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Certification Test Report

FCC ID: AZ489FT3829
IC: 109U-89FT3829

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

ACS Report Number: 10-2067.W06.11.A

Manufacturer: Motorola, Inc.
Model: APX 6000 (H98KGH9PW7AN)

Test Begin Date: August 27, 2010
Test End Date: September 17, 2010

Report Issue Date: September 28, 2010

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200897-0

This report is not be used to claim certification, approval, or endorsement by NVLAP, NIST or any government agency.

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This report contains 42 pages

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1 GENERAL

1.1 Purpose

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

1.2 Product description

The APX 6000 (H98KGH9PW7AN) is a VHF two way radio with Bluetooth, GPS, accelerometer and secure audio. The model variant tested provides dual display and full keypad.

Table 1.2-1: Transmitter Description

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

Table 1.2-2: APX 6000 VHF Model Variants Description

Variants	Description	Test
H98KGH9PW7AN	dual display , full keypad	Yes
H98KGF9PW6AN	dual display, limited keypad	---
H98KGD9PW5AN	single top display, no keypad	---

The model tested was considered by the manufacturer the worse case of all model variants declared here.

Manufacturer Information:
Motorola, Inc.
8000 West Sunrise Blvd.
Plantation, FL 33322
USA

Test Sample Serial Number(s): H98KGH9PW7AN , Serial: CAI1006S4L,
H98KGH9PW7AN, Serial: CAI1006S3B

Test Sample Condition: Good

1.3 Test Methodology and Considerations

This document reports the results for the Bluetooth transmitter of the APX 6000 (H98KGH9PW7AN). The EUT was evaluated for radiated spurious emissions up to the 10th harmonic of the Bluetooth fundamental frequency. The unit was pre-scanned in three orthogonal orientations and final measurements were performed in the orientation leading to the maximum emissions.
Data was collected for the GPSK and π/4 DQPSK (EDR2) modulation modes only. Data was not collected for the 8DPSK modulation method because this modulation method will not be incorporated in the radio as per the customer.

1.4 Emission Designators

The APX 6000 (H98KGH9PW7AN) transmitter produces 2 distinct modulation formats. The emissions designators for the modulation types used by the APX 6000 (H98KGH9PW7AN) transmitter are as follows:

EMISSIONS DESIGNATORS:

GFSK: 1M11F1D
π/4 DQPSK: 1M39G1D

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 #: 581606
Industry Canada Lab Code: 4175C-1

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 200897-0. Unless otherwise specified, all tests 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 metallic loaded springs. An EMCO Model 1051 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:

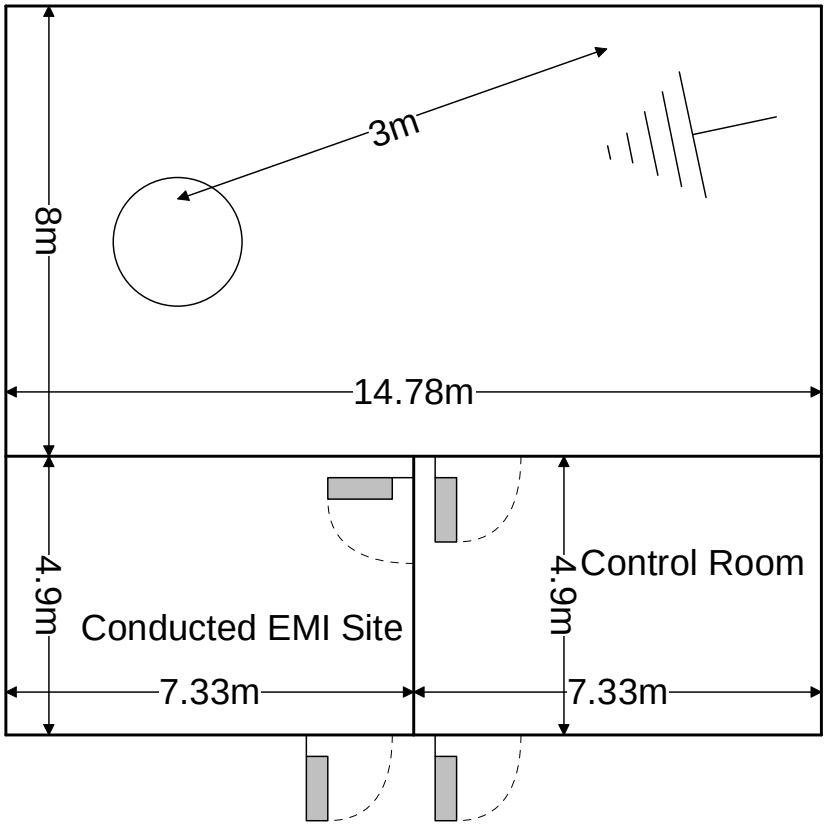

Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

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:

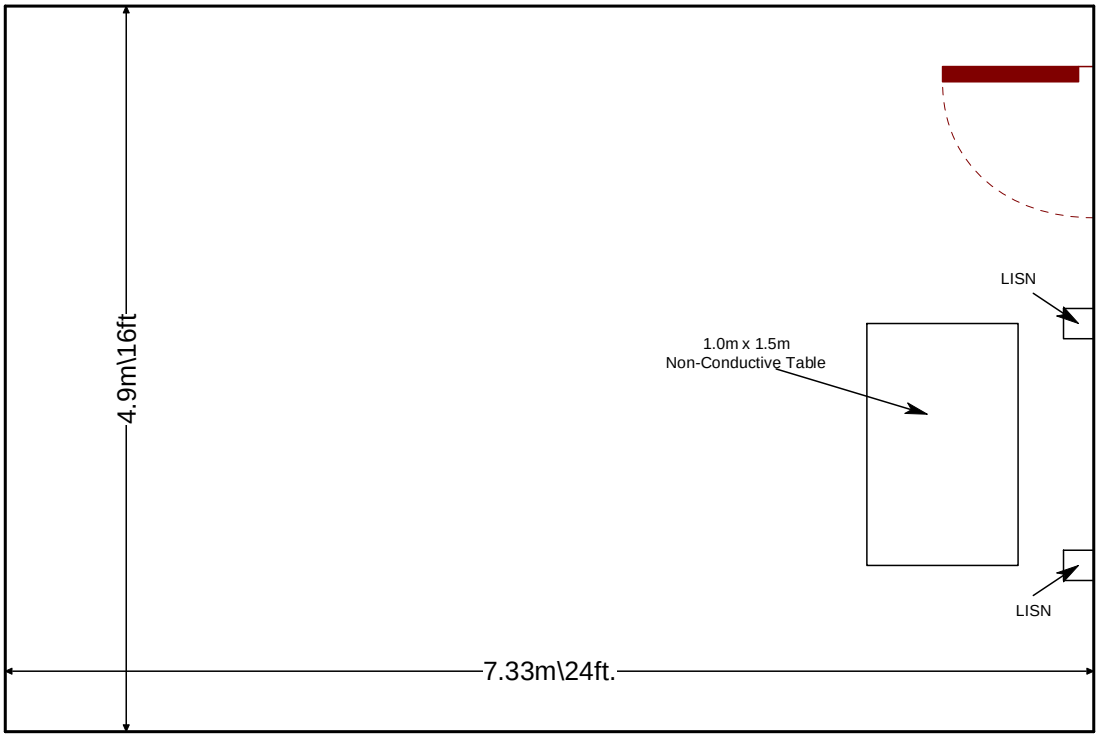

Figure 2.3.2-1: AC Mains Conducted EMI Site

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, 2010
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2010
- 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 7 June 2007
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue2, June 2007.

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 #	Cal Due Date
2002	EMCO	3108	Antennas	2147	9/10/2011
2004	EMCO	3146	Antennas	1385	9/10/2011
2006	EMCO	3115	Antennas	2573	2/21/2011
2008	COM-Power	AH-826	Antennas	81009	N/A
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	1/4/2011
2012	Hewlett-Packard	HP83017A	Amplifiers	3123A00324	12/30/2010
2013	Hewlett Packard	HP8566B	Spectrum Analyzers	2407A03233	8/5/2012
2014	Hewlett Packard	HP 85650A	Quasi Peak Adapter	2430A00559	8/5/2012
2015	Hewlett Packard	HP85685A	RF Preselector	2510A00151	8/5/2012
2022	EMCO	LISN3825/2R	LISN	1095	8/10/2011
2037	ACS Boca	Chamber EMI Cable Set	Cable Set	2037	12/30/2010
2044	QMI	N/A	Cables	2044	1/6/2011
2045	ACS Boca	Conducted Cable Set	Cable Set	2045	9/6/2011
2056	Hewlett Packard	11971K	Mixer	2332A00424	8/5/2012

*Note:
The asset 2008 is a standard gain horn antenna. Hence, recurring calibration beyond initial calibration per the manufacturer is not required only in case of damage, suspected deterioration or use at distance closer than $2xa^2/\lambda$, as per ANSI C63.4 requirements.

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment (Diagram 6.1)

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	APX 6000 VHF	Motorola	H98KGH9PW7AN	CAI1006S4L
2	Battery	Motorola	PMNN4404A	50000069B263
3	Impres Charger	Motorola	NNTN7079A V3.9	9134MTC02
4	ITE Power Supply	Motorola	NU20-C140150-I3	N/A

Table 5-2: Support Equipment (Diagram 6.2)

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	APX 6000 VHF	Motorola	H98KGH9PW7AN	CAI1006S4L
2	Battery	Motorola	PMNN4404A	50000069B263

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

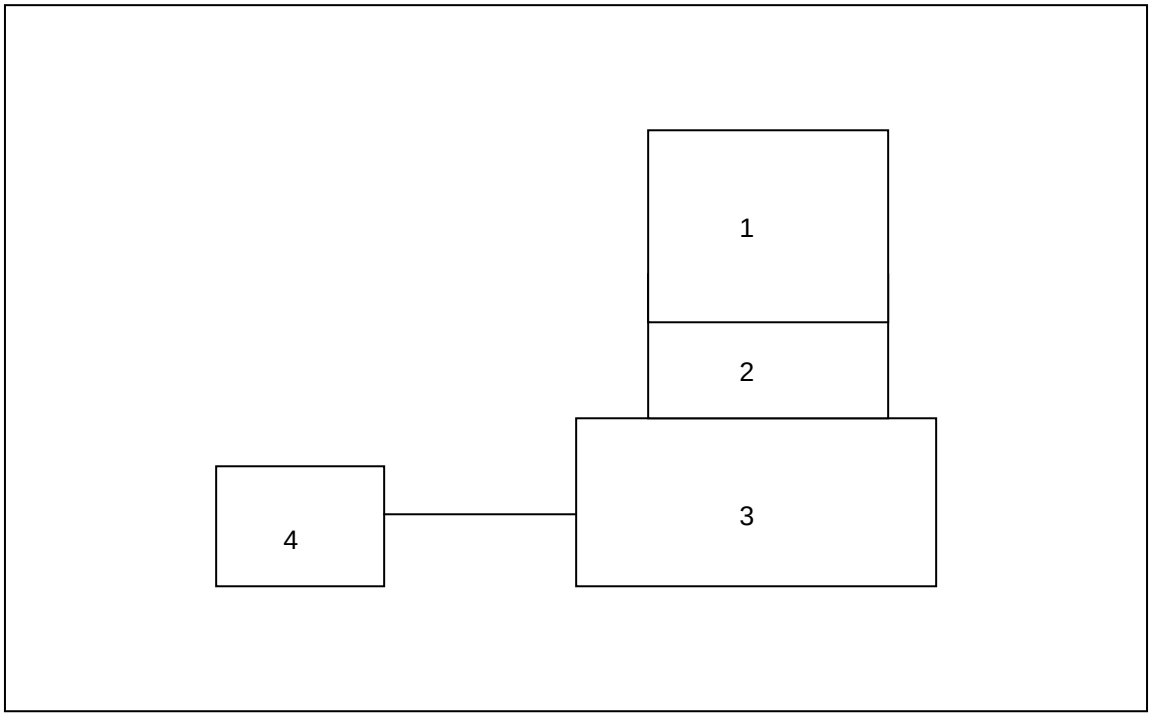

Diagram 6.1: EUT with Charger

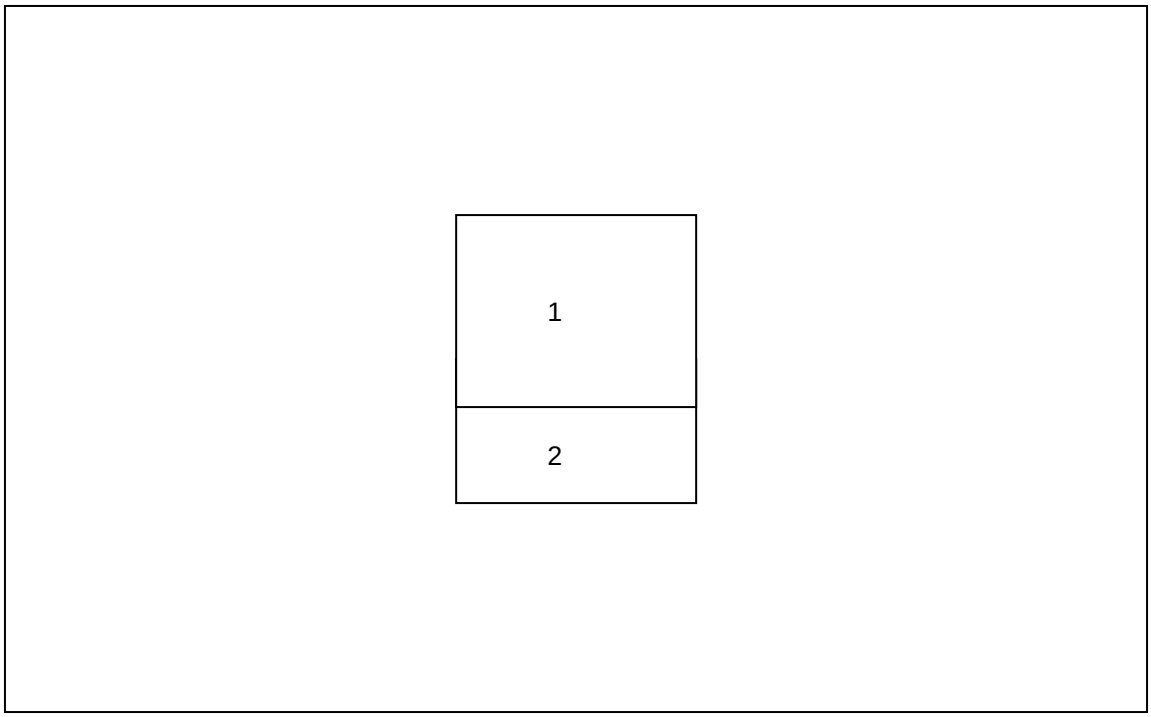

Diagram 6.2: EUT Standalone

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 APX 6000 (H98KGH9PW7AN) uses a 2.5 dBi PIFA for the Bluetooth transceiver.

7.2 Power Line Conducted Emissions – FCC: Section 15.207 IC: RSS-Gen 7.2.2

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 are shown below in and Table 7.2.2-1 and Figure 7.2.2-1.

Table 7.2.2-1: Conducted EMI Results

Line Tested	Frequency	Recorded Value (dBµV)		Correction Factor (dB)	Corrected Value (dBµV)		Limits (dBµV)		Margin (dB)	
	kHz	Peak	Avg		Peak	Avg	QP	Avg	QP	Avg
Phase	180.3	45.82	34.44	0.31	46.13	34.75	64.47	54.47	18.34	19.72
Phase	245.3	42.37	32.20	0.20	42.57	32.40	61.91	51.91	19.34	19.51
Phase	3427	36.87	31.33	0.39	37.26	31.72	56.00	46.00	18.74	14.28
Phase	5637	41.36	36.52	0.61	41.97	37.13	60.00	50.00	18.03	12.87
Phase	7229	42.26	37.20	0.73	42.99	37.93	60.00	50.00	17.01	12.07
Phase	9804	41.33	32.92	0.76	42.09	33.68	60.00	50.00	17.91	16.32
Phase	11085	40.20	33.99	0.77	40.97	34.76	60.00	50.00	19.03	15.24
Neutral	154.11	46.30	23.58	0.27	46.57	23.85	65.78	55.78	19.21	31.93
Neutral	186.6	47.55	39.77	0.25	47.80	40.02	64.19	54.19	16.39	14.17
Neutral	547.5	33.71	30.25	0.21	33.92	30.46	56.00	46.00	22.08	15.54
Neutral	5830	57.75	31.53	0.63	58.38	32.16	60.00	50.00	1.62	17.84
Neutral	7720	38.81	32.68	0.74	39.55	33.42	60.00	50.00	20.45	16.58
Neutral	9830	40.03	35.22	0.76	40.79	35.98	60.00	50.00	19.21	14.02
Neutral	11360	38.94	33.57	0.78	39.72	34.35	60.00	50.00	20.28	15.65

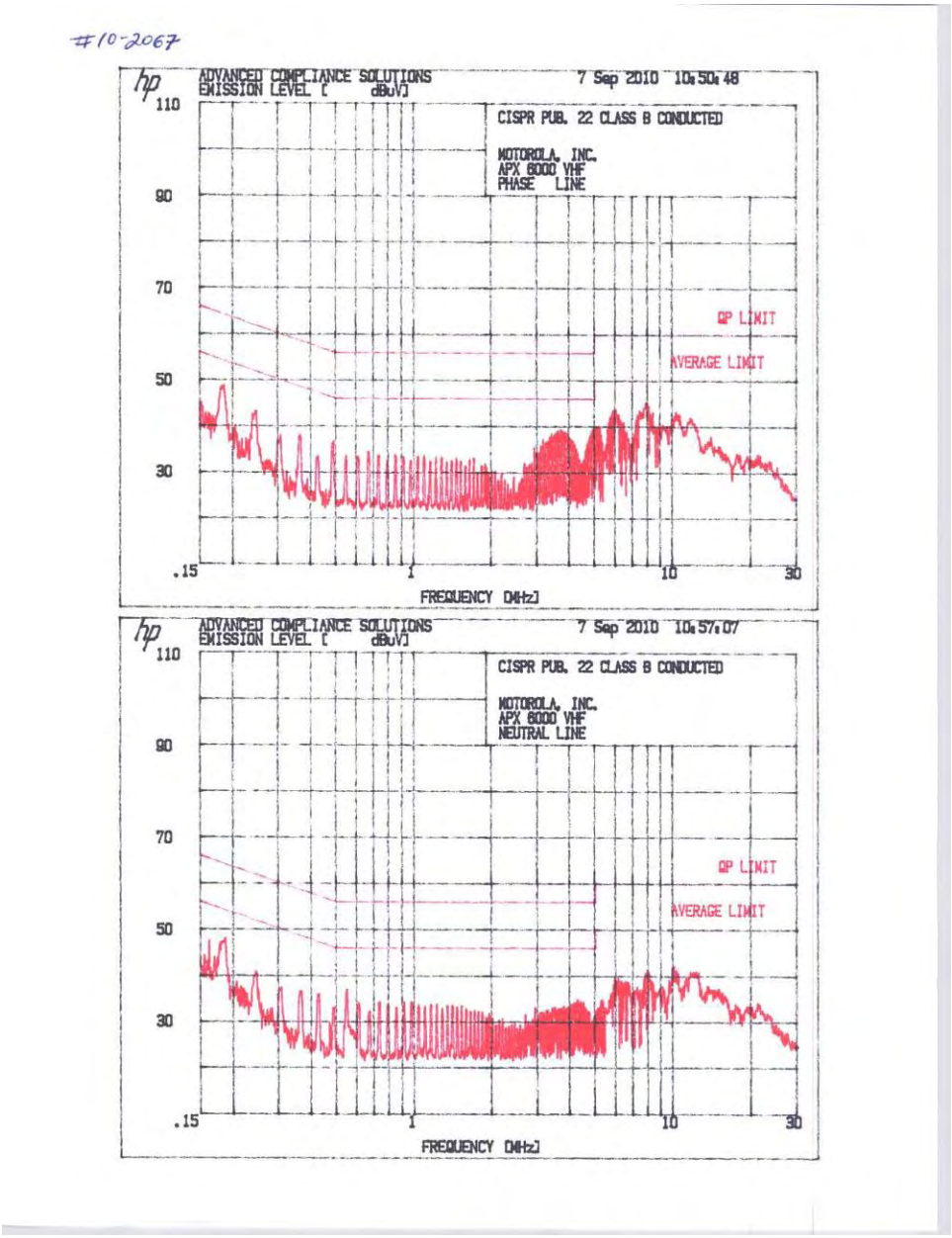

Figure 7.2.2-1: Conducted EMI Results

7.3 Radiated Emissions – FCC: Section 15.109(Unintentional Radiation) IC: RSS-210 2.6

7.3.1 Measurement Procedure

Radiated emissions tests were performed over the frequency range of 30 MHz to 12.5 GHz. Measurements of the radiated field strength were made at a distance of 3m from the boundary of the equipment under test (EUT) and the receiving antenna. The antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. Radiated measurements above 30 MHz and below 1 GHz were made with the Spectrum Analyzer's resolution bandwidth set to 120 kHz using a Quasi-peak detector. Above 1 GHz, peak and average measurements are taken with the RBW and VBW were set to 1MHz and 3MHz respectively.

7.3.2 Measurement Results

Results of the test are given in Table 7.3-1 below:

Table 7.3-1: Radiated Emissions Tabulated Data

Frequency (MHz)	Measured Level (dBuV)		Antenna Polarization	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	
	Pk	Qpk/Av	(H/V)	(dB)	Pk	Qpk/Av	Qpk/Av	Pk	Qpk/Av
84.40	34.60	---	V	19.30	15.30	---	40.00	24.70	---
132.70	35.40	---	V	14.04	21.36	---	43.50	22.14	---

* Note: All emissions above 132.7 MHz were attenuated below the permissible limit.

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

7.4.1 Measurement Procedure (Conducted Method)

The RF output port of the EUT was connected to the input of the spectrum analyzer through a 20 dB attenuator. The RBW and VBW of the SA were both set to 3 MHz, which is greater than the measured bandwidth.

7.4.2 Measurement Results

Results are shown below in Tables 7.4.2-1 and 7.4.2-2 below:

Table 7.4.2-1: RF Output Power (GFSK)

Frequency (MHz)	Reading (dBm)	Insertion Loss (dB)	Power (dBm)	Power (mW)	Limit (dBm)	Margin to Limit (dB)
2402.0	-13.30	21.20	7.90	6.17	**30**	22.10
2441.0	-13.50	21.22	7.72	5.91	**30**	22.28
2480.0	-14.20	21.23	7.03	5.05	**30**	22.97

Table 7.4.2-2: RF Output Power (Π/4-DQPSK)

Frequency (MHz)	Reading (dBm)	Insertion Loss (dB)	Power (dBm)	Power (mW)	Limit (dBm)	Margin to Limit (dB)
2402.0	-13.40	21.20	7.80	6.03	**30**	22.20
2441.0	-13.60	21.22	7.62	5.78	**30**	22.38
2480.0	-14.40	21.23	6.83	4.82	**30**	23.17

7.5 Channel Usage Requirements

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

7.5.1.1 Measurement Procedure

The RF output port of the EUT was connected to the input of the spectrum analyzer through a 20 dB attenuator. 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.

7.5.1.2 Measurement Results

Results are shown below in Figure 7.5.1.2-1

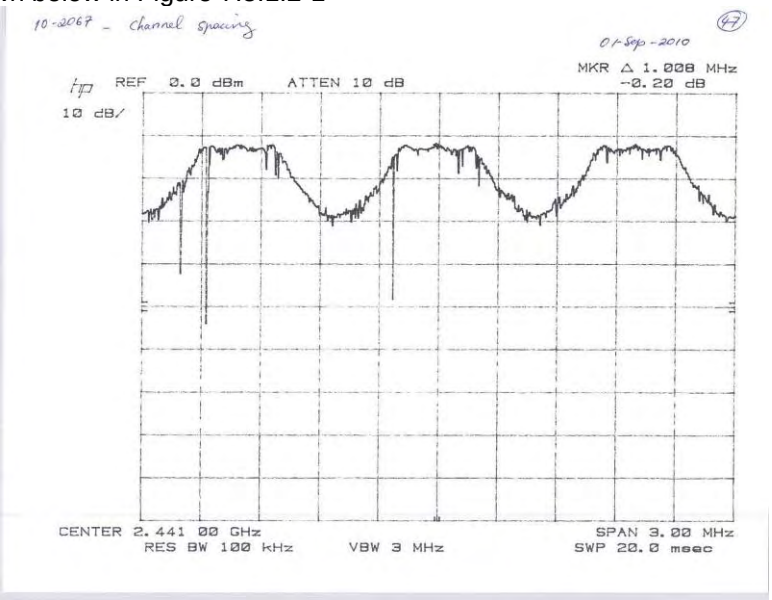

Figure 7.5.1.2-1: Carrier Frequency Separation (GFSK)

7.5.2 Number of Hopping Channels – FCC: Section 15.247(a)(1)(i) IC: RSS-210 A8.1(c)

7.5.2.1 Measurement Procedure

The RF output port of the EUT was connected to the input of the spectrum analyzer through a 20 dB attenuator. The span of the spectrum analyzer was set wide enough to capture the number of hopping channels. The RBW was set to ≥ 1% of the span with peak detector max hold function.

7.5.2.2 Measurement Results

Results are shown below in Figure 7.5.2.2-1

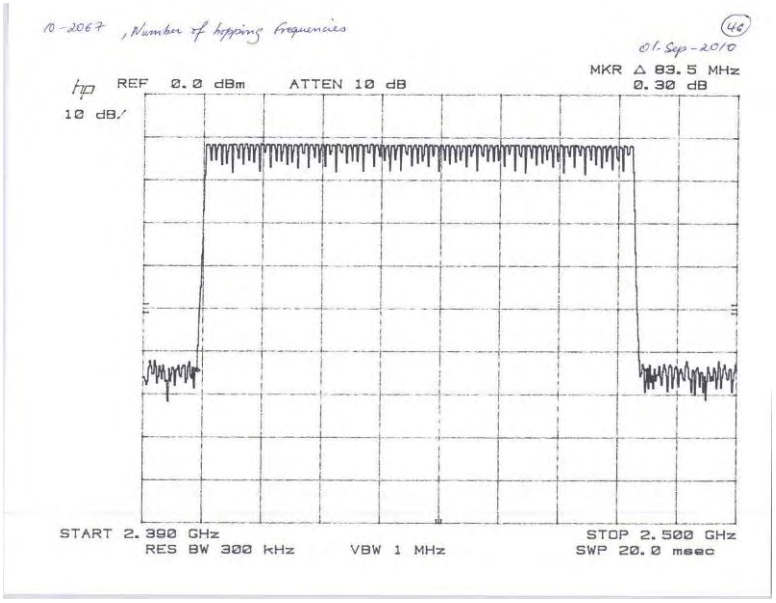

Figure 7.5.2.2-1: Number of Hopping Channels

7.5.3 Channel Dwell Time – FCC: Section 15.247(a)(1)(i) IC: RSS-210 A8.1(c)

7.5.3.1 Measurement Procedure

The RF output port of the EUT was connected to the input of the spectrum analyzer through a 20 dB attenuator. 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.

7.5.3.2 Measurement Results

Results are shown below in Figures 7.5.3.2-1 to 7.5.3.2-3 and Table 7.5.3.2-1.

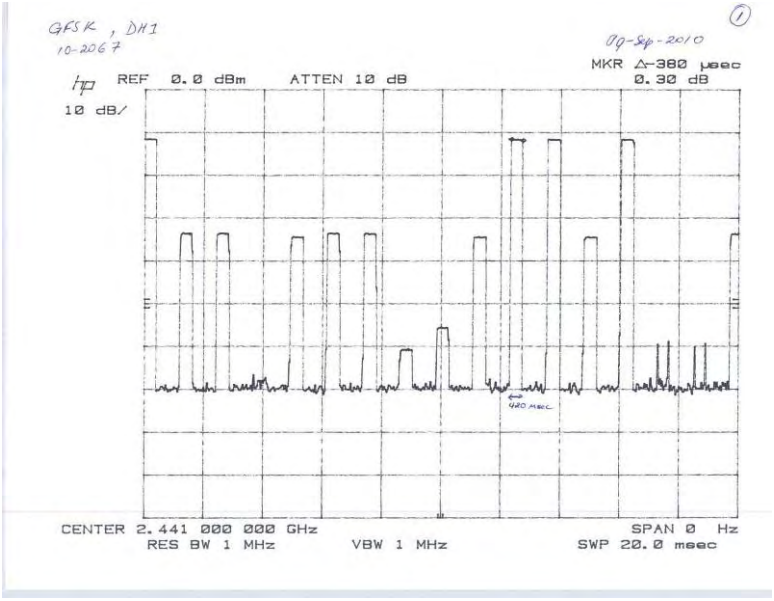

Figure 7.5.3.2-1: Channel Dwell Time (DH1)

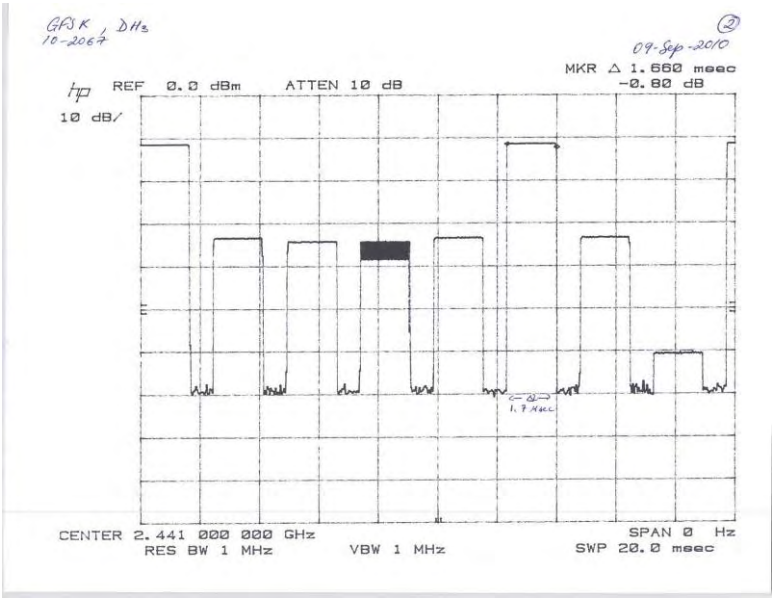

Figure 7.5.3.2-2: Channel Dwell Time (DH3)

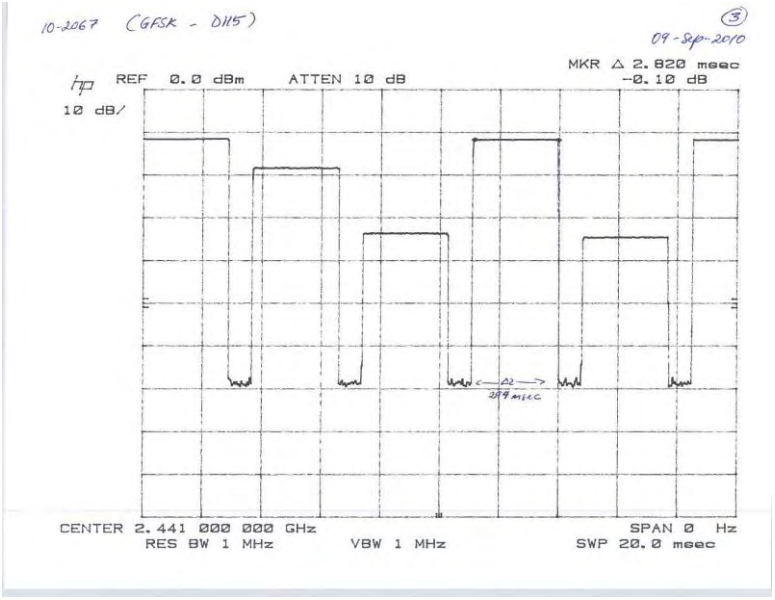

Figure 7.5.3.2-3: Channel Dwell Time (DH5)

Table 7.5.3.2-1: Computed Dwell Times

Packet Format	Dwell Times Per Sec.	Dwell Times per Channel per Sec.	Dwell Times on a 31.6 ms Cycle	Measured Dwell Times (ms)	Dwell Times on a 31.6 ms Cycle
DH1	800.00	10.13	320.00	0.38	121.60
DH3	400.00	5.06	160.00	1.66	265.60
DH5	266.70	3.38	106.68	2.82	300.84

7.5.4 20dB / 99% Bandwidth - FCC: Section 15.247(a)(1)(i) IC: RSS-210 A8.1(c)

7.5.4.1 Measurement Procedure

The RF output port of the EUT was connected to the input of the spectrum analyzer through a 20 dB attenuator. 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 and approximately 20dB below the peak level. The RBW was to 1% to 3% of the approximate emission width. The trace was set to max hold with a peak detector active. The 99% bandwidth was measured 26 dB down from the peak power value.

7.5.4.2 Measurement Results

Results are shown below in Tables 7.5.4.2-1 and 7.5.4.2-2 and Figures 7.5.4.2-1 through 7.5.4.2-12 for both types of modulation formats.

Table 7.5.4.2-1: 20dB / 99% Bandwidth (GFSK)

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
2402	954	1065
2441	969	1101
2480	957	1110

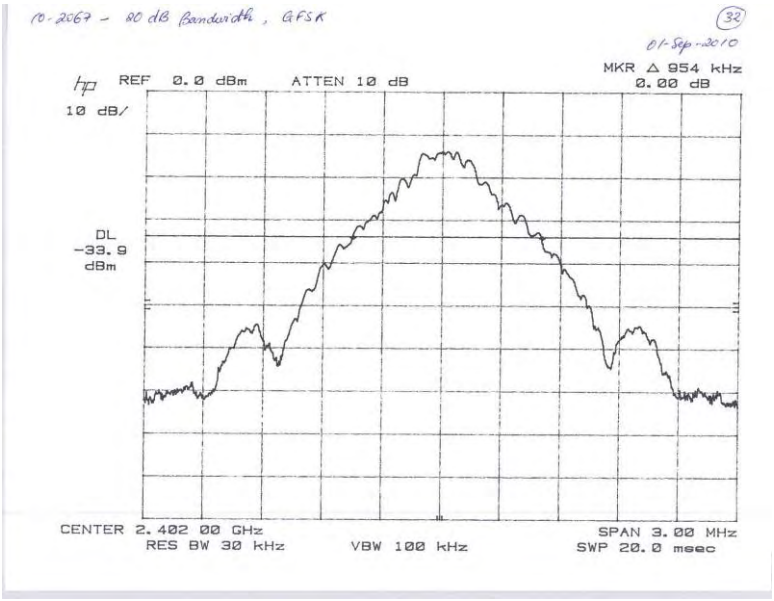

Figure 7.5.4.2-1: 20dB BW Low Channel (GFSK)

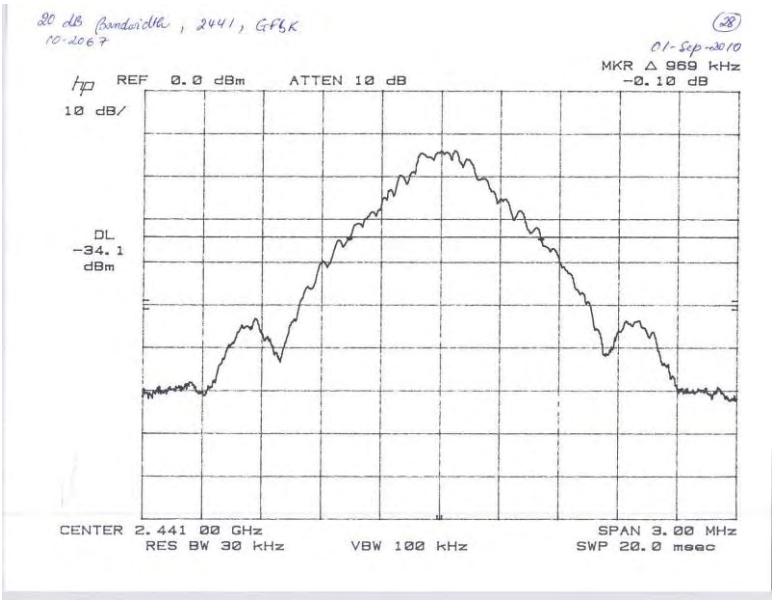

Figure 7.5.4.2-2: 20dB BW Middle Channel (GFSK)

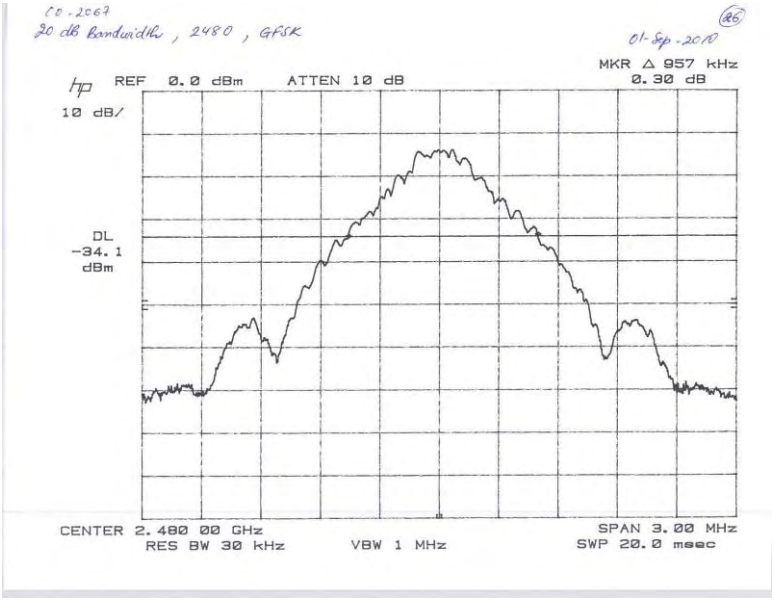

Figure 7.5.4.2-3: 20dB BW High Channel (GFSK)

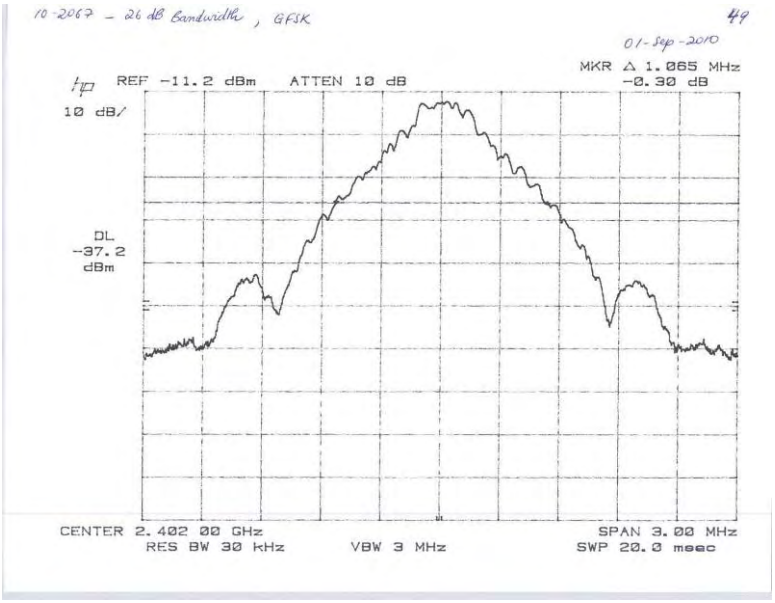

Figure 7.5.4.2-4: 99% OBW Low Channel (GFSK)

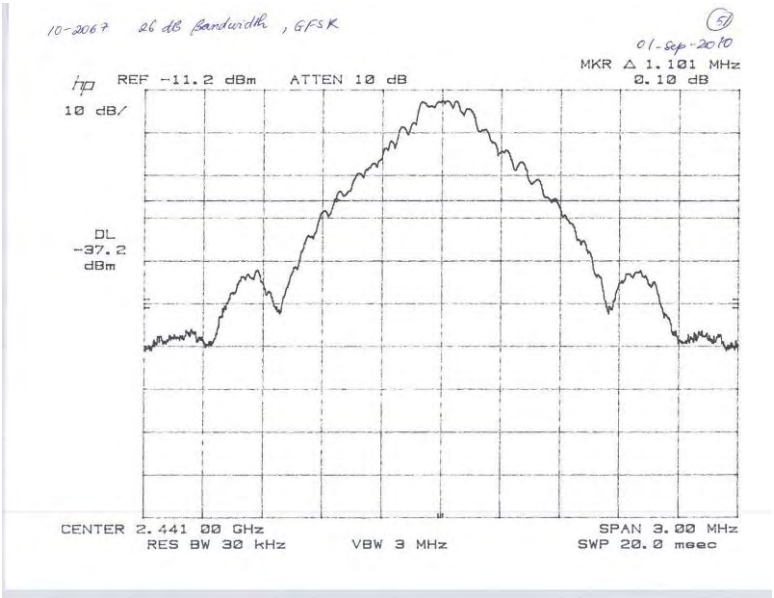

Figure 7.5.4.2-5: 99% OBW Middle Channel (GFSK)

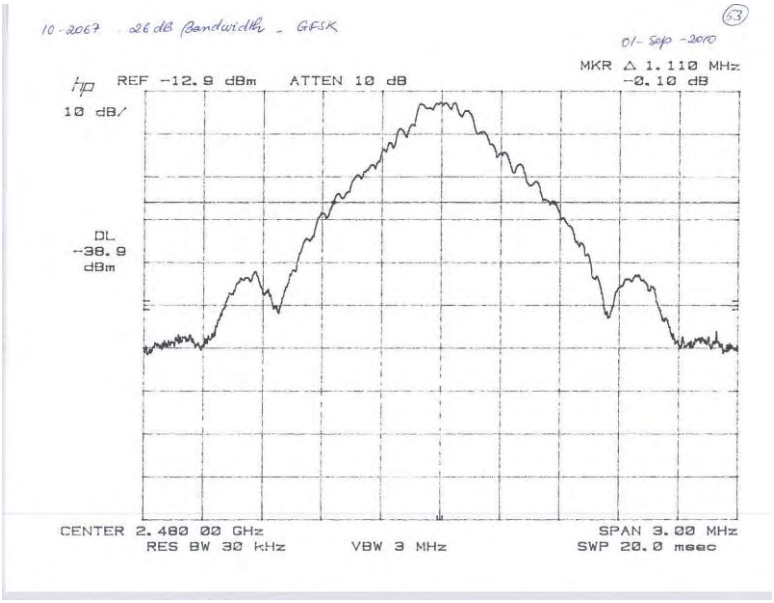

Figure 7.5.4.2-6: 99% OBW High Channel (GFSK)

Table 7.5.4.2-2: 20dB / 99% Bandwidth (Π/4-DQPSK)

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
2402	1389	1389
2441	1389	1368
2480	1392	1368

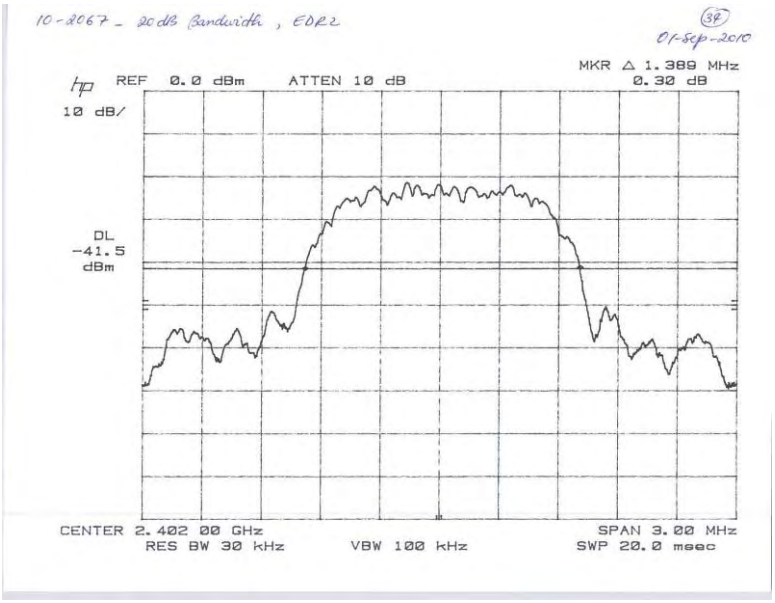

Figure 7.5.4.2-7: 20dB BW Low Channel (Π/4-DQPSK)

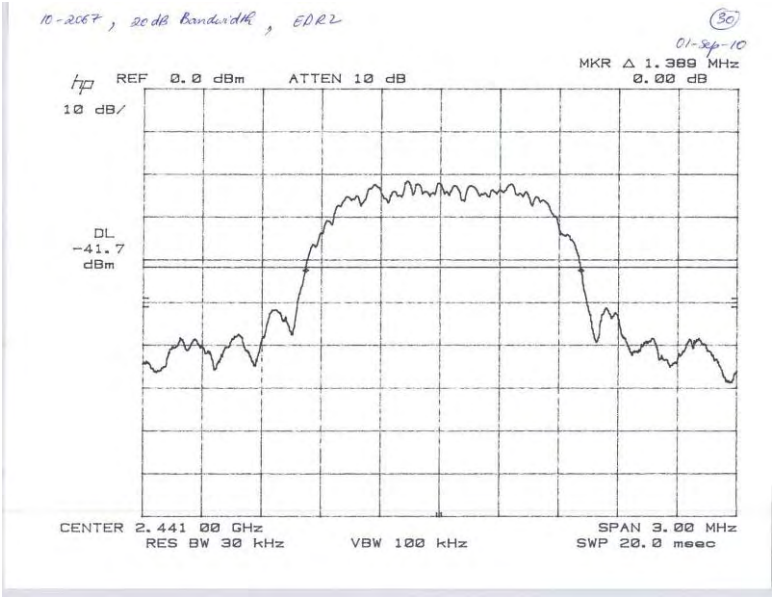

Figure 7.5.4.2-8: 20dB BW Middle Channel (Π/4-DQPSK)

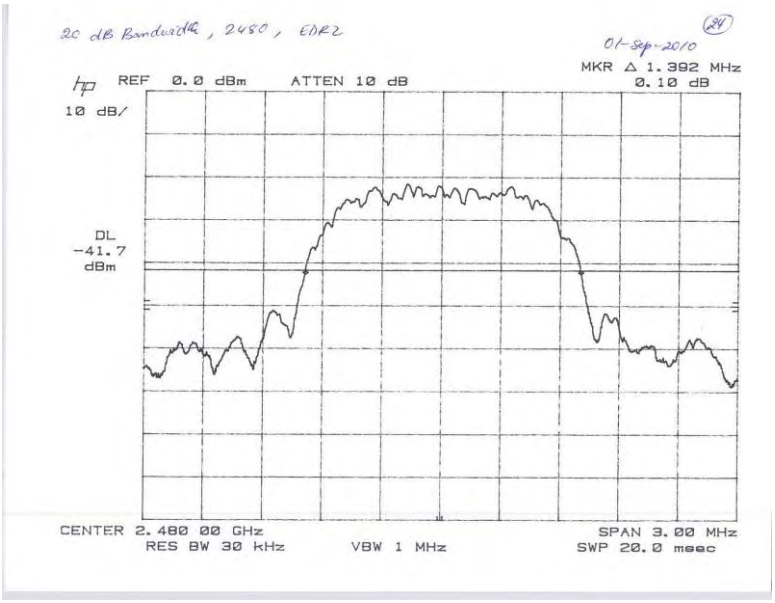

Figure 7.5.4.2-9: 20dB BW High Channel (Π/4-DQPSK)

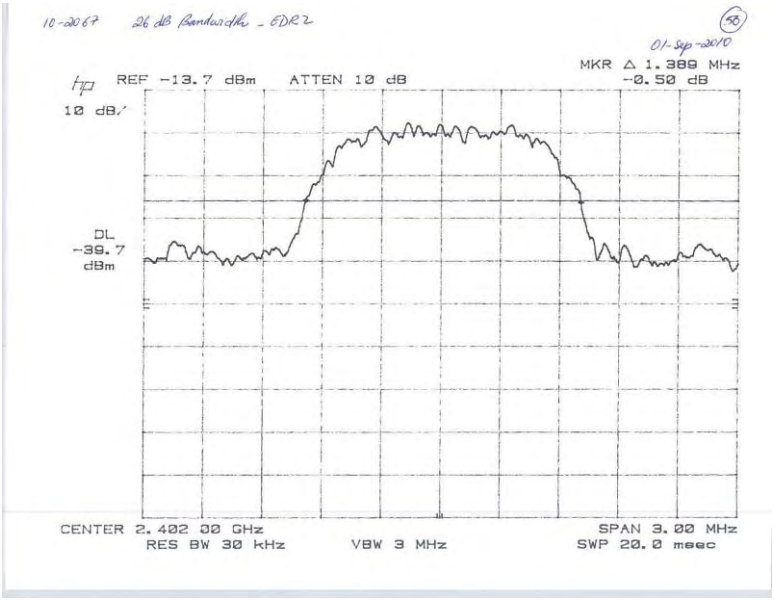

Figure 7.5.4.2-10: 99% OBW Low Channel (Π/4-DQPSK)

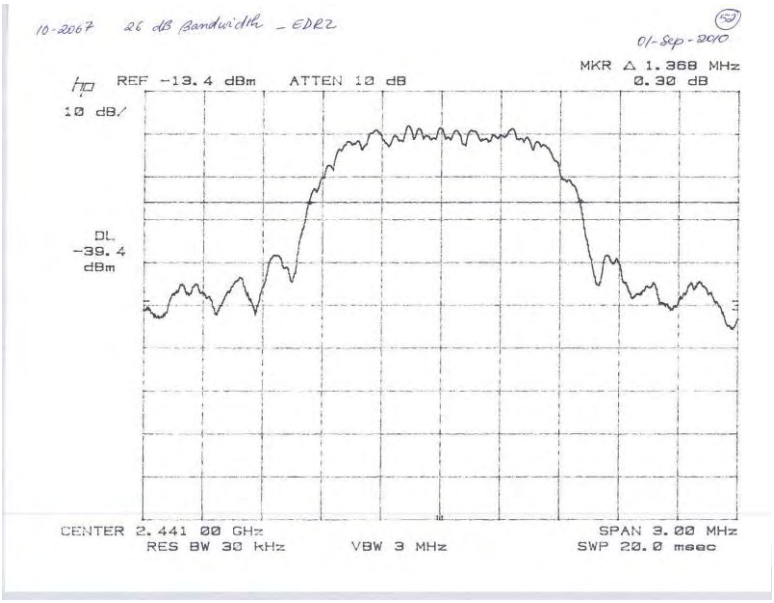

Figure 7.5.4.2-11: 99% OBW Middle Channel (Π/4-DQPSK)

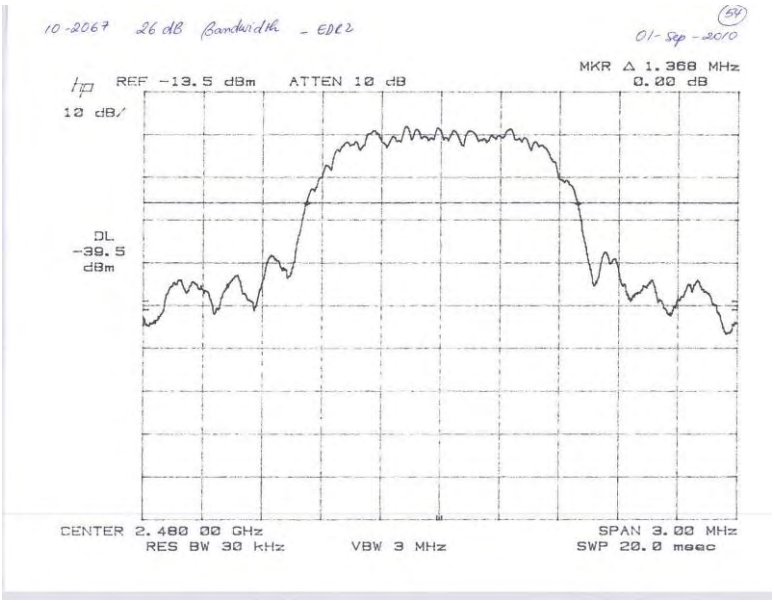

Figure 7.5.4.2-12: 99% OBW High Channel (Π/4-DQPSK)

7.6 Band-Edge Compliance and Spurious Emissions-FCC 15.247d IC:RSS-210 2.6, A8.5

7.6.1 Band-Edge Emissions Compliance

7.6.1.1 Measurement Procedure

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, and the VBW was set to 1000 kHz.

The emissions were maximized by rotating the EUT through 360° and the receive antenna height was varied from 1m to 4m. The emissions at the band edge were measured using the Marker-Delta Method.

7.6.1.2 Measurement Results

Results are shown in the tables 7.6.1.2-1 to 7.6.1.2-4 and figures 7.6.1.2-1 to 7.6.1.2-8 below.

Table 7.6.1.2-1: Marker-Delta Method Results (GFSK)

Frequency (MHz)	Antenna Polarization (H/V)	Reading (dBµV)	Marker-Delta (dB)	Band-Edge Level (dBµV)
2402	H	100.31	58.9	41.41
2402	V	105.52	57.9	47.62
2480	H	98.3	61.1	37.2
2480	V	104.5	63.1	41.4

Table 7.6.1.2-2: Restricted Band Radiated Band-Edge Measurement Results

Measurement Distance: 3 Meters										
Modulation Method.	Frequency (MHz)	Measured Level (dBuV)		Antenna Polarization	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	
		Pk	Qpk/Av	(H/V)	(dB)	Pk	Qpk/Av	Qpk/Av	Pk	Qpk/Av
GFSK	**2483.50**	37.20	---	H	-5.57	42.77	---	54.00	11.23	---
GFSK	**2483.50**	41.40	---	V	-5.57	46.97	---	54.00	7.03	---

*Notes:

- The emissions below 2390 MHz were attenuated below the noise floor of the measurement equipment.
- The emissions at 2400 MHz do not fall within the restricted bands; compliance is determined by the Marker-Delta Method.
- The peak emissions below the average limits were judged sufficient to show compliance.

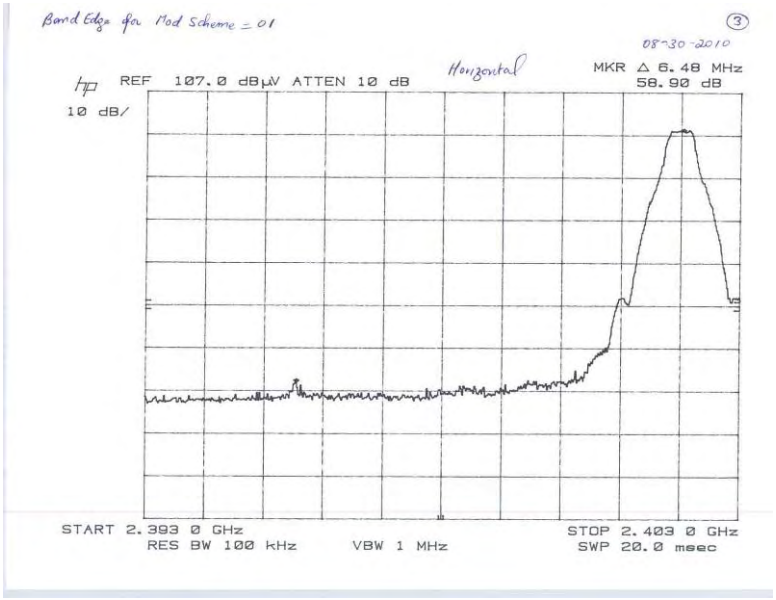

Figure 7.6.1.2-1: Lower Band-edge (Horizontal - GFSK)

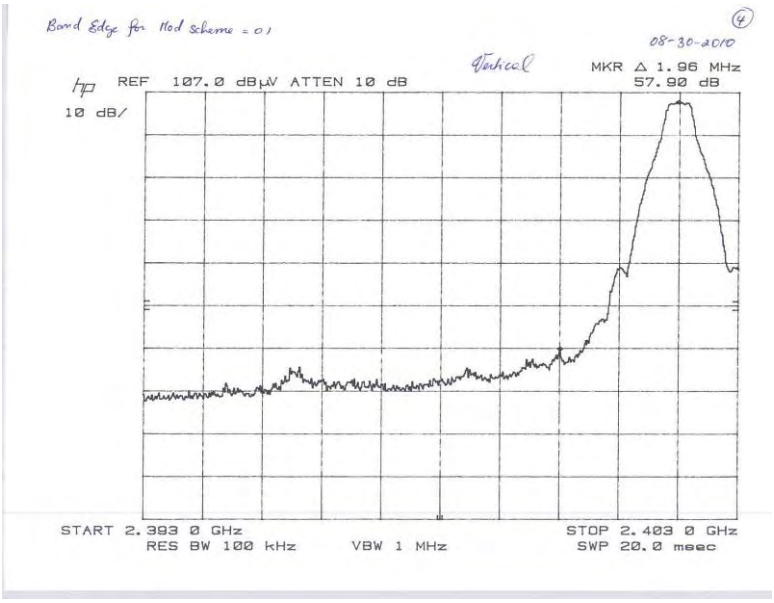

Figure 7.6.1.2-2: Lower Band-edge Vertical - GFSK

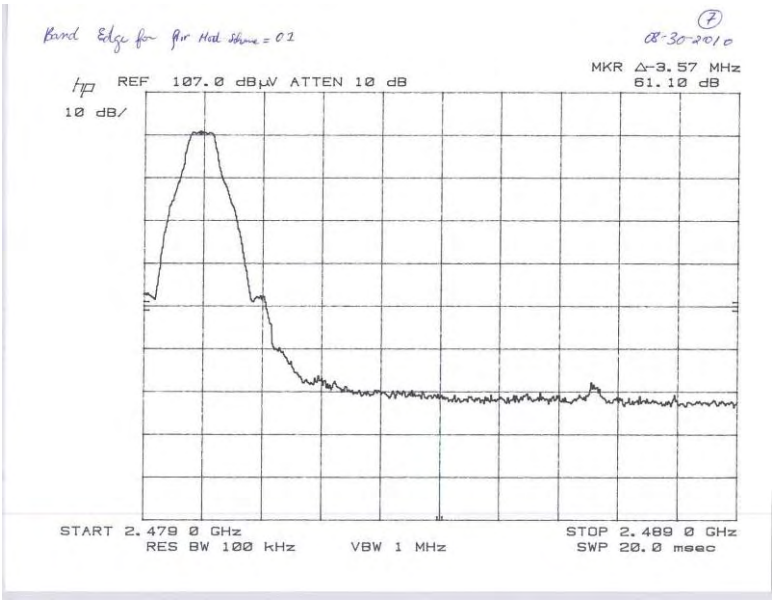

Figure 7.6.1.2-3: Higher Band-edge (Horizontal - GFSK)

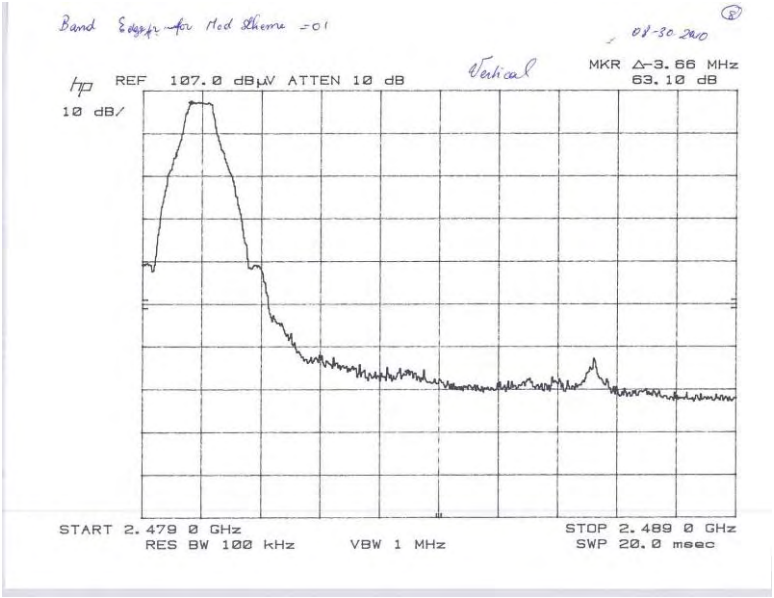

Figure 7.6.1.2-4: Higher Band-edge (Vertical - GFSK)

Table 7.6.1.2-3: Marker-Delta Method Results (Π/4-DQPSK)

Frequency (MHz)	Antenna Polarization (H/V)	Reading (dBµV)	Marker-Delta (dB)	Edge Level (dBµV)
2402	H	98.21	41.8	56.41
2402	V	103.44	42.0	61.44
2480	H	96.6	51.8	44.8
2480	V	103.4	54.9	48.5

Table 7.6.1.2-4: Restricted Band Radiated Band-Edge Measurement Results

Measurement Distance: 3 Meters										
Modulation Method	Frequency (MHz)	Measured Level (dBuV)		Antenna Polarization	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	
		Pk	Qpk/Av	(H/V)	(dB)	Pk	Qpk/Av	Qpk/Av	Pk	Qpk/Av
Π/4-DQPSK	**2483.50**	44.80	38.19	H	-5.57	50.37	43.76	54.00	3.63	10.24
Π/4-DQPSK	**2483.50**	48.50	43.87	V	-5.57	54.07	49.44	54.00	-0.07	4.56

*Notes:

- The emissions below 2390 MHz were attenuated below the noise floor of the measurement equipment.
- The emissions at 2400 MHz do not fall within the restricted bands; compliance is determined by the Marker-Delta Method.
- The emissions at 2483.5 MHz meet the Peak Limits of 74 dBµV/m

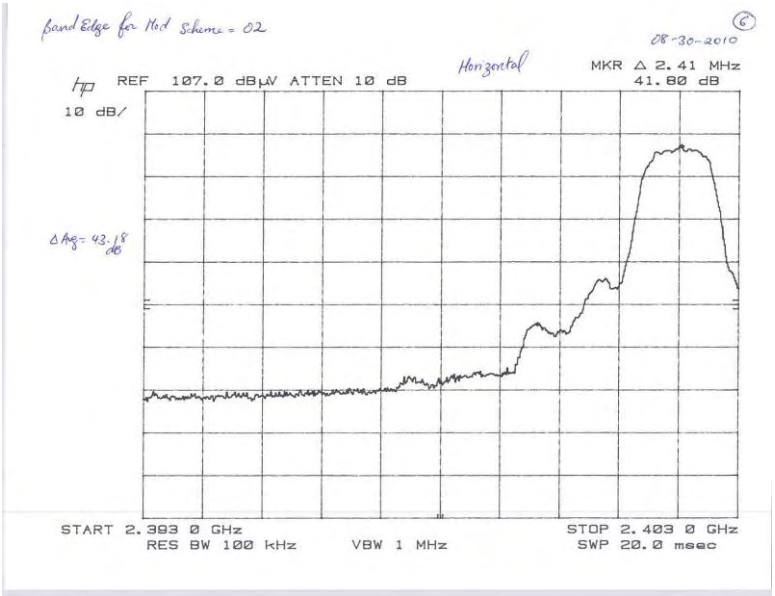

Figure 7.6.1.2-5: Lower Band-edge (Horizontal – Π/4-DQPSK)

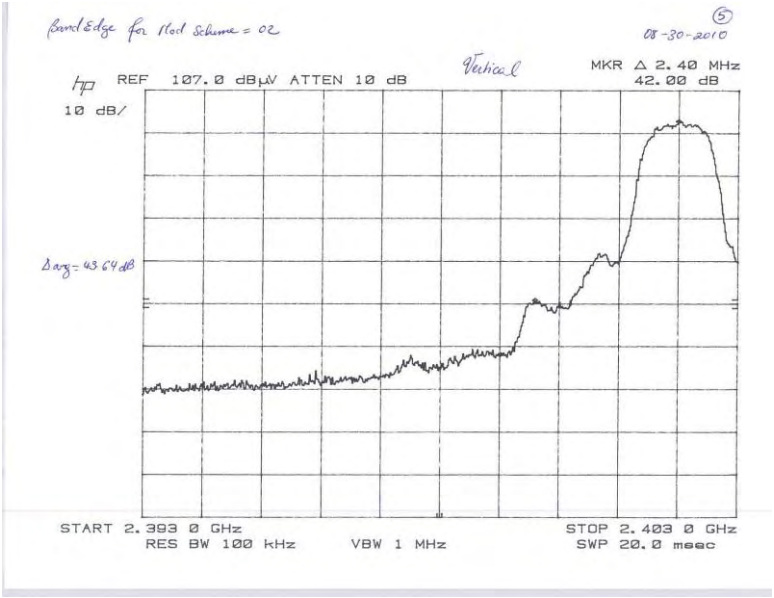

Figure 7.6.1.2-6: Lower Band-edge (Vertical – Π/4-DQPSK)

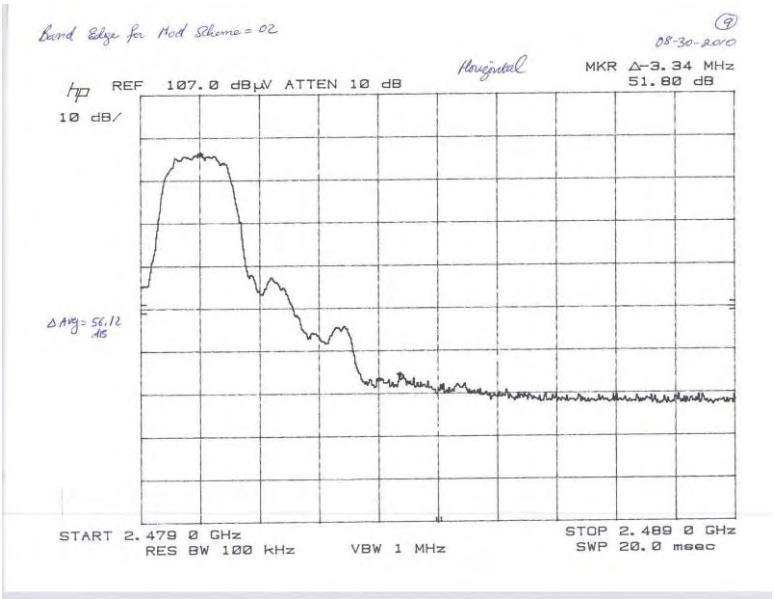

Figure 7.6.1.2-7: Higher Band-edge (Horizontal – Π/4-DQPSK)

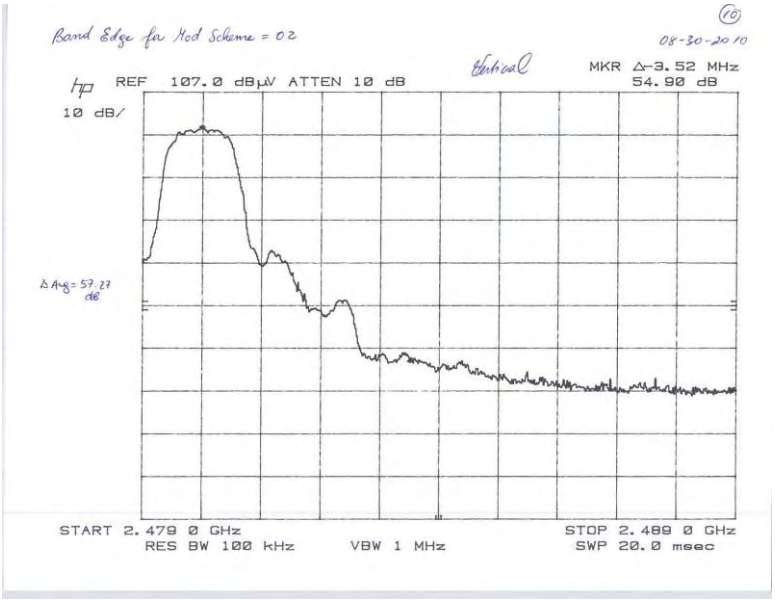

Figure 7.6.1.2-8: Higher Band-edge (Vertical – Π/4-DQPSK)

7.6.2 RF Conducted Spurious Emissions

7.6.2.1 Measurement Procedure

The RF output port of the EUT was connected to the input of the spectrum analyzer through a 20 dB attenuator for frequencies below 22 GHz and using an HP 11971K Mixer above 22 GHz. The EUT was investigated for conducted spurious emissions from 9 kHz to 25 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.

7.6.2.2 Measurement Results

Results are shown below in Tables 7.6.2.2-1 to 7.6.2.2-2 and Figures 7.6.2.2-1 to 7.6.2.2-12. The Figures are provided up to 22 GHz because the measurements above that frequency were performed using the mm menu of the SA and an external Hewlett Packard 11971K Mixer and the signal identification function of the SA.

Table 7.6.2.2-1: Conducted Spurious Emissions (GFSK)

Channel	Frequency (MHz)	Reading (dBm)	Insertion Loss (dB)	Spurious Level (dBm)	Limit (dBm)	Margin to Limit (dB)
Low	4804.00	-64.70	22.45	-42.25	-12.10	30.15
	14412.00	-73.20	24.27	-48.93	-12.10	36.83
	19216.00	-67.70	24.32	-43.38	-12.10	31.29
Middle	4882.00	-67.90	22.54	-45.36	-12.28	33.08
	19528.00	-67.90	24.21	-43.69	-12.28	31.41
High	4960.00	-68.70	22.65	-46.05	-12.97	33.08
	12400.00	-76.20	23.65	-52.55	-12.97	39.58
	19840.00	-68.60	24.29	-44.31	-12.97	31.34

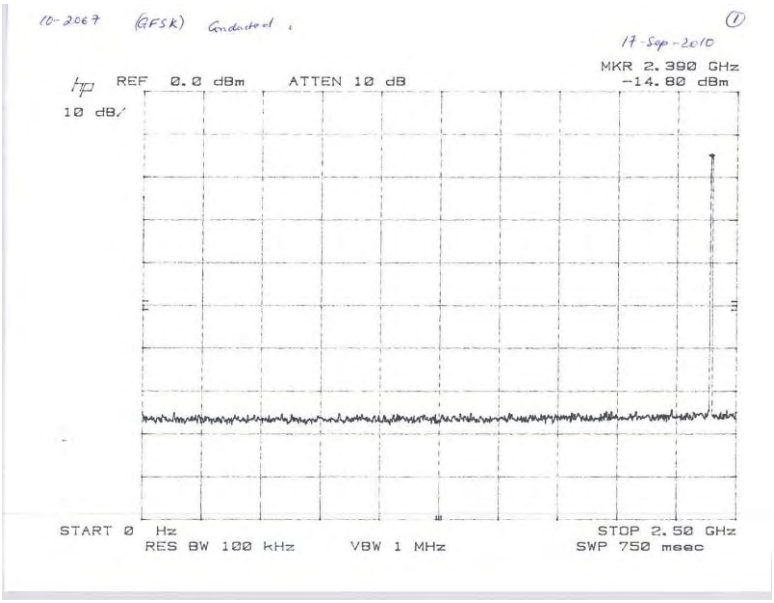

Figure 7.6.2.2-1: 0 Hz – 2.5 GHz – Low Channel

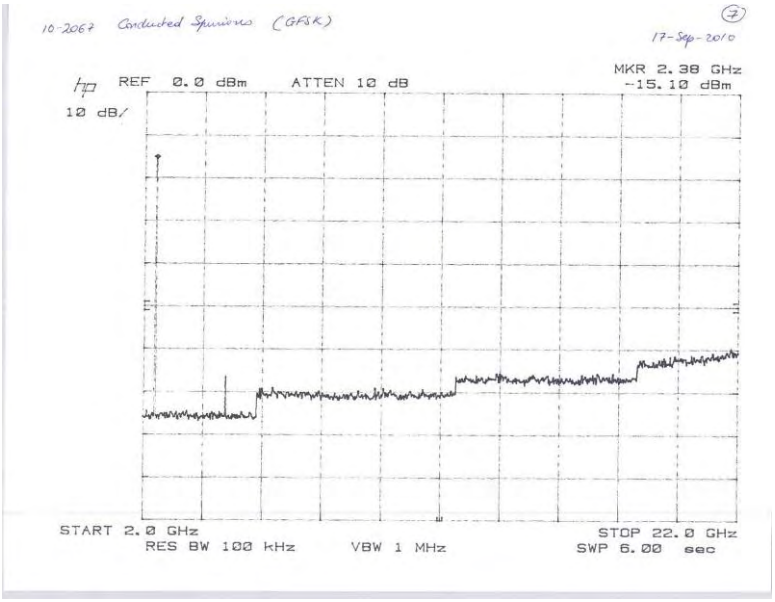

Figure 7.6.2.2-2: 2 GHz – 22 GHz – Low Channel

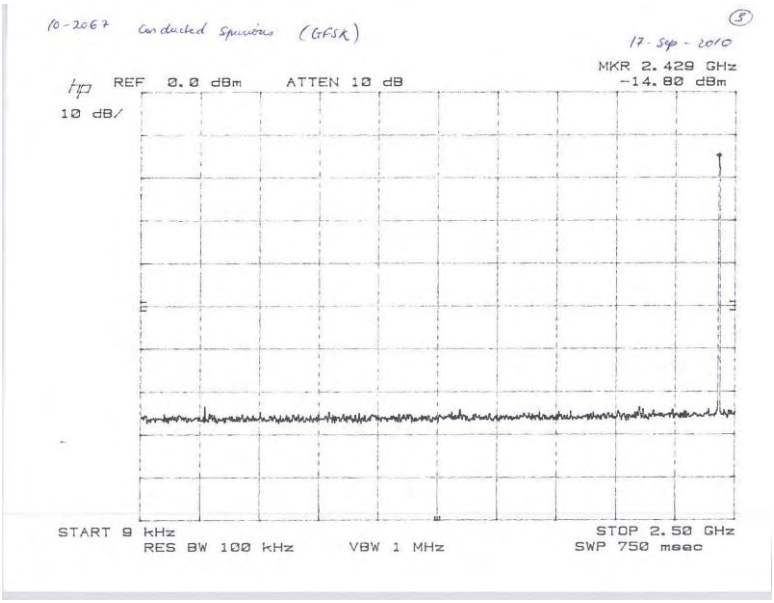

Figure 7.6.2.2-3: 9 kHz – 2.5 GHz –Mid Channel

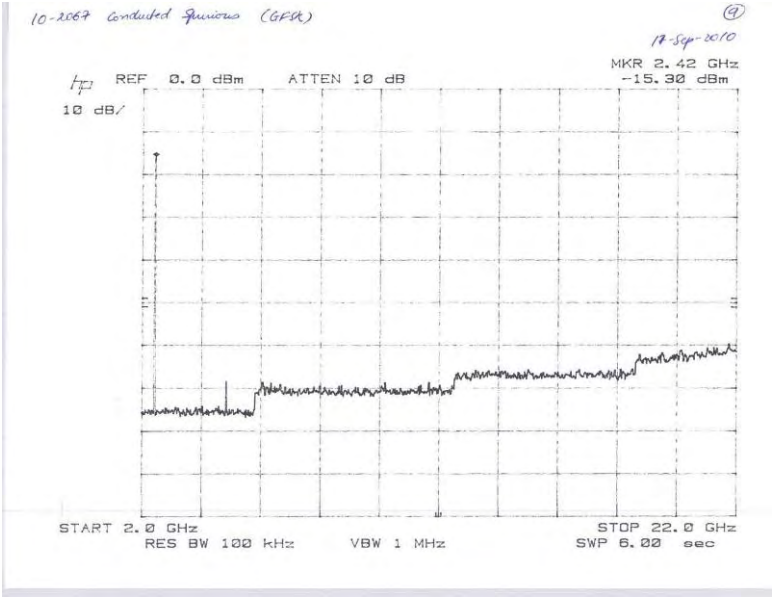

Figure 7.6.2.2-4: 2 GHz – 22 GHz – Mid Channel

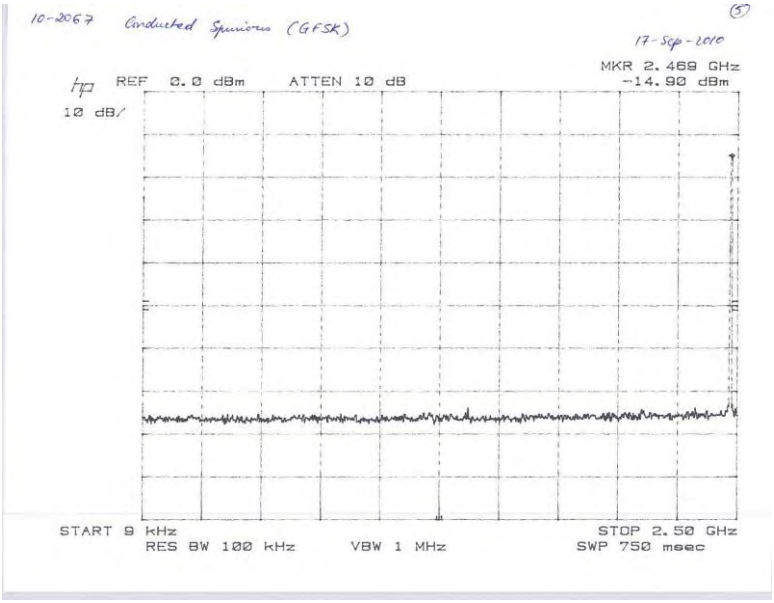

Figure 7.6.2.2-5: 9 kHz – 2.5 GHz – High Channel

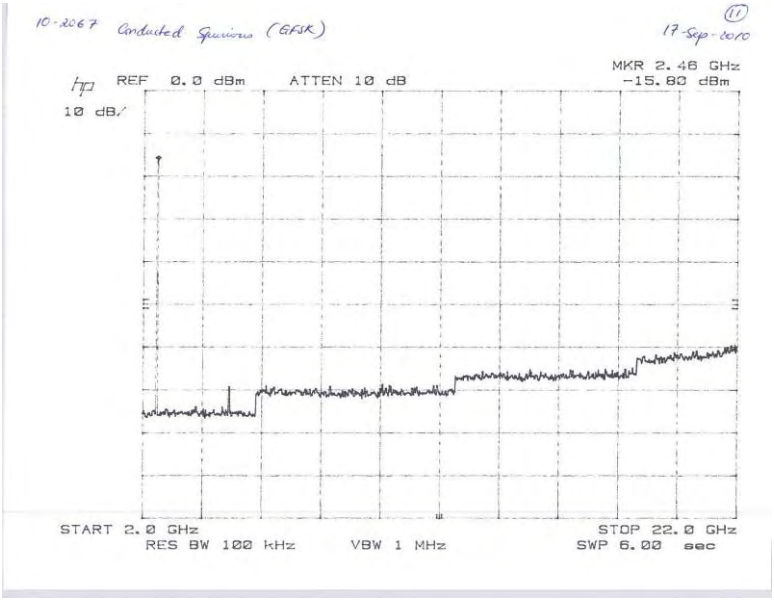

Figure 7.6.2.2-6: 2 GHz – 22 GHz –High Channel

Table 7.6.2.2-2: Conducted Spurious Emissions (Π/4-DQPSK)

Channel	Frequency (MHz)	Reading (dBm)	Insertion Loss (dB)	Spurious Level (dBm)	Limit (dBm)	Margin to Limit (dB)
Low						
Middle	All spurious emissions were attenuated below the noise floor of the measurement equipment.					
High						

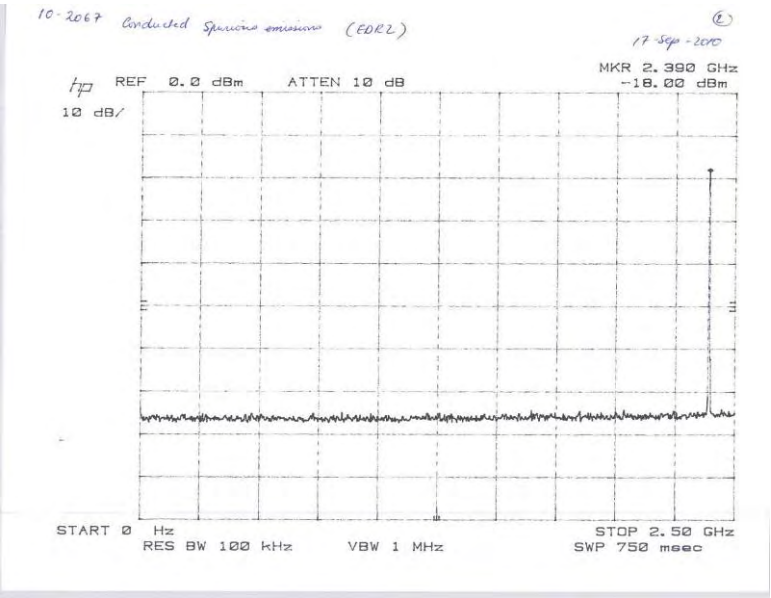

Figure 7.6.2.2-7: 0 Hz – 2.5 GHz – Low Channel

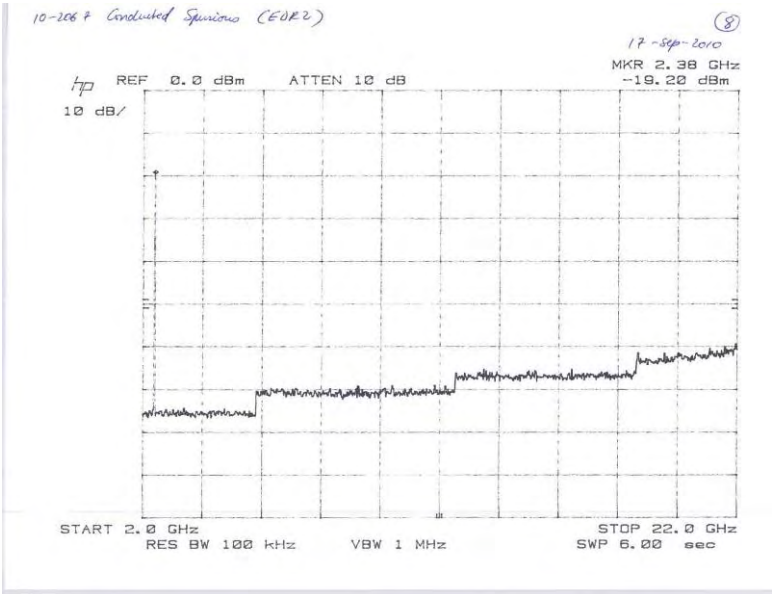

Figure 7.6.2.2-8: 2 GHz – 22 GHz – Low Channel

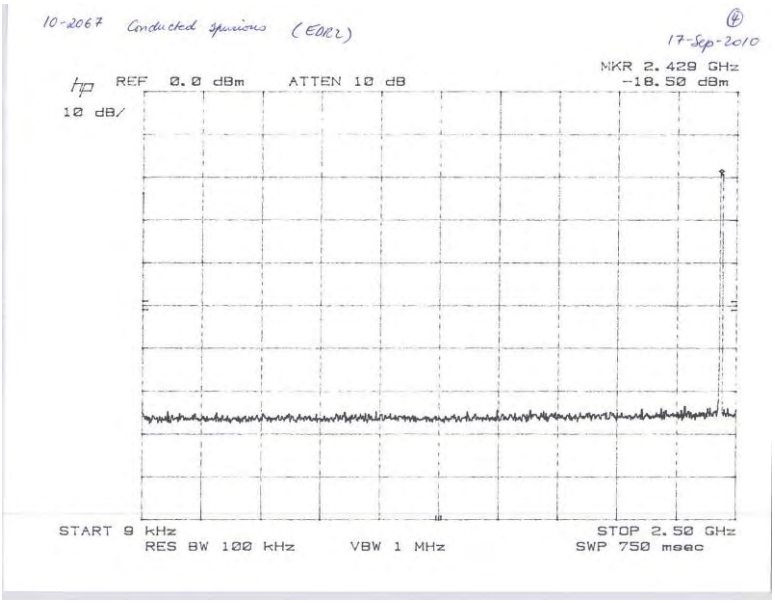

Figure 7.6.2.2-9: 9 kHz – 2.5 GHz –Mid Channel

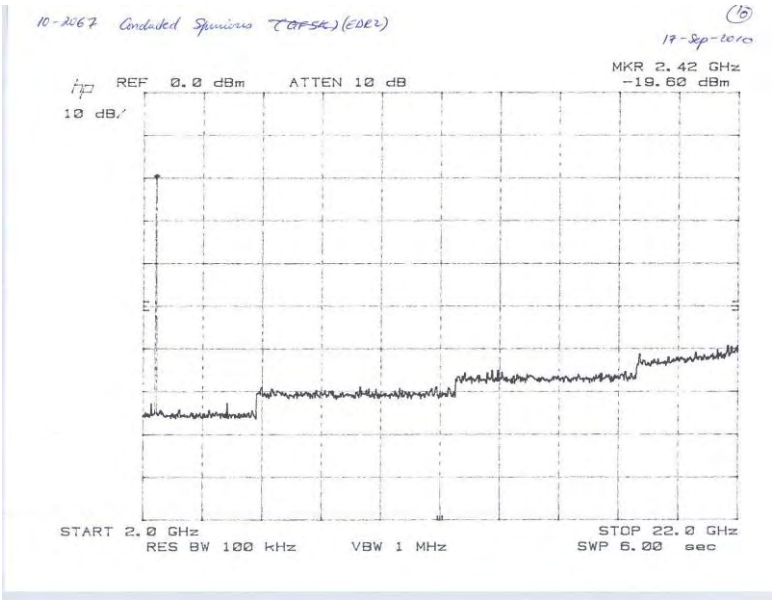

Figure 7.6.2.2-10: 2 GHz – 22 GHz – Mid Channel

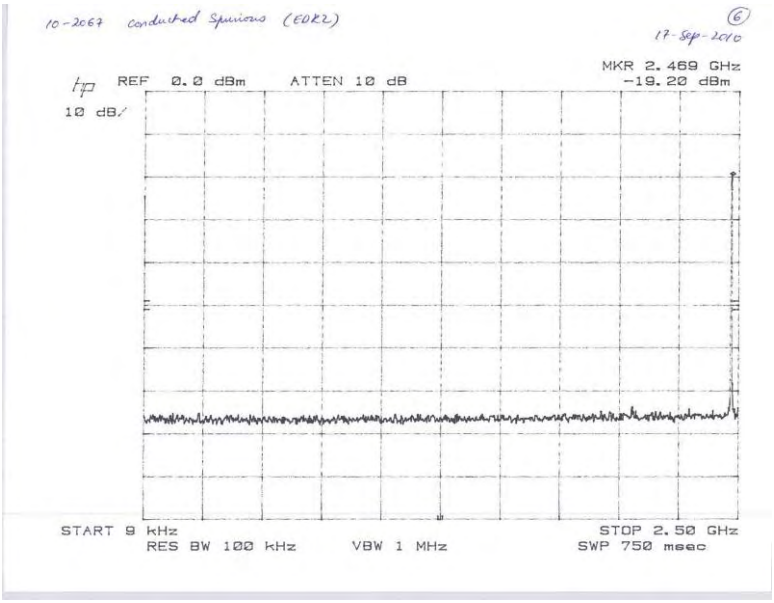

Figure 7.6.2.2-11: 9 kHz – 2.5 GHz – High Channel

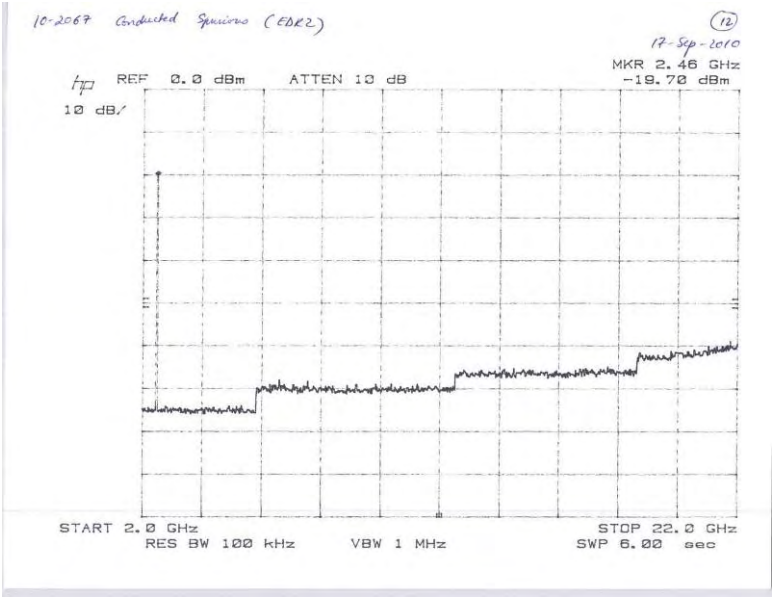

Figure 7.6.2.2-12: 2 GHz – 22 GHz –High Channel

7.6.3 Radiated Spurious Emissions - FCC Section 15.205 IC: RSS-210 2.6

7.6.3.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 30MHz to 25 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 1000MHz, peak and average measurements made with RBW and VBW of 1 MHz and 3MHz respectively.

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

7.6.3.2 Measurement Results

Radiated spurious emissions, both harmonics and intermodulation products associated with the collocated VHF radio, found in the band of 30MHz to 25 GHz are reported in the Tables 7.6.3.2-1 and 7.6.3.2-2 below.

Table 7.6.3.2-1: Radiated Spurious Emissions Tabulated Data (GFSK)

Measurement Distance: 3 Meters										
Channel	Frequency (MHz)	Measured Level (dBuV)		Antenna Polarization	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	
		Pk	Qpk/Av	(H/V)	(dB)	Pk	Qpk/Av	Qpk/Av	Pk	Qpk/Av
Low	19216.00	51.74	41.29	H	-3.00	54.74	44.29	54.00	-0.74	9.71
	19216.00	56.94	48.28	V	-3.00	59.94	51.28	54.00	-5.94	2.72
Middle	19528.00	51.60	41.57	H	-2.51	54.11	44.08	54.00	-0.11	9.92
	19528.00	55.57	46.28	V	-2.51	58.08	48.79	54.00	-4.08	5.21
High	19840.00	51.14	40.53	H	-2.70	53.84	43.23	54.00	0.16	10.77
	19840.00	54.01	44.63	V	-2.70	56.71	47.33	54.00	-2.71	6.67

* Note: All emissions above 19840 MHz were attenuated below the permissible limit.
All the peak emissions reported above meet the Peak Limit of 74 dBµV/m

Table 7.6.3.2-2: Radiated Spurious Emissions Tabulated Data (Π/4-DQPSK)

Measurement Distance:		3 Meters								
Channel	Frequency (MHz)	Measured Level (dBuV)		Antenna Polarization	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	
		Pk	Qpk/Av	(H/V)	(dB)	Pk	Qpk/Av	Qpk/Av	Pk	Qpk/Av
Low	**19216.00**	53.34	42.15	H	-3.00	56.34	45.15	54.00	-2.34	8.85
	19216.00	55.95	46.13	V	-3.00	58.95	49.13	54.00	-4.95	4.87
Middle	**19528.00**	54.26	43.34	H	-2.51	56.77	45.85	54.00	-2.77	8.15
	19528.00	54.46	44.36	V	-2.51	56.97	46.87	54.00	-2.97	7.13
High	**19840.00**	51.41	40.76	H	-2.70	54.11	43.46	54.00	-0.11	10.54
	19840.00	54.14	43.79	V	-2.70	56.84	46.49	54.00	-2.84	7.51

* Note: All emissions above 19840 MHz were attenuated below the permissible limit.
All the peak emissions reported above meet the Peak Limit of 74 dBµV/m

7.6.3.3 Sample Calculation:

$R_C = R_U + CF_T$

Where:

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

Example Calculation: Peak
Corrected Level: 51.74 dBuV + 3 dB/m = 54.74 dBuV/m
Margin: 74dBuV/m – 54.74 dBuV/m = 19.26 dB

Example Calculation: Average
Corrected Level: 41.29 dBuV+ 3 dB/m - 0= 44.29dBuV/m
Margin: 54dBuV/m – 44.29 dBuV/m = 9.71 dB

8 CONCLUSION

In the opinion of ACS, Inc. the APX 6000 (H98KGH9PW7AN), manufactured by Motorola meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT