FCC PART	15 SUBPART C TEST R	REPORT		
	FCC PART 15.247			
Report Reference No FCC ID	TZ170100238-EDR 2ALGP-VJB-105	1		
(position+printed name+signature):	File administrators Tony Li	for Li		
(position+printed name+signature):	Technique principal Hugo Chen	Hugo Chen		
(position+printed name+signature):	Manager James Wu	James Une		
Date of issue:	2017/3/13			
Representative Laboratory Name:	Shenzhen Tongzhou Testing Co.,	Ltd		
Address	1th floor, building 1, Haomai High- Dalang street, Longhua, Shenzhe	tech park, Huating Road 387, n, China		
Testing Laboratory Name:	Dongguan Dongdian Testing Service Co.,Ltd			
Address	No.17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China			
Applicant's name	Innovative Technology Electron	ics LLC		
Address:	No.1 Channel Drive, Port Washington, NY 11050, USA			
Test specification:				
Standard	FCC Part 15.247: Operation with 2400-2483.5 MHz and 5725-5850	hin the bands 902-928 MHz, MHz		
TRF Originator	Shenzhen Tongzhou Testing Co.,	Ltd		
Master TRF	Dated 2012-06			
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Test item description	Large Full Size Vinyl Turntable Ju	kebox		
Trade Mark	Victoria			
Model/Type reference:	VJB-105			
Listed Models	1			
Manufacturer:	Innovative Technology Electron	ics LLC		
Modulation Type	: GFSK,II/4DQPSK,8DPSK			
Operation Frequency	From 2402MHz to 2480MHz			
Rating:	: DC 18.0V Adapter from AC 100V~240V-50/60Hz			
Result	PASS			

TEST REPORT

Test Report No. :		TZ170100238-EDR	2017/3/13 Date of issue
Equipment under Test	:	Large Full Size Vinyl Turntable	e Jukebox
Model /Type	:	VJB-105	
Listed Models	:	1	
Applicant	:	Innovative Technology Elec	tronics LLC
Address	:	No.1 Channel Drive, Port Was	shington, NY 11050, USA
Manufacturer	:	Jin shun yan Electronic pro	cessing factory
Address	:	Xin xu Town,hui yang,Guangd	long,China

Test Result:	PASS
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The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. <u>TEST STANDARDS</u>

The tests were performed according to following standards:

<u>FCC Rules Part 15.247</u>: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz. <u>ANSI C63.10-2013</u>: American National Standard for Testing Unlicensed Wireless Devices

2. <u>SUMMARY</u>

2.1. General Remarks

Date of receipt of test sample	:	2017/1/18
Testing commenced on	•••	2017/1/18
Testing concluded on	•••	2017/3/13

2.2. Product Description

The **Innovative Technology Electronics LLC**'s Model: VJB-105 or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

Name of EUT	Large Full Size Vinyl Turntable Jukebox
Model/Type reference	VJB-105
Listed Models	1
FCC ID	2ALGP-VJB-105
Bluetooth	Supported BT 4.0+EDR
Antenna Type	Internal
Bluetooth FCC Operation frequency	2402MHz-2480MHz
Bluetooth Modulation	EDR(GFSK,8DPSK,π/4DQPSK)/BLE(GFSK)

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	0	120V / 60 Hz	0	115V / 60Hz
		0	12 V DC	Ο	24 V DC
			Other (specified in blank bel	ow)

DC 18.0V Adapter from AC 100V~240V-50/60Hz

2.4. Short description of the Equipment under Test (EUT)

2.4GHz (Large Full Size Vinyl Turntable Jukebox (M/N: VJB-105))

For more details, refer to the user's manual of the EUT.

2.5. EUT operation mode

The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continous transmitting and receiving mode for testing. There are 79 channels of EUT, and the test carried out at the lowest channel, middle channel and highest channel.

Channel	Frequency(MHz)	Channel	Frequency(MHz)
00	2402	40	2442
01	2403	41	2443
02	2404	42	2444
03	2405	43	2445
04	2406	44	2446
05	2407	45	2447
06	2408	46	2448

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07	2409	47	2449
08	2410	48	2450
09	2411	49	2451
10	2412	50	2452
11	2413	51	2453
12	2414	52	2454
13	2415	53	2455
14	2416	54	2456
15	2417	55	2457
16	2418	56	2458
17	2419	57	2459
18	2420	58	2460
19	2421	59	2461
20	2422	60	2462
21	2423	61	2463
22	2424	62	2464
23	2425	63	2465
24	2426	64	2466
25	2427	65	2467
26	2428	66	2468
27	2429	67	2469
28	2430	68	2470
29	2431	69	2471
30	2432	70	2472
31	2433	71	2473
32	2434	72	2474
33	2435	73	2475
34	2436	74	2476
35	2437	75	2477
36	2438	76	2478
37	2439	77	2479
38	2440	78	2480
39	2441		

2.6. Block Diagram of Test Setup

Fig. 2-1 Configuration of Tested System

EUT	Adapter	

Adapter:

Other Support Unit(s):

Type Name	Manufacturer	Model Name	Series
PC	ASUS	X454L	15105-0038A100
Software	CSR	BlueTest	

2.7. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2ALGP-VJB-105 filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.8. Modifications

No modifications were implemented to meet testing criteria.

2.9. NOTE

1. The EUT is a Large Full Size Vinyl Turntable Jukebox with WLAN and Bluetooth function, The functions of the EUT listed as below:

	Test Standards	Reference Report
Bluetooth-EDR	FCC Part 15 Subpart C	TZ170100238-EDR
Bluetooth-BLE	FCC Part 15 Subpart C	TZ170100238-BLE
MPE	FCC Per 47 CFR 2.1091(b)	TZ170100238-MPE

2. The frequency bands used in this EUT are listed as follows:

Frequency Band(MHz)	requency Band(MHz) 2400-2483.5		5470-5725	5725-5850
EUT	\checkmark	—	—	—

3. <u>TEST ENVIRONMENT</u>

3.1. Address of the test laboratory

Dongguan Dongdian Testing Service Co.,Ltd

No.17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2014) and CISPR Publication 22.

3.2. Test Facility

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

IC Registration No.: 10288A-1

The 3m alternate test site of Dongguan Dongdian Testing Service Co.,Ltd EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 10288A-1 on May, 2012.

FCC-Registration No.: 270092

Dongguan Dongdian Testing Service Co.,Ltd EMC Laboratory has been registered 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 270092, Mar, 2015.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C			
Humidity:	30-60 %			
Atmospheric pressure:	950-1050mbar			

3.4. Summary of measurement results

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Pass	Fail	NA	NP	Remark
§15.247(b)(4)	Antenna gain	GFSK	⊠ Lowest ⊠ Middle ⊠ Highest	GFSK	⊠ Lowest ⊠ Middle ⊠ Highest					complies
§15.247(e)	Power spectral density	-/-	-/-	-/-	-/-					Not applicable for FHSS!
§15.247(a)(1)	Carrier Frequency separation	GFSK 8DPSK	⊠ Lowest ⊠ Middle ⊠ Highest	GFSK 8DPSK	🖾 Middle	\boxtimes				complies
§15.247(a)(1)	Number of Hopping channels	GFSK 8DPSK	🛛 Full	GFSK 8DPSK	🛛 Full	\boxtimes				complies
§15.247(a)(1)	Time of Occupancy (dwell time)	GFSK 8DPSK	⊠ Lowest ⊠ Middle ⊠ Highest	GFSK 8DPSK	🛛 Middle	\boxtimes				complies
§15.247(a)(1)	Spectrum bandwidth of a FHSS system 20dB bandwidth	GFSK 8DPSK	⊠ Lowest ⊠ Middle ⊠ Highest	GFSK 8DPSK	⊠ Lowest ⊠ Middle ⊠ Highest	\boxtimes				complies
§15.247(b)(1)	Maximum output power	GFSK Π/4DQPSK 8DPSK	⊠ Lowest ⊠ Middle ⊠ Highest	GFSK N/4DQPSK 8DPSK	⊠ Lowest ⊠ Middle ⊠ Highest					complies

§15.247(d)	Band edge compliance conducted	GFSK 8DPSK	⊠ Lowest ⊠ Highest	GFSK 8DPSK	⊠ Lowest ⊠ Highest	\boxtimes		complies
§15.205	Band edge compliance radiated	GFSK 8DPSK	⊠ Lowest ⊠ Highest	GFSK	⊠ Lowest ⊠ Highest	\boxtimes		complies
§15.247(d)	TX spurious emissions conducted	GFSK 8DPSK	⊠ Lowest ⊠ Middle ⊠ Highest	GFSK 8DPSK	⊠ Lowest ⊠ Middle ⊠ Highest	\boxtimes		complies
§15.247(d)	TX spurious emissions radiated	GFSK 8DPSK	⊠ Lowest ⊠ Middle ⊠ Highest	GFSK	⊠ Lowest ⊠ Middle ⊠ Highest	\boxtimes		complies
§15.109	RX spurious emissions radiated	-/-	-/-	-/-	-/-	\boxtimes		complies
§15.209(a)	TX spurious Emissions radiated < 30 MHz	GFSK	-/-	GFSK	-/-	\boxtimes		complies
§15.107(a) §15.207	Conducted Emissions < 30 MHz	GFSK	-/-	GFSK	-/-	\boxtimes		complies

Remark:

- 1. The measurement uncertainty is not included in the test result.
- 2. NA = Not Applicable; NP = Not Performed
- 3. We tested all test mode and recorded worst case in report
- 4. For $\pi/4$ QPSK its same modulation type with 8-DPSK, and based exploratory test, there is no significant difference of that two types test result, so except output power, all other items final test were only performed with the worse case 8-DPSK and GFSK.

3.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the Dongguan Dongdian Testing Service Co.,Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Dongguan Dongdian Testing Service Co.,Ltd laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	3.16 dB	(1)
Radiated Emission	1~18GHz	2.56 dB	(1)
Radiated Emission	18-40GHz	2.56 dB	(1)
Conducted Disturbance	0.15~30MHz	2.44 dB	(1)

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

Radia	ted Method Test					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	462	2016/04/12	3 years
2	EMI TEST Receiver	Rohde&Schwarz	ESU8	100316	2016/10/25	1 years
3	EMI TEST Software	Audix	E3	6.111111	N/A	N/A
4	Horn Anternna	EMCO	3116	00060095	2016/04/12	3 years
5	Pre-Amplifer	Rohde&Schwarz	SCU-01	10049	2016/10/25	1 years
6	Pre-Amplifer	A.H.	PAM0-0118	360	2016/10/25	1 years
7	Pre-Amplifer	A.H.	PAM- 1840VH	562	2016/10/25	1 years

3.6. Equipments Used during the Test

8	Double Ridged Horn Antenna	Rohde&Schwarz	HF907	100265	2016/04/12	3 years
9	Active Loop Antenna	Schwarz beck	FMZB1519	0.38	2016/04/12	3 years
11	TURNTABLE	MATURO	TT2.0		N/A	N/A
12	ANTENNA MAST	MATURO	TAM-4.0-P		N/A	N/A
13	Spectrum Analyzer	R&S	FSU26	1166.1660.26	2016/10/25	1 years
14	Horn Antenna	SCHWARZBECK	BBHA 9170	1123	08/19/2016	08/18/2017

Conduc	Conducted Method Test										
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval					
1	Power Sensor	Rohde&Schwarz	NRP-Z81	102638	2016/11/02	1 years					
2	Spectrum Analyzer	Agilent	N9030A	MY49430428	2016/11/02	1 years					
3	Spectrum Analyzer	R&S	FSU26	1166.1660.26	2016/10/25	1 years					

AC Po	AC Power Conducted Emission										
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval					
1	Artificial Mains	Rohde&Schwarz	ENV216	101109	2016/10/25	1 years					
2	Artificial Mains	Rohde&Schwarz	ESH3-Z5	100309	2016/10/25	1 years					
3	EMI Test Receiver	Rohde&Schwarz	ESU8	100316	2016/10/25	1 years					
4	Pulse Limiter	Rohde&Schwarz	ESH3-Z2	101242	2016/10/25	1 years					

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a standfloor system and is placed on the ground plane as per ANSI C63.10-2013.

2 Support equipment, if needed, was placed as per ANSI C63.10-2013;

3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013;

4 The EUT received DC18V power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.

5 All support equipments received AC power from a second LISN, if any.

6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.

7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

8 During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

Frequency (MHz)	Maximum RF Line Voltage (dBµV)							
	CLA	SS A	CLASS B					
	Q.P.	Ave.	Q.P.	Ave.				
0.15 - 0.50	79	66	66-56*	56-46*				
0.50 - 5.00	73	60	56	46				
5.00 - 30.0	73	60	60	50				

* Decreasing linearly with the logarithm of the frequency

TEST RESULTS

Pre-scan all mode and recorded the worst case results in this report (BT Link @120VAC).



Item	Freq	Read	LISN	Cable	Pulse	Result	Limit	Over	Detector	Phase
		Level	Factor	LUSS	Factor	Level	Lille			
(Mark)	(MHz)	(dBµV)	(dB)	(dB)	(dB)	(dBµV)	(dBµV)	(dB)		
1	0.20	20.62	9.59	0.02	9.85	40.08	53.80	-13.72	Average	NEUTRAL
2	0.20	34.01	9.59	0.02	9.85	53.47	63.80	-10.33	QP	NEUTRAL
3	0.26	15.87	9.60	0.02	9.85	35.34	51.51	-16.17	Average	NEUTRAL
4	0.26	25.24	9.60	0.02	9.85	44.71	61.51	-16.80	QP	NEUTRAL
5	0.32	16.63	9.60	0.02	9.85	36.10	49.66	-13.56	Average	NEUTRAL
6	0.32	24.57	9.60	0.02	9.85	44.04	59.66	-15.62	QP	NEUTRAL
7	0.45	14.82	9.61	0.03	9.87	34.33	46.89	-12.56	Average	NEUTRAL
8	0.45	23.22	9.61	0.03	9.87	42.73	56.89	-14.16	QP	NEUTRAL
9	0.56	14.66	9.61	0.04	9.86	34.17	46.00	-11.83	Average	NEUTRAL
10	0.56	24.67	9.61	0.04	9.86	44.18	56.00	-11.82	QP	NEUTRAL
11	0.78	15.55	9.61	0.08	9.86	35.10	46.00	-10.90	Average	NEUTRAL
12	0.78	23.45	9.61	0.08	9.86	43.00	56.00	-13.00	QP	NEUTRAL



ltem	Freq	Read	LISN	Cable	Pulse	Result	Limit	Over	Detector	Phase
		Level	Factor	LOSS	Factor	Levei	Line	Limit		
(Mark)	(MHz)	(dBµV)	(dB)	(dB)	(dB)	(dBµV)	(dBµV)	(dB)		
1	0.15	14.71	9.61	0.01	9.84	34.17	56.00	-21.83	Average	LINE
2	0.15	27.99	9.61	0.01	9.84	47.45	66.00	-18.55	QP	LINE
3	0.20	20.34	9.62	0.02	9.85	39.83	53.71	-13.88	Average	LINE
4	0.20	33.13	9.62	0.02	9.85	52.62	63.71	-11.09	QP	LINE
5	0.33	16.97	9.63	0.02	9.85	36.47	49.57	-13.10	Average	LINE
6	0.33	25.09	9.63	0.02	9.85	44.59	59.57	-14.98	QP	LINE
7	0.53	14.72	9.63	0.04	9.87	34.26	46.00	-11.74	Average	LINE
8	0.53	23.84	9.63	0.04	9.87	43.38	56.00	-12.62	QP	LINE
9	0.56	14.83	9.63	0.04	9.86	34.36	46.00	-11.64	Average	LINE
10	0.56	25.34	9.63	0.04	9.86	44.87	56.00	-11.13	QP	LINE
11	0.78	16.08	9.62	0.08	9.86	35.64	46.00	-10.36	Average	LINE
12	0.78	23.87	9.62	0.08	9.86	43.43	56.00	-12.57	QP	LINE

Note:

1. Result Level = Read Level +LISN Factor + Pulse Limiter Factor + Cable loss.

If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz), Step size: 4 kHz, Scan time: auto.

4.2. Radiated Emission

TEST CONFIGURATION

Frequency range 9KHz – 30MHz



Frequency range 30MHz - 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1) Sequence of testing 9 kHz to 30 MHz

Setup:

- --- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- --- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
- --- If the EUT is a floor standing device, it is placed on the ground.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- --- The EUT was set into operation.

Premeasurement:

- --- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 0.8 meter.
- --- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

-- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

- --- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- --- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- --- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 3 meter.
- --- The EUT was set into operation.

Premeasurement:

- --- The turntable rotates from 0° to 315° using 45° steps.
- --- The antenna is polarized vertical and horizontal.
- --- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position $(\pm 45^{\circ})$ and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

- --- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- --- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- --- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 3 meter.
- --- The EUT was set into operation.

Premeasurement:

- --- The turntable rotates from 0° to 315° using 45° steps.
- --- The antenna is polarized vertical and horizontal.
- --- The antenna height scan range is 1 meter to 2.5 meter.
- -- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

- --- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- --- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- --- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 1 meter.
- --- The EUT was set into operation.

Premeasurement:

--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

Instruments Setting

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
	Peak Value: RBW=1MHz/VBW=3MHz,	
1GHz-40GHz	Sweep time=Auto	Peak
	Average Value: RBW=1MHz/VBW=330kHz,	1 Out
	Sweep time=Auto	

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

For example

Frequency	FS	RA	AF	CL	AG	Transd
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(dB)	(dB)	(dB)
300.00	40	58.1	12.2	1.6	31.90	

Transd=AF +CL-AG

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Frequency (MHz)	Distance (Meters)	Radiated (dBµV/m)	Radiated (µV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST RESULTS

For 9KHz to 30MHz

Frequency (MHz)	Corrected Reading (dBµV/m)@3m	FCC Limit (dBµV/m) @3m	Over Limit (dB)	Detector
				QP

Remark:

1. Over Limit = Emission level - Limit value

2. "---" states emission level at least lower than limit 20dB, so without recorded any values;

For 30MHz to 1000MHz



ltem	Freq	Read	Antenna Factor	Cable	Result	Limit	Over Limit	Detector	Polarization
(Mark)	(MHz)	(dBµV)	(dB/m)	dB	(dBµV/m)	(dBµV/m)	(dB)		
1	81.21	18.41	9.15	1.36	28.92	40.00	-11.08	QP	HORIZONTAL
2	148.44	19.35	8.67	1.79	29.81	43.50	-13.69	QP	HORIZONTAL
3	218.31	21.36	10.90	2.20	34.46	46.00	-11.54	QP	HORIZONTAL
4	744.87	12.62	19.33	4.52	36.47	46.00	-9.53	QP	HORIZONTAL
5	782.35	13.59	20.17	4.66	38.42	46.00	-7.58	QP	HORIZONTAL
6	893.86	14.02	22.03	4.95	41.00	46.00	-5.00	QP	HORIZONTAL



ltem	Freq	Read	Antenna	Cable	Result	Limit	Over	Detector	Polarization
		Level	Factor	Loss	Level	Line	Limit		
(Mark)	(MHz)	(dBµV)	(dB/m)	dB	(dBµV/m)	(dBµV/m)	(dB)		
1	54.26	17.69	14.20	1.09	32.98	40.00	-7.02	QP	VERTICAL
2	143.33	24.96	8.83	1.72	35.51	43.50	-7.99	QP	VERTICAL
3	218.31	22.21	10.90	2.20	35.31	46.00	-10.69	QP	VERTICAL
4	305.68	20.16	13.50	2.72	36.38	46.00	-9.62	QP	VERTICAL
5	478.85	18.18	15.98	3.62	37.78	46.00	-8.22	QP	VERTICAL
6	530.10	18.87	16.51	3.73	39.11	46.00	-6.89	QP	VERTICAL

Remark:

2. "---" states emission level at least lower than limit 20dB, so without recorded any values;

3. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

4. Pre-scan all mode and recorded the worst case results in this report (TX-Low Channel(1Mbps)).

^{1.} Over Limit = Emission level - Limit value

ltana	Erog	Read	Antenna	PRM	Cable	Result	Limit	Over						
(Mork)		Level	Factor	Factor	Loss	Level	Line	Limit	Detector	Polarization				
(wark)	(IVIEZ)	(dBµV)	(dB/m)	dB	(dB)	(dBµV/m)	(dBµV/m)	(dB)						
1	4804	45.46	35.40	29.13	12.07	63.8	74	-10.2	Peak	Horizontal				
1	4804	22.88	35.40	29.13	12.07	41.22	54	-12.78	AV	Horizontal				
2	7206	43.65	37.20	30.03	15.29	66.11	74	-7.89	Peak	Horizontal				
2	7206	23.43	37.20	30.03	15.29	45.89	54	-8.11	AV	Horizontal				

For 1GHz to 25GHz (Only record worst case at GFSK mode)

PRM Cable Result Limit Over Read Antenna Item Freq Polarization Level Factor Factor Loss Level Line Limit Detector (Mark) (MHz) (dBµV) (dB/m)dB (dB) (dBµV/m) $(dB\mu V/m)$ (dB) 4804 47.09 35.40 29.13 12.07 65.43 74 -8.57 Peak Vertical 1 1 4804 16.2 35.40 29.13 12.07 34.54 54 -19.46 AV Vertical 7206 37.20 74 -7.44 2 44.1 30.03 15.29 66.56 Peak Vertical 2 7206 21.71 37.20 30.03 15.29 44.17 54 -9.83 AV Vertical

Middle Channel @ Channel 39 @ 2441 MHz

Itom	Eroa	Read	Antenna	PRM	Cable	Result	Limit	Over		
(Mork)		Level	Factor	Factor	Loss	Level	Line	Limit	Detector	Polarization
(iviark)	(IVI⊓Z)	(dBµV)	(dB/m)	dB	(dB)	(dBµV/m)	(dBµV/m)	(dB)		
1	4882	33.78	35.46	29.16	12.17	52.25	74	-21.75	Peak	Horizontal
1	4882	27.47	35.46	29.16	12.17	45.94	54	-8.06	AV	Horizontal
2	7323	44.6	37.28	30.08	15.44	67.24	74	-6.76	Peak	Horizontal
2	7323	21.73	37.28	30.08	15.44	44.37	54	-9.63	AV	Horizontal

Itom	Frog	Read	Antenna	PRM	Cable	Result	Limit	Over		
(Mork)	/MU-)	Level	Factor	Factor	Loss	Level	Line	Limit	Detector	Polarization
(IVIALK)	(1011 12)	(dBµV)	(dB/m)	dB	(dB)	(dBµV/m)	(dBµV/m)	(dB)		
1	4882	46.37	35.46	29.16	12.17	64.84	74	-9.16	Peak	Vertical
1	4882	29.29	35.46	29.16	12.17	47.76	54	-6.24	AV	Vertical
2	7323	43.57	37.28	30.08	15.44	66.21	74	-7.79	Peak	Vertical
2	7323	23.68	37.28	30.08	15.44	46.32	54	-7.68	AV	Vertical

High Channel @ Channel 78 @ 2480 MHz

Itom	Erog	Read	Antenna	PRM	Cable	Result	Limit	Over		
(Mork)		Level	Factor	Factor	Loss	Level	Line	Limit	Detector	Polarization
(IVIALK)		(dBµV)	(dB/m)	dB	(dB)	(dBµV/m)	(dBµV/m)	(dB)		
1	4960	44.27	35.52	29.19	12.28	62.88	74	-11.12	Peak	Horizontal
1	4960	19.7	35.52	29.19	12.28	38.31	54	-15.69	AV	Horizontal
2	7440	43.41	37.37	30.12	15.60	66.26	74	-7.74	Peak	Horizontal
2	7440	22.98	37.37	30.12	15.60	45.83	54	-8.17	AV	Horizontal

Itom	Fred	Read	Antenna	PRM	Cable	Result	Limit	Over		
(Mork)		Level	Factor	Factor	Loss	Level	Line	Limit	Detector	Polarization
(IVIALK)	(1011 12)	(dBµV)	(dB/m)	dB	(dB)	(dBµV/m)	(dBµV/m)	(dB)		
1	4960	39.56	35.52	29.19	12.28	58.17	74	-15.83	Peak	Vertical
1	4960	16.53	35.52	29.19	12.28	35.14	54	-18.86	AV	Vertical
2	7440	43.22	37.37	30.12	15.60	66.07	74	-7.93	Peak	Vertical
2	7440	21.66	37.37	30.12	15.60	44.51	54	-9.49	AV	Vertical

REMARKS:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

2. The other emission levels were very low against the limit.

3. Over Limit=Emission Level - Limit.

4. The average measurement was not performed when the peak measured data under the limit of average detection.

4.3. Maximum Peak Output Power

TEST CONFIGURATION



TEST PROCEDURE

According to ANSI C63.10:2013 Maximum peak conducted output power for HFSS devices: The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the HFSS bandwidth and shall utilize a fast-responding diode detector.

<u>LIMIT</u>

For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 nonoverlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

TEST RESULTS

4.3.1 GFSK Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Measured Output Peak Power (dBm)	Limits (dBm)	Verdict
0	2402	4.65	30	PASS
39	2441	4.79	30	PASS
78	2480	4.26	30	PASS

$4.3.2 \pi/4DQPSK$ Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Measured Output Peak Power (dBm)	Limits (dBm)	Verdict
0	2402	4.82	21	PASS
39	2441	5.26	21	PASS
78	2480	4.12	21	PASS

4.3.3 8DPSK Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Measured Output Peak Power (dBm)	Limits (dBm)	Verdict
0	2402	4.92	21	PASS
39	2441	5.97	21	PASS
78	2480	5.39	21	PASS

Note: 1.The test results including the cable lose.

2.Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

4.4. 20dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=30 KHz and VBW=100KHz. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

<u>LIMIT</u>

For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwith.

TEST RESULTS

4.4.1 GFSK Test Mode

A. Test Verdict

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot	Limits (MHz)	Verdict
00	2402	0.896	Plot 4.4.1 A	/	PASS
39	2441	0.908	Plot 4.4.1 B	/	PASS
78	2480	0.904	Plot 4.4.1 C	/	PASS

Note: 1.The test results including the cable lose.



(Plot 4.4.1 A: Channel 00: 2402MHz @ GFSK)

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4.4.2 8DPSK Test Mode

A. Test Verdict

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot	Limits (MHz)	Verdict
00	2402	1.156	Plot 4.4.2 A	/	PASS
39	2441	1.160	Plot 4.4.2 B	/	PASS
78	2480	1.160	Plot 4.4.2 C	/	PASS

Note: 1.The test results including the cable lose.

B. Test Plots



(Plot 4.4.2 A: Channel 00: 2402MHz @ 8DPSK)

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(Plot 4.4.2 C: Channel 78: 2480MHz @ 8DPSK)

4.5. Frequency Separation

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=30 KHz and VBW=100KHz.

<u>LIMIT</u>

According to 15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

TEST RESULTS

Remark: 1. We test Frequency Separation at difference Packet Type (DH1, DH3 and DH5) and all test channels, recorded worst case at DH5 and middle channel.

4.5.1 GFSK Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Channel Separation (MHz)	Refer to Plot	Limits (MHz)	Verdict	
38	2440	1.000	Diot 4 5 1 A	25KHz or 20dB	DASS	
39	2441	1.000	FI01 4.5.1 A	bandwidth	PASS	

B. Test Plots

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(Plot 4.5.1 A: Channel 39: 2441MHz @ GFSK)

4.5.2 8DPSK Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Channel Separation (MHz)	Refer to Plot	Limits (MHz)	Verdict	
38	2440	1 004	Diot 4 5 2 A	25KHz or 2/3*20dB	DAGG	
39	2441	1.004	FI01 4.5.2 A	bandwidth	PASS	

B. Test Plots

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(Plot 4.5.2 A: Channel 39: 2441MHz @ 8DPSK)

4.6. Band Edge Compliance of RF Emission

TEST REQUIREMENT

In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.205(a).

TEST CONFIGURATION



For Conducted



TEST PROCEDURE

- 1. The EUT was placed on the ground.
- 2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
- 3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 4. Repeat above procedures until all frequency measurements have been completed..
- 5. The distance between test antenna and EUT was 3 meter:
- 6. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=330kHz, Sweep time=Auto	Peak

Peak

Horizontal

LIMIT

Below -20dB of the highest emission level in operating band. Radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)

TEST RESULTS

Remark: we measured all conditions(DH1,DH3,DH5) and recorded worst case at DH1

4.6.1 For Radiated Bandedge Measurement

Remark: we tested radiated bandedge at both hopping and no-hopping modes, recorded worst case at nohopping mode

4.6.1.1 GFSK Test Mode

Low Channel/Horizontal:



REMARKS:

2401.67

3

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

30.21

2. The other emission levels were very low against the limit.

29.99

3. Over Limit=Emission Level - Limit.

80.94

4. The average measurement was not performed when the peak measured data under the limit of average detection.

8.35

89.07



Item	Freq	Read	Antenna	PRM Factor	Cable	Result	Limit	Over	Detector	Delorization
(Mark)	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Delector	Polarization
1	2390.00	35.02	29.99	30.21	8.35	43.15	54	-30.85	Peak	Vertical
2	2400.00	39.35	29.99	30.21	8.35	47.48			Peak	Vertical
3	2401.67	73.99	29.99	30.21	8.35	82.12			Peak	Vertical

REMARKS:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

2. The other emission levels were very low against the limit.

3. Over Limit=Emission Level - Limit.

4. The average measurement was not performed when the peak measured data under the limit of average detection.

Horizontal

Horizontal

Horizontal



2479.7	75.38	30.25	30.25	8.5	83.88			Peak
2483.5	34.92	30.25	30.25	8.5	43.42	54	-30.58	Peak
2491.72	36.64	30.25	30.25	8.5	45.14	54	-28.86	Peak
2500	35.99	30.25	30.25	8.5	44.49	54	-29.51	Peak

REMARKS:

2

3

4

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

2. The other emission levels were very low against the limit.

3. Over Limit=Emission Level - Limit.

4. The average measurement was not performed when the peak measured data under the limit of average detection.



	rieducity (Minz)										
Itom	Erog	Read	Antenna	PRM	Cable	Result	Limit	Over			
(Mork)		Level	Factor	Factor	Loss	Level	Line	Limit	Detector	Polarization	
(IVIALK)		(dBµV)	(dB/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)			
1	2479.73	67.3	30.25	30.25	8.5	75.8			Peak	Vertical	
2	2483.50	34.48	30.25	30.25	8.5	42.98	54	-31.02	Peak	Vertical	
3	2494.59	37.41	30.25	30.25	8.5	45.91	54	-28.09	Peak	Vertical	
4	2500.00	35.2	30.25	30.25	8.5	43.7	54	-30.3	Peak	Vertical	

REMARKS:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

2. The other emission levels were very low against the limit.

3. Over Limit=Emission Level - Limit.

4. The average measurement was not performed when the peak measured data under the limit of average detection.

5. Detector AV is setting spectrum/receiver. RBW=1MHz/VBW=330kHz/Sweep time=Auto/Detector=Peak;

4.6.2 For Conducted Bandedge Measurement

4.6.2.1 GFSK Test Mode

A. Test Verdict

Frequency (MHz)	Delta Peak to Band emission (dBc)	Hoping Mode	Detector	Limit (dBc)	Refer to Plot	Verdict
2400.00	-56.396	OFF	Peak	-20	Plot 4.6.2.1 A	PASS
2400.00	-61.856	ON	Peak	-20	Plot 4.6.2.1 B	PASS
2483.50	-63.045	OFF	Peak	-20	Plot 4.6.2.1 C	PASS
2483.50	-63.839	ON	Peak	-20	Plot 4.6.2.1 D	PASS

B. Test Plots

		ortior th	-	N TON N TO	11.10.10.1	111100.0015	
rker 3 2.4000000000	00 GHz	Trig: Free Bun	Avg	Type: Log-Pwr Hold:>100/100	11:42:19 A IRACE TYPE	1 2 3 4 5 6 M	Marker
	IFGain:Low	Atten: 28 dB			DET	PNNNN	Marker Tab
Ref Offset 1 dB B/div Ref 18.00 dBn	1			Mkr3	2.400 00 -55.57	00 GHz /5 dBm	<u>On</u> (
						A	Marker Cour
						¥	Inter Cour
						-19 10 dDm	
							Cou
						الر	Marke
					11 J	3	
						almh	
Managed and a straight and a straight and a straight and a straight and	******		* 10-10-100-1-100				
					Stop 2 40	100 CH-	
es BW 100 kHz	#VB	W 300 kHz		Sweep 1	0.0 ms (1	400 GH2 001 pts)	
MODE TRC SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION	N VALUE	
N 1 f 2. N 1 f 2	402 024 GHz 390 000 GHz	0.821 dBm -63.018 dBm					
N 1 f 2.	400 000 GHz	-55.575 dBm					All Markers
							All Markers
							M
							2 0
	1 pro-			STATIS			

(Plot 4.6.2.1 A: Channel 00: 2402MHz @ GFSK)

Agilent Spect	rum Analyzer	- Swept SA			256				
X Start Fre	RF	50 Q AC	lz	SENSE:IN	Avg	ALIGNAUTO Type: Log-Pwr	11:46:00 IRA0	AM Jul 28, 2015 1 2 3 4 5 6	Frequency
10 dB/div	Ref Offs	et 1 dB 00 dBm	PNO: Fast C IFGain:Low	Trig: Free Rur Atten: 28 dB	n Avg	Hold:>100/100	2.390 -63.0	00 GHz	Auto Tune
-2.00									Center Freq 2.353500000 GHz
-22.0 32.0 -42.0								-16,95 dem	Start Freq 2.300000000 GHz
-52.0 -62.0 40-47- -72.0	at too be population of the second	- A- ed. (M. 3) - e - 54g F - 614	ىلارىلىم ى رىلىمى	ut. versone and the	Conde, Marcell Alloch stor	לייקארקאנעניין פיינע אייריאריטע	annon aprotes	2 ²	Stop Freq 2.407000000 GHz
Start 2.3 #Res BW	0000 GHz 100 kHz		#VB	W 300 kHz		Sweep	Stop 2.4 10.3 ms (0700 GHz 1001 pts)	CF Step 10.700000 MHz
MKR MODE 1	TRC SCL	X		Y 4.050 dDm	FUNCTION	FUNCTION WIDTH	FUNCTIO	ON VALUE	<u>Auto</u> Man
1 N 2 N 3 N 4 5	1 f 1 f	2.40 2.40 2.39	0 00 GHz 0 00 GHz	-60.804 dBm -63.052 dBm					Freq Offset 0 Hz
7 8 9 10 11 12									
MSG						STATUS			

(Plot 4.6.2.1 B: Hopping Mode @ GFSK)

Agilent Spect	trum Ana	lyzer - Swept	SA							
Start Fre	RF	50 Q 7800000	AC DO GHZ		SENSE	INT	ALIGNAUTO	11:51:58 AI	1 Jul 28, 2015	Frequency
10 dB/div	Ref	Offset 1 dB	PNO IFGai	: Fast 🖵 in:Low	Trig: Free Ru Atten: 28 dB	un Avg i	Hold:>100/100 Mkr3	2.500 00 -63.24	0 GHz 4 dBm	Auto Tune
Log 8.00 -2.00										Center Freq 2.514000000 GHz
-22.0 32.0 -42.0									-18.07 dBm	Start Freq 2.478000000 GHz
-52.0 / -62 0 -72.0		marhande	49.15-10 ¹ -1649	3	دیده اور افراد افراد افراد می منابع		مايور روايير مايور روايير مايور روايير مايور روايير مايور روايير مايور روايير مايور روايير مايور روايير مايور روايير مايور روايير مايور مار مايور مايور مايور مايور مايور مايور مام مايور مايور مايور ممار مايور مايور مايور مايور مام ماي مامور مام مام مام مام مام مامم ماماي مام ممار ممار	n, Pre-nationage and Provide and	rennes alle and a	Stop Freq 2.550000000 GHz
Start 2.4 #Res BW	7800 C / 100 F	GHZ (HZ		#VBW :	300 kHz		Sweep	Stop 2.55 6.93 ms (1	000 GHz 001 pts)	CF Step 7.200000 MHz
MKR MODE 1	TRC SCL		X 2.479 800 (GHz	Y 1.932 dBm 61 113 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION	VALUE	<u>Auto</u> Man
3 N 4 5 6 7	İ İ		2.500 000	GHz	-63.244 dBm					Freq Offset 0 Hz
8 9 10 11 12										
MSG							STATUS			



Agilent S	Spectru	m An	alyzer - Sw	rept SA										
Start	Fred	RF	50 ม 475000	AC	7	SEN	ISE:INT	Avg	ALIGNA Type: Log-	AUTO Pwr	11:53:18 TRAC	AM Jul 28, 2015	Fre	quency
				1	PNO: Fast C FGain:Low	Trig: Free Atten: 28	Run dB	Avgli	Hold:> 100/1	00	TYI			
10 dB/	div	Ref Re	Offset 1 f 18.00	dB dBm					М	kr1 2	2.479 8 1.8	00 GHz 00 dBm		Auto Tune
8.00 -2.00		1_											C (enter Freq 500000 GHz
-22.0 - -32.0 - -42.0 -												-18:20 (88%)	2.4750	Start Freq 000000 GHz
-52.0 - -62.0 - -72.0 -		2	2	*************	3	, , , , , , , , , , , , , , , , , , ,		-o ⁿ ationality in	alda and a day and a start	Barger and	Water town	udvisheeded Aux Au	2.5500	Stop Freq 000000 GHz
Start #Res	2.475 BW 1	500 100	GHz kHz		#VB	W 300 kHz			Swe	ep 7	stop 2.5: .20 ms (5000 GHz 1001 pts)	7.5	CF Step
MKR MO		sci f		× 2.479 8	00 GHz	Y 1.800 dE	Fi Sm	UNCTION	FUNCTION	WIDTH	FUNCTIO	DN VALUE	<u>Auto</u>	Man
2 3 4 4 5 6 7 8 9		f		2.483 5	00 GHz 00 GHz	-62.039 dE -62.557 dE	Sm Sm						F	req Offset 0 Hz
11 12 MSG										STATUS				

(Plot 4.6.2.1 D: Hopping Mode @ GFSK)

4.6.2.2 8DPSK Test Mode

A. Test Verdict

Frequency (MHz)	Delta Peak to Band emission (dBc)	Hoping Mode	Detector	Limit (dBc)	Refer to Plot	Verdict
2400.00	-56.454	OFF	Peak	-20	Plot 4.6.2.2 A	PASS
2400.00	-57.458	ON	Peak	-20	Plot 4.6.2.2 B	PASS
2483.50	-61.194	OFF	Peak	-20	Plot 4.6.2.2 C	PASS
2483.50	-58.907	ON	Peak	-20	Plot 4.6.2.2 D	PASS

B. Test Plots

Agilent Spect	um Analyzer	Swept SA							
Start Fre	RF 5	50 Q AC	7	SENSE:IN	Avg	ALIGNAUTO	11:57:59 A	M Jul 28, 2015	Frequency
	92.0000		PNO: Fast G Gain:Low	Trig: Free Run Atten: 28 dB	Avgi	Hóld:>100/100	TYPE DET		Auto Tune
10 dB/div	Ref Offse Ref 18.0	t1 dB 00 dBm				IVINIS	-62.98	7 dBm	
8.00									Center Freq 2.352000000 GHz
-22.0 32.0 -42.0								-19.81 #Bm	Start Freq 2.300000000 GHz
-52.0 -62.0 -72.0	Partaly, Hopman	ort-1-411-2-021-2-1-2-1	a) – matrodiadersi	ารุษณุกระบบสถามทางกฎโปลง	and and the second	على أنه إلى والمراجع من المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع	3	acort	Stop Freq 2.404000000 GHz
Start 2.30 #Res BW	000 GHz 100 kHz		#VB	N 300 kHz		Sweep 1	Stop 2.40 10.0 ms (1	400 GHz 001 pts)	CF Step 10.400000 MHz
MKR MODE T	RC SCL	× 2.401 8 2.400 0	16 GHz	Y 0.189 dBm -56.265 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION	VALUE	<u>Auto</u> Man
3 N 4 5 6	f	2.390 0	00 GHz	-62.987 dBm					Freq Offset 0 Hz
7 8 9 10									
12 MSG			1			STATUS			

(Plot 4.6.2.2 A: Channel 00: 2402MHz @ 8DPSK)

Agilent Spectr	um Analyzer - Si	wept SA						
Start Fre	RF 50	Ω AC 0000 GHz	SENSE:IN	Avg	ALIGNAUTO	11:59:01	AM Jul 28, 2015	Frequency
10 dB/div	Ref Offset 1 Ref 18.00	PNO: Fast IFGain:Low dB dBm	Atten: 28 dB	IEVA	Mkr1	2.403 8 0.2	80 GHz 58 dBm	Auto Tune
2.00 -2.00 -12.0							pwq.	Center Freq 2.363000000 GHz
-22.0 32.0 -12.0							-19.74 dBm	Start Freq 2.300000000 GHz
-52.0 -67.0	ur tograade waa doo	Anno ann an Anna Anna Anna Anna Anna Ann	an an an an an an an an an an an an an a	الليوي والي	مې ايدال مارد ال وال د اس		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Stop Freq 2.406000000 GHz
Start 2.30 #Res BW	0000 GHz 100 kHz	#VI	BW 300 kHz	FUNCTION	Sweep 1	Stop 2.40 10.1 ms (FUNCTIO	0600 GHz 1001 pts)	CF Step 10.600000 MHz Auto Man
1 N 1 2 N 1 3 N 1 4 5	f f f	2.403 880 GHz 2.400 000 GHz 2.390 000 GHz	0.258 dBm -57.200 dBm -62.230 dBm					Freq Offset 0 Hz
7 8 9 10 11 12								
MSG					STATUS			



Agilent Spectrum Analyzer - Swept SA						
M RF 50 Ω AC Start Freq 2.478000000 G	Hz	SENSE:IN	Avg	ALIGNAUTO Type: Log-Pwr	12:04:23 PM Jul 28, 2015	Frequency
Ref Offset 1 dB	PNO: Fast IFGain:Low	Trig: Free Run Atten: 28 dB	Avgli	Hold:>100/100	2.500 000 GHz	Auto Tune
10 dB/div Ref 18.00 dBm						Center Freq 2.514000000 GHz
-22.0					-19.00 dBm	Start Freq 2.478000000 GHz
-52.0 4 2 -62.0	3 Constanted	the strategy of the strategy o	n and and the spectrum generation of the spectru	an far gun daga a talang	a	Stop Freq 2.550000000 GHz
Start 2.47800 GHz #Res BW 100 kHz	#VBW	300 kHz		Sweep 6	Stop 2.55000 GHz .93 ms (1001 pts)	CF Step 7.200000 MHz
MKR MODE TRC SCL X 1 N 1 f 2.479 2 N 1 f 2.479	800 GHz	Y 0.910 dBm -60 284 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
3 N 1 f 2.500 4 - - - - 5 - - - - 6 - - - - 7 - - - - - 8 - <td>000 GHz</td> <td>43.506 dBm</td> <td></td> <td></td> <td></td> <td>Freq Offset 0 Hz</td>	000 GHz	43.506 dBm				Freq Offset 0 Hz
MSG				STATUS		

(Plot 4.6.2.2 C: Channel 78: 2480MHz @ 8DPSK)

Agilen	t Spec	etrun	n Ani	alyzer - Swe	pt SA									
xı Star	t Fr	eq	RF 2.4	50 Ω 750000	AC 000 GHz		SEN		Avg	ALIGNAUTO) 12:05: II	16 PM Jul 28, 2015	Fr	equency
10 di	3/div		Ref Ref	Offset 1 d 18.00 d	B B Bm	NO: Fast (Gain:Low	Atten: 28	dB	Argir	Mkr	1 2.479 0.	800 GHz 876 dBm		Auto Tune
8.00 -2.00	AN		1										C 2.512	enter Freq 500000 GHz
-22.0 -32.0 -42.0				2								-19.12 dDm	2.475	Start Freq
-52,0 -62,0 -72,0			4	Connerso	لديو هر رواستاريه ا	3	doora _e g	ւսդետրեւթն	alan-on-A	and a state of the second state of the	ามาวารระปะโรงหนึ่	habit topics that out	2.550	Stop Freq
Star #Re	t 2.4 s BV	175 N 1	00	GHz kHz	100	#VB	W 300 kHz			Sweep	Stop 2 7.20 ms	55000 GHz (1001 pts)	7	CF Step 500000 MHz
MKR I	N	TRC 1	SCL f		× 2.479 80	0 GHz	Y 0.876 dE	FU 3m	INCTION	FUNCTION WIDT	H FUNI	TION VALUE	<u>Auto</u>	Man
3 4 5 6	N	1	f		2.500 00	0 GHz	-62.352 dE	3m					F	F req Offset 0 Hz
7 8 9 10 11 12														
MSG										STAT	JS			

(Plot 4.6.2.2 D: Hopping Mode @ 8DPSK)

4.7. Spurious RF Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100kHz and VBW= 300KHz to measure the peak field strength , and mwasure frequeny range from 9KHz to 26.5GHz.

<u>LIMIT</u>

1. Below -20dB of the highest emission level in operating band.

2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

TEST RESULTS

Remark: The measurement frequency range is from 9KHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandege measurement data.

4.7.1 GFSK Test Mode

Channel	Frequency (MHz)	Frequency Range	Refer to Plot	Limit (dBc)	Verdict
		2402MHz	Plot 4.7.1 A1	N/A	PASS
		9KHz-30MHz	Plot 4.7.1 A2	-20	PASS
00	2402	30MHz-1GHz	Plot 4.7.1 A3	-20	PASS
00	2402	1GHz-8GHz	Plot 4.7.1 A4	-20	PASS
		8GHz-16GHz	Plot 4.7.1 A5	-20	PASS
		16GHz-26.5GHz	Plot 4.7.1 A6	-20	PASS
	2441	2440MHz	Plot 4.7.1 B1	N/A	PASS
		9KHz-30MHz	Plot 4.7.1 B2	-20	PASS
20		30MHz-1GHz	Plot 4.7.1 B3	-20	PASS
		1GHz-8GHz	Plot 4.7.1 B4	-20	PASS
		8GHz-16GHz	Plot 4.7.1 B5	-20	PASS
		16GHz-26.5GHz	Plot 4.7.1 B6	-20	PASS
		2480MHz	Plot 4.7.1 C1	N/A	PASS
		9KHz-30MHz	Plot 4.7.1 C2	-20	PASS
78	2480	30MHz-1GHz	Plot 4.7.1 C3	-20	PASS
	2400	1GHz-8GHz	Plot 4.7.1 C4	-20	PASS
	-	8GHz-16GHz	Plot 4.7.1 C5	-20	PASS
		16GHz-26.5GHz	Plot 4.7.1 C6	-20	PASS

A. Test Verdict

B. Test Plots

Agilent Spectr	um Analyzer - Swept S	٨						
Center Fr	RF 50 Ω A	00 GHz	SENSE		ALIGNAUTO	11:39:33 IRAC	AM Jul 28, 2015	Frequency
Genter	Ref Offset 1 dB	PNO: Wide IFGain:Low	Trig: Free R Atten: 28 df	un Avg Hol 3	d⇒100ĭ/100 <mark>Mkr1</mark>	2.401 8	26 GHz	Auto Tune
10 dB/div	Ref 18.00 dBn	n				0.8	71 dBm	
0.00			↓ 1					Center Freq 2.402000000 GHz
-2.00			\sim	~				
-12.0		~						Start Freq 2.401000000 GHz
-22.0							-19.13 dBm	
-32.0						-		Stop Freq 2.403000000 GHz
m	and and					~		
-42.0								CF Step 200.000 kHz Auto Man
-52.0								
-62 0								Freq Offset 0 Hz
-72.0								
Center 2.4 #Res BW	102000 GHz 100 kHz	#VBW	300 kHz		Sweep	Span 2 1.00 ms (.000 MHz 1001 pts)	
MSG					STATUS			





(Plot 4.7.1 A2: Channel 00: 2402MHz @ GFSK)

Agilent Spect	trum Analyzer - Swej	pt SA						
Marker '	RF 50 Ω 1 939.860000	AC 000 MHz	SENSE:I	Avg Type	ALIGNAUTO	11:40:48 IRAC	AM Jul 28, 2015	Peak Search
		PNO: Fast 😱 IFGain:Low	Trig: Free Ru Atten: 28 dB	n Avg Hold	:> 100/100	TYI		
10 dB/div	Ref Offset 1 dl Ref 18.00 dl	B Bm			М	kr1 939. -55.3	86 MHz 33 dBm	Next Peak
0.00								Next Pk Right
-2.00								Next Pk Left
-22.0							-13.13 (15)	Marker Delta
-42.0							1	Mkr→CF
-62 Ո հպ/հվությո	h Workward Britaday	hannahajathiranatinina	likulankan ^a lisikahilik	unihormoripolilasiaAbak	_{รายในระ} กันปูลอยุป _{ัญ} โร	n-Ingriferryh	and the second	Mkr→RefLvl
Start 30. #Res BW	0 MHz / 100 kHz	#VBW	300 kHz		Sweep	Stop 1.0 92.7 ms (0000 GHz 1001 pts)	More 1 of 2
MSG					STATU	s		





(Plot 4.7.1 A4: Channel 00: 2402MHz @ GFSK)

Agilent Spect	rum Analyzer - Sw	vept SA								
Marker 1	15.632000	0000000 G	Hz	Trig: Free	Run	Avg Type	Log-Pwr	11:41:15 IRAI TV	AM JUI 28, 2015	Peak Search
		PN IFG:	0: Fast 🖵 ain:Low	Atten: 28	dB	AT SILLER.		D	PNNNNN	NextBeak
10 dB/div	Ref Offset 1 Ref 18.00	dB dBm					M	kr1 15.6 -52.9	32 GHz 32 dBm	Nextreak
LON										Next Bk Bight
0.00										NEXT FK RIght
-2.00										
-12.0										Next Pk Left
-22 0									-19.13 dBm	_
22.0										Marker Delta
-32.0										
-42.0										Mkr→CF
-52.0									hi d'vi sala	
-62 D 🕬	artheory and the second	and the million of a stand	hater his harring we	which the work	elifelynestellenni	Ny the little of the state of t	ydersty respectives	he with a wind	ee Wroddylet	Mkr. Doff vi
										wiki → Rei L vi
-72.0										More
Start 8.00	00 GHz				,			Stop 16	.000 GHz	1 of 2
#Res BW	100 kHz		#VBW	300 kHz			Sweep	765 ms ((1001 pts)	
MSG							STATUS	5		





(Plot 4.7.1 A6: Channel 00: 2402MHz @ GFSK)







(Plot 4.7.1 B2: Channel 39: 2441MHz @ GFSK)

Agilent Spectr	um Analyzer - Swept SA		-						
Marker 1	RF 50 Ω AC	MHz	SEN	ISE:INT	Avg Type	Log-Pwr	11:48:47	AM Jul 28, 2015	Peak Search
		PNO: Fast 🖵 IFGain:Low	Atten: 28	dB	Avginola:	>100/100	DE	PNNNNN	
10 dB/div	Ref Offset 1 dB Ref 18.00 dBm					Μ	kr1 950. -52.4	53 MHz 82 dBm	Next Peak
0.00									Next Pk Right
-2.00									Next Pk Left
-22.0								-18,62 dBm	Marker Delta
-42.0								↓ ¹	Mkr→CF
-62 D		Johd Martin	ahlanditahan	hallondama	cantannahar	when relig	Ruggenseguptalishi	แกร่น 41 การความนี้	Mkr→RefLvl
Start 30.0	MHz 100 kHz	#VBW	300 kHz			Sweep	Stop 1.0	0000 GHz	More 1 of 2
MSG			0.00-11112			STATU	s		





(Plot 4.7.1 B4: Channel 39: 2441MHz @ GFSK)

Agilent Spectr	um Analyzer - Swept	SA					
Marker 1	RF 50 Ω A	0000 GHz	SENSE:	Avg	ALIGNAUTO	11:49:06 AM Ju IRACE 12	28, 2015 3 4 5 5 Peak Search
		PNO: Fast 🖵 IFGain:Low	Atten: 28 dB	n Avgi	Hold: 6/100	DET P	
10 dB/div	Ref Offset 1 dB Ref 18.00 dB	m			Μ	kr1 15.328 -53.874	GHz NextPeal dBm
0.00							Next Pk Righ
-2.00							Next Pk Lef
-22.0							Marker Delta
-42.0						∳ ¹	Mkr→Cf
-62 D -62 D	abel from the mean the	yddaesddallafaetar ywyddiod	all-populated shows h	manynhanablerb	aktoria and the figure of the	Alberto Inde Halt and the Horn	Miryuu Mkr→RefLv
Start 8.00 #Res BW	0 GHz 100 kHz	#VBW	300 kHz		Sweep	Stop 16.000 765 ms (100	More 0 GHz 1 of 2 1 pts)
MSG					STATUS	5	











(Plot 4.7.1 C2: Channel 78: 2480MHz @ GFSK)

Agilent Spect	rum Analyzer - Swept SA								
Marker 1	RF 50 Ω AC	MHz	SEN	SE;INT	Avg Type	Log-Pwr	11:50:25 IRAC	AM Jul 28, 2015	Peak Search
		PNO: Fast 🖵 IFGain:Low	Atten: 28	Run dB	Avg Hold:>	100/100	DE		
10 dB/div	Ref Offset 1 dB Ref 18.00 dBm					Μ	kr1 939. -53.6	86 MHz 35 dBm	Next Peak
8.00									Next Pk Right
-2.00								-18 17 dBm	Next Pk Left
-22.0									Marker Delta
-42.0								1	Mkr→CF
-62.0 -62.0 -72.0	un market and the second	J flihagia ang ang ang ang ang ang ang ang ang an	hinderstophylik	Holes and the states of the second second second second second second second second second second second second	ของมะเการรักษารักษารักษา	llege-Anno feit-orty	by and a second	Liver Manor	Mkr→RefLvl
Start 30.0 #Res BW) MHz 100 kHz	#VBW	300 kHz			Sweep	Stop 1.0 92.7 ms (0000 GHz 1001 pts)	More 1 of 2
MSG						STATU	5		





(Plot 4.7.1 C4: Channel 78: 2480MHz @ GFSK)

Agilent Spect	rum Analyzer - Swept SA								
Marker 1	RF 50 Ω AC	00 GHz	SEN	ISE:INT	Avg Type	Lignauto	11:50:59 TRAC	AM Jul 28, 2015	Peak Search
		PNO: Fast G	Trig: Free Atten: 28	Run dB	Avg Hold:	5/100	TYI		
10 dB/div	Ref Offset 1 dB Ref 18.00 dBm					М	kr1 15.3 -53.2	92 GHz 31 dBm	Next Peak
0.00									Next Pk Right
-2.00								-18 17 dHm	Next Pk Left
-22.0									Marker Delta
-42.0								↓1	Mkr→CF
-62 D	notorimonantalkondra	hallesborowarder	19% p.40 mm	anilatestoreity	npolocyclen	und the destroy and	lylog allowed	10 ⁻¹⁰⁻¹⁰ 1/2-10-14	Mkr→RefLvl
Start 8.00 #Res BW	00 GHz 100 kHz	#VBW	300 kHz			Sweep	Stop 16 765 ms (.000 GHz 1001 pts)	More 1 of 2
MSG						STATUS	5		





(Plot 4.7.1 C6: Channel 78: 2480MHz @ GFSK)

4.7.2 8DPSK Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Frequency Range	Refer to Plot	Limit (dBc)	Verdict
		2402MHz	Plot 4.7.2 A1	N/A	PASS
		9KHz-30MHz	Plot 4.7.2 A2	-20	PASS
00	2402	30MHz-1GHz	Plot 4.7.2 A3	-20	PASS
00		1GHz-8GHz	Plot 4.7.2 A4	-20	PASS
		8GHz-16GHz	Plot 4.7.2 A5	-20	PASS
		16GHz-26.5GHz	Plot 4.7.2 A6	-20	PASS
	2440	2440MHz	Plot 4.7.2 B1	N/A	PASS
		9KHz-30MHz	Plot 4.7.2 B2	-20	PASS
10		30MHz-1GHz	Plot 4.7.2 B3	-20	PASS
19		1GHz-8GHz	Plot 4.7.2 B4	-20	PASS
		8GHz-16GHz	Plot 4.7.2 B5	-20	PASS
		16GHz-26.5GHz	Plot 4.7.2 B6	-20	PASS
		2480MHz	Plot 4.7.2 C1	N/A	PASS
		9KHz-30MHz	Plot 4.7.2 C2	-20	PASS
20	2480	30MHz-1GHz	Plot 4.7.2 C3	-20	PASS
	2400	1GHz-8GHz	Plot 4.7.2 C4	-20	PASS
		8GHz-16GHz	Plot 4.7.2 C5	-20	PASS
		16GHz-26.5GHz	Plot 4.7.2 C6	-20	PASS

B. Test Plots



(Plot 4.7.2 A1: Channel 00: 2402MHz @8DPSK)

Agilen	t Spectru	ım Analyzer - S	wept SA		ing sour						
Mar	ker 1	RF 50		2	SE	NSE:INT	Avg Typ	e: Log-Pwr	11:55:54 IRAC	AM Jul 28, 2015	Peak Search
			0.0 1112	PNO: Wide 🖵 IFGain:Low	Trig: Free Atten: 28	e Run dB	Avg Hold	l:>100/100	TYF De		Next Deck
10 dE	B/div	Ref Offset	dB dBm						Mkr1 : -49.1	369 kHz 23 dBm	NextPeak
0.00											Next Pk Right
-2.00 -12.0											Next Pk Left
-22.0 -32.0										-19.82 dBm	Marker Delta
-42.0 -52.0	 										Mkr→CF
-62 D	Will South	haynwaltin	urnaku ⁿ wai	וריין אינרער אייר איירער א	qualitation	marthalbhorkd	lyahay min	Montanall	Nunzwaah	knowning	Mkr→RefLvl
Star #Re:	t9 kH sBW	z 100 kHz		#VBW	300 kHz			Sweep	Stop 3 2.87 ms (0.00 MHz 1001 pts)	More 1 of 2
MSG								STATUS	AC cou	pled: Accy u	nspec'd < 10MHz





(Plot 4.7.2 A3: Channel 00: 2402MHz @8DPSK)

Agilent Spect	rum Analyzer - Swe	pt SA								
(XI	RF 50 Ω	AC C	1	SE	NSE:INT	Aug Type	ALIGNAUTO	11:56:41	AM Jul 28, 2015	Peak Search
Marker	2.4000000	PI IF(NO: Fast 🖵 Sain:Low	Trig: Free Atten: 28	Run dB	Avg Hold:	7/100	TY D		NextPeak
10 dB/div	Ref Offset 1 d Ref 18.00 d	B IBm						/lkr1 2.4 0.0	16 dBm	NCATT CUR
0.00		1								Next Pk Right
2.00										
-12.0										Next Pk Left
-									-19.82 dBm	
-22.0										Marker Delta
-42.0										Mkr→CF
-62 D 10 10 10 10	warnahili	lantwayoth	rup alres	huhmaaydajog	alariterations, a	ylaha vi n a foshinina	unovalerative,	enterse at	unnurlywhologry	Mkr→RefLvl
Start 1.0	00 GHz							Stop 8	.000 GHz	More 1 of 2
#Res BW	100 kHz		#VBW	300 kHz			Sweep	669 ms ((1001 pts)	_
MSG							STATUS	5		





(Plot 4.7.2 A5: Channel 00: 2402MHz @8DPSK)

Agilent Spectr	um Analyzer - Swept SA							
Marker 1	RF 50 Q AC		SENS	E;INT		0 11:57:05 r IRA	AM Jul 28, 2015	Peak Search
Marker	24.940000000	PNO: Fast IFGain:Low	Trig: Free A Atten: 28 d	Run Av IB	g Hold: 6/100	די נ		
10 dB/div	Ref Offset 1 dB Ref 18.00 dBm				M	(r1 24.94 -48.1	6 0 GHz 34 dBm	NextPeak
0.00								Next Pk Right
-2.00								Next Pk Left
-22.0							-19.82 dBm	Marker Delta
-42.0	للېدىلاس بى اورىيى د	MUNHUR LEAD IN MILLION	العامينية المعاور	www.		1	uryultappaan,	Mkr→CF
-62 D	J ^{R/}							Mkr→RefLvl
Start 16.0 #Res BW	00 GHz 100 kHz	#VBW	300 kHz		Swe	Stop 26 ep 1.00 s	5.500 GHz (1001 pts)	More 1 of 2
MSG					STAT	rus		





(Plot 4.7.2 B1: Channel 39: 2441MHz @8DPSK)

Agilent Spectr	um Analyzer - Swept SA								
(X) Markar (RF 50 Q AC		SENSE	INT A			12:00:31 F	M Jul 28, 2015	Peak Search
Marker	300.092000 KHZ	PNO: Wide 🖵 IFGain:Low	Trig: Free R Atten: 28 dE	un Âv 3	g Hold:>1	100/100	TYP De		
10 dB/div	Ref Offset 1 dB Ref 18.00 dBm						Mkr1 3	869 kHz 81 dBm	Next Peak
0.00									Next Pk Right
-2.00									Next Pk Left
-22.0								-19 43 dHm	Marker Delta
-42.0									Mkr→CF
-62.0	hunnanananana	sallanne uthorit	_พ ใก _{้เ} ก่ะหมู่หาะ	J.J.W.W.Aramal.A	menhagemen	Wildenneity	ndalitenn	pertonisation	Mkr→RefLvl
Start 9 kH #Res BW	z 100 kHz	#VBW	300 kHz		5	Sweep 2	Stop 3 2.87 ms (0.00 MHz 1001 pts)	More 1 of 2
MSG						STATUS	LAC cou	pled: Accy un	spec'd < 10MHz





(Plot 4.7.2 B3: Channel 39: 2441MHz @8DPSK)

Agilent Spe	ectrum Analyzer - Swept SA								
Markar	RF 50 Q AC		SET	ISE:INT	Aug Type	ALIGNAUTO	12:01:03	PM Jul 28, 2015	Peak Search
Marker	12.442000000	PNO: Fast IFGain:Low	Trig: Free Atten: 28	Run dB	Avg Hold:	12/100	TYI Di		New Peak
10 dB/div	Ref Offset 1 dB Ref 18.00 dBm					- N	/kr1 2.4 0.4	42 GHz 98 dBm	NextPeak
0.00	1								Next Pk Right
-2.00									Next Pk Left
-22.0								-19 43 dHm	Marker Delta
-42.0									Mkr→CF
-62 0	stanoner Longrandura	arsonable glowings all by	hijnilig _{ansin} tuj	lanahadahaya	مواجاري بارجام اور اواليواليزر بارجام	alutat unausi ny	مريد <mark>المحاجر مراجر</mark>	theoryphy-restrying	Mkr→RefLvl
Start 1.0 #Res Bi	000 GHz W 100 kHz	#VBW	300 kHz			Sweep	Stop 8 669 ms (.000 GHz 1001 pts)	More 1 of 2
MSG						STATUS	5		





(Plot 4.7.2 B5: Channel 39: 2441MHz @8DPSK)

Agilent Spectr	rum Analyzer - Swept SA					
Marker 1	RF 50 Q AC		SENSE;INT	ALIGNAUTO	12:01:26 PM Jul 28, 2015	Peak Search
Marker	20.2193000000	PNO: Fast IFGain:Low	Trig: Free Run Atten: 28 dB	Avg Hold: 6/100	TYPE MUMANANA DET PNNNNN	NextBack
10 dB/div	Ref Offset 1 dB Ref 18.00 dBm			Mkr	1 26.279 5 GHz -48.110 dBm	NextPeak
8.00						Next Pk Right
-2.00						Next Pk Left
-22.0					-194,3 attm	Marker Delta
-42.0	,	ha Bhana ha a a a a a a a a a a a a a a a a	en share been to an to	upper transferration	variant and toplater	Mkr→CF
-62.0		and the second se				Mkr→RefLvl
Start 16.0 #Res BW	000 GHz 100 kHz	#VBW 3	00 kHz	Sweep	Stop 26.500 GHz 1.00 s (1001 pts)	More 1 of 2
MSG				STATUS		





(Plot 4.7.2 C1: Channel 78: 2480MHz @8DPSK)

Agilen	t Spectru	m Analyzer - S	wept SA								
DXI	Kor 4	RF 50			SE	NSE:INT	Aug Type	ALIGNAUTO	12:02:31	PM Jul 28, 2015	Peak Search
Mar	Ker T	+20.0740	JU KHZ	PNO: Wide 🖵 IFGain:Low	Trig: Free Atten: 28	Run dB	Avg Hold:	>100/100	TYI		
10 dE	3/div	Ref Offset 1 Ref 18.00	dB dBm						Mkr1 - 49.3	429 kHz 19 dBm	Next Peak
0.00											Next Pk Right
-2.00 -12.0											Next Pk Left
-22.0 -32.0										-19,13 dBm	Marker Delta
-42.0 -52.0	1 1										Mkr→CF
-62 D	V. May	m Marchander	YUMUWUMPUN	ม _ี คัญทางณาการค.ไ.	honorhan	manna	Journal for the	Lange Lange and	unnaha	เกิวะนงสมุมแห	Mkr→RefLvl
Star #Res	t9 kHz sBW 1	2 100 kHz		#VBW	300 kHz			Sweep	Stop 3 2.87 ms (0.00 MHz (1001 pts)	More 1 of 2
MSG								STATUS	AC COU	ipiea: Accy u	ispecial< TUMHz





(Plot 4.7.2 C3: Channel 78: 2480MHz @8DPSK)

Agilent Spectr	um Analyzer - Swept SA								
(X) Marker 1	RF 50 Q AC	CH-	SENSE	EINT	Aug Type		12:03:00 I	M Jul 28, 2015	Peak Search
Marker	2.41700000000	PNO: Fast C	Trig: Free R Atten: 28 dl	lun 3	Avg Hold:	8/100	TYF De		Next Deak
10 dB/div	Ref Offset 1 dB Ref 18.00 dBm					N	1kr1 2.4 -1.1	77 GHz 37 dBm	NEALFEak
0.00	1								Next Pk Right
-2.00									Next Pk Left
-22.0								-19.13 dBm	Marker Delta
-42.0									Mkr→CF
-62 0 10,100,419	we shall of the order of the shall be a start of the star	woodedwynall Andha	water to prove the providence of the second s	ying an an an an an an an an an an an an an	nallal an Israel	ha hannardad a	n Aproxide Lepolado	denter and the stand of the sta	Mkr→RefLvl
Start 1.00 #Res BW	0 GHz 100 kHz	#VBW 3	00 kHz			Sweep	Stop 8 669 ms (.000 GHz 1001 pts)	More 1 of 2
MSG						STATUS			



Agilent	t Spectrur	n Analyzer - Sv	vept SA								
Mark	or 1 1	RF 50 5	AC AC	CH2	SE	NSE:INT	Ava	ALIGNAUTO	12:03:12 IRA	PM Jul 28, 2015	Peak Search
Melli		51206000		PNO: Fast G FGain:Low	Trig: Free Atten: 28	Run dB	Avgit	101d: 6/100	TY D		NextBack
10 dB	8/div	Ref Offset 1 Ref 18.00	dB dBm					M	kr1 15.2 -53.4	208 GHz 00 dBm	NextPeak
0.00											Next Pk Right
-2.00 - -12.0 -											Next Pk Left
-22.0 -32.0										-19.13 dDm	Marker Delta
-42.0 - -52.0 -										1	Mkr→CF
-62 0	hatement	misquartication	yh aban paintan a	n and the second second	1. Arganyanyahihi	ala leferina de	4stypeine Vielan	ייייא אינגילי, לאיייאין אינארילע איייעראוייעראיייע	anternethen	the sector when	Mkr→RefLvl
Start #Res	t 8.000 s BW 1	GHz 00 kHz		#VBW	300 kHz			Sweep	Stop 16 765 ms (.000 GHz (1001 pts)	More 1 of 2
MSG								STATUS	5		

(Plot 4.7.2 C5: Channel 78: 2480MHz @8DPSK)

Agiler	it Spectr	ım Analyzer - Sv	wept SA								
DXI MICOL	kor 1	RF 50	Ω AC	CHIT	SE	NSE:INT	Ava Typ	ALIGNAUTO	12:03:25	PM Jul 28, 2015	Peak Search
Man	Ker 1	25.261000	000000	PNO: Fast G FGain:Low	Trig: Free Atten: 28	e Run dB	Avg Hold	: 6/100	TYI		Next Peak
10 di	B/div	Ref Offset 1 Ref 18.00	dB dBm					Mkr	-47.9	1 0 GHz 95 dBm	NEALFEak
0.00											Next Pk Right
-2.00 -12.0											Next Pk Left
-22.0 -32.0										-19.13 dBm	Marker Delta
-42.0 -52.0		ر مالياني معالياتي	Land Dahadas	dan Meda ta an ta an	Adama	Limer burn	المواجع والمعالية والمعالية والمعالية والمعالية والمعالية والمعالية والمعالية والمعالية والمعالية والمعالية وال	un Malanangan	ustodorasti	humunup.	Mkr→CF
-62 0	Alwryddia	M		man and and free heads							Mkr→RefLvl
Star #Re	t 16.0 s BW	00 ĜHz 100 kHz		#VBW	300 kHz			Sweep	Stop 26	.500 GHz 1001 pts)	More 1 of 2
MSG								STATUS			

(Plot 4.7.2 C6: Channel 78: 2480MHz @8DPSK)

4.8. Number of hopping frequency

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator.Set spectrum analyzer start 2400MHz to 2483.5MHz with RBW=30 KHz and VBW=100KHz.

<u>LIMIT</u>

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

4.8.1 GFSK Test Mode

A. Test Verdict

Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Refer to Plot	Limit	Verdict
2400-2483.5	79	Plot 4.8.1 A1	≥15	PASS

B. Test Plots



(Plot 4.8.1 A: @ GFSK)

4.8.2 8DPSK Test Mode

A. Test Verdict

Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Refer to Plot	Limit	Verdict
2400-2483.5	79	Plot 4.8.2 A1	≥15	PASS

B. Test Plots





4.9. Time Of Occupancy(Dwell Time)

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with RBW=1MHz and VBW=3MHz,Span=0Hz.

<u>LIMIT</u>

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a pe-riod of 0.4 seconds multiplied by the number of hopping channels employed.

TEST RESULTS

The Dwell Time=Burst Width*Total Hops. The detailed calculations are showed as follows:

The duration for dwell time calculation: 0.4[s]*hopping number=0.4[s]*79[ch]=31.6[s*ch];

The burst width [ms/hop/ch], which is directly measured, refers to the duration on one channel hop. The hops per second for all channels: The selected EUT Conf uses a slot type of 5-Tx&1-Rx and a hopping rate of 1600 [ch*hop/s] for all channels. So the final hopping rate for all channels is 1600/6=266.67 [ch*hop/s] The hops per second on one channel: 266.67 [ch*hops/s]/79 [ch]=3.38 [hop/s];

The total hops for all channels within the dwell time calculation duration: 3.38 [hop/s]*31.6[s*ch]=106.67 [hop*ch];

The dwell time for all channels hopping: 106.67 [hop*ch]*Burst Width [ms/hop/ch].

Remark: 1. We test Frequency Separation at all test channels, recorded worst case at middle channel.

4.9.1 GFSK Test Mode

A. Test Verdict

Mode	Frequency (MHz)	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Refer to Plot	Verdict				
	2441	0.4000	0.1280	0.4	Plot 4.9.1 A1	PASS				
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second									
	2441	1.6750	0.2680	0.4	Plot 4.9.1 B1	PASS				
DH S	<i>Note:</i> Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second									
	2441	2.9400	0.3136	0.4	Plot 4.9.1 C1	PASS				
5 10	Note: Dwell tin	ne=Pulse Time (ms) × (1600 ÷ 6	÷ 79) ×31.6 Sec	cond					

B. Test Plots

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(Plot 4.9.1.B1: Channel 39: 2441MHz @ GFSK @ DH3)

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(Plot 4.9.1.C1: Channel 39: 2441MHz @ GFSK @ DH5)

4.8.2 8DPSK Test Mode

A. Test Verdict

Mode	Frequency (MHz)	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Refer to Plot	Verdict					
	2441	0.4000	0.1280	0.4	Plot 4.9.2 A1	PASS					
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second										
	2441	1.7050	0.2728	0.4	Plot 4.9.2 B2	PASS					
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second										
	2441	2.9650	0.3163	0.4	Plot 4.9.2 C2	PASS					
6 110	Note: Dwell tin	ne=Pulse Time (ms) × (1600 ÷ 6	÷ 79) ×31.6 Sec	cond						

B. Test Plots

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(Plot 4.9.2.B1: Channel 39: 2441MHz @ 8DPSK @ DH3)

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(Plot 4.9.2.C1: Channel 39: 2441MHz @ 8DPSK @ DH5)

4.10. Pseudorandom Frequency Hopping Sequence

TEST APPLICABLE

For 47 CFR Part 15C section 15.247 (a)(1) requirement:

Frequency hopping systems shall have hopping channel carrier fre-quencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Al-ternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier fre-quencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo ran-domly ordered list of hopping fre-quencies. Each frequency must be used equally on the average by each trans-mitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their cor-responding transmitters and shall shift frequencies in synchronization with the transmitted signals.

EUT Pseudorandom Frequency Hopping Sequence Requirement

The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage.And the result is fed back to the input of the frist stage.The sequence begins with the frist one of 9 consecutive ones,for example:the shift register is initialized with nine ones.

- Number of shift register stages:9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An explame of pseudorandom frequency hopping sequence as follows:

0	2	4	6	 62	64	78	1	 73 75	77
					\square	1			
						i i			

Each frequency used equally one the average by each transmitter.

The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

4.11. Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 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.

And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Refer to statement below for compliance

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Measurement

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.For normal BT devices, the GFSK mode is used.

Measurement parameters

Measurement parameter					
Detector:	Peak				
Sweep time:	Auto				
Resolution bandwidth:	1MHz				
Video bandwidth:	3MHz				
Trace-Mode:	Max hold				

Limits

FCC	IC						
Antenna Gain							
6 dBi							

Results

T _{nom}	V _{nom}	Lowest Channel 2402 MHz	Middle Channel 2440 MHz	Highest Channel 2480 MHz			
Conducted p Measured with G	oower [dBm] GFSK modulation	4.65	4.79	4.26			
Radiated p Measured with G	ower [dBm] GFSK modulation	3.01	3.29	3.17			
Gain Calcu	[dBi] ılated	-1.64	-1.5	-1.09			
Measuremer	nt uncertainty	± 0.6 dB (cond.) / ± 2.56 dB (rad.)					

.....End of Report.....