FCC Test Report

Report No.:	RF160128E09-5
FCC ID:	UZ7WT6000
Test Model:	WT6000
Received Date:	Jan. 28, 2016
Test Date:	Feb. 17 to Apr. 12, 2016
Issued Date:	Apr. 26, 2016
Applicant:	Zebra Technologies Corporation
Address:	1 Zebra Plaza, Holtsville, NY 11742
Manufacturer:	Zebra Technologies Corporation
Address:	1 Zebra Plaza, Holtsville, NY 11742
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location (1):	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location (2):	No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan R.O.C.

Testing Laboratory
2022

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Release Control Record

Issue No.	Description	Date Issued
RF160128E09-5	Original release.	Apr. 26, 2016

1 Certificate of Conformity

Product:	Wearable Terminal
Brand:	Zebra
Test Model:	WT6000
Sample Status:	ENGINEERING SAMPLE
Applicant:	Zebra Technologies Corporation
Test Date:	Feb. 17 to Apr. 12, 2016
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.225) 47 CFR FCC Part 15, Subpart C (Section 15.215) ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : Wendy Wu , **Date:** Apr. 26, 2016
Wendy Wu / Specialist

Approved by : , **Date:** Apr. 26, 2016
May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.225, 15.215)			
FCC Clause	Test Item	Result	Remarks
15.207	Conducted emission test	PASS	Meet the requirement of limit. Minimum passing margin is -12.89dB at 0.41563MHz.
15.225 (a)	The field strength of any emissions within the band 13.553-13.567 MHz	PASS	Meet the requirement of limit. Minimum passing margin is -70.37dB at 13.560MHz.
15.225 (b)	The field strength of any emissions within the bands 13.410-13.553 MHz and 13.567-13.710 MHz	PASS	Meet the requirement of limit.
15.225 (c)	The field strength of any emissions within the bands 13.110-13.410 MHz and 13.710-14.010 MHz	PASS	Meet the requirement of limit.
15.225 (d)	The field strength of any emissions appearing outside of the 13.110-14.010 MHz band	PASS	Meet the requirement of limit. Minimum passing margin is -4.76dB at 323.16MHz.
15.225 (e)	The frequency tolerance	PASS	Meet the requirement of limit.
15.215 (c)	20dB Bandwidth	PASS	Meet the requirement of limit.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expended Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.86 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.31 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	3.40 dB
	6GHz ~ 18GHz	3.73 dB
	18GHz ~ 40GHz	4.11 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (RFID)

Product	Wearable Terminal
Brand	Zebra
Test Model	WT6000
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	DC 3.6V from Battery or DC 5.4V from Cradle or DC 5.4V from Adapter
Modulation Type	ASK
Operating Frequency	13.56MHz
Number of Channel	1
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Battery x1
Data Cable Supplied	NA

Note:

1. There are WLAN, BT, NFC technology used for the EUT.
2. For WLAN: 2.4GHz and 5GHz technology cannot transmit at same time.
3. WLAN <2.4GHz (1x2) or 5GHz (1x2)> + BT + NFC technology can transmit at same time.
4. The EUT could be supplied with a cradle, adapter or battery as below table:

Battery	
Brand:	ZEBRA TECHNOLOGIES CORPORATION
Part No.:	BT000262A01
Rating:	TYP: 3350mAh, 12.06WH Min: 3200mAh, 11.52WH Rechargeable, normal voltage: 3.6V, limit 4.2V
Cradles- 1slot (not for sale together)	
Brand:	Zebra
Model No.:	SHARECRADLE-01
Part No.:	SAC-TC8X-4SCHG-01
Input Power	+12V ------ 4.16A
Output Power:	DC 5.4V(for EUT used) DC 4.2V(for Battery used)
I/O Port	DC Port x 1 USB Port x 2
Associated Devices:	Adapter x 1 (Adapter: Part No.: PWRS-14000-148R)
Cradle adapter (for Cradle- 1slot used, not for sale together) Brand: HIPRO Model No.: HP-A0502R3D Part No.:: PWRS-14000-148R Input power : 100-240Vac, 2.4A, 50-60Hz Output power : +12Vdc ------ 4.16A DC output cable (unshielded, 1.8m with one core)	
Adapter (not for sale together)	
Brand:	Zebra
Model No.:	PWRS-14000-249R
Input Power	100-240Vac, 50-60Hz, 0.6A
Output Power:	+5.4Vdc ------ 3A 1. DC output cable (unshielded, 1.8m) 2. USB charging cable (Brand: SINBON, Model: A9304774-005, shielded, 0.95m with one core)

5. The EUT antennas information:

WLAN / BT antenna				
Transmitter Circuit	Antenna Gain(dBi) <Including cable loss>	Frequency range	Antenna Type	Connecter Type
0	3.37	2.4~2.4835GHz	Patch	i-pex(MHF)
	3.3	5.15~5.25GHz	Patch	i-pex(MHF)
	3.3	5.25~5.35GHz	Patch	i-pex(MHF)
	3.2	5.47~5.725GHz	Patch	i-pex(MHF)
	0.61	5.725~5.85GHz	Patch	i-pex(MHF)
1	3.86	2.4~2.4835GHz	Patch	i-pex(MHF)
	3.66	5.15~5.25GHz	Patch	i-pex(MHF)
	3.66	5.25~5.35GHz	Patch	i-pex(MHF)
	3.99	5.47~5.725GHz	Patch	i-pex(MHF)
	3.99	5.725~5.85GHz	Patch	i-pex(MHF)

NFC antenna		
Frequency range	Antenna Type	Connecter Type
13.56MHz	Loop	NA

6. The EUT was pre-tested under following test modes:

Mode	Terminal	Cradle	I/O (left)	I/O (right)	Polarity
Mode A	WT6000	-----	USB charge cable	wired RS419 coil	X-Y
Mode B	WT6000	-----	USB charge cable	wired RS419 coil	X-Z
Mode C	WT6000	-----	USB charge cable	wired RS419 coil	Y-Z
Mode D	WT6000	1-slot	1-slot cradle	wired RS419 coil	NA

From the above modes, the spurious emission below 1GHz worst case was found in **Mode D**.Therefore only the test data of the modes were recorded in this report individually.

7. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

One channel was provided to this EUT:

Channel	FREQ. (MHz)
1	13.56

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE	PLC	FS	EB	
1	√	√	√	√	With Adapter
2	-	√	-	-	With Cradles

Where **RE:** Radiated Emission below 1GHz **PLC:** Power Line Conducted Emission
FS: Frequency Stability **EB:** 20dB Bandwidth measurement

Radiated Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type
1	1	ASK

Power Line Conducted Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type
1	1	ASK

Frequency Stability:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type
1	1	ASK

20dB Bandwidth:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type
1	1	ASK

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY	TEST LOCATION
RE	20deg. C, 71%RH	120Vac, 60Hz	Tim Ho	1
PLC	24deg. C, 82%RH	120Vac, 60Hz	Wythe Lin	1
FS	16deg. C, 64%RH	120Vac, 60Hz	Anderson Chen	2
EB	16deg. C, 64%RH	120Vac, 60Hz	Anderson Chen	1

3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Cradle Adapter	HIPRO	HP-A0502R3D	NA	NA	Supplied by client
B.	Cradles-1slot	ZEBRA	SHARECRADLE-01	NA	NA	Supplied by client
C.	Notebook Computer	HP	Pavilion 14-ab023TU	5CD5340WXZ	NA	Provided by Lab
D.	iPod shuffle	Apple	MC749TA/A	CC4DMFJUDFDM	NA	Provided by Lab
E.	Wired Scanner	ZEBRA	RS419	NA	NA	Supplied by client
F.	Adapter	Motorola	PWRS-14000-249R	NA	NA	Supplied by client

Note:

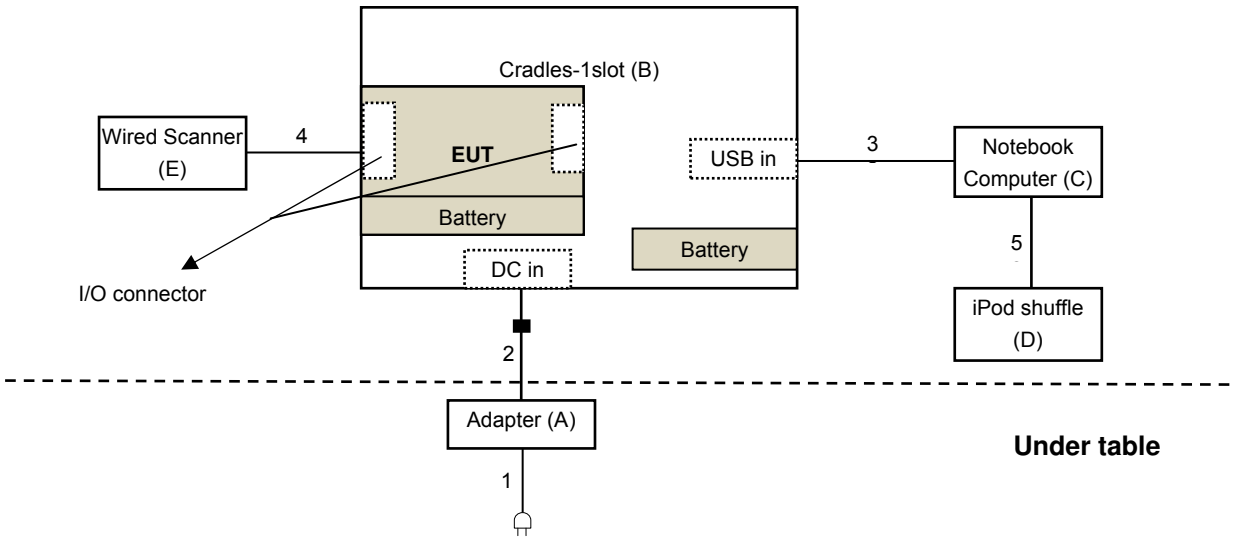
1. All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	AC cable	1	1.8	No	0	Supplied by client
2.	DC cable	1	1.8	No	1	Supplied by client
3.	USB cable	1	1.4	Yes	0	Supplied by client
4.	Wired Scanner cable	1	0.5	No	0	Supplied by client
5.	USB cable	1	0.1	Yes	0	Provided by Lab
6.	USB cable	1	0.95	Yes	1	Supplied by client
7.	DC cable	1	1.8	No	0	Supplied by client

Note: The core(s) is(are) originally attached to the cable(s).

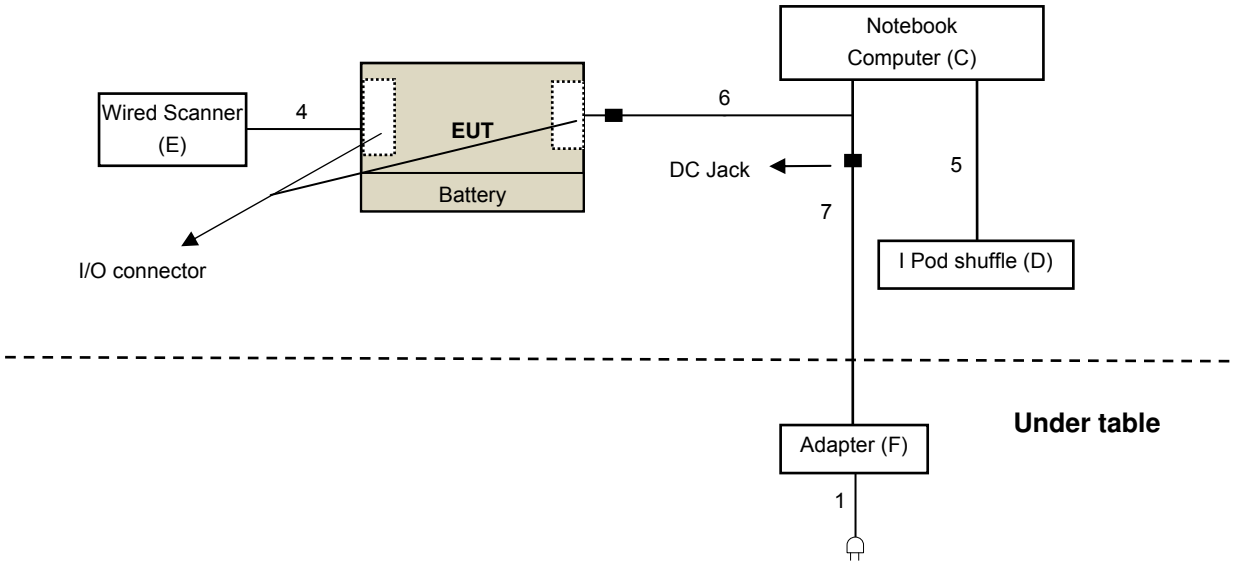
3.3.1 Configuration of System under Test

For Radiated Emissions (below 1GHz) & Cradle mode test:



For Radiated Emissions (Above 1GHz) & Adapter mode test:

.



3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.225)

FCC Part 15, Subpart C (15.215)

ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

NOTE: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

4 Test Types and Results

4.1 Radiated Emission Measurement

4.1.1 Limits of Radiated Emission Measurement

The field strength of any emission shall not exceed the following limits:

(a) 15.848 millivolts/m (84 dB μ V/m) at 30 m, within the band 13.553-13.567 MHz.
(b) 334 microvolts/m (50.5 dB μ V/m) at 30 m, within the bands 13.410-13.553 MHz and 13.567-13.710 MHz.
(c) 106 microvolts/m (40.5 dB μ V/m) at 30 m, within the bands 13.110-13.410 MHz and 13.710-14.010 MHz.

The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in RSS-GEN 8.9.

Frequencies (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	100	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. 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.

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010156	Aug. 12, 2015	Aug. 11, 2016
Pre-Amplifier(*) EMCI	EMC001340	980142	Jan. 20, 2016	Jan. 19, 2018
Loop Antenna(*) Electro-Metrics	EM-6879	264	Dec. 16, 2014	Dec. 15, 2016
RF Cable	NA	LOOPCAB-001 LOOPCAB-002	Jan. 18, 2016	Jan. 17, 2017
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-07	May 08, 2015	May 07, 2016
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-156	Jan. 04, 2016	Jan. 03, 2017
RF Cable	8D	966-3-1 966-3-2 966-3-3	Apr. 02, 2016	Apr. 01, 2017
Software	ADT_Radiated _V8.7.07	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. *The calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 3.
4. The FCC Site Registration No. is 147459
6. The CANADA Site Registration No. is 20331-1
7 Loop antenna was used for all emissions below 30 MHz.
8. Tested Date: Feb. 17 to Apr. 11, 2016

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. Both X and Y axes of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission 30~1000MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

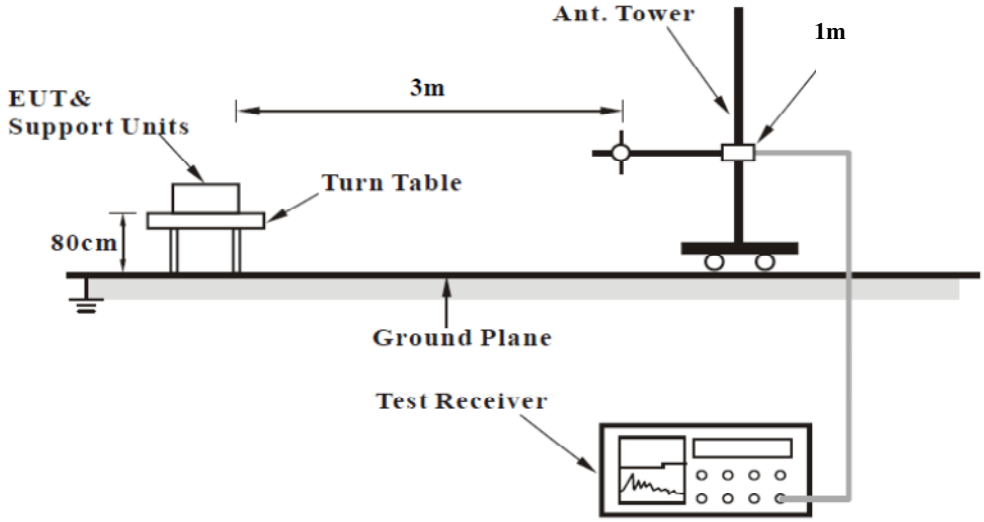
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency 30MHz ~ 1GHz.

4.1.4 Deviation from Test Standard

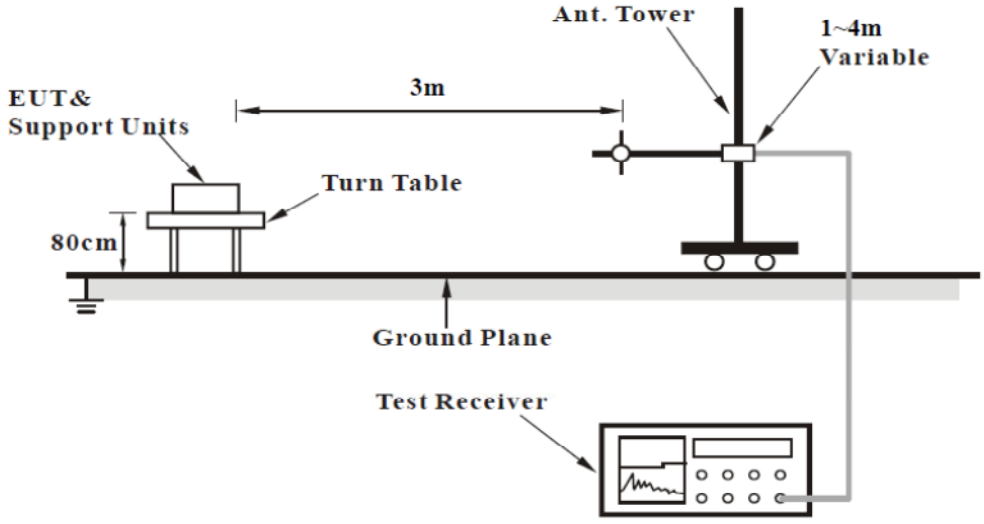
No deviation.

4.1.5 Test Set Up

For Radiated emission below 30MHz



For Radiated emission 30~1000MHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

a. Placed the EUT on the testing table.
b. Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Frequency Range	13.110 ~ 14.010MHz	Detector Function	Quasi-Peak

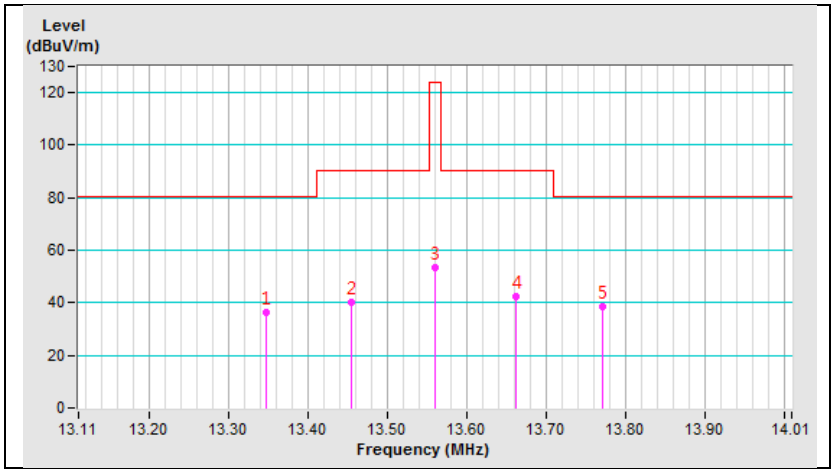
Antenna Polarity & Test Distance: Loop Antenna Open At 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	13.35	36.44 QP	80.50	-44.06	1.00 H	360	39.70	-3.26
2	13.45	40.03 QP	90.47	-50.44	1.00 H	16	43.30	-3.27
3	13.56	53.63 QP	124.00	-70.37	1.00 H	346	56.92	-3.29
4	13.66	42.38 QP	90.47	-48.09	1.00 H	360	45.68	-3.30
5	13.77	38.66 QP	80.50	-41.84	1.00 H	360	41.98	-3.32

REMARKS:
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. Above limits have been translated by the formula

The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

Example:

13.56MHz = 15848uV/m 30m
= 84dBuV/m 30m
= $84+20\log(30/3)^2$ 3m
= 124dBuV/m



Frequency Range	13.110 ~ 14.010MHz	Detector Function	Quasi-Peak

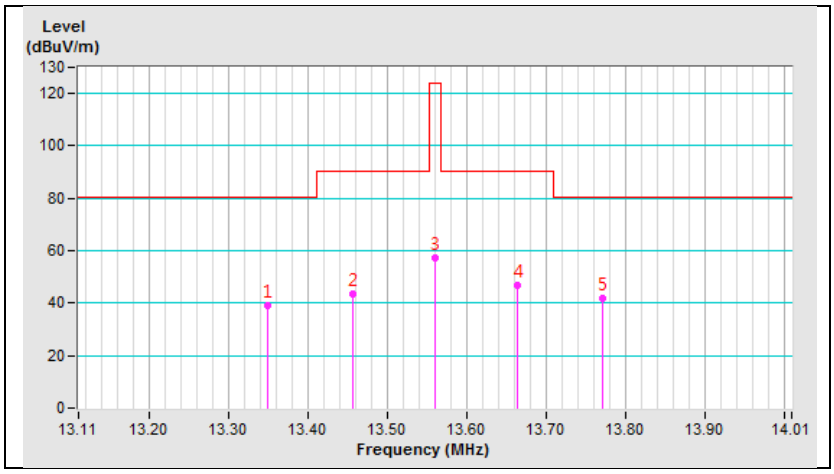
Antenna Polarity & Test Distance: Loop Antenna Close At 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	13.35	39.01 QP	80.50	-41.49	1.00 H	260	42.27	-3.26
2	13.46	43.24 QP	90.47	-47.23	1.00 H	263	46.51	-3.27
3	13.56	57.33 QP	124.00	-66.67	1.00 H	258	60.62	-3.29
4	13.67	46.67 QP	90.47	-43.80	1.00 H	268	49.97	-3.30
5	13.77	41.87 QP	80.50	-38.63	1.00 H	251	45.19	-3.32

REMARKS:
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. Above limits have been translated by the formula

The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

Example:

13.56MHz = 15848uV/m 30m
= 84dBuV/m 30m
= $84+20\log(30/3)^2$ 3m
= 124dBuV/m



Frequency Range	Below 30MHz	Detector Function	Quasi-Peak

Antenna Polarity & Test Distance: Loop Antenna Open At 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.01	45.44 QP	128.50	-83.06	1.00 H	360	7.04	38.40
2	1.80	44.74 QP	69.50	-24.76	1.00 H	179	45.33	-0.59
3	7.90	37.94 QP	69.50	-31.56	1.00 H	85	40.81	-2.87
4	13.56	43.20 QP	69.50	-26.30	1.00 H	352	46.49	-3.29
5	22.40	39.42 QP	69.50	-30.08	1.00 H	181	43.36	-3.94
6	24.35	40.63 QP	69.50	-28.87	1.00 H	111	44.11	-3.48
Antenna Polarity & Test Distance: Loop Antenna Close At 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.09	46.10 QP	108.91	-62.81	1.00 H	249	27.22	18.88
2	3.00	46.30 QP	69.50	-23.20	1.00 H	35	49.03	-2.73
3	6.00	40.10 QP	69.50	-29.40	1.00 H	6	43.07	-2.97
4	14.21	40.90 QP	69.50	-28.60	1.00 H	14	44.29	-3.39
5	22.39	42.98 QP	69.50	-26.52	1.00 H	42	46.92	-3.94
6	24.35	42.56 QP	69.50	-26.94	1.00 H	343	46.04	-3.48

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
   – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

Frequency Range	Below 1000MHz	Detector Function	Quasi-Peak

Antenna Polarity & Test Distance: Horizontal At 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	43.12	31.4 QP	40.0	-8.6	1.50 H	237	30.59	0.78
2	201.04	33.2 QP	43.5	-10.3	1.00 H	108	35.27	-2.04
3	314.22	41.2 QP	46.0	-4.9	1.00 H	210	38.99	2.16
4	**323.16**	**41.2 QP**	**46.0**	**-4.8**	**1.00 H**	**66**	**38.82**	**2.42**
5	497.39	35.1 QP	46.0	-10.9	1.50 H	28	28.70	6.41
6	931.19	38.4 QP	46.0	-7.6	1.50 H	115	24.56	13.88
ANTENNA POLARITY & Test Distance: Vertical At 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	36.25	34.5 QP	40.0	-5.5	1.00 V	112	34.72	-0.24
2	58.05	29.3 QP	40.0	-10.8	1.50 V	77	28.50	0.75
3	219.29	32.1 QP	46.0	-13.9	2.00 V	114	33.96	-1.84
4	267.36	31.2 QP	46.0	-14.8	2.00 V	296	30.51	0.66
5	319.25	39.1 QP	46.0	-6.9	1.00 V	103	36.80	2.29
6	797.17	37.3 QP	46.0	-8.7	1.50 V	108	25.53	11.75

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	100375	May 06, 2015	May 05, 2016
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK-8127	8127-522	Sep. 01, 2015	Aug. 31, 2016
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100072	June 11, 2015	June 10, 2016
RF Cable	5D-FB	COCCAB-001	Mar. 08, 2016	Mar. 07, 2017
50 ohms Terminator	N/A	EMC-03	Sep. 23, 2015	Sep. 22, 2016
50 ohms Terminator	N/A	EMC-02	Oct. 01, 2015	Sep. 30, 2016
50 ohms Terminator	E1-011315	13	Dec. 11, 2015	Dec. 10, 2016
Software BVADT	BVADT_Cond_ V7.3.7.3	NA	NA	NA

Note:
1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. C.
3 The VCCI Con C Registration No. is C-3611.
4 Tested Date: Apr. 11, 2016

4.2.3 Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

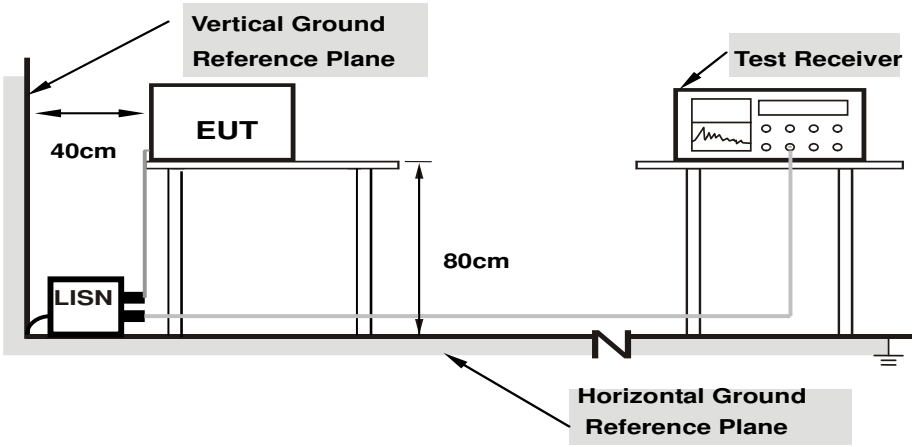
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 TEST SETUP



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Conditions

Same as 4.1.6.

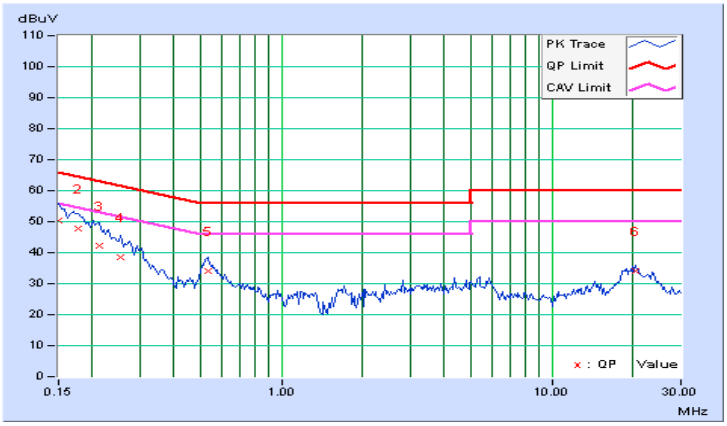
4.2.7 Test Results (Mode 1)

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.32	40.10	23.74	50.42	34.06	66.00	56.00	-15.58	-21.94
2	0.17734	10.30	37.61	19.65	47.91	29.95	64.61	54.61	-16.70	-24.66
3	0.21250	10.28	31.84	17.10	42.12	27.38	63.11	53.11	-20.99	-25.73
4	0.25547	10.29	28.13	14.95	38.42	25.24	61.58	51.58	-23.16	-26.34
5	0.53281	10.28	23.86	20.06	34.14	30.34	56.00	46.00	-21.86	-15.66
6	20.32031	10.95	23.02	16.06	33.97	27.01	60.00	50.00	-26.03	-22.99

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

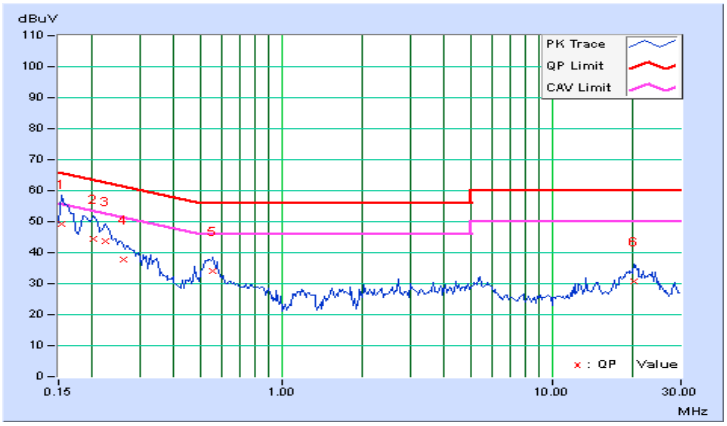


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	10.30	39.02	21.73	49.32	32.03	65.79	55.79	-16.46	-23.75
2	0.20078	10.26	34.14	18.00	44.40	28.26	63.58	53.58	-19.18	-25.32
3	0.22422	10.26	33.28	15.67	43.54	25.93	62.66	52.66	-19.12	-26.73
4	0.25938	10.27	27.42	15.56	37.69	25.83	61.45	51.45	-23.77	-25.63
5	0.56016	10.26	23.84	14.24	34.10	24.50	56.00	46.00	-21.90	-21.50
6	20.07031	10.98	19.72	13.76	30.70	24.74	60.00	50.00	-29.30	-25.26

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.



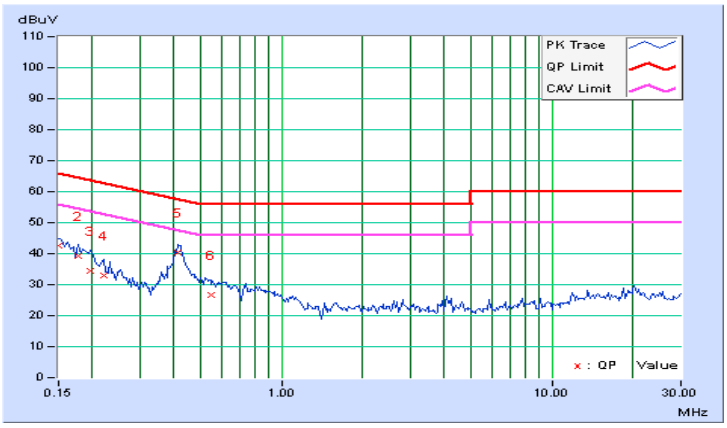
4.2.8 Test Results (Mode 2)

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.32	32.40	21.28	42.72	31.60	66.00	56.00	-23.28	-24.40
2	0.17734	10.30	28.87	15.01	39.17	25.31	64.61	54.61	-25.44	-29.30
3	0.19687	10.28	24.20	12.13	34.48	22.41	63.74	53.74	-29.26	-31.33
4	0.22031	10.28	22.58	10.30	32.86	20.58	62.81	52.81	-29.95	-32.23
5	0.41563	10.30	29.89	23.55	40.19	33.85	57.54	47.54	-17.35	-13.69
6	0.54844	10.28	16.30	9.29	26.58	19.57	56.00	46.00	-29.42	-26.43

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

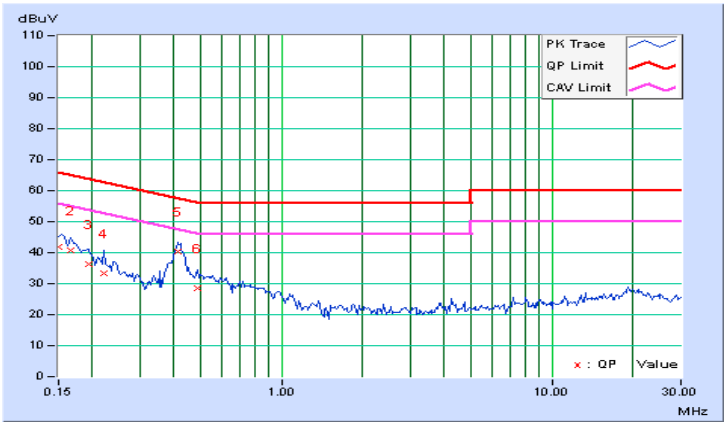


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.30	31.63	21.69	41.93	31.99	66.00	56.00	-24.07	-24.01
2	0.16562	10.29	30.41	17.84	40.70	28.13	65.18	55.18	-24.48	-27.05
3	0.19297	10.27	25.88	13.58	36.15	23.85	63.91	53.91	-27.76	-30.06
4	0.22031	10.26	23.25	12.07	33.51	22.33	62.81	52.81	-29.30	-30.48
5	**0.41563**	**10.28**	**30.12**	**24.28**	**40.40**	**34.56**	**57.54**	**47.54**	**-17.14**	**-12.98**
6	0.48984	10.27	18.31	11.36	28.58	21.63	56.17	46.17	-27.59	-24.54

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

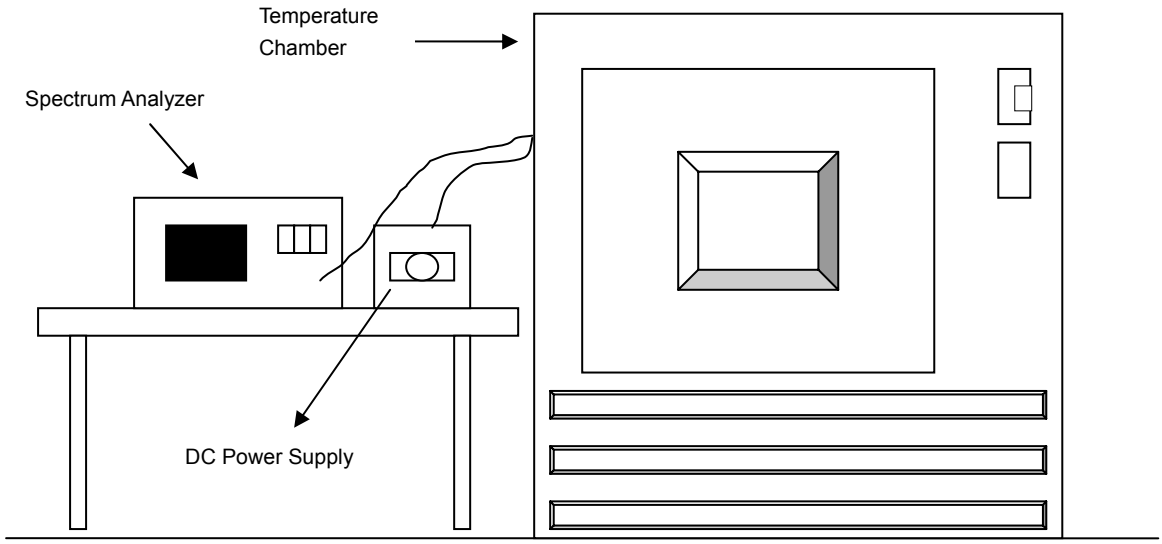


4.3 Frequency Stability

4.3.1 Limits of Frequency Stability Measurement

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.

4.3.2 Test Setup



4.3.3 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
SPECTRUM ANALYZER R&S	FSP 40	100060	May 08, 2015	May 07, 2016
Temperature & Humidity Chamber GIANTFORCE	GTH-150-40-SP-AR	MAA0812-008	Jan. 15, 2016	Jan. 14, 2017

NOTE: 1. The test was performed in Oven room 2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: Apr. 12, 2016

4.3.4 Test Procedure

a. The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.

b. Turned the EUT on and coupled its output to a spectrum analyzer.

c. Turned the EUT off and set the chamber to the highest temperature specified.

d. Allowed sufficient time (approximately 30 min) for the temperature of the chamber to stabilize then turned the EUT on and measured the operating frequency after 2, 5, and 10 minutes.

e. Repeated step 2 and 3 with the temperature chamber set to the lowest temperature.

f. 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.

4.3.5 Deviation fromTest Standard

No deviation.

4.3.6 EUT Operating Conditions

Same as Item 4.1.6.

4.3.7 Test Result

Frequency Stability Versus Temp.									
TEMP. (℃)	Power Supply (Vdc)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift
		(MHz)	%	(MHz)	%	(MHz)	%	(MHz)	%
50	3.6	13.55999	-0.00007	13.55999	-0.00007	13.55999	-0.00007	13.55998	-0.00015
40	3.6	13.55999	-0.00007	13.55999	-0.00007	13.56	0.00000	13.55999	-0.00007
30	3.6	13.56006	0.00044	13.56006	0.00044	13.56006	0.00044	13.56006	0.00044
20	3.6	13.56	0.00000	13.56	0.00000	13.56	0.00000	13.56	0.00000
10	3.6	13.55998	-0.00015	13.55998	-0.00015	13.55998	-0.00015	13.55998	-0.00015
0	3.6	13.55999	-0.00007	13.56	0.00000	13.55998	-0.00015	13.55999	-0.00007
-10	3.6	13.55995	-0.00037	13.55995	-0.00037	13.55996	-0.00029	13.55995	-0.00037
-20	3.6	13.56002	0.00015	13.56001	0.00007	13.56002	0.00015	13.56003	0.00022
-30	3.6	13.56006	0.00044	13.56006	0.00044	13.56007	0.00052	13.56005	0.00037

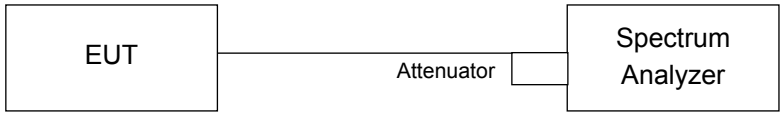
Frequency Stability Versus Voltage									
TEMP. (℃)	Power Supply (Vdc)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift
		(MHz)	%	(MHz)	%	(MHz)	%	(MHz)	%
20	4.14	13.56	0.00000	13.56	0.00000	13.56	0.00000	13.56	0.00000
	3.6	13.56	0.00000	13.56	0.00000	13.56	0.00000	13.56	0.00000
	3.06	13.56	0.00000	13.56	0.00000	13.56	0.00000	13.56	0.00000

4.4 20dB bandwidth

4.4.1 Limits Of 20dB BANDWIDTH Measurement

The 20dB bandwidth shall be specified in operating frequency band.

4.4.2 Test Setup



4.4.3 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
SPECTRUM ANALYZER R&S	FSP 40	100060	May 08, 2015	May 07, 2016

NOTE: 1. The test was performed in Oven room 2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: Apr. 12, 2016

4.4.4 Test Procedures

The bandwidth of the fundamental frequency was measured by spectrum analyzer with 1kHz RBW and 3kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

4.4.5 Deviation from Test Standard

No deviation.

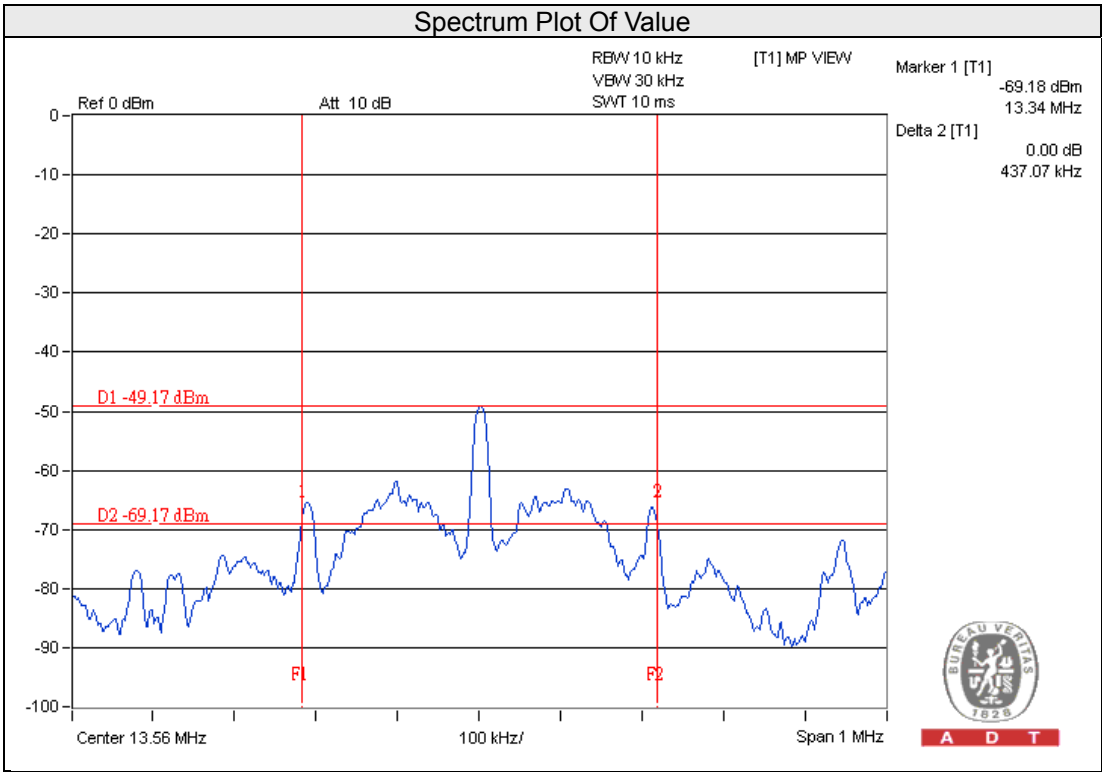
4.4.6 EUT Operating Conditions

Same as Item 4.1.6.

4.4.7 Test Results

20dBc point (Low)	20dBc point (High)	Operating frequency band (MHz)	Pass/Fail
13.34	13.77707	13.11 – 14.01	Pass

Spectrum Plot Of Value



5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
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Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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