FCC 47 CFR PART 15 SUBPART C

RF Test Report

Applicant	:	KRONOZ
Product Type	:	Smart Watch
Trade Name	:	MYKRONOZ
Model Number	:	ZeCircle^2
Test Specification	:	FCC 47 CFR PART 15 SUBPART C ANSI C63.10:2013
Receive Date	:	Sep. 23, 2016
Test Period	:	Oct. 20 ~ Nov. 21, 2016
Issue Date	:	Mar. 15, 2017

Issue by

A Test Lab Techno Corp.
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Taiwan Accreditation Foundation accreditation number: 1330

Revision History

Rev.	Issue Date	Revisions	Revised By
00	Nov. 30, 2016	Initial Issue	Joyce Liao
01	Mar. 15, 2017	Revised report information.	Joyce Liao

Verification of Compliance

Issued Date: Mar. 15, 2017

Applicant	:	KRONOZ
Product Type	:	Smart Watch
Trade Name	:	MYKRONOZ
Model Number	:	ZeCircle^2
FCC ID	:	2AA7D-ZECE2
EUT Rated Voltage	:	DC 5V, 0.5A
Test Voltage	:	120 Vac / 60 Hz
Applicable Standard	:	FCC 47 CFR PART 15 SUBPART C ANSI C63.10:2013
Test Result	:	Complied
Performing Lab.	:	A Test Lab Techno Corp. No. 140-1, Changan Street, Bade District, Taoyuan City 33465, Taiwan (R.O.C) Tel：+886-3-2710188 / Fax：+886-3-2710190 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

Reference 47 CFR Part 15.225	Test	Results	Remark
15.203	Antenna Requirement	Meet Require	---
15.207(a)	Conducted Emissions Voltage	PASS	---
15.225 (a), (b), (c), (d) 15.209	Radiated Emission Limits	PASS	---
15.225(e)	Frequency Stability	PASS	---
15.215(c)	20dB Bandwidth	-----	---
CFR 47 Part 15.225 / ANSI C63.10:2013			

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

Test Item	Frequency Range	Uncertainty
Conducted Emission	9kHz ~ 150KHz	2.7 dB
	150kHz ~ 30MHz	2.7 dB
Radiated Emission	9kHz ~ 30MHz	1.7 dB
	30MHz ~ 1000MHz	5.7 dB
	1000MHz ~ 18000MHz	5.5 dB
	18000MHz ~ 26500MHz	4.8 dB
	26500MHz ~ 40000MHz	4.8 dB
RF Bandwidth		4.96%
Frequency Stability		+ 2.212 x 10-7% / - 2.170 x 10-7

2 EUT Description

Applicant	KRONOZ ROUTE DE VALAVRAN 96, GENTHOD, 1294, Switzerland
Manufacturer	KRONOZ ROUTE DE VALAVRAN 96, GENTHOD, 1294, Switzerland
Product	Smart Watch
Trade Name	MYKRONOZ
Model Number	ZeCircle^2
FCC ID	2AA7D-ZECE2
Frequency Range	13.56 MHz
Modulation Type	ASK
Number of Channels	1 Channel
Antenna Type	FPC Antenna

3 Test Methodology

3.1. Mode of Operation

The following test mode(s) were scanned during the preliminary test：

Pre-Test Mode
Mode 1: Transmit Mode
Mode 2: Receive Mode

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 worst TX mode only.

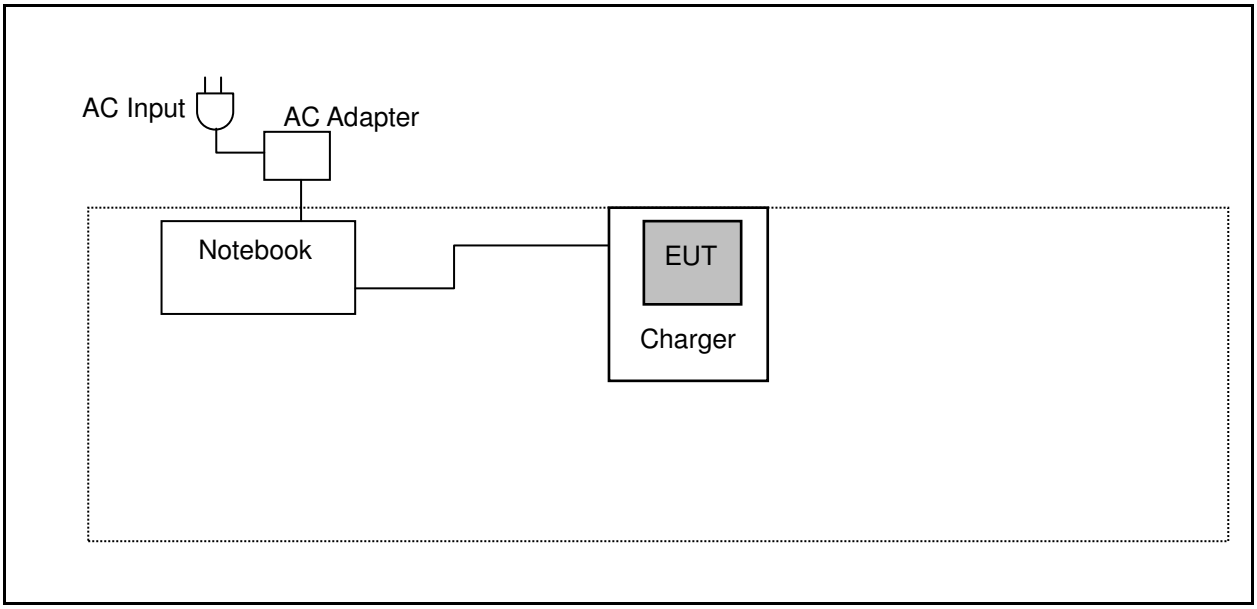
3.2. EUT Exercise Software

1.	Setup the EUT as shown on 3.3.
2.	Turn on the power of all equipment.
3.	The EUT will start to operate function.

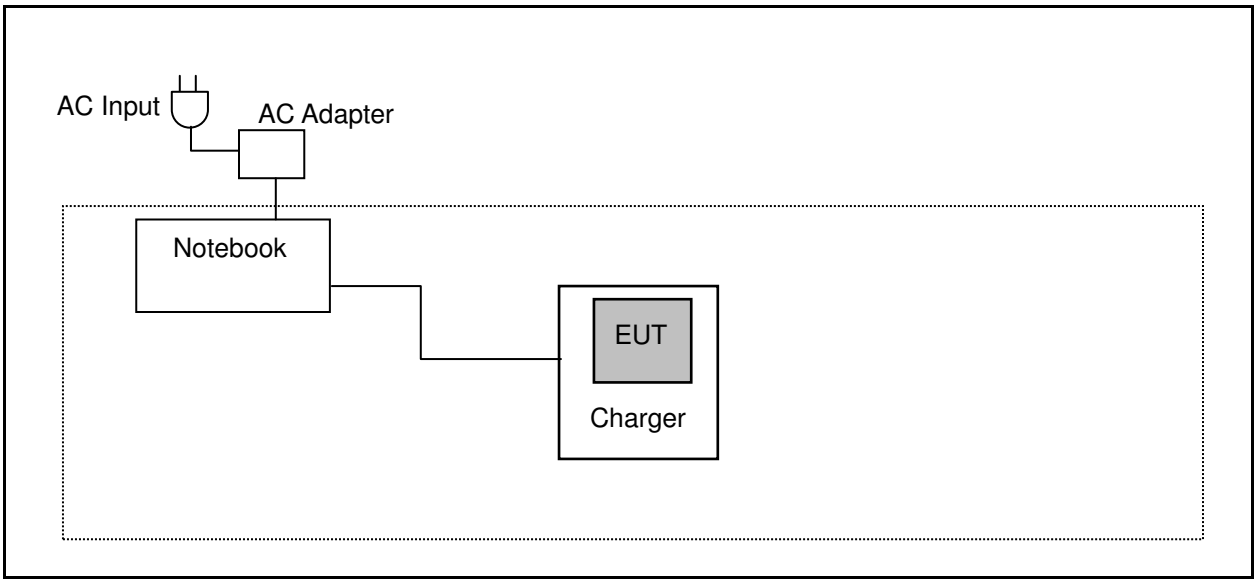
Measurement Software	
1	EZ-EMC Ver. ATL-03A1-1
2	EZ-EMC Ver ATL-ITC-3A1-1

3.3. Configuration of Test System Details

AC Power Conducted Emission



Radiated Emissions



3.4. Test Site Environment

Items	Required (IEC 60068-1)	Actual
Temperature (°C)	15-35	26
Humidity (%RH)	25-75	60
Barometric pressure (mbar)	860-1060	950

4 Test Results

4.1. AC Power Line Conducted Emission Measurement

■ Limit

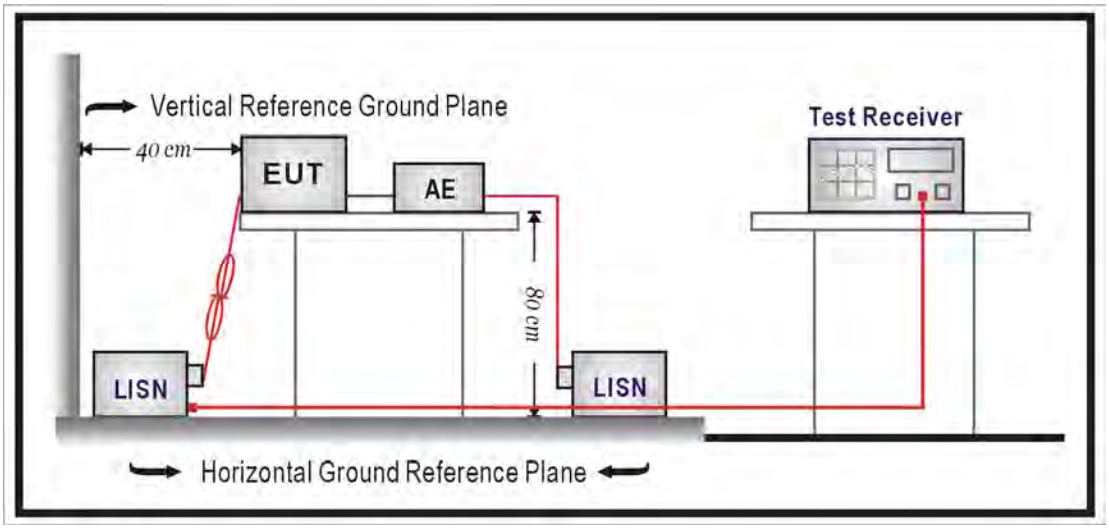
Frequency (MHz)	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

■ Test Instruments

Describe	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Test Receiver	R&S	ESCI	100367	05/13/2016	1 year
LISN	R&S	ENV216	101040	03/15/2016	1 year
LISN	R&S	ENV216	101041	03/07/2016	1 year
RF Cable	Woken	00100D1380194M	TE-02-02	05/31/2016	1 year
Test Site	ATL	TE02	TE02	N.C.R.	-----

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

■ Test Setup



■ Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50Ω// 50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50Ω// 50uH coupling impedance with 50ohm termination.

Tabletop device shall be placed on a non-conducting platform, of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The wall of screened room shall be located 40cm to the rear of the EUT. Other surfaces of tabletop or floor standing EUT shall be at least 80cm from any other ground conducting surface including one or more LISNs. For floor-standing device shall be placed under the EUT with a 12mm insulating material.

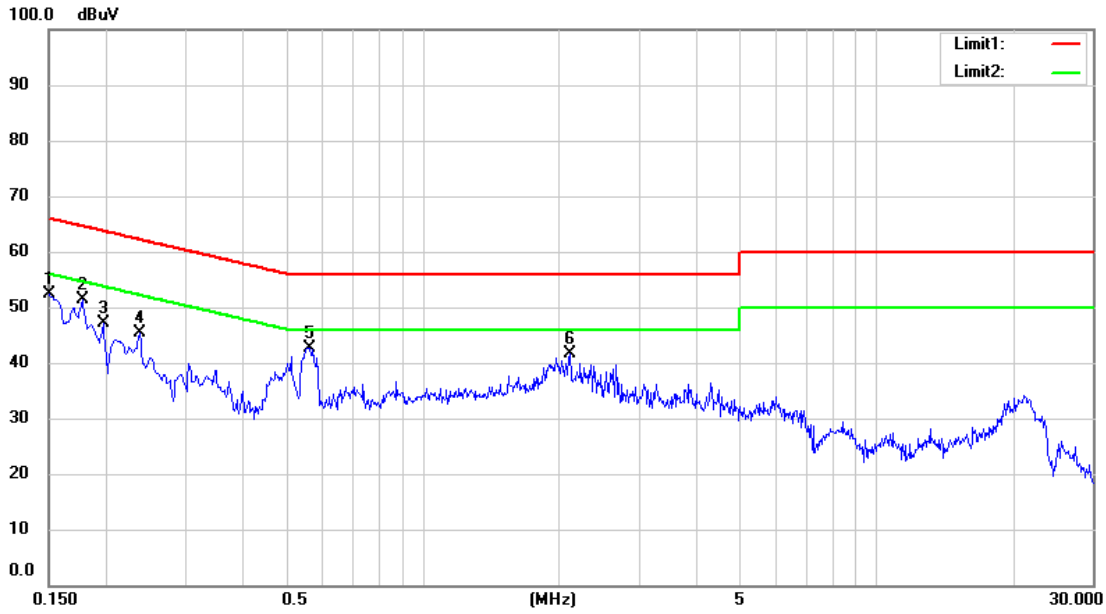
Conducted emissions were investigated over the frequency range from 0.15 MHz to 30 MHz using a resolution bandwidth of 9 kHz. The equipment under test (EUT) shall be meet the limits in section 4.1, as applicable, including the average limit and the quasi-peak limit when using respectively, an average detector and quasi-peak detector measured in accordance with the methods described of related standard. When all of peak value were complied with quasi-peak and average limit from 150kHz to 30MHz then quasi-peak and average measurement was unnecessary.

The AMN shall be placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for AMNs mounted on top of the ground reference plane. This distance is between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment shall be at least 0,8 m from the AMN. If the mains power cable is longer than 1m then the cable shall be folded back and forth at the centre of the lead to form a bundle no longer than 0.4m. All of interconnecting cables that hang closer than 40cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long. All of EUT and AE shall be separate place more than 0.1m. All 50 Ω ports of the LISN shall be resistively terminated into 50 Ω loads when not connected to the measuring instrument.

If the reading of the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 s at each measurement frequency; the higher reading shall be recorded with the exception of any brief isolated high reading which shall be ignored.

■ Test Result

Standard:	FCC Part 15C	Power:	AC 120V/60Hz
Test Mode:	Mode 1	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Line:	L1	Date:	10/20/2016
Description:			

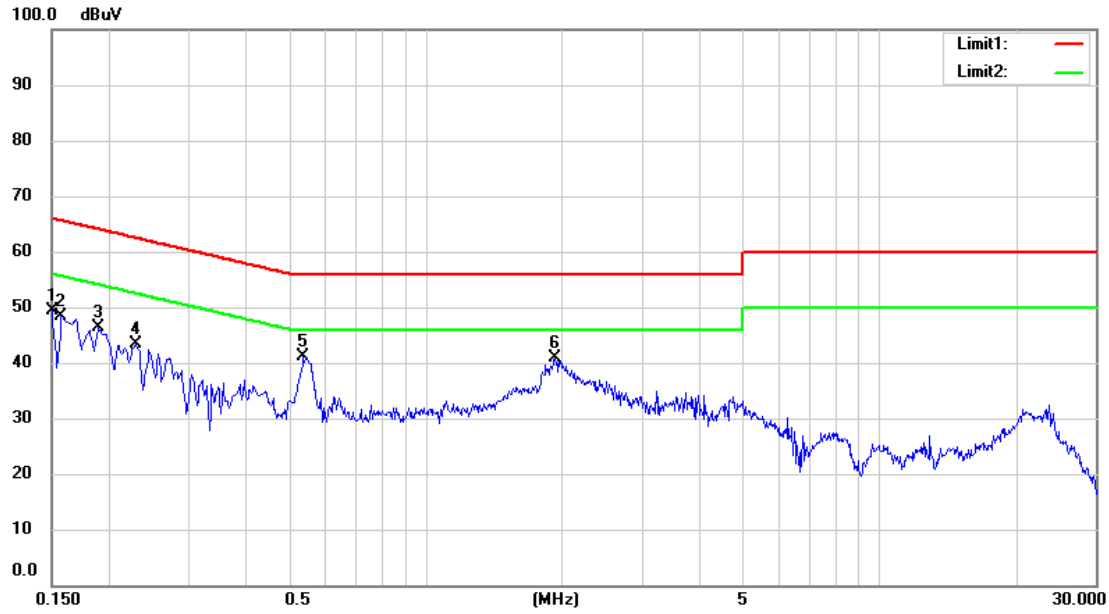


No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.1500	38.53	22.85	9.63	48.16	32.48	66.00	56.00	-17.84	-23.52	Pass
2	0.1780	35.02	21.08	9.64	44.66	30.72	64.58	54.58	-19.92	-23.86	Pass
3	0.1980	33.42	19.02	9.64	43.06	28.66	63.69	53.69	-20.63	-25.03	Pass
4	0.2380	26.55	13.01	9.64	36.19	22.65	62.17	52.17	-25.98	-29.52	Pass
5	0.5660	30.33	22.51	9.67	40.00	32.18	56.00	46.00	-16.00	-13.82	Pass
6	2.1140	23.80	16.87	9.75	33.55	26.62	56.00	46.00	-22.45	-19.38	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

Standard:	FCC Part 15C	Power:	AC 120V/60Hz
Test Mode:	Mode 1	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Line:	N	Date:	10/20/2016
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	35.11	14.43	9.62	44.73	24.05	66.00	56.00	-21.27	-31.95	Pass
2	0.1580	39.91	21.27	9.63	49.54	30.90	65.57	55.57	-16.03	-24.67	Pass
3	0.1900	31.50	15.38	9.64	41.14	25.02	64.04	54.04	-22.90	-29.02	Pass
4	0.2300	27.72	18.82	9.64	37.36	28.46	62.45	52.45	-25.09	-23.99	Pass
5	0.5380	28.75	22.47	9.66	38.41	32.13	56.00	46.00	-17.59	-13.87	Pass
6	1.9340	26.80	20.24	9.75	36.55	29.99	56.00	46.00	-19.45	-16.01	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

4.2. Radiated Emissions Measurement

■ Limit

According to §15.225,

(a) The field strength of any emissions within the band 13.553 – 13.567 MHz shall not exceed 15,848 microvolt / meter at 30 meters.

(b) Within the bands 13.410 – 13.553 MHz and 13.567 -13.710 MHz, the field strength of any emissions shall not exceed 334 microvolt / meter at 30 meters.

(c) Within the bands 13.110 – 13.410 MHz and 13.710 – 14.010 MHz the field strength of any emissions shall not exceed 106 microvolt / meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110 – 14.010 MHz and shall not exceed the general radiated emission limits in §15.209.

According to §15.225(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m at meter)	Measurement Distance (meter)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 - 88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

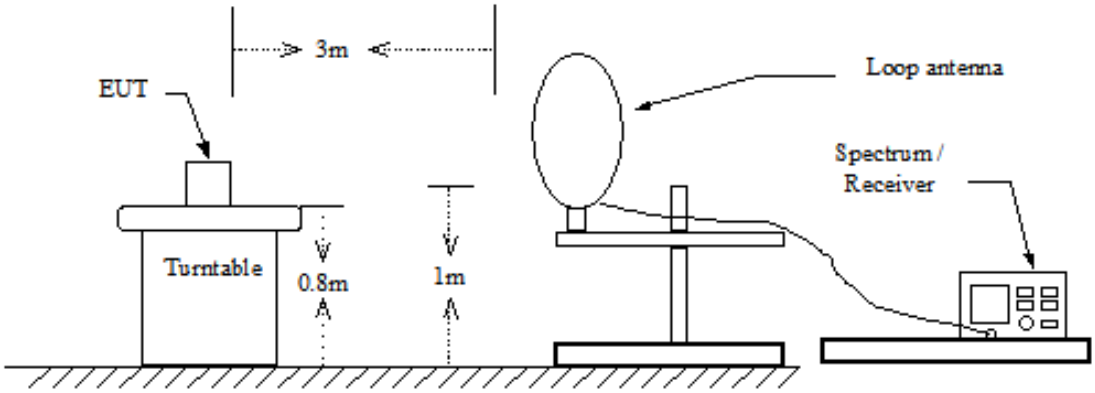
■ Test Instruments

3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
RF Pre-selector	Agilent	N9039A	MY46520256	03/22/2016	1 year
Spectrum Analyzer	Agilent	E4446A	MY46180578	03/22/2016	1 year
Pre Amplifier	Agilent	8449B	3008A02237	10/11/2016	1 year
Pre Amplifier	Agilent	8447D	2944A11119	01/11/2016	1 year
Broadband Antenna	Schwarzbeck	VULB9168	416	10/13/2016	1 year
Horn Antenna (1~18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	06/06/2016	1 year
Horn Antenna (18~40GHz)	ETS	3116	86467	09/05/2016	1 year
Loop Antenna	COM-POWER CORPORATION	AL-130	121014	02/01/2016	1 year
Microwave Cable	EMCI	EMC102-KM-KM-14000	151001	02/23/2016	1 year
Microwave Cable	EMCI	EMC-104-SM-SM-14000	140202	02/23/2016	1 year
Microwave Cable	EMCI	EMC104-SM-SM-600	140301	02/23/2016	1 year
Test Site	ATL	TE01	888001	08/29/2016	1 year

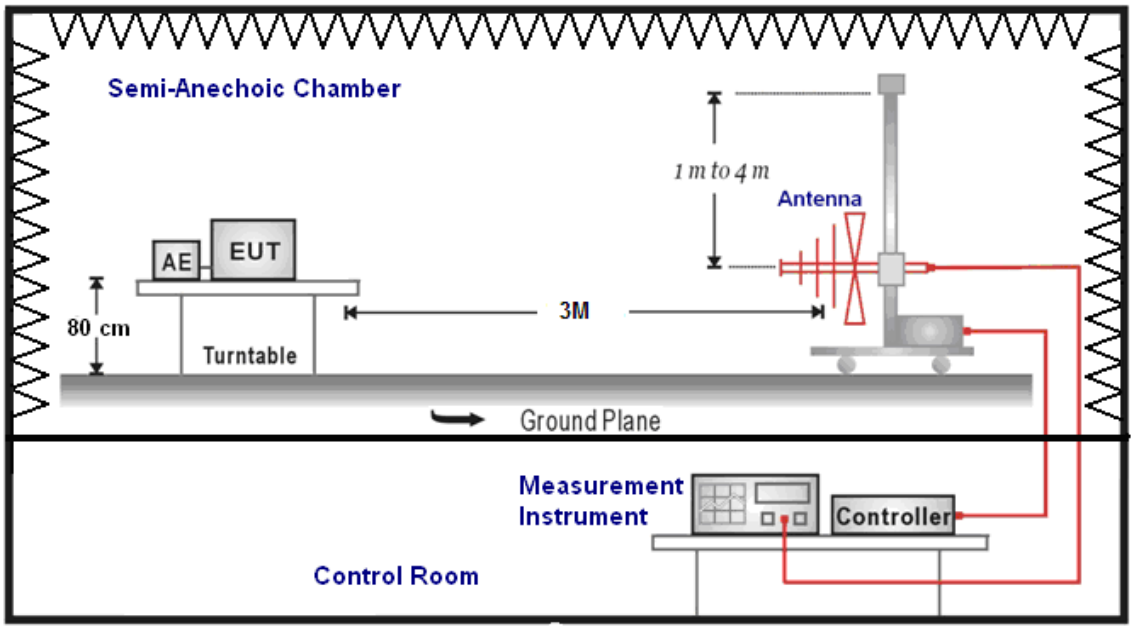
Note: N.C.R. = No Calibration Request.

■ Setup

9kHz ~ 30MHz



Below 1GHz



■ 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 or 1.5 meters height (below 1GHz use 0.8m turntable / above 1GHz use 1.5m turntable), 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 26.5 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.

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.

Broadband/Horn Antenna were used in frequency 30MHz to 18 GHz at a distance of 3 meter. Loop/Horn Antenna was used in frequency 9kHz to 30MHz and 18 to 26.5 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).

SCHWARZBECK MESS-ELEKTRONIK Biconilog Antenna at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna was used in frequencies 1 – 26.5 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.

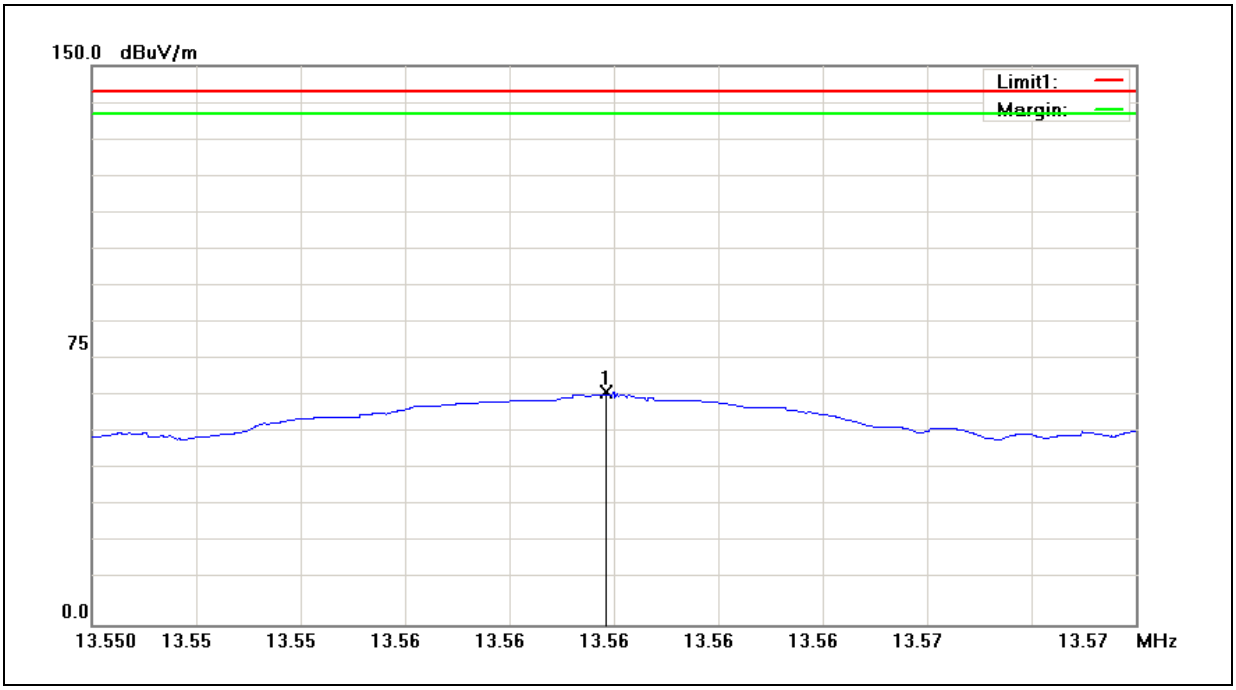
(2) Actual Amplitude (dBuV/m) = Amplitude (dBuV)-Dis(dB)
The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:
(a) For fundamental frequency : Transmitter Output < +30dBm
(b) For spurious frequency : Spurious emission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

Data of measurement within this frequency range without mark in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

■ Test Result

Fundamental Test Result:

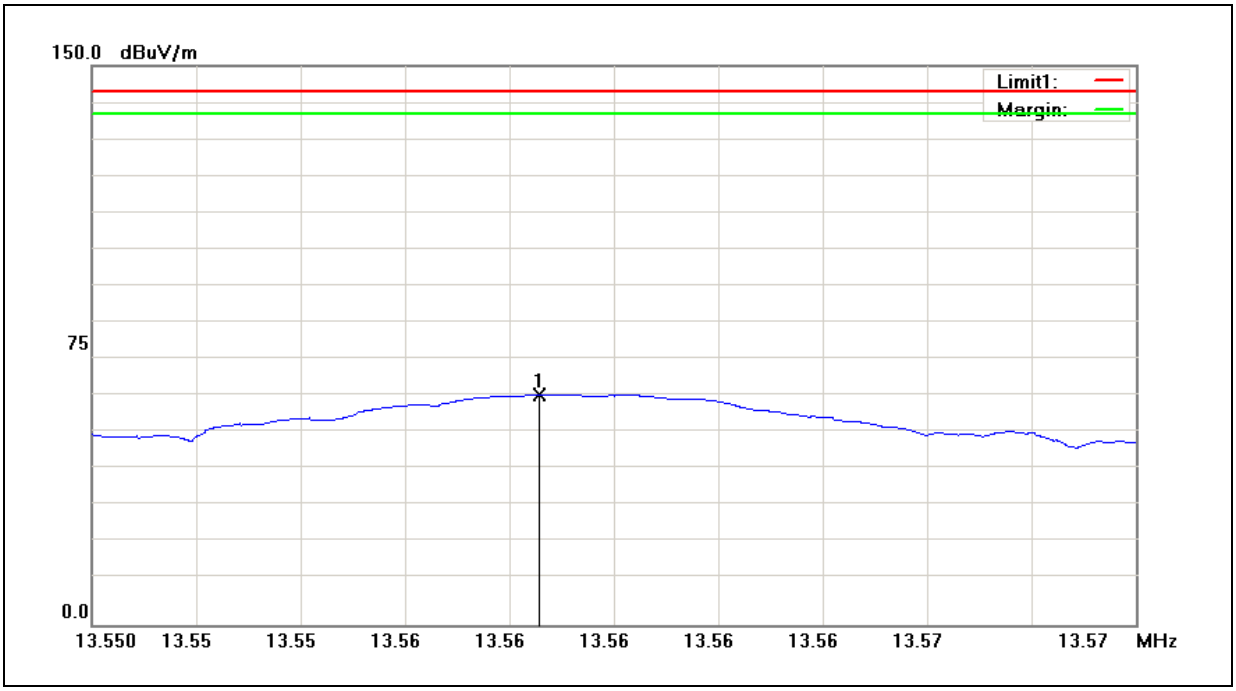
Standard:	FCC Part 15C	Test Distance:	1m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Test Mode:	Mode 1	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Ant.Polar.:	Horizontal	Date:	11/21/2016



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Near-Field Result (dBuV/m)	Derived Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	13.5600	48.28	14.18	62.46	21.99	84.00	-62.01	peak

Note: 1. The level is measured at 1 meter and is converted into result at 30 meter.
2. Near-Field Result (dBuV/m) = Correction factor (dB) + Reading(dBuV).
3. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).
4. The level is measured at 1 meter and is converted into result at 30 meter.
The converted formula listed below:
Measure result (1 meter distance): a
Compute result (30 meter distance): A
$d_{near\ field} = \lambda/2\pi$ ，$d_{measure}$ = 1 meter distance
$A = a - 40*\log(d_{near\ field}/d_{measure}) - 20*\log(d_{limit}/d_{near\ field})$
ex. a = 62.46 dBuV, A= 62.46 - 40*log(3.52/1) - 20*log(30/3.52) dBuV = 21.99 dBuV

Standard:	FCC Part 15C	Test Distance:	1m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Test Mode:	Mode 1	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Ant.Polar.:	Vertical	Date:	11/21/2016

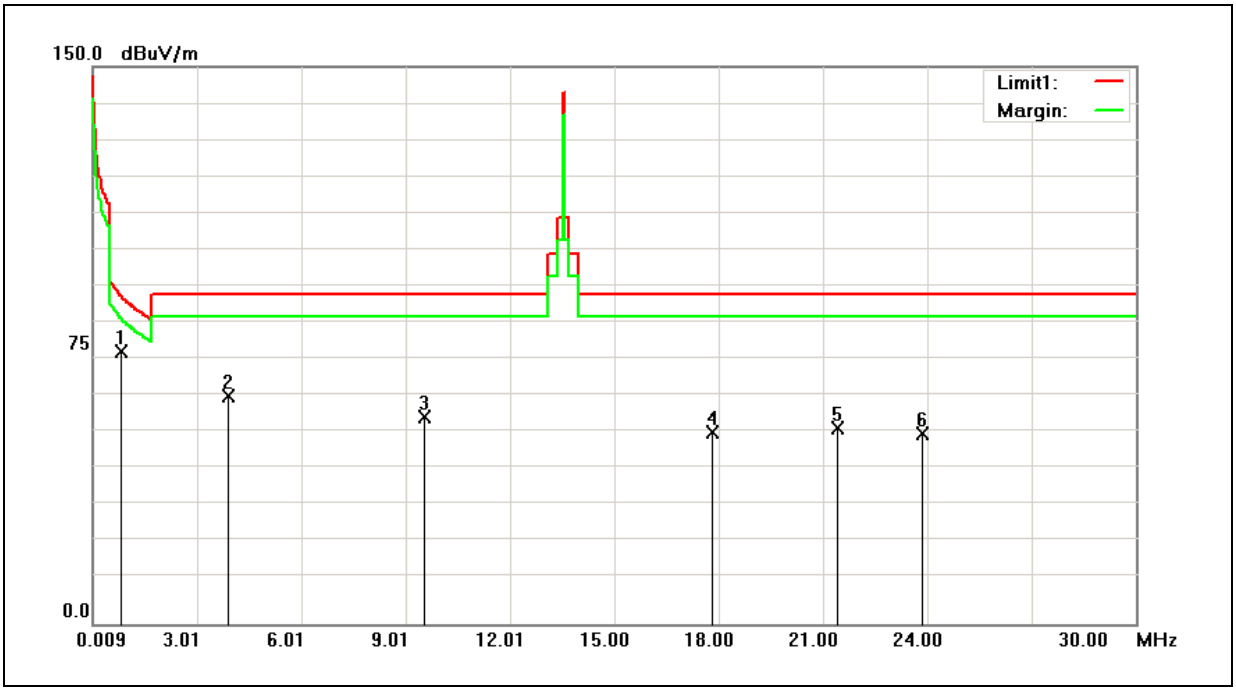


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Near-Field Result (dBuV/m)	Derived Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	13.5586	47.63	14.18	61.81	21.34	84.00	-62.66	peak

Note: 1. The level is measured at 1 meter and is converted into result at 30 meter.
2. Near-Field Result (dBuV/m) = Correction factor (dB) + Reading(dBuV).
3. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

9kHz ~ 30MHz:

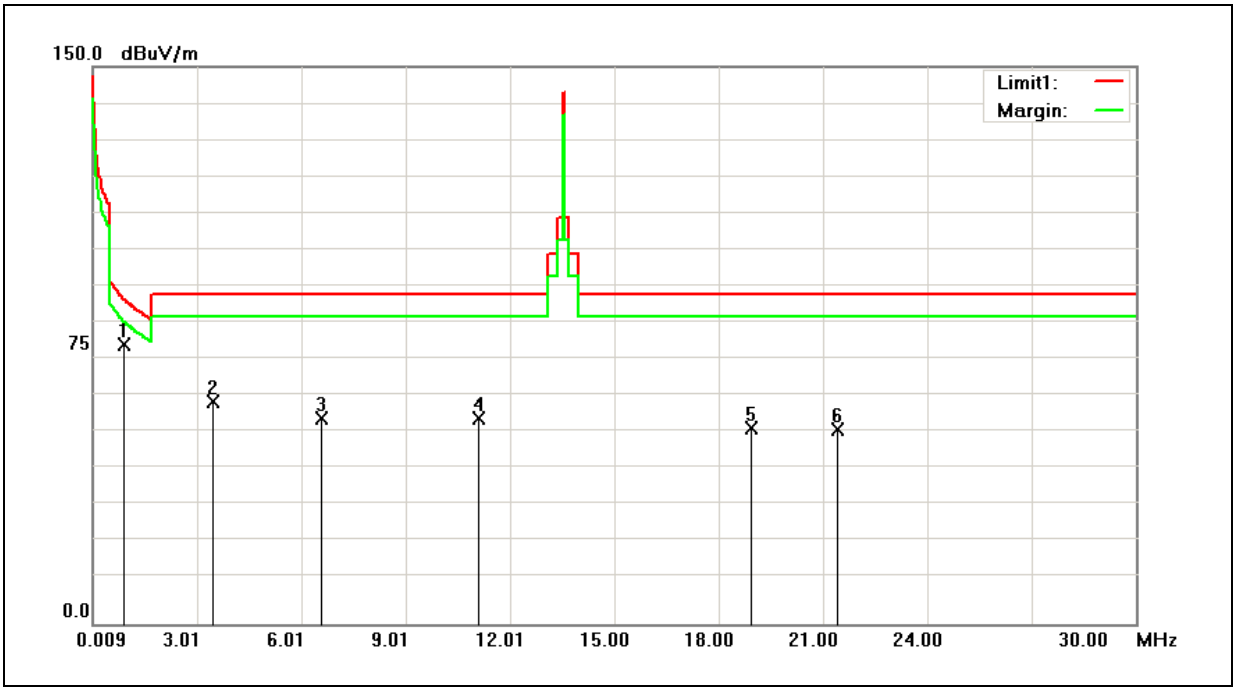
Standard:	FCC Part 15C	Test Distance:	1m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Test Mode:	Mode 1	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Ant.Polar.:	Horizontal	Date:	11/21/2016



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Near-Field Result (dBuV/m)	Derived Value (dBuV)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.8185	58.75	14.49	73.24	8.38	29.34	-20.96	QP
2	3.9077	46.71	14.78	61.49	10.21	29.54	-19.34	QP
3	9.546	40.19	15.44	55.63	12.11	29.54	-17.43	QP
4	17.8231	35.91	15.54	51.45	13.34	29.54	-16.20	QP
5	21.4222	37.28	15.23	52.51	16.00	29.54	-13.54	QP
6	23.8518	36.30	14.71	51.01	15.45	29.54	-14.10	QP

Note: 1. The level is measured at 1 meter and is converted into result at 300 or 30 meter.
2. Near-Field Result (dBuV/m) = Correction factor (dB) + Reading(dBuV).
3. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

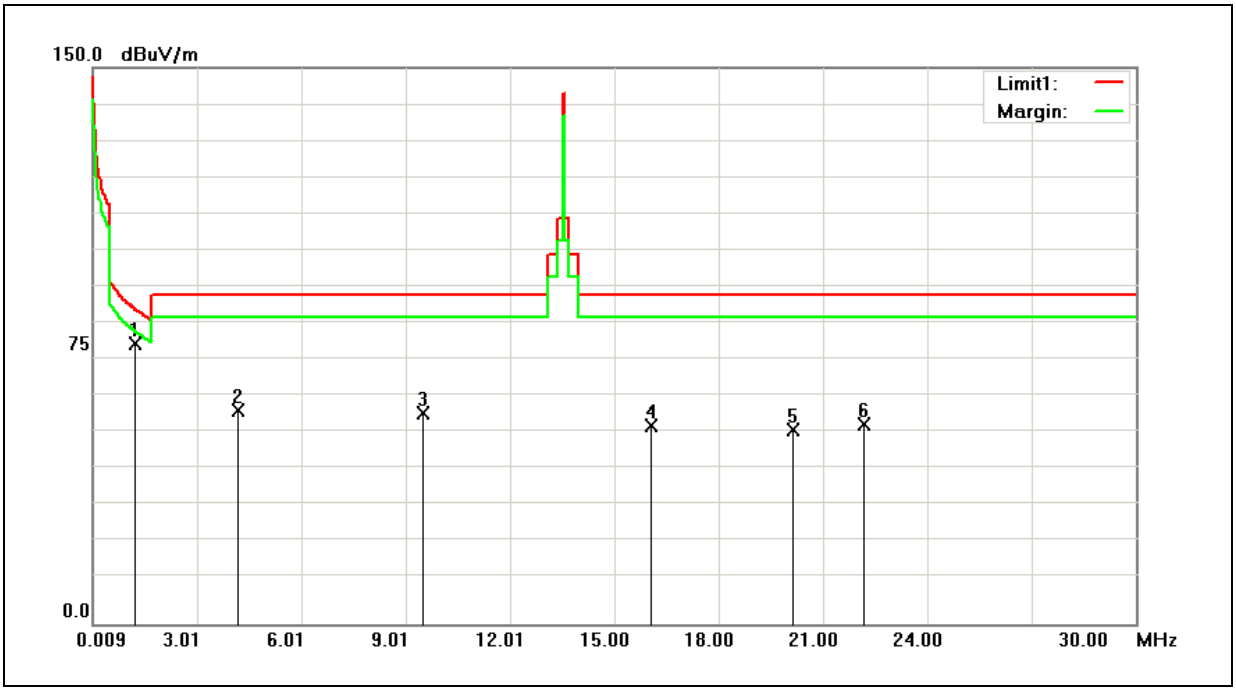
Standard:	FCC Part 15C	Test Distance:	1m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Test Mode:	Mode 1	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Ant.Polar.:	Vertical	Date:	11/21/2016



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Near-Field Result (dBuV/m)	Derived Value (dBuV)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.9082	60.80	14.55	75.35	11.39	28.44	-17.05	QP
2	3.458	45.03	14.63	59.66	7.31	29.54	-22.23	QP
3	6.577	40.01	15.24	55.25	8.49	29.54	-21.05	QP
4	11.1057	39.74	15.47	55.21	13.00	29.54	-16.54	QP
5	18.933	37.17	15.53	52.70	15.13	29.54	-14.41	QP
6	21.4222	37.23	15.23	52.46	15.95	29.54	-13.59	QP

Note: 1. The level is measured at 1 meter and is converted into result at 300 or 30 meter.
2. Near-Field Result (dBuV/m) = Correction factor (dB) + Reading(dBuV).
3. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

Standard:	FCC Part 15C	Test Distance:	300/30m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Test Mode:	Mode 2	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Ant.Polar.:	Horizontal	Date:	11/21/2016



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Near-Field Result (dBuV/m)	Derived Value (dBuV)	Limit (dBuV/m)	Margin (dB)	Remark
1	1.238	61.02	14.60	75.62	14.35	25.75	-11.40	QP
2	4.1774	42.57	14.87	57.44	6.74	29.54	-22.81	QP
3	9.516	41.42	15.44	56.86	13.30	29.54	-16.24	QP
4	16.0542	37.80	15.51	53.31	14.31	29.54	-15.23	QP
5	20.133	36.63	15.50	52.13	15.09	29.54	-14.45	QP
6	22.1722	38.56	15.07	53.63	17.44	29.54	-12.10	QP

Note: 1. The level is measured at 1 meter and is converted into result at 300 or 30 meter.
2. Near-Field Result (dBuV/m) = Correction factor (dB) + Reading(dBuV).
3. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

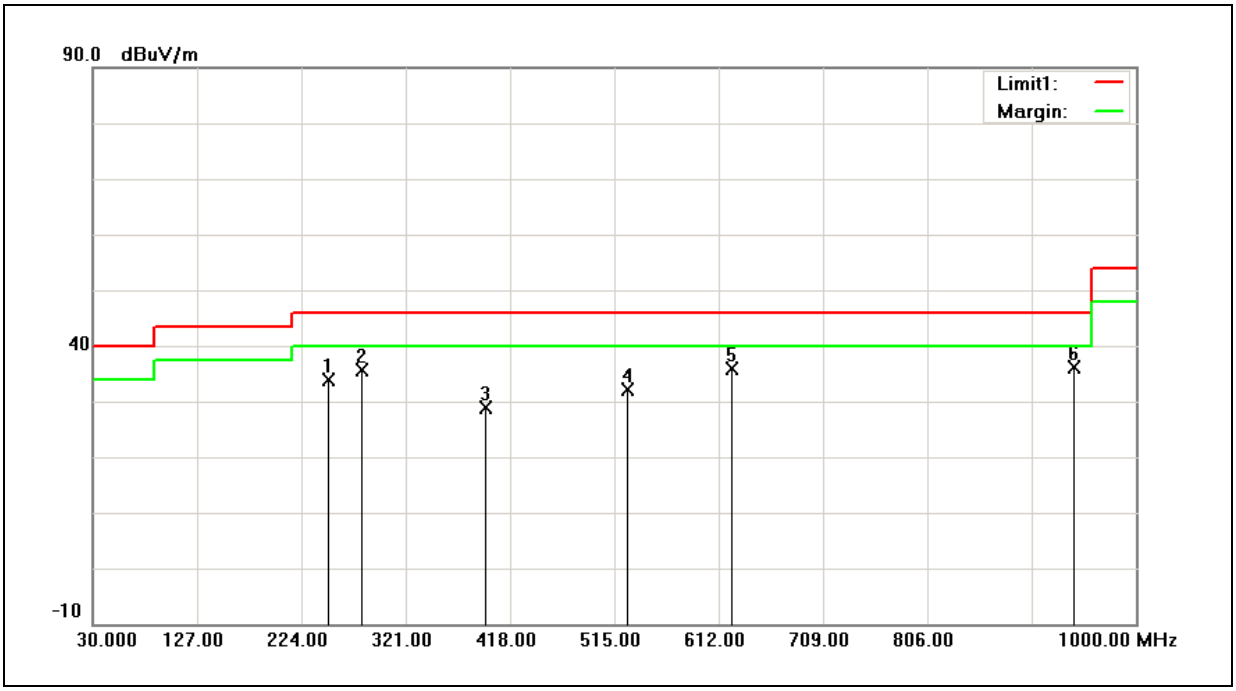
Standard:	FCC Part 15C	Test Distance:	300/30m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Test Mode:	Mode 2	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Ant.Polar.:	Vertical	Date:	11/21/2016

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Near-Field Result (dBuV/m)	Derived Value (dBuV)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.7588	61.23	14.46	75.69	10.17	30.00	-19.83	QP
2	4.1774	42.23	14.87	57.10	6.40	29.54	-23.15	QP
3	9.186	41.81	15.42	57.23	13.37	29.54	-16.17	QP
4	12.2751	40.81	15.47	56.28	14.94	29.54	-14.60	QP
5	17.8836	39.63	15.54	55.17	17.10	29.54	-12.45	QP
6	21.4526	37.79	15.23	53.02	16.55	29.54	-12.99	QP

Note: 1. The level is measured at 1 meter and is converted into result at 300 or 30 meter.
2. Near-Field Result (dBuV/m) = Correction factor (dB) + Reading(dBuV).
3. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

30MHz ~ 1GHz:

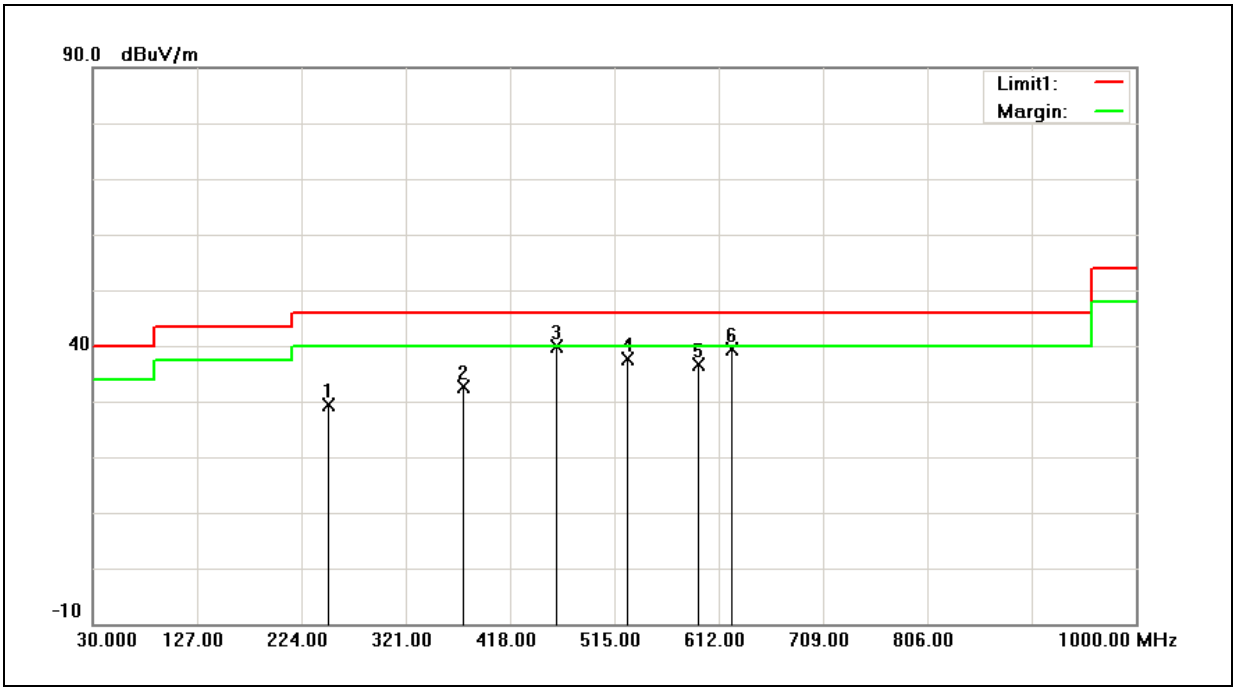
Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Test Mode:	Mode 1	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Ant.Polar.:	Horizontal	Date:	11/21/2016



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	250.0000	39.08	-5.28	33.80	46.00	-12.20	QP
2	280.5000	39.62	-3.90	35.72	46.00	-10.28	QP
3	396.0000	30.72	-1.78	28.94	46.00	-17.06	QP
4	528.0000	30.90	1.15	32.05	46.00	-13.95	QP
5	625.0000	32.44	3.41	35.85	46.00	-10.15	QP
6	943.0000	26.58	9.50	36.08	46.00	-9.92	QP

Note: 1. Result (dBuV/m) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

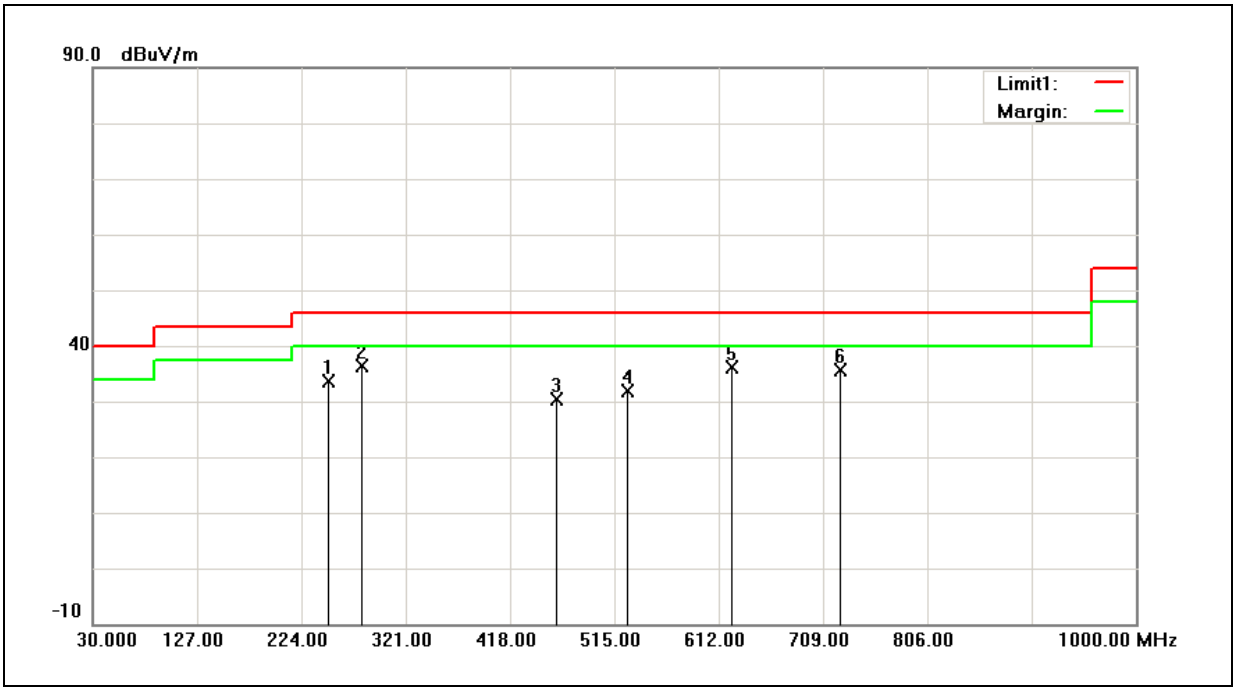
Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Test Mode:	Mode 1	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Ant.Polar.:	Vertical	Date:	11/21/2016



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	250.0000	34.64	-5.28	29.36	46.00	-16.64	QP
2	375.0000	34.81	-2.18	32.63	46.00	-13.37	QP
3	462.0000	39.85	0.05	39.90	46.00	-6.10	QP
4	528.0000	36.52	1.15	37.67	46.00	-8.33	QP
5	594.0000	33.89	2.74	36.63	46.00	-9.37	QP
6	625.0000	35.91	3.41	39.32	46.00	-6.68	QP

Note: 1. Result (dBuV/m) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

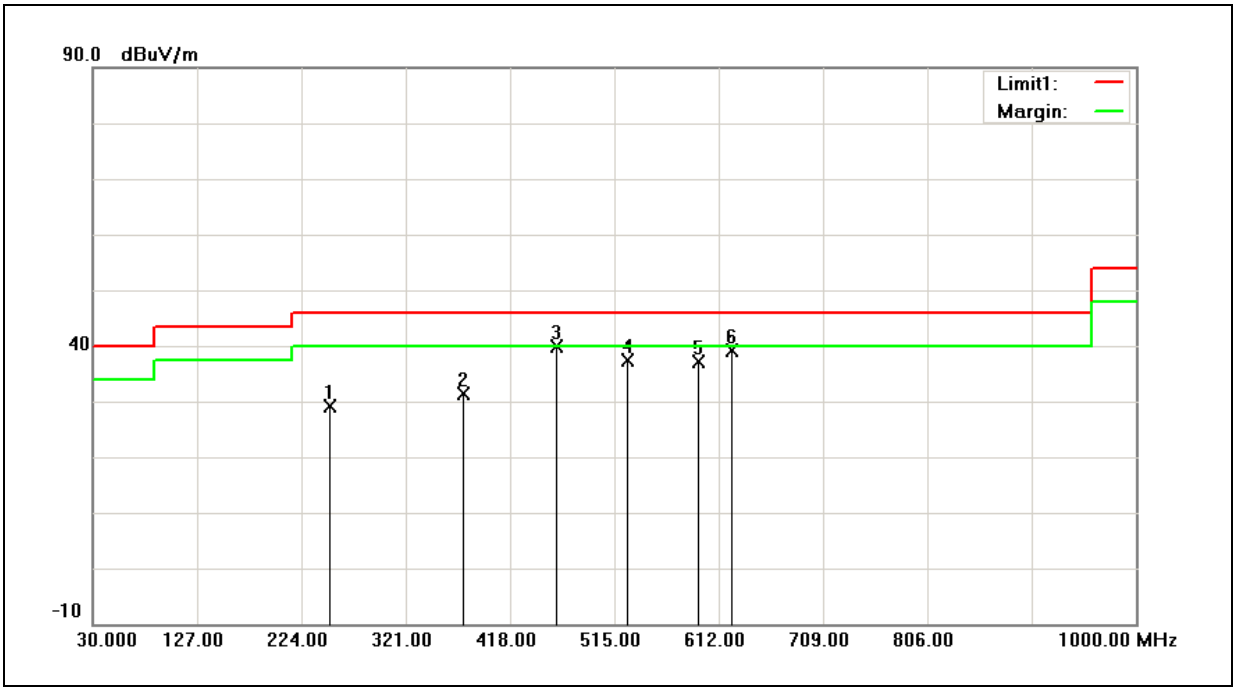
Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Test Mode:	Mode 2	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Ant.Polar.:	Horizontal	Date:	11/21/2016



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	250.0000	38.89	-5.28	33.61	46.00	-12.39	QP
2	280.5000	40.19	-3.90	36.29	46.00	-9.71	QP
3	462.0000	30.34	0.05	30.39	46.00	-15.61	QP
4	528.0000	30.69	1.15	31.84	46.00	-14.16	QP
5	625.0000	32.74	3.41	36.15	46.00	-9.85	QP
6	726.0000	30.26	5.37	35.63	46.00	-10.37	QP

Note: 1. Result (dBuV/m) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Test Mode:	Mode 2	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Ant.Polar.:	Vertical	Date:	11/21/2016



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	250.5000	34.33	-5.27	29.06	46.00	-16.94	QP
2	375.0000	33.49	-2.18	31.31	46.00	-14.69	QP
3	462.0000	39.74	0.05	39.79	46.00	-6.21	QP
4	528.0000	36.20	1.15	37.35	46.00	-8.65	QP
5	594.0000	34.34	2.74	37.08	46.00	-8.92	QP
6	625.0000	35.66	3.41	39.07	46.00	-6.93	QP

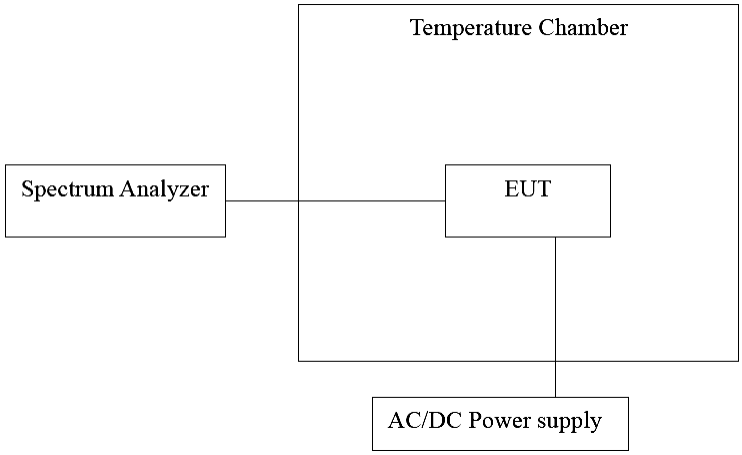
Note: 1. Result (dBuV/m) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

4.3. Frequency Stability Measurement

■ Limit

According to §15.225(e), the frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of –20 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. For battery operated equipment, the equipment tests shall be performed using a new battery.

■ Test Setup



■ Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4408B	MY45107753	08/08/2016	1 year
Temperature & Humidity Chamber	TAICHY	MHU-225LA	980729	04/18/2016	1 year
Test Site	ATL	TE05	TE05	N.C.R.	-----

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

■ Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the environment into appropriate environment.
4. Set the spectrum analyzer as RBW=1kHz, VBW = RBW, Span = 200kHz, Sweep = auto.
5. Mark the peak frequency and measure the frequency tolerance using frequency counter function.
6. Repeat until all the results are investigated.

■ Test Result

Temperature Variations

Test Mode	Mode 1					
Date of Test	11/15/2016					
Temp. (°C)	Voltage (Vac)	Measured Frequency (MHz)	Delta Frequency (Hz)	Tolerance (%)	Limit (±%)	Result (Pass/Fail)
-20	120	13.5595	-500.0000	-0.0037	±0.01	Pass
-10		13.5601	100.0000	0.0007	±0.01	Pass
0		13.5596	-400.0000	-0.0029	±0.01	Pass
10		13.5602	200.0000	0.0015	±0.01	Pass
20		13.5603	300.0000	0.0022	±0.01	Pass
30		13.5602	200.0000	0.0015	±0.01	Pass
40		13.5601	100.0000	0.0007	±0.01	Pass
50		13.5599	-100.0000	-0.0007	±0.01	Pass

Voltage Variations

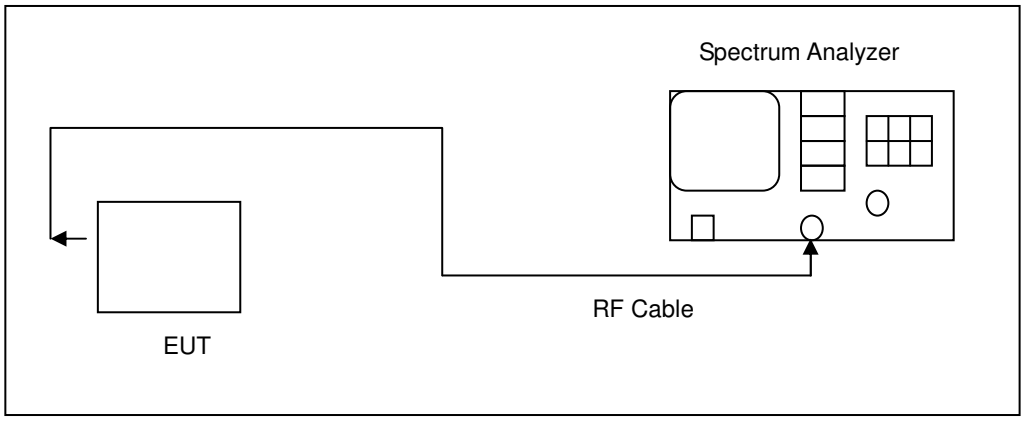
Test Mode	Mode 1					
Date of Test	11/15/2016					
Temp. (°C)	Voltage (Vac)	Measured Frequency (MHz)	Delta Frequency (Hz)	Tolerance (%)	Limit (±%)	Result (Pass/Fail)
20	102	13.5603	300.0000	0.0022	±0.01	Pass
	120	13.5603	300.0000	0.0022	±0.01	Pass
	138	13.5598	-200.0000	-0.0015	±0.01	Pass

4.4. 20dB Bandwidth Measurement

■ Limit

N/A

■ Test Setup



■ Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/15/2015	1 year
Microwave Cable	EMCI	EMC104-SM-SM-1500	140303	02/23/2016	1 year
Test Site	ATL	TE05	TE05	N.C.R.	-----

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

■ Test Procedure

Connect RF output port to the input of the spectrum analyzer. Connect the DUT to appropriate power supply. Turn RFID function of DUT on.

Analyzer used the following settings:

1. Span = 60 kHz
2. RBW ≥ 1% of the 20dB span
3. VBW ≥ RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate. The marker-to-peak function was used to set the marker to the peak of the emission. The marker-delta function was used to measure 20dB down one side of the emission. The marker-delta function and marker was moved to the other side of the emission until it was even with the reference marker. The marker-delta reading at this point was the 20dB bandwidth of the emission.

■ Test Result

Test Mode	Mode 1		
Date of Test	11/15/2016		
Frequency (MHz)	20dBc Low Point (MHz)	20dBc High Point (MHz)	Operating Frequency Band (MHz)
13.5600	13.55793	13.56201	13.553~13.567

■ Test Graphs


Agilent Spectrum Analyzer - Swept SA
Avg Type: Log-Pwr
PNO: Close
IFGain:High
Trig: Free Run
#Atten: 0 dB
Mkr3 13.562 01 MHz
-81.20 dBm
10 dB/div
Log
Ref -20.00 dBm
Center 13.56000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 30.00 kHz
Sweep 28.73 ms (1001 pts)
1 N 1 f 13.560 18 MHz -60.81 dBm
2 N 1 f 13.557 93 MHz -81.19 dBm
3 N 1 f 13.562 01 MHz -81.20 dBm
Frequency
Auto Tune
Center Freq
13.560000 MHz
Start Freq
13.545000 MHz
Stop Freq
13.575000 MHz
CF Step
3.000 kHz
Auto
Man
Freq Offset
0 Hz

4.5. Antenna Requirement

- Require

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

- Antenna Connector Construction

The antenna connector used in this product is FPC antenna, cannot be replaced by the end-user.