



FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

For

Party X

MODEL NUMBER: AR118KA2

FCC ID: 2AFVN-AR118A2XXA

REPORT NUMBER: 4788190840-1

ISSUE DATE: October 20, 2017

Prepared for

**Brookstone Purchasing, INC.
One Innovation Way, Merrimack, NH 03054**

Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
--	10/20/2017	Initial Issue	

Summary of Test Results			
Clause	Test Items	FCC/IC Rules	Test Results
1	20dB Bandwidth	FCC 15.247 (a) (1)	Complied
2	Peak Conducted Output Power	FCC 15.247 (b) (1)	Complied
3	Carrier Hopping Channel Separation	FCC 15.247 (a) (1)	Complied
4	Number of Hopping Frequency	15.247 (a) (1) III	Complied
5	Time of Occupancy (Dwell Time)	15.247 (a) (1) III	Complied
6	Conducted Bandage	FCC 15.247 (d)	Complied
7	Radiated Bandedge and Spurious	FCC 15.247 (d) FCC 15.209 FCC 15.205	Complied
8	Conducted Emission Test For AC Power Port	FCC 15.207	Complied
9	Antenna Requirement	FCC 15.203	Complied

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: Brookstone Purchasing, INC.
Address: One Innovation Way, Merrimack, NH 03054

Manufacturer Information

Company Name: Brookstone Purchasing, INC.
Address: One Innovation Way, Merrimack, NH 03054

EUT Description

Product Name: Party X
Model Name: AR118KA2
Serial Number: N/A
Model Difference: N/A
Date Tested: October 16~20, 2017

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	PASS

Tested By:



Miller Ma
Engineer
Approved By:



Stephen Guo
Laboratory Manager

Checked By:



Shawn Wen
Laboratory Leader

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with DA 00-705, KDB414788 D01 Radiated Test Site v01, ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

Test Location	UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch.
Address	Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China
Accreditation Certificate	UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. The Certificate Registration Number is 4102.01. UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The Designation Number is CN1187. UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. EMC Laboratory has been registered and fully described in a report filed with Industry Canada. The Company Number is 21320.

Note: The test anechoic chamber in UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch had been calibrated and compared to the open field sites.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty
Uncertainty for Conduction emission test	2.90dB
Uncertainty for Radiation Emission test(include Fundamental emission) (9KHz-30MHz)	2.00dB
Uncertainty for Radiation Emission test(include Fundamental emission) (30MHz-1GHz)	4.52dB
Uncertainty for Radiation Emission test (1GHz to 26GHz)(include Fundamental emission)	5.04dB(1-6GHz)
	5.30dB (6GHz-18Gz)
	5.23dB (18GHz-26Gz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

Equipment	Party X		
Model Name	AR118KA2		
Product Description (Bluetooth)	Operation Frequency	2402 MHz ~ 2480 MHz	
	Modulation Type		Data Rate
	GFSK		1Mbps
	π/4-DQPSK		2Mbps
	8DPSK		3Mbps
Adapter	Input:100-240VAC,50/60Hz,1.5A Output: 18V/3500mA		
Battery	11.1V,57.72Wh		
Bluetooth Version	BT V3.0+EDR		

5.2. MAXIMUM OUTPUT POWER

Bluetooth Mode	Frequency (MHz)	Channel Number	Max Output Power (dBm)	EIRP (dBm)
GFSK	2402-2480	00-78[79]	0.465	3.125
8DPSK	2402-2480	00-78[79]	0.463	3.123

5.3. PACKET TYPE CONFIGURATION

Test Mode	Packet Type	Setting(Packet Length)
GFSK	DH1	27
	DH3	183
	DH5	339
π/4-DQPSK	2-DH1	54
	2-DH3	367
	2-DH5	679
8DPSK	3-DH1	83
	3-DH3	552
	3-DH5	1021

5.4. CHANNEL LIST

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	20	2422	40	2442	60	2462
01	2403	21	2423	41	2443	61	2463
02	2404	22	2424	42	2444	62	2464
03	2405	23	2425	43	2445	63	2465
04	2406	24	2426	44	2446	64	2466
05	2407	25	2427	45	2447	65	2467
06	2408	26	2428	46	2448	66	2468
07	2409	27	2429	47	2449	67	2469
08	2410	28	2430	48	2450	68	2470
09	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

5.5. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel Number	Test Channel
GFSK	CH 00, CH 39, CH 78	Low, Middle, High
8DPSK	CH 00, CH 39, CH 78	Low, Middle, High

5.6. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band				
Test Software		BluTest3		
Modulation Type	Transmit Antenna Number	Test Channel		
		CH 00	CH 39	CH 78
GFSK	1	50	50	50
8DPSK	1	50	50	50

5.7. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2402-2480	ceramic Antenna	2.66

Test Mode	Transmit and Receive Mode	Description
GFSK	1TX, 1RX	Chain 1 can be used as transmitting/receiving antenna.
8DPSK	1TX, 1RX	Chain 1 can be used as transmitting/receiving antenna.

5.8. WORST-CASE CONFIGURATIONS

Bluetooth Mode	Modulation Technology	Modulation Type	Data Rate (Mbps)
BR	FHSS	GFSK	1Mbit/s
EDR	FHSS	8DPSK	3Mbit/s

Note: Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates.

5.9. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	55 ~ 65%	
Atmospheric Pressure:	1025Pa	
Temperature	TN	23 ~ 28 °C
Voltage :	VL	N/A
	VN	DC 11.1V/AC 120V 60Hz
	VH	N/A

Note: VL= Lower Extreme Test Voltage
VN= Nominal Voltage, AC 120V from Adapter, DC 11.1V from battery.
VH= Upper Extreme Test Voltage
TN= Normal Temperature

5.10. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	P/N
--	--	--	--	--

Remark : No need for Support equipment

I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
C-1	DC Power	DC Power	DC Power	1.5	N/A
C-1	AC Power	AC Power	AC Power	2.0	N/A

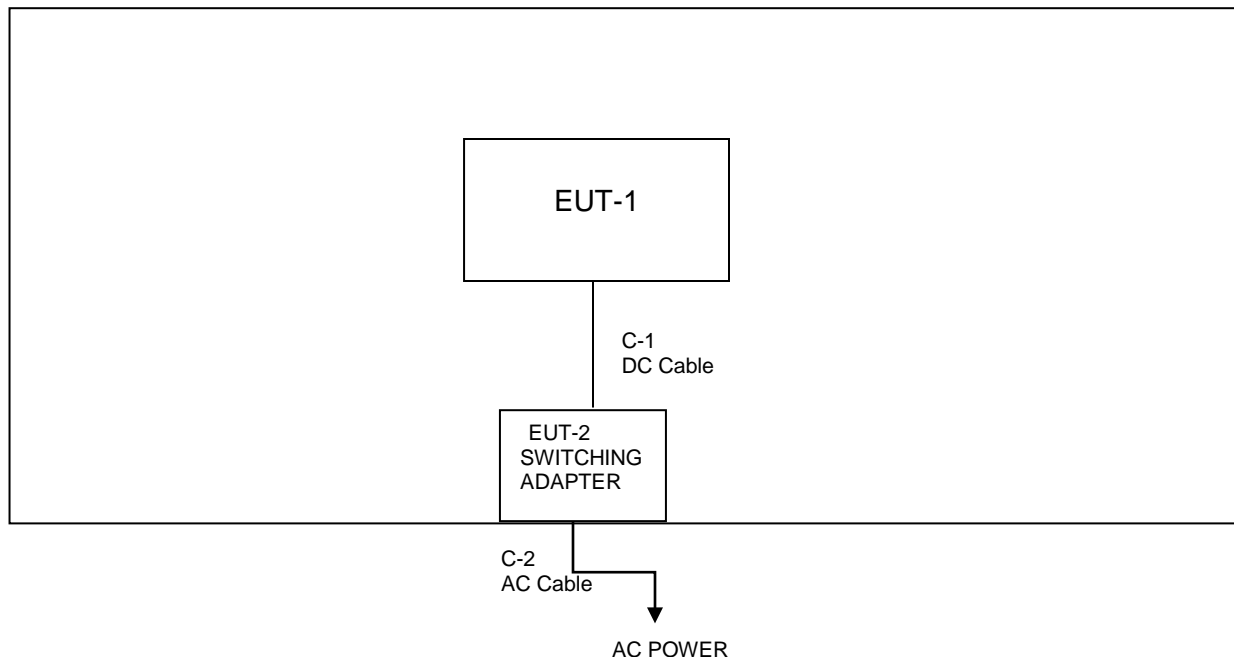
ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
EUT-2	SWITCHING ADAPTER	N/A	FJ-SW1803500D	Input:100-240VAC,50/60Hz,1.5A Output: 18V/3500mA

TEST SETUP

The EUT can work in an engineer mode with a software through a Laptop.

SETUP DIAGRAM FOR TESTS



5.11. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	EMI Test Receiver	R&S	ESR3	101961	Dec.20, 2016	Dec.19, 2017
<input checked="" type="checkbox"/>	Two-Line V-Network	R&S	ENV216	101983	Dec.20, 2016	Dec.19, 2017
<input checked="" type="checkbox"/>	Artificial Mains Networks	Schwarzbeck	NSLK 8126	8126465	Feb.10, 2017	Feb.10, 2018
Software						
Used	Description	Manufacturer	Name	Version		
<input checked="" type="checkbox"/>	Test Software for Conducted disturbance	Farad	EZ-EMC	Ver. UL-3A1		
Radiated Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Feb. 24, 2017	Feb. 24, 2018
<input checked="" type="checkbox"/>	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	Jan.09, 2016	Jan.09, 2019
<input checked="" type="checkbox"/>	Preamplifier	HP	8447D	2944A09099	Feb. 13, 2017	Feb. 13, 2018
<input checked="" type="checkbox"/>	EMI Measurement Receiver	R&S	ESR26	101377	Dec. 20, 2016	Dec. 20, 2017
<input checked="" type="checkbox"/>	Horn Antenna	TDK	HRN-0118	130939	Jan. 09, 2016	Jan. 09, 2019
<input checked="" type="checkbox"/>	High Gain Horn Antenna	Schwarzbeck	BBHA-9170	691	Jan.06, 2016	Jan.06, 2019
<input checked="" type="checkbox"/>	Preamplifier	TDK	PA-02-0118	TRS-305-00066	Jan. 14, 2017	Jan. 14, 2018
<input checked="" type="checkbox"/>	Preamplifier	TDK	PA-02-2	TRS-307-00003	Dec. 20, 2016	Dec. 20, 2017
<input checked="" type="checkbox"/>	Loop antenna	Schwarzbeck	1519B	00008	Mar. 26, 2016	Mar. 26, 2019
Software						
Used	Description	Manufacturer	Name	Version		
<input checked="" type="checkbox"/>	Test Software for Radiated disturbance	Farad	EZ-EMC	Ver. UL-3A1		
Other instruments						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	Spectrum Analyzer	Keysight	N9030A	MY55410512	Dec. 20, 2016	Dec. 20, 2017
<input checked="" type="checkbox"/>	Power Meter	Keysight	N9031A	MY55416024	Feb. 13, 2017	Feb. 13, 2018
<input checked="" type="checkbox"/>	Power Sensor	Keysight	N9323A	MY55440013	Feb. 13, 2017	Feb. 13, 2018

6. ANTENNA PORT TEST RESULTS

6.1. ON TIME AND DUTY CYCLE

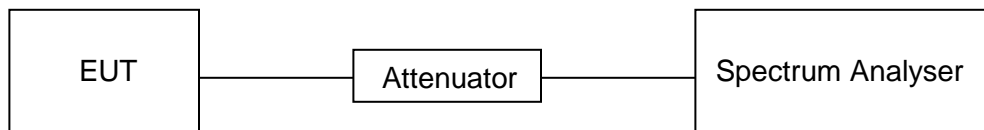
LIMITS

None; for reporting purposes only

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

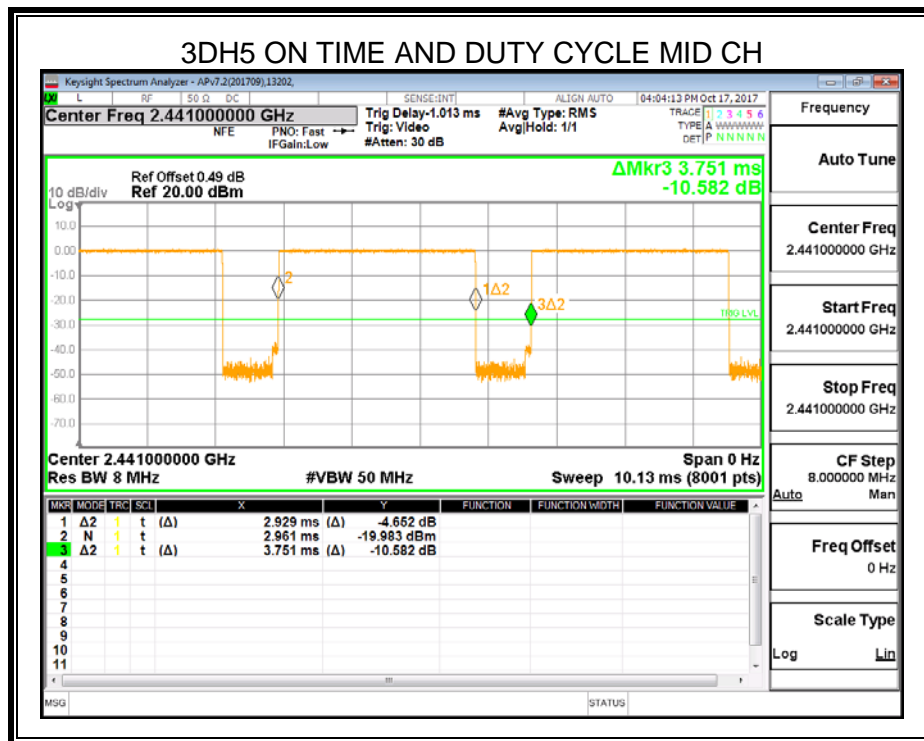
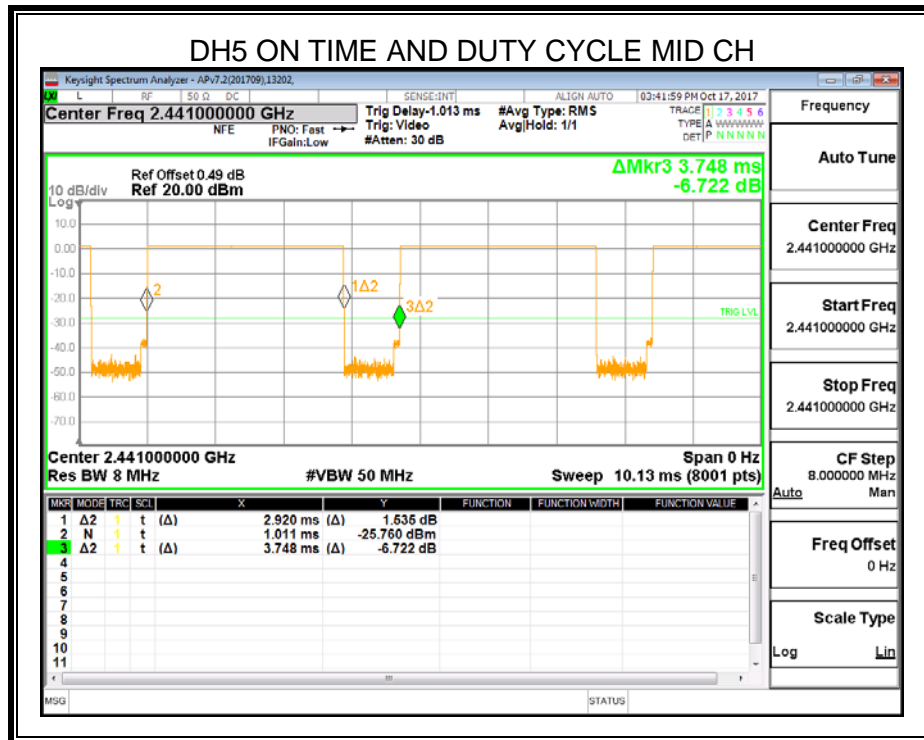
TEST SETUP



RESULTS

Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	1/T Minimum VBW (KHz)
GFSK	2.920	3.748	0.7790822	78	1.08	0.34
8DPSK	2.929	3.751	0.7808584	78	1.07	0.34

Note: Duty Cycle Correction Factor= $10\log(1/x)$.
Where: x is Duty Cycle(Linear)
Where: T is On Time (transmit duration)



6.2. 20 dB BANDWIDTH

LIMITS

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247 (a) (1)	20dB Bandwidth	500KHz	2400-2483.5

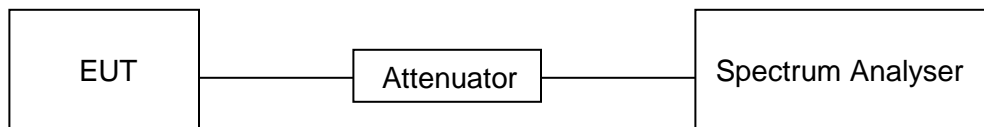
TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	For 20dB Bandwidth: 1%~5% of the 20 dB bandwidth
VBW	For 20dB Bandwidth: \geq RBW
Span	approximately 2 to 3 times the 20 dB bandwidth
Trace	Max hold
Sweep	Auto couple

Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

TEST SETUP

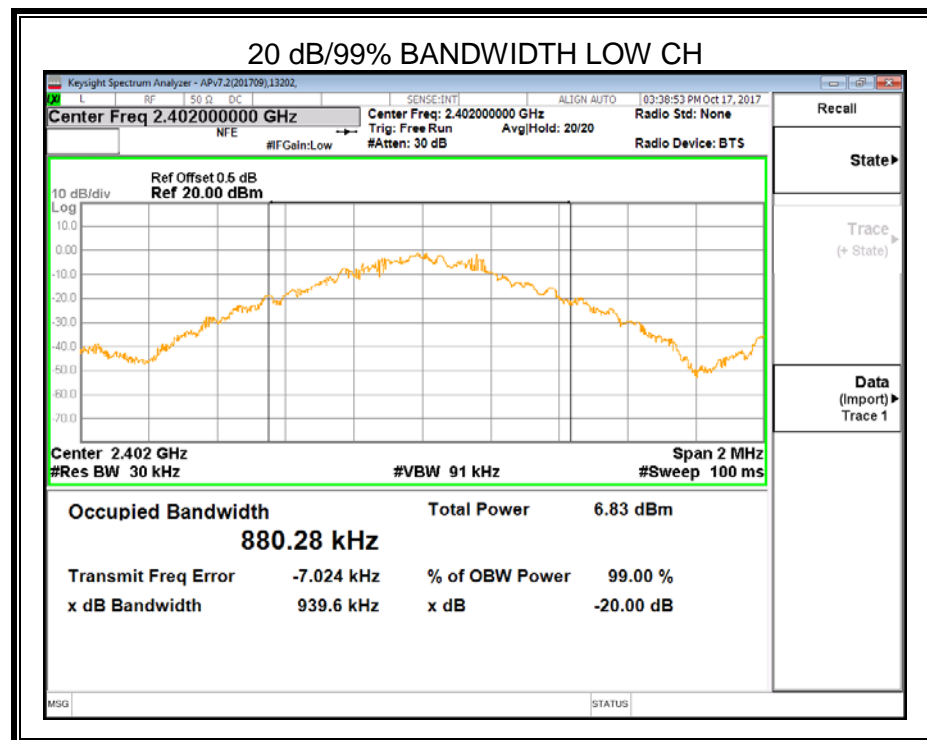


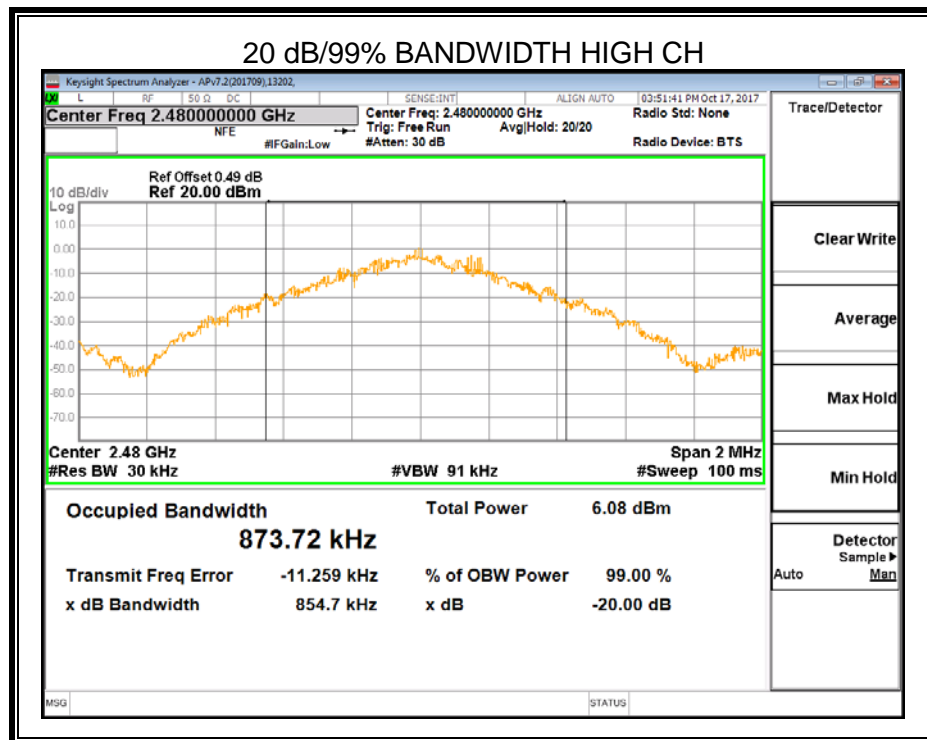
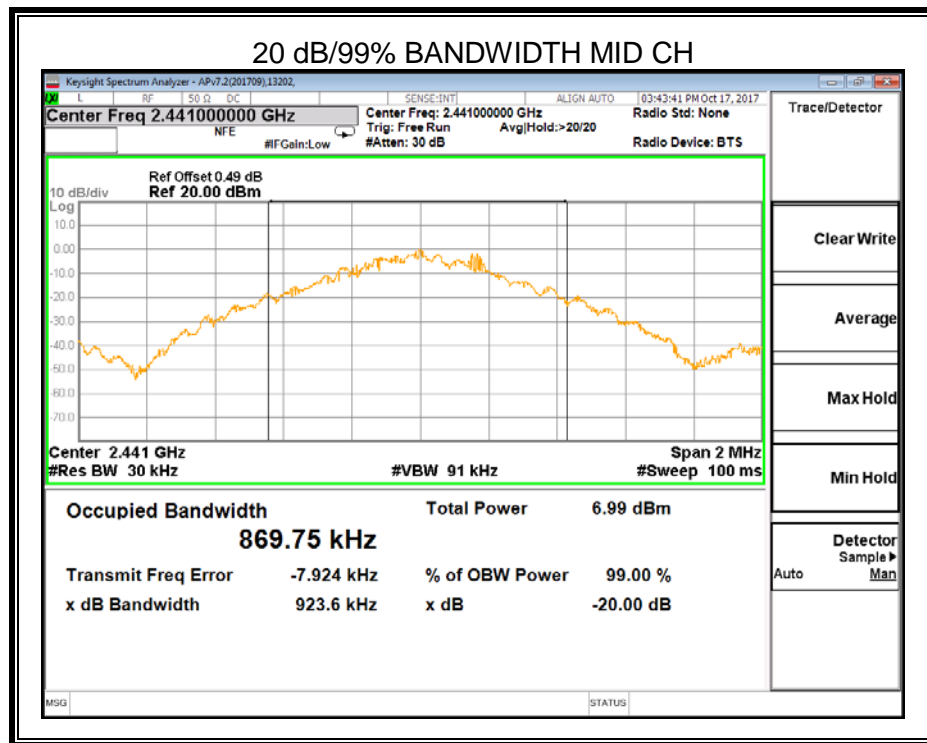
RESULTS

6.2.1. GFSK MODE

Channel	Frequency (MHz)	20dB bandwidth (MHz)	Result
Low	2402	0.940	PASS
Middle	2441	0.924	PASS
High	2480	0.855	PASS

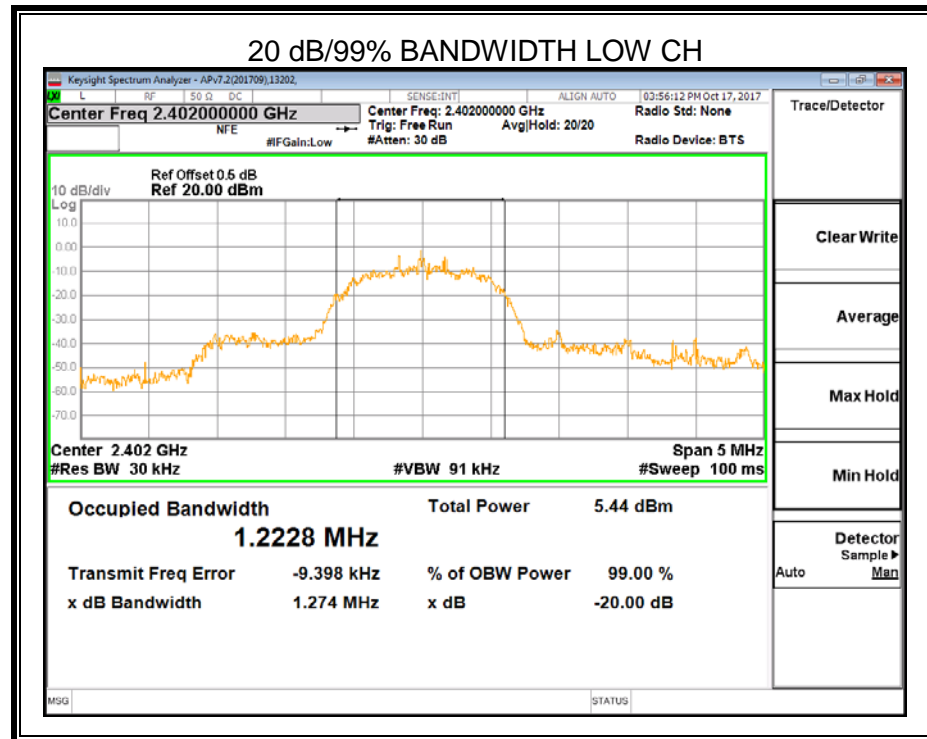
Test Graph

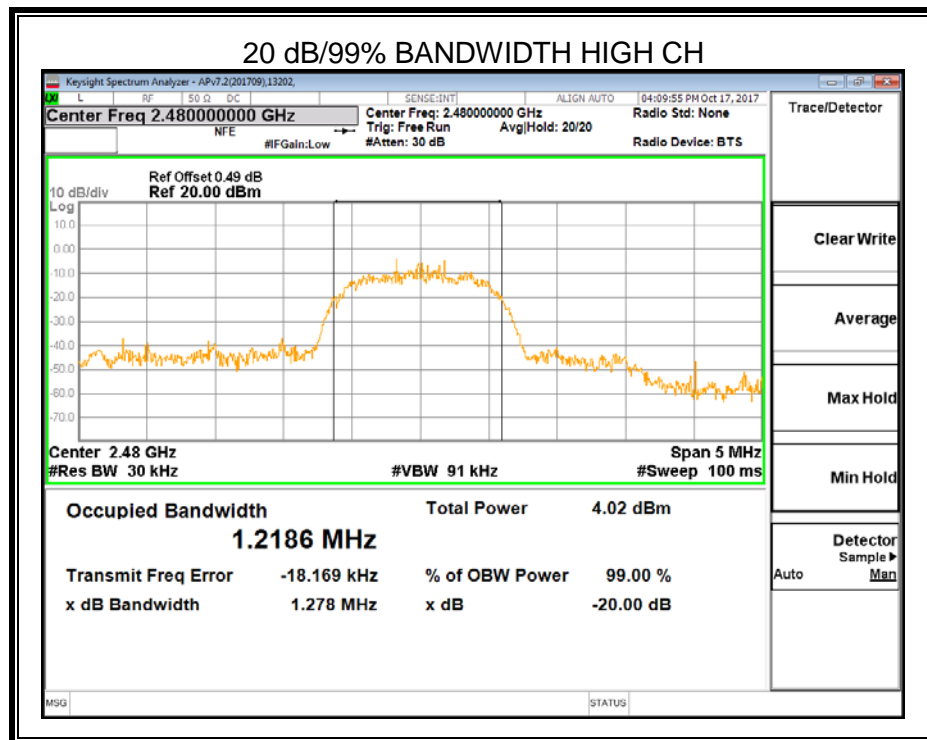
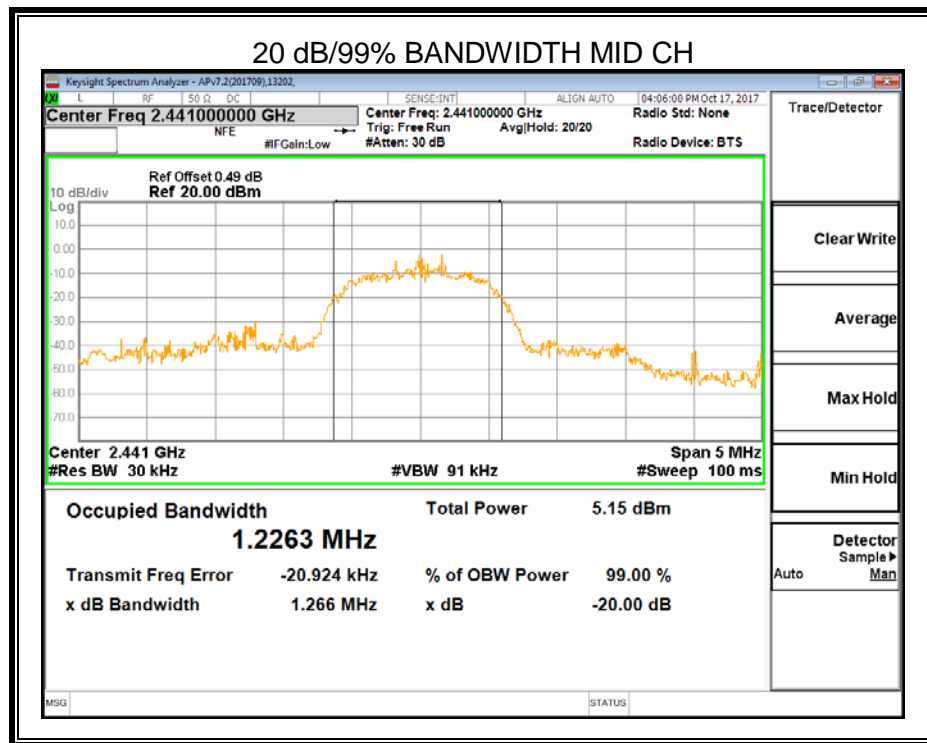




6.2.2. 8DPSK MODE

Channel	Frequency (MHz)	20dB bandwidth (MHz)	99% bandwidth (MHz)	Result
Low	2402	1.274	1.223	Pass
Middle	2441	1.266	1.226	Pass
High	2480	1.278	1.219	Pass





6.3. PEAK CONDUCTED OUTPUT POWER

LIMITS

FCC Part15 (15.247) , Subpart C RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247 (b) (1)	Peak Conducted Output Power	1 watt or 30dBm	2400-2483.5

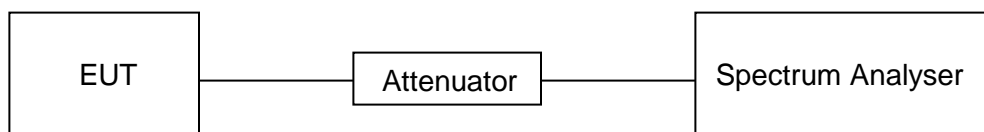
TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	≥ 20 dB bandwidth
VBW	≥RBW
Span	Approximately five times the 20 dB bandwidth
Trace	Max hold
Sweep time	Auto couple

Allow trace to fully stabilize and use peak marker function to determine the peak amplitude level.

TEST SETUP

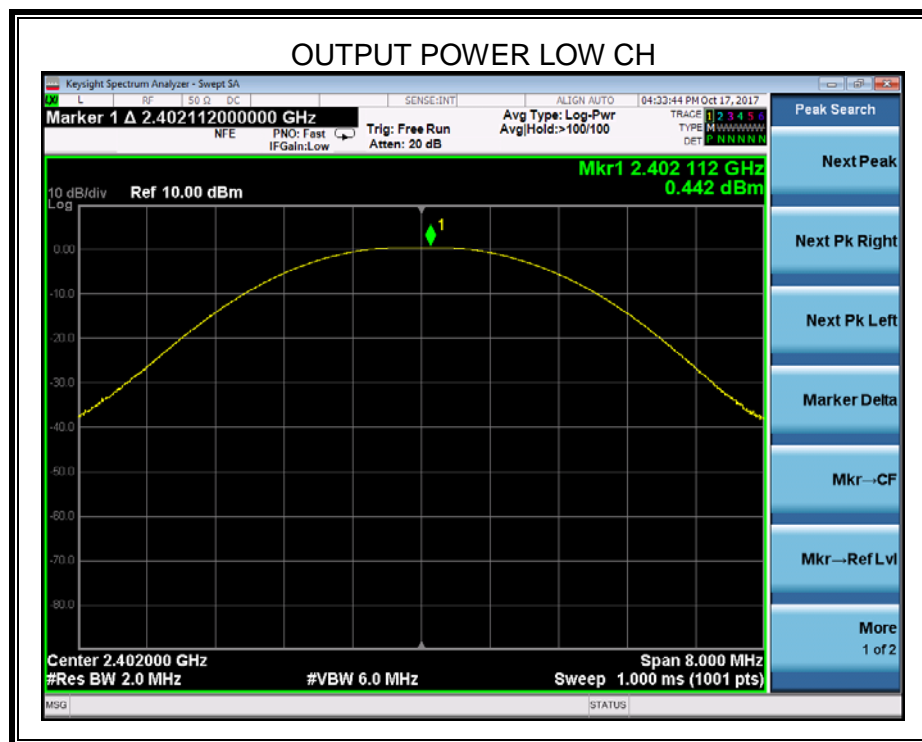


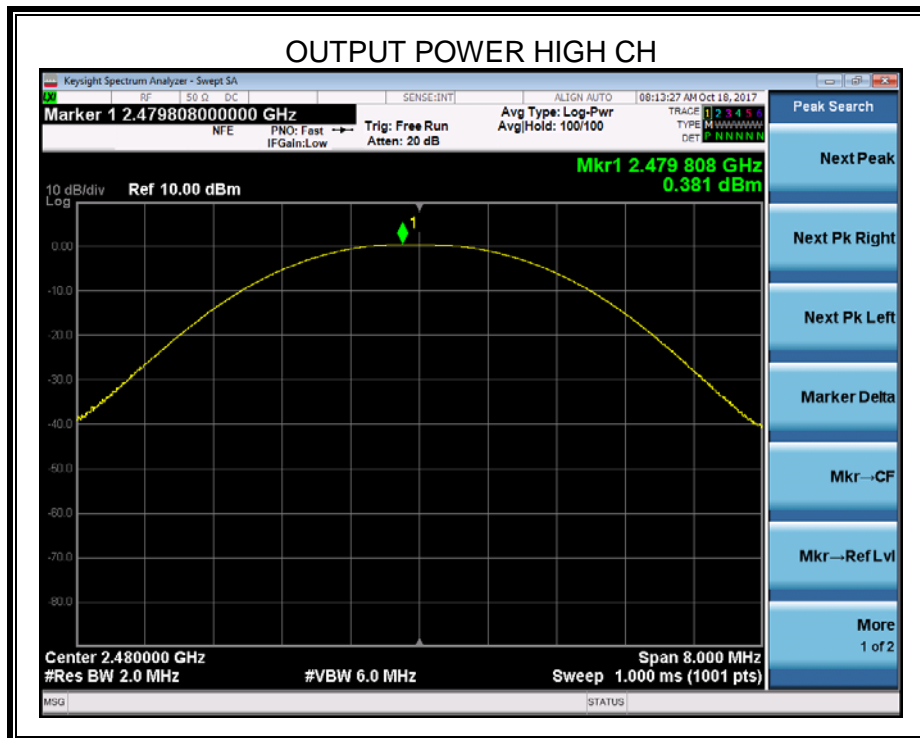
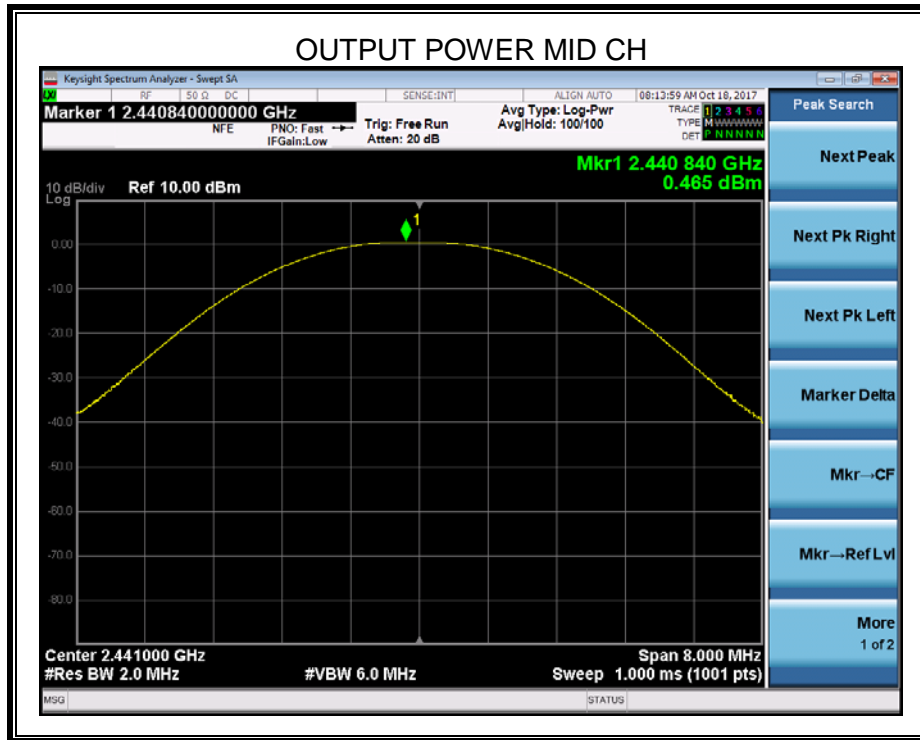
RESULTS

6.3.1. GFSK MODE

Channel	Frequency	Maximum Conducted Output Power(PK)	EIRP	Result
	(MHz)	(dBm)	(dBm)	
Low	2402	0.442	3.102	Pass
Middle	2441	0.465	3.125	Pass
High	2480	0.381	3.041	Pass

Note: EIRP= Maximum Conducted Output Power + Antenna Gain

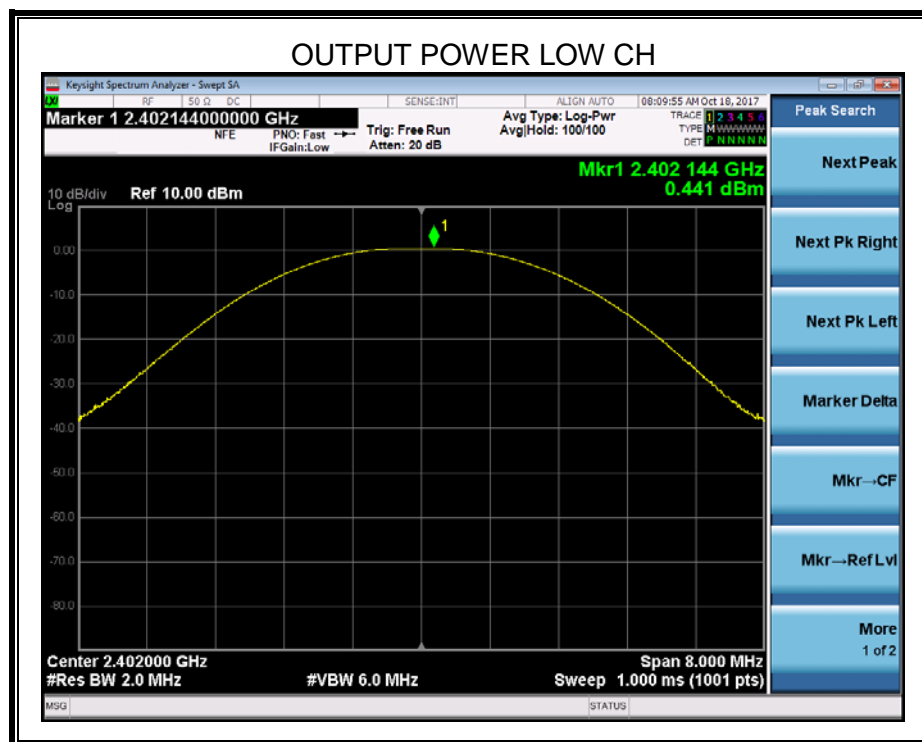


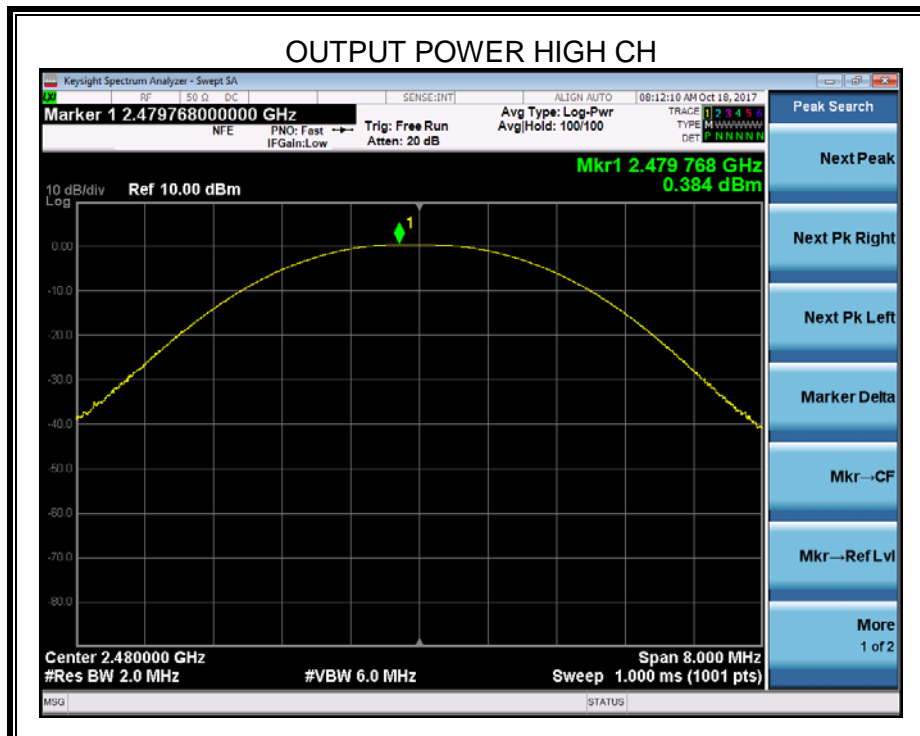
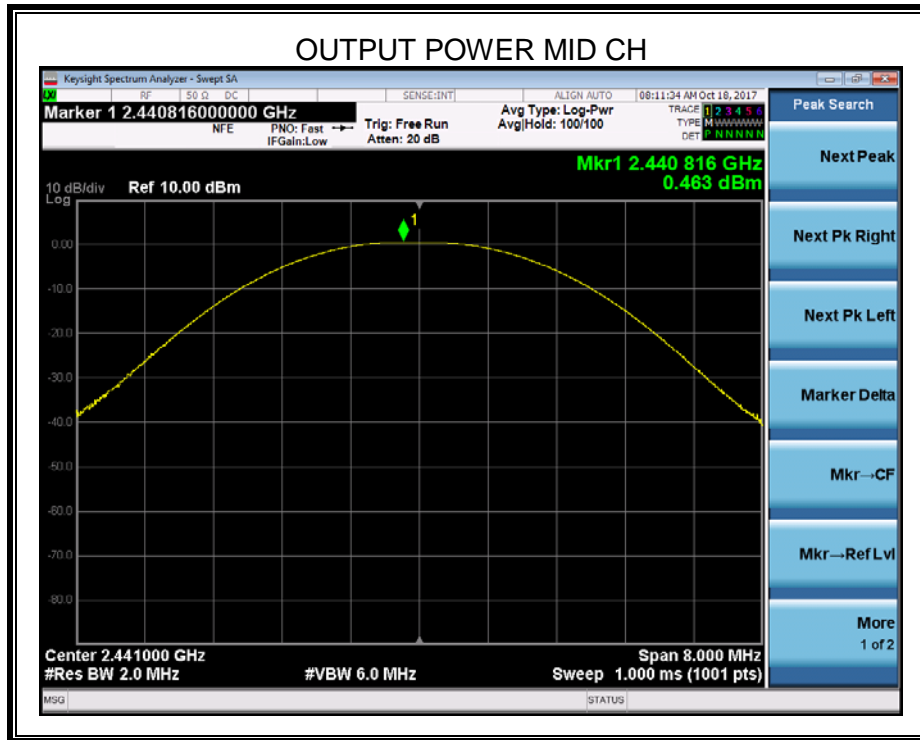


6.3.2. 8DPSK MODE

Channel	Frequency	Maximum Conducted Output Power(PK)	EIRP	Result
	(MHz)	(dBm)	(dBm)	
Low	2402	0.441	3.101	Pass
Middle	2441	0.463	3.123	Pass
High	2480	0.384	3.044	Pass

Note: EIRP= Maximum Conducted Output Power + Antenna Gain





6.4. CARRIER HOPPING CHANNEL SEPARATION

LIMITS

FCC Part15 (15.247) , Subpart C RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247 (a) (1)	Carrier Hopping Channel Separation	25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.	2400-2483.5

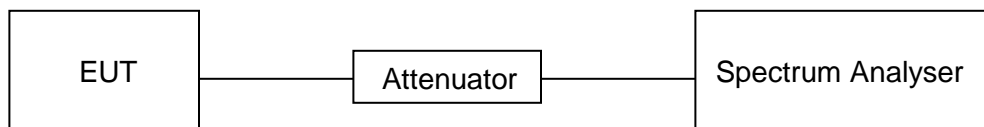
TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Span	wide enough to capture the peaks of two adjacent channels
Detector	Peak
RBW	$\geq 1\%$ of the span
VBW	\geq RBW
Trace	Max hold
Sweep time	Auto couple

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot.

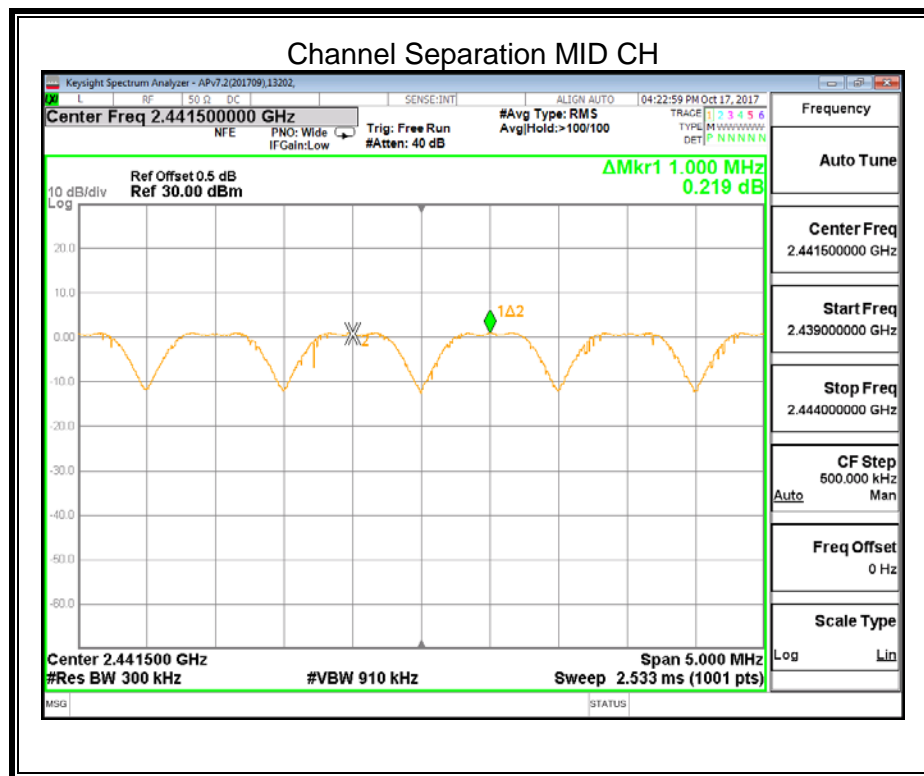
TEST SETUP



RESULTS

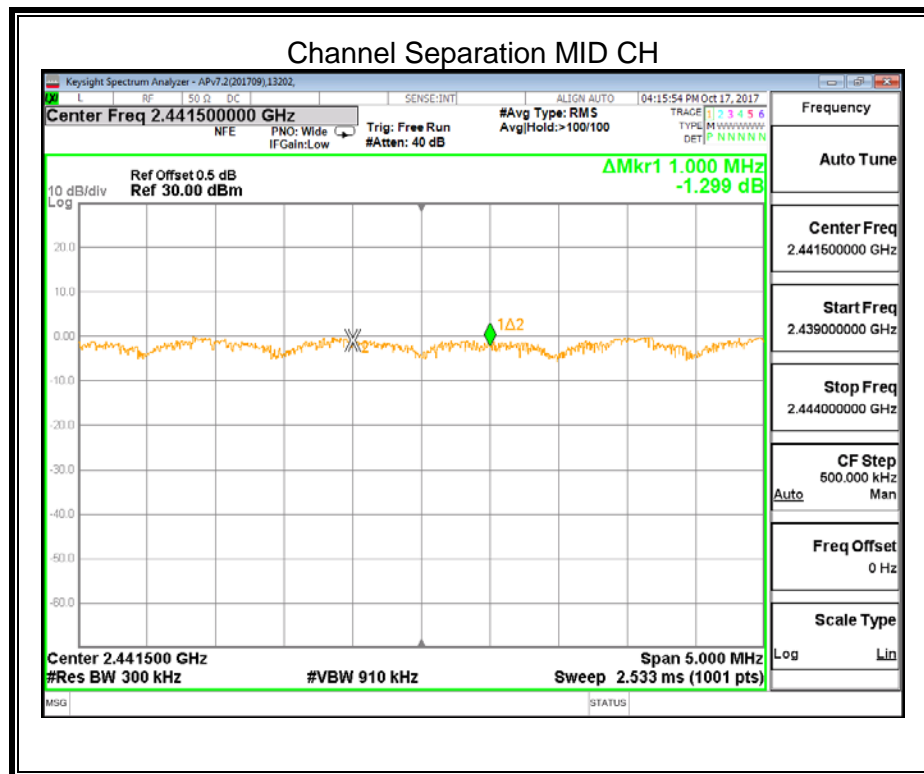
6.4.1. GFSK MODE

Channel	Carrier Hopping Channel Separation (MHz)	Limit (MHz)	Result
Middle	1.00	≥ two-thirds of the 20 dB Bandwidth Of The Hopping Channel	PASS



Note: For 20 dB Bandwidth of The Hopping Channel, please refer to clause 6.2.1.

Channel	Carrier Hopping Channel Separation (MHz)	Limit (MHz)	Result
Middle	1.00	≥ two-thirds of the 20 dB Bandwidth Of The Hopping Channel	PASS



6.5. NUMBER OF HOPPING FREQUENCY

LIMITS

FCC Part15 (15.247) , Subpart C		
Section	Test Item	Limit
15.247 (a) (1) III	Number of Hopping Frequency	at least 15 hopping channels

TEST PROCEDURE

Connect the EUT to the spectrum analyser and use the following settings:

Detector	Peak
RBW	1% of the span
VBW	≥RBW
Span	The frequency band of operation
Trace	Max hold
Sweep time	Auto couple

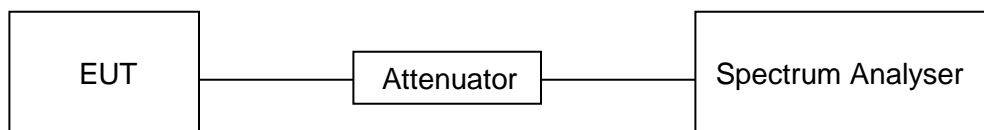
Set EUT to transmit maximum output power and switch on frequency hopping function. then set enough count time (larger than 5000 times) to get all the hopping frequency channel displayed on the screen of spectrum analyzer.

Count the quantity of peaks to get the number of hopping channels.

Normal Mode: 79 Channels observed.

AFH Mode: 20 Channels declared.

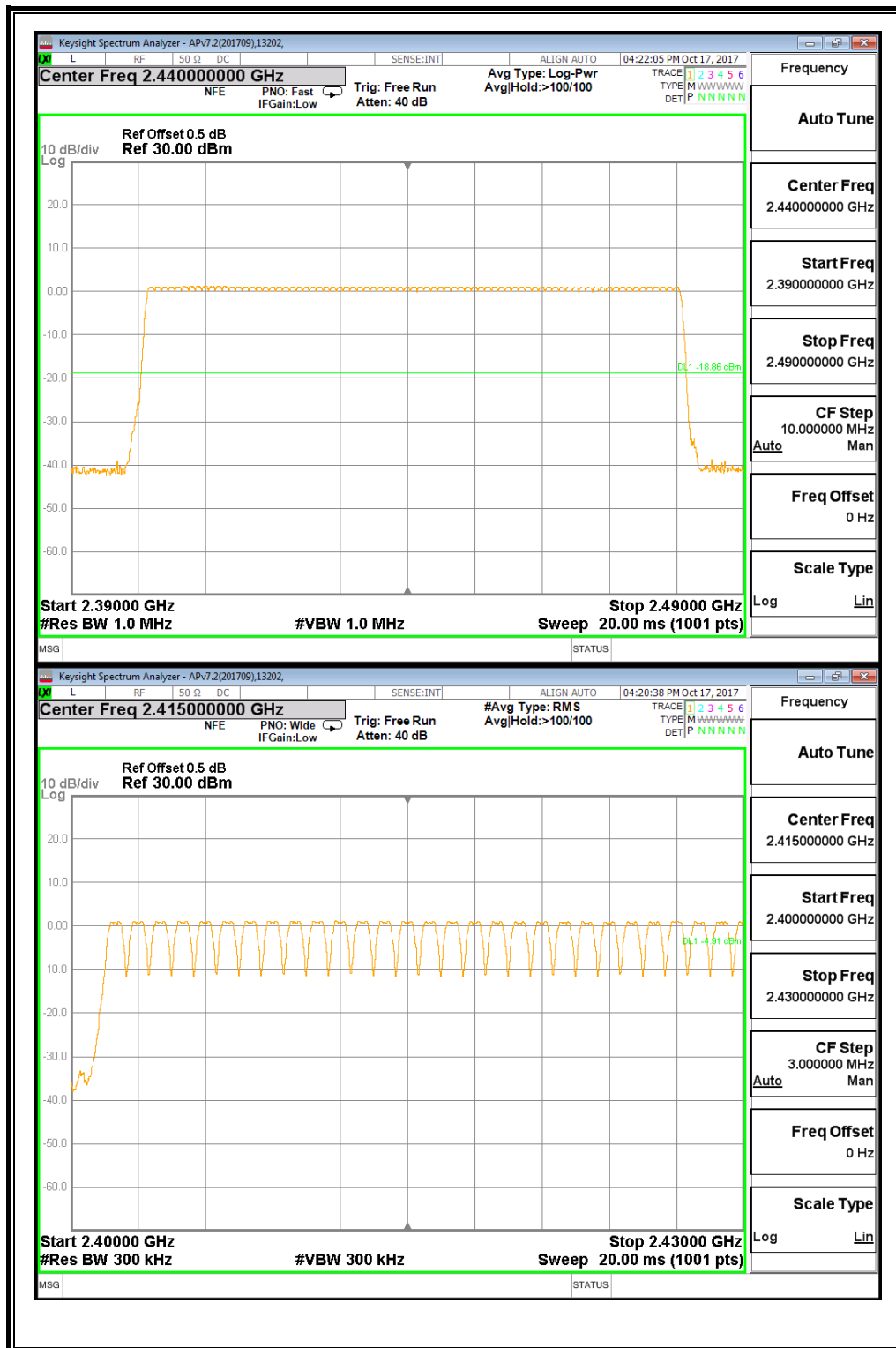
TEST SETUP

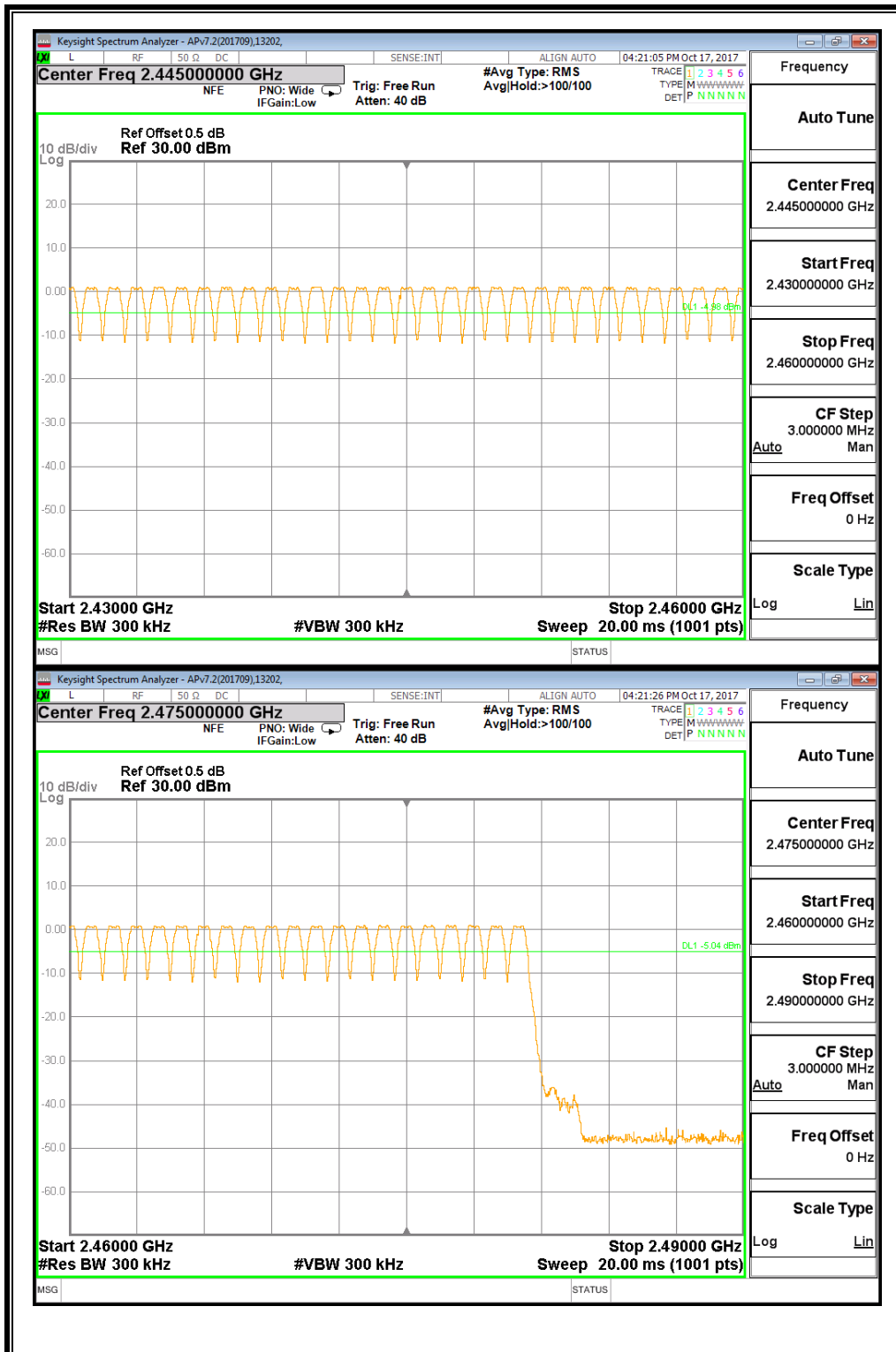


RESULTS

6.5.1. GFSK MODE

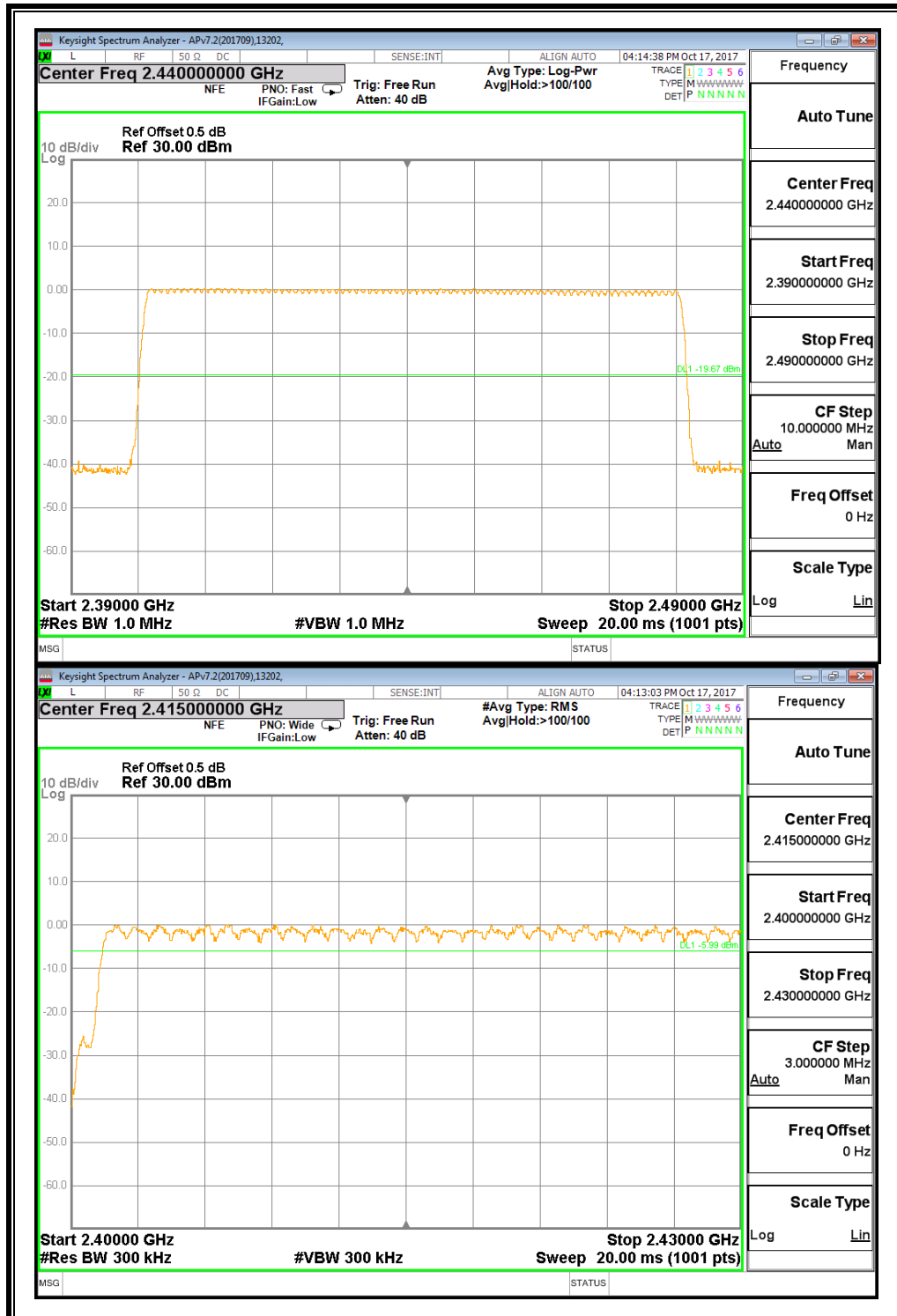
Hopping numbers	Limit	Results
79	>15	Pass

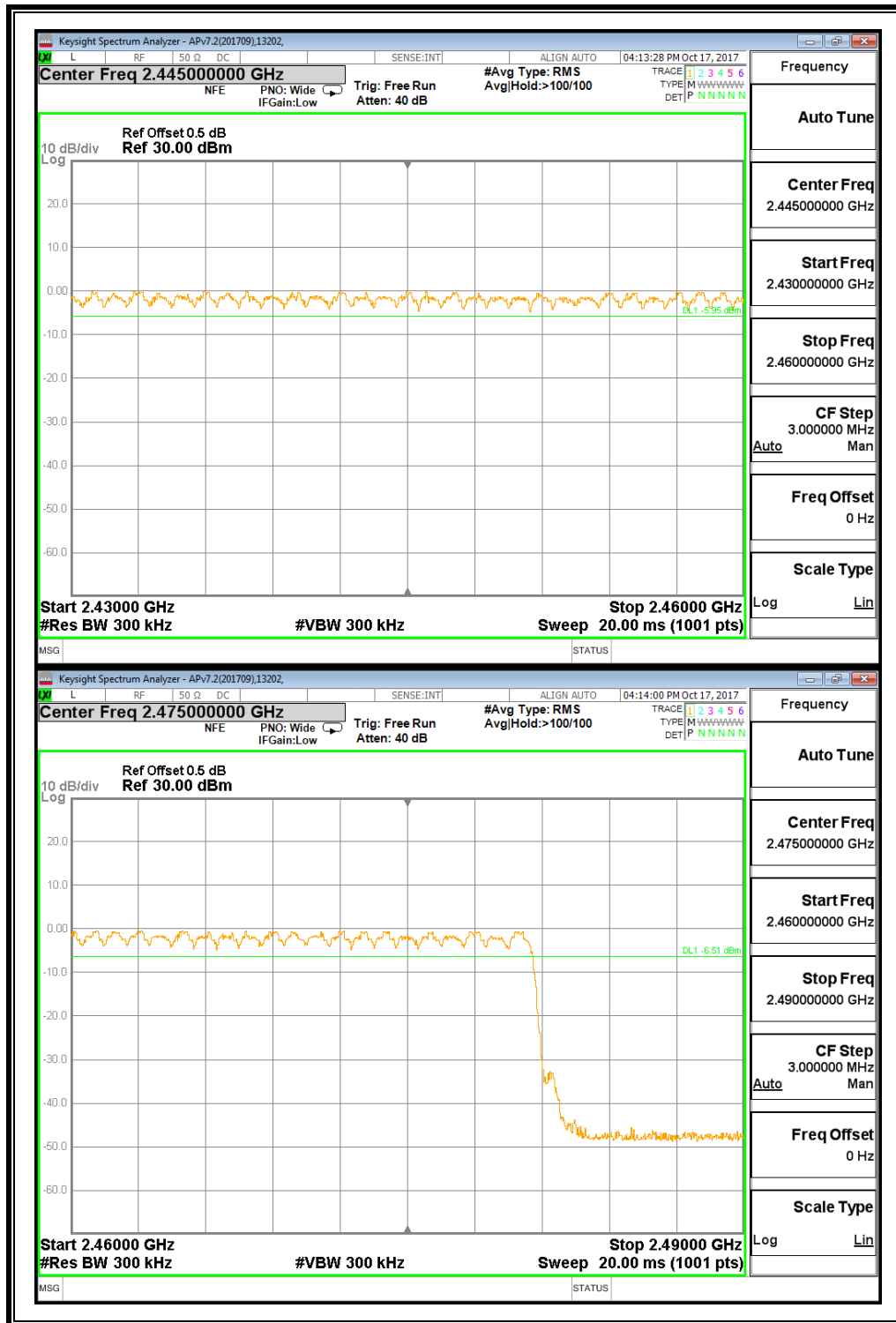




6.5.2. 8DPSK MODE

Hopping numbers	Limit	Results
79	>15	Pass





6.6. TIME OF OCCUPANCY (DWELL TIME)

LIMITS

FCC Part15 (15.247) , Subpart C RSS-247 ISSUE 2		
Section	Test Item	Limit
15.247 (a) (1) III	Time of Occupancy (Dwell Time)	The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds, multiplied by the number of hopping channels employed.

TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	1 MHz
VBW	≥RBW
Span	zero span
Trace	Max hold
Sweep time	As necessary to capture the entire dwell time per hopping channel

- The transmitter output (antenna port) was connected to the spectrum analyzer
- Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz.
- Use a video trigger with the trigger level set to enable triggering only on full pulses.
- Sweep Time is more than once pulse time.
- Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- Measure the maximum time duration of one single pulse.
- Set the EUT for DH5, DH3 and DH1 packet transmitting.
- Measure the maximum time duration of one single pulse.

A Period Time = (channel number)*0.4

For Normal Mode (79 Channel):

DH1 Time Slot: Reading * (1600/2)*31.6/(channel number)

DH3 Time Slot: Reading * (1600/4)*31.6/(channel number)

DH5 Time Slot: Reading * (1600/6)*31.6/(channel number)

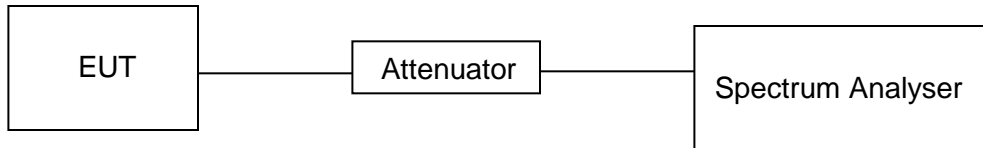
For AFH Mode (20 Channel):

DH1 Time Slot: Reading * (1600/2)*8/(channel number)

DH3 Time Slot: Reading * (1600/4)*8/(channel number)

DH5 Time Slot: Reading * (1600/6)*8/(channel number)

TEST SETUP

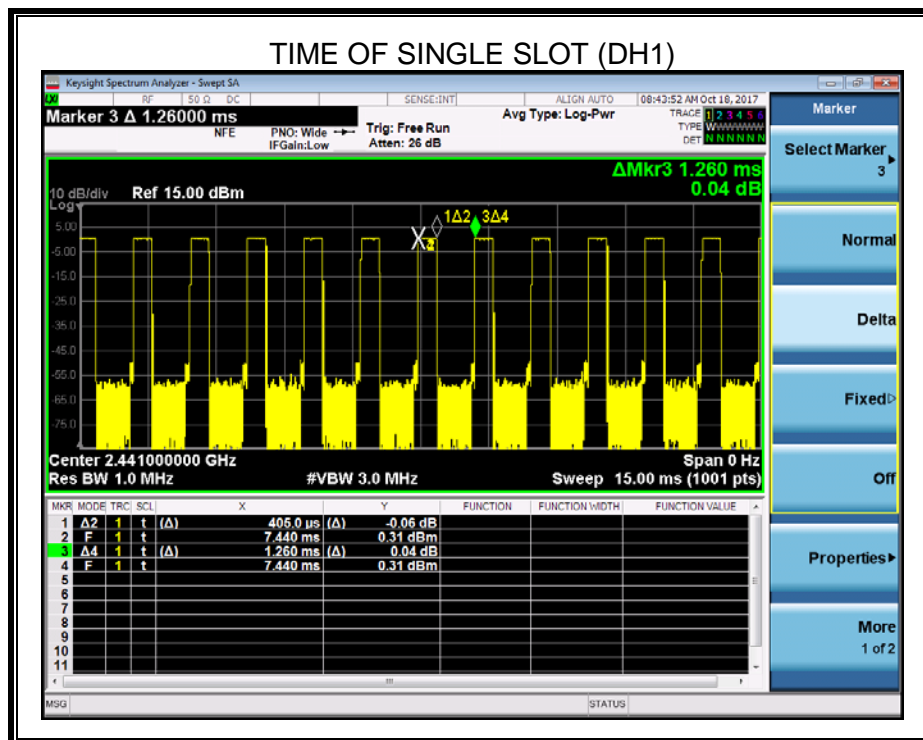


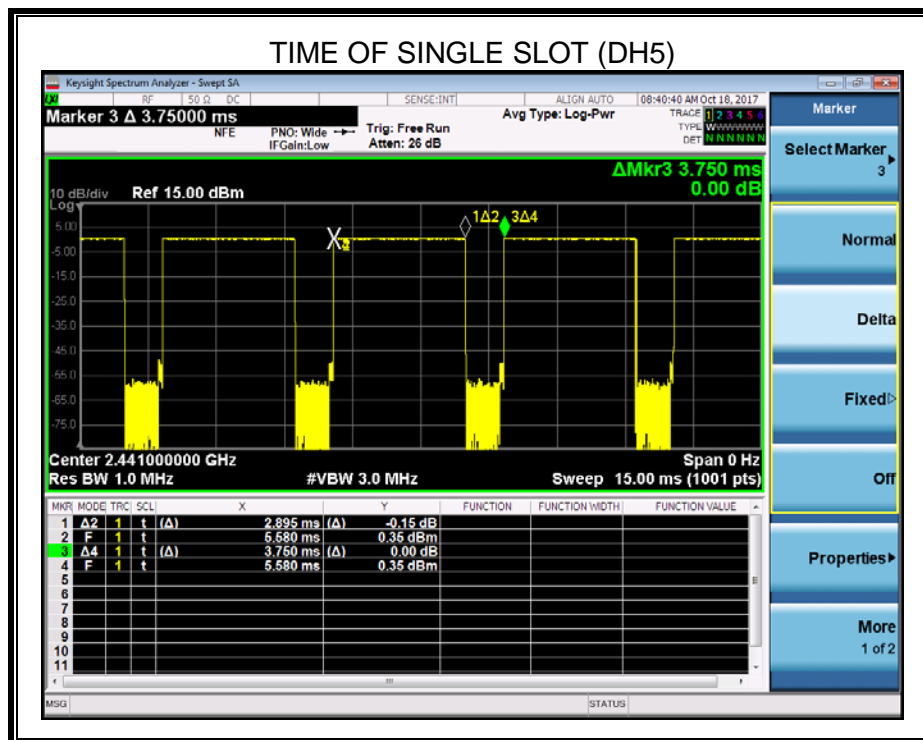
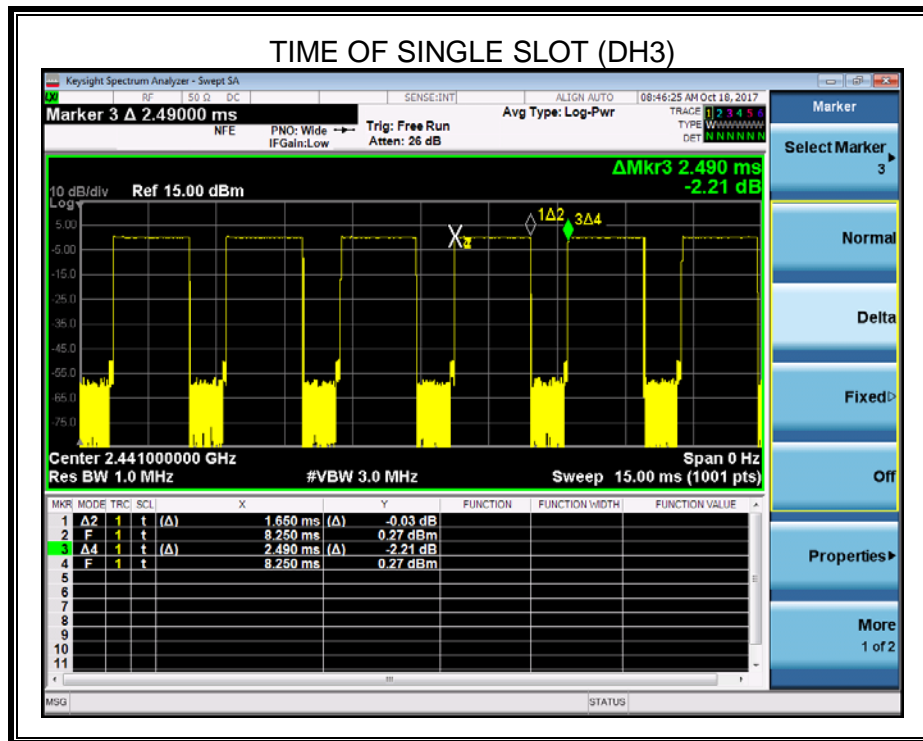
RESULTS

6.6.1. GFSK MODE

Normal Mode				
Packet	Channel	Burst Width [ms/hop/ch]	Dwell Time [ms]	Results
DH1	MCH	0.405	0.1296	PASS
DH3	MCH	1.650	0.2640	PASS
DH5	MCH	2.895	0.3088	PASS
AFH Mode				
DH1	MCH	0.405	0.1296	PASS
DH3	MCH	1.650	0.2640	PASS
DH5	MCH	2.895	0.3088	PASS

Test Graph

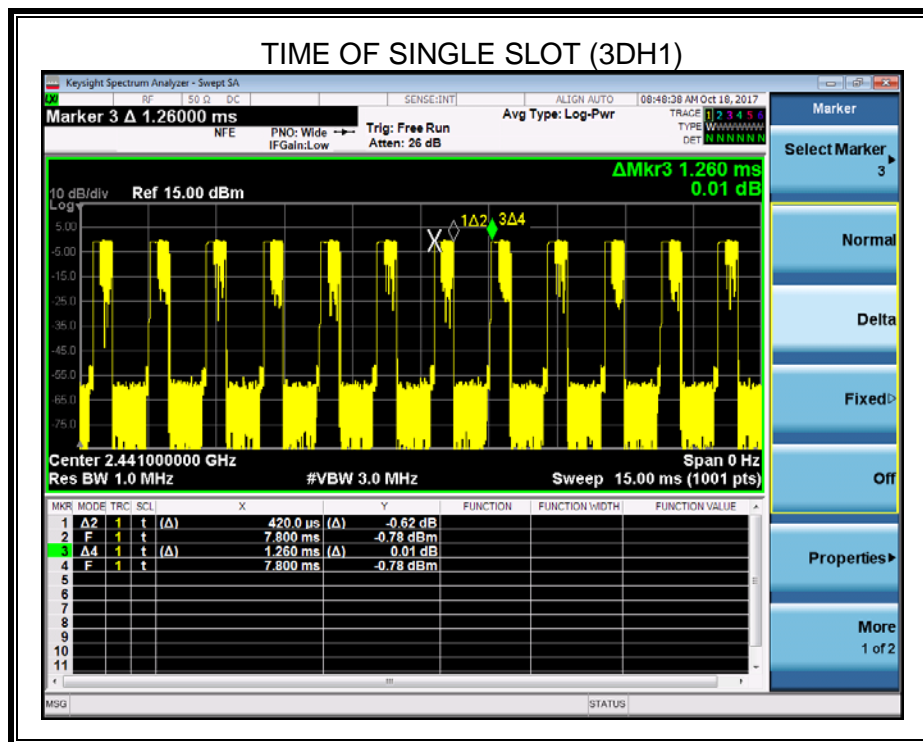


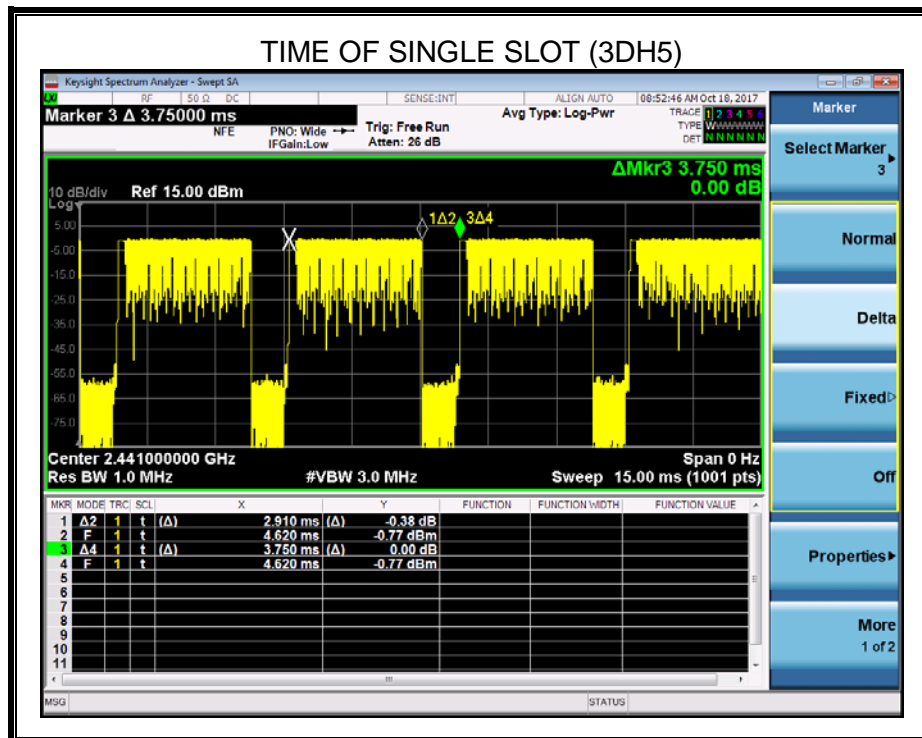
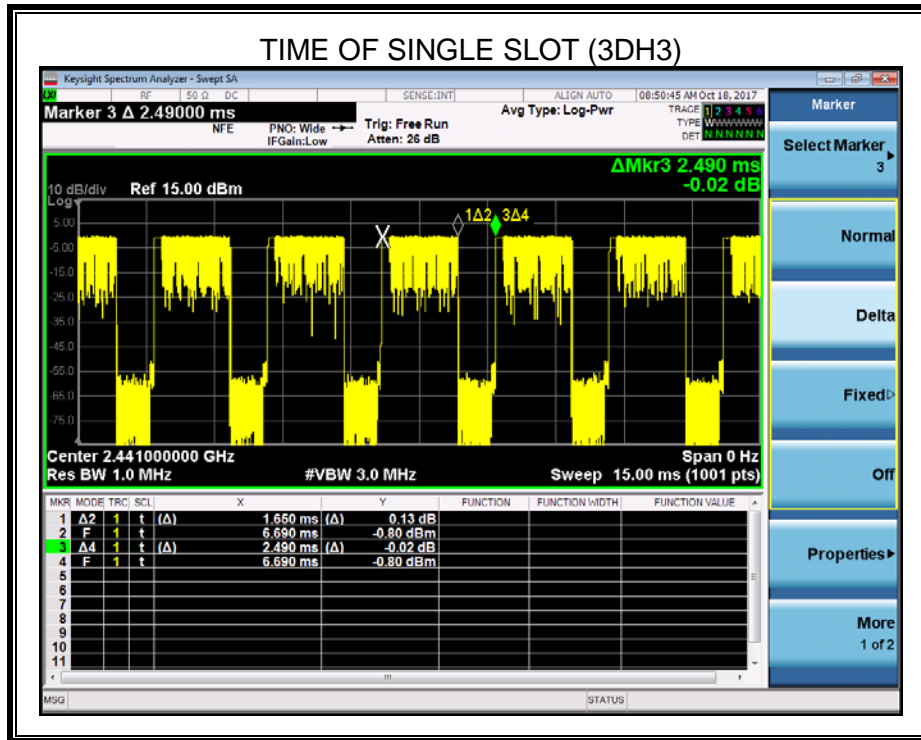


6.6.2. 8DPSK MODE

Normal Mode				
Packet	Channel	Burst Width [ms/hop/ch]	Dwell Time [ms]	Results
3DH1	MCH	0.420	0.1344	PASS
3DH3	MCH	1.650	0.2640	PASS
3DH5	MCH	2.910	0.3104	PASS
AFH Mode				
3DH1	MCH	0.420	0.1344	PASS
3DH3	MCH	1.650	0.2640	PASS
3DH5	MCH	2.910	0.3104	PASS

Test Graph





6.7. CONDUCTED SPURIOUS EMISSION

LIMITS

FCC Part15 (15.247) , Subpart C RSS-247 ISSUE 2		
Section	Test Item	Limit
FCC §15.247 (d)	Conducted Spurious Emission	at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

TEST PROCEDURE

For Bandedge use the following settings:

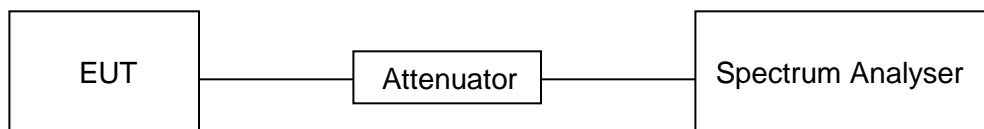
Detector	Peak
RBW	RBW \geq 1% of the span
VBW	\geq RBW
Span	wide enough to fully capture the emission being measured
Trace	Max hold
Sweep time	Auto couple.

For Spurious Emission use the following settings:

Detector	Peak
RBW	100K
VBW	\geq RBW
Span	wide enough to fully capture the emission being measured
Trace	Max hold
Sweep time	Auto couple.

Use the peak marker function to determine the maximum amplitude level.

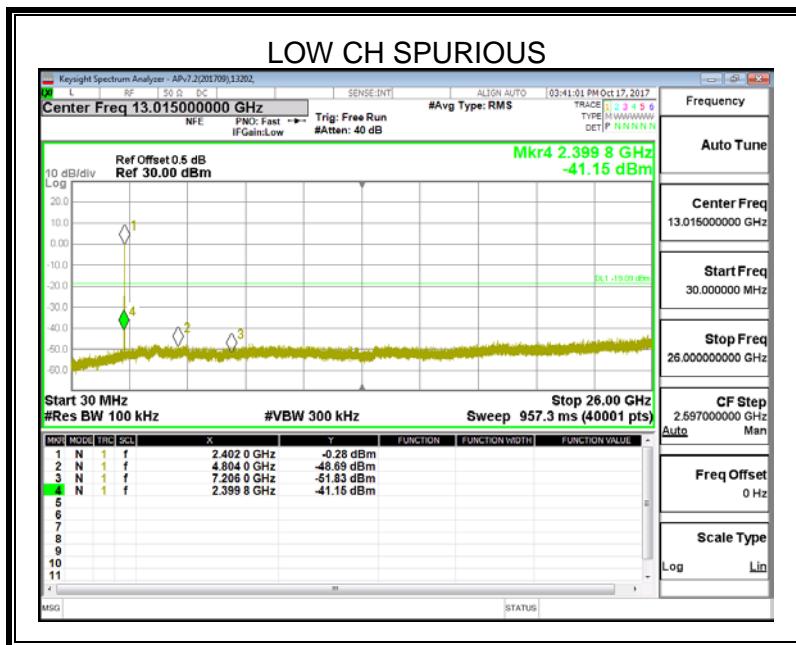
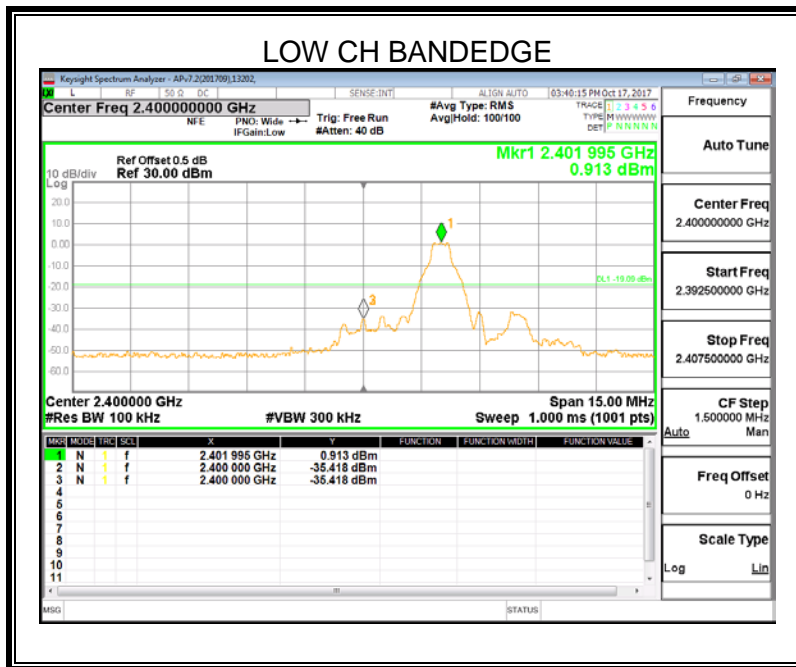
TEST SETUP



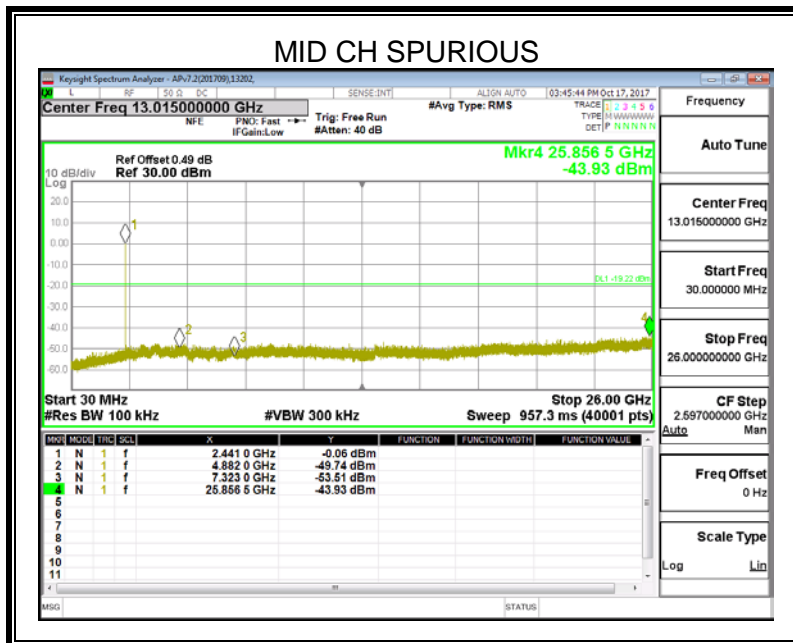
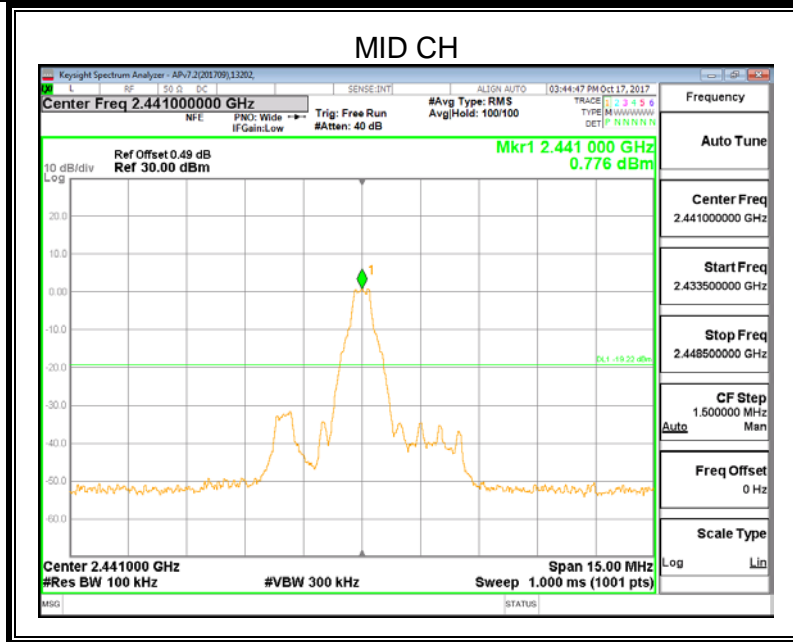
RESULTS

6.7.1. GFSK MODE

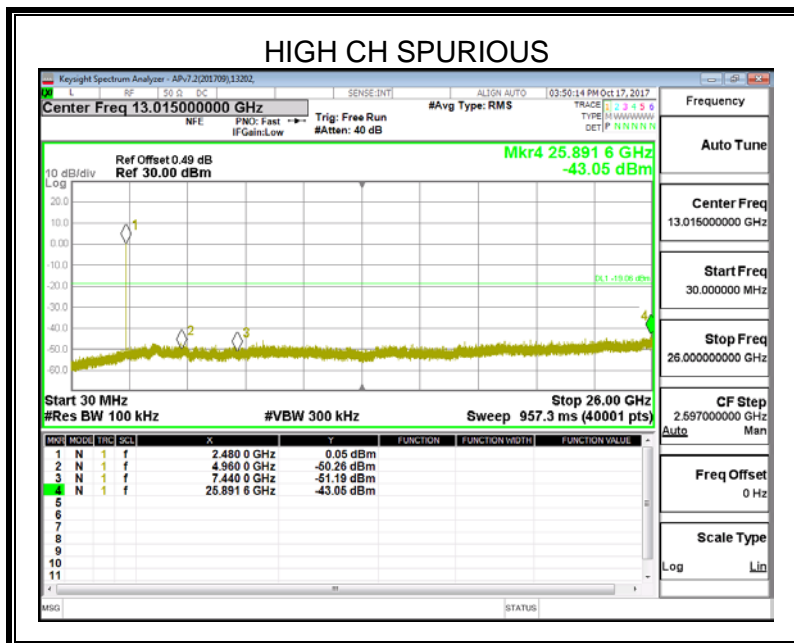
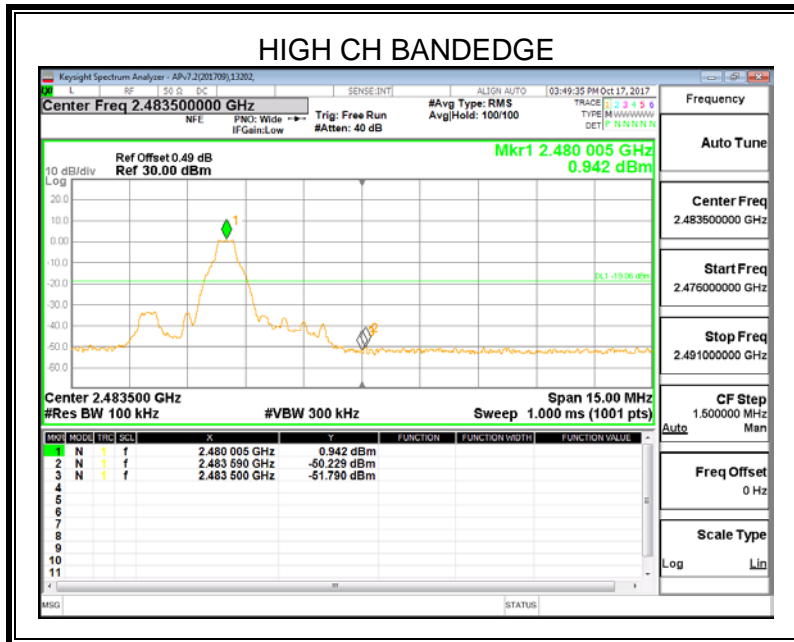
SPURIOUS EMISSIONS, LOW CHANNEL



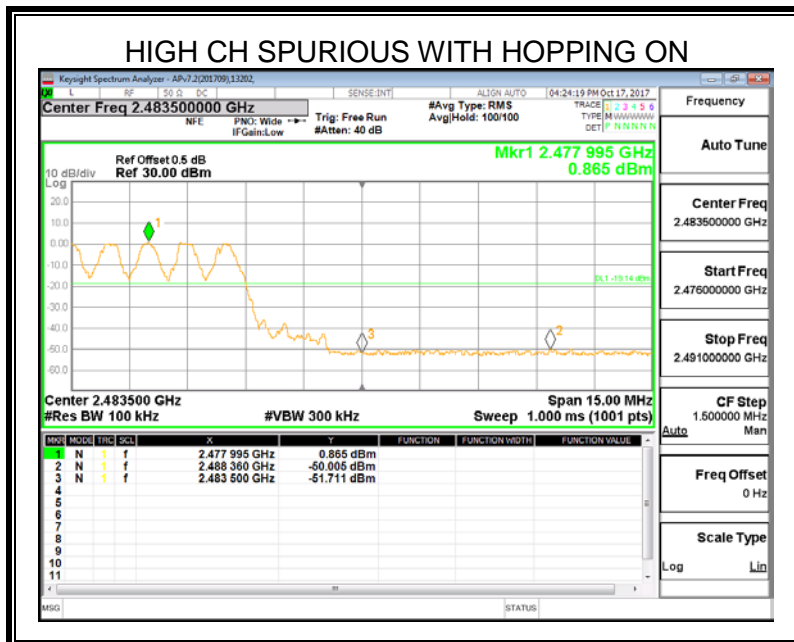
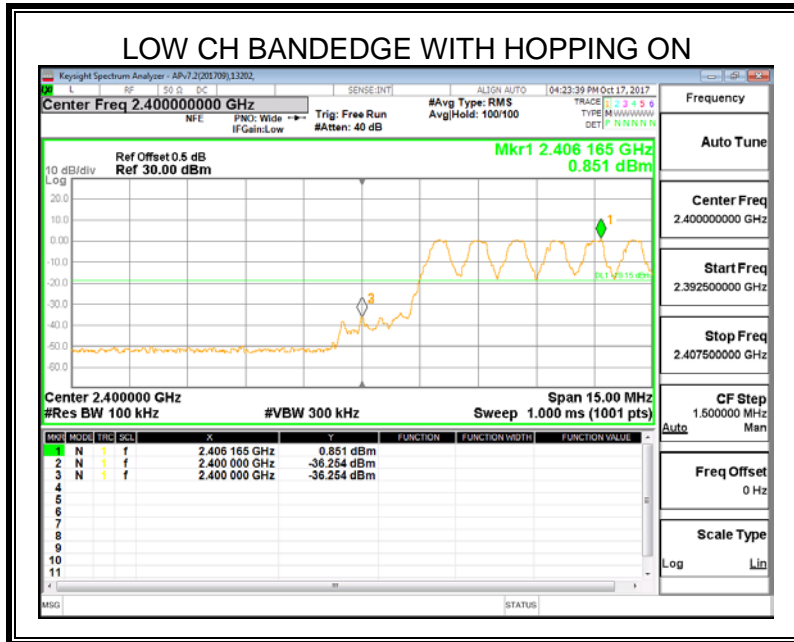
SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL

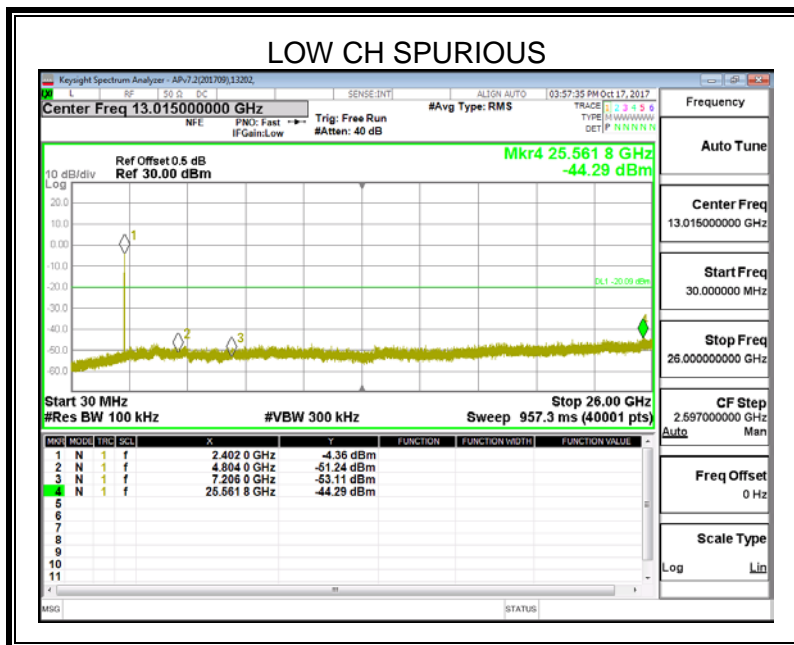
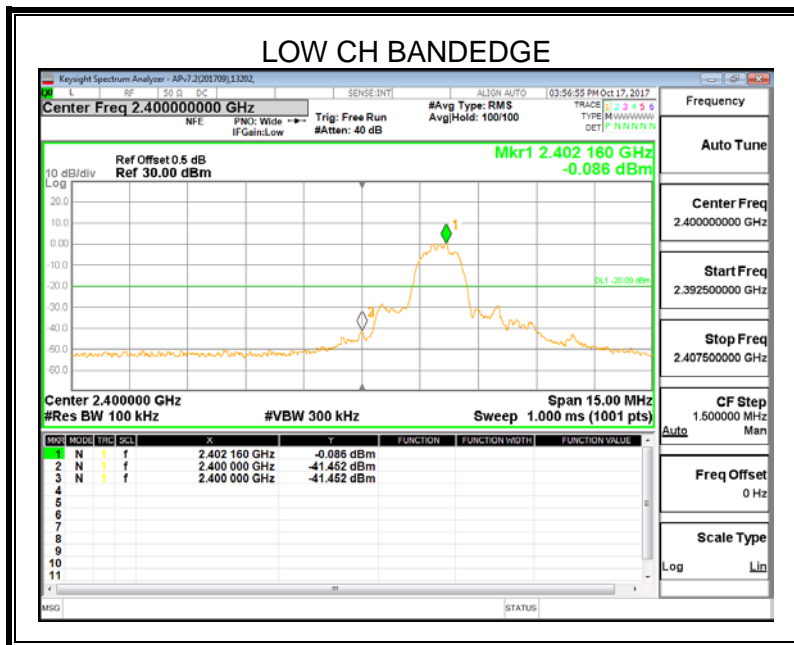


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

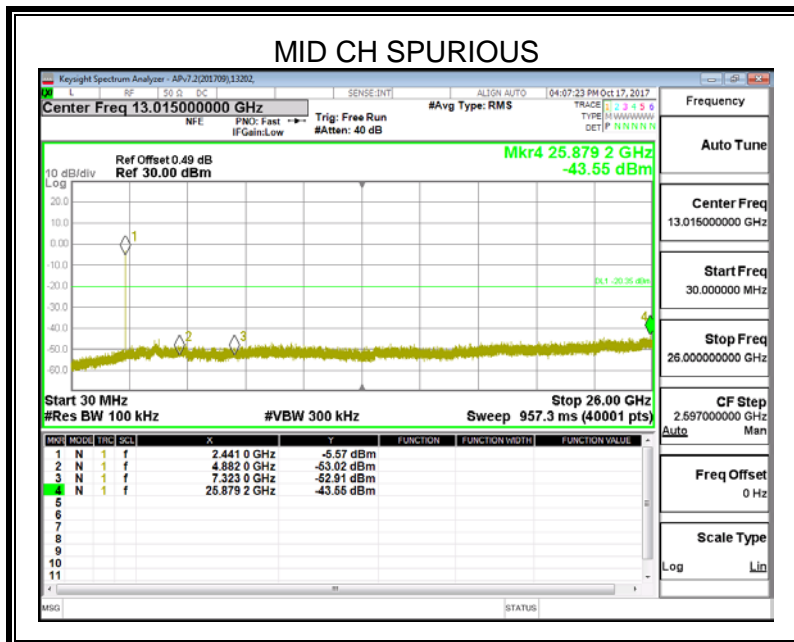
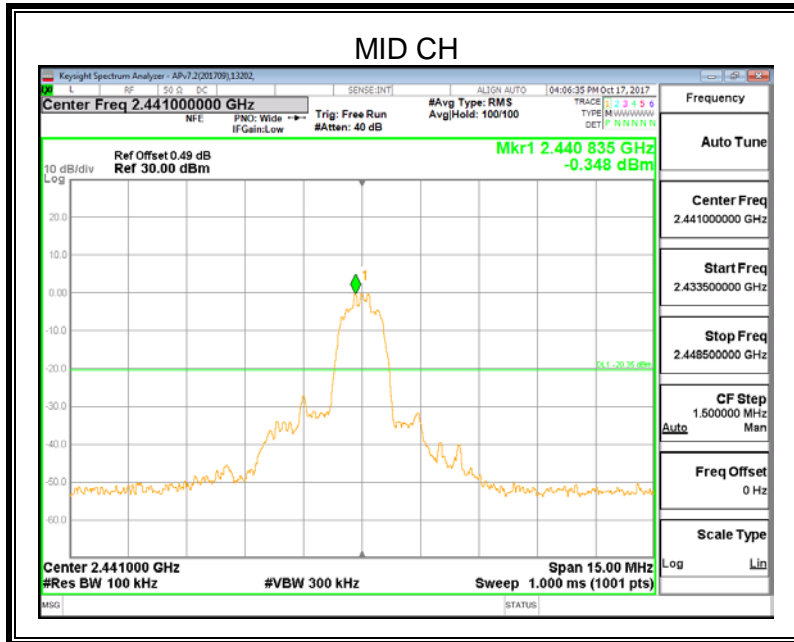


6.7.2. 8DPSK MODE

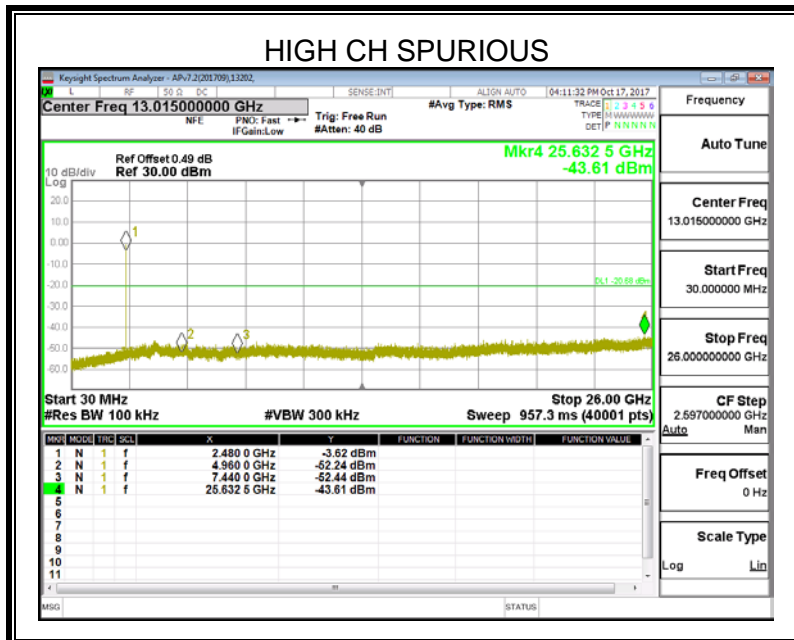
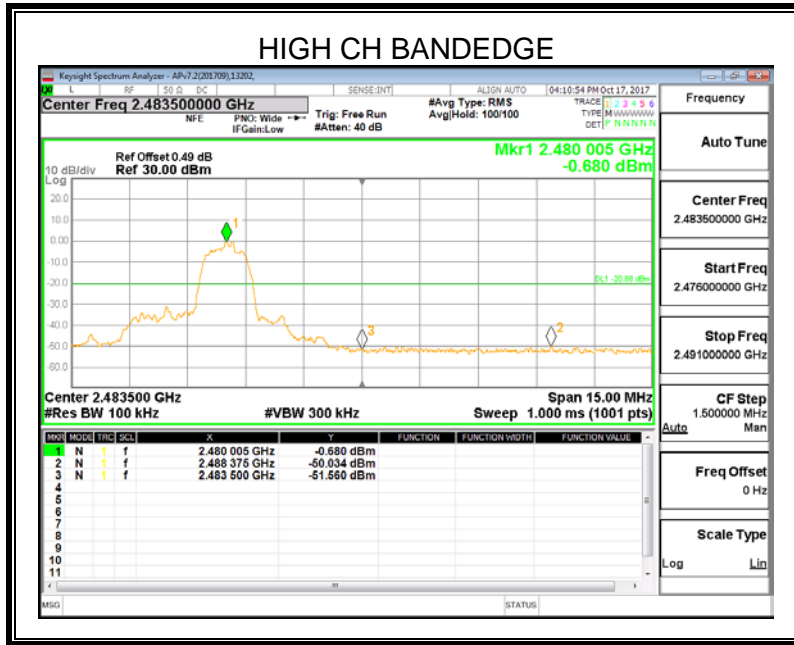
SPURIOUS EMISSIONS, LOW CHANNEL



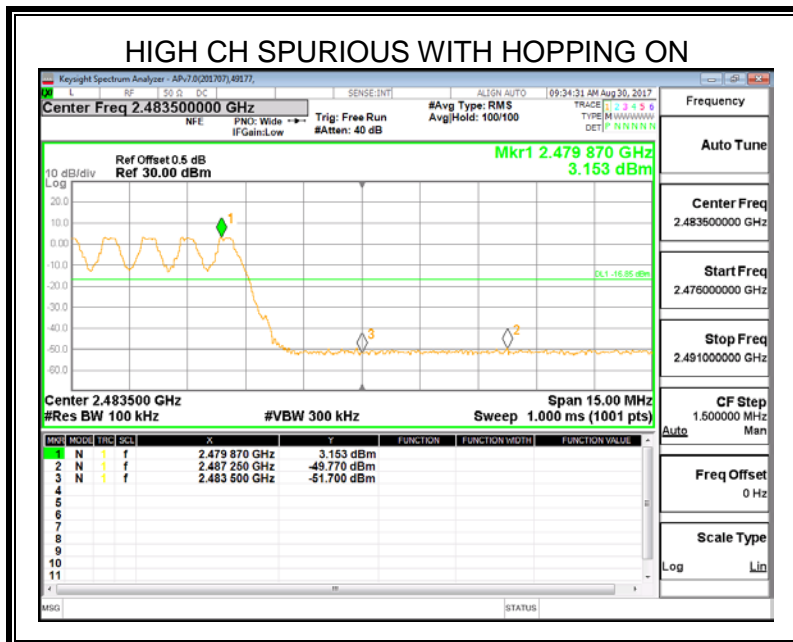
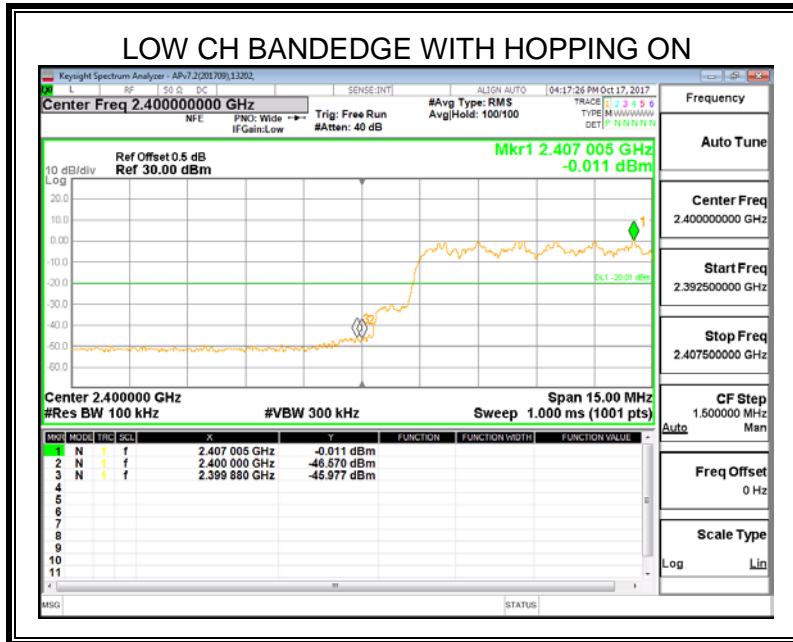
SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL



SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



7. RADIATED TEST RESULTS

7.1. LIMITS AND PROCEDURE

LIMITS

Please refer to FCC §15.205 and §15.209

Please refer to SS-GEN Clause 8.9 and Clause 8.10

Radiation Disturbance Test Limit for FCC (Class B)(9KHz-1GHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

Note: 1) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

(2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). This paragraph (f) shall not apply to Access BPL devices operating below 30 MHz.

Radiation Disturbance Test Limit for FCC (Above 1G)

Frequency (MHz)	dB(uV/m) (at 3 meters)	
	Peak	Average
Above 1000	74	54

Restricted bands of operation

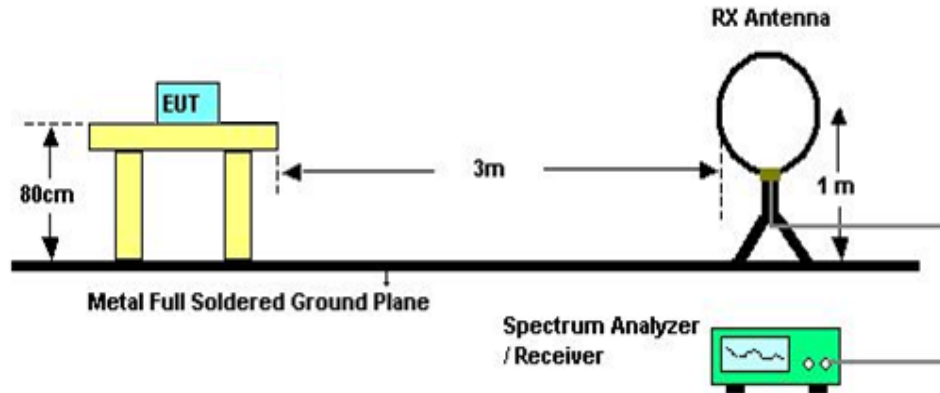
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

Note: ¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

²Above 38.6c

TEST SETUP AND PROCEDURE

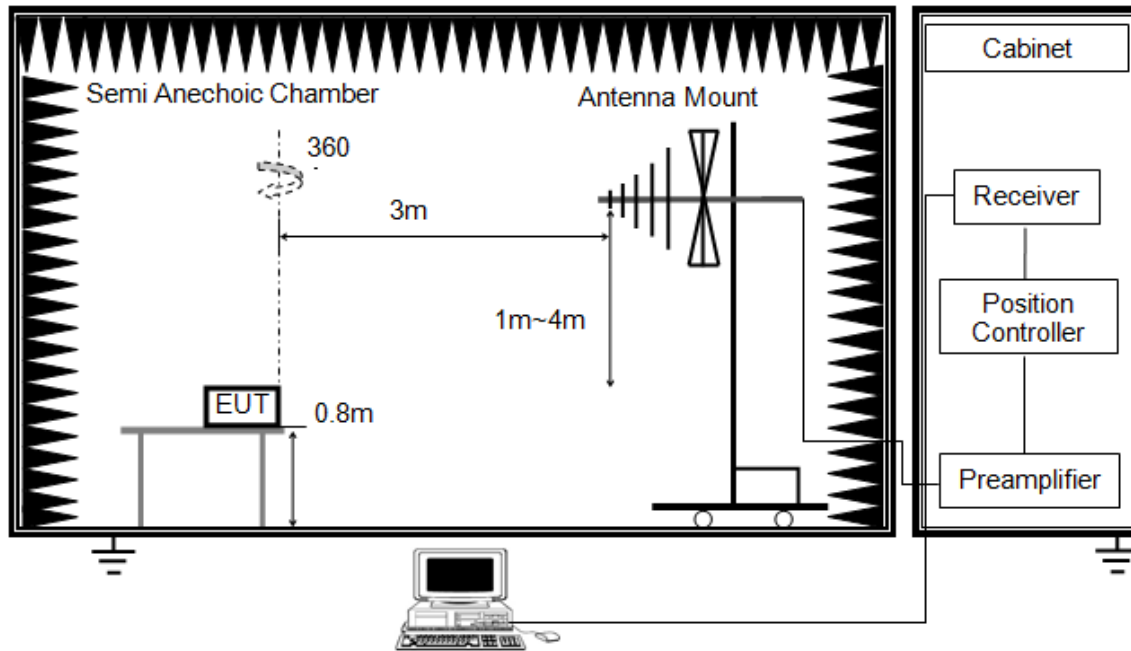
Below 30MHz



The setting of the spectrum analyser

RBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
VBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
Sweep	Auto
Trace	Max hold

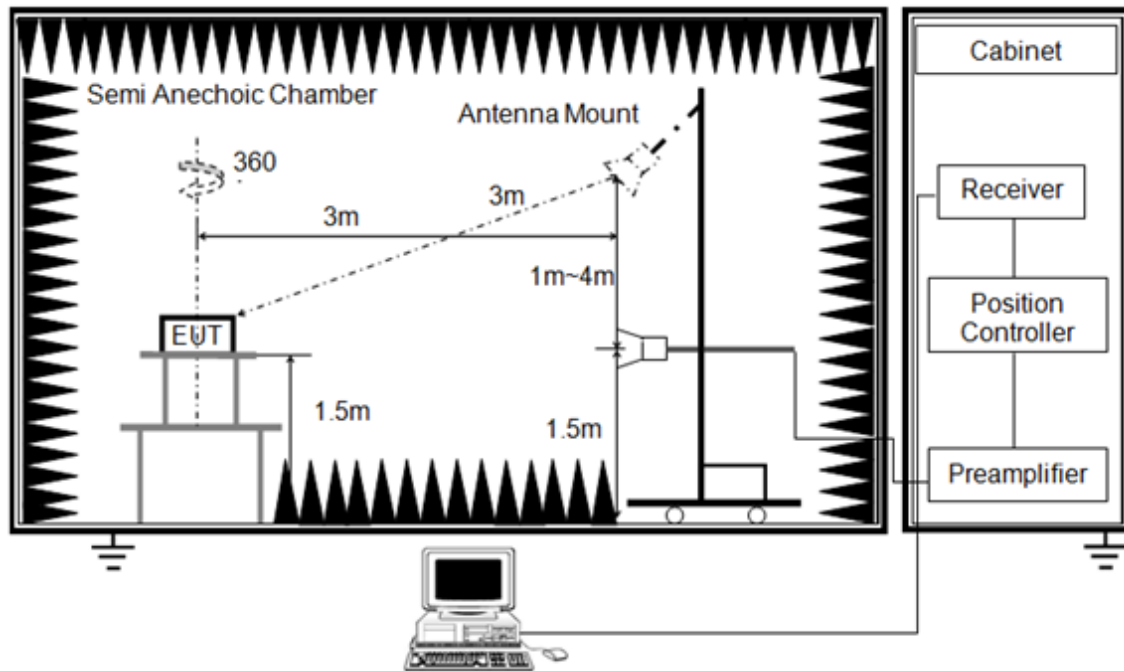
1. The testing follows the guidelines in ANSI C63.10-2013
2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 0.8m meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
6. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)



The setting of the spectrum analyser

RBW	120K
VBW	300K
Sweep	Auto
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 0.8m above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
6. For the actual test configuration, please refer to the related Item in this test report.



RBW	1M
VBW	PEAK: 3M AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 1.5m above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement above 1GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.
6. For average power measurement, set the detector to RMS, while maintaining all of the other instrument settings, if the duty cycle of the EUT is less than 98%, the Duty Cycle Correction Factor shall be added to the measured emission levels. For the Duty Cycle and Correction Factor please refer to clause 6.1.ON TIME AND DUTY CYCLE
7. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)

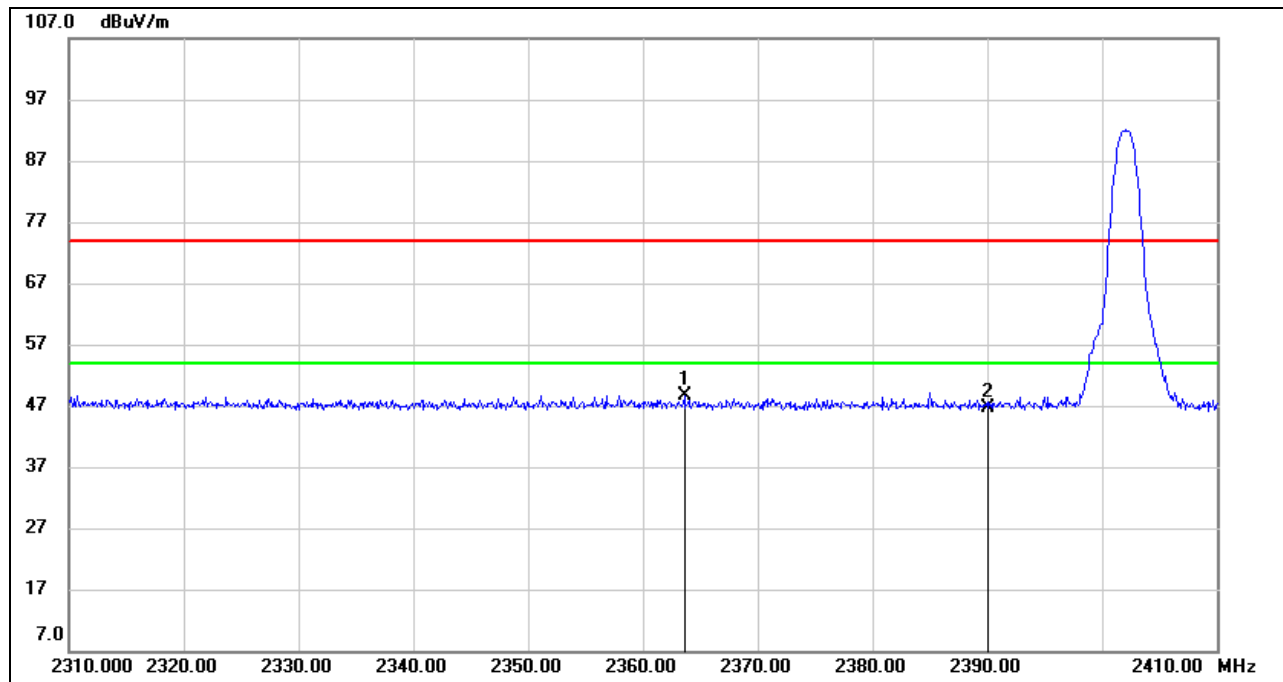
X axis, Y axis, Z axis positions, please refer to Setup Photo.

Note: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

7.2. RESTRICTED BANDEDGE

7.2.1. GFSK MODE

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



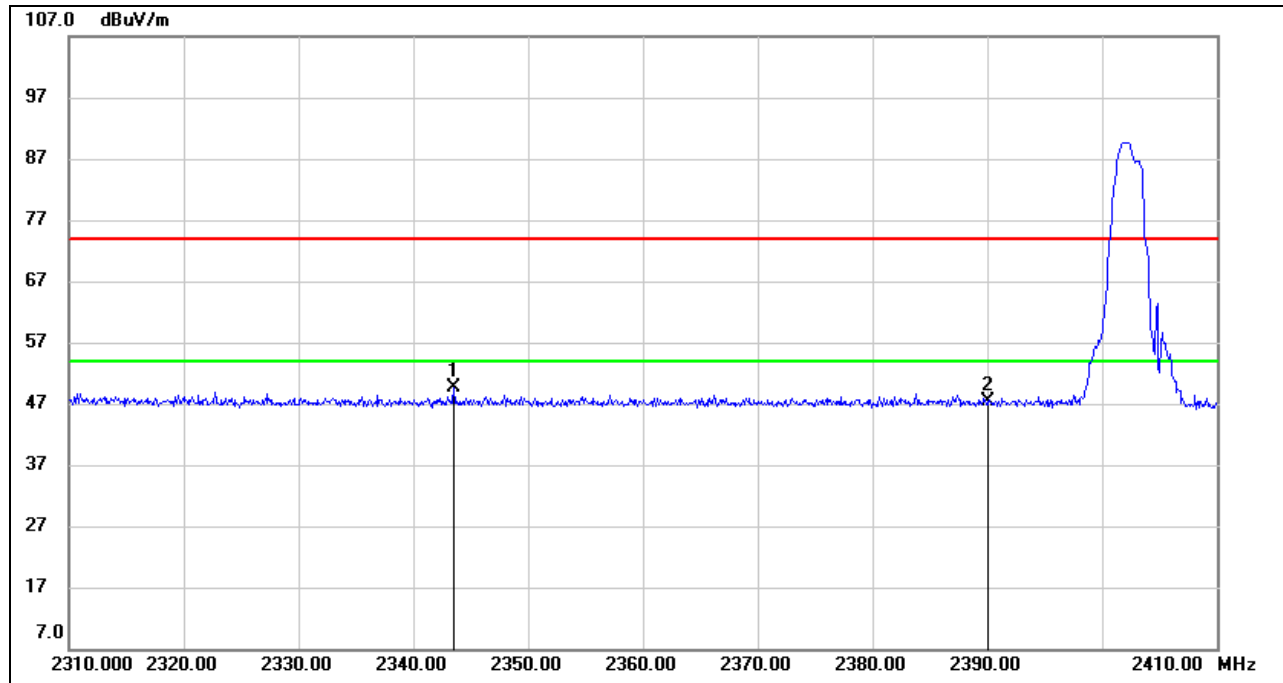
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2363.600	15.31	33.33	48.64	74.00	-25.36	peak
2	2390.000	13.48	33.14	46.62	74.00	-27.38	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Duty cycle factor was taking into account.

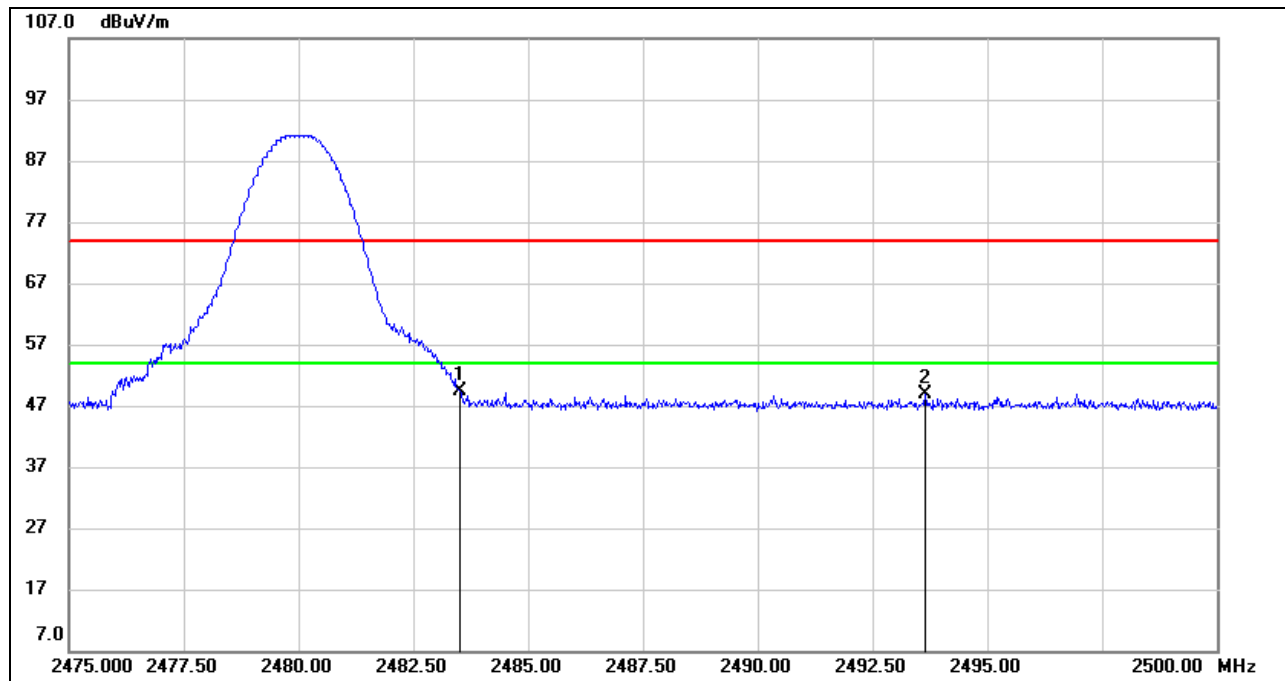
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2343.500	16.09	33.58	49.67	74.00	-24.33	peak
2	2390.000	14.07	33.24	47.31	74.00	-26.69	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Duty cycle factor was taking into account.

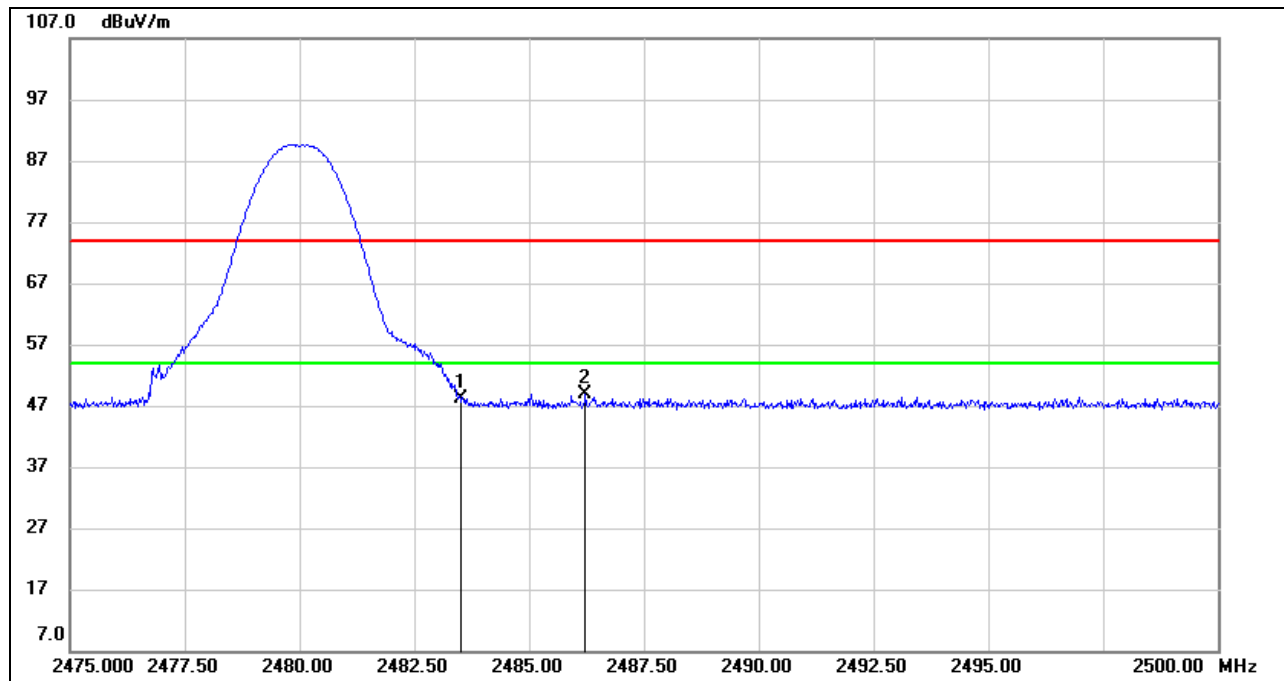
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	16.59	32.78	49.37	74.00	-24.63	peak
2	2493.650	16.11	32.77	48.88	74.00	-25.12	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Duty cycle factor was taking into account.

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

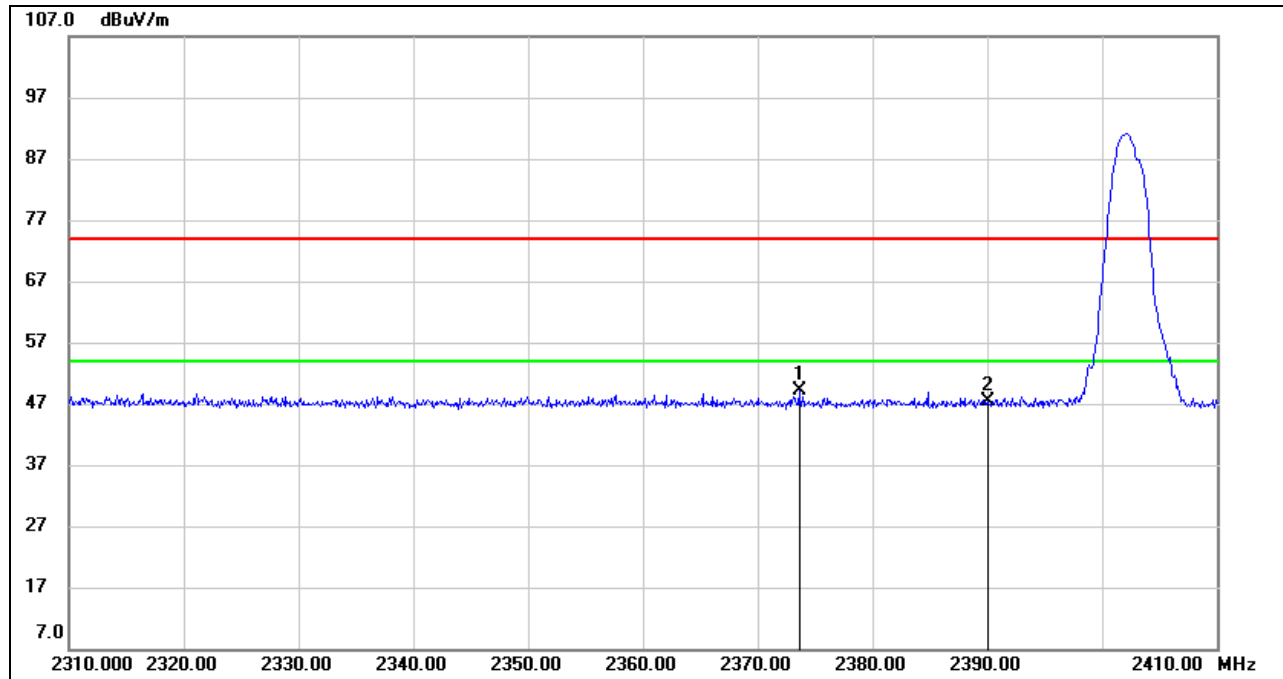


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	15.15	32.88	48.03	74.00	-25.97	peak
2	2486.225	16.05	32.89	48.94	74.00	-25.06	peak

Note: 1. Measurement = Reading Level + Correct Factor.
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
 3. Duty cycle factor was taking into account.

7.2.2. 8DPSK MODE

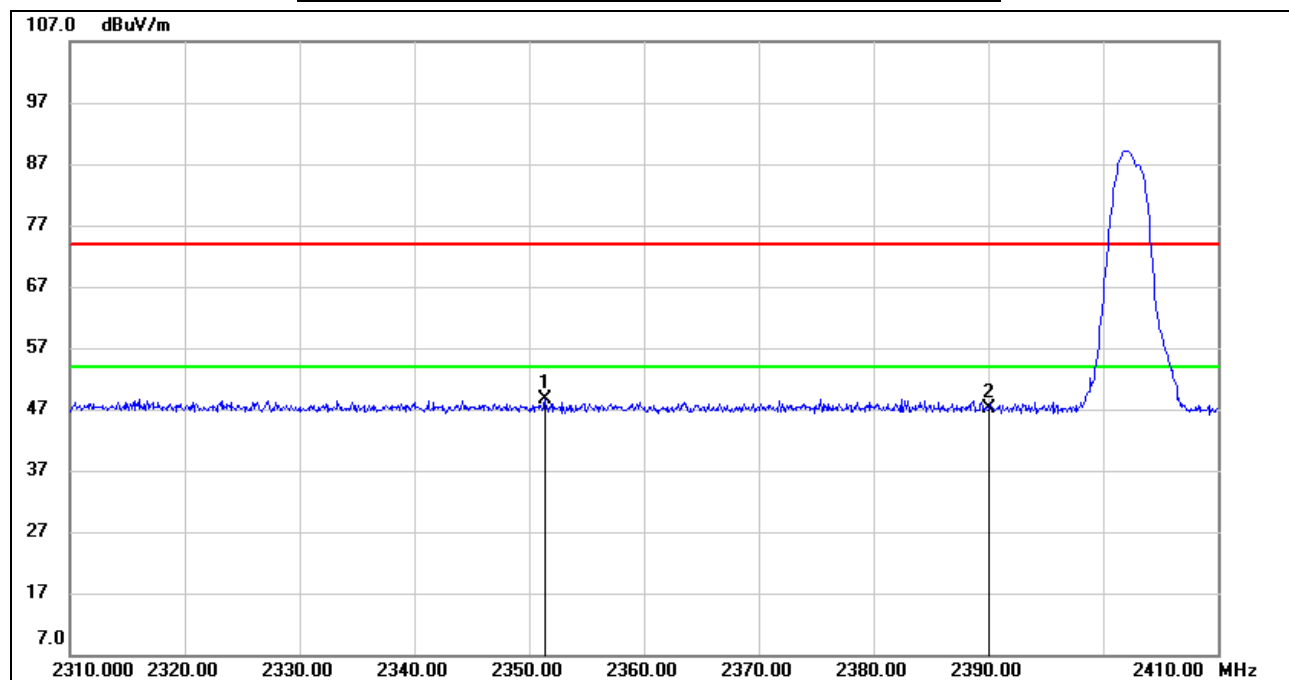
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2373.600	15.81	33.26	49.07	74.00	-24.93	peak
2	2390.000	14.23	33.14	47.37	74.00	-26.63	peak

- Note: 1. Measurement = Reading Level + Correct Factor.
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
 3. Duty cycle factor was taking into account.

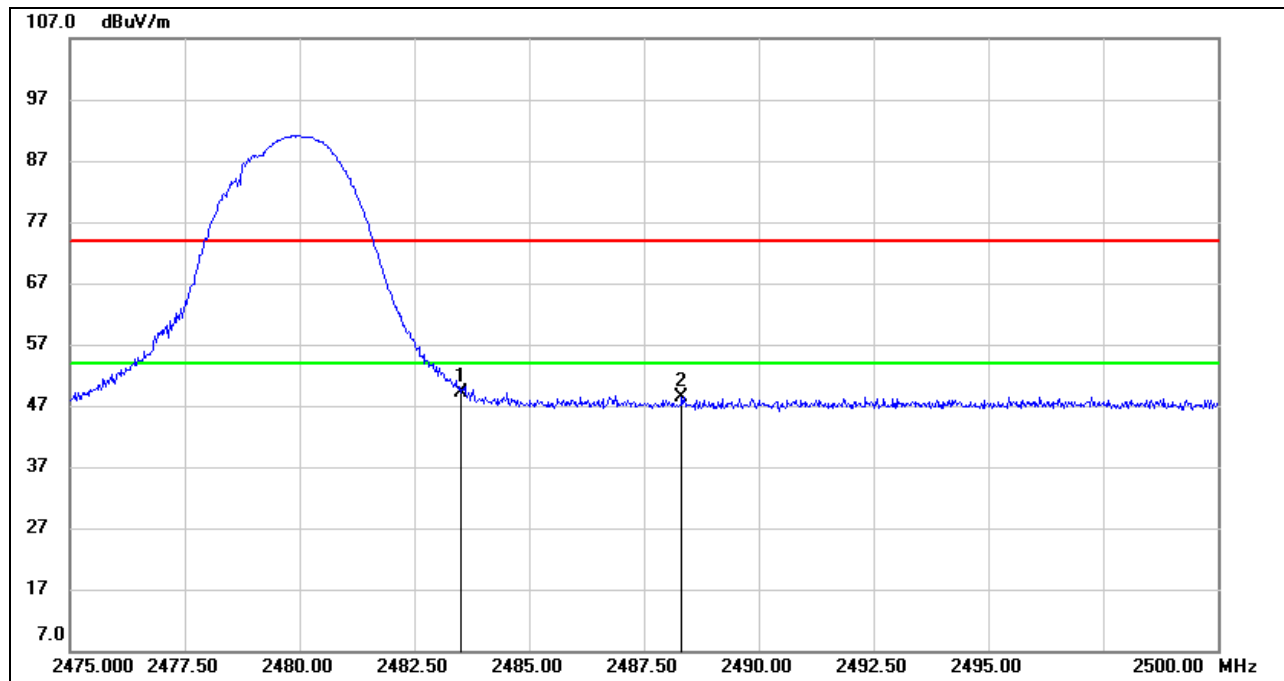
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2351.400	15.09	33.52	48.61	74.00	-25.39	peak
2	2390.000	13.79	33.24	47.03	74.00	-26.97	peak

- Note: 1. Measurement = Reading Level + Correct Factor.
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
 3. Duty cycle factor was taking into account.

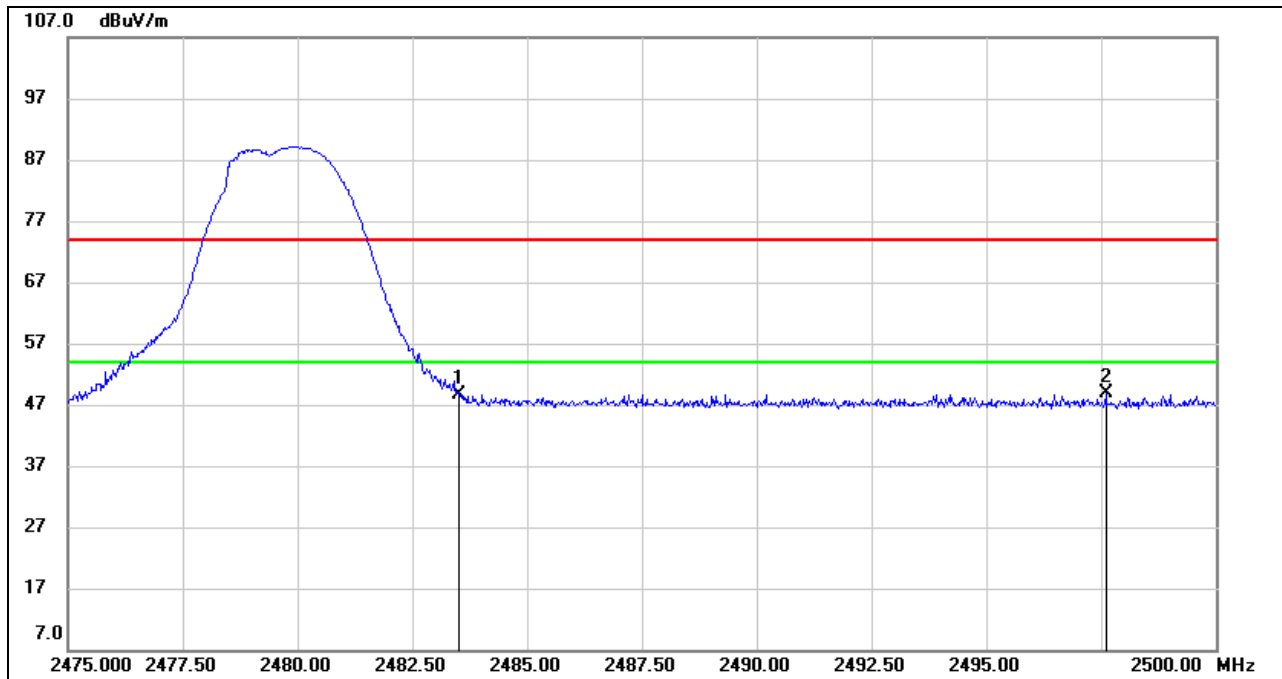
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	16.25	32.78	49.03	74.00	-24.97	peak
2	2488.325	15.56	32.78	48.34	74.00	-25.66	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Duty cycle factor was taking into account.

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



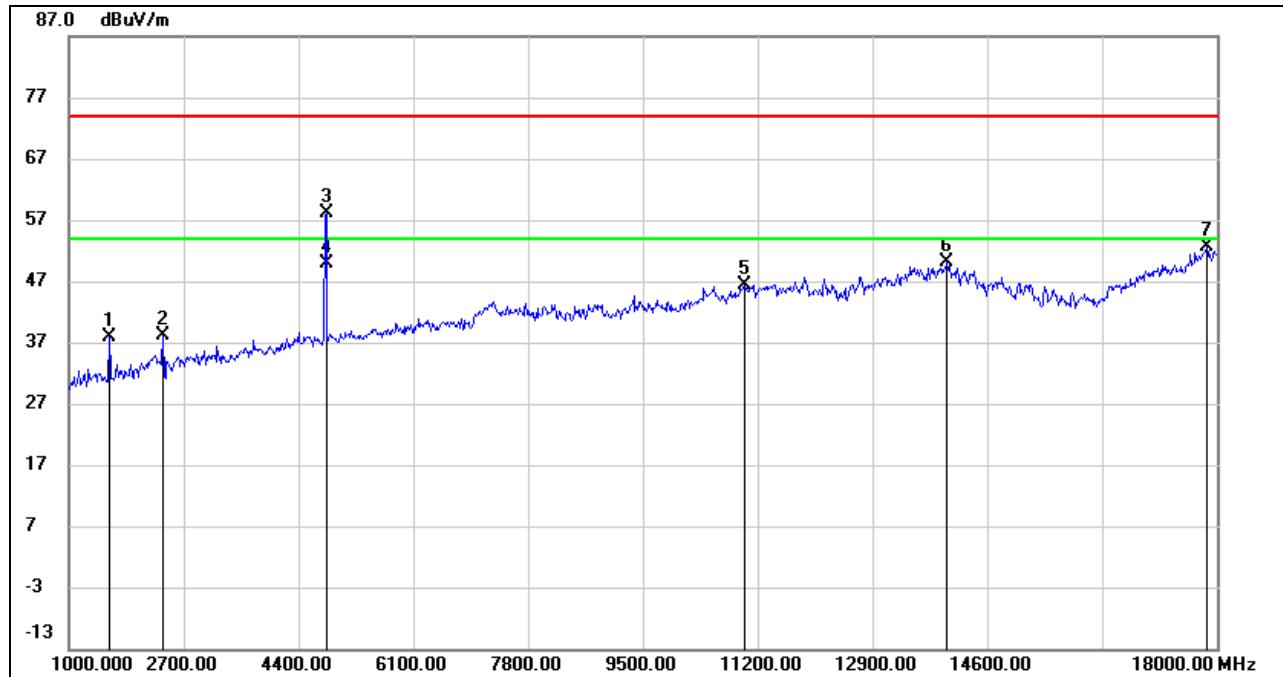
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	15.68	32.88	48.56	74.00	-25.44	peak
2	2497.600	15.95	32.87	48.82	74.00	-25.18	peak

Note: 1. Measurement = Reading Level + Correct Factor.
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
 3. Duty cycle factor was taking into account.

7.3. SPURIOUS EMISSIONS (1~18GHz)

7.3.1. GFSK MODE

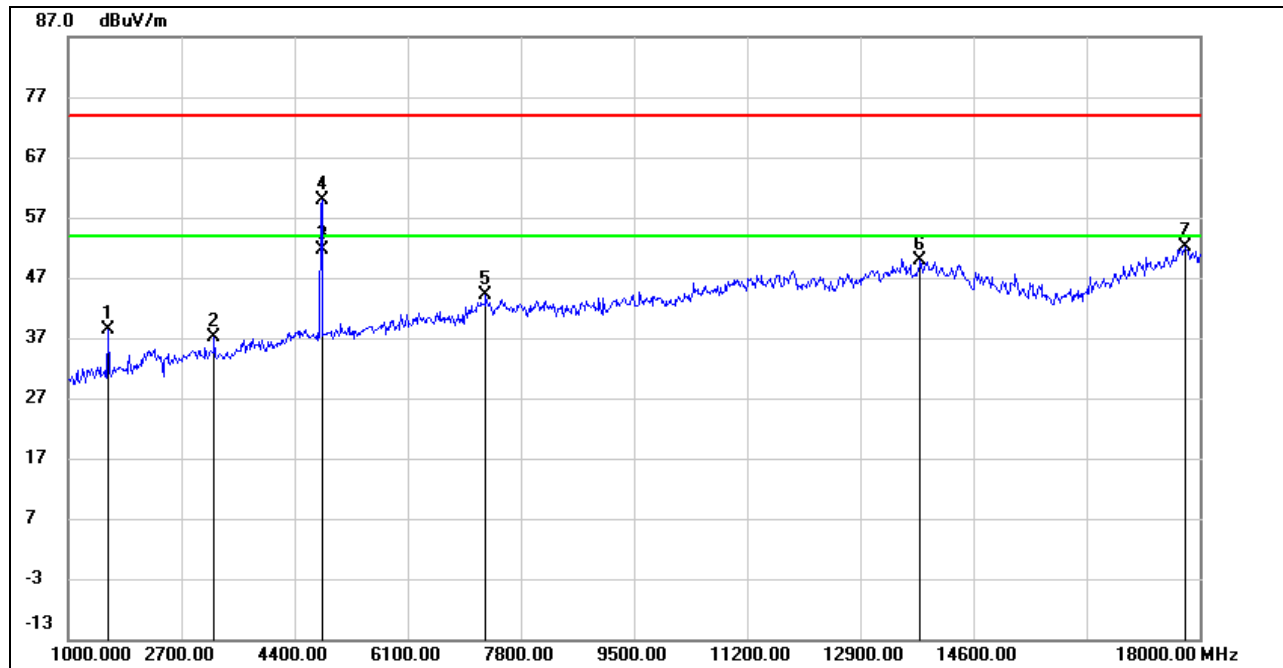
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1595.000	50.60	-12.71	37.89	74.00	-36.11	peak
2	2394.000	46.96	-8.94	38.02	74.00	-35.98	peak
3	4804.100	59.83	-1.76	58.07	74.00	-15.93	peak
4	4804.230	51.54	-1.76	49.78	54.00	-4.22	AVG
5	10996.000	33.26	13.09	46.35	74.00	-27.65	peak
6	14005.000	31.30	18.87	50.17	74.00	-23.83	peak
7	17847.000	26.75	25.95	52.70	74.00	-21.30	peak

- Note: 1. Measurement = Reading Level + Correct Factor.
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
 3. Duty cycle factor was taking into account.

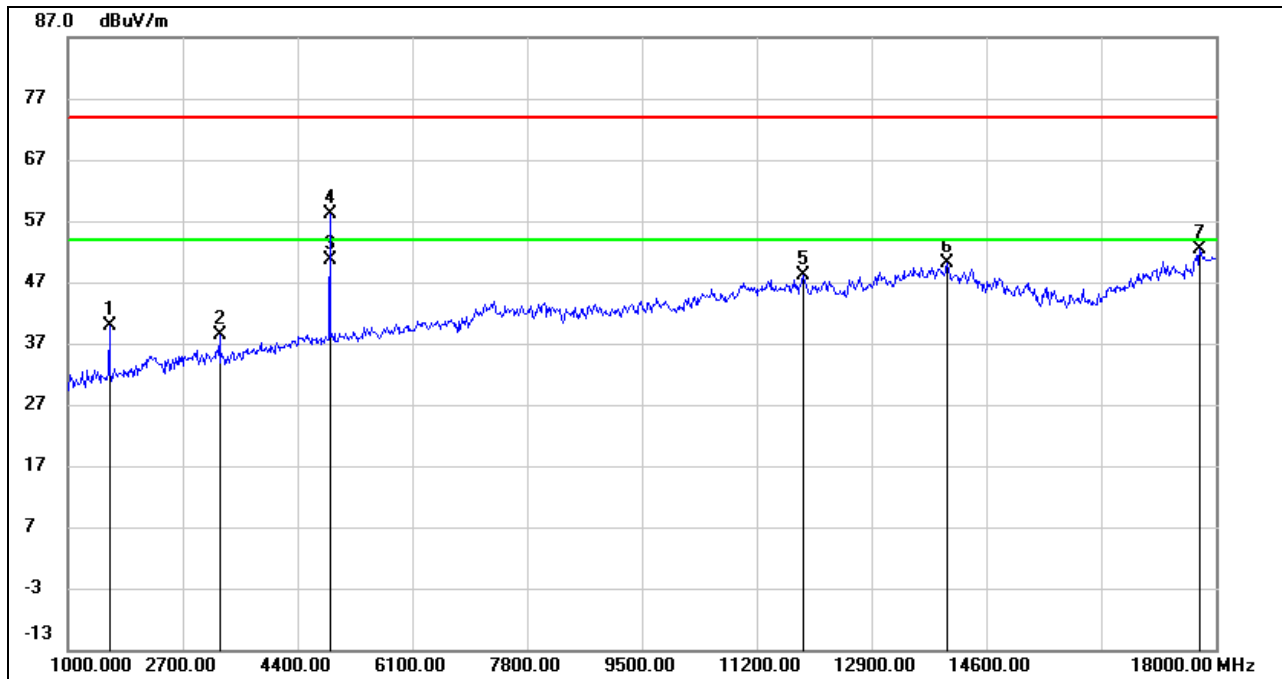
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1595.000	51.03	-12.70	38.33	74.00	-35.67	peak
2	3193.000	43.60	-6.35	37.25	74.00	-36.75	peak
3	4804.130	53.31	-1.67	51.64	54.00	-2.36	AVG
4	4804.310	61.46	-1.67	59.79	74.00	-14.21	peak
5	7273.000	38.22	5.91	44.13	74.00	-29.87	peak
6	13801.000	30.37	19.49	49.86	74.00	-24.14	peak
7	17779.000	26.16	25.99	52.15	74.00	-21.85	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Duty cycle factor was taking into account.

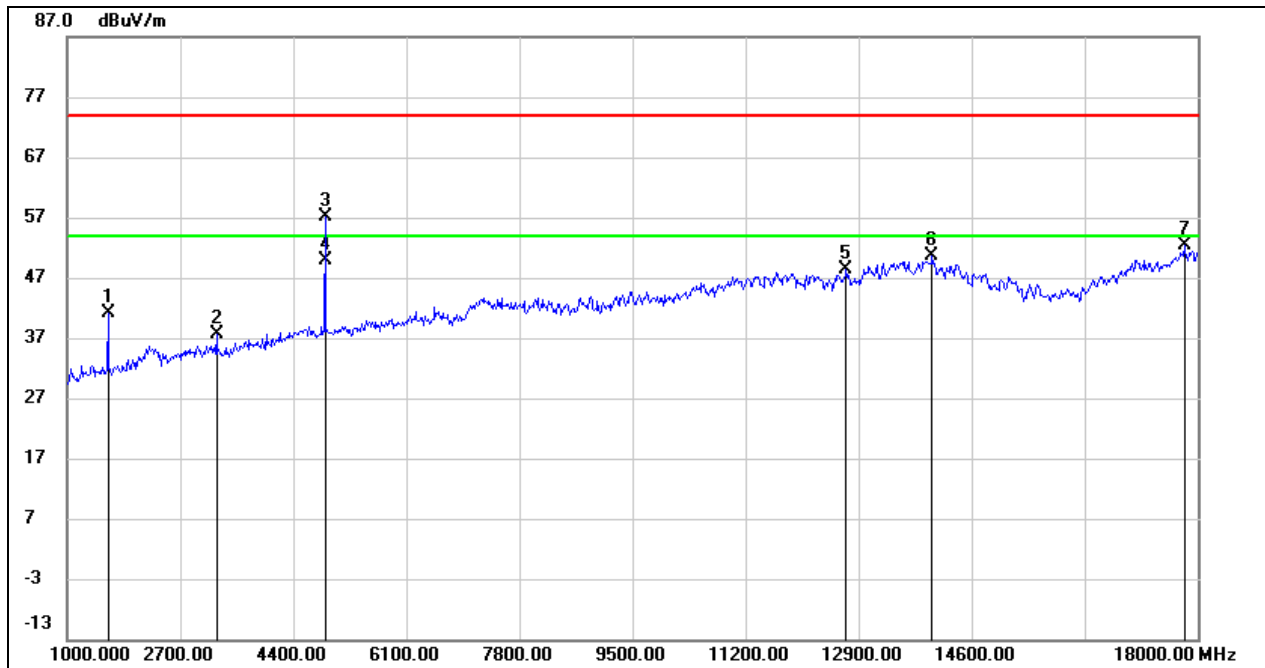
HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1612.000	52.55	-12.61	39.94	74.00	-34.06	peak
2	3244.000	44.76	-6.40	38.36	74.00	-35.64	peak
3	4881.870	51.49	-0.86	50.63	54.00	-3.37	AVG
4	4881.930	59.07	-0.85	58.22	74.00	-15.78	peak
5	11897.000	32.60	15.53	48.13	74.00	-25.87	peak
6	14022.000	31.37	18.87	50.24	74.00	-23.76	peak
7	17762.000	27.01	25.36	52.37	74.00	-21.63	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Duty cycle factor was taking into account.

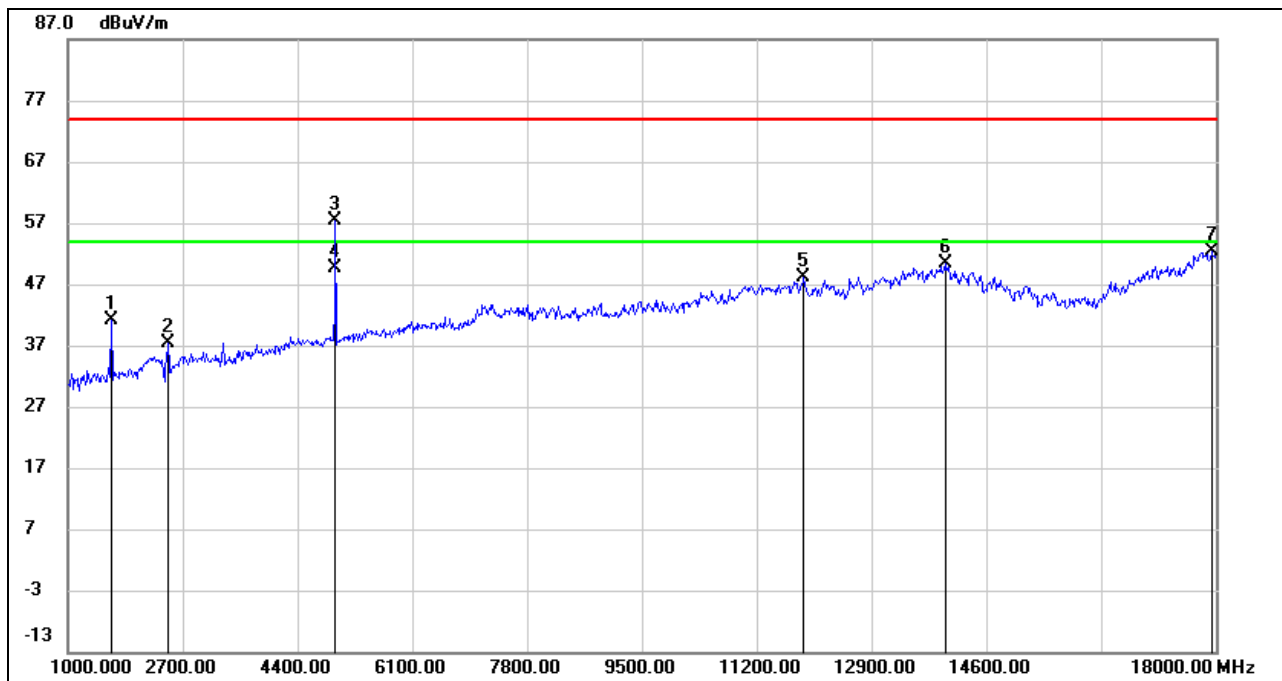
HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1612.000	53.71	-12.61	41.10	74.00	-32.90	peak
2	3244.000	43.85	-6.31	37.54	74.00	-36.46	peak
3	4881.890	58.05	-0.93	57.12	74.00	-16.88	peak
4	4881.940	50.72	-0.92	49.80	54.00	-4.20	AVG
5	12713.000	32.36	16.01	48.37	74.00	-25.63	peak
6	14005.000	31.65	18.95	50.60	74.00	-23.40	peak
7	17796.000	26.13	26.24	52.37	74.00	-21.63	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Duty cycle factor was taking into account.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)



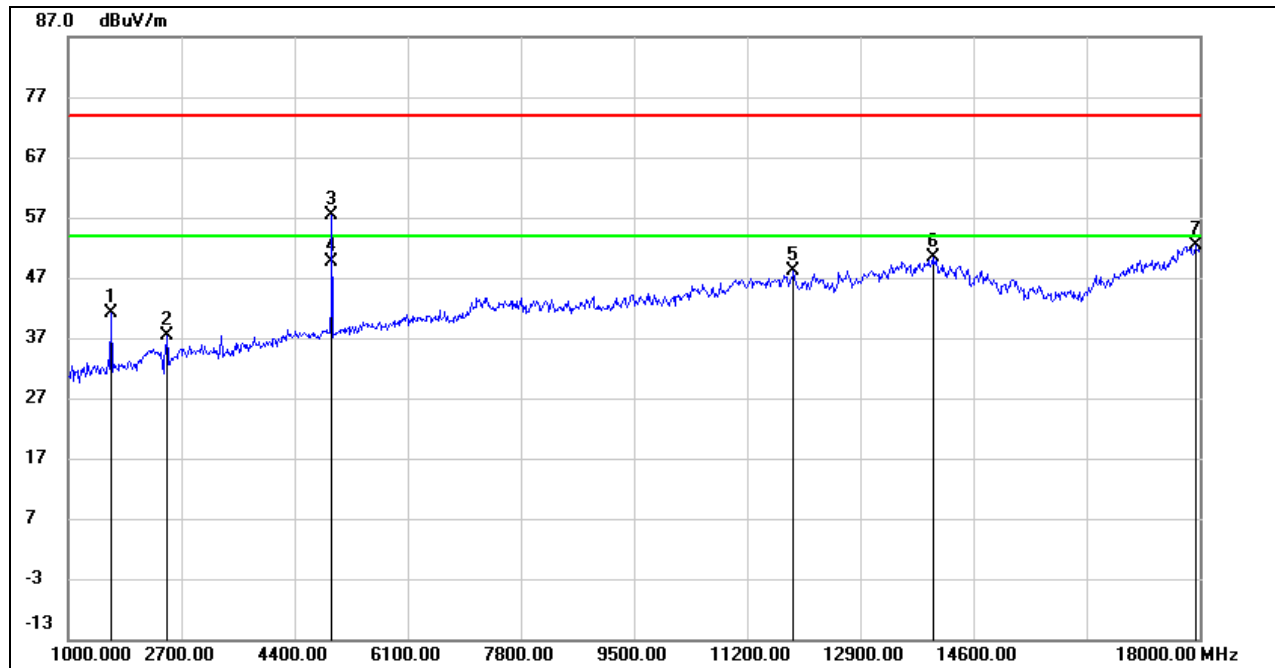
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1646.000	53.44	-12.42	41.02	74.00	-32.98	peak
2	2479.000	46.57	-9.21	37.36	74.00	-36.64	peak
3	4961.000	58.23	-0.78	57.45	74.00	-16.55	peak
4	4961.000	50.53	-0.78	49.75	54.00	-4.25	AVG
5	11897.000	32.68	15.53	48.21	74.00	-25.79	peak
6	13988.000	31.42	18.89	50.31	74.00	-23.69	peak
7	17932.000	26.11	26.28	52.39	74.00	-21.61	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Duty cycle factor was taking into account.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)

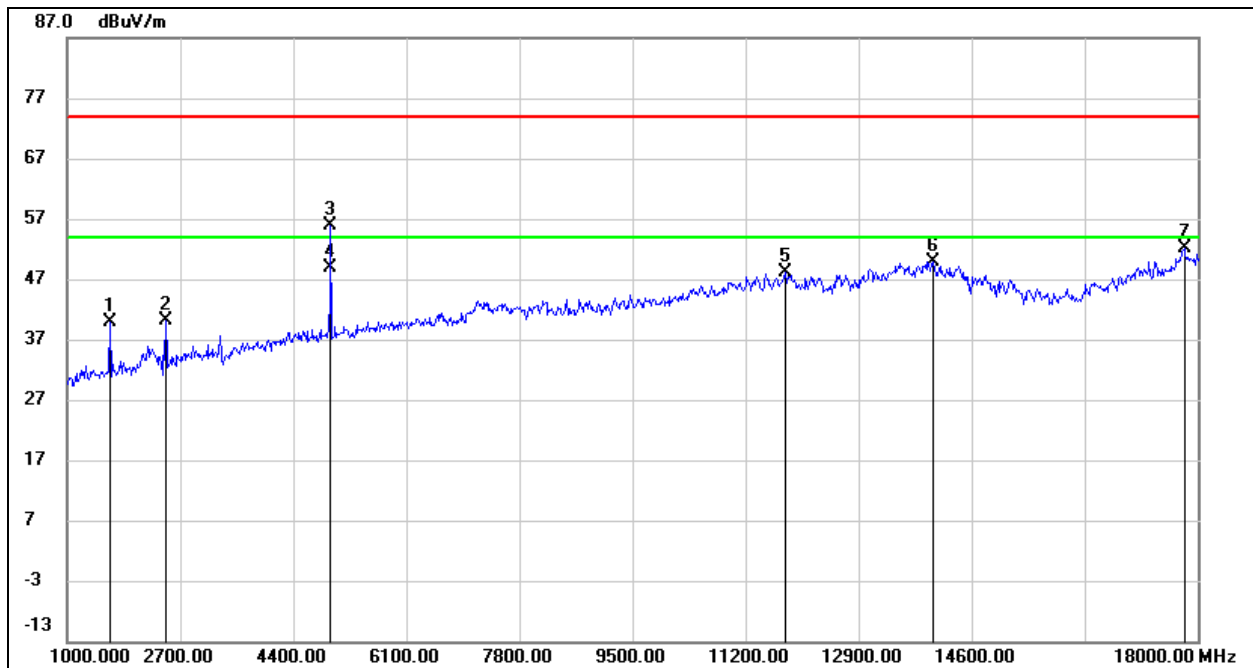


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1646.000	53.44	-12.42	41.02	74.00	-32.98	peak
2	2479.000	46.57	-9.21	37.36	74.00	-36.64	peak
3	4961.000	58.23	-0.78	57.45	74.00	-16.55	peak
4	4961.000	50.53	-0.78	49.75	54.00	-4.25	AVG
5	11897.000	32.68	15.53	48.21	74.00	-25.79	peak
6	13988.000	31.42	18.89	50.31	74.00	-23.69	peak
7	17932.000	26.11	26.28	52.39	74.00	-21.61	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Duty cycle factor was taking into account.

7.3.2. 8DPSK MODE

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



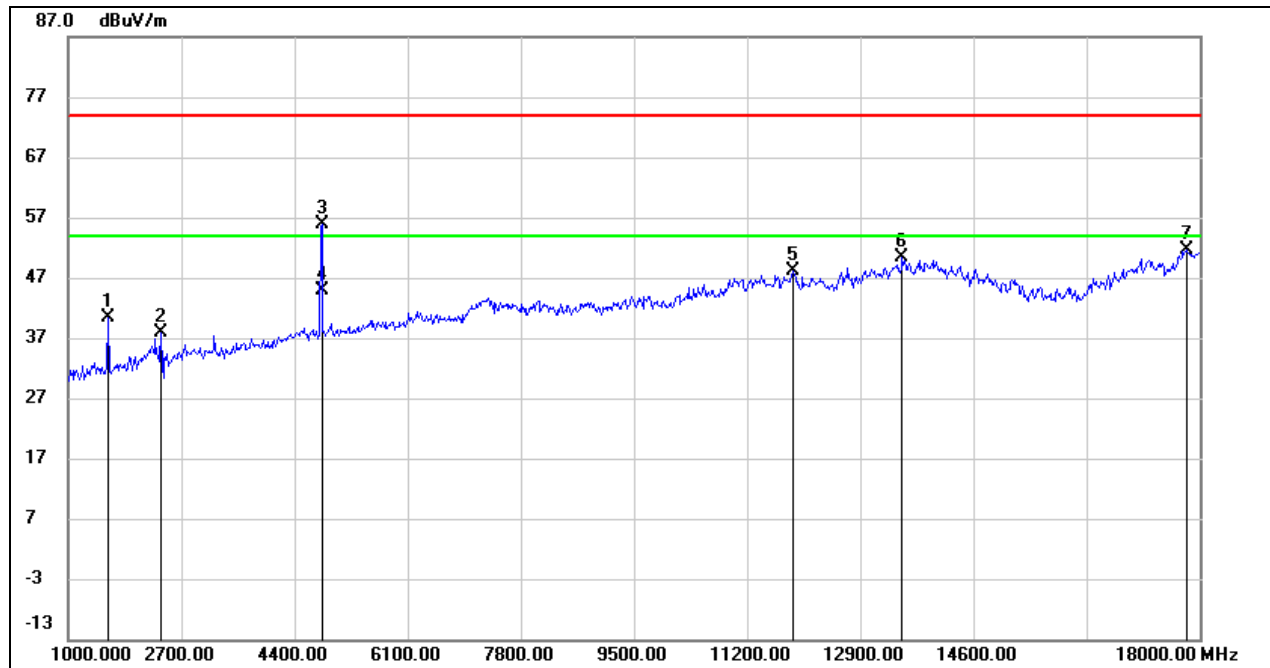
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1646.000	52.37	-12.42	39.95	74.00	-34.05	peak
2	2479.000	49.19	-9.11	40.08	74.00	-33.92	peak
3	4961.000	56.70	-0.76	55.94	74.00	-18.06	peak
4	4961.000	49.63	-0.76	48.87	54.00	-5.13	AVG
5	11795.000	33.17	14.87	48.04	74.00	-25.96	peak
6	14022.000	30.90	18.88	49.78	74.00	-24.22	peak
7	17796.000	25.81	26.24	52.05	74.00	-21.95	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Duty cycle factor was taking into account.

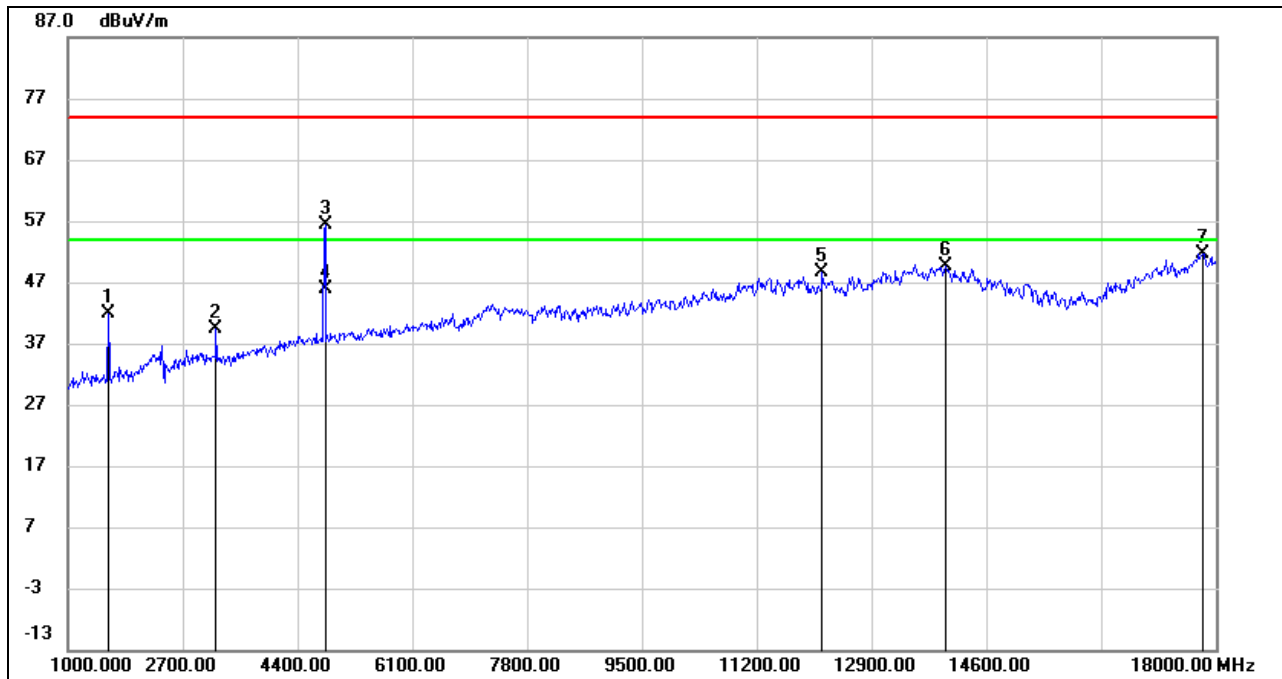
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1595.000	53.19	-12.71	40.48	74.00	-33.52	peak
2	2394.000	46.89	-8.94	37.95	74.00	-36.05	peak
3	4804.010	57.66	-1.76	55.90	74.00	-18.10	peak
4	4804.150	46.76	-1.76	45.00	54.00	-9.00	AVG
5	11880.000	32.90	15.18	48.08	74.00	-25.92	peak
6	13529.000	31.56	18.71	50.27	74.00	-23.73	peak
7	17796.000	25.90	25.84	51.74	74.00	-22.26	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Duty cycle factor was taking into account.

HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)

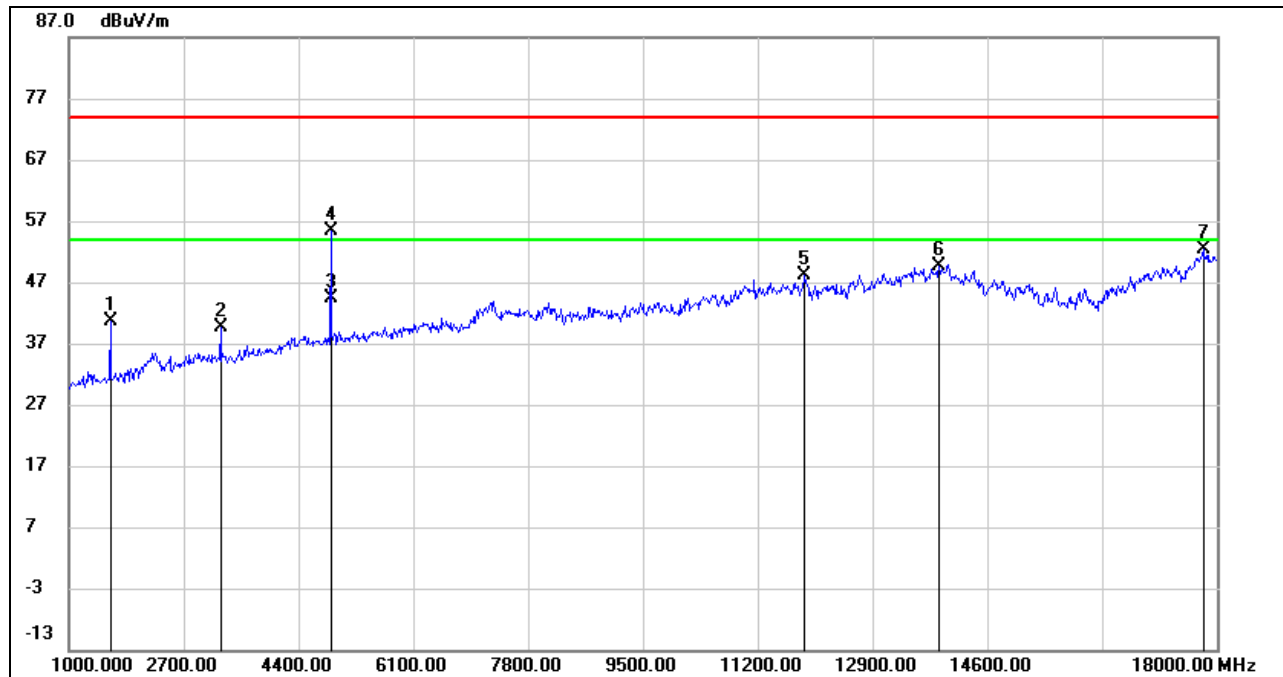


Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Duty cycle factor was taking into account.

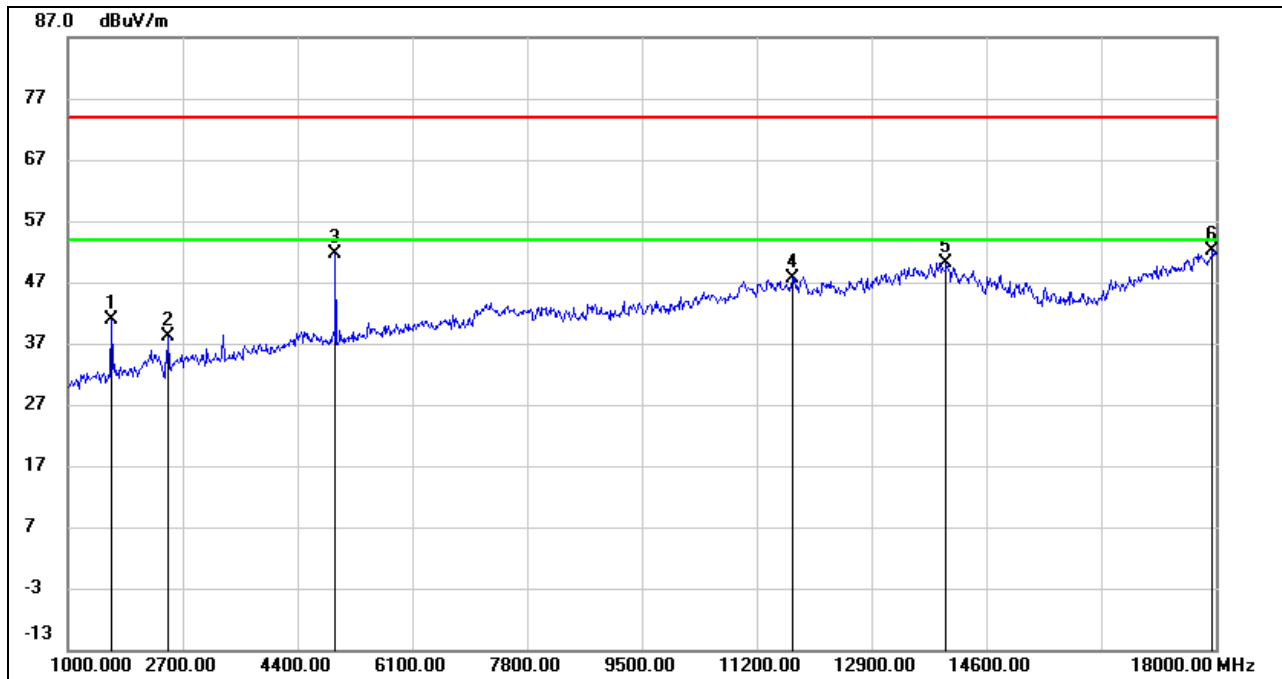
HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1612.000	53.13	-12.61	40.52	74.00	-33.48	peak
2	3244.000	46.04	-6.40	39.64	74.00	-34.36	peak
3	4881.320	45.21	-0.87	44.34	54.00	-9.66	AVG
4	4884.180	56.13	-0.83	55.30	74.00	-18.70	peak
5	11897.000	32.52	15.53	48.05	74.00	-25.95	peak
6	13886.000	30.58	18.98	49.56	74.00	-24.44	peak
7	17796.000	26.57	25.84	52.41	74.00	-21.59	peak

- Note: 1. Measurement = Reading Level + Correct Factor.
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
 3. Duty cycle factor was taking into account.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)

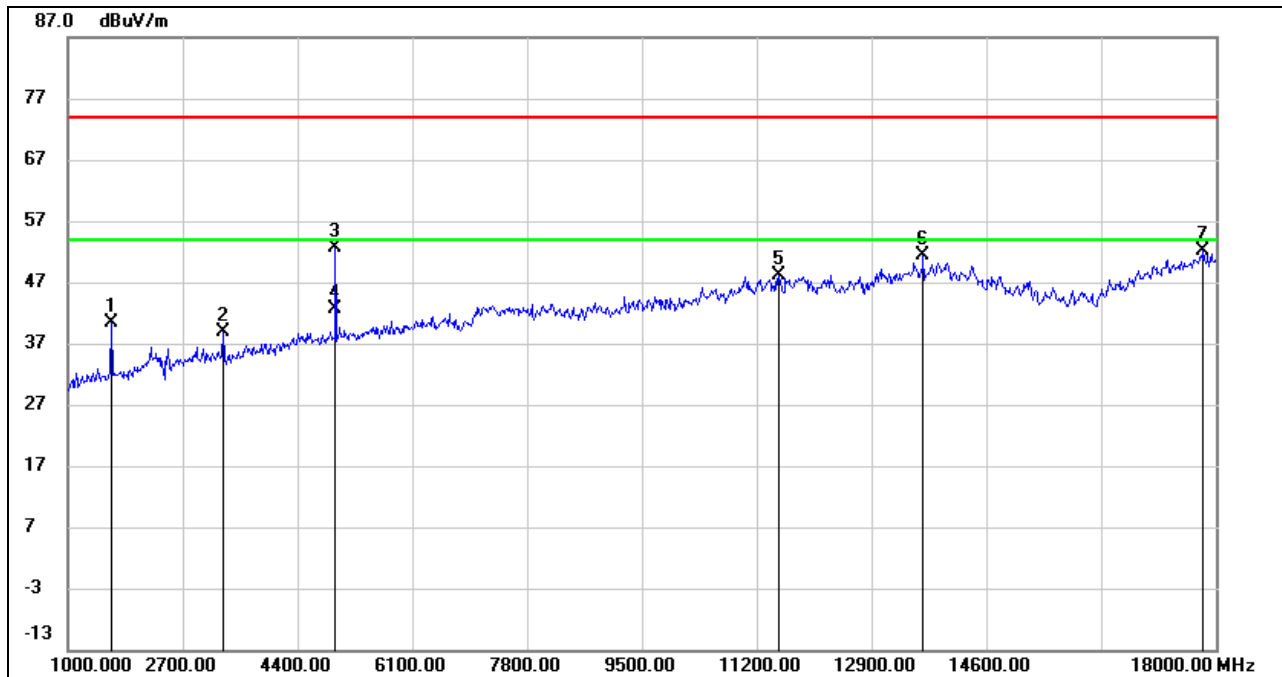


Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Duty cycle factor was taking into account.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1646.000	52.87	-12.42	40.45	74.00	-33.55	peak
2	3295.000	45.29	-6.45	38.84	74.00	-35.16	peak
3	4961.000	53.40	-0.76	52.64	74.00	-21.36	peak
4	4961.000	43.30	-0.76	42.54	54.00	-11.46	AVG
5	11523.000	33.66	14.43	48.09	74.00	-25.91	peak
6	13665.000	32.28	19.10	51.38	74.00	-22.62	peak
7	17813.000	25.97	26.11	52.08	74.00	-21.92	peak

Note: 1. Measurement = Reading Level + Correct Factor.

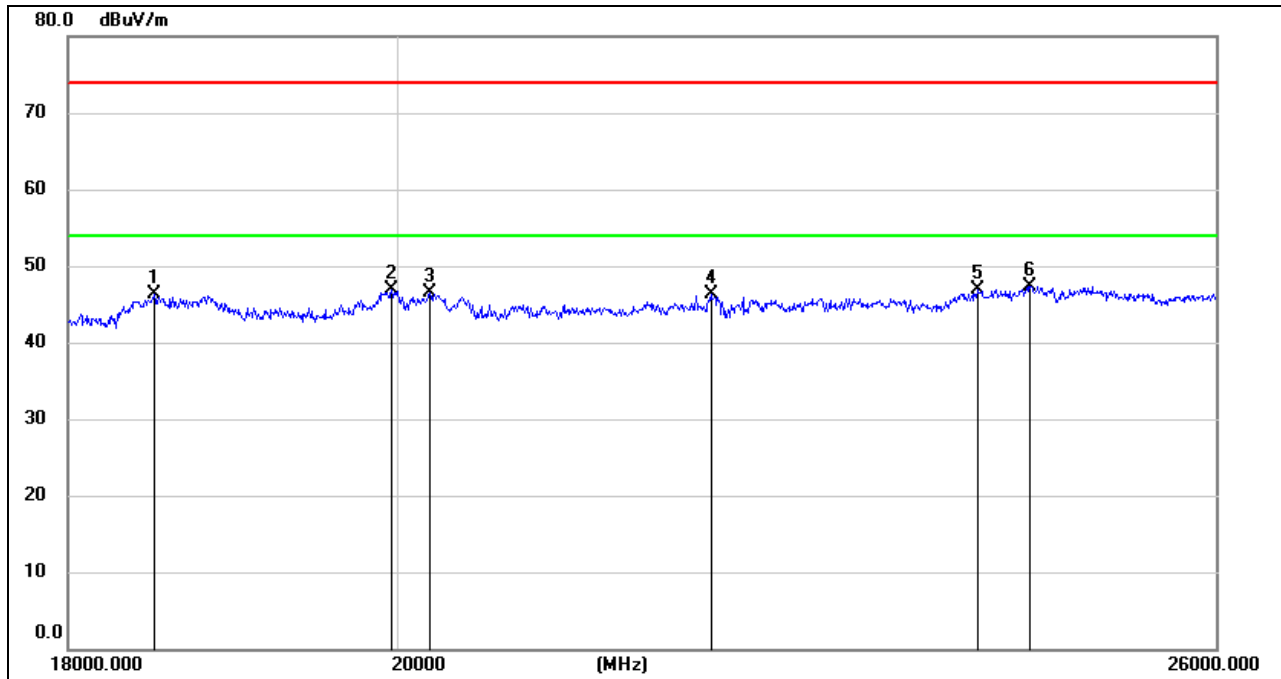
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Duty cycle factor was taking into account.

7.4. SPURIOUS EMISSIONS 18G ~ 26GHz

7.4.1. GFSK MODE

SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)



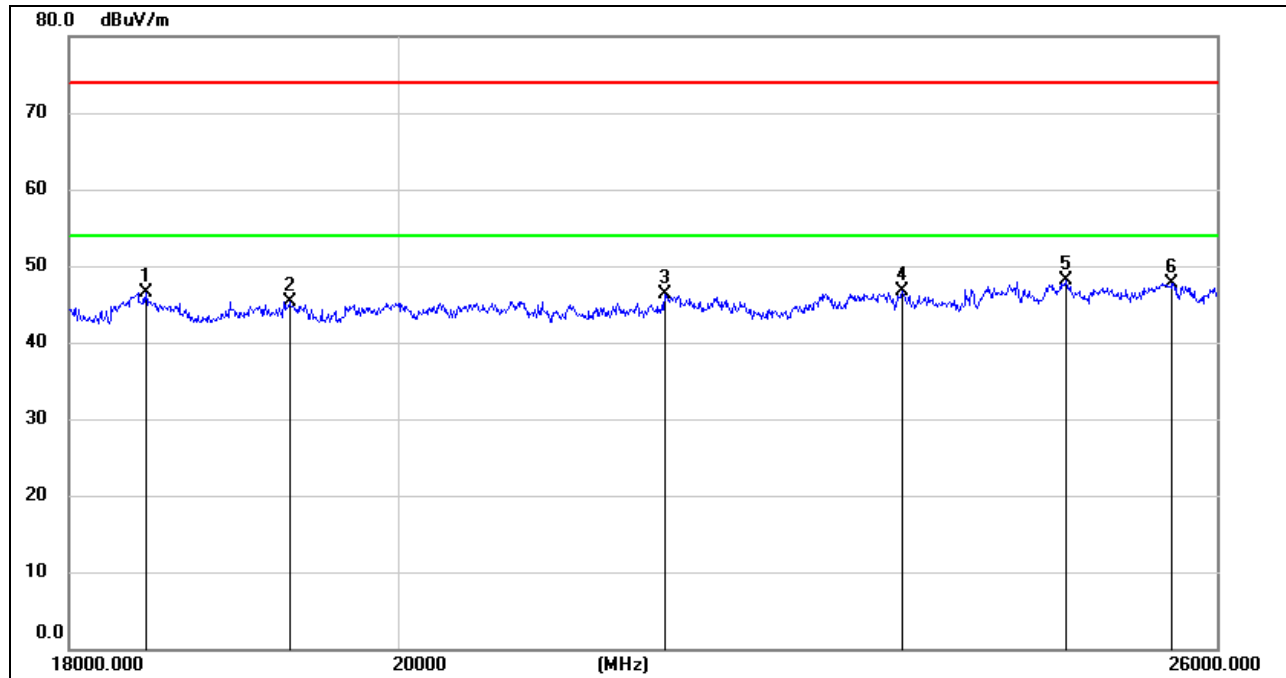
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	18503.337	51.46	-5.25	46.21	74.00	-27.79	peak
2	19966.785	52.25	-5.42	46.83	74.00	-27.17	peak
3	20210.556	52.04	-5.59	46.45	74.00	-27.55	peak
4	22115.918	50.74	-4.36	46.38	74.00	-27.62	peak
5	24085.495	49.58	-2.77	46.81	74.00	-27.19	peak
6	24496.374	49.72	-2.32	47.40	74.00	-26.60	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Duty cycle factor was taking into account.

SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, VERTICAL)



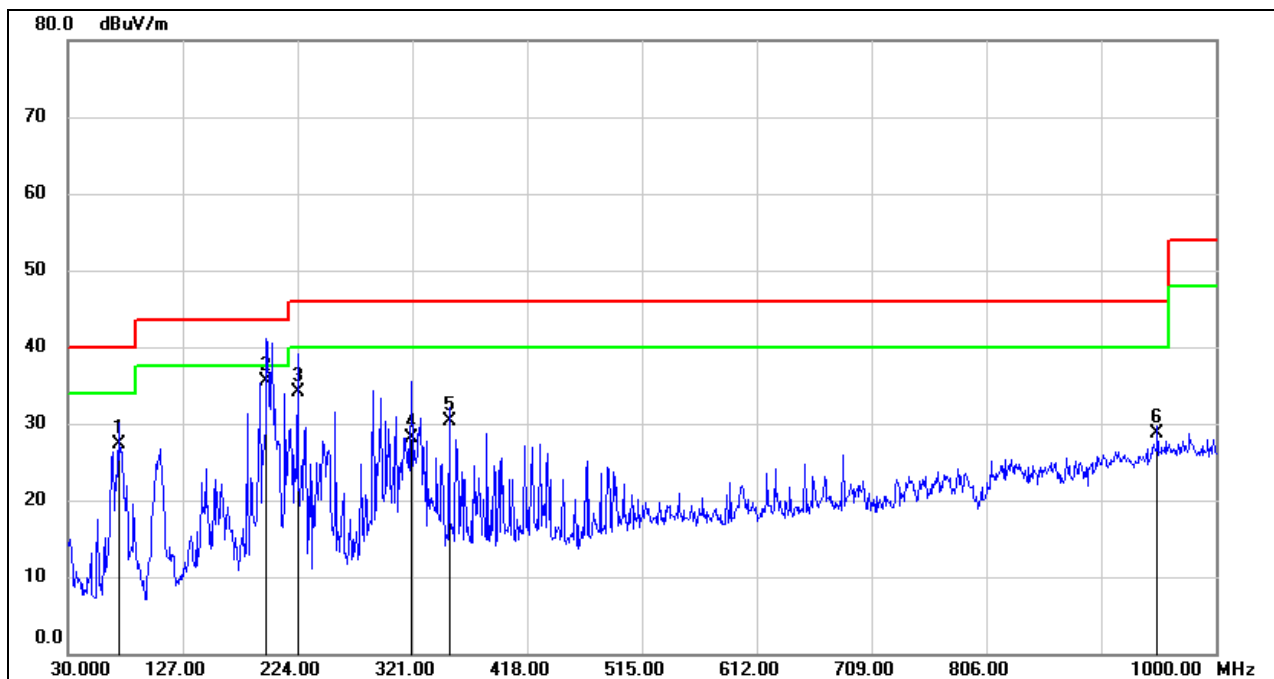
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	18448.984	51.77	-5.32	46.45	74.00	-27.55	peak
2	19316.795	50.96	-5.57	45.39	74.00	-28.61	peak
3	21784.984	50.67	-4.34	46.33	74.00	-27.67	peak
4	23507.980	49.82	-3.14	46.68	74.00	-27.32	peak
5	24777.218	50.37	-2.29	48.08	74.00	-25.92	peak
6	25629.788	48.84	-1.17	47.67	74.00	-26.33	peak

- Note: 1. Measurement = Reading Level + Correct Factor.
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
 3. Duty cycle factor was taking into account.

7.5. SPURIOUS EMISSIONS 30M ~ 1 GHz

7.5.1. GFSK MODE

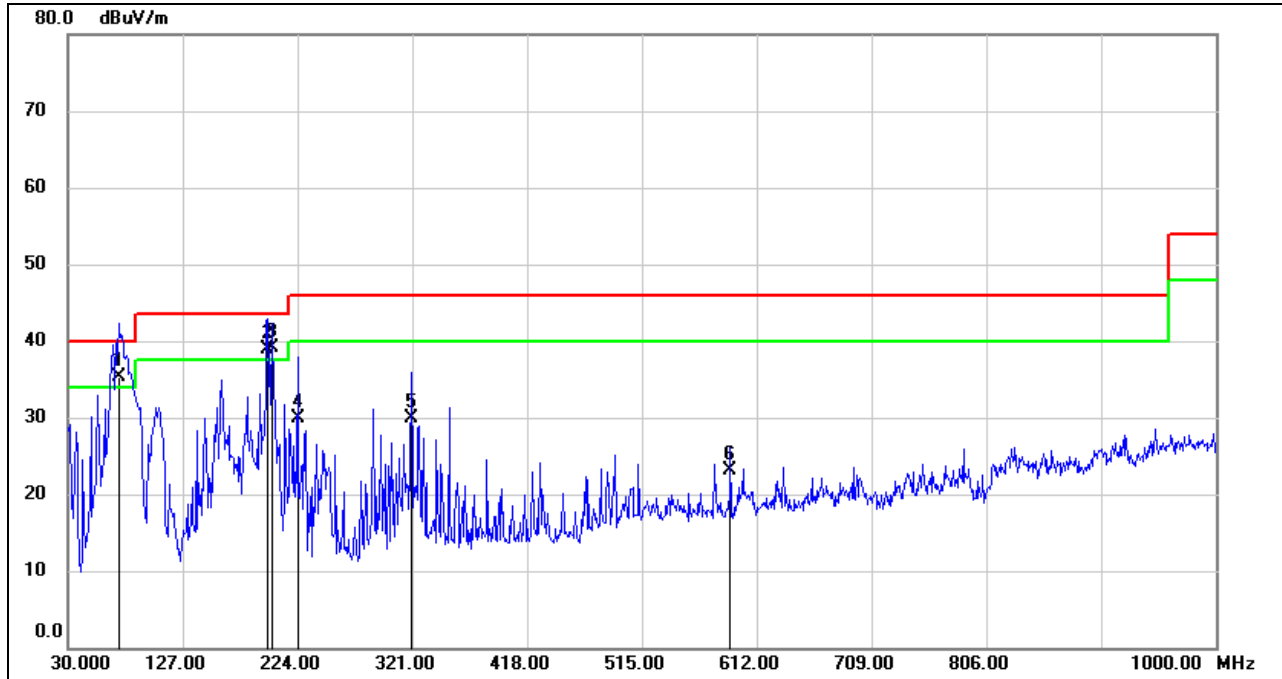
SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	72.6800	44.23	-17.00	27.23	40.00	-12.77	QP
2	197.8100	48.36	-12.95	35.41	43.50	-8.09	QP
3	224.0000	47.13	-13.07	34.06	46.00	-11.94	QP
4	320.0300	40.21	-12.19	28.02	46.00	-17.98	QP
5	352.0400	41.36	-11.05	30.31	46.00	-15.69	QP
6	950.5300	2.57	26.17	28.74	46.00	-17.26	QP

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, VERTICAL)



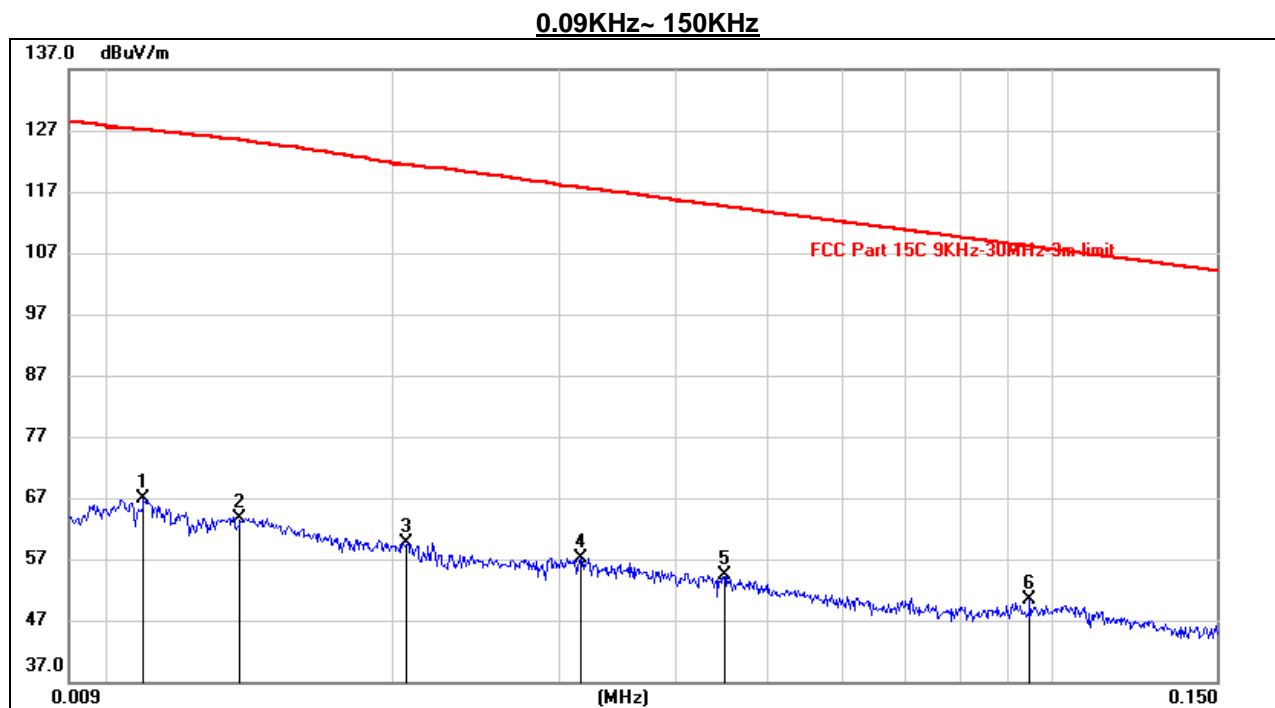
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	72.6800	52.27	-17.00	35.27	40.00	-4.73	QP
2	198.7800	51.74	-12.86	38.88	43.50	-4.62	QP
3	202.6600	51.53	-12.51	39.02	43.50	-4.48	QP
4	224.0000	42.97	-13.07	29.90	46.00	-16.10	QP
5	320.0300	42.12	-12.19	29.93	46.00	-16.07	QP
6	589.6900	30.44	-7.38	23.06	46.00	-22.94	QP

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

7.6. SPURIOUS EMISSIONS BELOW 30M

7.6.1. GFSK MODE

SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, VERTICAL)

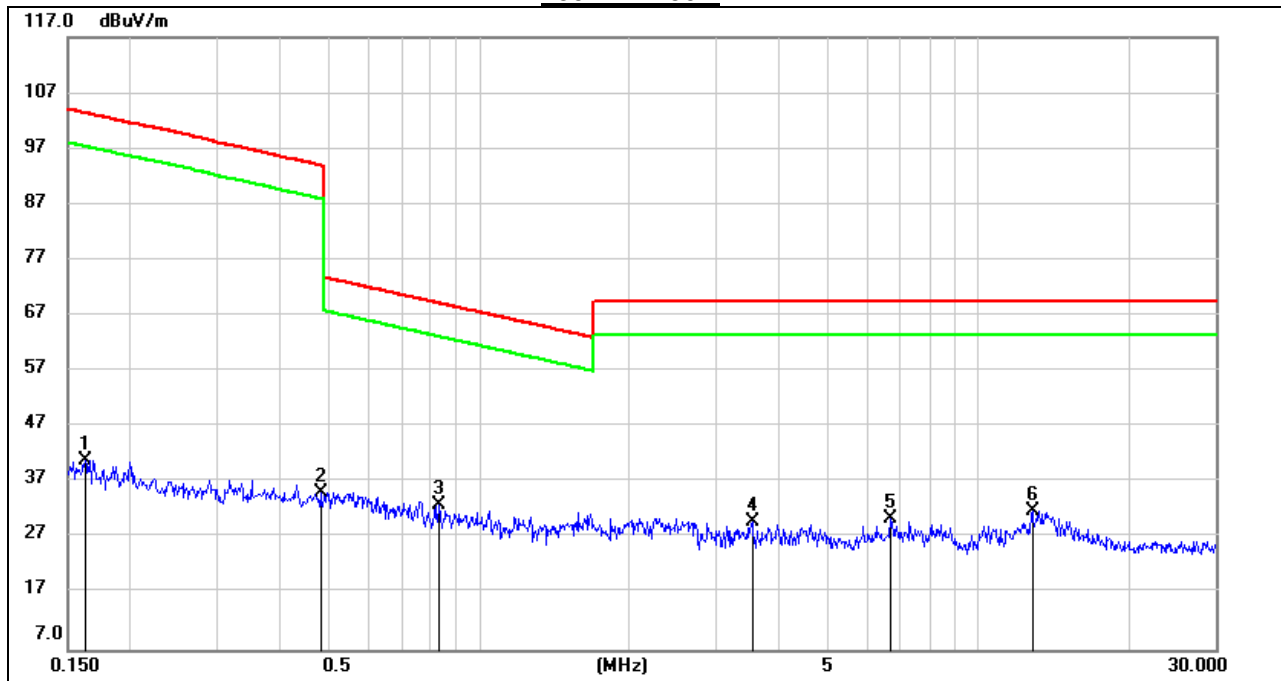


No.	Frequency (KHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0095	26.98	20.25	47.23	127.98	-80.75	QP
2	0.0108	25.81	20.22	46.03	127.12	-81.09	QP
3	0.0193	22.53	20.30	42.83	122.00	-79.17	QP
4	0.0274	17.67	20.31	37.98	118.98	-81.00	QP
5	0.0355	16.54	20.31	36.85	116.69	-79.84	QP
6	0.0640	17.45	20.31	37.76	111.50	-73.74	QP

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

150KHz ~ 30M



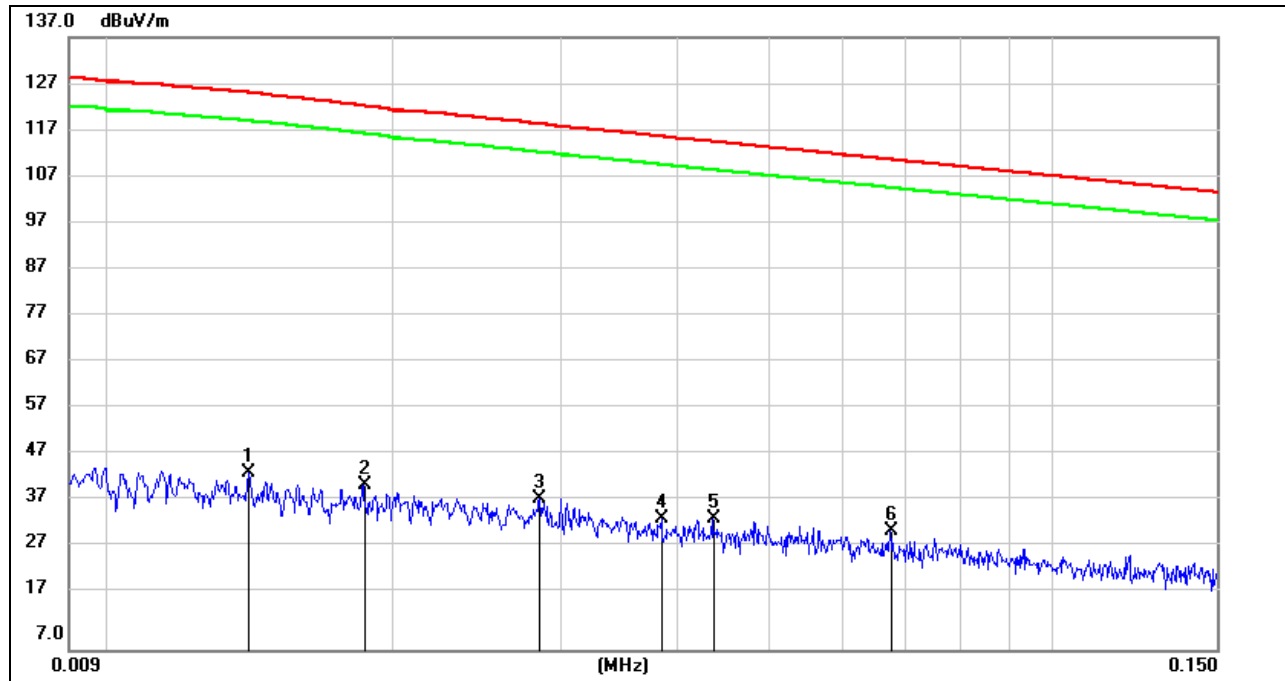
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.1621	20.61	20.41	41.02	103.41	-62.39	QP
2	0.4812	14.97	20.25	35.22	93.97	-58.75	QP
3	0.8305	12.54	20.36	32.90	69.23	-36.33	QP
4	3.5278	8.97	20.98	29.95	69.54	-39.59	QP
5	6.6623	9.71	20.90	30.61	69.54	-38.93	QP
6	12.8513	10.88	20.99	31.87	69.54	-37.67	QP

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)

0.09KHz~ 150KHz

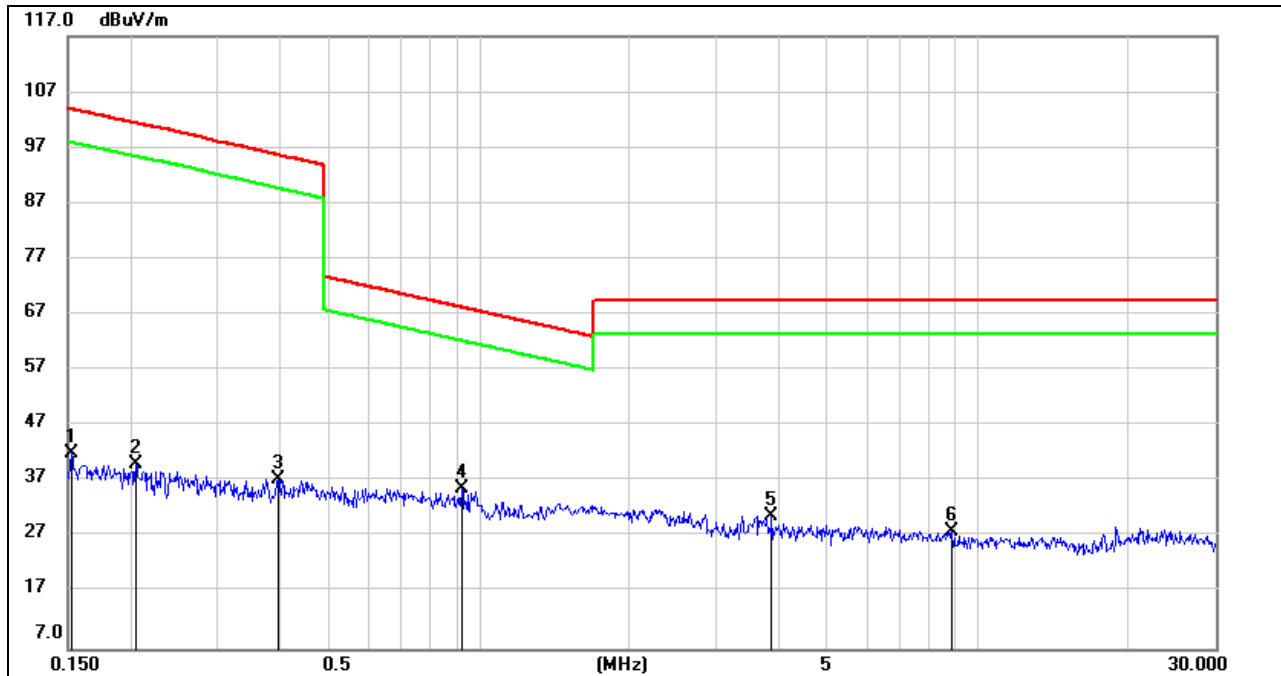


No.	Frequency (KHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0140	24.24	20.25	44.49	125.19	-80.70	QP
2	0.0185	21.66	20.29	41.95	122.48	-80.53	QP
3	0.0285	18.83	20.31	39.14	118.59	-79.45	QP
4	0.0384	14.52	20.31	34.83	115.96	-81.13	QP
5	0.0435	14.40	20.31	34.71	114.88	-80.17	QP
6	0.0675	11.98	20.31	32.29	111.03	-78.74	QP

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

150KHz ~ 30M



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.1524	21.66	20.42	42.08	103.95	-61.87	QP
2	0.2048	19.70	20.36	40.06	101.41	-61.35	QP
3	0.3955	16.99	20.27	37.26	95.67	-58.41	QP
4	0.9233	15.32	20.37	35.69	68.31	-32.62	QP
5	3.8603	9.74	21.04	30.78	69.54	-38.76	QP
6	8.8688	6.94	21.01	27.95	69.54	-41.59	QP

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

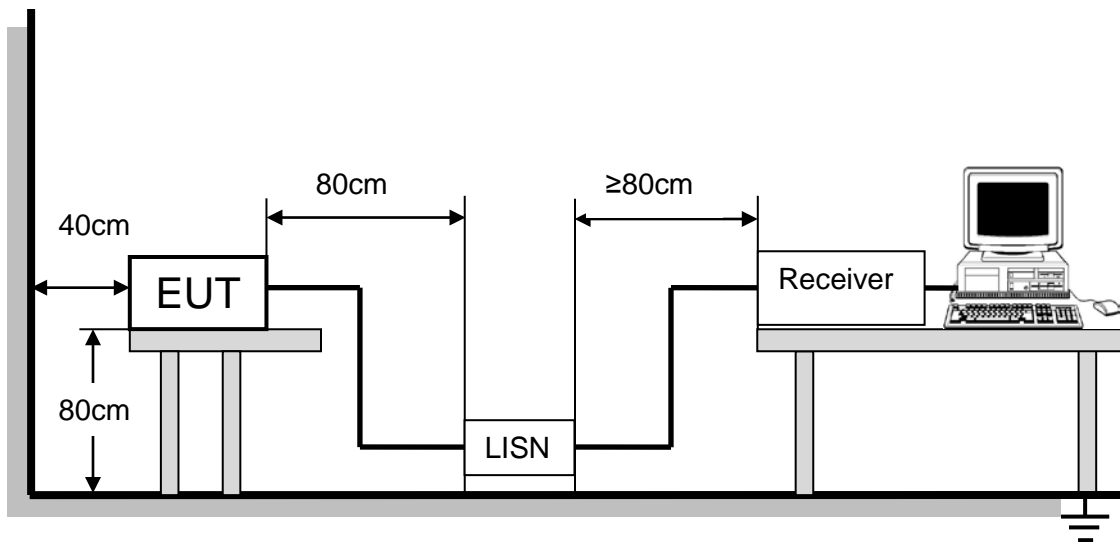
8. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

Please refer to FCC §15.207 (a) and RSS-Gen Clause 8.8.

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 -5.0	73.00	60.00	56.00	46.00
5.0 -30.0	73.00	60.00	60.00	50.00

TEST SETUP AND PROCEDURE



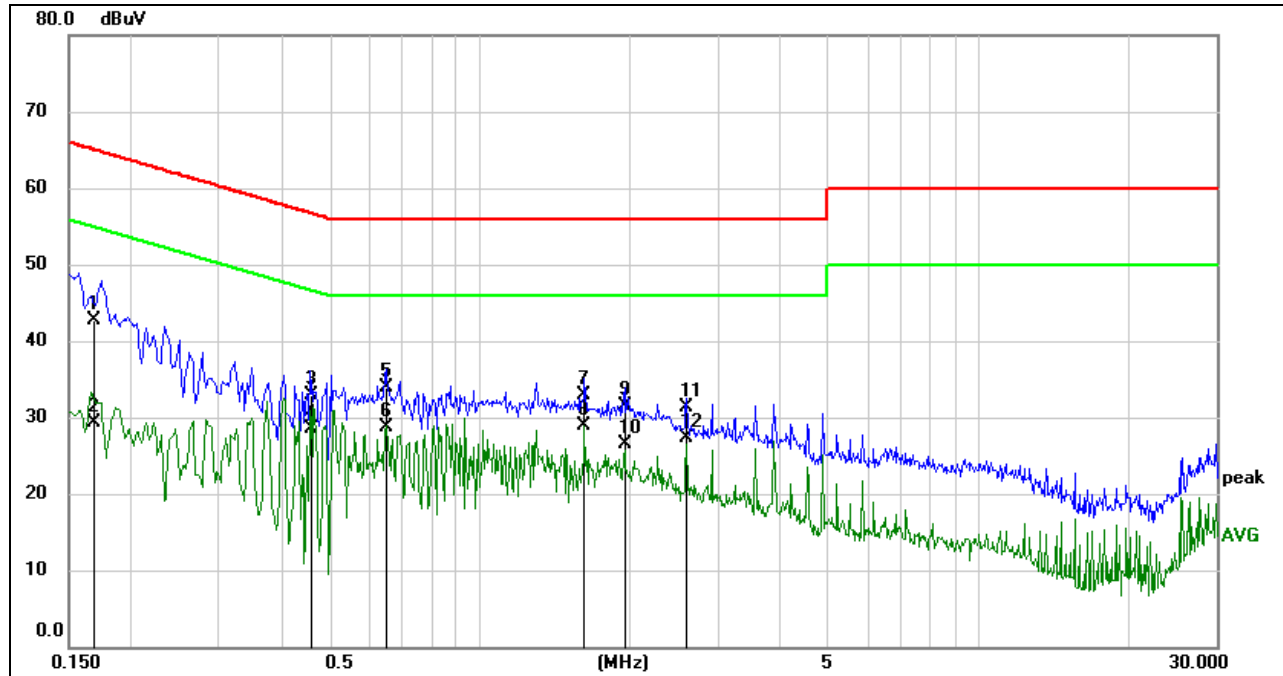
The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 6.2 of ANSI C63.10-2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9kHz.

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

8.1.1. GFSK MODE

TEST RESULTS (MID CHANNEL, WORST-CASE CONFIGURATION)

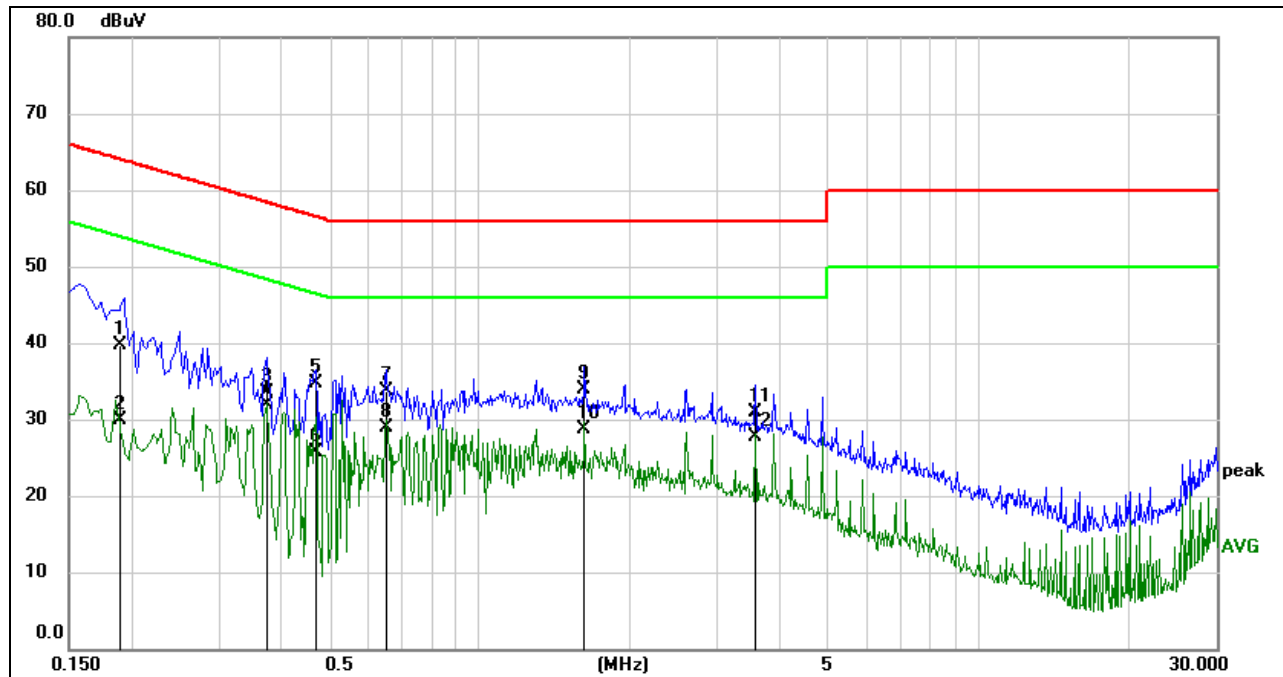
LINE N RESULTS



No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1694	33.12	9.64	42.76	64.99	-22.23	QP
2	0.1694	19.58	9.64	29.22	54.99	-25.77	AVG
3	0.4592	23.20	9.65	32.85	56.71	-23.86	QP
4	0.4592	18.83	9.65	28.48	46.71	-18.23	AVG
5	0.6504	24.24	9.66	33.90	56.00	-22.10	QP
6	0.6504	19.12	9.66	28.78	46.00	-17.22	AVG
7	1.6234	23.29	9.69	32.98	56.00	-23.02	QP
8	1.6234	19.29	9.69	28.98	46.00	-17.02	AVG
9	1.9485	21.74	9.67	31.41	56.00	-24.59	QP
10	1.9485	16.74	9.67	26.41	46.00	-19.59	AVG
11	2.5963	21.71	9.69	31.40	56.00	-24.60	QP
12	2.5963	17.55	9.69	27.24	46.00	-18.76	AVG

- Note: 1. Result = Reading +Correct Factor.
 2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
 3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
 4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.

LINE L RESULTS



No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1901	30.13	9.65	39.78	64.03	-24.25	QP
2	0.1901	20.24	9.65	29.89	54.03	-24.14	AVG
3	0.3740	23.80	9.64	33.44	58.41	-24.97	QP
4	0.3740	22.30	9.64	31.94	48.41	-16.47	AVG
5	0.4675	25.02	9.65	34.67	56.56	-21.89	QP
6	0.4675	16.13	9.65	25.78	46.56	-20.78	AVG
7	0.6480	24.14	9.66	33.80	56.00	-22.20	QP
8	0.6480	19.23	9.66	28.89	46.00	-17.11	AVG
9	1.6223	24.17	9.68	33.85	56.00	-22.15	QP
10	1.6223	19.12	9.68	28.80	46.00	-17.20	AVG
11	3.5717	21.23	9.71	30.94	56.00	-25.06	QP
12	3.5717	18.02	9.71	27.73	46.00	-18.27	AVG

Note: 1. Result = Reading +Correct Factor.

2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).

4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.

Note: All the modulation and channels had been tested, but only the worst data recorded in the report.

9. ANTENNA REQUIREMENTS

APPLICABLE REQUIREMENTS

Please refer to FCC §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Please refer to FCC §15.247(b)(4)

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

ANTENNA CONNECTOR

EUT has a ceramic antenna without antenna connector.

ANTENNA GAIN

The antenna gain of EUT is less than 6 dBi.

END OF REPORT