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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: TXL-700

This report is in conformity with ISO/IEC 17025. The A2LA logo endorsement applies only to the test methods and the standards that are listed in the scope of Hermon Laboratories accreditation.
The test results relate only to the items tested. **This test report must not be reproduced in any form except in full with the approval of Hermon Laboratories Ltd.**

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Document ID: ELMRAD_FCC.15310.doc
Date of Issue: November 2002



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1 Project information

Description of equipment under test

Test item	Home arrest tag
Manufacturer	ElmoTech Ltd.
Type (Model)	TXL-700
Software release	VER4
Serial number	61052
Transmitter operating frequency	318 MHz
Equipment FCC code ¹	DSC

Applicant information

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

Test performance

Project number:	15310
Location	Hermon Laboratories
Receipt date	October 14, 2002
Test performed	October 14, 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



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	October 14, 2002	
Field strength of fundamental	15.231(b)(2)	X				Mrs. E. Pitt, test engineer	October 14, 2002	
Field strength of spurious radiation	15.231(b)(3)	X				Mrs. E. Pitt, test engineer	October 14, 2002	
Unintentional radiation, §15.107, §15.109								
Conducted emissions	15.107				X			
Radiated emissions	15.109	X				Mrs. E. Pitt, test engineer	October 14, 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



3 EUT specification

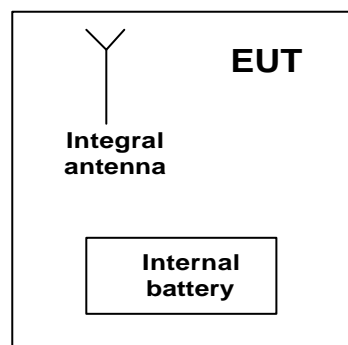
3.1 EUT description

The EUT is an ankle tag, which contains an integral transmitter. It transmits 5ms identification & status signals, which are used to monitor client location within an area covered by a local positioning system. One transmission duration is 5 ms. An interval between two successive transmissions is programmed to be randomly chosen and varies from 18 to 22 s. The device is powered by 3.5 V lithium battery.

3.2 EUT test configuration

Test configuration is provided in Figure 3.2.1.

Figure 3.2.1 EUT test configuration





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)		-27	
Transmitter duty cycle (worst case)			
Tx on (seconds)		0.006	
Tx off (seconds)		> 0.1	
Modulation			
Amplitude			
Frequency			
<input checked="" type="checkbox"/> Other (specify): 2FSK			
Can the transmitter be operated without modulation		<input type="checkbox"/> yes	<input checked="" type="checkbox"/> no
Transmitter power source			
Battery		Nominal rated voltage (VDC)	3.5
Nickel Cadmium			
<input checked="" type="checkbox"/> Lithium			
Other:			
DC		Nominal rated voltage (VDC)	
AC mains		Nominal rated voltage (VAC)	
Is there common power source for transmitter and receiver		<input type="checkbox"/> yes	<input type="checkbox"/> no
Antenna type			
<input checked="" type="checkbox"/> Integral			
External			
Type of antenna jack² - NA			
standard		connector type	<input type="checkbox"/> Male <input type="checkbox"/> Female
unique		connector type	<input type="checkbox"/> Male <input type="checkbox"/> Female

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



4 Test results

4.1 Bandwidth of emission according to § 15.231 (c)

METHOD OF MEASUREMENT: ANSI 63.4 §13.1.7
DATE: October 14, 2002
RELATIVE HUMIDITY: 49 %
AMBIENT TEMPERATURE: 24 °C
AIR PRESSURE: 1006 hPa
MODULATION: ON
DETECTOR USED: Peak

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



4.2 Field strength of fundamental, § 15.231

METHOD OF MEASUREMENT: ANSI 63.4 §13.1.5
DATE: October 14, 2002
RELATIVE HUMIDITY: 49 %
AMBIENT TEMPERATURE: 24 °C
AIR PRESSURE: 1006 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
317.968	92.04	95.8	3.76	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
317.968	92.04	-24.1	67.94	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 plot in Annex A
6.250 ms	0.062	-24.1	A3

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 frequency is 75.8 dB(μV/m)
The specified peak limit for 318 MHz frequency 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.



4.3 Field strength of spurious radiation, § 15.231

METHOD OF MEASUREMENT:	ANSI 63.4 §13.1.4
TEST PERFORMED IN:	ANECHOIC CHAMBER
DATE:	October 14, 2002
RELATIVE HUMIDITY:	49 %
AMBIENT TEMPERATURE:	24 °C
AIR PRESSURE:	1006 hPa
TEST PERFORMED AT FIELD STRENGTH OF CARRIER:	92.04 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, 1 MHz above 1 GHz
MEASUREMENT UNCERTAINTY:	-5.73 dB/ -5.57 dB

Frequency, MHz	Radiated emissions						Ref. to plot in App. A
	Peak			Average			
	Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB	Calculated*, dB(μV/m)	Limit, dB(μV/m)	Margin, dB	
636.068	40.45	75.8	35.35	16.35	55.8	39.45	A7
954.105	56.94	75.8	18.86	32.84	55.8	22.96	A8
1272	50.60	75.8	25.20	26.50	55.8	29.30	A10
1589**	51.47	74	22.53	27.37	54	26.63	A11
1908	60.03	75.8	15.77	35.93	55.8	19.87	A12
2225**	51.67	74	22.33	27.57	54	26.43	A14
2543	47.46	75.8	28.34	23.36	55.8	32.44	A15

For test results refer to Plots A4 to A15.

* Radiated emission value was calculated: Peak value + Average factor (= -24.1 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(μV/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.



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 14, 2002
RELATIVE HUMIDITY: 49 %
AMBIENT TEMPERATURE: 24 °C
AIR PRESSURE: 1006 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	5 th 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	The limit for unintentional radiated emission, class B was used throughout spurious emission measurements in Tx mode. All emissions except carrier, 3 rd and 6 th harmonics were found below the limit.					A6, A9
Measurement uncertainty, dB		-5.73 dB/ -5.57 dB				

Table abbreviations:

Antenna polarization: V = vertical, H = horizontal
Turntable position: 0° = EUT front panel faces the receiving antenna

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.



Appendix A Plots

Plot A1

Occupied bandwidth measurements

09:29:47 OCT 14, 2002

ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR Δ 455 kHz
-.22 dB

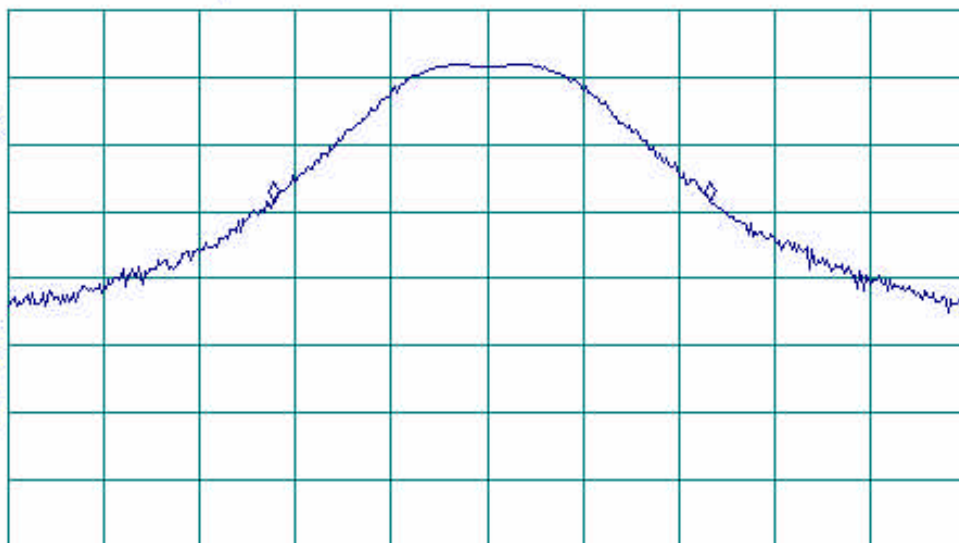
MEASURE
AT MKR

ADD TO
LIST

LOG REF 100.0 dB μ V/m

10
dB/
ATN
20 dB

VA SB
SC FC
ACORR



MARKER
NORMAL

MARKER
 Δ

MARKER
AMPTD

SELECT
1 2 3 4

MARKER 1
ON OFF

CENTER 310.000 MHz

RL #1F BW 100 kHz

#AVG BW_100 kHz

SPAN 1.000 MHz

SWP 20.0 msec

More

1 of 2



Plot A2

Field strength of fundamental measurements

09:27:00 OCT 14, 2002

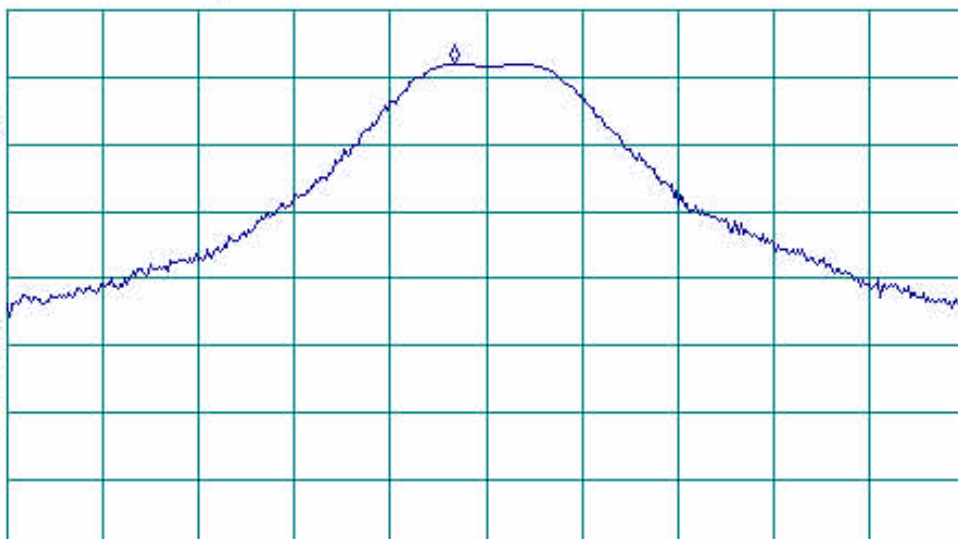
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 317.968 MHz
92.04 dB μ V/m

MEASURE
AT MKR
ADD TO
LIST

LOG REF 100.0 dB μ V/m

10
dB/
ATN
20 dB

VA SB
SC FC
ACORR



CENTER 318.000 MHz

RL #1F BW 120 kHz

AVG BW 300 kHz

SPAN 1.000 MHz

SWP 20.0 msec

MARKER
↓ CF

MARKER
△

NEXT
PEAK

NEXT PK
RIGHT

NEXT PK
LEFT

More
1 of 2

Average factor = $20\log(\text{Tx ON} / 100) = 20\log(6.250/100) = -24.1 \text{ dB}$

Average result = peak result + average factor = $92.04 - 24.1 = 67.94 \text{ dB}\mu\text{V/m}$ (Limit_{AVR} = 75.8 dB μ V/m @3m)

Peak result = 92.04 dB μ V/m (Limit_{PEAK} = 95.8 dB μ V/m @3m)



Plot A3

Average factor measurements, 100 ms interval



ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR Δ 6.2500 msec
.34 dB

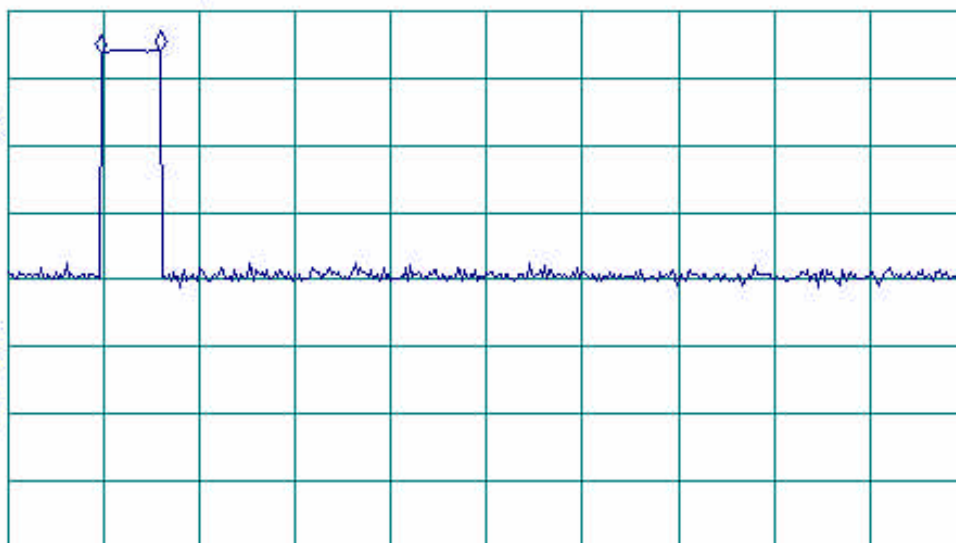
MEASURE
AT MKR
ADD TO
LIST

LOG REF 93.0 dB μ V/m

PREAMP ON

10
dB/
ATN
30 dB

VA SB
SC LC
ACORR



CENTER 318.000 MHz

SPAN 0 Hz

RL #1F BW 300 kHz

#AVG BW 1 MHz

#SWP 100 msec

CLEAR
WRITE A

MAX
HOLD A

VIEW A

BLANK A

Trace
A B C

More
1 of 3

Average factor = $20\log(\text{Tx ON} / 100) = 20\log(6.250/100) = -24.1 \text{ dB}$



Plot A4

Spurious emission measurements
9 kHz – 150 kHz range



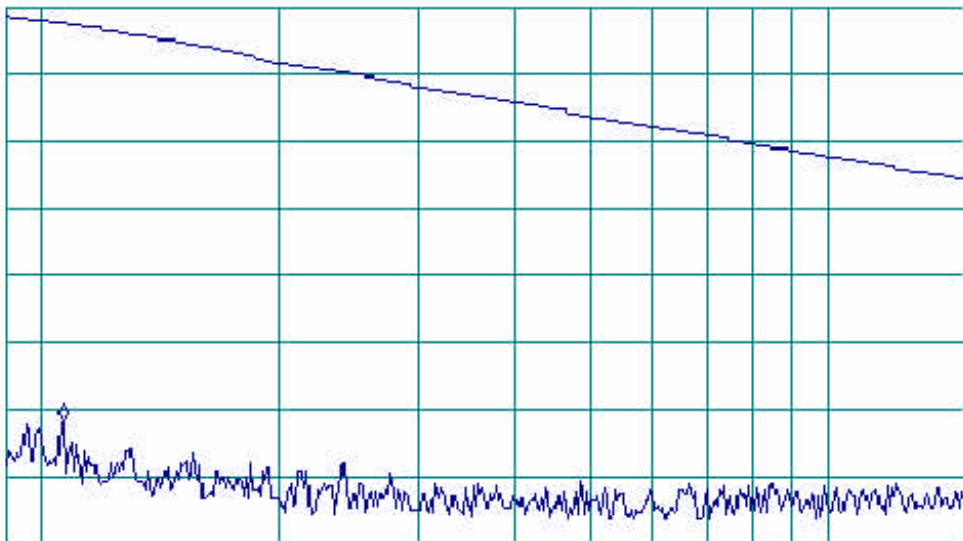
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 10.7 kHz
68.05 dB μ V/m

MEASURE
AT MKR
ADD TO
LIST

LOG REF 130.0 dB μ V/m

10
dB/
ATN
50 dB

UA SB
SC FC
ACORR



START 9.0 kHz STOP 150.0 kHz
R IF BW 200 Hz AVO BW 300 Hz SWP 10.3 sec

MARKER
↓ CF

MARKER
△

NEXT
PEAK

NEXT PK
RIGHT

NEXT PK
LEFT

More
1 of 2



Plot A5

Spurious emission measurements
150 kHz – 30 MHz range



ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 150 kHz
55.76 dB μ V/m

MEASURE
AT MKR

ADD TO
LIST

MARKER
↓ CF

MARKER
△

NEXT
PEAK

NEXT PK
RIGHT

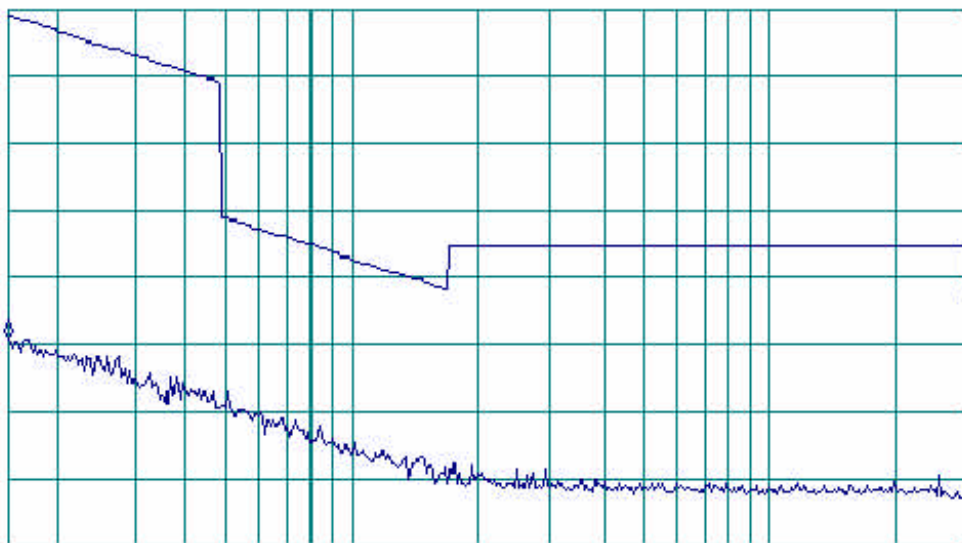
NEXT PK
LEFT

More
1 of 2

LOG REF 105.0 dB μ V/m

10
dB/
ATN
30 dB

UA SB
SC FC
ACORR



START 150 kHz

STOP 30.00 MHz

RL #1F BW 9.0 kHz

AVC BW 30 kHz

SWP 2.49 sec



Plot A6

Spurious emission measurements
30 MHz – 1000 MHz range

09:59:55 OCT 14, 2002

ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 958.8 MHz
57.22 dB μ V/m

MEASURE
AT MKR

ADD TO
LIST

CLEAR
WRITE A

MAX
HOLD A

VIEW A

BLANK A

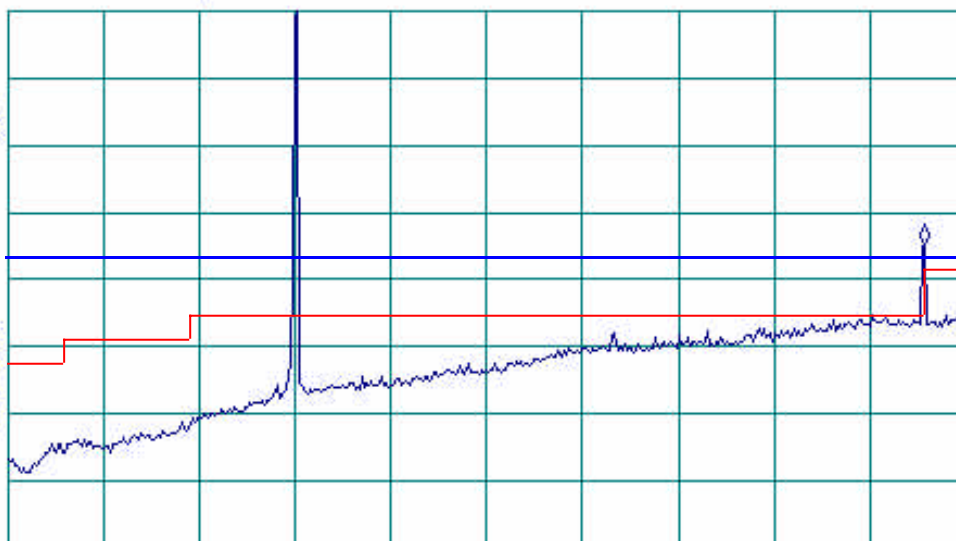
Trace
A B C

More
1 of 3

LOG REF 92.0 dB μ V/m

10
dB/
#ATN
10 dB

VA SB
SC FC
ACORR



START 30.0 MHz STOP 1.0000 GHz
RL #1F BW 120 kHz #AVG BW 300 kHz SWP 909 msec

The red line is unintentional radiated emission limit according to § 15.109.

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



Plot A7

Field strength of 2nd harmonic

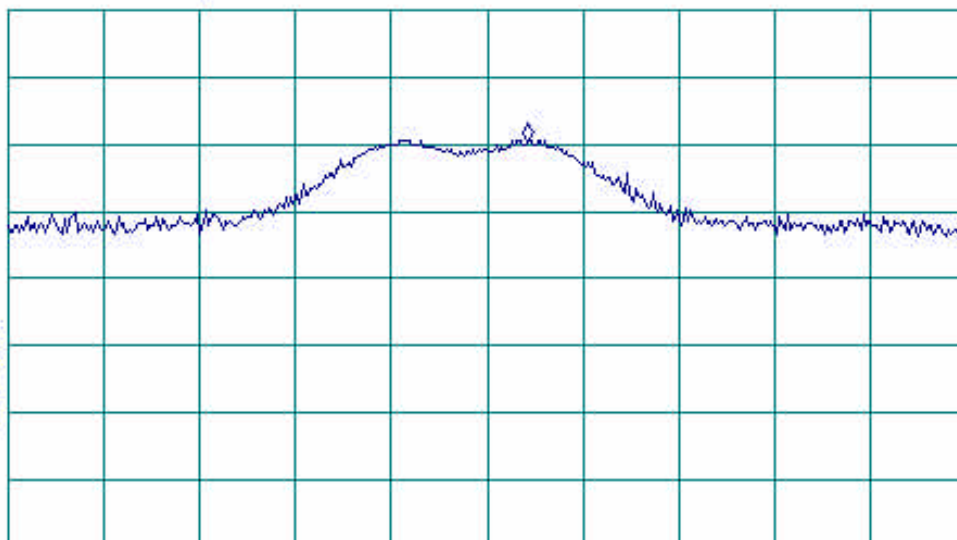
09:55:10 OCT 14, 2002

ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 636.068 MHz
40.45 dB μ V/m

MEASURE
AT MKR
ADD TO
LIST

LOG REF 60.0 dB μ V/m
10
dB/
#ATN
0 dB

VA SB
SC FC
ACORR



MARKER
↓ CF

MARKER
△

NEXT
PEAK

NEXT PK
RIGHT

NEXT PK
LEFT

CENTER 636.025 MHz SPAN 1.000 MHz
RL #1F BW 120 kHz #AVG BW 300 kHz SWP 20.0 msec

More
1 of 2



Plot A8

Field strength of 3rd harmonic

10:02:08 OCT 14, 2002

ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 954.105 MHz
56.94 dB μ V/m

MEASURE
AT MKR

ADD TO
LIST

MARKER
↓ CF

MARKER
△

NEXT
PEAK

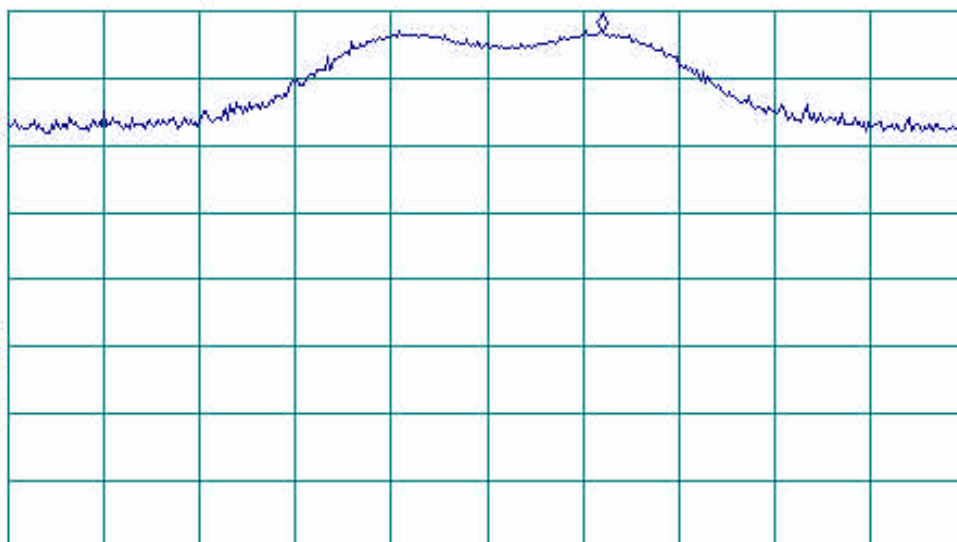
NEXT PK
RIGHT

NEXT PK
LEFT

More
1 of 2

LOG REF 60.0 dB μ V/m

10
dB/
#ATN
10 dB



CENTER 953.985 MHz

SPAN 1.000 MHz

RL #1F BW 120 kHz

#AVG BW 300 kHz

SWP 20.0 msec



Plot A9

Spurious emission measurements
1 – 2 GHz range

10:25:05 OCT 14, 2002

ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 1.900 GHz
58.69 dB μ V/m

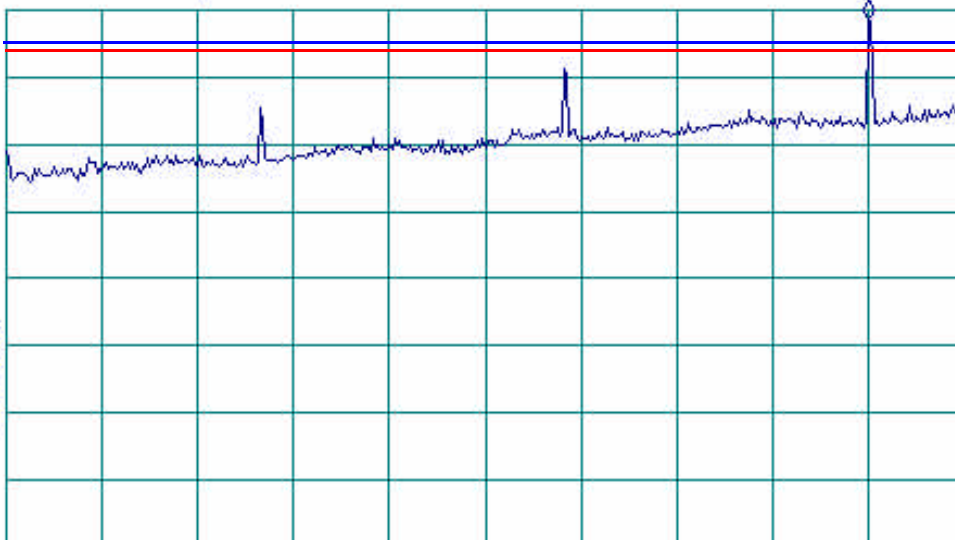
MEASURE
AT MKR
ADD TO
LIST

LOG REF 60.0 dB μ V/m

PREAMP ON

10
dB/
#ATN
0 dB

VA SB
SC FC
ACORR



MARKER
↓ CF

MARKER
△

NEXT PEAK

NEXT PK
RIGHT

NEXT PK
LEFT

START 1.000 GHz

STOP 2.000 GHz

RL #1F BW 1.0 MHz

#AVG BW 1 MHz

SWP 20.0 msec

More
1 of 2

The red line is radiated emission limit according to § 15.209, § 15.109.

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



Plot A10

Field strength of 4th harmonic

10:10:27 OCT 14, 2002

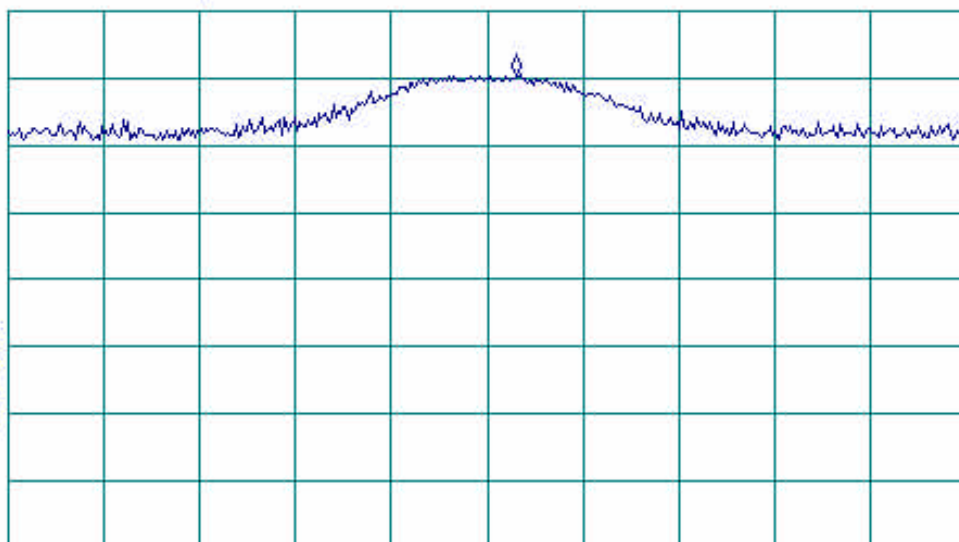
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 1.272135 GHz
50.60 dB μ V/m

MEASURE
AT MKR

ADD TO
LIST

LOG REF 60.0 dB μ V/m

10
dB/
#ATN
0 dB



MARKER
↓ CF

MARKER
△

NEXT
PEAK

NEXT PK
RIGHT

NEXT PK
LEFT

CENTER 1.271985 GHz

RL #1F BW 1.0 MHz

#AVG BW 1 MHz

SPAN 5.000 MHz

SWP 20.0 msec

More
1 of 2



Plot A11

Field strength of 5th harmonic

10:13:33 OCT 14, 2002

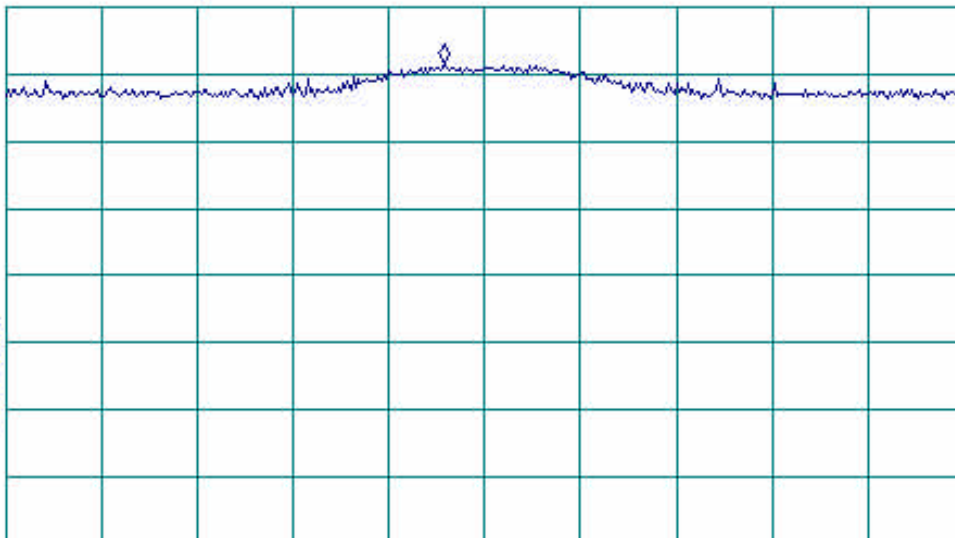
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 1.589773 GHz
51.47 dB μ V/m

MEASURE
AT MKR
ADD TO
LIST

HOLD

LOG REF 60.0 dB μ V/m

10
dB/
#ATN
0 dB



DSP LINE
ON OFF

Change
Title

Display
Config

INTENSITY

CENTER 1.589985 GHz

SPAN 5.000 MHz

More

RL #1F BW 1.0 MHz

#AVG BW 1 MHz

SWP 20.0 msec

1 of 2



Plot A12

Field strength of 6th harmonic

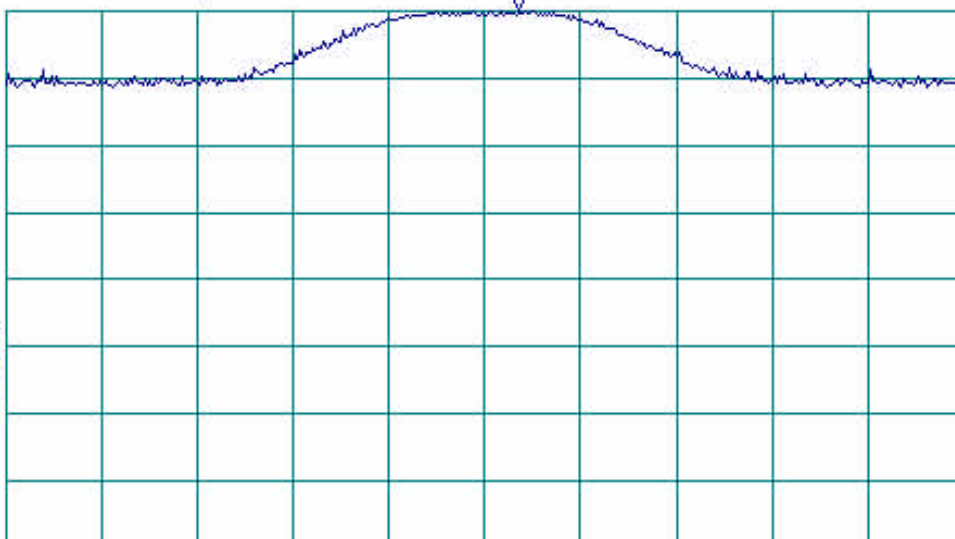
10:16:10 OCT 14, 2002

ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 1.908160 GHz
60.03 dB μ V/m

MEASURE
AT MKR
ADD TO
LIST

HOLD

LOG REF 60.0 dB μ V/m
10
dB/
#ATN
0 dB



DSP LINE
ON OFF

Change
Title

Display
Config

INTENSITY

CENTER 1.907985 GHz SPAN 5.000 MHz
RL #1F BW 1.0 MHz #AVG BW 1 MHz SWP 20.0 msec

More
1 of 2



Plot A13

Spurious emission measurements
2 – 3.2 GHz range

11:19:36 OCT 14, 2002

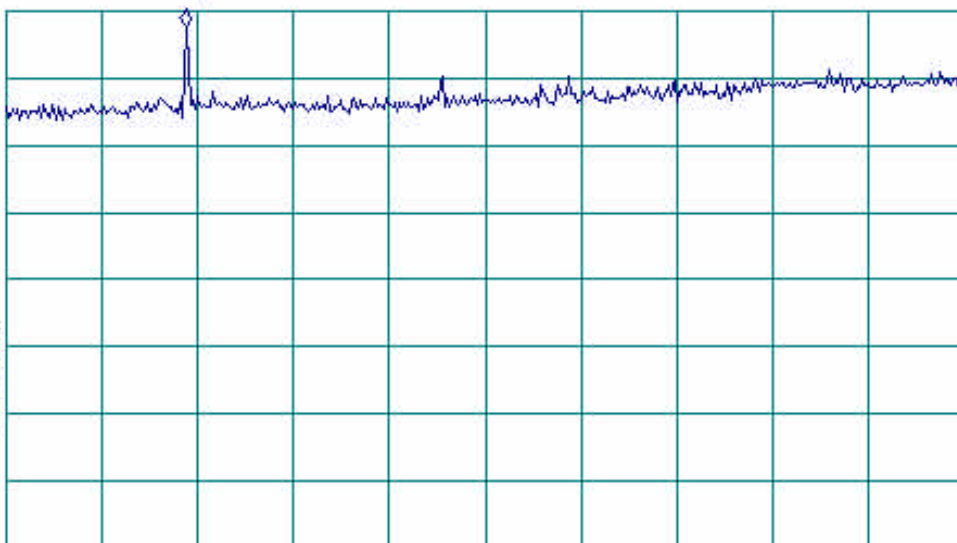
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 2.225 GHz
52.44 dB μ V/m

MEASURE
AT MKR
ADD TO
LIST

LOG REF 55.0 dB μ V/m

PREAMP ON

10
dB/
#ATN
0 dB



MARKER
↓ CF

MARKER
△

NEXT
PEAK

NEXT PK
RIGHT

NEXT PK
LEFT

START 2.000 GHz

STOP 3.200 GHz

RL #1F BW 1.0 MHz

#AVG BW 1 MHz

SWP 40.0 msec

More
1 of 2



Plot A14

Field strength of 7th harmonic

10:52:41 OCT 14, 2002

ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 2.225700 GHz
51.67 dB μ V/m

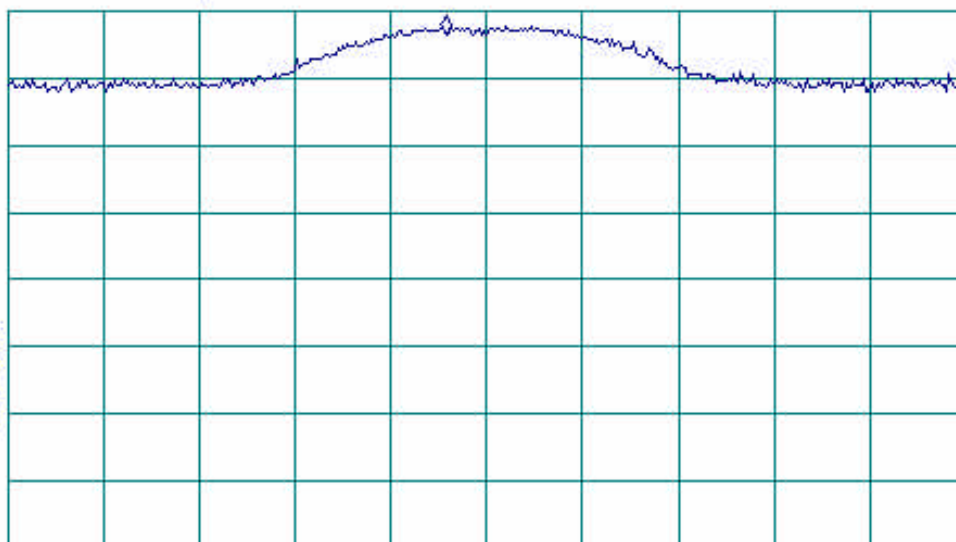
MEASURE
AT MKR
ADD TO
LIST

LOG REF 55.0 dB μ V/m

PREAMP ON

CLEAR
WRITE B

10
dB/
#ATN
0 dB



MAX
HOLD B

VIEW B

VA SB
SC FC
ACORR

BLANK B

Trace
A B C

CENTER 2.226000 GHz

SPAN 5.000 MHz

R #1F BW 1.0 MHz

#AVG BW 1 MHz

SWP 20.0 msec

More
1 of 3



Plot A15
Field strength of 8th harmonic

11:17:38 OCT 14, 2002

ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 2.54387 GHz
47.46 dB μ V/m

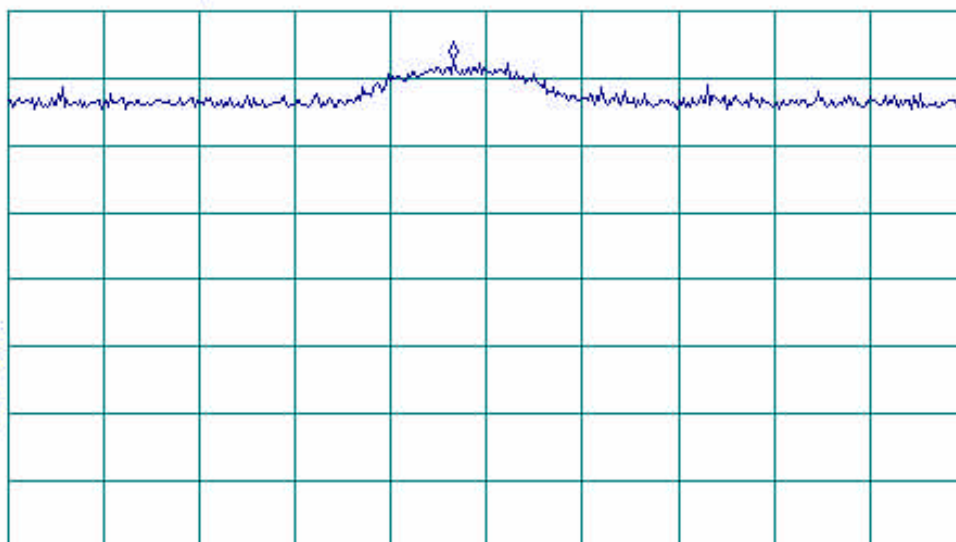
MEASURE
AT MKR
ADD TO
LIST

LOG REF 55.0 dB μ V/m

PREAMP ON

HOLD

10
dB/
#ATN
0 dB



DSP LINE
ON OFF

Change
Title

VA SB
SC FC
ACORR

Display
Config

INTENSITY

CENTER 2.54422 GHz

SPAN 10.00 MHz

More

RL #1F BW 1.0 MHz

#AVG BW 1 MHz

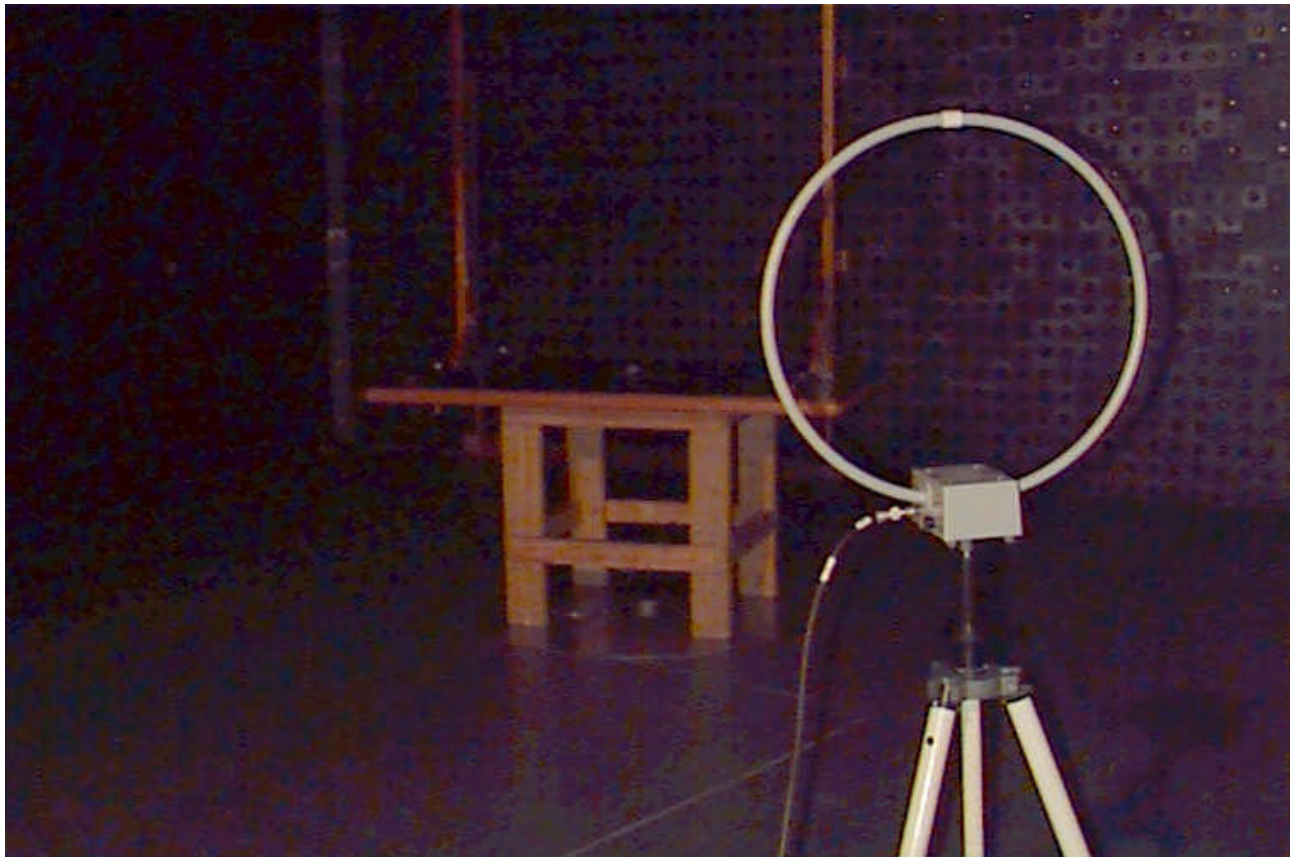
SWP 20.0 msec

1 of 2



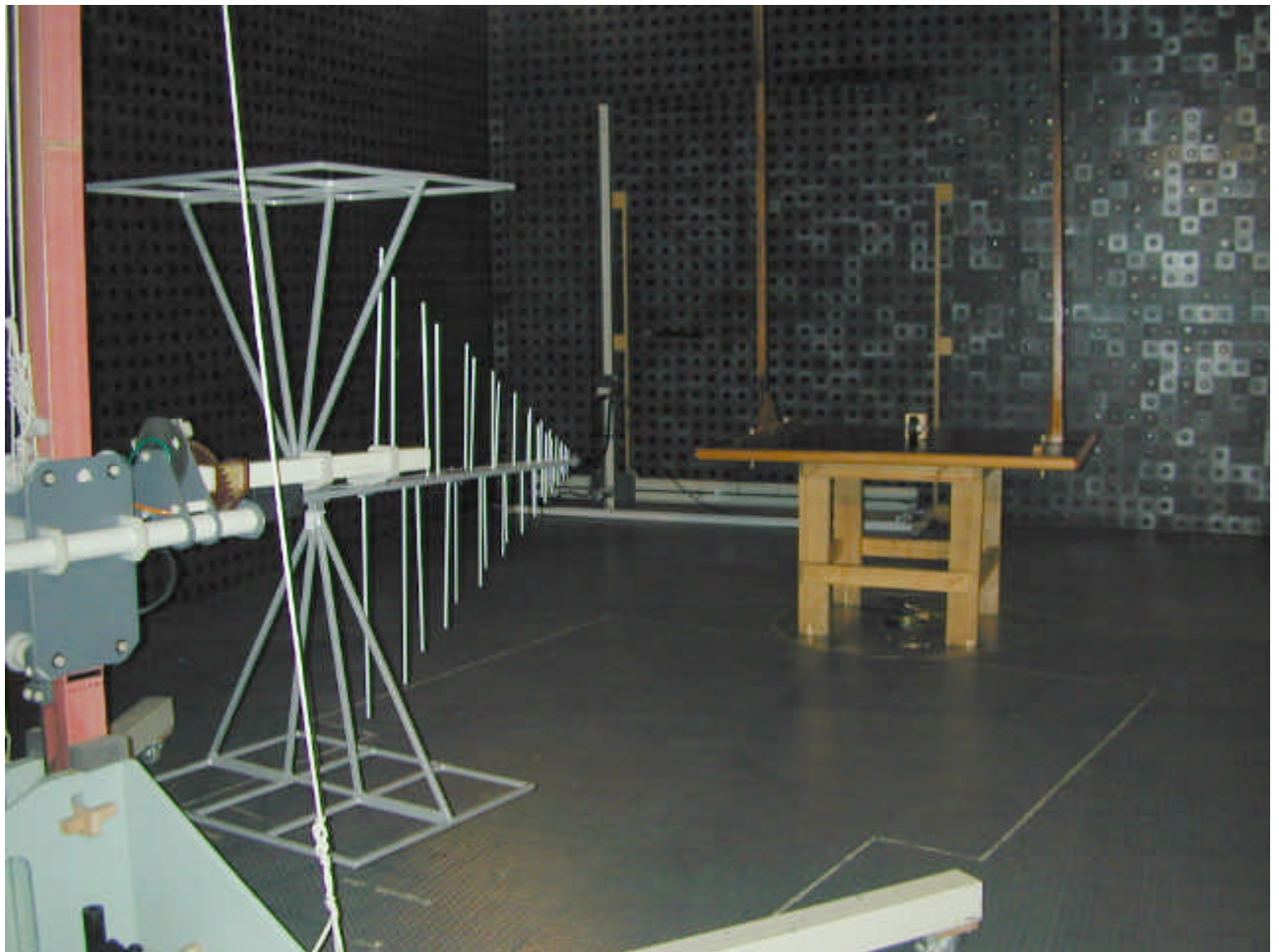
Appendix B Test setup photographs

RADIATED EMISSION MEASUREMENT SETUP, 9 kHz – 30 MHz RANGE



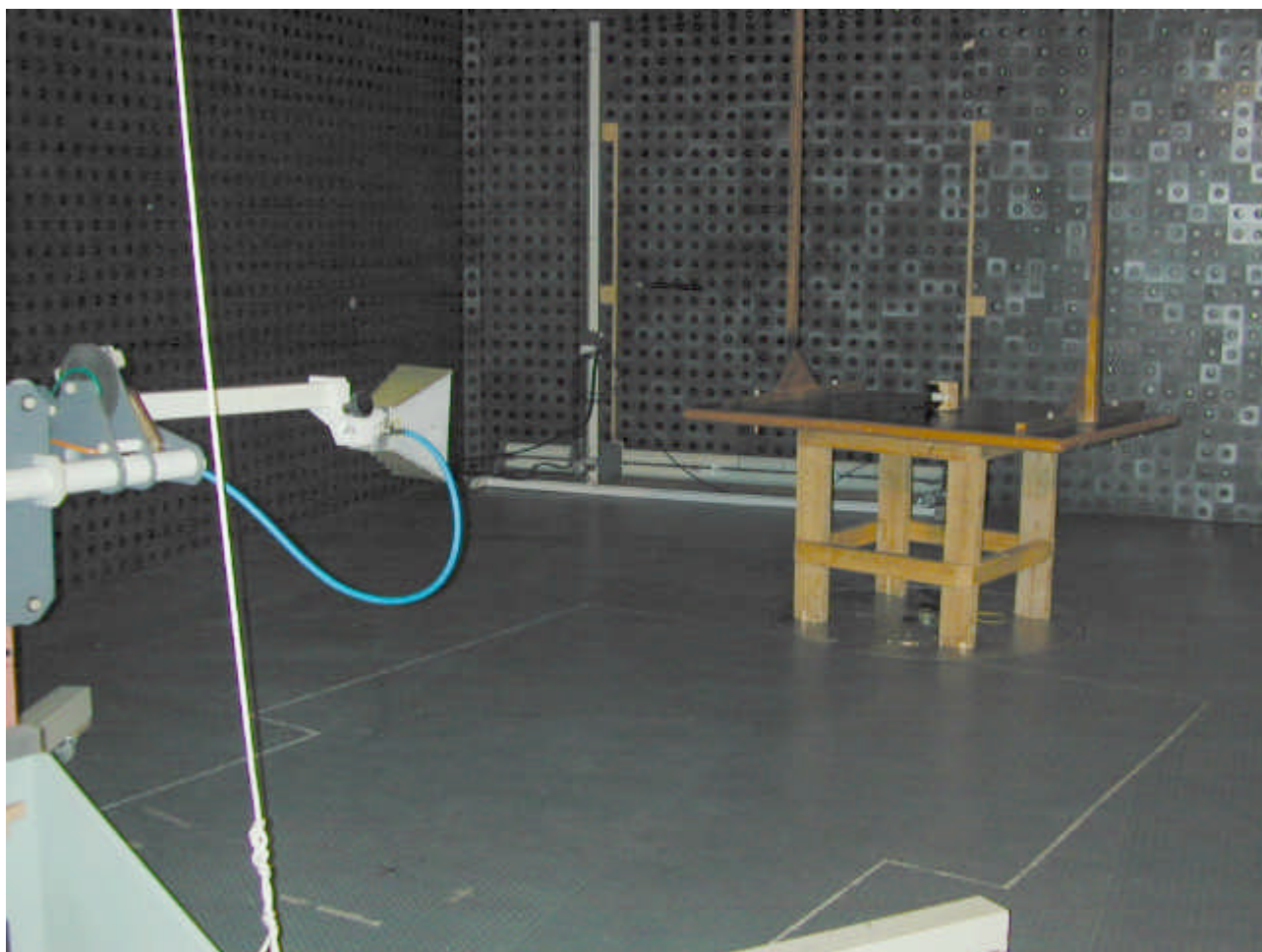


RADIATED EMISSION MEASUREMENT SETUP, 30 – 2000 MHz RANGE



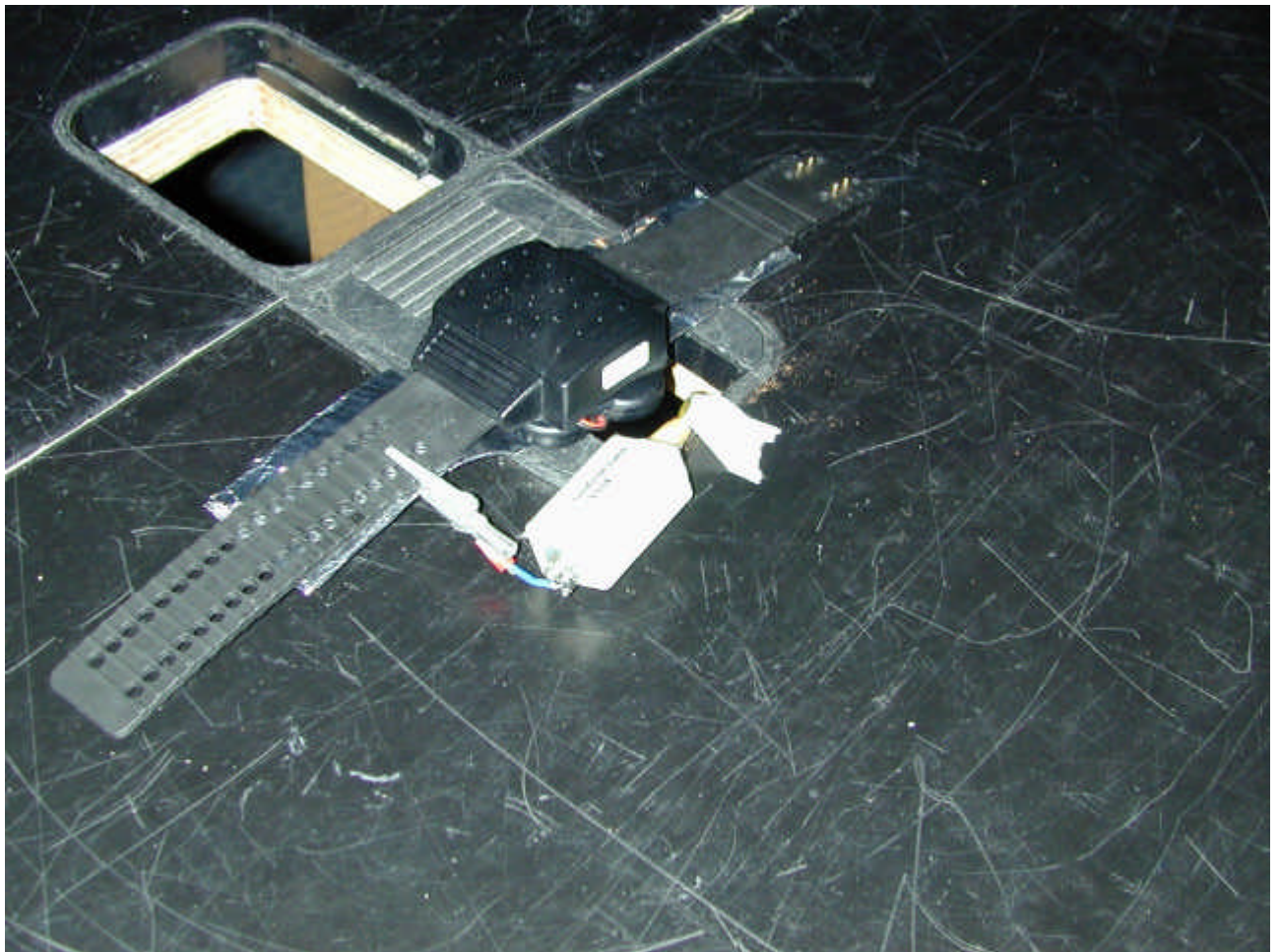


RADIATED EMISSION MEASUREMENT SETUP, 2000 – 3200 MHz RANGE





RADIATED EMISSION MEASUREMENTS, THE EUT VIEW





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	12/02
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	12/02
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



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(μ V) to convert it into field intensity in dB(μ V/m).



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(μ V) to convert it into field intensity in dB(μ V/m).



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(μ V) to convert it into field intensity in dB(μ V/m).



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	-			
22		4500	4.07	-		±0.17	
23		4800	4.36	-			
24		5100	4.62	-			
25		5400	4.78	-			
26		5700	5.16	-			
27		6000	5.67	-			
28		6500	5.99	-			

**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



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(μ V)	decibel referred to one microvolt
dB(μ V/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.



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