

FCC TEST REPORT

FCC ID : LE2UDS6
Applicant : JSW Pacific Corporation
Address : 3F-3, No. 700, Chung-Zweng Rd., Chung Ho City, Taipei Hsien, Taiwan
Manufacturer : JSW Pacific (China) Co., Ltd.
Address : 3F-3, No. 700, Chung-Zweng Rd., Chung Ho City, Taipei Hsien, Taiwan
Equipment Under Test (EUT) :
Product Name : Digital Wireless Surveillance System
Model No. : UDS6, UDS65, UDS655, UDS6555, UDS65555
Rules : FCC CFR47 Part 15 Section 15.247:2010

Date of Test : Dec. 04~06, 2012
Date of Issue : Dec. 17, 2012

Test Result : **PASS**

Remark:

* The sample described above has been tested to be in compliance with the requirements of ANSI C63.4:2003. The test results have been reviewed and comply with the rules listed above and found to meet their essential requirements.

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company.

The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:

Waltek Services (Shenzhen) Co., Ltd.

1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District,

Shenzhen 518105, China

Tel: +86-755-83551033

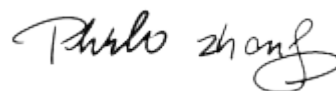
Fax: +86-755-83552400

Compiled by:

Approved by:



Zero Zhou / Project Engineer



Philo Zhong / Manager

2 Test Summary

Test Items	Test Requirement	Result
Conducted Emission	15.207	PASS
Radiated Emissions	15.205(a) 15.209 15.247(d)	PASS
Band Edge Measurement	15.205(c) 15.209 15.247(d)	PASS
20dB Bandwidth	15.247(a)(1)	PASS
Maximum Peak Output Power	15.247(b)(1)	PASS
Channel Separated	15.247(a)(1)	PASS
Hopping Channel Number	15.247(a)(1)(iii)	PASS
Dwell time	15.247(a)(1)(iii)	PASS
Antenna Requirement	15.203	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

3 Contents

Page

1	COVER PAGE	1
2	TEST SUMMARY.....	2
3	CONTENTS.....	3
4	GENERAL INFORMATION.....	5
4.1	GENERAL DESCRIPTION OF E.U.T.....	5
4.2	DETAILS OF E.U.T.....	5
4.3	DESCRIPTION OF SUPPORT UNITS.....	5
4.4	TEST FACILITY	5
4.5	TEST LOCATION	6
5	EQUIPMENT USED DURING TEST.....	7
5.1	EQUIPMENTS LIST.....	7
5.2	MEASUREMENT UNCERTAINTY.....	7
5.3	TEST EQUIPMENT CALIBRATION.....	8
6	CONDUCTED EMISSIONS.....	9
6.1	E.U.T. OPERATION.....	9
6.2	TEST PROCEDURE.....	9
6.3	TEST SETUP.....	9
6.4	CONDUCTED EMISSION TEST RESULT.....	10
7	RADIATED EMISSIONS.....	16
7.1	EUT OPERATION :	16
7.2	TEST SETUP.....	17
7.3	SPECTRUM ANALYZER SETUP.....	18
7.4	TEST PROCEDURE.....	18
7.5	CORRECTED AMPLITUDE & MARGIN CALCULATION.....	19
7.6	SUMMARY OF TEST RESULTS.....	20
8	BAND EDGE MEASUREMENT	33
8.1	TEST RESULT:.....	34
9	20 DB BANDWIDTH MEASUREMENT	38
9.1	TEST PROCEDURE:	38
9.2	TEST RESULT:.....	38
10	MAXIMUM PEAK OUTPUT POWER	40
10.1	TEST PROCEDURE:	40
10.2	TEST RESULT:.....	40
11	CHANNEL SEPARATED	41
11.1	TEST PROCEDURE:	41
11.2	TEST RESULT:.....	41
12	HOPPING CHANNEL NUMBER.....	44
12.1	TEST PROCEDURE:	44
12.2	TEST RESULT.....	44
13	DWELL TIME.....	45
13.1	TEST PROCEDURE:	45
13.2	TEST RESULT.....	45
14	ANTENNA REQUIREMENT	48
15	RF EXPOSURE.....	49

15.1	REQUIMENTS:	49
15.2	THE PROCEDURES / LIMIT	49
15.3	MPE CALCULATION METHOD.....	50
16	PHOTOGRAPHS – TEST SETUP	51
16.1	PHOTOGRAPH –CONDUCTED EMISSION TEST SETUP	51
16.2	PHOTOGRAPH –RADIATED EMISSIONS TEST SETUP	51
17	PHOTOGRAPHS - CONSTRUCTIONAL DETAILS	54
17.1	EUT –APPEARANCE VIEW	54
17.2	EUT – OPEN VIEW	59
17.3	EUT – PCB VIEW.....	63
17.4	RF –MODULE VIEW	65
17.5	ADAPTER 1–APPEARANCE VIEW.....	66
17.6	ADAPTER 2–APPEARANCE VIEW.....	67
17.7	ADAPTER 3–APPEARANCE VIEW.....	68
18	FCC LABEL.....	69

4 General Information

4.1 General Description of E.U.T.

Product Name	: Digital Wireless Surveillance System
Model No.	: UDS6, UDS65, UDS655, UDS6555, UDS65555
Model Difference	: Only model name is difference.
Type of Modulation	: GFSK
Operation Frequency	: 2408.625MHz ~ 2473.875MHz
Antenna installation	: RP-SMA Antenna
Antenna Gain	: 3dBi
Oscillator	: Crystal 18MHz for RF module; 12MHz and 32.768kHz for MCU

4.2 Details of E.U.T.

Technical Data	: (1) DC 3.7V, 2000mAh powered by battery (2) DC 5.0V, 1.0A powered by Adapter
Adapter 1	: KSAS0060500100VUD (Ktec) Input: 100– 240VAC, 50/60Hz, 0.18A Output: DC 5.0V, 1.0A
Adapter 2	: CS6D050100FU (Csec) Input: 100–240VAC, 50/60Hz, 200mA Output: DC 5.0V, 1.0A
Adapter 3	: MU05B7050100-A1 (LEI) Input: 100–240VAC, 50/60Hz, 0.3A Output: DC 5.0V, 1.0A
Screen 1	HSD070IDW1(HannStar) Rev:0 –E11
Screen 2	HSD070IDW1(HannStar) Rev:0 –E13

4.3 Description of Support Units

The EUT has been tested as an independent unit.

4.4 Test Facility

The test facility has a test site registered with the following organizations:

- **IC – Registration No.: 7760A**
Waltek Services(Shenzhen) Co., Ltd. has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files.
Registration number 7760A, July 12, 2012.
- **FCC – Registration No.: 880581**
Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 880581, May 26, 2011.

4.5 Test Location

All the tests were performed at:

Waltek Services(Shenzhen) Co., Ltd. at 1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District, Shenzhen, China

5 Equipment Used during Test

5.1 Equipments List

Conducted Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMI Test Receiver	R&S	ESCI	101178	Aug. 13,2012	Aug. 13,2013
2.	LISN	R&S	ENV216	101215	Aug. 13,2012	Aug. 13,2013
3.	Cable	HUBER+SUHNER	CBL2-NN-3M	2230300	Aug.14,2012	Aug. 14,2013
3m Semi-anechoic Chamber for Radiation Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMC Analyzer	Agilent	E7405A	MY45114943	Aug. 13,2012	Aug. 13,2013
2.	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Aug. 13,2012	Aug. 13,2013
3.	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Aug. 13,2012	Aug. 13,2013
4.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Aug. 13,2012	Aug. 13,2013
5.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	399	Aug. 13,2012	Aug. 13,2013
6.	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Feb .23,2012	Feb .23,2013
7.	Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-148	Aug. 13,2012	Aug. 13,2013
8.	10m Coaxial Cable with N- plug	SCHWARZBECK	AK 9515 H	-	Aug. 13,2012	Aug. 13,2013
9.	10m 50 Ohm Coaxial Cable with N-plug	SCHWARZBECK	AK 9513	-	Aug. 13,2012	Aug. 13,2013
Associated Equipment						
1.	Digital Wireless Camera	JSW	UDSC15	-	-	-
2.	Notebook	HITACHI	PC4NB8-XF143BAB0	4340AP0 T534000387	-	-

5.2 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-6}$
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Emissions	± 5.03 dB (Bilog antenna 30M~1000MHz)
	± 4.74 dB (Horn antenna 1000M~25000MHz)
Conducted Emission	± 3.64 dB

5.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

6 Conducted Emissions

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.4:2003
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Limit:	66-56 dB μ V between 0.15MHz & 0.5MHz 56 dB μ V between 0.5MHz & 5MHz 60 dB μ V between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit

6.1 E.U.T. Operation

Operating Environment:

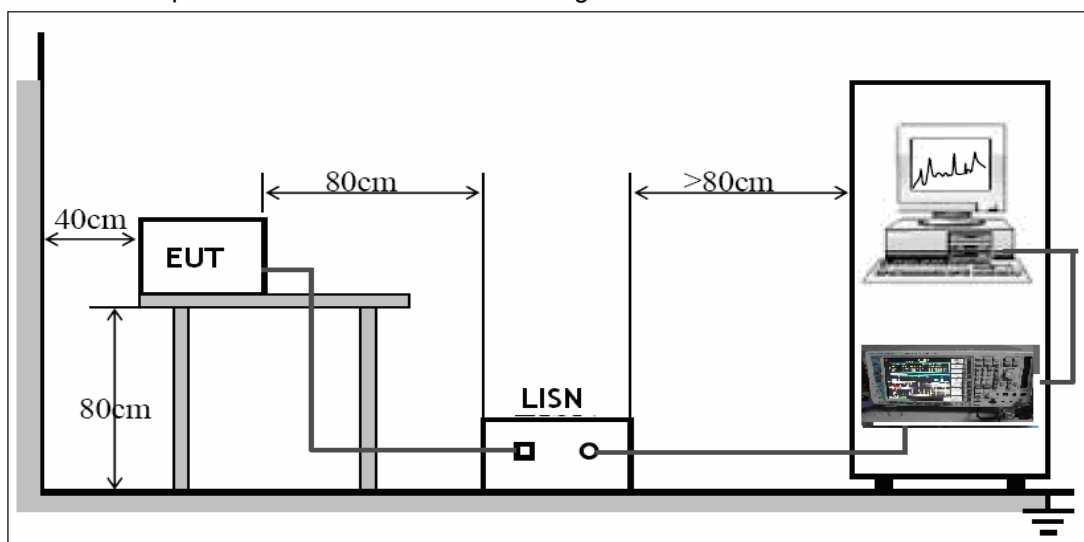
Temperature:	26 °C
Humidity:	50% RH
Atmospheric Pressure:	1018 mbar

6.2 Test Procedure

- (1) The EUT was tested according to ANSI C63.4:2003. The frequency spectrum from 150kHz to 30MHz was investigated.
- (2) The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.3 Test Setup

The EUT was placed on the test table in shielding room



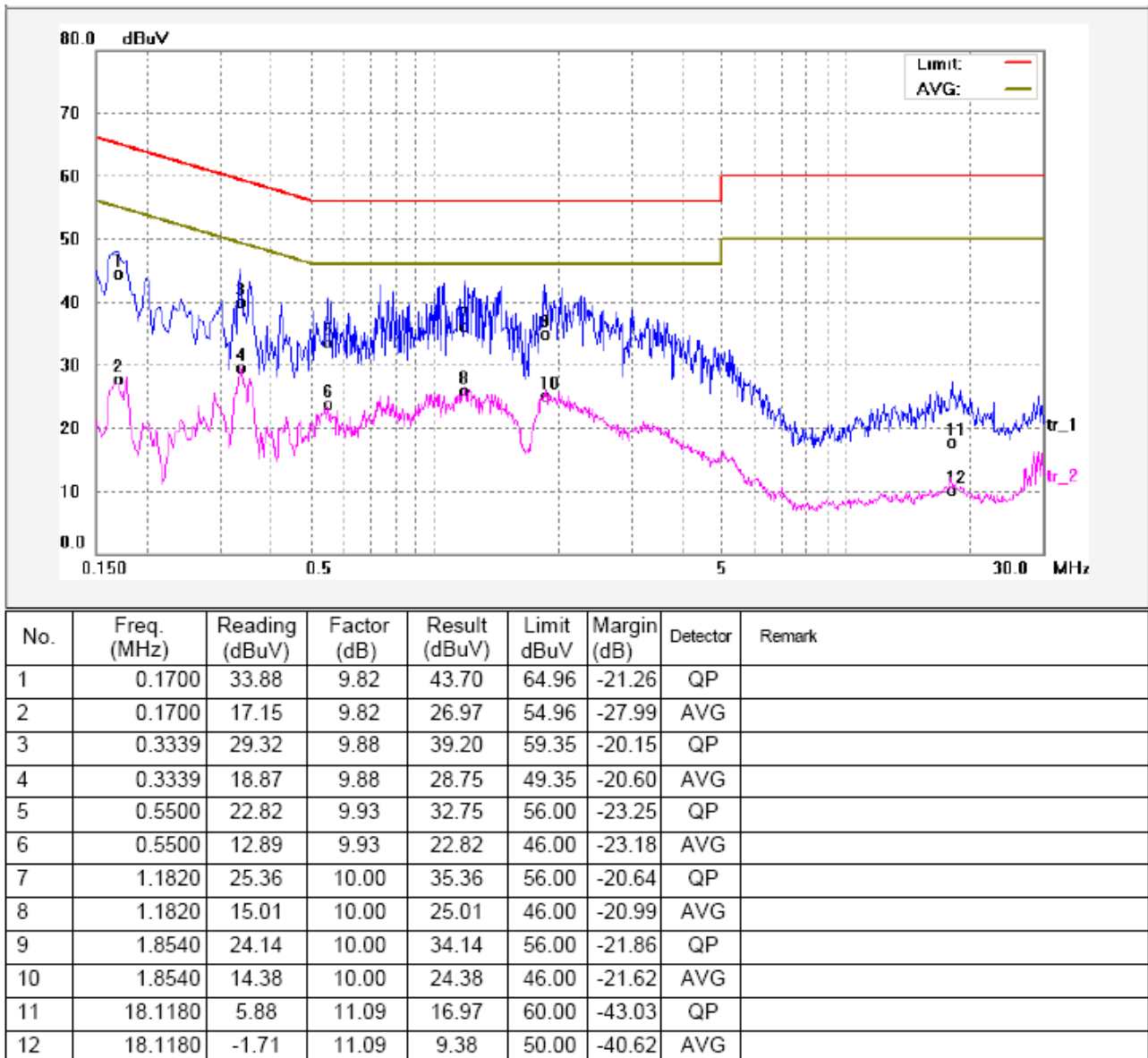
6.4 Conducted Emission Test Result

An initial pre-scan was performed on the live and neutral lines.

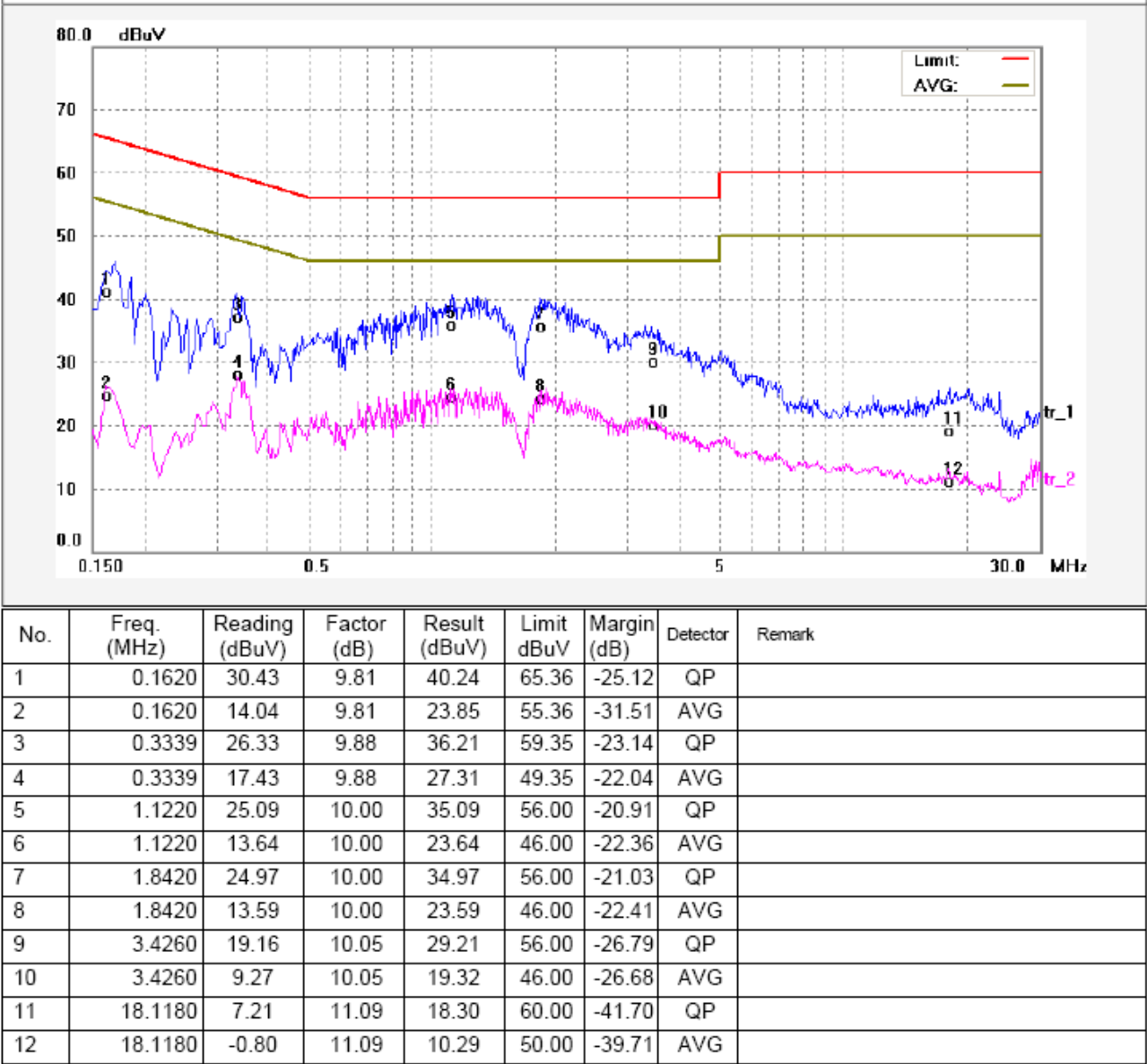
The EUT was tested in stand-alone working mode.

Adapter: KSAS0060500100VUD (Ktec)

Live line:

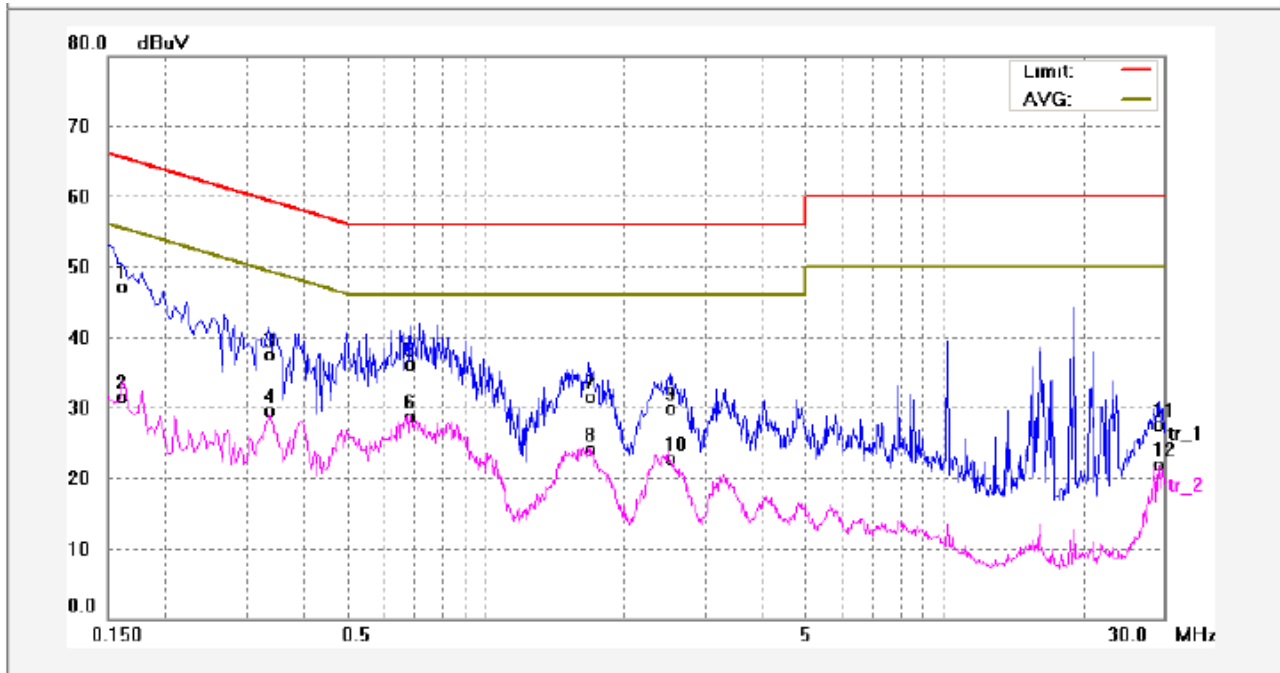


Neutral line:



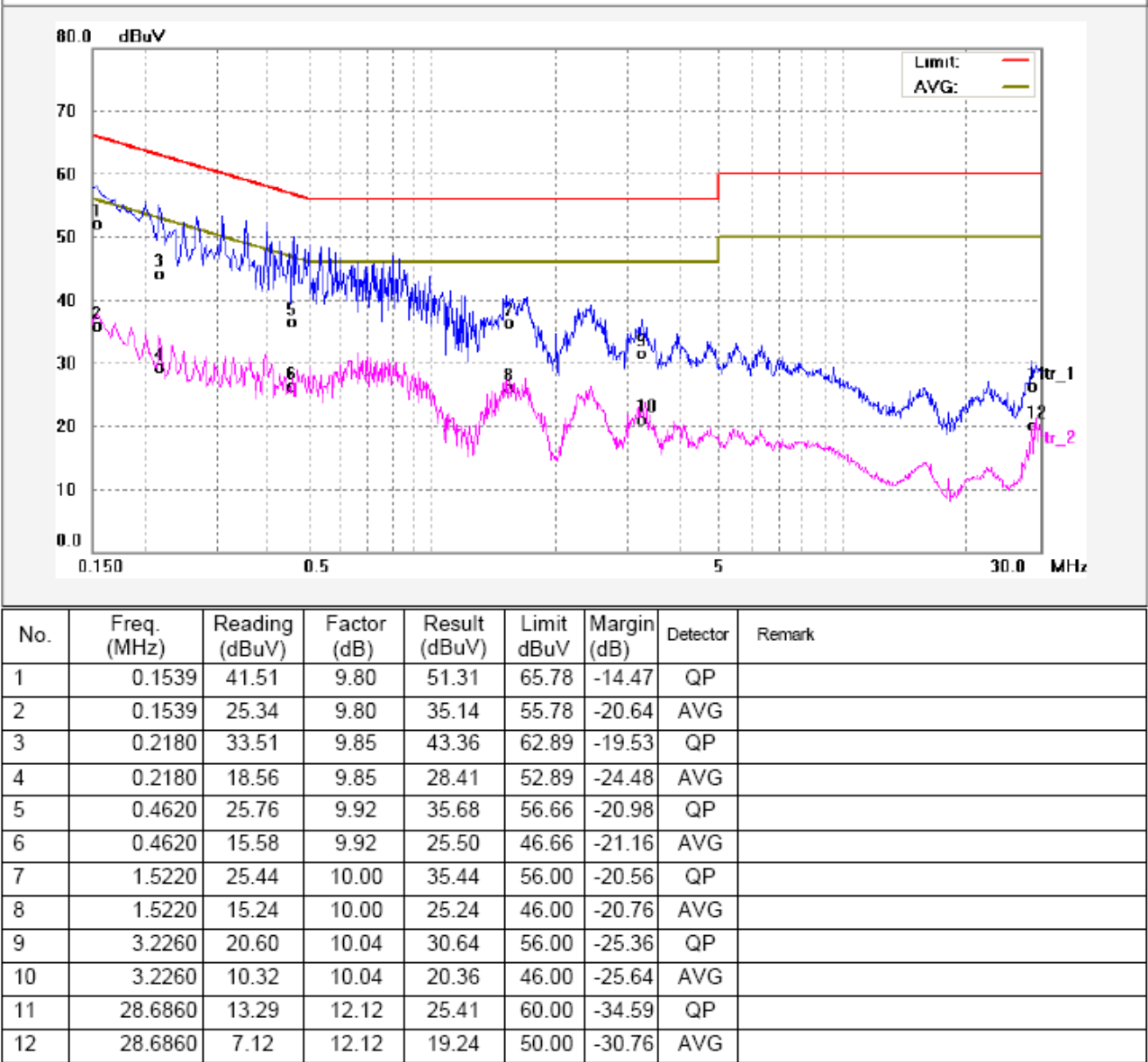
Adapter: CS6D050100FU (Csec)

Live line:



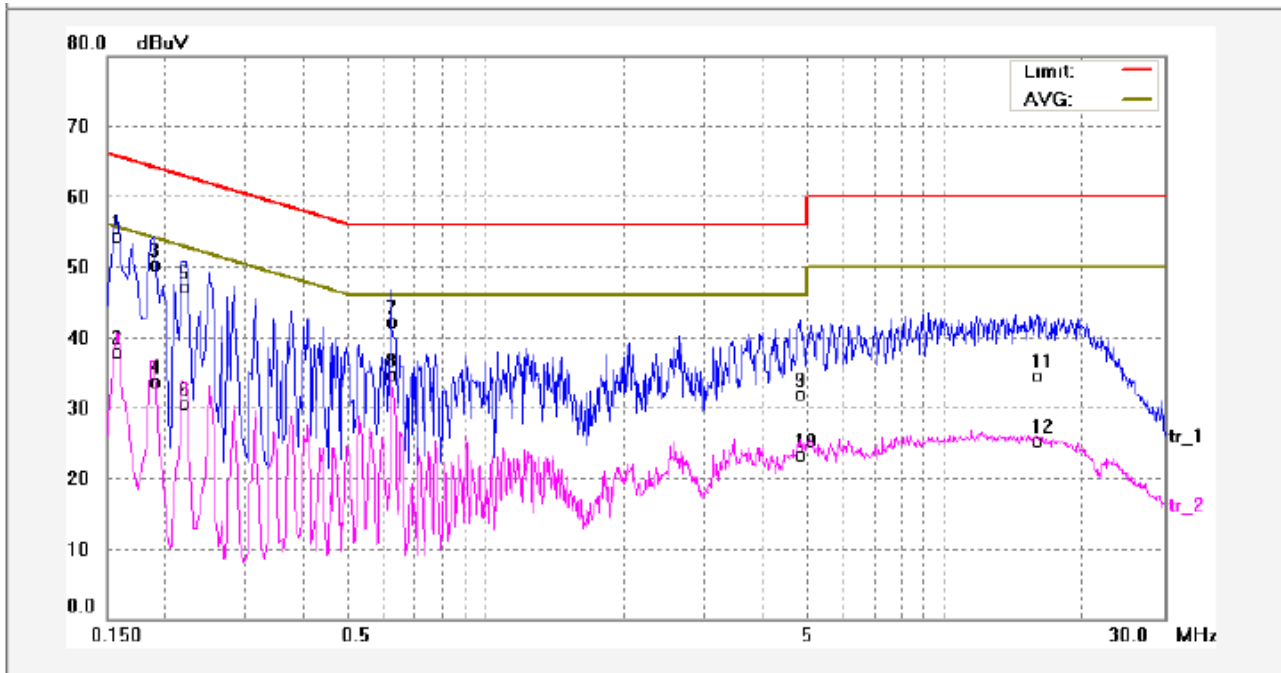
No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1624	36.54	9.81	46.35	65.34	-18.99	QP	
2	0.1624	20.83	9.81	30.64	55.34	-24.70	AVG	
3	0.3379	26.75	9.88	36.63	59.25	-22.62	QP	
4	0.3379	18.76	9.88	28.64	49.25	-20.61	AVG	
5	0.6860	25.41	9.95	35.36	56.00	-20.64	QP	
6	0.6860	18.05	9.95	28.00	46.00	-18.00	AVG	
7	1.6740	20.80	10.00	30.80	56.00	-25.20	QP	
8	1.6740	13.27	10.00	23.27	46.00	-22.73	AVG	
9	2.5300	19.00	10.02	29.02	56.00	-26.98	QP	
10	2.5300	11.90	10.02	21.92	46.00	-24.08	AVG	
11	29.2380	14.57	12.20	26.77	60.00	-33.23	QP	
12	29.2380	8.82	12.20	21.02	50.00	-28.98	AVG	

Neutral line:



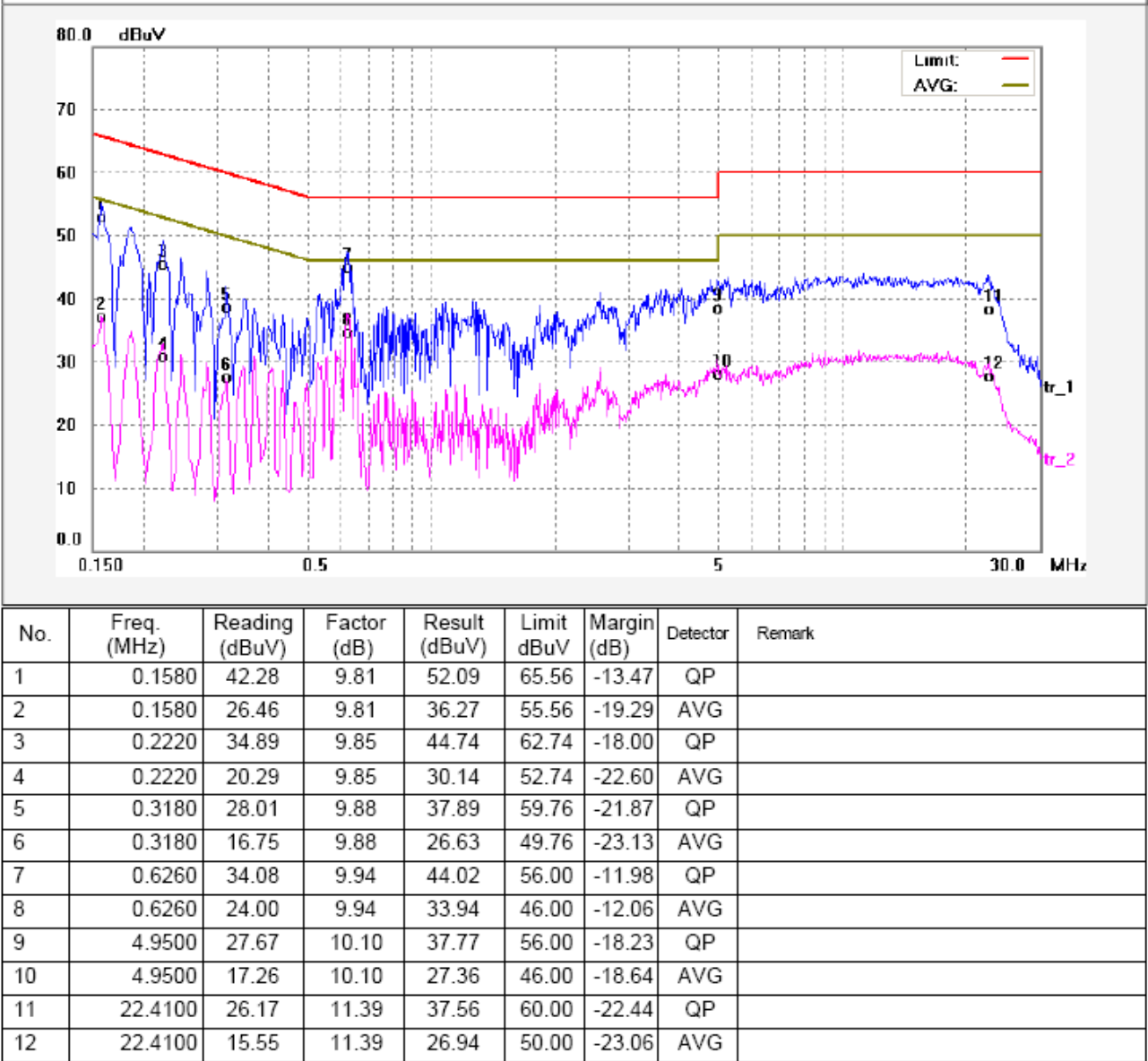
Adapter: MU05B7050100-A1 (LEI)

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1580	43.78	9.81	53.59	65.56	-11.97	QP	
2	0.1580	27.21	9.81	37.02	55.56	-18.54	AVG	
3	0.1900	39.62	9.83	49.45	64.03	-14.58	QP	
4	0.1900	23.17	9.83	33.00	54.03	-21.03	AVG	
5	0.2220	36.38	9.85	46.23	62.74	-16.51	QP	
6	0.2220	19.82	9.85	29.67	52.74	-23.07	AVG	
7	0.6220	31.40	9.94	41.34	56.00	-14.66	QP	
8	0.6220	23.98	9.94	33.92	46.00	-12.08	AVG	
9	4.8300	21.02	10.09	31.11	56.00	-24.89	QP	
10	4.8300	12.41	10.09	22.50	46.00	-23.50	AVG	
11	15.8740	22.70	10.95	33.65	60.00	-26.35	QP	
12	15.8740	13.50	10.95	24.45	50.00	-25.55	AVG	

Neutral line:



7 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: DA 00-705

Test Result: PASS

Frequency Range: 32.768kHz to 25GHz

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	$10000 * 2400/F(kHz)$	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	$100 * 24000/F(kHz)$	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

7.1 EUT Operation :

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

Atmospheric Pressure: 1012 mbar

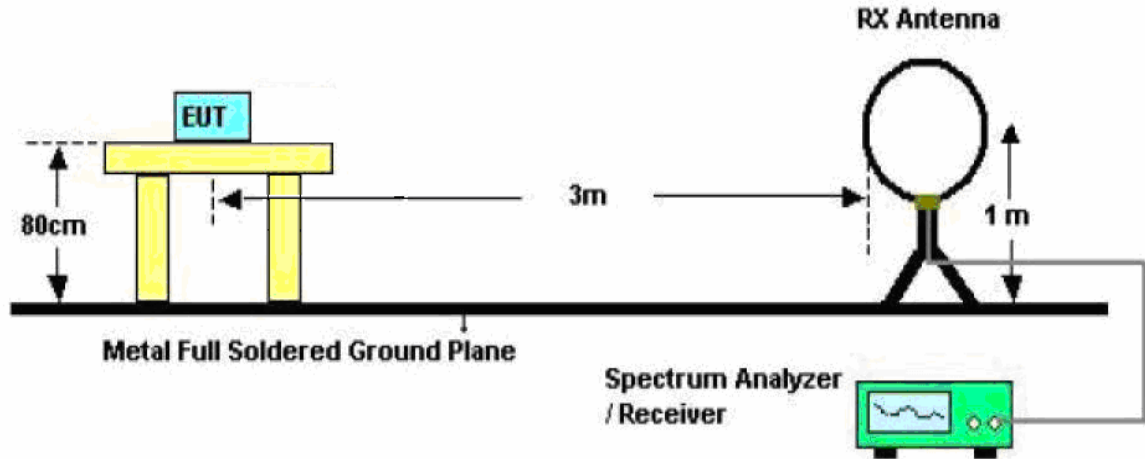
EUT Operation:

The EUT was tested in battery powered (Stand-alone working and AV out mode) and adapter powered (Stand-alone working mode).

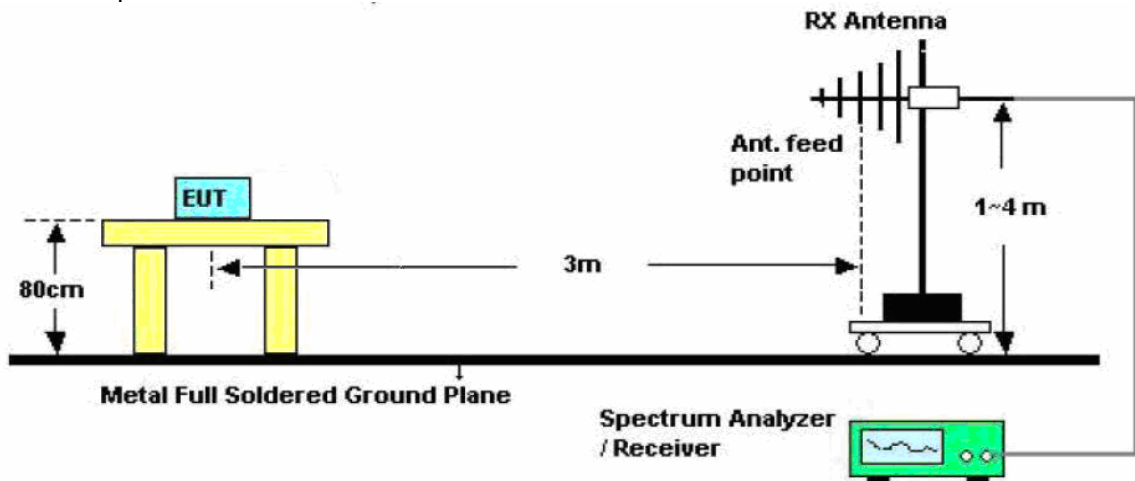
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4: 2003.

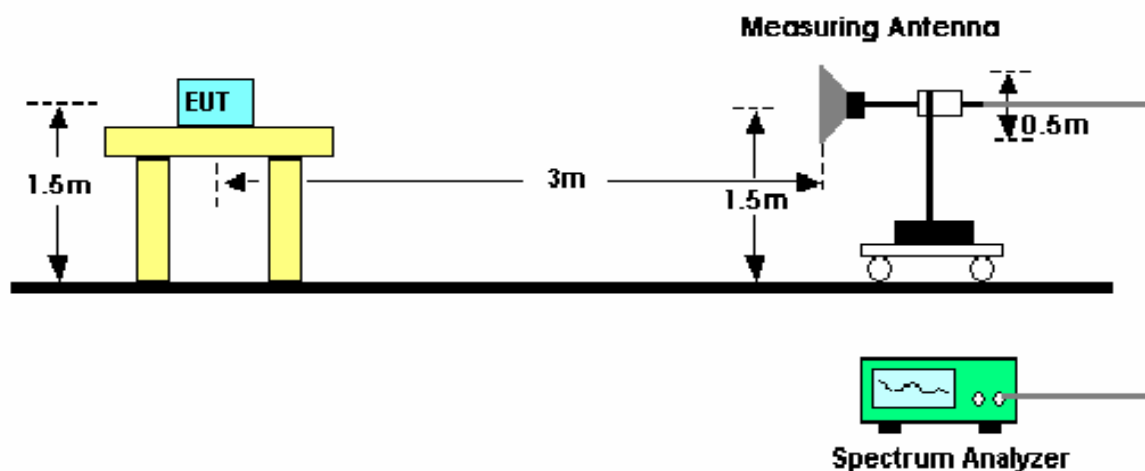
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

According to FCC Part15 Rules, the system was tested 32.768kHz to 25000MHz.

Below 30MHz

Sweep SpeedAuto
IF Bandwidth10KHz
Video Bandwidth10KHz
Resolution Bandwidth10KHz

30MHz ~ 1GHz

Sweep SpeedAuto
IF Bandwidth120KHz
Video Bandwidth100KHz
Quasi-Peak Adapter Bandwidth120KHz
Quasi-Peak Adapter ModeNormal
Resolution Bandwidth100KHz

Above 1GHz

Sweep SpeedAuto
IF Bandwidth120 KHz
Video Bandwidth3MHz
Quasi-Peak Adapter Bandwidth120 KHz
Quasi-Peak Adapter ModeNormal
Resolution Bandwidth1MHz

7.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under X-axes position(X denotes lying on the table).

7.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

7.6 Summary of Test Results

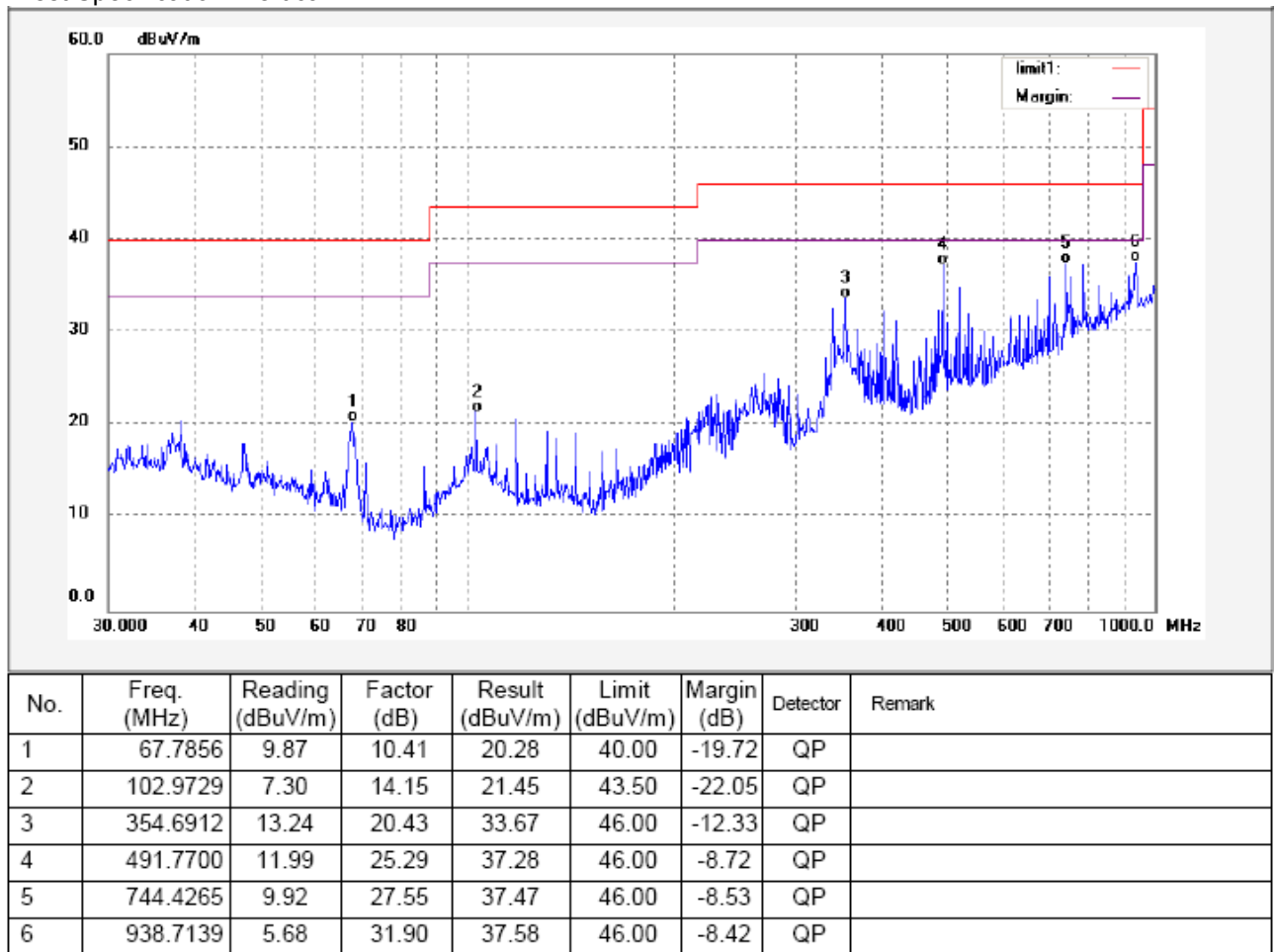
Test Frequency Range : Below 30MHz

Remark: Because the emissions below 30MHz are more than 20dB below the limit, the data is not show in the report.

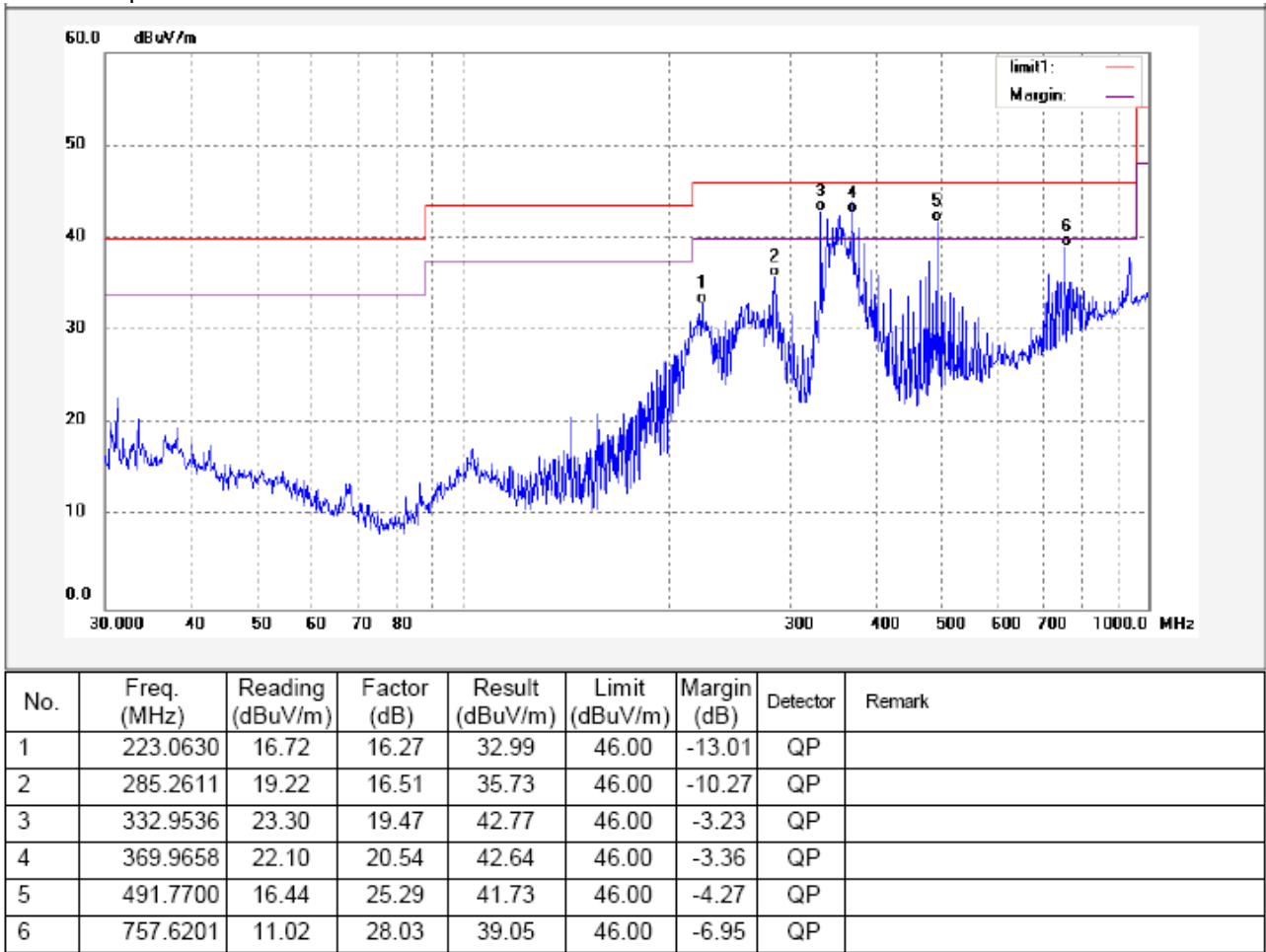
Test Frequency Range : 30MHz ~ 1000MHz

Test Mode: Battery powered (Stand-alone working mode)

Test Specification: Vertical

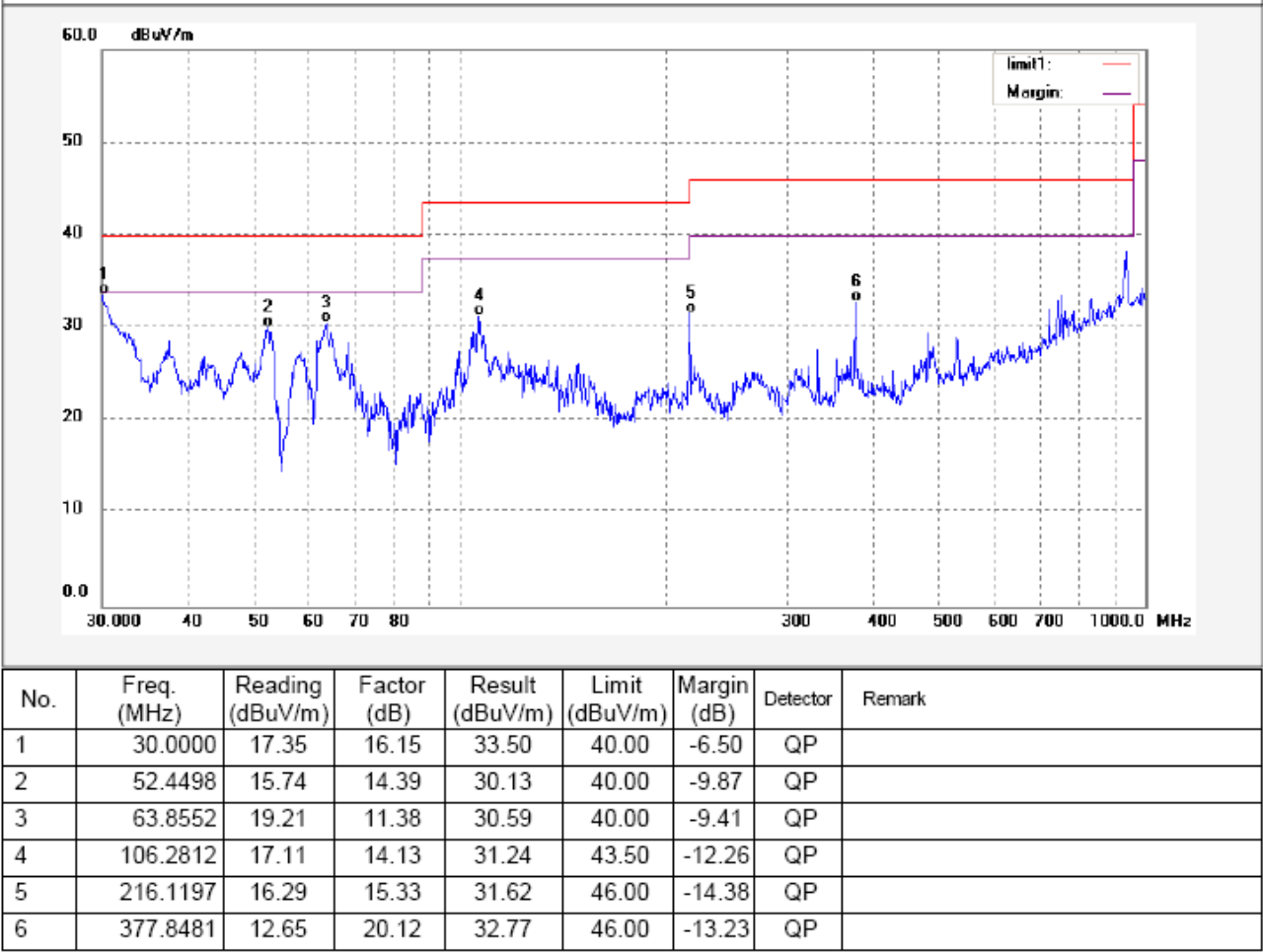


Antenna polarization: Horizontal

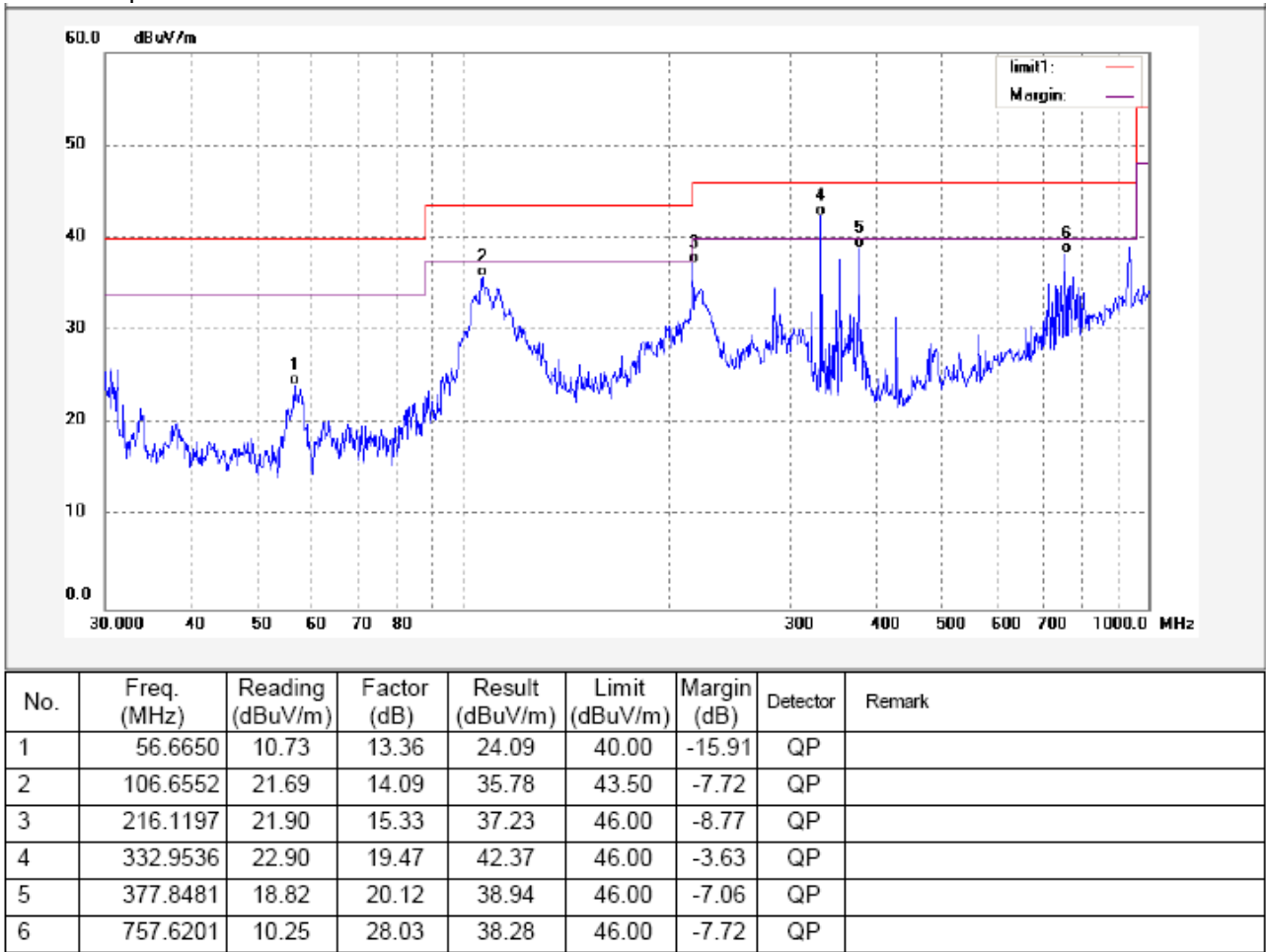


Test Mode: Battery powered (AV out mode)

Test Specification: Vertical



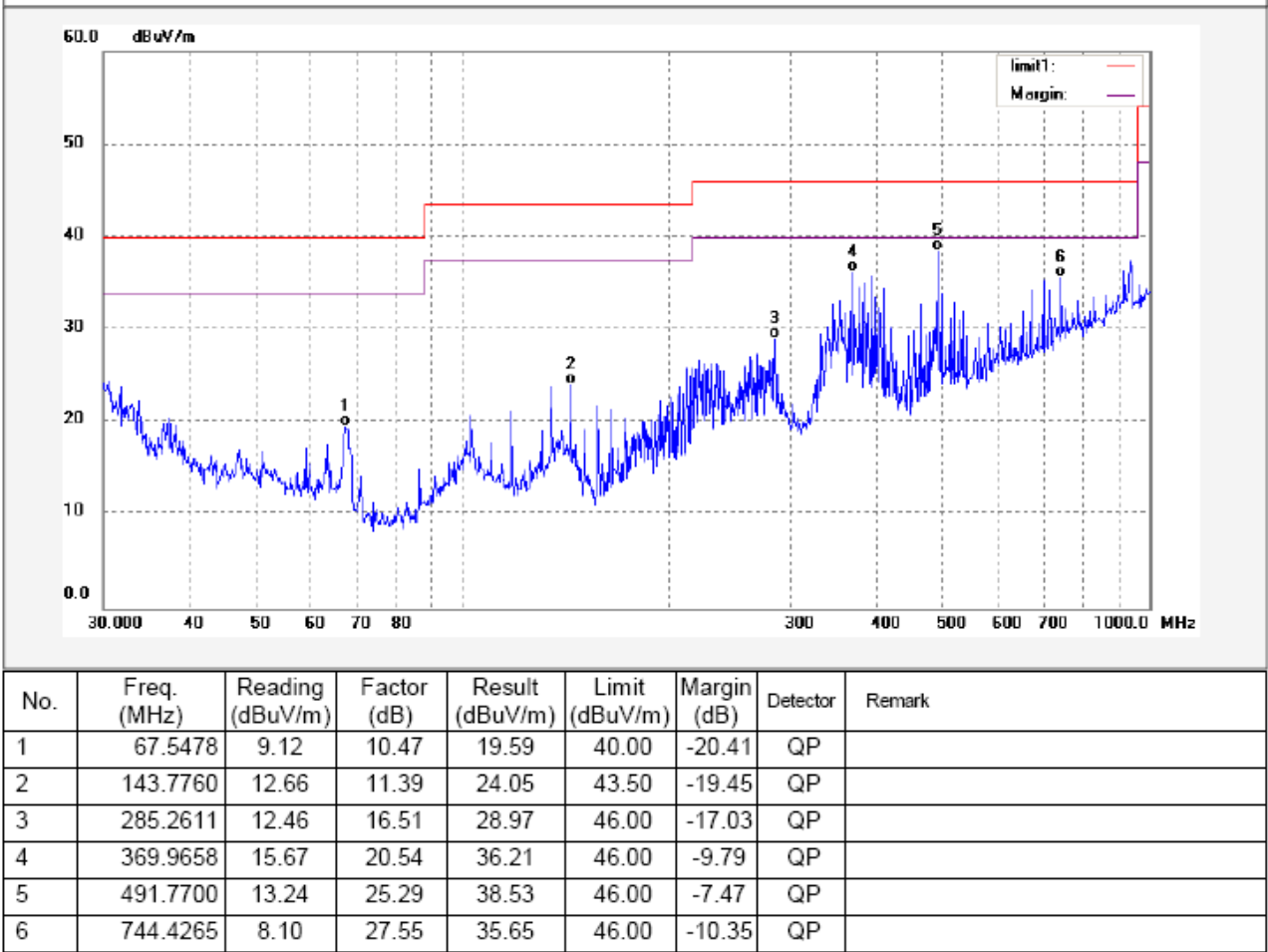
Antenna polarization: Horizontal



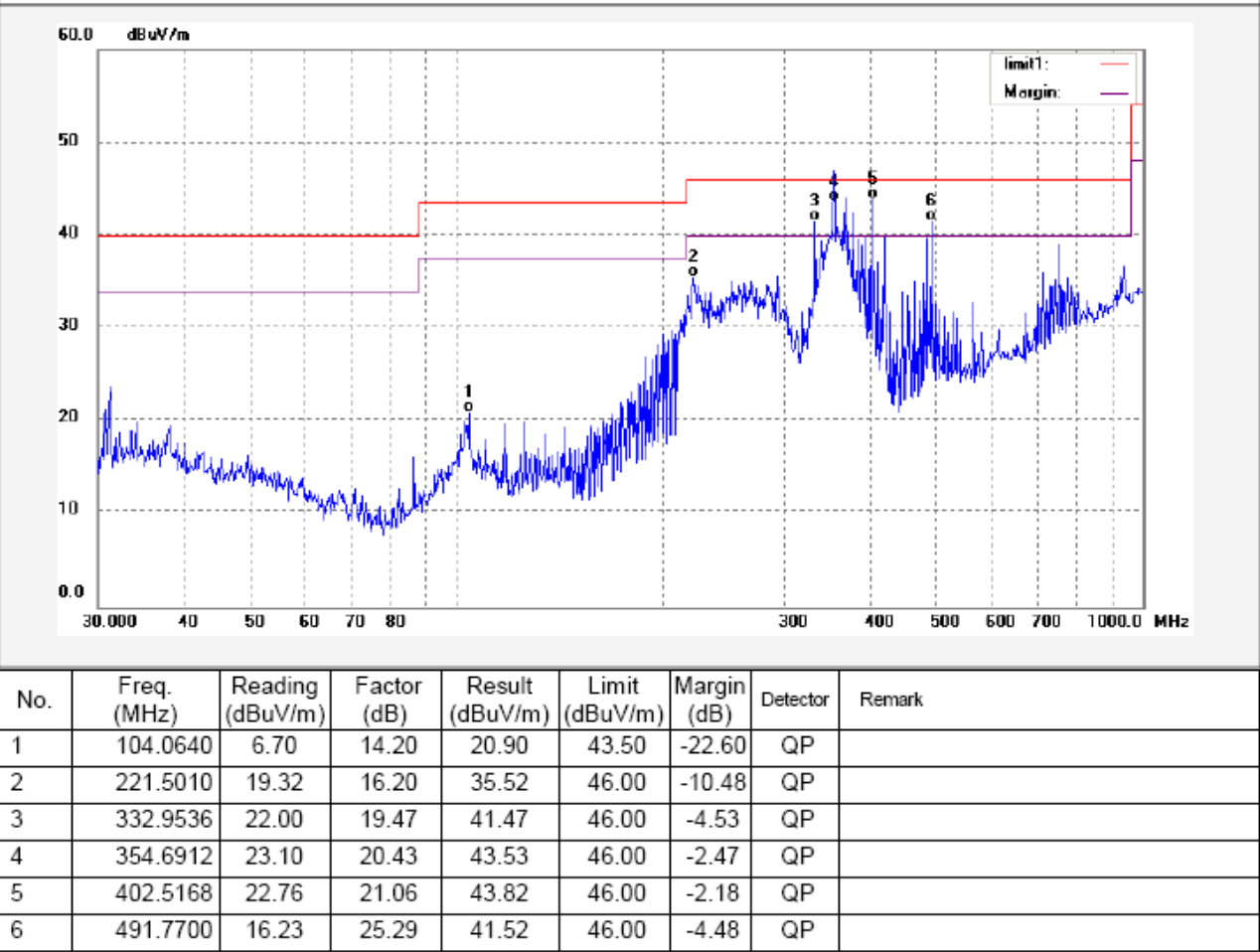
Test Mode: Adapter powered (Stand-alone working mode)

Adapter: KSAS0060500100VUD (Ktec)

Test Specification: Vertical



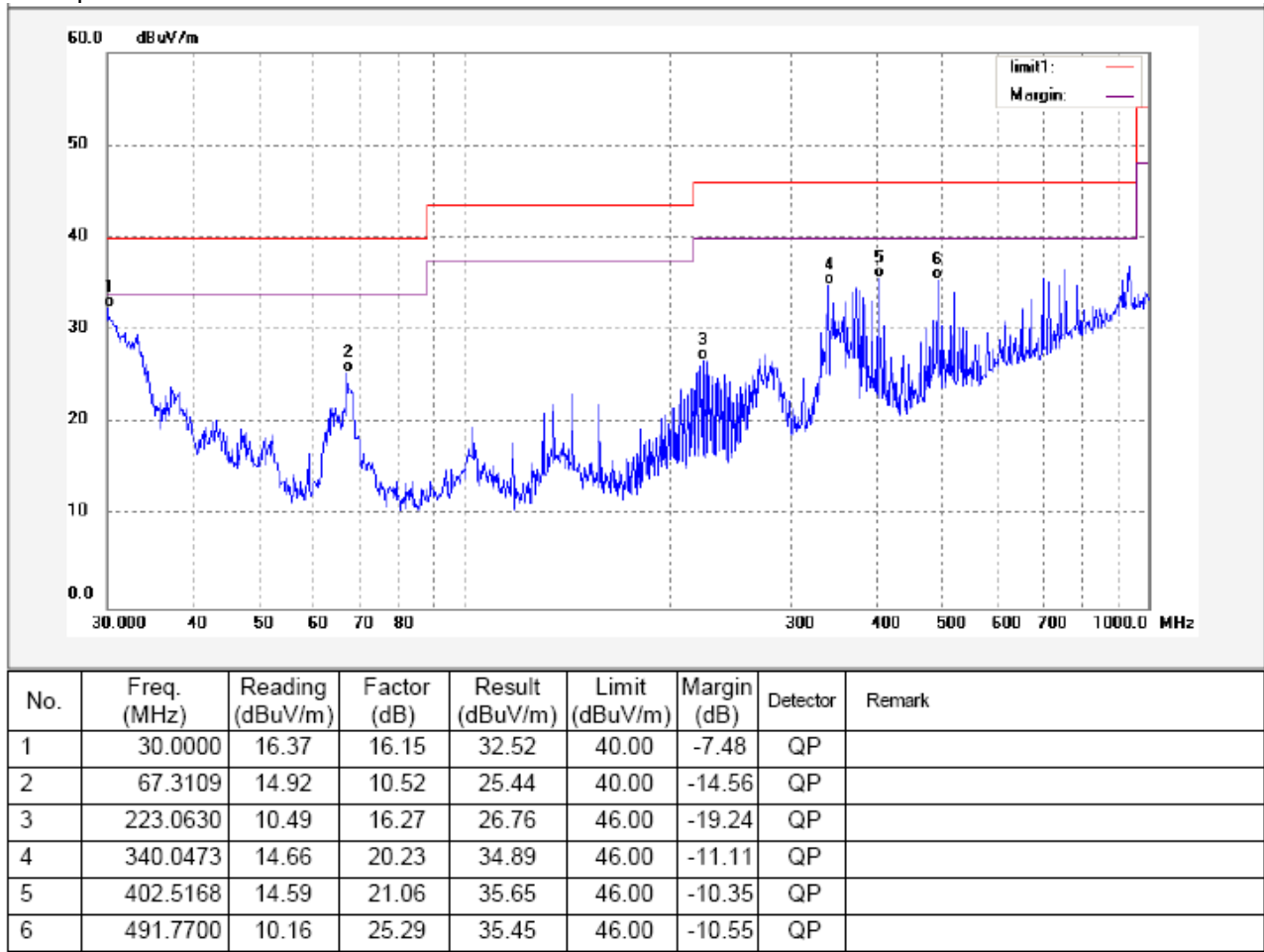
Antenna polarization: Horizontal



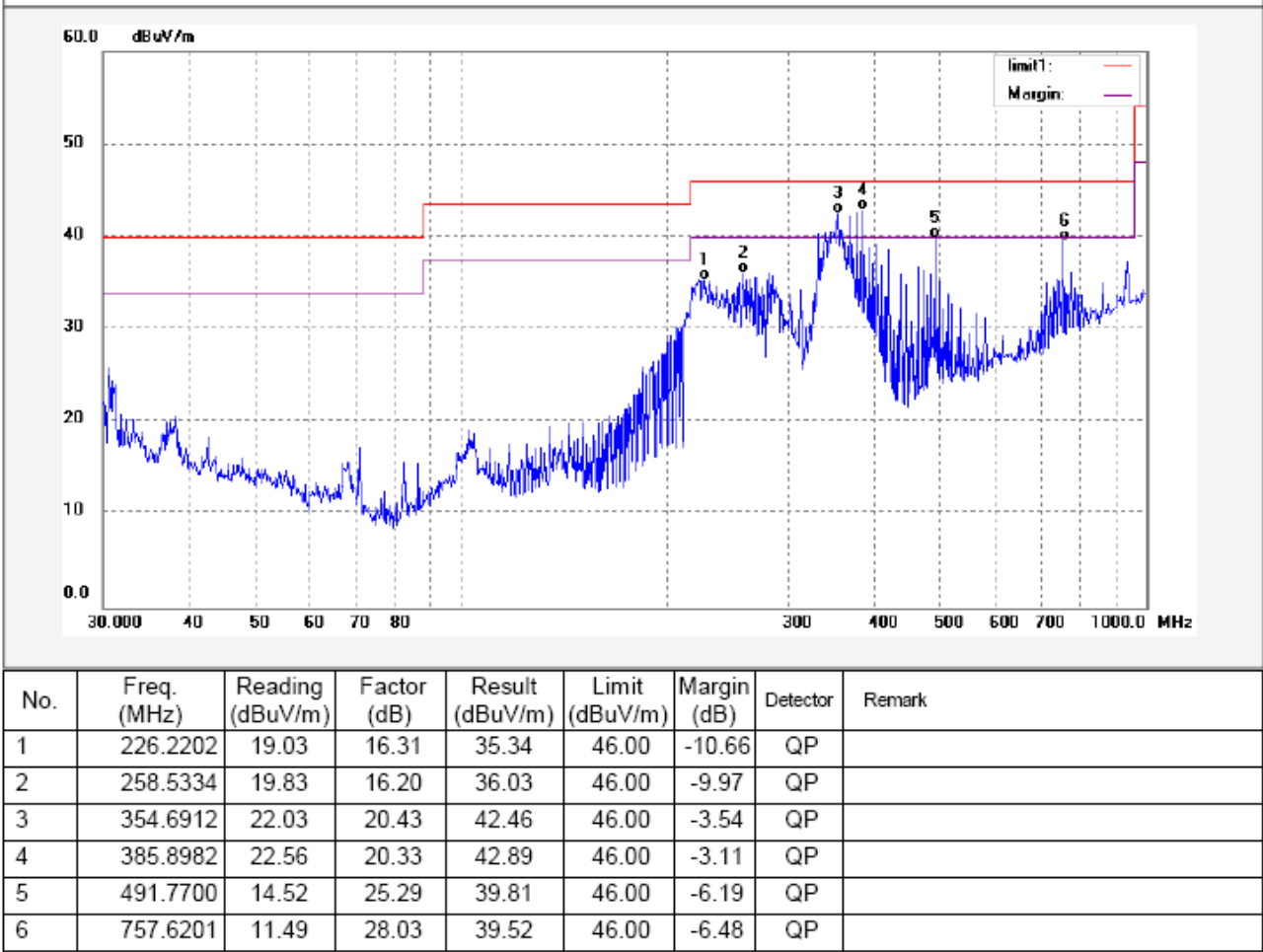
Test Mode: Adapter powered (Stand-alone working mode)

Adapter: CS6D050100FU (Csec)

Test Specification: Vertical



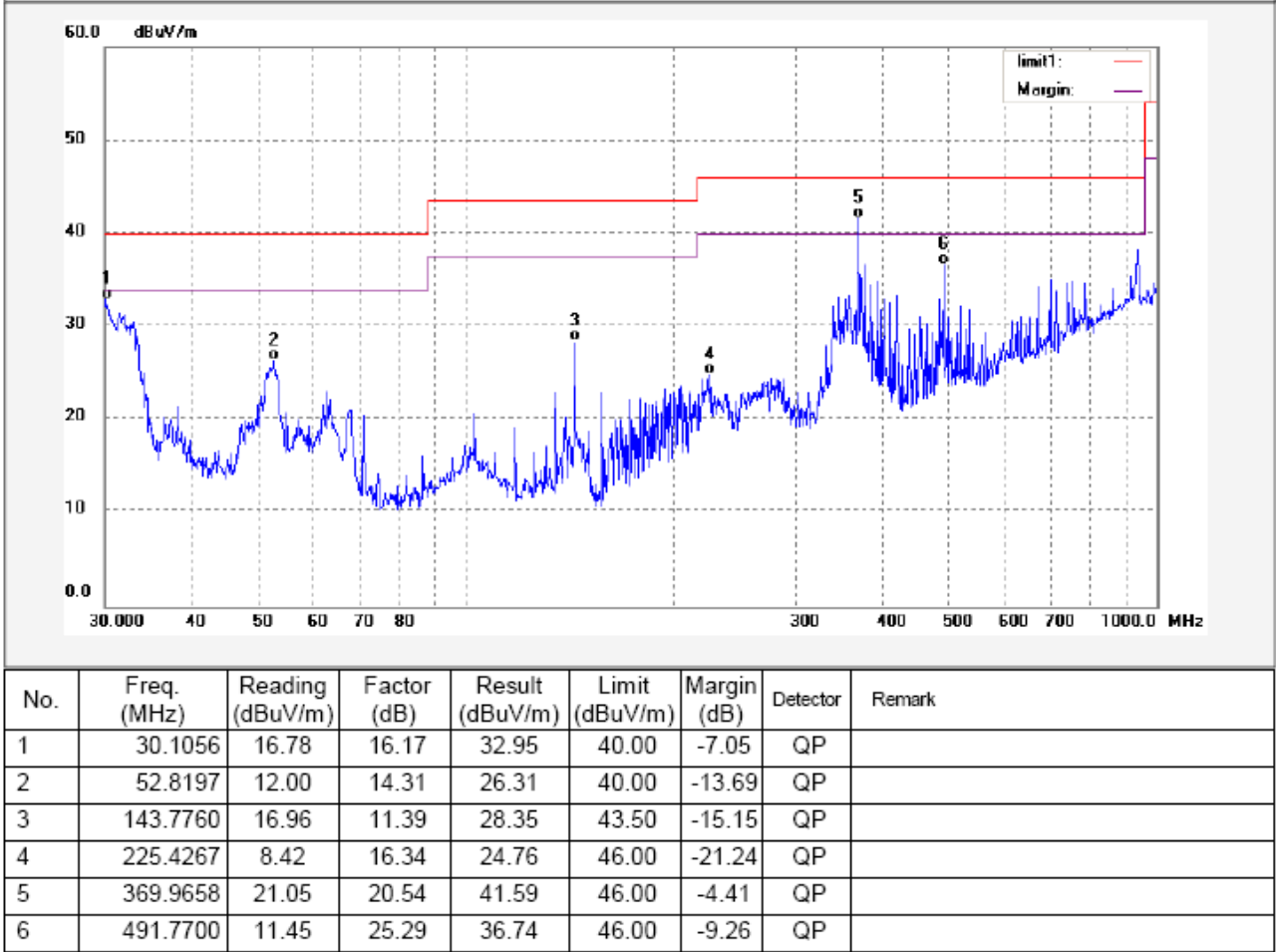
Antenna polarization: Horizontal



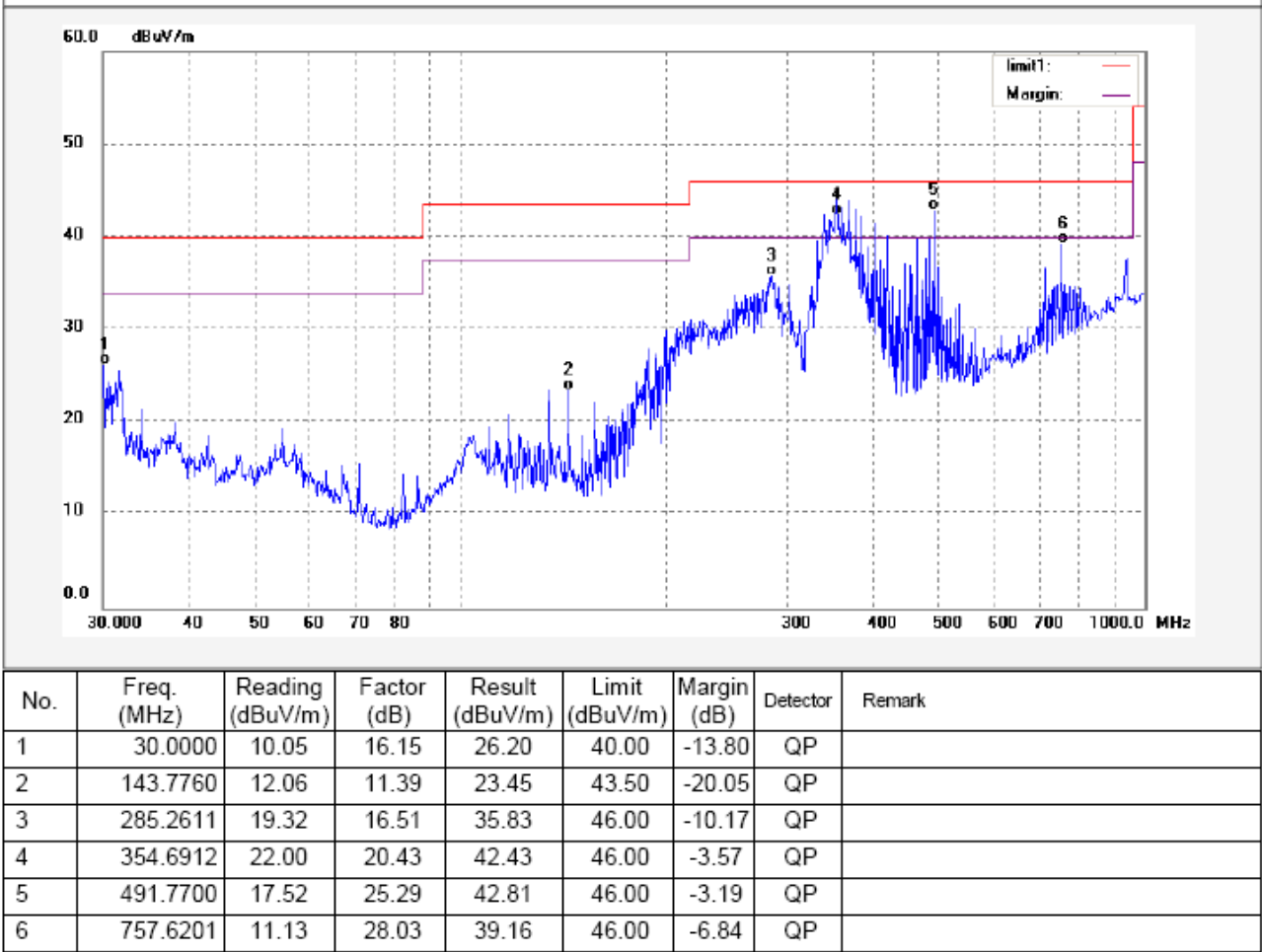
Test Mode: Adapter powered (Stand-alone working mode)

Adapter: MU05B7050100-A1 (LEI)

Test Specification: Vertical



Antenna polarization: Horizontal



Test Frequency Range: 1GHz ~ 25GHz

And the below is the Fundamental and Harmonic

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
Low frequency							
2408.625	AV	Vertical	102.06	-	(Fund.)	1.3	100
4817.25	AV	Vertical	43.61	54.00	-10.39	1.2	85
7225.875	AV	Vertical	44.55	54.00	-9.45	1.9	140
9634.5	AV	Vertical	41.28	54.00	-12.72	2.2	180
12043.13	AV	Vertical	37.64	54.00	-16.36	1.4	235
14451.75	AV	Vertical	38.93	54.00	-15.07	1.8	160
16860.38	AV	Vertical	35.74	54.00	-18.26	2.0	120
19269	AV	Vertical	34.02	54.00	-19.98	1.3	180
21677.63	AV	Vertical	31.80	54.00	-22.2	2.2	100
24086.25	AV	Vertical	32.95	54.00	-21.05	1.7	100
2408.625	AV	Horizontal	93.54	-	(Fund.)	2.5	20
4817.25	AV	Horizontal	42.92	54.00	-11.08	2.4	240
7225.875	AV	Horizontal	40.67	54.00	-13.33	2.3	160
9634.5	AV	Horizontal	37.78	54.00	-16.22	2.3	140
12043.13	AV	Horizontal	39.76	54.00	-14.24	2.2	80
14451.75	AV	Horizontal	34.67	54.00	-19.33	2.4	240
16860.38	AV	Horizontal	40.77	54.00	-13.23	1.7	200
19269	AV	Horizontal	32.62	54.00	-21.38	2.0	140
21677.63	AV	Horizontal	33.95	54.00	-20.05	2.8	120
24086.25	AV	Horizontal	35.72	54.00	-18.28	1.9	130
2408.625	PK	Vertical	112.09	-	(Fund.)	1.8	100
4817.25	PK	Vertical	56.61	74.00	-17.39	1.9	100
7225.875	PK	Vertical	57.55	74.00	-16.45	1.5	110
9634.5	PK	Vertical	54.28	74.00	-19.72	1.7	300
12043.13	PK	Vertical	50.64	74.00	-23.36	1.3	160
14451.75	PK	Vertical	51.93	74.00	-22.07	1.3	100
16860.38	PK	Vertical	48.74	74.00	-25.26	1.7	155
19269	PK	Vertical	47.02	74.00	-26.98	1.5	240
21677.63	PK	Vertical	44.80	74.00	-29.2	1.4	160
24086.25	PK	Vertical	45.95	74.00	-28.05	1.7	130
2408.625	PK	Horizontal	109.21	-	(Fund.)	2.2	80
4817.25	PK	Horizontal	47.92	74.00	-26.08	2.2	210
7225.875	PK	Horizontal	45.67	74.00	-28.33	2.9	160
9634.5	PK	Horizontal	42.78	74.00	-31.22	1.9	40
12043.13	PK	Horizontal	44.76	74.00	-29.24	1.7	155
14451.75	PK	Horizontal	39.67	74.00	-34.33	1.4	120
16860.38	PK	Horizontal	45.77	74.00	-28.23	2.3	280
19269	PK	Horizontal	37.62	74.00	-36.38	2.2	100
21677.63	PK	Horizontal	38.95	74.00	-35.05	2.2	140

24086.25	PK	Horizontal	40.72	74.00	-33.28	2.6	180
Middle frequency							
2439	AV	Vertical	99.94	-	(Fund.)	1.5	110
4878	AV	Vertical	45.87	54.00	-8.13	1.8	140
7317	AV	Vertical	43.98	54.00	-10.02	1.6	120
9756	AV	Vertical	39.84	54.00	-14.16	1.7	130
12195	AV	Vertical	43.08	54.00	-10.92	1.1	130
14634	AV	Vertical	35.75	54.00	-18.25	1.7	200
17073	AV	Vertical	39.00	54.00	-15	1.6	220
19512	AV	Vertical	33.81	54.00	-20.19	1.0	160
21951	AV	Vertical	37.80	54.00	-16.2	1.7	290
24390	AV	Vertical	30.86	54.00	-23.14	1.6	140
2439	AV	Horizontal	93.83	-	(Fund.)	1.8	150
4878	AV	Horizontal	40.94	54.00	-13.06	2.1	220
7317	AV	Horizontal	42.67	54.00	-11.33	2.0	200
9756	AV	Horizontal	36.78	54.00	-17.22	2.2	170
12195	AV	Horizontal	39.53	54.00	-14.47	1.9	180
14634	AV	Horizontal	34.93	54.00	-19.07	2.1	310
17073	AV	Horizontal	32.12	54.00	-21.88	1.6	245
19512	AV	Horizontal	34.81	54.00	-19.19	1.7	140
21951	AV	Horizontal	36.04	54.00	-17.96	2.5	180
24390	AV	Horizontal	30.72	54.00	-23.28	1.5	250
2439	PK	Vertical	111.67		(Fund.)	1.5	110
4878	PK	Vertical	58.87	74.00	-15.13	1.6	140
7317	PK	Vertical	56.98	74.00	-17.02	1.0	130
9756	PK	Vertical	52.84	74.00	-21.16	1.4	250
12195	PK	Vertical	56.08	74.00	-17.92	1.4	290
14634	PK	Vertical	48.75	74.00	-25.25	1.2	290
17073	PK	Vertical	52.00	74.00	-22	1.4	30
19512	PK	Vertical	46.81	74.00	-27.19	1.5	250
21951	PK	Vertical	50.80	74.00	-23.2	1.5	245
24390	PK	Vertical	43.86	74.00	-30.14	1.4	170
2439	PK	Horizontal	106.49	-	(Fund.)	1.9	30
4878	PK	Horizontal	53.94	74.00	-20.06	1.7	175
7317	PK	Horizontal	55.67	74.00	-18.33	2.6	200
9756	PK	Horizontal	49.78	74.00	-24.22	1.6	110
12195	PK	Horizontal	52.53	74.00	-21.47	1.4	180
14634	PK	Horizontal	47.93	74.00	-26.07	1.5	280
17073	PK	Horizontal	45.12	74.00	-28.88	2.0	230
19512	PK	Horizontal	47.81	74.00	-26.19	1.9	200
21951	PK	Horizontal	49.04	74.00	-24.96	1.9	30
24390	PK	Horizontal	43.72	74.00	-30.28	2.0	265

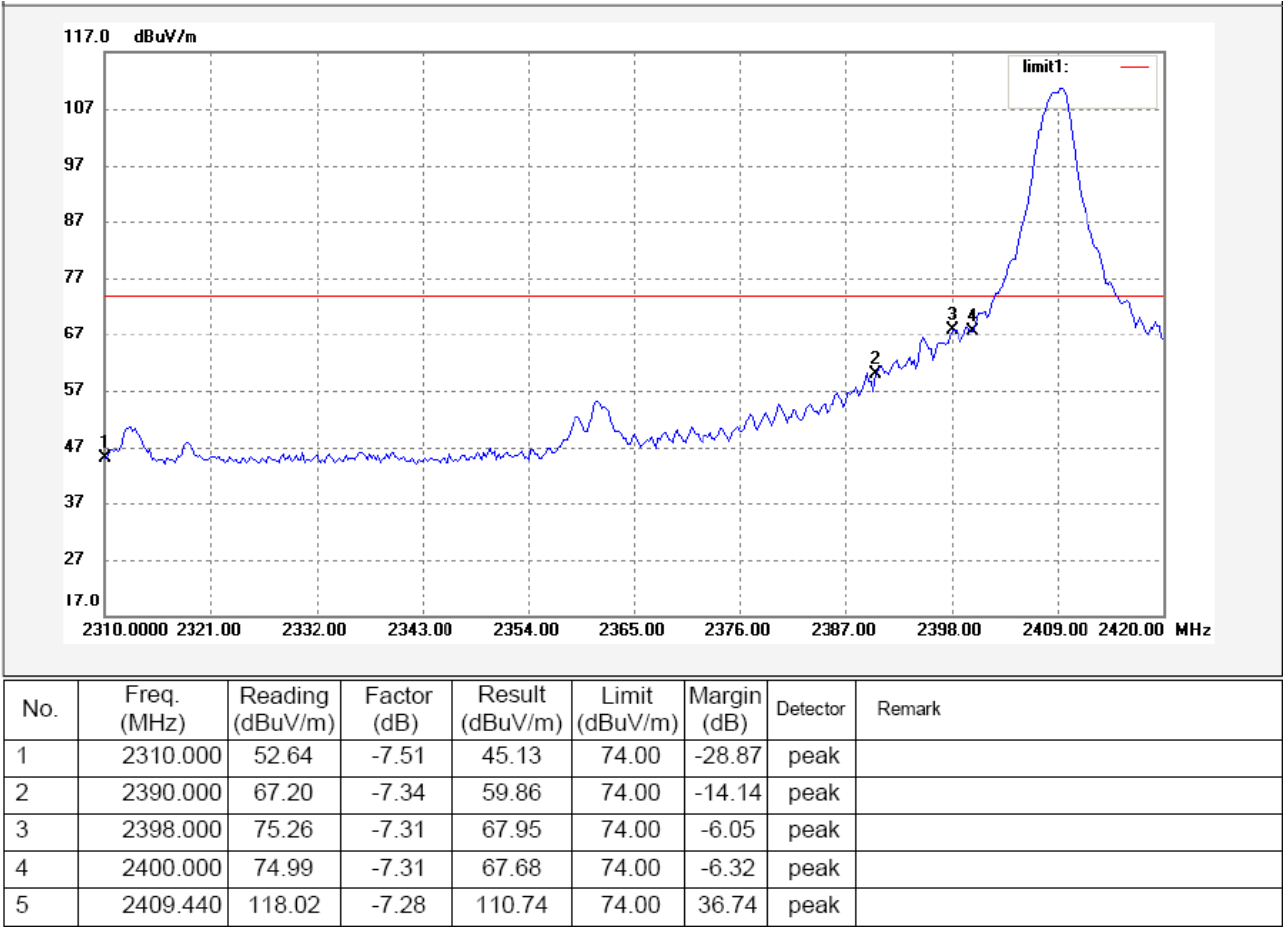
High frequency							
2473.875	AV	Vertical	99.18	-	(Fund.)	1.5	250
4947.75	AV	Vertical	44.29	54.00	-9.71	1.4	40
7421.625	AV	Vertical	40.72	54.00	-13.28	1.7	140
9895.5	AV	Vertical	43.18	54.00	-10.82	1.8	180
12369.38	AV	Vertical	38.28	54.00	-15.72	1.3	190
14843.25	AV	Vertical	44.83	54.00	-9.17	1.6	160
17317.13	AV	Vertical	38.86	54.00	-15.14	1.7	120
19791	AV	Vertical	39.73	54.00	-14.27	1.1	300
22264.88	AV	Vertical	38.05	54.00	-15.95	1.8	220
24738.75	AV	Vertical	31.67	54.00	-22.33	1.3	175
2473.875	AV	Horizontal	93.60	-	(Fund.)	1.9	140
4947.75	AV	Horizontal	40.68	54.00	-13.32	2.2	270
7421.625	AV	Horizontal	38.99	54.00	-15.01	2.0	220
9895.5	AV	Horizontal	39.81	54.00	-14.19	2.1	220
12369.38	AV	Horizontal	37.67	54.00	-16.33	2.0	155
14843.25	AV	Horizontal	31.86	54.00	-22.14	2.2	240
17317.13	AV	Horizontal	36.07	54.00	-17.93	1.5	280
19791	AV	Horizontal	30.74	54.00	-23.26	1.8	100
22264.88	AV	Horizontal	33.57	54.00	-20.43	2.6	110
24738.75	AV	Horizontal	28.95	54.00	-25.05	1.6	210
2473.875	PK	Vertical	111.94	-	(Fund.)	1.6	280
4947.75	PK	Vertical	57.29	74.00	-16.71	1.7	70
7421.625	PK	Vertical	53.72	74.00	-20.28	1.1	130
9895.5	PK	Vertical	56.18	74.00	-17.82	1.5	220
12369.38	PK	Vertical	51.28	74.00	-22.72	1.4	190
14843.25	PK	Vertical	57.83	74.00	-16.17	1.4	100
17317.13	PK	Vertical	51.86	74.00	-22.14	1.5	110
19791	PK	Vertical	52.73	74.00	-21.27	1.2	240
22264.88	PK	Vertical	51.05	74.00	-22.95	1.2	220
24738.75	PK	Vertical	44.67	74.00	-29.33	1.5	175
2473.875	PK	Horizontal	110.82	-	(Fund.)	2.0	200
4947.75	PK	Horizontal	53.68	74.00	-20.32	1.8	180
7421.625	PK	Horizontal	51.99	74.00	-22.01	2.7	220
9895.5	PK	Horizontal	52.81	74.00	-21.19	1.7	220
12369.38	PK	Horizontal	50.67	74.00	-23.33	1.5	110
14843.25	PK	Horizontal	44.86	74.00	-29.14	1.7	210
17317.13	PK	Horizontal	49.07	74.00	-24.93	2.1	250
19791	PK	Horizontal	43.74	74.00	-30.26	2.0	190
22264.88	PK	Horizontal	46.57	74.00	-27.43	2.1	140
24738.75	PK	Horizontal	41.95	74.00	-32.05	2.3	300

8 Band Edge Measurement

Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	DA 00-705
Measurement Distance:	3m
Limit:	40.0 dBuV/m between 30MHz & 88MHz; 43.5 dBuV/m between 88MHz & 216MHz; 46.0 dBuV/m between 216MHz & 960MHz; 54.0 dBuV/m above 960MHz. 74.0 dBuV/m for peak above 1GHz 54.0 dBuV/m for AVG above 1GHz
Detector:	For Peak value: RBW = 1 MHz for $f \geq 1$ GHz VBW $\geq$ RBW; Sweep = auto Detector function = peak Trace = max hold For AVG value: RBW = 1 MHz for $f \geq 1$ GHz VBW = 10Hz; Sweep = auto Detector function = AVG Trace = max hold

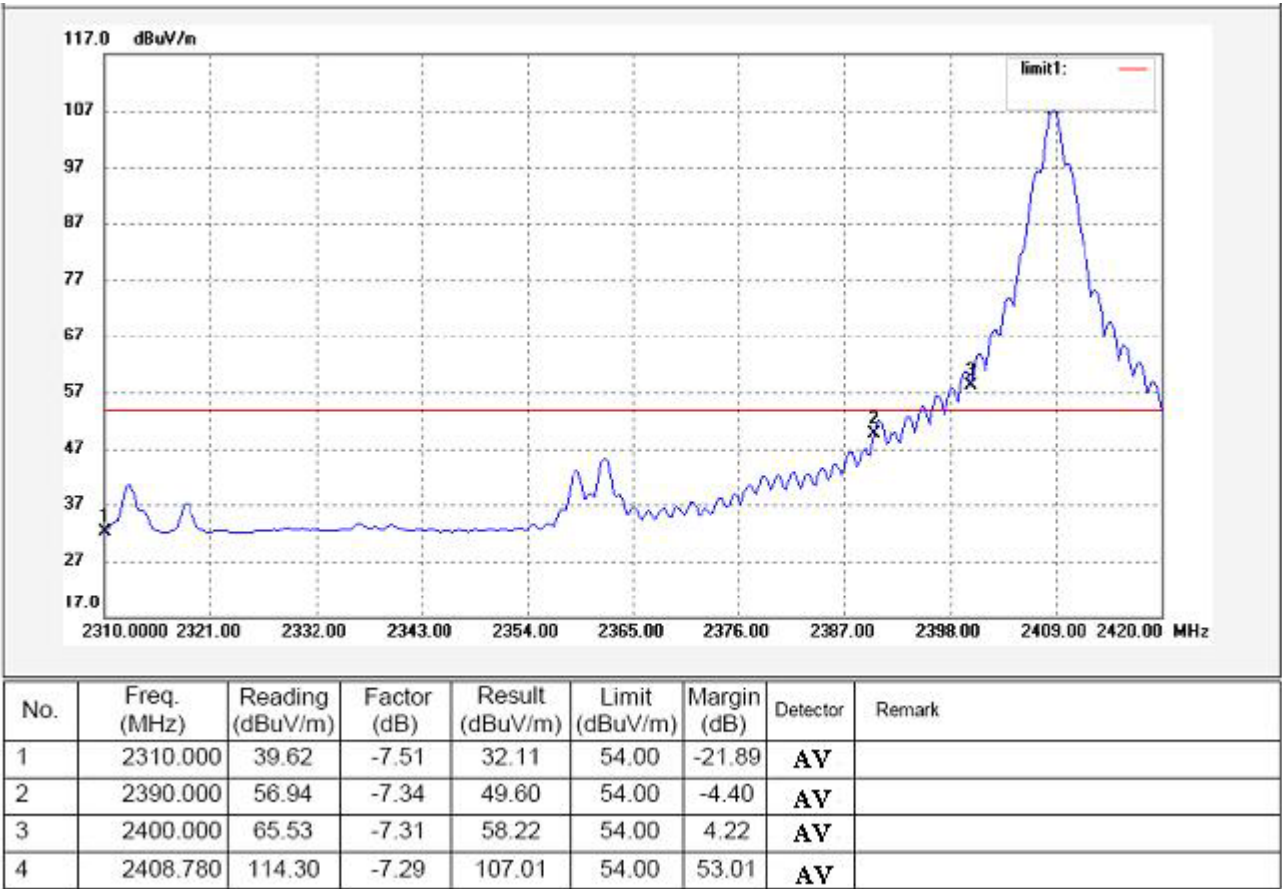
8.1 Test Result:

Low Channel – Peak



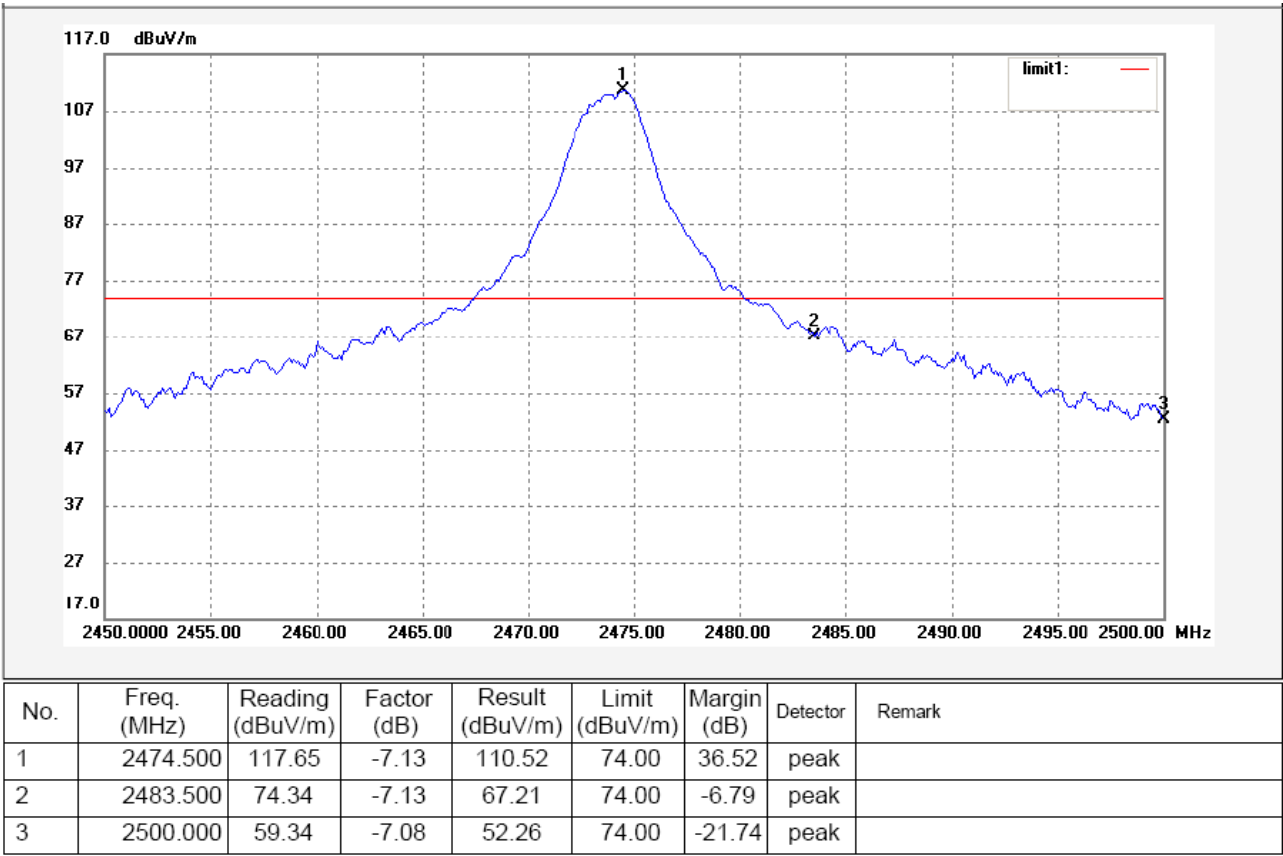
Remark:Mark 5 is fundamental wave.

Low Channel – AV



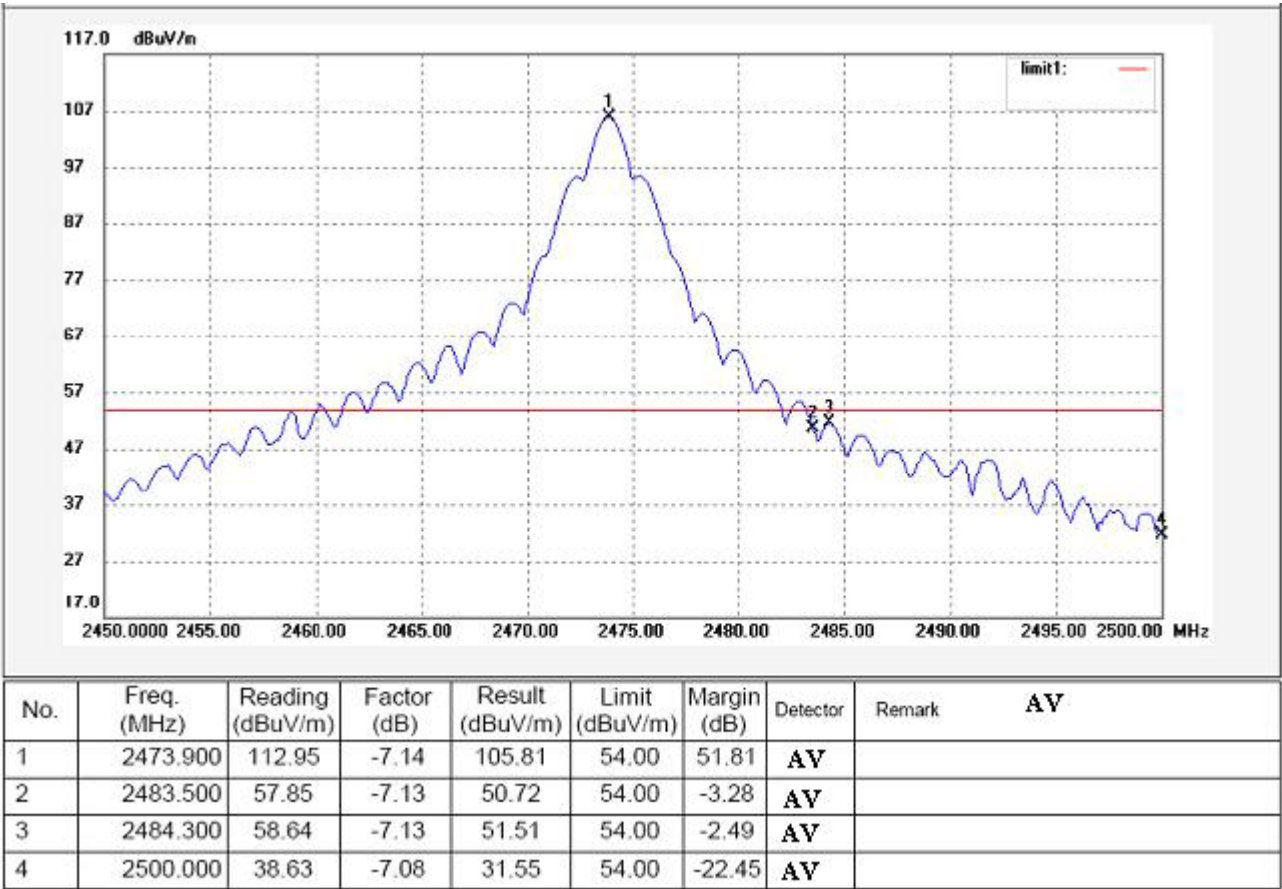
Remark:Mark 4 is fundamental wave.

High Channel – Peak



Remark:Mark 1 is fundamental wave.

High Channel – AV



Remark:Mark 1 is fundamental wave.

9 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247
 Test Method: DA 00-705
 Test Mode: Test in fixing operating frequency at low, Middle, high channel.

9.1 Test Procedure:

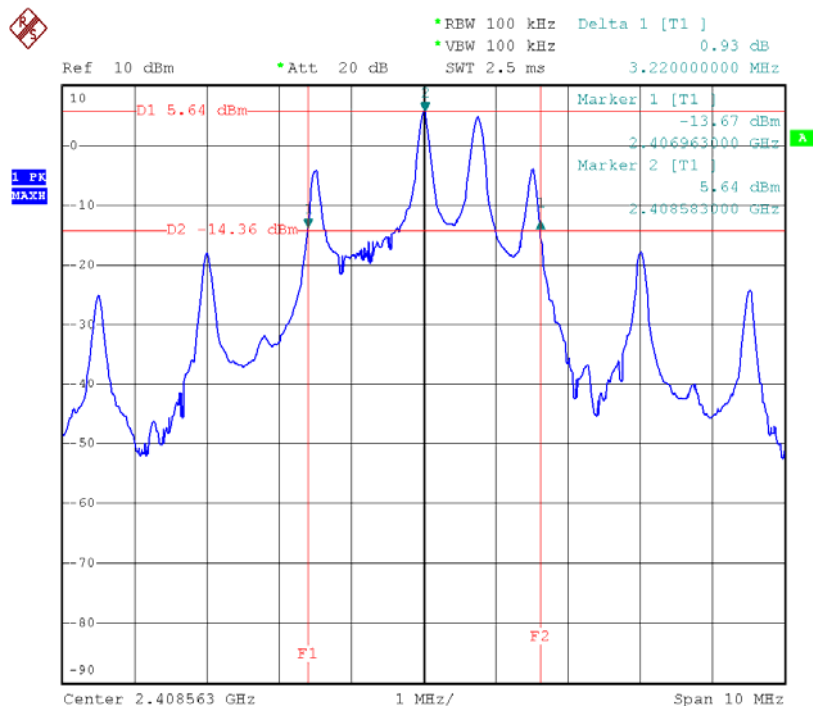
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 100kHz

9.2 Test Result:

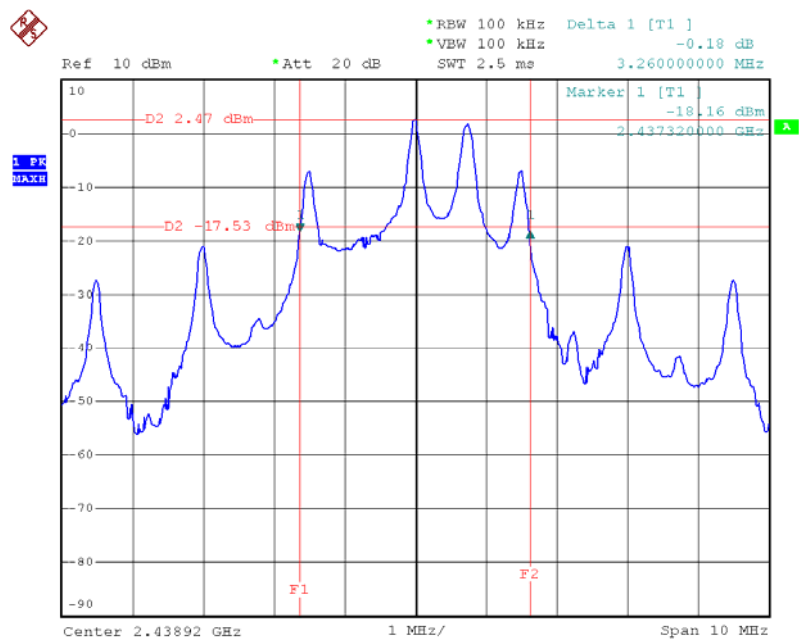
Test Channel	Bandwidth
Low	3.22MHz
Middle	3.26MHz
High	3.22MHz

Test result plot as follows:

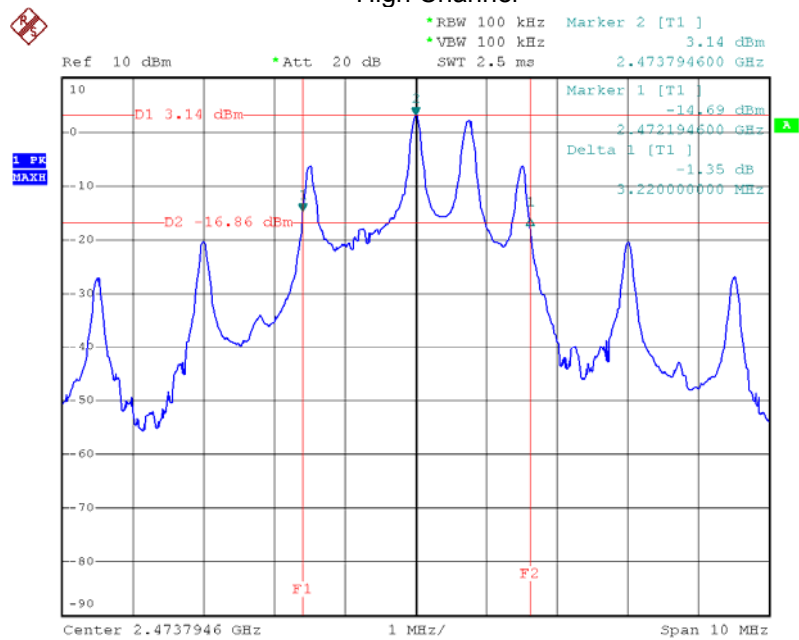
Low Channel



Middle Channel



High Channel



10 Maximum Peak Output Power

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	ANSI C63.4:2003
Test Limit:	Regulation 15.247 (b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts. Refer to the result "Number of Hopping Frequency" of this document. The 0.125watts (20.97 dBm) limit applies.
Test mode:	Test in fixing frequency transmitting mode.

10.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 1MHz. VBW = 1MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

10.2 Test Result:

Test Channel	Output Power (dBm)	Limit (dBm)
Low	9.32	20.97
Middle	9.26	20.97
High	9.25	20.97

11 Channel Separated

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	DA 00-705
Test Limit:	Regulation 15.247(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 1W.
Test Mode:	Test in hopping transmitting operating mode.

11.1 Test Procedure:

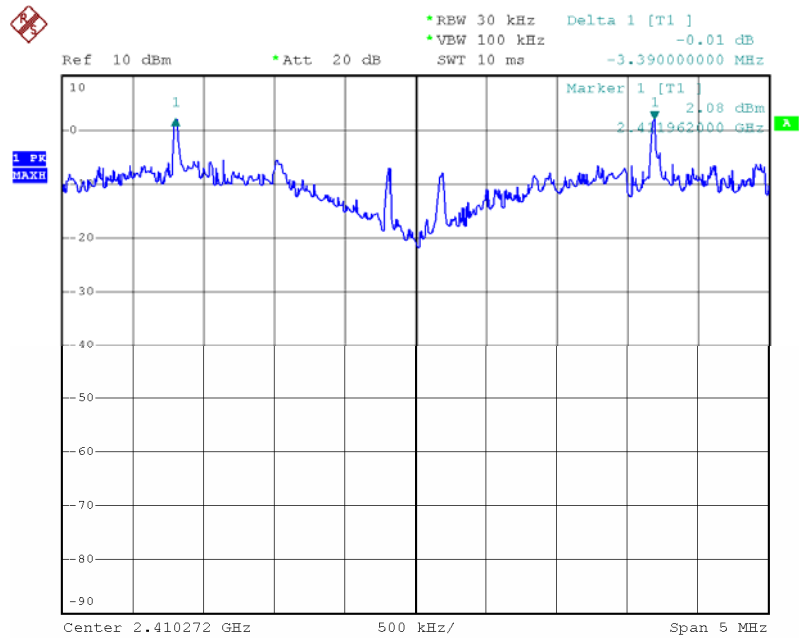
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 30kHz. VBW = 100kHz , Span = 5MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section
Submit this plot.

11.2 Test Result:

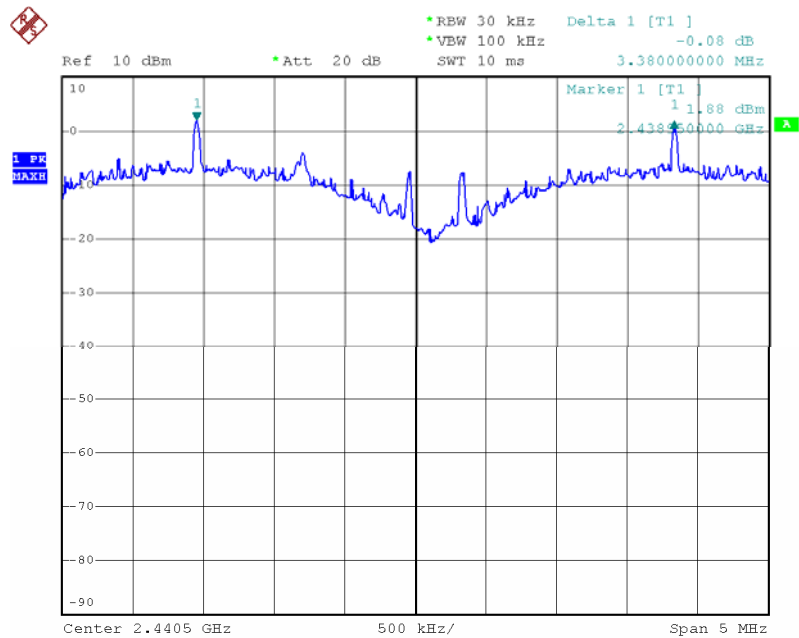
Test Channel	Separation (MHz)	Result
Low	3.39	PASS
Middle	3.38	PASS
High	3.38	PASS

Test result plot as follows:

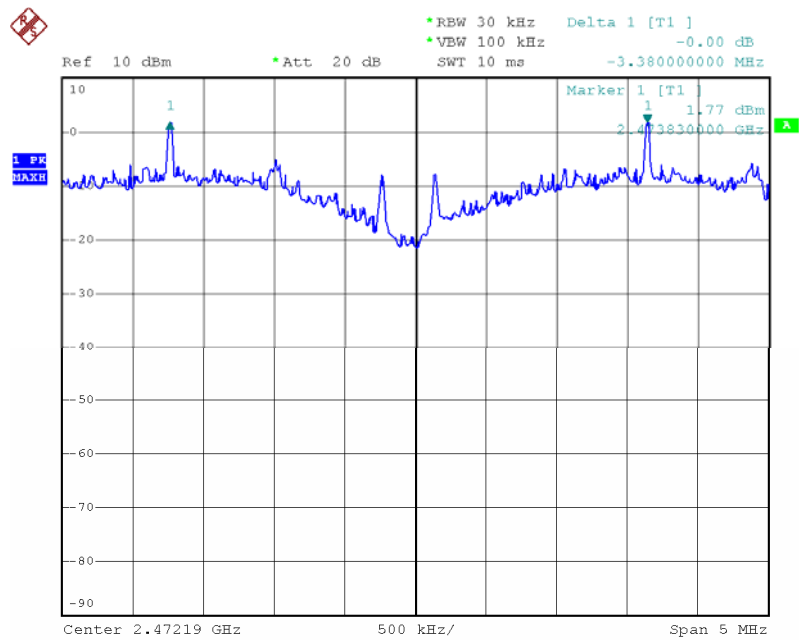
Low Channel



Middle Channel



High Channel



12 Hopping Channel number

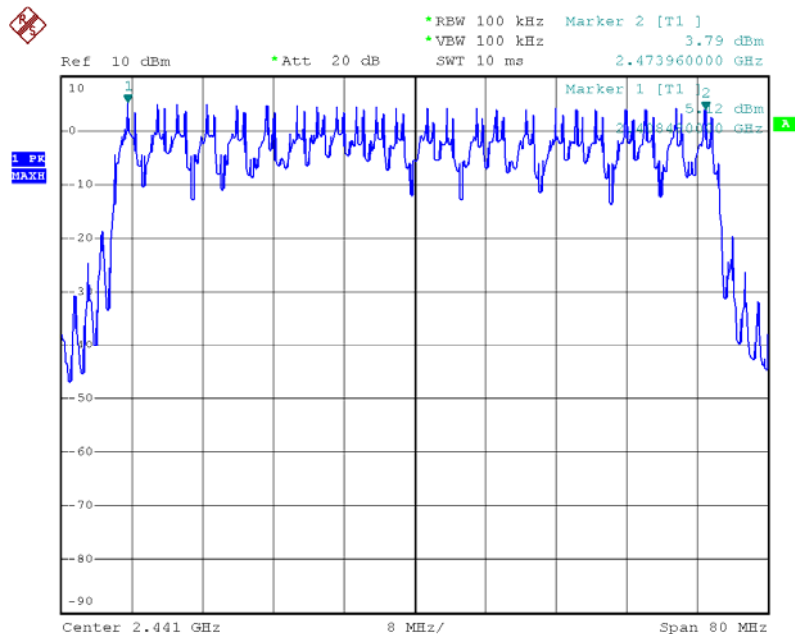
Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	DA 00-705
Test Limit:	Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
Test Mode:	Test in hopping transmitting operating mode.

12.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100 kHz. VBW = 100 kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.
4. Set the spectrum analyzer: Center Frequency = 2441MHz, Span = 80MHz. Submit the test result graph.

12.2 Test Result

Total Channels are 24 Channels.



13 Dwell Time

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	DA 00-705
Test Limit:	Regulation 15.247(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Mode:	Test in hopping transmitting operating mode.

13.1 Test Procedure:

- 1.Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
- 2.Set spectrum analyzer span = 0. centered on a hopping channel;
- 3.Set RBW = 1MHz and VBW = 1MHz.Sweep = as necessary to capture the entire dwell time per hopping channel.
- 4.Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

13.2 Test Result

Test channel	Dwell time(second)
Lower channel	0.018s
Middle channel	0.019s
Upper channel	0.019s

Remark: $\text{Dwell time}(T) = \text{Ton-time} * \text{Ntimes} / \text{Sweep time(s)} * 0.4 * \text{Total Channels} \leq 0.4\text{s}.$

Ton-time:refer to follow photos

Ntimes:10

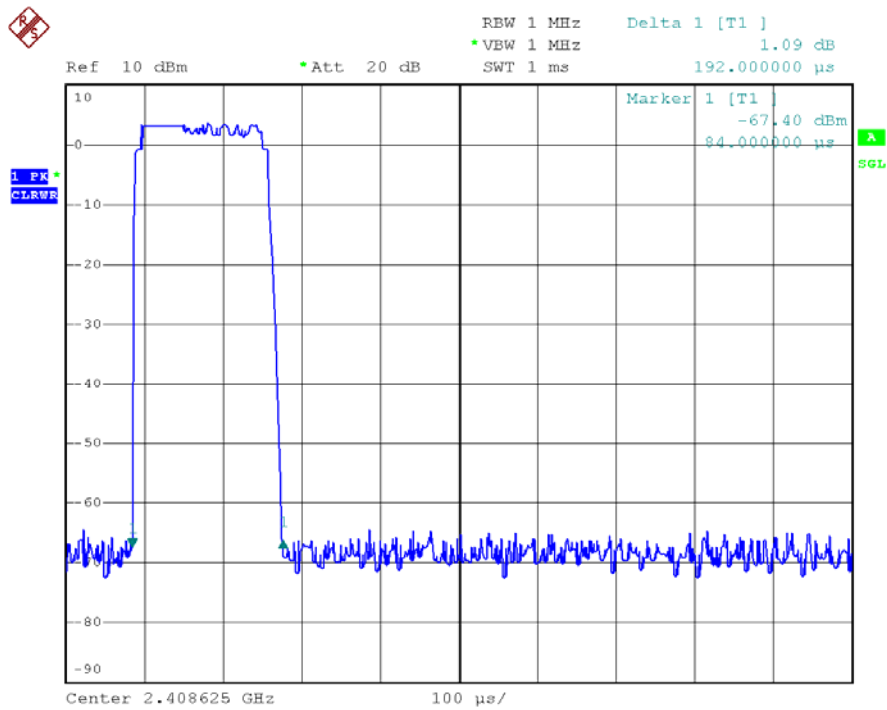
Sweep time:5s

Total channels:refer to section 12

Please refer to the below photos for more details.

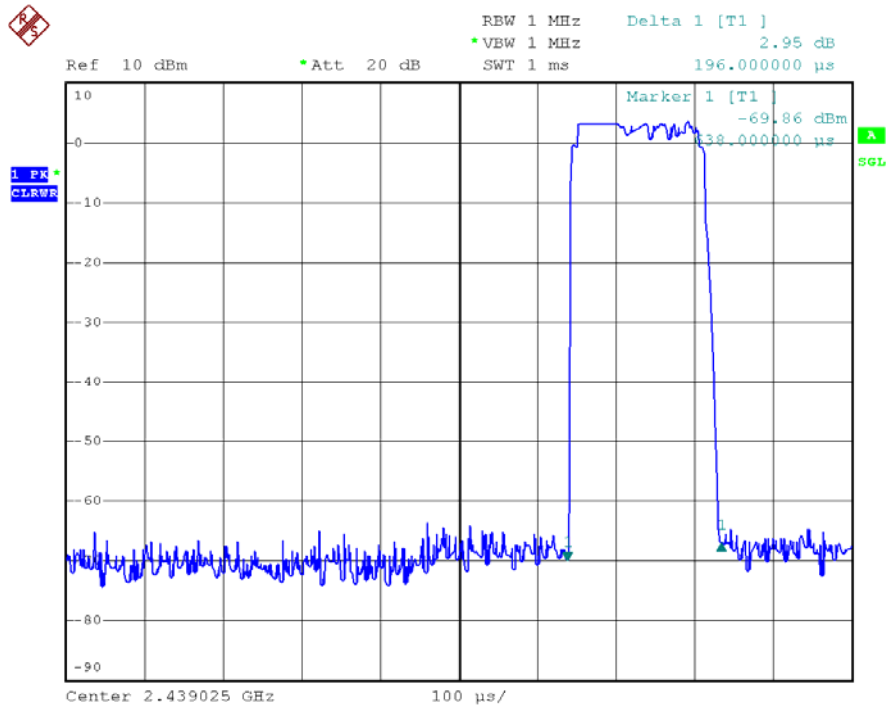
Low Channel

Ton-time=0.018s

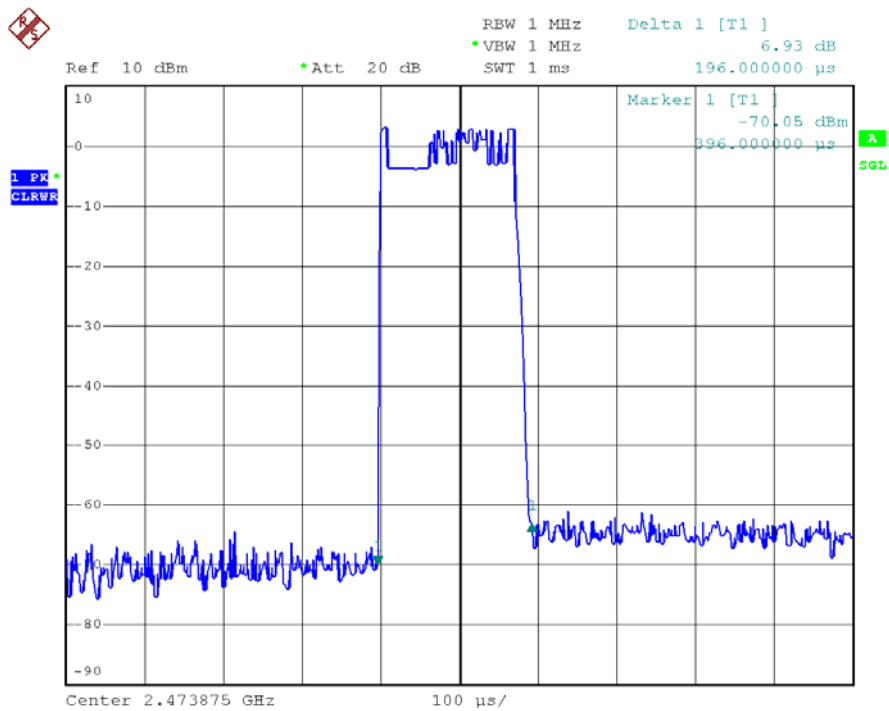


Middle Channel

Ton-time=0.019s



High Channel
Ton-time=0.019s



14 Antenna Requirement

According to the FCC Part 15 Paragraph 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. This product has a integrated permanent antenna , fulfill the requirement of this section.

15 RF Exposure

Test Requirement: FCC Part 1.1307

Test Mode: The EUT work in test mode(Tx).

15.1 Requirments:

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

15.2 The procedures / limit

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

15.3 MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Peak RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

dBm=10lgmW

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained

Peak Output Power (mW)	Antenna Gain (numeric)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)
8.55	1.995	0.00339	1

16 Photographs – Test Setup

16.1 Photograph –Conducted Emission Test Setup



16.2 Photograph –Radiated Emissions Test Setup

Below 30MHz

Battery powered: Stand-alone working mode



30MHz ~ 1GHz

Battery powered: Stand-alone working mode



Battery powered: AV out mode



Adapter powered: Stand-alone working mode



Above 1GHz

Battery powered: Stand-alone working mode



17 Photographs - Constructional Details

17.1 EUT –Appearance View









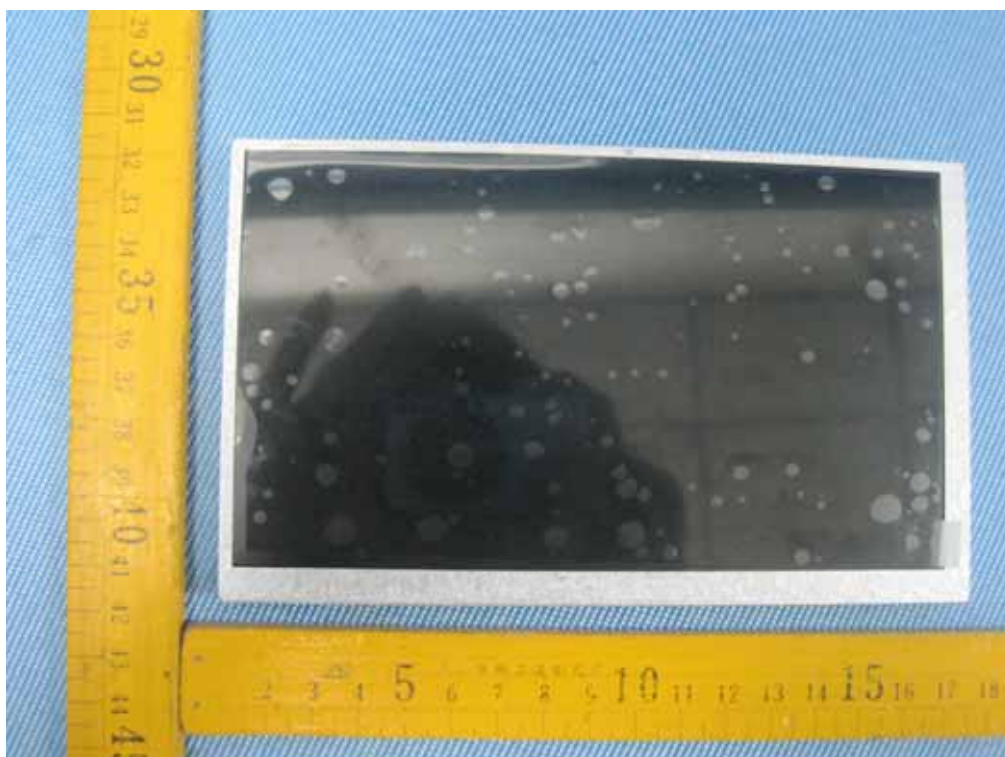


17.2 EUT – Open View

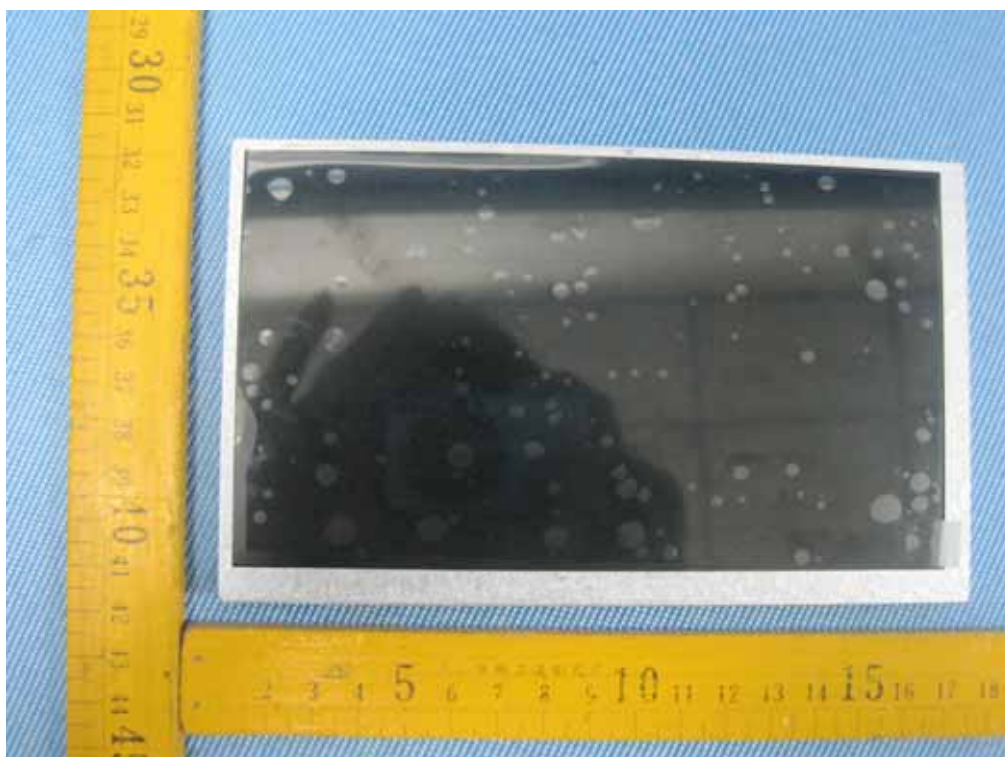
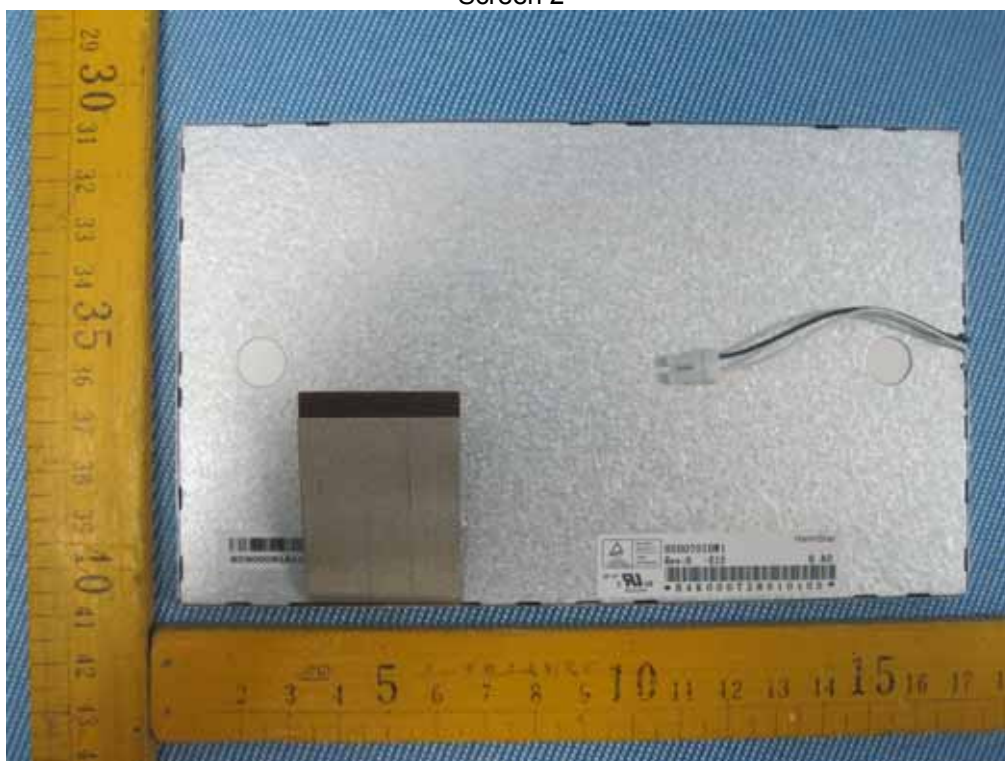




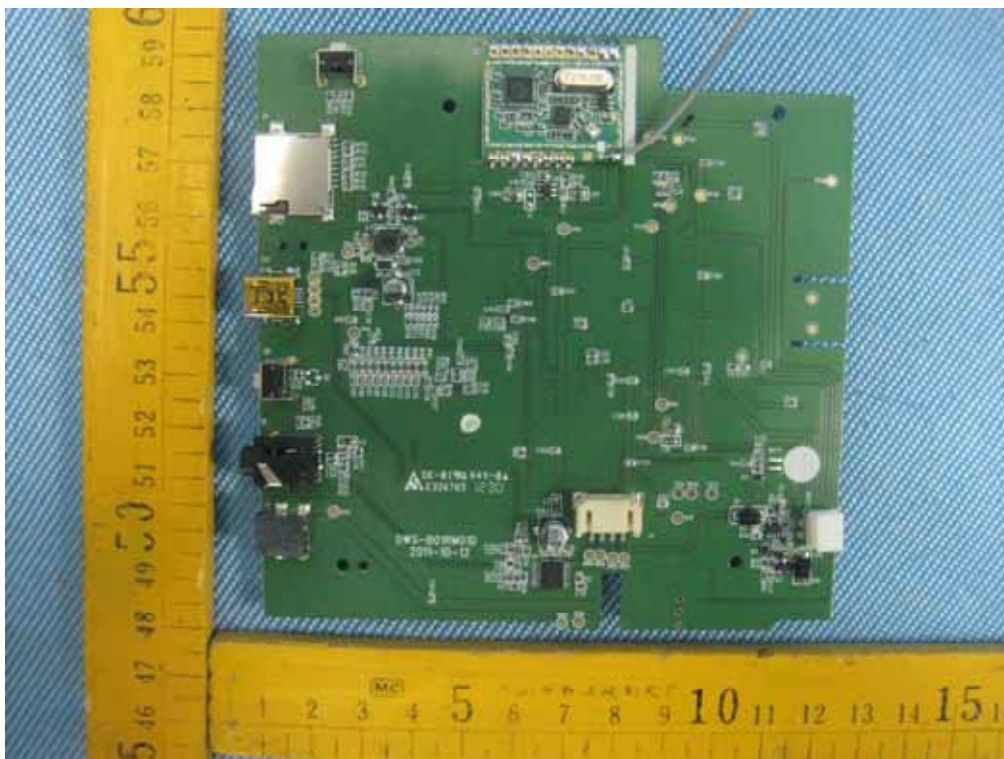
Screen 1

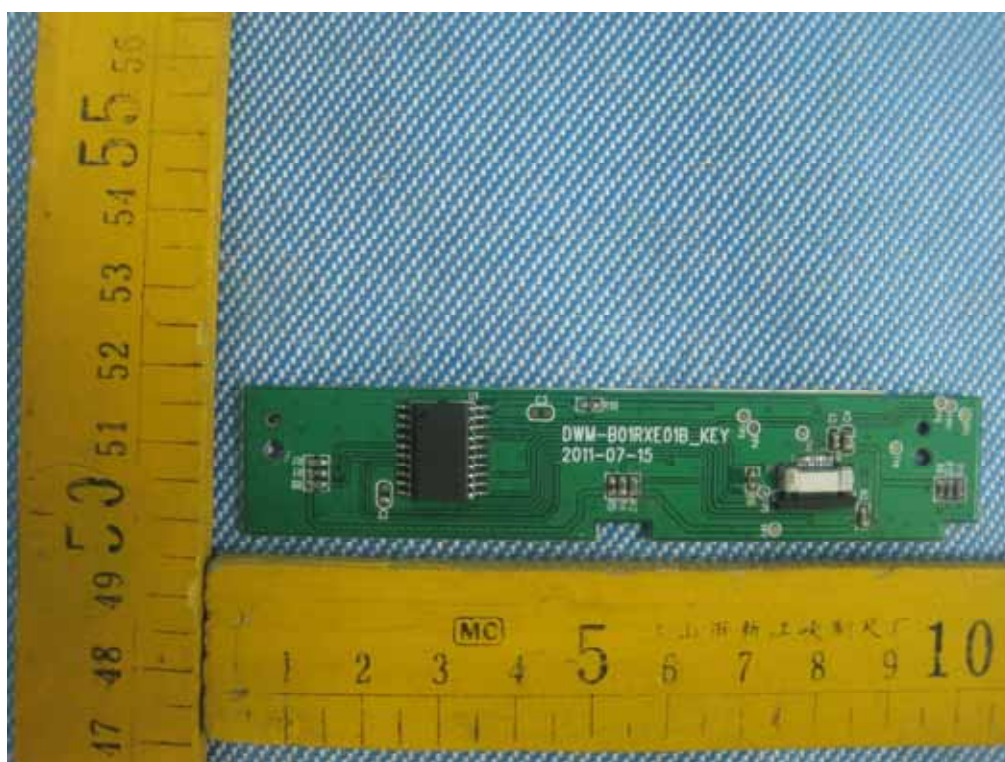
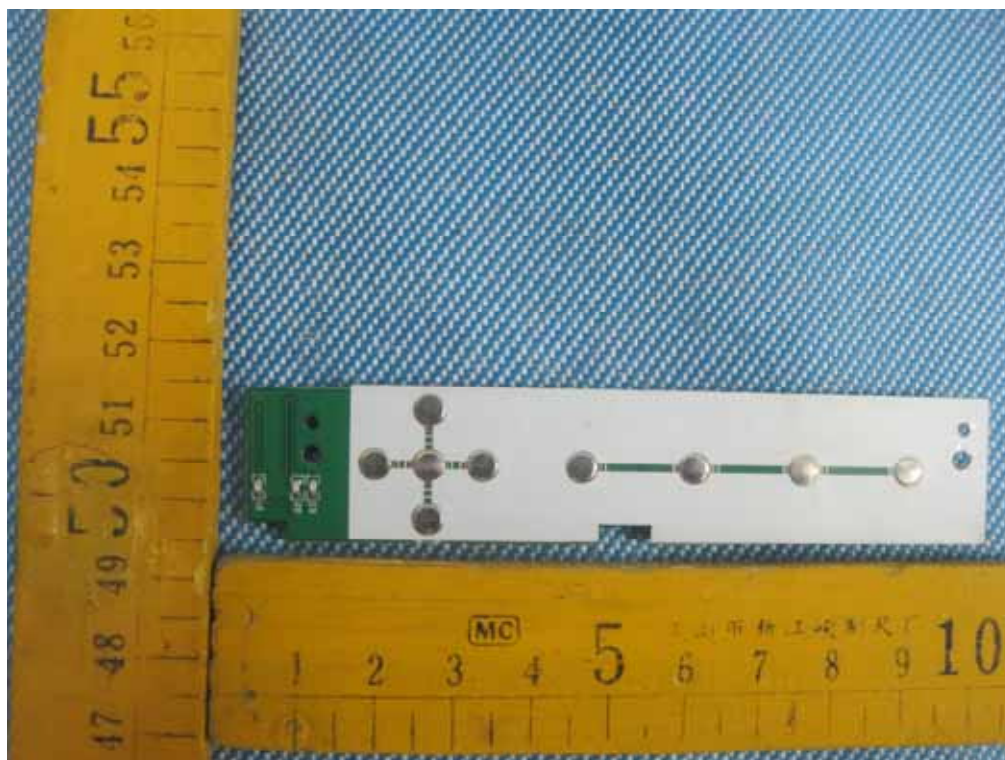


Screen 2

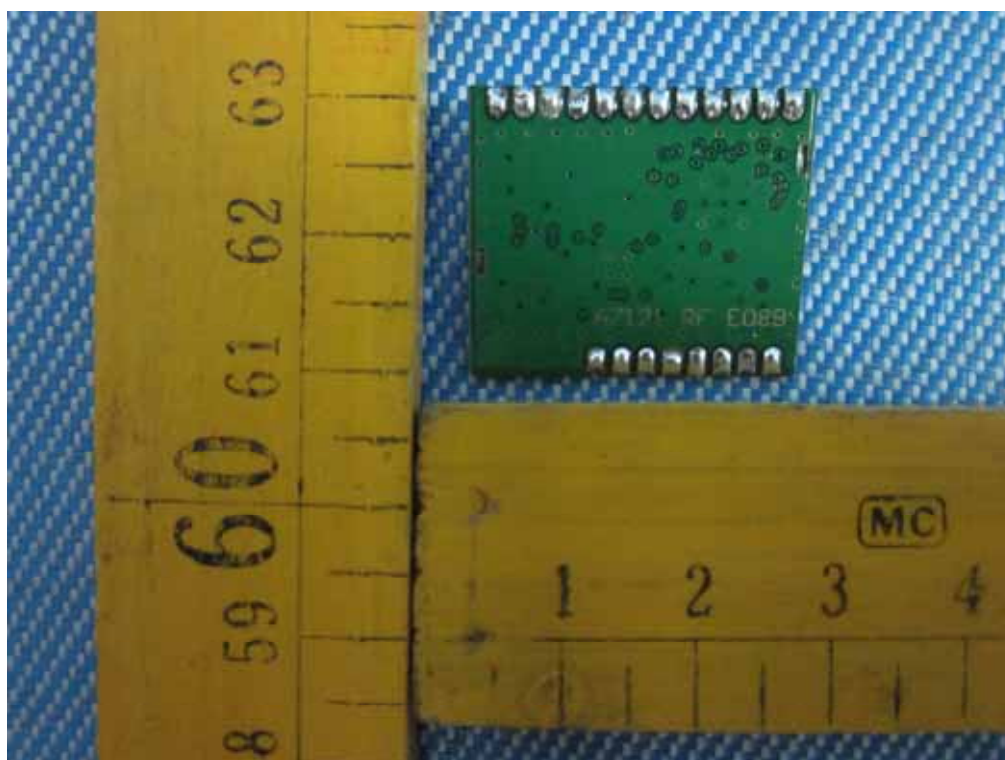
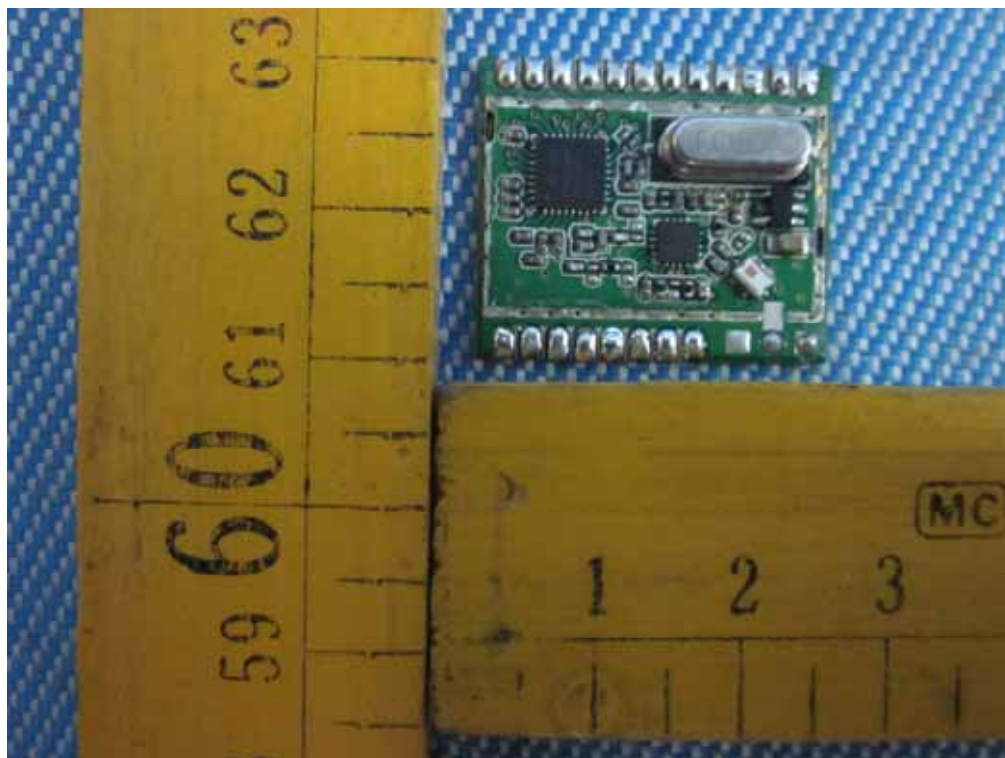


17.3 EUT – PCB View





17.4 RF –Module View



17.5 Adapter 1–Appearance View



17.6 Adapter 2–Appearance View



17.7 Adapter 3–Appearance View



18 FCC Label

FCC ID: LE2UDS6

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

The Label must not be a stick-on paper. The Label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

=End of report=