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Electrical

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RADIO TEST REPORT

According to 47 CFR Part 15 subpart C §15.231 and subpart B;
RSS-210 Issue 5:2001; ICES-003 Issue 3:1997
for

VISONIC Ltd.

EQUIPMENT UNDER TEST:

Wireless CodeSecure ä keyfob transmitter
Model: MCT-234

Document ID: VISRAD_FCC.15815.doc
Date of Issue: February 2004

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Contents

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1 Project information

EUT attributes

Test item	: Wireless CodeSecure™ keyfob transmitter
Operating frequency	: 315 MHz
Type (Model)	: MCT-234
Equipment FCC code	: DSC

Applicant information

Applicant's responsible person	: Mr. Arick Elshtein, international standards department manager
Applicant/Manufacturer	: Visonic Ltd.
Address	: 30, Habarzel street
City	: Tel Aviv
Postal code	: 69710
Country	: Israel
Telephone number	: +972 3645 6714
Telefax number	: +972 3645 6891

Test details

Project Number:	: 15815
Location	: Hermon Laboratories
Receipt date	: January 27, 2004
Test performed	: January 28, 2004
Purpose of test	: Apparatus compliance verification in accordance with emission requirements
Test specification(s)	: 47CFR Part 15, subpart C, §§15.231, 15.205, 15.209, and subpart B §15.109; RSS-210 Issue 5: 2001 and ICES-003 Issue 3: 1997

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2 Summary and signatures

The EUT, keyfob transmitter, was tested according to FCC part 15 subparts B, C, and found to comply with the standard requirements.

Test description	Specification reference	Tested by	Date tested	Test report paragraph	Verdict
Field strength of fundamental	15.231(b)(2)	Mr. Y. Neuman, test engineer	January 27, 2004	4.1	Pass
Field strength of spurious radiation	15.231(b)(3)	Mr. Y. Neuman, test engineer	January 28, 2004	4.2	Pass
Bandwidth of emission	15.231(c)	Mr. Y. Neuman, test engineer	January 27, 2004	4.3	Pass
Radiated emissions	15.109	Mr. Y. Neuman, test engineer	January 27, 2004	4.4	Pass

Test report prepared by:

Mrs. Marina Cherniavsky, MScEE, certification engineer _____

Test report approved by:

Mr. Michael Nikishin, MScEE, group leader _____

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

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3 EUT description

3.1 General description

The EUT, MCT-234, is a miniature CodeSecure™ 4-button (4-function) transmitter, operating at 315 MHz with ASK ON-OFF keying modulation and is a part of high-security alarm and remote control systems. The device is powered by 12 V alkaline internal battery.
The EUT general view is shown in Photograph 3.1.1.

Photograph 3.1.1

EUT general view

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4 Test results

4.1 Field strength of fundamental, § 15.231(b)(2) and RSS-210 § 6.1.1(b)

METHOD OF MEASUREMENT: ANSI 63.4 §13.1.5
DATE of TEST: January 27, 2004
AMBIENT TEMPERATURE: 21°C
RELATIVE HUMIDITY: 48 %
AIR PRESSURE 1011 hPa
SITE DESCRIPTION: OATS
MODE OF OPERATION: Continuous
MODULATION: ON
DETECTOR USED: Peak
MEASUREMENT UNCERTAINTY: ± 5.3 dB

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

Peak detector

Frequency, MHz	Measured field strength, dB(µV/m)	Antenna polarization	Antenna height, m	Turntable position, (^{o})	Specification limit, dB(µV/m)	Margin, dB	Verdict
315.0	67.8	Horizontal	1.0	0	75.6	7.8	Pass

The recorded test result was obtained throughout measurements in the EUT X-axis orthogonal position.

Turntable position in degrees, EUT front panel = 0^o.
Margin = dB below (negative if above) specification limit.

LIMIT § 15.231 (b)

Fundamental frequency, MHz	Field strength of fundamental @ 3 m, dB(µV/m)
315	75.6

The above field strength limits are based on average limits.
The provisions of section 15.35 for limiting peak emissions apply.

TEST PROCEDURE

The EUT was tested, being placed on a wooden 80 cm height turntable in three orthogonal positions (along X, Y and Z axes) 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.

TEST EQUIPMENT USED:

HL 0034	HL 0038	HL 0091	HL 0287	HL 0415	HL 0812	HL 1365
HL 1424	HL 1430	HL 1947				

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4.1.1 Average factor calculation, §15.35

The transmit signal consists of a preamble and a message as shown in plots A1-A3. The total duration of the preamble is 8.25 msec, the total ON time during the preamble is 8.25 msec x 50% = 4.125 msec (see plot A4).

The message duration is 71.25 msec, the message ON time is 71.25 x 66.667% = 47.5 (msec) – Manchester code is used (see plot A6).

The interval between transmissions is 14.75 msec, the pause duration between preamble and message is 3.6 msec.

The worst case of the transmission duration in 100 msec interval is: 100 – 14.75 – 3.6 – 8.25 = 73.4 (msec), the ON time in 100 msec interval is equal to 73.4 x 66.667% + 4.125 = 53.06 (msec).

Average factor is 20 log 0.5306 = -5.5 dB.

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4.2 Field strength of spurious radiation, § 15.231 and RSS-210 § 6.1.1(b)

METHOD OF MEASUREMENT:	ANSI 63.4 §13.1.4
TEST PERFROMED IN:	Anechoic chamber, OATS
DATE of TEST:	January 27, 28, 2004
AMBIENT TEMPERATURE:	21°C
RELATIVE HUMIDITY:	48 %
AIR PRESSURE	1011 hPa
MODULATION	ON
DETECTOR USED:	Peak
RANGE OF MEASUREMENTS	9 kHz to 3200 MHz
MEASUREMENT UNCERTAINTY:	± 6 dB

Frequency, MHz	RBW, kHz	VBW, kHz	Antenna polarization	Antenna height, m	TT position °	Radiated emission (peak), dB(μV/m)	Limit (average) @ 3 m, dB(μV/m)	Verdict
630	120	300	Vertical	1	0	39.6	55.6	Pass

For full test results refer to Plots A8 to A13**.**

LIMIT § 15.231 (b)

Fundamental frequency, MHz	Field strength of spurious emissions, dB(μV/m) @ 3 m
315	55.6

TEST PROCEDURE

The EUT was tested, being placed on a wooden 80 cm height turntable in 3 axes (X, Y, Z positions) in turn.

9 kHz – 30 MHz range. The test was performed in the anechoic chamber. 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 range. Preliminary test was performed in anechoic chamber with biconical antenna in 30 – 200 MHz range, with log periodic antenna in 200 – 1000 MHz and with double ridged guide antenna in 1000 – 3200 MHz range; the final test was performed at the OATS. 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.

TEST EQUIPMENT USED IN ANECHOIC CHAMBER:

HL 0446	HL 0566	HL 0569	HL 1425	HL 1553	HL 1566	HL 1826
HL 1849	HL 1850	HL 1942	HL 1984	HL 2109	HL 2432	

TEST EQUIPMENT USED AT OATS:

HL 0034	HL 0038	HL 0091	HL 0287	HL 0415	HL 0812	HL 1365
HL 1424	HL 1430	HL 1947	HL 1984			

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4.3 Bandwidth of emission according to § 15.231(c) and RSS-210 § 6.1.1(c)

METHOD OF MEASUREMENT: ANSI 63.4 §13.1.7
DATE of TEST: January 27, 2004
AMBIENT TEMPERATURE: 21°C
RELATIVE HUMIDITY: 48 %
AIR PRESSURE 1011 hPa
SITE DESCRIPTION: OATS
MODULATION: ON
DETECTOR USED: Peak

Carrier frequency MHz	Occupied bandwidth, kHz		Reference to plot in Annex A
	Measured	Limit	
315	420	787.5	A14
Measurement uncertainty	0.56 ppm		

The maximum allowed occupied bandwidth was calculated as 0.0025 of the center frequency.
Verdict: Pass

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.

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 dB down from the modulated carrier.

TEST EQUIPMENT USED:

HL 0034	HL 0038	HL 0091	HL 0287	HL 0415	HL 0812	HL 1430

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4.4 Unintentional radiated emissions test according to §15.109 and ICES-003

METHOD OF MEASUREMENT:	ANSI 63.4 §11.6 / ANSI 63.4 §12.1.4
TEST PERFORMED IN:	Anechoic chamber
DATE of TEST:	January 27, 2004
AMBIENT TEMPERATURE:	21°C
RELATIVE HUMIDITY:	48 %
AIR PRESSURE	1011 hPa
SITE DESCRIPTION:	Anechoic chamber
DISTANCE BETWEEN ANTENNA AND EUT:	3 m
THE EUT WAS TESTED AS:	TABLE-TOP
FREQUENCY RANGE:	30 MHz – 1 GHz

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	5^{th} harmonic of the highest frequency or 40 GHz, whichever is lower

No unintentional radiated emissions were found. The test results are shown in Plots A15, A16 in Appendix A.

LIMIT

Frequency, MHz	Class B equipment @ 3 m dB(μV/m)	
	FCC § 15.109	ICES-003
30 – 88	40	40
88 – 216	43.5	44
216 – 960	46	46
960 - 1000	54	46
1000 - 5000	54	NA

TEST PROCEDURE

The EUT was placed on a wooden 80 cm height turntable in 3 orthogonal positions in turn. 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.

TEST EQUIPMENT USED:

HL 0566	HL 0569	HL 1425	HL 1553	HL 1566	HL 1826	HL 1849
HL 1850	HL 2109					

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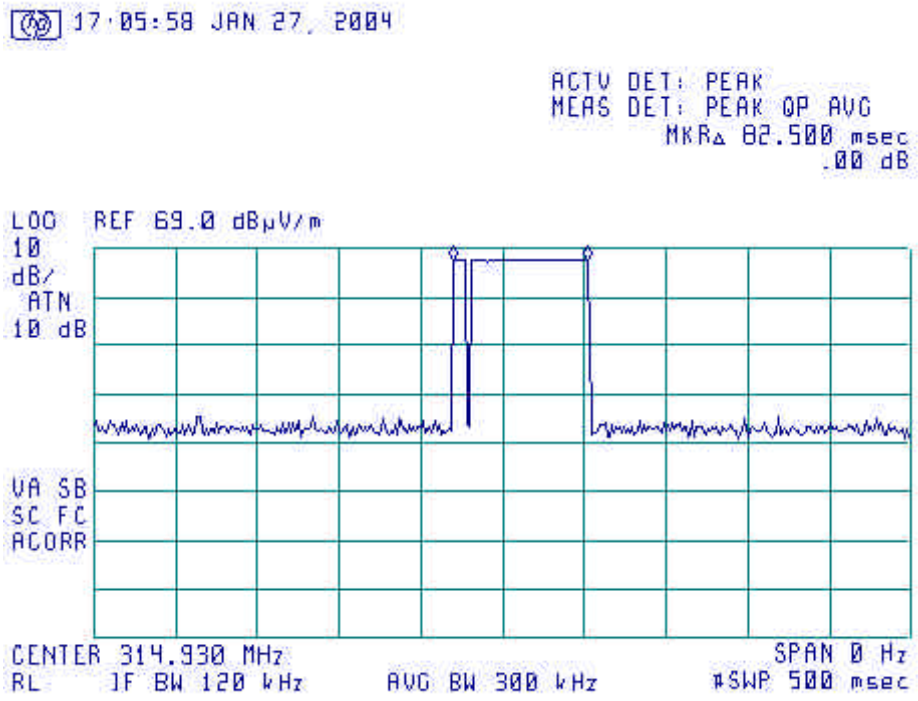
Appendix A - Plots

Plot A 1

Transmission duration measurement (preamble + message)



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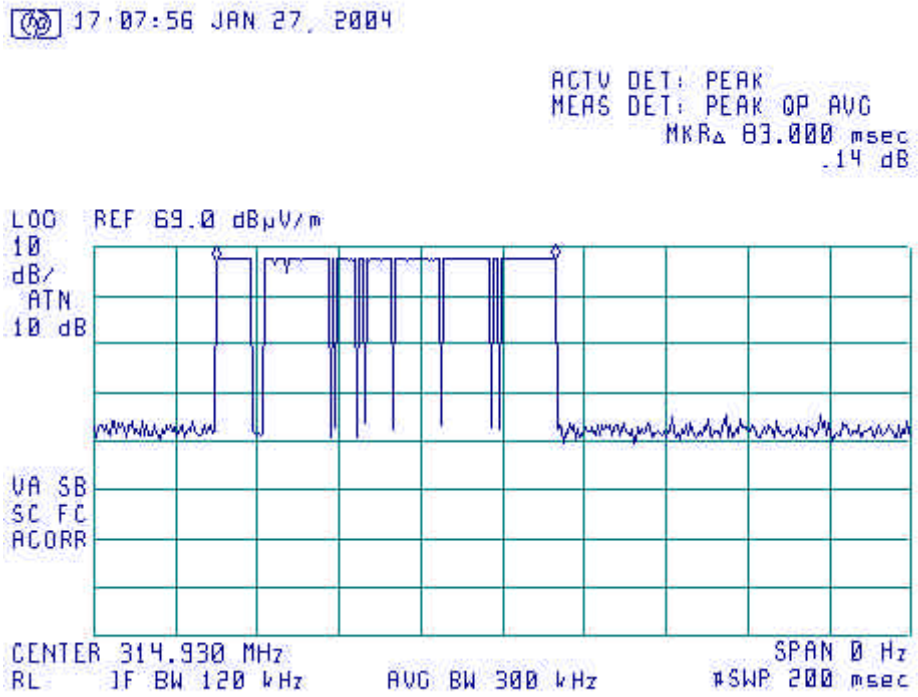
Plot A 2

Transmission duration measurement (preamble + message)



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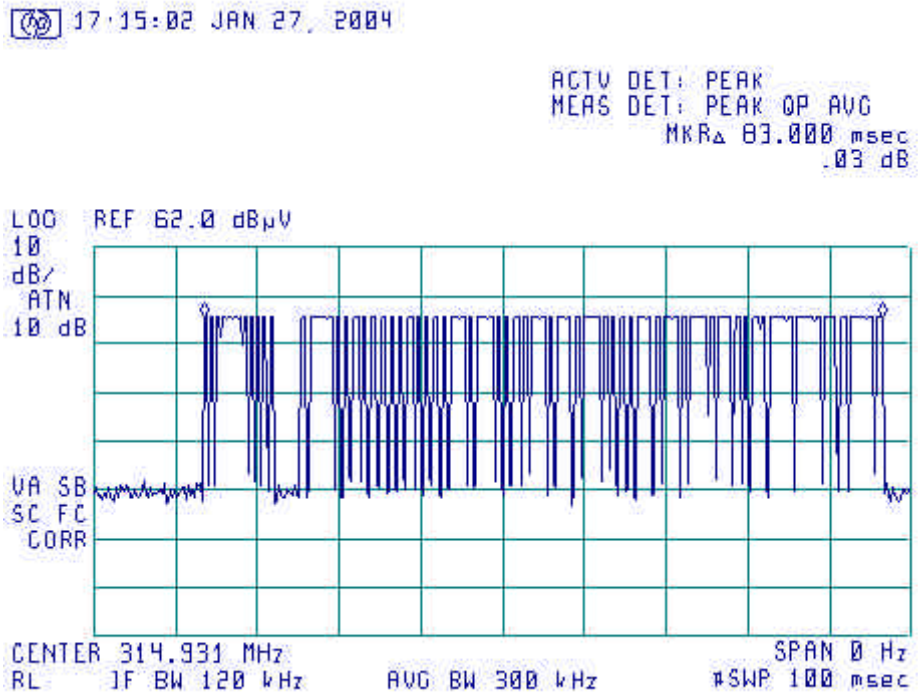
Plot A 3

Transmission duration measurement (preamble + message)



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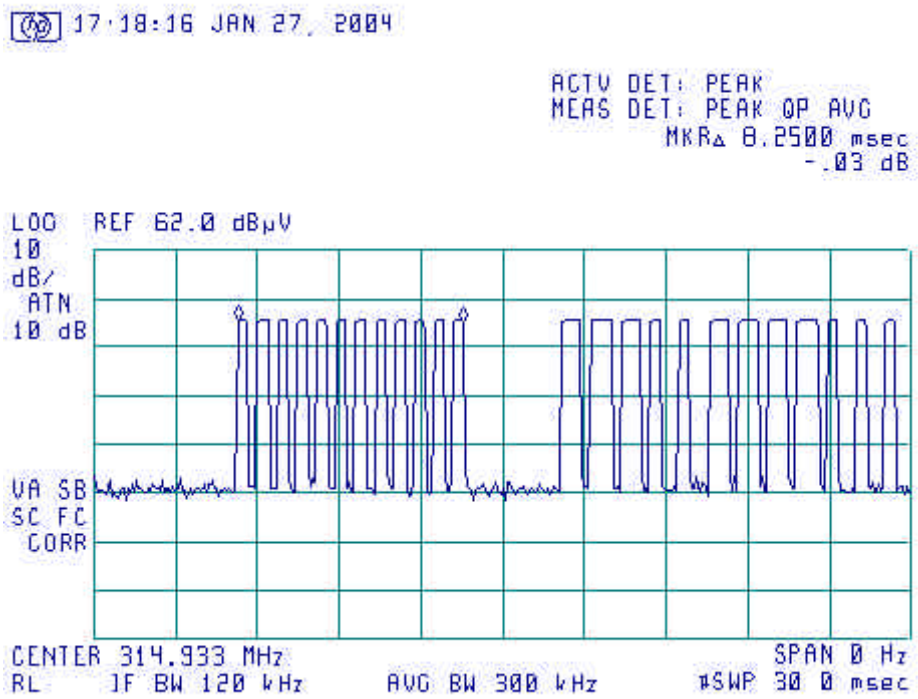
Plot A 4

Preamble duration measurement



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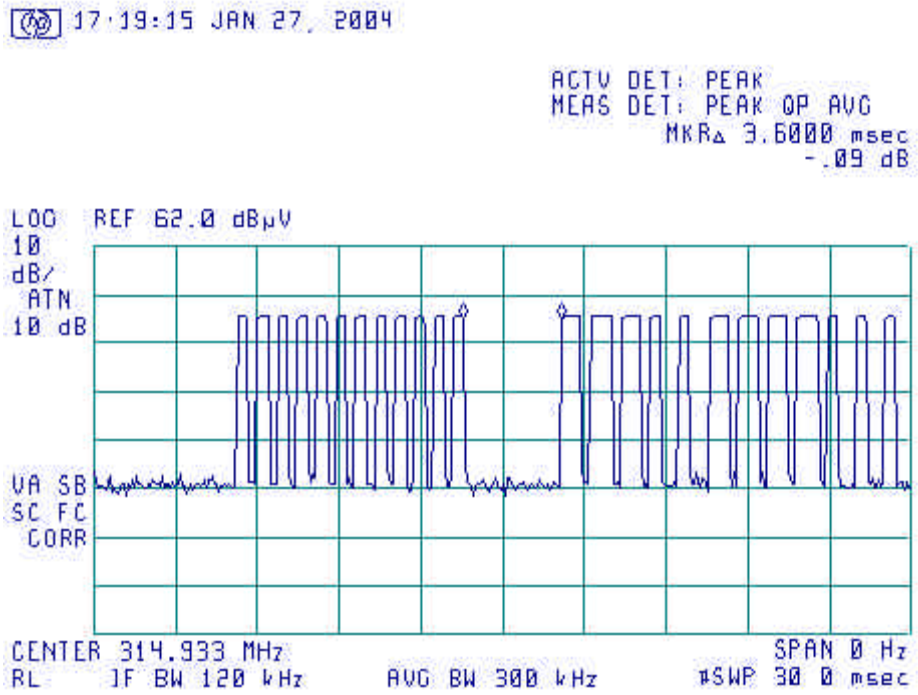
Plot A 5

Pause between preamble and message



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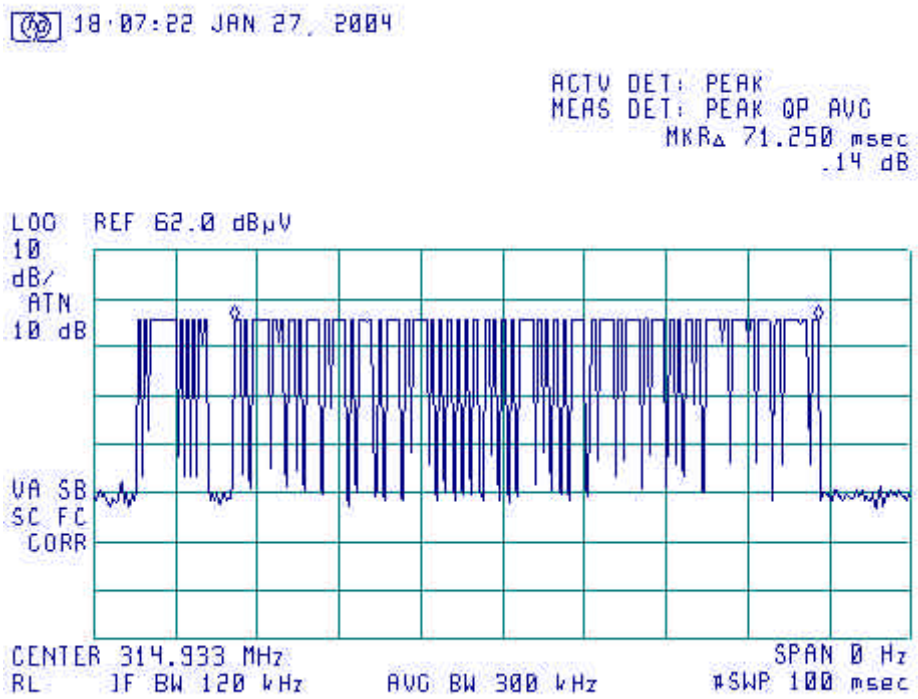
Plot A 6

Message duration measurement



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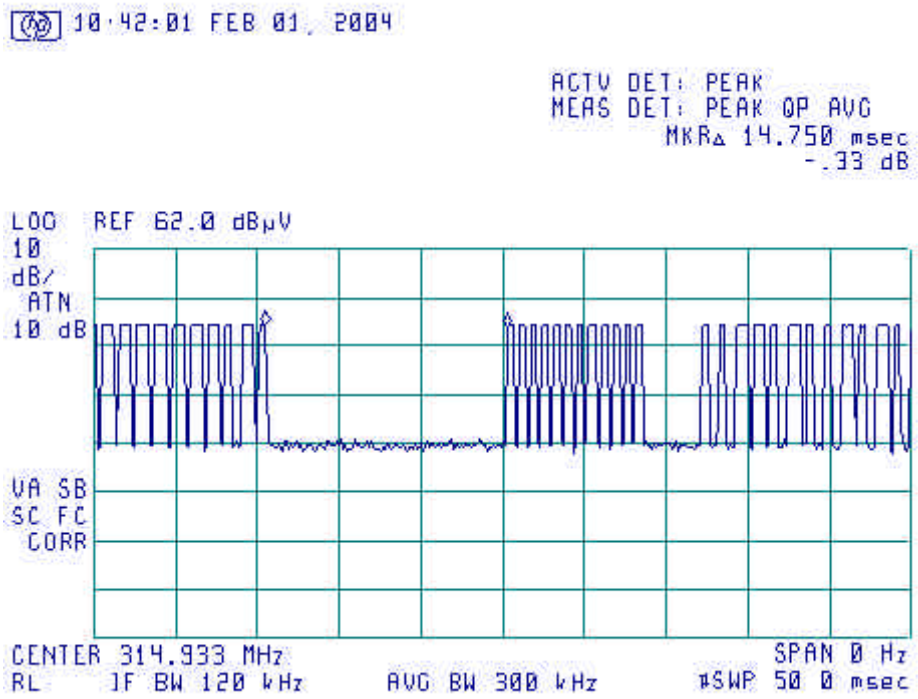
Plot A 7

Pause between two transmissions



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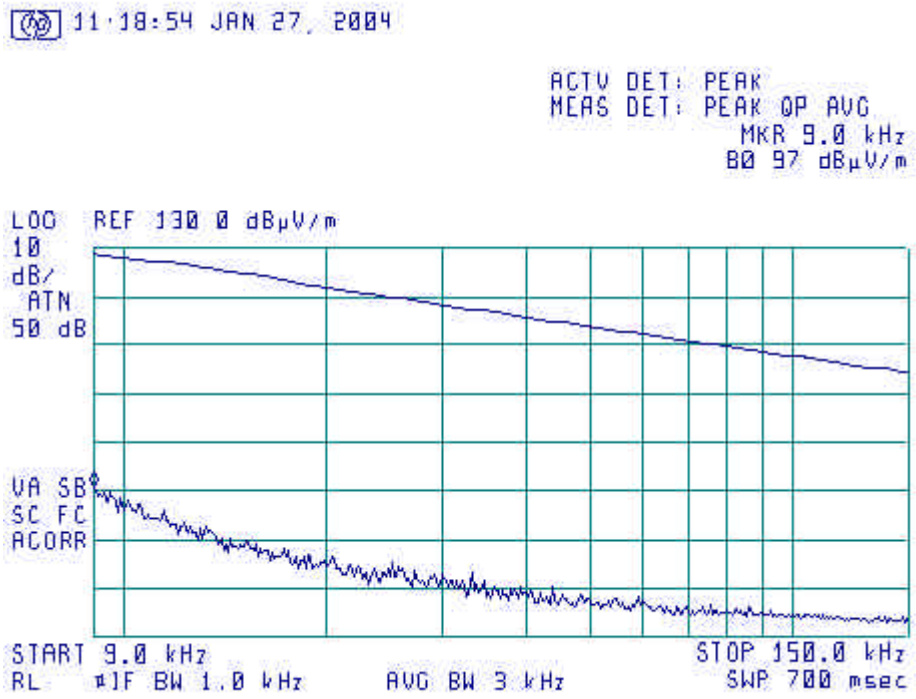
Plot A 8

Spurious emission measurements in anechoic chamber from 9 kHz to 150 kHz



EUT was tested in 3 orthogonal positions;
no spurious emissions were found

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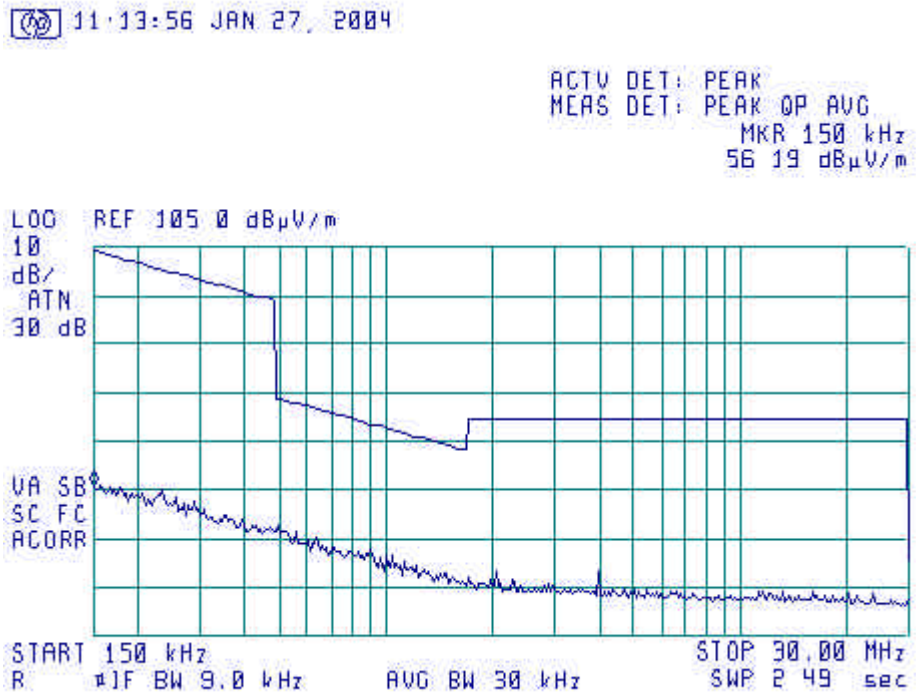
Plot A 9

Spurious emission measurements in anechoic chamber from 150 kHz – 30 MHz



EUT was tested in 3 orthogonal positions;
no spurious emissions were found

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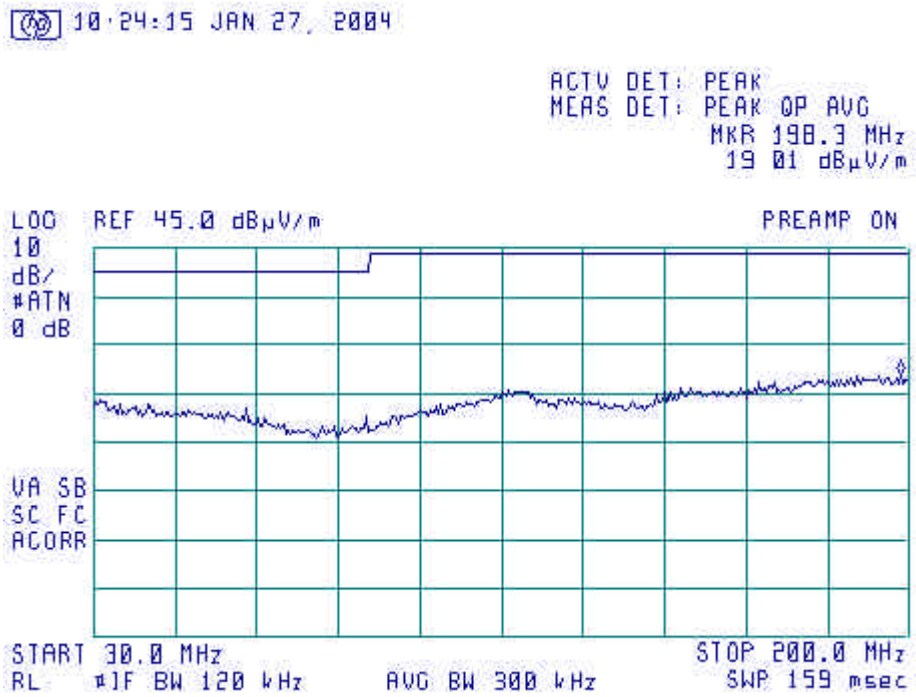
Plot A 10

Spurious emission measurements in anechoic chamber from 30 MHz to 200 MHz, vertical and horizontal antenna polarization



EUT was tested in 3 orthogonal positions;
no spurious emissions were found

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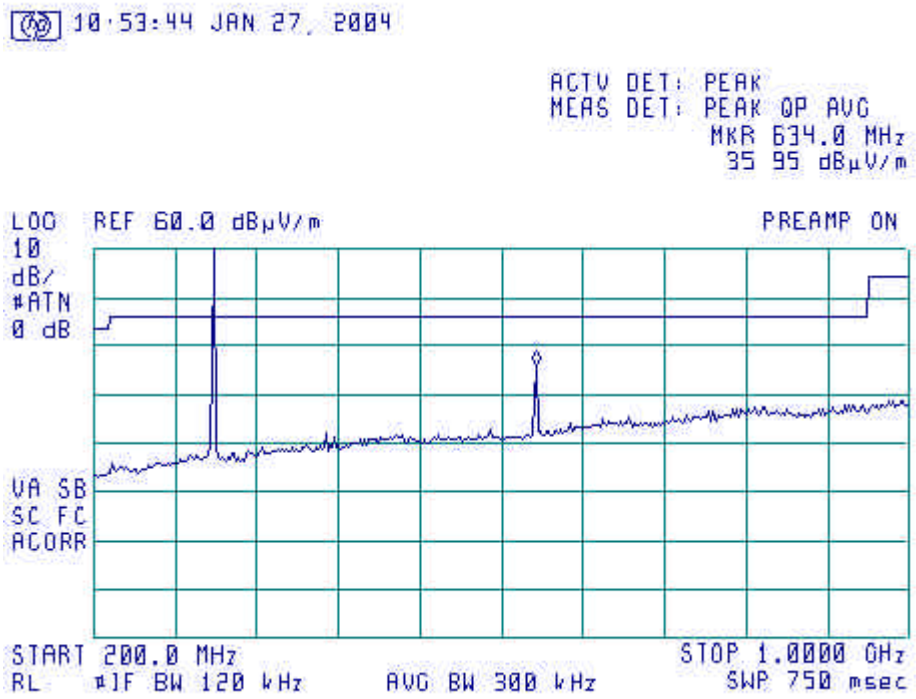
Plot A 11

Spurious emission measurements in anechoic chamber from 200 MHz to 1000 MHz, vertical and horizontal antenna polarization



EUT was tested in 3 orthogonal positions;
no spurious emissions except 2nd harmonic were found

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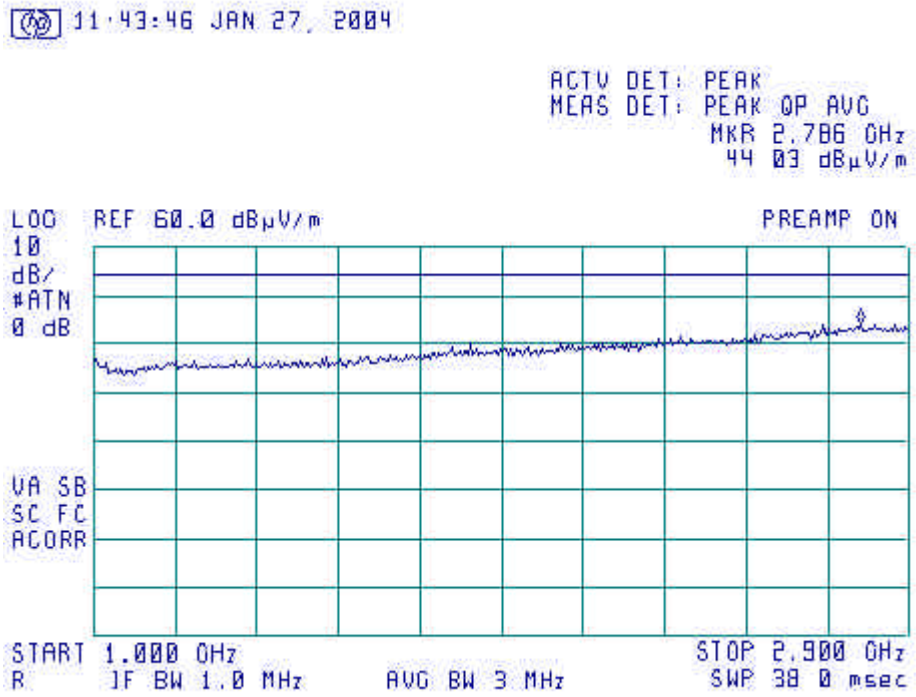
Plot A 12

Spurious emission measurements in anechoic chamber from 1 GHz to 2.9 GHz, vertical and horizontal antenna polarization



EUT was tested in 3 orthogonal positions;
no spurious emissions were found

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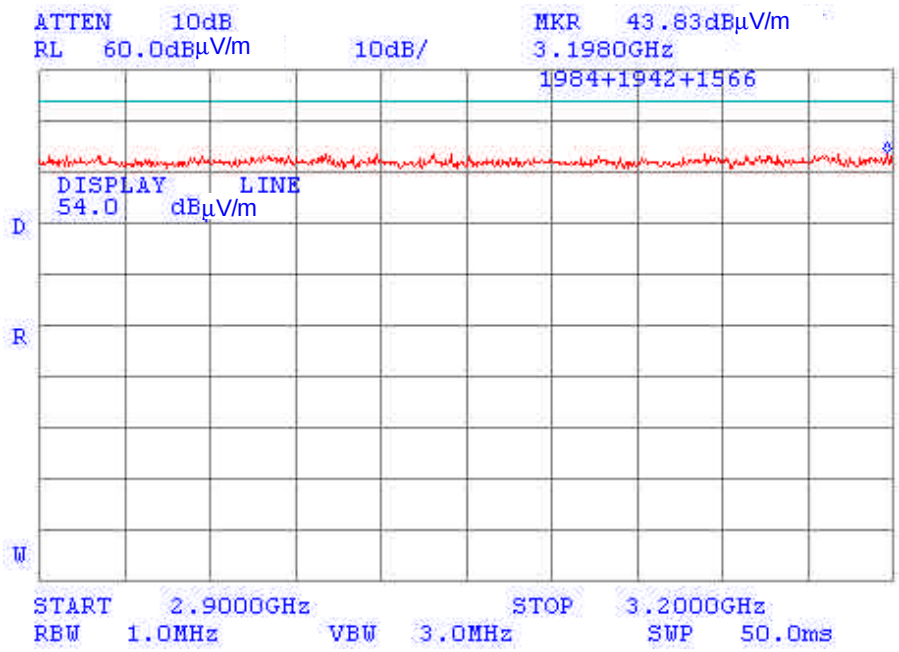
Plot A 13

Spurious emission measurements in anechoic chamber from 2.9 GHz to 3.2 GHz, vertical and horizontal antenna polarization



EUT was tested in 3 orthogonal positions;
no spurious emissions were found.

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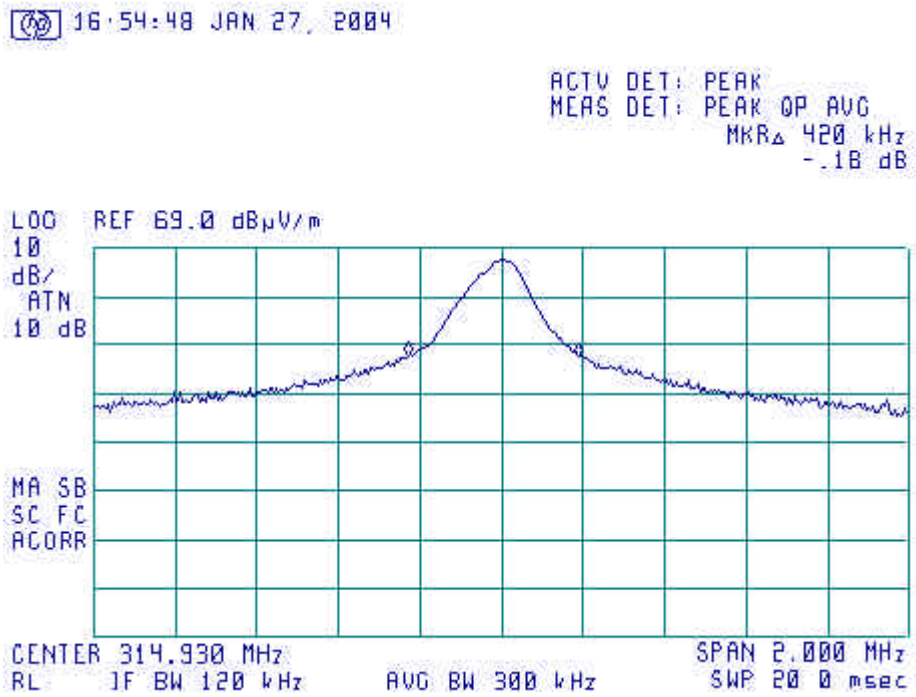
Plot A 14

Occupied bandwidth measurement result



Limit: 315 MHz x 0.25% = 787.5 kHz

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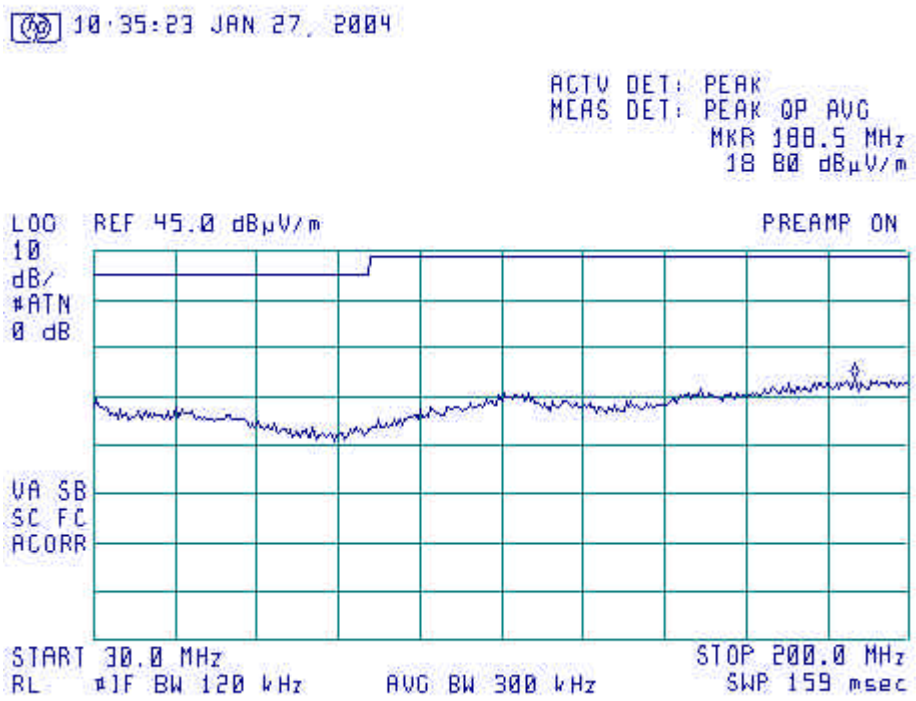
Plot A 15

Unintentional radiated emission measurements in anechoic chamber from 30 MHz to 200 MHz, vertical and horizontal antenna polarization



EUT was tested in 3 orthogonal positions;
no unintentional radiated emissions were found

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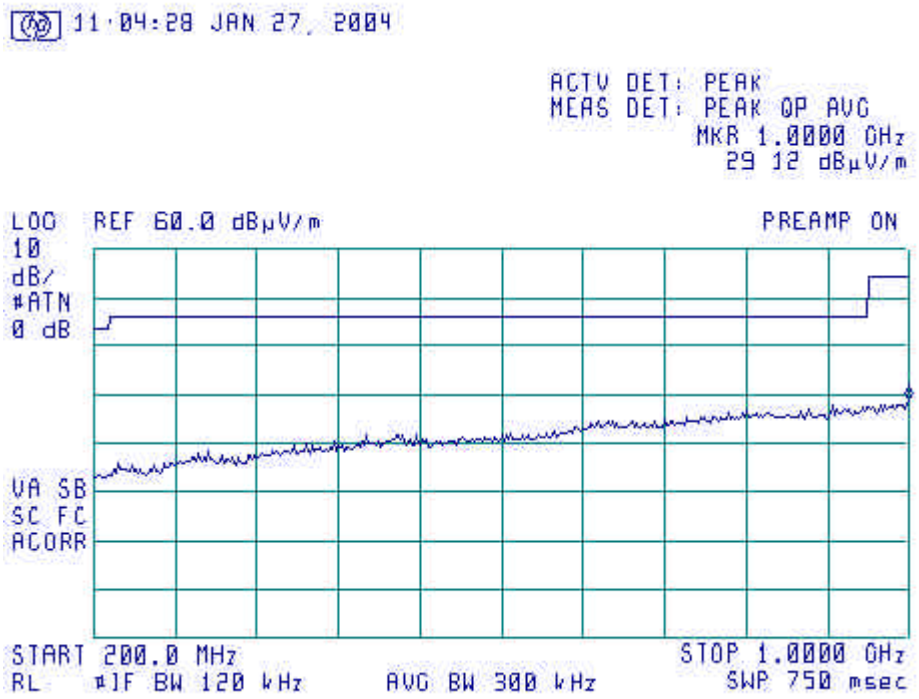
Plot A 16

Unintentional radiated emission measurements in anechoic chamber from 200 MHz to 1000 MHz, vertical and horizontal antenna polarization



EUT was tested in 3 orthogonal positions;
no unintentional radiated emissions were found.

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Appendix B - 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	1/05
0038	Antenna Mast, 1-4 m	Hermon Labs	AM-1	028	2/05 check
0091	Position controller for antenna mast + turntable, OFTS	Hermon Labs	CRL-2	091	4/04 check
0287	Turntable, motorized diameter, 2 m	Hermon Labs	TMD-2	042	11/04 check
0415	Cable coax RF, RG-58	Hermon Labs	CC-3	056	5/04
0446	Active loop antenna, 10 kHz - 30 MHz	Electro-Mechanics	6502	2857	10/04
0566	Antenna, biconical, 20-200 MHz	Electro-Metrics	BIA 25/30	3566	4/04
0569	Antenna, log periodic, 200 - 1000MHz	Electro-Metrics	LPA 25/30	1953	1/05
0812	Cable, coax, RG-214, 11.5 m, N-type connectors	Hermon Labs	C214-11	148	5/04
1365	Cable coaxial, RG-214, 5 m	Hermon Labs	C214-5	1365	4/04
1424	Spectrum analyzer, 30 Hz - 40 GHz	Agilent Technologies	8564EC	3946A00219	8/04
1425	EMI receiver system, 9 kHz - 2.9 GHz	Agilent Technologies	8542E	3710A00222	9/04
1430	EMI receiver system, 9 kHz - 2.9 GHz	Agilent Technologies	8542E	3807A00262	9/04
1553	Cable RF, 3.5 m	Alpha wire	RG-214	NA	5/04
1566	Cable RF, 2 m	Huber-Suhner	Sucoflex 104PE	13094/4PE	12/04
1826	Antenna mast and turntable position controller	Sh. I. Machines	CRL-4	1	5/04 check
1849	Antenna mast with polarity control	Sh. I. Mashines	AM-F4	NA	1/05 check
1850	Turntable	Sh. I. Mashines	TT-M-3	NA	1/05 check
1942	Cable 18 GHz, 4 m, blue	Rhophase Microwave Ltd	SPS-1803A-4000-NPS	T4658	10/04
1947	Cable 18 GHz, 6.5 m, blue	Rhophase Microwave Ltd.	NPS-1803A-6500-NPS	T4974	10/04
1984	Antenna, double ridged waveguide horn, 1-18 GHz, 300 W, N-type	EMC Test Systems	3115	9911-5964	3/04
2109	Anechoic chamber 6 (L) x 5.5 (W) x 2.95 (H) m	Hermon Labs	AC-2	NA	12/04 check
2432	Antenna, double-ridged waveguide horn, 1-18 GHz	EMC Test Systems	3115	000271777	7/04

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Appendix C Test equipment correction factors

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

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

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

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Antenna factor
Log periodic antenna (HL 0034)
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 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
Biconical antenna
Electro-Metrics, model BIA-25/30
Ser.No.3566, HL 0566

Frequency MHz	Antenna Factor dB(1/m)	Frequency MHz	Antenna Factor dB(1/m)
30	14.7	120	16.8
35	12.9	125	15.5
40	12.6	130	15.5
45	12.8	135	15.1
50	12.6	140	14.8
55	11.8	145	15.1
60	11.7	150	16.9
65	10.4	155	17.2
70	9.2	160	17.3
75	9.1	165	17.8
80	9.1	170	18.3
85	9.5	175	19.0
90	11.2	180	19.5
95	12.6	185	20.0
100	13.7	190	20.4
105	14.2	195	20.5
110	15.3	200	20.6
115	17.1		

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).

Antenna factor
Log periodic antenna
Electro-Metrics, model LPA-25/30
Ser.No.1953, HL 0569

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 wave guide horn antenna
Model 3115, S/N 9911-5964, HL1984

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

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

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Antenna factor
Double-ridged guide horn antenna
Model 3115, serial number: 00027177, HL2432

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

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

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Cable loss
Cable Coaxial, RG-58/RG-214, s/n 056, HL 0415
+ Cable Coaxial, RG-214, 11.5m, s/n 148, HL 0812

No.	Frequency, MHz	Cable loss, dB	Measured uncertainty, dB
1	20	0.73	±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 loss
Cable coaxial, RG-214, 5m, model: C214-5, HL 1365

No.	Frequency, MHz	Measured, dB	Measured uncertainty dB
1	1000	0.41	±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 loss
RF cable 3.5 m, Alpha Wire, model RG-214, S/N 149, HL 1553

No.	Frequency, MHz	Cable loss, dB	Measurement uncertainty, dB
1	1	0.01	±0.05
2	10	0.07	
3	30	0.12	
4	50	0.22	
5	100	0.26	
6	200	0.40	
7	300	0.52	
8	400	0.60	
9	500	0.70	
10	600	0.77	
11	700	0.84	
12	800	1.00	
13	900	1.00	
14	1000	1.05	
15	2000	1.70	

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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 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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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).

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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
EUT	equipment under test
GHz	gigahertz
H	height
Hz	hertz
kHz	kilohertz
kV	kilovolt
L	length
LISN	line impedance stabilization network
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: 2003	Radio Frequency Devices
ANSI C63.2:96	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4:01	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.