EMC
TEST REPORT

Report No.: TS13070084-EME
Model No.: T647
Issued Date: Jul. 22, 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**

Testing Laboratory
0597

The test report was prepared by:

Sunny Liu / Senior officer

These measurements were taken by:

Arthur Tsai/ Engineer

The test report was reviewed by:

Name Jimmy Yang
Title Engineer

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Summary of Tests

Test	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.:	T647
FCC ID.:	ZJLKOBOT647
Frequency Range:	2402 MHz ~ 2480 MHz
Channel Number:	79 channels
Frequency of Each Channel:	2402 + k MHz; k = 0~78
Type of Modulation:	GFSK, π/4DPSK, 8DPSK
Rated Power:	1. DC 3.7 V from battery 2. DC 5.35 V from adapter
Power Cord:	N/A
Sample Received:	Jul. 10, 2013
Test Date(s):	Jul. 11, 2013 ~ Jul. 18, 2013
Note 1:	This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.
Note 2:	When determining the test conclusion, the Measurement Uncertainty of test has been considered.

1.2 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: 100-240Vac, 50-60Hz, 0.3A O/P: 5.35 Vdc, 2.0 A

1.2 Additional information about the EUT

The EUT is a Tablet(BT2.0), 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

The EUT uses a permanently connected antenna.

Antenna Gain	: 1.79 dBi max
Antenna Type	: Chip antenna
Connector Type	: N/A

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 were 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.

2.3 Peripherals equipment

Peripherals	Brand	Model No.	Serial No.	Description of Data Cable
Notebook PC	DELL	ECL089	E5420	USB shielded cable 1 meter × 1

2.3 Test equipment

Equipment	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Test Receiver	Rohde&schwarz	ESCS30	833364/011	2013/06/11	2014/06/11
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--2 7-8A	828825	2012/09/18	2014/09/18
Two-Line -V-Network	Rohde&schwarz	ESH3-Z5	825562/003	2012/10/29	2013/10/29
Power Meter	Anritsu	ML2495A	0844001	2012/10/09	2013/10/09
Power Senor	Anritsu	MA2411B	0738452	2012/10/09	2013/10/09

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

3.2 Test setup & procedure

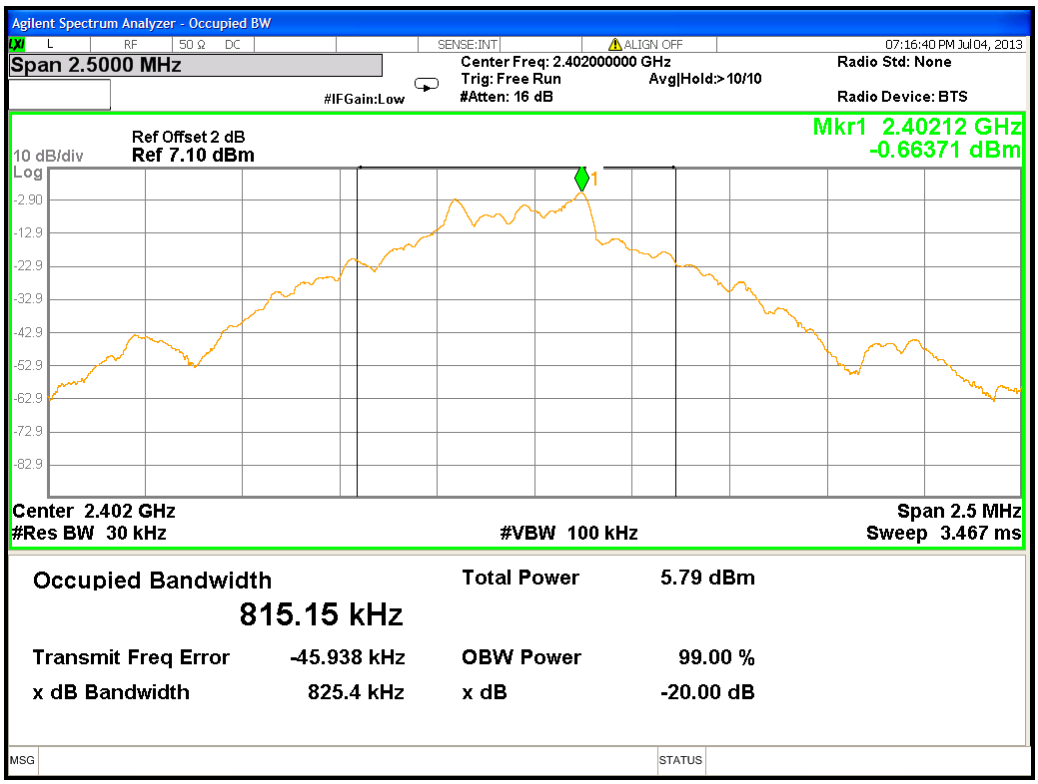
The test procedure was according to FCC measurement guidelines DA 00-705.
The 20dB bandwidth per FCC §15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at 100 kHz, the video bandwidth≧RBW, and the SPAN may equal to approximately 2 to 3 times the 20dB bandwidth. 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

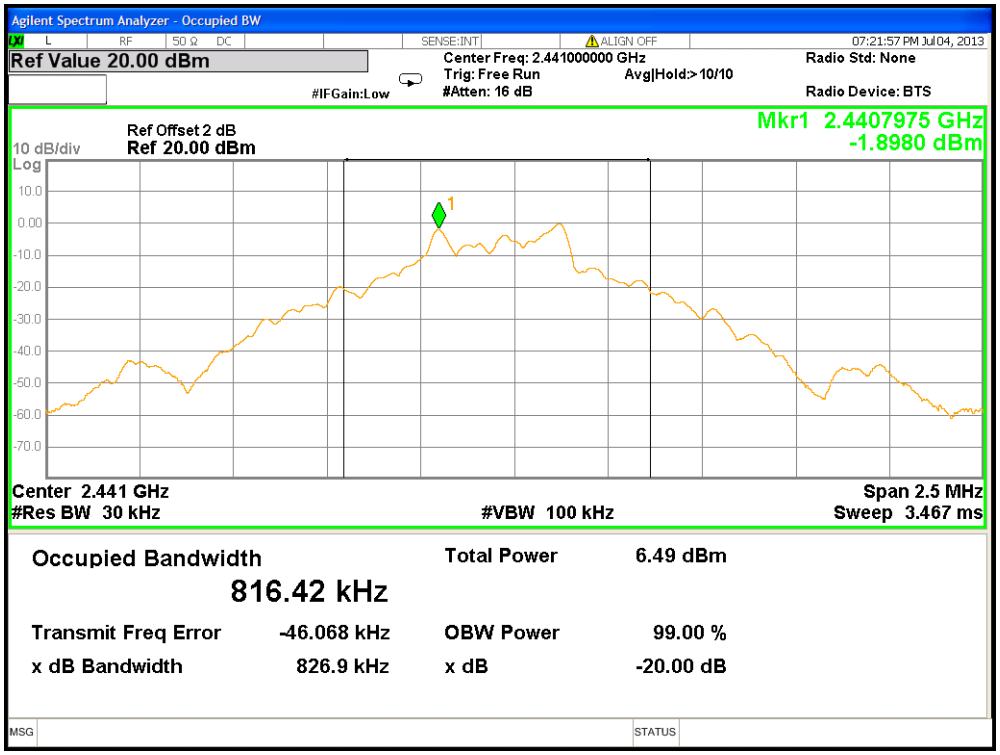
Mode	Channel	Frequency (MHz)	20dB Bandwidth (kHz)
GFSK	0	2402	0.8254
	39	2441	0.8269
	78	2480	0.8249
π/4DPSK	0	2402	1.219
	39	2441	1.220
	78	2480	1.215
8DPSK	0	2402	1.248
	39	2441	1.248
	78	2480	1.247

Please see the plot below.

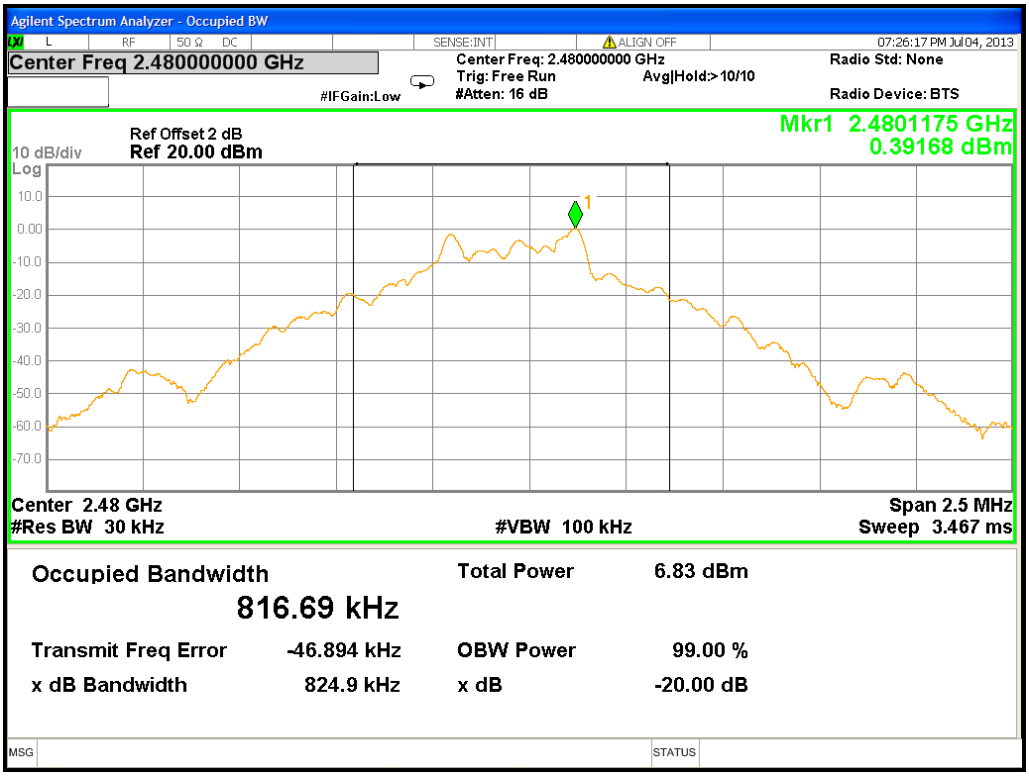
20 dB Bandwidth @ GFSK mode channel 0



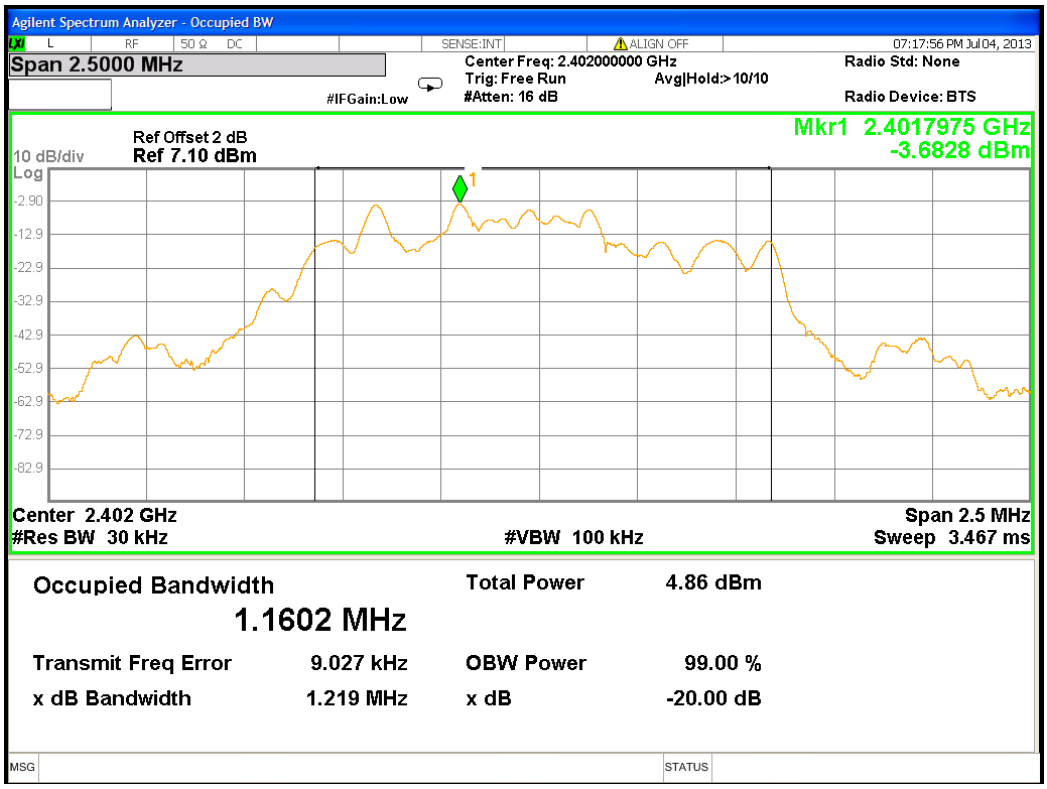
20 dB Bandwidth @ GFSK mode channel 39



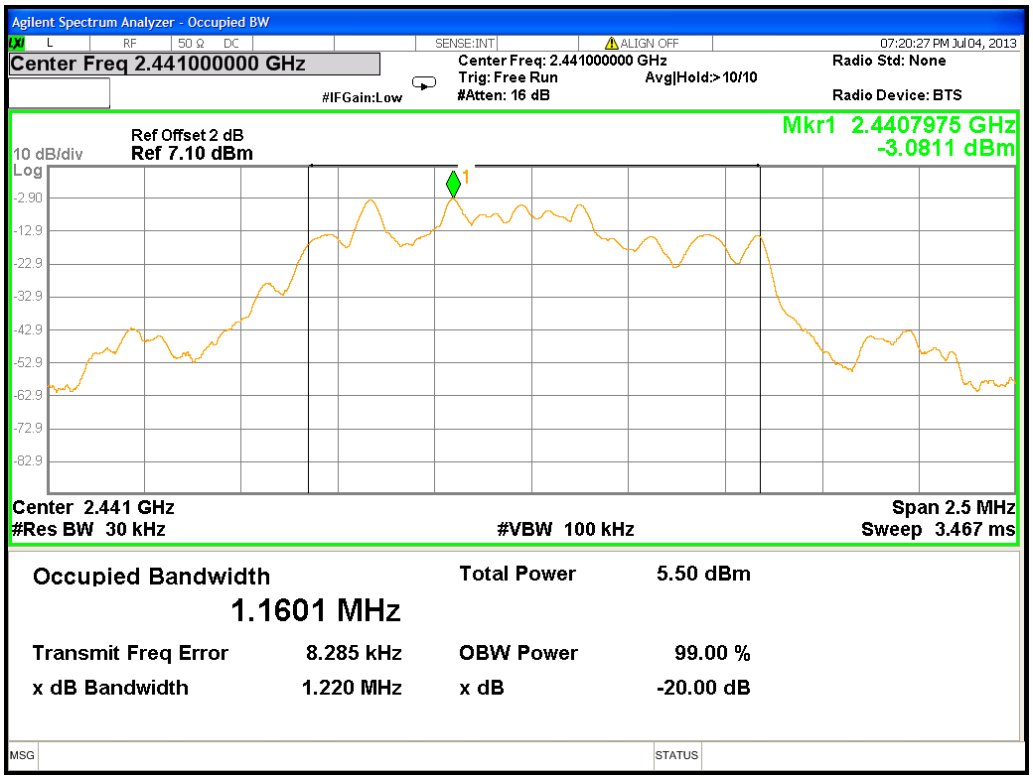
20 dB Bandwidth @ GFSK mode channel 78



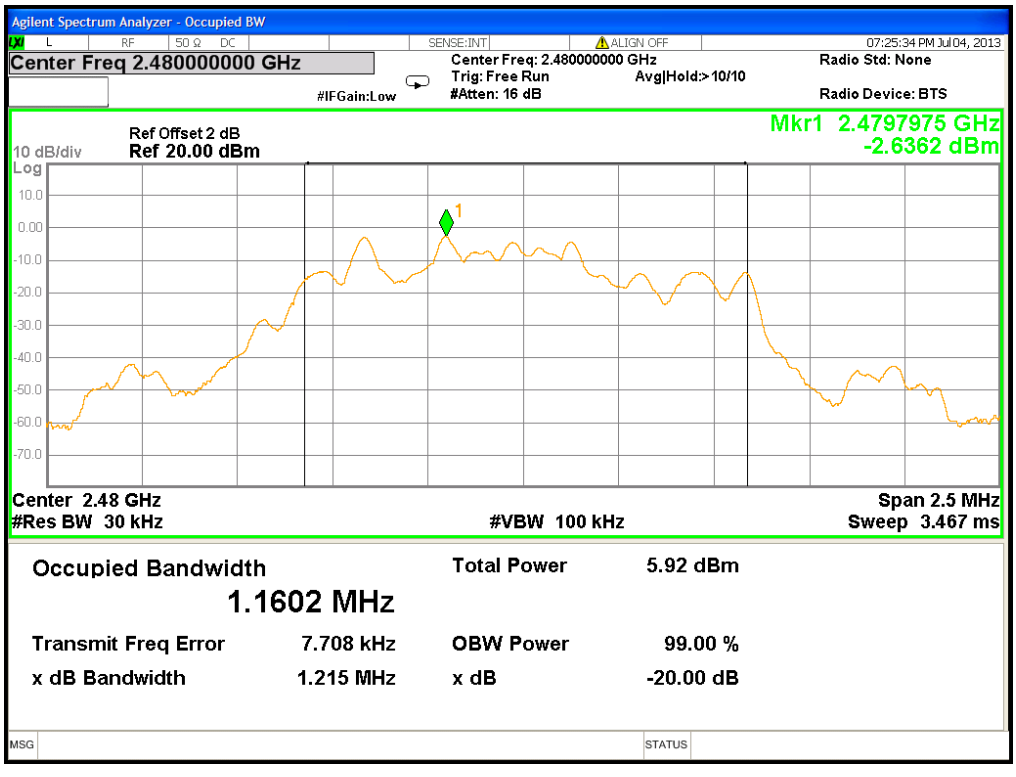
20 dB Bandwidth @ π/4DPSK mode channel 0



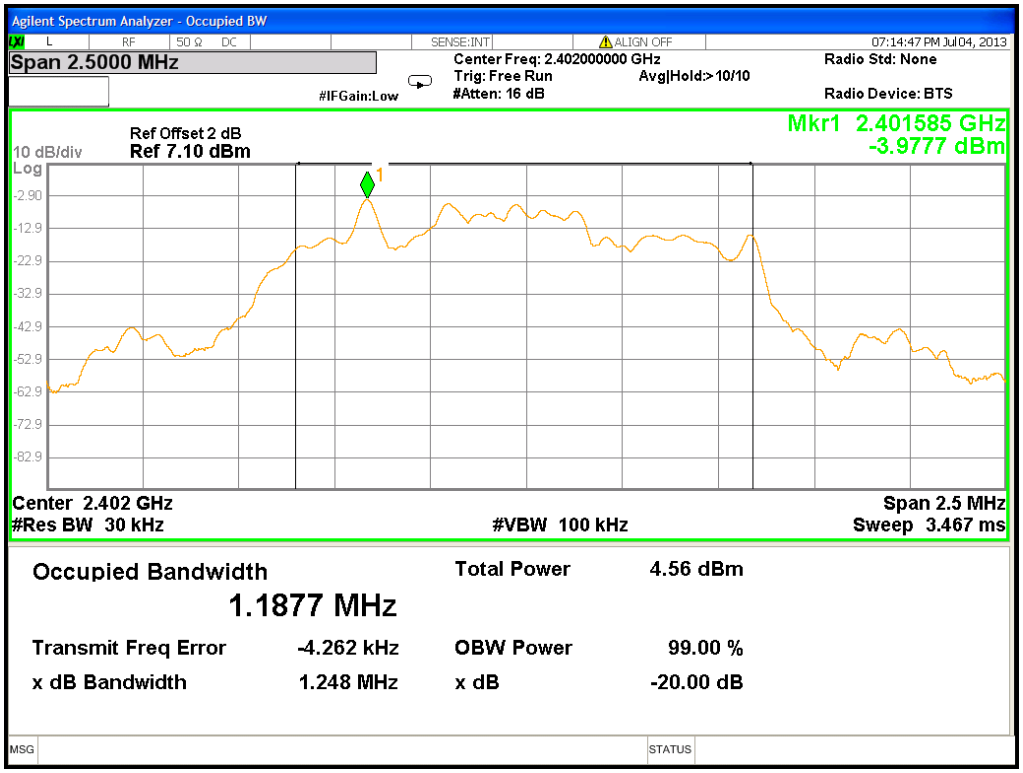
20 dB Bandwidth @ π/4DPSK mode channel 39



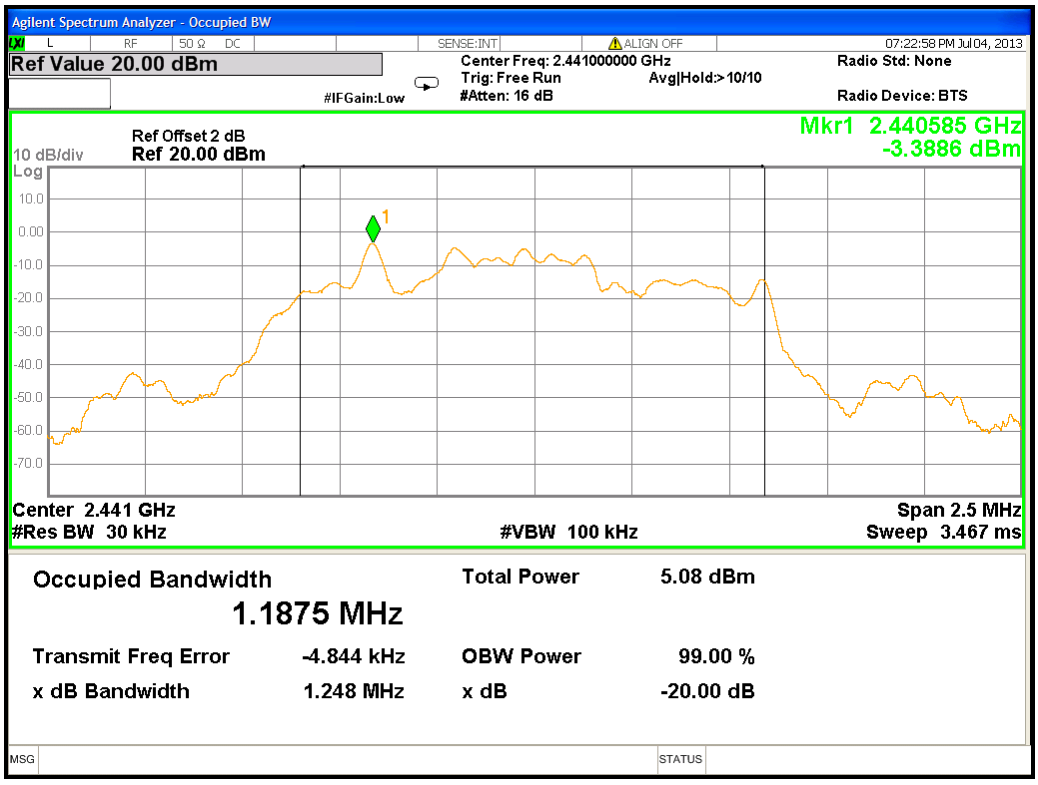
20 dB Bandwidth @ π/4DPSK mode channel 78



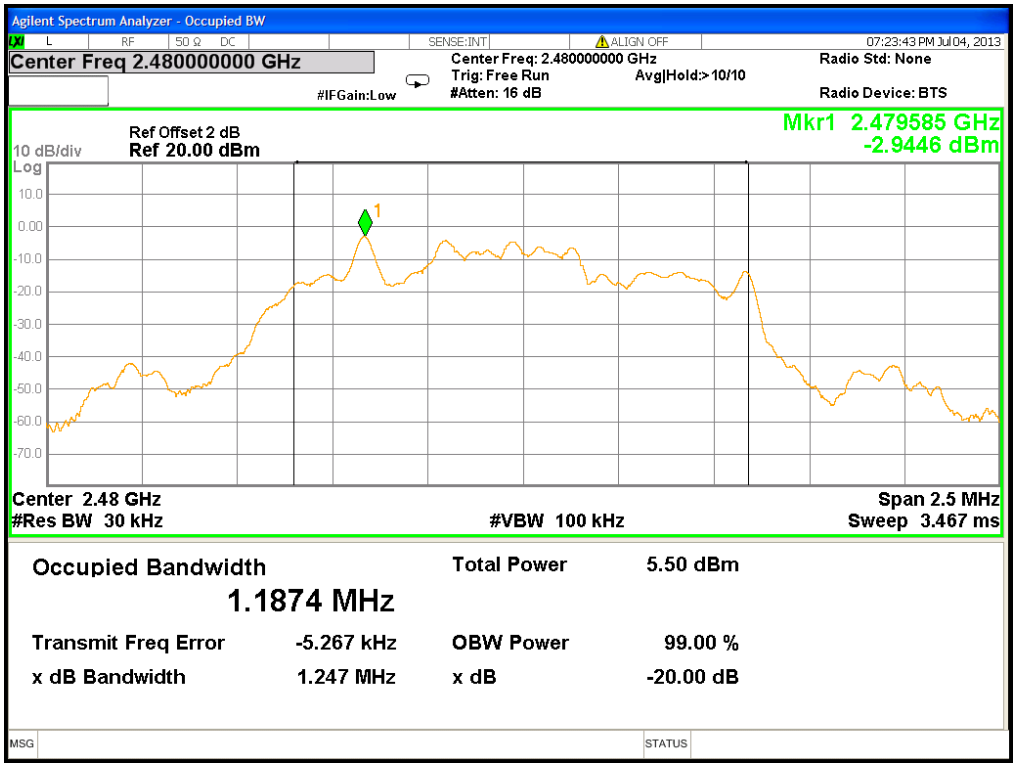
20 dB Bandwidth @ 8DPSK mode channel 0



20 dB Bandwidth @ 8DPSK mode channel 39



20 dB Bandwidth @ 8DPSK mode channel 78



4. Carrier Frequency Separation test

4.1 Operating environment

Temperature: 23 ℃
Relative Humidity: 55 %
Atmospheric Pressure: 1008 hPa

4.2 Test setup & procedure

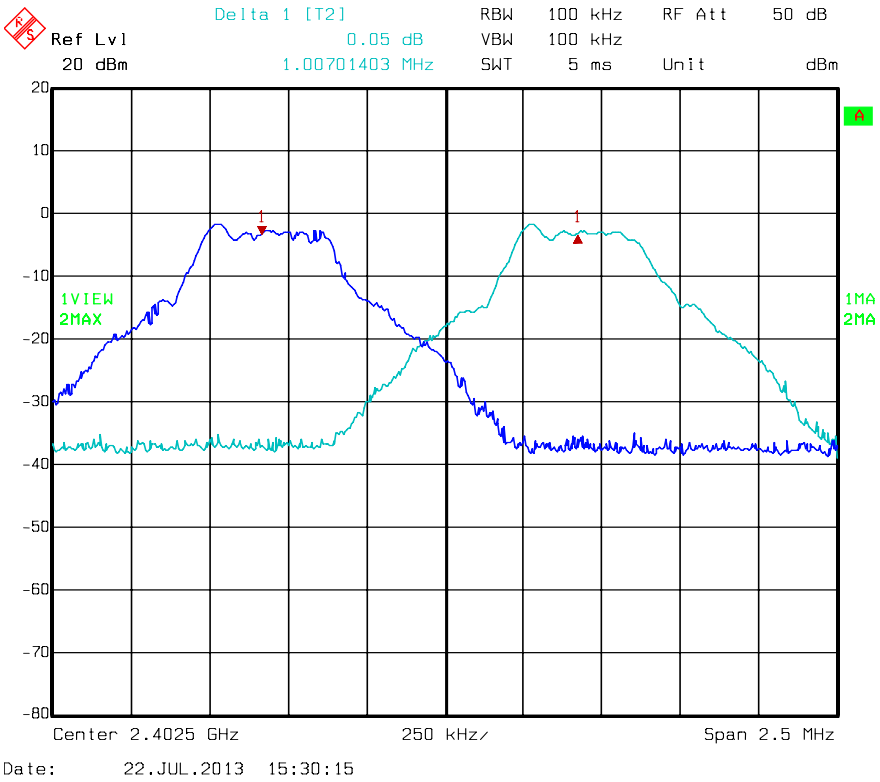
The test procedure was according to FCC measurement guidelines DA 00-705.
The carrier frequency separation per FCC §15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at ≧1% of the span, the video bandwidth≧RBW, and the SPAN was wide enough to capture the peaks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

4.3 Measured data of Carrier Frequency Separation test result

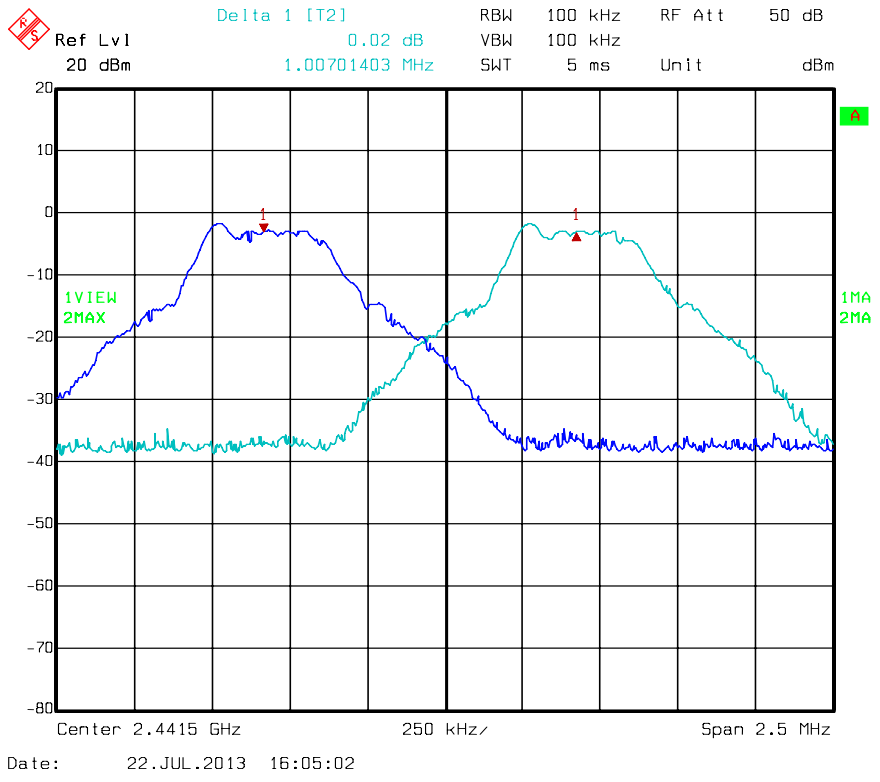
Mode	Channel	Frequency (MHz)	Adjacent channel separation (MHz)	20dB down Bandwidth (MHz)	Minimum limit 20dB BW*2/3(kHz)
GFSK	0	2402	1.010	0.8254	0.55
	39	2441	1.002	0.8269	0.55
	78	2480	1.010	0.8249	0.55
8DPSK	0	2402	1.002	1.248	0.83
	39	2441	1.014	1.248	0.83
	78	2480	1.018	1.247	0.83

Please see the spectrum plot of worst value.

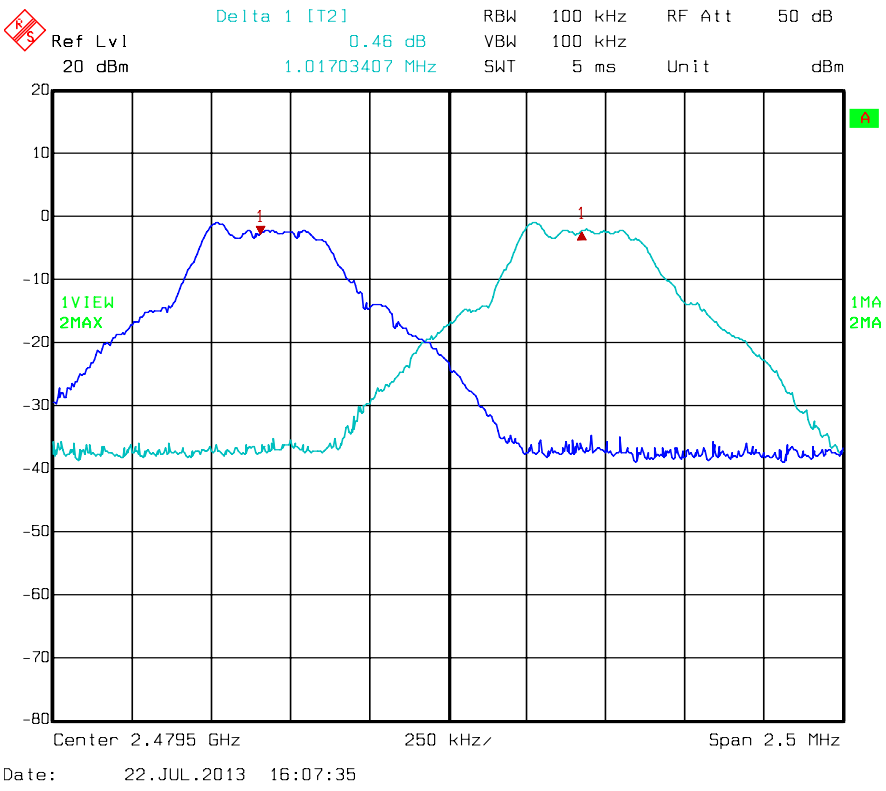
Carrier Frequency Separation @ GFSK mode channel 0



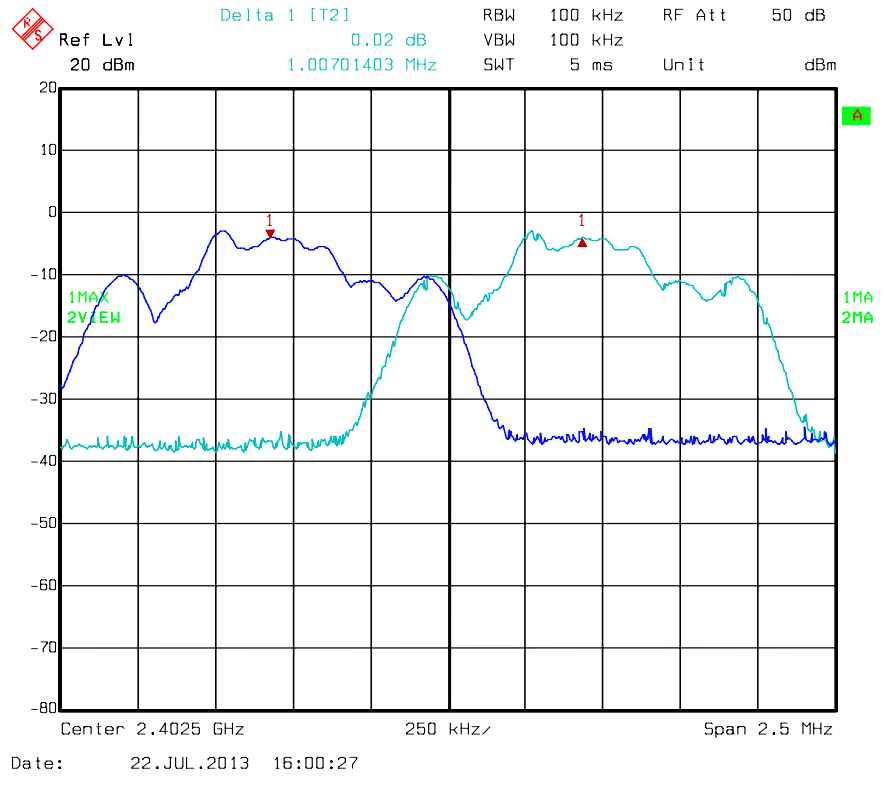
Carrier Frequency Separation @ GFSK mode channel 39



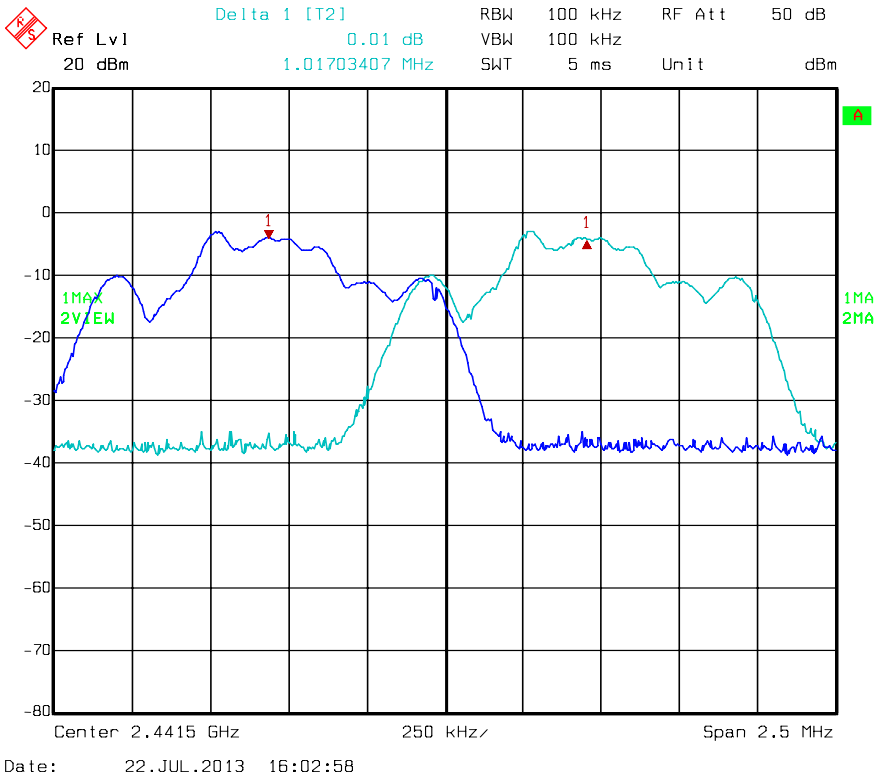
20 dB Bandwidth @ GFSK mode channel 78



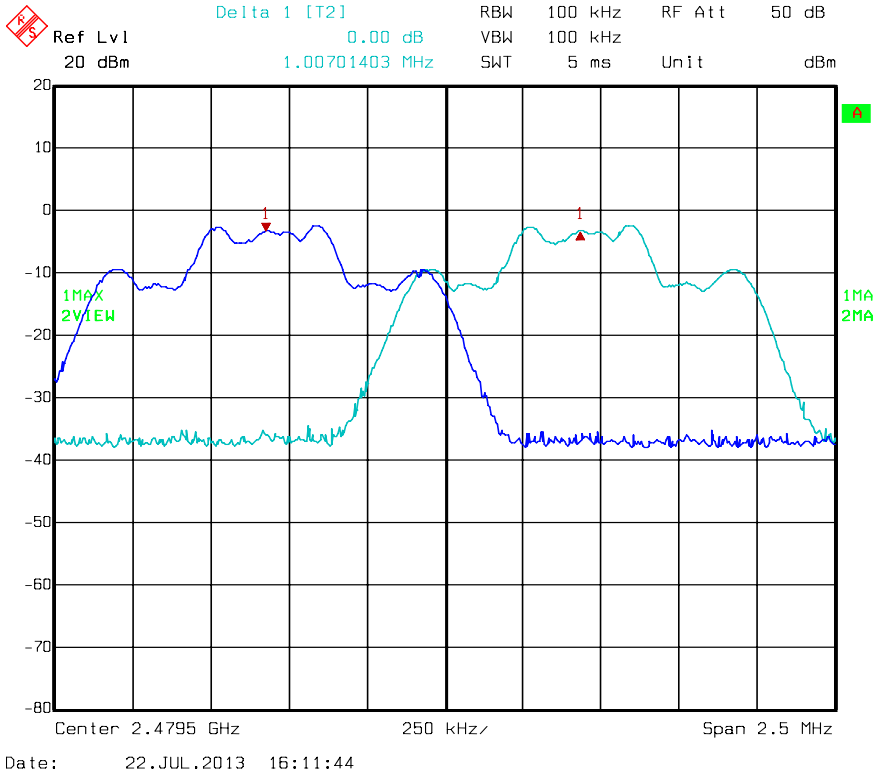
Carrier Frequency Separation @ 8DPSK mode channel 0



Carrier Frequency Separation @ 8DPSK mode channel 39



20 dB Bandwidth @ 8DPSK mode channel 78



5. Number of hopping frequencies test

5.1 Operating environment

Temperature:	23	℃
Relative Humidity:	55	%
Atmospheric Pressure:	1008	hPa

5.2 Test setup & procedure

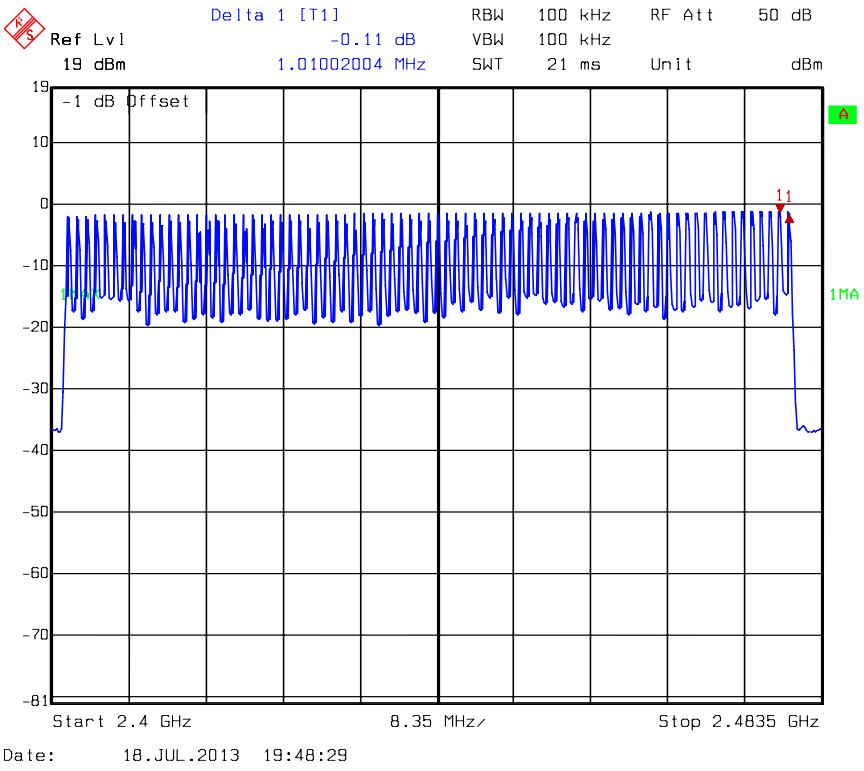
The test procedure was according to FCC measurement guidelines DA 00-705.
The number of hopping frequencies per FCC §15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at ≧1% of the span, the video bandwidth≧RBW, and the SPAN was the frequency band of operation.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

5.3 Measured data of number of hopping frequencies test result

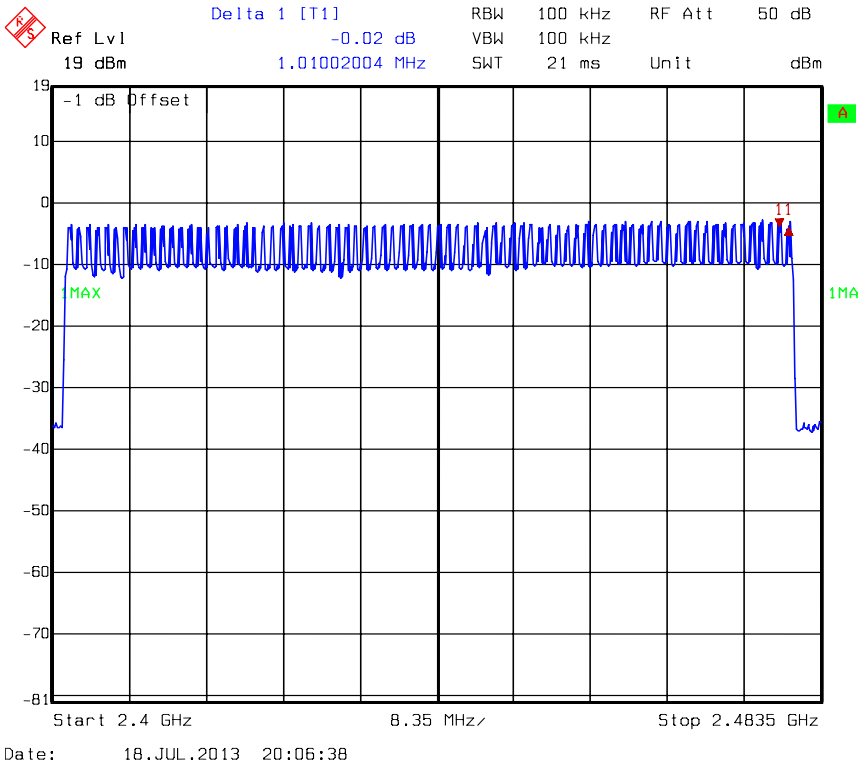
Frequency Range (MHz)	Total hopping channels
2400 ~ 2483.5	79

Please see the spectrum plot of worst value.

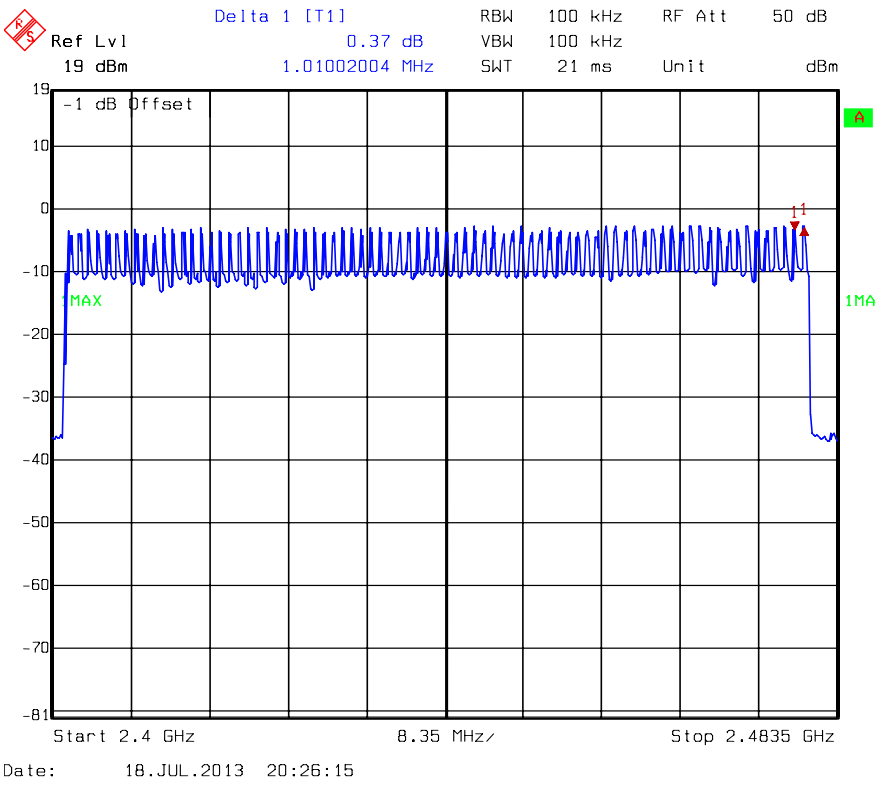
Number of hopping frequencies @ GFSK mode



Number of hopping frequencies @π/4DPSK mode



Number of hopping frequencies @ 8DPSK mode



6. Time of Occupancy (dwell time) & Duty Cycle Correction Factor test

6.1 Operating environment

Temperature:	23	℃
Relative Humidity:	55	%
Atmospheric Pressure:	1008	hPa

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.

The total sweep time is 0.4(79)=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.
(1)Mode：GFSK

Time of occupancy (dwell time) for DH1
Number of Hops in 5s=29 , Total Number of Hops in 31.6s = 29(6.32) =183.28
Single Pulse Width = 0.368 ms
Dwell time = Pulse Width * 183.28= 67.447 ms

Time of occupancy (dwell time) for DH3
Number of Hops in 5s=23 , Total Number of Hops in 31.6s = 23(6.32) =145.36
Single Pulse Width = 1.613ms
Dwell time = Pulse Width * 145.36= 234.46 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 = 2.867ms
Dwell time = Pulse Width * 94.8= 271.7916 ms

(2) Mode：8DPSK

Time of occupancy (dwell time) for 3-DH1

Number of Hops in 5s=25 , Total Number of Hops in 31.6s = 25(6.32) =158

Single Pulse Width = 0.376 ms

Dwell time = Pulse Width * 183.28= 59.408 ms

Time of occupancy (dwell time) for 3-DH3

Number of Hops in 5s=21 , Total Number of Hops in 31.6s = 21(6.32) =132.72

Single Pulse Width = 1.619ms

Dwell time = Pulse Width * 145.36= 214.87 ms

Time of occupancy (dwell time) for 3-DH5

Number of Hops in 5s=15 , Total Number of Hops in 31.6s = 15(6.32) =94.8

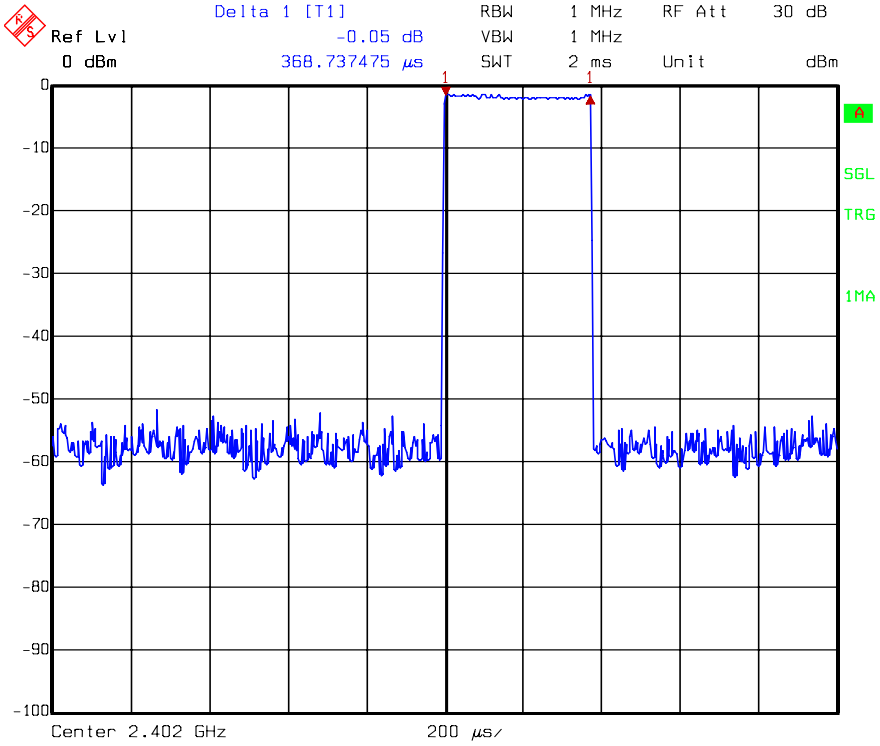
Single Pulse Width = 2.861ms

Dwell time = Pulse Width * 94.8= 271.22 ms

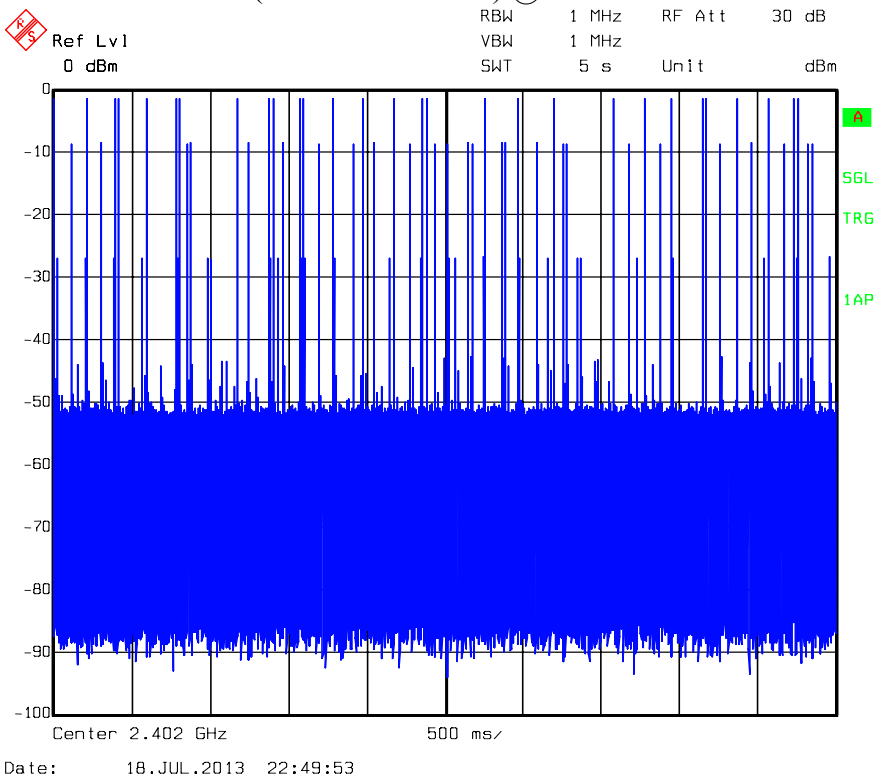
Mode	Mode	Pulse Width (ms)	Time of Occupancy (ms)	Limit (sec)
GFSK	DH1	0.368	67.447	0.4
	DH3	1.613	234.460	
	DH5	2.867	271.792	
8DPSK	DH1	0.376	59.408	0.4
	DH3	1.619	214.87	
	DH5	2.861	271.22	

Please see the spectrum plot of worst value.

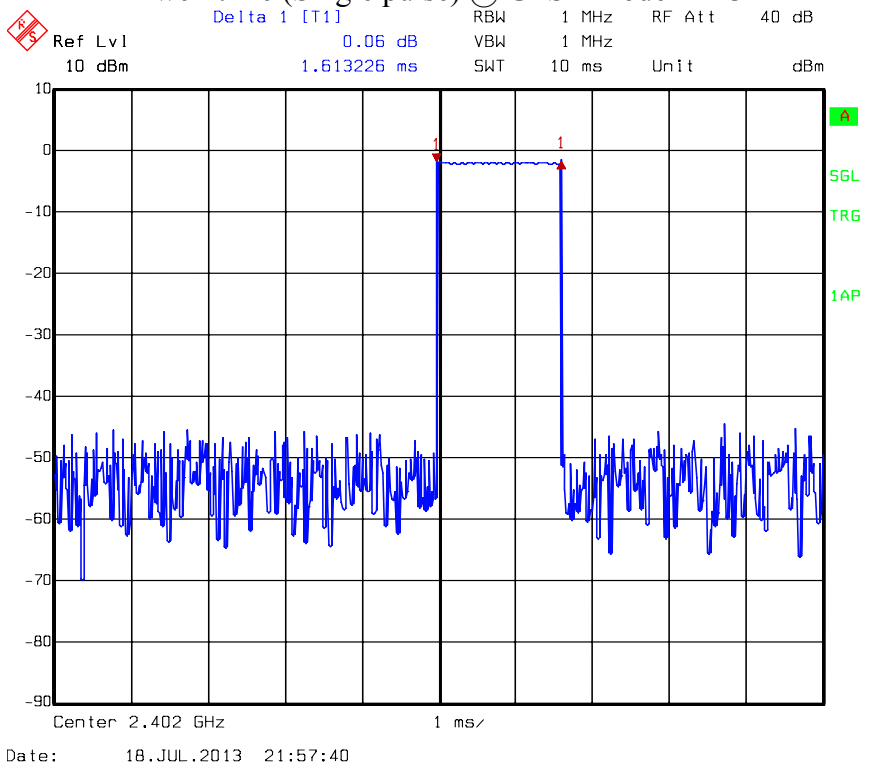
Dwell time (Single pulse) @ GFSK mode DH 1



Dwell time (Number of Pulses) @ GFSK mode DH 1



Dwell time (Single pulse) @ GFSK mode DH 3



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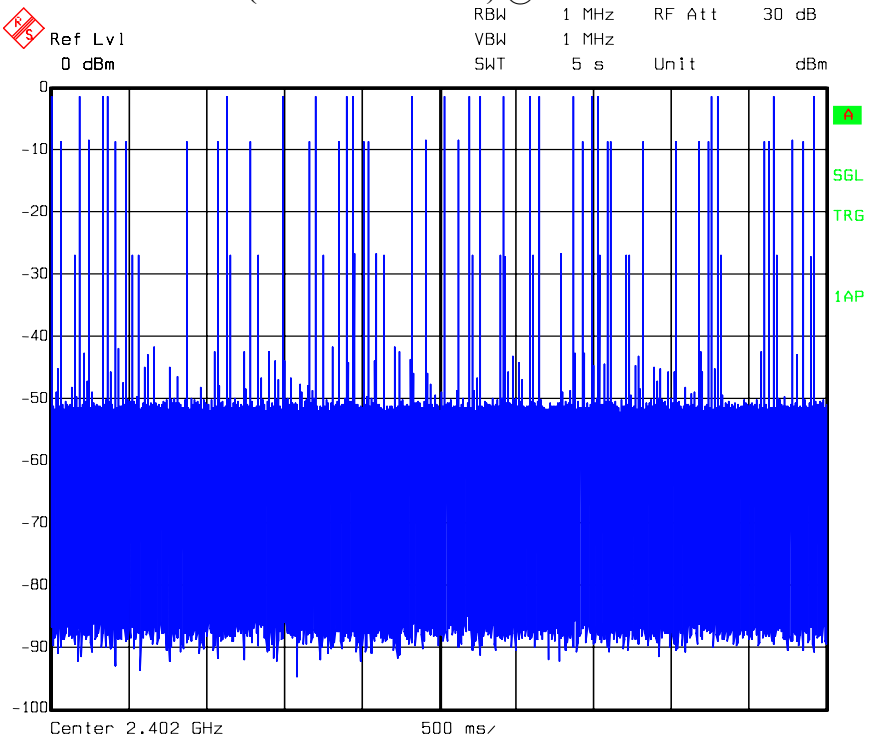
Dwell time (Number of Pulses) @ GFSK mode DH 3



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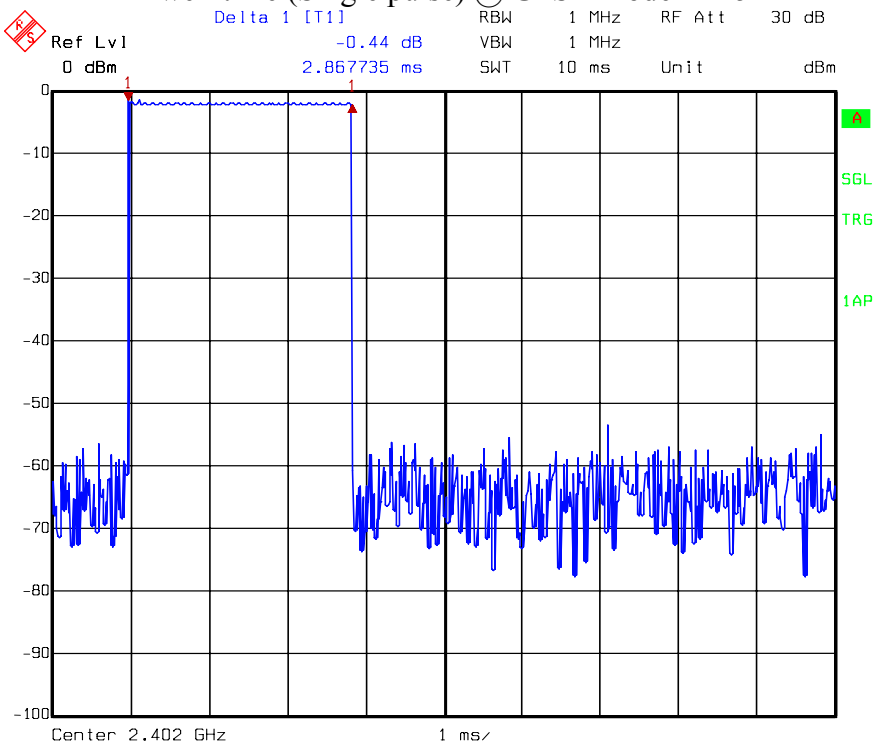
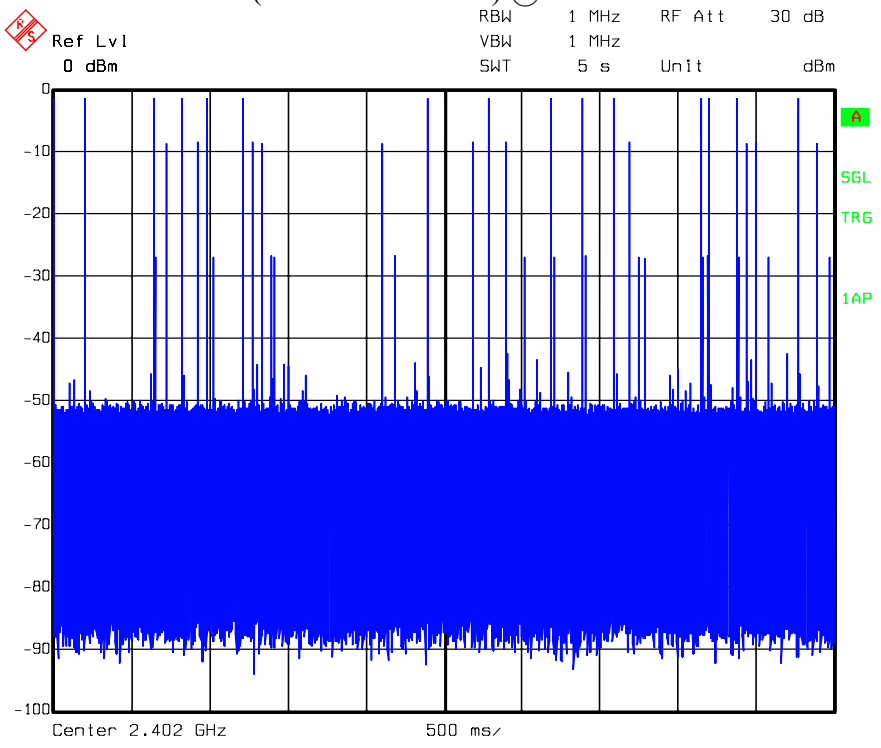
Dwell time (Single pulse) @ GFSK mode DH 5



Date: 18.JUL.2013 22:29:23

Dwell time (Number of Pulses) @ GFSK mode DH 5



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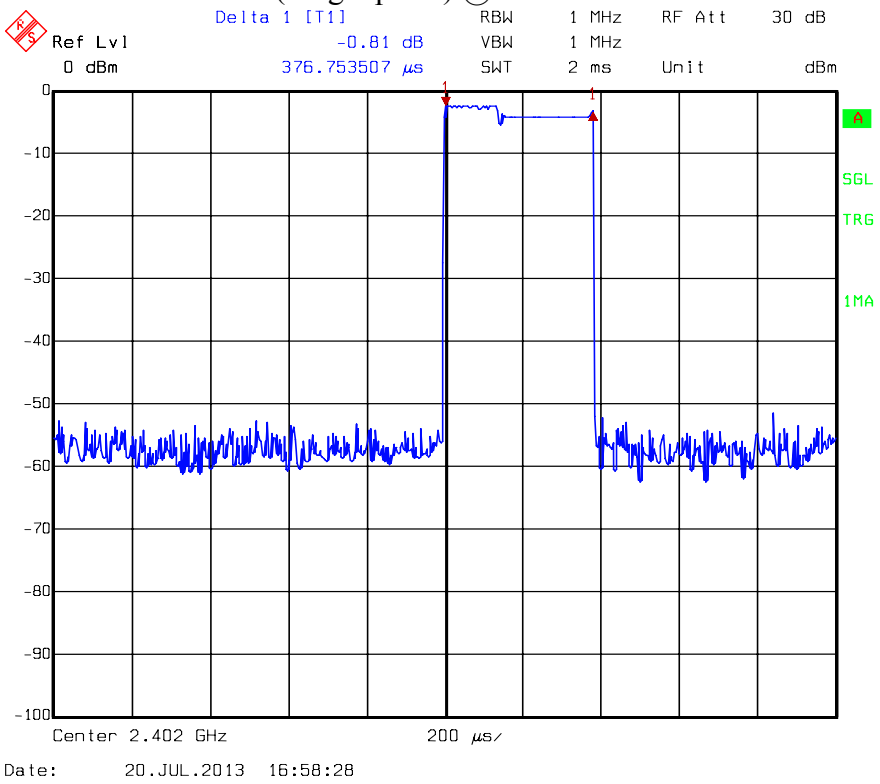
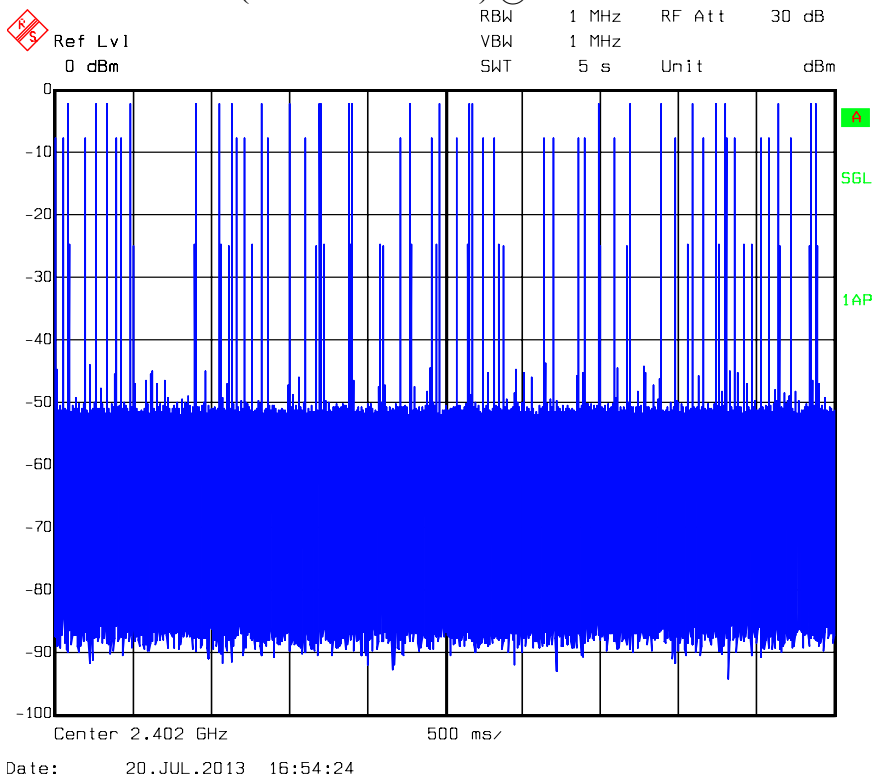
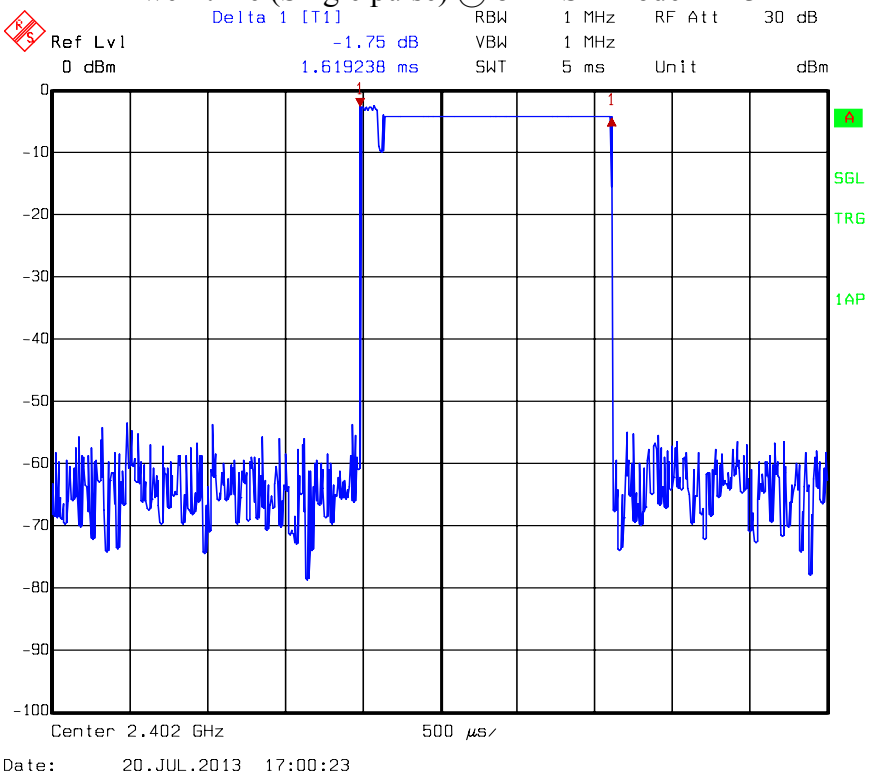
Dwell time (Single pulse) @ 8-DPSK mode DH 1



Dwell time (Number of Pulses) @ 8-DPSK mode DH 1



Dwell time (Single pulse) @ 8-DPSK mode DH 3



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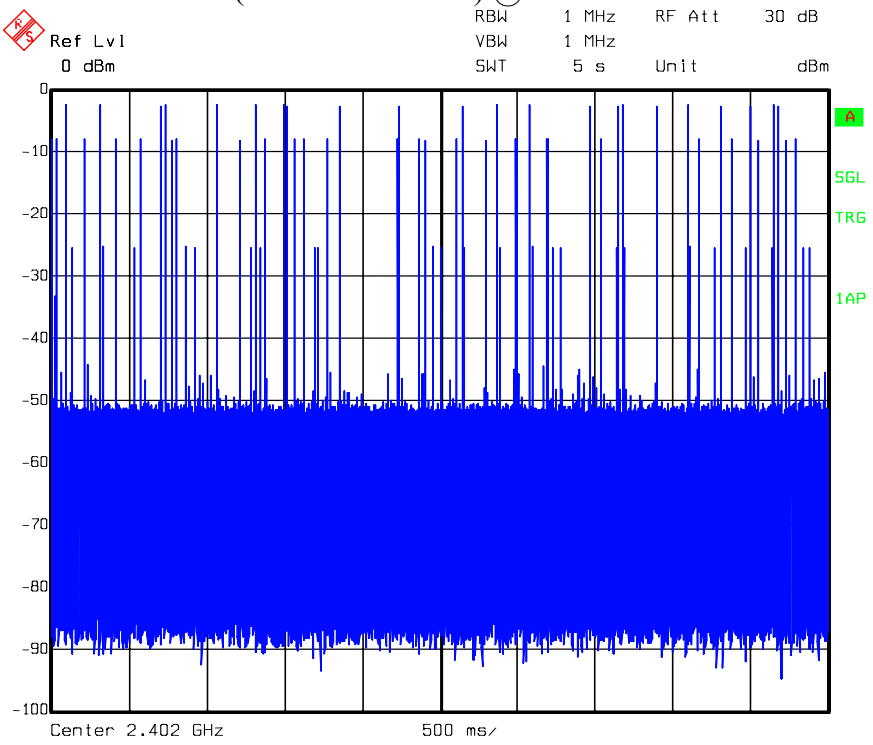
Dwell time (Number of Pulses) @ 8-DPSK mode DH 3



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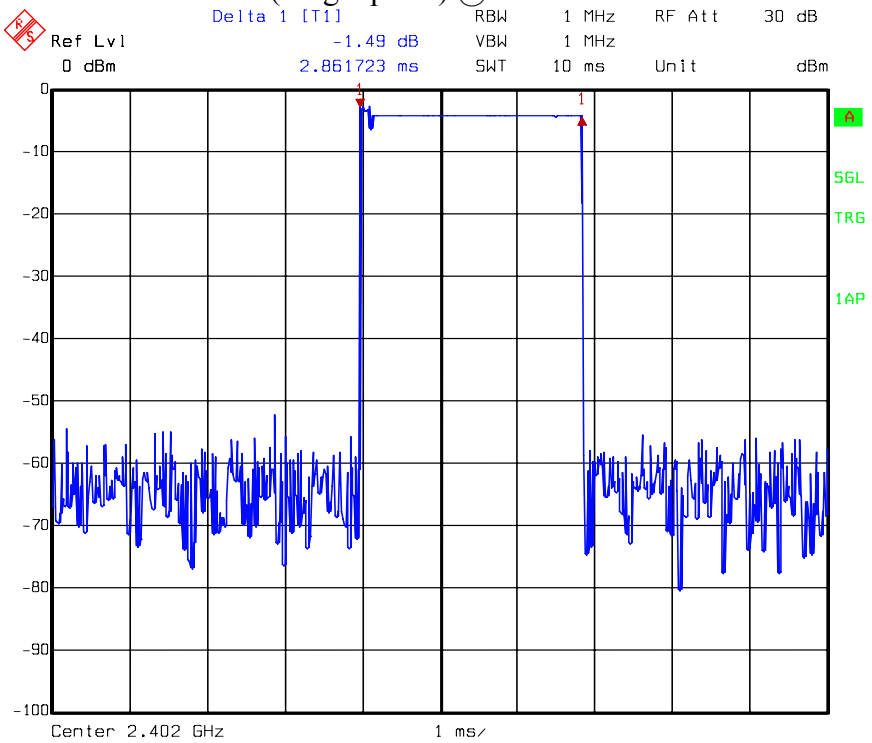
Dwell time (Single pulse) @ 8-DPSK mode DH 5



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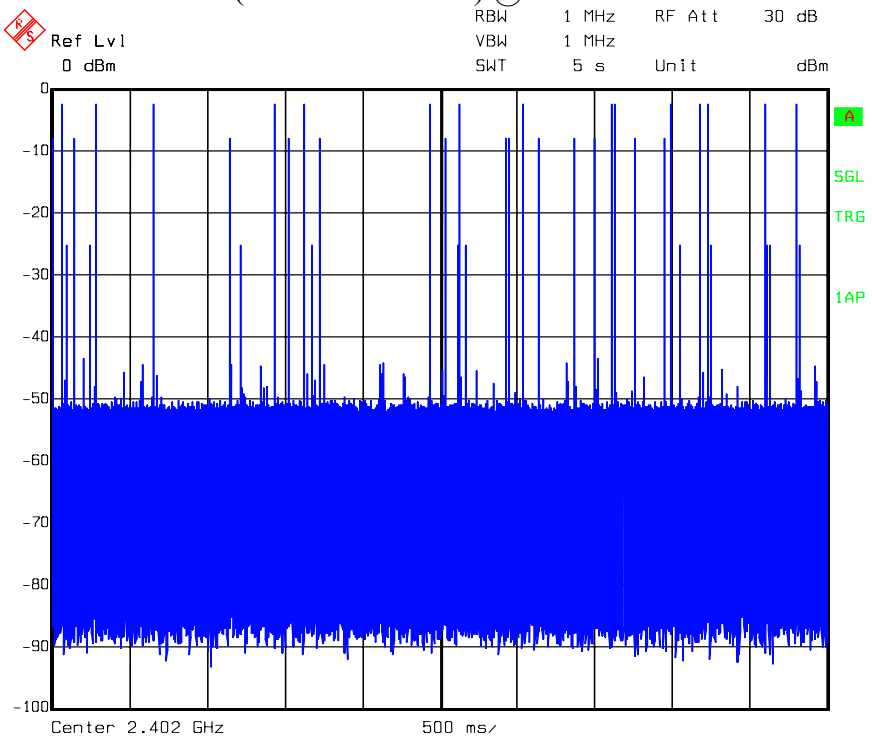
Dwell time (Number of Pulses) @ 8-DPSK mode DH 5



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7. Maximum Output Power test

7.1 Operating environment

Temperature: 23 ℃
Relative Humidity: 55 %
Atmospheric Pressure: 1008 hPa

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 (PK) (dBm)	Total Power (PK) (mw)	Limit (dBm)
GFSK	0	2402	-0.23	0.95	21
	39	2441	0.36	1.09	21
	78	2480	0.69	1.17	21
π/4DPSK	0	2402	-1.31	0.74	21
	39	2441	-0.76	0.84	21
	78	2480	-0.46	0.90	21
8DPSK	0	2402	-1.31	0.74	21
	39	2441	-0.78	0.84	21
	78	2480	-0.44	0.90	21

8. RF Antenna Conducted Spurious test

8.1 Operating environment

Temperature:	25	℃
Relative Humidity:	58	%
Atmospheric Pressure:	1008	hPa

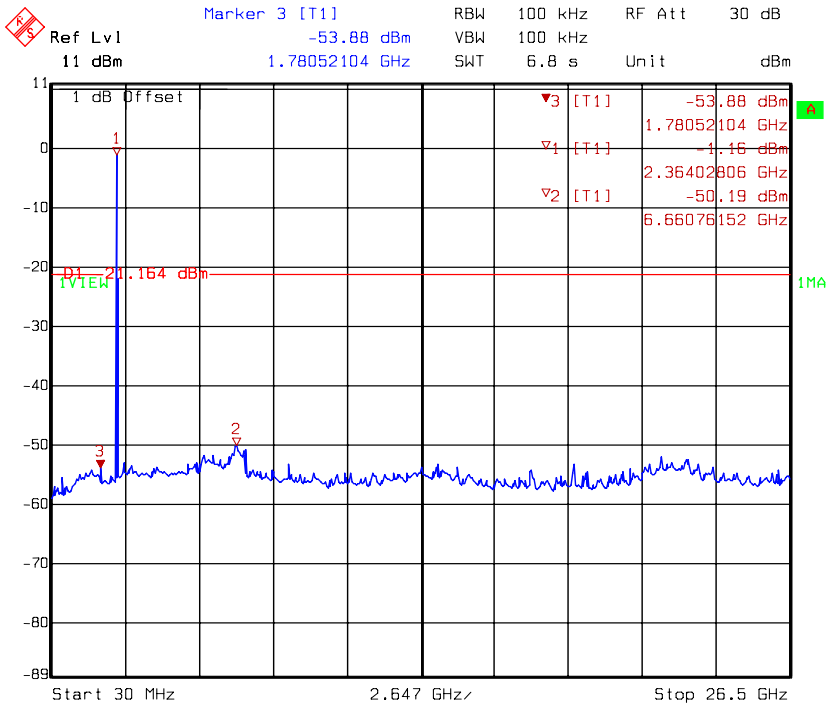
8.2 Test setup & procedure

The test procedure was according to FCC measurement guidelines DA 00-705.
The measurements were performed from lowest oscillator frequency to 10th fundamental frequency 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

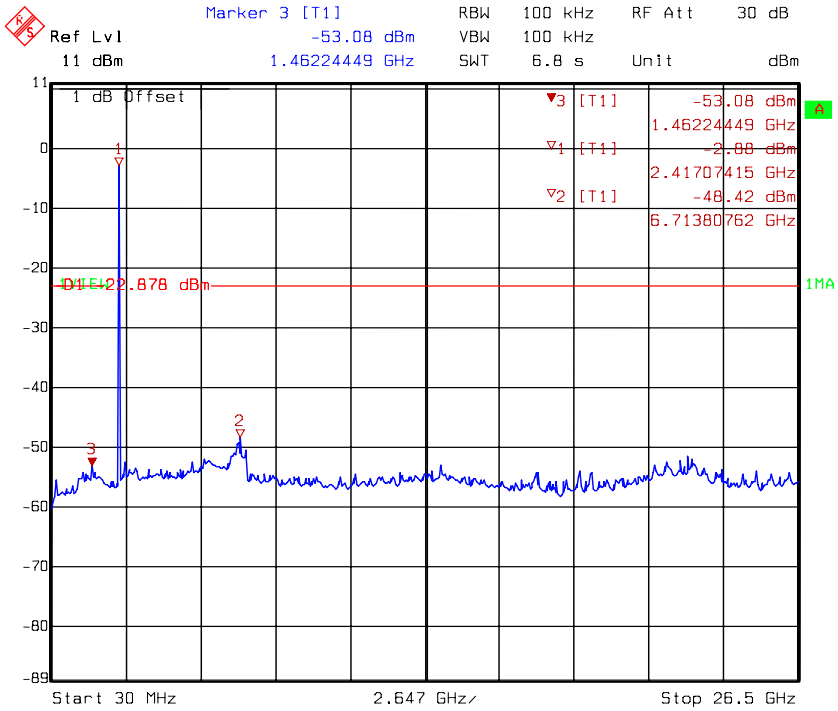
The test results please see the plot below.

Conducted spurious @ GFSK channel 0



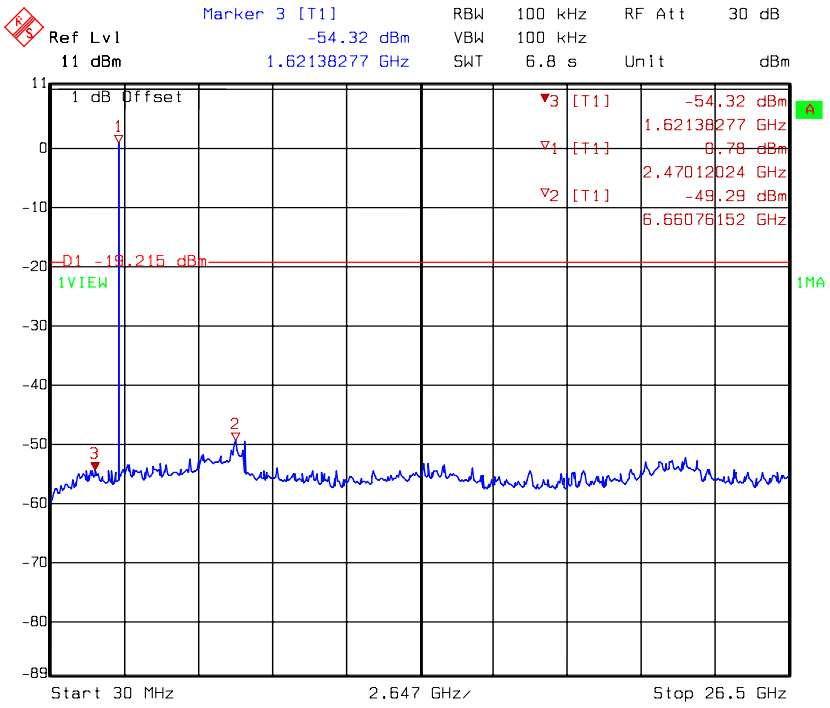
Title: Conductied Spurious
Comment A: GFSK ch0 2402 DH3
Date: 18.JUL.2013 20:34:05

Conducted spurious @ GFSK channel 39



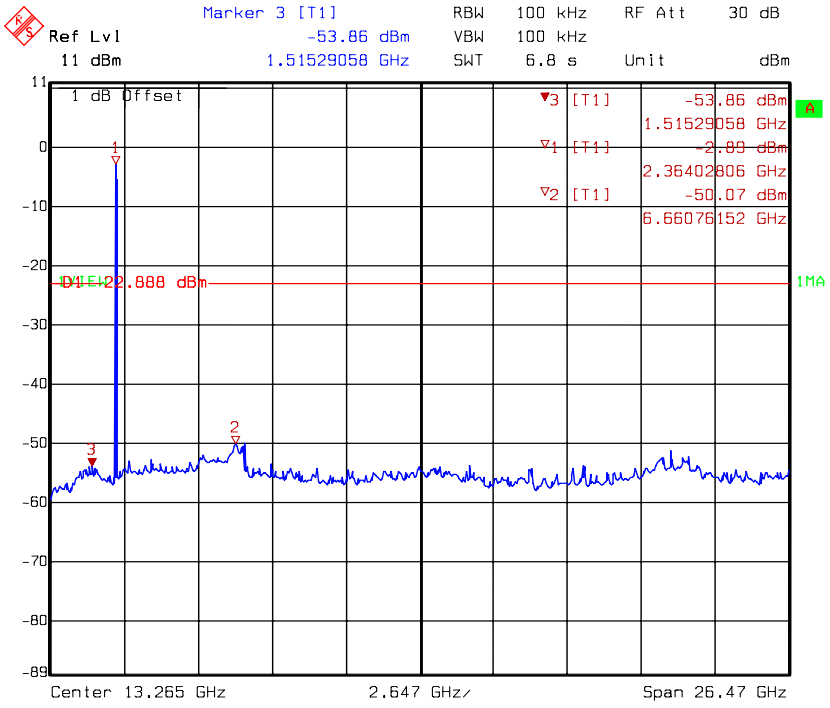
Title: Conductied Spurious
Comment A: GFSK ch39 2441 DH3
Date: 18.JUL.2013 20:36:07

Conducted spurious @ GFSK channel 78



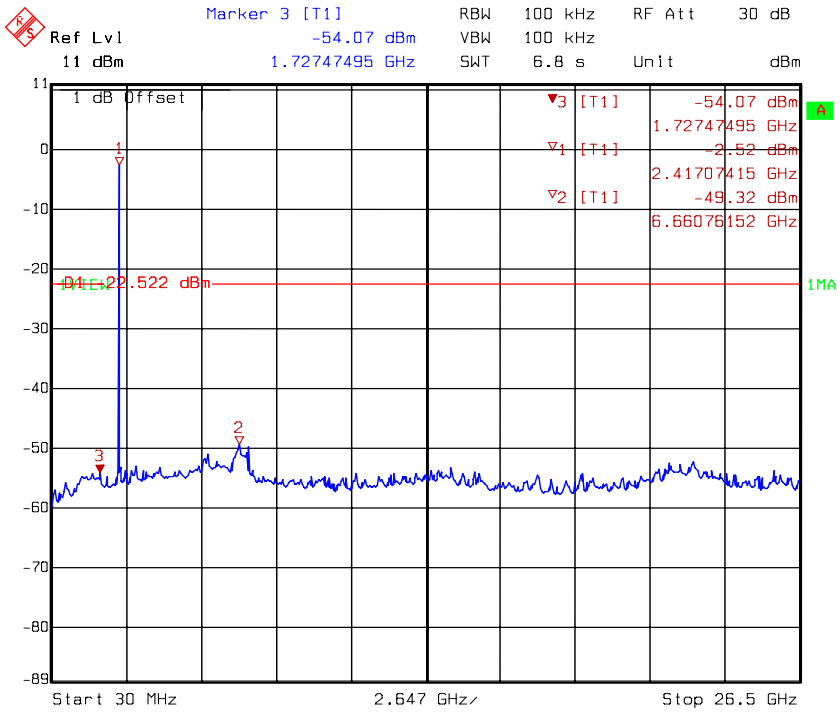
Title: Conductied Spurious
Comment A: GFSK ch78 2480 DH3
Date: 18.JUL.2013 20:37:23

Conducted spurious @ π /4 DPSK channel 0



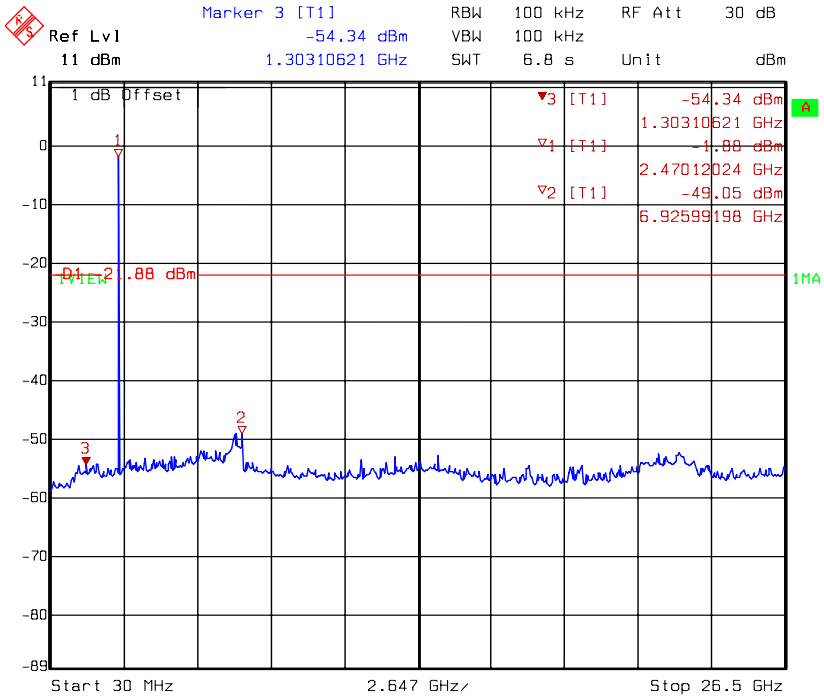
Title: Conductied Spurious
Comment A: GFSK ch0 2402 DH3
Date: 18.JUL.2013 20:53:46

Conducted spurious @ π /4 DPSK channel 39



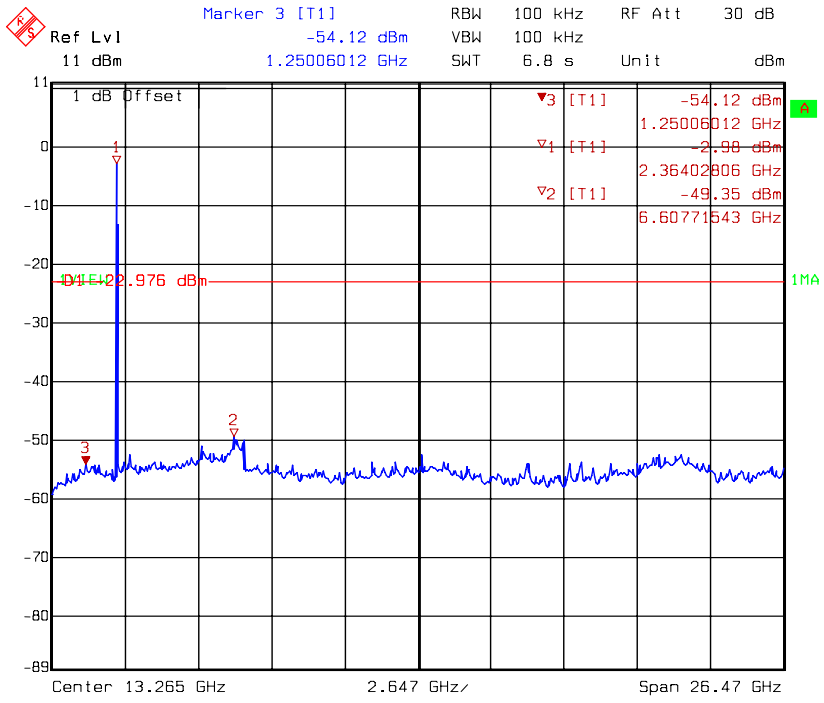
Title: Conductied Spurious
Comment A: GFSK ch39 2441 DH3
Date: 18.JUL.2013 20:55:03

Conducted spurious @ π /4 DPSK channel 78



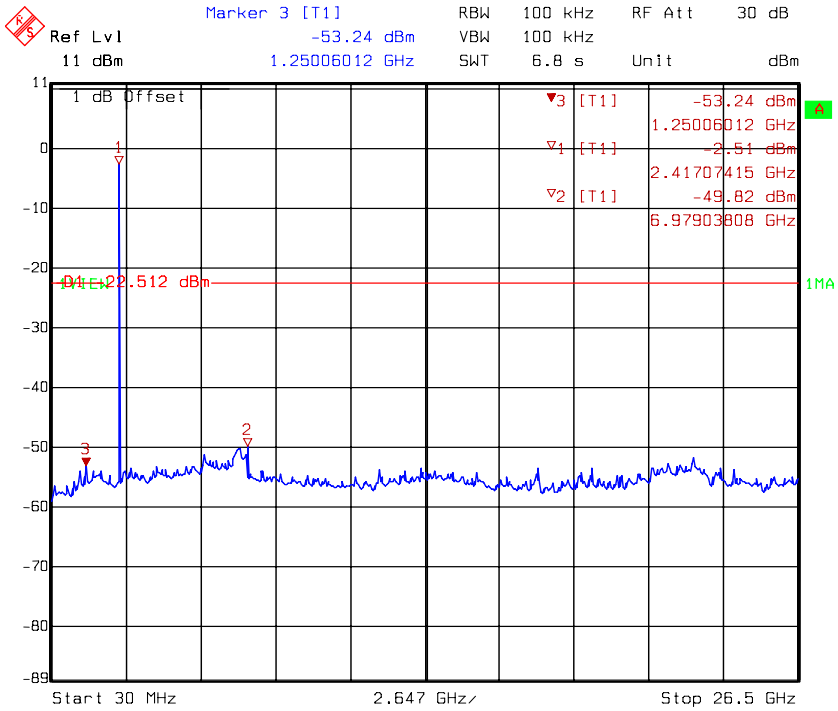
Title: Conductied Spurious
Comment A: GFSK ch78 2480 DH3
Date: 18.JUL.2013 20:56:22

Conducted spurious @ 8DPSK channel 0



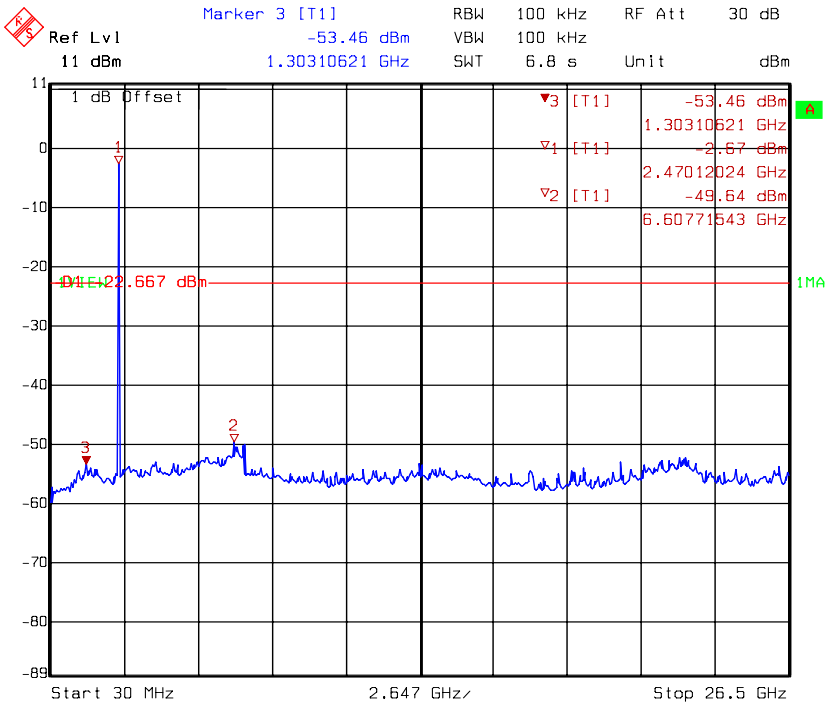
Title: Conductied Spurious
Comment A: 8DPSK ch0 2402 DH3
Date: 18.JUL.2013 20:44:41

Conducted spurious @ 8DPSK channel 39



Title: Conductied Spurious
Comment A: 8DPSK ch39 2441 DH3
Date: 18.JUL.2013 20:46:20

Conducted spurious @ 8DPSK channel 78



Title: Conductied Spurious
Comment A: 8DPSK ch78 2480 DH3
Date: 18.JUL.2013 20:47:22

9. Radiated Emission test

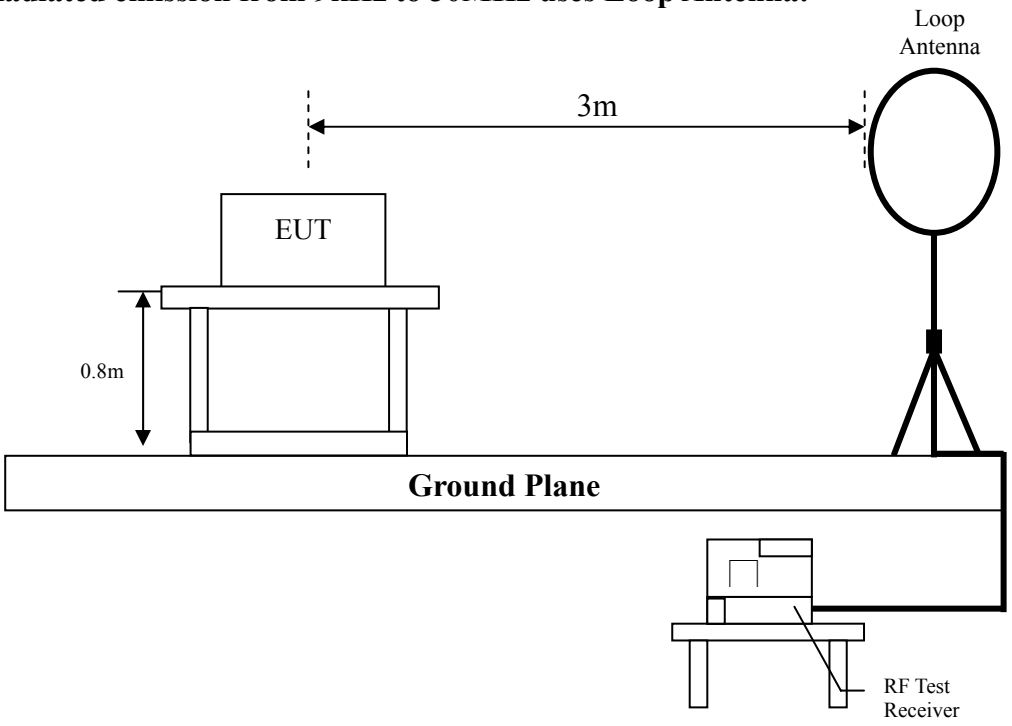
9.1 Operating environment

Temperature:	23	℃
Relative Humidity:	55	%
Atmospheric Pressure:	1008	hPa

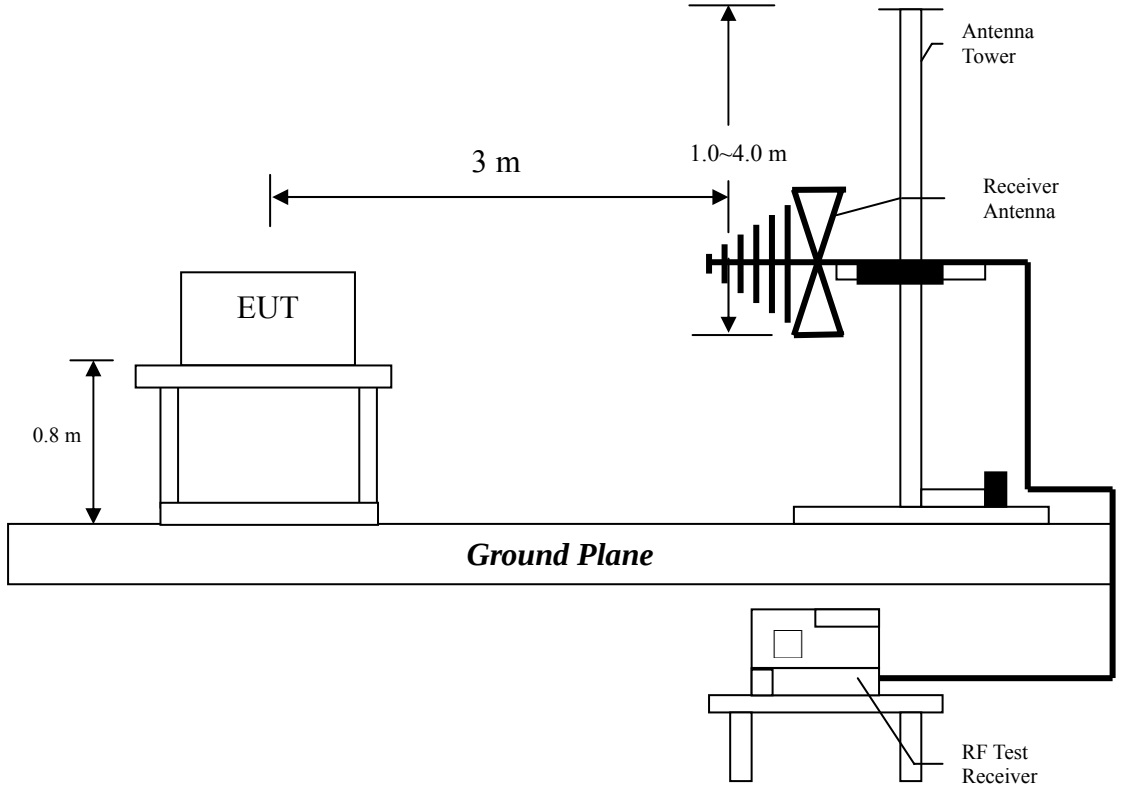
9.2 Test setup & procedure

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.

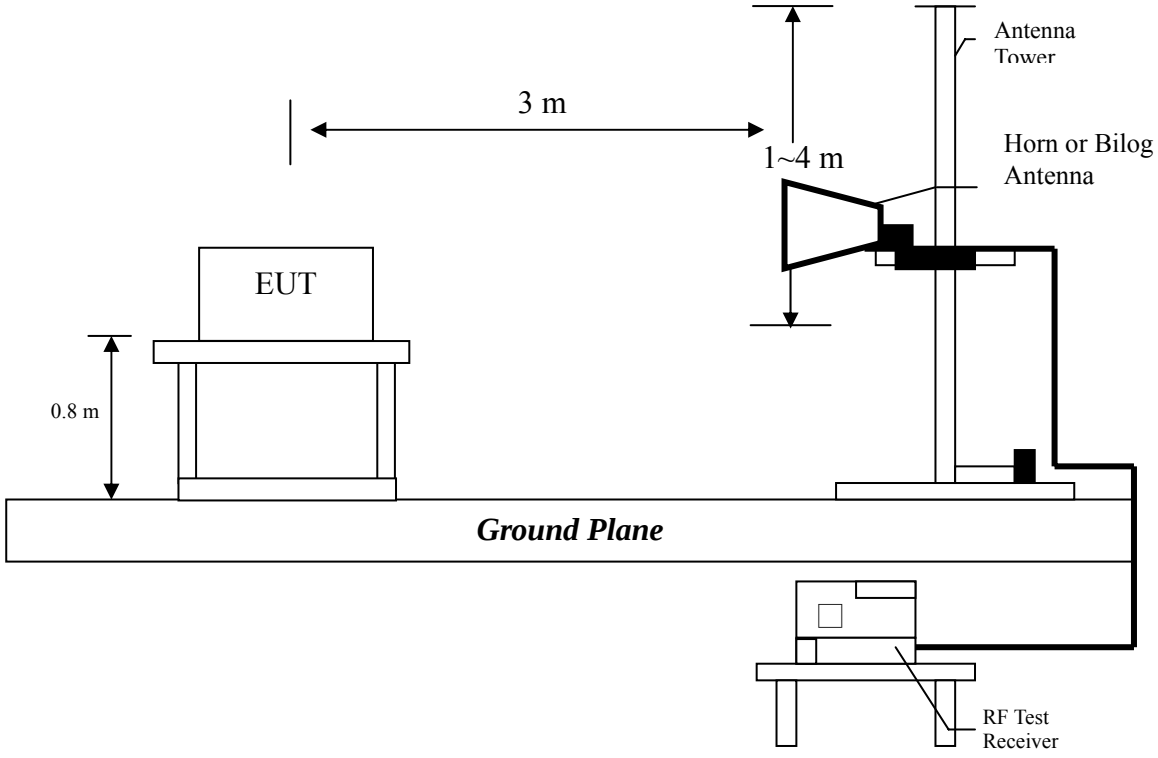
Radiated emission from 9kHz to 30MHz uses Loop Antenna:



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



Radiated emission above 1GHz uses Horn Antenna:

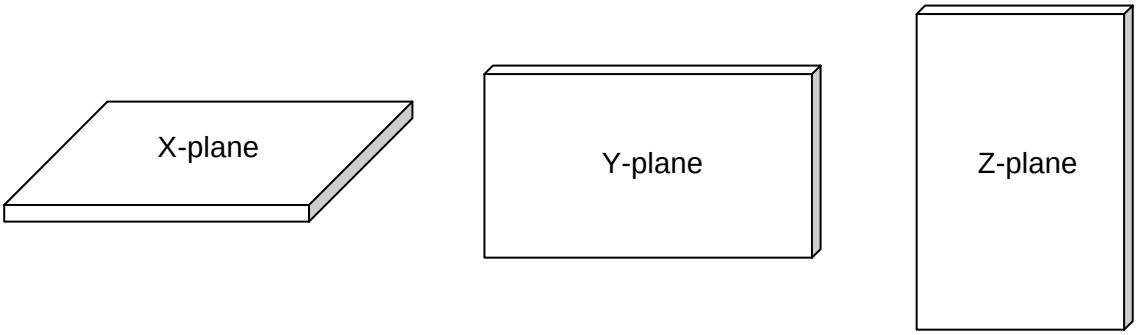


The signal is maximized through rotation and placement in the three orthogonal axes. According to §15.33(a), the spectrum shall be investigated from the lowest radio frequency signal generated in the device, to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower. 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 wooden 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 signal is maximized through rotation and placement in the three orthogonal axes.



After verifying three axes, we found the maximum electromagnetic field was occurred at X-plane configuration. The final test data was executed under this configuration.

The EUT configuration, please refer 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

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.

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/4DPSK and 8DPSK continuously transmitting mode. The worst case occurred at GFSK Tx channel 0.

EUT : T647
Worst Case : GFSK Tx channel 0

Antenna Polarization	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
Vertical	57.16	QP	12.90	17.87	30.76	40.00	-9.24
Vertical	165.80	QP	15.70	14.63	30.33	43.50	-13.17
Vertical	276.33	QP	13.24	20.08	33.31	46.00	-12.69
Vertical	404.42	QP	16.47	14.56	31.03	46.00	-14.97
Vertical	511.12	QP	18.56	12.52	31.07	46.00	-14.93
Vertical	714.82	QP	22.29	11.58	33.86	46.00	-12.14
Horizontal	135.80	QP	12.32	25.11	37.43	43.50	-6.07
Horizontal	202.66	QP	10.78	25.47	36.24	43.50	-7.26
Horizontal	276.38	QP	13.21	23.72	36.92	46.00	-9.08
Horizontal	305.48	QP	14.32	20.29	34.60	46.00	-11.40
Horizontal	404.42	QP	16.81	17.57	34.38	46.00	-11.62
Horizontal	664.38	QP	21.52	11.51	33.02	46.00	-12.98

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 : T647
Test Condition : GFSK at channel 0

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4804.00	PK	V	35.1	38.54	38.45	41.89	54	-12.11
4980.00	PK	V	35.1	38.54	45.36	48.80	54	-5.20
4804.00	PK	V	35.1	38.54	38.45	41.89	54	-12.11
4980.00	PK	V	35.1	38.54	45.36	48.80	54	-5.20

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.

EUT : T647
Test Condition : GFSK at channel 39

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4882.00	PK	V	35.1	38.54	35.95	39.39	54	-14.61
4980.00	PK	V	35.1	38.54	44.67	48.11	54	-5.89
4882.00	PK	H	35.1	38.54	35.85	39.29	54	-14.71
4980.00	PK	H	35.1	38.54	41.68	45.12	54	-8.88

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.

EUT : T647
Test Condition : GFSK at channel 78

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4960.00	PK	V	35.1	38.54	44.13	47.57	54	-6.43
4960.00	PK	H	35.1	38.54	40.92	44.36	54	-9.64

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.

EUT : T647
Test Condition : π/4DPSK at channel 0

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4804.00	PK	V	35.1	38.54	35.8	39.24	54	-14.76
4980.00	PK	V	35.1	38.54	41.92	45.36	54	-8.64
4804.00	PK	H	35.1	38.54	36.34	39.78	54	-14.22
4980.00	PK	H	35.1	38.54	40.43	43.87	54	-10.13

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.

EUT : T647
Test Condition : π/4DPSK at channel 39

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4882.00	PK	V	35.1	38.54	34.65	38.09	54	-15.91
4980.00	PK	V	35.1	38.54	43.41	46.85	54	-7.15
4882.00	PK	H	35.1	38.54	35.9	39.34	54	-14.66
4980.00	PK	H	35.1	38.54	41.23	44.67	54	-9.33

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.

EUT : T647
Test Condition : π/4DPSK at channel 78

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4960.00	PK	V	35.1	38.54	37.93	41.37	54	-12.63
4980.00	PK	V	35.1	38.54	44.81	48.25	54	-5.75
4960.00	PK	H	35.1	38.54	38.2	41.64	54	-12.36
4980.00	PK	H	35.1	38.54	40.53	43.97	55	-11.03

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.

EUT : T647
Test Condition : 8DPSK at channel 0

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4804.00	PK	V	35.1	38.54	35.88	39.32	54	-14.68
4980.00	PK	V	35.1	38.54	44.8	48.24	55	-6.76
4804.00	PK	H	35.1	38.54	36.03	39.47	54	-14.53
4980.00	PK	H	35.1	38.54	41.42	44.86	55	-10.14

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.

EUT : T647
Test Condition : 8DPSK at channel 39

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4882.00	PK	V	35.1	38.54	36.09	39.53	54	-14.47
4980.00	PK	V	35.1	38.54	42.52	45.96	55	-9.04
4882.00	PK	H	35.1	38.54	36.42	39.86	54	-14.14
4980.00	PK	H	35.1	38.54	40.79	44.23	55	-10.77

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.

EUT : T647
Test Condition : 8DPSK at channel 78

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4960.00	PK	V	35.1	38.54	43.86	47.30	54	-6.70
4960.00	PK	H	35.1	38.54	39.52	42.96	54	-11.04

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.

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 Test setup & procedure

Please refer to the clause 9.2 of this report.

10.2 Test Result

Test Mode: GFSK mode

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)	Restricted band (MHz)
2339.49	PK	V	38.01	31.61	64.54	58.14	74	-15.86	2310~2390
2339.49	AV	V	38.01	31.61	51.84	45.44	54	-8.56	
2402.00	PK	V	38.02	31.91	103.01	96.89	-	96.89	-
2402.00	AV	V	38.02	31.91	84.91	78.79	-	78.79	-
2480.00	PK	V	38.04	32.28	102.60	96.83	-	96.83	-
2480.00	AV	V	38.04	32.28	84.74	78.97	-	78.97	-
2483.50	PK	V	38.05	32.29	65.78	60.03	74	-13.97	2483.5~2500
2483.50	AV	V	38.05	32.29	56.53	50.78	54	-3.22	

Test Mode: π /4 DPSK mode

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)	Restricted band (MHz)
2338.91	PK	V	38.01	31.61	64.41	58.01	74	-15.99	2310~2390
2338.91	AV	V	38.01	31.61	51.83	45.43	54	-8.57	
2402.00	PK	V	38.02	31.91	101.97	95.85	-	95.85	-
2402.00	AV	V	38.02	31.91	83.25	77.13	-	77.13	-
2480.00	PK	V	38.04	32.28	101.59	95.82	-	95.82	-
2480.00	AV	V	38.04	32.28	83.03	77.26	-	77.26	-
2483.50	PK	V	38.05	32.29	65.08	59.33	74	-14.67	2483.5~2500
2483.50	AV	V	38.05	32.29	56.49	50.74	54	-3.26	

Test Mode: 8DPSK mode

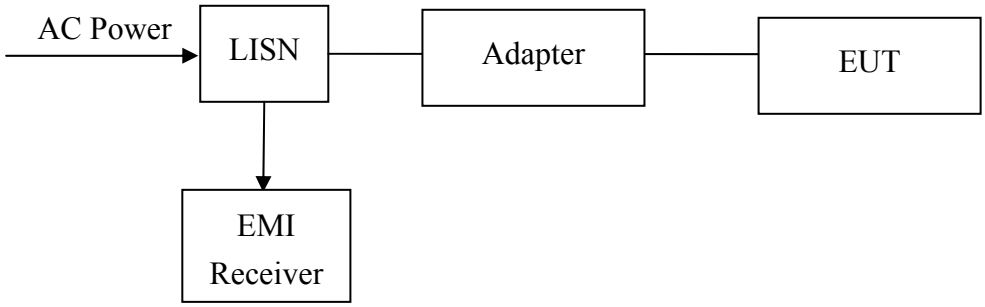
Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)	Restricted band (MHz)
2340.07	PK	V	38.01	31.61	64.58	58.18	74	-15.82	2310~2390
2340.07	AV	V	38.01	31.61	51.82	45.42	54	-8.58	
2402.00	PK	V	38.02	31.91	101.82	95.70	-	95.70	-
2402.00	AV	V	38.02	31.91	83.27	77.15	-	77.15	-
2480.00	PK	V	38.04	32.28	101.48	95.71	-	95.71	-
2480.00	AV	V	38.04	32.28	83.06	77.29	-	77.29	-
2483.50	PK	V	38.05	32.29	65.78	60.03	74	-13.97	2483.5~2500
2483.50	AV	V	38.05	32.29	55.85	50.10	54	-3.90	

11. Power Line Conducted Emission test §FCC 15.207

11.1 Operating environment

Temperature:	25	℃
Relative Humidity:	55	%
Atmospheric Pressure	1008	hPa

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 please refer 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

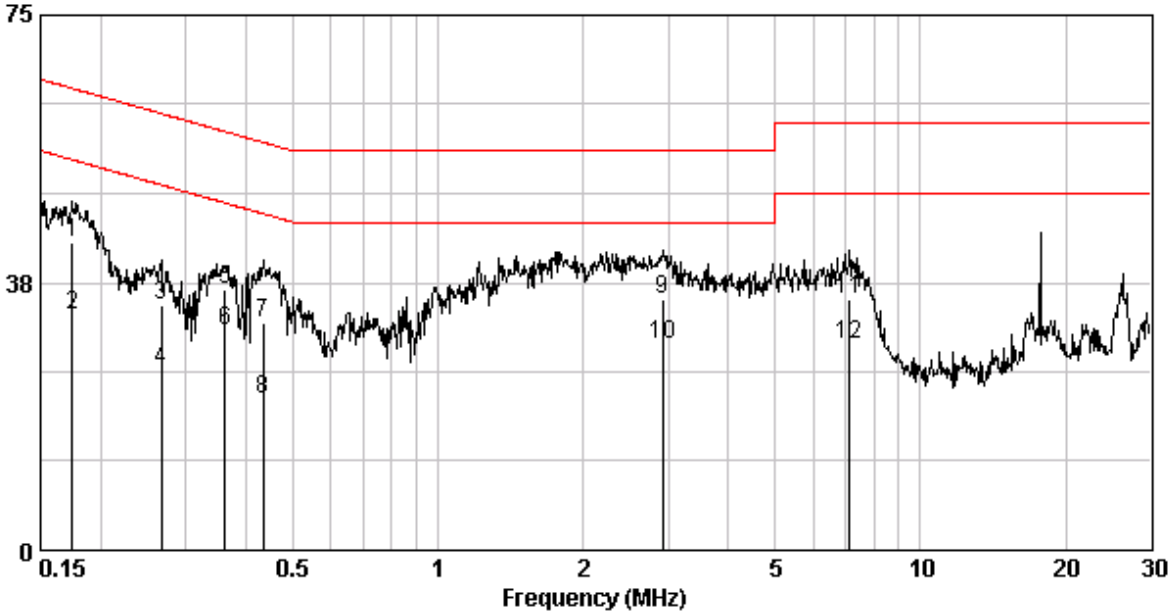
*Decreases with the logarithm of the frequency.

11.4 Power Line Conducted Emission test data

Phase: Line
Model No.: T647
Operating mode: Adapter mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Margin (dB) Av
0.175	0.13	43.13	64.72	32.95	54.72	-21.59	-21.77
0.267	0.15	34.43	61.20	25.17	51.20	-26.78	-26.04
0.361	0.16	36.48	58.69	30.74	48.69	-22.22	-17.96
0.435	0.16	31.90	57.15	21.19	47.15	-25.25	-25.96
2.915	0.31	35.16	56.00	28.98	46.00	-20.84	-17.02
7.137	0.51	35.14	60.00	28.86	50.00	-24.87	-21.15

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



Phase: Neutral
Model No.: T647
Operating mode: Adapter mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Margin (dB) Av
0.186	0.10	41.48	64.20	34.50	54.20	-22.71	-19.69
0.274	0.11	40.46	60.98	35.36	50.98	-20.52	-15.62
0.456	0.13	43.14	56.76	36.13	46.76	-13.62	-10.63
0.532	0.13	31.25	56.00	22.72	46.00	-24.75	-23.28
0.974	0.16	35.28	56.00	28.23	46.00	-20.72	-17.77
6.805	0.41	35.72	60.00	29.81	50.00	-24.28	-20.19

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