Certification Test Report

FCC ID: AZ489FT4910

FCC Rule Part: 15.247

ACS Report Number: 15-2031.W04.1A

Manufacturer: Motorola Solutions Sdn Bhd
Model(s): H51SDH9PW7AN, H51SDH9PW6AN

Test Begin Date: **April 22, 2015**
Test End Date: **April 29, 2015**

Report Issue Date: May 7, 2015

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 ANAB, ANSI, or any agency of the Federal Government.

Project Manager:

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

Reviewed by:

Kirby Munroe
Director, Wireless Certifications
Advanced Compliance Solutions, Inc.

This report contains 69 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 for a permissive change.

The purpose of the permissive change is to address the optimizations on the matching circuit of the Bluetooth option board on the dual knob model variants.

1.2 Product Description

The APX4000 Dual Knob UHF2 Band, models H51SDH9PW7AN, H51SDH9PW6AN are two way portable radios operating in the UHF band of 450 MHz - 520 MHz. The two radios are identical with the exception of the keypad. The radios also include a Bluetooth 2.0+EDR transceiver and are capable of TDMA as well as digital and analog FM transmission.

Technical Details

Mode of Operation:	Bluetooth 2.0 + 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 Sdn Bhd
Plot 2, Bayan Lepas,
Technoplex Industrial Park,
Mukim 12, SWD (CSC)
11900 Bayan Lepas, Penang Malaysia

Model Number: H51SDH9PW7AN, H51SDH9PW6AN

Test Sample Serial Number(s): 411TQT0508 (Radiated & Power Line Conducted Emissions), 411TQT0513 (RF Conducted)

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

1.4 Test Methodology and Considerations

The evaluation was performed on the H51SDH9PW7AN model which was judged representative of all the supported model variants. The Bluetooth radio was evaluated for radiated, power line conducted emissions, as well as RF conducted measurements at the antenna port. The modes of operation evaluated are provided below.

For the radiated emission test, preliminary evaluation was performed for the EUT set in three orthogonal orientations. The final measurements were collected using the EUT orientation leading to the highest emissions. The EUT was set on the side for radiated band-edge measurements and on the rear for the spurious measurements.

The EUT was also evaluated for intermodulation products generated by the co-located Bluetooth and UHF radios transmitting at the same time. All inter-modulation products were found to be compliant to the limits of FCC 15.209.

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

Table 1.4-1: Bluetooth Radio Test configuration

Modes of Operation	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 power line conducted emission evaluation was performed all all three modes of operation. The result reported corresponds to the worst case.

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 ANAB 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:

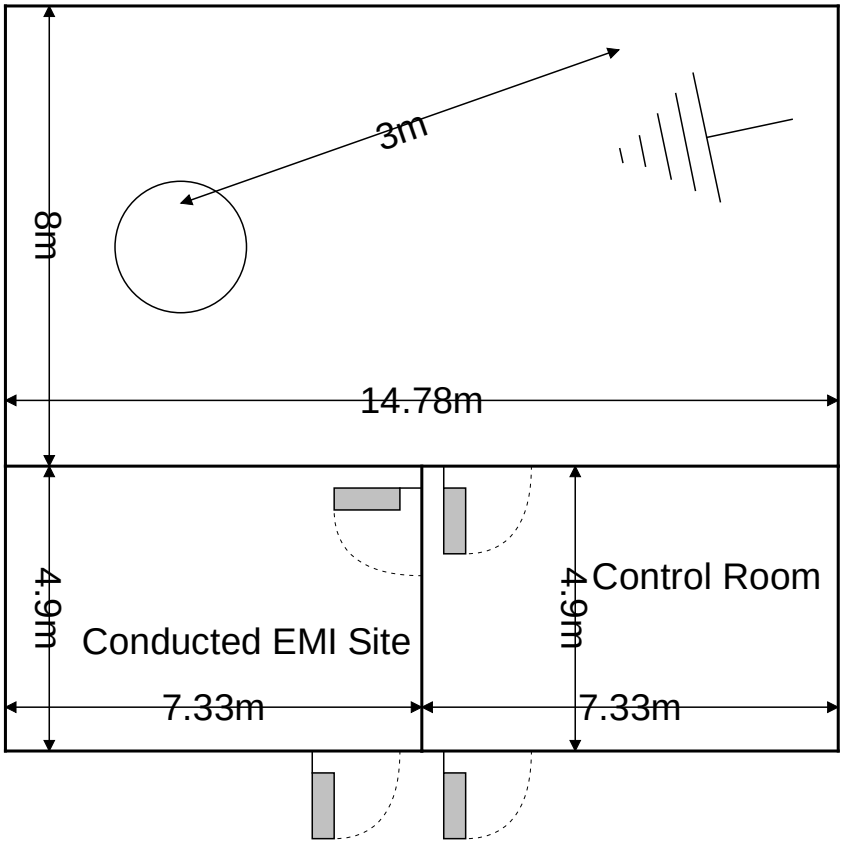


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

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 evaluations 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:

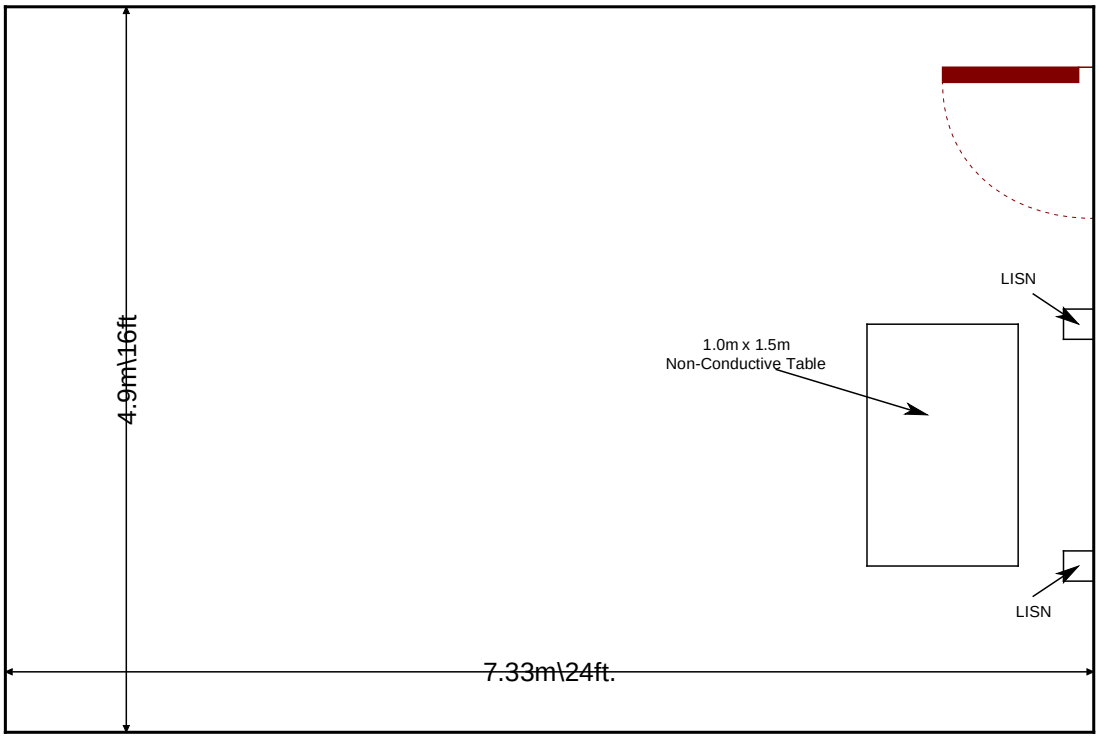


Figure 2.3.2-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2009: Methods 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

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
78	EMCO	6502	Antennas	9104-2608	2/13/2015	2/13/2017
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	4/14/2015	4/14/2017
2008	COM-Power	AH-826	Antennas	81009	NCR	NCR
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	2/17/2015	2/17/2016
2044	QMI	N/A	Cables	2044	12/31/2014	12/31/2015
2045	ACS Boca	Conducted Cable Set	Cable Set	2045	1/1/2015	1/1/2016
2070	Mini Circuits	VHF-8400+	Filter	2070	12/31/2014	12/31/2015
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	12/31/2014	12/31/2015
2089	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00214	12/12/2014	12/12/2015
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

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	Adaptive Charger	Motorola	WPLN4243A	1216ML22
2	14V I.T.E Power Supply	Motorola	NU20-C140150-I3	1201

Table 5-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	Power	1.89 m	No	Power Supply to Charger
B	Power	1.23 m	No	Power Supply to

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

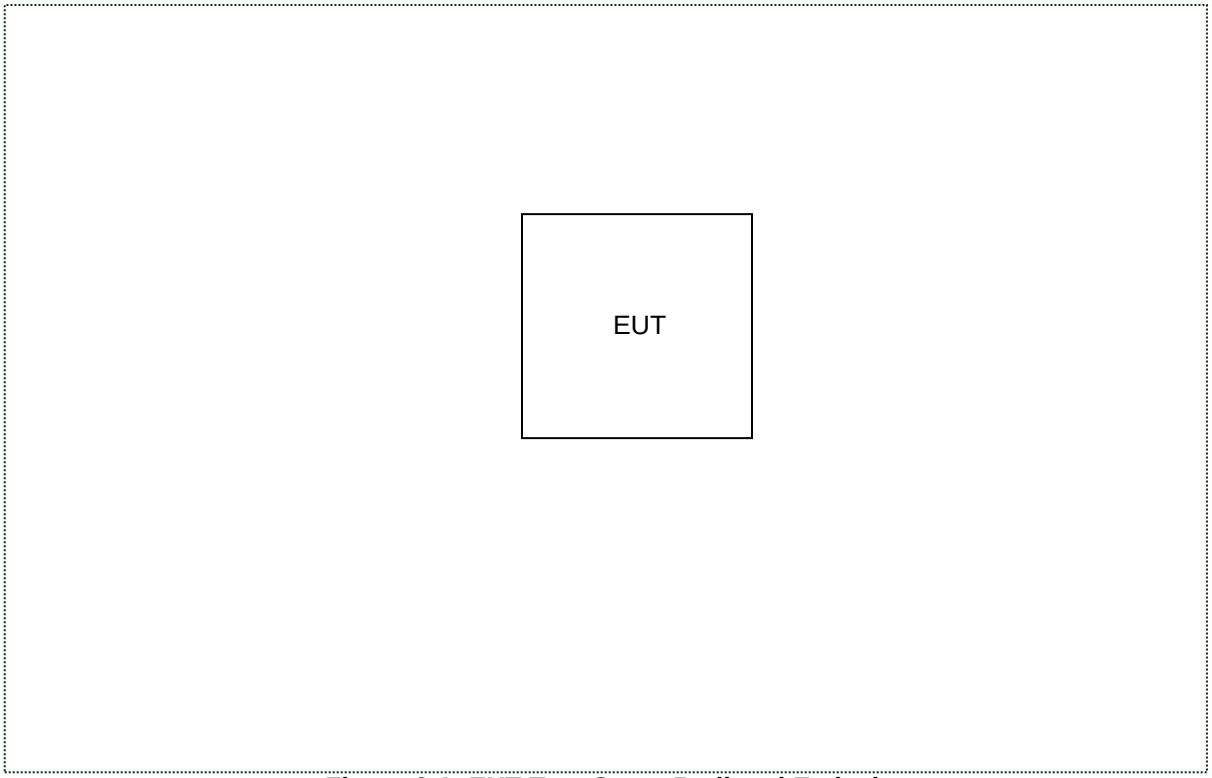


Figure 6-1: EUT Test Setup Radiated Emissions

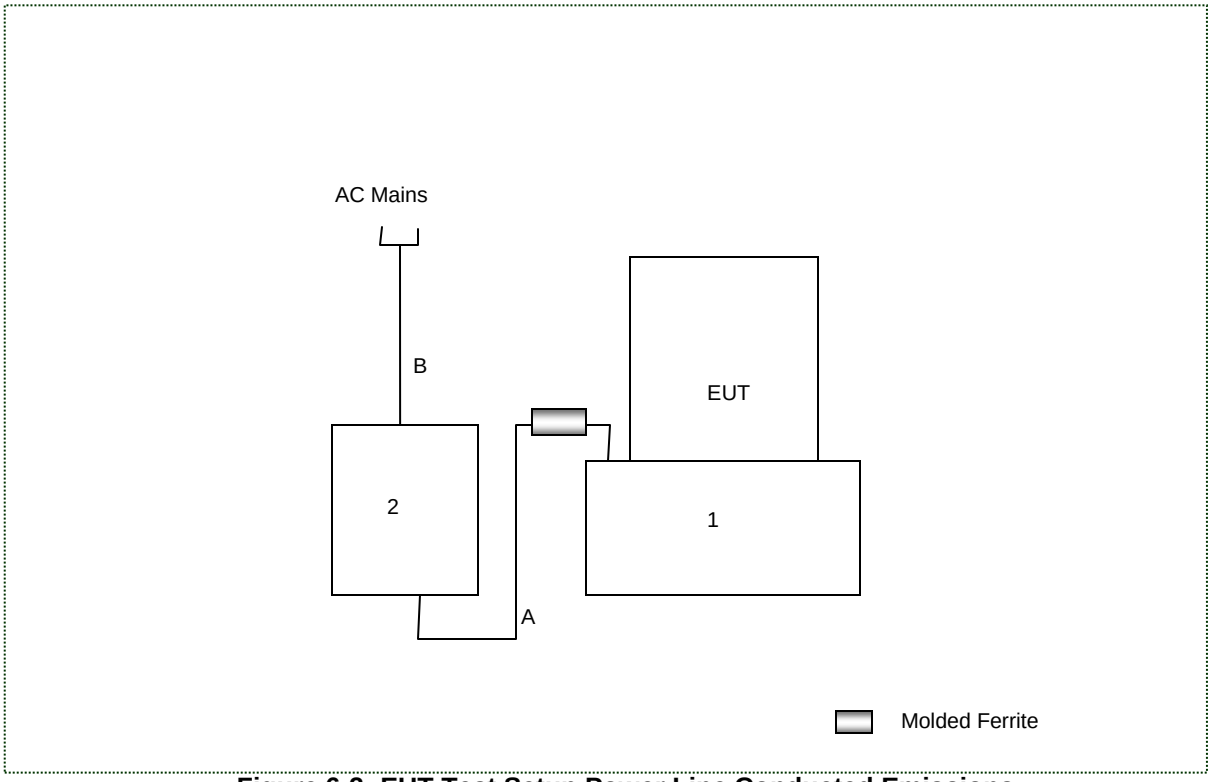


Figure 6-2: EUT Test Setup Power Line Conducted Emissions

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 unit provides a printed inverted-F antenna which is integral to the radio, non-removable and non-user accessible. Therefore, the equipment meets the requirements of FCC 15.203.

7.2 Power Line Conducted Emissions – FCC: Section 15.207

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:

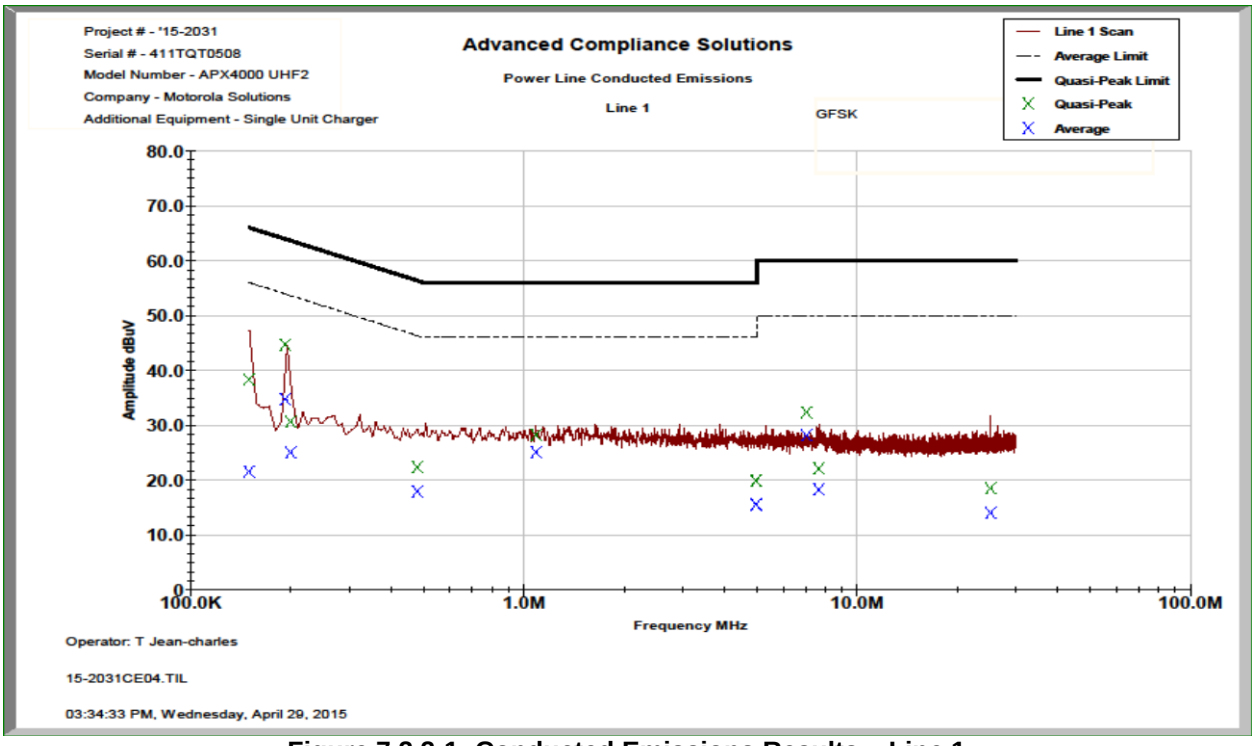


Figure 7.2.2-1: Conducted Emissions Results – Line 1

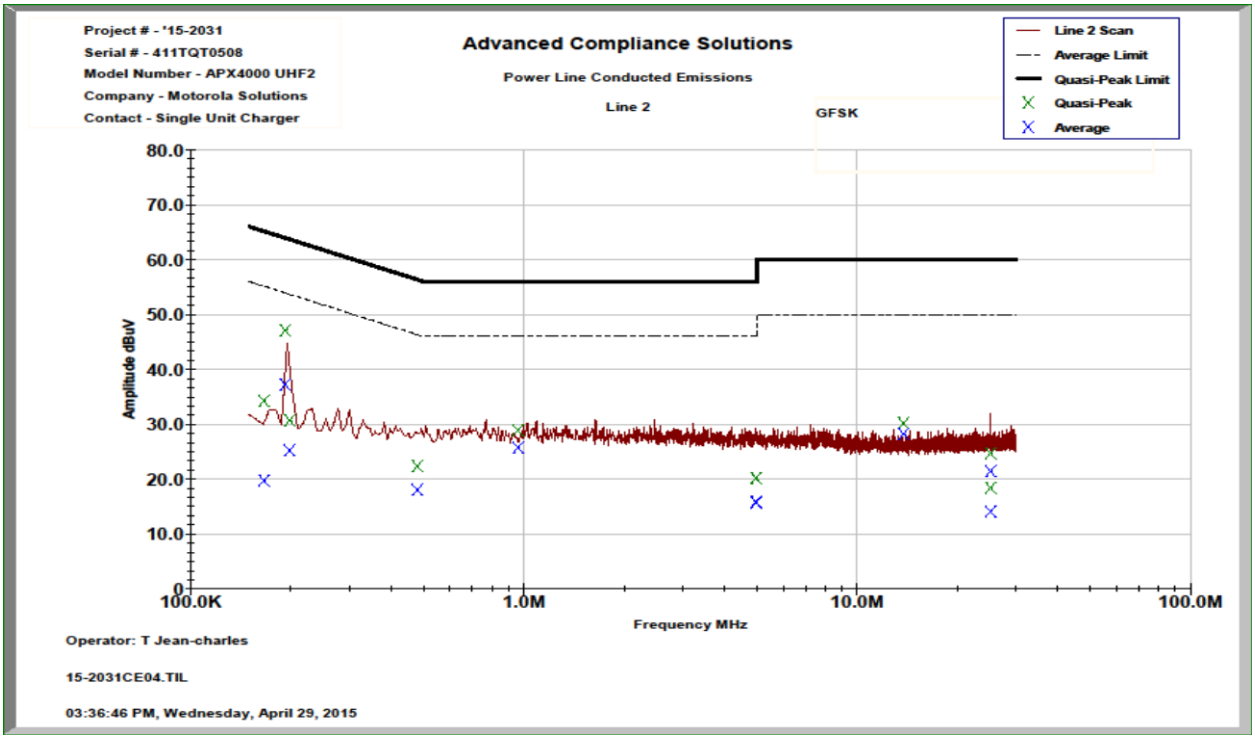


Figure 7.2.2-2: Conducted Emissions Results – Line 2

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: 15-2031CE04
Power Supply Description: 14 VDC

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									
0.15	28.32	11.53	10.05	38.37	21.58	66.00	56.00	27.6	34.4
0.1926	34.67	24.72	10.04	44.71	34.76	63.92	53.92	19.2	19.2
0.199888	20.629	14.984	10.04	30.67	25.02	63.62	53.62	32.9	28.6
0.48	12.357	7.928	10.03	22.39	17.96	56.34	46.34	34.0	28.4
1.09017	18.2	15.06	10.04	28.24	25.10	56.00	46.00	27.8	20.9
4.98	9.682	5.244	10.24	19.92	15.48	56.00	46.00	36.1	30.5
4.9801	9.567	5.282	10.24	19.81	15.52	56.00	46.00	36.2	30.5
7.0518	21.98	17.71	10.36	32.34	28.07	60.00	50.00	27.7	21.9
7.68205	11.704	7.832	10.38	22.08	18.21	60.00	50.00	37.9	31.8
25.1592	7.379	2.921	11.07	18.45	13.99	60.00	50.00	41.6	36.0
Line 2									
0.166	24.21	9.679	10.06	34.27	19.74	65.16	55.16	30.9	35.4
0.1927	37.056	27.21	10.05	47.11	37.26	63.92	53.92	16.8	16.7
0.198588	20.648	15.184	10.05	30.70	25.24	63.67	53.67	33.0	28.4
0.48	12.341	7.999	10.04	22.38	18.04	56.34	46.34	34.0	28.3
0.9615	18.86	15.7	10.06	28.92	25.76	56.00	46.00	27.1	20.2
4.98	9.9	5.395	10.26	20.16	15.66	56.00	46.00	35.8	30.3
4.9801	9.872	5.578	10.26	20.13	15.84	56.00	46.00	35.9	30.2
13.79	19.4	17.47	10.73	30.13	28.20	60.00	50.00	29.9	21.8
25.14	13.54	10.26	11.14	24.68	21.40	60.00	50.00	35.3	28.6
25.1518	7.259	2.916	11.14	18.40	14.06	60.00	50.00	41.6	35.9

7.3 Peak Output Power - FCC Section 15.247(b)(1)

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	5.72
2441	6.66
2480	7.33

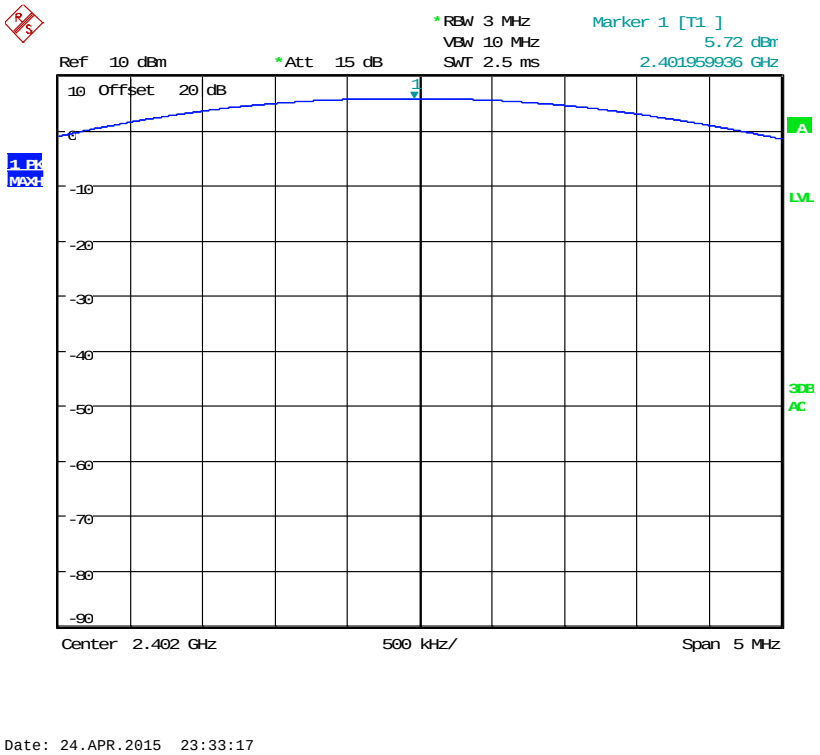


Figure 7.3.2-1: RF Output Power (GFSK) - Low Channel

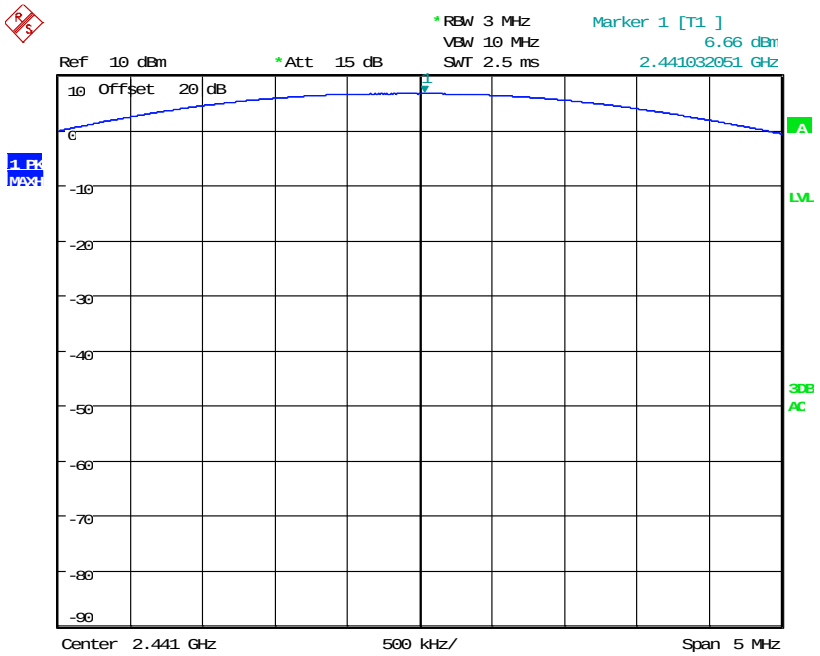


Figure 7.3.2-2: RF Output Power (GFSK) - Middle Channel

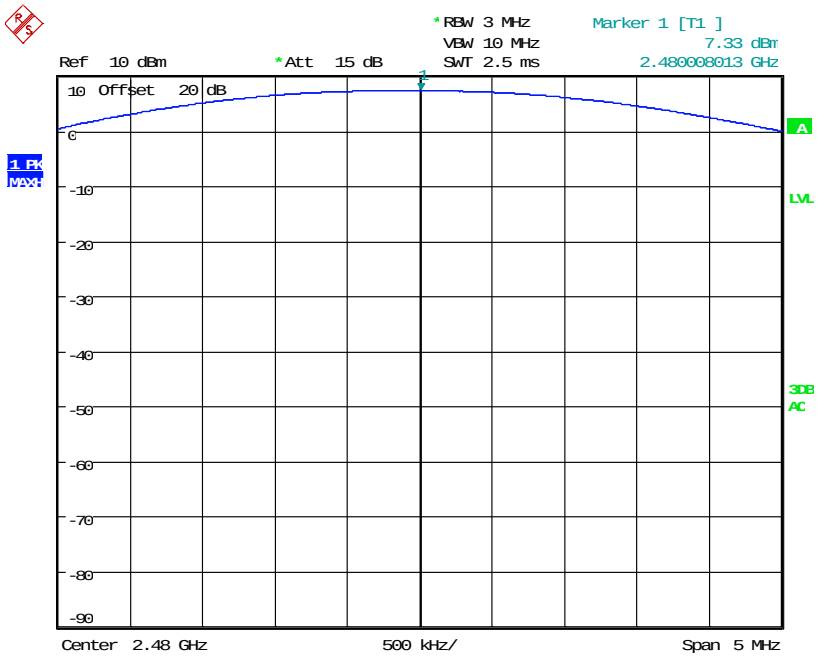


Figure 7.3.2-3: RF Output Power (GFSK) - High Channel

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

Frequency (MHz)	Power (dBm)
2402	6.15
2441	7.10
2480	7.37

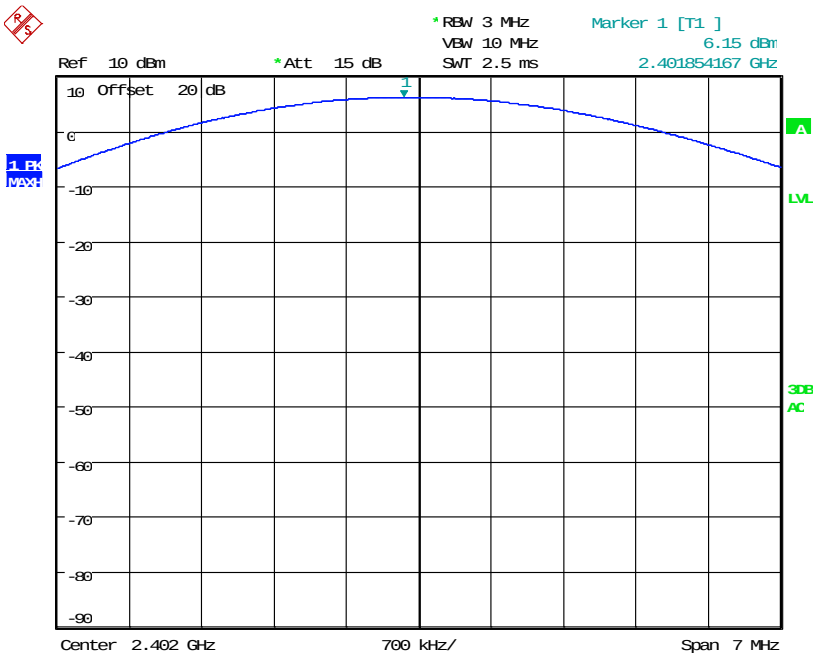


Figure 7.3.2-4: RF Output Power (π/4 DQPSK) - Low Channel

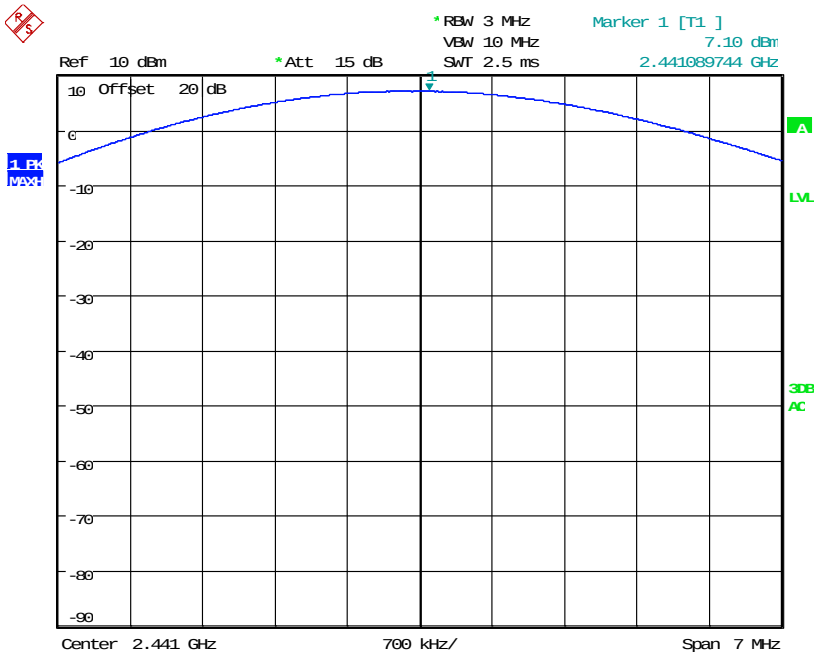


Figure 7.3.2-5: RF Output Power (π/4 DQPSK) - Middle Channel

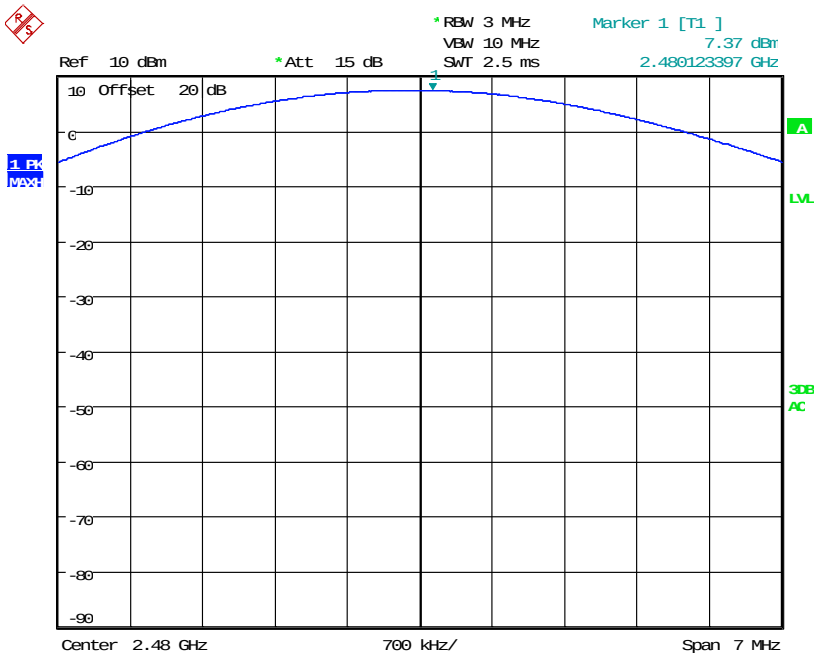


Figure 7.3.2-6: RF Output Power (π/4 DQPSK) - High Channel

Table 7.3.2-3 RF Output Power (8DPSK)

Frequency (MHz)	Power (dBm)
2402	6.93
2441	7.85
2480	7.84

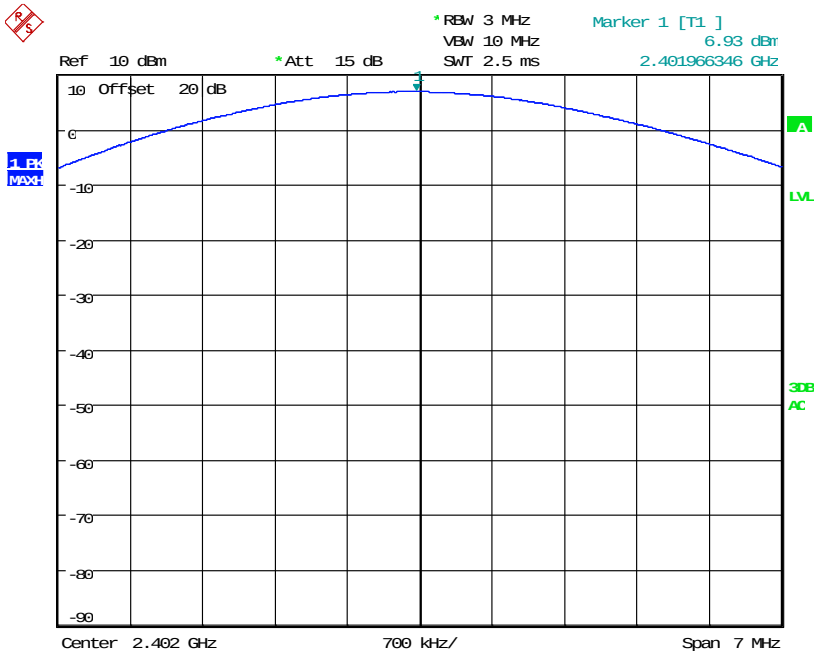


Figure 7.3.2-7: RF Output Power (8DPSK) - Low Channel

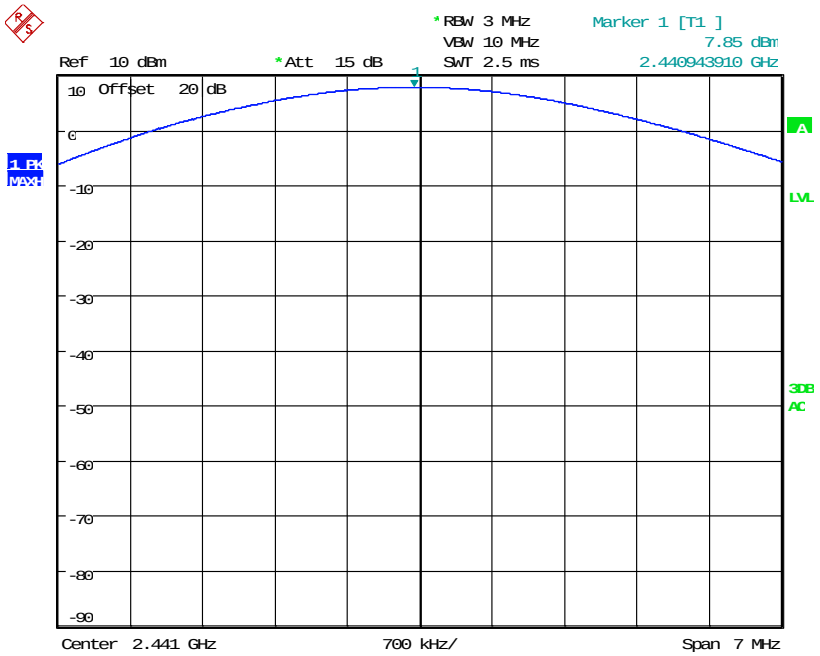


Figure 7.3.2-8: RF Output Power (8DPSK) - Middle Channel

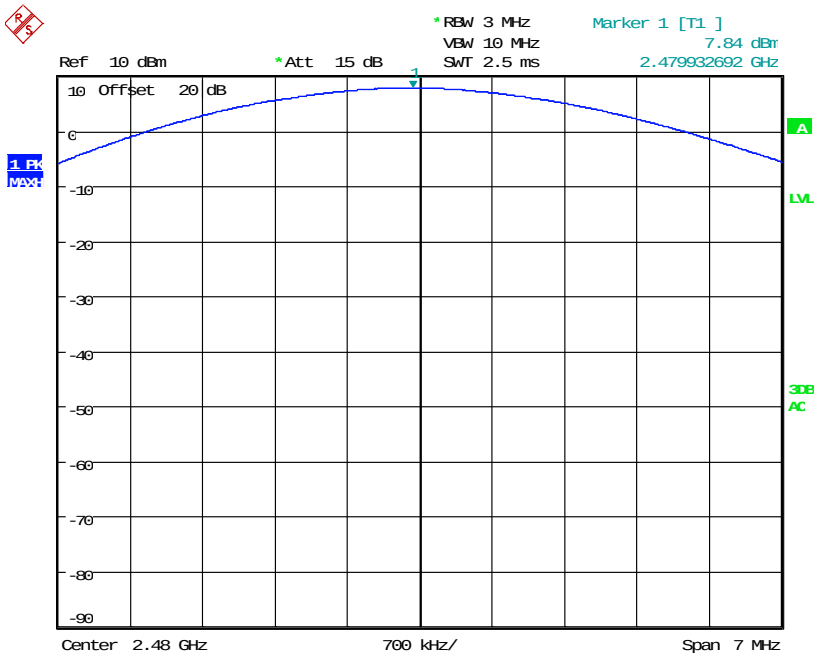


Figure 7.3.2-9: RF Output Power (8DPSK) - High Channel

7.4 Channel Usage Requirements

7.4.1 Carrier Frequency Separation – FCC: Section 15.247(a)(1)

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 was set to 30% of the channel spacing.

7.4.1.2 Measurement Results

Results are shown below:

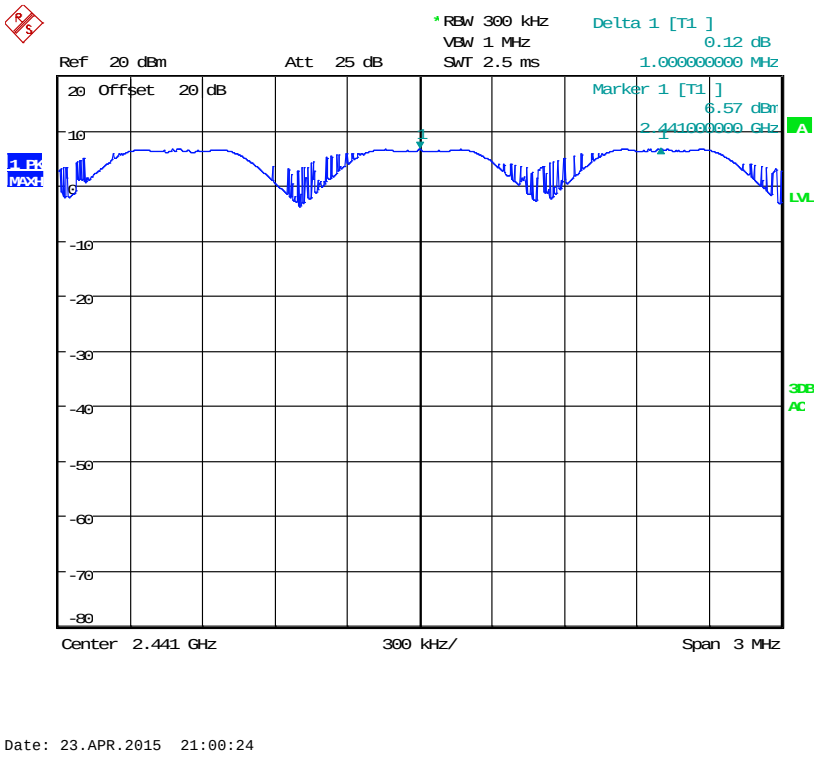


Figure 7.4.1.2-1: Carrier Frequency Separation

7.4.2 Number of Hopping Channels – FCC: Section 15.247(a)(1)(iii)

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:

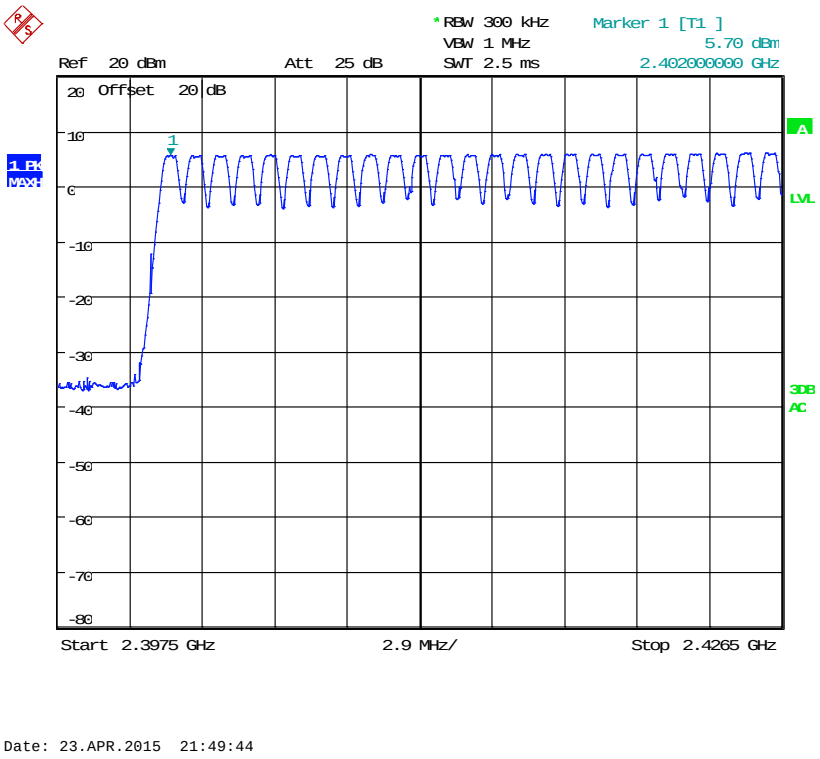


Figure 7.4.2.2-1: Number of Hopping Channels (1 – 25)

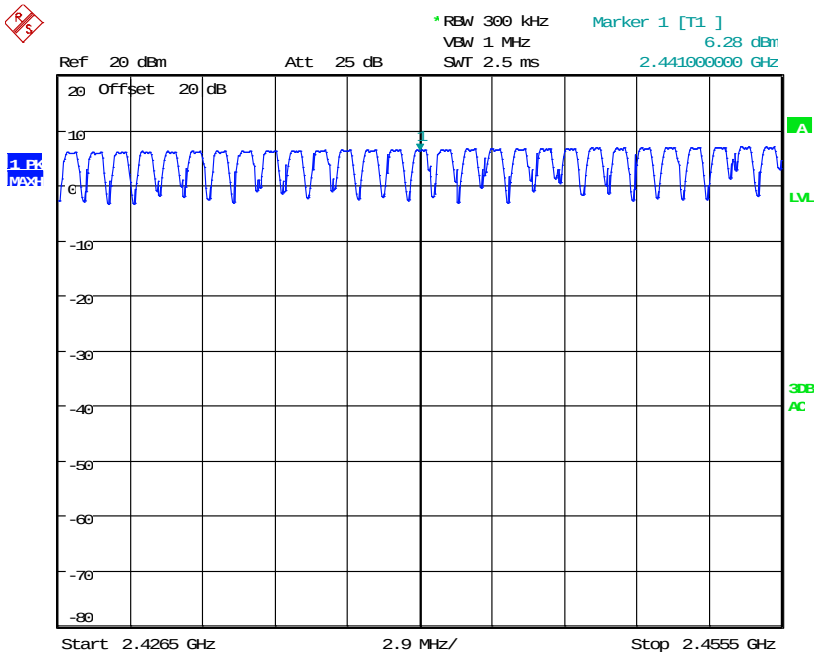


Figure 7.4.2.2-2: Number of Hopping Channels (26 – 54)

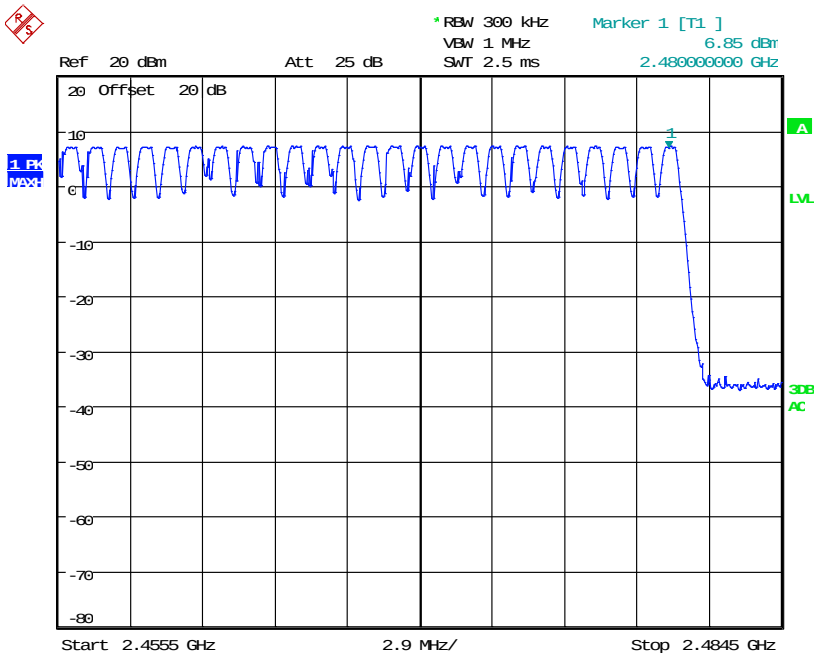


Figure 7.4.2.2-3: Number of Hopping Channels (55 – 79)

7.4.3 Channel Dwell Time – FCC: Section 15.247(a)(1)(iii))

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	0.3984359	127.50	400	PASS
DH3	400	5.06	160	1.656449	265.03	400	PASS
DH5	266.67	3.38	106.67	2.906449	310.03	400	PASS

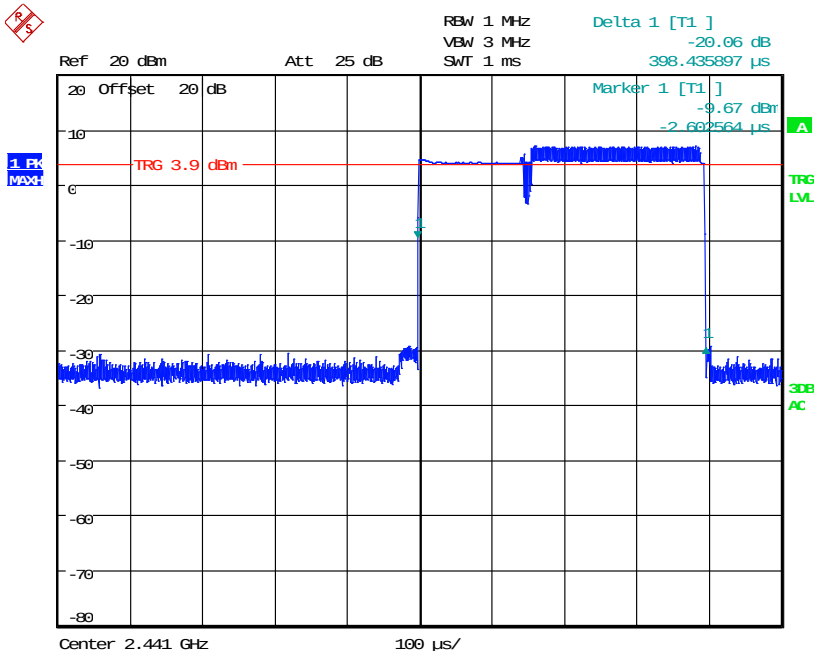


Figure 7.4.3.2-1: Channel Dwell Time – DH1

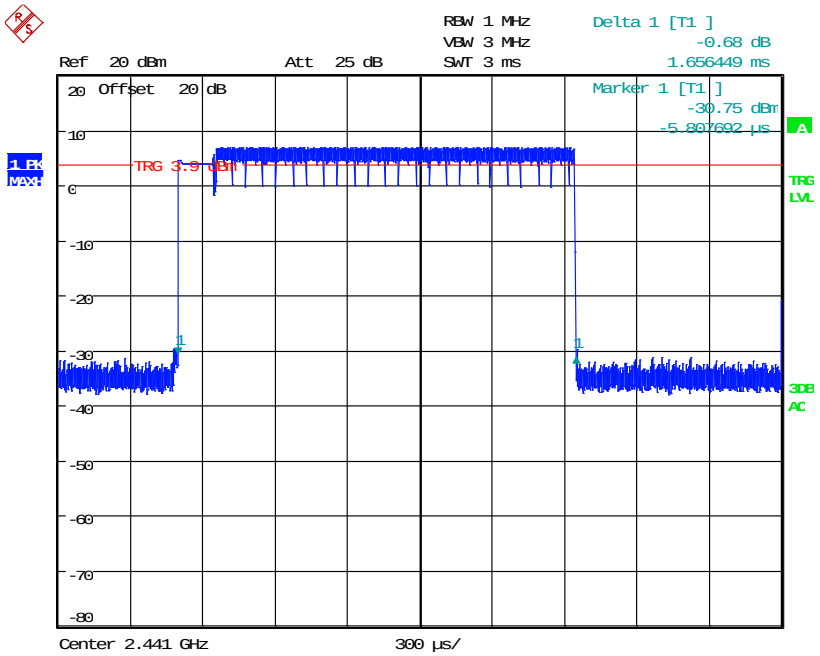


Figure 7.4.3.2-2: Channel Dwell Time – DH3

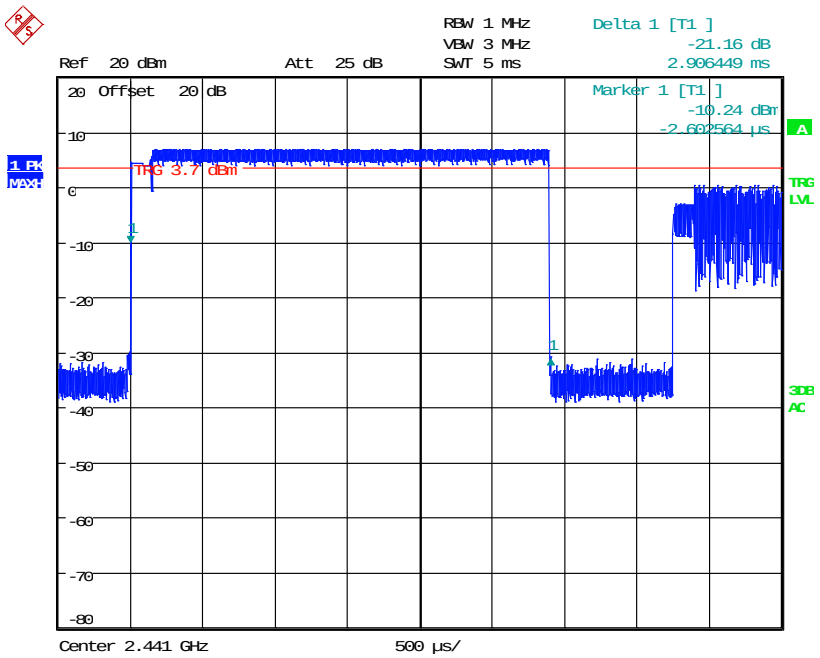


Figure 7.4.3.2-3: Channel Dwell Time – DH5

7.4.4 20dB / 99% Bandwidth - FCC: Section 15.247(a)(1)

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 between 2 to 5 times the estimated bandwidth of the emission. The RBW was set to 1% to 5% 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. The RBW was set to 1% to 5% of the approximated bandwidth. . The occupied 99% bandwidth was measured using the automated OBW measurement function of the SA.

7.4.4.2 Measurement Results

Results are shown below:

Table 7.4.4.2-1: 20dB / 99% Bandwidth (GFSK)

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
2402	961.5385	870.1923
2441	966.3462	879.8077
2480	961.5385	860.5769

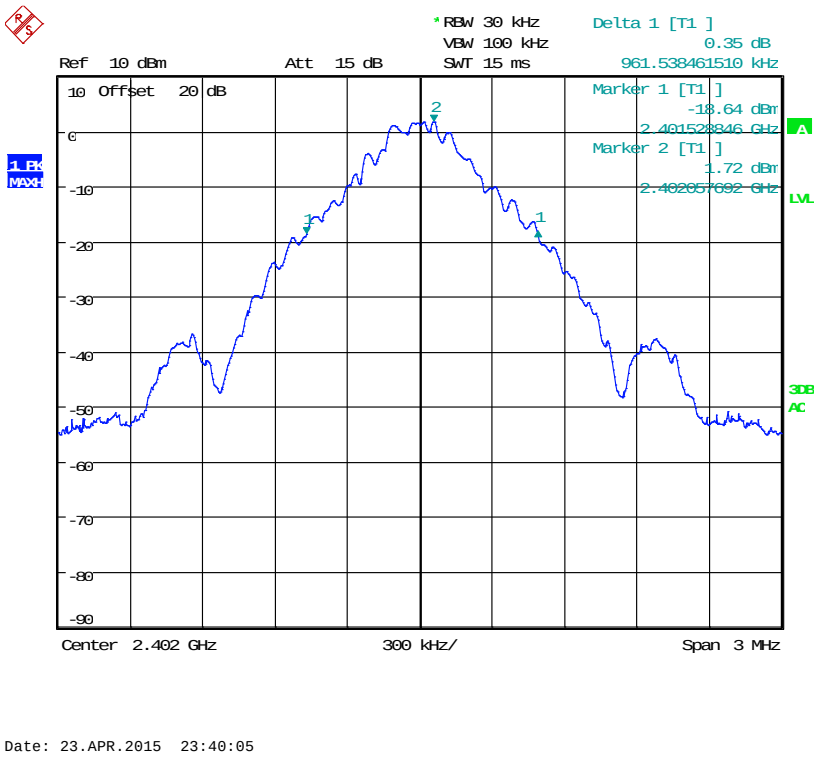


Figure 7.4.4.2-1: 20dB BW Low Channel (GFSK)

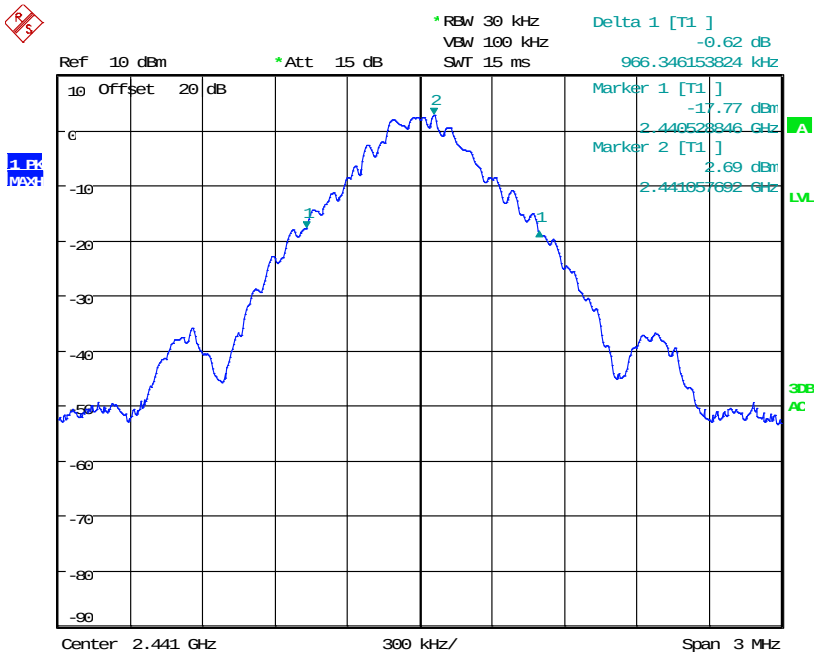


Figure 7.4.4.2-2: 20dB BW Middle Channel (GFSK)

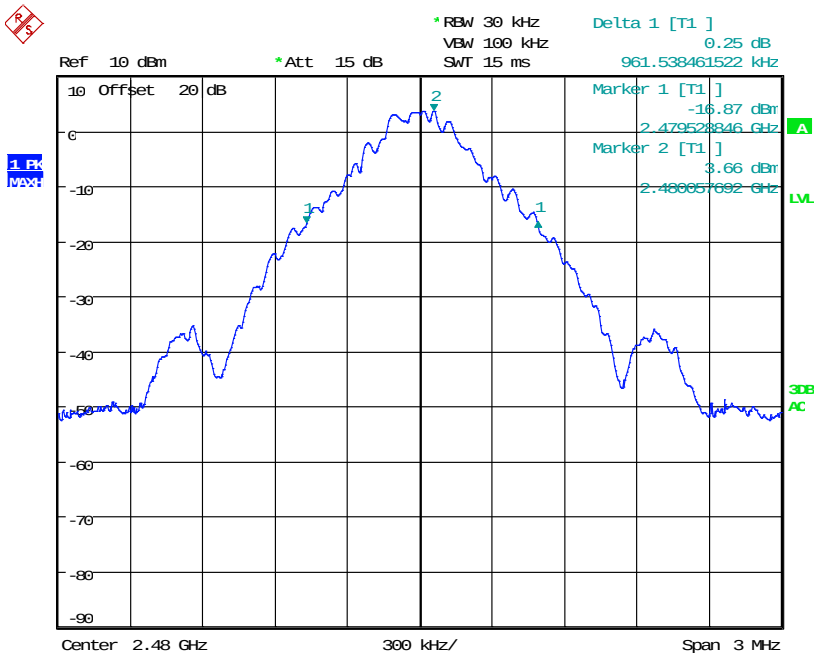


Figure 7.4.4.2-3: 20dB BW High Channel (GFSK)

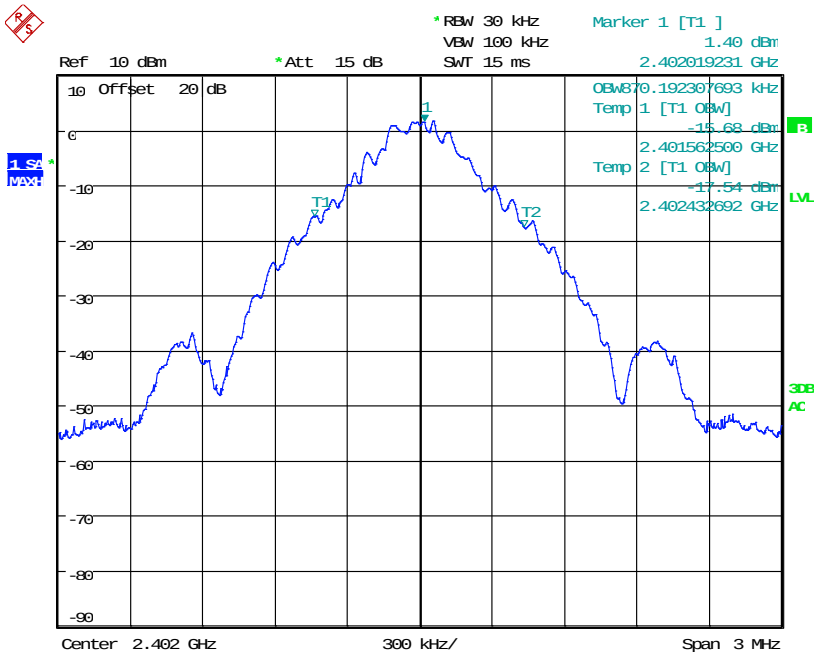


Figure 7.4.4.2-4: 99% OBW Low Channel (GFSK)

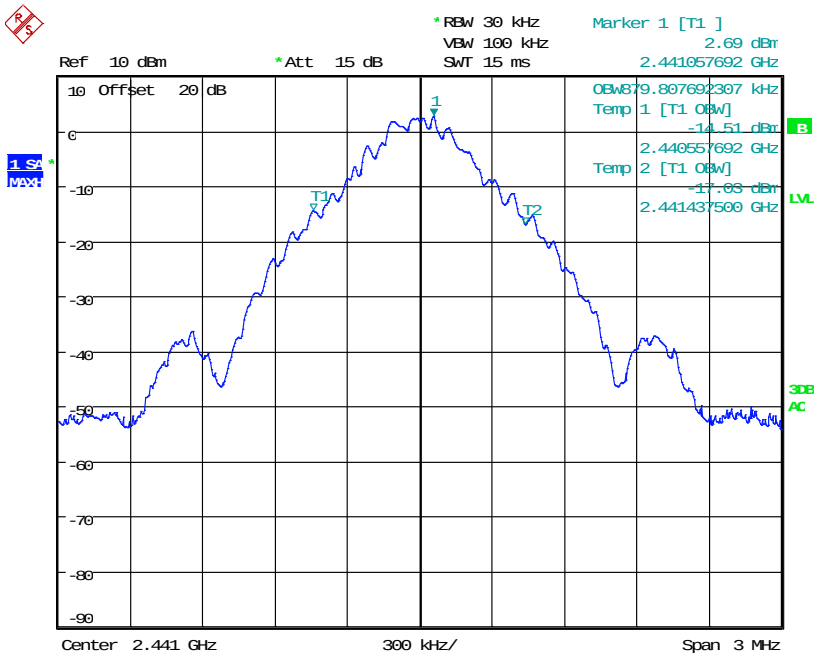


Figure 7.4.4.2-5: 99% OBW Middle Channel (GFSK)

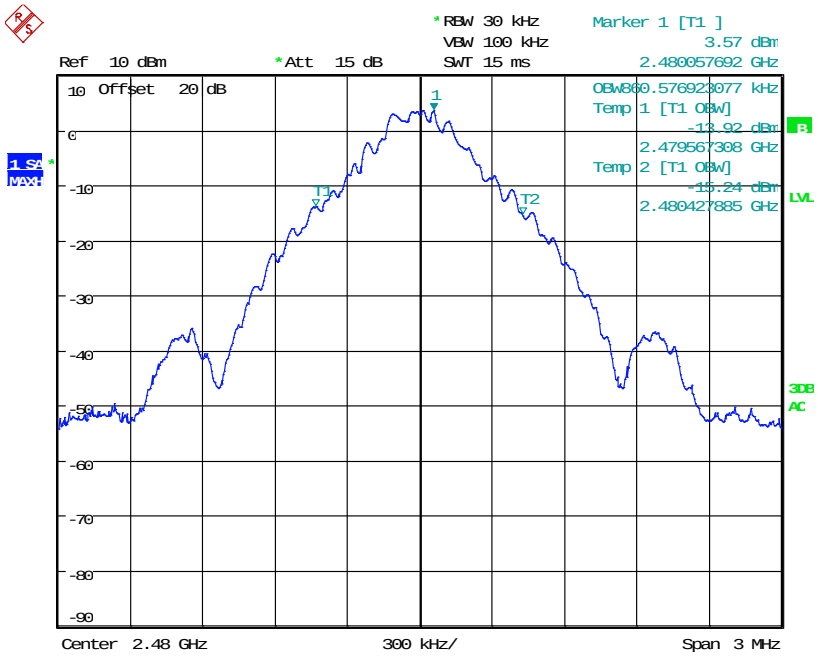


Figure 7.4.4.2-6: 99% OBW High Channel (GFSK)

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

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
2402	1402.2436	1221.1538
2441	1394.2308	1230.7692
2480	1418.2692	1288.4615

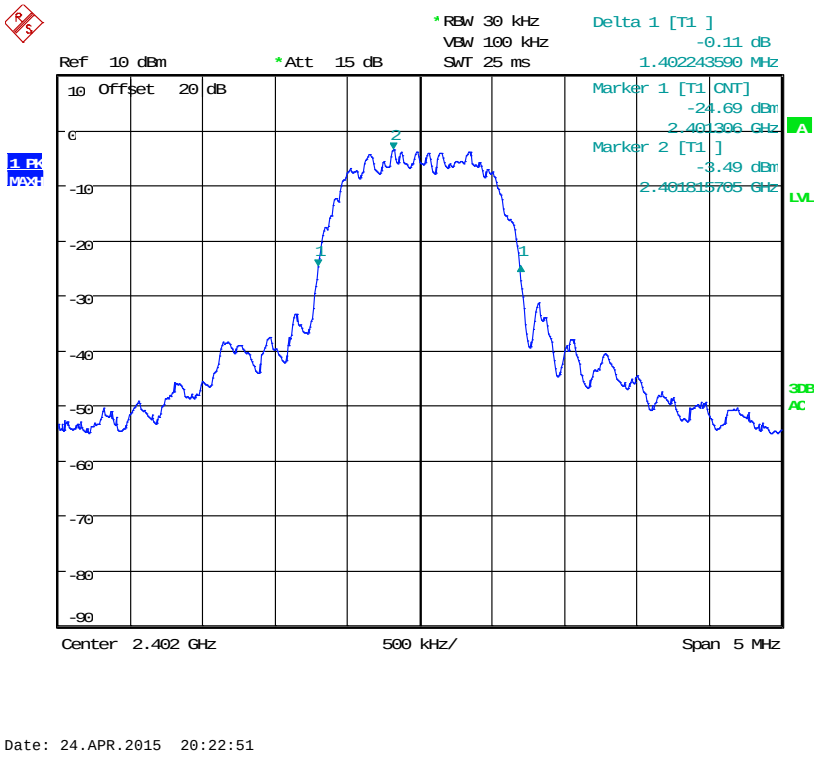


Figure 7.4.4.2-7: 20dB BW Low Channel (π/4 DQPSK)

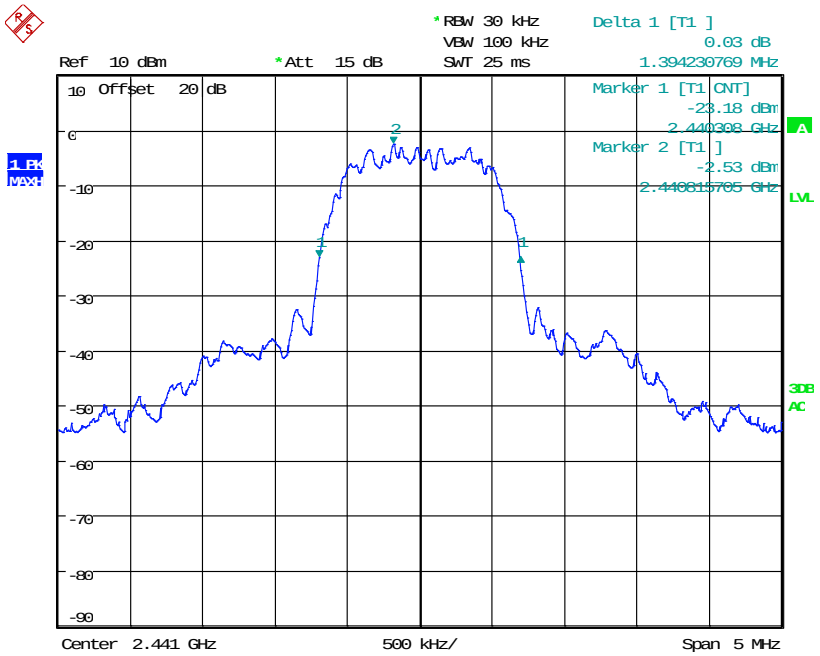


Figure 7.4.4.2-8: 20dB BW Middle Channel (π/4 DQPSK)

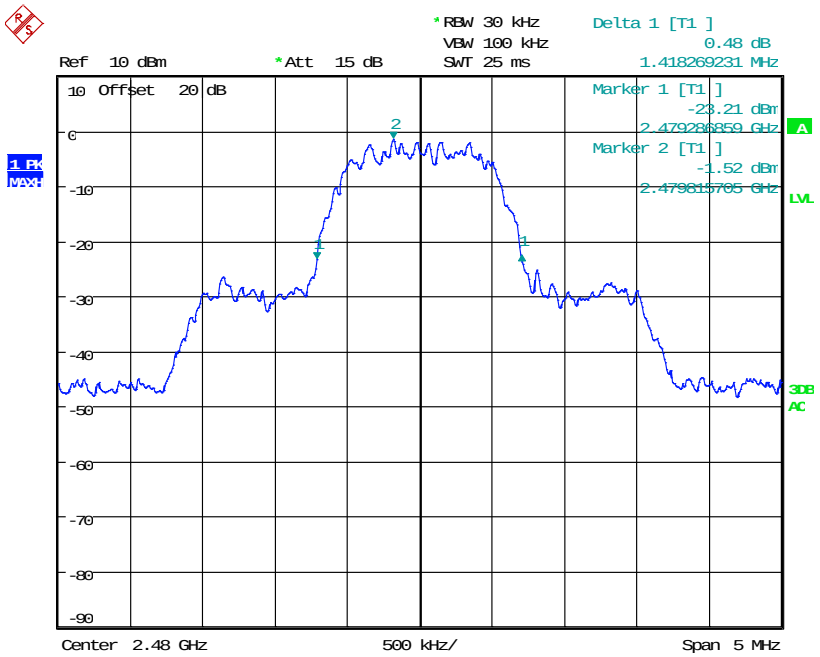


Figure 7.4.4.2-9: 20dB BW High Channel (π/4 DQPSK)

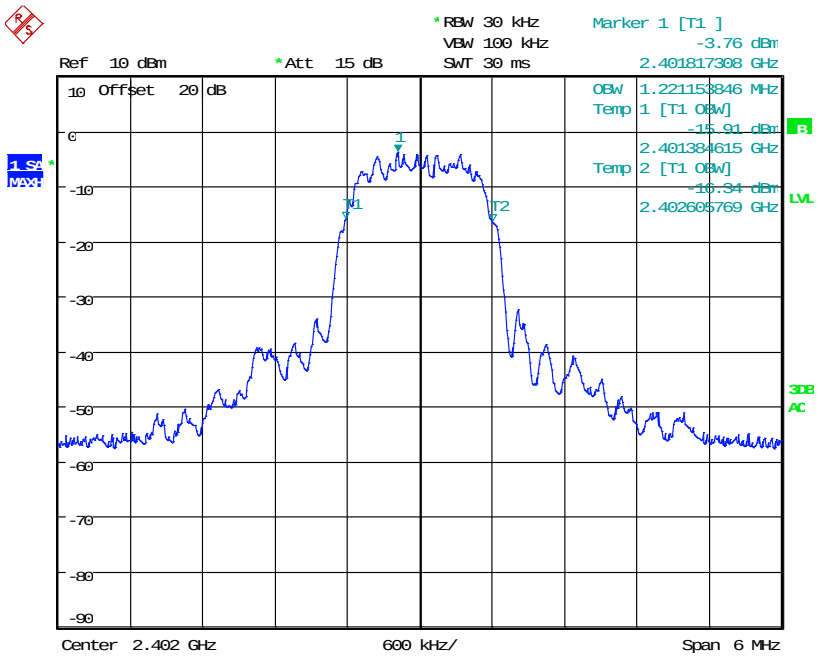


Figure 7.4.4.2-10: 99% OBW Low Channel (π/4 DQPSK)

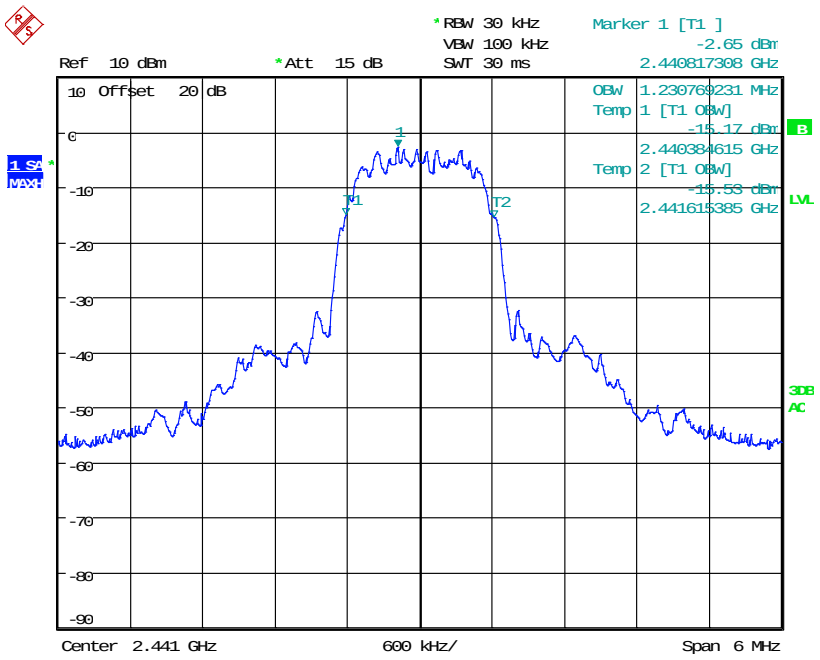


Figure 7.4.4.2-11: 99% OBW Middle Channel (π/4 DQPSK)

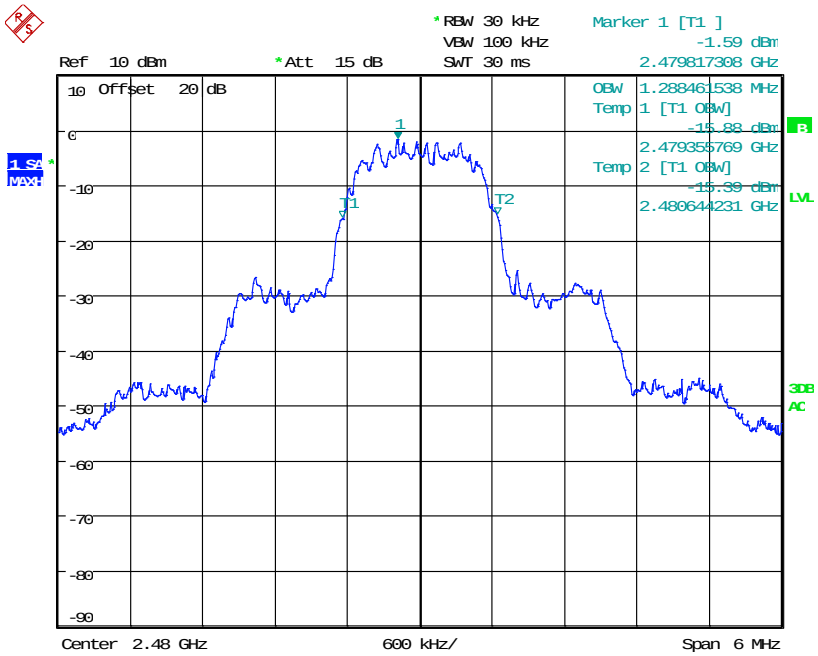


Figure 7.4.4.2-12: 99% OBW High Channel (π/4 DQPSK)

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

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
2402	1386.2179	1230.7692
2441	1386.2179	1230.7692
2480	1410.2564	1278.8461

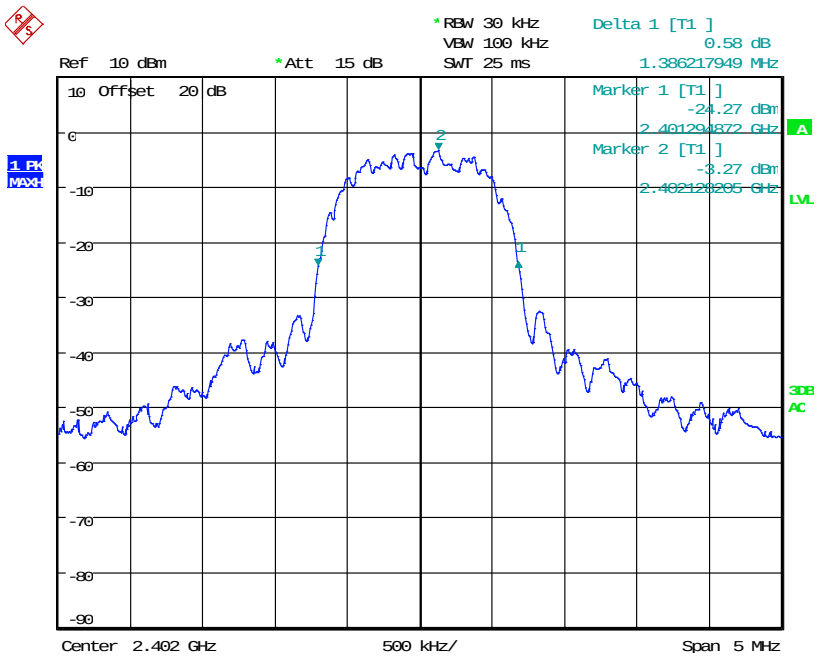


Figure 7.4.4.2-13: 20dB BW Low Channel (8DPSK)

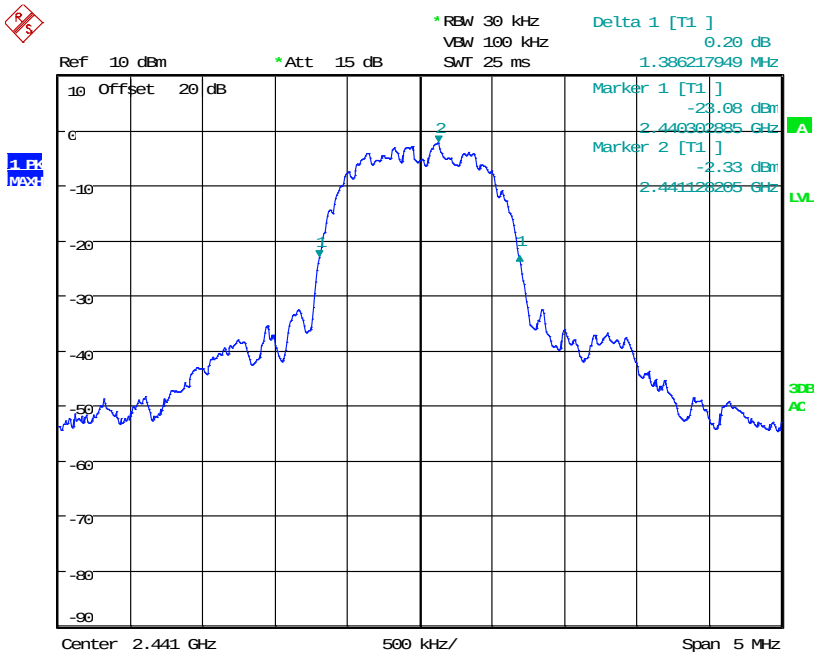


Figure 7.4.4.2-14: 20dB BW Middle Channel (8DPSK)

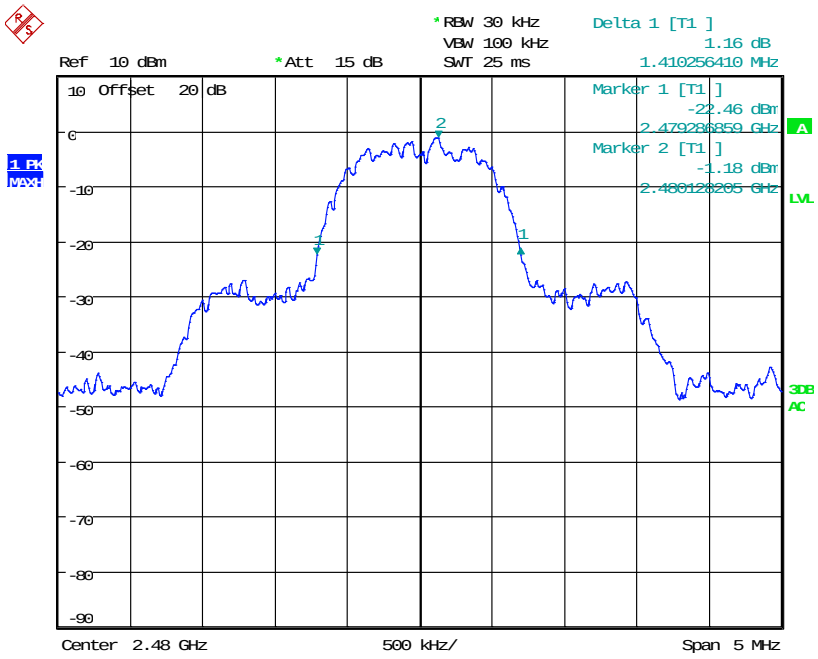


Figure 7.4.4.2-15: 20dB BW High Channel (8DPSK)

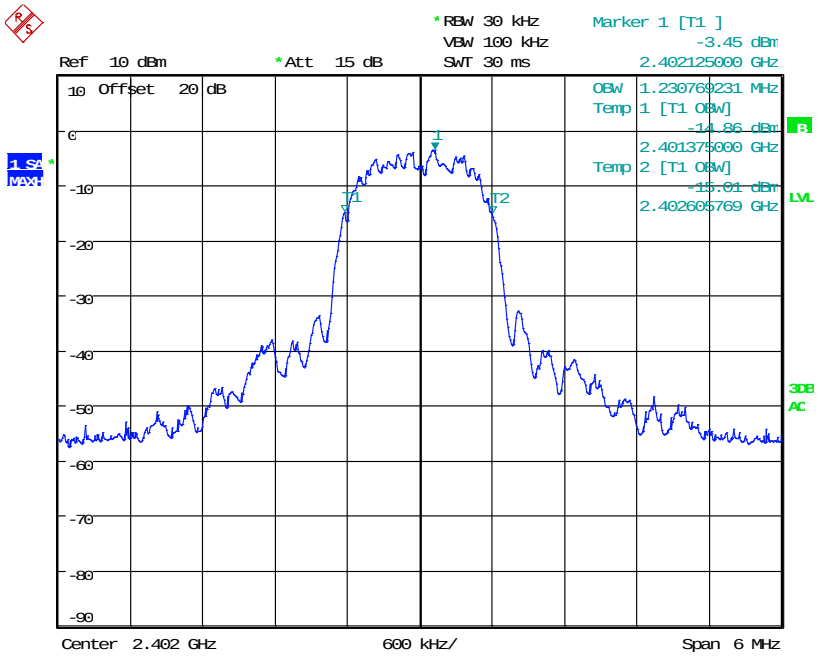


Figure 7.4.4.2-16: 99% OBW Low Channel (8DPSK)

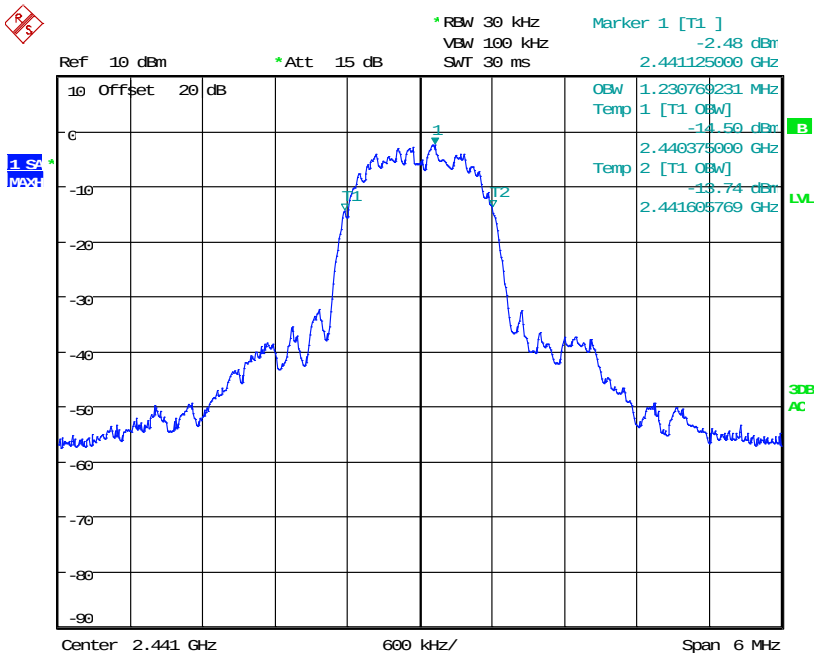


Figure 7.4.4.2-17: 99% OBW Middle Channel (8DPSK)

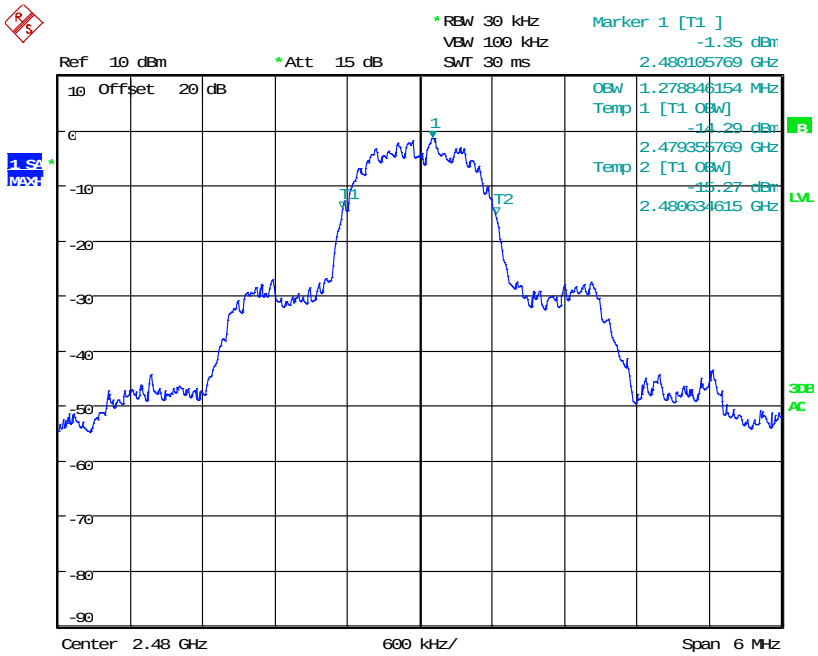


Figure 7.4.4.2-18: 99% OBW High Channel (8DPSK)

7.5 Band-Edge Compliance and Spurious Emissions-FCC 15.247(d)

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

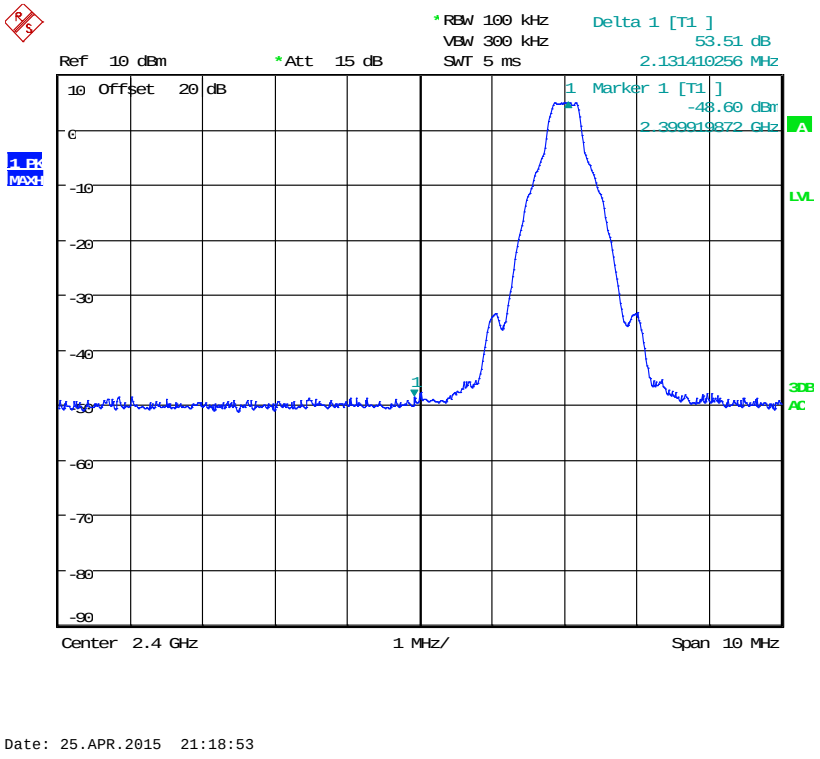


Figure 7.5.1.2-1: Lower Band-edge (GFSK)

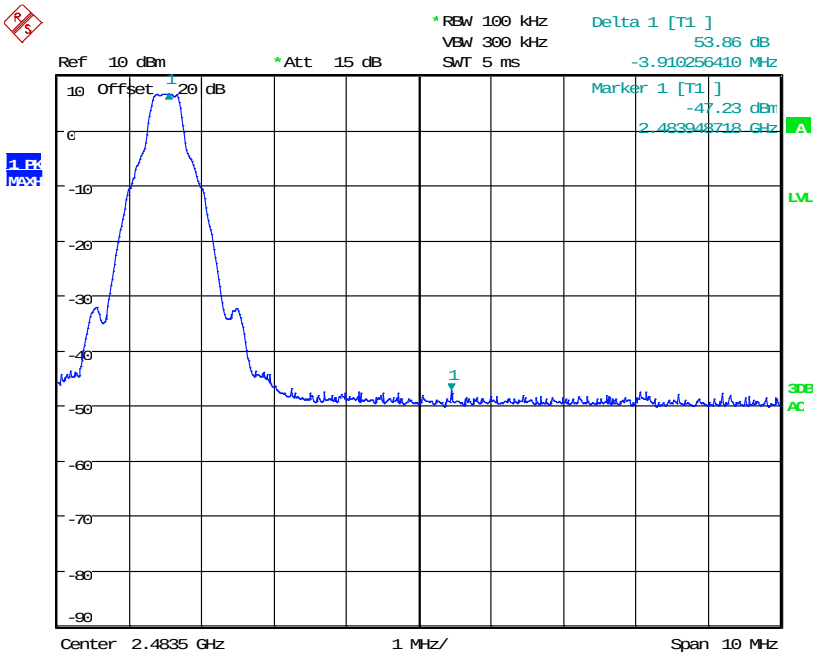


Figure 7.5.1.2-2: Upper Band-edge (GFSK)

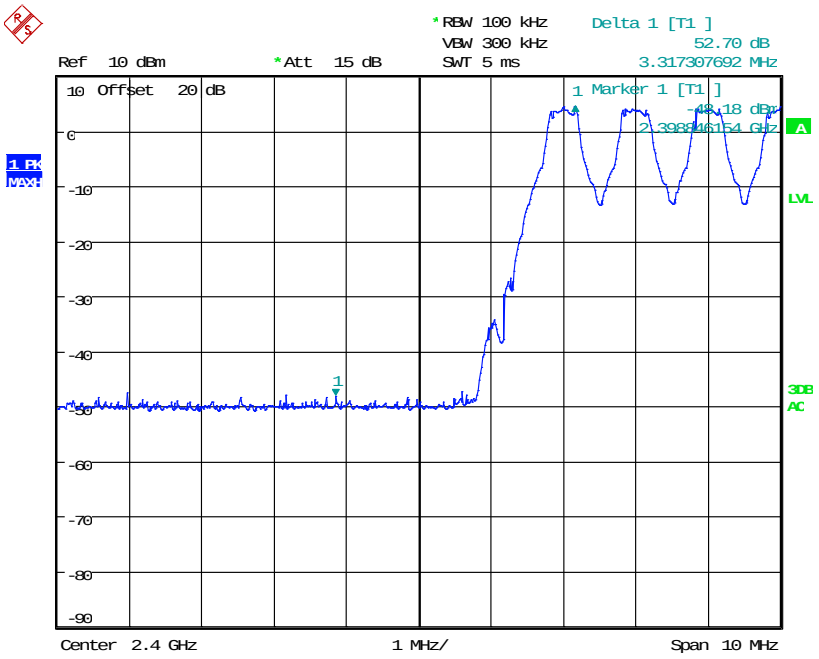


Figure 7.5.1.2-3: Lower Band-edge – Hopping Mode (GFSK)

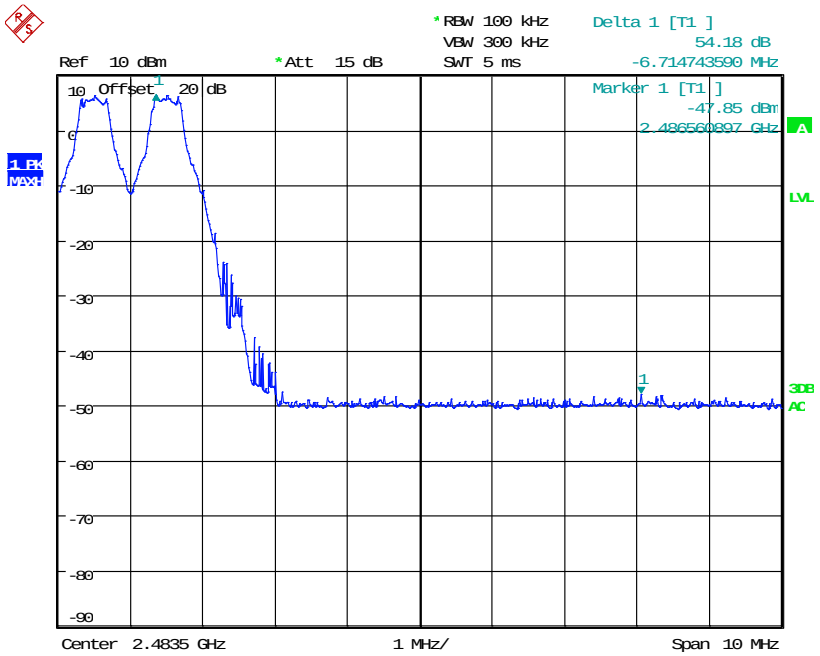


Figure 7.5.1.2-4: Upper Band-edge – Hopping Mode (GFSK)

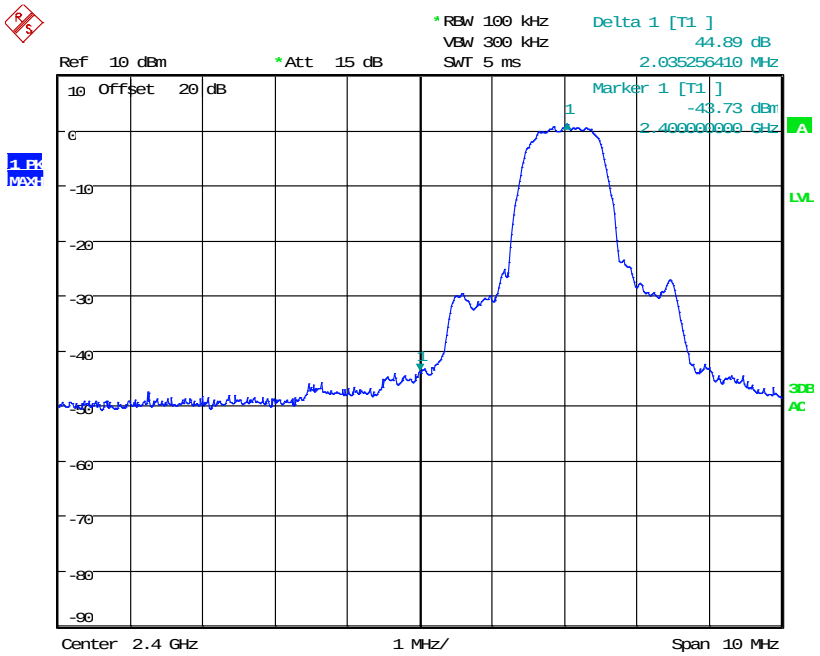


Figure 7.5.1.2-5: Lower Band-edge (π/4 DQPSK)

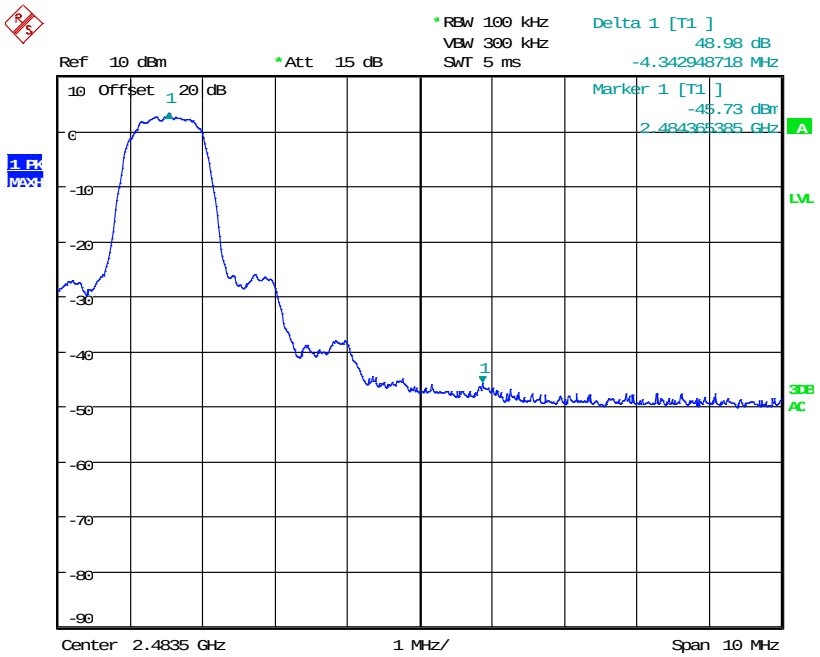


Figure 7.5.1.2-6: Upper Band-edge (π/4 DQPSK)

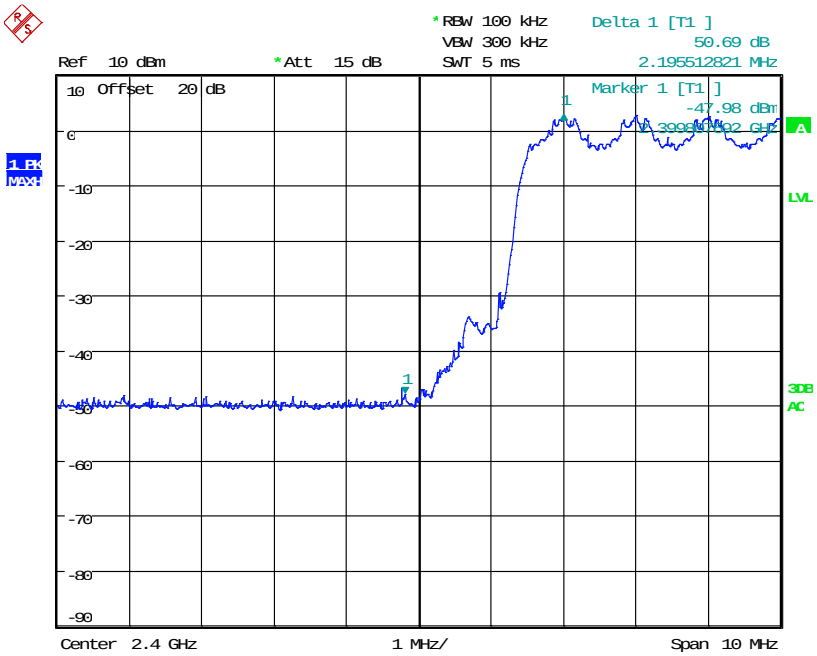


Figure 7.5.1.2-7: Lower Band-edge – Hopping Mode (π/4 DQPSK)

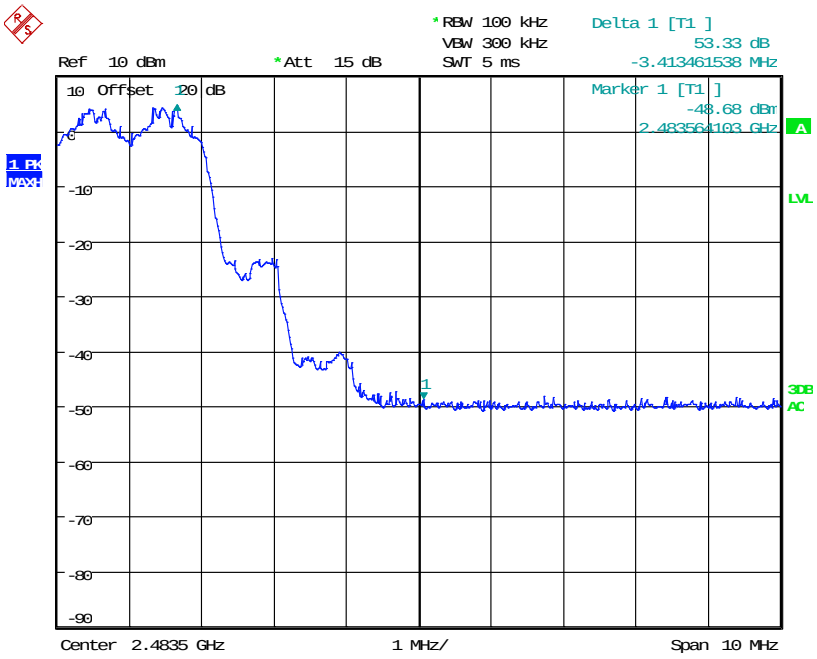


Figure 7.5.1.2-8: Upper Band-edge – Hopping Mode (π/4 DQPSK)

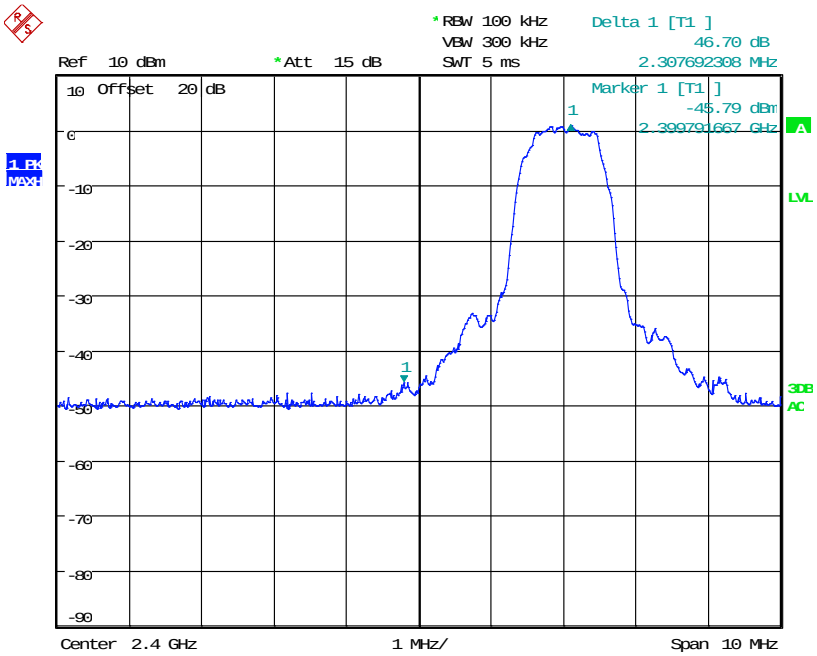


Figure 7.5.1.2-9: Lower Band-edge (8DPSK)

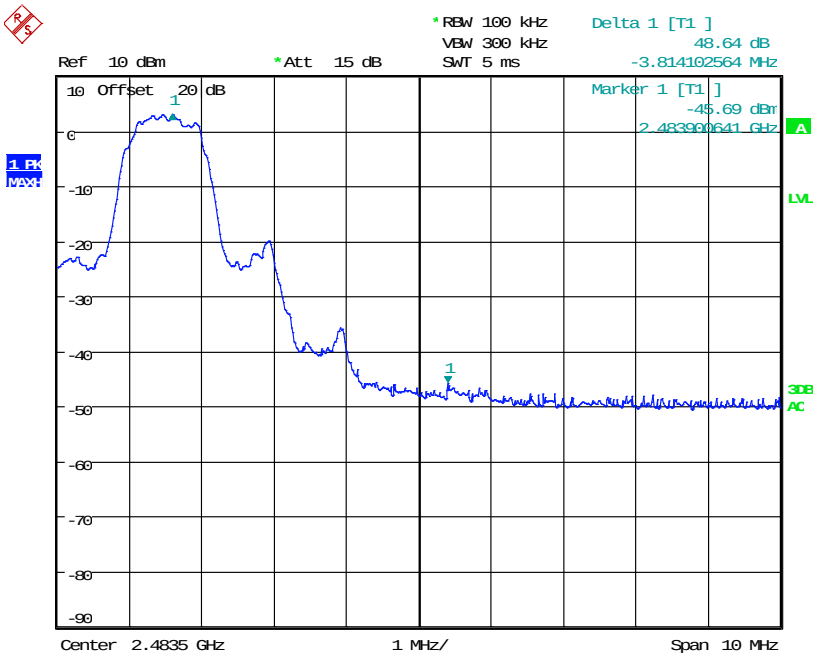


Figure 7.5.1.2-10: Upper Band-edge (8DPSK)

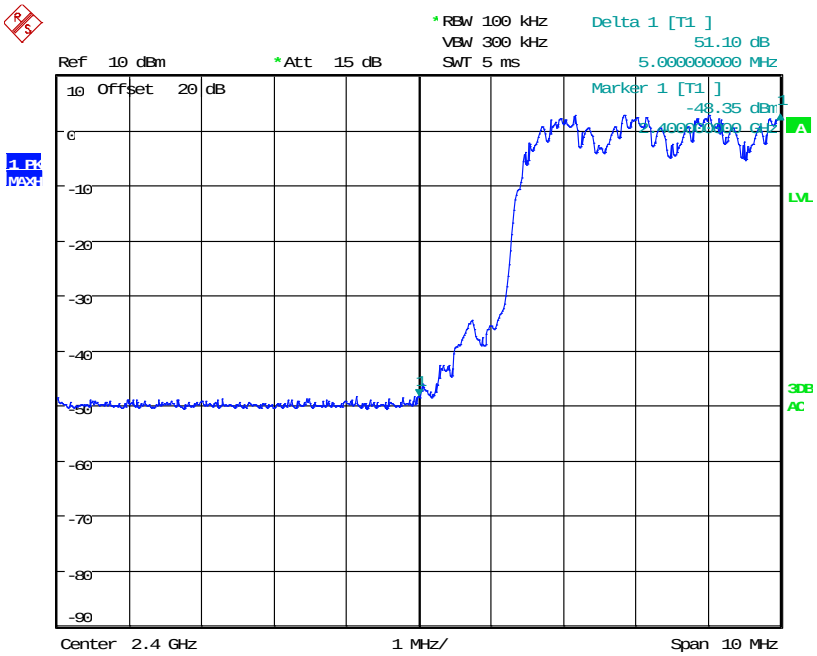


Figure 7.5.1.2-11: Lower Band-edge – Hopping Mode (8DPSK)

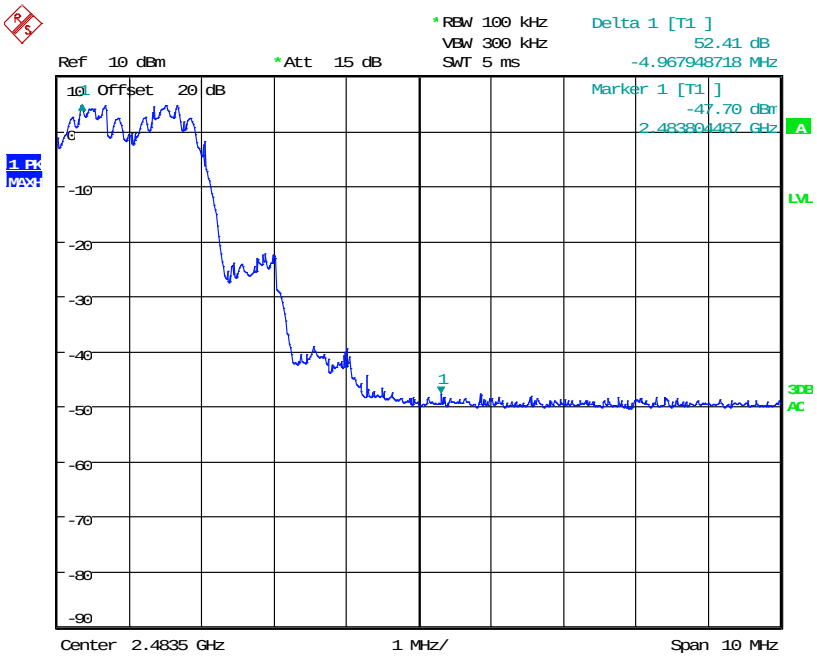


Figure 7.5.1.2-12: Upper Band-edge – Hopping Mode (8DPSK)

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:

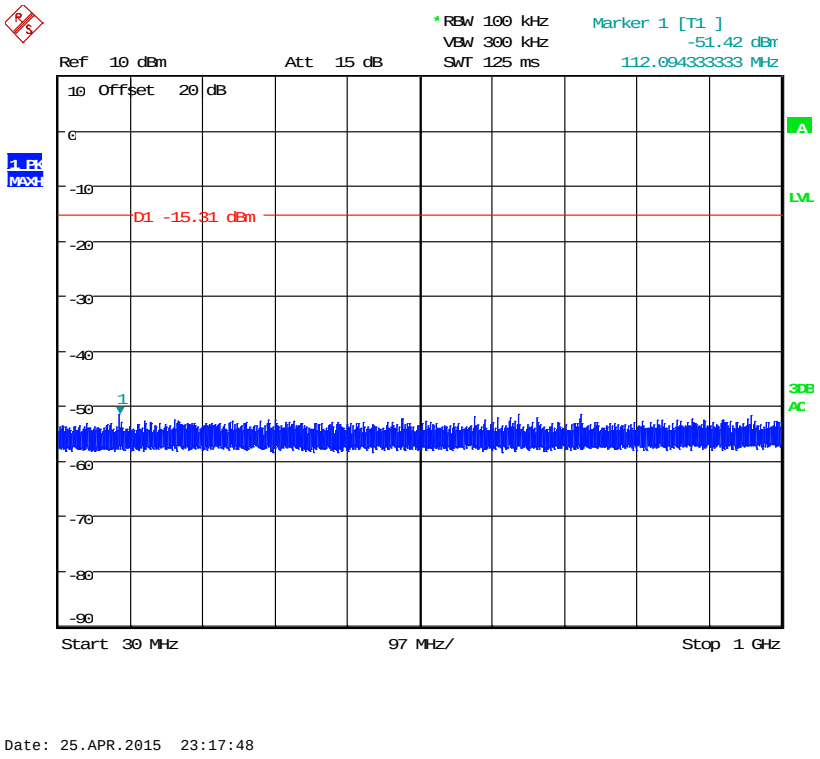


Figure 7.5.2.2-1: 30 MHz – 1 GHz – Low Channel (GFSK)

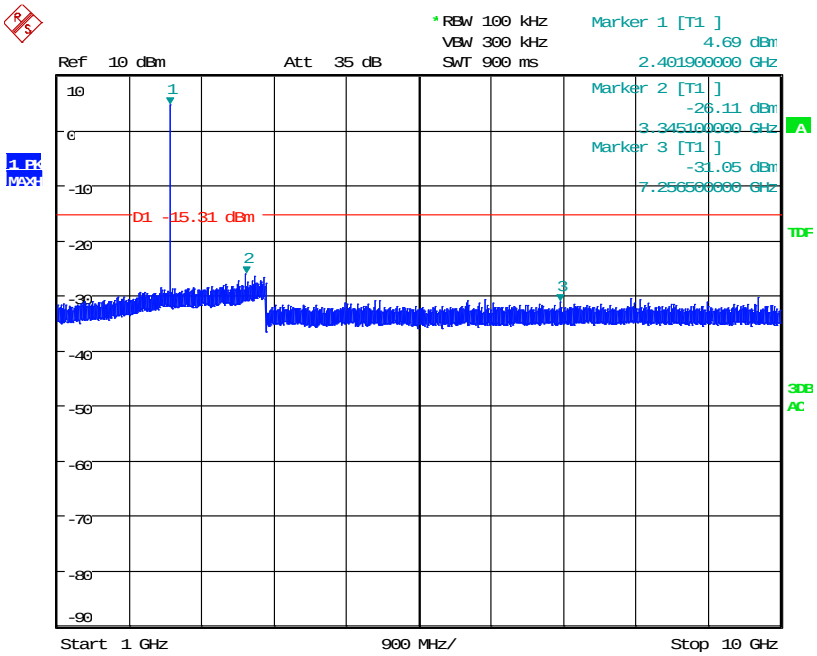


Figure 7.5.2.2-2: 1 GHz –10 GHz – Low Channel (GFSK)

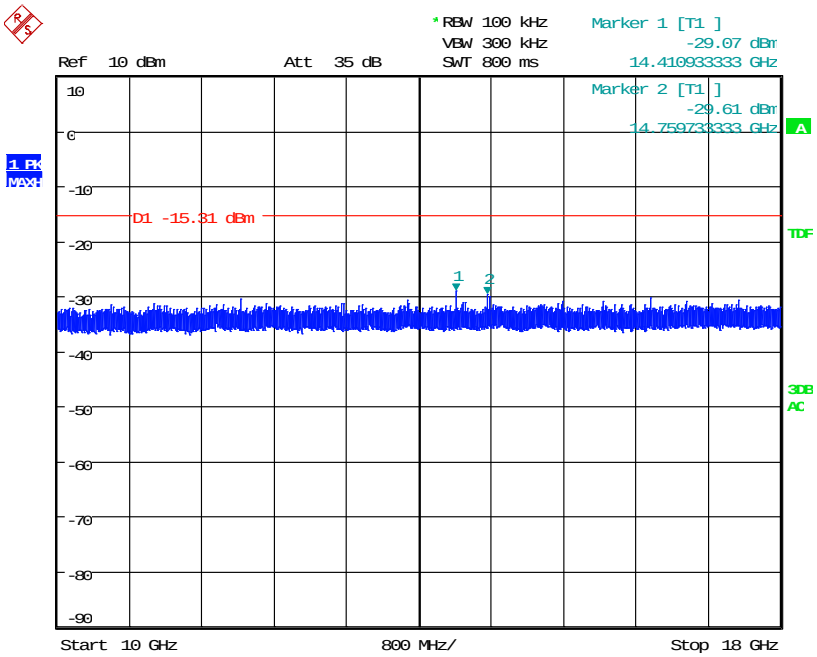


Figure 7.5.2.2-3: 10 GHz –18 GHz – Low Channel (GFSK)

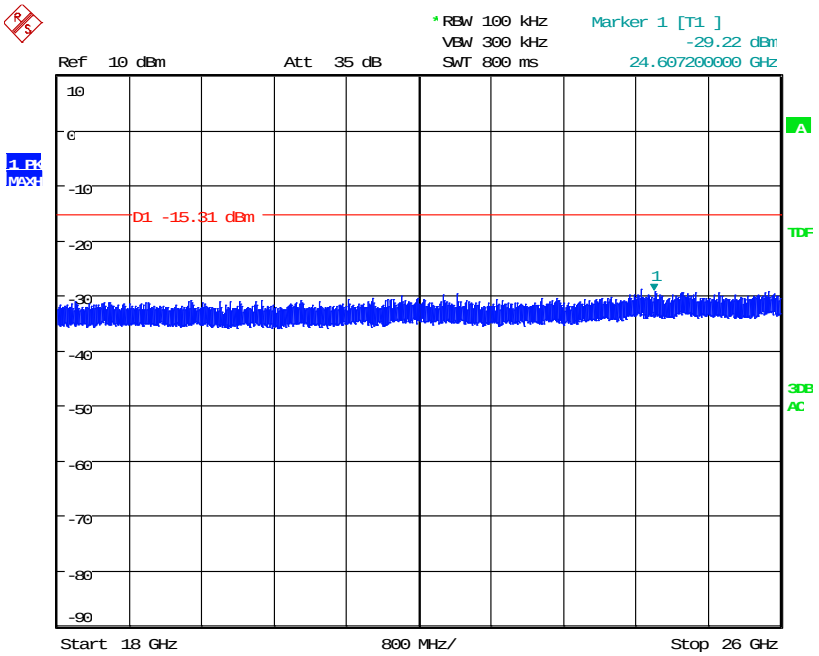


Figure 7.5.2.2-4: 18 GHz –26 GHz – Low Channel (GFSK)

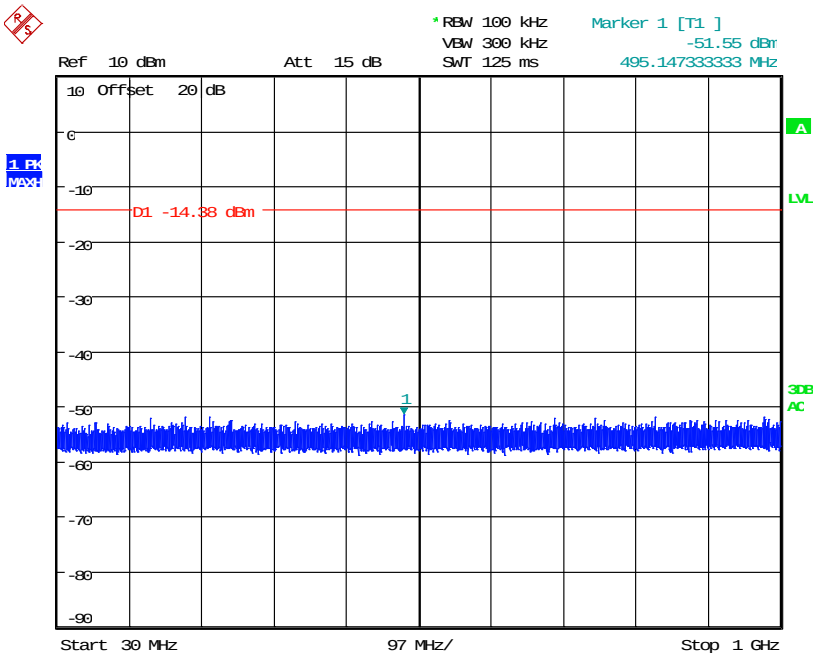
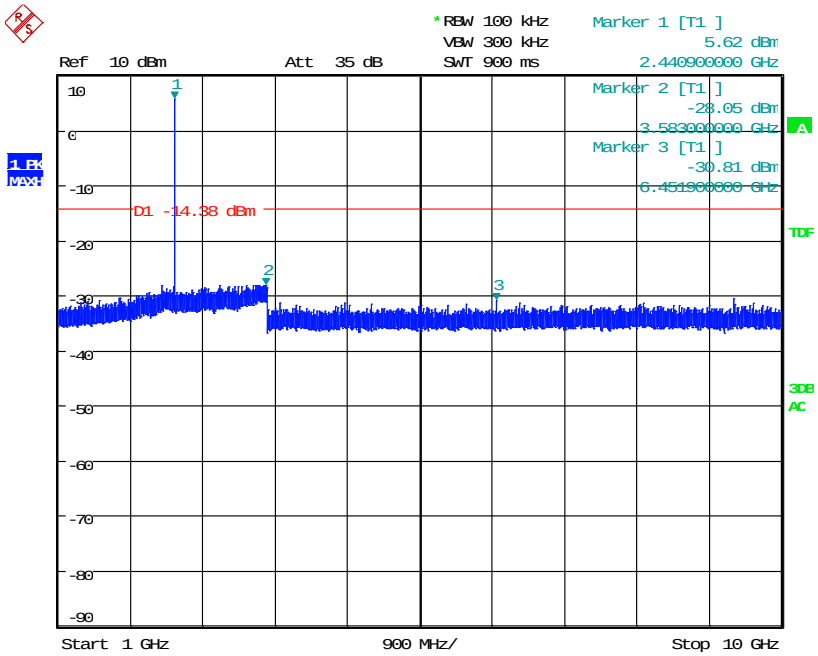
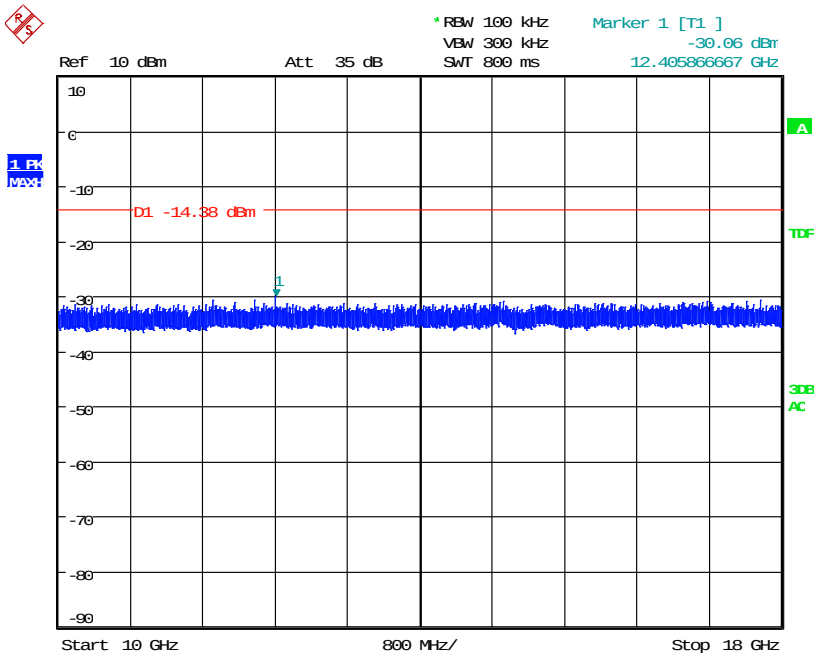


Figure 7.5.2.2-5: 30 MHz – 1 GHz –Middle Channel (GFSK)



Date: 25.APR.2015 23:28:56

Figure 7.5.2.2-6: 1 GHz –10 GHz – Middle Channel (GFSK)



Date: 25.APR.2015 23:32:42

Figure 7.5.2.2-7: 10 GHz –18 GHz – Middle Channel (GFSK)

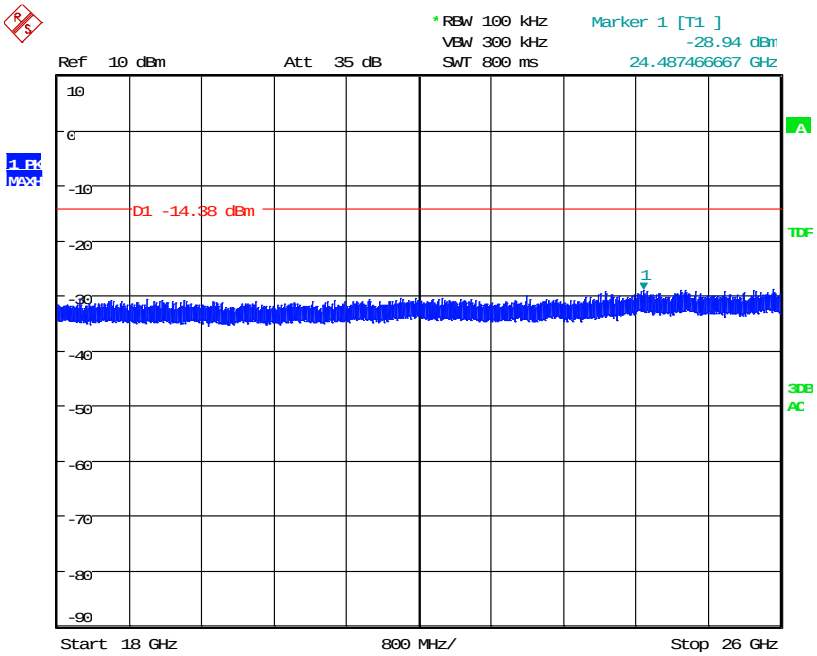


Figure 7.5.2.2-8: 18 GHz –26 GHz – Middle Channel (GFSK)

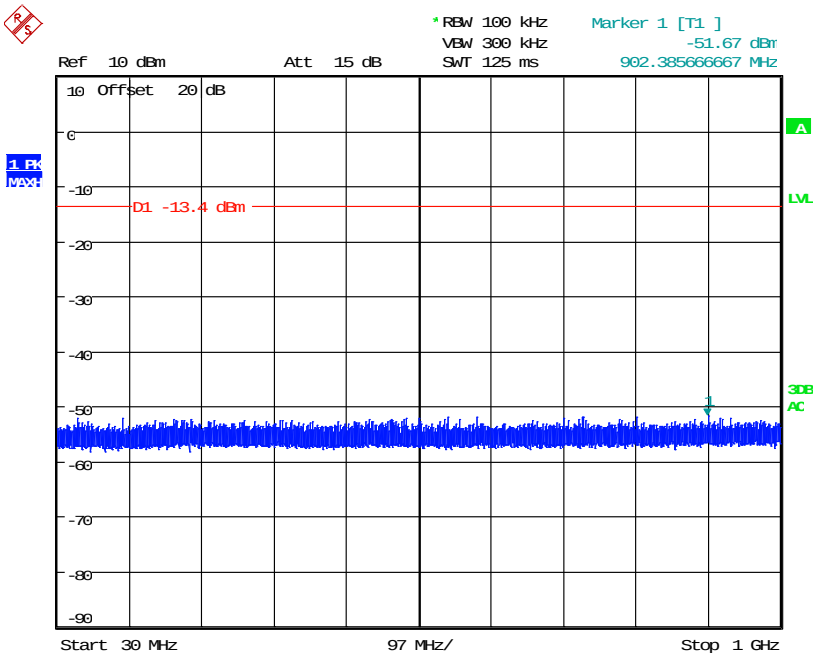
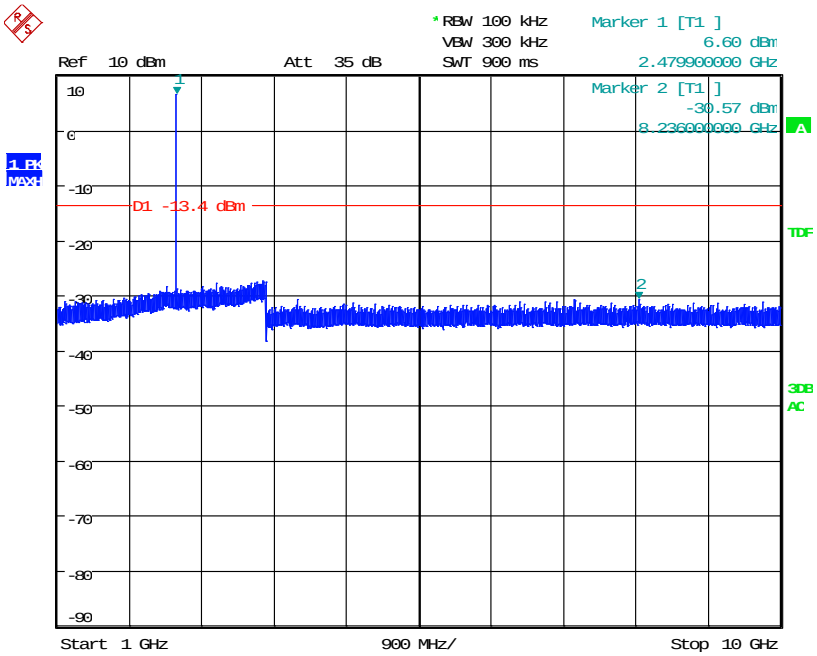
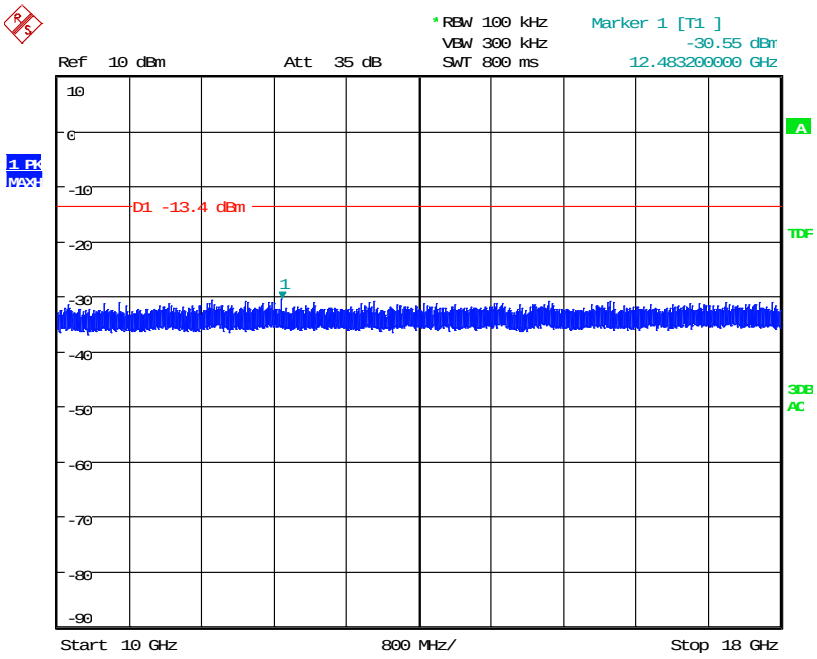


Figure 7.5.2.2-9: 30 MHz – 1 GHz – High Channel (GFSK)



Date: 26.APR.2015 00:02:29

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



Date: 26.APR.2015 00:05:19

Figure 7.5.2.2-11: 10 GHz –18 GHz – High Channel (GFSK)

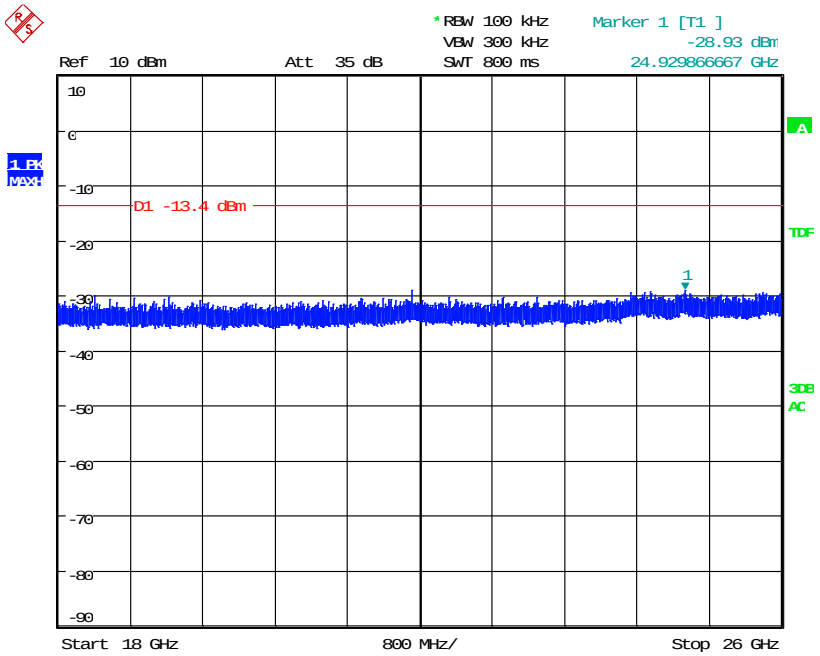


Figure 7.5.2.2-12: 18 GHz –26 GHz – High Channel (GFSK)

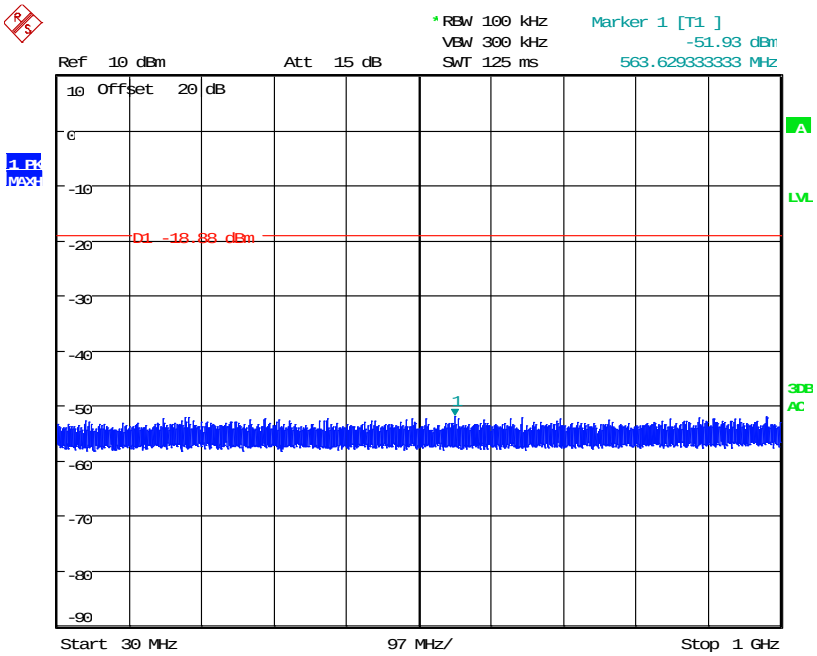


Figure 7.5.2.2-13: 30 MHz – 1 GHz – Low Channel (π/4 DQPSK)

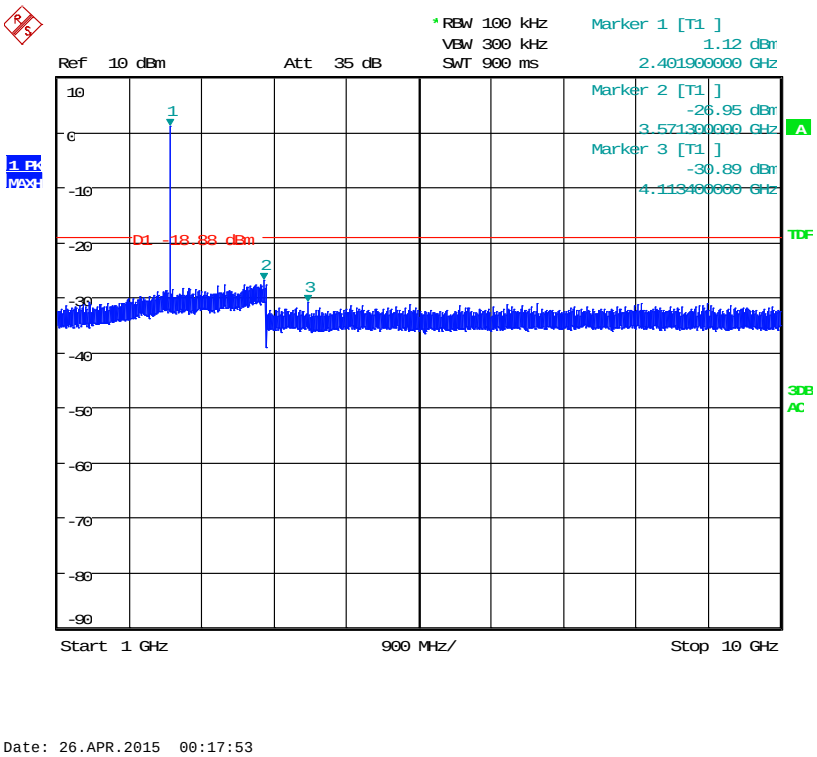
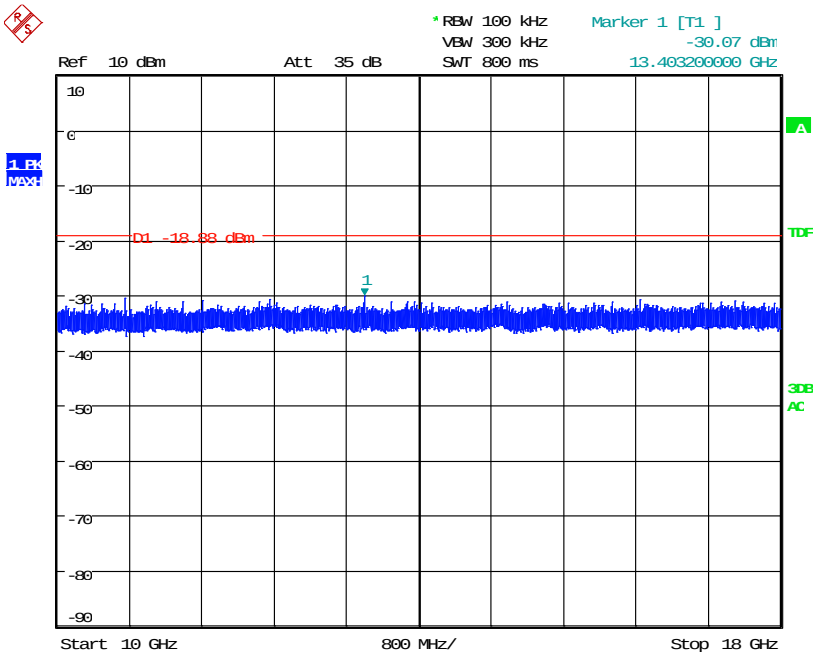
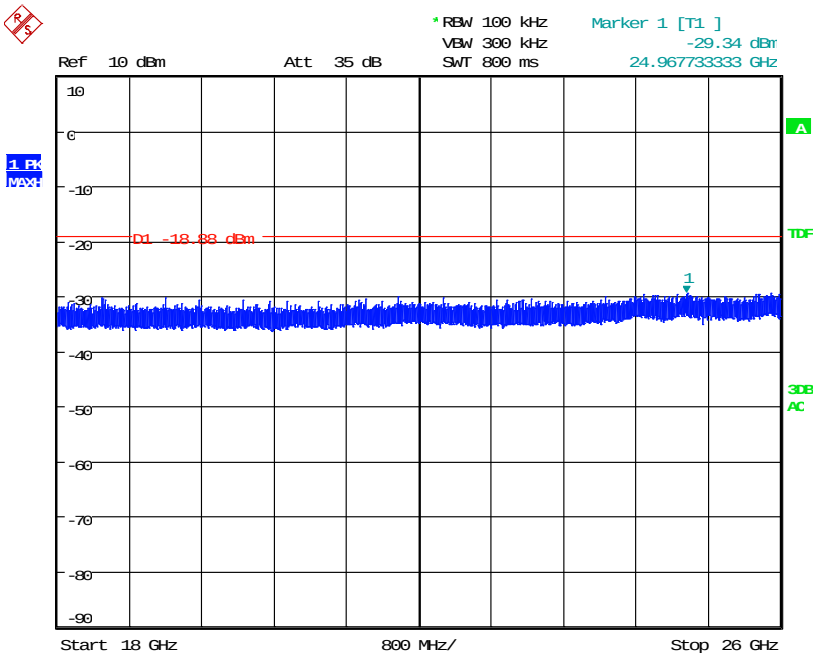


Figure 7.5.2.2-14: 1 GHz –10 GHz – Low Channel (π/4 DQPSK)



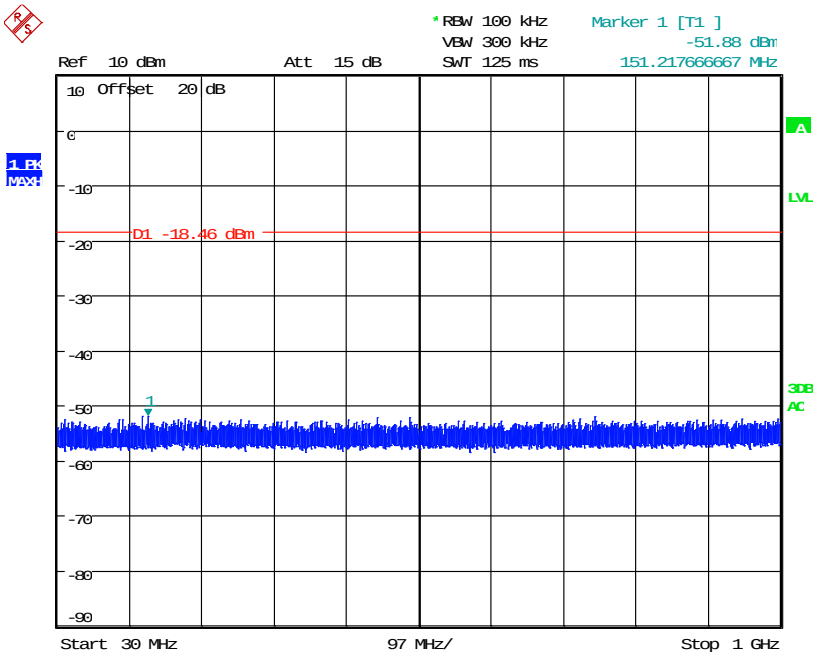
Date: 26.APR.2015 00:20:06

Figure 7.5.2.2-15: 10 GHz –18 GHz – Low Channel (π/4 DQPSK)



Date: 26.APR.2015 00:22:51

Figure 7.5.2.2-16: 18 GHz –26 GHz – Low Channel (π/4 DQPSK)



Date: 26.APR.2015 00:41:47

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

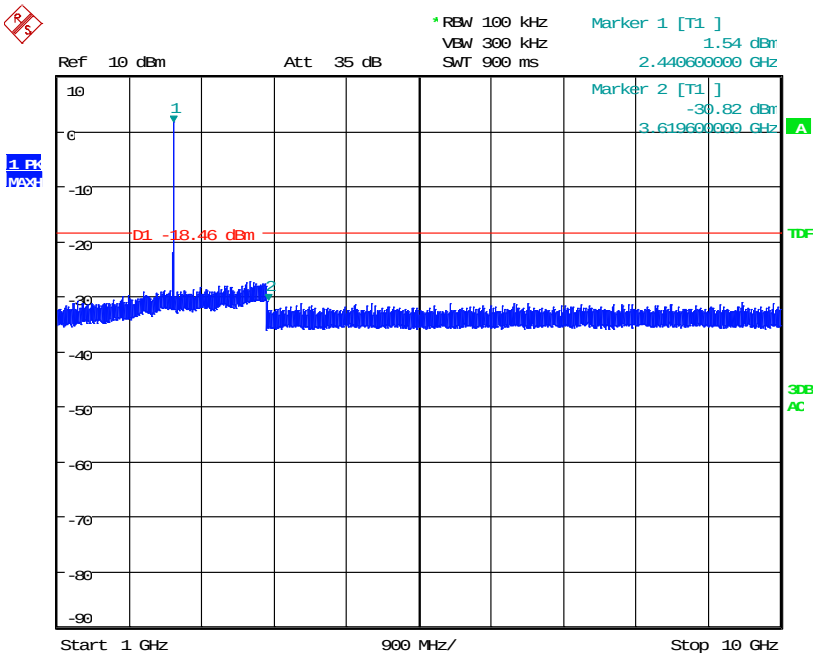


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Figure 7.5.2.2-18: 1 GHz –10 GHz – Middle Channel (π/4 DQPSK)

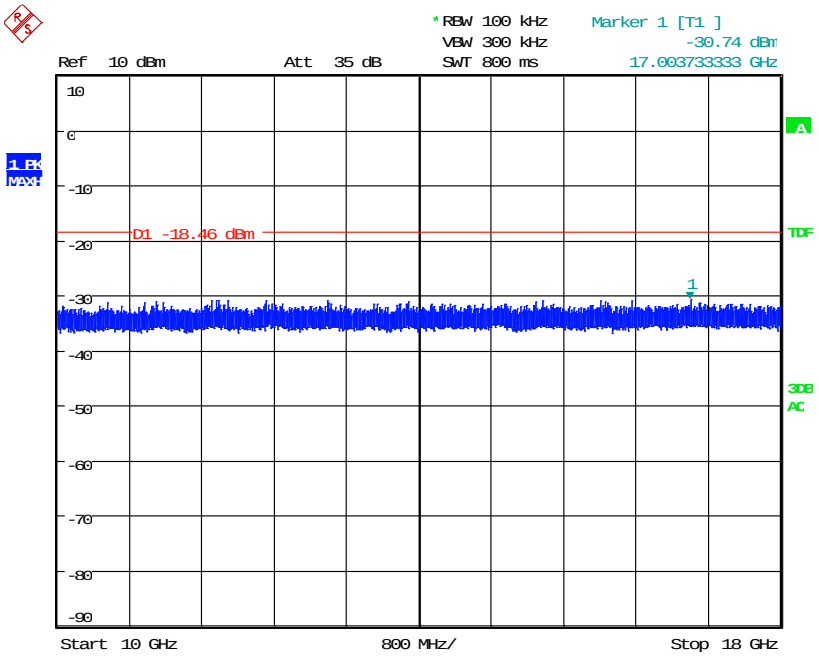

Figure 7.5.2.2-19: 10 GHz –18 GHz – Middle Channel (π/4 DQPSK)

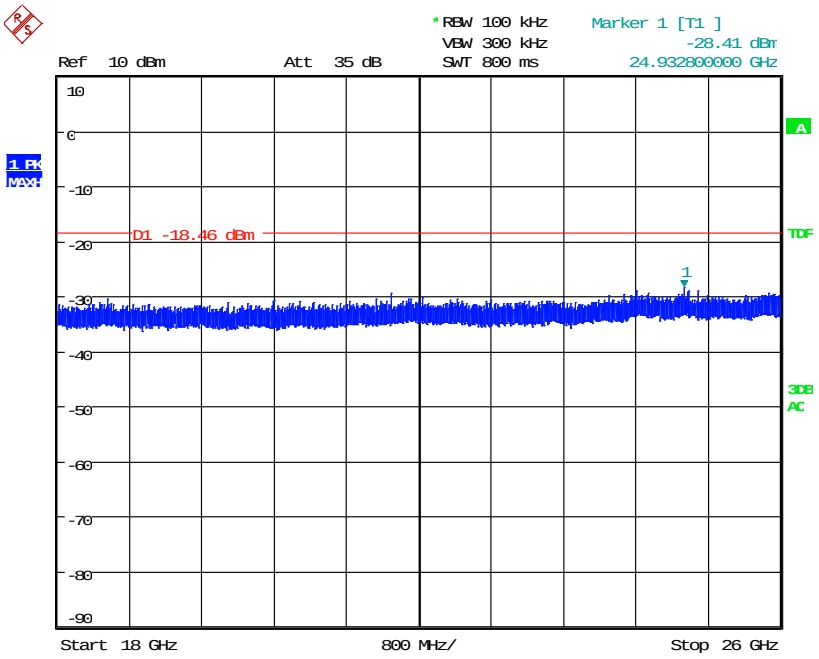

Figure 7.5.2.2-20: 18 GHz –26 GHz – Middle Channel (π/4 DQPSK)

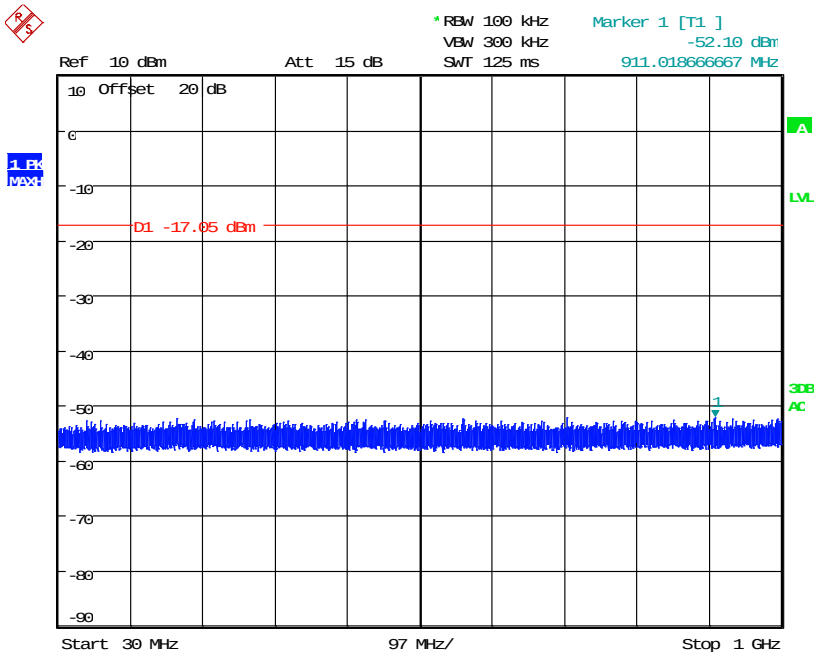

Figure 7.5.2.2-21: 30 MHz – 1 GHz – High Channel (π/4 DQPSK)

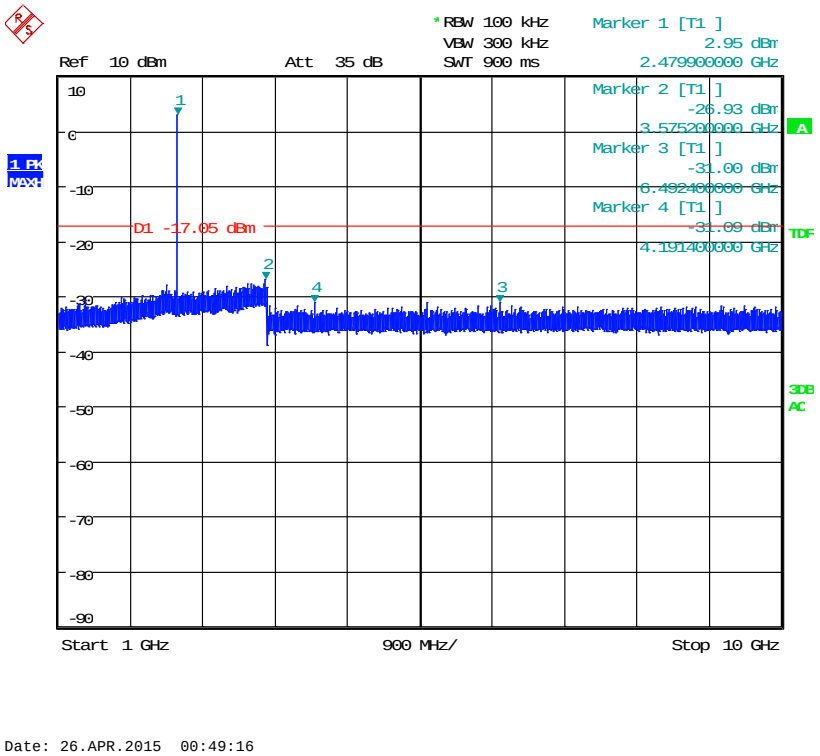

Figure 7.5.2.2-22: 1 GHz –10 GHz –High Channel (π/4 DQPSK)

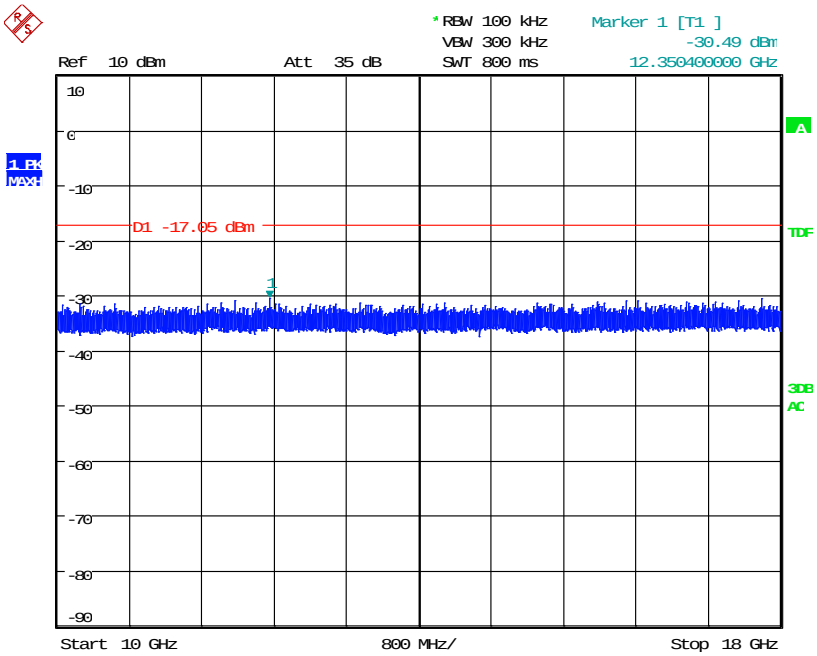

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Figure 7.5.2.2-23: 10 GHz –18 GHz – High Channel (π/4 DQPSK)

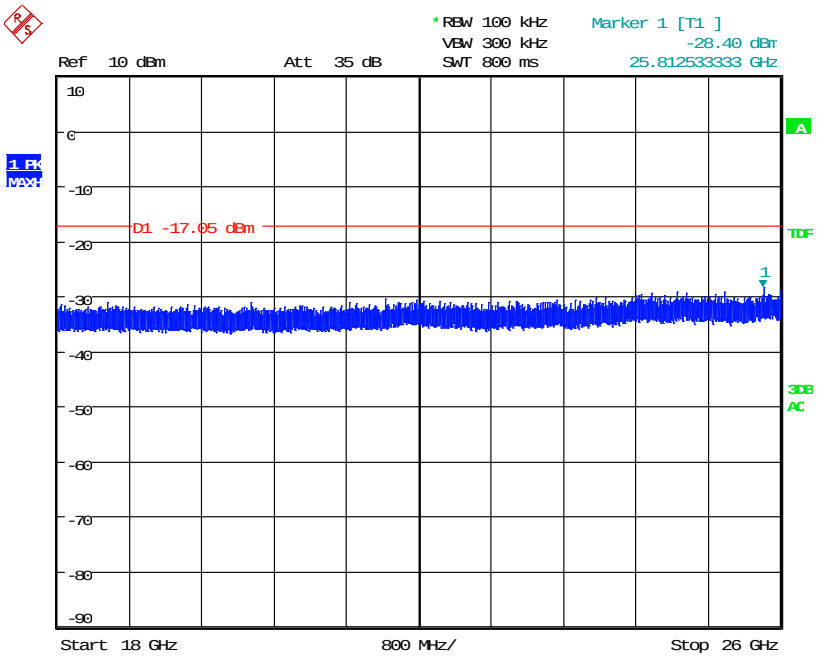

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Figure 7.5.2.2-24: 18 GHz –26 GHz – High Channel (π/4 DQPSK)

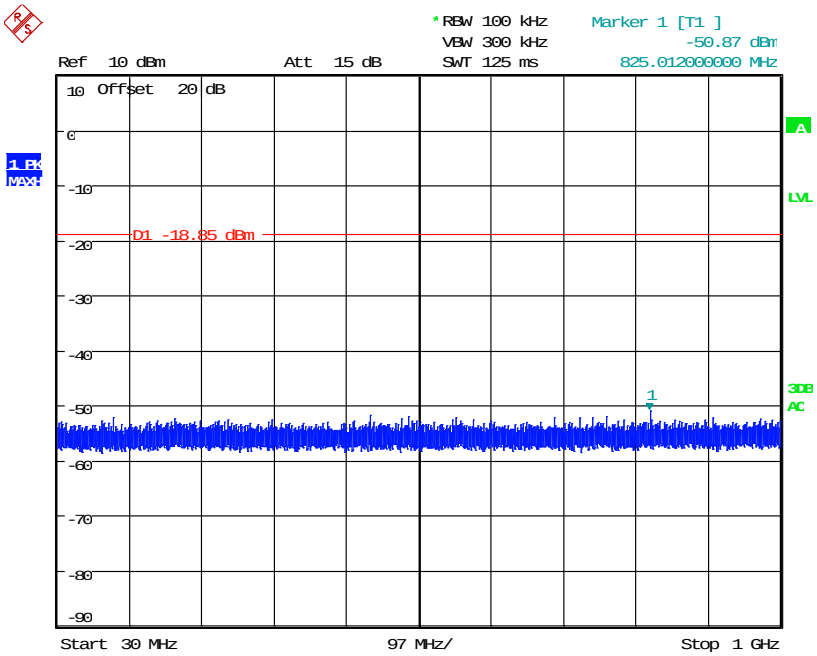

Figure 7.5.2.2-25: 30 MHz – 1 GHz – Low Channel (8DPSK)

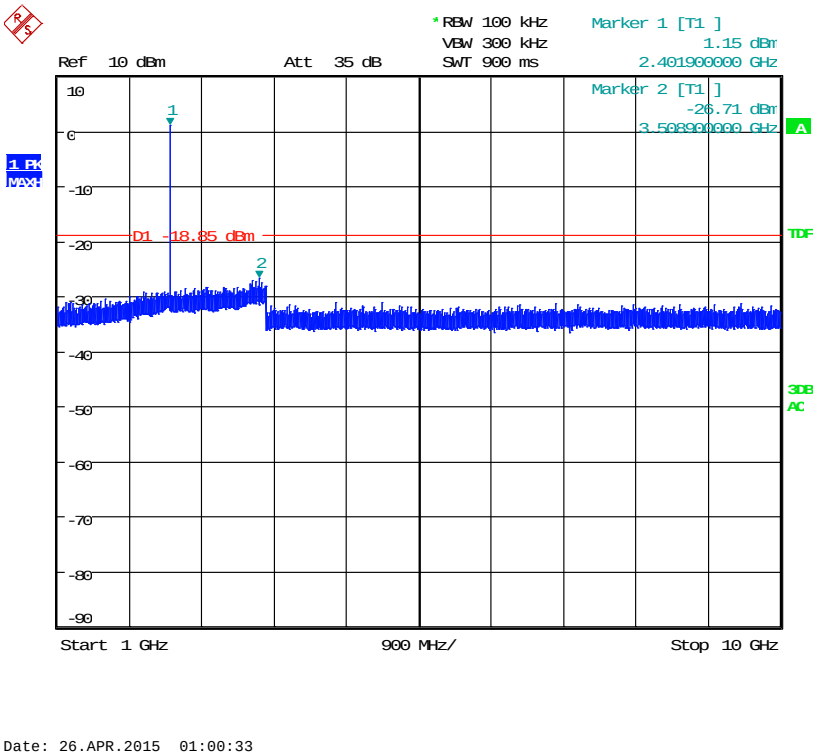

Figure 7.5.2.2-26: 1 GHz –10 GHz – Low Channel (8DPSK)

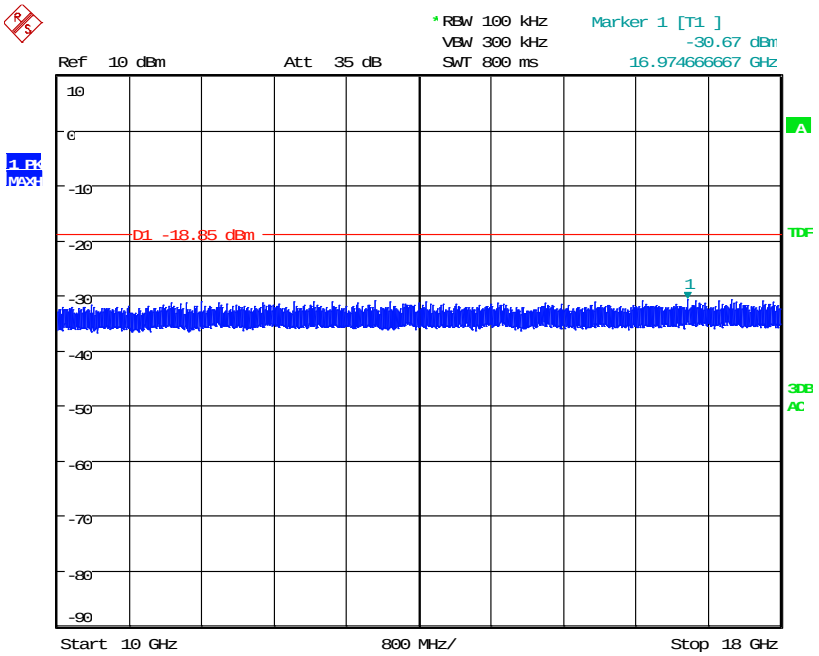

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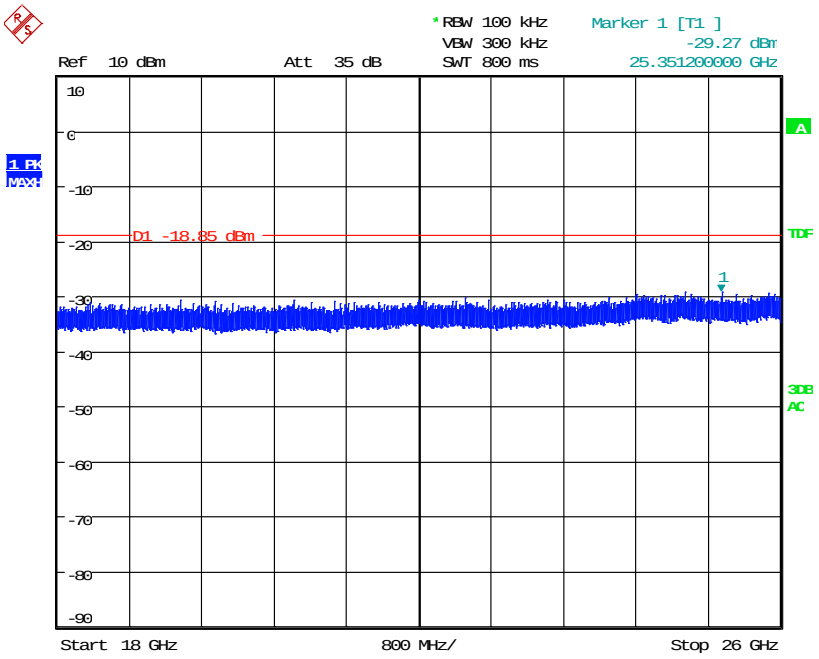
Figure 7.5.2.2-27: 10 GHz –18 GHz – Low Channel (8DPSK)



Date: 26.APR.2015 01:05:47

Figure 7.5.2.2-28: 18 GHz –26 GHz – Low Channel (8DPSK)

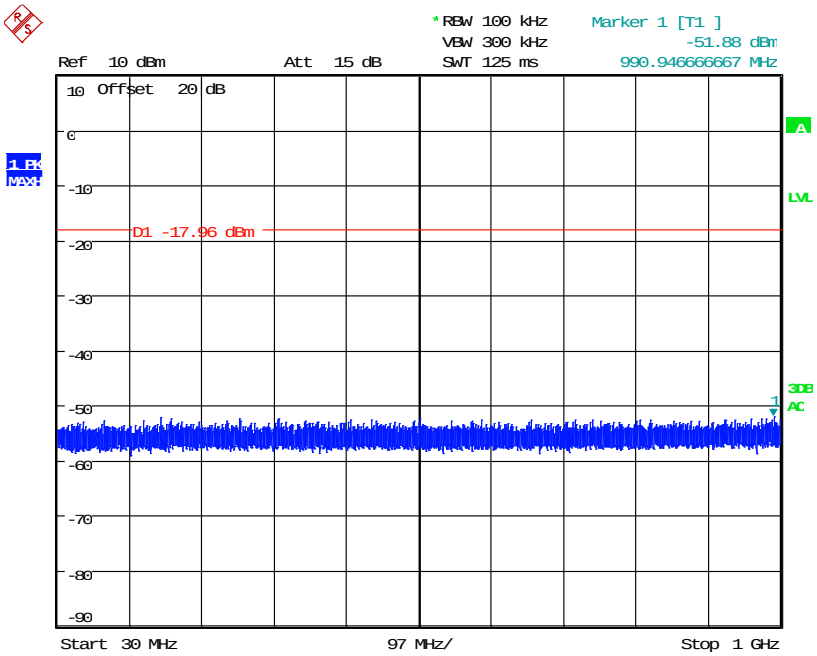


Figure 7.5.2.2-29: 30 MHz – 1 GHz –Middle Channel (8DPSK)

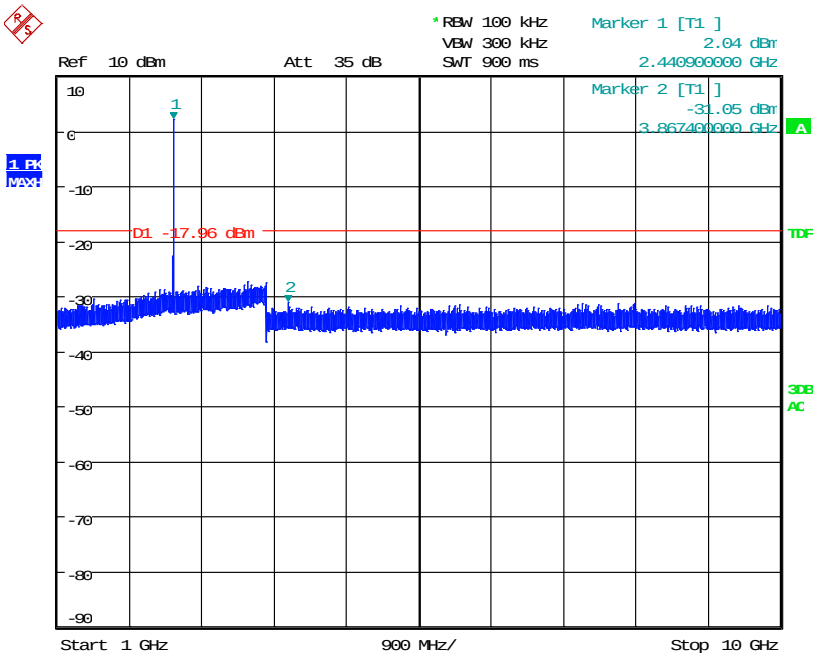


Figure 7.5.2.2-30: 1 GHz –10 GHz – Middle Channel (8DPSK)

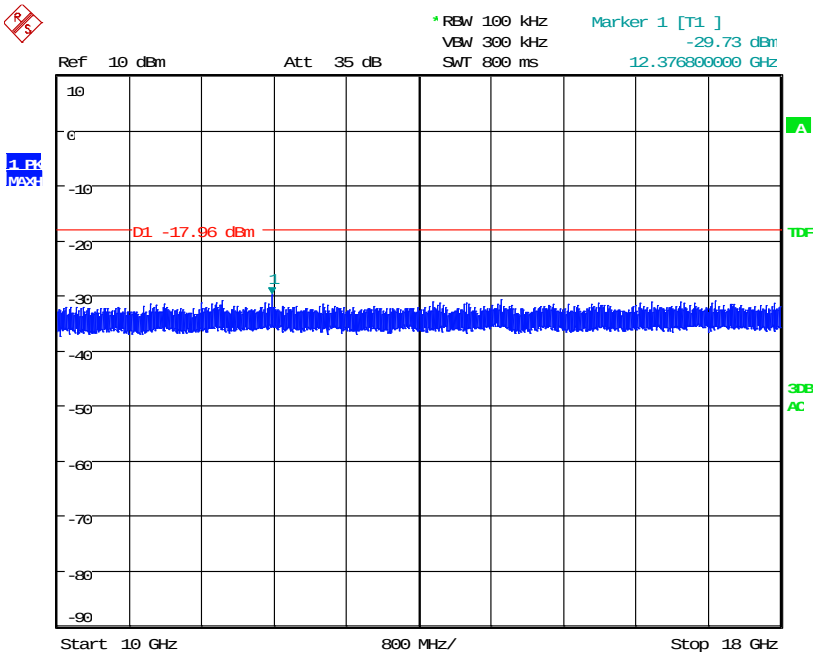


Figure 7.5.2.2-31: 10 GHz –18 GHz – Middle Channel (8DPSK)

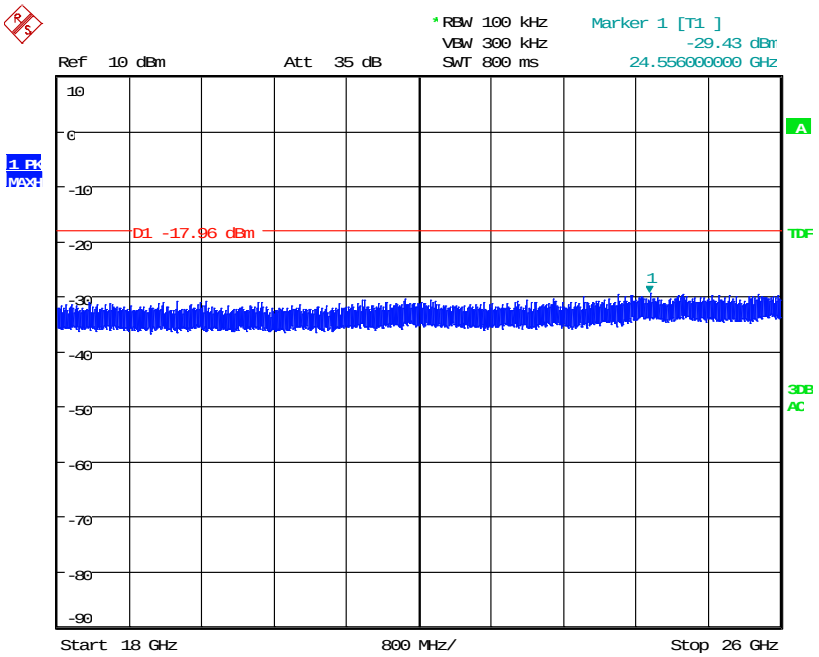


Figure 7.5.2.2-32: 18 GHz –26 GHz – Middle Channel (8DPSK)

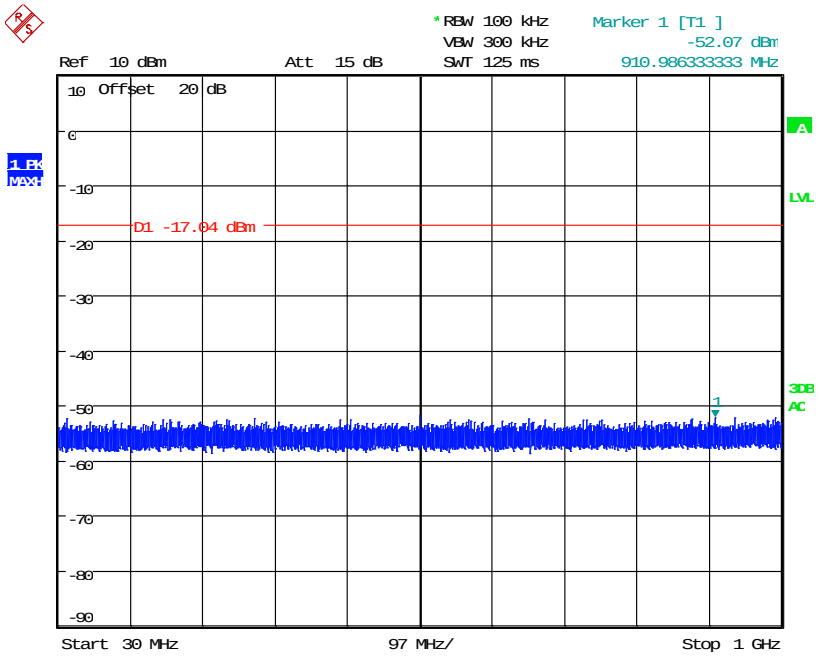


Figure 7.5.2.2-33: 30 MHz – 1 GHz – High Channel (8DPSK)

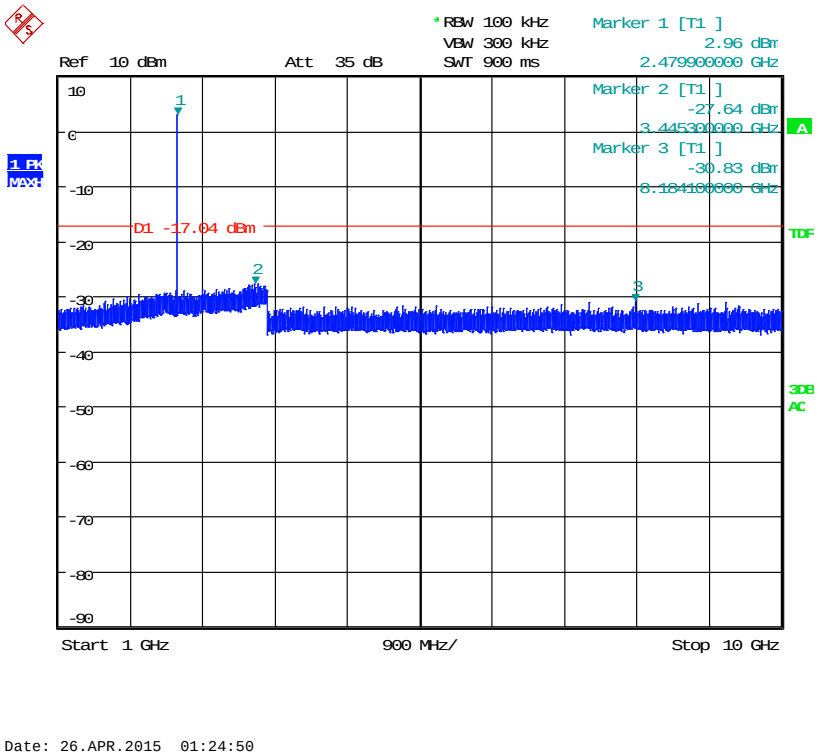
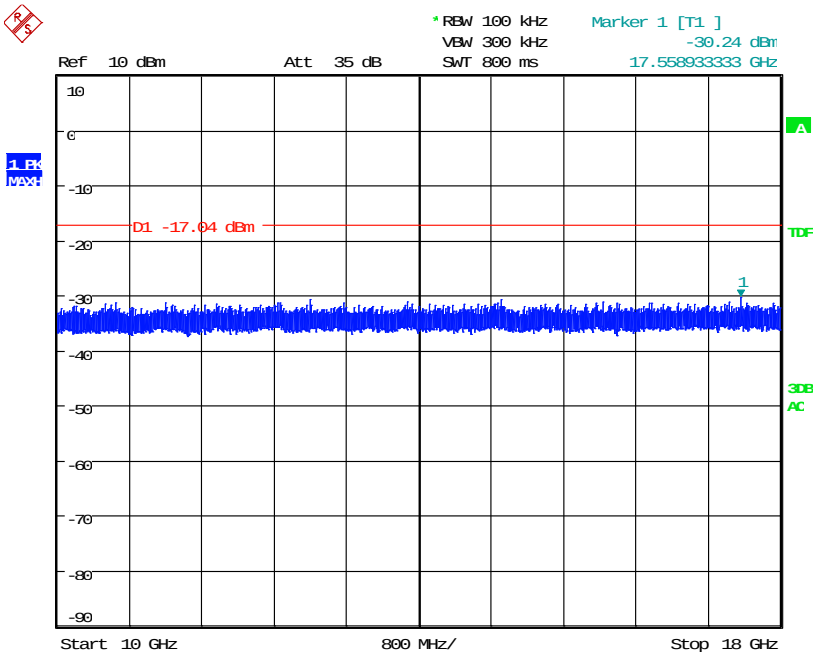
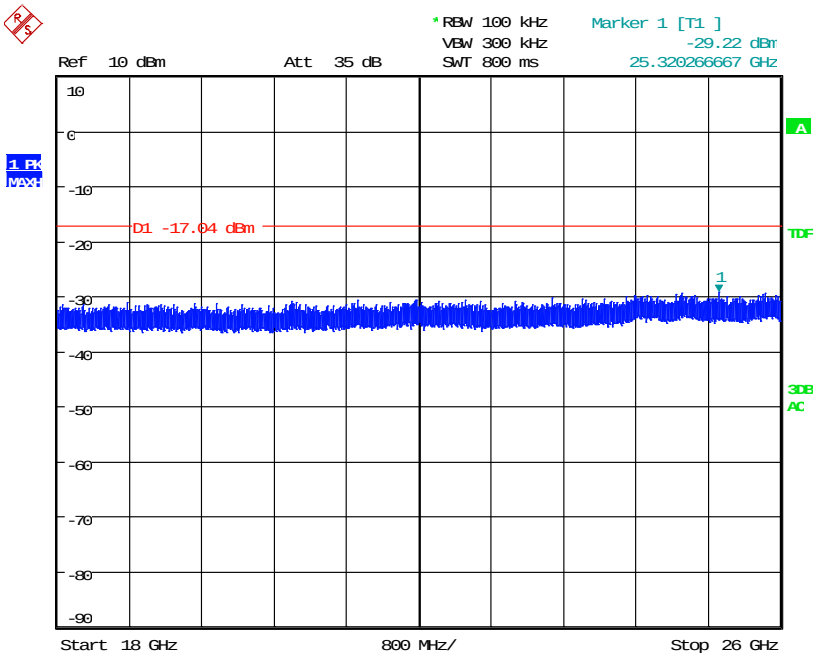


Figure 7.5.2.2-34: 1 GHz –10 GHz –High Channel (8DPSK)



Date: 26.APR.2015 01:26:34

Figure 7.5.2.2-35: 10 GHz –18 GHz – High Channel (8DPSK)



Date: 26.APR.2015 01:28:26

Figure 7.5.2.2-36: 18 GHz –26 GHz – High Channel (8DPSK)

7.5.3 Radiated Spurious Emissions within the Restricted Bands - FCC Sections 15.205, 15.209;

7.5.3.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 9 kHz to 26 GHz, 10 times the highest fundamental frequency. Each emission found to be in a restricted band as defined by section 15.205, including any emission at the operational band-edge, was compared to the radiated emission limits as defined in section 15.209.

For measurements below 30 MHz, the receive antenna height was set to 1m and the EUT was rotated through 360 degrees. The resolution bandwidth was set to 200 Hz below 150 kHz and to 9 kHz above 150 kHz.

For measurements above 30 MHz, 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 9 kHz 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	51.40	44.97	H	0.42	51.82	45.39	74.0	54.0	22.2	8.6
4804	48.48	39.60	V	0.42	48.90	40.02	74.0	54.0	25.1	14.0
12010	45.79	32.86	H	13.17	58.96	46.03	83.5	63.5	24.5	17.5
12010	47.23	34.84	V	13.17	60.40	48.01	83.5	63.5	23.1	15.5
Middle Channel (2441 MHz)										
4882	51.11	44.23	H	0.67	51.78	44.90	74.0	54.0	22.2	9.1
4882	48.73	39.33	V	0.67	49.40	40.00	74.0	54.0	24.6	14.0
12205	45.96	33.00	H	13.31	59.27	46.31	83.5	63.5	24.2	17.2
12205	48.11	36.88	V	13.31	61.42	50.19	83.5	63.5	22.1	13.3
19528	45.42	32.53	H	13.06	58.48	45.59	83.5	63.5	25.0	17.9
19528	45.04	33.02	V	13.06	58.10	46.08	83.5	63.5	25.4	17.4
High Channel (2480 MHz)										
2483.5	63.40	59.23	H	-7.48	55.92	51.75	74.0	54.0	18.1	2.2
2483.5	61.72	55.27	V	-7.48	54.24	47.79	74.0	54.0	19.8	6.2
4960	56.48	52.99	H	0.91	57.39	53.90	74.0	54.0	16.6	0.1
4960	52.48	46.97	V	0.91	53.39	47.88	74.0	54.0	20.6	6.1
12400	45.49	33.31	H	13.45	58.94	46.76	83.5	63.5	24.6	16.7
12400	49.01	39.16	V	13.45	62.46	52.61	83.5	63.5	21.0	10.9
19840	47.89	37.02	H	14.04	61.93	51.06	83.5	63.5	21.6	12.4
19840	47.21	34.11	V	14.04	61.25	48.15	83.5	63.5	22.3	15.4
22320	43.57	31.09	H	15.45	59.02	46.54	83.5	63.5	24.5	17.0
22320	44.55	32.00	V	15.45	60.00	47.45	83.5	63.5	23.5	16.1

Notes:

- **All emissions above 22.32 GHz were attenuated below the limits and the noise floor of the measurement equipment.**
- **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) dB.**

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	58.81	45.62	H	-7.89	50.92	37.73	74.0	54.0	23.1	16.3
4804	50.45	41.41	H	0.42	50.87	41.83	74.0	54.0	23.1	12.2
4804	47.74	35.62	V	0.42	48.16	36.04	74.0	54.0	25.8	18.0
12010	46.05	32.25	H	13.17	59.22	45.42	83.5	63.5	24.3	18.1
12010	46.96	32.94	V	13.17	60.13	46.11	83.5	63.5	23.4	17.4
19216	44.94	31.45	H	12.82	57.76	44.27	83.5	63.5	25.7	19.2
19216	44.38	31.35	V	12.82	57.20	44.17	83.5	63.5	26.3	19.3
Middle Channel (2441 MHz)										
4882	52.45	44.81	H	0.67	53.12	45.48	74.0	54.0	20.9	8.5
4882	48.62	38.67	V	0.67	49.29	39.34	74.0	54.0	24.7	14.7
12205	44.89	32.01	H	13.31	58.20	45.32	83.5	63.5	25.3	18.2
12205	46.09	33.40	V	13.31	59.40	46.71	83.5	63.5	24.1	16.8
19528	44.00	31.36	H	13.06	57.06	44.42	83.5	63.5	26.4	19.1
19528	45.41	31.83	V	13.06	58.47	44.89	83.5	63.5	25.0	18.6
High Channel (2480 MHz)										
2483.5	66.71	58.71	H	-7.48	59.23	51.23	74.0	54.0	14.8	2.8
2483.5	63.77	55.50	V	-7.48	56.29	48.02	74.0	54.0	17.7	6.0
4960	53.05	45.58	H	0.91	53.96	46.49	74.0	54.0	20.0	7.5
4960	49.67	39.24	V	0.91	50.58	40.15	74.0	54.0	23.4	13.8
12400	45.13	31.97	H	13.45	58.58	45.42	83.5	63.5	24.9	18.1
12400	47.60	35.48	V	13.45	61.05	48.93	83.5	63.5	22.5	14.6
19840	47.19	34.80	H	14.04	61.23	48.84	83.5	63.5	22.3	14.7
19840	46.31	33.54	V	14.04	60.35	47.58	83.5	63.5	23.2	15.9
22320	44.05	30.67	V	15.45	59.50	46.12	83.5	63.5	24.0	17.4

Notes:

- **All emissions above 22.32 GHz were attenuated below the limits and the noise floor of the measurement equipment.**
- **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) dB.**

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	61.72	45.81	H	-7.89	53.83	37.92	74.0	54.0	20.2	16.1
4804	50.07	41.47	H	0.42	50.49	41.89	74.0	54.0	23.5	12.1
4804	47.90	35.81	V	0.42	48.32	36.23	74.0	54.0	25.7	17.8
12010	45.78	32.07	H	13.17	58.95	45.24	83.5	63.5	24.6	18.3
12010	46.00	32.79	V	13.17	59.17	45.96	83.5	63.5	24.3	17.5
19216	44.20	30.93	H	12.82	57.02	43.75	83.5	63.5	26.5	19.8
19216	44.46	31.15	V	12.82	57.28	43.97	83.5	63.5	26.2	19.5
Middle Channel (2441 MHz)										
4882	52.50	45.04	H	0.67	53.17	45.71	74.0	54.0	20.8	8.3
4882	48.62	38.58	V	0.67	49.29	39.25	74.0	54.0	24.7	14.8
12205	45.85	31.99	H	13.31	59.16	45.30	83.5	63.5	24.3	18.2
12205	46.63	33.28	V	13.31	59.94	46.59	83.5	63.5	23.6	16.9
19528	45.29	31.11	H	13.06	58.35	44.17	83.5	63.5	25.1	19.3
19528	45.31	31.53	V	13.06	58.37	44.59	83.5	63.5	25.1	18.9
High Channel (2480 MHz)										
2483.5	69.42	58.95	H	-7.48	61.94	51.47	74.0	54.0	12.1	2.5
2483.5	66.51	55.54	V	-7.48	59.03	48.06	74.0	54.0	15.0	5.9
4960	53.86	46.30	H	0.91	54.77	47.21	74.0	54.0	19.2	6.8
4960	49.74	40.35	V	0.91	50.65	41.26	74.0	54.0	23.3	12.7
12400	45.63	31.87	H	13.45	59.08	45.32	83.5	63.5	24.4	18.2
12400	47.45	35.23	V	13.45	60.90	48.68	83.5	63.5	22.6	14.8
19840	47.48	35.06	H	14.04	61.52	49.10	83.5	63.5	22.0	14.4
19840	46.30	33.93	V	14.04	60.34	47.97	83.5	63.5	23.2	15.5
22320	43.45	30.18	H	15.45	58.90	45.63	83.5	63.5	24.6	17.9
22320	43.78	30.67	V	15.45	59.23	46.12	83.5	63.5	24.3	17.4

Notes:

- **All emissions above 22.32 GHz were attenuated below the limits and the noise floor of the measurement equipment.**
- **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) dB.**

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

Example Calculation: Peak
Corrected Level: 51.4+ 0.42 = 51.82 dBµV/m
Margin: 74 dBµV/m – 51.82 dBµV/m = 22.2dB

Example Calculation: Average
Corrected Level: 44.97 + 0.42 = 45.39 dBµV/m
Margin: 54 dBµV/m – 45.39 dBµV/m = 8.6 dB

8 CONCLUSION

In the opinion of ACS, Inc., the models H51SDH9PW7AN, H51SDH9PW6AN manufactured by Motorola Solutions Sdn Bhd meet the requirements of FCC Part 15 subpart C for the test procedures documented in the test report.

END REPORT