Test Report No.8112 319134 Rev.1

For Alvarion (formally Breezecom) Ltd.

Equipment Under Test:
One Box 2.4 GHz Radio with Antenna QD2415 UNI-16P and cable LMR-240

Model: SU-R-2.4

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

ACCREDITED

Certificate No.1487-01

Test Report No.: 8112319134 Rev.1 **Page 1 of 20 Pages**
Title: Test on One Box 2.4 GHz Radio with Antenna QD2415 UNI-16P and cable LMR-240 **Model: SU-R-2.4**

Order placed by:	Alvarion (formally Breezecom) Ltd.
Address:	P.O. Box 13139 Tel Aviv 61131 Israel
Sample for test selected by:	The orderer
The date of test:	13/11/2001.

Description of Equipment Under Test (EUT):	One Box 2.4 GHz Radio with Antenna QD2415 UNI-16P and cable LMR-240
Model:	SU-R-2.4
Manufactured by:	Alvarion (formally 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 20 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.

Table of Contents

1 EUT Description and operation

1.1 General description:

Description of Equipment Under Test (EUT): One Box 2.4 GHz Radio with Antenna QD2415 UNI-16P and cable LMR-240

Model: SU-R-2.4

Manufactured by: Alvarion (formally Breezecom) Ltd.

The EUT is a spread spectrum transmitter operating within the frequency band 2400 – 2483 MHz.
Antenna used: P/N QD2415 UNI-16P, mfr Andrew
Cable used: P/N LMR-240 3.75 dB total attenuation, length 25 feet.

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. Test requirements per FCC Part 15 Subpart C Sec.15.205, 15.35.

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
Measuring detector function and bandwidths:

Detector type	Peak
Resolution bandwidth	1MHz
Video bandwidth	1 MHz

Detector type	Average
Resolution bandwidth	1MHz
Video bandwidth	3 kHz*

The frequency range was investigated from 4804 MHz up to 24780 MHz. Results above 18GHz are not calibrated. No harmonics above 18GHz were detected.

3.3.2 Radiated emission test results:

The test results of spurious emissions are shown in table #1 to #3 .

The test results of emissions in restricted bands are shown in Plots #1 to #4.

Note : The measurements were performed at 1 m distance instead of 3 m, thus the specified limit line of 54 dBμV/m (for Average detector) and 74 dBμV/m (for Peak detector) were raised to 10 dB.

Table 1. Spurious emissions test results

Tested unit: SU-R-2.4
Frequency: Low operating frequency 2402 MHz

Frequency (MHz)	Emission Level (dBμV/m)		Limit @ 3m (dBμV/m)		Margin (dB)		Results
	Average	Peak	Average	Peak	Average	Peak	
4804	39.92	42.04	54	74	14.08	31.96	Complies
7206	47.55	49.73			6.45	24.27	Complies
9608	30.18	39.97			23.82	34.03	Complies
12010	37.61	43.56			16.39	30.44	Complies
14412	37.84	47.67			16.16	26.33	Complies
16814	36.12	47.19			17.88	26.81	Complies
19216	40.48	50.85			13.52	23.15	Informative
21618	42.31	52.56			11.69	21.44	Informative
24020	44.99	55.56			9.01	18.44	Informative

Note : Emission level = E Reading (dBμV) + measuring cable loss (dB) + measuring antenna factor (dB/m) + Distance correction factor
For measuring cable loss and measuring 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
Frequency: Middle operating frequency 2441 MHz

Frequency (MHz)	Emission Level (dBμV/m)		Limit @ 3m (dBμV/m)		Margin (dB)		Results
	Average	Peak	Average	Peak	Average	Peak	
4882	26.97	33.78	54	74	27.03	40.22	Complies
7323	36.69	42.71			17.31	31.29	Complies
9764	28.77	39.2			25.23	34.8	Complies
12205	30.59	40.82			23.41	33.18	Complies
14646	36.59	48.09			17.41	25.91	Complies
17087	37.28	47.37			16.72	26.63	Complies
19528	41.28	52.34			12.72	21.66	Informative
21969	42.90	54.50			11.1	19.50	Informative
24410	44.88	54.77			9.12	19.23	Informative

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

Table 3. Spurious emissions test results

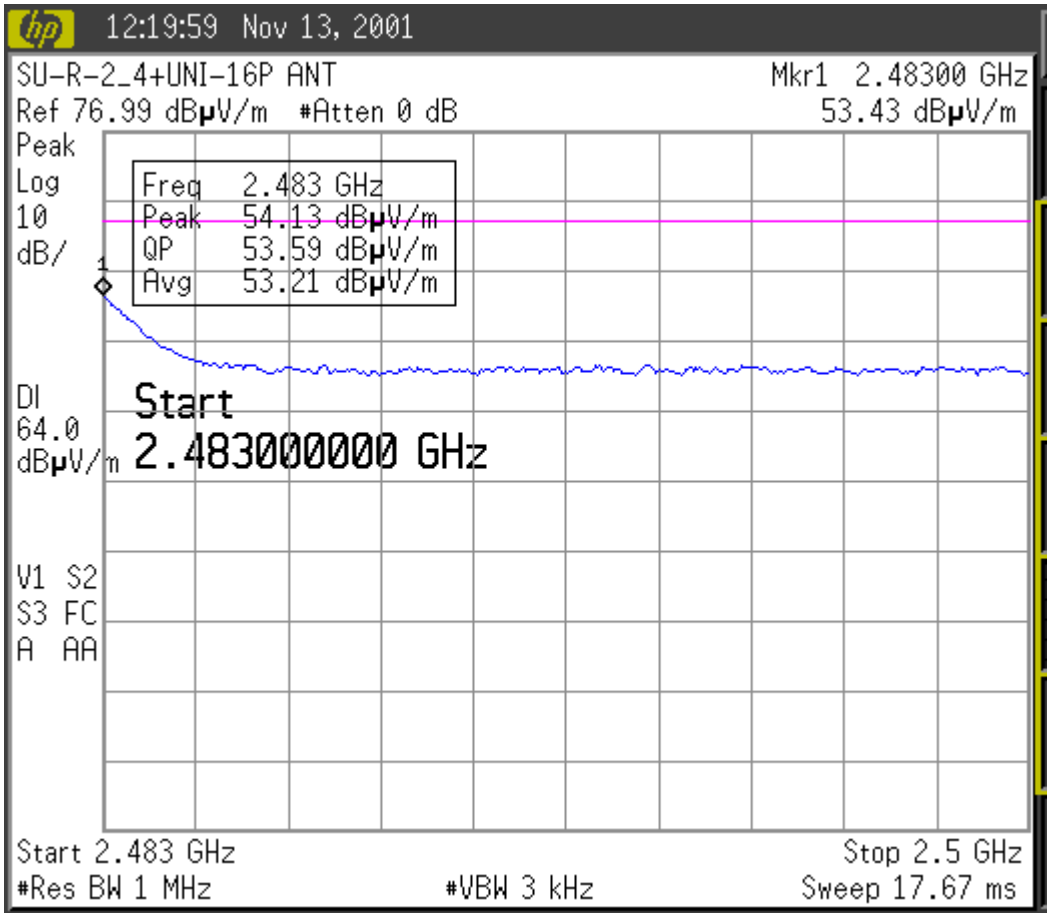
Tested unit: SU-R-2.4
Frequency: High operating frequency 2478 MHz

Frequency (MHz)	Emission Level (dBμV/m)		Limit @ 3m (dBμV/m)		Margin (dB)		Results
	Average	Peak	Average	Peak	Average	Peak	
4956	25.13	36.02	54	74	28.87	37.98	Complies
7434	31.73	42.63			22.27	31.37	Complies
9912	33.02	42.80			20.98	31.20	Complies
12390	35.13	45.94			18.87	28.06	Complies
14868	39.58	50.35			14.42	23.65	Complies
17346	42.14	54.36			11.86	19.64	Complies
19824	45.97	55.77			8.03	18.23	Informative
22302	46.41	56.46			7.59	17.54	Informative
24780	33.46	42.10			20.54	31.90	Informative

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

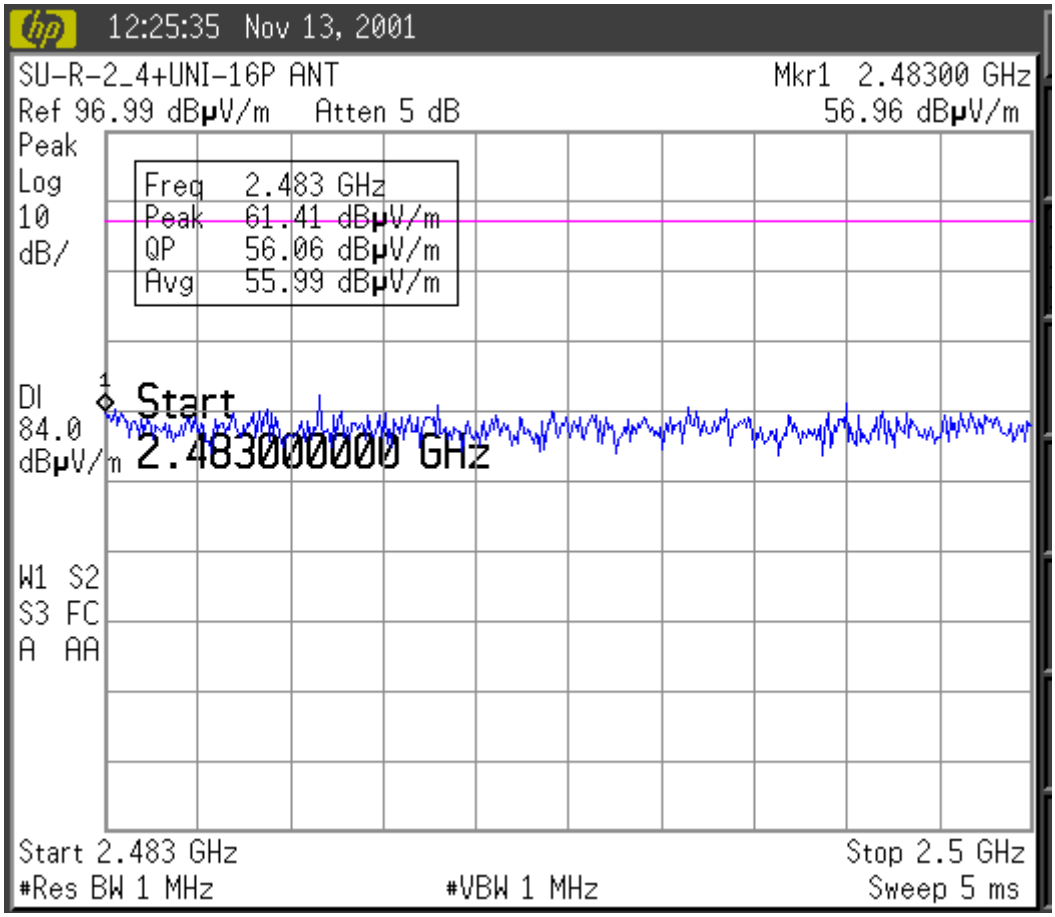
Plot #1
Radiated emissions measured in restricted band 2483.5 –2500 MHz
at High operating frequency 2478 MHz

Detector used: Average



Plot #2
Radiated emissions measured in restricted band 2483.5–2500 MHz at High operating frequency 2478 MHz

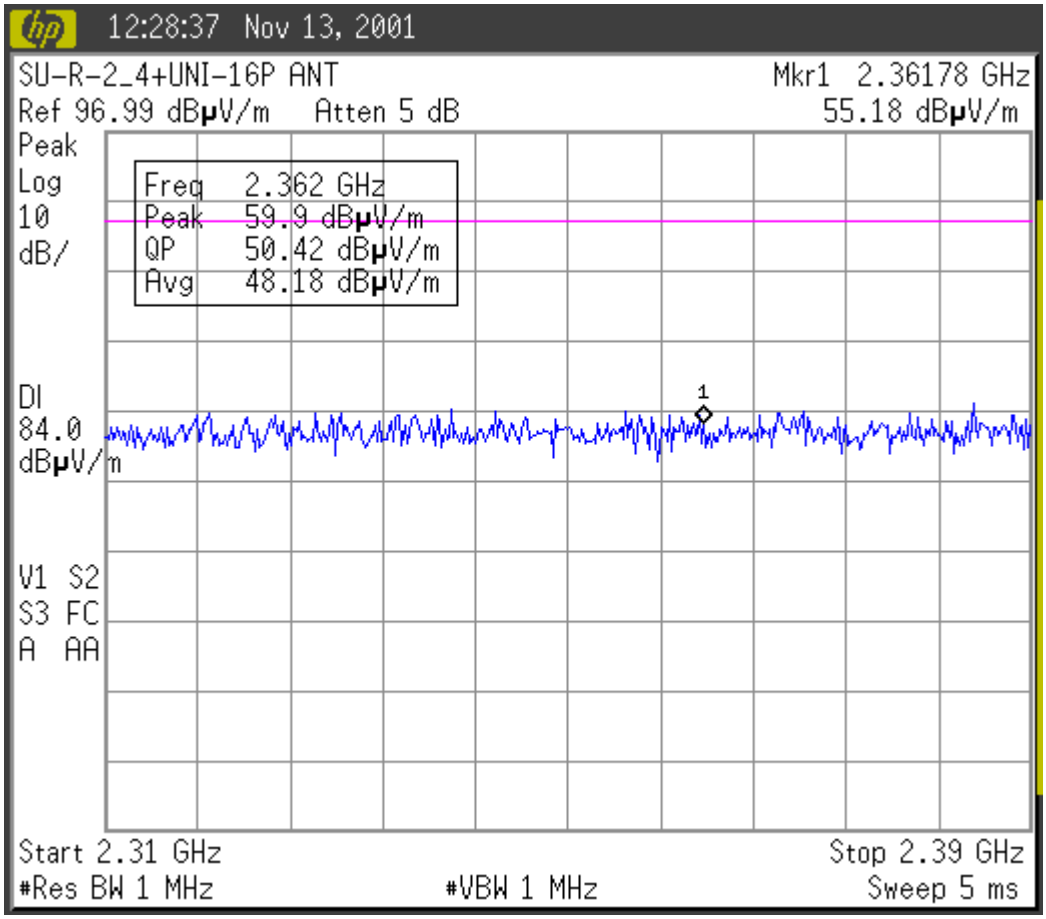
Detector used: Peak



Plot #3

Radiated emissions measured in restricted band 2310 –2390 MHz at Low operating frequency 2402 MHz

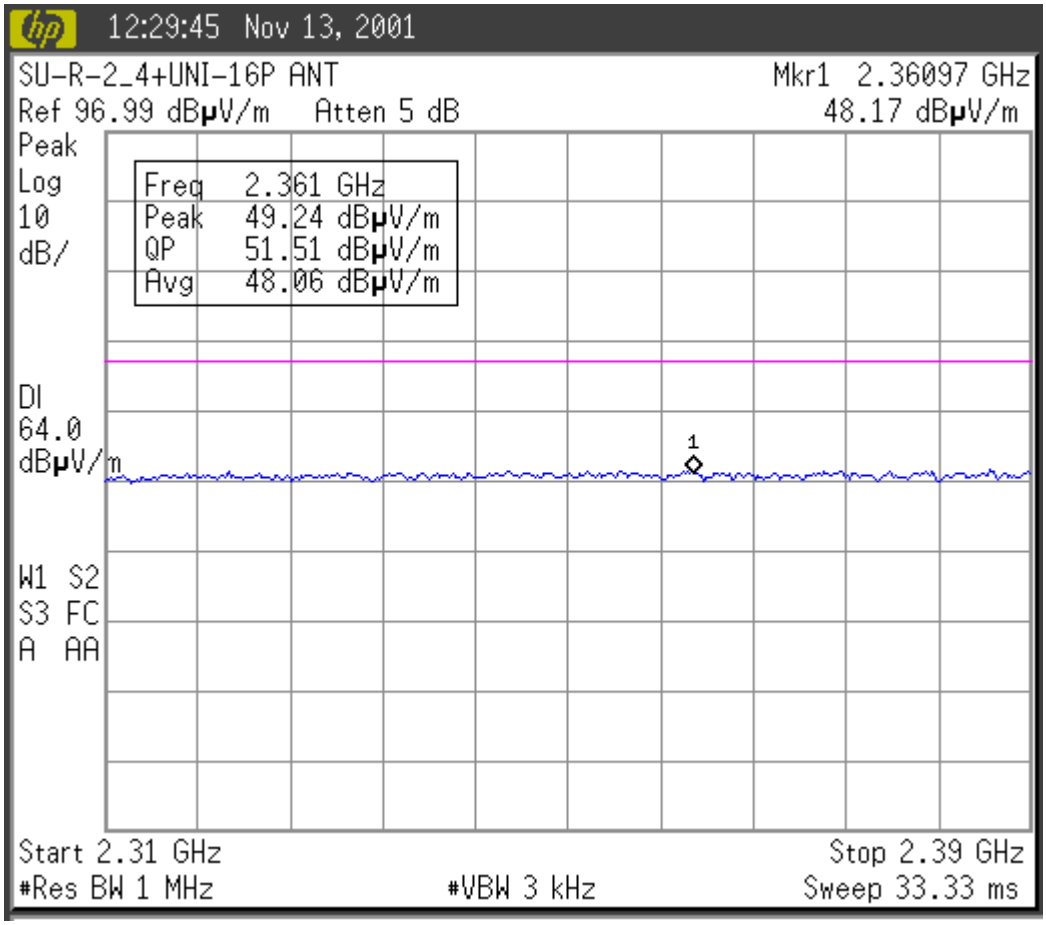
Detector used: Peak



Plot #4

Radiated emissions measured in restricted band 2310 –2390 MHz at Low operating frequency 2402 MHz

Detector used: Average



4 Compliance with specification

Test	Standard	Test result
Spurious radiated emission	FCC Part 15 Subpart C Sec.15.209	Complies
Radiated emissions in restricted bands	FCC Part 15 Subpart C Sec.15.205	Complies

Telematics Laboratory
23 January, 2002

Name: Eng. Yuri Rozenberg
Position: Head of EMC Branch

Name Maxim Reizin
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 analyzer 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.21327/4PE; 4 m length

Point	Frequency (GHz)	Cable Loss (dB)
0	0.0-1.8	1.67
1	1.8 – 3.6	2.39
2	3.6 – 5.4	3.04
3	5.4-7.2	3.58
4	7.2-9.0	4.06
5	9.0-10.8	4.49
6	10.8-12.6	4.91
7	12.6-14.4	5.31
8	14.4-16.2	5.66
9	16.2-18.00	6.01

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.
One Box 2.4 GHz Radio with Antenna QD2415 UNI-16P and cable LMR-240

Photo #2.

One Box 2.4 GHz Radio with Antenna QD2415 UNI-16P and cable LMR-240

Photo #3
One Box 2.4 GHz Radio with Antenna QD2415 UNI-16P and cable LMR-240

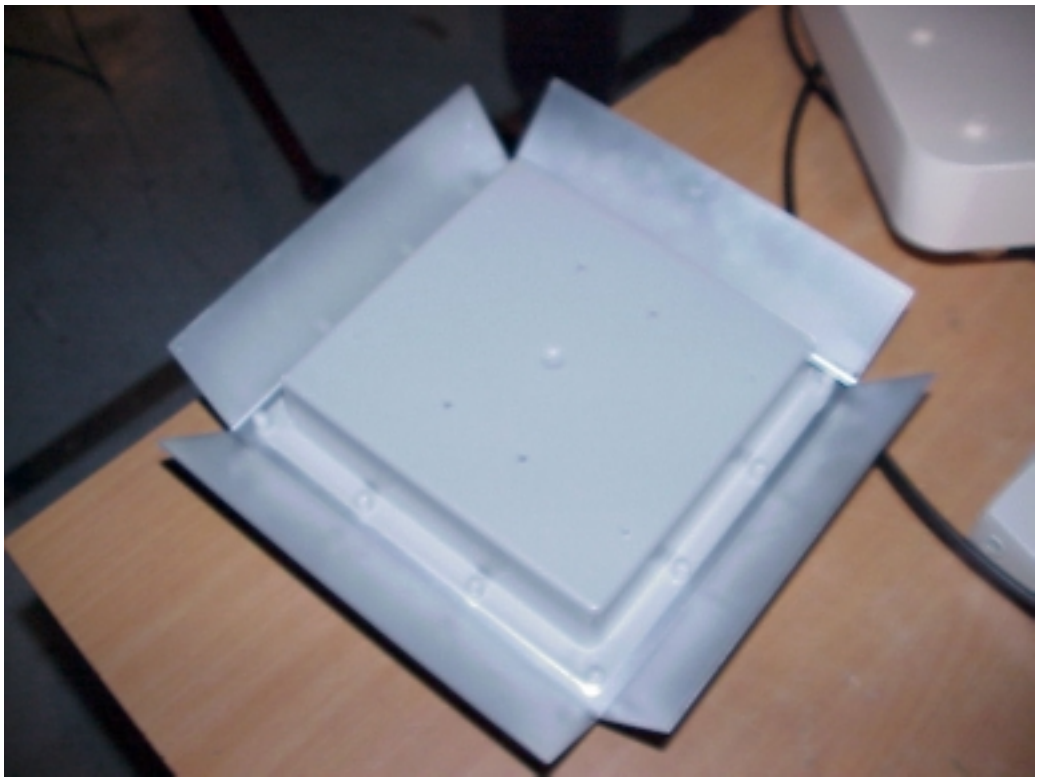


Photo #4
Antenna QD2415 UNI-16P

Photo #5
Antenna QD2415 UNI-16P