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RADIO TEST REPORT

Report No: STS1608239F01

Issued for

Walli Wearables Inc.

17330 Preston Road, STE # 200D, Dallas, Texas. TX 75080
USA

Product Name:	WALLI – Smart Wallet
Brand Name:	Walli
Test Model Name:	Walli
Series Model:	N/A
FCC-ID:	2AJNH-WALLI
Test Standard:	FCC Part 15.247

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TEST RESULT CERTIFICATION

Applicant's name: Walli Wearables Inc.

Address: 17330 Preston Road, STE # 200D, Dallas, Texas. TX 75080 USA

Manufacture's Name.....: SHENZHEN BOTERLAN TECHNOLOGY CO.,LTD

Address: 4F.Building B2 Gangshen High Tech zone, Gongming, guangming, ShenZhen, Guangdong, China

Product description

Product name.....: WALLI – Smart Wallet

Trademark: Walli

Model and/or type reference ..: Walli

Series Model.....: N/A

Standards: FCC Part15.247

Test procedure ANSI C63.10-2013

This device described above has been tested by STS, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test:

Date (s) of performance of tests: 17 Aug. 2016 ~ 02 Sep. 2016

Date of Issue.....: 03 Sep. 2016

Test Result.....: **Pass**

Testing Engineer :

(Tony Liu)

Technical Manager :

(Vita Li)

Authorized Signatory :

(Bovey Yang)



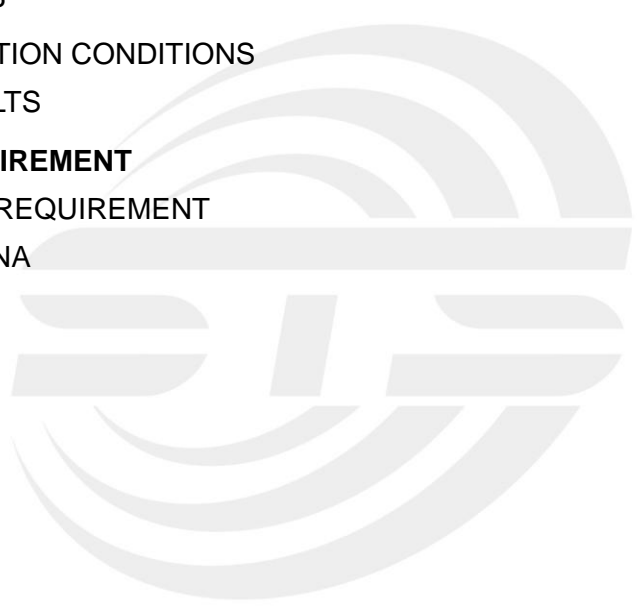
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1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:
KDB 558074 D01 DTS Meas Guidance v03r05

FCC Part 15.247, Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	N/A	--
15.247 (a)(2)	6dB Bandwidth	PASS	--
15.247 (b)(3)	Output Power	PASS	--
15.247 (c)	Radiated Spurious Emission	PASS	--
15.247 (d)	Conducted Spurious & Band Edge Emission	PASS	--
15.247 (e)	Power Spectral Density	PASS	--
15.205	Band Edge Emission	PASS	--
15.203	Antenna Requirement	PASS	--

NOTE:

(1) "N/A" denotes test is not applicable in this Test Report

(2) all tests are according to ANSI C63.10-2013

1.1 TEST FACTORY

Shenzhen STS Test Services Co., Ltd.

Add. : 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road,

Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

CNAS Registration No.: L7649;

FCC Registration No.: 842334; IC Registration No.: 12108A-1



1.2 MEASUREMENT UNCERTAINTY

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

No.	Item	Uncertainty
1	Conducted Emission (9KHz-150KHz)	$\pm 2.88\text{dB}$
2	Conducted Emission (150KHz-30MHz)	$\pm 2.67\text{dB}$
3	RF power,conducted	$\pm 0.70\text{dB}$
4	Spurious emissions,conducted	$\pm 1.19\text{dB}$
5	All emissions,radiated(<30M) (9KHz-30MHz)	$\pm 2.45\text{dB}$
6	All emissions,radiated(<1G) 30MHz-200MHz	$\pm 2.83\text{dB}$
7	All emissions,radiated(<1G) 200MHz-1000MHz	$\pm 2.94\text{dB}$
8	All emissions,radiated(>1G)	$\pm 3.03\text{dB}$
9	Temperature	$\pm 0.5^{\circ}\text{C}$
10	Humidity	$\pm 2\%$



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	WALLI – Smart Wallet	
Trade Name	Walli	
Test Model Name	Walli	
Series Model	N/A	
Model Difference	N/A	
Product Description	The EUT is WALLI – Smart Wallet	
	Operation Frequency:	2402~2480 MHz
	Modulation Type:	GFSK
	Radio Technology	BLE
	Number Of Channel	40
	Antenna Designation:	Please see Note 3.
	Antenna Gain (dBi)	2 dBi
	Duty Cycle	>98%
Channel List	Please refer to the Note 2.	
Battery	Battery(rating): Rated Voltage: 3.0V Charge Limit: 3.2V Capacity: 220mAh	
Hardware version number	N/A	
Software version number	N/A	
Connecting I/O Port(s)	N/A	

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.



2.

Channel List							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2402	11	2422	21	2442	31	2462
02	2404	12	2424	22	2444	32	2464
03	2406	13	2426	23	2446	33	2466
04	2408	14	2428	24	2448	34	2468
05	2410	15	2430	25	2450	35	2470
06	2412	16	2432	26	2452	36	2472
07	2414	17	2434	27	2454	37	2474
08	2416	18	2436	28	2456	38	2476
09	2418	19	2438	29	2458	39	2478
10	2420	20	2440	30	2460	40	2480

3.

Table for Filed Antenna

Ant.	Brand	Test Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	Walli	Walli	FPCB Antenna	N/A	2	BT 4.0 ANT





2.2 DESCRIPTION OF TEST MODES

For conducted test items and radiated spurious emissions

Each of these EUT operation mode(s) or test configuration mode(s) mentioned below was evaluated respectively..

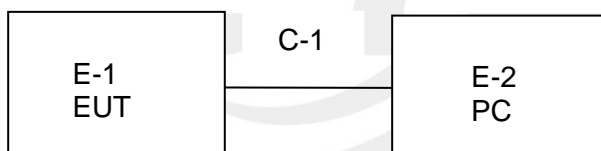
Pretest Mode	Description	Data/Modulation
Mode 1	TX CH1(2402MHz)	1 MHz/GFSK
Mode 2	TX CH20(2440MHz)	1 MHz/GFSK
Mode 3	TX CH40(2480MHz)	1 MHz/GFSK

Note:

(1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported

(2) The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED





2.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
E-1	WALLI – Smart Wallet	Walli	Walli	N/A	EUT
E-2	PC	HP	500-320cx	4CV428DQYN	N/A

Item	Shielded Type	Ferrite Core	Length	Note
C-1	Unshielded	NO	90cm	/

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.



2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Spectrum Analyzer	Agilent	E4407B	MY50140340	2015.10.25	2016.10.24
Test Receiver	R&S	ESCI	101427	2015.10.25	2016.10.24
Bilog Antenna	TESEQ	CBL6111D	34678	2015.11.25	2016.11.24
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-1343	2016.03.06	2017.03.05
Horn Antenna	Schwarzbeck	BBHA 9170	9170-0741	2016.03.06	2017.03.05
50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2016.06.06	2017.06.05
PreAmplifier	Agilent	8449B	60538	2015.10.25	2016.10.24
Loop Antenna	ARA	PLA-1030/B	1029	2016.06.08	2017.06.07
Preamplifier	Agilent	8449B	60538	2015.11.05	2016.11.05
Low frequency cable	EM	R01	N/A	N/A	N/A
High frequency cable	SCHWARZBECK	AK9515H	SN-96286/96287	N/A	N/A
Semi-anechoic chamber	Changling	966	N/A	2015.10.25	2016.10.24

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
EMI Test Receiver	R&S	ESPI	102086	2015.11.20	2016.11.19
LISN	R&S	ENV216	101242	2015.10.25	2016.10.24
LISN	EMCO	3810/2NM	000-23625	2015.10.25	2016.10.24
Conduction Cable	EM	C01	N/A	N/A	N/A
Shielding Room	Changling	854	N/A	2015.10.25	2016.10.24

RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
USB RF power sensor	DARE	RPR3006W	15I00041SNO03	2015.10.25	2016.10.24
Spectrum Analyzer	Agilent	E4407B	MY50140340	2015.10.25	2016.10.24
Signal Analyzer	Agilent	N9020A	MY49100060	2015.11.18	2016.11.17



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

operating frequency band. In case the emission fall within the restricted band specified on Part 207(a) limit in the table below has to be followed.

FREQUENCY (MHz)	Conducted Emission limit (dBuV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

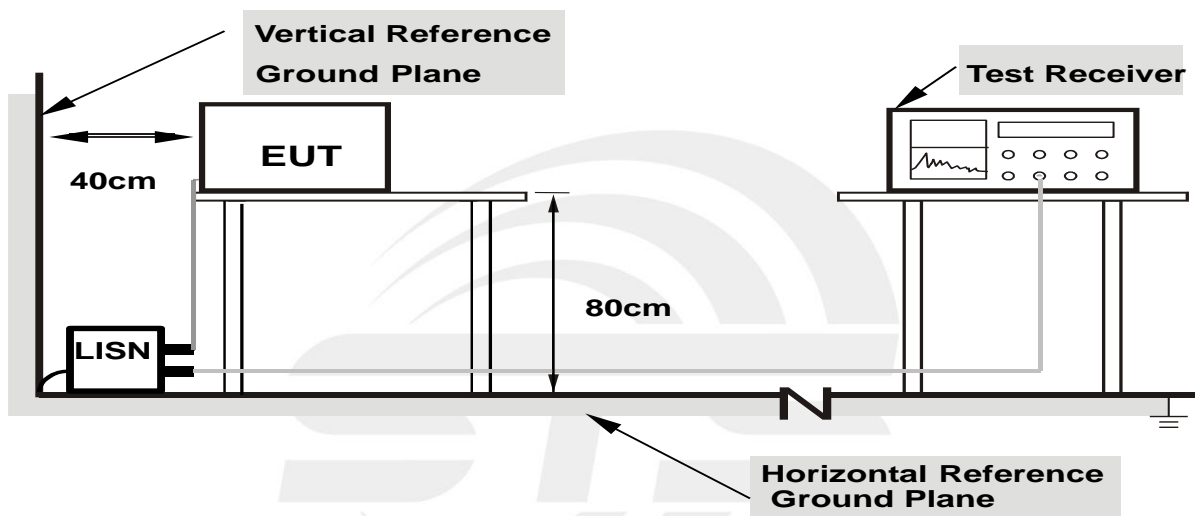
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.2 TEST PROCEDURE

- The EUT was 0.8 meters from the horizontal ground plane and 0.4 meters from the vertical 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 at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.3 TEST SETUP



Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.4 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.



3.5 TEST RESULTS

Temperature:	26 °C	Relative Humidity:	54%
Pressure:	1010hPa	Phase:	L/N
Test Mode:	N/A		

Note: EUT is a battery power device, not applicable AC conducted emission test..





4. RADIATED EMISSION MEASUREMENT

4.1 RADIATED EMISSION LIMITS

in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on Part 15. 205(a)&209(a) limit in the table below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (Frequency Range 9kHz-1000MHz)

Frequencies (MHz)	Field Strength (micorvolts/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

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

For Radiated Emission

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak
Start Frequency	1000 MHz(Peak/AV)
Stop Frequency	10 th carrier hamonic(Peak/AV)
RB / VB (emission in restricted band)	1 MHz / 3 MHz

For Band edge

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	Lower Band Edge: 2300 to 2430 MHz Upper Band Edge: 2450 to 2500 MHz
RB / VB (emission in restricted band)	1 MHz / 3 MHz



Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.2 TEST PROCEDURE

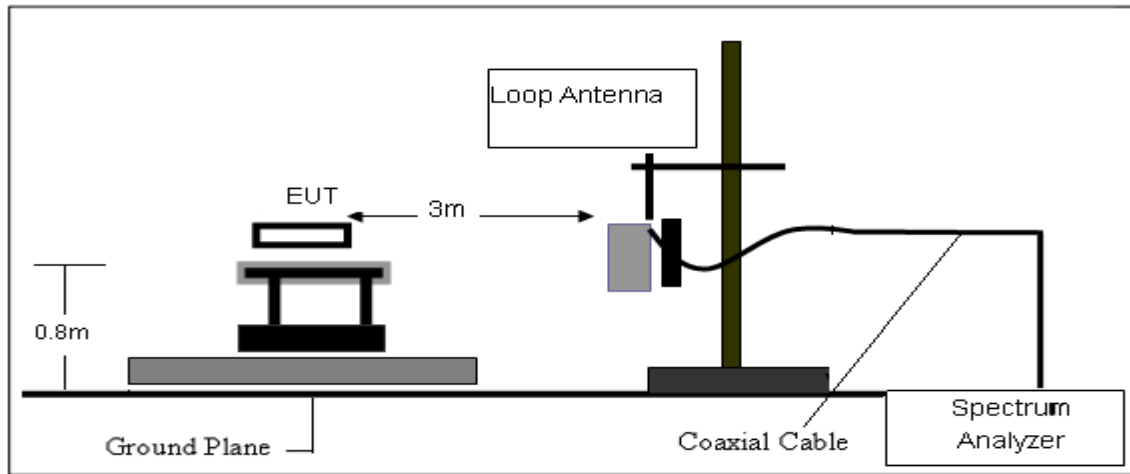
- The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz, and above 1GHz.
- The EUT was placed on the top of a rotating table 0.8 meters(above 1GHz is 1.5 m) above the ground at a 3 meter anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment shall be 0.8 m(above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. Horizontal and vertical polarizations of the antenna are set to make the measurement
- 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.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

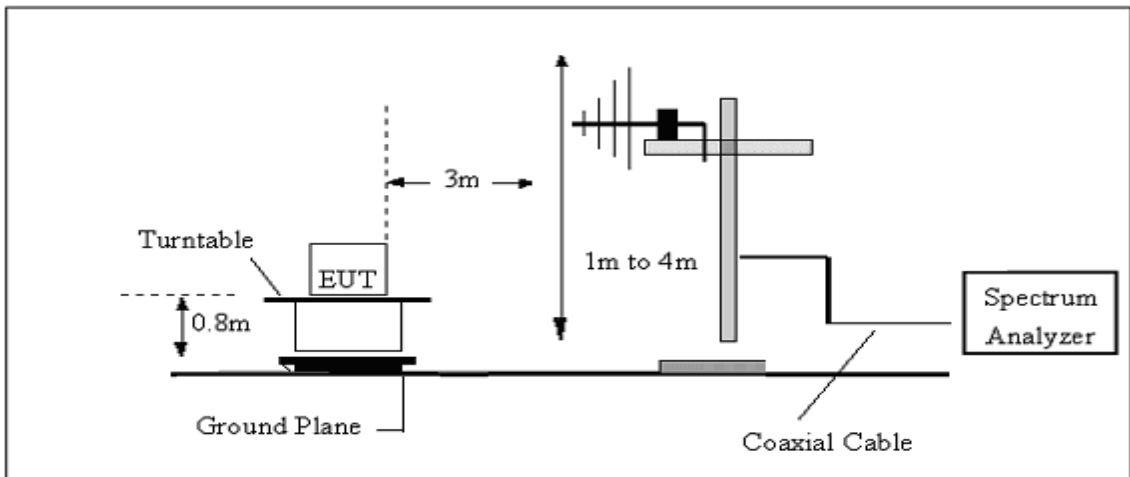
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

4.3 TEST SETUP

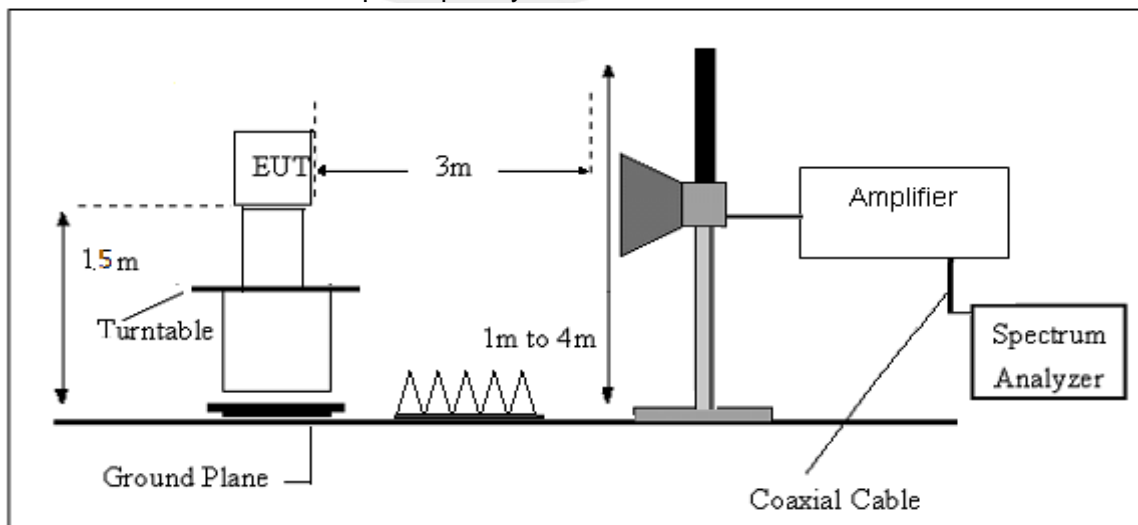
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



4.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



4.5 TEST RESULTS

(Between 9KHz – 30 MHz)

Temperature:	20 °C	Relative Humidity:	48%
Pressure:	1010hPa	Test Voltage:	DC 3.0V
Test Mode:	TX Mode	Polarization:	--

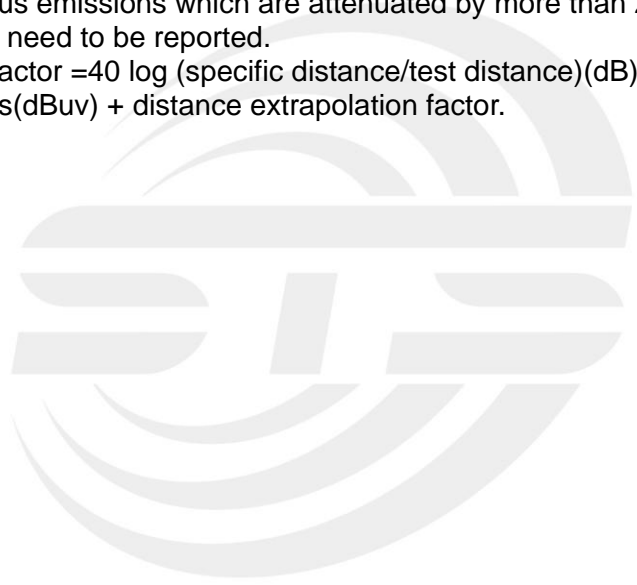
Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance/test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.





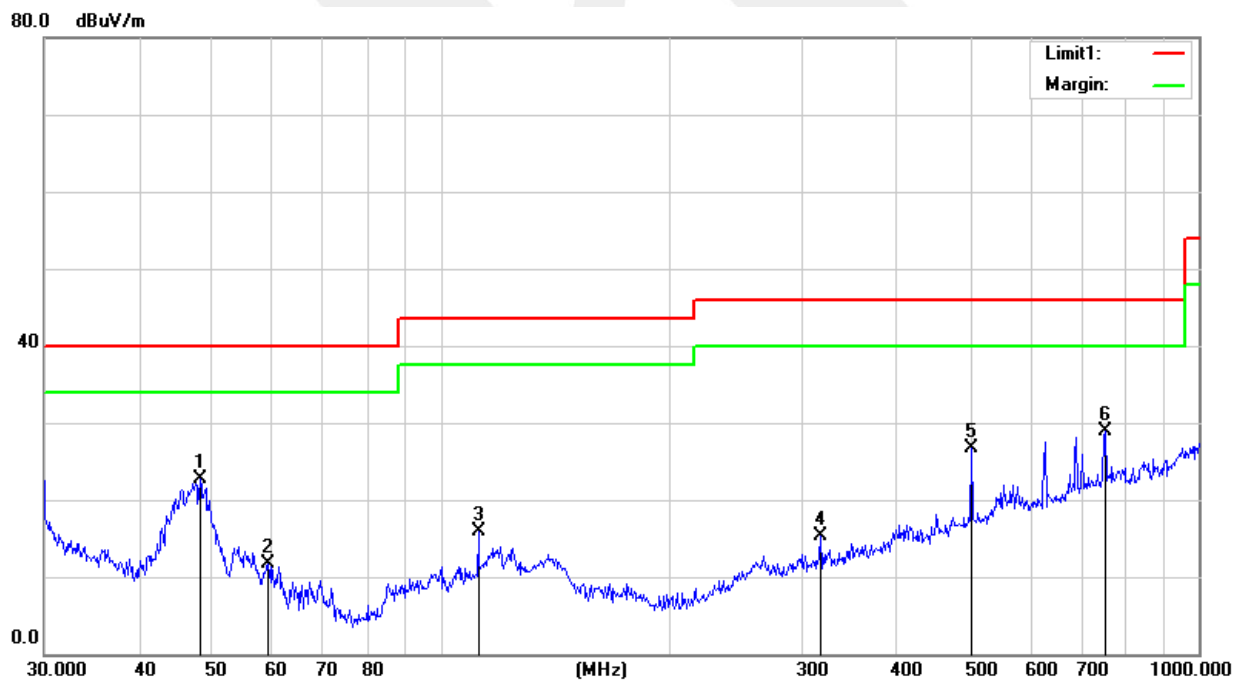
(30MHz -1000MHz)

Temperature:	26 °C	Relative Humidity:	54%
Pressure:	1010hPa	Phase:	Horizontal
Test Voltage:	DC 3.0V	Test Mode:	Mode1/2/3 (Mode 1-1M worst mode)

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
48.1625	43.26	-20.53	22.73	40.00	-17.27	QP
59.2325	35.78	-24.12	11.66	40.00	-28.34	QP
112.1303	34.07	-18.20	15.87	43.50	-27.63	QP
317.7010	29.51	-14.25	15.26	46.00	-30.74	QP
501.1790	35.67	-8.90	26.77	46.00	-19.23	QP
752.7432	32.51	-3.57	28.94	46.00	-17.06	QP

Remark:

1. Margin = Result (Result =Reading + Factor)-Limit





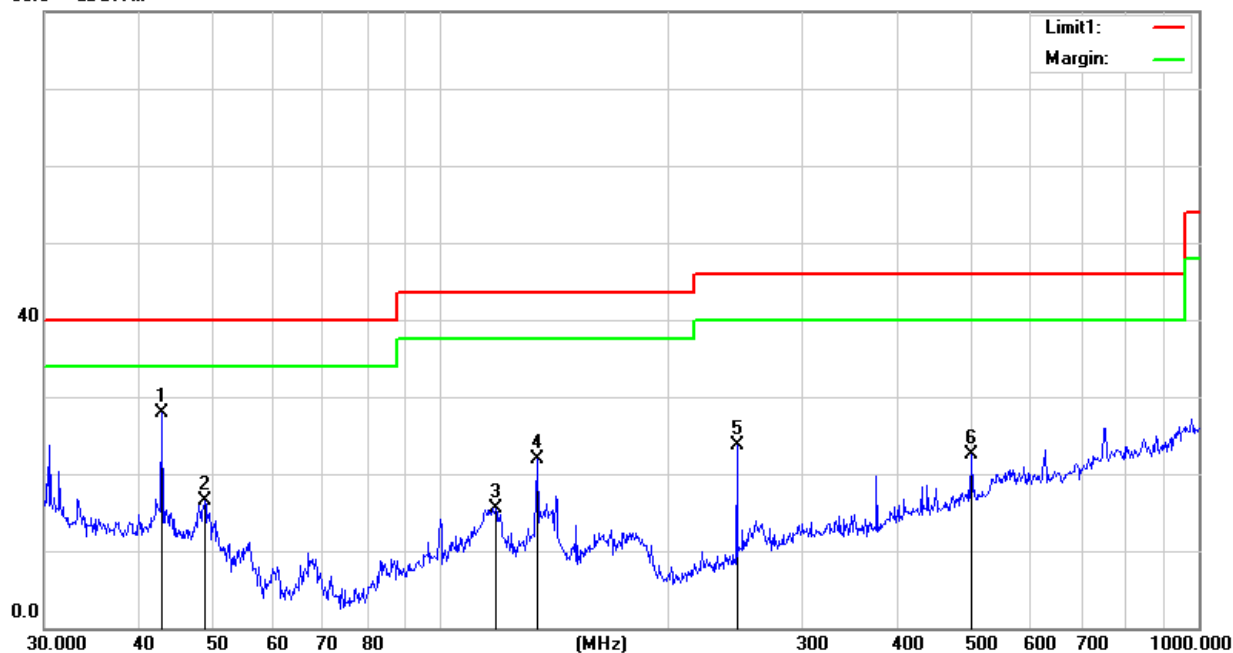
Temperature:	26 °C	Relative Humidity:	54%
Pressure:	1010hPa	Phase:	Vertical
Test Voltage:	DC 3.0V	Test Mode:	Mode1/2/3 (Mode 1-1M worst mode)

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
42.8997	45.78	-17.83	27.95	40.00	-12.05	QP
48.8430	37.41	-20.89	16.52	40.00	-23.48	QP
118.1860	33.33	-17.81	15.52	43.50	-27.98	QP
134.0882	39.47	-17.54	21.93	43.50	-21.57	QP
245.9507	40.57	-16.91	23.66	46.00	-22.34	QP
501.1790	31.32	-8.90	22.42	46.00	-23.58	QP

Remark:

1. Margin = Result (Result = Reading + Factor)-Limit

80.0 dBuV/m





(1GHz-25GHz)

GFSK Low Channel

Meter		Antenna		Orrected	Emission					
Frequency	Reading	Amplifier	Loss	Factor	Factor	Level	Limits	Margin	Detector	
(MHz)	(dBμV)	(dB)	(dB)	(dB/m)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	Type	Comment
Low Channel (2402 MHz)										
3265.26	50.12	44.70	6.70	28.20	-9.80	40.32	74.00	-33.68	PK	Vertical
3265.26	40.08	44.70	6.70	28.20	-9.80	30.28	54.00	-23.72	AV	Vertical
3265.23	50.10	44.70	6.70	28.20	-9.80	40.30	74.00	-33.70	PK	Horizontal
3265.23	40.10	44.70	6.70	28.20	-9.80	30.30	54.00	-23.70	AV	Horizontal
4803.93	60.38	44.20	9.04	31.60	-3.56	56.82	74.00	-17.18	PK	Vertical
4803.93	50.42	44.20	9.04	31.60	-3.56	46.86	54.00	-7.14	AV	Vertical
4804.91	60.40	44.20	9.04	31.60	-3.56	56.84	74.00	-17.16	PK	Horizontal
4804.91	50.42	44.20	9.04	31.60	-3.56	46.86	54.00	-7.14	AV	Horizontal
5360.20	47.32	44.20	9.86	32.00	-2.34	44.98	74.00	-29.02	PK	Vertical
5360.20	39.34	44.20	9.86	32.00	-2.34	37.00	54.00	-17.00	AV	Vertical
5360.20	47.30	44.20	9.86	32.00	-2.34	44.96	74.00	-29.04	PK	Horizontal
5360.20	39.31	44.20	9.86	32.00	-2.34	36.97	54.00	-17.03	AV	Horizontal
7206.29	52.80	43.50	11.40	35.50	3.40	56.20	74.00	-17.80	PK	Vertical
7206.29	44.74	43.50	11.40	35.50	3.40	48.14	54.00	-5.86	AV	Vertical
7206.33	52.77	43.50	11.40	35.50	3.40	56.17	74.00	-17.83	PK	Horizontal
7206.33	44.80	43.50	11.40	35.50	3.40	48.20	54.00	-5.80	AV	Horizontal
11036.36	42.07	43.60	14.30	39.50	10.20	52.27	74.00	-21.73	PK	Vertical
11036.36	32.05	43.60	14.30	39.50	10.20	42.25	54.00	-11.75	AV	Vertical
11036.59	42.02	43.60	14.30	39.50	10.20	52.22	74.00	-21.78	PK	Horizontal
11036.59	32.02	43.60	14.30	39.50	10.20	42.22	54.00	-11.78	AV	Horizontal
13299.74	41.86	42.60	15.90	38.90	12.20	54.06	74.00	-19.94	PK	Vertical
13299.74	31.87	42.60	15.90	38.90	12.20	44.07	54.00	-9.93	AV	Vertical
13299.88	41.92	42.60	15.90	38.90	12.20	54.12	74.00	-19.88	Pk	Horizontal
13299.88	30.88	42.60	15.90	38.90	12.20	43.08	54.00	-10.92	AV	Horizontal
16000.29	41.96	42.70	18.00	37.10	12.40	54.36	74.00	-19.64	PK	Vertical
16000.29	31.92	42.70	18.00	37.10	12.40	44.32	54.00	-9.68	AV	Vertical
16000.20	41.96	42.70	18.00	37.10	12.40	54.36	74.00	-19.64	PK	Horizontal
16000.20	31.15	42.70	18.00	37.10	12.40	43.55	54.00	-10.45	AV	Horizontal
17998.30	32.09	42.70	19.40	46.50	23.20	55.29	74.00	-18.71	PK	Vertical
17998.30	22.10	42.70	19.40	46.50	23.20	45.30	54.00	-8.70	AV	Vertical
17998.16	32.08	42.70	19.40	46.50	23.20	55.28	74.00	-18.72	PK	Horizontal
17998.16	22.06	42.70	19.40	46.50	23.20	45.26	54.00	-8.74	AV	Horizontal



GFSK Mid Channel

Frequency	Meter	Amplifier	Loss	Antenna	Orrected	Emission	Limits	Margin	Detector	Comment
(MHz)	Reading	(dB)	(dB)	Factor	Factor	Level	(dBμV/m)	(dB)	Type	
Low Channel (2440 MHz)										
3265.16	50.06	44.70	6.70	28.20	-9.80	40.26	74.00	-33.74	PK	Vertical
3265.16	39.99	44.70	6.70	28.20	-9.80	30.19	54.00	-23.81	AV	Vertical
3265.17	50.03	44.70	6.70	28.20	-9.80	40.23	74.00	-33.77	PK	Horizontal
3265.17	40.05	44.70	6.70	28.20	-9.80	30.25	54.00	-23.75	AV	Horizontal
4880.85	60.30	44.20	9.04	31.60	-3.56	56.74	74.00	-17.26	PK	Vertical
4880.85	50.35	44.20	9.04	31.60	-3.56	46.79	54.00	-7.21	AV	Vertical
4880.80	60.32	44.20	9.04	31.60	-3.56	56.76	74.00	-17.24	PK	Horizontal
4880.80	50.30	44.20	9.04	31.60	-3.56	46.74	54.00	-7.26	AV	Horizontal
5360.10	47.26	44.20	9.86	32.00	-2.34	44.92	74.00	-29.08	PK	Vertical
5360.10	39.20	44.20	9.86	32.00	-2.34	36.86	54.00	-17.14	AV	Vertical
5360.02	47.26	44.20	9.86	32.00	-2.34	44.92	74.00	-29.08	PK	Horizontal
5360.02	39.23	44.20	9.86	32.00	-2.34	36.89	54.00	-17.11	AV	Horizontal
7320.20	52.70	43.50	11.40	35.50	3.40	56.10	74.00	-17.90	PK	Vertical
7320.20	44.64	43.50	11.40	35.50	3.40	48.04	54.00	-5.96	AV	Vertical
7320.58	52.75	43.50	11.40	35.50	3.40	56.15	74.00	-17.85	PK	Horizontal
7320.58	44.71	43.50	11.40	35.50	3.40	48.11	54.00	-5.89	AV	Horizontal
11036.30	42.01	43.60	14.30	39.50	10.20	52.21	74.00	-21.79	PK	Vertical
11036.30	31.99	43.60	14.30	39.50	10.20	42.19	54.00	-11.81	AV	Vertical
11036.47	41.93	43.60	14.30	39.50	10.20	52.13	74.00	-21.87	PK	Horizontal
11036.47	31.98	43.60	14.30	39.50	10.20	42.18	54.00	-11.82	AV	Horizontal
13299.83	41.76	42.60	15.90	38.90	12.20	53.96	74.00	-20.04	PK	Vertical
13299.83	31.78	42.60	15.90	38.90	12.20	43.98	54.00	-10.02	AV	Vertical
13299.75	41.80	42.60	15.90	38.90	12.20	54.00	74.00	-20.00	PK	Horizontal
13299.75	30.77	42.60	15.90	38.90	12.20	42.97	54.00	-11.03	AV	Horizontal
16000.14	41.87	42.70	18.00	37.10	12.40	54.27	74.00	-19.73	PK	Vertical
16000.14	31.79	42.70	18.00	37.10	12.40	44.19	54.00	-9.81	AV	Vertical
16000.09	41.85	42.70	18.00	37.10	12.40	54.25	74.00	-19.75	PK	Horizontal
16000.09	31.08	42.70	18.00	37.10	12.40	43.48	54.00	-10.52	AV	Horizontal
17998.29	32.00	42.70	19.40	46.50	23.20	55.20	74.00	-18.80	PK	Vertical
17998.29	22.01	42.70	19.40	46.50	23.20	45.21	54.00	-8.79	AV	Vertical
17998.17	32.05	42.70	19.40	46.50	23.20	55.25	74.00	-18.75	PK	Horizontal
17998.17	22.00	42.70	19.40	46.50	23.20	45.20	54.00	-8.80	AV	Horizontal



GFSK High Channel

Frequency (MHz)	Meter Reading (dBμV)	Amplifier (dB)	Loss (dB)	Antenna Factor (dB/m)	Corrected Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
Low Channel (2480 MHz)										
3265.16	50.04	44.70	6.70	28.20	-9.80	40.24	74.00	-33.76	PK	Vertical
3265.16	40.01	44.70	6.70	28.20	-9.80	30.21	54.00	-23.79	AV	Vertical
3265.16	50.04	44.70	6.70	28.20	-9.80	40.24	74.00	-33.76	PK	Horizontal
3265.16	40.03	44.70	6.70	28.20	-9.80	30.23	54.00	-23.77	AV	Horizontal
4960.84	60.35	44.20	9.04	31.60	-3.56	56.79	74.00	-17.21	PK	Vertical
4960.84	50.33	44.20	9.04	31.60	-3.56	46.77	54.00	-7.23	AV	Vertical
4960.83	60.34	44.20	9.04	31.60	-3.56	56.78	74.00	-17.22	PK	Horizontal
4960.83	50.34	44.20	9.04	31.60	-3.56	46.78	54.00	-7.22	AV	Horizontal
5360.14	47.27	44.20	9.86	32.00	-2.34	44.93	74.00	-29.07	PK	Vertical
5360.14	39.26	44.20	9.86	32.00	-2.34	36.92	54.00	-17.08	AV	Vertical
5360.14	47.21	44.20	9.86	32.00	-2.34	44.87	74.00	-29.13	PK	Horizontal
5360.14	39.21	44.20	9.86	32.00	-2.34	36.87	54.00	-17.13	AV	Horizontal
7440.16	52.71	43.50	11.40	35.50	3.40	56.11	74.00	-17.89	PK	Vertical
7440.16	44.69	43.50	11.40	35.50	3.40	48.09	54.00	-5.91	AV	Vertical
7440.23	52.75	43.50	11.40	35.50	3.40	56.15	74.00	-17.85	PK	Horizontal
7440.23	44.73	43.50	11.40	35.50	3.40	48.13	54.00	-5.87	AV	Horizontal
11036.26	42.01	43.60	14.30	39.50	10.20	52.21	74.00	-21.79	PK	Vertical
11036.26	31.95	43.60	14.30	39.50	10.20	42.15	54.00	-11.85	AV	Vertical
11036.30	41.95	43.60	14.30	39.50	10.20	52.15	74.00	-21.85	PK	Horizontal
11036.30	31.98	43.60	14.30	39.50	10.20	42.18	54.00	-11.82	AV	Horizontal
16000.14	41.85	42.70	18.00	37.10	12.40	54.25	74.00	-19.75	PK	Vertical
16000.14	31.81	42.70	18.00	37.10	12.40	44.21	54.00	-9.79	AV	Vertical
16000.15	41.87	42.70	18.00	37.10	12.40	54.27	74.00	-19.73	PK	Horizontal
16000.15	31.11	42.70	18.00	37.10	12.40	43.51	54.00	-10.49	AV	Horizontal
17998.29	31.99	42.70	19.40	46.50	23.20	55.19	74.00	-18.81	PK	Vertical
17998.29	22.03	42.70	19.40	46.50	23.20	45.23	54.00	-8.77	AV	Vertical
17998.17	32.07	42.70	19.40	46.50	23.20	55.27	74.00	-18.73	PK	Horizontal
17998.17	22.01	42.70	19.40	46.50	23.20	45.21	54.00	-8.79	AV	Horizontal

Note:

1) Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Meter Reading + Factor



4.6 TEST RESULTS (Restricted Bands Requirements)

Meter		Antenna		Orrected	Emission					
Frequency	Reading	Amplifier	Loss	Factor	Factor	Level	Limits	Margin	Detector	
(MHz)	(dBμV)	(dB)	(dB)	(dB/m)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	Type	Comment
GFSK										
2400.00	69.18	43.80	4.91	25.90	-12.99	56.19	74	-17.81	PK	Vertical
2400.00	54.98	43.80	4.91	25.90	-12.99	41.99	54	-12.01	AV	Vertical
2400.00	70.16	43.80	4.91	25.90	-12.99	57.17	74	-16.83	PK	Horizontal
2400.00	54.08	43.80	4.91	25.90	-12.99	41.09	54	-12.91	AV	Horizontal
2483.50	70.99	43.80	5.12	25.90	-12.78	58.21	74	-15.79	PK	Vertical
2483.50	53.99	43.80	5.12	25.90	-12.78	41.21	54	-12.79	AV	Vertical
2483.50	71.08	43.80	5.12	25.90	-12.78	58.30	74	-15.70	PK	Horizontal
2483.50	53.99	43.80	5.12	25.90	-12.78	41.21	54	-12.79	AV	Horizontal
Low measurement frequencies is range from 2310 to 2400 MHz, high measurement frequencies is range from 2483.5 to 2500 MHz. Only show the worst point data of the emissions in the frequency 2310-2400 MHz and 2483.5-2500 MHz.										



5. CONDUCTED SPURIOUS & BAND EDGE EMISSION

5.1 REQUIREMENT

According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

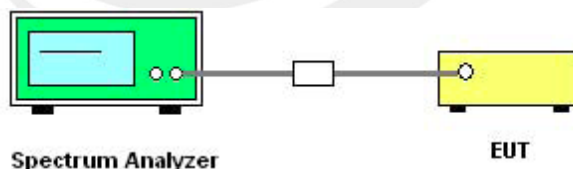
5.2 TEST PROCEDURE

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	30 MHz to 10th carrier harmonic
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

For Band edge

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	Lower Band Edge: 2310 – 2404 MHz Upper Band Edge: 2478 – 2500 MHz
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

5.3 TEST SETUP



The EUT which is powered by the Battery, is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50 Ohm; the path loss as the factor is calibrated to correct the reading. Make the measurement with the spectrum analyzer's resolution bandwidth(RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

5.4 EUT OPERATION CONDITIONS

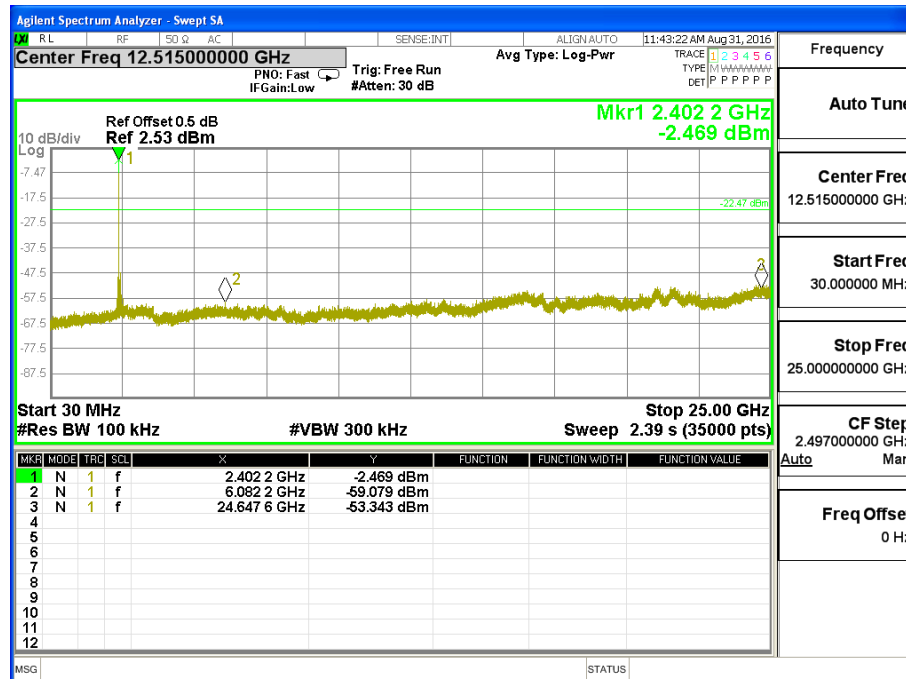
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



5.5 TEST RESULTS

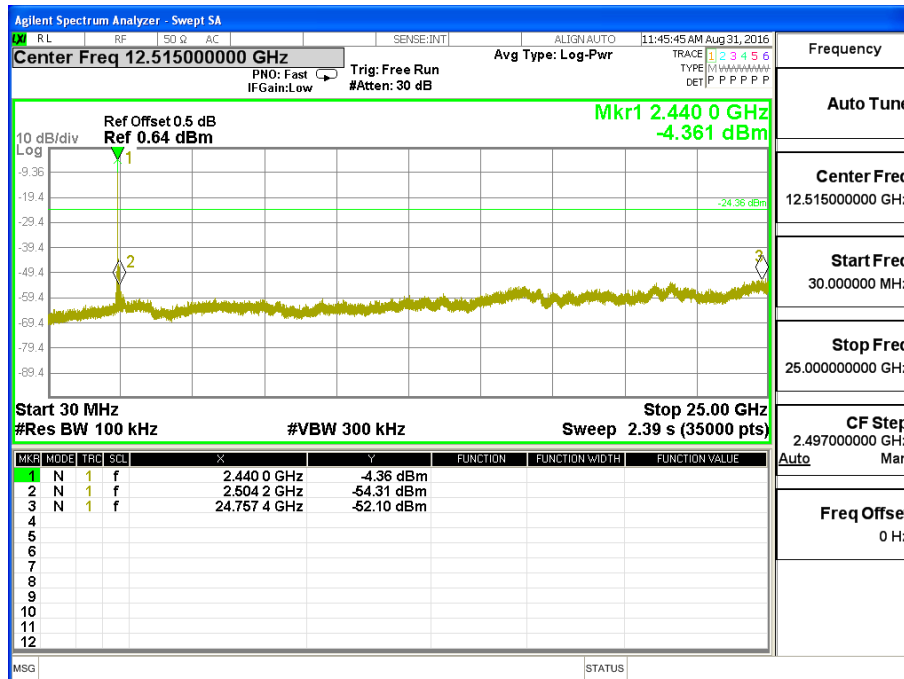
Temperature:	25 °C	Relative Humidity:	50%
Pressure:	1012 hPa	Test Voltage:	DC 3.0V
Test Mode:	TX Mode /CH01, CH20, CH40		

01 CH

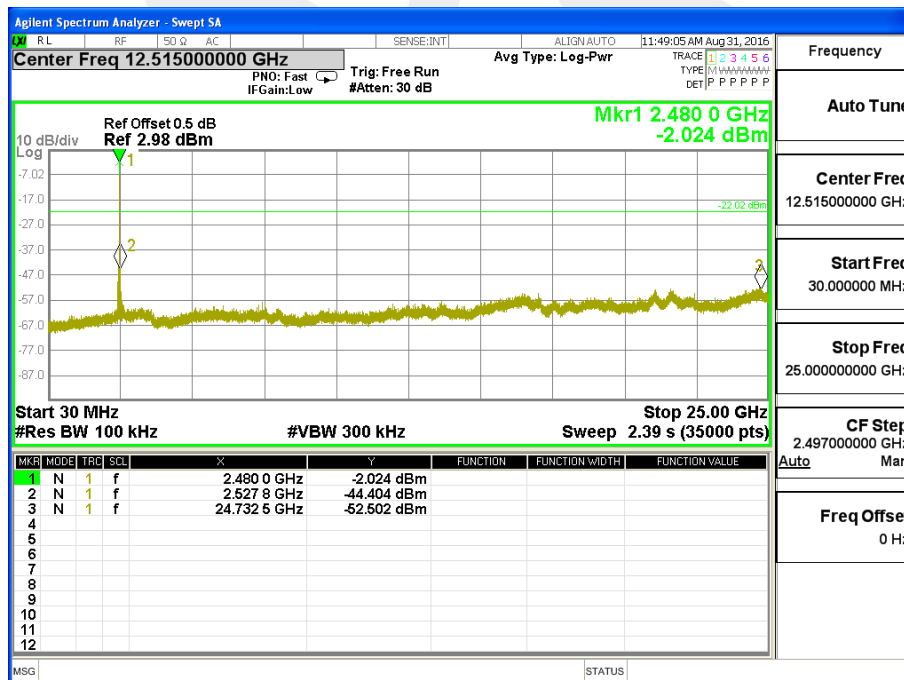




20 CH



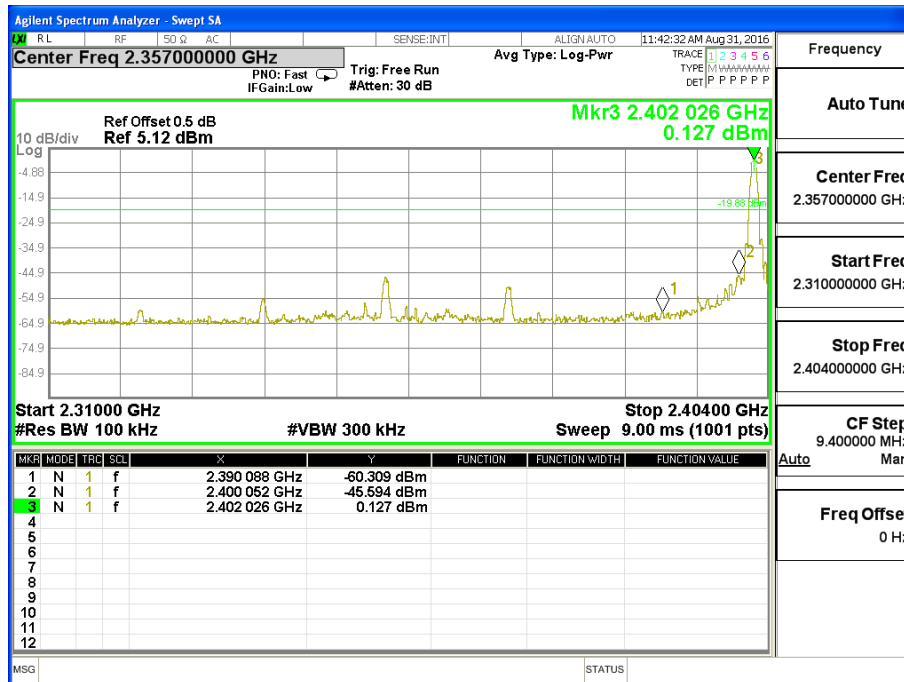
40 CH



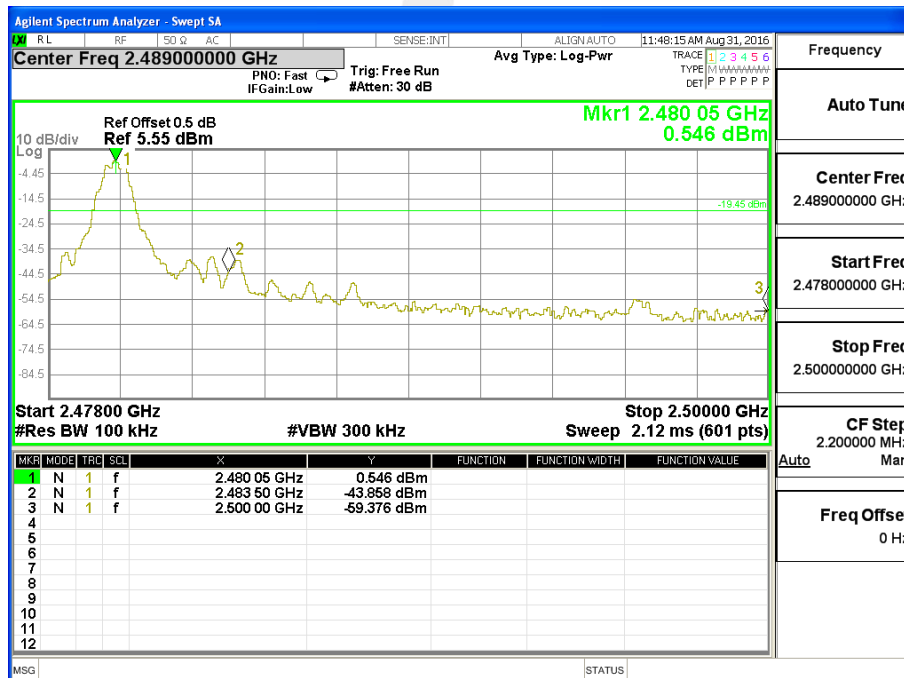


For Band edge

01 CH



40 CH





6. POWER SPECTRAL DENSITY TEST

6.1 APPLIED PROCEDURES / LIMIT

FCC Part 15.247, Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(e)	Power Spectral Density	≤ 8 dBm (RBW ≥ 3 KHz)	2400-2483.5	PASS

6.2 TEST PROCEDURE

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW to: $100 \text{ kHz} \geq \text{RBW} \geq 3 \text{ kHz}$.
4. Set the VBW $\geq 3 \times \text{RBW}$.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

6.3 TEST SETUP



6.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

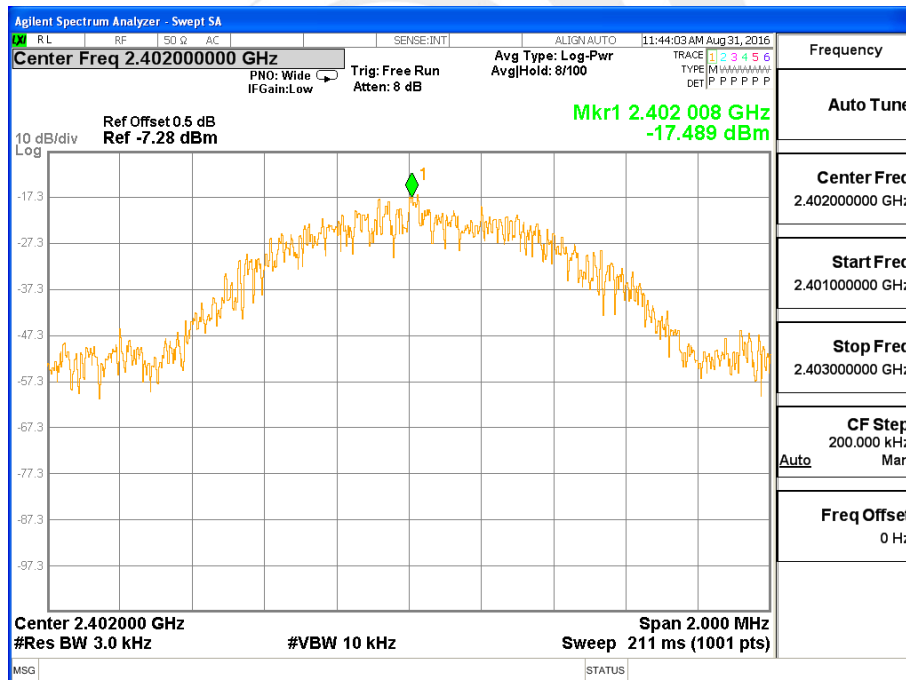


6.5 TEST RESULTS

Temperature:	25 °C	Relative Humidity:	60%
Pressure:	1015 hPa	Test Voltage:	DC 3.0V
Test Mode:	TX Mode /CH01, CH20, CH40		

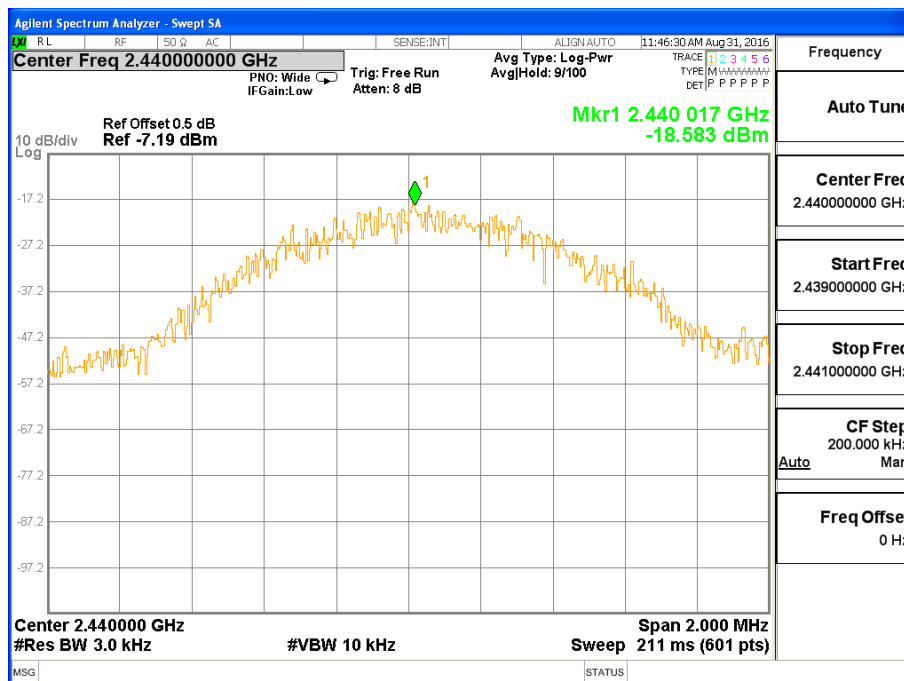
Frequency	Power Density (dBm/3kHz)	Limit (dBm)	Result
2402 MHz	-17.489	≤ 8	PASS
2440 MHz	-18.583	≤ 8	PASS
2480 MHz	-15.298	≤ 8	PASS

TX CH01

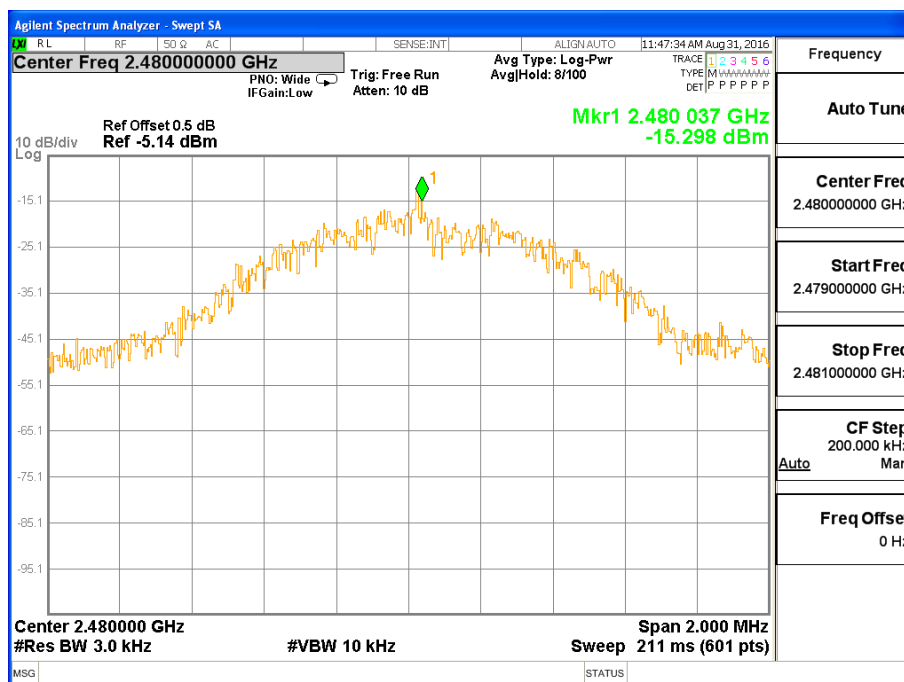




TX CH20



TX CH40





7. BANDWIDTH TEST

7.1 APPLIED PROCEDURES / LIMIT

FCC Part 15.247, Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	$\geq 500\text{KHz}$ (6dB bandwidth)	2400-2483.5	PASS

7.2 TEST PROCEDURE

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW ≥ 3 RBW, peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.

7.3 TEST SETUP



7.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



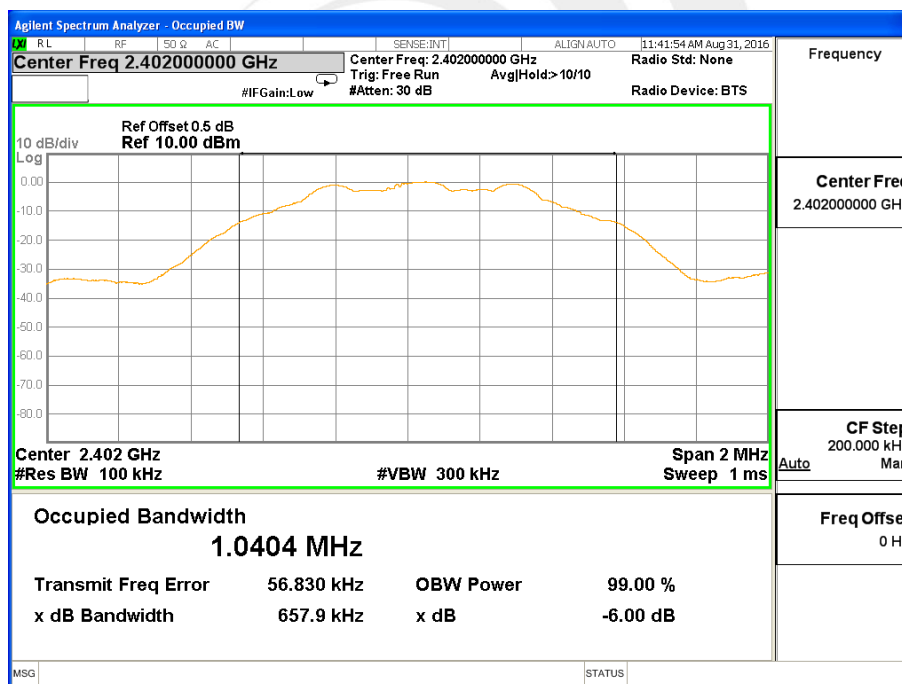
7.5 TEST RESULTS

Temperature:	25 °C	Relative Humidity:	60%
Pressure:	1012 hPa	Test Voltage:	DC 3.0V
Test Mode:	TX Mode /CH01, CH20, CH40		

Remark: PEAK DETECTOR IS USED

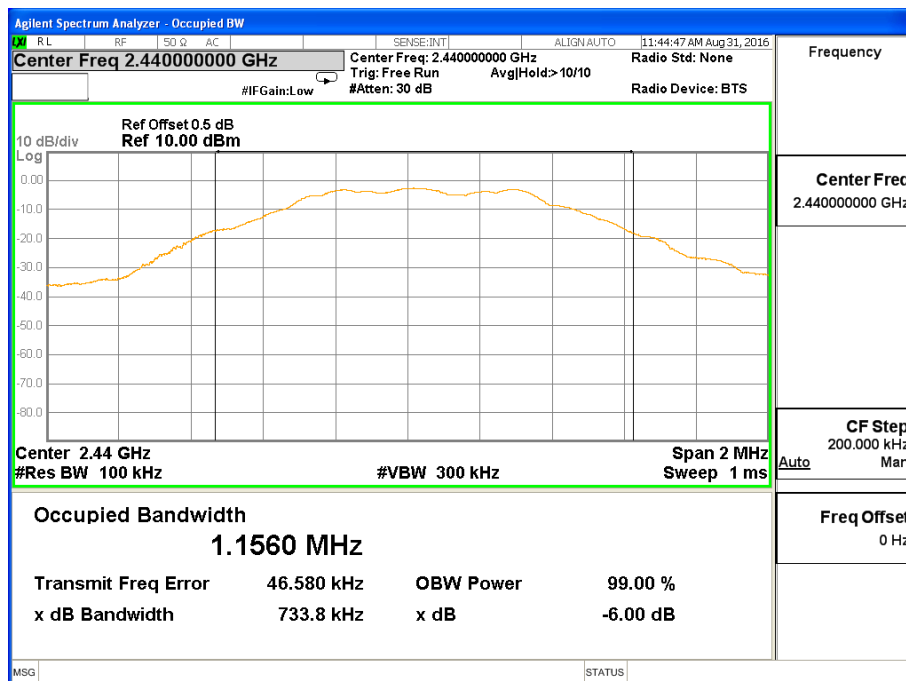
Frequency	6dB Bandwidth (MHz)	Channel Separation (MHz)	Result
2402 MHz	657.9	>=500KHz	PASS
2440 MHz	733.8	>=500KHz	PASS
2480 MHz	701.3	>=500KHz	PASS

TX CH 01

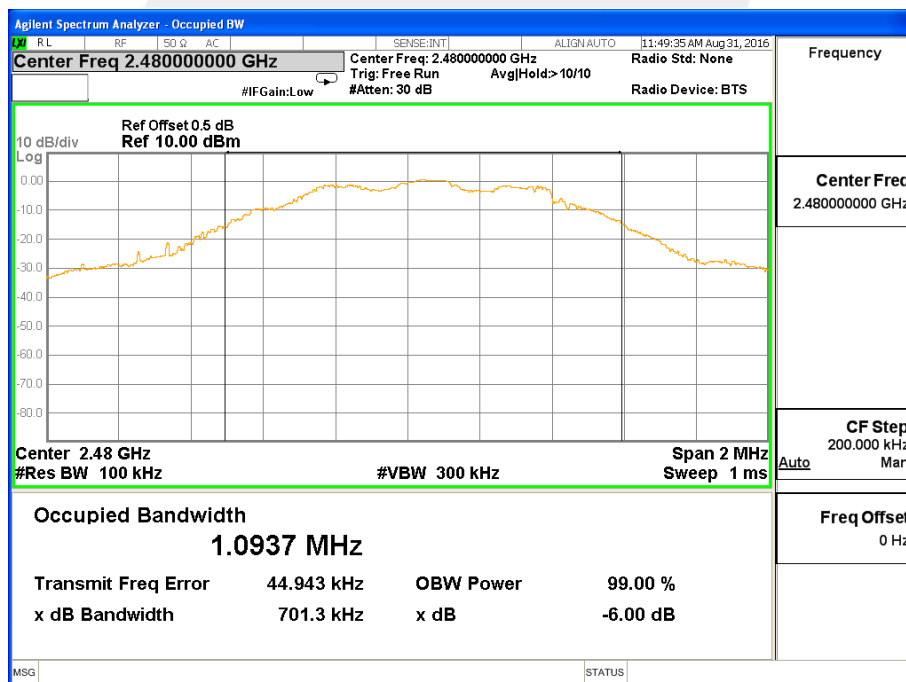




TX CH 20



TX CH 40





8. PEAK OUTPUT POWER TEST

8.1 APPLIED PROCEDURES / LIMIT

FCC Part 15.247, Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Output Power	1 watt or 30dBm	2400-2483.5	PASS

8.2 TEST PROCEDURE

- a. The EUT was directly connected to the Power Sensor&PC

8.3 TEST SETUP



8.4 EUT OPERATION CONDITIONS

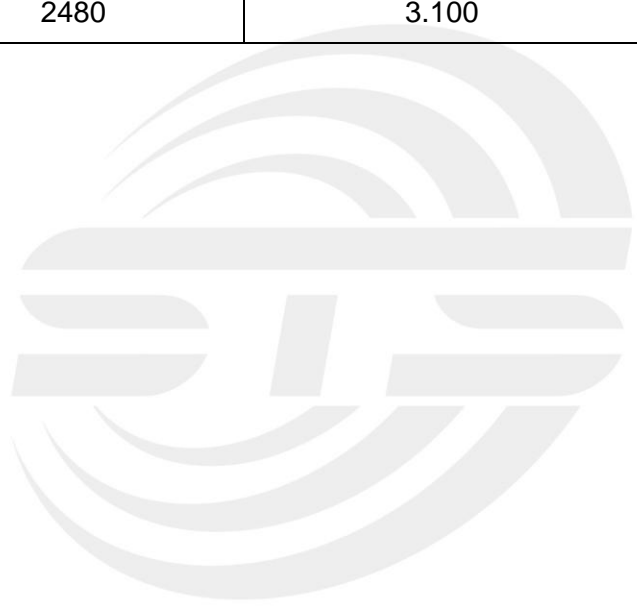
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



8.5 TEST RESULTS

Temperature:	25 °C	Relative Humidity:	60%
Pressure:	1012 hPa	Test Voltage:	DC 3.0V
Test Mode:	TX Mode /CH01, CH20, CH40		

Test Channel	Frequency	Peak Conducted Output Power	LIMIT
	(MHz)	(dBm)	dBm
CH01	2402	3.600	30
CH20	2440	3.000	30
CH40	2480	3.100	30





9. ANTENNA REQUIREMENT

9.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 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.

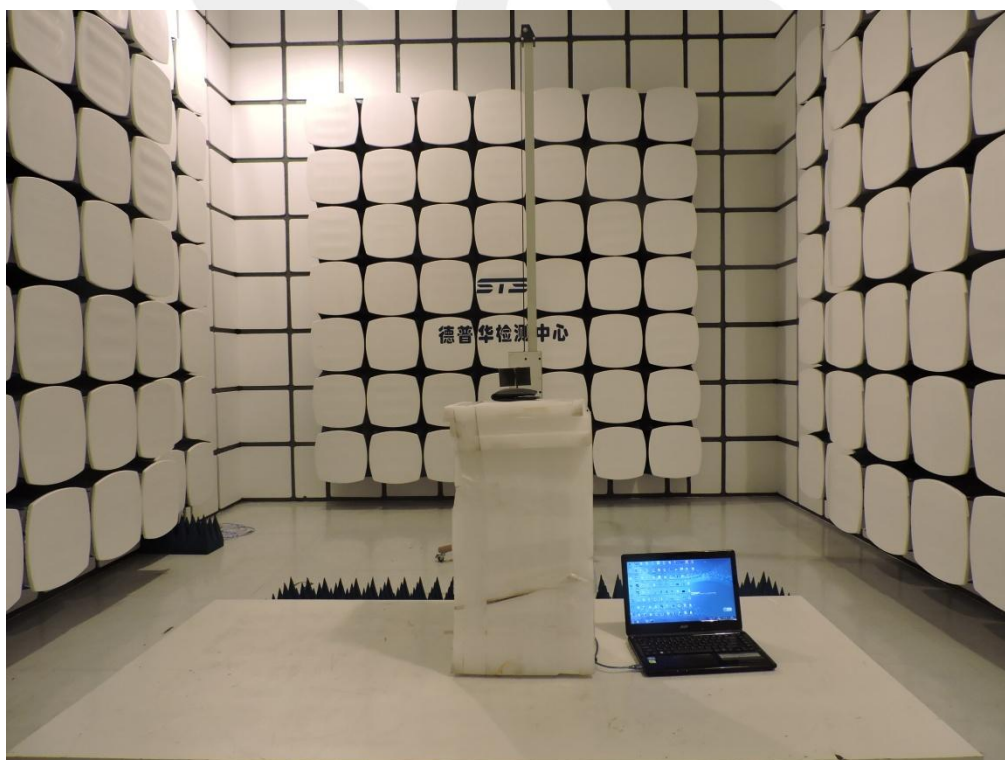
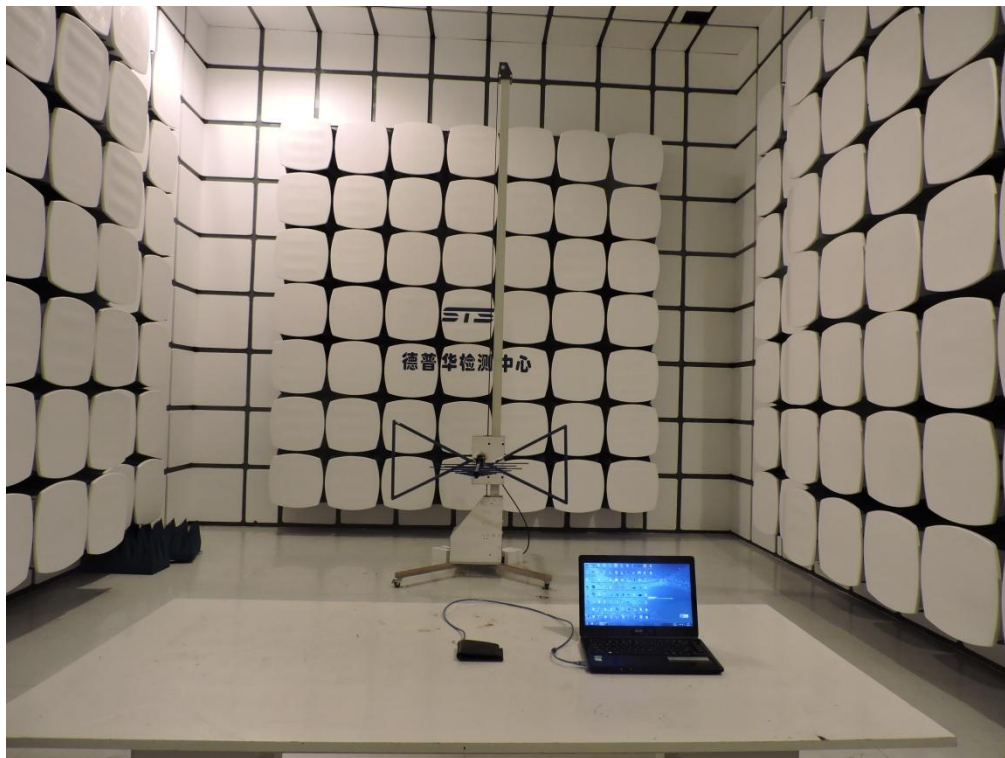
9.2 EUT ANTENNA

The EUT antenna is FPCB Antenna. It comply with the standard requirement.



APPENDIX I-PHOTOGRAPHS OF EUT

RE



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