Radio Equipment Directive-Radio
for

Fhab Bluetooth Speaker
Model No.: P326.642

Prepared for	:	
Address	:	

Prepared By	:	Shenzhen Anbotek Compliance Laboratory Limited
Address	:	1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong, China Tel: (86) 755-26066544 Fax: (86) 755-26014772

Report Number	:	R0117010918W
Date of Test	:	Jan. 10~ 19, 2017
Date of Report	:	Jan. 20, 2017

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Test Report

TEST REPORT

Applicant	:	
Manufacturer	:	
EUT	:	Fhab Bluetooth Speaker
Model No.	:	P326.642
Serial No.	:	N.A.
Trade Mark	:	N.A.
Rating	:	Input DC 5V, 1A (Battery DC 3.7V, 2000mAh)

Measurement Procedure Used:
ETSI EN 300 328 V1.9.1 (2015-02)

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN 300 328 requirements.
This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Test : Jan. 10~ 19, 2017

Prepared by : (Tested Engineer / Baron Wen)

Reviewer : (Project Manager / Amy Ding)

Approved & Authorized Signer : (Manager / Tom Chen)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Fhab Bluetooth Speaker
Model Number	:	P326.642
Test Power Supply	:	DC 3.7V Battery inside
Frequency	:	2402~2480MHz
Antenna Specification	:	PCB Antenna: 0dBi
Modulation	:	GFSK, π/4DQPSK, 8DPSK
Applicant	:	
Address	:	
Manufacturer	:	
Address	:	
Date of receipt	:	Jan. 10, 2017
Date of Test	:	Jan. 10~ 19, 2017

1.2. Auxiliary Equipment Used during Test

N/A

1.3. Description of Test Facility

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

FCC-Registration No.: 752021
Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registed 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 752021, July 06, 2016.

IC-Registration No.: 8058A-1
Shenzhen Anbotek Compliance Laboratory Limited., EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration 8058A, Jun. 13, 2016.

Test Location
All Emissions tests were performed at
Shenzhen Anbotek Compliance Laboratory Limited. at 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong, China

1.4. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 4.1 dB (Horizontal) Ur = 4.3 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4dB

1.5. Test Standards

ETSI EN 300 328 V1.9.1 (2015-02) Electromagnetic compatibility and Radio spectrum Matters (ERM); wideband transmission systems; Data transmission equipment operating in the 2,4GHz ISM band and using wide band modulation techniques; Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive

2. MEASURING DEVICE AND TEST EQUIPMENT

Test equipments list of Shenzhen Anbotek Compliance Laboratory Limited.

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analysis	Agilent	E4407B	US39390582	Jul. 12, 2016	1 Year
2.	Preamplifier	Instruments corporation	EMC011830	980100	Jun. 17, 2016	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Jun. 17, 2016	1 Year
4.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	May 06, 2016	1 Year
5.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	May 06, 2016	1 Year
6.	Pre-amplifier	SONOMA	310N	186860	Jun. 17, 2016	1 Year
7.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
8	Power Sensor	Agilent	KFSW150502	15I00041SN045	Jun. 17, 2016	1 Year
9	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Jun. 17, 2016	1 Year
10	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Jun. 17, 2016	1 Year
11	Signal Generator	Agilent	E4421B	MY41000743	Jun. 17, 2016	1 Year
12	DC Power supply	IV	IV-8080	YQSB0096	Jun. 17, 2016	1 Year
13	TEMP&HUMI PROGRAMMABLE CHAMBER	Bell Group	BE-THK-150M8	SE-0137	Jun. 17, 2016	1 Year

3. Technical Test

3.1. Summary of Test Results

No Deviations from the technical specification(s) were ascertained in the course of the tests Performed	
Final Verdict: (only “Passed” if all single measurements are “Passed”)	Passed

3.2. Test Report

Test Report Reference

List of Measurements		
Description of Test	Reference: Clause No.	Result
RF Output Power	4.3.1.1 or 4.3.2.1	Complies
Power Spectral Density	4.3.2.2	N/A
Duty Cycle, TX-Sequence, TX-gap	4.3.1.2 or 4.3.2.3	N/A Note (2)
Dwell Time, Minimum Frequency Occupation & Hopping Sequence	4.3.1.3	Complies
Hopping Frequency Separation	4.3.1.4	Complies
Medium Utilisation	4.3.1.5 or 4.3.2.4	N/A Note (2)
Adaptivity	4.3.1.6 or 4.3.2.5	N/A Note (2)
Occupied Channel Bandwidth	4.3.1.7 or 4.3.2.6	Complies
Transmitter Unwanted Emissions in Out-Of-Band Domain	4.3.1.8 or 4.3.2.7	Complies
Transmitter Unwanted Emissions in the Spurious Domain	4.3.1.9 or 4.3.2.8	Complies
Receiver Spurious Emissions	4.3.1.10 or 4.3.2.9	Complies
Receiver Blocking	4.3.1.11 or 4.3.2.10	N/A Note (2)

Note:
(1) “N/A”: indicates test is not applicable in this Test Report.

(2) This requirement does not apply for equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.

4. RF Output Power

Applicable Standard

According to ETSI EN 300 328 §4.3.2.1, For adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be 20dBm.
The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20dBm. See clause 5.3.1m). For non-adaptive equipemt using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the supplier.
This limit shall apply for any combination of power level and intended antenna assembly.

Test Procedure

The measurement shall be performed using normal operation of the equipment with modulation, using the test data sequence, applied. The test procedure shall be as follows:

Step 1:
Use a fast power sensor suitable for 2,4 GHz and capable of 1 MS/s.
Use the following settings:
- Sample speed 1 MS/s or faster.
- The samples must represent the power of the signal.
- Measurement duration: For non-adaptive equipment: equal to the observation period defined in clauses 4.3.1.2.1 or 4.3.2.3.1. For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) are captured.
NOTE 1: For adaptive equipment, to increase the measurement accuracy, a higher number of bursts may be used.

Step 2:
• For conducted measurements on devices with one transmit chain:
- Connect the power sensor to the transmit port, sample the transmit signal and store the raw data. Use these stored samples in all following steps.
• For conducted measurements on devices with multiple transmit chains:
- Connect one power sensor to each transmit port for a synchronous measurement on all transmit ports.
- Trigger the power sensors so that they start sampling at the same time. Make sure the time difference between the samples of all sensors is less than half the time between two samples.
- For each instant in time, sum the power of the individual samples of all ports and store them. Use these stored samples in all following steps.
Step 3:
• Find the start and stop times of each burst in the stored measurement samples.
NOTE 2: The start and stop times are defined as the points where the power is at least 20 dB below the RMS burst power calculated in step 4.

Step 4:
• Between the start and stop times of each individual burst calculate the RMS power over the burst. Save these burst values, as well as the start and stop times for each burst.

Step 5:
• The highest of all Pburst values (value "A" in dBm) will be used for maximum e.i.r.p. calculations.
• If applicable, add the additional beamforming gain "Y" in dB.

Step 6:
• Add the (stated) antenna assembly gain "G" in dBi of the individual antenna.
• If more than one antenna assembly is intended for this power setting, the maximum overall antenna gain (G or G + Y) shall be used.
• The RF Output Power (P) shall be calculated using the formula below:
P = A + G + Y
• This value, which shall comply with the limit given in clauses 4.3.1.1.2 or 4.3.2.1.2, shall be recorded in the test report.

Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.9 kPa

Antenna Assembly Gain G:	0 dBi
P=A+G	

The range of temperature is tested according to the applicant's requirement.

Mode: BDR

Test Conditions			Low Freq. (2402MHz)	Mid Freq. (2441MHz)	High Freq. (2480MHz)
Tmin(-10)℃	Vmin(3.4V)	Measured Power	1.78	2.05	2.36
		EIRP	1.78	2.05	2.36
	Vmax(4.2V)	Measured Power	2.53	1.41	1.88
		EIRP	2.53	1.41	1.88
Tnom(+25)℃	Vnom(3.7V)	Measured Power	1.50	1.78	2.88
		EIRP	1.50	1.78	**2.88**
Tmax(+55)℃	Vmin(3.4V)	Measured Power	1.82	1.37	2.33
		EIRP	1.82	1.37	2.33
	Vmax(4.2V)	Measured Power	2.12	1.91	2.30
		EIRP	2.12	1.91	2.30
Limit		Average Limit = 20 dBm			

Mode: EDR

Test Conditions			Low Freq. (2402MHz)	Mid Freq. (2441MHz)	High Freq. (2480MHz)
Tmin(-10)℃	Vmin(3.4V)	Measured Power	-0.17	0.23	0.49
		EIRP	-0.17	0.23	0.49
	Vmax(4.2V)	Measured Power	-0.76	0.09	0.73
		EIRP	-0.76	0.09	0.73
Tnom(+25)℃	Vnom(3.7V)	Measured Power	-0.09	-0.17	0.71
		EIRP	-0.09	-0.17	0.71
Tmax(+55)℃	Vmin(3.4V)	Measured Power	-0.10	0.19	0.23
		EIRP	-0.10	0.19	0.23
	Vmax(4.2V)	Measured Power	-0.82	0.04	0.76
		EIRP	-0.82	0.04	0.76
Limit		Average Limit = 20 dBm			

Note:
(1) The value of table is worst case during test condition, includes different combinations of transmitter rate antenna polarity and temperature.

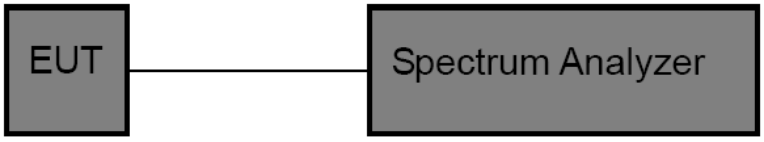
Limits: EN 300 328 Clause 4.3.1.1
The maximum RF output power for adaptive Frequency Hopping equipment shall be equal to or less than 20 dBm.
The maximum RF output power for non-adaptive Frequency Hopping equipment, shall be declared by the supplier. See clause 5.3.1 m). The maximum RF output power for this equipment shall be equal to or less than the value declared by the supplier. This declared value shall be equal to or less than 20 dBm. This limit shall apply for any combination of power level and intended antenna assembly.

5. Dwell Time, Minimum Frequency Occupation and Hopping Sequence

Test Limit

Test Item	Frequency Range (MHz)	Limit	Result
Dwell Time	2400-2483.5	0.4s	PASS
Minimum Frequency Occupation Time		Not exceeding four times of the dwell time per hop and the number of hopping frequencies in use	PASS
Hopping Sequence		At least 15 hopping frequencies at all times	PASS

Test Setup



Test Procedure

See ETST EN 300 328 clause 5.3.4 for the test conditions and the measurement method.
1. The transmitter output was connected to the spectrum analyzer.
2. Set Resolution Bandwidth of the spectrum analyzer to 1MHz and Video Bandwidth to 1MHz.
3. Use a video trigger with the trigger level set to enable triggering only on full pulses.
4. Sweep Time is more than once pulse time.
5. Set the center frequency on any frequency would be measured and set the frequency span to zero span.
6. Measure the maximum time duration of one single pulse.
7. Set the EUT for DH5, DH3 and DH1 packet transmitting.
8. Measure the maximum time duration of one single pulse.

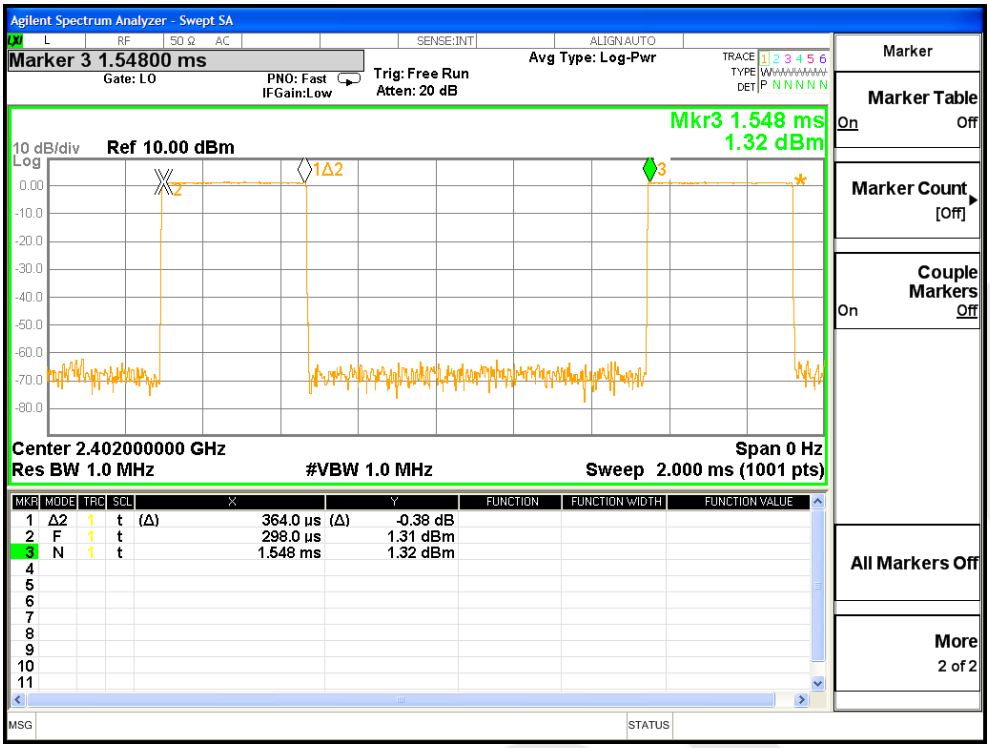
Test Results

PASS. Please refer to the following pages.

(1) Dwell Time

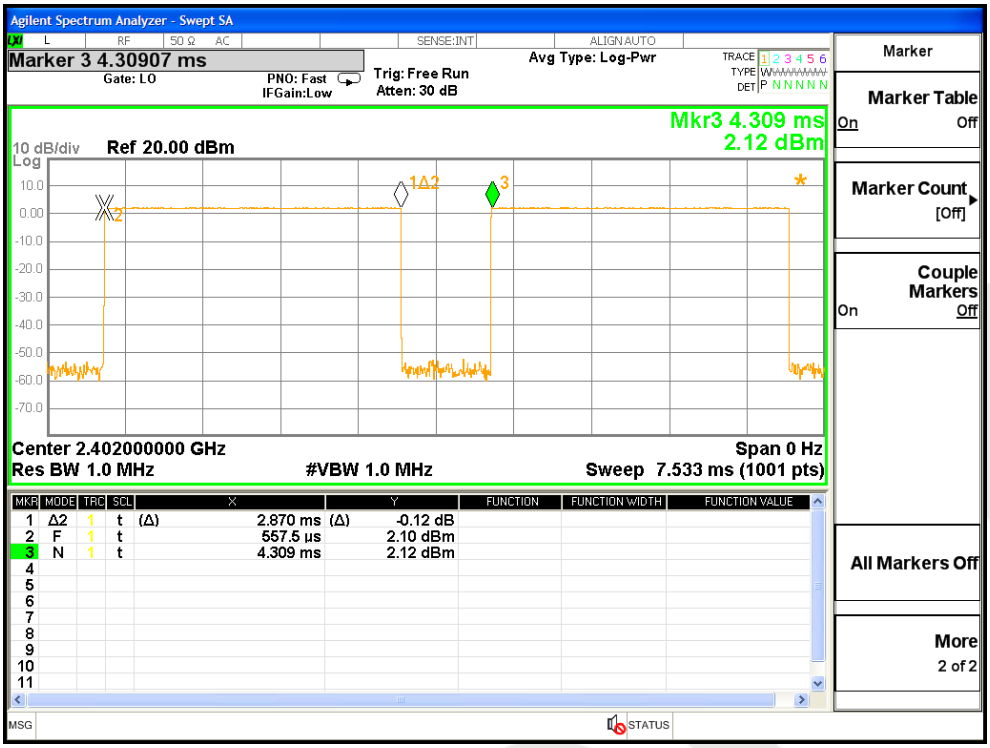
Test Item	:	Time of Occupancy	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 3.7V Battery inside	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

Package Type	*Pulse width (ms)*	Time slot length(ms)	Dwell time (ms)	Limit (s)	Modulation
DH1	0.364	time slot length *1600/2 /79 * 31.6	116.48	0.4	BDR
DH3	1.620	time slot length *1600/4 /79 * 31.6	259.20	0.4	BDR
DH5	2.870	time slot length *1600/6 /79 * 31.6	306.13	0.4	BDR
3DH1	0.378	time slot length *1600/2 /79 * 31.6	120.96	0.4	EDR
3DH3	1.625	time slot length *1600/4 /79 * 31.6	260.00	0.4	EDR
3DH5	2.870	time slot length *1600/6 /79 * 31.6	306.13	0.4	EDR

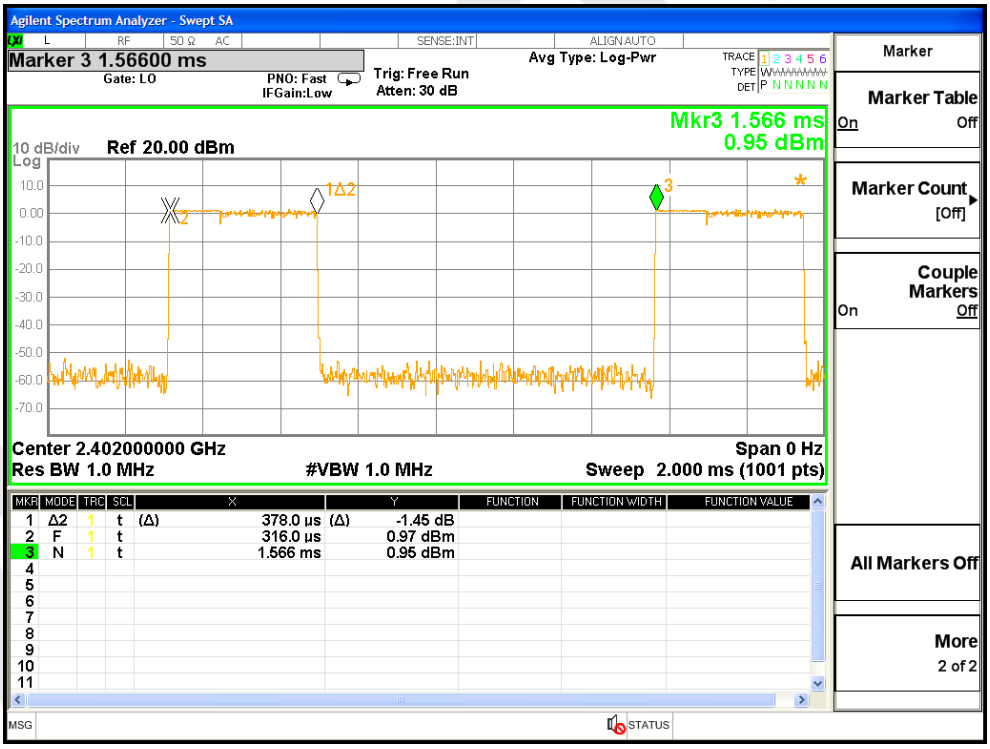


Test Mode: BDR---DH1

Test Mode: BDR---DH3

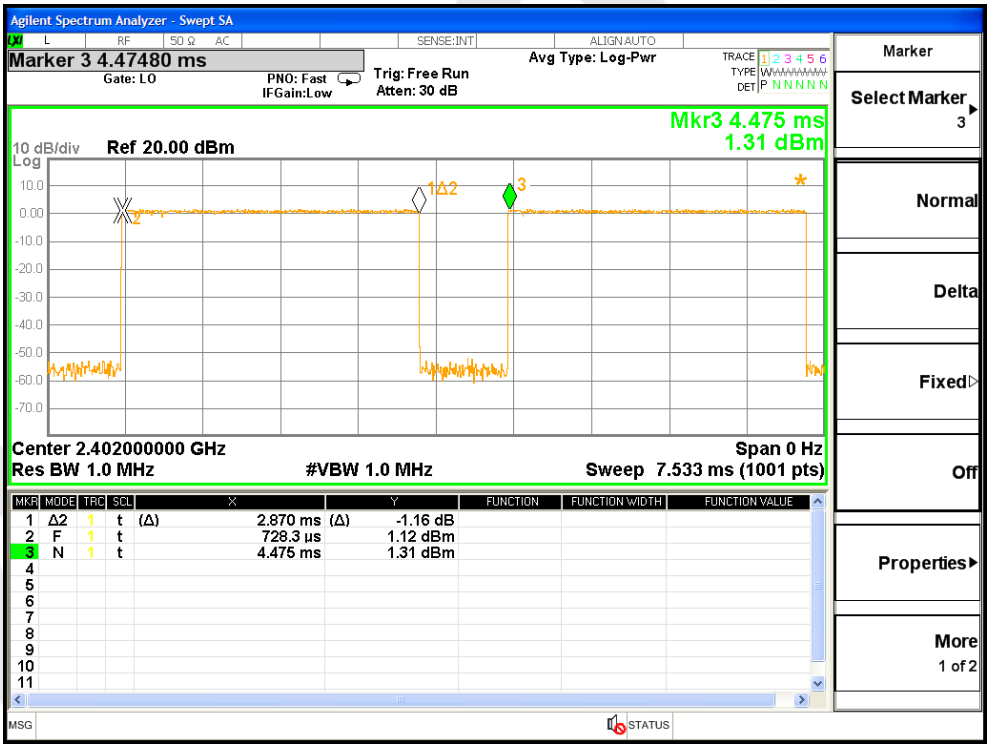


Test Mode: BDR—DH5



Test Mode: EDR---3DH1

Test Mode: EDR---3DH3



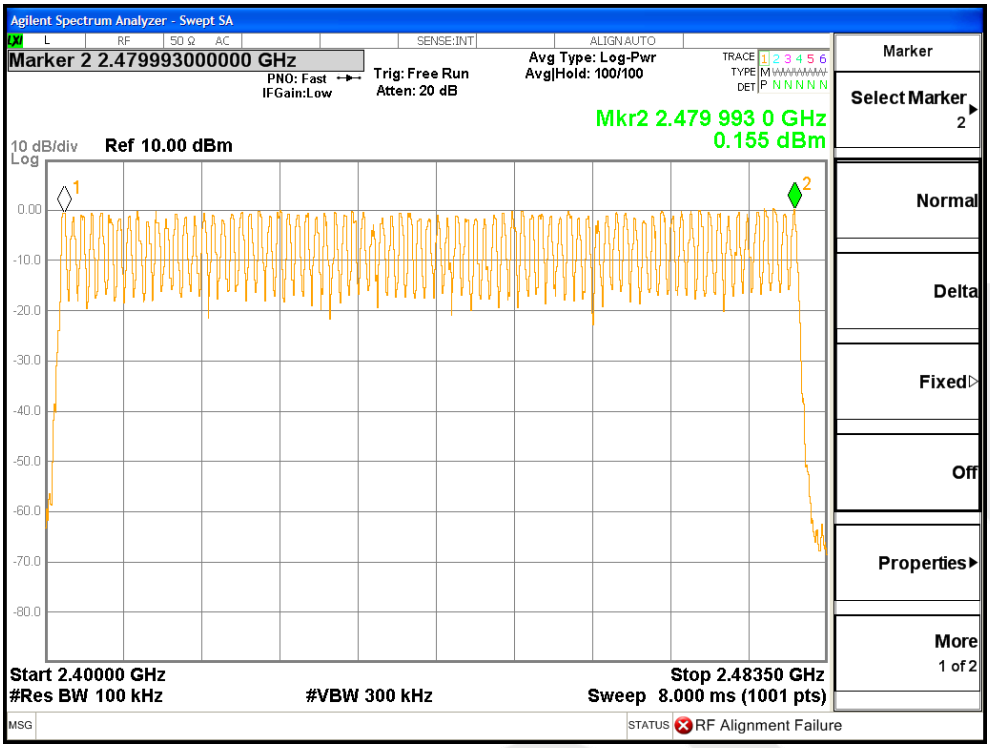
Test Mode: EDR—3DH5

(2) Hopping Sequence

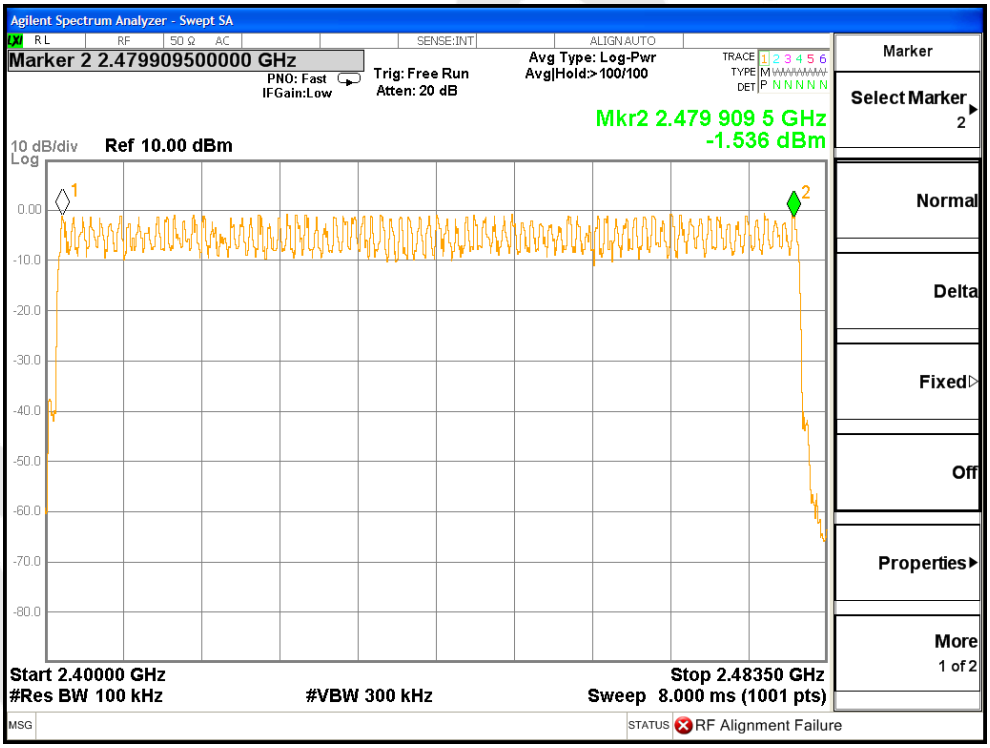
Test Item	:	Number of Hopping Frequency	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 3.7V Battery inside	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

Hopping Channel Frequency Ranger	Quantity Hopping Channel Read Value	Quantity of Hopping Channel Limit
2402 ~ 2480	79	15

Number of Hopping Frequency



BDR Mode



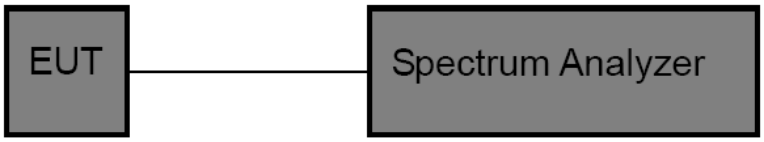
EDR Mode

6. Hopping Frequency Separation

Test Limit

Test Item	Frequency Range (MHz)	Limit	Result
Hopping Channel Separation(Non-adaptive)	2400-2483.5	Occupied Channel Bandwidth or 100 kHz which is greater	PASS
Hopping Channel Separation(Adaptive)		100 kHz	PASS

Test Setup



Test Procedure

See clause 5.1 for the test conditions. These measurements shall only be performed at normal test conditions. The measurement shall be performed on 2 adjacent hopping frequencies.
The frequencies on which the test was performed shall be recorded.

1. The transmitter output was connected to the spectrum analyzer.
2. Set the spectrum analyzer as follows to measure the frequency separation and 20 dB bandwidth.
- Centre Frequency: Centre of the two adjacent hopping frequencies
- Frequency Span: Sufficient to see the complete power envelope of both hopping frequencies
- Resolution BW : 30 kHz
- Resolution BW :100 kHz
- Detector : Peak
- Trace Mode : Max Hold.
- Sweep time : Auto.

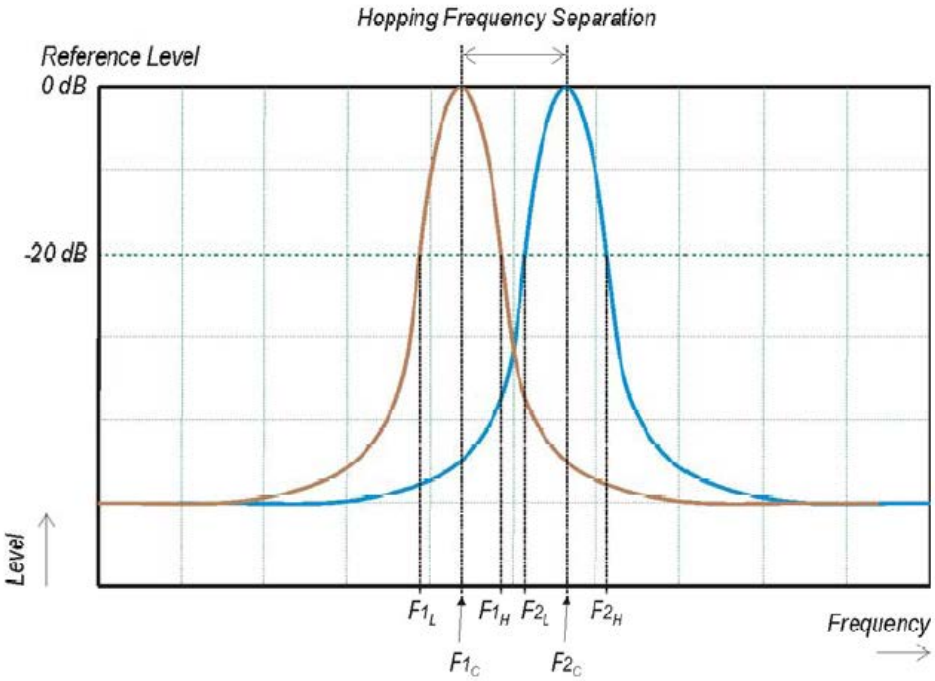


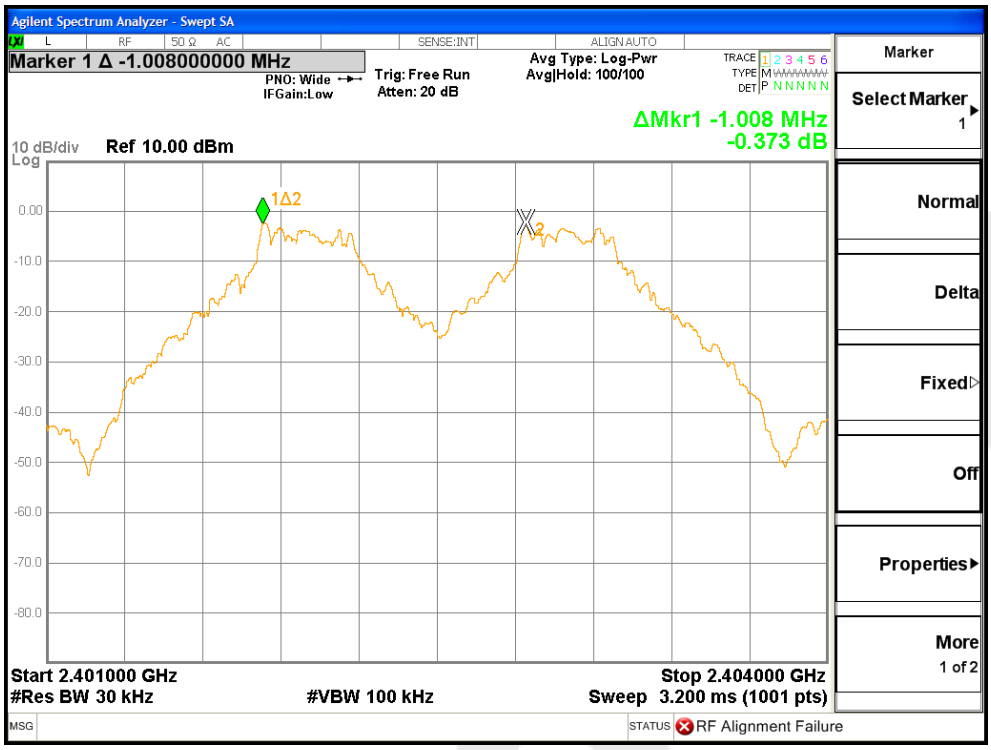
Figure 4: Hopping Frequency Separation

Test Results

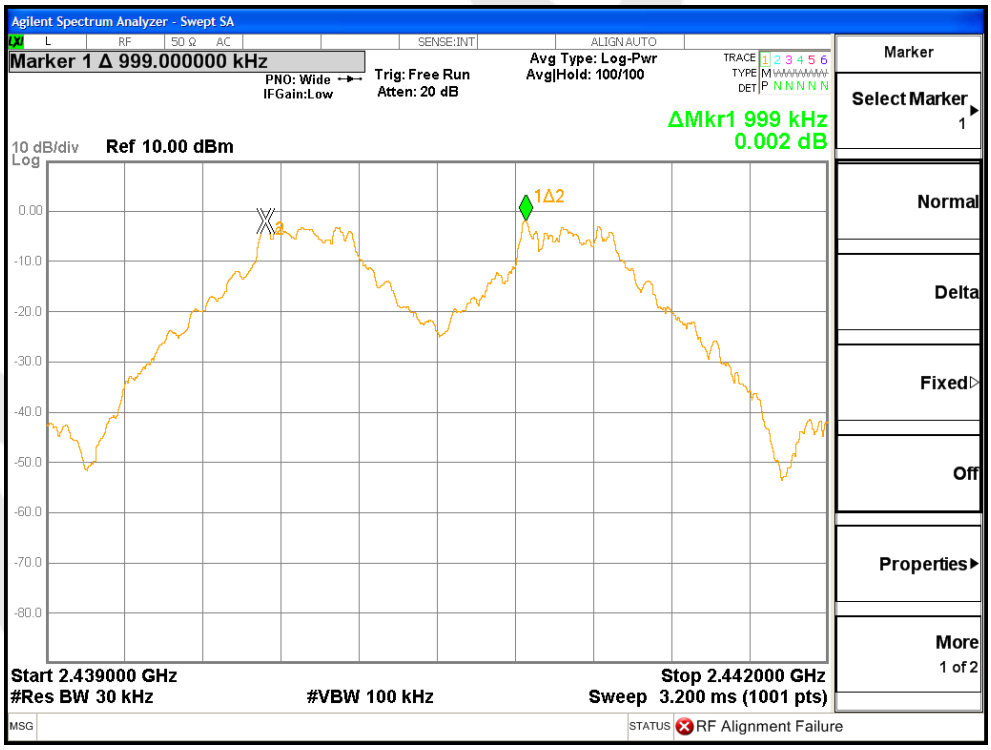
PASS. Please refer to the following data.

Test Item	:	Frequency Separation	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 3.7V Battery inside	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

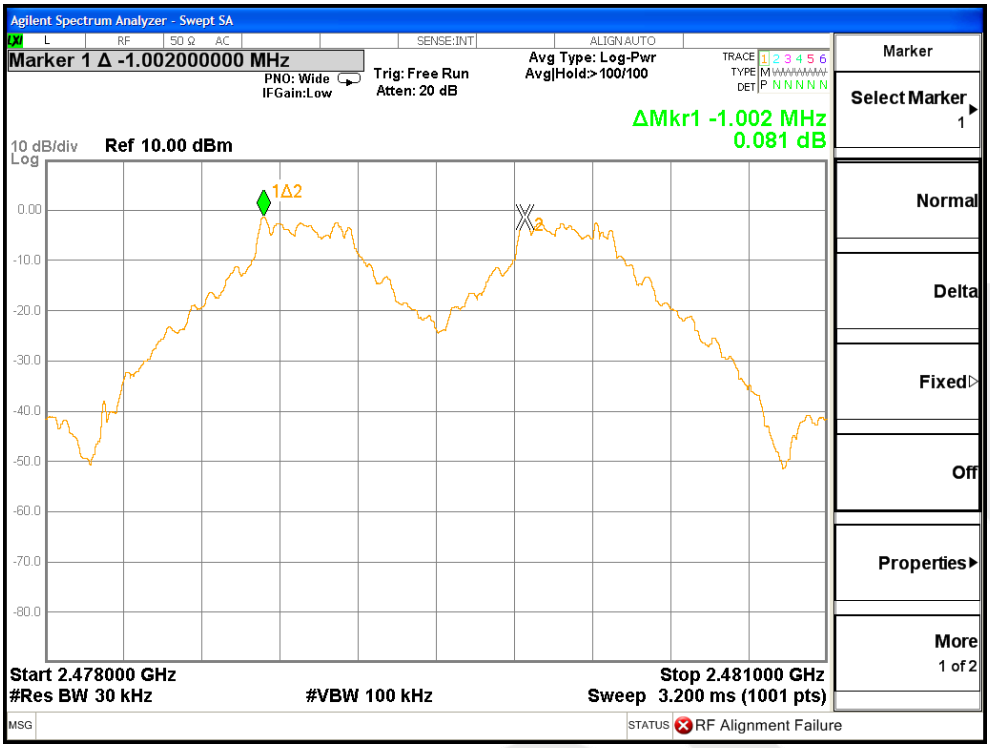
Channel	Frequency (MHz)	Separation Read Value (kHz)	Mode
Low	2401	1008	BDR
Mid	2441	999	BDR
High	2480	1002	BDR
Low	2401	996	EDR
Mid	2441	996	EDR
High	2480	996	EDR



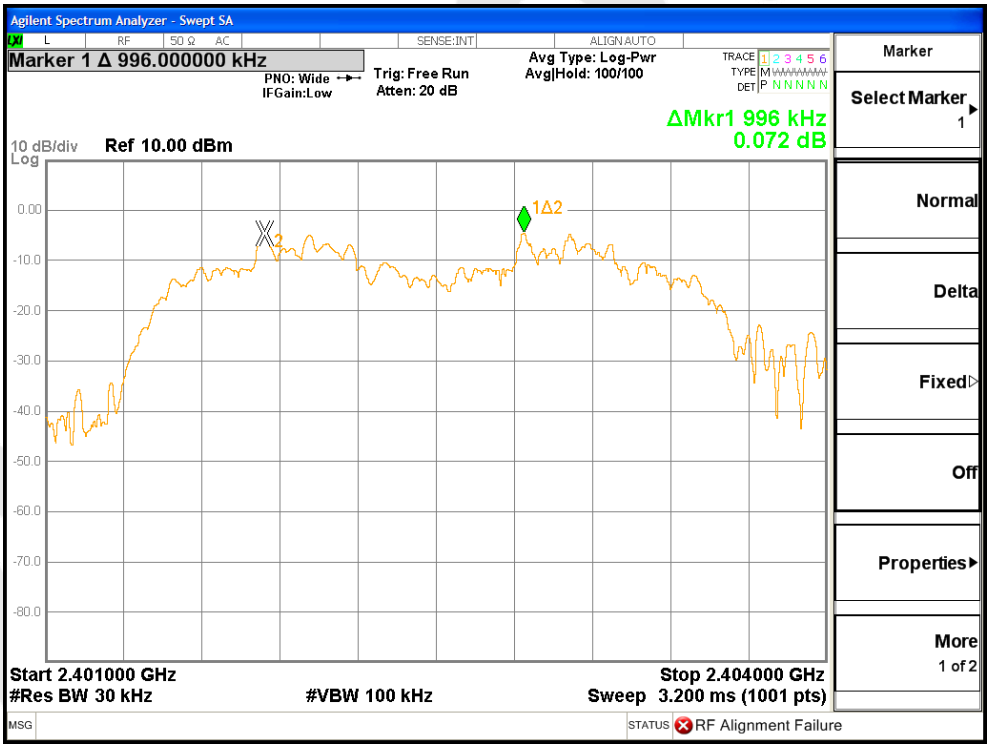
Test Mode: BDR---Low



Test Mode: BDR---Middle



Test Mode: BDR---High



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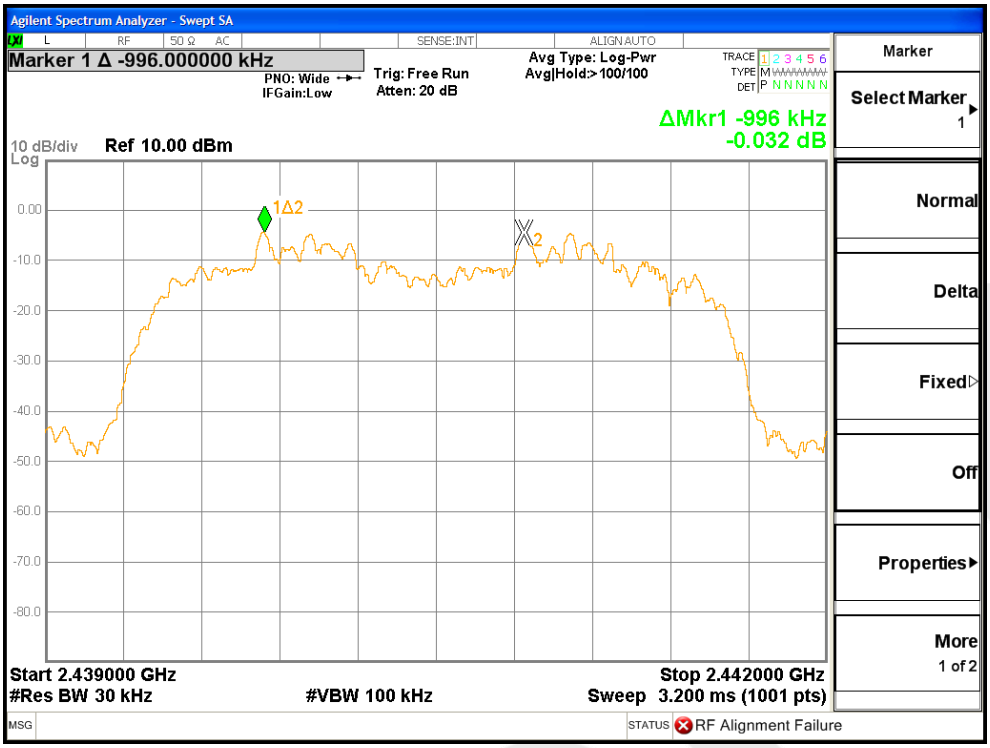
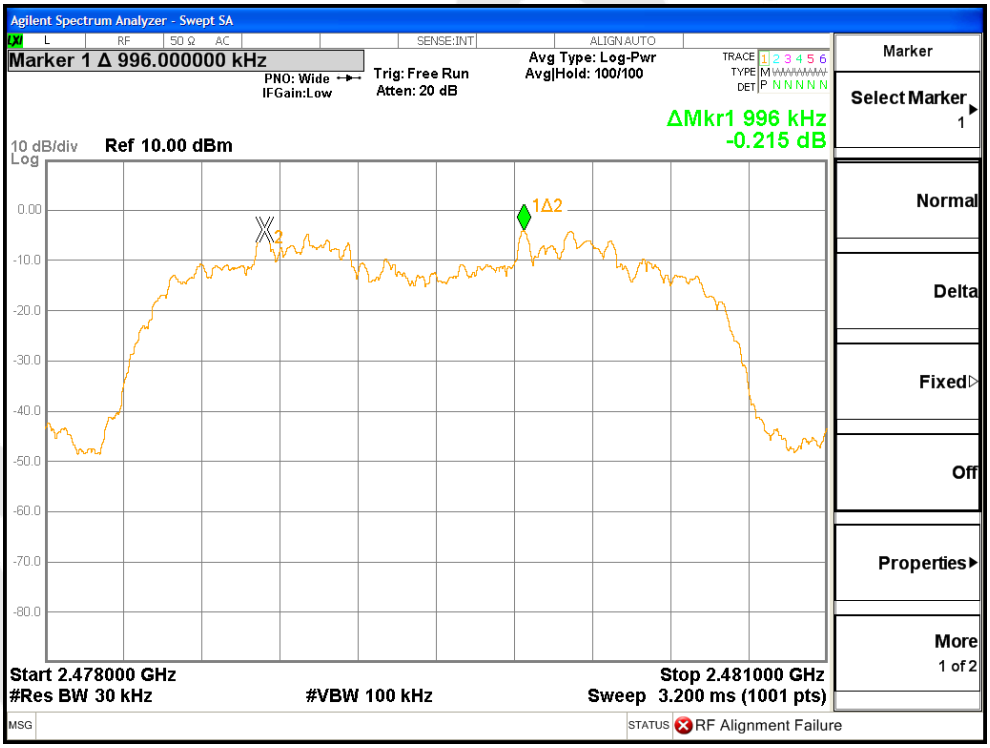


Test Mode: EDR---Middle



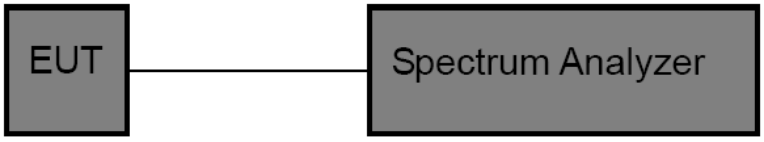
Test Mode: EDR---High

7. Occupied Channel Bandwidth

Test Limit

Test Item	Frequency Range (MHz)	Limit	Result
Occupied Bandwidth	2400-2483.5	Fall completely within the Operation Band	Pass
		For non-adaptive Frequency Hopping equipment with e.i.r.p greater than 10 dBm, the occupied Bandwidth shall equal to or less than the value declared by the supplier, and shall not greater than 5 MHz.	

Test Setup



Test Procedure

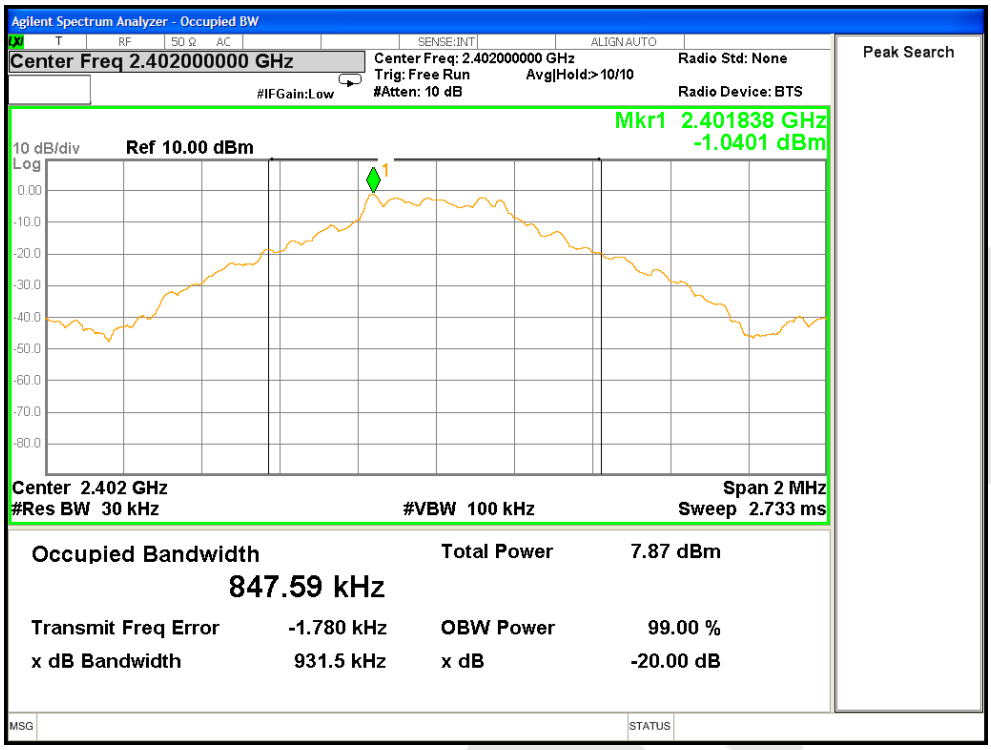
1. The transmitter output was connected to the spectrum analyzer.
2. Set the spectrum analyzer as follows to measure the 99% bandwidth.
-Resolution BW : 30kHz.
-Resolution BW :100kHz.
-Detector : RMS.
-Trace Mode : Max Hold.
-Sweep time : Auto.
-Span : 3MHz
3. Set the spectrum analyzer as follows to measure the 20 dB bandwidth.
-Resolution BW : 30kHz.
-Resolution BW :100kHz.
-Detector : RMS.
-Trace Mode : Max Hold.

Test Results

PASS. Please refer to the following data.

Test Item	:	99% and 20dB BW	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 3.7V Battery inside	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

Channel	Frequency (MHz)	20dB Down BW(kHz)	99% BW (kHz)	Mode
Low	2401	931.5	847.59	BDR
Mid	2441	930.0	844.96	BDR
High	2480	931.4	844.59	BDR
Low	2401	1366.0	1160.6	EDR
Mid	2441	1264.0	1157.6	EDR
High	2480	1256.0	1156.6	EDR



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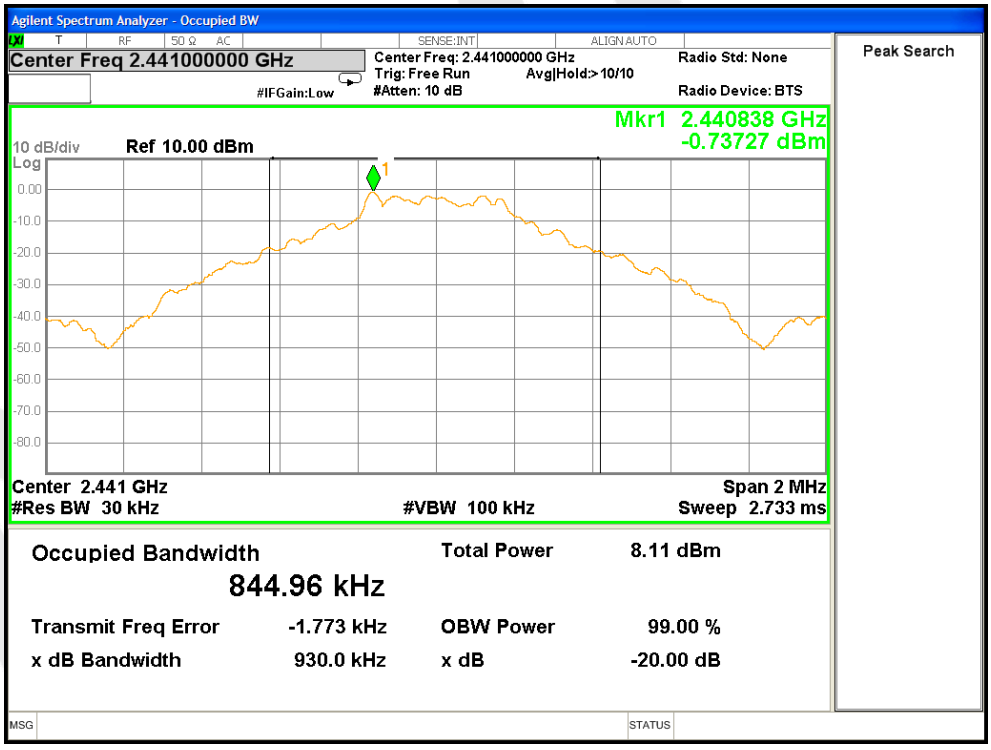

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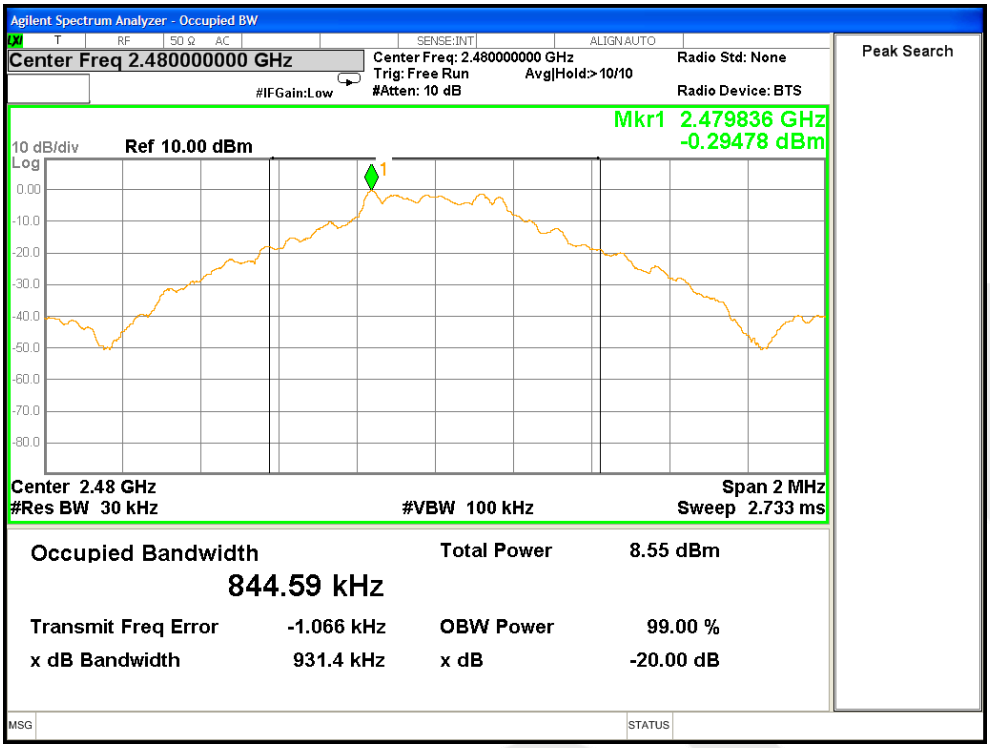

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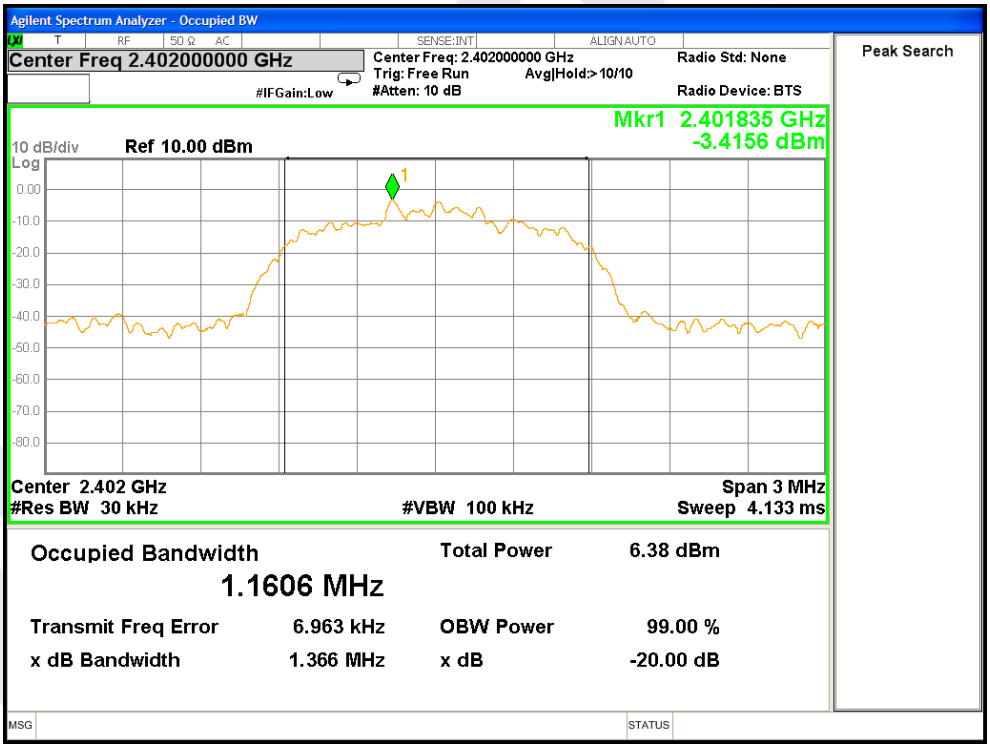

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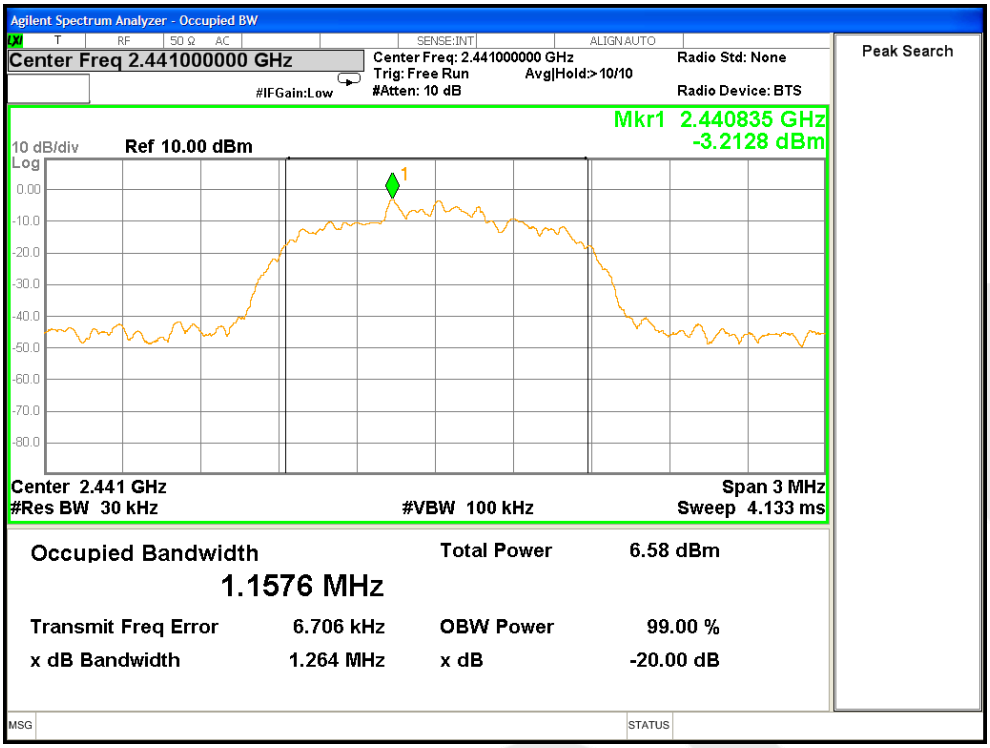
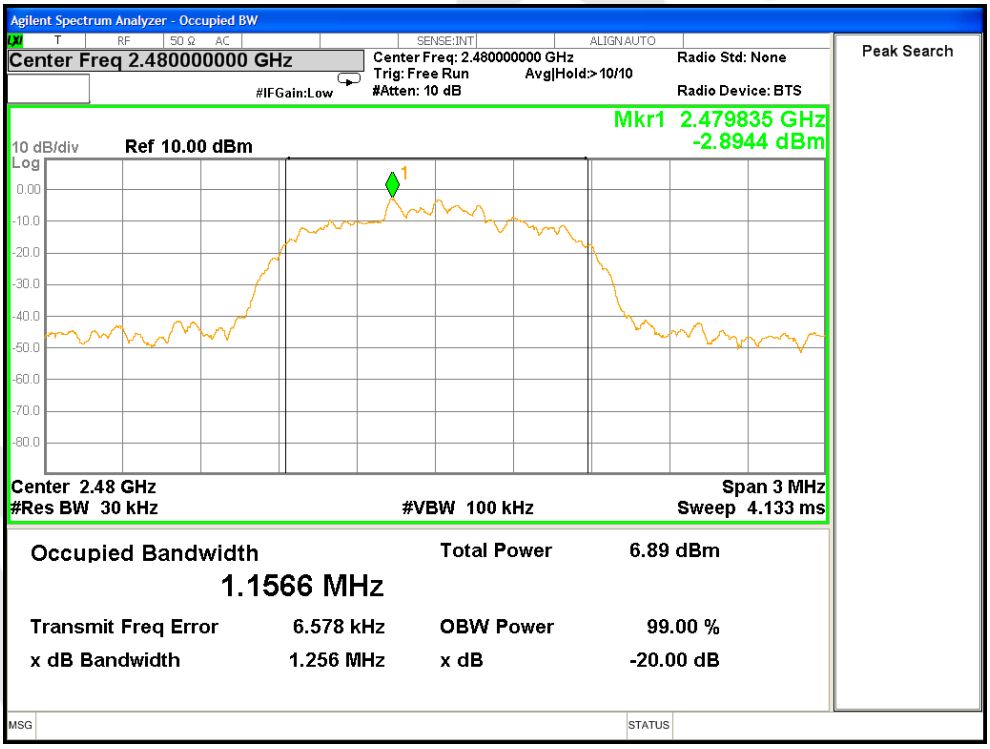


Test Mode: EDR---Middle

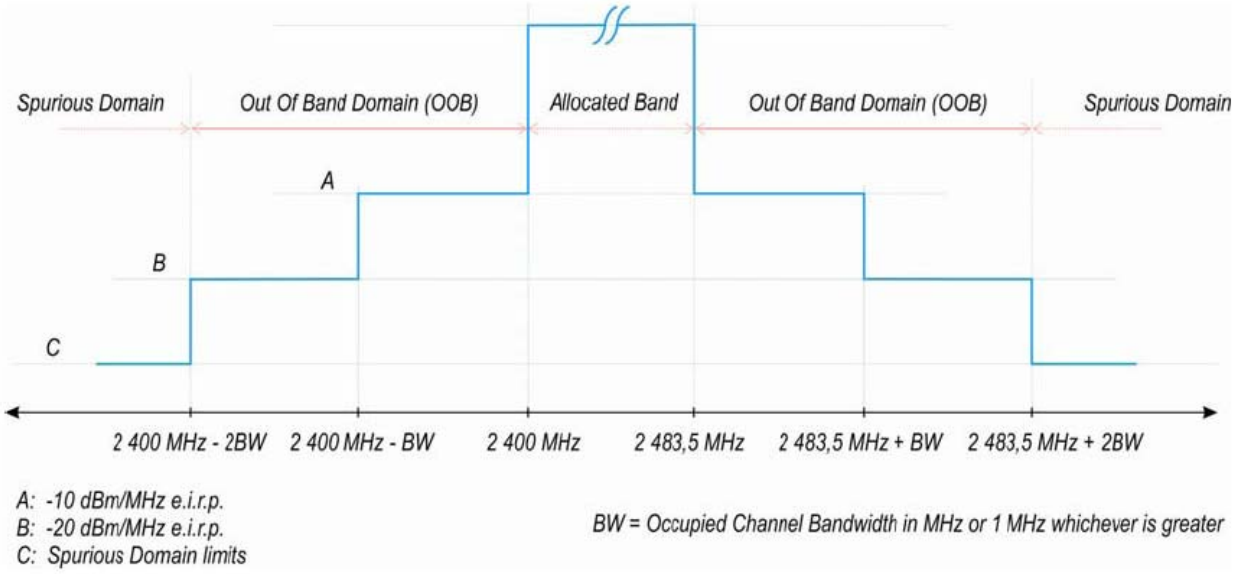


Test Mode: EDR---High

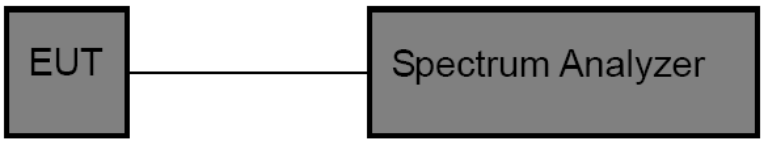
8. Transmitter Unwanted Emissions in the out-of-band Domain

Test Limit

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure 1of clause 4.3.1.8.2



Test Setup



Test Procedure

Step 1:
The transmitter output was connected to the spectrum analyzer.
Set the spectrum analyzer as following:
-Centre Frequency: 2484 MHz.
-Span: 0 Hz
-Resolution BW : 1 MHz
-Filter mode: Channel filter
-Video BW : 3 MHz
-Detector Mode: RMS
-Trace Mode : Clear / Write
-Sweep Mode: Continuous
-Sweep Points : 5000
-Trigger Mode: Video trigger
-Sweep Time: Suitable to capture one transmission burst

Step 2 (2483.5 MHz to 2483.5 MHz +BW):
Adjust trigger level to select the transmissions with the highest power level.
The highest power level shall be selected.
Set a window to match with the start and end of the burst and in which the RMS Power shall be measured using the Time Domain Power Function.
RMS Power within this 1 MHz segment (2483.5 MHz to 2484.5 MHz). Compare this value the applicable limit provided by the mask.
Increase the centre frequency in steps of 1 MHz and repeat this measurement for every 1 MHz segment within the range 2483.5 MHz to 2483.5 MHz+BW. The centre frequency of the last 1 MHz segment within the range 2483.5 MHz to 2483.5 MHz +BW. The centre frequency of the last 1 MHz segment shall be set to 2483.5 MHz+BW-0.5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 3 (2483.5 MHz +BW to 2483.5 MHz +2BW):
Change the centre frequency of the analyzer to 2484MHz + BW and perform the measurement for the first 1MHz segment within range 2483.5MHz +BW to 2483.5 MHz +2BW. Increase the centre frequency in 1MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2483.5 MHz+ 2BW-0.5 MHz.

Step 4 (2400 MHz-BW to 2400 MHz):
Change the centre frequency of the analyzer to 2399.5MHz and perform the measurement for the first 1MHz segment within range 2400 MHz -BW to 2400 MHz Reduce the centre frequency in 1MHz steps and repeat the measurement to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2400 MHz -BW+ 0.5 MHz.

Step 5 (2400 MHz-BW to 2400 MHz):
Change the centre frequency of the analyzer to 2399.5MHz-BW and perform the measurement for the first 1MHz segment within range 2400 MHz -2BW to 2400 MHz –BW. Reduce the centre frequency in 1MHz steps and repeat the measurement to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2400 MHz -2BW+ 0.5 MHz.

Test Results

PASS. Please refer to the following data.

Test Item	:	Spurious Emissions	Test Mode	:	Transmitter Operating
Test Voltage	:	DC 3.7V Battery inside	Temperature	:	25℃
Test Result	:	PASS	Humidity	:	54%RH

Mode: BDR

Frequency Band	Maximum Level	Limit	Result
[2483.5 MHz, 2483.5 MHz+ BW]	-29.15	-10 dBm/MHz	Pass
[2483.5 MHz+ BW, 2483.5 MHz+ 2BW]	-37.31	-20 dBm/MHz	Pass
[2400 MHz- BW, 2400 MHz]	-28.62	-10 dBm/MHz	Pass
[2400 MHz- 2BW, 2400 MHz- BW]	-38.17	-20 dBm/MHz	Pass

Mode: EDR

[2483.5 MHz, 2483.5 MHz+ BW]	-27.07	-10 dBm/MHz	Pass
[2483.5 MHz+ BW, 2483.5 MHz+ 2BW]	-35.97	-20 dBm/MHz	Pass
[2400 MHz- BW, 2400 MHz]	-31.62	-10 dBm/MHz	Pass
[2400 MHz- 2BW, 2400 MHz- BW]	-38.50	-20 dBm/MHz	Pass

9. Transmitter Unwanted Emissions in the Spurious Domain

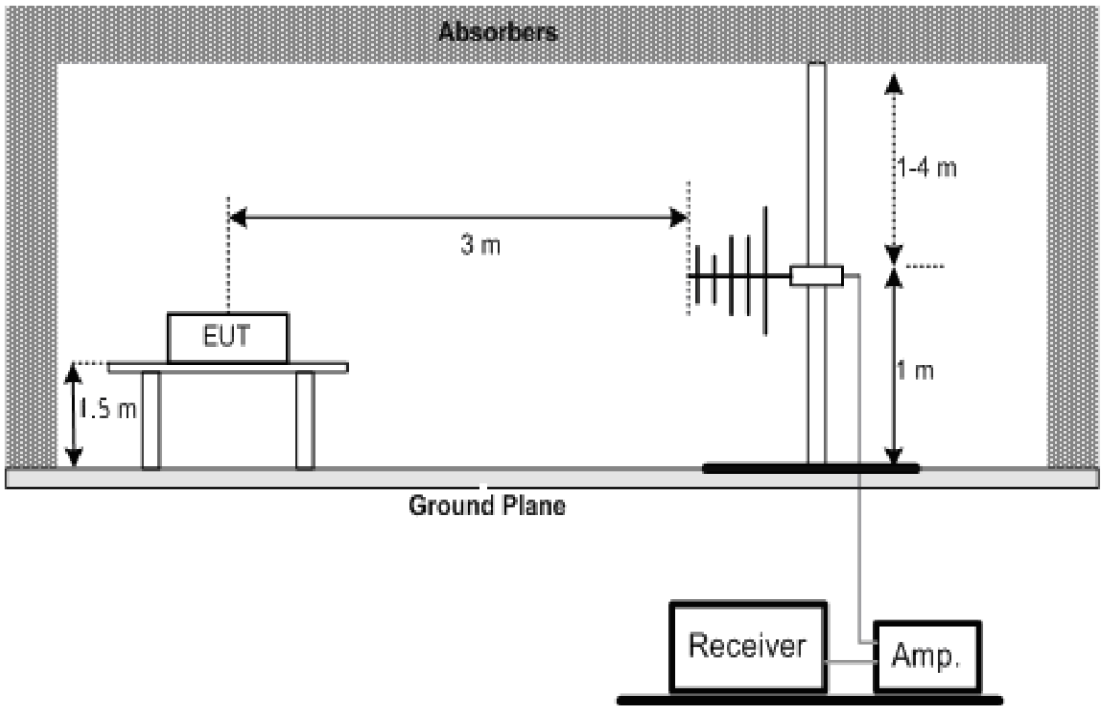
Test Limit

The transmitter unwanted emissions in the spurious domain shall not exceed the values given in table.

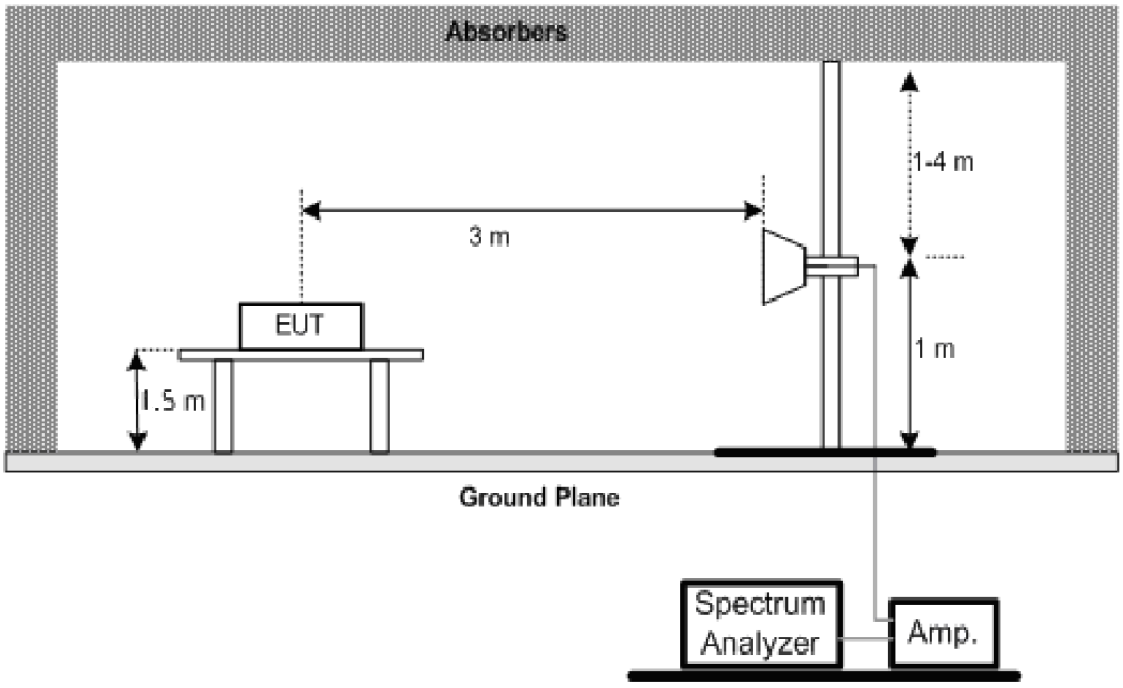
Frequency range	Maximum power, e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz)	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz	-54 dBm	100 kHz
862 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz

Test Setup

(A) Radiated Emission Test Set-Up Frequency Bellow 1 GHz.



(B) Radiated Emission Test Set-Up Frequency Above 1 GHz.



Test Procedure

The EUT was placed on the top of the turntable in chamber.

The test shall be made in the transmitting mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.

Set the spectrum analyzer as follows to measure the emissions (Bellow 1 GHz):

-Resolution BW : 100 kHz.
-Resolution BW :300 kHz.
-Detector : RMS.
-Trace Mode : Max Hold.
-Sweep time : 1s.
-Span :100M.
-Amplitude :Adjust for middle of the instrument's range.

Set the spectrum analyzer as follows to measure the emissions (Above 1 GHz):

-Resolution BW : 1 MHz.
-Resolution BW :3 MHz.
-Detector : RMS.
-Trace Mode : Max Hold.
-Sweep time : 1s.
-Span :100M.
-Amplitude :Adjust for middle of the instrument's range.

For 30~1000MHz spurious emissions measurement, the broad band bi-log receiving antenna was

placed 3 meters far away from the turntable. .

The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).

Replace the EUT by standard antenna and feed the RF port by signal generator.
Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.

Adjust the power level of the signal generator to reach the same reading with Read Level (Raw). The level of the spurious emission is the power level of (g) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.

If the measuring emissions that exceed the level of 6 dB below the applicable limit, the resolution bandwidth shall be switched to 30 kHz and the span shall be adjusted accordingly. If the level does not change by more than 2 dB, it is a narrowband emission; the observed value shall be recorded. If the level changes by more than 2 dB, the emission is a wideband emission and its level shall be measured and recorded.
The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.

Test Results

PASS. Please refer to the following data.

Test Item	:	Spurious Emissions	Test Mode	:	Transmitter Operating
Test Voltage	:	DC 3.7V Battery inside	Temperature	:	25℃
Test Result	:	PASS	Humidity	:	54%RH

Bellow 1GHz:

The worst case: Low 2402MHz

Frequency (MHz)	Ant H / V	TX/RX	Measured (dBm)	Limits (dBm)	Margins
143.329	V	TX	-65.88	-36.00	-29.88
608.021	V	TX	-66.16	-54.00	-12.16
---	V	TX	---	---	---
204.614	H	TX	-68.59	-54.00	-14.59
378.830	H	TX	-57.70	-36.00	-21.70
---	H	TX	---	---	---

The worst case: High 2480MHz

Frequency (MHz)	Ant H / V	TX/RX	Measured (dBm)	Limits (dBm)	Margins
142.828	V	TX	-62.45	-36.00	-26.45
780.307	V	TX	-66.14	-54.00	-12.14
---	V	TX	---	---	---
163.571	H	TX	-58.38	-36.00	-22.38
787.090	H	TX	-64.52	-54.00	-10.52
---	H	TX	---	---	---

Above 1GHz:					
The worst case: Low 2402MHz					
Frequency (MHz)	Ant H / V	TX/RX	Measured (dBm)	Limits (dBm)	Margins
4803.68	V	TX	-45.32	-30.00	-15.32
1823.63	V	TX	-52.99	-30.00	-22.99
---	V	TX	---	---	---
4805.67	H	TX	-37.80	-30.00	-7.80
1520.74	H	TX	-49.52	-30.00	-19.52
---	H	TX	---	---	---
The worst case: High 2480MHz					
Frequency (MHz)	Ant H / V	TX/RX	Measured (dBm)	Limits (dBm)	Margins
4960.76	V	TX	-44.83	-30.00	-14.83
1497.85	V	TX	-47.27	-30.00	-17.27
---	V	TX	---	---	---
4960.06	H	TX	-43.47	-30.00	-13.47
1563.70	H	TX	-46.99	-30.00	-16.99
---	H	TX	---	---	---

10. Receiver Spurious Emissions

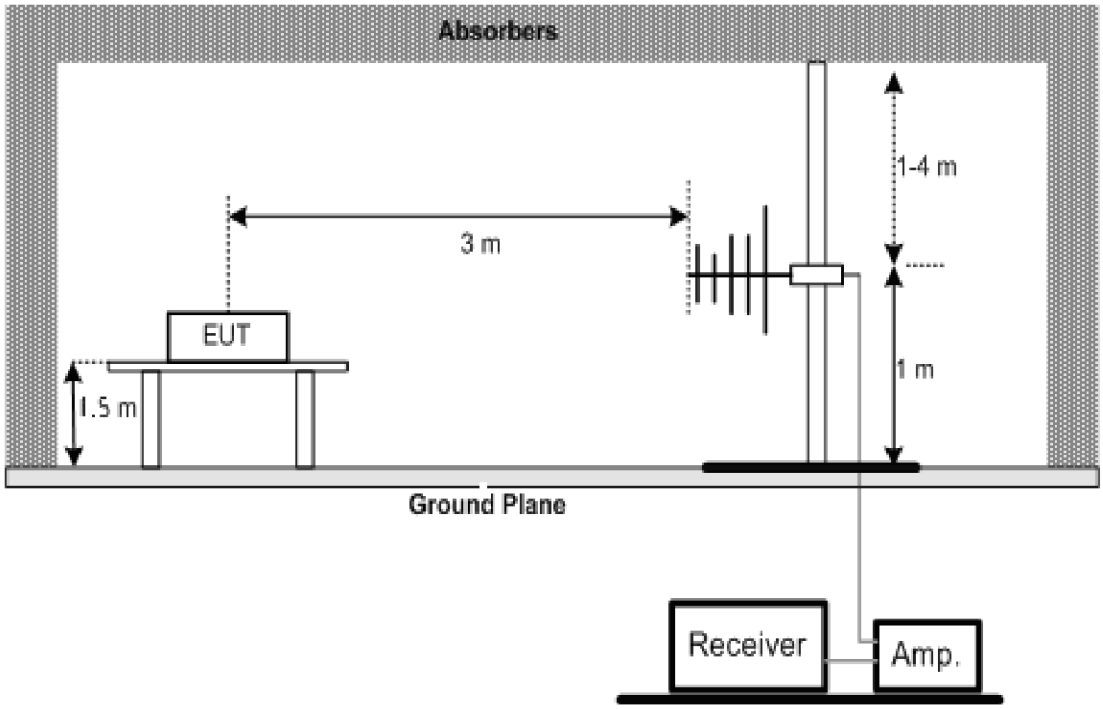
Test Limit

The spurious emissions of the receiver shall not exceed the values given in table.

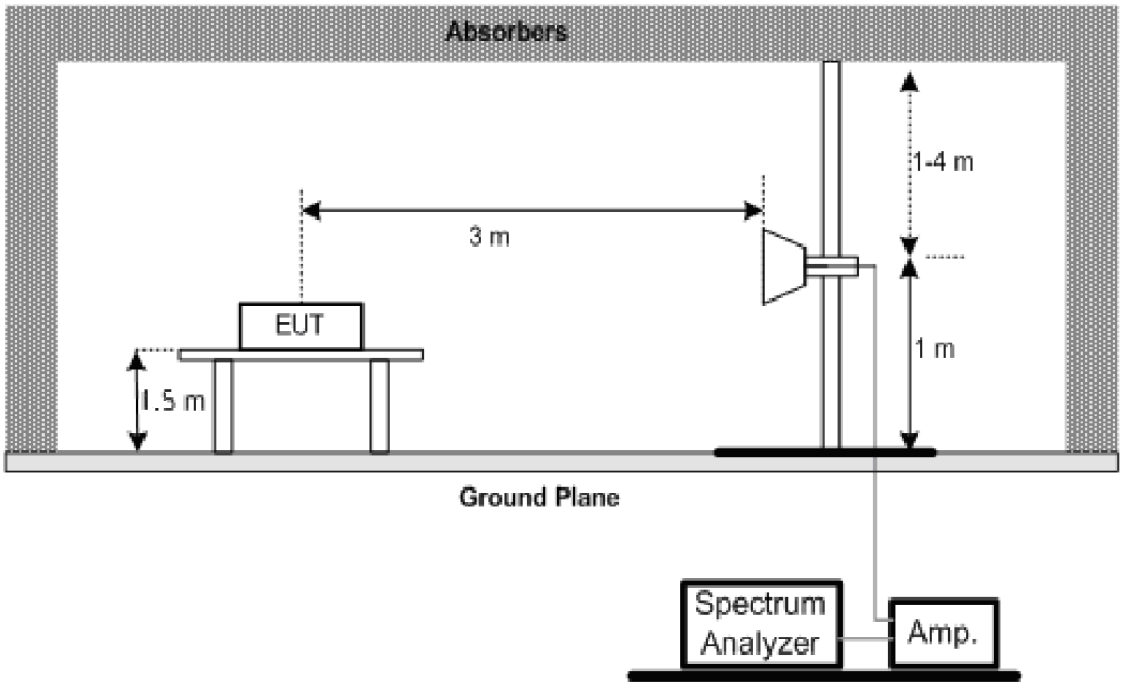
Frequency range	Maximum power, e.r.p.	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12,75 GHz	-47 dBm	1 MHz

Test Setup

(A) Radiated Emission Test Set-Up Frequency Bellow 1 GHz.



(B) Radiated Emission Test Set-Up Frequency Above 1 GHz.



Test Procedure

The EUT was placed on the top of the turntable in chamber.

The test shall be made in the transmitting mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.

Set the spectrum analyzer as follows to measure the emissions (Bellow 1 GHz):

-Resolution BW : 100 kHz.
-Resolution BW :300 kHz.
-Detector : RMS.
-Trace Mode : Max Hold.
-Sweep time : 1s.
-Span :100M.
-Amplitude :Adjust for middle of the instrument's range.

Set the spectrum analyzer as follows to measure the emissions (Above 1 GHz):

-Resolution BW : 1 MHz.
-Resolution BW :3 MHz.
-Detector : RMS.
-Trace Mode : Max Hold.
-Sweep time : 1s.
-Span :100M.
-Amplitude :Adjust for middle of the instrument's range.

For 30~1000MHz spurious emissions measurement, the broad band bi-log receiving antenna was

placed 3 meters far away from the turntable. .

The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).

Replace the EUT by standard antenna and feed the RF port by signal generator.
Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.

Adjust the power level of the signal generator to reach the same reading with Read Level (Raw). The level of the spurious emission is the power level of (g) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.

If the measuring emissions that exceed the level of 6 dB below the applicable limit, the resolution bandwidth shall be switched to 30 kHz and the span shall be adjusted accordingly. If the level does not change by more than 2 dB, it is a narrowband emission; the observed value shall be recorded. If the level changes by more than 2 dB, the emission is a wideband emission and its level shall be measured and recorded.
The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.

Test Results

PASS. Please refer to the following data.

Test Item	:	Spurious Emissions	Test Mode	:	TX
Test Voltage	:	DC 3.7V Battery inside	Temperature	:	25℃
Test Result	:	PASS	Humidity	:	54%RH

Bellow 1GHz:

The worst case: Low 2402MHz					
Frequency (MHz)	Ant H / V	TX/RX	Measured (dBm)	Limits (dBm)	Margins
375.234	V	RX	-65.79	-57.00	-8.79
---	V	RX	---	---	---
---	V	RX	---	---	---
210.948	H	RX	-70.35	-57.00	-13.35
---	H	RX	---	---	---
---	H	RX	---	---	---
The worst case: High 2480MHz					
Frequency (MHz)	Ant H / V	TX/RX	Measured (dBm)	Limits (dBm)	Margins
365.455	V	RX	-66.58	-57.00	-9.58
---	V	RX	---	---	---
---	V	RX	---	---	---
430.381	H	RX	-67.06	-57.00	-10.06
---	H	RX	---	---	---
---	H	RX	---	---	---

Above 1GHz:					
The worst case: Low 2402MHz					
Frequency (MHz)	Ant H / V	TX/RX	Measured (dBm)	Limits (dBm)	Margins
1300.60	V	RX	-59.07	-47.00	-12.07
---	V	RX	---	---	---
---	V	RX	---	---	---
1658.43	H	RX	-60.92	-47.00	-13.92
---	H	RX	---	---	---
---	H	RX	---	---	---
The worst case: High 2480MHz					
Frequency (MHz)	Ant H / V	TX/RX	Measured (dBm)	Limits (dBm)	Margins
1900.58	V	RX	-58.63	-47.00	-11.63
---	V	RX	---	---	---
---	V	RX	---	---	---
2439.88	H	RX	-61.37	-47.00	-14.37
---	H	RX	---	---	---
---	H	RX	---	---	---

11. PHOTOGRAPH

11.1. Photo of Emission Test