EMC
TEST REPORT

Report No.: **TS13070033-EME**
Model No.: **K110**
Issued Date: **Jul. 25, 2013**

Applicant:	**Kobo Inc** **135 Liberty Street, Suite 101, Toronto, Ontario, M6K1A7** **Canada**
Test Method/ Standard:	**FCC Part 15 Subpart C Section §15.205, §15.207, §15.209, §15.247, DA 00-705 and ANSI C63.4/2003**
Test By:	**Intertek Testing Services Taiwan Ltd.** **No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,** **Shiang-Shan District, Hsinchu City, Taiwan**

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Testing Laboratory
0597

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Arthur Tsai / Senior Engineer

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Name Jimmy Yang
Title Engineer

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Summary of Tests

Test Item	Reference	Results
20dB Bandwidth test	15.247(a)(1)	Pass
Carrier Frequency Separation test	15.247(a)(1)	Pass
Number of hopping frequencies test	15.247(a)(1)	Pass
Time of Occupancy (dwell time) test	15.247(a)(1)	Pass
Maximum Output Power test	15.247(b)	Pass
RF Antenna Conducted Spurious test	15.247(d)	Pass
Radiated Spurious Emission test	15.205, 15.209	Pass
Emission on the Band Edge test	15.247(d)	Pass
AC Power Line Conducted Emission test	15.207	Pass

1. General information

1.1 Identification of the EUT

Product:	Tablet
Model No.:	K110
FCC ID.:	ZJLKOBOK110
Frequency Range:	2402MHz~2480MHz
Total Hopping Channel No:	79 channels
Frequency of Each Channel:	2402+1k, k＝0~78
Type of Modulation:	GFSK, π/4-DPSK, 8-DPSK
Rated Power:	1. DC 5.35 V from adapter 2. DC 3.7 V from battery
Power Cord:	N/A
Data Cable:	USB shielded cable 1 meter × 1
Sample Received:	Jun. 11, 2013
Test Date(s):	Jun. 11, 2013~Jul. 22, 2013
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Note 2:	When determining the test conclusion, the Measurement Uncertainty of test has been considered.

1.2 Additional information about the EUT

The EUT is Tablet, and was defined as information technology equipment.

For more detail features, please refer to User's manual as file name “Installation guide.pdf”

1.3 Antenna description

Chain 0: AUX Antenna

The antenna is affixed to the EUT using a unique connector, which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector.

Antenna Gain	: 3.24dBi
Antenna Type	: PIFA Antenna
Connector Type	: I-PEX

1.4 Adapter information

The EUT will be supplied with a power supply from below list:

No.	Brand	Model no.	Specification
Adapter	kobo	PSAI10R-050Q	I/P: 100-240V~, 0.3A, 50-60Hz O/P: 5.35V, 2.0A

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Section §15.205, §15.207, §15.209, §15.247, DA 00-705 and ANSI C63.4/2003.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band was all meet limit requirement, thus we evaluate the EUT pass the specified test.

2.2 Operation mode

The EUT is supplied with DC 3.7 V from battery for all test items except for conducted emission test.

The EUT is supplied with DC 5.35 V from adapter (Test voltage: 120VAC, 60Hz) for conducted emission test.

The EUT executes test by "MS-DOS" and key-in commands provided by Wistron.

The signal is maximized through rotation and placement in the three orthogonal axes (The EUT configuration refers to the "Spurious set-up photo.pdf").
After verifying three axes, we found the maximum electromagnetic field was occurred at X axis. The final test data was executed under this configuration.

2.3 Measurement Uncertainty

Measurement uncertainty was calculated in accordance with TR 100 028-1

Parameter	Uncertainty		
Radiated Emission	Below 1 GHz	Vertical	3.90 dB
		Horizontal	3.86 dB
	Above 1 GHz	Vertical	5.74 dB
		Horizontal	5.55 dB
Conducted Emission	2.08 dB		

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

2.4 Test equipment

Equipment	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Test Receiver	Rohde & Schwarz	ESCI	100018	2012/11/30	2013/11/29
Spectrum Analyzer	Rohde&schwarz	FSP30	100137	2013/06/21	2014/06/21
Spectrum Analyzer	Rohde&schwarz	FSEK30	100186	2013/01/23	2014/01/23
Horn Antenna (1-18G)	Schwarzbeck	BBHA 9120 D	9120D-456	2012/09/03	2014/09/03
Horn Antenna (14-42G)	SHWARZBECK	BBHA 9170	BBHA9170159	2012/09/05	2014/09/05
Broadband Antenna	SCHWARZBECK	VULB 9168	9168-172	2011/07/26	2013/07/25
Loop Antenna	RolfHeine	LA-285	02/10033	2012/03/20	2014/03/20
Pre-Amplifier	MITEQ	AFS44-00102650--42-10P-44	1495287	2011/10/27	2013/10/26
Pre-Amplifier	MITEQ	JS4-26004000--27-8A	828825	2012/09/18	2014/09/18
Power Meter	Anritsu	ML2495A	0844001	2012/10/09	2013/10/09
Power Senor	Anritsu	MA2411B	0738452	2012/10/09	2013/10/09
Temperature& Humidity Test Chamber	TERCHY	MHU-225LRU (SA)	950838	2013/06/14	2014/06/14
Two-Line V-Network	Rohde&schwarz	ESH3-Z5	838979/014	2012/10/29	2013/10/29

Note: The above equipments are within the valid calibration period.

3. 20dB Bandwidth test

3.1 Operating environment

Temperature: 23 ℃
Relative Humidity: 55 %
Atmospheric Pressure: 1008 hPa
Test Date: Jul. 03, 2013

3.2 Test setup & procedure

The test procedure was according to FCC measurement guidelines DA 00-705.

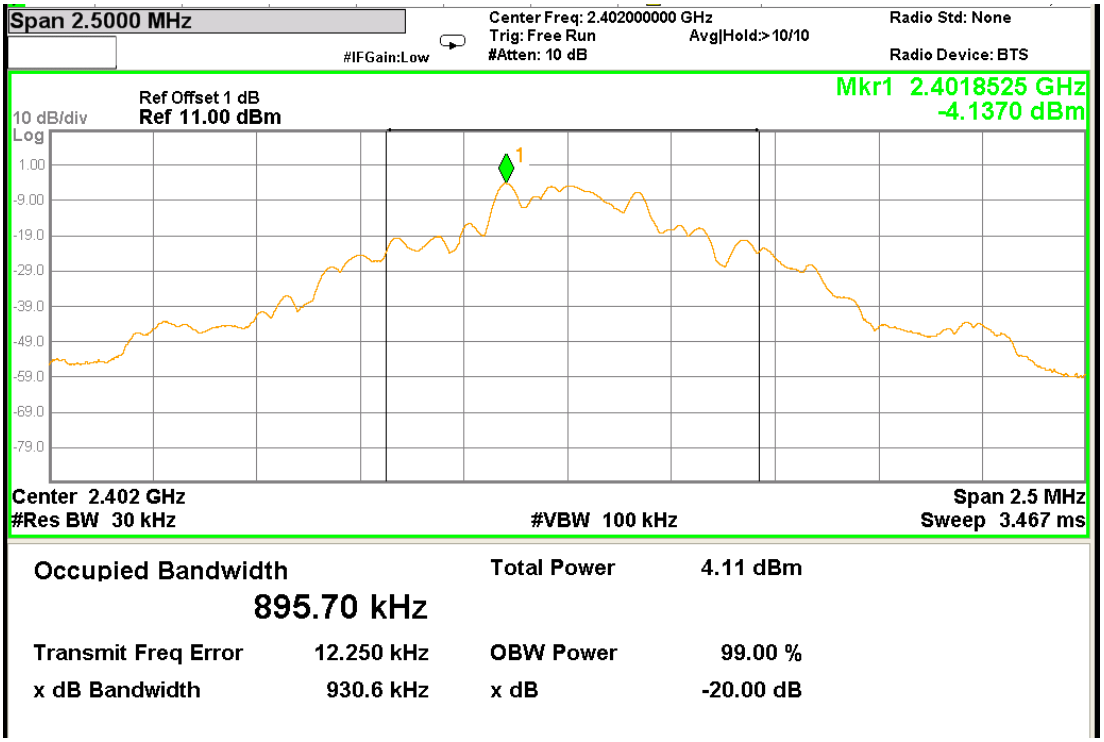
The 20dB bandwidth per FCC §15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set≧1% of the Span, the video bandwidth ≧ RBW, and the SPAN may equal to approximately 2 to 3 times the 20dB bandwidth. The test was performed at 3 channels (lowest, middle and highest channel). The maximum 20dB modulation bandwidth is in the following Table.

3.3 Measured data of modulated bandwidth test results

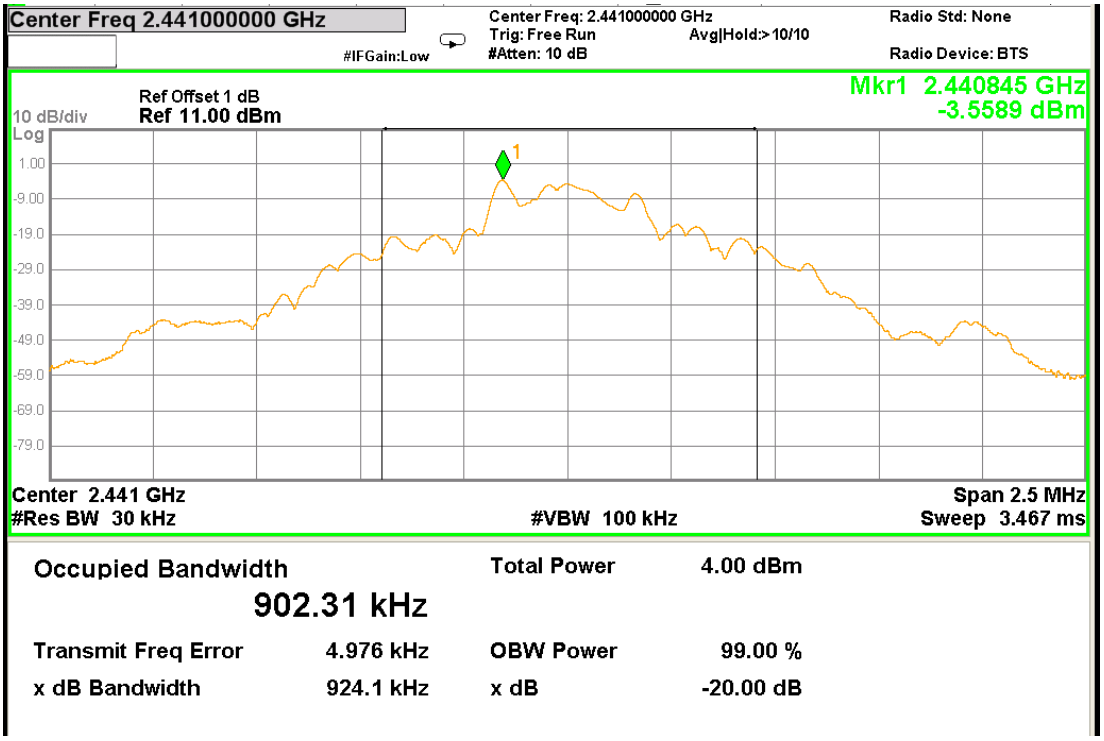
Mode	Channel	Frequency (MHz)	20dB Bandwidth (MHz)
GFSK	0	2402	0.9306
	39	2441	0.9241
	78	2480	0.9296
π/4-DPSK	0	2402	1.351
	39	2441	1.351
	78	2480	1.35
8-DPSK	0	2402	1.276
	39	2441	1.271
	78	2480	1.294

Please see the plot below.

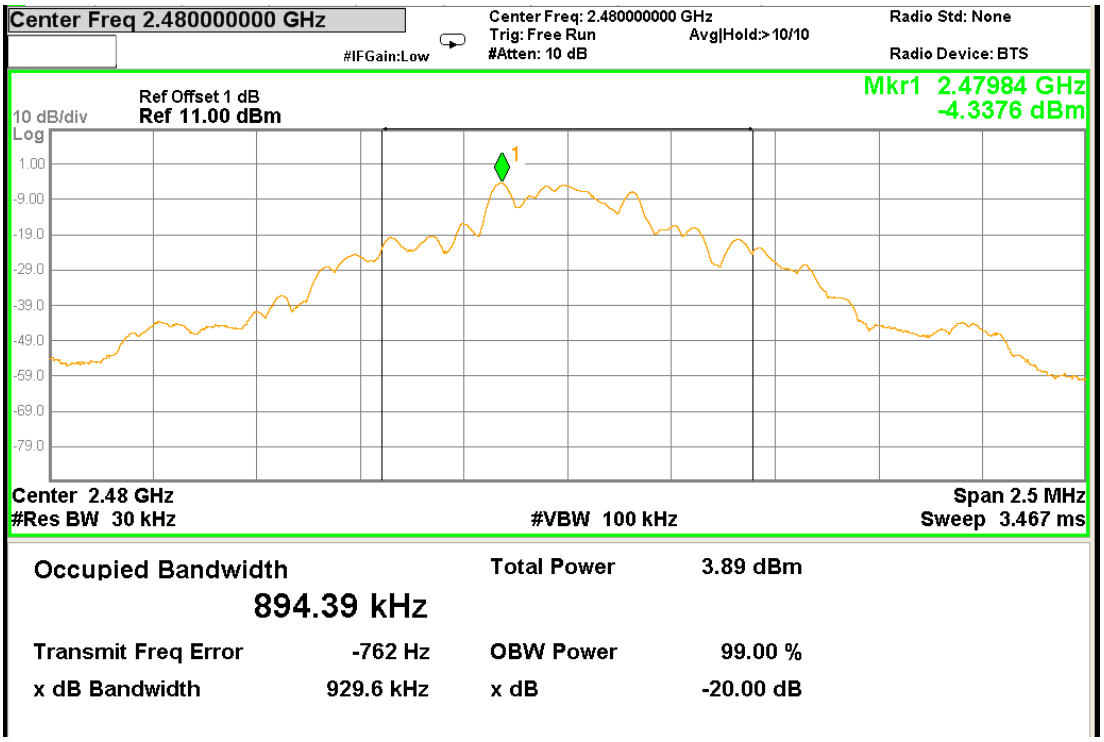
20 dB Bandwidth @ GFSK mode Channel 0



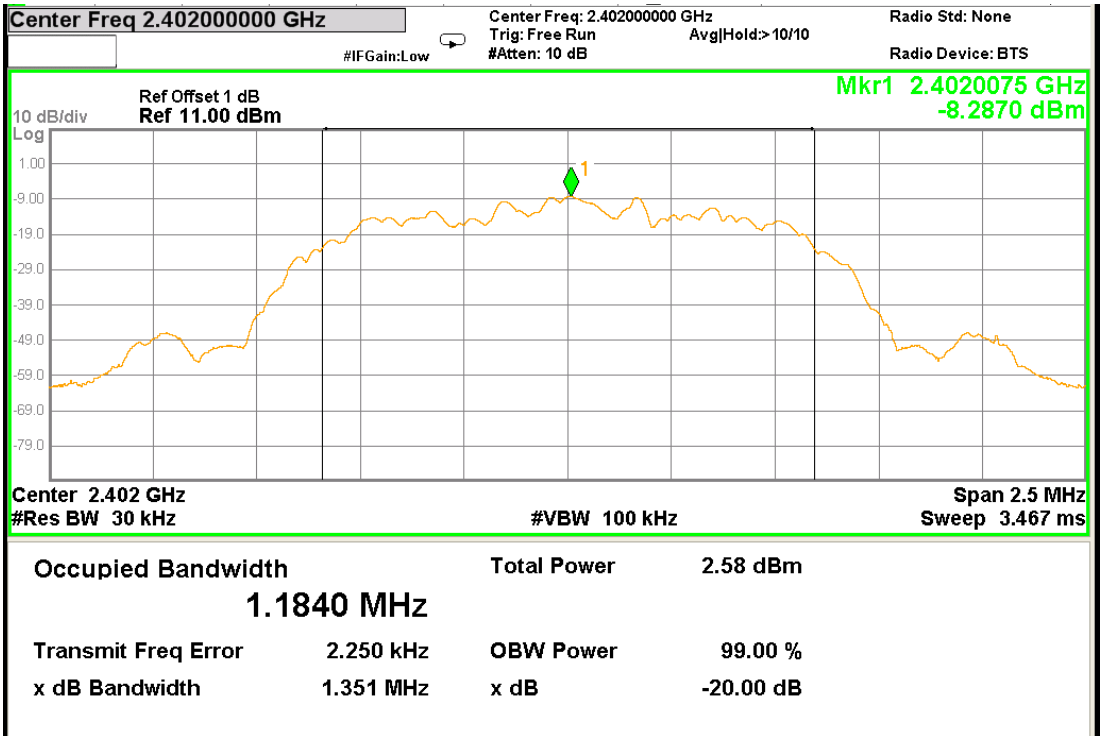
20 dB Bandwidth @ GFSK mode Channel 39



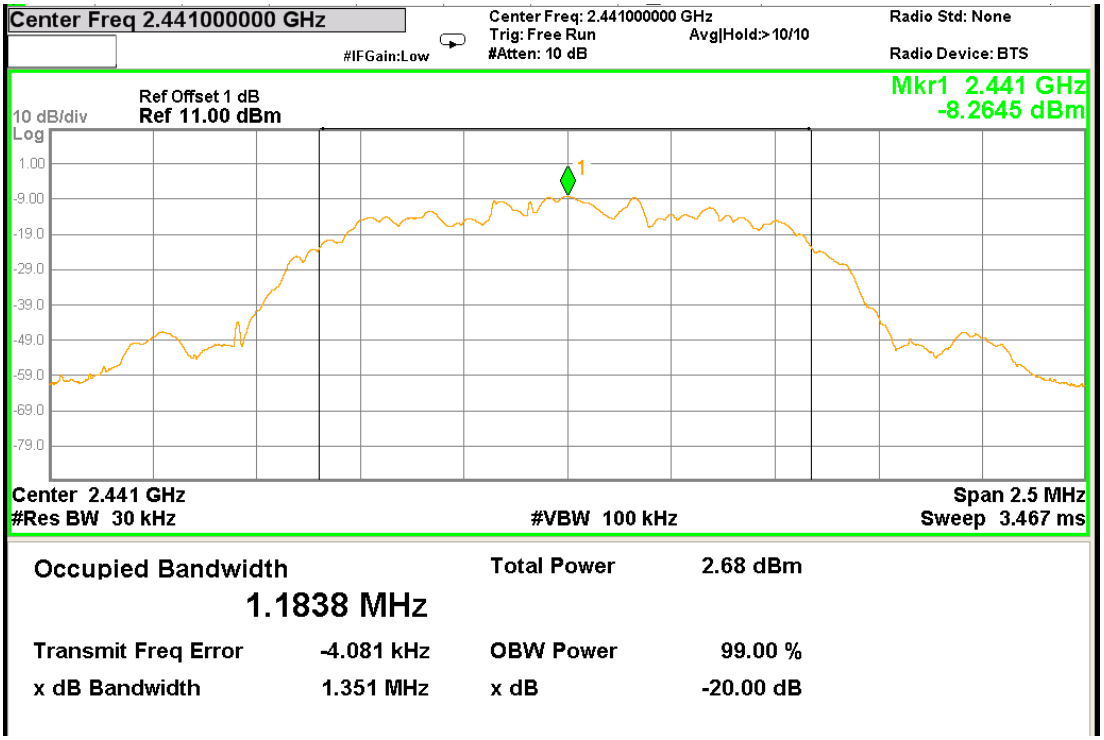
20 dB Bandwidth @ GFSK mode Channel 78



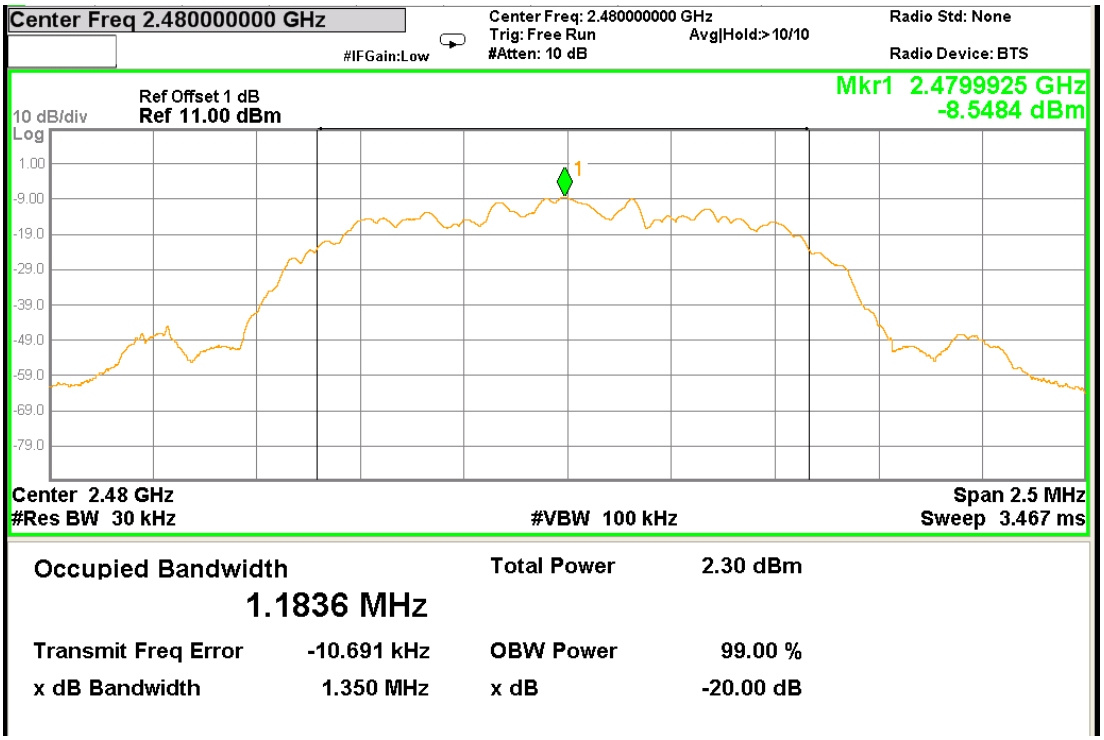
20 dB Bandwidth @ π/4-DPSK mode Channel 0



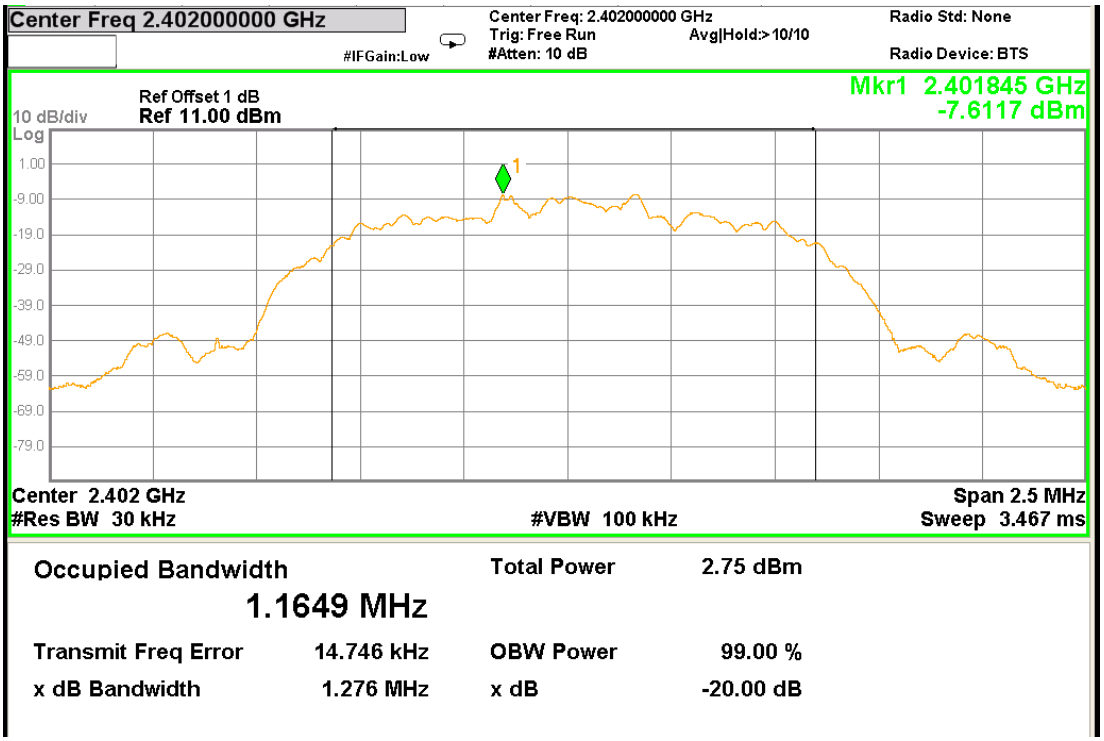
20 dB Bandwidth @ π/4-DPSK mode Channel 39



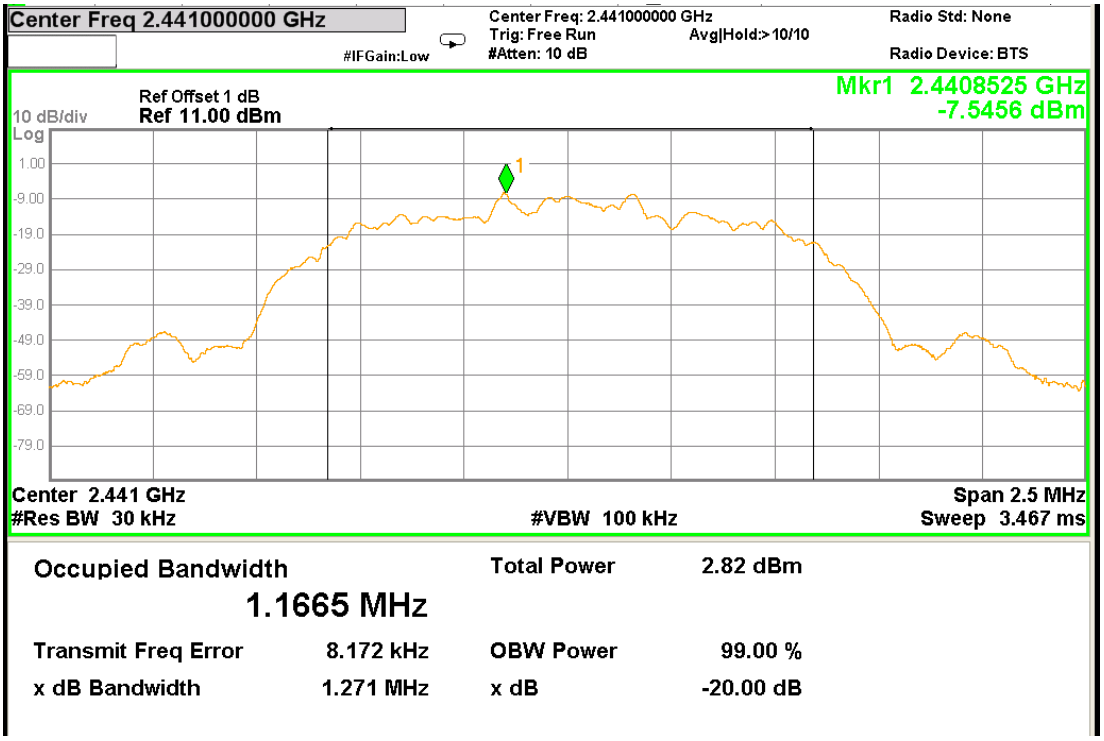
20 dB Bandwidth @ π/4-DPSK mode Channel 78



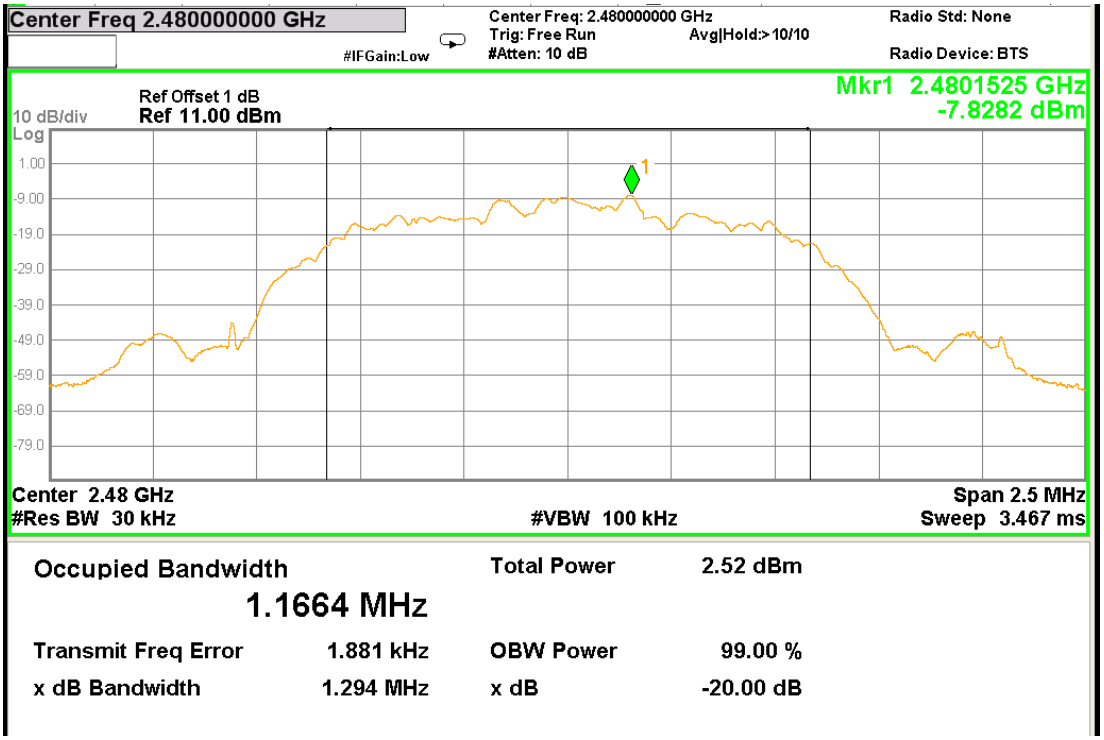
20 dB Bandwidth @ 8-DPSK mode Channel 0



20 dB Bandwidth @ 8-DPSK mode Channel 39



20 dB Bandwidth @ 8-DPSK mode Channel 78



4. Carrier Frequency Separation test

4.1 Operating environment

Temperature: 23 ℃
Relative Humidity: 55 %
Atmospheric Pressure: 1008 hPa
Test Date: Jul. 22, 2013

4.2 Test setup & procedure

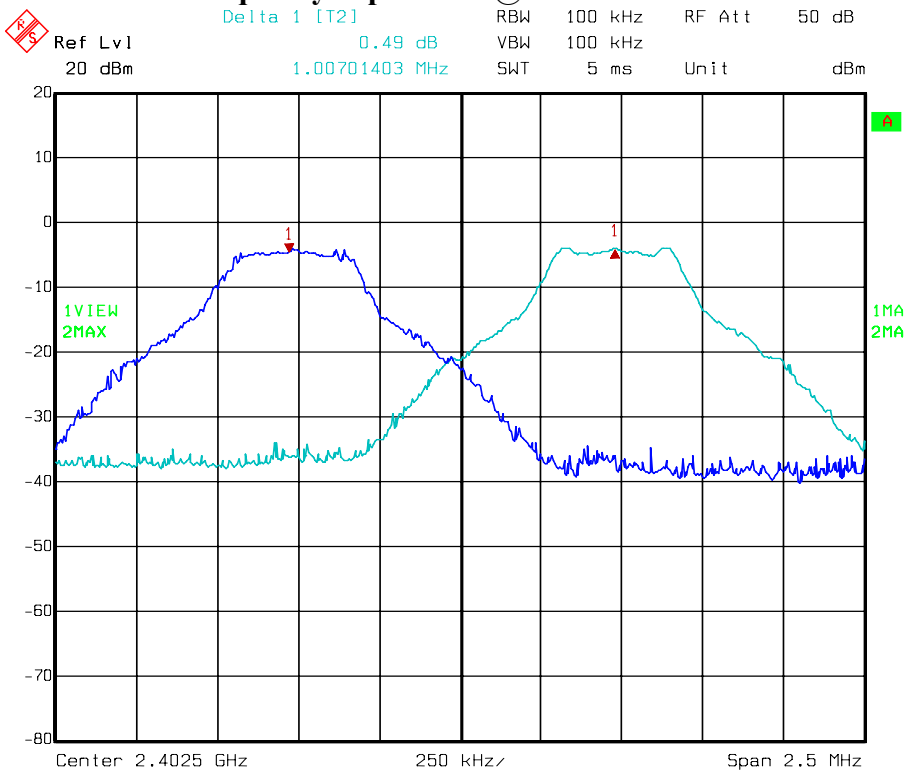
The test procedure was according to FCC measurement guidelines DA 00-705.
The carrier frequency separation per FCC §15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at ≧ 1% of the span, the video bandwidth ≧ RBW, and the SPAN was wide enough to capture the peaks of two adjacent channels. The carrier frequency separation result is in the following Table.

4.3 Measured data of Carrier Frequency Separation test result

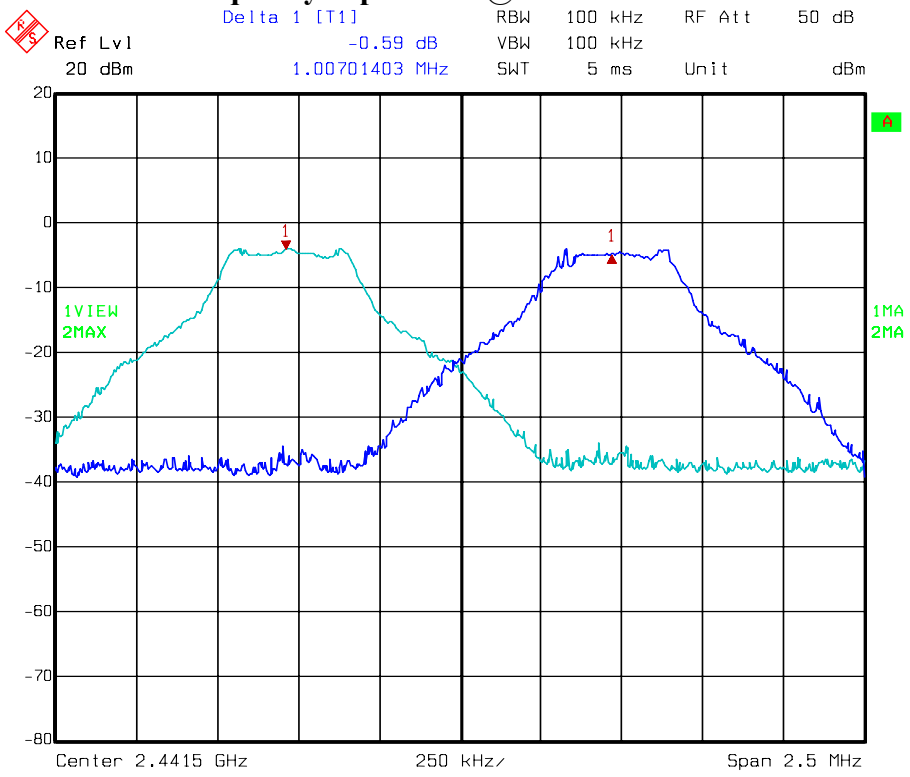
Mode	Channel	Frequency (MHz)	Carrier freq. Separation (MHz)	Limit 20dB BW*2/3(kHz)
GFSK	0	2402	1.007	0.62
	39	2441	1.007	0.62
	78	2480	1.007	0.62
8-DPSK	0	2402	1.027	0.85
	39	2441	1.022	0.85
	78	2480	1.024	0.86

Please see the spectrum plots of worst value below.

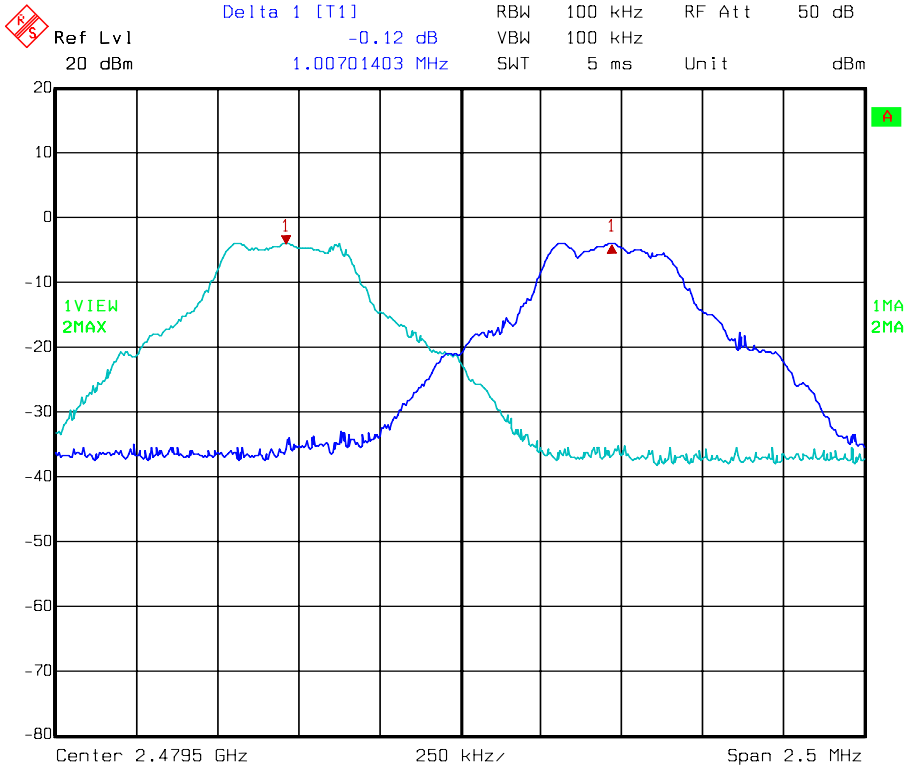
Carrier Frequency Separation @ GFSK mode Channel 0



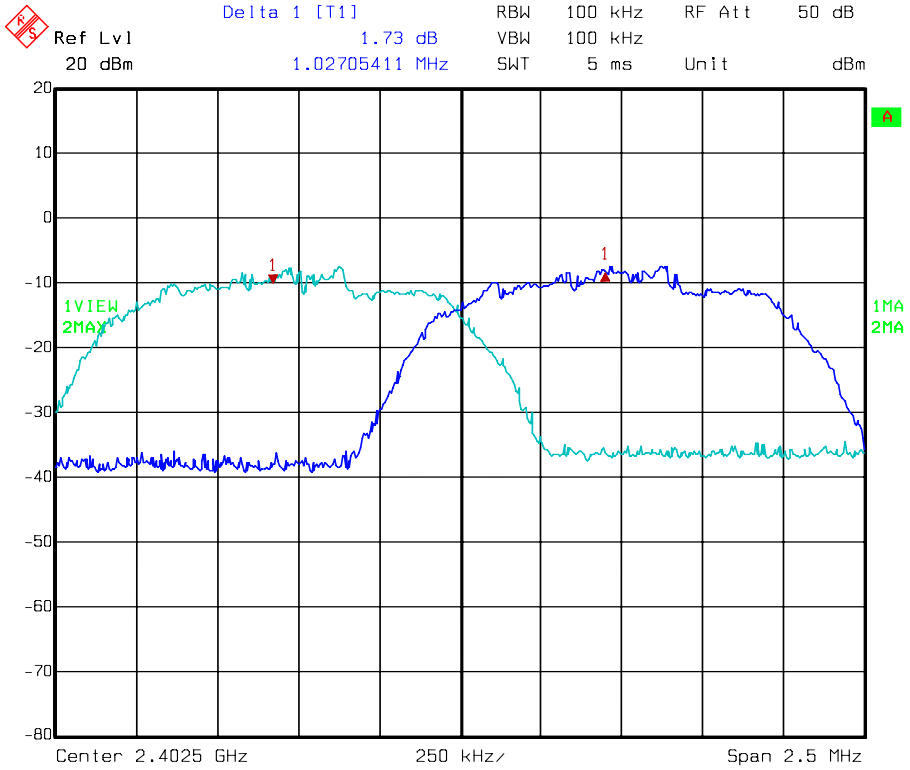
Carrier Frequency Separation @ GFSK mode Channel 39



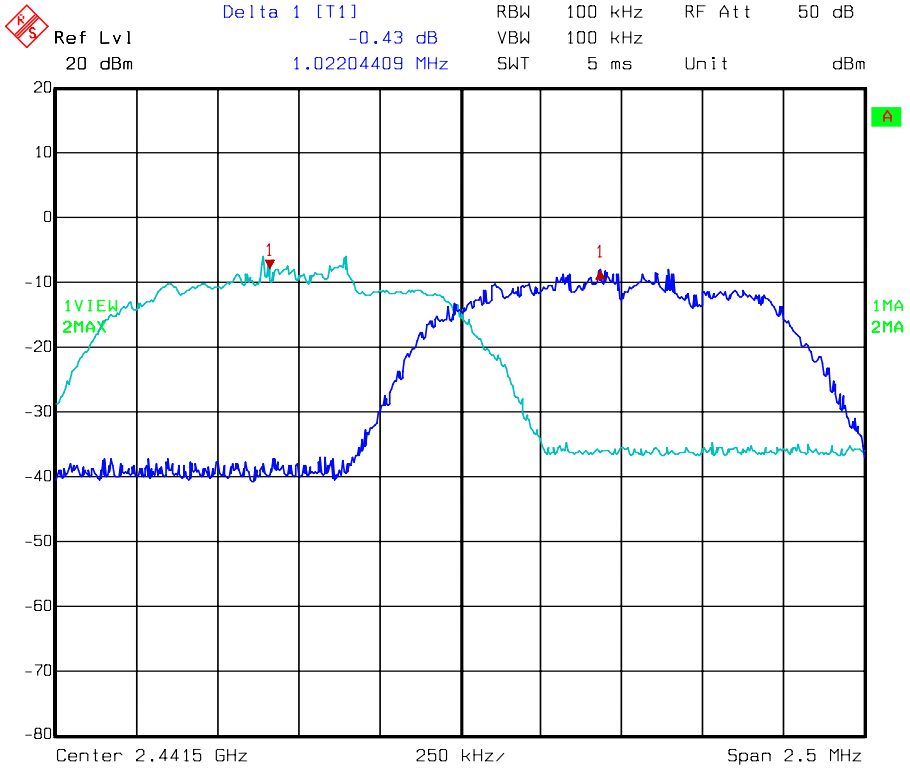
Carrier Frequency Separation @ GFSK mode Channel 78



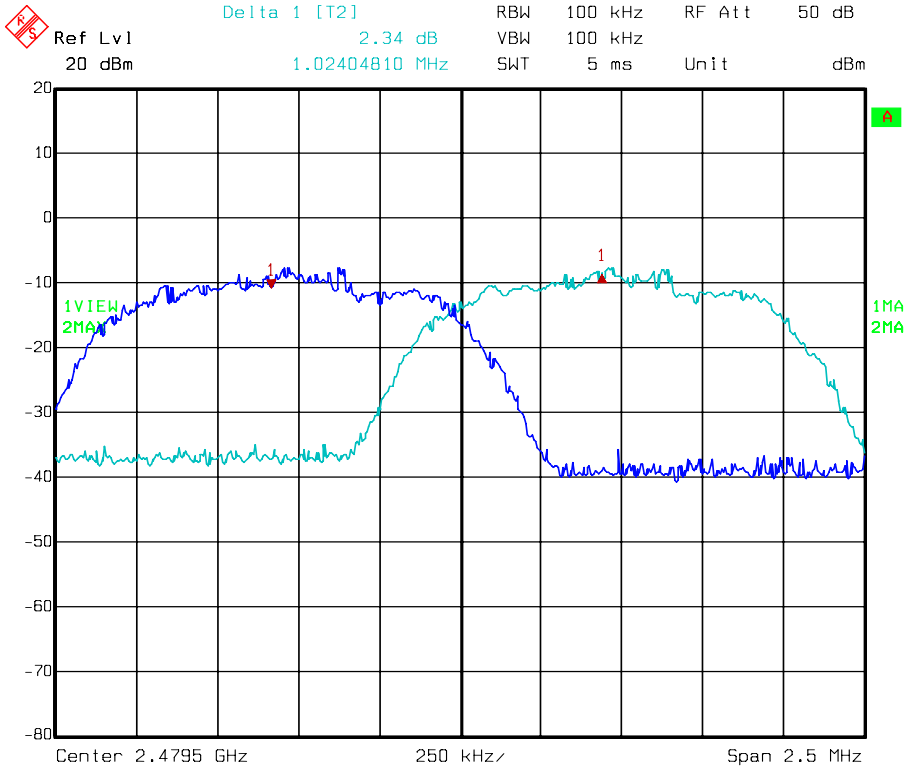
Carrier Frequency Separation @ 8-DPSK mode Channel 0



Carrier Frequency Separation @ 8-DPSK mode Channel 39



Carrier Frequency Separation @ 8-DPSK mode Channel 78



5. Number of hopping frequencies test

5.1 Operating environment

Temperature:	25	℃
Relative Humidity:	55	%
Atmospheric Pressure:	1008	hPa
Test Date:	Jul. 03, 2013	

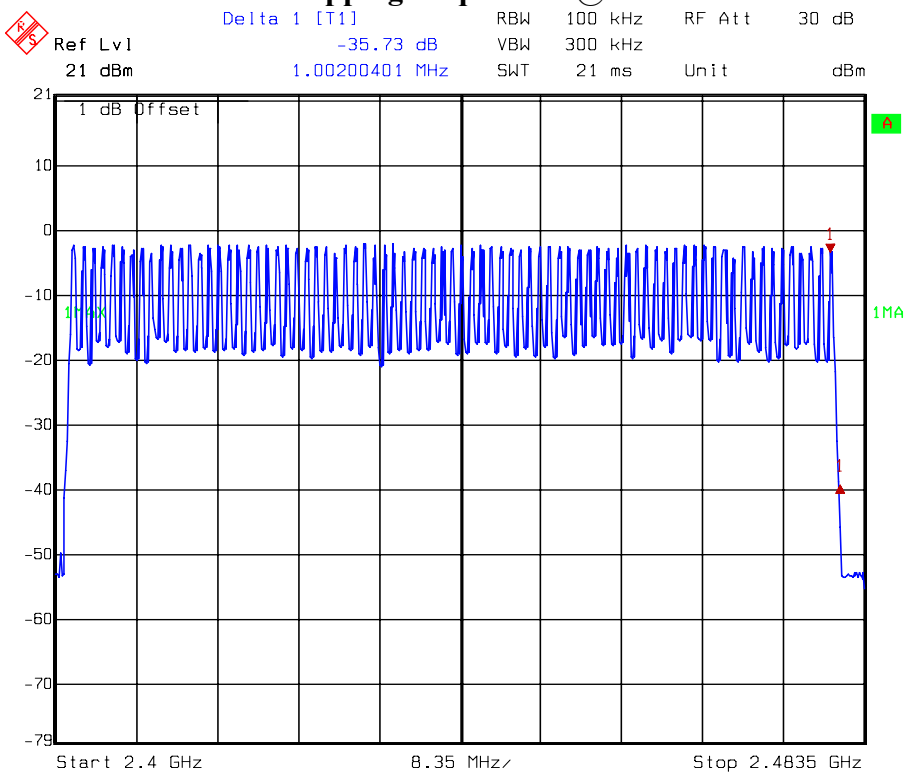
5.2 Test setup & procedure

The test procedure was according to FCC measurement guidelines DA 00-705.
The number of hopping frequencies per FCC §15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at ≧1% of the span, the video bandwidth ≧ RBW, and the SPAN was the frequency band of operation. The carrier frequency separation result is in the following Table.

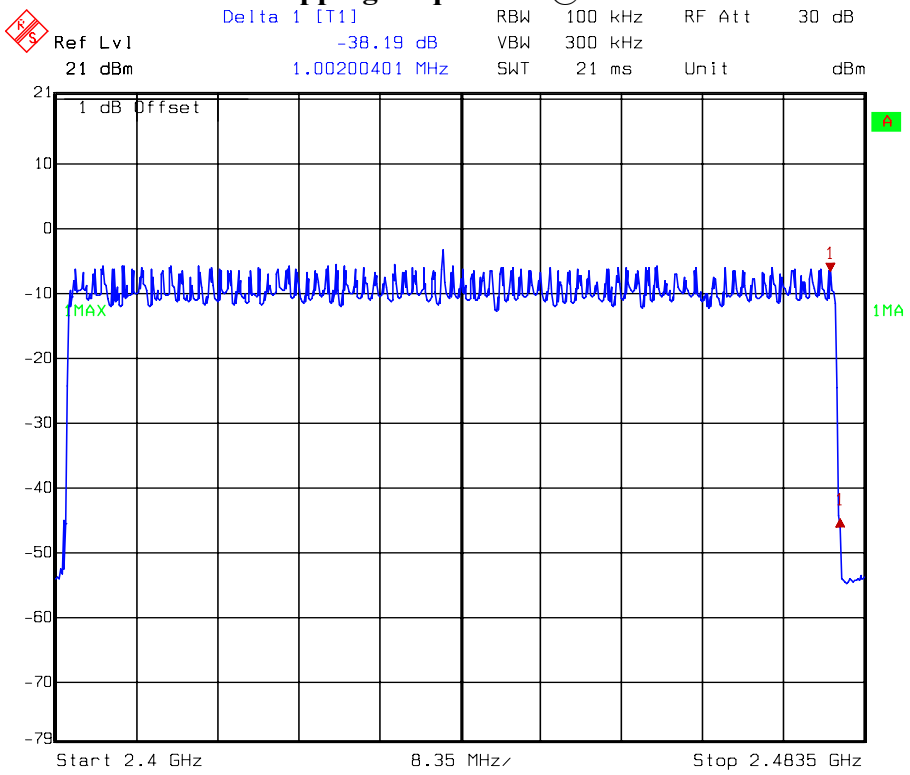
5.3 Measured data of number of hopping frequencies test result

Frequency Range (MHz)	Hopping Channels
2402~2480	79

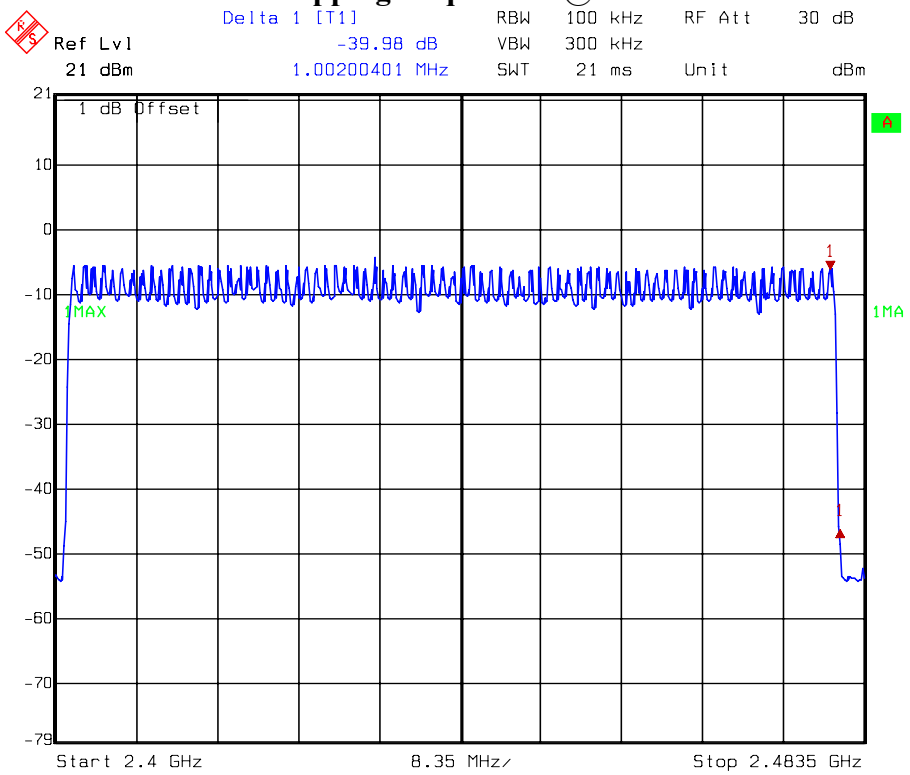
Number of hopping frequencies @ GFSK mode



Number of hopping frequencies @ π/4-DPSK mode



Number of hopping frequencies @ 8-DPSK mode



6. Time of Occupancy (dwell time)

6.1 Operating environment

Temperature:	24	℃
Relative Humidity:	55	%
Atmospheric Pressure:	1008	hPa
Test Date:	Jul. 22, 2013	

6.2 Test setup & procedure

The test procedure was according to FCC measurement guidelines DA 00-705.

The time of occupancy (dwell time) per FCC §15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at 1MHz, the video bandwidth ≧ RBW, and the zero span function of spectrum analyzer was enable. The EUT has its hopping function enable.

6.3 Measured data of Maximum Output Power test results

The total sweep time is 0.4×79 Channels =31.6 seconds
Due to the number of hops in the 31.6s sweep we determined to reduce the sweep time to 5s, count the number of hops and multiply by 6.32. The total number of hops will be multiplied by the measured time of one pulse.

GFSK Mode:
Time of occupancy (dwell time) for DH1
Number of Hops in 5s=37, Total Number of Hops in 31.6s = 37×6.32 =233.84
Single Pulse Width = 0.379 ms
Dwell time = Pulse Width × 233.84= 88.625 ms

Time of occupancy (dwell time) for DH3
Number of Hops in 5s=20, Total Number of Hops in 31.6s = 20×6.32 =126.4
Single Pulse Width = 1.595ms
Dwell time = Pulse Width ×126.4= 201.608 ms

Time of occupancy (dwell time) for DH5
Number of Hops in 5s=15, Total Number of Hops in 31.6s = 15×6.32 =94.8
Single Pulse Width = 2.845ms
Dwell time = Pulse Width × 94.8= 269.706 ms

8-DPSK Mode:
Time of occupancy (dwell time) for DH1
Number of Hops in 5s=51, Total Number of Hops in 31.6s = 51×6.32 =322.32
Single Pulse Width = 0.389 ms
Dwell time = Pulse Width × 322.32= 125.3825ms

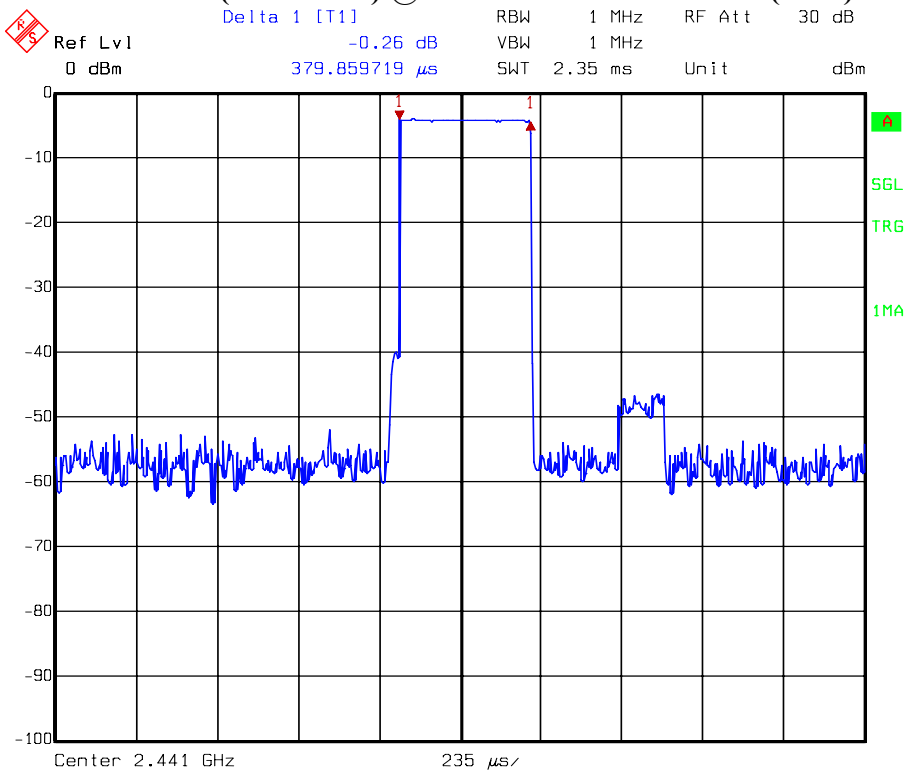
Time of occupancy (dwell time) for DH3
Number of Hops in 5s=22, Total Number of Hops in 31.6s = 22×6.32 =139.04
Single Pulse Width = 1.642ms
Dwell time = Pulse Width × 139.04= 228.3037 ms

Time of occupancy (dwell time) for DH5
Number of Hops in 5s=13, Total Number of Hops in 31.6s = 13×6.32 =82.16
Single Pulse Width = 2.825ms
Dwell time = Pulse Width × 82.16= 232.102 ms

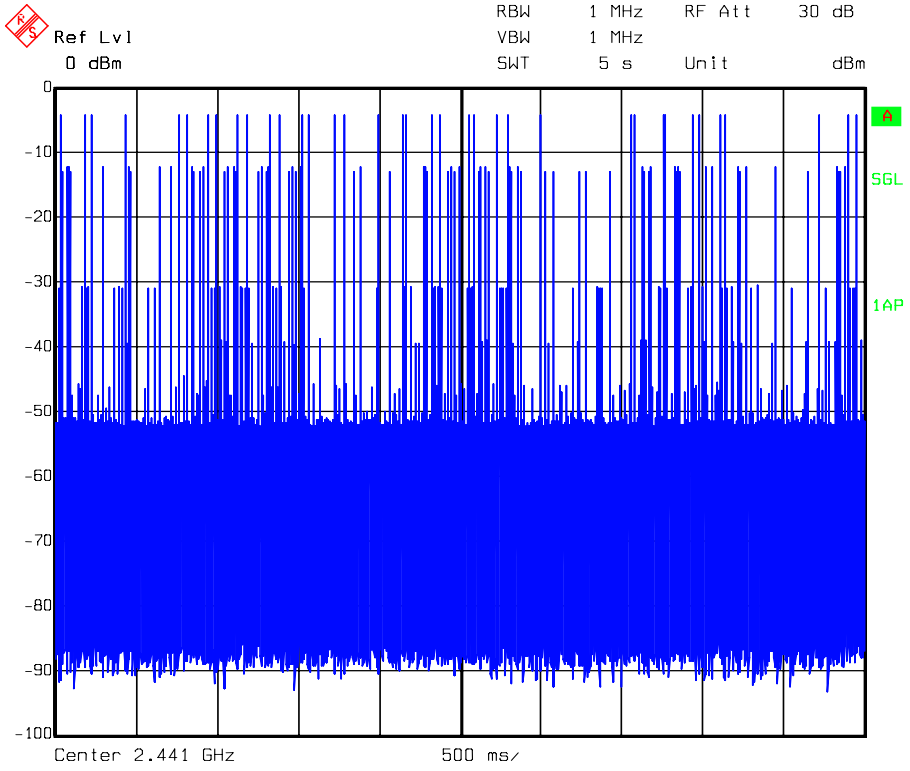
Mode	Packet type	Frequency (MHz)	Pulse Duration (ms)	Number of pulse	Measure time (s)	Dwell time (ms)	Limit (ms)
GFSK	DH1	2402	0.379	37	5	88.6254	400
	DH3		1.595	20	5	201.6080	400
	DH5		2.845	15	5	269.7060	400
8-DPSK	DH1	2480	0.389	51	5	125.3825	400
	DH3		1.642	22	5	228.3037	400
	DH5		2.825	13	5	232.1020	400

Please see the plot below.

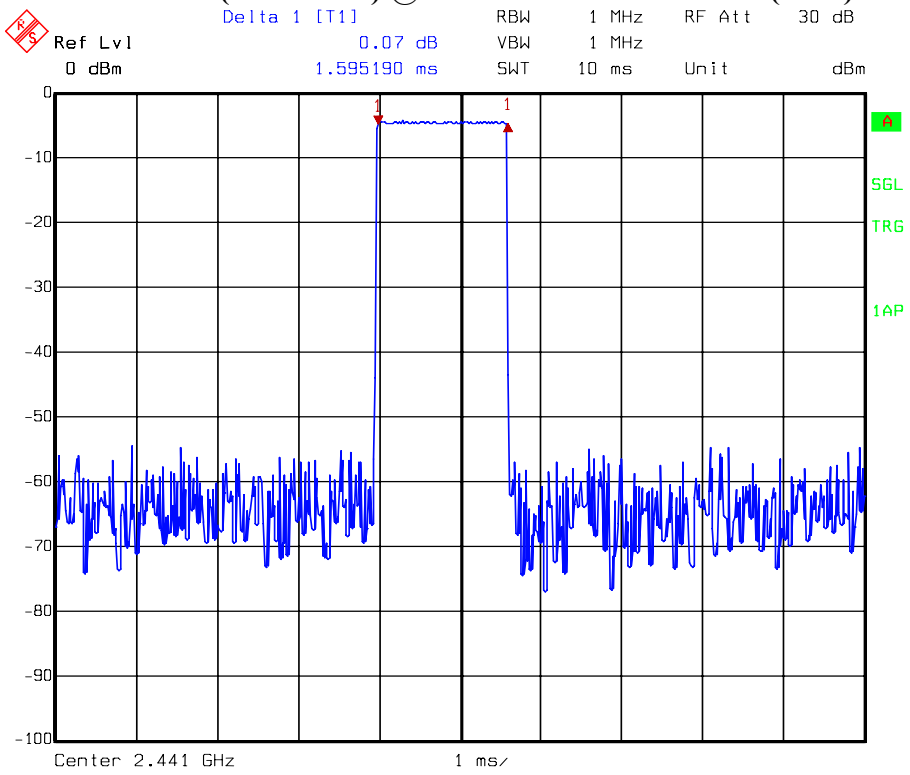
Dwell time (Pulse time) @ GFSK mode Channel 39 (DH1)



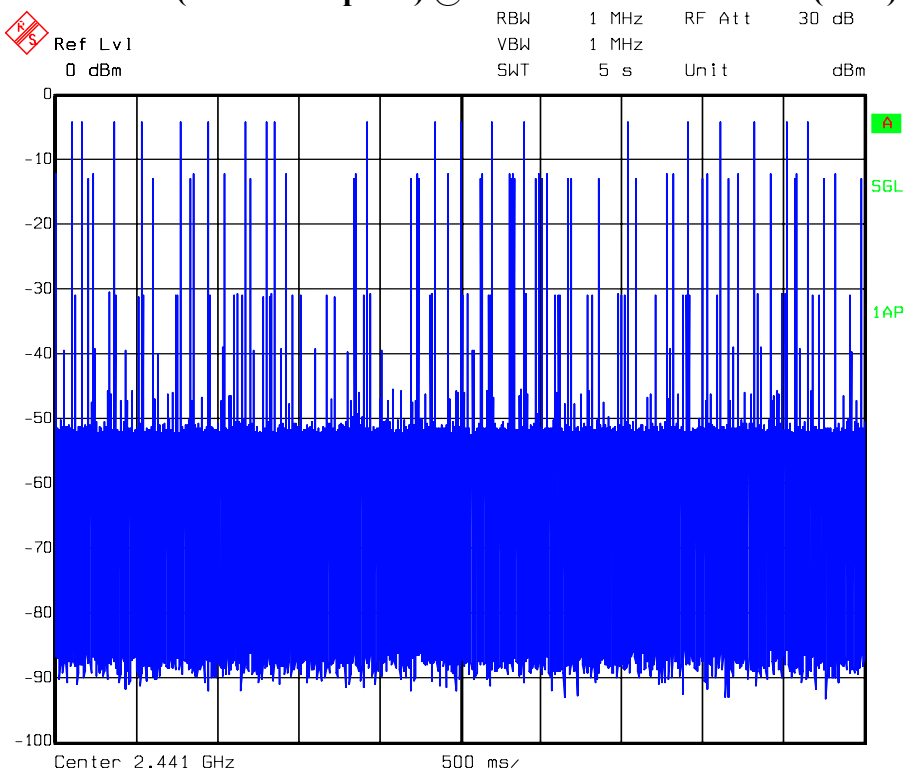
Dwell time (Number of pulse) @ GFSK mode Channel 39 (DH1)



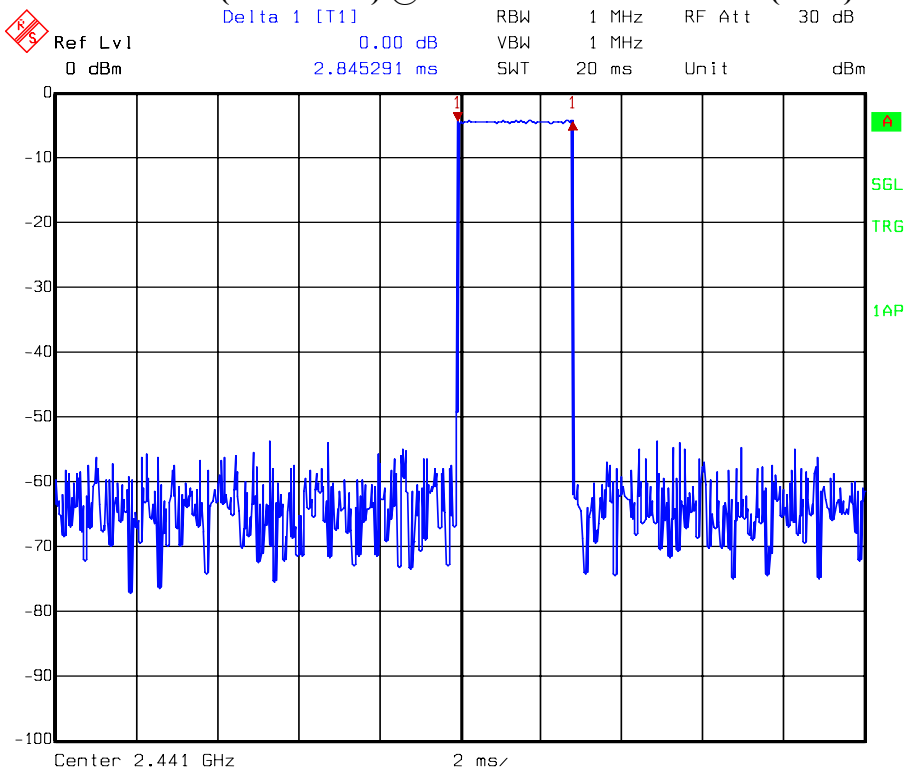
Dwell time (Pulse time) @ GFSK mode Channel 39 (DH3)



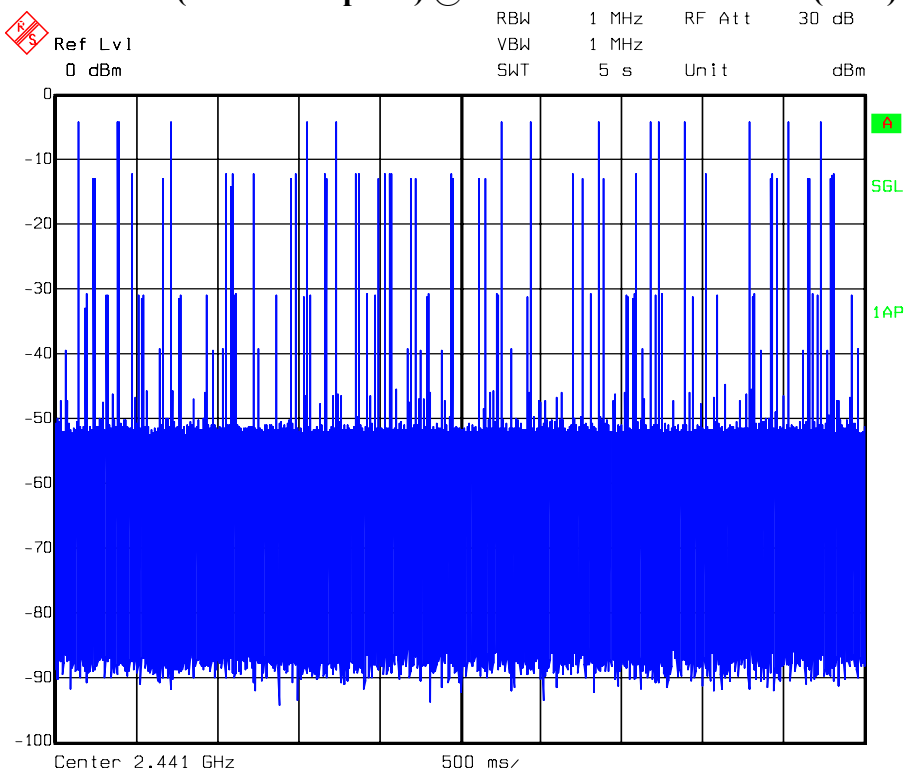
Dwell time (Number of pulse) @ GFSK mode Channel 39 (DH3)



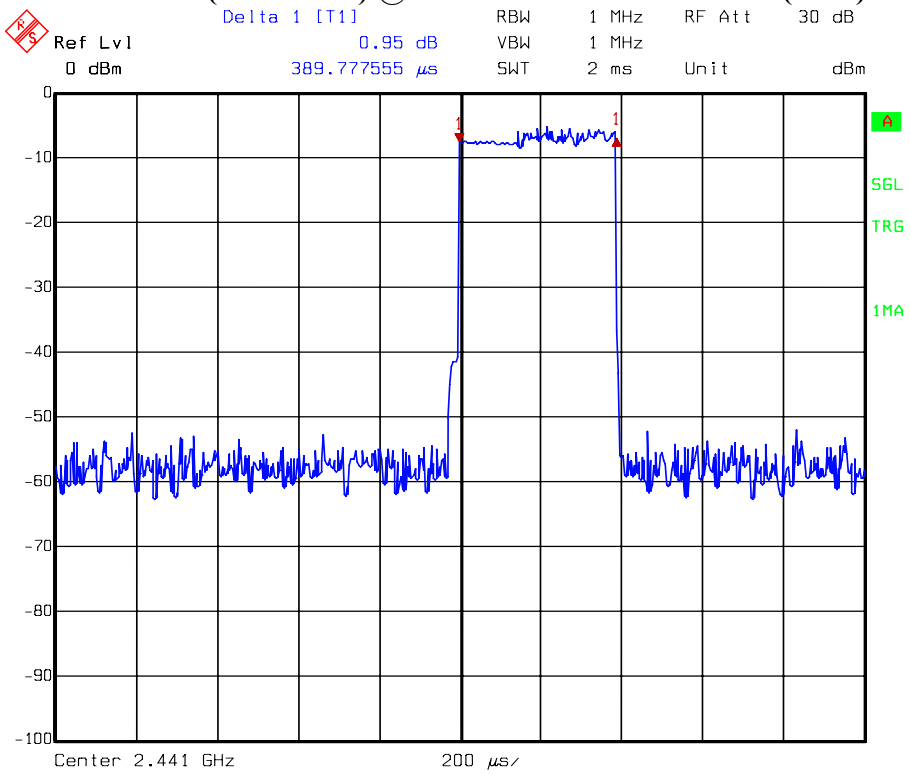
Dwell time (Pulse time) @ GFSK mode Channel 39 (DH5)



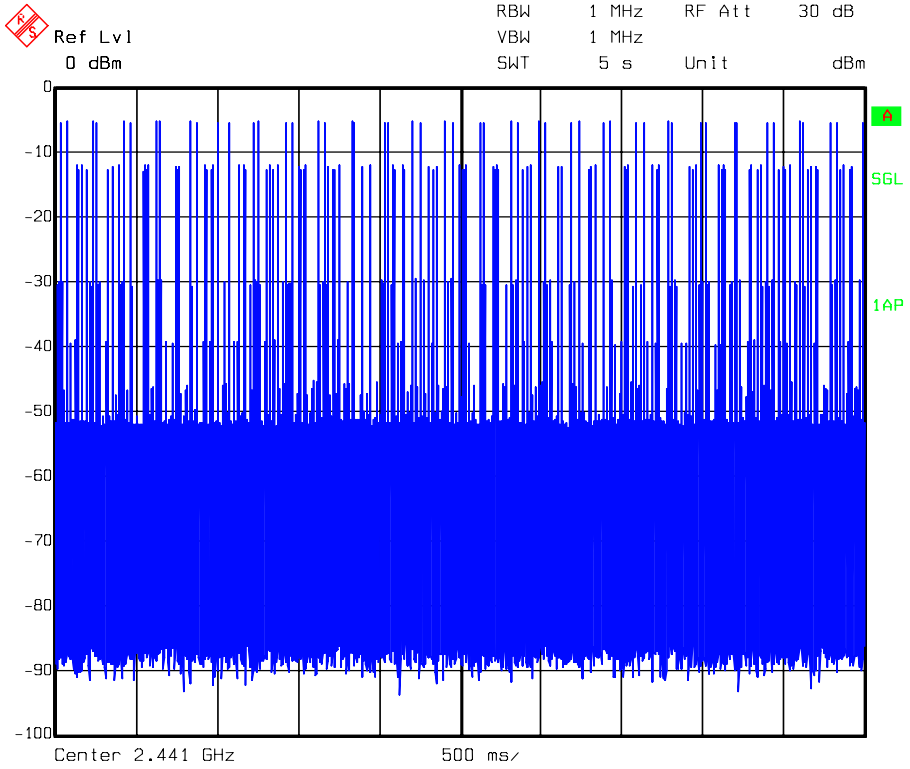
Dwell time (Number of pulse) @ GFSK mode Channel 39 (DH5)



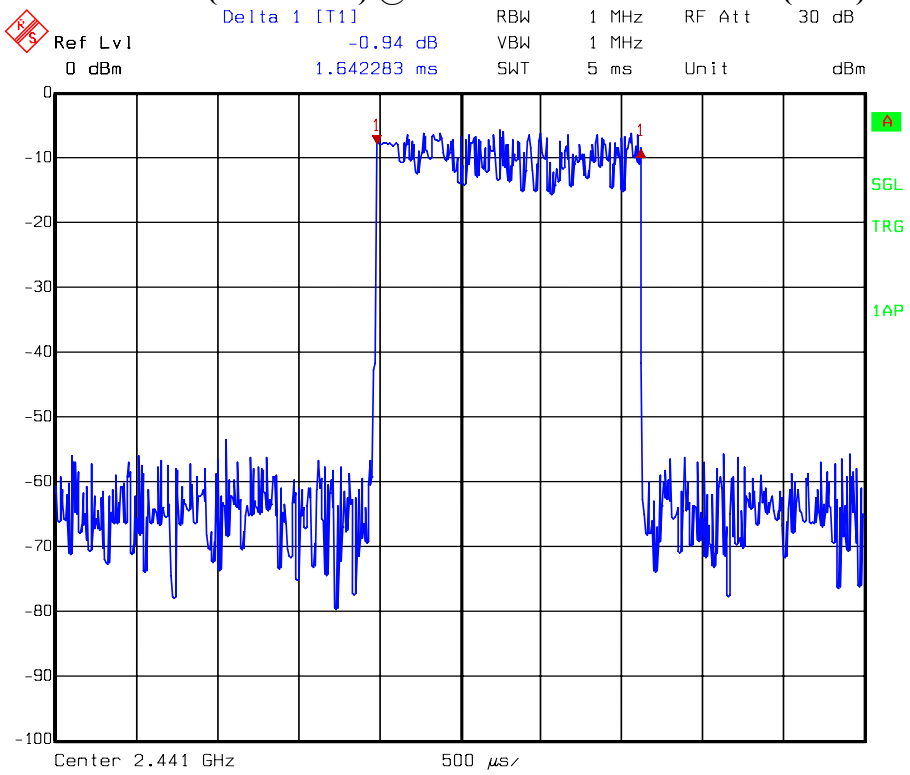
Dwell time (Pulse time) @ 8-DPSK mode Channel 39 (DH1)



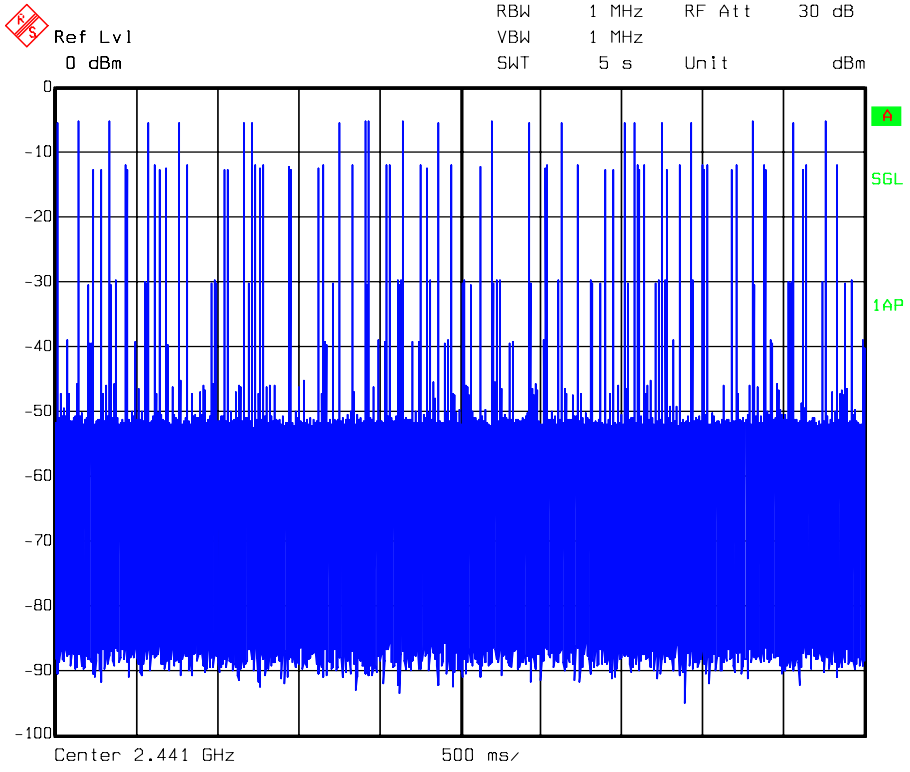
Dwell time (Number of pulse) @ 8-DPSK mode Channel 39 (DH1)



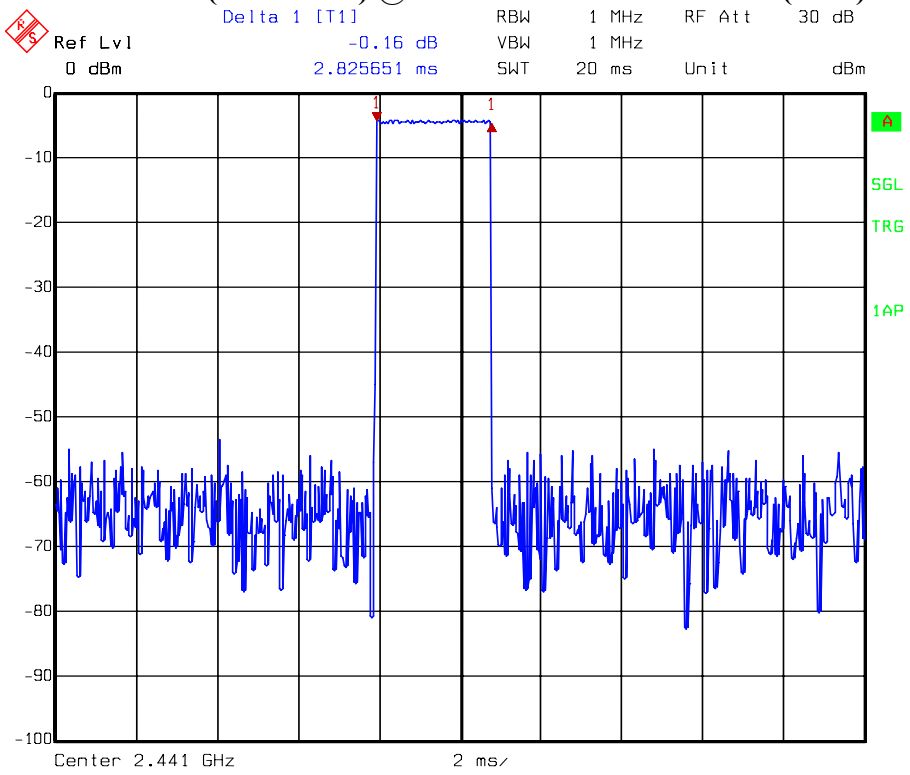
Dwell time (Pulse time) @ 8-DPSK mode Channel 39 (DH3)



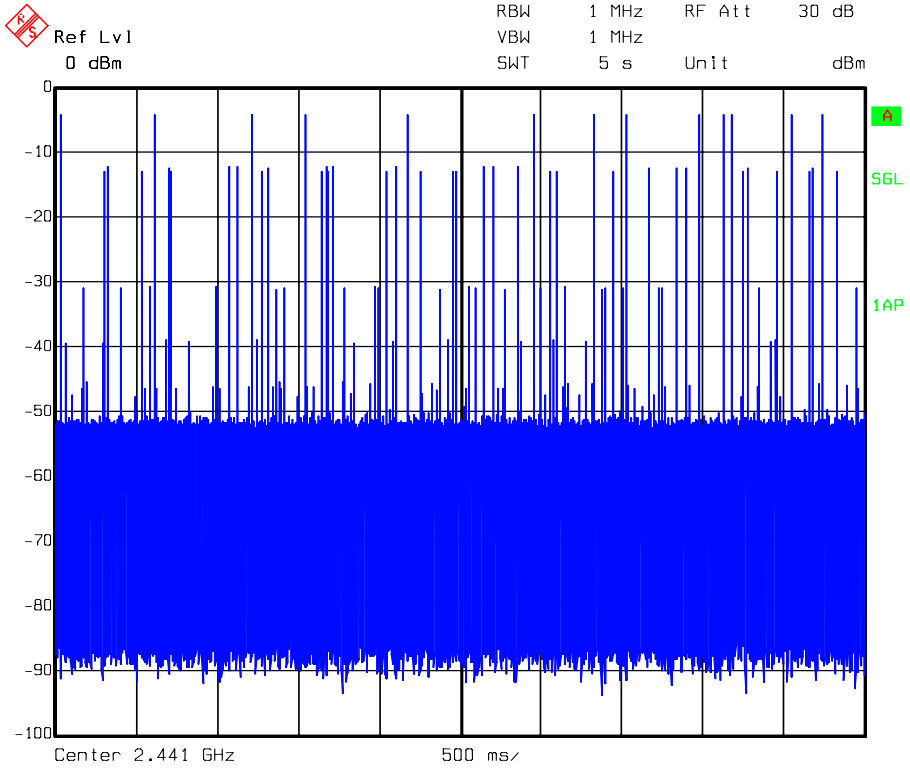
Dwell time (Number of pulse) @ 8-DPSK mode Channel 39 (DH3)



Dwell time (Pulse time) @ 8-DPSK mode Channel 39 (DH5)



Dwell time (Number of pulse) @ 8-DPSK mode Channel 39 (DH5)



7. Maximum Output Power test

7.1 Operating environment

Temperature: 23 ℃
Relative Humidity: 55 %
Atmospheric Pressure: 1008 hPa
Test Date: Jul. 03, 2013

7.2 Test setup & procedure

The test procedure was according to FCC measurement guidelines DA 00-705.
The power output per FCC §15.247(b) was measured on the EUT using a 50 ohm SMA cable connected to peak power meter via power sensor. Power was read directly and cable loss correction (2 dB) was added to the reading to obtain power at the EUT antenna terminals. The test was performed at 3 channels (lowest, middle and highest channel).

7.3 Measured data of Maximum Output Power test results

Mode	Channel	Frequency (MHz)	Output Power (dBm) (PK)	Total Power (mW) (PK)	Limit (dBm)	Margin (dB)
GFSK	0	2402	0.45	1.11	30	-29.55
	39	2441	0.39	1.09	30	-29.61
	78	2480	0.23	1.05	30	-29.77
π/4-DPSK	0	2402	-0.8	0.83	30	-30.80
	39	2441	-0.84	0.82	30	-30.84
	78	2480	-1.04	0.79	30	-31.04
8-DPSK	0	2402	-0.45	0.90	30	-30.45
	39	2441	-0.51	0.89	30	-30.51
	78	2480	-0.31	0.93	30	-30.31

8. RF Antenna Conducted Spurious test

8.1 Operating environment

Temperature:	23	℃
Relative Humidity:	55	%
Atmospheric Pressure:	1008	hPa
Test Date:	Jul. 04, 2013	

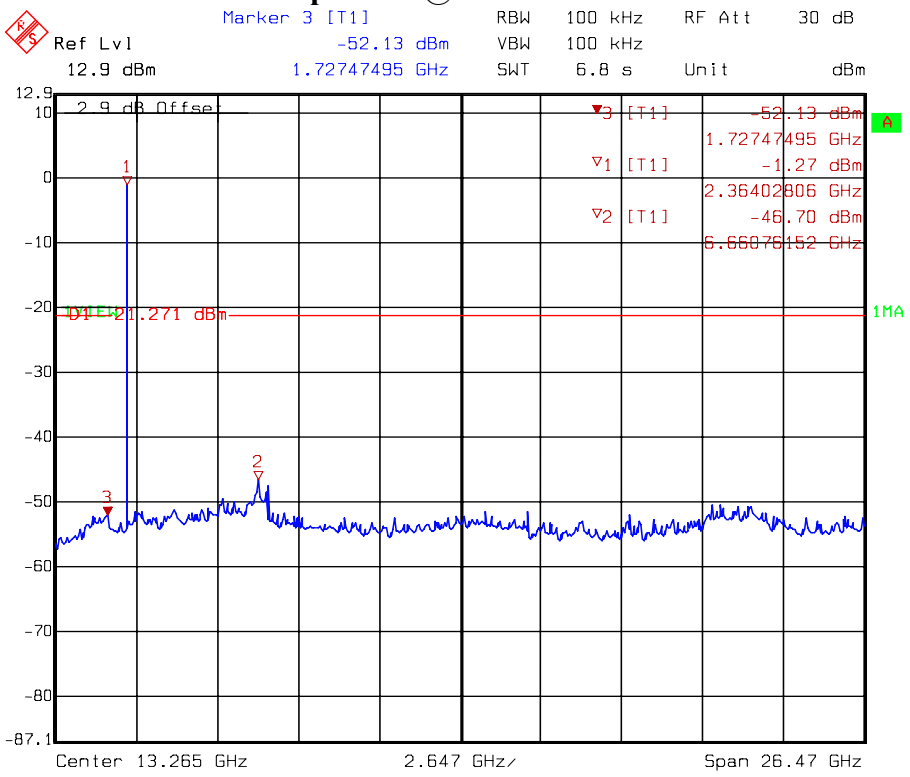
8.2 Test setup & procedure

The test procedure was according to FCC measurement guidelines DA 00-705.

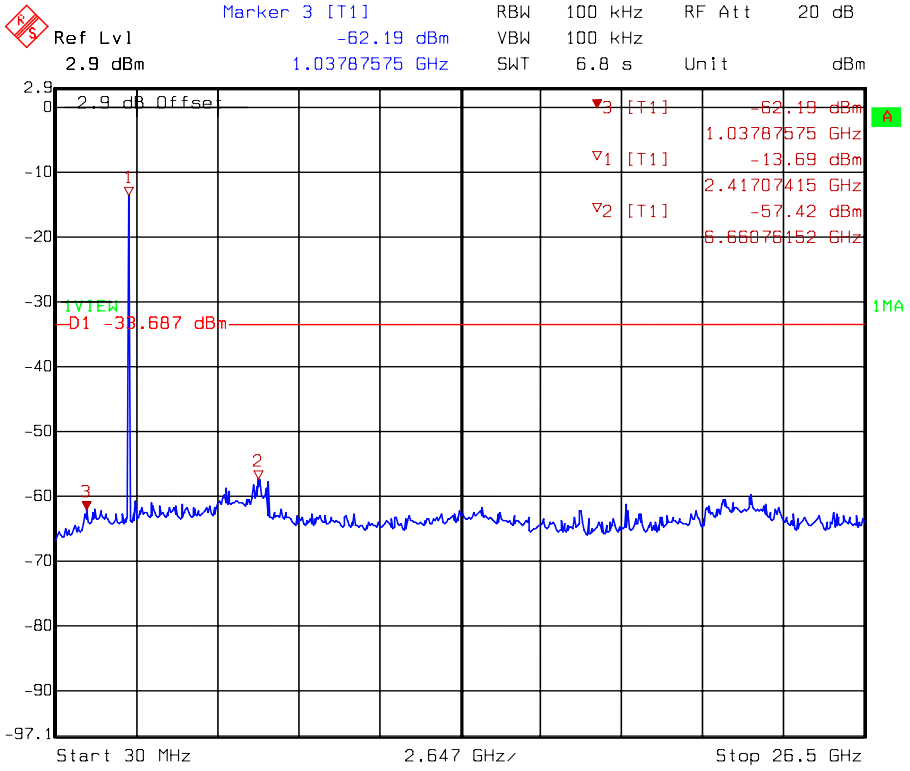
The measurements were performed from 30MHz to 25GHz RF antenna conducted per FCC 15.247 (c) was measured from the EUT antenna port using a 50ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz.
Harmonics and spurious noise must be at least 20dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. The table below is the results from the highest emission for each channel within the authorized band. This table was used to determine the spurious limits for each channel.

8.3 Measured data of the highest RF Antenna Conducted Spurious test result

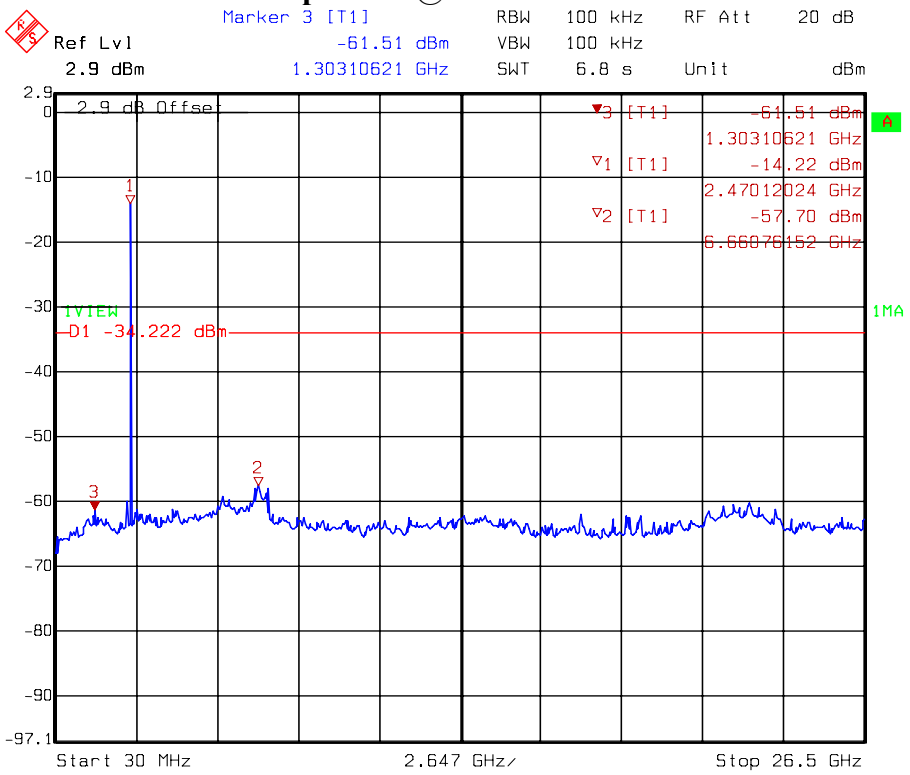
Conducted spurious @ GFSK mode Channel 0



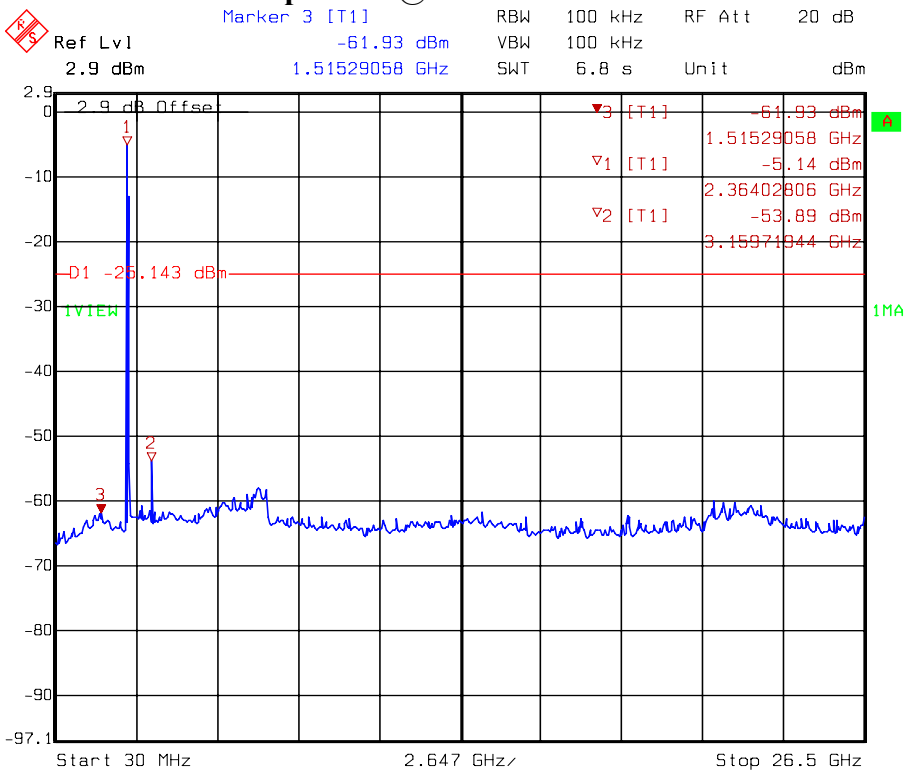
Conducted spurious @ GFSK mode Channel 39



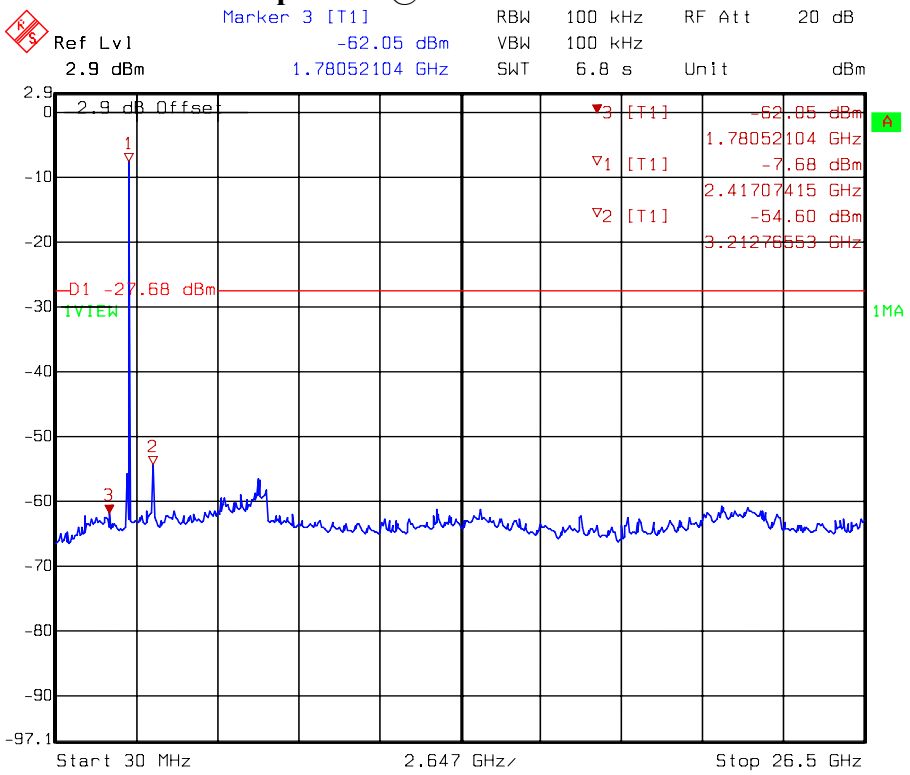
Conducted spurious @ GFSK mode Channel 78



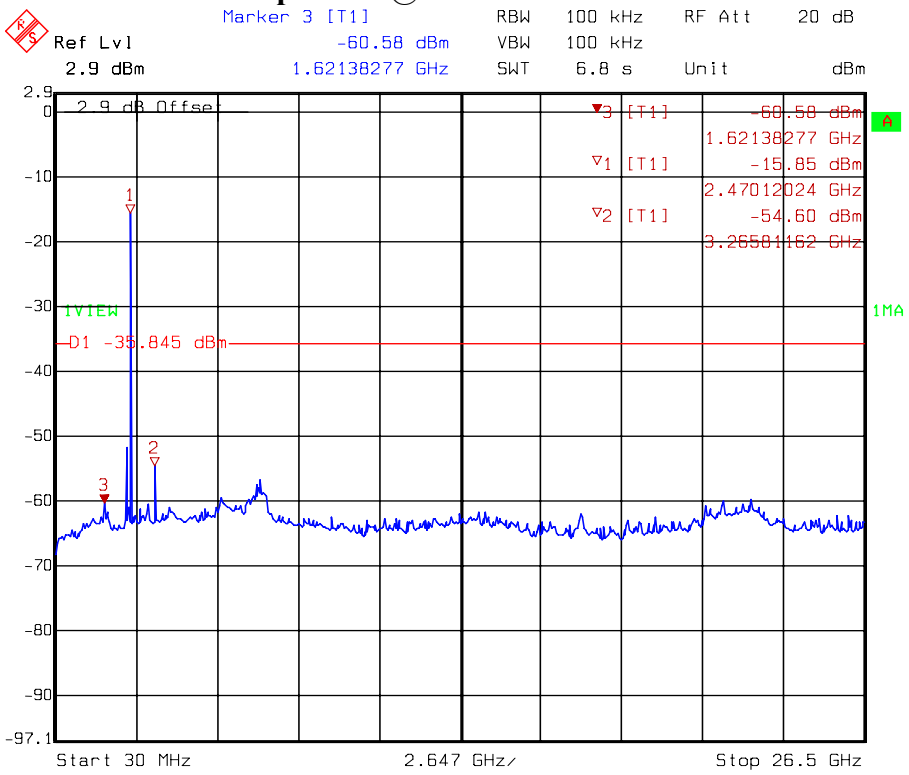
Conducted spurious @ π/4-DPSK mode Channel 0



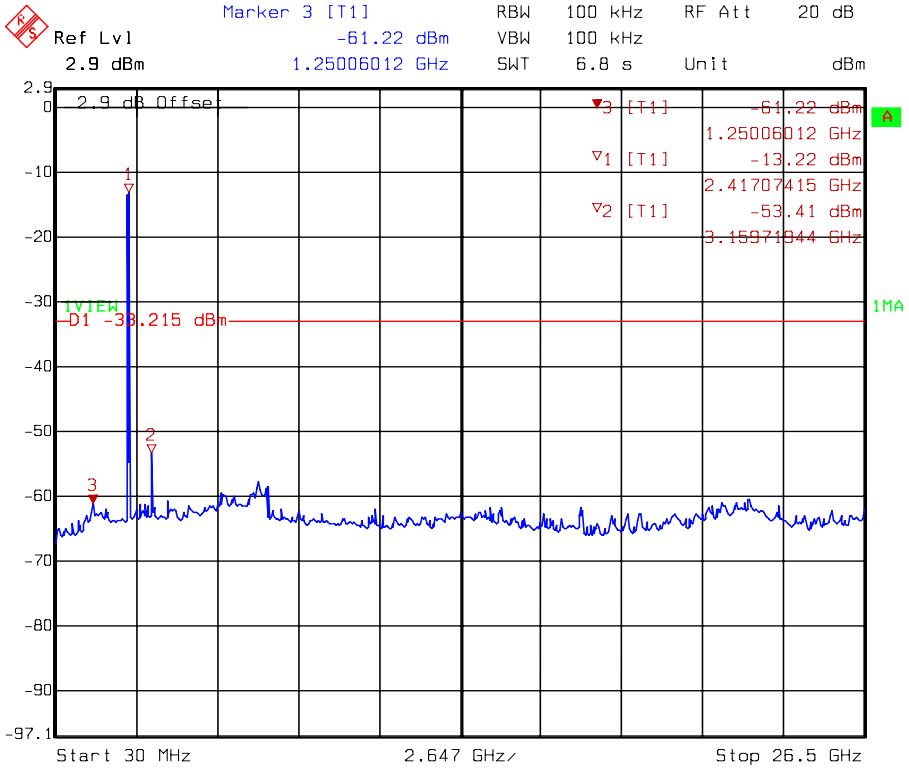
Conducted spurious @ π/4-DPSK mode Channel 39



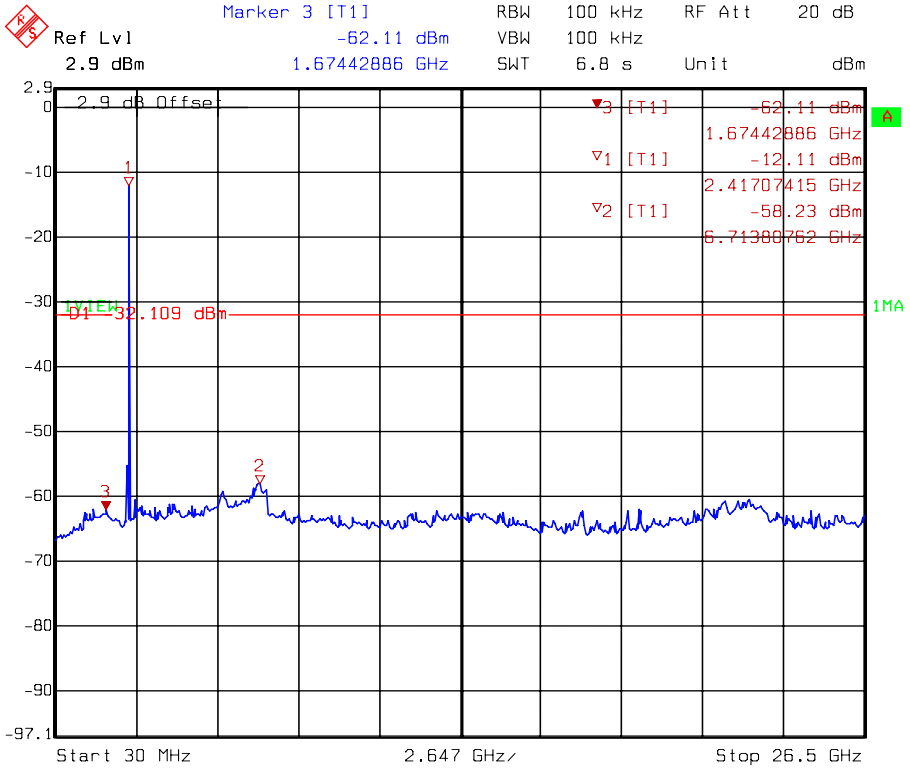
Conducted spurious @ π/4-DPSK mode Channel 78



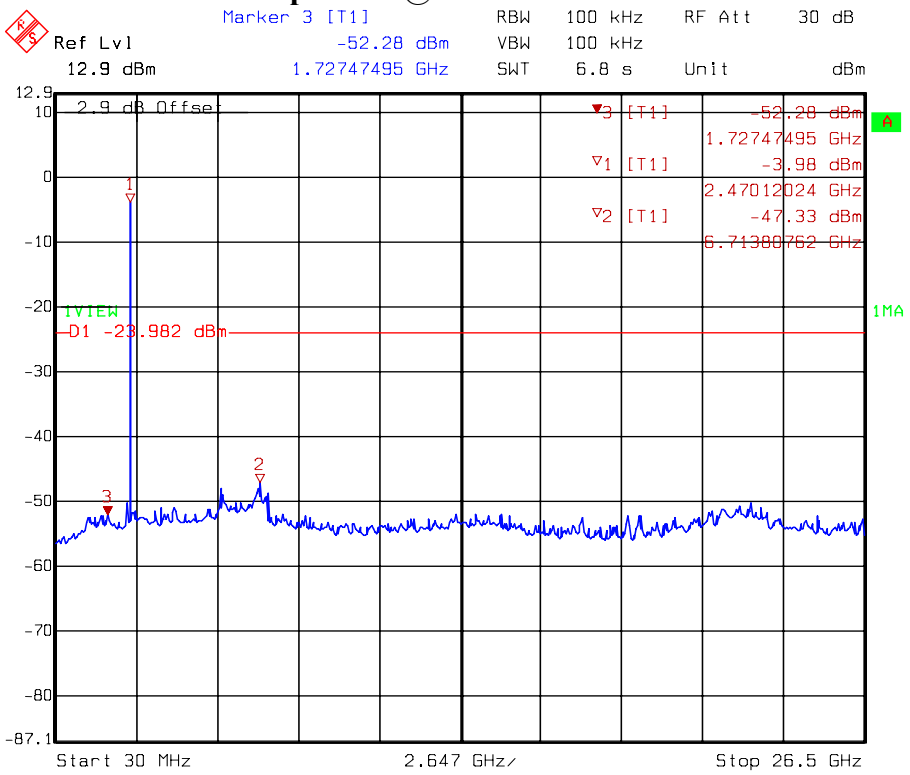
Conducted spurious @ 8-DPSK mode Channel 0



Conducted spurious @ 8-DPSK mode Channel 39



Conducted spurious @ 8-DPSK mode Channel 78



9. Radiated Emission test

9.1 Operating environment

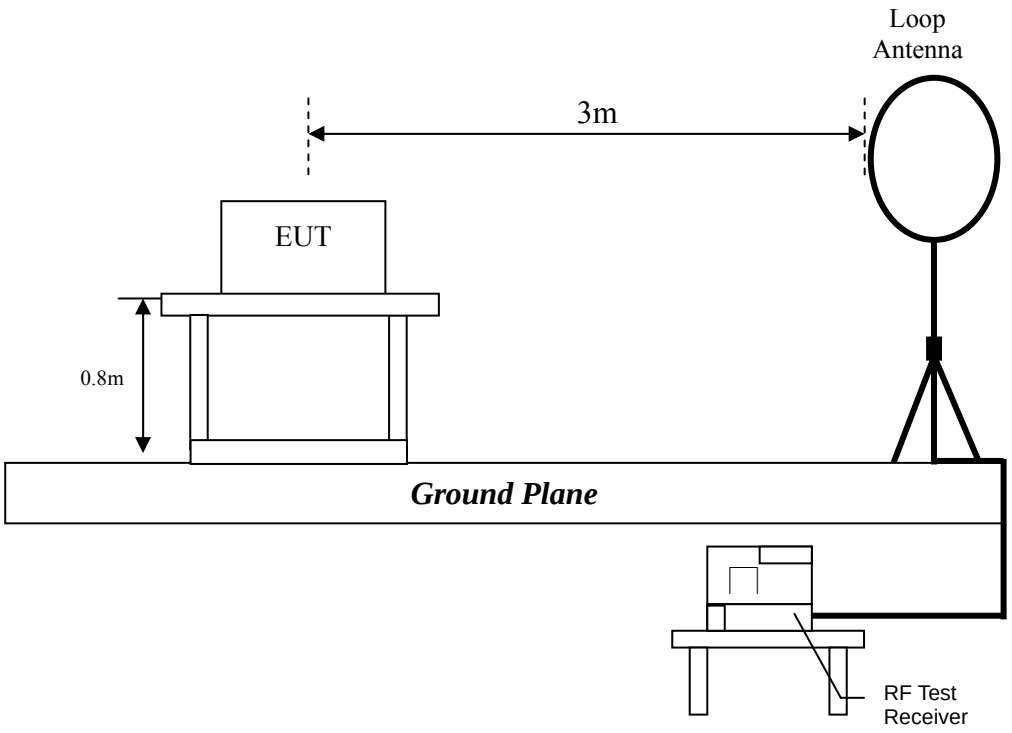
Temperature:	22	℃
Relative Humidity:	52	%
Atmospheric Pressure:	1008	hPa
Test Date:	Jul. 04, 2013~Jul. 17, 2013	

9.2 Test setup & procedure

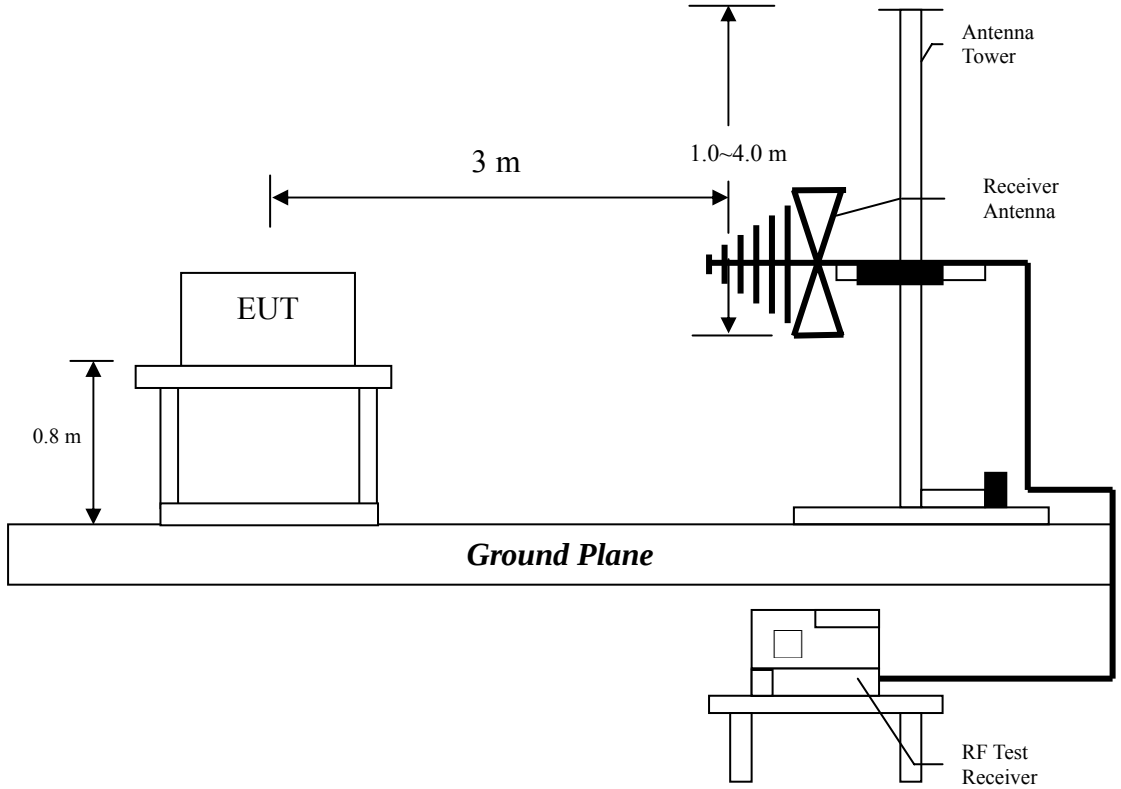
The test procedure was according to FCC measurement guidelines DA 00-705 and ANSI C63.4/2003.

The Diagram below shows the test setup, which is utilized to make these measurements.

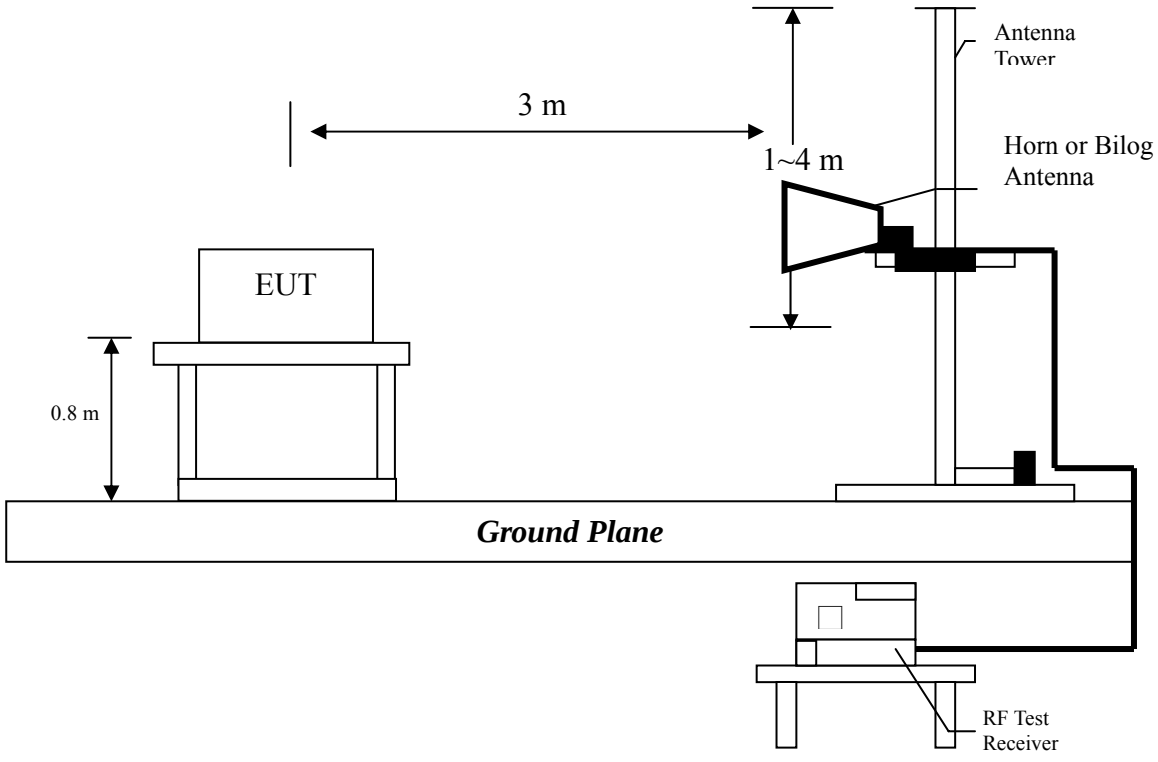
Radiated emission from 9kHz to 30MHz uses Loop Antenna:



Radiated emission from 30MHz to 1GHz uses Bilog Antenna:



Radiated emission above 1GHz uses Horn Antenna:



The signal is maximized through rotation and placement in the three orthogonal axes. According to §15.33(a), the spectrum shall be investigated from the lowest radio frequency signal generated in the device, to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower. Spectrum Analyzer Resolution Bandwidth is 100kHz or greater for frequencies 30MHz to 1GHz, 1MHz – for frequencies above 1GHz.

The EUT for testing is arranged on a fiberglass turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent 3 meter reading using inverse scaling with distance.

The EUT configuration refers to the "Spurious set-up photo.pdf".

9.3 Emission limits

The spurious Emission shall test through the 10th harmonic. 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).

Frequency (MHz)	Field Strength (microvolts/meter)
0.009~0.490	2400/F(kHz)
0.490~1.705	2400/F(kHz)
1.705~30	30
30-88	100
88-216	150
216-960	200
Above 960	500

Remark:
1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

9.4 Radiated spurious emission test data

9.4.1 Measurement results: frequencies equal to or less than 1 GHz

The test was performed on EUT under GFSK, π/4-DPSK and 8-DPSK mode. The worst case occurred at GFSK mode (DH5) Channel 39.

EUT : K110
Worst Case : GFSK mode (DH5) at Channel 39

Antenna Polariz. (V/H)	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
V	51.34	QP	12.90	18.45	31.34	40.00	-8.66
V	99.84	QP	7.38	24.55	31.92	43.50	-11.58
V	237.58	QP	12.18	20.36	32.54	46.00	-13.46
V	423.82	QP	16.47	16.89	33.36	46.00	-12.64
V	493.66	QP	18.43	14.55	32.97	46.00	-13.03
V	718.70	QP	22.29	20.27	42.55	46.00	-3.45
H	99.84	QP	7.93	20.59	28.51	43.50	-14.99
H	241.46	QP	12.36	24.65	37.01	46.00	-8.99
H	260.86	QP	12.88	19.92	32.80	46.00	-13.20
H	336.52	QP	14.40	21.17	35.56	46.00	-10.44
H	423.82	QP	16.81	17.57	34.38	46.00	-11.62
H	720.64	QP	22.44	22.35	44.79	46.00	-1.21

Remark:1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

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

9.4.2 Measurement results: frequency above 1GHz

EUT : K110
Test Condition : GFSK mode (DH5) at Channel 0

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4804	PK	V	35.1	38.54	36.67	40.11	54	-13.89
4804	PK	H	35.1	38.54	36.64	40.08	54	-13.92

Remark:
1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

EUT : K110
Test Condition : GFSK mode (DH5) at Channel 39

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4882	PK	V	35.1	38.54	36.75	40.19	54	-13.81
4882	PK	H	35.1	38.54	38.18	41.62	54	-12.38

Remark:
1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

EUT : K110
Test Condition : GFSK mode (DH5) at Channel 78

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4960	PK	V	35.1	38.54	38.57	42.01	54	-11.99
4960	PK	H	35.1	38.54	37.19	40.63	54	-13.37

Remark:
1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

EUT : K110
Test Condition : π/4-DPSK mode (DH5) at Channel 0

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4804	PK	V	35.1	38.54	36.54	39.98	54	-14.02
4804	PK	H	35.1	38.54	35.68	39.12	54	-14.88

Remark:
1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

EUT : K110
Test Condition : π/4-DPSK mode (DH5) at Channel 39

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4882	PK	V	35.1	38.54	37.17	40.61	54	-13.39
4882	PK	H	35.1	38.54	36.75	40.19	54	-13.81

Remark:
1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

EUT : K110
Test Condition : π/4-DPSK mode (DH5) at Channel 78

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4960	PK	V	35.1	38.54	36.38	39.82	54	-14.18
4960	PK	H	35.1	38.54	36.72	40.16	54	-13.84

Remark:
1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

EUT : K110
Test Condition : 8-DPSK mode (DH5) at Channel 0

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4804	PK	V	35.1	38.54	36.81	40.25	54	-13.75
4804	PK	H	35.1	38.54	36.38	39.82	54	-14.18

Remark:
1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

EUT : K110
Test Condition : 8-DPSK mode (DH5) at Channel 39

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4882	PK	V	35.1	38.54	37.57	41.01	54	-12.99
4882	PK	H	35.1	38.54	37.08	40.52	54	-13.48

Remark:
1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

EUT : K110
Test Condition : 8-DPSK mode (DH5) at Channel 78

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4960	PK	V	35.1	38.54	36.72	40.16	54	-13.84
4960	PK	H	35.1	38.54	36.8	40.24	54	-13.76

Remark:
1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

10. Emission on the band edge §FCC 15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.

10.1 Operating environment

Temperature: 23 ℃
Relative Humidity: 55 %
Atmospheric Pressure: 1008 hPa
Test Date: Jul. 08, 2013

10.2 Test setup & procedure

Please refer to the section 9.2 of this report.

10.3 Test Result

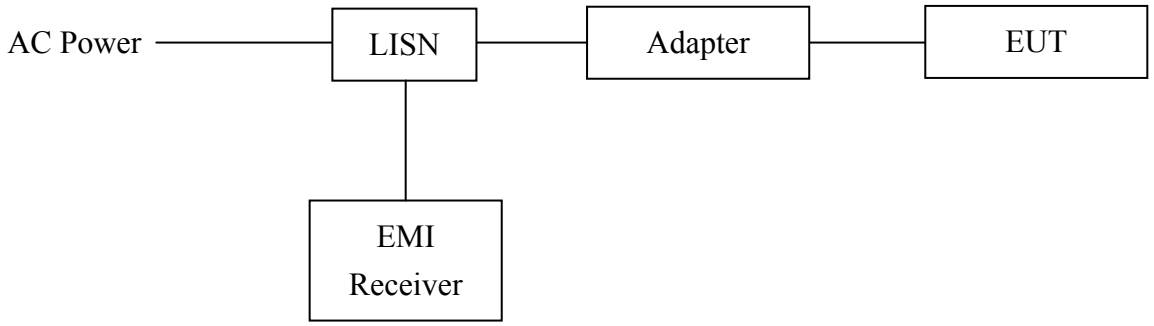
Mode	Restricted Band (MHz)	Freq. (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
GFSK	2310~2390	2340.00	PK	H	38.008	31.612	64.496	58.10	74	-15.90
		2340.00	AV	H	38.008	31.612	51.836	45.44	54	-8.56
	-	2402.00	PK	H	38.025	31.907	106.777	100.66	-	100.66
		2402.00	AV	H	38.025	31.907	90.327	84.21	-	84.21
	-	2480.00	PK	H	38.045	32.278	103.797	98.03	-	98.03
		2480.00	AV	H	38.045	32.278	92.057	86.29	-	86.29
	2483.5~2500	2483.49	PK	H	38.046	32.294	66.681	60.93	74	-13.07
		2483.49	AV	H	38.046	32.294	59.141	53.39	54	-0.61
8-DPSK	2310~2390	2338.60	PK	H	38.008	31.606	64.622	58.22	74	-15.78
		2338.60	AV	H	38.008	31.606	51.842	45.44	54	-8.56
	-	2402.00	PK	H	38.025	31.907	105.527	99.41	-	99.41
		2402.00	AV	H	38.025	31.907	89.987	83.87	-	83.87
	-	2480.00	PK	H	38.045	32.278	102.467	96.70	-	96.70
		2480.00	AV	H	38.045	32.278	88.167	82.40	-	82.40
	2483.5~2500	2483.50	PK	H	38.046	32.294	65.991	60.24	74	-13.76
		2483.50	AV	H	38.046	32.294	57.421	51.67	54	-2.33

11. Power Line Conducted Emission test §FCC 15.207

11.1 Operating environment

Temperature:	23	℃
Relative Humidity:	52	%
Atmospheric Pressure	1008	hPa
Test Date:	Jun. 11, 2013	

11.2 Test setup & procedure



The test procedure was according to ANSI C63.4/2003.

The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50 ohm/50uH coupling impedance with 50 ohm termination.
Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/2003 on conducted measurement. The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9 kHz.

The EUT configuration refers to the “Conducted set-up photo.pdf”.

11.3 Emission limit

Freq. (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56*	56 – 46*
0.50~5.00	56	46
5.00~30.0	60	50

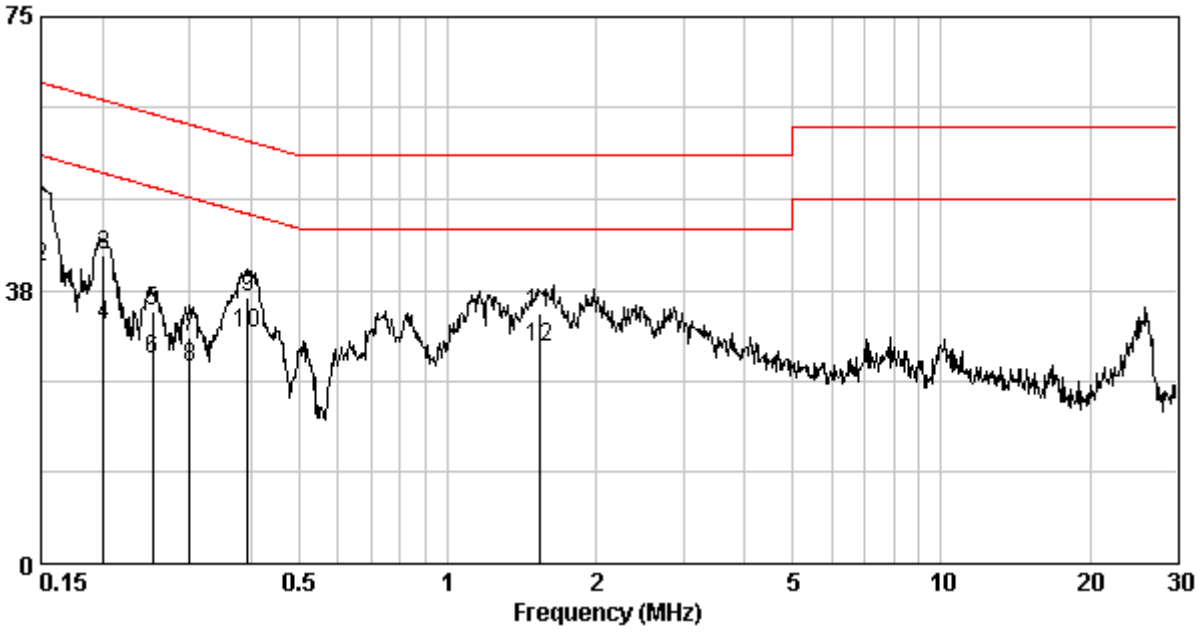
*Decreases with the logarithm of the frequency.

11.4 Power Line Conducted Emission test data

Phase: Line
Model No.: K110
Operating mode: TX mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Margin (dB) Av
0.150	0.13	49.48	66.00	40.70	56.00	-16.52	-15.30
0.201	0.14	42.20	63.58	32.59	53.58	-21.38	-20.99
0.252	0.14	34.66	61.69	27.94	51.69	-27.02	-23.74
0.300	0.15	31.17	60.24	27.03	50.24	-29.06	-23.20
0.393	0.16	36.53	57.99	31.53	47.99	-21.46	-16.46
1.544	0.24	34.32	56.00	29.64	46.00	-21.68	-16.36

Remark:
1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



Phase: Neutral
Model No.: K110
Operating mode: TX mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Margin (dB) Av
0.151	0.10	50.41	65.96	43.47	55.96	-15.55	-12.49
0.202	0.11	43.73	63.54	37.09	53.54	-19.81	-16.45
0.253	0.11	39.81	61.64	33.36	51.64	-21.83	-18.28
0.299	0.11	38.11	60.28	33.62	50.28	-22.16	-16.65
0.354	0.12	35.29	58.87	31.33	48.87	-23.58	-17.54
0.417	0.12	37.88	57.51	32.71	47.51	-19.62	-14.79

Remark:
1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)