Test Report No.8112309391

On Breezecom Ltd.
One Box 2.4 GHz Radio

Model: SU-R-2.4

From The Standards Institution
Of Israel
Industry Division
Telematics Laboratory
EMC Section

ACCREDITED

Certificate No.1487-01

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Test Report No.: 8112309391	**Page 1 of 34 Pages**
Title: Test on One Box 2.4 GHz Radio	**Model: SU-R-2.4**

Order placed by:	Breezecom Ltd.
Address:	P.O. Box 13139 Tel Aviv 61131 Israel
Sample for test selected by:	The orderer
The date of test:	11/06/2001

Description of Equipment Under Test (EUT):	One Box 2.4 GHz Radio
Model:	SU-R-2.4
Manufactured by:	Breezecom Ltd.

Reference Documents:

- CFR 47 FCC: "Rules and Regulations";
  Part 15. "Radio frequency devices";
  Subpart C: "Intentional radiators" Sec.15.205, 15.209

Test Results: The EUT was found to be in compliance with the requirements of FCC Rules Part 15 Subpart C Sec.15.205, 15.209.

This Test Report contains 34 pages and may be used only in full.	This Test Report applies only to the specimen tested and may not be applied to other specimens of the same product.

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1 EUT Description and operation

1.1 General description:

Description of Equipment Under Test (EUT): One Box 2.4 GHz Radio
Model: SU-R-2.4
Manufactured by: Breezecom Ltd.

The EUT is a spread spectrum transmitter operating within the frequency band 2400 – 2483 MHz.
The measurements were performed with 3 different detachable antennas as described below:

No	Antenna description	Breezecom name	MFR name
1	Flat panel patch antenna	UNI-8.5	Huber-Shuner SPA 2400/75/9/0/V 2300-2500MHz
2	Flat panel patch antenna	UNI-7	M/A -Com
3	2 x antenna	Omni-6dBi	NA

1.2 Test requirements:

1. Spurious emission measurements up to 10 th harmonic for low, middle and high channels. Test requirements per FCC Part 15 Subpart C Sec.15.209.
2. Radiated emission measurements in restricted bands 2310-2390 MHz and 2483.5-2500 MHz for low, middle and high channel. Test requirements per FCC Part 15 Subpart C per Sec.15.205.

2 Test specification, Methods and Procedures

Test Specification:

- CFR 47 FCC: "Rules and Regulations";
  Part 15. "Radio frequency devices";
  Subpart C: "Intentional radiators".Sec.15.205, 15.209

Methods and Procedures:

- ANSI C63/4/1992: "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".

3 Measurements, examinations and derived results

3.1 Location of the Test Site:

EMC laboratory of the Standards Institution of Israel in Tel-Aviv.

3.2 Test condition:

Temperature: 22 °C
Humidity: 60 %

3.3 Radiated emission test:

3.3.1 Test procedure:

The measurements were performed in the Anechoic Chamber.
The EUT was arranged on a non-metallic table 0.8 m placed on the turntable. The turntable was slowly rotated to find the maximum emissions.

All measurements were performed at a 1 m measurement distance, antenna height was about 1m.
Measuring antenna used: Double Ridge

The measuring equipment settings were:

Detector type	Average
Resolution Bandwidth	1MHz

The frequency range was investigated from 4804 MHz up to 24780 MHz using a 2-18GHz standard gain horn. Results above 18GHz are not calibrated. No harmonics above 18GHz were detected.

3.3.2 Radiated emission test results:

Test results of are presented in table #1 to #9 (spurious emissions measurements) and in Plots #1 to #6 (emissions in restricted bands).

Table 1. Spurious emissions test results

Tested unit: SU-R-2.4
Antenna Breezecom name: UNI-8.5
Antenna MFR name: Huber-Shuner SPA 2400/75/9/0/V 2300-2500MHz

Low operating frequency 2402 MHz

Frequency (MHz)	Emission level (dBmV/m)	Limit @ 3m (dBmV/m)	Margin (dB)	Results
4804	39.18	53.9	24.22	Complies
7206	53.53	53.9	9.87	Complies
9608	39.16	53.9	24.24	Complies
12010	34.56	53.9	28.84	Complies
14412	40.97	53.9	22.43	Complies
16814	39.34	53.9	24.06	Complies
19216	43.87	53.9	19.53	Complies
21618	45.26	53.9	18.14	Complies
24020	48.01	53.9	15.39	Complies

Note : Emission level = E Reading (dBµV) + Cable loss (dB) + Antenna Factor (dB/m) + Distance correction factor
For Cable Loss and Antenna Factor refer to Appendix 2.
Distance correction factor = -9.5 dB (correction to extrapolation reading from 1 m to 3m specified distance)

Table 2. Spurious emissions test results

Tested unit: SU-R-2.4
Antenna Breezecom name: UNI-8.5
Antenna MFR name: Huber-Shuner SPA 2400/75/9/0/V 2300-2500MHz

Middle operating frequency 2441 MHz

Frequency (MHz)	Emission Level (dBmV/m)	Limit @ 3m (dBmV/m)	Margin (dB)	Results
4882	29.09	53.9	24.81	Complies
7323	46.94	53.9	6.96	Complies
9764	23.99	53.9	29.91	Complies
12205	25.52	53.9	28.38	Complies
14646	30.31	53.9	23.59	Complies
17087	31.61	53.9	22.29	Complies
19528	45.17	53.9	18.23	Complies
21969	46.45	53.9	16.95	Complies
24410	48.65	53.9	14.75	Complies

Table 3. Spurious emissions test results

Tested unit: SU-R-2.4
Antenna Breezecom name: UNI-8.5
Antenna MFR name: Huber-Shuner SPA 2400/75/9/0/V 2300-2500MHz

High operating frequency 2478 MHz

Frequency (MHz)	Emission Level (dBmV/m)	Limit @ 3m (dBmV/m)	Margin (dB)	Results
4956	32.29	53.9	21.61	Complies
7434	40.67	53.9	13.23	Complies
9912	23.97	53.9	29.93	Complies
12390	26.19	53.9	27.71	Complies
14868	29.73	53.9	24.17	Complies
17346	32.29	53.9	21.61	Complies
19824	45.39	53.9	18.01	Complies
22302	45.86	53.9	17.54	Complies
24780	48.38	53.9	15.02	Complies

Table 4. Spurious emissions test results

Tested unit: SU-R-2.4
Antenna Breezecom name: UNI-7
Antenna MFR name: M/A -Com

Low operating frequency 2402 MHz

Frequency (MHz)	Emission Level (dBmV/m)	Limit @ 3m (dBmV/m)	Margin (dB)	Results
4804	27.81	53.9	26.09	Complies
7206	40.95	53.9	12.95	Complies
9608	31.02	53.9	22.88	Complies
12010	25.7	53.9	28.2	Complies
14412	31.44	53.9	22.46	Complies
16814	30.59	53.9	23.31	Complies
19216	44.54	53.9	18.86	Complies
21618	45.79	53.9	17.61	Complies
24020	47.93	53.9	15.47	Complies
26422	48.48	53.9	14.92	Complies

Table 5. Spurious emissions test results

Tested unit: SU-R-2.4
Antenna Breezecom name: UNI-7
Antenna MFR name: M/A -Com

Middle operating frequency 2441 MHz

Frequency (MHz)	Emission Level (dBmV/m)	Limit @ 3 m (dBmV/m)	Margin (dB)	Results
4882	32.49	53.9	21.41	Complies
7323	42.83	53.9	11.07	Complies
9764	24.3	53.9	29.6	Complies
12205	29.5	53.9	24.4	Complies
14646	31.25	53.9	22.65	Complies
17087	34.77	53.9	19.13	Complies
19528	45.32	53.9	18.08	Complies
21969	46.77	53.9	16.63	Complies
24410	41.71	53.9	21.69	Complies
26851	48.8	53.9	14.6	Complies

Table 6. Spurious emissions test results

Tested unit: SU-R-2.4
Antenna Breezecom name: UNI-7
Antenna MFR name: M/A -Com

High operating frequency 2478

Frequency (MHz)	Emission Level (dBmV/m)	Limit @ 3m (dBmV/m)	Margin (dB)	Results
4956	33.43	53.9	20.47	Complies
7434	42.96	53.9	10.94	Complies
9912	30.21	53.9	23.69	Complies
12390	26.09	53.9	27.81	Complies
14868	30.13	53.9	23.77	Complies
17346	32.15	53.9	21.75	Complies
19824	45.11	53.9	18.29	Complies
22302	45.54	53.9	17.86	Complies
24780	47.85	53.9	15.55	Complies

Table 7 Spurious emissions test results

Tested unit: SU-R-2.4
Antenna Breezecom name: 2X Antenna OMNI-6dBi
Antenna MFR name: NA

Low operating frequency 2402 MHz

Frequency (MHz)	Emission Level (dBmV/m)	Limit @ 3m (dBmV/m)	Margin (dB)	Results
4804	33.35	53.9	20.55	Complies
7206	37.53	53.9	16.37	Complies
9608	25.53	53.9	28.37	Complies
12010	24.47	53.9	29.43	Complies
14412	30.28	53.9	23.62	Complies
16814	29.84	53.9	24.06	Complies
19216	43.57	53.9	19.83	Complies
21618	44.8	53.9	18.6	Complies
24020	47.37	53.9	16.03	Complies

Table 8 Spurious emissions test results

Tested unit: SU-R-2.4
Antenna Breezecom name: 2X Antenna OMNI-6dBi
Antenna MFR name: NA

Middle operating frequency 2441 MHz

Frequency (MHz)	Emission Level (dBmV/m)	Limit @ 3m (dBmV/m)	Margin (dB)	Results
4882	33.37	53.9	20.53	Complies
7323	40.76	53.9	13.14	Complies
9764	23.47	53.9	30.43	Complies
12205	32.3	53.9	21.6	Complies
14646	29.65	53.9	24.25	Complies
17087	30.55	53.9	23.35	Complies
19528	43.91	53.9	19.49	Complies
21969	45.29	53.9	18.11	Complies
24410	47.28	53.9	16.12	Complies

Table 9 Spurious emissions test results

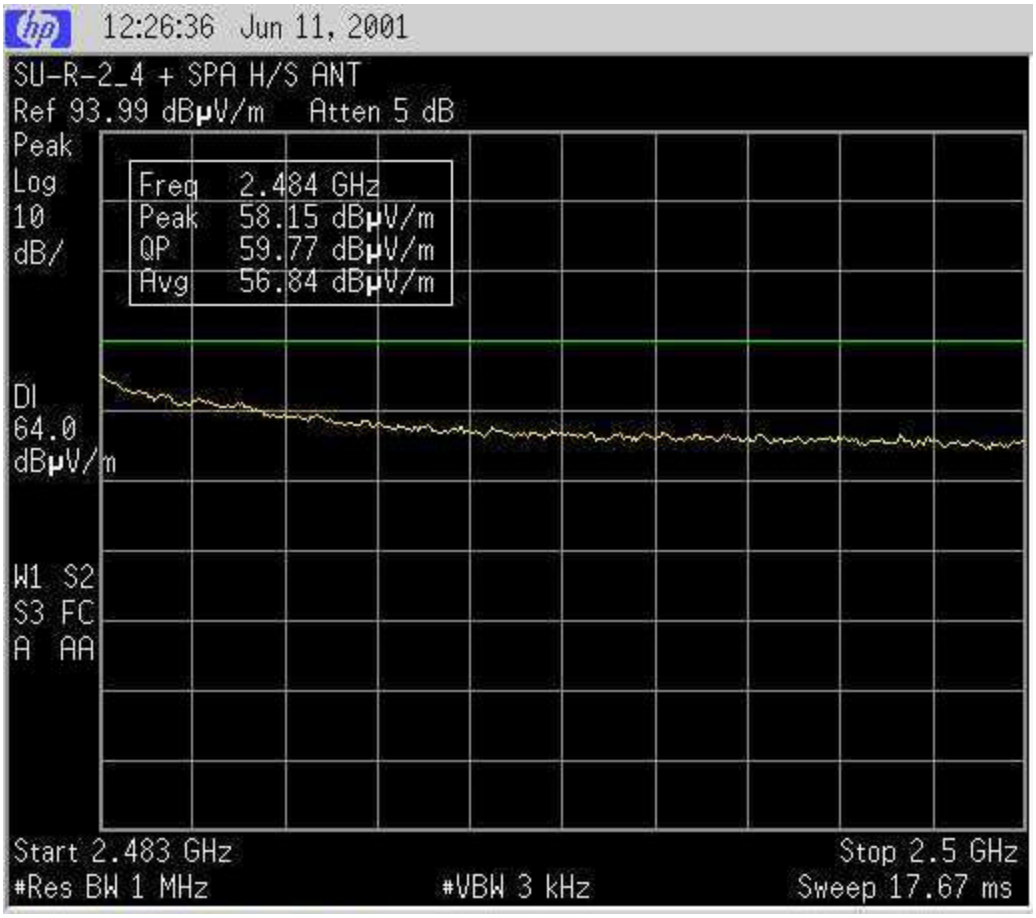
Tested unit: SU-R-2.4
Antenna Breezecom name: 2X Antenna OMNI-6dBi
Antenna MFR name: NA

High operating frequency 2478 MHz

Frequency (MHz)	Emission Level (dBmV/m)	Limit @ 3 m (dBmV/m)	Margin (dB)	Results
4956	30.35	53.9	23.55	Complies
7434	42.42	53.9	11.48	Complies
9912	22.64	53.9	31.26	Complies
12390	24.75	53.9	29.15	Complies
14868	28.21	53.9	25.69	Complies
17346	30.69	53.9	23.21	Complies
19824	43.82	53.9	19.58	Complies
22302	44.05	53.9	19.35	Complies
24780	46.73	53.9	16.67	Complies

Plot #1
Radiated emissions measured in restricted band 2483.5 –2500 MHz

Antenna Breezecom name:	UNI-8.5
Antenna MFR name:	Huber-Shuner SPA 2400/75/9/0/V 2300-2500MHz

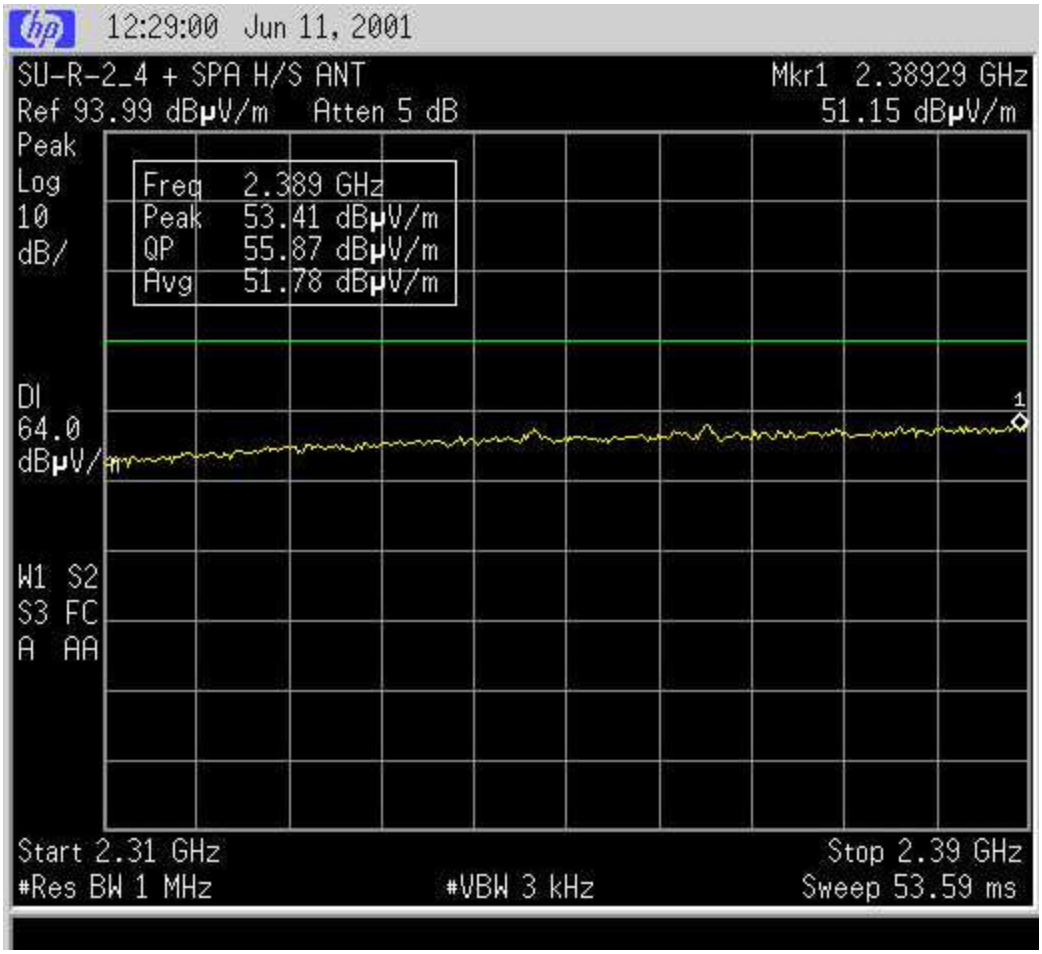


Note 1: The measurements were performed at 1 m distance instead of 3 m, thus the specified limit of 53.4 dBµV/m on the plot raised to 10 dB.

Note 2: The Video Bandwidth 3 kHz instead of 10 Hz was used (at this condition the lowest level of averaged signal was measured).

Plot #2
Radiated emissions measured in restricted band 2310–2390 MHz

Antenna Breezecom name:	UNI-8.5
Antenna MFR name:	Huber-Shuner SPA 2400/75/9/0/V 2300-2500MHz



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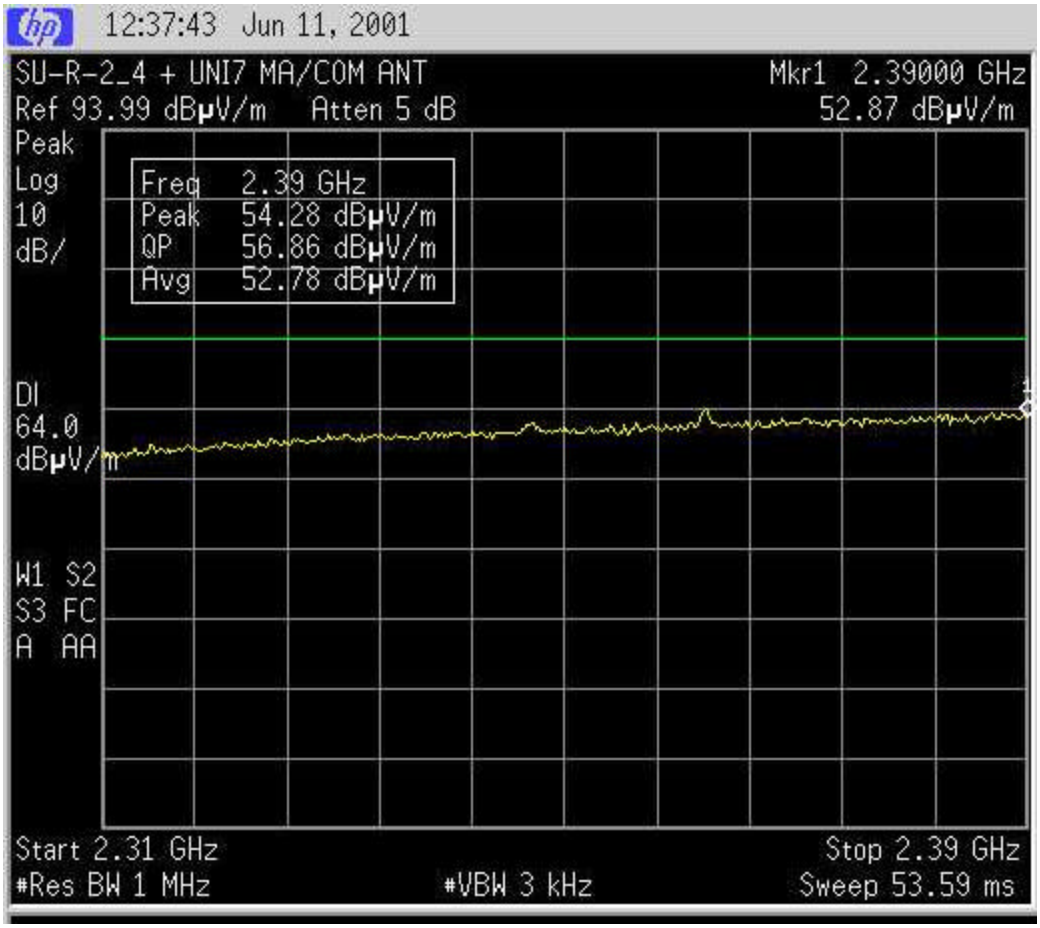
Plot #3
Radiated emissions measured in restricted band 2310–2390 MHz

Antenna Breezecom name: UNI-7
Antenna MFR name: M/A -Com



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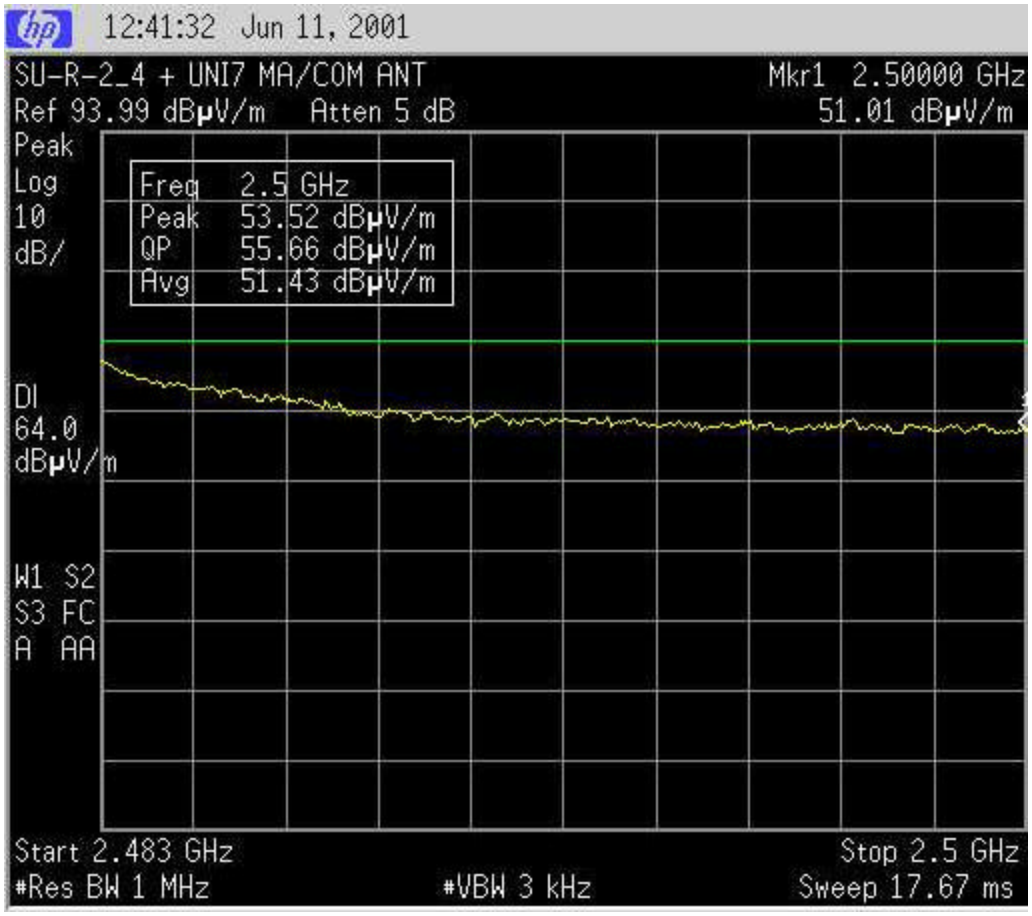
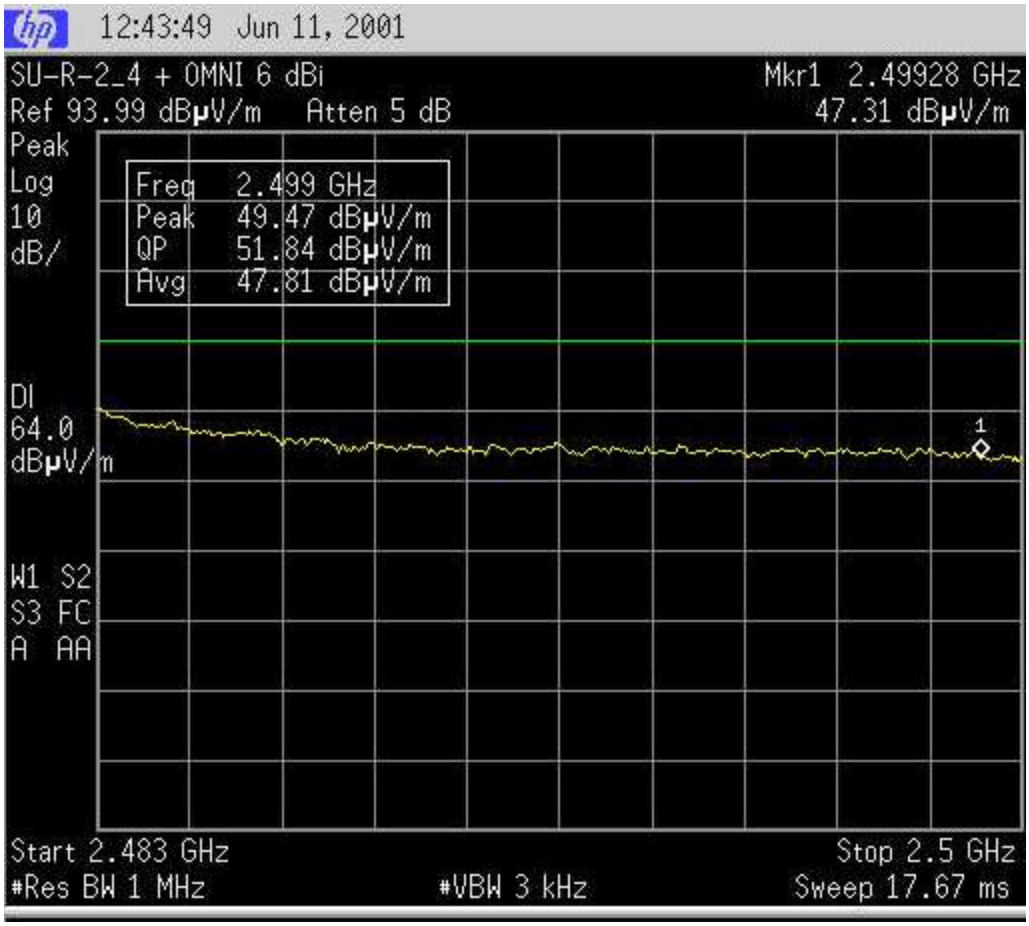
Plot #4
Radiated emissions measured in restricted band 2483.5 –2500 MHz

Antenna Breezecom name: UNI-7
Antenna MFR name: M/A -Com



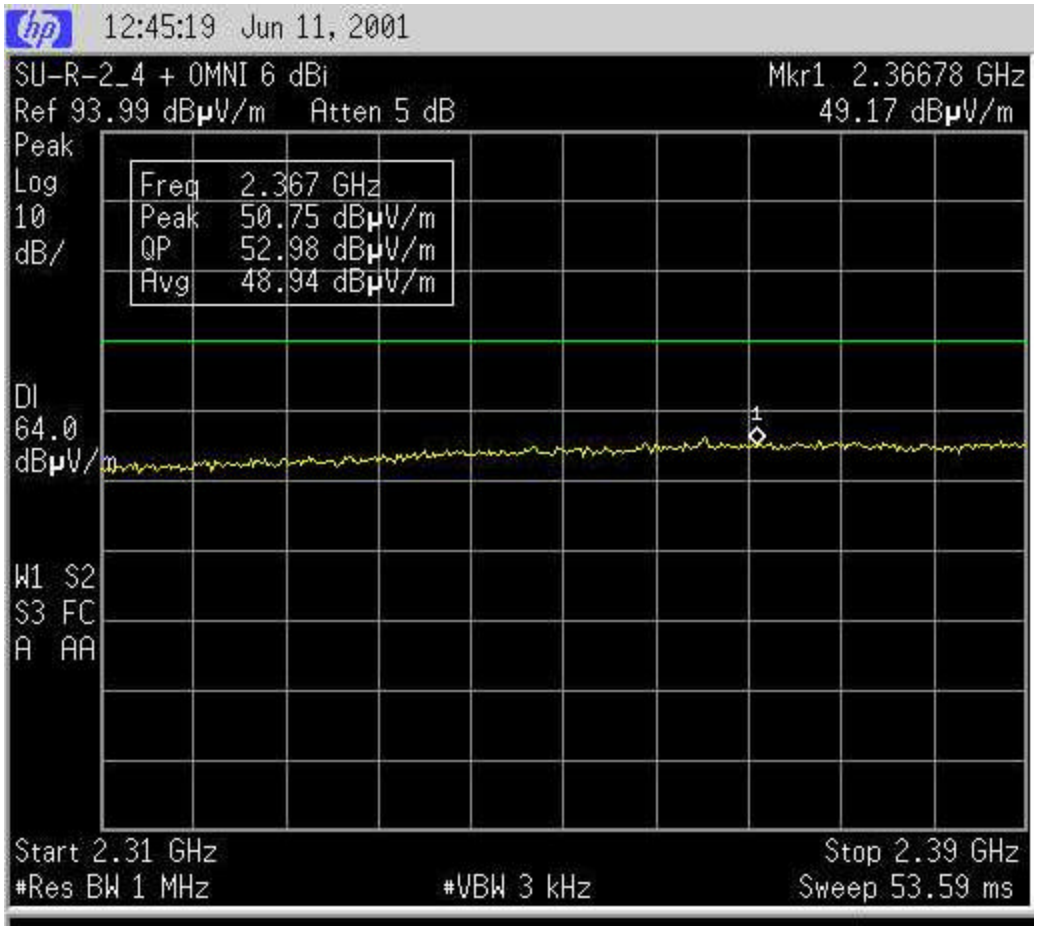
Plot #5
Radiated emissions measured in restricted band 2483.5 –2500 MHz

Antenna Breezecom name: 2X Antenna OMNI-6dBi
Antenna MFR name: NA



Plot #6
Radiated emissions measured in restricted band 2310–2390 MHz

Antenna Breezecom name: 2X Antenna OMNI-6dBi
Antenna MFR name: NA



4 Compliance with specification

Test	Standard	Test result
Spurious radiated emission Frequencies range from 4804 - 2800 MHz	FCC Part 15 Subpart C Sec.15.209	Complies

Radiated emissions in restricted bands FCC Part 15
Subpart C Sec.15.205 Complies

lematics??Laboratory?? 12 June, 2001
Name: Eng. Yuri Rozenberg Name Maxim Reizin Position: Head of EMC
Branch Position: Test Technician

5 Appendix 1: Test equipment used

All measurements equipment is on SII calibration schedule with a recalibration interval not exceeding once a year.

Instrument	Manufac-turer	Model	Serial No.	Last calibration date	Next calibration date
Spectrum analyze 10 KHz-26.5 GHz	HP	E7405a	SII 4944	04/01	04/02
Antenna Double Ridge 1-18 GHz	EMCO	3115	SII4873	03/01	03/02

6 Appendix 2: Antenna Factor and Cable Loss

Cable Loss
Type: Sucoflex; Ser.No.21328/4PE; 4 m length

Point	Frequency (GHz)	Cable Loss (dB)
1	1.8 – 3.6	2.43
2	3.6 – 5.4	3.06
3	5.4-7.2	3.66
4	7.2-9.0	4.11
5	9.0-10.8	4.53
6	10.8-12.6	4.93
7	12.6-14.4	5.3
8	14.4-16.2	5.67
9	16.2-18.00	6.02

Antenna Factor
Double Ridged Guide Antenna mfr EMCO model 3115

Point	Frequency (MHz)	Antenna Factor (dB/m)
1	2000	27.4
2	2500	28.9
3	3000	31.0
4	4000	33.1
5	4500	32.5
6	5000	32.4
7	6000	53.7
8	6500	35.6
9	7000	36.4
10	7500	36.9
11	8000	37.0
12	8500	38.0
13	9000	38.6
14	9500	38.4
15	10000	38.4
16	10500	38.4
17	11000	38.9
18	11500	39.6
19	12000	39.4
20	12500	39.2
21	13000	40.3
22	13500	41.0
23	14000	41.2
24	14500	41.3
25	15000	40.0
26	15500	38.0
27	16000	38.1
28	16500	40.3
29	17000	42.2
30	17500	44.6
31	18000	46.2

7 Appendix 3: Test configuration illustration

Photo #1. UNI-8.5 test configuration

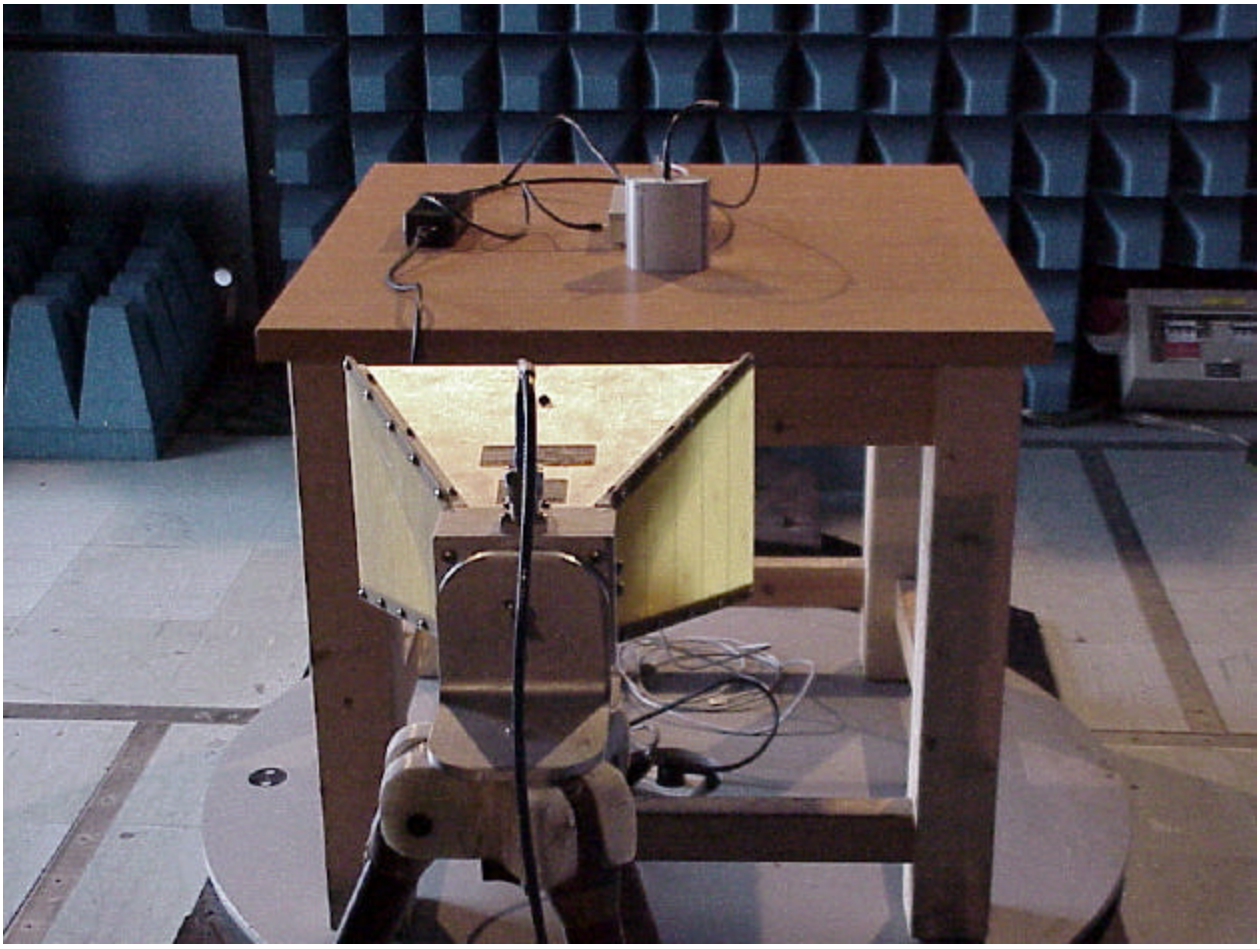


Photo #2. UNI-8.5 test configuration

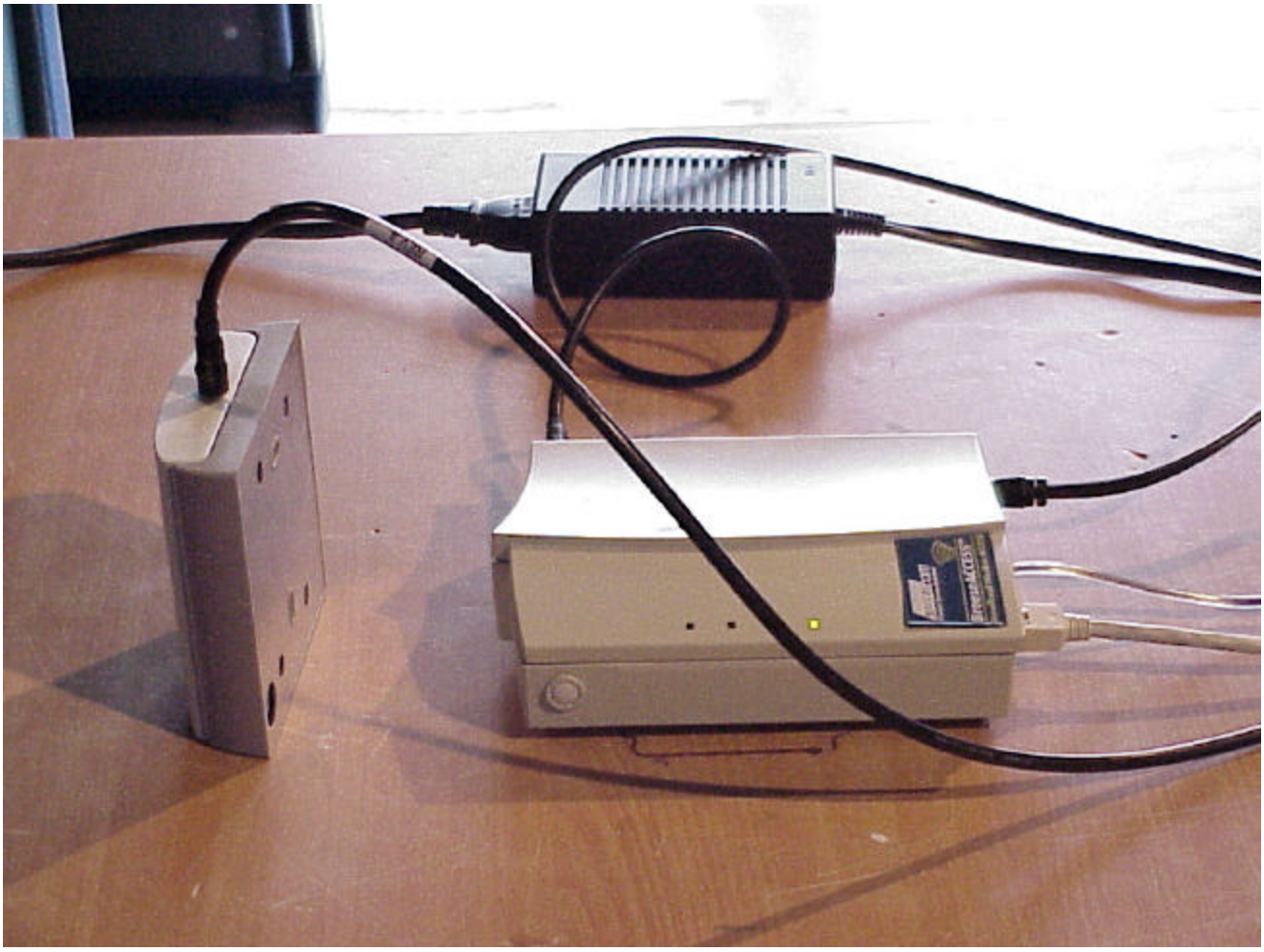


Photo #3 UNI-8.5 test configuration

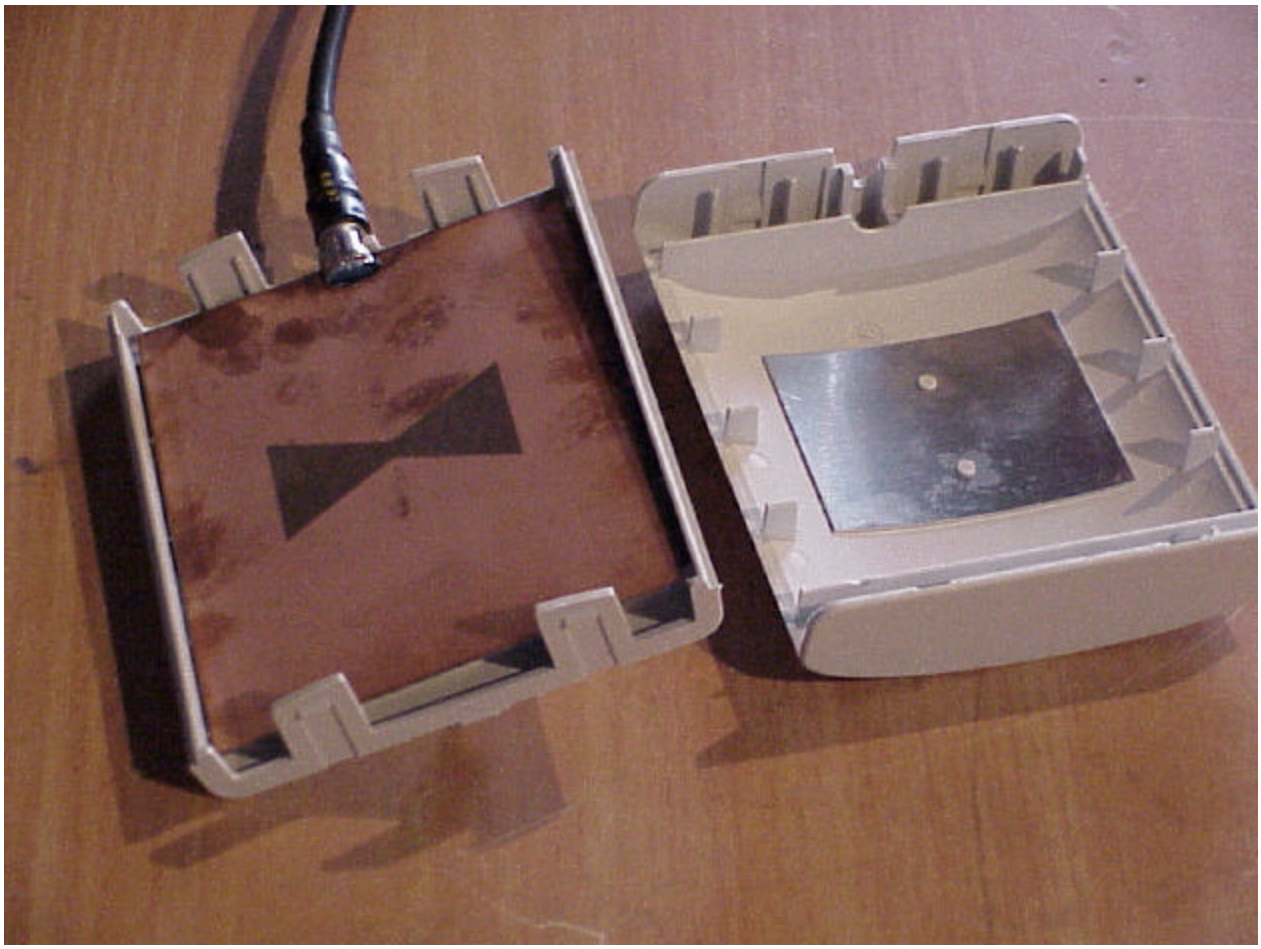


Photo #4 UNI-8.5 antenna

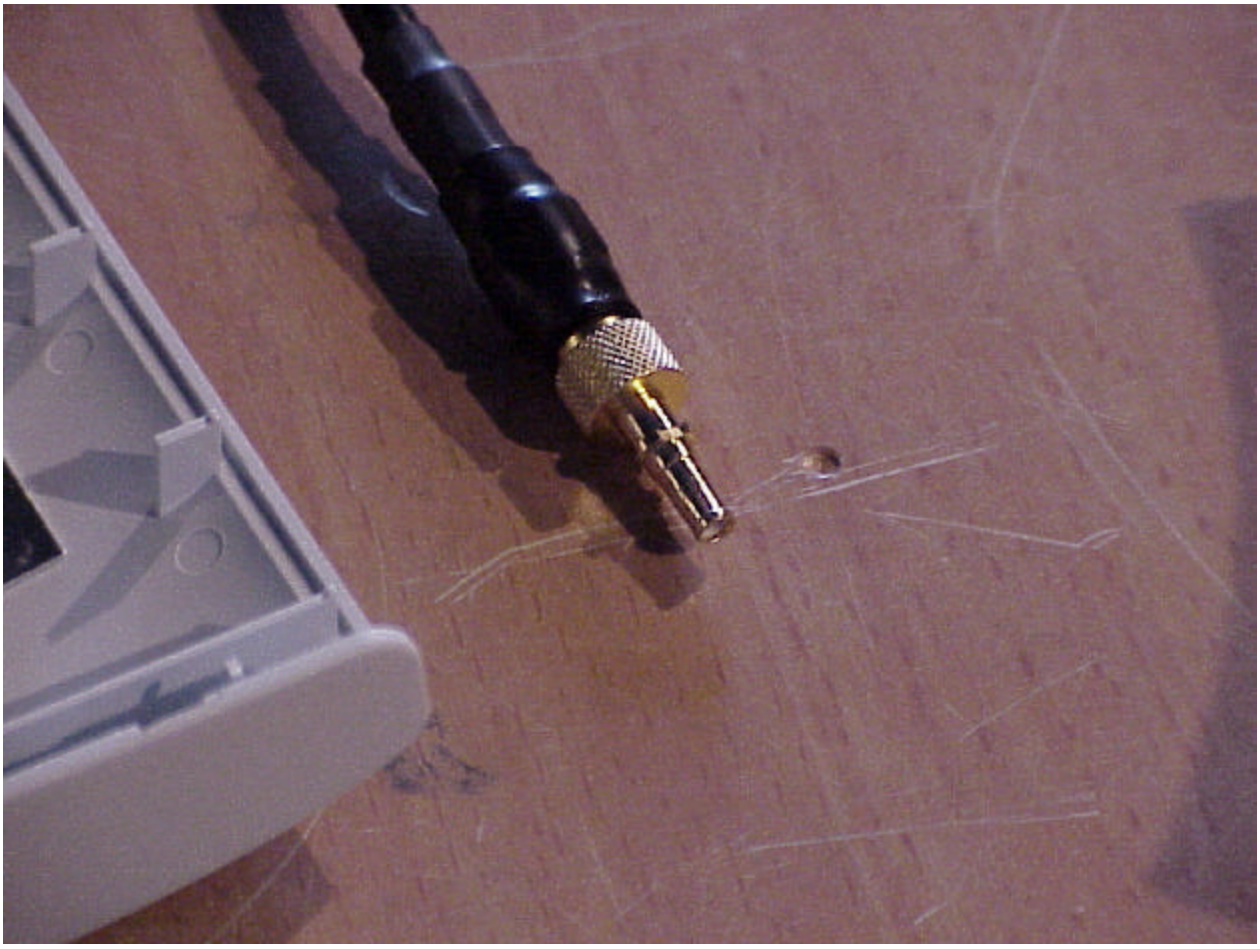


Photo #5 UNI-8.5 antenna

Photo #6 6dBi Omni antenna

Photo #7 UNI-7 connector

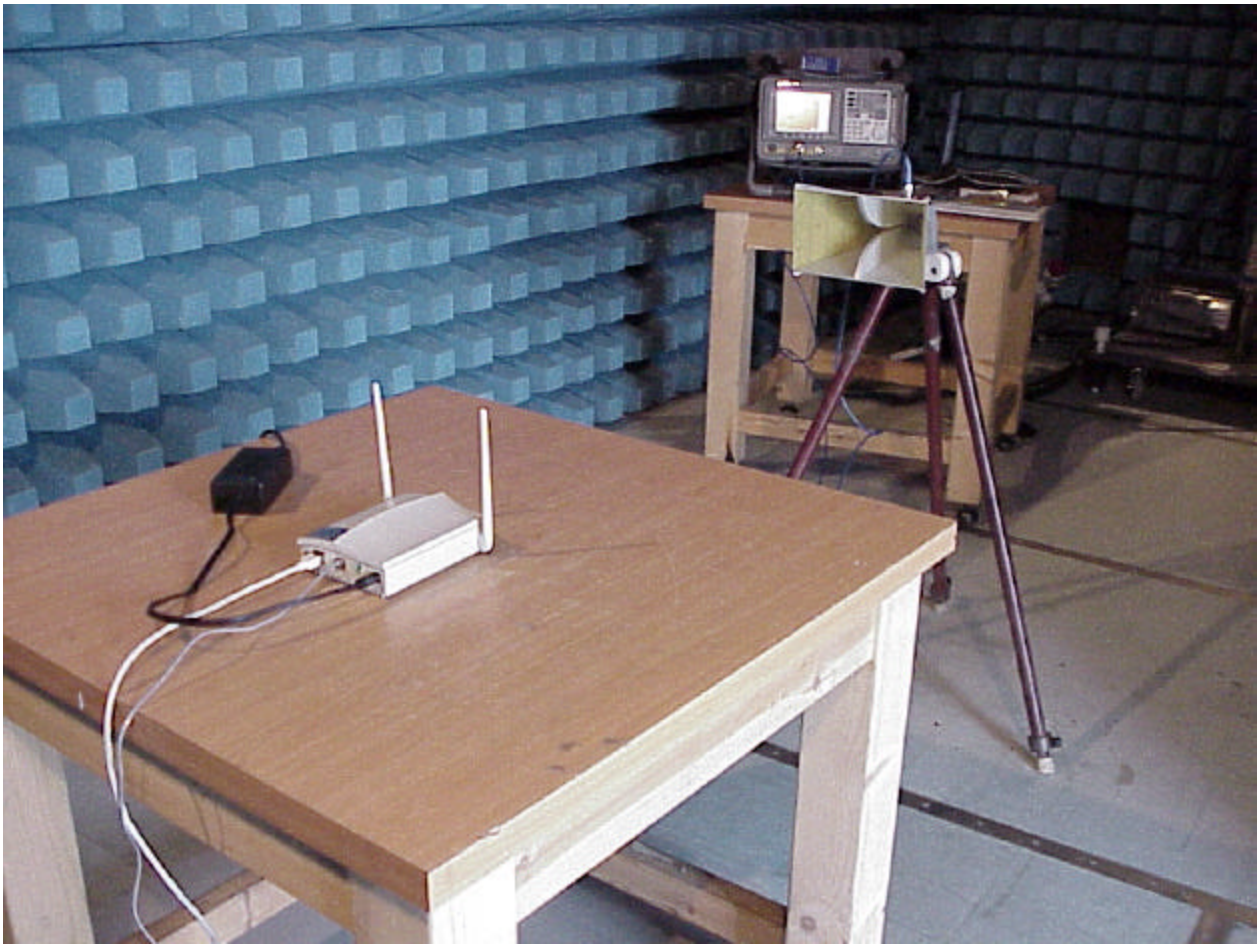


Photo #86dBi Omni antenna test configuration

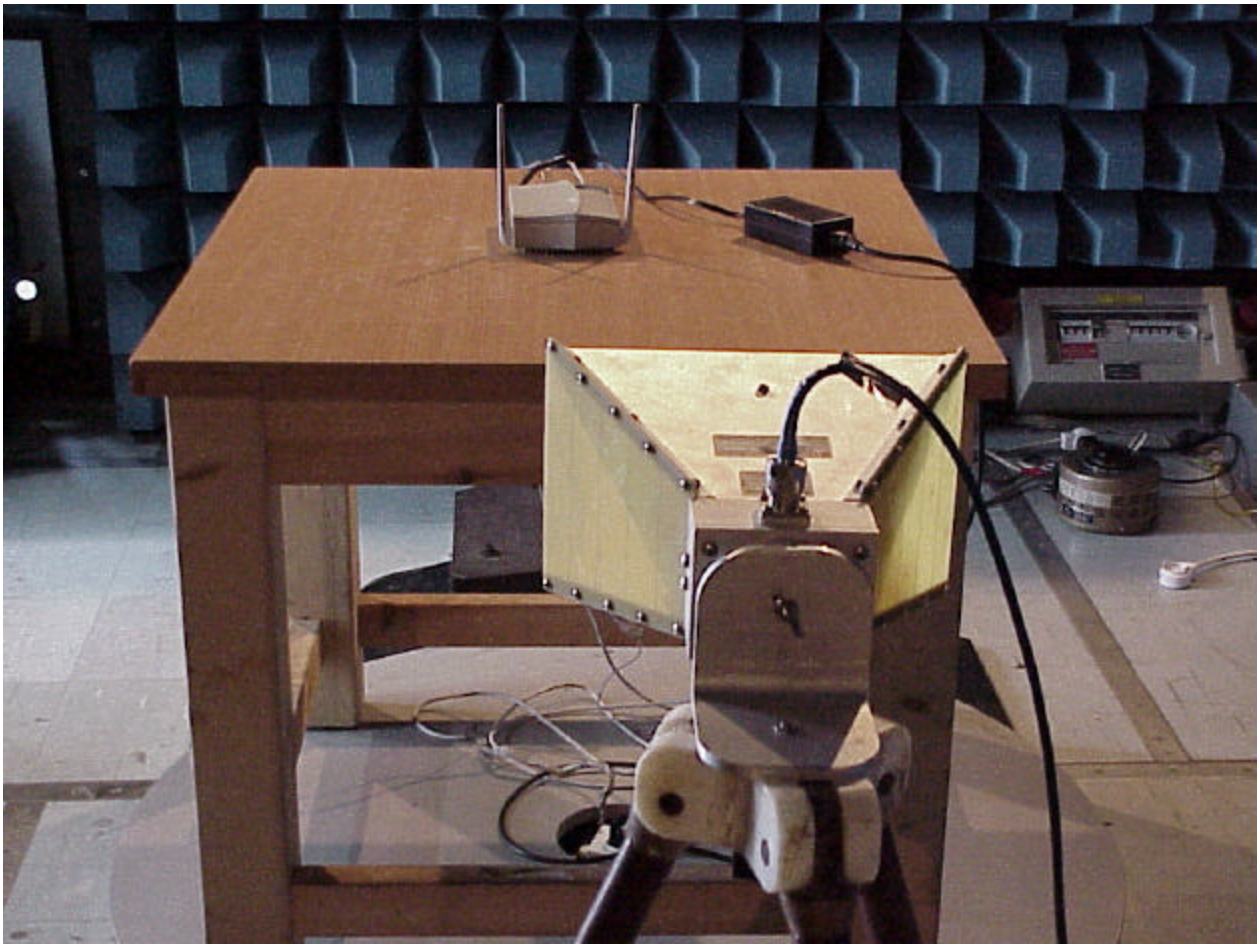


Photo #9 6dBi Omni antenna test configuration

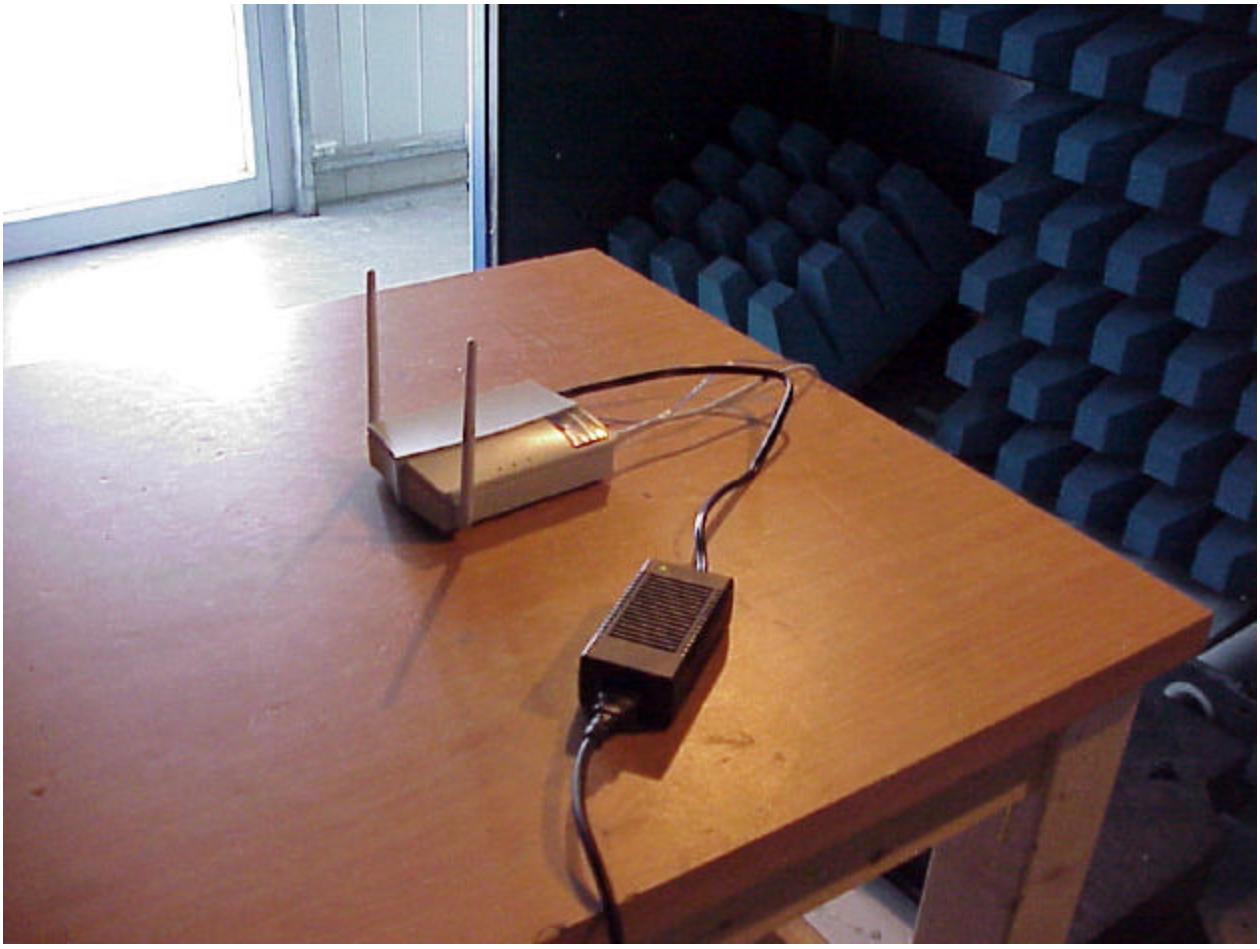


Photo #10 6dBi Omni antenna test configuration

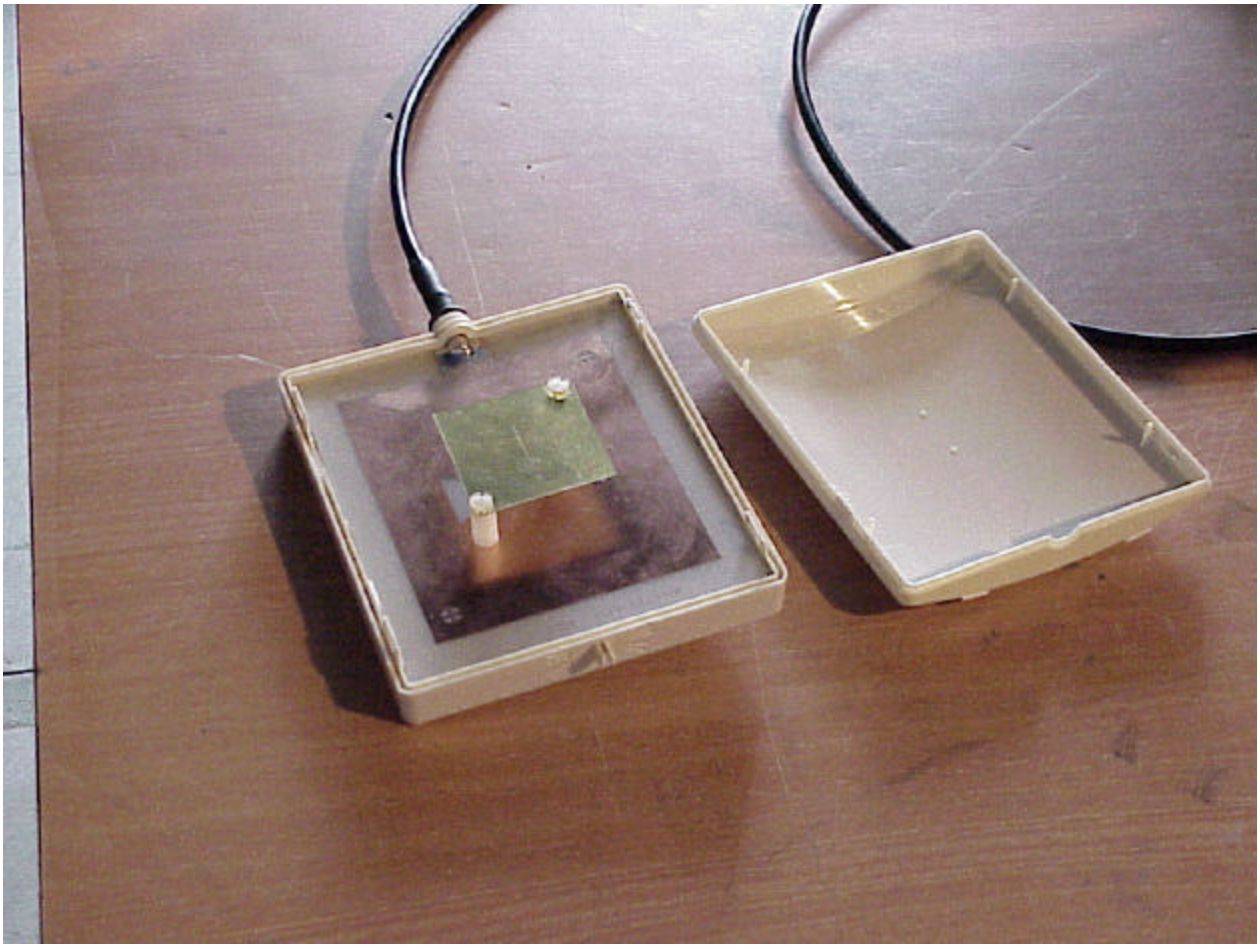


Photo #11 Uni-7 antenna