

FCC PART 15.247 TEST REPORT

For

Avantronics Limited

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FCC ID: WJ5-AS8

Report Type: Original Report	Product Type: Bluetooth Stereo Headset
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Report Number: RSZ120601001-00B	
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* This report contains data that are not covered by the NVLAP accreditation and are marked with an asterisk "★" (Rev.2)

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Avantronics Limited*'s product, model number: *BTHS-AS8 (FCC ID: WJ5-AS8)* or the "EUT" in this report was a *Bluetooth Stereo Headset*, which was measured approximately: 3.7 cm (L) x 2.0 cm (W) x 3.0 cm (H), rated input voltage: DC 3.7 V from battery or DC 5 V charging from Adapter.

Adapter information

Model: GMT-TR108

Input: 100-240VAC 50/60Hz 200mA

Output: DC 5.0V 600mA

** All measurement and test data in this report was gathered from production sample serial number: 1206001 (Assigned by BACL, Shenzhen). The EUT was received on 2012-06-01.*

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)

N/A

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 and 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 C63.4-2009.

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 EUT was configured for testing in an engineering mode which was provided by the manufacturer.

EUT Exercise Software

Bluetest 3

Equipment Modifications

No modification was made to the EUT tested.

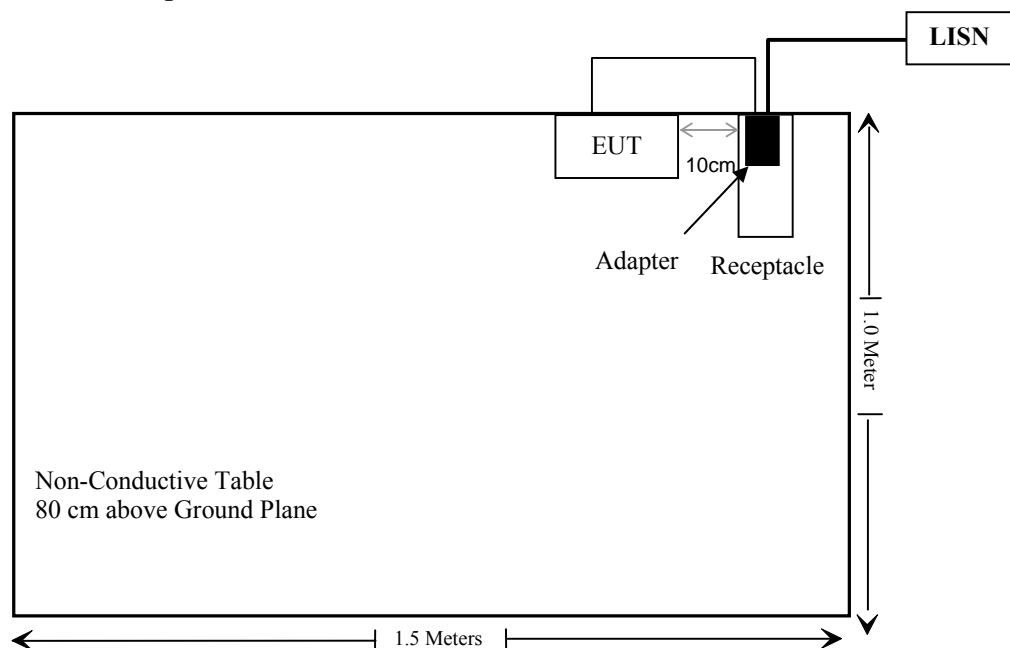
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Guang Ming Tong	Adapter	GMT-TR108	N/A

External I/O Cable

Cable Description	Length (m)	From/Port	To
Unshield detachable DC power cable(USB cable)	0.5	Adapter	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §2.1093	RF Exposure	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 Test	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliance
§15.247(b)(1)	Peak Output Power Measurement	Compliance
§15.247(d)	Band edges	Compliance

FCC §15.247 (i) & §2.1093 – RF EXPOSURE

Applicable Standard

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

According to KDB 447498 D01 Mobile Portable RF Exposure v03r03, no SAR required if power is lower than the following threshold:

When routine evaluation is required for SAR and the output power is $\leq 60/f(\text{GHz})$ mW, the test reduction and test exclusion procedures given herein, or in KDB 616217 or KDB 648474, are applicable.

A device may be used in portable exposure conditions with no restrictions on host platforms when either the source-based time-averaged output power is $\leq 60/f(\text{GHz})$ mW or all measured 1-g SAR are < 0.4 W/kg. 10 When SAR evaluation is required, the most conservative exposure conditions for all expected operating configurations must be tested.

Measurement Result:

Max Peak output power:

Frequency at 2402 MHz is 5.85 dBm

Antenna Gain: 2.0 dBi

EIRP = $5.85 + 2.0 = 7.85$ dBm = 6.095 mW

$60/f_{\text{GHz}} = 60/2402 = 24.98$ mW

Max Peak output power $< 60/f_{\text{GHz}}$

This is a portable device and the Max Peak output power of EUT is less than 24.98 mW.

So the SAR measurement is not necessary.

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 for bluetooth, which was permanently attached and the gain was 2 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

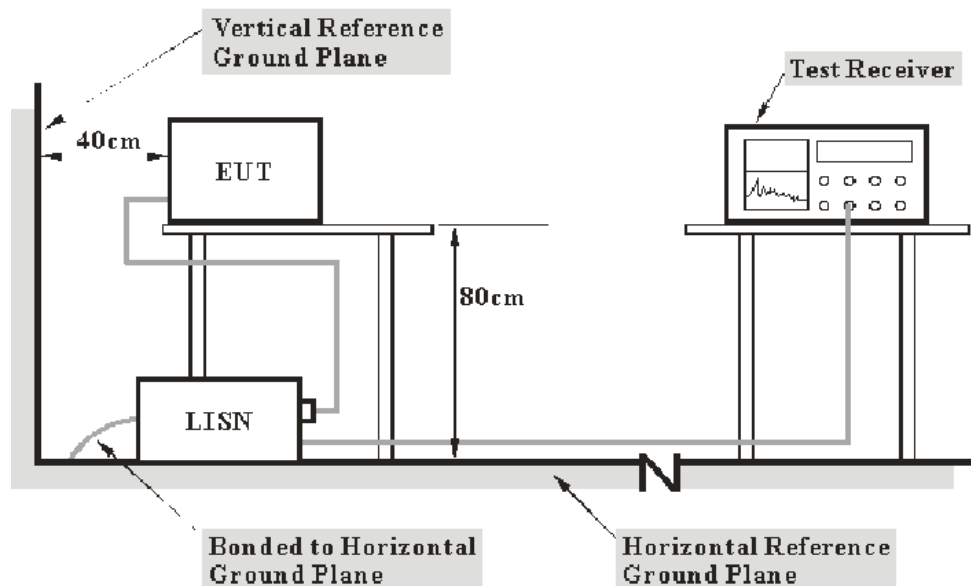
FCC §15.207

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 16-4-4, 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).

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 adapter 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:

<i>Frequency Range</i>	<i>IF B/W</i>
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	2011-11-24	2012-11-23
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2011-11-17	2012-11-16
Rohde & Schwarz	Pulse limiter	ESH3Z2	DE25985	2011-07-08	2012-07-07

* **Statement of Traceability:** Bay Area Compliance Laboratory Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

During the conducted emission test, the adapter was connected to the LISN.

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.

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:

13.07 dB at 0.355 MHz in the Line conducted mode

Test Data

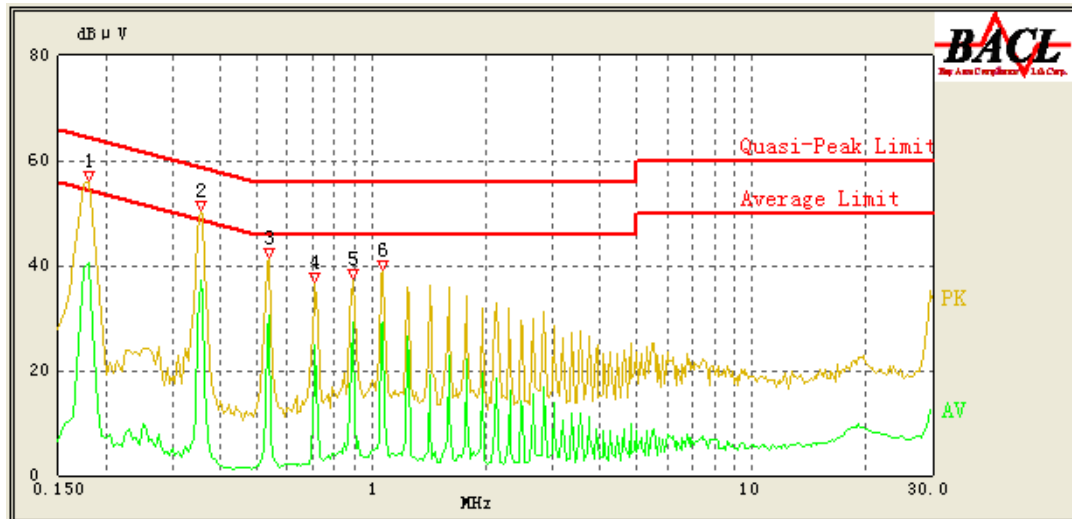
Environmental Conditions

Temperature:	25 °C
Relative Humidity:	48 %
ATM Pressure:	100.0 kPa

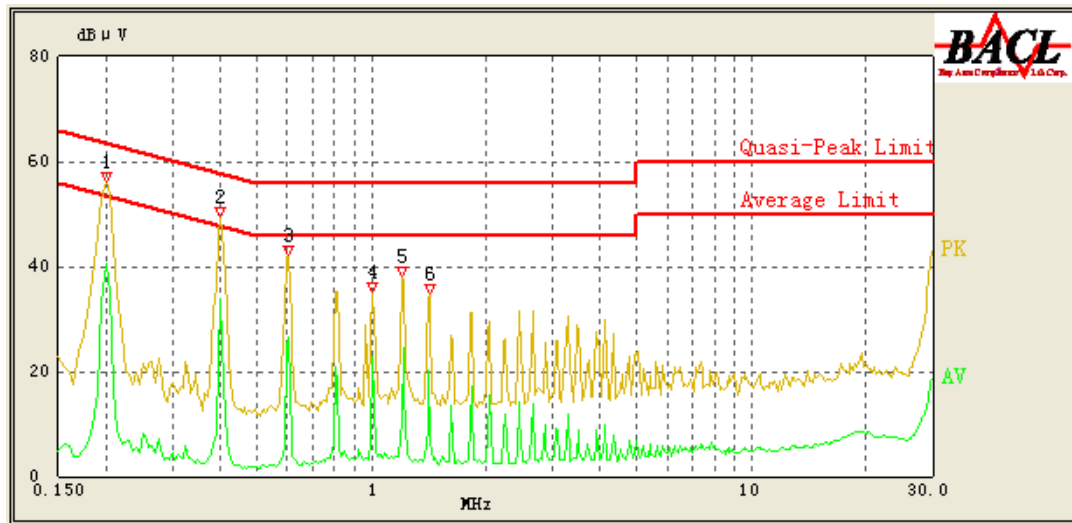
The testing was performed by Gardon Zhang on 2012-06-05.

Test Mode: Charging & Communication

AC 120 V, 60 Hz, Line:



Conducted Emissions			FCC Part 15.207		
Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.355	37.07	9.67	50.14	13.07	Ave.
0.180	40.38	9.64	55.14	14.76	Ave.
0.535	30.51	9.72	46.00	15.49	Ave.
0.890	29.17	9.84	46.00	16.83	Ave.
1.070	29.10	9.87	46.00	16.90	Ave.
0.710	24.86	9.78	46.00	21.14	Ave.
0.355	38.34	9.67	60.14	21.80	QP
0.180	42.37	9.64	65.14	22.77	QP
0.535	31.90	9.72	56.00	24.10	QP
0.890	30.88	9.84	56.00	25.12	QP
1.070	30.51	9.87	56.00	25.49	QP
0.710	26.60	9.78	56.00	29.40	QP

AC 120V, 60 Hz, Neutral:

Conducted Emissions			FCC Part 15.207		
Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.200	40.37	9.64	54.57	14.20	Ave.
0.400	33.98	9.68	48.86	14.88	Ave.
0.605	26.53	9.75	46.00	19.47	Ave.
1.210	24.35	9.88	46.00	21.65	Ave.
1.010	23.00	9.87	46.00	23.00	Ave.
0.200	41.38	9.64	64.57	23.19	QP
0.400	34.38	9.68	58.86	24.48	QP
1.415	20.11	9.88	46.00	25.89	Ave.
1.205	27.46	9.88	56.00	28.54	QP
0.605	27.21	9.75	56.00	28.79	QP
1.005	25.51	9.87	56.00	30.49	QP
1.420	24.45	9.88	56.00	31.55	QP

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

Applicable Standard

FCC §15.205; §15.209; §15.247(d)

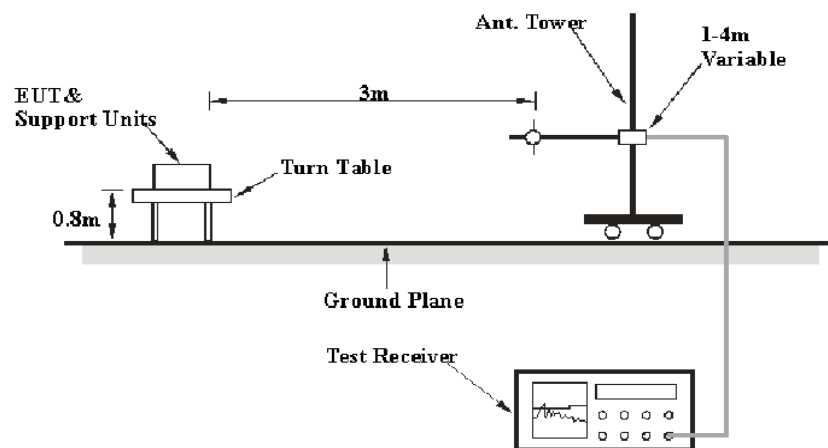
Measurement Uncertainty

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.

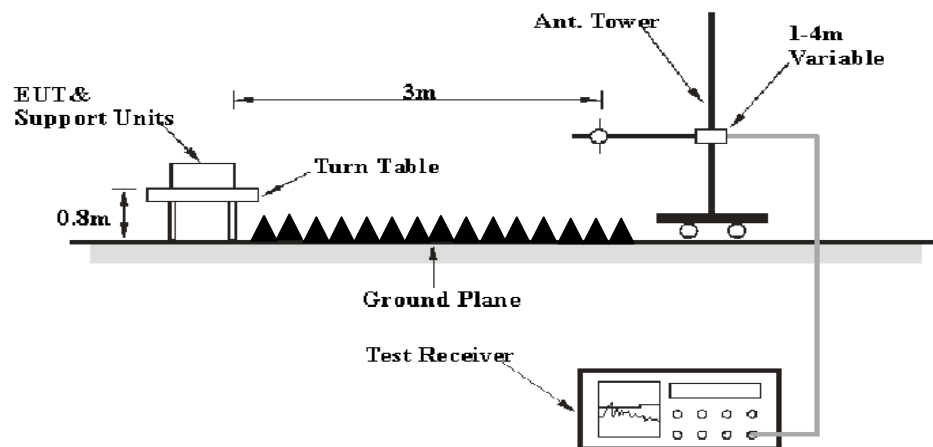
Based on CISPR 16-4-4, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is 4.0 dB. ($k=2$, 95% level of confidence).

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.

The spacing between the peripherals was 10 cm

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

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:

<i>Frequency Range</i>	<i>RBW</i>	<i>Video B/W</i>	<i>Detector</i>
30 MHz – 1000 MHz	100 kHz	300 kHz	QP
1000 MHz – 25 GHz	1 MHz	3 MHz	PK
1000 MHz – 25 GHz	1 MHz	10 Hz	Ave.

Test Procedure

For radiated emissions, the adapter was connected to the AC floor outlet.

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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447D	2944A09795	2011-11-24	2012-11-23
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2011-11-17	2012-11-16
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2012-11-27
SUPER ULTRA	Amplifier	ZVA-213+	N/A	2011-11-24	2012-11-23
Sunol Sciences	Horn Antenna	DRH-118	A052304	2011-12-01	2012-11-30
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2011-11-24	2012-11-23
the electro-Mechanics Co.	Horn Antenna	3116	9510-2270	2011-10-14	2012-10-13

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

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:

2.51 dB at 1627.4 MHz in the Vertical polarization

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100 kPa

The testing was performed by Gardon Zhang on 2012-06-06.

30 MHz ~25 GHz:

Test mode: Transmitting

(Scan with GFSK, $\pi/4$ -DQPSK, 8-DPSK, the worst case is BDR Mode (GFSK))

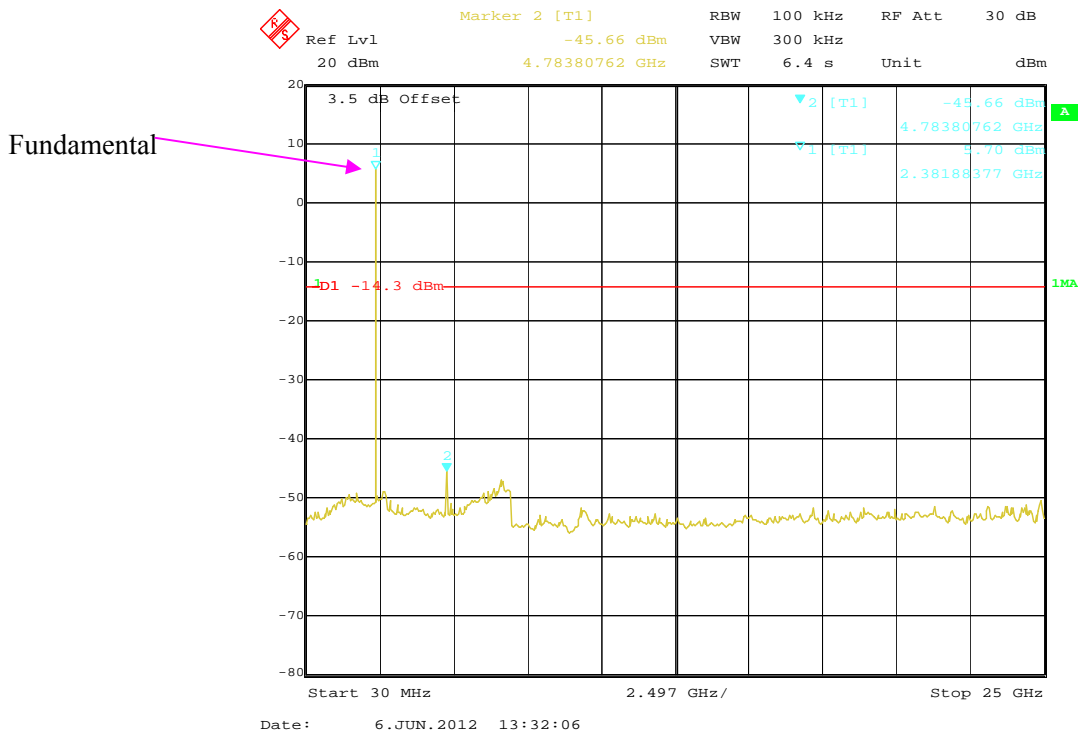
Frequency (MHz)	Receiver Reading (dBμV)	Detector (PK/QP/Ave)	Direction (Degree)	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	FCC Part 15.247/205/209		
				Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2402 MHz)												
2402.0	90.37	PK	223	1.2	V	29.60	3.03	26.50	96.50	/	/	fundmental
2402.0	71.24	Ave.	223	1.2	V	29.60	3.03	26.50	77.37	/	/	fundmental
1601.4	44.34	Ave.	145	1.1	V	25.90	2.37	26.50	46.11	54.00	7.89	spurious
4824.0	50.19	PK	43	1.2	V	34.60	4.30	26.50	62.59	74.00	11.41	harmonic
4824.0	28.29	Ave.	43	1.2	V	34.60	4.30	26.50	40.69	54.00	13.31	harmonic
2485.5	49.64	PK	39	1.3	V	30.20	3.11	26.50	56.45	74.00	17.55	spurious
2485.5	28.67	Ave.	39	1.3	V	30.20	3.11	26.50	35.48	54.00	18.52	spurious
7206.0	18.67	Ave.	7	1.1	H	37.90	5.22	26.50	35.29	54.00	18.71	harmonic
1601.4	50.24	PK	145	1.1	V	25.90	2.37	26.50	52.01	74.00	21.99	spurious
7206.0	33.69	PK	7	1.1	H	37.90	5.22	26.50	50.31	74.00	23.69	harmonic
2366.7	43.56	PK	75	1.2	H	29.00	2.98	26.50	49.04	74.00	24.96	spurious
2366.7	23.46	Ave.	75	1.2	H	29.00	2.98	26.50	28.94	54.00	25.06	spurious
2305.6	23.04	Ave.	45	1.1	V	29.00	2.98	26.50	28.52	54.00	25.48	spurious
2305.6	42.38	PK	45	1.1	V	29.00	2.98	26.50	47.86	74.00	26.14	spurious
Middle Channel (2441 MHz)												
2441.0	90.28	PK	254	1.1	V	30.20	3.11	26.50	97.09	/	/	fundmental
2441.0	73.51	Ave.	254	1.1	V	30.20	3.11	26.50	80.32	/	/	fundmental
1627.4	49.72	Ave.	102	1.3	V	25.90	2.37	26.50	51.49	54.00	2.51*	spurious
4882.0	50.37	PK	42	1.1	V	34.60	4.36	26.50	62.83	74.00	11.17	harmonic
4882.0	28.65	Ave.	42	1.1	V	34.60	4.36	26.50	41.11	54.00	12.89	harmonic
2487.3	50.14	PK	227	1.1	V	30.20	3.11	26.50	56.95	74.00	17.05	spurious
2487.3	29.67	Ave.	227	1.1	V	30.20	3.11	26.50	36.48	54.00	17.52	spurious
7323.0	18.66	Ave.	43	1.2	H	37.90	5.09	26.50	35.15	54.00	18.85	harmonic
1627.4	51.15	PK	102	1.3	V	25.90	2.37	26.50	52.92	74.00	21.08	spurious
7323.0	34.21	PK	43	1.2	H	37.90	5.09	26.50	50.70	74.00	23.30	spurious
2361.2	43.91	PK	4	1.2	H	29.00	2.98	26.50	49.39	74.00	24.61	spurious
2361.2	23.37	Ave.	4	1.2	H	29.00	2.98	26.50	28.85	54.00	25.15	spurious
2338.3	43.26	PK	12	1.2	V	29.00	2.98	26.50	48.74	74.00	25.26	spurious
2338.3	22.94	Ave.	12	1.2	V	29.00	2.98	26.50	28.42	54.00	25.58	spurious

Frequency (MHz)	Receiver Reading (dBμV)	Detector (PK/QP/Ave)	Direction (Degree)	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	FCC Part 15.247/205/209		
				Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	Comment
High Channel (2480 MHz)												
2480.0	90.67	PK	33	1.2	V	30.20	3.11	26.50	97.48	/	/	fundmental
2480.0	73.86	Ave.	33	1.2	V	30.20	3.11	26.50	80.67	/	/	fundmental
1653.4	47.53	Ave.	125	1.2	V	25.90	2.37	26.50	49.30	54.00	4.70	spurious
4960.0	49.12	PK	78	1.3	V	34.60	4.40	26.50	61.62	74.00	12.38	harmonic
4960.0	27.63	Ave.	78	1.3	V	34.60	4.40	26.50	40.13	54.00	13.87	harmonic
2486.5	49.74	PK	44	1.2	V	30.20	3.11	26.50	56.55	74.00	17.45	spurious
2486.5	29.63	Ave.	44	1.2	V	30.20	3.11	26.50	36.44	54.00	17.56	spurious
1653.4	54.41	PK	125	1.2	V	25.90	2.37	26.50	56.18	74.00	17.82	spurious
7440.0	19.02	Ave.	22	1.2	H	37.20	5.20	26.50	34.92	54.00	19.08	harmonic
7440.0	33.99	PK	22	1.2	H	37.20	5.20	26.50	49.89	74.00	24.11	harmonic
2363.3	43.22	PK	226	1.2	H	29.00	2.98	26.50	48.70	74.00	25.30	spurious
2331.8	23.19	Ave.	45	1.1	V	29.00	2.98	26.50	28.67	54.00	25.33	spurious
2363.3	22.97	Ave.	226	1.2	H	29.00	2.98	26.50	28.45	54.00	25.55	spurious
2331.8	42.15	PK	45	1.1	V	29.00	2.98	26.50	47.63	74.00	26.37	spurious

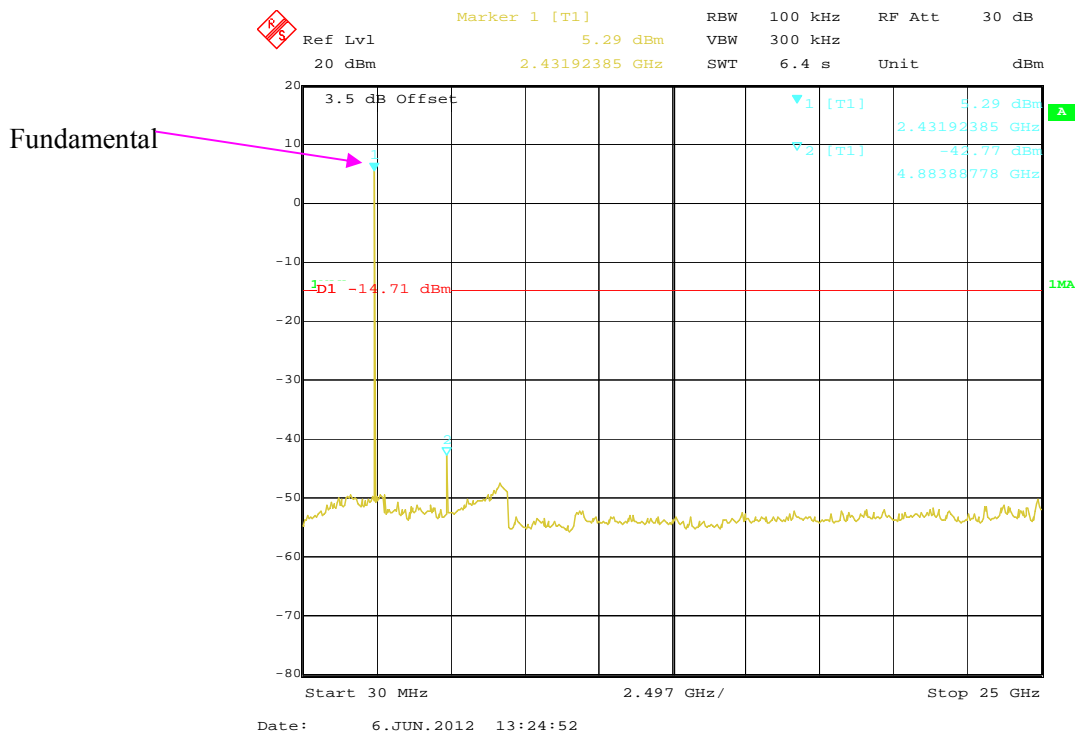
*within measurement uncertainty

Spurious Emission at Antenna Terminals

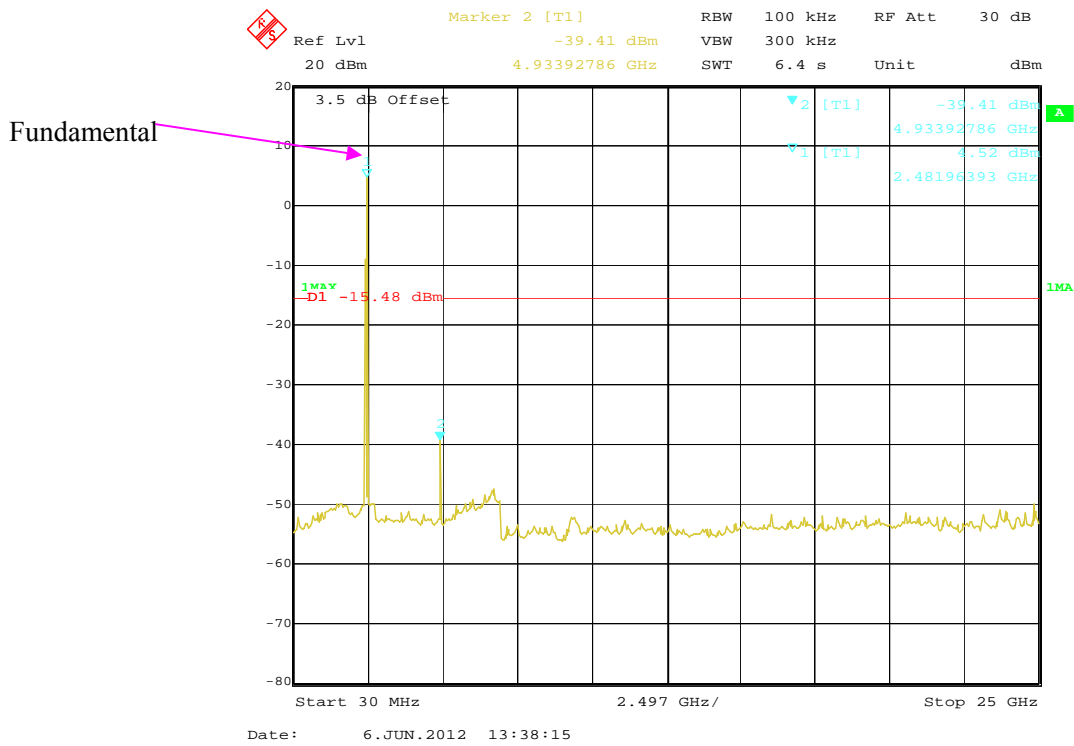
Low Channel



Middle Channel



High Channel



FCC §15.247(a) (1)-CHANNEL SEPARATION TEST**Applicable Standard**

Frequency hopping systems shall have hopping 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	2011-11-24	2012-11-23

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100 kPa

* The testing was performed by Gardon Zhang on 2012-06-05 and 2012-06-06.

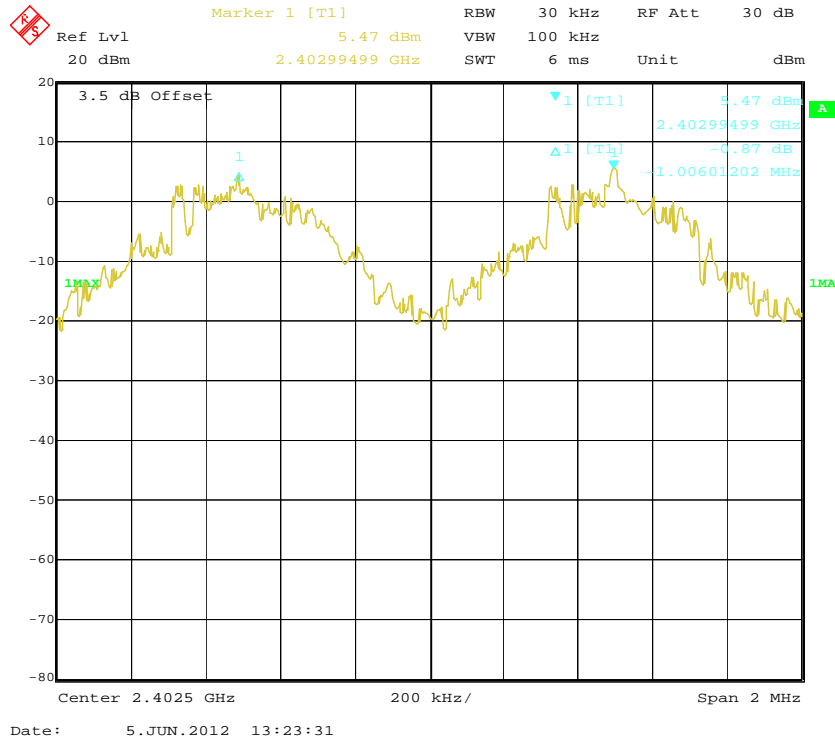
Test Mode: Transmitting

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

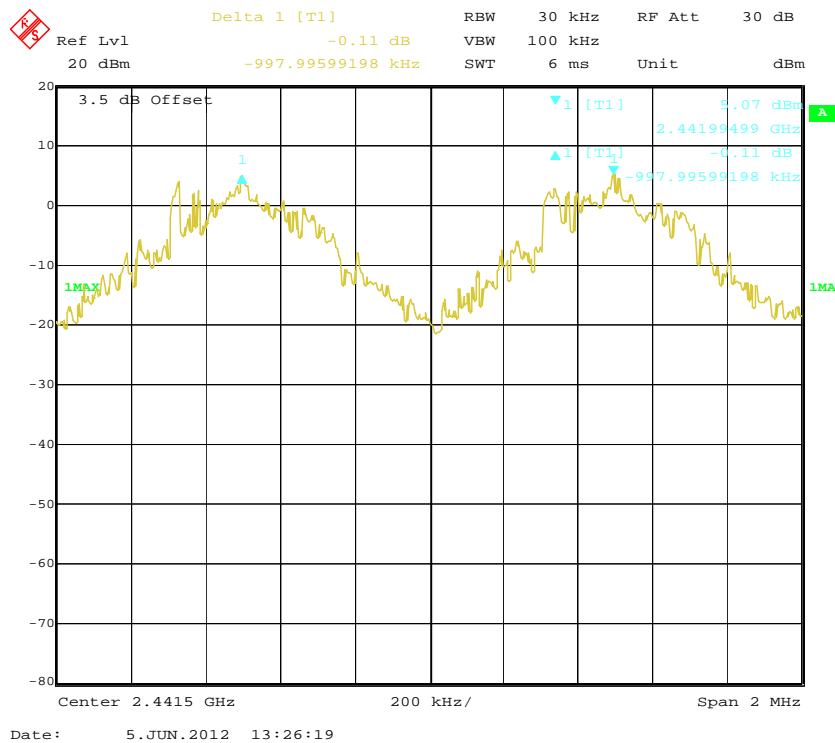
Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	\geq Limit (MHz)	Result
BDR (GFSK)	Low	2402	1.006	0.620	Pass
	Adjacent	2403			
	Middle	2441	0.998	0.612	Pass
	Adjacent	2442			
	High	2480	1.034	0.612	Pass
	Adjacent	2479			
EDR ($\pi/4$-DQPSK)	Low	2402	1.014	0.828	Pass
	Adjacent	2403			
	Middle	2441	1.010	0.817	Pass
	Adjacent	2442			
	High	2480	1.014	0.820	Pass
	Adjacent	2479			
EDR (8DPSK)	Low	2402	1.004	0.815	Pass
	Adjacent	2403			
	Middle	2441	1.004	0.815	Pass
	Adjacent	2442			
	High	2480	1.004	0.815	Pass
	Adjacent	2479			

Note: Limit = 20 dB bandwidth *2/3

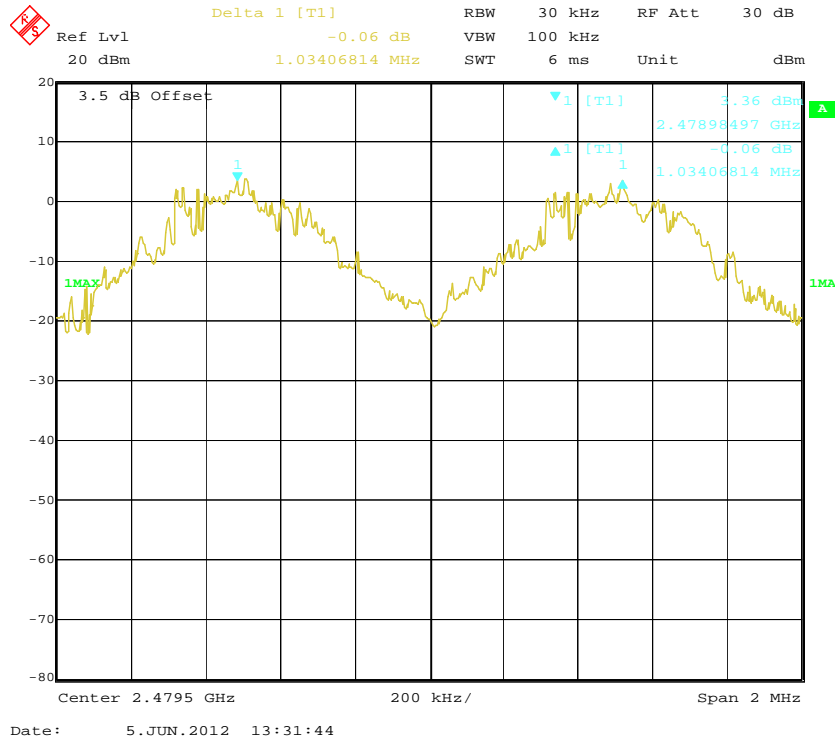
BDR (GFSK): Low Channel



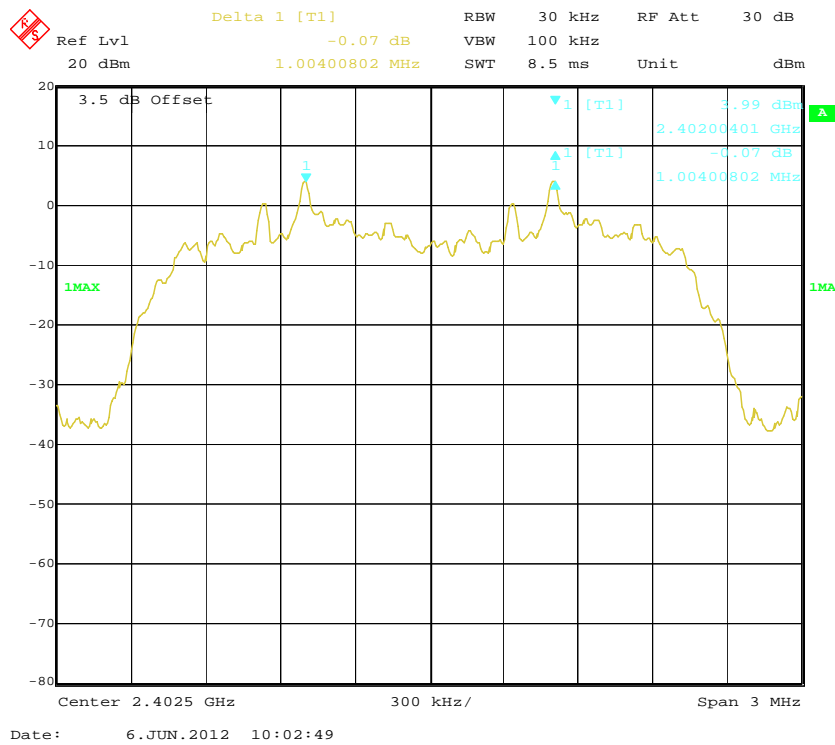
BDR (GFSK): Middle Channel

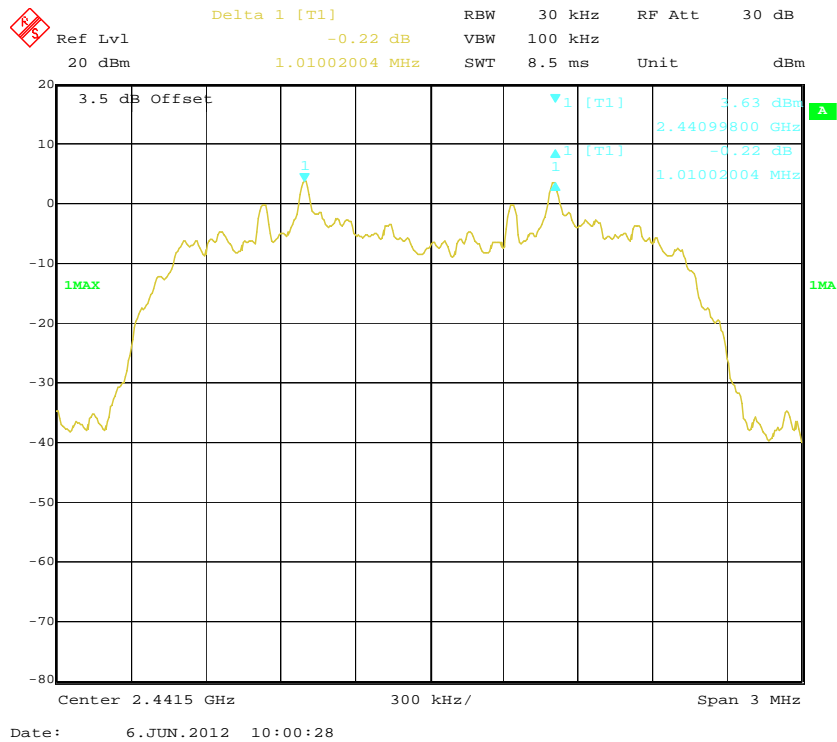
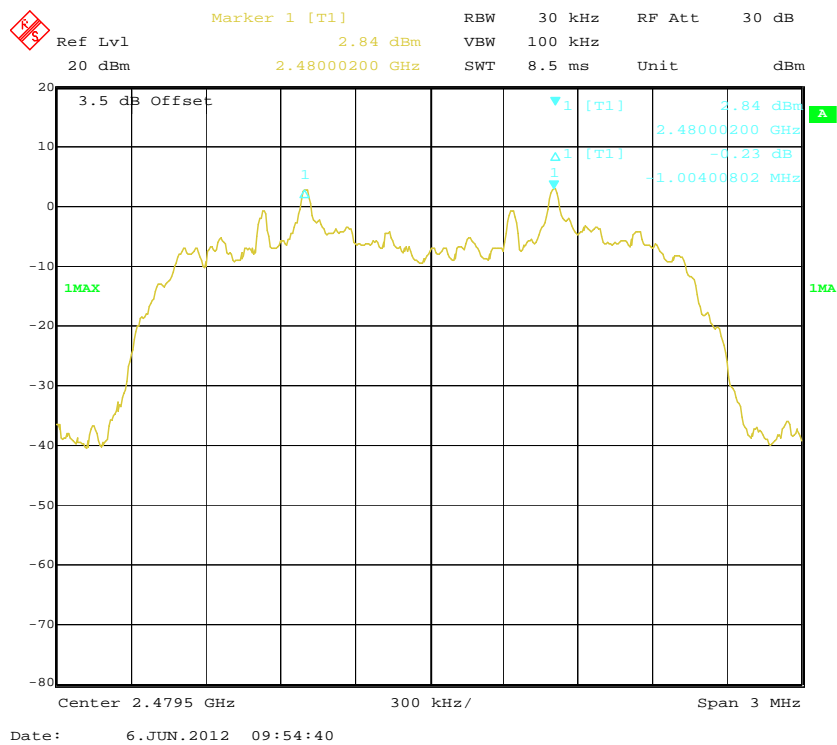


BDR (GFSK): High Channel

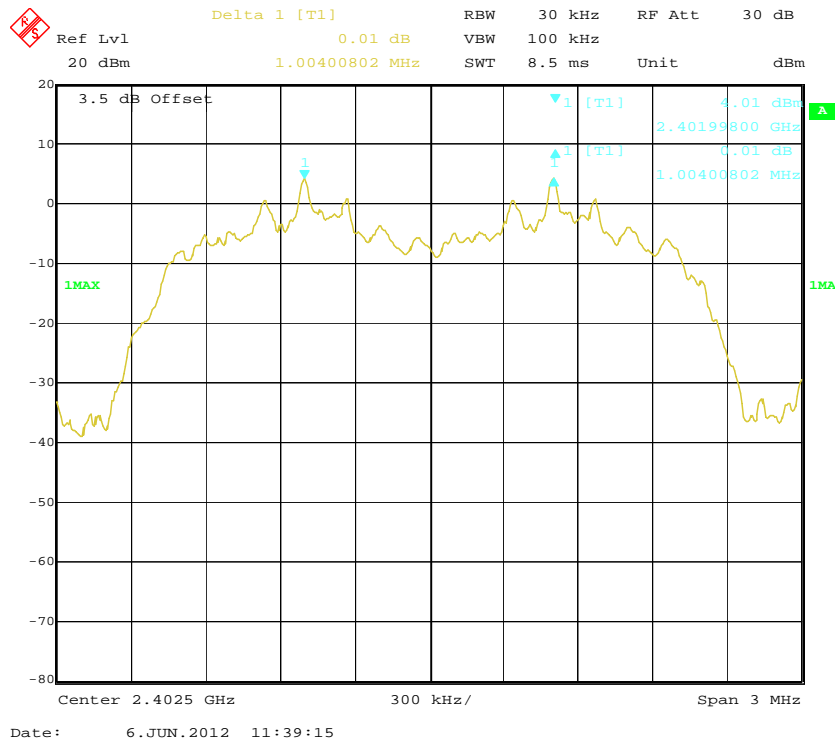


EDR ($\pi/4$ -DQPSK): Low Channel

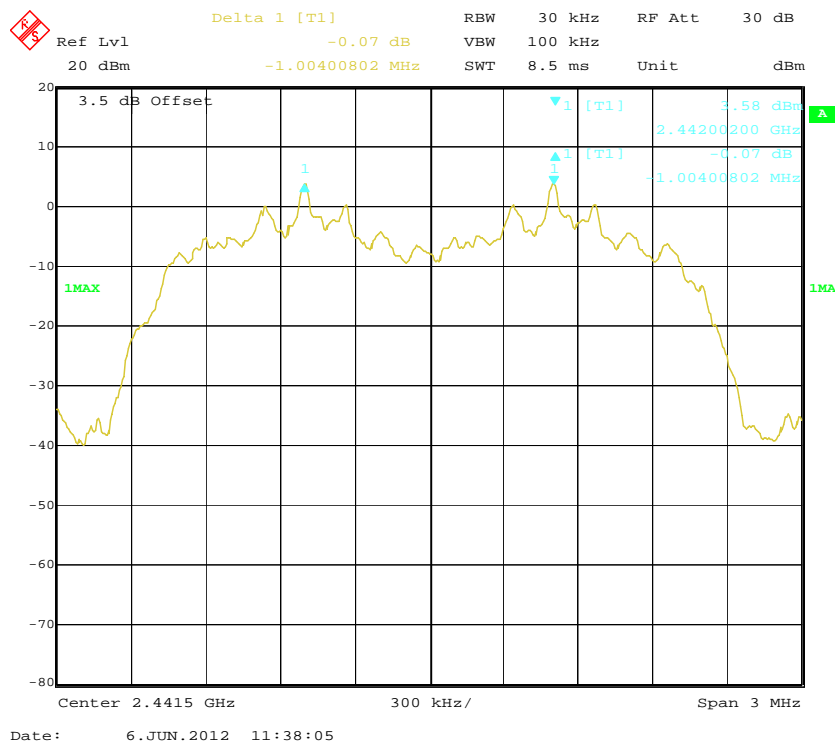


EDR ($\pi/4$ -DQPSK): Middle ChannelEDR ($\pi/4$ -DQPSK): High Channel

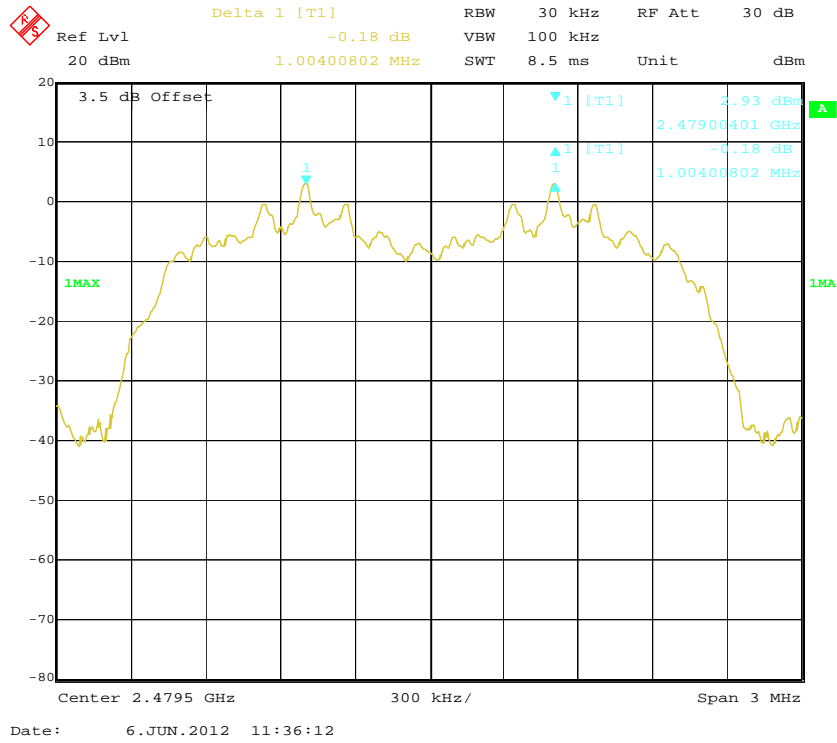
EDR (8DPSK): Low Channel



EDR (8DPSK): Middle Channel



EDR (8DPSK): High Channel



FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH TESTING**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	2011-11-24	2012-11-23

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data**Environmental Conditions**

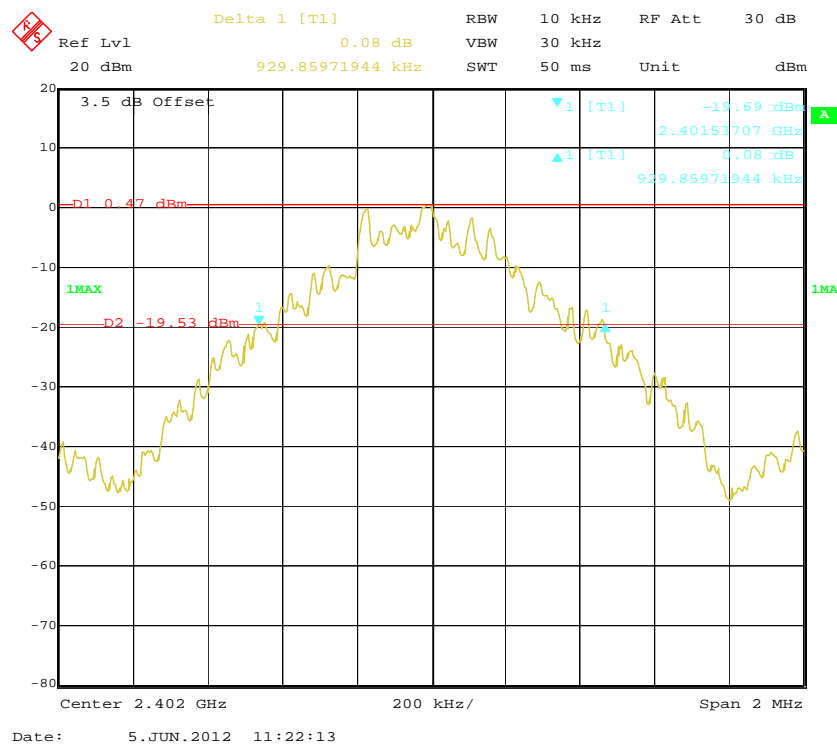
Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100 kPa

* The testing was performed by Gardon Zhang on 2012-06-05 and 2012-06-06.

Test Mode: Transmitting

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

Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
BDR (GFSK)	Low	2402	0.930
	Middle	2441	0.918
	High	2480	0.918
EDR ($\pi/4$-DQPSK)	Low	2402	1.242
	Middle	2441	1.226
	High	2480	1.230
EDR (8DPSK)	Low	2402	1.222
	Middle	2441	1.222
	High	2480	1.222

BDR (GFSK): Low Channel

Delta 1 [T1] -0.20 dB RBW 10 kHz RF Att 30 dB

Ref Lvl 20 dBm 917.83567134 kHz SWT 50 ms Unit dBm

3.5 dB Offset

D1 0.29 dBm

D2 -19.71 dBm

T1 [T1] -15.65 dBm

T1 [T1] -1.20 dBm

2.44054910 GHz

917.83567134 kHz

Center 2.441 GHz 200 kHz/ Span 2 MHz

Date: 5.JUN.2012 11:27:57

Delta 1 [T1] -0.26 dB RBW 10 kHz RF Att 30 dB

Ref Lvl 20 dBm 917.83567134 kHz SWT 50 ms Unit dBm

3.5 dB Offset

D1 -0.11 dBm

1MAX

D2 -20.11 dBm

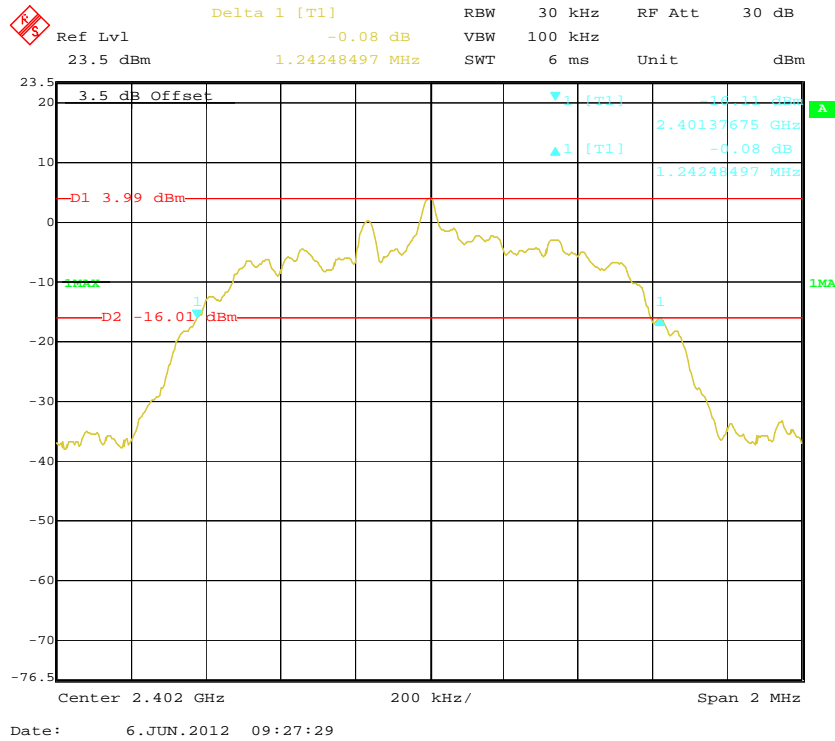
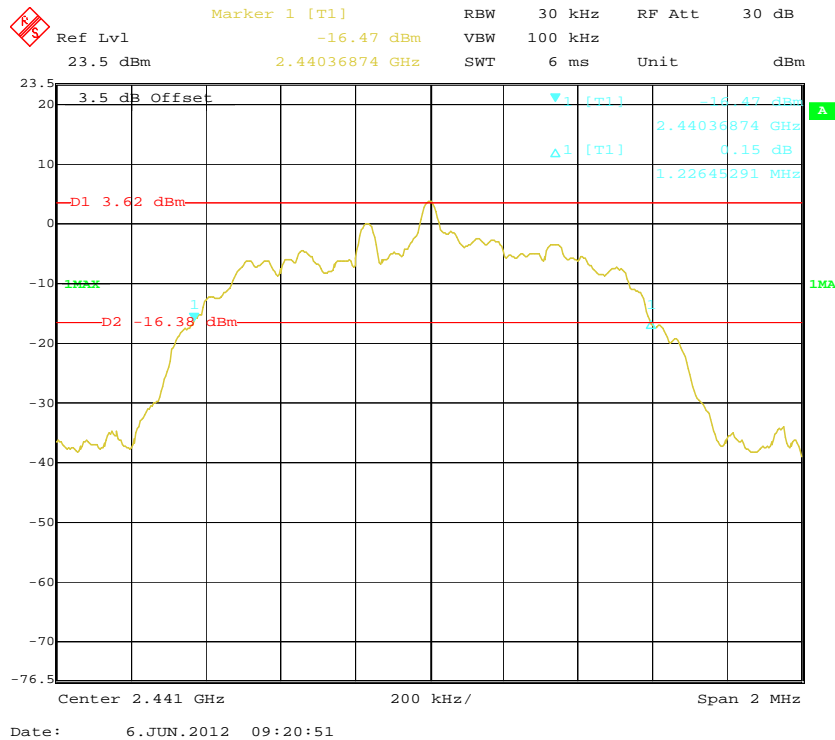
1 [T1] -20.02 dBm

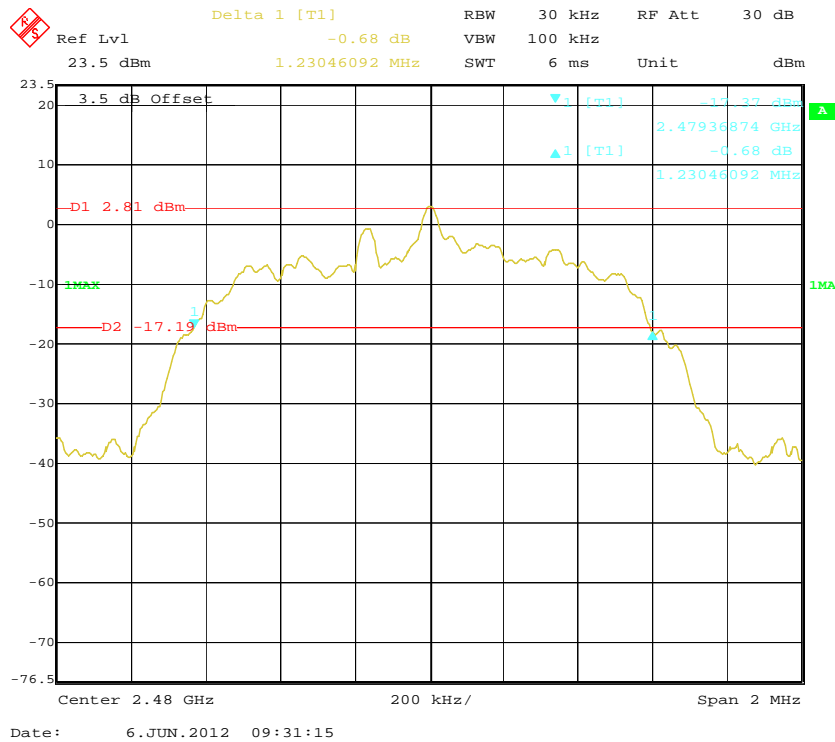
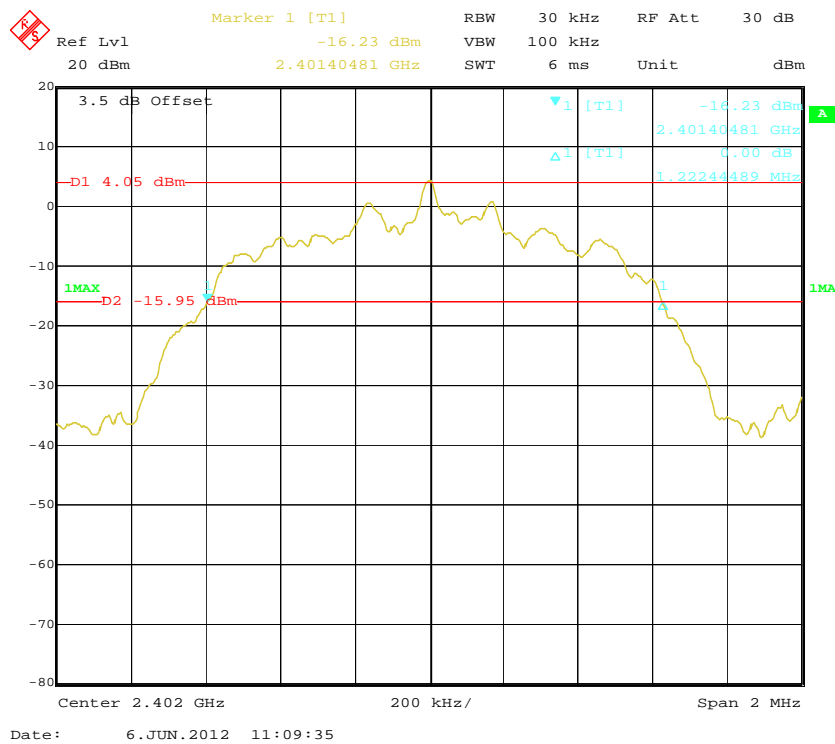
2.47954910 GHz

917.83567134 kHz

Center 2.48 GHz 200 kHz/ Span 2 MHz

Date: 5 JUN 2012 11:34:03

EDR ($\pi/4$ -DQPSK): Low ChannelEDR ($\pi/4$ -DQPSK): Middle Channel

EDR ($\pi/4$ -DQPSK): High Channel**EDR (8DPSK): Low Channel**

Delta 1 [T1] 0.11 dB RBW 30 kHz RF Att 30 dB

Ref Lvl 20 dBm 1.22244489 MHz SWT 6 ms Unit dBm

3.5 dB Offset

D1 3.6 dBm

1MAX -16.4 dBm

1 [T1] -16.57 dBm

2.44040080 GHz 0.11 dB

1.22244489 MHz

Center 2.441 GHz 200 kHz/ Span 2 MHz

Date: 6 JUN 2012 11:12:49

[illegible]

FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST**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	2011-11-24	2012-11-23

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100 kPa

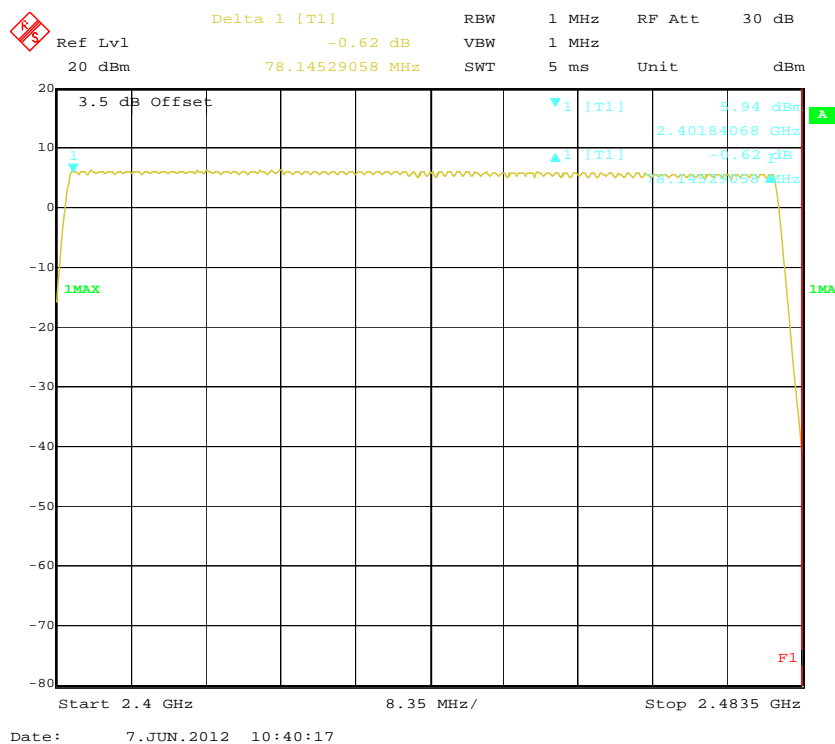
The testing was performed by Gardon Zhang on 2012-06-07.

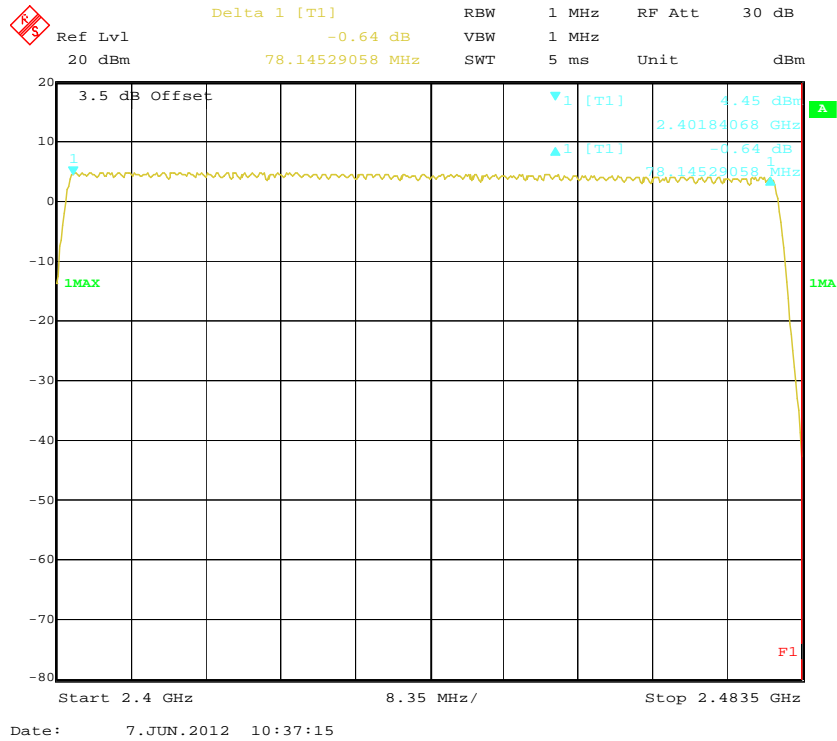
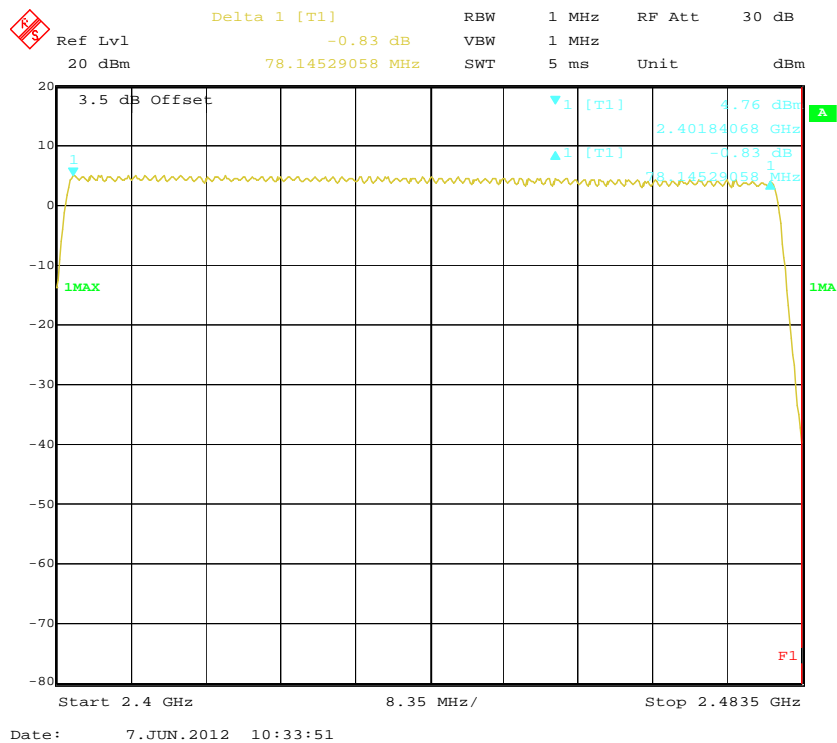
Test Mode: Transmitting

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

Mode	Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
BDR (GFSK)	2402-2480	79	≥ 15
EDR ($\pi/4$ -DQPSK)	2402-2480	79	≥ 15
EDR (8DPSK)	2402-2480	79	≥ 15

BDR (GFSK): Number of Hopping Channels



EDR ($\pi/4$ -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. The quantity of pulse was get from single sweep. In addition, the time of single pulses was tested.

Dwell time = Pulse time*hop 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	2011-11-24	2012-11-23

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100 kPa

The testing was performed by Gardon Zhang on 2012-06-05 and 2012-06-06.

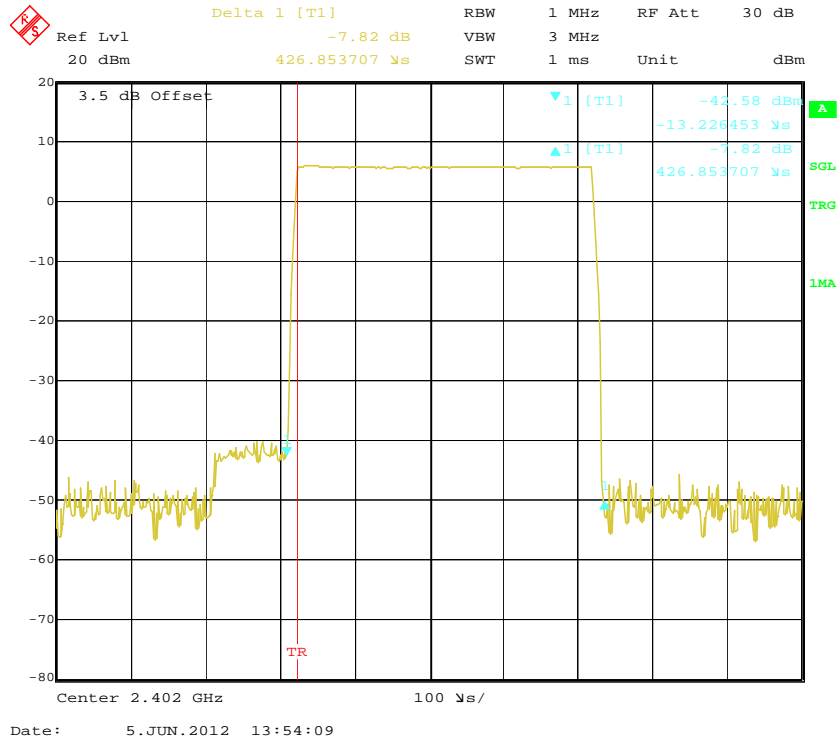
Test Mode: Transmitting

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

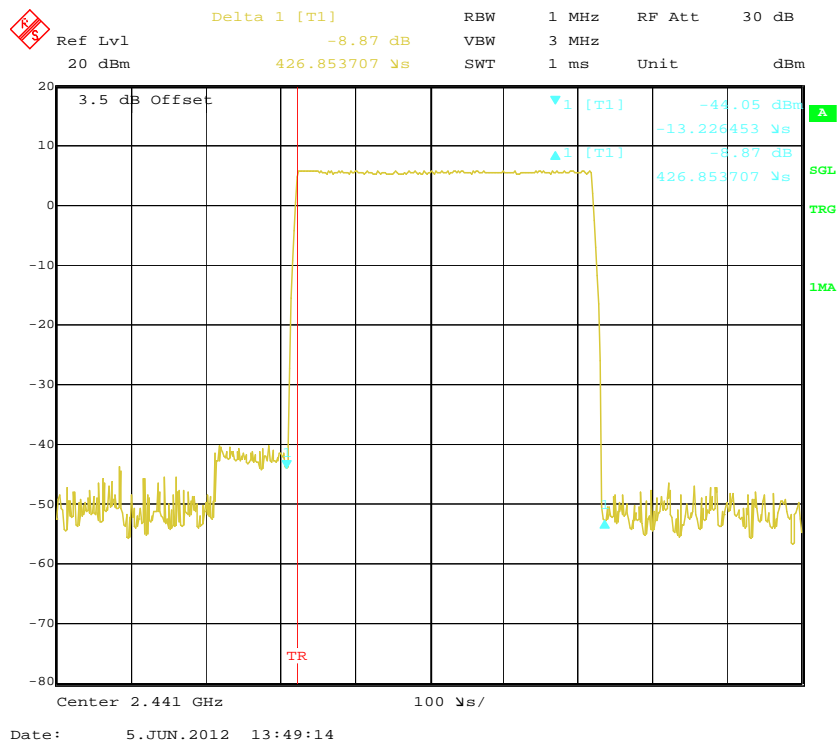
Mode		Channel	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Result
BDR (GFSK)	DH 1	Low	0.4269	0.1366	0.4	Pass
		Middle	0.4269	0.1366	0.4	Pass
		High	0.4269	0.1366	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.6894	0.2703	0.4	Pass
		Middle	1.6894	0.2703	0.4	Pass
		High	1.6894	0.2703	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	2.9519	0.3149	0.4	Pass
		Middle	2.9519	0.3149	0.4	Pass
		High	2.9519	0.3149	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR ($\pi/4$ -DQPSK)	DH 1	Low	0.4389	0.1404	0.4	Pass
		Middle	0.4389	0.1404	0.4	Pass
		High	0.4389	0.1404	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.7134	0.2741	0.4	Pass
		Middle	1.7134	0.2741	0.4	Pass
		High	1.7134	0.2741	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	2.9479	0.3144	0.4	Pass
		Middle	2.9479	0.3144	0.4	Pass
		High	2.9479	0.3144	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR (8DPSK)	DH 1	Low	0.4376	0.1400	0.4	Pass
		Middle	0.4376	0.1400	0.4	Pass
		High	0.4376	0.1400	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.6959	0.2713	0.4	Pass
		Middle	1.6959	0.2713	0.4	Pass
		High	1.6959	0.2713	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	2.9504	0.3147	0.4	Pass
		Middle	2.9504	0.3147	0.4	Pass
		High	2.9504	0.3147	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				

BDR (GFSK):

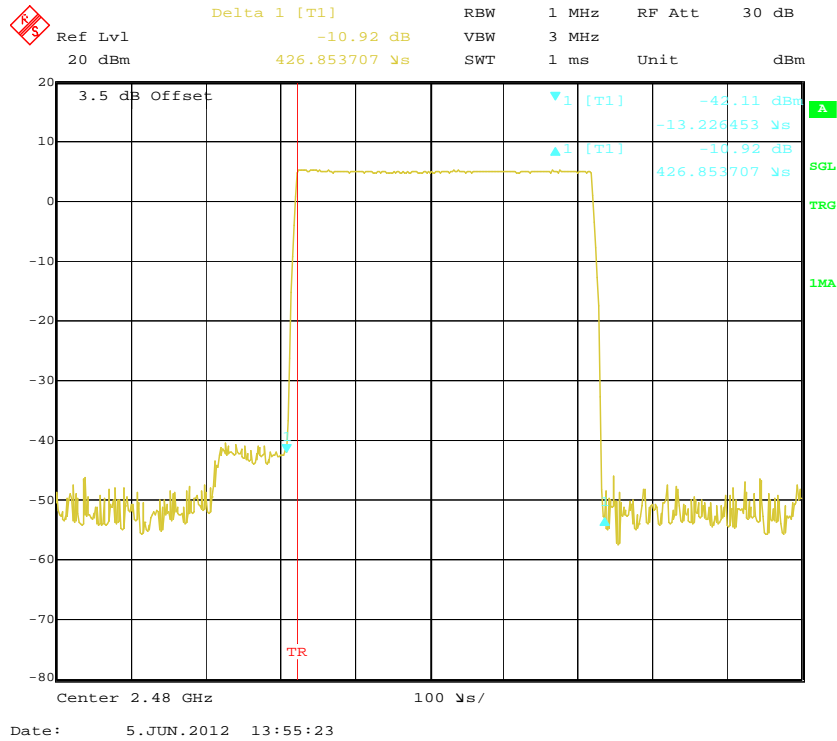
Pulse time, Low Channel, DH1



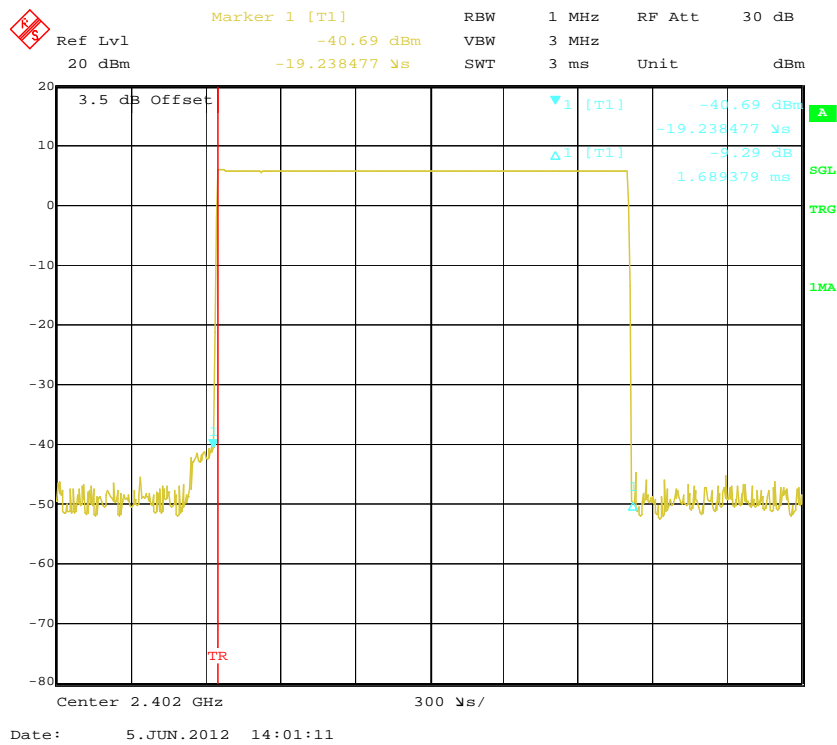
Pulse time, Middle Channel, DH1



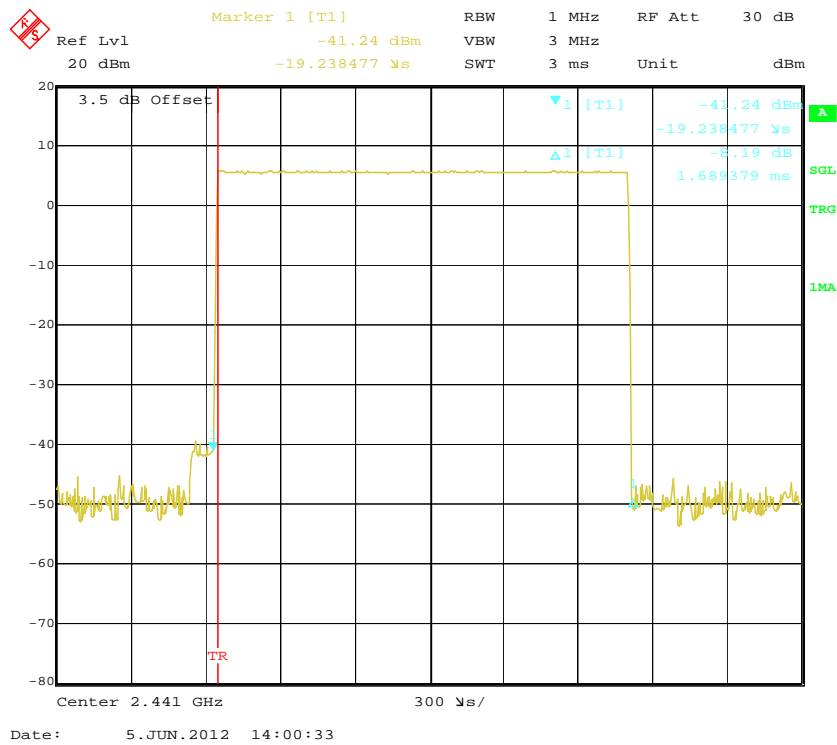
Pulse time, High Channel, DH1



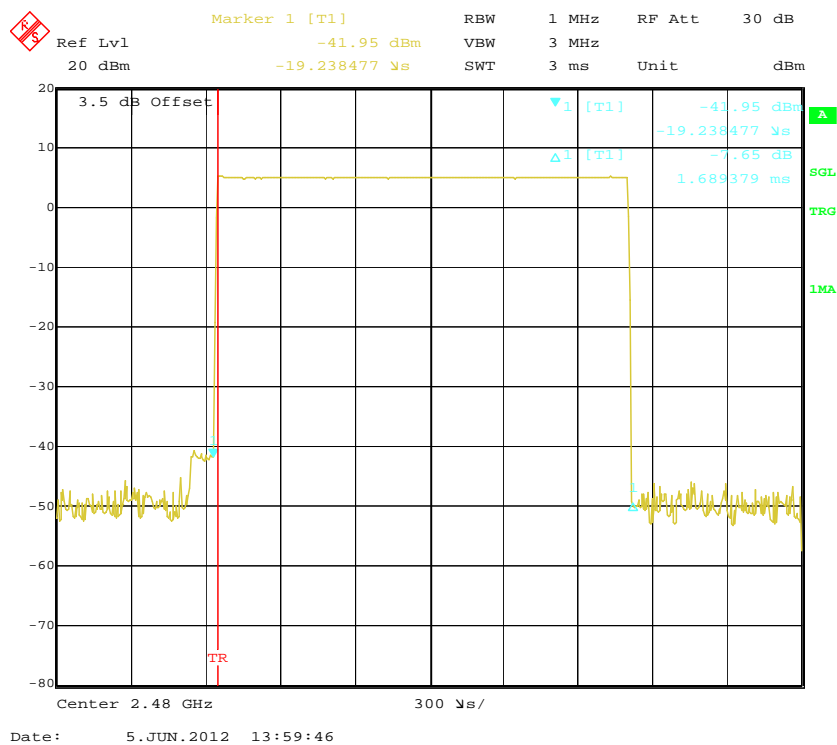
Pulse time, Low Channel, DH3



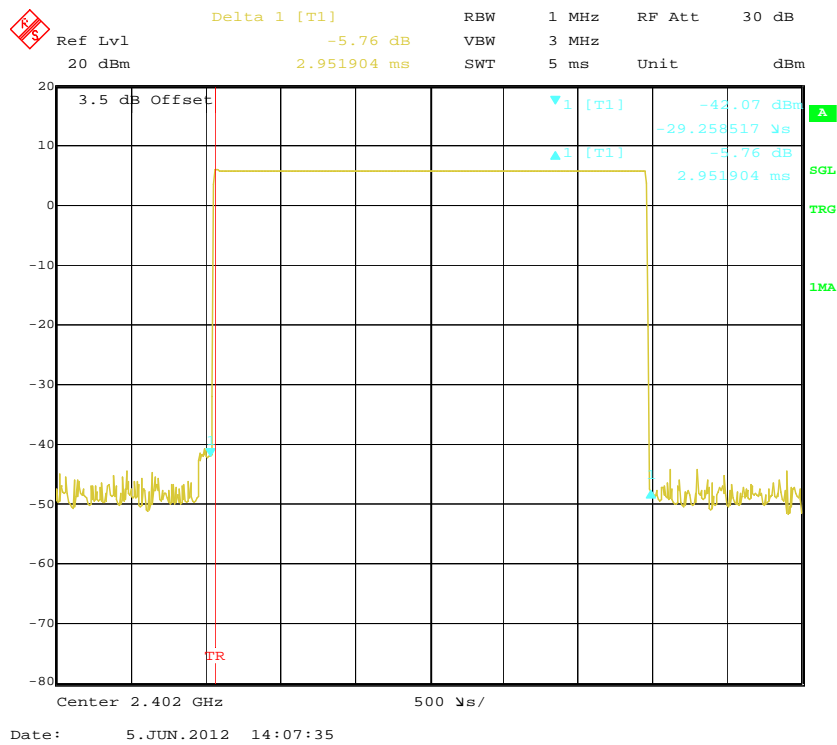
Pulse time, Middle Channel, DH3



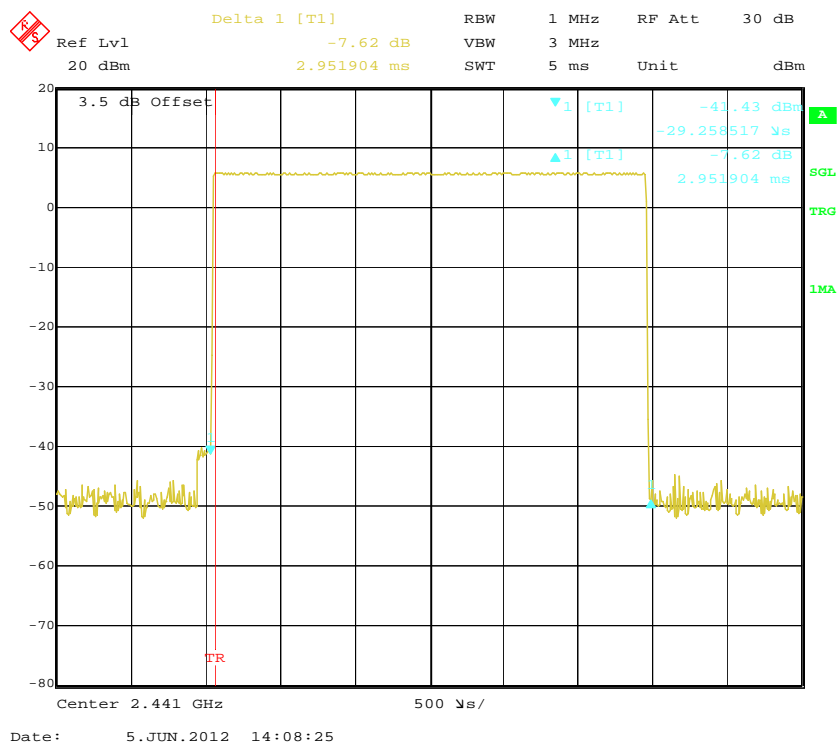
Pulse time, High Channel, DH3



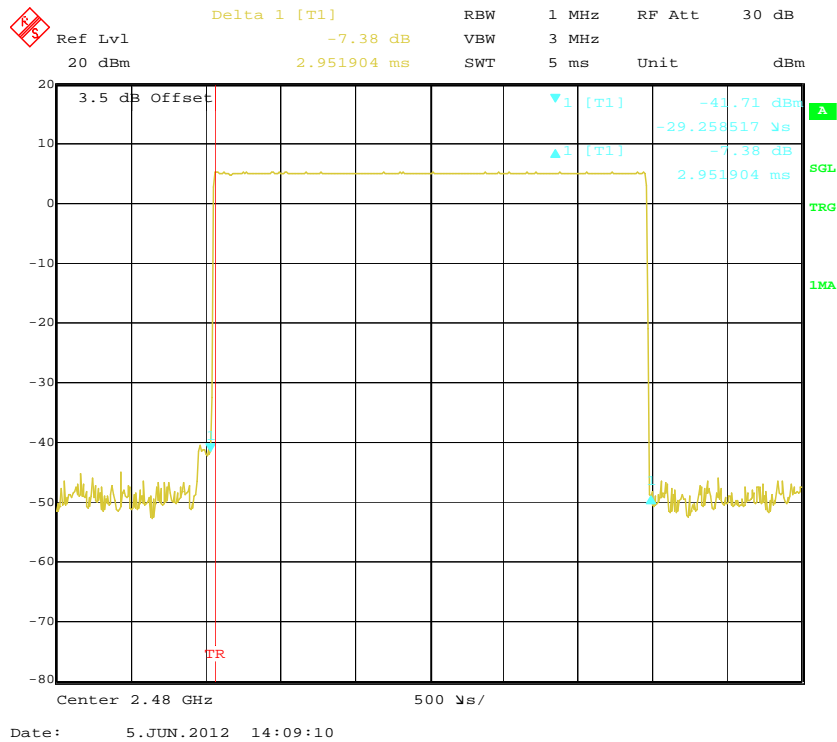
Pulse time, Low Channel, DH5



Pulse time, Middle Channel, DH5

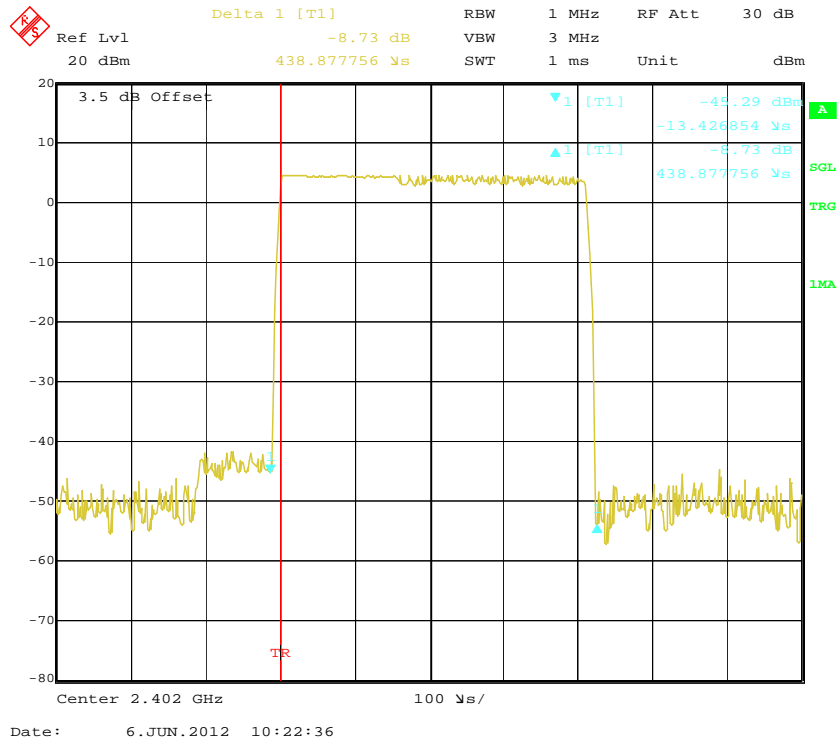


Pulse time, High Channel, DH5

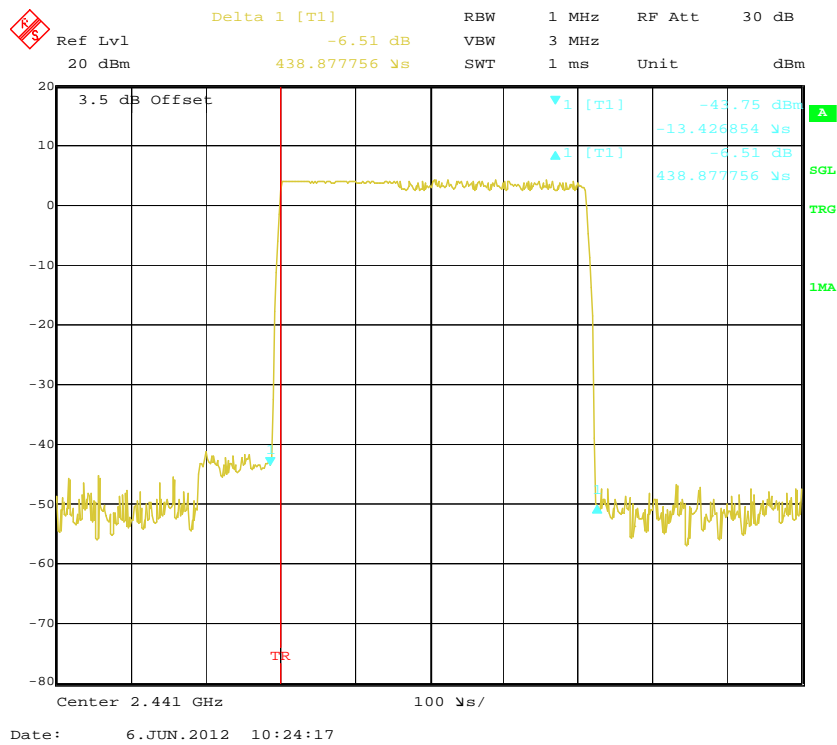


EDR ($\pi/4$ -DQPSK):

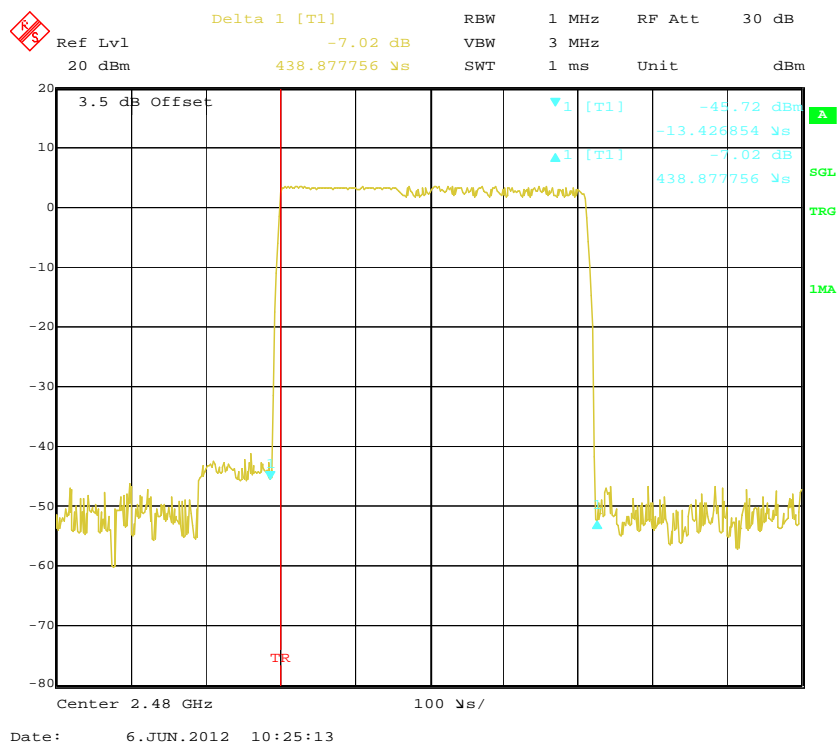
Pulse time, Low Channel, DH1



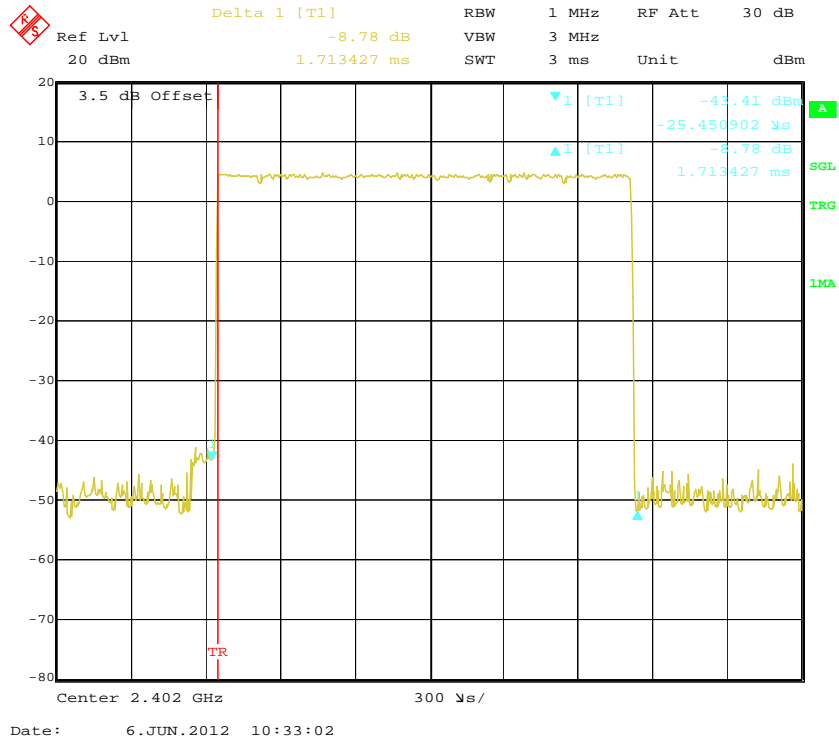
Pulse time, Middle Channel, DH1



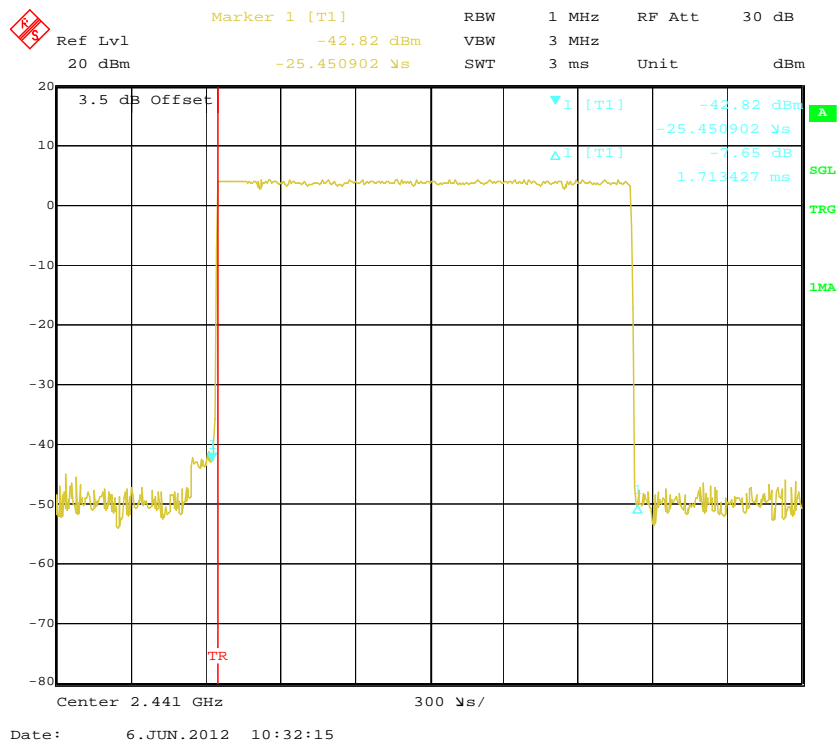
Pulse time, High Channel, DH1



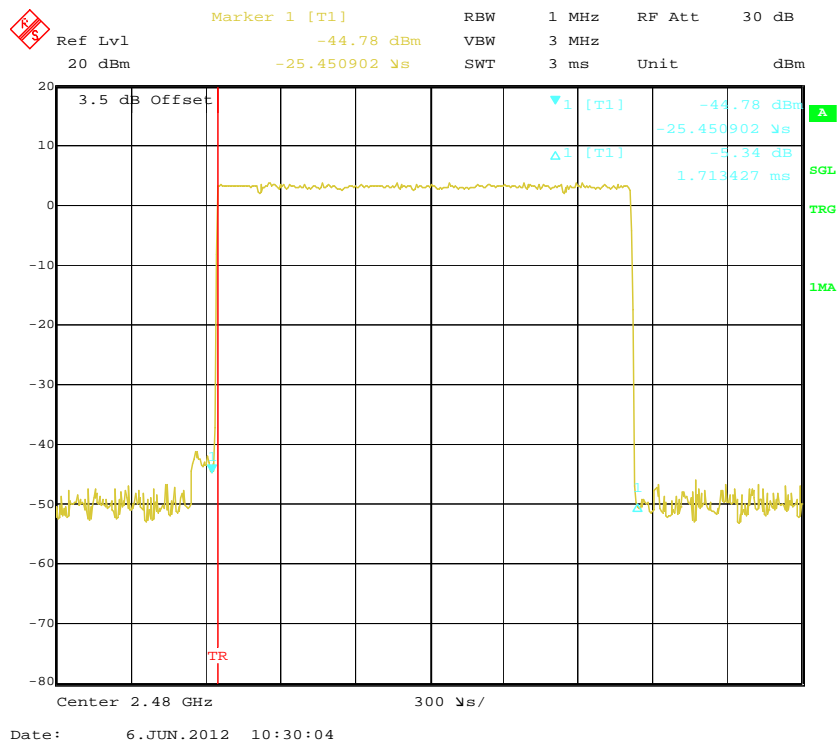
Pulse time, Low Channel, DH3



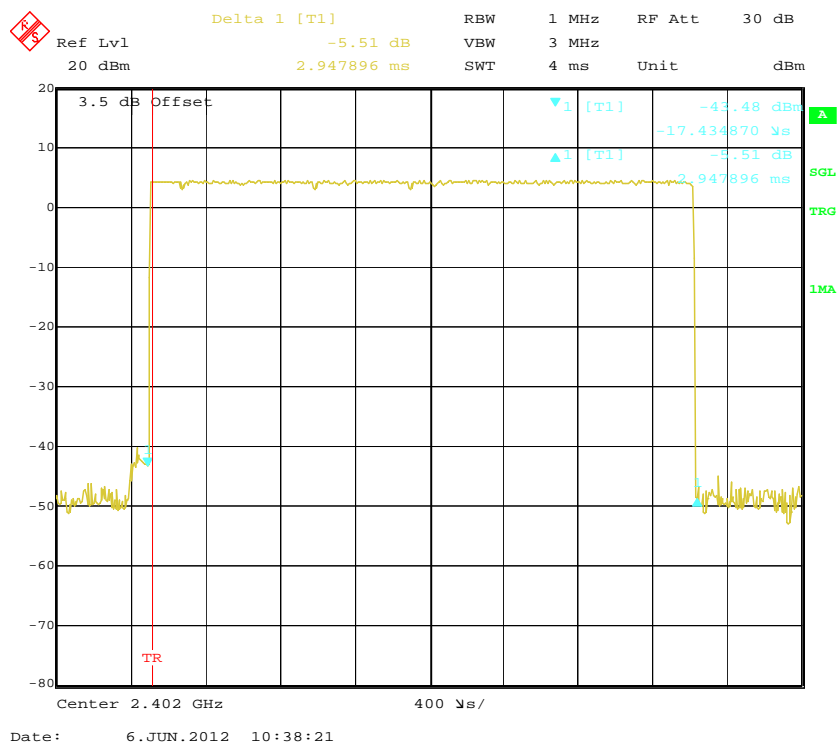
Pulse time, Middle Channel, DH3



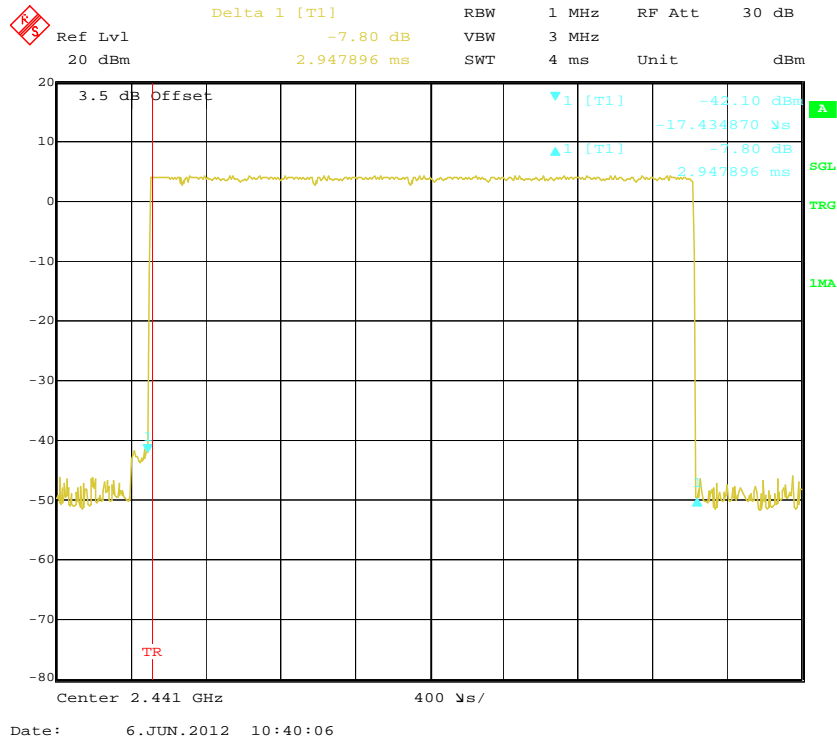
Pulse time, High Channel, DH3



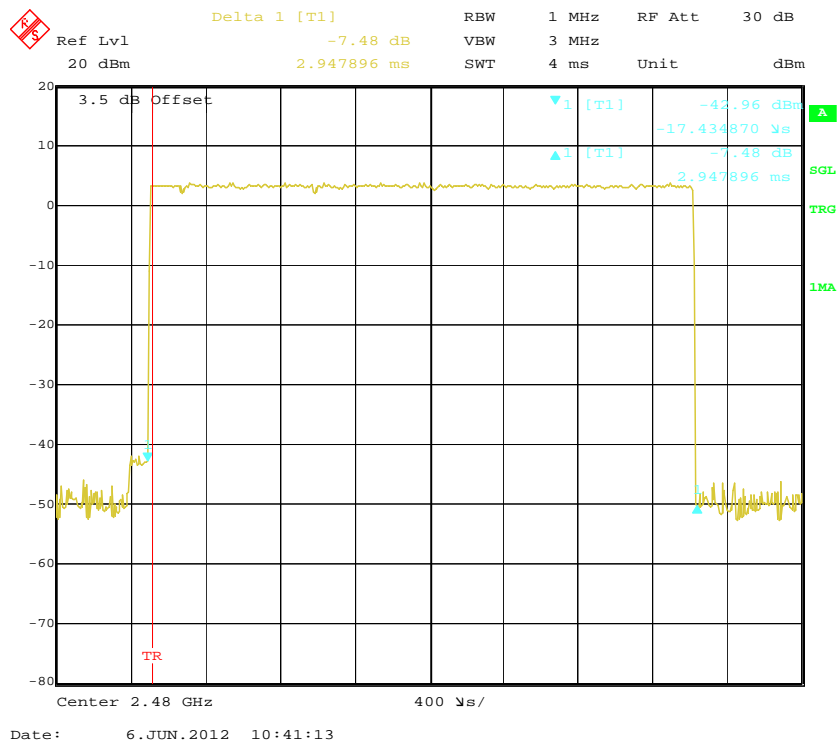
Pulse time, Low Channel, DH5



Pulse time, Middle Channel, DH5

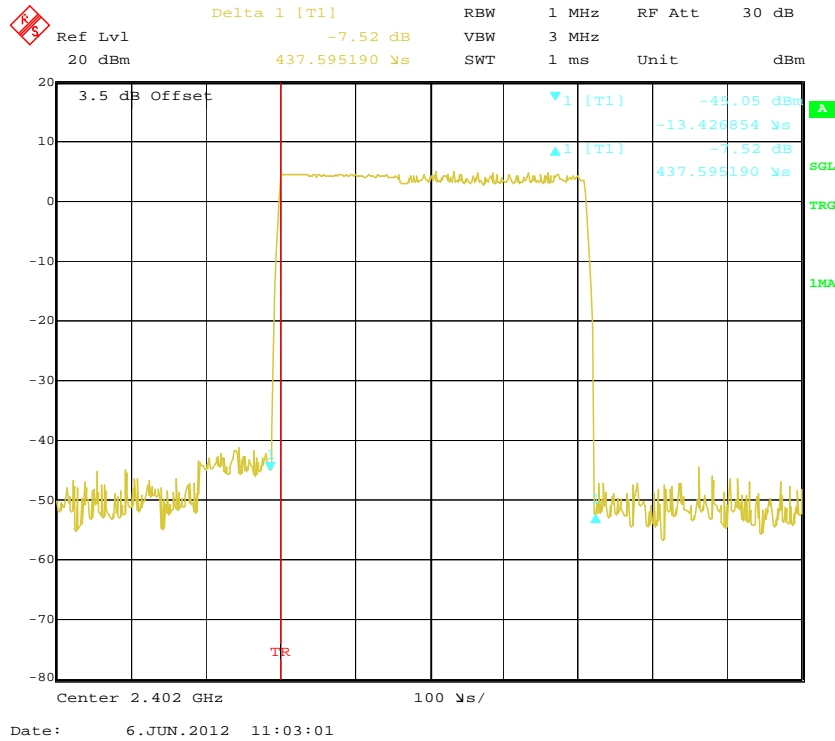


Pulse time, High Channel, DH5

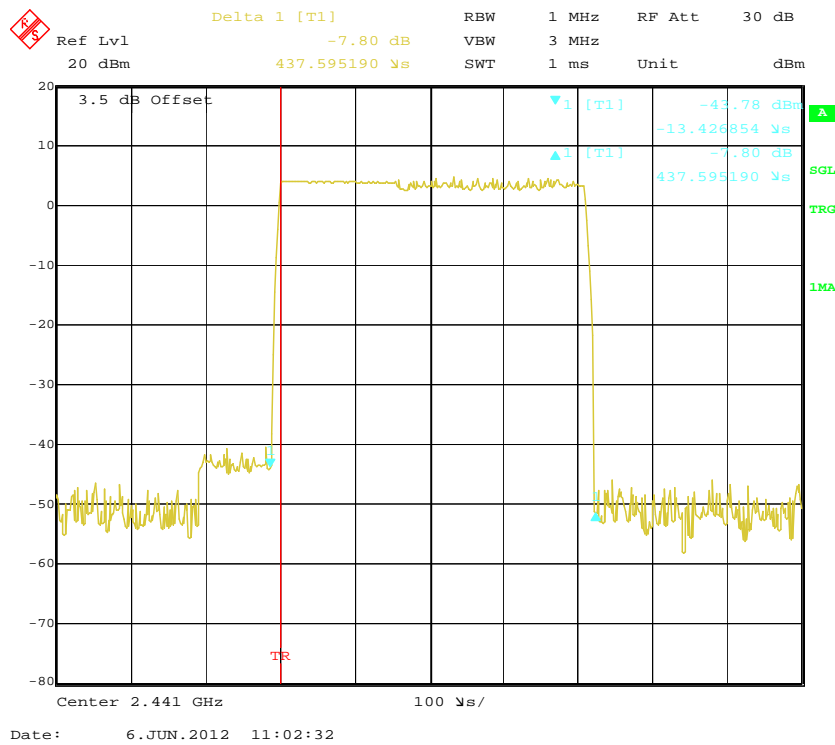


EDR (8DPSK):

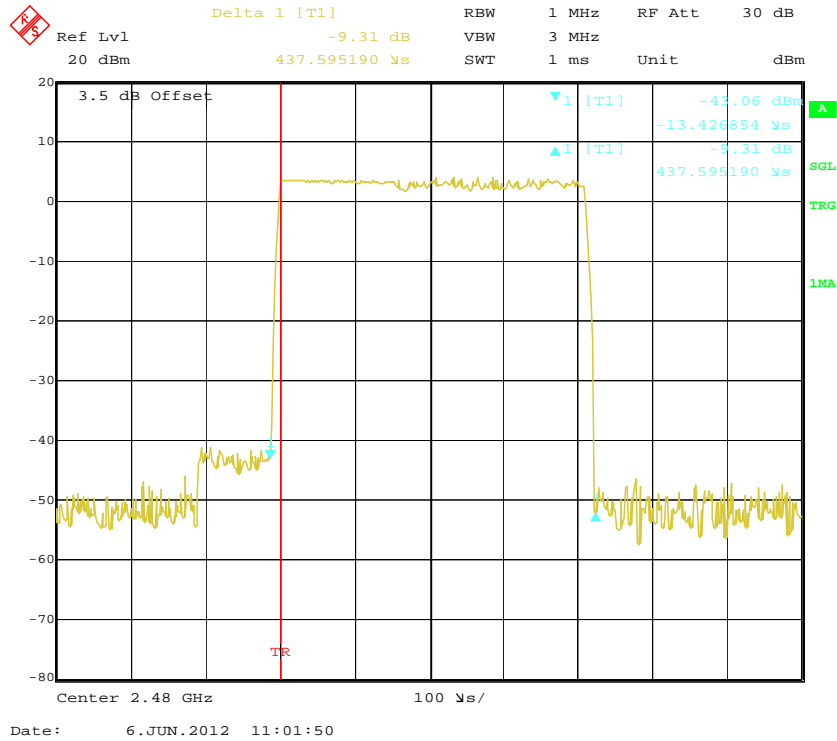
Pulse time, Low Channel, DH1



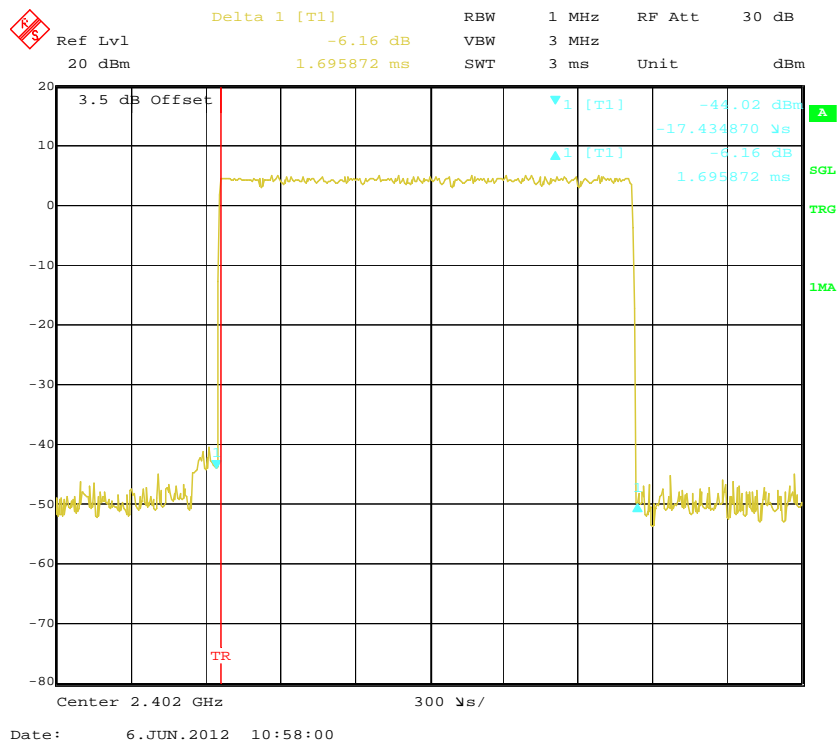
Pulse time, Middle Channel, DH1



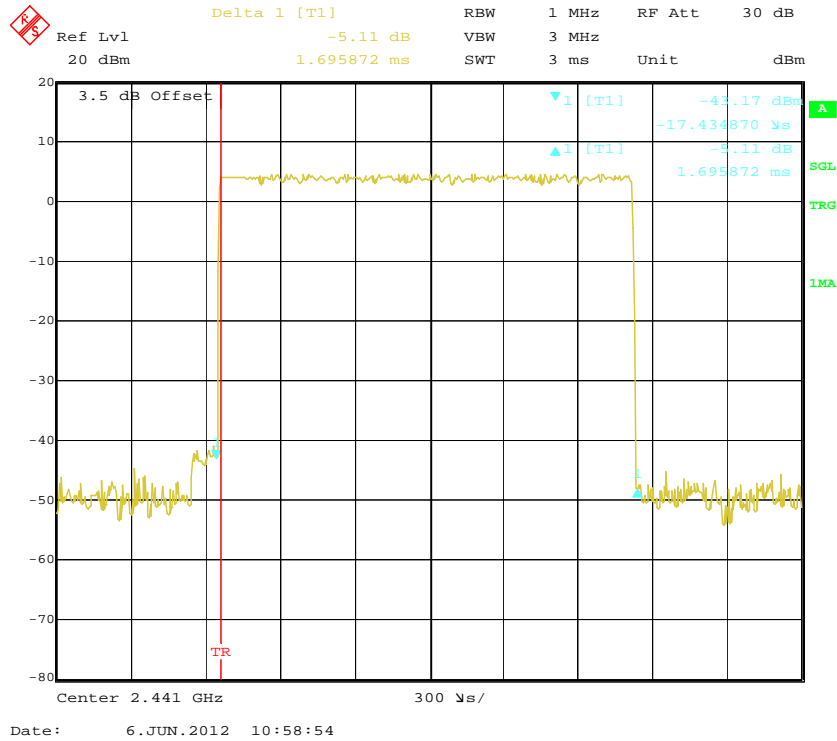
Pulse time, High Channel, DH1



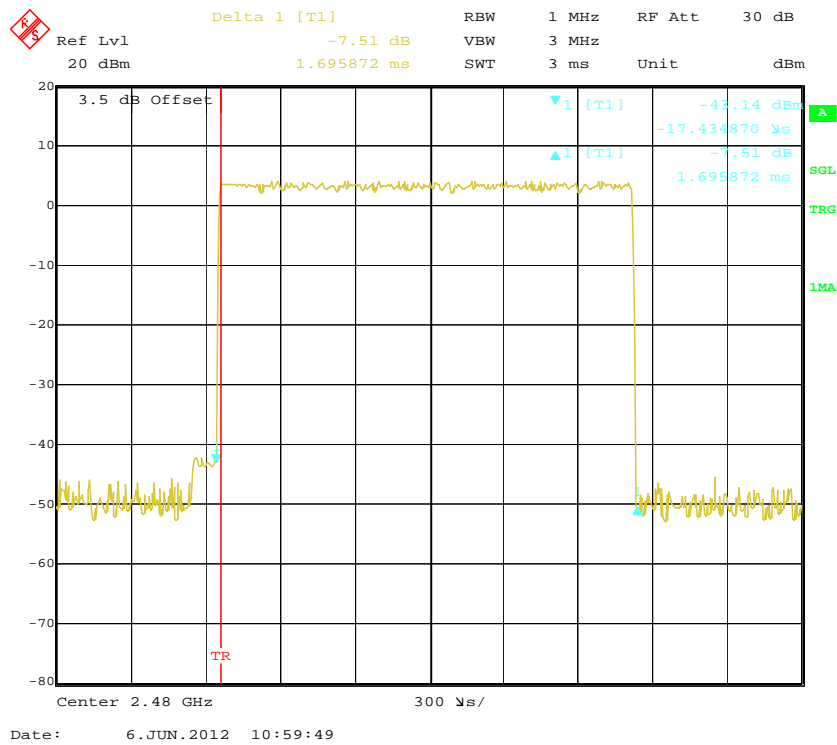
Pulse time, Low Channel, DH3



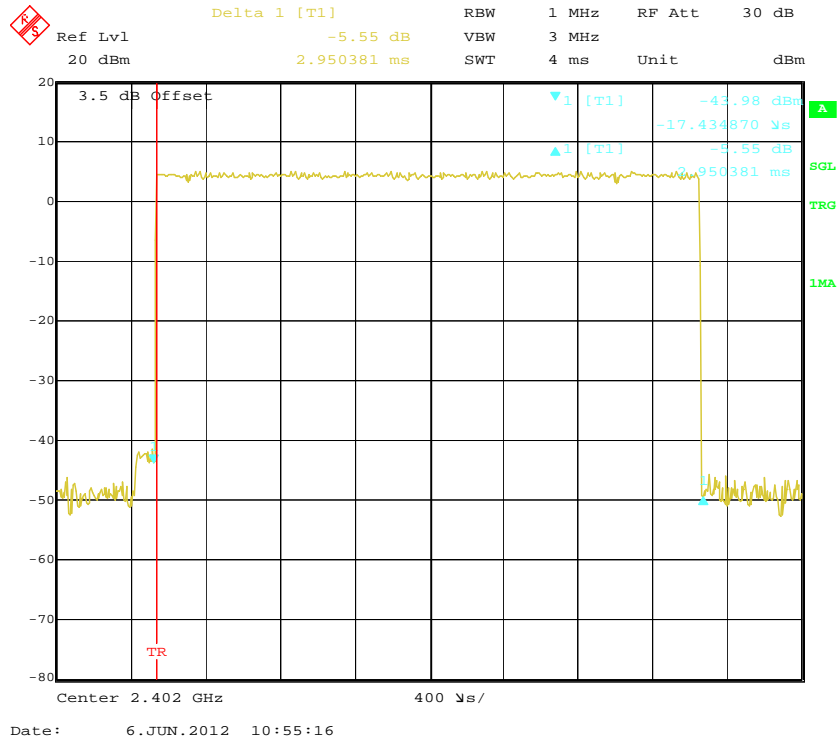
Pulse time, Middle Channel, DH3



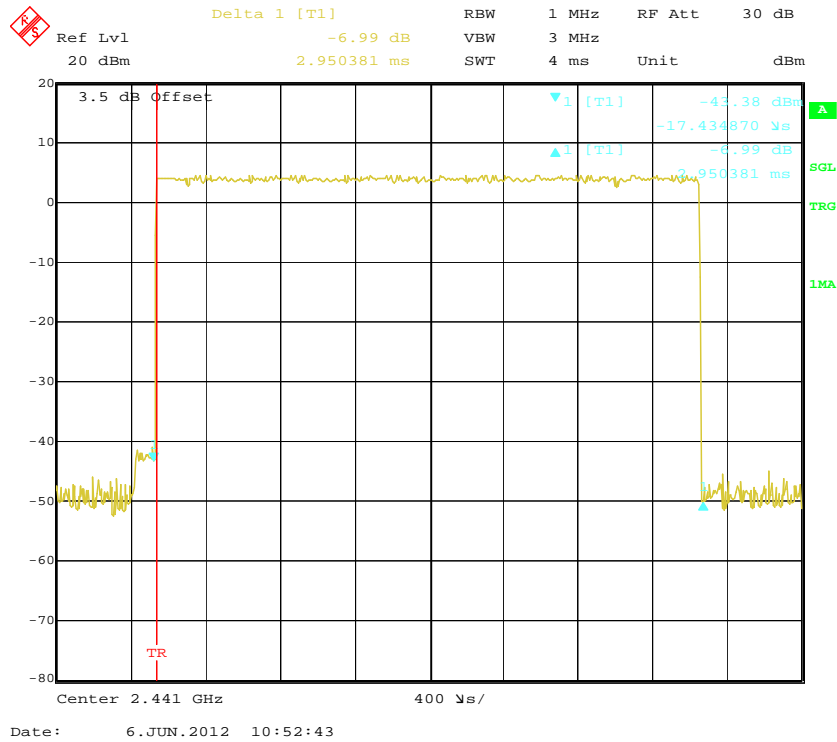
Pulse time, High Channel, DH3



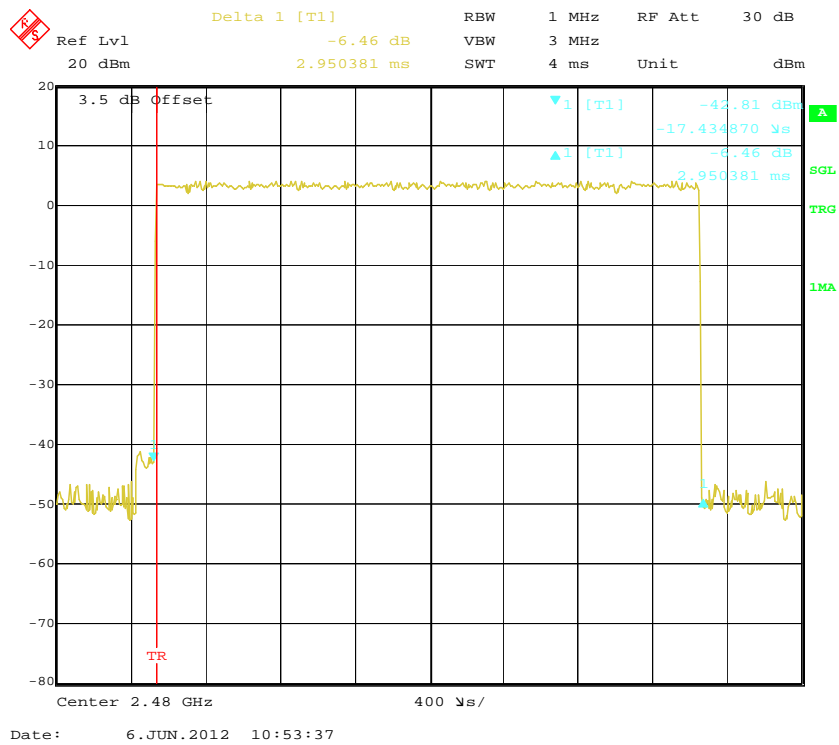
Pulse time, Low Channel, DH5



Pulse time, Middle Channel, DH5



Pulse time, High Channel, DH5



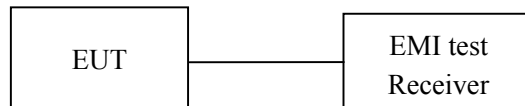
FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

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	2011-11-24	2012-11-23

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100 kPa

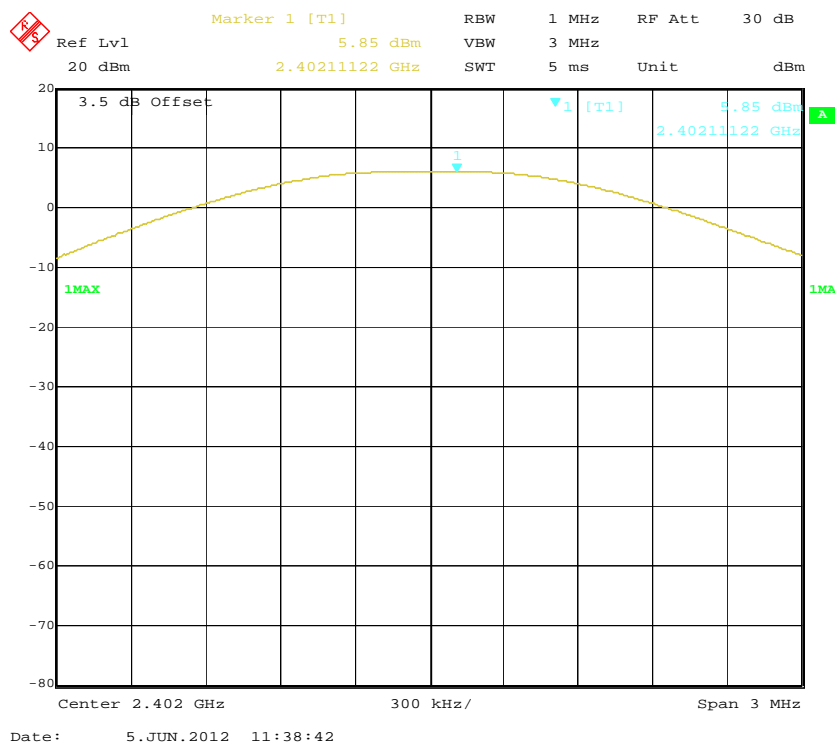
The testing was performed by Gardon Zhang on 2012-06-05 and 2012-06-06.

Test Mode: Transmitting

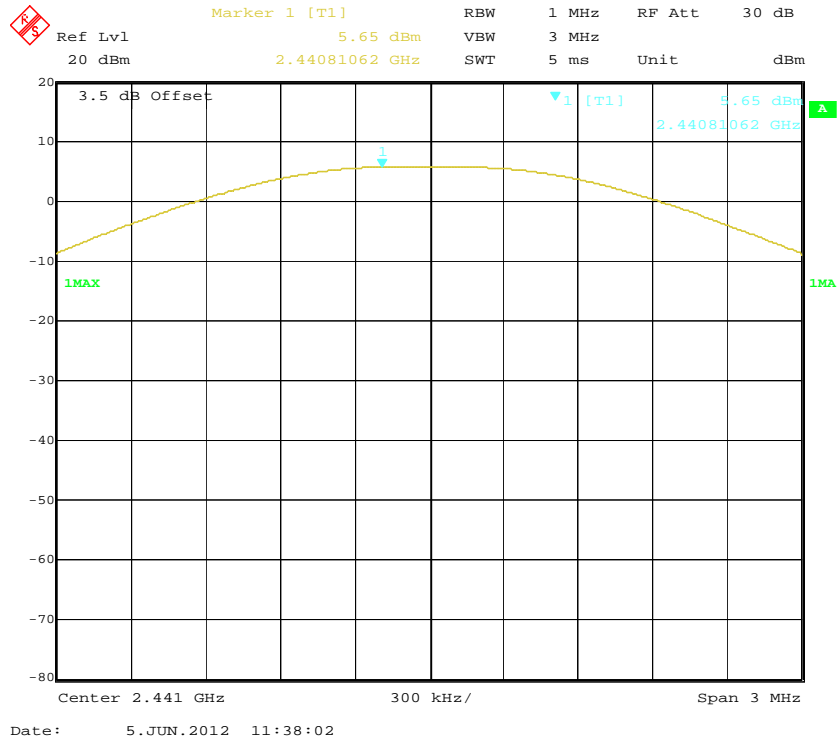
Test Result: Compliance. Please refer to following tables and plots

Mode	Channel	Frequency (MHz)	Conducted Output Power		Limit (mW)
			(dBm)	(mW)	
BDR (GFSK)	Low	2402	5.85	3.846	1000
	Middle	2441	5.65	3.673	1000
	High	2480	5.07	3.214	1000
EDR ($\pi/4$ -DQPSK)	Low	2402	4.88	3.076	1000
	Middle	2441	4.54	2.844	1000
	High	2480	4.54	2.844	1000
EDR (8DPSK)	Low	2402	5.2	3.311	1000
	Middle	2441	4.86	3.062	1000
	High	2480	4.23	2.649	1000

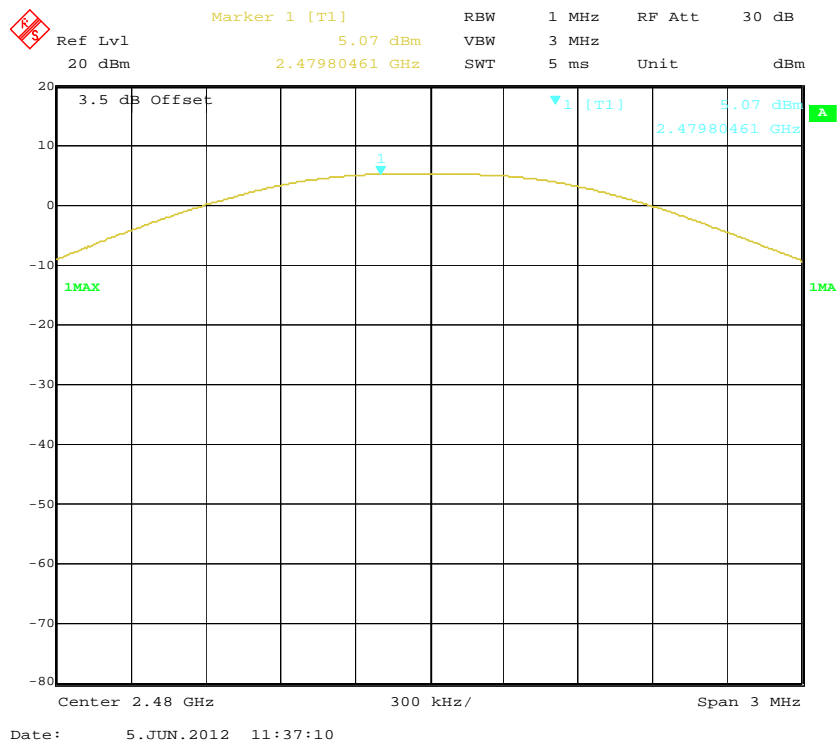
BDR (GFSK): Low Channel



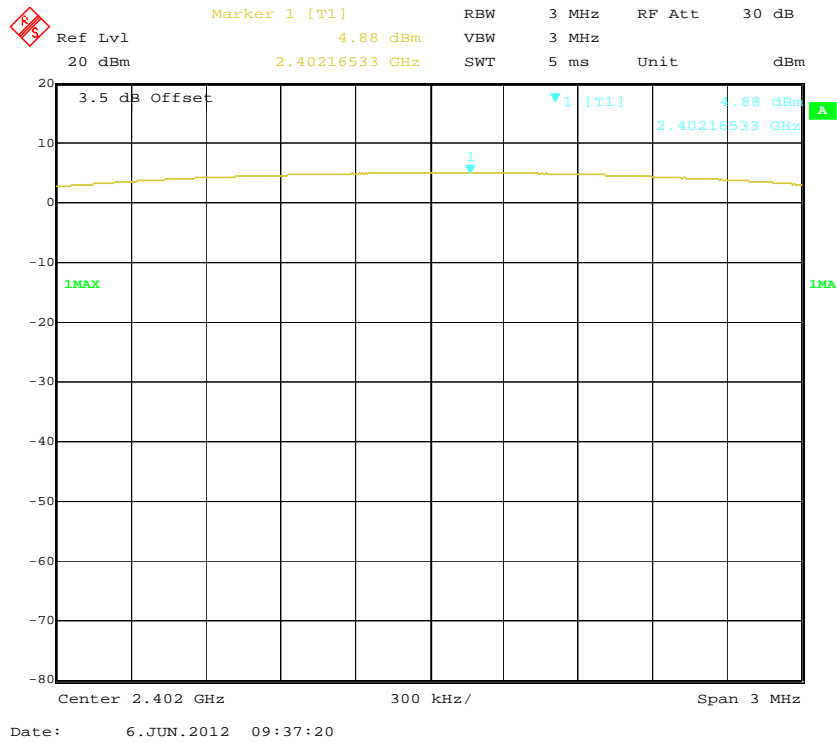
BDR (GFSK): Middle Channel



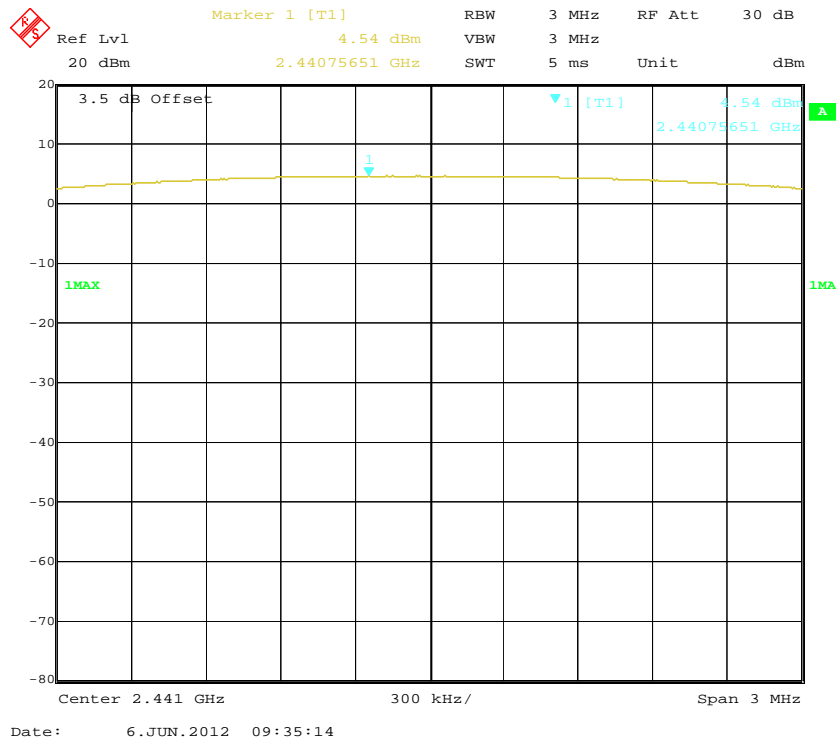
BDR (GFSK): High Channel



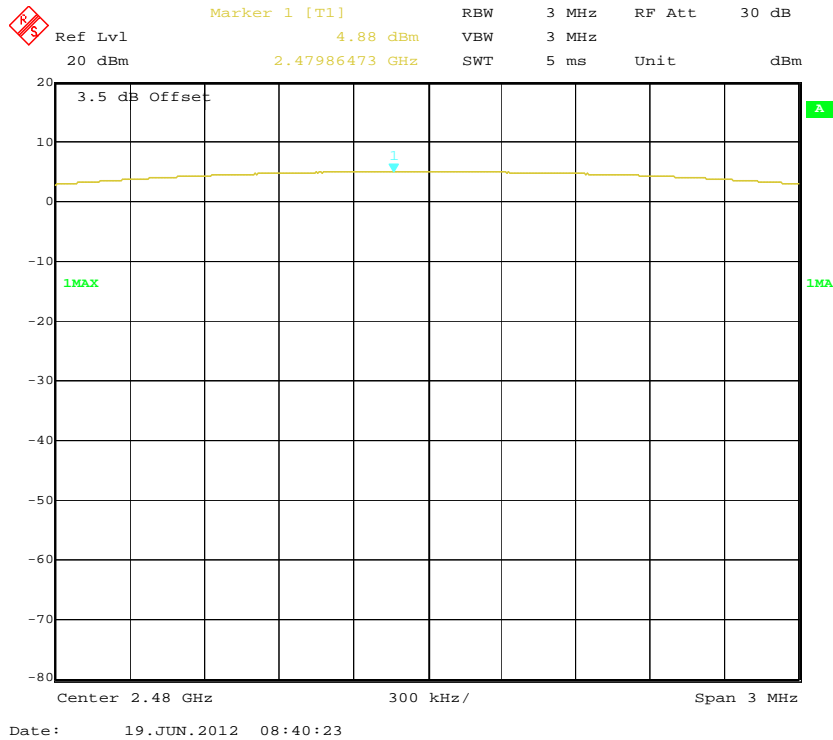
EDR($\pi/4$ -DQPSK): Low Channel



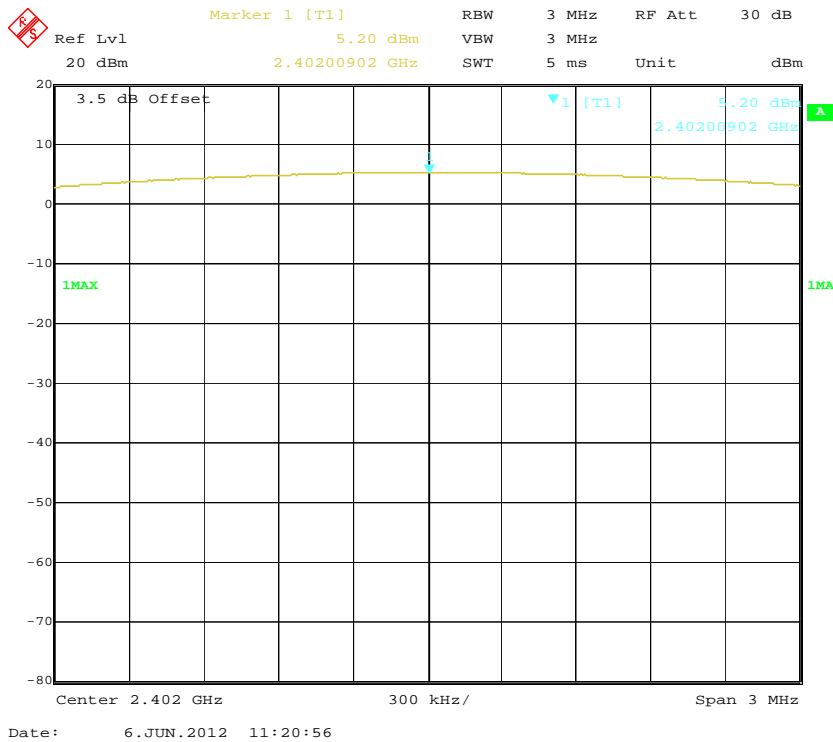
EDR($\pi/4$ -DQPSK): Middle Channel



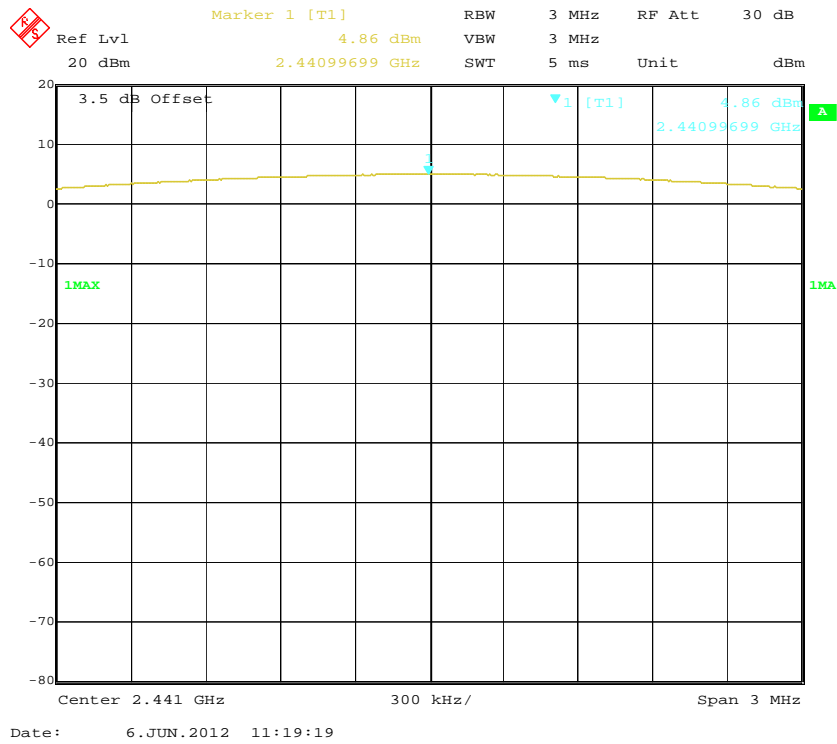
EDR($\pi/4$ -DQPSK): High Chanel



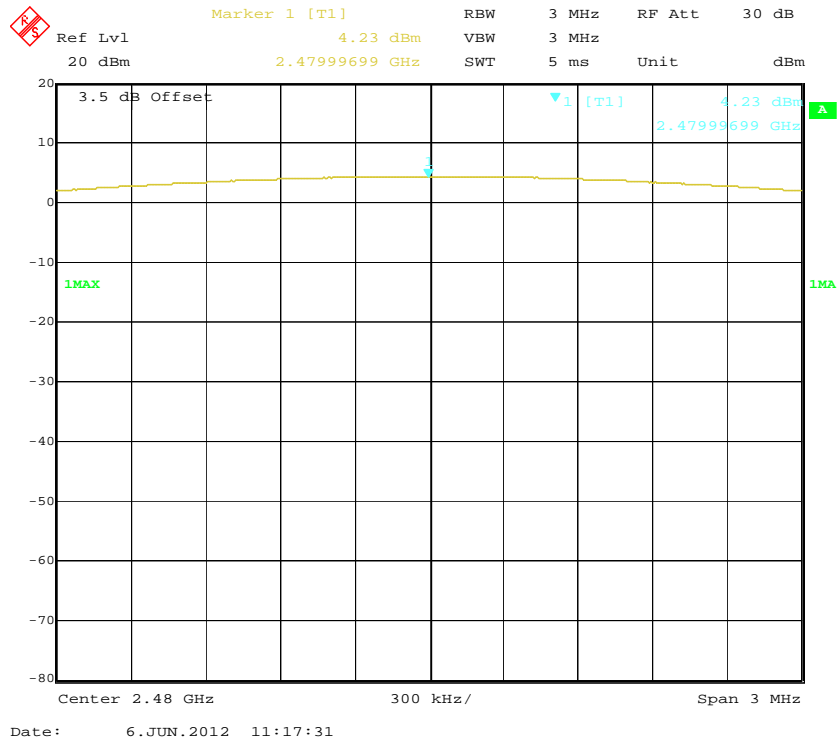
EDR(8DPSK): Low Channel



EDR(8DPSK): Middle Channel



EDR(8DPSK): High Channel



FCC §15.247(d) - BAND EDGES TESTING

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 300 kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1 MHz, VBW=3 MHz.
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	2011-11-24	2012-11-23

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data**Environmental Conditions**

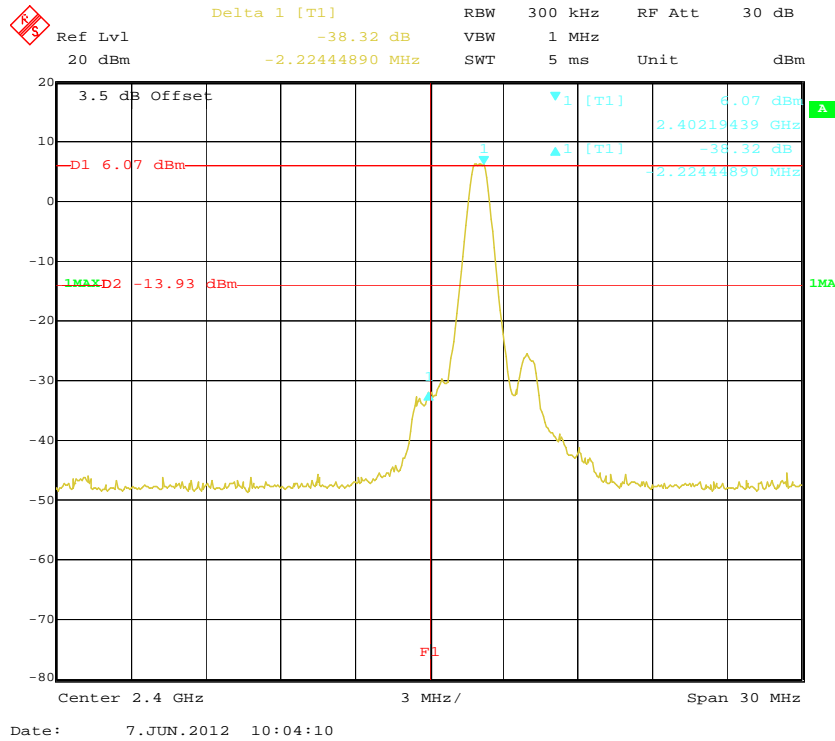
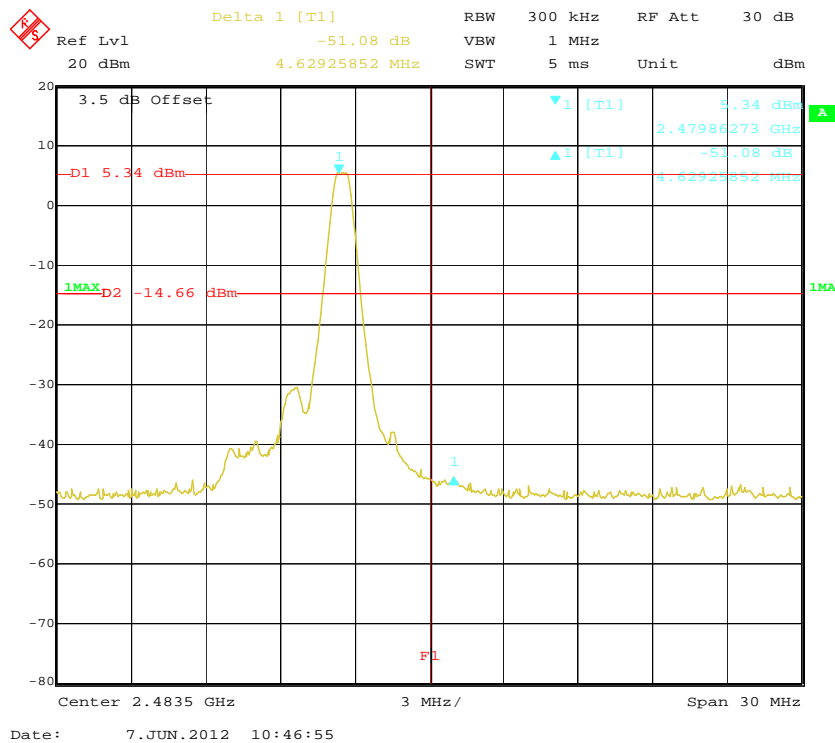
Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100 kPa

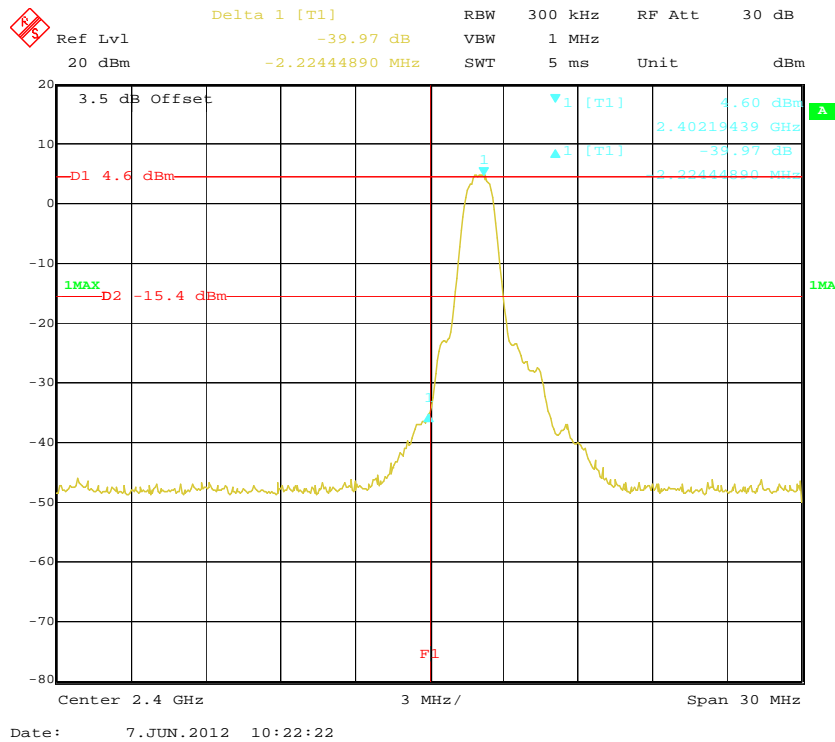
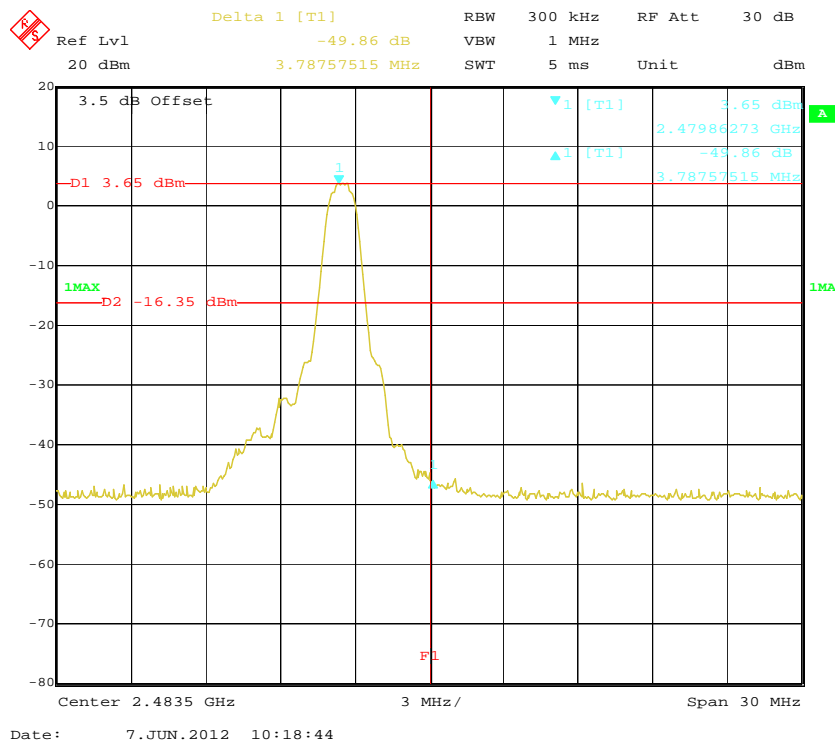
The testing was performed by Gardon Zhang on 2012-06-07.

Test Mode: Transmitting

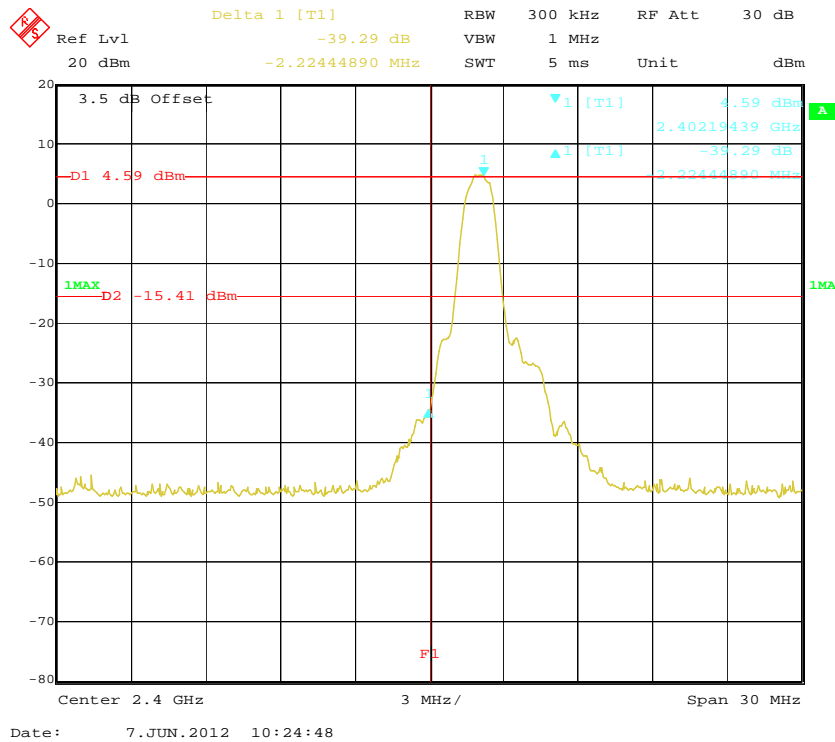
Test Result: Compliance. Please refer to following tables and plots

Mode	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)
BDR (GFSK)	2399.97	38.32	>20
	2484.49	51.08	>20
EDR ($\pi/4$-DQPSK)	2399.97	39.97	>20
	2483.65	49.86	>20
EDR (8DPSK)	2399.97	39.29	>20
	2483.89	49.49	>20

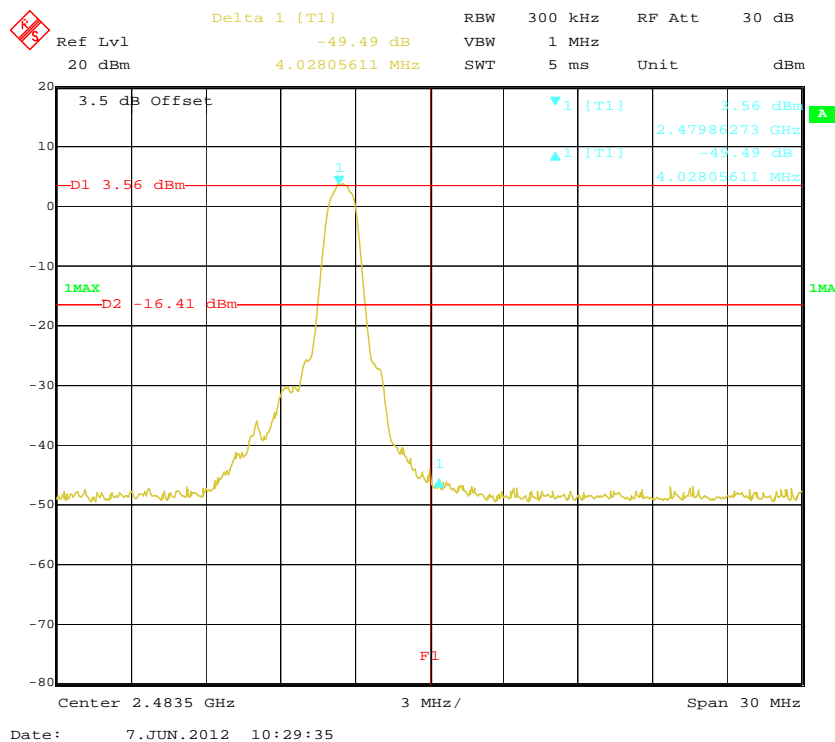
BDR (GFSK): Band Edge-Left Side**BDR (GFSK): Band Edge-Right Side**

EDR ($\pi/4$ -DQPSK): Band Edge-Left SideEDR ($\pi/4$ -DQPSK): Band Edge-Right Side

EDR (8DPSK): Band Edge-Left Side



BDR (8DPSK): Band Edge-Right Side



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