



Test Report No.: 9012328334

Page 31 of 60 Pages

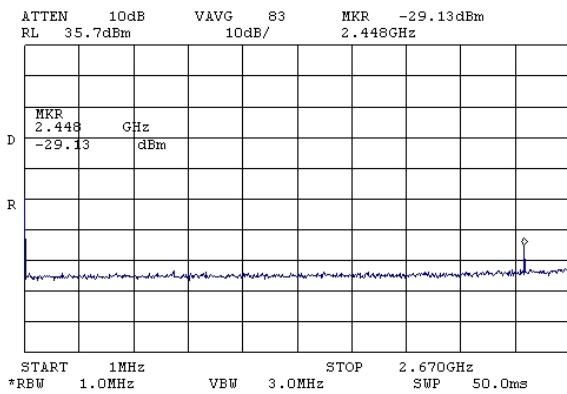
Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

Model: ODU-2485-2690-000N-38-2x2-N-0

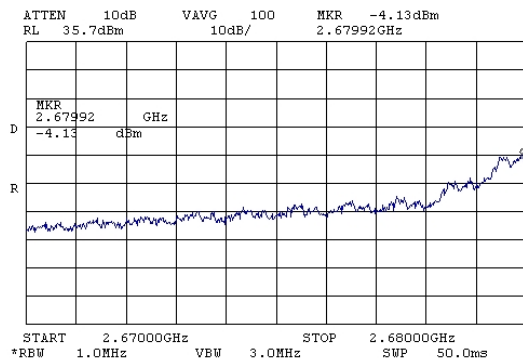
FCC ID: LKT-BMAX-2-OR-25

BMAX-4M-ODU-2X2
Spurious emissions at antenna terminal
BW = 10MHz

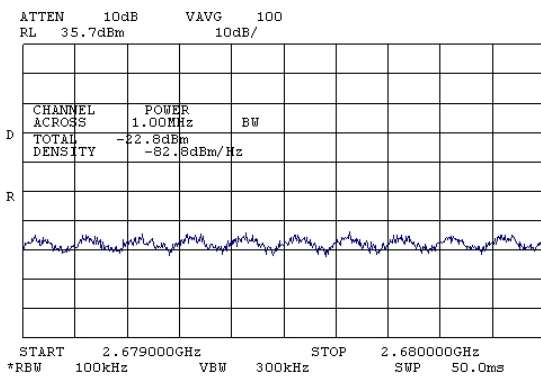
Top frequency 2685MHz



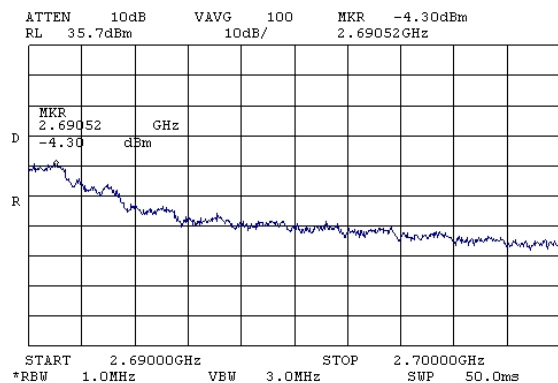
Plot # 63



Plot # 64



Plot # 65



Plot # 66



Test Report No.: 9012328334

Page 32 of 60 Pages

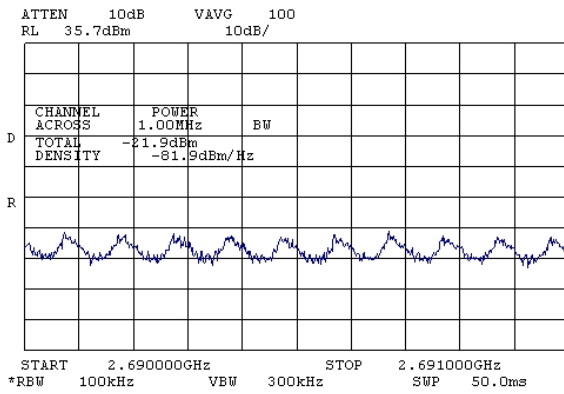
Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

Model: ODU-2485-2690-000N-38-2x2-N-0

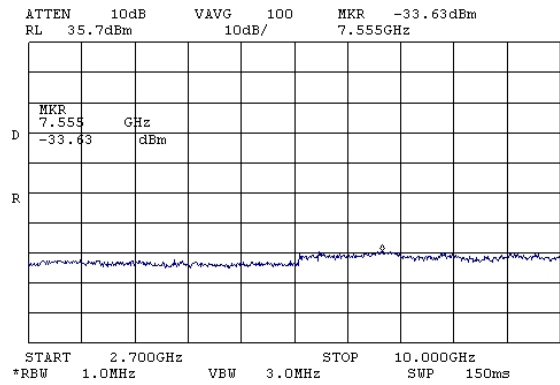
FCC ID: LKT-BMAX-2-OR-25

BMAX-4M-ODU-2X2
Spurious emissions at antenna terminal
BW = 10MHz

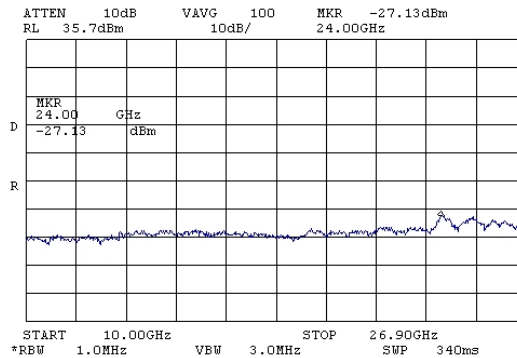
Top frequency 2685MHz



Plot # 67



Plot # 68



Plot # 69



Test Report No.: 9012328334

Page 33 of 60 Pages

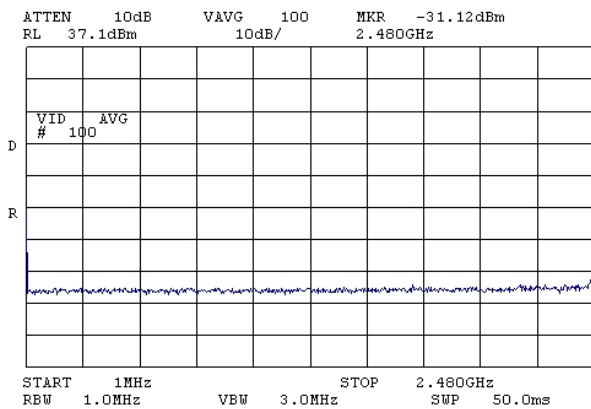
Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

Model: ODU-2485-2690-000N-38-2x2-N-0

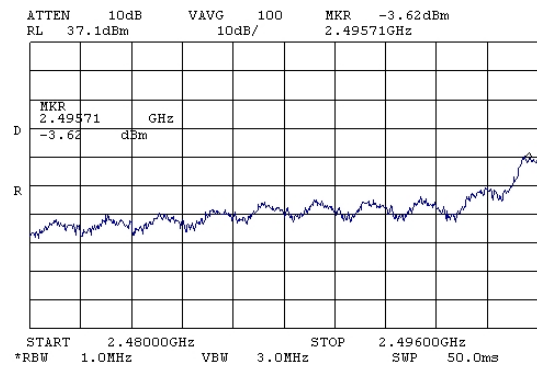
FCC ID: LKT-BMAX-2-OR-25

BMAX-4M-ODU-2X2 with IF MUX
Spurious emissions at antenna terminal
BW = 20MHz

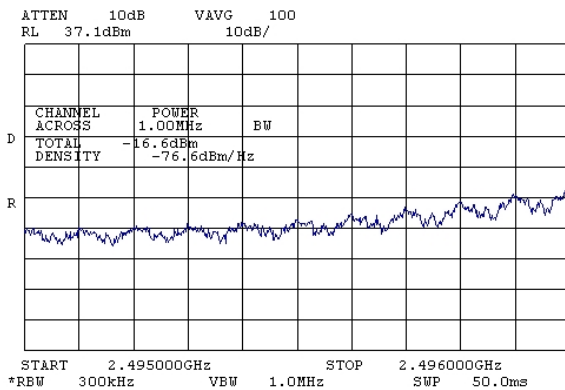
Bottom frequency 2506MHz



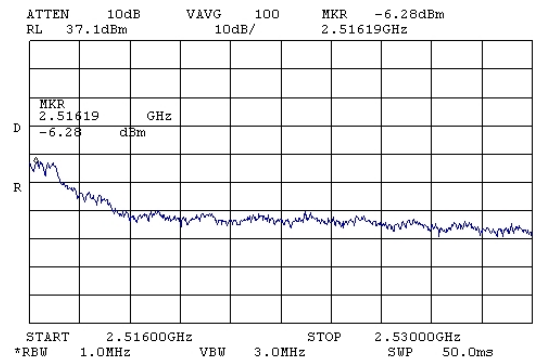
Plot # 70



Plot # 71



Plot # 72



Plot # 73



Test Report No.: 9012328334

Page 34 of 60 Pages

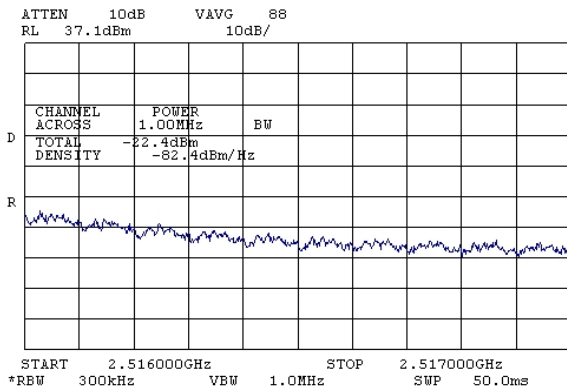
Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

Model: ODU-2485-2690-000N-38-2x2-N-0

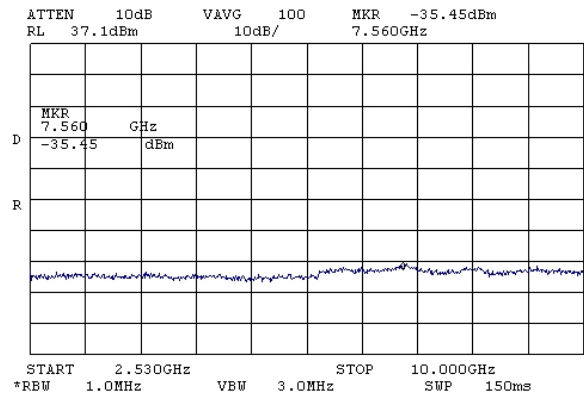
FCC ID: LKT-BMAX-2-OR-25

BMAX-4M-ODU-2X2 with IF MUX
Spurious emissions at antenna terminal
BW = 20MHz

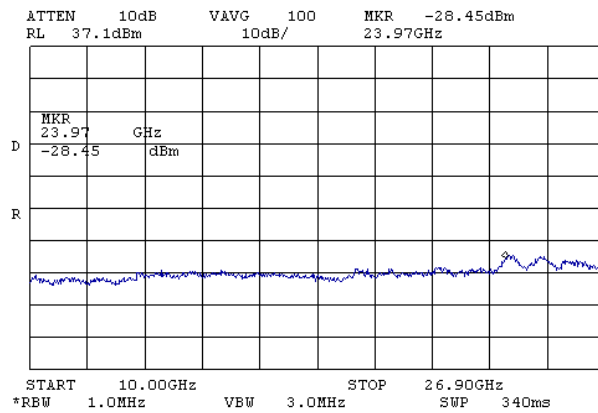
Bottom frequency 2506MHz



Plot # 74



Plot # 75



Plot # 76



Test Report No.: 9012328334

Page 35 of 60 Pages

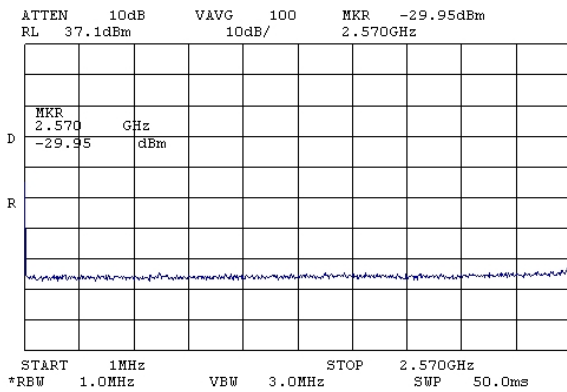
Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

Model: ODU-2485-2690-000N-38-2x2-N-0

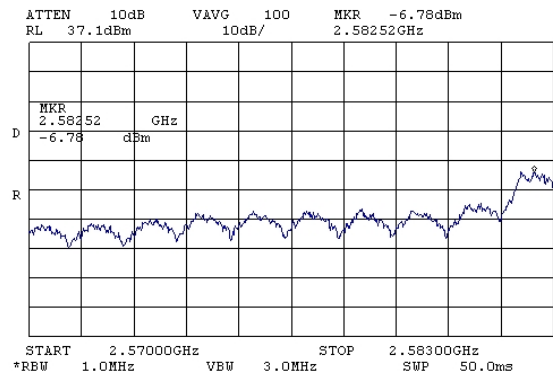
FCC ID: LKT-BMAX-2-OR-25

BMAX-4M-ODU-2X2 with IF MUX
Spurious emissions at antenna terminal
BW = 20MHz

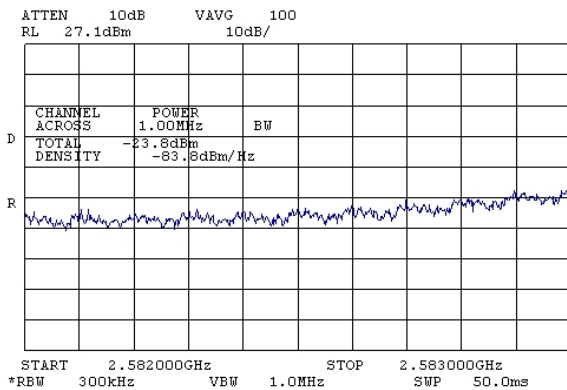
Middle frequency 2593MHz



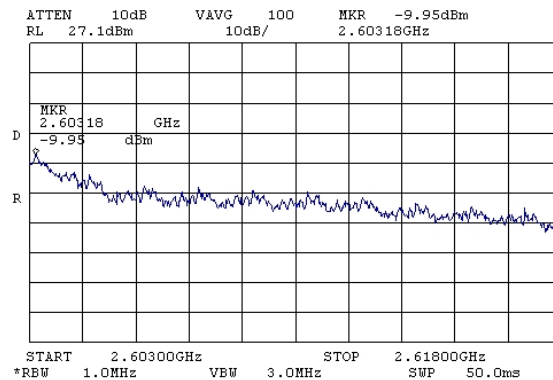
Plot # 77



Plot # 78



Plot # 79



Plot #80



Test Report No.: 9012328334

Page 36 of 60 Pages

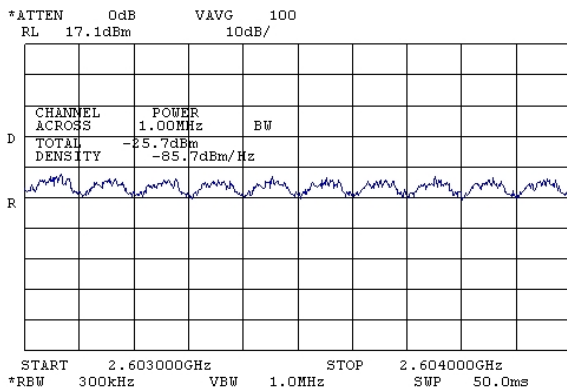
Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

Model: ODU-2485-2690-000N-38-2x2-N-0

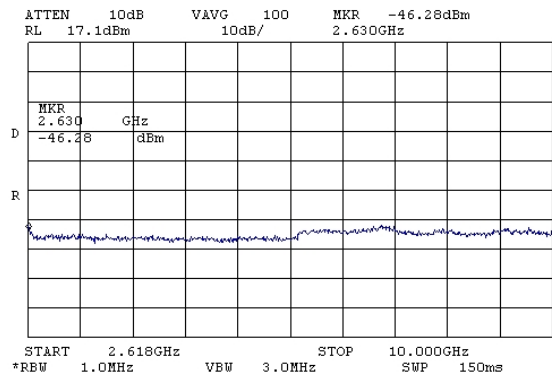
FCC ID: LKT-BMAX-2-OR-25

BMAX-4M-ODU-2X2 with IF MUX
Spurious emissions at antenna terminal
BW = 20MHz

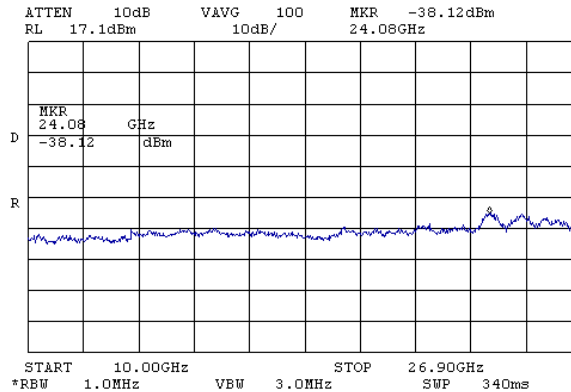
Middle frequency 2593MHz



Plot # 81



Plot # 82



Plot # 83



Test Report No.: 9012328334

Page 37 of 60 Pages

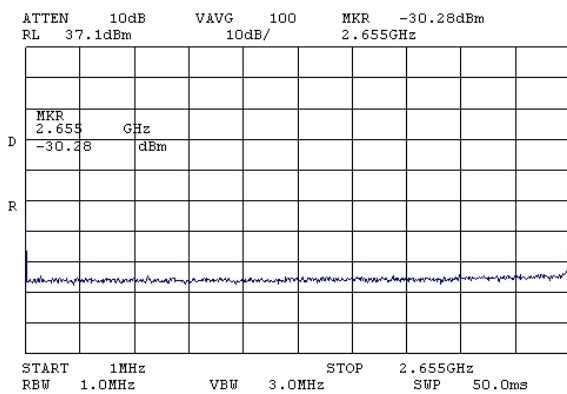
Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

Model: ODU-2485-2690-000N-38-2x2-N-0

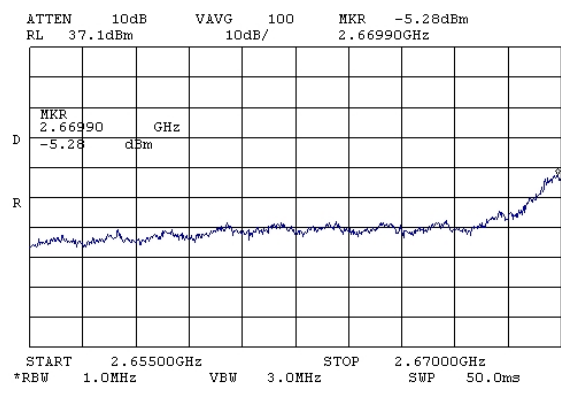
FCC ID: LKT-BMAX-2-OR-25

BMAX-4M-ODU-2X2 with IF MUX
Spurious emissions at antenna terminal
BW = 20MHz

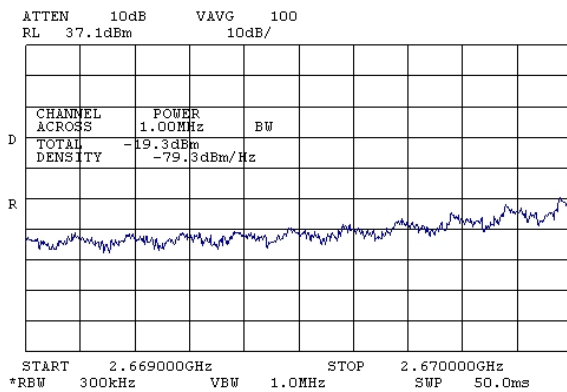
Top frequency 2680MHz



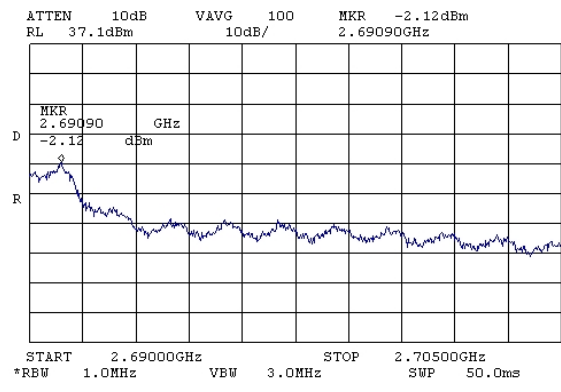
Plot # 84



Plot #85



Plot # 86



Plot #87



Test Report No.: 9012328334

Page 38 of 60 Pages

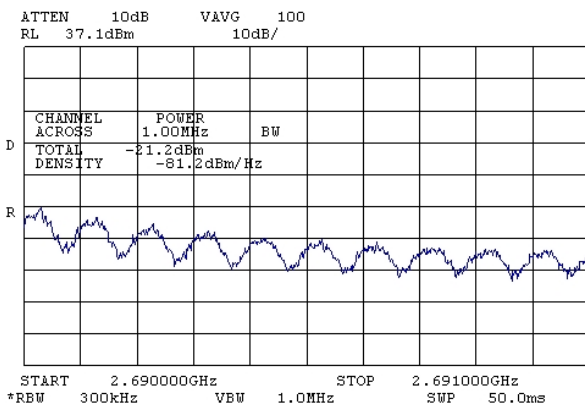
Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

Model: ODU-2485-2690-000N-38-2x2-N-0

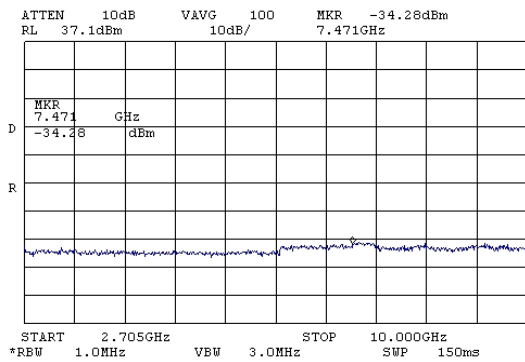
FCC ID: LKT-BMAX-2-OR-25

BMAX-4M-ODU-2X2 with IF MUX
Spurious emissions at antenna terminal
BW = 20MHz

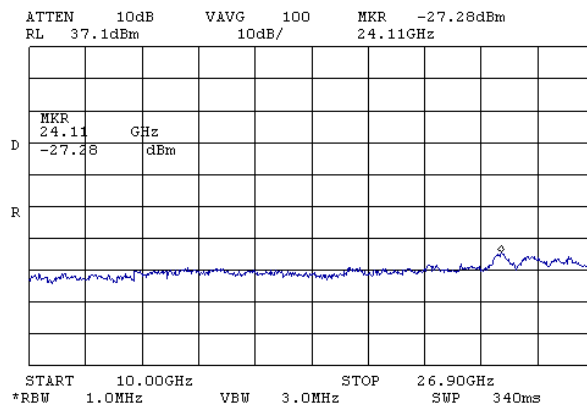
Top frequency 2680MHz



Plot # 88



Plot # 89



Plot # 90

**Test Report No.:** 9012328334

Page 39 of 60 Pages

Title: Test on BreezeMAX 4Motion Broadband Wireless Access System**Model:** ODU-2485-2690-000N-38-2x2-N-0**FCC ID:** LKT-BMAX-2-OR-25**3.5. Transmitter radiated emissions according to §§ 2.1053, 27.53**

Operating frequency range:	2498.5 MHz-2687.5 MHz		
Ambient Temperature 21 ⁰ C	Relative Humidity 47%	Air Pressure 1006 hPa	

Test Procedure

The frequency spectrum was investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency. The emission levels of the EUT more than 20 dB lower than the specified limit were not recorded in the tables. All measured results are shown in plots ## 91- 109.

Substitution Method

The measurements were performed according to ANSI/TIA-603-C-2004 section 2.2.12 test method. Transmitter was operated with internal antenna in 3 carrier frequencies at low, middle and high points of the band. 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 operation in the declare 2496MHz-2690MHz band, the power of any emissions outside the authorized frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts, by the factor not less than: $43+10\text{Log}(P)$ dB = -13 dBm @ 82.2 dB μ V/m at 3m distance.

Test Summary

The measured results are shown in plots from #91 to #126 in the following order:

Channel spacing – 5MHz

Carrier frequency 2498.5 - see plots ## 91-96
 Carrier frequency 2593 - see plots ## 97-102
 Carrier frequency 2687.5 - see plots ## 103-108

Channel spacing – 10MHz

Carrier frequency 2501 - see plots ## 109 -114
 Carrier frequency 2593 - see plots ## 115-120
 Carrier frequency 2685 - see plots ## 121-126

EBW 20 MHz channel spacing have the same band-edge frequencies as the 5 MHz channel spacing and results at least 20 dB under the limit.

All detected emissions were found below specified limit. Those emissions, which margin was less, than 20 dB, are recorded to tables # 7 and #8.



Test Report No.: 9012328334

Page 40 of 60 Pages

Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

Model: ODU-2485-2690-000N-38-2x2-N-0

FCC ID: LKT-BMAX-2-OR-25

Table 7. Radiated emissions, channel spacing – 5MHz

Carrier frequency, MHz	Frequency GHz	Measured emissions dB μ V/m	Limit dB μ V/m	Margin, dB	Reference to plot #
2498.5	17.943	68.34	82.2	13.9	95
2593	17.943	68.19	82.2	14.0	101
2687.5	2.634	65.40	82.2	16.8	103
	6.195	62.81	82.2	19.4	106
	17.914	67.98	82.2	14.2	107

Table 8. Radiated emissions, channel spacing – 10MHz

Carrier frequency, MHz	Frequency GHz	Measured emissions dB μ V/m	Limit dB μ V/m	Margin, dB	Reference to plot #
2501	6.500	62.67	82.2	19.5	112
	18.000	68.70	82.2	13.5	113
2593	6.402	62.98	82.2	19.2	118
	18.000	68.71	82.2	13.5	119
2685	6.500	63.07	82.2	19.1	124
	18.000	68.66	82.2	13.5	125

Test Equipment Used

1	4	5	6	12	
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Test Report No.: 9012328334

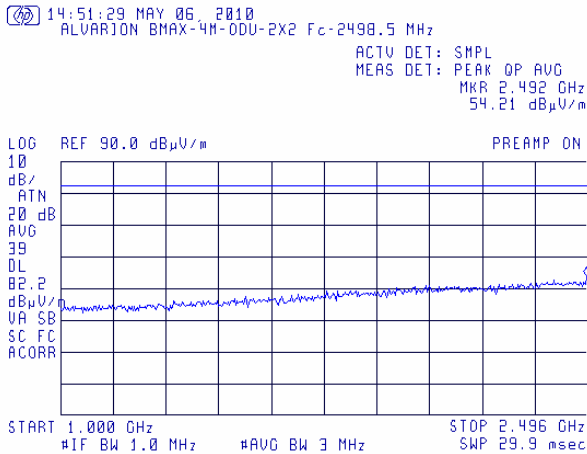
Page 41 of 60 Pages

Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

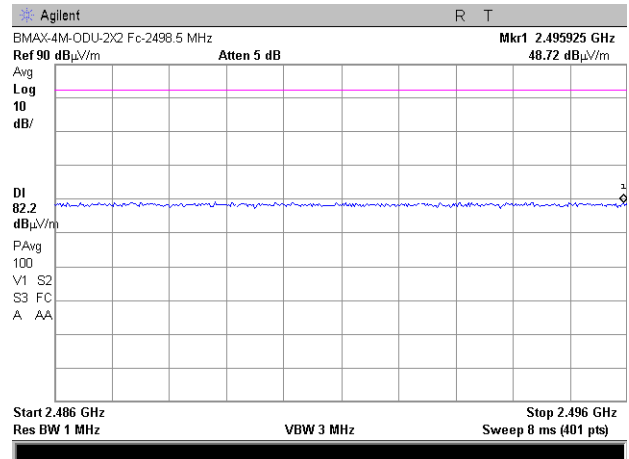
Model: ODU-2485-2690-000N-38-2x2-N-0

FCC ID: LKT-BMAX-2-OR-25

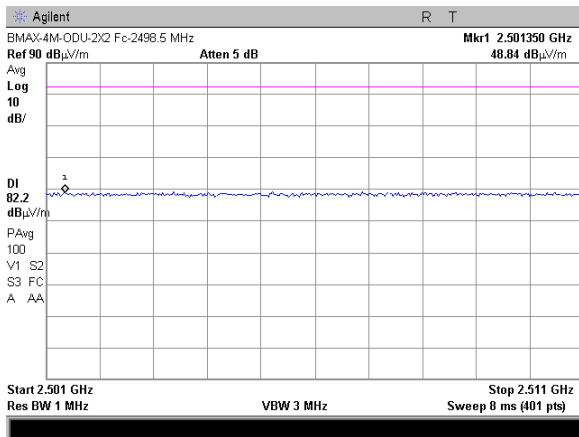
Radiated emissions EBW = 5MHz
Bottom frequency 2498.5MHz



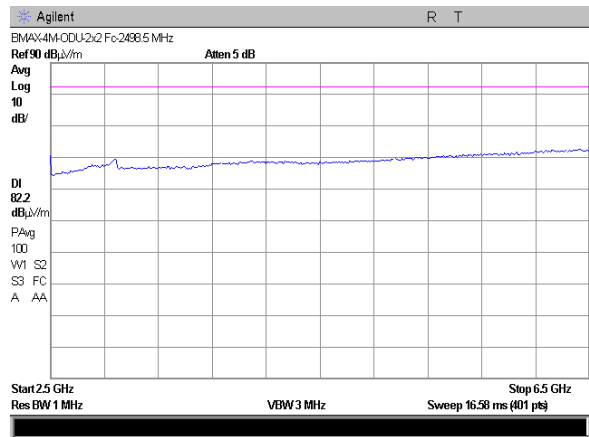
Plot # 91



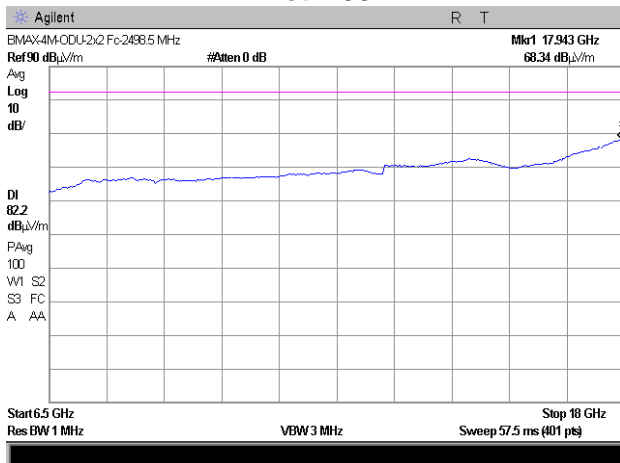
Plot # 92



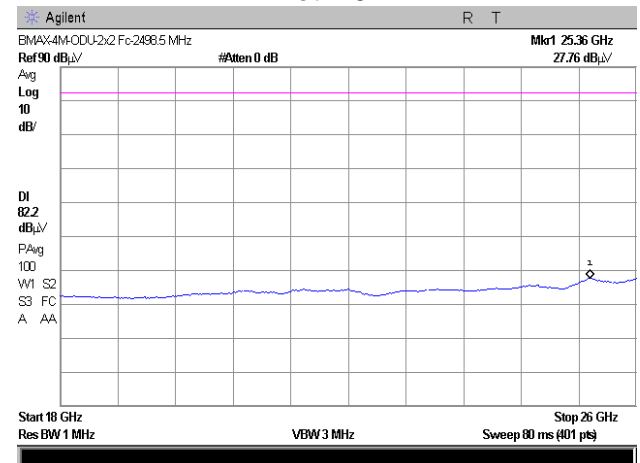
Plot # 93



Plot # 94



Plot # 95



Plot # 96



Test Report No.: 9012328334

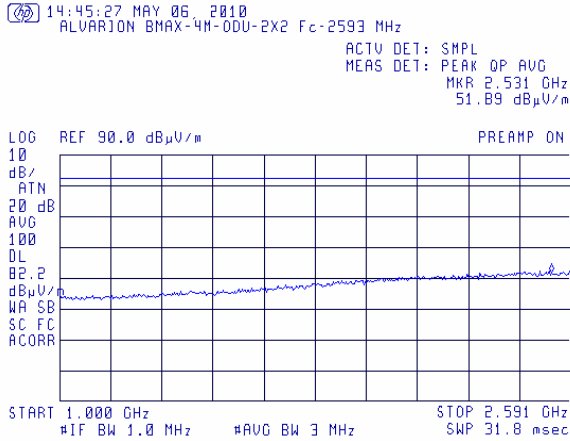
Page 42 of 60 Pages

Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

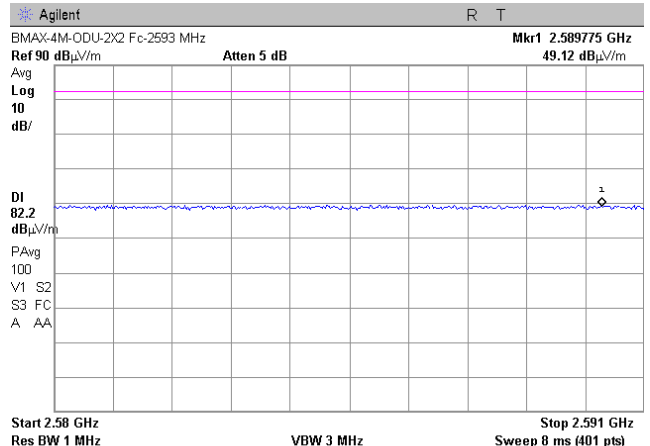
Model: ODU-2485-2690-000N-38-2x2-N-0

FCC ID: LKT-BMAX-2-OR-25

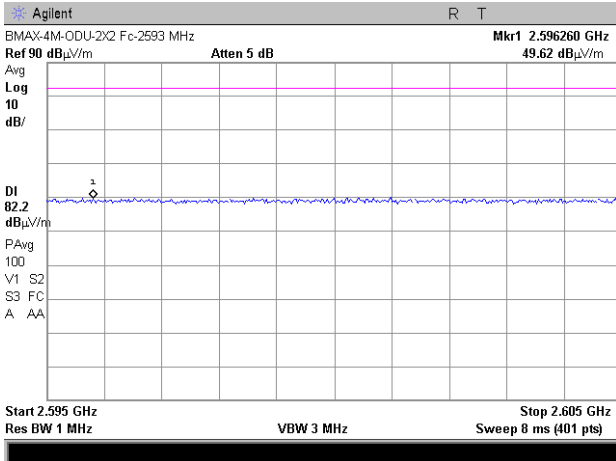
Middle frequency 2593MHz



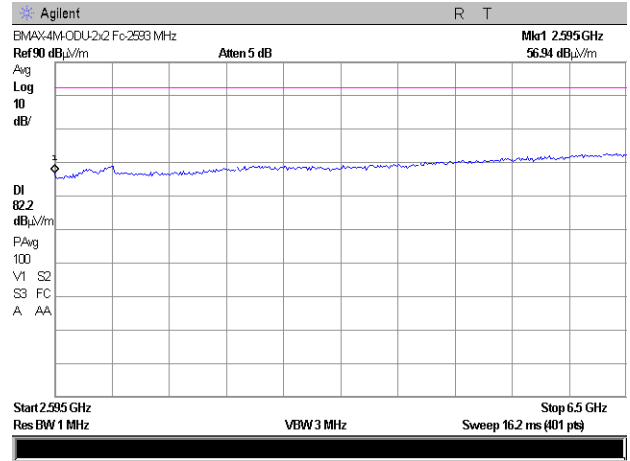
Plot # 97



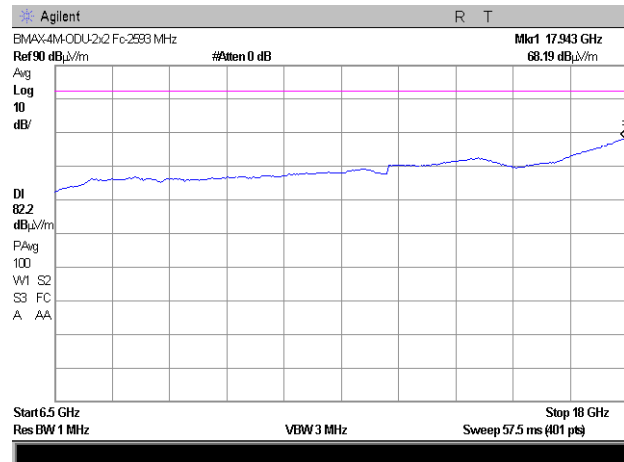
Plot #98



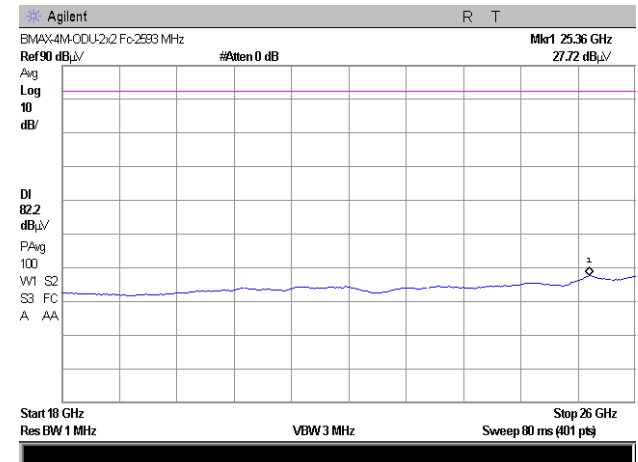
Plot #99



Plot #100



Plot # 101



Plot # 102



Test Report No.: 9012328334

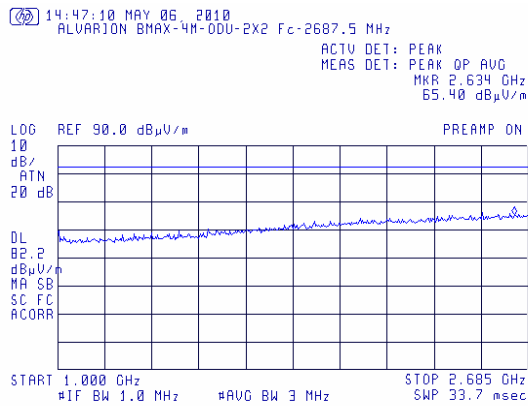
Page 43 of 60 Pages

Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

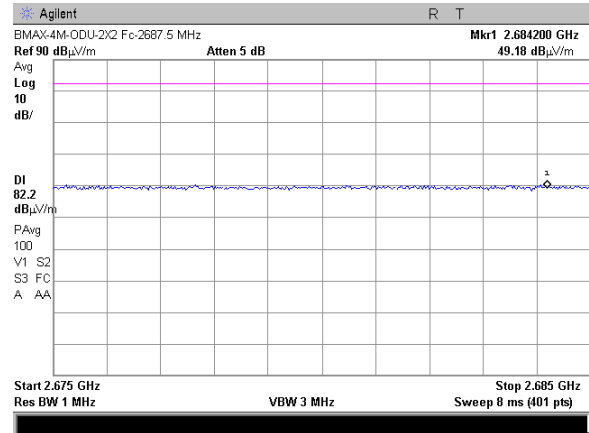
Model: ODU-2485-2690-000N-38-2x2-N-0

FCC ID: LKT-BMAX-2-OR-25

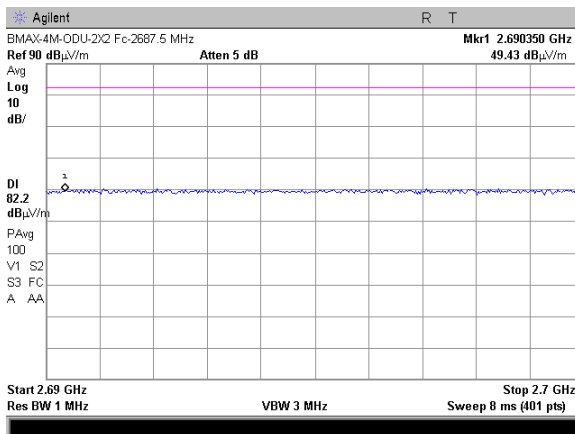
Top frequency 2687.5MHz



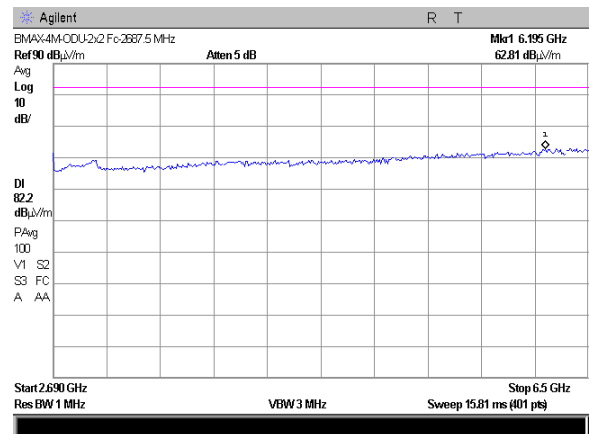
Plot # 103



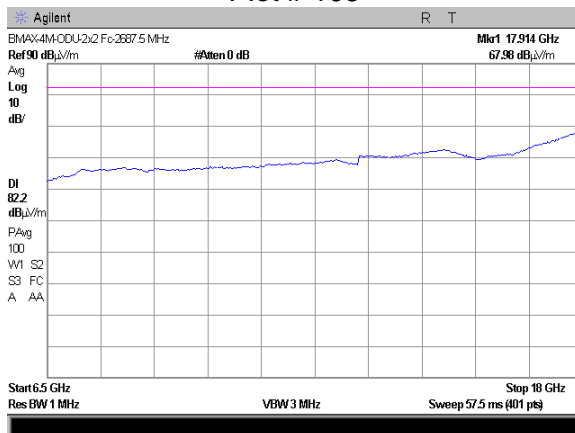
Plot # 104



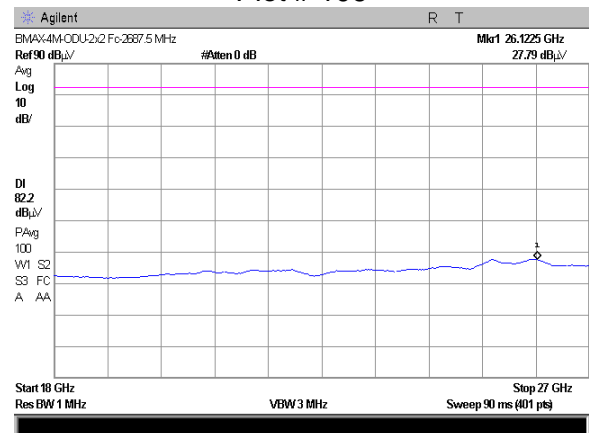
Plot # 105



Plot # 106



Plot # 107



Plot # 108



Test Report No.: 9012328334

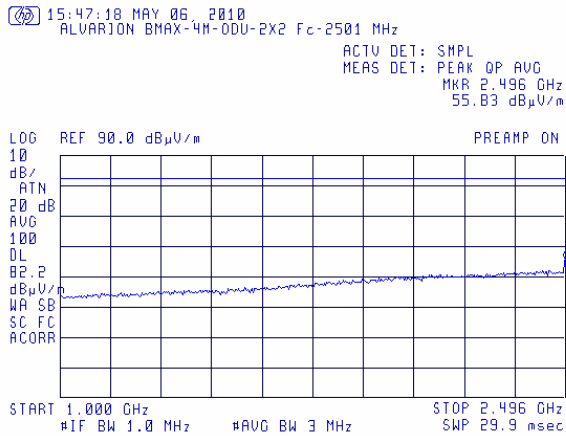
Page 44 of 60 Pages

Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

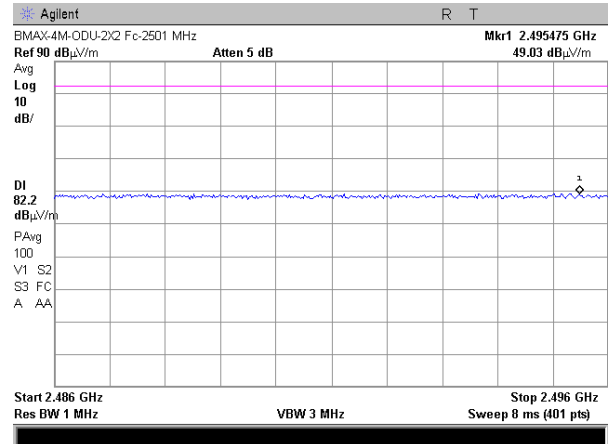
Model: ODU-2485-2690-000N-38-2x2-N-0

FCC ID: LKT-BMAX-2-OR-25

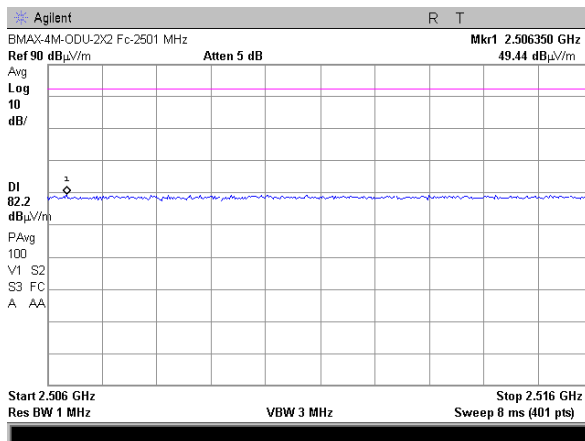
EBW = 10MHz
Bottom frequency 2501MHz



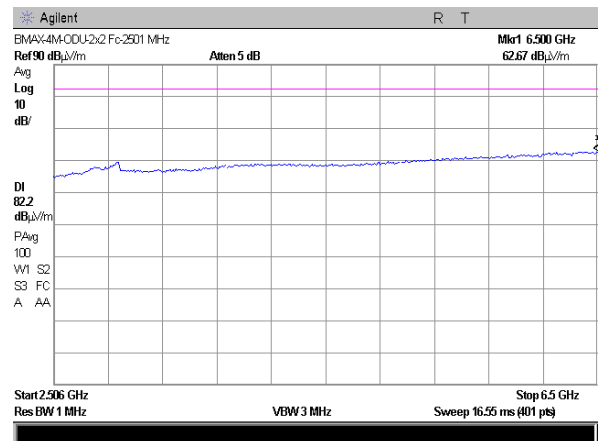
Plot # 109



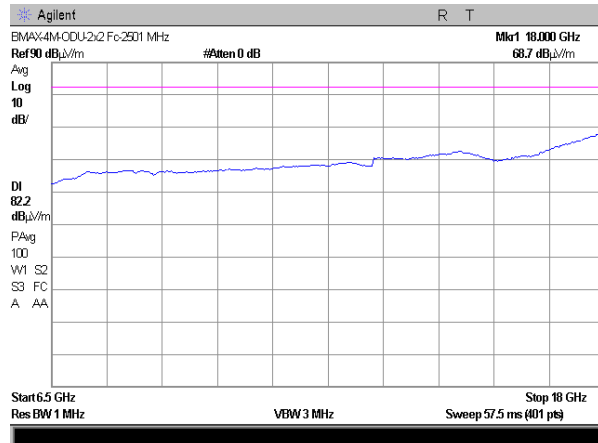
Plot # 110



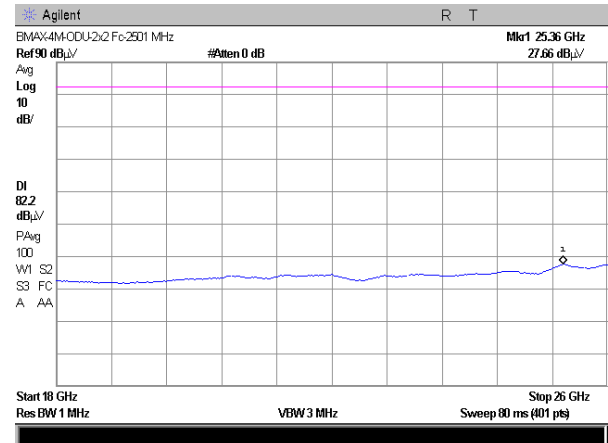
Plot # 111



Plot # 112



Plot # 113



Plot # 114



Test Report No.: 9012328334

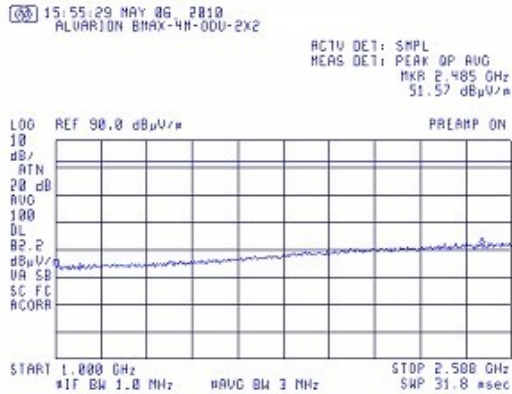
Page 45 of 60 Pages

Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

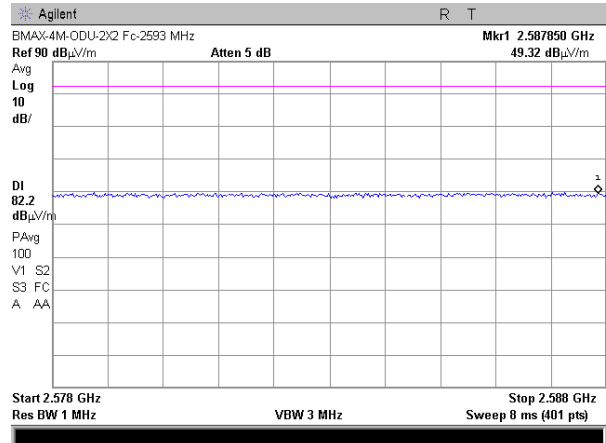
Model: ODU-2485-2690-000N-38-2x2-N-0

FCC ID: LKT-BMAX-2-OR-25

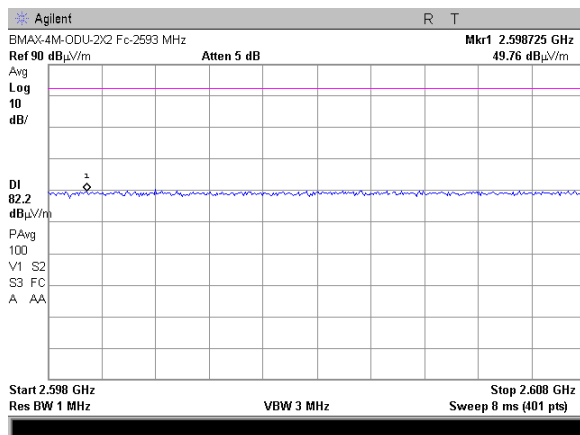
Middle frequency 2593MHz



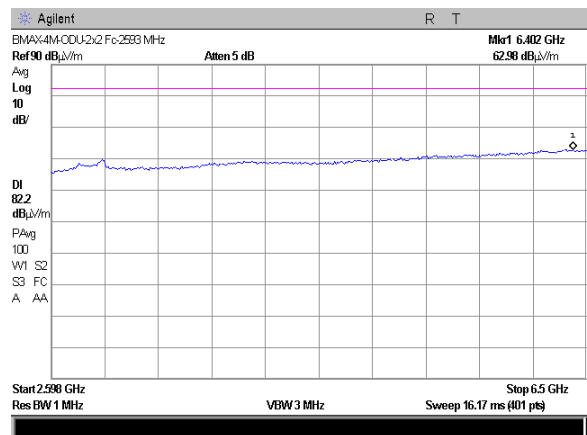
Plot # 115



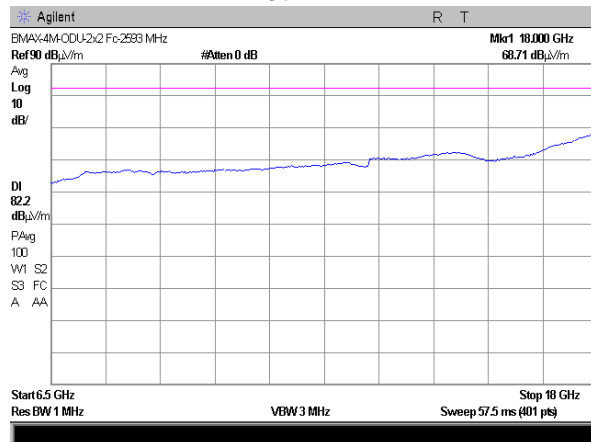
Plot # 116



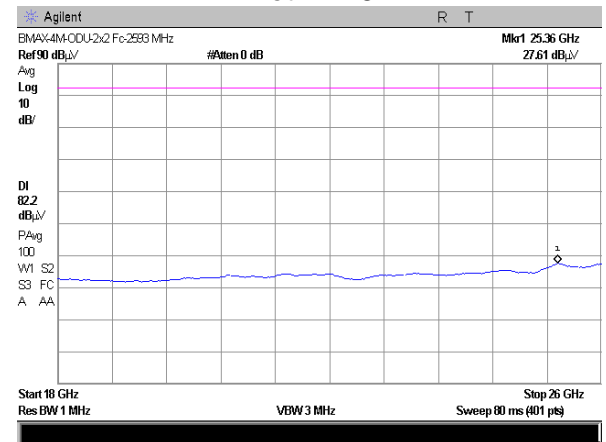
Plot # 117



Plot # 118



Plot # 119



Plot # 120



Test Report No.: 9012328334

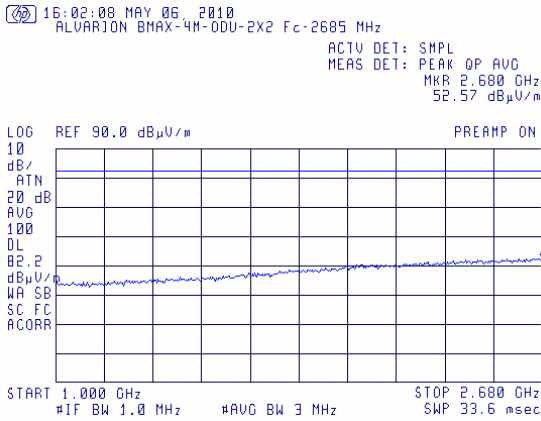
Page 46 of 60 Pages

Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

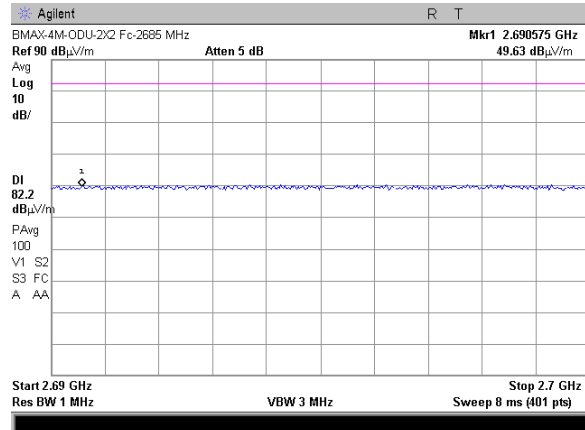
Model: ODU-2485-2690-000N-38-2x2-N-0

FCC ID: LKT-BMAX-2-OR-25

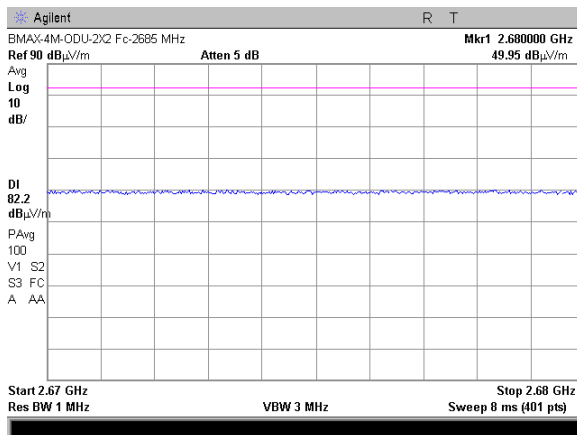
Top frequency 2685MHz



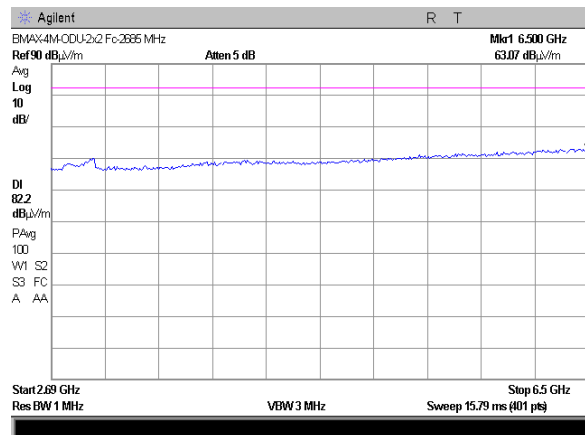
Plot # 121`



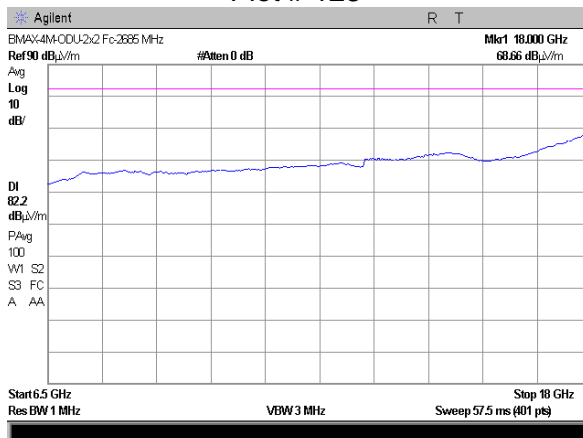
Plot # 122



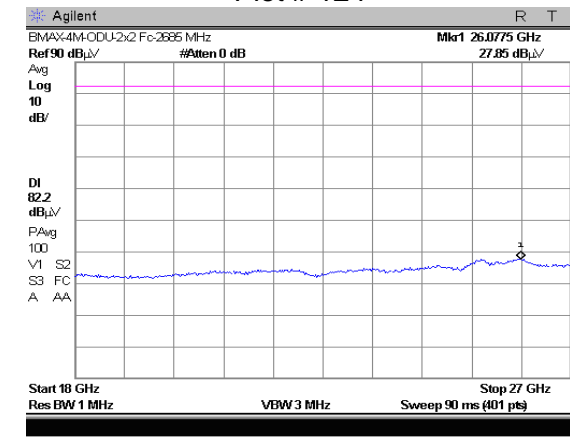
Plot # 123



Plot # 124



Plot # 125



Plot # 126

**Test Report No.:** 9012328334**Page 47 of 60 Pages****Title:** Test on BreezeMAX 4Motion Broadband Wireless Access System**Model:** ODU-2485-2690-000N-38-2x2-N-0**FCC ID:** LKT-BMAX-2-OR-25**3.6. Transmitter frequency stability according to § 27.54, 2.1055**

Operating frequency range:	2498.5 MHz-2687.5 MHz		
Ambient Temperature 21 ⁰ C	Relative Humidity 47%	Air Pressure 1006 hPa	

EUT: BMAX-4M-ODU-2X2

Modulation: CW

Table 9. Frequency stability test

Test Conditions		Lowest TX Frequency 2498.5 MHz	Highest TX Frequency 2687.5MHz
Test temperature, (°C)	Test voltage,(DC)		
+50	48	2498493970	2687499190
+40	48	2498496550	2687495380
+30	48	2498496480	2687497880
+20	Vmin (40.5)	2498496930	2687497230
	Vnom (48)	2498497500	2687497250
	Vmax (57)	2498497570	2687496470
+10	48	2498498370	2687496960
0	48	2498496000	2687496380
-10	48	2498496110	2687498150
-20	48	2498497080	2687496910
-30	48	2498497850	2687497640

Test Procedure

The EUT was placed in a climatic chamber and allowed to stabilize at 20°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% of nominal. 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 frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized frequency bands of operation

Test Summary

Transmitter carrier frequency stays within the authorized frequency band 2496MHz-2690MHz.

Test Equipment Used

2	3	12
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Test Report No.: 9012328334

Page 48 of 60 Pages

Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

Model: ODU-2485-2690-000N-38-2x2-N-0

FCC ID: LKT-BMAX-2-OR-25

3.7. Radiated Emission test according to §15 .109

Method of measurement	ANSI 63.4 §13.1.4		
Ambient Temperature 21° C	Relative Humidity 47%	Air Pressure 1006 hPa	

Test Procedure

The measurements were performed at the Open Area Test Site. EUT test configuration is shown in Fig.1. EUT was arranged on a wooden table 0.8m height, installed on a turntable. The measurements were performed at 10m distance. The Biconilog 30MHz – 2GHz antenna was used. The frequency range was investigated from 30MHz to 1GHz. The measurements were performed at each frequency, where the signal was 10dB below limit or less. The level was maximized by rotating turntable through 360°, varying the antenna height from 1m to 4m, rerouting EUT cables and changing antenna polarization from vertical to horizontal.

Limit

EUT radiated emission shall not exceed value required in section 15.109 class A

Test Summary

Test results are presented in table 10.

Test Equipment Used

6	7	10
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**Test Report No.:** 9012328334

Page 49 of 60 Pages

Title: Test on BreezeMAX 4Motion Broadband Wireless Access System**Model:** ODU-2485-2690-000N-38-2x2-N-0**FCC ID:** LKT-BMAX-2-OR-25**Table 10: Radiated emission test results**

No	Frequency (MHz)	Antenna Polariz	Antenna Height (cm)	Azimuth (°)	Emission Level Note 1 (dB μ V/m)	Limit @ 10 m Note 2 (dB μ V/m)	Margin (dB)	Results
1	30.7	V	120	125	29.6	39	-9.4	Complies
2	64.0	V	380	108	28.6	39	-10.4	Complies
3	81.2	V	380	141	25.0	39	-14.0	Complies
4	125.0	V	110	250	27.2	43.5	-16.3	Complies
5	132.0	V	120	260	25.6	43.5	-17.9	Complies
6	167.9	V	380	180	28.4	43.5	-15.1	Complies
7	237.9	H	390	289	28.5	46.5	-18.0	Complies
8	375.0	H	120	270	36.9	46.5	-9.6	Complies
9	395.8	H	120	180	26.7	46.5	-19.8	Complies
10	625.0	H	145	200	39.2	46.5	-7.3	Complies

Note 1: Emission level = E Reading (dB μ V) + Cable loss (dB) + Antenna Factor (dB/m)
For Cable Loss and Antenna Factor refer to Appendix 3.

Note 2: Margin (dB) = Emission level (dB μ V/m) - Limit (dB μ V/m).

**Test Report No.:** 9012328334

Page 50 of 60 Pages

Title: Test on BreezeMAX 4Motion Broadband Wireless Access System**Model:** ODU-2485-2690-000N-38-2x2-N-0**FCC ID:** LKT-BMAX-2-OR-25**3.8. Conducted Emission test according to §15.107**

Method of measurement	ANSI 63.4 §13.1.3		
Ambient Temperature 21° C	Relative Humidity 47%	Air Pressure 1006 hPa	

Test Procedure

The measurements were performed in the shielded chamber. EUT was arranged on a wooden table 0.8m height from the floor and 0.4m apart from the vertical reference plane. The measurements were performed at mains terminals of the power supply by means of LISN, connected to the spectrum analyzer in the frequency range 0.15 – 30MHz. The measurements were made with quasi-peak (CISPR) detector and average detector. The position of the EUT cables was varied to determine the maximum emission level.

Limit

Frequency, MHz	dB (dB μ V)	
	QP	AVG
0.15 – 0.5	66-56*	56-46*
0.5 – 5	56	46
5 - 30	60	50

* Decreases with the logarithm of the frequency

Test Summary

The test results are shown in plots ##127 – 128.

Test Equipment Used

7	8	9	10
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Test Report No.: 9012328334

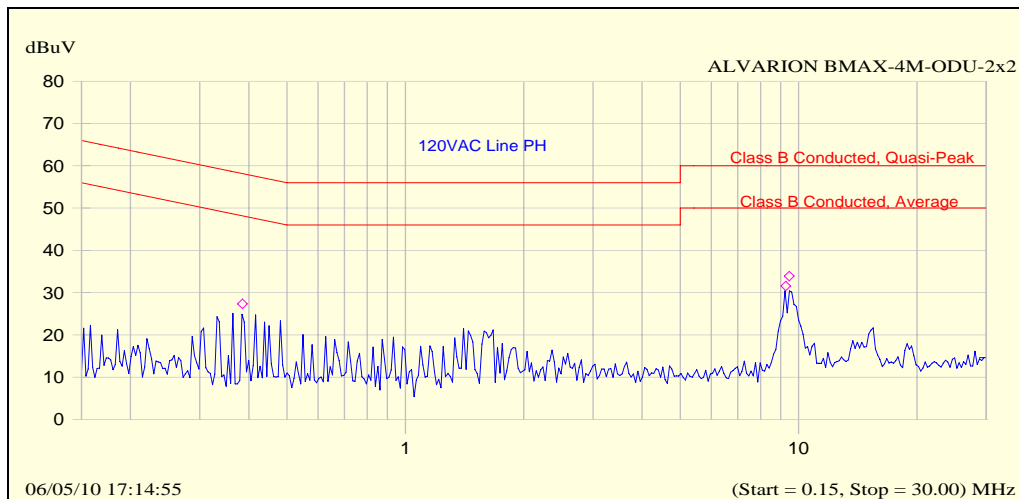
Page 51 of 60 Pages

Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

Model: ODU-2485-2690-000N-38-2x2-N-0

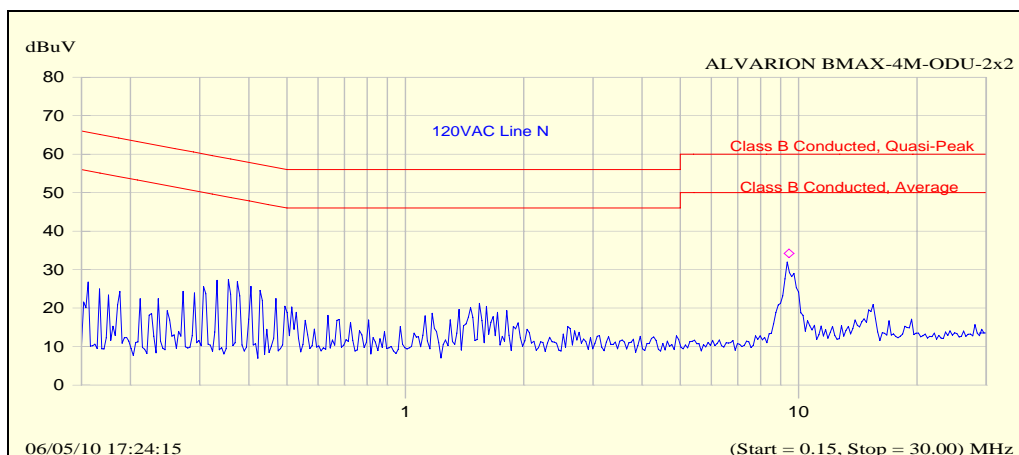
FCC ID: LKT-BMAX-2-OR-25

Plot#127: Conducted emission on 120VAC Phase line.



Frequency MHz	Peak dB μ V	QP dB μ V	QP Limit dB μ V	QP-QP Limit dB	Avg dB μ V	Avg Limit dB μ V	Avg-Avg Limit dB
0.39	27.3	19.5	58.2	-38.6	2.9	48.2	-45.3
9.28	31.6	29.1	60.0	-30.9	26.9	50.0	-23.1
9.46	33.9	31.6	60.0	-28.4	29.0	50.0	-21.0

Plot#128: Conducted emission on 120VAC Neutral line



Frequency MHz	Peak dB μ V	QP dB μ V	QP Limit dB μ V	QP-QP Limit dB	Avg dB μ V	Avg Limit dB μ V	Avg-Avg Limit dB
0.39	28.2	21.1	58.2	-37.1	2.8	48.2	-45.4
9.45	34.2	31.2	60.0	-28.8	28.5	50.0	-21.5
9.73	32.1	29.2	60.0	-30.8	25.3	50.0	-24.7

**Test Report No.:** 9012328334**Page 52 of 60 Pages****Title:** Test on BreezeMAX 4Motion Broadband Wireless Access System**Model:** ODU-2485-2690-000N-38-2x2-N-0**FCC ID:** LKT-BMAX-2-OR-25

4. Measurement uncertainty.

Were relevant, the following measurement uncertainty level have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

This uncertainty represents an expended uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test description	Expanded uncertainty
<u>Radiated emissions</u> in the open field test site at 3 m measuring distance: 30 MHz – 1.0 GHz 1.0 GHz – 18 GHz	2 Uc (E) = ± 4.32 dB 2 Uc (E) = ± 4.47 dB

Test Report No.: 9012328334

Page 53 of 60 Pages

Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

Model: ODU-2485-2690-000N-38-2x2-N-0

FCC ID: LKT-BMAX-2-OR-25

5. Appendix 1: Test illustrations



Photos #1-2. Test setup on OATS

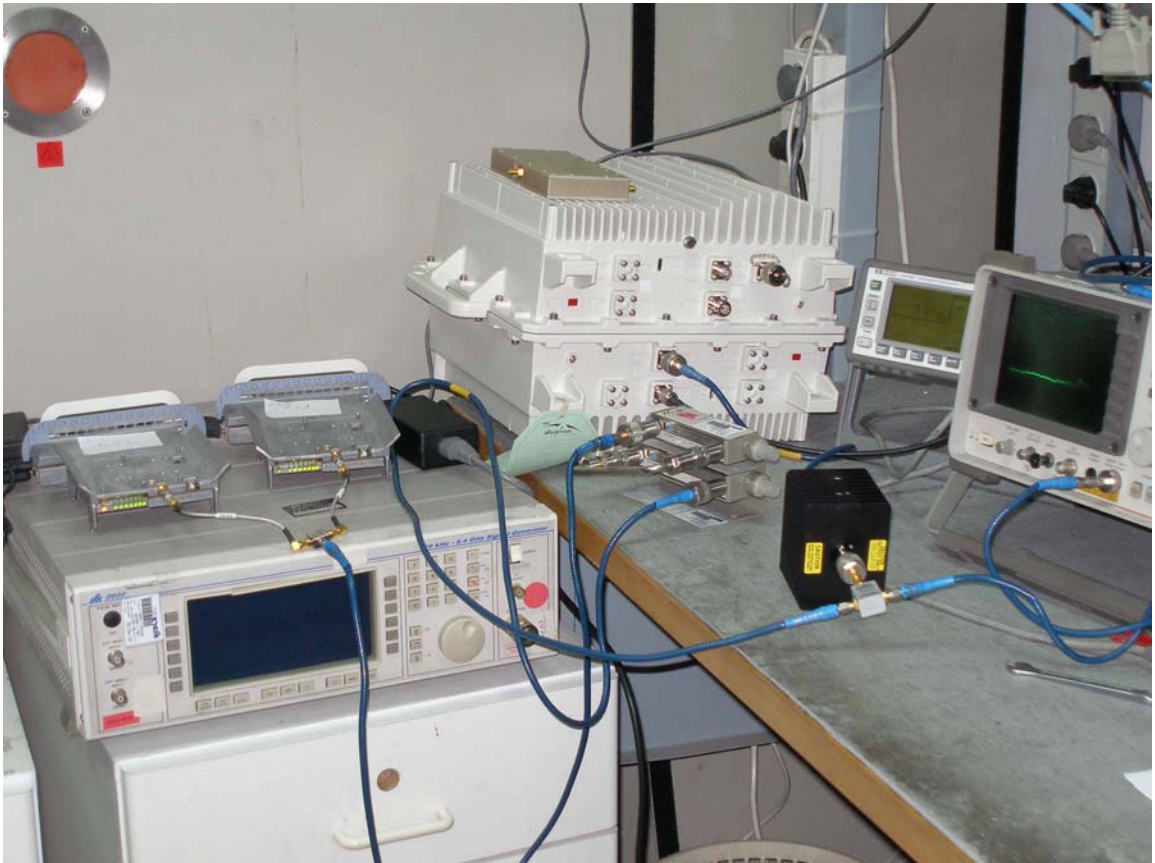
Test Report No.: 9012328334

Page 54 of 60 Pages

Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

Model: ODU-2485-2690-000N-38-2x2-N-0

FCC ID: LKT-BMAX-2-OR-25



Picture #3 Conducted emission measurements. Test setup

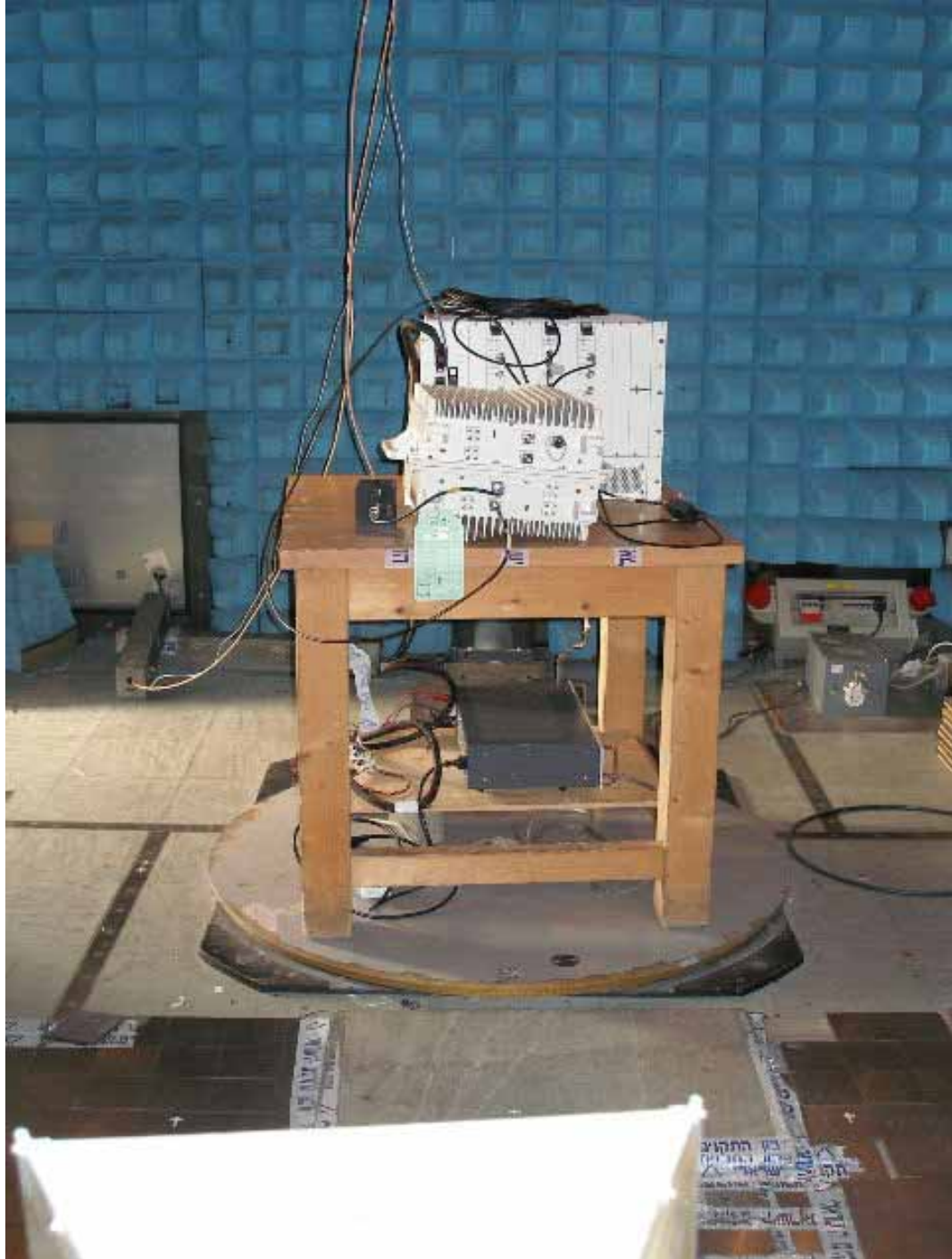
Test Report No.: 9012328334

Page 55 of 60 Pages

Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

Model: ODU-2485-2690-000N-38-2x2-N-0

FCC ID: LKT-BMAX-2-OR-25



Picture #4 Test setup in anechoic chamber

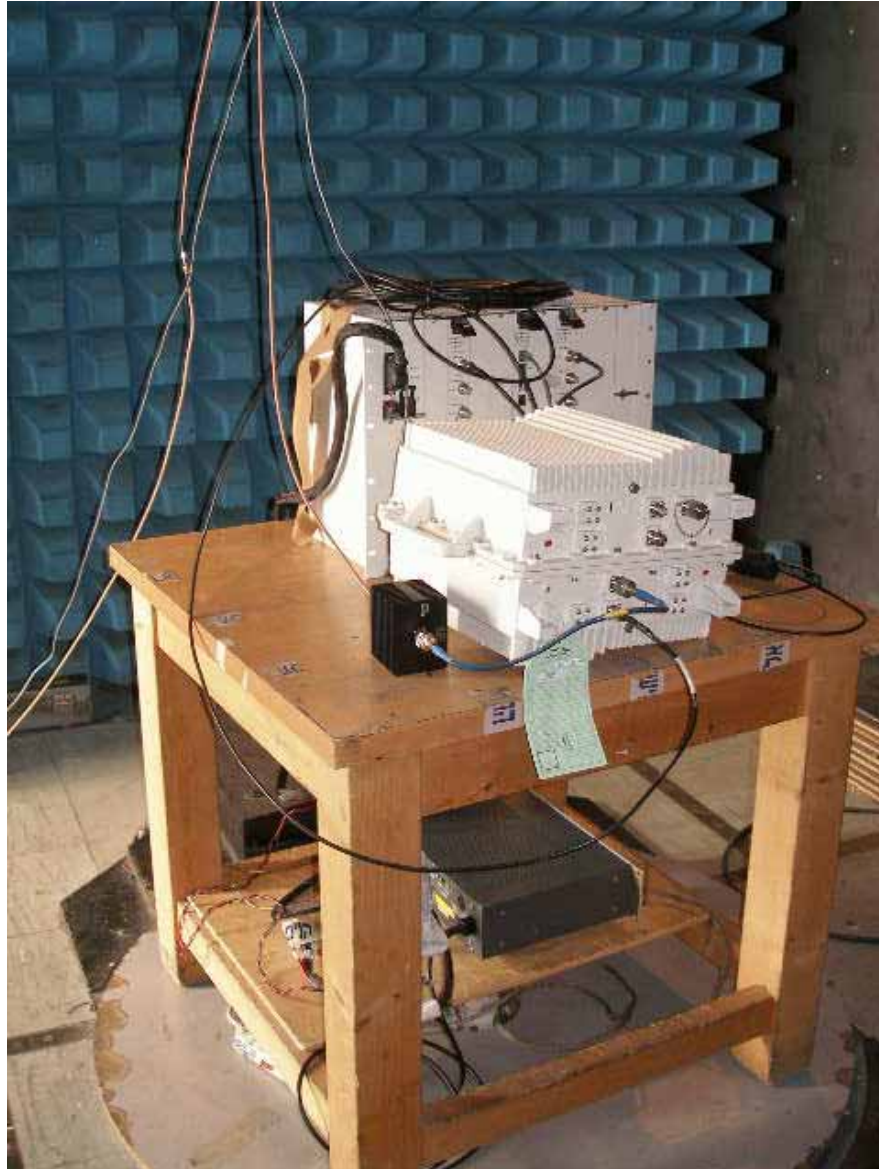
Test Report No.: 9012328334

Page 56 of 60 Pages

Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

Model: ODU-2485-2690-000N-38-2x2-N-0

FCC ID: LKT-BMAX-2-OR-25



Picture #5 Test setup in anechoic chamber

**Test Report No.:** 9012328334**Page 57 of 60 Pages****Title:** Test on BreezeMAX 4Motion Broadband Wireless Access System**Model:** ODU-2485-2690-000N-38-2x2-N-0**FCC ID:** LKT-BMAX-2-OR-25

6. Appendix 2: Test equipment used

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

No	Description	Manufacturer information			Due Calibration date
		Name	Model No	Serial No	
1	Spectrum Analyzer 9 kHz – 50 GHz	HP	8565E	3720A00699	06/2010
2	Spectrum Analyzer 9 kHz - 26.5 GHz	Agilent	E4407B	US40241729	06/2010
3	Attenuators 30 dB 100W	Inmet	64671	6N100W-30	06/2010
4	Cable RF 1m	Huber-Suhner	Sucoflex 104	21324/4PE	10/2010
5	Double Ridged Guide Antenna 1 – 18 GHz	EMCO	3115	5802	08/2010
6	Antenna Biconilog 30 – 2000 MHz	Schaffner- Chase	CBL6112B	S/N 23181	08/2010
7	EMI Receiver 9 kHz-6.5 GHz	HP	8546A+85460A	SII 4068	05/2011
8	LISN 9 kHz – 30 MHz	FCC	LISN 250-32-4- 16	SII5023	10/2010
9	Transient limiter 0.009-200 MHz	HP	11947A	3107105	10/2010
10	Spectrum analyzer 10 KHz-26.5 GHz	HP	E7405A	SII 4944	12/2010
11	Attenuator 50Ohm 3dB DC-18GHz	HP	8491B	50655	06/2010
12	Cable RF 3m	Huber-Suhner	Sucoflex 104PE	21328/4PE	10/2010



Test Report No.: 9012328334

Page 58 of 60 Pages

Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

Model: ODU-2485-2690-000N-38-2x2-N-0

FCC ID: LKT-BMAX-2-OR-25

7. Appendix 3: Antenna Factor and Cable Loss

Cable Loss (10m cable + Mast)

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

Antenna Factor

For Biconilog Antenna, Model Number: CBL6112D, S/N: 23181
10 m distance

No.	f / MHz	AF / dB/m	f / MHz	AF / dB/m
1	30	19.1	160	10.0
2	35	16.0	180	9.5
3	40	13.4	200	9.4
4	45	10.4	250	12.0
5	50	8.3	300	13.1
6	60	6.8	400	15.7
7	70	6.3	500	17.2
8	80	6.8	600	18.3
9	90	8.7	700	19.1
10	100	10.8	800	19.8
11	120	12.2	900	20.7
12	140	11.3	1000	21.2



Test Report No.: 9012328334

Page 59 of 60 Pages

Title: Test on BreezeMAX 4Motion Broadband Wireless Access System

Model: ODU-2485-2690-000N-38-2x2-N-0

FCC ID: LKT-BMAX-2-OR-25

Antenna Factor

Double Ridged Guide Antenna mfr EMCO model 3115 1m calibration

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

**Test Report No.:** 9012328334**Page 60 of 60 Pages****Title:** Test on BreezeMAX 4Motion Broadband Wireless Access System**Model:** ODU-2485-2690-000N-38-2x2-N-0**FCC ID:** LKT-BMAX-2-OR-25

8. Appendix 4: 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	width

Reference specifications

47CFR part 15:2007	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.