

FCC Radio Test Report

FCC ID: 2AAPF-MKA7

Report No. : TB-FCC143918

Applicant : Hongkong Meike Digital Technology Co., LTD.

Equipment Under Test (EUT)

EUT Name : Battery grip

Model No. : MK-A7

Series Model No. : Please see page 3.

Brand Name : Meike

Receipt Date : 2015-04-15

Test Date : 2015-05-11 to 2015-05-15

Issue Date : 2015-05-22

Standards : FCC Part 15, Subpart C (15.249: 2014)

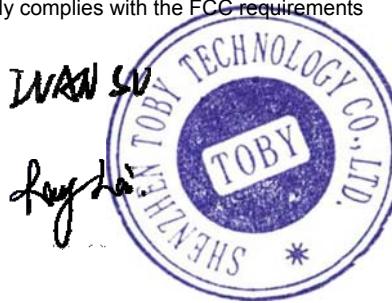
Test Method : ANSI C63.10: 2013

Conclusions : **PASS**

In the configuration tested, the EUT complied with the standards specified above,

The EUT technically complies with the FCC requirements

Test/Witness Engineer



Approved& Authorized

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

TB-RF-074-1.0

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1. General Information about EUT

1.1 Client Information

Applicant	:	Hongkong Meike Digital Technology Co., LTD.
Address	:	Room 902.9/F., Fu Fai Commercial Centre, 27 Hillier Street , Sheung Wan, Hongkong
Manufacturer	:	Sky wise Medical Instrument(Shenzhen) CO., LTD.
Address	:	No.12, Pingxi South Road, Pingdi Town, Longgang District, Shenzhen 518117, China

1.2 General Description of EUT (Equipment Under Test)

EUT Name	:	Battery grip	
Models No.	:	MK-A7, MK-AR7, MK-7D II , MK-7DII PRO, MK-XT1, MK-XT1 PRO, MK-A7II, MK-A7II PRO, MK-D650, MK-860D, MK-800D, MK-D5600, MK-D7500, MK-850D, MK-7DR II , MK-1100D Pro, MK-DR7100, MK-760 D, MK-760D Pro, MK-5D III WIFI, MK-DR750, MK-D5500 Pro, MK-DR7000, MK-5D III Pro	
Model Difference	:	The different models are identical in schematic, structure and critical component, the only different is the appearance.	
Product Description	Operation Frequency:	2445 MHz	
	Number of Channels:	1 channels	
	Out Power:	90.64 dBuV/m@3m Peak 89.97 dBuV/m@3m Avg	
	Antenna Gain:	2 dBi	
	Modulation Type:	FSK	
Power Supply	:	DC Voltage supplied by Li-ion battery.	
Power Rating	:	DC 7.2V (Li-ion battery).	
Connecting I/O Port(S)	:	Please refer to the User's Manual	

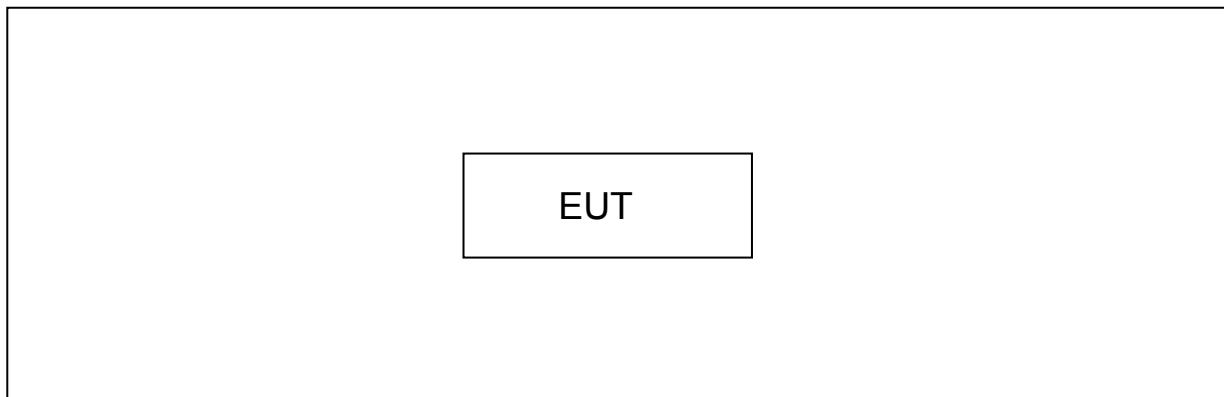
Note:

- (1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
- (2) Channel List:

Channel List
CH 01
2445 MHz

1.3 Block Diagram Showing the Configuration of System Tested

Mode 1: TX Mode



1.4 Description of Support Units

The EUT has been tested as an independent unit.

Name	Model	S/N	Manufacturer	Used “√”
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1.5 Description of Test Mode

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 follow was evaluated respectively.

For Conducted Test	
Final Test Mode	Description
N/A	N/A

For Radiated Test	
Final Test Mode	Description
Mode 1	TX Mode

Note:

For all test, we have verified the construction and function in typical operation. And all the test modes were carried out with the EUT in transmitting operation in maximum power with all kinds of data rate.

(1)According to ANSI C63.10 standards, the measurements are performed at the highest,

middle, lowest available channels.

(2) During the testing procedure, the continuously transmitting with the maximum power mode was programmed by the customer.

(3) The EUT is considered a portable unit; it was pre-tested on the positioned of each 3 axis, X-plane, Y-plane and Z-plane. The worst case was found positioned on X-plane. Therefore only the test data of this Z-plane was used for radiated emission measurement test.

1.6 Description of Test Software Setting

During testing channel & Power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of RF mode.

Product SW/HW Version :	N/A
Radio SW/HW Version:	N/A
Test Software Version	N/A
Frequency	2445 MHz
FSK	DEF

1.7 Measurement Uncertainty

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

Test Item	Parameters	Expanded Uncertainty (U_{Lab})
Conducted Emission	Level Accuracy: 9kHz~150kHz 150kHz to 30MHz	± 3.42 dB ± 3.42 dB
Radiated Emission	Level Accuracy: 9kHz to 30 MHz	± 4.60 dB
Radiated Emission	Level Accuracy: 30MHz to 1000 MHz	± 4.40 dB
Radiated Emission	Level Accuracy: Above 1000MHz	± 4.20 dB

1.8 Test Facility

The testing was performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at:

1A/F., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, Guangdong, China.

At the time of testing, the following bodies accredited the Laboratory:

CNAS (L5813)

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

FCC List No.: (811562)

The Laboratory is listed in the United States of American Federal Communications Commission (FCC), and the registration number is 811562.

IC Registration No.: (11950A-1)

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A-1.

2. Test Summary

FCC Part 15 Subpart C(15.249)			
Standard Section	Test Item	Judgment	Remark
15.203	Antenna Requirement	PASS	N/A
15.205	Restricted Bands	PASS	N/A
15.207	AC Power Conducted Emission	N/A	N/A
15.249 &15.209	Radiated Spurious Emission	PASS	N/A
15.215(C)	20dB Bandwidth	PASS	N/A

Note: N/A is an abbreviation for Not Applicable.

3. Conducted Emission Test

3.1 Test Standard and Limit

3.1.1 Test Standard
FCC Part 15.207

3.1.2 Test Limit

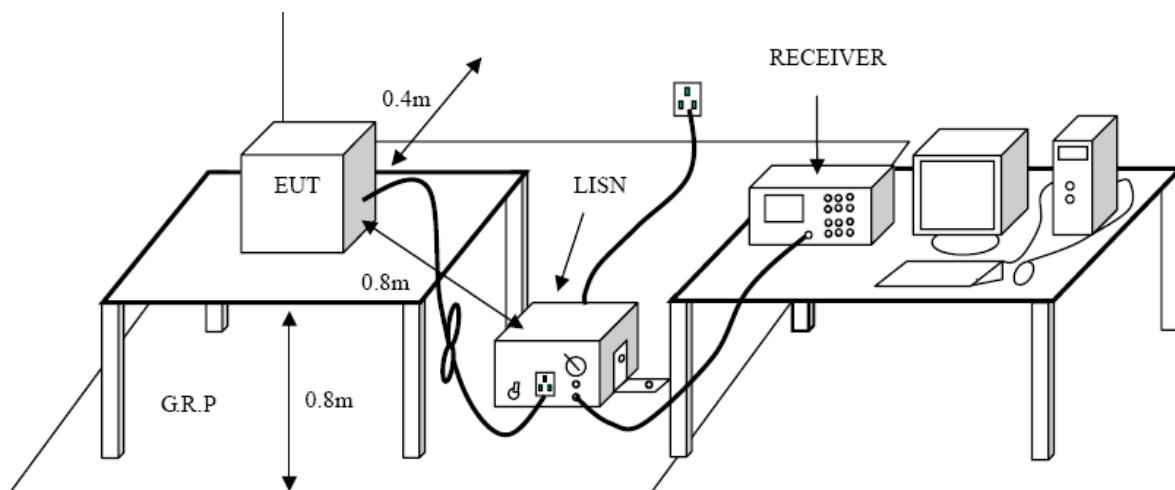
Conducted Emission Test Limit

Frequency	Maximum RF Line Voltage (dB μ V)	
	Quasi-peak Level	Average Level
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
500kHz~5MHz	56	46
5MHz~30MHz	60	50

Notes:

- (1) *Decreasing linearly with logarithm of the frequency.
- (2) The lower limit shall apply at the transition frequencies.
- (3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

3.2 Test Setup



3.3 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 is at least 80 cm from nearest part of EUT chassis.

The bandwidth of EMI test receiver is set at 9kHz, and the test frequency band is from 0.15MHz to 30MHz.

3.4 Test Equipment Used

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
EMI Test Receiver	ROHDE& SCHWARZ	ESCI	100321	Aug. 08, 2014	Aug. 07, 2015
50ΩCoaxial Switch	Anritsu	MP59B	X10321	Aug. 08, 2014	Aug. 07, 2015
L.I.S.N	Rohde & Schwarz	ENV216	101131	Aug. 08, 2014	Aug. 07, 2015
L.I.S.N	SCHWARZBECK	NNBL 8226-2	8226-2/164	Aug. 08, 2014	Aug. 07, 2015

3.5 EUT Operating Mode

Please refer to the description of test mode.

3.6 Test Data

The EUT is powered by battery, so no requirement for this test item.

4. Radiated Emission Test

4.1 Test Standard and Limit

4.1.1 Test Standard
FCC Part 15.209

4.1.2 Test Limit

Radiated Emission Limit (9kHz~1000MHz)

Frequency (MHz)	Field Strength (microvolt/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

Radiated Emission Limit (Above 1000MHz)

Frequency (MHz)	Class B (dB _B V/m)(at 3 M)	
	Peak	Average
Above 1000	74	54

Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission Level(dB_BV/m)=20log Emission Level(UV/m)

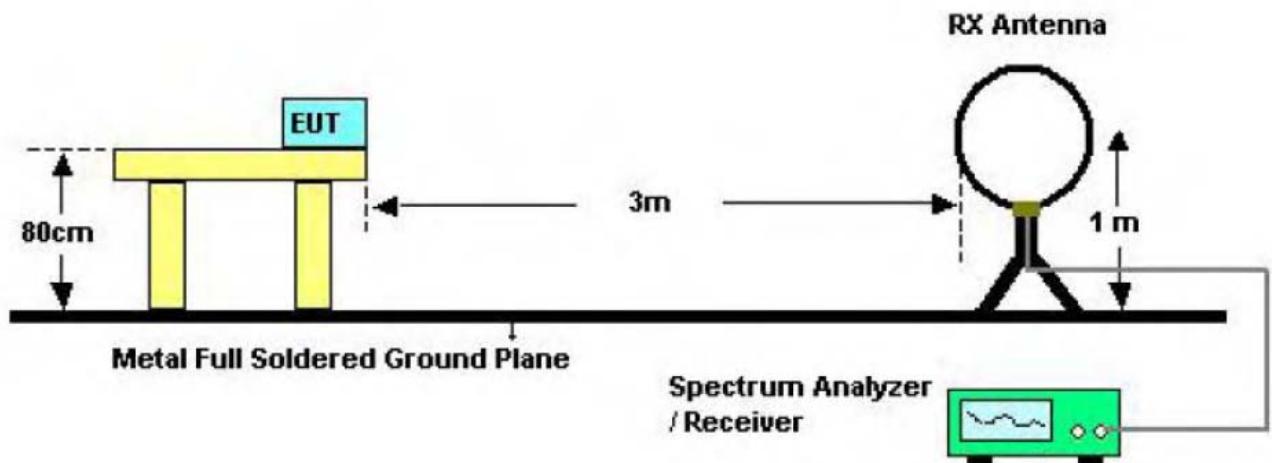
Limits of radiated emission measurement (15.249)

FCC Part 15 (15.249), Subpart C	
Limit	Frequency Range (MHz)
Field strength of fundamental 50000 μ V/m (94 dB μ V/m) @ 3 m	2400~2483.5
Field strength of fundamental 500 μ V/m (94 dB μ V/m) @ 3 m	Above 2483.5

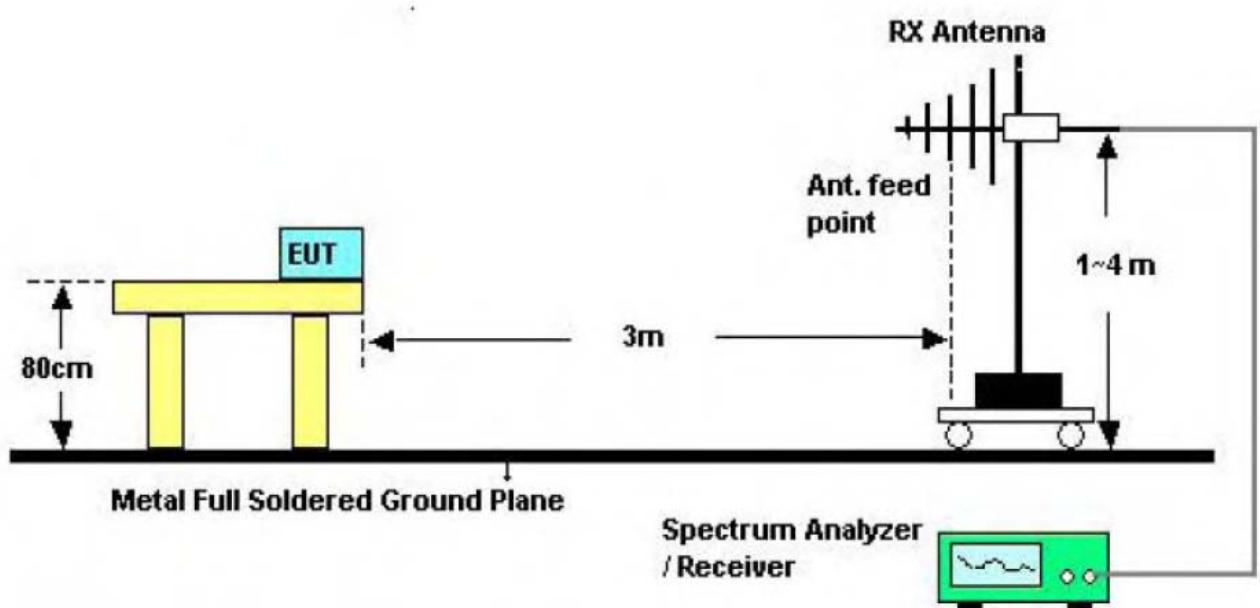
Restricted bands requirement for equipment operating in 2400MHz to 2483.5 MHz (15.249)

Restricted Frequency Band (MHz)	(dB _{UV} /m)(at 3 M)
2310~2390	Attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in 15.209, whichever is the lesser attenuation
2483.5~2500	

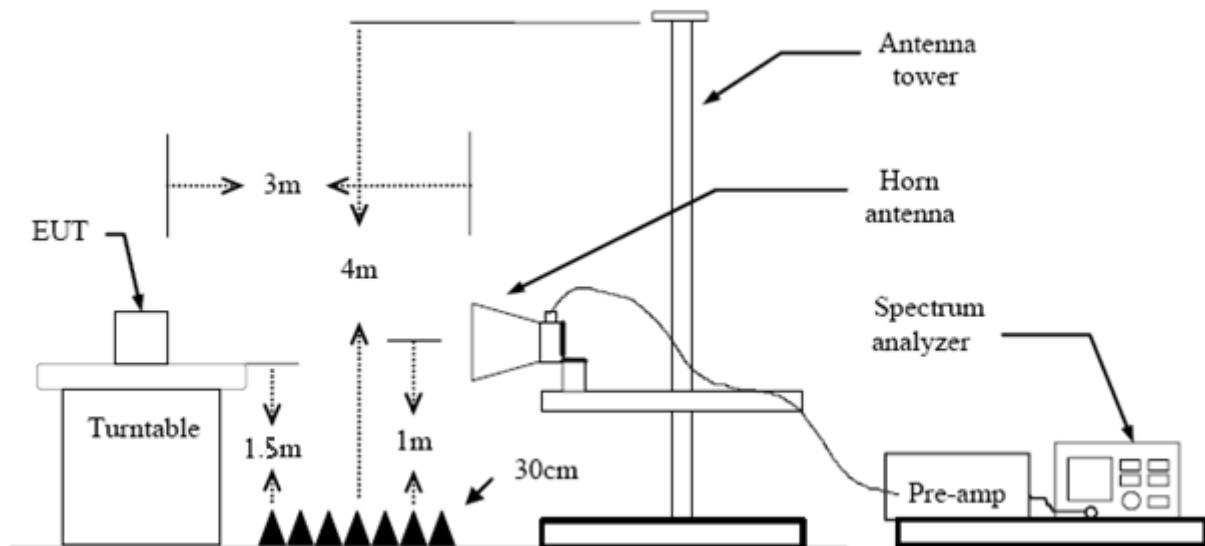
4.2 Test Setup



Bellow 30MHz Test Setup



Bellow 1000MHz Test Setup



Above 1GHz Test Setup

4.3 Test Procedure

- (1) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.
- (2) Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.
- (3) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- (4) 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.
- (5) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- (6) Testing frequency range below 1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection.
- (7) Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.
- (8) For the actual test configuration, please see the test setup photo.

4.4 EUT Operating Condition

The EUT was set to Continual Transmitting in maximum power, and new batteries are used during testing.

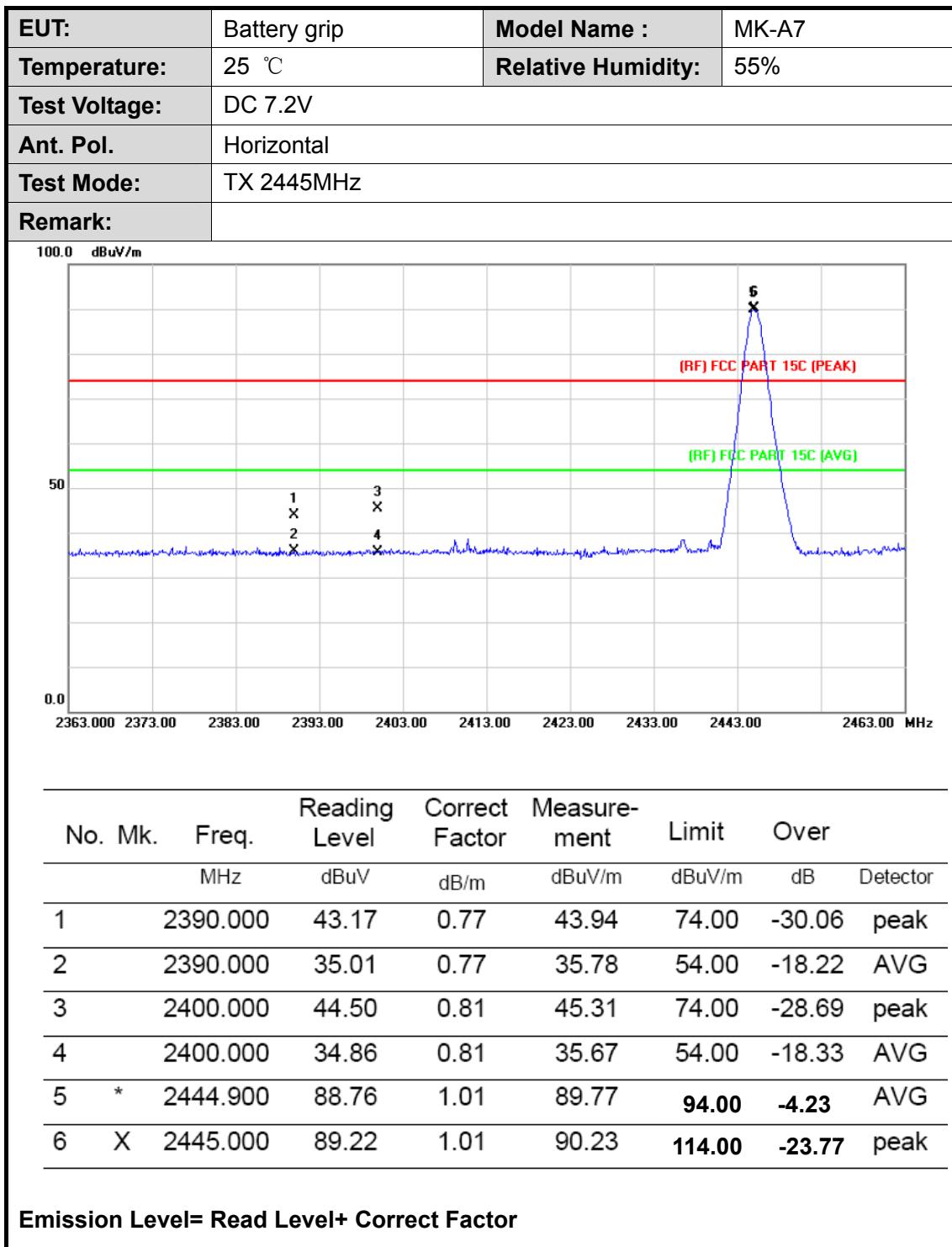
4.5 Test Equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Aug. 08, 2014	Aug.07, 2015
Spectrum Analyzer	Rohde & Schwarz	FSP30	DE25181	Aug. 08, 2014	Aug.07, 2015
EMI Test Receiver	Rohde & Schwarz	ESCI	101165	Aug. 08, 2014	Aug.07, 2015
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Mar. 06, 2015	Mar.05, 2016
Horn Antenna	ETS-LINDGREN	3117	00143207	Mar. 06, 2015	Mar.05, 2016
Pre-amplifier	HP	11909A	185903	Mar. 06, 2015	Mar.05, 2016
Pre-amplifier	HP	8447B	3008A00849	Mar. 06, 2015	Mar.05, 2016
Cable	HUBER+SUHNER	100	SUCOFLEX	Mar. 06, 2015	Mar.05, 2016
Signal Generator	Rohde & Schwarz	SML03	IKW682-054	Feb. 10, 2015	Feb.09, 2016
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A

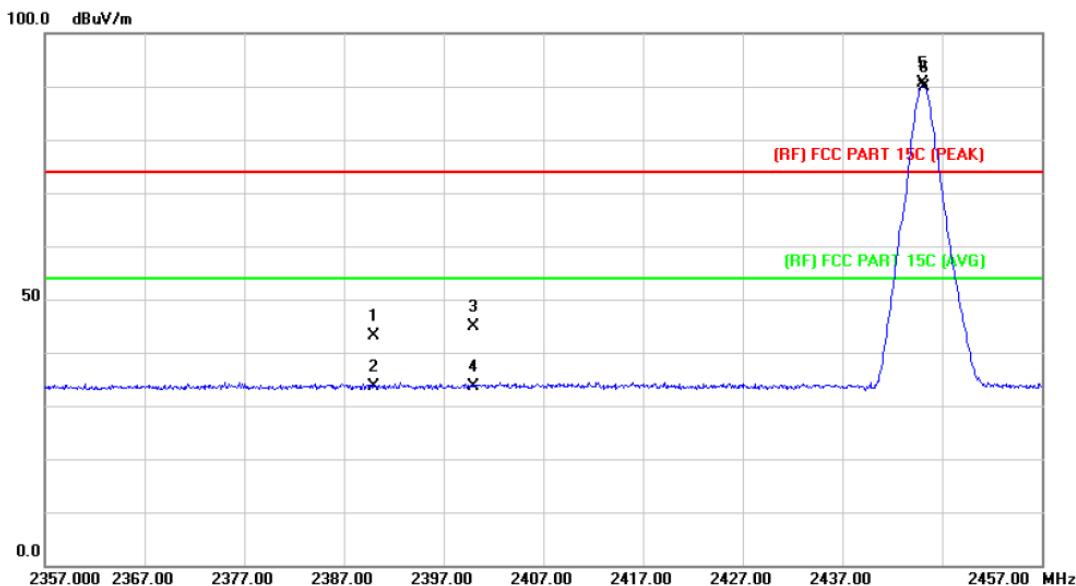
4.6 Test Data

Please see the next page.

4.6.1 Field Strength of the Fundamental



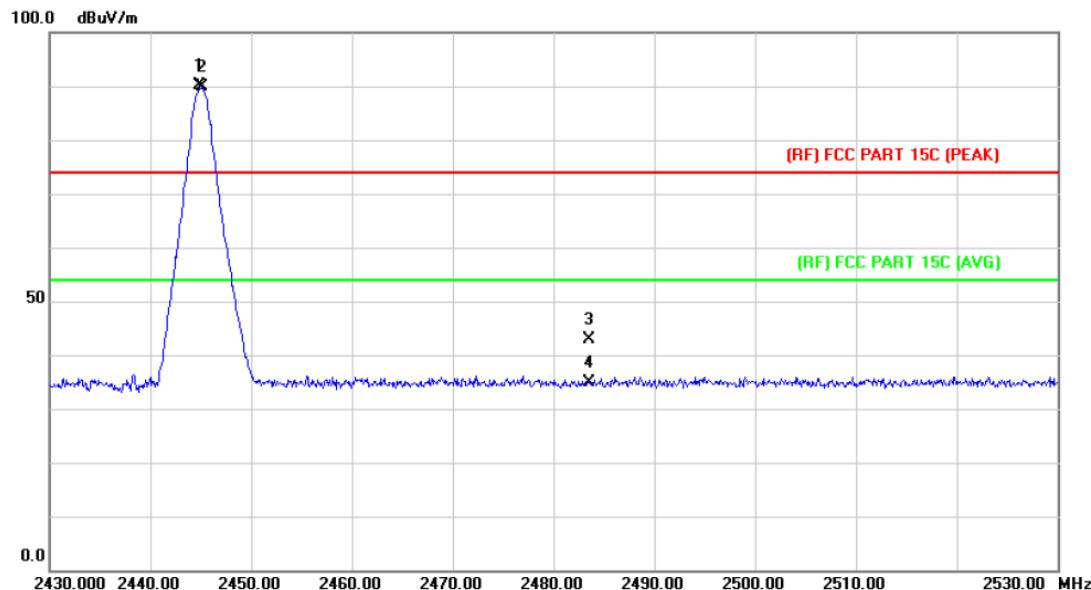
EUT:	Battery grip	Model Name :	MK-A7
Temperature:	25 °C	Relative Humidity:	55%
Test Voltage:	DC 7.2V		
Ant. Pol.	Vertical		
Test Mode:	TX 2445MHz		
Remark:			



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over
		MHz	dBuV	dB/m	dBuV/m	dB	Detector
1		2390.000	42.38	0.77	43.15	74.00	-30.85 peak
2		2390.000	32.86	0.77	33.63	54.00	-20.37 AVG
3		2400.000	44.18	0.81	44.99	74.00	-29.01 peak
4		2400.000	32.77	0.81	33.58	54.00	-20.42 AVG
5	X	2445.100	89.63	1.01	90.64	94.00	-3.36 peak
6	*	2445.200	88.96	1.01	89.97	114.00	-24.03 AVG

Emission Level= Read Level+ Correct Factor

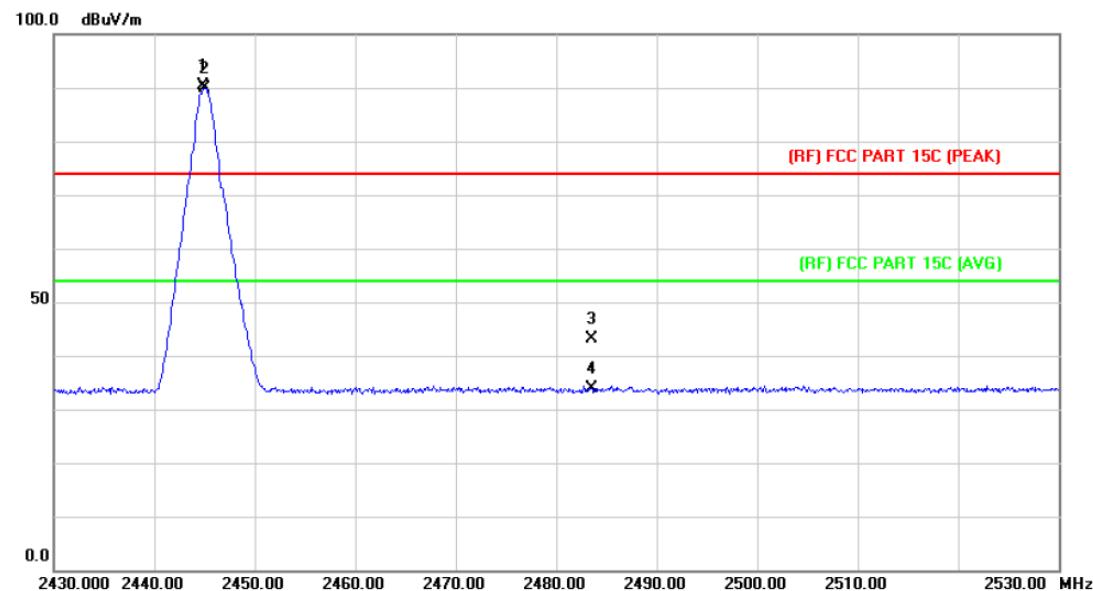
EUT:	Battery grip	Model Name :	MK-A7
Temperature:	25 °C	Relative Humidity:	55%
Test Voltage:	DC 7.2V		
Ant. Pol.	Horizontal		
Test Mode:	TX 2445MHz		
Remark:			



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over
		MHz	dBuV	dB/m	dBuV/m	dB	Detector
1	X	2444.800	89.06	1.01	90.07	114.00	-23.93 peak
2	*	2445.100	88.77	1.01	89.78	94.00	-4.22 AVG
3		2483.500	41.83	1.17	43.00	74.00	-31.00 peak
4		2483.500	33.59	1.17	34.76	54.00	-19.24 AVG

Emission Level= Read Level+ Correct Factor

EUT:	Battery grip	Model Name :	MK-A7
Temperature:	25 °C	Relative Humidity:	55%
Test Voltage:	DC 7.2V		
Ant. Pol.	Vertical		
Test Mode:	TX 2445MHz		
Remark:			



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB
1	X	2444.900	89.34	1.01	90.35	114.00	-23.65 peak
2	*	2445.000	88.93	1.01	89.94	94.00	-4.06 AVG
3		2483.500	41.88	1.17	43.05	74.00	-30.95 peak
4		2483.500	32.63	1.17	33.80	54.00	-20.20 AVG

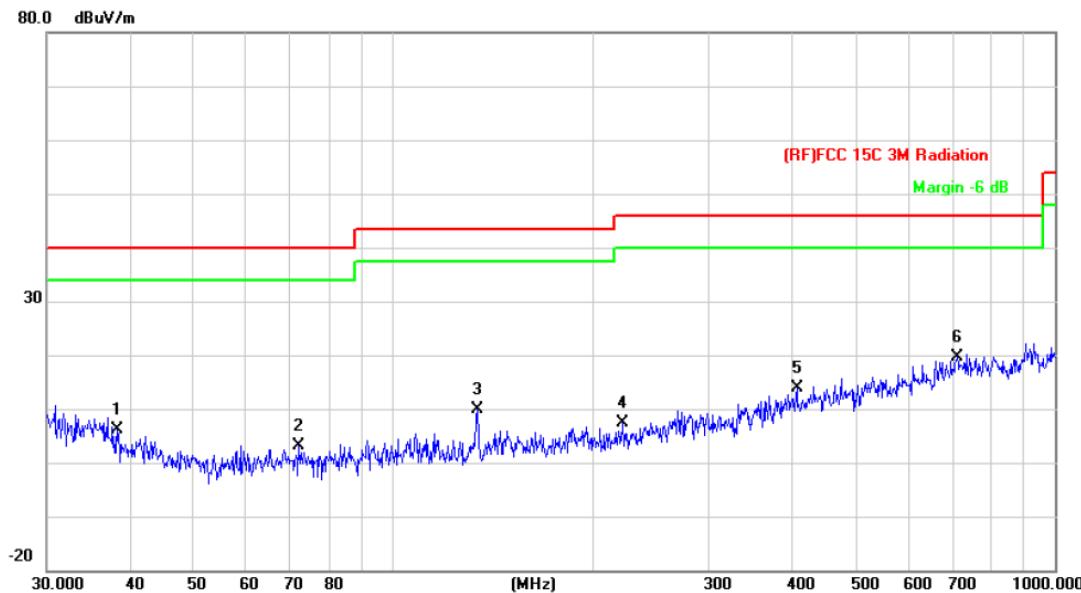
Emission Level= Read Level+ Correct Factor

4.6.2 Radiated Spurious Emission (Below 1 GHz)

EUT:	Battery grip	Model Name :	MK-A7				
Temperature:	25 °C	Relative Humidity:	55%				
Test Voltage:	DC 7.2V						
Ant. Pol.	Horizontal						
Test Mode:	TX 2445MHz						
Remark:	Only worse case is reported						
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over
		MHz	dBuV	dB/m	dBuV/m	dB	Detector
1		43.6584	27.35	-21.70	5.65	40.00	-34.35 peak
2		117.3603	28.97	-22.34	6.63	43.50	-36.87 peak
3		191.7450	27.14	-20.81	6.33	43.50	-37.17 peak
4		278.0668	27.39	-17.51	9.88	46.00	-36.12 peak
5		556.7744	27.39	-10.12	17.27	46.00	-28.73 peak
6	*	724.2611	27.47	-7.13	20.34	46.00	-25.66 peak

Emission Level= Read Level+ Correct Factor

EUT:	Battery grip	Model Name :	MK-A7
Temperature:	25 °C	Relative Humidity:	55%
Test Voltage:	DC 7.2V		
Ant. Pol.	Vertical		
Test Mode:	TX 2445MHz		
Remark:	Only worse case is reported		

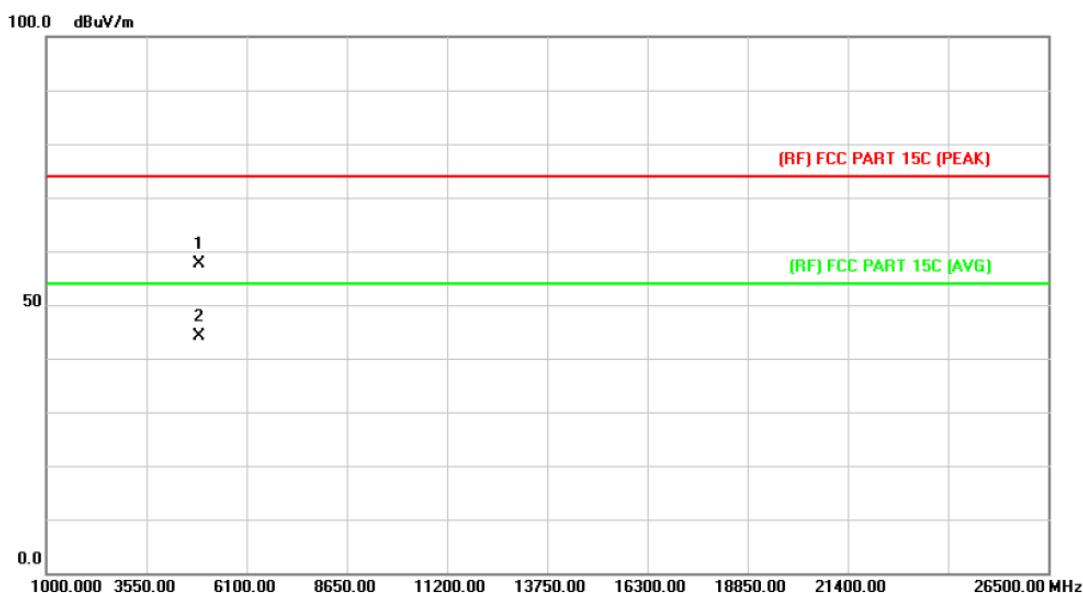


No.	Mk.	Freq. MHz	Reading	Correct	Measure-	Limit	Over
			Level dBuV	Factor dB/m	ment dBuV/m		
1		38.3462	25.24	-19.13	6.11	40.00	-33.89 peak
2		72.0843	26.72	-23.54	3.18	40.00	-36.82 peak
3		134.0882	31.88	-22.09	9.79	43.50	-33.71 peak
4		222.1698	26.89	-19.43	7.46	46.00	-38.54 peak
5		407.5145	26.61	-12.84	13.77	46.00	-32.23 peak
6	*	711.6734	26.53	-6.99	19.54	46.00	-26.46 peak

Emission Level= Read Level+ Correct Factor

4.6.3 Radiated Spurious Emission (Above 1 GHz)

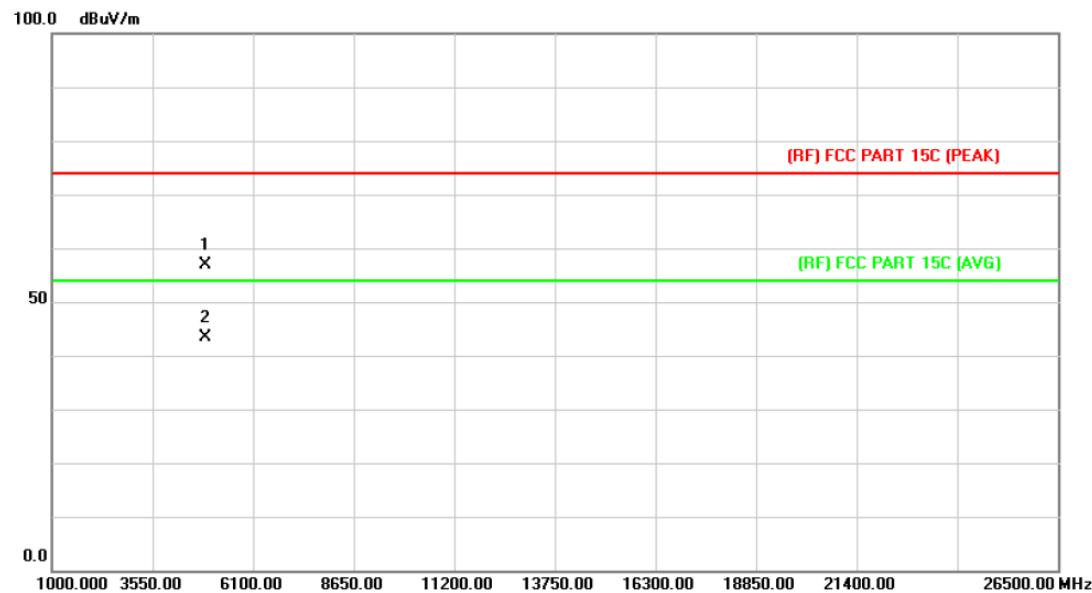
EUT:	Battery grip	Model Name :	MK-A7
Temperature:	25 °C	Relative Humidity:	55%
Test Voltage:	DC 7.2V		
Ant. Pol.	Horizontal		
Test Mode:	TX 2445MHz		
Remark:			



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over
		MHz	dBuV	dB/m	dBuV/m	dB	Detector
1		4890.354	43.80	13.95	57.75	74.00	-16.25 peak
2	*	4890.393	30.08	13.95	44.03	54.00	-9.97 AVG

Emission Level= Read Level+ Correct Factor

EUT:	Battery grip	Model Name :	MK-A7
Temperature:	25 °C	Relative Humidity:	55%
Test Voltage:	DC 7.2V		
Ant. Pol.	Vertical		
Test Mode:	TX 2445MHz		
Remark:			

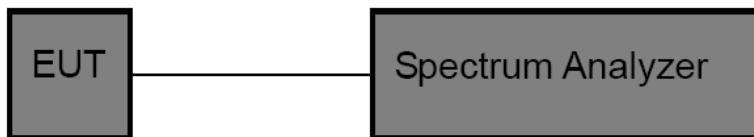


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over
		MHz	dBuV	dB/m	dBuV/m	dB	Detector
1		4889.859	42.86	13.95	56.81	74.00	-17.19 peak
2	*	4889.973	29.51	13.95	43.46	54.00	-10.54 AVG

Emission Level= Read Level+ Correct Factor

5. Bandwidth Test

5.1 Test Setup



5.2 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting:
Bandwidth: RBW=100 kHz, VBW=300kHz.
- (3) The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst -case (i.e the widest) bandwidth.

5.3 EUT Operating Condition

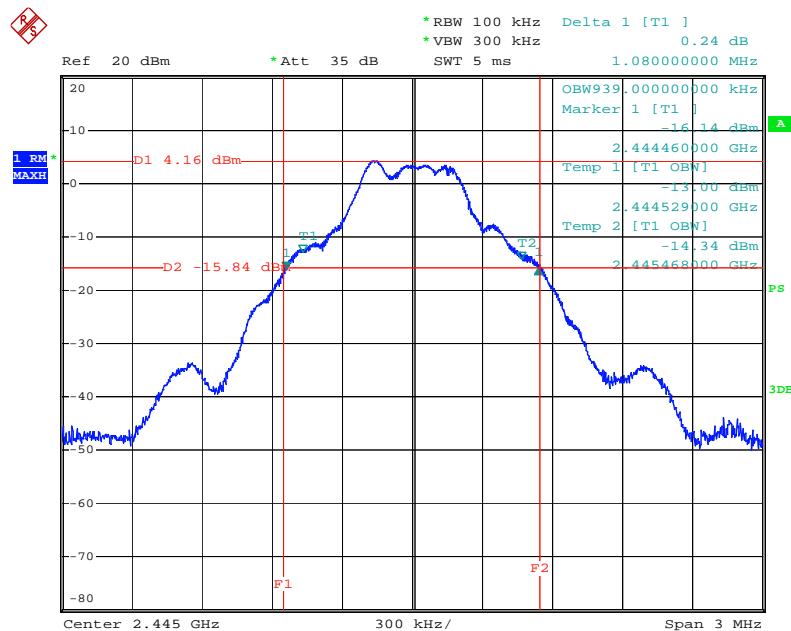
The EUT was set to continuously transmitting for the Bandwidth Test.

5.4 Test Equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Rohde & Schwarz	FSP30	DE25181	Aug. 08, 2014	Aug. 07, 2015
EMI Test Receiver	Rohde & Schwarz	ESCI	101165	Aug. 08, 2014	Aug. 07, 2015

5.5 Test Data

Low Channel Frequency (MHz)	20dB Bandwidth (MHz)
2445	1.080

2445 MHz

Date: 18.MAY.2015 17:26:00

6. Antenna Requirement

6.1 Standard Requirement

6.1.1 Standard

FCC Part 15.203

6.1.2 Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

6.2 Antenna Connected Construction

The directional gains of the antenna used for transmitting is 2 dBi, and the antenna de-signed with permanent attachment and no consideration of replacement. Please see the EUT photo for details.

6.3 Result

The EUT antenna is a Printed Antenna. It complies with the standard requirement.

Antenna Type
<input checked="" type="checkbox"/> Permanent attached antenna
<input type="checkbox"/> Unique connector antenna
<input type="checkbox"/> Professional installation antenna