



Test Report No. 8912325558

For ALVARION Ltd.

Equipment Under Test:

***BreezeMax 4Motion™
Broadband Wireless Access System***

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



***ACCLASS Accreditation Services
Certificate Number: IT-1359***



Test report No: 8912325558

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Title: BreezeMAX 4Motion™ Broadband Wireless Access System

Model: ODU-2483-2494-000N-37-4x2-N-0

FCC ID: LKT-BMAX-OR-25

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1. Applicant information

Order placed by:	Alvarion Ltd
Address:	21A Habarzel str, Tel-Aviv, 69710, Israel
Sample for test selected by:	The customer
The date of test:	20 – 22 April 2009

Equipment under test information

Description of Equipment Under Test (EUT):	Transmitter BreezeMAX 4Motion™
Model:	ODU-2483-2494-000N-37-4x2-N-0
Serial Number:	NA
Manufactured by:	Alvarion Ltd

2. Test performance

Location:	SII EMC Section
Purpose of test:	Apparatus compliance verification in accordance with emission requirements
Test specifications:	47CFR part 25 § 25.254, 25.202 part 1 §1.1307, 1.1310

This Test Report contains 24 pages and may be used only in full.
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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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The EUT was found to be in compliance with requirements of: 47CFR Part 25 §§ 25.254 and 25.202

Parameter	Subclasses
Transmitter characteristics	
Peak EIRP	25.254 (a)(1)
Out of channel interference emission	25.254 (a)(2)
EIRP density in 1559 – 1610 MHz band	25.254 (a)(4)
Unwanted emissions in adjacent BRS bands	25.254 (d)(1)
Frequency tolerance	25.202 (d)

Test performed by: Mr. Michael Feldman test technician

Test report prepared by: Mr. Michael Feldman test technician

Test report approved by: Mr. Yuri Rozenberg. Head of EMC Branch

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4. Equipment under test description.

*The customer provided description.

4.1 General description

BreezeMAX 4M 2.5GHz is digital modulated TDD system operating in the two frequency bands. The frequency range of the BMAX 4M 2.5GHz is 2483.5MHz up to 2690MHz divided into two sub bands: 2483.5MHz-2493.5MHz sub-band working with external cavity band pass filter, nominal output power is 37dBm at external cavity filter output connector. 2496 – 2690 MHz sub-band, nominal power 38 dBm at transmitter antenna connector.

The system contains a base station unit and a subscriber unit.

The basic system configuration is a two-box configuration that contains

1. Indoor unit that contains the IF unit, digital card, power supply and modem.
2. Outdoor unit contain the radio and digital control section unit.

EUT technical characteristics

Transmitter technical characteristics.		Note	
Stand-alone/fixed use			
Assigned frequency range	2483.5 MHz - 2500 MHz		
Operating frequency range	2483.5 – 2493.5 MHz	With external cavity filter	
Emission bandwidth	10 MHz		
Maximum rated output power	37 dBm	At transmitter external cavity filter RF output connector	
Antenna connection	Standard connector: N - type	Professional installation	
Type of modulation	BPSK, 4QAM, 16QAM, 64QAM		
Type of multiplexing	OFDM		
Modulating test signal (baseband)	PRBS		
Maximum transmitter duty cycle in normal use	60 %		
Transmitter duty cycle supplied for test	60 %		
Antenna/ External filter information			
Type	Manufacturer	Model	Gain
Remote Tilt Panel	Argus Technologies	LPX310RT	18 dBi
External band pass cavity filter and cable	RFMORECOM	RMC2488.5B10M01	1 dB loss

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4.1.1 Environmental evaluation and exposure limit according to FCC CFR 47 part 1, §1.1307, §1.1310.

Limit for power density for general population/uncontrolled exposure is 1(mW/cm²) or 10 (W/m²).

The power density calculation $S = (Pt / 4\pi r^2)$.

Where

Pt - The transmitted power (EIRP) (mW)

r - The distance from the unit. (cm)

The 1(mW/cm²) limit can be calculated from the above based on the following data:

Pt- the transmitted power which is equal to the output power 37 dBm plus external antenna gain 18 dBi. The maximum EIRP = 55 dBm = 316228 mW

Minimum allowed distance from antenna were FCC RF exposure limit may not be exceeded

$r = \text{SQRT}(316228/4\pi) = 1.59 \text{ m.}$

4.2 EUT test configuration

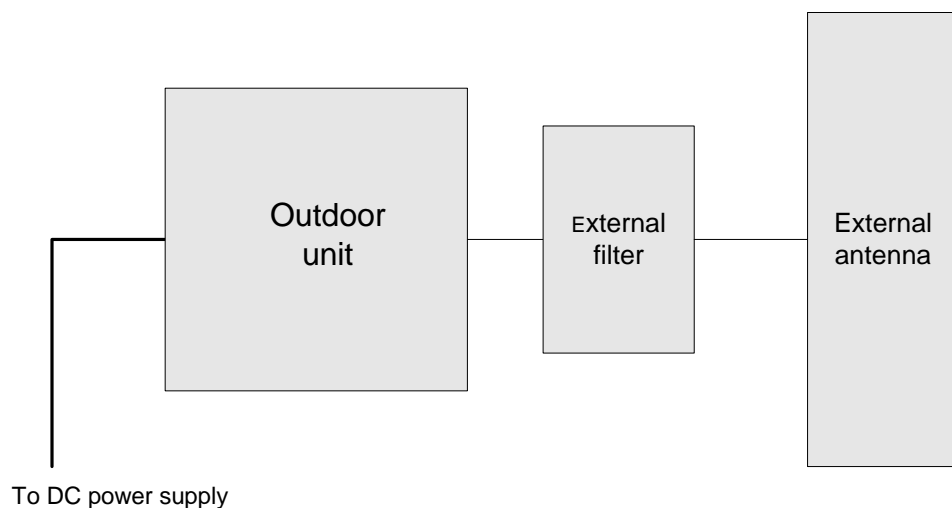


Fig. 1 EUT block diagram.



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5. Test results

5.1 Transmitter characteristics

5.1.1 Peak EIRP power test § 25.254 (a)(1)

Operating Frequencies Range 2483.5 – 2493.5 MHz
 Ambient Temperature 23⁰ C Relative Humidity 52% Air Pressure 1009 hPa

Peak EIRP power test result

Frequency, MHz	Peak output power, dBm	Peak EIRP power dBm/1.25 MHz	EIRP limit dBm/1.25 MHz	Reference to plot number
2485	36.77	54.77	62.0	#4

LIMIT

The peak EIRP shall not exceed 32 dBW (62 dBm) in 1.25 MHz.

TEST PROCEDURE

The measurements were performed in normal (transmitting) mode at 2488.5 MHz carrier frequency under maximum data transfer bit rate. The EUT RF output was connected to the Spectrum Analyzer through appropriate attenuator and accounted with cable loss in SA settings. Calculation of measured peak EIRP with external antenna was performed as follows:
 Plot result + 18 dBi antenna gain.

TEST EQUIPMENT USED:

2	3	4	10			
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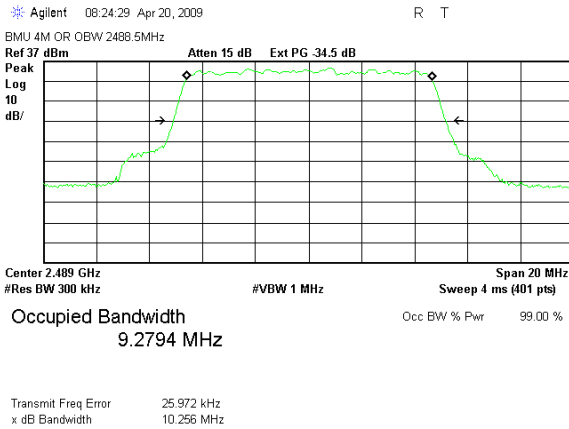
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Title: BreezeMAX 4Motion™ Broadband Wireless Access System

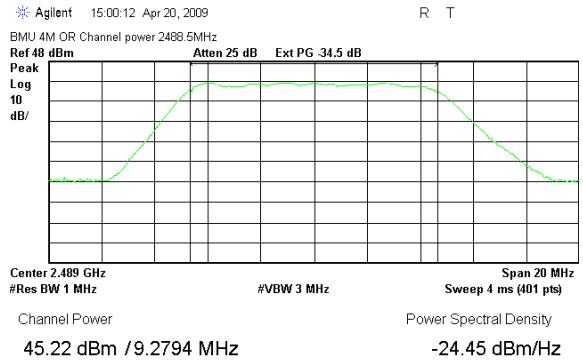
Model: ODU-2483-2494-000N-37-4x2-N-0

FCC ID: LKT-BMAX-OR-25

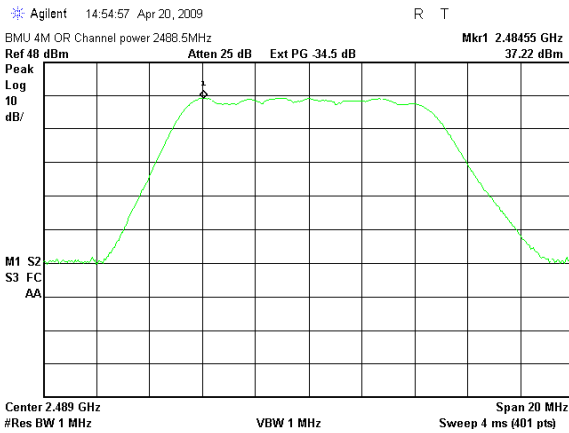
Peak output power test results.



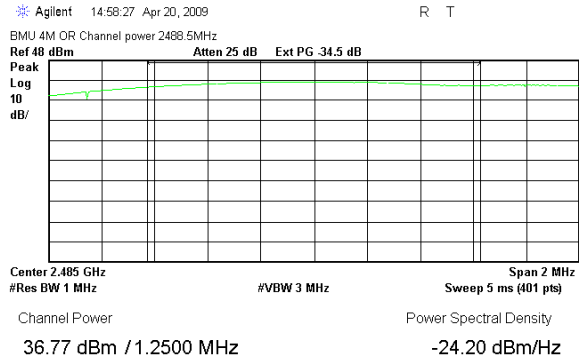
Plot # 1. 99% Emission bandwidth



Plot # 2. Maximum power in EBW



Plot # 3. Peak of emission envelope



Plot # 4. Output power in 1.25 MHz EBW

External attenuator and cable loss – 34.5 dB



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5.1.2 Out of channel interference emission § 25.254(a) (2)

Operating Frequencies Range 2483.5 – 2493.5 MHz
 Ambient Temperature 23⁰ C Relative Humidity 49% Air Pressure 1008 hPa

Out-of-channel interference test result

Frequency MHz	Peak level dBm	Interference limit dBm	Margin, dB	Reference to plot number
2483.5	-18.2	-14.1	4.1	#5
2493.5	-17.6	-14.1	3.5	#5

LIMIT

Out-of-channel unacceptable interference shall not exceed -44.1 dBW (-14.1 dBm)/30 kHz.

TEST PROCEDURE

The measurements were performed in normal (transmitting) mode at 2488.5 MHz carrier frequency under maximum data transfer bit rate. The EUT RF output was connected to the Spectrum Analyzer through appropriate attenuator and accounted with cable loss in SA settings.

TEST EQUIPMENT USED:

2	3	4	10			
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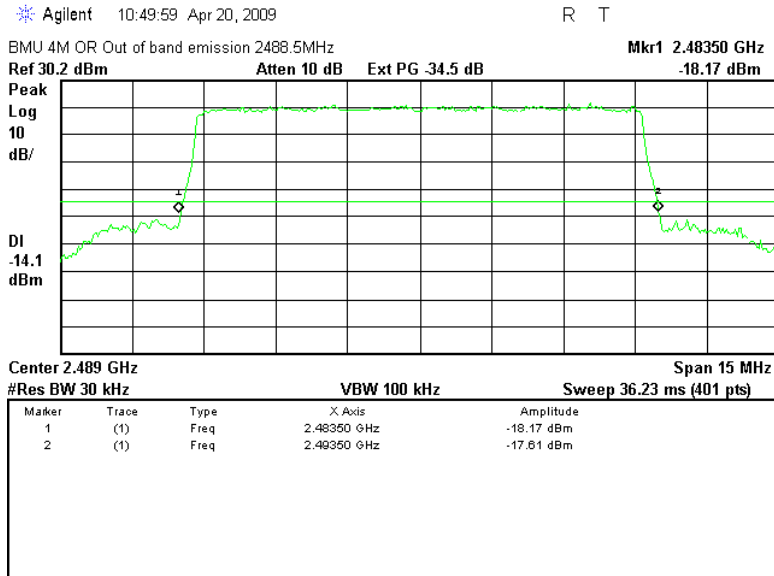
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Plot # 5. Out-of-channel interference.

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Title: BreezeMAX 4Motion™ Broadband Wireless Access System**Model:** ODU-2483-2494-000N-37-4x2-N-0**FCC ID:** LKT-BMAX-OR-25**5.1.3 EIRP density test in 1559 - 1610 MHz band § 25.254(a) (4)**

Operating Frequencies Range 2483.5 – 2493.5 MHz
 Ambient Temperature 23⁰ C Relative Humidity 49% Air Pressure 1009 hPa

EIRP density test result at antenna terminal.

Frequency MHz	Wide band EIRP dBm	Narrowband EIRP, dBµV/m/dBm	EIRP density limit dBm	Margin, dBm	Reference to plot
1601.7	-67.7	-	-58.0	9.7	#6
1599.9	-	-97.9	-58.0	39.9	#7

EIRP density test result radiated.

Frequency MHz	Wide band EIRP dBµV/m/dBm	Narrowband EIRP, dBµV/m/dBm	EIRP density limit dBm	Margin, dBm	Reference to plot
1601.7	43.8/ -51.4	-	-40.0	11.4	#8
1599.9	-	27.4/-67.8	-40.0	27.8	#9

LIMIT

Base station operating in frequencies above 2483.5 MHz shall not generate EIRP density greater than -70 dBw (-40 dBm)/MHz in 1559 – 1610 MHz band.

For used antenna 18 dBi gain conducted emission calculated limit is -58 dBm.

TEST PROCEDURE

Test was performed conducted at antenna terminal and radiated by substitution method. The EUT RF output was connected to the Spectrum Analyzer through 9 dB attenuator, low pass filter 0.6 dB insertion loss and accounted with cable loss in SA settings. Radiated emission test was performed according to ANSI/TIA-603-C-2004 section 2.2.12 test method. Transmitter was operated at 2488.5 MHz carrier frequency. Investigation of transmitter spurious emissions was performed. EUT was replaced by generator and substitution antenna. Level calculated from generator output level, substitution antenna gain and connected cable loss was compared with the limit.

TEST EQUIPMENT USED:

2	4	5	8	9	11	12
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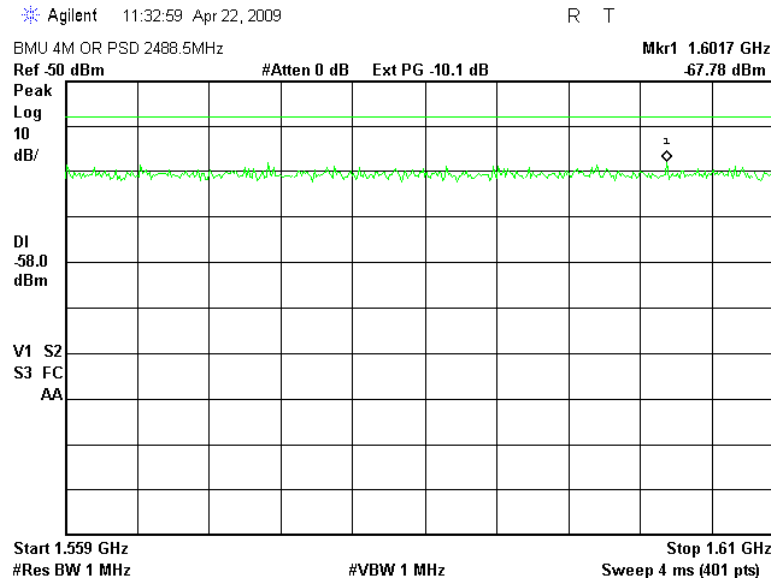
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Title: BreezeMAX 4Motion™ Broadband Wireless Access System

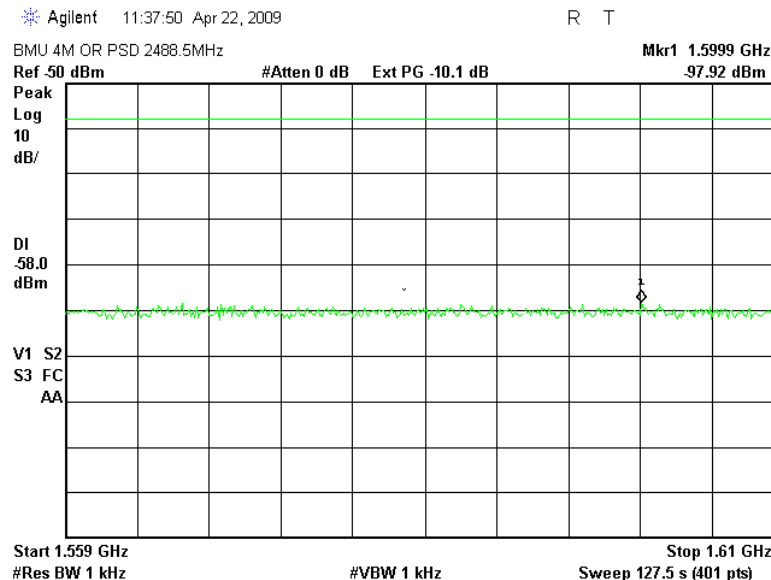
Model: ODU-2483-2494-000N-37-4x2-N-0

FCC ID: LKT-BMAX-OR-25

Power density test results at antenna terminal.



Plot # 6. Wide band power density.



Plot # 7. Narrow band power density.

External attenuation added to SA settings is 10.1 dB.



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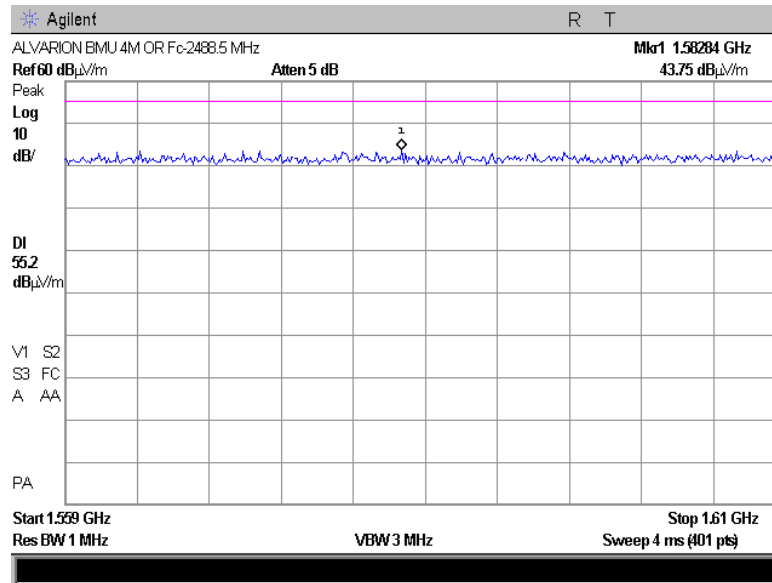
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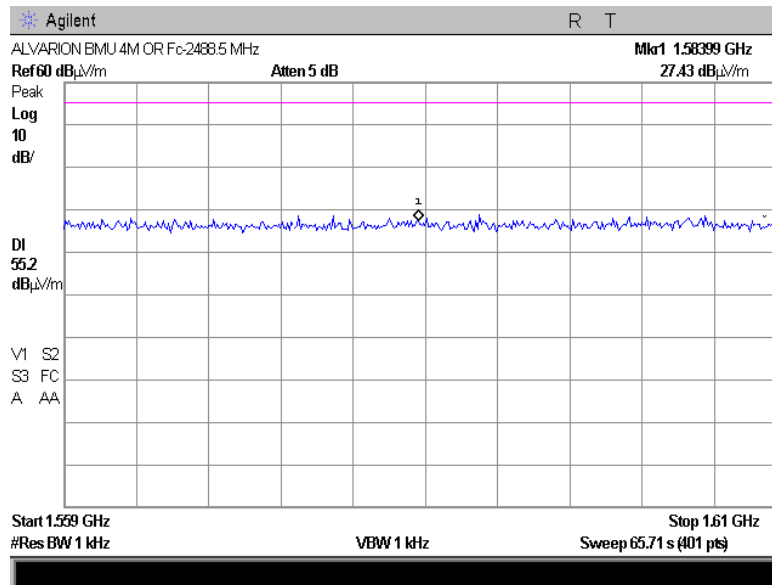
Model: ODU-2483-2494-000N-37-4x2-N-0

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Power density test results radiated.



Plot # 8. Wide band power density.



Plot # 9. Narrow band power density.



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5.1.4 Unwanted emissions at antenna terminal in adjacent BRS bands § 25.254(d) (1)

Operating Frequencies Range 2483.5 – 2493.5 MHz
Ambient Temperature 23⁰ C Relative Humidity 49% Air Pressure 1009 hPa

Frequency, MHz	Measured emissions, dBm	Limit, dBm	Margin, dB	Reference to Plot number
2495.1	-18.2	-13.0	5.2	#11
2830.0	-34.2	-13.0	21.2	#10

LIMIT

For base stations emissions above 2495 MHz shall be attenuated below the transmitter power (P) measured in watts, by a factor not less then: $43+10\text{Log}(P)$ dB = -13 dBm.

TEST PROCEDURE

The measurements were performed in normal (transmitting) mode at 2488.5 MHz carrier frequency under maximum data transfer bit rate. The EUT RF output was connected to the Spectrum Analyzer through appropriate attenuator and accounted with cable loss in SA settings

TEST EQUIPMENT USED:

1	2	3	4			
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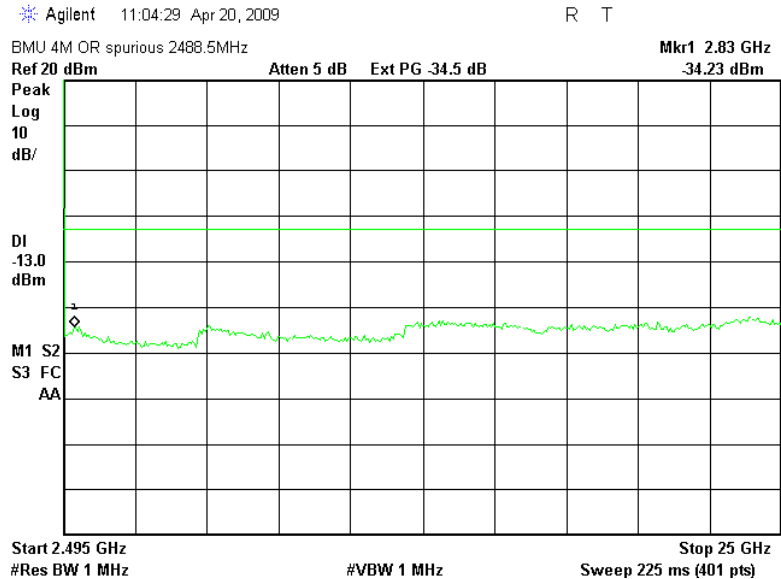
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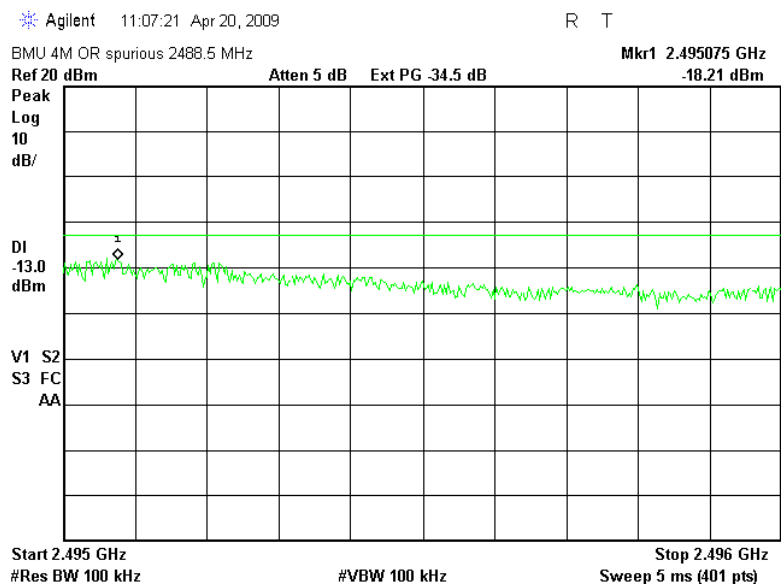
Title: BreezeMAX 4Motion™ Broadband Wireless Access System

Model: ODU-2483-2494-000N-37-4x2-N-0

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Plot # 10. Unwanted emission in 2.495 – 25.0 GHz band.



Plot # 11. Unwanted emission in 2.495 – 2.496 GHz band.

Insertion loss of external attenuator, splitter and cable is 34.5 dB.



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5.1.5 Unwanted emissions in adjacent BRS bands radiated § 25.254(d) (1)

Operating Frequencies Range 2483.5 – 2493.5 MHz
 Ambient Temperature 22⁰ C Relative Humidity 52% Air Pressure 1007 hPa

Frequency, MHz	Antenna polarization	Measured emissions, dBµV/m/dBm	Limit, dBm	Margin, dB	Reference to Plot number
2495.0	V	77.8/-17.2	-13.0	4.2	#12
2950.8	V	75.4/-19.8	-13.0	6.8	#13

TEST PROCEDURE

The frequency spectrum was investigated up to the tenth harmonic of the 2488.5 MHz fundamental frequency. The emission levels of the EUT more than 20 dB lower than the specified limit were not recorded in the table. For the test results refer to plots in this section.

Substitution method

The measurements were performed according to ANSI/TIA-603-C-2004 section 2.2.12 test method. Transmitter was operated at 2488.5 MHz carrier frequency. Investigation of transmitter spurious emissions was performed. EUT was replaced by generator and substitution antenna. Level calculated from generator output level, substitution antenna gain and connected cable loss was compared with the limit.

LIMIT

For base stations emissions above 2495 MHz shall be attenuated below the transmitter power (P) measured in watts by a factor not less then $43+10\text{Log}(P)$ dB = -13 dBm@ 82.2 dBµV/m at 3m test distance.

TEST SUMMARY

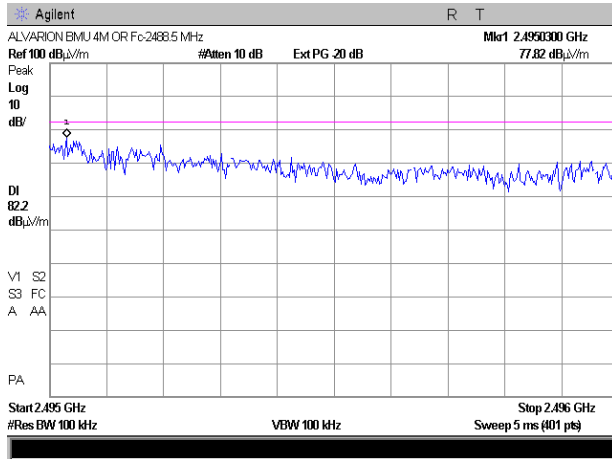
Transmitter meets standard requirement.
 No emissions in 3 – 25 GHz frequency range were found above SA noise floor that is at least 40 dB under the specified limit. For the test results refer to plots ## 14, 15 in this section.

TEST EQUIPMENT USED:

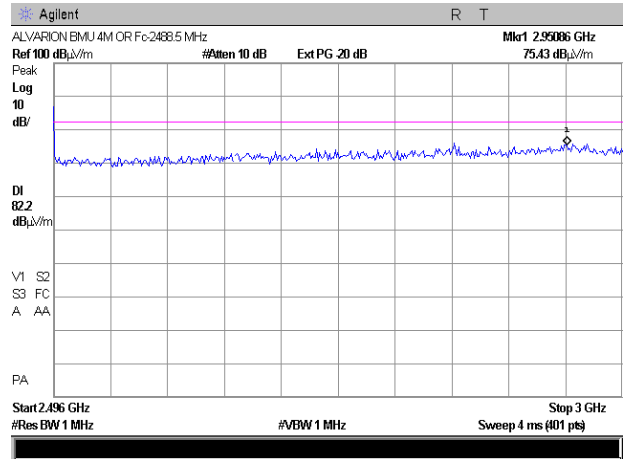
4	5	6	8			
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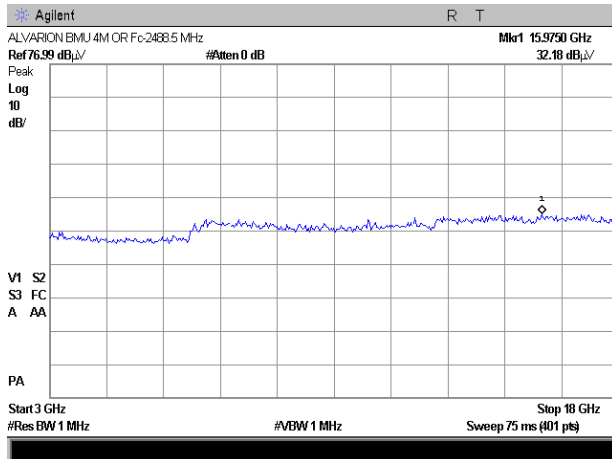
Frequency carrier 2592.5 MHz.



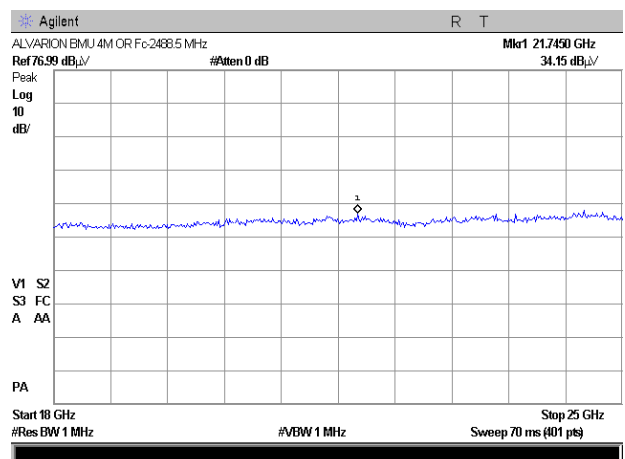
Plot # 12



Plot # 13



Plot # 14



Plot # 15



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5.1.6 Frequency tolerance test according to § 25.202 (d)

Operating Frequencies Range 2483.5 – 2493.5 MHz
 Ambient Temperature 24⁰ C Relative Humidity 59% Air Pressure 1007 hPa

Frequency tolerance test.

TEST CONDITIONS		Carrier frequency, GHz
Test temperature	Test voltage(DC)	
+25°C	Vmin (40.8)	2.488500650
	Vnom (48.0)	2.488500160
	Vmax (55.2)	2.488500920
-30°C	Vnom (48)	2.488500590
-20°C	Vnom (48)	2.488500480
-10°C	Vnom (48)	2.488500890
0°C	Vnom (48)	2.488500730
+10°C	Vnom (48)	2.488500890
+20°C	Vnom (48)	2.488501010
+30°C	Vnom (48)	2.488500800
+40°C	Vnom (48)	2.488500820
+50°C	Vnom (48)	2.488500670

TEST PROCEDURE

The EUT was placed in a climatic chamber and allowed to stabilize at 25°C temperature and nominal voltage for at list 15 min. The reference carrier frequency was taken. The input voltage was changed from 85% of nominal to 115%. Frequency changes were noted. The temperature in climatic chamber was varied from -30°C to +50°C. Measured frequencies were noted in table above.

LIMIT

The carrier frequency of each earth station transmitter authorized in these services shall be maintained within 0.001 percent of the reference frequency.
For 2488.5 MHz transmitted carrier frequency tolerance shall be within 24.88 kHz of the reference frequency.

TEST SUMMARY

Maximum measured frequency tolerance is +994 Hz.

TEST EQUIPMENT USED:

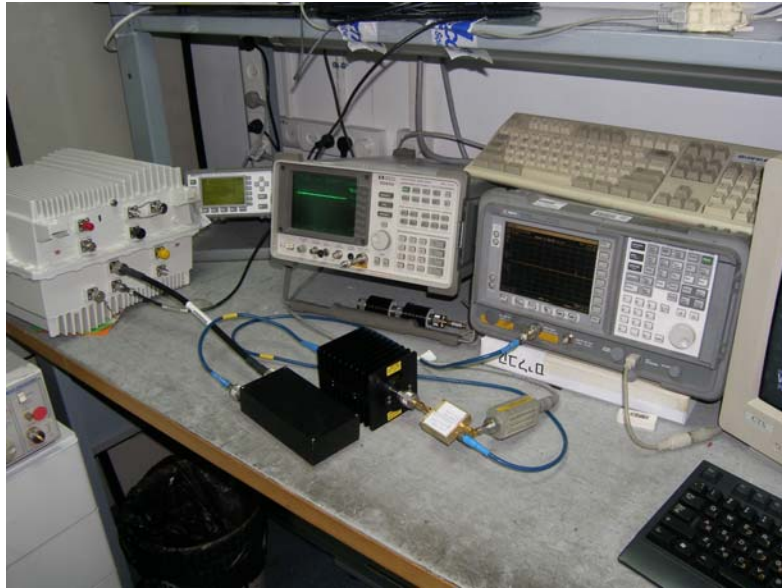
2	3	4				
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APPENDIX A Photographs**Photo 1. Conducted measurements. Test setup.****Photo 2. Test setup in anechoic chamber..**



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Photo 3. Test setup in anechoic chamber.

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No	Description	Manufacturer information			Due Calibration date
		Name	Model No	Serial No	
1	Spectrum Analyzer 9 kHz - 50 GHz	HP	8565E	3720A00699	June 2009
2	Spectrum Analyzer 9 kHz - 26.5 GHz	Adjilent	4407B	US40241729	June 2009
3	Attenuators 30 dB 100W	Inmet	64671	6N100W-30	June 2009
4	Cable RF 1m	Huber-Suhner	Sucoflex 104	21324/4PE	Aug 2009
5	Double Ridged Guide Antenna 1 – 18 GHz	EMCO	3115	5802	Aug 2009
6	Broadband Horn antenna 15 – 40 GHz	Schwarzbeck Mess-Electronik	BBHA 9170	9170-341	Aug 2009
7	Antenna Biconilog 30 – 2000 MHz	Schaffner-Chase	CBL6112B	S/N 23181	May 2009
8	Spectrum analyzer 10 KHz-26.5 GHz	HP	E7405A	SII 4944	April 2010
9	Low pass filter DC – 1700 MHz	Mini -Circuit	VLF - 1700	15542	April 2010
10	Power splitter 1.7 – 9 GHz	Mini-Circuits	ZN2PD-9G	0142	June 2009
11	Attenuator 50 Ohm 6 dB DC-8.5 GHz	Aeroflex/ Weinshel	33-6-34	BV7219	April 2010
12	Attenuator 50 Ohm 3 dB DC-8.5 GHz	Aeroflex/ Weinshel	33-3-34	BV9910	April 2010
13	Cable RF 4 m	Huber-Suhner	Sucoflex 104PE	21328/4PE	Dec 2009

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Point	Frequency (MHz)	Cable Loss (dB)	Point	Frequency (MHz)	Cable Loss (dB)
1	30	0.53	21	1000	3.68
2	50	0.75	22	1100	3.82
3	100	1.08	23	1200	4.07
4	150	1.39	24	1300	4.24
5	200	1.61	25	1400	4.43
6	250	1.752	26	1500	4.6
7	300	2.00	27	1600	4.7
8	350	2.15	28	1700	4.85
9	400	2.26	29	1800	4.98
10	450	2.383	30	1900	5.19
11	500	2.52	31	2000	5.34
12	550	2.606	32	2100	5.51
13	600	2.75	33	2200	5.69
14	650	2.856	34	2300	5.89
15	700	3.06	35	2400	6.07
16	750	3.201	36	2500	6.22
17	800	3.27	37	2600	6.28
18	850	3.38	38	2700	6.41
19	900	3.46	39	2800	6.53
20	950	3.55	40	2900	6.84



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Biconilog Antenna, Model Number: CBL-6112D, S/N: 23181.

No.	f / MHz)	AF / dB/m	f / MHz)	AF / dB/m	f / MHz)	AF / dB/m	f / MHz)	AF / dB/m
1	30	17.90	170	9.40	530	17.70	1040	22.20
2	32	16.70	175	9.00	540	18.25	1060	22.50
3	34	15.55	180	8.50	550	18.60	1080	22.50
4	36	14.35	185	8.45	560	14.45	1100	22.40
5	38	13.30	190	8.60	570	18.40	1120	22.60
6	40	12.20	195	8.85	580	18.50	1140	22.45
7	42	11.05	200	8.95	590	18.60	1160	22.50
8	44	9.95	205	8.80	600	18.60	1180	22.40
9	46	8.90	210	8.50	610	18.80	1200	22.80
10	48	8.05	215	8.20	620	18.99	1220	22.95
11	50	7.30	220	8.50	630	19.05	1240	23.10
12	52	6.80	225	9.00	640	19.23	1260	23.40
13	54	6.45	230	9.65	650	19.10	1280	23.35
14	56	6.00	235	10.30	660	19.13	1300	23.62
15	58	5.70	240	11.00	670	19.04	1320	23.64
16	60	5.45	245	11.60	680	19.00	1340	23.86
17	62	5.30	250	12.00	690	19.17	1360	23.95
18	64	5.20	255	12.45	700	19.28	1380	23.90
19	66	5.30	260	12.85	710	19.25	1400	24.45
20	68	5.30	265	12.50	720	19.45	1420	24.74
21	70	5.35	270	12.45	730	19.75	1440	24.93
22	72	5.50	275	12.40	740	19.95	1460	25.03
23	74	5.80	280	12.55	750	20.07	1480	25.45
24	76	6.00	285	12.65	760	19.85	1500	25.30
25	78	6.60	290	12.75	770	19.80	1520	25.25
26	80	6.70	295	12.95	780	19.85	1540	25.36
27	82	7.15	300	13.00	790	19.95	1560	25.58
28	84	7.60	310	13.35	800	20.05	1580	25.50
29	86	8.10	320	13.75	810	20.10	1600	25.65
30	88	8.50	330	13.85	820	20.35	1620	25.60
31	90	8.90	340	14.10	830	20.40	1640	25.70
32	92	9.20	350	14.50	840	20.35	1660	25.83
33	94	9.75	360	14.70	850	20.46	1680	25.97
34	96	9.95	370	14.90	860	20.39	1700	26.10
35	98	10.20	380	15.10	870	20.29	1720	26.25
36	100	10.50	390	15.45	880	20.24	1740	26.04
37	105	11.25	400	16.00	890	20.35	1760	26.14
38	110	11.70	410	16.40	900	20.55	1780	26.20
39	115	11.70	420	16.70	910	20.45	1800	26.40
40	120	11.80	430	16.35	920	20.60	1820	26.64
41	125	11.80	440	16.30	930	20.60	1840	26.86
42	130	11.70	450	16.30	940	20.66	1860	27.12
43	135	11.35	460	16.70	950	20.88	1880	27.00
44	140	10.95	470	17.05	960	21.11	1900	27.25
45	145	10.35	480	17.20	970	20.93	1920	27.36
46	150	10.05	490	17.30	980	21.03	1940	27.68
47	155	9.70	500	17.40	990	21.05	1960	27.10
48	160	9.70	510	17.50	1000	21.10	1980	27.06
49	165	9.45	520	17.60	1020	21.40	2000	27.25

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Point	Frequency (MHz)	Antenna Factor (dB/m)
1	1000	23.9
2	2000	28.3
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

Cable Loss**Type: Sucoflex 104PE; Ser. No.21328/4PE; 4 m length**

Point	Frequency (GHz)	Cable Loss (dB)
1	0.0-1.0	1.7
2	1.0- 3.5	3.2
3	3.5- 5.5	4.0
4	5.5 - 7.5	4.7
5	7.5 - 9.5	5.3
6	9.5 - 10.5	5.6
7	10.5 - 12.5	6.2
8	12.5 - 14.5	6.8
9	14.5 - 16.5	7.5
10	16.5 - 18.0	8.1

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APPENDIX C General information

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
L	length
LNA	low noise amplifier
m	meter
Mbps	megabit per second
MHz	megahertz
NA	not applicable
OFDM	Orthogonal Frequency Division Multiple Access
PRBS	pseudo random binary sequence
QP	quasi-peak
RF	radio frequency
RE	radiated emission
rms	root mean square
W	Watt

Specification references

47 CFR part 15: 2008	Radio Frequency Devices
ANSI C63.4: 2003	American National Standard for Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communication Equipment Measurement and Performance.