Certification Test Report

FCC ID: AZ489FT5866
IC: 109U-89FT5866

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

ACS Report Number: 13-2110.W06.1A

Manufacturer: Motorola Solutions SDNBHD
Model: AAH81VCN9NB2AN

Test Begin Date: **June 5, 2013**
Test End Date: **September 23, 2013**

Report Issue Date: September 23, 2013

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.

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 and Industry Canada's Radio Standards Specification RSS-210.

1.2 Manufacturer Information

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

1.3 Product Description

The Motorola Solutions MotoTRBO SL7580, model AAH81VCN9NB2AN is a 2W two way portable radio capable of digital transmission. The device operates in the 806 MHz to 870 MHz band and also includes a Bluetooth 2.0+ EDR transceiver.

Table1.3-1: Bluetooth Radio Properties

Mode of Operation	Frequency Range (MHz)	Number of Channels	Channel Separation (kHz)	Data Rates Supported (kbps)
GFSK	2402 - 2480	79	1000	1000
π/4-DQPSK	2402 - 2480	79	1000	2000
8DPSK	2402 - 2480	79	1000	3000

Model Number: AAH81VCN9NB2AN (Radiated and power line conducted emissions)
AAH81WCN9NB2AN (RF Conducted)

Test Sample Serial Number(s): 806TPR1078 (Radiated and power line conducted emissions)
806TPK0188 (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 tested for RF conducted emissions at the antenna port as well as for radiated and power line conducted emissions for the Bluetooth radio for all available modulations.

The RF conducted measurements were performed on the model AAH81WCN9NB2AN (FCC ID: AZ489FT5867 / IC: 109U-89FT5867) per the manufacturer request based on the justification that the Bluetooth transceivers for the two radio models are identical in terms of hardware and software. The sample enclosure was modified to provide access to the Bluetooth antenna port. Where applicable, data is provided for the modulation corresponding to the worst case.

The radiated emissions evaluations were conducted up to the 10th harmonic for all available modulations. Preliminary measurements were collected for the EUT set in three orthogonal orientations. The measurements reported herein correspond to the orientation leading to the highest emissions relative to the limits. The EUT was also evaluated for inter-modulation products for the co-located Bluetooth and 800 MHz radios transmitting at the same time. All inter-modulation products were found compliant to the limits of FCC Section 15.209 and Industry Canada RSS-GEN.

Power line conducted emissions measurements were performed for the Bluetooth in the hopping mode for all available modulations. The results are provided for the worst case configuration.

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 when operating as a computer peripheral device. 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:

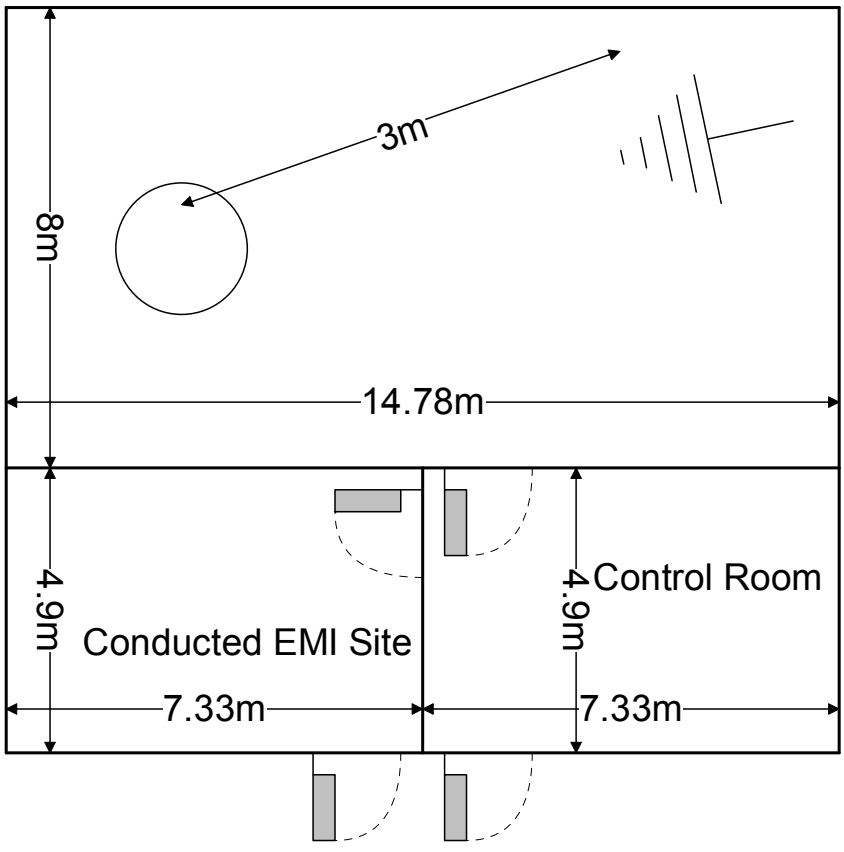


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

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 2003 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 220 V, 50 Hz, 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:

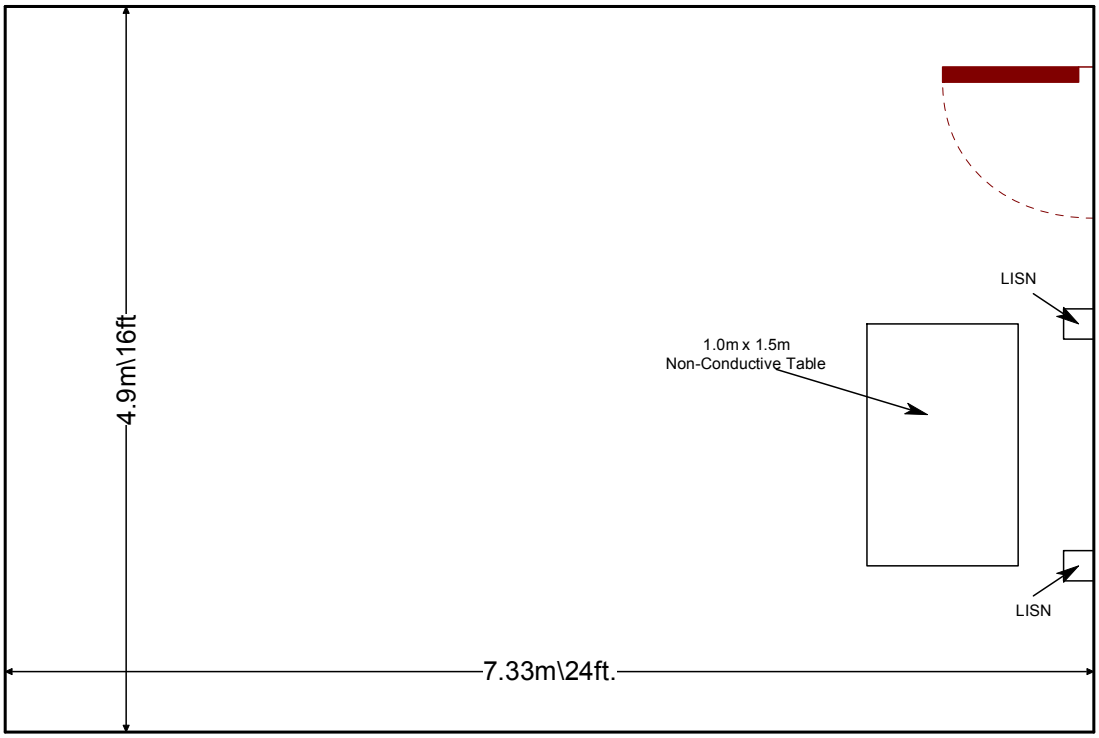


Figure 2.3.2-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: 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, 2013
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2013
- 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 and Information for the Certification of Radiocommunication Equipment, Issue 3, December 2010.

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

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
523	Agilent	E7405	Spectrum Analyzers	MY45103293	1/8/2013	1/8/2015
524	Chase	CBL6111	Antennas	1138	1/7/2013	1/7/2015
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	12/31/2012	12/31/2013
2022	EMCO	LISN3825/2R	LISN	1095	8/19/2011	9/30/2013
2022	EMCO	LISN3825/2R	LISN	1095	9/9/2013	9/9/2015
2044	QMI	N/A	Cables	2044	12/31/2012	12/31/2013
2045	ACS Boca	Conducted Cable Set	Cable Set	2045	12/31/2012	12/31/2013
2064	CIR Q-TEL	FHT/22-10K-13/50-3A/3A	Filter	9	12/31/2012	12/31/2013
2070	Mini Circuits	VHF-8400+	Filter	2070	12/31/2012	12/31/2013
2072	Mini Circuits	VHF-3100+	Filter	30737	12/31/2012	12/31/2013
2075	Hewlett Packard	8495B	Attenuators	2626A11012	12/31/2012	12/31/2013
2076	Hewlett Packard	HP5061-5458	Cables	2076	12/29/2012	12/29/2013
2082	Teledyne Storm Products	90-010-048	Cables	2082	5/31/2013	5/31/2014
2086	Merrimac	FAN-6-10K	Attenuators	23148-83-1	12/29/2012	12/29/2013
2089	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00214	12/20/2012	12/20/2013
2095	ETS Lindgren	TILE4! - Version 4.2.A	Software	85242	NCR	NCR
RE361	Agilent	AT/E7405A	Analyzers	MY42000089	5/28/2013	5/28/2014

Notes:

- **NCR=No Calibration Required**
- **The information for Asset 2022 is provided to cover the entire testing cycle.**

5 SUPPORT EQUIPMENT

Table 5-1: EUT and Support Equipment (Stand-alone)

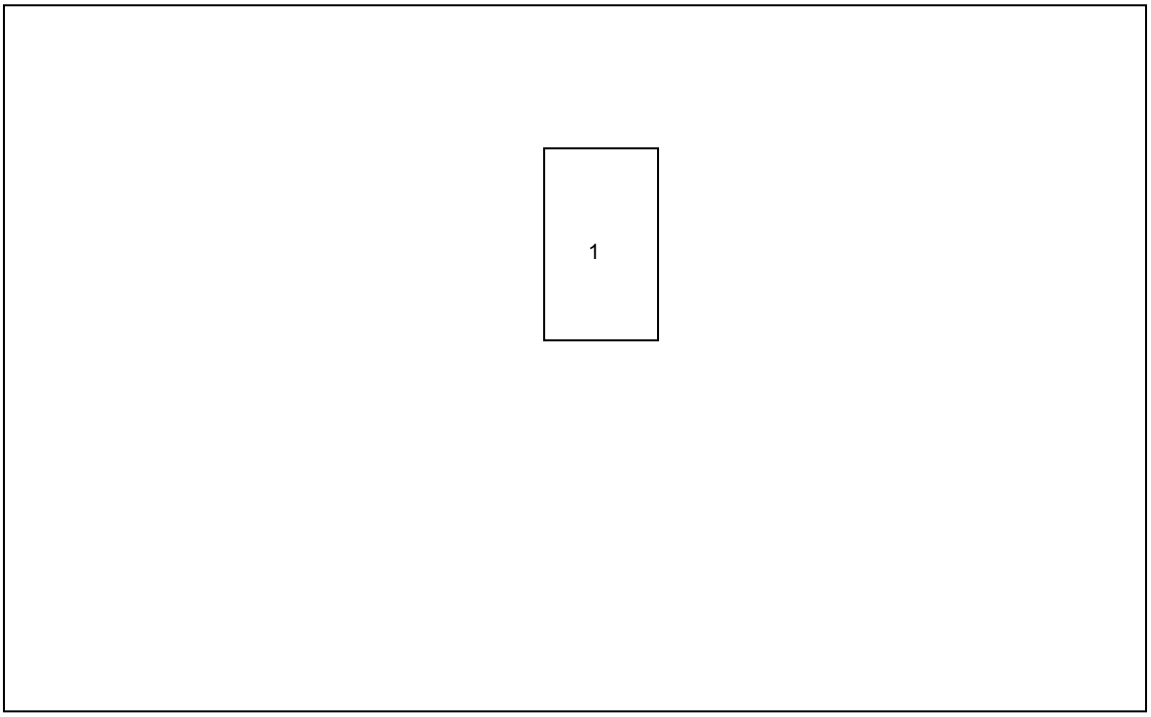
Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	Motorola Solutions	AAH81VCN9NB2AN	806TPR1078
			AAH81WCN9NB2AN	806TPK0188

Table 5-2: EUT and Support Equipment (With charger)

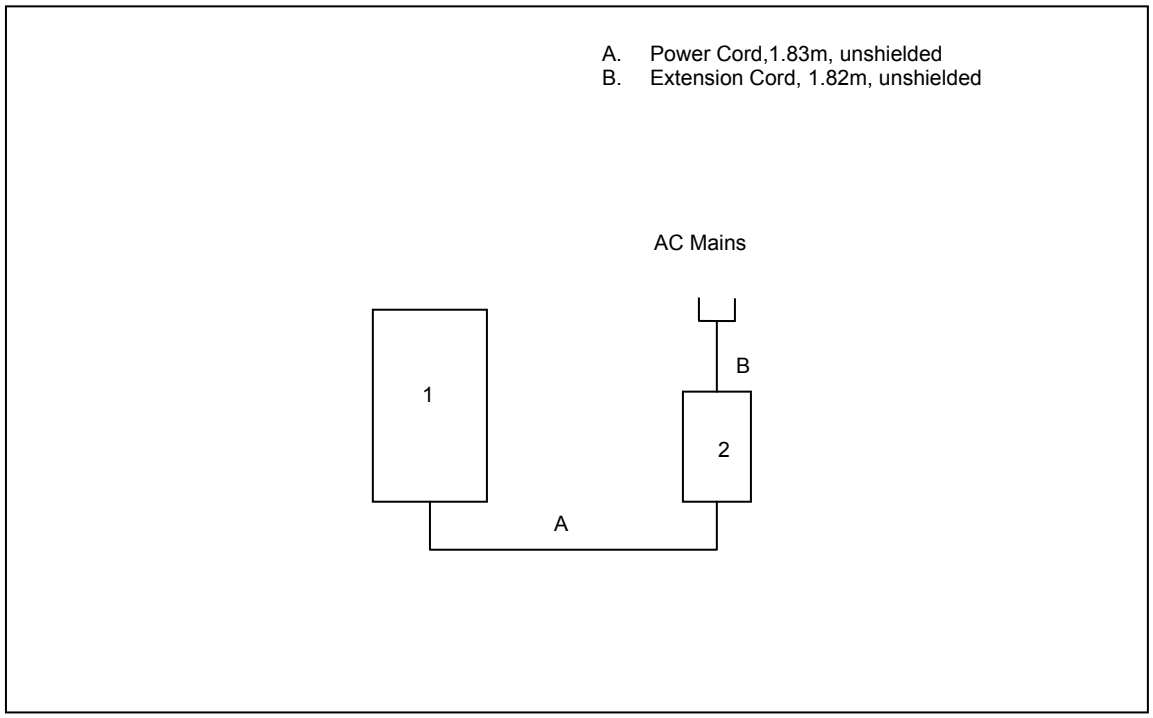
Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	Motorola Solutions	AAH81VCN9NB2AN	806TPR1078
2	5 VDC Power Supply	Motorola Solutions	DCH4-050MV-0301	17MAY12-C6-0821306-4006T

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

Configuration 1 – Radiated Emissions and RF Conducted Measurements (EUT Stand-alone)



Configuration 2 – Power Line Conducted Emissions (With charger)



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 antenna for the Bluetooth radio. The antenna is not easily accessible to the user, thus meeting the requirements of FCC 15.203.

7.2 Power Line Conducted Emissions – FCC: Section 15.207 IC: RSS-Gen 7.2.4

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 in Table 7.2.2-1 and Figure 7.2.2-1 to Figure 7.2.2-2.

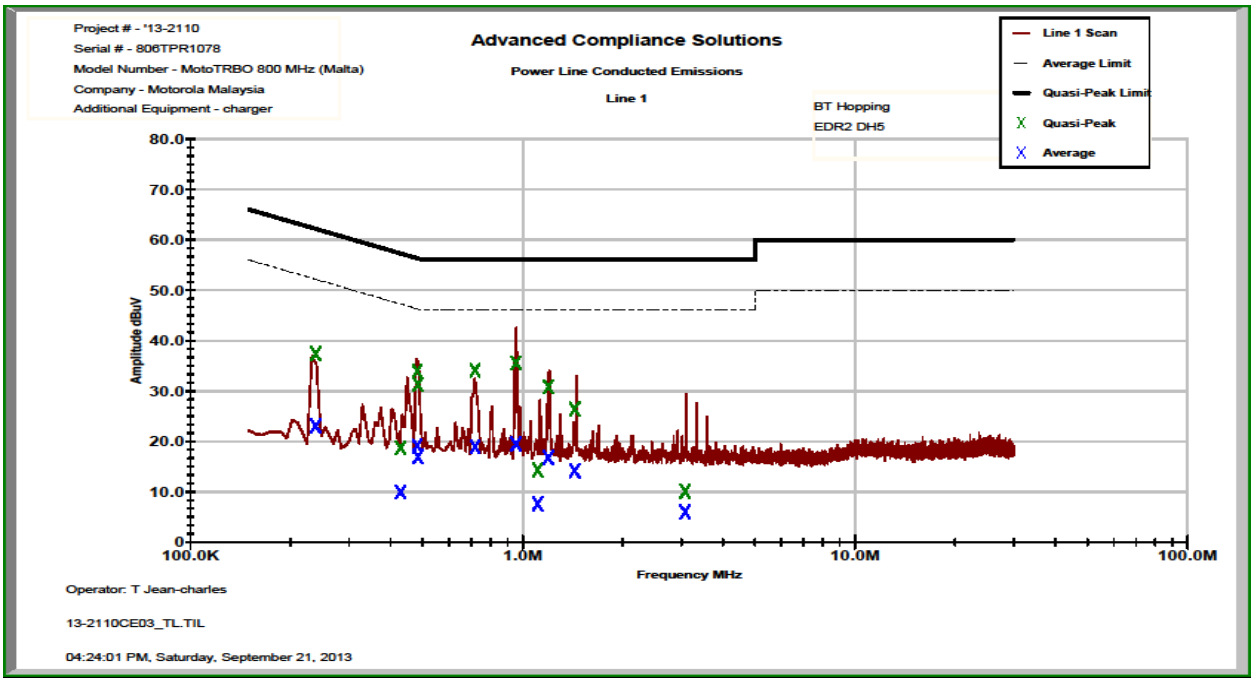


Figure 7.2.2-1: Conducted Emissions Results – Line 1

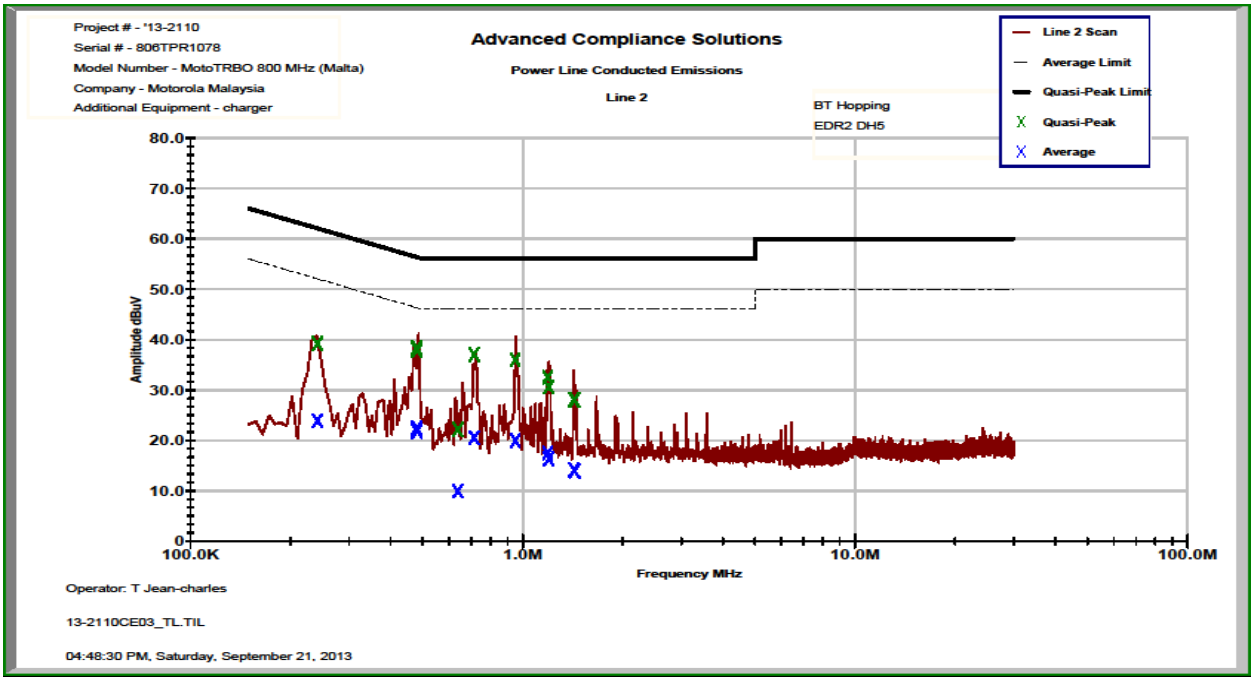


Figure 7.2.2-2: Conducted Emissions Results – Line 2

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: 13-2110CE03
Power Supply Description: 5 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									
0.238088	36.452	22.126	0.33	36.78	22.45	62.16	52.16	25.4	29.7
0.4285	18.174	9.401	0.25	18.43	9.65	57.28	47.28	38.9	37.6
0.48115	33.474	18.597	0.25	33.73	18.85	56.32	46.32	22.6	27.5
0.48385	30.762	16.424	0.25	31.01	16.67	56.27	46.27	25.3	29.6
0.7183	33.667	18.455	0.25	33.92	18.71	56.00	46.00	22.1	27.3
0.9532	35.148	19.046	0.24	35.38	19.28	56.00	46.00	20.6	26.7
1.10759	13.905	7.181	0.23	14.14	7.41	56.00	46.00	41.9	38.6
1.19311	30.393	16.329	0.23	30.62	16.56	56.00	46.00	25.4	29.4
1.43222	25.96	13.763	0.23	26.19	13.99	56.00	46.00	29.8	32.0
3.07769	9.553	5.439	0.37	9.92	5.81	56.00	46.00	46.1	40.2
Line 2									
0.24125	38.246	22.966	0.35	38.59	23.31	62.05	52.05	23.5	28.7
0.479462	37.898	21.858	0.28	38.18	22.14	56.35	46.35	18.2	24.2
0.48045	37.323	21.283	0.28	37.60	21.56	56.33	46.33	18.7	24.8
0.63745	21.644	9.422	0.27	21.91	9.69	56.00	46.00	34.1	36.3
0.713712	36.575	20.068	0.27	36.85	20.34	56.00	46.00	19.2	25.7
0.9497	35.537	19.508	0.27	35.80	19.77	56.00	46.00	20.2	26.2
1.18795	32.111	17.08	0.23	32.34	17.31	56.00	46.00	23.7	28.7
1.19567	30.223	15.925	0.23	30.46	16.16	56.00	46.00	25.5	29.8
1.42479	27.657	13.676	0.23	27.89	13.91	56.00	46.00	28.1	32.1
1.43267	27.578	13.516	0.23	27.81	13.75	56.00	46.00	28.2	32.3

* Note: Results are reported for the EUT configuration leading to the worst case emissions.

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. The display values were corrected for cable and external attenuation.

7.3.2 Measurement Results

Results are shown below in Table 7.3.2-1 to Table 7.3.2-3 and Figure 7.3.2-1 to Figure 7.3.2-9 below:

Table 7.3.2-1: RF Output Power (GFSK)

Frequency (MHz)	Power (dBm)
2402	4.795
2441	4.383
2480	3.678

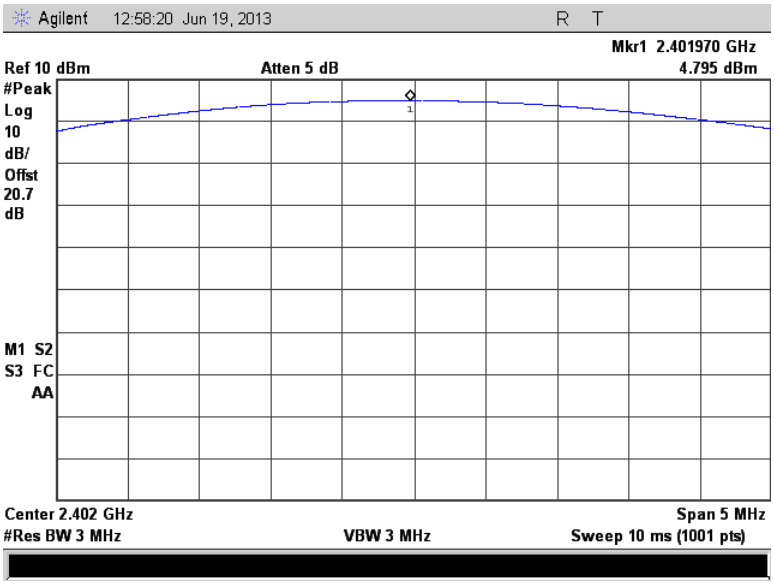


Figure 7.3.2-1: RF Output Power (GFSK) - Low Channel

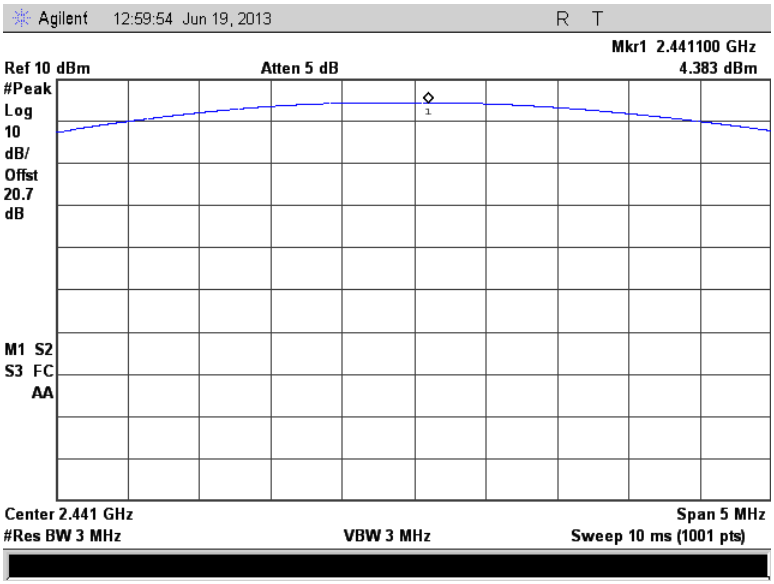


Figure 7.3.2-2: RF Output Power (GFSK) - Middle Channel

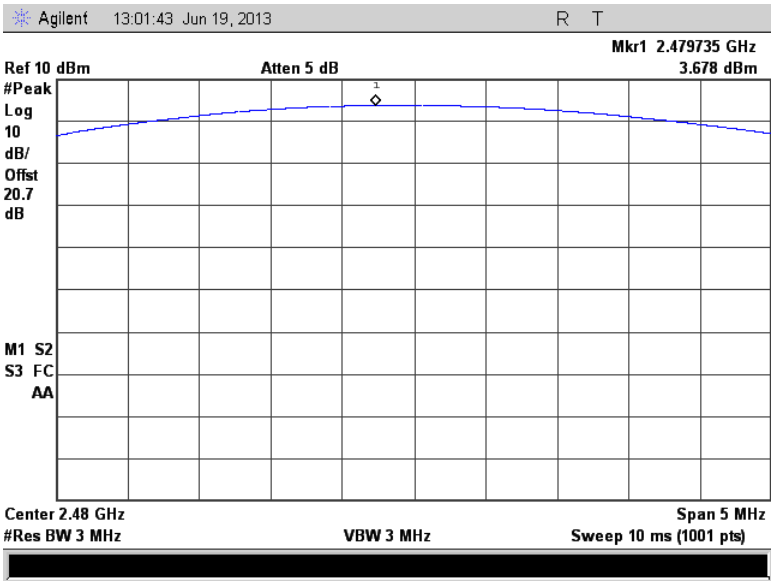


Figure 7.3.2-3: RF Output Power (GFSK) - High Channel

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

Frequency (MHz)	Power (dBm)
2402	7.537
2441	7.156
2480	6.618

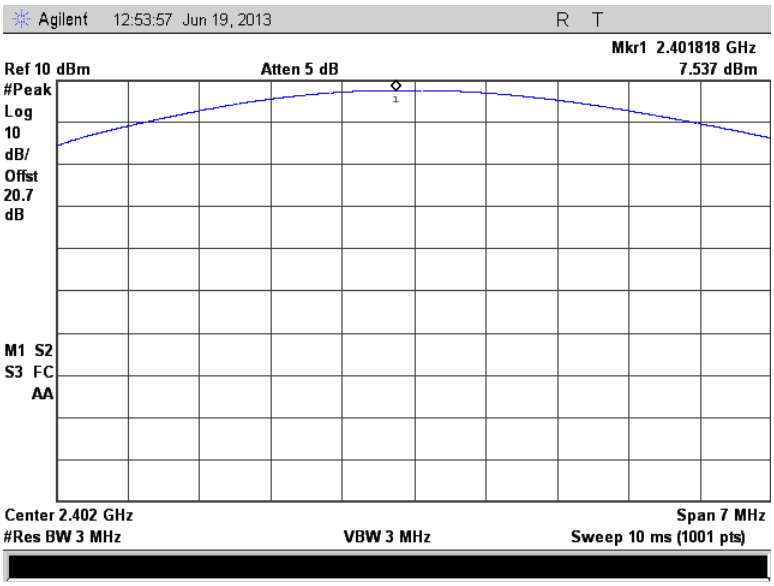


Figure 7.3.2-4: RF Output Power (π/4 DQPSK) - Low Channel

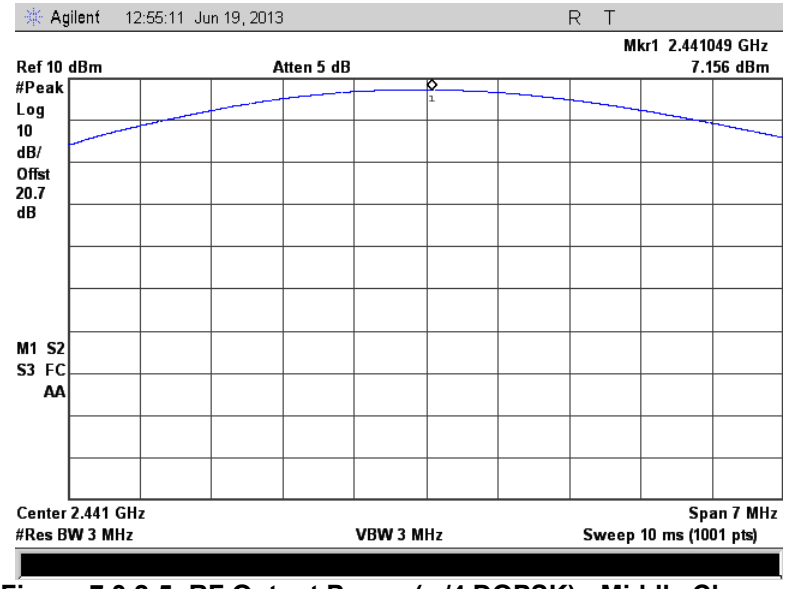


Figure 7.3.2-5: RF Output Power (π/4 DQPSK) - Middle Channel

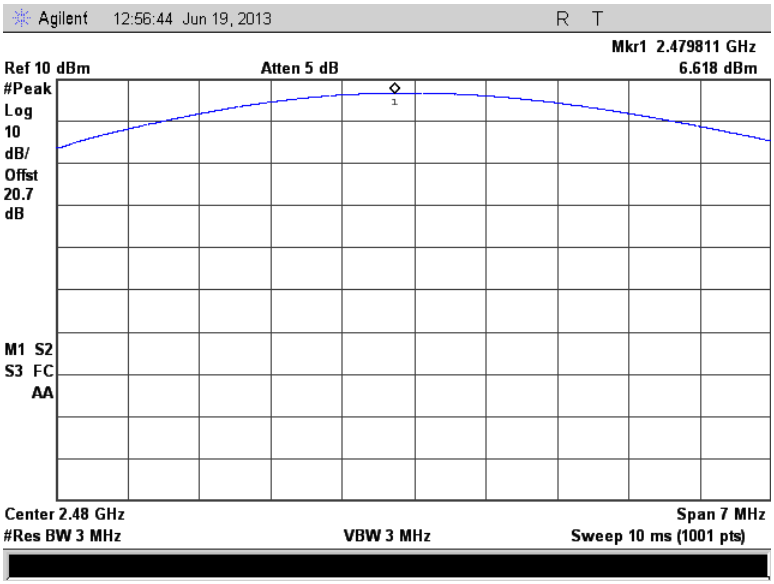


Figure 7.3.2-6: RF Output Power (π/4 DQPSK) - High Channel

Table 7.3.2-3 RF Output Power (8DPSK)

Frequency (MHz)	Power (dBm)
2402	8.09
2441	7.703
2480	7.176

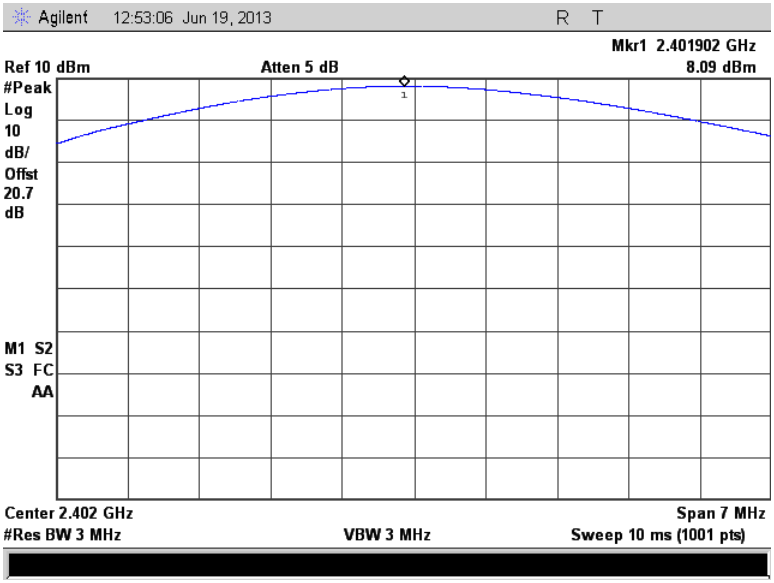


Figure 7.3.2-7: RF Output Power (8DPSK) - Low Channel

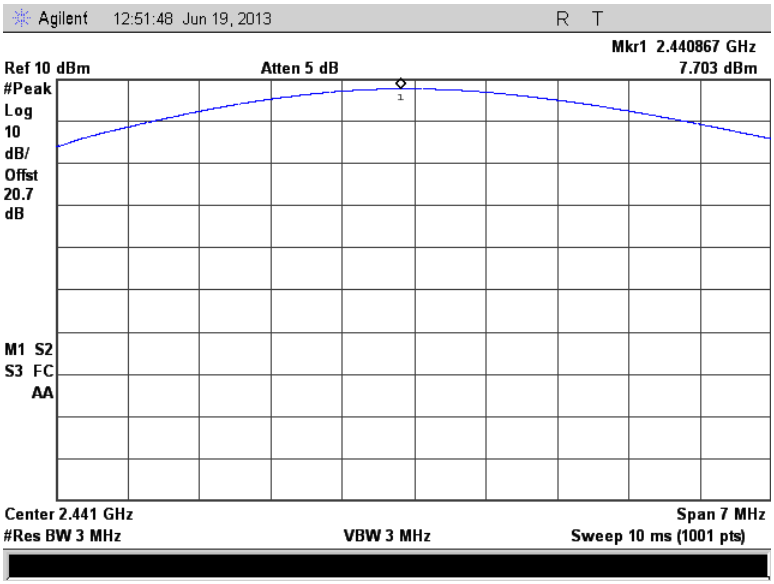


Figure 7.3.2-8: RF Output Power (8DPSK) - Middle Channel

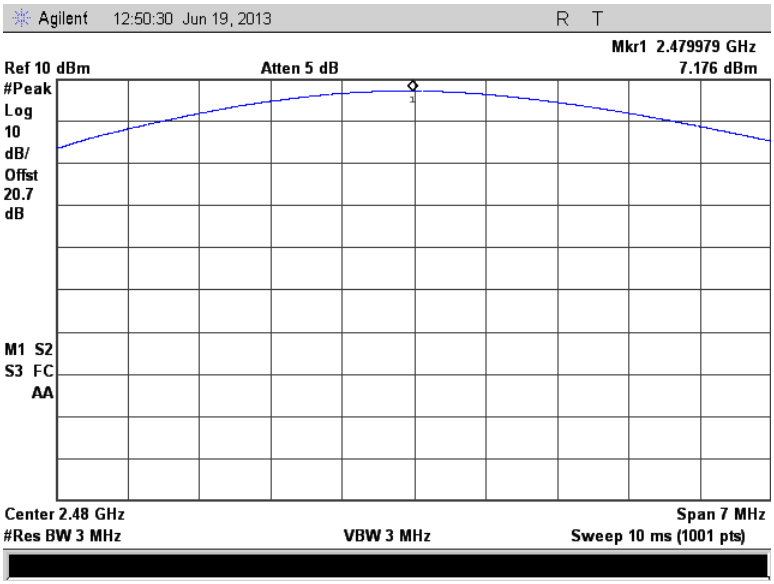


Figure 7.3.2-9: RF Output Power (8DPSK) - High Channel

7.4 Channel Usage Requirements

7.4.1 Carrier Frequency Separation – FCC: Section 15.247(a)(1) 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 in Figure 7.4.1.2-1.

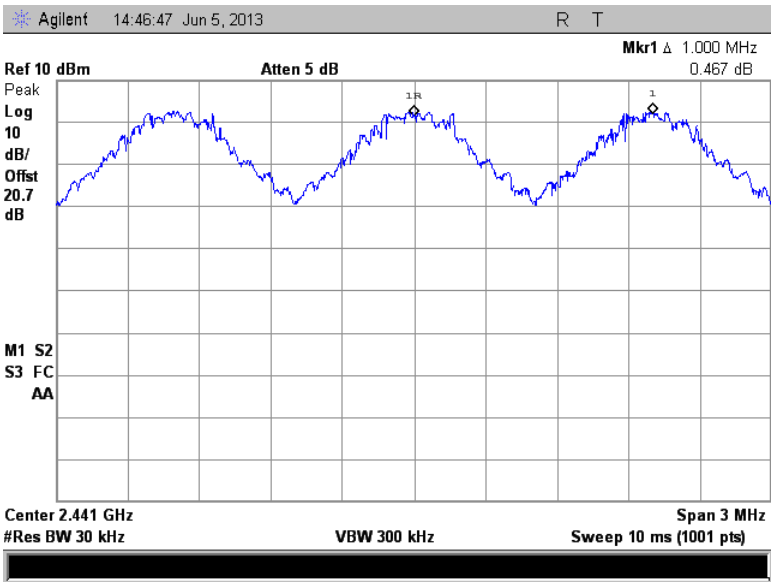


Figure 7.4.1.2-1: Carrier Frequency Separation

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 through suitable attenuation. 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 in Figures 7.4.2.2-1 to 7.4.2.2-3.

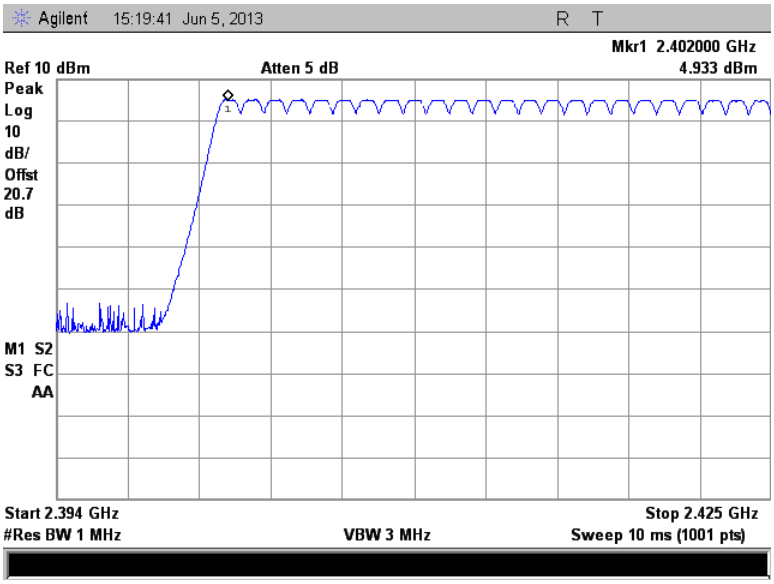


Figure 7.4.2.2-1: Number of Hopping Channels (1 – 24)

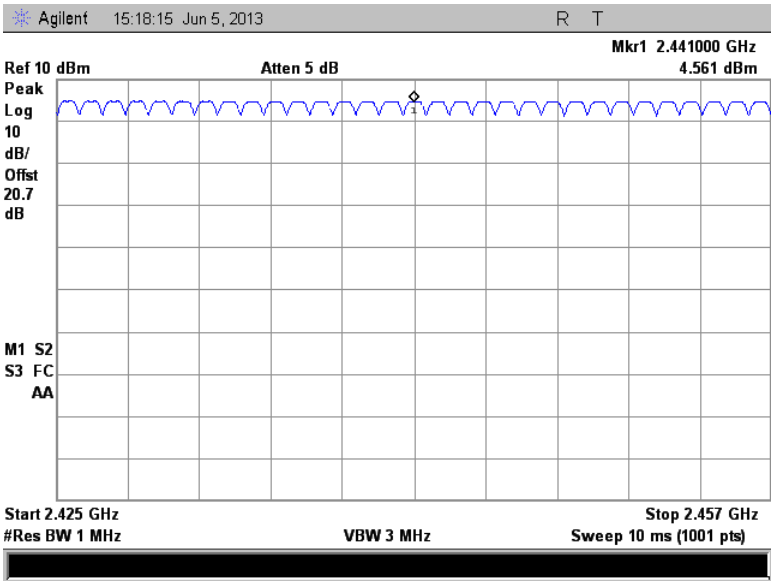


Figure 7.4.2.2-2: Number of Hopping Channels (25 – 55)

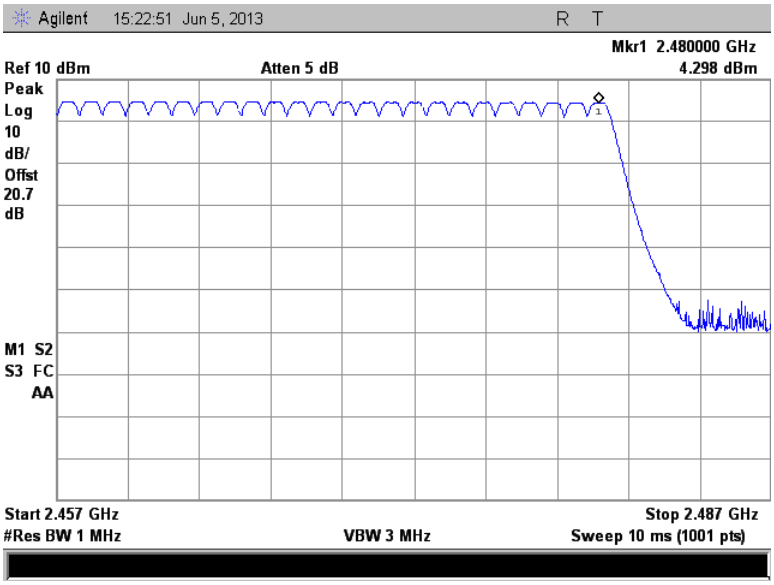


Figure 7.4.2.2-3: Number of Hopping Channels (56 – 79)

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 in Table 7.4.3.2-1 and Figure 7.4.3.2-1 to Figure 7.4.3.2-3

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	0.44	140.80	400	PASS
DH3	400	5.06	160	1.69	270.40	400	PASS
DH5	266.67	3.38	106.67	2.945	314.14	400	PASS

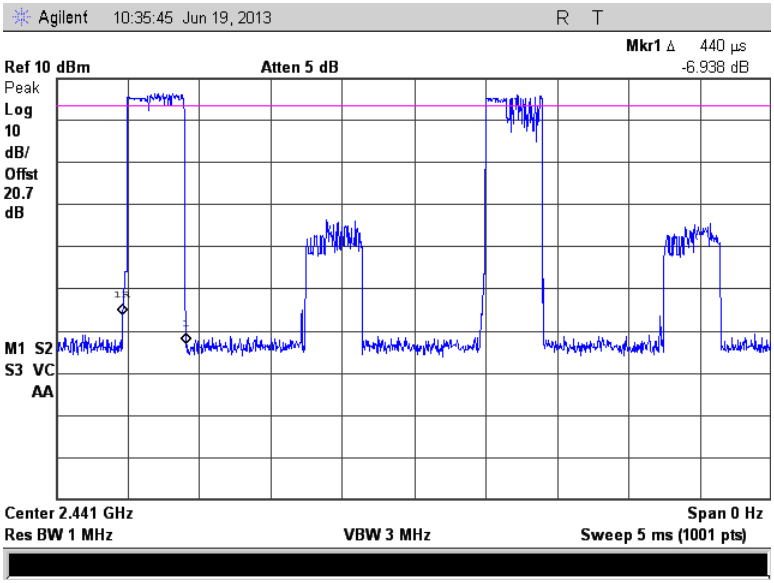


Figure 7.4.3.2-1: Channel Dwell Time – DH1

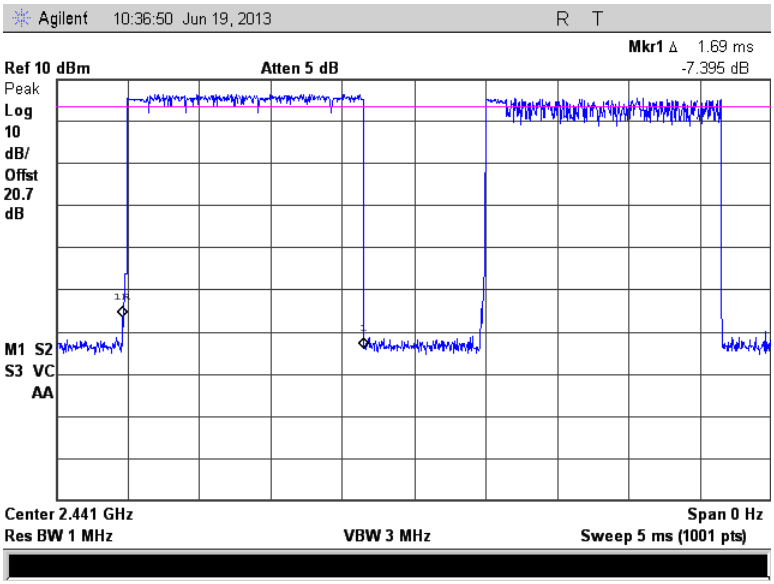


Figure 7.4.3.2-2: Channel Dwell Time – DH3

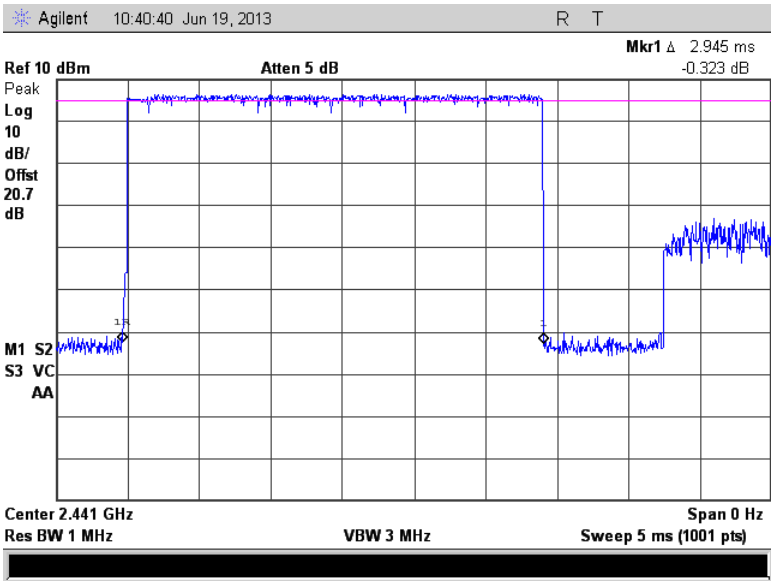


Figure 7.4.3.2-3: Channel Dwell Time – DH5

7.4.4 20dB / 99% Bandwidth - FCC: Section 15.247(a)(1)(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 in Table 7.4.4.2-1 to Table 7.4.4.2-3 and Figures 7.4.4.2-1 to 7.4.4.2-18.

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

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
2402	957	873
2441	957	864
2480	957	873

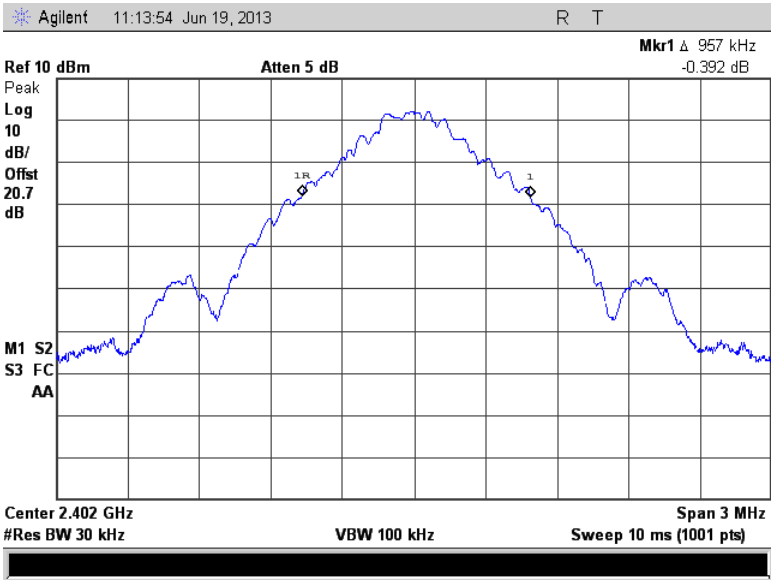


Figure 7.4.4.2-1: 20dB BW Low Channel (GFSK)

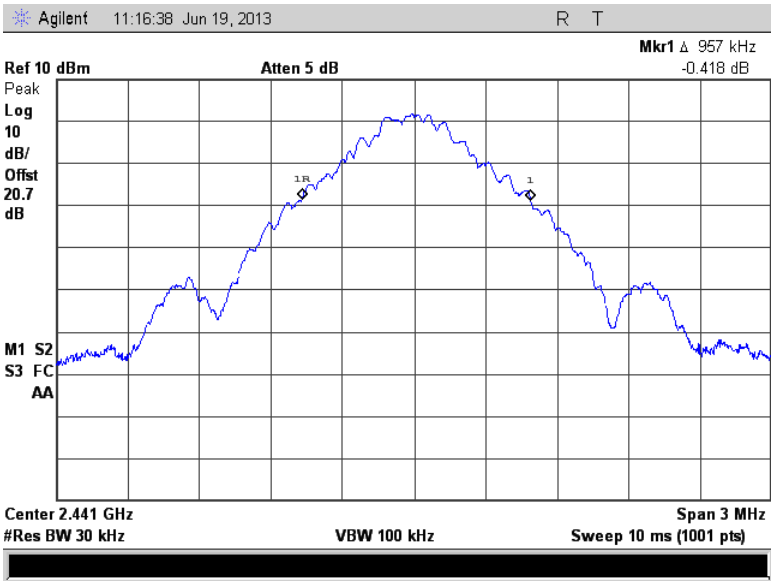


Figure 7.4.4.2-2: 20dB BW Middle Channel (GFSK)

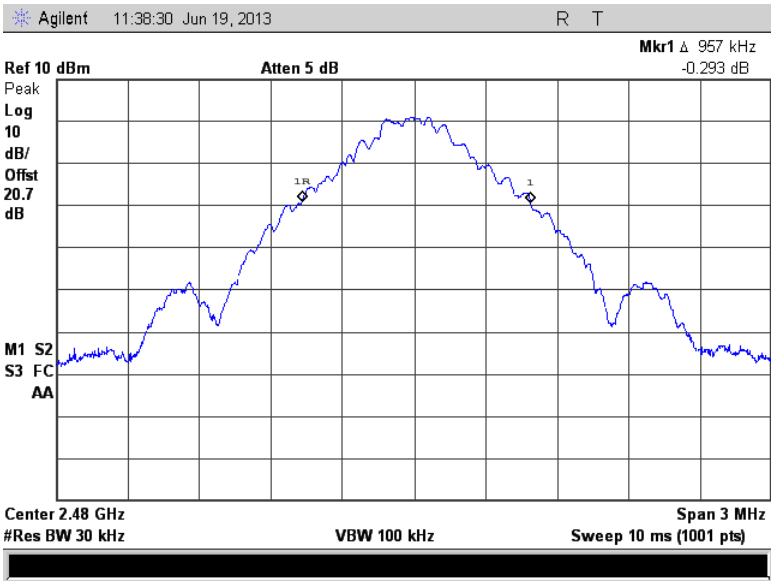


Figure 7.4.4.2-3: 20dB BW High Channel (GFSK)

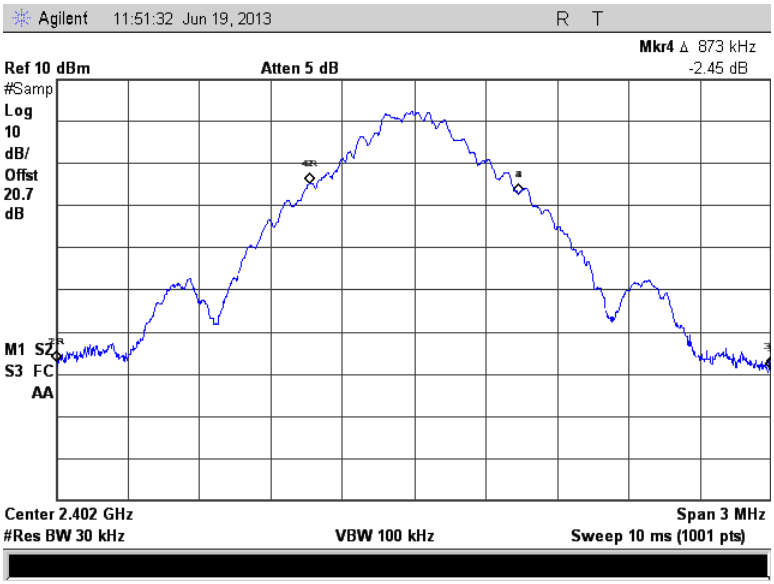


Figure 7.4.4.2-4: 99% OBW Low Channel (GFSK)

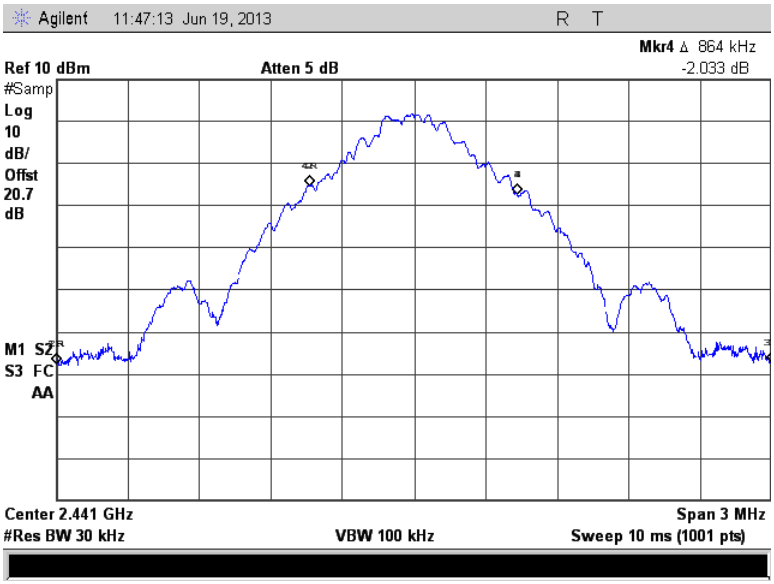


Figure 7.4.4.2-5: 99% OBW Middle Channel (GFSK)

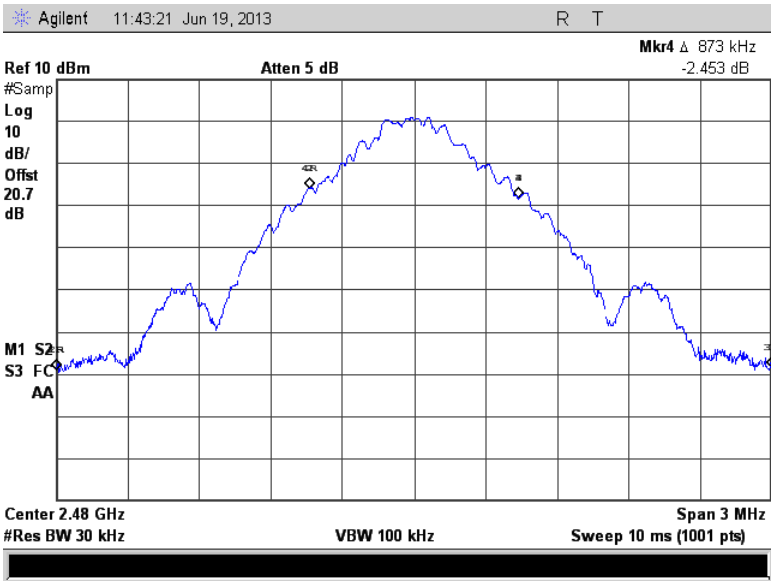


Figure 7.4.4.2-6: 99% OBW High Channel (GFSK)

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

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
2402	1389	1234
2441	1389	1237
2480	1386	1230

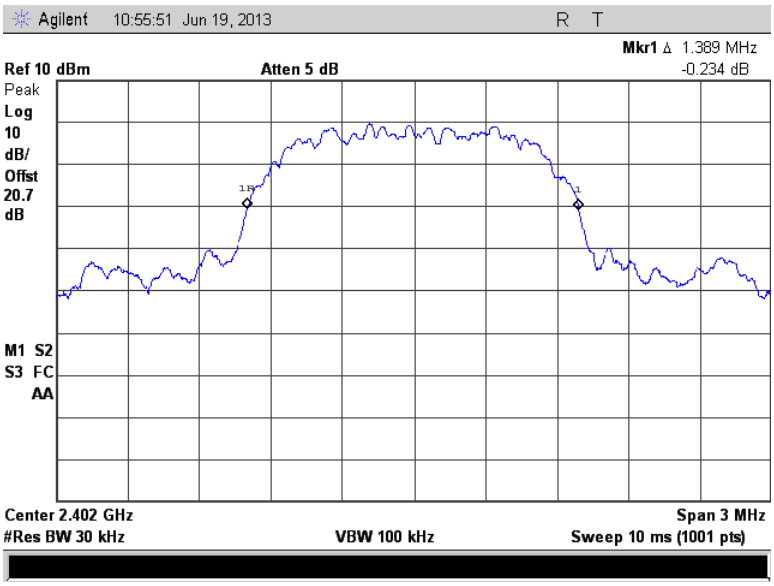


Figure 7.4.4.2-7: 20dB BW Low Channel (π/4 DQPSK)

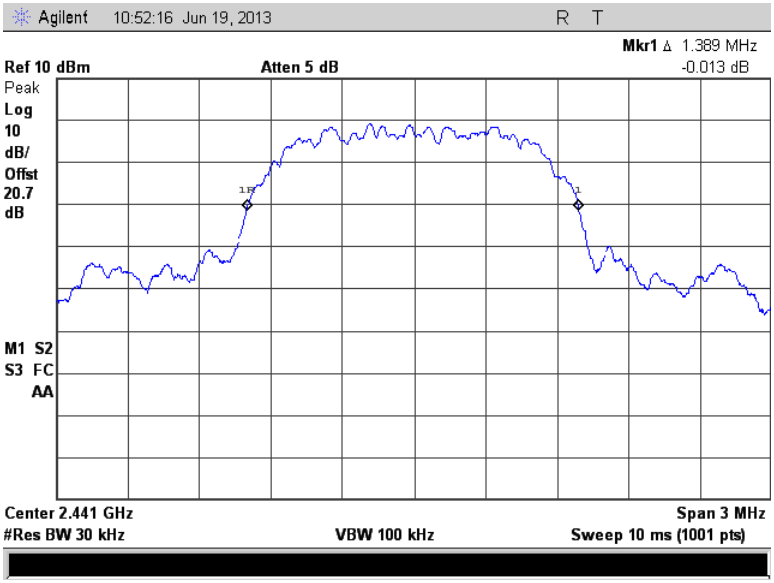


Figure 7.4.4.2-8: 20dB BW Middle Channel (π/4 DQPSK)

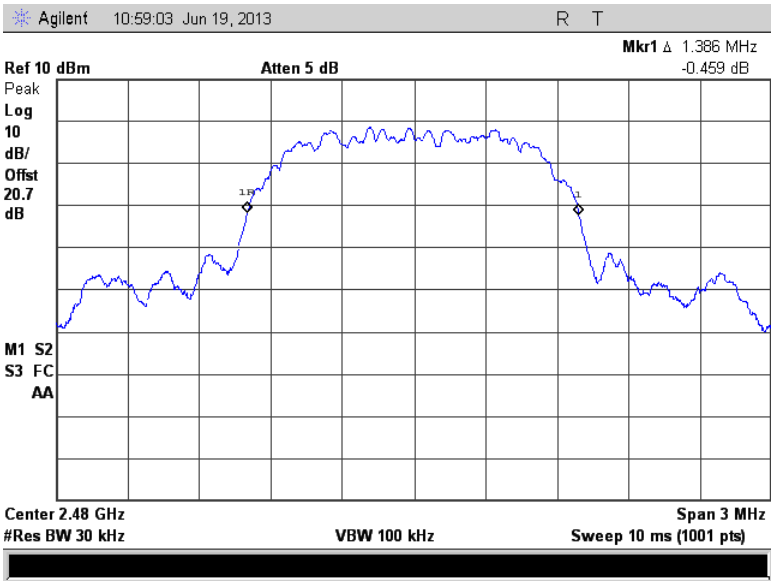


Figure 7.4.4.2-9: 20dB BW High Channel (π/4 DQPSK)

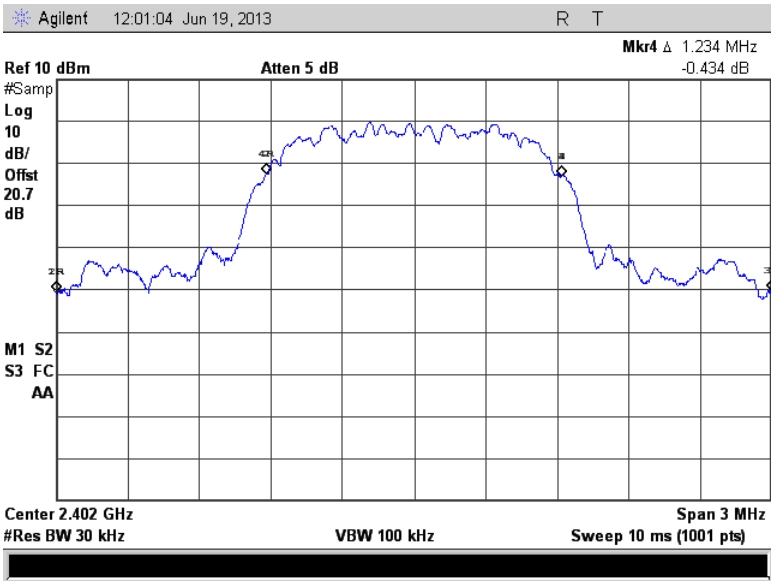


Figure 7.4.4.2-10: 99% OBW Low Channel (π/4 DQPSK)

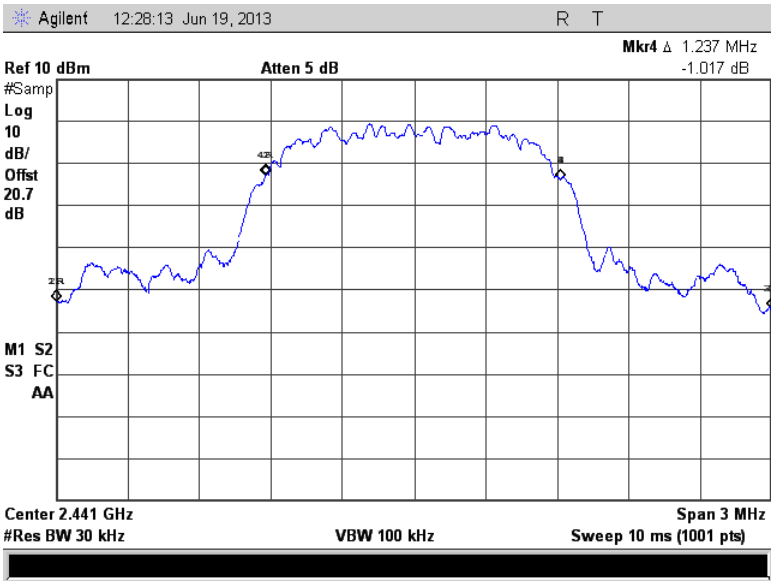


Figure 7.4.4.2-11: 99% OBW Middle Channel (π/4 DQPSK)

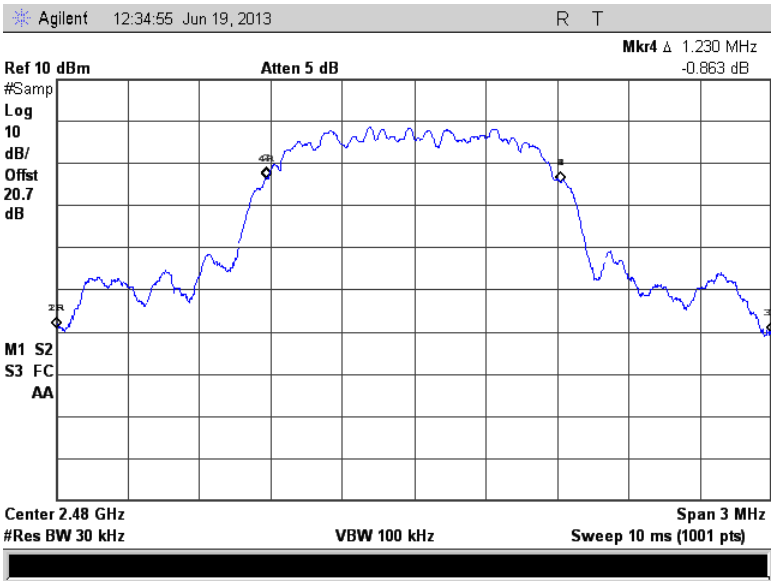


Figure 7.4.4.2-12: 99% OBW High Channel (π/4 DQPSK)

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

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
2402	1380	1230
2441	1374	1230
2480	1374	1230

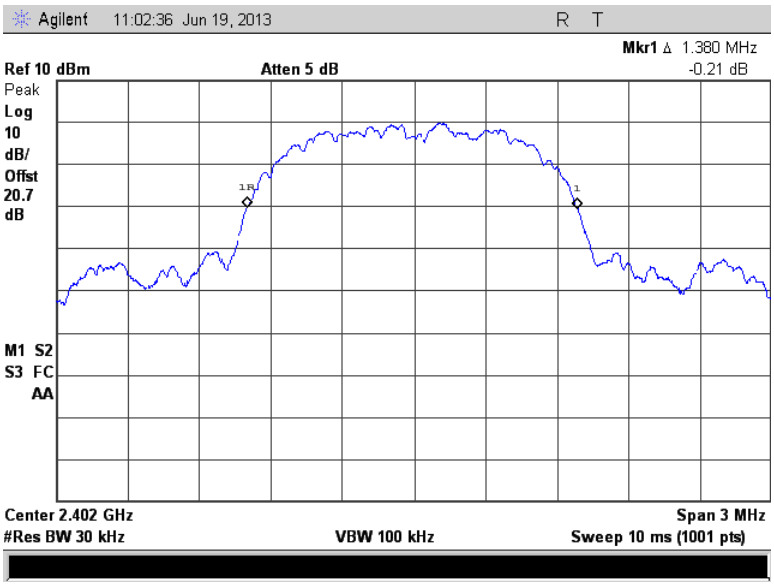


Figure 7.4.4.2-13: 20dB BW Low Channel (8DPSK)

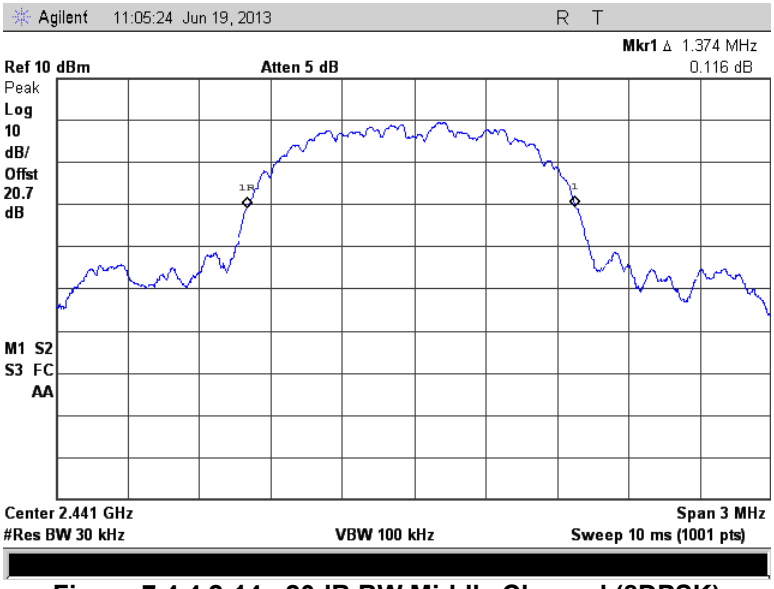


Figure 7.4.4.2-14: 20dB BW Middle Channel (8DPSK)

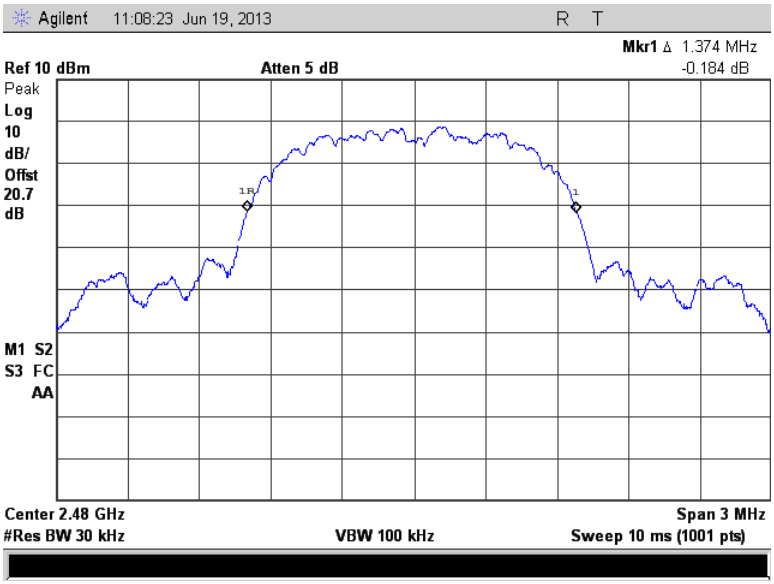


Figure 7.4.4.2-15: 20dB BW High Channel (8DPSK)

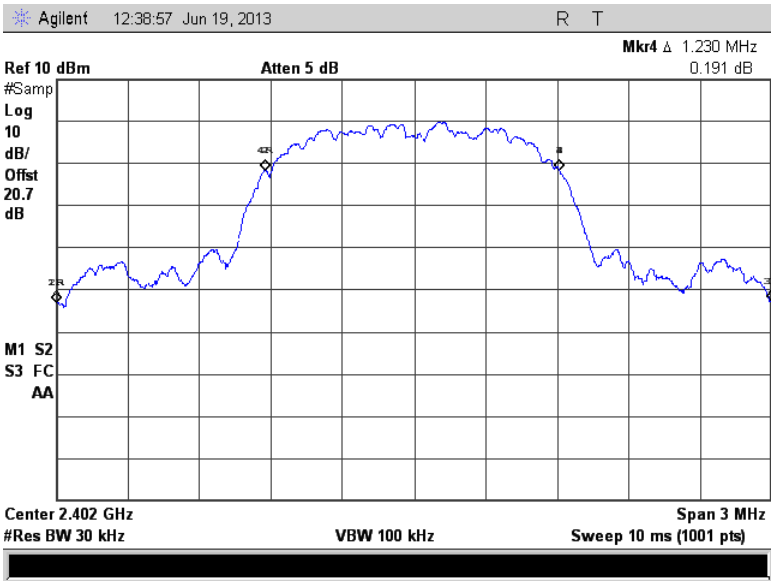


Figure 7.4.4.2-16: 99% OBW Low Channel (8DPSK)

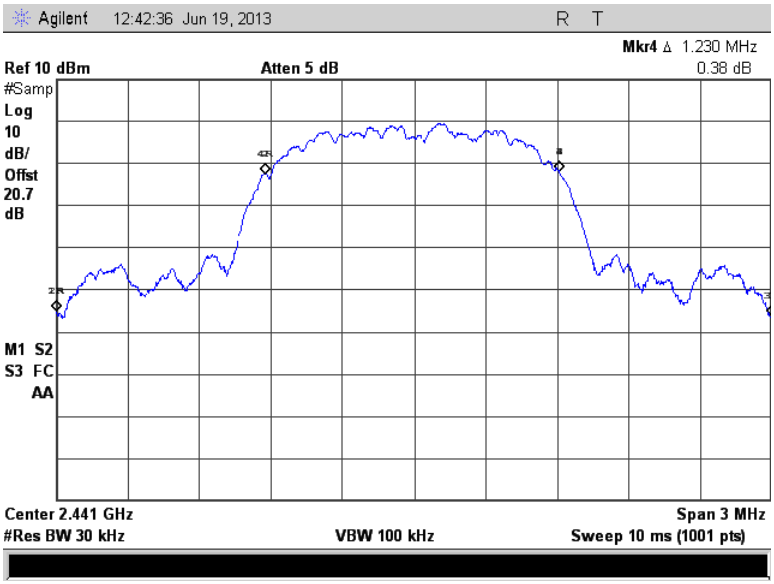


Figure 7.4.4.2-17: 99% OBW Middle Channel (8DPSK)

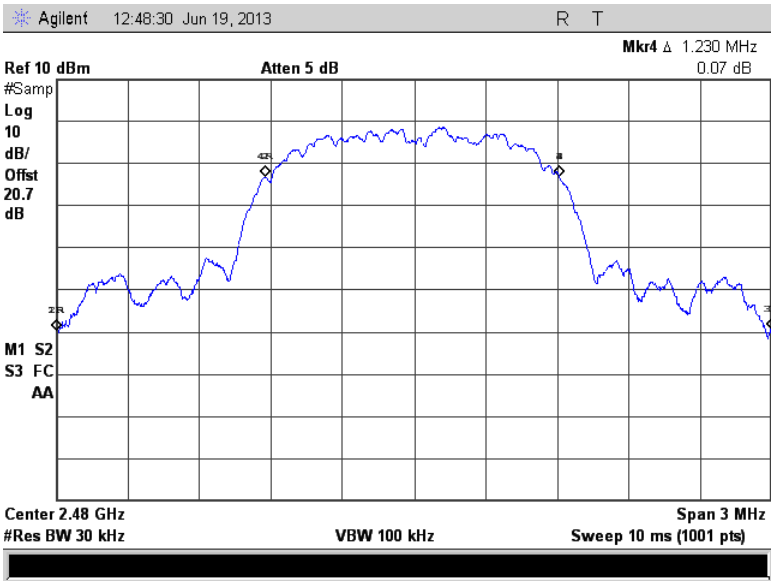


Figure 7.4.4.2-18: 99% OBW High Channel (8DPSK)

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

Results are shown in Figure 7.5.1.2-1 to Figure 7.5.1.2-12 below.

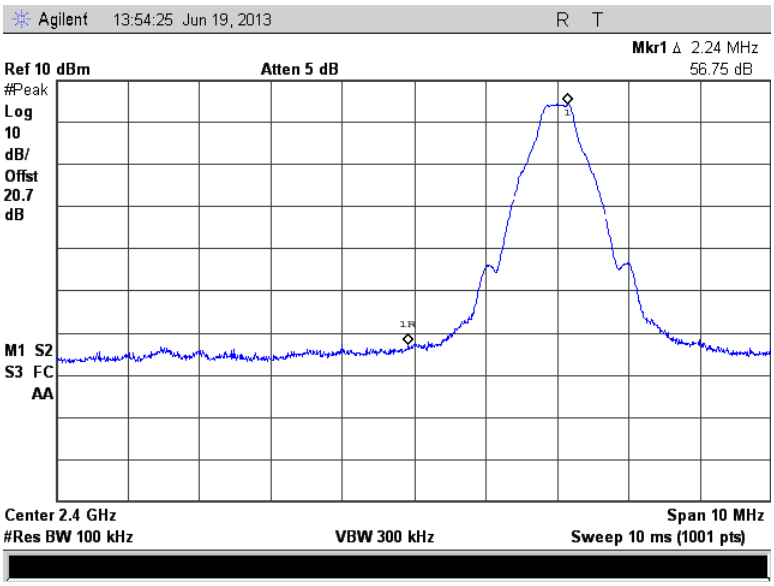


Figure 7.5.1.2-1: Lower Band-edge – Continuous Mode (GFSK)

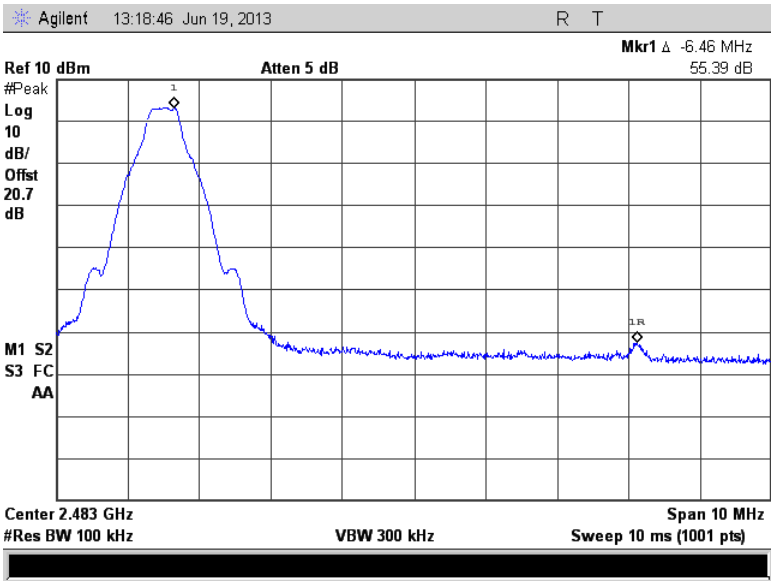


Figure 7.5.1.2-2: Upper Band-edge – Continuous Mode (GFSK)

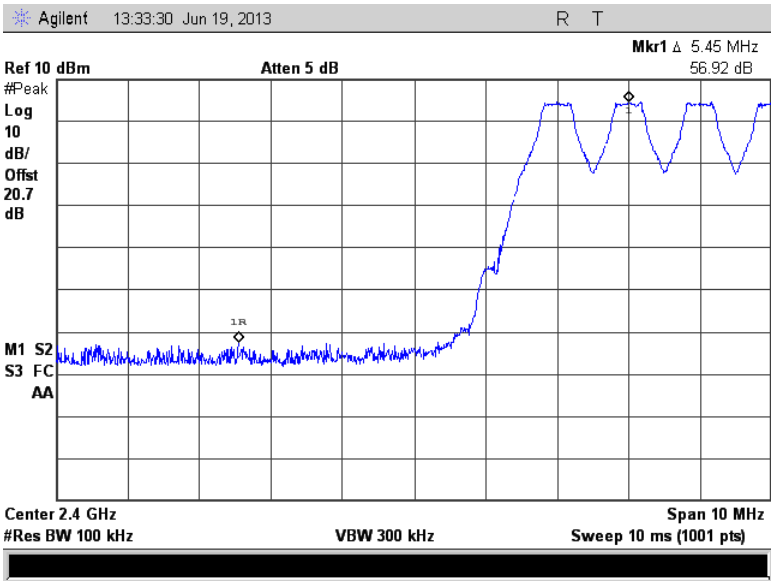


Figure 7.5.1.2-3: Lower Band-edge – Hopping Mode (GFSK)

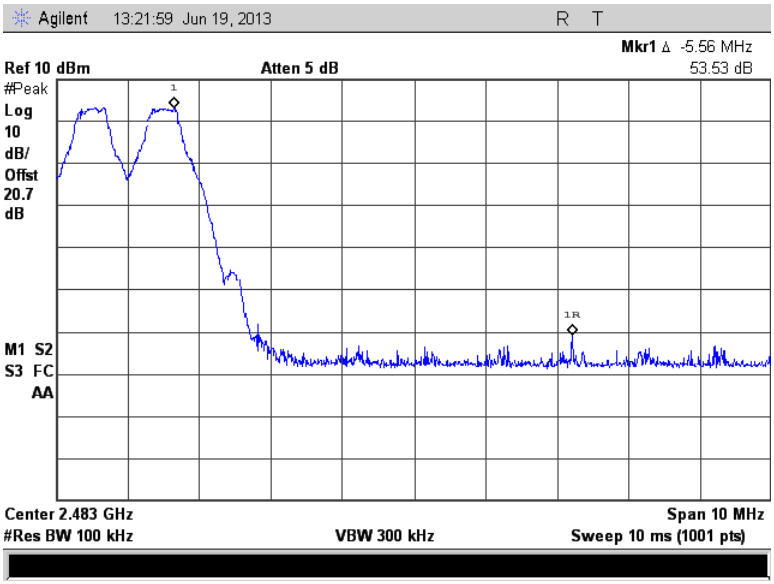


Figure 7.5.1.2-4: Upper Band-edge – Hopping Mode (GFSK)

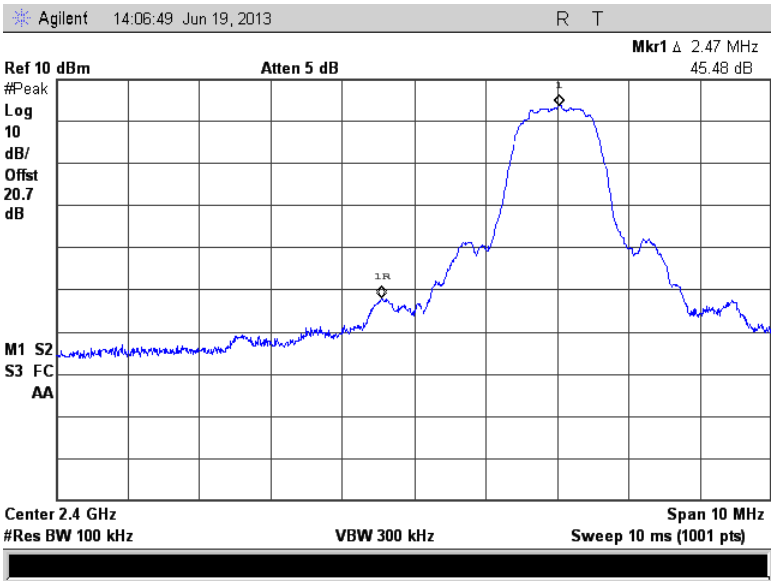


Figure 7.5.1.2-5: Lower Band-edge – Continuous Mode (π/4 DQPSK)

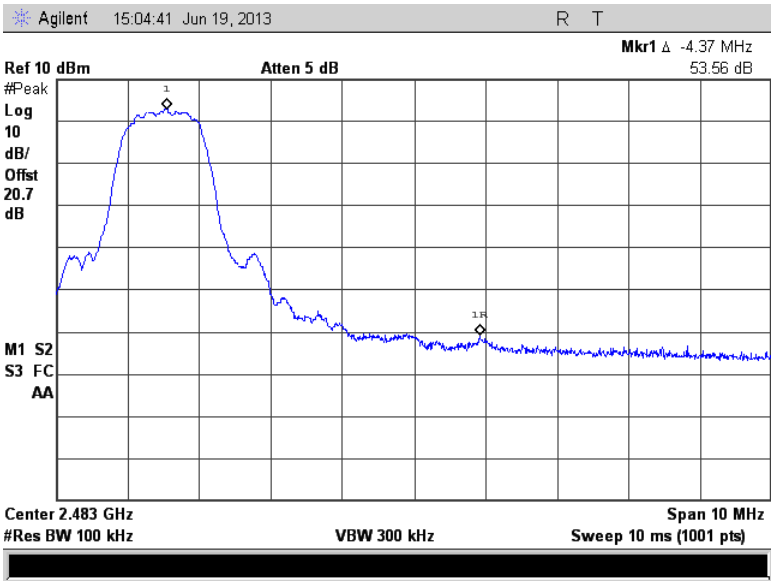


Figure 7.5.1.2-6: Upper Band-edge – Continuous Mode (π/4 DQPSK)

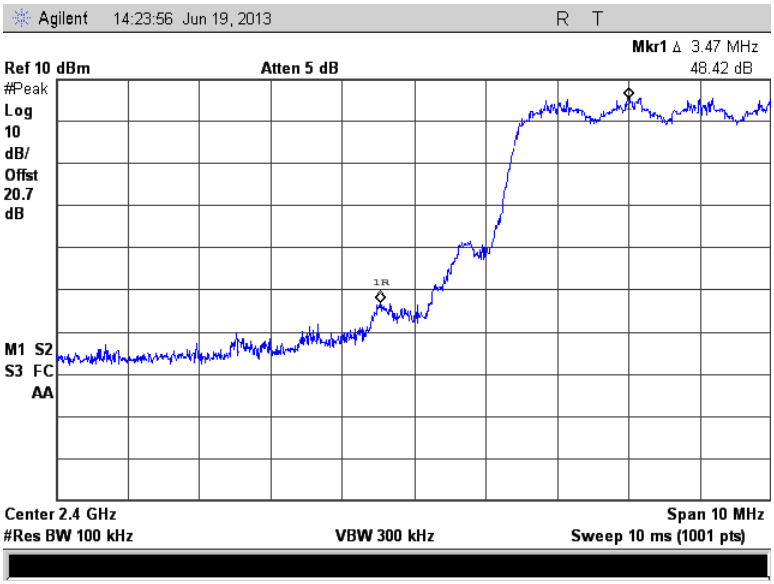


Figure 7.5.1.2-7: Lower Band-edge – Hopping Mode (π/4 DQPSK)

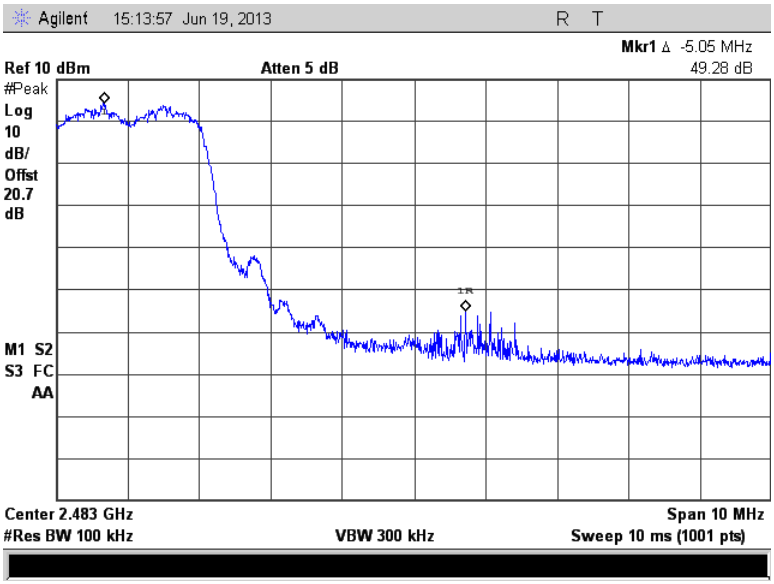


Figure 7.5.1.2-8: Upper Band-edge – Hopping Mode (π/4 DQPSK)

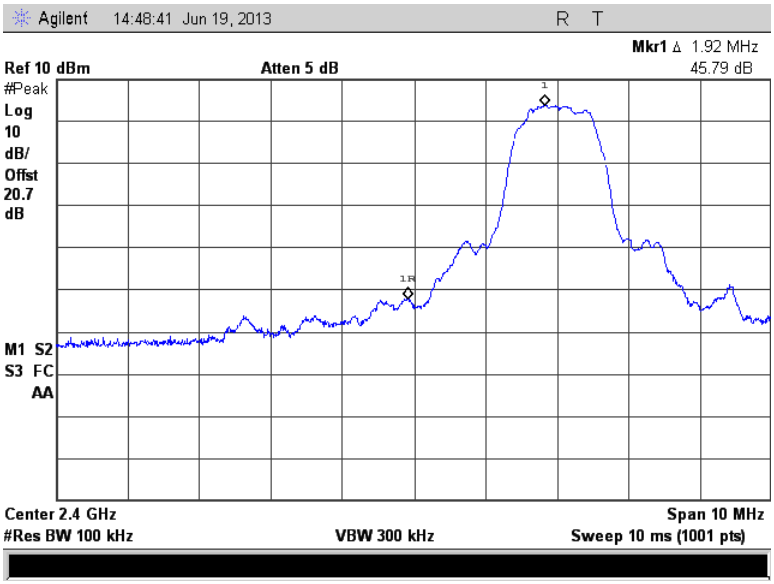


Figure 7.5.1.2-9: Lower Band-edge – Continuous Mode (8DPSK)

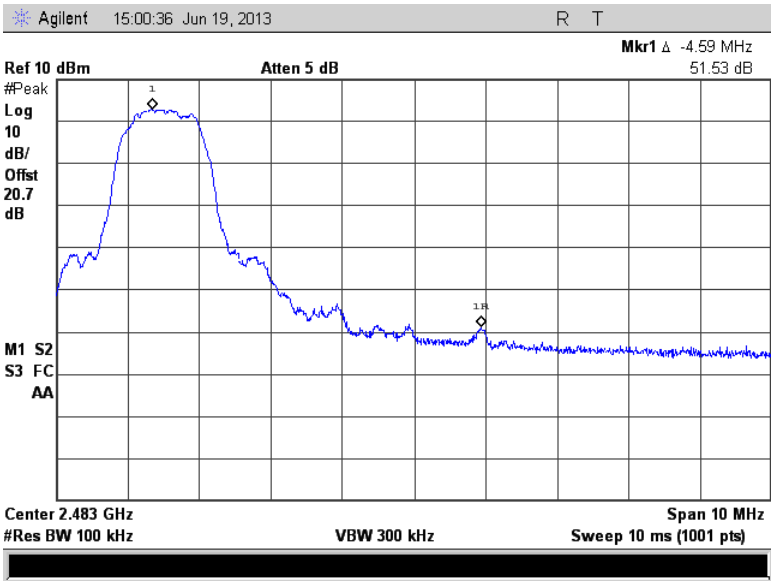


Figure 7.5.1.2-10: Upper Band-edge – Continuous Mode (8DPSK)

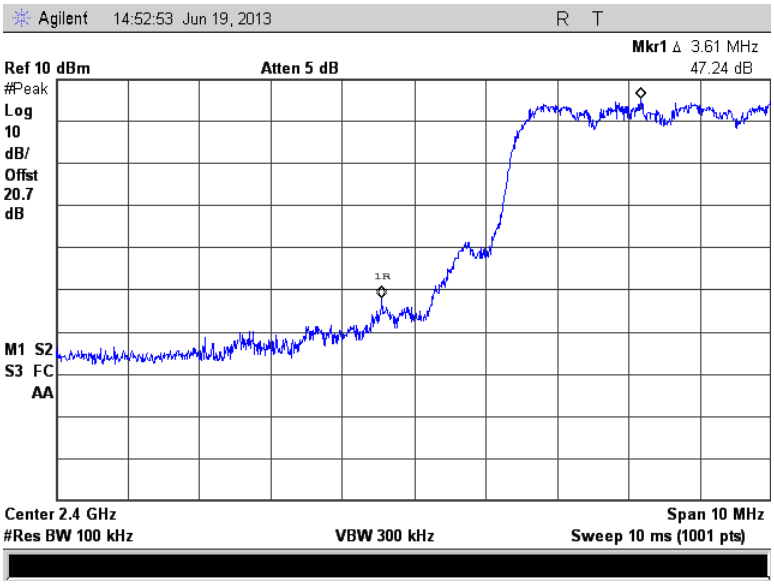


Figure 7.5.1.2-11: Lower Band-edge – Hopping Mode (8DPSK)

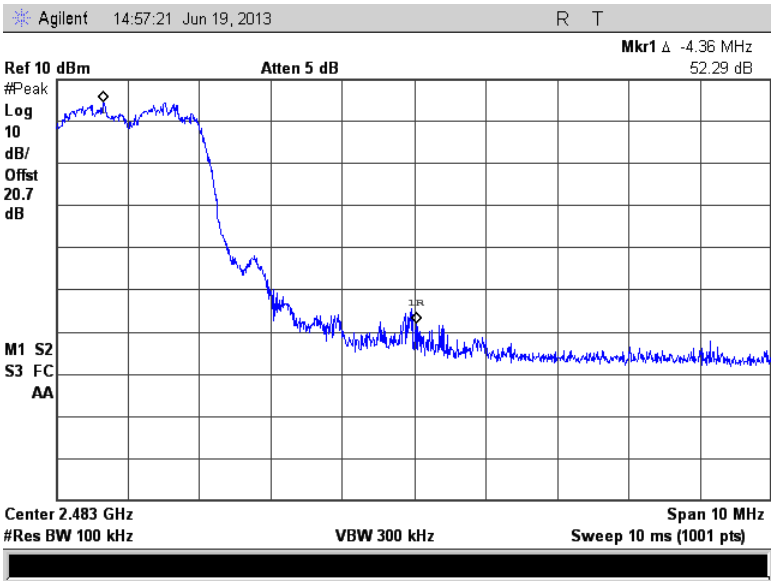


Figure 7.5.1.2-12: Upper Band-edge – Hopping Mode (8DPSK)

7.5.2 Band-Edge Compliance of Radiated Spurious Emissions

7.5.2.1 Measurement Procedure

Because the upper band-edge coincides with a restricted band, band-edge compliance for the upper band-edge was determined using the radiated mark-delta method. The radiated field strength of the fundamental emission was first determined and then the mark-delta method was used to determine the field strength of the band-edge emission.

7.5.2.2 Measurement Results

Band-edge compliance is displayed in Table 7.5.2.2-1 to Table 7.5.2.2-3 and Figure 7.5.2.2-1 to Figure 7.5.2.2-6.

Table 7.5.2.2-1: Upper Band-edge – GFSK

Frequency (MHz)	Uncorrected Level (dBuV)		Antenna Polarity	Correction Factors	Fundamental Level (dBuV/m)		Marker-Delta (dB)	Band-Edge Level (dBuV/m)		Margin to Limits (dB)	
										74	54
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg		pk	Qpk/Avg	pk	Qpk/Avg
2480	104.30	103.80	H	-8.28	96.02	95.52	49.19	46.83	46.33	27.17	7.67
2480	109.90	109.30	V	-8.28	101.62	101.02	53.91	47.70	47.11	26.30	6.89

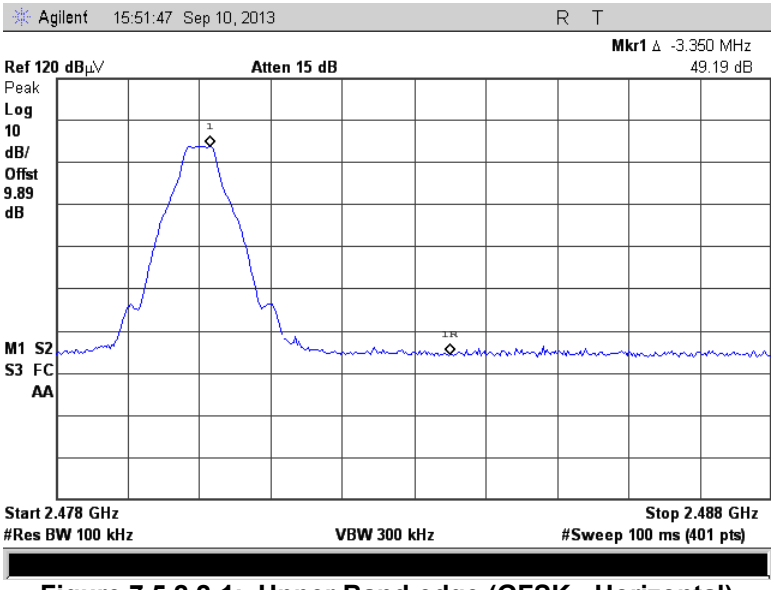


Figure 7.5.2.2-1: Upper Band-edge (GFSK - Horizontal)

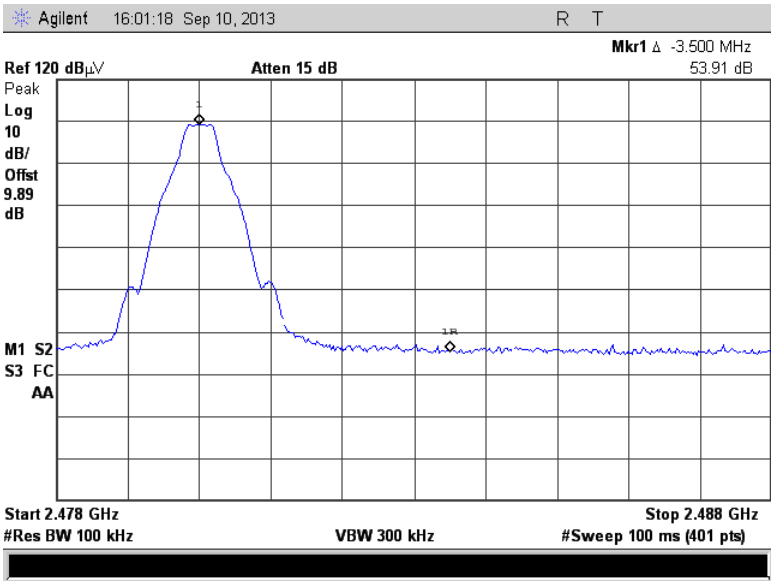


Figure 7.5.2.2-2: Upper Band-edge (GFSK - Vertical)

Table 7.5.2.2-2: Upper Band-edge – π/4 DQPSK

Frequency (MHz)	Uncorrected Level (dBuV)		Antenna Polarity	Correction Factors	Fundamental Level (dBuV/m)		Marker-Delta (dB)	Band-Edge Level (dBuV/m)		Margin to Limits (dB)	
										74	54
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg		pk	Qpk/Avg	pk	Qpk/Avg
2480	106.80	103.10	H	-8.28	98.52	94.82	48.51	50.01	46.31	23.99	7.69
2480	112.10	108.50	V	-8.28	103.82	100.22	52.62	51.20	47.60	22.80	6.40

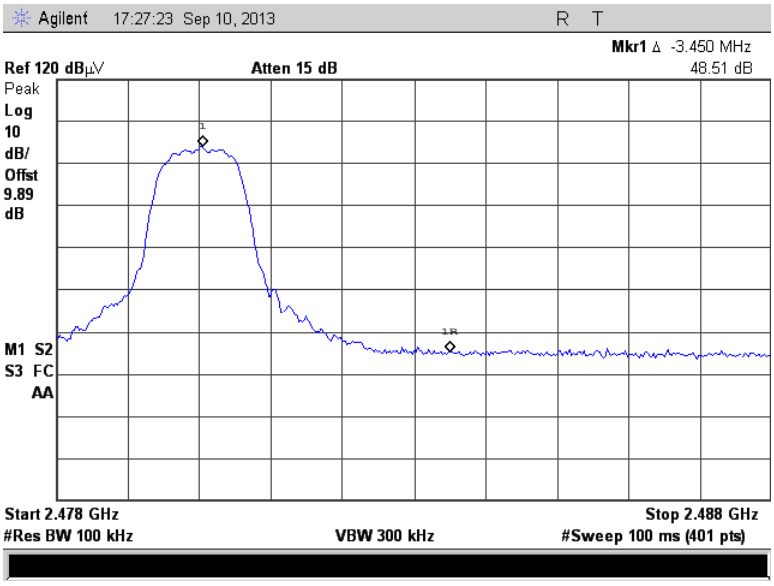


Figure 7.5.2.2-3: Upper Band-edge (π/4 DQPSK - Horizontal)

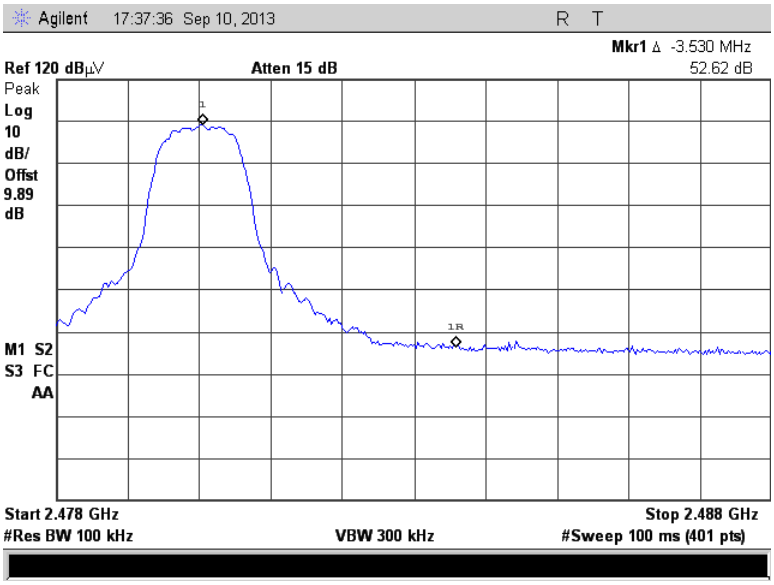


Figure 7.5.2.2-4: Upper Band-edge (π/4 DQPSK - Vertical)

Table 7.5.2.2-3: Upper Band-edge – 8DPSK

Frequency (MHz)	Uncorrected Level (dBuV)		Antenna Polarity	Correction Factors	Fundamental Level (dBuV/m)		Marker-Delta (dB)	Band-Edge Level (dBuV/m)		Margin to Limits (dB)	
										74	54
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg		pk	Qpk/Avg	pk	Qpk/Avg
2480	106.90	103.10	H	-8.28	98.62	94.82	48.03	50.59	46.79	23.41	7.21
2480	112.40	108.40	V	-8.28	104.12	100.12	51.81	52.31	48.31	21.69	5.69

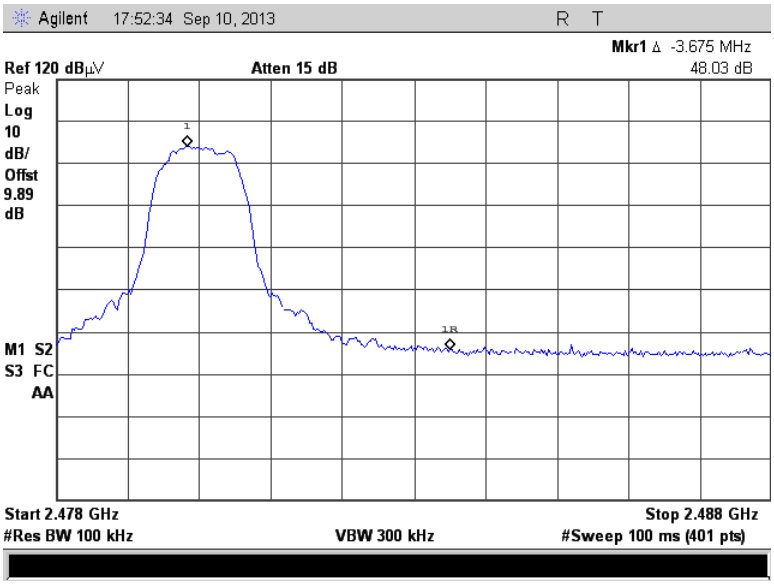


Figure 7.5.2.2-5: Upper Band-edge (8DPSK- Horizontal)

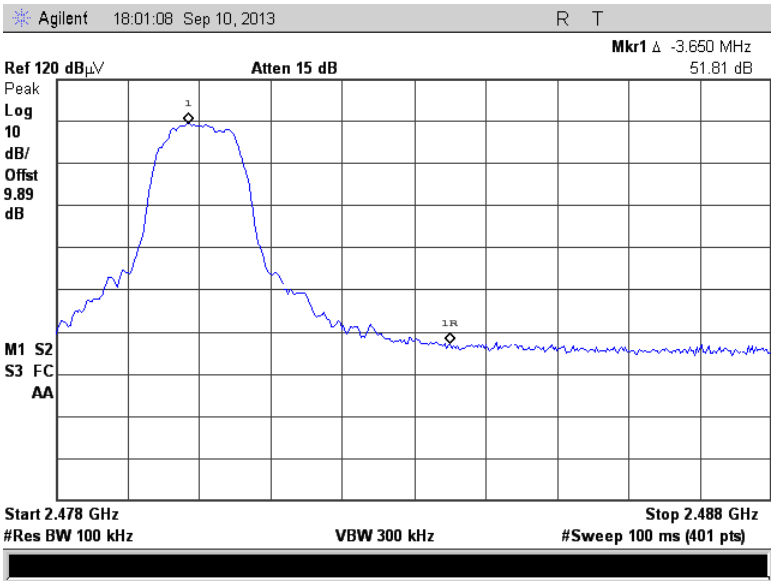


Figure 7.5.2.2-6: Upper Band-edge (8DPSK - Vertical)

7.5.3 RF Conducted Spurious Emissions

7.5.3.1 Measurement Procedure

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

7.5.3.2 Measurement Results

Results are shown below in Figure 7.5.3.2-1 to Figure 7.5.3.2-36:

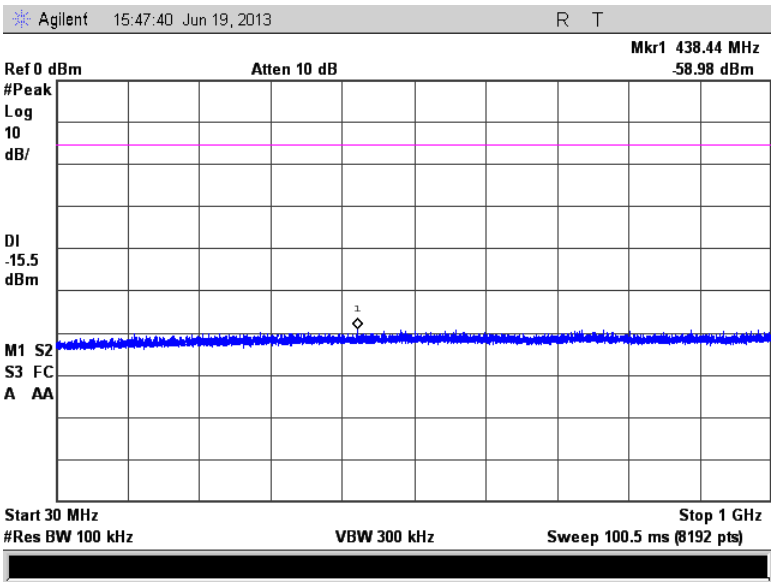


Figure 7.5.3.2-1: 30 MHz – 1 GHz – Low Channel (GFSK)

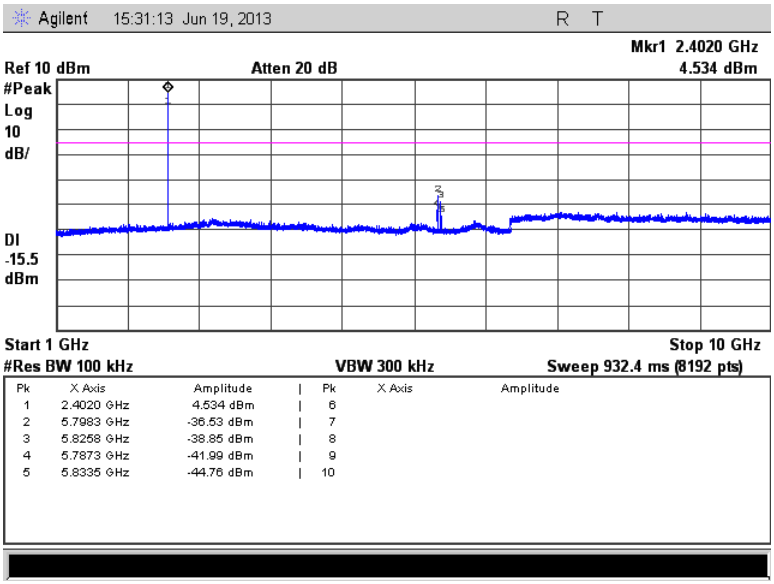


Figure 7.5.3.2-2: 1 GHz – 10 GHz – Low Channel (GFSK)

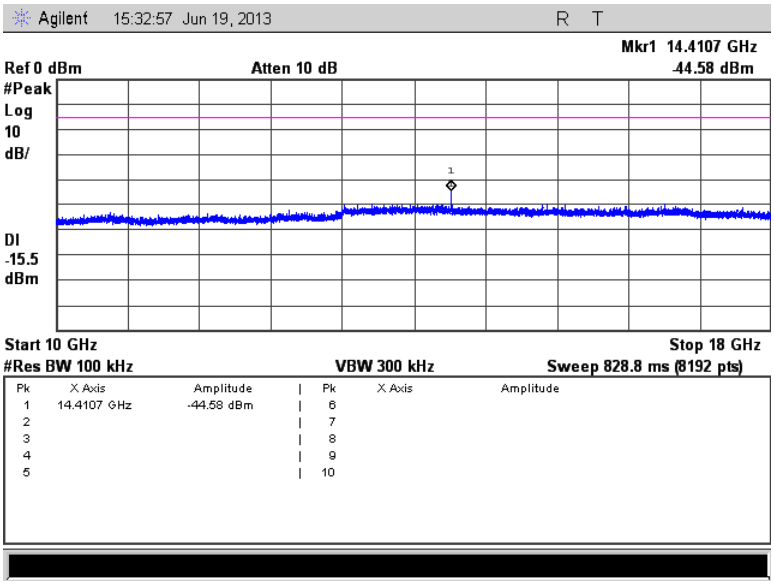


Figure 7.5.3.2-3: 10 GHz –18 GHz – Low Channel (GFSK)

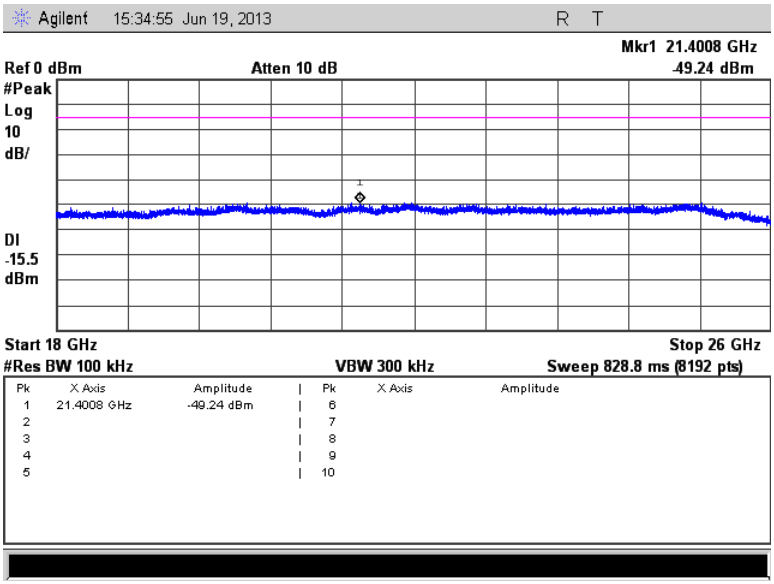


Figure 7.5.3.2-4: 18 GHz –26 GHz – Low Channel (GFSK)

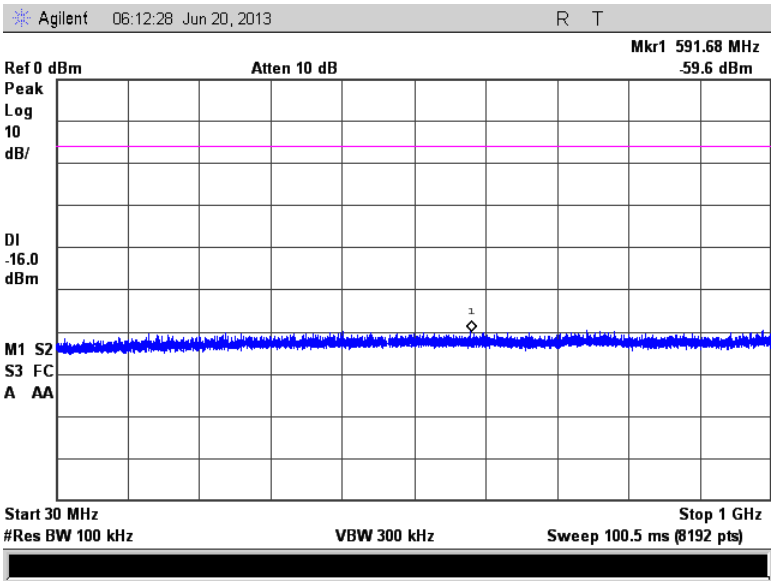


Figure 7.5.3.2-5: 30 MHz – 1 GHz – Middle Channel (GFSK)

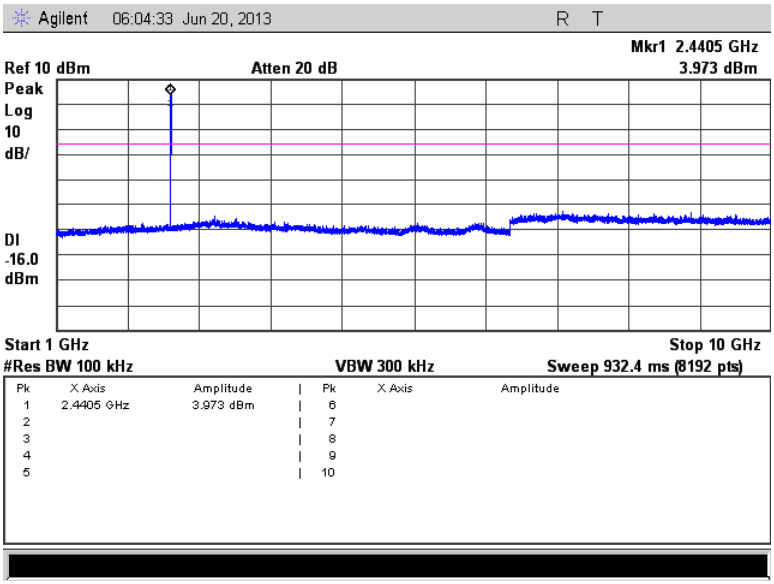


Figure 7.5.3.2-6: 1 GHz – 10 GHz – Middle Channel (GFSK)

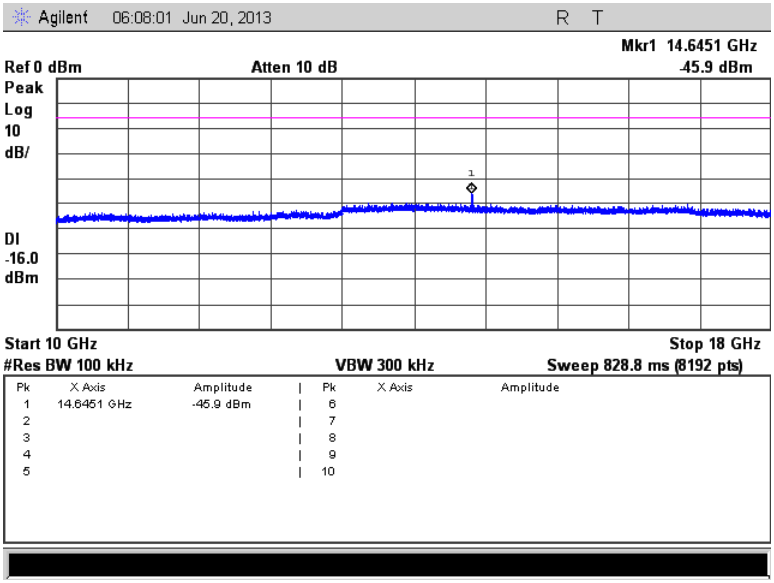


Figure 7.5.3.2-7: 10 GHz –18 GHz – Middle Channel (GFSK)

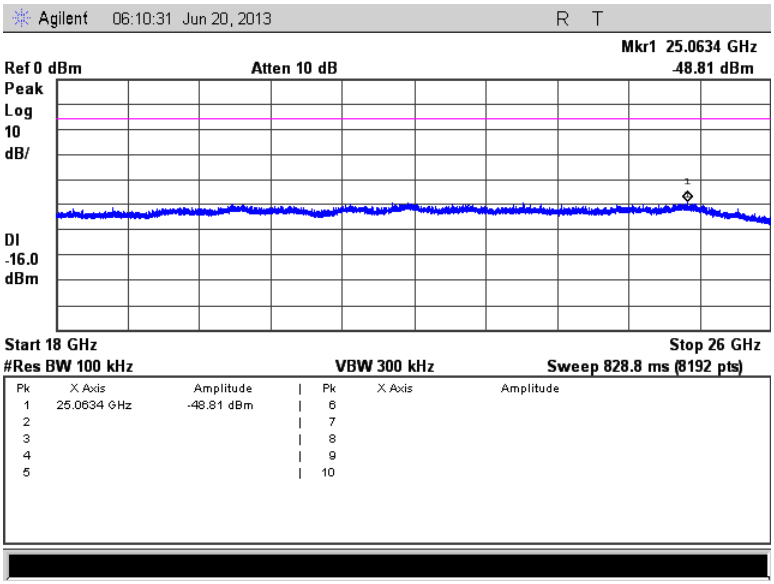


Figure 7.5.3.2-8: 18GHz –26 GHz – Middle Channel (GFSK)

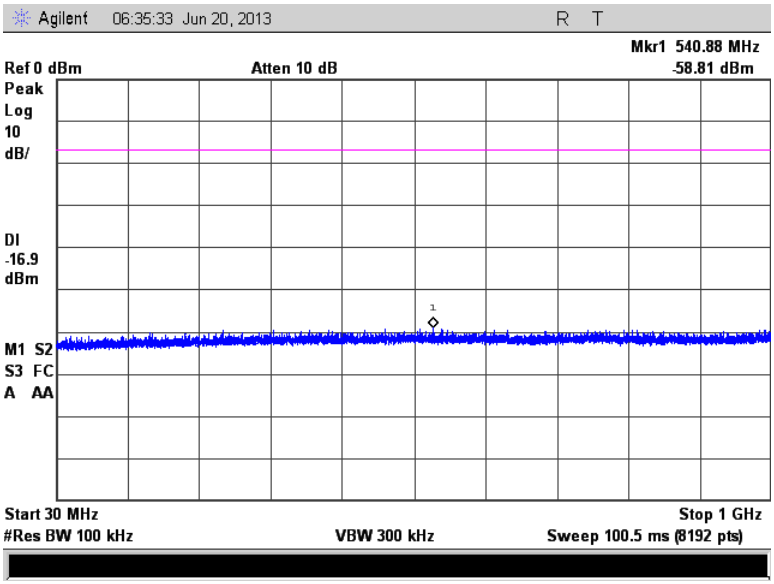


Figure 7.5.3.2-9: 30 MHz – 1 GHz – High Channel (GFSK)

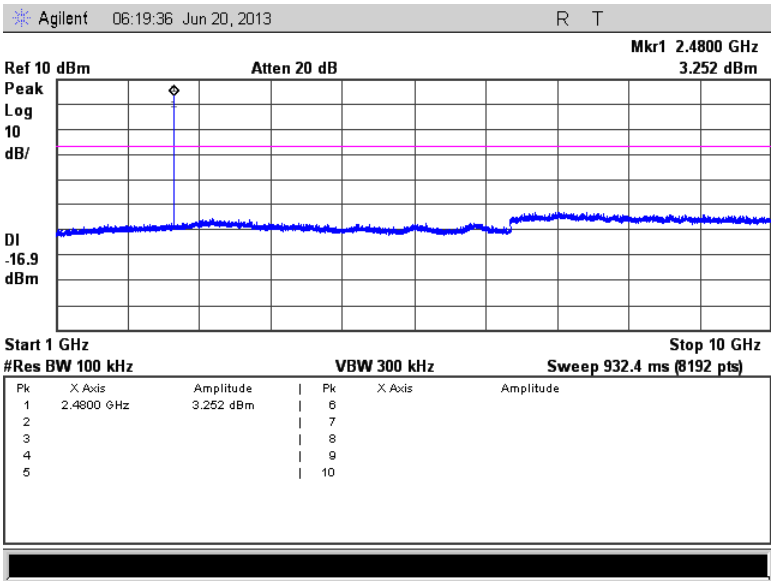


Figure 7.5.3.2-10: 1 GHz – 10 GHz – High Channel (GFSK)

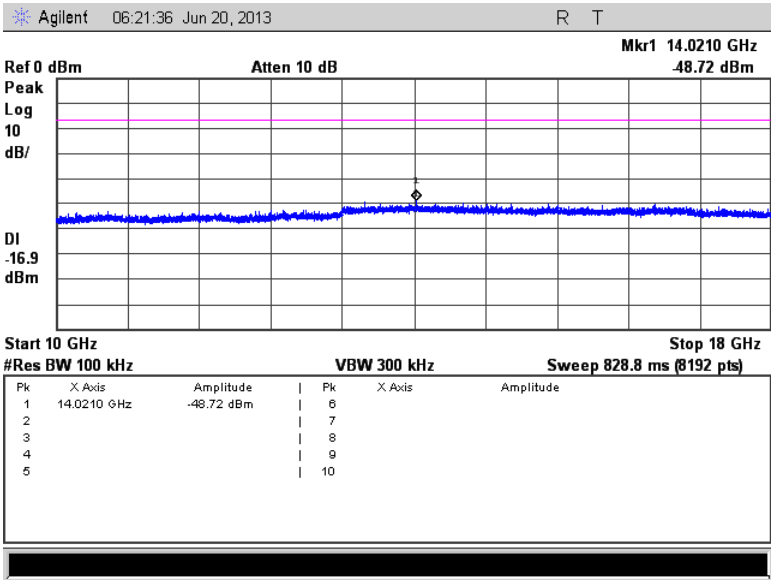


Figure 7.5.3.2-11: 10 GHz – 18 GHz – High Channel (GFSK)

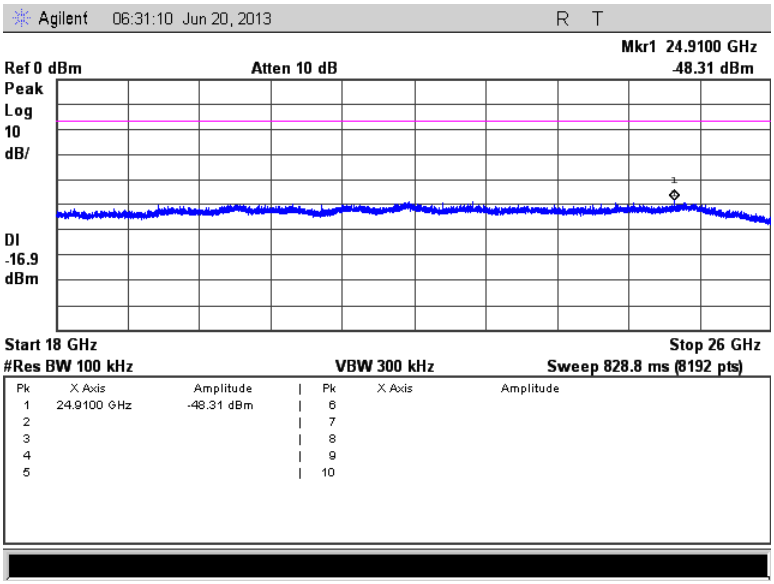


Figure 7.5.3.2-12: 18 GHz – 26 GHz – High Channel (GFSK)

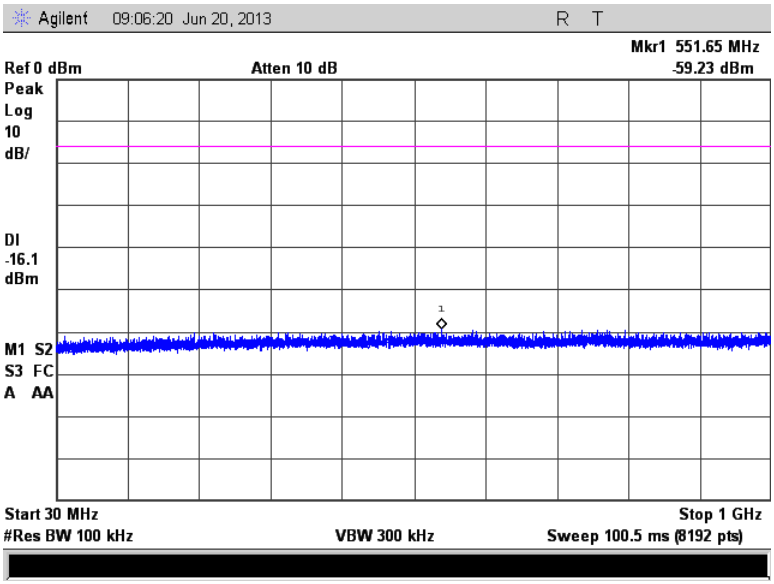


Figure 7.5.3.2-13: 30 MHz – 1 GHz – Low Channel (π/4 DQPSK)

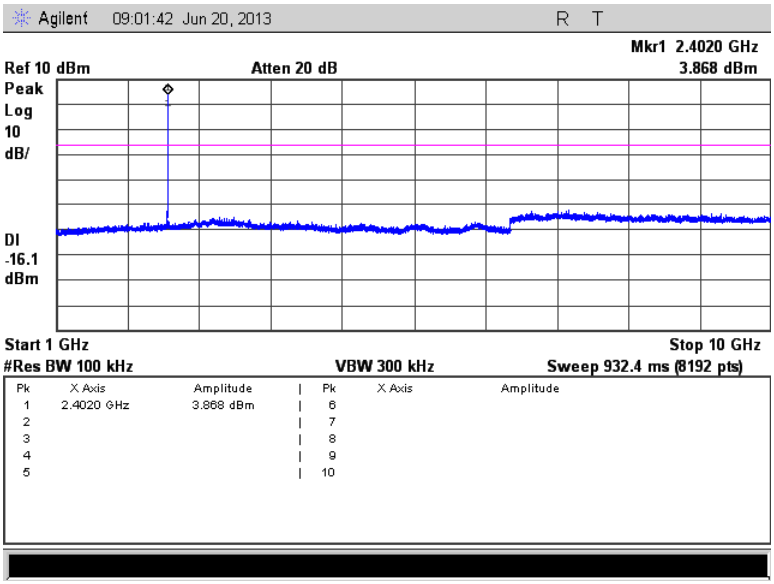


Figure 7.5.3.2-14: 1 GHz – 10 GHz – Low Channel (π/4 DQPSK)

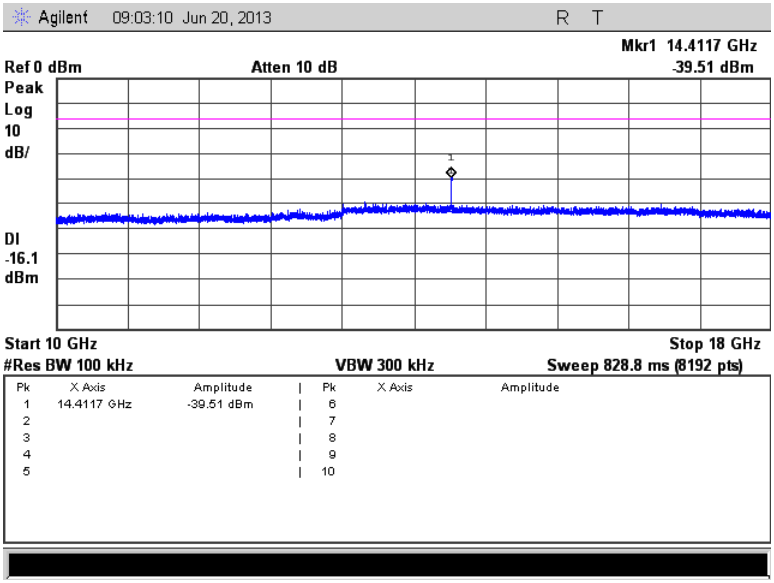


Figure 7.5.3.2-15: 10 GHz –18 GHz – Low Channel (π/4 DQPSK)

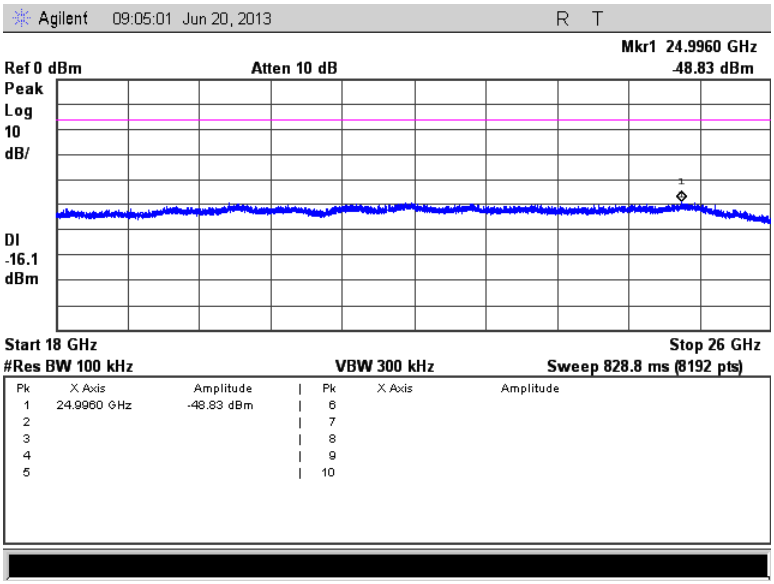


Figure 7.5.3.2-16: 18 GHz –26 GHz – Low Channel (π/4 DQPSK)

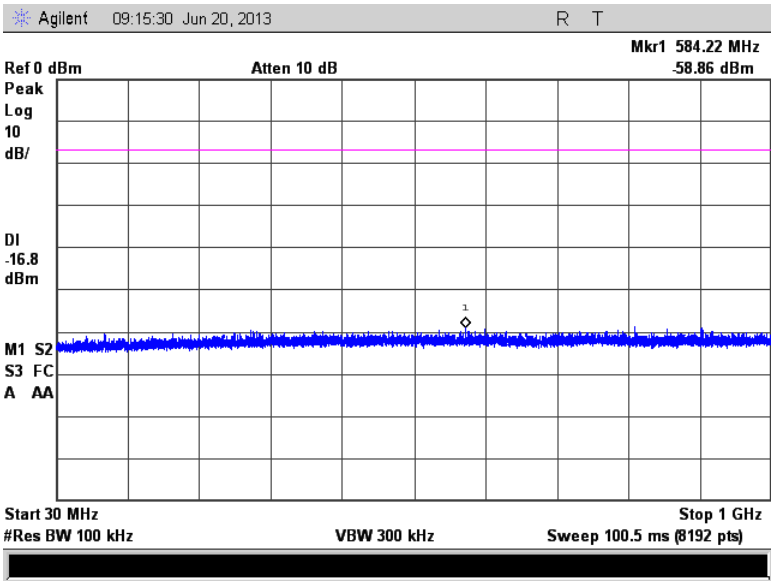


Figure 7.5.3.2-17: 30 MHz – 1 GHz – Middle Channel (π/4 DQPSK)

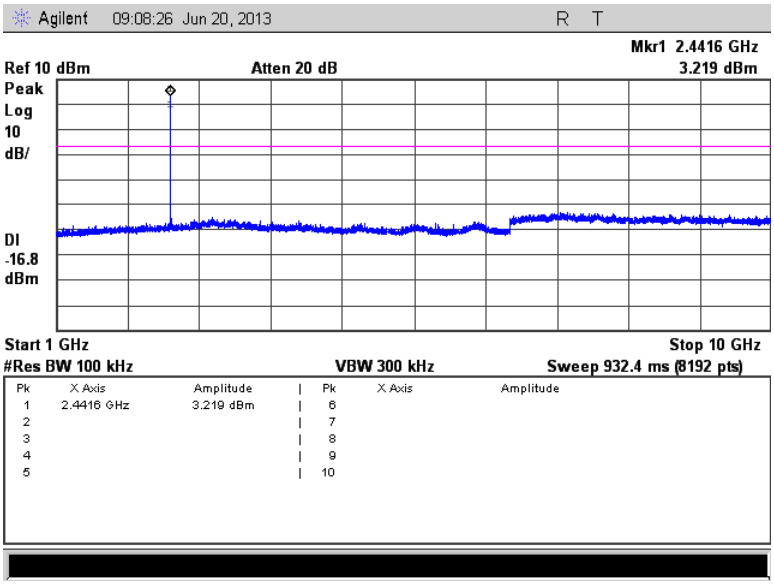


Figure 7.5.3.2-18: 1 GHz – 10 GHz – Middle Channel (π/4 DQPSK)

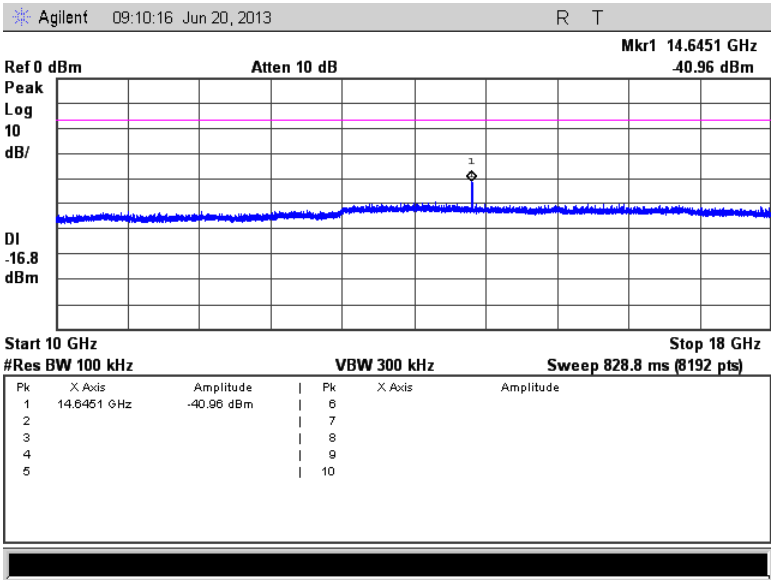


Figure 7.5.3.2-19: 10 GHz – 18 GHz – Middle Channel (π/4 DQPSK)

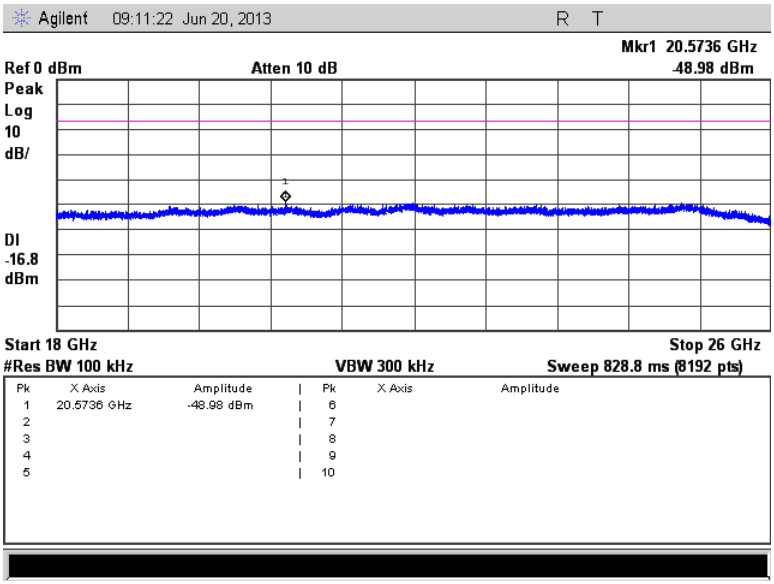


Figure 7.5.3.2-20: 18 GHz –26 GHz – Middle Channel (π/4 DQPSK)

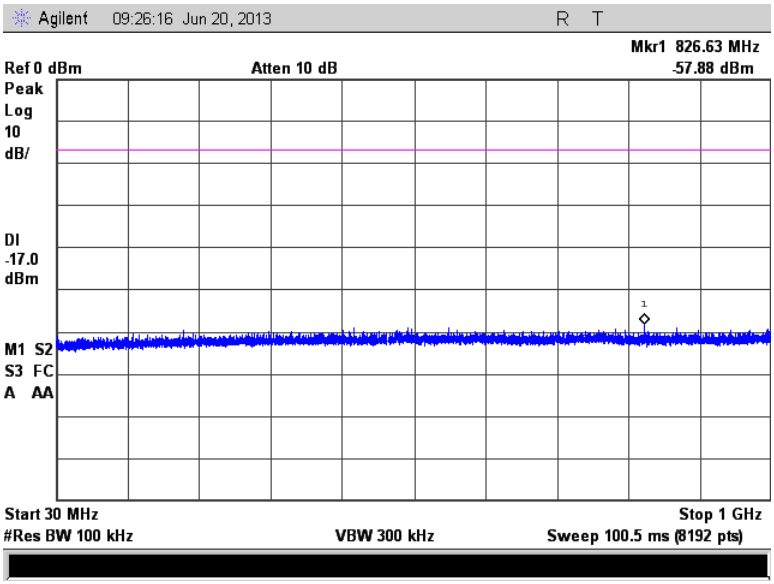


Figure 7.5.3.2-21: 30 MHz – 1 GHz – High Channel (π/4 DQPSK)

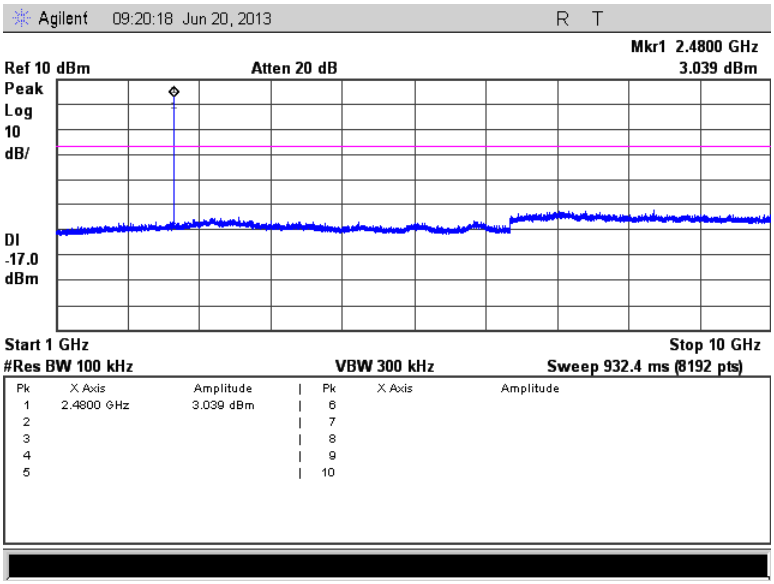


Figure 7.5.3.2-22: 1 GHz – 10 GHz – High Channel (π/4 DQPSK)

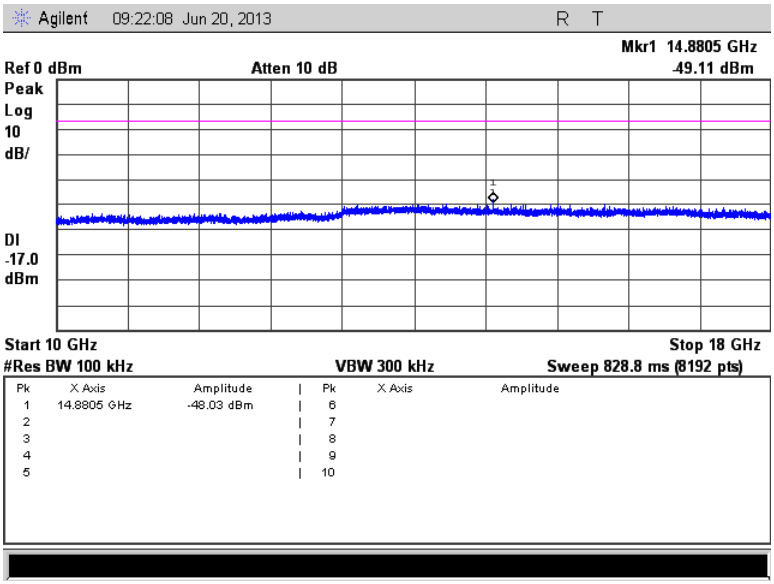


Figure 7.5.3.2-23: 10 GHz – 18 GHz – High Channel (π/4 DQPSK)

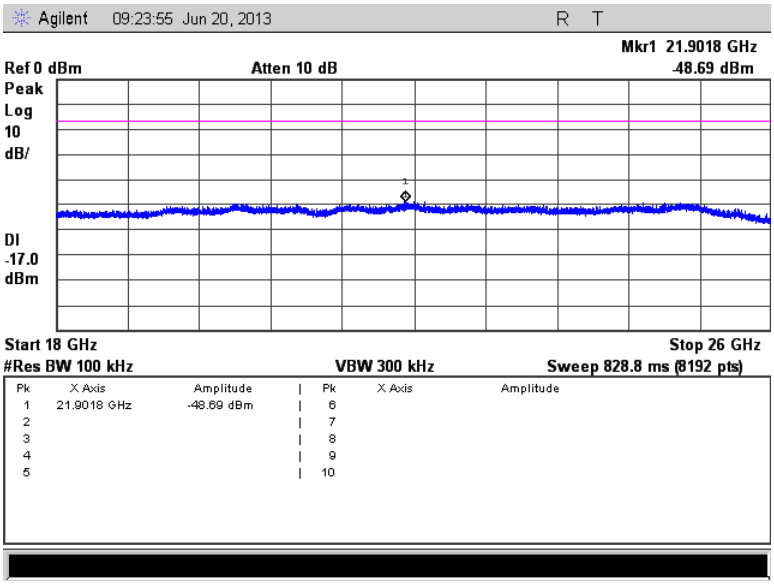


Figure 7.5.3.2-24: 18 GHz –26 GHz – High Channel (π/4 DQPSK)

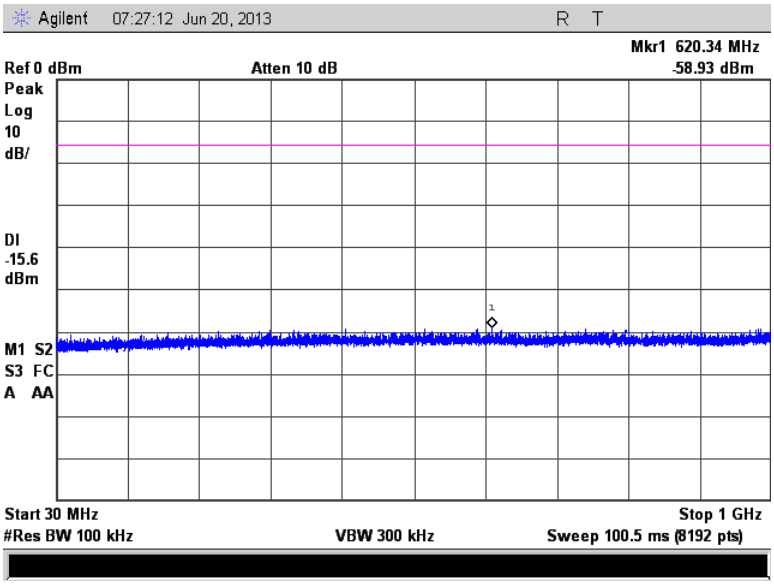


Figure 7.5.3.2-25: 30 MHz – 1 GHz – Low Channel (8DPSK)

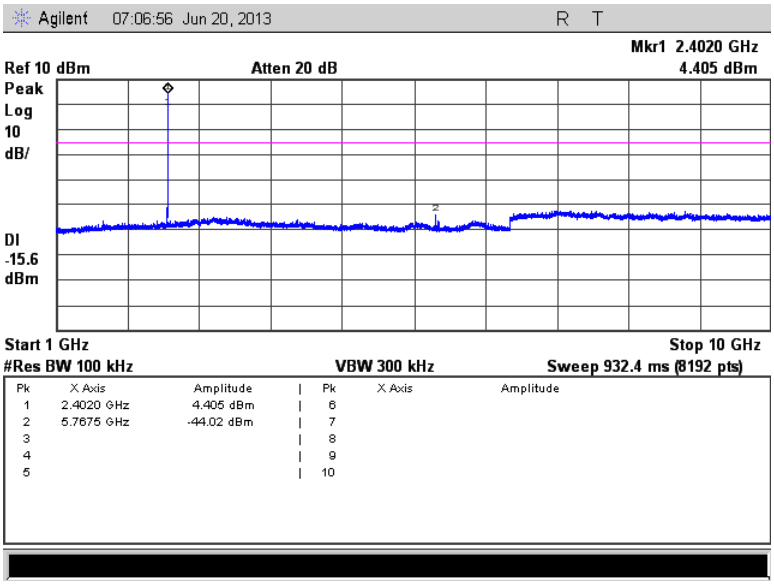


Figure 7.5.3.2-26: 1 GHz – 10 GHz – Low Channel (8DPSK)

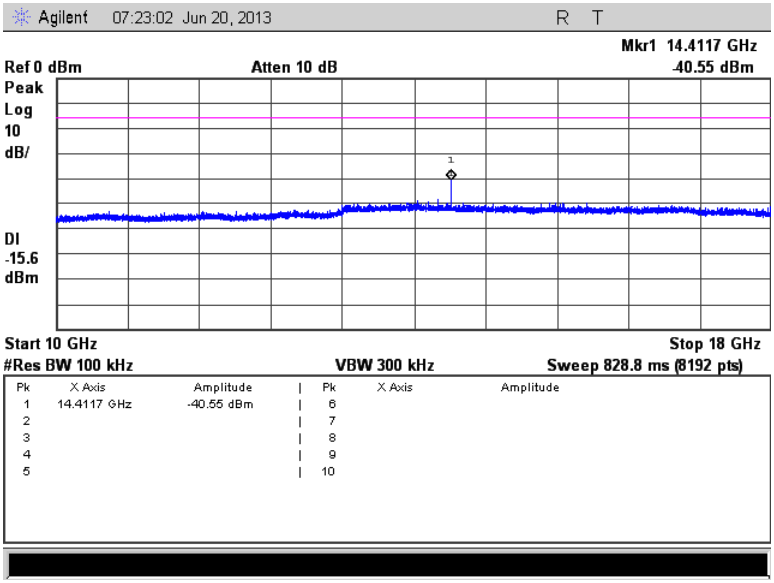


Figure 7.5.3.2-27: 10 GHz – 18 GHz – Low Channel (8DPSK)

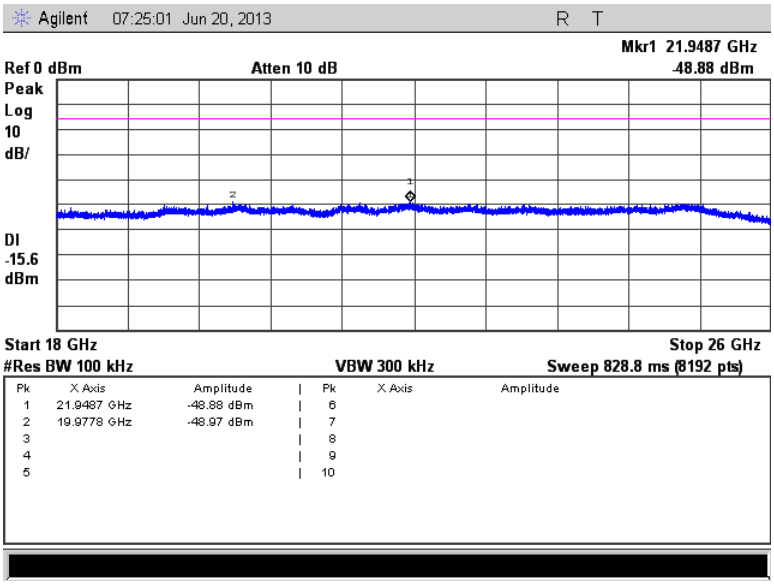


Figure 7.5.3.2-28: 18 GHz – 26 GHz – Low Channel (8DPSK)

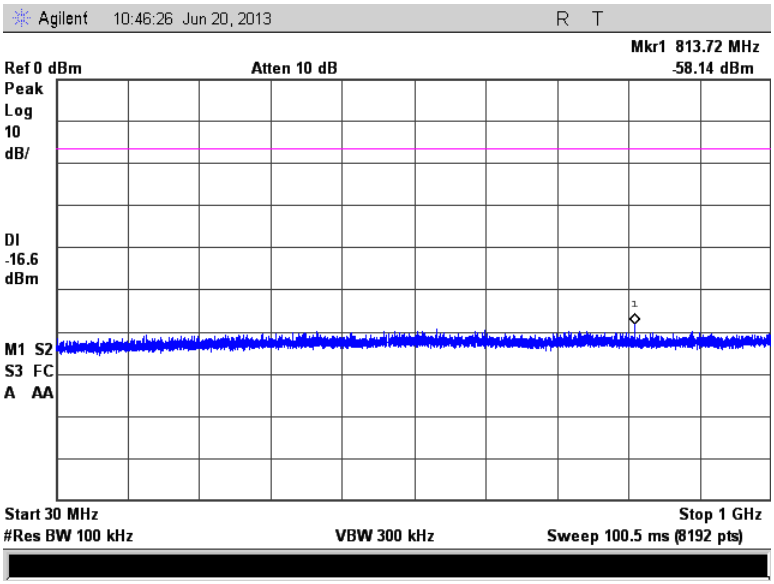


Figure 7.5.3.2-29: 30 MHz – 1 GHz – Middle Channel (8DPSK)

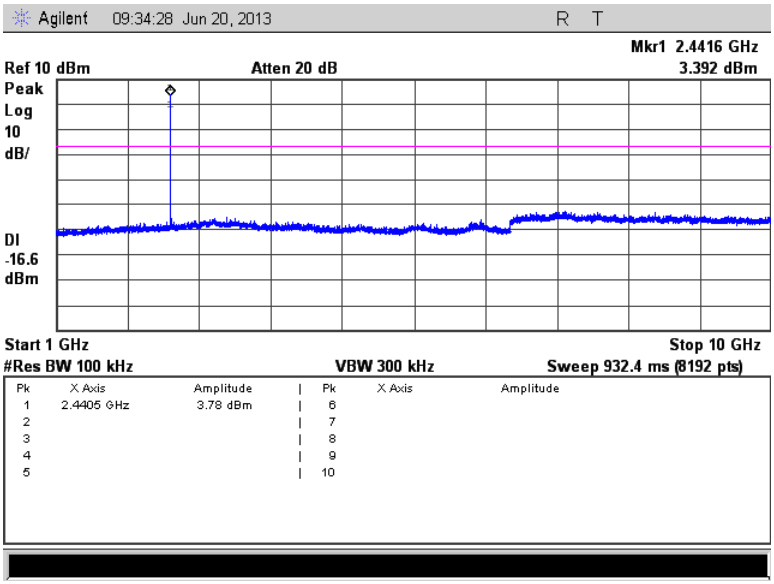


Figure 7.5.3.2-30: 1 GHz – 10 GHz – Middle Channel (8DPSK)

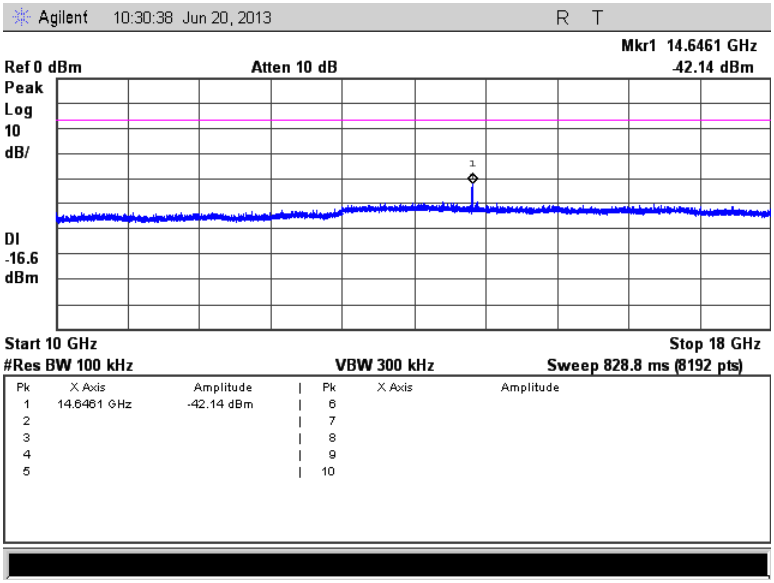


Figure 7.5.3.2-31: 10 GHz – 18 GHz – Middle Channel (8DPSK)

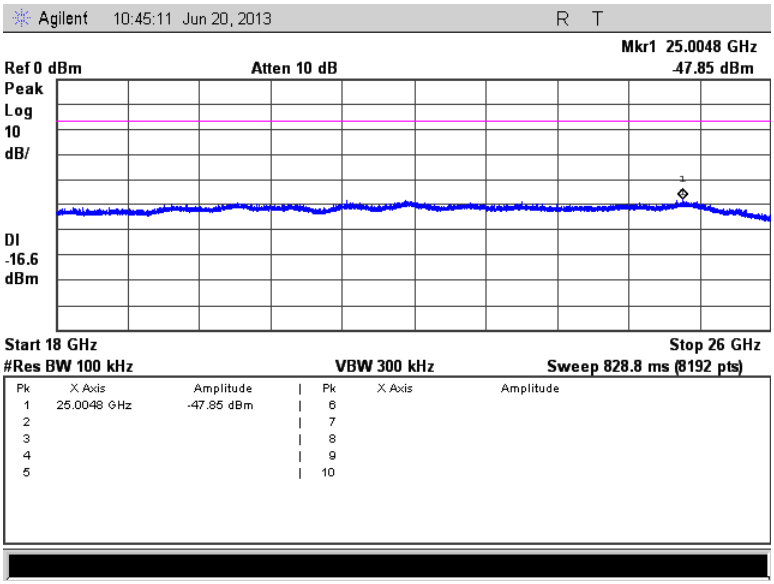


Figure 7.5.3.2-32: 18 GHz –26 GHz – Middle Channel (8DPSK)

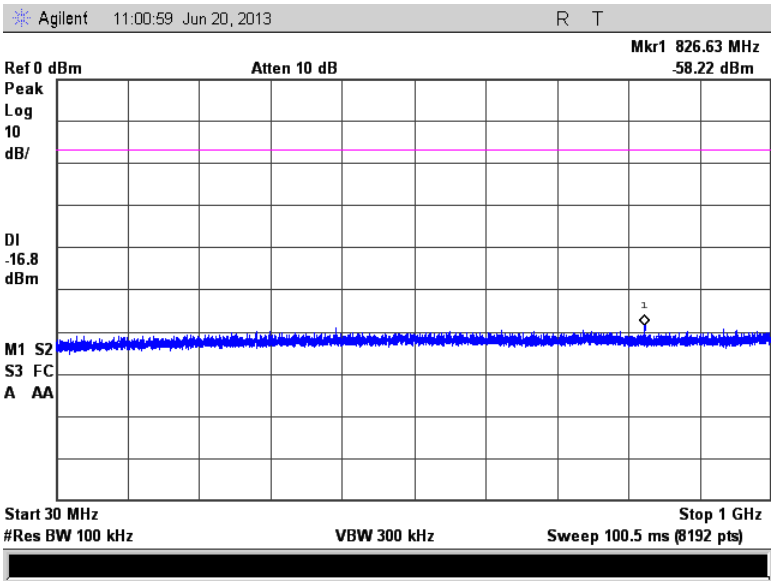


Figure 7.5.3.2-33: 30 MHz – 1 GHz – High Channel (8DPSK)

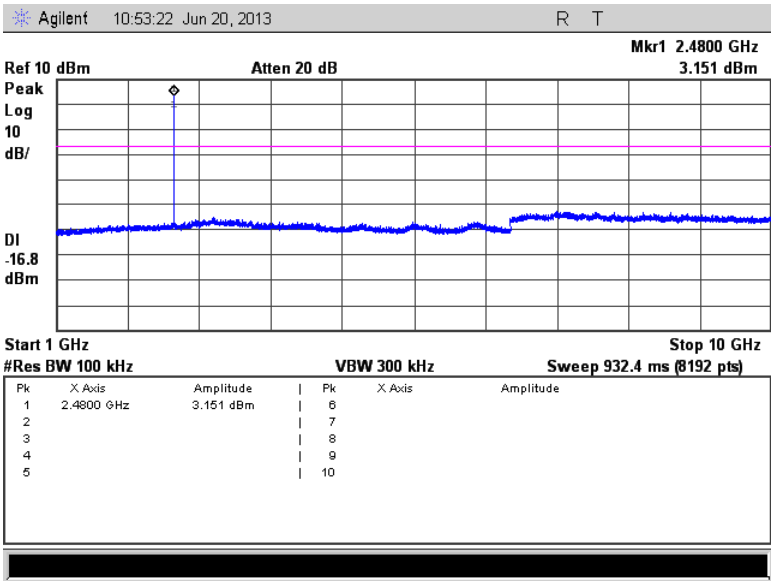


Figure 7.5.3.2-34: 1 GHz – 10 GHz – High Channel (8DPSK)

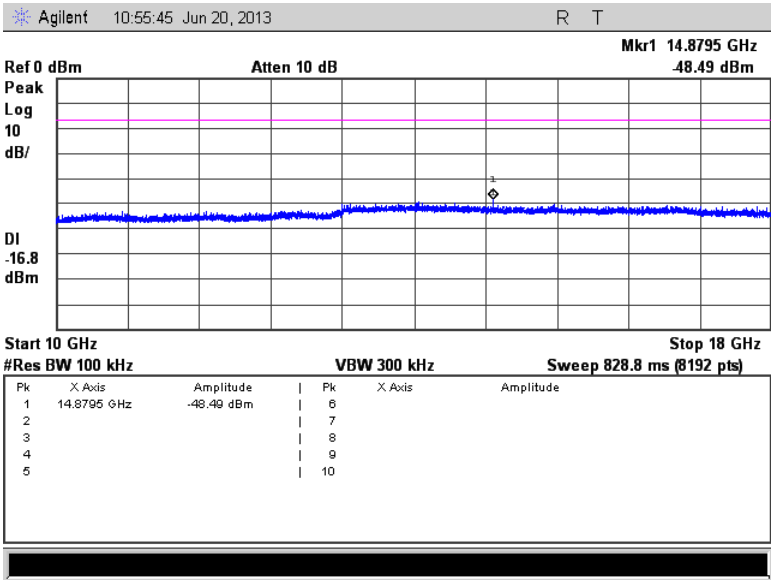


Figure 7.5.3.2-35: 10 GHz – 18 GHz – High Channel (8DPSK)

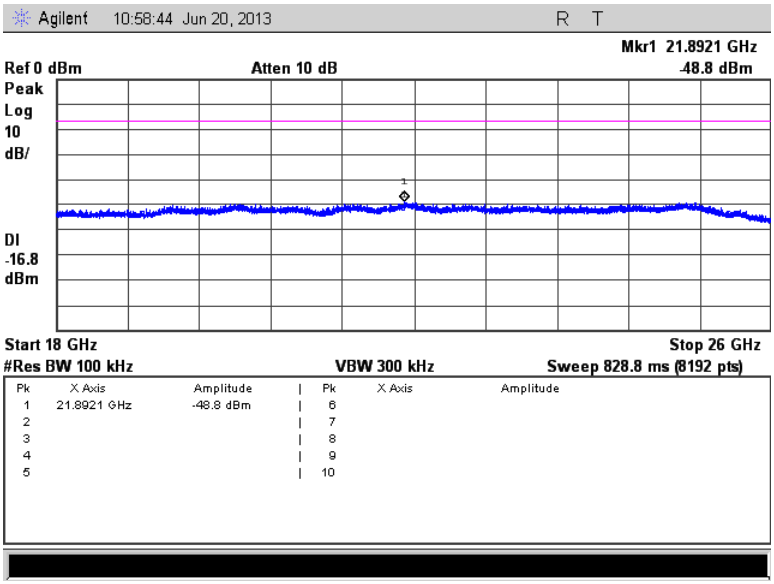


Figure 7.5.3.2-36 18 GHz – 26 GHz – High Channel (8DPSK)

7.5.4 Radiated Spurious Emissions - FCC Section 15.205 IC: RSS-Gen 7.2.5

7.5.4.1 Measurement Procedure

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

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.

7.5.4.2 Measurement Results

Radiated spurious emissions found in the band of 30MHz to 26 GHz are reported in the tables below.

Table 7.5.4.2-1: 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										
4804	53.45	48.29	H	-0.89	52.56	47.40	74.0	54.0	21.4	6.6
4804	51.06	44.76	V	-0.89	50.17	43.87	74.0	54.0	23.8	10.1
12010	46.92	34.96	H	11.35	58.27	46.31	83.5	63.5	25.2	17.2
12010	45.06	33.15	V	11.35	56.41	44.50	83.5	63.5	27.1	19.0
19216	42.58	29.57	H	9.23	51.81	38.80	83.5	63.5	31.7	24.7
19216	42.75	30.06	V	9.23	51.98	39.29	83.5	63.5	31.5	24.2
Middle Channel 2441 MHz										
4882	51.92	46.29	H	-0.66	51.26	45.63	74.0	54.0	22.7	8.4
4882	49.81	42.51	V	-0.66	49.15	41.85	74.0	54.0	24.8	12.1
7323	47.72	34.61	H	4.00	51.72	38.61	74.0	54.0	22.3	15.4
7323	47.27	34.44	V	4.00	51.27	38.44	74.0	54.0	22.7	15.6
12205	46.84	35.17	H	11.22	58.06	46.39	83.5	63.5	25.4	17.1
12205	46.20	33.69	V	11.22	57.42	44.91	83.5	63.5	26.1	18.6
19528	43.03	30.01	H	9.55	52.58	39.56	83.5	63.5	30.9	23.9
19528	43.83	30.58	V	9.55	53.38	40.13	83.5	63.5	30.1	23.4
High Channel 2480 MHz										
4960	50.65	43.85	H	-0.43	50.22	43.42	74.0	54.0	23.8	10.6
4960	48.64	39.62	V	-0.43	48.21	39.19	74.0	54.0	25.8	14.8
7440	46.98	34.46	H	4.31	51.29	38.77	74.0	54.0	22.7	15.2
7440	46.81	34.09	V	4.31	51.12	38.40	74.0	54.0	22.9	15.6
12400	47.15	36.11	H	11.10	58.25	47.21	83.5	63.5	25.3	16.3
12400	45.58	33.39	V	11.10	56.68	44.49	83.5	63.5	26.8	19.0
19840	43.91	32.40	H	10.92	54.83	43.32	83.5	63.5	28.7	20.2
19840	45.22	33.44	V	10.92	56.14	44.36	83.5	63.5	27.4	19.1

Notes:

- **All emissions above 19.84 GHz were attenuated below the limits and the noise floor of the measurement equipment.**
- **All emissions above 10 GHz were measured at a distance of 1m from the EUT. The limits are corrected accordingly using a distance factor of 20*log(3/1) dB ≈ 9.54 dB**

Table 7.5.4.2-2: 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										
4804	53.77	44.64	H	-0.89	52.88	43.75	74.0	54.0	21.1	10.2
4804	50.90	41.37	V	-0.89	50.01	40.48	74.0	54.0	24.0	13.5
12010	45.72	33.09	H	11.35	57.07	44.44	83.5	63.5	26.4	19.1
12010	45.60	31.69	V	11.35	56.95	43.04	83.5	63.5	26.6	20.5
19216	42.86	29.11	H	9.23	52.09	38.34	83.5	63.5	31.4	25.2
19216	43.10	29.77	V	9.23	52.33	39.00	83.5	63.5	31.2	24.5
Middle Channel 2441 MHz										
4882	52.26	43.33	H	-0.66	51.60	42.67	74.0	54.0	22.4	11.3
4882	50.80	39.96	V	-0.66	50.14	39.30	74.0	54.0	23.9	14.7
7323	47.57	34.85	H	4.00	51.57	38.85	74.0	54.0	22.4	15.1
7323	46.44	34.41	V	4.00	50.44	38.41	74.0	54.0	23.6	15.6
12205	45.95	32.88	H	11.22	57.17	44.10	83.5	63.5	26.3	19.4
12205	44.85	32.21	V	11.22	56.07	43.43	83.5	63.5	27.4	20.1
19528	42.47	29.38	H	9.55	52.02	38.93	83.5	63.5	31.5	24.6
19528	42.25	29.51	V	9.55	51.80	39.06	83.5	63.5	31.7	24.4
High Channel 2480 MHz										
4960	51.67	43.50	H	-0.43	51.24	43.07	74.0	54.0	22.8	10.9
4960	49.81	39.81	V	-0.43	49.38	39.38	74.0	54.0	24.6	14.6
7440	46.97	33.96	H	4.31	51.28	38.27	74.0	54.0	22.7	15.7
7440	46.27	33.97	V	4.31	50.58	38.28	74.0	54.0	23.4	15.7
12400	45.56	33.44	H	11.10	56.66	44.54	83.5	63.5	26.8	19.0
12400	44.81	31.78	V	11.10	55.91	42.88	83.5	63.5	27.6	20.6
19840	45.45	32.46	H	10.92	56.37	43.38	83.5	63.5	27.1	20.1
19840	45.54	33.85	V	10.92	56.46	44.77	83.5	63.5	27.0	18.7

Notes:

- **All emissions above 19.84 GHz were attenuated below the limits and the noise floor of the measurement equipment.**
- **All emissions above 10 GHz were measured at a distance of 1m from the EUT. The limits are corrected accordingly using a distance factor of 20*log(3/1) dB ≈ 9.54 dB**

Table 7.5.4.2-3: 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										
4804	53.77	44.99	H	-0.89	52.88	44.10	74.0	54.0	21.1	9.9
4804	51.42	41.99	V	-0.89	50.53	41.10	74.0	54.0	23.5	12.9
12010	45.53	32.72	H	11.35	56.88	44.07	83.5	63.5	26.6	19.4
12010	45.37	31.71	V	11.35	56.72	43.06	83.5	63.5	26.8	20.4
19216	41.20	28.75	H	9.23	50.43	37.98	83.5	63.5	33.1	25.5
19216	42.12	29.38	V	9.23	51.35	38.61	83.5	63.5	32.1	24.9
Middle Channel 2480 MHz										
4882	52.78	43.80	H	-0.66	52.12	43.14	74.0	54.0	21.9	10.9
4882	50.13	40.52	V	-0.66	49.47	39.86	74.0	54.0	24.5	14.1
7323	46.63	34.70	H	4.00	50.63	38.70	74.0	54.0	23.4	15.3
7323	46.81	34.30	V	4.00	50.81	38.30	74.0	54.0	23.2	15.7
12205	46.29	32.50	H	11.22	57.51	43.72	83.5	63.5	26.0	19.8
12205	44.62	31.90	V	11.22	55.84	43.12	83.5	63.5	27.7	20.4
19528	43.14	29.67	H	9.55	52.69	39.22	83.5	63.5	30.8	24.3
19528	42.38	29.84	V	9.55	51.93	39.39	83.5	63.5	31.6	24.1
High Channel 2480 MHz										
4960	51.76	43.55	H	-0.43	51.33	43.12	74.0	54.0	22.7	10.9
4960	49.27	39.59	V	-0.43	48.84	39.16	74.0	54.0	25.2	14.8
7440	47.15	34.12	H	4.31	51.46	38.43	74.0	54.0	22.5	15.6
7440	46.82	34.12	V	4.31	51.13	38.43	74.0	54.0	22.9	15.6
12400	45.36	32.97	H	11.10	56.46	44.07	83.5	63.5	27.0	19.4
12400	44.34	31.20	V	11.10	55.44	42.30	83.5	63.5	28.1	21.2
19840	43.95	31.92	H	10.92	54.87	42.84	83.5	63.5	28.6	20.7
19840	46.09	33.33	V	10.92	57.01	44.25	83.5	63.5	26.5	19.3

Notes:

- **All emissions above 19.84 GHz were attenuated below the limits and the noise floor of the measurement equipment.**
- **All emissions above 10 GHz were measured at a distance of 1m from the EUT. The limits are corrected accordingly using a distance factor of 20*log(3/1) dB ≈ 9.54 dB**

7.5.4.3 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: 49.21+ (-0.89) = 48.32 dBµV/m
Margin: 74 dBµV/m – 48.32dBµV/m = 25.7 dB

Example Calculation: Average
Corrected Level: 40.49 + (-0.89) = 39.6 dBµV/m
Margin: 54 dBµV/m – 39.6 dBµV/m = 14.4 dB

8 CONCLUSION

In the opinion of ACS, Inc., the AAH81VCN9NB2AN 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