CFR 47 FCC PART 15 SUBPART C

CERTIFICATION TEST REPORT

For

MAXX ACTION GLOW RACERS HYPER BASS

MODEL NUMBER: 320278

FCC ID: 2AXT6SDE320278

REPORT NUMBER: 4789648521-1

ISSUE DATE: October 18, 2020

Prepared for

SUNNY DAYS ENTERTAINMENT, LLC
433 SE MAIN STREET, SUITE A, SIMPSONVILLE, SC 29681

Prepared by

UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch

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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	10/18/2020	Initial Issue	

Summary of Test Results			
Clause	**Test Items**	**FCC**	**Test Results**
1	20dB Bandwidth and 99% Occupied Bandwidth	FCC 15.247 (a) (1)	Pass
2	Conducted Output Power	FCC 15.247 (b) (1)	Pass
3	Carrier Hopping Channel Separation	FCC 15.247 (a) (1)	Pass
4	Number of Hopping Frequency	15.247 (a) (1) III	Pass
5	Time of Occupancy (Dwell Time)	15.247 (a) (1) III	Pass
6	Conducted Bandedge	FCC 15.247 (d)	Pass
7	Radiated Bandedge and Spurious	FCC 15.247 (d) FCC 15.209 FCC 15.205	Pass
8	Conducted Emission Test for AC Power Port	FCC 15.207	NA
9	Antenna Requirement	FCC 15.203	Pass

Note:
1.This test report is only published to and used by the applicant, and it is not for evidence purpose in China.
2. The measurement result for the sample received is <Pass> according to < CFR 47 FCC PART 15 SUBPART C > when <Accuracy Method> decision rule is applied.

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name:	SUNNY DAYS ENTERTAINMENT, LLC
Address:	433 SE MAIN STREET, SUITE A, SIMPSONVILLE, SC 29681

Manufacturer Information

Company Name:	SUNNY DAYS ENTERTAINMENT, LLC
Address:	433 SE MAIN STREET, SUITE A, SIMPSONVILLE, SC 29681

Factory Information

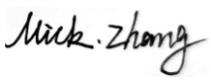
Company Name:	Shantou Chenghai Guangyi Xianxin Plastic Toys Factory
Address:	Bumei Industrial Area, Guangyi, Chenghai, Shantou, Guangdong, China

EUT Information

EUT Name:	MAXX ACTION GLOW RACERS HYPER BASS
Model:	320278
Brand:	MAXX ACTION
Sample Received Date:	October 12, 2020
Sample Status:	Normal
Sample ID:	3379349
Date of Tested:	October 13, 2020~ October 16, 2020

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 FCC PART 15 SUBPART C	PASS
ISED RSS-247 Issue 2	PASS
ISED RSS-GEN Issue 5	PASS

Prepared By:



Mick Zhang
Project Engineer

Checked By:

Shawn Wen
Laboratory Leader

Approved By:

Stephen Guo

Laboratory Manager

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with KDB 558074 D01 15.247 Meas Guidance v05r02, 414788 D01 Radiated Test Site v01r01, CFR 47 FCC Part 2, CFR 47 FCC Part 15, ANSI C63.10-2013.

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	**A2LA (Certificate No.: 4102.01)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA. **FCC (FCC Designation No.: CN1187)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Delcaration of Conformity (DoC) and Certification rules **ISED (Company No.: 21320)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with ISED. The Company Number is 21320. **VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793. Facility Name: Chamber D, the VCCI registration No. is G-20019 and R-20004 Shielding Room B , the VCCI registration No. is C-20012 and T-20011

Note 1: All tests measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China

Note 2: 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 and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.

Note 3: For below 30 MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. And these measurements below 30 MHz had been correlated to measurements performed on an OFS.

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
Conduction emission	3.62 dB
Radiated Emission (Included Fundamental Emission) (9 kHz ~ 30 MHz)	2.2 dB
Radiated Emission (Included Fundamental Emission) (30 MHz ~ 1 GHz)	4.00 dB
Radiated Emission (Included Fundamental Emission) (1 GHz to 26 GHz)	5.78 dB (1 GHz ~ 18 GHz)
	5.23 dB (18 GHz ~ 26 GHz)
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

EUT Name	MAXX ACTION GLOW RACERS HYPER BASS	
EUT Description	The EUT is a toy car with a Bluetooth speaker.	
Model	320278	
Technology	Bluetooth – BR & EDR	
Transmit Frequency Range	2402 MHz ~ 2480 MHz	
Mode	Basic Rate	Enhanced Data Rate
Modulation	GFSK	∏/4-DQPSK
Packet Type (Maximum Payload):	DH5	2DH5
Data Rate	1 Mbps	2 Mbps
Power Supply	DC 4.5V (Battery)	

5.2. MAXIMUM PEAK OUTPUT POWER

Test Mode	Frequency (MHz)	Channel Number	Maximum Peak Output Power (dBm)	Maximum EIRP (dBm)
GFSK	2402 ~ 2480	0-78[79]	-3.80	-4.38
∏/4-DQPSK	2402 ~ 2480	0-78[79]	-3.15	-3.73

5.3. PACKET TYPE CONFIGURATION

Test Mode	Packet Type	Setting (Packet Length)
GFSK	DH1	27
	DH3	183
	DH5	339
∏/4-DQPSK	2-DH1	54
	2-DH3	367
	2-DH5	679

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	Frequency
GFSK	CH 0(Low Channel), CH 39(MID Channel), CH 78(High Channel)	2402 MHz, 2441 MHz, 2480 MHz
∏/4-DQPSK	CH 0(Low Channel), CH 39(MID Channel), CH 78(High Channel)	2402 MHz, 2441 MHz, 2480 MHz
GFSK	Hopping	2402 MHz ~ 2480 MHz
∏/4-DQPSK	Hopping	2402 MHz ~ 2480 MHz

5.6. WORST-CASE CONFIGURATIONS

Test Mode	Modulation Technology	Modulation Type	Data Rate	Packet Type
GFSK	FHSS	GFSK	1Mbit/s	DH5
∏/4-DQPSK	FHSS	∏/4-DQPSK	2Mbit/s	2-DH5

Note: Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates. Only GFSK and ∏/4-DQPSK test data were report in this report.

5.7. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter under 2400 ~ 2483.5 MHz Band				
Test Software		FCCAssist 2.4		
Test Mode	Transmit Antenna Number	Test Software Setting Value		
		CH 00	CH 39	CH 78
GFSK	1	4	4	4
∏/4-DQPSK	1	4	4	4

5.8. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna	Frequency (MHz)	Antenna Type	MAX Antenna Gain (dBi)
1	2402 ~ 2480	PCB antenna	-0.58

Test Mode	Transmit and Receive Mode	Description
GFSK	☒1TX, 1RX	Antenna 1 can be used as transmitting/receiving antenna.
∏/4-DQPSK	☒1TX, 1RX	Antenna 1 can be used as transmitting/receiving antenna.

Note: 1. The value of the antenna gain was declared by customer.

5.9. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	Remarks
1	PC	Dell	Vostro 3902	8KNDDB2
2	USB TO UART	/	/	/

I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB	/	/	1.0m	/

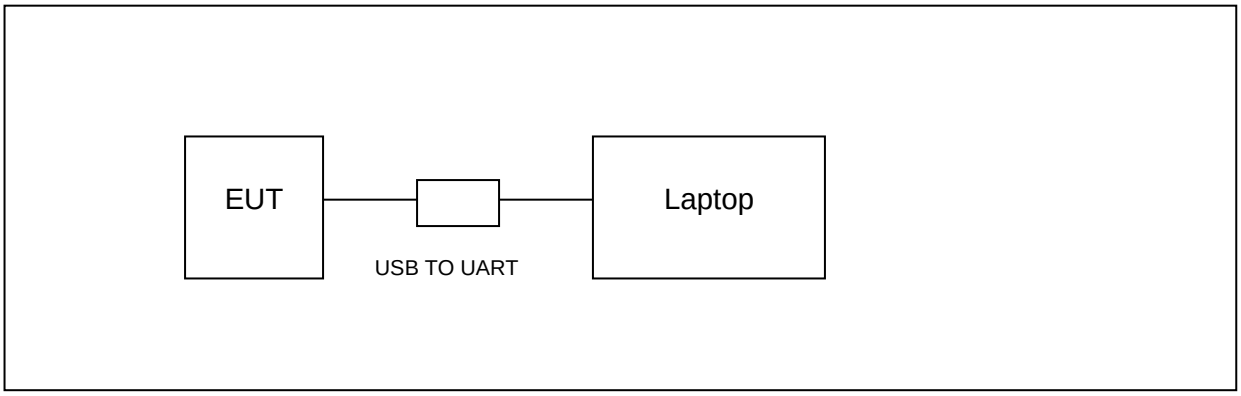
ACCESSORIES

Item	Accessory	Brand Name	Model Name	Description
/	/	/	/	/

TEST SETUP

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

SETUP DIAGRAM FOR TESTS



Note: New battery was used during all tests.

6. MEASURING INSTRUMENT AND SOFTWARE USED

Radiated Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Dec.06,2019	Dec.06,2020
☑	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	Sep.17, 2018	Sep.17, 2021
☑	Preamplifier	HP	8447D	2944A09099	Dec.05,2019	Dec.05,2020
☑	EMI Measurement Receiver	R&S	ESR26	101377	Dec.05,2019	Dec.05,2020
☑	Horn Antenna	TDK	HRN-0118	130939	Sep.17, 2018	Sep.17, 2021
☑	High Gain Horn Antenna	Schwarzbeck	BBHA-9170	691	Aug.11, 2018	Aug.11, 2021
☑	Preamplifier	TDK	PA-02-0118	TRS-305-00066	Dec.05,2019	Dec.05,2020
☑	Preamplifier	TDK	PA-02-2	TRS-307-00003	Dec.05,2019	Dec.05,2020
☑	Loop antenna	Schwarzbeck	1519B	00008	Jan.07, 2019	Jan.07, 2022
☑	Preamplifier	TDK	PA-02-001-3000	TRS-302-00050	Dec.5, 2019	Dec.5, 2020
☑	High Pass Filter	Wi	WHKX10-2700-3000-18000-40SS	23	Dec.05,2019	Dec.05,2020
Software						
Used	Description		Manufacturer	Name		Version
☑	Test Software for Radiated disturbance		Farad	EZ-EMC		Ver. UL-3A1

Other instruments						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	Spectrum Analyzer	Keysight	N9030A	MY55410512	Dec.06,2019	Dec.06,2020
☑	Spectrum Analyzer	Keysight	N9020A	MY49100060	Dec.06,2019	Dec.06,2020
☑	Power Meter	Keysight	N1911A	MY55416024	Dec.06,2019	Dec.06,2020
☑	Power Sensor	Keysight	U2021XA	MY5100022	Dec.06,2019	Dec.06,2020

7. ANTENNA PORT TEST RESULTS

7.1. ON TIME AND DUTY CYCLE

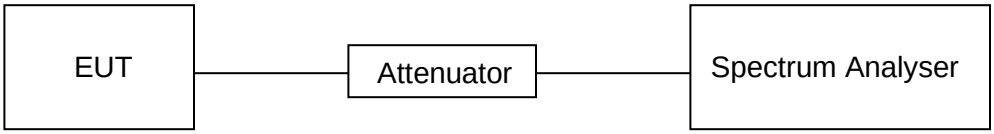
LIMITS

None; for reporting purposes only.

PROCEDURE

Refer to ANSI C63.10-2013 Zero – Span Spectrum Analyzer method.

TEST SETUP



TEST ENVIRONMENT

Temperature	24.8 °C	Relative Humidity	59.8 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 4.5 V

RESULTS

Please refer to appendix A.

7.2. 20 dB BANDWIDTH AND 99 % OCCUPIED BANDWIDTH

LIMITS

CFR 47FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247 (a) (1)	20 dB Bandwidth	None; for reporting purposes only.	2400-2483.5
ISED RSS-Gen Clause 6.7	99 % Occupied Bandwidth	None; for reporting purposes only.	2400-2483.5

TEST PROCEDURE

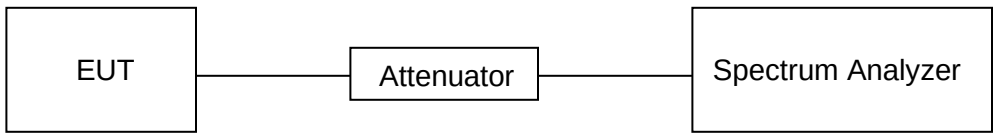
Refer to ANSI C63.10-2013 clause 6.9.2.

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

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	For 20 dB Bandwidth: 1 % to 5 % of the 20 dB bandwidth For 99 % Occupied Bandwidth: 1 % to 5 % of the occupied bandwidth
VBW	For 20 dB Bandwidth: approximately 3×RBW For 99 % Occupied Bandwidth: ≥ 3×RBW
Span	Between 2 times and 5 times the OBW
Trace	Max hold
Sweep	Auto couple

a) Use the occupied bandwidth function of the instrument, allow the trace to stabilize and report the measured 99 % occupied bandwidth and 20 dB Bandwidth.

TEST SETUP



TEST ENVIRONMENT

Temperature	24.8 °C	Relative Humidity	59.8 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 4.5 V

RESULTS

Please refer to appendix B and C.

7.3. CONDUCTED OUTPUT POWER

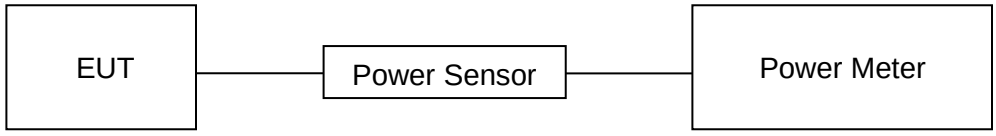
LIMITS

CFR 47 FCC Part15 (15.247), Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247 (b) (1)	Peak Conducted Output Power	Hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel: 1 watt or 30 dBm; Hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel: 125 mW or 21 dBm	2400-2483.5

TEST PROCEDURE

Connect the EUT to a low loss RF cable from the antenna port to the power sensor (video bandwidth is greater than the occupied bandwidth).
Measure peak emission level, the indicated level is the peak output power, after any corrections for external attenuators and cables.

TEST SETUP



TEST ENVIRONMENT

Temperature	24.8 °C	Relative Humidity	59.8 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 4.5 V

RESULTS

Please refer to appendix D.

7.4. CARRIER FREQUENCY SEPARATION

LIMITS

CFR 47 FCC Part15 (15.247),Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247 (a) (1)	Carrier Frequency Separation	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel.	2400-2483.5

TEST PROCEDURE

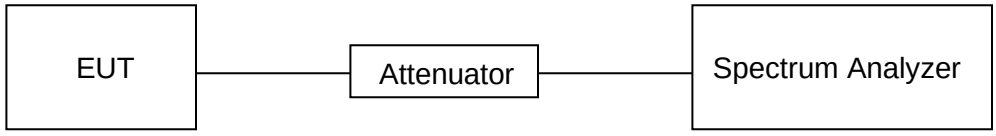
Refer to ANSI C63.10-2013 clause 7.8.2.

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

Center Frequency	The center frequency of the channel under test
Span	wide enough to capture the peaks of two adjacent channels
Detector	Peak
RBW	Start with the RBW set to approximately 30 % of the channel spacing; adjust as necessary to best identify the center of each individual channel.
VBW	≥RBW
Trace	Max hold
Sweep time	Auto couple

Allow the trace to stabilize and use the marker-delta function to determine the separation between the peaks of the adjacent channels.
Compliance of an EUT with the appropriate regulatory limit shall be determined.

TEST SETUP



TEST ENVIRONMENT

Temperature	24.8 °C	Relative Humidity	59.8 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 4.5 V

RESULTS

Please refer to Appendix E.

7.5. NUMBER OF HOPPING FREQUENCIES

LIMITS

CFR 47 FCC Part15 (15.247), Subpart C		
Section	Test Item	Limit
CFR 47 15.247 (a) (1) III	Number of Hopping Frequency	at least 15 hopping channels

TEST PROCEDURE

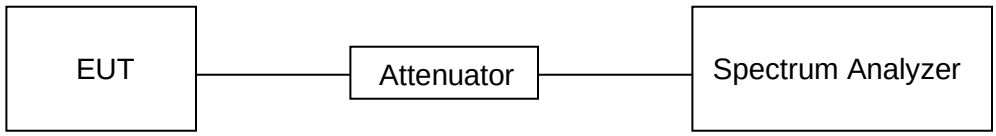
Refer to ANSI C63.10-2013 clause 7.8.3.

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

Detector	Peak
RBW	To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
VBW	≥RBW
Span	The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
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.

TEST SETUP



TEST ENVIRONMENT

Temperature	24.8 °C	Relative Humidity	59.8 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 4.5 V

RESULTS

Please refer to appendix G.

7.6. TIME OF OCCUPANCY (DWELL TIME)

LIMITS

CFR 47 FCC Part15 (15.247), Subpart C		
Section	Test Item	Limit
CFR 47 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

Refer to ANSI C63.10-2013 clause 7.8.4.

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

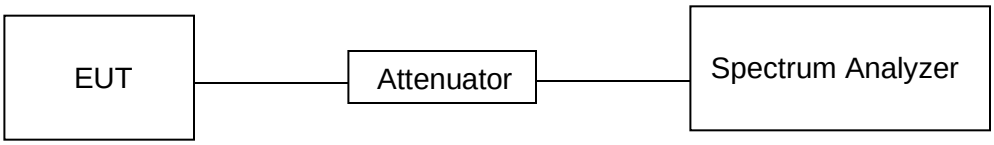
Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	1 MHz
VBW	≥RBW
Span	Zero span, centered on a hopping channel
Trace	Max hold
Sweep time	As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel

Use the marker-delta function to determine the transmit time per hop (Burst Width). If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

For FHSS Mode (79 Channel):
DH1/2DH1 Dwell Time: Burst Width * (1600/2) * 31.6 / (channel number)
DH3/2DH3 Dwell Time: Burst Width * (1600/4) * 31.6 / (channel number)
DH5/2DH5 Dwell Time: Burst Width * (1600/6) * 31.6 / (channel number)

For AFHSS Mode (20 Channel):
DH1/2DH1 Dwell Time: Burst Width * (800/2) * 8 / (channel number)
DH3/2DH3 Dwell Time: Burst Width * (800/4) * 8 / (channel number)
DH5/2DH5 Dwell Time: Burst Width * (800/6) * 8 / (channel number)

TEST SETUP



TEST ENVIRONMENT

Temperature	24.8 °C	Relative Humidity	59.8 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 4.5 V

RESULTS

Please refer to appendix F.

7.7. CONDUCTED BANDEDGE AND SPURIOUS EMISSION

LIMITS

CFR 47 FCC Part15 (15.247), Subpart C		
Section	Test Item	Limit
CFR 47 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

Refer to ANSI C63.10-2013 clause 7.8.6 and 7.8.8.

Connect the EUT to the spectrum analyser and use the following settings for reference level measurement:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	100 kHz
VBW	≥3 × RBW
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

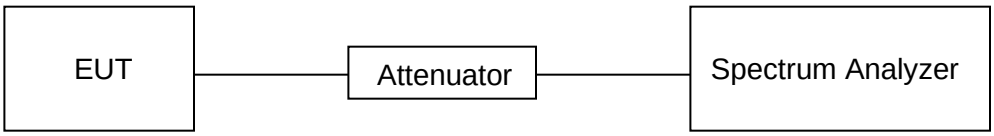
Allow trace to fully stabilize and use the peak marker function to determine the maximum PSD level.

Change the settings for emission level measurement:

Span	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100 kHz
VBW	≥3 × RBW
measurement points	≥span/RBW
Trace	Max hold
Sweep time	Auto couple.

Allow trace to fully stabilize and use the peak marker function to determine the maximum PSD level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements.

TEST SETUP



TEST ENVIRONMENT

Temperature	24.8 °C	Relative Humidity	59.8 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 4.5 V

RESULTS

Please refer to appendix H & I.

8. RADIATED TEST RESULTS

LIMITS

Please refer to CFR 47 FCC §15.205 and §15.209.

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

Emissions radiated outside of the specified frequency bands above 30 MHz			
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m	
		Quasi-Peak	
30 - 88	100	40	
88 - 216	150	43.5	
216 - 960	200	46	
Above 960	500	54	
Above 1000	500	Peak	Average
		74	54

FCC Emissions radiated outside of the specified frequency bands below 30 MHz		
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

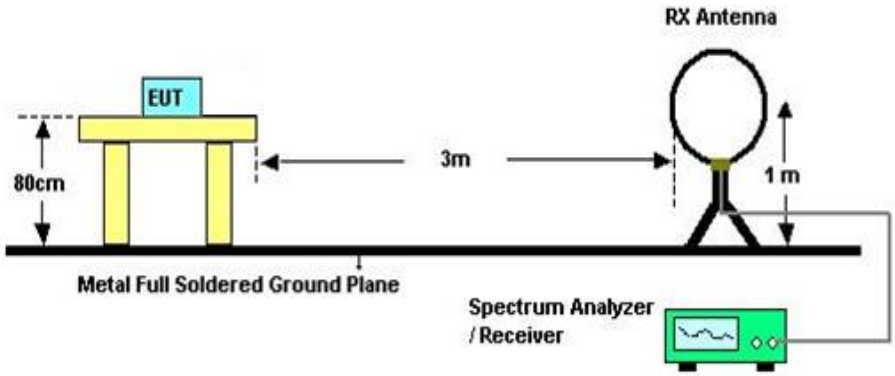
FCC Restricted bands of operation refer to FCC §15.205 (a):

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: [1]Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2]Above 38.6c

TEST SETUP AND PROCEDURE

Below 30MHz



The setting of the spectrum analyser

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

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.4.

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, Face-on and Face-off polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 80 cm above ground.

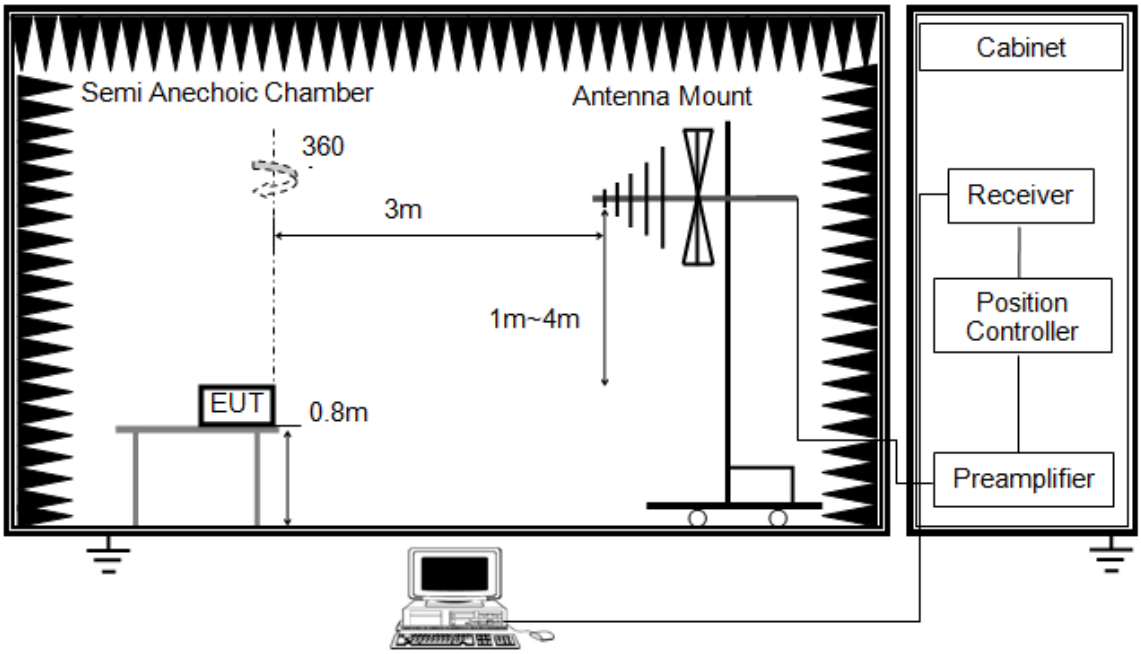
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1 m height antenna tower.

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 1 GHz, 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 and average 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 and average detector and reported.

7. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field site based on KDB 414788.

Below 1GHz and above 30 MHz



The setting of the spectrum analyser

RBW	120 kHz
VBW	300 kHz
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.5.

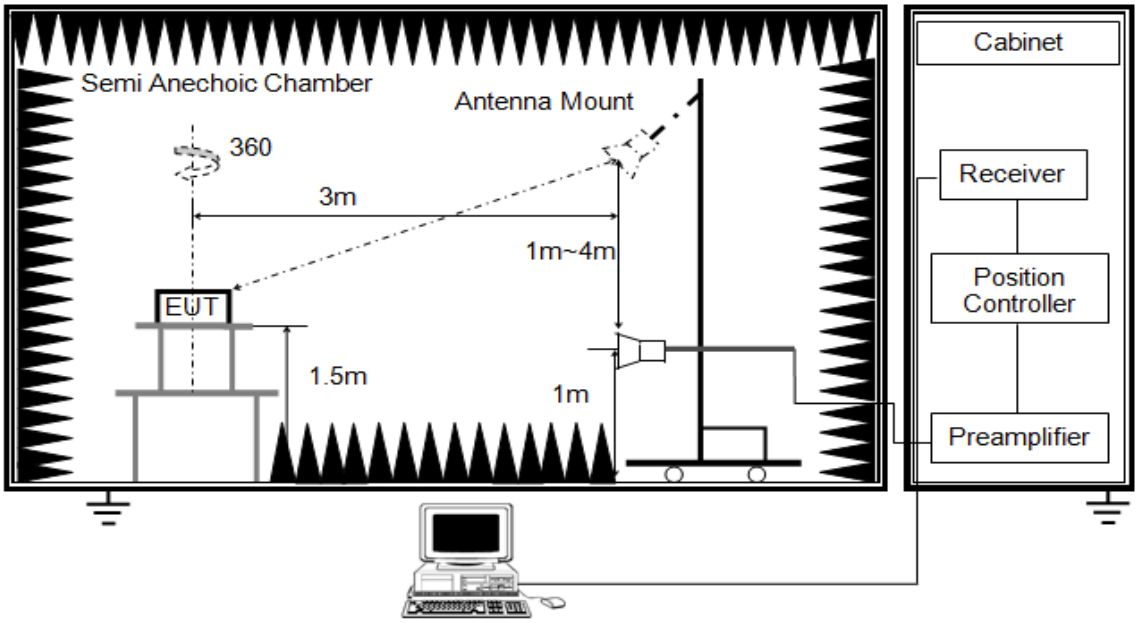
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 80 cm 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 1 GHz, 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.

Above 1G



The setting of the spectrum analyser

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

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.6.

2. The EUT was arranged to its worst case and then tune the antenna tower (1.5 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.

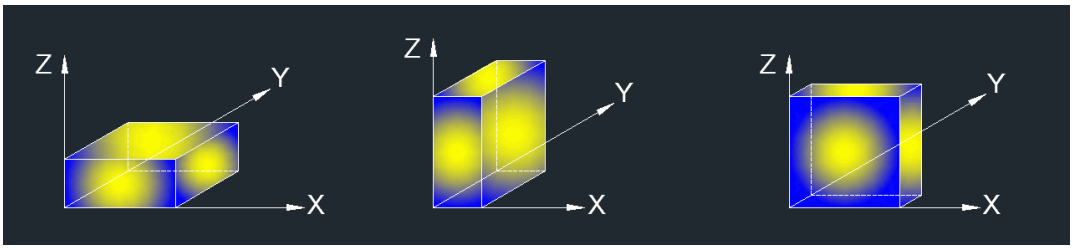
3. The EUT was placed on a turntable with 1.5 m above ground.

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 1 GHz, 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 measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause 7.1.ON TIME AND DUTY CYCLE.

X axis, Y axis, Z axis positions:



Note 1: 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.

Note 2: The EUT was fully exercised with external accessories during the test. In the case of multiple accessory external ports, an external accessory shall be connected to one of each type of port.

TEST ENVIRONMENT

Temperature	23.7 °C	Relative Humidity	61.0 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 4.5 V

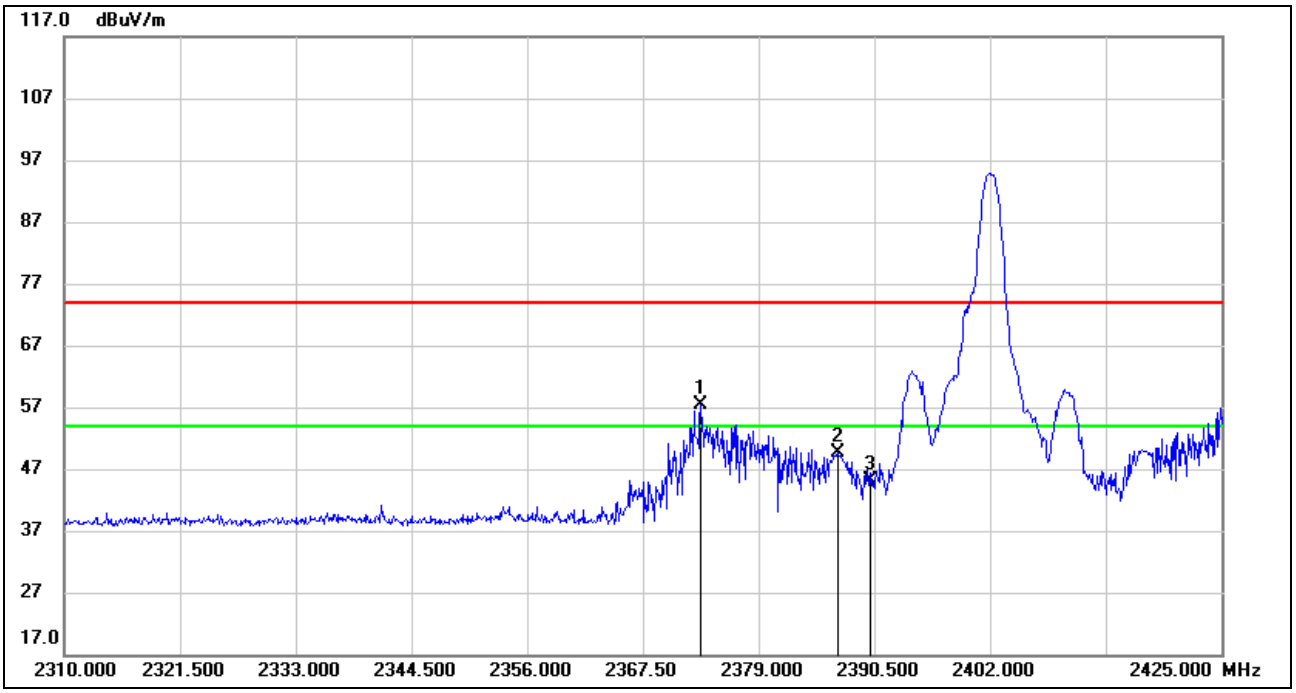
RESULTS

8.1. RESTRICTED BANDEDGE

8.1.1. GFSK MODE

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

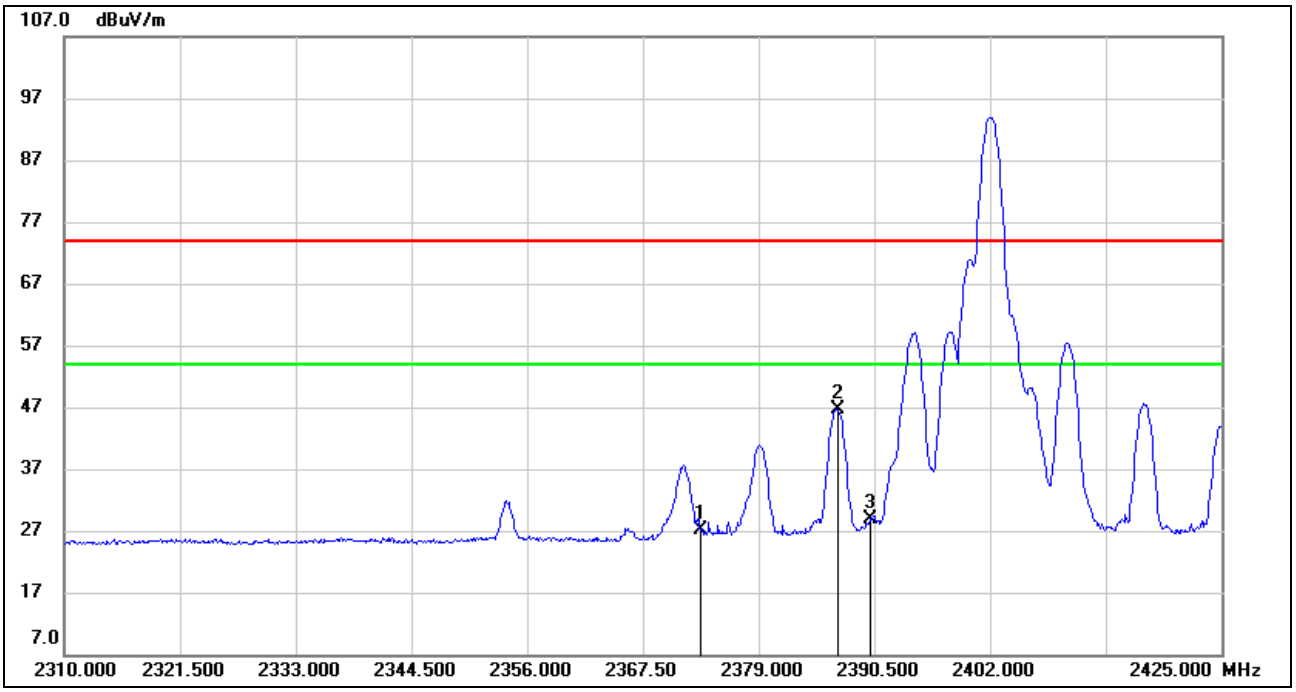
PEAK



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2373.250	45.42	11.84	57.26	74.00	-16.74	peak
2	2386.820	37.73	11.94	49.67	74.00	-24.33	peak
3	2390.000	33.23	11.96	45.19	74.00	-28.81	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. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

AVG



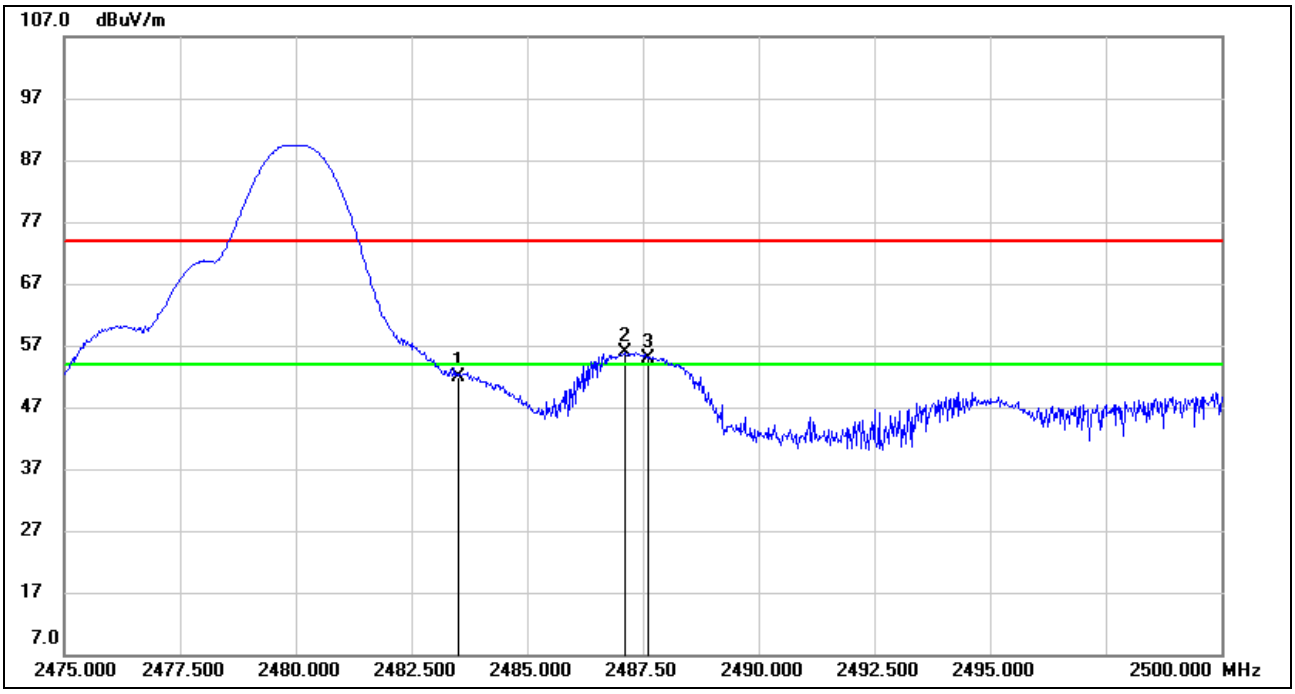
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2373.250	15.17	11.84	27.01	54.00	-26.99	AVG
2	2386.820	34.74	11.94	46.68	54.00	-7.32	AVG
3	2390.000	16.97	11.96	28.93	54.00	-25.07	AVG

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. Peak: Peak detector.
4. AVG: VBW=1/Ton, where: Ton is the transmitting duration.
5. For the transmitting duration, please refer to clause 7.1.
6. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

Note: The Horizontal and vertical position have been tested, only the worst data for Horizontal was recorded in the report.

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

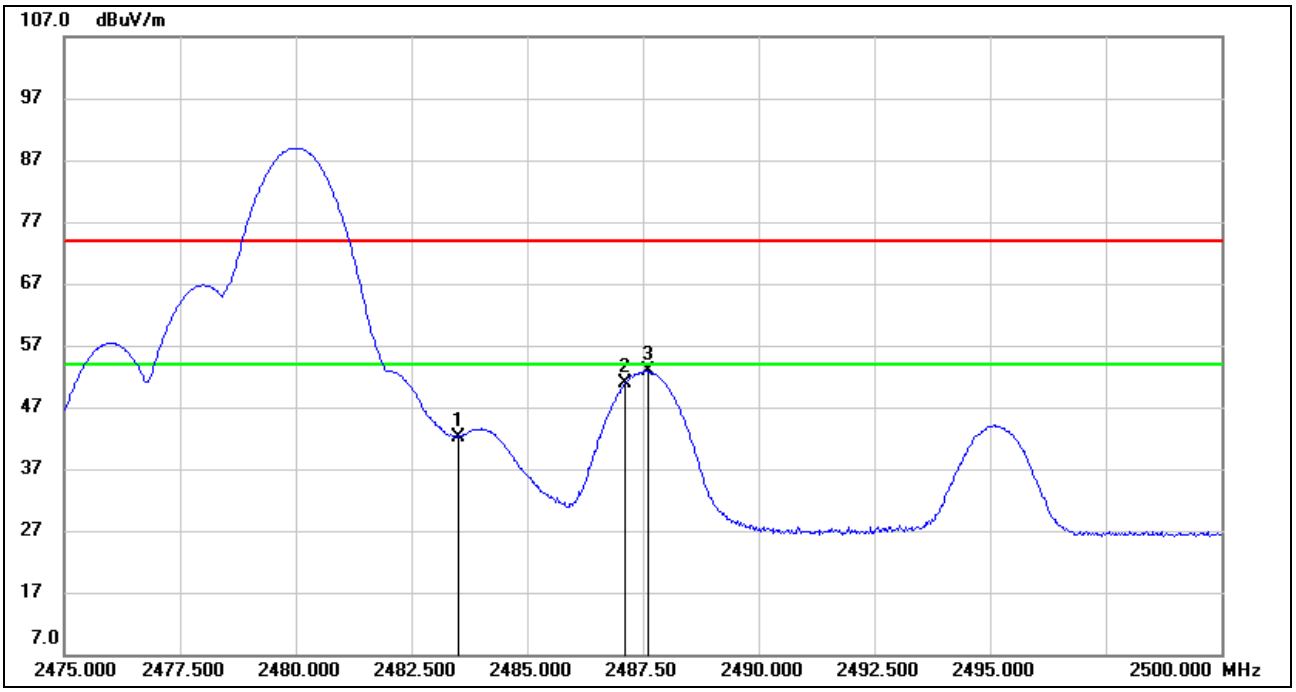
PEAK



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	39.62	12.38	52.00	74.00	-22.00	peak
2	2487.125	43.55	12.39	55.94	74.00	-18.06	peak
3	2487.600	42.58	12.39	54.97	74.00	-19.03	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. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

AVG



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	29.77	12.38	42.15	54.00	-11.85	AVG
2	2487.125	38.59	12.39	50.98	54.00	-3.02	AVG
3	2487.600	40.47	12.39	52.86	54.00	-1.14	AVG

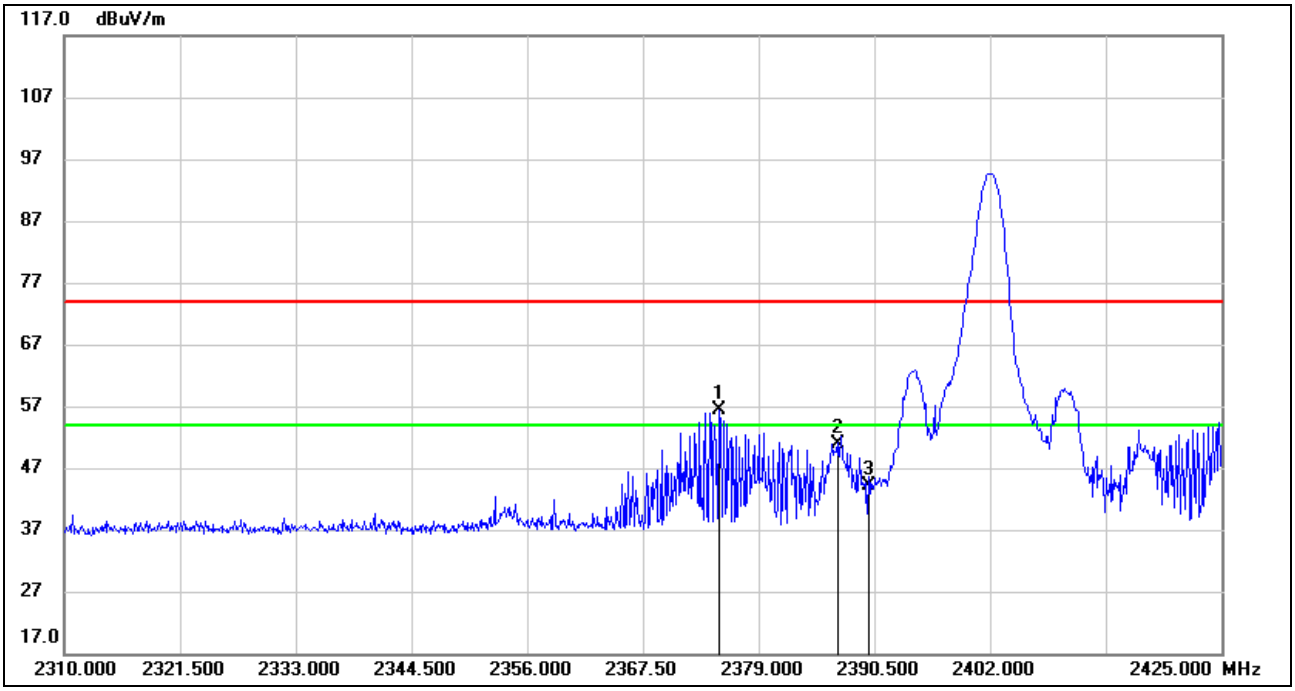
Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG: VBW=1/Ton, where: Ton is the transmitting duration.
5. For the transmitting duration, please refer to clause 7.1.
6. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

Note: The Horizontal and vertical position have been tested, only the worst data for Horizontal was recorded in the report.

8.1.2. ∏/4-DQPSK MODE

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

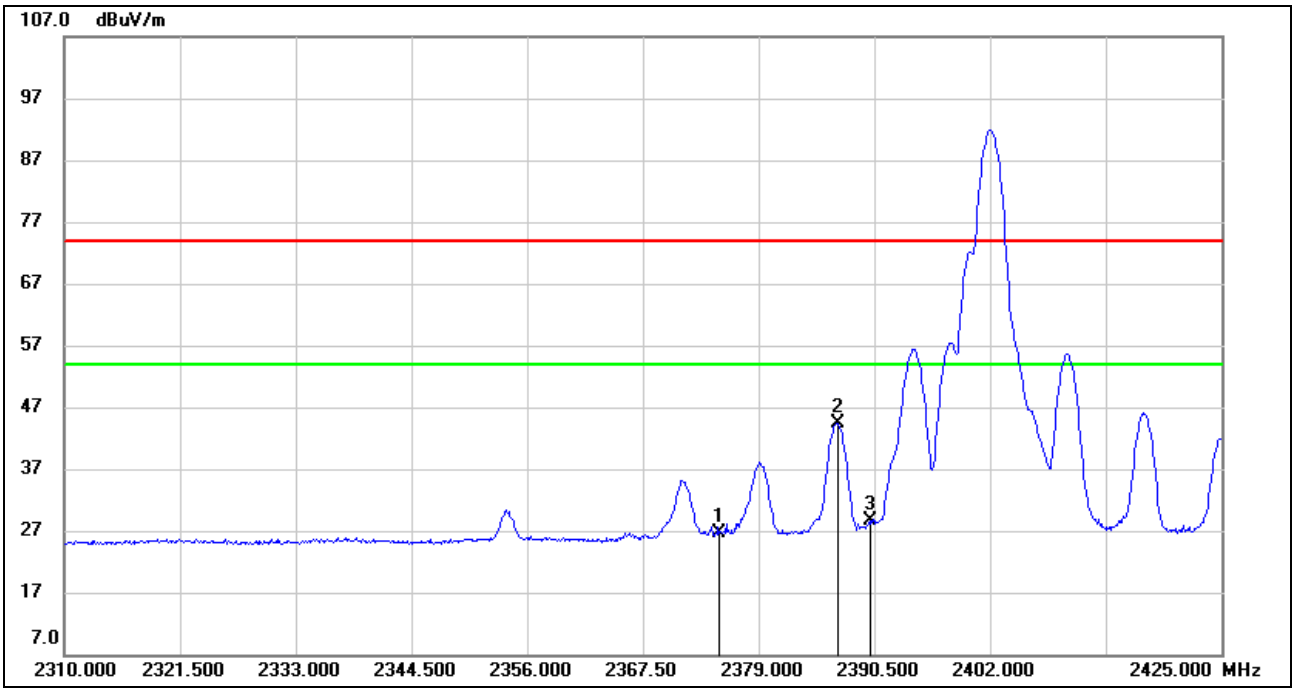
PEAK



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2375.090	44.53	11.86	56.39	74.00	-17.61	peak
2	2386.820	39.06	11.94	51.00	74.00	-23.00	peak
3	2390.000	32.10	11.96	44.06	74.00	-29.94	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. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

AVG



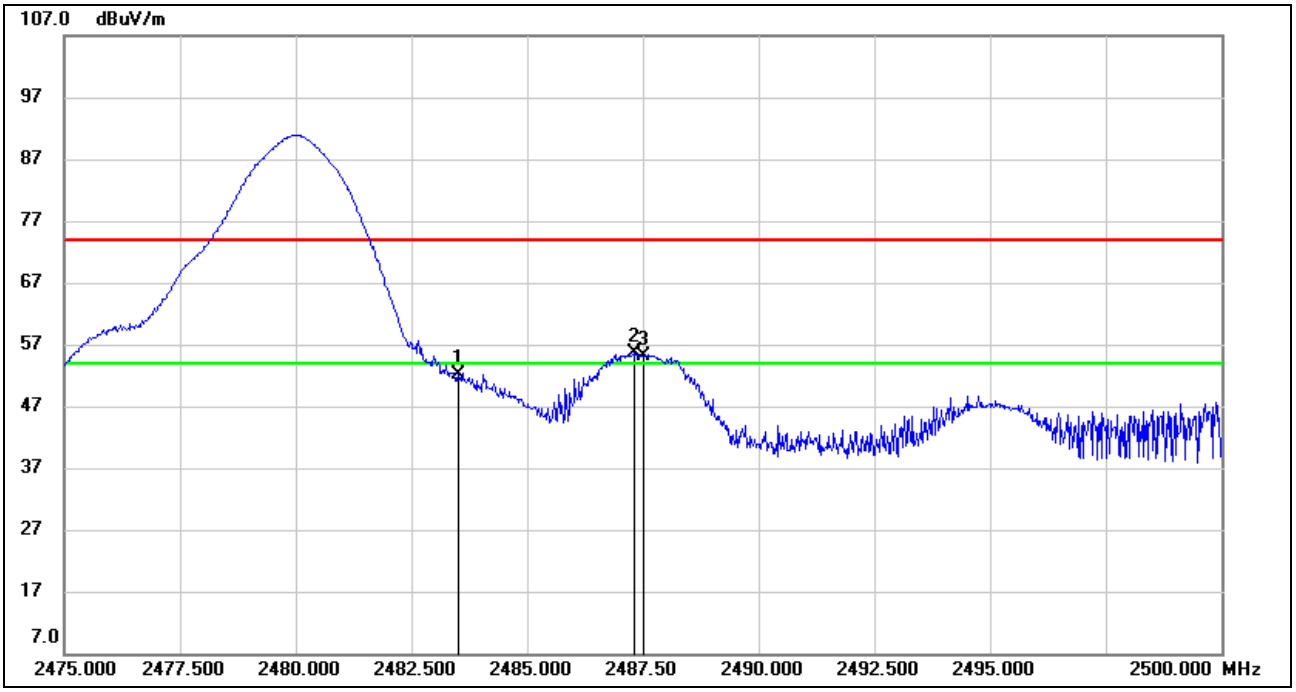
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2375.090	14.71	11.86	26.57	54.00	-27.43	AVG
2	2386.820	32.47	11.94	44.41	54.00	-9.59	AVG
3	2390.000	16.78	11.96	28.74	54.00	-25.26	AVG

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. Peak: Peak detector.
4. AVG: VBW=1/Ton, where: Ton is the transmitting duration.
5. For the transmitting duration, please refer to clause 7.1.
6. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

Note: The Horizontal and vertical position have been tested, only the worst data for Horizontal was recorded in the report.

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

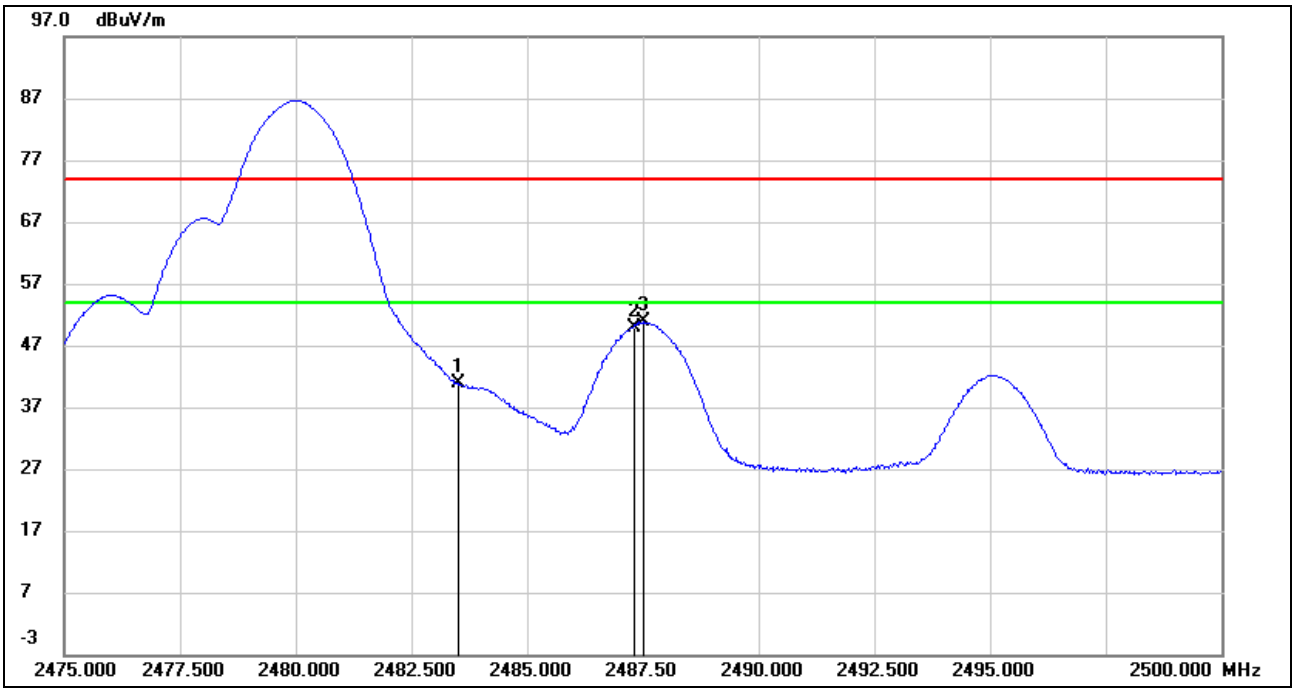
PEAK



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	39.73	12.38	52.11	74.00	-21.89	peak
2	2487.300	43.33	12.39	55.72	74.00	-18.28	peak
3	2487.525	42.84	12.39	55.23	74.00	-18.77	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. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

AVG



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	28.41	12.38	40.79	54.00	-13.21	AVG
2	2487.300	37.61	12.39	50.00	54.00	-4.00	AVG
3	2487.525	38.41	12.39	50.80	54.00	-3.20	AVG

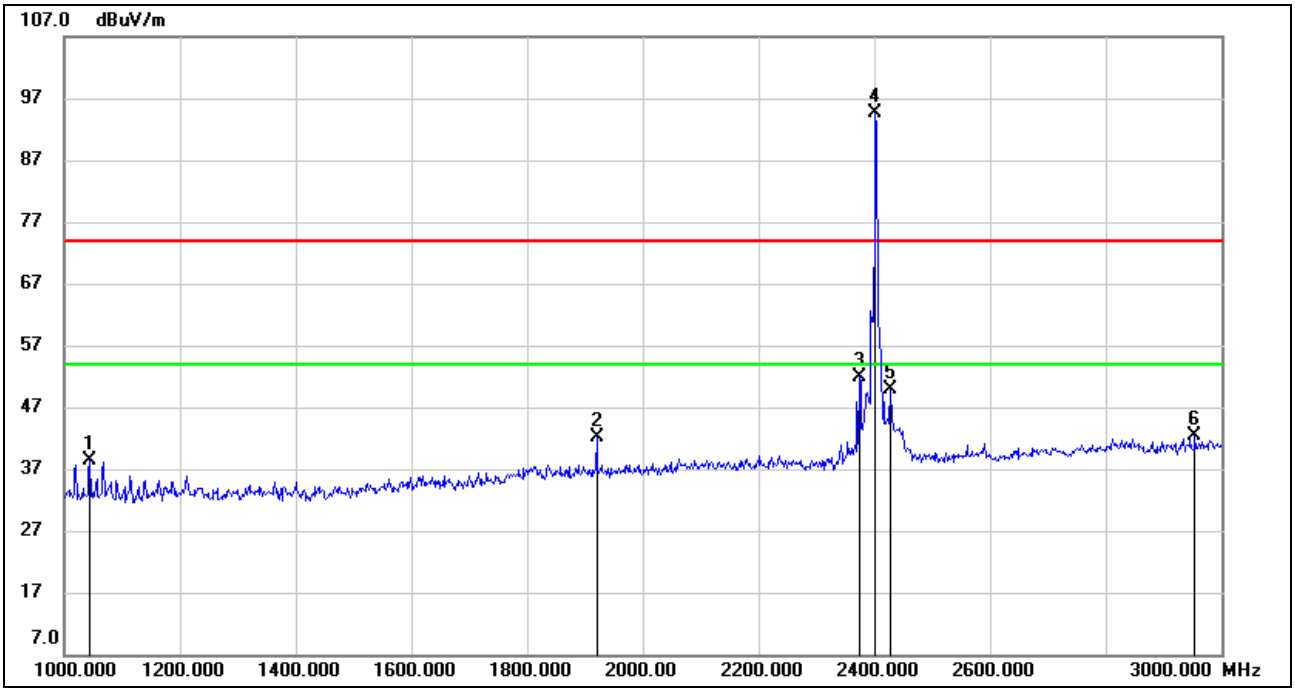
Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG: VBW=1/Ton, where: Ton is the transmitting duration.
5. For the transmitting duration, please refer to clause 7.1.
6. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

Note: The Horizontal and vertical position have been tested, only the worst data for Horizontal was recorded in the report.

8.2. SPURIOUS EMISSIONS (1 GHz ~ 3 GHz)

8.2.1. GFSK MODE

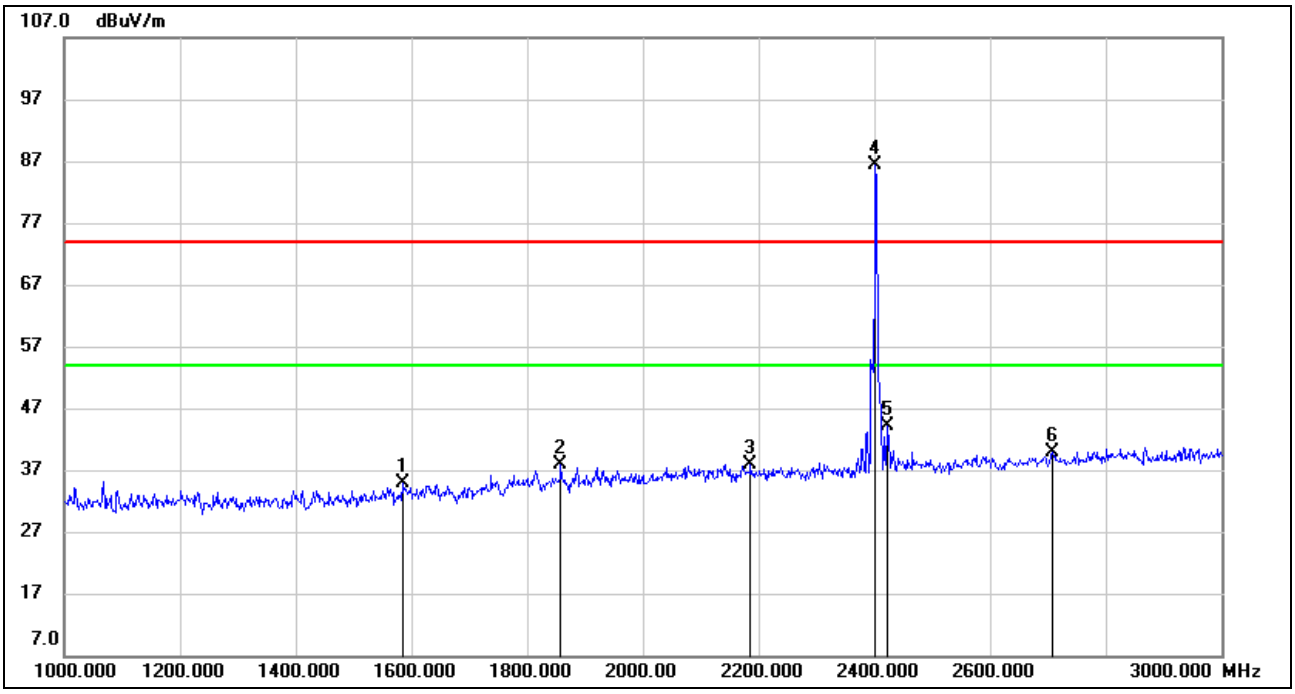
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL WORST-CASE CONFIGURATION)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1044.000	33.17	5.12	38.29	74.00	-35.71	peak
2	1920.000	32.16	10.03	42.19	74.00	-31.81	peak
3	2374.000	39.97	11.84	51.81	74.00	-22.19	peak
4	2402.000	82.64	12.03	94.67	/	/	fundamental
5	2428.000	37.63	12.15	49.78	74.00	-24.22	peak
6	2954.000	27.90	14.38	42.28	74.00	-31.72	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. Peak: Peak detector.

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL WORST-CASE CONFIGURATION)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1584.000	26.99	7.81	34.80	74.00	-39.20	peak
2	1858.000	28.03	9.90	37.93	74.00	-36.07	peak
3	2186.000	26.63	11.28	37.91	74.00	-36.09	peak
4	2402.000	74.29	12.03	86.32	/	/	fundamental
5	2422.000	32.03	12.12	44.15	74.00	-29.85	peak
6	2708.000	26.84	13.05	39.89	74.00	-34.11	peak

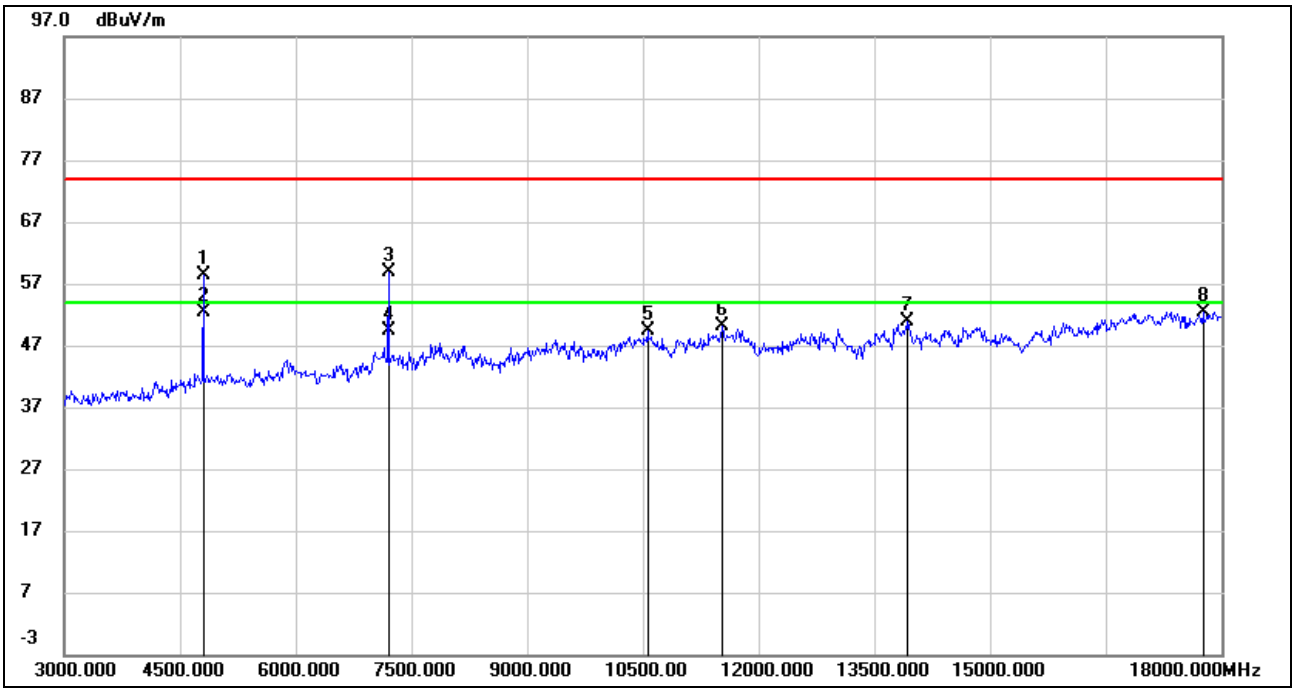
Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.

Note: All the modes and channels have been tested, only the worst data was recorded in the report.

8.3. SPURIOUS EMISSIONS (3 GHz ~ 18 GHz)

8.3.1. GFSK MODE

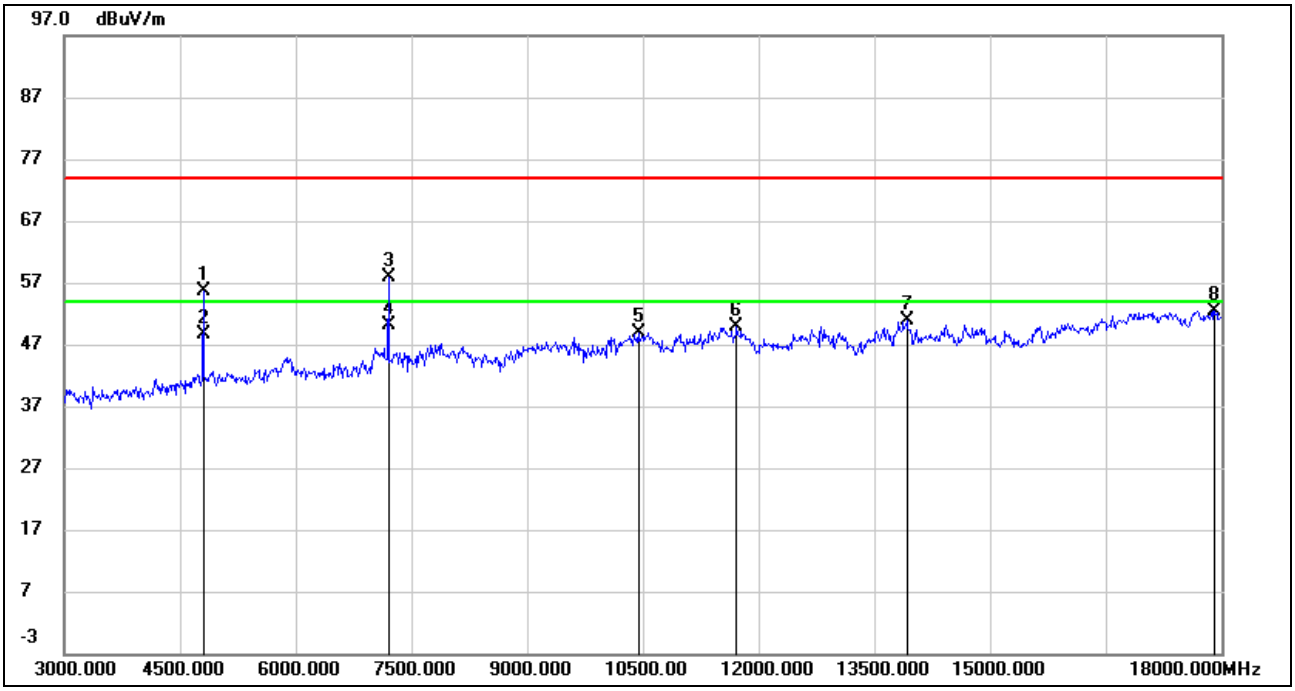
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4800.000	57.89	0.46	58.35	74.00	-15.65	peak
2	4800.000	52.04	0.46	52.50	54.00	-1.50	AVG
3	7200.000	53.10	5.82	58.92	74.00	-15.08	peak
4	7200.000	43.61	5.82	49.43	54.00	-4.57	AVG
5	10560.000	37.58	11.73	49.31	74.00	-24.69	peak
6	11535.000	36.83	13.33	50.16	74.00	-23.84	peak
7	13935.000	34.76	16.15	50.91	74.00	-23.09	peak
8	17760.000	29.45	22.95	52.40	74.00	-21.60	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG: VBW=1/Ton, where: Ton is the transmitting duration.
5. For the transmitting duration, please refer to clause 7.1.
6. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for High Pass Filter losses.
7. Proper operation of the transmitter prior to adding the filter to the measurement chain.

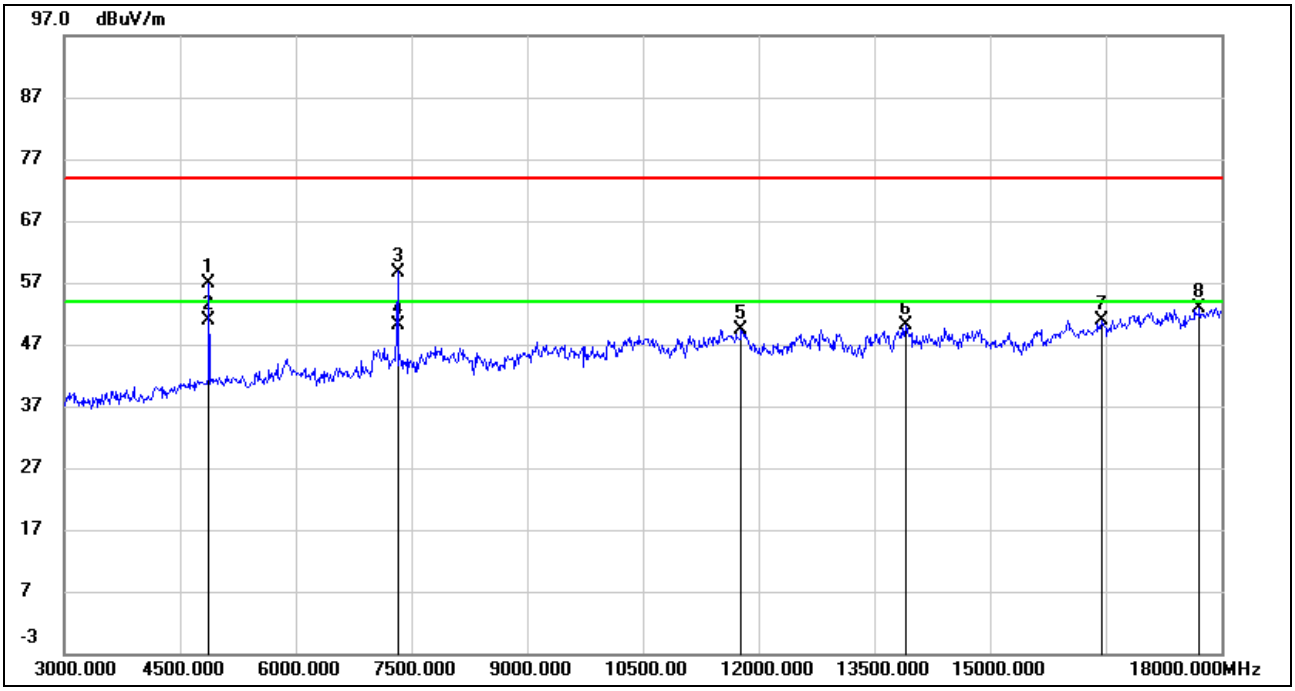
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4800.000	55.23	0.46	55.69	74.00	-18.31	peak
2	4800.000	48.19	0.46	48.65	54.00	-5.35	AVG
3	7200.000	52.12	5.82	57.94	74.00	-16.06	peak
4	7200.000	44.25	5.82	50.07	54.00	-3.93	AVG
5	10440.000	37.81	11.13	48.94	74.00	-25.06	peak
6	11715.000	36.86	12.99	49.85	74.00	-24.15	peak
7	13920.000	34.68	16.17	50.85	74.00	-23.15	peak
8	17910.000	29.10	23.35	52.45	74.00	-21.55	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG: VBW=1/Ton, where: Ton is the transmitting duration.
5. For the transmitting duration, please refer to clause 7.1.
6. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for High Pass Filter losses.
7. Proper operation of the transmitter prior to adding the filter to the measurement chain.

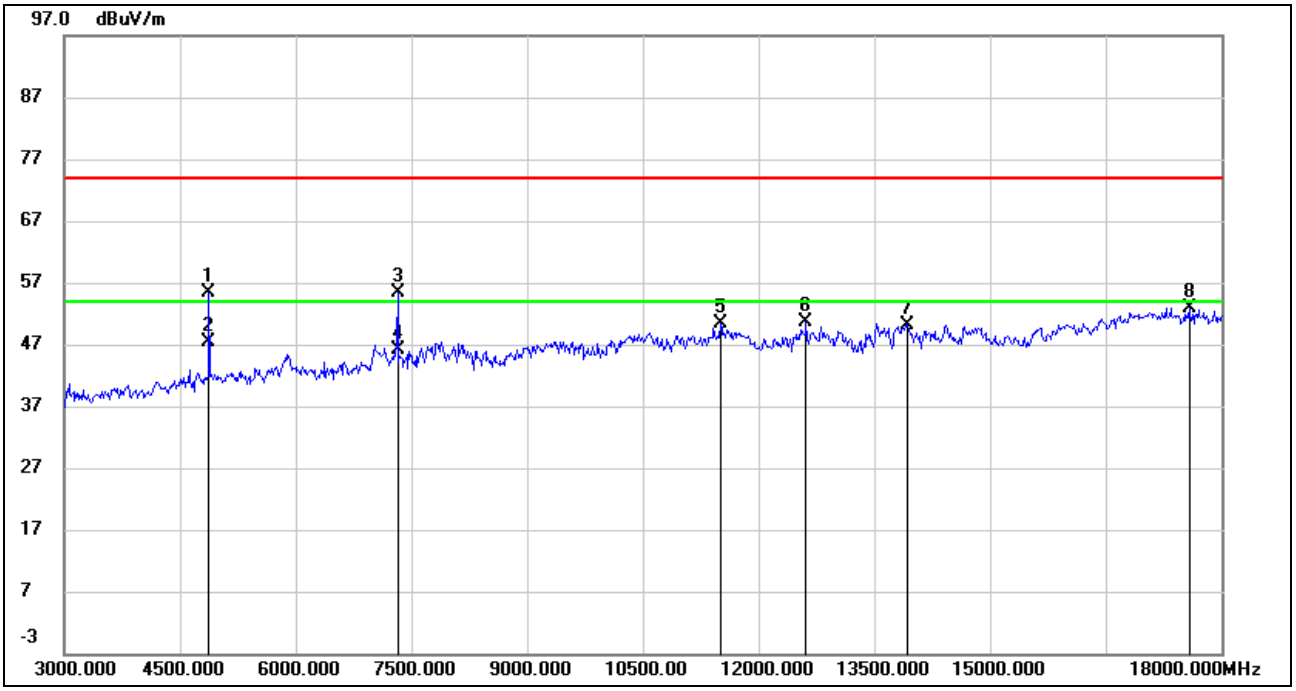
HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4875.000	56.17	0.76	56.93	74.00	-17.07	peak
2	4875.000	50.13	0.76	50.89	54.00	-3.11	AVG
3	7320.000	52.61	6.14	58.75	74.00	-15.25	peak
4	7320.000	44.02	6.14	50.16	54.00	-3.84	AVG
5	11775.000	36.35	13.13	49.48	74.00	-24.52	peak
6	13905.000	34.04	16.20	50.24	74.00	-23.76	peak
7	16440.000	31.95	18.94	50.89	74.00	-23.11	peak
8	17715.000	30.29	22.56	52.85	74.00	-21.15	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG: VBW=1/Ton, where: Ton is the transmitting duration.
5. For the transmitting duration, please refer to clause 7.1.
6. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for High Pass Filter losses.
7. Proper operation of the transmitter prior to adding the filter to the measurement chain.

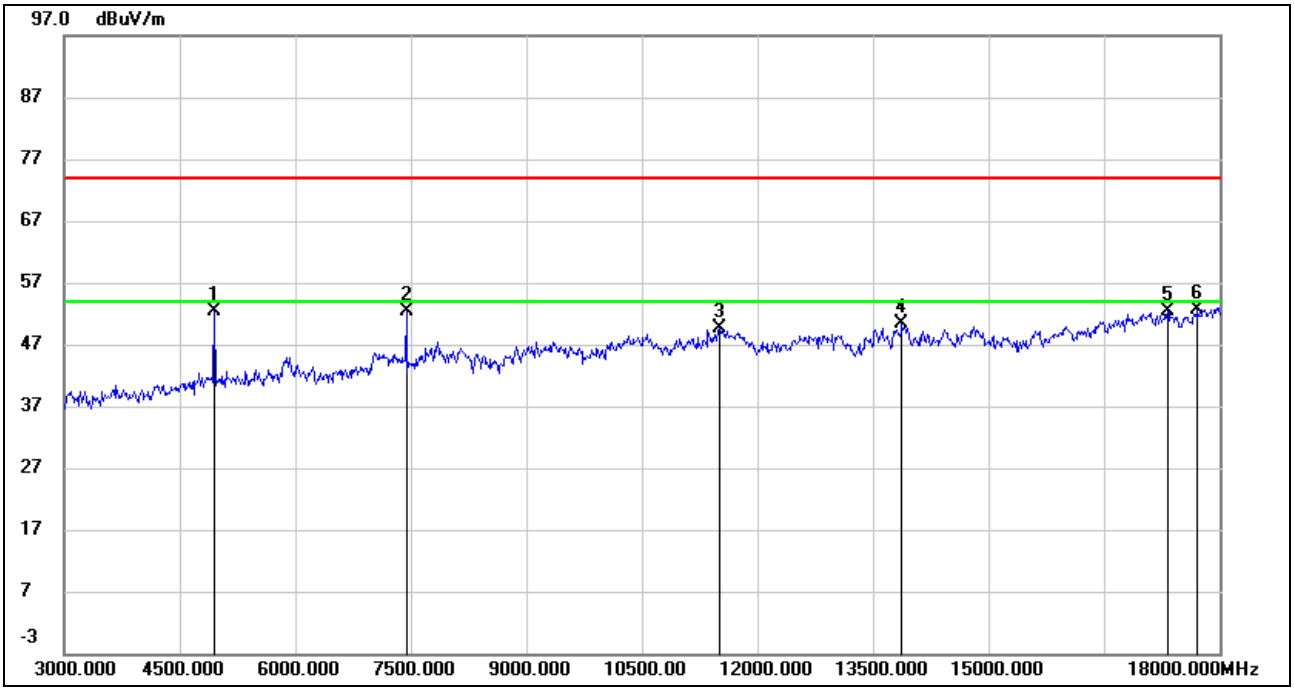
HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4875.000	54.64	0.76	55.40	74.00	-18.60	peak
2	4875.000	46.74	0.76	47.50	54.00	-6.50	AVG
3	7320.000	49.13	6.14	55.27	74.00	-18.73	peak
4	7320.000	40.10	6.14	46.24	54.00	-7.76	AVG
5	11505.000	37.05	13.42	50.47	74.00	-23.53	peak
6	12615.000	36.52	14.03	50.55	74.00	-23.45	peak
7	13935.000	34.07	16.15	50.22	74.00	-23.78	peak
8	17580.000	31.29	21.71	53.00	74.00	-21.00	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG: VBW=1/Ton, where: Ton is the transmitting duration.
5. For the transmitting duration, please refer to clause 7.1.
6. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for High Pass Filter losses.
7. Proper operation of the transmitter prior to adding the filter to the measurement chain.

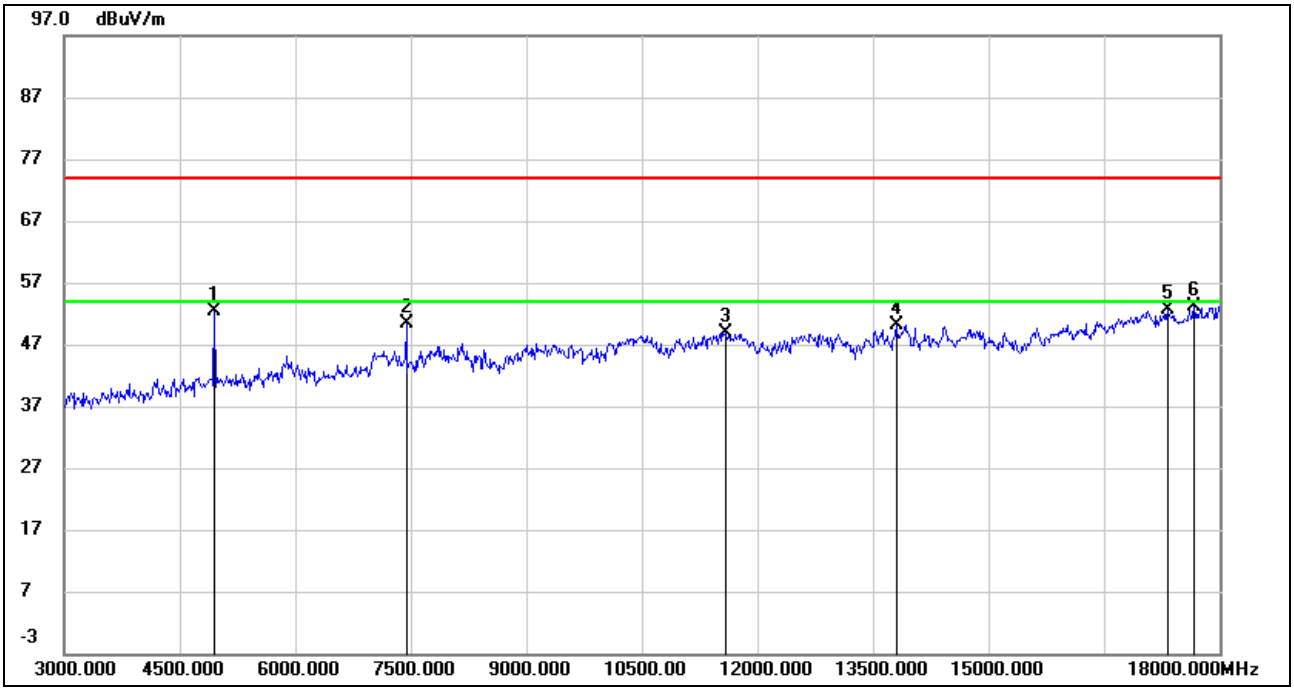
HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4950.000	51.29	1.13	52.42	74.00	-21.58	peak
2	7440.000	45.94	6.32	52.26	74.00	-21.74	peak
3	11505.000	36.31	13.42	49.73	74.00	-24.27	peak
4	13875.000	34.00	16.44	50.44	74.00	-23.56	peak
5	17325.000	30.70	21.67	52.37	74.00	-21.63	peak
6	17715.000	30.16	22.56	52.72	74.00	-21.28	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for High Pass Filter losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)

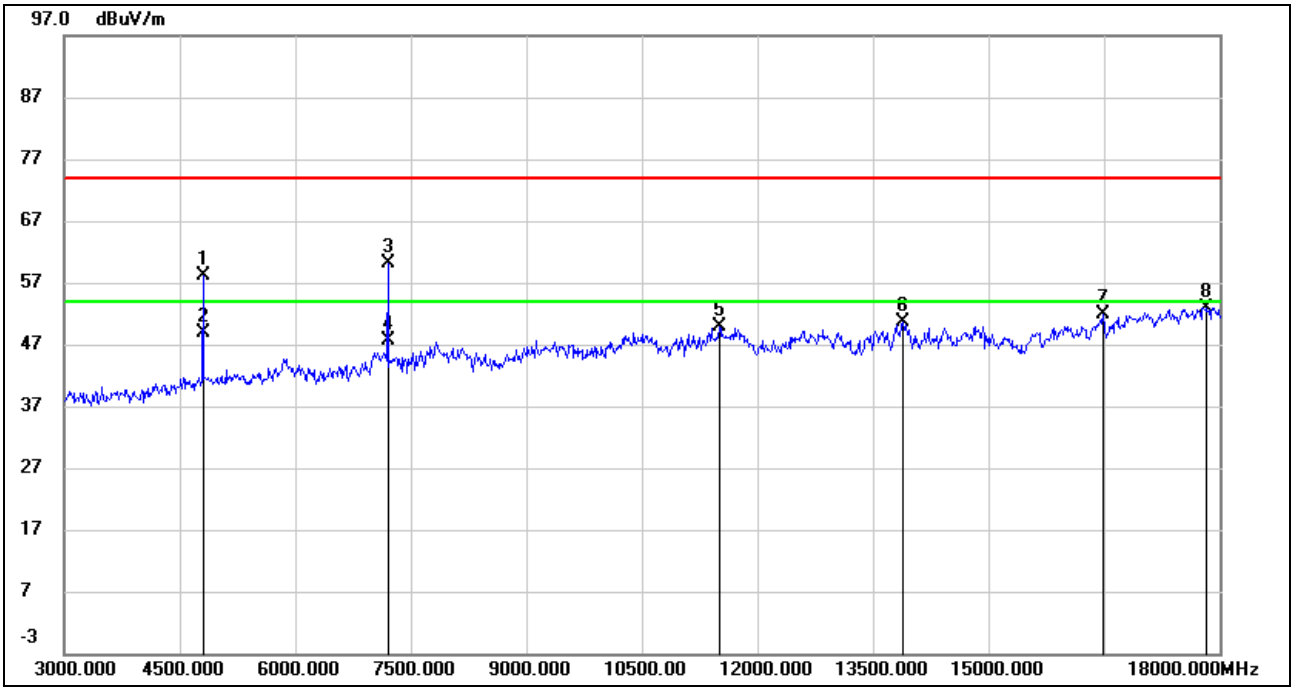


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4950.000	51.22	1.13	52.35	74.00	-21.65	peak
2	7440.000	44.04	6.32	50.36	74.00	-23.64	peak
3	11580.000	35.72	13.23	48.95	74.00	-25.05	peak
4	13800.000	32.99	17.10	50.09	74.00	-23.91	peak
5	17325.000	30.96	21.67	52.63	74.00	-21.37	peak
6	17670.000	30.78	22.24	53.02	74.00	-20.98	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for High Pass Filter losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

8.3.2. ∏/4-DQPSK MODE

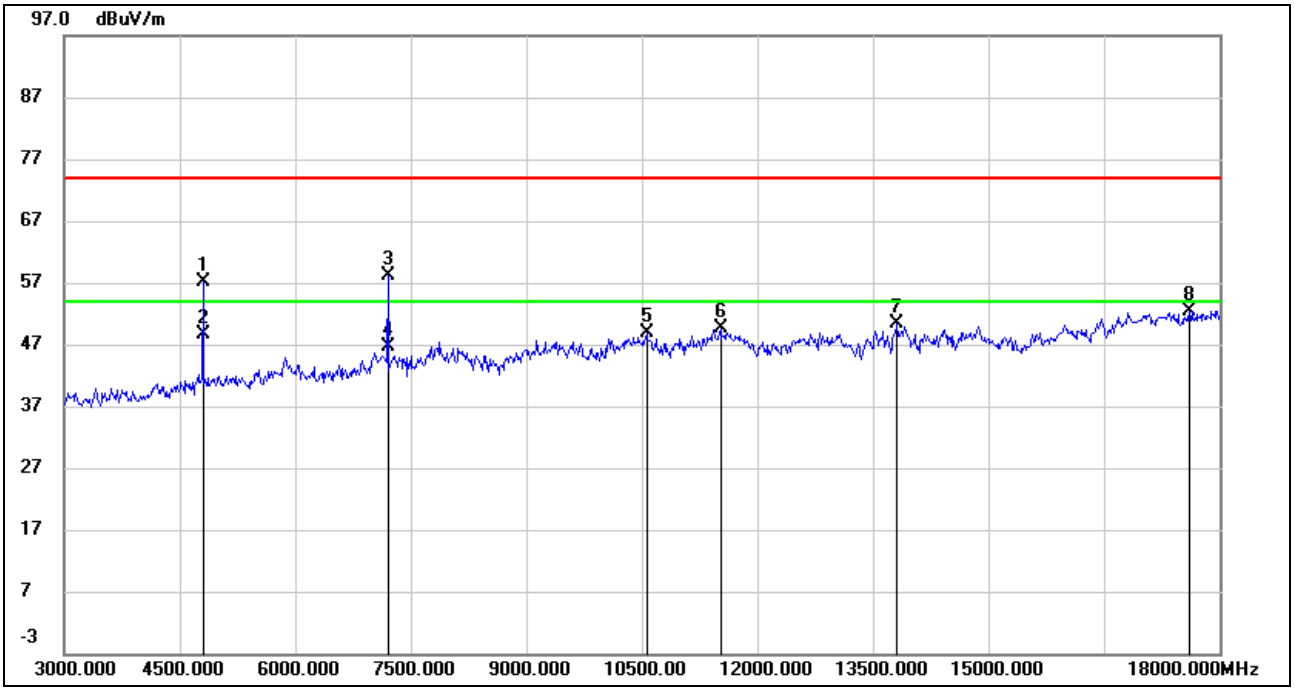
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4800.000	57.67	0.46	58.13	74.00	-15.87	peak
2	4800.000	48.34	0.46	48.80	54.00	-5.20	AVG
3	7200.000	54.26	5.82	60.08	74.00	-13.92	peak
4	7200.000	41.77	5.82	47.59	54.00	-6.41	AVG
5	11505.000	36.48	13.42	49.90	74.00	-24.10	peak
6	13890.000	34.20	16.31	50.51	74.00	-23.49	peak
7	16485.000	32.65	19.13	51.78	74.00	-22.22	peak
8	17820.000	29.69	23.30	52.99	74.00	-21.01	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG: VBW=1/Ton, where: Ton is the transmitting duration.
5. For the transmitting duration, please refer to clause 7.1.
6. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for High Pass Filter losses.
7. Proper operation of the transmitter prior to adding the filter to the measurement chain.

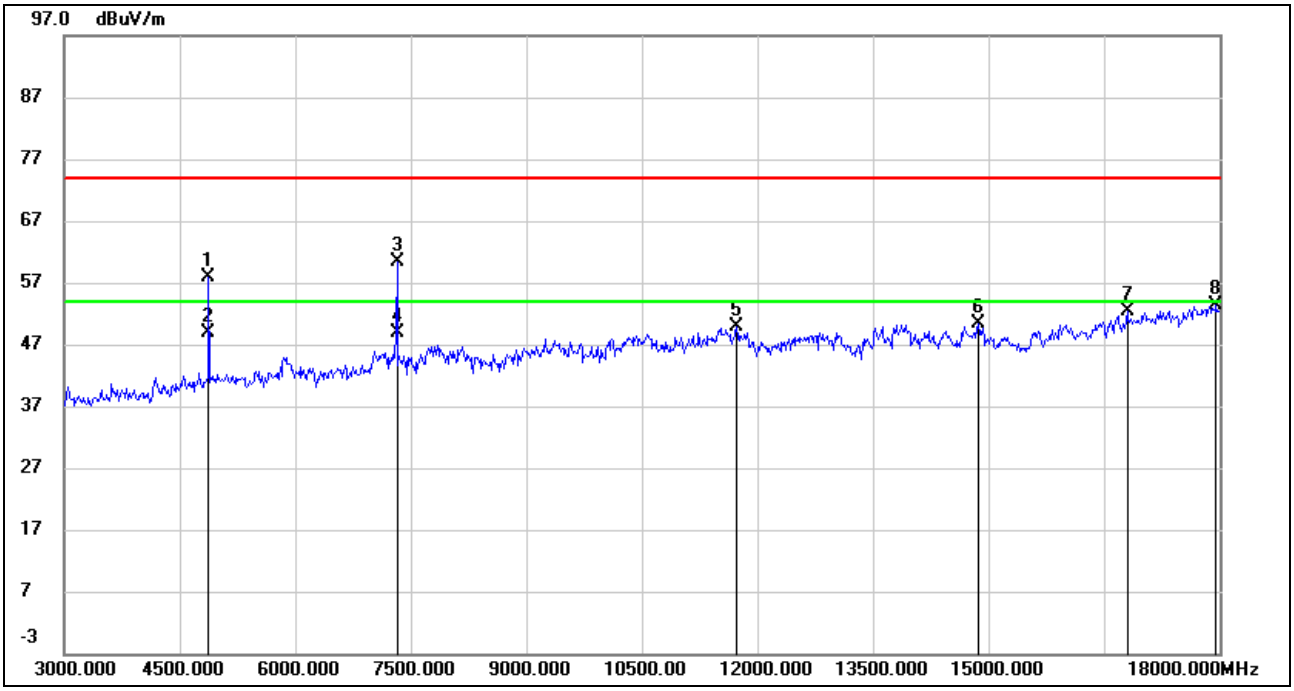
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4800.000	56.66	0.46	57.12	74.00	-16.88	peak
2	4800.000	48.10	0.46	48.56	54.00	-5.44	AVG
3	7200.000	52.40	5.82	58.22	74.00	-15.78	peak
4	7200.000	40.69	5.82	46.51	54.00	-7.49	AVG
5	10560.000	37.08	11.73	48.81	74.00	-25.19	peak
6	11520.000	36.14	13.38	49.52	74.00	-24.48	peak
7	13815.000	33.29	16.97	50.26	74.00	-23.74	peak
8	17610.000	30.57	21.86	52.43	74.00	-21.57	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG: VBW=1/Ton, where: Ton is the transmitting duration.
5. For the transmitting duration, please refer to clause 7.1.
6. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for High Pass Filter losses.
7. Proper operation of the transmitter prior to adding the filter to the measurement chain.

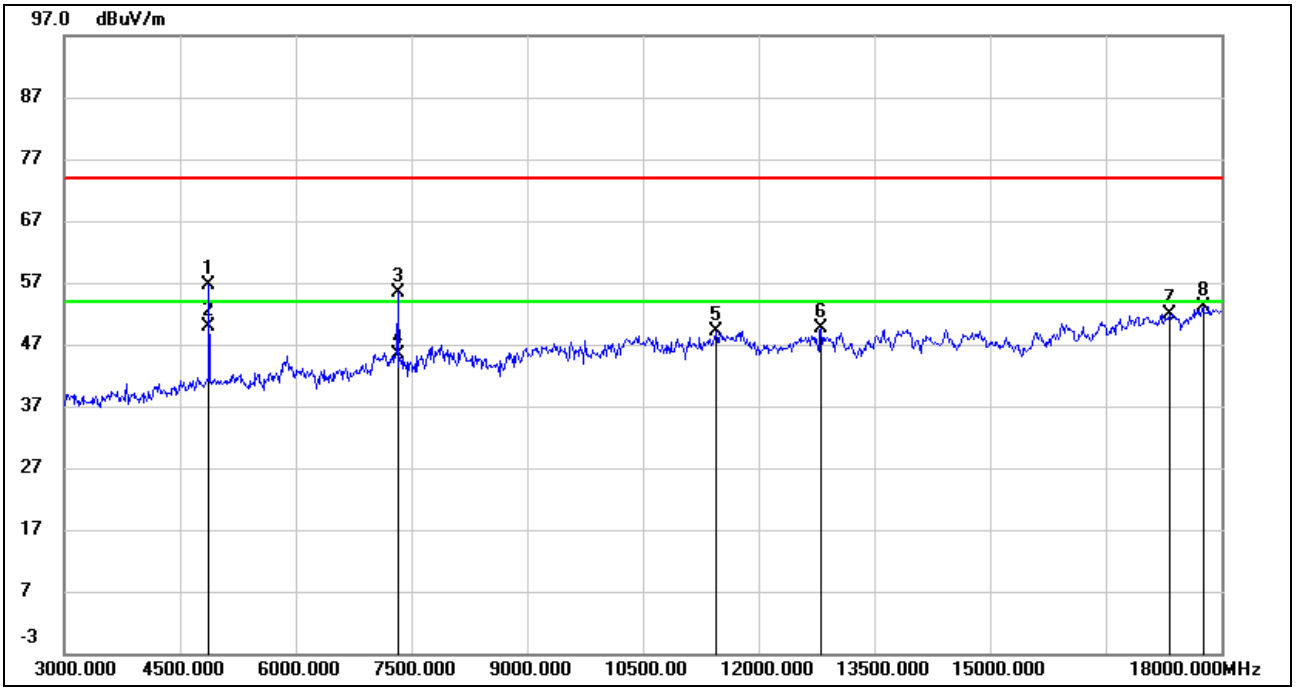
HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4875.000	57.08	0.76	57.84	74.00	-16.16	peak
2	4875.000	48.09	0.76	48.85	54.00	-5.15	AVG
3	7320.000	54.12	6.14	60.26	74.00	-13.74	peak
4	7320.000	42.80	6.14	48.94	54.00	-5.06	AVG
5	11730.000	36.86	13.02	49.88	74.00	-24.12	peak
6	14865.000	34.50	15.98	50.48	74.00	-23.52	peak
7	16800.000	32.52	19.95	52.47	74.00	-21.53	peak
8	17955.000	30.02	23.41	53.43	74.00	-20.57	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG: VBW=1/Ton, where: Ton is the transmitting duration.
5. For the transmitting duration, please refer to clause 7.1.
6. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for High Pass Filter losses.
7. Proper operation of the transmitter prior to adding the filter to the measurement chain.

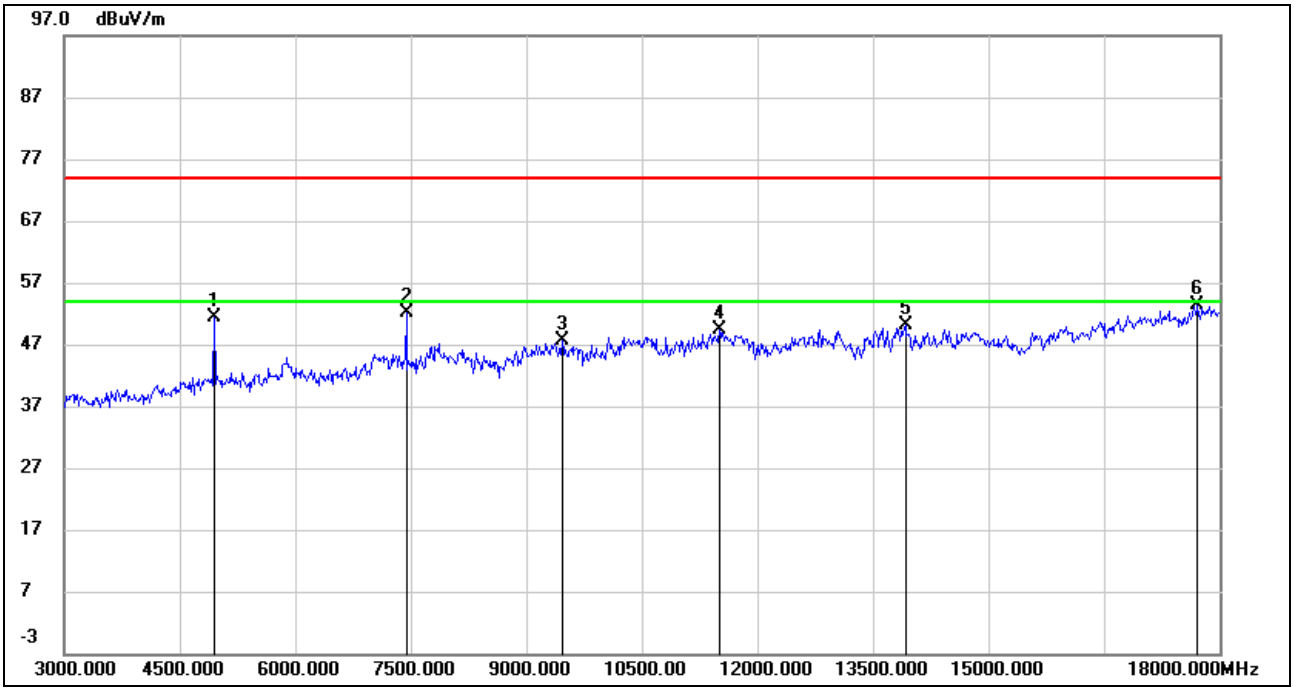
HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4875.000	55.92	0.76	56.68	74.00	-17.32	peak
2	4875.000	49.21	0.76	49.97	54.00	-4.03	AVG
3	7320.000	49.19	6.14	55.33	74.00	-18.67	peak
4	7320.000	39.12	6.14	45.26	54.00	-8.74	AVG
5	11445.000	36.17	12.99	49.16	74.00	-24.84	peak
6	12810.000	34.02	15.59	49.61	74.00	-24.39	peak
7	17325.000	30.23	21.67	51.90	74.00	-22.10	peak
8	17760.000	30.27	22.95	53.22	74.00	-20.78	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG: VBW=1/Ton, where: Ton is the transmitting duration.
5. For the transmitting duration, please refer to clause 7.1.
6. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for High Pass Filter losses.
7. Proper operation of the transmitter prior to adding the filter to the measurement chain.

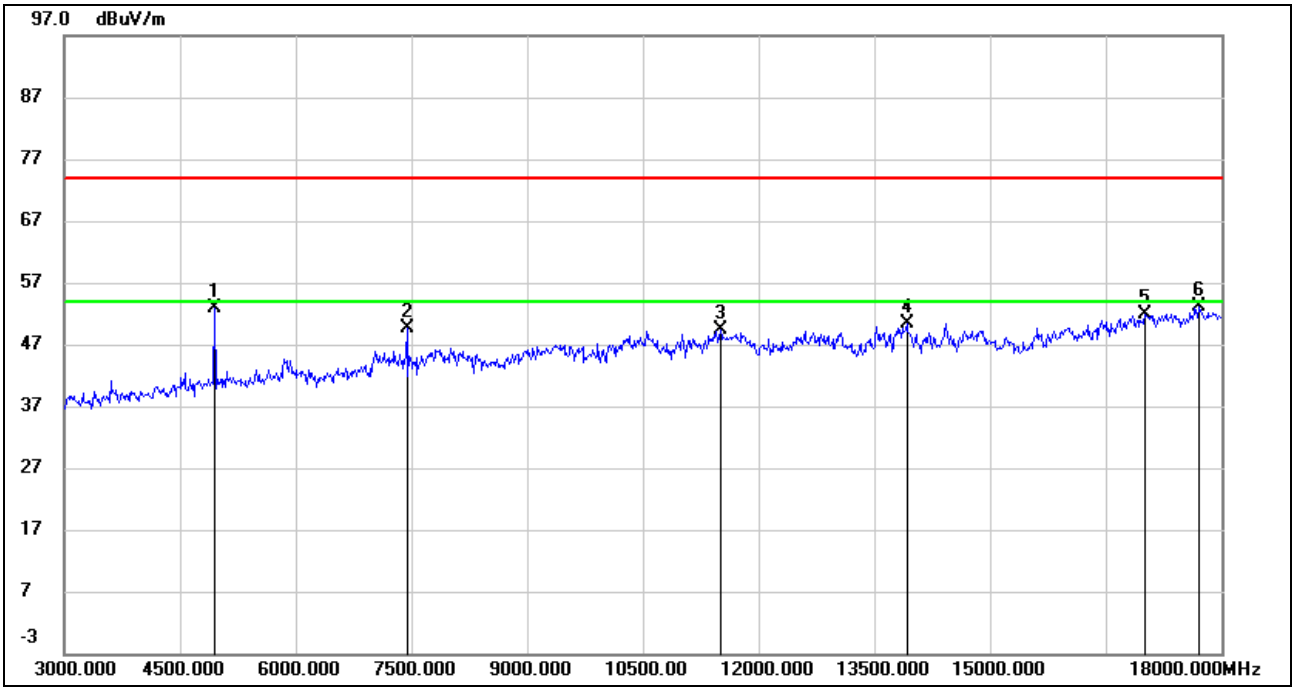
HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4950.000	50.14	1.13	51.27	74.00	-22.73	peak
2	7440.000	45.81	6.32	52.13	74.00	-21.87	peak
3	9465.000	38.08	9.54	47.62	74.00	-26.38	peak
4	11505.000	35.94	13.42	49.36	74.00	-24.64	peak
5	13920.000	33.92	16.17	50.09	74.00	-23.91	peak
6	17715.000	30.83	22.56	53.39	74.00	-20.61	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for High Pass Filter losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)



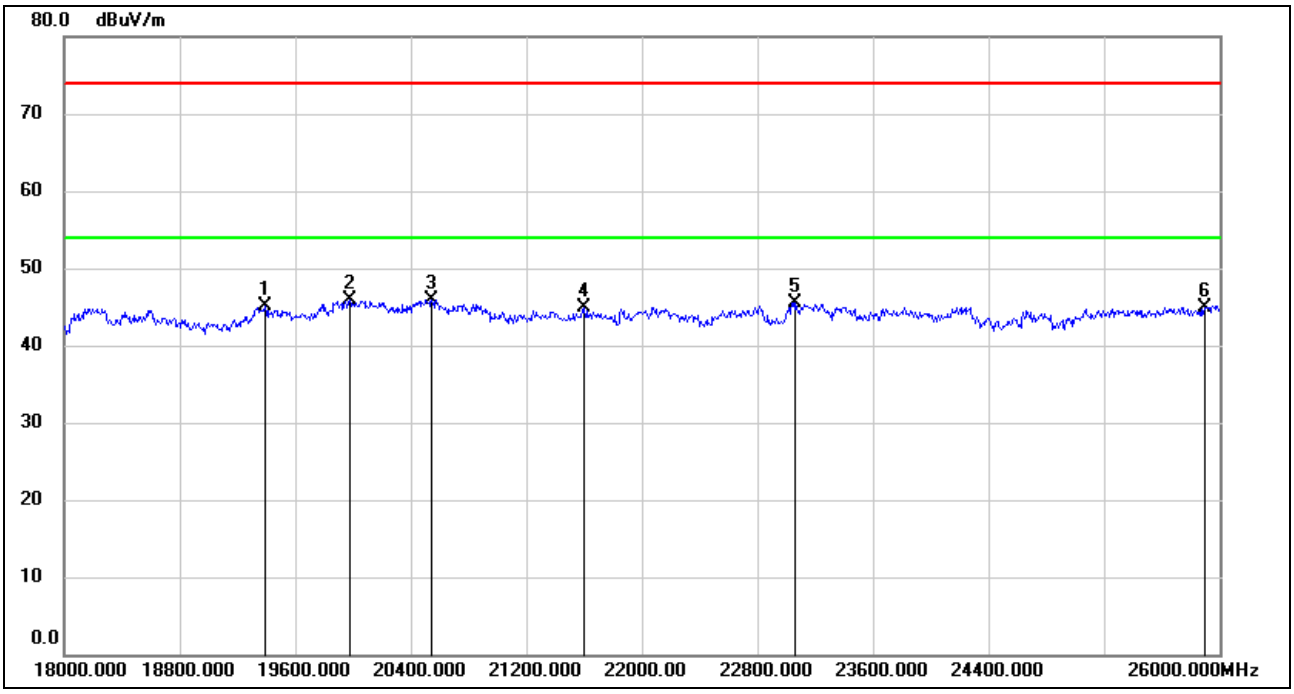
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4950.000	51.68	1.13	52.81	74.00	-21.19	peak
2	7440.000	43.34	6.32	49.66	74.00	-24.34	peak
3	11505.000	36.06	13.42	49.48	74.00	-24.52	peak
4	13920.000	34.29	16.17	50.46	74.00	-23.54	peak
5	17010.000	31.53	20.43	51.96	74.00	-22.04	peak
6	17715.000	30.57	22.56	53.13	74.00	-20.87	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for High Pass Filter losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

8.4. SPURIOUS EMISSIONS (18 GHz ~ 26 GHz)

8.4.1. GFSK MODE

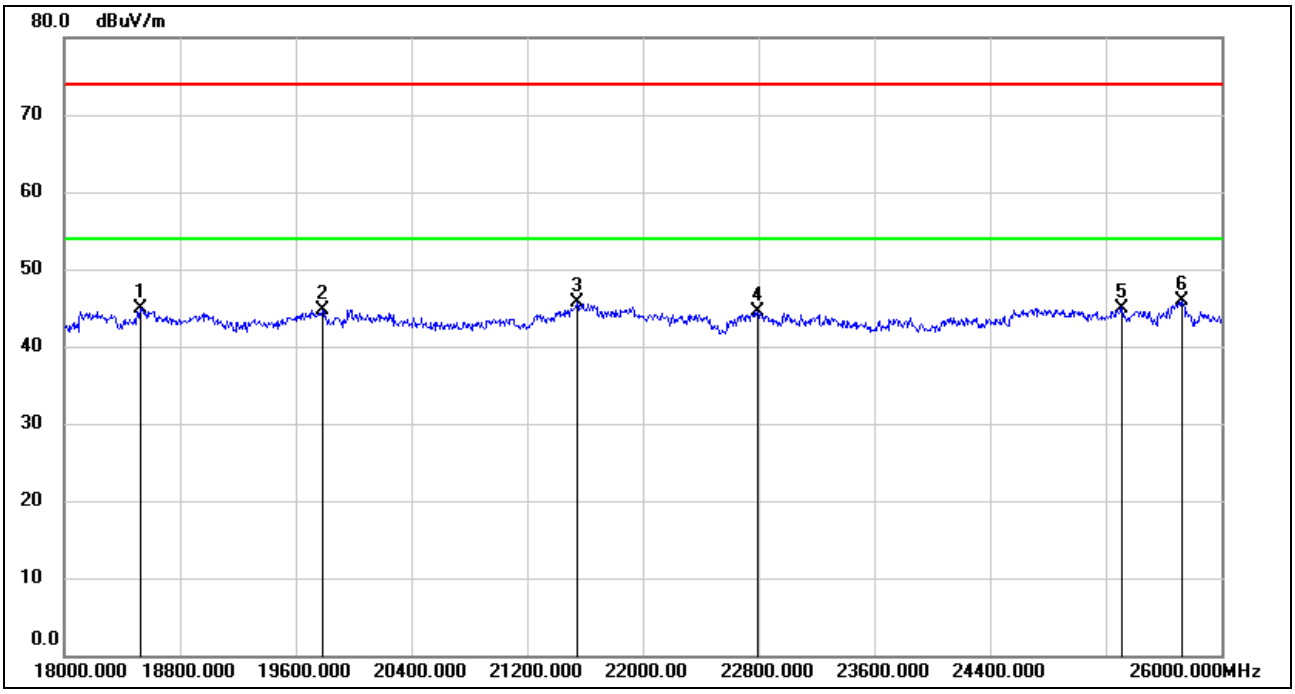
SPURIOUS EMISSIONS (LOW CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	19392.000	50.62	-5.57	45.05	74.00	-28.95	peak
2	19976.000	51.32	-5.44	45.88	74.00	-28.12	peak
3	20544.000	51.20	-5.31	45.89	74.00	-28.11	peak
4	21600.000	49.52	-4.54	44.98	74.00	-29.02	peak
5	23064.000	48.99	-3.42	45.57	74.00	-28.43	peak
6	25896.000	45.82	-0.87	44.95	74.00	-29.05	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. The preamplifier only effect to the above 18GHz signal and no filter added to the measurement chain.

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



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	18528.000	50.11	-5.26	44.85	74.00	-29.15	peak
2	19784.000	50.07	-5.28	44.79	74.00	-29.21	peak
3	21544.000	50.26	-4.63	45.63	74.00	-28.37	peak
4	22792.000	48.11	-3.65	44.46	74.00	-29.54	peak
5	25312.000	46.70	-1.70	45.00	74.00	-29.00	peak
6	25728.000	46.61	-0.72	45.89	74.00	-28.11	peak

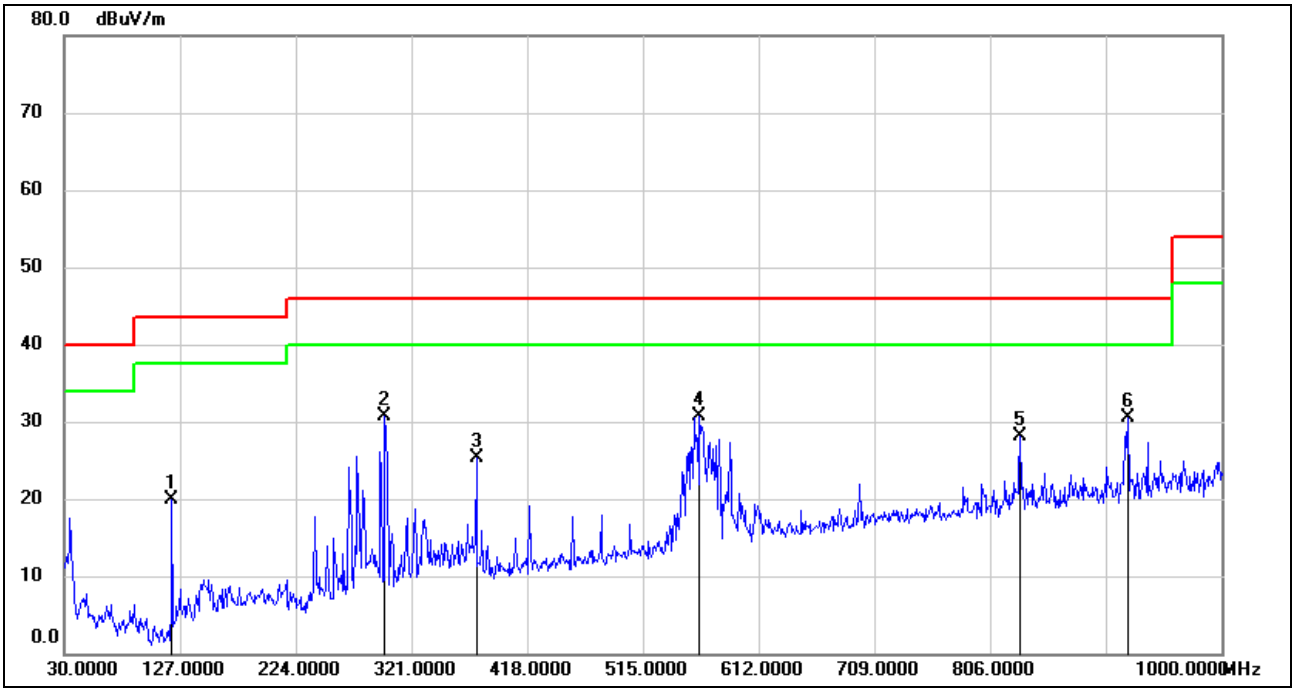
Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. The preamplifier only effect to the above 18GHz signal and no filter added to the measurement chain.

Note: All the modes have been tested, only the worst data was recorded in the report.

8.5. SPURIOUS EMISSIONS (30 MHz ~ 1 GHz)

8.5.1. GFSK MODE

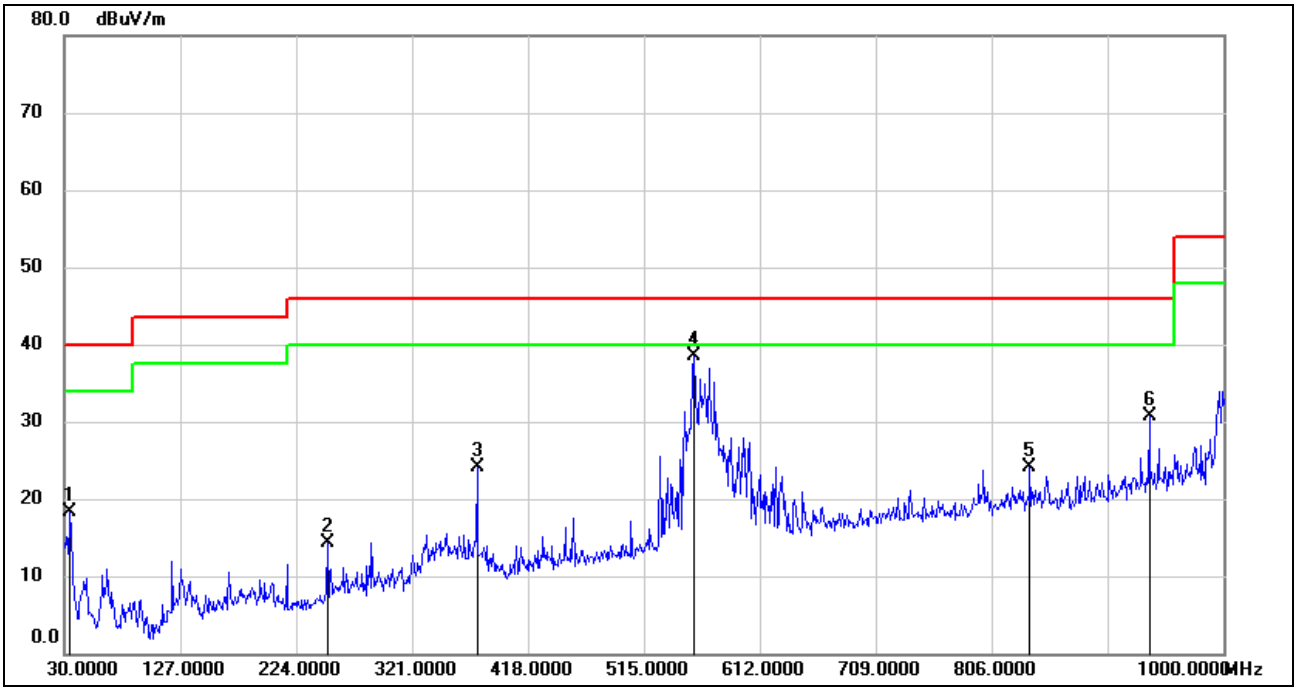
SPURIOUS EMISSIONS (LOW CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	120.2100	40.72	-20.74	19.98	43.50	-23.52	QP
2	298.6900	45.05	-14.41	30.64	46.00	-15.36	QP
3	375.3200	38.34	-13.09	25.25	46.00	-20.75	QP
4	562.5300	40.38	-9.69	30.69	46.00	-15.31	QP
5	831.2199	33.29	-5.09	28.20	46.00	-17.80	QP
6	921.4300	34.41	-3.95	30.46	46.00	-15.54	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 (LOW CHANNEL, WORST-CASE CONFIGURATION, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	34.8500	35.83	-17.45	18.38	40.00	-21.62	QP
2	250.1900	30.72	-16.34	14.38	46.00	-31.62	QP
3	375.3200	37.29	-13.09	24.20	46.00	-21.80	QP
4	556.7100	48.34	-9.82	38.52	46.00	-7.48	QP
5	838.0100	28.92	-4.91	24.01	46.00	-21.99	QP
6	937.9200	34.40	-3.76	30.64	46.00	-15.36	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

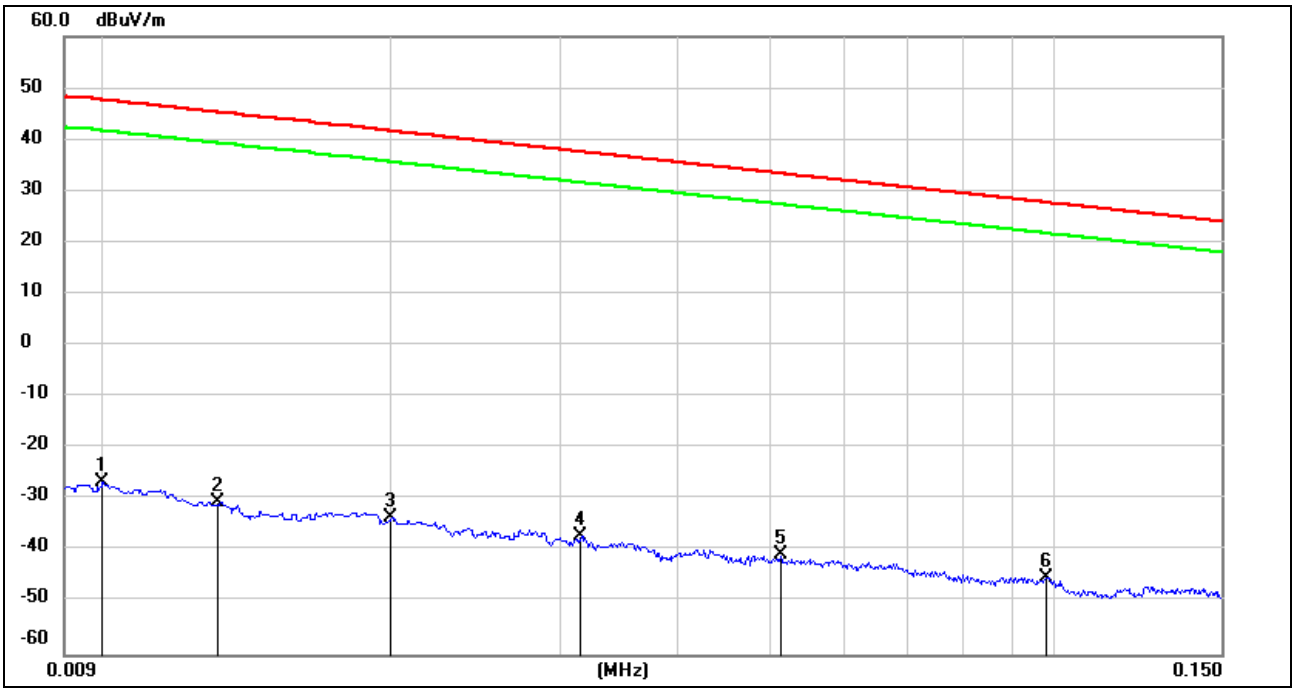
Note: All the modes have been tested, only the worst data was recorded in the report.

8.6. SPURIOUS EMISSIONS BELOW 30 MHz

8.6.1. GFSK MODE

(LOW CHANNEL, LOOP ANTENNA FACE ON TO THE EUT, WORST-CASE CONFIGURATION)

9 kHz~ 150 kHz



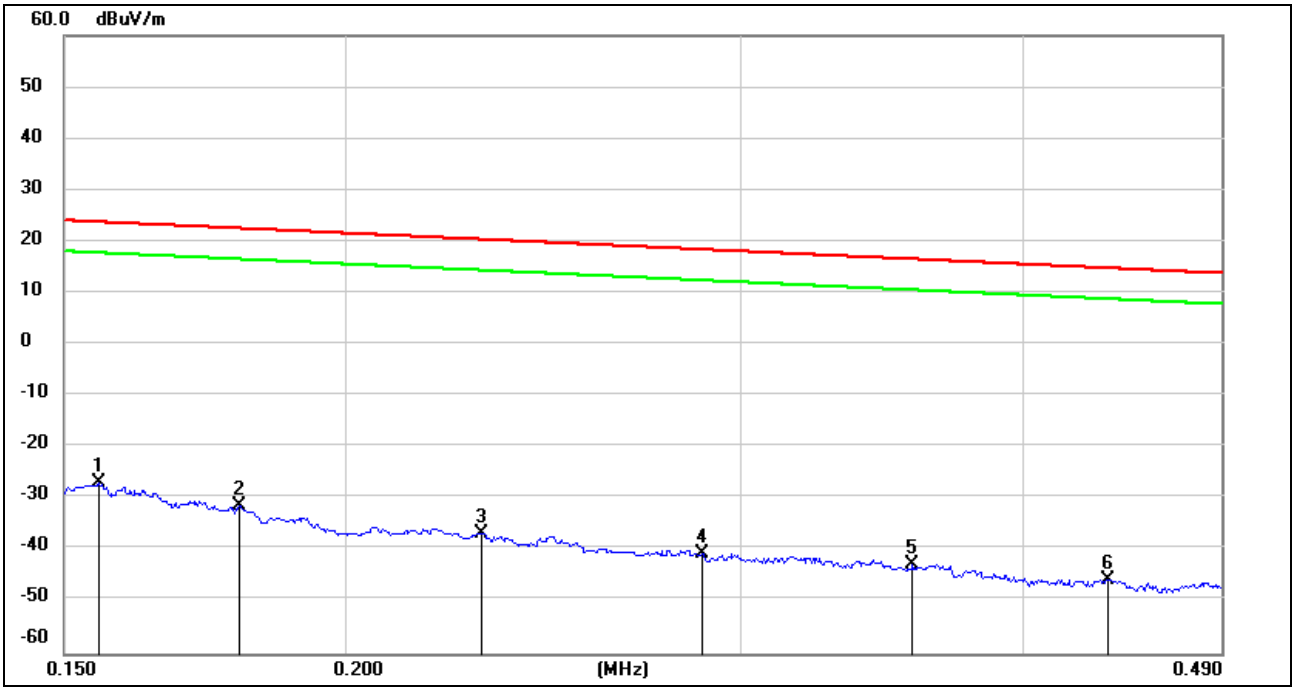
No.	Frequency	Reading	Correct	Result	Limit	ISED Result	ISED Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuA/m)	(dBuA/m)	(dB)	
1	0.0100	74.72	-101.40	-26.68	47.60	-78.18	-3.90	-74.28	peak
2	0.0131	70.97	-101.38	-30.41	45.25	-81.91	-6.25	-75.66	peak
3	0.0200	67.86	-101.34	-33.48	41.58	-84.98	-9.92	-75.06	peak
4	0.0316	64.24	-101.40	-37.16	37.61	-88.66	-13.89	-74.77	peak
5	0.0514	60.68	-101.48	-40.80	33.38	-92.30	-18.12	-74.18	peak
6	0.0981	56.77	-101.78	-45.01	27.77	-96.51	-23.73	-72.78	peak

Note: 1. Measurement = Reading Level + Correct Factor (dBuA/m= dBuV/m- 20Log10[120π] = dBuV/m- 51.5).

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

3. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

150 kHz ~ 490 kHz



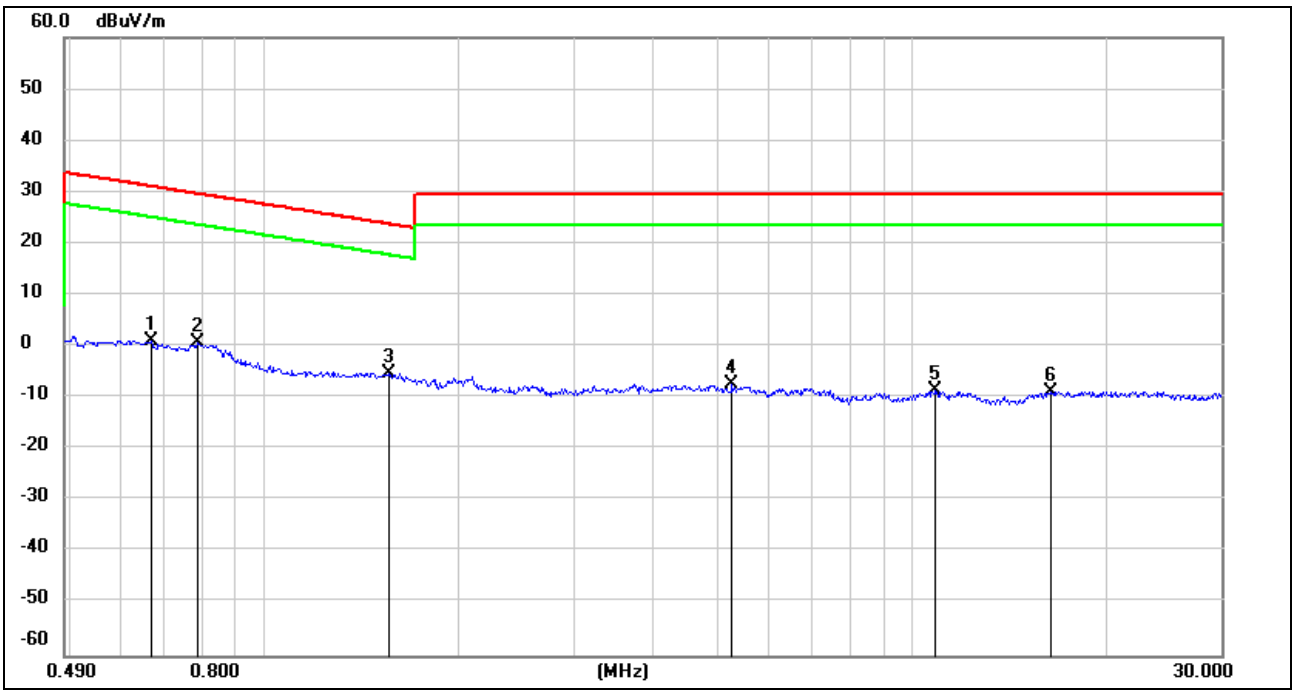
No.	Frequency	Reading	Correct	Result	Limit	ISED Result	ISED Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuA/m)	(dBuA/m)	(dB)	
1	0.1554	74.77	-101.65	-26.88	23.77	-78.38	-27.73	-50.65	peak
2	0.1794	70.27	-101.68	-31.41	22.53	-82.91	-28.97	-53.94	peak
3	0.2298	65.05	-101.77	-36.72	20.37	-88.22	-31.13	-57.09	peak
4	0.2878	61.22	-101.85	-40.63	18.42	-92.13	-33.08	-59.05	peak
5	0.3573	59.08	-101.91	-42.83	16.54	-94.33	-34.96	-59.37	peak
6	0.4364	56.36	-101.99	-45.63	14.80	-97.13	-36.70	-60.43	peak

Note: 1. Measurement = Reading Level + Correct Factor (dBuA/m= dBuV/m- 20Log10[120π] = dBuV/m- 51.5).

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

3. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

490 kHz ~ 30 MHz



No.	Frequency	Reading	Correct	Result	Limit	ISED Result	ISED Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuA/m)	(dBuA/m)	(dB)	
1	0.6671	63.25	-62.10	1.15	31.12	-50.35	-20.38	-29.97	peak
2	0.7861	62.83	-62.14	0.69	29.69	-50.81	-21.81	-29.00	peak
3	1.5564	56.68	-62.02	-5.34	23.76	-56.84	-27.74	-29.10	peak
4	5.2705	54.04	-61.45	-7.41	29.54	-58.91	-21.96	-36.95	peak
5	10.8772	52.24	-60.84	-8.60	29.54	-60.10	-21.96	-38.14	peak
6	16.3959	52.17	-60.96	-8.79	29.54	-60.29	-21.96	-38.33	peak

Note: 1. Measurement = Reading Level + Correct Factor (dBuA/m= dBuV/m- 20Log10[120π] = dBuV/m- 51.5).

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

3. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

Note: All the modes have been tested, only the worst data was 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.

RESULTS

Complies

APPENDIX A: DUTY CYCLE

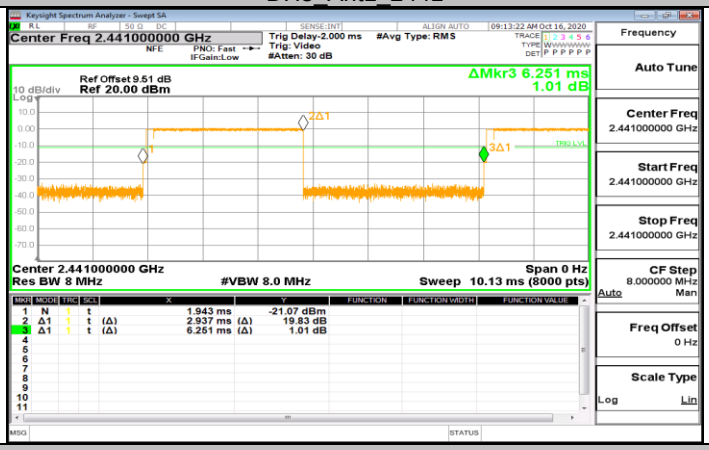
Test Result

Test Packet Type	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)	Final setting For VBW (kHz)
DH5	2.93	6.25	0.4688	46.88	3.29	0.34	0.5
2DH5	2.94	6.25	0.4704	47.04	3.28	0.34	0.5

Note:
Duty Cycle Correction Factor=10log (1/x).
Where: x is Duty Cycle (Linear)
Where: T is On Time
If that calculated VBW is not available on the analyzer then the next higher value should be used

Test Graphs

DH5_Ant1_2441



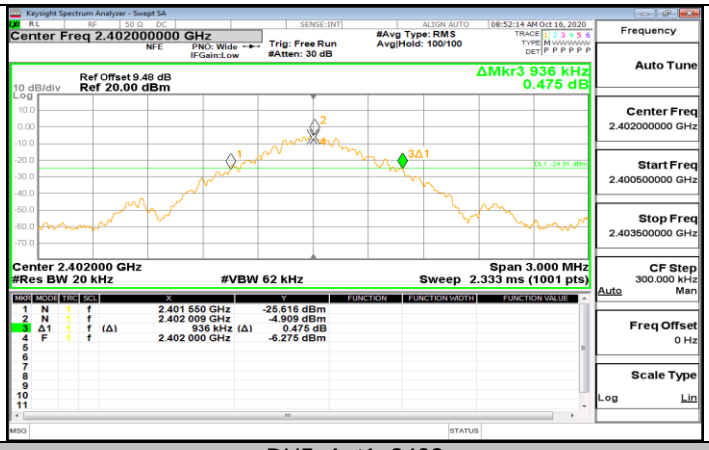
2DH5_Ant1_2441

Appendix B: 20dB Emission Bandwidth

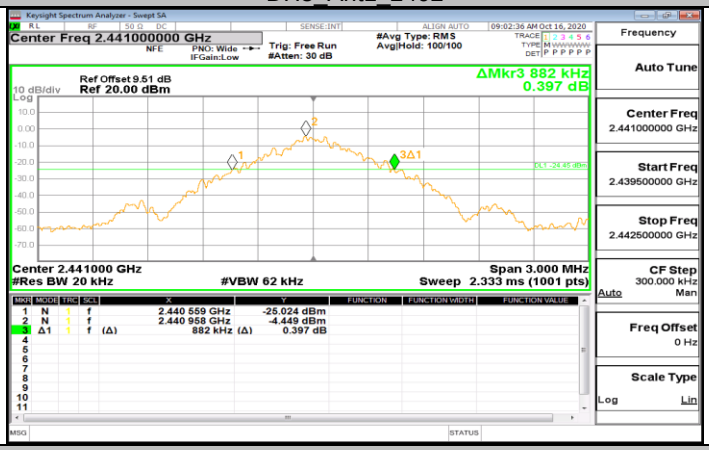
Test Result

Test Packet Type	Antenna	Channel	20db EBW[MHz]	FL[MHz]	FH[MHz]	Verdict
DH5	Ant1	2402	0.936	2401.550	2402.486	PASS
		2441	0.882	2440.559	2441.441	PASS
		2480	0.924	2479.562	2480.486	PASS
2DH5	Ant1	2402	1.284	2401.352	2402.636	PASS
		2441	1.287	2440.349	2441.636	PASS
		2480	1.341	2479.340	2480.681	PASS

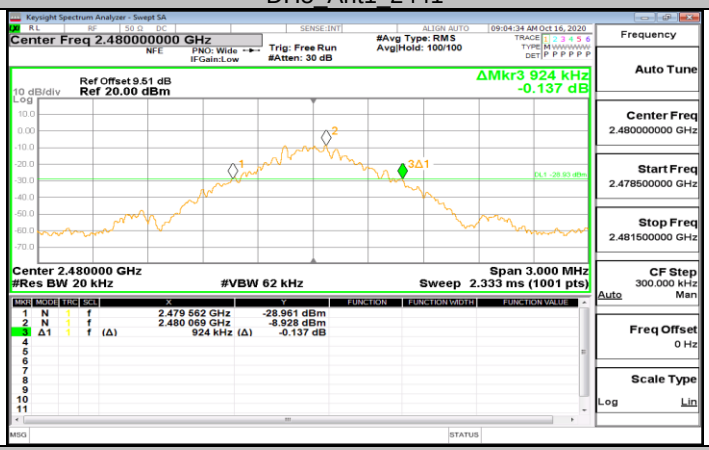
Test Graphs



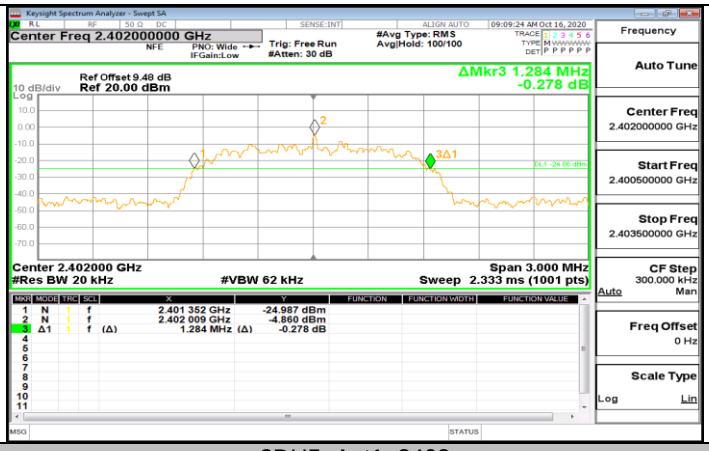
DH5_Ant1_2402



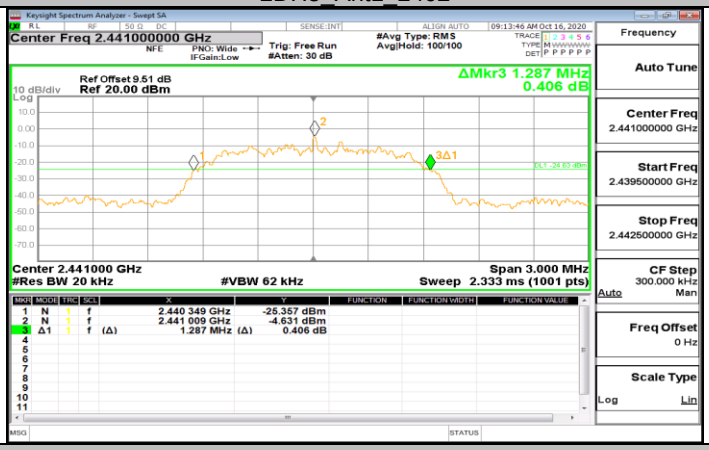
DH5_Ant1_2441



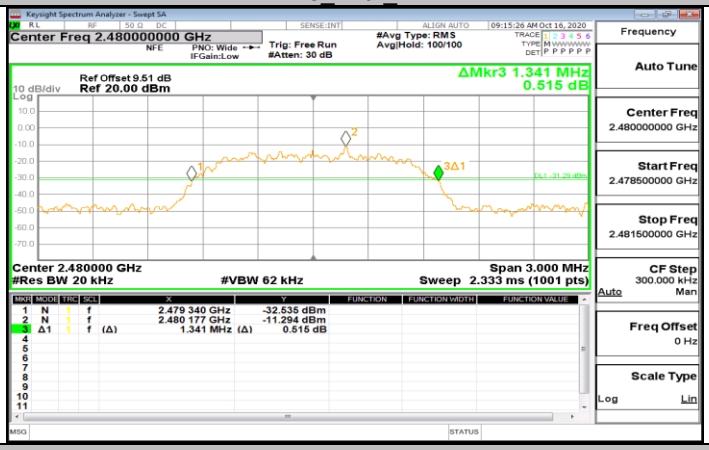
DH5_Ant1_2480



2DH5_Ant1_2402



2DH5_Ant1_2441



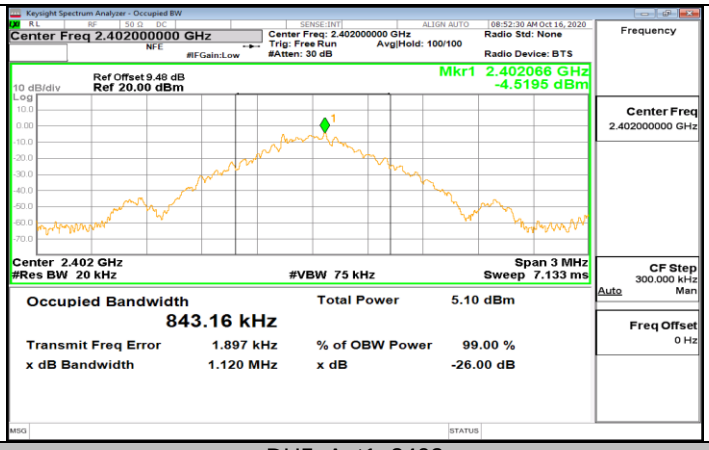
2DH5_Ant1_2480

Appendix C: Occupied Channel Bandwidth

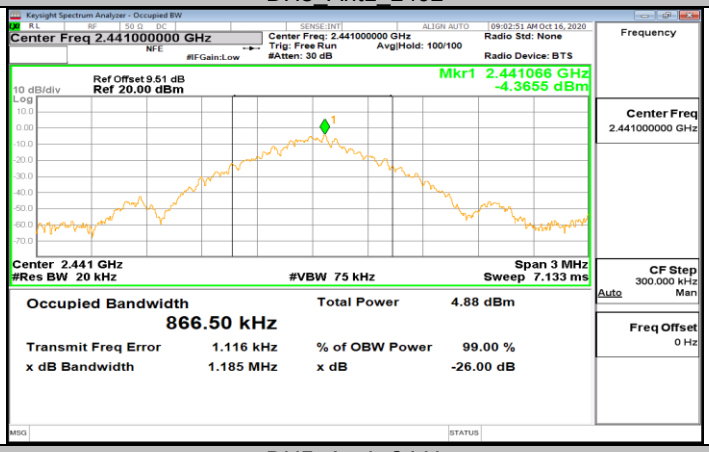
Test Result

Test Packet Type	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Verdict
DH5	Ant1	2402	0.84316	2401.580	2402.423	PASS
		2441	0.86650	2440.568	2441.434	PASS
		2480	0.85123	2479.575	2480.427	PASS
2DH5	Ant1	2402	1.1978	2401.406	2402.603	PASS
		2441	1.2090	2440.401	2441.610	PASS
		2480	1.1812	2479.412	2480.593	PASS

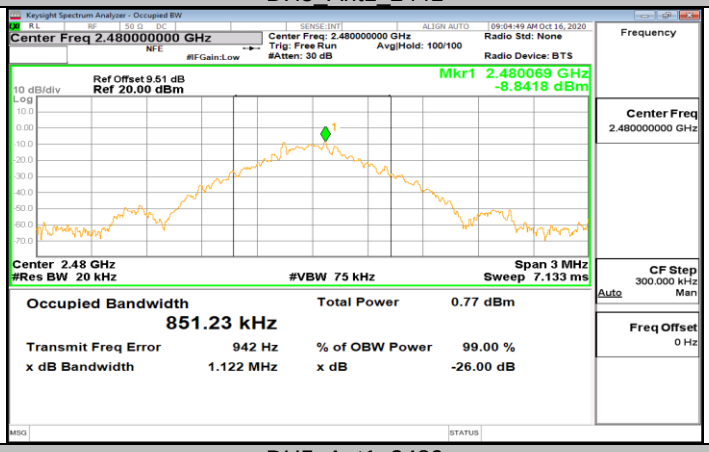
Test Graphs



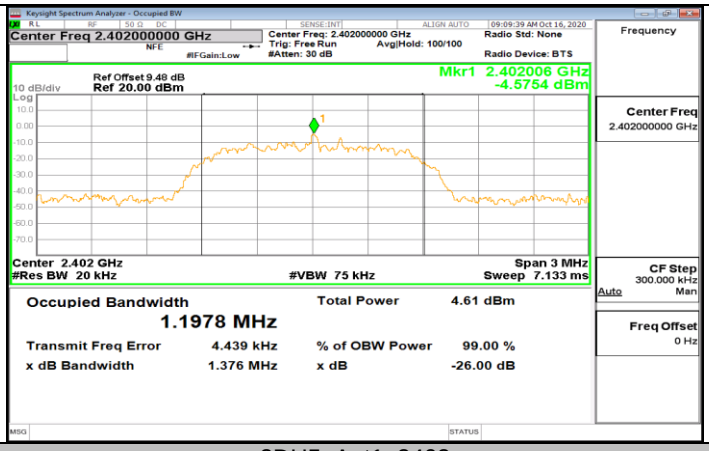
DH5_Ant1_2402



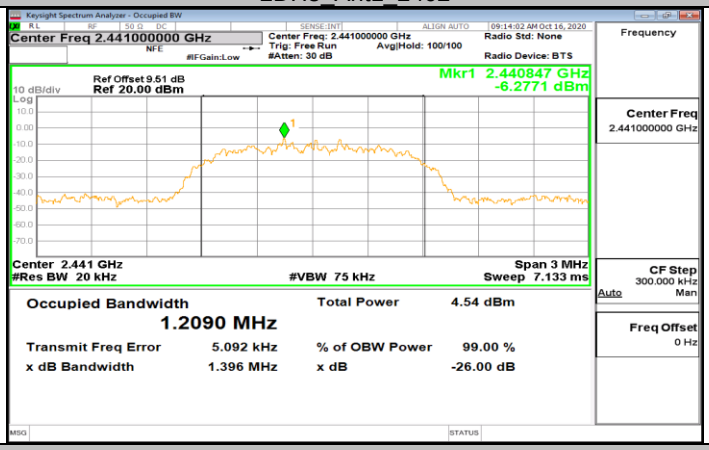
DH5_Ant1_2441



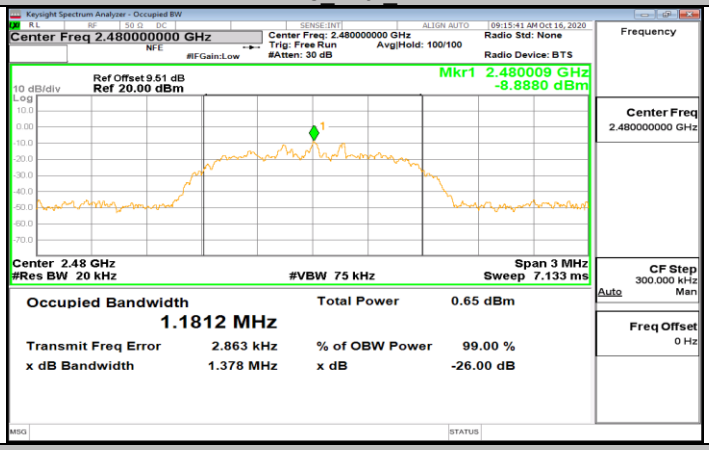
DH5_Ant1_2480



2DH5_Ant1_2402



2DH5_Ant1_2441



2DH5_Ant1_2480

Appendix D: Maximum conducted peak output power

Test Result

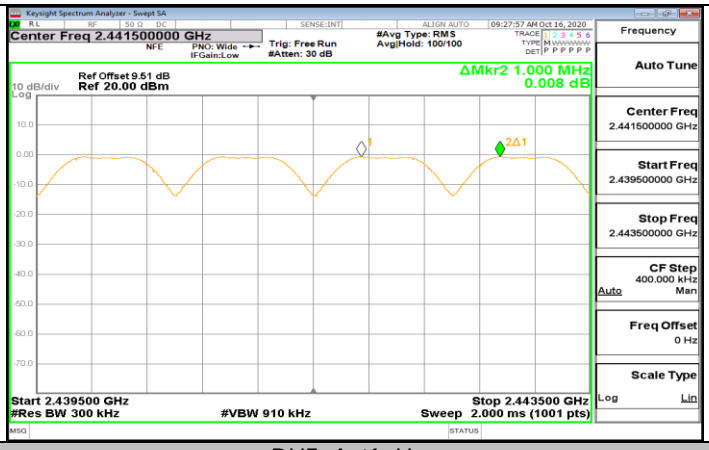
Test Packet Type	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	2402	-3.91	<=30	PASS
		2441	-3.80	<=30	PASS
		2480	-4.83	<=30	PASS
2DH5	Ant1	2402	-3.26	<=21	PASS
		2441	-3.15	<=21	PASS
		2480	-4.30	<=21	PASS

Appendix E: Carrier frequency separation

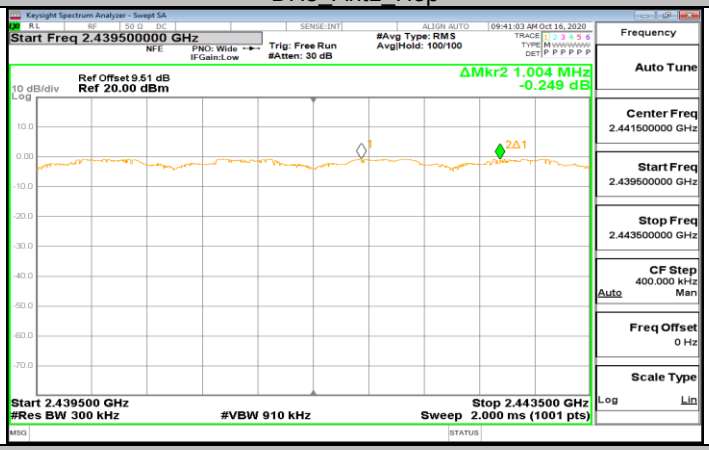
Test Result

Test Packet Type	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	Hopping	1.000	>=0.936	PASS
2DH5	Ant1	Hopping	1.004	>=0.894	PASS

Test Graphs



DH5_Ant1_Hop



2DH5_Ant1_Hop

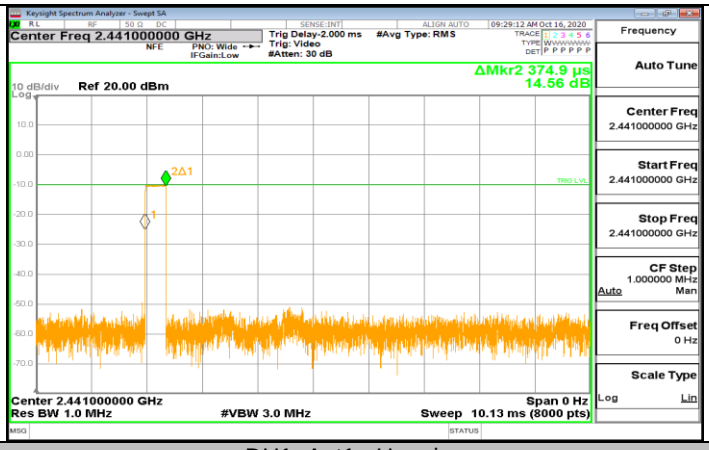
Appendix F: Time of occupancy

Test Result

FHSS Mode						
Test Packet Type	Antenna	Channel	BurstWidth [ms]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hopping	0.37	0.118	<=0.4	PASS
DH3	Ant1	Hopping	1.63	0.261	<=0.4	PASS
DH5	Ant1	Hopping	2.88	0.307	<=0.4	PASS
3DH1	Ant1	Hopping	0.39	0.125	<=0.4	PASS
3DH3	Ant1	Hopping	1.64	0.262	<=0.4	PASS
3DH5	Ant1	Hopping	2.89	0.308	<=0.4	PASS

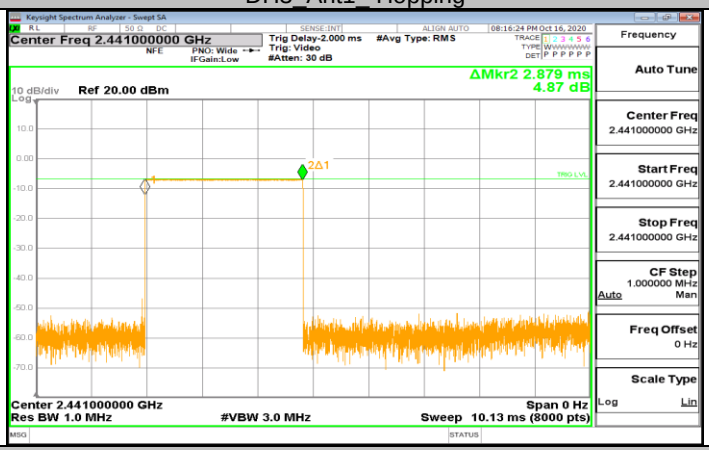
AFHSS Mode						
Test Packet Type	Antenna	Channel	BurstWidth [ms]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hopping	0.37	0.059	<=0.4	PASS
DH3	Ant1	Hopping	1.63	0.130	<=0.4	PASS
DH5	Ant1	Hopping	2.88	0.154	<=0.4	PASS
3DH1	Ant1	Hopping	0.39	0.062	<=0.4	PASS
3DH3	Ant1	Hopping	1.64	0.131	<=0.4	PASS
3DH5	Ant1	Hopping	2.89	0.154	<=0.4	PASS

Test Graphs



DH1_Ant1_ Hopping

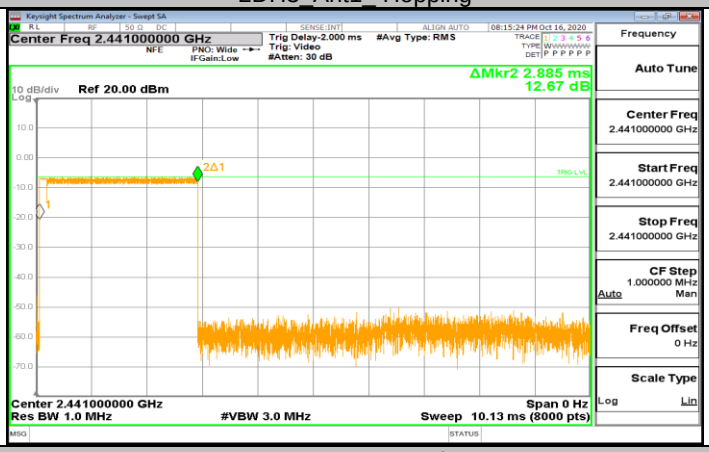
DH3_Ant1_ Hopping



DH5_Ant1_ Hopping

2DH1_Ant1_ Hopping

2DH3_Ant1_ Hopping



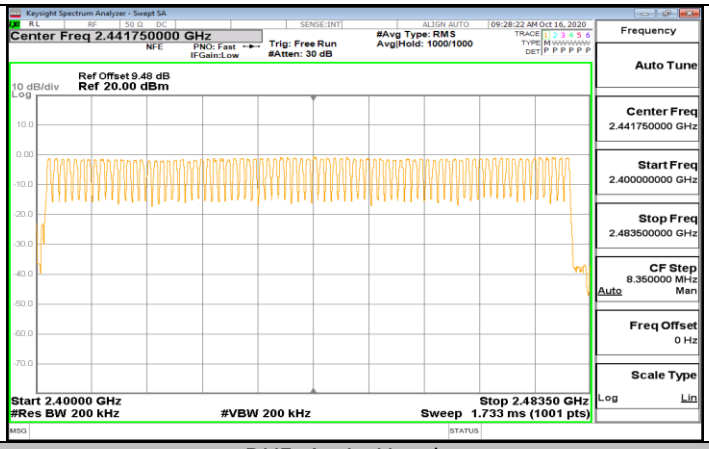
2DH5_Ant1_ Hopping

Appendix G: Number of hopping channels

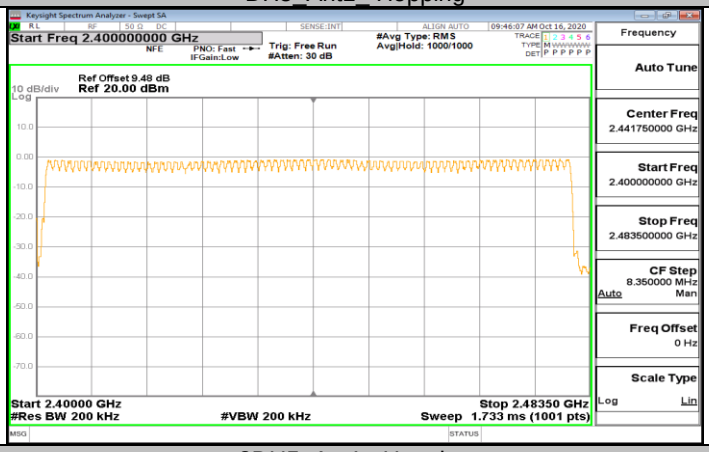
Test Result

Test Packet Type	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH5	Ant1	Hopping	79	>=15	PASS
2DH5	Ant1	Hopping	79	>=15	PASS

Test Graphs



DH5_Ant1_ Hopping



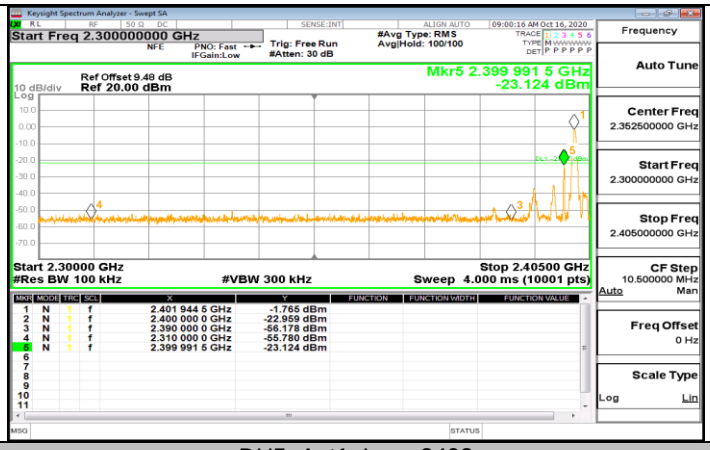
2DH5_Ant1_ Hopping

Appendix H: Band edge measurements

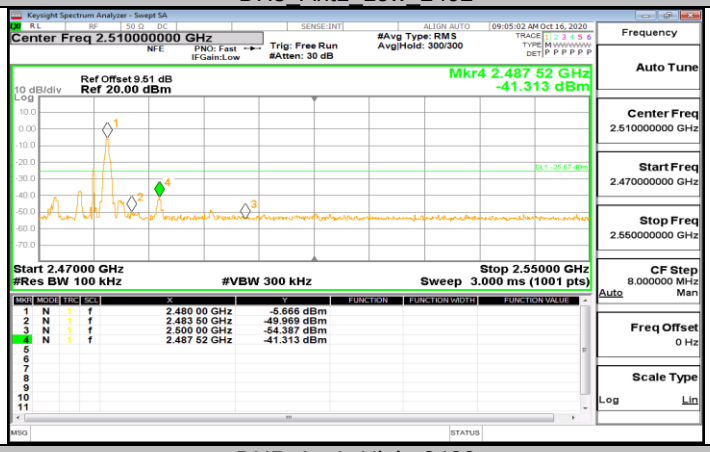
Test Result

Test Packet Type	Antenna	ChName	Channel	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	-1.77	-23.12	<=-21.77	PASS
		High	2480	-5.67	-41.31	<=-25.67	PASS
		Low	Hopping _2402	-1.65	-48.73	<=-21.65	PASS
		High	Hopping _2480	-1.50	-49.92	<=-21.5	PASS
2DH5	Ant1	Low	2402	-1.21	-22.6	<=-21.21	PASS
		High	2480	-5.43	-43.01	<=-25.43	PASS
		Low	Hopping _2402	-1.35	-48.75	<=-21.35	PASS
		High	Hopping _2480	-1.19	-50.67	<=-21.19	PASS

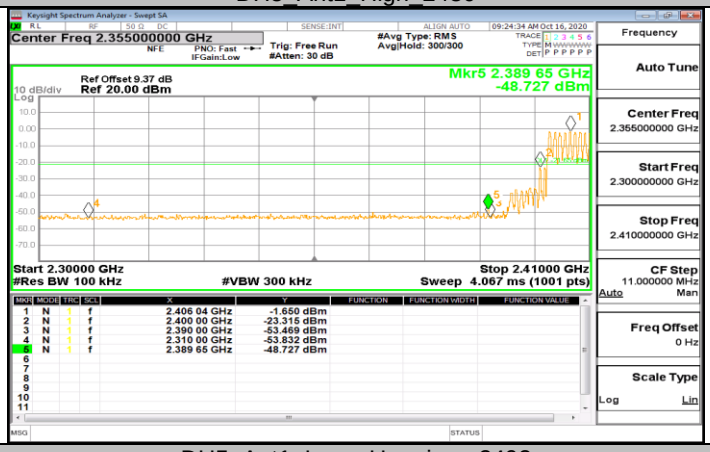
Test Graphs



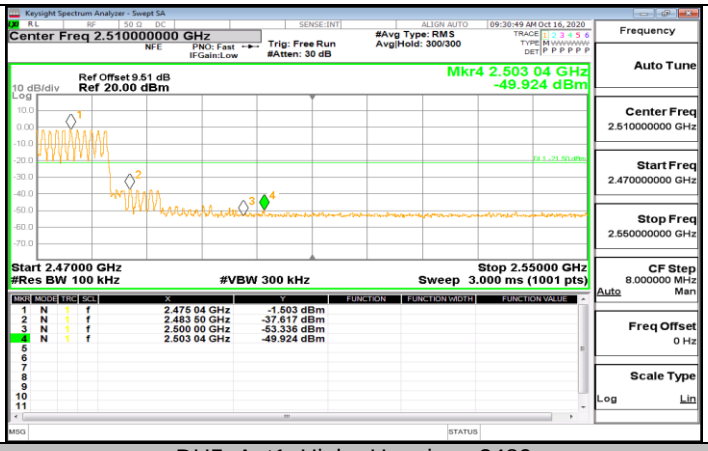
DH5_Ant1_Low_2402



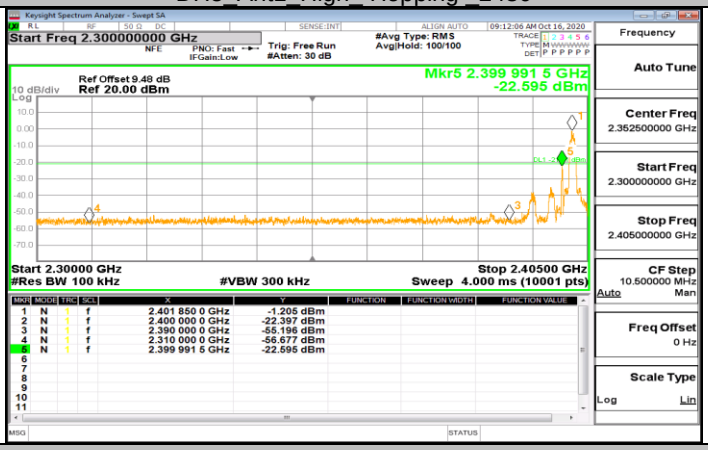
DH5_Ant1_High_2480



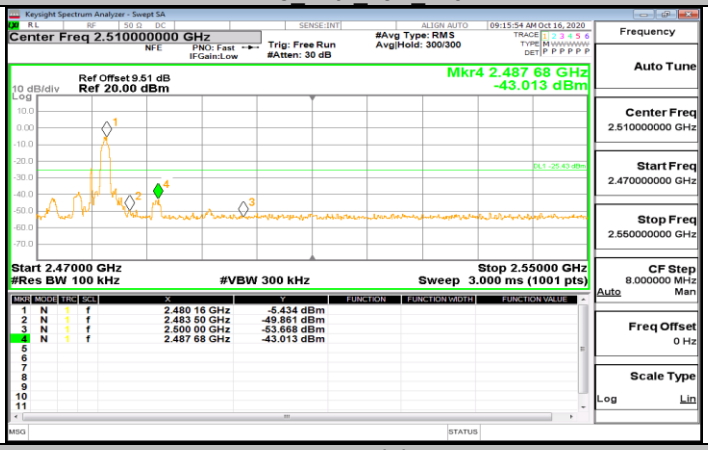
DH5_Ant1_Low_ Hopping _2402



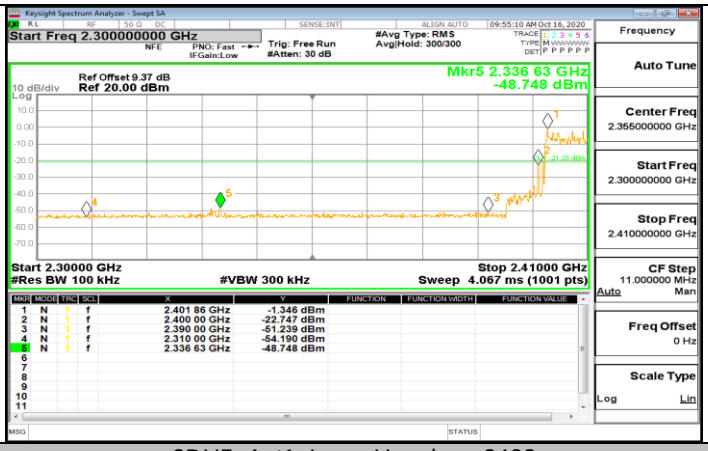
DH5_Ant1_High_ Hopping _2480



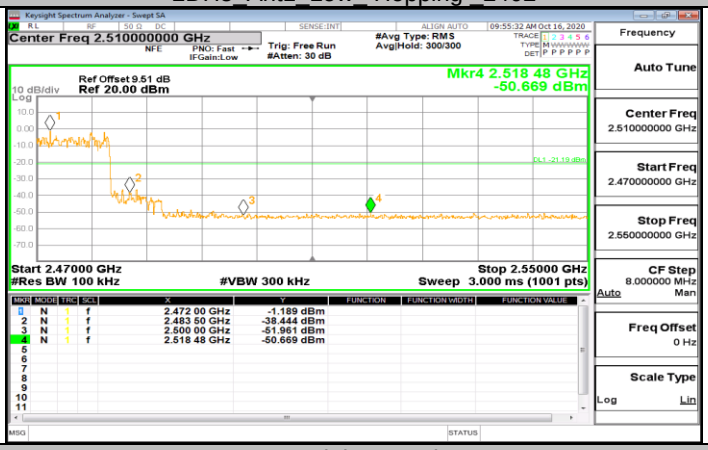
2DH5_Ant1_Low_2402



2DH5_Ant1_High_2480



2DH5_Ant1_Low_ Hopping _2402



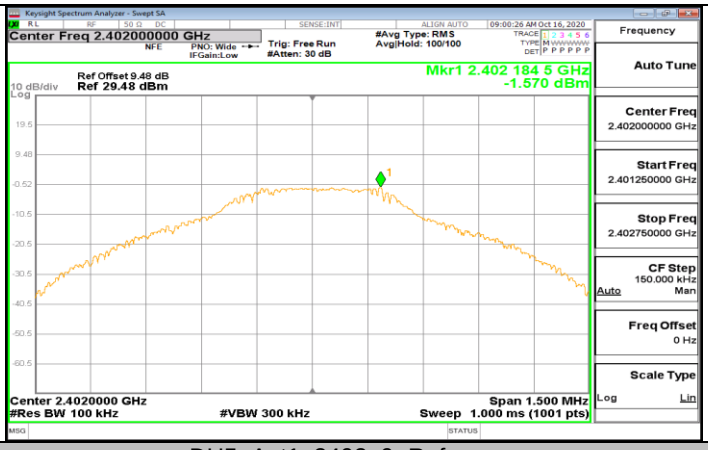
2DH5_Ant1_High_ Hopping _2480

Appendix I: Conducted Spurious Emission

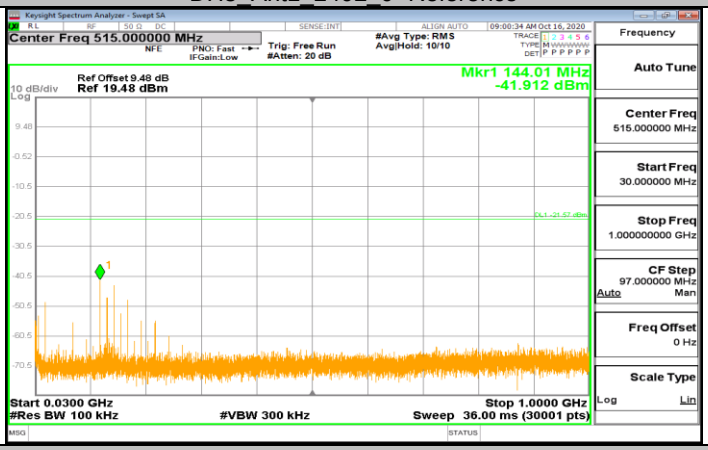
Test Result

Test Packet Type	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	Reference	-1.57	-1.57	---	PASS
			30~1000	30~1000	-41.912	<=-21.57	PASS
			1000~26500	1000~26500	-45.888	<=-21.57	PASS
		2441	Reference	-1.09	-1.09	---	PASS
			30~1000	30~1000	-41.802	<=-21.086	PASS
			1000~26500	1000~26500	-46.224	<=-21.086	PASS
		2480	Reference	-5.64	-5.64	---	PASS
			30~1000	30~1000	-41.958	<=-25.641	PASS
			1000~26500	1000~26500	-52.936	<=-25.641	PASS
2DH5	Ant1	2402	Reference	-1.26	-1.26	---	PASS
			30~1000	30~1000	-41.862	<=-21.264	PASS
			1000~26500	1000~26500	-48.476	<=-21.264	PASS
		2441	Reference	-1.07	-1.07	---	PASS
			30~1000	30~1000	-42.448	<=-21.067	PASS
			1000~26500	1000~26500	-49.426	<=-21.067	PASS
		2480	Reference	-5.45	-5.45	---	PASS
			30~1000	30~1000	-41.648	<=-25.452	PASS
			1000~26500	1000~26500	-54.686	<=-25.452	PASS

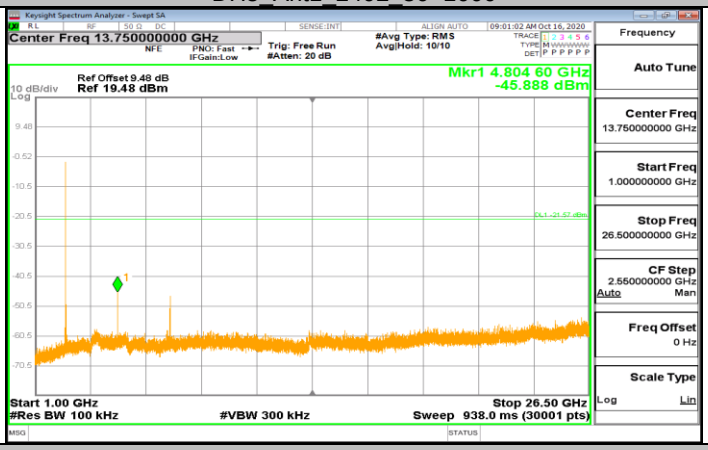
Test Graphs



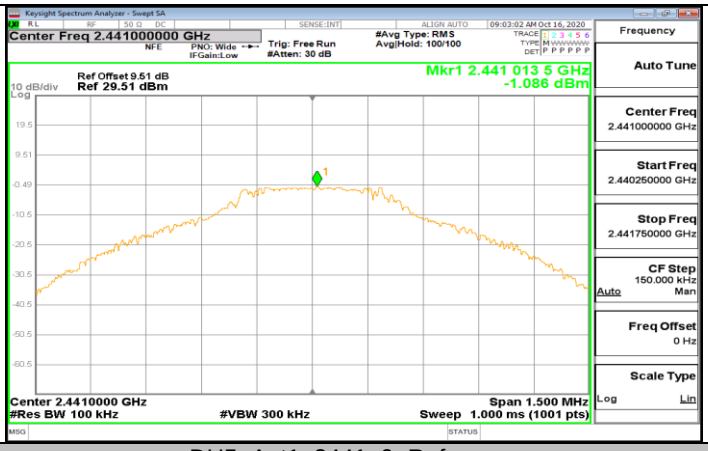
DH5_Ant1_2402_0~Reference



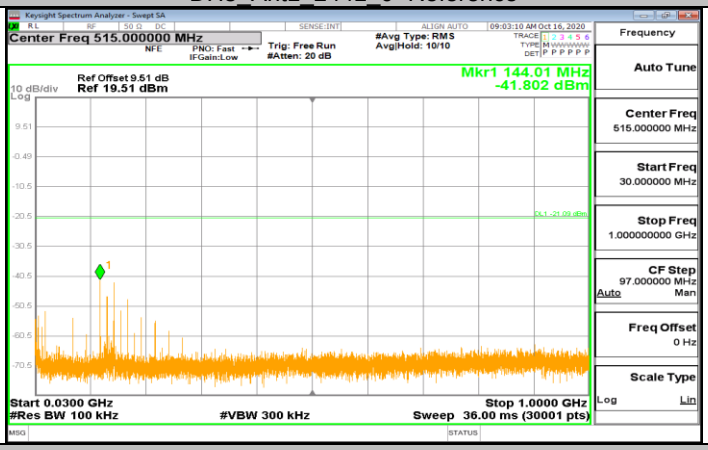
DH5_Ant1_2402_30~1000



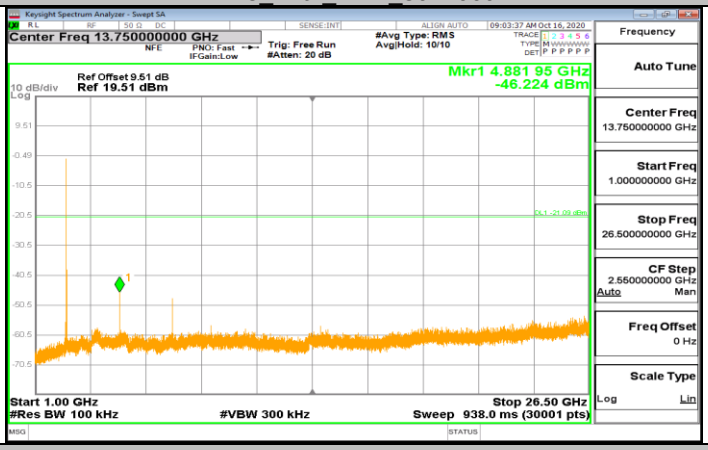
DH5_Ant1_2402_1000~26500



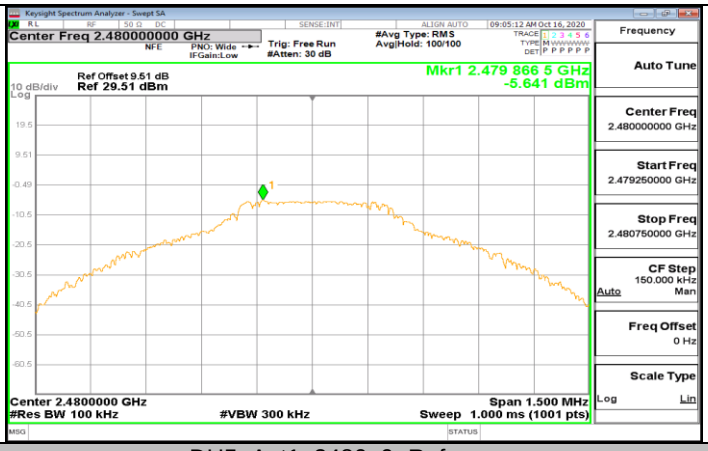
DH5_Ant1_2441_0~Reference



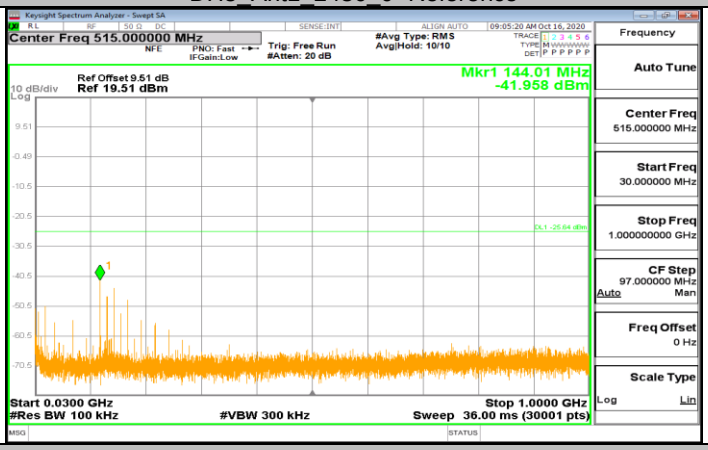
DH5_Ant1_2441_30~1000



DH5_Ant1_2441_1000~26500



DH5_Ant1_2480_0~Reference



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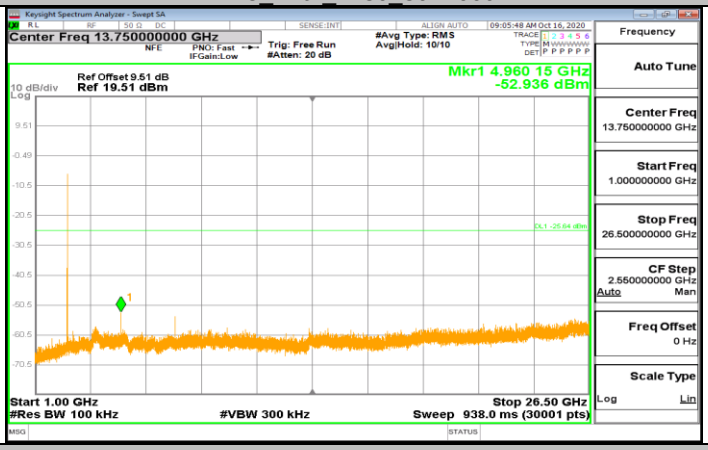

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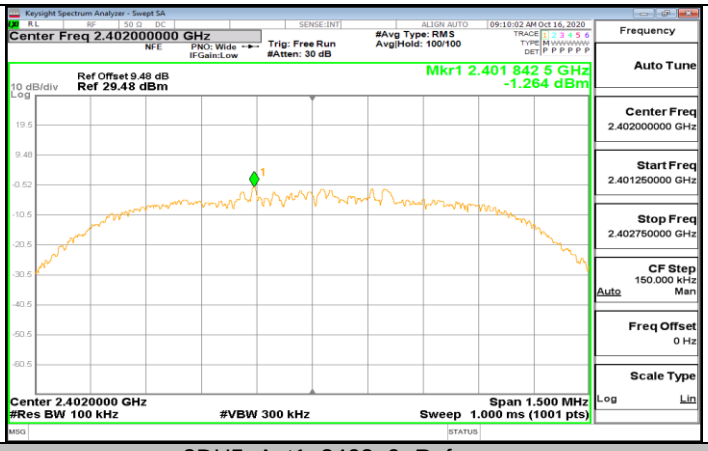

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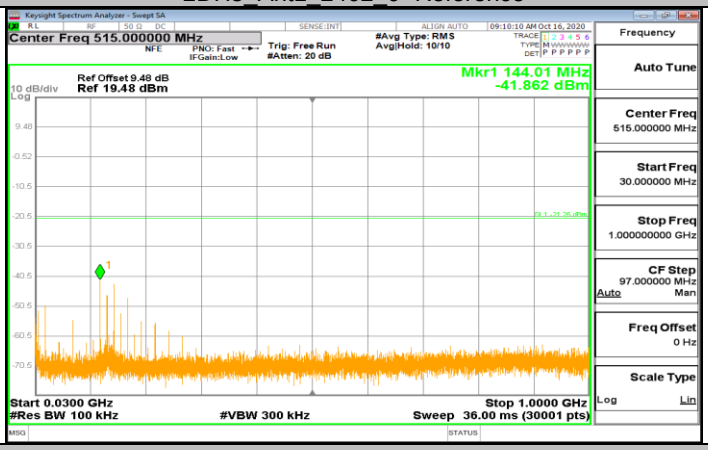

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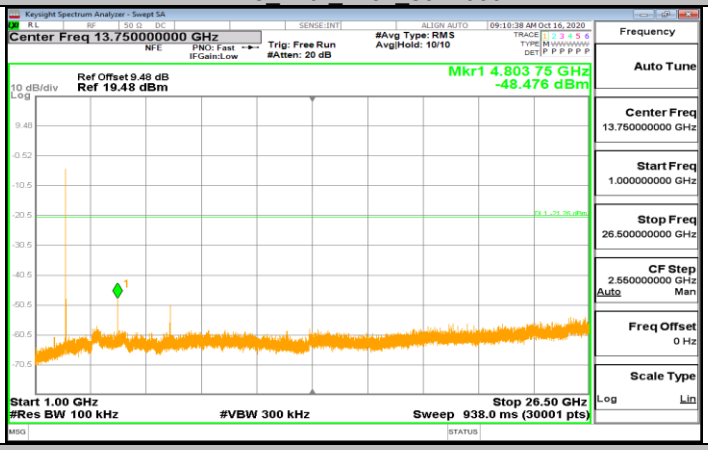

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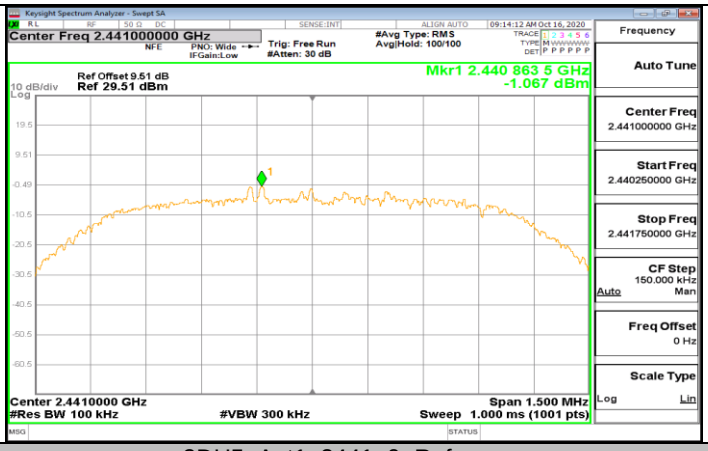

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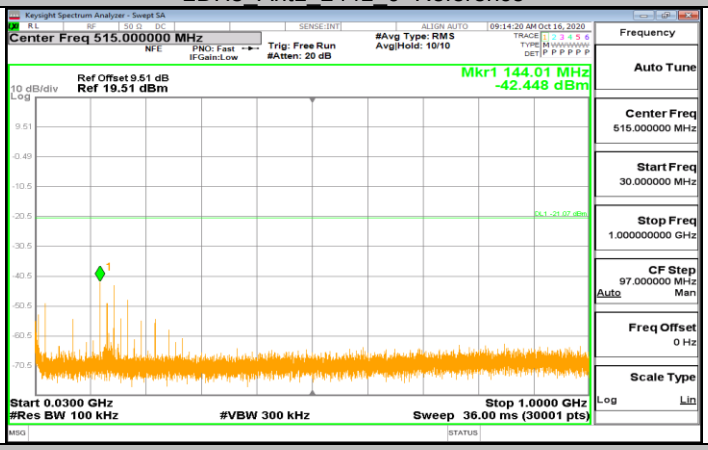

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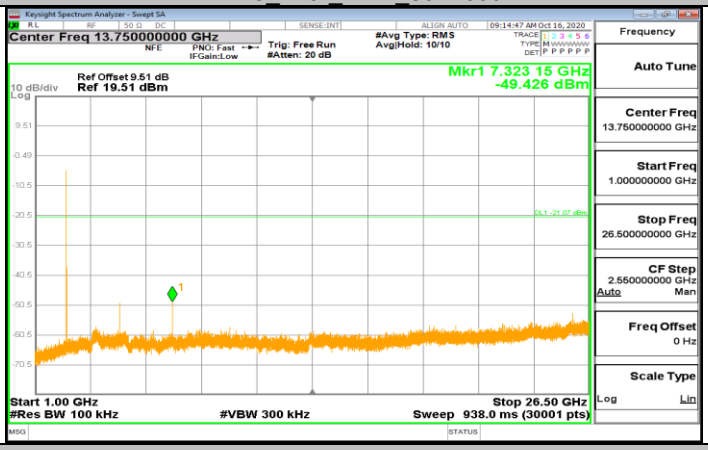

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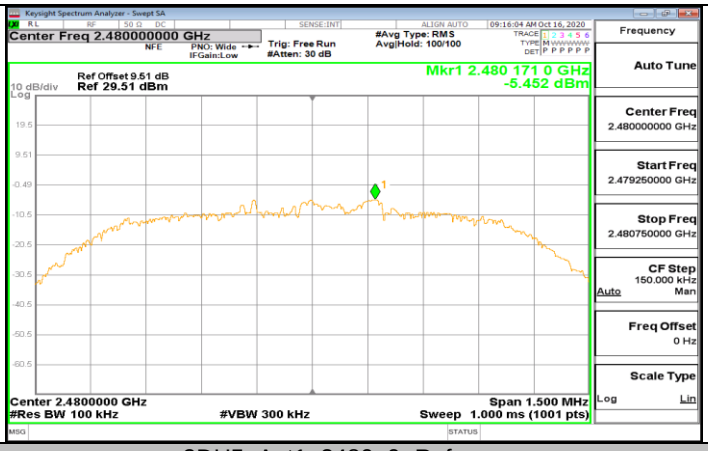

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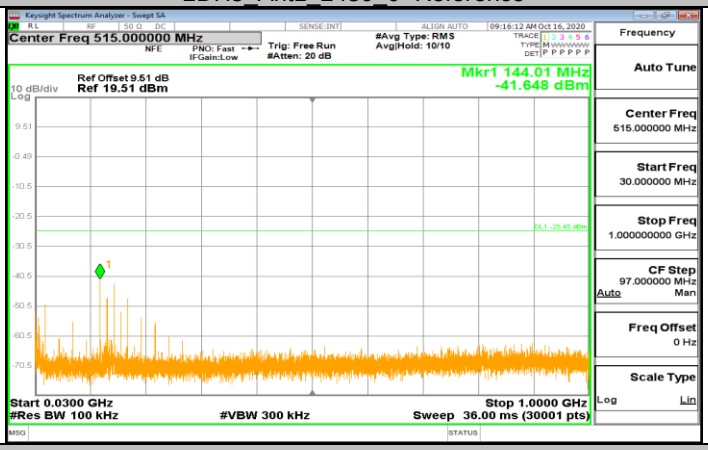

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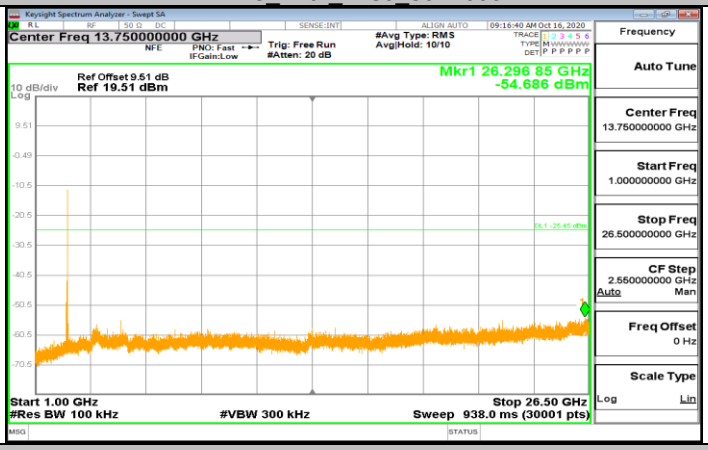

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END OF REPORT