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Supplementary FCC Test Report

Report No.: RF991201E03O-2

FCC ID: UZ7MC319ZUS

Test Model: MC319ZUS

Received Date: Jan. 11, 2016

Test Date: Jan. 15 to 25, 2016

Issued Date: Feb. 04, 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
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Report Issue History Record of EUT (MC319ZUS)

Attachment No.	Issue Date	Description
991201E03G-2	Sep. 11, 2013	1. Changed the touch panel. 2. Added one new adapter.
991201E03O-2	Feb. 04, 2016	Upgraded the versions of the standard to section 15.407 under new rule.

Release Control Record

Issue No.	Description	Date Issued
RF991201E03O-2	Original release.	Feb. 04, 2016

1 Certificate of Conformity

Product: Mobile Computing Terminal

Brand: Zebra

Test Model: MC319ZUS


Sample Status: MASS-PRODUCTION

Applicant: Zebra Technologies Corporation

Test Date: Jan. 15 to 25, 2016

Standard: 47 CFR FCC Part 15, Subpart E (Section 15.407)
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 :  , **Date:** Feb. 04, 2016
Claire Kuan / Specialist

Approved by :  , **Date:** Feb. 04, 2016
May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (SECTION 15.407)			
FCC Clause	Test Item	Result	Remarks
15.407(b) (1/2/3/4/6)	Radiated Emissions & Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.3dB at 5715.00MHz.
15.407(a)(1/2 /3)	Max Average Transmit Power	PASS	Meet the requirement of limit.
15.407(a)(1/2 /3)	Peak Power Spectral Density	PASS	Meet the requirement of limit.
15.407(e)	6dB bandwidth	PASS	Meet the requirement of limit. (U-NII-3 Band only)
15.407(g)	Frequency Stability	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna connector is Hirose not a standard connector.

Note: This report is prepared for FCC Class II change. (Upgrade the standard to section 15.407 under new rule.)

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	Expanded 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

Product	Mobile Computing Terminal
Brand	Zebra
Test Model	MC319ZUS
Status of EUT	MASS-PRODUCTION
MFD	24DEC15
Power Supply Rating	DC 3.7V from battery, DC 12V to cradle or DC 5.4V to cable adapter
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11a/g: up to 54Mbps
Operating Frequency	For 15.407 5.18 ~ 5.24GHz, 5.26 ~ 5.32GHz, 5.50 ~ 5.7GHz, 5.745 ~ 5.825GHz
	For 15.247 2.412 ~ 2.462GHz
Number of Channel	For 15.407 24 for 802.11a
	For 15.247 13 for 802.11b, 802.11g
Output Power	For 15.407 5.18 ~ 5.24GHz: 802.11a: 25.1mW 5.26 ~ 5.32GHz: 802.11a: 27.5mW 5.5 ~ 5.72MHz: 802.11a: 33.1mW 5.745 ~ 5.825MHz: 802.11a: 30.269mW
	For 15.247 802.11b: 47.9mW 802.11g: 151.4mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Battery x 1 (Part No.: 82-127909-02 Rev B)
Data Cable Supplied	Charger cable(Unshielded, 1.8m with one core) x 1 RS232 cable(Unshielded, 1.8m)x 1 USB cable(Shielded, 1.55m) x 1

Note:

- This report is prepared for FCC Class II change. The difference compared with the Report No.: RF991201E03G-2 design is as the following:
 - ◆ Upgrade the standard to section 15.407 under new rule.
- For U-NII-1, U-NII-2A and 2C Bands: There is no increase in authorized power level, so RF test data refer original test report (Report No.: RF991201E03G-2).
- According to above conditions, all test items of U-NII-3 band test item need to be performed, except for AC power conducted emission test item. And all data was verified to meet the requirements.
- There are Bluetooth technology (BT2.1+EDR), WLAN and RFID technology used for the EUT
- Bluetooth technology (BT2.1+EDR), WLAN and RFID technology cannot transmit at same time.

6. The antennas provided to the EUT, please refer to the following table:

WLAN Antenna Spec.								
NO.	Brand	Antenna Type	Peak Gain(dBi) with cable loss	Connector Type	Frequency range	Cable Loss (dB)	Cable Length	
1	Auden	Monopole + coupling	3.4 dBi (2.4GHz) 4.5 dBi (5GHz)	hirose	2.4 ~ 2.5 GHz 4.92 ~ 5.85 GHz	-0.2640 dB -0.6168 dB	52 mm	
2	Auden	PIFA	1.3 dBi (2.4GHz) 3.6 dBi (5GHz)	hirose	2.4 ~ 2.5 GHz 4.92 ~ 5.85 GHz	-0.6409 dB -1.0418 dB	68 mm	
RFID Antenna Spec.								
NO.	Brand	Antenna Type	Peak Gain(dBi) with cable loss	Connector Type	Frequency range	Cable Loss (dB)	Cable Length	
1	Auden	Dipole	3.66	hirose	902 ~ 928 MHz	-0.43 dB	85 mm	
2	Auden	Slot Dipole	1.95	hirose	902 ~ 928 MHz	-0.43 dB	85 mm	
Bluetooth Antenna Spec.								
NO.	Brand	Model No.	Antenna Type	Peak Gain(dBi)	Connector Type	Frequency range	Cable Loss (dB)	Cable Length
1	Antenova	(Mica 2.4GHz) 303DA5654-01	Chip Antenna	-1.34	U.FL	2400-2500 MHz	0.185	74 mm

7. The Version of EUT information are as below:

Mobile Computer	Base Version	5.02.29315
	OEM Version	6.47.0012
Wireless(Fusion)	Versiion	3.00.2.0.037R
	Part Number	31-FSUION-01
CEcTxRx	Versiion	1.5.0.0

8. The EUT could be supplied with a cradle, power adapter and battery as below table:

Battery	
Brand:	MOTOROLA
Part No.:	82-127909-02 Rev B
Rating:	3.7V, 4800mAh/17.8Wh
Cable adapter (not for sale together)	
Brand:	MOTOROLA
Model No.:	EADP-16BB A
Part No.:	PWRS-14000-249R
Input power :	100-240V, 50-60Hz, 0.4A AC input cable (unshielded, 1.85m)
Output power :	5.4V ----- 3A
Cradle (not for sale together)	
Brand:	SYMBOL TECHNOLOGIES INC.
Model No.:	CRD3000-1000R
Part No.:	CRD3000-1001RR
Rating:	12V, 3.33A
Adapter for Cradle (not for sale together)	
Brand:	HIPRO
Model No.:	HP-O204D43
Part No.:	50-14000-148R
Input power :	100-240V, 50-60Hz, 1.5A AC input cable (unshielded, 1.8m)
Output power :	+12V ----- 3.33A DC output cable (unshielded, 1.8m with one core)
Cable adapter (not for sale together)	
Brand:	MOTOROLA
Model No.:	86-14000-249R
Input power :	100-240V, 50/60Hz, 0.6A AC input cable (unshielded, 1.85m)
Output power :	5.4V, 3A DC output cable (unshielded, 1.85m with one core)

9. The EUT incorporates a SISO function.

2.4GHz Band			
MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11b	1 ~ 11Mbps	1TX	1RX
802.11g	6 ~ 54Mbps	1TX	1RX
5GHz Band			
MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11a	6 ~ 54Mbps	1TX	1RX

10. 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

FOR 5745 ~ 5825MHz:

5 channels are provided for 802.11a:

Channel	Frequency	Channel	Frequency
149	5745MHz	161	5805MHz
153	5765MHz	165	5825MHz
157	5785MHz		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE \geq 1G	RE $<$ 1G	PLC	APCM	
A	√	-	-	-	Y-Z plane: EUT + Cable adapter
B	-	√	-	√	Y-Z plane: EUT + Cradle + adapter

Where **RE \geq 1G**: Radiated Emission above 1GHz **RE $<$ 1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM**: Antenna Port Conducted Measurement

- NOTE:
1. The test mode was reference to the worst case in the original test report.
 2. "-" means no effect.

Radiated Emission Test (Above 1GHz):

- 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.

MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6

Radiated Emission Test (Below 1GHz):

- 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.

MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	5745-5825	149 to 165	165	OFDM	BPSK	6

Antenna Port Conducted Measurement:

- 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.

MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6

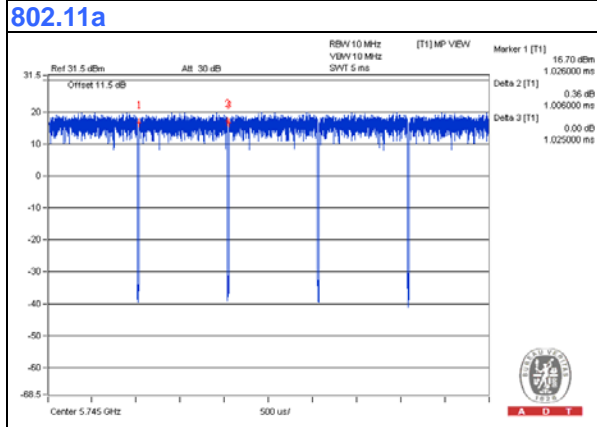
Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE \geq 1G	25deg. C, 65%RH	120Vac, 60Hz	Tim Ho
RE $<$ 1G	25deg. C, 65%RH	120Vac, 60Hz	Tim Ho
APCM	14deg. C, 57%RH	120Vac, 60Hz	Anderson Chen

3.3 Duty Cycle of Test Signal

If duty cycle of test signal is $\geq 98\%$, duty factor is not required.

802.11a: Duty cycle = $1.006 \text{ ms} / 1.025 \text{ ms} = 0.981$



3.4 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.

No.	Product	Brand	Model No.	Serial No.	FCC ID	Remark
A	NOTEBOOK COMOPUTER	DELL	E5430	HYV4VY1	FCC DoC	Provided by Lab
B	EARPHONE	NA	NA	NA	NA	Supplied by Client
C	ADAPTER	Motorola	EADP-16BB A	NA	NA	Supplied by Client
D	CRADLE	Symbol	CRD3000-1001RR	NA	NA	Supplied by Client
E	ADAPTER	HIPRO	HP-Q204D43	NA	NA	Supplied by Client

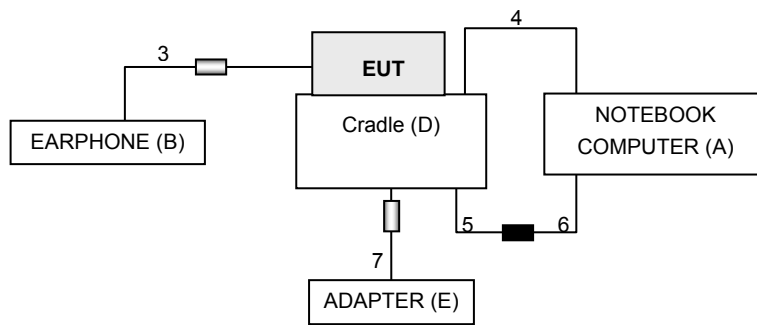
NOTE:

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

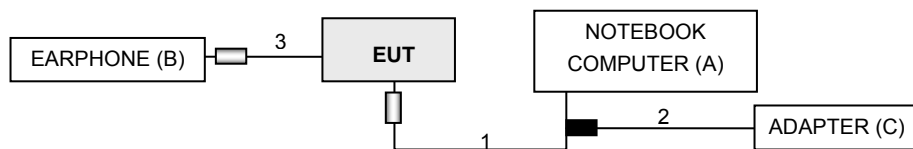
No.	Cable	Qty.	Length (m)	Shielded (Yes/ No)	Cores (Number)	Remark
1	Charger USB	1	1.8	No	1	Supplied by Client
2	DC	1	1.85	No	0	Supplied by Client
3	Audio	1	0.9	No	0	Supplied by Client
4	USB	1	1.55	No	0	Supplied by Client
5	RJ45 to RS232	1	1.8	No	0	Provided by Lab
6	USB to RS232	1	0.5	No	0	Provided by Lab
7	DC	1	1.8	No	0	Supplied by Client

3.4.1 Configuration of System under Test

For below 1GHz test:



For above 1GHz test:



3.5 General Description of Applied Standard

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 E (15.407)

KDB 789033 D02 General UNII Test Procedure New Rules v01r01

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 and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

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.

LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

APPLICABLE TO	LIMIT	
789033 D02 General UNII Test Procedure New Rules v01r01	FIELD STRENGTH AT 3m	
	PK:74 (dBuV/m)	AV:54 (dBuV/m)
APPLICABLE TO	EIRP LIMIT	EQUIVALENT FIELD STRENGTH AT 3m
15.407(b)(1)	PK:-27 (dBm/MHz)	PK:68.2(dBuV/m)
15.407(b)(2)		
15.407(b)(3)		
15.407(b)(4)	PK:-27 (dBm/MHz) ^{*1} PK:-17 (dBm/MHz) ^{*2}	PK: 68.2(dBuV/m) ^{*1} PK:78.2 (dBuV/m) ^{*2}

NOTE: ^{*1} beyond 10MHz of the band edge ^{*2} within 10 MHz of band edge

The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3} \mu\text{V/m, where } P \text{ is the eirp (Watts).}$$

4.1.2 Test Instruments

For below 1GHz:

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	138	Feb. 03, 2015	Feb. 02, 2016
RF Cable	8D	966-3-1 966-3-2 966-3-3	Apr. 03, 2015	Apr. 02, 2016
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. Loop antenna was used for all emissions below 30 MHz.
4. The test was performed in 966 Chamber No. 3.
5. The FCC Site Registration No. is 147459
6. The CANADA Site Registration No. is 20331-1
7. Tested Date: Jan. 21, 2016

**For above 1GHz:**

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010156	Aug. 12, 2015	Aug. 11, 2016
Horn_Antenna SCHWARZBECK	BBHA9120-D	9120D-406	Feb. 05, 2015	Feb. 04, 2016
Pre-Amplifier Agilent	8449B	3008A02465	Apr. 06, 2015	Apr. 05, 2016
RF Cable	EMC104-SM- SM-2000 EMC104-SM- SM-5000 EMC104-SM- SM-5000	150317 150321 150322	Mar. 31, 2015	Mar. 30, 2016
Spectrum Analyzer Keysight	N9030A	MY54490520	July 26, 2015	July 25, 2016
Pre-Amplifier EMCI	EMC184045	980143	Jan. 16, 2015	Jan. 15, 2016
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Feb. 05, 2015	Feb. 04, 2016
RF Cable	SUCOFLEX 102	36432/2 36441/2	Jan. 17, 2015	Jan. 16, 2016
Software	ADT_Radiated _V8.7.07	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA
Power Meter Anritsu	ML2495A	1014008	Apr. 28, 2015	Apr. 27, 2016
Power Sensor Anritsu	MA2411B	0917122	Apr. 28, 2015	Apr. 27, 2016
Spectrum Analyzer R&S	FSP40	100060	May 08, 2015	May 07, 2016

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 test was performed in 966 Chamber No. 3.
3. The FCC Site Registration No. is 147459
4. The CANADA Site Registration No. is 20331-1
5. Tested Date: Jan. 15, 2016

4.1.3 Test Procedure

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. 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 when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

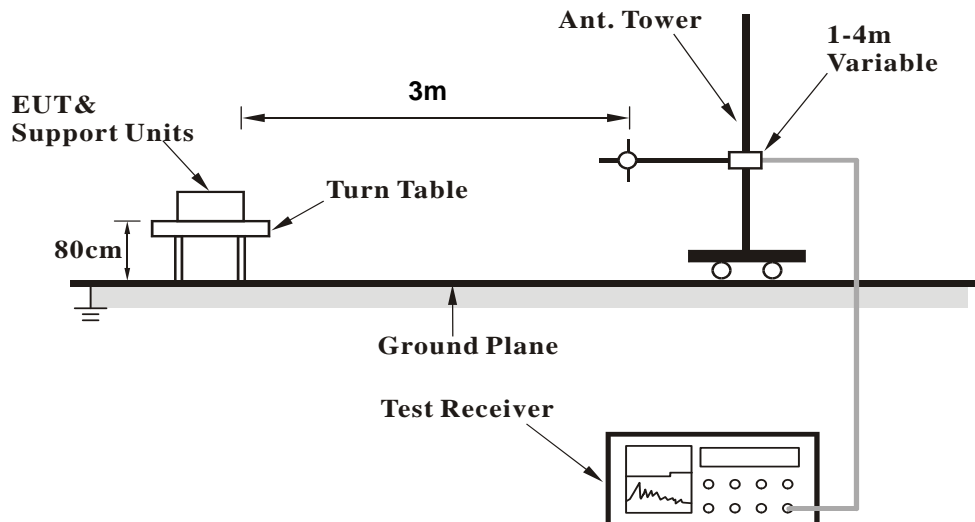
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($10 \log(1/\text{duty cycle})$).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

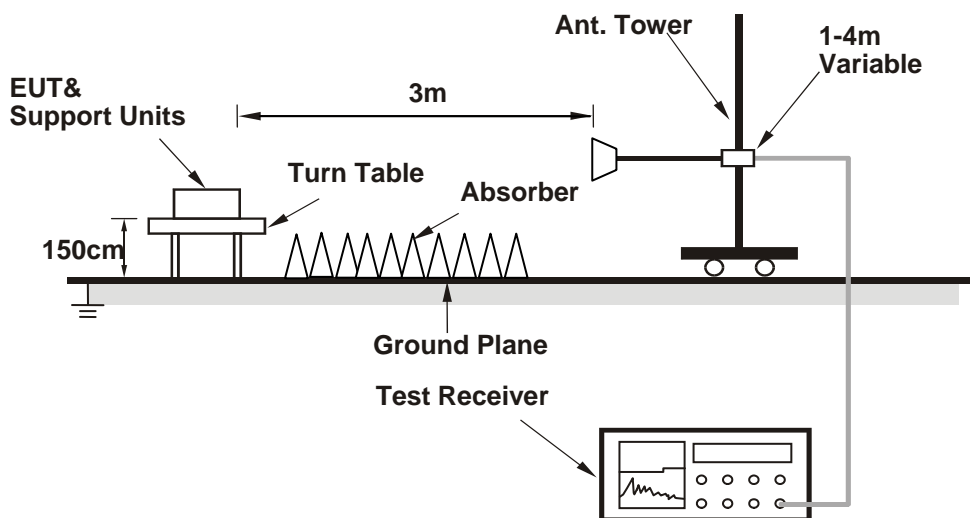
No deviation.

4.1.5 Test Setup

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



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

4.1.6 EUT Operating Condition

1. Turn on the power of EUT.
2. The EUT run test program "CEcTxRx.exe V1.5.0.0" to enable EUT under transmission / receiver condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Data

CHANNEL	TX Channel 149	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	#5715.00	68.9 PK	74.0	-5.1	1.00 H	96	65.56	3.34
2	#5715.00	53.7 AV	54.0	-0.3	1.00 H	96	50.36	3.34
3	#5725.00	77.8 PK	78.2	-0.4	1.00 H	96	74.44	3.36
4	*5745.00	108.2 PK			1.00 H	96	104.82	3.38
5	*5745.00	98.2 AV			1.00 H	96	94.82	3.38
6	11490.00	52.2 PK	74.0	-21.8	1.17 H	172	38.69	13.51
7	11490.00	40.2 AV	54.0	-13.8	1.17 H	172	26.69	13.51
8	#17235.00	57.7 PK	74.0	-16.3	1.20 H	182	36.98	20.72
9	#17235.00	45.9 AV	54.0	-8.1	1.20 H	182	25.18	20.72

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	#5715.00	66.2 PK	74.0	-7.8	1.00 V	116	62.86	3.34
2	#5715.00	51.1 AV	54.0	-2.9	1.00 V	116	47.76	3.34
3	#5725.00	75.3 PK	78.2	-2.9	1.00 V	116	71.94	3.36
4	*5745.00	104.9 PK			1.00 V	116	101.52	3.38
5	*5745.00	95.0 AV			1.00 V	116	91.62	3.38
6	11490.00	52.7 PK	74.0	-21.3	1.42 V	163	39.19	13.51
7	11490.00	39.8 AV	54.0	-14.2	1.42 V	163	26.29	13.51
8	#17235.00	58.9 PK	74.0	-15.1	1.36 V	217	38.18	20.72
9	#17235.00	46.0 AV	54.0	-8.0	1.36 V	217	25.28	20.72

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. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 157	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	#5715.00	57.6 PK	74.0	-16.4	1.00 H	96	54.26	3.34
2	#5715.00	45.4 AV	54.0	-8.6	1.00 H	96	42.06	3.34
3	#5725.00	57.7 PK	78.2	-20.5	1.00 H	96	54.34	3.36
4	*5785.00	107.9 PK			1.00 H	96	104.47	3.43
5	*5785.00	97.9 AV			1.00 H	96	94.47	3.43
6	#5850.00	55.9 PK	78.2	-22.3	1.00 H	96	52.41	3.49
7	#5860.00	56.3 PK	74.0	-17.7	1.00 H	96	52.80	3.50
8	#5860.00	43.1 AV	54.0	-10.9	1.00 H	96	39.60	3.50
9	11570.00	52.6 PK	74.0	-21.4	1.20 H	155	39.24	13.36
10	11570.00	40.3 AV	54.0	-13.7	1.20 H	155	26.94	13.36
11	#17355.00	57.7 PK	74.0	-16.3	1.24 H	193	36.52	21.18
12	#17355.00	46.1 AV	54.0	-7.9	1.24 H	193	24.92	21.18

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	#5715.00	54.2 PK	74.0	-19.8	1.06 V	107	50.86	3.34
2	#5715.00	42.3 AV	54.0	-11.7	1.06 V	107	38.96	3.34
3	#5725.00	54.3 PK	78.2	-23.9	1.06 V	107	50.94	3.36
4	*5785.00	104.8 PK			1.06 V	107	101.37	3.43
5	*5785.00	94.7 AV			1.06 V	107	91.27	3.43
6	#5850.00	52.8 PK	78.2	-25.4	1.06 V	107	49.31	3.49
7	#5860.00	53.4 PK	74.0	-20.6	1.06 V	107	49.90	3.50
8	#5860.00	40.1 AV	54.0	-13.9	1.06 V	107	36.60	3.50
9	11570.00	52.9 PK	74.0	-21.1	1.42 V	162	39.54	13.36
10	11570.00	40.1 AV	54.0	-13.9	1.42 V	162	26.74	13.36
11	#17355.00	58.5 PK	74.0	-15.5	1.32 V	219	37.32	21.18
12	#17355.00	45.5 AV	54.0	-8.5	1.32 V	219	24.32	21.18

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. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 165	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	*5825.00	107.3 PK			1.00 H	95	103.84	3.46
2	*5825.00	97.2 AV			1.00 H	95	93.74	3.46
3	#5850.00	72.8 PK	78.2	-5.4	1.00 H	95	69.31	3.49
4	#5860.00	65.1 PK	74.0	-8.9	1.00 H	95	61.60	3.50
5	#5860.00	49.9 AV	54.0	-4.1	1.00 H	95	46.40	3.50
6	11650.00	52.7 PK	74.0	-21.3	1.15 H	161	39.44	13.26
7	11650.00	40.5 AV	54.0	-13.5	1.15 H	161	27.24	13.26
8	#17475.00	57.7 PK	74.0	-16.3	1.24 H	197	35.68	22.02
9	#17475.00	46.1 AV	54.0	-7.9	1.24 H	197	24.08	22.02

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	*5825.00	104.0 PK			1.08 V	112	100.54	3.46
2	*5825.00	93.9 AV			1.08 V	112	90.44	3.46
3	#5850.00	68.9 PK	78.2	-9.3	1.08 V	112	65.41	3.49
4	#5860.00	61.5 PK	74.0	-12.5	1.08 V	112	58.00	3.50
5	#5860.00	46.4 AV	54.0	-7.6	1.08 V	112	42.90	3.50
6	11650.00	53.1 PK	74.0	-20.9	1.38 V	166	39.84	13.26
7	11650.00	40.2 AV	54.0	-13.8	1.38 V	166	26.94	13.26
8	#17475.00	58.9 PK	74.0	-15.1	1.30 V	204	36.88	22.02
9	#17475.00	46.0 AV	54.0	-8.0	1.30 V	204	23.98	22.02

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. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Below 1GHz Data

CHANNEL	TX Channel 165	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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	37.51	27.8 QP	40.0	-12.2	1.50 H	0	36.92	-9.11
2	168.01	33.8 QP	43.5	-9.7	2.00 H	158	41.93	-8.14
3	552.13	35.2 QP	46.0	-10.8	1.50 H	76	36.84	-1.62
4	563.82	37.2 QP	46.0	-8.8	1.50 H	187	38.41	-1.25
5	719.89	38.3 QP	46.0	-7.7	2.00 H	25	36.79	1.54
6	912.05	33.4 QP	46.0	-12.6	1.50 H	126	28.87	4.53

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	227.88	39.5 QP	46.0	-6.5	1.00 V	346	50.02	-10.55
2	263.84	37.8 QP	46.0	-8.2	1.00 V	204	46.53	-8.75
3	611.83	40.7 QP	46.0	-5.3	1.50 V	222	40.56	0.15
4	659.89	36.6 QP	46.0	-9.5	1.00 V	316	35.81	0.74
5	695.90	35.1 QP	46.0	-11.0	1.00 V	42	33.71	1.34
6	799.23	35.0 QP	46.0	-11.0	1.00 V	352	31.90	3.06

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

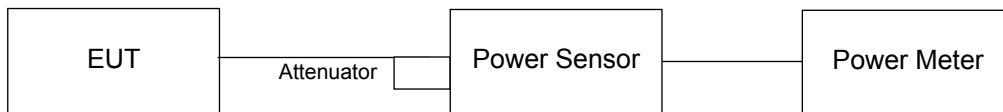
4.2 Transmit Power Measurement

4.2.1 Limits of Transmit Power Measurement

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	1 Watt (30 dBm) (Max. e.i.r.p \leq 125mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon)
		Fixed point-to-point Access Point	1 Watt (30 dBm)
		Indoor Access Point	1 Watt (30 dBm)
		Mobile and Portable client device	250mW (24 dBm)
U-NII-2A			250mW (24 dBm) or 11 dBm+10 log B*
U-NII-2C			250mW (24 dBm) or 11 dBm+10 log B*
U-NII-3	√		1 Watt (30 dBm)

*B is the 26 dB emission bandwidth in megahertz

4.2.2 Test Setup



4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.2.4 Test Procedure

Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

4.2.5 Deviation from Test Standard

No deviation.

4.2.6 EUT Operating Condition

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.2.7 Test Result

802.11a

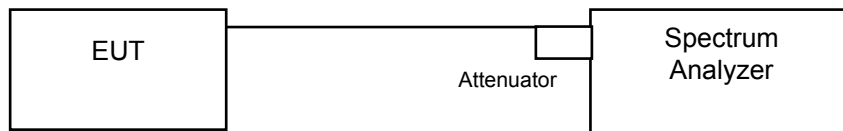
Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
149	5745	25.763	14.11	30	Pass
157	5785	27.416	14.38	30	Pass
165	5825	30.269	14.81	30	Pass

4.3 Peak Power Spectral Density Measurement

4.3.1 Limits of Peak Power Spectral Density Measurement

Operation Band	EUT Category		LIMIT
U-NII-1		Outdoor Access Point	17dBm/ MHz
		Fixed point-to-point Access Point	
		Indoor Access Point	
		Mobile and Portable client device	11dBm/ MHz
U-NII-2A			11dBm/ MHz
U-NII-2C			11dBm/ MHz
U-NII-3	√		30dBm/ 500kHz

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 300 kHz, Set VBW \geq 1 MHz, Detector = RMS
3. Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.
4. Scale the observed power level to an equivalent value in 500 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where $BWCF = 10\log(500 \text{ kHz}/300\text{kHz})$
5. Sweep time = auto, trigger set to "free run".
6. Trace average at least 100 traces in power averaging mode.
7. Record the max value

4.3.5 Deviation from Test Standard

No deviation.

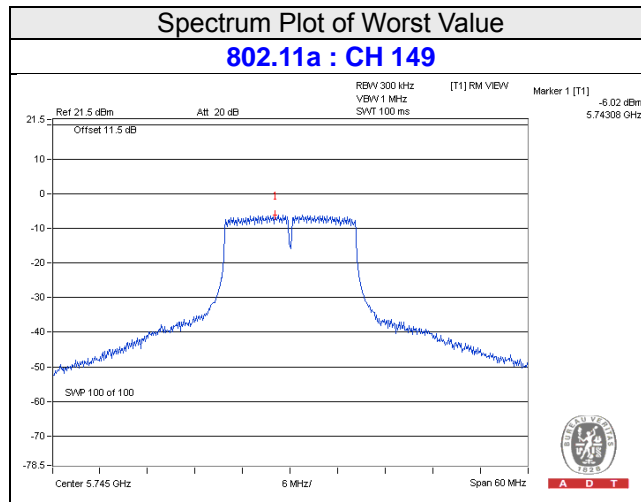
4.3.6 EUT Operating Condition

Same as Item 4.2.6.

4.3.7 Test Results

802.11a

Chan.	Chan. Freq. (MHz)	PSD (dBm/300kHz)	PSD (dBm/500kHz)	Limit (dBm/500kHz)	Pass /Fail
149	5745	-6.02	-3.80	30	Pass
157	5785	-6.49	-4.27	30	Pass
165	5825	-6.10	-3.88	30	Pass

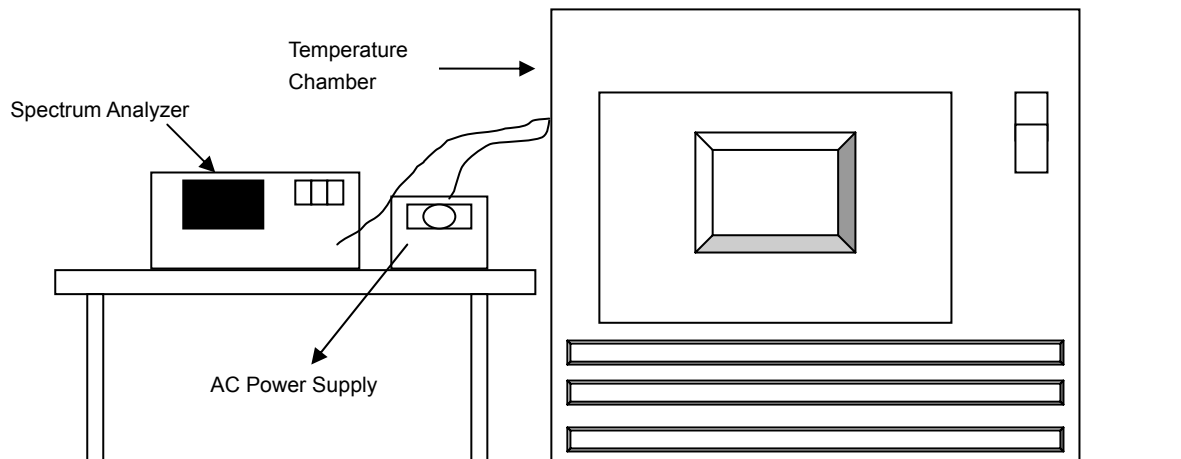


4.4 Frequency Stability Measurement

4.4.1 Limits of Frequency Stability Measurement

The frequency of the carrier signal shall be maintained within band of operation

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedure

- The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
- Turn the EUT on and couple its output to a spectrum analyzer.
- Turn the EUT off and set the chamber to the highest temperature specified.
- Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
- Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
- 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.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Condition

Set the EUT transmit at un-modulation mode to test frequency stability.

4.4.7 Test Results

FREQUENCY STABILITY VERSUS TEMP.									
OPERATING FREQUENCY: 5745MHz									
TEMP. (°C)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
50	120	5745.0254	0.00044	5745.0254	0.00044	5745.0253	0.00044	5745.0261	0.00045
40	120	5744.9753	-0.00043	5744.9756	-0.00042	5744.9797	-0.00035	5744.9767	-0.00041
30	120	5744.9963	-0.00006	5744.9988	-0.00002	5744.9971	-0.00005	5744.9986	-0.00002
20	120	5744.9787	-0.00037	5744.978	-0.00038	5744.9789	-0.00037	5744.9786	-0.00037
10	120	5744.9904	-0.00017	5744.9914	-0.00015	5744.9908	-0.00016	5744.9909	-0.00016
0	120	5745.0221	0.00038	5745.0173	0.00030	5745.0209	0.00036	5745.0212	0.00037
-10	120	5744.9823	-0.00031	5744.979	-0.00037	5744.9846	-0.00027	5744.9833	-0.00029
-20	120	5744.9722	-0.00048	5744.9708	-0.00051	5744.9753	-0.00043	5744.9707	-0.00051
-30	120	5745.0135	0.00023	5745.0149	0.00026	5745.0126	0.00022	5745.0132	0.00023

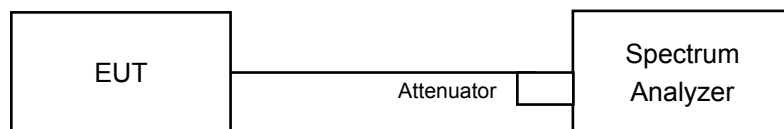
FREQUENCY STABILITY VERSUS VOLTAGE									
OPERATING FREQUENCY: 5745MHz									
TEMP. (°C)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
20	138	5744.9785	-0.00037	5744.9783	-0.00038	5744.979	-0.00037	5744.9786	-0.00037
	120	5744.9787	-0.00037	5744.978	-0.00038	5744.9789	-0.00037	5744.9786	-0.00037
	102	5744.9779	-0.00038	5744.9788	-0.00037	5744.9797	-0.00035	5744.9795	-0.00036

4.5 6dB Bandwidth Measurement

4.5.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5MHz.

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

MEASUREMENT PROCEDURE REF

- a. Set resolution bandwidth (RBW) = 100kHz
- b. Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- c. Trace mode = max hold.
- d. Sweep = auto couple.
- e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.5.5 Deviation from Test Standard

No deviation.

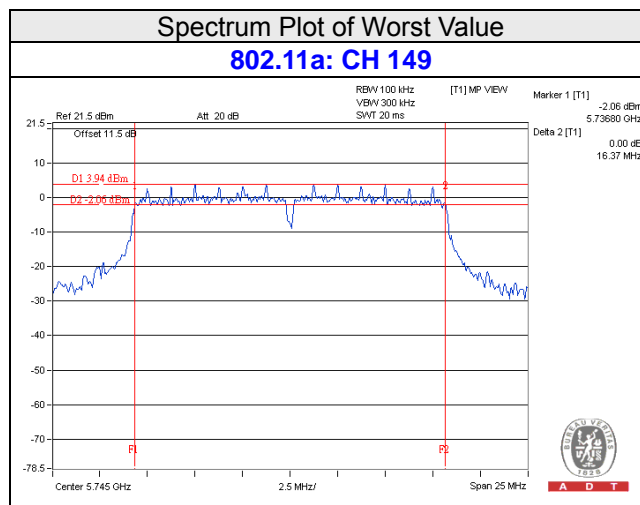
4.5.6 EUT Operating Condition

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.5.7 Test Results

802.11a

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
149	5745	16.37	0.5	Pass
157	5785	16.37	0.5	Pass
165	5825	16.37	0.5	Pass



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:

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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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