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Report Number: 68.950.12.211.01



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Details about the Test Laboratory 2

Details about the Test Laboratory

Test Site 1 Company name:	Jiangsu TÜV Product Service Ltd. – Shenzhen Branch 6th Floor, H Hall, Century Craftwork Culture Square, No. 4001, Fuqiang Road, Futian District 518048, Shenzhen,P.R.C.
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Test Site 2 Company name:	Audix Technology (shenzhen) Co.,Ltd Block Shenzhen, Science & Industry Park, Nantou, Shenzhen, Guangdong, China
Telephone:	86 755 2663 9496
Fax:	86 755 2663 2877



Description of the Equipment Under Test 3

Product:	Speaker
Model no.:	WAE-BT03-W
FCC ID:	NAM5061649
Brand Name:	Hercules
Options and accessories:	NIL
Rating:	18VDC, 1.5A (Supplied by external adapter) Adaptor information: Model: GM26-180150-1A Input: 100-240VAC, 50/60Hz, 0.1A
RF Transmission Frequency:	2402-2480MHz
No. of Operated Channel:	79
Modulation:	GFSK, π/4-DQPSK, 8-DPSK
Duty Cycle:	41.7%
Antenna Type:	Internal antenna
Antenna Gain:	0dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Speaker operated at 2.4GHz
· ··· - · · · · · · · ·	

Auxiliary Equipment Used during Test: NIL



Summary of Test Standards 4

Test Standards					
FCC Part 15 Subpart C, PART 15 - RADIO FREQUENCY DEVICES					
10-1-2011 Edition	Subpart C - Intentional Radiators				

All the test methods were according to Public Notice DA 00-705 -Frequency Hopper Spread Spectrum Test Procedure released by FCC on March 30, 2000.

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Summary of Test Results 5

	Technical Requirements FCC Part 15 Subpart C, RSS-Gen, RSS-210							
FCC Part 15 Subpart C								
Test Condition		Pages	Test Site	Test Result				
§15.207	5.207 Conducted emission AC power port			Pass				
§15.247 (b) (1)	Conducted peak output power	12	Site 2	Pass				
§15.247(d)	Band edge compliance of RF emissions	13	Site 2	Pass				
§15.247(d)	Spurious RF conducted emissions	30	Site 2	Pass				
§15.247(d) & §15.209	Spurious radiated emissions	40	Site 2	Pass				
§15.247(a)(2)	6dB bandwidth*			Not Applicable				
§15.247(e)	Power spectral density*			Not Applicable				
§15.247(a)(1)	20dB bandwidth and 99% Occupied Bandwidth	43	Site 2	Pass				
§15.247(a)(1)	Carrier frequency separation	50	Site 2	Pass				
§15.247(a)(1)(iii)	Number of hopping frequencies	52	Site 2	Pass				
§15.247(a)(1)(iii)	Dwell Time	54	Site 2	Pass				
§15.203	Antenna requirement	See	e note 1	Pass				
-								

Note 1: The EUT uses a permanently internal antenna, which in accordance to §15.203, is considered sufficient to comply with the provisions of this section.

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General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: NAM5061649 complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules.

The difference between three models only lies in the colour of enclosure, so all the tests were applied on WAE-BT03-W, other models are deemed to fulfill relevant requirement without further testing.

SUMMARY:

All tests according to the regulations cited on page 5 were

- Performed
- □ Not Performed

The Equipment Under Test

- Fulfills the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date:

November 9, 2012

Testing Start Date:

November 12, 2012

Testing End Date:

November 27, 2012

- Jiangsu TÜV Product Service Ltd. – Shenzhen Branch -

Reviewed by:

Prepared by:

Tested by:

leo Li

Leo Li **EMC Test Engineer**

Ken Li **EMC** Project Manager

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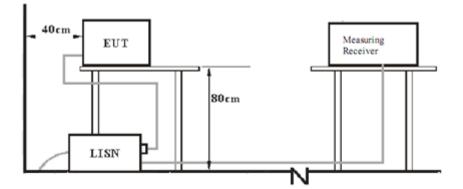
Cookies Bu EMC Project Engineer

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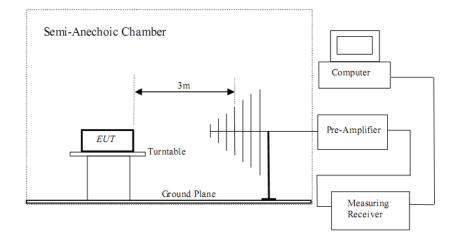


7 Test Setups

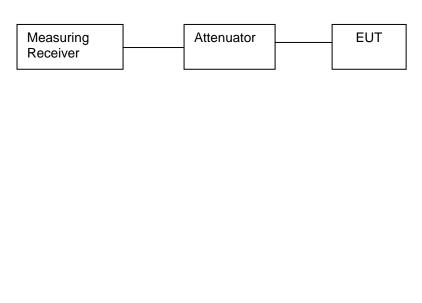
7.1 AC Power Line Conducted Emission test setups



7.2 Radiated test setups



7.3 Conducted RF test setups



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Technical Requirement 8

8.1 Conducted Emission

Test Method

- 1. The EUT was placed on a table, which is 0.8m above ground plane
- 2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
- 3. Maximum procedure was performed to ensure EUT compliance
- 4. A EMI test receiver is used to test the emissions from both sides of AC line

Limit

According to §15.207, conducted emissions limit as below:

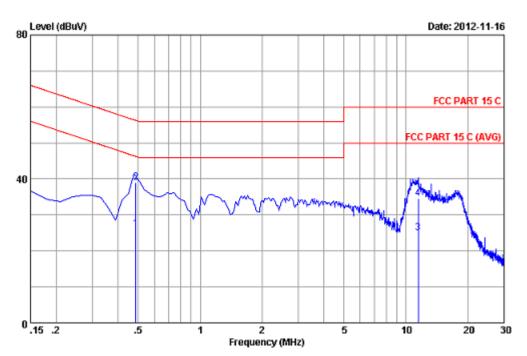
Frequency	QP Limit	AV Limit				
MHz	dBµV	dBµV				
0.150-0.500	66-56*	56-46*				
0.500-5	56	46				
5-30	60	50				
Decreasing linearly with logarithm of the frequency						

Remark: This test was carried out in all the test modes, here only the worst test result was shown.



Conducted Emission

Product Type	:	Speaker
M/N	:	WAE-BT03-W
Operating Condition	:	Transmitting
Test Specification	:	Vertical
Comment	:	AC 120V/60Hz



No	Freq (MHz)	LISN Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emissio: Level (dBuV)	h Limits (dBuV)	Margin (dB)	Remark
1	0.48700	0.15	9.95	16.00	26.10	46.22	20.12	Average
2	0.48700	0.15	9.95	29.00	39.10	56.22	17.12	QP
3	11.493	0.29	9.98	14.80	25.07	50.00	24.93	Average
4	11.493	0.29	9.98	24.30	34.57	60.00	25.43	OP

Remarks: 1.Emission Level=LISN Factor+Cable Loss(Include 10dB pulse limit) +Reading.

2.If the average limit is met when useing a quasi-peak detector. the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

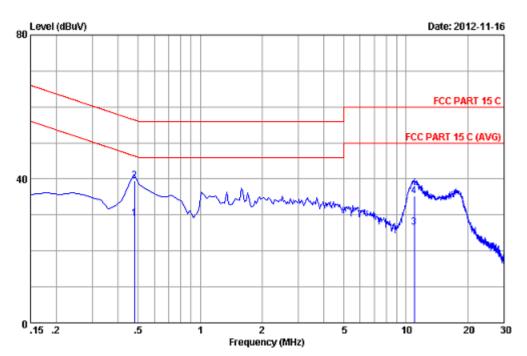
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Conducted Emission

:	Speaker
:	WAE-BT03-W
:	Transmitting
:	Neutral
:	AC 120V/60Hz
	:



No	Freq (MHz)	LISN Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.48000	0.16	9.95	18.89	29.00	46.34	17.34	Average
2	0.48000	0.16	9.95	29.29	39.40	56.34	16.94	QP
3	10.980	0.34	9.97	16.20	26.51	50.00	23.49	Average
4	10.980	0.34	9.97	25.00	35.31	60.00	24.69	QP

Remarks: 1.Emission Level=LISN Factor+Cable Loss(Include 10dB pulse limit) +Reading.

2.If the average limit is met when useing a quasi-peak detector. the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

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8.2 Conducted peak output power

Test Method

- Use the following spectrum analyzer settings: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel RBW > the 20 dB bandwidth of the emission being measured, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 2. Add a correction factor to the display.
- 3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power

Limits

According to §15.247 (b) (1) conducted peak output power limit as below:

	Frequency Range	Limit	Limit
_	MHz	W	dBm
	2400-2483.5	≤1	≤30

Conducted peak output power

Bluetooth Mode GFSK modulation Test Result						
Conducted Peak Frequency Output Power Result						
MHz	dBm					
Low channel 2402MHz	3.80	Pass				
Middle channel 2441MHz	4.25	Pass				
High channel 2480MHz	4.24	Pass				

Bluetooth Mode π /4-DQPSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	3.14	Pass
Middle channel 2441MHz	3.21	Pass
High channel 2480MHz	2.93	Pass

Bluetooth Mode 8-DPSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	3.28	Pass
Middle channel 2441MHz	3.36	Pass
High channel 2480MHz	3.22	Pass

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Test Method

- Use the following spectrum analyzer settings: Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation.RBW≥ 1% of the span, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 2. Allow the trace to stabilize. Set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. The marker-delta value now displayed must comply with the limit specified in this Section. Submit this plot.
- 3. Now, using the same instrument settings, enable the hopping function of the EUT. Allow he trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit. Submit this plot.

Limits

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in 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. 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 15.209(a) (see Section 15.205(c)).

Frequency	Limit Average	Limit Peak
MHz	dBuV/m	dBuV/m
Below 2390 Above 2483.5	54	74

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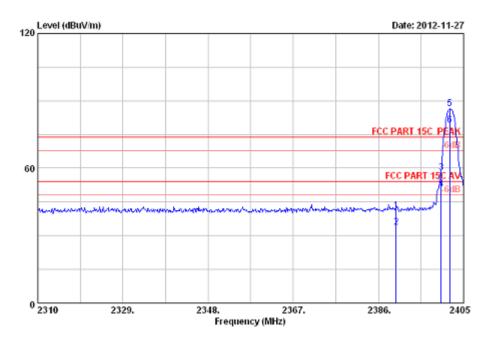
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The EUTs have been tested under all modulation modes, only the worse case GFSK and 8-DPSK modulation test result are listed in the report.

Radiated measurement result:

Bluetooth Mode GFSK Modulation Test Result: Lower edge peak Plot, hopping off Vertical:



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.000	26.70	6.00	35.92	44.36	41.14	74.00	32.86	Peak
2	2390.000	26.70	6.00	35.92	36.96	33.74	54.00	20.26	Average
3	2400.000	26.76	6.02	35.92	61.25	58.11	74.00	15.89	Peak
4	2400.000	26.76	6.02	35.92	53.85	50.71	54.00	3.29	Average
5	2401.960	26.77	6.02	35.92	89.72	86.59	74.00	-12.59	Peak
6	2401.960	26.77	6.02	35.92	82.32	79.19	54.00	-25.19	Average

Remarks:

1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.

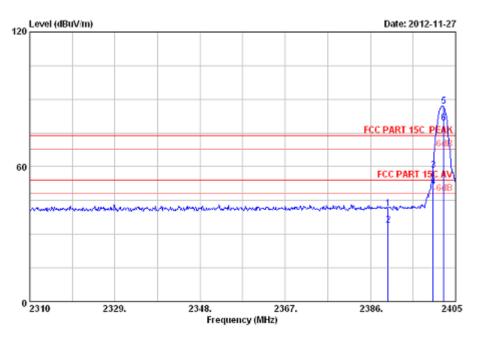
2. The emission levels that are 20dB below the official limit are not reported.

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Lower edge peak Plot, hopping off Horizontal:



	Freq. (MHz)	Ànt. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.000	26.70	6.00	35.92	44.67	41.45	74.00	32.55	Peak
2	2390.000	26.70	6.00	35.92	37.27	34.05	54.00	19.95	Average
3	2400.000	26.76	6.02	35.92	61.61	58.47	74.00	15.53	Peak
4	2400.000	26.76	6.02	35.92	54.21	51.07	54.00	2.93	Average
5	2402.340	26.77	6.02	35.92	90.08	86.95	74.00	-12.95	Peak
6	2402.340	26.77	6.02	35.92	82.69	79.56	54.00	-25.56	Average

Remarks:

1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.

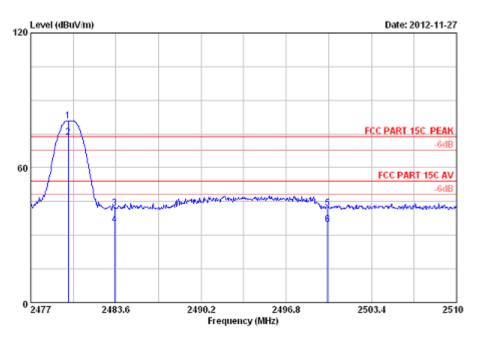
2. The emission levels that are 20dB below the official limit are not reported.

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Upper edge peak Plot, hopping off Vertical:



	Freq. (MHz)	Ànt. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.904	27.27	6.15	35.92	83.51	81.01	74.00	-7.01	Peak
2	2479.904	27.27	6.15	35.92	76.11	73.61	54.00	-19.61	Average
3	2483.500	27.29	6.16	35.92	44.57	42.10	74.00	31.90	Peak
4	2483.500	27.29	6.16	35.92	37.17	34.70	54.00	19.30	Average
5	2500.000	27.40	6.19	35.93	44.54	42.20	74.00	31.80	Peak
6	2500.000	27.40	6.19	35.93	37.14	34.80	54.00	19.20	Average

Remarks:

1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.

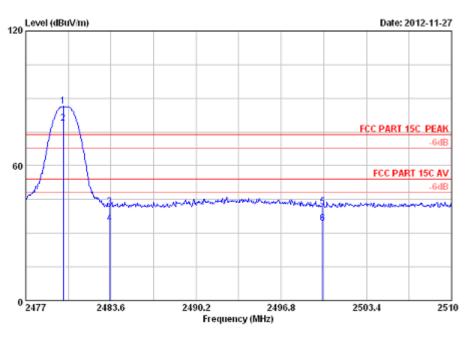
2. The emission levels that are 20dB below the official limit are not reported.

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Upper edge peak Plot, hopping off Horizontal:



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.904	27.27	6.15	35.92	88.92	86.42	74.00	-12.42	Peak
2	2479.904	27.27	6.15	35.92	81.52	79.02	54.00	-25.02	Average
3	2483.500	27.29	6.16	35.92	44.34	41.87	74.00	32.13	Peak
4	2483.500	27.29	6.16	35.92	36.94	34.47	54.00	19.53	Average
5	2500.000	27.40	6.19	35.93	44.25	41.91	74.00	32.09	Peak
6	2500.000	27.40	6.19	35.93	36.85	34.51	54.00	19.49	Average

Remarks:

1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.

2. The emission levels that are 20dB below the official limit are not reported.

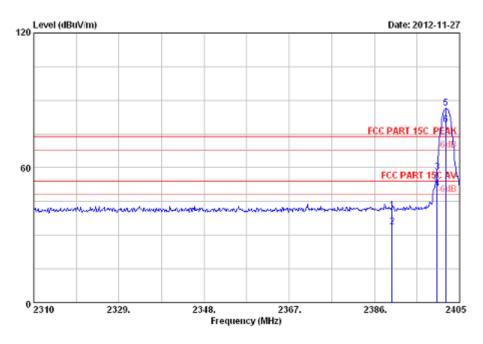
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Bluetooth Mode 8-DPSK Modulation Test Result:

Lower edge peak Plot, hopping off Vertical:



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.000	26.70	6.00	35.92	44.36	41.14	74.00	32.86	Peak
2	2390.000	26.70	6.00	35.92	36.96	33.74	54.00	20.26	Average
3	2400.000	26.76	6.02	35.92	61.25	58.11	74.00	15.89	Peak
4	2400.000	26.76	6.02	35.92	53.85	50.71	54.00	3.29	Average
5	2401.960	26.77	6.02	35.92	89.72	86.59	74.00	-12.59	Peak
6	2401.960	26.77	6.02	35.92	82.32	79.19	54.00	-25.19	Average

Remarks:

1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.

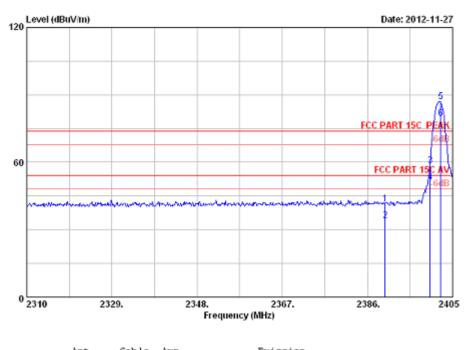
2. The emission levels that are 20dB below the official limit are not reported.

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Lower edge peak Plot, hopping off Horizontal:



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.000	26.70	6.00	35.92	44.67	41.45	74.00	32.55	Peak
2	2390.000	26.70	6.00	35.92	37.27	34.05	54.00	19.95	Average
3	2400.000	26.76	6.02	35.92	61.61	58.47	74.00	15.53	Peak
4	2400.000	26.76	6.02	35.92	54.21	51.07	54.00	2.93	Average
5	2402.340	26.77	6.02	35.92	90.08	86.95	74.00	-12.95	Peak
6	2402.340	26.77	6.02	35.92	82.69	79.56	54.00	-25.56	Average

Remarks:

1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.

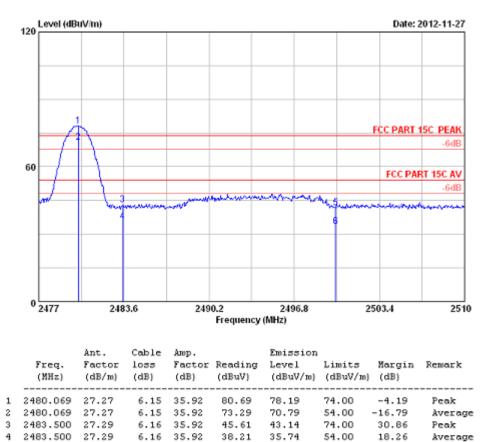
2. The emission levels that are 20dB below the official limit are not reported.

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Upper edge peak Plot, hopping off Vertical:



Remarks:

2500.000 27.40

27.40

6.19

35.93

6.19 35.93

2500.000

5

6

1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.

43.97

35.67

2. The emission levels that are 20dB below the official limit are not reported.

41.63

33.33

32.37

20.67

Peak

Average

74.00

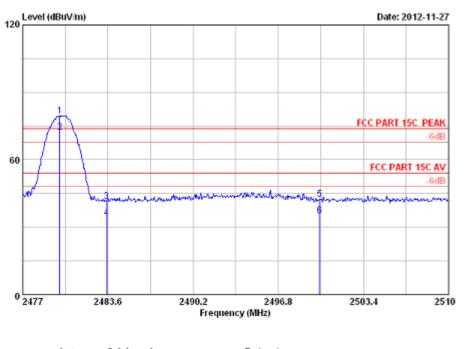
54.00

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Upper edge peak Plot, hopping off Horizontal:



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.871	27.27	6.15	35.92	82.18	79.68	74.00	-5.68	Peak
2	2479.871	27.27	6.15	35.92	74.78	72.28	54.00	-18.28	Average
3	2483.500	27.29	6.16	35.92	44.03	41.56	74.00	32.44	Peak
4	2483.500	27.29	6.16	35.92	36.63	34.16	54.00	19.84	Average
5	2500.000	27.40	6.19	35.93	44.68	42.34	74.00	31.66	Peak
6	2500.000	27.40	6.19	35.93	37.28	34.94	54.00	19.06	Average

Remarks:

1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.

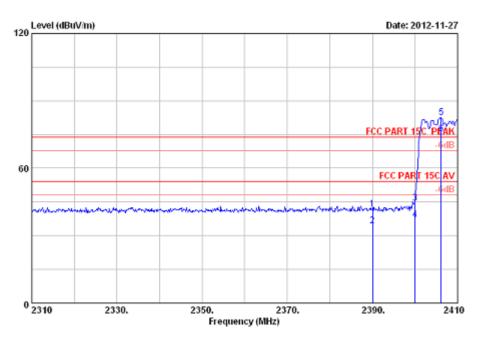
2. The emission levels that are 20dB below the official limit are not reported.

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Bluetooth Mode GFSK Modulation Test Result: Lower edge peak Plot, hopping on Vertical:



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.000	26.70	6.00	35.92	45.04	41.82	74.00	32.18	Peak
2	2390.000	26.70	6.00	35.92	37.64	34.42	54.00	19.58	Average
3	2400.000	26.76	6.02	35.92	47.71	44.57	74.00	29.43	Peak
4	2400.000	26.76	6.02	35.92	40.31	37.17	54.00	16.83	Average
5	2406.200	26.80	6.03	35.92	85.55	82.46	74.00	-8.46	Peak
6	2406.200	26.80	6.03	35.92	78.15	75.06	54.00	-21.06	Average

Remarks:

1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.

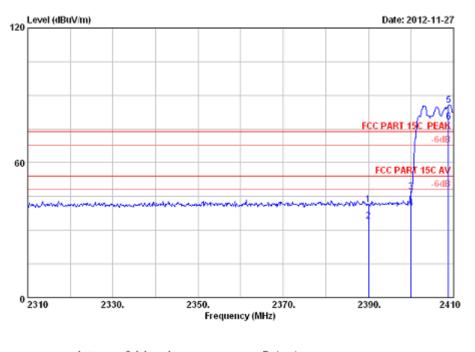
2. The emission levels that are 20dB below the official limit are not reported.

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Lower edge peak Plot, hopping on Horizontal:



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.000	26.70	6.00	35.92	44.63	41.41	74.00	32.59	Peak
2	2390.000	26.70	6.00	35.92	37.23	34.01	54.00	19.99	Average
3	2400.000	26.76	6.02	35.92	50.18	47.04	74.00	26.96	Peak
4	2400.000	26.76	6.02	35.92	42.78	39.64	54.00	14.36	Average
5	2408.800	26.82	6.03	35.92	88.63	85.56	74.00	-11.56	Peak
6	2408.800	26.82	6.03	35.92	81.23	78.16	54.00	-24.16	Average

Remarks:

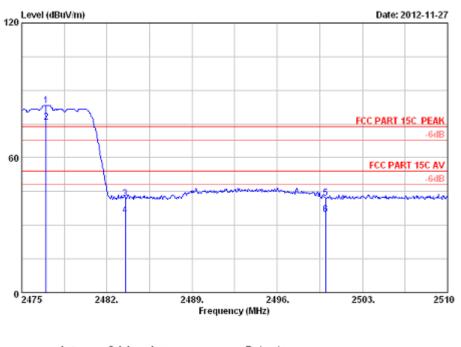
Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
The emission levels that are 20dB below the official limit are not reported.

Report Number: 68.950.12.211.01

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Upper edge peak Plot, hopping on Vertical:



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2476.995	27.25	6.15	35.92	85.89	83.37	74.00	-9.37	Peak
2	2476.995	27.25	6.15	35.92	78.49	75.97	54.00	-21.97	Average
3	2483.500	27.29	6.16	35.92	44.32	41.85	74.00	32.15	Peak
4	2483.500	27.29	6.16	35.92	36.92	34.45	54.00	19.55	Average
5	2500.000	27.40	6.19	35.93	44.50	42.16	74.00	31.84	Peak
6	2500.000	27.40	6.19	35.93	37.10	34.76	54.00	19.24	Average

Remarks:

1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.

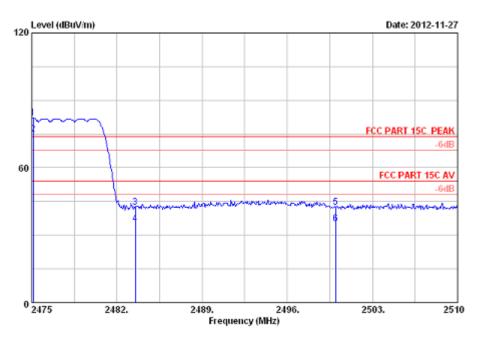
2. The emission levels that are 20dB below the official limit are not reported.

Report Number: 68.950.12.211.01

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Upper edge peak Plot, hopping on Horizontal:



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2475.105	27.24	6.15	35.92	84.68	82.15	74.00	-8.15	Peak
2	2475.105	27.24	6.15	35.92	77.27	74.74	54.00	-20.74	Average
3	2483.500	27.29	6.16	35.92	44.99	42.52	74.00	31.48	Peak
4	2483.500	27.29	6.16	35.92	37.59	35.12	54.00	18.88	Average
5	2500.000	27.40	6.19	35.93	44.84	42.50	74.00	31.50	Peak
6	2500.000	27.40	6.19	35.93	37.44	35.10	54.00	18,90	Average

Remarks:

Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
The emission levels that are 20dB below the official limit are not reported.

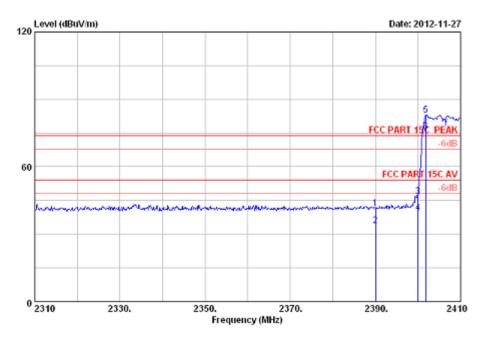
Report Number: 68.950.12.211.01

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Bluetooth Mode 8-DPSK Modulation Test Result:

Lower edge peak Plot, hopping on Vertical:



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.000	26.70	6.00	35.92	44.55	41.33	74.00	32.67	Peak
2	2390.000	26.70	6.00	35.92	37.15	33.93	54.00	20.07	Average
3	2400.000	26.76	6.02	35.92	49.91	46.77	74.00	27.23	Peak
4	2400.000	26.76	6.02	35.92	42.51	39.37	54.00	14.63	Average
5	2401.800	26.77	6.02	35.92	86.18	83.05	74.00	-9.05	Peak
6	2401.800	26.77	6.02	35.92	78.78	75.65	54.00	-21.65	Average

Remarks:

1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.

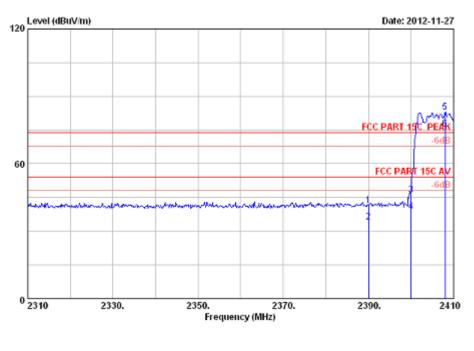
2. The emission levels that are 20dB below the official limit are not reported.

Report Number: 68.950.12.211.01

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Lower edge peak Plot, hopping on Horizontal:



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.000	26.70	6.00	35.92	44.76	41.54	74.00	32.46	Peak
2	2390.000	26.70	6.00	35.92	37.36	34.14	54.00	19.86	Average
3	2400.000	26.76	6.02	35.92	49.43	46.29	74.00	27.71	Peak
4	2400.000	26.76	6.02	35.92	42.06	38.92	54.00	15.08	Average
5	2408.000	26.81	6.03	35.92	86.14	83.06	74.00	-9.06	Peak
6	2408.000	26.81	6.03	35.92	78.74	75.66	54.00	-21.66	Average

Remarks:

1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.

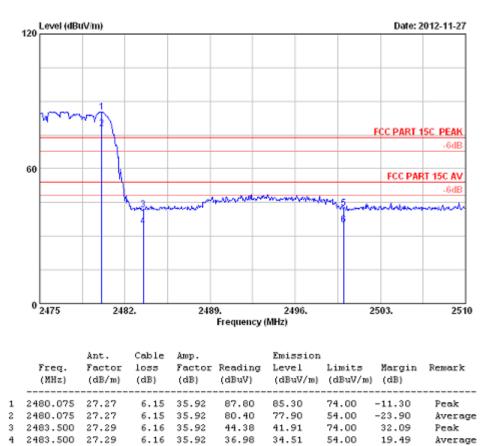
2. The emission levels that are 20dB below the official limit are not reported.

Report Number: 68.950.12.211.01

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Upper edge peak Plot, hopping on Vertical:



Remarks:

2500.000

2500.000

27.40

27.40

6.19

6.19

35.93

35.93

5

6

1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.

44.72

37.32

2. The emission levels that are 20dB below the official limit are not reported.

42.38

34.98

74.00

54.00

31.62

19.02

Peak

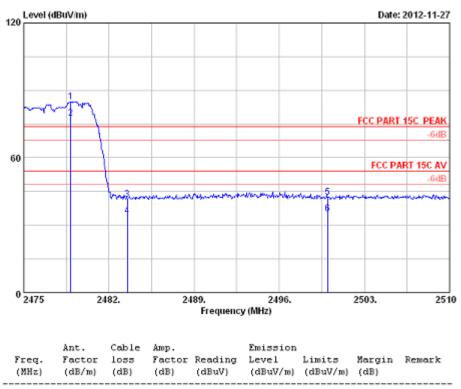
Average

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Upper edge peak Plot, hopping on Horizontal:



	(MHz)	(dB/m)	(dB)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dB)	1121001212
	0470 050	27.26	6 15		07 54			11 00	Peak
	2478.850	67.66	6.15	35.92	87.54	85.03	74.00	-11.03	reax
2	2478.850	27.26	6.15	35.92	80.14	77.63	54.00	-23.63	Åverage
3	2483.500	27.29	6.16	35.92	43.98	41.51	74.00	32.49	Peak
4	2483.500	27.29	6.16	35.92	36.58	34.11	54.00	19.89	Åverage
5	2500.000	27.40	6.19	35.93	44.86	42.52	74.00	31.48	Peak
6	2500.000	27.40	6.19	35.93	37.46	35.12	54.00	18.88	Åverage

Remarks:

1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.

2. The emission levels that are 20dB below the official limit are not reported.

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Test Method

- 1. Use the following spectrum analyzer settings:
- Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span. RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
- 3. The level displayed must comply with the limit specified in this Section. Submit these plots.
- 4. Repeat above procedures until all frequencies measured were complete.

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

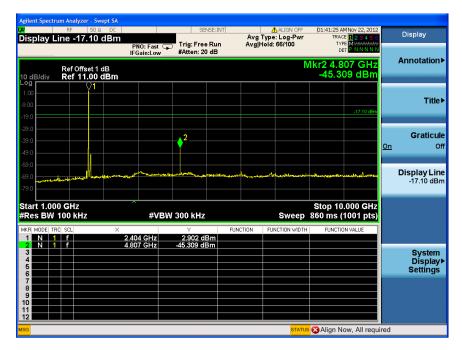


The EUTs have been tested under all modulation modes, only the worst case GFSK and 8-DPSK modulation test result are listed in the report.

Bluetooth Mode GFSK Modulation Test Result:

2402MHz

warker 1	RF 50 936.95000		HZ PNO: Fast (FGain:Low		Run A	Avg Type	ALIGN OFF :: Log-Pwr >100/100	TRAC	MNov 22, 2012 E 1 2 3 4 5 6 PE M WARKAWA ET P N N N N N	Peak Search
10 dB/div	Ref Offset 1 Ref 11.00						M		95 MHz 16 dBm	NextPea
- og 1.00 -9.00 -19.0									-17.10 dBm	Next Pk Rig
-29.0 -39.0 -49.0									1	Next Pk Le
-59.0 -69.0 -79.0	alaa fadaa ay maxaa	undelment and	upinhardunte	Jerger Justin to some types	aliferent for the design	spender	d of the optimized and	numer al de la	non Nerre	Marker De
Start 30.0 #Res BW	100 kHz	× 936	#VB 95 MHz	W 300 kHz -59.416 dBr	FUNCTIO	DN FU	Sweep	92.7 ms (0000 GHz 1001 pts) IN VALUE	Mkr→0
										Mkr→RefL
2 3 4 5 6 7										Miki — Kere



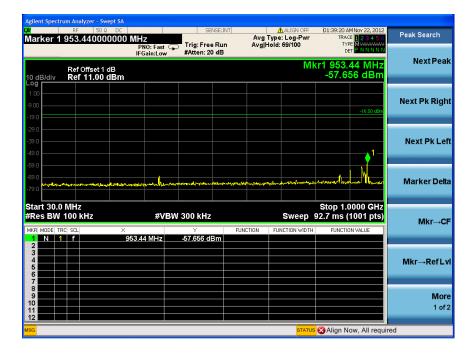
Report Number: 68.950.12.211.01

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	12 010000	000000 GHz		SENSE:INT		ALIGN OFF	TRACE	1Nov 22, 2012	Peak Search
	12.010000		ast 😱 Trig: F	ree Run : 20 dB	AvgHold	: 5/100	TYP	PNNNN	
dB/div	Ref Offset 1 o Ref 11.00 o					MI	kr1 12.0 -62.32	10 GHz 2 dBm	Next Pea
								-17.10 dBm	Next Pk Righ
									Next Pk Le
.0 .0		and the second	╱ϒϔͻͿͶϷϲϭͶ _Ϸ ·Ͷ·ϳϞϲͷϲϣϷ;Ͷͼͽϲͻ;	مەرىلەرلەر يەر بالەردۇرىيى بەر يەر يەر يەر يەر يەر يەر يەر يەر يەر ي	n o tabloo dynaata taba	we have been as a second	lamelana an	i, v fantlef ferfanger	Marker Del
	100 kHz		#VBW 300 ki	łz		Sweep	Stop 25. 1.43 s (1	000 GHz 001 pts)	Mkr→C
R MODE TR	C SCL	× 12.010 Gł	+z -62.322		INCTION FU	NCTION WIDTH	FUNCTIO	N VALUE	
									Mkr→RefL
									Mo 1 of

2441MHz



Report Number: 68.950.12.211.01



Display Display Line -16.50 dBm Avg Type: Log-Pwr Avg|Hold: 35/100 PNO: Fast Trig: Free Run IFGain:Low #Atten: 20 dB TYP DE Annotation Mkr2 4.879 GH: -45.850 dBr Ref Offset 1 dB Ref 11.00 dBm Title <mark>^</mark>2 Graticule <u> On</u> Of Display Line -16.50 dBm Stop 10.000 GHz Sweep 860 ms (1001 pts) Start 1.000 GHz #Res BW 100 kHz #VBW 300 kHz 2.440 GHz 4.879 GHz 3.497 dBm -45.850 dBm N 1 f N 1 f System Display▶ Settings S 🛿 Align Now, All required

LXI	m Analyzer - Swej RF 50 Ω 12.2050000	DC	SENSE:	Avg	ALIGN OFF Type: Log-Pwr Iold: 2/100	01:39:38 AM Nov 22, 2012 TRACE 1 2 3 4 5 6 TYPE M MANDALIAN	Peak Search
10 dB/div	Ref Offset 1 d Ref 11.00 d	IFGain:Low	#Atten: 20 dB			(r1 12.205 GHz -61.521 dBm	Next Peak
1.00						-16.50 dBm	Next Pk Right
-29.0	1						Next Pk Lef
-59.0 -69.0 m/shines	n lar wijder het sone of gra	way with the second sector grade and second	hadigayaan dhaqayadhaa ya	aller the second second	nak _{a lan} an manaka ^{na} t	_{เสร} นของการการการเกิดเหตุด	Marker Delta
Start 10.00 #Res BW 1	100 kHz		W 300 kHz	FUNCTION	Sweep	Stop 25.000 GHz 1.43 s (1001 pts)	Mkr→CF
1 N 1 2 3 4 4 5 5 6 1		× 12.205 GHz	-61.521 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Mkr→RefLv
7 8 9 10 11 12							Mor a 1 of 2
MSG					STATUS	🛿 Align Now, All requir	ed

Report Number: 68.950.12.211.01



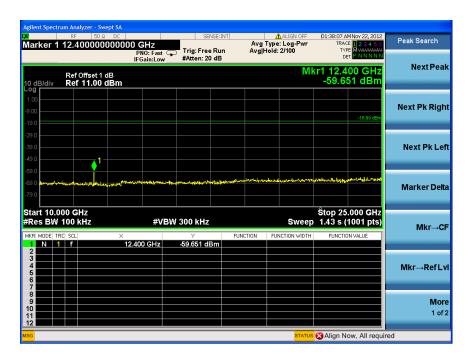
2480MHz

v Marker 1	rum Analyzer - Sv RF 50 0 895,24000	2 DC	17			ALIGN OFF	01:37:48 AM Nov 22, 2012 TRACE 1 2 3 4 5 6	Peak Search
			PNO: Fast G Gain:Low	Trig: Free #Atten: 20		vg Hold:>100/100	TYPE M WWWWW DET P N N N N N	NextPeak
I0 dB/div	Ref Offset 1 Ref 11.00					M	kr1 895.24 MHz -52.207 dBm	Nextr cur
1.00								Next Pk Righ
9.00 19.0							-16.99 dBm	J
29.0								Next Pk Lef
49.0							1	NEXT FR LET
59.0 69.0			÷.				N M	
-79.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	artan rans transm	uhar son gellegene he	an a	and a second	ياديون ومعاجبا ومعادية ومعادية ومعادية ومعادية ومعادية والمعادية والمعادية والمعادية ومعادية والمعادية ومعادية	nhaltationeta/"Historiania = Janachana	Marker Delta
Start 30.0 Res BW			#VB	N 300 kHz		Sweep	Stop 1.0000 GHz 92.7 ms (1001 pts)	
MKR MODE TF		×	24 MHz	, -52.207 dB	FUNCTIO		FUNCTION VALUE	Mkr→CF
2 3		895.		-52.207 dB				
4 5 6								Mkr→RefLv
7 8								
9								More
10								1 of 2

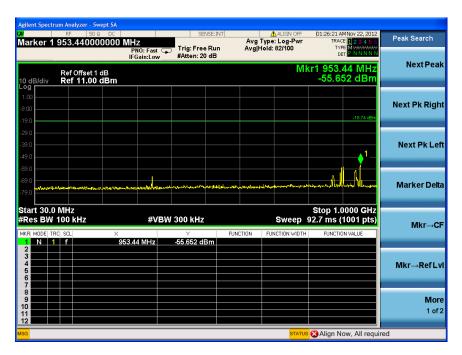
Agilent Spectrum Analyzer - Swept SA X RF 50 & DC Display Line -16.99 dBm	PNO: Fast 🖵	SENSE:I	Avg	▲ ALIGN OFF Type: Log-Pwr Hold: 40/100	TYPE	lov 22, 2012 1 2 3 4 5 6 M M M M M M	Display
Ref Offset 1 dB 10 dB/div Ref 11.00 dBm	IFGain:Low	#Atten: 20 dB		N	lkr1 2.47	6 GHz I dBm	Annotation►
Log 1.00 -9.00						-16.99 dBm	Title►
-19.0							Graticule On Off
-59.0 -69.0 -79.0	and the second day and	durt V analysis and make			ada, ang pangang pang p		Display Line -16.99 dBm
Start 1.000 GHz #Res BW 100 kHz	#VBW	300 kHz		Sweep	Stop 10.0 860 ms (10		
	2.476 GHz 4.960 GHz	⊻ 3.014 dBm -44.396 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION	VALUE	
							System Display▶ Settings
7 8 9 10 11 12							
MSG				STATUS	🔇 Align Nov	/, All requir	ed

Report Number: 68.950.12.211.01





Bluetooth Mode 8-DPSK Modulation Test Result: 2402MHz



Report Number: 68.950.12.211.01



	RF 50 Ω		SENSE:II		ALIGN OFF	01:25:58 AMNov 22, 2012	
rt Fre	q 1.0000000	DO GHz PNO: Fast IFGain:Low	Trig: Free Run #Atten: 20 dB		Type: Log-Pwr Hold:>100/100	TRACE 123456 TYPE MWWWW DET PNNNN	
dB/div	Ref Offset 1 d⊟ Ref 11.00 dE				N	1kr1 2.404 GHz 1.264 dBm	Auto Tu
						-18.74 dBn	Center Fi 5.500000000 G
			<mark>2</mark>				Start Fr 1.000000000 G
	-had been a flam.	and and a second second	man and the second	**************************************	and an and an an and a second s	adamana Marina ang sa Astrono	Stop Fr 10.000000000 G
es BW	00 GHz 100 kHz		3W 300 kHz			Stop 10.000 GHz 860 ms (1001 pts)	CF St 900.000000 N
N N		× 2.404 GHz 4.807 GHz	ץ 1.264 dBm -48.902 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Auto N Freq Offs 0

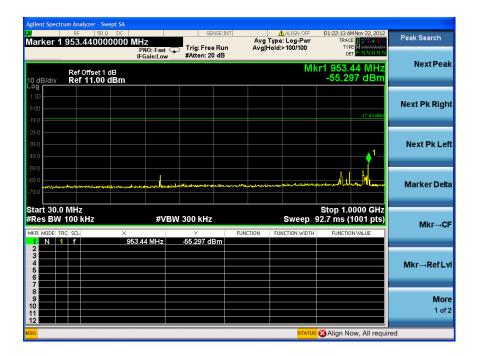
Agilent Spectrum An W RF Marker 1 22.4	50 Ω DC	0 GHz PNO: Fast C IFGain:Low	SENSE Trig: Free Ru #Atten: 20 dE	Avg un Avg	ALIGN OFF Type: Log-Pwr Hold: 4/100	TYPE	Nov 22, 2012 1 2 3 4 5 6 M	Peak Search
10 dB/div Rel	Offset 1 dB f 11.00 dBm	3	Mkr1 22.435 GHz -63.533 dBm					
-9.00							-18.74 dBm	Next Pk Righ
29.0								Next Pk Lef
-59.0 -69.0	m	Hanster of the second second	urthard and the state of the	and a state of the second	৵৾৾৻ ৳৽য়৾৾৻৶৻৻ড়৾৾ঀ৻ঀ৾ঢ়৾ঀঢ়৻৻৻৻৽৾ঀ৾৻৻	A. Andrahastera		Marker Delta
#Res BW 100 MKR MODE TRC SCL 1 N 1 F	1 N 1 f 22.435 GHz -63.533 dBm			FUNCTION	Sweep	Stop 25.000 GHz 1.43 s (1001 pts) FUNCTION VALUE		Mkr→Cl
2 3 4 5 6 7								Mkr→RefLv
8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9								Mor 1 of:
sg Status 🔀 Align Now, All required								

Report Number: 68.950.12.211.01



Spurious RF conducted emissions

2441MHz



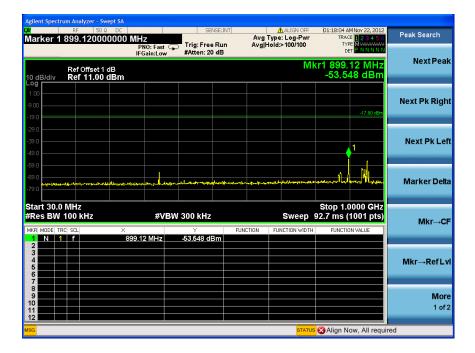
Agilent Spectr											
Marker 2	^{RF} 4.8790	50 Ω 00000	000 GHz			ISE:INT		ALIGN OFF	TRAC	MNov 22, 2012 E 1 2 3 4 5 6 E M M M M M	Peak Search
10 dB/div	Ref Offs Ref 11		IFGain	Fast 🖵 :Low	Trig: Free #Atten: 20		AvgiHol	d:>100/100	⁰⁸	79 GHz 15 dBm	NextPeak
1.00 -9.00 -19.0		⊘1								-17.43 dBm	Next Pk Right
-29.0 -39.0 -49.0					¢ ²						Next Pk Lef
-59.0 -69.0 -79.0		I	, and a second	and the second of		-the Barrison Party and the Barrison Party and the Barrison Party and the Barrison Party and the Barrison Party		-94	and the second	the sector of	Marker Delta
Start 1.00 #Res BW	100 kHz		× 2.440 G	Hz	300 kHz Y 2.572 dE	3m	ICTION F	Sweep	860 ms (.000 GHz 1001 pts) IN VALUE	Mkr→CF
2 N 1 3 4 5 6 7	f		4.879 G	Hz	-49.815 dE	3m					Mkr→RefLv
8 9 10 11 12											More 1 of 2
MSG								STATUS	🔀 Align N	ow, All requi	red



Spurious RF conducted emissions

rker 1		2 DC 0000000 GH	Z		SE:INT	Avg Typ	ALIGN OFF e: Log-Pwr	TRAC	MNov 22, 2012 E 1 2 3 4 5 6	Peak Search
			Fast 🗔	Trig: Free #Atten: 20	Run dB	Avg Hold	: 9/100	TYF		
dB/div	Ref Offset 1 Ref 11.00						MI		45 GHz 55 dBm	NextPea
										Next Pk Rig
.0									-17.43 dBm	5
.0										Next Pk Le
9.0 9.0										
9.0 	danser-westlightform	- Human	~~~ ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	munula	de la magalitation	ng takala geographia	يدفوا بالعلمين والمعاد والمعار والمع	ومروده والمراجع والمحارب	mpresendo	Marker Del
art 10.0 Res BW	00 GHZ 100 kHz		#VBW	300 kHz			Sweep	Stop 25 1.43 s (.000 GHz 1001 pts)	Mkr→C
	RC SCL	× 24.745 0	Hz	ץ -62.255 dB		CTION FL	INCTION WIDTH	FUNCTIO	IN VALUE	
2										Mkr→RefL
5 6 7										
										Мо
			_							1 of

2480MHz



Report Number: 68.950.12.211.01



Spurious RF conducted emissions

Marker	MNov 22, 2012		🚹 ALIGN OFF		SENSE:II	Ω DC	
Select Marke	E 123456 E MWWWW T P N N N N N	TYP	Type: Log-Pwr Iold:>100/100		Trig: Free Run #Atten: 20 dB	000000 GHz PNO: Fast C IFGain:Low	rker 1 2.4760000
	76 GHz 01 dBm	1kr1 2.4 2.20	Ν				Ref Offset 1 IB/div Ref 11.00
Norm						1) 1
Norm	-17.80 dBm						
Del					<u>^2</u>		
Be							ý
Eive	n (many shalip national	A grana gaggy and the object of	and a stand of the stand of the	- June	www.ananatom	when the second second	- Andrew
Fixed							
c	.000 GHz 1001 pts)	Stop 10. 860 ms (′	Sweep		300 kHz	#VBI	rt 1.000 GHz es BW 100 kHz
	N VALUE	FUNCTIO	FUNCTION WIDTH	FUNCTION	⊻ 2.201 dBm	× 2.476 GHz	MODE TRC SCL
					-46.299 dBm	4.960 GHz	N 1 f
Properties							
Ma							
10							

CC 123456 PE MUMUU FET P NNNN 720 GHz 42 dBm	TYF DE (r1 22.7		Avg Typ Avg Hold		Trig: Free Ru ≇Atten: 20 dE	GHZ NO: Fast 🖵 Gain:Low	P IF dB	2.720000 Ref Offset 1 Ref 11.00	
720 GHz 42 dBm	(r1 22.7	Mk		3	¥Atten: 20 dE	Gain:Low	dB		
42 dBm		Mk							
-17.80 dBm									dB/div
-17.80 dBm									g
-17.80 dBm									
									.0
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									.0
5.000 GHz	Stop 25							0 GHz	art 10.00
(1001 pts)	1.43 s (Sweep			00 kHz	#VBW			es BW
ION VALUE	FUNCTIO	NCTION WIDTH	TION FU	FUNG	Y		×		R MODE TR
					64.342 dBm	0 GHz	22.72	f	N 1
	1.43 s (FUNCTIO	NCTION WIDTH	ION FL	FUNC		#VBW		GHz) KHz	100 C SC

Report Number: 68.950.12.211.01



8.5 Spurious radiated emissions for transmitter and receiver

Test Method

- 1. The EUT is placed on a turntable, which is 0.8m above ground plane.
- 2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- 3. Use the following spectrum analyzer settings: Span = wide enough to fully capture the emission being measured ,RBW = 1 MHz for f \geq 1GHz, 100 kHz for f < 1 GHz, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 4. Follow the guidelines in ANSI C63.4-1992 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 5. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the duty cycle per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from 20log(duty cycle/100 ms), in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Limit				
	Frequency	Field Strength	Field Strength	Detector
	MHz	uV/m	dBµV/m	
_	30-88	100	40	QP
	88-216	150	43.5	QP
	216-960	200	46	QP
	960-1000	500	54	QP
	Above 1000	500	54	AV
	Above 1000	5000	74	PK



Spurious radiated emissions for transmitter and receiver

Remark: According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit. The EUTs have been tested under all modulation modes, only the worse case GFSK and 8-

DPSK modulation test result are listed in the report.

Transmitting spurious emission test result as below:

Bluetooth Mode GFSK Modulation 2402MHz Test Result

Frequency	Antenna Factor	Cable Loss	Amp. Factor	Reading	Emission Level	Polarization	Limit	Detector	Result
MHz	dB/m	dB	dB	dBuV	dBuV/m		dBµV/m		
83.35	7.41	0.76	-	23.00	31.17	Vertical	40.0	QP	Pass
4804.0	32.47	8.67	35.72	46.84	52.26	Vertical	74.0	PK	Pass
4804.0	32.47	8.67	35.72	39.44	44.86	Vertical	54.0	AV	Pass
4804.0	32.47	8.67	35.72	49.47	54.89	Horizontal	74.0	PK	Pass
4804.0	32.47	8.67	35.72	42.07	47.49	Horizontal	54.0	AV	Pass
	_	_		_	_	_	_	_	

Bluetooth Mode 8-DPSK Modulation 2441MHz Test Result

Frequency	Antenna Factor	Cable Loss	Amp. Factor	Reading	Emission Level	Polarization	Limit	Detector	Result
MHz	dB/m	dB	dB	dBuV	dBuV/m		dBµV/m		
4882.0	32.64	8.74	35.69	49.92	55.61	Vertical	74.0	PK	Pass
4882.0	32.64	8.74	35.69	42.52	48.21	Vertical	54.0	AV	Pass
4882.0	32.64	8.74	35.69	50.94	56.63	Horizontal	74.0	PK	Pass
4882.0	32.64	8.74	35.69	43.54	49.23	Horizontal	54.0	AV	Pass
-	-	-		-	-	-	-	-	

Bluetooth Mode 8-DPSK Modulation 2480MHz Test Result

Frequency	Antenna Factor	Cable Loss	Amp. Factor	Reading	Emission Level	Polarization	Limit	Detector	Result
MHz	dB/m	dB	dB	dBuV	dBuV/m		dBµV/m		
4960.0	32.81	8.81	35.66	50.08	56.04	Vertical	74.0	PK	Pass
4960.0	32.81	8.81	35.66	42.68	48.64	Vertical	54.0	AV	Pass
4960.0	32.81	8.81	35.66	47.90	53.86	Horizontal	74.0	PK	Pass
4960.0	32.81	8.81	35.66	40.30	46.26	Horizontal	54.0	AV	Pass
-	-	-		-	-	-	-	-	

Remark:

(1) QP Emission Level= Antenna Factor +Cable Loss + Reading PK Emission Level= Antenna Factor +Cable Loss - Amp. factor + Reading AV Emission Level= PK Emission Level+20log(dutycycle)

(2) Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.

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Spurious radiated emissions for transmitter and receiver

Frequency	Antenna Factor	Cable Loss	Amp. Factor	Reading	Emission Level	Polarization	Limit	Detector	Result
MHz	dB/m	dB	dB	dBuV	dBuV/m		dBµV/m		
4804.0	32.47	8.67	35.72	44.71	50.13	Vertical	74.0	PK	Pass
4804.0	32.47	8.67	35.72	37.31	42.73	Vertical	54.0	AV	Pass
7206.0	35.44	10.74	35	46.62	57.80	Vertical	74.0	PK	Pass
7206.0	35.44	10.74	35	39.22	50.40	Vertical	54.0	AV	Pass
4804.0	32.47	8.67	35.72	52.46	57.88	Horizontal	74.0	PK	Pass
4804.0	32.47	8.67	35.72	45.06	50.48	Horizontal	54.0	AV	Pass
-	-	-		-	-	-	-	-	

Bluetooth Mode 8-DPSK Modulation 2402MHz Test Result

Bluetooth Mode 8-DPSK Modulation 2441MHz Test Result

Frequency	Antenna Factor	Cable Loss	Amp. Factor	Reading	Emission Level	Polarization	Limit	Detector	Result
MHz	dB/m	dB	dB	dBuV	dBuV/m		dBµV/m		
4882.0	32.64	8.74	35.69	44.75	50.44	Vertical	74.0	PK	Pass
4882.0	32.64	8.74	35.69	37.35	43.04	Vertical	54.0	AV	Pass
4882.0	32.64	8.74	35.69	43.46	49.15	Horizontal	74.0	PK	Pass
4882.0	32.64	8.74	35.69	36.06	41.75	Horizontal	54.0	AV	Pass
-	-	-		-	-	-	-	-	

Bluetooth Mode 8-DPSK Modulation 2480MHz Test Result

Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Amp. Factor dB	Reading dBuV	Emission Level dBuV/m	Polarization	Limit dBµV/m	Detector	Result
4960.0	32.81	8.81	35.66	48.73	54.42	Vertical	74.0	PK	Pass
4960.0	32.81	8.81	35.66	41.33	47.02	Vertical	54.0	AV	Pass
4960.0	32.81	8.81	35.66	48.73	54.69	Horizontal	74.0	PK	Pass
4960.0	32.81	8.81	35.66	41.33	47.29	Horizontal	54.0	AV	Pass
-	-	-		-	-	-	-	-	

Remark:

 QP Emission Level= Antenna Factor +Cable Loss + Reading PK Emission Level= Antenna Factor +Cable Loss - Amp. factor + Reading AV Emission Level= PK Emission Level+20log(dutycycle)

(2) Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.

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Test Method

- Use the following spectrum analyzer settings: Span = wide enough to capture the peaks of two adjacent channels, RBW ≥ 1% of the span, VBW) ≥RBW, Sweep = auto, Detector function = peak
- 2. By using the Max-Hold function record the separation of two adjacent channels.
- 3. Measure the frequency difference of these two adjacent channels by spectrum analyzer marker function.
- 4. Repeat above procedures until all frequencies measured were complete.

Test Method

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- 3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
- 4. Repeat above procedures until all frequencies measured were complete.

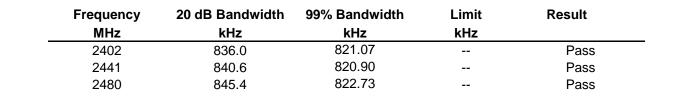
Limit

Limit [kHz]

N/A



Bluetooth Mode GFSK Modulation test result







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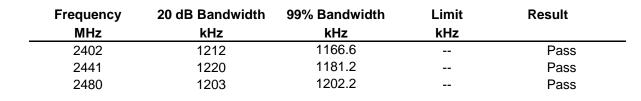
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Bluetooth Mode $\pi/4$ -DQPSK Modulation test result





-79.0								
Center 2.441 GHz #Res BW 30 kHz	#	#VBW 100 kHz			Span 3 MH Sweep 3.2 m			Min Hold
Occupied Bandwidtl 1.	1812 MHz	Total Po	wer	9.73	dBm		Auto	Detector Peak▶ <u>Man</u>
Transmit Freq Error	-4.554 kHz	OBW Po	wer	99	9.00 %			
x dB Bandwidth	1.220 MHz	x dB		-20.	00 dB			
MSG				STATUS	🔀 Align N	ow, All requ	ired	

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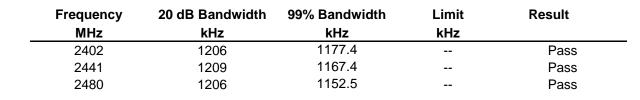




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Bluetooth Mode 8-DPSK Modulation test result



 Scheelint
 August

 GHz
 Center Freq:2.40200000 GHz

 Trig: Freq:2.40200000 Hz
 Trig: Stree Run

 #IFGainLow
 #Atten: 20 dB
 02:34:50 AMNov 22, 201 Radio Std: None Trace/Detector enter Freq 2.402000000 GHz Radio Device: BTS Ref Offset 1 dB Ref 11.00 dBm **Clear Write** Average Max Hold Min Hold Center 2.402 GHz #Res BW 30 kHz Span 3 MHz Sweep 3.2 ms #VBW 100 kHz Total Power 9.80 dBm Occupied Bandwidth Detector Peak 1.1774 MHz Auto Man Transmit Freq Error 16.907 kHz **OBW Power** 99.00 % 1.206 MHz -20.00 dB x dB Bandwidth x dB Align Now, All required



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8.7 Carrier Frequency Separation

Test Method

- 5. Use the following spectrum analyzer settings: Span = wide enough to capture the peaks of two adjacent channels, RBW \geq 1% of the span, VBW) ≥RBW, Sweep = auto, Detector function = peak
- 6. By using the Max-Hold function record the separation of two adjacent channels.
- 7. Measure the frequency difference of these two adjacent channels by spectrum analyzer marker function.
- 8. Repeat above procedures until all frequencies measured were complete.

Limit

Limit kHz ≥25KHz or 2/3 of the 20 dB bandwidth which is greater

GFSK Modulation Limit

Frequency MHz	2/3 of 20 dB Bandwidth kHz
2402	557.3
2441	560.4
2480	563.6

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Carrier Frequency Separation

GFSK Modulation test result

Frequency	Carrier Frequency Separation	Result
MHz	kHz	
2402	1000	Pass
2441	1000	Pass
2480	1000	Pass

LXI F	analyzer - Swept SA RF 50 Ω DC 1.0000000000	MHz	SENSE:	Avg	ALIGN OFF	TRAC	4Nov 22, 2012 1 2 3 4 5 6	Marker
	ef Offset 1 dB ef 11.00 dBm	PNO: Wide 🕞 IFGain:Low	Trig: Free Ru #Atten: 20 dB		lold:>100/100	1kr3 1.0	00 MHz 225 dB	Select Marker
1.00 -9.00		1 ¹¹⁻¹ 2811-11	W.	12	~X*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	And	304	Normal
-29.0								Delta
-59.0 -69.0 -79.0								Fixed⊳
Center 2.441 #Res BW 100 MKR MODE TRC SO	D kHz		100 kHz	FUNCTION	Sweep FUNCTION WIDTH	2.53 ms (′		Off
2 F 1 f	· (Δ)	1.000 MHz (Δ) 40 000 GHz 1.000 MHz (Δ) 42 000 GHz	3.598 dB -0.425 dBm -0.225 dB 2.808 dBm					Properties►
7 8 9 9 9 10 11 12 12 12 12 12 12 12 12 12 12 12 12								More 1 of 2
MSG					STATUS	S 🐼 Align No	ow, All requir	red

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8.8 Number of hopping frequencies

Test Method

- 1. Use the following spectrum analyzer settings: Span = wide enough to capture the peaks of two adjacent channels, RBW ≥ 1% of the span, VBW) ≥RBW, Sweep = auto, Detector function = peak
- 2. Set the spectrum analyzer on Max-Hold Mode, and then keep the EUT in hopping mode.
- 3. Record all the signals from each channel until each one has been recorded.
- 4. Repeat above procedures until all frequencies measured were complete.

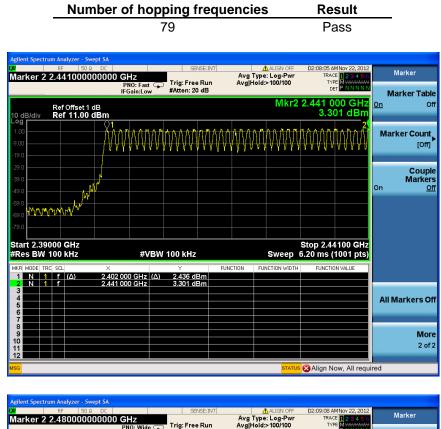
Limit

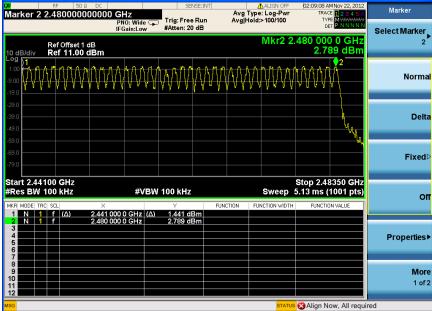
Limit number ≥ 15



Number of hopping frequencies

Test result:





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8.9 Dwell Time

Test Method

- 1. Connect EUT antenna terminal to the spectrum analyzer with a low loss cable. Equipment mode: Spectrum analyzer
- 2. RBW: 1MHz; VBW: 1MHz; SPAN: Zero Span
- 3. Adjust the center frequency of spectrum analyzer on any frequency be measured.
- 4. Measure the Dwell Time by spectrum analyzer Marker function.
- 5. Repeat above procedures until all frequencies measured were complete.

Limit

According to §15.247(a)(1)(iii) The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

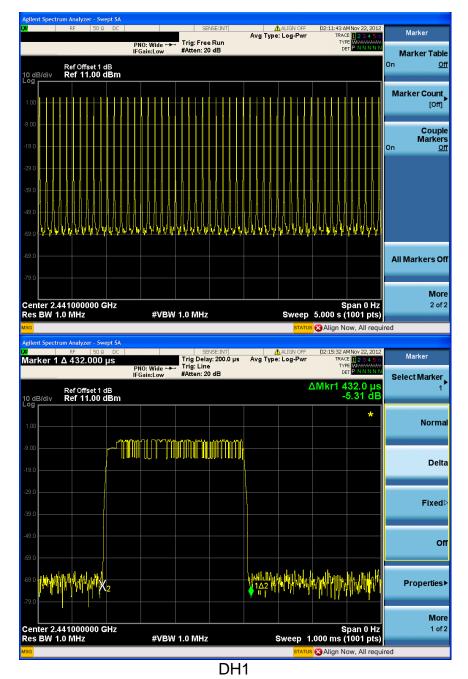


Dwell Time

Dwell time

The maximum dwell time shall be 0,4 s. Bluetooth Mode GFSK Modulation:

		Test Result		
Mode	Reading (µs)	Test Result (ms)	Limit (ms)	Result
DH1	432.0	139.24	< 400	Pass
DH3	1689	266.86	< 400	Pass
DH5	2950	316.95	< 400	Pass

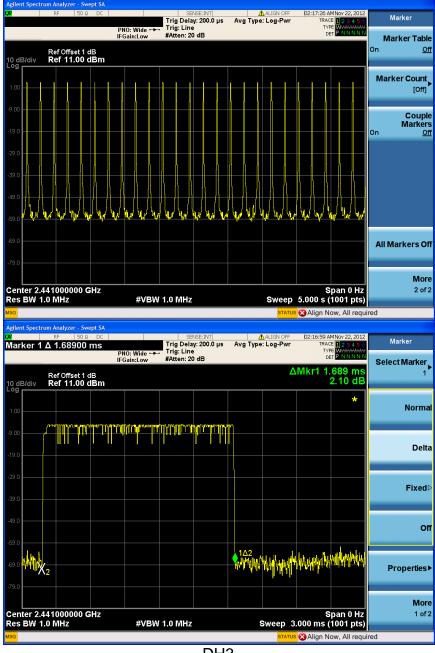


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Dwell Time



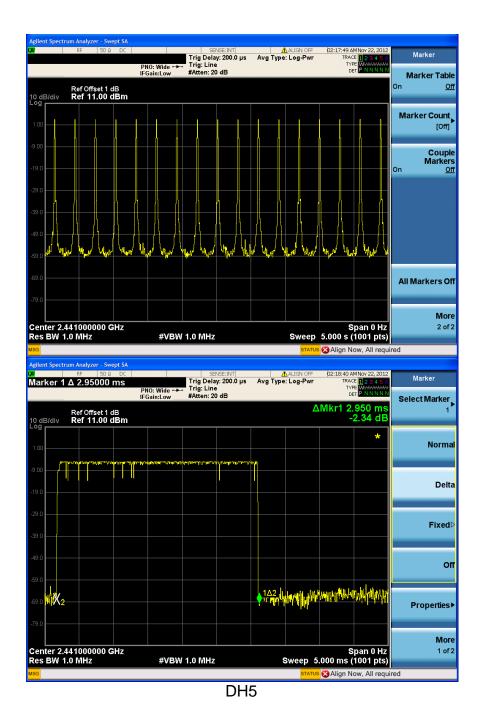
DH3

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Dwell Time



Note:

A period time=79x0.4(s)=31.6(s)

DH1	time slot= 51(times)/5(s) *432 (µs) *31.6(s)= 139.24 (ms)
DH3	time slot= $25(times)/5(s) *1689 (\mu s) *31.6(s) = 266.86(ms)$
DH5	time slot= 17(times)/5(s) *2950 (µs) *31.6(s)= 316.95 (ms)

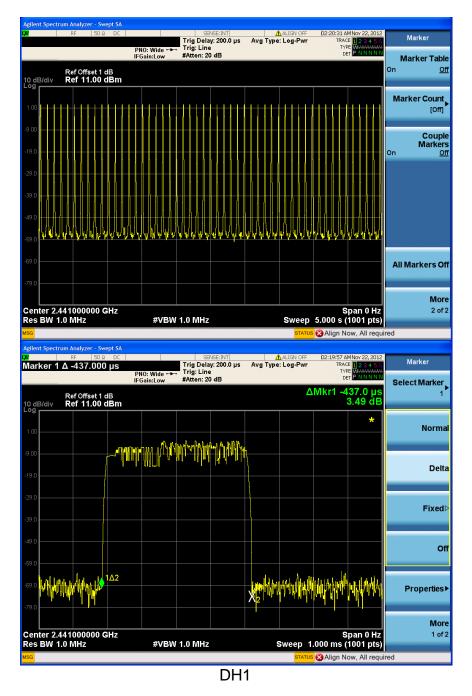
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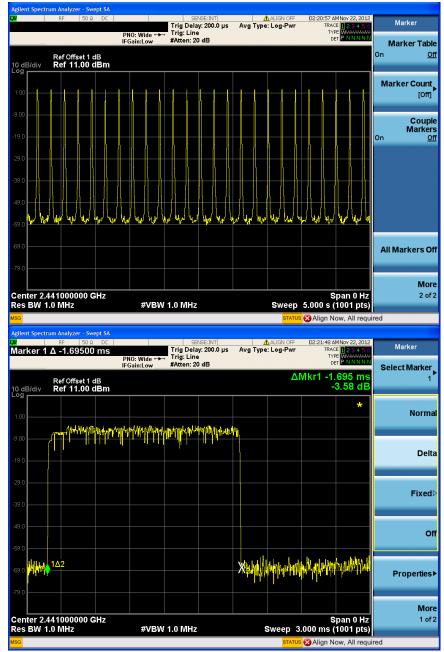
Bluetooth Mode π /4-DQPSK Modulation:

Mode	Reading (µs)	Test Result (ms)	Limit (ms)	Result
DH1	437	140.85	< 400	Pass
DH3	1695	267.81	< 400	Pass
DH5	1758	277.76	< 400	Pass



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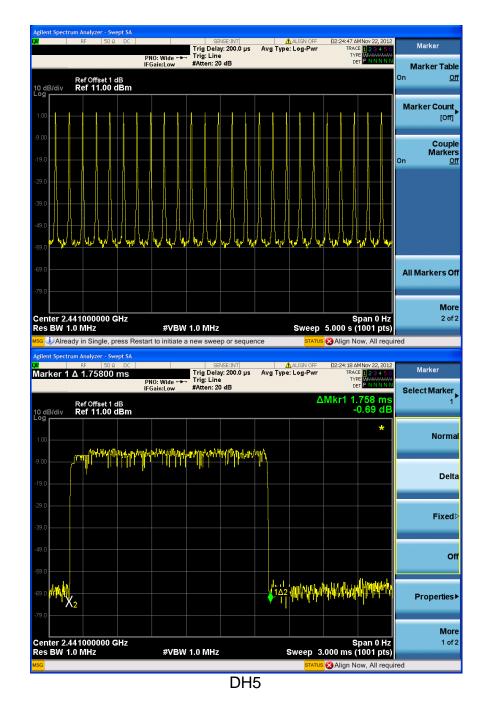


DH3

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Note: A period time=79x0.4(s)=31.6(s)

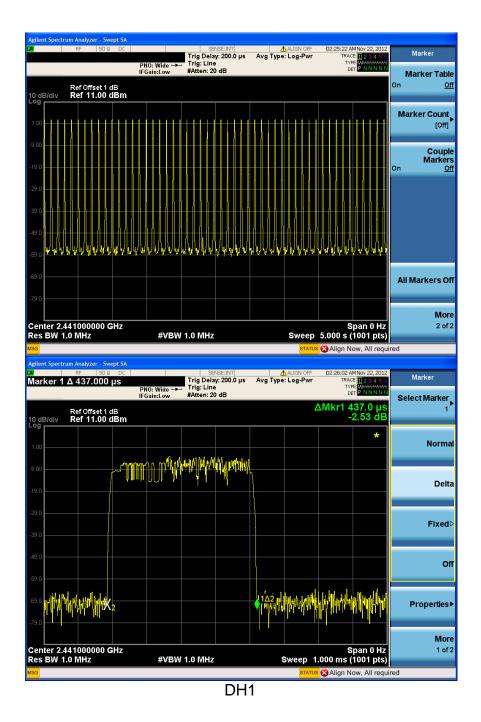
DH1	time slot= 51(times)/5(s) *437(µs) *31.6(s)= 140.85(ms)
DH3	time slot= 25(times)/5(s) *1695 (µs) *31.6(s)= 267.81(ms)
DH5	time slot= 25(times)/5(s) *1758 (µs) *31.6(s)=277.76 (ms)

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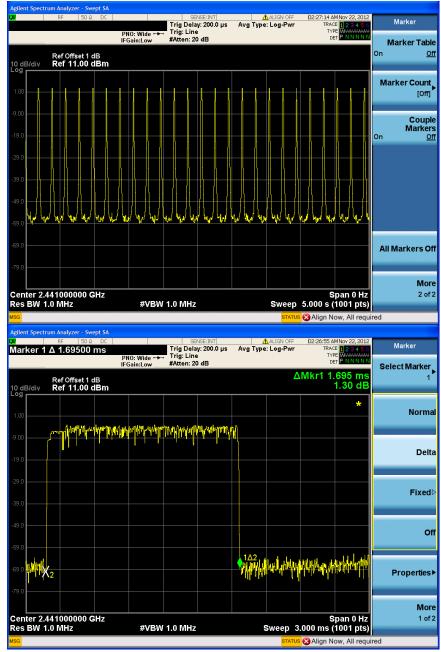


		Test Result		
Mode	Reading (µs)	Test Result (ms)	Limit (ms)	Result
DH1	437	140.85	< 400	Pass
DH3	1695	267.81	< 400	Pass
DH5	2945	316.41	< 400	Pass



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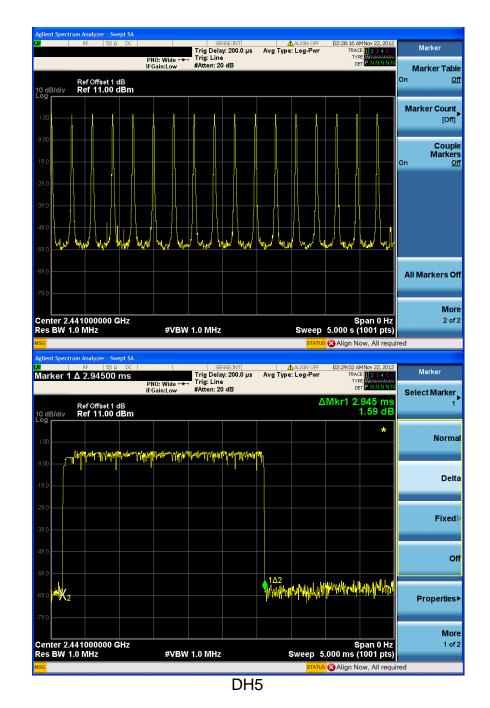


DH3

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Note: A period time=79x0.4(s)=31.6(s)

DH1	time slot= 51(times)/5(s) *437(µs) *31.6(s)=140.85(ms)
DH3	time slot= 25(times)/5(s) *1695(µs) *31.6(s)=267.81(ms)
DH5	time slot= 17(times)/5(s) *2945 (µs) *31.6(s)=316.41 (ms)

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Test Equipment List 9

List of Test Instruments					
ESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE	
Spectrum	Agilent	E4446A	US44300459	May.08, 13	
Amp	HP	8449B	3008A08495	May.08, 13	
Antenna	EMCO	3115	9510-4580	May.17, 13	
HF Cable	Hubersuhne	Sucoflex104	-	May.08, 13	
Power Meter	Anritsu	ML2487A	6K00002472	May.08, 13	
Power Sensor	Anritsu	MA2491A	033005	May.08, 13	
Power meter	Agilent	436A	MY45100928	May.08, 13	
Power Sensor	Agilent	8482B	MY41090514	May.08, 13	
Power meter	Anritsu	ML2487A	6K00002472	May.08, 13	
Power Sensor	Anritsu	ML2491A	032516	May.08, 13	
Noise Figure	HP	8970B	3247U02193	May.08, 13	
Noise Source	HP	346B	3318A13134	May.08, 13	
Loop Antenna	Chase	HLA6120	1062	May.08, 13	
Test Receiver	Rohde & Schwarz	ESHS10	838693/001	Oct.31, 13	
L.I.S.N.#1	Rohde & Schwarz	ESH2-Z5	834066/011	Oct.31, 13	
L.I.S.N.#3	Kyoritsu	KNW-242C	8-1920-1	May.08, 13	
Terminator	Hubersuhner	50Ω	No. 1	May.08, 13	
Terminator	Hubersuhner	50Ω	No. 2	May.08, 13	
RF Cable	Fujikura	3D-2W	No.1	May.08, 13	
Coaxial Switch	Anritsu	MP59B	M50564	May.08, 13	
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100341	May.08, 13	
Oscilloscope	Tektronix	TDS3052B	B026036	May.20, 13	

List of Test Instruments



10 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty

Items		Extended Uncertainty
RE	Field strength (dBµV/m)	U=4.32dB (30MHz-25GHz)
CE	Disturbance Voltage (dBµV)	U=2.4dB

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