Excellence in Compliance Testing

Certification Test Report

FCC ID: ABZ99FT5014
IC: 109AB-99FT5014

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

ACS Report Number: 12-2159.W06.1A

Manufacturer: Motorola Solutions SDNBHD
Model: AAH56UCN9KB1AN

Test Begin Date: **December 19, 2012**
Test End Date: **December 27, 2012**

Report Issue Date: January 11, 2013

ACCREDITED
TESTING

FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER AT-1533

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

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This report contains 58 pages

TABLE OF CONTENTS

1 GENERAL 3

1.1 Purpose 3

1.2 Manufacturer Information 3

1.3 Product description 3

1.4 Test Methodology and Considerations 4

2 TEST FACILITIES 5

2.1 Location 5

2.2 Laboratory Accreditations/Recognitions/Certifications 5

2.3 Radiated & Conducted Emissions Test Site Description 6

3 APPLICABLE STANDARD REFERENCES 7

4 LIST OF TEST EQUIPMENT 8

5 SUPPORT EQUIPMENT 9

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM 9

7 SUMMARY OF TESTS 11

7.1 Antenna Requirement – FCC: Section 15.203 11

7.2 Power Line Conducted Emissions – FCC: Section 15.207 IC: RSS-Gen 7.2.4 11

7.3 Peak Output Power - FCC Section 15.247(b)(1) IC: RSS-210 A8.4(2) 14

7.4 Channel Usage Requirements 20

7.5 Band-Edge Compliance and Spurious Emissions-FCC 15.247(d) IC:RSS-210 A8.5 35

8 CONCLUSION 57

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 AAH56UCN9KB1AN is a two way portable radio capable of digital and analog FM transmission . The radio also includes a Bluetooth 2.0 + EDR radio 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: AAH56UCN9KB1AN

There are multiple model variants which are associated with the FCC ID: ABZ99FT5014 and IC: 109AB-99FT5014. These model variants are listed below:

Table1.3-1: Model Variants

Model Variant	Description	Tested
AAH56UCN9KB1AN	XPR 7580 8/900 2.5W Full Key Pad GPS BT GOB	Yes
AAH56UCC9KB1AN	XPR 7380 8/900 2.5W Non-Key Pad GPS BT GOB	--------

The customer declares the model tested the worst case and the Non-Key Pad model compliant based on similarity.

Test Sample Serial Number(s): 126TNX0426, 126TNX0039

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

1.4 Test Methodology and Considerations

The AAH56UCN9KB1AN Bluetooth radio was evaluated for radiated and power line conducted emissions as well as RF conducted measurements at the antenna port.

For the radiated emissions evaluation, the unit was pre-scanned in three orthogonal positions. The final measurements were performed for the EUT orientation leading to the highest emissions.

The EUT was also evaluated for inter-modulation products from the collocated Bluetooth and the 8/900 MHz radio. The evaluation was performed using both 800 MHz and 900 MHz whip antennas of the licensed radio and all inter-modulation products were found to be compliant to the requirements of 15.209.

The RF conducted evaluation was performed on the EUT modified with a temporary SMA connector at the antenna port.

The power line conducted emissions evaluations were performed for the EUT set to the hopping mode for the three available modes of operation. The results are reported for the configuration leading to the highest emissions

The EUT radio configuration for the evaluation are reported below.

Table 1.4-1: Bluetooth Radio Test configuration

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

The EUT was also evaluated for unintentional emissions 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 #: 587595
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:

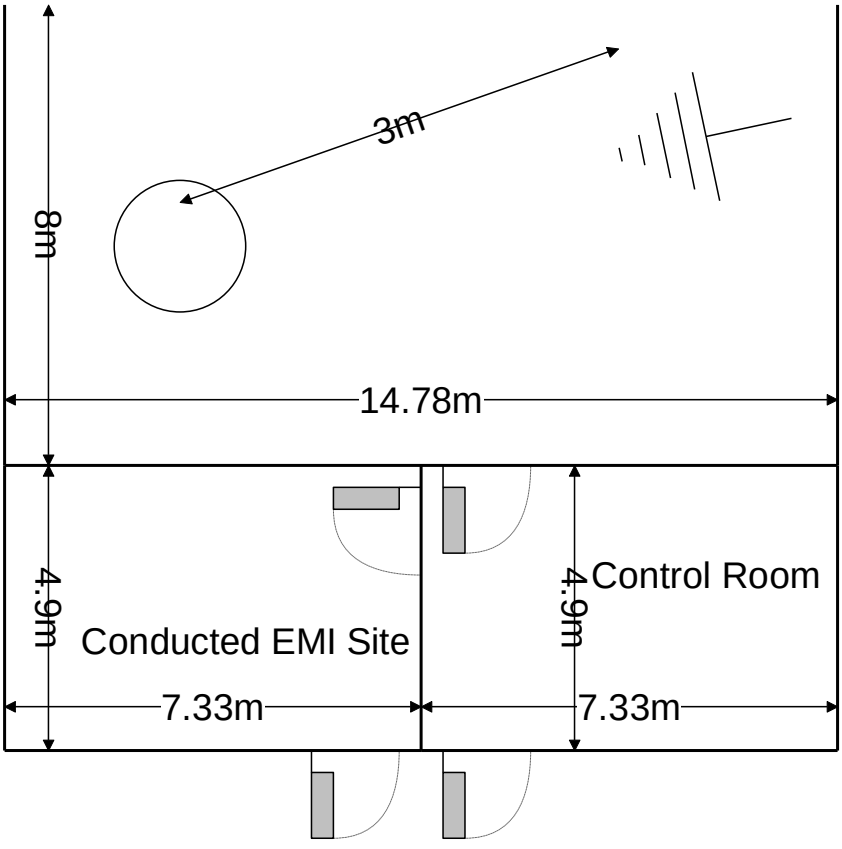


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

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:

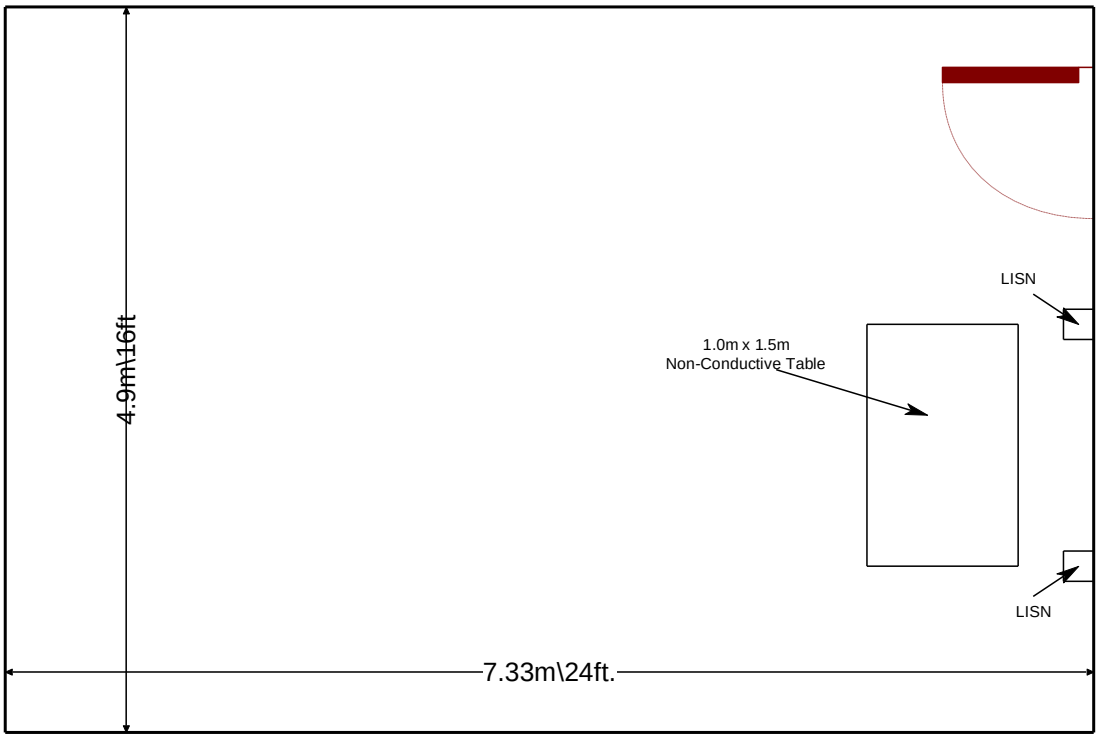


Figure 2.3.2-1: AC Mains Conducted EMI Site

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
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2012
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2012
- 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	1/5/2011	1/5/2013
524	Chase	CBL6111	Antennas	1138	1/7/2011	1/7/2013
2006	EMCO	3115	Antennas	2573	3/2/2011	3/2/2013
2008	COM-Power	AH-826	Antennas	81009	NCR	NCR
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	1/2/2012	1/2/2013
2022	EMCO	LISN3825/2R	LISN	1095	8/19/2011	8/19/2013
2037	ACS Boca	Chamber EMI Cable Set	Cable Set	2037	1/2/2012	1/2/2013
2044	QMI	N/A	Cables	2044	1/2/2012	1/2/2013
2045	ACS Boca	Conducted Cable Set	Cable Set	2045	1/2/2012	1/2/2013
2064	CIR Q-TEL	FHT/22-10K-13/50-3A/3A	Filter	9	12/30/2011	12/30/2012
2070	Mini Circuits	VHF-8400+	Filter	2070	1/19/2012	1/19/2013
2072	Mini Circuits	VHF-3100+	Filter	30737	1/19/2012	1/19/2013
2076	Hewlett Packard	HP5061-5458	Cables	2076	1/2/2012	1/2/2013
2082	Teledyne Storm Products	90-010-048	Cables	2082	5/31/2012	5/31/2013
2086	Merrimac	FAN-6-10K	Attenuators	23148-83-1	12/30/2011	12/30/2012
22	Agilent	8449B	Amplifiers	3008A00526	8/2/2012	8/2/2013
2091	Agilent Technologies, Inc.	8573A	Spectrum Analyzers	2407A03233	12/12/2011	12/12/2013
2095	ETS Lindgren	TILE4! - Version 4.2.A	Software	85242	NCR	NCR
2075	Hewlett Packard	8495B	Attenuators	2626A11012	1/2/2012	1/2/2013

NCR=No Calibration Required

5 SUPPORT EQUIPMENT

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

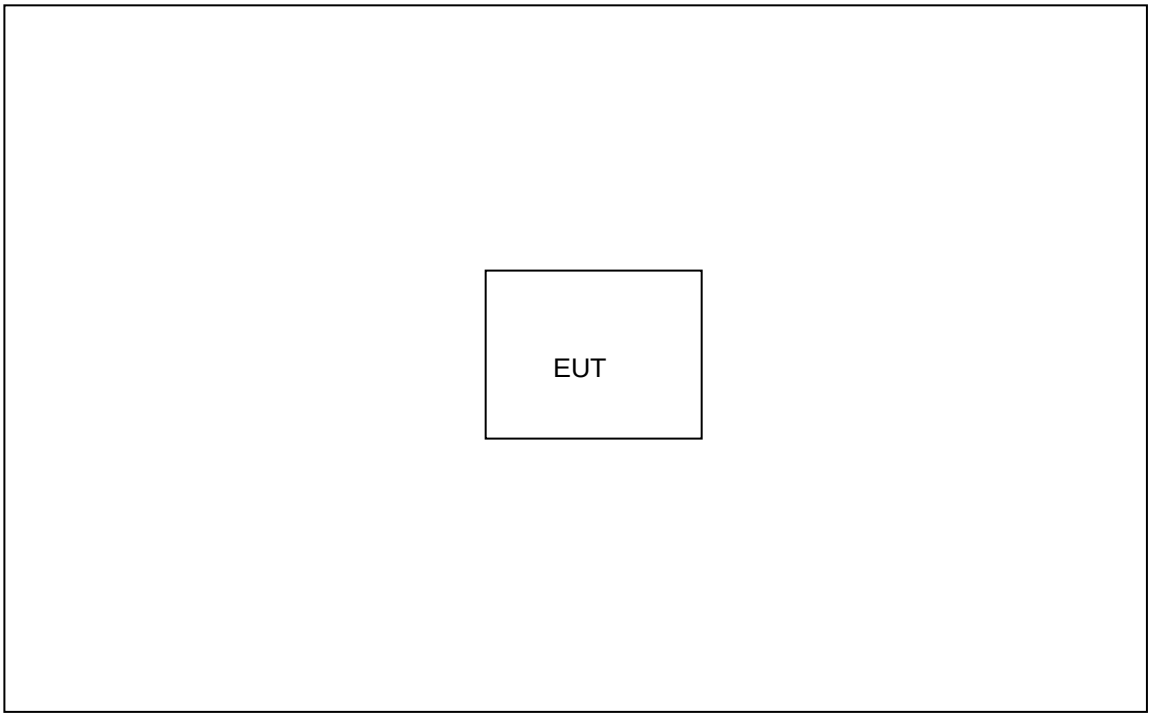
Item	Equipment Type	Manufacturer	Model Number	Serial Number
No Support Equipment				

Table 5-2: Support Equipment (With charger)

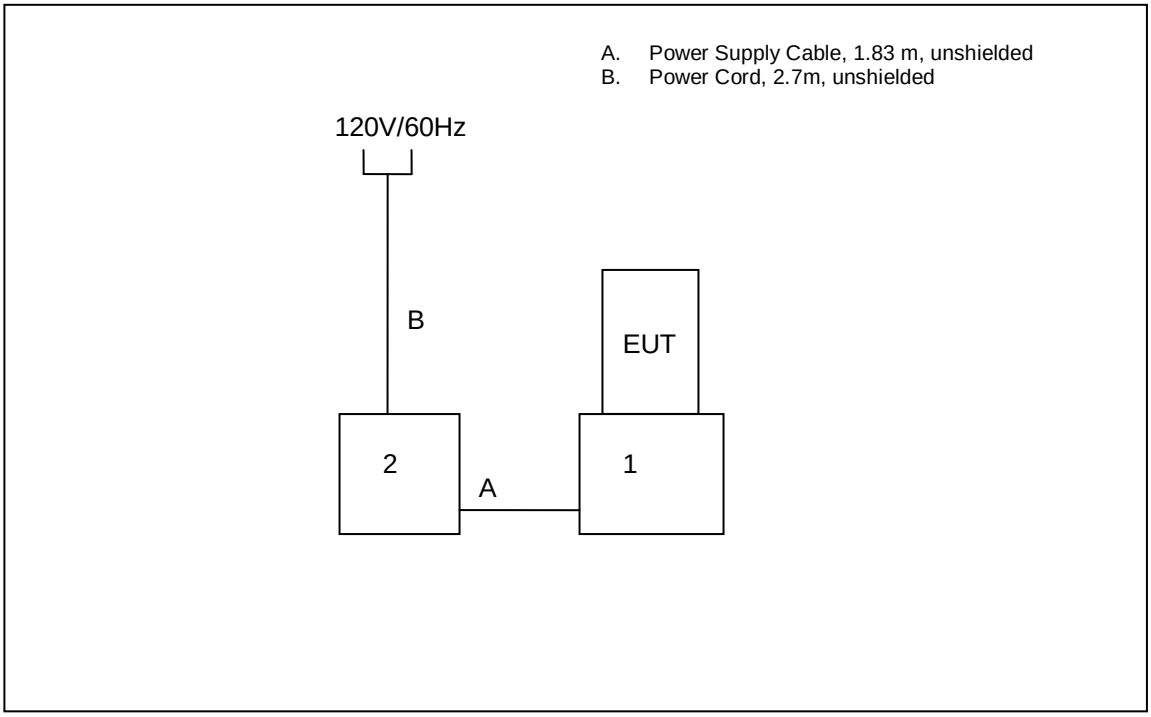
Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	Charger	Motorola Solutions	WPLN4226A	0072MTI01
2	18 VDC Power Supply	Motorola Solutions	481809OO3NT	1015

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

Configuration 1 – Radiated Emissions (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 unit uses an internal antenna for the Bluetooth radio. The antenna is not accessible to the end-user, thus meeting the requirements of 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.

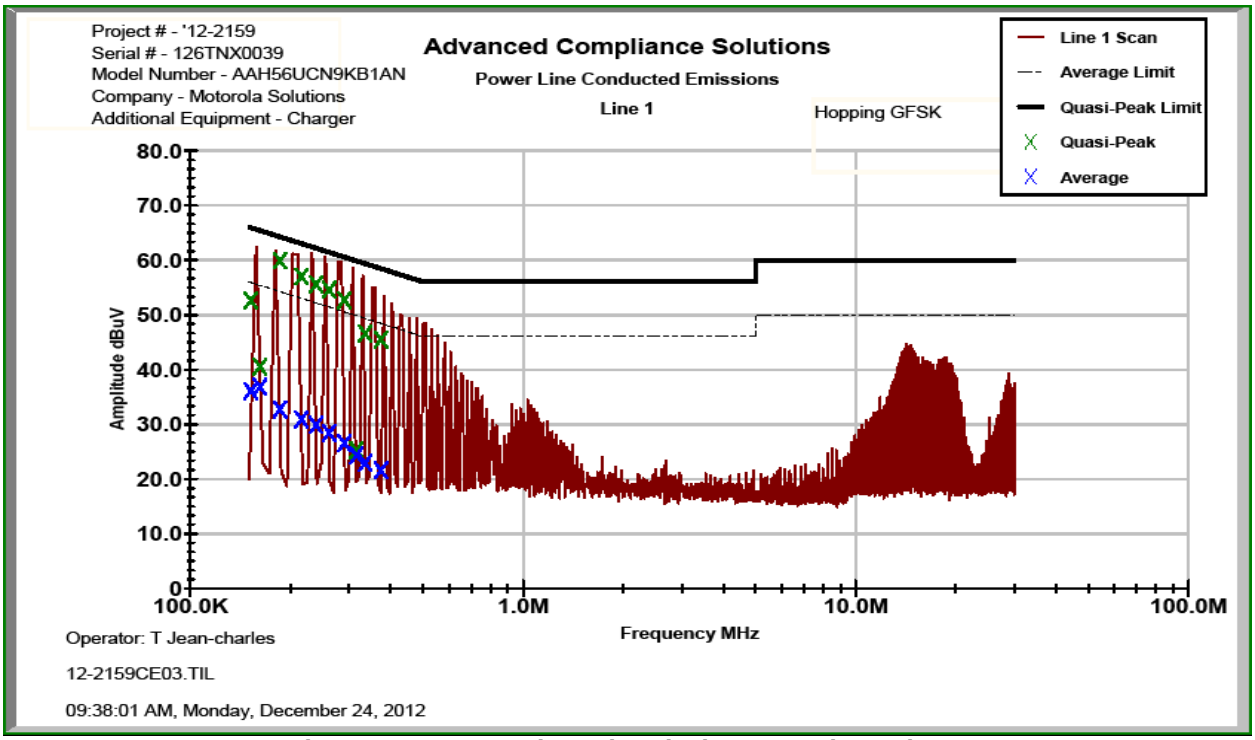


Figure 7.2.2-1: Conducted Emissions Results – Line 1

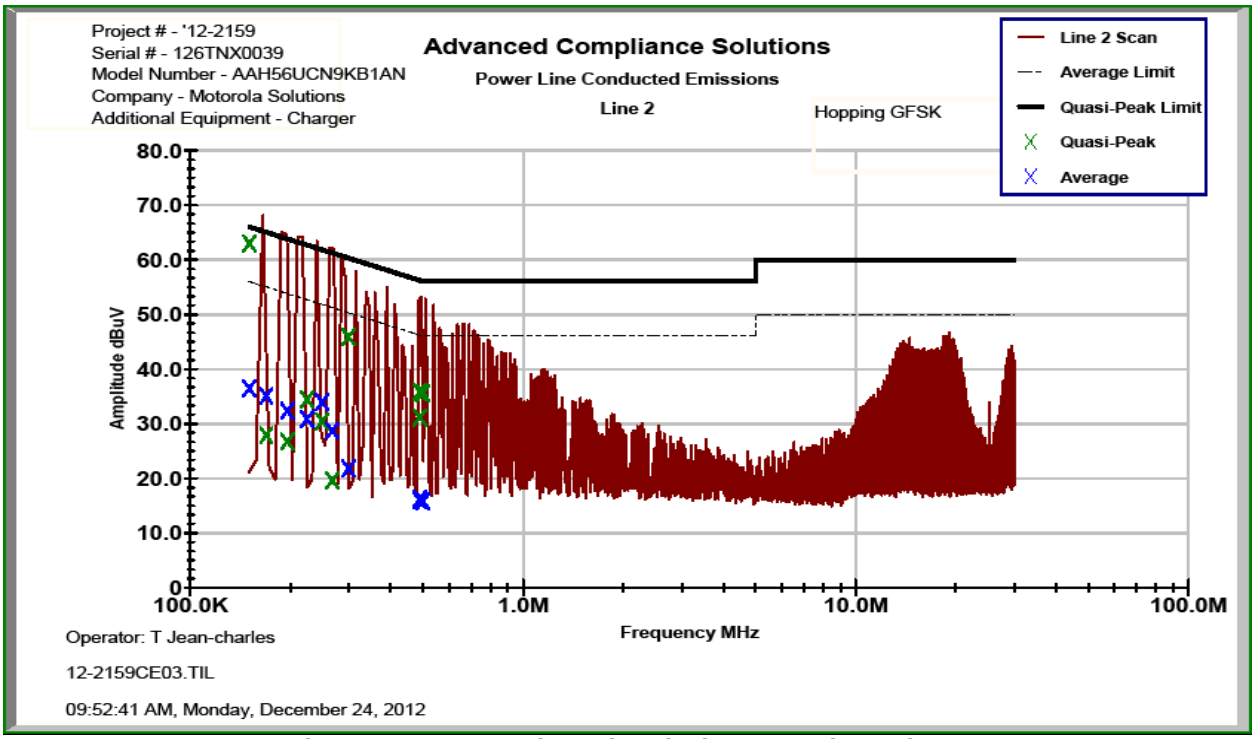


Figure 7.2.2-2: Conducted Emissions Results – Line 2

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: 12-2159CE03
Power Supply Description: _____

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									
0.151589	51.106	34.563	1.52	52.62	36.08	65.91	55.91	13.3	19.8
0.161749	39.117	35.386	1.50	40.61	36.88	65.37	55.37	24.8	18.5
0.185487	58.668	31.468	1.29	59.96	32.76	64.24	54.24	4.3	21.5
0.215637	55.931	29.824	1.06	57.00	30.89	62.99	52.99	6.0	22.1
0.238375	54.616	28.856	1.04	55.65	29.89	62.15	52.15	6.5	22.3
0.260713	53.651	27.537	0.87	54.52	28.40	61.41	51.41	6.9	23.0
0.290163	51.883	25.717	0.84	52.72	26.56	60.52	50.52	7.8	24.0
0.315449	24.532	23.565	0.73	25.27	24.30	59.83	49.83	34.6	25.5
0.335187	45.874	22.176	0.72	46.60	22.90	59.32	49.32	12.7	26.4
0.373237	44.839	20.915	0.66	45.50	21.58	58.43	48.43	12.9	26.9
Line 2									
0.150185	61.465	34.933	1.55	63.02	36.49	65.99	55.99	3.0	19.5
0.168863	56.04	33.11	1.52	57.56	34.63	65.02	55.02	7.5	20.4
0.195199	55.51	28.295	1.31	56.82	29.61	63.81	53.81	7.0	24.2
0.223799	33.421	29.853	1.08	34.50	30.94	62.68	52.68	28.2	21.7
0.248587	50.853	33.01	1.05	51.91	34.06	61.80	51.80	9.9	17.7
0.266675	53.361	27.427	0.88	54.24	28.31	61.22	51.22	7.0	22.9
0.298275	45.106	21.01	0.85	45.96	21.86	60.29	50.29	14.3	28.4
0.488025	35.292	15.609	0.58	35.88	16.19	56.20	46.20	20.3	30.0
0.489049	30.605	15.345	0.58	31.19	15.93	56.18	46.18	25.0	30.3
0.499699	35.077	15.288	0.58	35.66	15.87	56.00	46.00	20.3	30.1

* 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	9.632
2441	9.890
2480	10.280

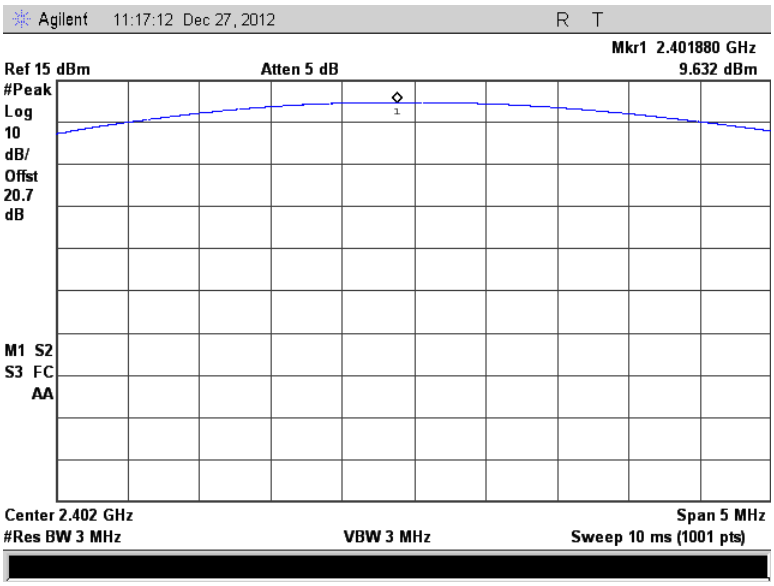


Figure 7.3.2-1: RF Output Power (GFSK) - Low Channel

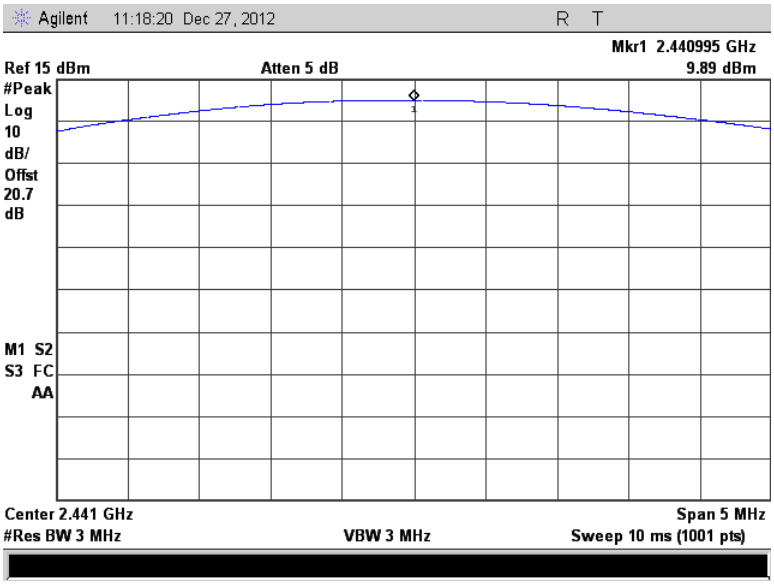


Figure 7.3.2-2: RF Output Power (GFSK) - Middle Channel

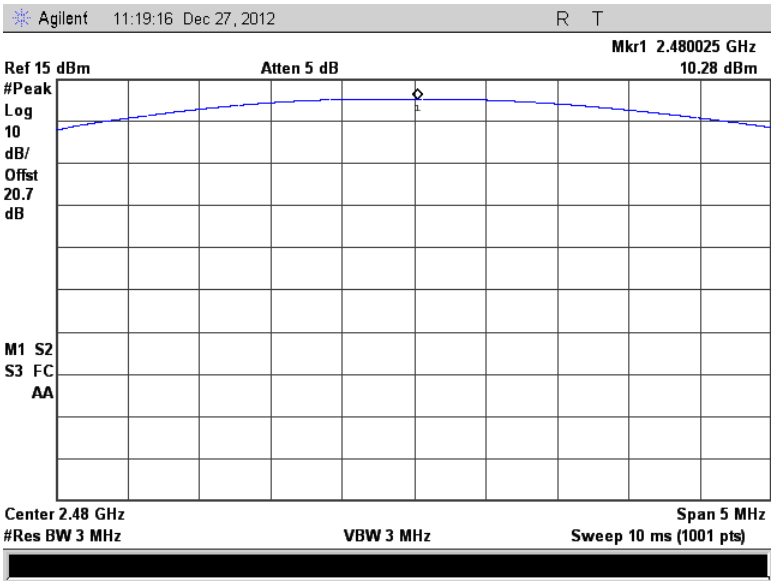


Figure 7.3.2-3: RF Output Power (GFSK) - High Channel

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

Frequency (MHz)	Power (dBm)
2402	5.984
2441	5.866
2480	6.046

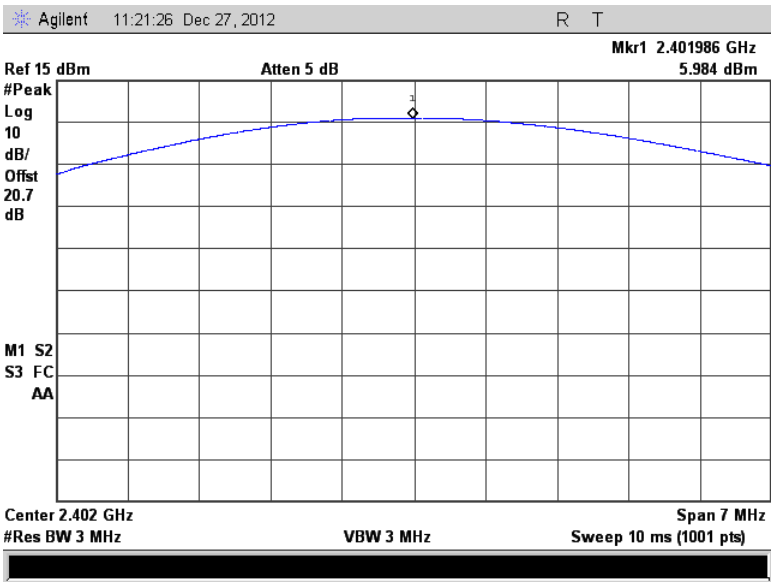


Figure 7.3.2-4: RF Output Power (π/4 DQPSK) - Low Channel

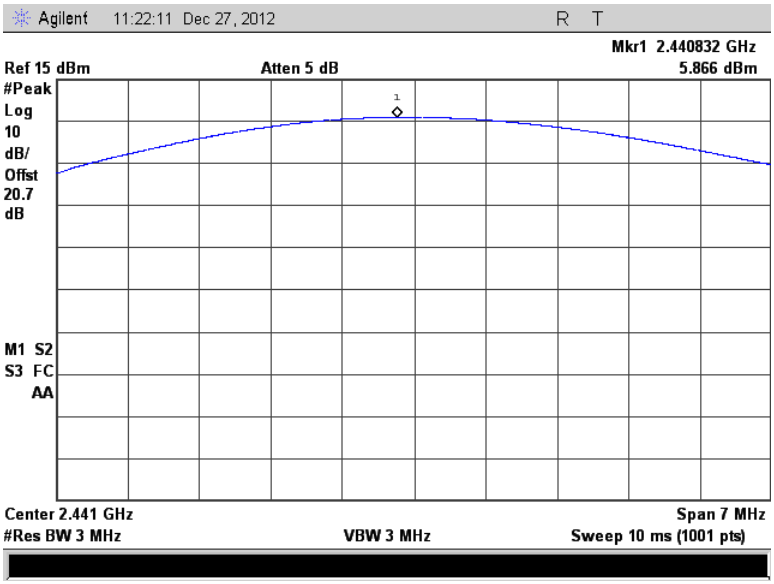


Figure 7.3.2-5: RF Output Power (π/4 DQPSK) - Middle Channel

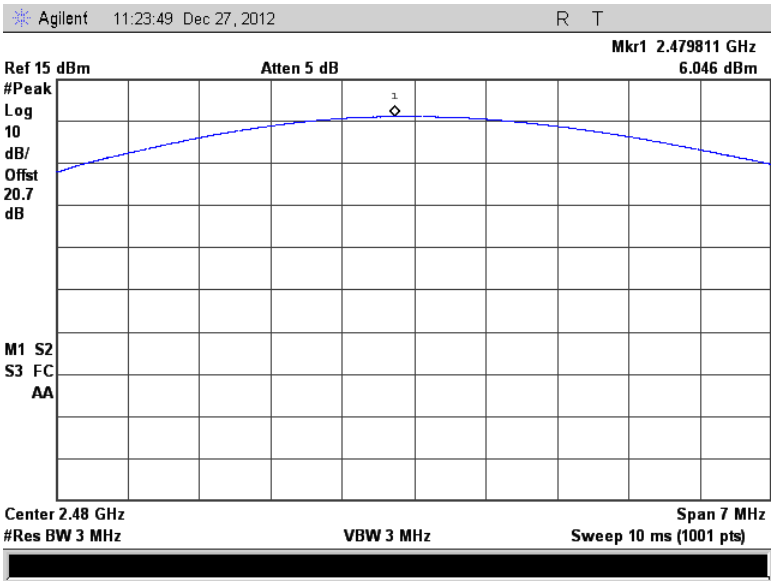


Figure 7.3.2-6: RF Output Power (π/4 DQPSK) - High Channel

Table 7.3.2-3 RF Output Power (8DPSK)

Frequency (MHz)	Power (dBm)
2402	6.662
2441	6.645
2480	6.889

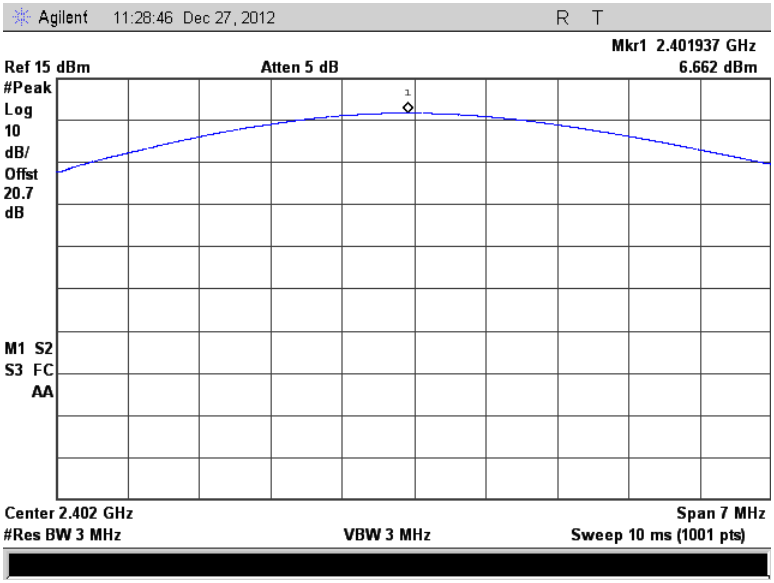


Figure 7.3.2-7: RF Output Power (8DPSK) - Low Channel

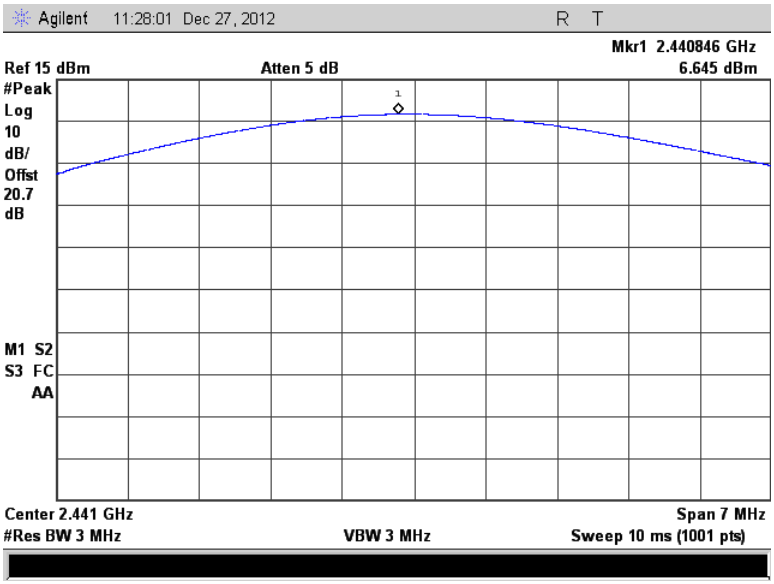


Figure 7.3.2-8: RF Output Power (8DPSK) - Middle Channel

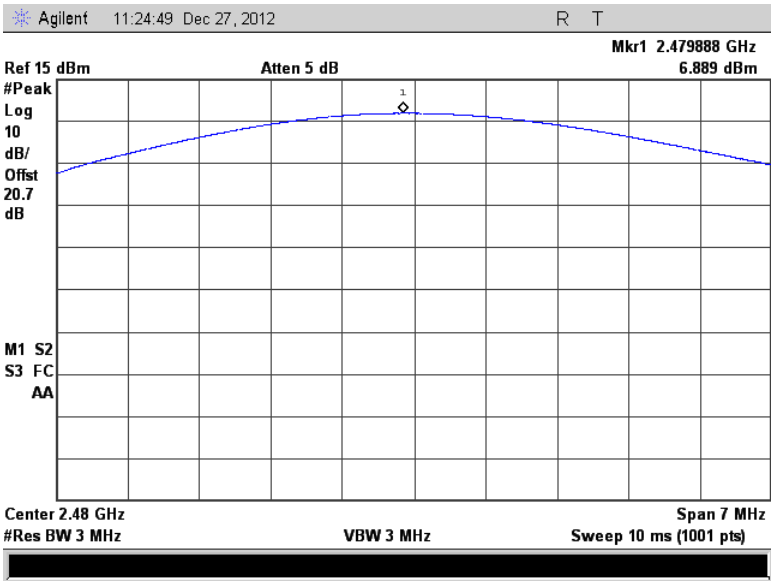


Figure 7.3.2-9: RF Output Power (8DPSK) - High Channel

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.

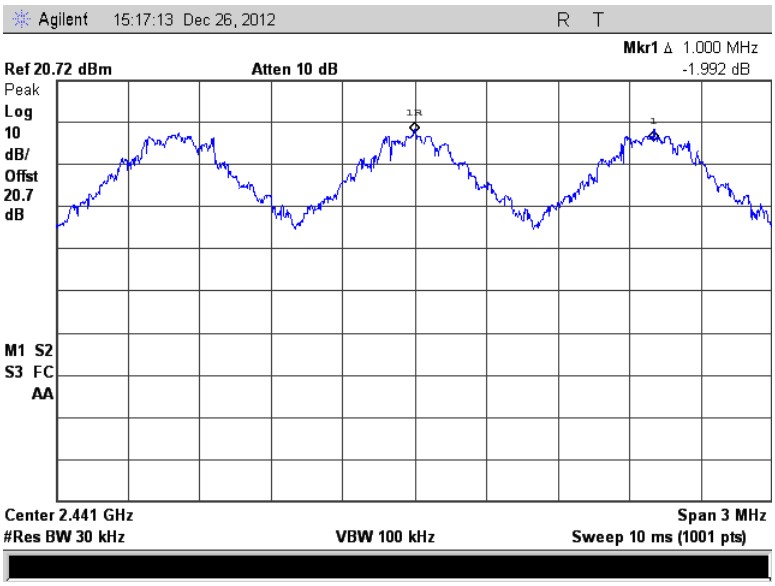


Figure 7.4.1.2-1: Carrier Frequency Separation

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.

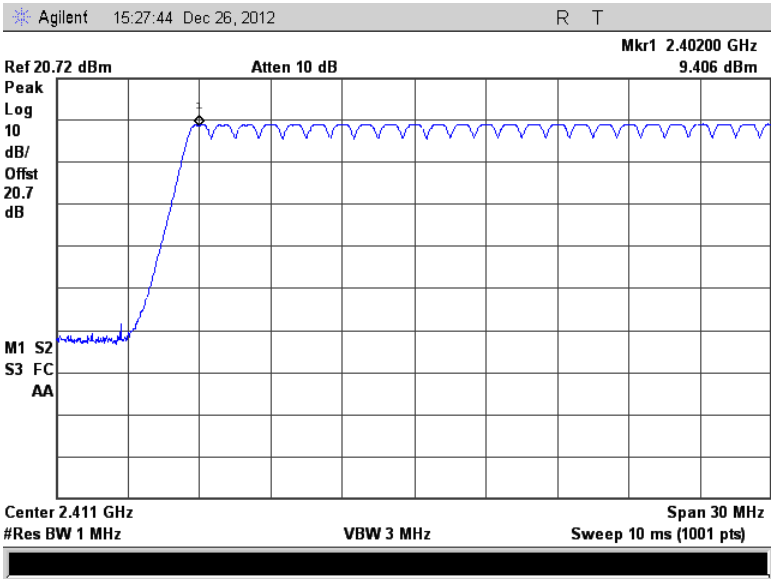


Figure 7.4.2.2-1: Number of Hopping Channels (1 – 24)

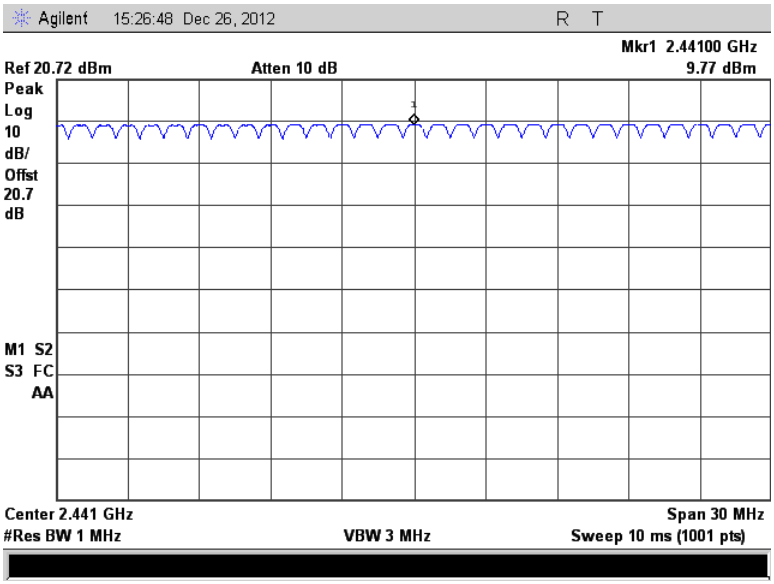


Figure 7.4.2.2-2: Number of Hopping Channels (25 – 55)

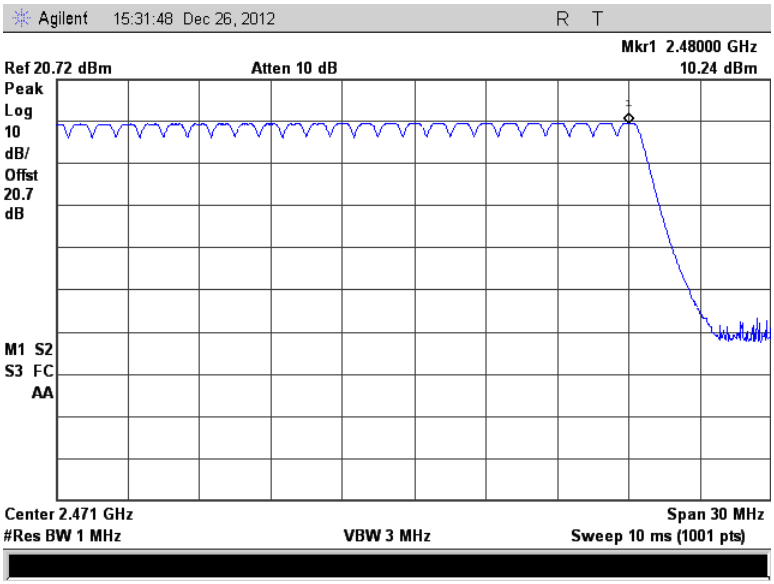


Figure 7.4.2.2-3: Number of Hopping Channels (56 – 79)

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 Time (ms)	Dwell Times on a 31.6 s Cycle	Limit (ms)	Status
DH1	800	10.13	320	0.406	129.92	400	PASS
DH3	400	5.06	160	1.655	264.80	400	PASS
DH5	266.67	3.38	106.668	2.915	310.94	400	PASS

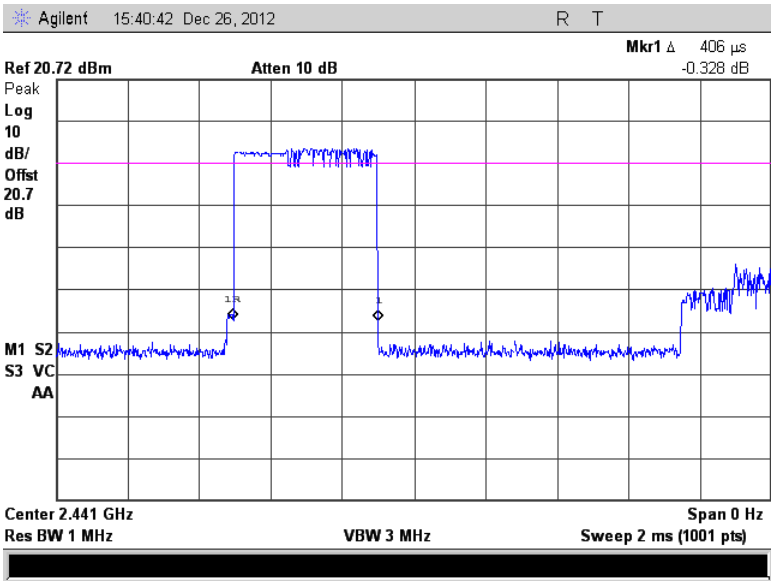


Figure 7.4.3.2-1: Channel Dwell Time – DH1

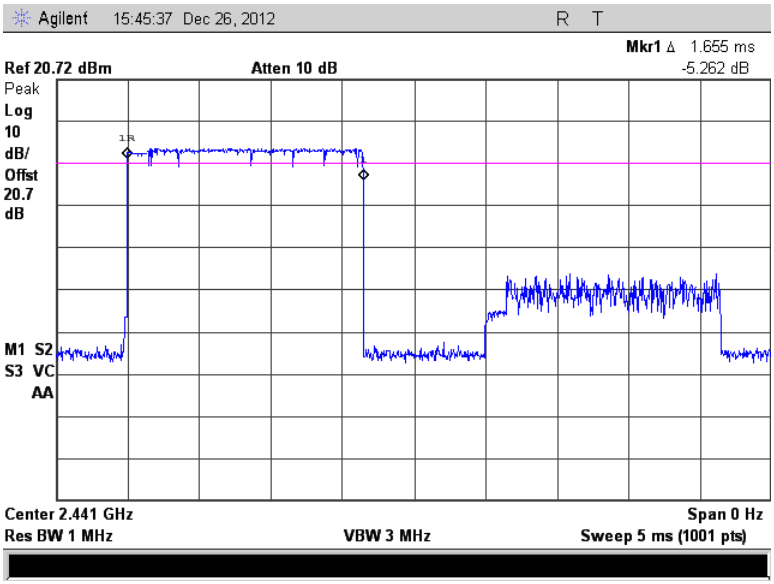


Figure 7.4.3.2-2: Channel Dwell Time – DH3

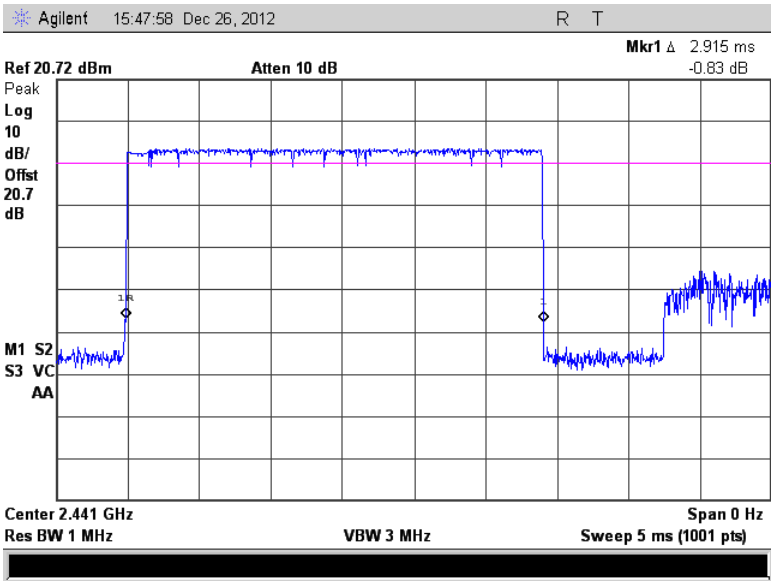


Figure 7.4.3.2-3: Channel Dwell Time – DH5

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	951	864
2441	957	870
2480	957	870

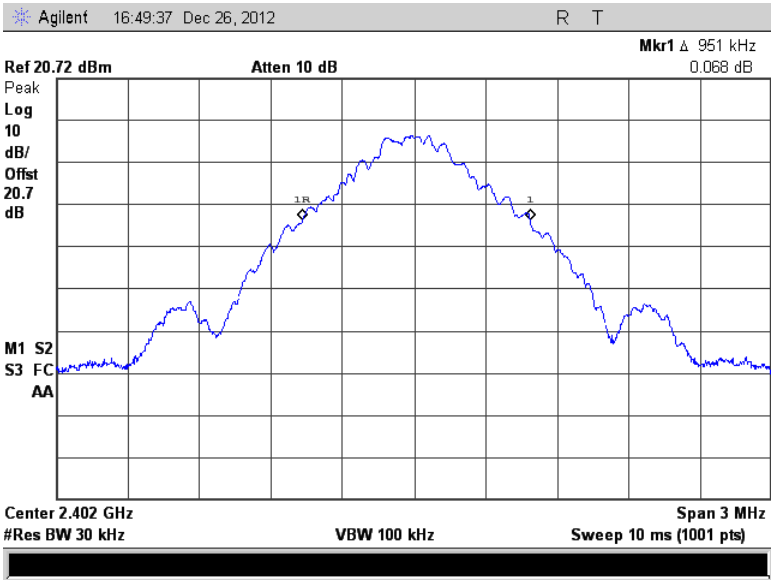


Figure 7.4.4.2-1: 20dB BW Low Channel (GFSK)

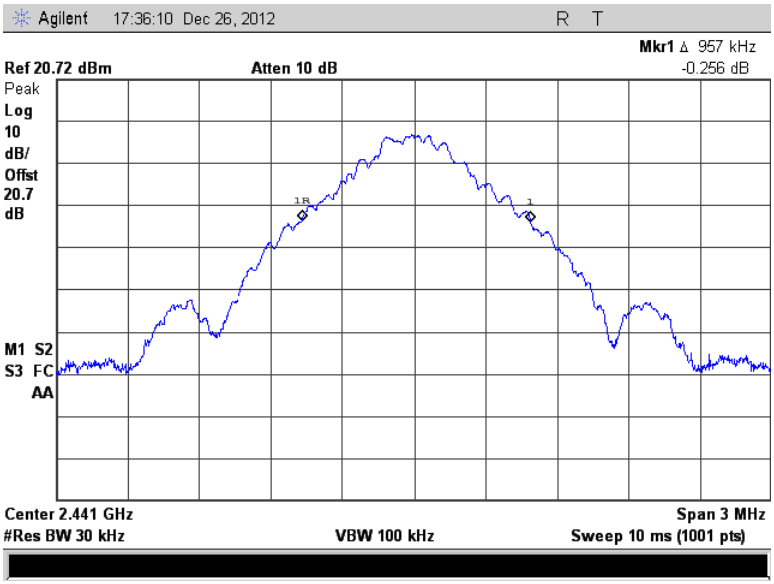


Figure 7.4.4.2-2: 20dB BW Middle Channel (GFSK)

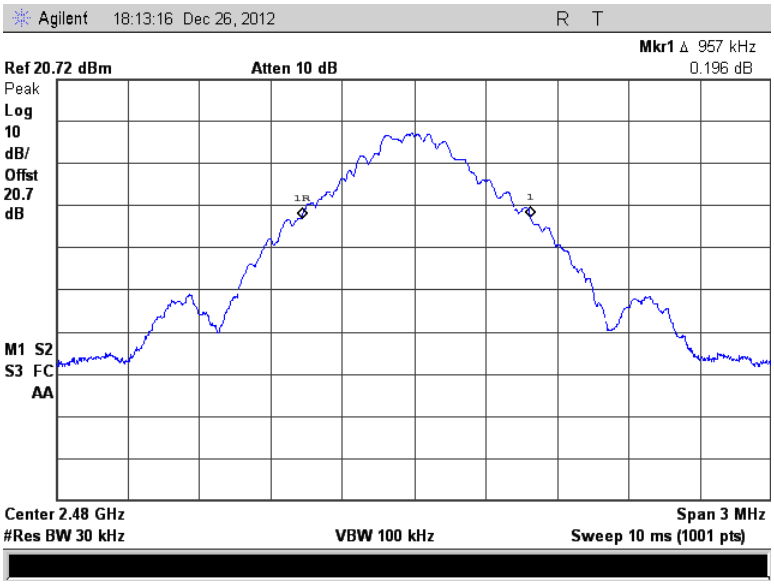


Figure 7.4.4.2-3: 20dB BW High Channel (GFSK)

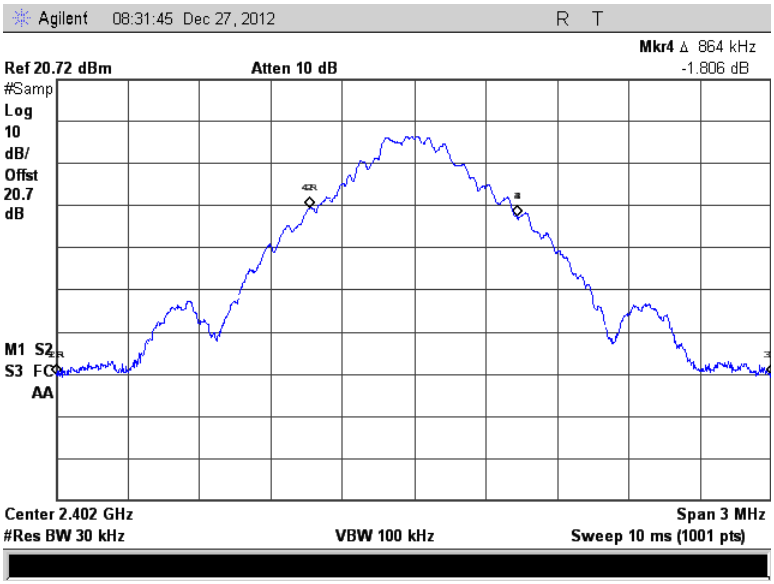


Figure 7.4.4.2-4: 99% OBW Low Channel (GFSK)

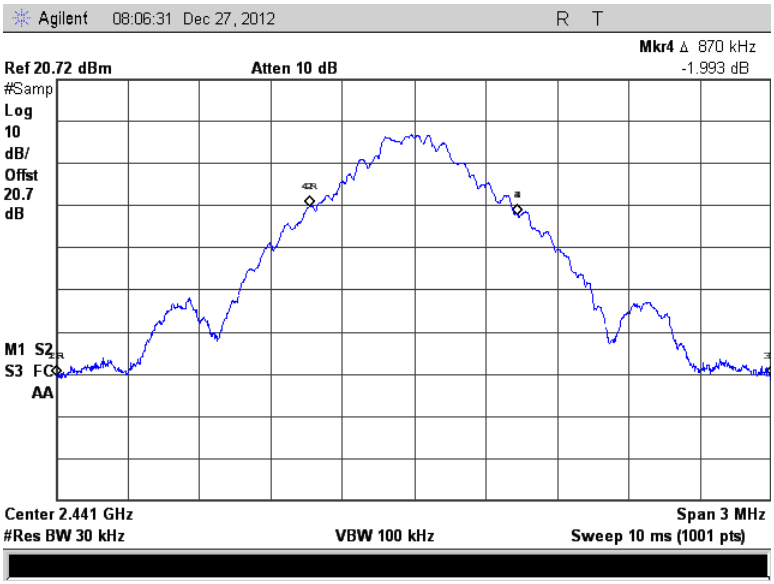


Figure 7.4.4.2-5: 99% OBW Middle Channel (GFSK)

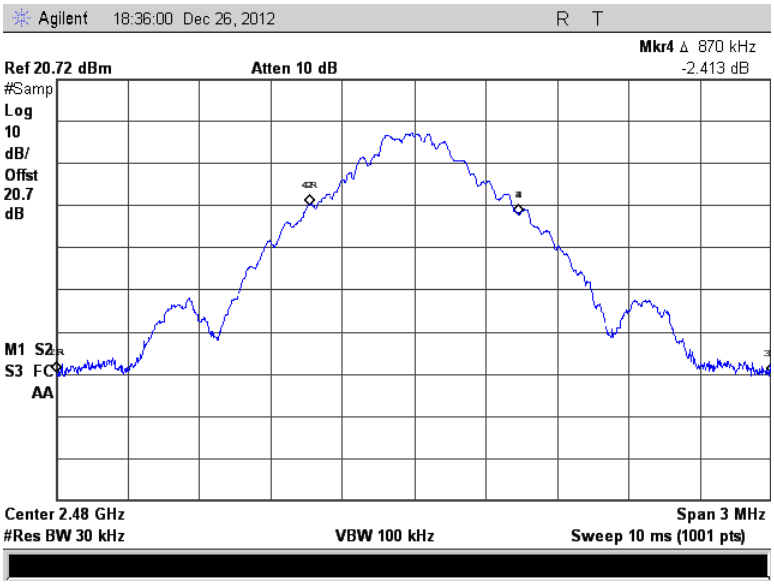


Figure 7.4.4.2-6: 99% OBW High Channel (GFSK)

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

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
2402	1380	1236
2441	1380	1245
2480	1380	1242

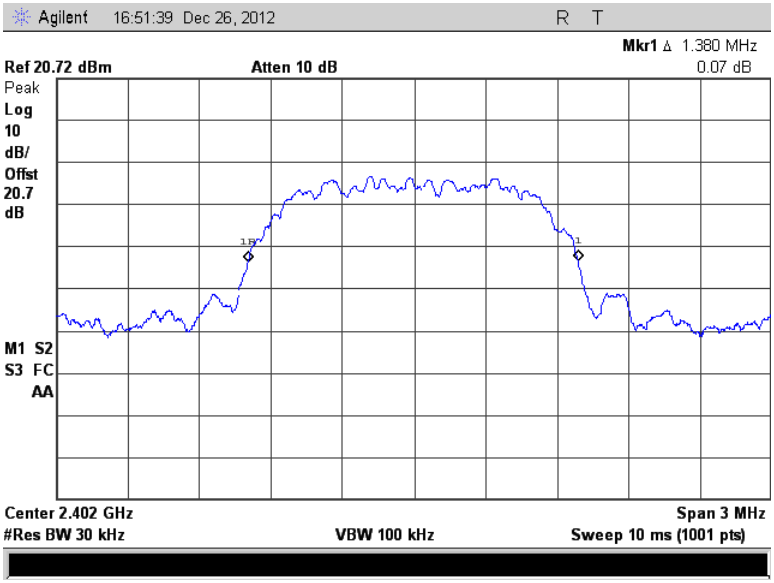


Figure 7.4.4.2-7: 20dB BW Low Channel (π/4 DQPSK)

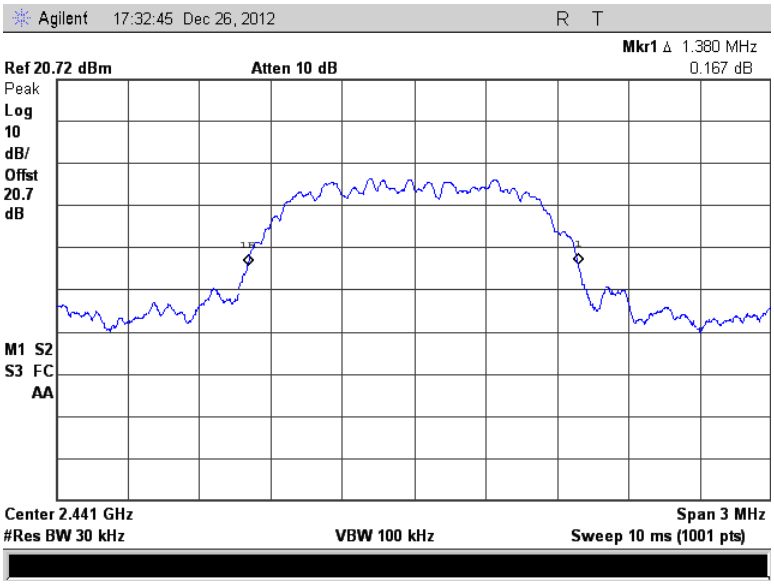


Figure 7.4.4.2-8: 20dB BW Middle Channel (π/4 DQPSK)

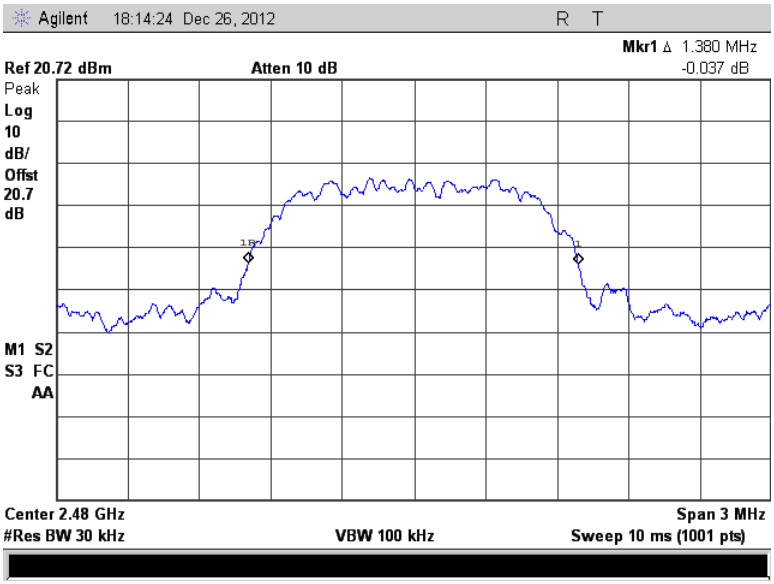


Figure 7.4.4.2-9: 20dB BW High Channel (π/4 DQPSK)

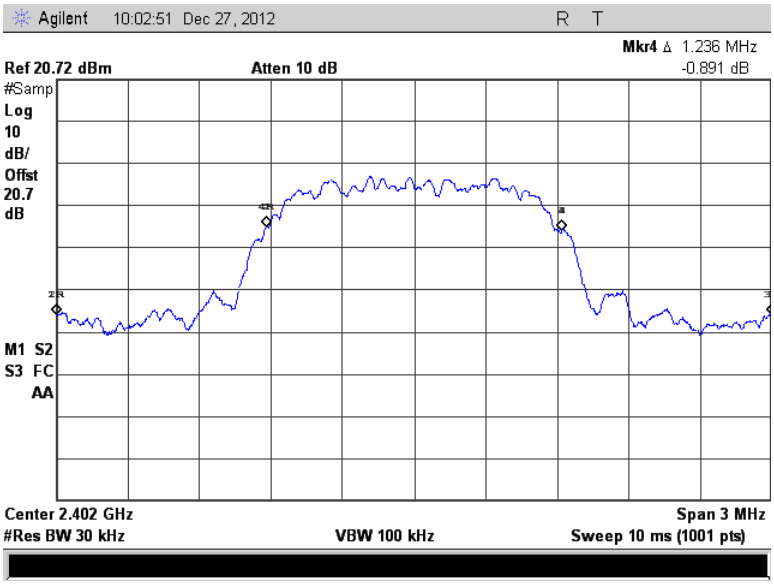


Figure 7.4.4.2-10: 99% OBW Low Channel (π/4 DQPSK)

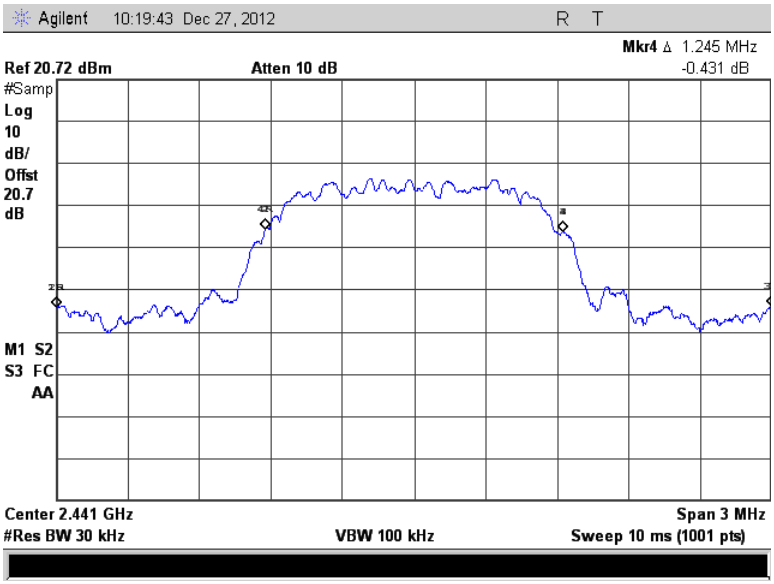


Figure 7.4.4.2-11: 99% OBW Middle Channel (π/4 DQPSK)

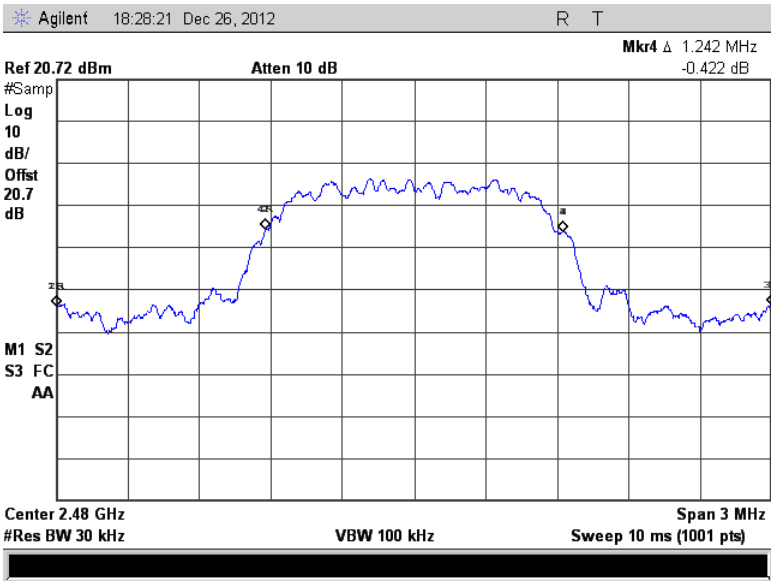


Figure 7.4.4.2-12: 99% OBW High Channel (π/4 DQPSK)

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

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
2402	1362	1227
2441	1362	1233
2480	1359	1233

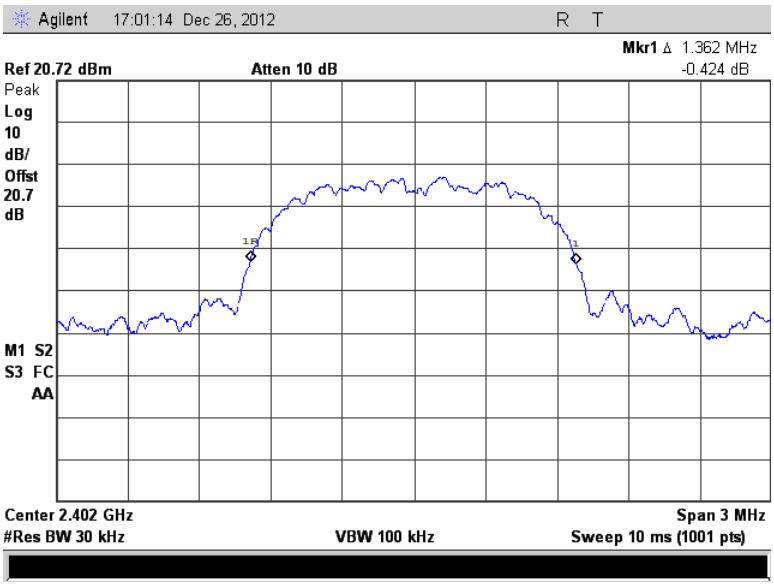


Figure 7.4.4.2-13: 20dB BW Low Channel (8DPSK)

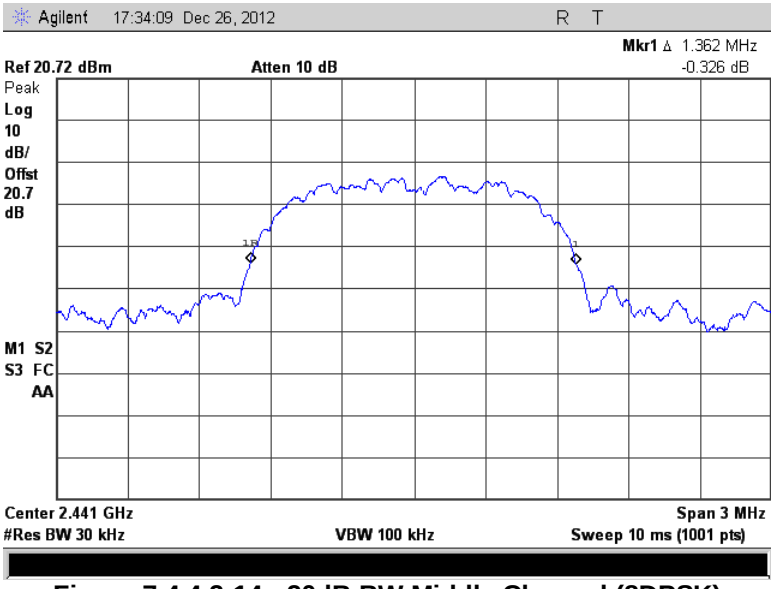


Figure 7.4.4.2-14: 20dB BW Middle Channel (8DPSK)

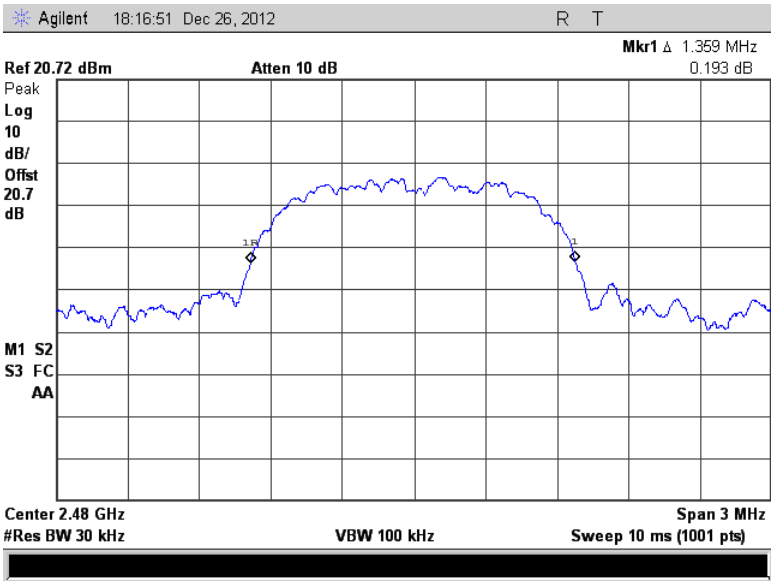


Figure 7.4.4.2-15: 20dB BW High Channel (8DPSK)

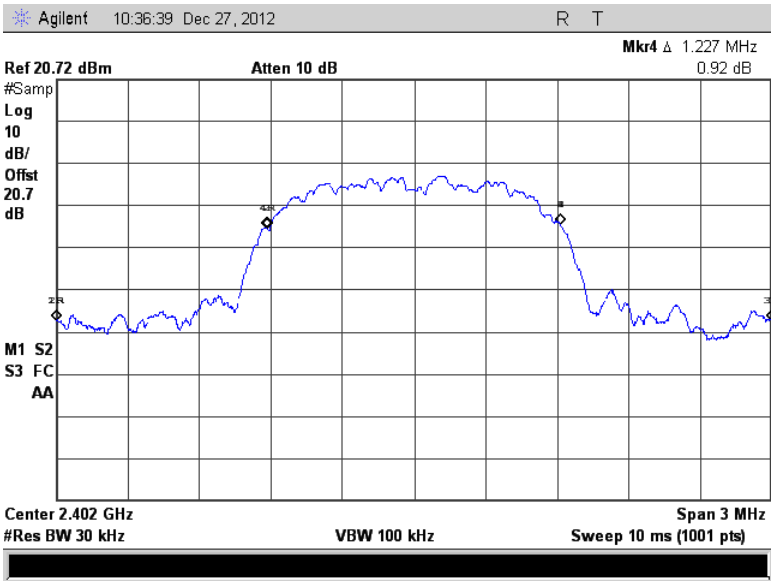


Figure 7.4.4.2-16: 99% OBW Low Channel (8DPSK)

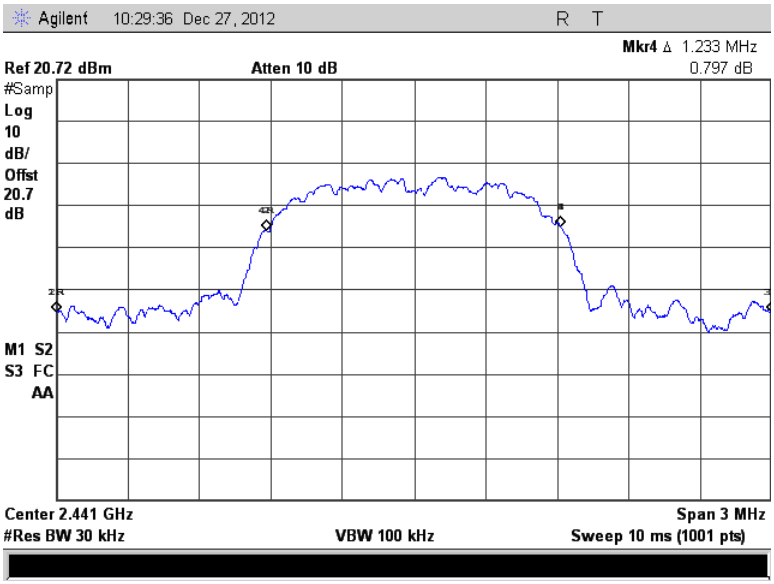


Figure 7.4.4.2-17: 99% OBW Middle Channel (8DPSK)

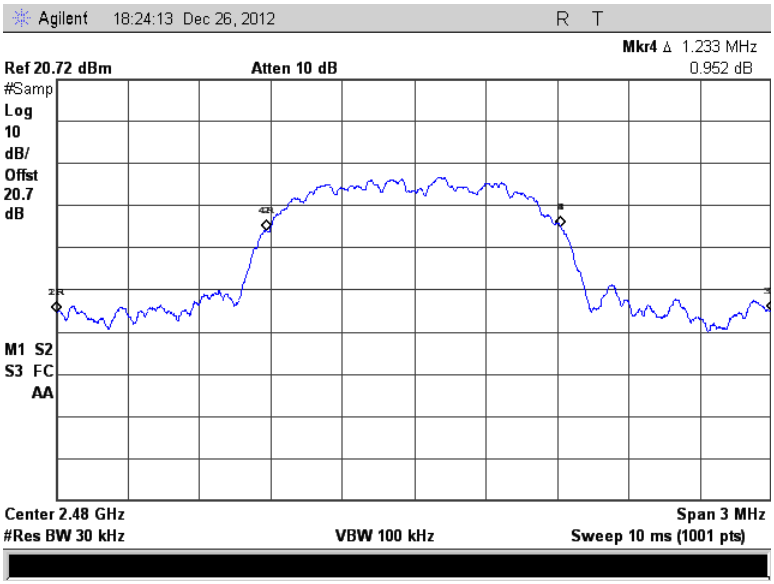


Figure 7.4.4.2-18: 99% OBW High Channel (8DPSK)

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.

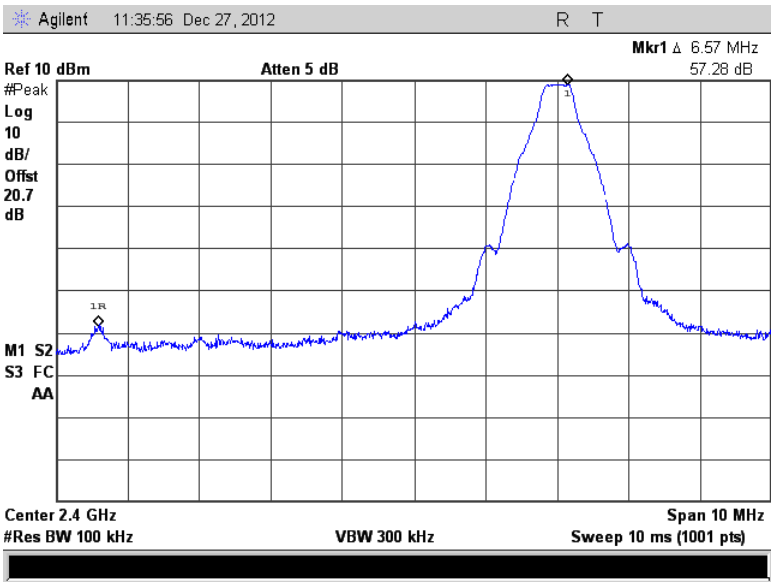


Figure 7.5.1.2-1: Lower Band-edge – Continuous Mode (GFSK)

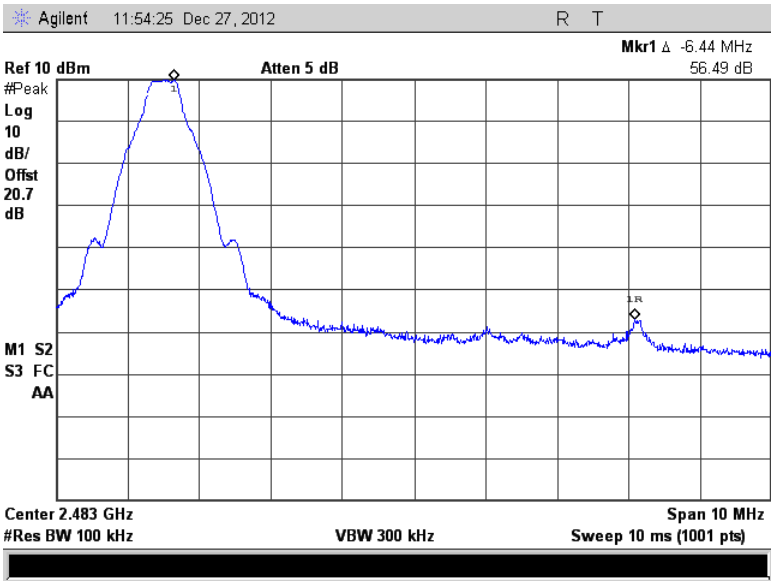


Figure 7.5.1.2-2: Upper Band-edge – Continuous Mode (GFSK)

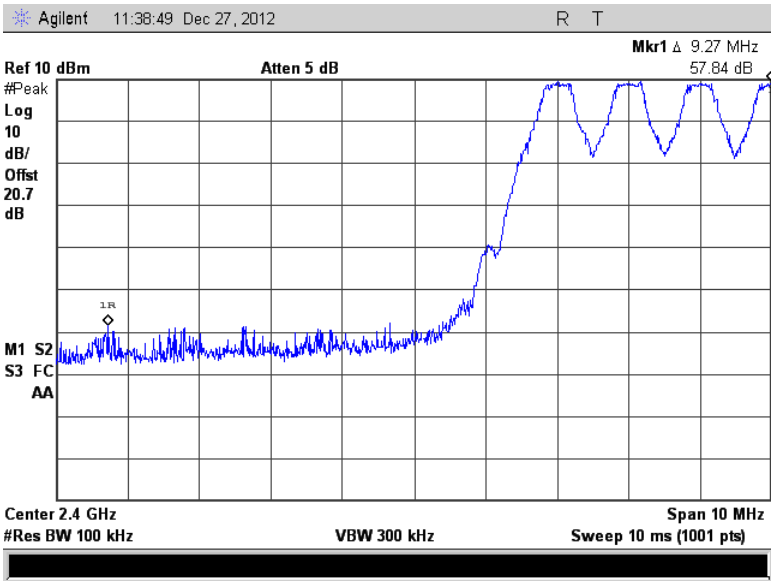


Figure 7.5.1.2-3: Lower Band-edge – Hopping Mode (GFSK)

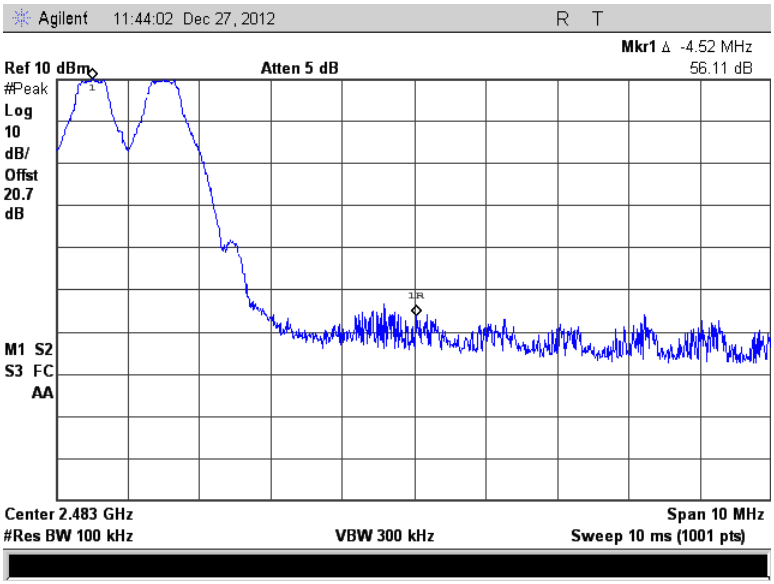


Figure 7.5.1.2-4: Upper Band-edge – Hopping Mode (GFSK)

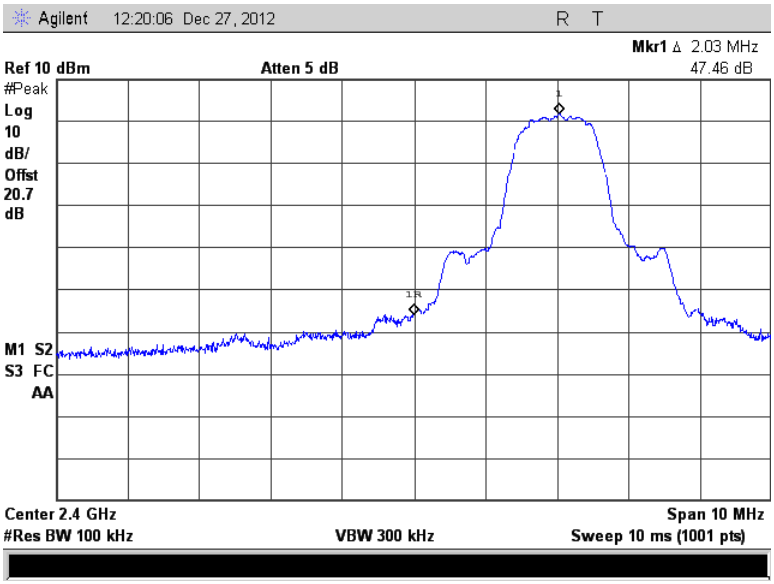


Figure 7.5.1.2-5: Lower Band-edge – Continuous Mode (π/4 DQPSK)

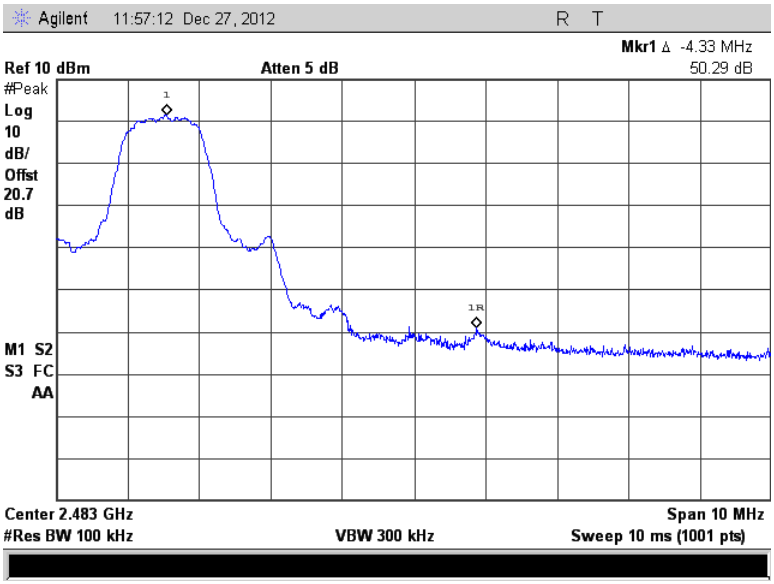


Figure 7.5.1.2-6: Upper Band-edge – Continuous Mode (π/4 DQPSK)

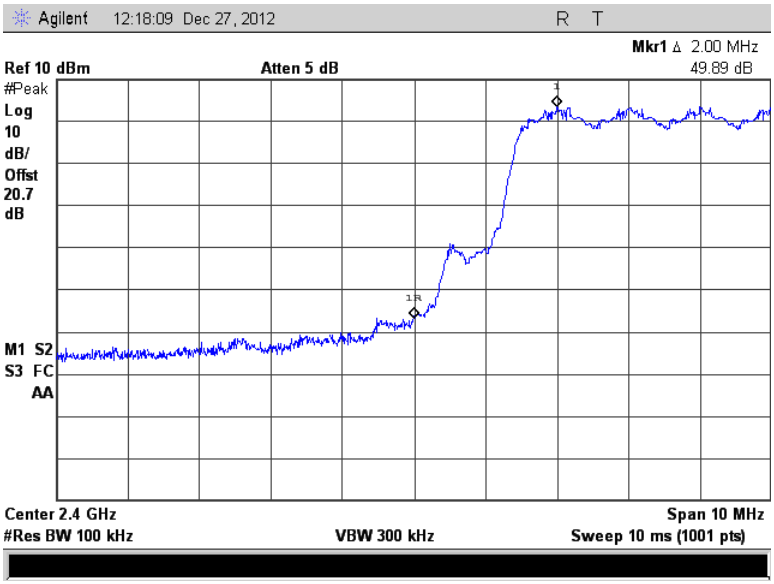


Figure 7.5.1.2-7: Lower Band-edge – Hopping Mode (π/4 DQPSK)

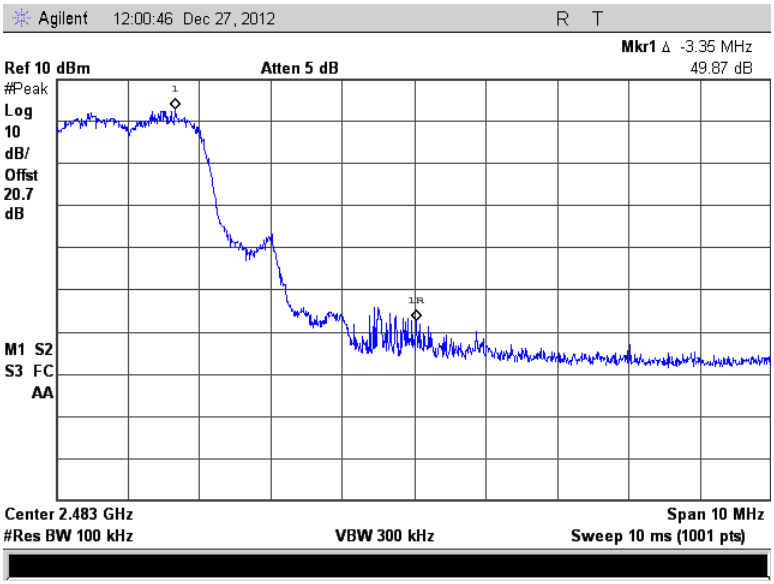


Figure 7.5.1.2-8: Upper Band-edge – Hopping Mode (π/4 DQPSK)

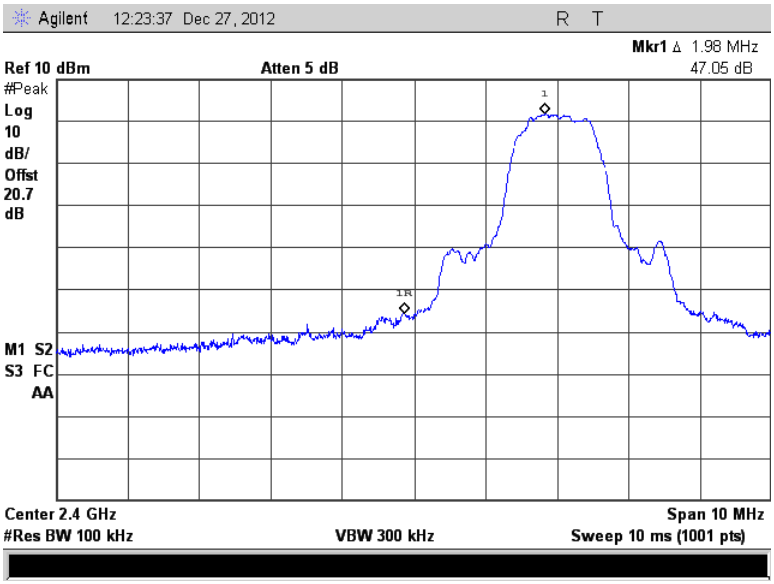


Figure 7.5.1.2-9: Lower Band-edge – Continuous Mode (8DPSK)

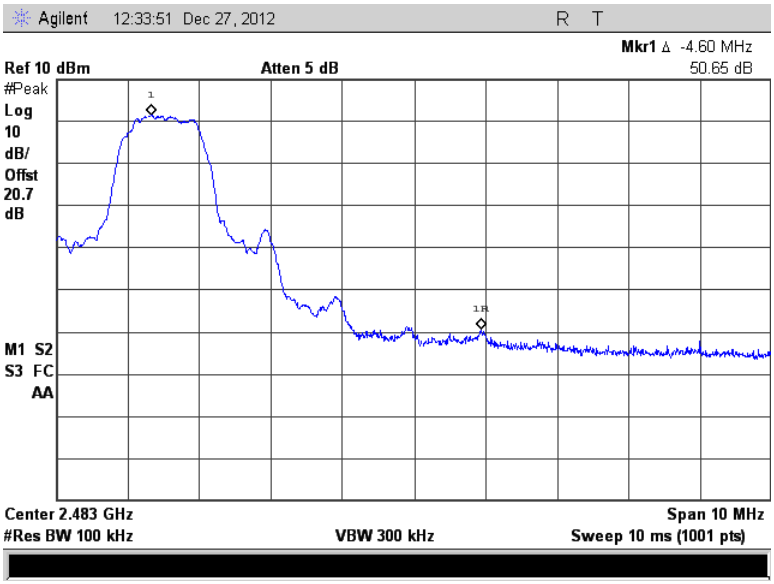


Figure 7.5.1.2-10: Upper Band-edge – Continuous Mode (8DPSK)

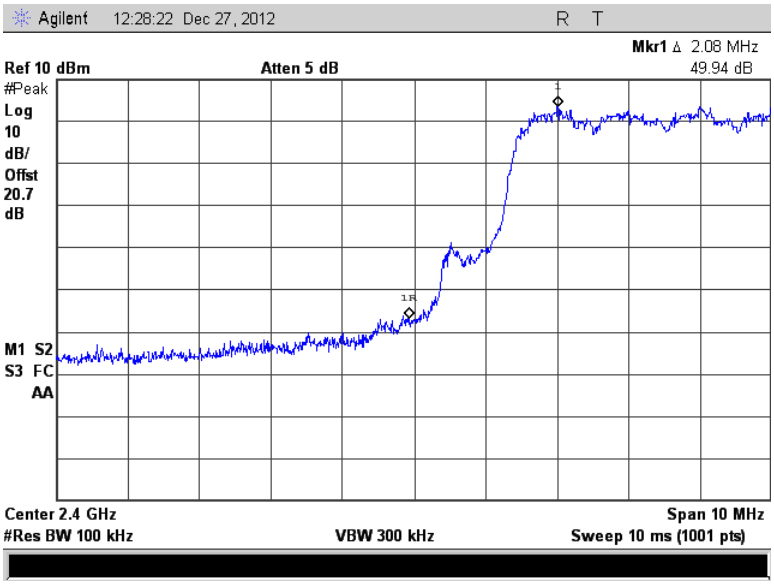


Figure 7.5.1.2-11: Lower Band-edge – Hopping Mode (8DPSK)

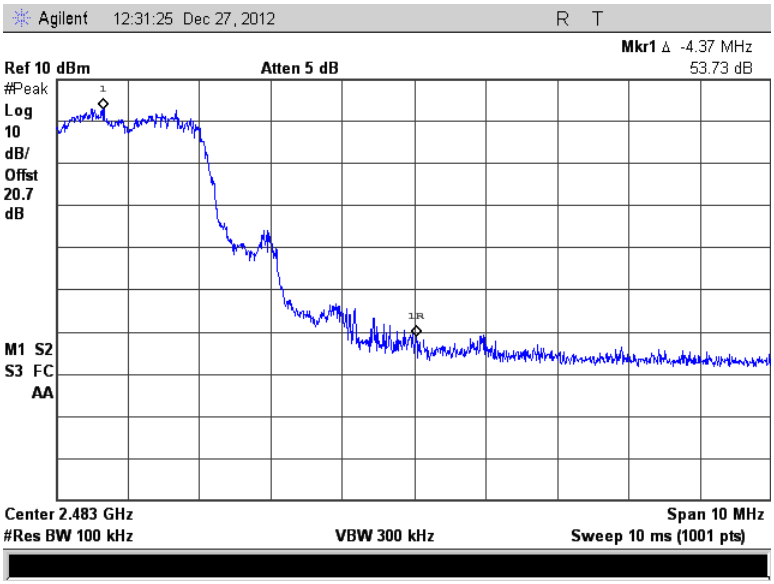


Figure 7.5.1.2-12: Upper Band-edge – Hopping Mode (8DPSK)

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	110.20	109.60	H	-2.04	108.16	107.56	58.64	49.52	48.92	24.48	5.08
2480	107.60	106.90	V	-2.04	105.56	104.86	58.06	47.50	46.80	26.50	7.20

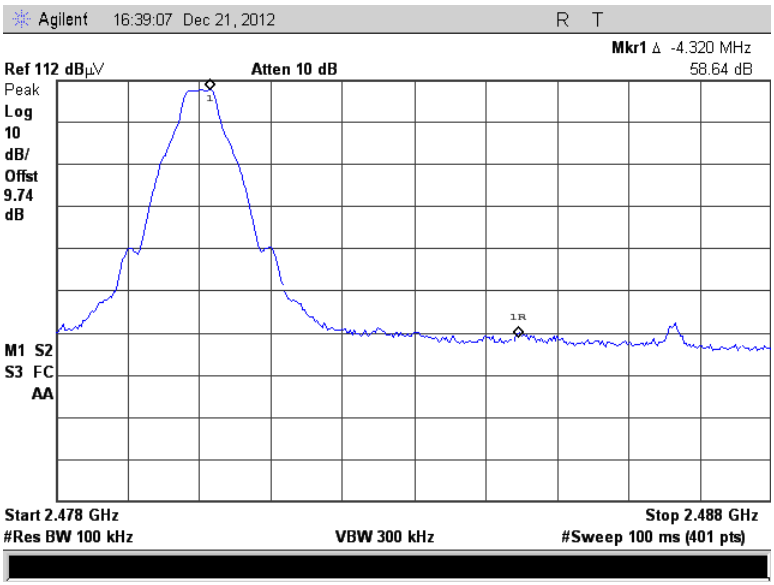


Figure 7.5.2.2-1: Upper Band-edge (GFSK - Horizontal)

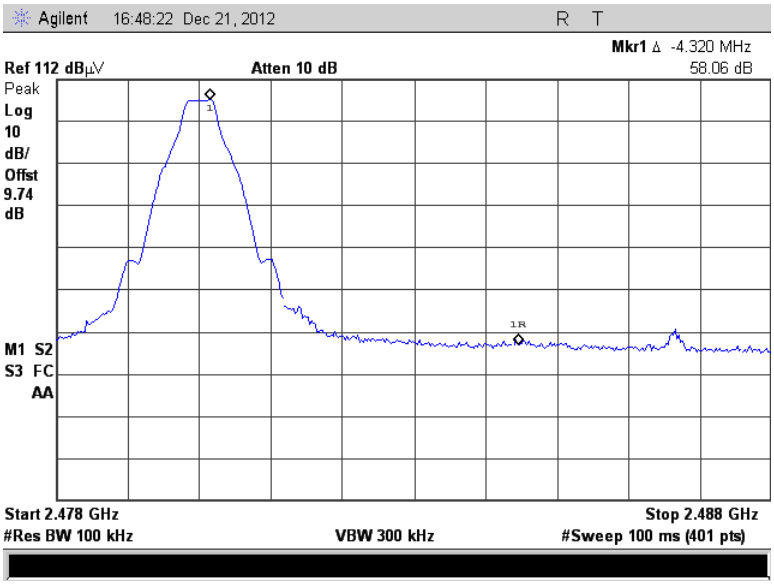


Figure 7.5.2.2-2: Upper Band-edge (GFSK - Vertical)

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	106.40	102.70	H	-2.04	104.36	100.66	50.54	53.82	50.12	20.18	3.88
2480	103.70	100.00	V	-2.04	101.66	97.96	49.92	51.74	48.04	22.26	5.96

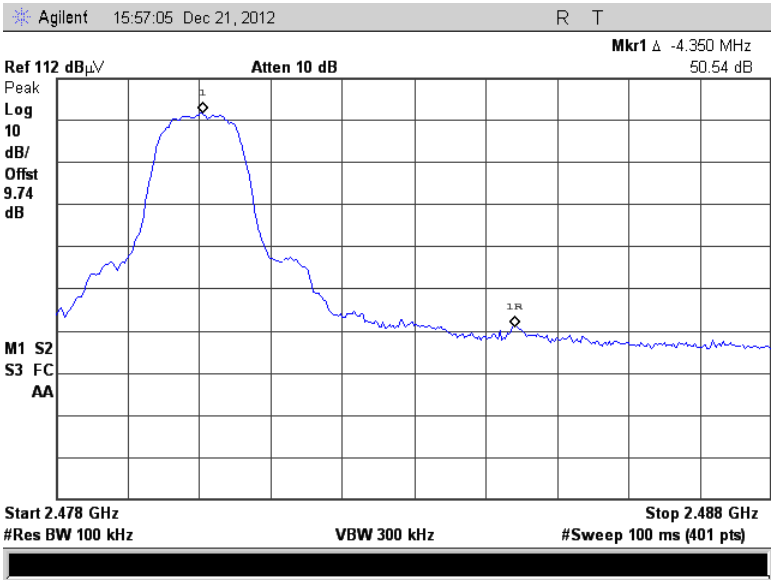


Figure 7.5.2.2-3: Upper Band-edge (π/4 DQPSK - Horizontal)

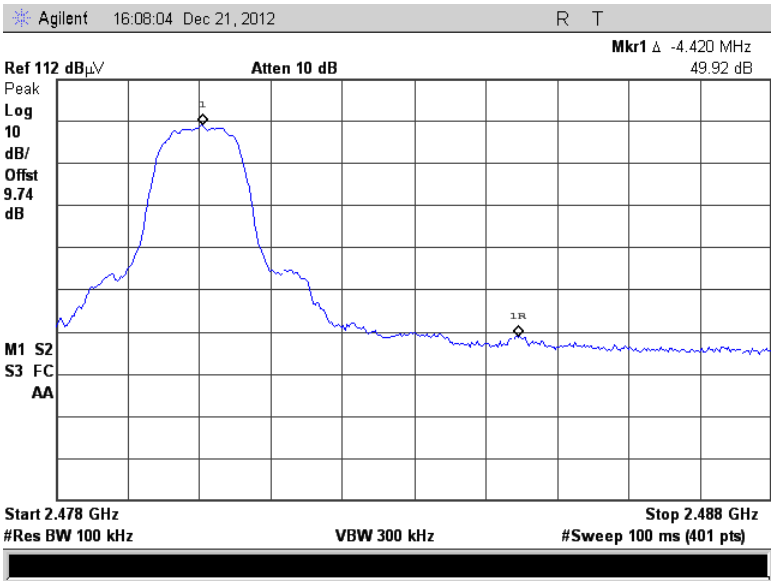


Figure 7.5.2.2-4: Upper Band-edge (π/4 DQPSK - Vertical)

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	106.60	102.80	H	-2.04	104.56	100.76	50.76	53.80	50.00	20.20	4.00
2480	103.10	99.30	V	-2.04	101.06	97.26	50.14	50.92	47.12	23.08	6.88

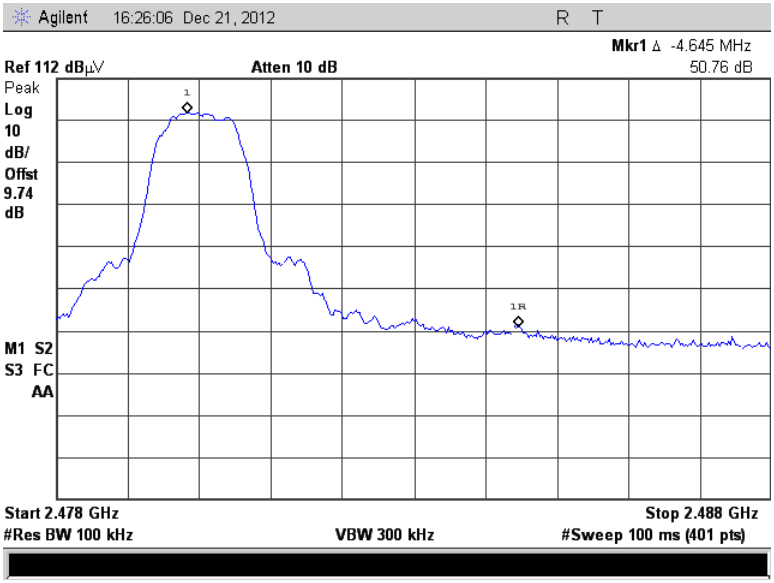


Figure 7.5.2.2-5: Upper Band-edge (8DPSK- Horizontal)

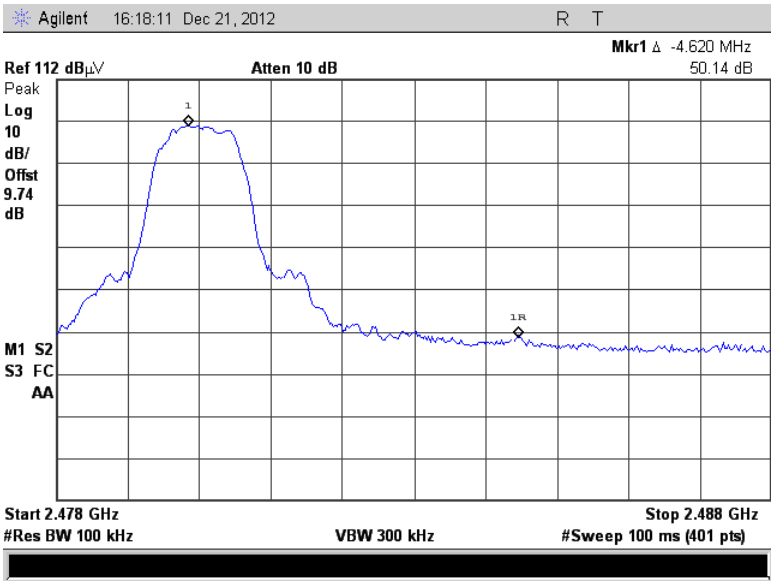


Figure 7.5.2.2-6: Upper Band-edge (8DPSK - Vertical)

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 a 20 dB attenuator. 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 7.5.3.2-18:

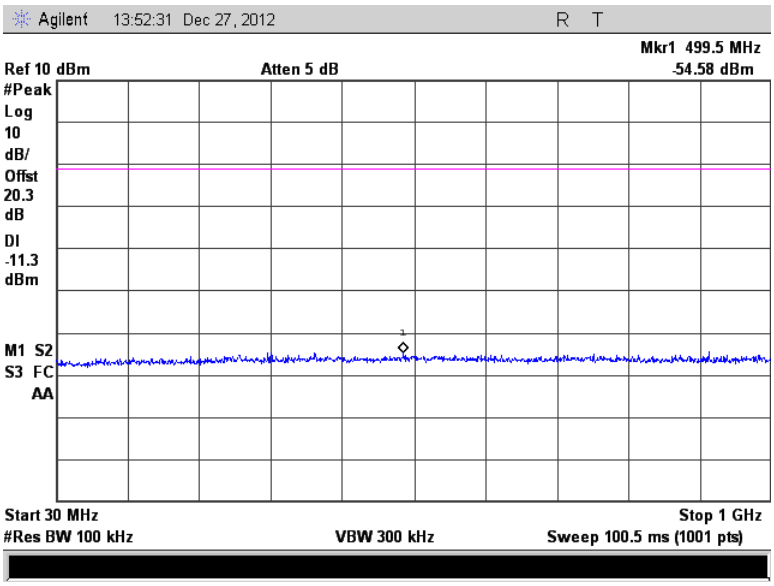


Figure 7.5.3.2-1: 30 MHz – 1 GHz – Low Channel (GFSK)

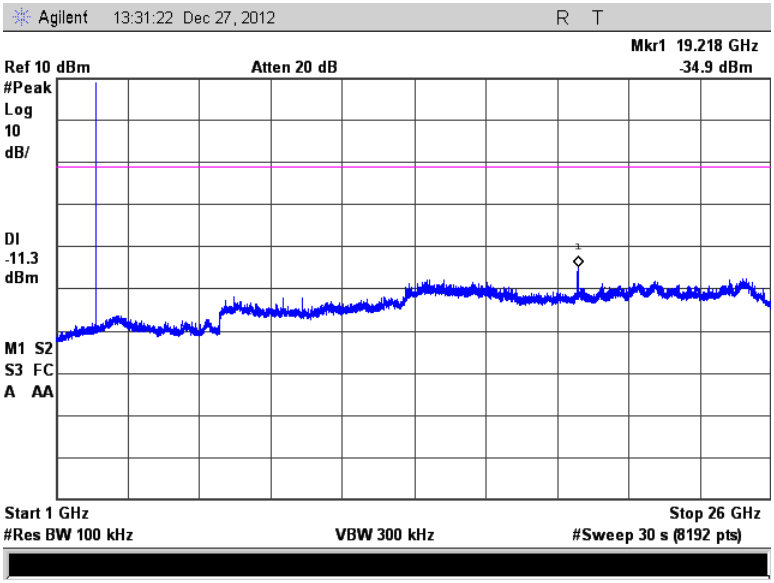


Figure 7.5.3.2-2: 1 GHz –26 GHz – Low Channel (GFSK)

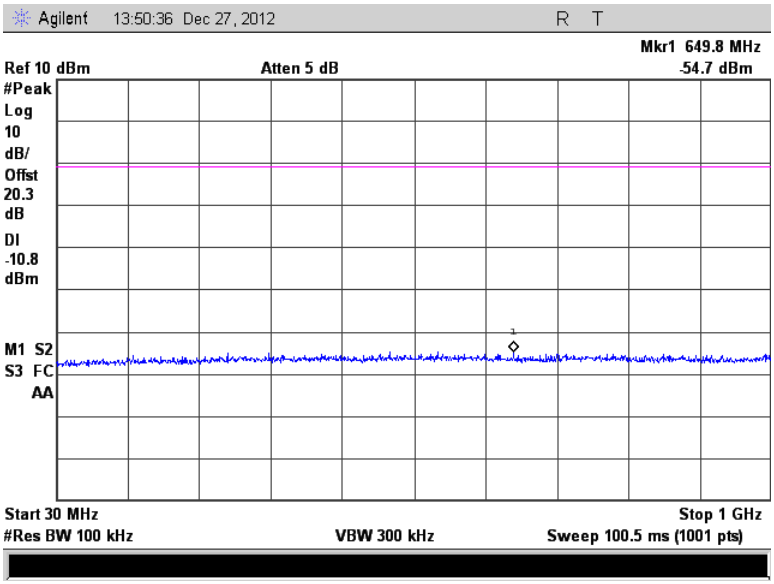


Figure 7.5.3.2-3: 30 MHz – 1 GHz – Middle Channel (GFSK)

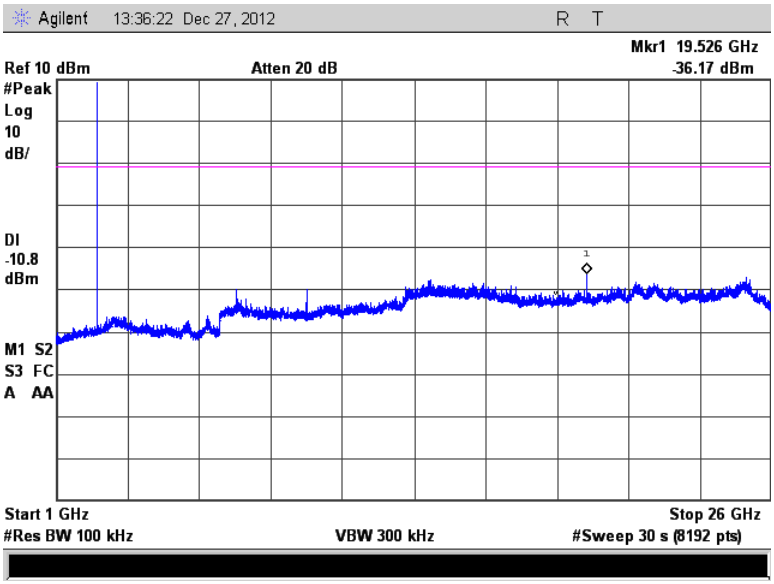


Figure 7.5.3.2-4: 1 GHz –26 GHz – Middle Channel (GFSK)

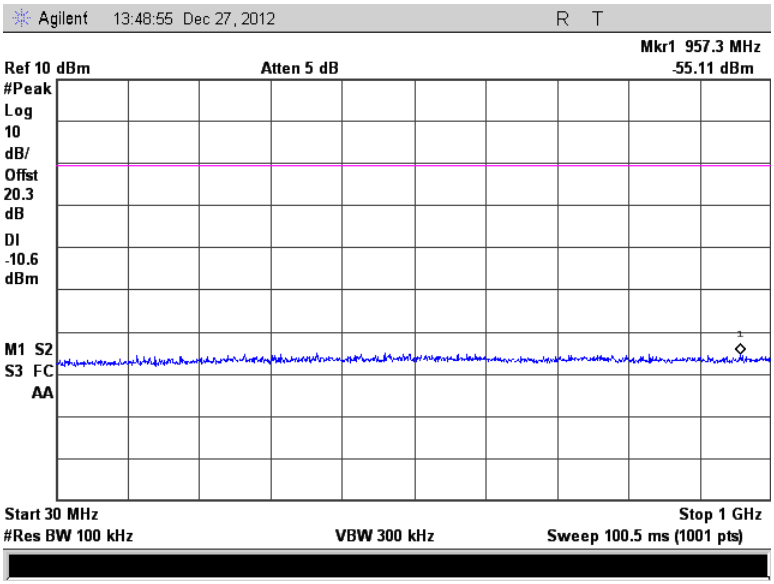


Figure 7.5.3.2-5: 30 MHz – 1 GHz – High Channel (GFSK)

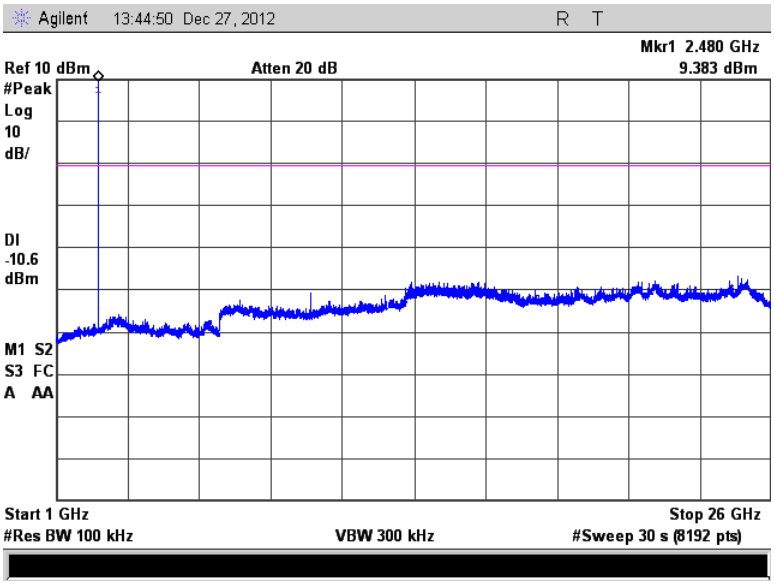


Figure 7.5.3.2-6: 1 GHz –26 GHz – High Channel (GFSK)

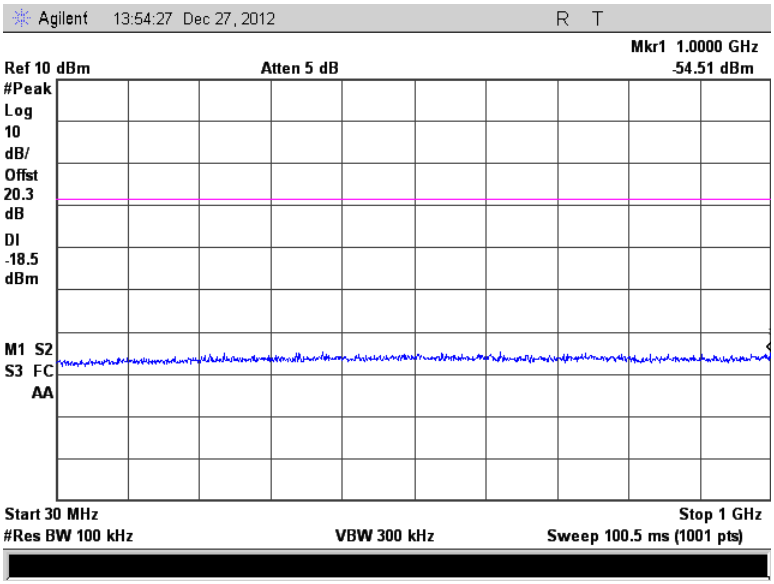


Figure 7.5.3.2-7: 30 MHz – 1 GHz – Low Channel (π/4 DQPSK)

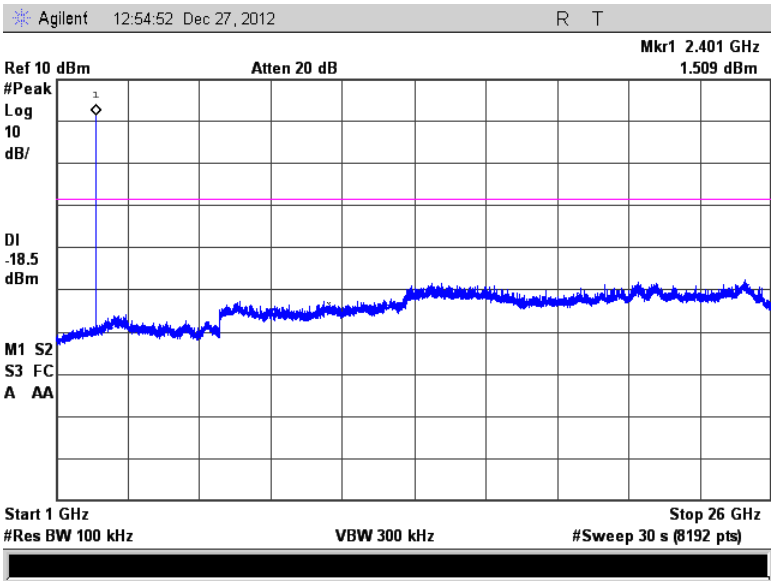


Figure 7.5.3.2-8: 1 GHz –26 GHz – Low Channel (π/4 DQPSK)

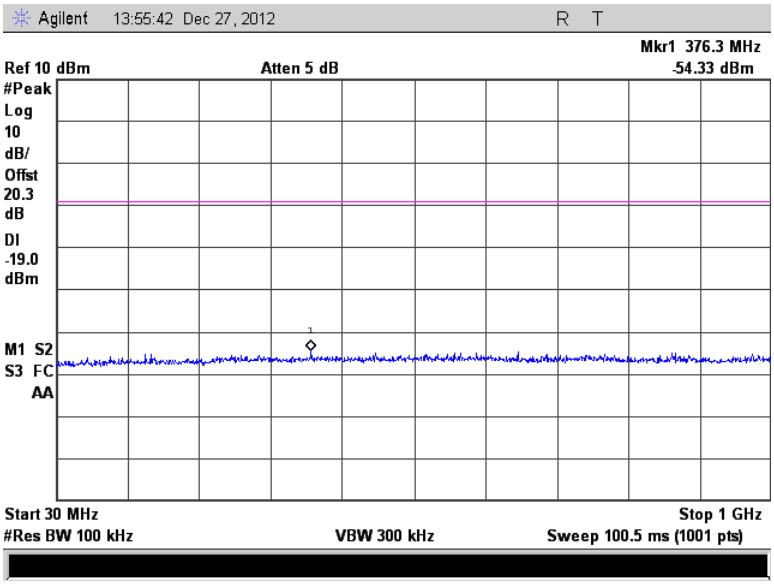


Figure 7.5.3.2-9: 30 MHz – 1 GHz – Middle Channel (π/4 DQPSK)

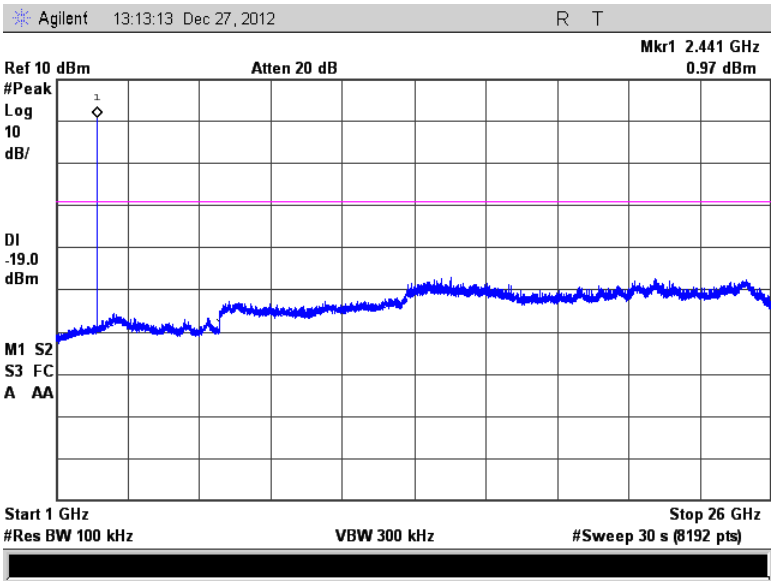


Figure 7.5.3.2-10: 1 GHz –26 GHz – Middle Channel (π/4 DQPSK)

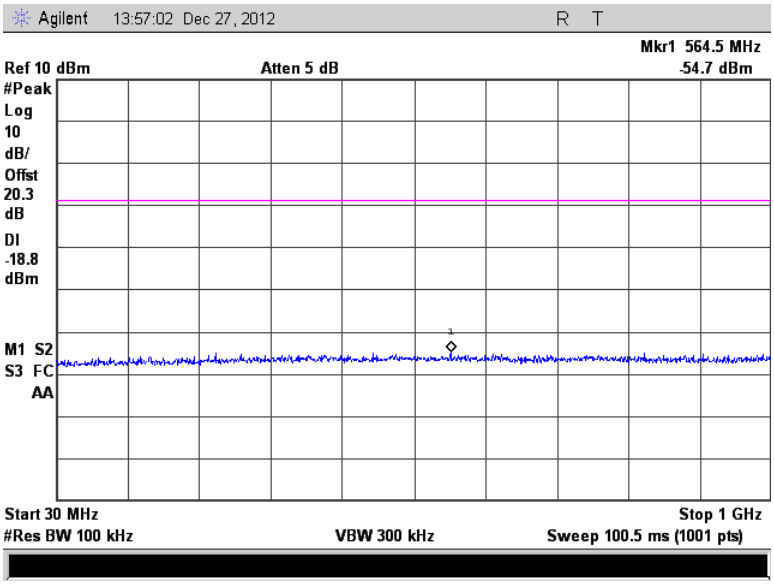


Figure 7.5.3.2-11: 30 MHz – 1 GHz – High Channel (π/4 DQPSK)

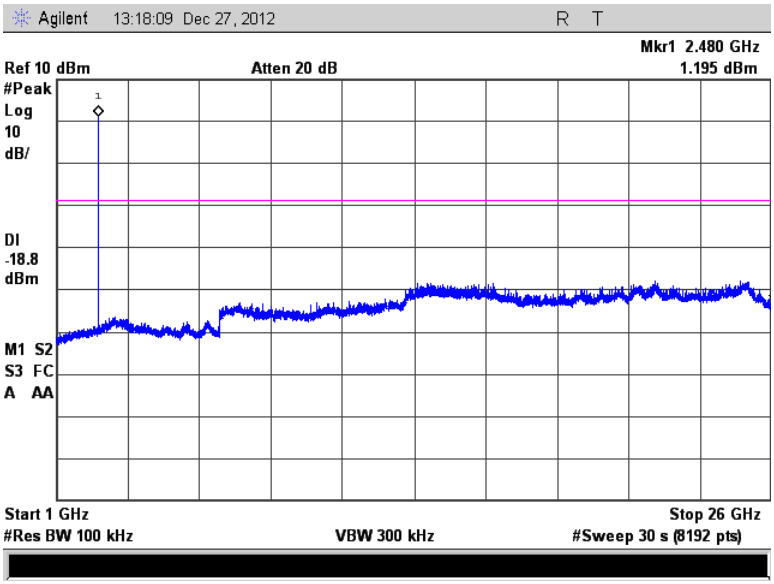


Figure 7.5.3.2-12: 1 GHz –26 GHz – High Channel (π/4 DQPSK)

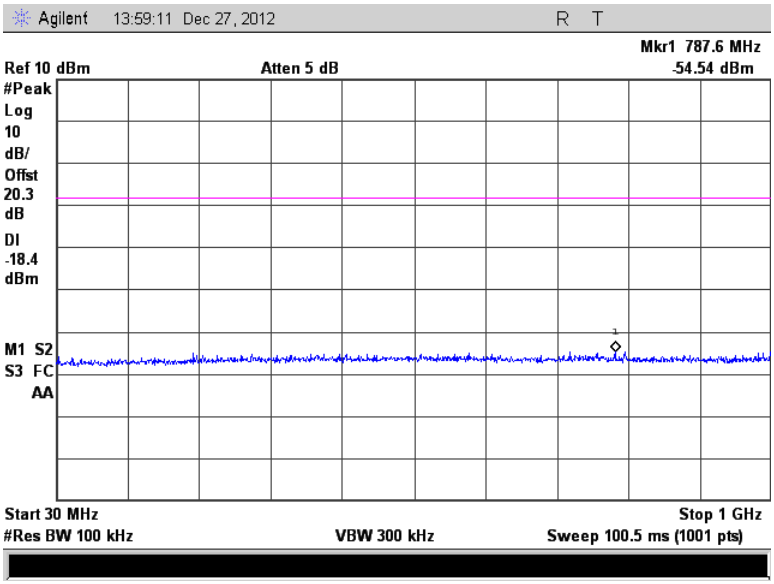


Figure 7.5.3.2-13: 30 MHz – 1 GHz – Low Channel (8DPSK)

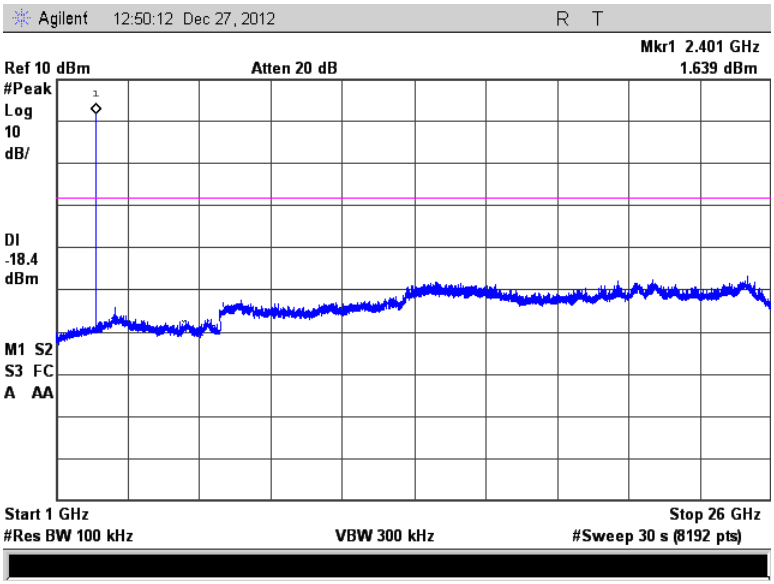


Figure 7.5.3.2-14: 1 GHz –26 GHz – Low Channel (8DPSK)

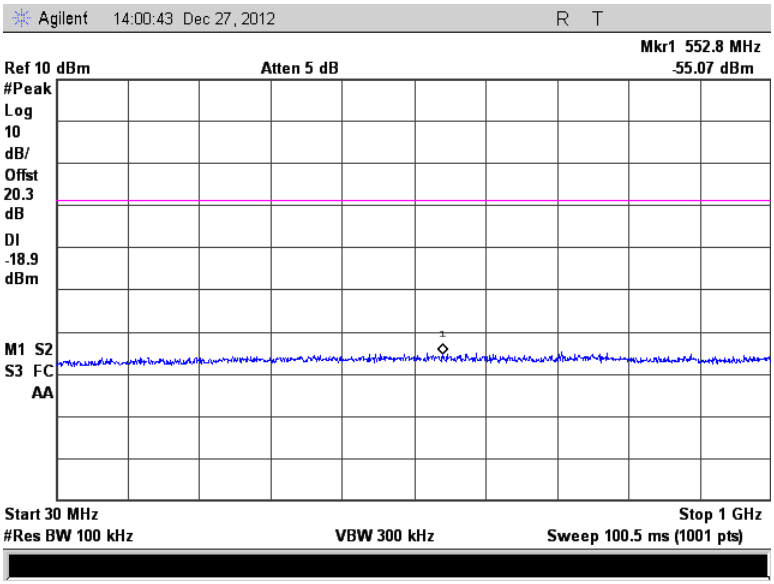


Figure 7.5.3.2-15: 30 MHz – 1 GHz – Middle Channel (8DPSK)

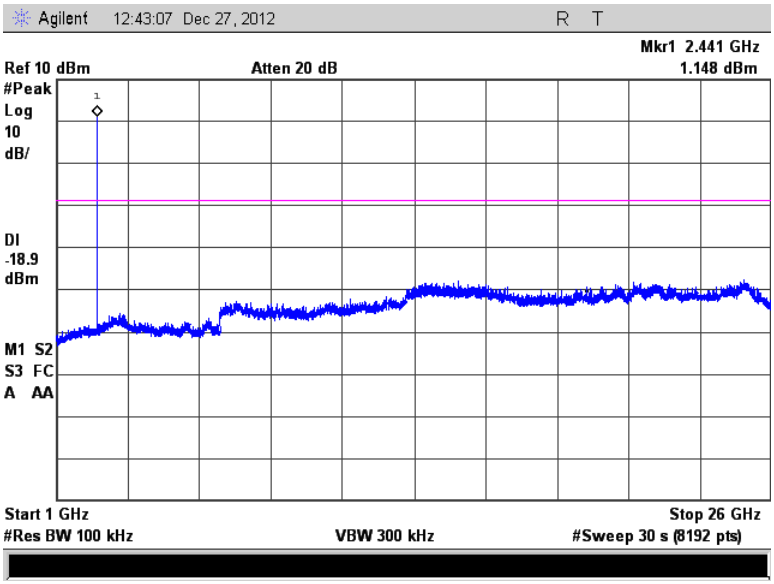


Figure 7.5.3.2-16: 1 GHz –26 GHz – Middle Channel (8DPSK)

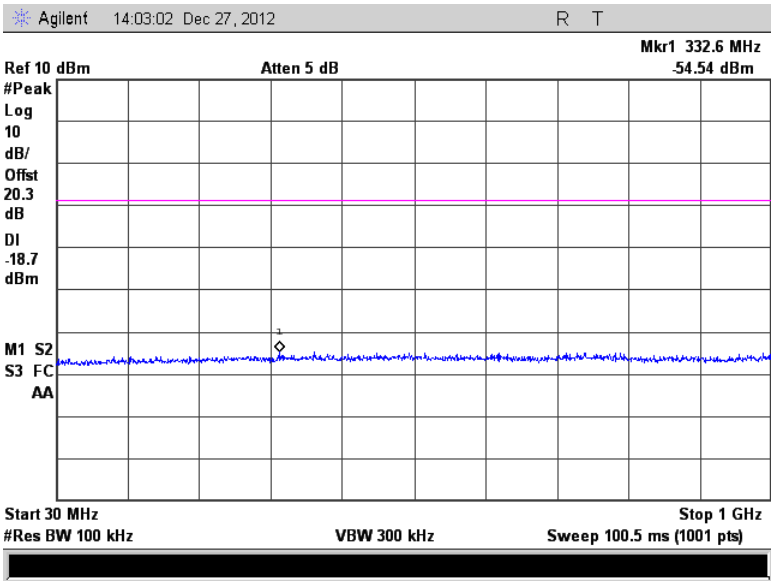


Figure 7.5.3.2-17: 30 MHz – 1 GHz – High Channel (8DPSK)

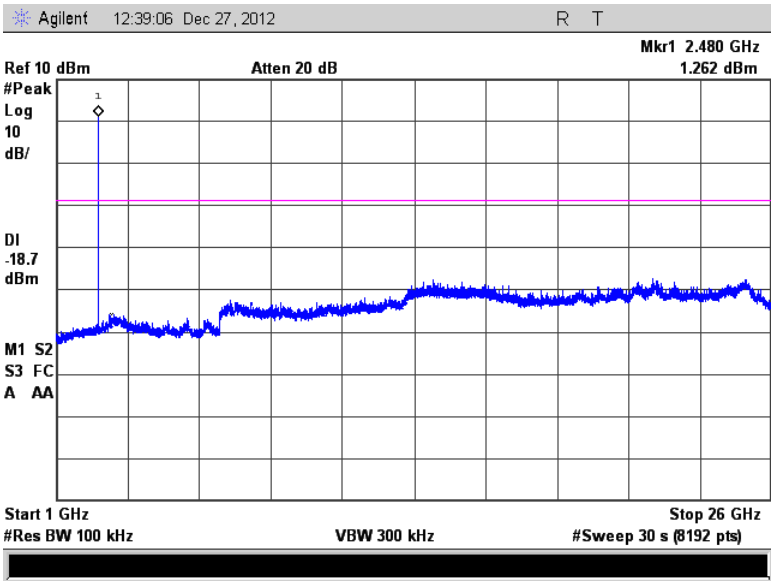


Figure 7.5.3.2-18: 1 GHz –26 GHz – High Channel (8DPSK)

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 and average measurements made with RBW and VBW of 1 MHz and 3 MHz respectively.

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 = 2402 MHz										
12010	40.65	27.94	H	15.55	56.20	43.49	83.5	63.5	27.3	20.0
12010	40.51	27.77	V	15.55	56.06	43.32	83.5	63.5	27.4	20.2
19216	50.59	41.85	H	11.13	61.72	52.98	83.5	63.5	21.8	10.5
19216	50.93	42.51	V	11.13	62.06	53.64	83.5	63.5	21.4	9.9
Middle Channel = 2441 MHz										
4882	40.79	28.64	H	4.07	44.86	32.71	74.0	54.0	29.1	21.3
4882	41.62	30.19	V	4.07	45.69	34.26	74.0	54.0	28.3	19.7
7323	43.88	33.24	H	8.19	52.07	41.43	74.0	54.0	21.9	12.6
7323	43.83	32.01	V	8.19	52.02	40.20	74.0	54.0	22.0	13.8
12205	44.17	31.55	H	15.71	59.88	47.26	83.5	63.5	23.6	16.2
12205	43.10	31.84	V	15.71	58.81	47.55	83.5	63.5	24.7	16.0
19528	50.26	40.71	H	10.60	60.86	51.31	83.5	63.5	22.6	12.2
19528	49.95	41.50	V	10.60	60.55	52.10	83.5	63.5	23.0	11.4
High Channel = 2480 MHz										
7440	43.02	30.71	H	8.55	51.57	39.26	74.0	54.0	22.4	14.7
7440	41.24	29.75	V	8.55	49.79	38.30	74.0	54.0	24.2	15.7
12400	40.85	29.91	H	15.87	56.72	45.78	83.5	63.5	26.8	17.7
12400	42.10	30.36	V	15.87	57.97	46.23	83.5	63.5	25.5	17.3
19840	51.50	42.67	H	11.34	62.84	54.01	83.5	63.5	20.7	9.5
19840	51.36	43.17	V	11.34	62.70	54.51	83.5	63.5	20.8	9.0

Notes:

- The measurements above 10 GHz were performed at a distance of 1m. The limits are corrected using a distance factor of 20*log(3/1) dB ≈ 9.54 dB.
- All emissions above 19840 MHz were attenuated below the limits and the noise floor of the measurement equipment.

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										
12010	41.31	27.71	H	15.55	56.86	43.26	83.5	63.5	26.6	20.2
19216	47.54	36.61	H	11.13	58.67	47.74	83.5	63.5	24.8	15.8
19216	47.25	36.14	V	11.13	58.38	47.27	83.5	63.5	25.1	16.2
Middle Channel = 2441 MHz										
12205	41.83	29.29	H	15.71	57.54	45.00	83.5	63.5	26.0	18.5
12205	41.89	28.84	V	15.71	57.60	44.55	83.5	63.5	25.9	19.0
19528	47.85	37.04	H	10.60	58.45	47.64	83.5	63.5	25.1	15.9
19528	47.52	36.41	V	10.60	58.12	47.01	83.5	63.5	25.4	16.5
High Channel = 2480 MHz										
12400	40.06	27.18	H	15.87	55.93	43.05	83.5	63.5	27.6	20.5
12400	39.89	27.14	V	15.87	55.76	43.01	83.5	63.5	27.7	20.5
19840	46.70	35.82	H	11.34	58.04	47.16	83.5	63.5	25.5	16.3
19840	46.37	35.83	V	11.34	57.71	47.17	83.5	63.5	25.8	16.3

Notes:

- The measurements above 10 GHz were performed at a distance of 1m. The limits are corrected using a distance factor of 20*log(3/1) dB ≈ 9.54 dB.
- All emissions above 19840 MHz were attenuated below the limits and the noise floor of the measurement equipment.

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										
19216	48.64	37.08	H	11.13	59.77	48.21	83.5	63.5	23.7	15.3
19216	47.96	36.64	V	11.13	59.09	47.77	83.5	63.5	24.4	15.7
Middle Channel = 2441 MHz										
12205	41.20	28.31	H	15.71	56.91	44.02	83.5	63.5	26.6	19.5
12205	41.25	28.14	V	15.71	56.96	43.85	83.5	63.5	26.5	19.7
19528	47.91	36.56	H	10.60	58.51	47.16	83.5	63.5	25.0	16.3
19528	47.45	36.42	V	10.60	58.05	47.02	83.5	63.5	25.5	16.5
High Channel = 2480 MHz										
12400	40.58	26.98	H	15.87	56.45	42.85	83.5	63.5	27.1	20.7
12400	39.78	26.96	V	15.87	55.65	42.83	83.5	63.5	27.9	20.7
19840	46.60	35.40	H	11.34	57.94	46.74	83.5	63.5	25.6	16.8
19840	47.16	35.94	V	12.89	60.05	48.83	83.5	63.5	23.5	14.7

Notes:

- The measurements above 10 GHz were performed at a distance of 1m. The limits are corrected using a distance factor of 20*log(3/1) dB ≈ 9.54 dB.
- All emissions above 19840 MHz were attenuated below the limits and the noise floor of the measurement equipment.

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

Duty Cycle Correction Factor
DC = 20*log(2.901/100) = -30.749 dB

Example Calculation: Peak
Corrected Level: 40.65+ 15.55 = 56.2dBµV/m
Margin: 83.5 dBuV/m – 56.2dBµV/m = 27.3dB

Example Calculation: Average
Corrected Level: 27.94 + 15.55 = 43.49dBµV/m
Margin: 63.5 dBuV/m – 43.49dBµV/m = 20dB

8 CONCLUSION

In the opinion of ACS, Inc., the AAH56UCN9KB1AN 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