



FCC RADIO TEST REPORT-BT 4.0

FCC ID: 2ABGW-AM2308G

Product : MID

Trade Name : ARTAB

Model Name : AM2308G

Serial Model : AM7001G

Report No. : NTEK-2014NT12022115F3

Prepared for

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Prepared by

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TEST RESULT CERTIFICATION**Applicant's name** Hong Kong Topsky Technology Limited.Address Unit 5, 27/F., Richmond Commercial Building, 109 Argyle Street,
Mongkok, Kowloon, Hong Kong**Manufacture's Name**... Hong Kong Topsky Technology Limited.Address Unit 5, 27/F., Richmond Commercial Building, 109 Argyle Street,
Mongkok, Kowloon, Hong Kong**Product description**

Product name MID

Model and/or type AM2308G
reference

Serial Model AM7001G

Standards FCC Part15.247: 01 Oct. 2014

Test procedure ANSI C63.4-2003 and KDB 558074: June 5, 2014

This device described above has been tested by NTEK, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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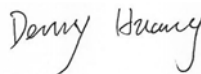
Date of Test

Date (s) of performance of tests 02 Dec. 2014 ~11 Dec. 2014

Date of Issue 11 Dec. 2014

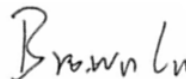
Test Result **Pass**

Testing Engineer :



Denny Huang

Technical Manager :



(Brown Lu)

Authorized Signatory :



(Bill Yao)

Table of Contents

	Page
1 . SUMMARY OF TEST RESULTS	4
1.1 TEST FACILITY	5
1.2 MEASUREMENT UNCERTAINTY	5
2 . GENERAL INFORMATION	6
2.1 GENERAL DESCRIPTION OF EUT	6
2.2 DESCRIPTION OF TEST MODES	8
2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	9
2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)	10
2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS	11
3 . EMC EMISSION TEST	12
3.1 CONDUCTED EMISSION MEASUREMENT	12
3.1.1 POWER LINE CONDUCTED EMISSION LIMITS	12
3.1.2 TEST PROCEDURE	13
3.1.3 DEVIATION FROM TEST STANDARD	13
3.1.4 TEST SETUP	13
3.1.5 EUT OPERATING CONDITIONS	13
3.1.6 TEST RESULTS	14
3.2 RADIATED EMISSION MEASUREMENT	16
3.2.1 RADIATED EMISSION LIMITS	16
3.2.2 TEST PROCEDURE	17
3.2.3 DEVIATION FROM TEST STANDARD	17
3.2.4 TEST SETUP	18
3.2.5 EUT OPERATING CONDITIONS	19
3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)	20
3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)	21
3.2.8 TEST RESULTS (ABOVE 1000 MHZ)	23
4 . ANTENNA REQUIREMENT	25
4.1 STANDARD REQUIREMENT	25
4.2 EUT ANTENNA	25
5 . EUT TEST PHOTO	26
APPENDIX-PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS	

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.247) , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.247 (c)	Radiated Spurious Emission	PASS	
15.205	Band Edge Emission	PASS	
15.203	Antenna Requirement	PASS	

Note : This C2PC testing , the changed is: Only change the shape of the Mainboard and layout of board, Circuit and RF module are the same.

1.1 TEST FACILITY

NTEK Testing Technology Co., Ltd

Add.:1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen P.R. China.

FCC Registration No.:238937; IC Registration No.:9270A-1

CNAS Registration No.:L5516

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 1.38\text{dB}$
2	RF power,conducted	$\pm 0.16\text{dB}$
3	Spurious emissions,conducted	$\pm 0.21\text{dB}$
4	All emissions,radiated(<1G)	$\pm 4.68\text{dB}$
5	All emissions,radiated(>1G)	$\pm 4.89\text{dB}$
6	Temperature	$\pm 0.5^{\circ}\text{C}$
7	Humidity	$\pm 2\%$

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	MID										
Trade Name	ARTAB										
Model Name	AM2308G										
Serial Model	AM7001G										
Model Difference	All the model are the same circuit and RF module, except the model name and colour.										
Product Description	<p>The EUT is a MID</p> <table> <tr> <td>Operation Frequency:</td><td>2402~2480MHz</td></tr> <tr> <td>Modulation Type:</td><td>GFSK</td></tr> <tr> <td>Number Of Channel</td><td>40CH</td></tr> <tr> <td>Antenna Designation:</td><td>Please see Note 3.</td></tr> <tr> <td>Antenna Gain (dBi)</td><td>1.0dbi</td></tr> </table> <p>Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.</p>	Operation Frequency:	2402~2480MHz	Modulation Type:	GFSK	Number Of Channel	40CH	Antenna Designation:	Please see Note 3.	Antenna Gain (dBi)	1.0dbi
Operation Frequency:	2402~2480MHz										
Modulation Type:	GFSK										
Number Of Channel	40CH										
Antenna Designation:	Please see Note 3.										
Antenna Gain (dBi)	1.0dbi										
Channel List	Please refer to the Note 2.										
Ratings	DC 3.7V										
Adapter	Mode: FJ-SW0501500UU Input: 100-240V~,50/60Hz,0.35AMAX Output: 5.0V---, 1500mAh										
Battery	DC 3.7V, 2800mAh										
Connecting I/O Port(s)	Please refer to the User's Manual										

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.

Channel	Frequency (MHz)
00	2402
01	2404
.....
.....
...	...
.....
38	2478
39	2480

3.

Table for Filed Antenna

Ant	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
A	N/A	N/A	FPCB Antenna	N/A	1.0	BT Antenna

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	CH00
Mode 2	CH19
Mode 3	CH39
Mode 4	Link Mode

For Conducted Emission	
Final Test Mode	Description
Mode 4	Link Mode

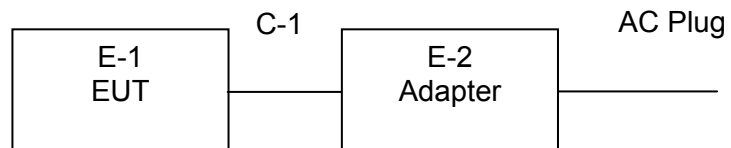
For Radiated Emission	
Final Test Mode	Description
Mode 1	CH00
Mode 2	CH19
Mode 3	CH39
Mode 4	Link Mode

Note:

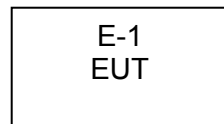
- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Conducted Emission Test



Radiated Spurious Emission Test



2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

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.

Item	Equipment	Brand	Model/Type No.	Series No.	Note
E-1	MID	ARTAB	AM2308G	N/A	EUT
E-2	Adapter	N/A	FJ-SW0501500UU	N/A	

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	0.8m	

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2014.07.06	2015.07.05	1 year
2	Test Receiver	R&S	ESPI	101318	2014.06.07	2015.06.06	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2014.07.06	2015.07.05	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2014.06.07	2015.06.06	1 year
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	2014.06.07	2015.06.06	1 year
6	Horn Antenna	EM	EM-AH-10180	2011071402	2014.07.06	2015.07.05	1 year
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2014.07.06	2015.07.05	1 year
8	Amplifier	EM	EM-30180	060538	2013.12.22	2014.12.21	1 year
9	Loop Antenna	ARA	PLA-1030/B	1029	2014.06.08	2015.06.07	1 year
10	Power Meter	R&S	NRVS	100696	2014.07.06	2015.07.05	1 year
11	Power Sensor	R&S	URV5-Z4	0395.1619.05	2014.07.06	2015.07.05	1 year

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	101160	2014.06.06	2015.06.05	1 year
2	LISN	R&S	ENV216	101313	2014.08.24	2015.08.23	1 year
3	LISN	EMCO	3816/2	00042990	2014.08.24	2015.08.23	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2014.06.07	2015.06.06	1 year
5	Passive Voltage Probe	R&S	ESH2-Z3	100196	2014.06.07	2015.06.06	1 year
6	Absorbing clamp	R&S	MOS-21	100423	2014.06.08	2015.06.07	1 year

1	Attenuation	MCE	24-10-34	BN9258	2014.06.08	2015.06.07	1 year
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3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)		Standard
	Quasi-peak	Average	Quasi-peak	Average	
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	CISPR
0.50 -5.0	73.00	60.00	56.00	46.00	CISPR
5.0 -30.0	73.00	60.00	60.00	50.00	CISPR

0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	73.00	60.00	56.00	46.00	FCC
5.0 -30.0	73.00	60.00	60.00	50.00	FCC

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

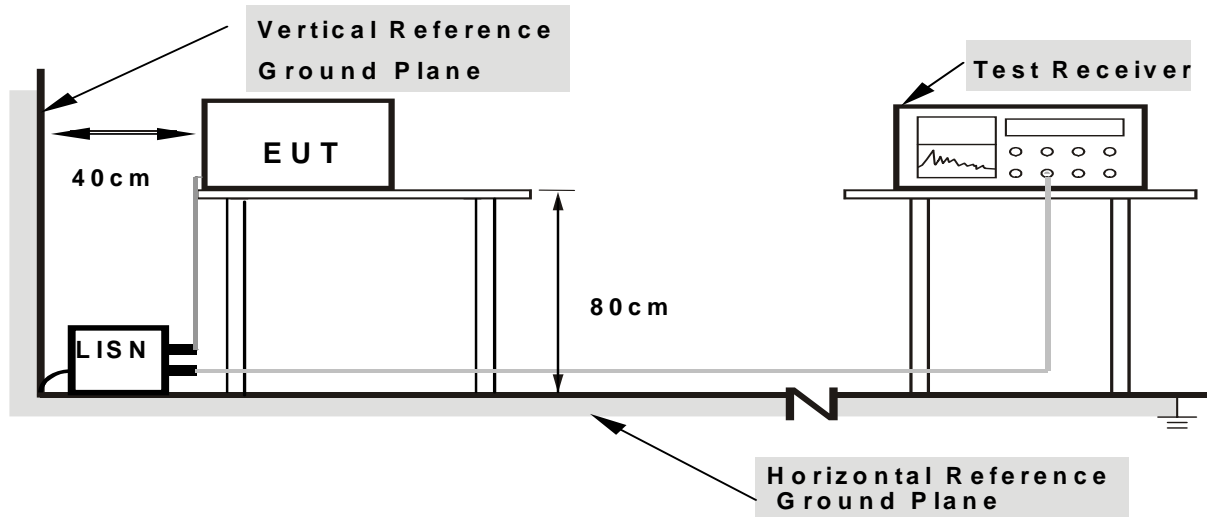
3.1.2 TEST PROCEDURE

- The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 TEST SETUP



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

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

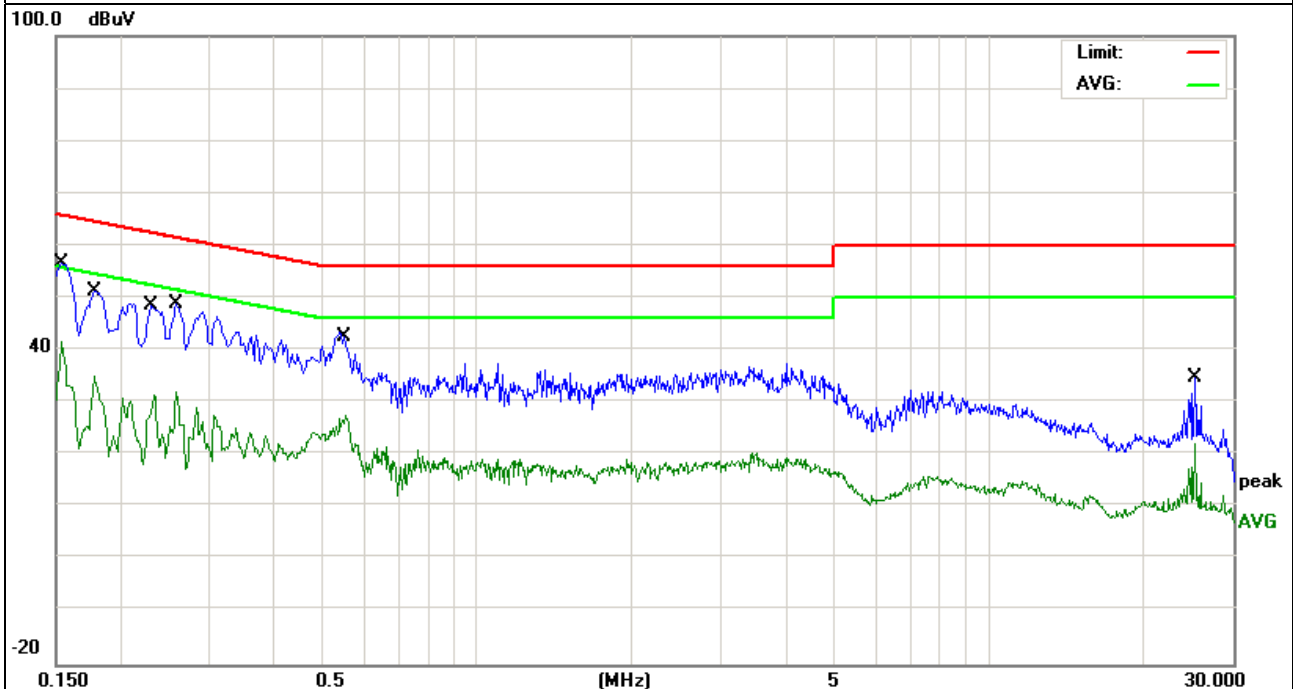
3.1.6 TEST RESULTS

EUT :	MID	Model Name. :	AM2308G
Temperature :	26 °C	Relative Humidity :	56%
Pressure :	1010hPa	Phase :	L
Test Voltage :	DC 5V form Adapter AC 120V/60Hz	Test Mode :	Mode 4

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.1539	46.93	9.63	56.56	65.78	-9.22	QP
0.1539	32.04	9.63	41.67	55.78	-14.11	AVG
0.1779	41.07	9.55	50.62	64.58	-13.96	QP
0.1779	25.57	9.55	35.12	54.58	-19.46	AVG
0.2340	39.20	9.46	48.66	62.30	-13.64	QP
0.2340	21.99	9.46	31.45	52.30	-20.85	AVG
0.2580	39.29	9.46	48.75	61.49	-12.74	QP
0.2580	22.49	9.46	31.95	51.49	-19.54	AVG
0.5540	33.27	9.46	42.73	56.00	-13.27	QP
0.5540	17.95	9.46	27.41	46.00	-18.59	AVG
25.2820	24.86	9.87	34.73	60.00	-25.27	QP
25.2820	12.32	9.87	22.19	50.00	-27.81	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

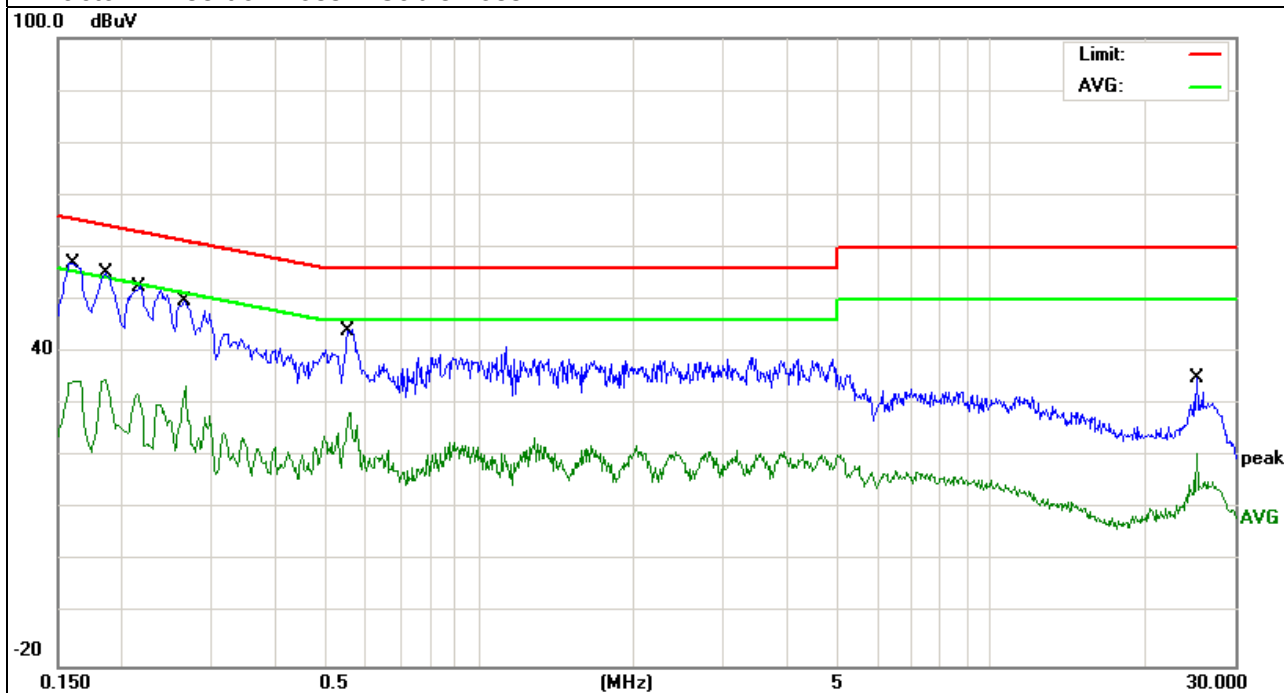


EUT :	MID	Model Name. :	AM2308G
Temperature :	26 °C	Relative Humidity :	56%
Pressure :	1010hPa	Phase :	N
Test Voltage :	DC 5V form Adapter AC 120V/60Hz	Test Mode :	Mode 4

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
(MHz)	(dBμV)	(dB)	(dBμV)	(dBμV)	(dB)	
0.1620	47.34	9.60	56.94	65.36	-8.42	QP
0.1620	24.99	9.60	34.59	55.36	-20.77	AVG
0.1859	45.26	9.52	54.78	64.21	-9.43	QP
0.1859	25.24	9.52	34.76	54.21	-19.45	AVG
0.2139	42.33	9.47	51.80	63.05	-11.25	QP
0.2139	22.68	9.47	32.15	53.05	-20.90	AVG
0.2660	40.78	9.46	50.24	61.24	-11.00	QP
0.2660	24.02	9.46	33.48	51.24	-17.76	AVG
0.5580	32.24	9.46	41.70	56.00	-14.30	QP
0.5580	19.06	9.46	28.52	46.00	-17.48	AVG
25.2698	25.21	9.87	35.08	60.00	-24.92	QP
25.2698	10.79	9.87	20.66	50.00	-29.34	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/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

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	(dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

Both horizontal and vertical antenna polarities were tested

and performed pretest to three orthogonal axis. The worst case emissions were reported

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

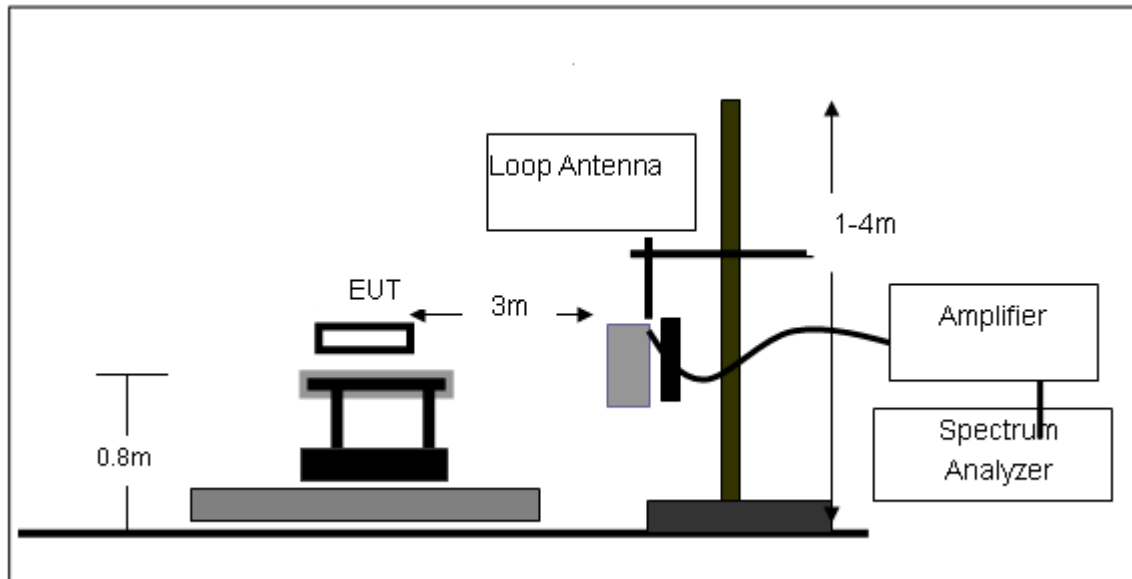
Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	1 MHz
	Peak	1 MHz	10 Hz

3.2.3 DEVIATION FROM TEST STANDARD

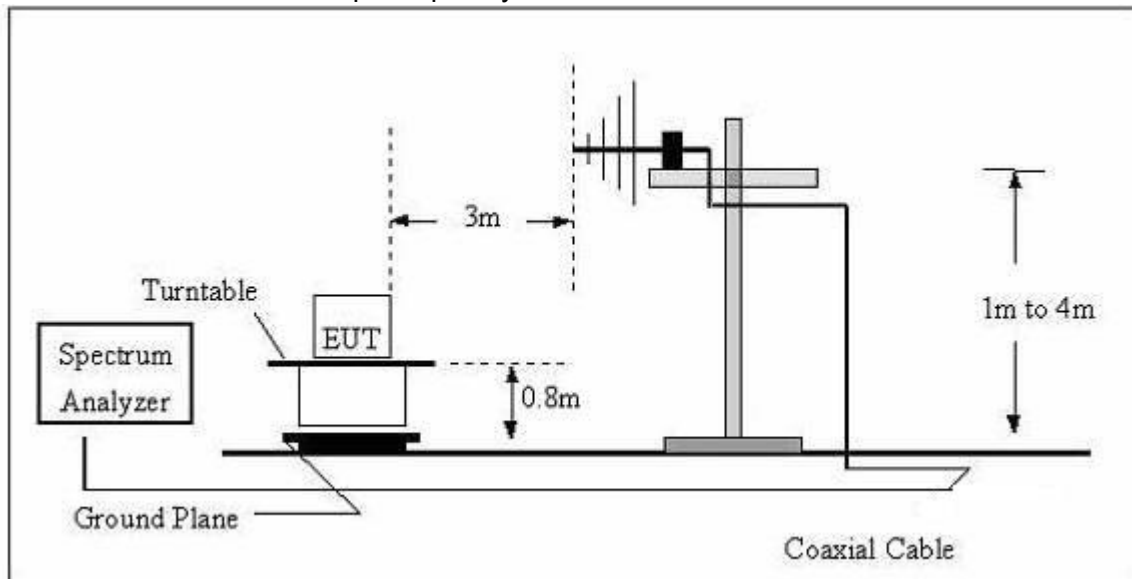
No deviation

3.2.4 TEST SETUP

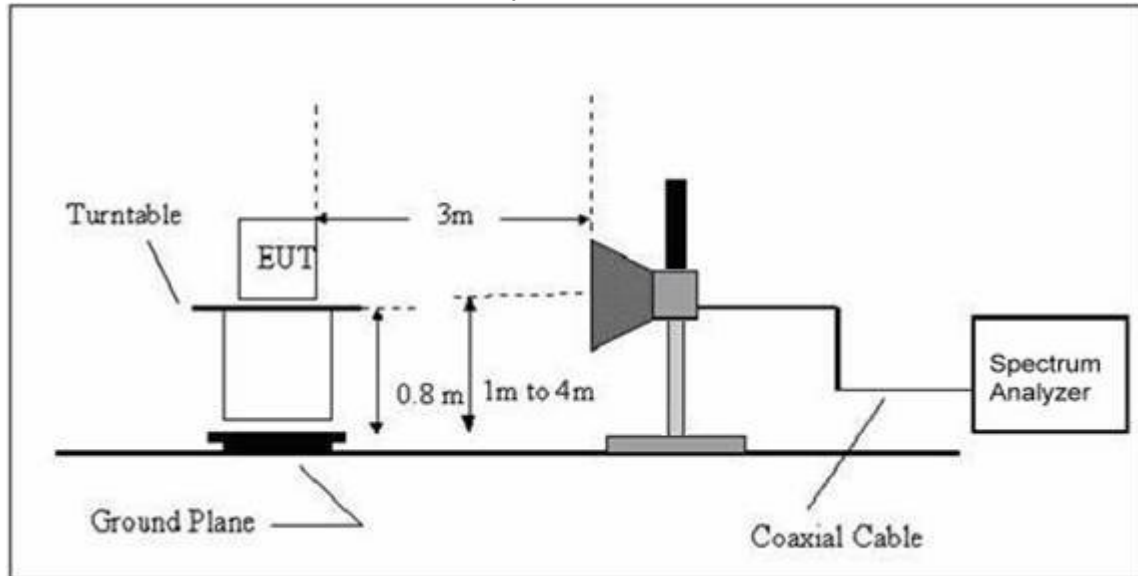
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz

**3.2.5 EUT OPERATING CONDITIONS**

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)

EUT:	MID	Model Name. :	AM2308G
Temperature:	20 °C	Relative Humidity:	48%
Pressure:	1010 hPa	Test Voltage :	DC 3.7V
Test Mode :	TX	Polarization :	--

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	N/A
--	--	--	--	N/A

NOTE:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance/test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.

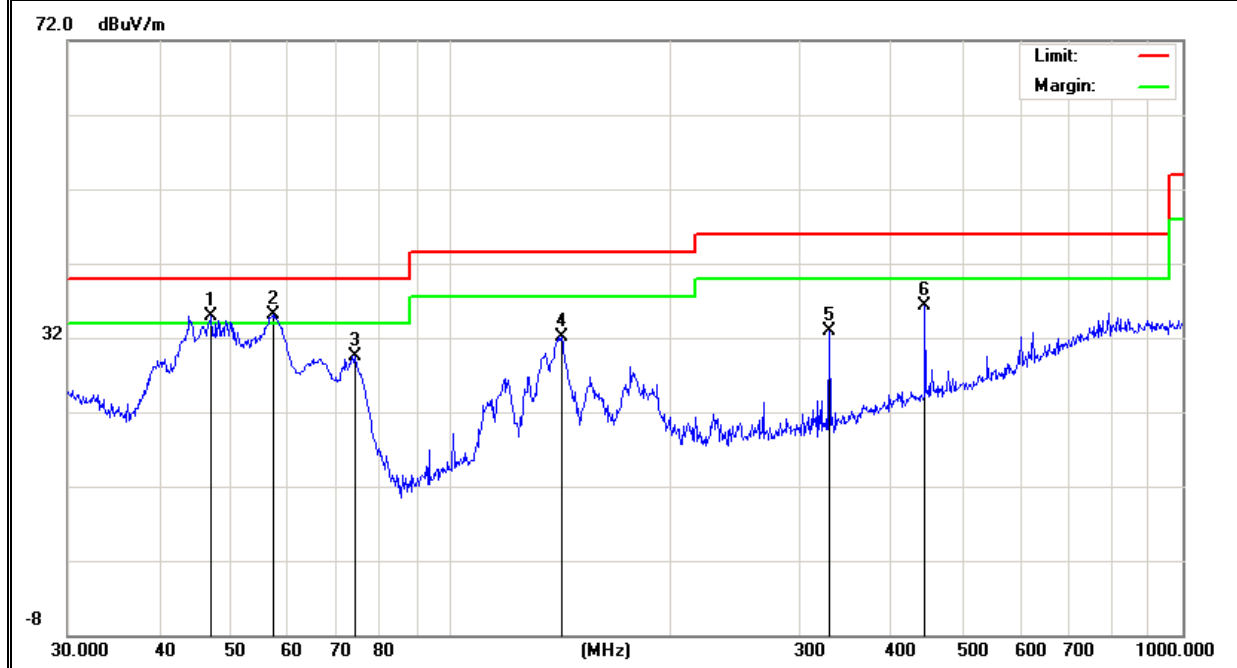
3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)

EUT :	MID	Model Name :	AM2308G
Temperature :	20 °C	Relative Humidity :	48%
Pressure:	1010 hPa	Test Voltage :	DC 3.7V
Test Mode :	TX		

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
V	47.1599	23.57	11.40	34.97	40.00	-5.03	QP
V	57.3922	26.45	8.58	35.03	40.00	-4.97	QP
V	74.1350	23.83	5.69	29.52	40.00	-10.48	QP
V	141.8262	20.83	11.23	32.06	43.50	-11.44	QP
V	329.0389	17.56	15.36	32.92	46.00	-13.08	QP
V	444.8514	17.19	19.21	36.40	46.00	-9.60	QP

Remark:

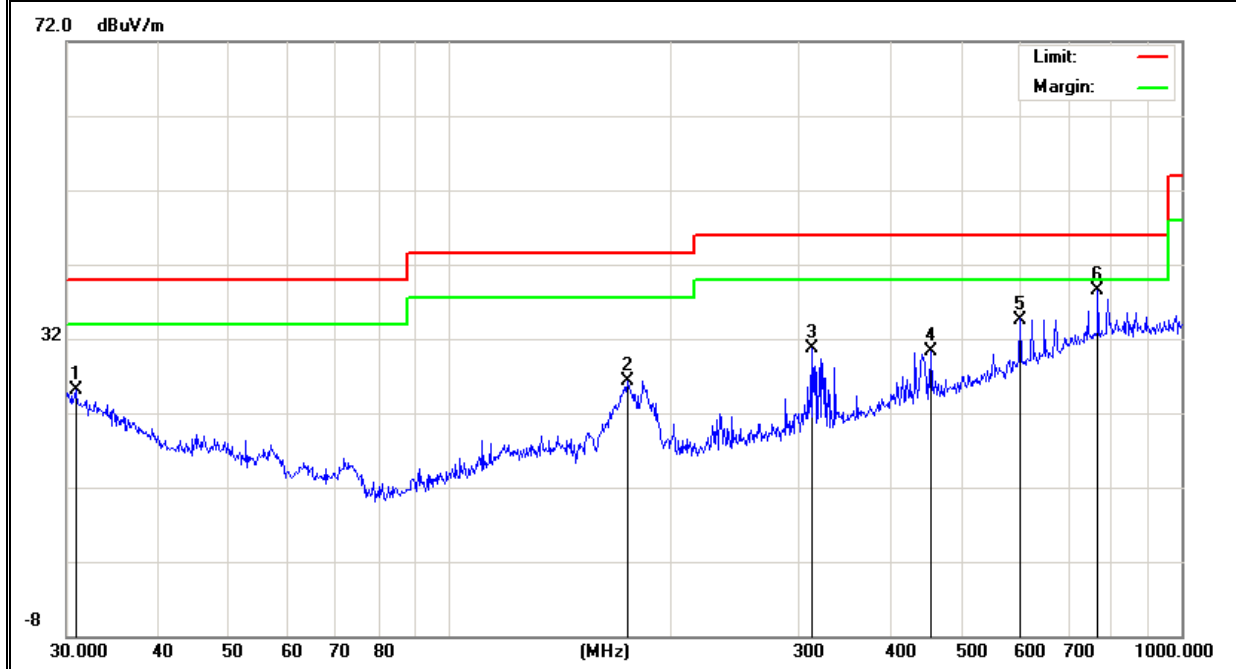
Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit



Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
H	30.8535	6.05	18.97	25.02	40.00	-14.98	QP
H	175.0365	15.69	10.59	26.28	43.50	-17.22	QP
H	312.1792	15.95	14.66	30.61	46.00	-15.39	QP
H	454.3100	10.96	19.39	30.35	46.00	-15.65	QP
H	601.4265	12.16	22.44	34.60	46.00	-11.40	QP
H	768.7481	11.84	26.59	38.43	46.00	-7.57	QP

Remark:

Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit



3.2.8 TEST RESULTS (ABOVE 1000 MHZ)

EUT :	MID	Model Name :	AM2308G
Temperature :	20 °C	Relative Humidity :	48%
Pressure:	1010 hPa	Test Voltage :	DC 3.7V
Test Mode :	TX		

Frequency (MHz)	Reading (dBμV)	Factor (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark	Polar (H/V)
Low Channel (2402 MHz)-Above 1G							
4804.158	59.14	-3.64	62.78	74.00	-11.22	Pk	Vertical
4804.158	41.48	-3.64	45.12	54.00	-8.88	AV	Vertical
7206.263	59.29	-0.95	60.24	74.00	-13.76	Pk	Vertical
7206.263	37.42	-0.95	38.37	54.00	-15.63	AV	Vertical
4804.147	59.52	-3.64	63.16	74.00	-10.84	Pk	Horizontal
4804.147	42.38	-3.64	46.02	54.00	-7.98	AV	Horizontal
7206.205	57.49	-0.95	58.44	74.00	-15.56	Pk	Horizontal
7206.205	37.31	-0.95	38.26	54.00	-15.74	AV	Horizontal
Mid Channel (2440 MHz)-Above 1G							
4880.146	59.89	-3.68	63.57	74.00	-10.43	Pk	Vertical
4880.146	41.92	-3.68	45.60	54.00	-8.40	AV	Vertical
7320.255	59.28	-0.82	60.10	74.00	-13.90	Pk	Vertical
7320.255	40.12	-0.82	40.94	54.00	-13.06	AV	Vertical
4880.136	61.79	-3.68	65.47	74.00	-8.53	Pk	Horizontal
4880.136	44.92	-3.68	48.60	54.00	-5.40	AV	Horizontal
7320.321	59.22	-0.82	60.04	74.00	-13.96	Pk	Horizontal
7320.321	39.39	-0.82	40.21	54.00	-13.79	AV	Horizontal
High Channel (2480MHz)- Above 1G							
4960.258	59.21	-3.59	62.80	74.00	-11.20	Pk	Vertical
4960.258	42.06	-3.59	45.65	54.00	-8.35	AV	Vertical
7440.133	57.68	-0.68	58.36	74.00	-15.64	Pk	Vertical
7440.133	41.94	-0.68	42.62	54.00	-11.38	AV	Vertical
4960.208	59.04	-3.59	62.63	74.00	-11.37	Pk	Horizontal
4960.208	42.22	-3.59	45.81	54.00	-8.19	AV	Horizontal
7440.182	60.57	-0.68	61.25	74.00	-12.75	Pk	Horizontal
7440.182	39.41	-0.68	40.09	54.00	-13.91	AV	Horizontal

Remark:

Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit

Radiated band edge:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
2390	57.07	-13.06	44.01	74	-29.99	peak	Vertical
2390	56.87	-13.06	43.81	74	-30.19	peak	Horizontal
2483.5	58.05	-12.78	45.27	74	-28.73	peak	Vertical
2483.5	58.05	-12.78	45.27	74	-28.73	peak	Horizontal

Note: Test method to see chapter 3.2 . When PK value is lower than the Average value limit, average not record.

4. ANTENNA REQUIREMENT

4.1 STANDARD REQUIREMENT

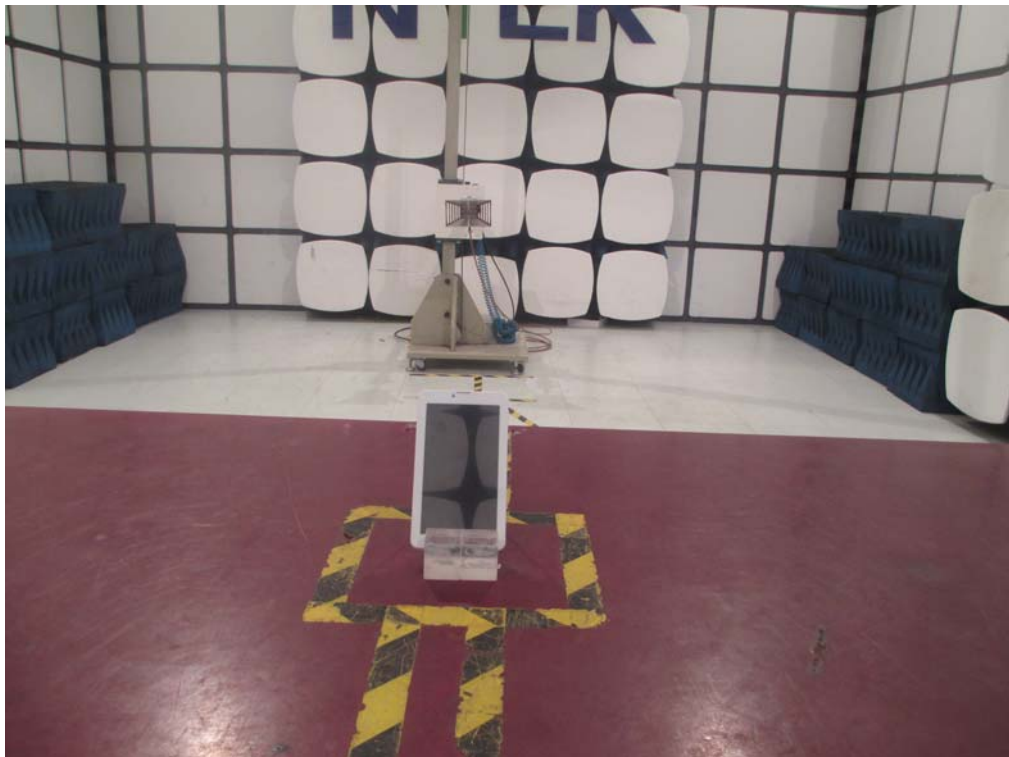
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

4.2 EUT ANTENNA

The EUT antenna is FPCB antenna. It comply with the standard requirement.

5. EUT TEST PHOTO

Radiated Measurement Photos



Conducted Measurement Photos