Excellence in Compliance Testing

Certification Test Report

FCC ID: AZ489FT5868
IC: 109U-89FT5868

FCC Rule Part: 15.247
IC Radio Standards Specification: RSS-210

ACS Report Number: 14-2001.W06.1A

Manufacturer: Motorola Solutions SDNBHD
Model: H63UCH6TZ7AN

Test Begin Date: **December 22, 2014**
Test End Date: **January 10, 2015**

Report Issue Date: January 12, 2015

ACCREDITED TESTING

FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER AT-1533

This report must not be used by the client to claim product certification, approval, or endorsement by ACLASS, ANSI, or any agency of the Federal Government.

Reviewed by:

Thierry Jean-Charles
EMC Engineer
Advanced Compliance Solutions, Inc.

This report contains 67 pages

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1 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations and Industry Canada's Radio Standards Specification RSS-210.

1.2 Product Description

The Motorola Solutions MTP3250 model H63UCH6TZ7AN is an 800 MHz two way handheld portable radio. The EUT also includes a Bluetooth 2.1+EDR transceiver.

Technical Details

Mode of Operation:	Bluetooth 2.1 + Enhanced Data Rate (EDR)
Frequency Range:	2402 MHz - 2480 MHz
Number of Channels:	79
Channel Separation:	1 MHz
Modulations:	GFSK, π/4-DQPSK, 8DPSK
TX Data Rates:	GFSK: 1Mbps π/4-DQPSK: 2Mbps 8DPSK: 3Mbps
Antenna Type/Gain:	PIFA, 2.15 dBi

1.3 Manufacturer Information

Motorola Solutions Malaysia Sdn Bhd
Plot 2, Bayan Lepas,
Technoplex Industrial Park,
Mukim 12, SWD (CSC)
11900 Bayan Lepas, Penang Malaysia

Model Number: H63UCH6TZ7AN

Test Sample Serial Number(s): 893TNZ1693 (Radiated & Power Line Conducted Emissions), 893TNZ1643 (RF Conducted)

Test Sample Condition: The samples were in good conditions with no observable physical damages.

1.4 Test Methodology and Considerations

The EUT was evaluated for RF conducted, radiated and power line conducted emissions for the Bluetooth transceiver.

The RF conducted measurements were performed with the EUT configured with a temporary SMA connector at the RF port for direct coupling to a spectrum analyzer.

The radiated emissions evaluation was performed up to the 10th harmonic. Preliminary evaluation was performed for the EUT set in 3 orthogonal orientations. The final measurements were carried out using the EUT orientation leading to the highest emissions as compared to the limits. The EUT was also evaluated for intermodulation products of the co-located 800 MHz and Bluetooth radio. All intermodulation products were found compliant to the limits of FCC Section 15.209 and IC RSS-Gen 8.9.

Preliminary power line conducted emissions measurements were performed for all available modulations. The final measurements were collected for the worst case configuration.

The frequencies and data rates used during the evaluation are provided below.

Table 1.4-1: Bluetooth Radio Test configuration

Mode of Operations	Frequency (MHz)	Data Rate (kbps)
GFSK	2402	1000
	2441	1000
	2480	1000
π/4 DQPSK	2402	2000
	2441	2000
	2480	2000
8 DPSK	2402	3000
	2441	3000
	2480	3000

The EUT was also evaluated for unintentional emissions. The results are documented separately in a Declaration of Conformity/Verification test report.

2 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions, Inc.
3998 FAU Blvd, Suite 310
Boca Raton, Florida 33431
Phone: (561) 961-5585
Fax: (561) 961-5587
www.acstestlab.com

FCC Test Firm Registration #: 475089
Industry Canada Lab Code: 4175C

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board under their ACLASS program and has been issued certificate number AT-1533 in recognition of this accreditation. Unless otherwise specified, all test methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

2.3 Radiated & Conducted Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The EMC radiated test facility consists of an RF-shielded enclosure. The interior dimensions of the indoor semi-anechoic chamber are approximately 48 feet (14.6 m) long by 36 feet (10.8 m) wide by 24 feet (7.3 m) high and consist of rigid, 1/8 inch (0.32 cm) steel-clad, wood core modular panels with steel framing. In the shielded enclosure, the faces of the panels are galvanized and the chamber is self-supporting. 8-foot RF absorbing cones are installed on 4 walls and the ceiling. The steel-clad ground plane is covered with vinyl floor.

The turntable is driven by pneumatic motor, which is capable of supporting a 2000 lb. load. The turntable is flushed with the chamber floor which it is connected to, around its circumference, with a continuous metallic loaded spring. An EMCO Model 1050 Multi-device Controller controls the turntable position.

A pneumatic motor is used to control antenna polarizations and height relative to the ground. The height information is displayed on the control unit EMCO Model 1050.

The control room is an RF shielded enclosure attached to the semi-anechoic chamber with two bulkhead panels for connecting RF, and control cables. The dimension of the room is 7.3 m x 4.9 m x 3 m high and the entrance doors of both control and conducted rooms are 3 feet (0.91 m) by 7 feet (2.13 m).

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3.1-1 below:

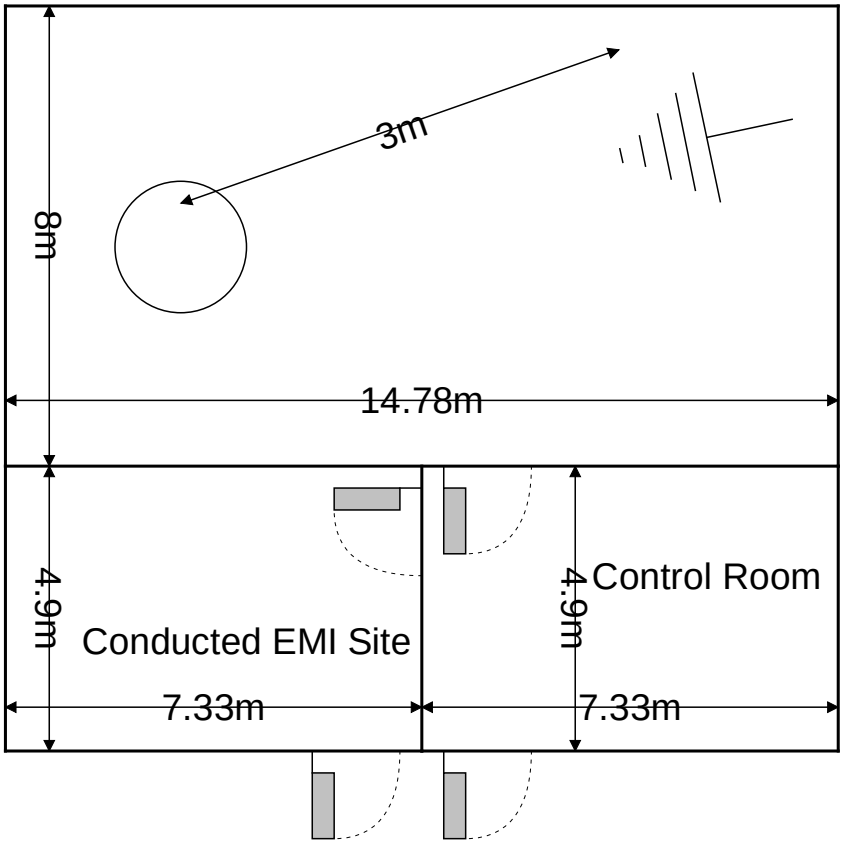


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 m^3. As per ANSI C63.4 2009 requirements, the data were taken using two LISNs; a Solar Model 8028-50 50 Ω/50 µH and an EMCO Model 3825, which are installed as shown in Photograph 3. For evaluation requiring 220 V, 50 Hz AC input, a Polarad LISN (S/N 879341/048) is used in conjunction with a 1 kVA, 50 Hz/220 V EDGAR variable frequency generator, Model 1001B, to filter conducted noise from the generator.

A diagram of the room is shown below in figure 2.3.2-1:

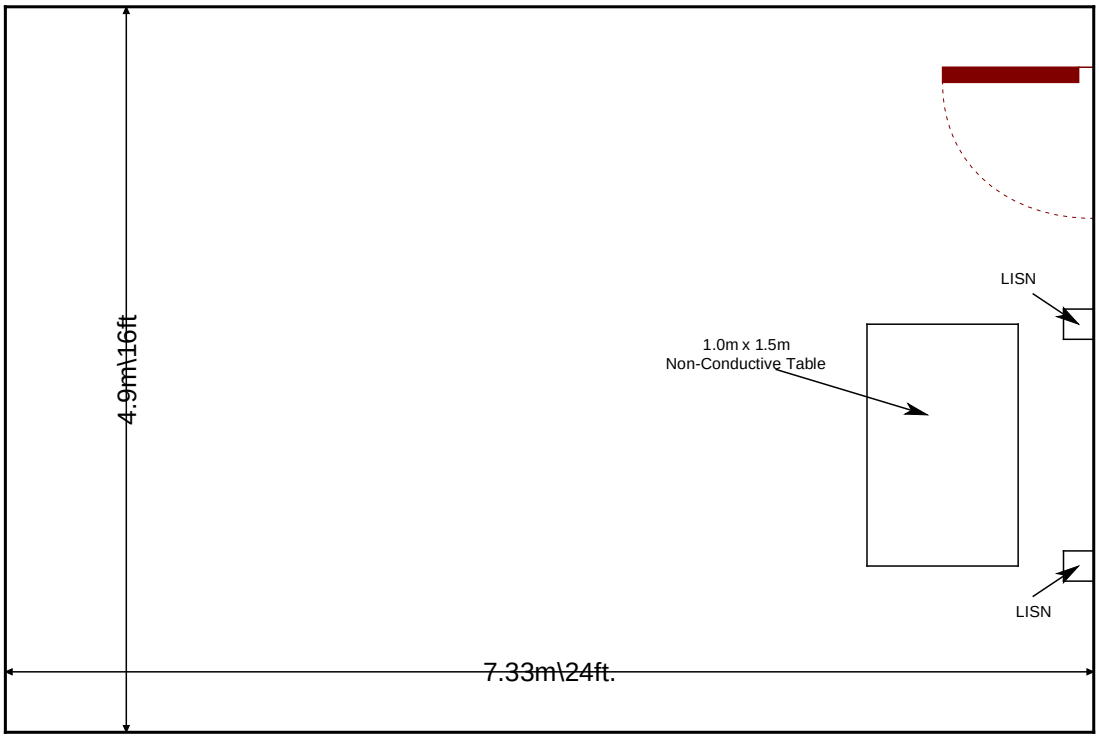


Figure 2.3.2-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2009: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9kHz to 40GHz
- ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2015
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2015
- FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems, March 30, 2000
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 8 December 2010.
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements for Compliance of Radio Apparatus, Issue 4, November 2014.

4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment List

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
22	Agilent	8449B	Amplifiers	3008A00526	7/30/2013	7/30/2015
283	Rohde & Schwarz	FSP40	Spectrum Analyzers	1000033	9/18/2013	9/18/2015
523	Agilent	E7405	Spectrum Analyzers	MY45103293	1/8/2013	1/8/2015
523	Agilent	E7405	Spectrum Analyzers	MY45103293	12/26/2014	12/26/2016
2002	EMCO	3108	Antennas	2147	11/22/2013	11/22/2015
2004	EMCO	3146	Antennas	1385	11/22/2013	11/22/2015
2006	EMCO	3115	Antennas	2573	4/24/2013	4/24/2015
2008	COM-Power	AH-826	Antennas	81009	NCR	NCR
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	12/31/2013	12/31/2014
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	12/31/2014	12/31/2015
2022	EMCO	LISN3825/2R	LISN	1095	9/9/2013	9/9/2015
2037	ACS Boca	Chamber EMI Cable Set	Cable Set	2037	2/27/2014	2/27/2015
2044	QMI	N/A	Cables	2044	12/31/2013	12/31/2014
2044	QMI	N/A	Cables	2044	12/31/2014	12/31/2015
2045	ACS Boca	Conducted Cable Set	Cable Set	2045	1/1/2014	1/1/2015
2045	ACS Boca	Conducted Cable Set	Cable Set	2045	1/1/2015	1/1/2016
2070	Mini Circuits	VHF-8400+	Filter	2070	1/1/2014	1/1/2015
2070	Mini Circuits	VHF-8400+	Filter	2070	12/31/2014	12/31/2015
2072	Mini Circuits	VHF-3100+	Filter	30737	1/1/2014	1/1/2015
2072	Mini Circuits	VHF-3100+	Filter	30737	12/31/2014	12/31/2015
2082	Teledyne Storm Products	90-010-048	Cables	2082	5/8/2014	5/8/2015
2086	Merrimac	FAN-6-10K	Attenuators	23148-83-1	12/31/2013	12/31/2014
2086	Merrimac	FAN-6-10K	Attenuators	23148-83-1	12/31/2014	12/31/2015
2095	ETS Lindgren	TILE4! - Version 4.2.A	Software	85242	NCR	NCR
2111	Aeroflex Inmet	40AH2W-20	Attenuator	2111	7/25/2014	7/25/2015
3004	Teseq	CFL 9206A	Attenuators	34720	10/21/2013	10/21/2015

Notes:

- **NCR=No Calibration Required**
- **The calibration information for the assets utilized is provided to cover the entire test period.**

5 SUPPORT EQUIPMENT

Table 5-1: EUT and Support Equipment – Radiated Emissions

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	Motorola Solutions	H63UCH6TZ7AN	893TNZ1693
2	Laptop	DELL	Latitude D531	CN-0XM006-48643-789-2125
3	Microphone	Motorola	PMMN4074A	N/A
4	Headphone	Motorola	N/A	N/A
5	Mouse	DELL	M-UAR DEL7	LZ9440C43W5
6	Laptop AC Adapter	DELL	LA65NS2-01	CN-06TM1C-72438-358-218F-A01

Table 5-2: Cable Description – Radiated Emissions

Cable #	Cable Type	Length	Shield	Termination
A	USB	1.52 m	No	EUT to Laptop
B	GCAI	2.5 m	No	EUT to Microphone
C	Audio	0.7 m	No	Microphone to Headphone
D	USB	1.8 m	No	Laptop to Mouse
E	Power	1.83 m	No	Laptop to AC Adapter
F	Power	0.9 m	No	AC Adapter to Extension Cord
G	Serial Cable	1.84 m	No	Not Terminated
H	Extension Cord	1.82m	No	Power Cord to AC Mains

Table 5-3: EUT and Support Equipment – Power Line Conducted Emissions

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	Motorola Solutions	H63UCH6TZ7AN	893TNZ1693
2	5V AC Adapter	Motorola	25012023003	1092-NNTN8134B-02
3	Microphone	Motorola	PMMN4074A	N/A
4	Headphone	Motorola	N/A	N/A

Table 5-4: Cable Description – Power Line Conducted Emissions

Cable #	Cable Type	Length	Shield	Termination
A	Power Cord	1.8 m	No	AC Adapter to EUT
B	GCAI	2.5 m	No	EUT to Microphone
C	Audio	0.7 m	No	Microphone to Headphone
D	Extension Cord	1.82m	No	AC Adapter to AC Mains

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

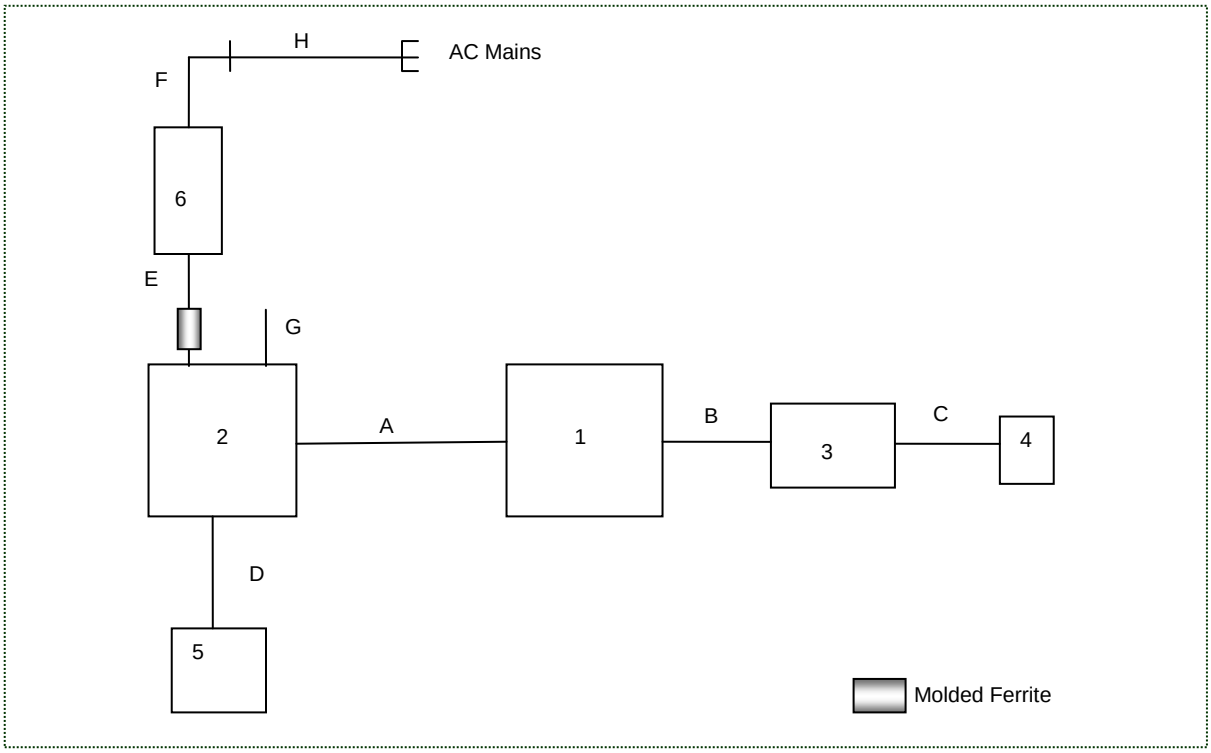


Figure 6-1: Radiated Emissions Setup

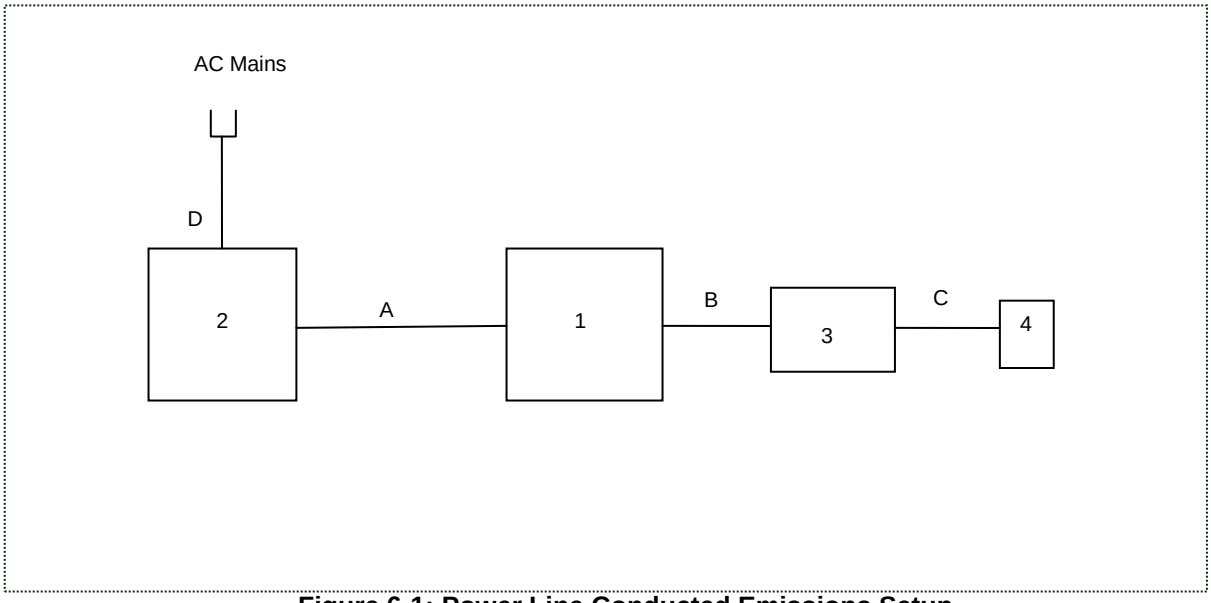


Figure 6-1: Power Line Conducted Emissions Setup

7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement – FCC: Section 15.203

The EUT uses an internal PIFA which connects to the main board via contact springs. The antenna connector is unique, thus meeting the requirements of FCC 15.203.

7.2 Power Line Conducted Emissions – FCC: Section 15.207 IC: RSS-Gen 8.8

7.2.1 Measurement Procedure

ANSI C63.4 sections 6 and 7 were the guiding documents for this evaluation. Conducted emissions were performed from 150 kHz to 30 MHz with the spectrum analyzer's resolution bandwidth set to 9 kHz and the video bandwidth set to 30 kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss
Margin = Applicable Limit - Corrected Reading

7.2.2 Measurement Results

Results of the test corresponding to the EUT configuration leading to the worse case emissions are shown below:

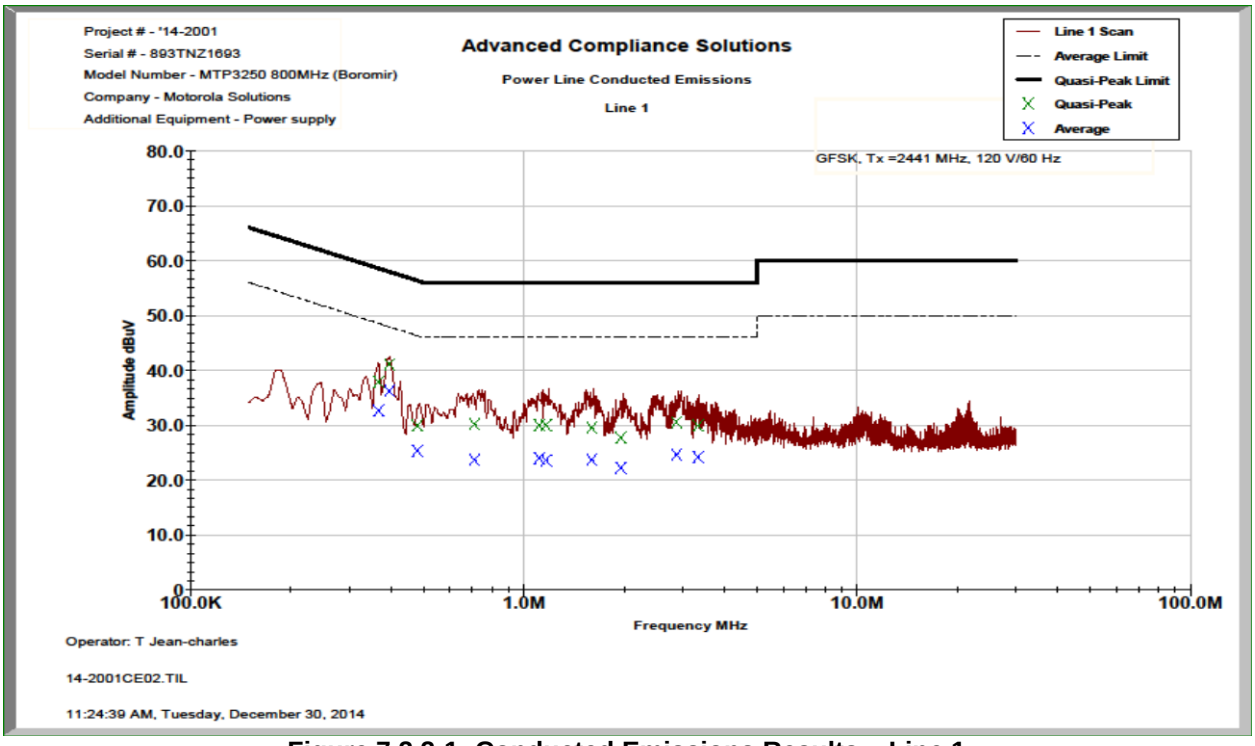


Figure 7.2.2-1: Conducted Emissions Results – Line 1

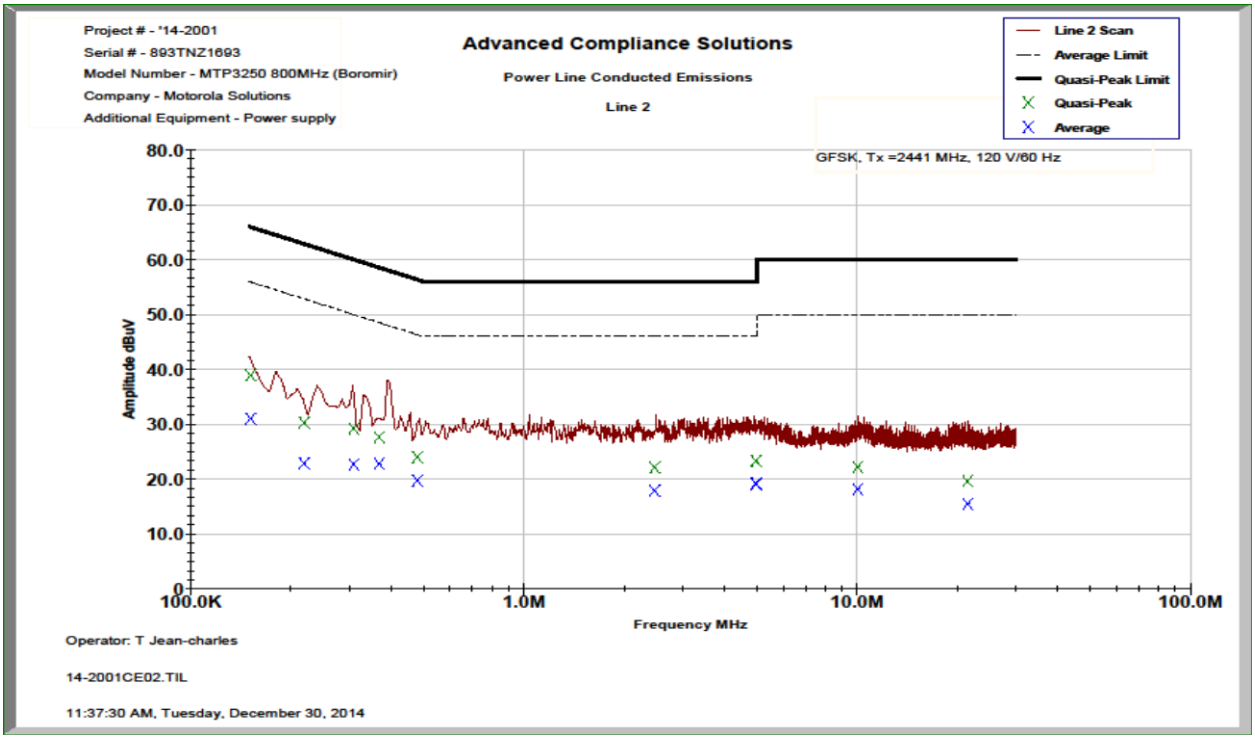


Figure 7.2.2-2: Conducted Emissions Results – Line 2

Table 7.2.2-1: Conducted EMI Results

☒ Line 1 ☒ Line 2 ☐ Line 3
☐ Line 4
☐ To Ground ☒ Floating
☐ Telecom Port _____
☒ dBµV ☐ dBµA

Plot Number: 14-2001CE02
Power Supply Description:
5VDC

Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
Line 1									
0.366713	27.845	22.579	10.08	37.92	32.65	58.58	48.58	20.7	15.9
0.395713	31.032	26.166	10.08	41.11	36.24	57.94	47.94	16.8	11.7
0.479999	19.865	15.34	10.08	29.94	25.42	56.34	46.34	26.4	20.9
0.712075	20.104	13.569	10.09	30.20	23.66	56.00	46.00	25.8	22.3
1.11505	19.887	13.911	10.11	30.00	24.02	56.00	46.00	26.0	22.0
1.16729	19.914	13.489	10.11	30.02	23.60	56.00	46.00	26.0	22.4
1.60011	19.413	13.562	10.11	29.52	23.67	56.00	46.00	26.5	22.3
1.95831	17.533	12.073	10.11	27.64	22.18	56.00	46.00	28.4	23.8
2.8762	20.365	14.427	10.18	30.55	24.61	56.00	46.00	25.5	21.4
3.33887	19.661	13.928	10.23	29.89	24.16	56.00	46.00	26.1	21.8
Line 2									
0.151633	28.849	20.962	10.08	38.93	31.04	65.91	55.91	27.0	24.9
0.219549	20.236	12.81	10.08	30.32	22.89	62.84	52.84	32.5	29.9
0.309099	19.148	12.617	10.06	29.21	22.68	59.99	49.99	30.8	27.3
0.368799	17.622	12.783	10.05	27.67	22.83	58.53	48.53	30.9	25.7
0.479999	13.994	9.698	10.05	24.05	19.75	56.34	46.34	32.3	26.6
2.47322	11.95	7.693	10.14	22.09	17.83	56.00	46.00	33.9	28.2
4.98	12.947	8.938	10.24	23.19	19.18	56.00	46.00	32.8	26.8
4.9801	13.032	8.788	10.24	23.27	19.03	56.00	46.00	32.7	27.0
10.0551	11.695	7.606	10.54	22.24	18.15	60.00	50.00	37.8	31.8
21.4877	8.655	4.476	10.90	19.55	15.38	60.00	50.00	40.4	34.6

7.3 Peak Output Power - FCC Section 15.247(b)(1) IC: RSS-210 A8.4(2)

7.3.1 Measurement Procedure (Conducted Method)

The RF output port of the EUT was directly connected to the input of the spectrum analyzer through suitable attenuation.

7.3.2 Measurement Results

Results are shown below:

Table 7.3.2-1: RF Output Power (GFSK)

Frequency (MHz)	Power (dBm)
2402	3.95
2441	3.89
2480	3.68

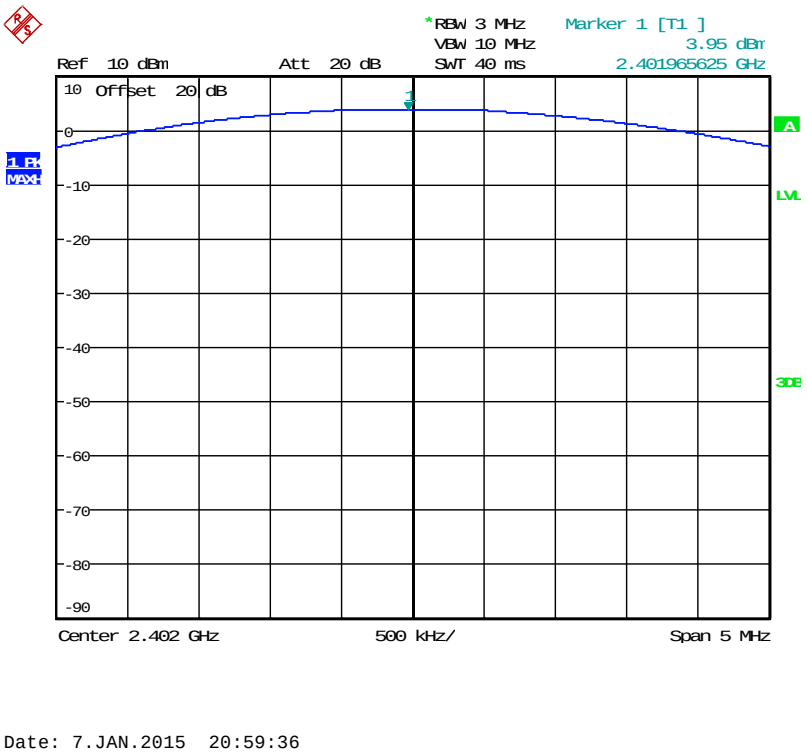
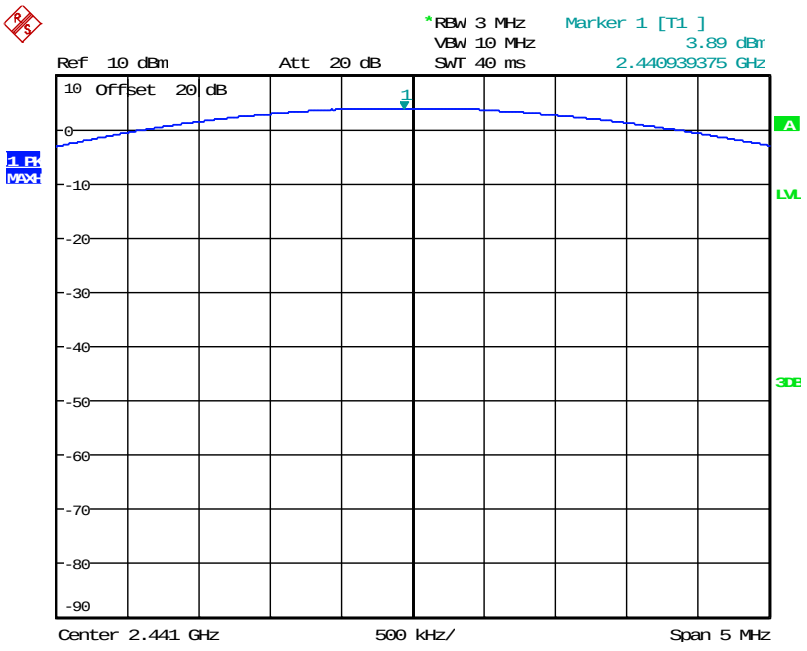
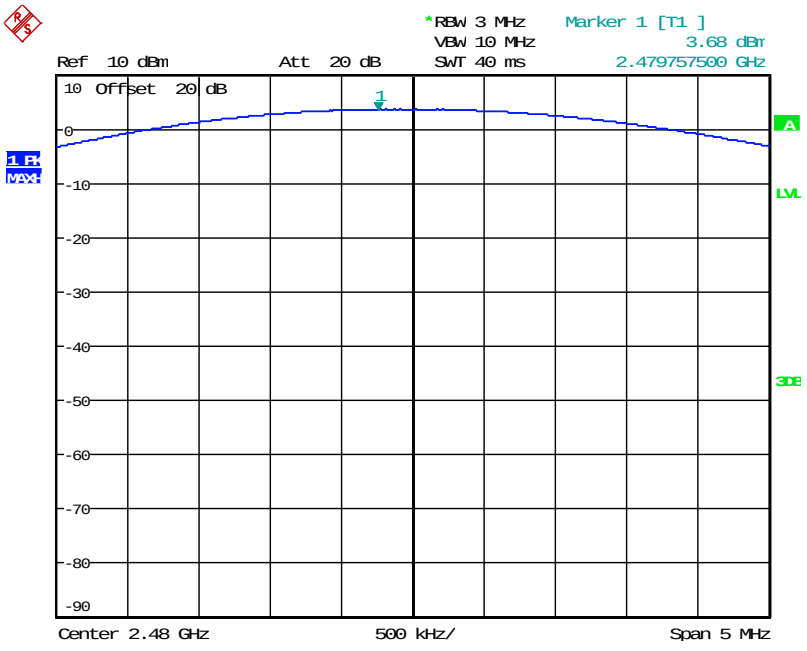


Figure 7.3.2-1: RF Output Power (GFSK) - Low Channel



Date: 7.JAN.2015 20:56:48

Figure 7.3.2-2: RF Output Power (GFSK) - Middle Channel



Date: 7.JAN.2015 20:54:50

Figure 7.3.2-3: RF Output Power (GFSK) - High Channel

Table 7.3.2-2: RF Output Power (π/4 DQPSK)

Frequency (MHz)	Power (dBm)
2402	5.99
2441	5.87
2480	5.66

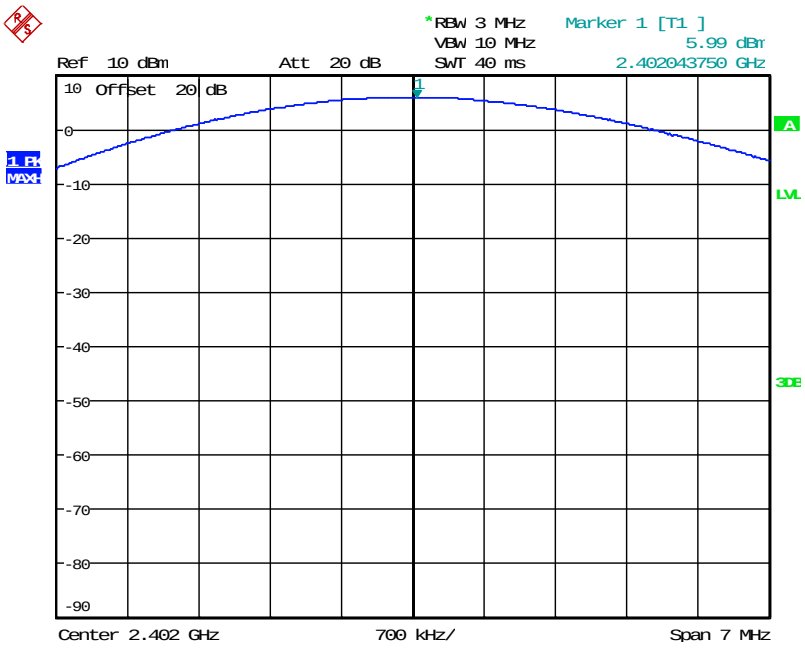
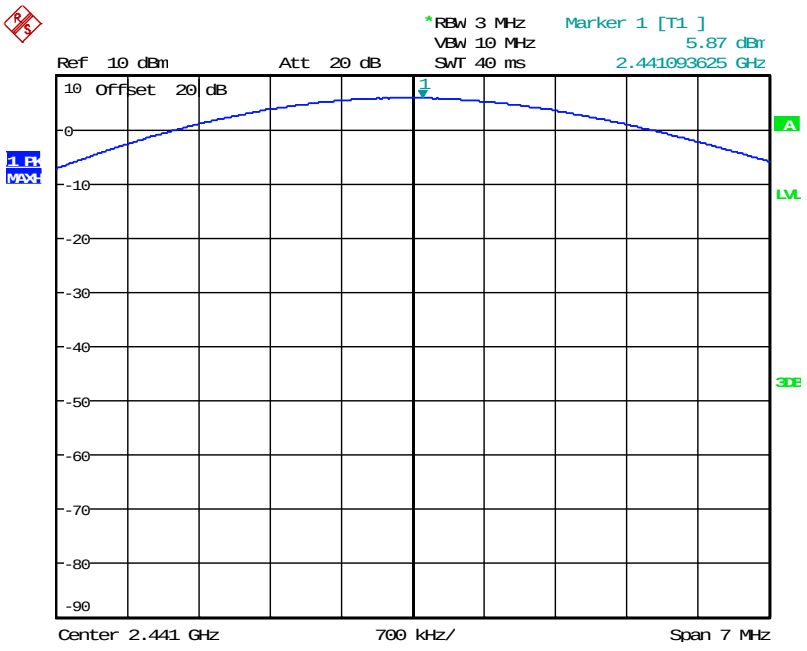
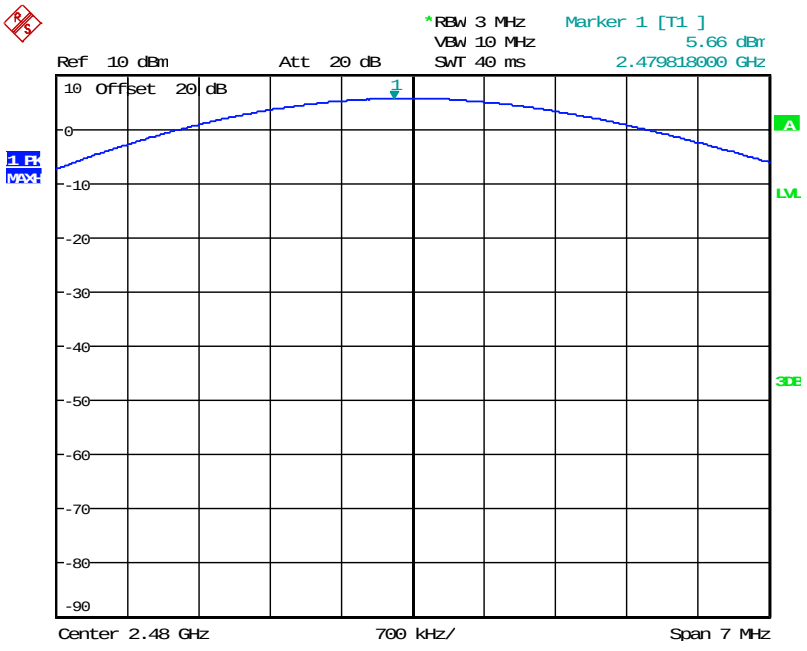


Figure 7.3.2-4: RF Output Power (π/4 DQPSK) - Low Channel



Date: 7.JAN.2015 23:06:08

Figure 7.3.2-5: RF Output Power (π/4 DQPSK) - Middle Channel



Date: 7.JAN.2015 23:03:49

Figure 7.3.2-6: RF Output Power (π/4 DQPSK) - High Channel

Table 7.3.2-3 RF Output Power (8DPSK)

Frequency (MHz)	Power (dBm)
2402	6.64
2441	6.64
2480	6.51

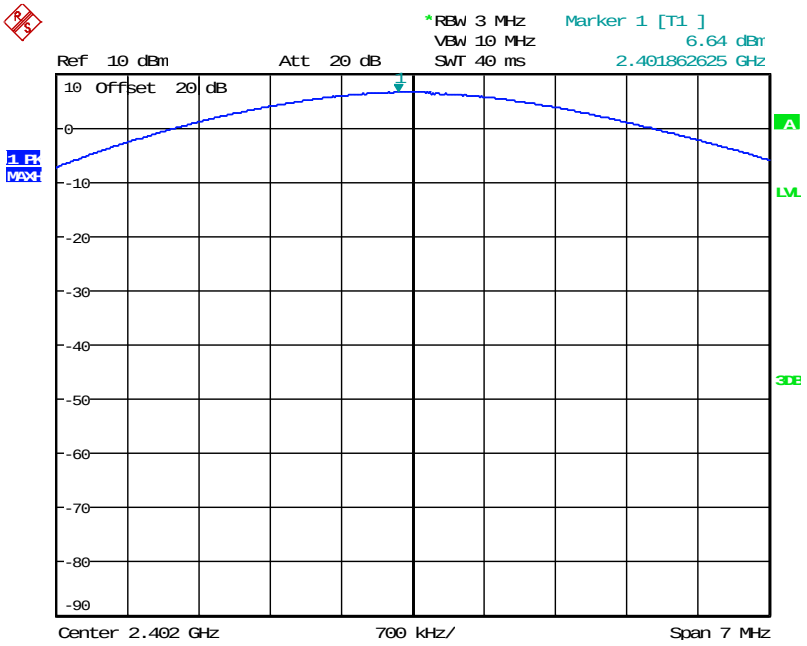
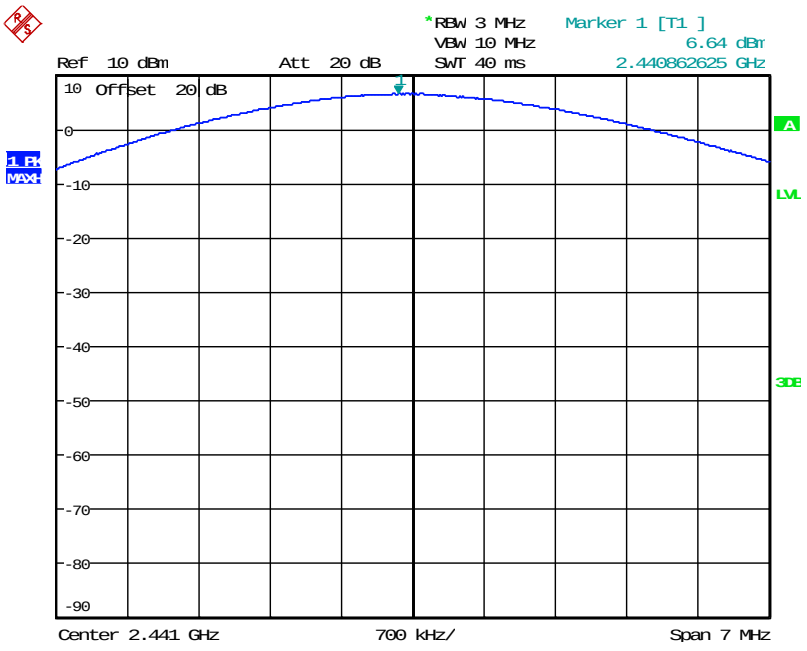
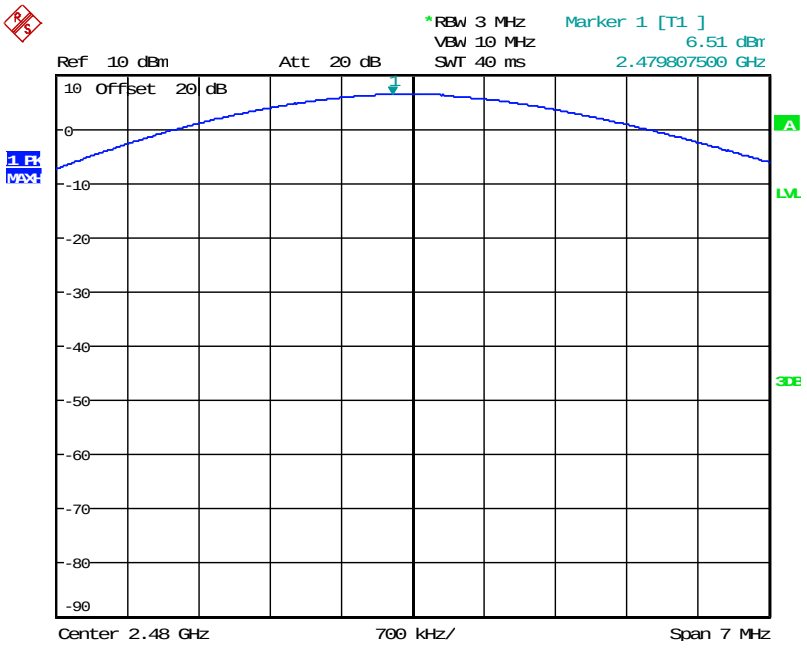


Figure 7.3.2-7: RF Output Power (8DPSK) - Low Channel



Date: 8.JAN.2015 00:19:29

Figure 7.3.2-8: RF Output Power (8DPSK) - Middle Channel



Date: 8.JAN.2015 00:21:05

Figure 7.3.2-9: RF Output Power (8DPSK) - High Channel

7.4 Channel Usage Requirements

7.4.1 Carrier Frequency Separation – FCC: Section 15.247(a)(1) IC: RSS-210 A8.1(b)

7.4.1.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The span of the spectrum analyzer was set wide enough to capture two adjacent peaks and the RBW and VBW were set to ≥ 1% of the span.

7.4.1.2 Measurement Results

Results are shown below:

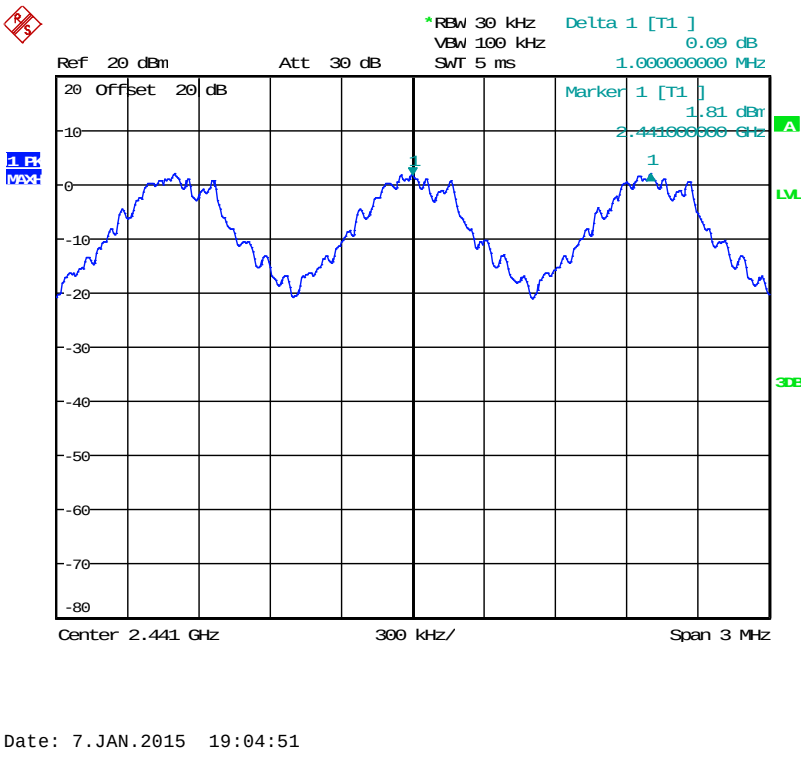


Figure 7.4.1.2-1: Carrier Frequency Separation

7.4.2 Number of Hopping Channels – FCC: Section 15.247(a)(1)(iii) IC: RSS-210 A8.1(d)

7.4.2.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The span of the spectrum analyzer was set wide enough to capture the number of hopping channels. The peak detector max hold function was enabled for the measurements.

7.4.2.2 Measurement Results

Results are shown below:

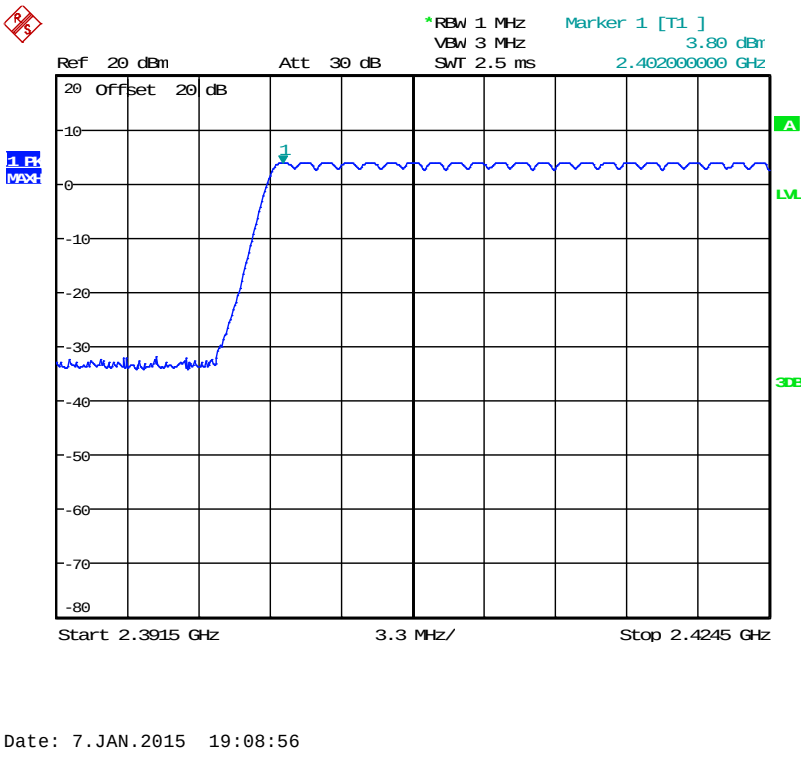


Figure 7.4.2.2-1: Number of Hopping Channels (1 – 23)

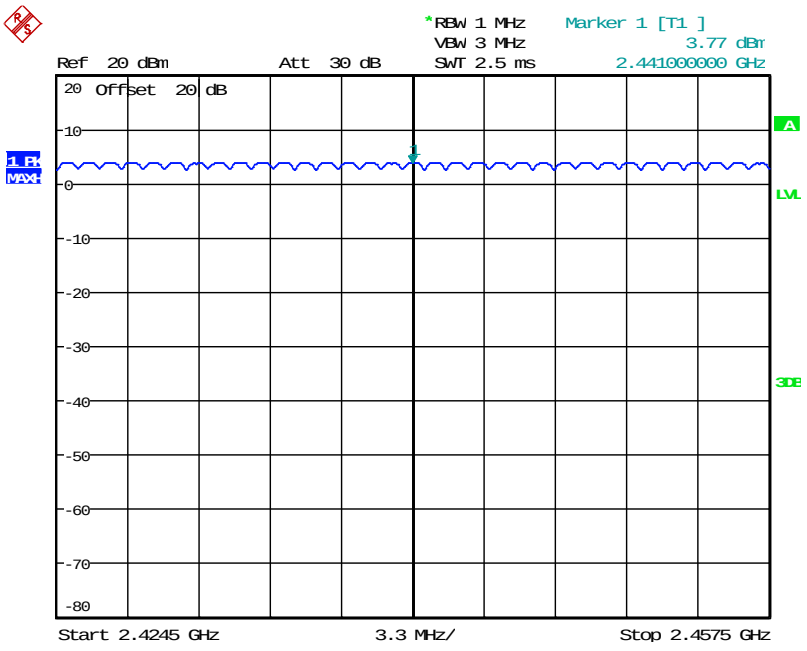


Figure 7.4.2.2-2: Number of Hopping Channels (24 – 56)

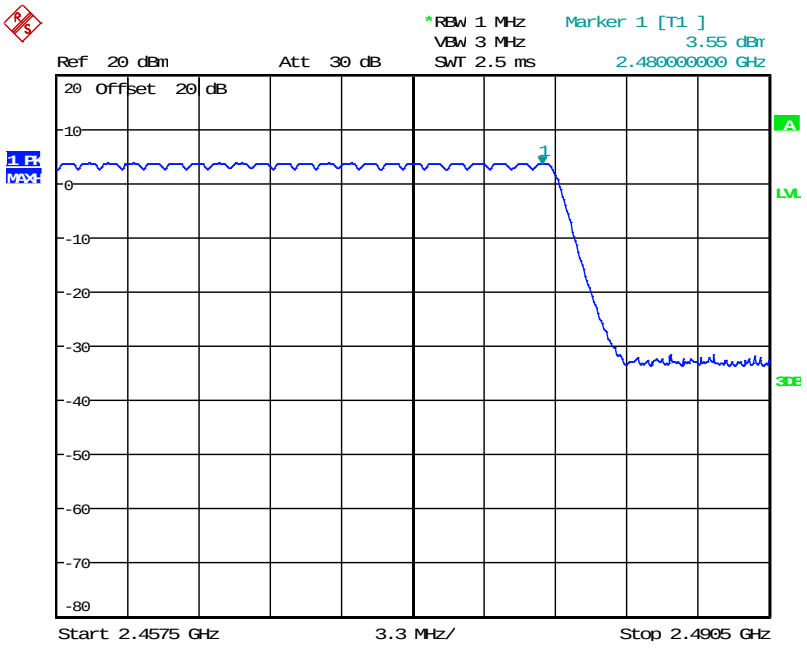


Figure 7.4.2.2-3: Number of Hopping Channels (57 – 79)

7.4.3 Channel Dwell Time – FCC: Section 15.247(a)(1)(iii) IC: RSS-210 A8.1(d)

7.4.3.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The span of the spectrum analyzer was set 0 Hz centered on a hopping channel. The RBW was set to 1 MHz and the sweep time adjusted to capture the entire dwell time per channel with peak detector max hold function.

7.4.3.2 Measurement Results

Results are shown below:

Table 7.4.3.2-1 Dwell Time on a 31.6 Second Cycle

Packet Format	Number of Hops Per Sec. (NHPS)	Number of Hops per Channel Per Sec. (NHPCPS)	Number of hops on a 31.6 s Cycle (NHPC)	Measured Dwell Times (ms)	Dwell Times on a 31.6 s Cycle	Limit (ms)	Status
DH1	800	10.13	320	0.406	129.92	400	PASS
DH3	400	5.06	160	1.686	269.76	400	PASS
DH5	266.67	3.38	106.67	2.916	311.05	400	PASS

*

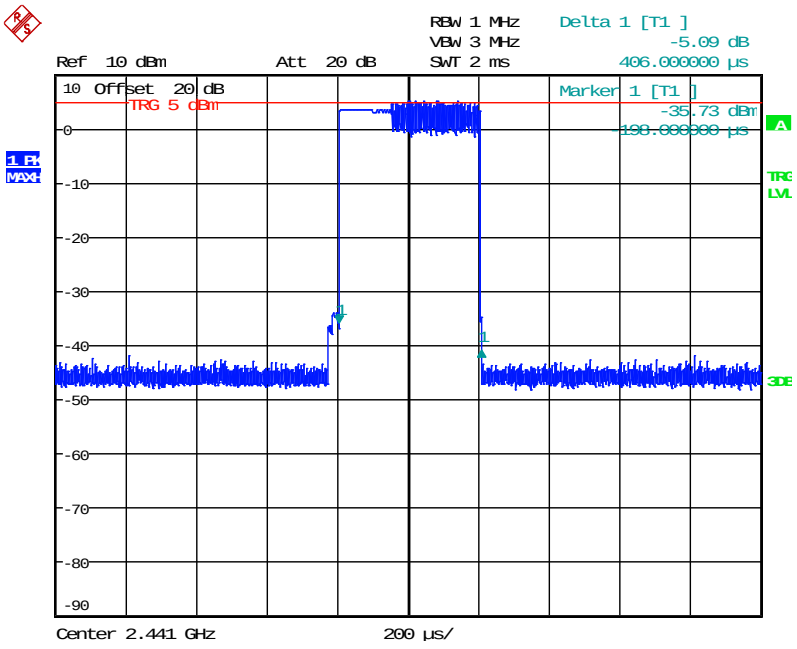
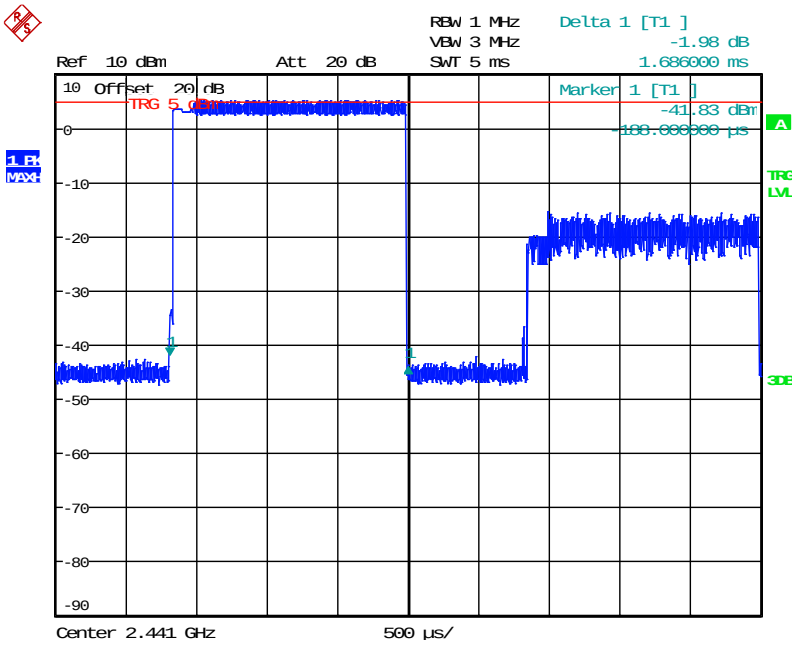
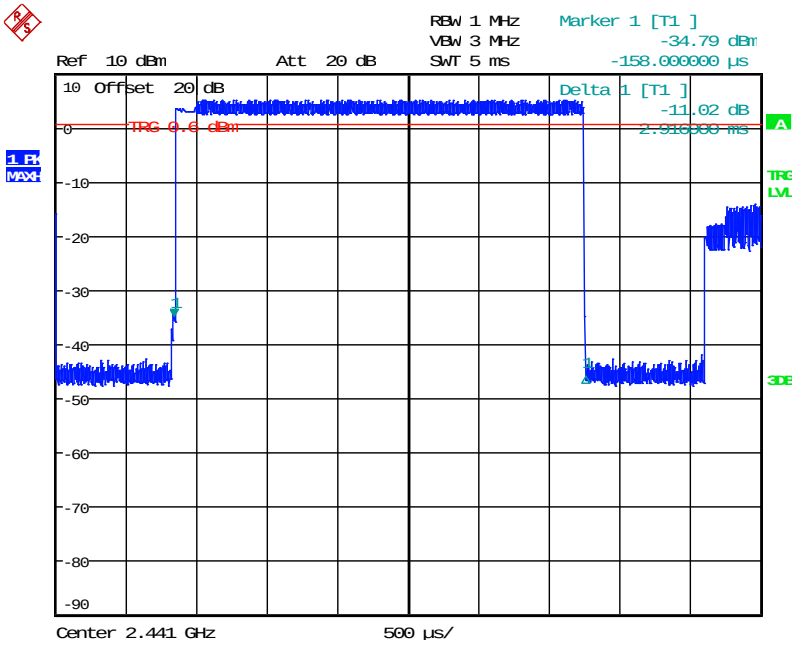


Figure 7.4.3.2-1: Channel Dwell Time – DH1



Date: 7.JAN.2015 20:11:50

Figure 7.4.3.2-2: Channel Dwell Time – DH3



Date: 7.JAN.2015 20:15:23

Figure 7.4.3.2-3: Channel Dwell Time – DH5

7.4.4 20dB / 99% Bandwidth - FCC: Section 15.247(a)(1)(i) IC: RSS-210 A8.1(a)

7.4.4.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The spectrum analyzer span was set to 2 to 3 times the estimated bandwidth of the emission. The RBW was to ≥ 1% of the estimated emission bandwidth. The trace was set to max hold with a peak detector active. The Delta function of the analyzer was utilized to determine the 20 dB bandwidth of the emission.

The 99% occupied bandwidth was measured with the spectrum analyzer span set to fully display the emission, including the emissions skirts. The RBW was to 1% of the span. . The occupied 99% bandwidth was measured by using a delta marker at the lower and upper frequencies leading to 0.5% of the total power.

7.4.4.2 Measurement Results

Results are shown below:

Table 7.4.4.2-1: 20dB / 99% Bandwidth

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
2402	951.8750	866.2500
2442	960.0000	875.2500
2480	955.0000	874.5000

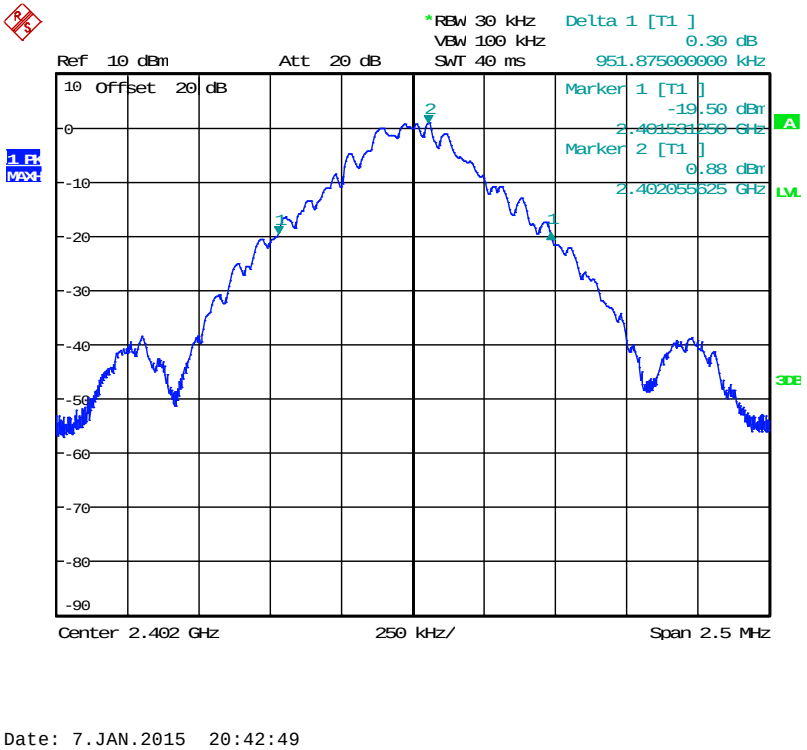
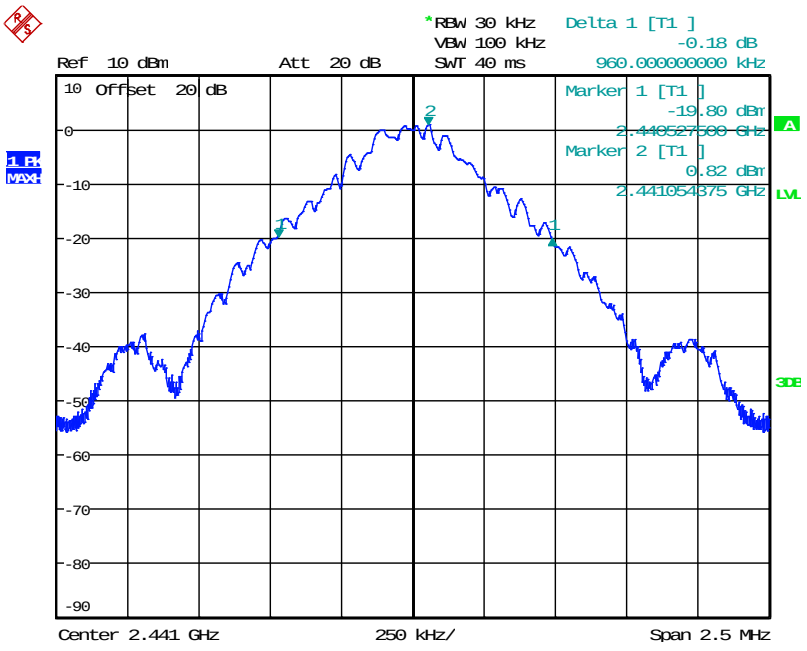
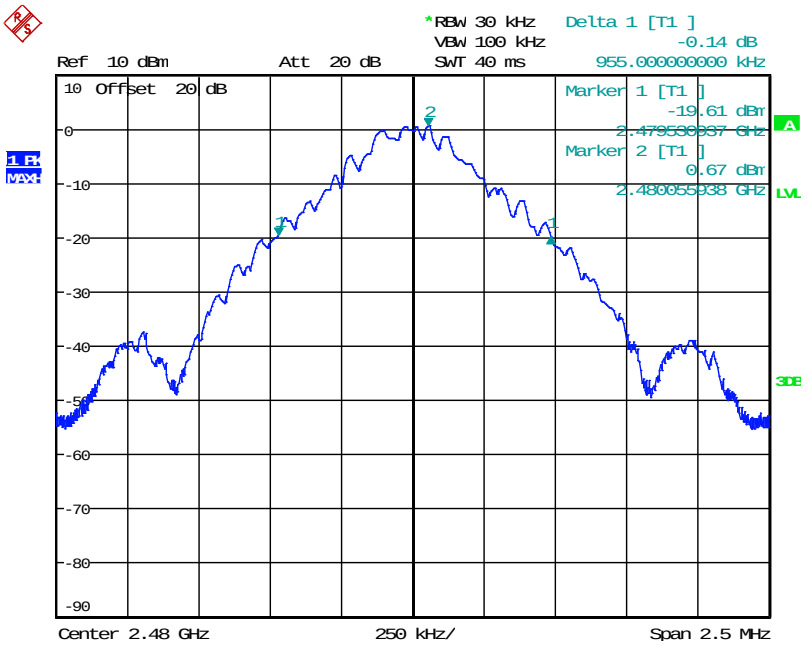


Figure 7.4.4.2-1: 20dB BW Low Channel (GFSK)



Date: 7.JAN.2015 20:33:29

Figure 7.4.4.2-2: 20dB BW Middle Channel (GFSK)



Date: 7.JAN.2015 20:49:18

Figure 7.4.4.2-3: 20dB BW High Channel (GFSK)

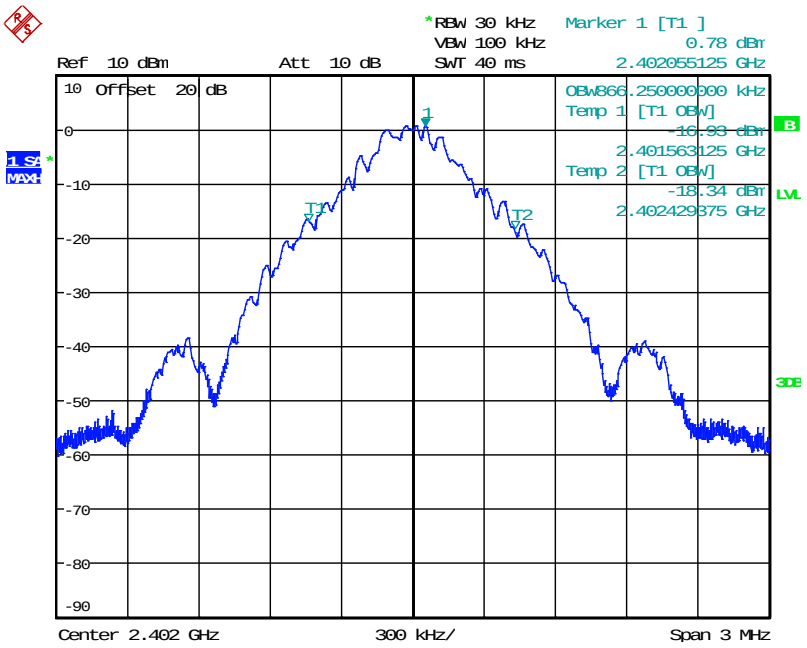


Figure 7.4.4.2-4: 99% OBW Low Channel (GFSK)

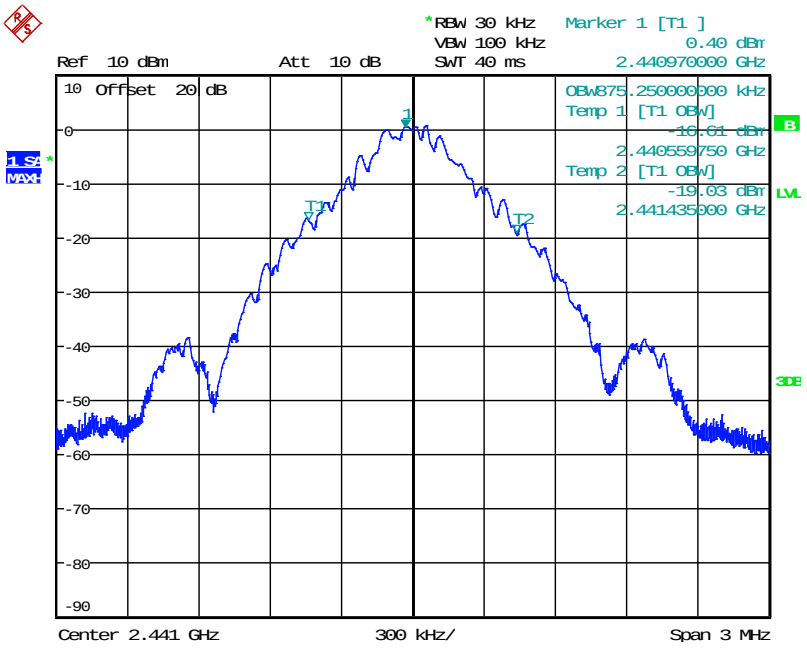


Figure 7.4.4.2-5: 99% OBW Middle Channel (GFSK)

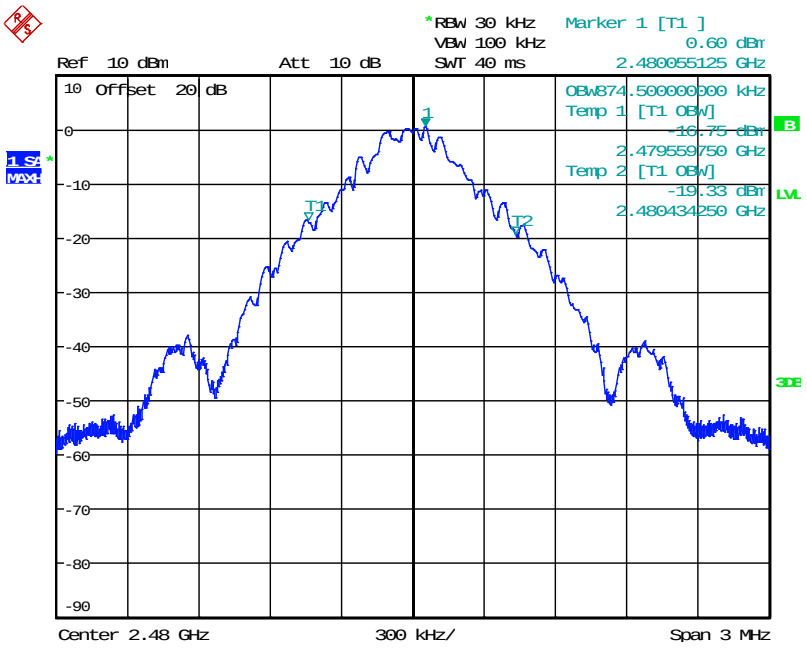


Figure 7.4.4.2-6: 99% OBW High Channel (GFSK)

Table 7.4.4.2-2: 20dB / 99% Bandwidth (π/4 DQPSK)

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
2402	1380.3750	1221.8750
2441	1380.0000	1224.3750
2480	1380.0000	1225.6250

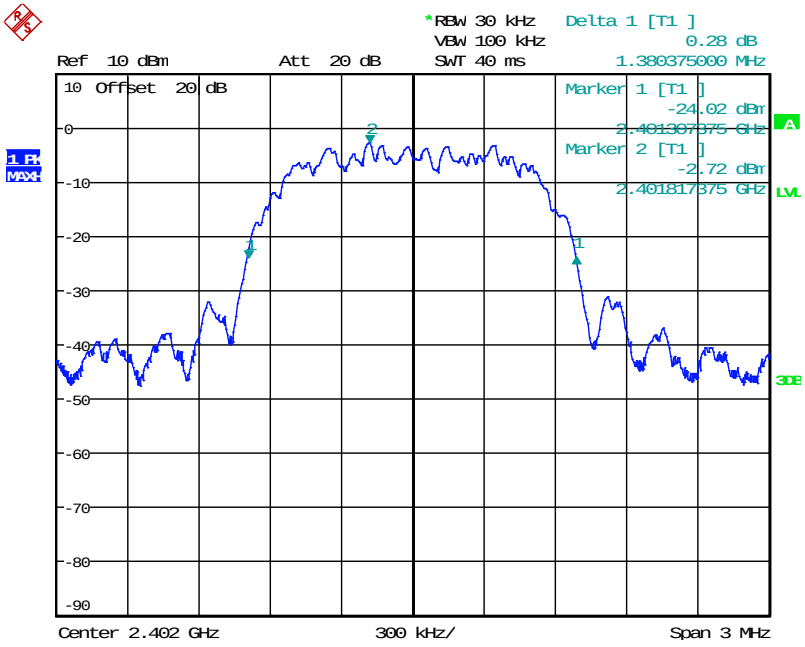


Figure 7.4.4.2-7: 20dB BW Low Channel (π/4 DQPSK)

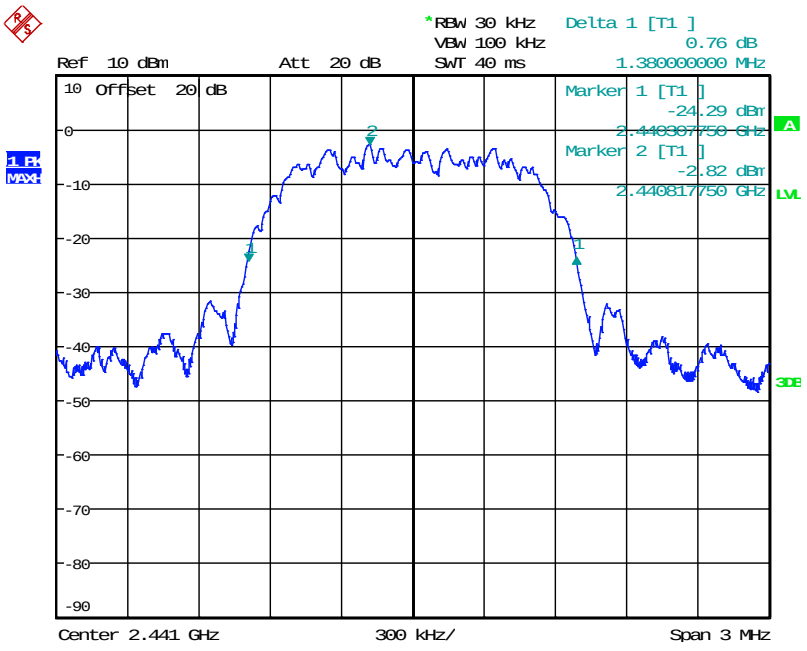


Figure 7.4.4.2-8: 20dB BW Middle Channel (π/4 DQPSK)

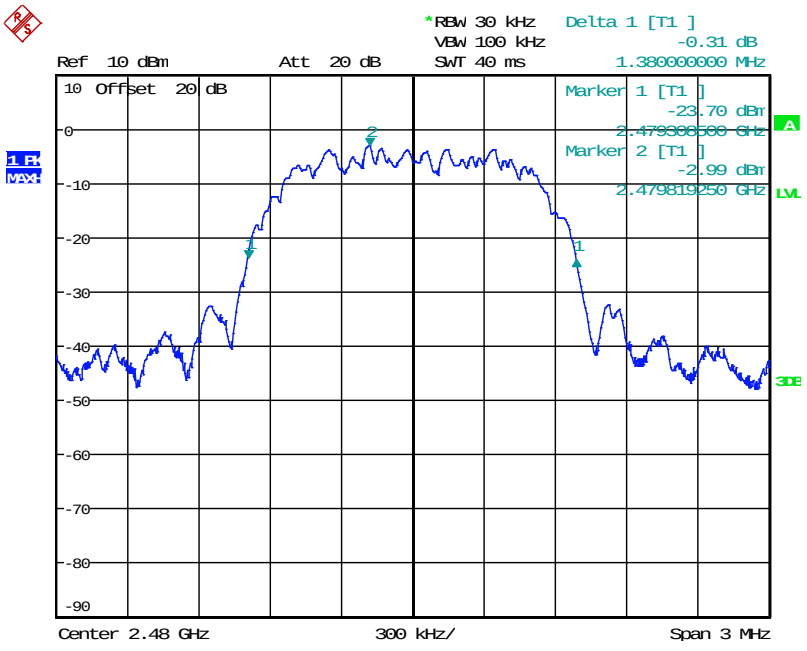


Figure 7.4.4.2-9: 20dB BW High Channel (π/4 DQPSK)

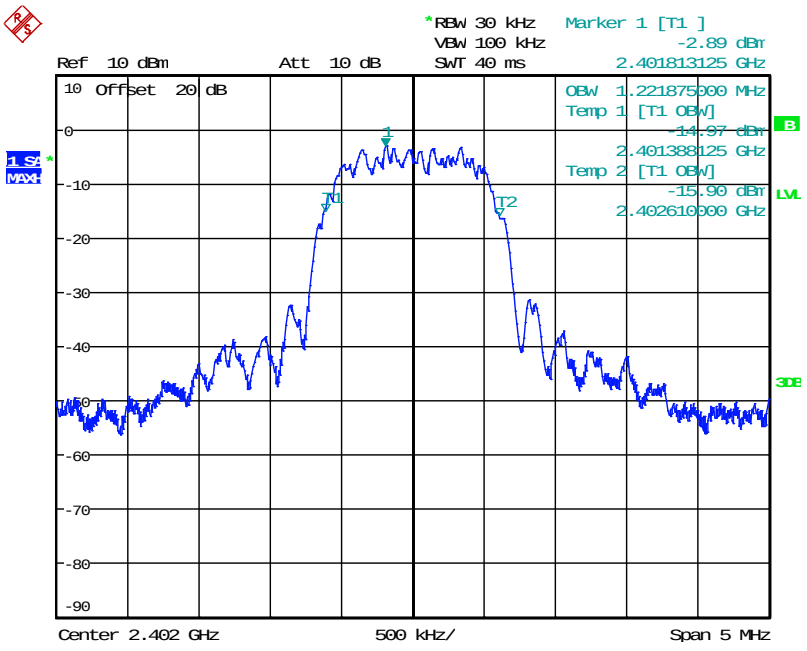


Figure 7.4.4.2-10: 99% OBW Low Channel (π/4 DQPSK)

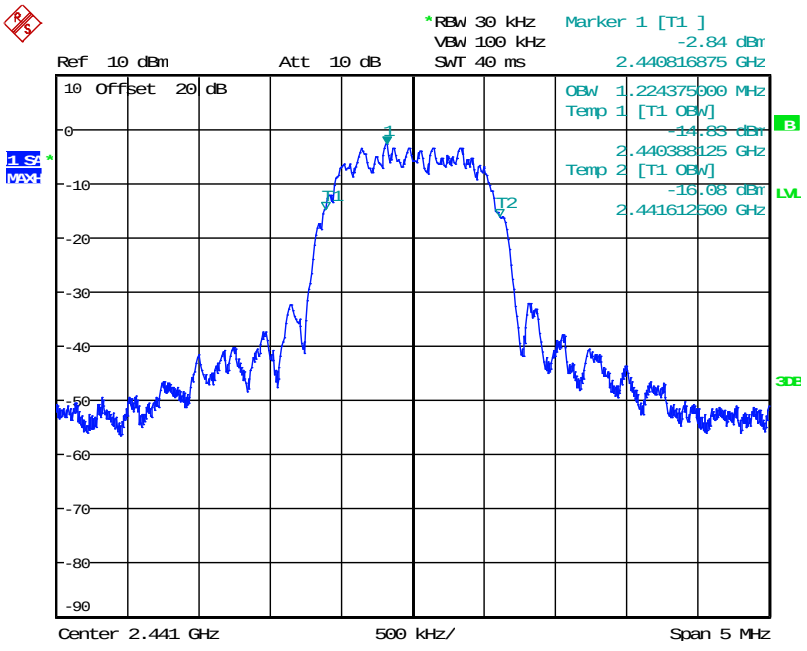


Figure 7.4.4.2-11: 99% OBW Middle Channel (π/4 DQPSK)

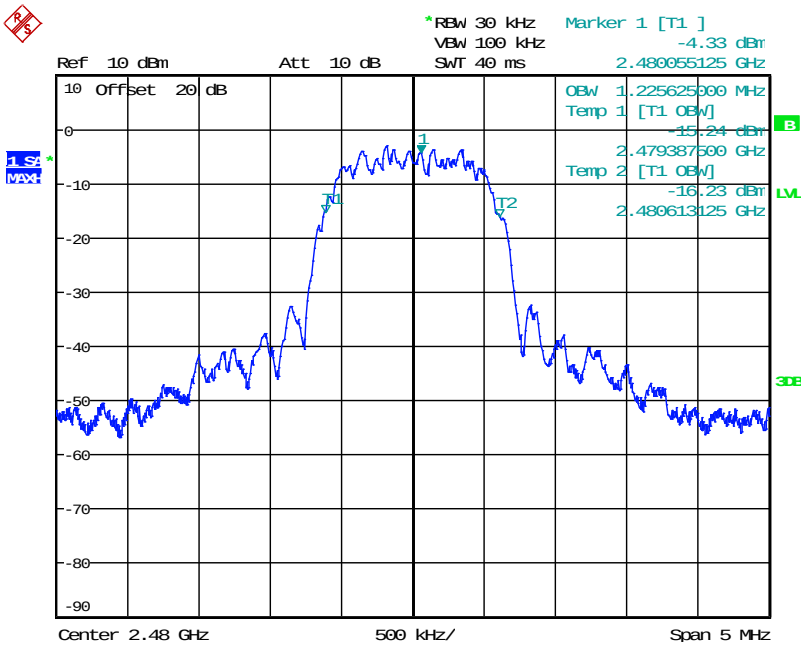


Figure 7.4.4.2-12: 99% OBW High Channel (π/4 DQPSK)

Table 7.4.4.2-3: 20dB / 99% Bandwidth (8DPSK)

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
2402	1362.0000	1224.3750
2441	1359.3750	1223.1250
2480	1358.2500	1222.5000

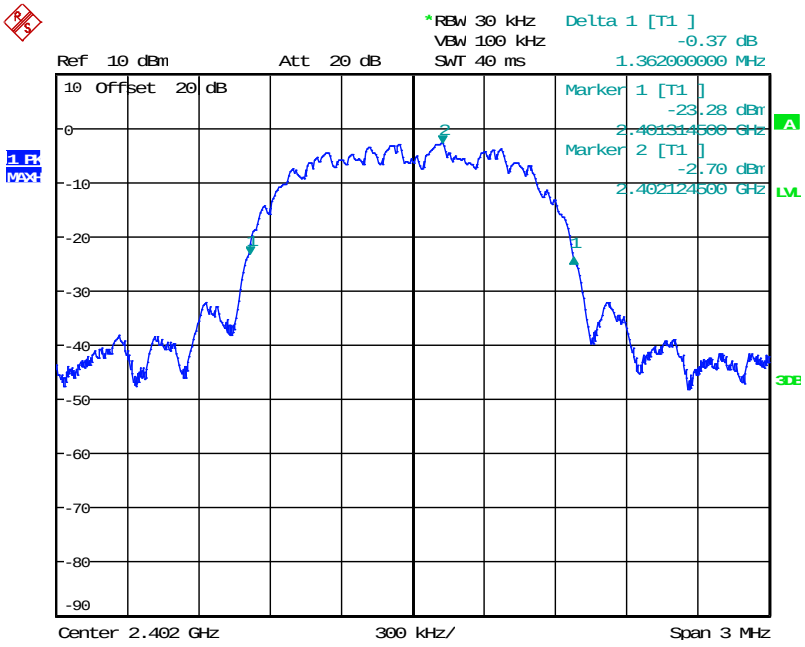


Figure 7.4.4.2-13: 20dB BW Low Channel (8DPSK)

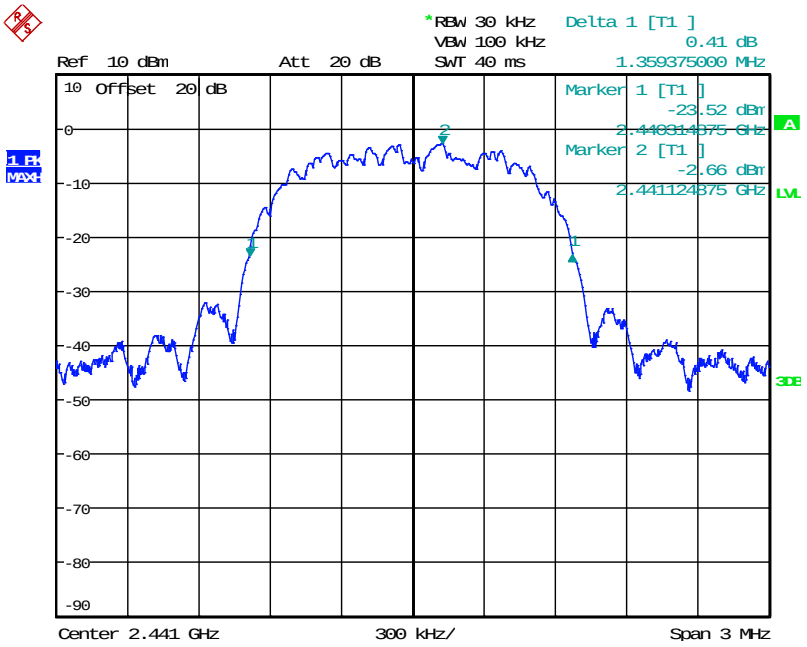


Figure 7.4.4.2-14: 20dB BW Middle Channel (8DPSK)

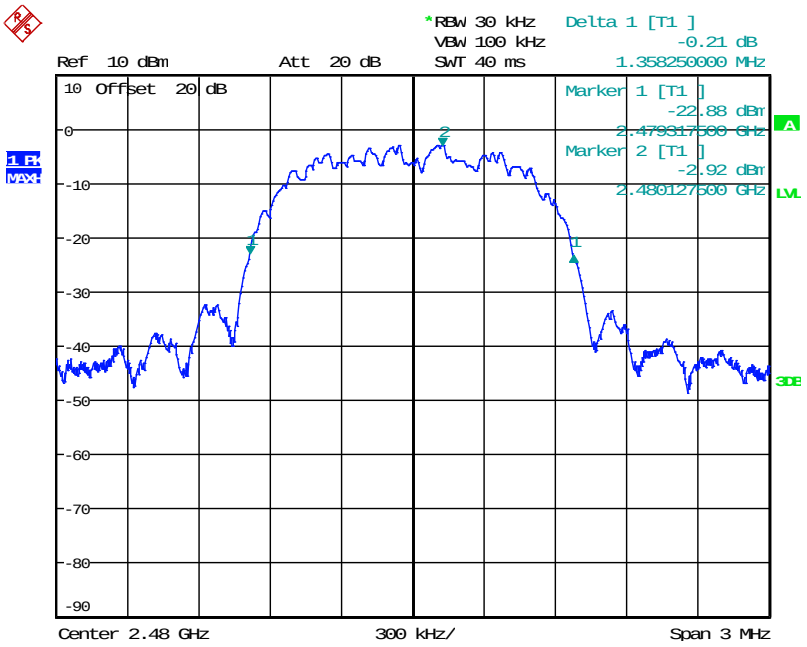


Figure 7.4.4.2-15: 20dB BW High Channel (8DPSK)

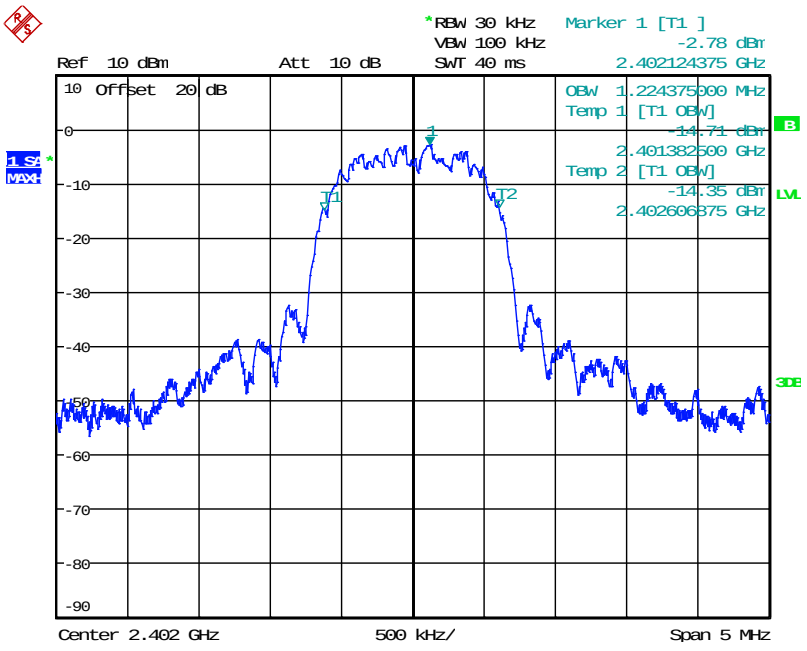


Figure 7.4.4.2-16: 99% OBW Low Channel (8DPSK)

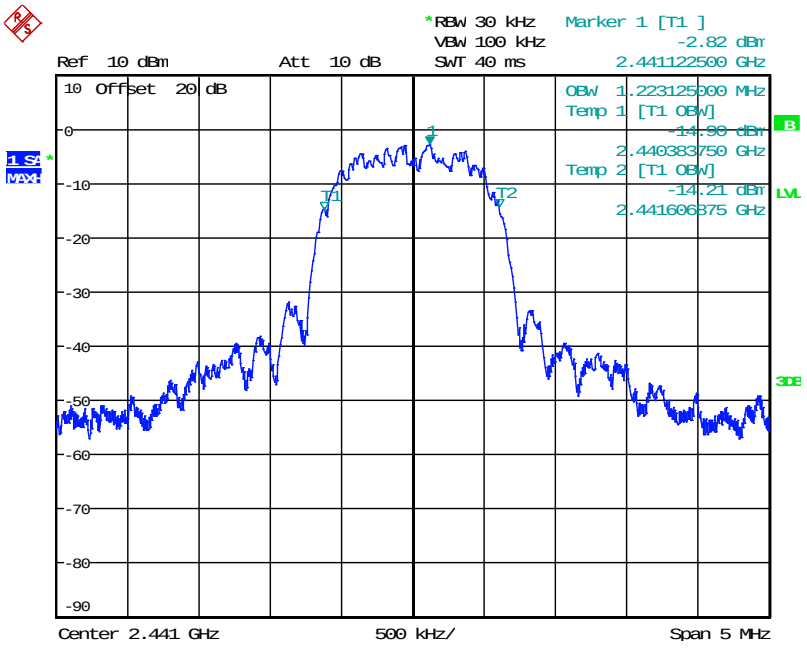


Figure 7.4.4.2-17: 99% OBW Middle Channel (8DPSK)

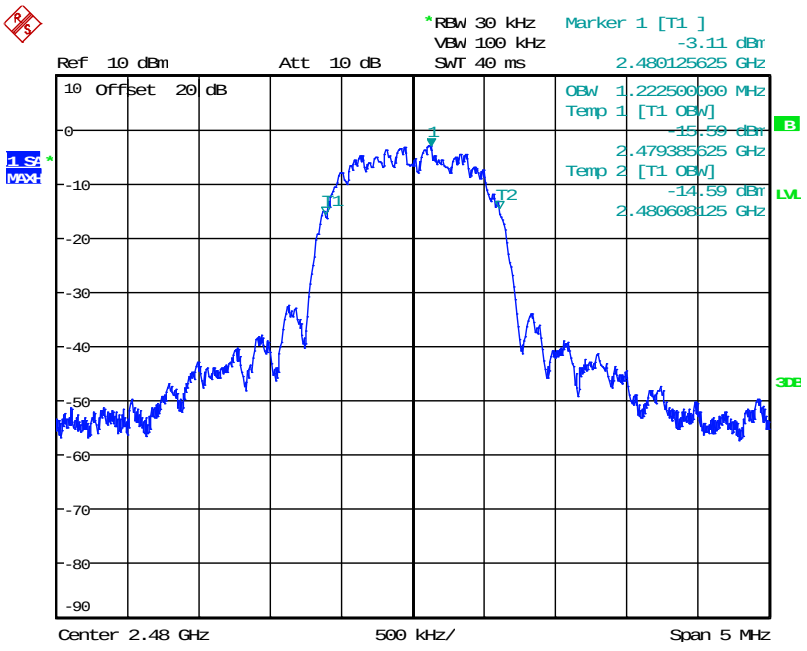


Figure 7.4.4.2-18: 99% OBW High Channel (8DPSK)

7.5 Band-Edge Compliance and Spurious Emissions-FCC 15.247(d) IC: RSS-210 A8.5

7.5.1 Band-Edge Compliance of RF Conducted Emissions

7.5.1.1 Measurement Procedure

The RF output port of the EUT was connected to the input of the spectrum analyzer through suitable attenuation. The EUT was investigated at the lowest and highest channel available to determine band-edge compliance. For each measurement the spectrum analyzer's RBW was set to 100 kHz, which is ≥ 1% of the span, and the VBW was set to >= 300 kHz.

7.5.1.2 Measurement Results

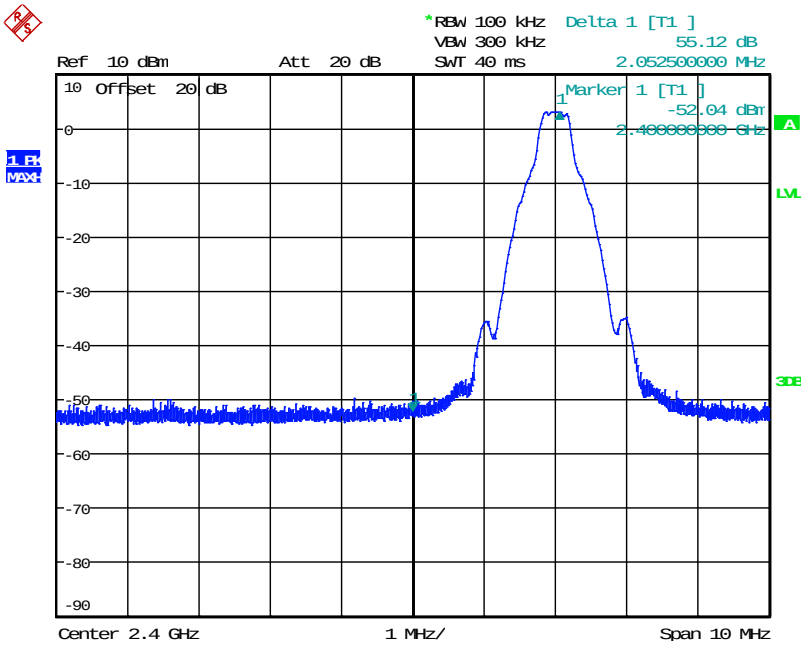


Figure 7.5.1.2-1: Lower Band-edge (GFSK)

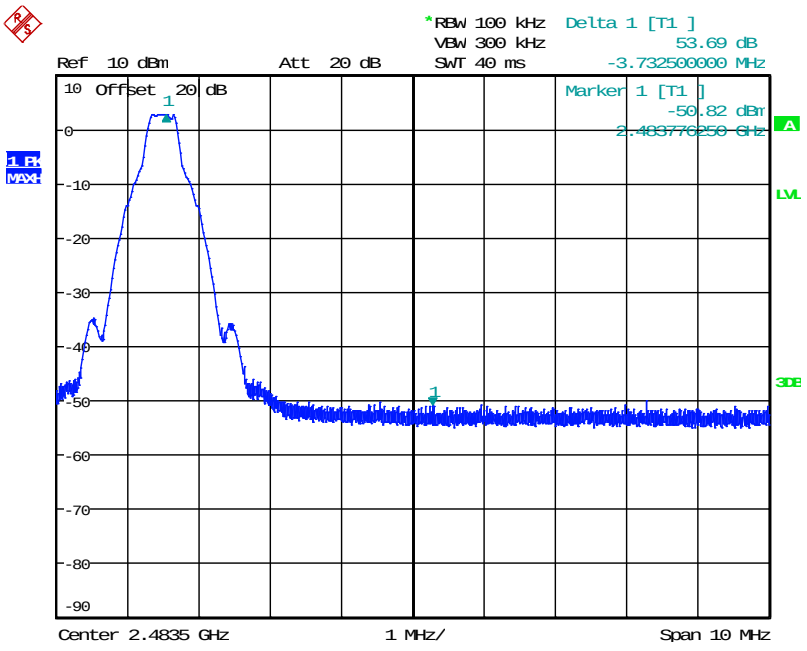


Figure 7.5.1.2-2: Upper Band-edge (GFSK)

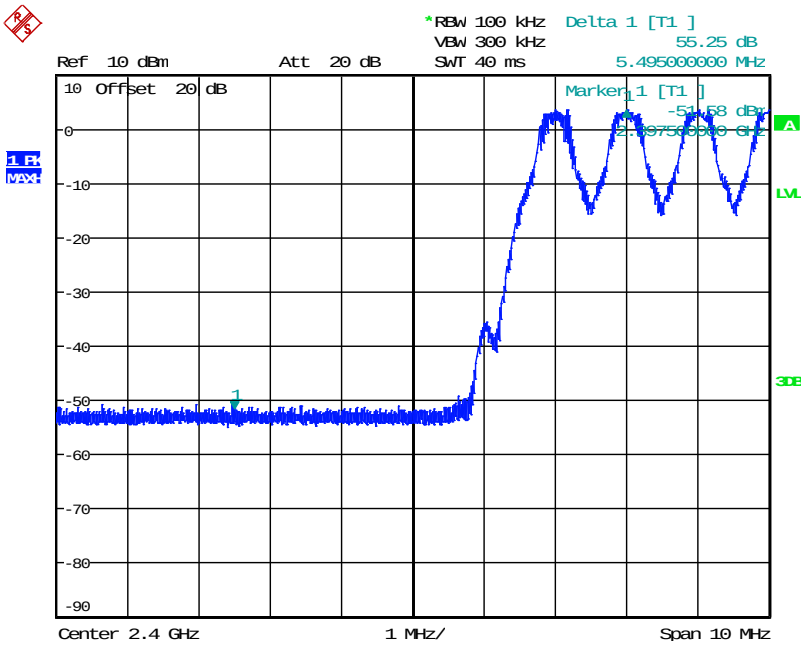


Figure 7.5.1.2-3: Lower Band-edge – Hopping Mode (GFSK)

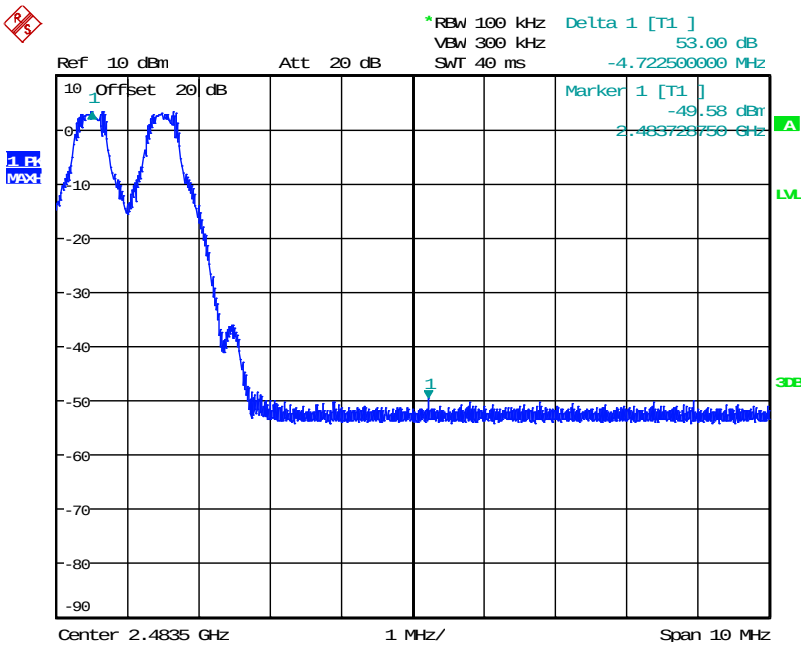
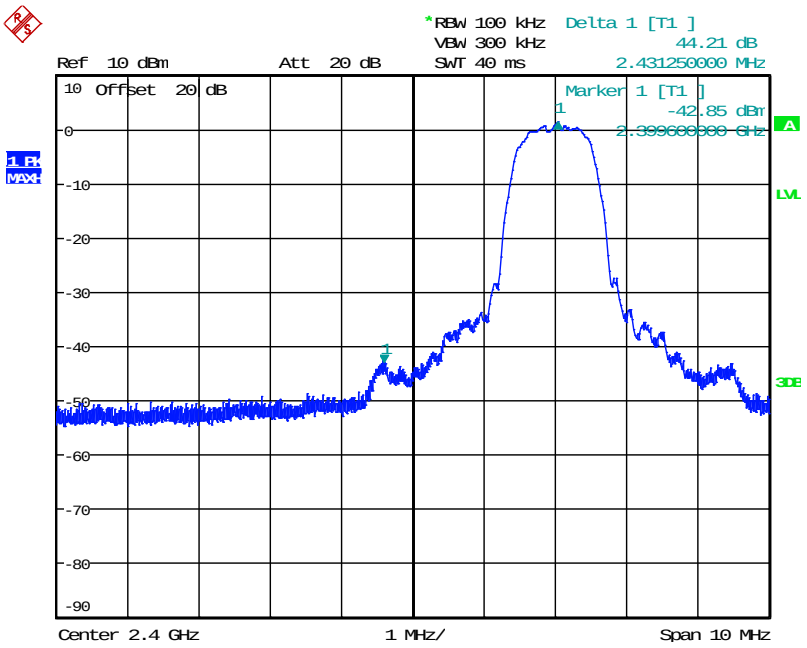
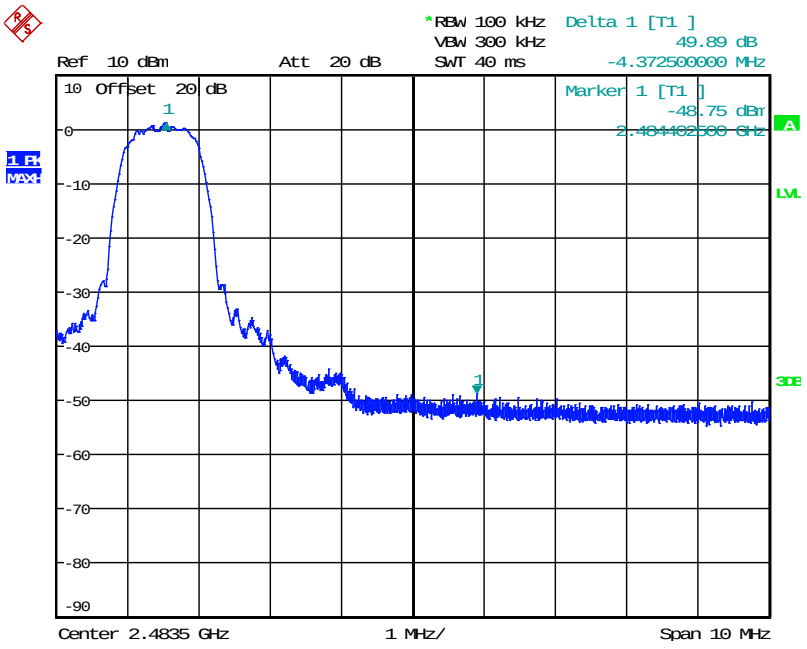


Figure 7.5.1.2-4: Upper Band-edge – Hopping Mode (GFSK)



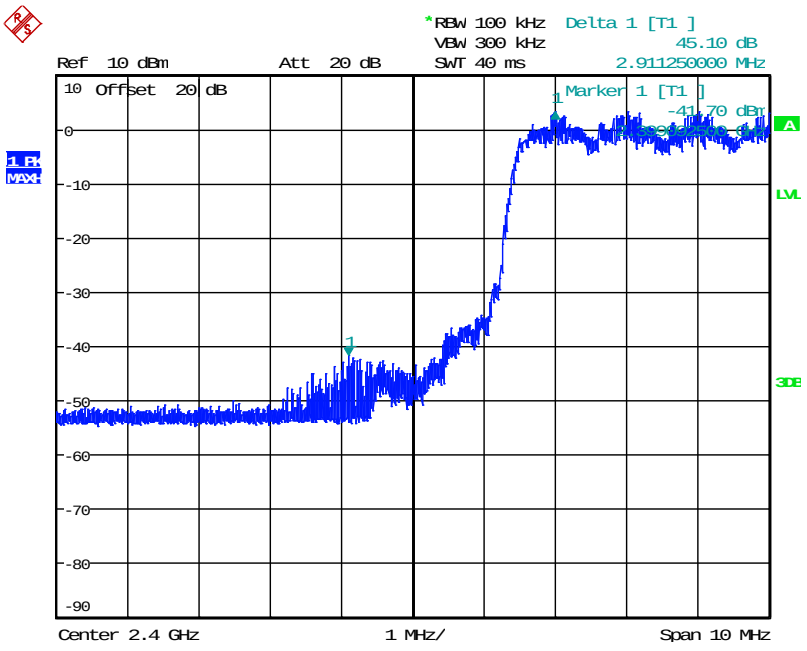
Date: 7.JAN.2015 22:40:07

Figure 7.5.1.2-5: Lower Band-edge (π/4 DQPSK)



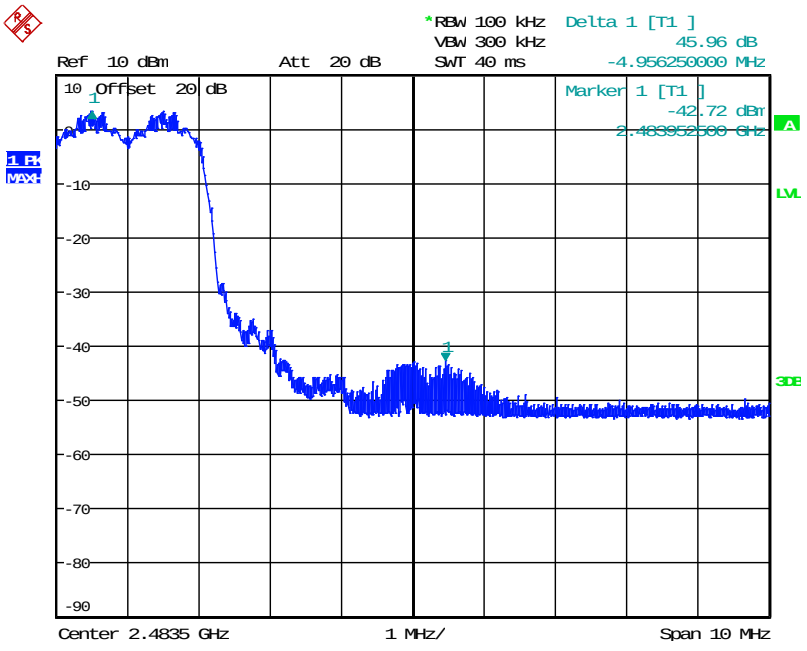
Date: 7.JAN.2015 22:50:52

Figure 7.5.1.2-6: Upper Band-edge (π/4 DQPSK)



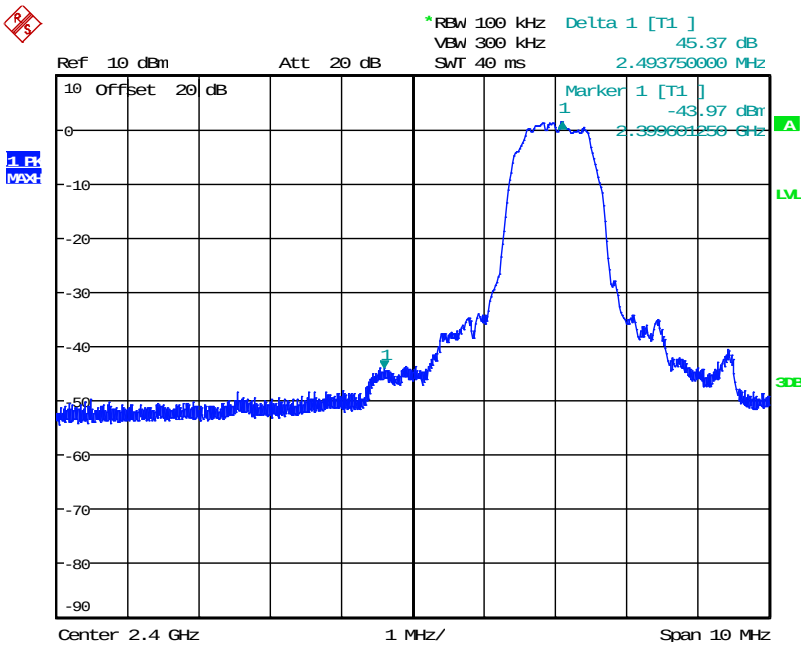
Date: 7.JAN.2015 22:36:46

Figure 7.5.1.2-7: Lower Band-edge – Hopping Mode (π/4 DQPSK)



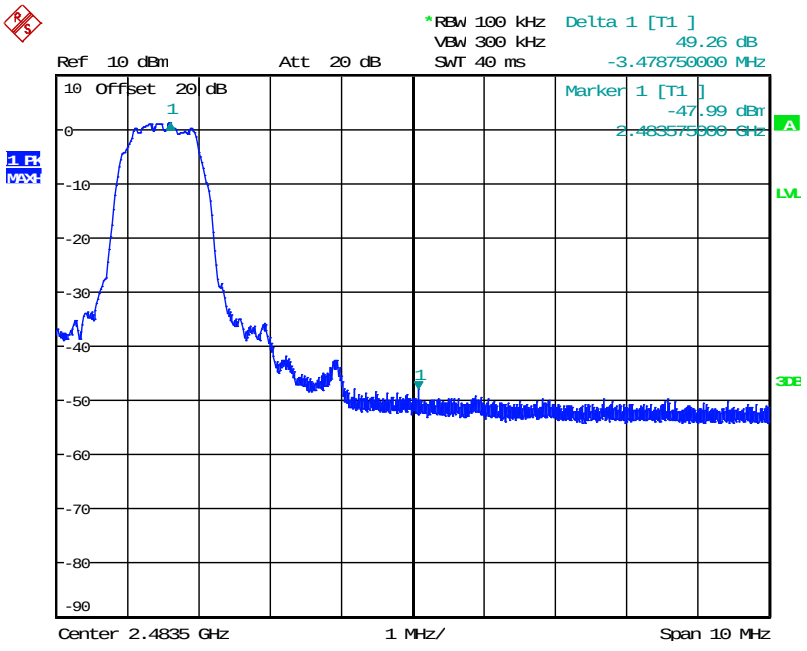
Date: 7.JAN.2015 22:19:00

Figure 7.5.1.2-8: Upper Band-edge – Hopping Mode (π/4 DQPSK)



Date: 7.JAN.2015 22:43:49

Figure 7.5.1.2-9: Lower Band-edge (8DPSK)



Date: 7.JAN.2015 22:47:01

Figure 7.5.1.2-10: Upper Band-edge (8DPSK)

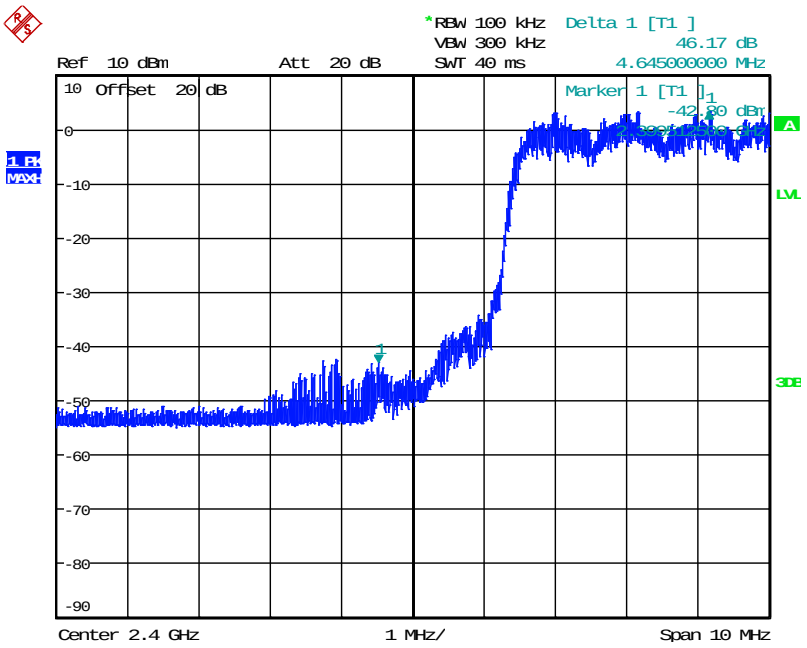


Figure 7.5.1.2-11: Lower Band-edge – Hopping Mode (8DPSK)

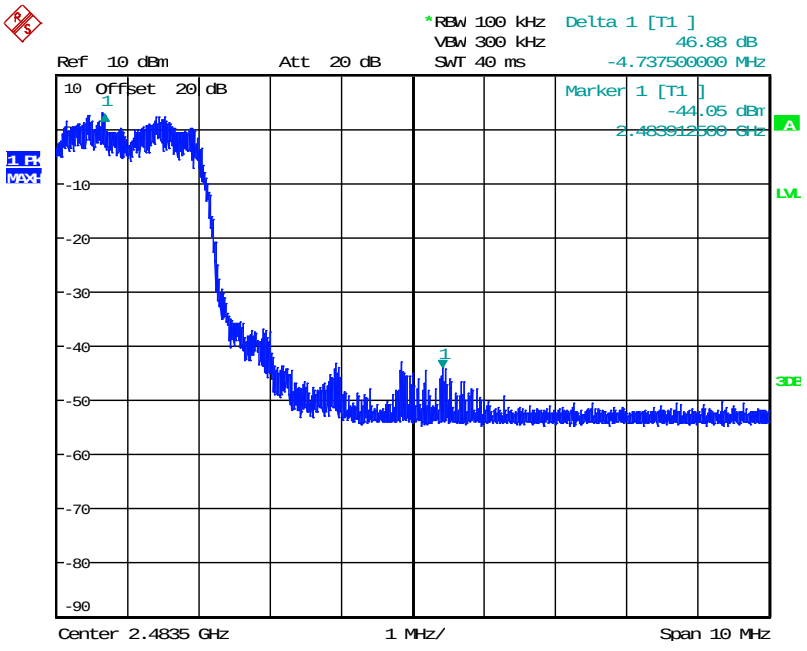


Figure 7.5.1.2-12: Upper Band-edge – Hopping Mode (8DPSK)

7.5.2 RF Conducted Spurious Emissions

7.5.2.1 Measurement Procedure

The RF output port of the EUT was connected to the spectrum analyzer. The EUT was investigated for conducted spurious emissions from 30MHz to 26 GHz, 10 times the highest fundamental frequency. Measurements were made at the low, center and high channels of the EUT. For each measurement, the spectrum analyzer's RBW was set to 100 kHz. A peak detector function was used with the trace set to max hold. The levels were corrected for cable and attenuator losses.

7.5.2.2 Measurement Results

Results are shown below:

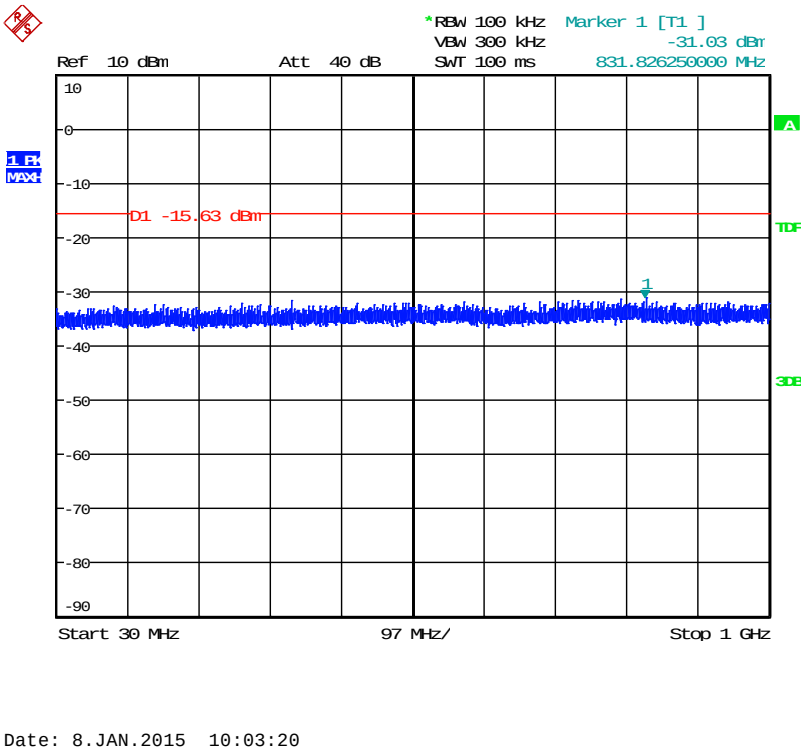
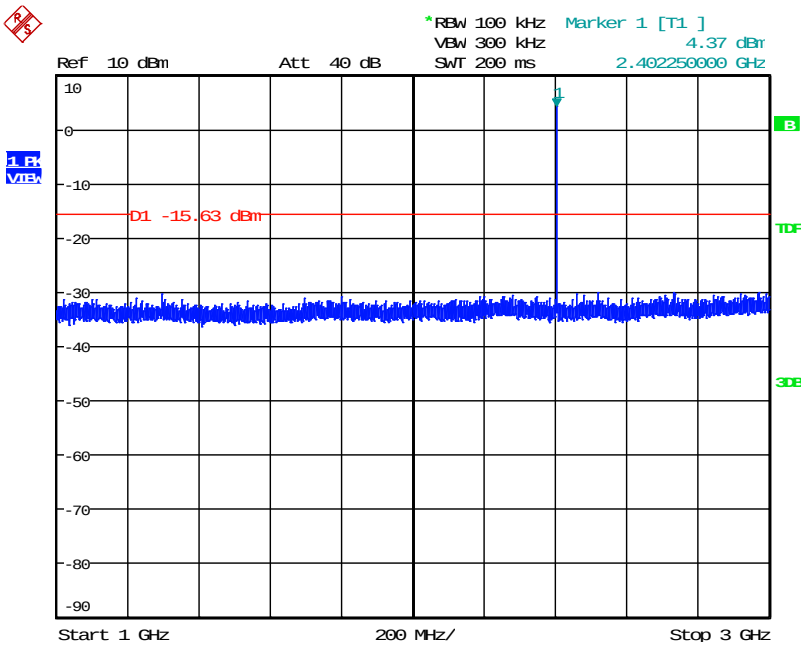
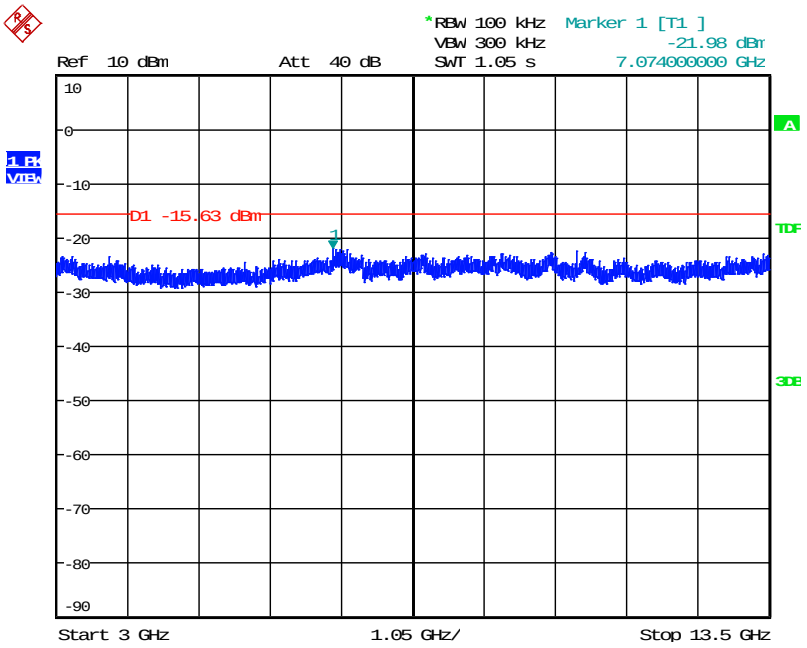


Figure 7.5.2.2-1: 30 MHz – 1 GHz – Low Channel (GFSK)



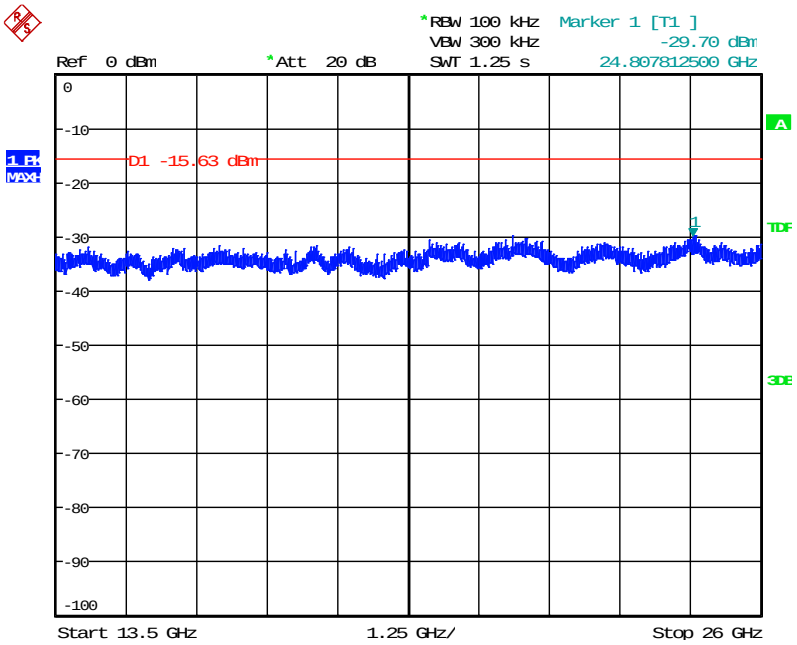
Date: 8.JAN.2015 09:57:52

Figure 7.5.2.2-2: 1 GHz –3 GHz – Low Channel (GFSK)



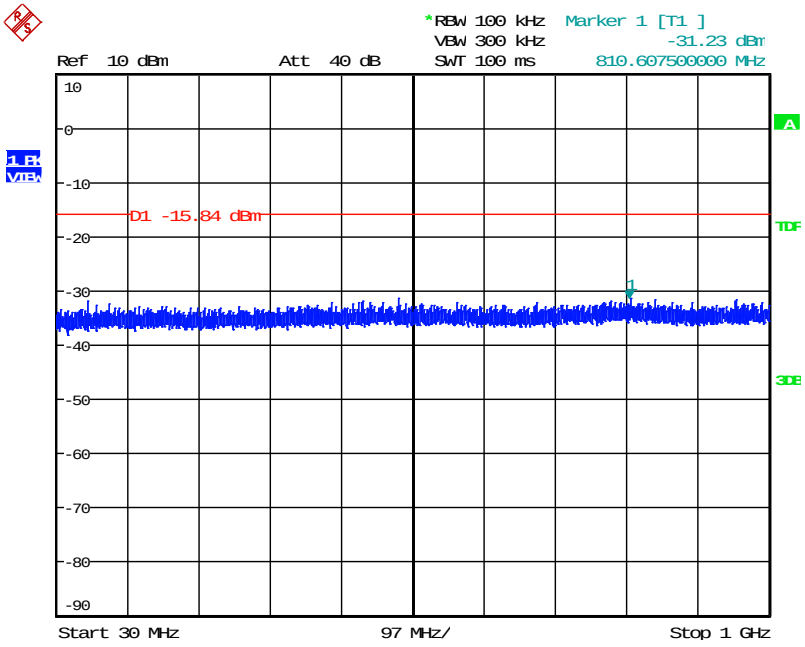
Date: 8.JAN.2015 09:58:38

Figure 7.5.2.2-3: 3 GHz –13.5 GHz – Low Channel (GFSK)



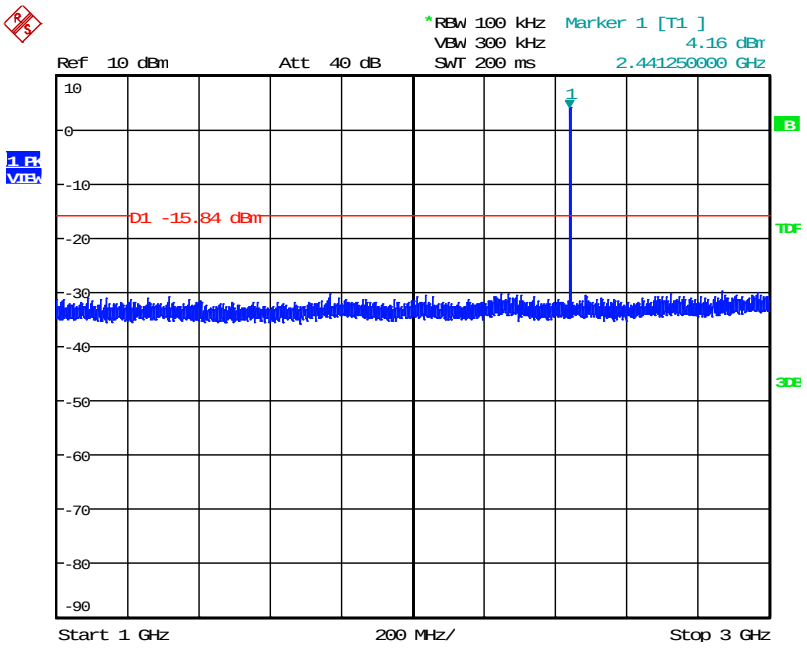
Date: 8.JAN.2015 23:36:08

Figure 7.5.2.2-4: 13.5 GHz –26 GHz – Low Channel (GFSK)



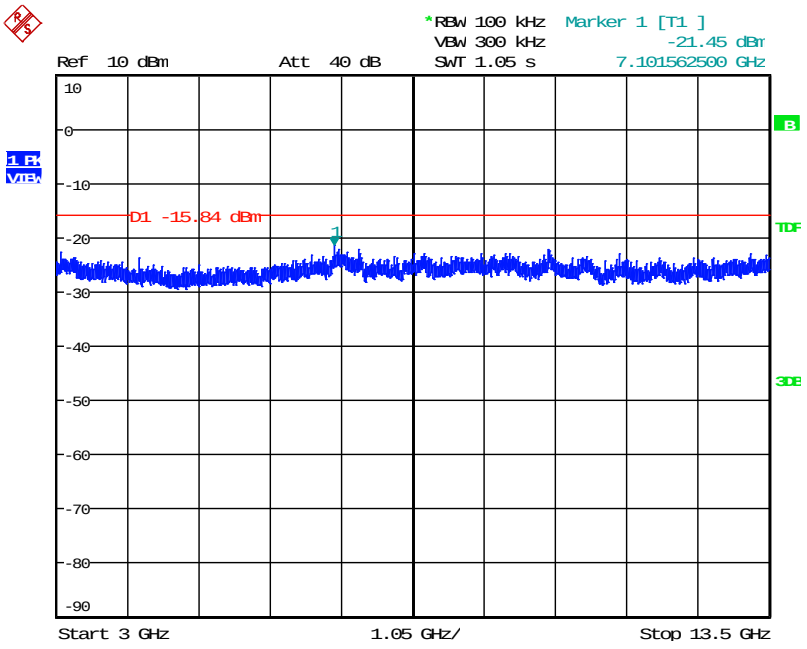
Date: 8.JAN.2015 10:07:52

Figure 7.5.2.2-5: 30 MHz – 1 GHz –Middle Channel (GFSK)



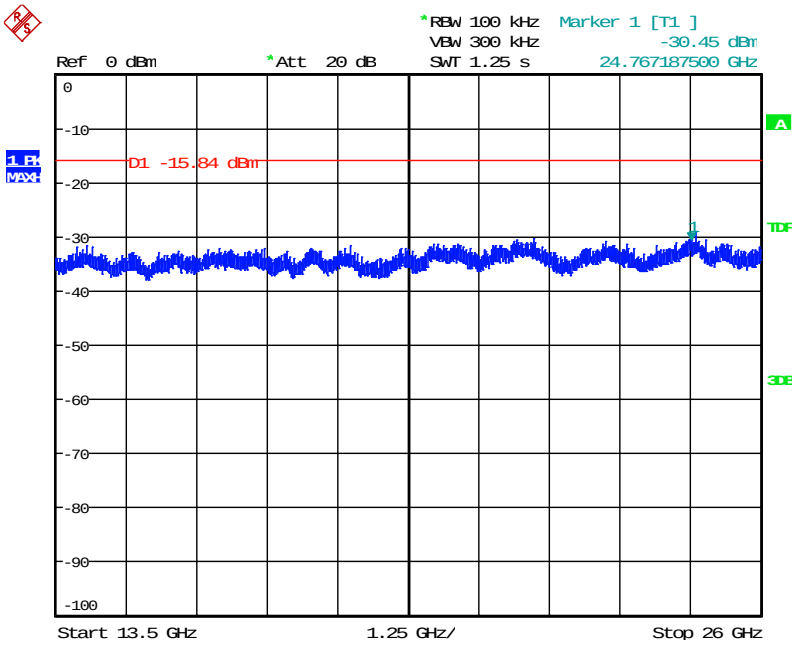
Date: 8.JAN.2015 10:07:25

Figure 7.5.2.2-6: 1 GHz –3 GHz – Middle Channel (GFSK)



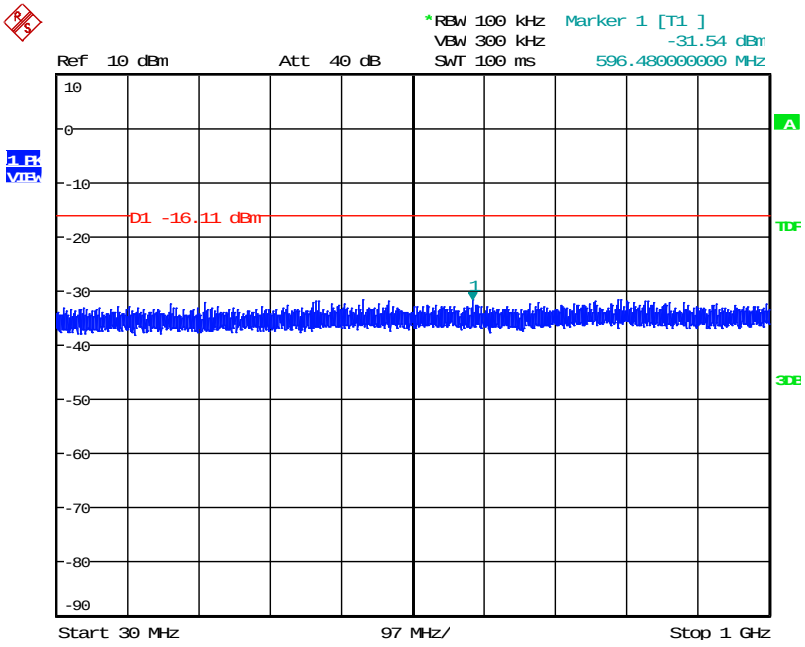
Date: 8.JAN.2015 10:13:09

Figure 7.5.2.2-7: 3 GHz –13.5 GHz – Middle Channel (GFSK)



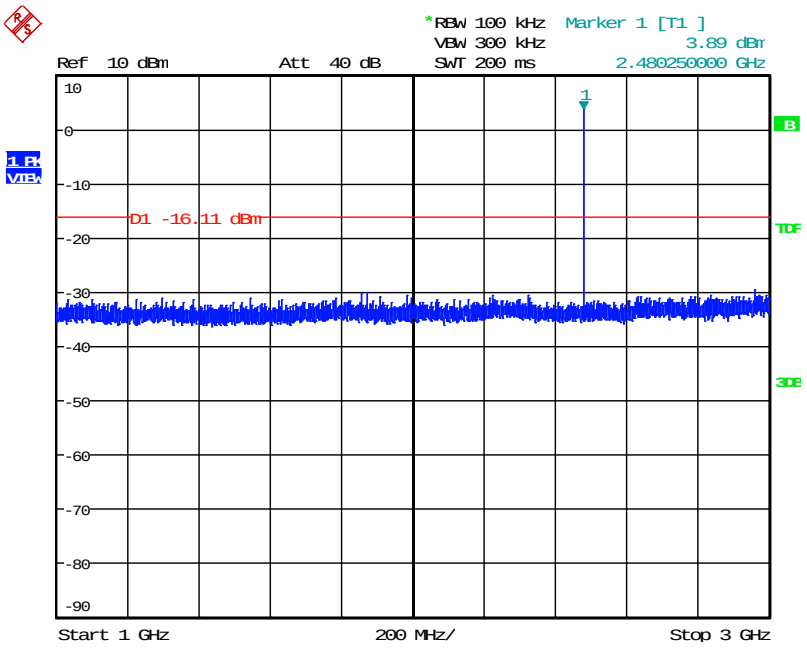
Date: 8.JAN.2015 23:38:43

Figure 7.5.2.2-8: 13.5 GHz –26 GHz – Middle Channel (GFSK)



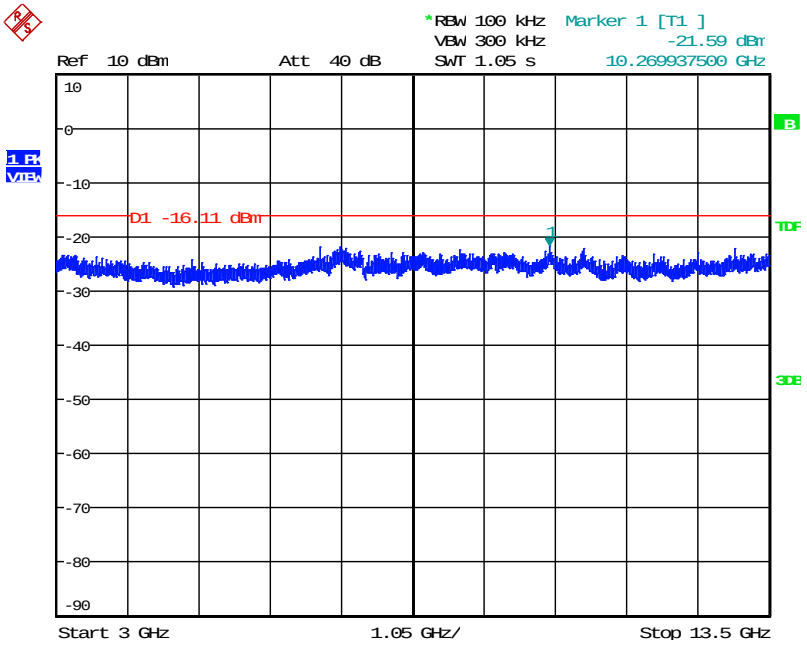
Date: 8.JAN.2015 10:30:01

Figure 7.5.2.2-9: 30 MHz – 1 GHz – High Channel (GFSK)



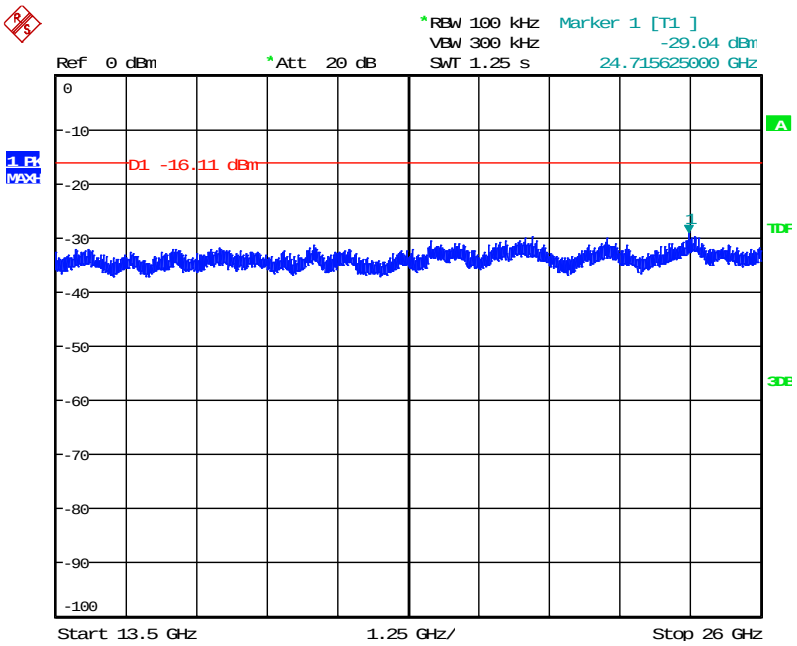
Date: 8.JAN.2015 10:20:18

Figure 7.5.2.2-10: 1 GHz –3 GHz –High Channel (GFSK)



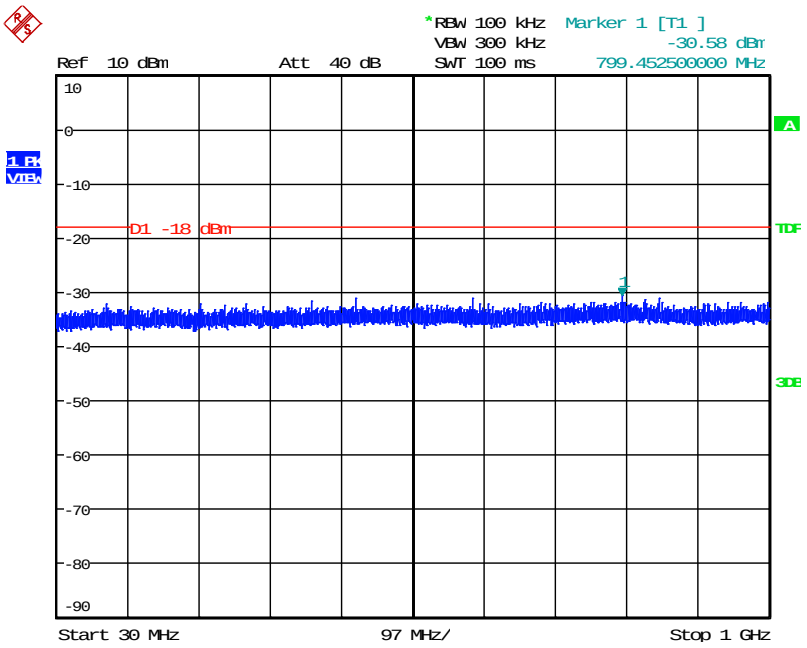
Date: 8.JAN.2015 10:25:55

Figure 7.5.2.2-11: 3 GHz –13.5 GHz – High Channel (GFSK)



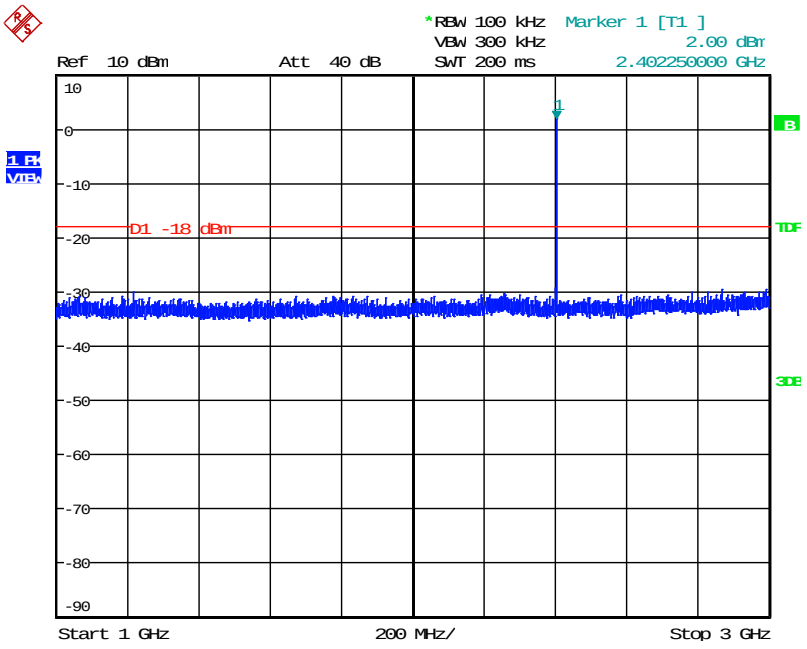
Date: 8.JAN.2015 23:41:53

Figure 7.5.2.2-12: 13.5 GHz –26 GHz – High Channel (GFSK)



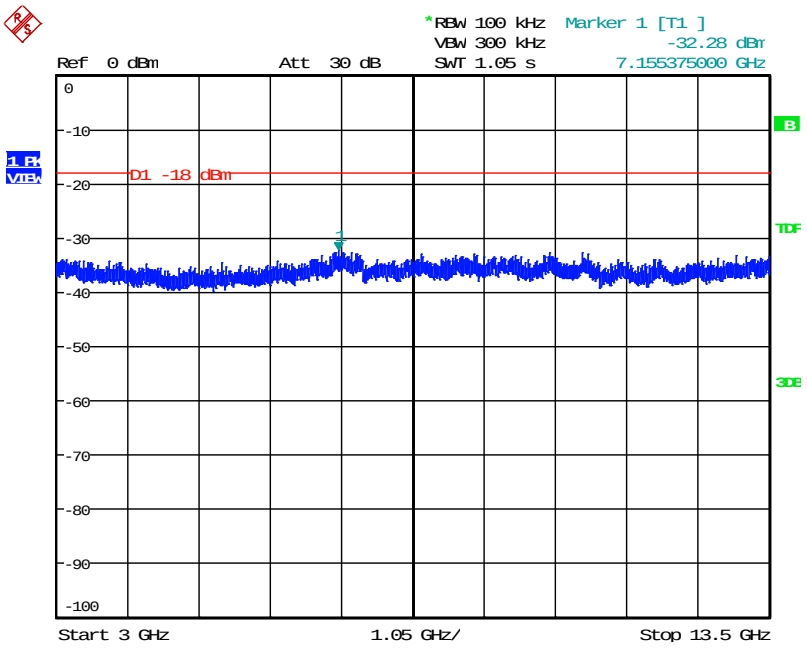
Date: 8.JAN.2015 10:38:50

Figure 7.5.2.2-13: 30 MHz – 1 GHz – Low Channel (π/4 DQPSK)



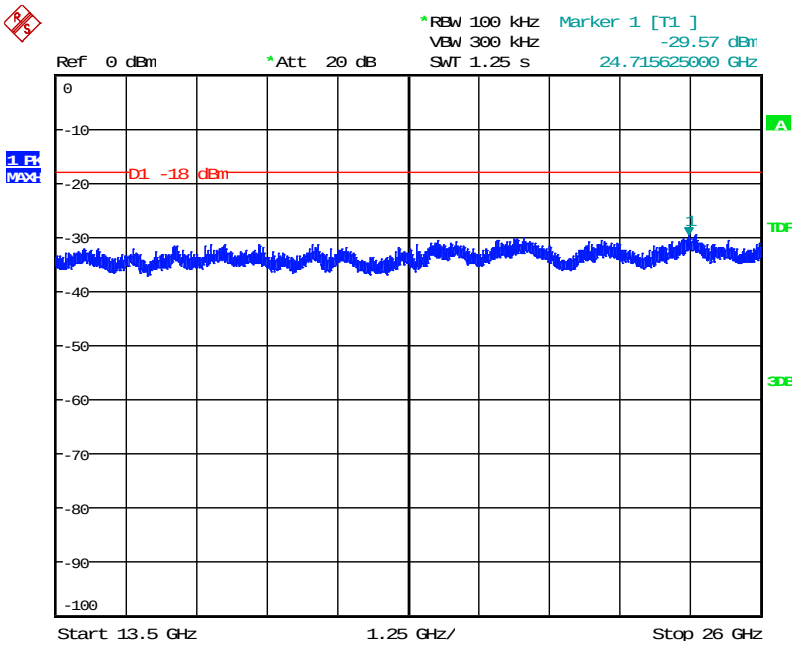
Date: 8.JAN.2015 10:38:29

Figure 7.5.2.2-14: 1 GHz –3 GHz – Low Channel (π/4 DQPSK)



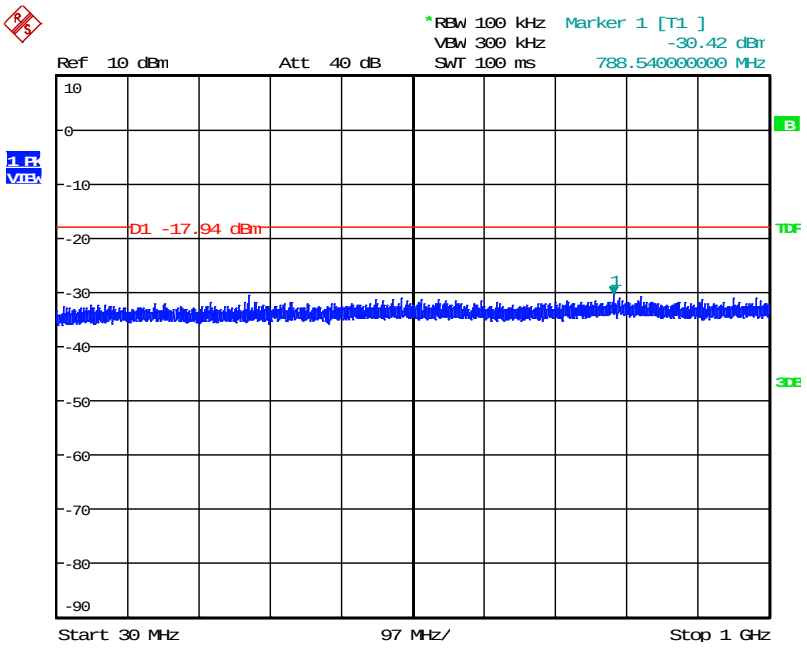
Date: 8.JAN.2015 10:42:54

Figure 7.5.2.2-15: 3 GHz –13.5 GHz – Low Channel (π/4 DQPSK)



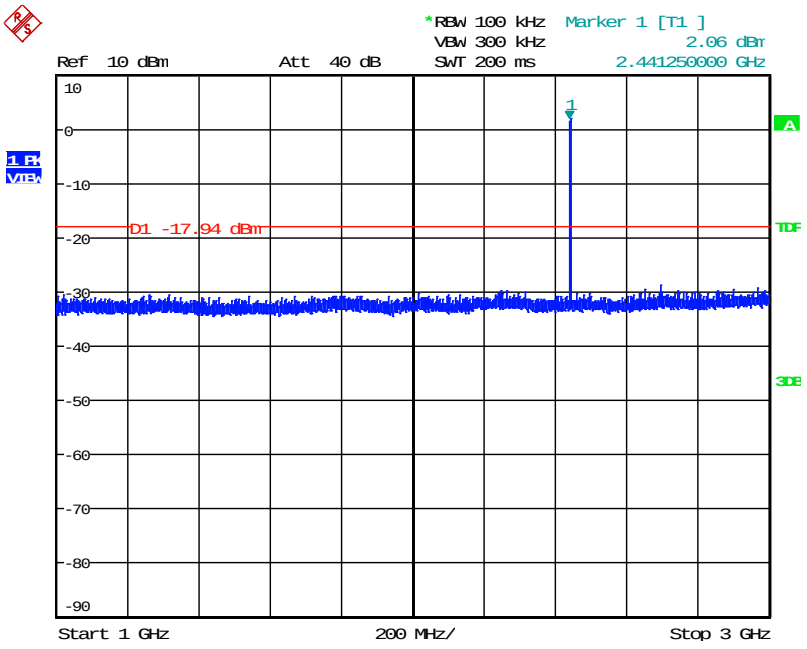
Date: 8.JAN.2015 23:29:25

Figure 7.5.2.2-16: 13.5 GHz –26 GHz – Low Channel (π/4 DQPSK)



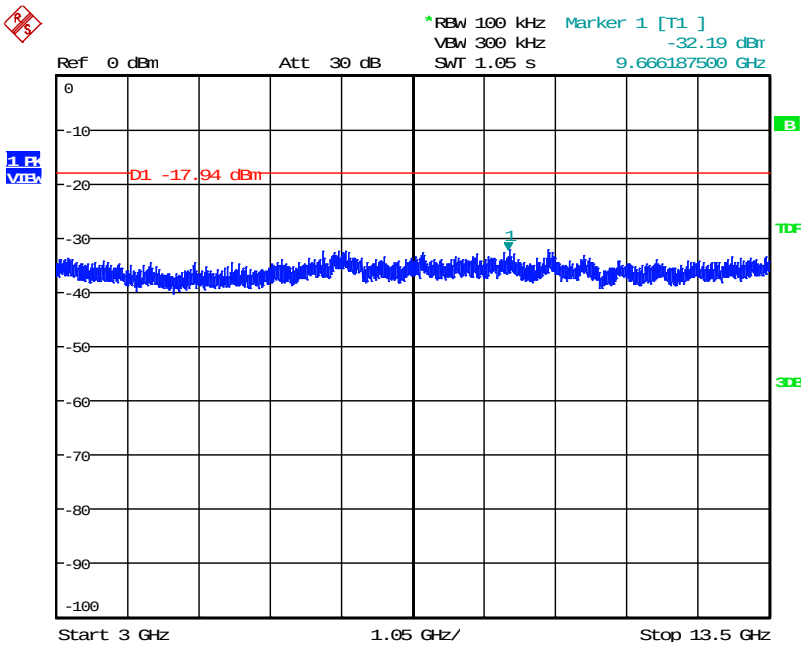
Date: 8.JAN.2015 11:00:47

Figure 7.5.2.2-17: 30 MHz – 1 GHz –Middle Channel (π/4 DQPSK)



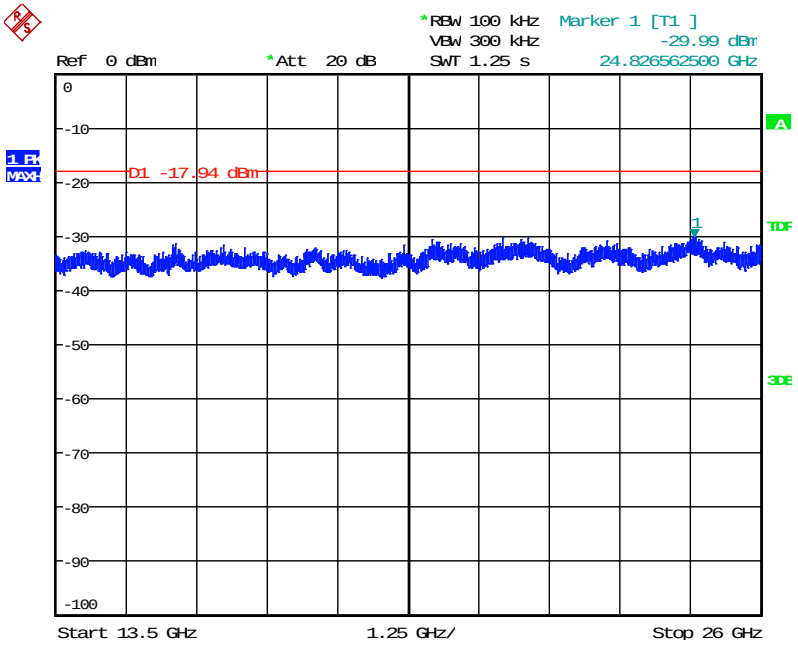
Date: 8.JAN.2015 11:00:25

Figure 7.5.2.2-18: 1 GHz –3 GHz – Middle Channel (π/4 DQPSK)



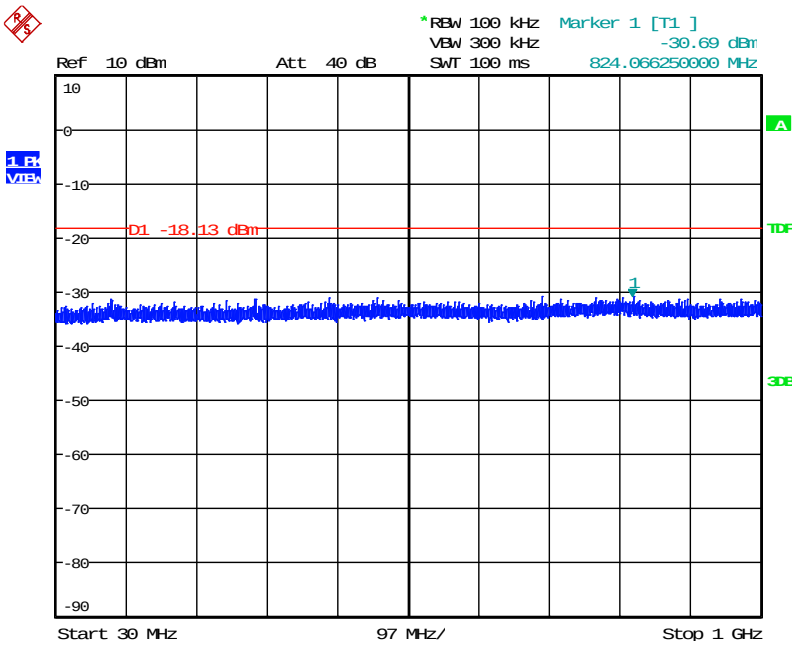
Date: 8.JAN.2015 11:04:35

Figure 7.5.2.2-19: 3 GHz –13.5 GHz – Middle Channel (π/4 DQPSK)



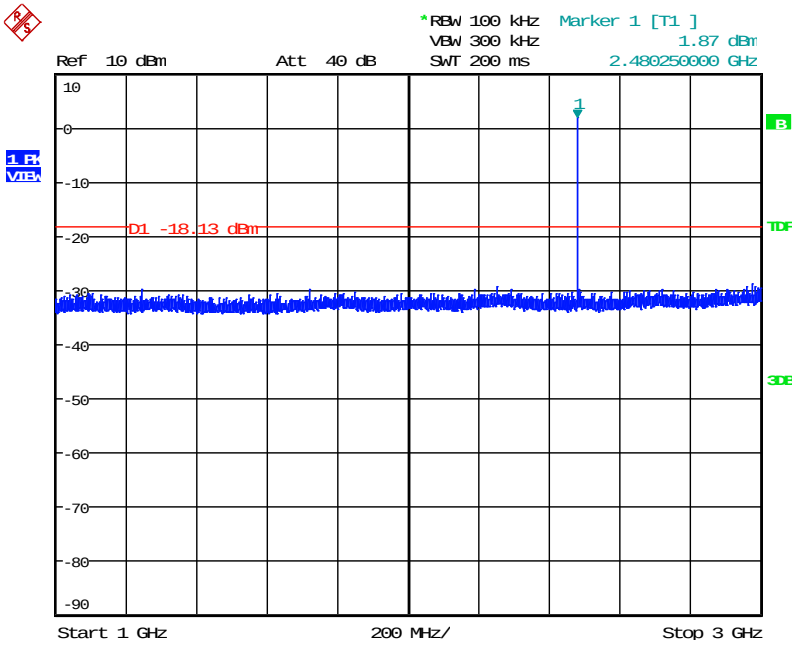
Date: 8.JAN.2015 23:31:20

Figure 7.5.2.2-20: 13.5 GHz –26 GHz – Middle Channel (π/4 DQPSK)



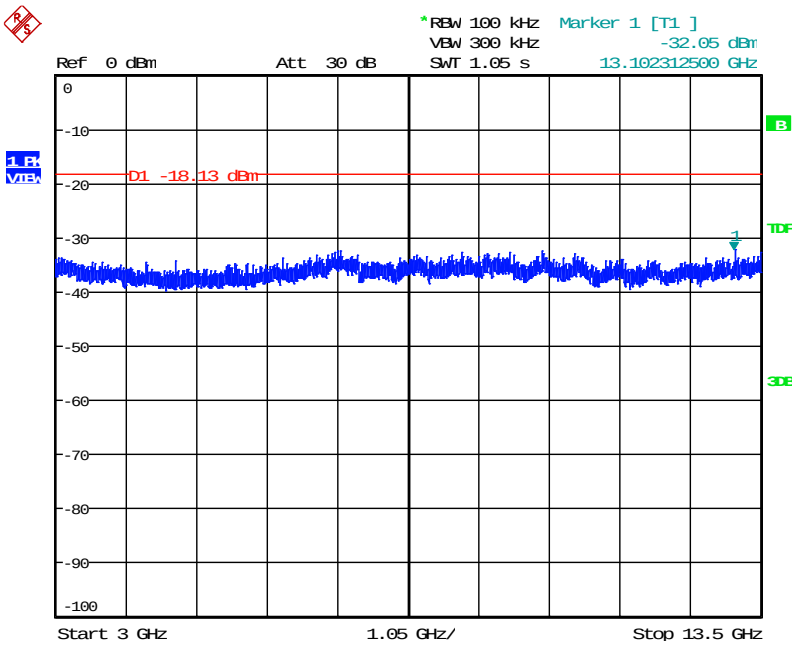
Date: 8.JAN.2015 21:16:12

Figure 7.5.2.2-21: 30 MHz – 1 GHz – High Channel (π/4 DQPSK)



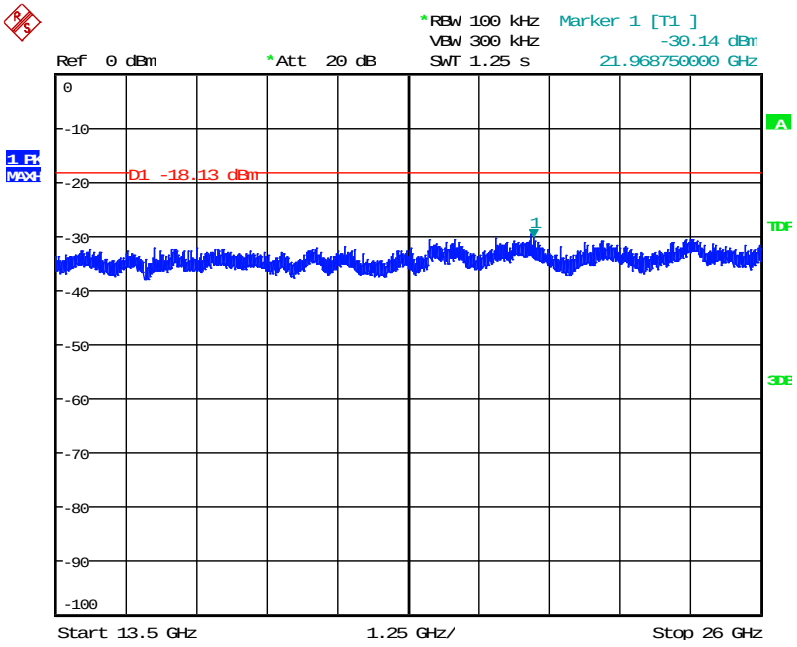
Date: 8.JAN.2015 21:15:41

Figure 7.5.2.2-22: 1 GHz –3 GHz –High Channel (π/4 DQPSK)



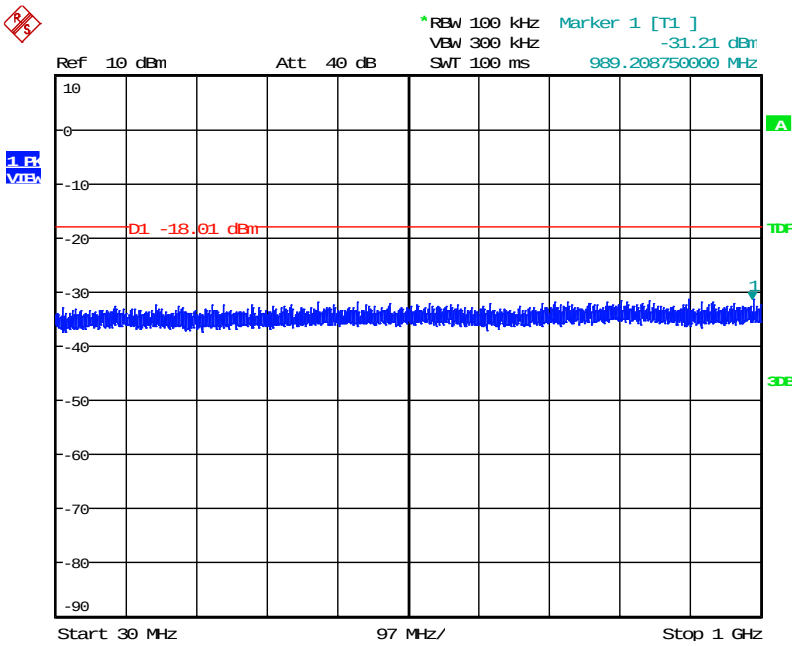
Date: 8.JAN.2015 21:20:10

Figure 7.5.2.2-23: 3 GHz –13.5 GHz – High Channel (π/4 DQPSK)



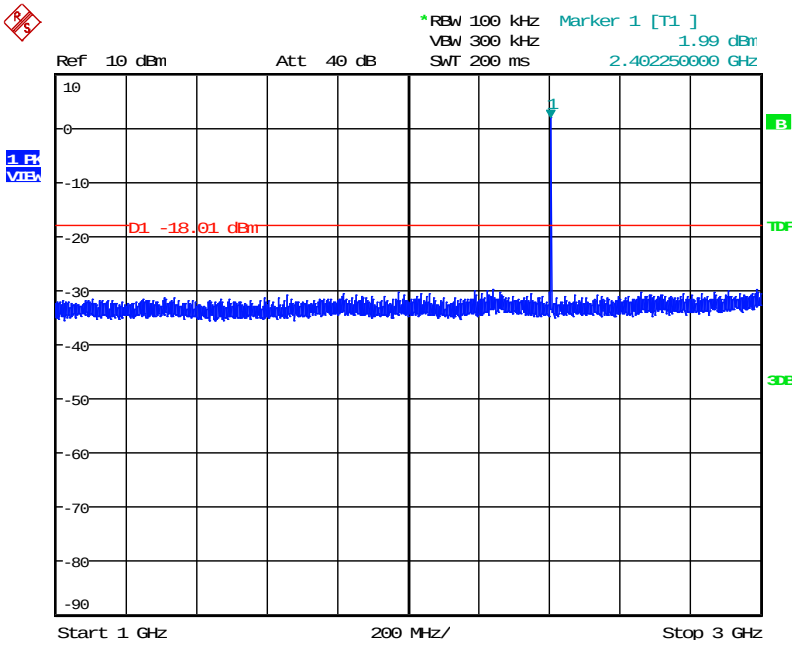
Date: 8.JAN.2015 23:33:14

Figure 7.5.2.2-24: 13.5 GHz –26 GHz – High Channel (π/4 DQPSK)



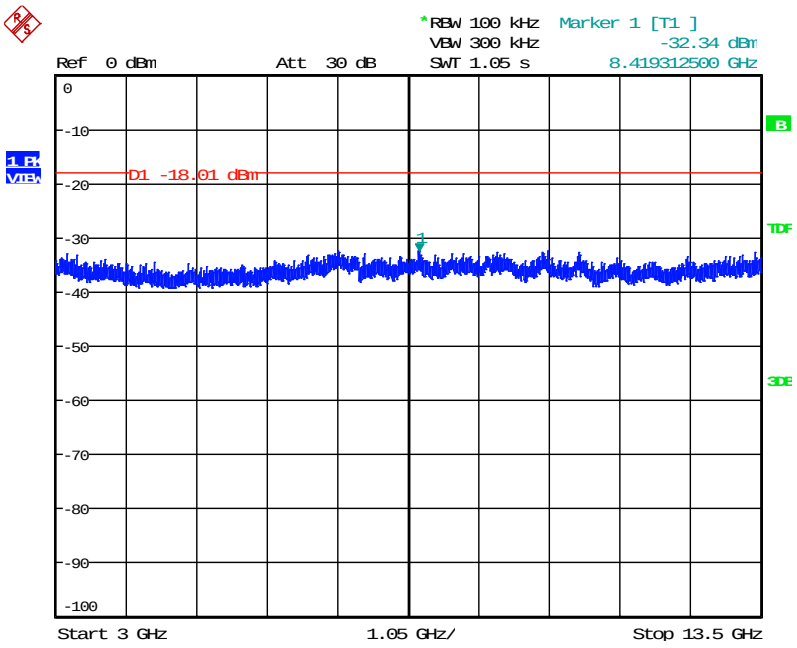
Date: 8.JAN.2015 21:25:46

Figure 7.5.2.2-25: 30 MHz – 1 GHz – Low Channel (8DPSK)



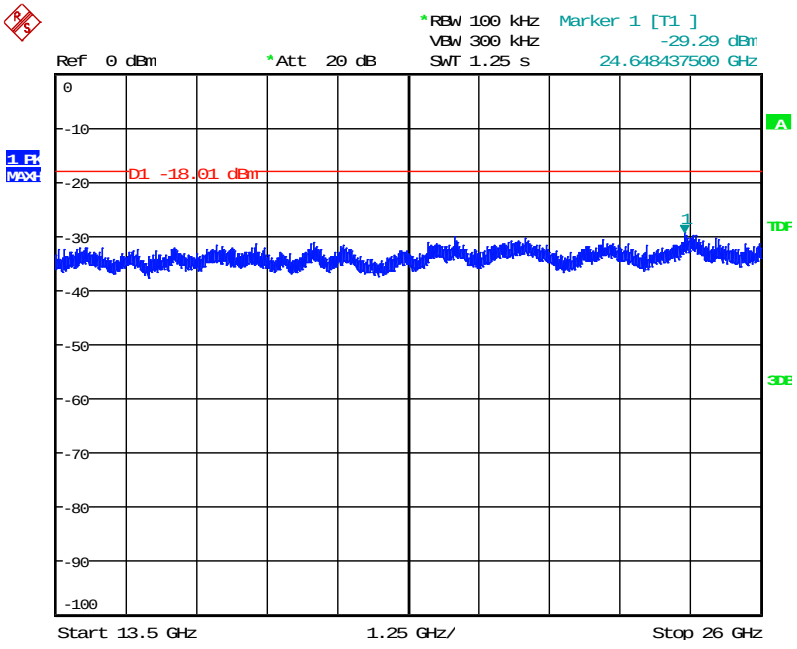
Date: 8.JAN.2015 21:25:21

Figure 7.5.2.2-26: 1 GHz –3 GHz – Low Channel (8DPSK)



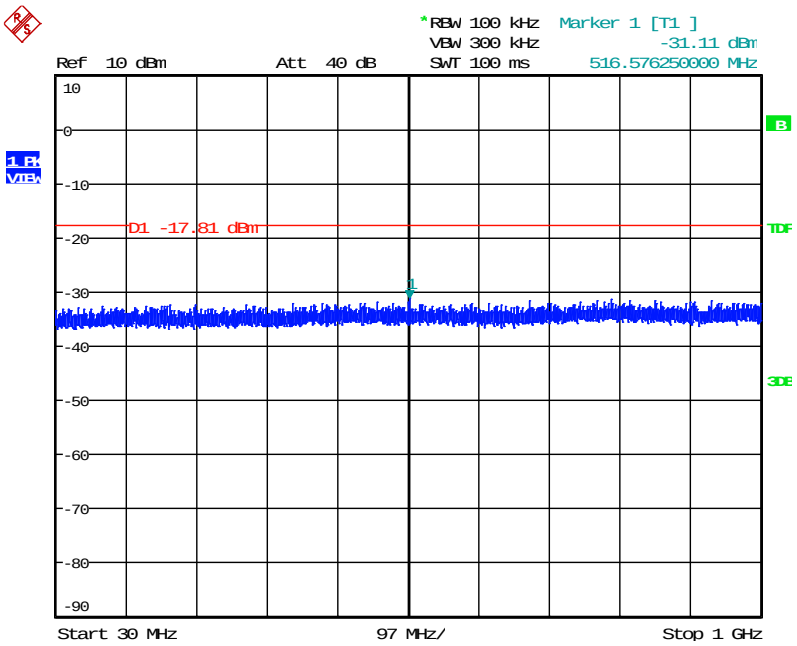
Date: 8.JAN.2015 21:30:14

Figure 7.5.2.2-27: 3 GHz –13.5 GHz – Low Channel (8DPSK)



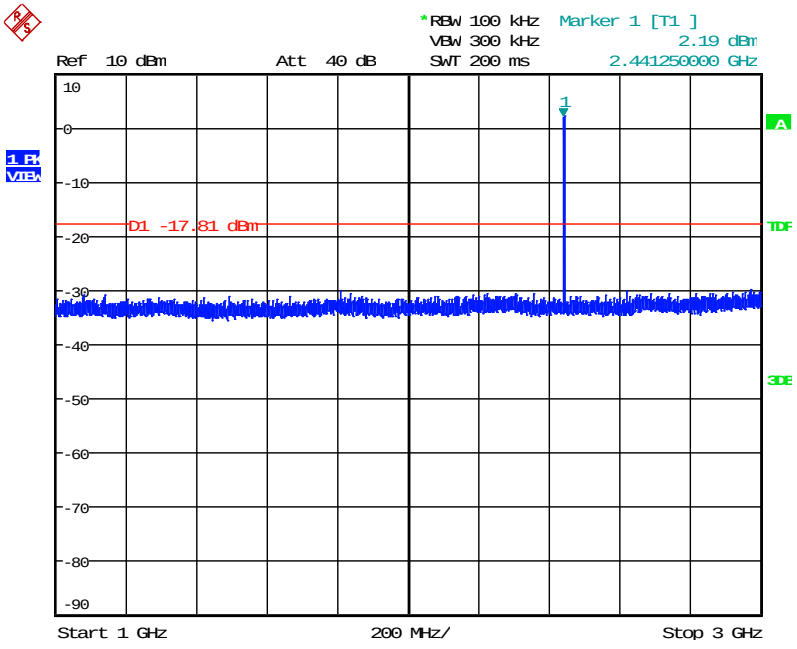
Date: 8.JAN.2015 23:21:06

Figure 7.5.2.2-28: 13.5 GHz –26 GHz – Low Channel (8DPSK)



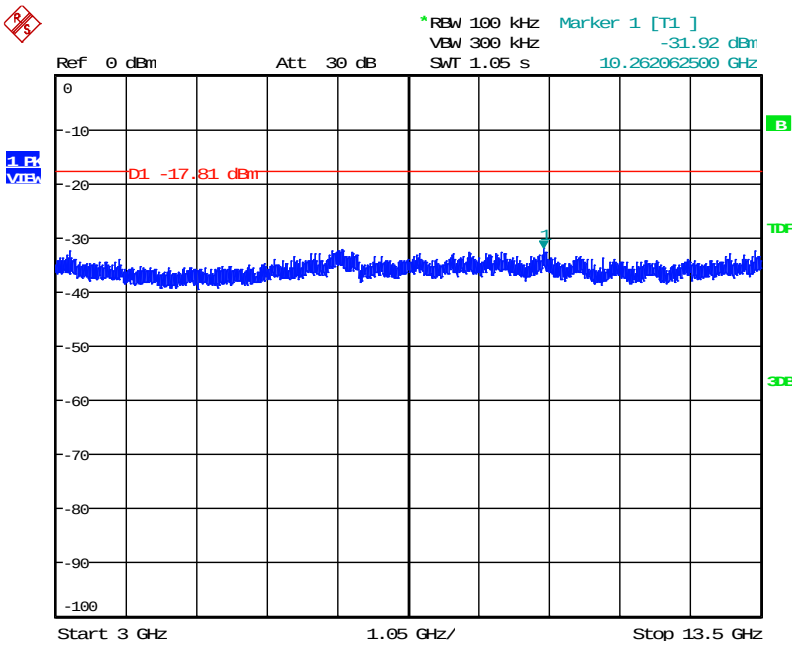
Date: 8.JAN.2015 21:35:47

Figure 7.5.2.2-29: 30 MHz – 1 GHz –Middle Channel (8DPSK)



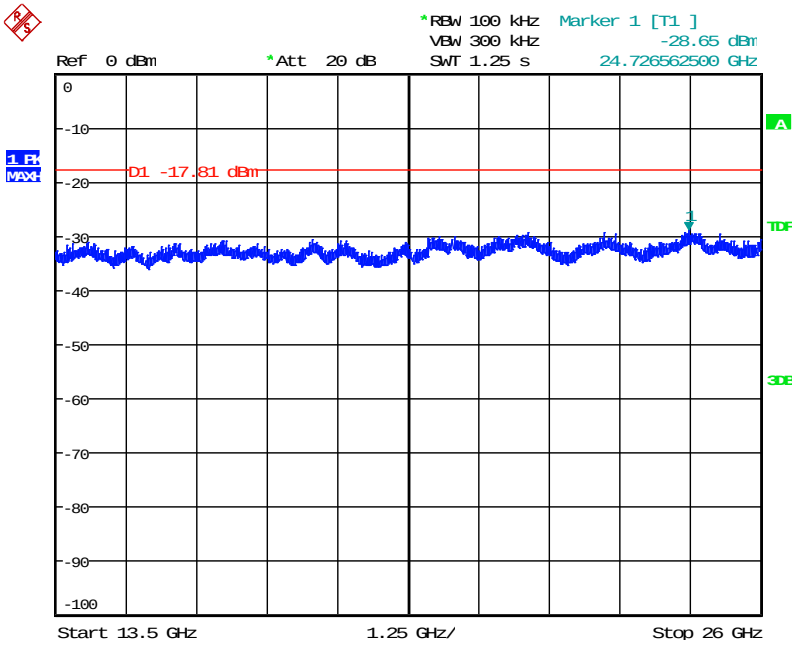
Date: 8.JAN.2015 21:36:08

Figure 7.5.2.2-30: 1 GHz –3 GHz – Middle Channel (8DPSK)



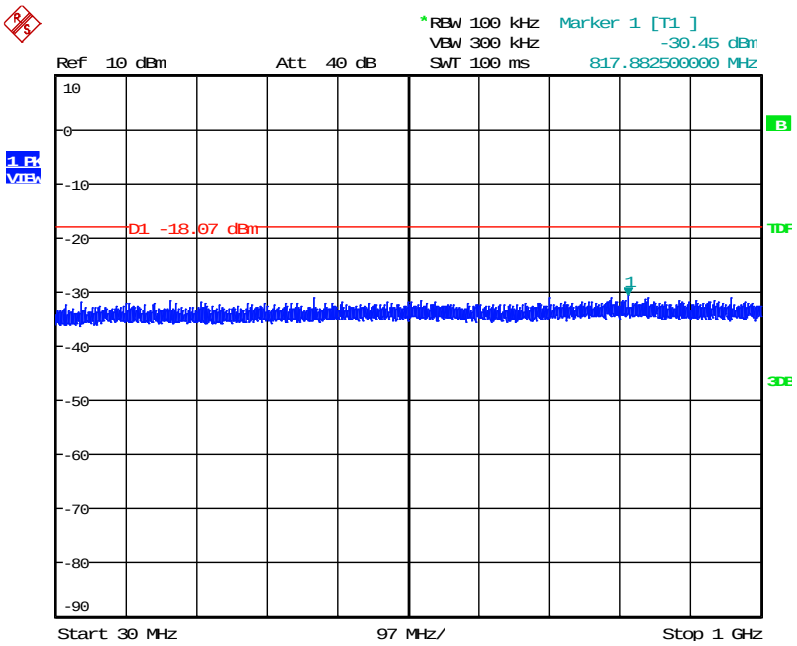
Date: 8.JAN.2015 22:21:14

Figure 7.5.2.2-31: 3 GHz –13.5 GHz – Middle Channel (8DPSK)



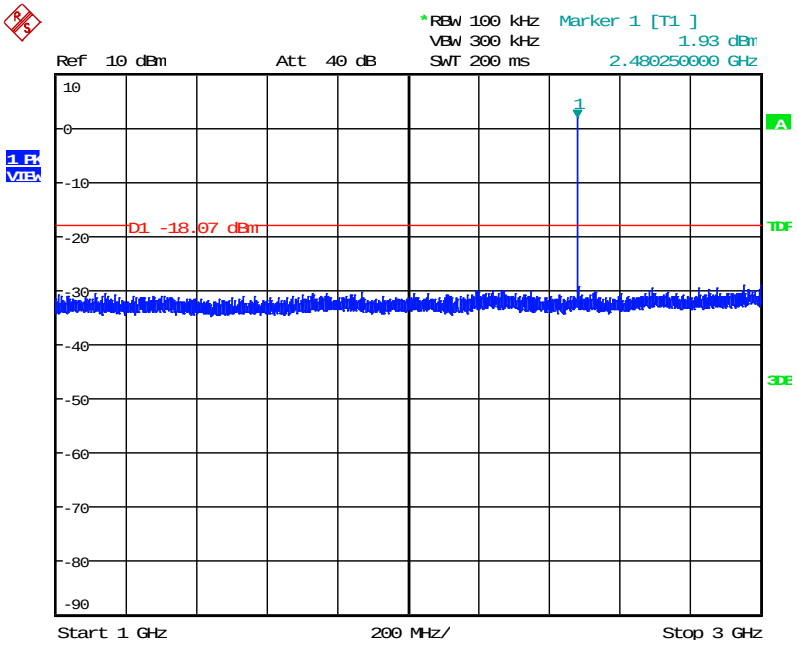
Date: 8.JAN.2015 23:18:11

Figure 7.5.2.2-32: 13.5 GHz –26 GHz – Middle Channel (8DPSK)



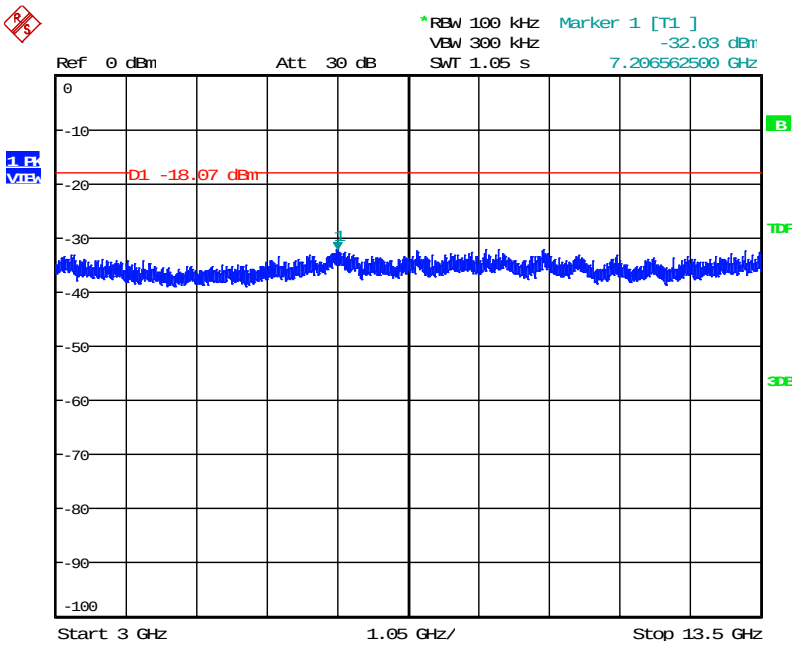
Date: 8.JAN.2015 22:33:04

Figure 7.5.2.2-33: 30 MHz – 1 GHz – High Channel (8DPSK)



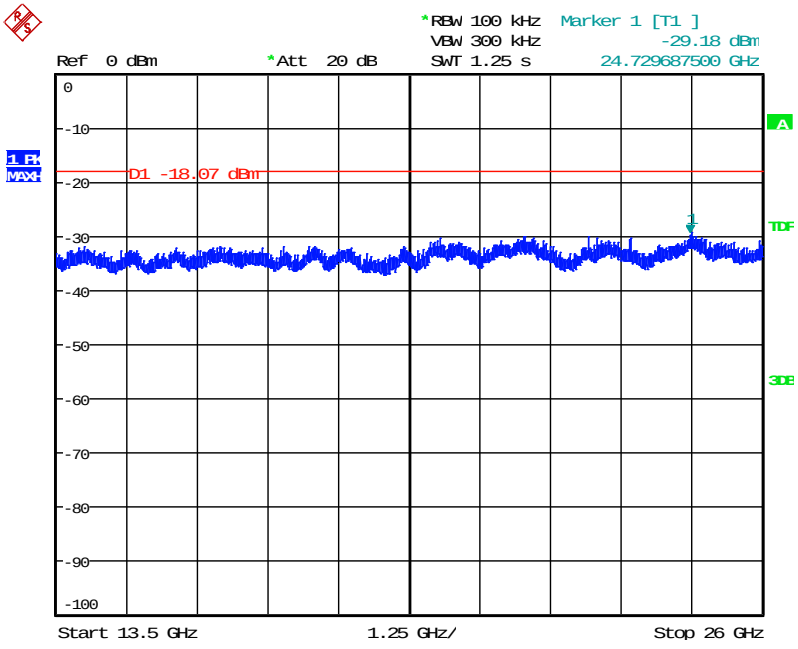
Date: 8.JAN.2015 22:33:31

Figure 7.5.2.2-34: 1 GHz –3 GHz –High Channel (8DPSK)



Date: 8.JAN.2015 22:40:33

Figure 7.5.2.2-35: 3 GHz –13.5 GHz – High Channel (8DPSK)



Date: 8.JAN.2015 22:44:12

Figure 7.5.2.2-36: 13.5 GHz –26 GHz – High Channel (8DPSK)

7.5.3 Radiated Spurious Emissions within the Restricted Bands - FCC Sections 15.205, 15.209; IC: RSS-Gen 8.9, 8.10

7.5.3.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 30 MHz to 26 GHz, 10 times the highest fundamental frequency for emissions falling within the restricted bands.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000 MHz, peak measurements made with RBW and VBW of 1 MHz and 3 MHz respectively. Average measurements were collected in the linear amplitude scale with VBW of 30 Hz.

The EUT was caused to generate a continuous carrier signal on the hopping channel.

7.5.3.2 Measurement Results

Band-edge and radiated spurious emissions found in the restricted bands of 30MHz to 26 GHz are reported in the tables below.

Table 7.5.3.2-1: Radiated Spurious Emissions Tabulated Data - GFSK

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel = 2402 MHz										
4804	47.77	40.07	H	5.07	52.84	14.43	74.0	54.0	21.2	39.6
4804	46.08	34.68	V	5.07	51.15	9.04	74.0	54.0	22.9	45.0
12010	45.39	32.03	H	15.82	61.21	17.14	83.5	63.5	22.3	46.4
12010	45.93	32.42	V	15.82	61.75	17.53	83.5	63.5	21.8	46.0
Middle Channel = 2441 MHz										
4882	46.22	33.16	H	5.28	51.50	7.73	74.0	54.0	22.5	46.3
4882	45.76	32.60	V	5.28	51.04	7.17	74.0	54.0	23.0	46.8
7323	45.77	32.47	H	11.51	57.28	13.27	74.0	54.0	16.7	40.7
7323	46.20	32.27	V	11.51	57.71	13.07	74.0	54.0	16.3	40.9
12205	45.69	32.09	V	16.05	61.74	17.44	83.5	63.5	21.8	46.1
High Channel = 2480 MHz										
2483.5	66.00	62.78	H	-1.21	64.79	30.86	74.0	54.0	9.2	23.1
2483.5	62.92	58.77	V	-1.21	61.71	26.85	74.0	54.0	12.3	27.1
4960	45.97	33.50	H	5.48	51.45	8.28	74.0	54.0	22.5	45.7
4960	45.77	32.55	V	5.48	51.25	7.33	74.0	54.0	22.7	46.7
7440	46.54	33.08	H	11.83	58.37	14.21	74.0	54.0	15.6	39.8
7440	47.00	33.07	V	11.83	58.83	14.20	74.0	54.0	15.2	39.8

Notes:

- **The average measurements were further corrected using a duty cycle correction factor corresponding to the logarithm of the dwell time over 100ms = 20*log(2.916/100).**
- **The emissions above 10 GHz were performed at a measurement distance of 1m. The limits are corrected accordingly using a distance factor of 20*log(3/1) = 9.5 dB.**
- **All the emissions above 12.205 GHz were attenuated below the limits and the noise floor of the measurement equipment.**

Table 7.5.3.2-2: Radiated Spurious Emissions Tabulated Data – (π/4) DQPSK

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel = 2402 MHz										
2390	53.69	41.76	H	-1.62	52.07	9.44	74.0	54.0	21.9	44.6
4804	47.67	37.85	H	5.07	52.74	12.21	74.0	54.0	21.3	41.8
4804	46.03	34.42	V	5.07	51.10	8.78	74.0	54.0	22.9	45.2
Middle Channel = 2441 MHz										
4882	46.65	35.43	H	5.28	51.93	10.00	74.0	54.0	22.1	44.0
4882	45.92	34.75	V	5.28	51.20	9.32	74.0	54.0	22.8	44.7
High Channel = 2480 MHz										
2483.5	70.65	63.59	H	-1.21	69.44	31.67	74.0	54.0	4.6	22.3
2483.5	67.81	59.89	V	-1.21	66.60	27.97	74.0	54.0	7.4	26.0
4960	46.18	34.23	H	5.48	51.66	9.01	74.0	54.0	22.3	45.0
4960	45.41	34.58	V	5.48	50.89	9.36	74.0	54.0	23.1	44.6
7440	47.21	34.00	H	11.83	59.04	15.13	74.0	54.0	15.0	38.9
7440	47.08	33.75	V	11.83	58.91	14.88	74.0	54.0	15.1	39.1

Notes:

- **The average measurements were further corrected using a duty cycle correction factor corresponding to the logarithm of the dwell time over 100ms = 20*log(2.916/100).**
- **All the emissions above 7.44 GHz were attenuated below the limits and the noise floor of the measurement equipment.**

Table 7.5.3.2-3: Radiated Spurious Emissions Tabulated Data – 8DPSK

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel = 2402 MHz										
2390	60.49	44.80	H	-1.62	58.87	12.48	74.0	54.0	15.1	41.5
4804	49.19	40.70	H	5.07	54.26	15.06	74.0	54.0	19.7	38.9
4804	46.31	35.24	V	5.07	51.38	9.60	74.0	54.0	22.6	44.4
Middle Channel = 2441 MHz										
4882	47.49	36.95	H	5.28	52.77	11.52	74.0	54.0	21.2	42.5
4882	47.03	35.74	V	5.28	52.31	10.31	74.0	54.0	21.7	43.7
High Channel = 2480 MHz										
2483.5	69.99	63.57	H	-1.21	68.78	31.65	74.0	54.0	5.2	22.3
2483.5	65.09	59.03	V	-1.21	63.88	27.11	74.0	54.0	10.1	26.9
4960	46.26	33.33	H	5.48	51.74	8.11	74.0	54.0	22.3	45.9
4960	45.54	33.21	V	5.48	51.02	7.99	74.0	54.0	23.0	46.0

Notes:

- **The average measurements were further corrected using a duty cycle correction factor corresponding to the logarithm of the dwell time over 100ms = 20*log(2.916/100).**
- **All the emissions above 4.96 GHz were attenuated below the limits and the noise floor of the measurement equipment.**

7.5.3.3 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

Duty Cycle Correction Factor (DC): 20*log(2.916/100) = -30.7 dB

Example Calculation: Peak
Corrected Level: 47.77+ 5.07 = 52.84 dBµV/m
Margin: 74 dBµV/m – 52.84 dBµV/m = 21.2 dB

Example Calculation: Average
Corrected Level: 40.07 + 5.07 – 30.7 = 14.44 dBµV/m
Margin: 54 dBµV/m – 14.44 dBµV/m = 39.6 dB

8 CONCLUSION

In the opinion of ACS, Inc., the H63UCH6TZ7AN manufactured by Motorola Solutions SDNBHD meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT