



THE STANDARDS INSTITUTION OF ISRAEL

Electronics & Telematics Laboratory

Test Report No. 8912307852/1

Applicant: Alvarion Ltd

***BreezeMAX Broadband Wireless Access
BreezeMax Extreme CPE System (5.8 GHz)***

Model: BMAX- EXTR- CPE- DIV-1D 4.9 2-A

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



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

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FCC ID: LKT-EXTR-CPE-50

1. Applicant information

Applicant:	Alvarion Ltd
Address:	21A Habarzel str, Tel-Aviv, 69710, Israel
Sample for test selected by:	The customer
The date of tests:	14, 22, 28 January 2009

Equipment under test information

Description of Equipment Under Test (EUT): BreezeMax Extreme CPE 5.8
Model: BMAX- EXTR- CPE- DIV-1D 4.9 2-A
alternate name; OD210-5
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 15.247

Reference Documents:

CFR 47 FCC: Rules and Regulations; Part 15. "Radio frequency devices";
Subpart C: "Intentional radiators"

Note: Test Report # 8912307852 has been superseded by the presented
Test Report # 8912307852/1.

This Test Report contains 29 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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3. Summary of test

The EUT was found to be in compliance with requirements of: 47CFR Part 15, §§ 15.247, 15.209 and 15.207.

Transmitter characteristics	Subclasses
Minimum 6 dB bandwidth	15.247(a)(2)
Maximum output power	15.247(b)(3)
Spurious emissions at antenna terminal	15.247(d)
Out of band spurious emissions radiated	15.205, 15.247(d)
Peak power spectral density	15.247(e)
Conducted emissions on AC power line	15.207
Unwonted radiated emissions below 1 GHz	15.209

**Electronics and
Telematics Laboratory**
16 July 2011

Test performed 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 Extreme 5K is a high capacity, IP services oriented Broadband Wireless Access system. BreezeMAX Extreme 5K is digital modulated TDD system operating in the 4900 MHz up to 5950 MHz band. The system contains a base station unit and a subscriber unit.

Subscriber unit configuration:

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

Indoor unit that contains a power supply and an Ethernet 10/100BaseT (RJ 45) interface.

Outdoor unit containing the entire radio and digital section.

A single CAT5 cable connecting the indoor and outdoor unit serves for carrying the data as well as for transferring power, management and control signals.

The subscriber indoor unit is a single power supply (55VDC) and Ethernet 10/100BaseT (RJ 45) interface.

EUT technical characteristics

Transmitter technical characteristics.		Note	
Stand-alone/fixed use			
Assigned frequency range	5.725 GHz – 5.850 GHz		
Operating frequency range	5.730 GHz – 5.845 GHz		
RF channel spacing	10 MHz		
Maximum rated peak output power	30 dBm		
Type of modulation	4QAM, 16QAM, 64QAM		
Type of multiplexing	OFDM		
Modulating test signal (baseband)	PRBS		
Antenna information			
Type	Manufacturer	Model	Gain
Internal	Caltronics	3943	17 dBi

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5. EUT test configuration

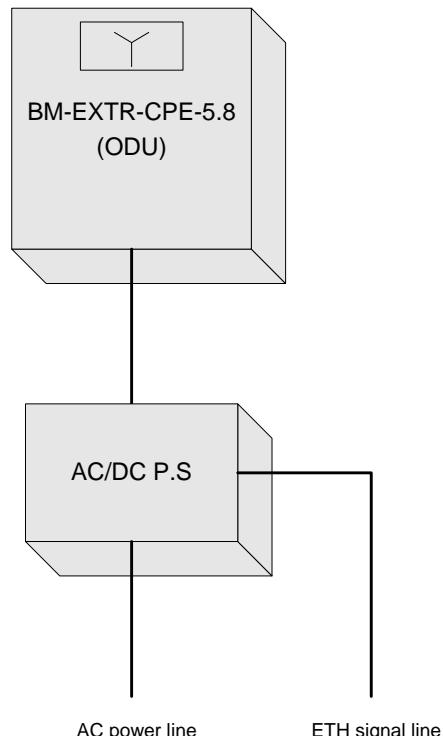


Fig. 1. Test configuration.

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6. Test results

6.1 Transmitter characteristics

6.1.1 Occupied 6 dB bandwidth for digitally systems.

Method of measurement FCC March 23, 2005 procedure
Operating Frequency Range 5730 – 5845 MHz
Ambient Temperature 23⁰ C Relative Humidity 49% Air Pressure 1009 hPa

Carrier frequency MHz	Measured 6 dB bandwidth, MHz	Reference to plots #
5730.0	9.14	1
5787.75	9.10	2
5845.0	9.03	3

LIMIT

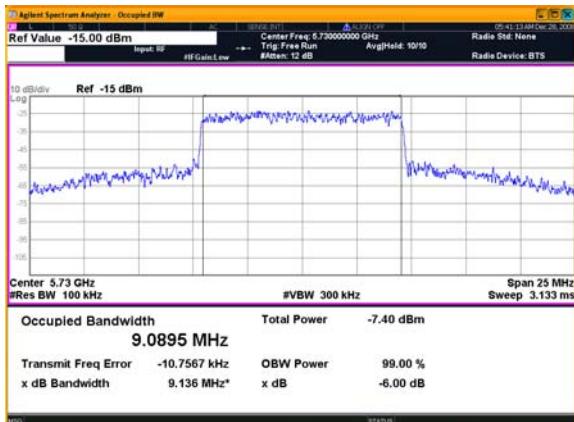
Minimum allowed bandwidth - 500 kHz @ 6 dBc

TEST PROCEDURE

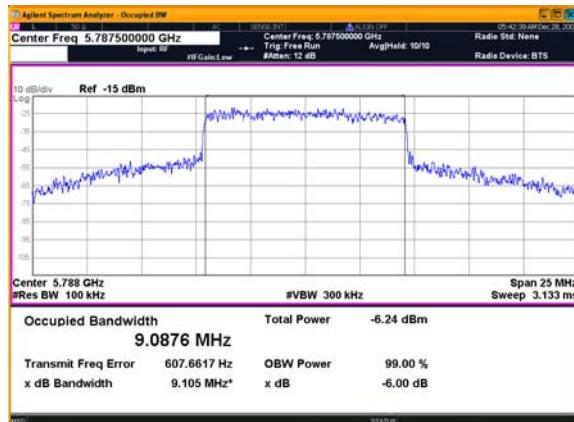
The measurements were performed in normal (transmitting) mode of operation for carrier (channel) frequency at bottom, middle and at the top of 5730 - 5845 MHz frequency range under maximum data transfer bit rate. The EUT RF output was connected to the Spectrum Analyzer through appropriate attenuator and accounted with cable loss in SA settings.

TEST EQUIPMENT USED:

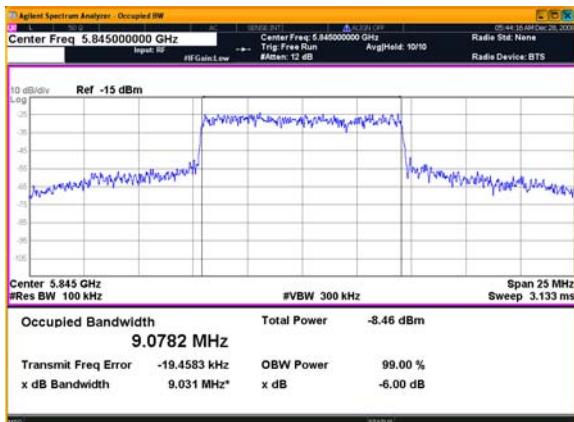
3	4	5	12				
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Plot # 1



Plot # 2



Plot # 3

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6.1.2 Maximum peak output power test according to §15.247 (b)(3).

Method of measurement	FCC March 23, 2005 procedure		
Operating Frequency Range	5730 – 5845 MHz		
Ambient Temperature	23 ⁰ C	Relative Humidity	49%
		Air Pressure	1009 hPa

Carrier frequency MHz	Peak output power, dBm	Reference to plots #
5730.0	29.56	4
5787.75	29.74	5
5845.0	28.52	6

LIMIT

Maximum peak output power – 1W*

*Systems operating in the 5725 - 5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.

TEST PROCEDURE

The measurements were performed in normal (transmitting) mode of operation for carrier (channel) frequency at bottom, middle and the top of the 5730 - 5845 MHz frequency range 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. Measured peak output power result was corrected by additional $10 \log \text{EBW}/\text{RBW} = 10 \log 9.14/8 = 0.58 \text{ dBm}$ and noted in the table.

TEST EQUIPMENT USED:

3	4	5	12			
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Plot # 4



Plot # 5



Plot # 6

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6.1.3 Out of band conducted emissions test according to §15.247(d)

Method of measurement	FCC March 23, 2005 procedure		
Operating Frequency Range	5730 – 5845 MHz		
Ambient Temperature	23 ⁰ C	Relative Humidity	49%
		Air Pressure	1009 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 emission levels of the EUT in peak mode more than 20 dB lower than the specified limit were not recorded in the table. For the test results refer to Plots ## 7-9.

LIMIT

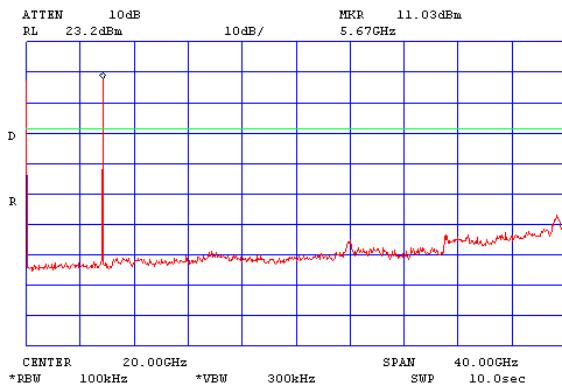
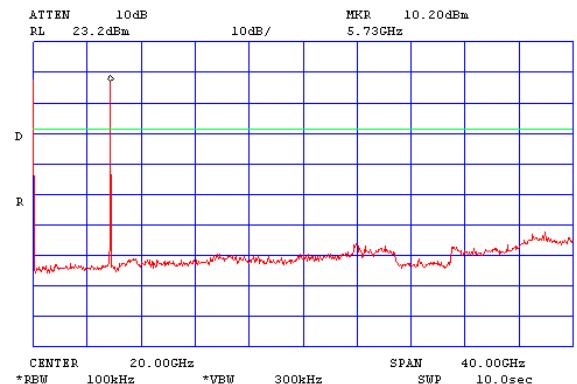
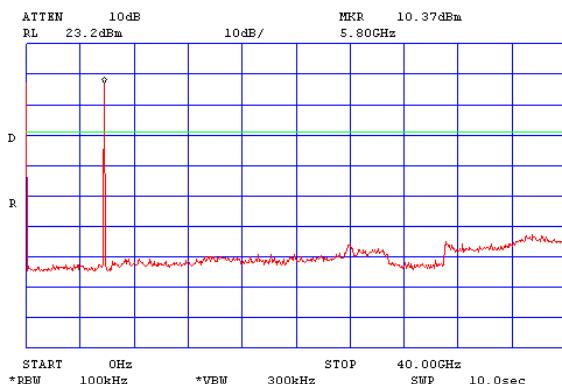
In any 100 kHz bandwidth, outside the frequency band, in which the intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

TEST PROCEDURE

The measurements were performed in normal (transmitting) mode of operation for carrier (channel) frequency at bottom, middle and the top of the 5730 - 5845 MHz frequency range 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	4	5			
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Method of measurement

FCC March 23, 2005 procedure

Operating Frequency Range

5730 – 5845 MHz

Ambient Temperature

23° C Relative Humidity 49% Air Pressure 1009 hPa

The frequency spectrum was investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to 40 GHz. 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 tables and plots in this section. Test results found in 30 – 1000 MHz frequency range are recorded in section 5.2.

Carrier frequency = 5730 MHz

Frequency, MHz	Radiated emissions, dB (μ V/m)	Peak limit dB (μ V/m)	Avg limit, dB (μ V/m)	Margin, dB	Note
5444	73.8	84*	-	10.2	Detector peak
5444	58.1	-	64*	5.9	Detector Average.

Carrier frequency = 5787.75 MHz

Frequency, MHz	Radiated emissions, dB (μ V/m)	Peak limit dB (μ V/m)	Avg limit, dB (μ V/m)	Margin, dB	Note
5371	71.1	84*	-	12.9	Detector peak
5371	59.1	-	64*	4.9	Detector Average.

Carrier frequency = 5845 MHz

Frequency, MHz	Radiated emissions, dB (μ V/m)	Peak limit dB (μ V/m)	Avg limit, dB (μ V/m)	Margin, dB	Note
5360	70.8	84*	-	13.2	Detector peak
5371	58.7	-	64*	5.3	Detector Average.

*Limit 15.205(c) 1m test distance.

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The measurements were performed at three transmitted carrier (channel) frequencies 5730 MHz, 5787.75 MHz and 5845 MHz at bottom, middle and top of the 5730 – 5845 MHz frequency band under maximum data transfer bit rate. To find maximum radiation the turntable was rotated 360°, measuring antenna height was changed from 1 to 4 m, and the antennas polarization was changed from vertical to horizontal.

LIMIT

In any 100 kHz bandwidth outside the frequency band the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below in band highest level desired power.

Radiated emissions, which fall in the restricted bands, must comply with the radiated emissions limit specified in Section 15.205(c).

TEST EQUIPMENT USED:

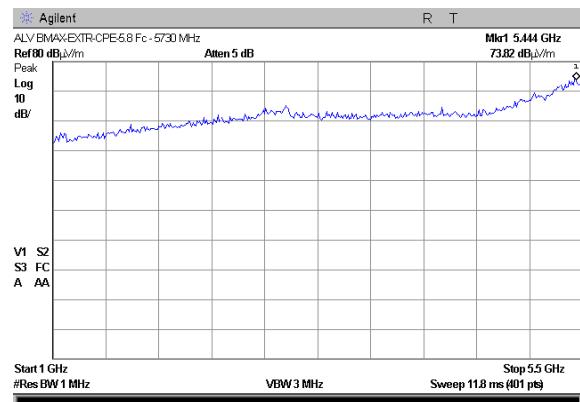
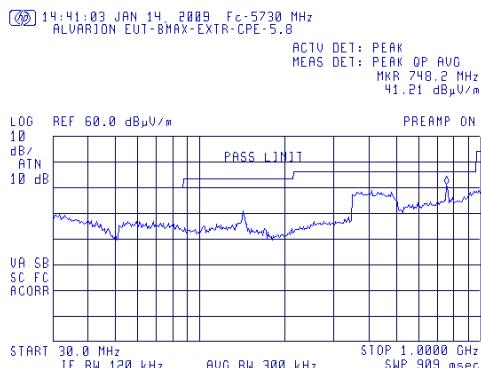
1	5	6	7	8	14	
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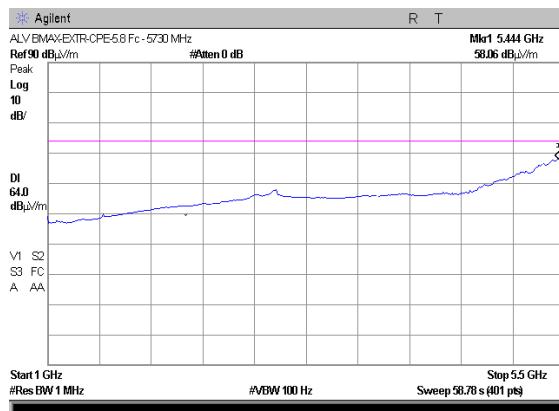
Test report N: 8912307852/1
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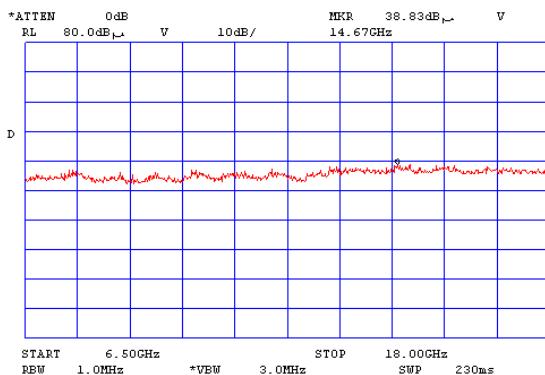
FCC ID: LKT-EXTR-CPE-50

Carrier frequency - 5730 MHz

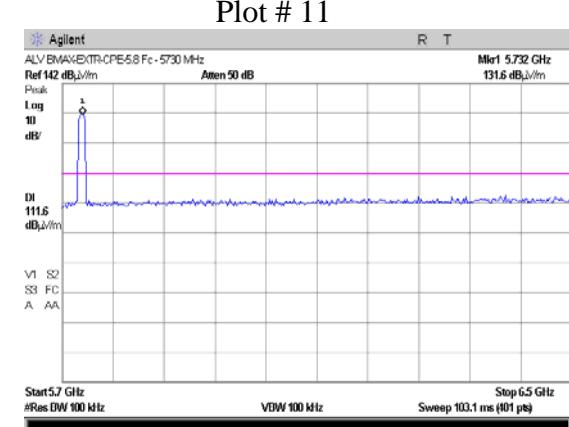
Plot # 10



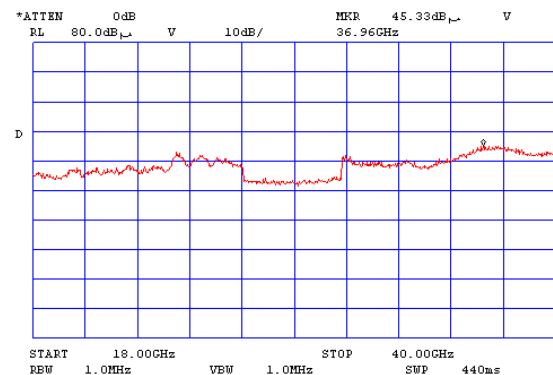
Plot # 12



Plot # 14



Plot # 13



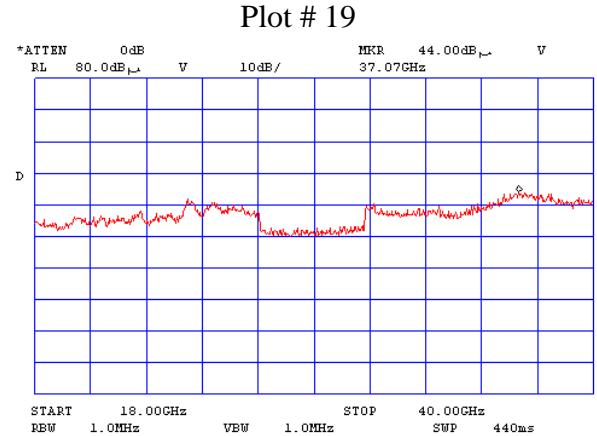
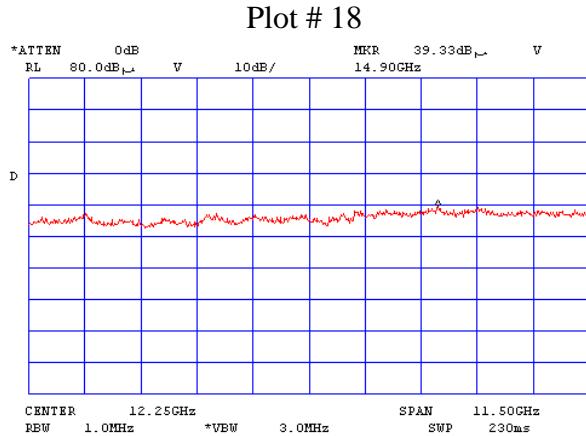
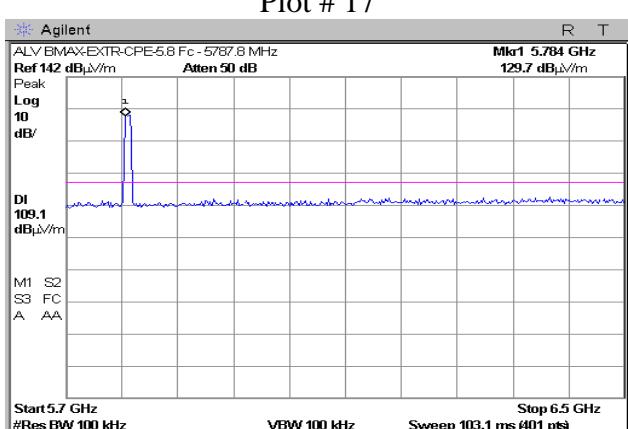
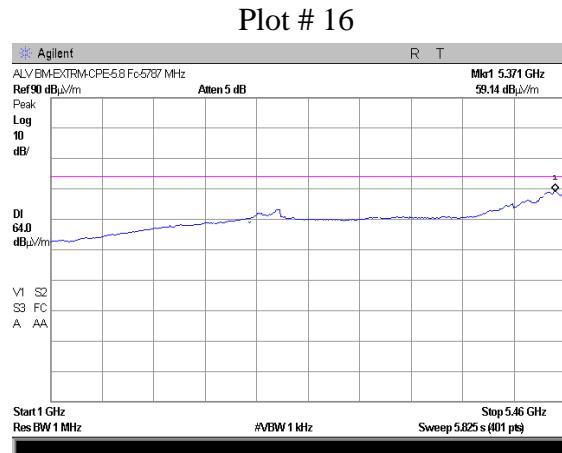
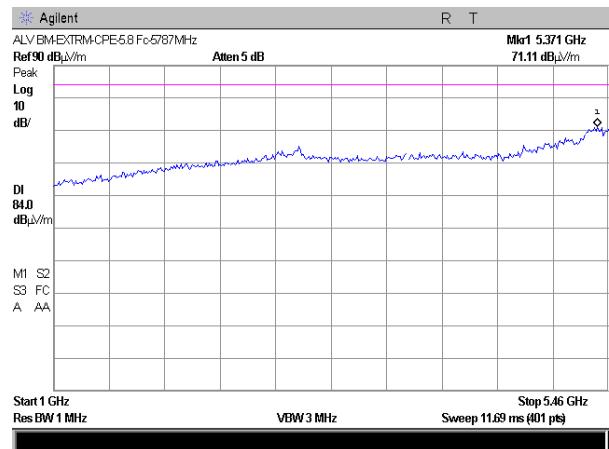
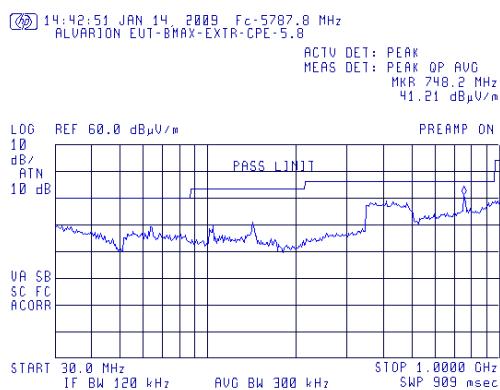
Plot # 15



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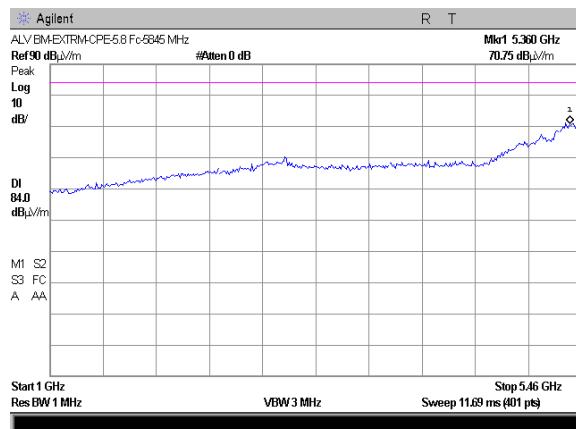
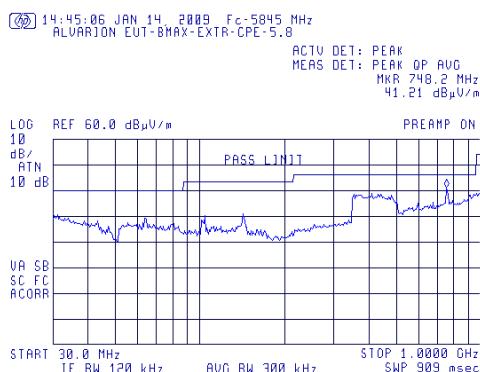
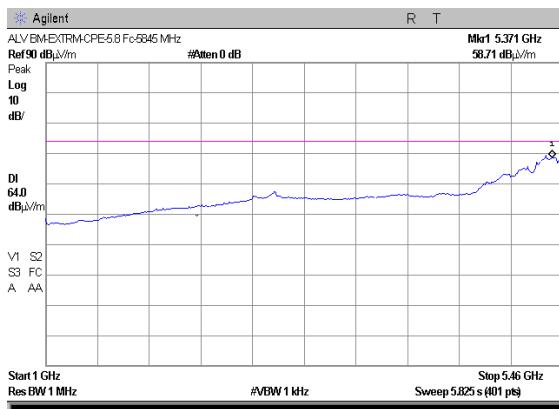
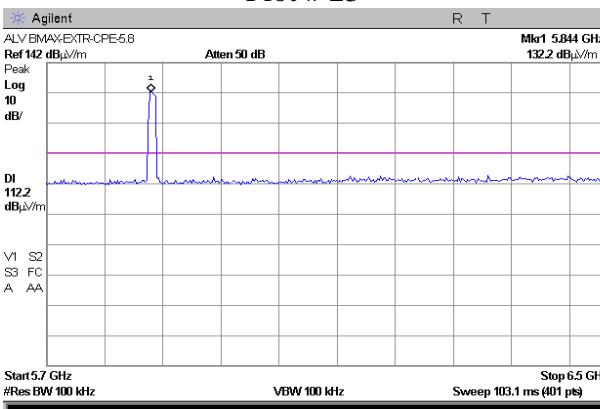
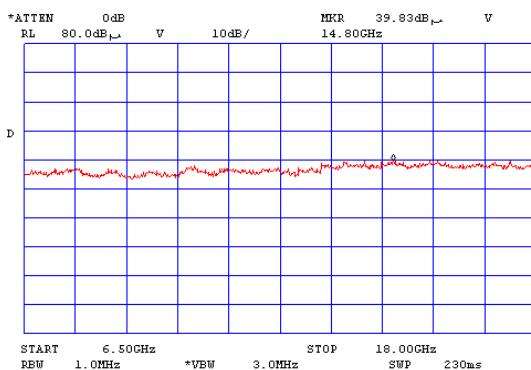
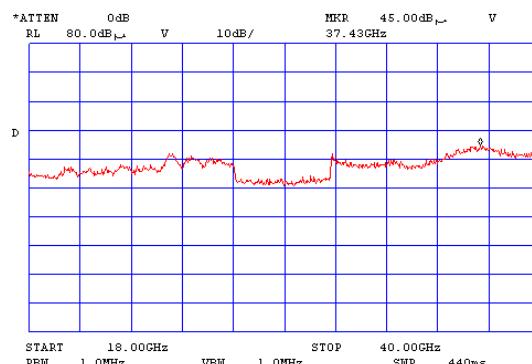
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Carrier frequency – 5787.75 MHz

Plot # 20

Plot # 21

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6.1.5 Power spectral density of digital modulated systems according to § 15.247(e)

Method of measurement	FCC March 23, 2005 procedure		
Operating Frequency Range	5730 – 5845 MHz		
Ambient Temperature	23 ⁰ C	Relative Humidity	49%
		Air Pressure	1009 hPa

Carrier frequency MHz	Measured PSD dBm	Specified limit dBm	Reference to plots #
5730.0	-5.5	8	29
5787.75	-6.0	8	31
5845.0	-5.7	8	33

TEST PROCEDURE

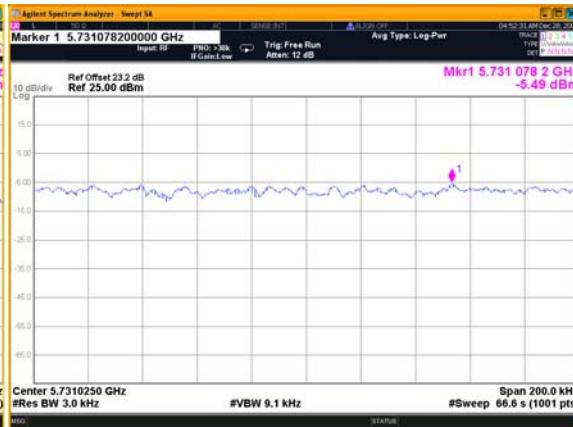
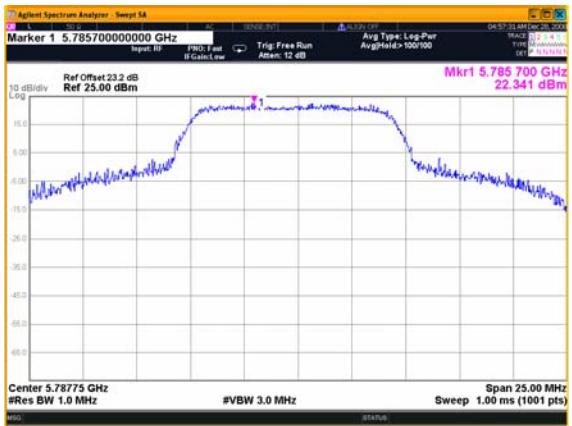
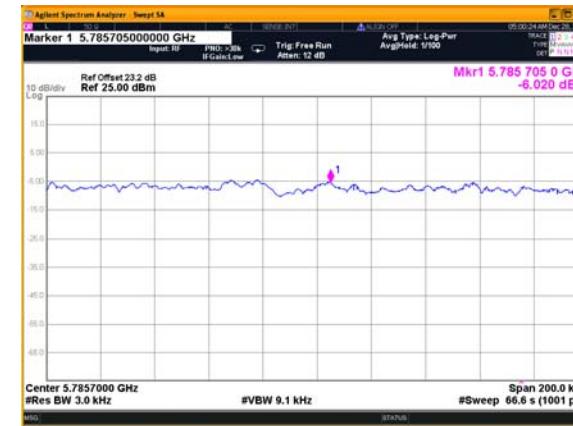
The measurements were performed in normal (transmitting) mode of operation for carrier (channel) frequency at bottom, middle and the top of the 5730 - 5845 MHz frequency range under maximum data transfer bit rate. The EUT RF output was connected to the Spectrum Analyzer through appropriate attenuator and accounted with cable loss in SA settings

LIMIT

The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST EQUIPMENT USED:

3	4	5	12			
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7. Radiated emissions test according to § 15.209

Method of measurement	ANSI 63.4 §13.1.4		
Operating Frequency Range	5730 – 5845 MHz		
Ambient Temperature	23 ⁰ C	Relative Humidity	49%
		Air Pressure	1009 hPa

TEST DESCRIPTION:

The measurements were performed at the Open Area Test Site at a 10 m test distance. EUT was arranged on a wooden table 0.8 m placed on the turn - table. The Biconilog antenna 30 MHz-2 GHz frequency range was used. The frequency range was investigated from 30 MHz to 1.0 GHz and the measurements were performed at each frequency at which the signal was 10 dB below the limit or less. The level was maximized by initially rotating turntable through 360°, varying the antenna height between 1 m and 4 m, rerouting EUT cables and changing antenna polarization from vertical to horizontal.

REQUIREMENTS:

EUT radiated emission shall not exceed value required in section 15.209

TEST RESULT:

Test results are presented in the table #1.

Results more than 20 dB under the limit were not inserted in the table

Table 1. Radiated emission test results

No	Frequency (MHz)	Antenna Polariz. V/H	Antenna Height (m)	Turn- table Angle (°)	Emission Level Note 1 (dB μ V/m)	Limit @ 3 m (dB μ V/m)	Margin (dB)
1	200	V	1.0	77	29.3	43.5	14.2
2	600	H	1.2	104	34.2	46.0	11.8
3	700	H	1.0	85	34.4	46.0	11.6
4	750	H	1.0	51	39.2	46.0	6.8

Emission level = E Reading (dB μ V) + Cable loss (dB) + Antenna Factor (dB/m) + 10 dB.

Note 1: Where 10 dB is an extrapolation distance factor.

For Cable Loss and Antenna Factor refer to Appendix 2.

TEST EQUIPMENT USED:

8	14					
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8. Conducted emissions test according to § 15.207

Method of measurement	ANSI 63.4 §13.1.3				
Operating Frequency Range	5730 – 5845 MHz				
Ambient Temperature	21 ⁰ C	Relative Humidity	54%	Air Pressure	1008 hPa

Frequency, MHz	Class B equipment, dB (μ V)	
	QP	AVRG
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 PROCEDURE

EUT was placed on a wooden table in a shielded chamber at a height of 80 cm from the floor and 40 cm from the vertical reference plane. The measurements were performed at mains terminals by means of LISN, connected to spectrum analyzer in the frequency range as referred to in the table above. The measurements were made with quasi-peak (CISPR) and average detectors. The position of the EUT cables was varied to determine maximum emission level.

TEST RESULTS:

Test results are shown at tables and plots # 34 for line Phase and # 35 for line Neutral

TEST EQUIPMENT USED:

9	10	11				
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Plot # 34. Conducted emissions test. Line Phase

Frequency MHz	Peak dB μ V	QP dB μ V	QP Limit dB	Margin dB	Avg dB μ V	Avg limit dB	Margin dB
0.202	45.3	44.0	63.5	19.5	29.8	53.5	23.7
0.471	36.1	32.6	56.5	23.9	20.5	46.5	26.0
1.865	31.2	30.1	56.0	25.9	29.4	46.0	16.6
17.692	38.5	37.6	60.0	22.4	35.7	50.0	14.3
18.242	38.6	37.4	60.0	22.6	35.2	50.0	14.8

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Plot # 35. Conducted emissions test. Line Neutral

Frequency MHz	Peak dB μ V	QP dB μ V	QP limit dB	Margin dB	Avg dB μ V	Avg Limit dB	Margin dB
0.162	51.2	48.8	65.3	16.6	36.8	55.3	18.5
0.471	35.7	31.9	56.5	24.6	19.3	46.5	27.2
1.866	31.8	30.1	56.0	25.9	29.5	46.0	16.5
17.692	39.4	37.8	60.0	22.2	35.7	50.0	14.3
18.241	39.5	37.7	60.0	22.3	35.4	50.0	14.6

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9. APPENDIX A

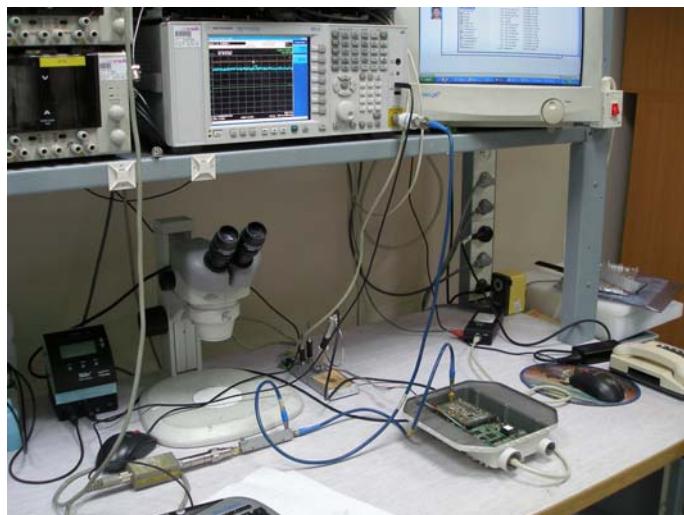


Photo #1. RF conducted emissions test setup.



Photo #2. Radiated emissions test setup. Investigation test at 1m test distance.

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Photo #3. Radiated emissions test setup on OATS.

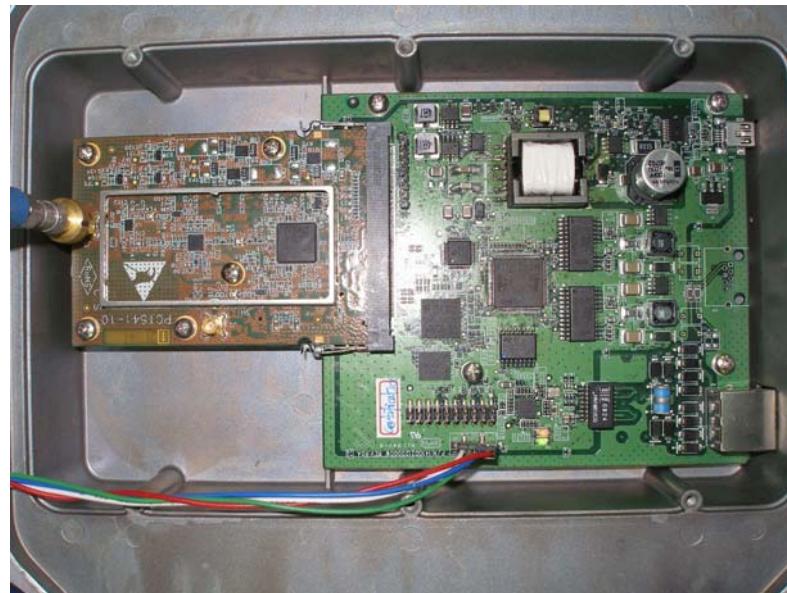


Photo #4. Outdoor unit. Internal view.

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No	Description	Manufacturer information			Due Calibration date
		Name	Model No	Serial No	
1	Spectrum Analyzer 9 kHz - 40 GHz	HP	8565E	3835A01359	June 2009
2	Spectrum Analyzer 9 kHz - 26.5 GHz	Agilent	4407B	US40241729	June 2009
3	Attenuators 20 dB DC – 8.5 GHz	Aeroflex/ Weinsel	33-30-34	A3451	June 2009
4	Power splitter 1.7 – 9 GHz	Mini-Circuits	ZN2PD-9G	0142	June 2009
5	Cable RF 1m	Huber-Suhner	Sucoflex 104	21324/4PE	December 2009
6	Double Ridged Guide Antenna 1 – 18 GHz	EMCO	3115	5802	Aug 2009
7	Broadband Horn antenna 15 – 40 GHz	Schwarzbeck Mess-Electronik	BBHA 9170	9170-341	Aug 2009
8	Antenna Biconilog 30 – 2000 MHz	Schaffner-Chase	CBL6112B	S/N 23181	Aug 2009
9	EMI Receiver 9 kHz-6.5 GHz	HP	8546A+8546 0A	SII 4068	April 2009
10	LISN 9 kHz – 30 MHz	FCC	LISN 250-32-4-16	SII5023	October 2009
11	Transient limiter 0.009-200 MHz	HP	11947A	3107105	October 2009
12	Spectrum analyzer 20 Hz - 13.6 GHz	Agilent	MXA 9020A	MY48010501	June 2009
13	Cable RF 4m	Huber-Suhner	Sucoflex 104PE	21328/4PE	December 2009
14	Spectrum analyzer 10 KHz-26.5 GHz	HP	E7405A	SII 4944	April 2009
15	Active Loop antenna 10 kHz – 30 MHz	EMCO	6502	SII 4874	October 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

**Test report N: 8912307852/1****Page 27 of 29****Title: BreezeMax Extreme CPE 5.8****Model: BMAX- EXTR- CPE- DIV-1D 4.9 2-A****FCC ID: LKT-EXTR-CPE-50****Biconilog Antenna, Model Number: CBL-6112D, S/N: 23181.**

No.	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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11. APPENDIX C

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(μV)	decibel referred to one microvolt
dB(μV/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: 2008

Radio Frequency Devices

ANSI C63.2: 1996

American National Standard for Instrumentation
Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz
Specifications.

ANSI C63.4: 1992

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