



# FCC RF TEST REPORT

*Issued to*

Tenway (Shanghai) Inc.,Ltd

*For*

EPD tag

Model Name : IVY-E-E21  
Trade Name : ESL-EPD  
Brand Name : IVY  
Standard : 47 CFR Part 15,Subpart C  
ANSI C63.10-2013  
Test date : Jun.15,2015 to Jul.3,2015  
Issue date : Jul.3,2015  
FCC ID : 2AEPEIVY-E-E21

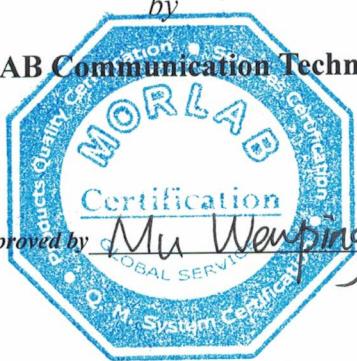
*by*

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LAB CODE 20081223-00

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### Change History

Issue	Date	Reason for change
1.0	Jun.18,2015	First edition
2.0	Jul.3,2015	Second edition

## 1. General Information

### 1.1 Applicant

**Tenway (Shanghai) Inc.,Ltd**

9th F, Xinwei Building B, 1455 Pingcheng Road, Jiading District, Shanghai, PR. China

### 1.2 Description of EUT

EUT Name ..... : EPD tag

Model Name..... : IVY-E-E21

Brand Name ..... : IVY

Trade Name ..... : ESL-EPD

Hardware Version..... : TW-ESL02-FW1.0

Software Version ..... : TW-ESL02-HW1.0

Modulation Type ..... : GFSK

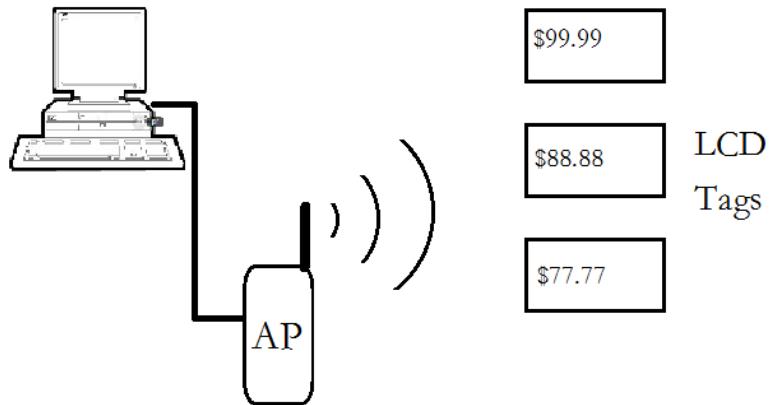
Frequency Range..... : 420MHz~471MHz (at intervals of 200kHz)

Number of Channels ..... : 256

Power Supply ..... : Battery 3V (CR2450)

*NOTE :*

*EPD tag is a price tag which displays price and flags.*



*The EUT is working at the fixed channel, the channel was set in manufacture and can't change anymore. At standby mode, the EPD tag listen several milliseconds every 8 seconds. While the AP is activated to update price, EPD tag will start to receive data package about 20ms, after this data was successful catch, EPD tag transmit several milliseconds confirmed signal to AP. Then the EPD tag go back to standby mode, until next update.*

- 2. The lowest, middle, highest channel numbers of the EPD tag transmit channel used and tested in this report are separately 0 (420MHz), 128 (445.6MHz) and 255 (471MHz).*
- 3. For more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacture.*

## 2. Facilities and Accreditations

### 2.1 Test Facility

Shanghai Morlab Communications Technology Co., Ltd. Morlab Laboratory is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6644. A 9\*6\*6(m) fully anechoic chamber was used for the radiated spurious emissions test.

### 2.2 Environmental Conditions

Ambient temperature: 20~25°C

Relative humidity: 40~60%

Atmosphere pressure: 86-106kPa

### 2.3 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

Uncertainty of Conducted Emission:  $\pm 1.76\text{dB}$

Uncertainty of Radiated Emission:  $\pm 3.16\text{dB}$

### 2.4 List of Equipments Used

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU26	200880	2015.2.25	1year
Attenuator 1	Resnet	10dB	(n.a.)	(n.a.)	(n.a.)
Attenuator 2	Resnet	3dB	(n.a.)	(n.a.)	(n.a.)
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2012.9.14	3year
Test Antenna	Schwarzbeck	VULB 9163	9163-561	2014.7.25	1year
Test Antenna	Schwarzbeck	BBHA9170	BBHA91970171	2014.9.22	1year
Test Antenna	Schwarzbeck	FMZB 1519	1519-025	2014.7.25	1year
Personal Computer	HP	(n.a.)	(n.a.)	(n.a.)	(n.a.)
EMI Test Receiver	R&S	ESCI7	100787	2015.02.24	1year
Full Anechoic Chamber	MTG	6m*4m*4m	(n.a.)	2013.9.6	3year
Test Antenna	Schwarzbeck	BBHA-9120LFA	BBHA-9120LFA	2014.10.15	1year
CTIA's OTA test system	MTG	(n.a.)	(n.a.)	(n.a.)	(n.a.)

*NOTE:*

*Equipments listed above have been calibrated and are in the period of validation.*

### 3. Test Standards and Results

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

FCC Part 15 Subpart C §15.231

FCC Part 15 Subpart C §15.209

ANSI C63.10-2013

**NOTE:**

(1) *All test items were verified and recorded according to the standards and without any deviation during the test.*

(2) *This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart C.*

Test items and the results are as bellow:

No.	Section	Description	Result
1	15.231(a)	Transmission Requirements	Pass
2	15.231(b)& 15.209 (a)	Radiated Emissions	Pass
3	15.231(c)	Occupied Bandwidth	Pass
4	15.231(d)	Frequency Tolerance	N/A
5	15.231(e)	Alternate Field Strength Requirements	N/A
6	15.207	Powerline Conducted Emission	N/A

**NOTE:**

(1) *The device not operate between 40.66 to 40.70MHz*

(2) *The device does not operate at a periodic rate*

(2) *The device is battery powered*

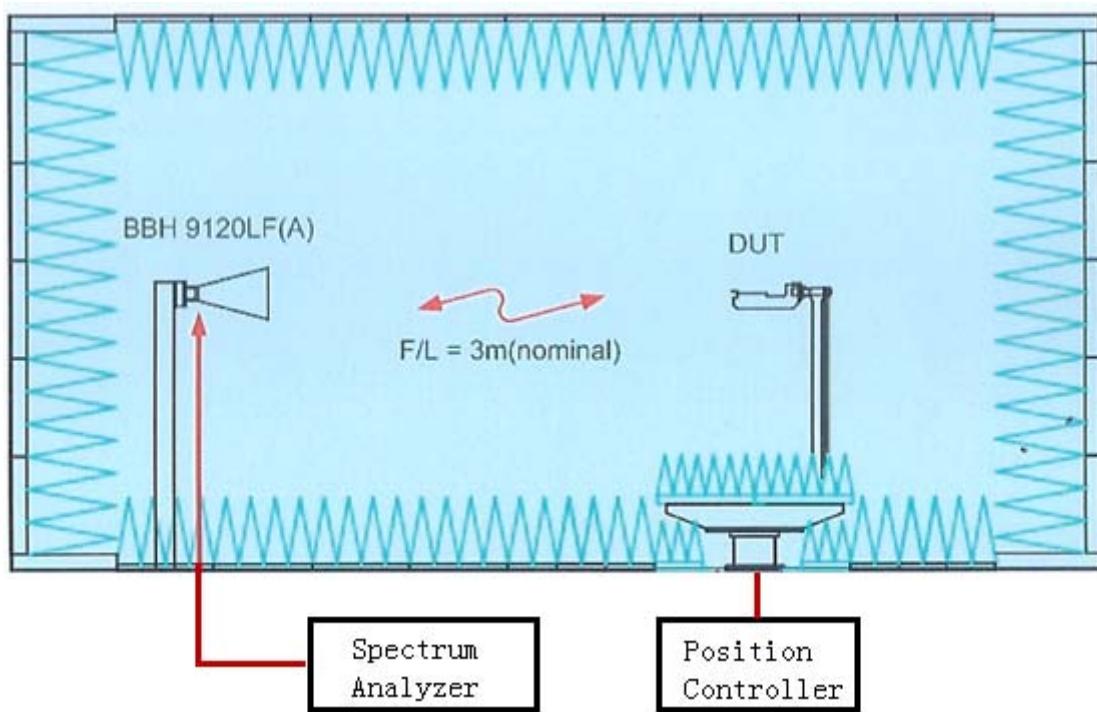
## 4. Test Result

### 4.1 Transmission Requirements

#### 4.1.1 Requirement

- (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
- (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

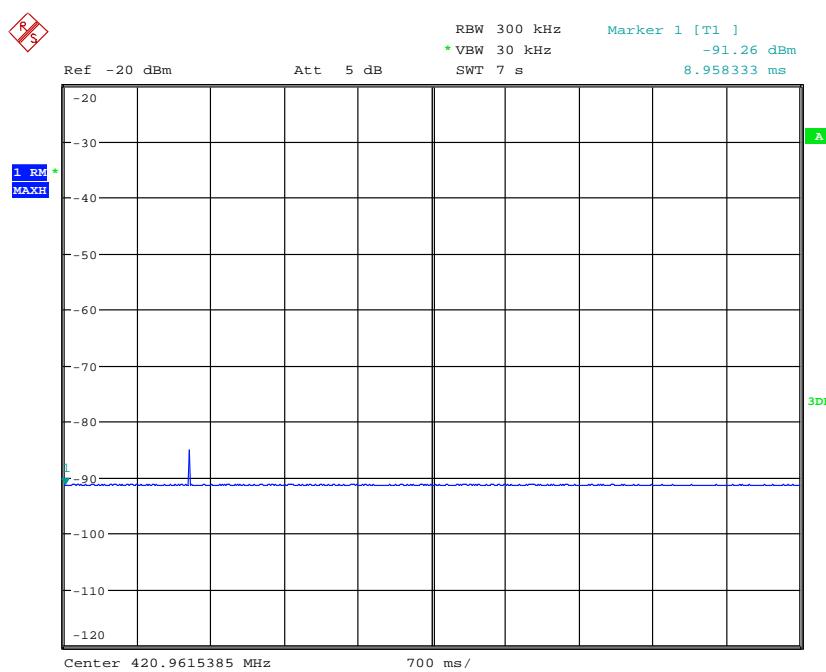
#### 4.1.2 Test Setup



#### 4.1.3 Test Result

##### A. Test Verdict:

Deactivate Time (s)	Limit (s)	Refer to plot	Verdict
<1	5	Plot A	Pass

**B. Test Plots:**

Date: 30.JUN.2015 16:30:45

Plot A

## 4.2 Radiated Emissions

### 4.2.1 Requirement

According to section 15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

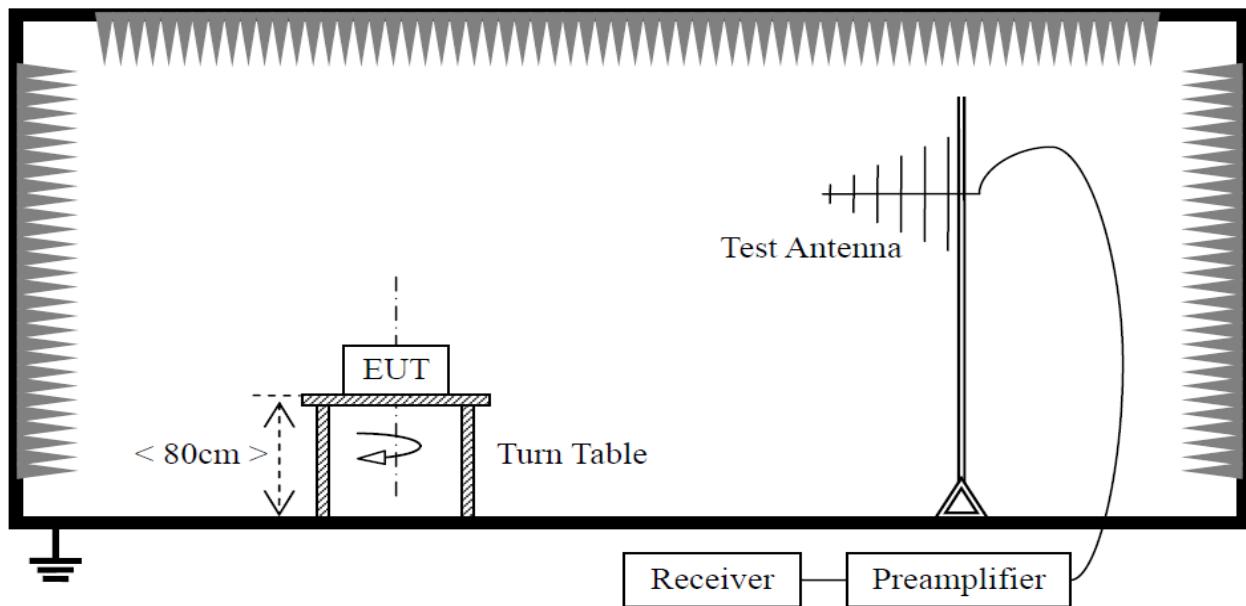
Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750	125 to 375
174-260	3,750	375
260-470	3,750 to 12,500	375 to 1,250
Above 470	12,500	1,250

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ( $\mu$ V/m)	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

As shown in FCC section 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector. When average radiated emission measurements are specified in this part, including emission measurements below 1000MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

#### 4.2.2 Test Setup



For the Test Antenna:

(a) In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.

(b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength, the azimuth range of turntable was 0o to 360o, the receive antenna has two polarizations horizontal and vertical. When doing measurements above 1GHz, the EUT was placed within the 3dB beam width range of the horn antenna, and the EUT was tested in 3 orthogonal positions as recommended in ANSI C63.10 for Radiated Emissions and the worst-case data was presented.

#### 4.2.3 Test Result

The Fundamental Emissions

Channel	Frequency (MHz)	Fundamental Emission (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Polarization (H/V)
		PK	PK	
0	420.58	68.51	80.41	H
		67.44		V
128	446.41	76.77	81.22	H
		68.26		V
255	472.18	55.97	81.93	H
		65.20		V

## The un-wanted Emissions

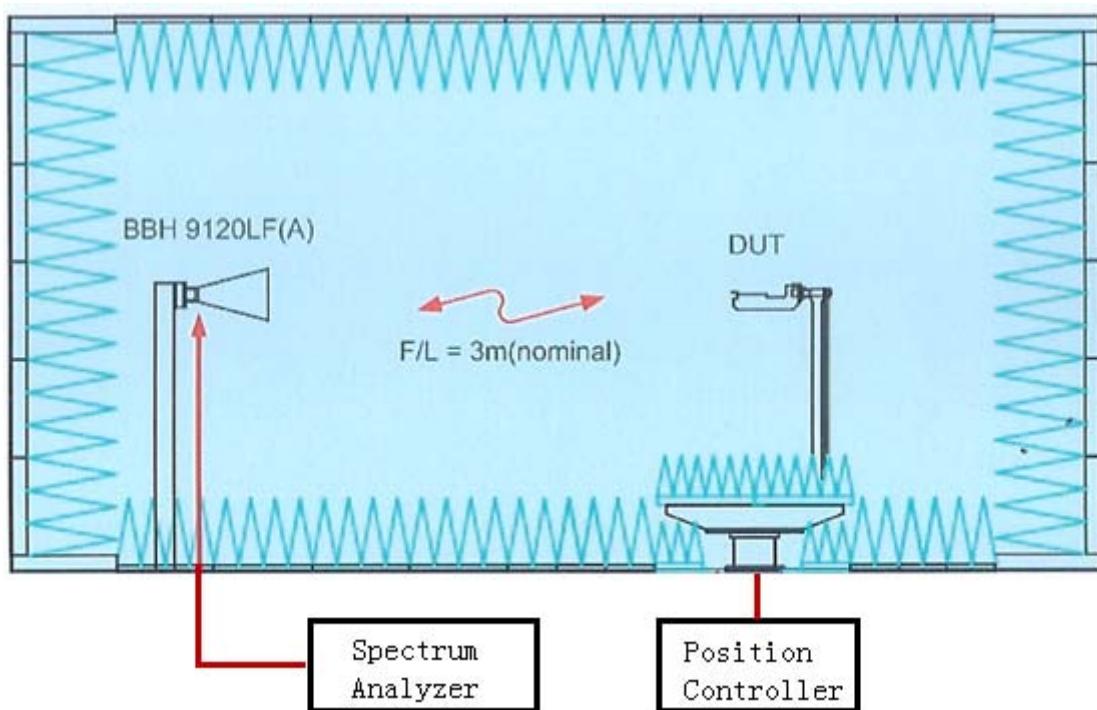
Frequency (MHz)	Polarization (H/V)	Measure Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB $\mu$ V/m)	Detector
Channel 0 (420MHz)					
0.009-30	/	Not found	/	/	QP
45.54	H	26.64	40	-13.36	QP
61.78	H	26.88	40	-13.12	QP
842.13	H	45.08	46	-0.92	QP
Above 1000	H	Not found	54	/	AV
61.78	V	28.20	40	-11.8	QP
63.31	V	28.33	40	-11.67	QP
840.00	V	43.69	46	-2.31	QP
Above 1000	V	Not found	54	/	AV
Channel 128 (445.6MHz)					
0.009-30	/	Not found	/	/	QP
98.39	H	28.67	43.5	-14.83	QP
343.71	H	26.16	46	-19.84	QP
893.86	H	45.39	46	-0.61	QP
Above 1000	H	Not found	54	/	AV
253.09	V	27.57	46	-18.43	QP
391.47	V	26.04	46	-19.96	QP
893.86	V	43.33	46	-2.67	QP
Above 1000	V	Not found	54	/	AV
Channel 255 (471MHz)					
0.009-30	/	Not found	/	/	QP
307.83	H	21.92	46	-24.08	QP
771.45	H	32.22	46	-13.78	QP
942.13	H	41.16	46	-4.84	QP
Above 1000	H	Not found	54	/	AV
33.33	V	22.85	40	-17.15	QP
774.16	V	32.18	46	-13.82	QP
942.13	V	44.88	46	-1.12	QP
Above 1000	V	Not found	54	/	AV

## 4.3 Occupied Bandwidth

### 4.3.1 Requirement

According to FCC 15.231(c), the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. bandwidth is determined at the points 20dB down from the modulated carrier

### 4.3.2 Test Setup

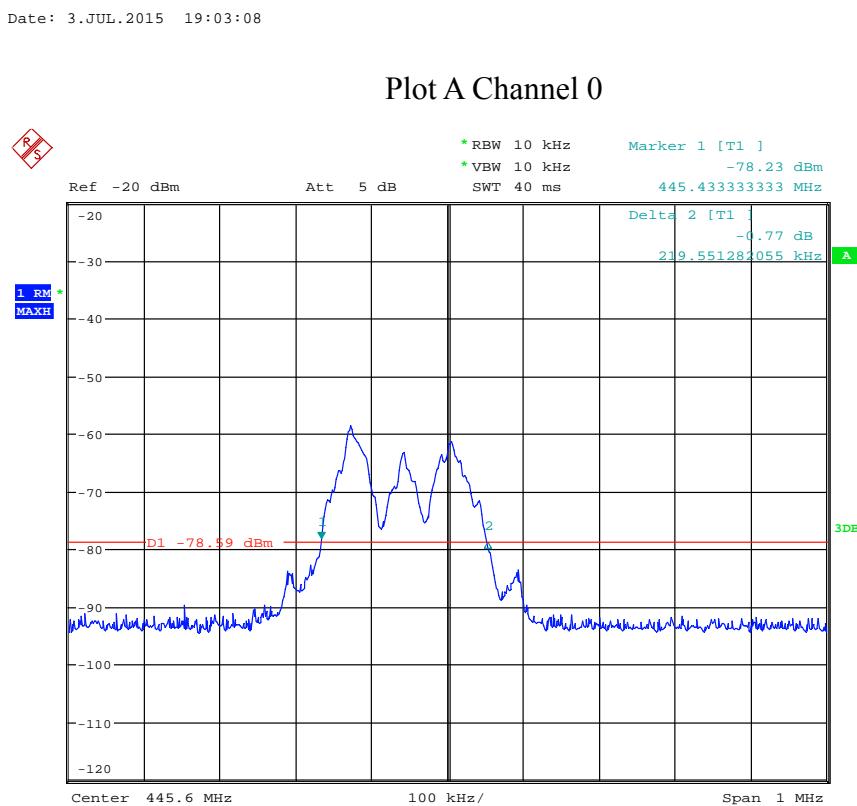
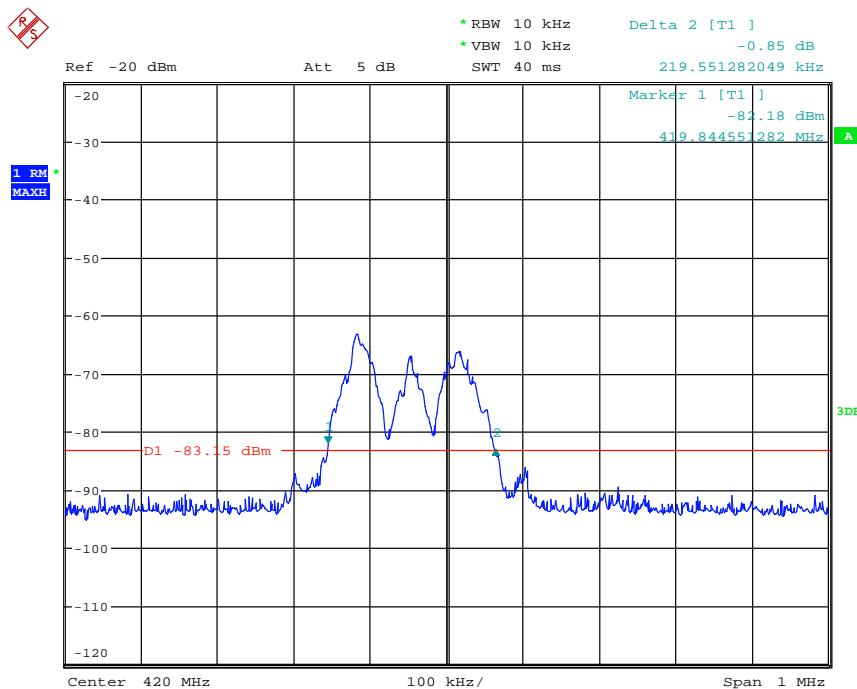


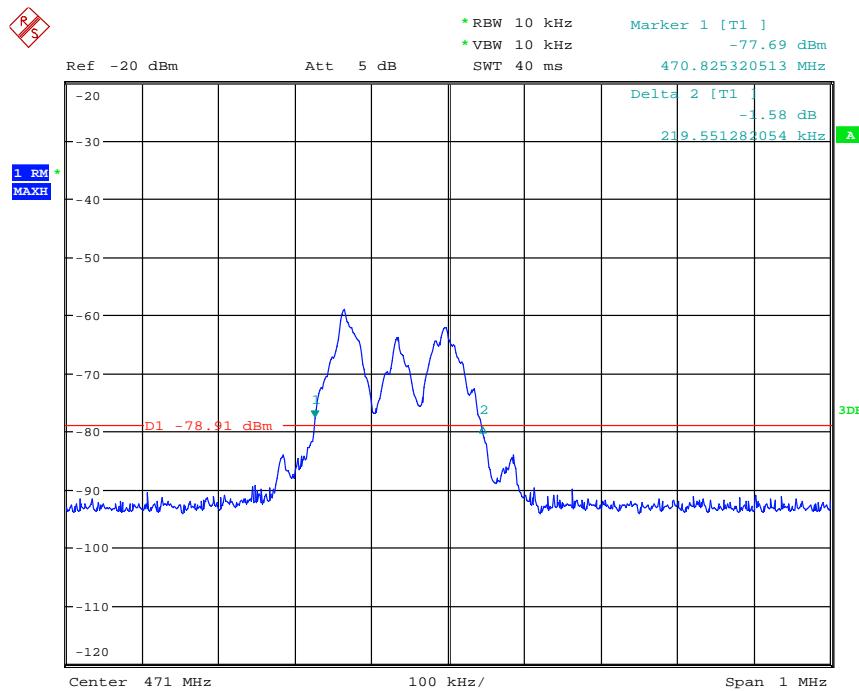
### 4.3.3 Test Result

#### A. Test Verdict:

Channel	Frequency (MHz)	20dB Bandwidth (KHz)	Refer to plot	Limit (KHz)	Result
0	420	219.55	Plot A	1050	Pass
128	445.6	219.55	Plot B	1114	Pass
255	471	219.55	Plot C	1177.5	Pass

## B. Test Plot:

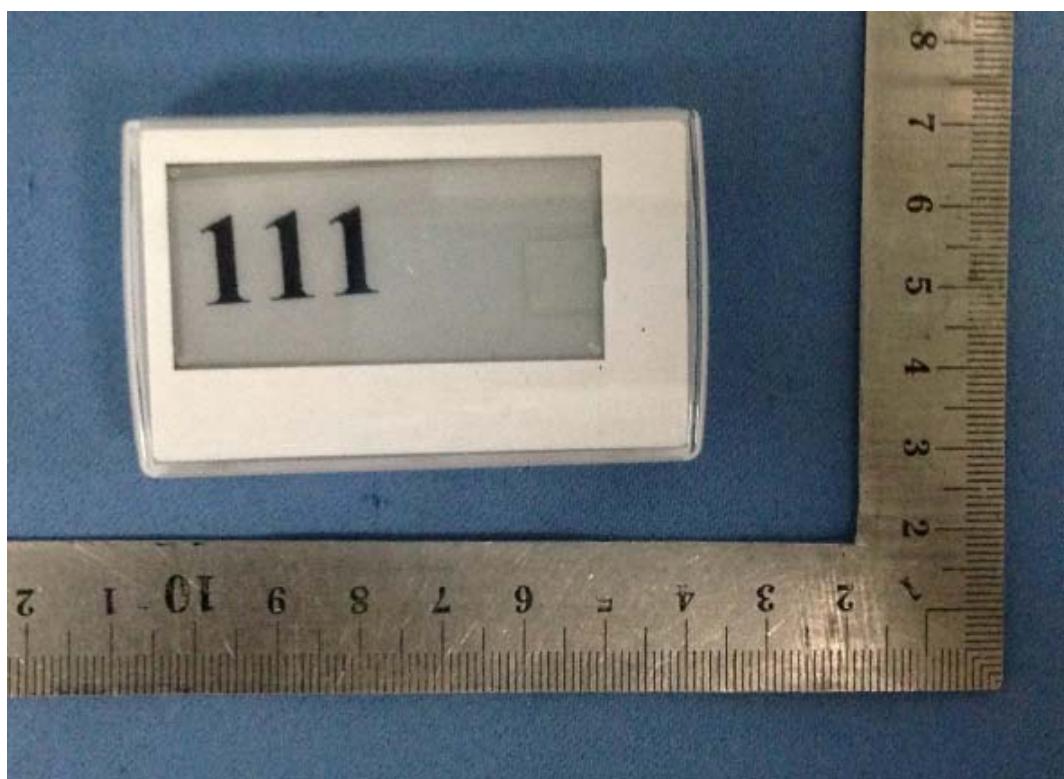


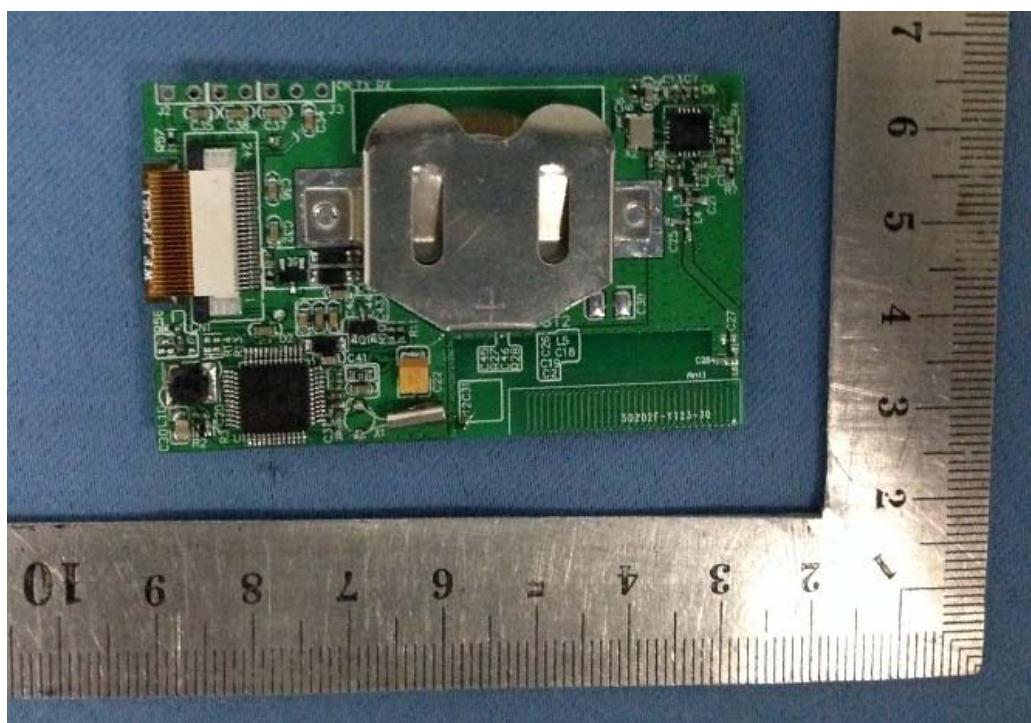
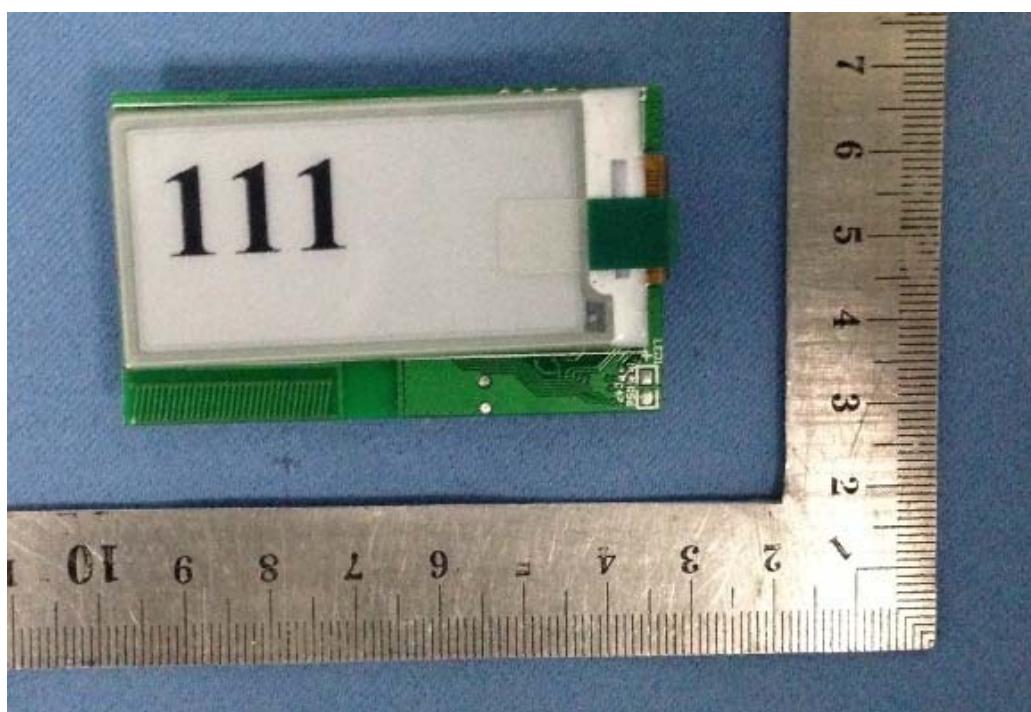


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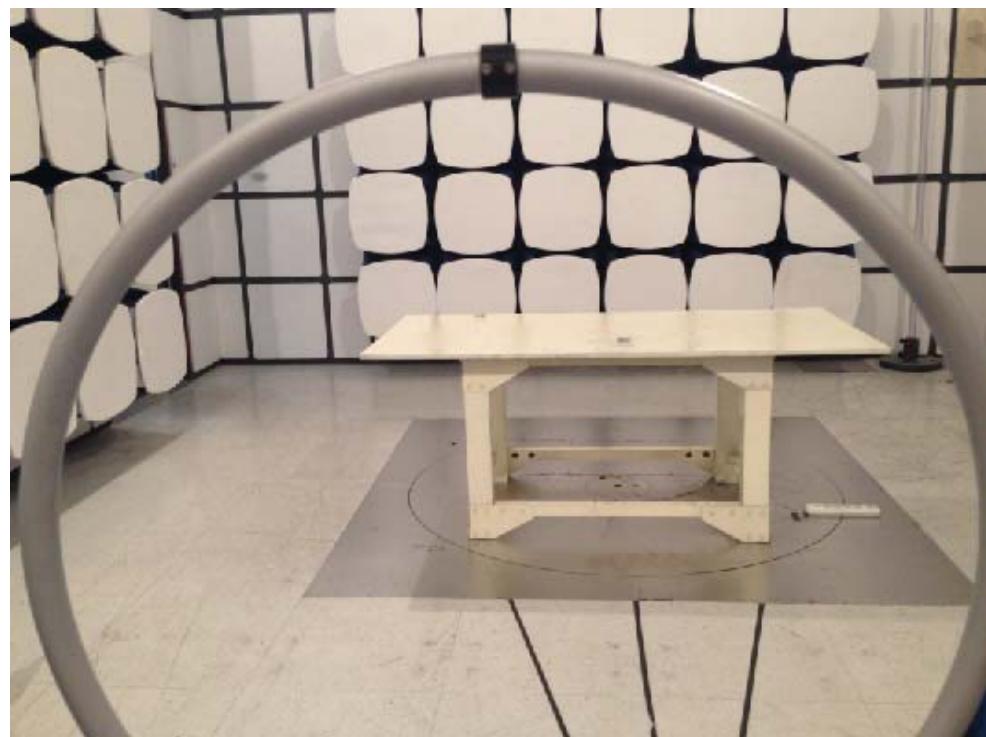
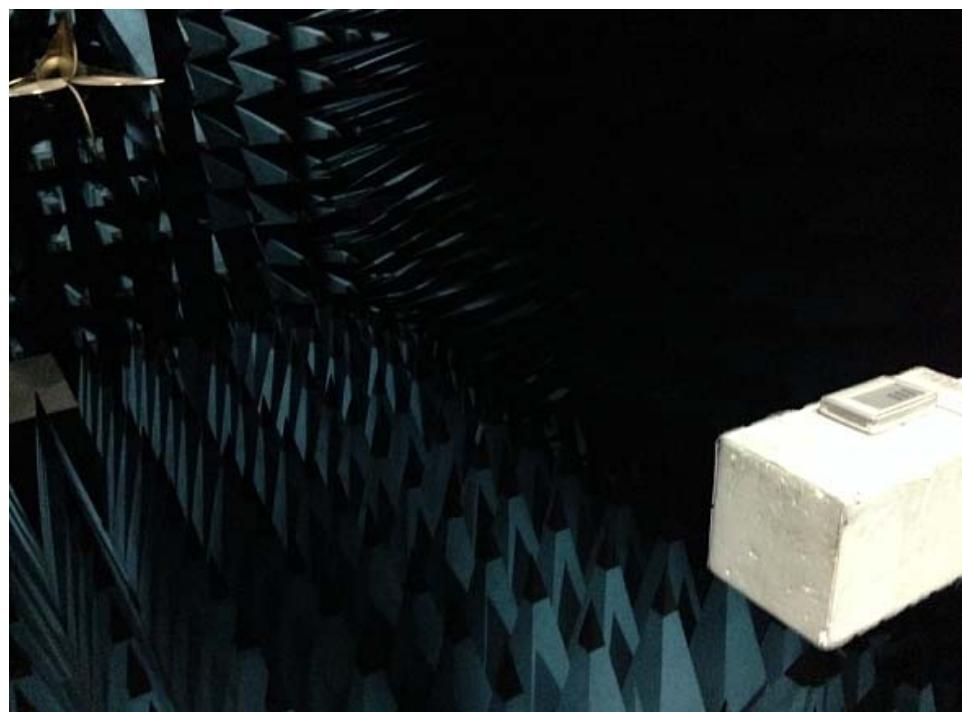
Plot B Channel 225

## Annex A Photos of the EUT

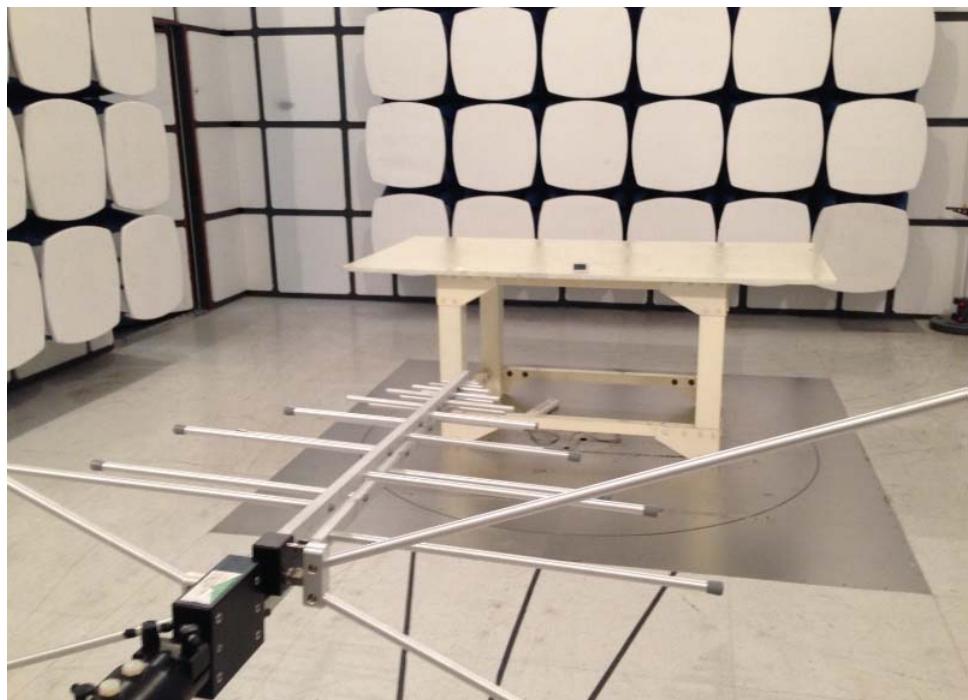




## Annex B Photos of Setup



RE 9kHz-30MHz



RE 30MHz-1GHz



RE Above 1GHz

\*\* END OF REPORT \*\*