

TEST REPORT

Reference No. : WTD13S0806598E
FCC ID : NDZACA020ATB000
Applicant : Precision Enterprise Ltd.
Address : Unit 2504 25/F, Nanyang Plaza, No.57 Hung To Road, Kwun Tong, Kowloon, Hong Kong
Manufacturer : DongGuan Protronic Electronics Ltd.
Address : Protronic Building, Xiangxi Village, Shipai Town, Dongguan City, Guangdong Province, P.R. China
Product Name : Wireless Backup Camera System
Model No. : ACA020&ATB000
Standards : FCC CFR47 Part 15 Section 15.249: 2012
Date of Receipt sample : August 20, 2013
Date of Test : August 20~ September 11, 2013
Date of Issue : December 19, 2013
Test Result : **Pass ***

***Remarks:**

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.

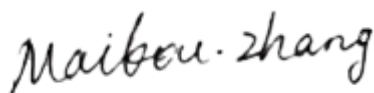
Address: 1/F., Fukangtai Building, West Baima Road, Songgang Street, Baoan District, Shenzhen, Guangdong, China

Testing location: The same as above

Tel :+86-755-83551033

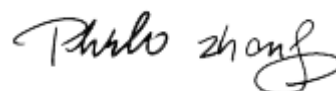
Fax:+86-755-83552400

Compiled by:



Maikou Zhang / Project Engineer

Approved by:



Philo Zhong / Manager

2 Test Summary

Test Items	Test Requirement	Result
Out-of-band Emissions	15.205	PASS
20dB Bandwidth	15:215(c)	N/A
Conducted Emissions	15.207	N/A
Radiated Emission	15.205(a) 15.209 15.249(a)	PASS
Antenna Requirement	15.203	PASS

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4 General Information

4.1 General Description of E.U.T.

Product Name	: Wireless Backup Camera System
Model No.	: ACA020&ATB000
Type of Modulation	: GFSK
Frequency Range	: 2414~2468 MHz, 4 channels in total
Oscillator	: 6MHz
Antenna installation	: Integrated Antenna

4.2 Details of E.U.T.

Technical Data	: Camera:DC 5V by Transmitter model Transmitter:DC 12V
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4.3 Frequency Table

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2414	2	2432	3	2450	4	2468

4.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **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.

- **IC – Registration No.:7760A-1**

Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory 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.

4.5 Test Location

All Emissions tests were performed at:-

1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District, Shenzhen 518105, Guangdong, China.

4.6 General condition

Ambient Condition: 25.5 °C 58 %RH

4.6.1 Environmental condition of test site

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

The follow condition is not applicable

Test Voltage	Input voltage
Rated voltage-15%	#####
normal	#####
Rated voltage+15%	#####

The follow condition is applicable.

Test voltage	Test Voltage
Rated voltage	DC 12V

4.6.2 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Lower channel	Middle channel	Upper channel
Transmitting	2414MHz	2450MHz	2468MHz
Receiving	#####MHz	#####MHz	#####MHz

5 Equipment Used during Test

5.1 Equipments List

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	Sep.21,2012	Sep.20,2013
2.	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Sep.21,2012	Sep.20,2013
3.	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Sep.21,2012	Sep.20,2013
4.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Sep.21,2012	Sep.20,2013
5.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	399	Sep.21,2012	Sep.20,2013
6.	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Sep.21,2012	Sep.20,2013
7.	Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-148	Sep.21,2012	Sep.20,2013
8.	Cable	Top	EWO2014-7	-	Sep.21,2012	Sep.20,2013
9.	Cable	Top	TYPE16(13M)	-	Sep.21,2012	Sep.20,2013
10.	DC POWER SUPPLY	LWDQGS	PS-303D		Sep.21,2012	Sep.20,2013
11.	Humidity Chamber	GTH-225-40-1P	IAA061213		Sep.21,2012	Sep.20,2013
12.	Spectrum Analyzer	ROHDE & SCHWARZ	FSL6	100959	Sep.21,2012	Sep.20,2013

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 Spurious Emissions test	± 4.50 dB (Active Loop Antenna 9kHz~30MHz)
	± 5.03 dB (Bilog antenna 30M~1000MHz)
	± 4.74 dB (Horn antenna 1000M~25000MHz)

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 Emission Test

Test Requirement:	FCC Part15 Paragraph 15.207
Test Method:	ANSI C63.4
Frequency Range:	150kHz to 30MHz
Class:	Class B
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average
Limit	
Test Result:	N/A
Remark:	Due to the EUT powered by DC 12V, the power need not attend connecting to AC mains, this section is not applicable.

7 Radiation Emission Test

Test Requirement: FCC Part15 Paragraph 15.249
 Test Method: ANSI 63.4:2003
 Measurement Distance: 3m
 Detector: Peak for pre-scan (120kHz resolution bandwidth)
 Quasi-Peak if maximised peak within 6dB of limit
 Test Result: PASS

15.249 Limit:

Fundamental frequency	Field strength of fundamental		Field strength of harmonics	
	mV/m	dBuV/m	uV/m	dBuV/m
902-928 MHz	50	94	500	54
2400-2483.5 MHz	50	94	500	54
5725-5875 MHz	50	94	500	54
24.0-24.25 GHz	250	108	2500	68

15.209 Limit:

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

Note: RF Voltage(dBuV)= $20 \log_{10}$ RF Voltage(uV)

7.1 EUT Operation:

Operating Environment:

Temperature: 25.5 °C
 Humidity: 51 % RH
 Atmospheric Pressure: 1012 mbar

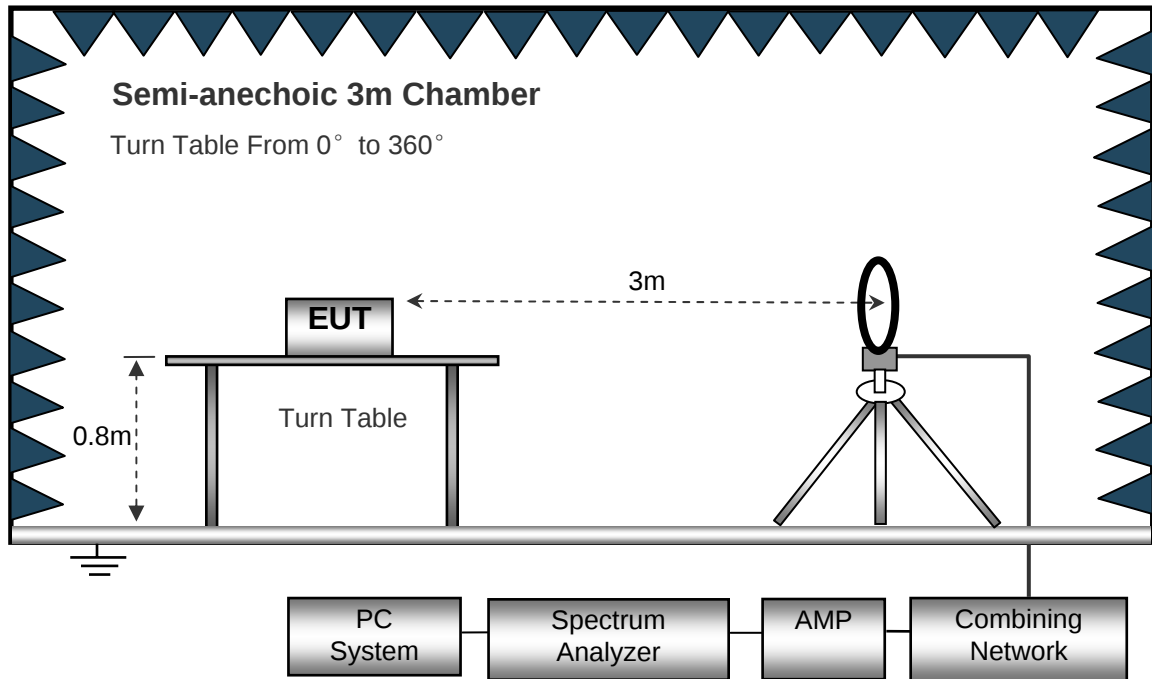
Operation Mode:

The EUT was tested in continuously transmitting mode. The test data were shown as follow.

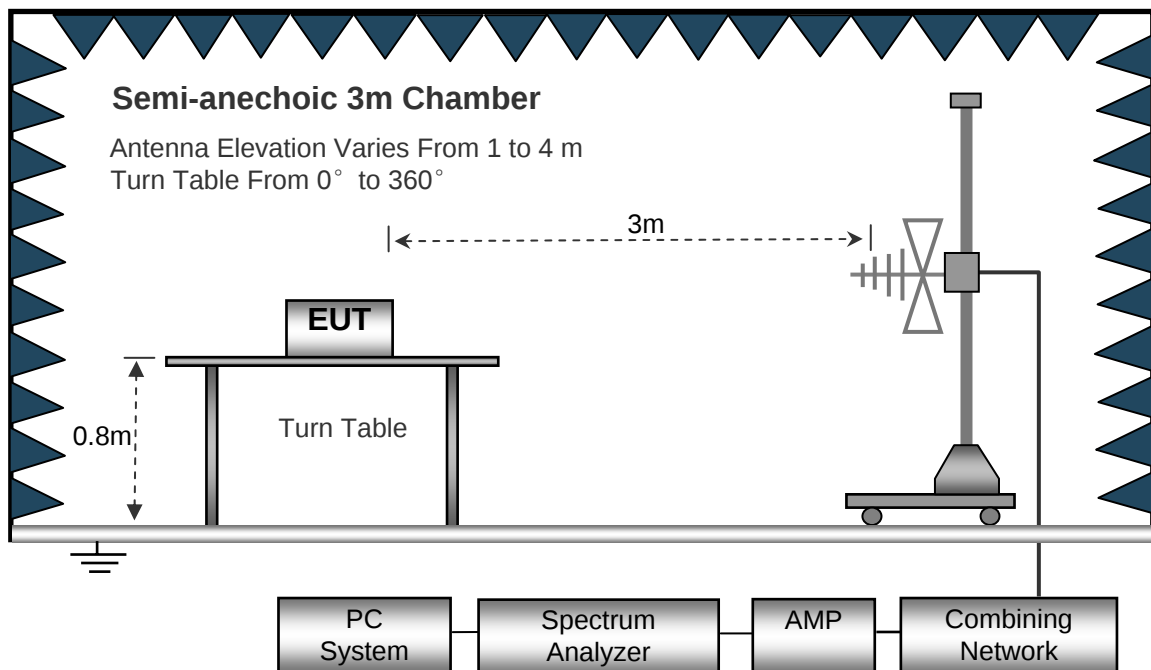
7.2 Test Setup

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

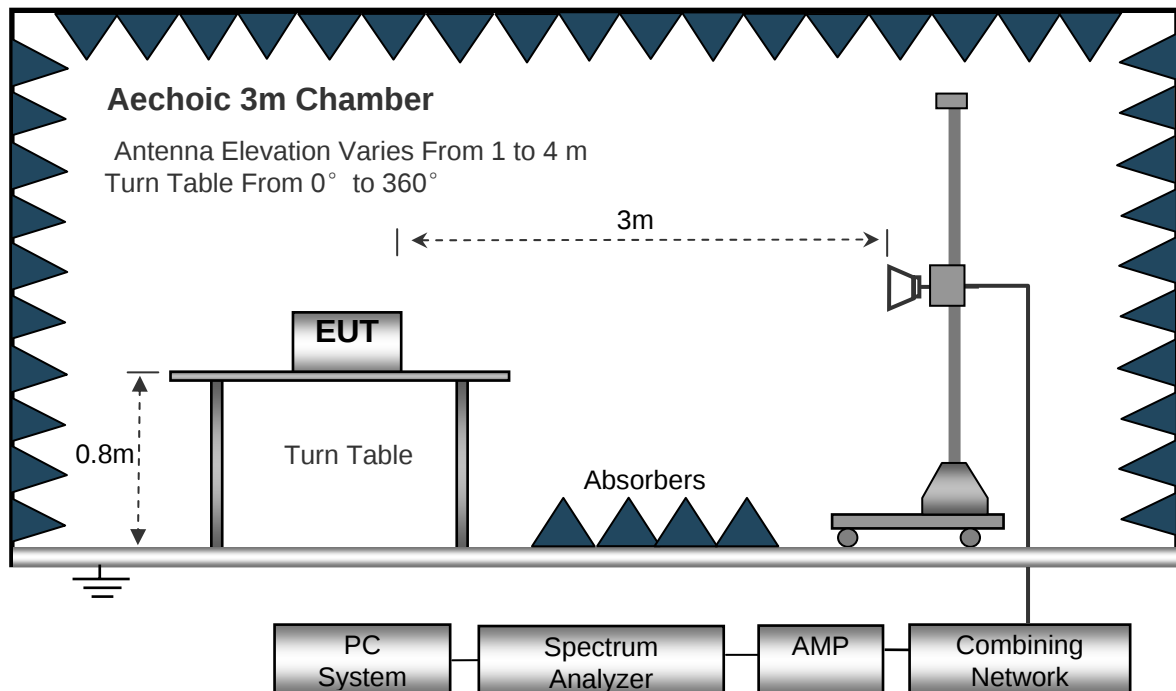
The test setup for emission measurement below 30MHz.



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 from 6MHz to 24.68GHz.

Below 30MHz

Sweep Speed	Auto
IF Bandwidth	10 KHz
Video Bandwidth	10KHz
Resolution Bandwidth	10 KHz

30MHz ~ 1GHz

Sweep Speed	Auto
IF Bandwidth	120 KHz
Video Bandwidth	100KHz
Quasi-Peak Adapter Bandwidth	120 KHz
Quasi-Peak Adapter Mode	Normal
Resolution Bandwidth	100KHz

Above 1GHz

Sweep Speed	Auto
IF Bandwidth	120 KHz
Video Bandwidth	3MHz
Quasi-Peak Adapter Bandwidth	120 KHz
Quasi-Peak Adapter Mode	Normal
Resolution Bandwidth	1MHz

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 3-axes(X, Y, Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand). After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

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:
 Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - 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 Radiated Emissions Test Result

Formula of conversion factors:the field strength at 3m was established by adding
 The meter reading of the spectrum analyzer (which is set to read in units of dBuV/m)
 To the antenna correction factor supplied by the antenna manufacturer. The antenna
 Correction factors are stated in terms of dB.The gain of the pressletor was accounted
 For in the spectrum analyser meter reading.

Example:

Freq(MHz) Meter Reading +ACF=FS

33 20dBuV+10.36dB=30.36dBuV/m @3m

7.7 Radiated Emission Data

Test Frequency :Below 30MHz

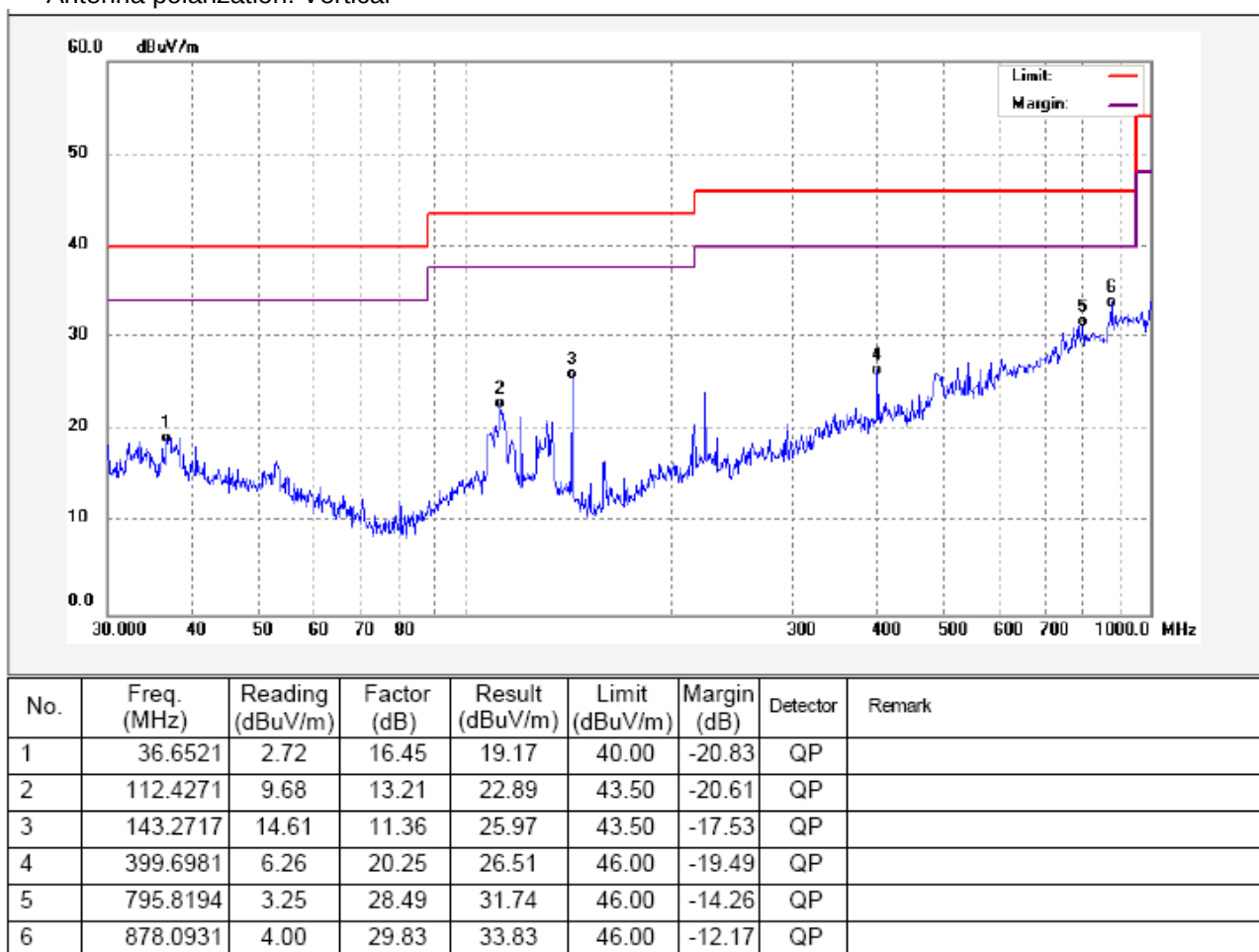
The measurements were more than 20 dB below the limit and not reported.

Test Frequency: 30MHz ~ 1000MHz

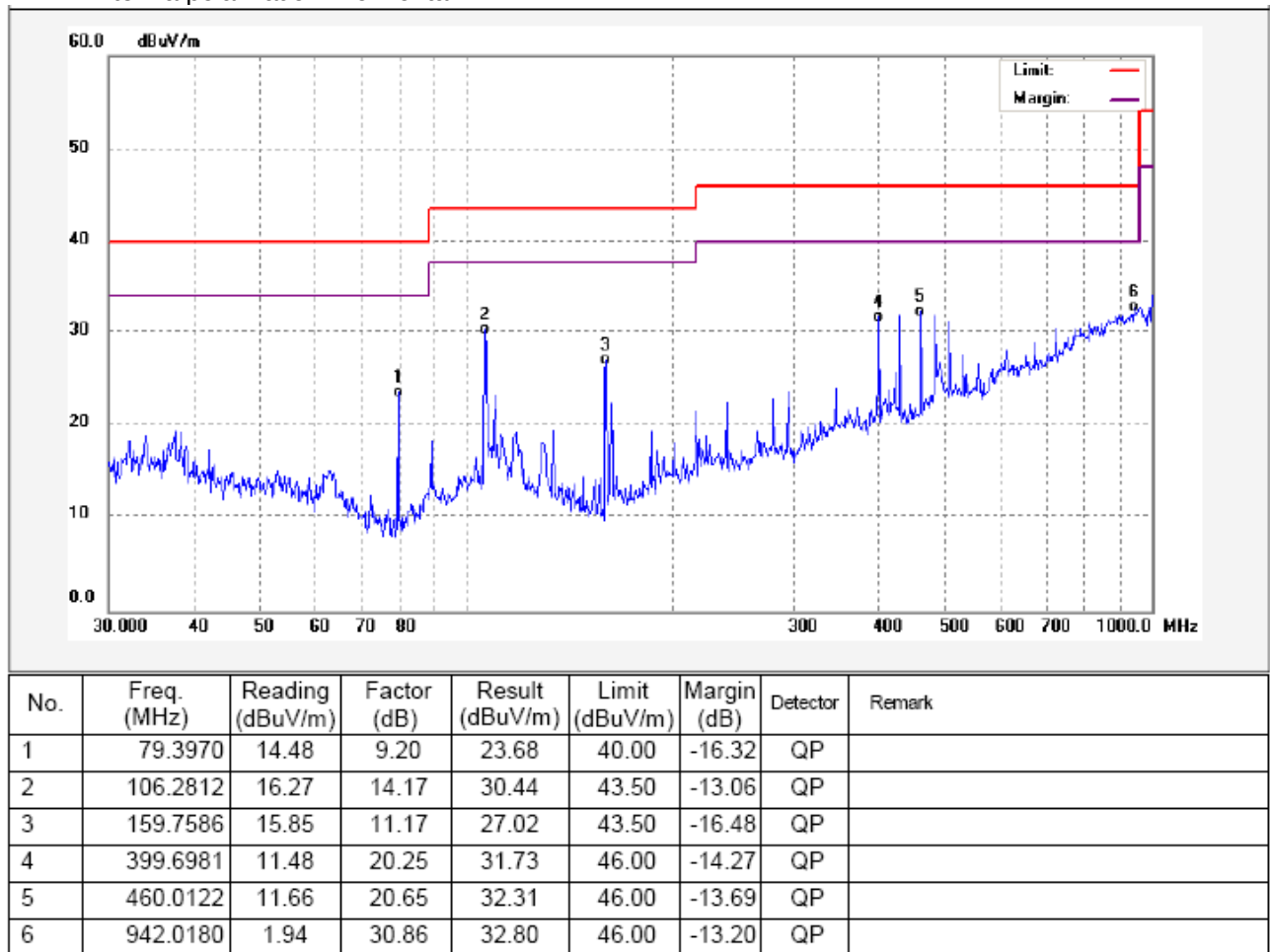
Remark: the EUT was pretested at the highest, middle and lowest channel, and the worst case was the lowest Channel, so the data show was the lowest channel only.

Test Mode: Continuously Transmitting

Antenna polarization: Vertical



Antenna polarization: Horizontal

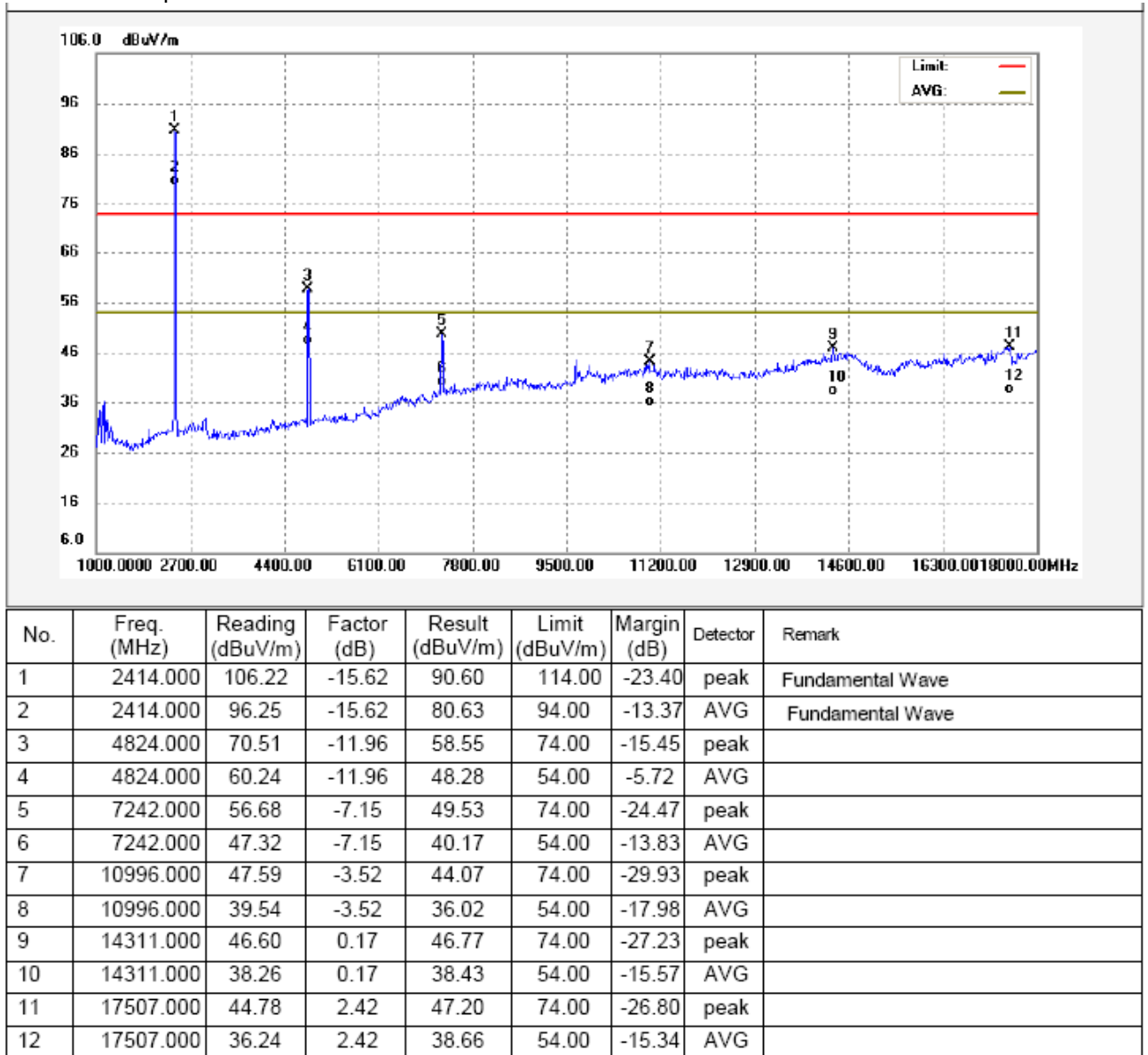


Test Frequency: 1GHz ~ 24.68GHz

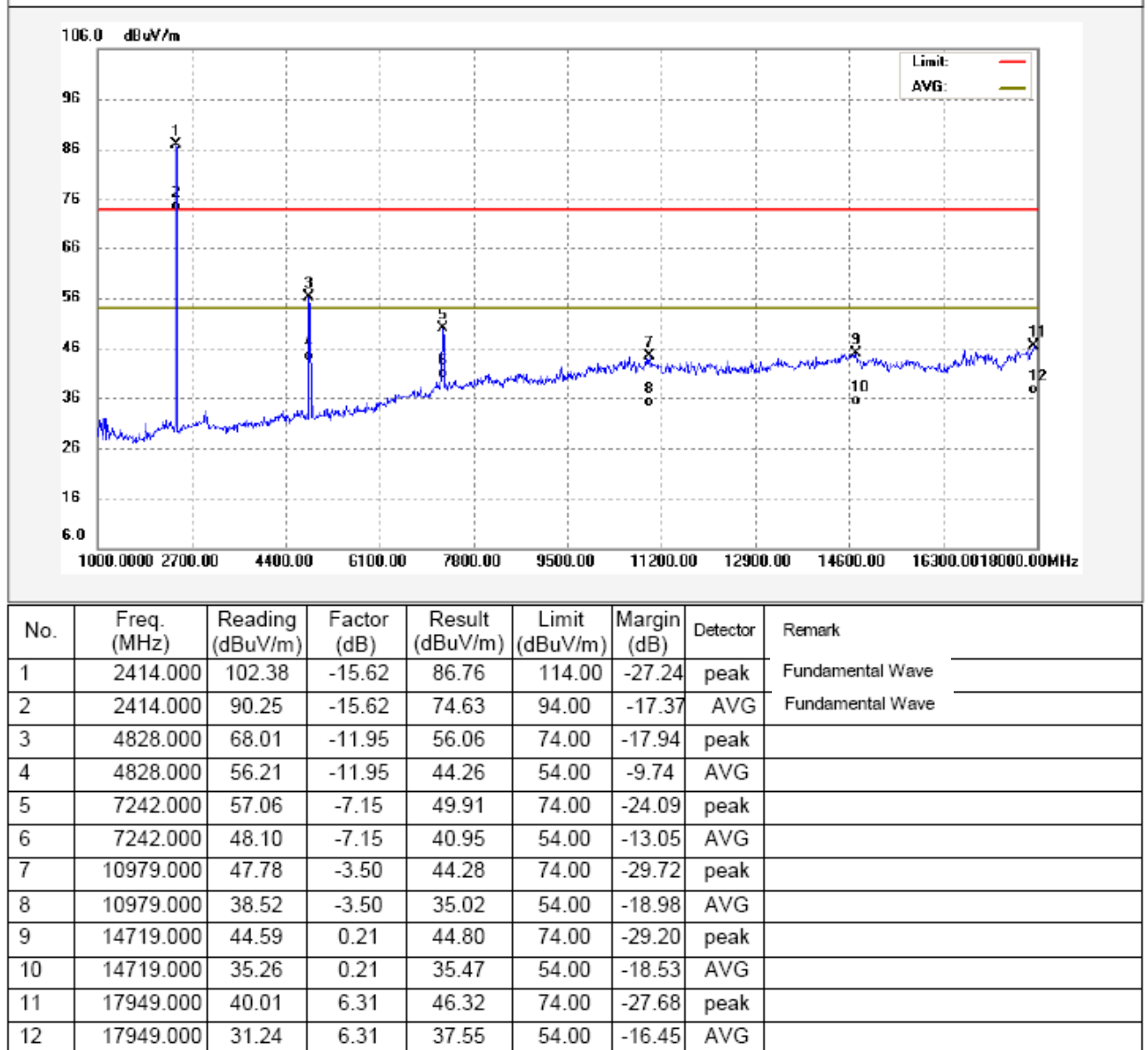
Test Mode: Continuously Transmitting

Test channel: TX 2414MHz

Antenna polarization: Vertical

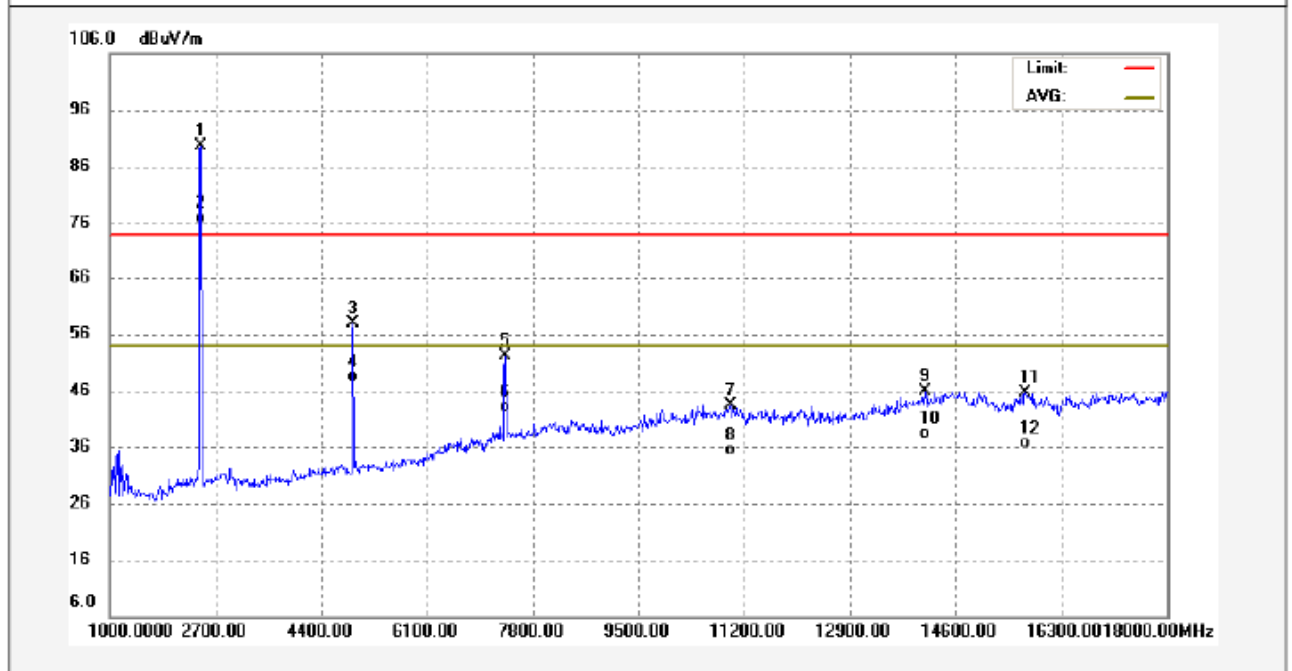


Antenna polarization: Horizontal



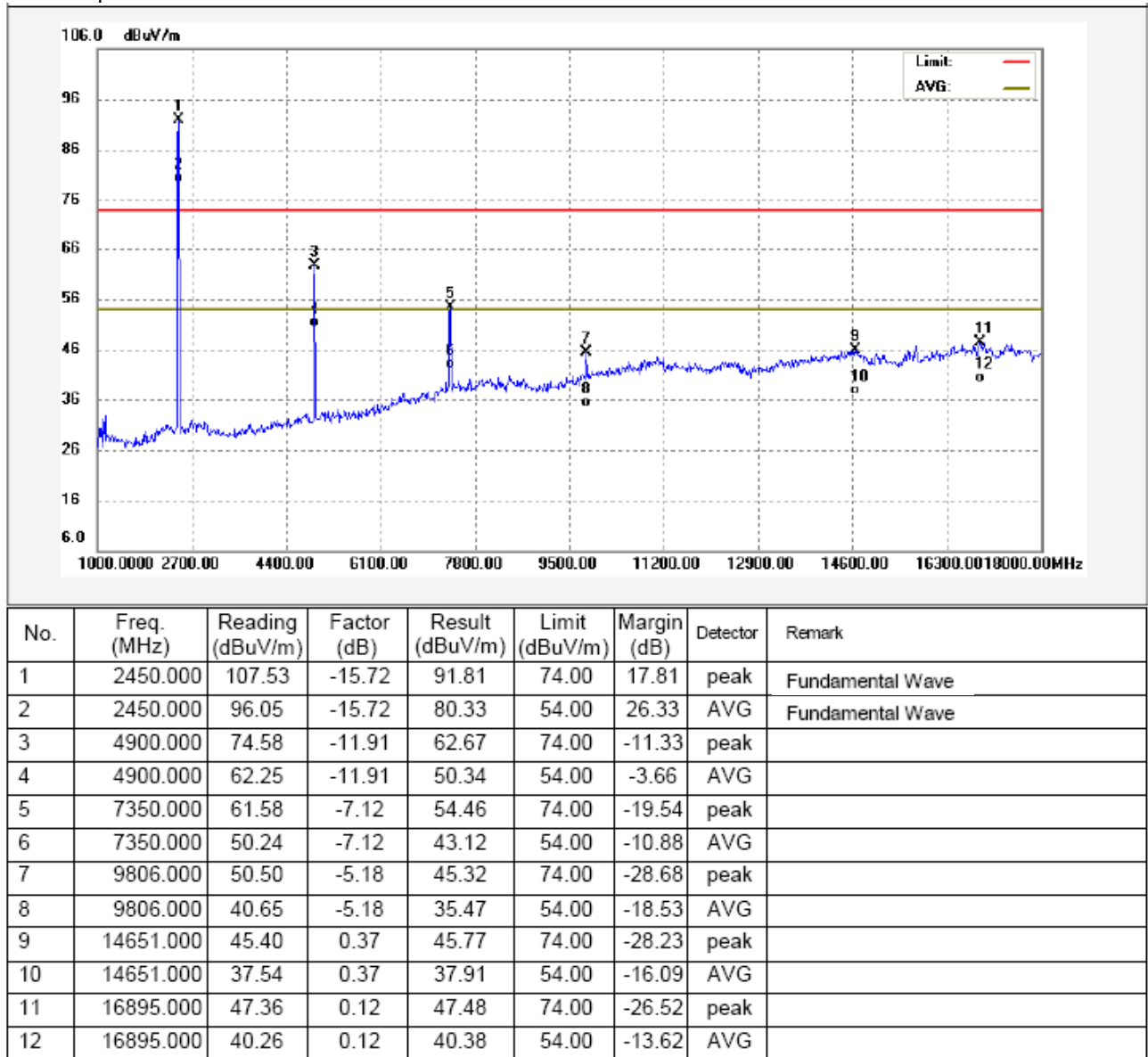
Test channel: TX 2450MHz

Antenna polarization: Vertical



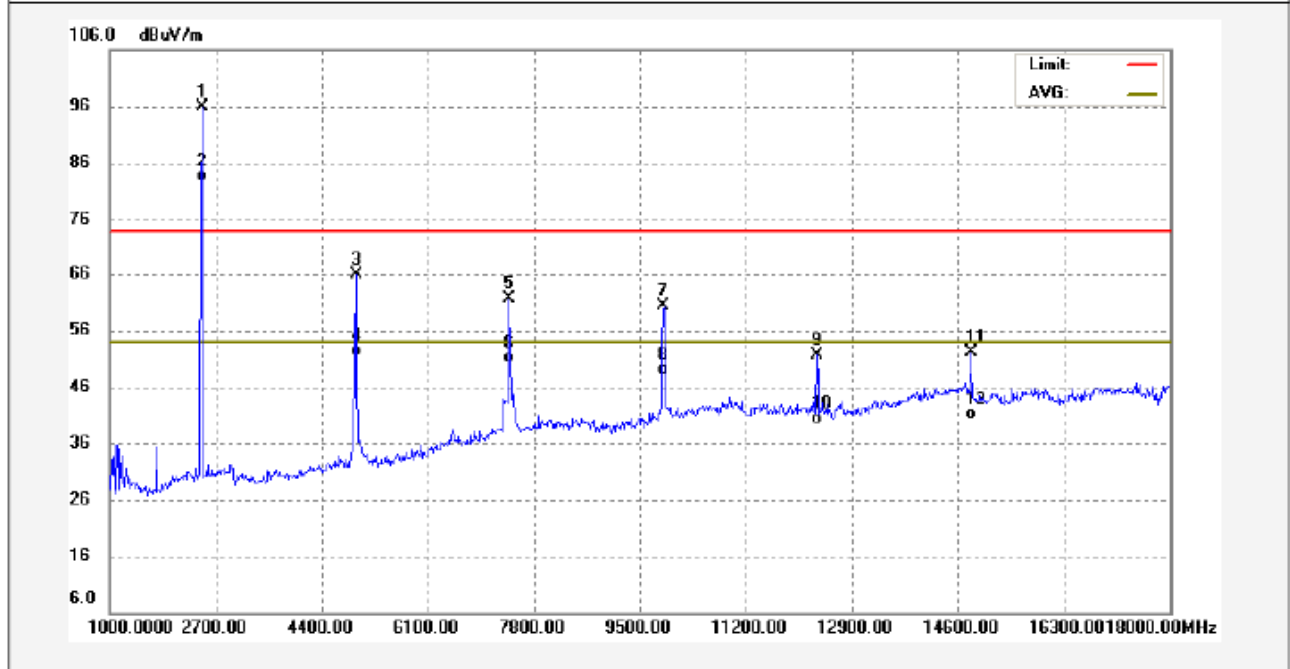
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2450.000	105.28	-15.72	89.56	114.00	-24.44	peak	Fundamental Wave
2	2450.000	92.65	-15.72	76.93	94.00	-17.03	AVG	Fundamental Wave
3	4900.000	69.86	-11.91	57.95	74.00	-16.05	peak	
4	4900.000	60.24	-11.91	48.33	54.00	-5.67	AVG	
5	7350.000	59.32	-7.12	52.20	74.00	-21.80	peak	
6	7350.000	50.21	-7.12	43.09	54.00	-10.91	AVG	
7	10979.000	46.88	-3.50	43.38	74.00	-30.62	peak	
8	10979.000	38.84	-3.50	35.34	54.00	-18.66	AVG	
9	14107.000	46.23	-0.32	45.91	74.00	-28.09	peak	
10	14107.000	38.65	-0.32	38.33	54.00	-15.67	AVG	
11	15722.000	49.27	-3.66	45.61	74.00	-28.39	peak	
12	15722.000	40.21	-3.66	36.55	54.00	-17.45	AVG	

Antenna polarization: Horizontal



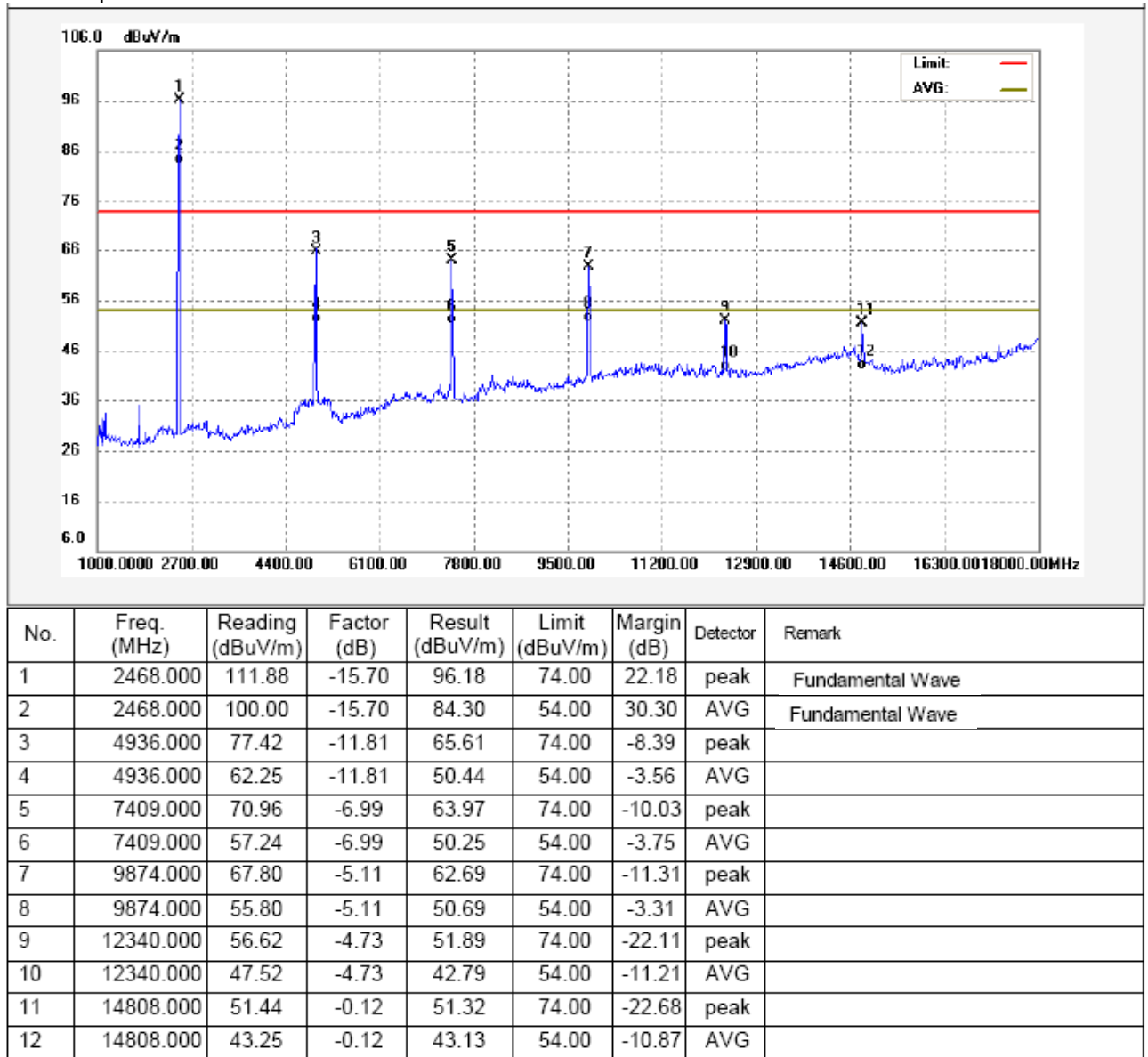
Test channel: TX 2468MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2468.000	111.46	-15.70	95.76	74.00	21.76	peak	Fundamental Wave
2	2468.000	99.25	-15.70	83.55	54.00	29.55	AVG	Fundamental Wave
3	4936.000	77.71	-11.81	65.90	74.00	-8.10	peak	
4	4936.000	62.25	-11.81	50.44	54.00	-3.56	AVG	
5	7404.000	68.54	-7.01	61.53	74.00	-12.47	peak	
6	7404.000	57.24	-7.01	50.23	54.00	-3.77	AVG	
7	9872.000	65.51	-5.11	60.40	74.00	-13.60	peak	
8	9872.000	54.12	-5.11	49.01	54.00	-4.99	AVG	
9	12339.000	56.36	-4.72	51.64	74.00	-22.36	peak	
10	12339.000	45.21	-4.72	40.49	54.00	-13.51	AVG	
11	14804.000	52.30	-0.11	52.19	74.00	-21.81	peak	
12	14804.000	41.32	-0.11	41.21	54.00	-12.79	AVG	

Antenna polarization: Horizontal



Test Frequency :Above 18GHz

The measurements were more than 20 dB below the limit and not reported.

8 Restricted band

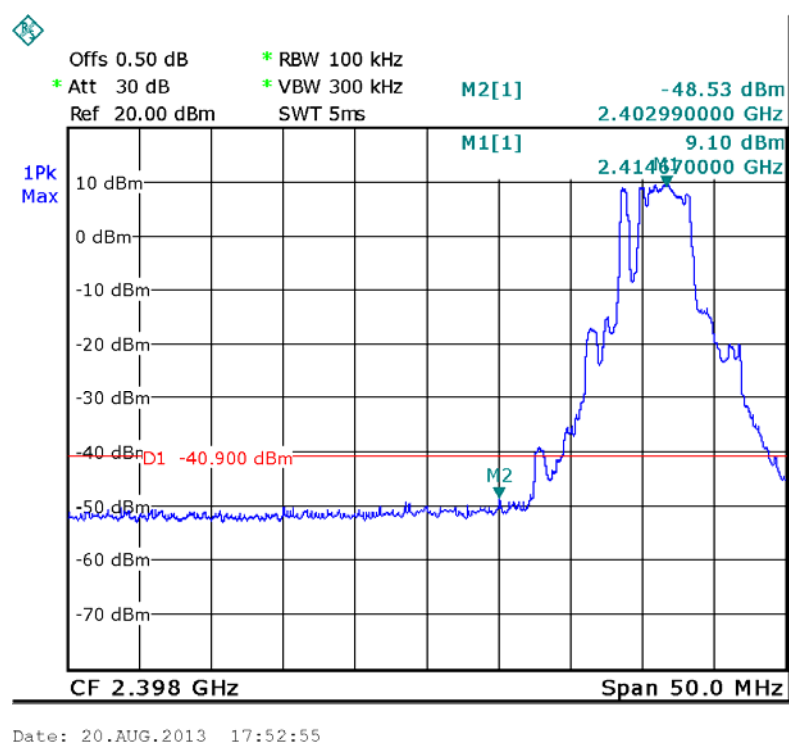
Test Requirement:	FCC Part15 Paragraph 15.205
Test Method:	ANSI C63.4: 2003
Test Result:	N/A

8.1 Requirments:

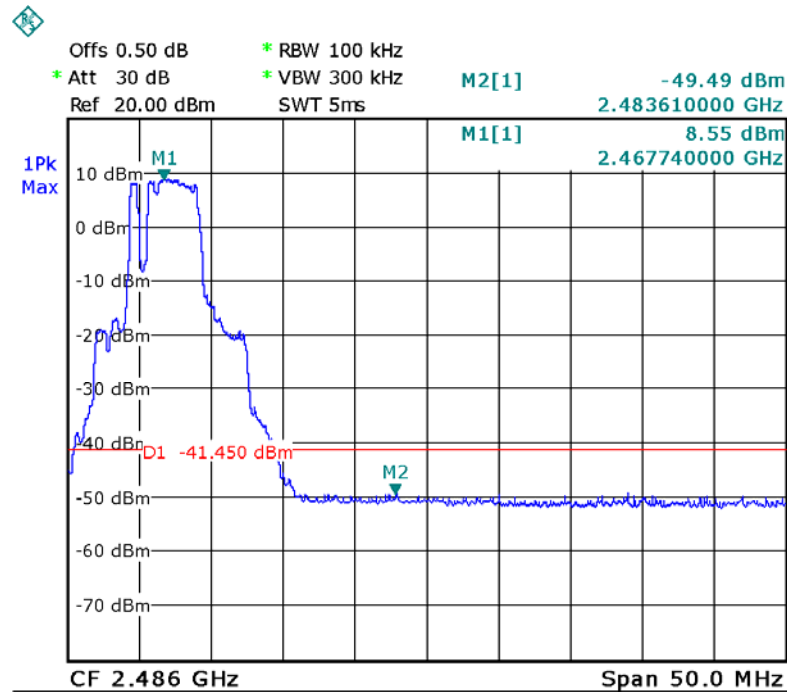
emissions that fall in the restricted bands(15.205).Above 1000MHz, compliance with the emissions limits in section 15.209 shall be demonstrated based on the average value of the measured emissions,The provisions in section 15.35apply to these measurements.

8.2 Test Result

Mode:transmitting at lower channel:



Mode:transmitting at upper channel



Date: 20.AUG.2013 17:41:18

9 Antenna Requirement

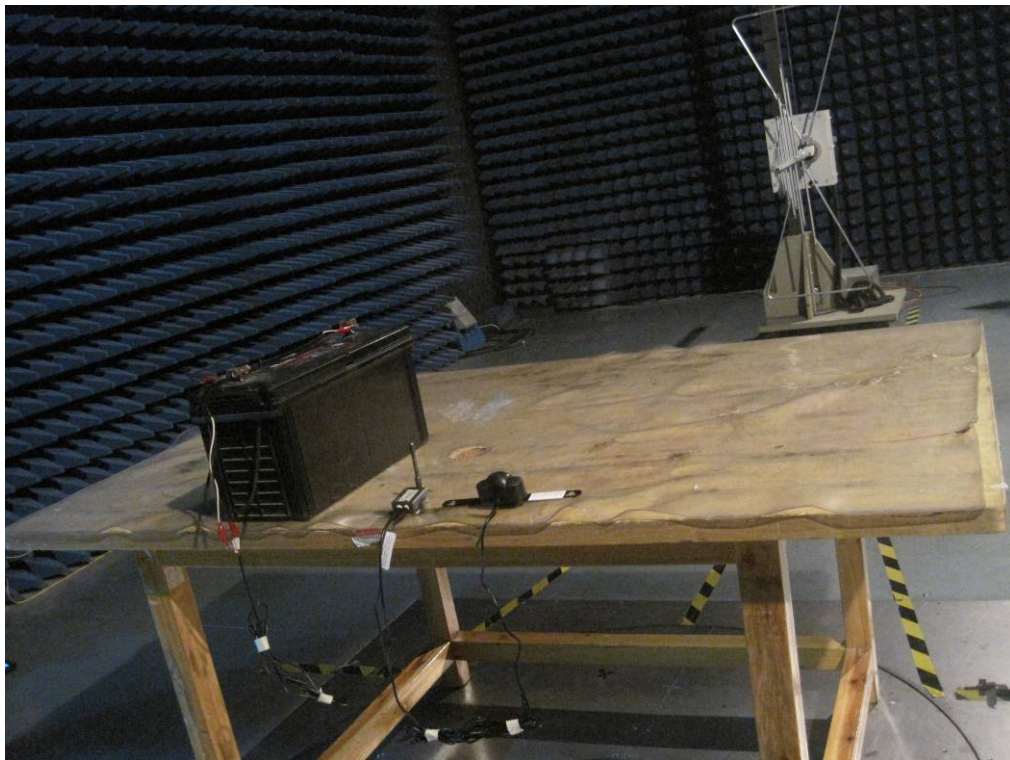
According to the FCC Part 15 Paragraph 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. This product has a integrated antenna, fulfil the requirement of this section.

10 Photographs of Testing

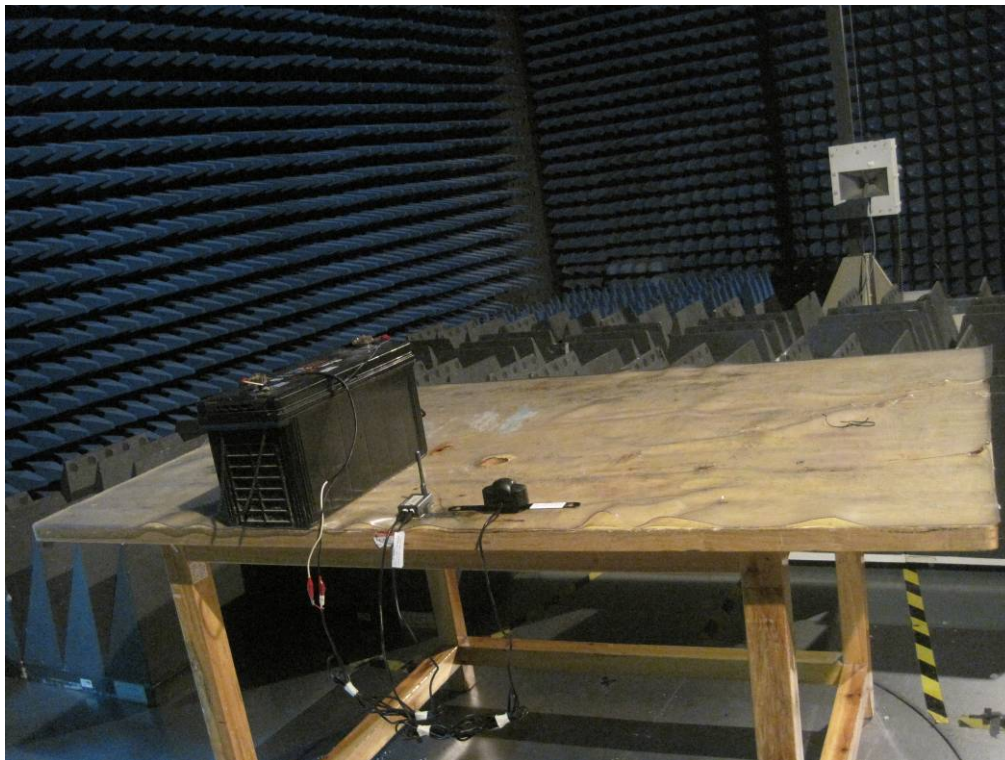
10.1 Radiation Emission From Below 30MHz



10.2 Radiation Emission From 30MHz-1GHz



10.3 Radiation Emission Above 1GHz



11 Photographs - Constructional Details

11.1 EUT - Appearance View



Camera:





Transmitter:

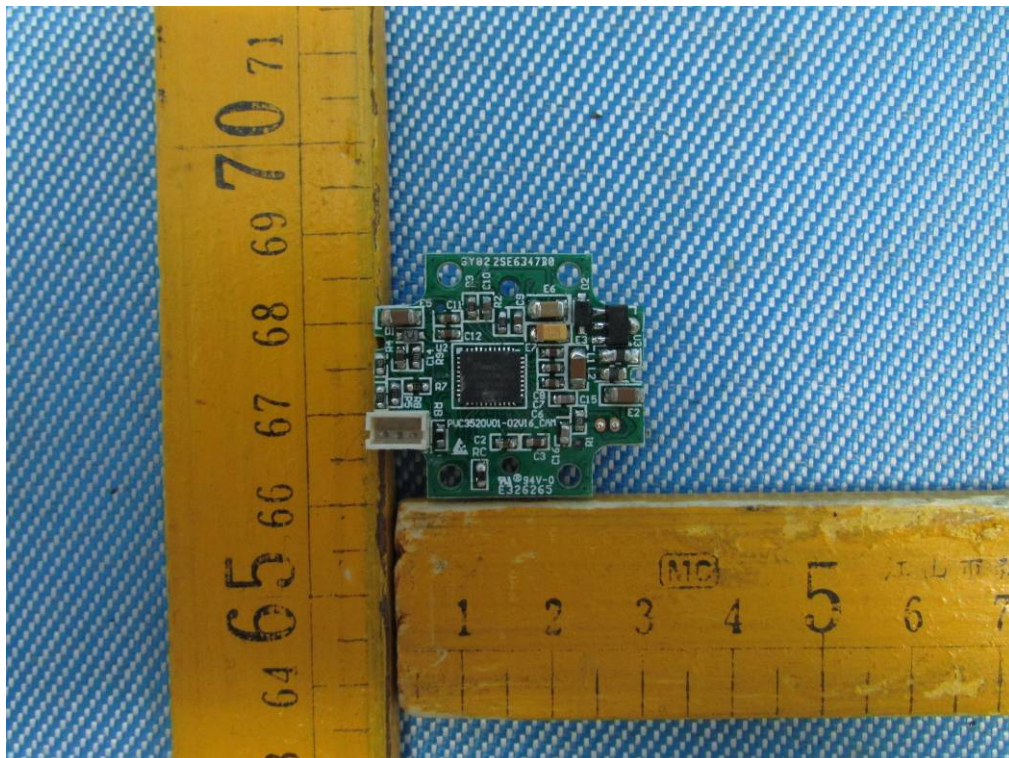
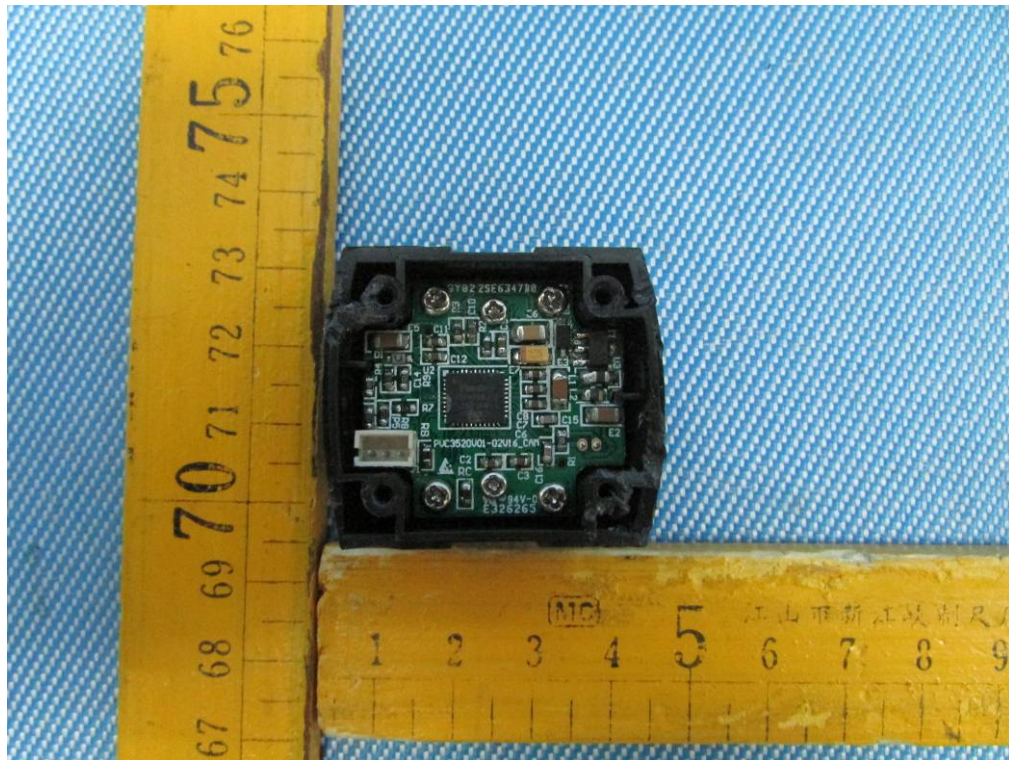


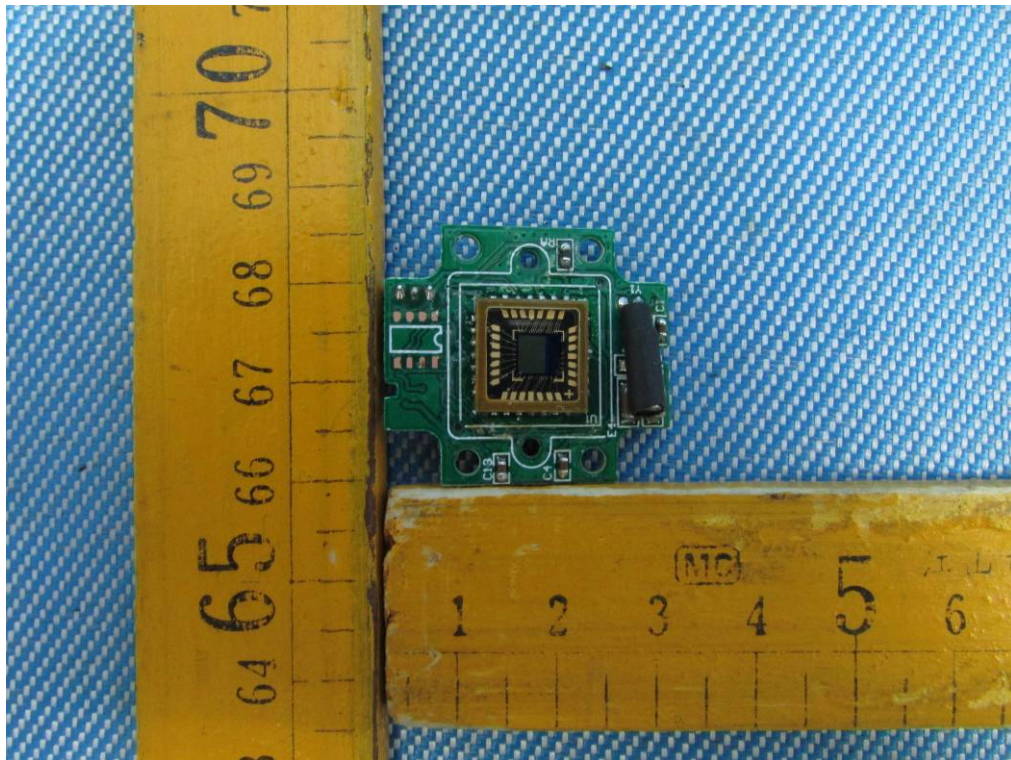


11.2 EUT - Open View

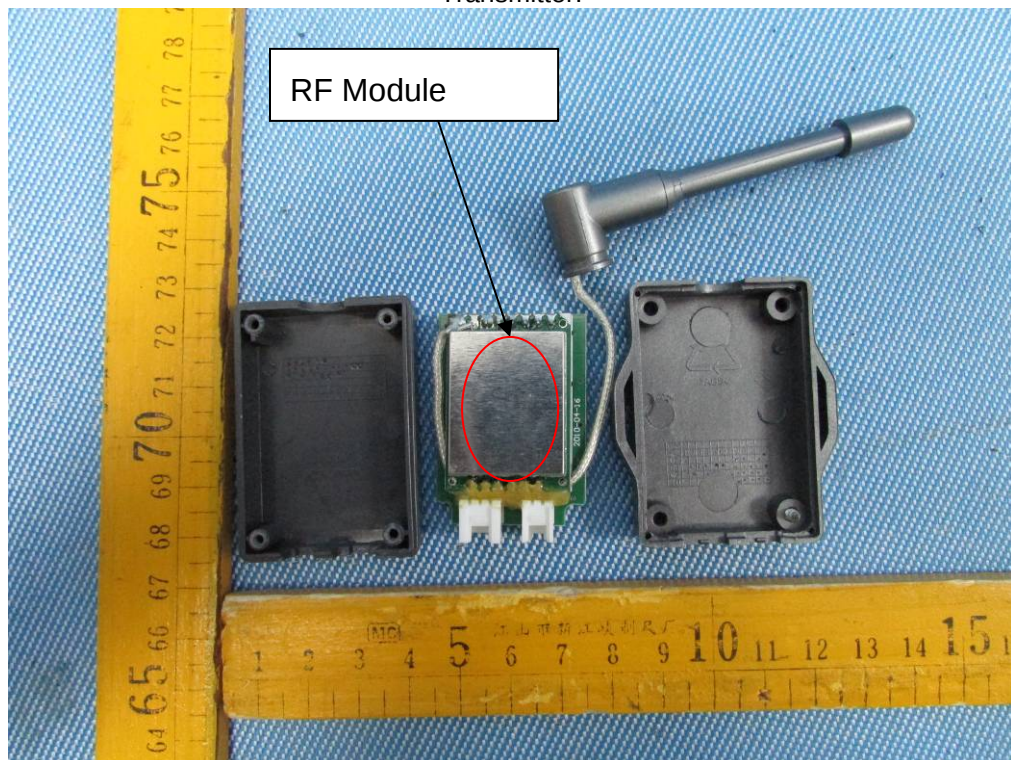
Camera:

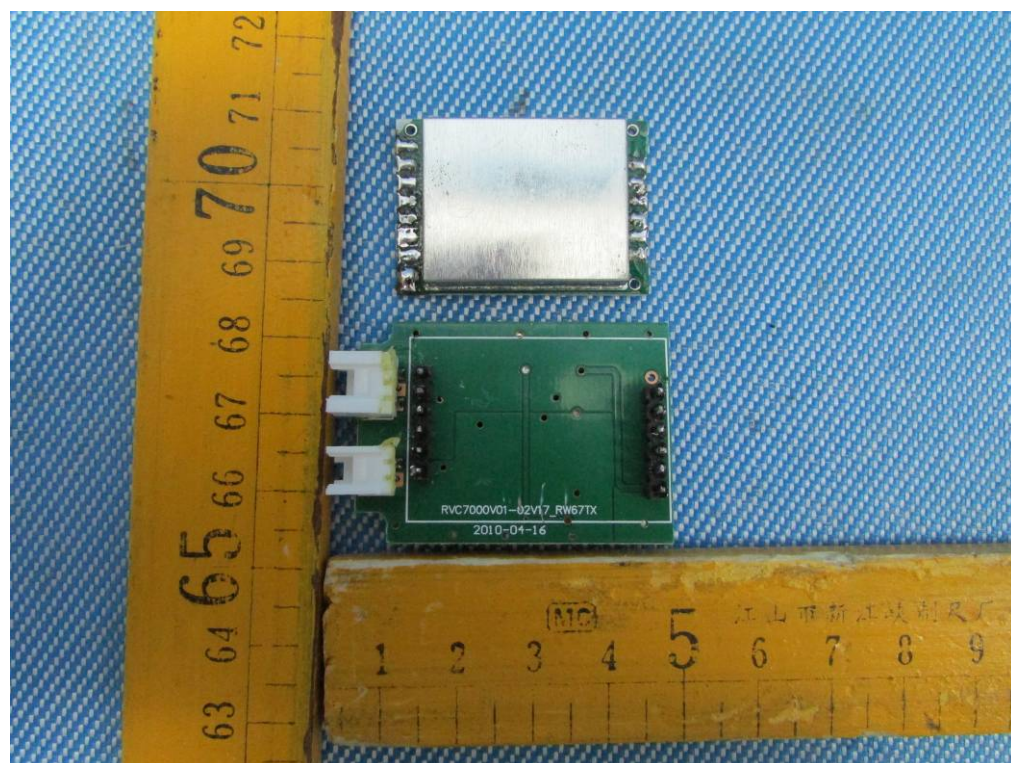
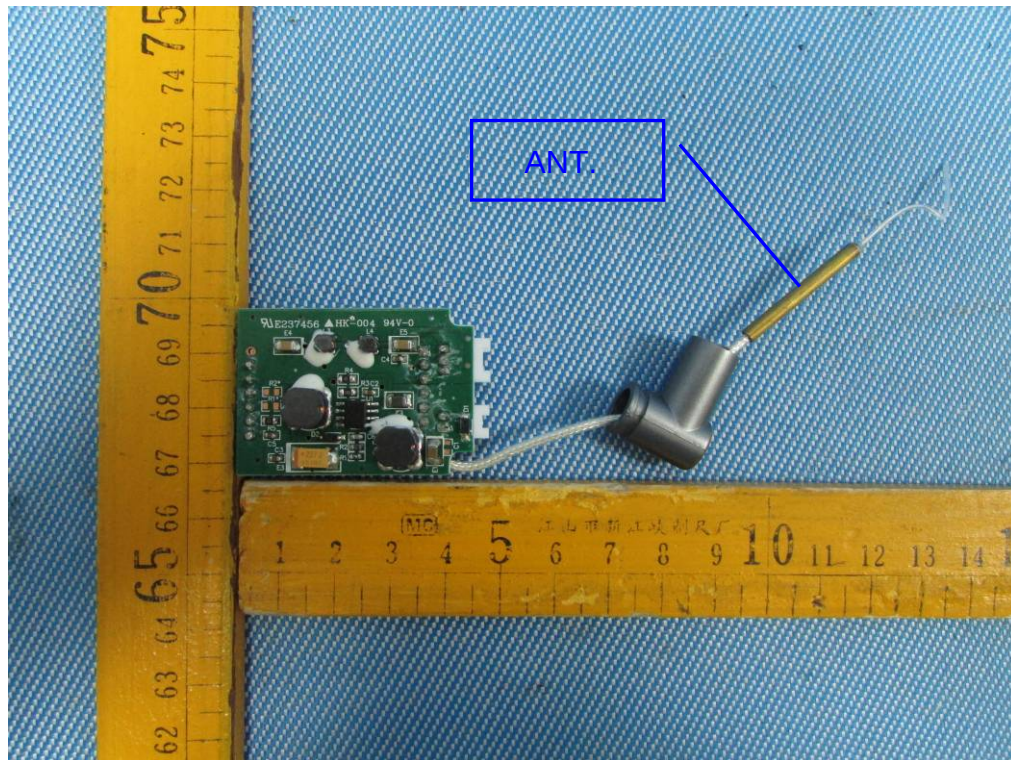


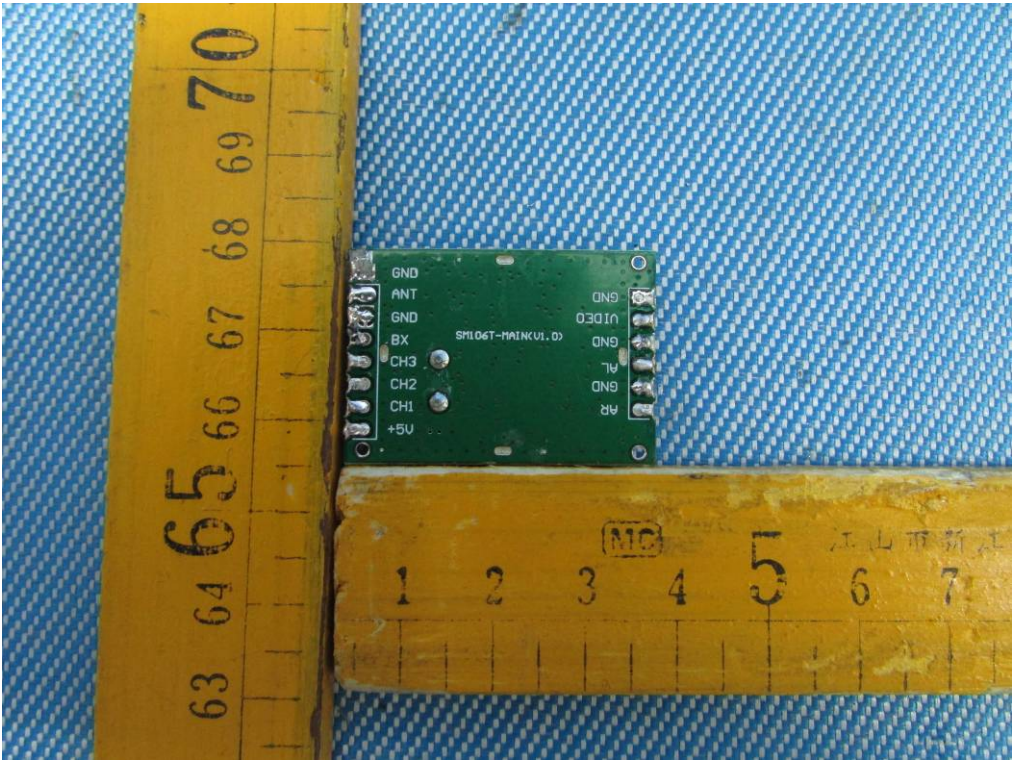
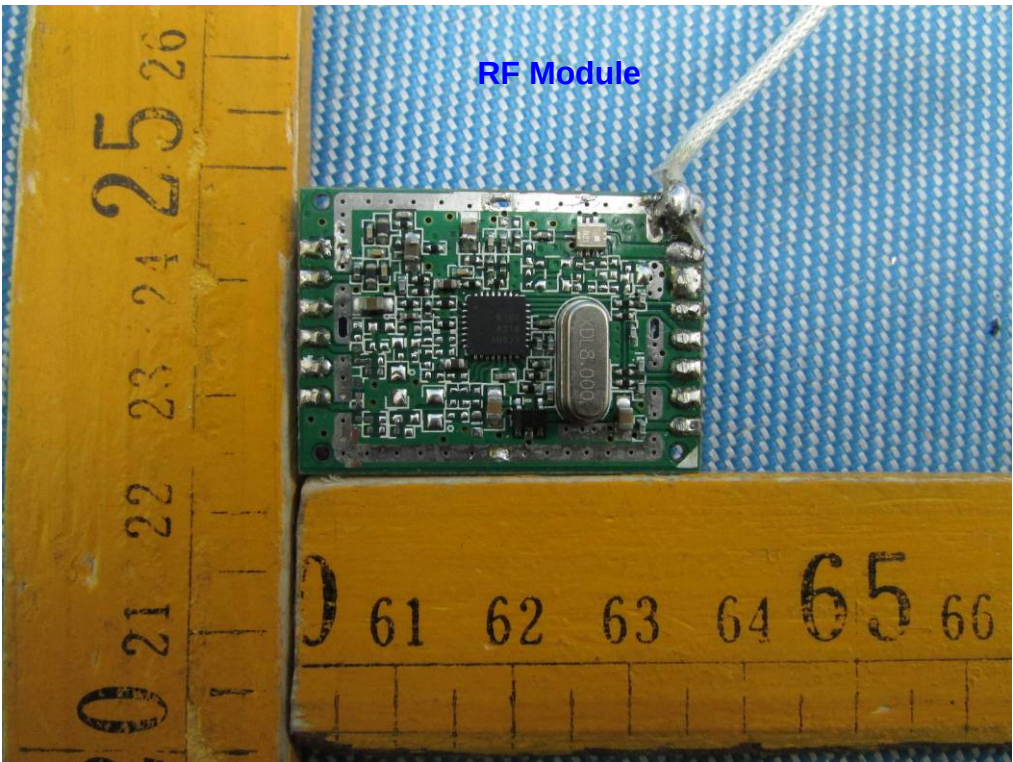




Transmitter:







===== End of Test Report =====