ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT
INTENTIONAL RADIATOR CERTIFICATION

Product Name	:	WIRELESS FLASH TRANSCEIVER
Model Number	:	V5
Trade Name	:	CACTUS
FCC ID	:	VAAWFTV5
Report Number	:	SZEE100810473411-3
Date	:	Dec. 27, 2010

Standards	Results
☒ 47 CFR FCC Part 15 Subpart C 15.249	PASS

Prepared for:

HARVEST ONE LIMITED
9D, ON SHING IND BLDG, 2-16 WO LIU HANG RD, FO TAN, HONG KONG
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Prepared by:

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TABLE OF CONTENTS

Description Page

N/A means not applicable.

1. CERTIFICATION INFORMATION

Applicant & Address:	HARVEST ONE LIMITED 9D, ON SHING IND BLDG, 2-16 WO LIU HANG RD, FO TAN, HONG KONG
Manufacturer & Address:	HARVEST ONE LIMITED 9D, ON SHING IND BLDG, 2-16 WO LIU HANG RD, FO TAN, HONG KONG
Type of Test:	FCC Part 15 (Certification)
FCC ID:	VAAWFTV5
Equipment Under Test:	WIRELESS FLASH TRANSCEIVER
Test Model:	V5
Trade Name:	CACTUS
Serial Number:	Not Applicable
Technical Data:	DC 3V
Date of test:	Dec. 12, 2010 to Dec. 27, 2010
Condition of Test Sample:	Normal

The above equipment was tested by Centre Testing International for compliance with the requirements set forth in the FCC Rules and Regulations Part 15, Subpart C and the measurement procedure according to ANSI C63.4.
The test results of this report relate only to the tested sample identified in this report.

Prepared by : Hengpei Wang

Reviewed by : Louisa Lu

Approved by : Lily Yan
Supervisor

Date Dec. 27, 2010

2. TEST SUMMARY

Clause	Test Item	Rule	Result
1	Radiated Emission	FCC 15.209 FCC 15.249(a) (d)	**PASS**
2	20dB Bandwidth	FCC 15.215(c)	**PASS**
3	Out of Band Emission	FCC 15.249 (d)	**PASS**

3. MEASUREMENT UNCERTAINTY

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement items	Uncertainty
Radiated Emissions / Out of Band Emission	4.4dB

4. PRODUCT INFORMATION

The EUT works in 2.4GHz frequency band with 16 selectable channels (channel 1 to 5 has same frequency). It need two EUT work together when in normal use, one act as a transmitter and the other one act as a receiver when them works in same channel. The EUT is powered by 2*AAA 1.5V batteries.

The relevant frequency of each channel is as following:

Channel 1 2.445796783GHz
Channel 2 2.445796783GHz
Channel 3 2.445796783GHz
Channel 4 2.445796783GHz
Channel 5 2.445796783GHz
Channel 6 2.448996002GHz
Channel 7 2.452195221GHz
Channel 8 2.455394440GHz
Channel 9 2.458593658GHz
Channel 10 2.461792877GHz
Channel 11 2.464992096GHz
Channel 12 2.468191315GHz
Channel 13 2.471390533GHz
Channel 14 2.474589752GHz
Channel 15 2.477788971GHz
Channel 16 2.480988190GHz

5. TEST EQUIPMENT LIST

10M Semi-anechoic Chamber - Radiated disturbance Test				
Equipment	Manufacturer	Model	Serial No.	Due Date
10M Chamber & Accessory Equipment	Rainford	--	--	06/18/2012
Receiver	R&S	ESCI	100009	07/10/2011
Receiver	R&S	ESCI	100435	10/27/2011
Spectrum Analyzer	R&S	FSP40	100416	07/10/2011
Biconilog Antenna	schwarzbeck	VULB9136	9136-401	08/03/2011
Horn Antenna	ETS-LINGREN	3117	00044562	07/31/2011
Microwave Preamplifier	Agilent	11909A	186871	N/A

6. SYSTEM TEST CONFIGURATION

6.1. JUSTIFICATION

For emission testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables were manipulated to produce worst case emissions. It was powered by 2*AAA 1.5V batteries. Only the worst case data were recorded in this test report.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

The unit was operated standalone and placed in the centre of the turntable.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

6.2. EUT EXERCISING SOFTWARE

No Software was used during testing.

7. Radiated Emissions Measurement

7.1. LIMITS

(1) the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/ meter)	Field strength of harmonics (microvolts/ meter)	Distance (m)
902–928 MHz	50	500	3
2400–2483.5 MHz	50	500	3
5725–5875 MHz	50	500	3
24.0–24.25 GHz	250	2500	3

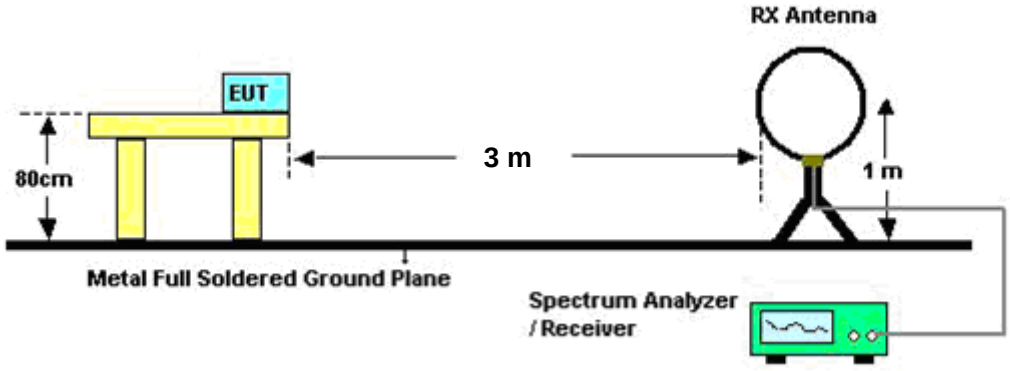
(2) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209 as the following , whichever is the lesser attenuation.

Frequency (MHz)	Field strength (μV/m)	Distance (m)
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

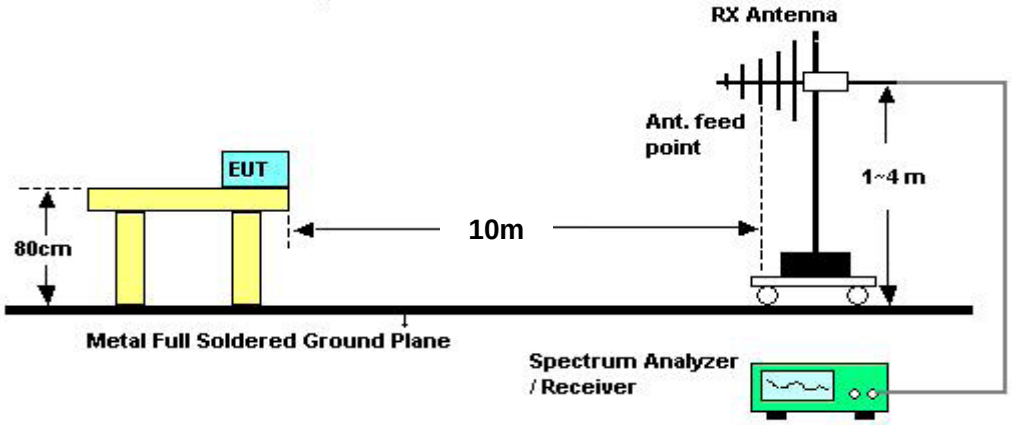
Note: the tighter limit applies at the band edges.

7.2. BLOCK DIAGRAM OF TEST SETUP

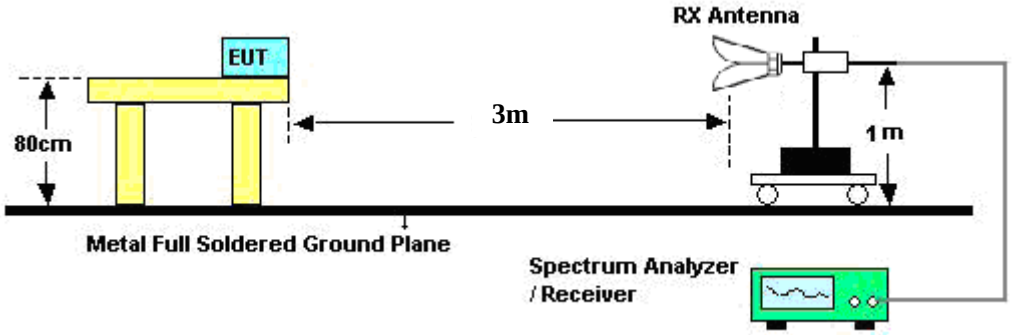
For radiated emissions from 9kHz to 30MHz



For radiated emissions from 30 - 1000MHz



For radiated emissions from 1GHz to 25GHz



7.3. TEST PROCEDURE

A. Above 30MHz

a. The EUT was placed on the top of a turntable 0.8 meters above the ground in the chamber, 10 meters away from the antenna (wideband antenna), which was mounted on the top of a variable-height antenna tower. The maximum values of the field strength are recorded by adjusting the polarizations of the test antenna and rotating the turntable.

b. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.

c. The test frequency analyzer system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

B. Below 30MHz

a. The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The maximum values of the field strength are recorded by adjusting the polarizations of the test antenna and rotating the turntable.

b. For each suspected emission, the EUT was arranged to its worst case and then turn table was turned from 0 degrees to 360 degrees to find the maximum reading.

c. The test frequency analyzer system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

7.4. TEST RESULT

EUT	**:**	WIRELESS FLASH TRANSCEIVER	**Voltage**	**:**	DC 3V
M/N	**:**	V5	**Temperature**	**:**	26℃
Mode	**:**	Transmitting	**Humidity**	**:**	50%

Fundamental Emission Test Result:

Test Results-(Measurement Distance: below 1GHz :10m, above 1GHz 3m)									
Frequency	Reading Level - peak	Total Factor	Final Emission Peak	AV factor	Final Emission AV	Limit		Antenna	Result
						QP	AV		
(MHz)	(dBμV/m)	(dB)	(dBμV/m)	（dB）	(dBμV/m)	(dBμV/m)		(H/V)	(P/F)
2445.797	91.8	4.6	96.4	-10.26	86.14	114.0	94.0	H	P
2445.797	92.1	4.6	96.7	-10.26	86.44	114.0	94.0	V	P
2464.992	91.3	4.6	95.9	-10.26	85.64	114.0	94.0	H	P
2464.992	90.8	4.6	95.4	-10.26	85.14	114.0	94.0	V	P
2480.988	91.0	4.6	95.6	-10.26	85.34	114.0	94.0	H	P
2480.988	90.1	4.6	94.7	-10.26	84.44	114.0	94.0	V	P

Spurious Emission Test Result：

Test Results-(Measurement Distance: below 1GHz :10m, above 1GHz 3m)									
Frequency	Reading Level - peak	Total Factor	Final Emission Peak	AV factor	Final Emission AV	Limit		Antenna	Result
						QP	AV		
(MHz)	(dBμV/m)	(dB)	(dBμV/m)	（dB）	(dBμV/m)	(dBμV/m)		(H/V)	(P/F)
41.640	33.2	-18.6	14.6	-10.26	--	30.0	--	H	P
47.460	33.4	-18.7	14.7	-10.26	--	30.0	--	H	P
1000.000	33.6	-2.8	30.8	-10.26	--	44.0	--	H	P
4892.000	45.6	10.5	56.1	-10.26	45.84	74.0	54.0	H	P
92.080	33.1	-19.3	13.8	-10.26	--	33.5	--	V	P
710.94	32.1	-8.3	23.8	-10.26	--	36.0	--	V	P
1000.000	31.6	-2.8	28.8	-10.26	--	44.0	--	V	P
2190.000	41.5	4.0	45.5	-10.26	--	74.0	--	V	P
4892.000	41.5	10.4	55.2	-10.26	44.94	74.0	54.0	V	P

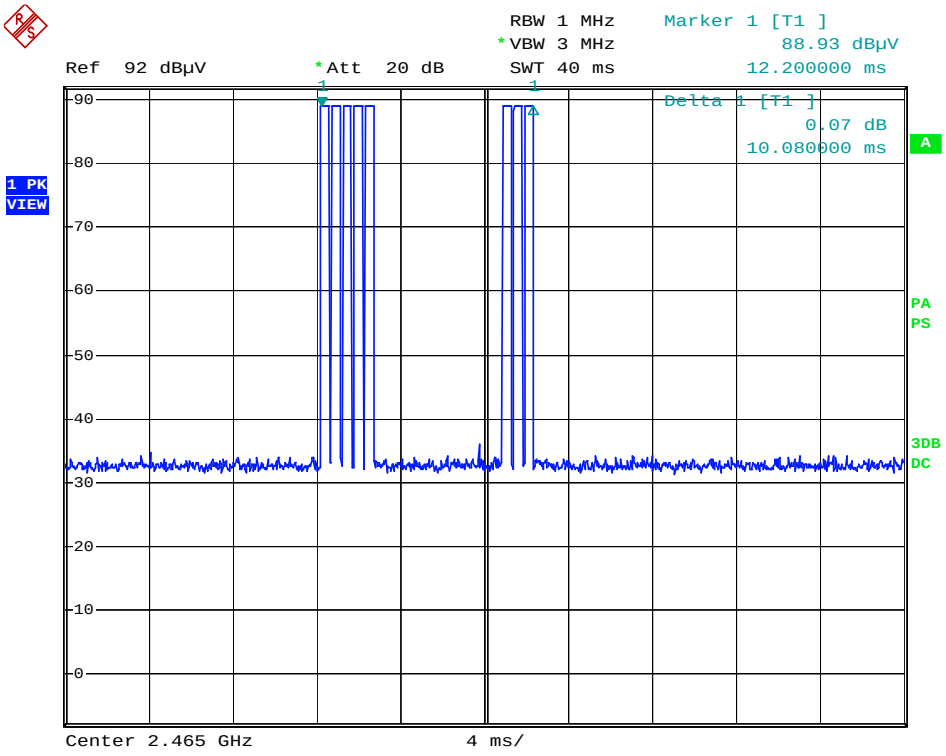
Note 1: The duty cycle is simply the on-time divided by the period: The duration of total sends time in 10.08ms: 8x0.387ms=3.096ms

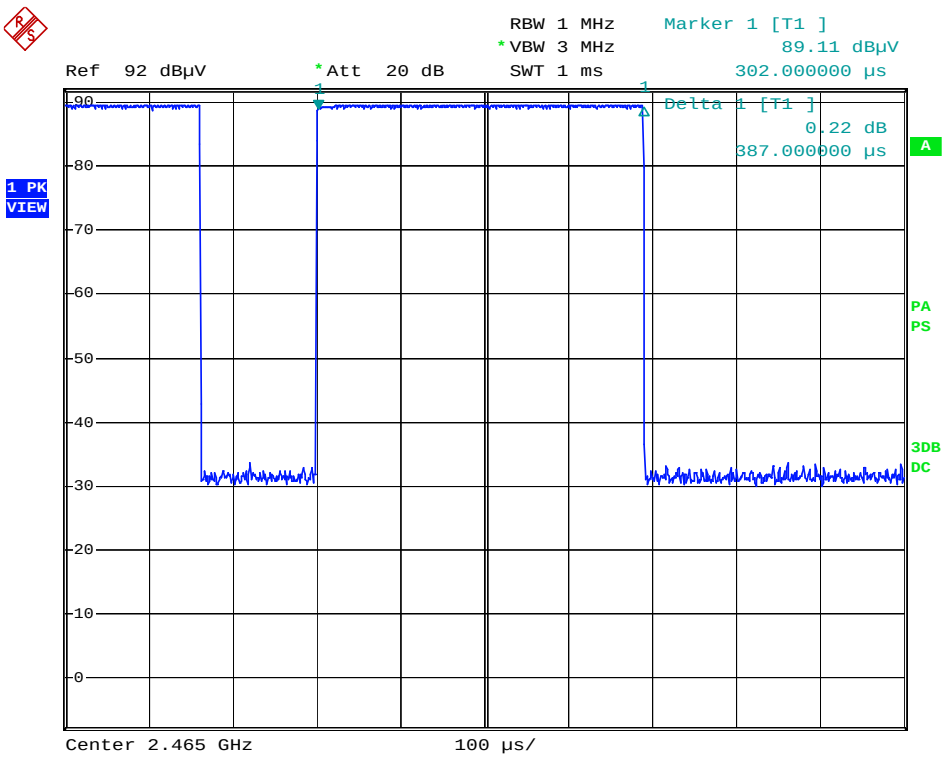
DC = 3.096 /10.08 = 0.307

Therefore, the averaging factor is found by 20 $\log_{10}$ 0.307 = -10.26 dB

The following plots showed the characteristics of the pulse train for one of these functions.

The plots of duty cycle:





8. OUT OF BAND EMISSION MEASUREMENT

8.1. LIMITS

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the funda-mental or to the general radiated emis-sion limits in § 15.209, whichever is the lesser attenuation.

8.2. BLOCK DIAGRAM OF TEST SETUP

Spectrum Analayzer EUT

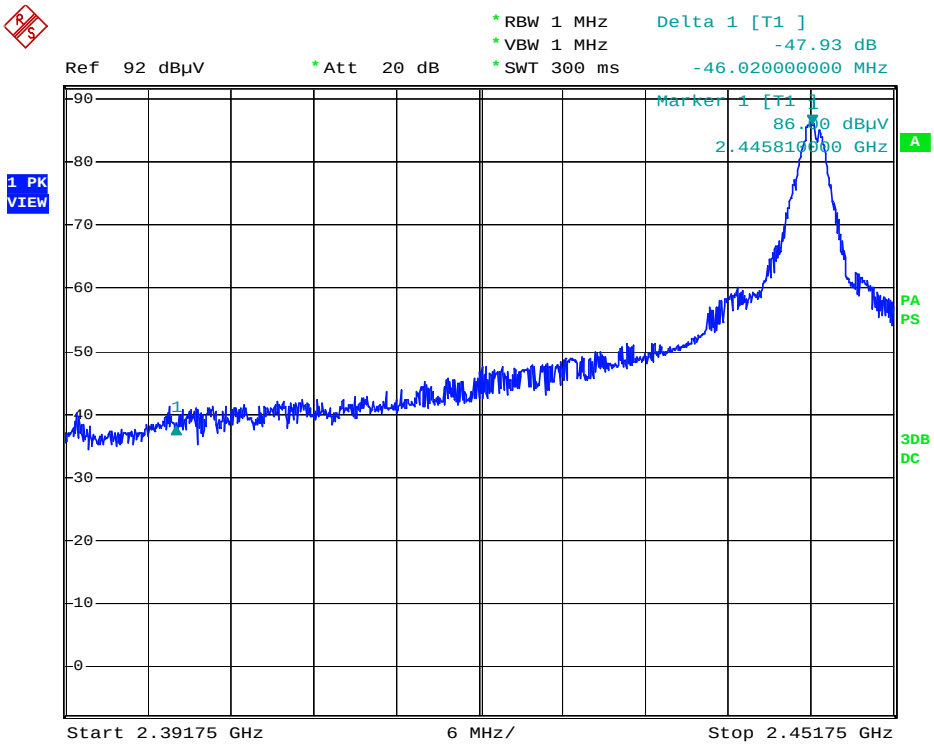
8.3. TEST PROCEDURE

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set spectrum analyzer's RBW and VBW to applicable value with Peak in Max Hold.
3. Record the emission drops at the frequency 2400MHz&2483.5MHz respectively.
4. Use the marker method to determine the frequency 2400MHz&2483.5MHz compliance as required.

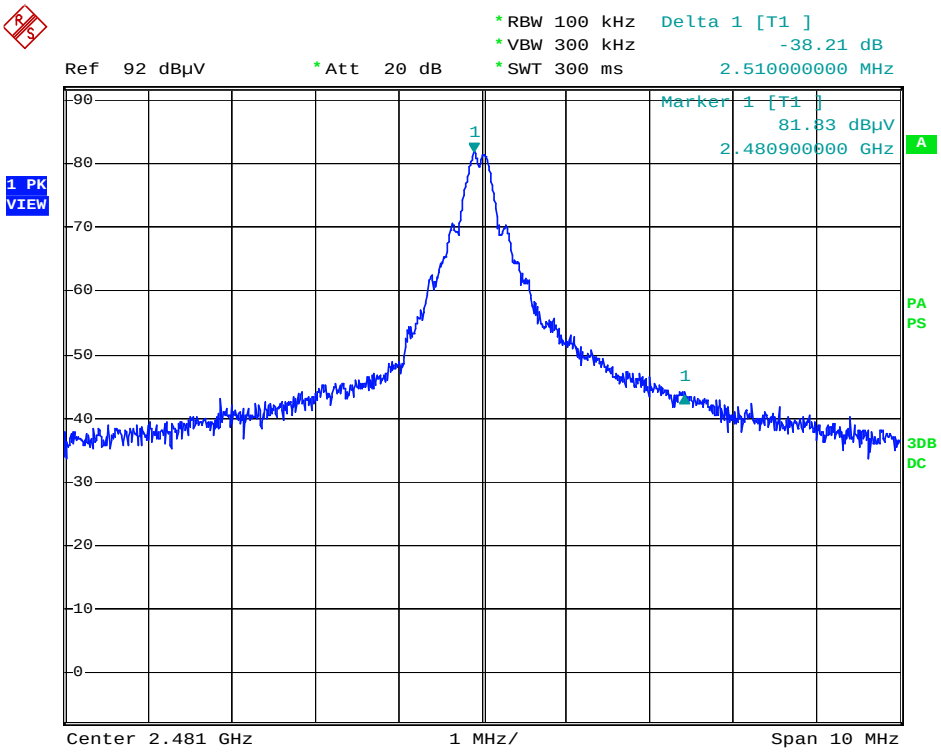
8.4. TEST RESULT

Freq. (MHz)	FundamentalEmission (dBμV/m)		Delta (dB)	Final Emission (dBμV/m)		Limit (dBμV/m)		Result
	PK	AV		PK	AV	PK	AV	
2400.0	96.70	86.44	-47.93	48.77	38.51	74.0	54.0	Pass
2483.5	95.60	85.34	-38.21	57.39	47.13	74.0	54.0	Pass

8.5. TEST GRAPH



Graph 1


*RBW 100 kHz
*VBW 300 kHz
*SWT 300 ms
Delta 1 [T1]
-38.21 dB
2.510000000 MHz
Ref 92 dBµV
*Att 20 dB
Marker 1 [T1]
81.83 dBµV
2.480900000 GHz
1 PK
VIEW
A
PA
PS
3DB
DC
90
80
70
60
50
40
30
20
10
0
Center 2.481 GHz
1 MHz/
Span 10 MHz

Graph 2

9. 20DB BANDWIDTH MEASUREMENT

9.1. LIMITS

The bandwidth should be contained within the frequency band which designed in the rule section under the equipment is operated

9.2. BLOCK DIAGRAM OF TEST SETUP

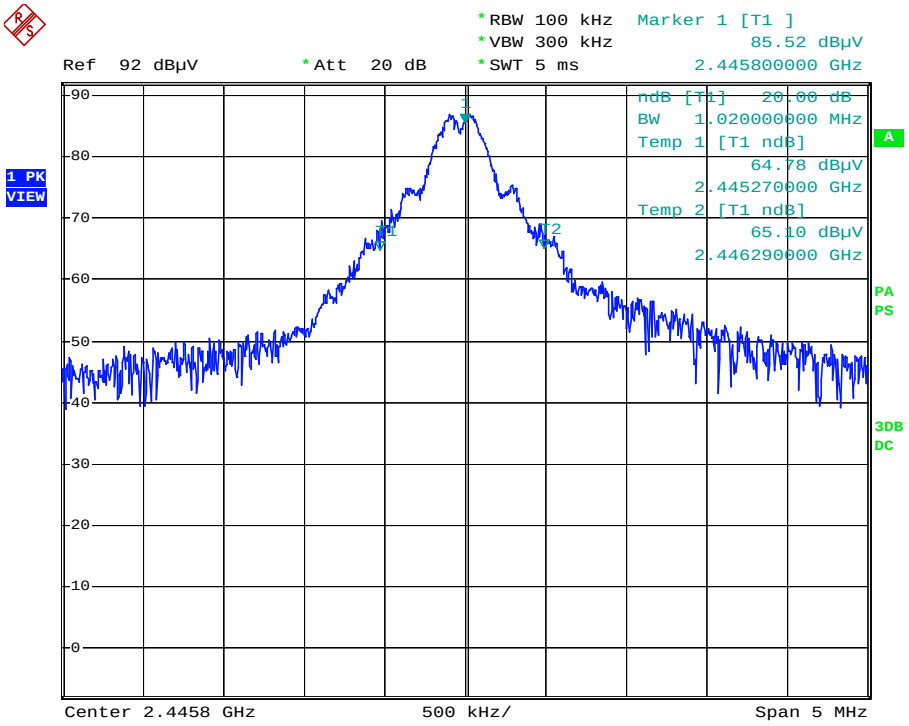
9.3. TEST PROCEDURE

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set spectrum analyzer's RBW and VBW to applicable value with Peak in Max Hold.
3. A PEAK output reading was taken, a DISPLAY line was drawn 20 dB lower than PEAK level.
4. The 20dB bandwidth was determined from where the channel output spectrum intersected the display line.

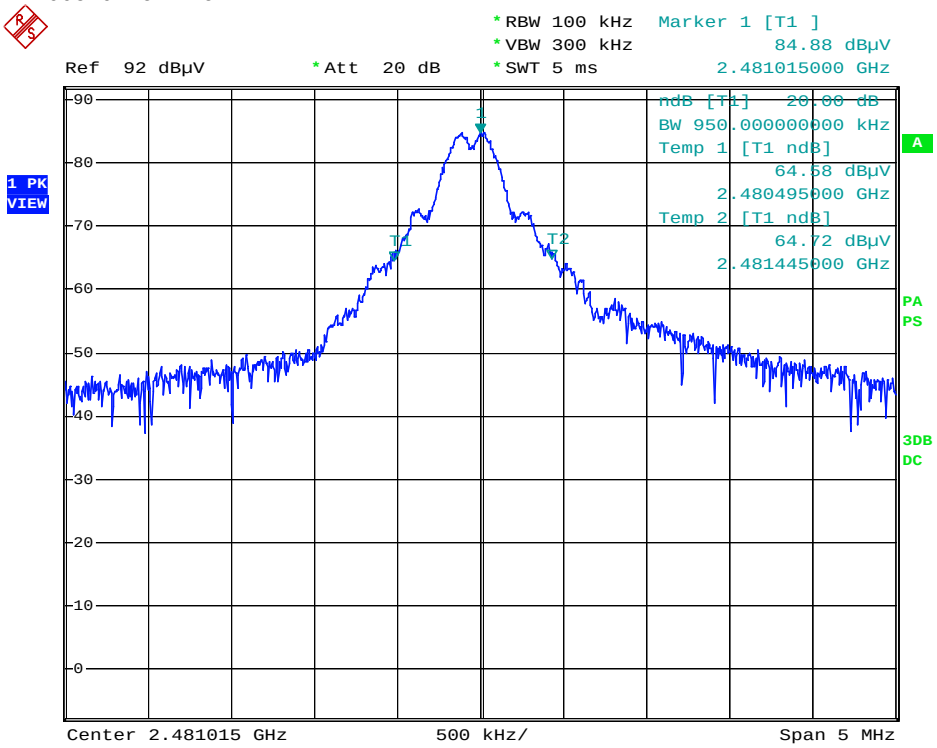
9.4. TEST RESULT

Measured Freq. (GHz)	Limit (MHz)	Result
Lowest:2.44527	>2400.0	Pass
Highest:2.48144	<2483.5	Pass

9.5. TEST GRAPH



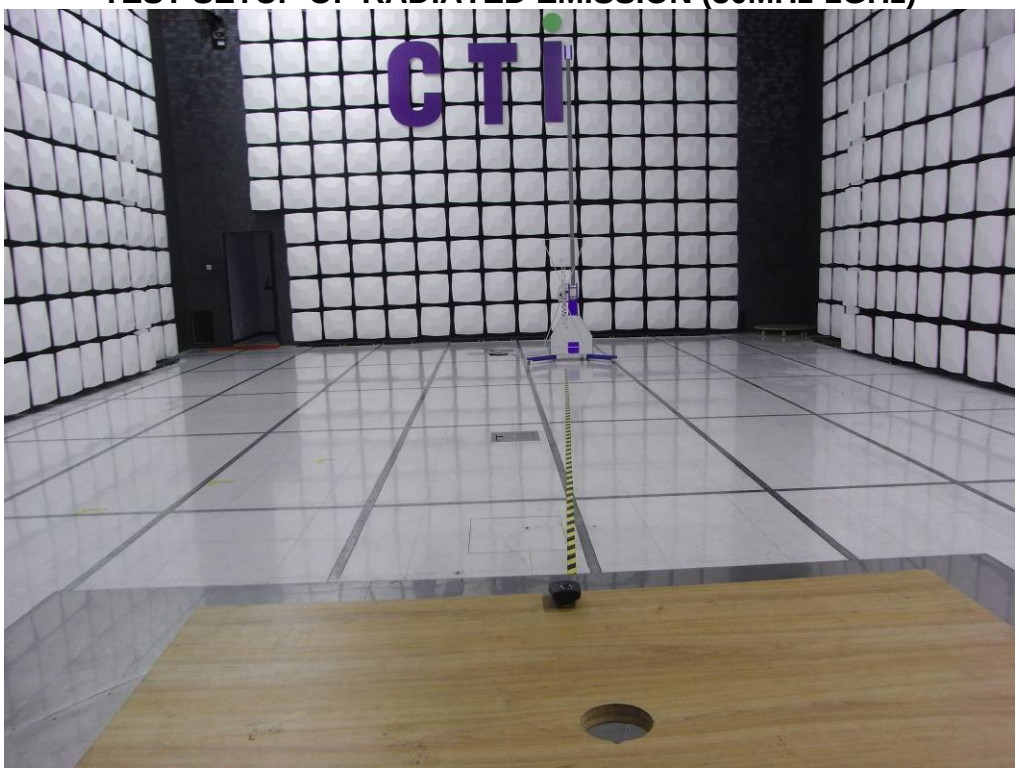
2446MHz


*RBW 100 kHz
*VBW 300 kHz
*SWT 5 ms
Marker 1 [T1]
84.88 dBµV
2.481015000 GHz
Ref 92 dBµV
*Att 20 dB
ndB [T1] 20.00 dB
BW 950.000000000 kHz
Temp 1 [T1 ndB]
64.58 dBµV
2.480495000 GHz
Temp 2 [T1 ndB]
64.72 dBµV
2.481445000 GHz
1 PK
VIEW
A
PA
PS
3DB
DC
90
80
70
60
50
40
30
20
10
0
T1
T2
Center 2.481015 GHz
500 kHz/
Span 5 MHz

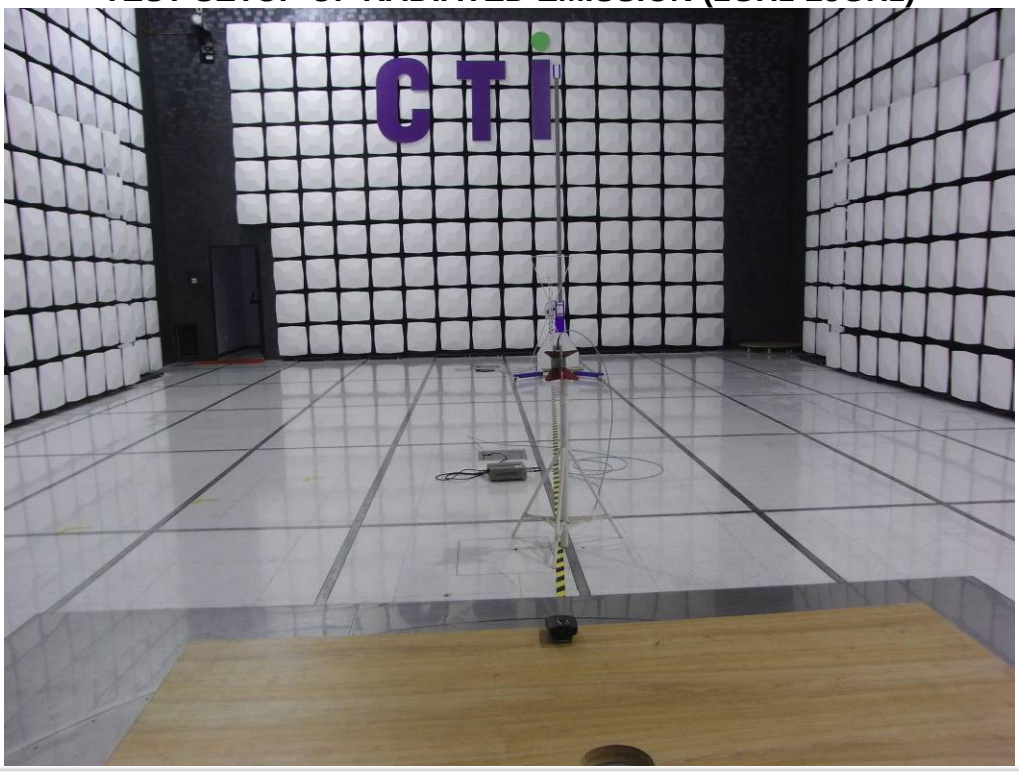
2481MHz

APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

TEST SETUP OF RADIATED EMISSION (30MHz-1GHz)



TEST SETUP OF RADIATED EMISSION (1GHz-25GHz)

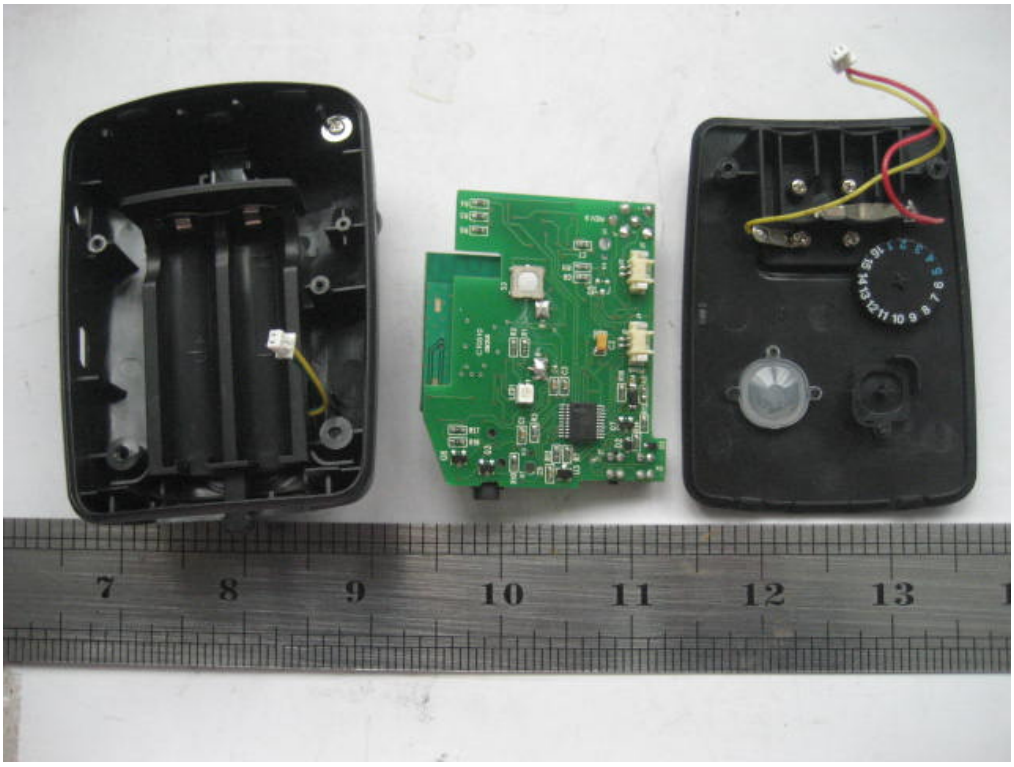


APPENDIX 2 EXTERNAL PHOTOGRAPHS OF EUT

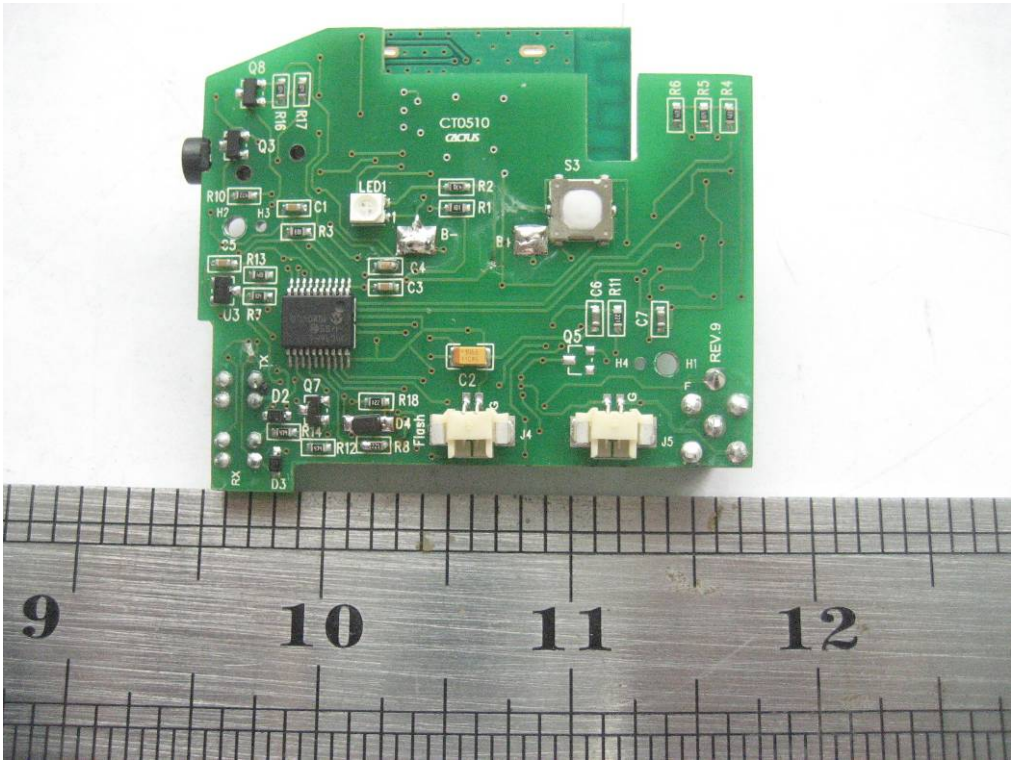
Front View of EUT

Rear View of EUT

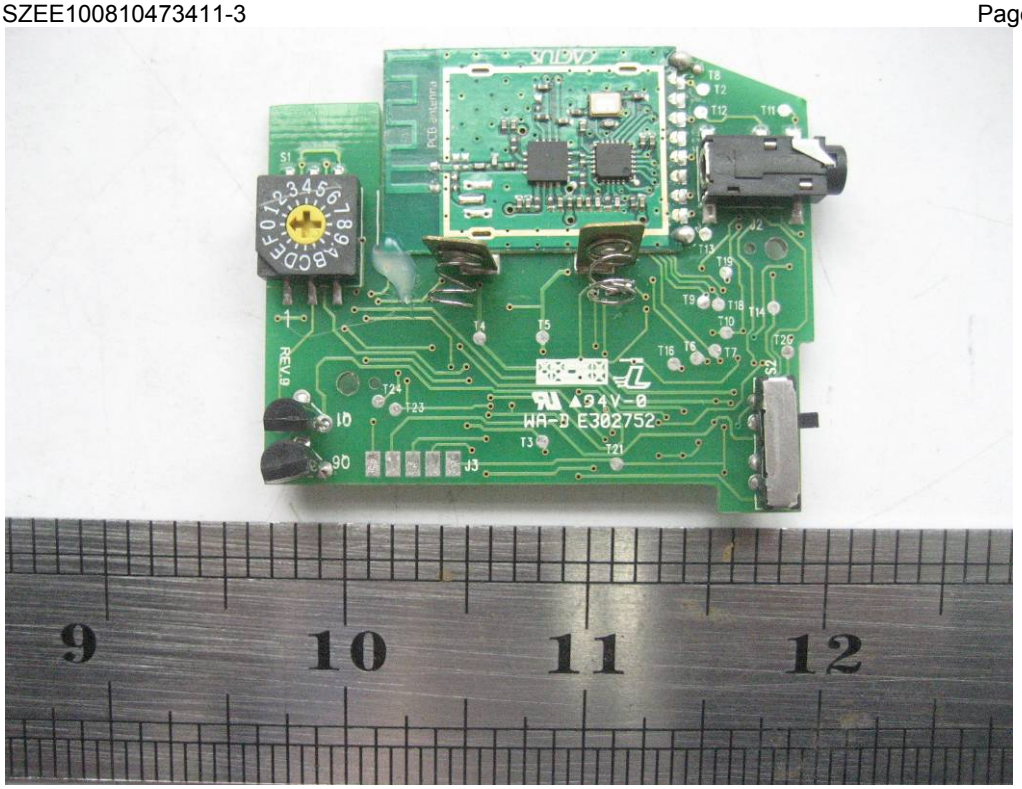
APPENDIX 3 INTERNAL PHOTOGRAPHS OF EUT



Internal View of EUT-1



Internal View of EUT-2



Internal View of EUT-3

------- End of report -------