FCC 47 CFR PART 15 SUBPART E

Product Type	:	MS-102 Wifi TV Stick
Applicant	:	Good Harvest Technology
Address	:	13-2F, No.738, Zhongzheng Rd, Zhonghe Dist, New Taipei, Taiwan, R.O.C.
Trade Name	:	Good Harvest Technology Co.
Model Number	:	MS-102
Test Specification	:	FCC 47 CFR PART 15 SUBPART E: Oct., 2014 ANSI C63.10:2009
Application Purpose	:	Original
Receive Date	:	Mar. 04, 2015
Test Period	:	Mar. 05 ~ 12, 2015
Issue Date	:	Mar. 19, 2015

Issue by

A Test Lab Techno Corp.
No. 140-1, Changan Street, Bade City,
Taoyuan County 334, Taiwan R.O.C.
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Taiwan Accreditation Foundation accreditation number: 1330

Revision History

Rev.	Issue Date	Revisions	Revised By
00	Mar. 19, 2015	Initial Issue	

Verification of Compliance

Issued Date: 03/19/2015

Product Type	:	MS-102 Wifi TV Stick
Applicant	:	Good Harvest Technology
Address	:	13-2F, No.738, Zhongzheng Rd, Zhonghe Dist, New Taipei, Taiwan, R.O.C.
Trade Name	:	Good Harvest Technology Co.
Model Number	:	MS-102
FCC ID	:	2AD86MS-102
EUT Rated Voltage	:	DC 5V
Test Voltage	:	120 Vac / 60 Hz
Applicable Standard	:	FCC 47 CFR PART 15 SUBPART E: Oct., 2014 ANSI C63.10:2009
Test Result	:	Complied
Application Purpose	:	Original
Performing Lab.	:	A Test Lab Techno Corp. No. 140-1, Changan Street, Bade City, Taoyuan County 334, Taiwan R.O.C. Tel：+86-3-2710188 / Fax：+86-3-2710190 Taiwan Accreditation Foundation accreditation number: 1330 http://www.atl-lab.com.tw/e-index.htm

A Test Lab Techno Corp. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by A Test Lab Techno Corp. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Approved By	:	Fly Lu	Reviewed By	:	Eric Ou Yang
(Manager)		(Fly Lu)	(Testing Engineer)		(Eric Ou Yang)

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1 General Information

1.1. Summary of Test Result

Standard FCC	Item	Result	Remark
15.407(b)(6) 15.207	AC Power Conducted Emission	PASS	---
15.407(b) 15.205 / 15.209	Transmitter Radiated Emissions	PASS	---
15.407(a)	Maximum Conducted Output Power	PASS	---
15.407(a)	26dB RF Bandwidth	Reference	---
15.407(a)	6dB RF Bandwidth	PASS	-----
15.407(a)	Peak Power Spectral Density	PASS	---
15.407(g)	Frequency Stability	PASS	---
15.407(a) 15.203	Antenna Requirement	PASS	---

The test results of this report relate only to the tested sample(s) identified in this report. Manufacturer or whom it may concern should recognize the pass or fail of the test result.

1.2. Measurement Uncertainty

Measurement Item	Frequency Range		Uncertainty (dB)
Conducted Emission	9kHz ~ 30MHz		± 2.020
Radiated Emission	30MHz ~ 1000MHz	Horizontal	± 3.960
		Vertical	± 3.570
	1000MHz ~ 18000MHz	Horizontal	± 3.072
		Vertical	± 3.028
	18000MHz ~ 40000MHz	Horizontal	± 3.622
		Vertical	± 3.506

2 EUT Description

Product Type	MS-102 Wifi TV Stick			
Trade Name	Good Harvest Technology Co.			
Model No.	MS-102			
Applicant	Good Harvest Technology 13-2F, No.738, Zhongzheng Rd, Zhonghe Dist, New Taipei, Taiwan, R.O.C.			
Manufacturer	Good Harvest Technology 13-2F, No.738, Zhongzheng Rd, Zhonghe Dist, New Taipei, Taiwan, R.O.C.			
FCC ID	2AD86MS-102			
Frequency Range	Band	Mode	Frequency Range (MHz)	Number of Channels
	U-NII Band III	IEEE 802.11a	5745 – 5825	5 Channels
		IEEE 802.11n 20 MHz	5745 – 5825	5 Channels
		IEEE 802.11n 40 MHz	5755 – 5795	2 Channels
Modulation Type	OFDM			
Antenna Type	Multilayer Chip Antennas			
Antenna Gain	4.09			
Antenna Delivery	1TX + 1RX			
RF Output Power	IEEE 802.11a U-NII Band III : 0.015 W / 11.67 dBm IEEE 802.11n 20MHz U-NII Band III: 0.014 W / 11.51 dBm			

3 Test Methodology

3.1. Mode of Operation

Decision of Test ATL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

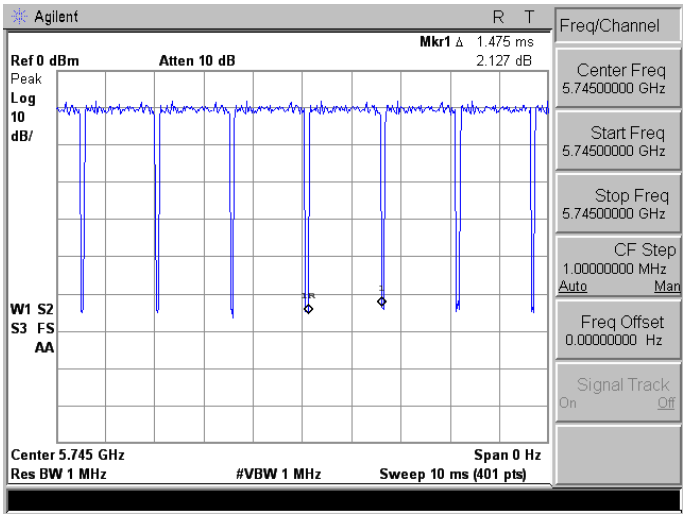
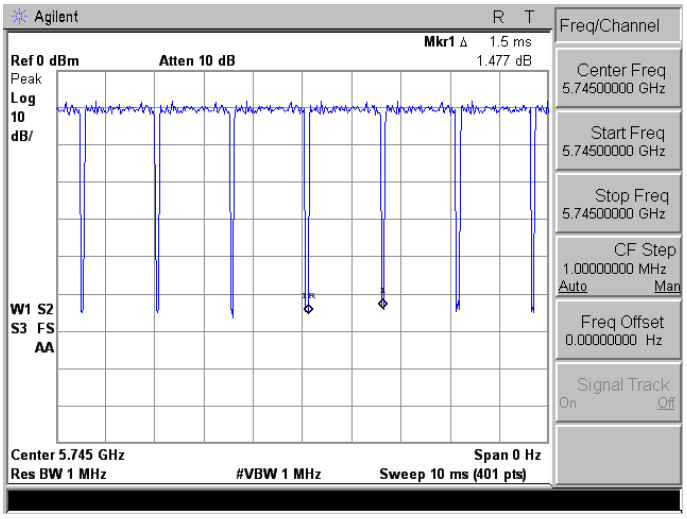
Test Mode
Mode 1: Normal Operation Mode
Mode 2: IEEE 802.11a Link Mode
Mode 3: IEEE 802.11n 20MHz Link Mode

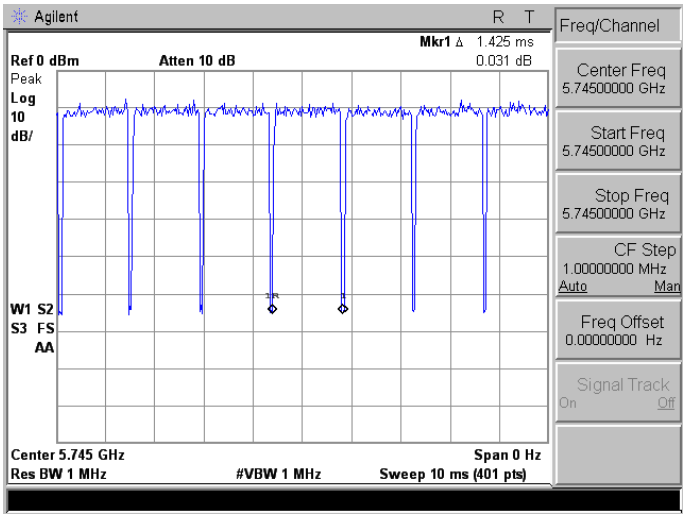
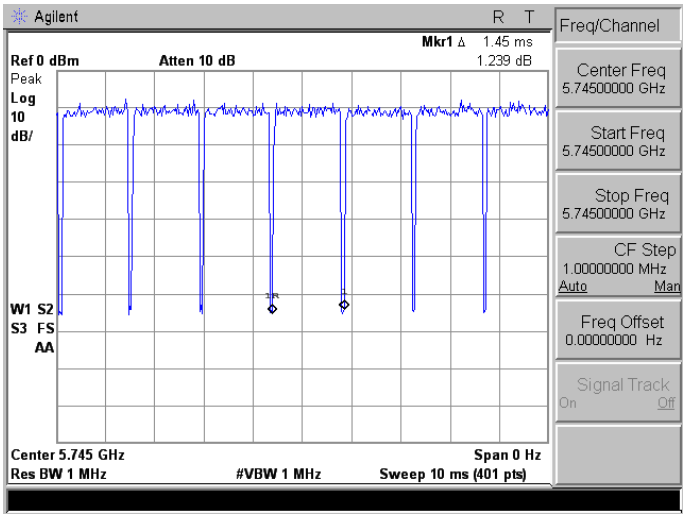
Software used to control the EUT for staying in continuous transmitting mode was programmed.
After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode only.

Test Mode	Band	Data Rate	Test Channel
IEEE 802.11a Link Mode	U-NII Band III	6M	149, 157, 165
IEEE 802.11n 20MHz Link Mode	U-NII Band III	6.5M	149, 157, 165

Duty cycle of test signal is >98%

Test Mode	**Frequency (MHz)**	**on time (ms)**	**on+off time (ms)**	**Duty cycle (%)**
Mode 2: IEEE 802.11a Link Mode	5745.0	1.475	1.500	0.983
Mode 3: IEEE 802.11n 20MHz Link Mode	5745.0	1.425	1.450	0.983

Mode 2: IEEE 802.11a Link Mode	
On time	
On+off time	

Mode 3: IEEE 802.11n 20MHz Link Mode	
On time	
On+off time	

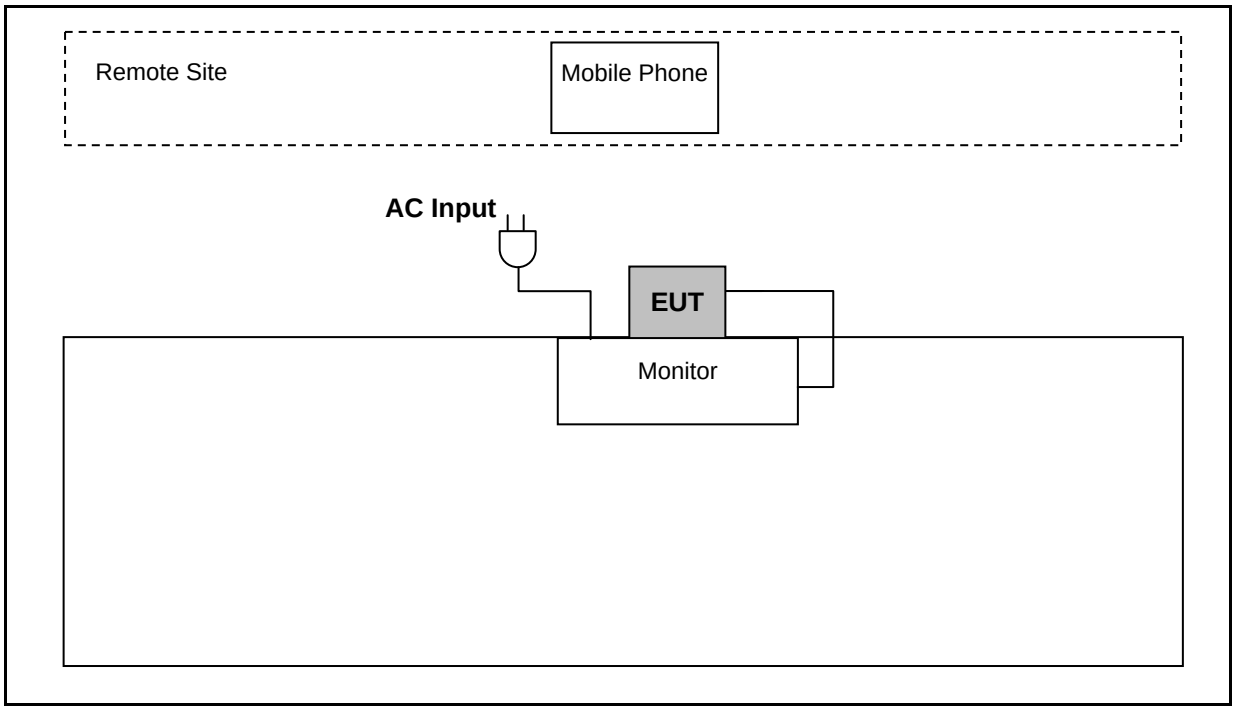
3.2. EUT Exercise Software

The EUT is operated in the engineering mode to fix the TX frequency for the purposes of measurement. According to its specifications, the EUT must comply with the requirements of Section 15.407 under the FCC Rules Part 15 Subpart E.

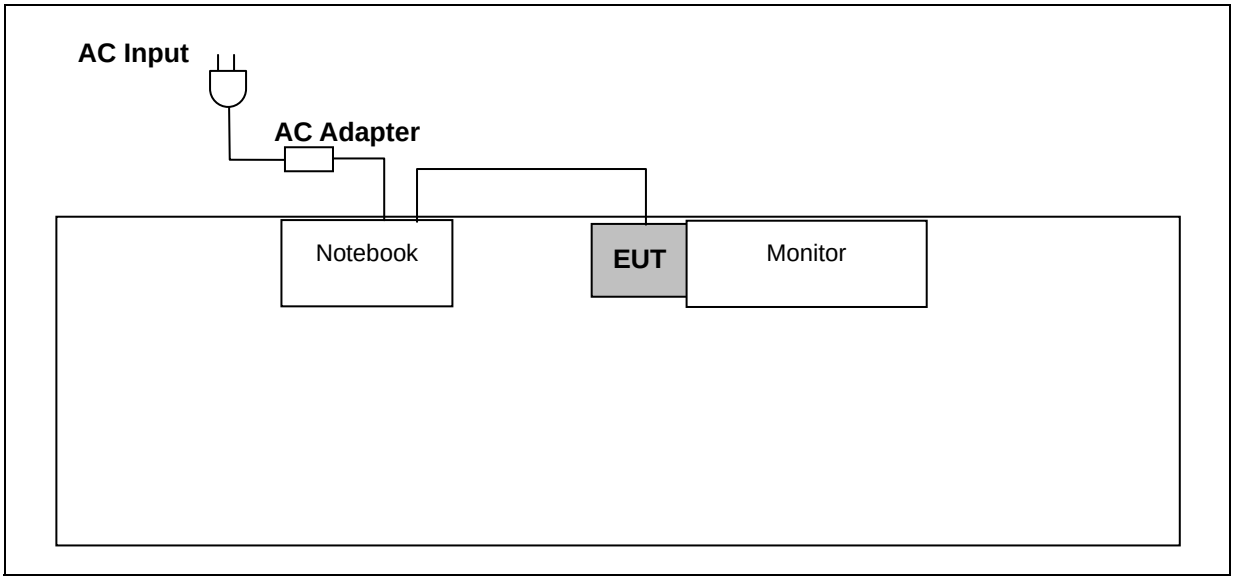
1.	Setup the EUT shown on 3.3.
2.	Turn on the power of all equipment.
3.	Turn on Wi-Fi function link to mobile phone.
4.	EUT run test program.

3.3. Configuration of Test System Details

Conducted Emission



Radiated Emission



3.4. Test Site Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	26
Humidity (%RH)	25-75	60
Barometric pressure (mbar)	860-1060	950

4 AC Power Conducted Emission Measurement

4.1. Limit

Frequency (MHz)	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

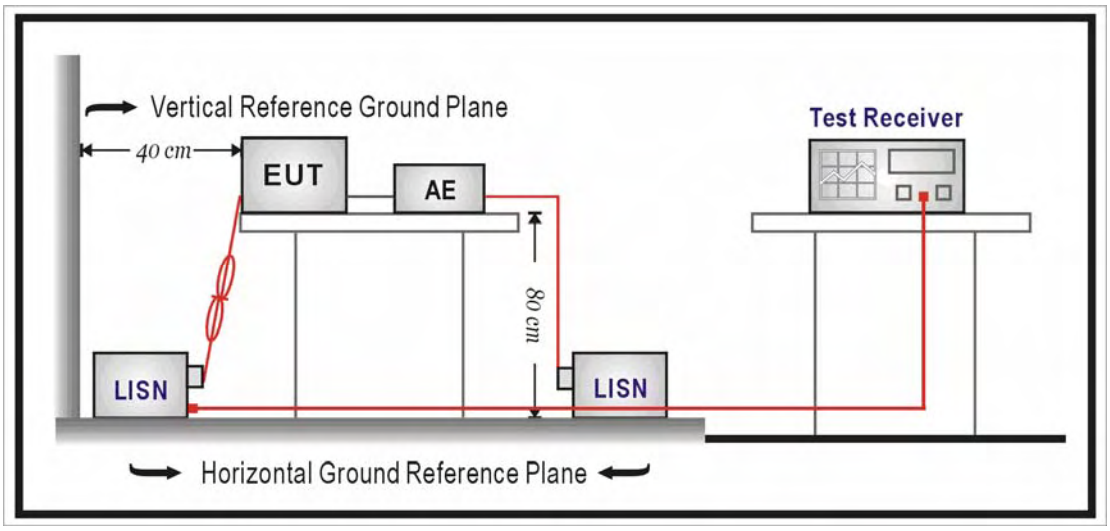
4.2. Test Instruments

Describe	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Test Receiver	R&S	ESCI	100367	06/12/2014	(1)
LISN	R&S	ENV216	101040	03/06/2015	(1)
LISN	R&S	ENV216	101041	03/06/2015	(1)
Test Site	ATL	TE05	TE05	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

Note: N.C.R. = No Calibration Request.

4.3. Test Setup



4.4. Test Procedure

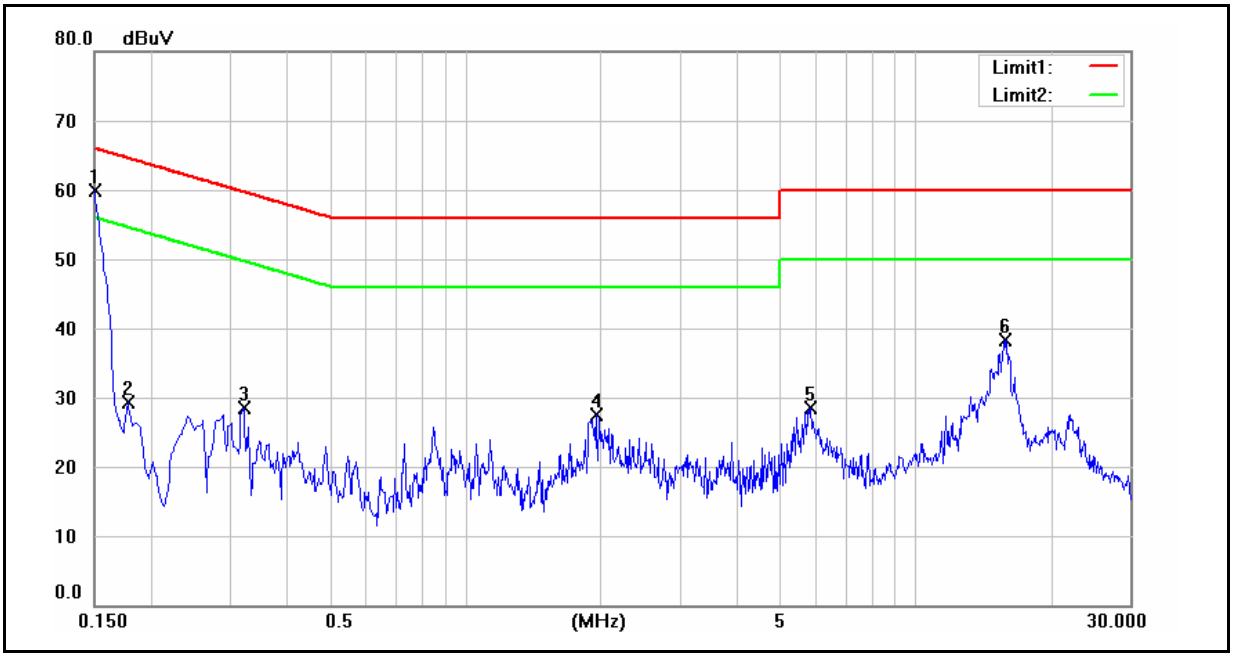
The power line conducted emission measurements were performed in a shielded enclosure. The EUT was assembled on a wooden table which is 80 centimeters high, was placed 40 centimeters from the back wall and at least 1 meter from the sidewall.

Power was fed to the EUT from the public utility power grid through a line filter and EMCO Model 3162/2 SH Line Impedance Stabilization Networks (LISN). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPR quasi-peak detection mode. The analyzer's 6 dB bandwidth was set to 9 KHz. No post-detector video filter was used.

The spectrum was scanned from 150 KHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in paragraph 4.1.

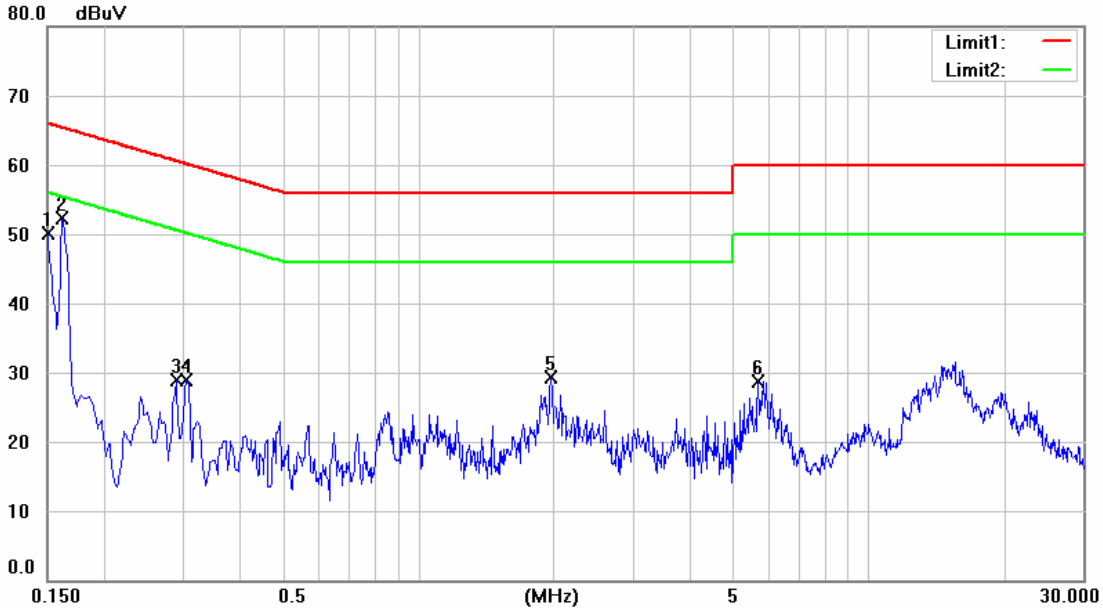
4.5. Test Result

Standard:	FCC Part 15E	Line:	L1
Test item:	Conducted Emission	Power:	AC 120V/60Hz
Model Number:	MS-102	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Test Mode:	Mode 1	Date:	03/12/2015
		Test By:	Eric Ou Yang
Description:			



No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.1500	48.58	37.85	9.59	58.17	47.44	66.00	56.00	-7.83	-8.56	Pass
2	0.1780	11.99	6.07	9.60	21.59	15.67	64.58	54.58	-42.99	-38.91	Pass
3	0.3220	14.47	7.41	9.61	24.08	17.02	59.66	49.66	-35.58	-32.64	Pass
4	1.9580	13.37	5.02	9.69	23.06	14.71	56.00	46.00	-32.94	-31.29	Pass
5	5.8660	15.28	8.86	9.83	25.11	18.69	60.00	50.00	-34.89	-31.31	Pass
6	15.8420	13.09	7.88	10.12	23.21	18.00	60.00	50.00	-36.79	-32.00	Pass

Standard:	FCC Part 15E	Line:	N
Test item:	Conducted Emission	Power:	AC 120V/60Hz
Model Number:	MS-102	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Test Mode:	Mode 1	Date:	03/12/2015
		Test By:	Eric Ou Yang
Description:			



No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.1500	48.42	37.54	9.59	58.01	47.13	66.00	56.00	-7.99	-8.87	Pass
2	0.1620	38.59	22.42	9.60	48.19	32.02	65.36	55.36	-17.17	-23.34	Pass
3	0.2900	15.38	4.22	9.61	24.99	13.83	60.52	50.52	-35.53	-36.69	Pass
4	0.3060	15.47	6.37	9.61	25.08	15.98	60.08	50.08	-35.00	-34.10	Pass
5	1.9740	12.71	4.10	9.70	22.41	13.80	56.00	46.00	-33.59	-32.20	Pass
6	5.7020	17.20	10.07	9.84	27.04	19.91	60.00	50.00	-32.96	-30.09	Pass

5 Radiated Emission Measurement

5.1. Limit

Limits of Radiated Emission Measurement

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

Frequency Range (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	10	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Note: 1. The lower limit shall apply at the transition frequencies.

2. Emission level (dBuV/m) = 20 log Emission level (uV/m).

3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

5.2. Test Instruments

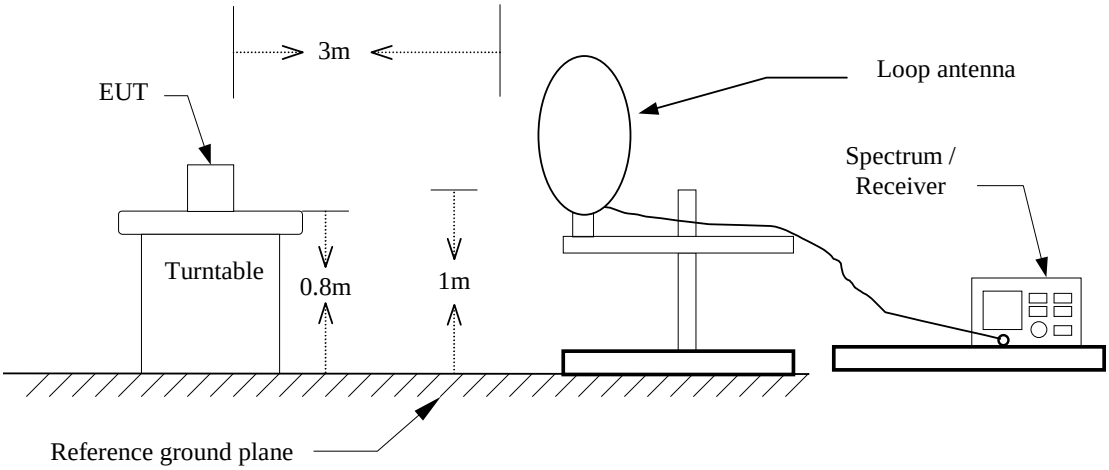
3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
RF Pre-selector	Agilent	N9039A	MY46520256	01/06/2015	(1)
Spectrum Analyzer	Agilent	E4446A	MY46180578	01/06/2015	(1)
Pre Amplifier	Agilent	8449B	3008A02237	02/24/2015	(1)
Pre Amplifier	Agilent	8447D	2944A10961	02/24/2015	(1)
Broadband Antenna (30MHz~1GHz)	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	9163-270	07/22/2014	(1)
Horn Antenna (1~18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	06/11/2014	(1)
Horn Antenna (18~40GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170	9170-320	06/13/2014	(1)
Test Site	ATL	TE01	888001	08/28/2014	(1)

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

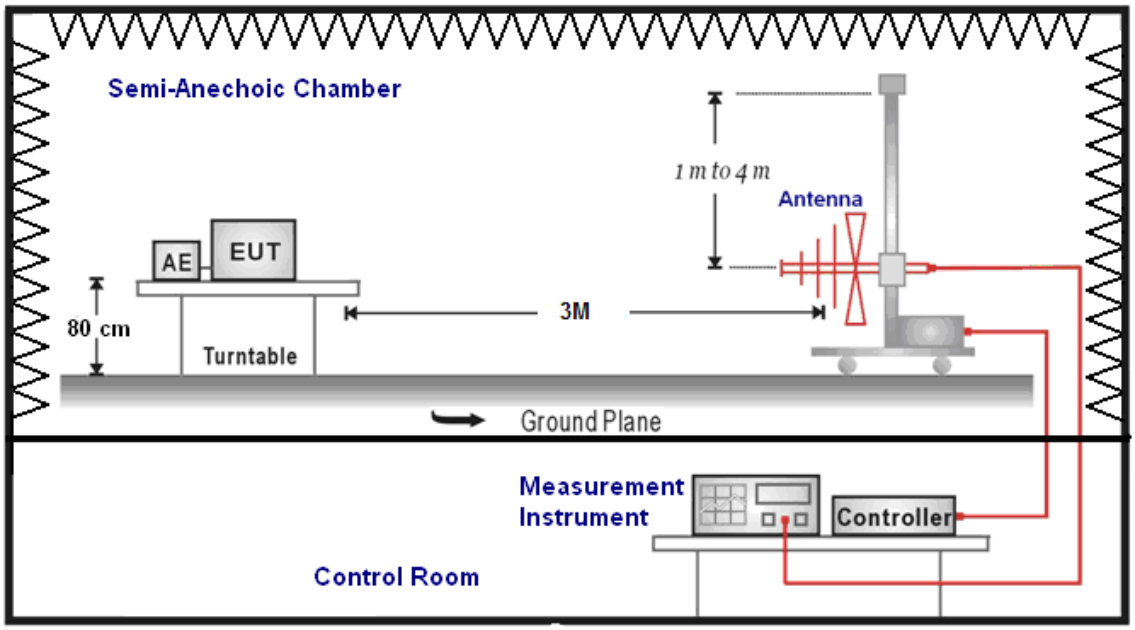
Note: N.C.R. = No Calibration Request.

5.3. Setup

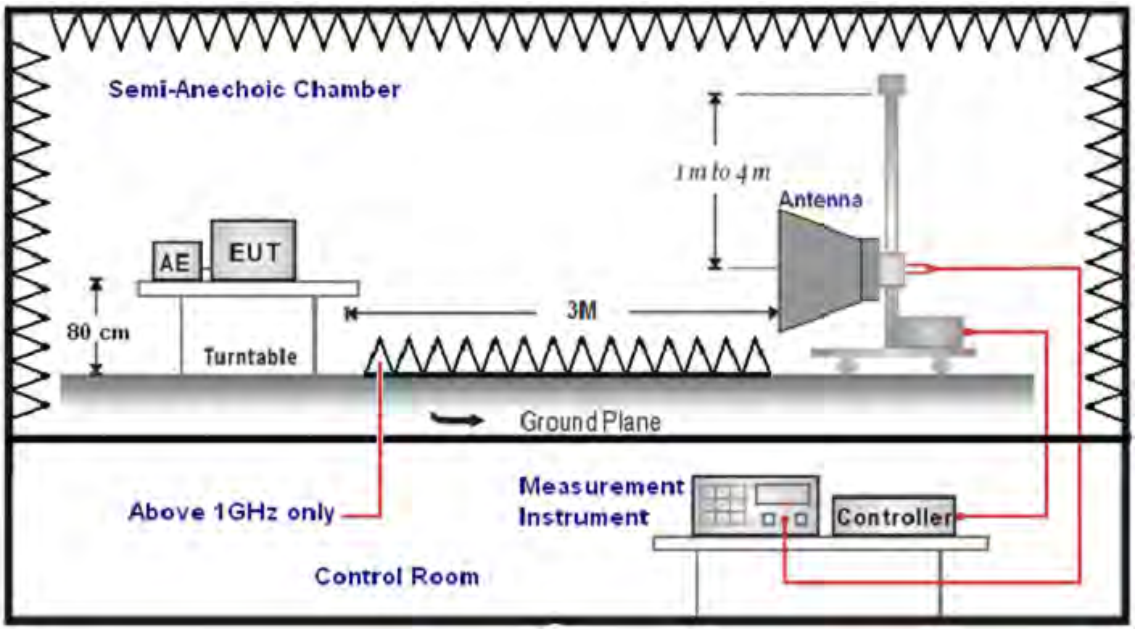
9kHz ~ 30MHz



30MHz ~ 1GHz



Above 1GHz


Semi-Anechoic Chamber
1 m to 4 m
Antenna
AE
EUT
80 cm
Turntable
3M
Ground Plane
Above 1GHz only
Measurement
Instrument
Controller
Control Room

5.4. Test Procedure

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 meters height, top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 9 kHz to 40 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 3 MHz for peak measurements and 3 MHz for average measurements.

A nonconductive material surrounded the EUT to supporting the EUT for standing on tree orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

SCHWARZBECK MESS-ELEKTRONIK Trilog-Broadband Antenna (mode SB AC VULB) at 3 Meter and the ETS-Lindgren Double-Ridged Waveguide Horn antnna (model 3117) Schwarzbeck Mess-Elektronik Broadband Horn Antenna (BBHA 9170) was used in frequencies 1 – 40 GHz at a distance of 1 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).

For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts pre meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro colts per meter (dBuV/m).

The actual field is intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

(1) Amplitude (dBuV/m) = FI (dBuV) +AF (dBuV) +CL (dBuV)-Gain (dB)
FI= Reading of the field intensity.
AF= Antenna factor.
CL= Cable loss.
P.S Amplitude is auto calculate in spectrum analyzer.

(2) Actual Amplitude (dBuV/m) = Amplitude (dBuV)-Dis(dB)
The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:
(a) For fundamental frequency : Transmitter Output < +30dBm
(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

5.5. Test Result

Below 1GHz

Standard:	FCC Part 15E	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	MS-102	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Test Mode:	Mode 1	Date:	03/06/2015
		Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
36.0000	38.43	-13.50	24.93	40.00	-15.07	QP	H
280.0000	32.92	-11.09	21.83	46.00	-24.17	QP	H
371.0000	29.18	-9.11	20.07	46.00	-25.93	QP	H
494.5000	32.38	-6.66	25.72	46.00	-20.28	QP	H
773.0000	27.61	-1.00	26.61	46.00	-19.39	QP	H
873.0000	29.71	0.82	30.53	46.00	-15.47	QP	H
65.0000	35.52	-13.56	21.96	40.00	-18.04	QP	V
120.0000	33.31	-14.56	18.75	43.50	-24.75	QP	V
283.5000	34.72	-10.99	23.73	46.00	-22.27	QP	V
690.0000	27.38	-2.80	24.58	46.00	-21.42	QP	V
873.5000	30.42	0.83	31.25	46.00	-14.75	QP	V
938.0000	27.41	2.35	29.76	46.00	-16.24	QP	V

Note: No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

Above 1GHz

Standard:	FCC Part 15E	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	MS-102	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Test Mode:	Mode 2	Date:	03/07/2015
Frequency:	5745MHz	Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2813.000	37.24	-0.98	36.26	74.00	-37.74	peak	H
4577.000	34.54	3.98	38.52	74.00	-35.48	peak	H
5715.000	33.33	6.25	39.58	68.20	-28.62	peak	H
5725.000	33.87	6.27	40.14	78.20	-38.06	peak	H
7650.000	33.64	11.74	45.38	74.00	-28.62	peak	H
2806.000	37.36	-0.99	36.37	74.00	-37.63	peak	V
4577.000	34.36	3.98	38.34	74.00	-35.66	peak	V
5715.000	34.96	6.25	41.21	68.20	-26.99	peak	V
5725.000	34.28	6.27	40.55	78.20	-37.65	peak	V
7685.000	33.31	11.78	45.09	74.00	-28.91	peak	V

Standard:	FCC Part 15E	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	MS-102	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Test Mode:	Mode 2	Date:	03/07/2015
Frequency:	5785MHz	Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2806.000	37.10	-0.99	36.11	74.00	-37.89	peak	H
4619.000	33.94	4.10	38.04	74.00	-35.96	peak	H
7657.000	32.95	11.74	44.69	74.00	-29.31	peak	H
2799.000	37.79	-1.01	36.78	74.00	-37.22	peak	V
4591.000	33.90	4.01	37.91	74.00	-36.09	peak	V
7657.000	32.86	11.74	44.60	74.00	-29.40	peak	V

Standard:	FCC Part 15E	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	MS-102	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Test Mode:	Mode 2	Date:	03/07/2015
Frequency:	5825MHz	Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2813.000	36.32	-0.98	35.34	74.00	-38.66	peak	H
4598.000	34.30	4.04	38.34	74.00	-35.66	peak	H
5850.000	33.25	6.53	39.78	78.20	-38.42	peak	H
5860.000	32.95	6.55	39.50	68.20	-28.70	peak	H
7657.000	33.05	11.74	44.79	74.00	-29.21	peak	H
2841.000	37.65	-0.91	36.74	74.00	-37.26	peak	V
4563.000	34.43	3.95	38.38	74.00	-35.62	peak	V
5850.000	32.34	6.53	38.87	78.20	-39.33	peak	V
5860.000	32.95	6.55	39.50	68.20	-28.70	peak	V
7650.000	32.39	11.74	44.13	74.00	-29.87	peak	V

Standard:	FCC Part 15E	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	MS-102	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Test Mode:	Mode 3	Date:	03/07/2015
Frequency:	5745MHz	Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2813.000	36.24	-0.98	35.26	74.00	-38.74	peak	H
4570.000	34.47	3.97	38.44	74.00	-35.56	peak	H
5715.000	33.89	6.25	40.14	68.20	-28.06	peak	H
5725.000	33.38	6.27	39.65	68.20	-28.55	peak	H
7671.000	32.89	11.76	44.65	74.00	-29.35	peak	H
2785.000	37.70	-1.05	36.65	74.00	-37.35	peak	V
4598.000	34.22	4.04	38.26	74.00	-35.74	peak	V
5715.000	34.28	6.25	40.53	68.20	-27.67	peak	V
5725.000	33.26	6.27	39.53	68.20	-28.67	peak	V
7657.000	33.79	11.74	45.53	74.00	-28.47	peak	V

Standard:	FCC Part 15E	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	MS-102	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Test Mode:	Mode 3	Date:	03/07/2015
Frequency:	5785MHz	Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2813.000	36.35	-0.98	35.37	74.00	-38.63	peak	H
4591.000	34.65	4.01	38.66	74.00	-35.34	peak	H
7657.000	33.99	11.74	45.73	74.00	-28.27	peak	H
2841.000	38.21	-0.91	37.30	74.00	-36.70	peak	V
4563.000	33.84	3.95	37.79	74.00	-36.21	peak	V
7657.000	34.38	11.74	46.12	74.00	-27.88	peak	V

Standard:	FCC Part 15E	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	MS-102	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Test Mode:	Mode 3	Date:	03/07/2015
Frequency:	5825MHz	Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2813.000	36.24	-0.98	35.26	74.00	-38.74	peak	H
4577.000	34.59	3.98	38.57	74.00	-35.43	peak	H
5850.000	32.81	6.53	39.34	68.20	-28.86	peak	H
5860.000	33.77	6.55	40.32	68.20	-27.88	peak	H
7671.000	33.38	11.76	45.14	74.00	-28.86	peak	H
2806.000	37.19	-0.99	36.20	74.00	-37.80	peak	V
4577.000	34.32	3.98	38.30	74.00	-35.70	peak	V
5850.000	33.30	6.53	39.83	78.20	-38.37	peak	V
5860.000	32.53	6.55	39.08	68.20	-29.12	peak	V
7643.000	33.07	11.72	44.79	74.00	-29.21	peak	V

6 Maximum Conducted Output Power and EIRP Measurement

6.1. Limit

Conducted Output Power

Frequency Range (MHz)	FCC Limit
5.150 ~ 5.250 GHz	The lesser of 250mW (24dBm)
5.250 ~ 5.350 GHz	The lesser of 250mW (24dBm) or 11dBm + 10log (B)
5.470 ~ 5.725 GHz	The lesser of 250mW (24dBm) or 11dBm + 10log (B)
5.725 ~ 5.850 GHz	The lesser of 1000mW (30dBm)

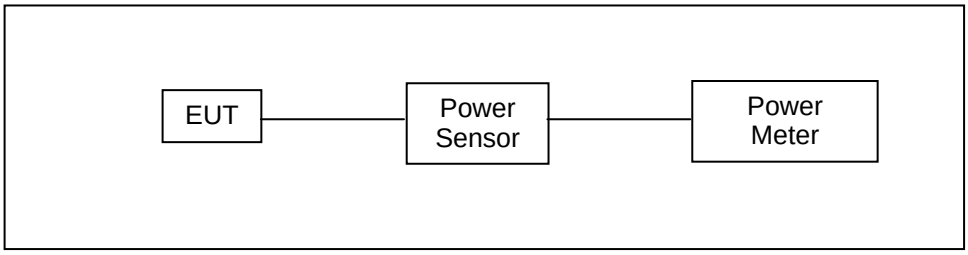
Note: Where B is the 26dB emission bandwidth in MHz.

EIRP

Frequency Range (MHz)	FCC Limit
5.150 ~ 5.250 GHz	The lesser of 4W (36dBm)
5.250 ~ 5.350 GHz	The lesser of 1W (30dBm)
5.470 ~ 5.725 GHz	The lesser of 1W (30dBm)
5.725 ~ 5.850 GHz	The lesser of 4W (36dBm)

Note: Where B is the 26dB emission bandwidth in MHz.

6.2. Test Setup



6.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Power Sensor	Anritsu	MA2411B	1126022	08/21/2014	(1)
Power Meter	Anritsu	ML2495A	1135009	08/21/2014	(1)
Test Site	ATL	TE02	TE02	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

Note: N.C.R. = No Calibration Request.

6.4. Test Procedure

The test is performed in accordance with KDB789033: D02 General UNII Test Procedures New Rules v01, Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E.

6.5. Test Result

Model Number	MS-102			
Test Item	Maximum Conducted Output Power			
Test Mode	Mode 2: IEEE 802.11a Link Mode			
Date of Test	03/05/2015		Test Site	TE02

Frequency (MHz)	Data Rate	Average Power		FCC Limit (dBm)
		(dBm)	(W)	
5745.0	6M	11.44	0.014	< 30
5765.0		11.45	0.014	
5785.0		11.47	0.014	
5805.0		11.43	0.014	
5825.0		**11.67**	**0.015**	
5745.0	54M	11.42	0.014	
5765.0		11.43	0.014	
5785.0		11.44	0.014	
5805.0		11.40	0.014	
5825.0		11.63	0.015	

Model Number	MS-102			
Test Item	Maximum Conducted Output Power			
Test Mode	Mode 3: IEEE 802.11n 20MHz Link Mode			
Date of Test	03/05/2015		Test Site	TE02

Frequency (MHz)	Data Rate	Average Power		FCC Limit (dBm)
		(dBm)	(W)	
5745.0	6.5M	11.37	0.014	< 30
5765.0		11.33	0.014	
5785.0		11.35	0.014	
5805.0		11.39	0.014	
5825.0		**11.51**	**0.014**	
5745.0	65M	11.34	0.014	
5765.0		11.30	0.013	
5785.0		11.32	0.014	
5805.0		11.36	0.014	
5825.0		11.48	0.014	

Model Number	MS-102				
Test Item	EIRP				
Test Mode	Mode 2: IEEE 802.11a Link Mode				
Date of Test	03/05/2015		Test Site	TE02	

Frequency (MHz)	Data Rate	Average Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	FCC Limit (dBm)
5745.0	6M	11.44	4.09	15.53	0.036	< 36
5765.0		11.45	4.09	15.54	0.036	
5785.0		11.47	4.09	15.56	0.036	
5805.0		11.43	4.09	15.52	0.036	
5825.0		11.67	4.09	15.76	0.038	
5745.0	54M	11.42	4.09	15.51	0.036	
5765.0		11.43	4.09	15.52	0.036	
5785.0		11.44	4.09	15.53	0.036	
5805.0		11.40	4.09	15.49	0.035	
5825.0		11.63	4.09	15.72	0.037	

Model Number	MS-102				
Test Item	EIRP				
Test Mode	Mode 3: IEEE 802.11n 20MHz Link Mode				
Date of Test	03/05/2015		Test Site	TE02	

Frequency (MHz)	Data Rate	Average Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	FCC Limit (dBm)
5745.0	6.5M	11.37	4.09	15.46	0.035	< 36
5765.0		11.33	4.09	15.42	0.035	
5785.0		11.35	4.09	15.44	0.035	
5805.0		11.39	4.09	15.48	0.035	
5825.0		11.51	4.09	15.60	0.036	
5745.0	65M	11.34	4.09	15.43	0.035	
5765.0		11.30	4.09	15.39	0.035	
5785.0		11.32	4.09	15.41	0.035	
5805.0		11.36	4.09	15.45	0.035	
5825.0		11.48	4.09	15.57	0.036	

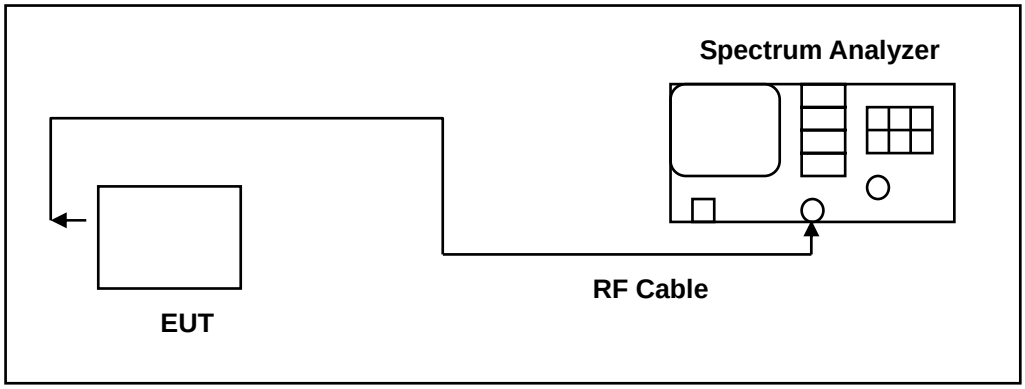
7 6dB RF Bandwidth Measurement

7.1. Limit

6dB RF Bandwidth

Systems using digital modulation techniques may operate in the 5725~5850MHz bands. The minimum 6 dB band-width shall be at least 500 kHz.

7.2. Test Setup



7.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/16/2014	(1)
Test Site	ATL	TE05	TE05	N.C.R.	-----

dRemark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

Note: N.C.R. = No Calibration Request.

7.4. Test Procedure

6dB RF Bandwidth

The EUT tested to UNII test procedure of KDB789033 D02 for compliance to FCC 47CFR 15.247 requirements.

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A peak output reading was taken, a DISPLAY line was drawn 6 dB lower than peak level. The 6 dB bandwidth was determined from where the channel output spectrum intersected the display line.

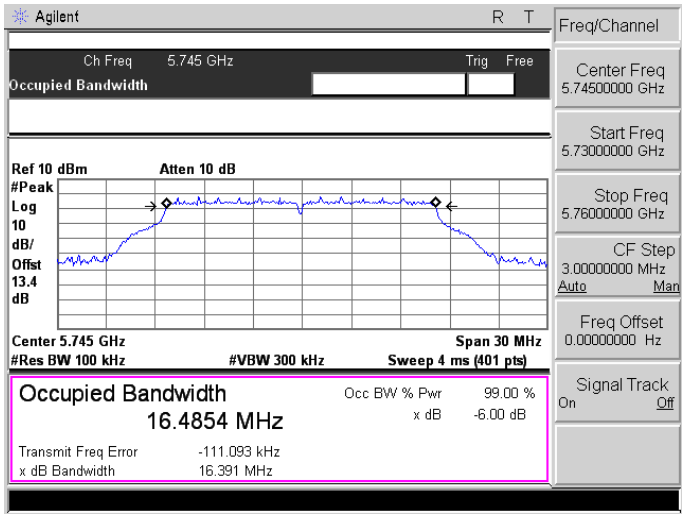
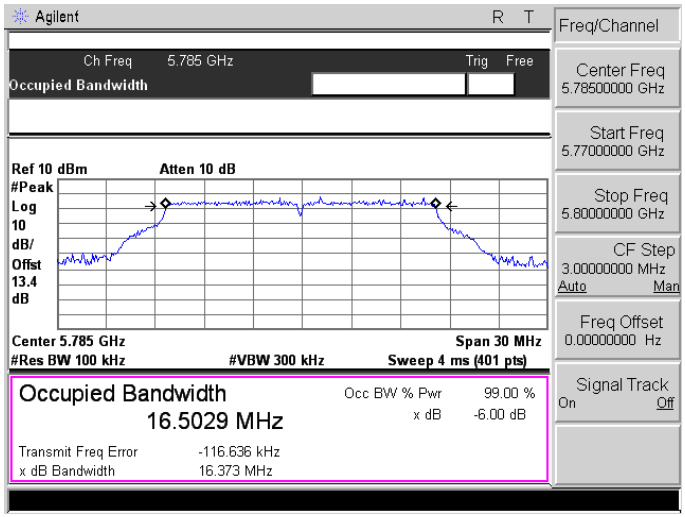
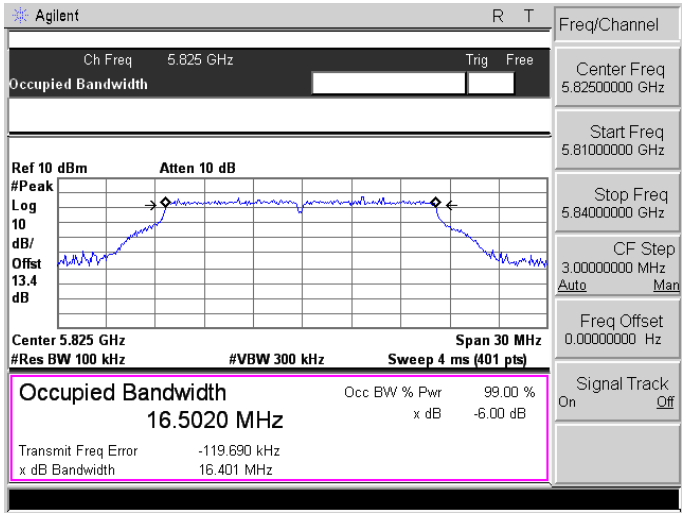
The test was performed at 3 channels.

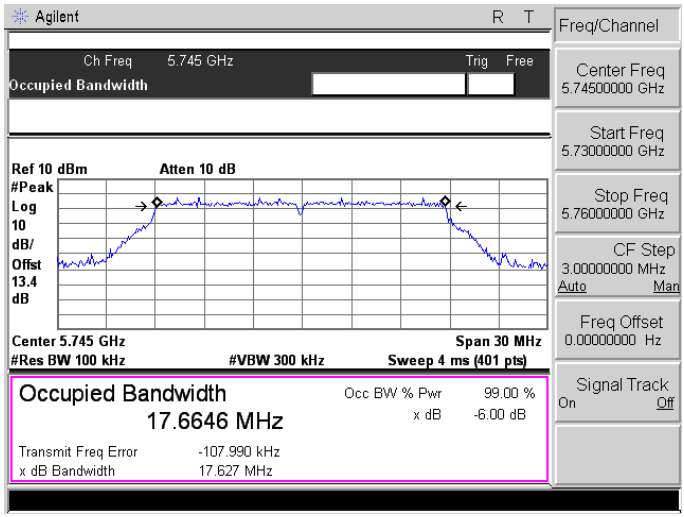
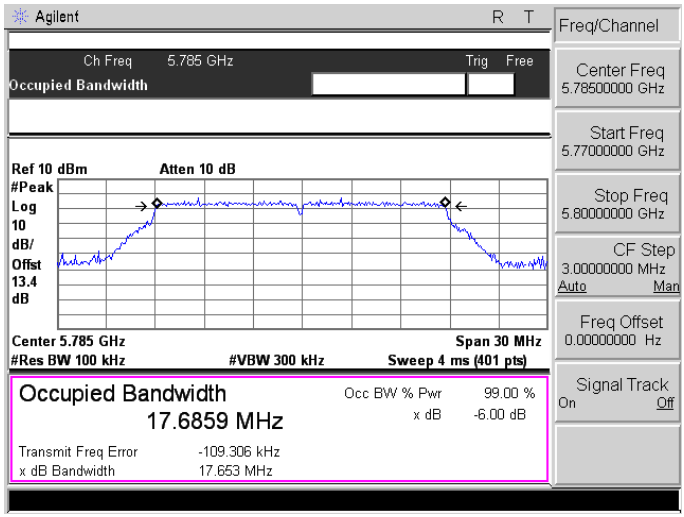
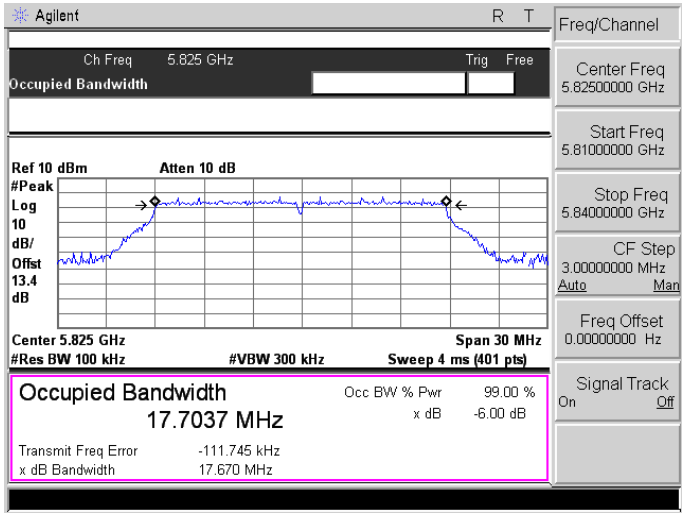
7.5. Test Result

Model Number	MS-102		
Test Item	6dB RF Bandwidth		
Test Mode	Mode 2: IEEE 802.11a Link Mode		
Date of Test	03/05/2015	Test Site	TE05
Frequency (MHz)	6dB Bandwidth (MHz)	6dB Bandwidth Limit (kHz)	
5745	16.391	> 500	
5785	16.373	> 500	
5825	16.401	> 500	

Model Number	MS-102		
Test Item	6dB RF Bandwidth		
Test Mode	Mode 3: IEEE 802.11n 20MHz Link Mode		
Date of Test	03/05/2015	Test Site	TE05
Frequency (MHz)	6dB Bandwidth (MHz)	6dB Bandwidth Limit (kHz)	
5745	17.627	> 500	
5785	17.653	> 500	
5825	17.670	> 500	

7.6. Test Graphs

Mode 2: IEEE 802.11a Link Mode	
5745	
5785	
5825	

Mode 3: IEEE 802.11n 20MHz Link Mode	
5745	
5785	
5825	

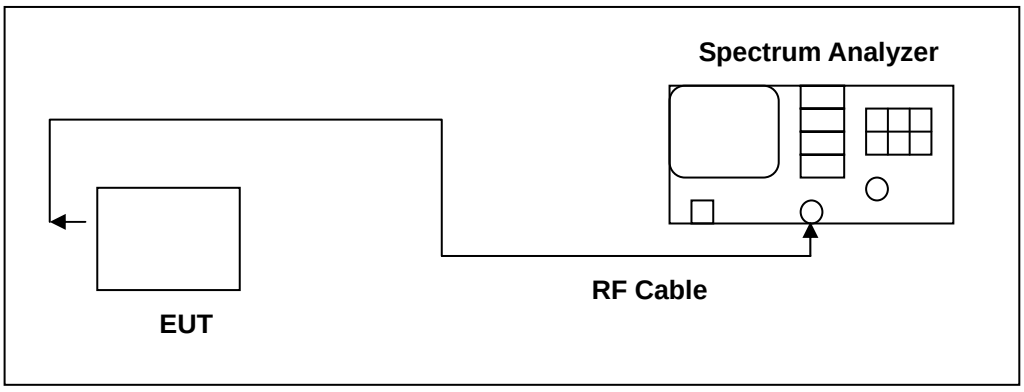
8 Peak Power Spectral Density Measurement

8.1. Limit

Conducted power spectral density

Frequency Range (MHz)	FCC Limit
5.150 ~ 5.250 GHz	11 dBm/MHz
5.250 ~ 5.350 GHz	11 dBm/MHz
5.470 ~ 5.725 GHz	11 dBm/MHz
5.725 ~ 5.850 GHz	30 dBm/500KHz

8.2. Test Setup



8.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/16/2014	(1)
Test Site	ATL	TE02	TE02	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

Note: N.C.R. = No Calibration Request.

8.4. Test Procedure

The test is performed in accordance with KDB789033: D02 General UNII Test Procedures New Rules v01, Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E.

8.5. Test Result

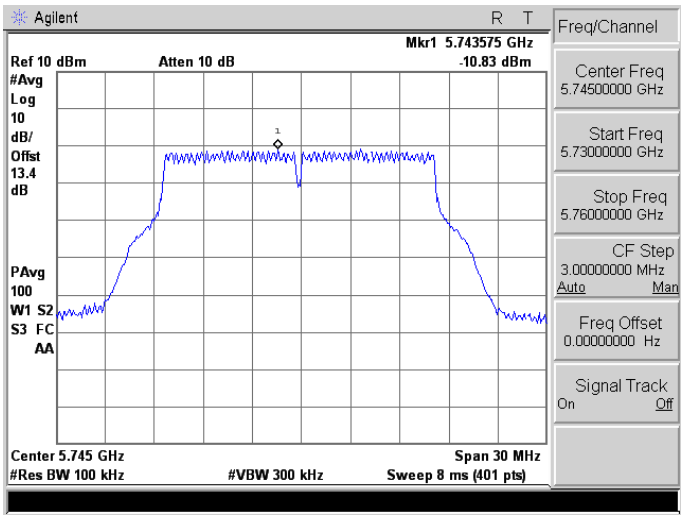
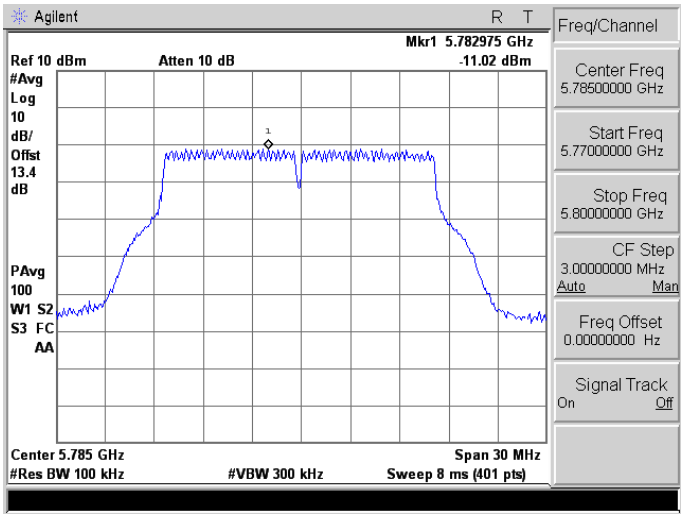
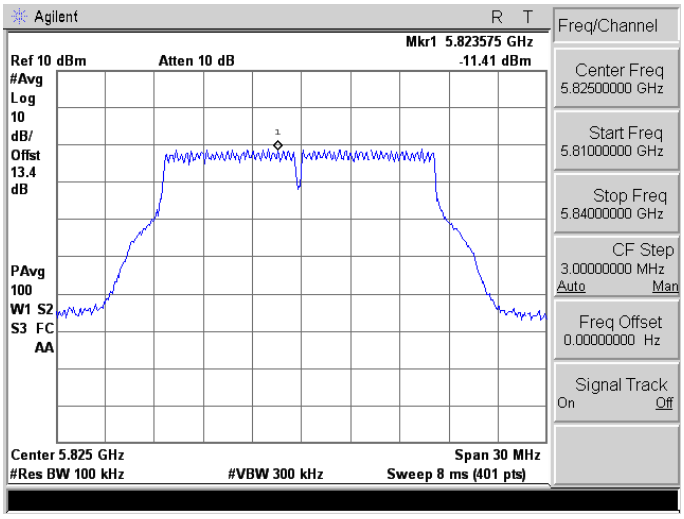
Model Number	MS-102		
Test Item	Conducted power spectral density		
Test Mode	Mode 2: IEEE 802.11a Link Mode		
Date of Test	03/05/2015	Test Site	TE02

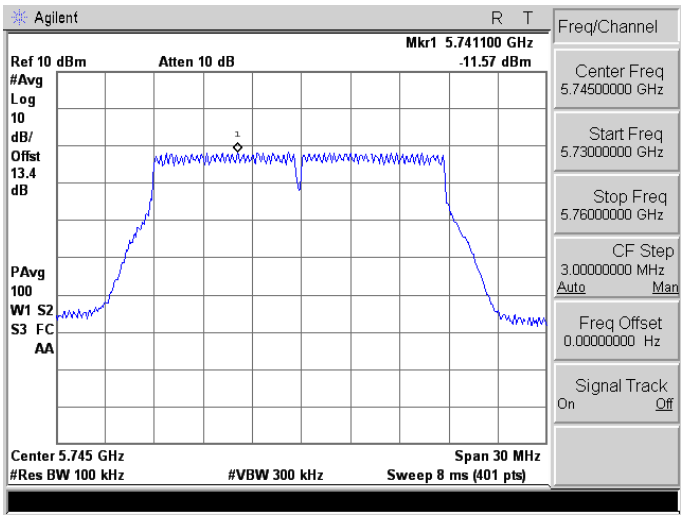
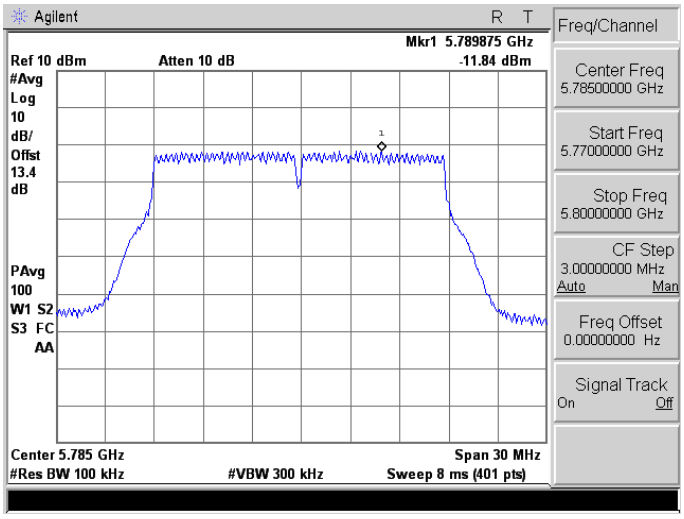
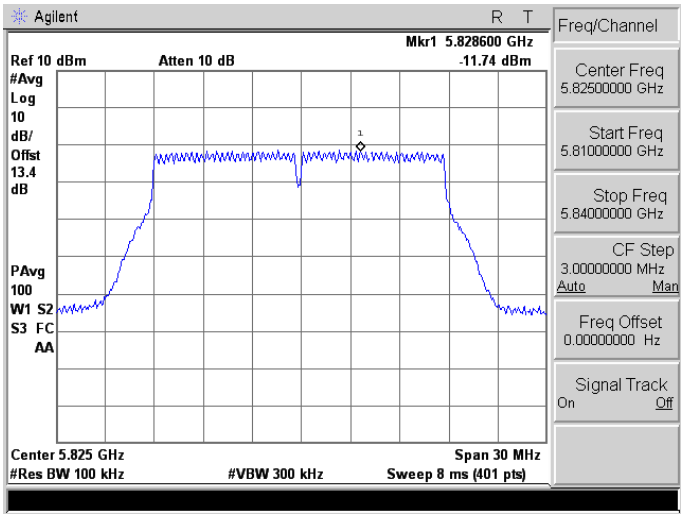
Frequency (MHz)	Measurement (dBm/100KHz)	Measurement (dBm/500KHz)	FCC Limit (dBm/500KHz)
5745	-10.83	-3.84	< 30
5785	-11.02	-4.03	
5825	-11.41	-4.42	

Model Number	MS-102		
Test Item	Conducted power spectral density		
Test Mode	Mode 3: IEEE 802.11n 20MHz Link Mode		
Date of Test	03/05/2015	Test Site	TE02

Frequency (MHz)	Measurement (dBm/100KHz)	Measurement (dBm/500KHz)	FCC Limit (dBm/500KHz)
5745	-11.57	-4.58	< 30
5785	-11.84	-4.85	
5825	-11.74	-4.75	

8.6. Test Graphs

Mode 2: IEEE 802.11a Link Mode	
5745	
5785	
5825	

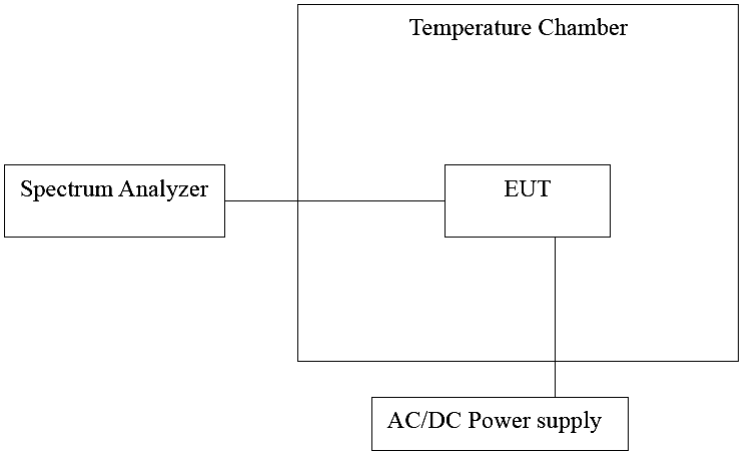
Mode 3: IEEE 802.11n 20MHz Link Mode	
5745	
5785	
5825	

9 Frequency Stability Measurement

9.1. Limit

The frequency tolerance of the carrier signal shall be maintained within the band of operation frequency over a temperature variation of –30 degrees to 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

9.2. Test Setup



9.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4408B	MY45107753	07/24/2014	(1)
Temperature & Humidity Chamber	TAICHY	MHU-225LA	980729	08/14/2014	(1)
Test Site	ATL	TE02	TE02	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

Note: N.C.R. = No Calibration Request.

9.4. Test Procedure

1. The EUT was placed inside the environmental test chamber and powered by nominal AC/DC voltage.
2. Turn the EUT on and couple its output to a spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

9.5. Test Result

Temperature Variations

Model Number	MS-102				
Test Mode	Mode 2				
Frequency	5785 MHz				
Date of Test	03/05/2015			Test Site	TE02
Temp. (°C)	Voltage (VAC)	Measured Frequency (MHz)	Delta Frequency (Hz)	Tolerance (ppm)	Result (Pass/Fail)
-30	120	5784.9715	-28500	-4.927	Pass
-20		5784.9758	-24200	-4.183	Pass
-10		5784.9798	-20200	-3.492	Pass
0		5784.9835	-16500	-2.852	Pass
10		5784.9845	-15500	-2.679	Pass
20		5784.9952	-4800	-0.830	Pass
30		5784.9943	-5700	-0.985	Pass
40		5784.9961	-3900	-0.674	Pass
50		5785.0097	9700	1.677	Pass

Note: The manufacturer's frequency stability specification is better then 20ppm.

Model Number	MS-102				
Test Mode	Mode 3				
Frequency	5785 MHz				
Date of Test	03/05/2015			Test Site	TE02
Temp. (°C)	Voltage (VAC)	Measured Frequency (MHz)	Delta Frequency (Hz)	Tolerance (ppm)	Result (Pass/Fail)
-30	120	5784.973	-27000	-4.667	Pass
-20		5784.9738	-26200	-4.529	Pass
-10		5784.9835	-16500	-2.852	Pass
0		5784.9852	-14800	-2.558	Pass
10		5784.9917	-8300	-1.435	Pass
20		5784.9943	-5700	-0.985	Pass
30		5784.9989	-1100	-0.190	Pass
40		5784.9977	-2300	-0.398	Pass
50		5785.0037	3700	0.640	Pass

Note: The manufacturer's frequency stability specification is better then 20ppm.

Voltage Variations

Model Number	MS-102				
Test Mode	Mode 2				
Frequency	5785 MHz				
Date of Test	03/05/2015			Test Site	TE02
Temp. (°C)	Voltage (VAC)	Measured Frequency (MHz)	Delta Frequency (Hz)	Tolerance (ppm)	Result (Pass/Fail)
20	138.00	5784.9908	-9200	-1.590	Pass
	120.00	5784.9936	-6400	-1.106	Pass
	102.00	5784.9931	-6900	-1.193	Pass

Model Number	MS-102				
Test Mode	Mode 3				
Frequency	5785 MHz				
Date of Test	03/05/2015			Test Site	TE02
Temp. (°C)	Voltage (VAC)	Measured Frequency (MHz)	Delta Frequency (Hz)	Tolerance (ppm)	Result (Pass/Fail)
20	138.00	5784.9908	-9200	-1.590	Pass
	120.00	5784.9933	-6700	-1.158	Pass
	102.00	5784.998	-2000	-0.346	Pass

Note: The manufacturer's frequency stability specification is better then 20ppm.

10 Antenna Requirement

10.1. Limit

For intentional device, according to 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
And According to 15.407 (a), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

10.2. Antenna Connector Construction

The antenna used in this product is Multilayer Chip Antennas. And the maximum Gain of this antenna is only 4.09 dBi.