



**Test Report No. 9012327928**

**For ALVARION Ltd.**

**Equipment Under Test:**

**BreezeMAX 2300  
Broadband Wireless Access System**

**Base station (AU).**

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



**AClass Accreditation Services**

**Certificate Number: IT-1359**



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**Title: BreezeMax 2300 Broadband Wireless Access System**

**Model: BMAX-BST-AU-ODU-HP-2.3**

**FCC ID: LKT-BMAX-BA23**

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## 1. Applicant information

<b>Applicant:</b>	Alvarion Ltd
<b>Address:</b>	21A Habarzel str, Tel-Aviv, 69710, Israel
<b>Sample for test selected by:</b>	The customer
<b>The date of test:</b>	22, 26 April 2010

### Equipment under test information

<b>Description of Equipment Under Test (EUT):</b>	Transmitter BreezeMAX 2300
<b>Model:</b>	BMAX-BST-AU-ODU-HP-2.3
<b>Serial Number:</b>	NA
<b>Manufactured by:</b>	Alvarion Ltd

## 2. Test performance

<b>Location:</b>	SII EMC Section
<b>Purpose of test:</b>	Apparatus compliance verification in accordance with emission requirements
<b>Test specifications:</b>	47CFR part 15, part 27, part 2 §§ 2.1049, 2.1053, part 1 §1.1310

This Test Report contains 29 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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**3. Summary of test:**

**The EUT was found to be in compliance with requirements of:** 47CFR part 27, §§ 27.50, 27.53, 27.54 and part 2 §§ 2.1049

Transmitter characteristics	Subclasses
Transmitter characteristics	
Occupied bandwidth	2.1049
Peak output power	27.50
Spurious emissions at antenna terminal	27.53
Spurious emissions radiated	27.53
Frequency stability	27.54
Unwanted radiated emissions below 1 GHz	see SII test report # 8612329133

Test performed by: Mr. Michael Feldman test technician

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

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
<b><u>Radiated emissions</u></b> 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

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#### 4. Equipment under test description.

\*The customer provided description.

##### 4.1 General description

**BreezeMAX 2300** is Alvarion's WiMAX platform for the licensed 2.3 GHz WCS frequency band. It is digital modulated TDD system operating in the 2300MHz up to 2360MHz band with OFDM modulation. The Base station -AU outdoor unit contain the radio {Basic + HPA} and digital control section unit. The AU comprises an Indoor Unit (IDU) and an Outdoor Unit (ODU). The AU-IDU module connects to the AU-ODU via an Intermediate Frequency (IF) cable. The IF cable carries full duplex data, control and management signals between the AU-IDU and the AU-ODU, as well as power (48 VDC) and 64 MHz synchronization reference clock from the AU-IDU to the AU-ODU.

##### EUT technical characteristics

Technical characteristics of transmitter.		Note	
Stand-alone/fixed use	Always at distance at least 2 m from the people and public area		
Assigned frequency range	2305 – 2320 MHz and 2345 – 2360 MHz		
Declare frequency range	2315 – 2320 MHz and 2345 – 2350 MHz		
Operating frequencies	2316.75 MHz and 2348.25 MHz		
Antenna connection	N-Type connector	Professional installation	
Transmitter 99% power bandwidth	3.5 MHz		
Type of modulation	BPSK, 4QAM, 16QAM, 64QAM		
Type of multiplexing	OFDM		
Modulating test signal (baseband)	PRBS		
Maximum transmitter duty cycle in normal use	50 %		
Transmitter duty cycle supplied for test	100 %		
Antenna information			
Type	Manufacturer	Model	Gain
Tilt panel antenna	Argus Technologies	TLLPX310M-E1	17 dBi

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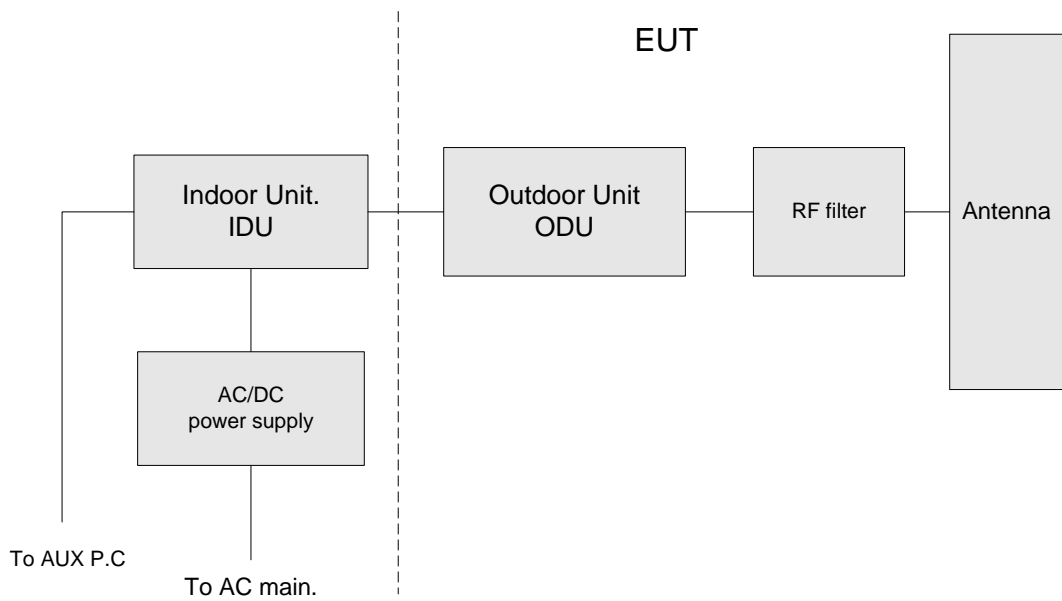
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#### 4.2 EUT configuration.



**Fig. 1. BMAX-BST-AU-ODU-HP-2.3 configuration.**



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**5. Test results**

**5.1 Transmitter characteristics**

**5.1.1 Occupied bandwidth according to § 2.1049**

Method of measurement	ANSI 63.4 §13.1.7		
Operating Frequency Range	2315 – 2320 MHz, 2345 – 2350 MHz		
Ambient Temperature	21 <sup>0</sup> C	Relative Humidity	47% Air Pressure 1006 hPa

Carrier frequency MHz	Measured 99% occupied bandwidth, MHz	Reference to plot #
2316.75	3.23	1
2348.25	3.23	2

**TEST PROCEDURE**

The measurements were performed in normal (transmitting) mode at all transmitted carrier (channel) frequencies of the 2.315 – 2.320 GHz and 2.345 – 2.350 GHz frequency ranges 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	3	5				
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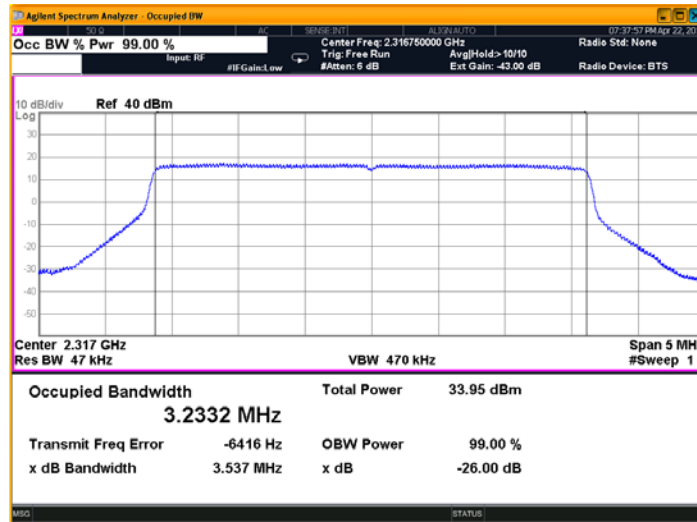
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Title: BreezeMax 2300 Broadband Wireless Access System

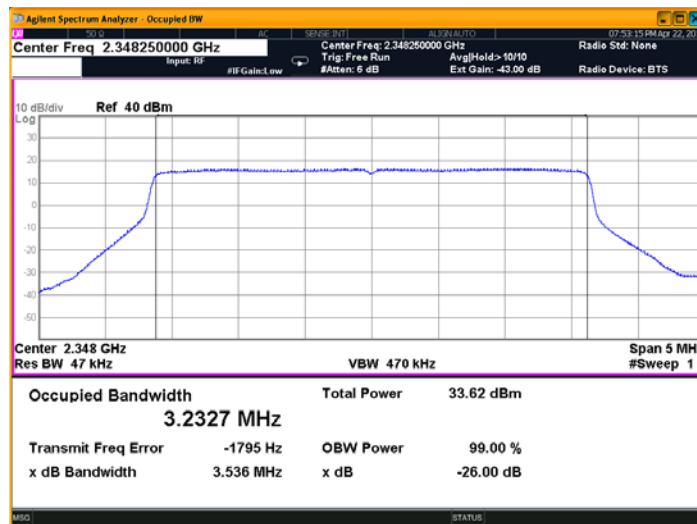
Model: BMAX-BST-AU-ODU-HP-2.3

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Occupied bandwidth test.



Plot # 1. Carrier Frequency 2316.75 MHz



Plot # 2. Carrier Frequency 2348.25 MHz





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5.1.2 Peak output power test § 27.50

Operating Frequency Range 2315 – 2320 MHz, 2345 – 2350 MHz
Ambient Temperature 21° C Relative Humidity 47% Air Pressure 1006 hPa

Table with 6 columns: Carrier frequency MHz, Peak output power dBm, EIRP output power dBm, Limit dBm, Margin dB, Reference to plot #. Rows show data for 2316.75 MHz and 2348.25 MHz.

\* EIRP output power = P output at antenna terminal + Antenna gain (17 dBi).

The following power limits apply to the 2305 – 2320 MHz and 2345 – 2360 MHz bands: Fixed, land, and radiolocation station transmitting are limited to 2000W (63 dBm) peak equivalent isotropically radiated power

TEST PROCEDURE

Calculation of measured output power with external antenna was performed as follows: Plot result + Ant. gain. The measurements were performed in normal (transmitting) mode at all transmitted carrier (channel) frequencies of the 2.315 - 2.320 GHz and 2.345 – 2.350 GHz frequency ranges 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:

Table with 7 empty columns for listing test equipment used.



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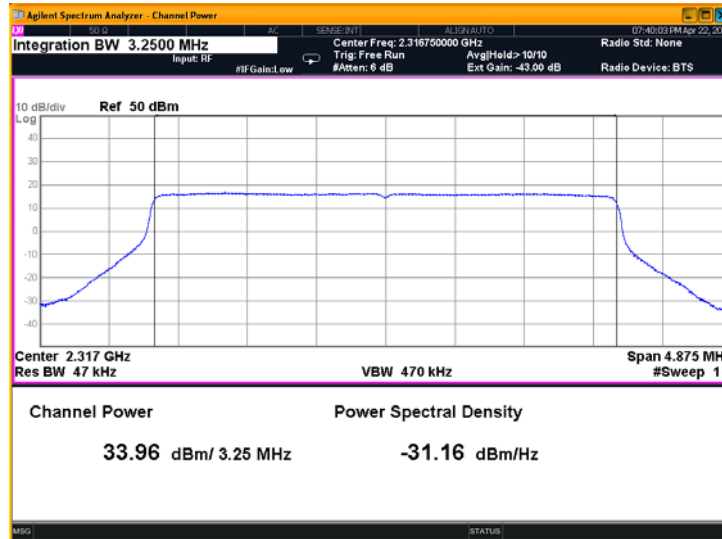
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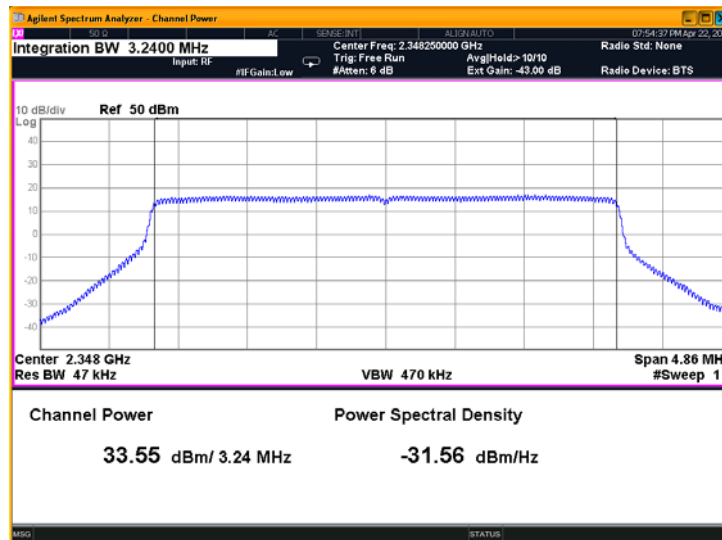
Model: BMAX-BST-AU-ODU-HP-2.3

FCC ID: LKT-BMAX-BA23

Output power test results.



Plot # 3. Carrier Frequency 2316.75 MHz



Plot # 4. Carrier Frequency 2348.25 MHz.

\* Insertion loss of external attenuator, directional coupler and cable = 43 dB.

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Operating Frequency Range      2315 – 2320 MHz, 2345 – 2350 MHz  
 Ambient Temperature    21<sup>0</sup> C      Relative Humidity      47%      Air Pressure      1006 hPa

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 undesired emission more than 20 dB lower than the specified limit was not recorded in the tables.

**Carrier frequency – 2316.75 MHz.**

Frequency, MHz	Spurious emission level, dBm	Calculated limit, dBm	Margin dB	Reference to plot #
1522	-45.1	-40	5.1	5
2315	-24.2	-13	11.2	7
2320.1	-51.0	-50	1.0	8
2350.2	-44.0	-40	4.0	9
6503	-45.2	-40	5.2	10

**Carrier frequency – 2348.25 MHz.**

Frequency, MHz	Spurious emission level, dBm	Calculated limit, dBm	Margin dB	Reference to plot #
1568	-44.8	-40	4.8	12
2345	-52.5	-50	2.5	14
2350	-35.0	-13	22.0	16
7190	-54.0	-40	14.0	17



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**LIMIT**

For operation in the bands 2305 –2320 MHz and 2345 – 2360 MHz, the power of any emissions outside the licensee’s frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by the following amounts:

Below 2300 MHz and above 2370 MHz by factor not less then  $70+10\log(P)$  dB = -40 dBm.

On all frequencies from 2300 to 2320 MHz and 2345 to 2370 MHz by factor not less then  $43+10\log(P)$  dB = -13 dBm.

On all frequencies from 2320 to 2345 MHz by factor not less then  $80+10\log(P)$  dB = -50 dBm.

**TEST PROCEDURE**

The measurements were performed in normal (transmitting) mode at all transmitted carrier (channel) frequencies of the 2315 - 2320 MHz and 2345 -2350 MHz frequency ranges 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	5				
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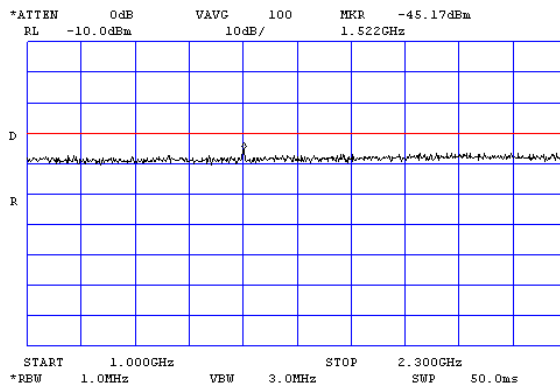
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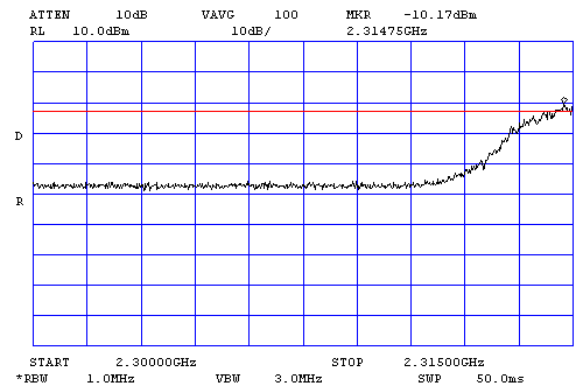
FCC ID: LKT-BMAX-BA23

Spurious emissions at antenna terminal.

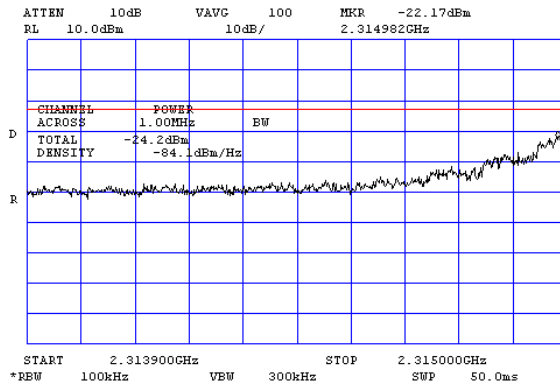
Carrier frequency 2316.75 MHz.



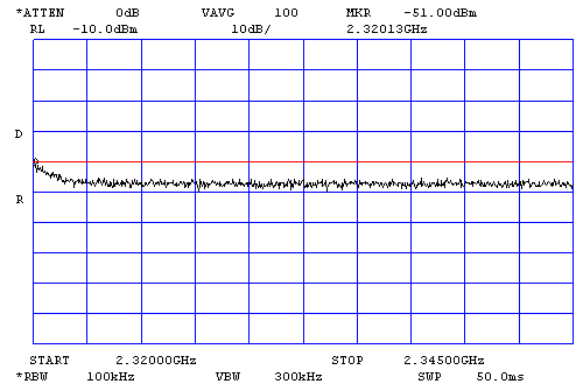
Plot # 5



Plot # 6



Plot # 7.



Plot # 8



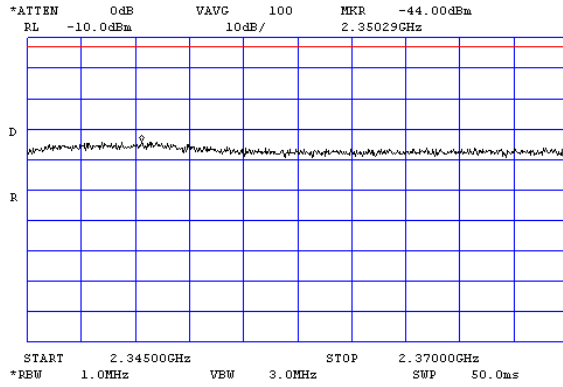
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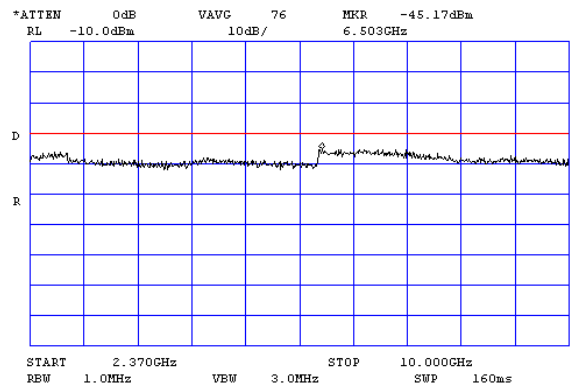
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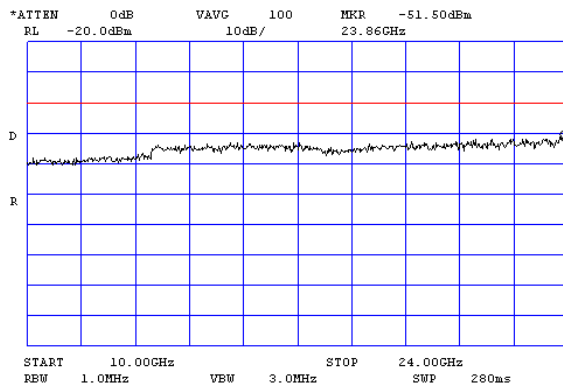
**FCC ID: LKT-BMAX-BA23**



Plot # 9.



Plot # 10



Plot # 11



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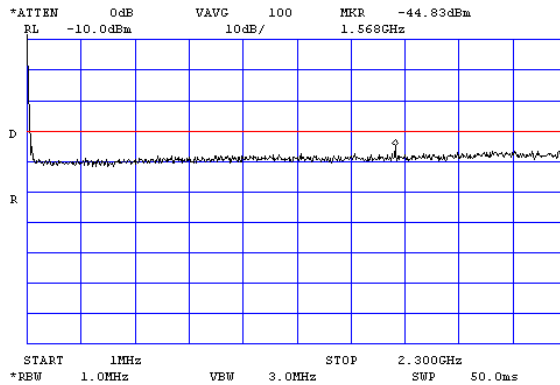
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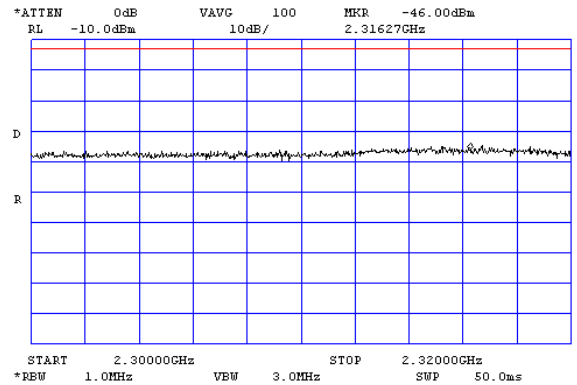
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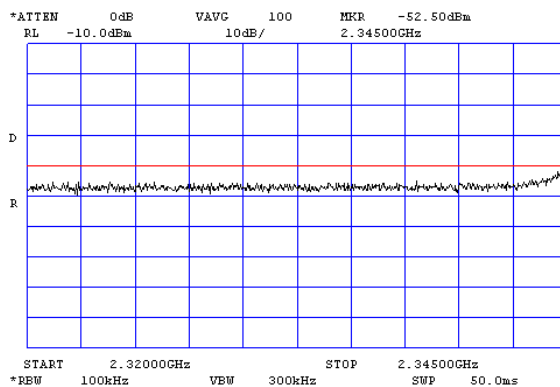
Carrier frequency 2348.25 MHz.



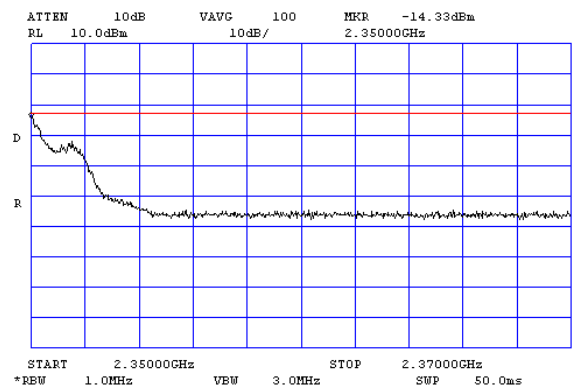
Plot # 12



Plot # 13



Plot # 14.



Plot # 15





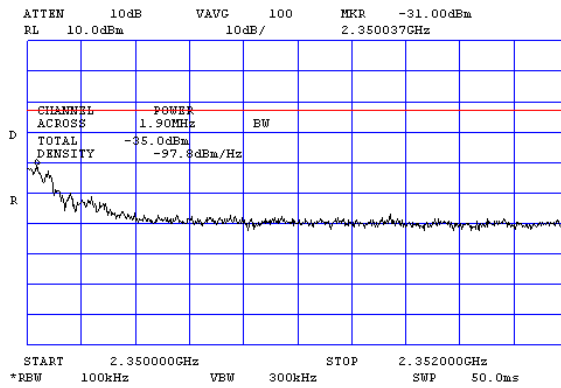
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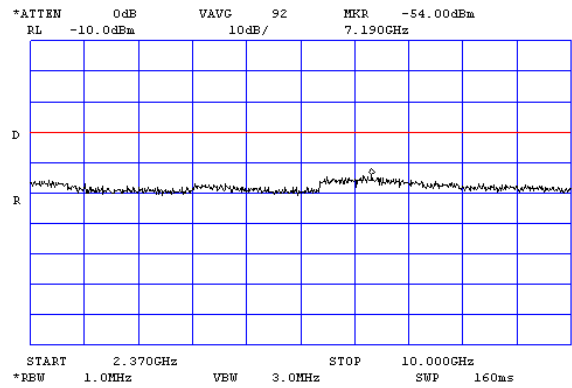
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Model: BMAX-BST-AU-ODU-HP-2.3

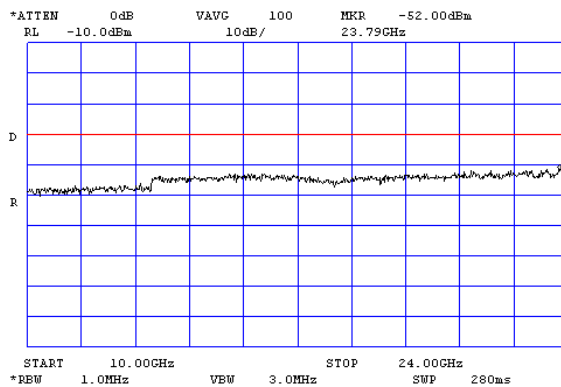
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Plot # 16.



Plot # 17



Plot # 18

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#### 5.1.4 Radiated emissions test according to §§ 2.1053, 27.53

Operating Frequency Range      2315 – 2320 MHz, 2345 – 2350 MHz  
 Ambient Temperature    21<sup>0</sup> C      Relative Humidity      48%      Air Pressure      1006 hPa

##### Carrier frequency 2316.75 MHz

Frequency, MHz	Radiated emissions, dBm	Limit, dBm	Margin, dB	Note	Reference to plot #
2264.2	-47.1	-40	7.1		19
2315	-17.4	-13	4.4		21
2320	-50.6	-50	0.6	1m test distance	23
6139	-47.5	-40	7.5	Noise floor	25

##### Carrier frequency 2348.25 MHz

Frequency, MHz	Radiated emissions, dBm	Limit, dBm	Margin, dB	Note	Reference to plot #
2235	-47.1	-40	7.1		27
2345	-50.5	-50	0.5	1m test distance	30
2350	-21.9	-13	8.9		32
6386	-47.7	-40	7.7	Noise floor	33

#### TEST PROCEDURE

The test was performed at worse case configuration included antenna instead dummy load. 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. No emissions except at band-edge points were found.

The emission levels of the EUT more than 20 dB lower than the specified limit were not recorded in the tables. For the test results refer to the tables and plots in this section.



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**Substitution method.**

The measurements were performed according to ANSI/TIA-603-C-2004 section 2.2.12 test method. 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. Transmitter was operated in follow carrier frequencies 2316.75 MHz and 2348.25 MHz.

**LIMIT**

Any emissions outside of the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) by the following amount:

Below 2300 MHz and above 2370 MHz by factor not less then  $70+10 \log(P)$  dB = -40 dBm @ 55.2 dB $\mu$ V/m at 3m distance.

On all frequencies from 2300 to 2320 MHz and 2345 to 2370 MHz by factor not less then  $43+10\text{Log}(P)$  dB = -13 dBm @ 82.2 dB $\mu$ V/m at 3m distance.

On all frequencies from 2320 to 2345 MHz by factor not less then  $80+10\text{Log}(P)$  dB = -50 dBm @ 45.2 dB $\mu$ V/m at 3m distance.

**TEST EQUIPMENT USED:**

5	6	7	8	9	13	
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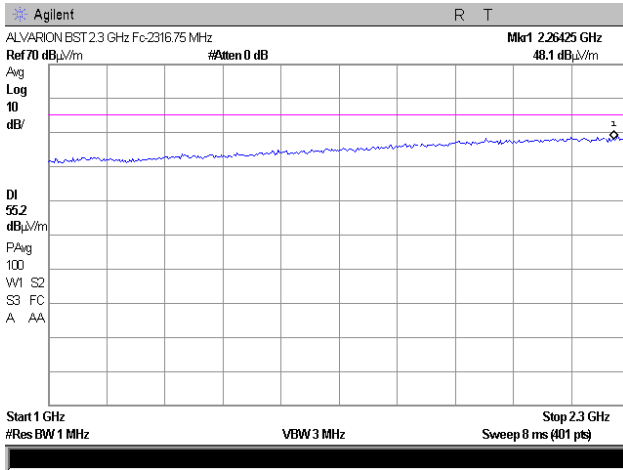
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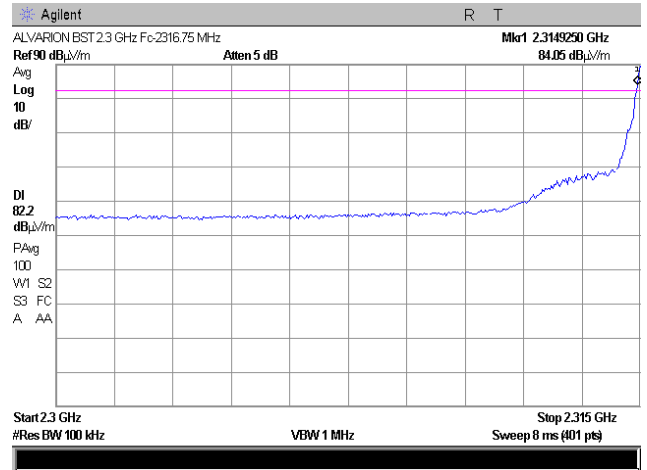
Model: BMAX-BST-AU-ODU-HP-2.3

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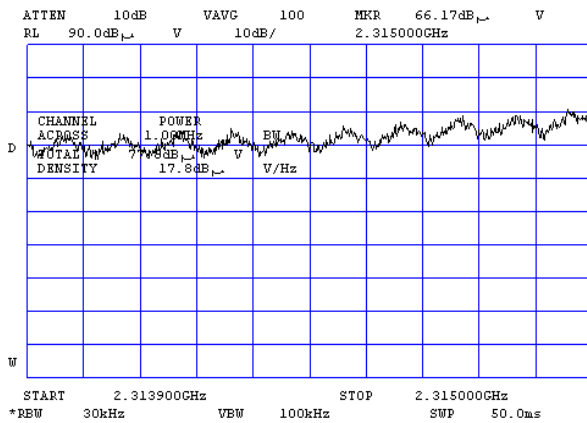
Carrier frequency 2316.75 MHz.



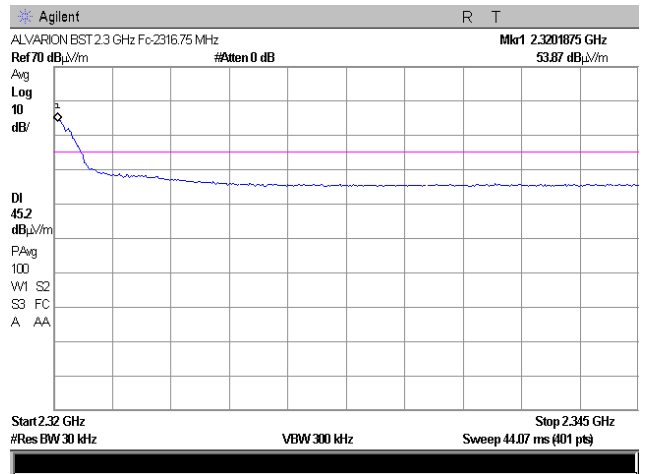
Plot # 19



Plot # 20



Plot # 21.



Plot # 22



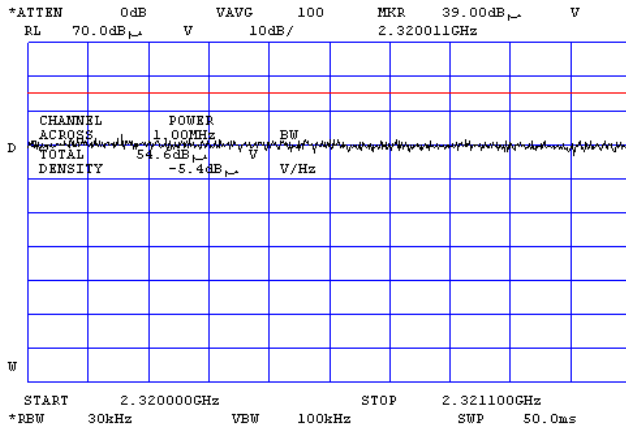
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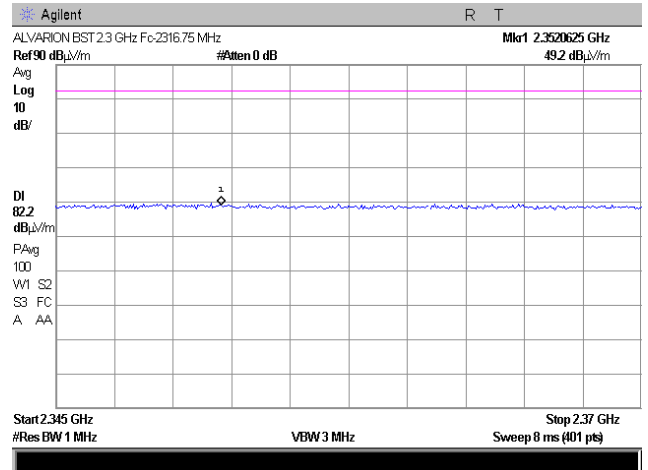
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Model: BMAX-BST-AU-ODU-HP-2.3

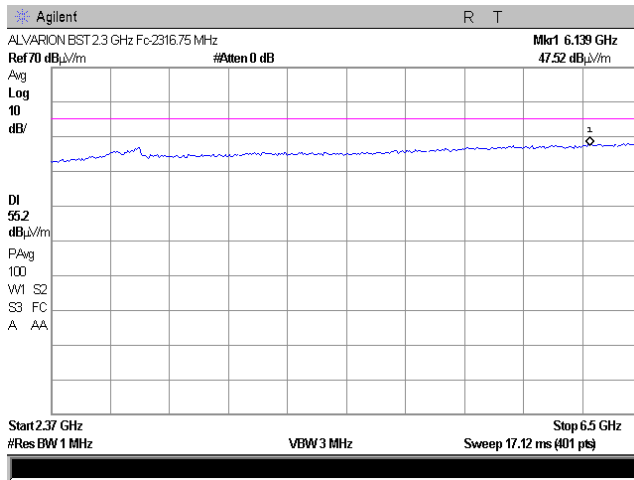
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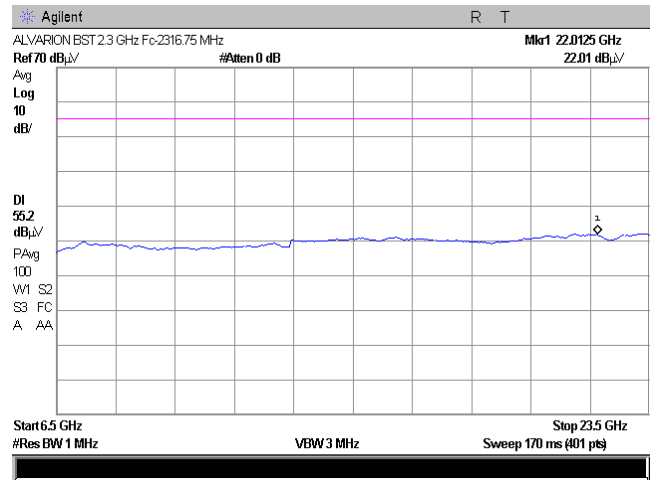
Plot # 23.



Plot # 24



Plot # 25



Plot # 26



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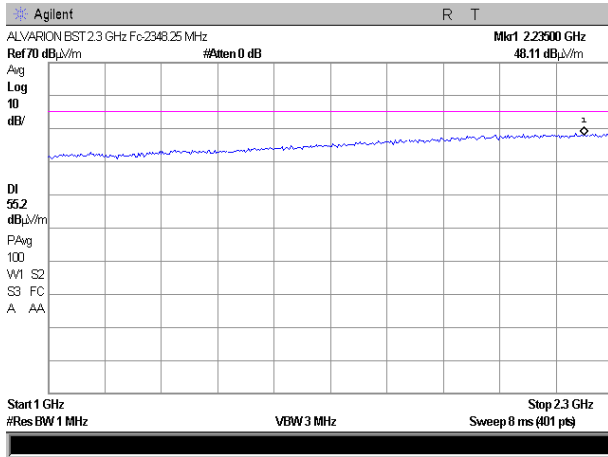
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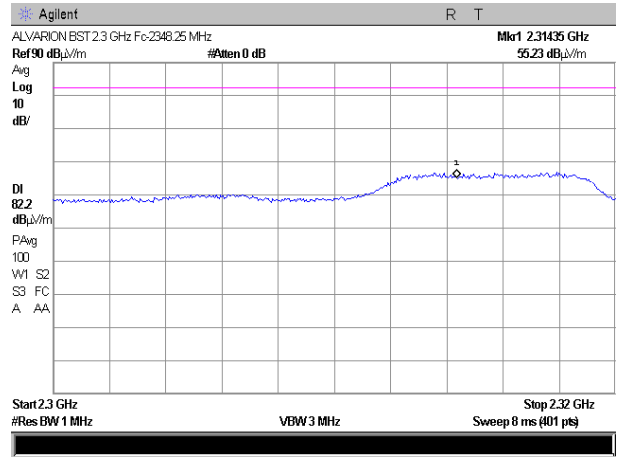
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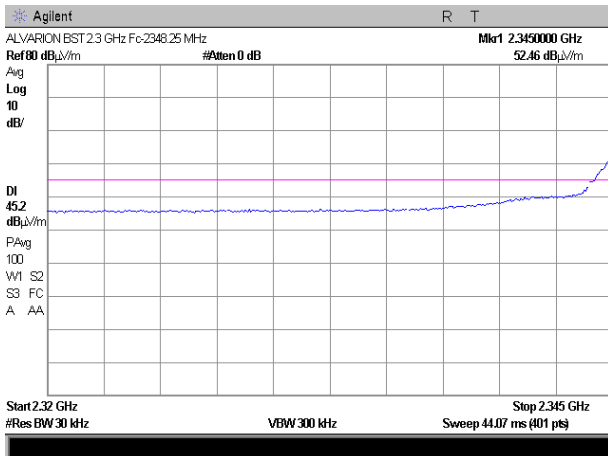
Carrier frequency 2348.25 MHz.



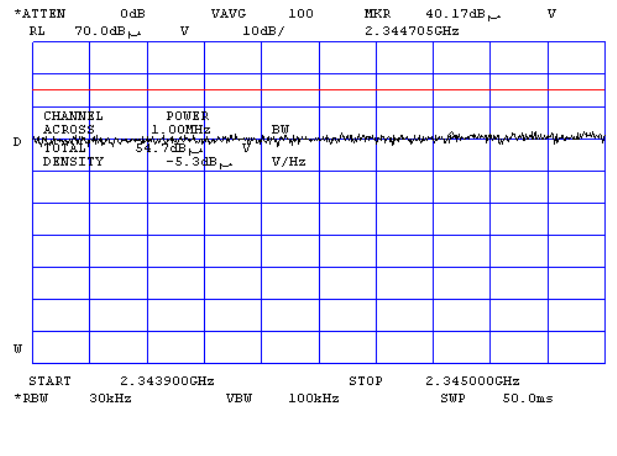
Plot # 27



Plot # 28



Plot # 29.



Plot # 30



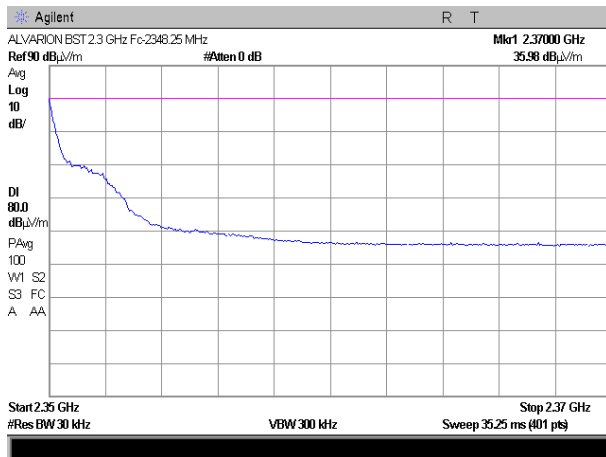
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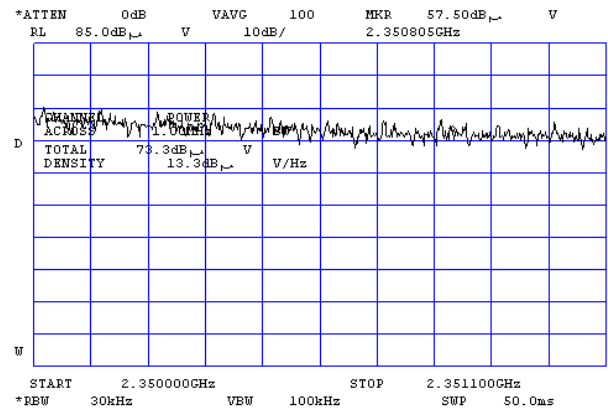
Title: BreezeMax 2300 Broadband Wireless Access System

Model: BMAX-BST-AU-ODU-HP-2.3

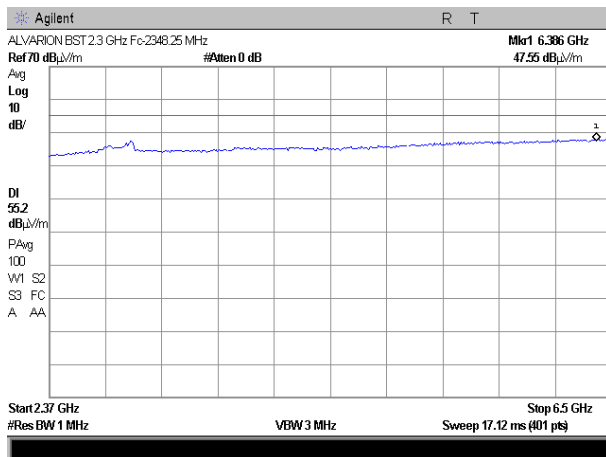
FCC ID: LKT-BMAX-BA23



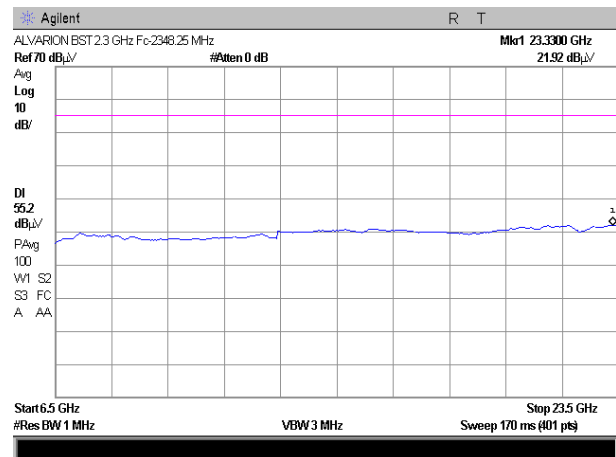
Plot # 31.



Plot # 32



Plot # 33



Plot # 34





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5.1.5 Frequency stability test according to § 27.54

Operating Frequency Range 2315 – 2320 MHz, 2345 – 2350 MHz
Ambient Temperature 23° C Relative Humidity 48% Air Pressure 1004 hPa

Table with 4 columns: TEST CONDITIONS (Test temperature, Test voltage(AC)), Carrier frequency, 2316.75MHz, Carrier frequency, 2348.25MHz. Rows include temperatures from +25°C to +45°C and voltage levels Vmin, Vmax, Vnom.

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% of nominal. Frequency changes were noted. The temperature in climatic chamber was varied from -5°C to +45°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 frequencies stay within the authorized frequency bands 2315 -2320 MHz and 2345 - 2350 MHz.

TEST EQUIPMENT USED:

Table with 7 empty cells for equipment details.

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## APPENDIX A      Photographs



**Photo 1. Conducted measurements. Test setup.**



**Photo 2. Measurement of radiated emission. Test setup.**

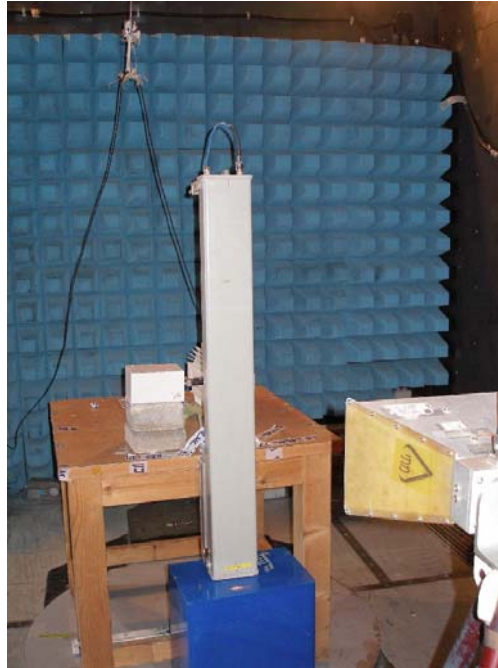
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**Photo 3. Investigation test at 1m test distance.**

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No	Description	Manufacturer information			Due Calibration date
		Name	Model No	Serial No	
1	Spectrum Analyzer MXA 20 Hz – 8.4 GHz	HP	9020A	MY46471772	June 2010
2	Spectrum Analyzer 9 kHz - 26.5 GHz	Agilent	8563E	3432A02626	June 2010
3	Attenuators set (10,20, 30 dB) DC - 18 GHz	M/A-COM	2082	1650	Aug 2010
4	Power splitter 1.7 – 9 GHz	Mini-Circuits	ZN2PD-9G	0142	June 2010
5	Cable RF 1m	Huber-Suhner	Sucoflex 104	21324/4PE	October 2010
6	Double Ridged Guide Antenna 1 – 18 GHz	EMCO	3115	5802	Aug 2010
7	Broadband Horn antenna 15 – 40 GHz	Schwarzbeck Mess-Electronik	BBHA 9170	9170-341	Aug 2010
8	Antenna Biconilog 30 – 2000 MHz	Schaffner- Chase	CBL6112B	S/N 23181	Aug 2010
9	Spectrum analyzer 10 KHz-26.5 GHz	HP	E7405A	SII 4944	April 2010
10	EMI Receiver 9 kHz-6.5 GHz	HP	8546A+85460A	SII 4068	April 2010
11	LISN 9 kHz – 30 MHz	FCC	LISN 250-32-4-16	SII5023	October 2010
12	Transient limiter 0.009-200 MHz	HP	11947A	3107105	October 2010
13	Cable RF 4m	Huber-Suhner	Sucoflex 104PE	21328/4PE	October 2010
14	Cable RF 0.5m	Huber-Suhner	Multiflex 141	520201	October 2010
15	Active Loop antenna 10 kHz – 30 MHz	EMCO	6502	SII 4874	October 2010

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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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**Title: BreezeMax 2300 Broadband Wireless Access System**

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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( $\mu$ V)	decibel referred to one microvolt
dB( $\mu$ 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

### Specification references

47 CFR part 15: 2009	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.