

Test Report No. 8312310817

For Alvarion Ltd.

Equipment Under Test:

***Point-to-point wireless bridge Outdoor Unit
with two various antennas***

Name: BreezeNET-B

Model: BU-B14/28/D & RB-B14/28/D

***From The Standards Institution
Of Israel***

Industry Division

Telematics Laboratory

EMC Section

**Test Report No.:** 8312310817**Page 1 of 19 Pages****Title:** Test on Point-to-point wireless bridge Outdoor Unit with two various antennas**Name:** BreezeNET-B **Model:** BU-B14/28/D & RB-B14/28/D

Order placed by:	Alvarion Ltd.
Address:	21A Habarzel str, Tel-Aviv, 69710, Israel
Sample for test selected by:	The orderer
The date of test:	15/07/2003

Description of Equipment Under Test (EUT):	Point-to-point wireless bridge Outdoor Unit with two various antennas
Name:	BreezeNET-B
Model:	BU-B14/28/D & RB-B14/28/D
Manufactured by:	Alvarion Ltd.

Reference Documents:

- ❖ CFR 47 FCC: Rules and Regulations; Part 15. "Radio frequency devices"; Subpart C: "Intentional radiators" (2002)

Test Results:

- ❖ The EUT meets the following requirements of CFR 47 FCC Part 15 Subpart C:
 - Spurious radiated emission Sec.15.209
 - Radiated emissions in restricted bands 15.205.

This Test Report contains 19 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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Title: Test on Point-to-point wireless bridge Outdoor Unit with two various antennas

Name: BreezeNET-B **Model:** BU-B14/28/D & RB-B14/28/D

1 Scope

This test report contains results of spurious emissions and emission in restricted bands, performed on BreezeNET-B Outdoor Unit, with two various Uni-Directional antennas, according to the relevant requirements of CFR 47 FCC Part 15 Subpart C.

2 EUT description

2.1 *t configuration:*

EUT #1: Point-to-point wireless bridge ODU with
Uni-Directional antenna UNI-28-4 P/N 858109 Type: Planar Array

EUT #2: Point-to-point wireless bridge ODU with
Uni-Directional antenna UNI-28-5.8 P/N 872811 Type: Parabolic.

3 Test specification, Methods and Procedures

- ❖ CFR 47 FCC: Rules and Regulations; Part 15. "Radio frequency devices"; Subpart C: "Intentional radiators" (2002)
- ❖ 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".

4 Measurements, examinations and derived results

4.1 *Location of the Test Site:*

The tests were conducted in the EMC laboratory of the Standards Institution of Israel in Tel-Aviv .

4.2 *Test condition:*

Temperature: 22 °C, Humidity: 55 %

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4.3 Radiated emission test - spurious:

4.3.1 Requirements:

The radiated emission shall not exceed value required in section 15.209 Subpart C.

4.3.2 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.

Measuring antennas used: 1 to 18 GHz - Double Ridge **EMCO** model 3115
above 18 GHz - Alpha TRG model A361

Antenna height = 1 m.

Polarization: Vertical/Horizontal

Measurement distance = 1m.

The frequency range was investigated up to 40 GHz.

The measurements were performed in vertical and horizontal polarization, the maximum reading recorded.

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

4.3.3 Test results and calculation ratio:

ODU with Antenna UNI-28-4: The test results are shown in table #1.

ODU with Antenna UNI-28-5.8: The test results are shown in table #2.

The emission level in tables 1, 2 was calculated as:

$E \text{ (dB}\mu\text{V/m)} = SA \text{ (dB}\mu\text{V)} + CL \text{ (dB)} + AF \text{ (dB/m)} - DCF$

Were

SA – spectrum analyzer reading (dB μ V)

CL cable loss (dB)

AF measuring antenna factor (dB/m), refer to Appendix 2

DCF distance correction factor = 9.5 dB , used for extrapolation of results taken at 1m measuring distance to 3m specified distance.

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Title: Test on Point-to-point wireless bridge Outdoor Unit with two various antennas

Name: BreezeNET-B Model: BU-B14/28/D & RB-B14/28/D

Table 1. Spurious emissions test results
EUT: ODU with Antenna UNI-28-4 P/N 858109

Frequency (GHz)	Emission Level (dBμV/m)		Limit @ 3m (dBμV/m)		Margin (dB)		Results
	Average	Peak	Average	Peak	Average	Peak	
LOW 5.740 GHz							
11.48	42.6	62.4	54	74	11.4	11.6	Complies
17.22	50.5	69.8			3.5	4.2	Complies
22.96	44.4	63.8			9.6	10.2	Complies
28.66	45.8	65.5			8.2	8.5	Complies
34.44	45.8	65.3			8.2	8.7	Complies
MIDDLE 5.784 GHz							
11.56	36.5	62.2	54	74	17.5	11.8	Complies
17.34	43.3	70.7			10.7	3.3	Complies
23.13	38.2	64.8			15.8	9.2	Complies
28.92	39.4	66.6			14.6	7.4	Complies
34.75	46.7	66.2			7.3	7.8	Complies
HIGH 5.835 GHz							
11.67	41.6	62.8	54	74	12.4	11.2	Complies
17.50	49.9	71.3			4.1	2.7	Complies
23.34	44.0	64.5			10.0	9.5	Complies
29.18	44.5	65.1			9.5	8.9	Complies
34.01	46.2	66.2			7.8	7.8	Complies



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Title: Test on Point-to-point wireless bridge Outdoor Unit with two various antennas**Name:** BreezeNET-B **Model:** BU-B14/28/D & RB-B14/28/D

Table 2. Spurious emissions test results
EUT: ODU with Antenna UNI-28-5.8 P/N 872811

Frequency (GHz)	Emission Level (dBμV/m)		Limit @ 3m (dBμV/m)		Margin (dB)		Results
	Average	Peak	Average	Peak	Average	Peak	
LOW 5.740 GHz							
11.48	42.5	62.1	54	74	11.5	11.9	Complies
17.22	49.4	69.5			4.6	4.5	Complies
22.96	43.5	63.4			10.5	10.6	Complies
28.70	45.9	65.6			8.1	8.4	Complies
34.40	45.7	65.9			8.3	8.1	Complies
MIDDLE 5.784 GHz							
11.57	41.7	62.2	54	74	12.3	11.8	Complies
17.35	48.4	69.4			5.6	4.6	Complies
23.14	43.0	64.9			11.0	9.1	Complies
28.92	45.1	65.5			8.9	8.5	Complies
34.71	45.4	66.0			8.6	8.0	Complies
HIGH 5.835 GHz							
11.67	41.5	62.7	54	74	12.5	11.3	Complies
17.51	49.7	71.4			4.3	2.6	Complies
23.34	43.5	64.0			10.5	10.0	Complies
29.18	44.7	65.7			9.3	8.3	Complies
34.98	46.5	66.3			7.5	7.7	Complies

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4.4 Radiated emission test - restricted bands:

4.4.1 Requirements:

Radiated emission in restricted bands should meet the requirements sec. 15.205 Sub. C.

4.4.2 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.

Measuring antennas used: Up to 18 GHz - Double Ridge **EMCO** model 3115
above 18 GHz - Alpha TRG model A361

Antenna height = 1 m, distance = 1m. 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 measurements were performed with both AVG and Peak detector.

The spurious were found in following restricted bands:

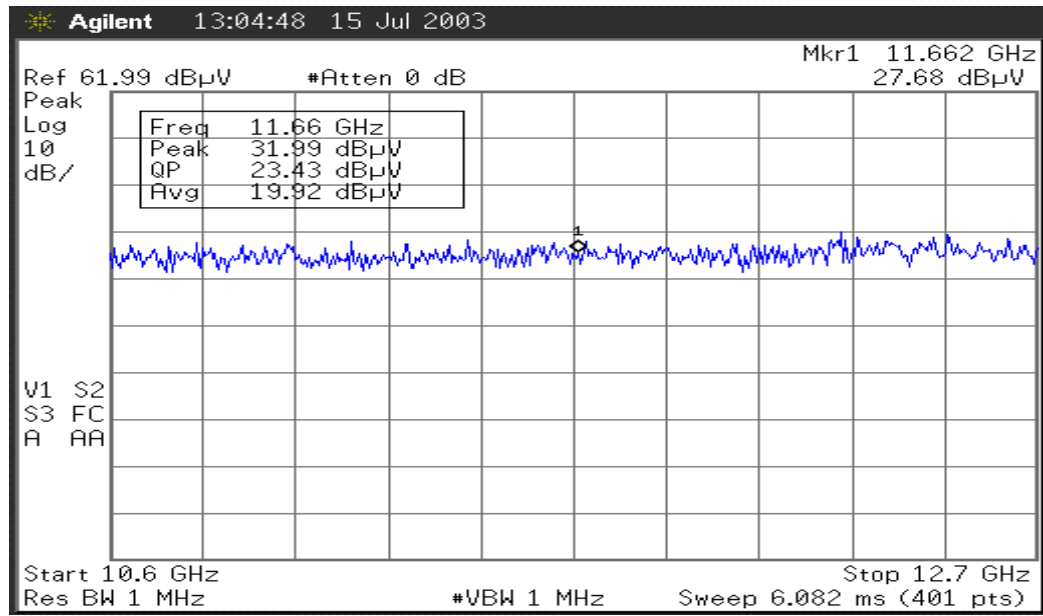
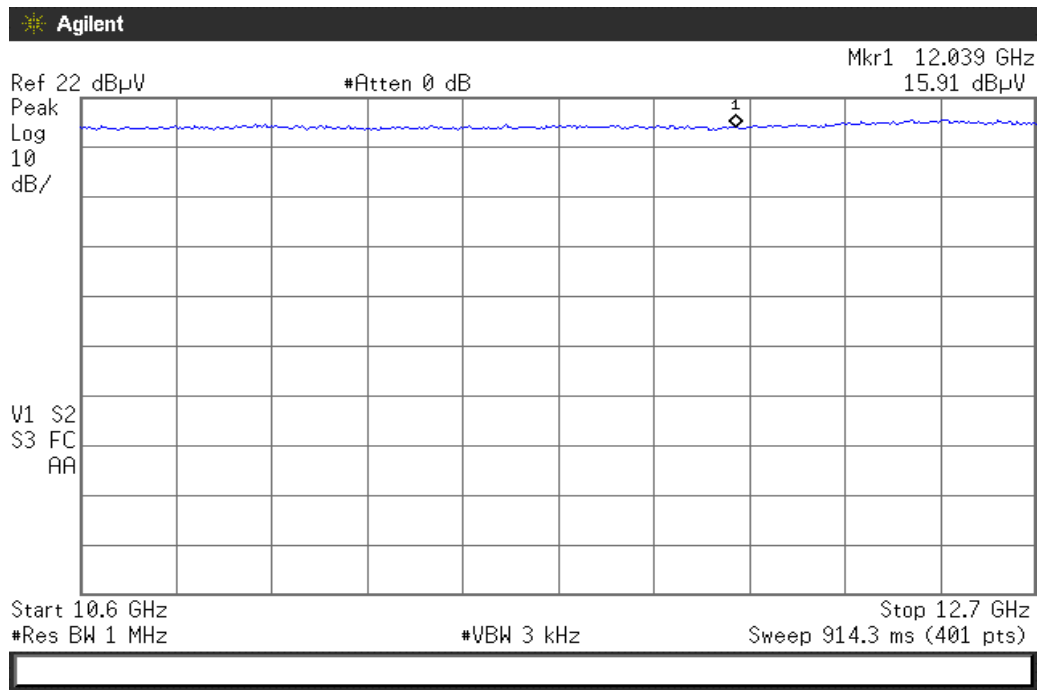
1. 10.6-12.7 GHz (2-nd harmonic of the low, mid and high frequencies).
The measurements were performed with two antennas, the worst results are demonstrated in the plots.
2. 22.01-23.12 GHz (4-th harmonic of the low frequency). The measurements were performed with two antennas, the worst results are demonstrated in the plots.

4.4.3 Test results :

Band (10.6-12.7 GHz): The test results are shown in plots ## 1-6, the results do not contain Antenna factor.

The maximum measured peak emission (29.6 dB μ V) and maximum average emission (17.2 dB μ V) being added with antenna factor (39 dB/m) are below Peak limit (84 dB μ V/m) and below Average limit (64 dB μ V/m) at 1 m distance.

Band (22.01-23.12 GHz): The test results are shown in plots ## 7-8, the results do not contain Antenna factor. The measured peak emission (33.6 dB μ V) and average emission (19.9 dB μ V) being added with antenna factor (35 dB/m) are below Peak limit (84 dB μ V/m) and below Average limit (64 dB μ V/m) at 1 m distance.

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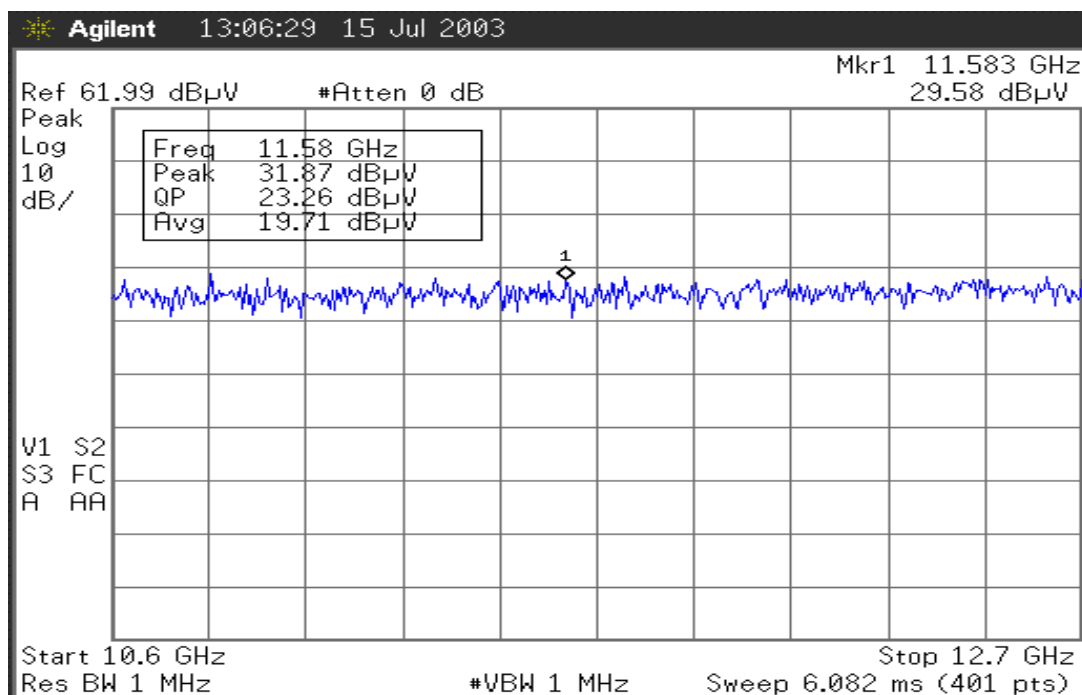


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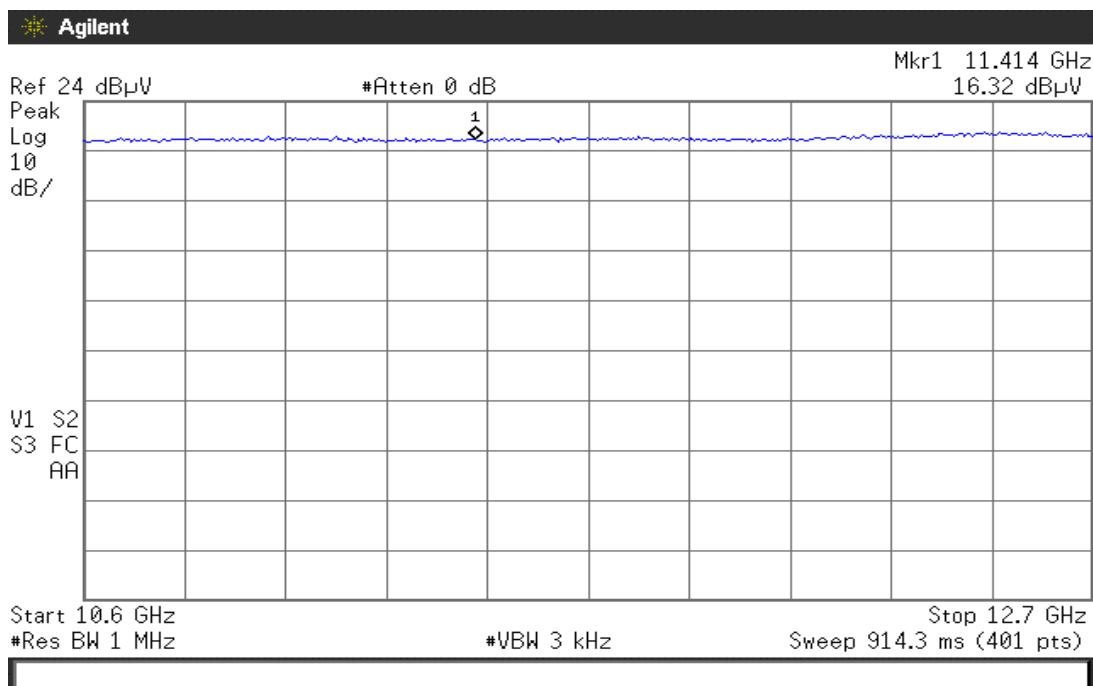
Title: Test on Point-to-point wireless bridge Outdoor Unit with two various antennas

Name: BreezeNET-B Model: BU-B14/28/D & RB-B14/28/D



Plot #3

Radiated emission in restricted band 10.6-12.7 GHz/PEAK detector/MID freq.



Plot #4

Radiated emission in restricted band 10.6-12.7 GHz/AVERAGE detector/MID freq.

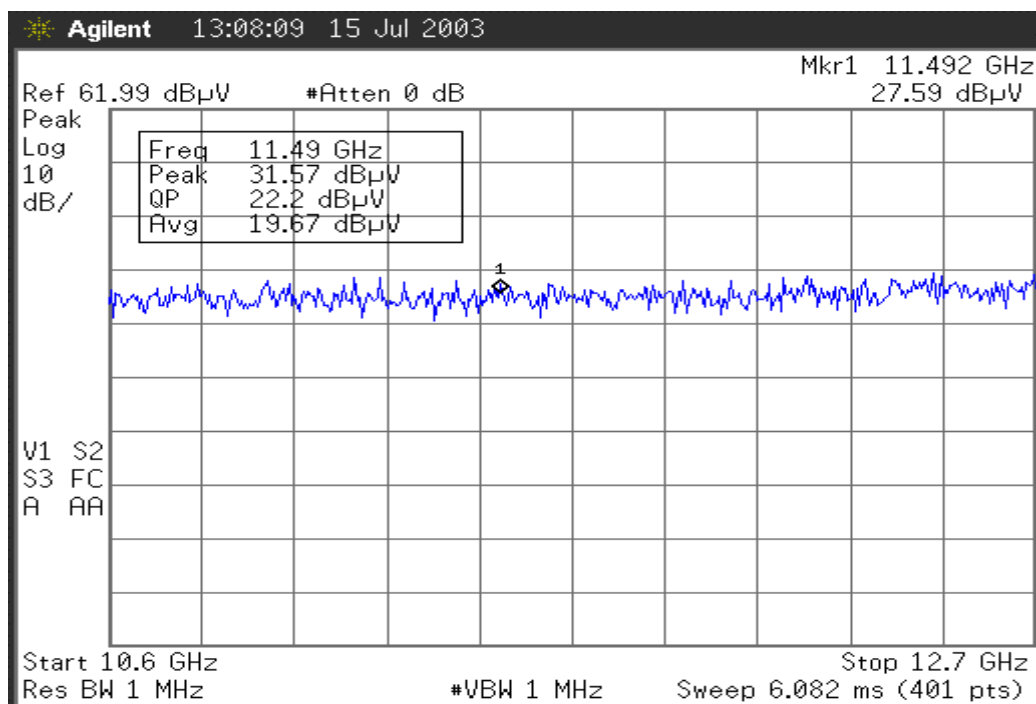


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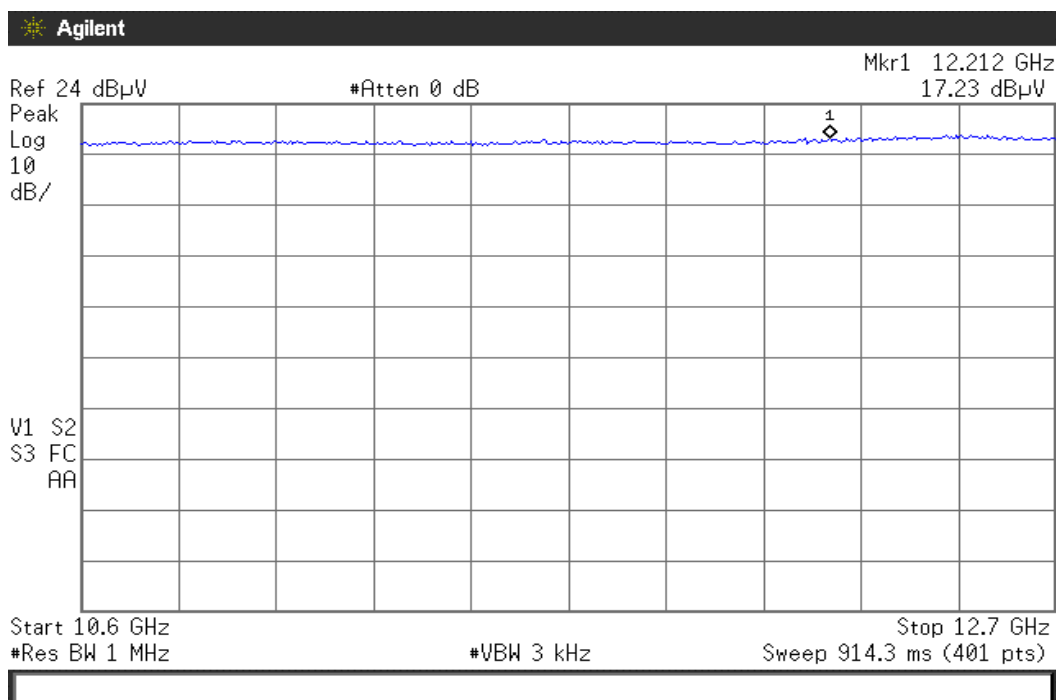
Title: Test on Point-to-point wireless bridge Outdoor Unit with two various antennas

Name: BreezeNET-B Model: BU-B14/28/D & RB-B14/28/D



Plot #5

Radiated emission in restricted band 10.6-12.7 GHz/PEAK detector/HIGH freq.



Plot #6

Radiated emission in restricted band 10.6-12.7 GHz/AVERAGE detector/HIGH freq.

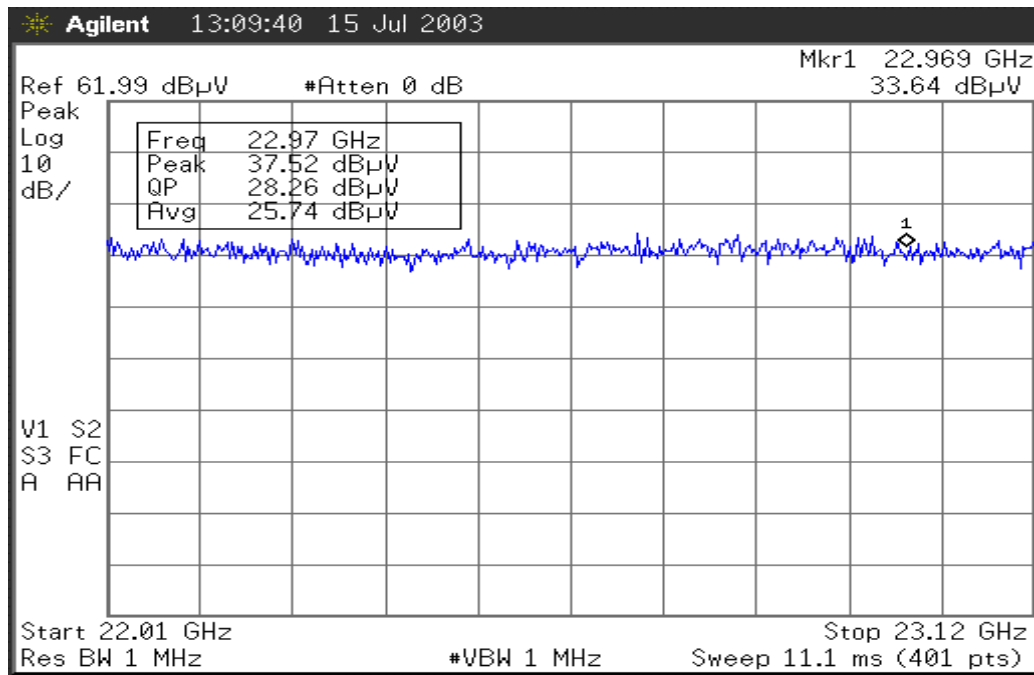


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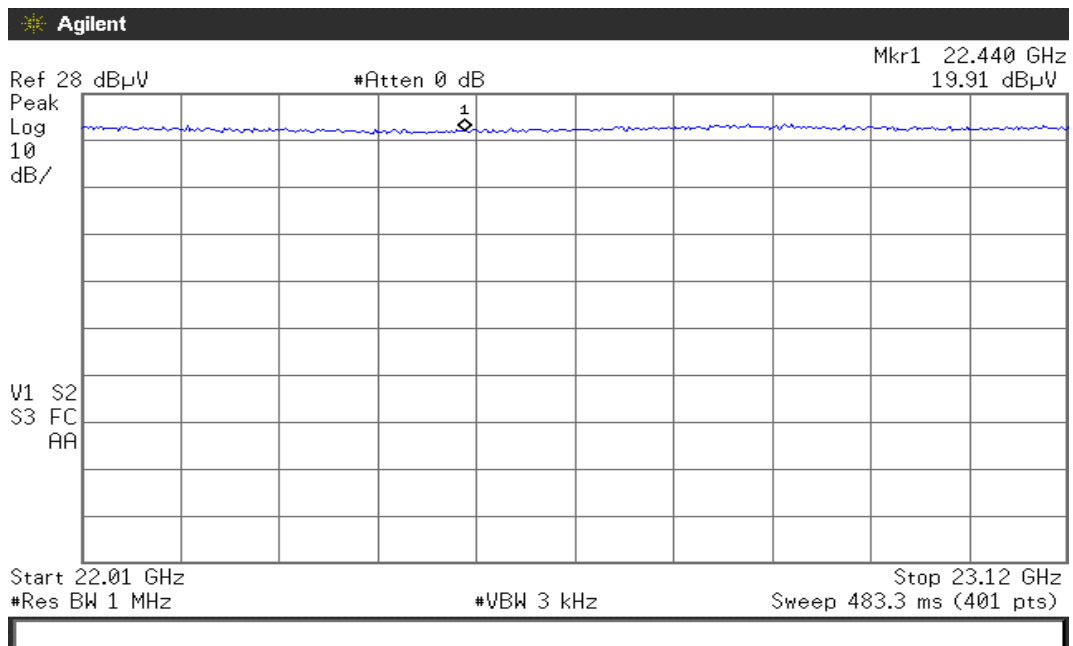
Title: Test on Point-to-point wireless bridge Outdoor Unit with two various antennas

Name: BreezeNET-B Model: BU-B14/28/D & RB-B14/28/D



Plot #7

Radiated emission in restricted band 22.01-23.12 GHz/PEAK detector



Plot #8

Radiated emission in restricted band 22.01-23.12 GHz/AVG detector

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Title: Test on Point-to-point wireless bridge Outdoor Unit with two various antennas

Name: BreezeNET-B **Model:** BU-B14/28/D & RB-B14/28/D

5 Compliance with specification

Test	FCC Part 15	Test result
<u>BreezeNET B ODU with Antenna UNI-28-4 P/N 858109</u>		
Spurious radiated emission	Sec.15.209	Complies
Radiated emissions in restricted bands	Sec.15.205	Complies
<u>BreezeNET B ODU with Antenna UNI-28-5.8 P/N 872811</u>		
Spurious radiated emission	Sec.15.209	Complies
Radiated emissions in restricted bands	Sec.15.205	Complies



Approved by: Yuri Rozenberg
Position: Head of EMC Branch

Telematics Laboratory
July 27, 2003



Tested by: Albert Herzenshtein
Position: Testing Engineer



Written by: Galit Grodetsky
Position: Standard Engineer

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6 Appendix 1: Test equipment used

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

Instrument	MFR	Model	Serial No.	Last calibration date	Next calibration date
Spectrum analyzer 10 KHz-26.5 GHz	HP	E7405a	SII 4944	04/03	04/04
Spectrum analyzer 9 KHz-50 GHz	HP	8565E	3517A00347	07/02	07/03
Antenna Double Ridge 1-18 GHz	EMCO	3115	5802	10/02	10/03
Antenna Standard Gain Horn 18-40 GHz	WILTRON	Alpha TRG A361	861A/590	01/03	01/04
Coax cable	Huber & Suhm	Sucoflex 104P	21327/4PE	12/02	12/04

7 Appendix 2: Antenna Factors

Antenna Factor
Standard Gain Horn 26 – 40 GHz Alpha TRG Model A361

Point	Frequency (MHz)	Antenna Factor (dB/m)
1	26000	35.22
2	27000	35.40
3	28000	35.52
4	29000	35.64
5	30000	35.76
6	31000	35.90
7	32000	36.07
8	33000	36.16
9	34000	36.31
10	35000	36.46
11	36000	36.60
12	37000	36.74
13	38000	36.93
14	39000	37.21
15	40000	37.28

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Gain and Antenna Factors for Double Ridged Guide Antenna
Manufactured by EMC Test Systems
Model Number: 3115 Serial Number: 5802
1.0 Meter Calibration Polarization: Horizontal

Frequency (MHz)	Antenna Factor (dB/m)	Gain Numeric	Gain dBi
1000	24.3	3.86	5.9
1500	25.6	6.48	8.1
2000	27.9	6.83	8.3
2500	28.9	8.43	9.3
3000	30.7	7.97	9.0
3500	32.0	8.06	9.1
4000	33.0	8.38	9.2
4500	32.9	10.91	10.4
5000	34.1	10.16	10.1
5500	34.8	10.51	10.2
6000	35.2	11.38	10.6
6500	35.4	12.79	11.1
7000	36.4	11.83	10.7
7500	37.3	10.90	10.4
8000	37.5	12.05	10.8
8500	37.9	12.36	10.9
9000	38.2	12.86	11.1
9500	38.3	14.04	11.5
10000	38.7	14.25	11.5
10500	38.5	16.26	12.1
11000	38.8	16.87	12.3
11500	39.5	15.41	11.9
12000	39.3	17.96	12.5
12500	39.1	20.03	13.0
13000	40.2	16.83	12.3
13500	41.2	14.53	11.6
14000	41.9	13.20	11.2
14500	41.3	16.27	12.1
15000	39.6	26.07	14.2
15500	38.1	39.49	16.0
16000	38.4	39.12	15.9
16500	39.8	29.81	14.7
17000	41.6	20.97	13.2
17500	44.8	10.55	10.2
18000	46.5	7.57	8.8

Specification compliance testing factor (1.0 meter spacing) to be added to receiver meter reading in dBV to convert to field intensity in dBV/meter. Calibrated 07 Oct 02 (DD/MM/YYYY). Calibration per ARP 958.

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Gain and Antenna Factors for Double Ridged Guide Antenna
Manufactured by EMC Test Systems
Model Number: 3115 Serial Number: 5802
1.0 Meter Calibration Polarization: Vertical

Frequency (MHz)	Antenna Factor (dB/m)	Gain Numeric	Gain dBi
1000	24.1	4.11	6.1
1500	25.6	6.48	8.1
2000	27.9	6.83	8.3
2500	28.9	8.47	9.3
3000	30.6	8.18	9.1
3500	31.9	8.24	9.2
4000	33.0	8.45	9.3
4500	32.8	11.14	10.5
5000	34.0	10.34	10.1
5500	34.8	10.40	10.2
6000	35.1	11.67	10.7
6500	35.4	12.86	11.1
7000	36.3	11.92	10.8
7500	37.3	10.95	10.4
8000	37.4	12.15	10.8
8500	37.8	12.58	11.0
9000	38.2	13.01	11.1
9500	38.2	14.21	11.5
10000	38.5	14.79	11.7
10500	38.6	16.05	12.1
11000	38.8	16.93	12.3
11500	39.3	16.19	12.1
12000	39.1	18.46	12.7
12500	39.1	20.28	13.1
13000	40.1	17.19	12.4
13500	41.1	14.85	11.7
14000	41.8	13.55	11.3
14500	41.3	16.25	12.1
15000	39.6	25.78	14.1
15500	38.0	39.54	16.0
16000	38.3	39.73	16.0
16500	39.6	31.52	15.0
17000	41.3	22.72	13.6
17500	44.5	11.49	10.6
18000	46.5	7.69	8.9

Specification compliance testing factor (1.0 meter spacing) to be added to receiver meter reading in dBV to convert to field intensity in dBV/meter. Calibrated 07 Oct 02 (DD/MM/YYYY). Calibration per ARP 958.

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Name: BreezeNET-B **Model:** BU-B14/28/D & RB-B14/28/D

8 Appendix 3: Test configuration illustration



Photo #1

BreezeNET B outdoor unit with Antenna UNI-28-4 P/N 858109. Test setup

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Name: BreezeNET-B **Model:** BU-B14/28/D & RB-B14/28/D



Photo #2

BreezeNET B outdoor unit with Antenna UNI-28-4 P/N 858109. Test setup

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Title: Test on Point-to-point wireless bridge Outdoor Unit with two various antennas

Name: BreezeNET-B **Model:** BU-B14/28/D & RB-B14/28/D



Photo #3

BreezeNET B outdoor unit with Antenna UNI-28-5.8 P/N 872811. Test setup

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Name: BreezeNET-B **Model:** BU-B14/28/D & RB-B14/28/D



Photo #4

BreezeNET B outdoor unit with Antenna UNI-28-5.8 P/N 872811. Test setup