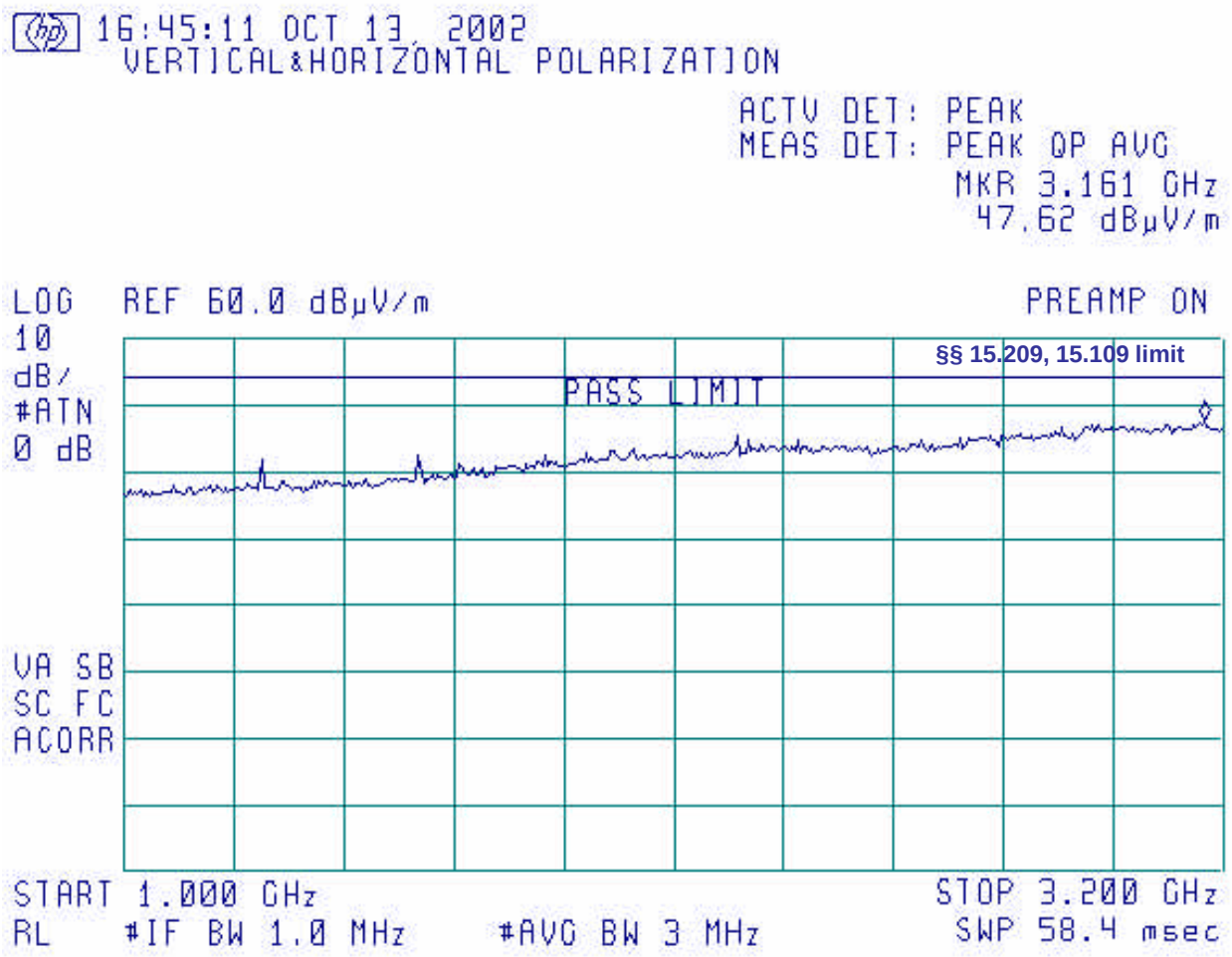
Plot A9

Spurious emission measurements
1 – 3.2 GHz range



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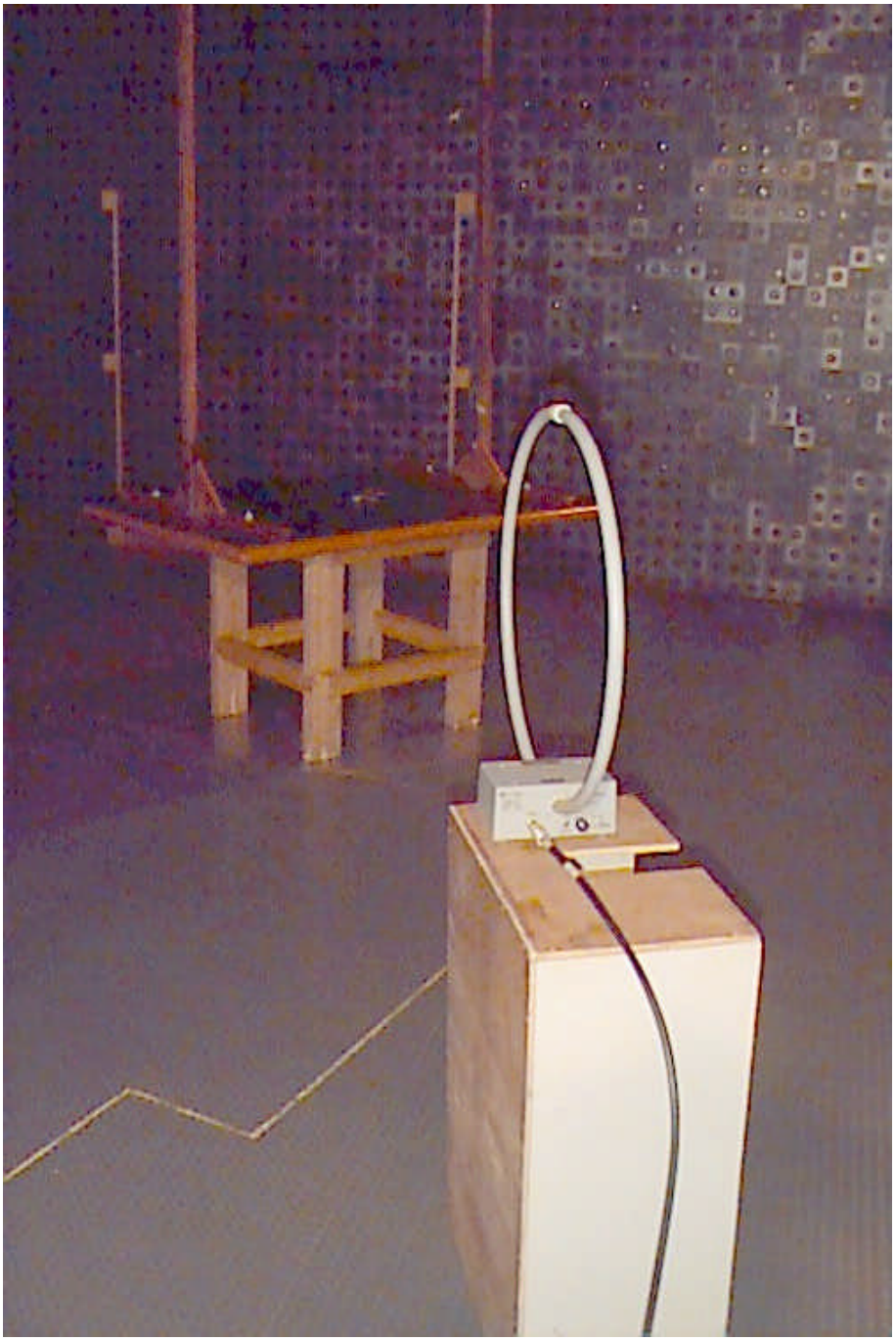
Appendix B Test setup photographs

PHOTOGRAPH 1
SETUP VIEW FOR RADIATED EMISSION MEASUREMENTS PERFORMED IN ANECHOIC CHAMBER, 9 kHz – 30 MHz RANGE



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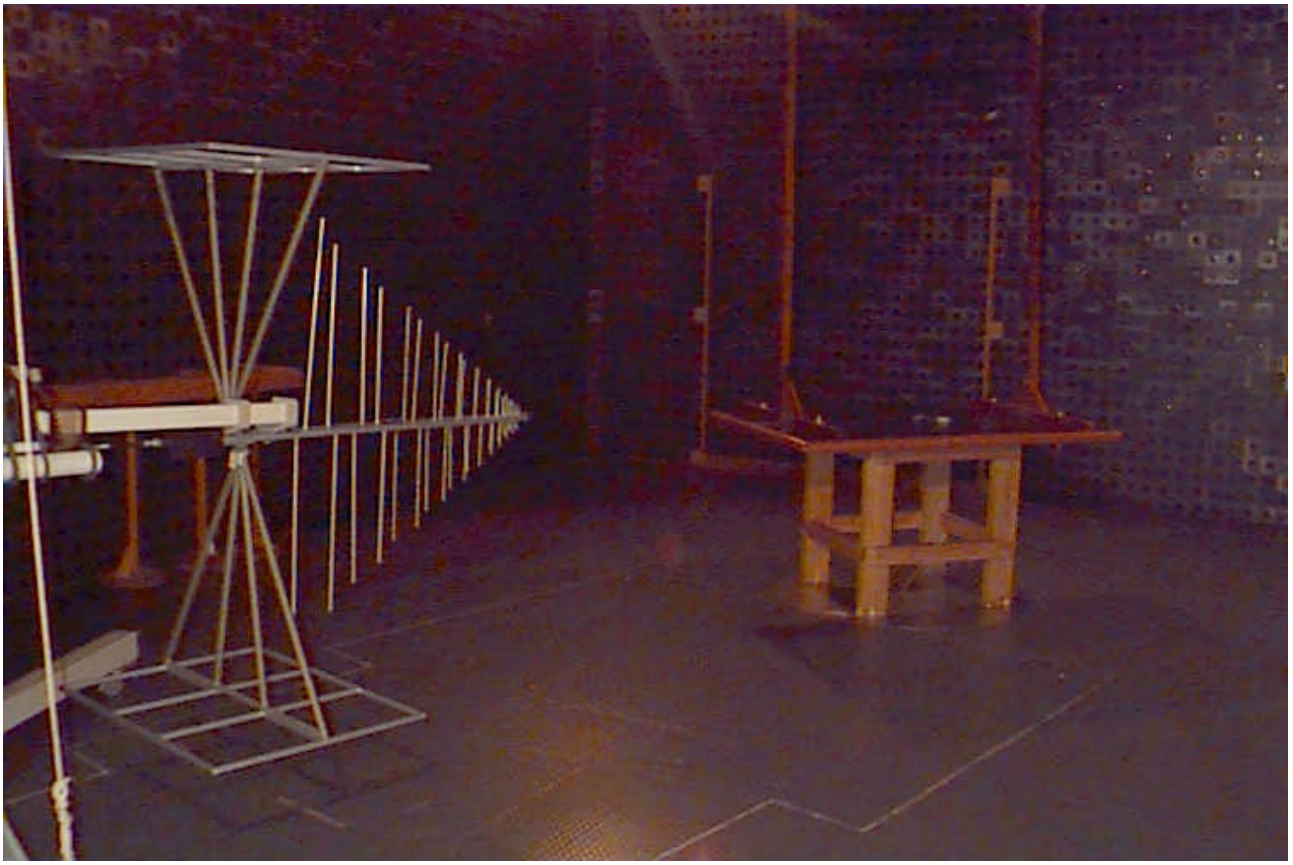
PHOTOGRAPH 2
SETUP VIEW FOR RADIATED EMISSION MEASUREMENTS PERFORMED IN ANECHOIC CHAMBER, 30 – 1000 MHz RANGE



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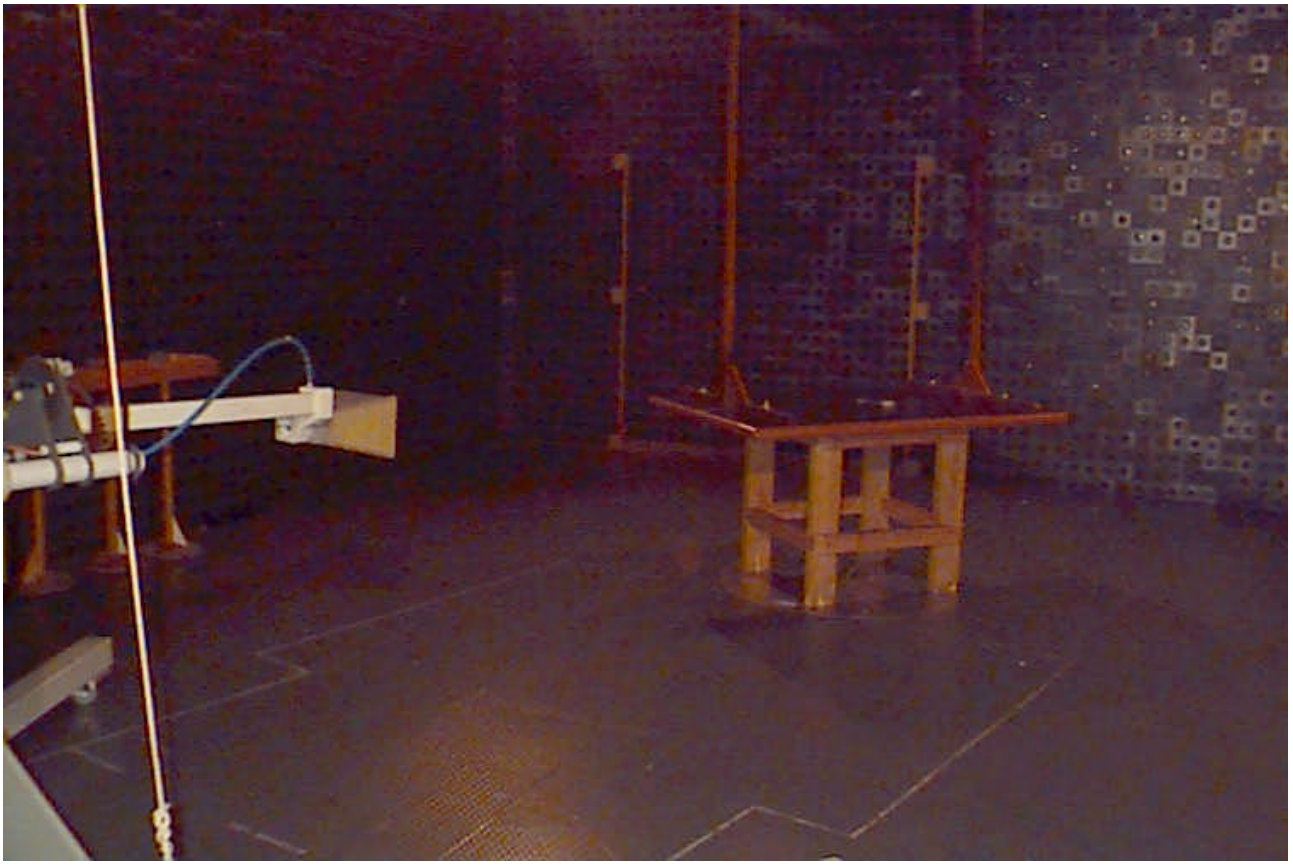
PHOTOGRAPH 3
SETUP VIEW FOR RADIATED EMISSION MEASUREMENTS PERFORMED IN ANECHOIC CHAMBER, 1000 – 3200 MHz RANGE



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PHOTOGRAPH 4
SETUP VIEW FOR RADIATED EMISSION MEASUREMENTS PERFORMED AT OATS,
200 – 1000 MHz RANGE

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PHOTOGRAPH 5
SETUP VIEW FOR RADIATED EMISSION MEASUREMENTS PERFORMED AT OATS,
1000 – 3200 MHz RANGE

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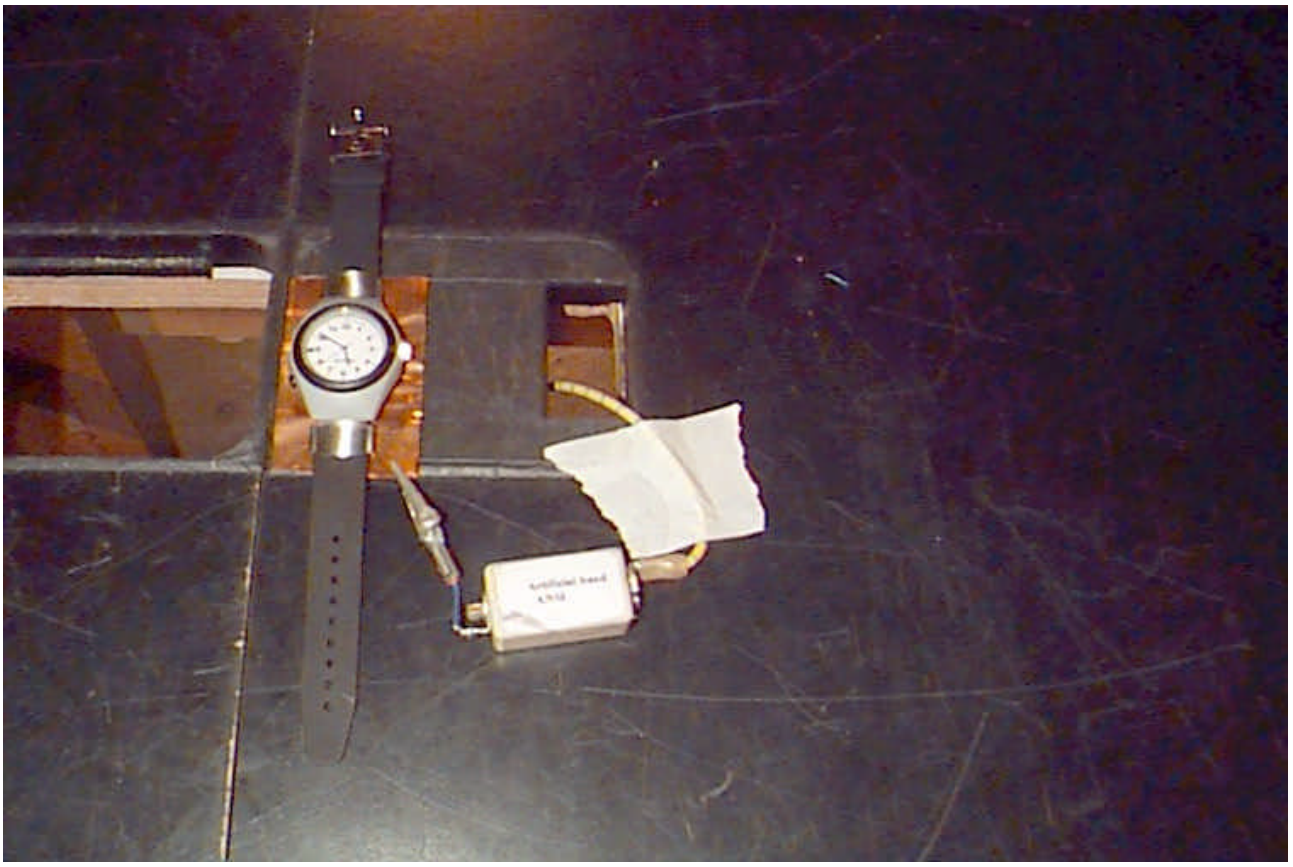
PHOTOGRAPH 6
RADIATED EMISSION MEASUREMENTS, THE EUT VIEW



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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.	
0034	Log periodic antenna, 200 - 1000 MHz	Electro-Metrics	LPA 25/30	1988	1/03
0038	Antenna mast, 1-4 m	Hermon Labs	AM-1	028	2/03 Check
0041	Double ridged guide antenna, 1-18 GHz	Electro-Metrics	RGA 50/60	2811	3/03
0415	Cables coax RF, misc., RG-58, RG-214	Hermon Labs	CC3	056	5/03
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
0521	Spectrum analyzer with RF filter section (EMI receiver 9 kHz - 6.5 GHz)	Hewlett Packard	8546A	0319	9/03
0554	Amplifier, 2 – 18 GHz RF	Miteq	AFD-4	4300	12/03
0589	Cable coaxial, GORE A2POL118.2, 3m	Hermon Labs	GORE-3	589	12/03
0592	Position controller	Hermon Labs	L2-SR3000	100	5/03 Check
0593	Antenna mast, 1-4 m/ 1-6 m Pneumatic	Hermon Labs	AM-F1	101	2/03 Check
0594	Turntable for anechoic chamber, flush mounted, d=1.2 m, pneumatic	Hermon Labs	WDC1	102	1/04 Check
0604	Antenna biconilog log-periodic/T Bow-Tie, 26 - 2000 MHz	EMCO	3141	9611-1011	1/03
0812	Cable, coax, RG-214, 11.5 m, N-type connectors	Hermon Labs	C214-11	148	5/03
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
1200	Quadruplexer	Electronica	UE 84	0240	4/03 Check
1365	Cable coaxial, RG-214, 5 m	Hermon Labs	C214-5	1365	12/03
1424	Spectrum analyzer, 30 Hz – 40 GHz	Agilent Technologies	8564 EC	3946A00219	8/03
1430	EMI receiver, 9 kHz – 2.9 GHz	Agilent Technologies	8542E	3807A00262, 3705A00217	9/03
1938	Cable 40 GHz, 0.8 m, blue	Rhophase Microwave Ltd.	KPS-1503A-800-KPS	T4660	10/03
1947	Cable 18 GHz, 6.5 m, blue	Rhophase Microwave Ltd	NPS-1803A-6500-NPS	T4974	10/03
2009	Cable RF, 8 m	Alpha Wire	RG-214	C-56	12/03

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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
Log periodic antenna
Electro-Metrics, model LPA-25/30
Ser.No.1988

Frequency, MHz	Antenna factor, dB(1/m)	Frequency, MHz	Antenna factor, dB(1/m)
200	12.6	625	20.4
225	12.2	650	20.9
250	13.4	675	22.0
275	14.3	700	22.2
300	15.2	725	22.7
325	15.7	750	22.5
350	15.9	775	22.7
375	16.4	800	22.8
400	17.0	825	23.2
425	17.4	850	23.5
450	17.9	875	23.9
475	18.6	900	24.0
500	19.1	925	24.0
525	19.3	950	24.2
550	19.6	975	24.7
575	19.8	1000	25.1
600	20.0		

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	Measured uncertainty dB	Notes
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
	HL1947
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
	HL1947
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 RF, 8 m, model: RG-214, s/n C-56 (HL 2009)
Calibration data

No.	Parameter	Set, MHz	Measured, dB	Deviation, dB	Tolerance (specification), dB	Measured uncertainty dB	Notes
1	Insertion Loss	1	0.10	NA	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 coaxial, RG-58/RG-214, model: CC-3, s/n 056 (HL 0415)
+ Cable coaxial, RG-214, 11.5m, model: C214-11, s/n 148 (HL 0812)
Calibration data

No.	Parameter	Set, MHz	Measured, dB	Deviation, dB	Tolerance (specification), dB	Measured uncertainty dB
1	Insertion Loss	20	0.73	-	NA	±0.12
2		30	0.91	-		
3		50	1.2	-		
4		80	1.56	-		
5		100	1.76	-		
6		200	2.59	-		
7		300	3.26	-		
8		400	3.93	-		
9		500	4.42	-		
10		600	4.92	-		
11		700	5.36	-		
12		800	5.88	-		
13		900	6.41	-		
14		1000	6.71	-		
15		1500	8.63	-		
16		2000	10.39	-		

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Cable coaxial, RG-214, 5m, model: C214-5, s/n 1365 (HL 1365)
Calibration data

No.	Parameter	Set, MHz	Measured, dB	Deviation, dB	Tolerance (specification), dB	Measured uncertainty dB
1	Insertion Loss	1000	0.41	-	NA	±0.12
2		1200	0.44	-		
3		1400	0.48	-		
4		1600	0.52	-		
5		1800	0.55	-		
6		2000	0.58	-		
7		2200	0.61	-		
8		2400	0.64	-		±0.17
9		2600	0.67	-		
10		2800	0.7	-		
11		3000	0.73	-		
12		3300	0.79	-		
13		3600	0.84	-		
14		3900	0.94	-		
15		4200	1.22	-		

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Cable 40 GHz, 0.8m, blue, model: KPS-1503A-800-KPS, s/n T4660 (HL 1938)
Calibration data (0.03 – 5 GHz)

No.	Parameter	Set, GHz	Measured, dB	Deviation, dB	Tolerance (specification), dB	Measured uncertainty dB
1	Insertion Loss	0.03	0.08	-	NA	±0.12
2		0.05	0.10	-		
3		0.10	0.14	-		
4		0.20	0.21	-		
5		0.30	0.27	-		
6		0.50	0.29	-		
7		0.70	0.33	-		
8		0.90	0.40	-		
9		1.10	0.44	-		
10		1.30	0.47	-		
11		1.50	0.50	-		
12		1.70	0.54	-		
13		1.90	0.56	-		
14		2.10	0.57	-		
15		2.30	0.62	-		
16		2.50	0.65	-		
17		2.70	0.66	-		
18		2.90	0.69	-		
19		3.10	0.74	-		
20		3.30	0.74	-		
21		3.50	0.78	-		
22		3.70	0.78	-		
23		3.90	0.81	-		
24		4.10	0.83	-		
25		4.30	0.84	-		
26		4.50	0.90	-		
27		4.70	0.92	-		
28		4.90	0.90	-		

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Cable 40 GHz, 0.8m, blue, model: KPS-1503A-800-KPS, s/n T4660 (HL 1938)
Calibration data (5 – 12 GHz)

No.	Parameter	Set, GHz	Measured, dB	Deviation, dB	Tolerance (specification), dB	Measured uncertainty dB
29	Insertion Loss	5.10	0.92	-	NA	±0.17
30		5.30	0.94	-		
31		5.50	0.98	-		
32		5.70	0.95	-		
33		5.90	0.95	-		
34		6.10	0.98	-		
35		6.30	1.02	-		
36		6.50	0.96	-		
37		6.70	1.03	-		
38		6.90	1.06	-		
39		7.10	1.08	-		
40		7.30	1.09	-		
41		7.50	1.10	-		
42		7.70	1.15	-		
43		7.90	1.15	-		
44		8.10	1.15	-		
45		8.30	1.15	-		
46		8.50	1.19	-		
47		8.70	1.23	-		
48		8.90	1.20	-		
49		9.10	1.22	-		
50		9.30	1.28	-		
51		9.50	1.30	-		
52		9.70	1.28	-		
53		9.90	1.30	-		
54		10.10	1.34	-		
55		10.30	1.35	-		
56		10.50	1.35	-		
57		10.70	1.36	-		
58		10.90	1.42	-		
59		11.10	1.38	-		
60		11.30	1.33	-		
61		11.50	1.34	-		
62		11.70	1.32	-		
63		11.90	1.36	-		

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Cable 40 GHz, 0.8m, blue, model: KPS-1503A-800-KPS, s/n T4660 (HL 1938)
Calibration data (12 – 18 GHz)

No.	Parameter	Set, GHz	Measured, dB	Deviation, dB	Tolerance (specification), dB	Measured uncertainty dB
64	Insertion Loss	12.10	1.40	-	NA	±0.26
65		12.40	1.46	-		
66		13.00	1.52	-		
67		13.50	1.54	-		
68		14.00	1.64	-		
69		14.50	1.61	-		
70		15.00	1.58	-		
71		15.50	1.62	-		
72		16.00	1.67	-		
73		16.50	1.70	-		
74		17.00	1.71	-		
75		17.50	1.64	-		
76		18.00	1.76	-		

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Cable 40 GHz, 0.8m, blue, model: KPS-1503A-800-KPS, s/n T4660 (HL 1938)
Calibration data (18 – 40 GHz)

No.	Parameter	Set, GHz	Measured, dB	Deviation, dB	Tolerance (specification), dB	Measured uncertainty dB
77	Insertion Loss	18.50	1.92	-	NA	±0.56
78		19.00	1.88	-		
79		19.50	1.87	-		
80		20.00	2.09	-		
81		20.50	2.12	-		
82		21.00	2.18	-		
83		21.50	2.03	-		
84		22.00	1.94	-		
85		22.50	2.10	-		
86		23.00	2.12	-		
87		23.50	2.17	-		
88		24.00	2.21	-		
89		24.50	2.22	-		
90		25.00	2.19	-		
91		25.50	2.21	-		
92		26.00	2.25	-		
93		26.50	2.98	-		
94		27.00	NA	-		
95		28.00		-		
96		29.00		-		
97		30.00		-		
98		31.00		-		
99		32.00		-		
100		33.00		-		
101		34.00		-		
102		35.00		-		
103		36.00		-		
104		37.00		-		
105		38.00		-		
106		39.00		-		
107		40.00		-		

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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 and 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
rms	root mean square
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