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CNAS L5313



DEKRA

2.4GHz Wideband Low Power Data Communication System Test Report

Product Name : EZ-BT Module
Model No. : CYBT-343026-01;CYBT-343029-0
1;CYBT-143038-01

Applicant : Cypress Semiconductor
Address : 198 Champion Ct, San Jose, California 95134

Date of Receipt : May. 11th, 2017
Test Date : May. 11th, 2017~Jun. 19th, 2017
Issued Date : Jun. 26th, 2017
Report No. : 1752099R-RF- JP-P01V02
Report Version : V1.0

The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

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Test Report Certification

Issued Date: Jun. 26th, 2017
Report No.: 1752099R-RF-JP-P01V02



Product Name : EZ-BT Module
Applicant : Cypress Semiconductor
Address : 198 Champion Ct, San Jose, California 95134
Manufacturer : Cypress Semiconductor
Address : 198 Champion Ct, San Jose, California 95134
Model No. : CYBT-343026-01;CYBT-343029-01;CYBT-143038-01
EUT Voltage : DC 2.3-3.6V
Test Voltage : AC 230V/50Hz
Applicable Standard : ARIB STD-T66
Article 2 Paragraph 1 Item 19 of the Ordinance Concerning
Technical Regulations
Test Result : Complied
Performed Location : DEKRA Testing and Certification (Suzhou) Co., Ltd.
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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
1752099R-RF-JP-P01V02	V1.0	Initial Issued Report	Jun. 26th, 2017

1. General Information

1.1. EUT Description

Product Name	EZ-BT Module
Model No.	CYBT-343026-01;CYBT-343029-01;CYBT-143038-01
EUT Voltage	DC 2.3-3.6V
Test Voltage	AC 230V/50Hz
BT	
Bluetooth Specification	V3.0+V4.2
Frequency Range	2402- 2480 MHz
Channel Number	V3.0: 79 V4.2: 40
Channel Separation	V3.0: 1MHz V4.2: 2MHz
Type of Modulation	V3.0: GFSK, Pi/4 DQPSK, 8DPSK V4.2: GFSK
Data Rate	V3.0: 1Mbps(GFSK), 2Mbps(Pi/4 DQPSK), 3Mbps (8DPSK) V4.2: 1Mbps(GFSK)
Declared Power	0.1 mW/MHz for normal mode 0.5 mW/MHz for AFH mode
Antenna Type	Reference to Antenna List
Antenna Gain	Reference to Antenna List

Note : Model CYBT-343029-01 is identical to Model CYBT-343026-01 and CYBT-143038-01 except for whether there is a certified Homekit chip or flash memory inside. Details see table below

Model No.	Flash	Homekit
CYBT-343026-01	Y	N
CYBT-343029-01	Y	Y
CYBT-143038-01	N	N

Channel List

Bluetooth Working Frequency of Each Channel: (For V3.0)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402 MHz	01	2403 MHz	02	2404 MHz	03	2405 MHz
04	2406 MHz	05	2407 MHz	06	2408 MHz	07	2409 MHz
08	2410 MHz	09	2411 MHz	10	2412 MHz	11	2413 MHz
12	2414 MHz	13	2415 MHz	14	2416 MHz	15	2417 MHz
16	2418 MHz	17	2419 MHz	18	2420 MHz	19	2421 MHz
20	2422 MHz	21	2423 MHz	22	2424 MHz	23	2425 MHz
24	2426 MHz	25	2427 MHz	26	2428 MHz	27	2429 MHz
28	2430 MHz	29	2431 MHz	30	2432 MHz	31	2433 MHz
32	2434 MHz	33	2435 MHz	34	2436 MHz	35	2437 MHz
36	2438 MHz	37	2439 MHz	38	2440 MHz	39	2441 MHz
40	2442 MHz	41	2443 MHz	42	2444 MHz	43	2445 MHz
44	2446 MHz	45	2447 MHz	46	2448 MHz	47	2449 MHz
48	2450 MHz	49	2451 MHz	50	2452 MHz	51	2453 MHz
52	2454 MHz	53	2455 MHz	54	2456 MHz	55	2457 MHz
56	2458 MHz	57	2459 MHz	58	2460 MHz	59	2461 MHz
60	2462 MHz	61	2463 MHz	62	2464 MHz	63	2465 MHz
64	2466 MHz	65	2467 MHz	66	2468 MHz	67	2469 MHz
68	2470 MHz	69	2471 MHz	70	2472 MHz	71	2473 MHz
72	2474 MHz	73	2475 MHz	74	2476 MHz	75	2477 MHz
76	2478 MHz	77	2479 MHz	78	2480 MHz	N/A	N/A

Antenna List

Model No.	N/A		
Antenna manufacturer	N/A		
Antenna Delivery	<input checked="" type="checkbox"/> 1*TX+1*RX	<input type="checkbox"/> 2*TX+2*RX	<input type="checkbox"/> 3*TX+3*RX
Antenna technology	<input checked="" type="checkbox"/> SISO		
	<input type="checkbox"/> MIMO	<input type="checkbox"/> Basic	
		<input type="checkbox"/> CDD	
		<input type="checkbox"/> Beam-forming	
Antenna Type	<input type="checkbox"/> External	<input type="checkbox"/> Dipole	
	<input checked="" type="checkbox"/> Internal	<input type="checkbox"/> PIFA	
		<input checked="" type="checkbox"/> PCB	
		<input type="checkbox"/> Ceramic Chip Antenna	
		<input type="checkbox"/> Metal plate type F antenna	
Antenna Gain	-0.5dBi		

1.2. Mode of Operation

DEKRA Testing & Certification (Suzhou) Co., Ltd. has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: Transmitter-Normal-1Mbps (GFSK_DH5)
Mode 2: Transmitter-Normal-2Mbps(/4 DQPSK_DH5)
Mode 3: Transmitter-Normal-3Mbps (8DPSK_DH5)
Mode 4: Transmitter-AFH-1Mbps (GFSK_DH5)
Mode 5: Transmitter-AFH-2Mbps(/4 DQPSK_DH5)
Mode 6: Transmitter-AFH-3Mbps (8DPSK_DH5)
Mode 7: Receiver-Normal-1Mbps (GFSK_DH5)
Mode 8: Receiver -Normal-2Mbps(/4 DQPSK_DH5)
Mode 9: Receiver -Normal-3Mbps (8DPSK_DH5)

Note:

1. For portable device, radiated spurious emission was verified over X, Y, Z Axis, and shown the worst case on this report.
2. Regards to the frequency band operation for systems using FHSS modulation: normal operation (hopping) was selected to test for conducted, and the lowest, highest frequency channel for radiation spurious test.
3. The extreme test condition for voltage and temperature were declared by the manufacturer.
4. The reading values of all the test items contain cable loss.

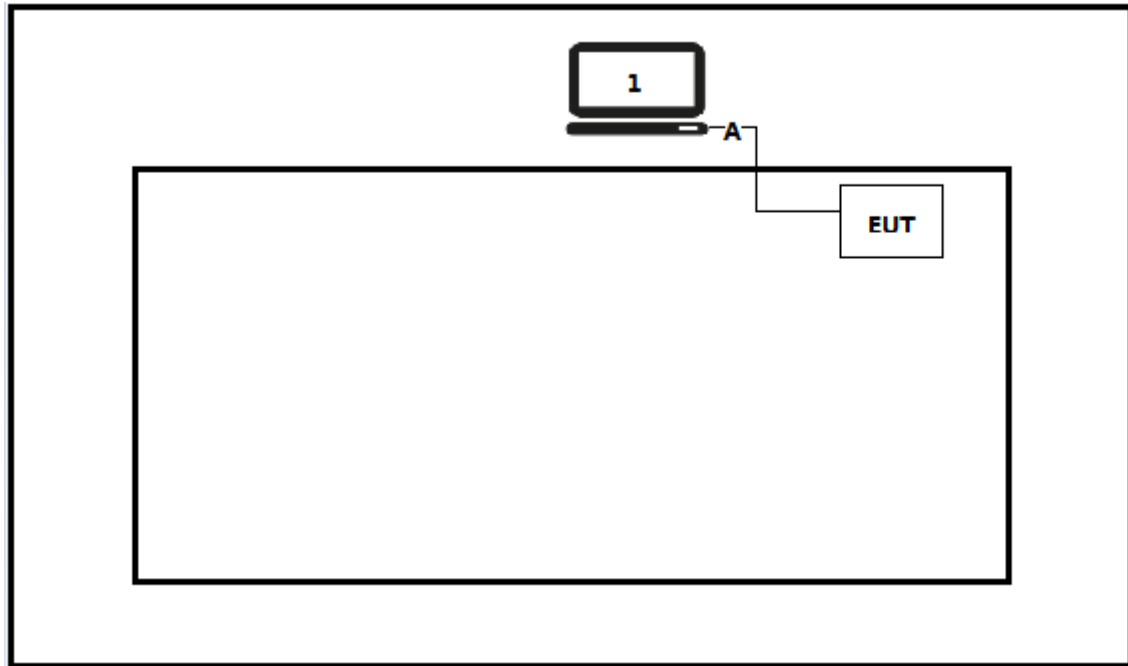
1.3. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

No.	Product	Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook	Think Pad	2526	LV-A3285	Power by adapter
A	USB cable	N/A	N/A	N/A	Shielded,0.5m
B	USB cable	N/A	N/A	N/A	Shielded,10m

1.4. Configuration of Tested System

Test setup Diagram- Conducted Test



1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of all equipment.
3	Run the RF test software[BlueTest 3], and set the test mode and channel, then press OK to start continue Transmit.

2. Technical Test

2.1. Summary of Test Result

- No deviations from the test standards
 Deviations from the test standards as below description:

Technical requirements for Frequency Hopping equipment

Performed Test Item	Normative References	Test Performed	Deviation
Output Power Density 、 Output Power Density Tolerance and E.I.R.P	Ministry of Internal Affairs and Communications notification Article 88 ARIB STD-T66 Clause 3.2.(2),(3)	Yes	No
Spread Bandwidth and Spread Factor	Ministry of Internal Affairs and Communications notification Article 88 ARIB STD-T66 Clause 3.2.(8)	Yes	No
Occupied Bandwidth	Ministry of Internal Affairs and Communications notification Article 88 ARIB STD-T66 Clause 3.2.(7)	Yes	No
Frequency Tolerance	Ministry of Internal Affairs and Communications notification Article 88 ARIB STD-T66 Clause 3.2.(4)	Yes	No
Dwell Time	Ministry of Internal Affairs and Communications notification Article 88 ARIB STD-T66 Clause 3.2.(11)	Yes	No
Transmitter Spurious Emissions	Ministry of Internal Affairs and Communications notification Article 88 ARIB STD-T66 Clause 3.2.(6)	Yes	No
Receiver Spurious Emissions	Ministry of Internal Affairs and Communications notification Article 88 ARIB STD-T66 Clause 3.3	Yes	No

2.2. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-7}$
RF Power Conducted	$\pm 0.7\text{dB}$
RF Power Radiated	$\pm 5.2\text{dB}$
Spurious Emissions, Conducted	$\pm 2.8\text{dB}$
Spurious Emissions, Radiated	$\pm 5.2\text{dB}$
Humidity	$\pm 1\%$
Temperature	± 0.5
Time	$\pm 8\%$

2.3. Test Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	25
Humidity (%RH)	25-75	50
Barometric pressure (mbar)	860-1060	950-1000

3. Output Power Density, Output Power Density Tolerance and E.I.R.P

3.1. Test Equipment

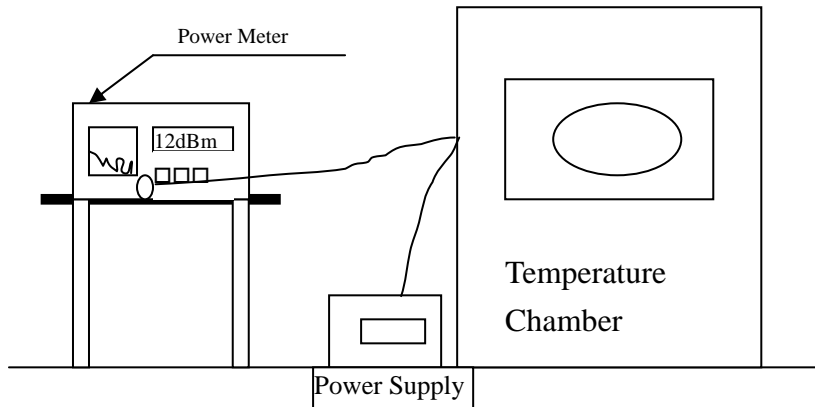
Output Power Density , Output Power Density Tolerance and E.I.R.P / TR8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Power Meter	Anritsu	ML2495A	0905006	2017.10.29
Power Sensor	Anritsu	MA2411B	0846014	2017.10.29
DC Power Supply	IDRC	CD-035-020PR	977272	2017.09.16
Programmable Temperature & Humidity Chamber	Gaoyu	TH-1P-B	WIT-05121302	2018.01.04
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2018.04.03

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

3.2. Test Setup

For Conducted Measurement



3.3. Limit

Output Power must be 3 mW/MHz or less.

Output Power Tolerance: +20% to -80%

E.I.R.P. must be 6.9112dBm/MHz or less or 16.9112dBm/MHz.

3.4. Test Procedure

1. Measure the total power by Power Meter in a state of hopping mode (with Average Sensor).
2. If it's the burst wave, please measure the burst ratio. Then calculate the real total power by burst ratio.
3. Calculate the mean power per 1MHz by dividing the total power by spread bandwidth.

3.5. Test Result

Product	:	EZ-BT Module
Test Item	:	Output Power Density , Output Power Density Tolerance and E.I.R.P
Test Site	:	TR8
Test Mode	:	Mode 1: Transmitter-1Mbps(GFSK_DH5)

Output Power Density

Cable Loss=-0.5dB			
Frequency (MHz)	Reading Value (dBm)	Real Value (mW/MHz)	Limit (mW/MHz)
2402	8.01	0.117	3
2441	7.98	0.116	3
2480	7.17	0.096	3

Note: Reading Value = Cable Loss + power meter reading value
Real Value = Reading Value (mW) / Burst Ratio / Spread bandwidth (MHz)
Calculate Real Value:
2402MHz = 6.324mW/0.77/70.447MHz=0.117mW/MHz
2441MHz = 6.281mW/0.77/70.447MHz=0.116mW/MHz
2480MHz = 5.212mW/0.77/70.447MHz=0.096mW/MHz

Output Power Density Tolerance

Frequency (MHz)	Declared Output Power (mW/MHz)	Output Power (mW/MHz)	Tolerance (%)	Limit
2402	0.15	0.117	-22.00%	+20%~-80%
2441	0.15	0.116	-22.67%	+20%~-80%
2480	0.15	0.096	-36.00%	+20%~-80%

Note: Deviation = (Output Power – Declared Output Power) / Declared Output Power * 100%

E.I.R.P

Frequency (MHz)	Output Power (dBm/MHz)	Real Value (dBm/MHz)	Limit (dBm/MHz)
2402	-9.334	-9.834	6.911
2441	-9.364	-9.864	6.911
2480	-10.174	-10.674	6.911

Note: Real Value = Output Power + Antenna Max Gain (dBi)

Product	:	EZ-BT Module
Test Item	:	Output Power Density , Output Power Density Tolerance and E.I.R.P
Test Site	:	TR8
Test Mode	:	Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH5)

Output Power Density

Cable Loss=-0.5dB			
Frequency (MHz)	Reading Value (dBm)	Real Value (mW/MHz)	Limit (mW/MHz)
2402	6.28	0.078	3
2441	6.07	0.075	3
2480	4.99	0.058	3

Note: Reading Value = Cable Loss + power meter reading value
Real Value = Reading Value (mW) / Burst Ratio / Spread bandwidth (MHz)
Calculate Real Value:
2402MHz = 4.246mW/0.77/70.580MHz=0.078mW/MHz
2441MHz = 4.046mW/0.77/70.580MHz =0.075mW/MHz
2480MHz = 3.155mW/0.77/70.580MHz =0.058mW/MHz

Output Power Density Tolerance

Frequency (MHz)	Declared Output Power (mW/MHz)	Output Power (mW/MHz)	Tolerance (%)	Limit
2402	0.09	0.078	-13.33%	+20%~-80%
2441	0.09	0.075	-16.67%	+20%~-80%
2480	0.09	0.058	-35.56%	+20%~-80%

Note: Deviation = (Output Power – Declared Output Power) / Declared Output Power * 100%

E.I.R.P

Frequency (MHz)	Output Power (dBm/MHz)	Real Value (dBm/MHz)	Limit (dBm/MHz)
2402	-11.072	-11.572	6.911
2441	-11.282	-11.782	6.911
2480	-12.362	-12.862	6.911

Note: Real Value = Output Power Density + Antenna Max Gain (dBi)

Product	:	EZ-BT Module
Test Item	:	Output Power Density 、 Output Power Density Tolerance and E.I.R.P
Test Site	:	TR8
Test Mode	:	Mode 3: Transmitter-3Mbps(8DPSK_DH5)

Output Power Density

Cable Loss=-0.5dB			
Frequency (MHz)	Reading Value (dBm)	Real Value (mW/MHz)	Limit (mW/MHz)
2402	6.54	0.083	3
2441	6.38	0.080	3
2480	5.31	0.063	3

Note: Reading Value = Cable Loss + power meter reading value
Real Value = Reading Value (mW) / Burst Ratio / Spread bandwidth (MHz)
Calculate Real Value:
2402MHz =4.508mW/0.77/71.947MHz=0.083mW/MHz
2441MHz =4.345mW/0.77/71.947MHz =0.080mW/MHz
2480MHz =3.396mW/0.77/71.947MHz =0.063mW/MHz

Output Power Density Tolerance

Frequency (MHz)	Declared Output Power (mW/MHz)	Output Power (mW/MHz)	Tolerance (%)	Limit
2402	0.09	0.083	-7.78%	+20%~-80%
2441	0.09	0.080	-11.11%	+20%~-80%
2480	0.09	0.063	-30.00%	+20%~-80%

Note: Deviation = (Output Power – Declared Output Power) / Declared Output Power * 100%

E.I.R.P

Frequency (MHz)	Output Power (dBm/MHz)	Real Value (dBm/MHz)	Limit (dBm/MHz)
2402	-10.811	-11.311	6.911
2441	-10.971	-11.471	6.911
2480	-12.041	-12.541	6.911

Note: Real Value = Output Power Density + Antenna Max Gain (dBi)

Product	:	EZ-BT Module
Test Item	:	Output Power Density , Output Power Density Tolerance and E.I.R.P
Test Site	:	TR8
Test Mode	:	Mode 4: Transmitter-AFH -1Mbps(GFSK_DH5)

Output Power Density

Cable Loss=-0.5dB			
Frequency (MHz)	Reading Value (dBm)	Real Value (mW/MHz)	Limit (mW/MHz)
2402	8.01	0.485	10
2411	7.98	0.482	10
2421	7.17	0.400	10

Note: Reading Value = Cable Loss + power meter reading value
Real Value = Reading Value (mW) / Burst Ratio / Spread bandwidth (MHz)
Calculate Real Value:
2402MHz =6.324mW/0.77/16.932MHz=0.485mW/MHz
2411MHz =6.281mW/0.77/16.932MHz=0.482mW/MHz
2421MHz =5.212mW/0.77/16.932MHz=0.400mW/MHz

Output Power Density Tolerance

Frequency (MHz)	Declared Output Power (mW/MHz)	Output Power (mW/MHz)	Tolerance (%)	Limit
2402	0.61	0.485	-20.49%	+20%~-80%
2411	0.61	0.482	-20.98%	+20%~-80%
2421	0.61	0.400	-34.43%	+20%~-80%

Note: Deviation = (Output Power – Declared Output Power) / Declared Output Power * 100%

E.I.R.P

Frequency (MHz)	Output Power (dBm/MHz)	Real Value (dBm/MHz)	Limit (dBm/MHz)
2402	-3.142	-3.642	16.911
2411	-3.172	-3.672	16.911
2421	-3.982	-4.482	16.911

Note: Real Value = Output Power Density + Antenna Max Gain (dBi)

Product	:	EZ-BT Module
Test Item	:	Output Power Density 、 Output Power Density Tolerance and E.I.R.P
Test Site	:	TR8
Test Mode	:	Mode 5: Transmitter-AFH-2Mbps(Pi/4 DQPSK_DH5)

Output Power Density

Cable Loss=-0.5dB			
Frequency (MHz)	Reading Value (dBm)	Real Value (mW/MHz)	Limit (mW/MHz)
2402	6.28	0.322	10
2411	6.07	0.307	10
2421	4.99	0.239	10

Note: Reading Value = Cable Loss + power meter reading value
Real Value = Reading Value (mW) / Burst Ratio / Spread bandwidth (MHz)
Calculate Real Value:
2402MHz =4.246mW/0.77/17.109MHz=0.322mW/MHz
2411MHz =4.046mW/0.77/17.109MHz =0.307mW/MHz
2421MHz =3.155mW/0.77/17.109MHz =0.239mW/MHz

Output Power Density Tolerance

Frequency (MHz)	Declared Output Power (mW/MHz)	Output Power (mW/MHz)	Tolerance (%)	Limit
2402	0.38	0.322	-15.26%	+20%~-80%
2411	0.38	0.307	-19.21%	+20%~-80%
2421	0.38	0.239	-37.11%	+20%~-80%

Note: Deviation = (Output Power – Declared Output Power) / Declared Output Power * 100%

E.I.R.P

Frequency (MHz)	Output Power (dBm/MHz)	Real Value (dBm/MHz)	Limit (dBm/MHz)
2402	-4.917	-5.417	16.911
2411	-5.127	-5.627	16.911
2421	-6.207	-6.707	16.911

Note: Real Value = Output Power Density + Antenna Max Gain (dBi)

Product	:	EZ-BT Module
Test Item	:	RF Output Power
Test Site	:	TR8
Test Mode	:	Mode 6: Transmitter-AFH-3Mbps(8DPSK_DH5)

Output Power Density

Cable Loss=-0.5dB			
Frequency (MHz)	Reading Value (dBm)	Real Value (mW/MHz)	Limit (mW/MHz)
2402	6.54	0.344	10
2411	6.38	0.332	10
2421	5.31	0.259	10

Note: Reading Value = Cable Loss + power meter reading value
Real Value = Reading Value (mW) / Burst Ratio / Spread bandwidth (MHz)
Calculate Real Value:
2402MHz = 4.508mW/0.77/17.014MHz=0.344mW/MHz
2411MHz = 4.345mW/0.77/17.014MHz=0.332mW/MHz
2421MHz = 3.396mW/0.77/17.014MHz=0.259mW/MHz

Output Power Density Tolerance

Frequency (MHz)	Declared Output Power (mW/MHz)	Output Power (mW/MHz)	Tolerance (%)	Limit
2402	0.38	0.344	-9.47%	+20%~-80%
2411	0.38	0.332	-12.63%	+20%~-80%
2421	0.38	0.259	-31.84%	+20%~-80%

Note: Deviation = (Output Power – Declared Output Power) / Declared Output Power * 100%

E.I.R.P

Frequency (MHz)	Output Power (dBm/MHz)	Real Value (dBm/MHz)	Limit (dBm/MHz)
2402	-4.633	-5.133	16.911
2411	-4.793	-5.293	16.911
2421	-5.863	-6.363	16.911

Note: Real Value = Output Power Density + Antenna Max Gain (dBi)

4. Spread Bandwidth and Spread Factor

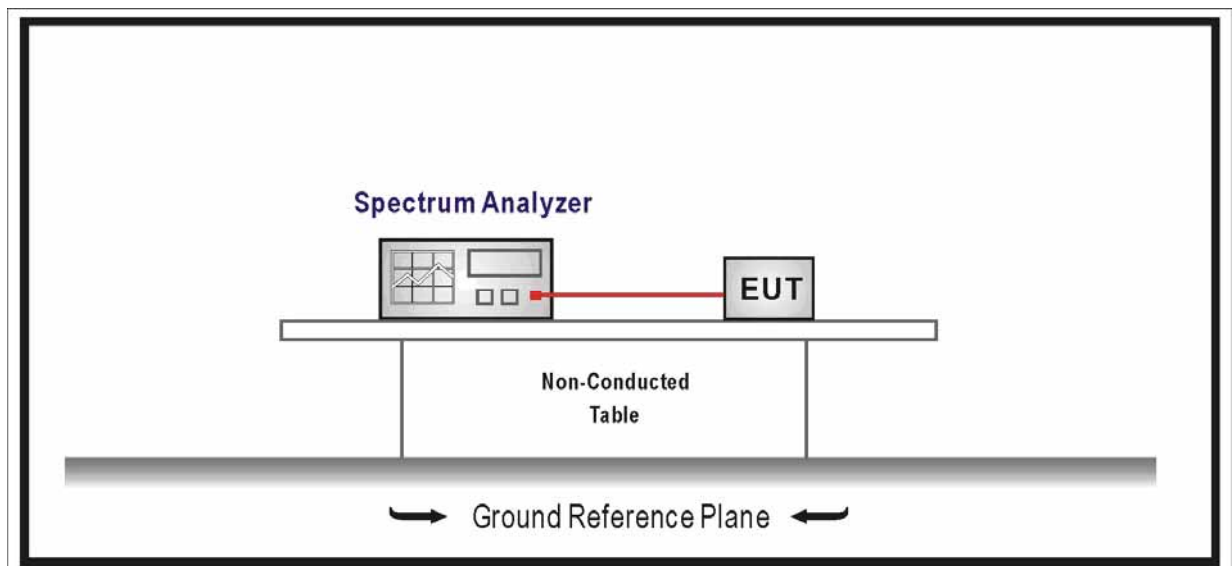
4.1. Test Equipment

Spread Bandwidth and Spread Factor / TR8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2018.01.15
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2018.04.03

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

4.2. Test Setup



4.3. Limit

Spread Bandwidth 500 kHz

Spread Factor 5 for 2400 – 2483.5 MHz, 10 for 2471 – 2497 MHz

4.4. Test Procedure

A spectrum analyzer or similar device shall be used to observe a sample of the modulated transmitter's radio frequency power output.

1. A positive peak detector function must be used.
2. A measurement instrument with an integrated 90% power bandwidth function may be used to automate the test process.

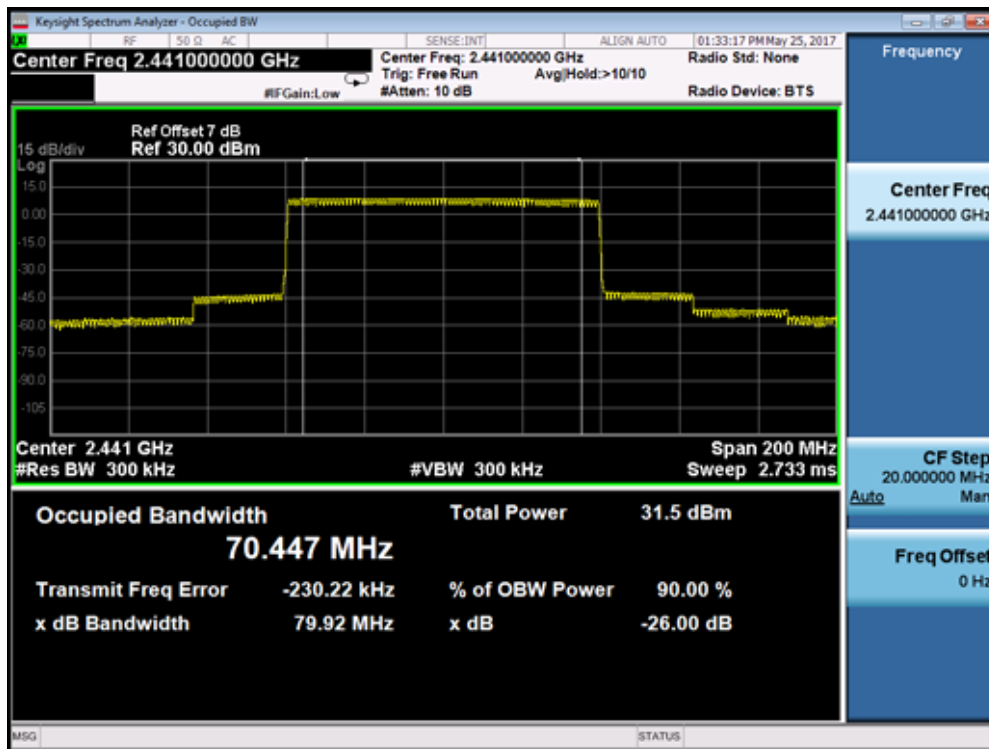
3. The measurement instrument bandwidth and span must be set sufficiently with, and, the scan time set sufficiently slow, to ensure all major modulation products are captured. Note that the measurement bandwidth should also be set sufficiently narrow to avoid adding significant error to the test result.
4. 'Maximum Hold' mode may be used to accumulate the measurement result over several scans provided the emission is repetitive in nature.

4.5. Test Result

Product	:	EZ-BT Module
Test Item	:	Spread Bandwidth
Test Site	:	TR8
Test Mode	:	Mode 1: Transmitter-1Mbps(GFSK_DH5)

Frequency (MHz)	Reading Value (MHz)	Limit (KHz)
2402	--	500
2441	70.447	500
2480	--	500

2441MHz



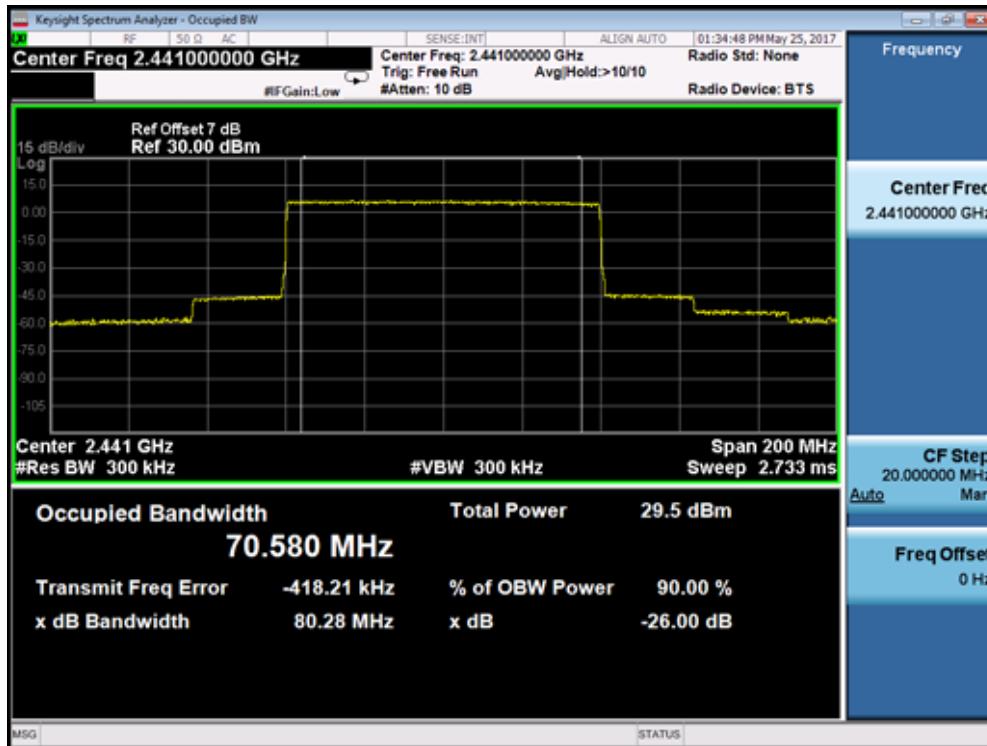
Product	:	EZ-BT Module
Test Item	:	Spread Factor
Test Site	:	TR8
Test Mode	:	Mode 1: Transmitter-1Mbps(GFSK_DH5)

Frequency (MHz)	Spread Bandwidth/1	Limit
2402	--	5
2441	70.447	5
2480	--	5

Product	:	EZ-BT Module
Test Item	:	Spread Bandwidth
Test Site	:	TR8
Test Mode	:	Mode 2: Transmitter-2Mbps(/4 DQPSK _DH5)

Frequency (MHz)	Reading Value (MHz)	Limit (KHz)
2402	--	500
2441	70.580	500
2480	--	500

2441MHz



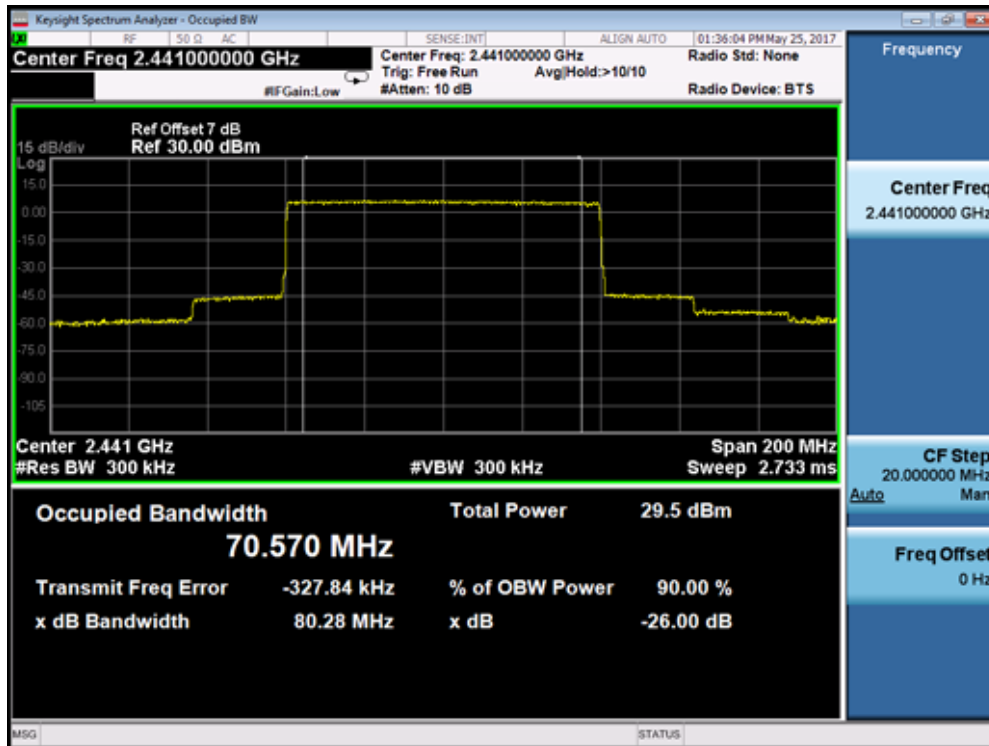
Product	:	EZ-BT Module
Test Item	:	Spread Factor
Test Site	:	TR8
Test Mode	:	Mode 2: Transmitter-2Mbps(/4 DQPSK _DH5)

Frequency (MHz)	Spread Bandwidth/1	Limit
2402	--	5
2441	70.580	5
2480	--	5

Product	:	EZ-BT Module
Test Item	:	Spread Bandwidth
Test Site	:	TR8
Test Mode	:	Mode 3: Transmitter-Normal-3Mbps(8DPSK_DH5)

Frequency (MHz)	Reading Value (MHz)	Limit (KHz)
2402	--	500
2441	70.570	500
2480	--	500

2441MHz



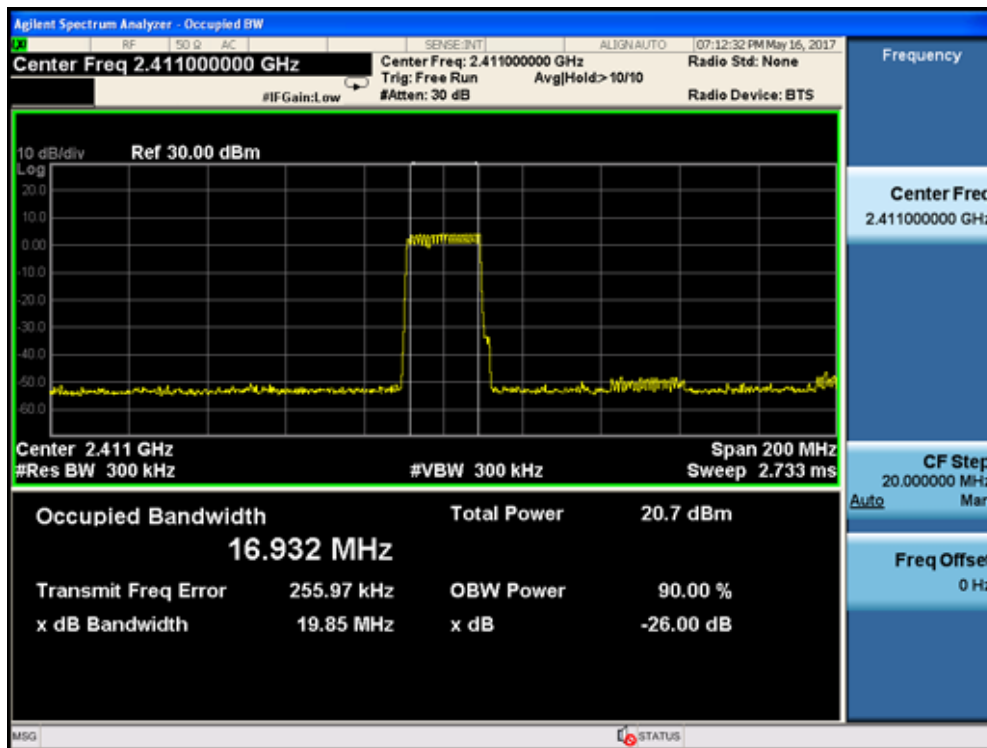
Product	:	EZ-BT Module
Test Item	:	Spread Factor
Test Site	:	TR8
Test Mode	:	Mode 3: Transmitter-Normal-3Mbps(8DPSK_DH5)

Frequency (MHz)	Spread Bandwidth/1	Limit
2402	--	5
2441	70.570	5
2480	--	5

Product	:	EZ-BT Module
Test Item	:	Spread Bandwidth
Test Site	:	TR8
Test Mode	:	Mode 4: Transmitter-AFH-1MHz (GFSK_DH5)

Frequency (MHz)	Reading Value (MHz)	Limit (KHz)
2402	--	500
2411	16.932	500
2421	--	500

2411MHz



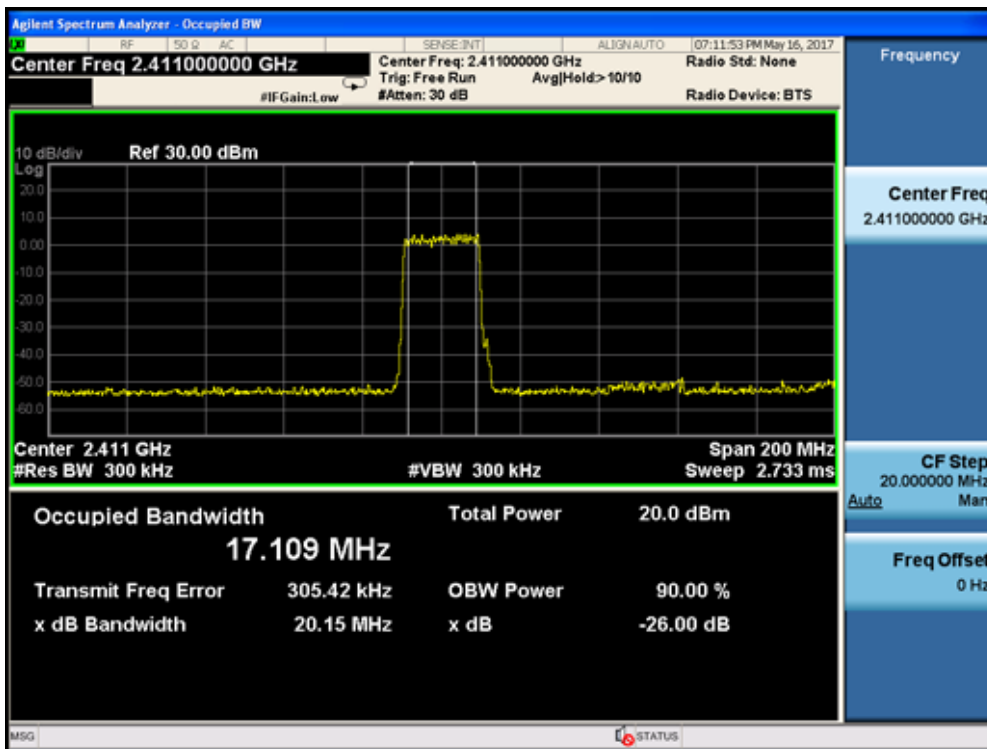
Product	:	EZ-BT Module
Test Item	:	Spread Factor
Test Site	:	TR8
Test Mode	:	Mode 4: Transmitter-AFH-1MHz (GFSK_DH5)

Frequency (MHz)	Spread Bandwidth/1	Limit
2402	--	5
2411	16.932	5
2421	--	5

Product	:	EZ-BT Module
Test Item	:	Spread Bandwidth
Test Site	:	TR8
Test Mode	:	Mode 5: Transmitter-AFH-2MHz (Pi/4DQPSK_DH5)

Frequency (MHz)	Reading Value (MHz)	Limit (KHz)
2402	--	500
2411	17.109	500
2421	--	500

2411MHz



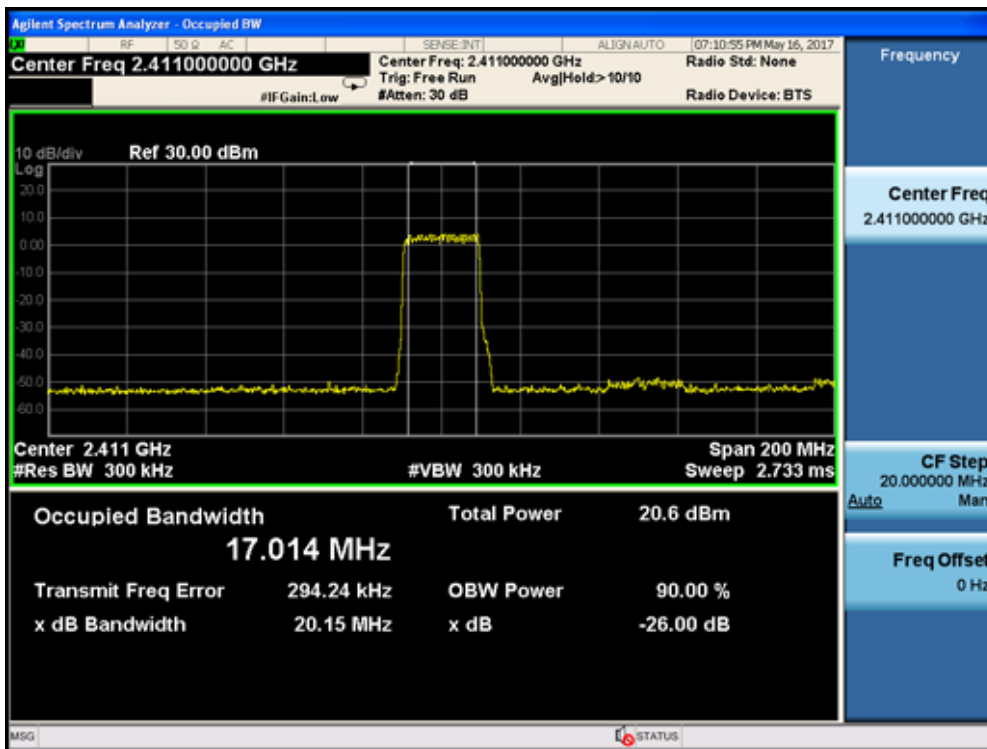
Product	:	EZ-BT Module
Test Item	:	Spread factor
Test Site	:	TR8
Test Mode	:	Mode 5: Transmitter-AFH-2MHz (Pi/4DQPSK_DH5)

Frequency (MHz)	Spread Bandwidth/1	Limit
2402	--	5
2411	17.109	5
2421	--	5

Product	:	EZ-BT Module
Test Item	:	Spread Bandwidth
Test Site	:	TR8
Test Mode	:	Mode 6: Transmitter-AFH-3Mbps(8DPSK_DH5)

Frequency (MHz)	Reading Value (MHz)	Limit (KHz)
2402	--	500
2411	17.014	500
2421	--	500

2411MHz



Product	:	EZ-BT Module
Test Item	:	Spread Factor
Test Site	:	TR8
Test Mode	:	Mode 6: Transmitter-AFH-3Mbps(8DPSK_DH5)

Frequency (MHz)	Spread Bandwidth/1	Limit
2402	--	5
2411	17.014	5
2421	--	5

5. Occupied Bandwidth

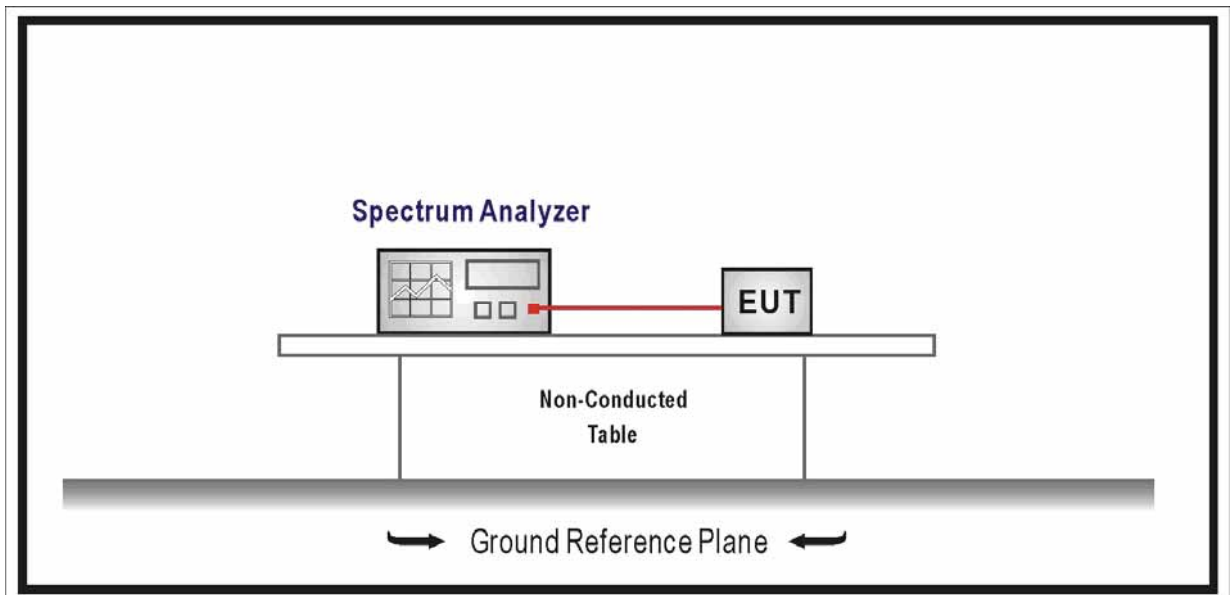
5.1. Test Equipment

Occupied Bandwidth/ TR8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2018.01.15
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2018.04.03

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

5.2. Test Setup



5.3. Limit

26 MHz for DSSS&OFDM, 83.5 MHz for FHSS

5.4. Test Procedure

A spectrum analyzer or similar device shall be used to observe a sample of the modulated transmitter's radio frequency power output.

1. A positive peak detector function must be used.
2. A measurement instrument with an integrated 99% power bandwidth function may be used to automate the test process.
3. The measurement instrument bandwidth and span must be set sufficiently with, and, the

scan time set sufficiently slow, to ensure all major modulation products are captured. Note that the measurement bandwidth should also be set sufficiently narrow to avoid adding significant error to the test result.

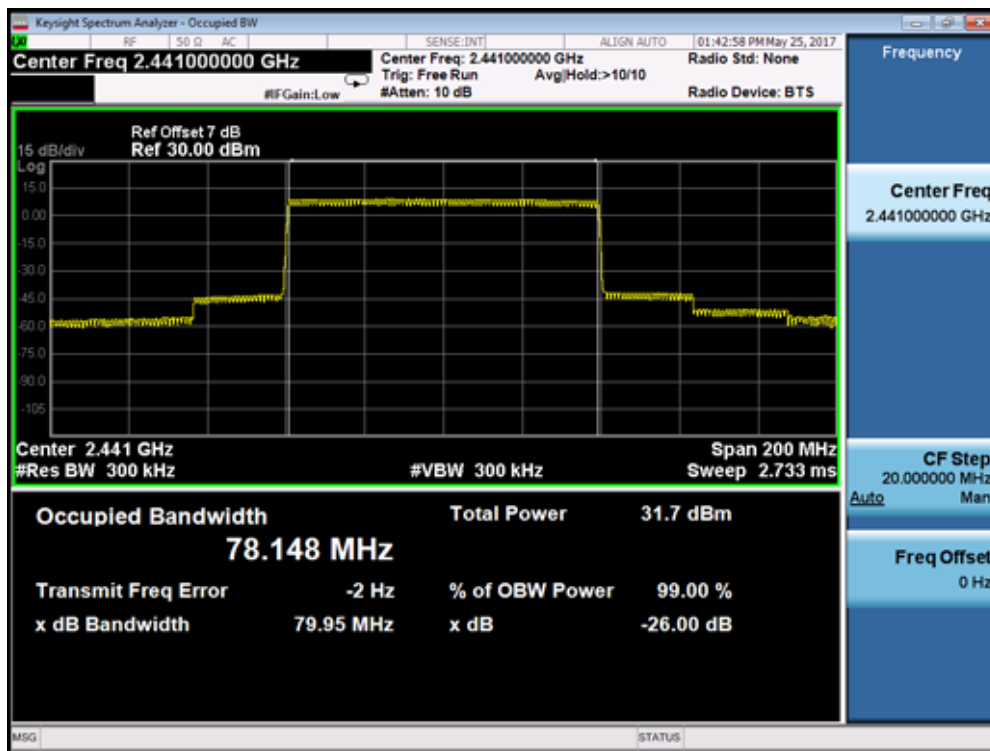
4. 'Maximum Hold' mode may be used to accumulate the measurement result over several scans provided the emission is repetitive in nature.

5.5. Test Result

Product	:	EZ-BT Module
Test Item	:	Occupied Bandwidth
Test Site	:	TR8
Test Mode	:	Mode 1: Transmitter-1Mbps(GFSK_DH5)

Frequency (MHz)	Reading Value (MHz)	Limit (KHz)
2402	--	83.5
2441	78.148	83.5
2480	--	83.5

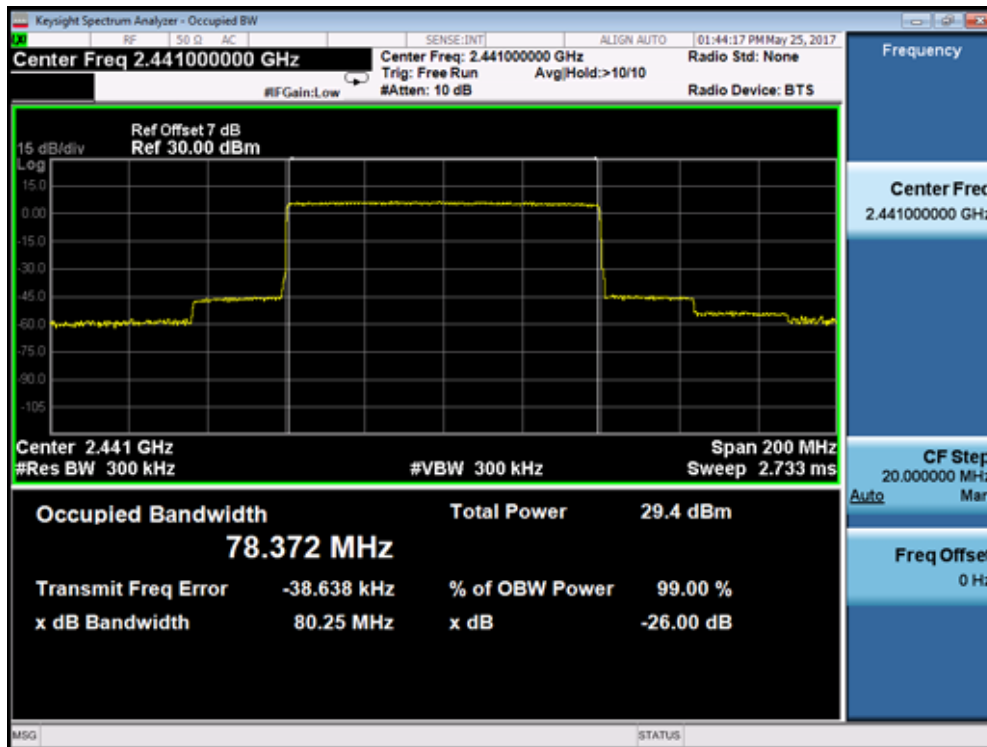
2441MHz



Product	:	EZ-BT Module
Test Item	:	Occupied Bandwidth
Test Site	:	TR8
Test Mode	:	Mode 2: Transmitter-2Mbps(/4 DQPSK _DH5)

Frequency (MHz)	Reading Value (MHz)	Limit (KHz)
2402	--	83.5
2441	78.372	83.5
2480	--	83.5

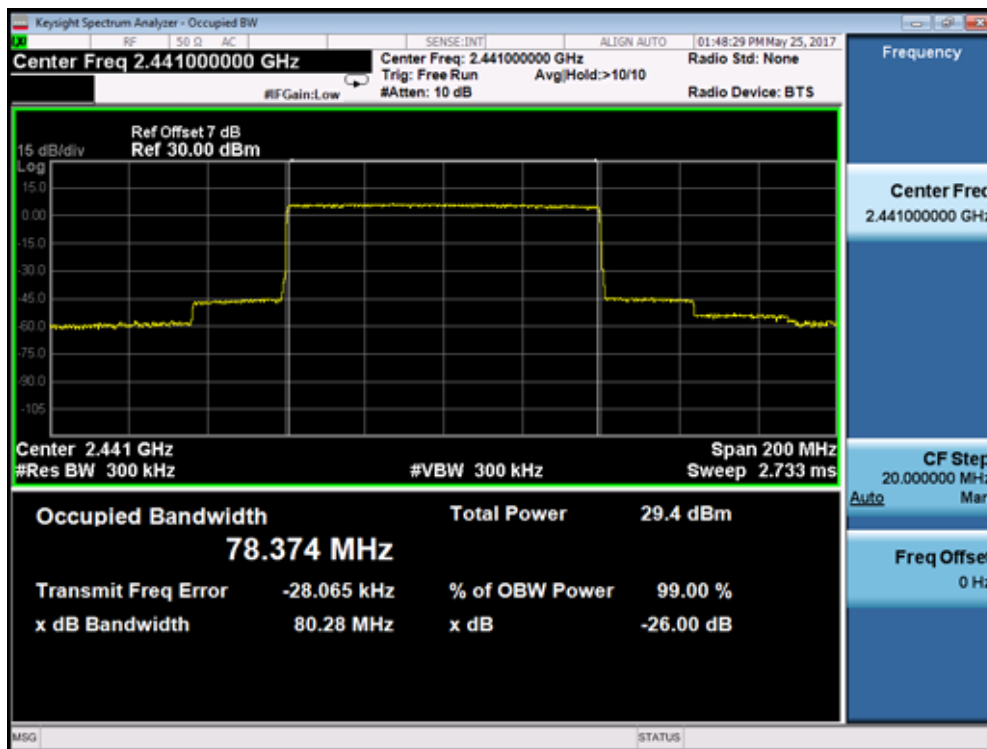
2441MHz



Product	:	EZ-BT Module
Test Item	:	Occupied Bandwidth
Test Site	:	TR8
Test Mode	:	Mode 3: Transmitter-Normal-3Mbps(8DPSK_DH5)

Frequency (MHz)	Reading Value (MHz)	Limit (KHz)
2402	--	83.5
2441	78.374	83.5
2480	--	83.5

2441MHz



Test Result	Pass
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6. Frequency Tolerance

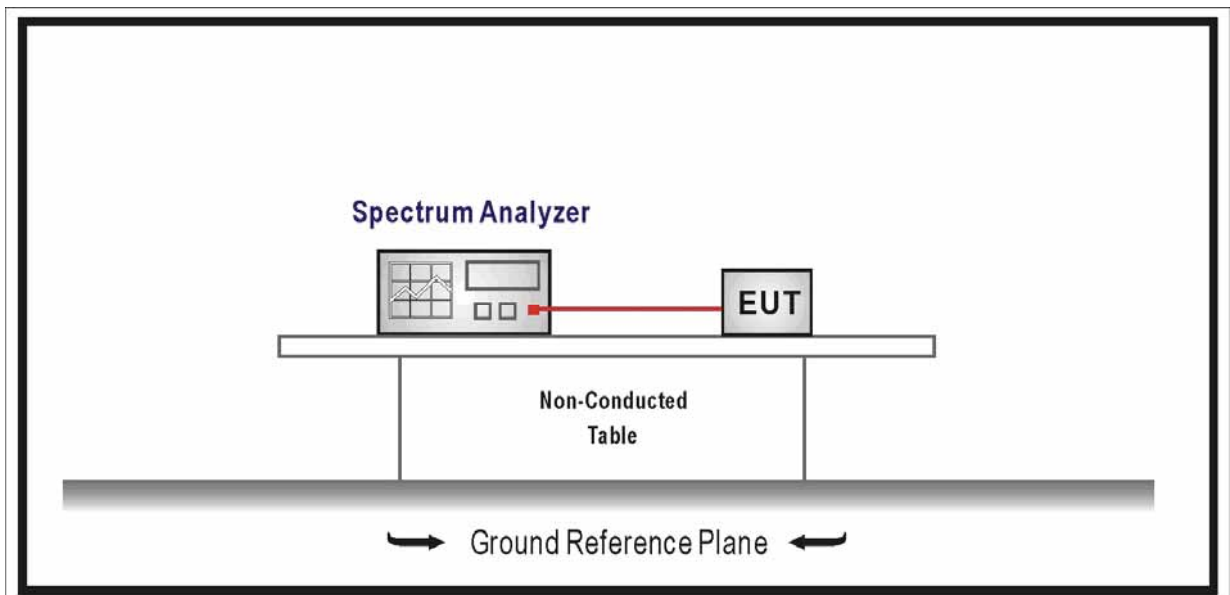
6.1. Test Equipment

Frequency Tolerance / TR8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2018.01.04
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2018.04.03

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

6.2. Test Setup



6.3. Limit

50 ppm

6.4. Test Procedure

A spectrum analyzer or similar device shall be used to observe a sample of the modulated transmitter's radio frequency power output.

1. A positive peak detector function must be used.
2. The measurement instrument bandwidth and span must be set sufficiently with, and, the scan time set sufficiently slow, to ensure all major modulation products are captured. Note that the measurement bandwidth should also be set sufficiently narrow to avoid adding significant error to the test result.

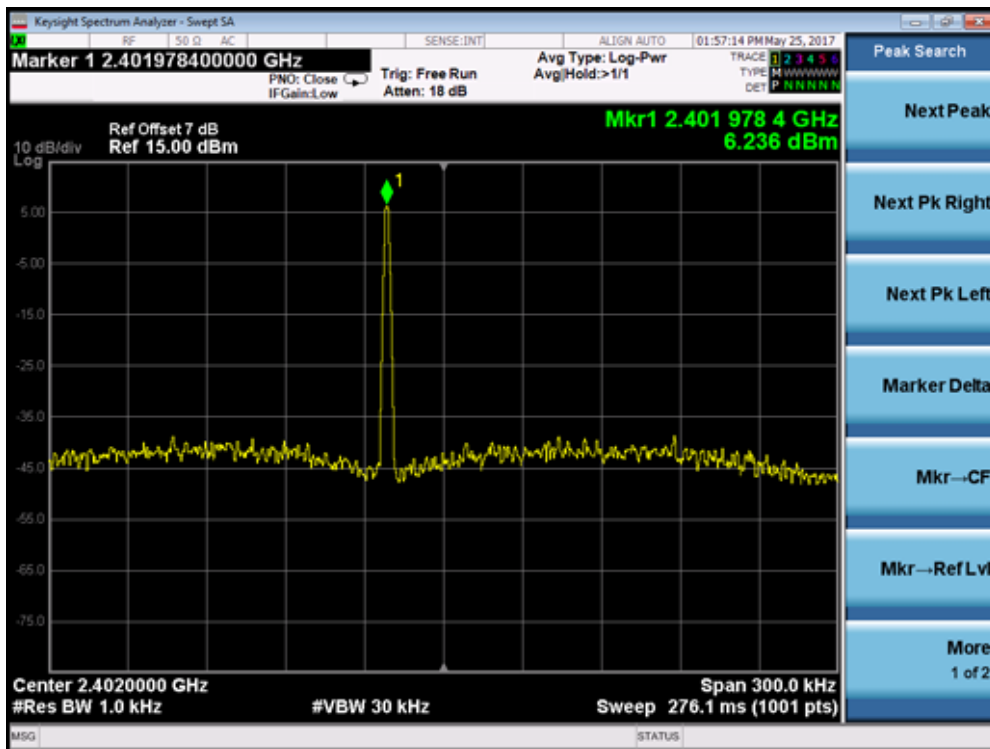
3. 'Maximum Hold' mode may be used to accumulate the measurement result over several scans provided the emission is repetitive in nature.

6.5. Test Result

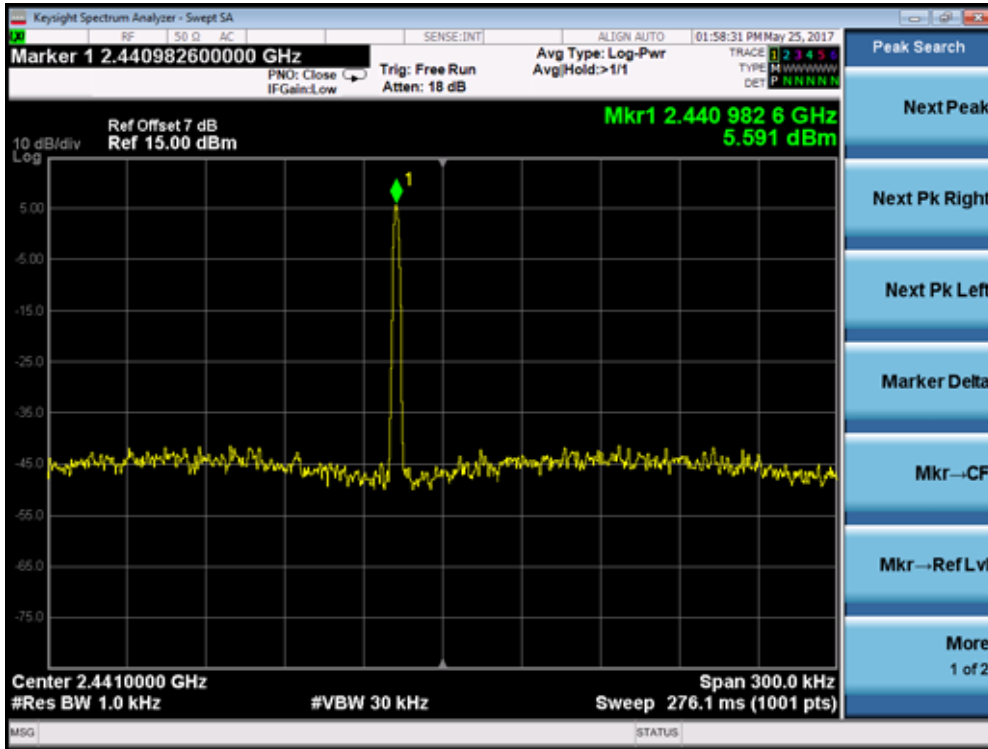
Product	:	EZ-BT Module
Test Item	:	Frequency Tolerance
Test set	:	TR-8
Test mode	:	Transmit (Carrier)

Frequency (MHz)	Reading Value (MHz)	Tolerance (ppm)	Limit (ppm)
2402	2401.9784	-8.99	50
2441	2440.9826	-7.13	50
2480	2479.9868	-5.32	50

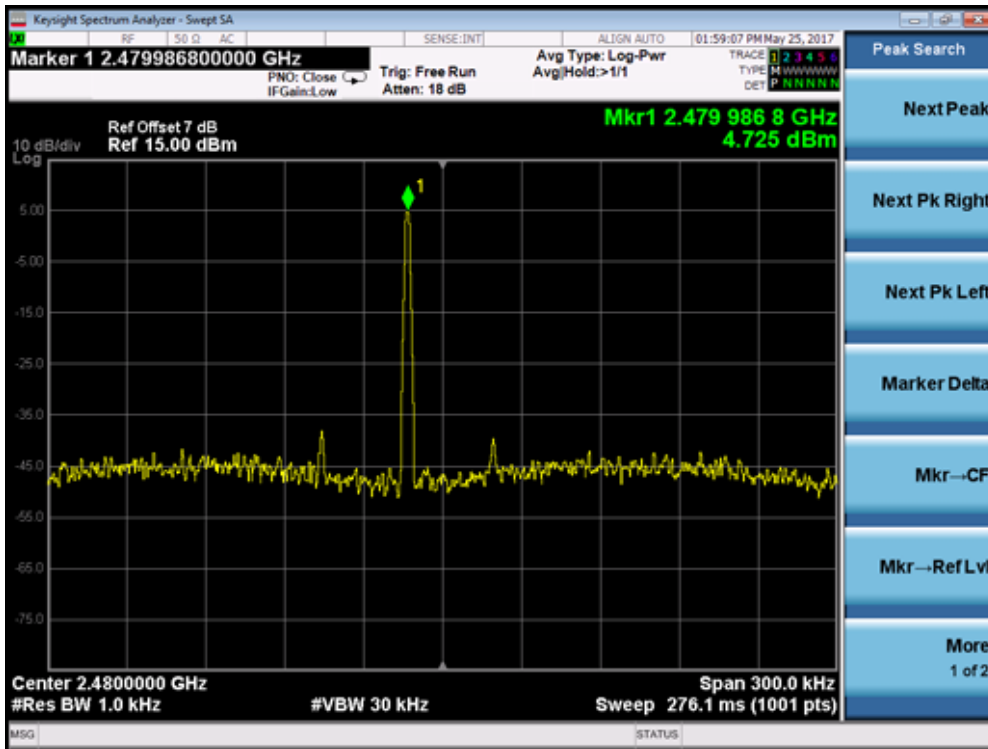
2402MHz



2441MHz



2480MHz



Test Result	Pass
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7. Dwell Time

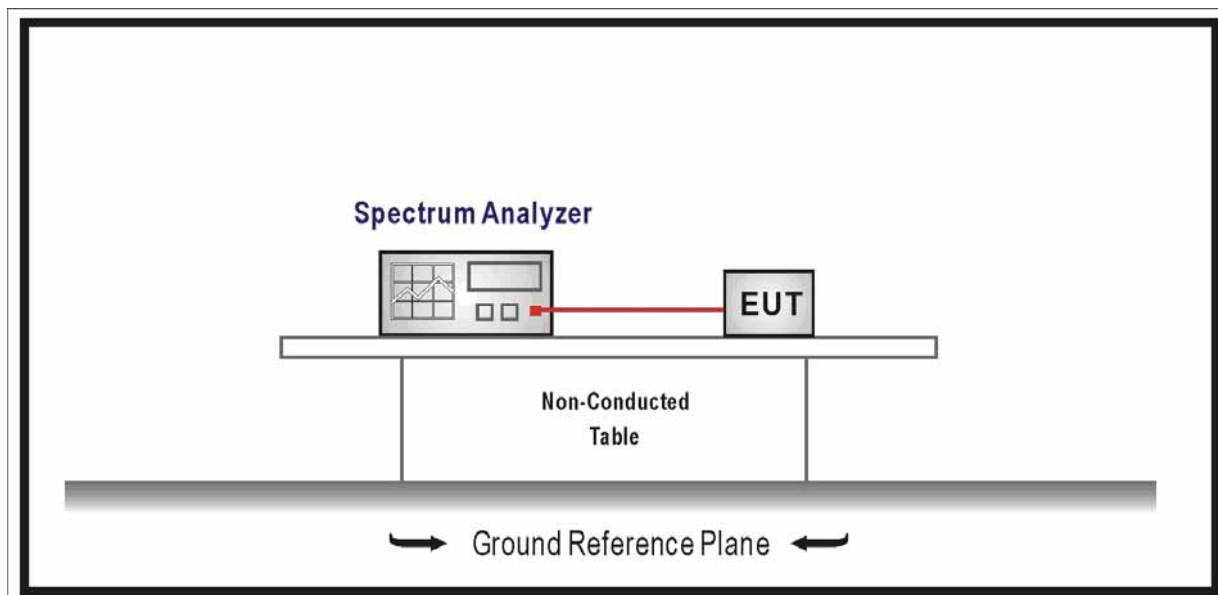
7.1. Test Equipment

Dwell Time / TR8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2018.01.15
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2018.04.03

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

7.2. Test Setup



7.3. Limit

400 ms.

7.4. Test Procedure

A spectrum analyzer or similar device shall be used to observe a sample of the modulated transmitter's radio frequency power output.

1. A positive peak detector function must be used.
2. The center frequency is set to the test frequency and the span is switched to zero.
3. The measurement instrument bandwidth and span must be set sufficiently with, and, the scan time set sufficiently slow, to ensure all major modulation products are captured. Note that

the measurement bandwidth should also be set sufficiently narrow to avoid adding significant error to the test result.

4. 'Single sweep' mode may be used to capture a packet over a single scan.

7.5. Test Result

Product	:	EZ-BT Module
Test Item	:	Dwell Time
Test Site	:	TR8
Test Mode	:	Mode 1: Transmitter-1Mbps(GFSK_DH5)

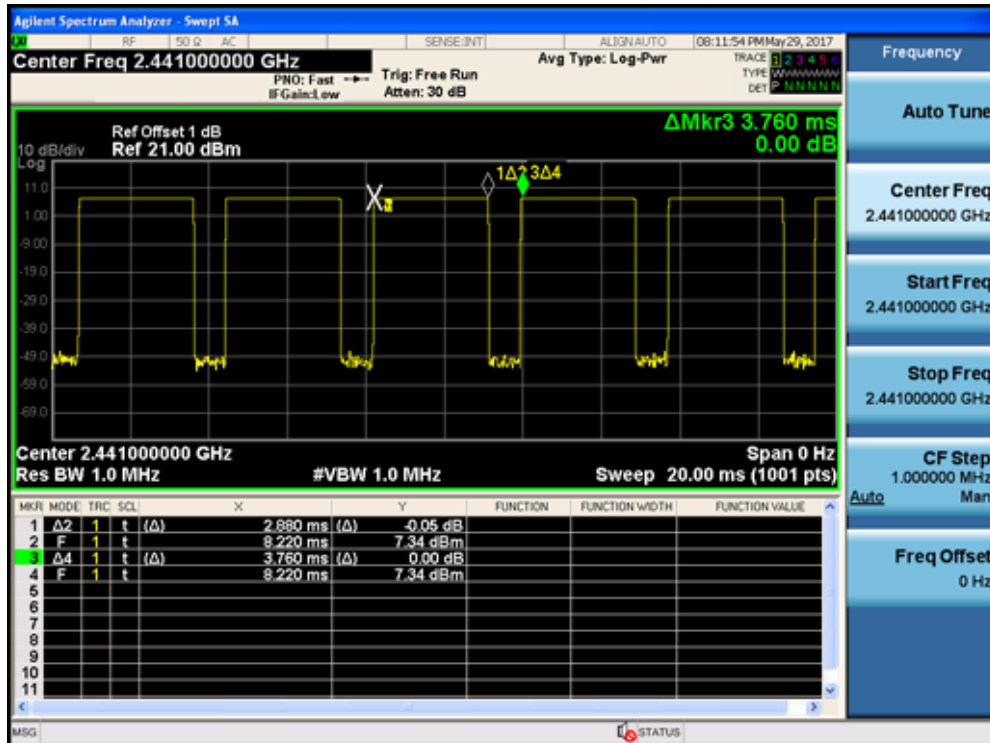
Frequency (MHz)	Duty cycle	Dwell Time (Sec)	Limit (Sec)	Result
2441(DH5)	0.77	0.28	0.4	Pass

Note: Dwell Time = (Spreading rate * 0.4) * (Duty cycle / 79); Spreading rate = 68.273

Frequency (MHz)	Packet Type	ON Time (ms)	(ON+OFF) Time (ms)	Burst Ratio
2441	DH5	2.88	3.76	0.77

Note: Burst Ratio = ON Time / (ON Time + OFF Time)

CH 39 Transmission Time (DH5)



Product	:	EZ-BT Module
Test Item	:	Dwell Time
Test Site	:	TR8
Test Mode	:	Mode 2: Transmitter-2Mbps(/4 DQPSK _DH5)

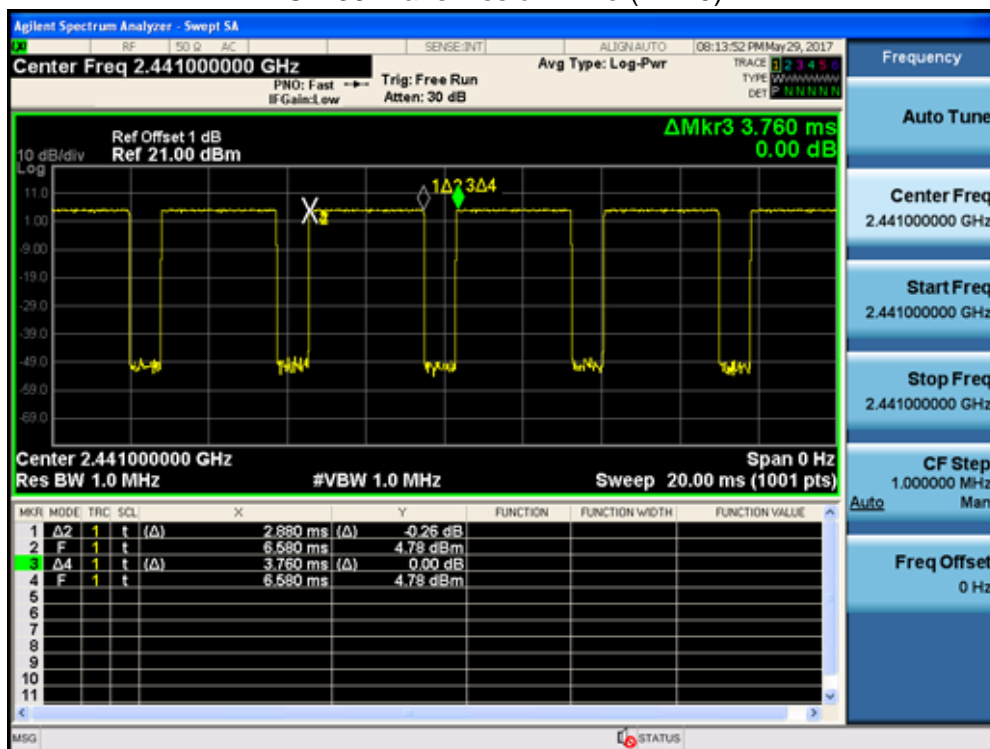
Frequency (MHz)	Duty cycle	Dwell Time (Sec)	Limit (Sec)	Result
2441(DH5)	0.77	0.28	0.4	Pass

Note: Dwell Time = (Spreading rate * 0.4) * (Duty cycle / 79); Spreading rate = 68.495

Frequency (MHz)	Packet Type	ON Time (ms)	(ON+OFF) Time (ms)	Burst Ratio
2441	2DH5	2.88	3.76	0.77

Note: Burst Ratio = ON Time / (ON Time + OFF Time)

CH 39 Transmission Time (2DH5)



Product	:	EZ-BT Module
Test Item	:	Dwell Time
Test Site	:	TR8
Test Mode	:	Mode 3: Transmitter-Normal-3Mbps(8DPSK_DH5)

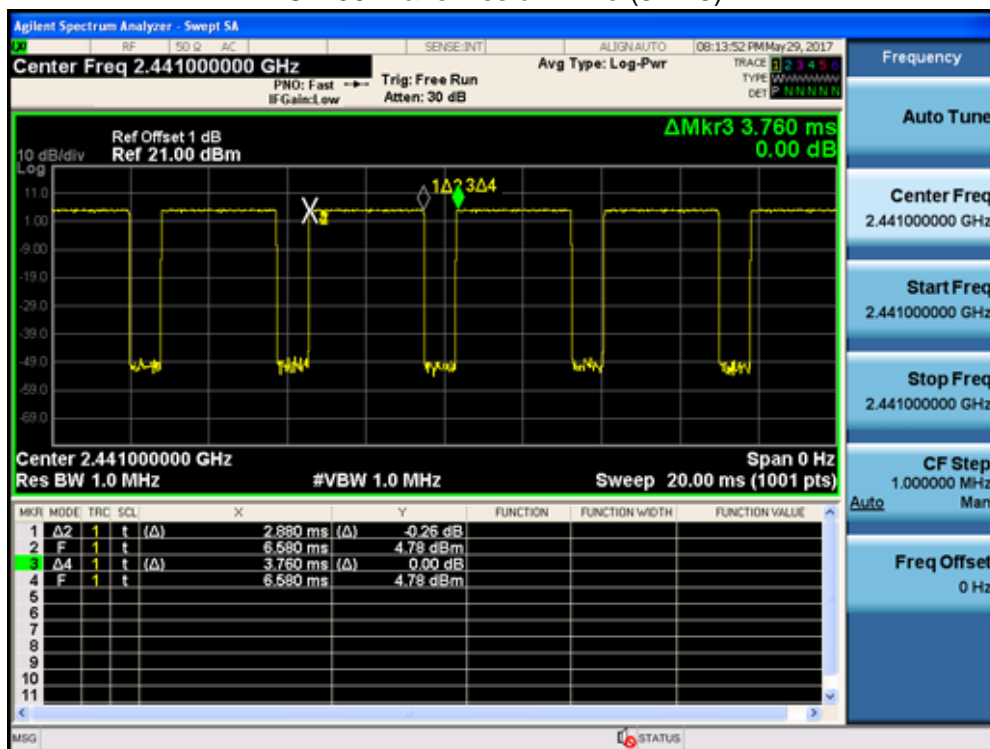
Frequency (MHz)	Duty cycle	Dwell Time (Sec)	Limit (Sec)	Result
2441(DH5)	0.77	0.28	0.4	Pass

Note: Dwell Time = (Spreading rate * 0.4) * (Duty cycle / 79); Spreading rate = 68.166

Frequency (MHz)	Packet Type	ON Time (ms)	(ON+OFF) Time (ms)	Burst Ratio
2441	3DH5	2.88	3.76	0.77

Note: Burst Ratio = ON Time / (ON Time + OFF Time)

CH 39 Transmission Time (3DH5)



8. Transmitter Spurious Emissions

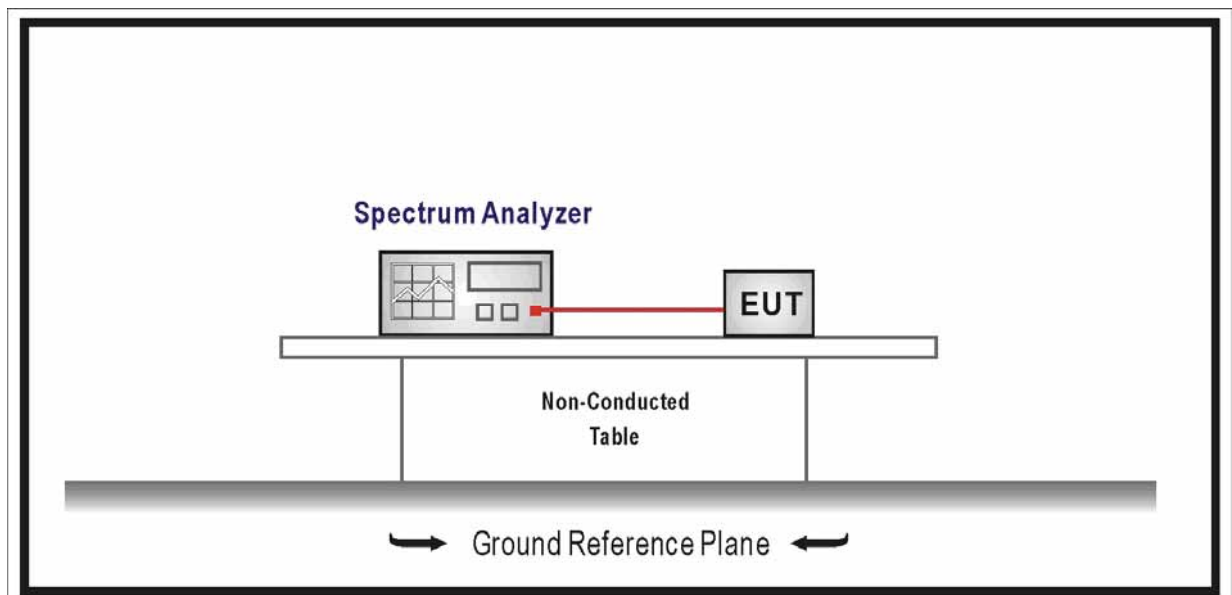
8.1. Test Equipment

Transmitter Spurious Emissions / TR8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2018.01.15
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2018.04.03

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

8.2. Test Setup



8.3. Limit

- $\leq 2.5\mu\text{W}$ for 10 – 2387 MHz
- $\leq 25\mu\text{W}$ for 2387 – 2400 MHz
- $\leq 25\mu\text{W}$ for 2483.5 – 2496.5 MHz
- $\leq 2.5\mu\text{W}$ for 2496.5 – 12500 MHz

8.4. Test Procedure

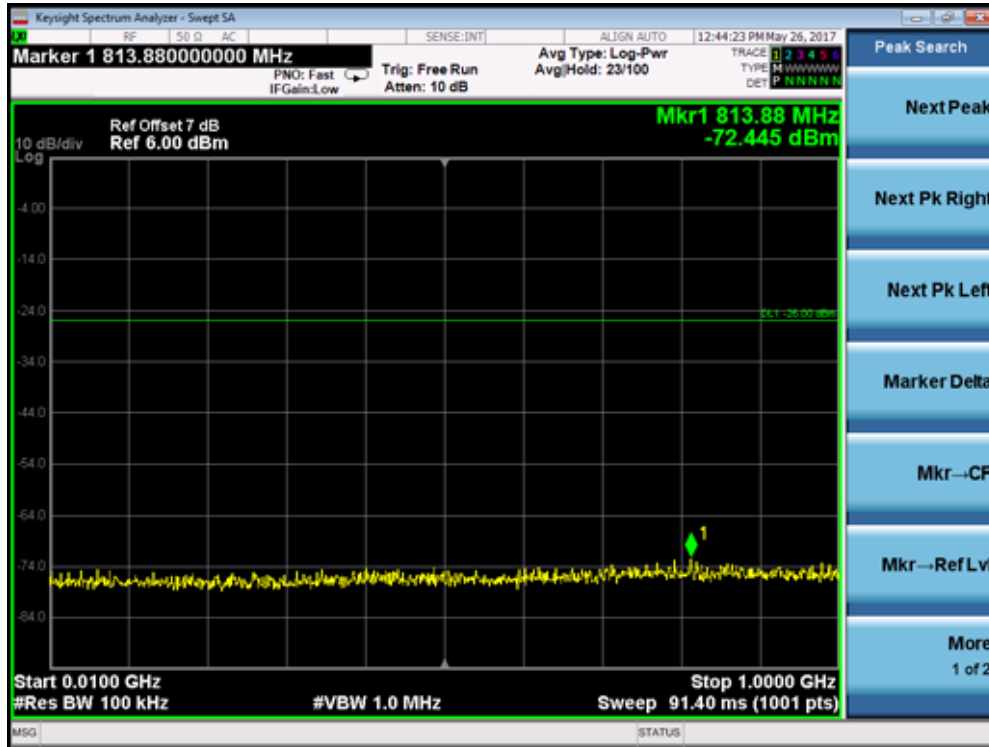
A spectrum analyzer or similar device shall be used to observe a sample of the modulated transmitter's radio frequency power output.

1. A positive peak detector function must be used.
2. The measurement instrument bandwidth and span must be set sufficiently with, and, the scan time set sufficiently slow, to ensure all major modulation products are captured. Note that the measurement bandwidth should also be set sufficiently narrow to avoid adding significant error to the test result.
3. 'Maximum Hold' mode may be used to accumulate the measurement result over several scans provided the emission is repetitive in nature.

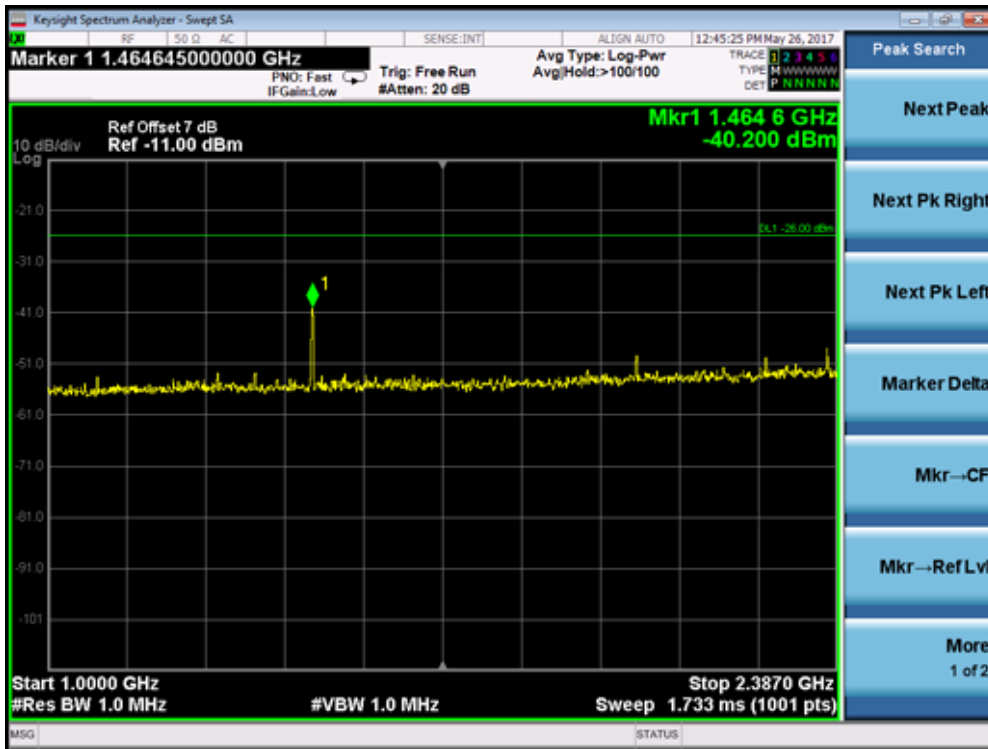
8.5. Test Result

Product	:	EZ-BT Module
Test Item	:	Transmitter Spurious Emissions
Test Site	:	TR8
Test Mode	:	Mode 1: Transmitter-1Mbps(GFSK_DH5)

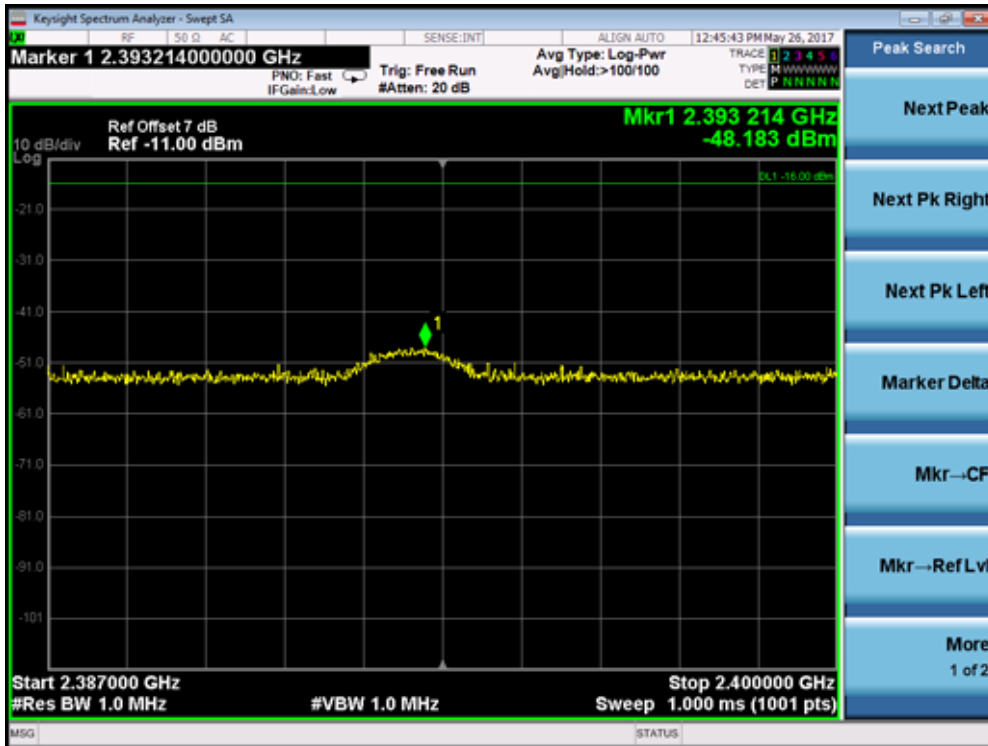
10 – 1000MHz



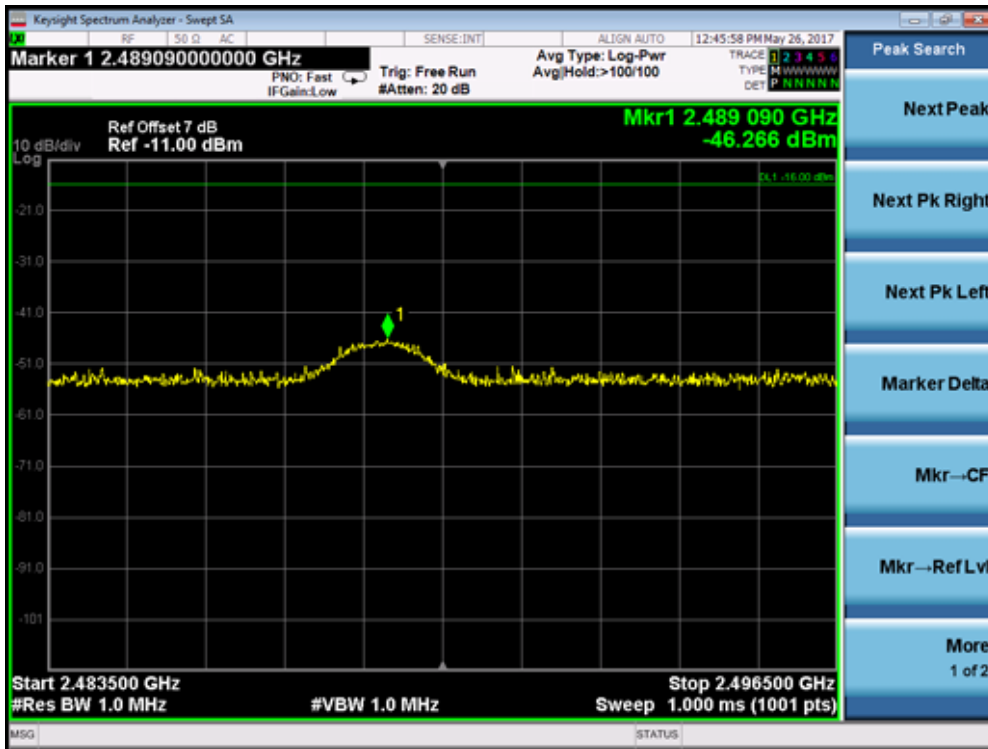
1000– 2387MHz



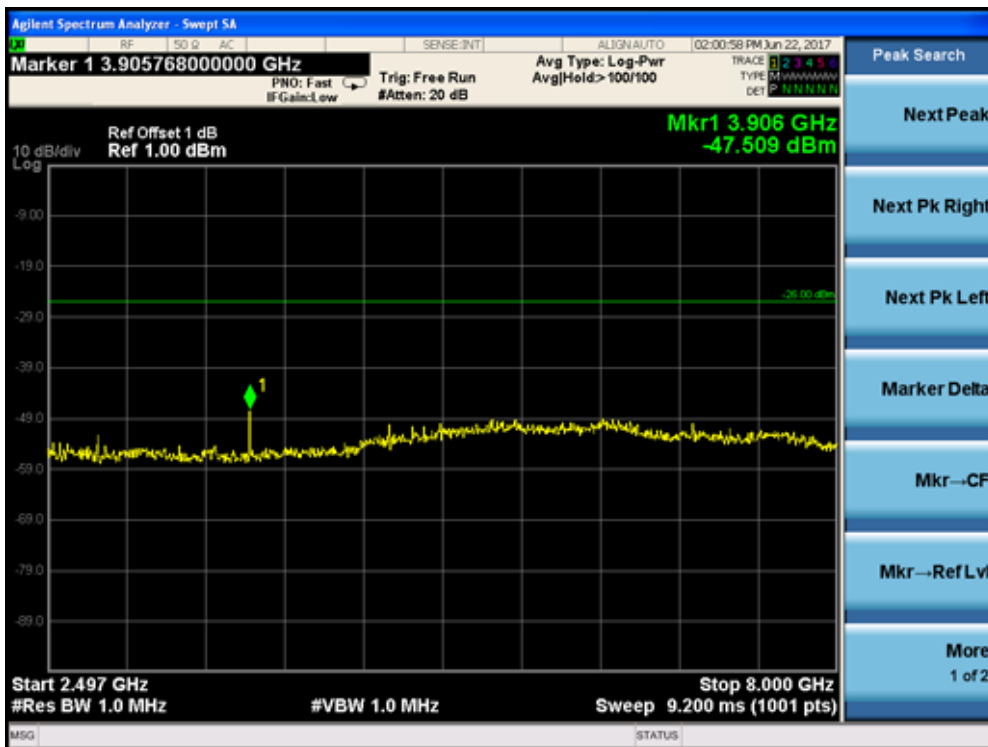
2387 – 2400 MHz



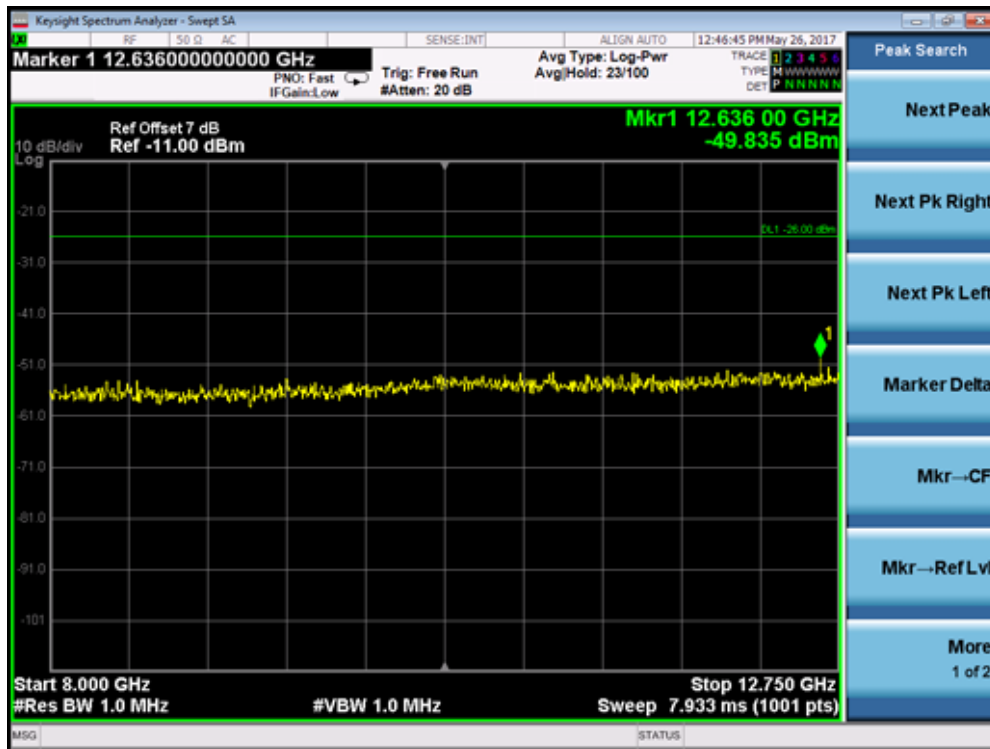
2483.5 – 2496.5MHz



2496.5 – 8000MHz

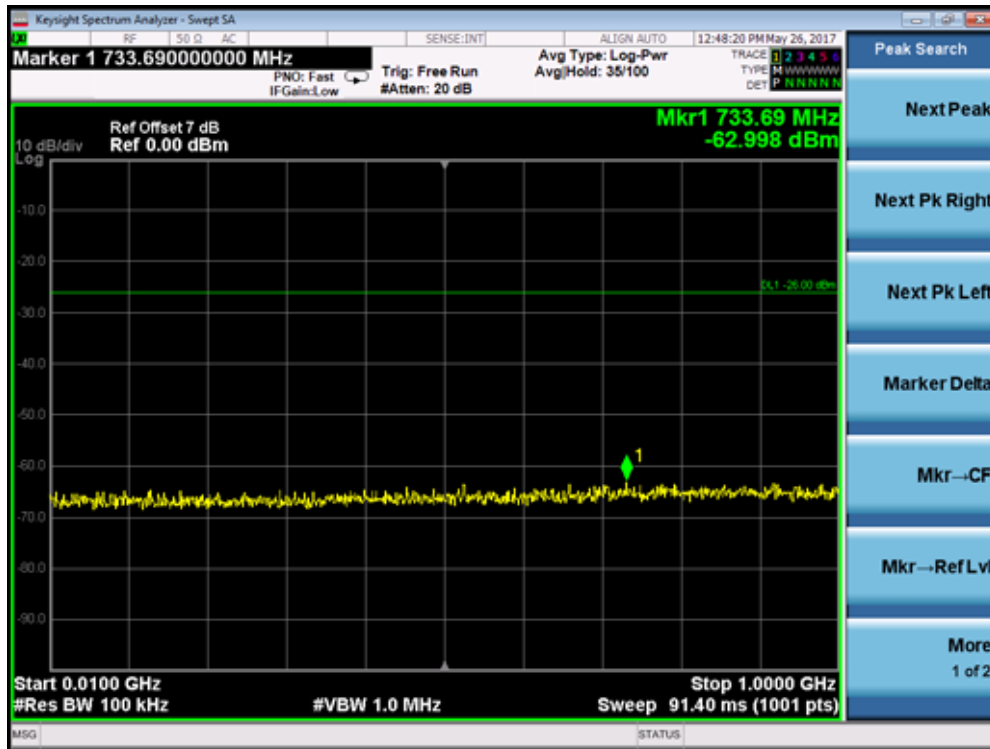


8000 – 12750MHz

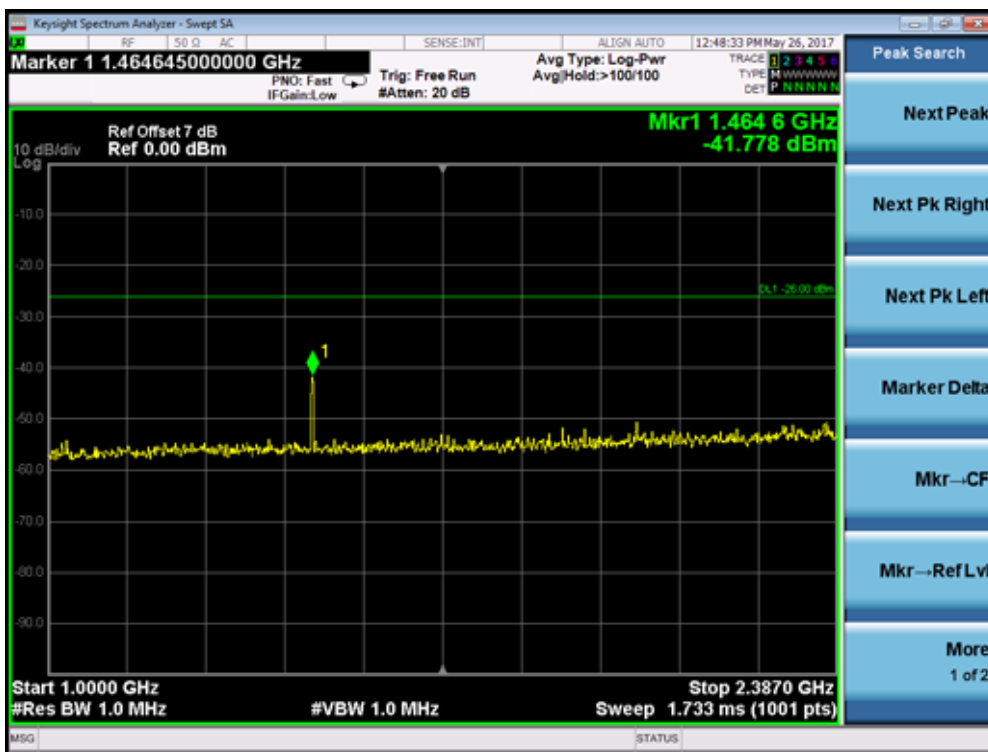


Product	:	EZ-BT Module
Test Item	:	Transmitter Spurious Emissions
Test Site	:	TR8
Test Mode	:	Mode 2: Transmitter-2Mbps(/4 DQPSK _DH5)

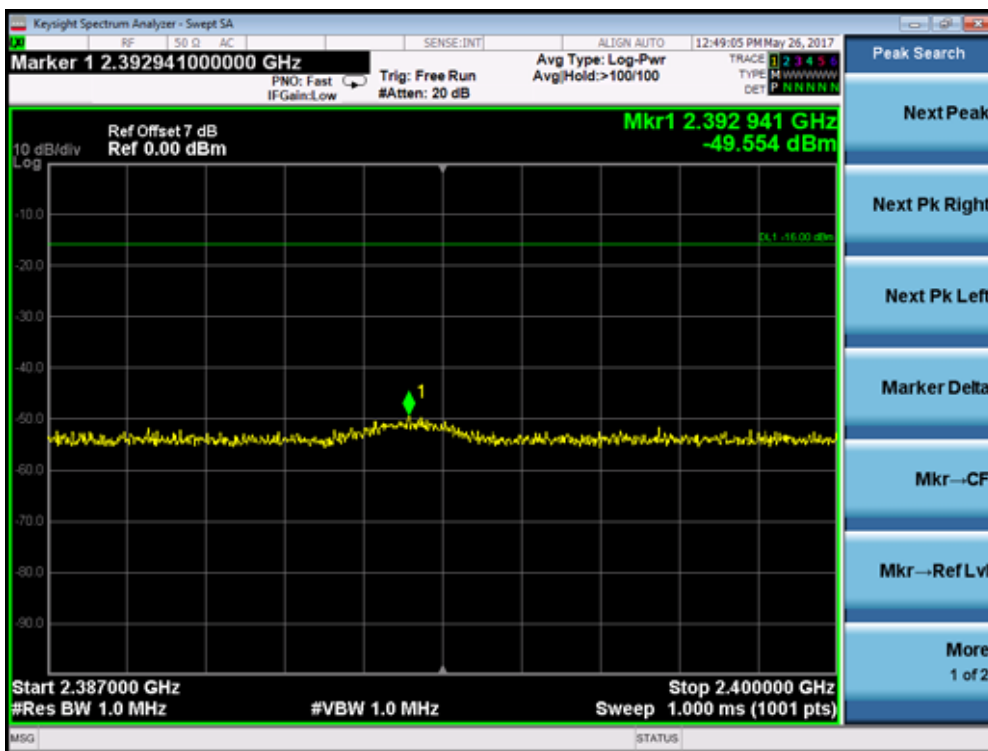
10 – 1000MHz



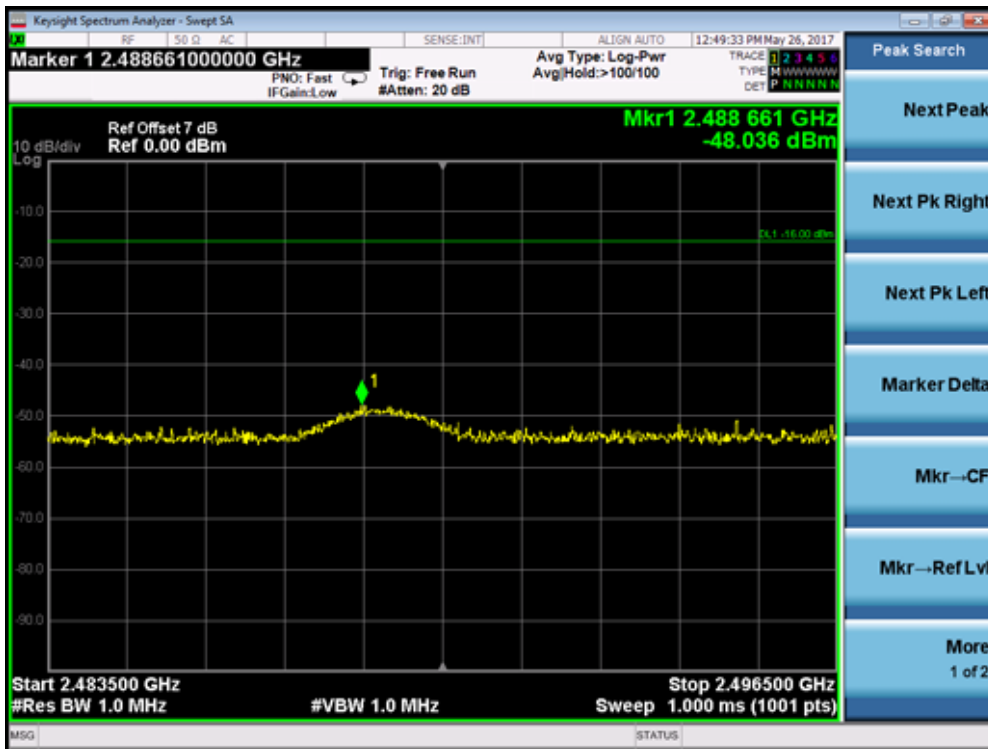
1000– 2387MHz



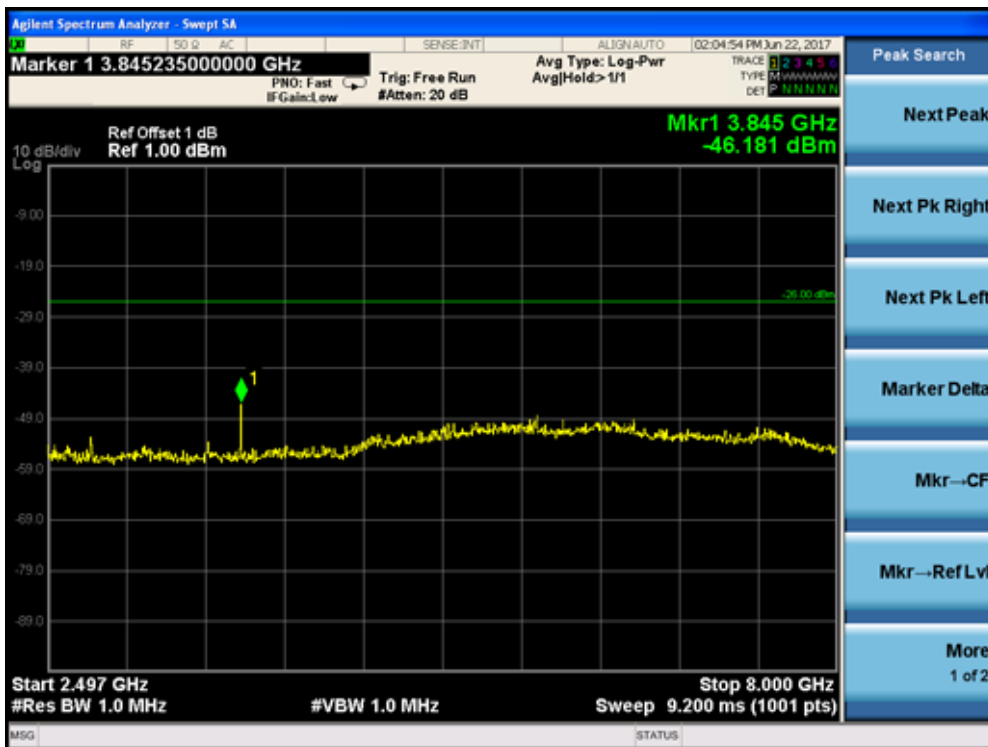
2387 – 2400 MHz



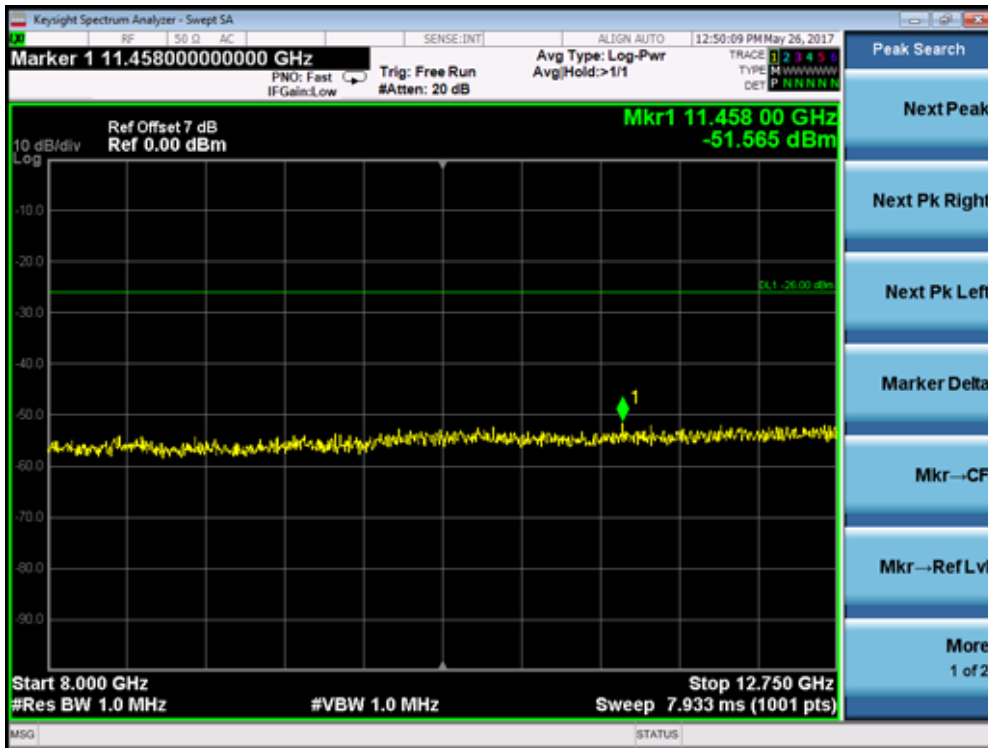
2483.5 – 2496.5MHz



2496.5 – 8000MHz

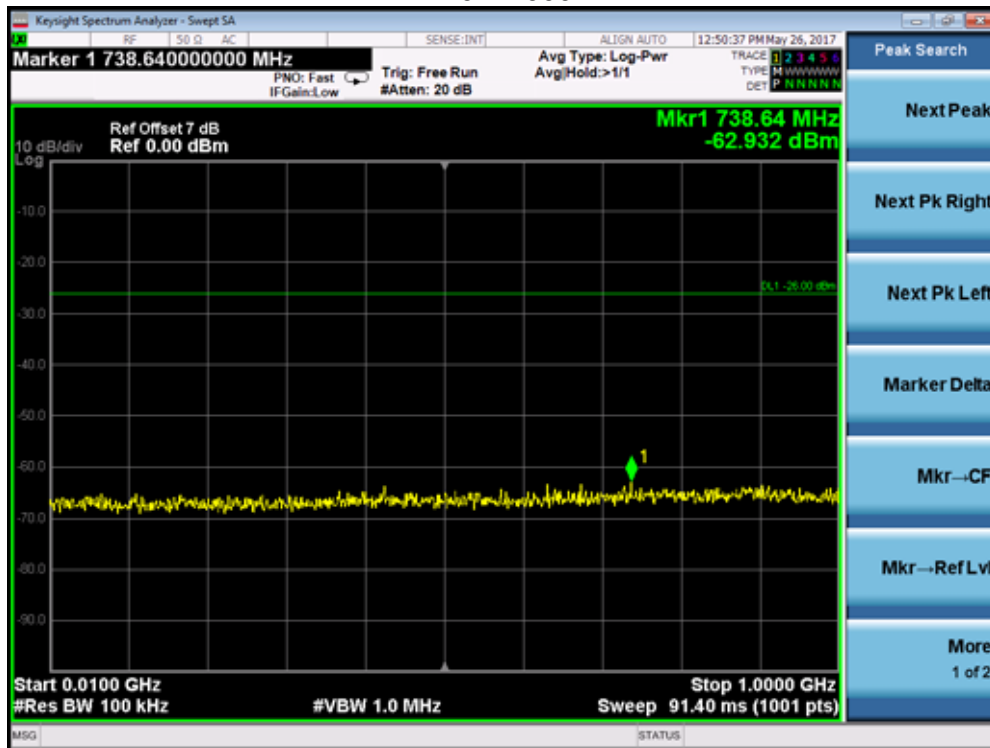


8000 – 12750MHz

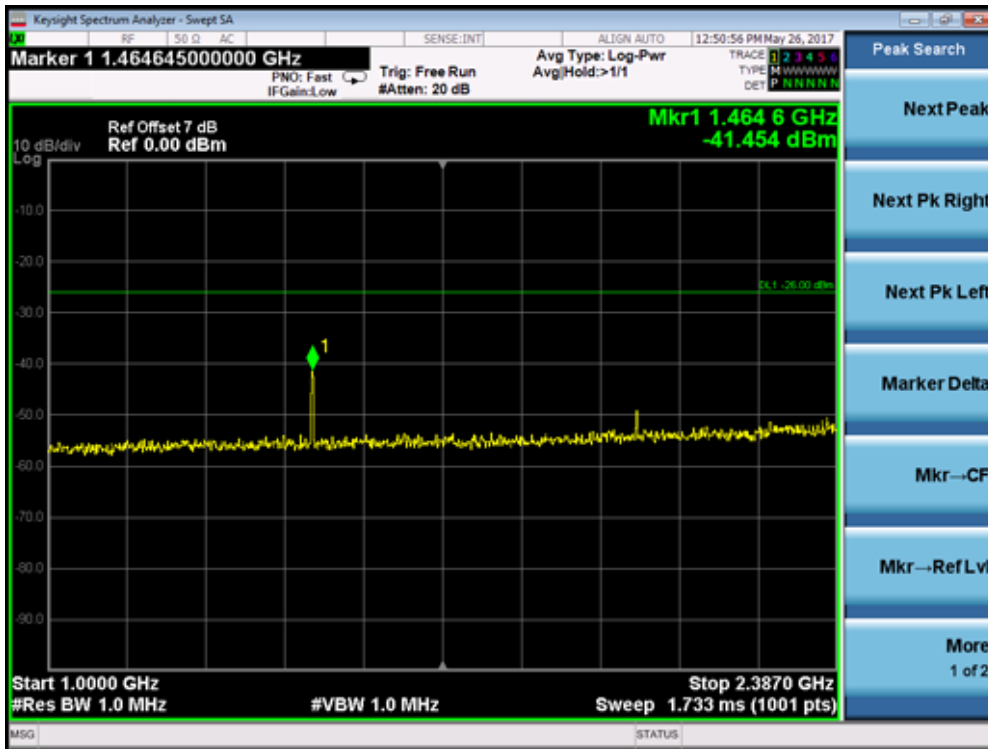


Product	:	EZ-BT Module
Test Item	:	Transmitter Spurious Emissions
Test Site	:	TR8
Test Mode	:	Mode 3: Transmitter-Normal-3Mbps(8DPSK_DH5)

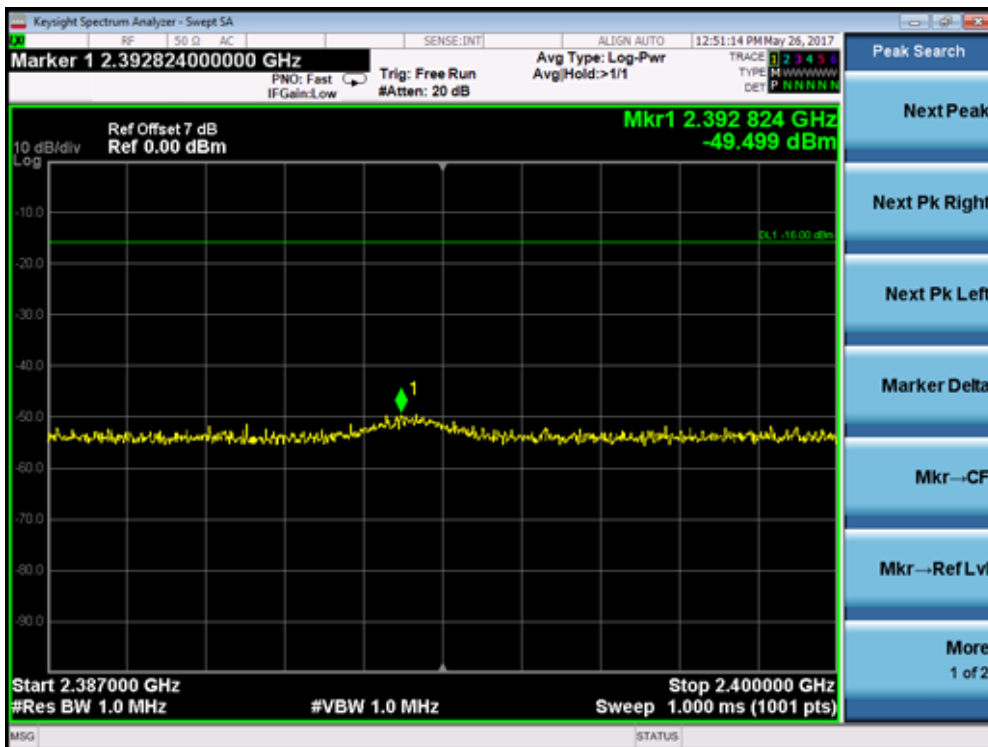
10 – 1000MHz



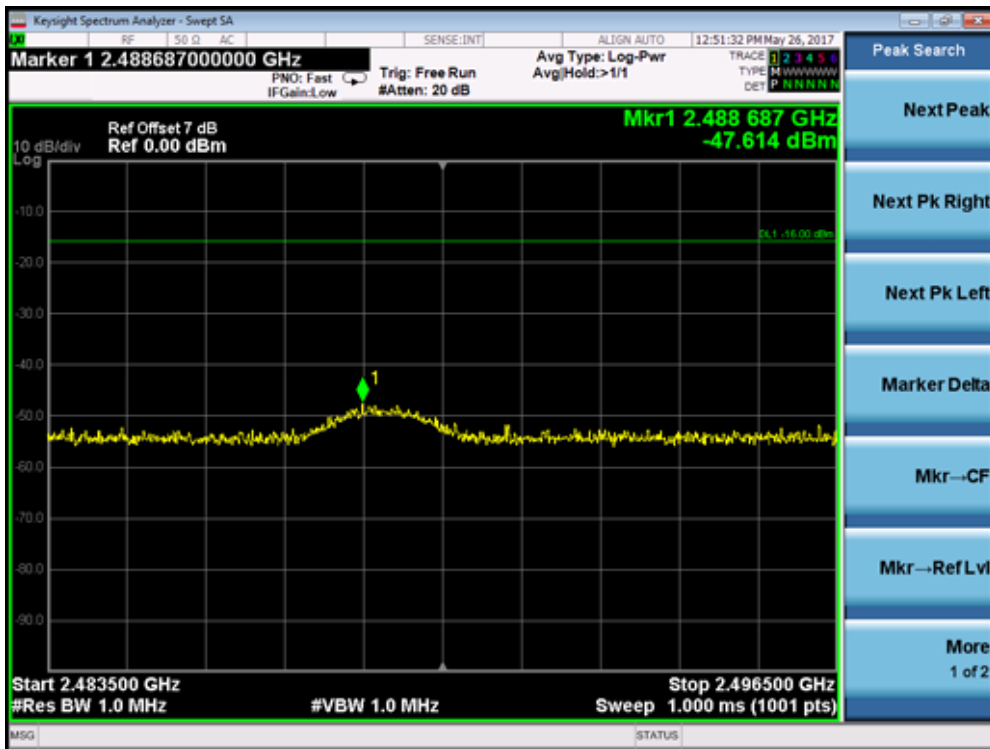
1000– 2387MHz



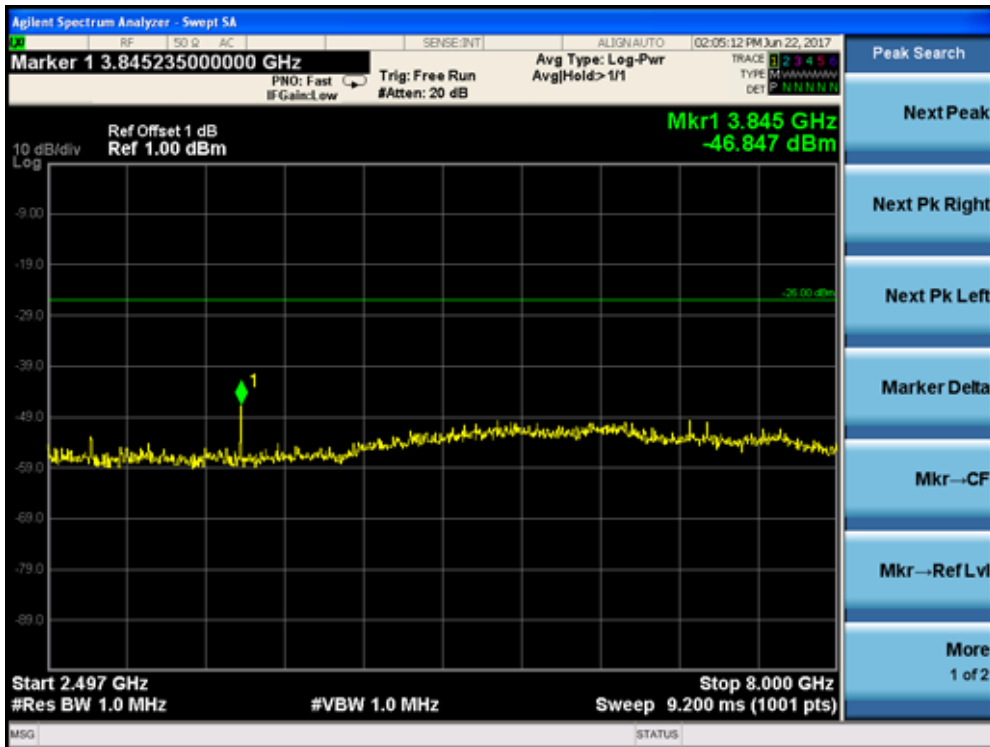
2387 – 2400 MHz



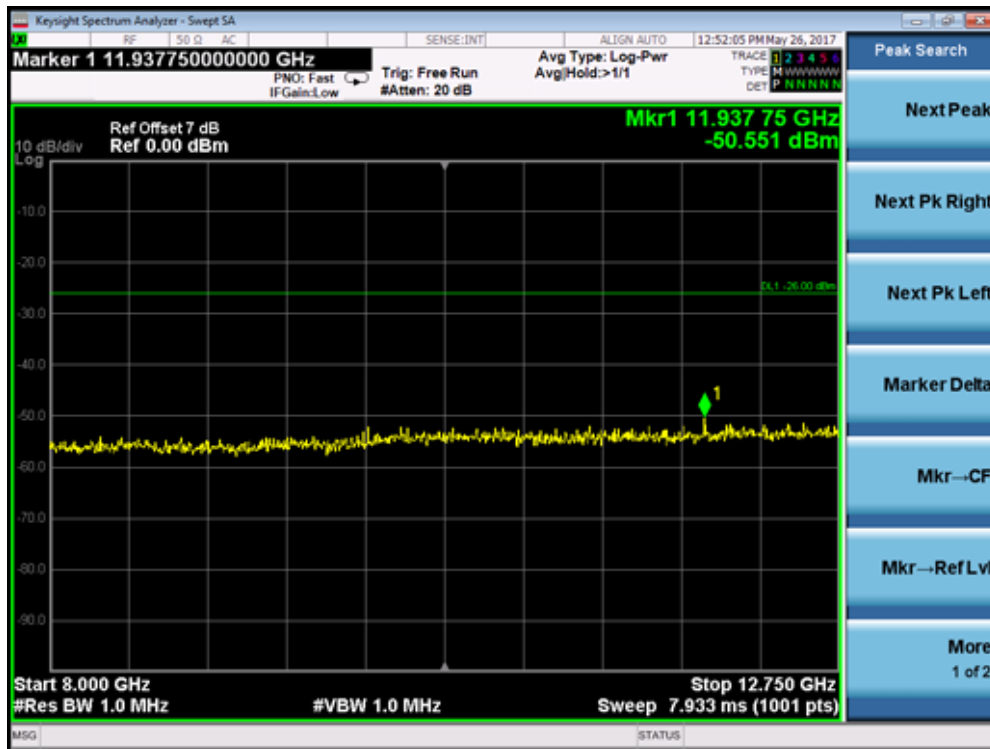
2483.5 – 2496.5MHz



2496.5 – 8000MHz



8000 – 12750MHz



Test Result	Pass
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9. Receiver Spurious Emissions

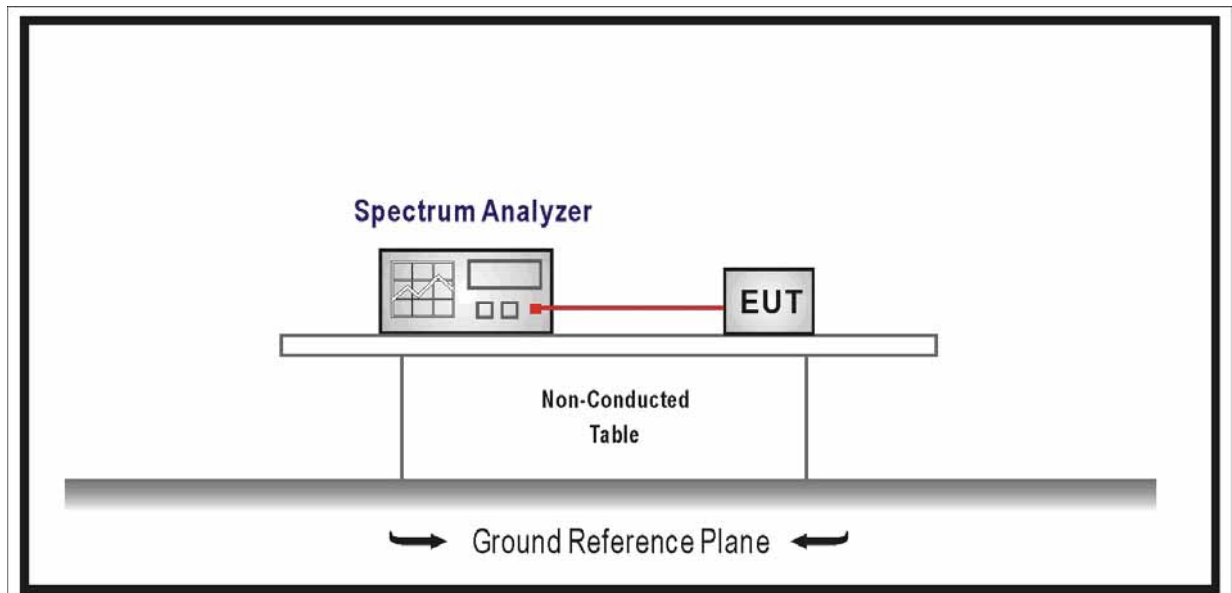
9.1. Test Equipment

Receiver Spurious Emissions / TR8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2018.01.15
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2018.04.03

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

9.2. Test Setup



9.3. Limit

- <= 4nW for 10 – 1000 MHz
- <= 20nW for 1000 – 3000 MHz
- <= 20nW for 3000 – 8000 MHz
- <= 20nW for 8000 – 12750 MHz

9.4. Test Procedure

A spectrum analyzer or similar device shall be used to observe a sample of the modulated transmitter's radio frequency power output.

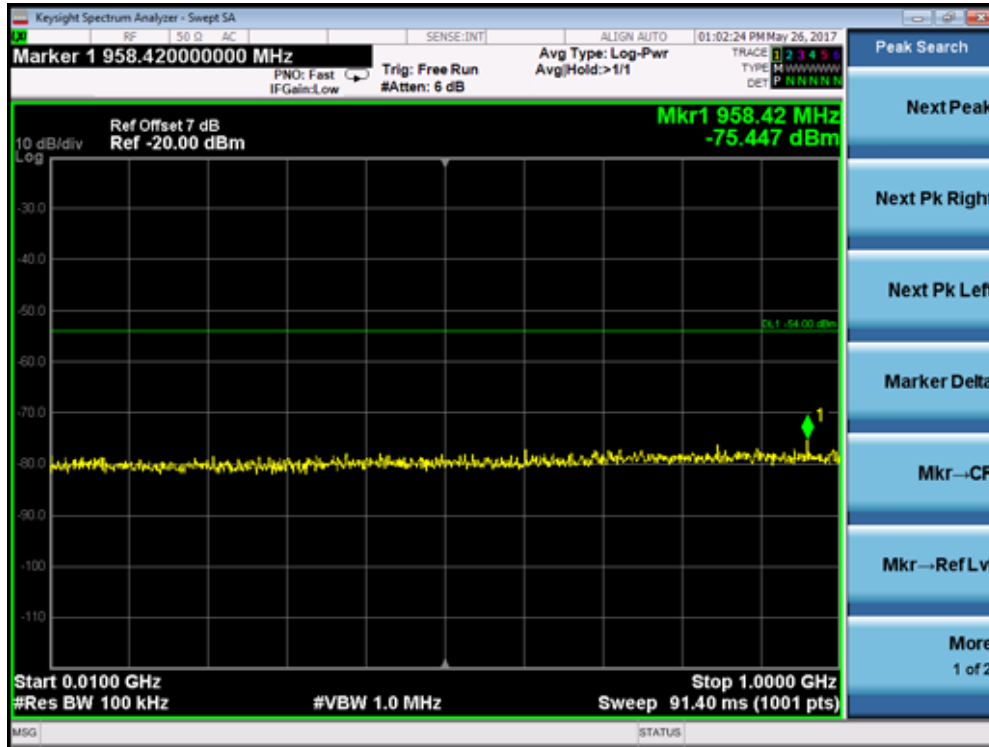
1. A positive peak detector function must be used.

2. The measurement instrument bandwidth and span must be set sufficiently with, and, the scan time set sufficiently slow, to ensure all major modulation products are captured. Note that the measurement bandwidth should also be set sufficiently narrow to avoid adding significant error to the test result.
3. 'Maximum Hold' mode may be used to accumulate the measurement result over several scans provided the emission is repetitive in nature.

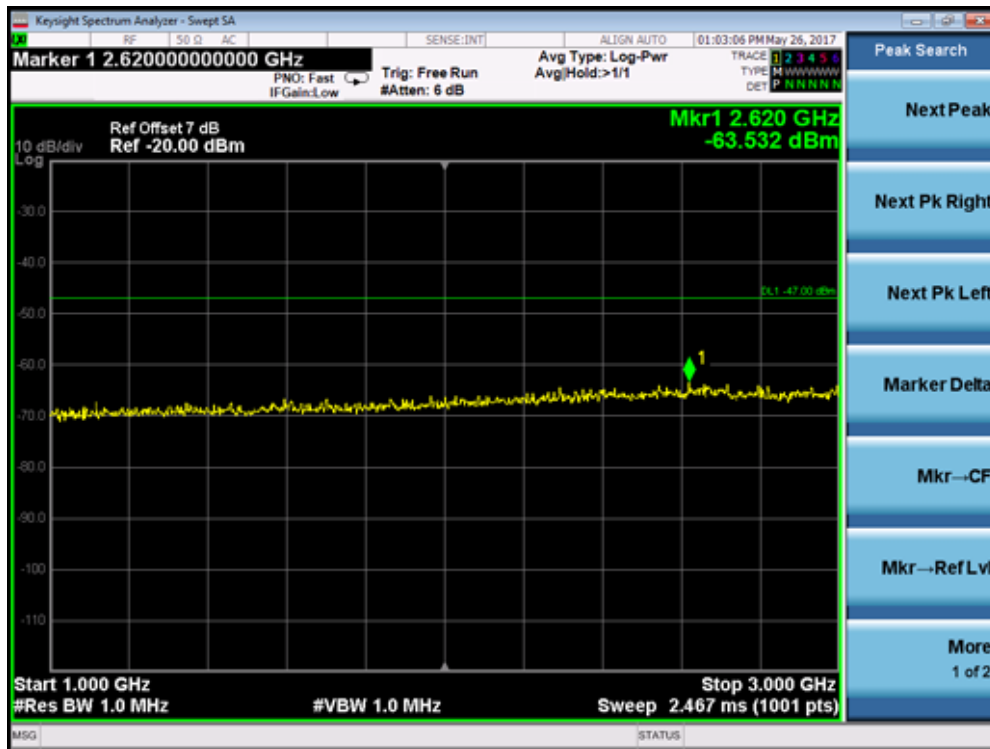
9.5. Test Result

Product	:	EZ-BT Module
Test Item	:	Transmitter Spurious Emissions
Test Site	:	TR8
Test Mode	:	Mode 7: Receiver -1Mbps(GFSK_DH5)

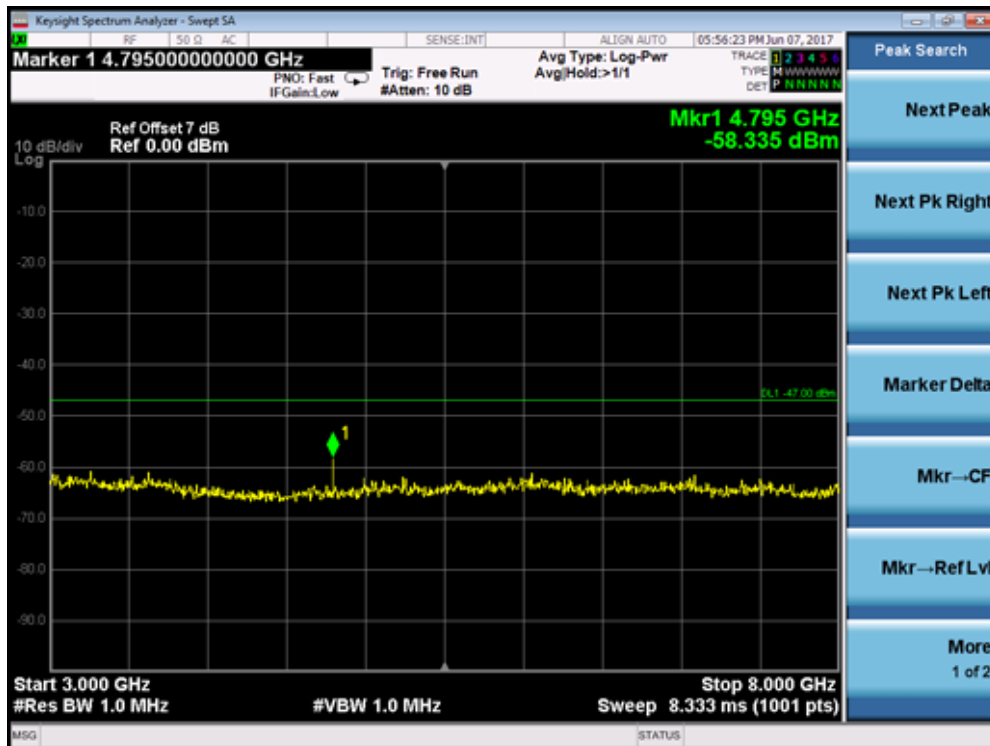
10 – 1000MHz



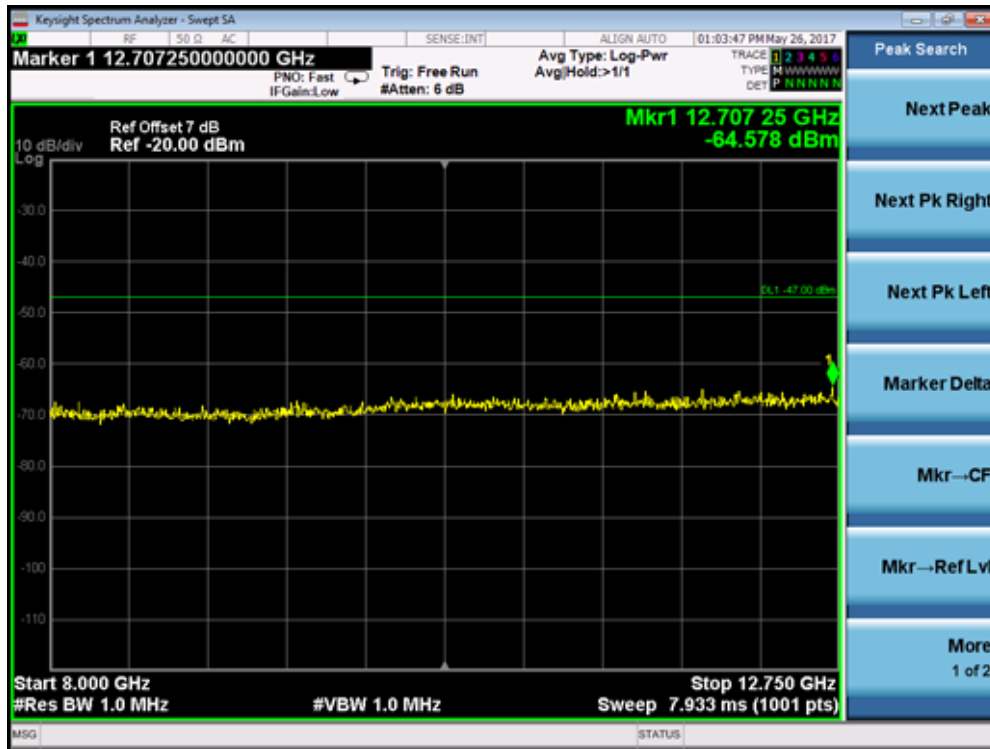
1000 – 3000MHz



3000 – 8000MHz

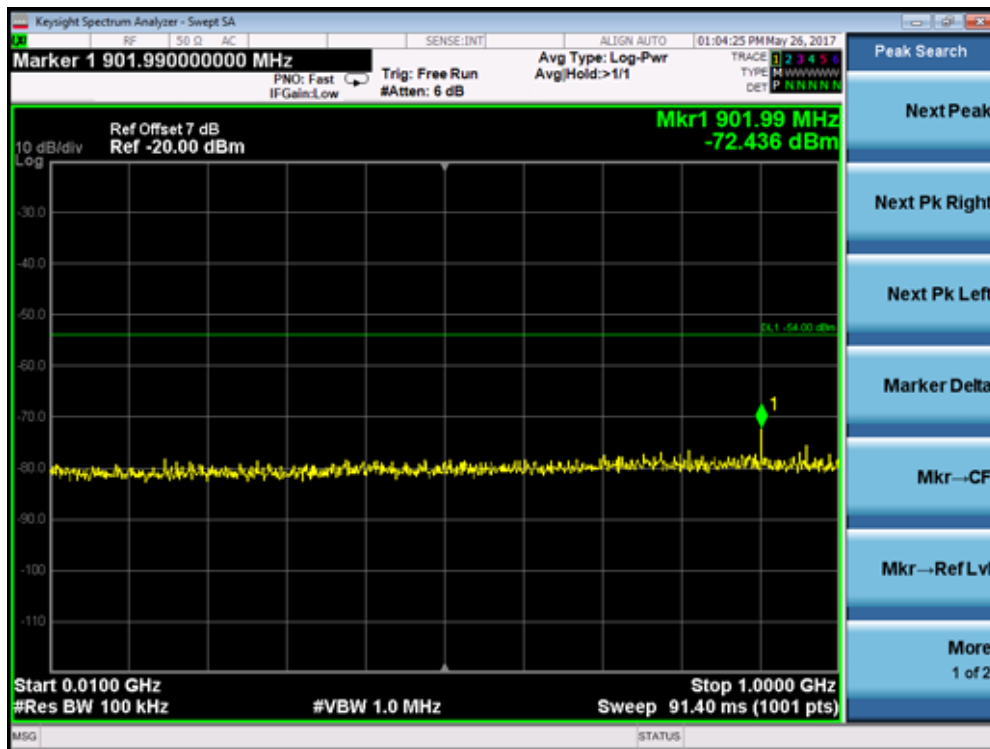


8000 – 12750MHz

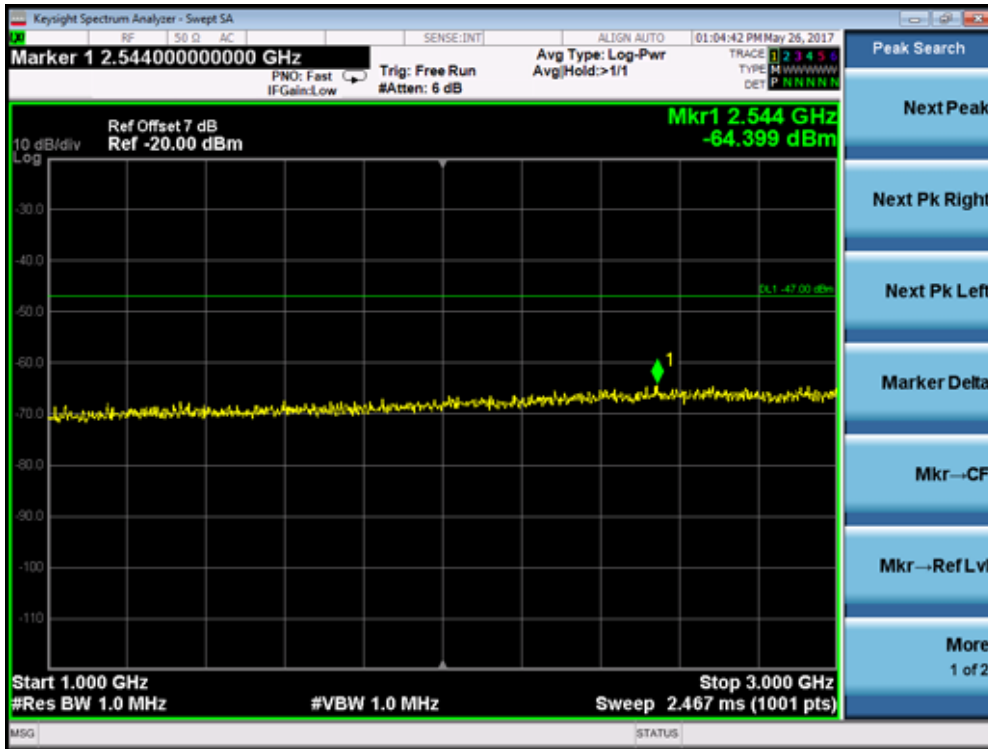


Product	:	EZ-BT Module
Test Item	:	Transmitter Spurious Emissions
Test Site	:	TR8
Test Mode	:	Mode 8: Receiver -2Mbps(Pi/4DQPSK_DH5)

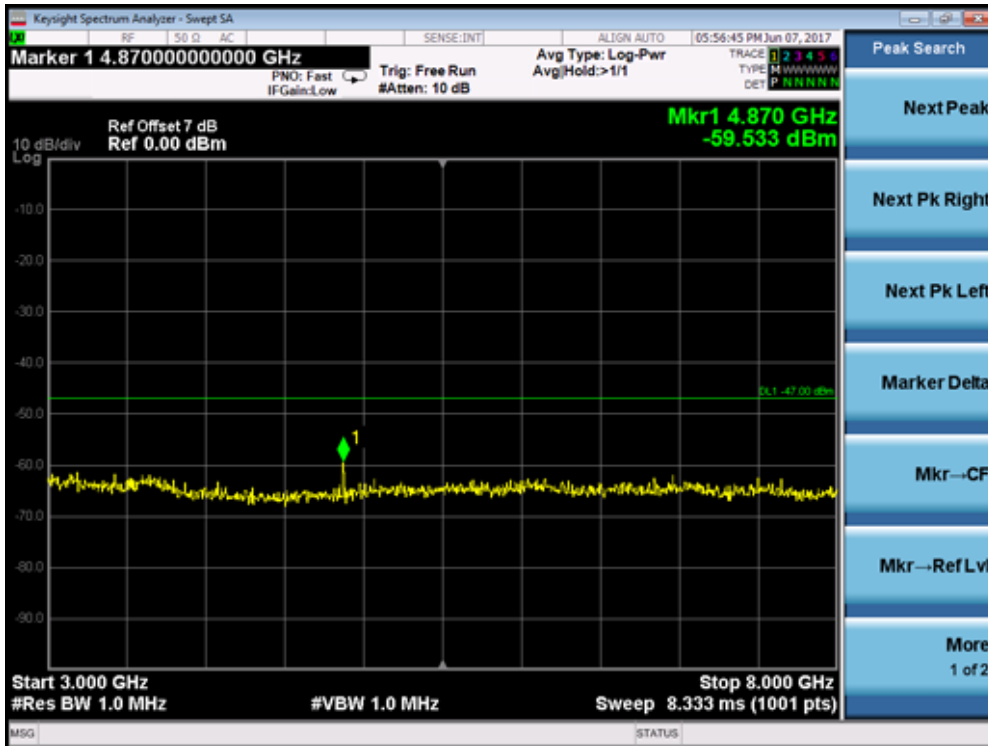
10 – 1000MHz



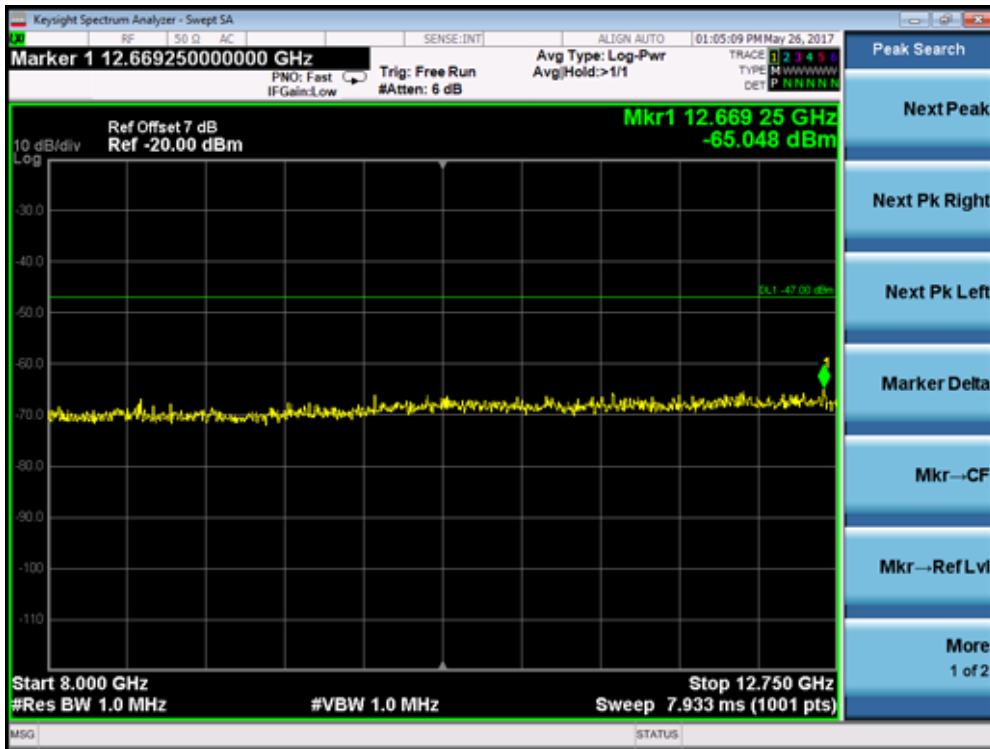
1000 – 3000MHz



3000 – 8000MHz

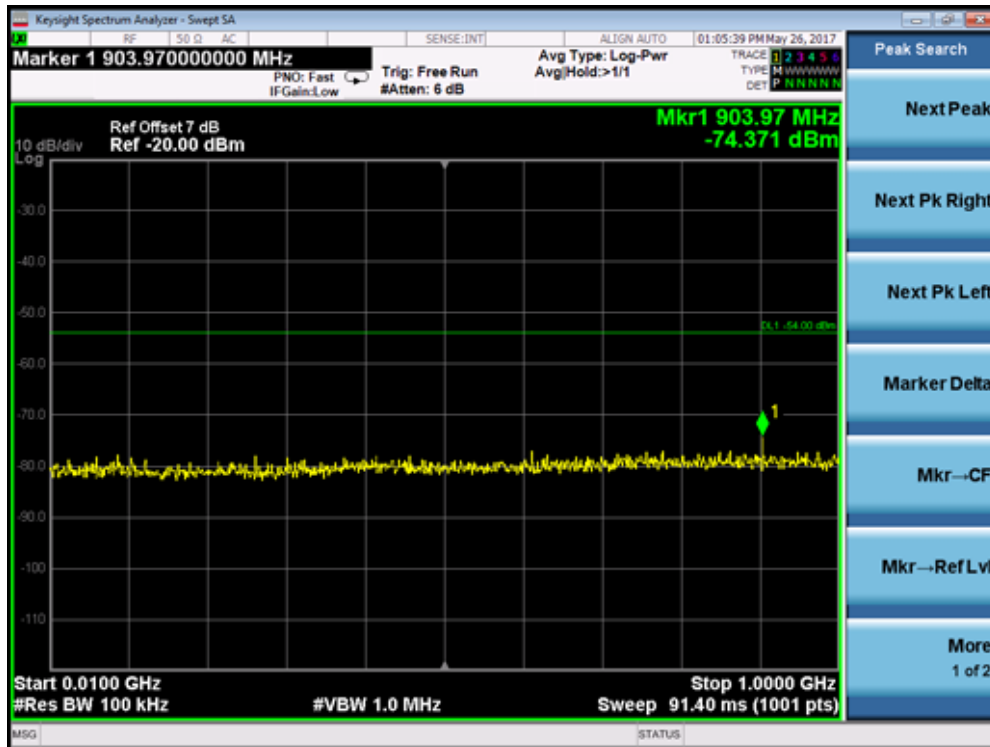


8000 – 12750MHz

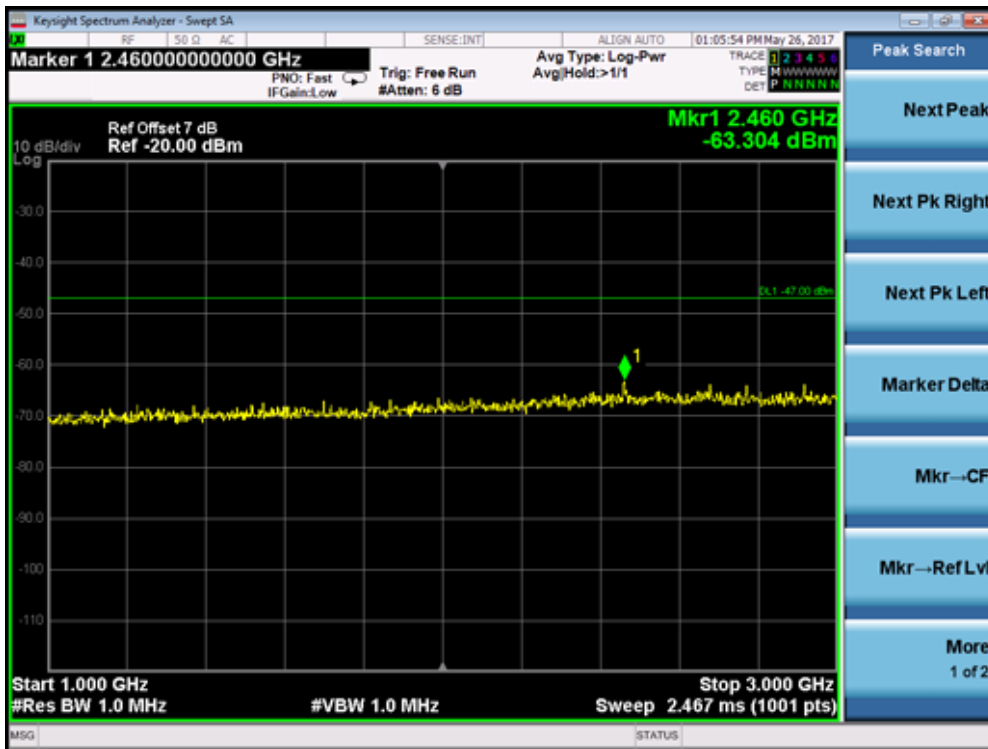


Product	:	EZ-BT Module
Test Item	:	Transmitter Spurious Emissions
Test Site	:	TR8
Test Mode	:	Mode 9: Receiver -Normal-3Mbps(8DPSK_DH5)

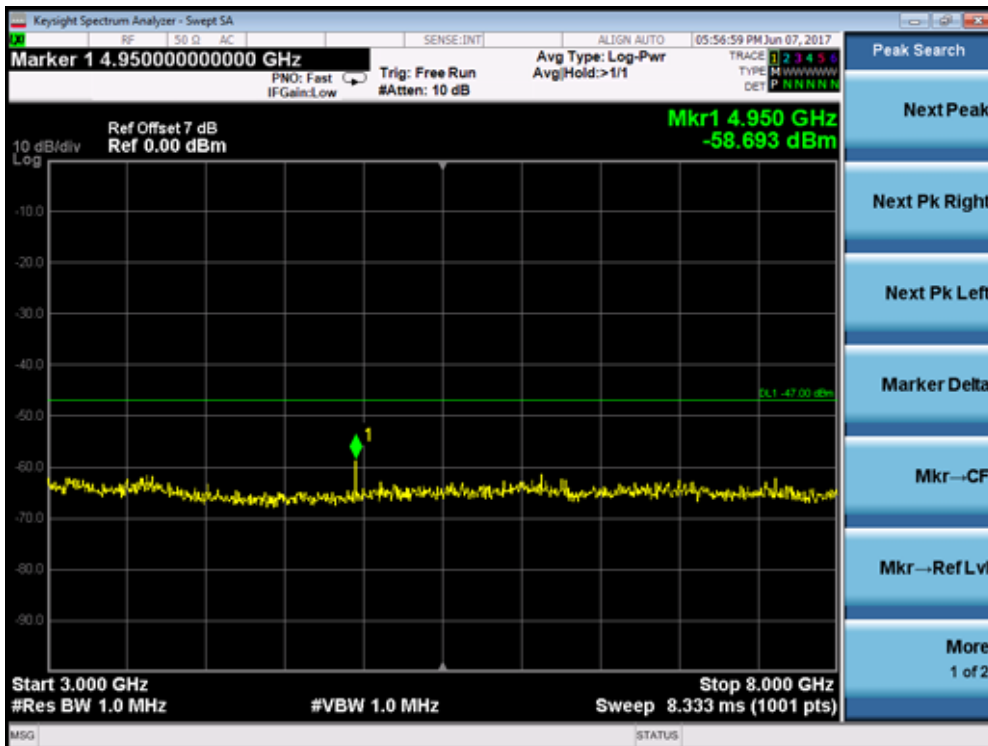
10 – 1000MHz



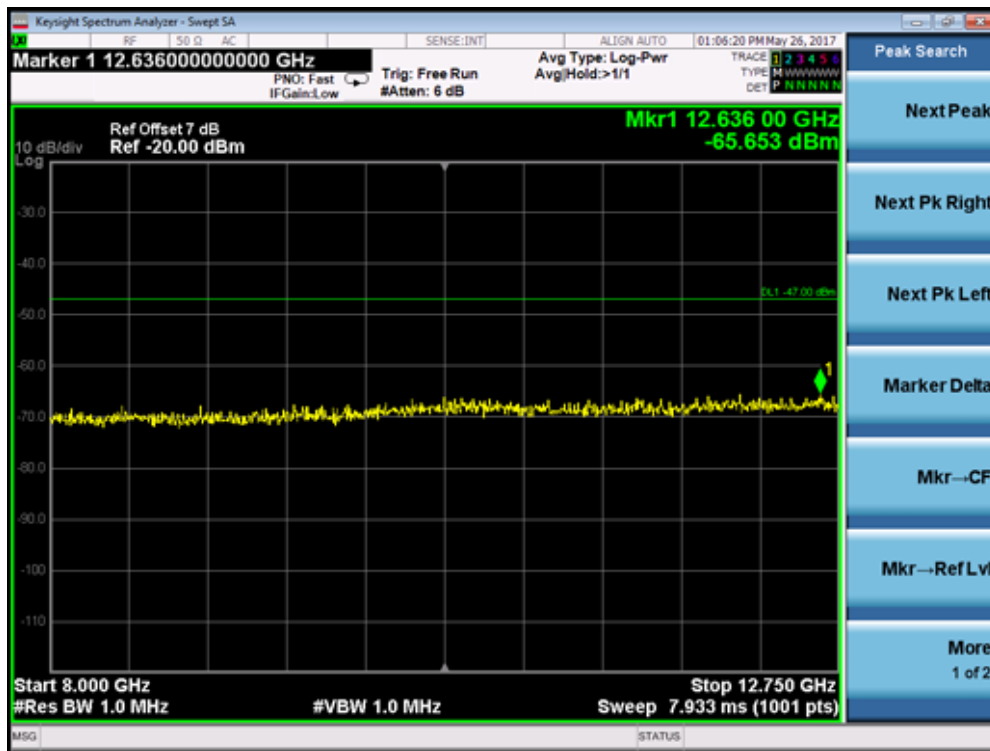
1000 – 3000MHz



3000 – 8000MHz



8000 – 12750MHz



Test Result	Pass
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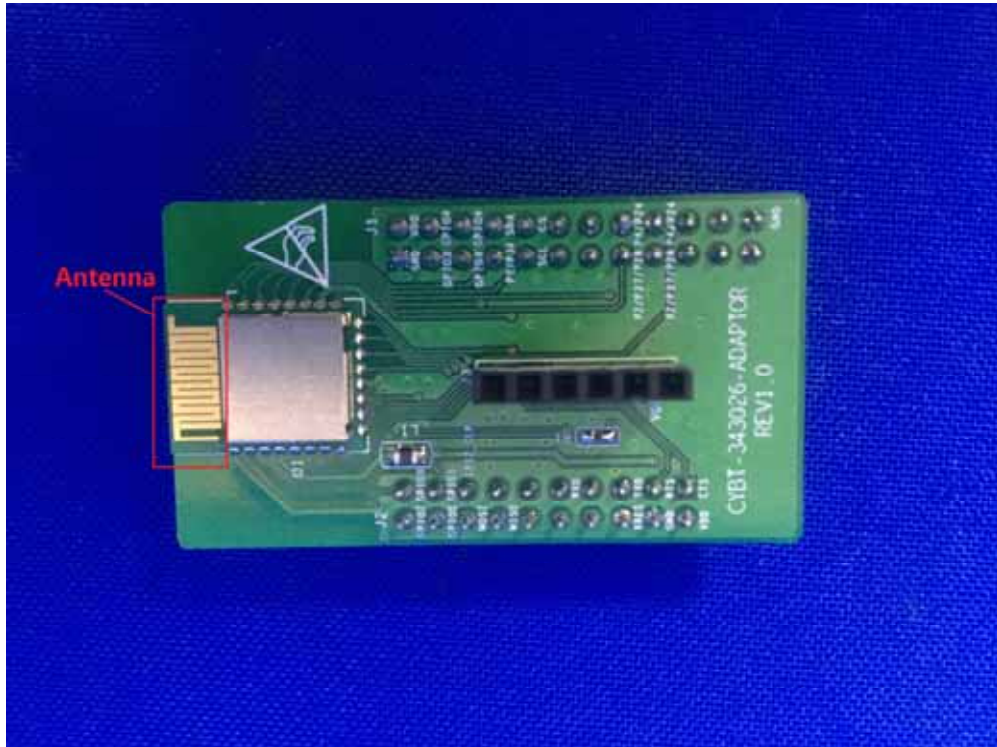
10. Attachment

➤ **Setup Photograph**

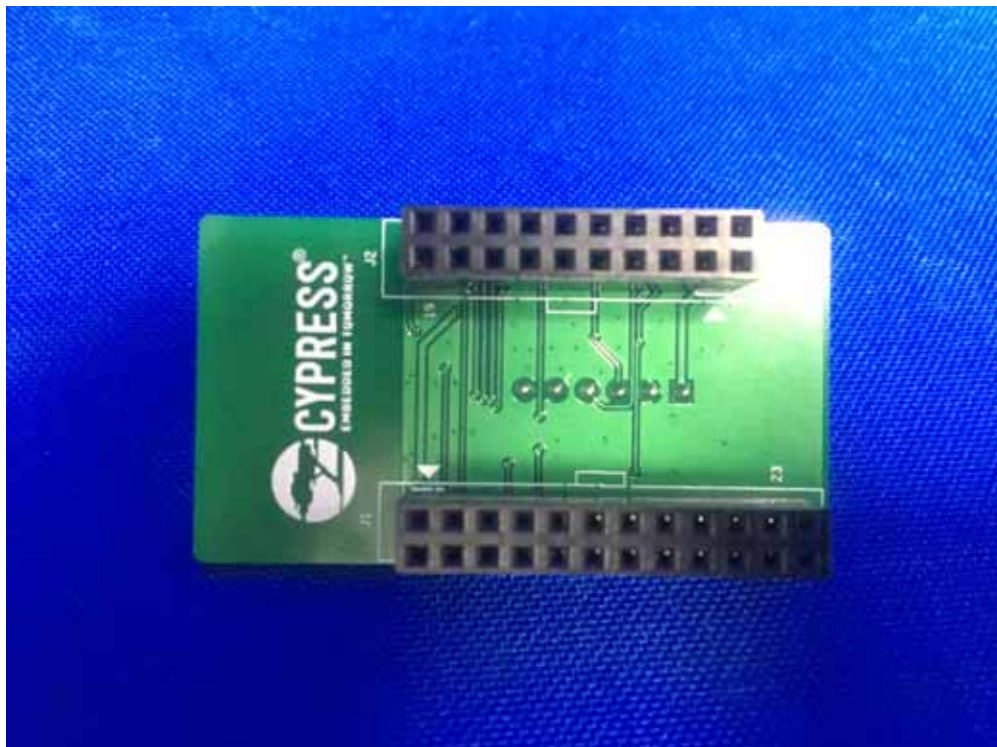


➤ **EUT Photograph**

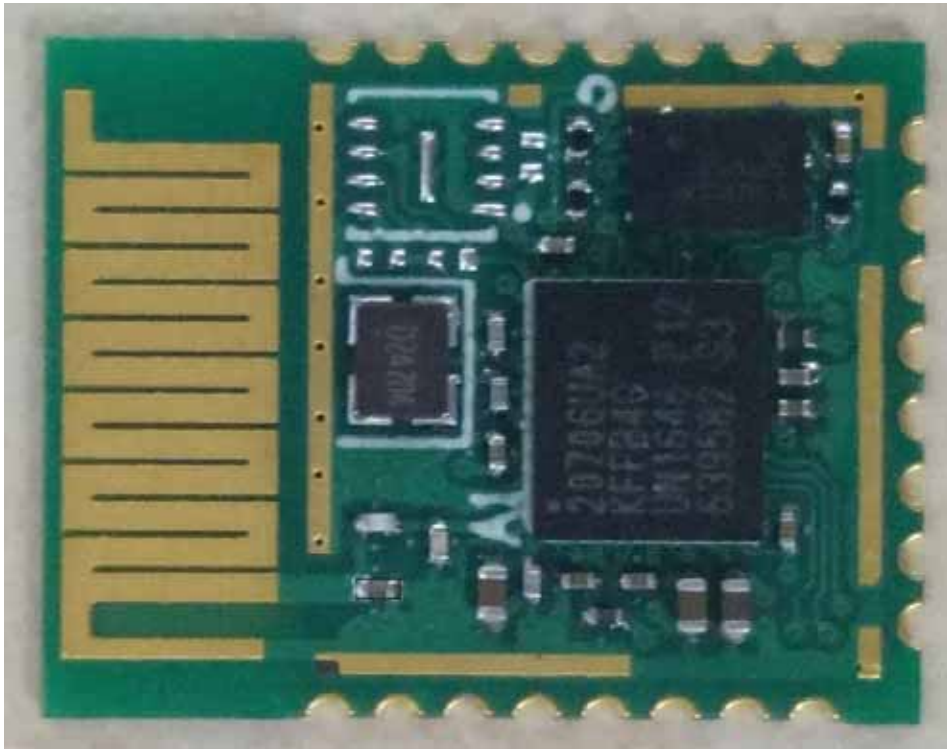
(1) EUT Photo



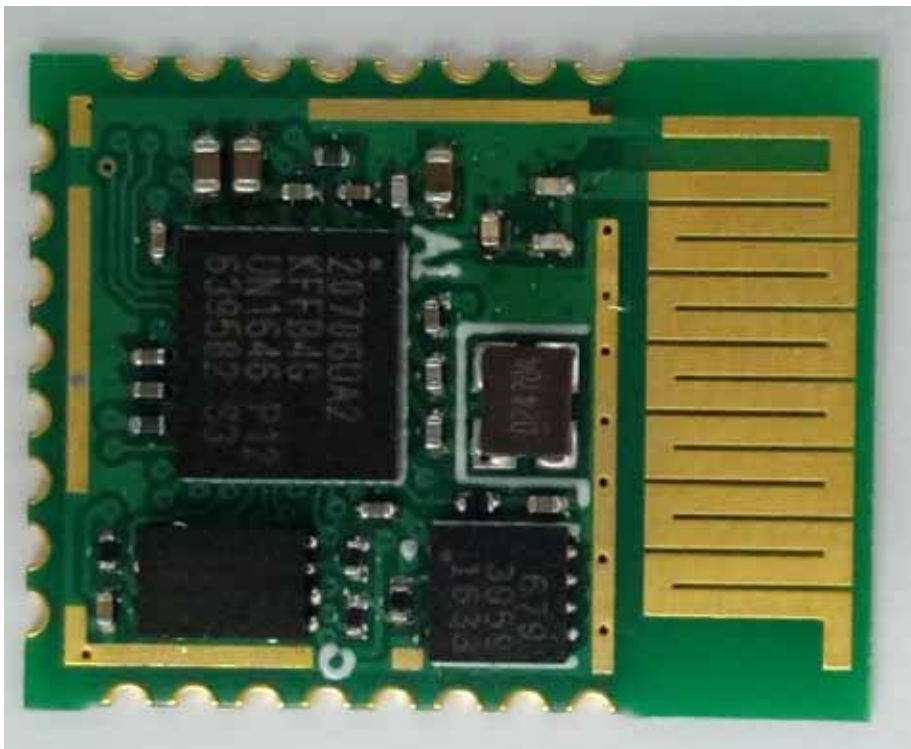
(2) EUT Photo



(3) EUT Photo



(4) EUT Photo



(5) EUT Photo



————— The End —————