Lab Code: 200707-0

FCC PART 15.247
TEST REPORT

For

Avantronics Limited

The 4th Floor, Yuepeng Building, No.1019 Jiabin Rd, Luohu District, Shenzhen, Guangdong, China

FCC ID: WJ5-BTCK-200

Report Type:	Product Type:
Original Report	Bluetooth stereo handsfree car kit

Test Engineer:	Mick Yin
Report Number:	RSZ130106003-00A
Report Date:	2013-01-17
Reviewed By:	Sula Huang RF Engineer
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Avantronics Limited*'s product, model number: *BTCK-200 (FCC ID: WJ5-BTCK-200)* or the "EUT" in this report was a *Bluetooth stereo handsfree car kit,* which was measured approximately: 4.86 cm (L) x 4.86 cm (W) x 1.84 cm (H), rated input voltage: 3.7V rechargeable lithium polymer battery.

** All measurement and test data in this report was gathered from production sample serial number: 1212009 (Assigned by Shenzhen BACL). The EUT supplied by the applicant was received on 2013-01-06.*

Objective

This test report is prepared on behalf of *Avantronics Limited* in accordance with Part 2-Subpart J, Part 15-Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS submission with FCC ID: WJ5-BTCK-200.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 200707-0).

The current scope of accreditations can be found at http://ts.nist.gov/Standards/scopes/2007070.htm

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The software (CSR BlueSuite 2.5) provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

EUT Exercise Software

CSR BlueSuite 2.5

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

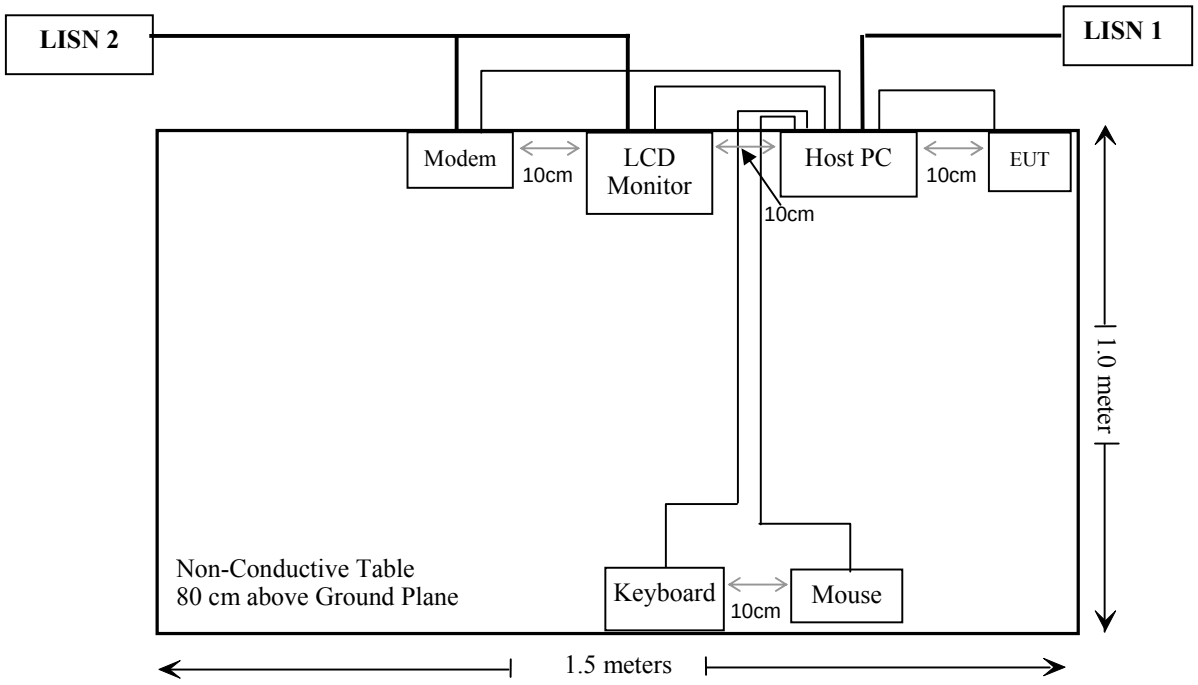
Manufacturer	Description	Model	Serial Number
DELL	PC	VOSTRO 220S	127BP2X
DELL	Keyboard	L100	CNORH656658907BL04TY
DELL	Mouse	MOC5UO	G1B0096D
DELL	Monitor	E178WFPC	CN-OWY564-64180-7C4-2SQH
SAST	Modem	AEM-2100	0293

External I/O Cable

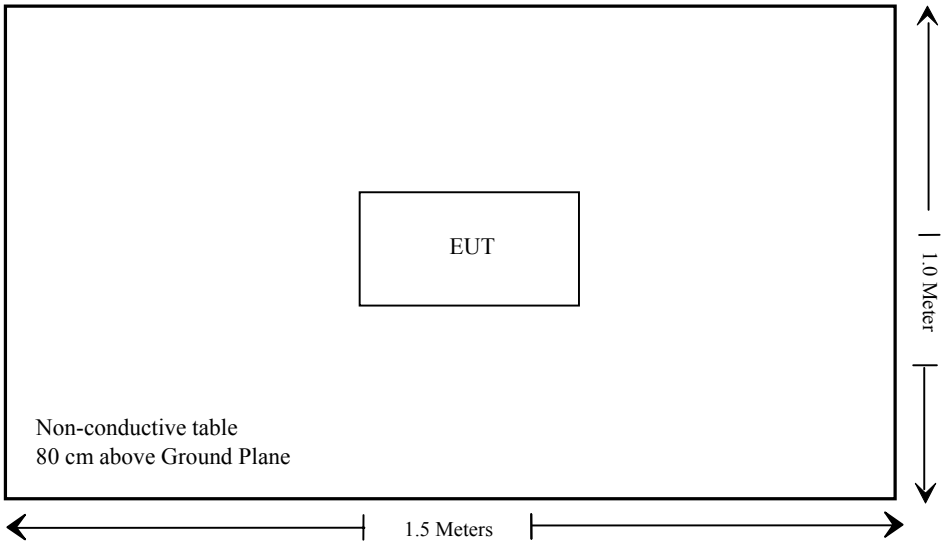
Cable Description	Length (m)	From/Port	To
Shielding Detachable USB Cable	1.5	Host PC	Mouse
Shielding Detachable Serial Cable	1.2	Host PC	Modem
Shielding Detachable K/B Cable	1.5	Host PC	Keyboard
Shielding Detachable VGA Cable	1.5	Host PC	LCD Monitor
Un-shielding Detachable USB Cable	1.0	EUT	Host PC

Block Diagram of Test Setup

For AC Line Conducted Emissions Test



For Radiated Emission Test



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b)(1), §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209 & §15.247(d)	Radiated Emissions	Compliance
§15.247(a)(1)	20 dB Emission Bandwidth	Compliance
§15.247(a)(1)	Channel Separation	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(iii)	Quantity of hopping channel	Compliance
§15.247(b)(1)	Peak Output Power Measurement	Compliance
§15.247(d)	Band edges	Compliance

FCC §15.247 (i) & §1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247 (i) and subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (Minutes)**
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

MPE Calculation

Predication of MPE limit at a given distance

$$S = PG/4\pi R^2$$

Where:
S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW).
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally ***numeric*** gain.
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Mode	Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
BDR (GFSK)	2480	0	1.0	5.86	3.855	20	0.000767	1.0
EDR (π/4-DQPSK)	2480	0	1.0	4.44	2.780	20	0.000553	1.0
EDR (8DPSK)	2480	0	1.0	4.69	2.944	20	0.000586	1.0

Note: To comply with FCC RF exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna of this device and all persons.

Result: Compliance

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Antenna Connector Construction

The EUT has an integrated antenna arrangement, which was permanently attached and the gain was 0 dBi, fulfill the requirement of this section. Please refer to the internal photos.

Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

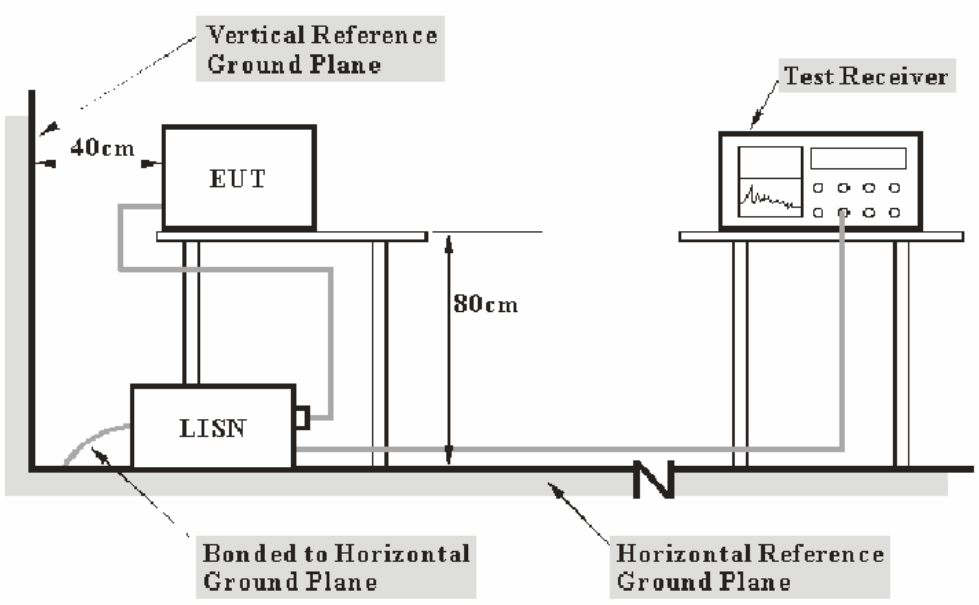
FCC §15.207

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on CISPR 16-4-2, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at Bay Area Compliance Laboratory Corp. (Shenzhen) is 2.4 dB (k=2, 95% level of confidence), and the uncertainty will not be taken into consideration for the test data recorded in the report.

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.4-2009 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm

The host PC was connected to a 120 VAC/60 Hz power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2012-11-24	2013-11-23
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2012-08-22	2013-08-21
Rohde & Schwarz	Pulse limiter	ESH3Z2	DE25985	2012-07-08	2013-07-07
BACL	CE Test software	BACL-CE	V1.0	N/A	N/A

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

Test Procedure

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN/ISN VDF (Voltage Division Factor), Cable Loss and Pulse Limiter Attenuation. The basic equation is as follows:

Correction Factor = LISN VDF + Cable Loss + Pulse Limiter Attenuation

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207, with the worst margin reading of:

6.65 dB at **13.645 MHz** in the **Line** conducted mode

Test Data

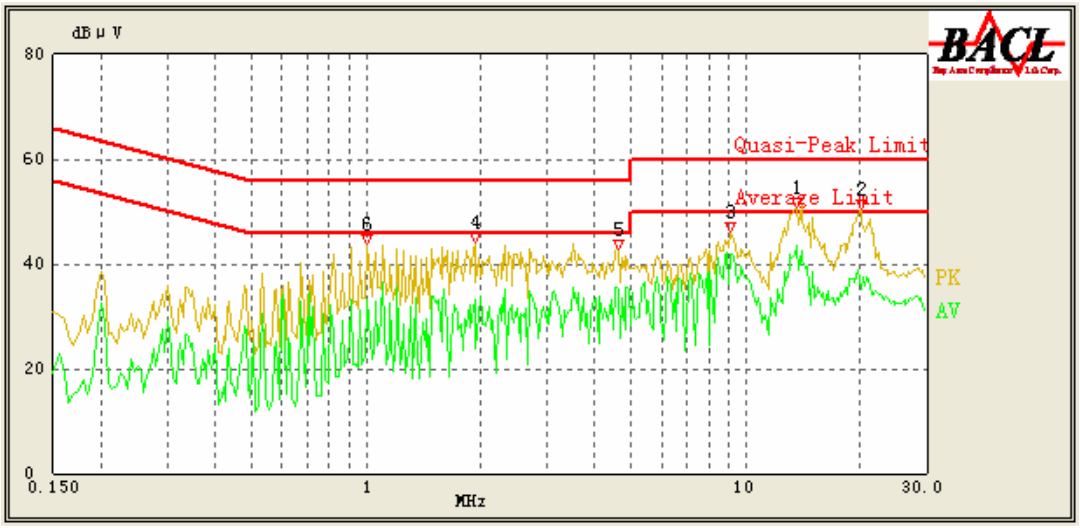
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

The testing was performed by Mick Yin on 2013-01-09.

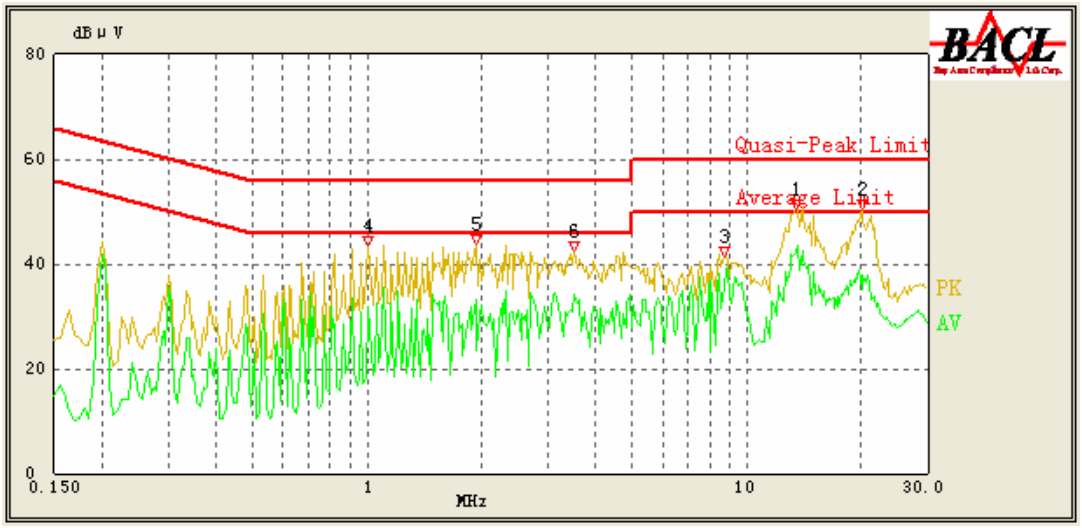
EUT operation mode: Charging & Transmitting

AC 120 V, 60 Hz, Line:



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
13.645	43.35	11.10	50.00	6.65	Ave.
9.150	41.86	10.46	50.00	8.14	Ave.
4.625	35.21	10.29	46.00	10.79	Ave.
1.005	33.20	10.17	46.00	12.80	Ave.
1.930	33.18	10.20	46.00	12.82	Ave.
13.595	45.21	11.09	60.00	14.79	QP
20.105	35.14	12.77	50.00	14.86	Ave.
20.105	44.56	12.77	60.00	15.44	QP
1.930	39.24	10.20	56.00	16.76	QP
1.010	39.22	10.17	56.00	16.78	QP
9.150	42.08	10.46	60.00	17.92	QP
4.625	37.82	10.29	56.00	18.18	QP

AC 120V, 60 Hz, Neutral:



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
13.500	42.23	11.01	50.00	7.77	Ave.
3.520	34.24	10.25	46.00	11.76	Ave.
1.930	33.17	10.20	46.00	12.83	Ave.
1.005	31.82	10.17	46.00	14.18	Ave.
8.750	35.36	10.44	50.00	14.64	Ave.
20.155	35.09	12.55	50.00	14.91	Ave.
20.105	44.78	12.56	60.00	15.22	QP
13.450	44.69	11.01	60.00	15.31	QP
1.930	39.35	10.20	56.00	16.65	QP
1.010	39.30	10.17	56.00	16.70	QP
3.520	38.96	10.25	56.00	17.04	QP
8.750	36.40	10.44	60.00	23.60	QP

Note:
1) Corrected Amplitude = Reading + Correction Factor
2) Correction Factor = LISN VDF + Cable Loss + Pulse Limiter Attenuation
The corrected factor has been input into the transducer of the test software.
3) Margin = Limit – Corrected Amplitude

FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS

Applicable Standard

FCC §15.205; §15.209; §15.247(d)

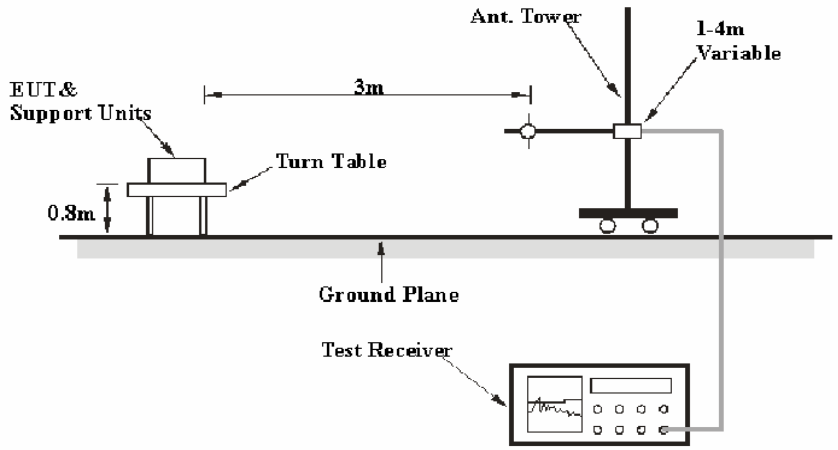
Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

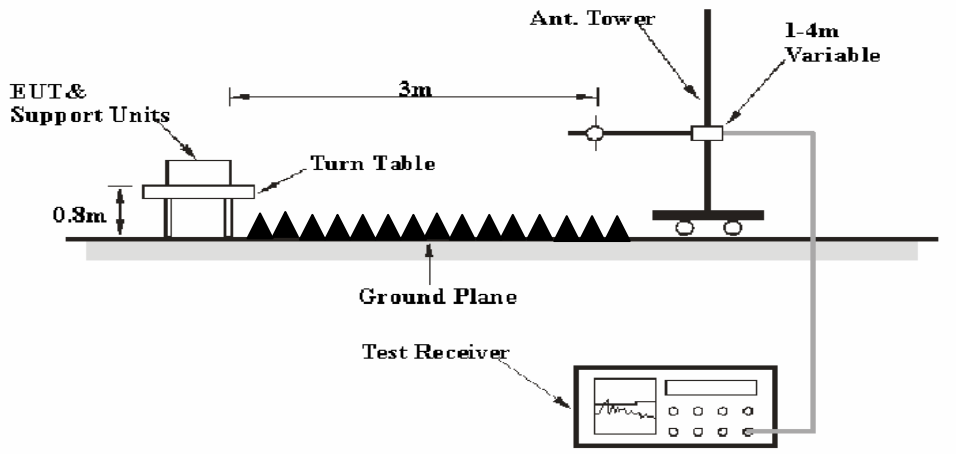
Based on CISPR 16-4-2, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is 4.0 dB. (k=2, 95% level of confidence), and the uncertainty will not be taken into consideration for the test data recorded in the report.

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.4-2009. The specification used was the FCC 15.209 and FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
1 GHz – 25 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	/	Ave.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz -1 GHz and peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss- Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Limit - Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	8447E	1937A01057	2012-11-24	2013-11-23
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2012-08-08	2013-08-07
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2014-11-27
Mini-Circuits	Amplifier	ZVA-213+	N/A	2012-11-24	2013-11-23
Sunol Sciences	Horn Antenna	DRH-118	A052304	2011-12-01	2014-11-30
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23
the electro-Mechanics Co.	Horn Antenna	3116	9510-2270	2010-10-14	2013-10-13

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247, with the worst margin reading of:

11.94 dB at **207.98 MHz** in the **Horizontal** polarization

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	56 %
ATM Pressure:	100 kPa

The testing was performed by Mick Yin on 2012-12-13.

EUT operation mode: Transmitting (Scan with GFSK, π/4-DQPSK, 8DPSK, the worst case is BDR Mode (GFSK))

30 MHz ~25 GHz:

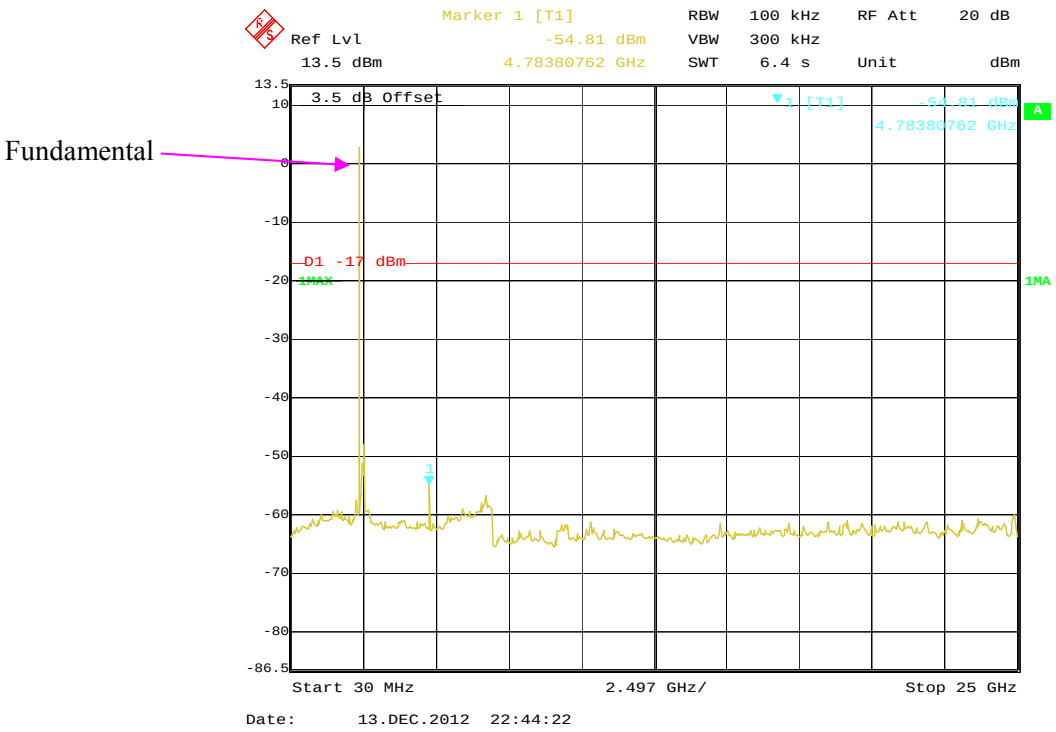
Frequency (MHz)	Receiver		Turn table Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV/m)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel(2402 MHz)									
2402.0	94.01	PK	25	1.1	H	6.13	100.14	/	/
2402.0	83.69	Ave.	25	1.1	H	6.13	89.82	/	/
2402.0	93.09	PK	114	1.3	V	6.13	99.22	/	/
2402.0	82.82	Ave.	114	1.3	V	6.13	88.95	/	/
207.98	47.75	QP	86	1.2	H	-16.5	31.25	43.5	12.25
7206.0	23.12	Ave.	74	1.0	V	17.06	40.18	54	13.82
4804.0	27.48	Ave.	83	1.1	V	12.40	39.88	54	14.12
9608.0	19.33	Ave.	91	1.2	V	19.28	38.61	54	15.39
4804.0	46.05	PK	83	1.1	V	12.40	58.45	74	15.55
7206.0	37.99	PK	74	1.0	V	17.06	55.05	74	18.95
9608.0	31.66	PK	91	1.2	V	19.28	50.94	74	23.06
2485.7	21.03	Ave.	22	1.2	V	7.21	28.24	54	25.76
2373.5	20.83	Ave.	34	1.0	H	6.13	26.96	54	27.04
2311.3	21.12	Ave.	74	1.1	V	5.48	26.60	54	27.40
2485.7	35.38	PK	22	1.2	V	7.21	42.59	74	31.41
2311.3	33.36	PK	74	1.1	V	5.48	38.84	74	35.16
2373.5	32.59	PK	34	1.0	H	6.13	38.72	74	35.28
Middle Channel(2441 MHz)									
2441.0	94.45	PK	11	1.2	H	7.21	101.66	/	/
2441.0	84.03	Ave.	11	1.2	H	7.21	91.24	/	/
2441.0	94.74	PK	35	1.1	V	7.21	101.95	/	/
2441.0	83.45	Ave.	35	1.1	V	7.21	90.66	/	/
207.98	48.06	QP	267	1.1	H	-16.5	31.56	43.5	11.94
7323.0	24.63	Ave.	93	1.2	H	16.49	41.12	54	12.88
4882.0	47.84	PK	227	1.3	V	12.46	60.30	74	13.70
4882.0	27.65	Ave.	227	1.3	V	12.46	40.11	54	13.89
9764.0	19.73	Ave.	103	1.1	V	19.40	39.13	54	14.87
7323.0	41.56	PK	93	1.2	H	16.49	58.05	74	15.95
9764.0	30.96	PK	103	1.1	V	19.40	50.36	74	23.64
2492.6	20.78	Ave.	93	1.1	V	7.21	27.99	54	26.01
2337.4	21.71	Ave.	87	1.3	H	5.48	27.19	54	26.81
2389.2	20.18	Ave.	135	1.2	V	6.13	26.31	54	27.69
2337.4	37.18	PK	87	1.3	H	5.48	42.66	74	31.34
2492.6	35.41	PK	93	1.1	V	7.21	42.62	74	31.38
2389.2	35.32	PK	135	1.2	V	6.13	41.45	74	32.55

Frequency (MHz)	Receiver		Turn table Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV/m)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
High Channel(2480 MHz)									
2480.0	92.56	PK	73	1.1	H	7.21	99.77	/	/
2480.0	81.70	Ave.	73	1.1	H	7.21	88.91	/	/
2480.0	93.21	PK	25	1.2	V	7.21	100.42	/	/
2480.0	82.31	Ave.	25	1.2	V	7.21	89.52	/	/
207.98	47.99	QP	158	1.0	H	-16.5	31.49	43.5	12.01
7440.0	25.18	Ave.	12	1.1	V	15.90	41.08	54	12.92
4960.0	48.42	PK	88	1.0	V	12.50	60.92	74	13.08
4960.0	28.17	Ave.	88	1.0	V	12.50	40.67	54	13.33
7440.0	44.19	PK	12	1.1	V	15.90	60.09	74	13.91
9920.0	19.17	Ave.	227	1.2	V	19.38	38.55	54	15.45
2483.5	48.04	PK	93	1.2	H	7.21	55.25	74	18.75
2483.5	25.87	Ave.	93	1.2	H	7.21	33.08	54	20.92
9920.0	31.39	PK	227	1.2	V	19.38	50.77	74	23.23
2376.4	23.14	Ave.	116	1.1	V	6.13	29.27	54	24.73
2349.9	22.23	Ave.	77	1.3	H	5.48	27.71	54	26.29
2376.4	37.84	PK	116	1.1	V	6.13	43.97	74	30.03
2349.9	35.73	PK	77	1.3	H	5.48	41.21	74	32.79

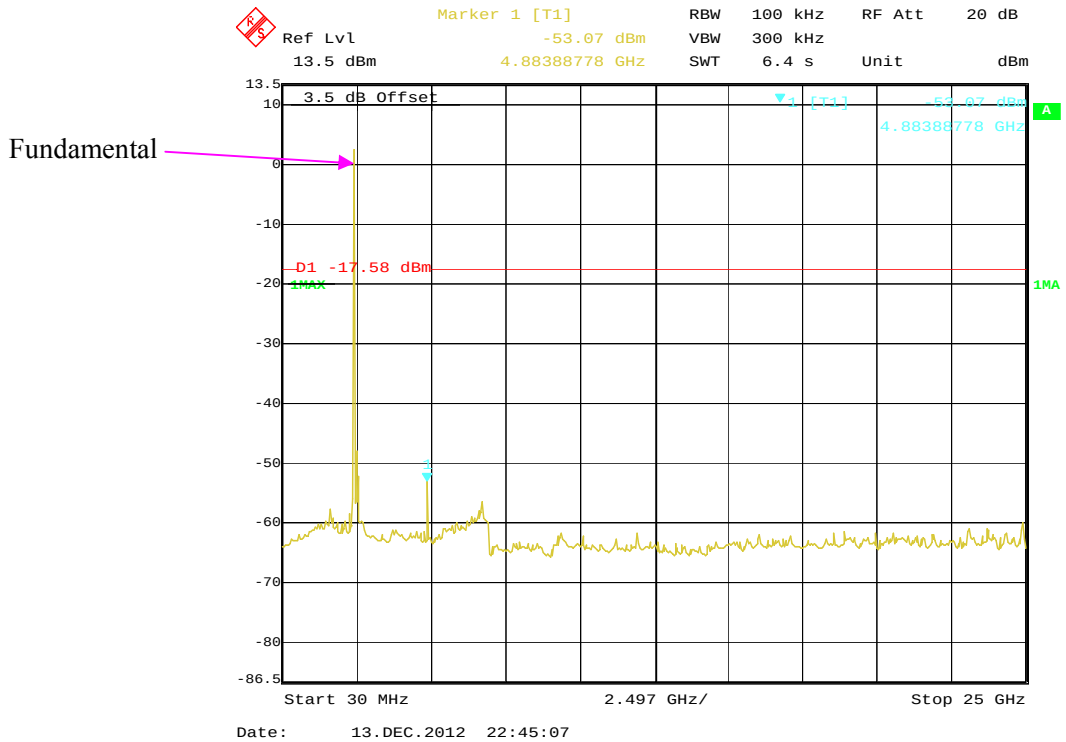
Note:
1) Corrected Amplitude = Corrected Factor + Reading
2) Corrected Factor=Antenna factor (RX) + Cable loss – Amplifier factor
3) Margin = Limit - Corrected Amplitude

Conducted Spurious Emissions at Antenna Port

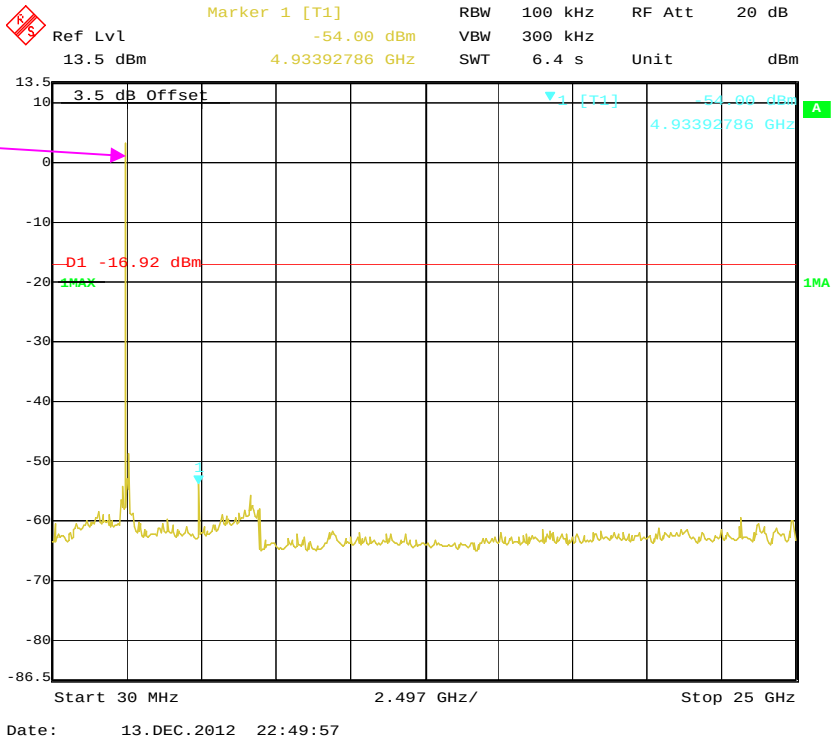
Low Channel



Middle Channel



High Channel



Fundamental

FCC §15.247(a) (1)-CHANNEL SEPARATION TEST

Applicable Standard

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

Test Procedure

1. Set the EUT in transmitting mode, RBW of spectrum was set at 30 kHz, maxhold the channel.
2. Set the adjacent channel of the EUT maxhold another trace
3. Measure the channel separation.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	56 %
ATM Pressure:	100 kPa

** The testing was performed by Mick Yin on 2013-01-07.*

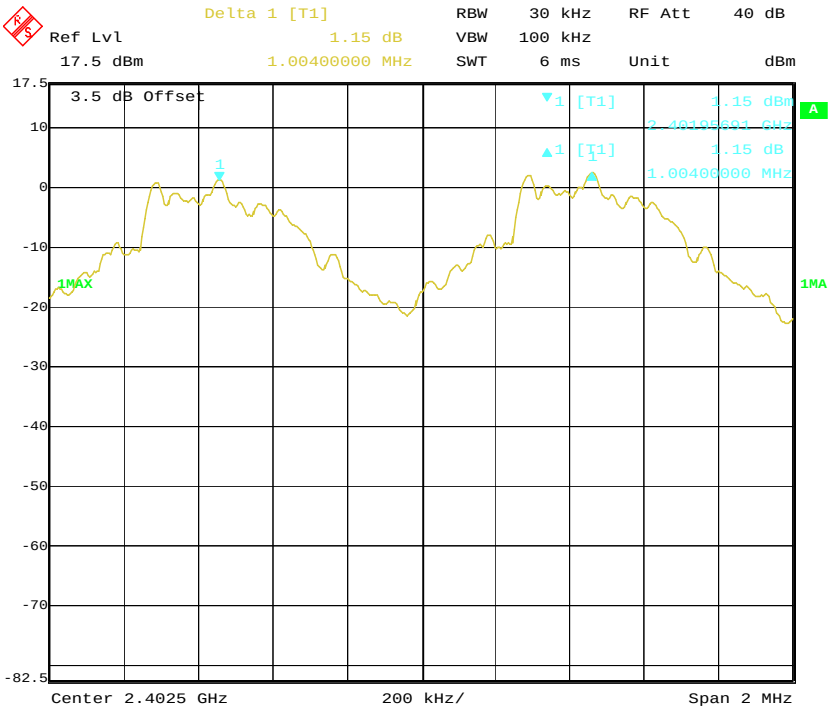
EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following tables and plots

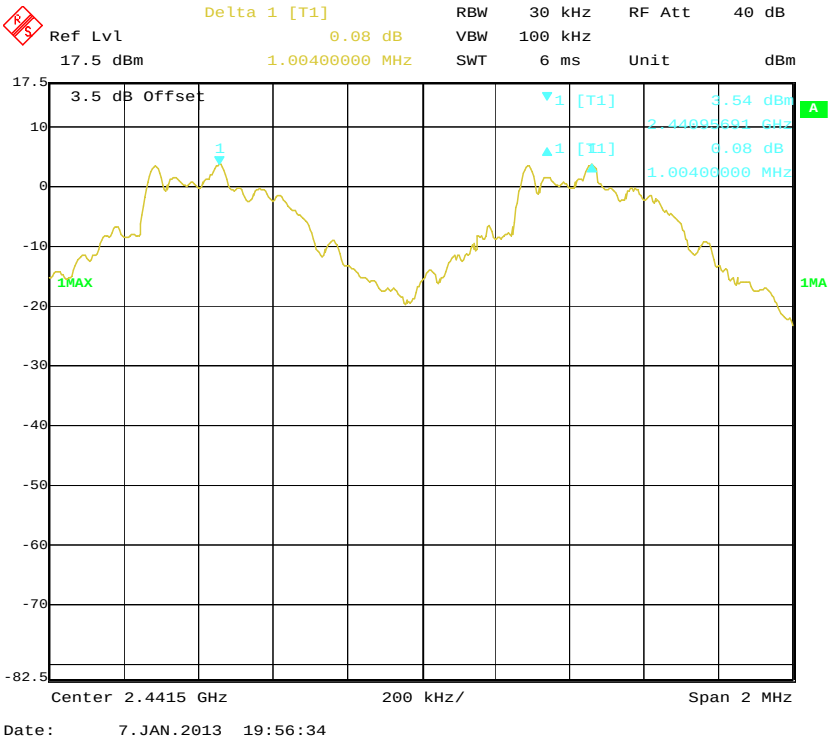
Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	≥Limit (MHz)	Result
BDR (GFSK)	Low	2402	1.004	0.628	Pass
	Adjacent	2403			
	Middle	2441	1.004	0.628	Pass
	Adjacent	2440			
	High	2480	1.004	0.628	Pass
	Adjacent	2479			
EDR (π/4-DQPSK)	Low	2402	1.004	0.815	Pass
	Adjacent	2403			
	Middle	2441	1.004	0.815	Pass
	Adjacent	2440			
	High	2480	1.004	0.815	Pass
	Adjacent	2479			
EDR (8DPSK)	Low	2402	1.004	0.817	Pass
	Adjacent	2403			
	Middle	2441	1.004	0.817	Pass
	Adjacent	2440			
	High	2480	1.004	0.817	Pass
	Adjacent	2479			

Note: Limit =2/3 of 20 dB bandwidth

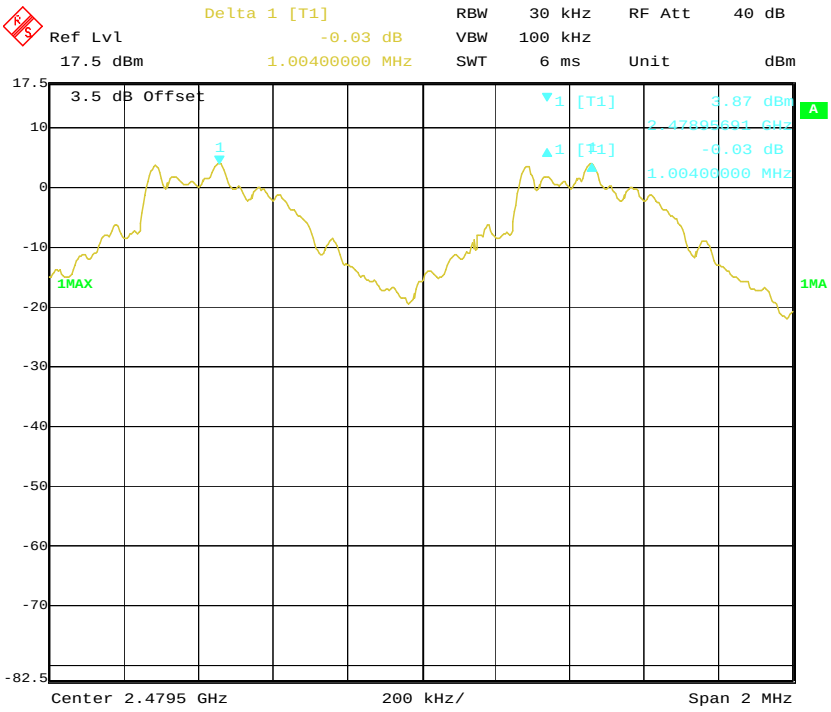
BDR (GFSK): Low Channel



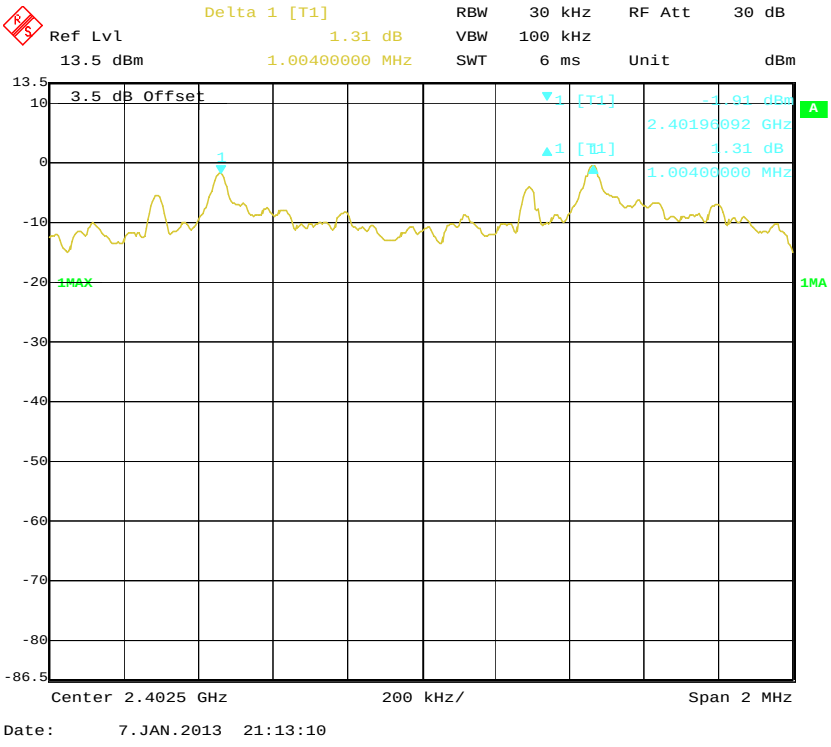
BDR (GFSK): Middle Channel



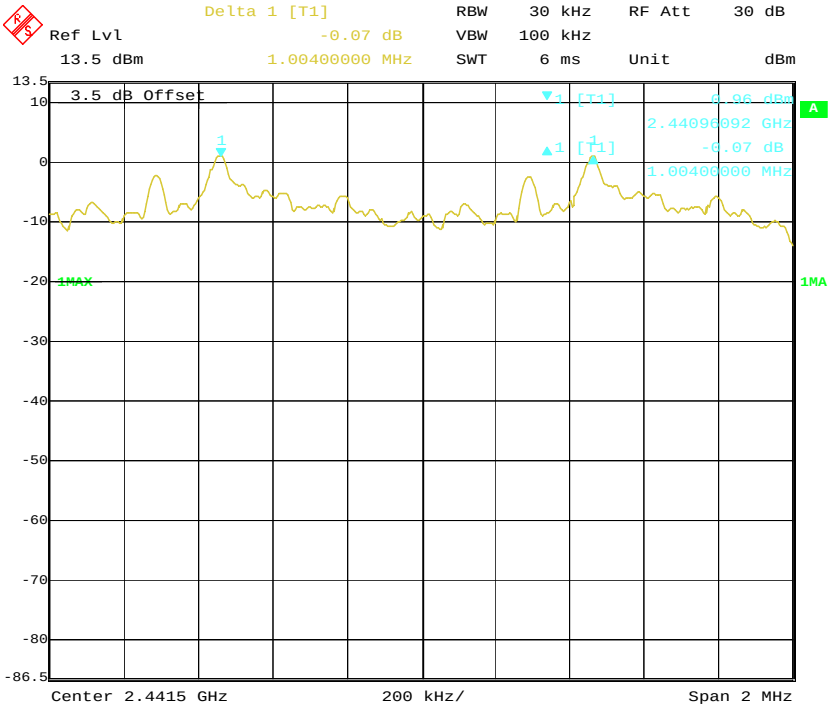
BDR (GFSK): High Channel



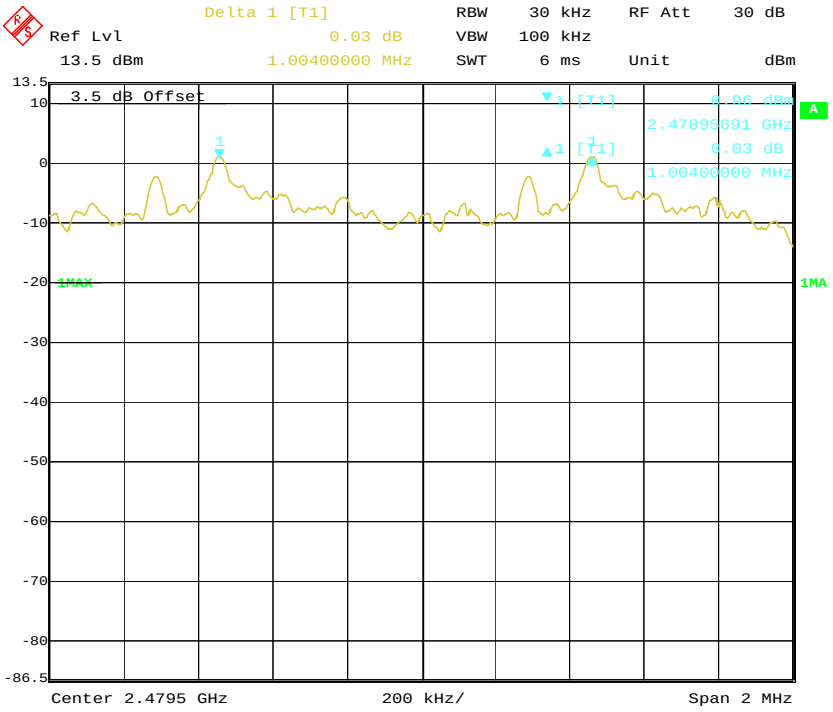
EDR (π/4-DQPSK): Low Channel



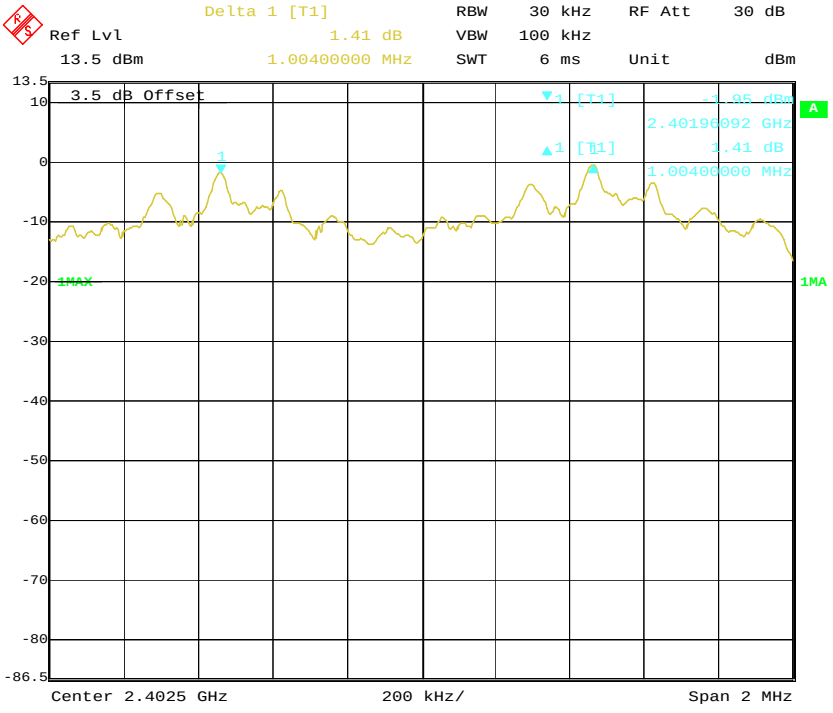
EDR (π/4-DQPSK): Middle Channel



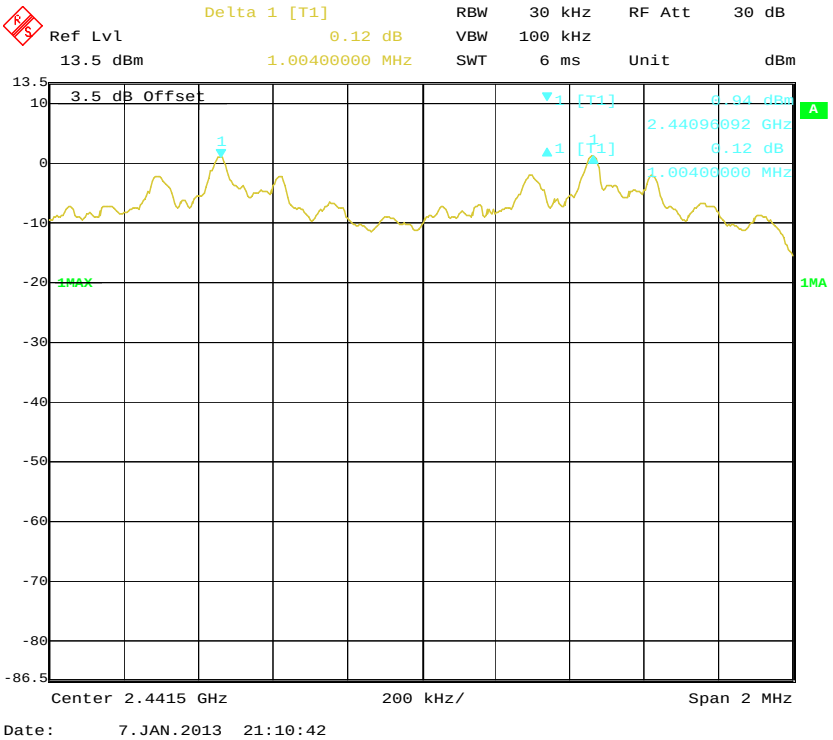
EDR (π/4-DQPSK): High Channel



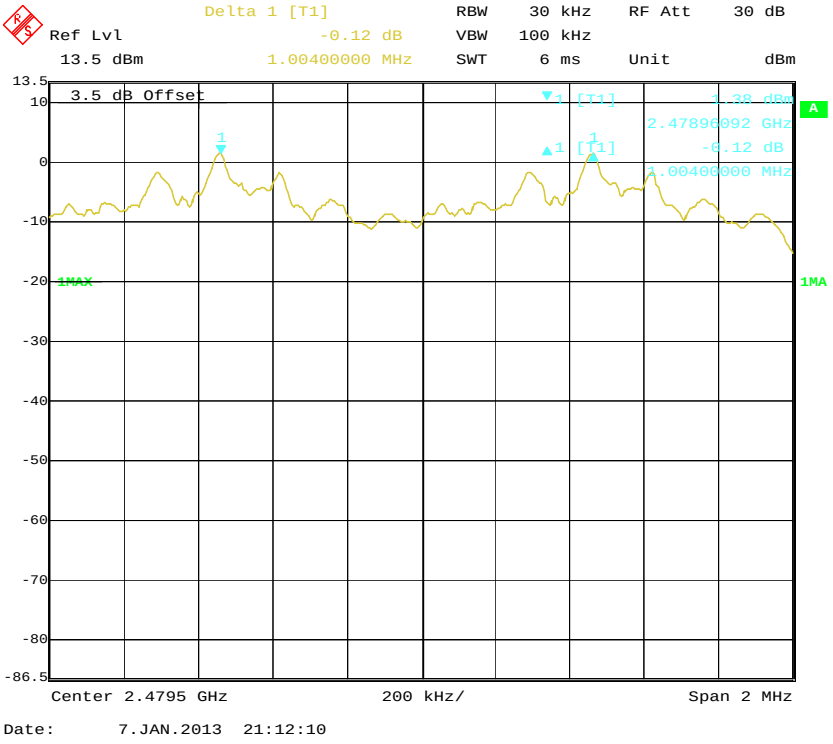
EDR (8DPSK): Low Channel



EDR (8DPSK): Middle Channel



EDR (8DPSK): High Channel



FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH

Applicable Standard

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

Test Procedure

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.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	56 %
ATM Pressure:	100 kPa

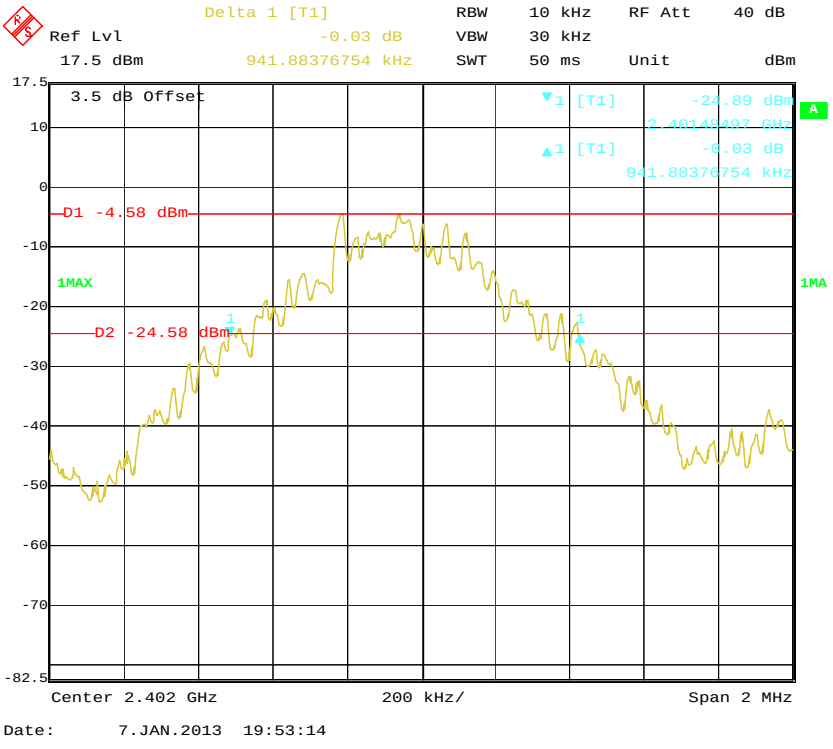
** The testing was performed by Mick Yin on 2013-01-07.*

EUT operation mode: Transmitting

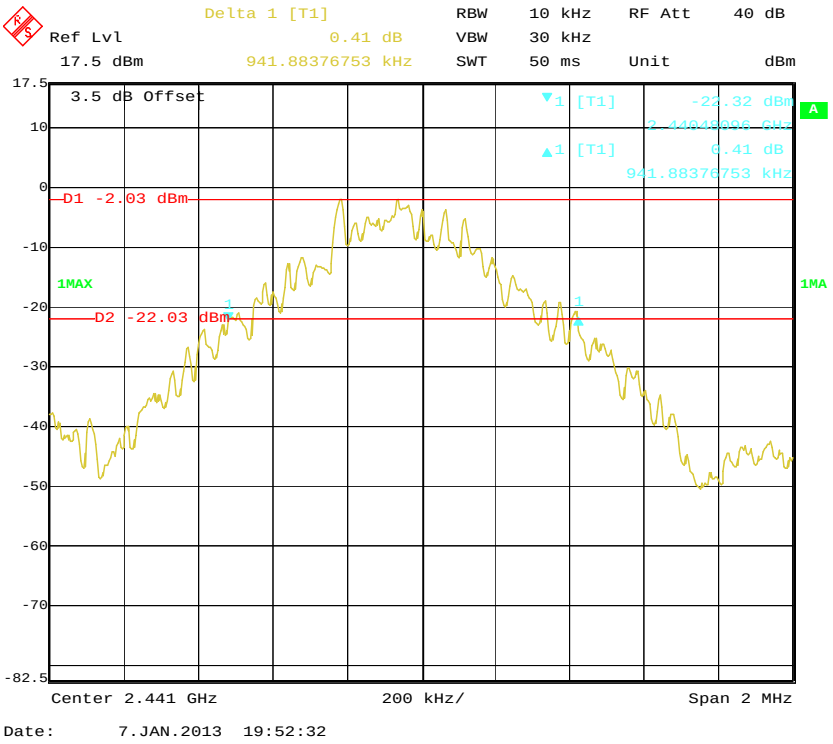
Test Result: Compliance. Please refer to following tables and plots

Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
BDR (GFSK)	Low	2402	0.942
	Middle	2441	0.942
	High	2480	0.942
EDR (π/4-DQPSK)	Low	2402	1.222
	Middle	2441	1.222
	High	2480	1.222
EDR (8DPSK)	Low	2402	1.226
	Middle	2441	1.226
	High	2480	1.226

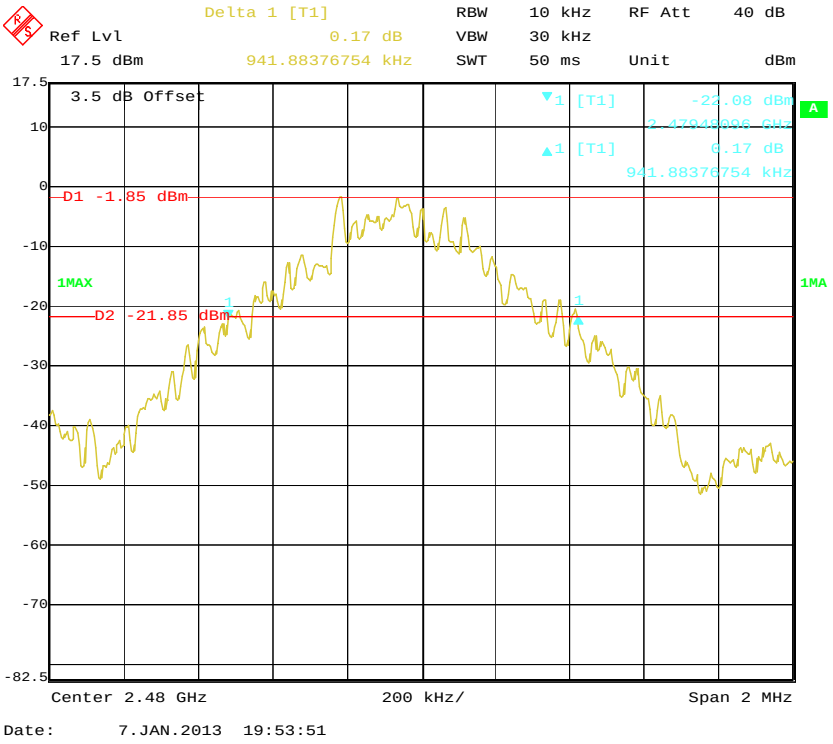
BDR (GFSK): Low Channel



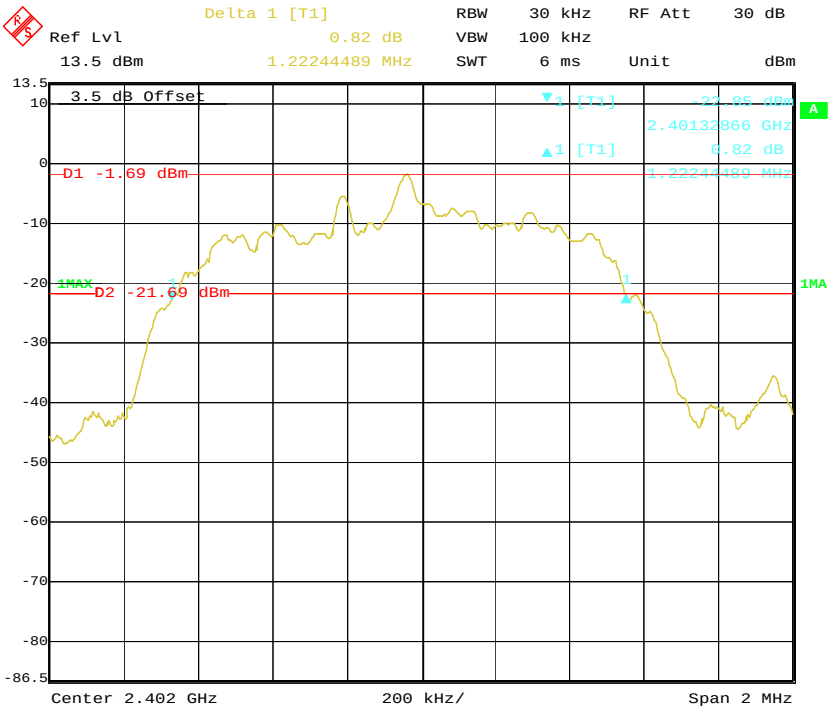
BDR (GFSK): Middle Channel



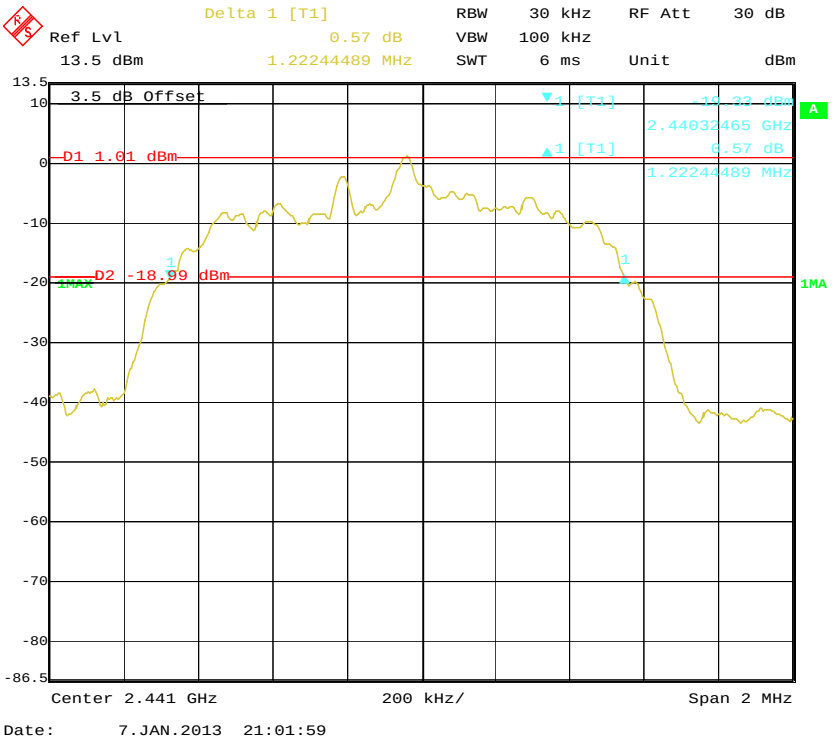
BDR (GFSK): High Channel



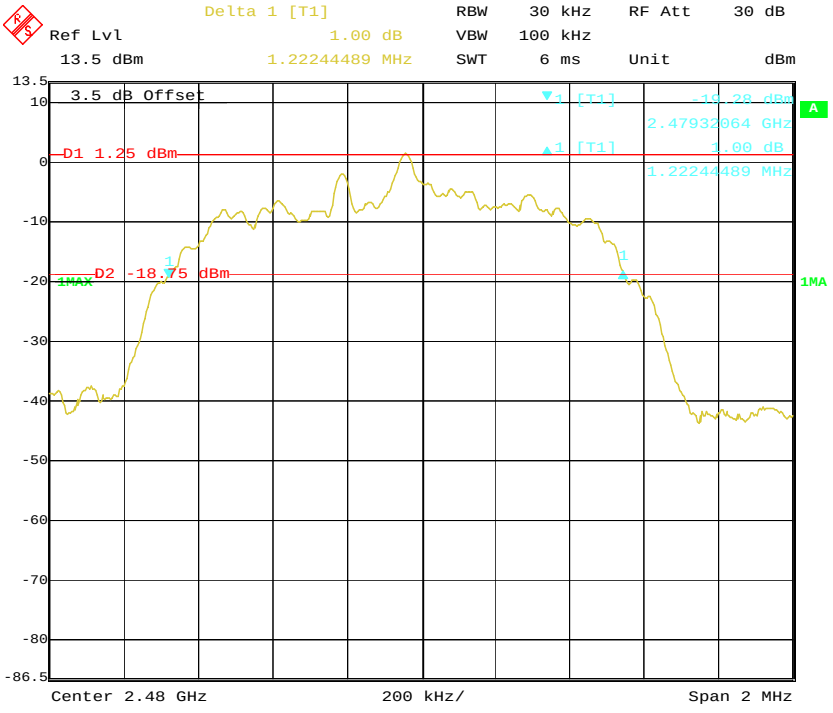
EDR (π/4-DQPSK): Low Channel



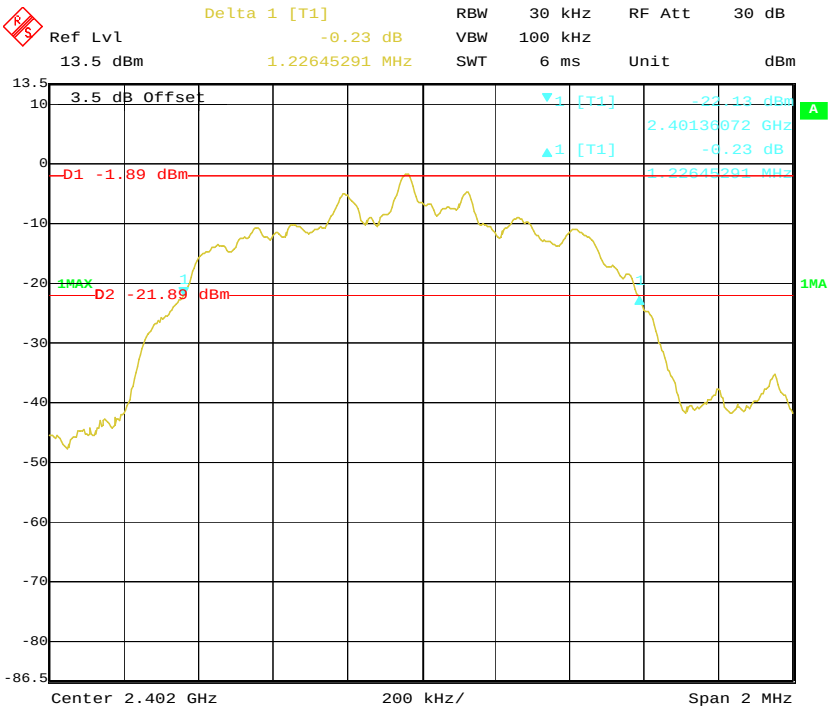
EDR (π/4-DQPSK): Middle Channel



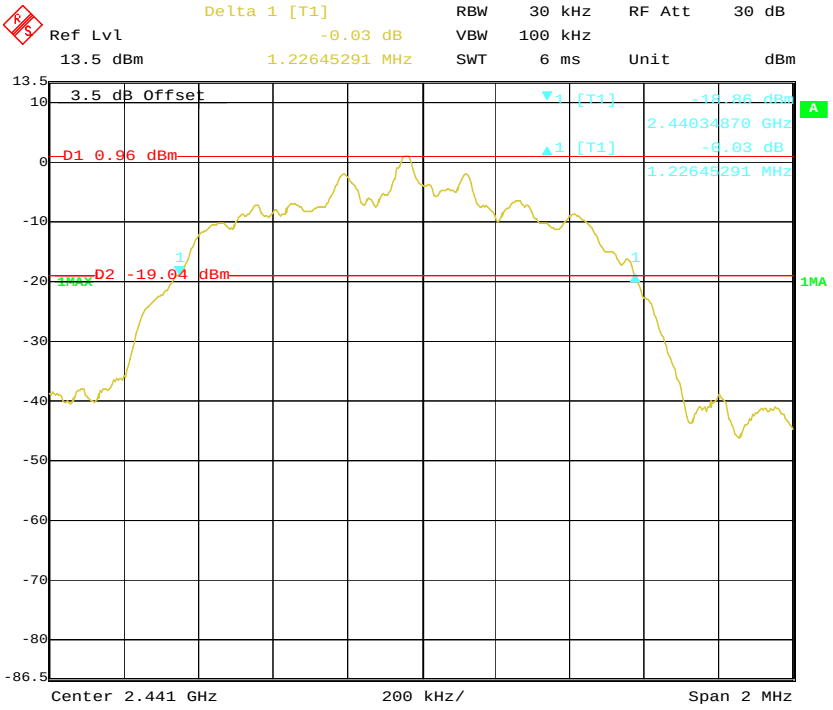
EDR (π/4-DQPSK): High Channel



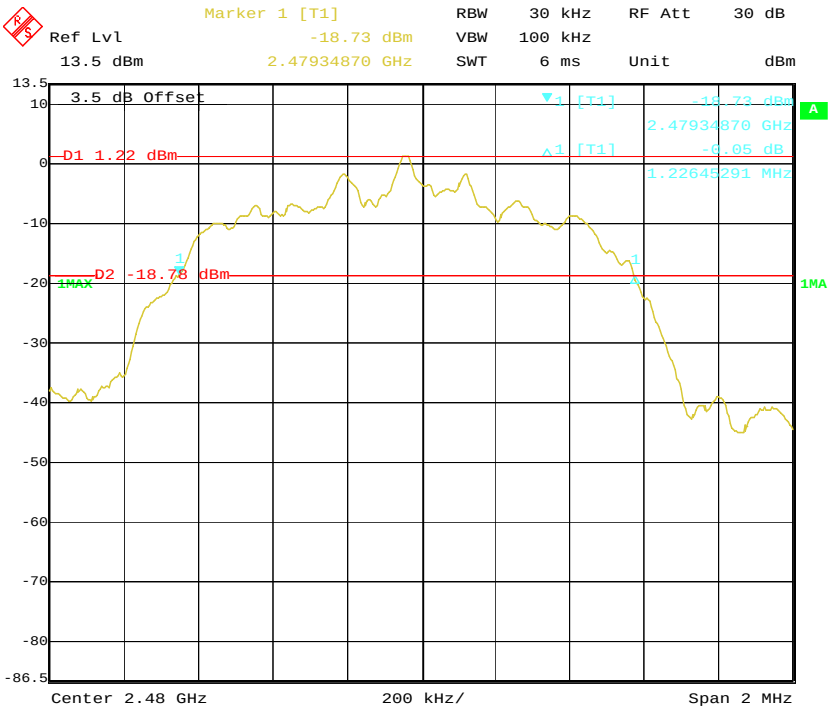
EDR (8DPSK): Low Channel



EDR (8DPSK): Middle Channel



EDR (8DPSK): High Channel



FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL

Applicable Standard

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

2. Set the EUT in hopping mode from first channel to last.

3. By using the Max-Hold function record the Quantity of the channel.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	56 %
ATM Pressure:	100 kPa

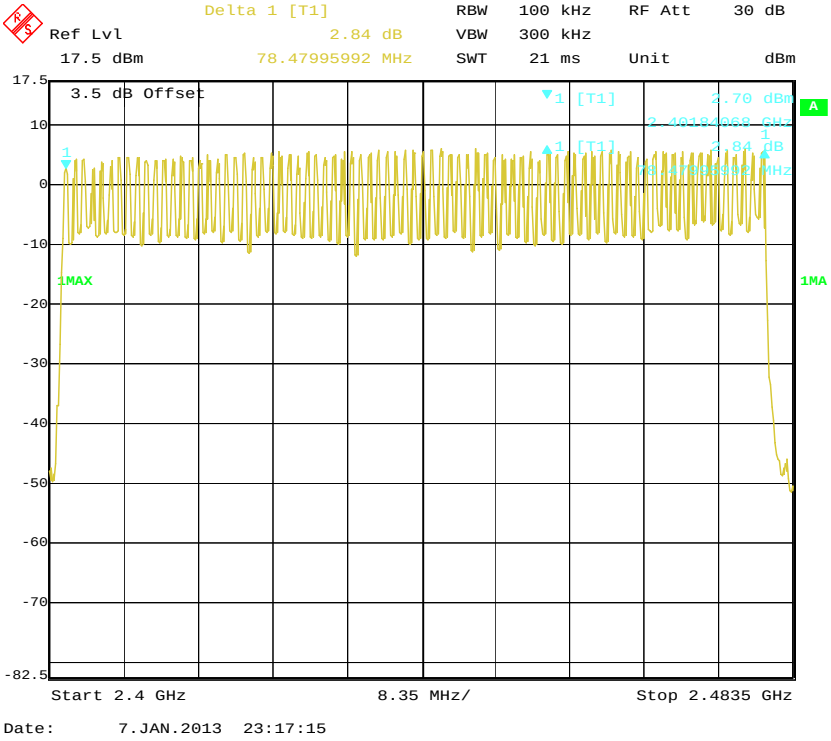
The testing was performed by Mick Yin on 2013-01-07.

EUT operation mode: Transmitting

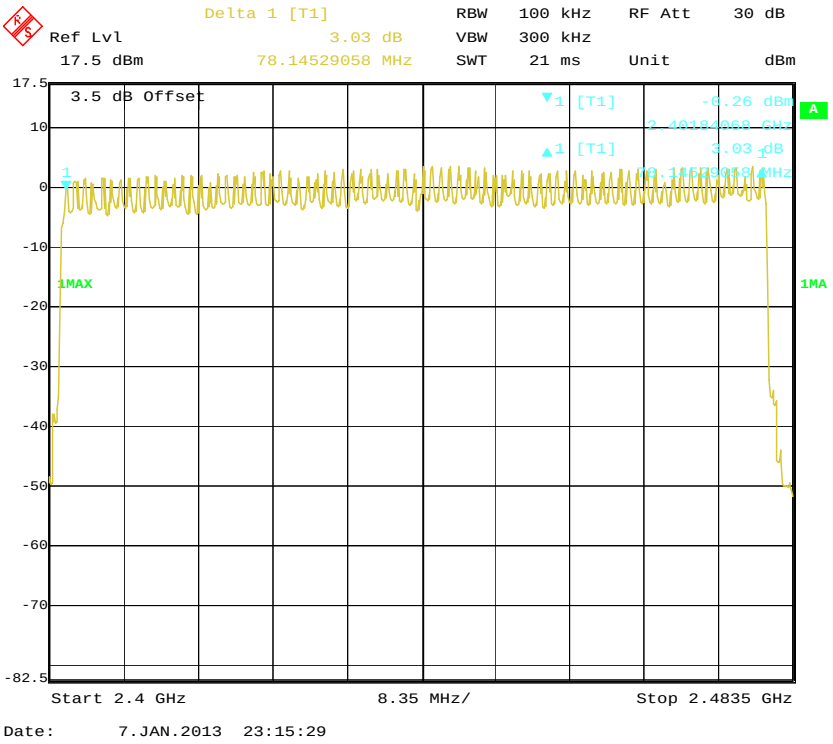
Test Result: Compliance. Please refer to following tables and plots

Mode	Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
BDR (GFSK)	2400-2483.5	79	≥15
EDR (π/4-DQPSK)	2400-2483.5	79	≥15
EDR (8DPSK)	2400-2483.5	79	≥15

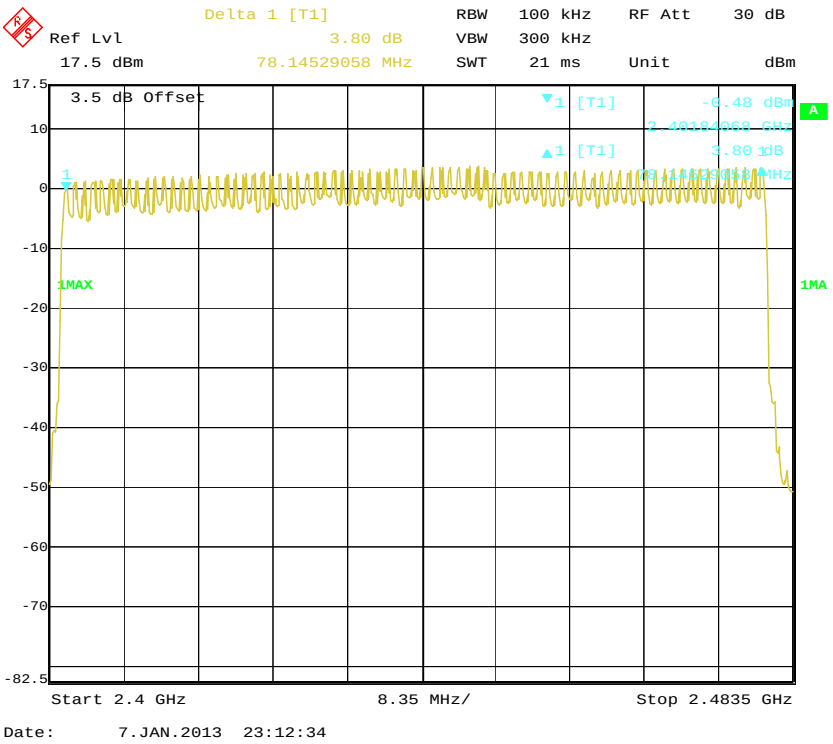
BDR (GFSK): Number of Hopping Channels



EDR (π/4-DQPSK): Number of Hopping Channels



(8DPSK): Number of Hopping Channels



FCC §15.247(a) (1) (iii) -TIME OF OCCUPANCY (DWELL TIME)

Applicable Standard

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Procedure

The EUT was worked in channel hopping; Spectrum SPAN was set as 0. Sweep was set as 0.4 X channel no. (s), the quantity of pulse was get from single sweep. In addition, the time of single pulses was tested.

Dwell time = Pulse time*hope rate/number of hopping channels*31.6S
Hop rate=1600/S

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	56 %
ATM Pressure:	100 kPa

The testing was performed by Mick Yin on 2013-01-07.

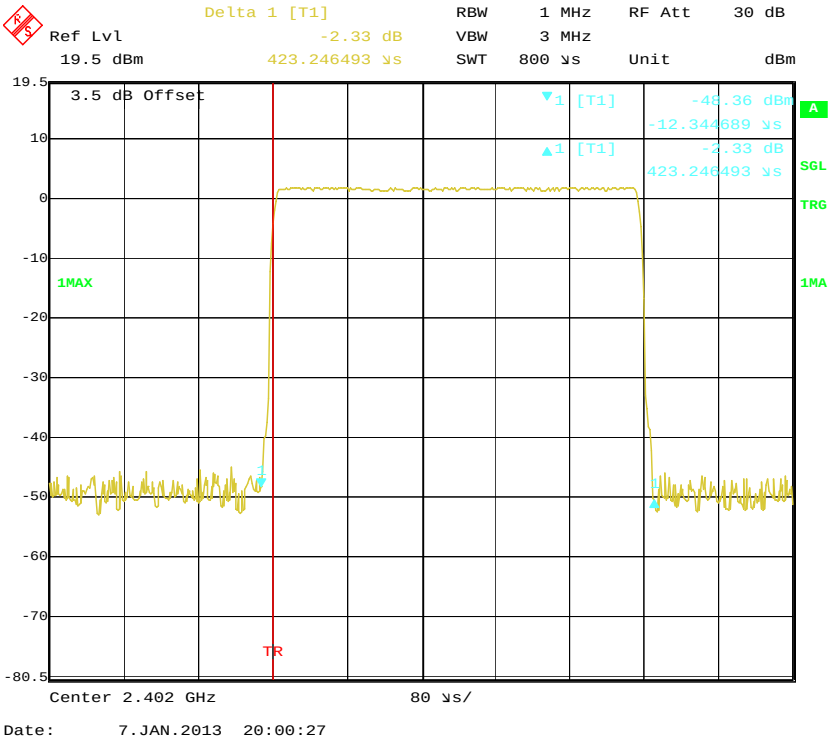
EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following tables and plots

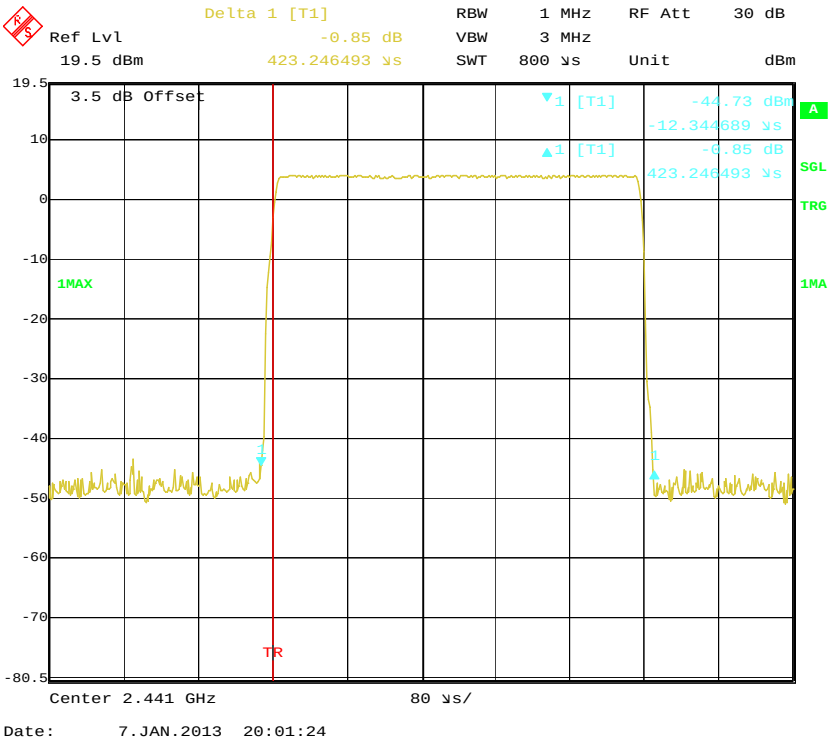
Mode		Channel	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Result
BDR (GFSK)	DH 1	Low	0.423	0.135	0.4	Pass
		Middle	0.423	0.135	0.4	Pass
		High	0.423	0.135	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.698	0.272	0.4	Pass
		Middle	1.698	0.272	0.4	Pass
		High	1.698	0.272	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	2.960	0.316	0.4	Pass
		Middle	2.960	0.316	0.4	Pass
		High	2.960	0.316	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR (π/4-DQPSK)	DH 1	Low	0.442	0.141	0.4	Pass
		Middle	0.442	0.141	0.4	Pass
		High	0.442	0.141	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.693	0.271	0.4	Pass
		Middle	1.693	0.271	0.4	Pass
		High	1.693	0.271	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	2.964	0.316	0.4	Pass
		Middle	2.964	0.316	0.4	Pass
		High	2.964	0.316	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR (8DPSK)	DH 1	Low	0.443	0.142	0.4	Pass
		Middle	0.443	0.142	0.4	Pass
		High	0.443	0.142	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.699	0.272	0.4	Pass
		Middle	1.699	0.272	0.4	Pass
		High	1.699	0.272	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	2.964	0.316	0.4	Pass
		Middle	2.964	0.316	0.4	Pass
		High	2.964	0.316	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				

BDR (GFSK):

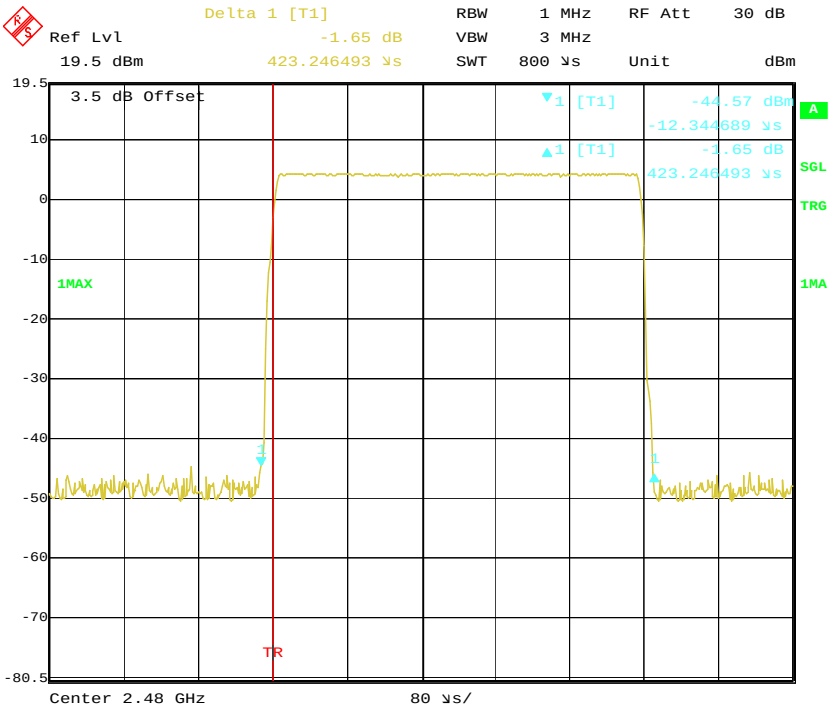
Pulse time, Low Channel, DH1



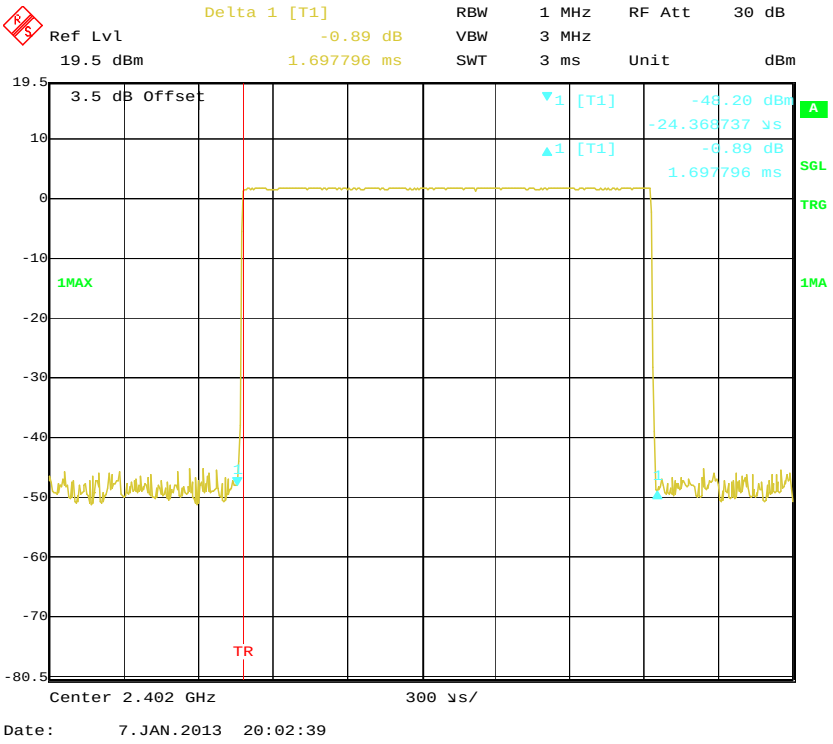
Pulse time, Middle Channel, DH1



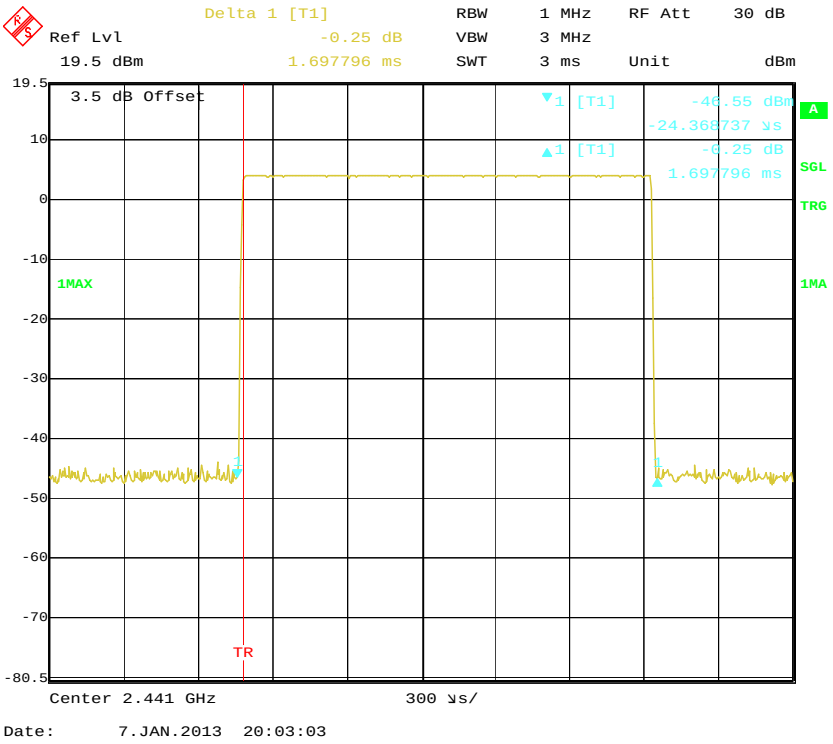
Pulse time, High Channel, DH1



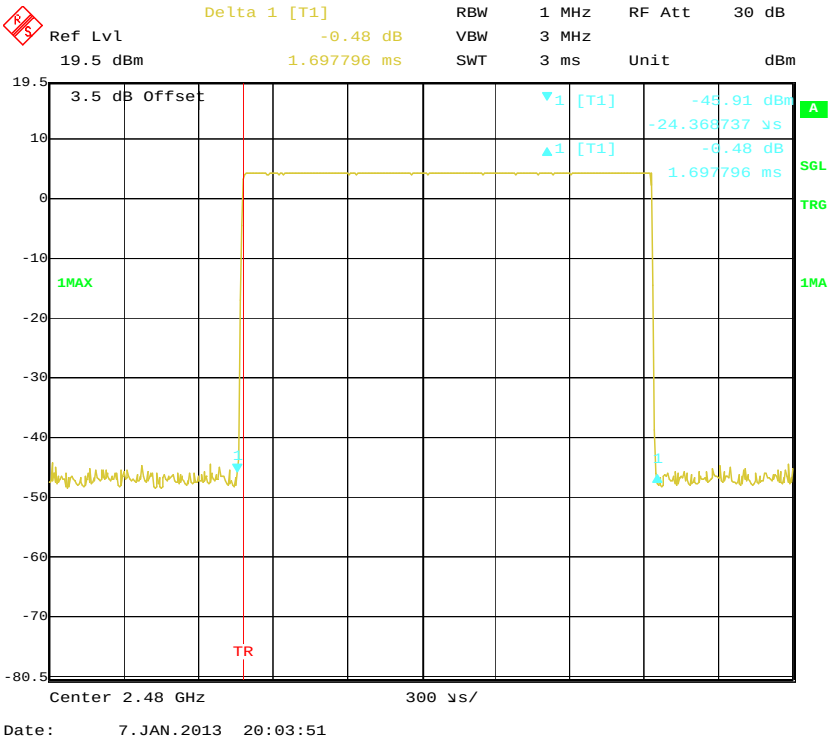
Pulse time, Low Channel, DH3



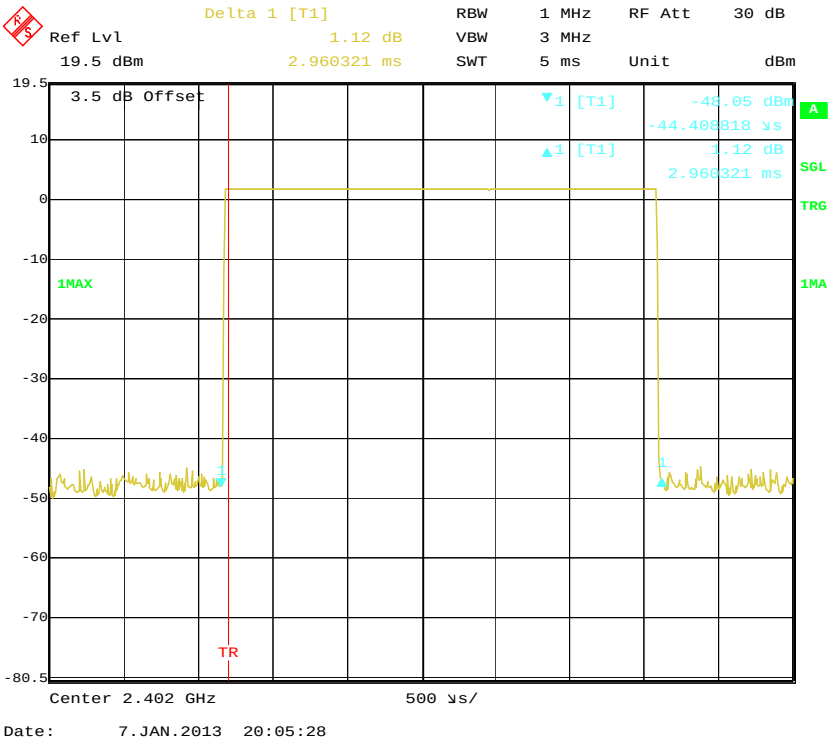
Pulse time, Middle Channel, DH3



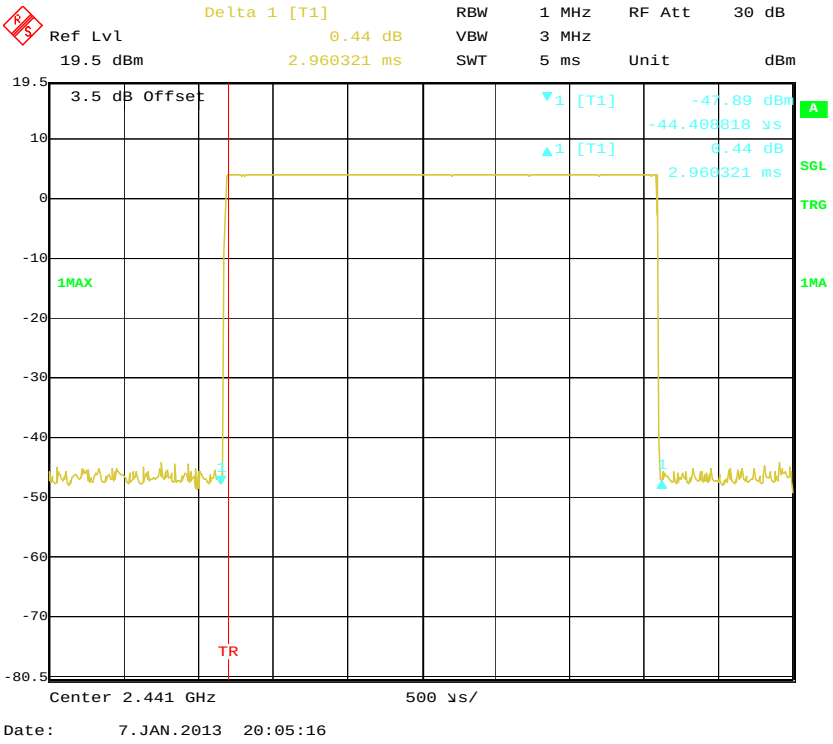
Pulse time, High Channel, DH3



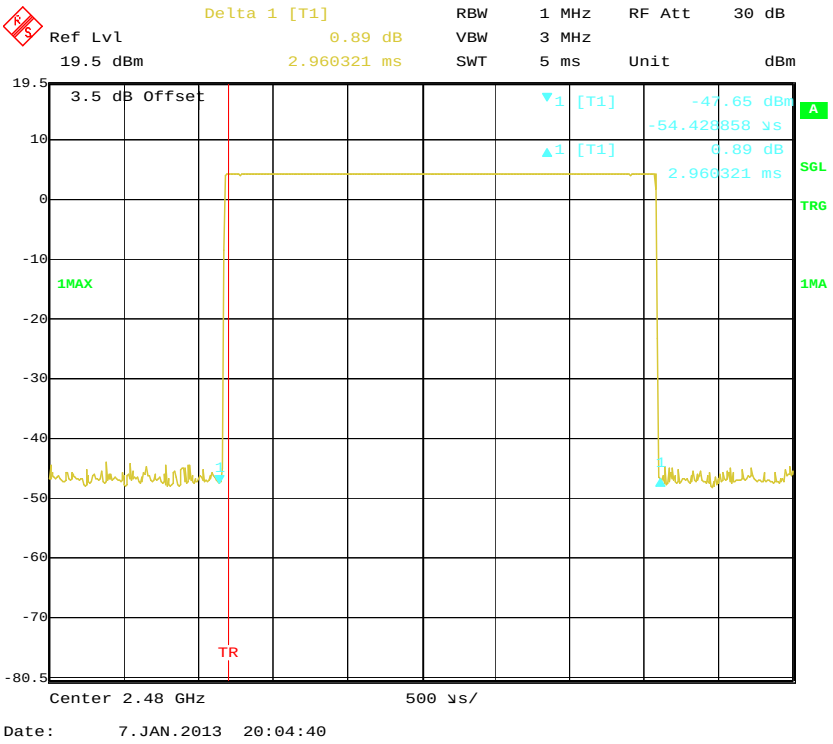
Pulse time, Low Channel, DH5



Pulse time, Middle Channel, DH5

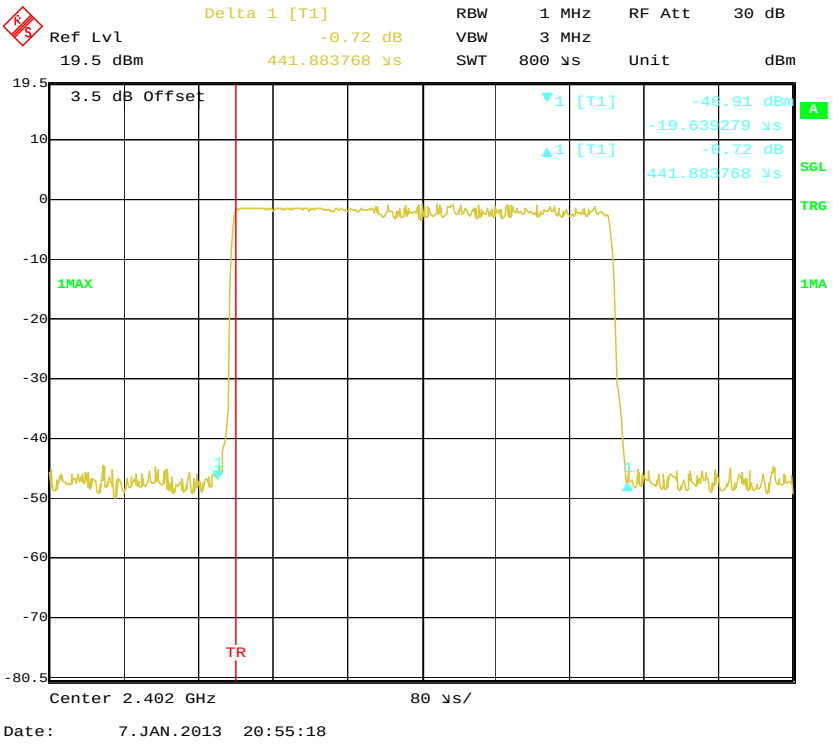


Pulse time, High Channel, DH5

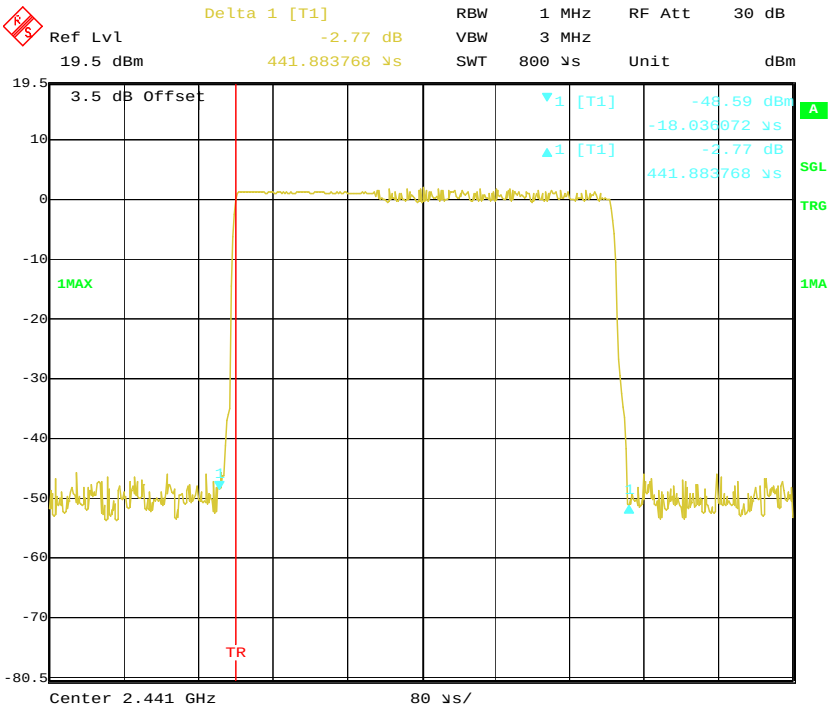


EDR (π/4-DQPSK):

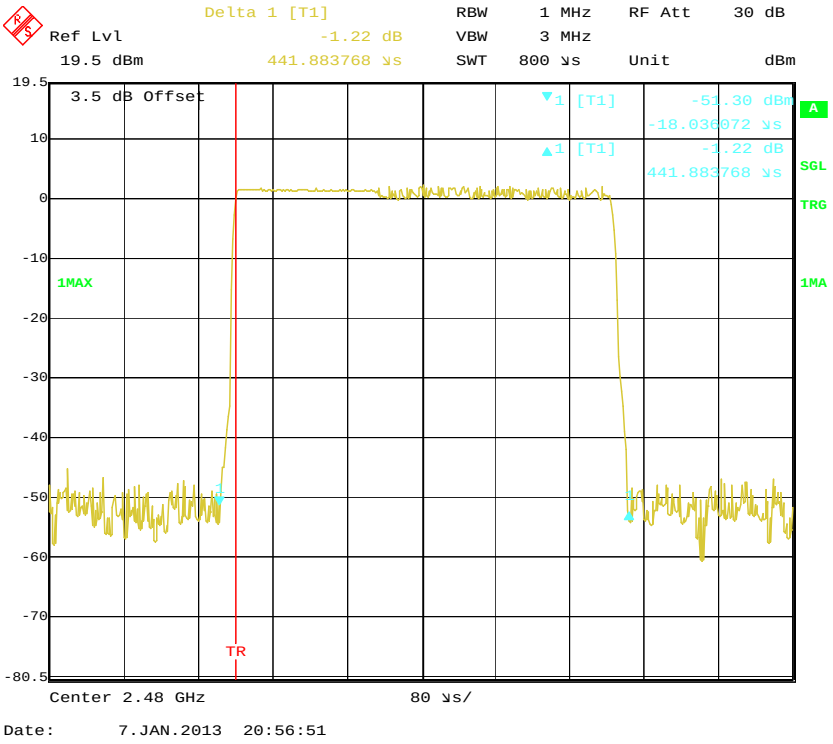
Pulse time, Low Channel, DH1



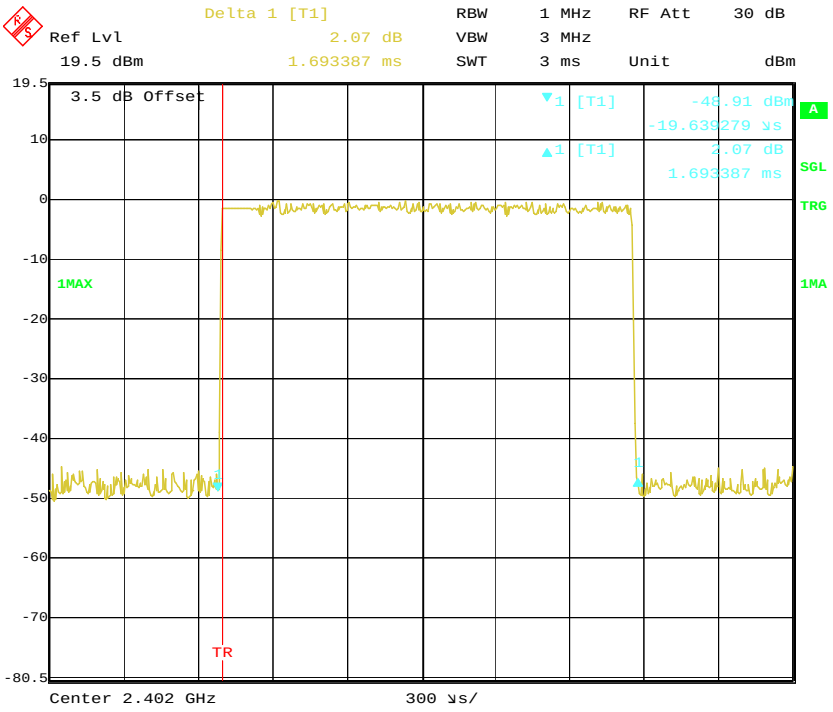
Pulse time, Middle Channel, DH1



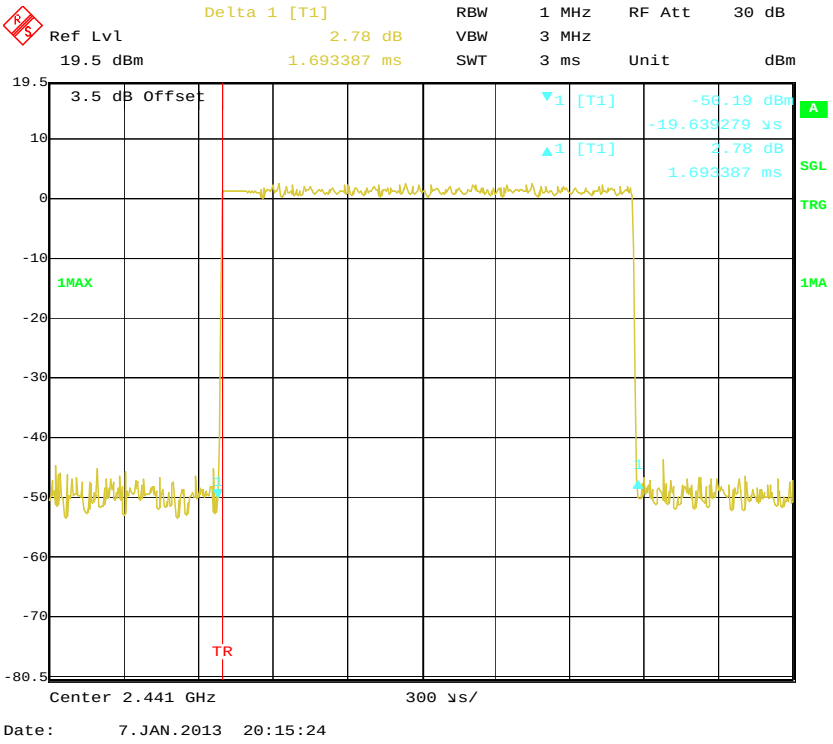
Pulse time, High Channel, DH1



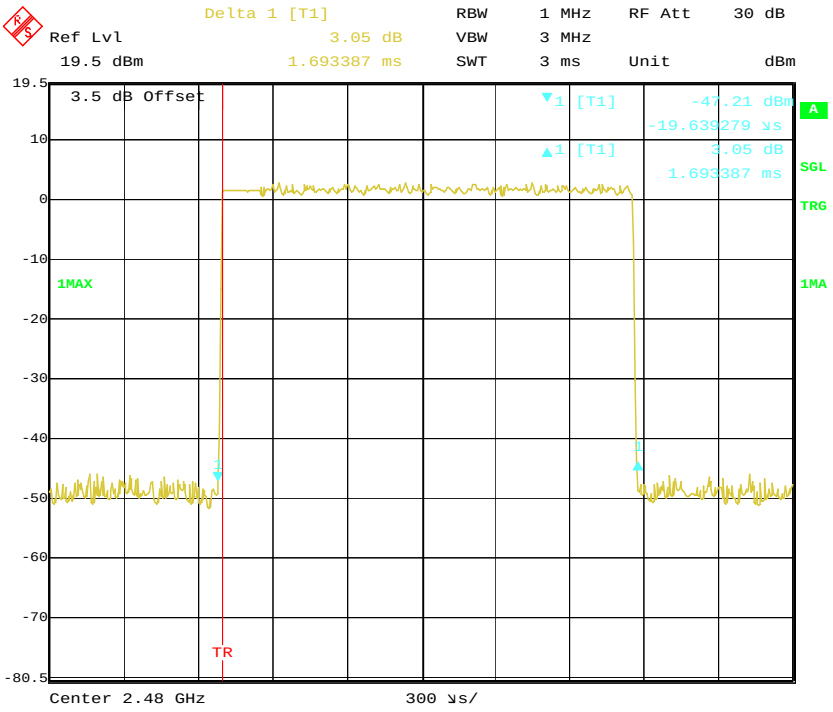
Pulse time, Low Channel, DH3



Pulse time, Middle Channel, DH3

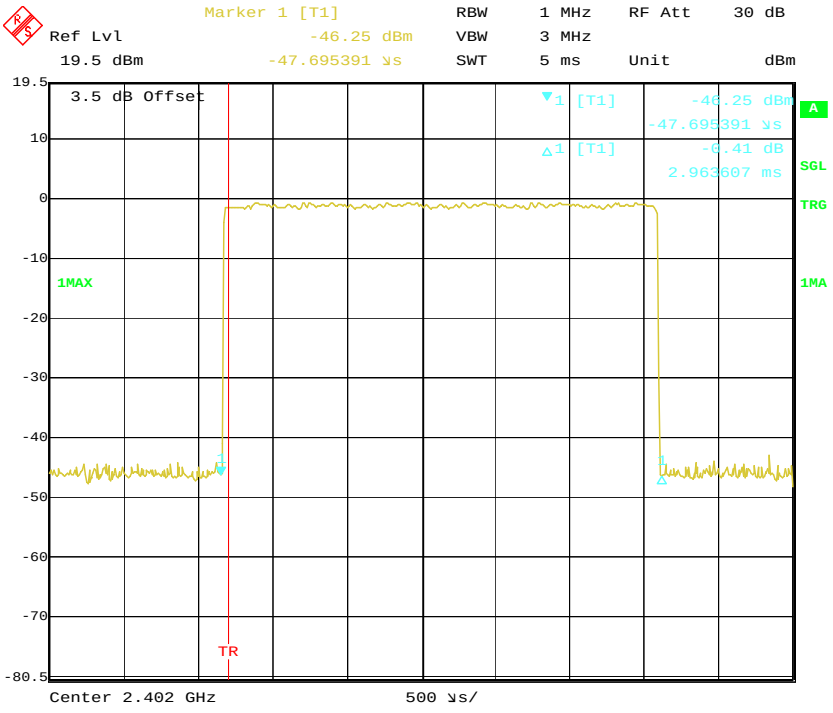


Pulse time, High Channel, DH3



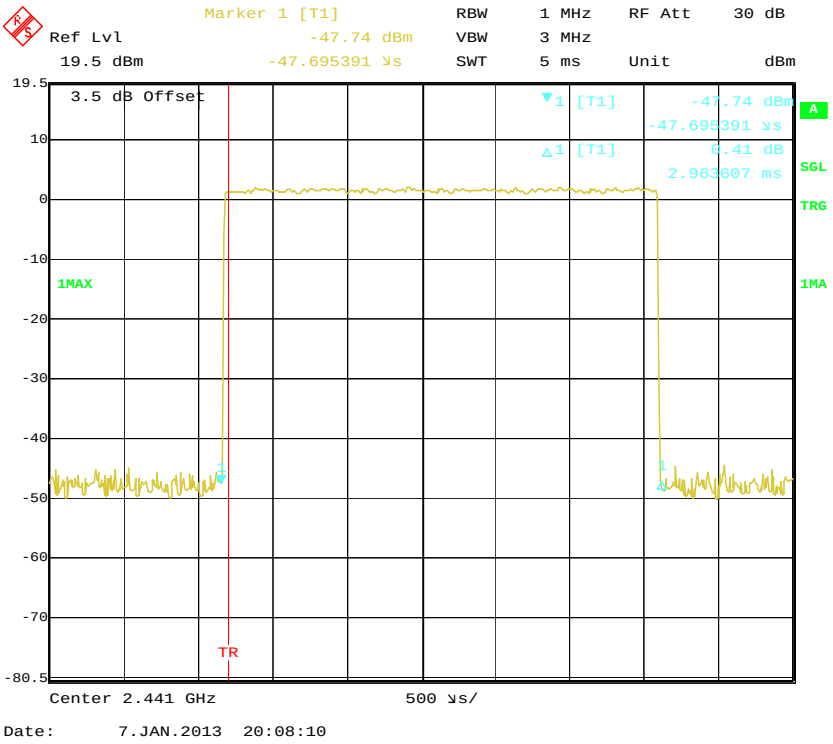
Date: 7.JAN.2013 20:16:58

Pulse time, Low Channel, DH5

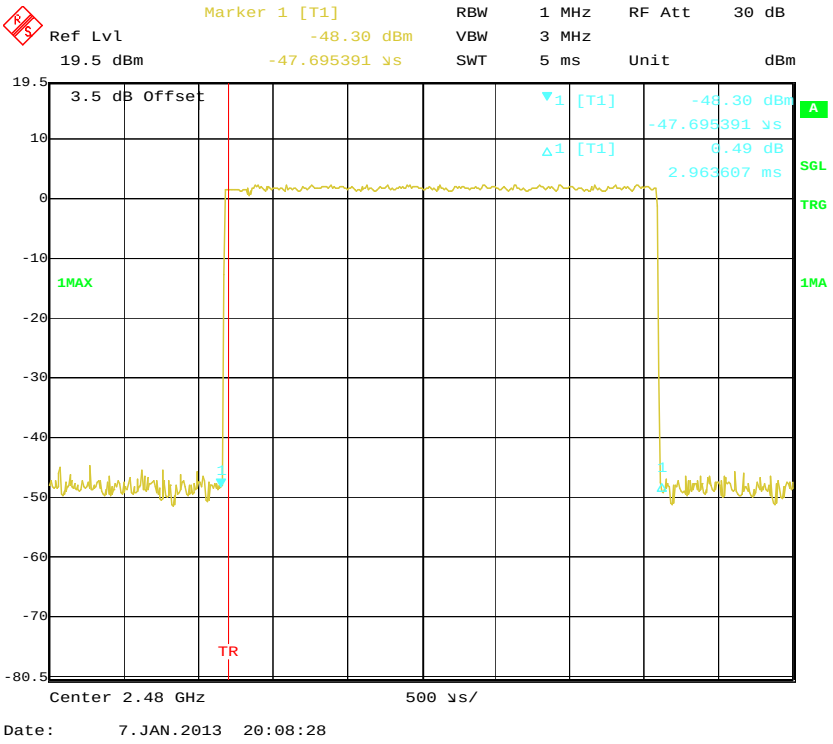


Date: 7.JAN.2013 20:07:49

Pulse time, Middle Channel, DH5

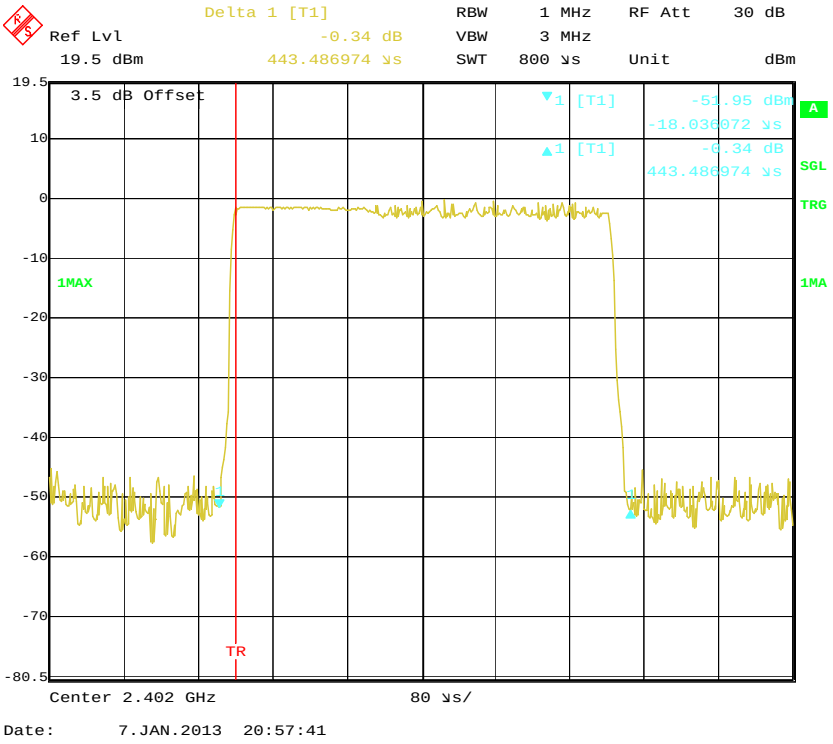


Pulse time, High Channel, DH5



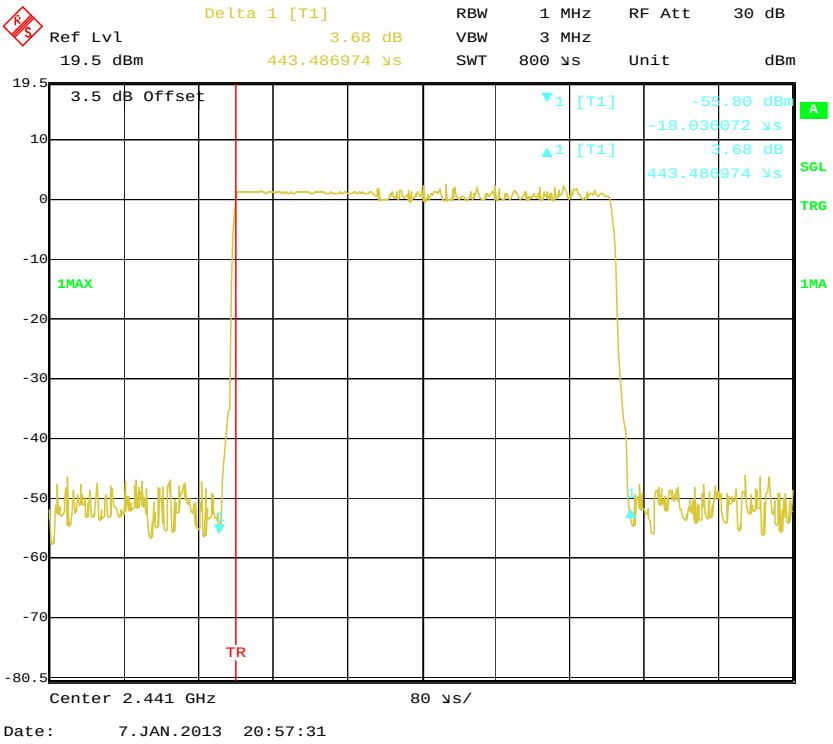
EDR (8DPSK):

Pulse time, Low Channel, DH1



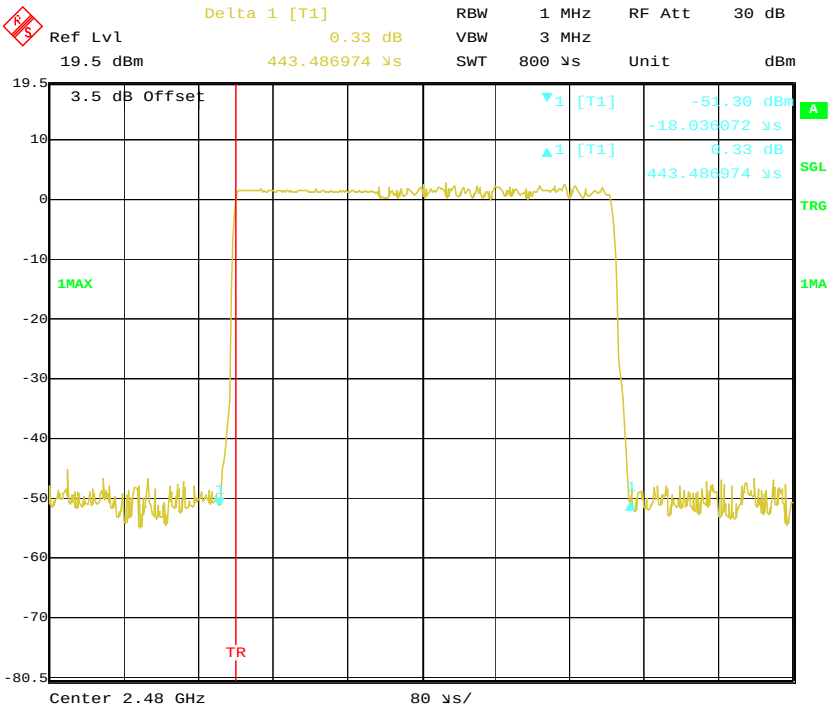
Date: 7.JAN.2013 20:57:41

Pulse time, Middle Channel, DH1

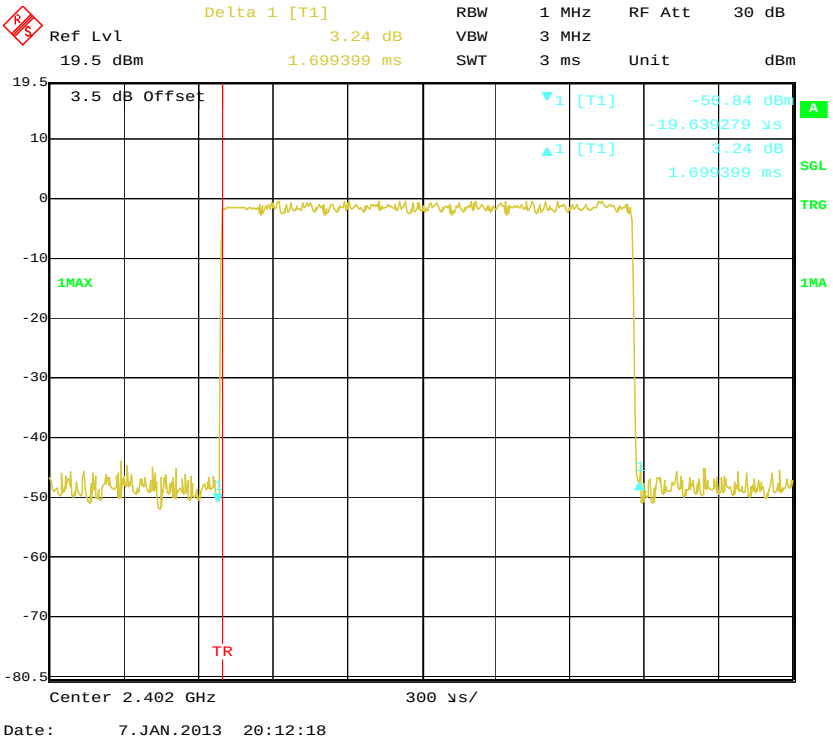


Date: 7.JAN.2013 20:57:31

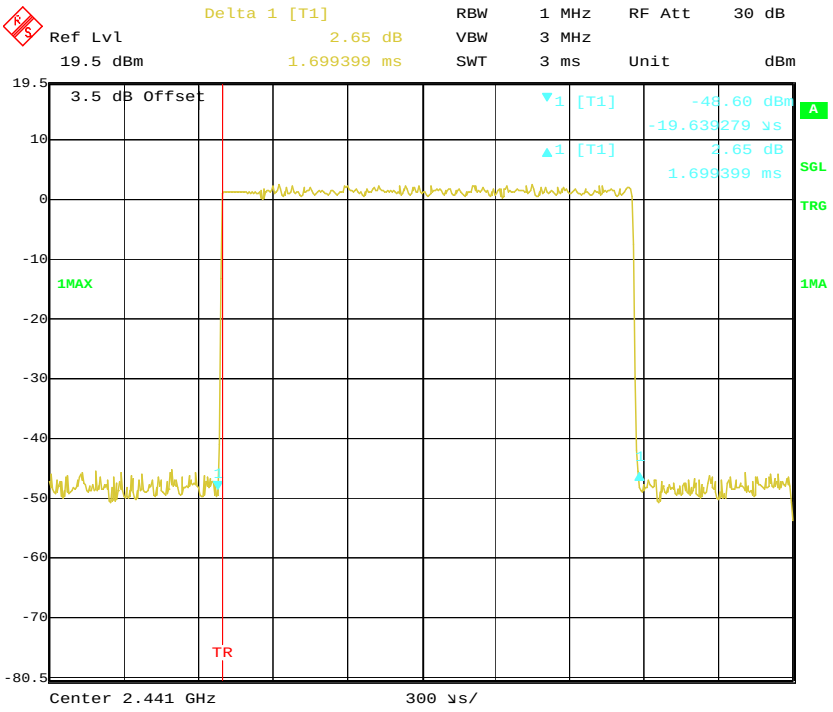
Pulse time, High Channel, DH1



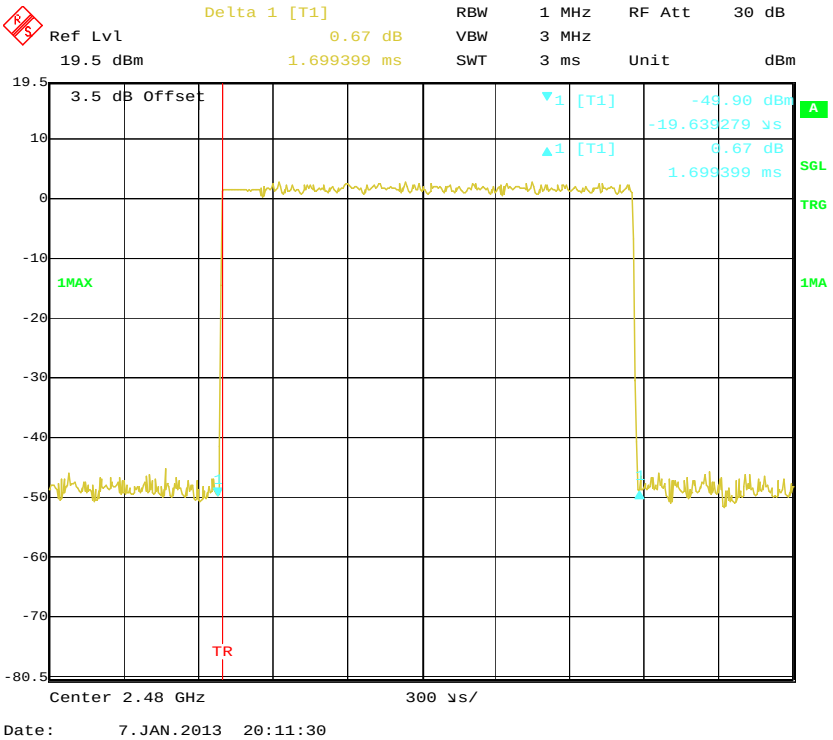
Pulse time, Low Channel, DH3



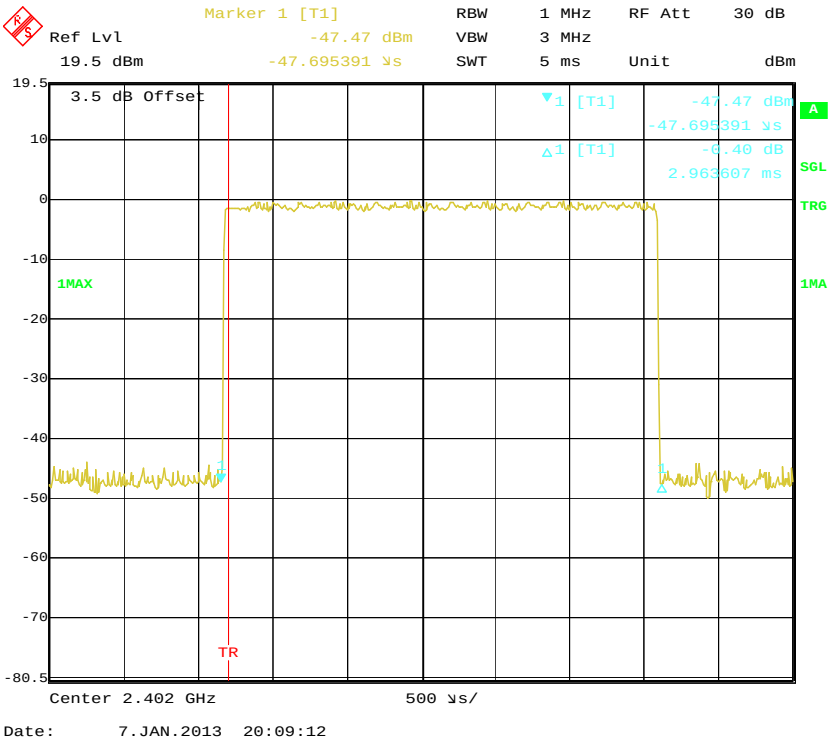
Pulse time, Middle Channel, DH3



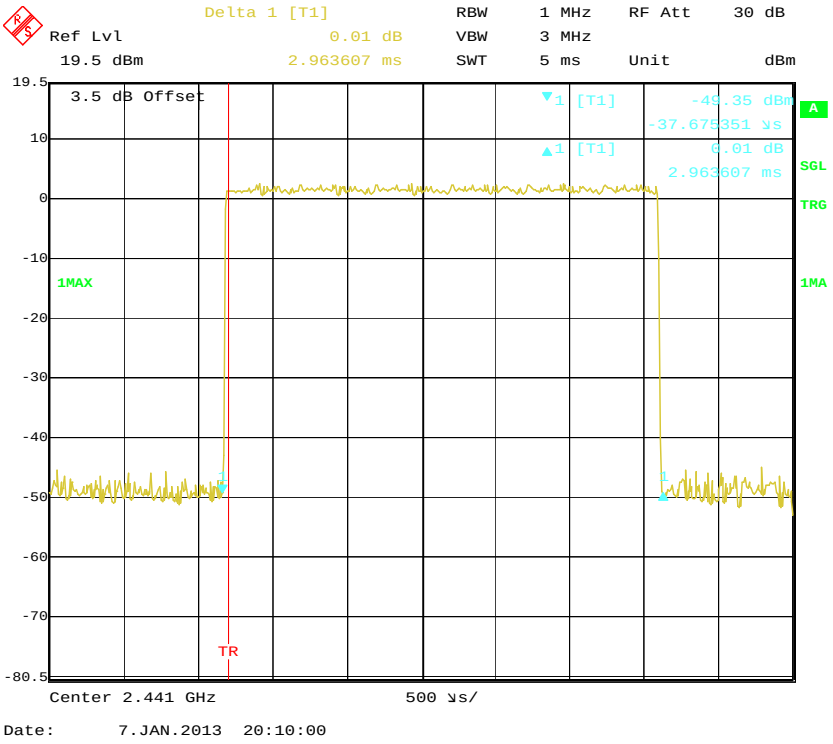
Pulse time, High Channel, DH3



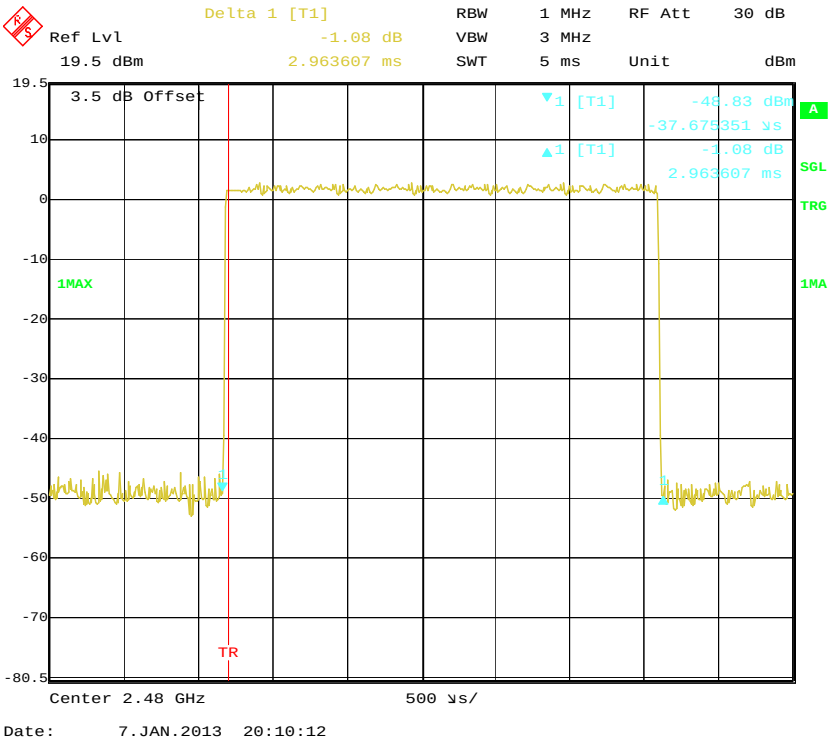
Pulse time, Low Channel, DH5



Pulse time, Middle Channel, DH5



Pulse time, High Channel, DH5



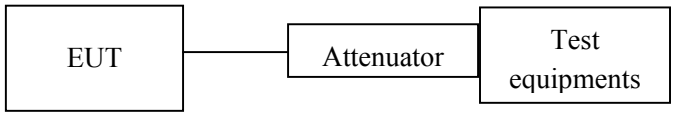
FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

According to §15.247(b) (1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. And for all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

Test Procedure

1. Place the EUT on a bench and set in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to an EMI test receiver.
3. Add a correction factor to the display.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	22~25 ℃
Relative Humidity:	55~56 %
ATM Pressure:	100.0~100.1 kPa

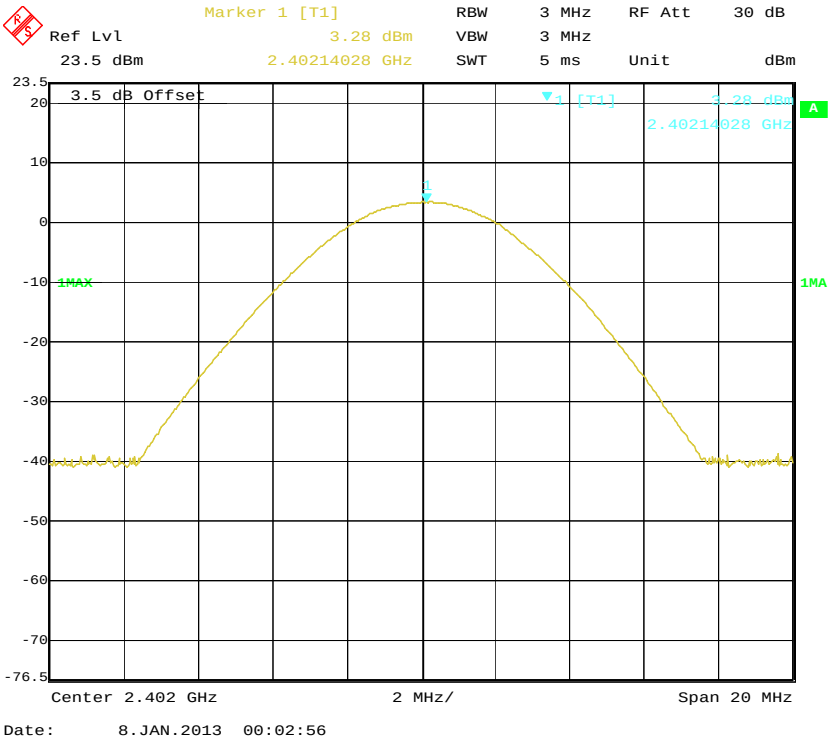
The testing was performed by Mick Yin on 2013-01-07 and 2013-01-08.

EUT operation mode: Transmitting

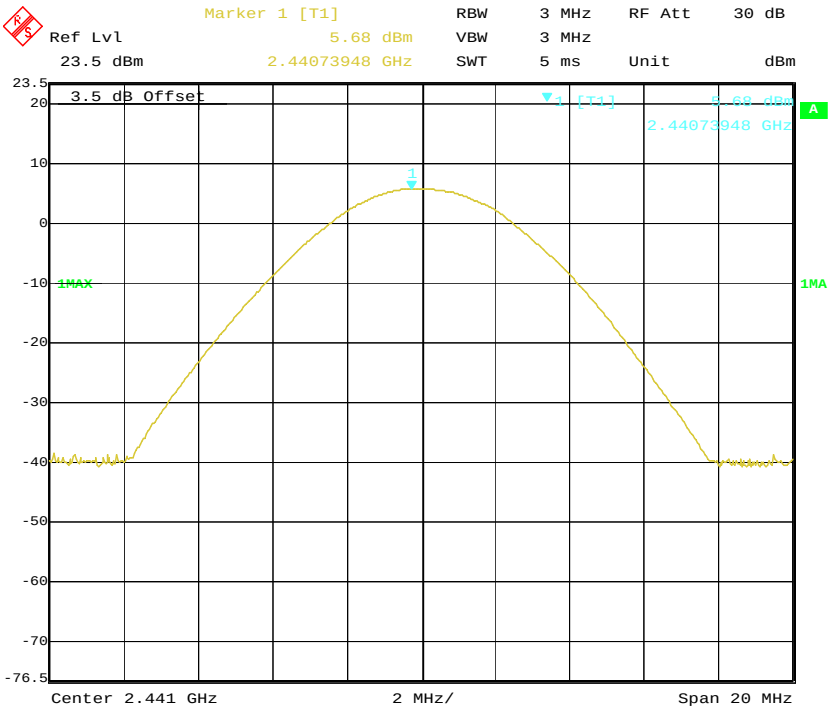
Test Result: Compliance. Please refer to following tables and plots

Mode	Channel	Frequency (MHz)	Conducted Output Power		Limit (mW)
			(dBm)	(mW)	
BDR (GFSK)	Low	2402	3.28	2.128	1000
	Middle	2441	5.68	3.698	1000
	High	2480	5.86	3.855	1000
EDR (π/4-DQPSK)	Low	2402	1.02	1.265	1000
	Middle	2441	4.25	2.661	1000
	High	2480	4.44	2.780	1000
EDR (8DPSK)	Low	2402	1.68	1.472	1000
	Middle	2441	4.62	2.897	1000
	High	2480	4.69	2.944	1000

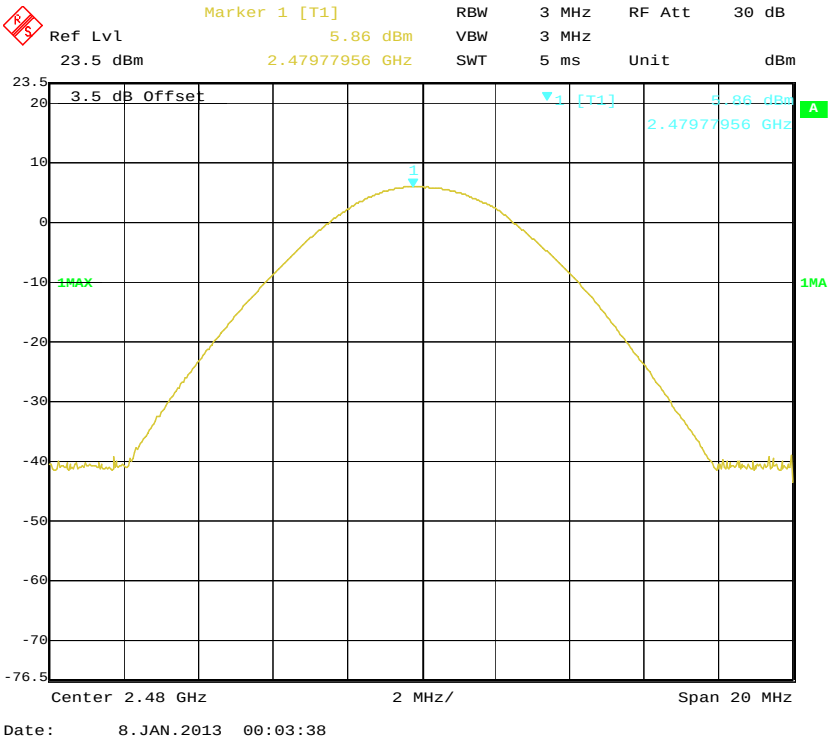
BDR (GFSK): Low Channel



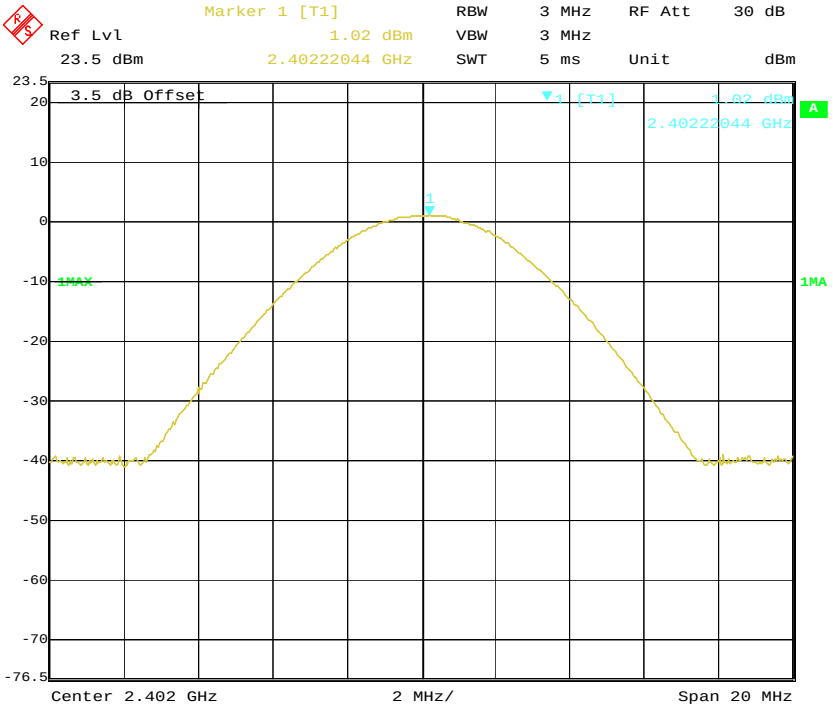
BDR (GFSK): Middle Channel



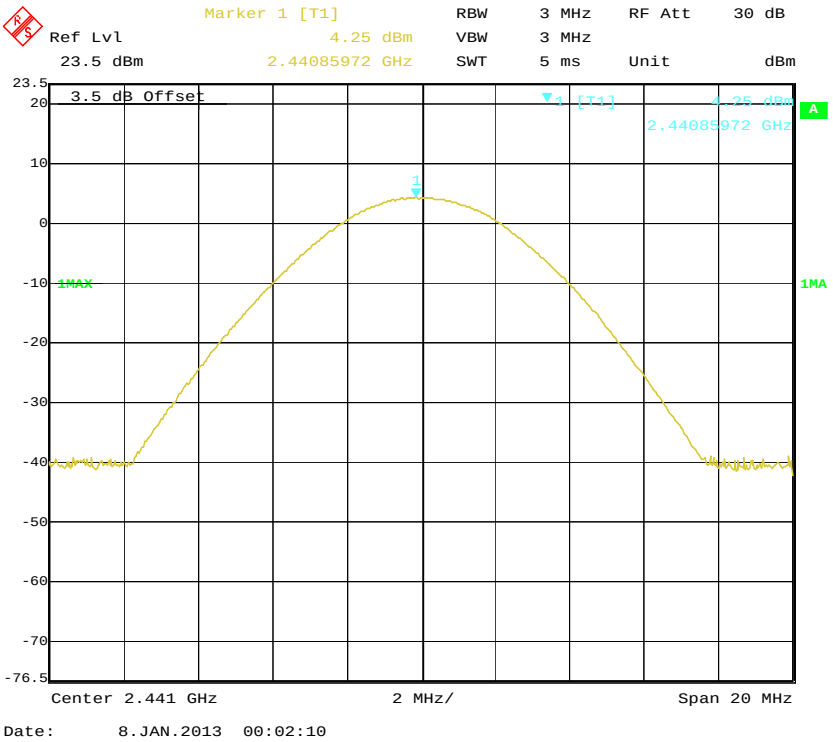
BDR (GFSK): High Chanel



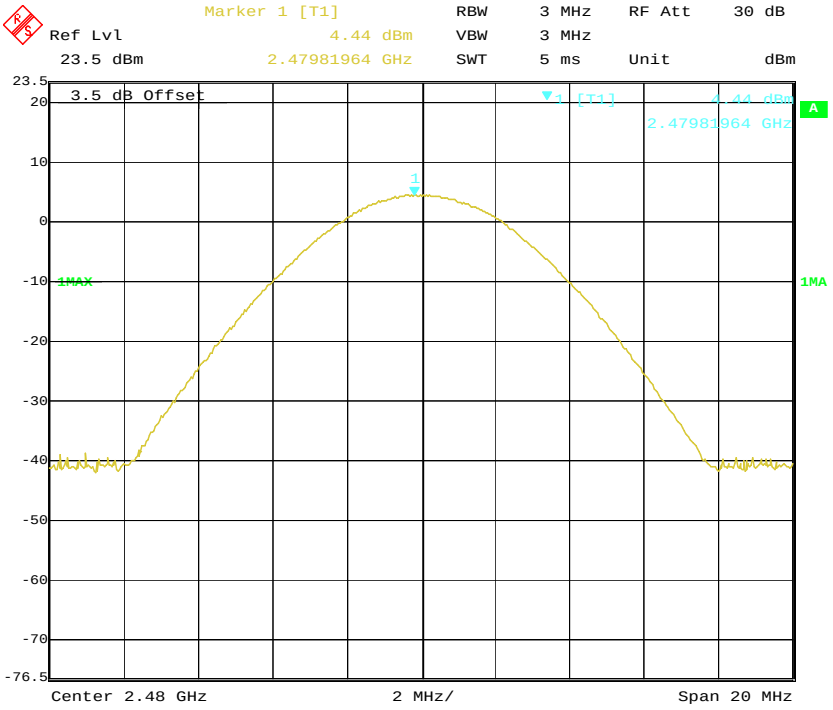
EDR(π/4-DQPSK): Low Channel



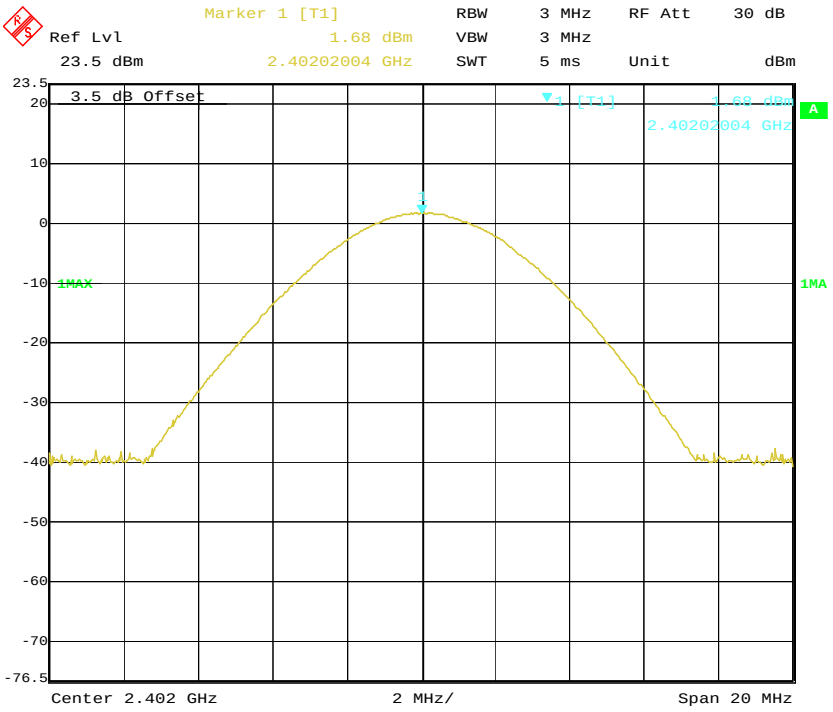
EDR(π/4-DQPSK): Middle Channel



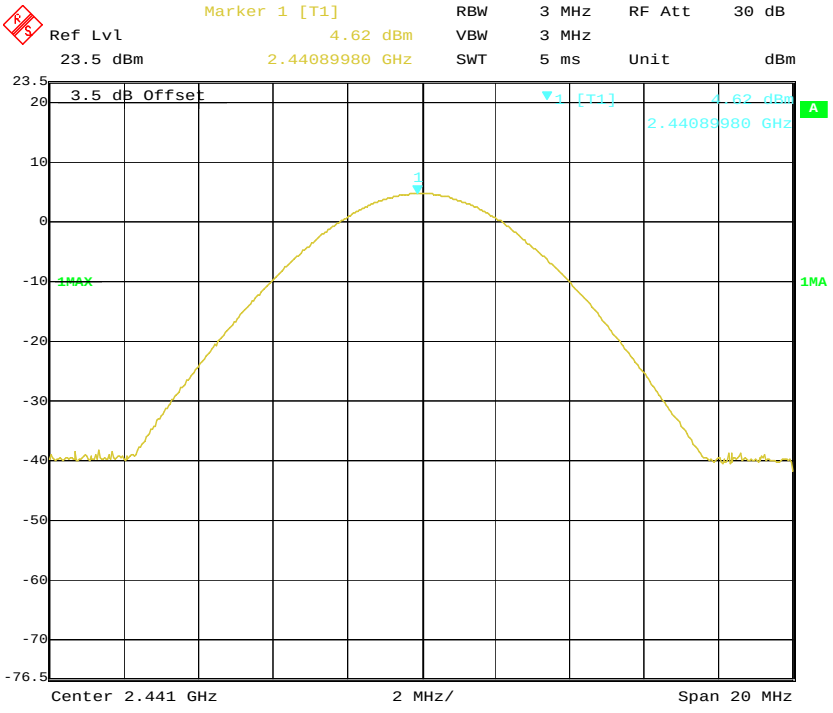
EDR(π/4-DQPSK): High Chanel



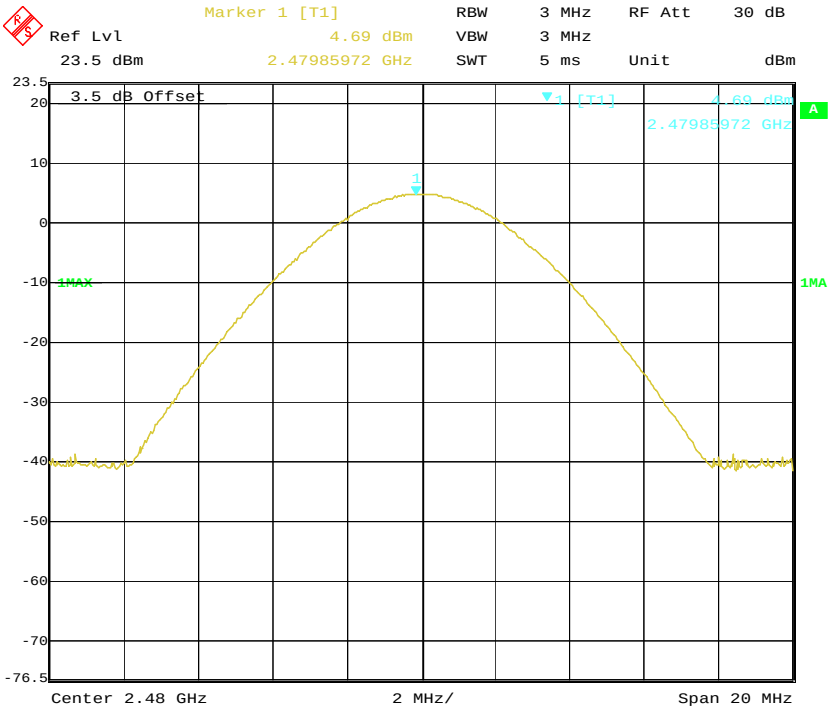
EDR(8DPSK): Low Channel



EDR(8DPSK): Middle Channel



EDR(8DPSK): High Chanel



FCC §15.247(d) - BAND EDGES

Applicable Standard

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

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

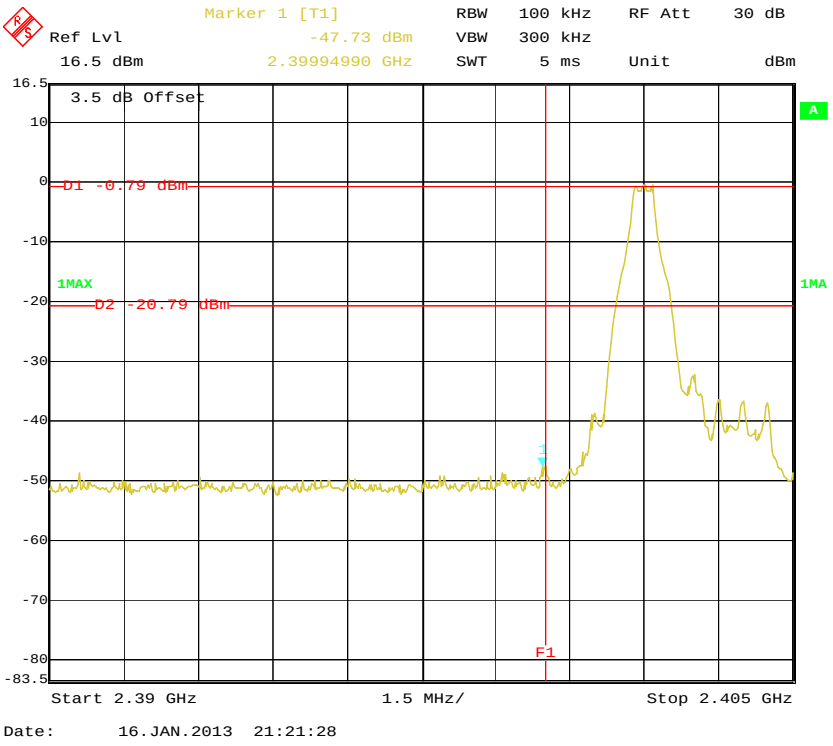
Temperature:	22~25 ℃
Relative Humidity:	55~56 %
ATM Pressure:	100.0~100.1 kPa

The testing was performed by Mick Yin on 2013-01-07 and 2013-01-16.

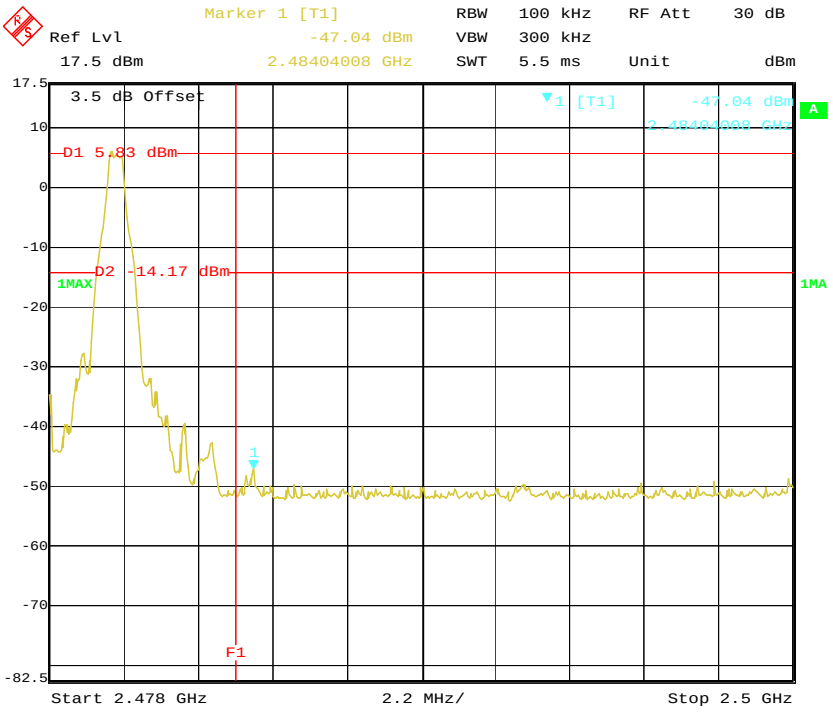
EUT operation mode: Transmitting

Test Result: Compliance. Please refer to the following plots

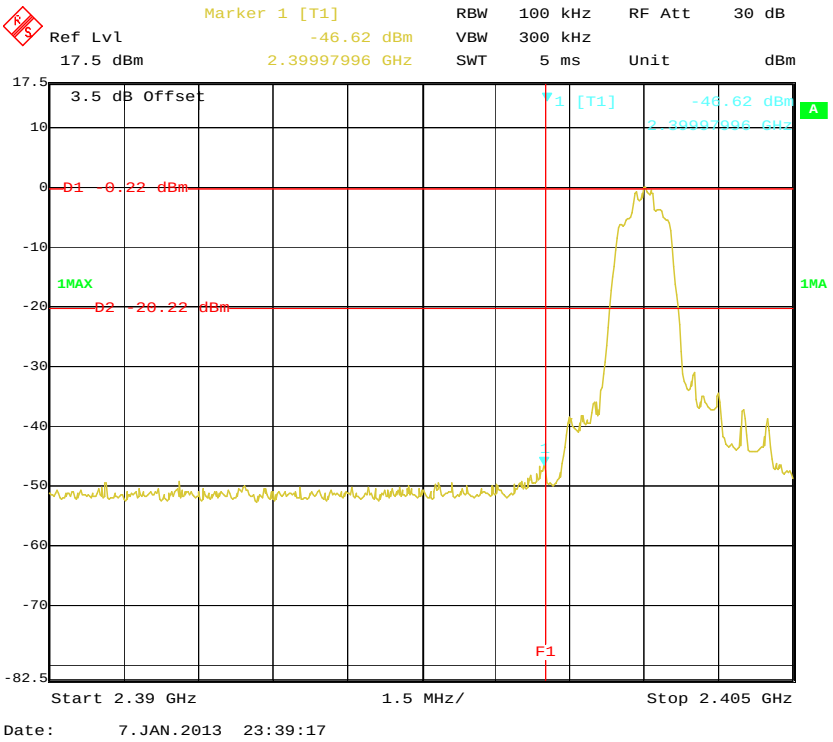
BDR (GFSK): Band Edge-Left Side



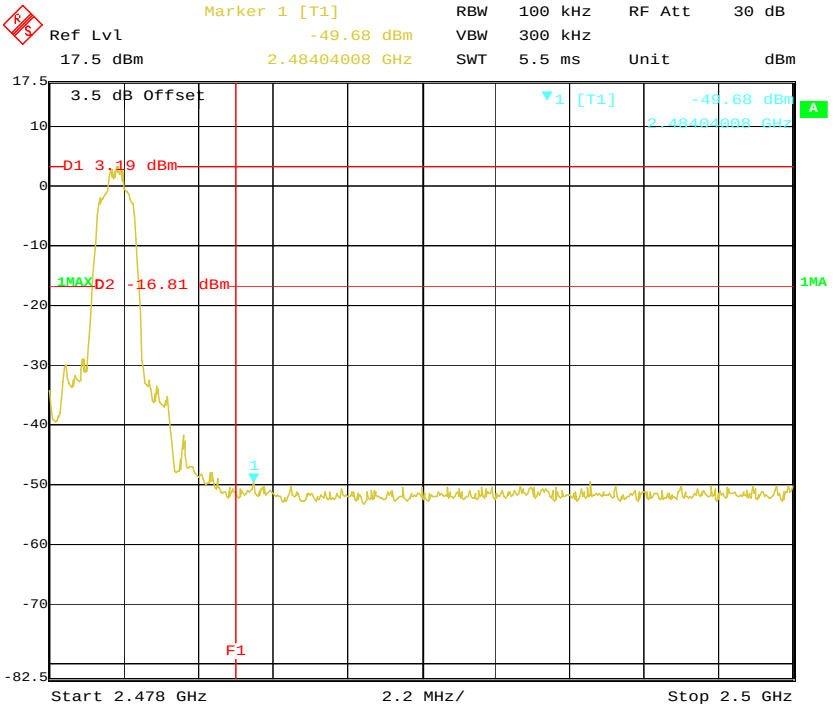
BDR (GFSK): Band Edge-Right Side



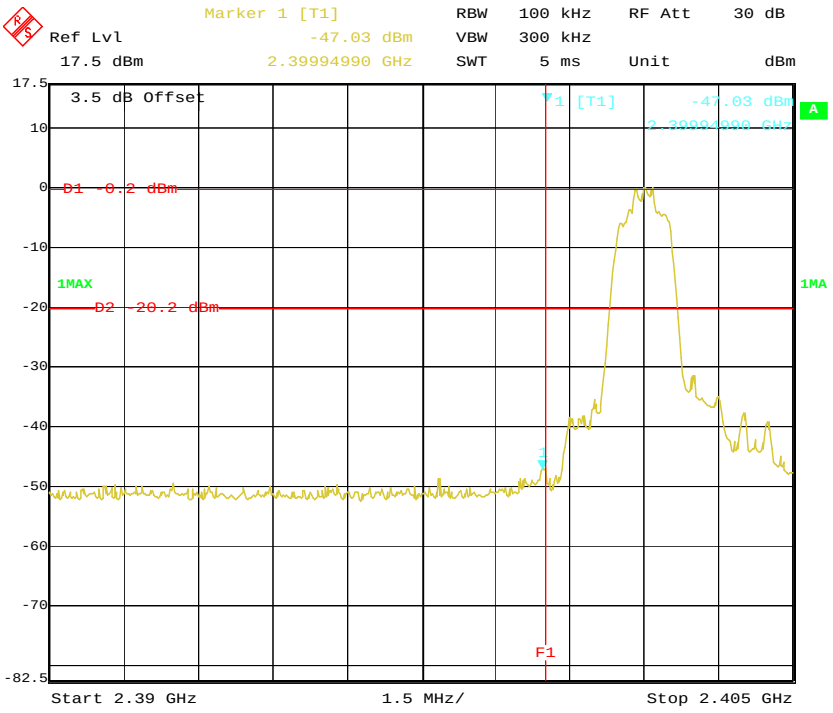
EDR (π/4-DQPSK): Band Edge-Left Side



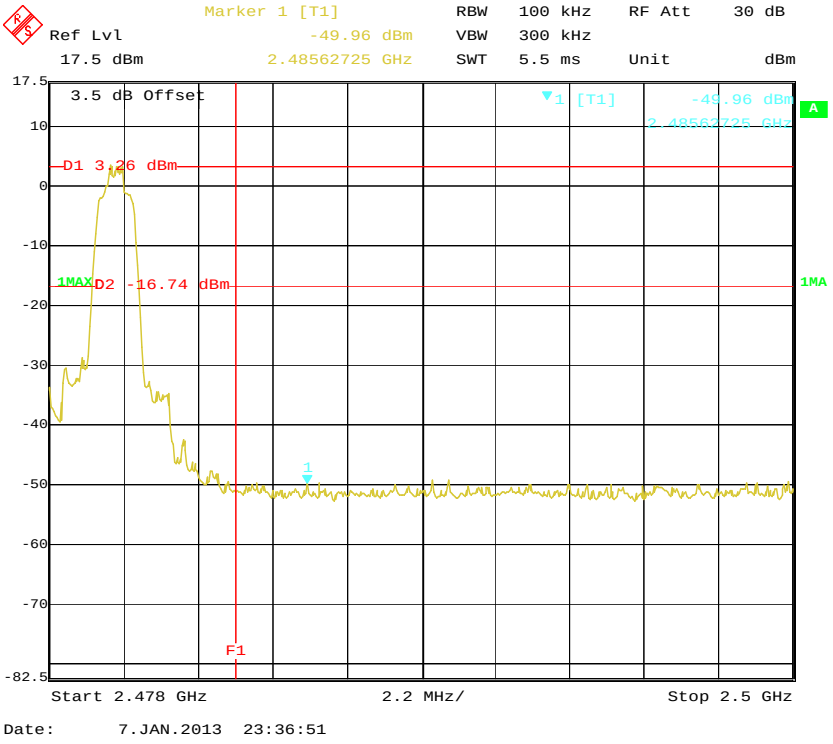
EDR (π/4-DQPSK): Band Edge-Right Side



EDR (8DPSK): Band Edge-Left Side



EDR (8DPSK): Band Edge-Right Side



******* END OF REPORT *******