CFR 47 FCC PART 15 SUBPART C
ISED RSS-247 ISSUE 2

CERTIFICATION TEST REPORT

For

Square Register

MODEL NUMBER: SPS1-01

FCC ID: 2AF3K-SPS1

IC: 21827-SPS1

REPORT NUMBER: 4789598114.1-2

ISSUE DATE: October 9, 2020

Prepared for

Square, Inc. (FCC)
1455 Market St, Suite 600, San Francisco, California, United States 94103

Square Canada, Inc. (ISED)
5000 Yonge Street, Suite 1501; Toronto, ON, M2N7E9 Canada

Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	10/09/2020	Initial Issue	

Summary of Test Results			
Clause	**Test Items**	**FCC/ISED Rules**	**Test Results**
1	20dB Bandwidth and 99% Occupied Bandwidth	FCC 15.247 (a) (1) RSS-247 Clause 5.1 (a) RSS-Gen Clause 6.7	Pass
2	Conducted Output Power	FCC 15.247 (b) (1) RSS-247 Clause 5.1 (b)	Pass
3	Carrier Hopping Channel Separation	FCC 15.247 (a) (1) RSS-247 Clause 5.1 (b)	Pass
4	Number of Hopping Frequency	15.247 (a) (1) III RSS-247 Clause 5.1 (d)	Pass
5	Time of Occupancy (Dwell Time)	15.247 (a) (1) III RSS-247 Clause 5.1 (d)	Pass
6	Conducted Bandedge	FCC 15.247 (d) RSS-247 Clause 5.5	Pass
7	Radiated Bandedge and Spurious	FCC 15.247 (d) FCC 15.209 FCC 15.205 RSS-247 Clause 5.5 RSS-GEN Clause 8.9 RSS-GEN Clause 8.10	Pass
8	Conducted Emission Test for AC Power Port	FCC 15.207 RSS-GEN Clause 8.8	Pass
9	Antenna Requirement	FCC 15.203 RSS-GEN Clause 6.8	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 >< ISED RSS-247 > when <Accuracy Method> decision rule is applied.

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1. ATTESTATION OF TEST RESULTS

FCC
Applicant Information

Company Name:	Square, Inc.
Address:	1455 Market St, Suite 600, San Francisco, California, United States 94103

ISED
Applicant Information

Company Name:	Square Canada, Inc.
Address:	5000 Yonge Street, Suite 1501; Toronto, ON, M2N7E9 Canada

FCC
Manufacturer Information

Company Name:	Square, Inc.
Address:	1455 Market St, Suite 600, San Francisco, California, United States 94103

ISED
Manufacturer Information

Company Name:	Square Canada, Inc.
Address:	5000 Yonge Street, Suite 1501; Toronto, ON, M2N7E9 Canada

EUT Information

EUT Name:	Square Register
Square Register Model:	SPS1-01
Brand:	SQUARE
Sample Received Date:	August 17, 2020
Sample Status:	Normal
Sample ID:	2809002
Date of Tested:	August 17~ September 15, 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:

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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, ISED RSS-247 Issue 2 and ISED RSS-GEN Issue 5.

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	Square Register			
Square Register Model	SPS1-01			
Technology	Bluetooth – BR & EDR			
Transmit Frequency Range	2402 MHz ~ 2480 MHz			
Mode	Basic Rate		Enhanced Data Rate	
Modulation	GFSK		∏/4-DQPSK	8DPSK
Packet Type (Maximum Payload):	DH5		2DH5	3DH5
Data Rate	1 Mbps		2 Mbps	3 Mbps
Power Supply	Power Adapter	Input	100~240 Vac,50/60 Hz,1.2 A	
		Output	12 Vdc,4.0 A	
	Battery	/		

5.2. MAXIMUM PEAK OUTPUT POWER

Modulation	Frequency (MHz)	Channel Number	Maximum Peak Output Power (dBm)	Maximum EIRP (dBm)
GFSK	2402 ~ 2480	0-78[79]	9.91	12.37
8DPSK	2402 ~ 2480	0-78[79]	9.70	12.16

5.3. PACKET TYPE CONFIGURATION

Modulation	Packet Type	Setting (Packet Length)
GFSK	DH1	27
	DH3	183
	DH5	339
∏/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	Frequency
GFSK-DH5	CH 0(Low Channel), CH 39(MID Channel), CH 78(High Channel)	2402 MHz, 2441 MHz, 2480 MHz
8DPSK-3DH5	CH 0(Low Channel), CH 39(MID Channel), CH 78(High Channel)	2402 MHz, 2441 MHz, 2480 MHz
GFSK-DH5	Hopping	2402 MHz ~ 2480 MHz
8DPSK-3DH5	Hopping	2402 MHz ~ 2480 MHz

5.6. WORST-CASE CONFIGURATIONS

Bluetooth Mode	Modulation Technology	Modulation Type	Data Rate	Packet Type
BR	FHSS	GFSK	1Mbit/s	DH5
EDR	FHSS	8DPSK	3Mbit/s	3-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 8DPSK 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		QRCT		
Modulation	Transmit Antenna Number	Test Software Setting Value		
		CH 00	CH 39	CH 78
GFSK	1	9	9	9
8DPSK	1	9	9	9

5.8. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna	Frequency (MHz)	Antenna Type	MAX Antenna Gain (dBi)
1	2402-2480	Internal PCB antenna	2.46

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

Note: 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	Laptop	ThinkPad	X230i	/
2	RJ45 terminal spring block adapter	Adafruit	485-4511	/
3	USB flash disk	Kingston	8GB	5PCS
4	Customer Display	SQUARE	SPS4-01/ SPS4-01-A	/

I/O PORT

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB	/	/	1.0 m	/
2	USB	/	/	2.0 m	Customer display cable

ACCESSORY

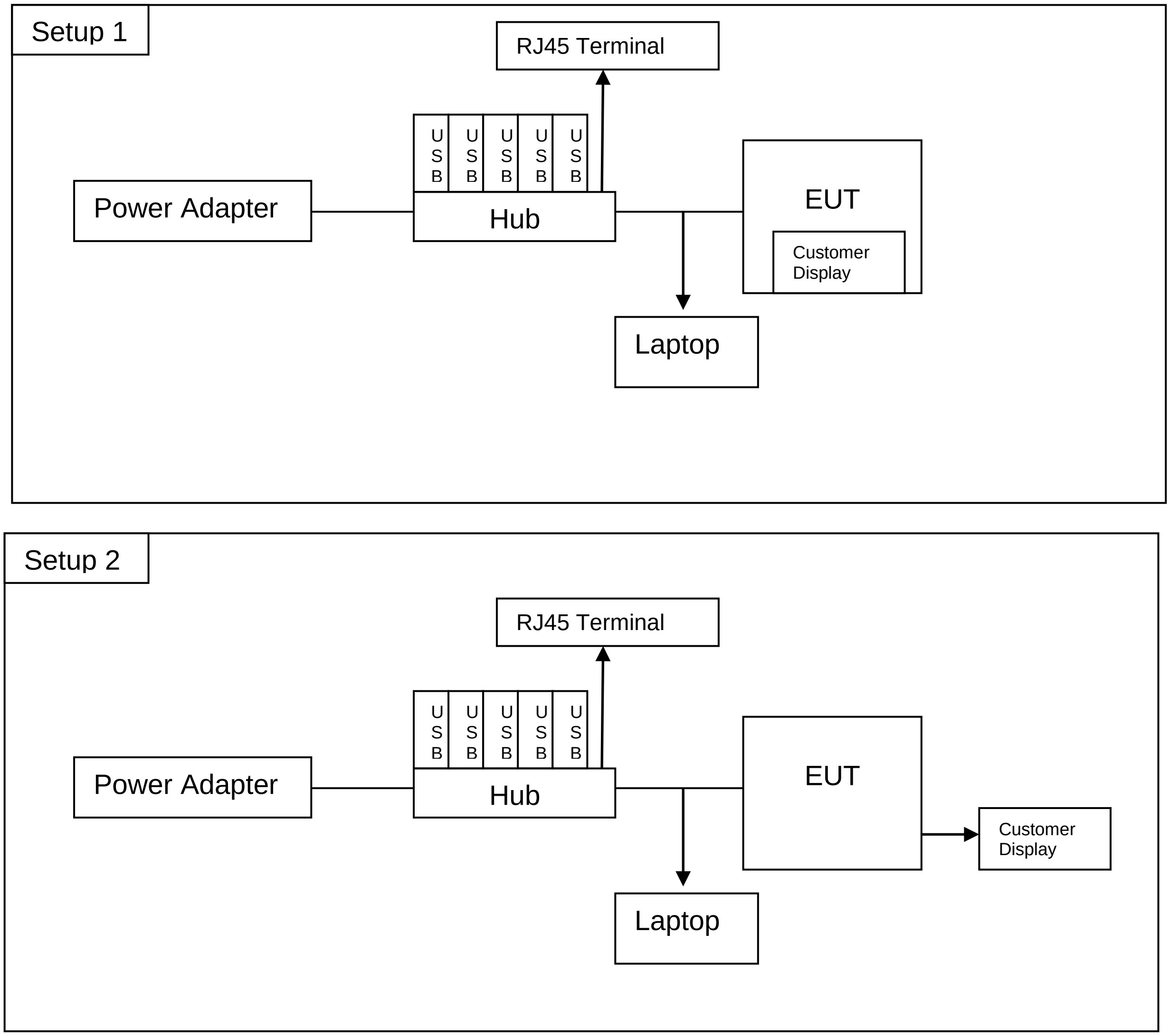
Item	Accessory	Brand Name	Model Name	Description
1	Power Adapter	SQUARE	SWB2-01	Input: 100-240V,50/60Hz, 1.2A Output: 12Vdc, 4A
2	Hub	SQUARE	SHF3-01	Hub Output X5: 5Vdc, 2.5A Output for Register: 12Vdc, 2.3A
3	HUB	SQUARE	SHB3-01	Hub Output: 5V, 2.5A Register Output: 12V2.3A

Note: Two Hubs had been considered, but only the worst data (SHF3-01) recorded in the report.

TEST SETUP

The EUT can work in an engineering mode though the laptop before the testing.

SETUP DIAGRAM FOR TESTS



Note:

1. After setting the EUT to engineering mode, the Laptop was removed from the test table.
2. There are two Settings for the sample and both settings have considered, Only the worst cases (Setup 1) were recorded in the report.

6. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	EMI Test Receiver	R&S	ESR3	101961	Dec.05,2019	Dec.05,2020
☑	Two-Line V-Network	R&S	ENV216	101983	Dec.05,2019	Dec.05,2020
Software						
Used	Description		Manufacturer		Name	Version
☑	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.
☑	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

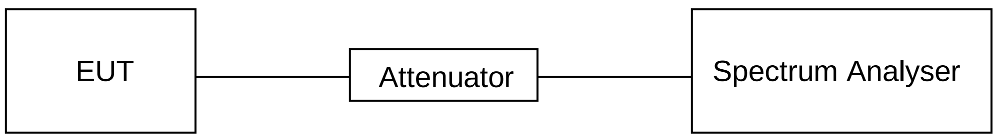
LIMITS

None; for reporting purposes only.

PROCEDURE

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

TEST SETUP



TEST ENVIRONMENT

Temperature	23.7 °C	Relative Humidity	64.2 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V,60HZ

RESULTS

Please refer to appendix A.

7.2. 20 dB BANDWIDTH AND 99 % OCCUPIED BANDWIDTH

LIMITS

CFR 47FCC Part15 (15.247) Subpart C ISED RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247 (a) (1) RSS-247 Clause 5.1 (a)	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

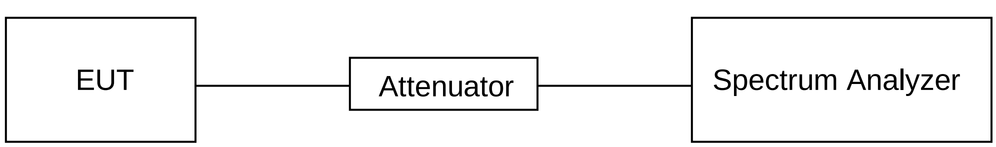
Refer to ANSI C63.10-2013 clause 6.9.2.

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	Approximately 2 to 3 times the 20dB bandwidth
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	23.7 °C	Relative Humidity	64.2 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V,60HZ

RESULTS

Please refer to appendix B and C.

7.3. CONDUCTED OUTPUT POWER

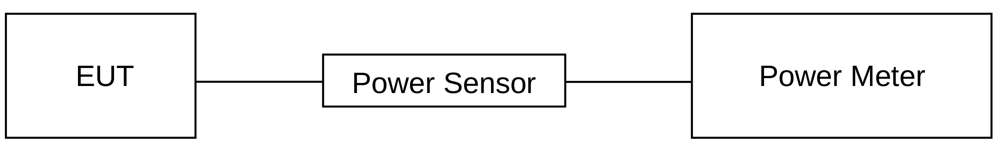
LIMITS

CFR 47 FCC Part15 (15.247), Subpart C ISED RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247 (b) (1) ISED RSS-247 Clause 5.4 (b)	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	23.7 °C	Relative Humidity	64.2 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V,60HZ

RESULTS

Please refer to appendix D.

7.4. CARRIER FREQUENCY SEPARATION

LIMITS

CFR 47 FCC Part15 (15.247), Subpart C ISED RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247 (a) (1) ISED RSS-247 Clause 5.1 (b)	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

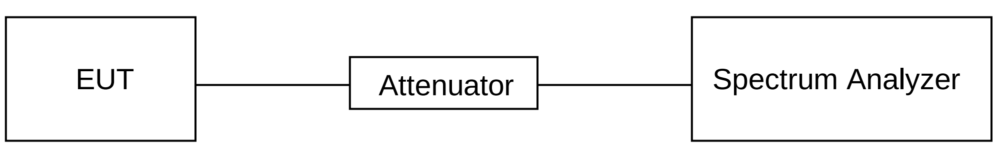
Refer to ANSI C63.10-2013 clause 7.8.2.

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	23.7 °C	Relative Humidity	64.2 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V,60HZ

RESULTS

Please refer to Appendix E.

7.5. NUMBER OF HOPPING FREQUENCIES

LIMITS

CFR 47 FCC Part15 (15.247), Subpart C ISED RSS-247 ISSUE 2		
Section	Test Item	Limit
CFR 47 15.247 (a) (1) III ISED RSS-247 Clause 5.1 (d)	Number of Hopping Frequency	at least 15 hopping channels

TEST PROCEDURE

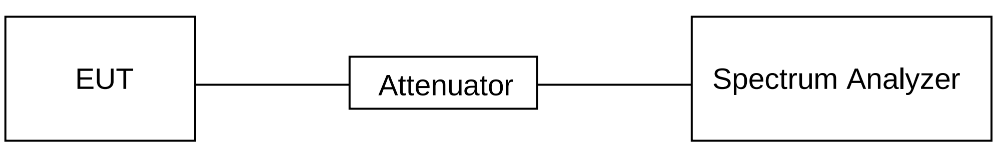
Refer to ANSI C63.10-2013 clause 7.8.3.

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	23.7 °C	Relative Humidity	64.2 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V,60HZ

RESULTS

Please refer to appendix F.

7.6. TIME OF OCCUPANCY (DWELL TIME)

LIMITS

CFR 47 FCC Part15 (15.247), Subpart C ISED RSS-247 ISSUE 2		
Section	Test Item	Limit
CFR 47 15.247 (a) (1) III ISED RSS-247 Clause 5.1 (d)	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:

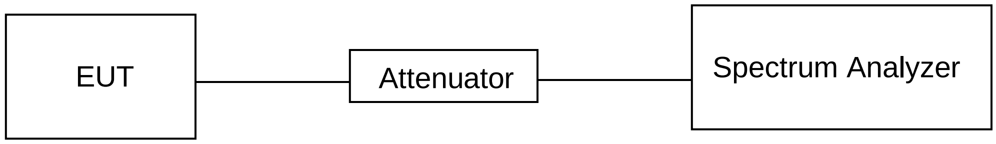
Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	1 MHz
VBW	≥RBW
Span	Zero span, centered on a hopping channel
Trace	Max hold
Sweep time	As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the 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 Dwell Time: Burst Width * (1600/2) * 31.6 / (channel number)
DH3 Dwell Time: Burst Width * (1600/4) * 31.6 / (channel number)
DH5 Dwell Time: Burst Width * (1600/6) * 31.6 / (channel number)

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

TEST SETUP



TEST ENVIRONMENT

Temperature	23.7 °C	Relative Humidity	64.2 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V,60HZ

RESULTS

Please refer to appendix G.

7.7. CONDUCTED BANDEDGE AND SPURIOUS EMISSION

LIMITS

CFR 47 FCC Part15 (15.247), Subpart C ISED RSS-247 ISSUE 2		
Section	Test Item	Limit
CFR 47 FCC §15.247 (d) ISED RSS-247 5.5	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.

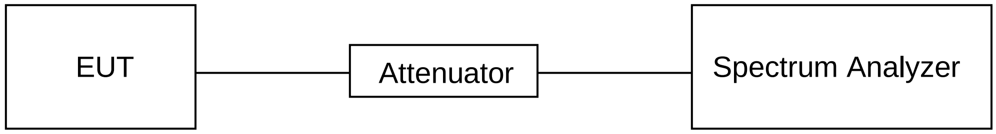
Allow trace to fully stabilize and use the peak marker function to determine the maximum PSD level.

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	23.7 °C	Relative Humidity	64.2 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V,60HZ

RESULTS

Please refer to appendix H & I.

8. RADIATED TEST RESULTS

LIMITS

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

Please refer to ISED RSS-GEN Clause 8.9 and Clause 8.10.

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

ISED General field strength limits at frequencies below 30 MHz

Table 6 – General field strength limits at frequencies below 30 MHz

Frequency	Magnetic field strength (H-Field) (μA/m)	Measurement distance (m)
9 - 490 kHz[Note 1]	6.37/F (F in kHz)	300
490 - 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

ISED Restricted bands please refer to ISED RSS-GEN Clause 8.10

Table 7 – Restricted frequency bands[Note 1]

MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 – 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 – 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 – 8500	
108 – 138		

Note 1: Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

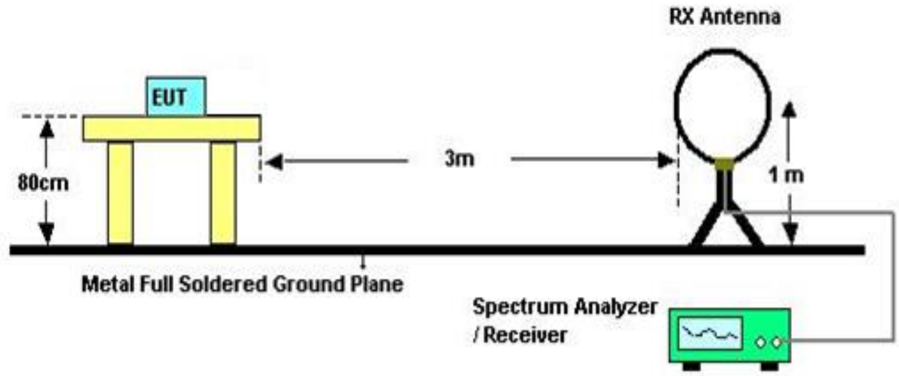
FCC Restricted bands of operation refer to FCC §15.205 (a):

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 30 MHz



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.

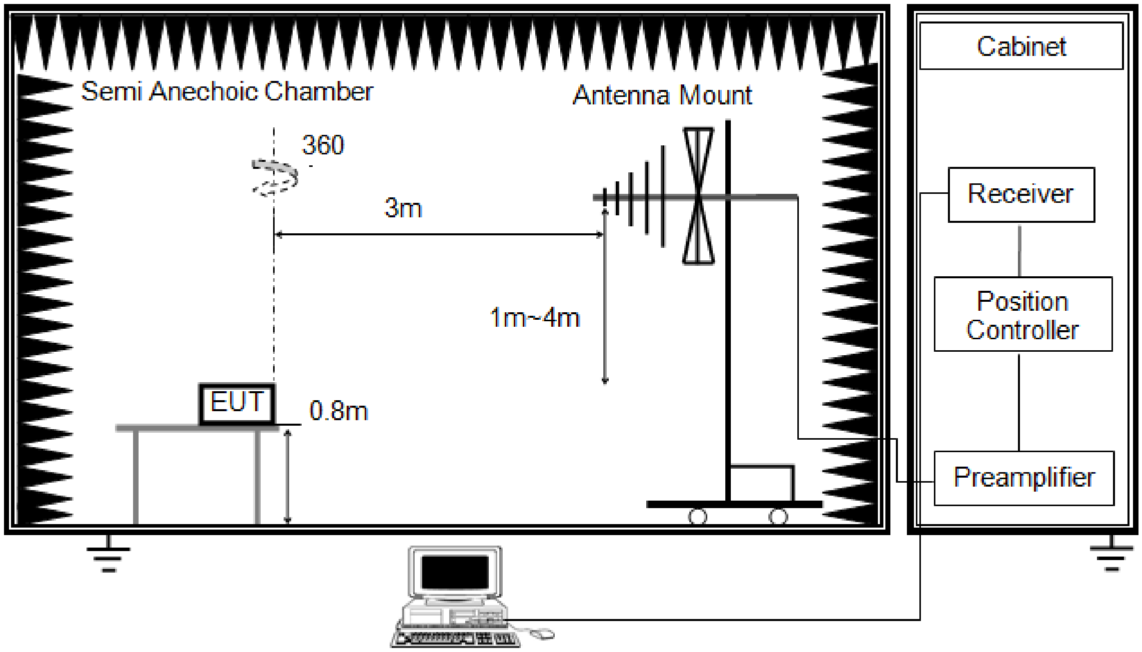
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1 m height antenna tower.

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 1 GHz 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.

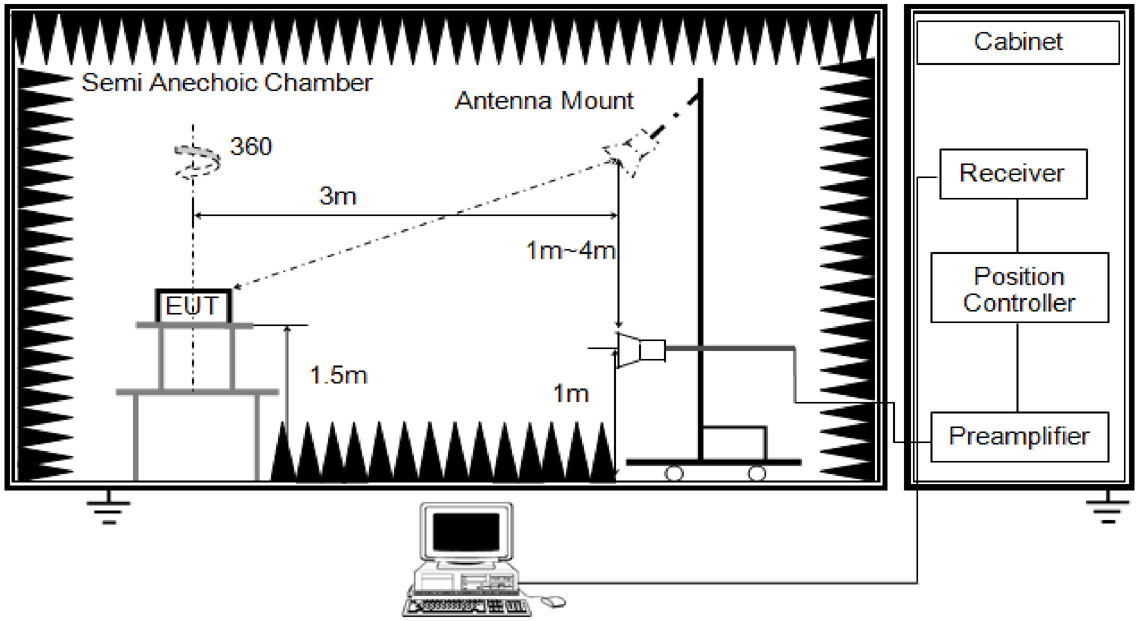
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations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



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 (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.

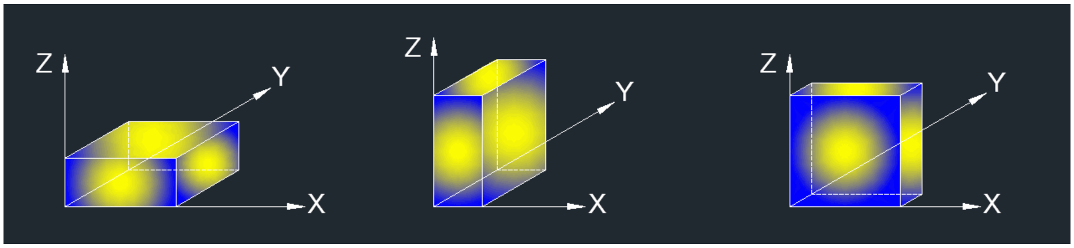
3. The EUT was placed on a turntable with 1.5 m above ground.

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: The manufacturer has recommended that the EUT only be used in the desktop (horizontal)orientation; therefore, all radiated testing was performed in desktop orientation(X).

Note 2: The EUT does not support simultaneous transmission.

Note 3: 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

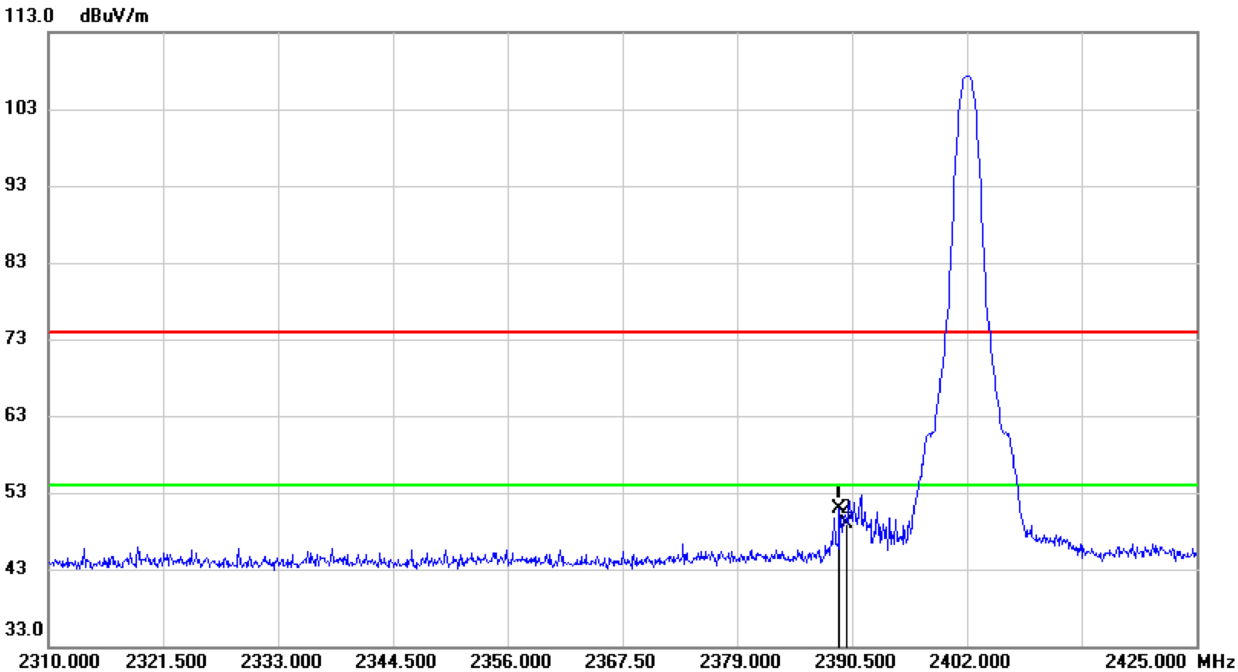
Temperature	23.5 °C	Relative Humidity	58 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V,60HZ

RESULTS

8.1. RESTRICTED BANDEDGE

8.1.1. GFSK MODE

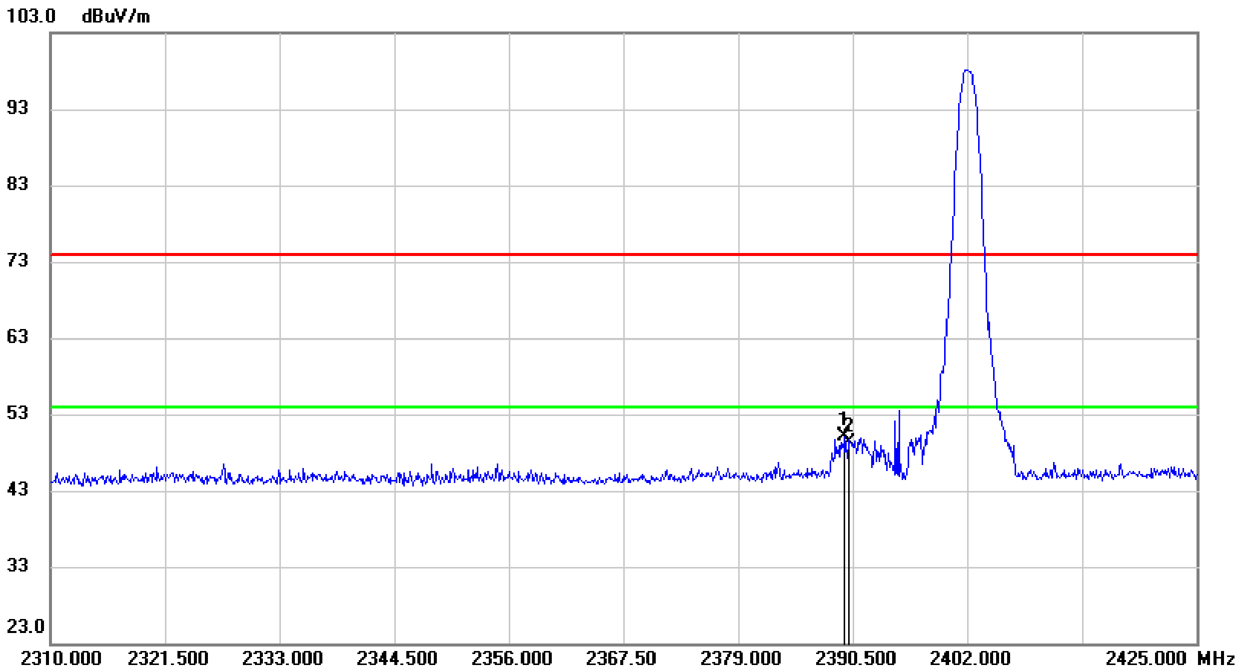
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2389.235	39.04	11.95	50.99	74.00	-23.01	peak
2	2390.000	36.85	11.96	48.81	74.00	-25.19	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. 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.

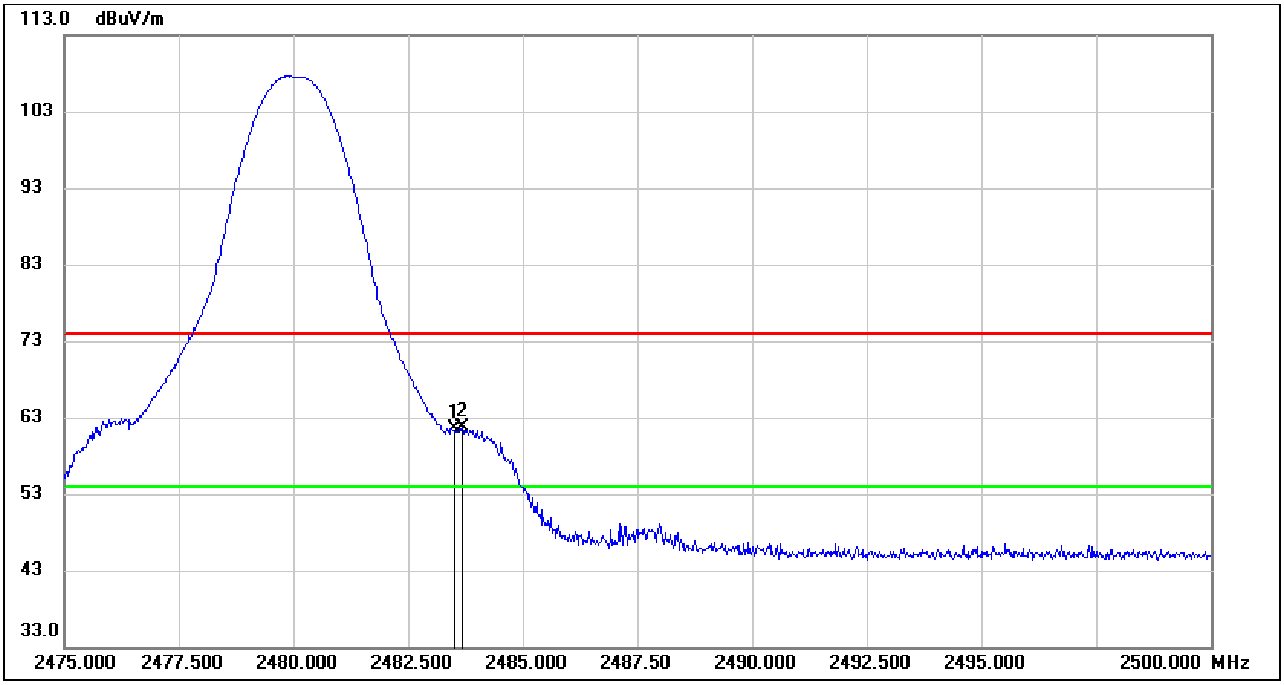
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2389.695	38.09	11.96	50.05	74.00	-23.95	peak
2	2390.000	37.35	11.96	49.31	74.00	-24.69	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. 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.

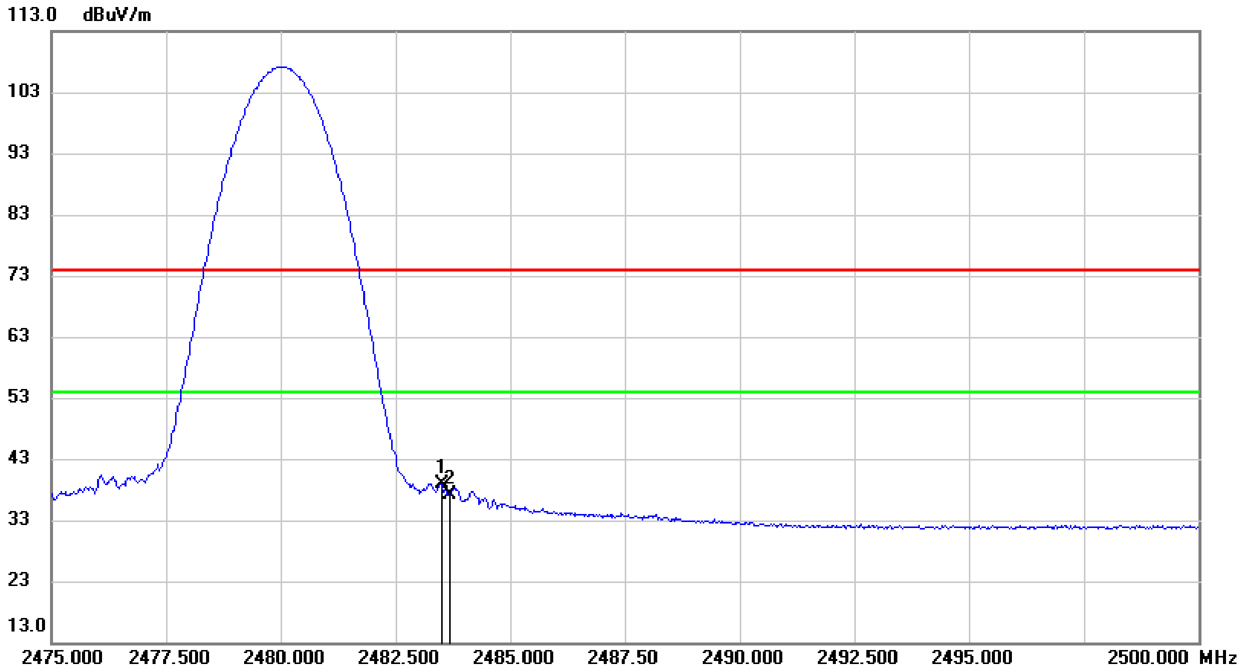
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	49.13	12.38	61.51	74.00	-12.49	peak
2	2483.675	49.35	12.38	61.73	74.00	-12.27	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. 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.

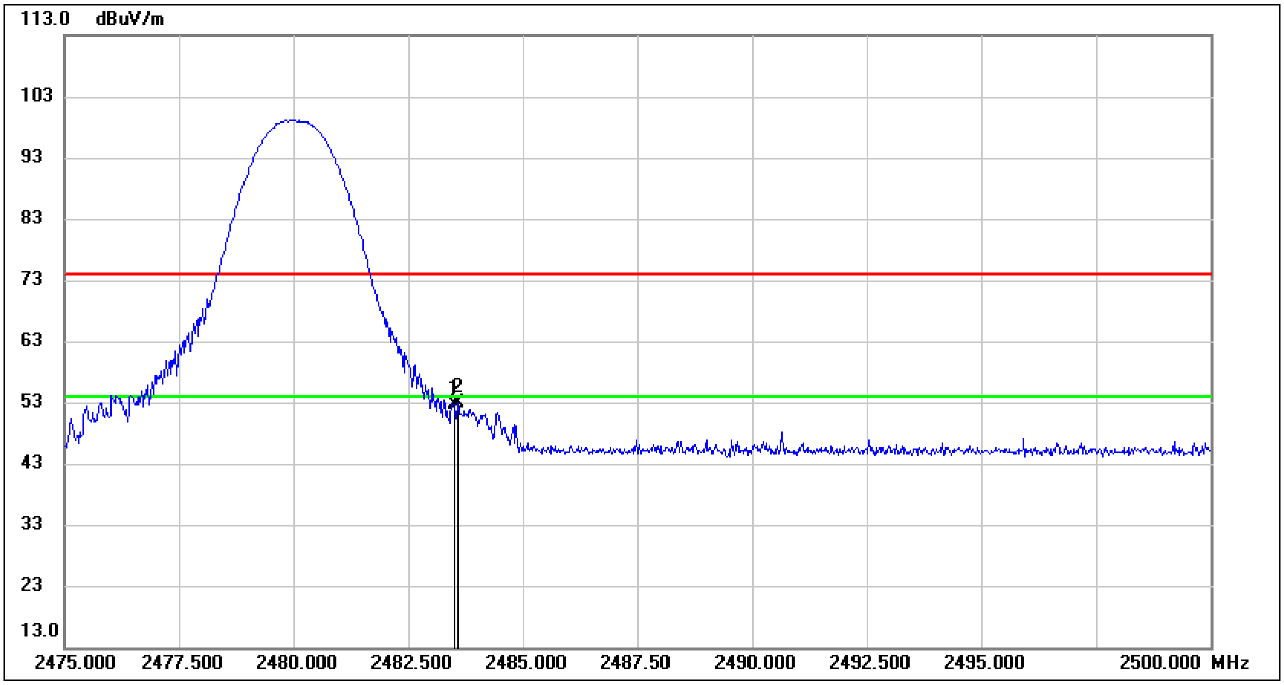
AVG



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	26.43	12.38	38.81	54.00	-15.19	AVG
2	2483.675	24.81	12.38	37.19	54.00	-16.81	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. AVG: VBW=1/Ton, where: Ton is the transmitting duration.
4. For the transmitting duration, please refer to clause 7.1.
5. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

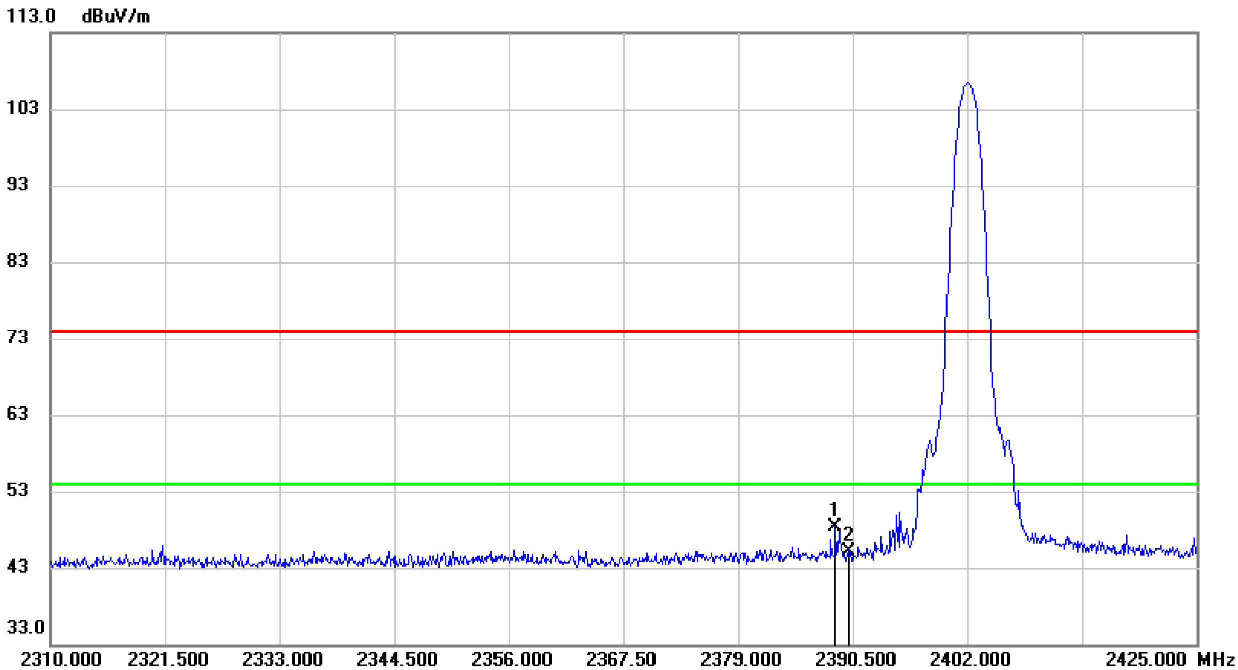


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	40.29	12.38	52.67	74.00	-21.33	peak
2	2483.575	40.47	12.38	52.85	74.00	-21.15	peak

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. 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.

8.1.2. 8DPSK MODE

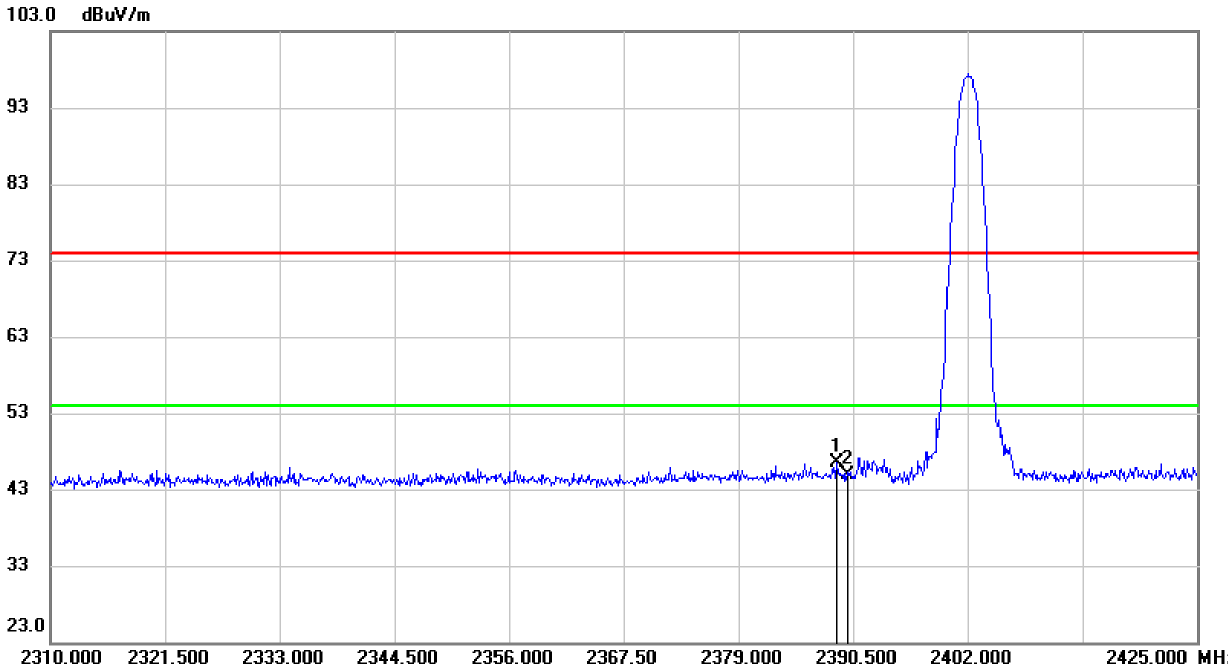
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2388.775	36.25	11.95	48.20	74.00	-25.80	peak
2	2390.000	33.10	11.96	45.06	74.00	-28.94	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. 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.

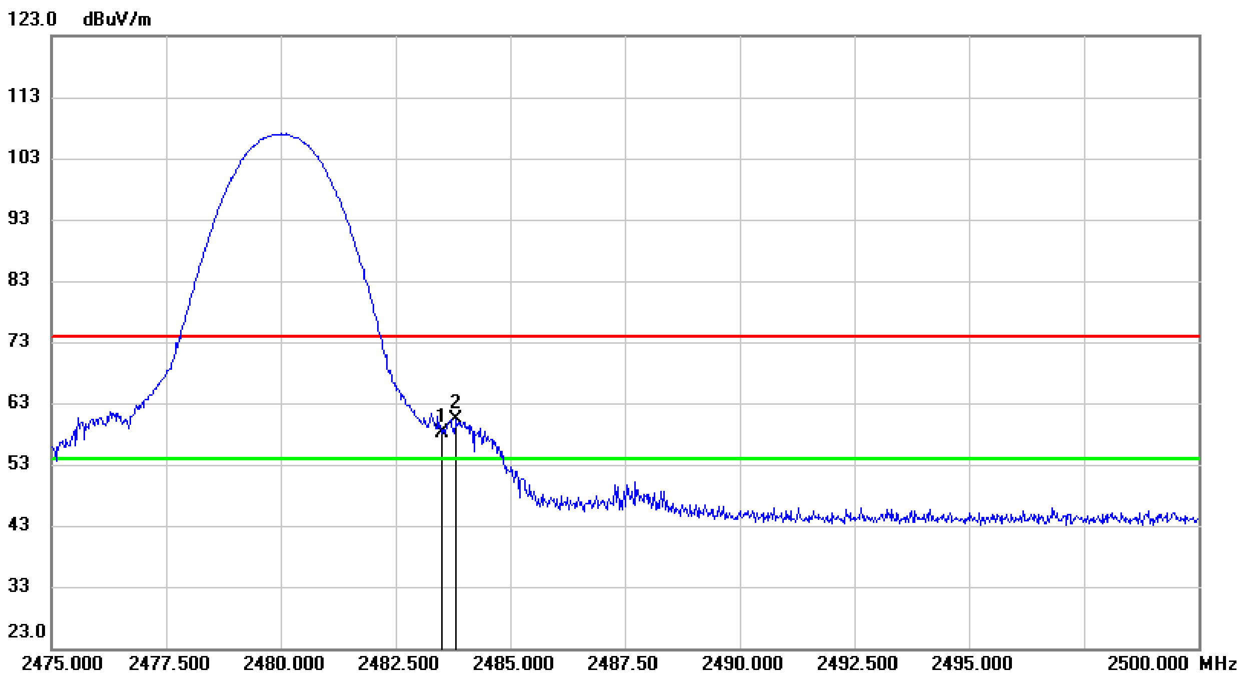
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2388.890	34.47	11.95	46.42	74.00	-27.58	peak
2	2390.000	32.96	11.96	44.92	74.00	-29.08	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. 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.

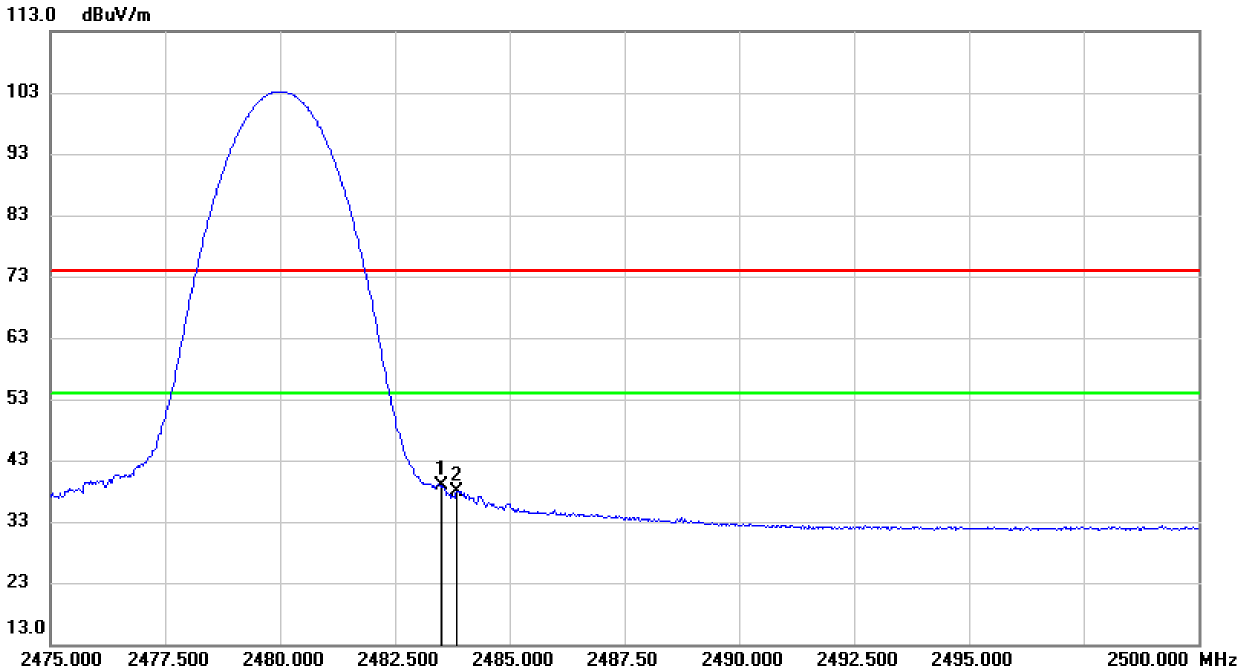
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	45.75	12.38	58.13	74.00	-15.87	peak
2	2483.825	47.91	12.38	60.29	74.00	-13.71	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. 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.

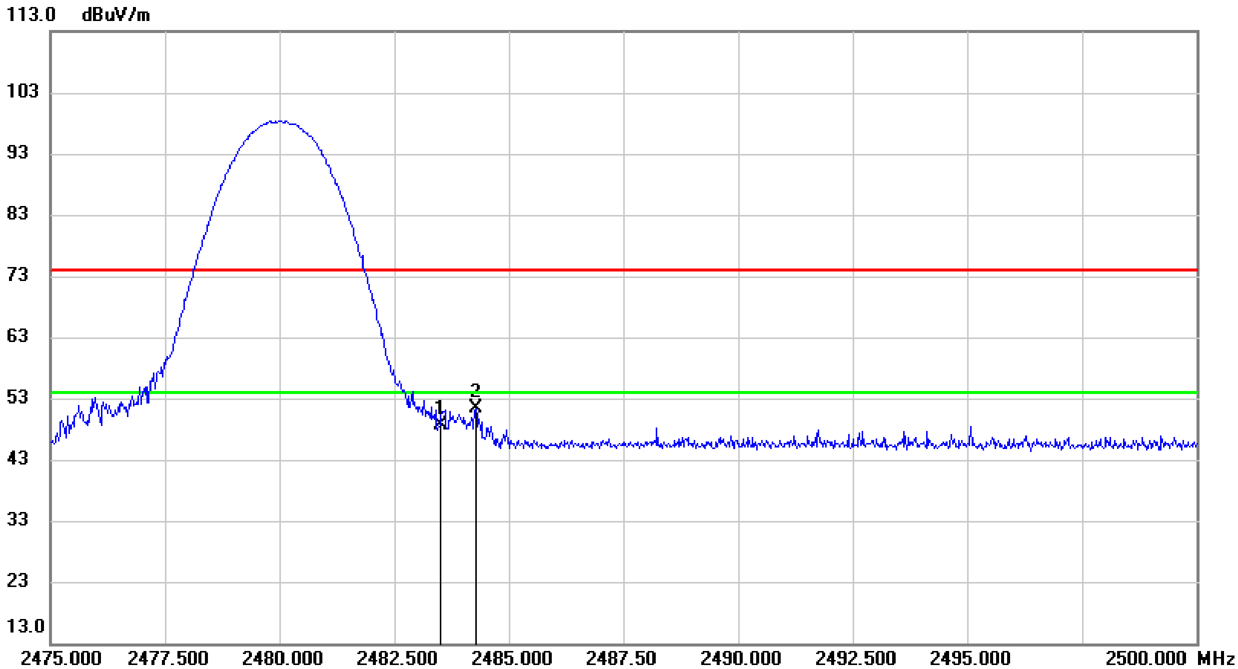
AVG



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	26.45	12.38	38.83	54.00	-15.17	AVG
2	2483.825	25.59	12.38	37.97	54.00	-16.03	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. AVG: VBW=1/Ton, where: Ton is the transmitting duration.
4. For the transmitting duration, please refer to clause 7.1.
5. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	36.23	12.38	48.61	74.00	-25.39	peak
2	2484.275	39.02	12.38	51.40	74.00	-22.60	peak

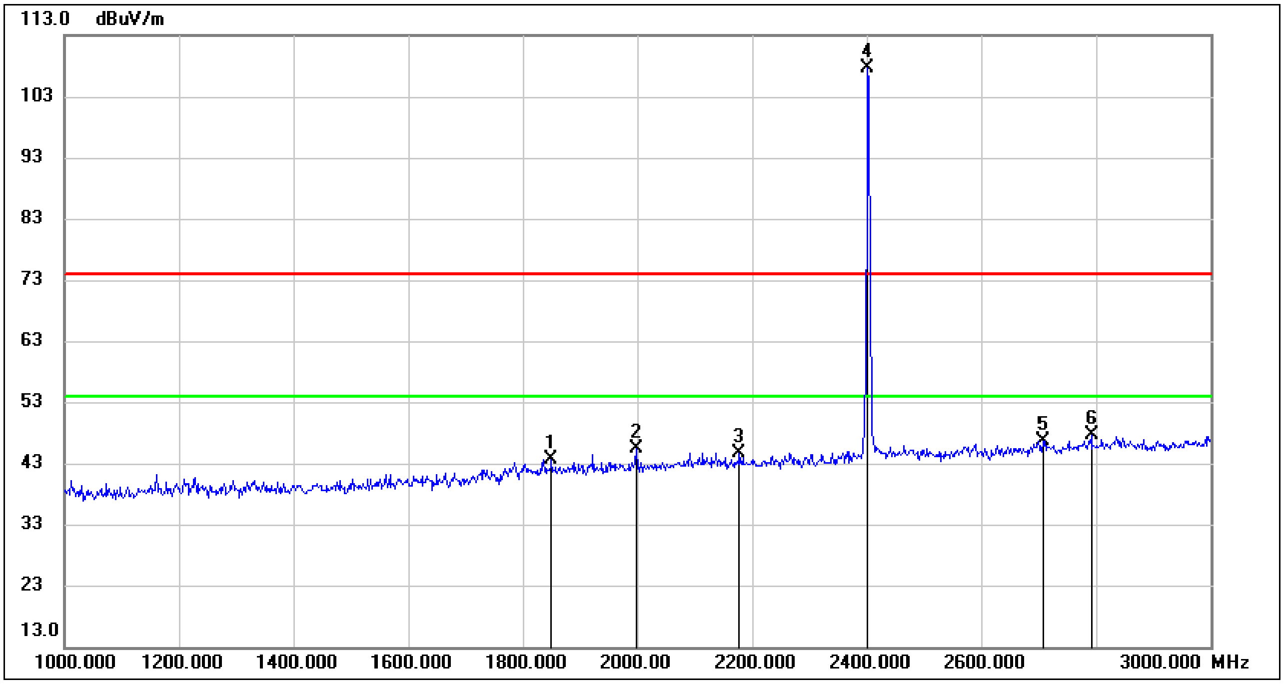
Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG: VBW=1/Ton, where: Ton is the transmitting duration.
5. For the transmitting duration, please refer to clause 7.1.
6. Only the worst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

Note: All the polarities had been tested, only the worst data was recorded in the report.

8.2. SPURIOUS EMISSIONS (1 GHz ~ 3 GHz)

8.2.1. GFSK MODE

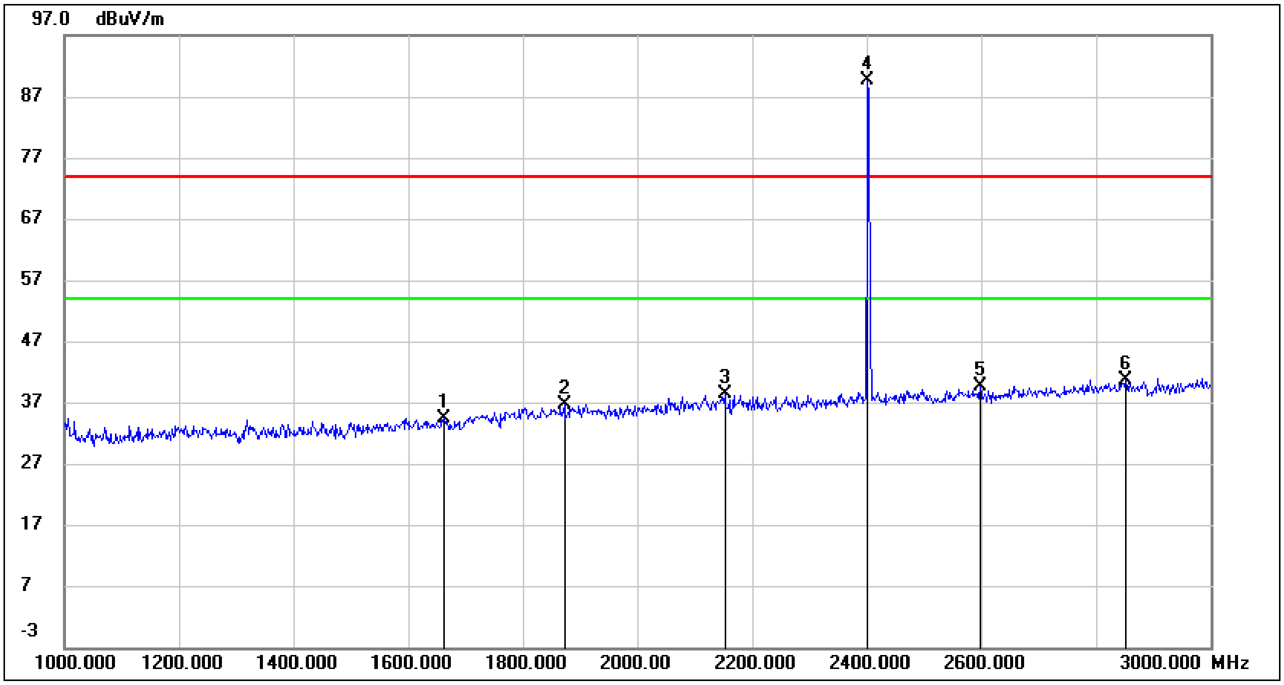
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1850.000	33.66	9.88	43.54	74.00	-30.46	peak
2	1998.000	35.04	10.24	45.28	74.00	-28.72	peak
3	2178.000	33.49	11.26	44.75	74.00	-29.25	peak
4	2402.000	95.70	12.03	107.73	/	/	fundamental
5	2708.000	33.66	13.05	46.71	74.00	-27.29	peak
6	2792.000	33.96	13.70	47.66	74.00	-26.34	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.

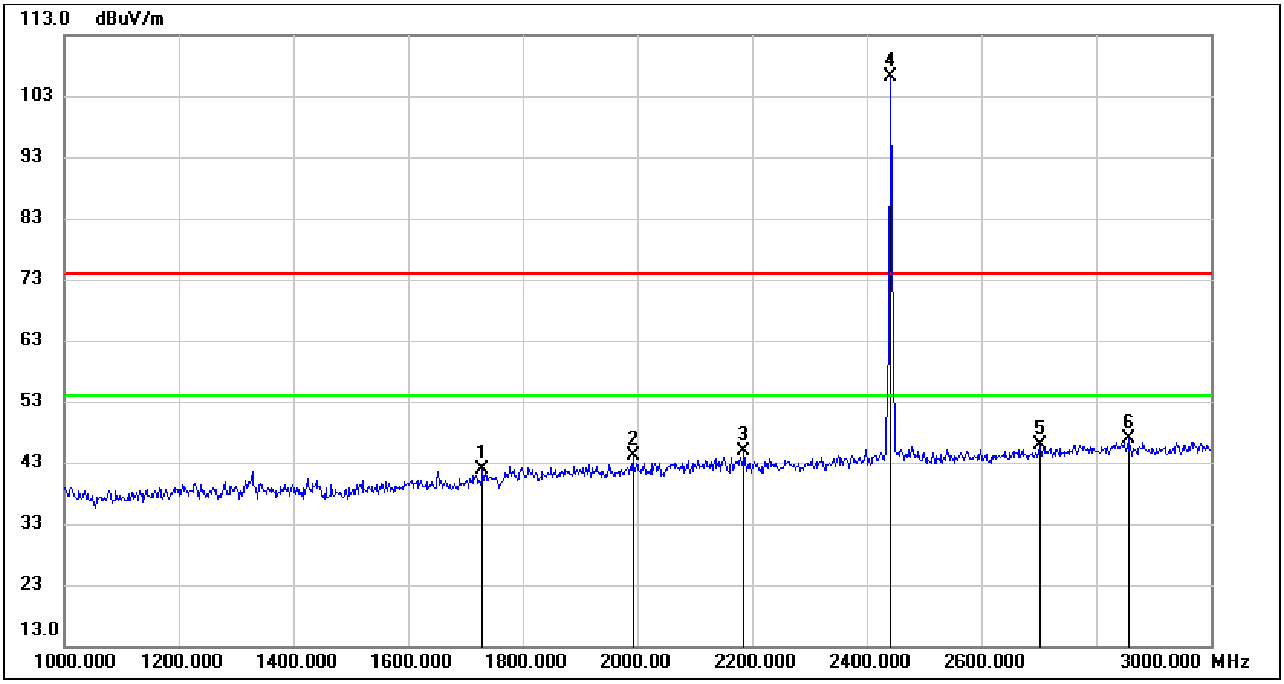
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1662.000	26.34	8.13	34.47	74.00	-39.53	peak
2	1872.000	26.72	9.92	36.64	74.00	-37.36	peak
3	2152.000	27.09	11.18	38.27	74.00	-35.73	peak
4	2402.000	77.67	12.03	89.70	/	/	fundamental
5	2598.000	27.34	12.41	39.75	74.00	-34.25	peak
6	2852.000	26.77	13.90	40.67	74.00	-33.33	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. Peak: Peak detector.

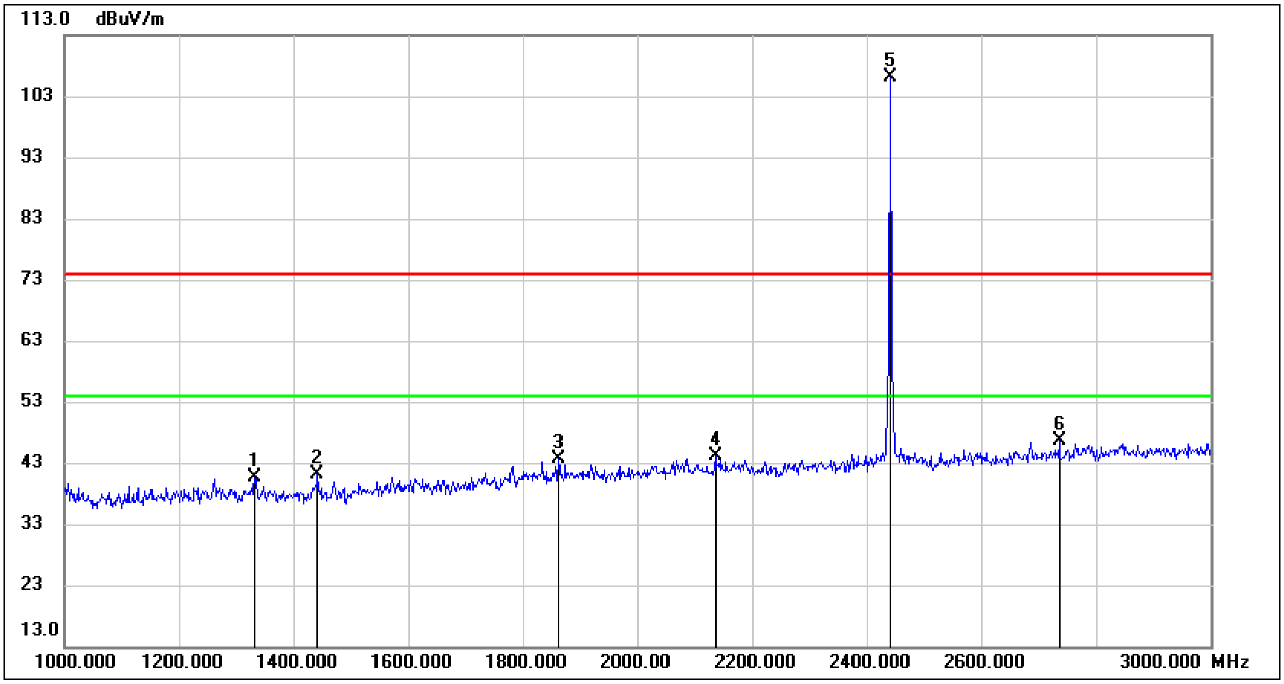
HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1730.000	33.17	8.68	41.85	74.00	-32.15	peak
2	1992.000	33.98	10.22	44.20	74.00	-29.80	peak
3	2186.000	33.61	11.28	44.89	74.00	-29.11	peak
4	2441.000	94.04	12.19	106.23	/	/	fundamental
5	2702.000	32.94	13.02	45.96	74.00	-28.04	peak
6	2856.000	32.86	13.91	46.77	74.00	-27.23	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.

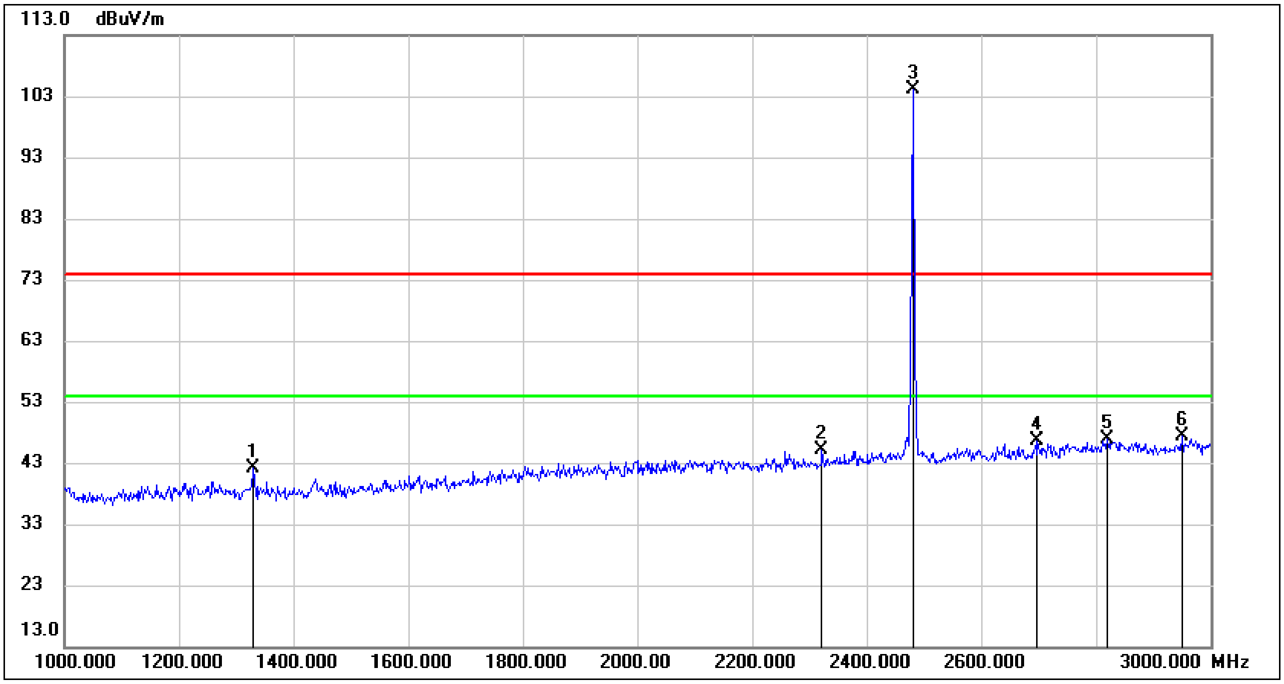
HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1332.000	34.08	6.64	40.72	74.00	-33.28	peak
2	1442.000	34.35	6.81	41.16	74.00	-32.84	peak
3	1862.000	33.71	9.91	43.62	74.00	-30.38	peak
4	2136.000	33.01	11.13	44.14	74.00	-29.86	peak
5	2441.000	93.95	12.19	106.14	/	/	fundamental
6	2736.000	33.24	13.27	46.51	74.00	-27.49	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.

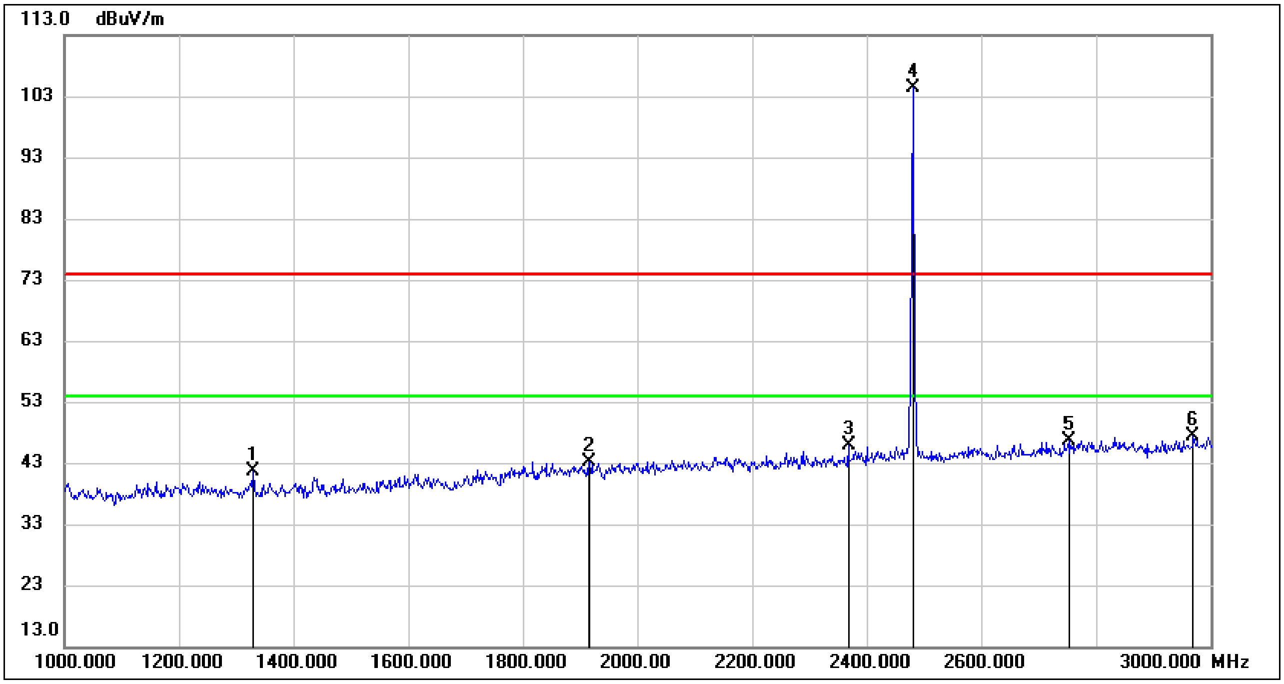
HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1330.000	35.48	6.64	42.12	74.00	-31.88	peak
2	2322.000	33.53	11.48	45.01	74.00	-28.99	peak
3	2480.000	91.82	12.35	104.17	/	/	fundamental
4	2696.000	33.74	12.98	46.72	74.00	-27.28	peak
5	2820.000	33.13	13.81	46.94	74.00	-27.06	peak
6	2950.000	32.90	14.36	47.26	74.00	-26.74	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 (HIGH CHANNEL, VERTICAL)

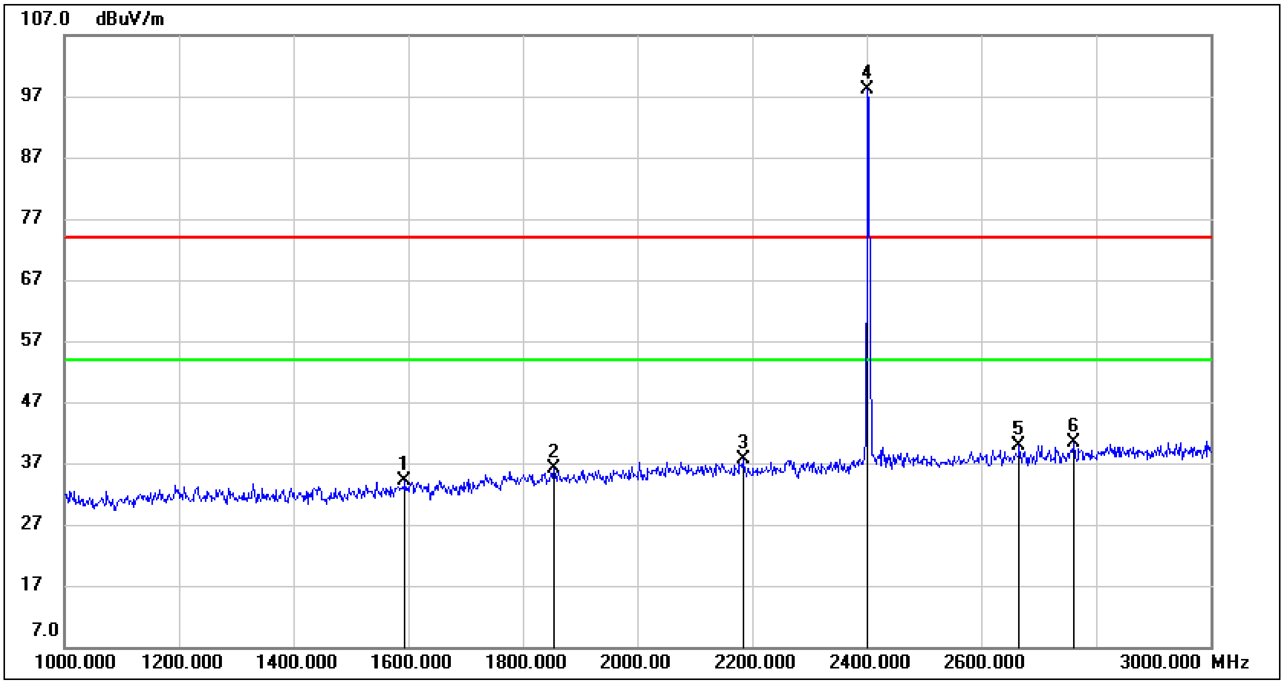


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1330.000	34.95	6.64	41.59	74.00	-32.41	peak
2	1916.000	33.08	10.01	43.09	74.00	-30.91	peak
3	2368.000	34.09	11.81	45.90	74.00	-28.10	peak
4	2480.000	91.93	12.35	104.28	/	/	fundamental
5	2752.000	33.27	13.40	46.67	74.00	-27.33	peak
6	2970.000	32.77	14.49	47.26	74.00	-26.74	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.

8.2.2. 8DPSK MODE

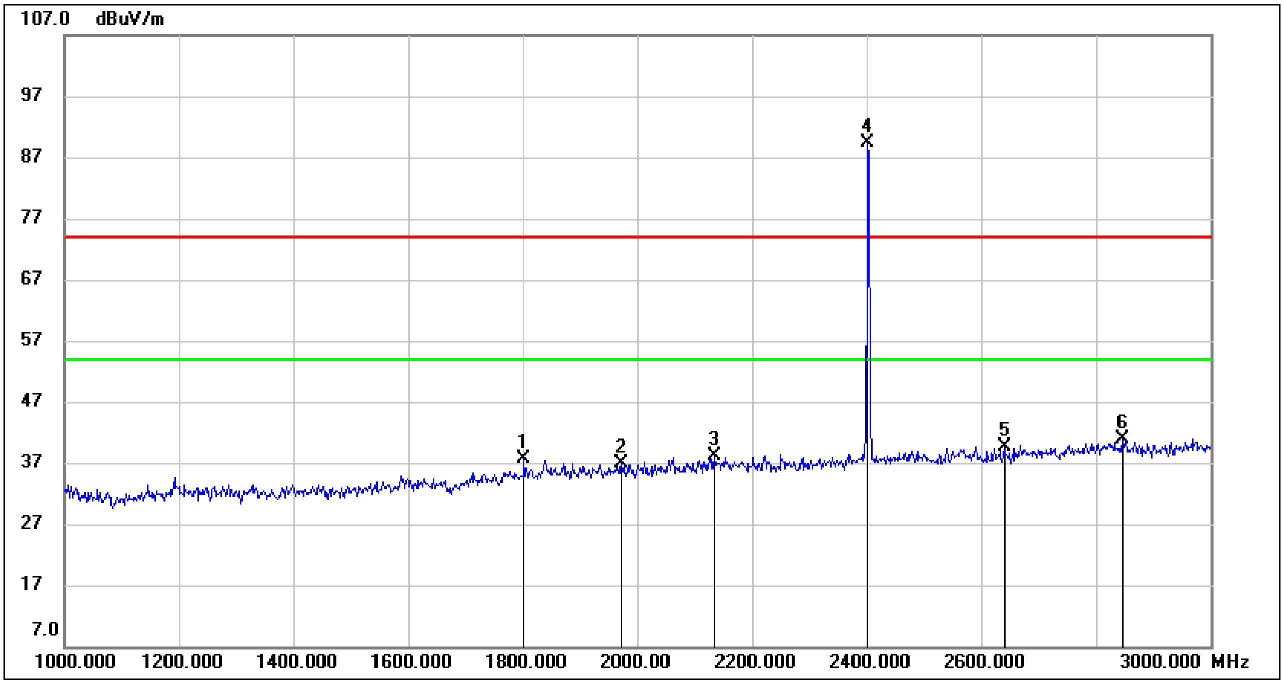
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1594.000	26.16	7.92	34.08	74.00	-39.92	peak
2	1854.000	26.21	9.89	36.10	74.00	-37.90	peak
3	2184.000	26.46	11.27	37.73	74.00	-36.27	peak
4	2402.000	86.19	12.03	98.22	/	/	fundamental
5	2666.000	27.05	12.80	39.85	74.00	-34.15	peak
6	2762.000	26.91	13.47	40.38	74.00	-33.62	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.

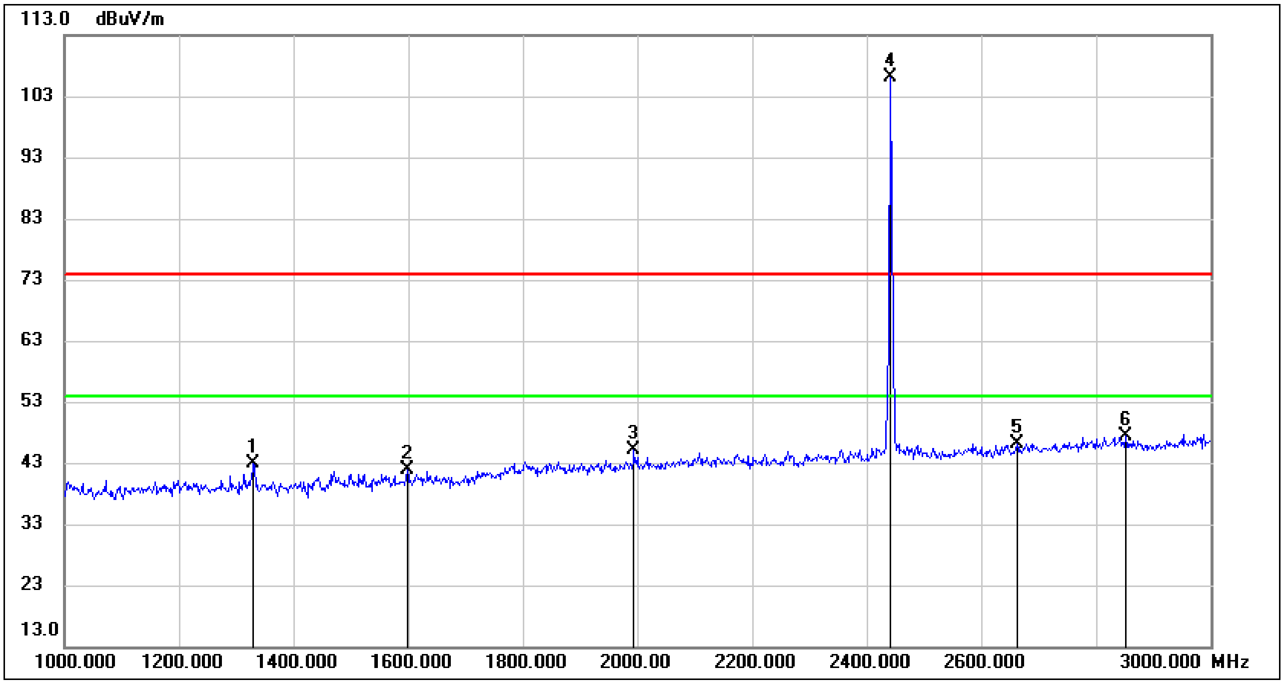
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1802.000	27.87	9.79	37.66	74.00	-36.34	peak
2	1972.000	26.78	10.17	36.95	74.00	-37.05	peak
3	2134.000	27.10	11.13	38.23	74.00	-35.77	peak
4	2402.000	77.40	12.03	89.43	/	/	fundamental
5	2640.000	26.93	12.64	39.57	74.00	-34.43	peak
6	2846.000	26.87	13.89	40.76	74.00	-33.24	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.

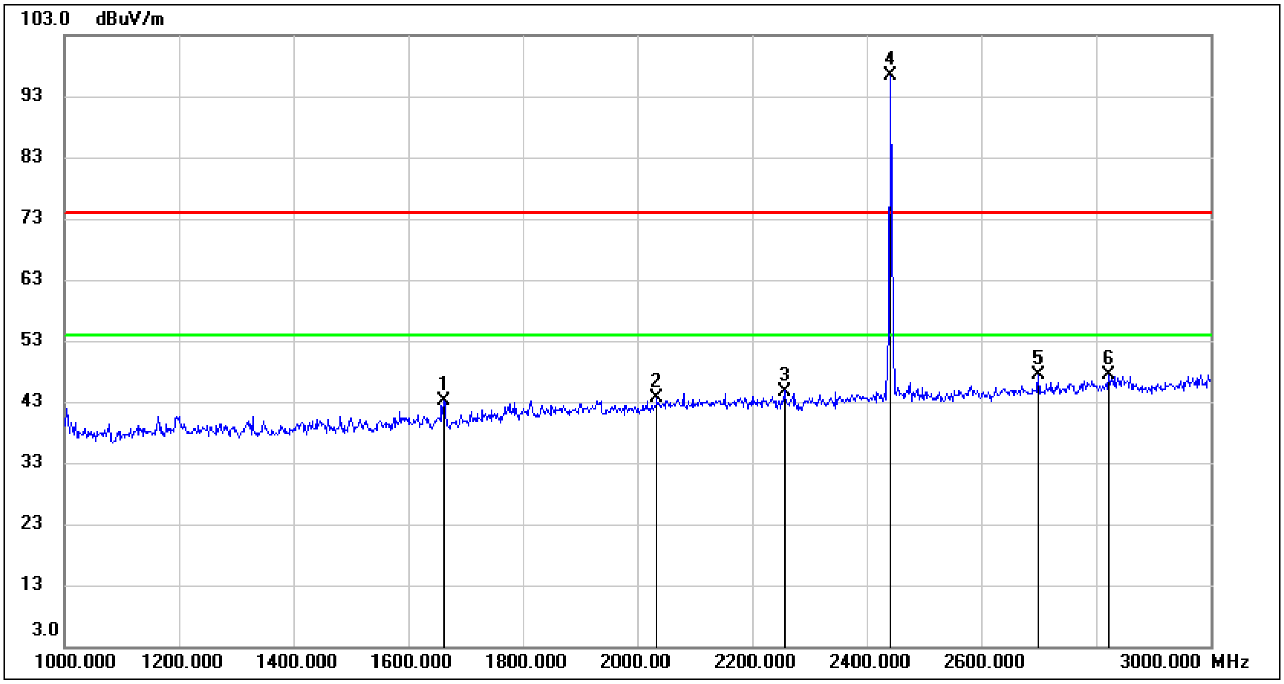
HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1330.000	36.28	6.64	42.92	74.00	-31.08	peak
2	1598.000	33.88	7.95	41.83	74.00	-32.17	peak
3	1994.000	34.85	10.24	45.09	74.00	-28.91	peak
4	2441.000	94.05	12.19	106.24	/	/	fundamental
5	2662.000	33.43	12.77	46.20	74.00	-27.80	peak
6	2852.000	33.37	13.90	47.27	74.00	-26.73	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.

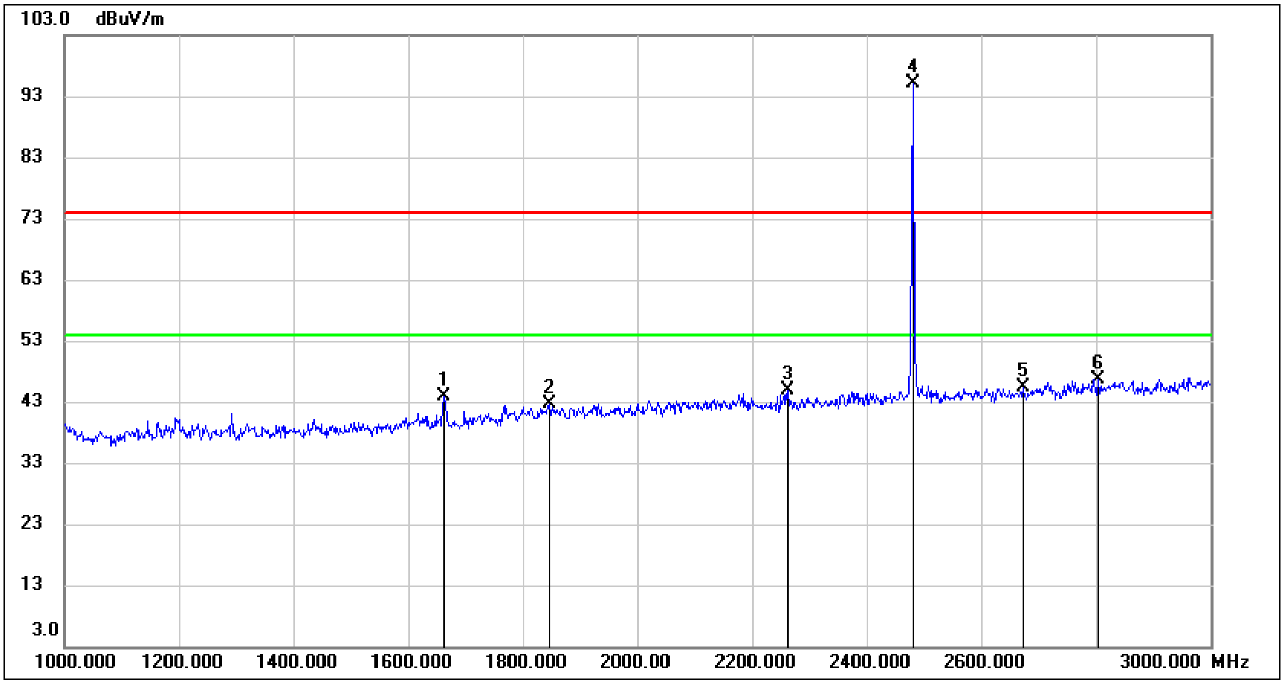
HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1662.000	34.96	8.13	43.09	74.00	-30.91	peak
2	2034.000	33.09	10.52	43.61	74.00	-30.39	peak
3	2256.000	33.43	11.32	44.75	74.00	-29.25	peak
4	2441.000	84.24	12.19	96.43	/	/	fundamental
5	2700.000	34.36	13.00	47.36	74.00	-26.64	peak
6	2822.000	33.54	13.82	47.36	74.00	-26.64	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.

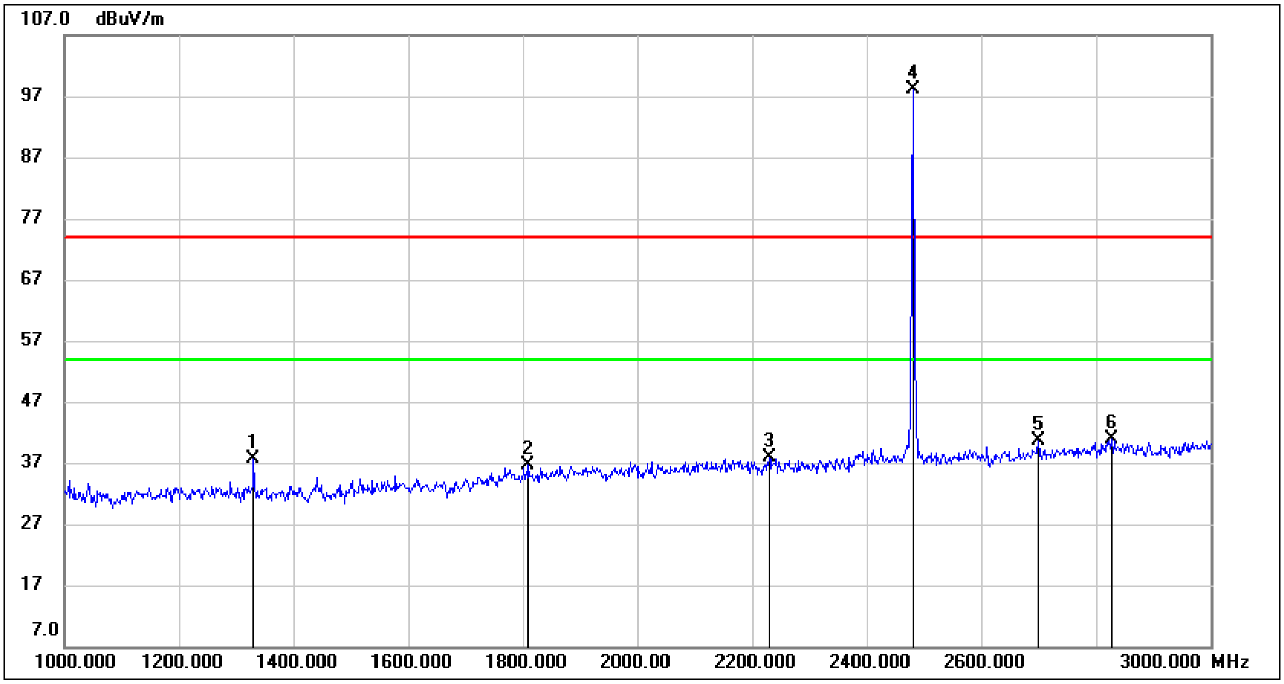
HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1662.000	35.69	8.13	43.82	74.00	-30.18	peak
2	1846.000	32.69	9.87	42.56	74.00	-31.44	peak
3	2262.000	33.44	11.33	44.77	74.00	-29.23	peak
4	2480.000	82.67	12.35	95.02	/	/	fundamental
5	2672.000	32.42	12.84	45.26	74.00	-28.74	peak
6	2804.000	32.77	13.76	46.53	74.00	-27.47	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 (HIGH CHANNEL, VERTICAL)



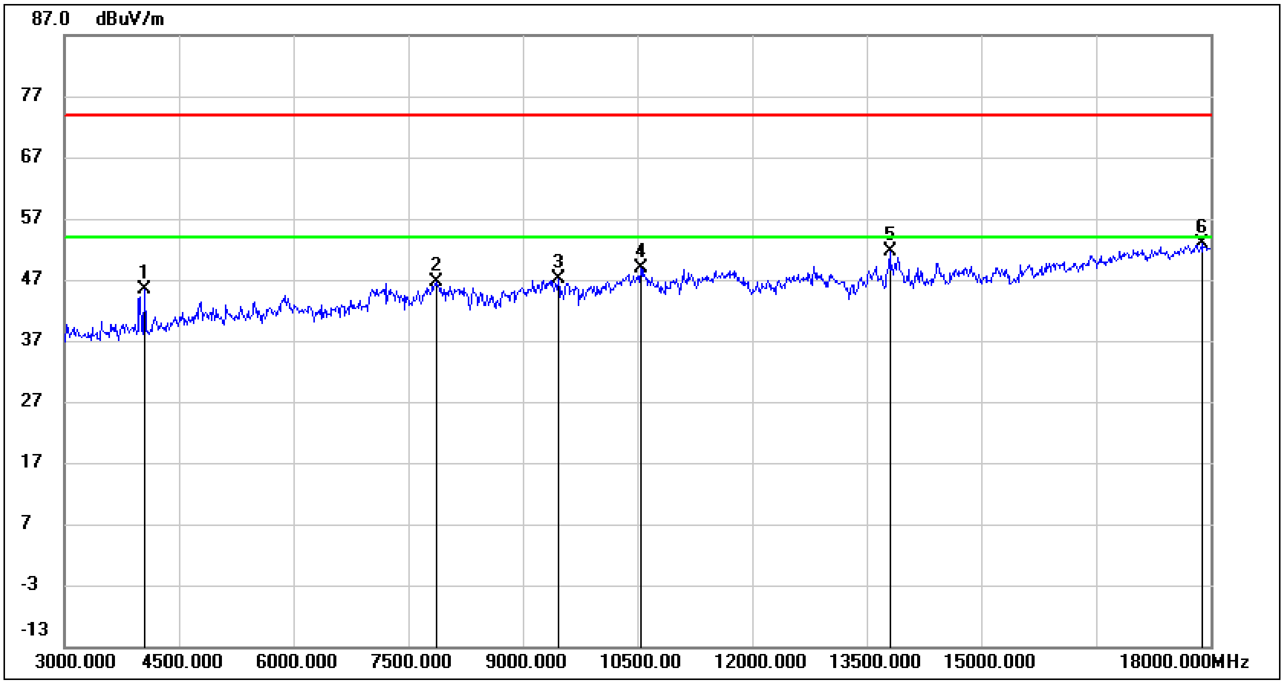
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1330.000	30.88	6.64	37.52	74.00	-36.48	peak
2	1810.000	26.71	9.81	36.52	74.00	-37.48	peak
3	2230.000	26.46	11.32	37.78	74.00	-36.22	peak
4	2480.000	85.73	12.35	98.08	/	/	fundamental
5	2700.000	27.61	13.00	40.61	74.00	-33.39	peak
6	2828.000	26.93	13.84	40.77	74.00	-33.23	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.

8.3. SPURIOUS EMISSIONS (3 GHz ~ 18 GHz)

8.3.1. GFSK MODE

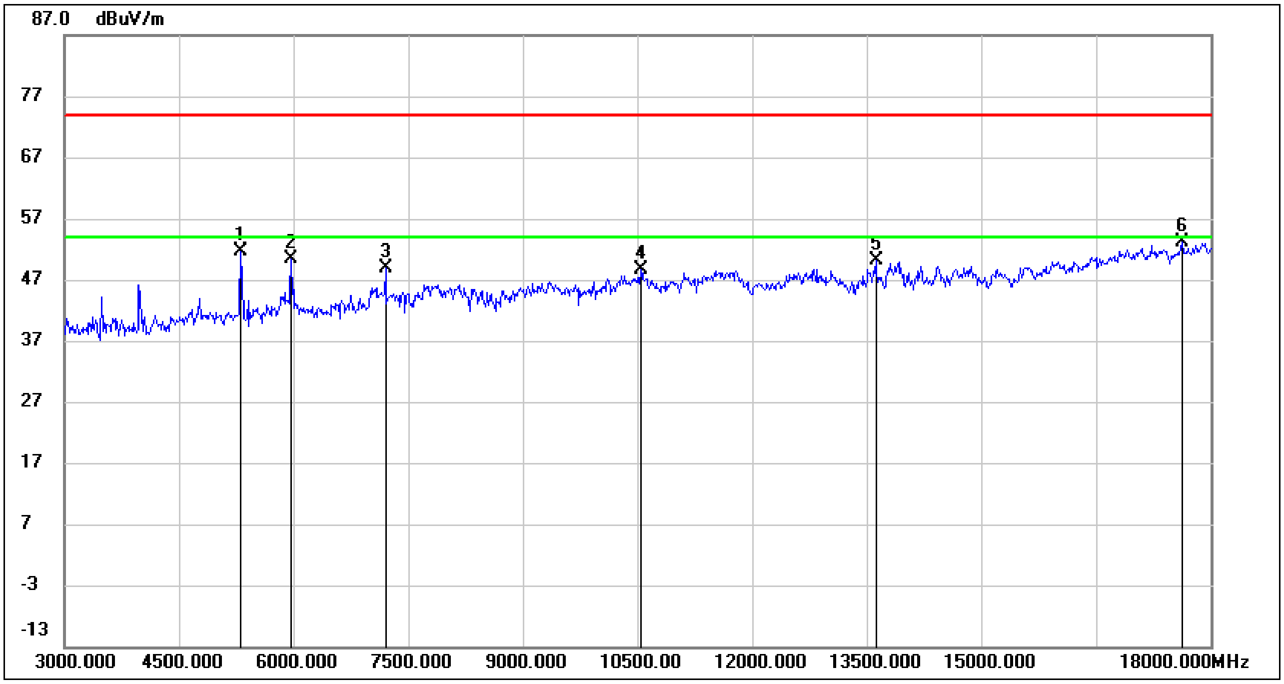
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4050.000	48.38	-2.89	45.49	74.00	-28.51	peak
2	7860.000	39.02	7.51	46.53	74.00	-27.47	peak
3	9465.000	37.49	9.54	47.03	74.00	-26.97	peak
4	10545.000	37.21	11.64	48.85	74.00	-25.15	peak
5	13800.000	34.45	17.10	51.55	74.00	-22.45	peak
6	17895.000	29.63	23.34	52.97	74.00	-21.03	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.

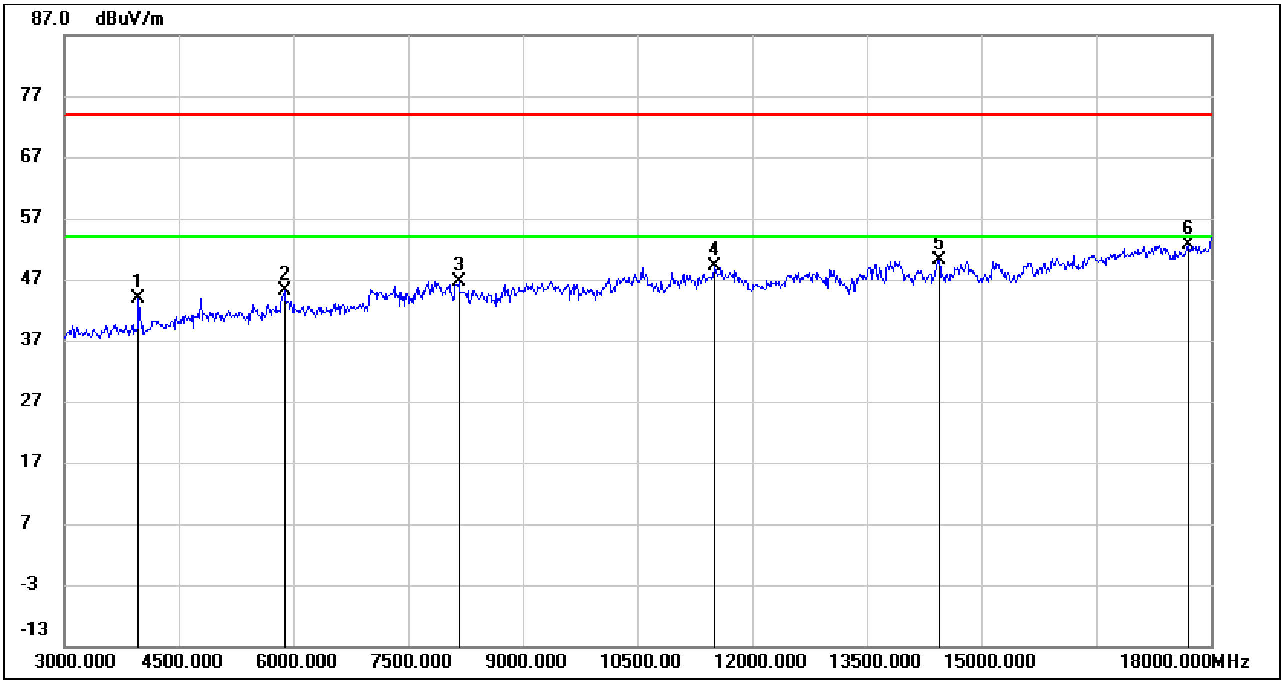
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	5310.000	49.49	2.02	51.51	74.00	-22.49	peak
2	5970.000	46.60	3.79	50.39	74.00	-23.61	peak
3	7200.000	43.14	5.82	48.96	74.00	-25.04	peak
4	10545.000	36.99	11.64	48.63	74.00	-25.37	peak
5	13620.000	34.22	15.99	50.21	74.00	-23.79	peak
6	17625.000	31.16	21.95	53.11	74.00	-20.89	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.

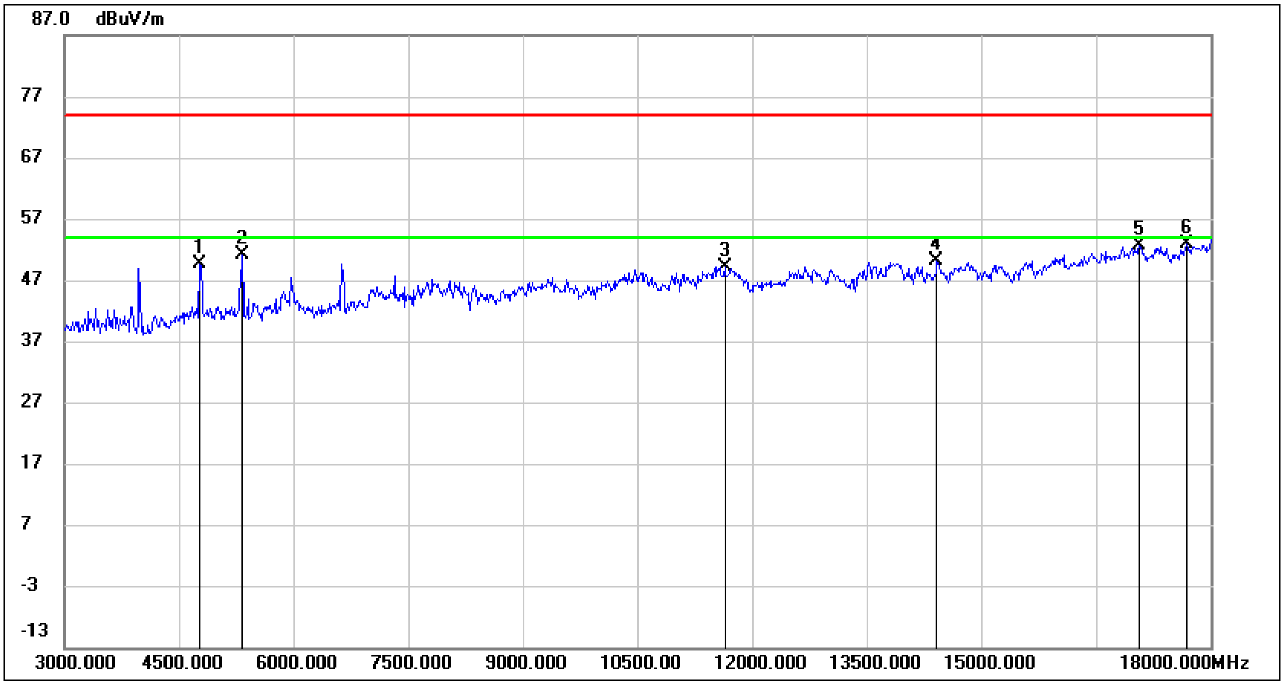
HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3975.000	46.80	-2.90	43.90	74.00	-30.10	peak
2	5880.000	40.46	4.59	45.05	74.00	-28.95	peak
3	8160.000	38.45	8.18	46.63	74.00	-27.37	peak
4	11505.000	35.69	13.42	49.11	74.00	-24.89	peak
5	14445.000	33.89	16.36	50.25	74.00	-23.75	peak
6	17715.000	30.18	22.56	52.74	74.00	-21.26	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.

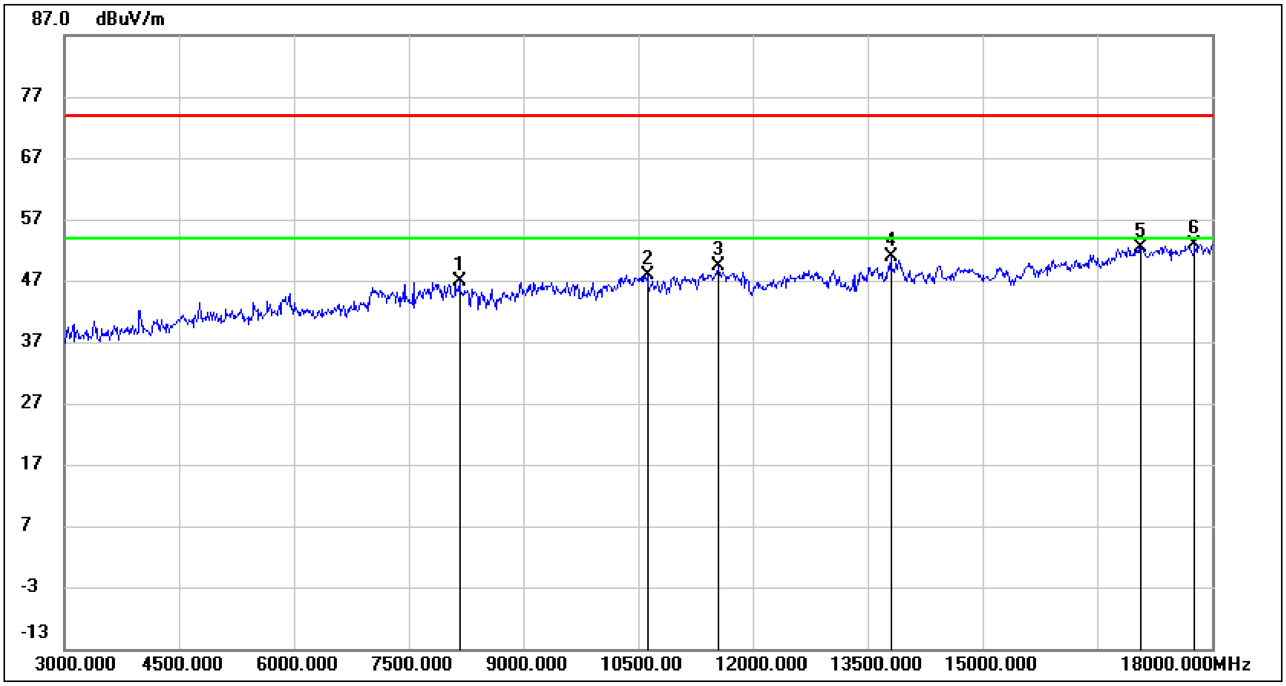
HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4770.000	49.25	0.37	49.62	74.00	-24.38	peak
2	5325.000	49.23	1.99	51.22	74.00	-22.78	peak
3	11640.000	36.07	13.09	49.16	74.00	-24.84	peak
4	14415.000	33.76	16.35	50.11	74.00	-23.89	peak
5	17070.000	32.11	20.57	52.68	74.00	-21.32	peak
6	17685.000	30.45	22.33	52.78	74.00	-21.22	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.

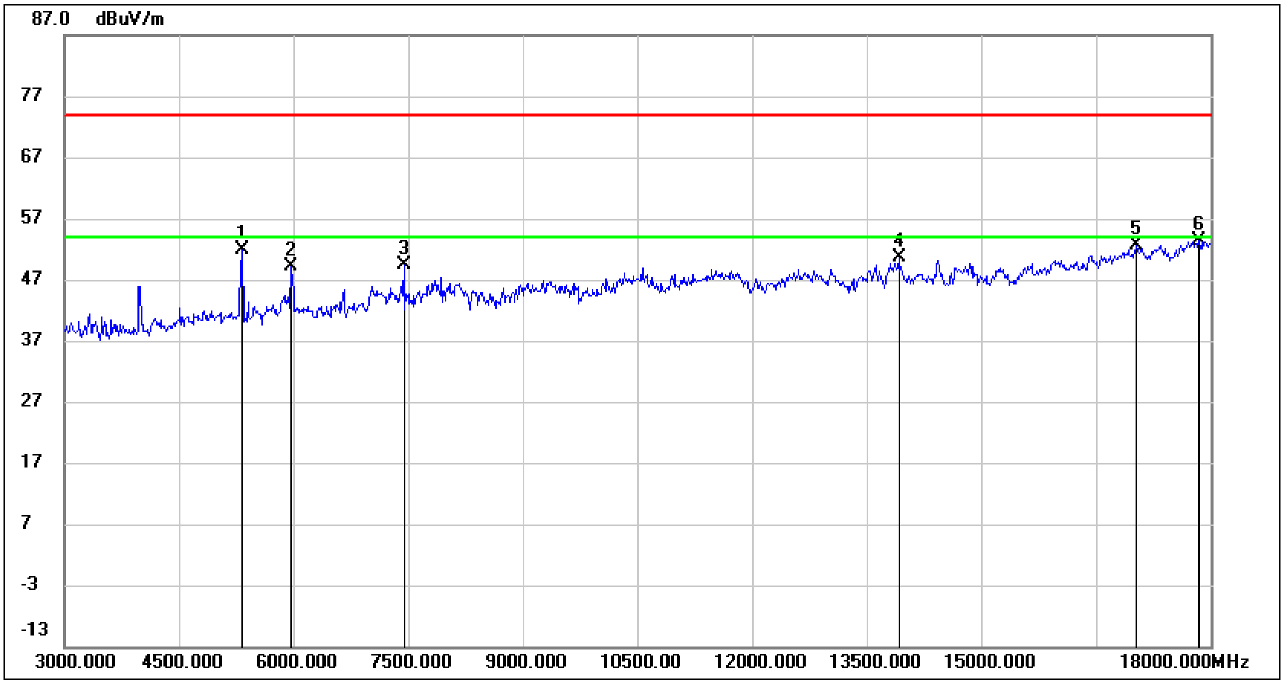
HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	8160.000	38.73	8.18	46.91	74.00	-27.09	peak
2	10620.000	36.08	11.88	47.96	74.00	-26.04	peak
3	11550.000	36.13	13.30	49.43	74.00	-24.57	peak
4	13800.000	33.76	17.10	50.86	74.00	-23.14	peak
5	17070.000	31.91	20.57	52.48	74.00	-21.52	peak
6	17775.000	29.87	23.09	52.96	74.00	-21.04	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, VERTICAL)

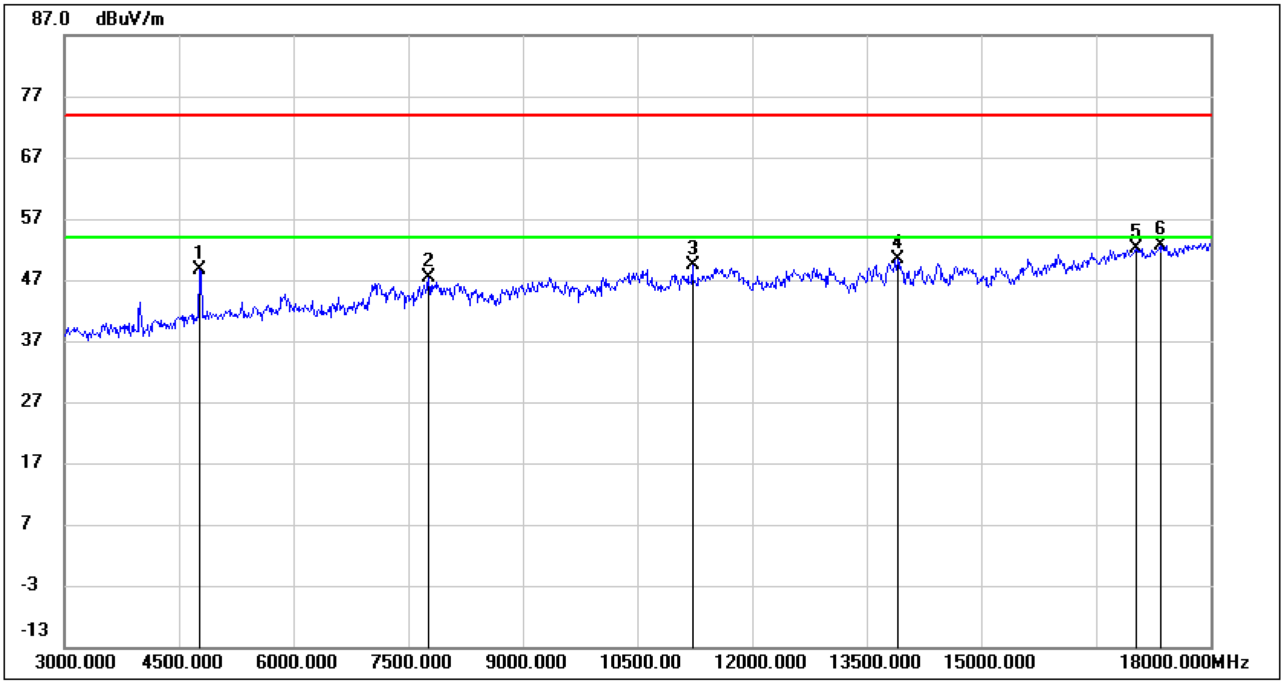


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5325.000	49.96	1.99	51.95	74.00	-22.05	peak
2	5970.000	45.29	3.79	49.08	74.00	-24.92	peak
3	7440.000	43.15	6.32	49.47	74.00	-24.53	peak
4	13920.000	34.49	16.17	50.66	74.00	-23.34	peak
5	17025.000	32.15	20.46	52.61	74.00	-21.39	peak
6	17850.000	30.03	23.32	53.35	74.00	-20.65	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.

8.3.2. 8DPSK MODE

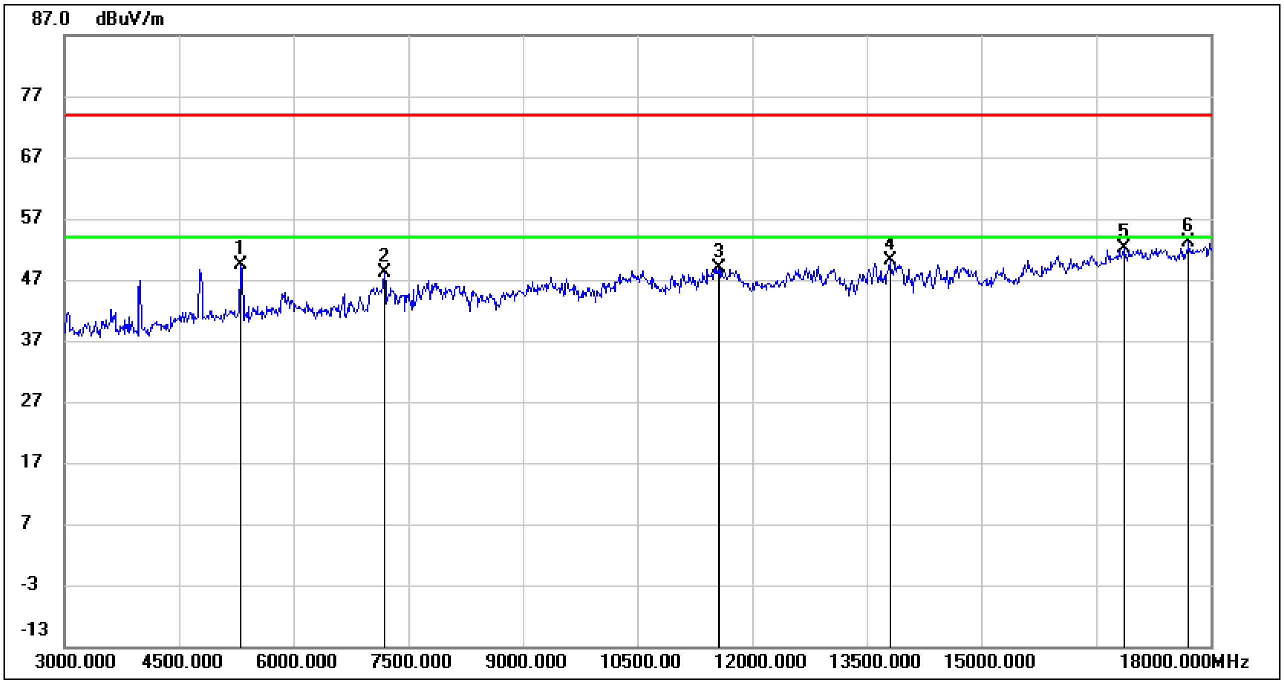
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4770.000	48.38	0.37	48.75	74.00	-25.25	peak
2	7770.000	39.97	7.50	47.47	74.00	-26.53	peak
3	11220.000	36.82	12.48	49.30	74.00	-24.70	peak
4	13905.000	34.13	16.20	50.33	74.00	-23.67	peak
5	17025.000	31.79	20.46	52.25	74.00	-21.75	peak
6	17340.000	31.14	21.61	52.75	74.00	-21.25	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.

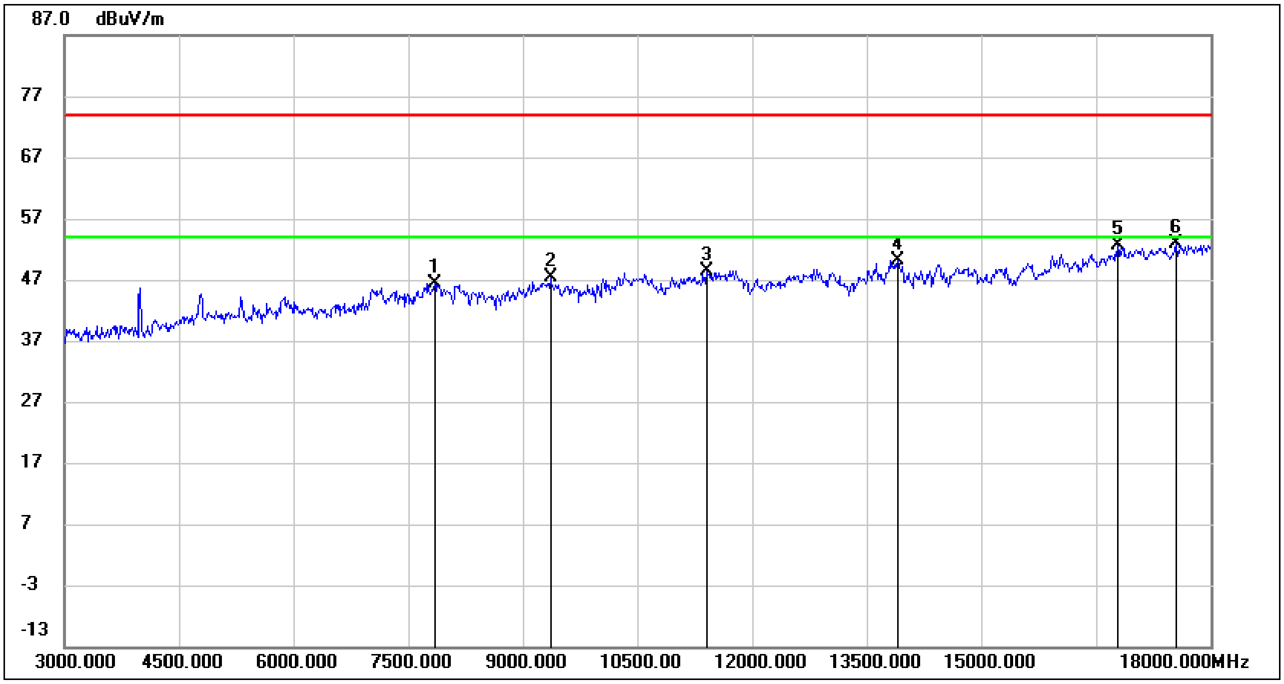
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	5310.000	47.24	2.02	49.26	74.00	-24.74	peak
2	7185.000	42.36	5.83	48.19	74.00	-25.81	peak
3	11565.000	35.61	13.26	48.87	74.00	-25.13	peak
4	13800.000	33.10	17.10	50.20	74.00	-23.80	peak
5	16860.000	32.08	19.95	52.03	74.00	-21.97	peak
6	17715.000	30.50	22.56	53.06	74.00	-20.94	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.

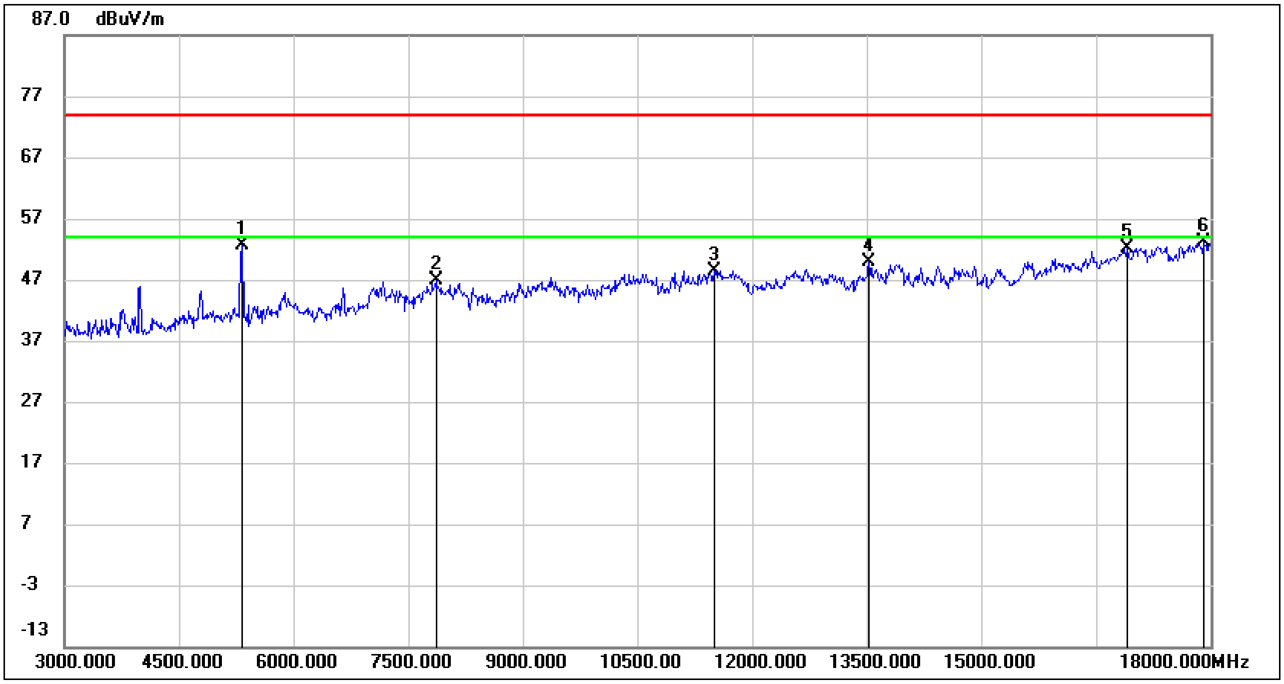
HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	7845.000	38.72	7.62	46.34	74.00	-27.66	peak
2	9360.000	37.91	9.36	47.27	74.00	-26.73	peak
3	11400.000	35.88	12.62	48.50	74.00	-25.50	peak
4	13905.000	33.90	16.20	50.10	74.00	-23.90	peak
5	16785.000	32.71	19.94	52.65	74.00	-21.35	peak
6	17550.000	31.20	21.57	52.77	74.00	-21.23	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.

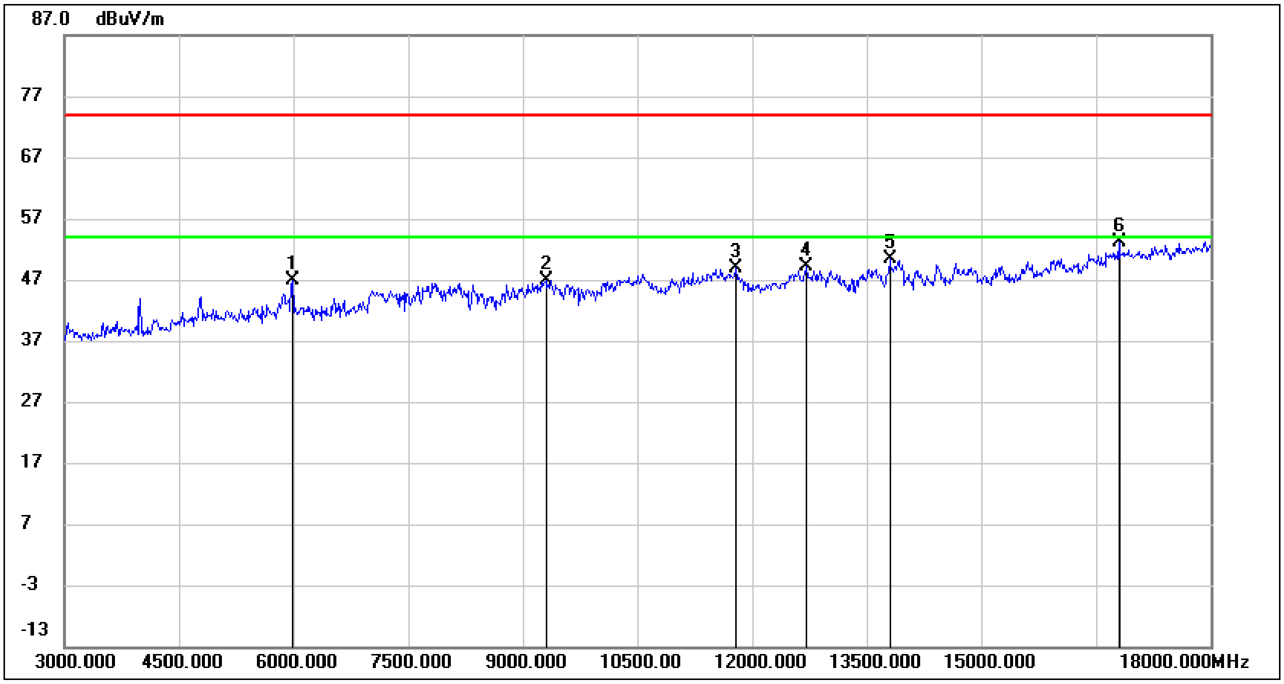
HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5325.000	50.73	1.99	52.72	74.00	-21.28	peak
2	7860.000	39.46	7.51	46.97	74.00	-27.03	peak
3	11505.000	34.91	13.42	48.33	74.00	-25.67	peak
4	13530.000	33.94	15.86	49.80	74.00	-24.20	peak
5	16905.000	32.23	19.99	52.22	74.00	-21.78	peak
6	17910.000	29.67	23.35	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. 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.

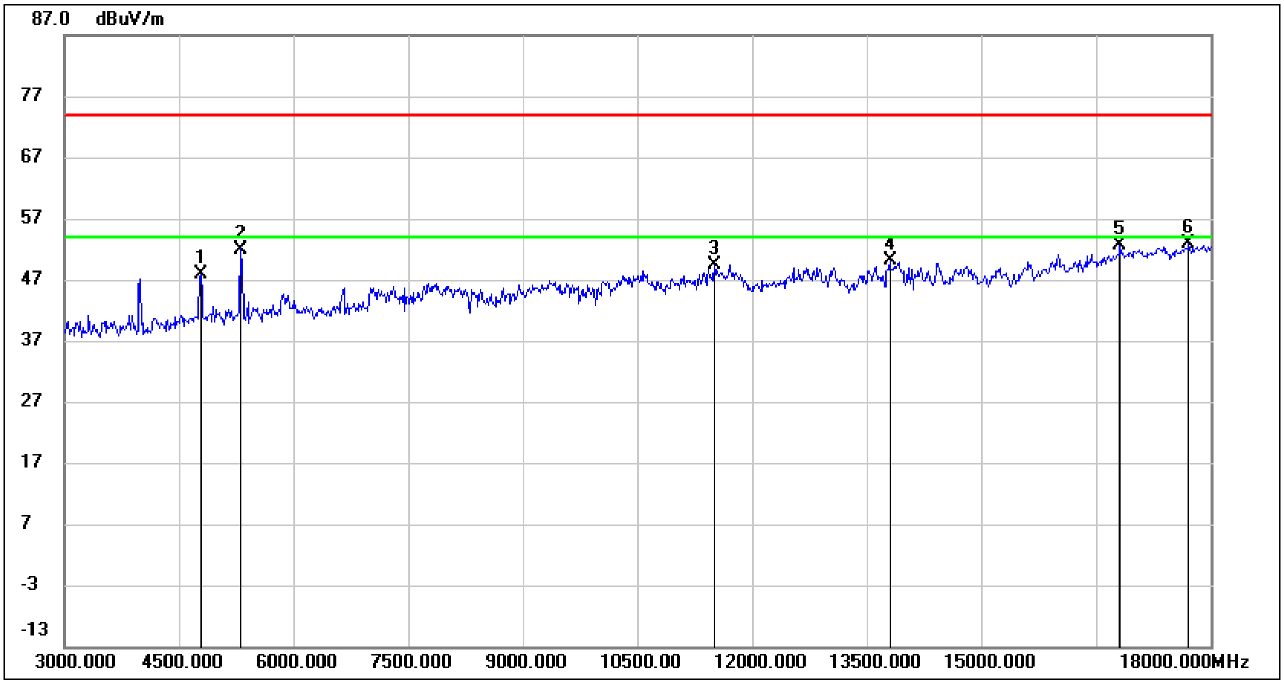
HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	5985.000	43.24	3.54	46.78	74.00	-27.22	peak
2	9300.000	37.86	8.99	46.85	74.00	-27.15	peak
3	11790.000	35.62	13.17	48.79	74.00	-25.21	peak
4	12705.000	34.71	14.35	49.06	74.00	-24.94	peak
5	13800.000	33.27	17.10	50.37	74.00	-23.63	peak
6	16800.000	33.22	19.95	53.17	74.00	-20.83	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, VERTICAL)



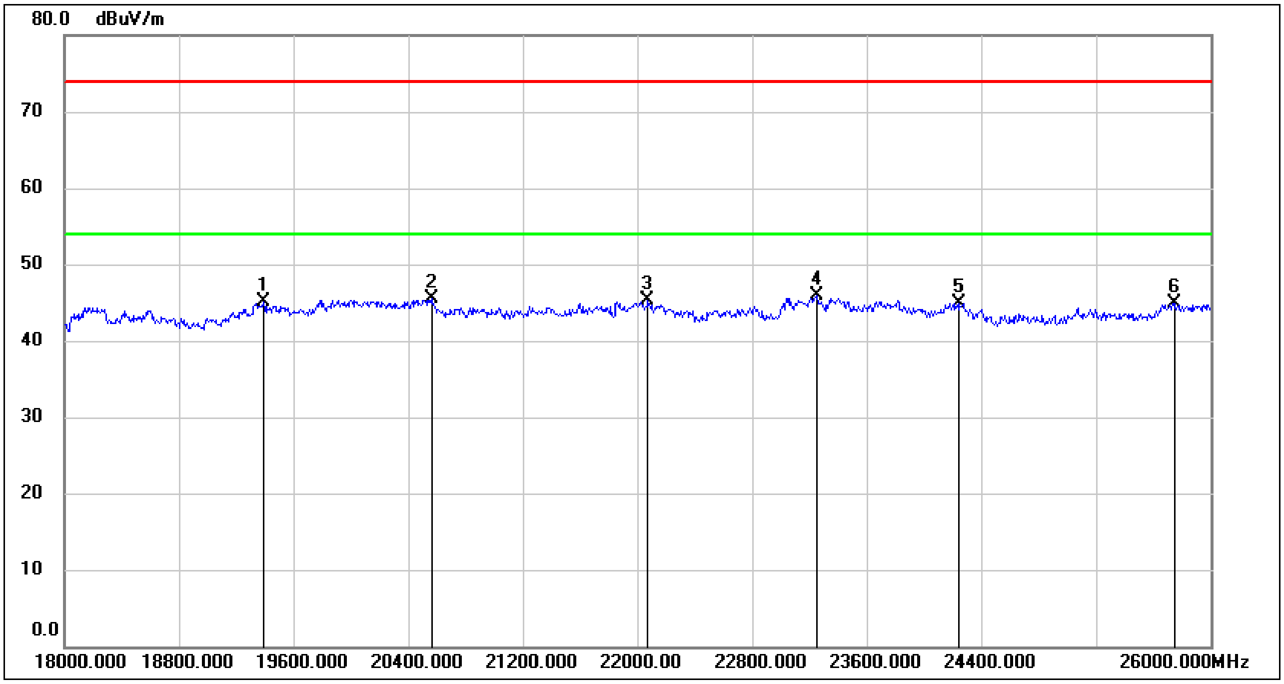
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4785.000	47.55	0.42	47.97	74.00	-26.03	peak
2	5310.000	49.98	2.02	52.00	74.00	-22.00	peak
3	11505.000	35.88	13.42	49.30	74.00	-24.70	peak
4	13800.000	33.03	17.10	50.13	74.00	-23.87	peak
5	16815.000	32.55	19.96	52.51	74.00	-21.49	peak
6	17715.000	30.31	22.56	52.87	74.00	-21.13	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.

8.4. SPURIOUS EMISSIONS (18 GHz ~ 26 GHz)

8.4.1. GFSK MODE

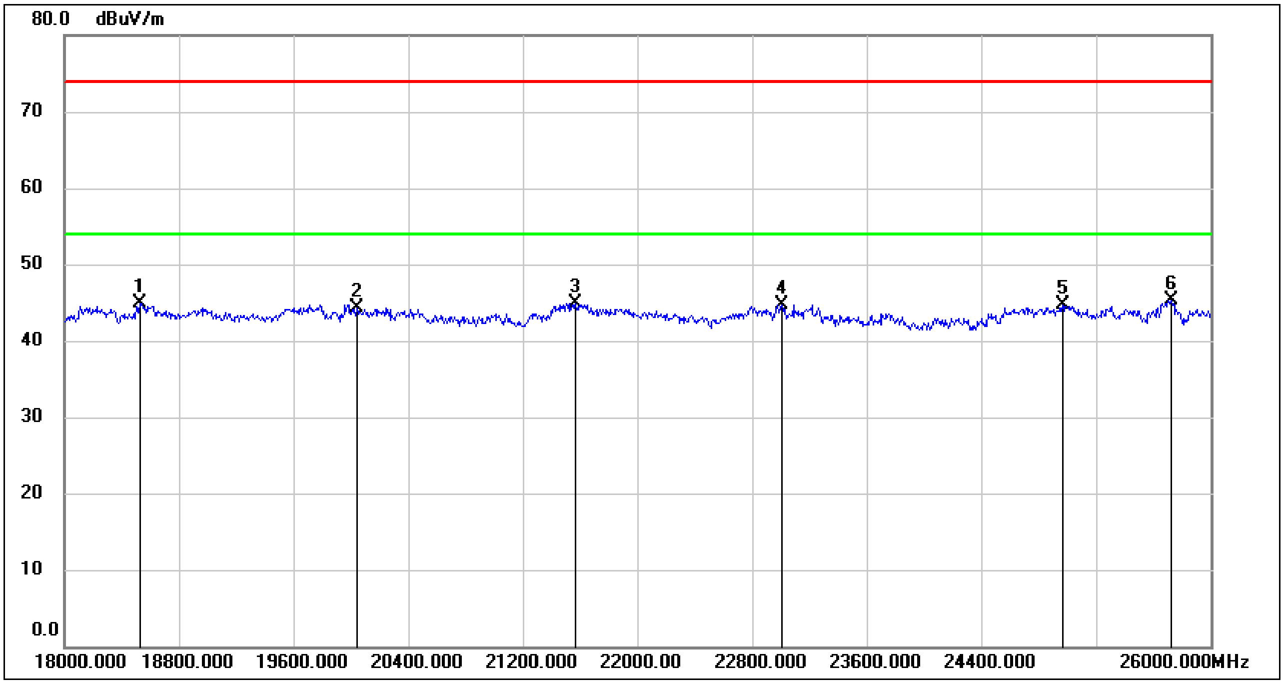
SPURIOUS EMISSIONS (LOW CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	19392.000	50.62	-5.57	45.05	74.00	-28.95	peak
2	20560.000	50.73	-5.30	45.43	74.00	-28.57	peak
3	22072.000	49.77	-4.41	45.36	74.00	-28.64	peak
4	23256.000	49.22	-3.35	45.87	74.00	-28.13	peak
5	24248.000	47.82	-2.83	44.99	74.00	-29.01	peak
6	25744.000	45.50	-0.64	44.86	74.00	-29.14	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.

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	20040.000	49.71	-5.48	44.23	74.00	-29.77	peak
3	21568.000	49.44	-4.59	44.85	74.00	-29.15	peak
4	23008.000	48.10	-3.44	44.66	74.00	-29.34	peak
5	24968.000	46.76	-2.14	44.62	74.00	-29.38	peak
6	25728.000	46.11	-0.72	45.39	74.00	-28.61	peak

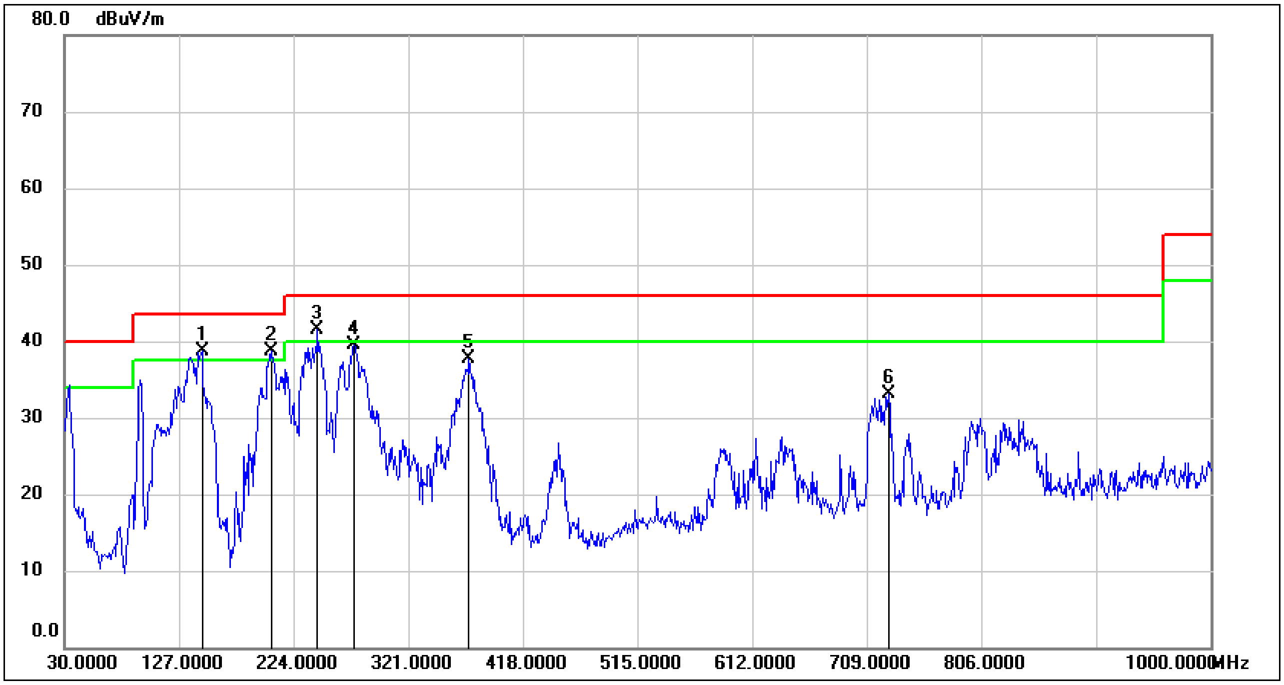
Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.

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

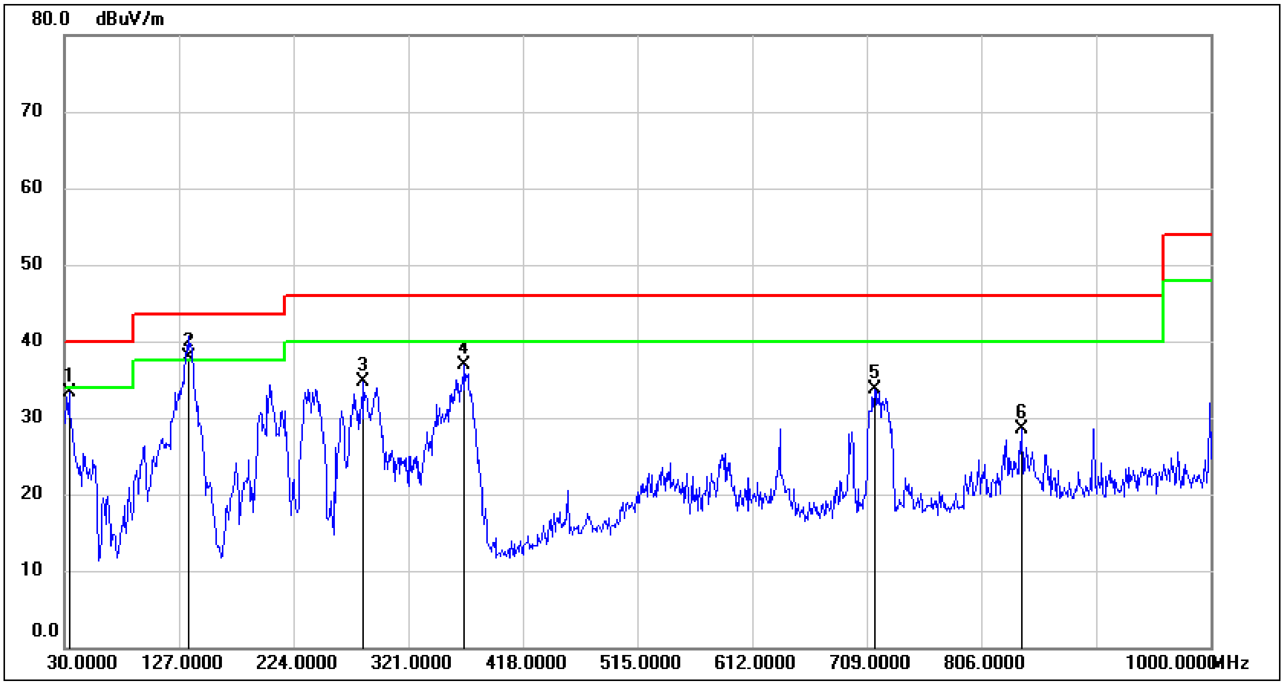
SPURIOUS EMISSIONS (LOW CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	146.4000	57.28	-18.56	38.72	43.50	-4.78	QP
2	204.6000	54.93	-16.31	38.62	43.50	-4.88	QP
3	244.3700	58.38	-16.84	41.54	46.00	-4.46	QP
4	275.4100	54.83	-15.33	39.50	46.00	-6.50	QP
5	372.4100	50.75	-13.13	37.62	46.00	-8.38	QP
6	727.4300	39.62	-6.57	33.05	46.00	-12.95	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	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	33.8800	50.72	-17.33	33.39	40.00	-6.61	QP
2	134.7600	57.27	-19.40	37.87	43.50	-5.63	QP
3	283.1700	49.71	-14.97	34.74	46.00	-11.26	QP
4	368.5300	50.14	-13.20	36.94	46.00	-9.06	QP
5	715.7900	40.34	-6.58	33.76	46.00	-12.24	QP
6	839.9500	33.44	-4.86	28.58	46.00	-17.42	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

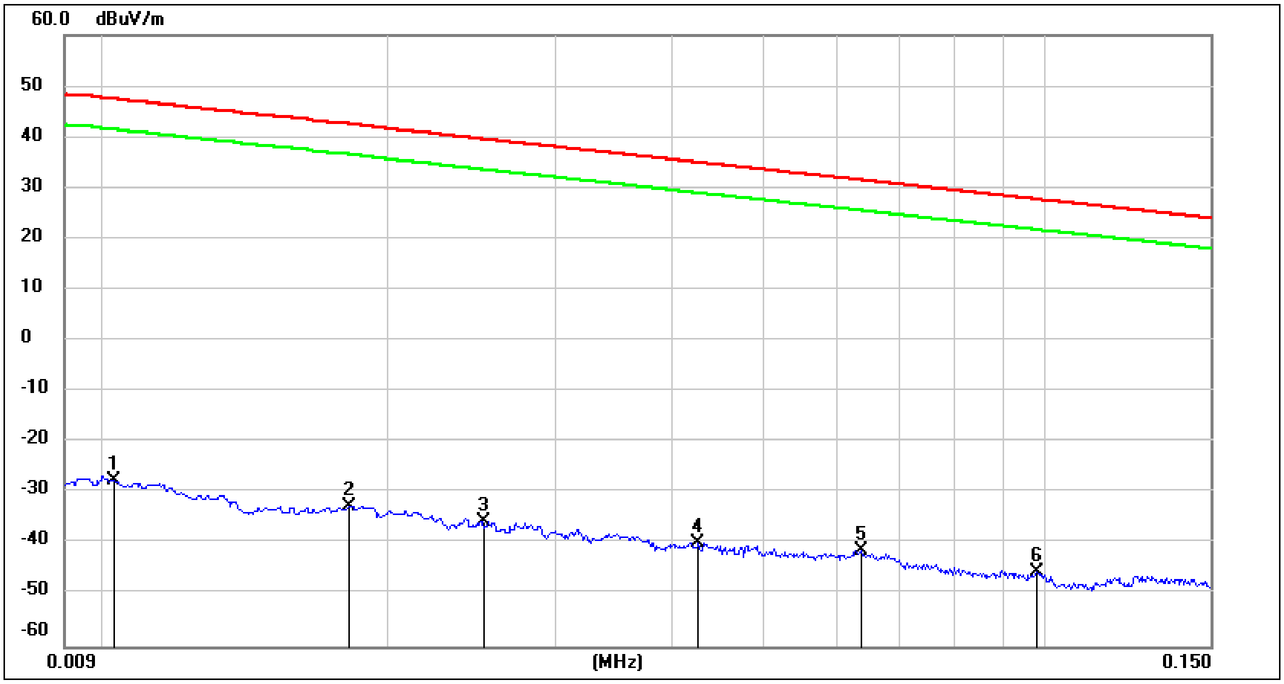
Note: All the modes have been tested, only the worst data was recorded in the report.

8.6. SPURIOUS EMISSIONS BELOW 30 MHz

8.6.1. GFSK MODE

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

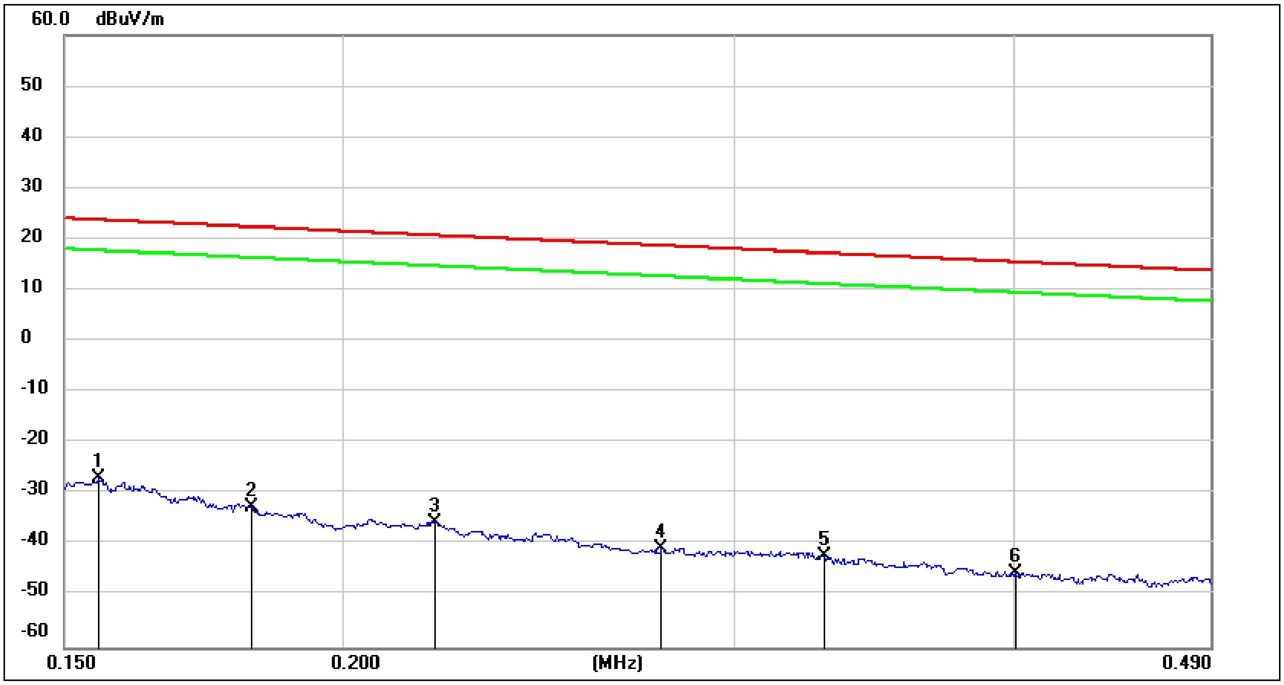
9 kHz~ 150 kHz



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	0.0102	74.05	-101.40	-27.35	47.43	-78.85	-4.07	-74.78	peak
2	0.0181	68.85	-101.36	-32.51	42.45	-84.01	-9.05	-74.96	peak
3	0.0252	65.82	-101.37	-35.55	39.57	-87.05	-11.93	-75.12	peak
4	0.0427	61.64	-101.45	-39.81	34.99	-91.31	-16.51	-74.80	peak
5	0.0636	60.31	-101.54	-41.23	31.53	-92.73	-19.97	-72.76	peak
6	0.0981	56.27	-101.78	-45.51	27.77	-97.01	-23.73	-73.28	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



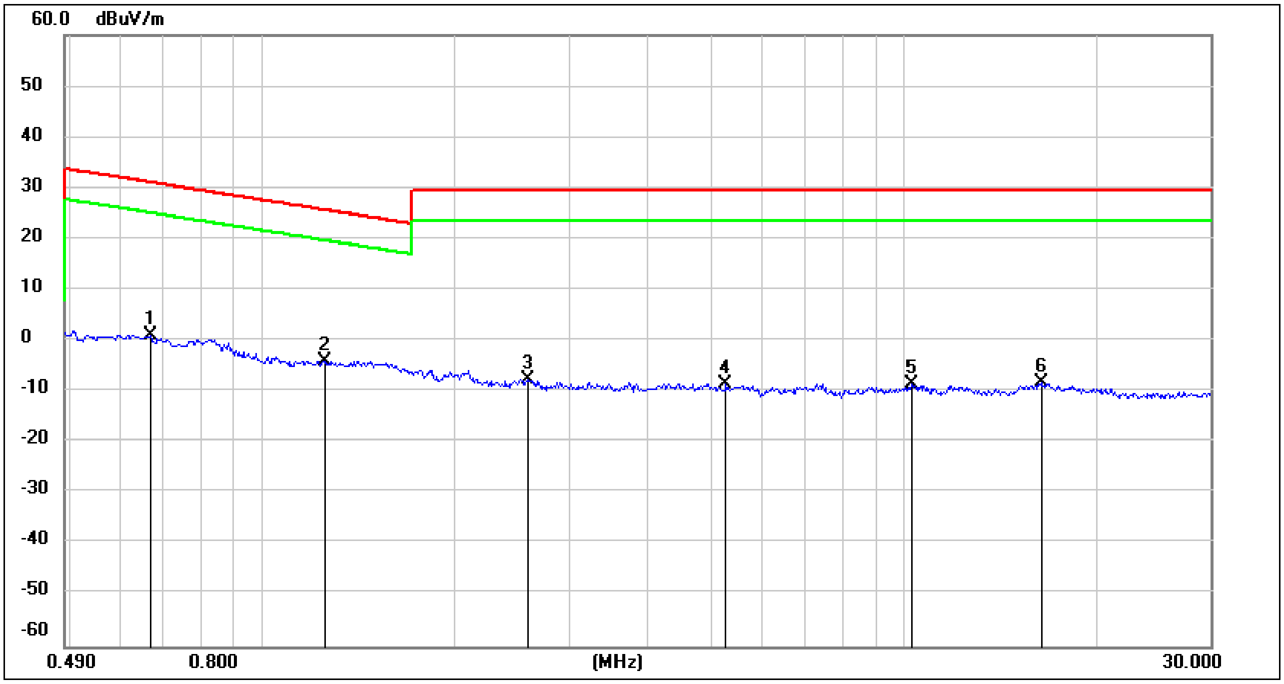
No.	Frequency	Reading	Correct	Result	Limit	ISED Result	ISED Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuA/m)	(dBuA/m)	(dB)	
1	0.1554	74.77	-101.65	-26.88	23.77	-78.38	-27.73	-50.65	peak
2	0.1819	68.99	-101.68	-32.69	22.41	-84.19	-29.09	-55.10	peak
3	0.2200	66.24	-101.75	-35.51	20.75	-87.01	-30.75	-56.26	peak
4	0.2782	61.29	-101.83	-40.54	18.71	-92.04	-32.79	-59.25	peak
5	0.3286	59.71	-101.88	-42.17	17.27	-93.67	-34.23	-59.44	peak
6	0.4007	56.56	-101.96	-45.40	15.54	-96.90	-35.96	-60.94	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	1.2460	58.25	-62.16	-3.91	25.70	-55.41	-25.80	-29.61	peak
3	2.5935	54.11	-61.68	-7.57	29.54	-59.07	-21.96	-37.11	peak
4	5.2705	53.04	-61.45	-8.41	29.54	-59.91	-21.96	-37.95	peak
5	10.2576	52.13	-60.81	-8.68	29.54	-60.18	-21.96	-38.22	peak
6	16.3959	52.67	-60.96	-8.29	29.54	-59.79	-21.96	-37.83	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. AC POWER LINE CONDUCTED EMISSIONS

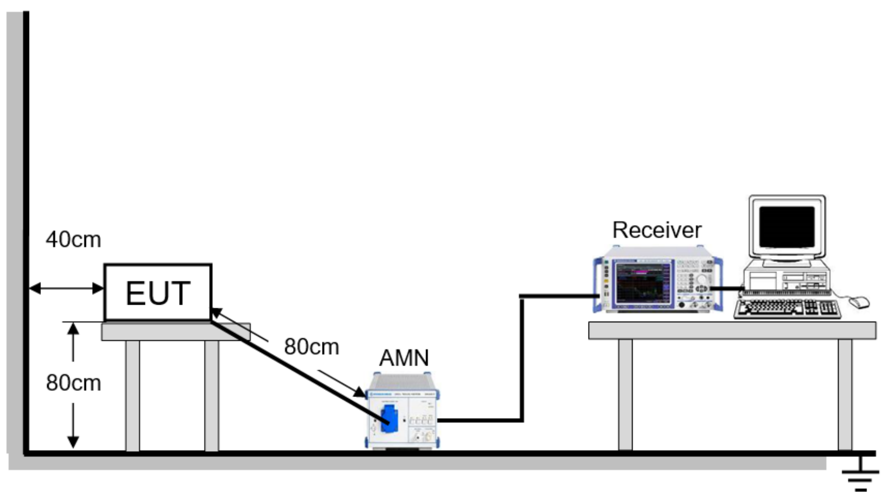
LIMITS

Please refer to CFR 47 FCC §15.207 (a) and ISED RSS-Gen Clause 8.8

FREQUENCY (MHz)	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

TEST SETUP AND PROCEDURE

Refer to ANSI C63.10-2013 clause 6.2.



The EUT is put on a table of non-conducting material that is 80 cm high. The vertical conducting wall of shielding is located 40 cm 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 30 MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9 kHz.

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.

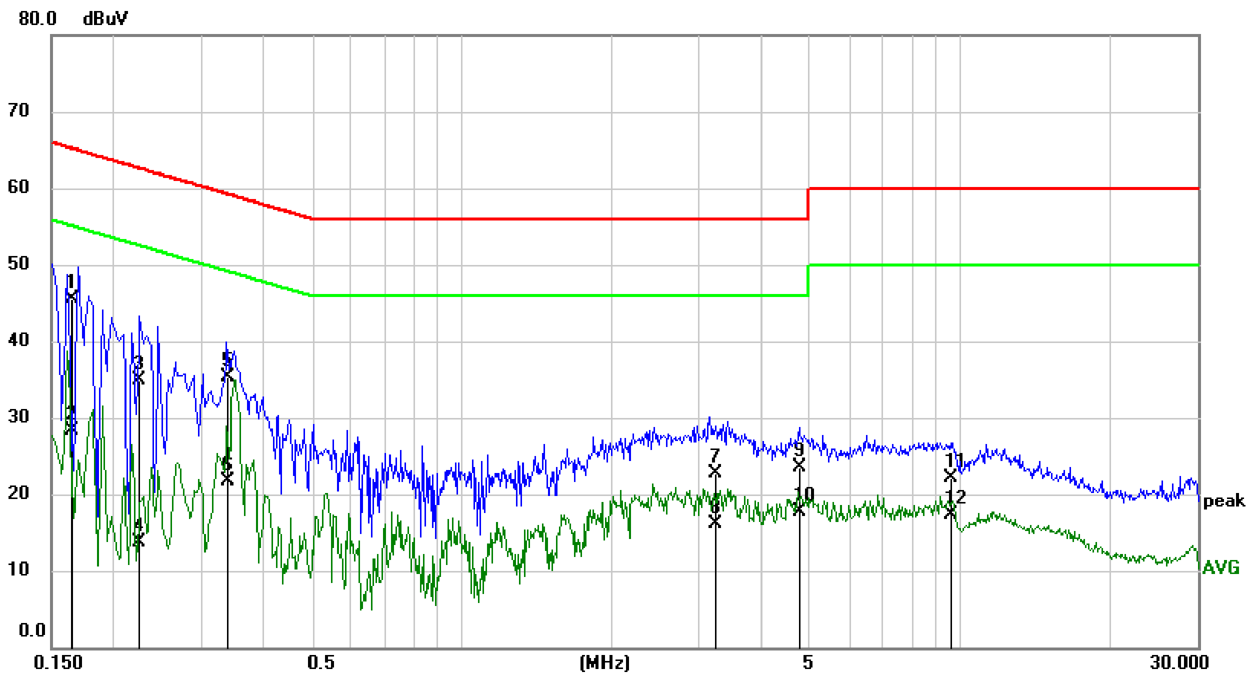
TEST ENVIRONMENT

Temperature	25.2 °C	Relative Humidity	64.5 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120 V/60 Hz

TEST RESULTS

9.1.1. GFSK MODE

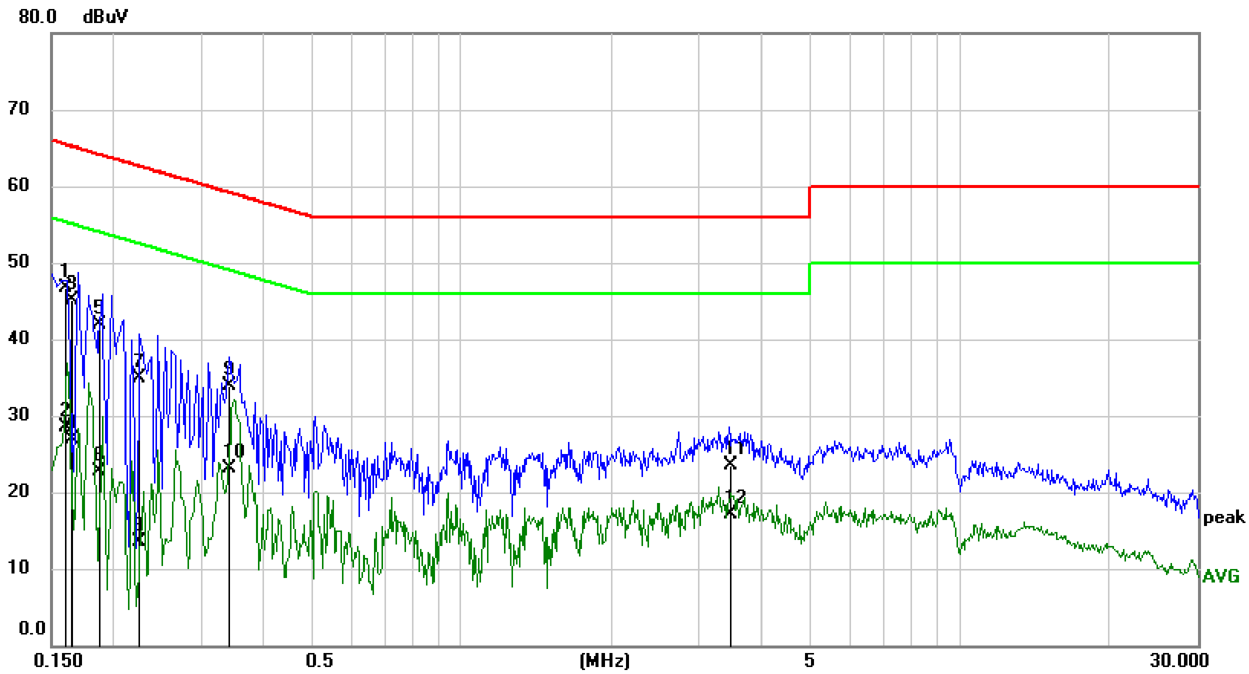
LINE L RESULTS (LOW CHANNEL, WORST-CASE CONFIGURATION)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)	
1	0.1654	35.84	9.61	45.45	65.19	-19.74	QP
2	0.1654	18.76	9.61	28.37	55.19	-26.82	AVG
3	0.2261	25.26	9.60	34.86	62.59	-27.73	QP
4	0.2261	4.09	9.60	13.69	52.59	-38.90	AVG
5	0.3397	25.69	9.60	35.29	59.21	-23.92	QP
6	0.3397	12.16	9.60	21.76	49.21	-27.45	AVG
7	3.2413	13.11	9.64	22.75	56.00	-33.25	QP
8	3.2413	6.54	9.64	16.18	46.00	-29.82	AVG
9	4.7598	13.93	9.67	23.60	56.00	-32.40	QP
10	4.7598	8.02	9.67	17.69	46.00	-28.31	AVG
11	9.6081	12.27	9.74	22.01	60.00	-37.99	QP
12	9.6081	7.55	9.74	17.29	50.00	-32.71	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: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

LINE N RESULTS (LOW CHANNEL, WORST-CASE CONFIGURATION)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)	
1	0.1594	37.08	9.60	46.68	65.50	-18.82	QP
2	0.1594	18.84	9.60	28.44	55.50	-27.06	AVG
3	0.1655	35.53	9.60	45.13	65.18	-20.05	QP
4	0.1655	17.21	9.60	26.81	55.18	-28.37	AVG
5	0.1870	32.21	9.60	41.81	64.17	-22.36	QP
6	0.1870	13.20	9.60	22.80	54.17	-31.37	AVG
7	0.2241	25.31	9.60	34.91	62.67	-27.76	QP
8	0.2241	3.85	9.60	13.45	52.67	-39.22	AVG
9	0.3425	24.34	9.60	33.94	59.14	-25.20	QP
10	0.3425	13.49	9.60	23.09	49.14	-26.05	AVG
11	3.4822	13.94	9.65	23.59	56.00	-32.41	QP
12	3.4822	7.54	9.65	17.19	46.00	-28.81	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: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

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

10. 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

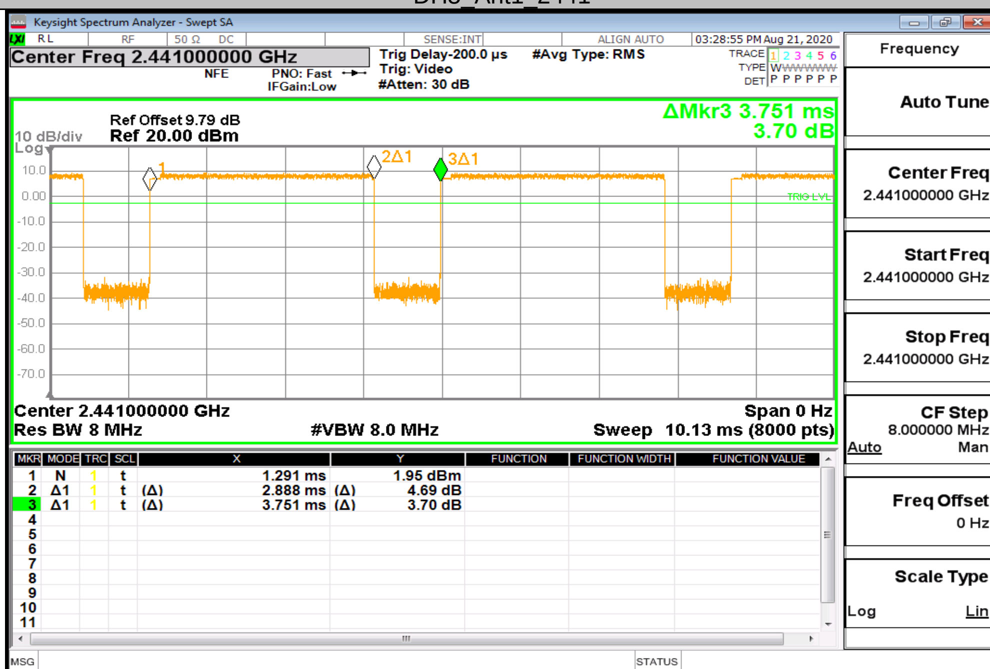
Test Result

Mode	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)
GFSK	2.884	3.749	0.7693	76.93%	1.1392	0.35	0.5
8DPSK	2.888	3.751	0.7699	76.99%	1.1355	0.35	0.5

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

Test Graphs

DH5_Ant1_2441



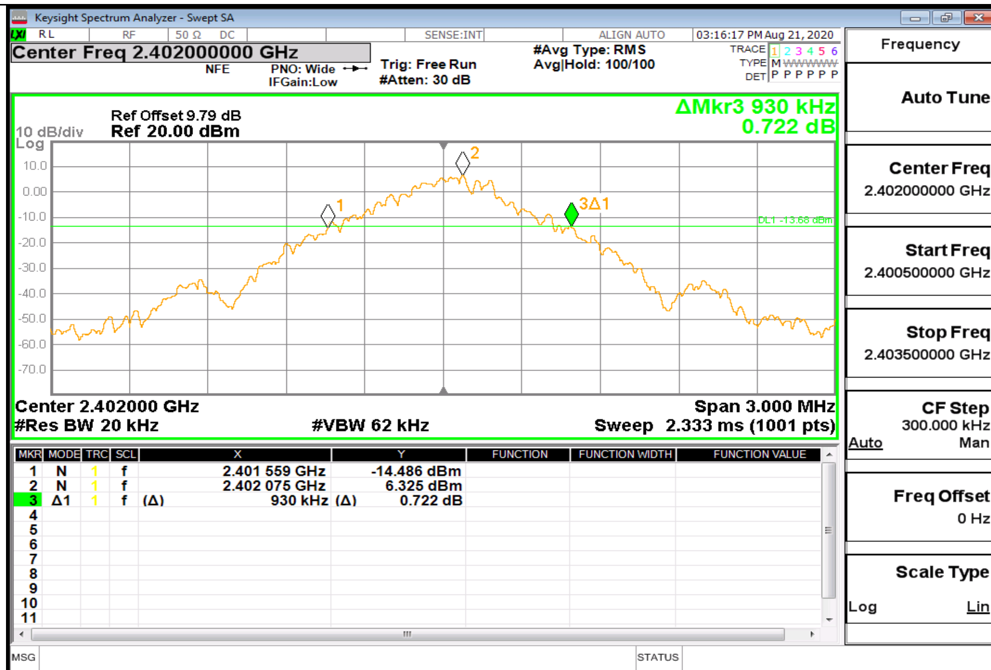
3DH5_Ant1_2441

APPENDIX B: 20DB BANDWIDTH

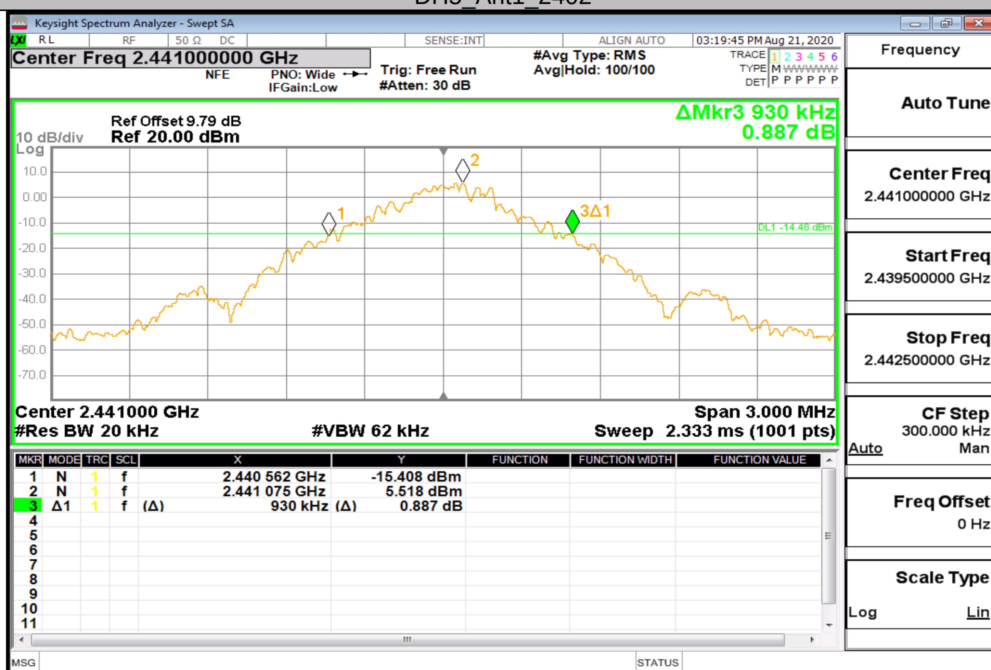
Test Result

Test Mode	Antenna	Channel	20dB EBW[MHz]	FL[MHz]	FH[MHz]	Verdict
DH5	Ant1	2402	0.930	2401.559	2402.489	PASS
		2441	0.930	2440.562	2441.492	PASS
		2480	0.864	2479.559	2480.423	PASS
3DH5	Ant1	2402	1.272	2401.370	2402.642	PASS
		2441	1.272	2440.370	2441.642	PASS
		2480	1.263	2479.373	2480.636	PASS

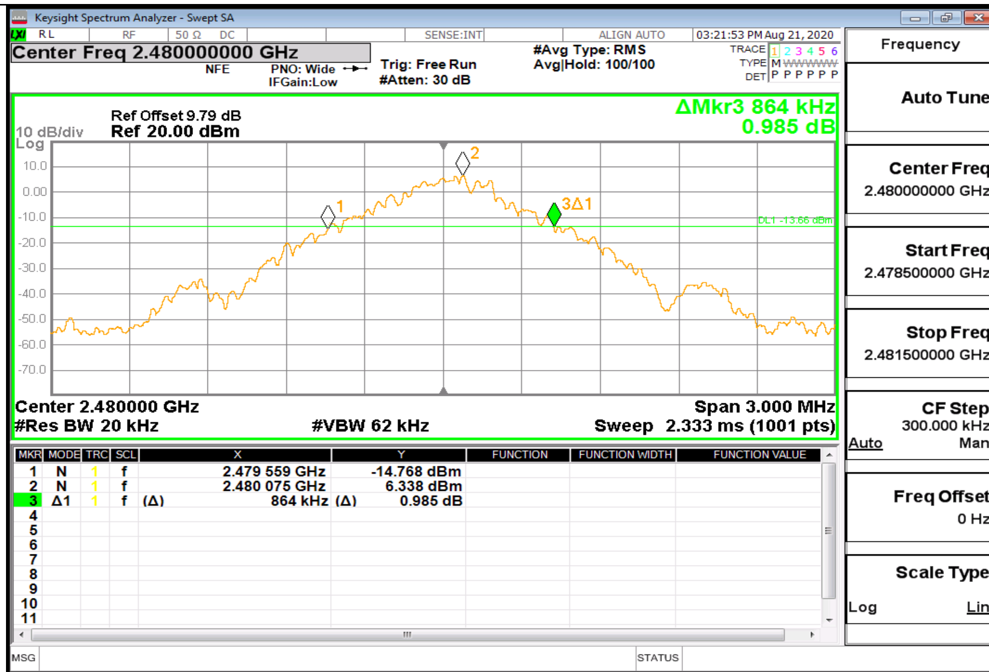
Test Graphs



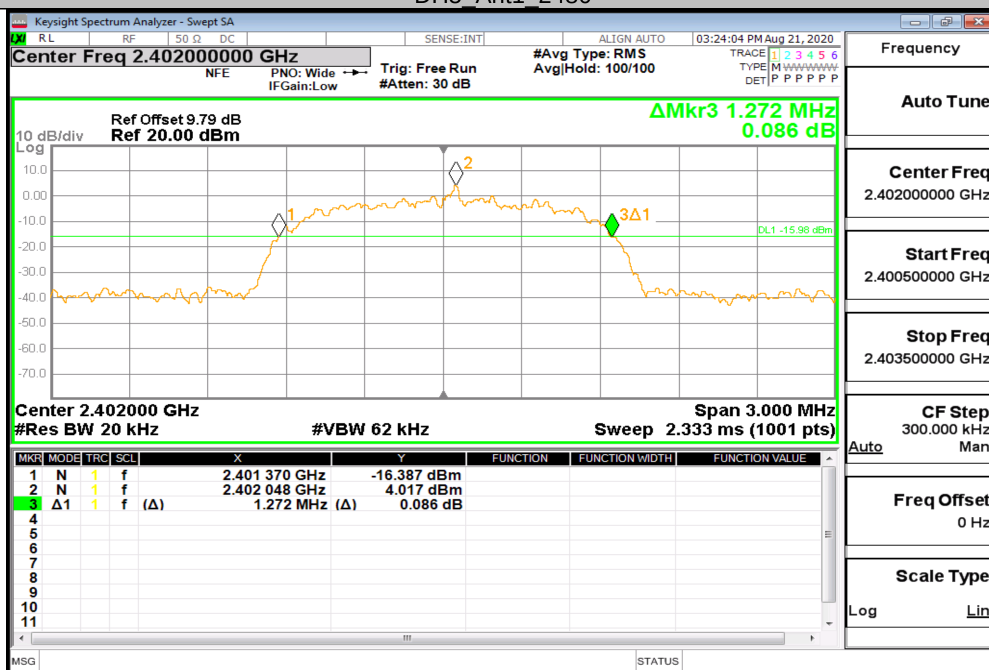
DH5_Ant1_2402



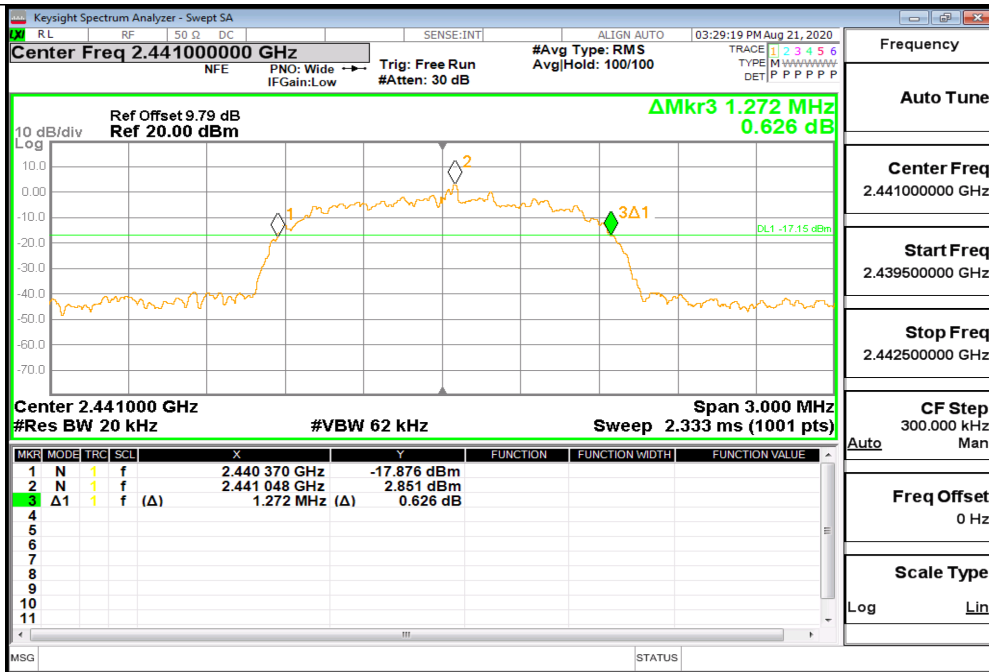
DH5_Ant1_2441



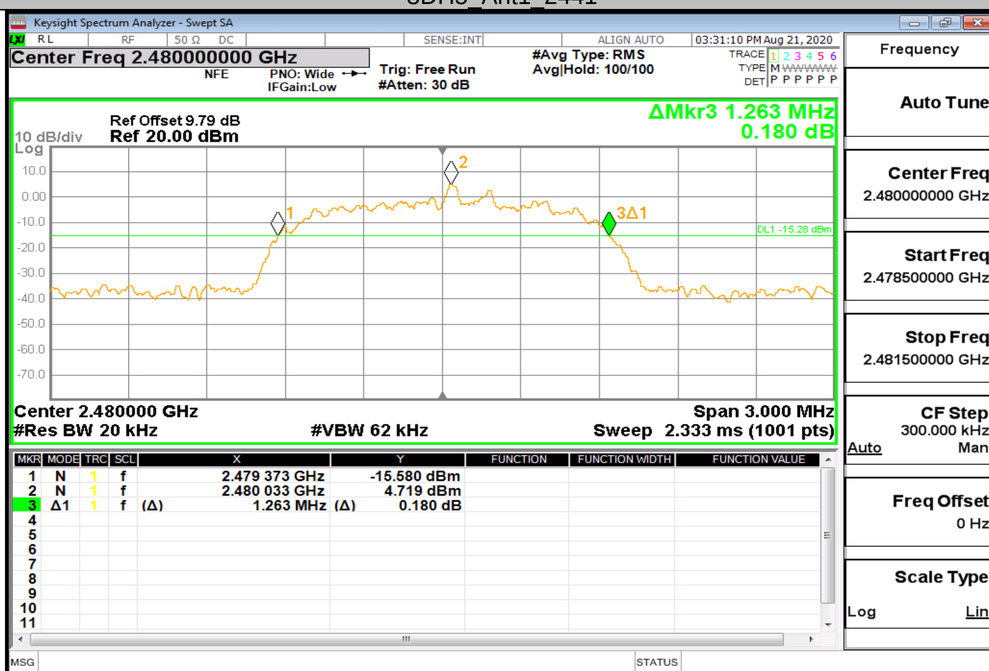
DH5_Ant1_2480



3DH5_Ant1_2402



3DH5_Ant1_2441



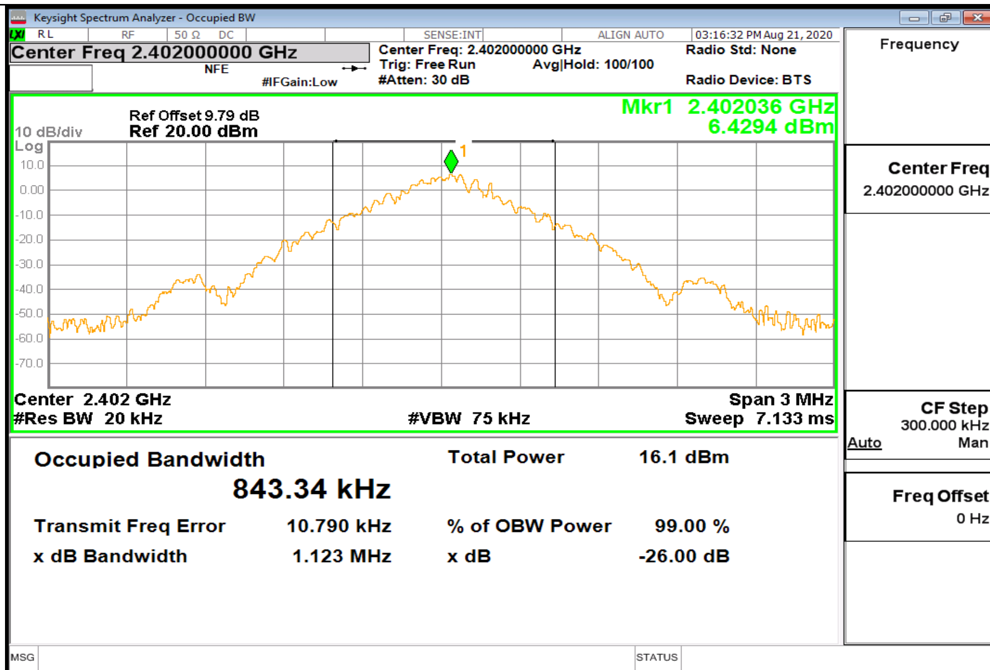
3DH5_Ant1_2480

APPENDIX C: OCCUPIED CHANNEL BANDWIDTH

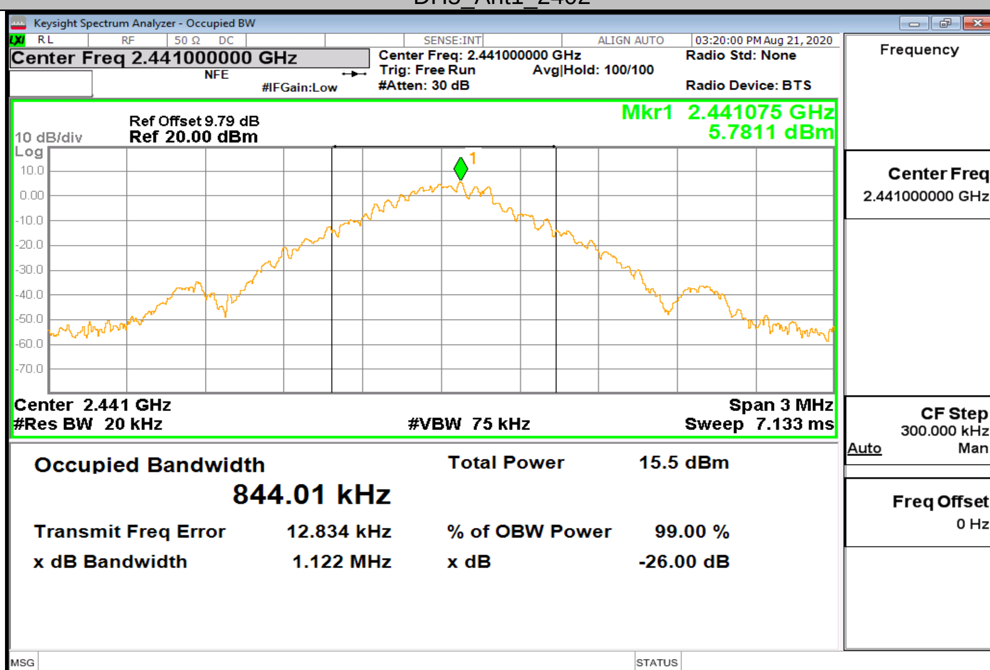
Test Result

Test Mode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Verdict
DH5	Ant1	2402	0.84334	2401.589	2402.432	PASS
		2441	0.84401	2440.591	2441.435	PASS
		2480	0.83792	2479.594	2480.432	PASS
3DH5	Ant1	2402	1.2002	2401.409	2402.609	PASS
		2441	1.1866	2440.421	2441.607	PASS
		2480	1.1987	2479.412	2480.611	PASS

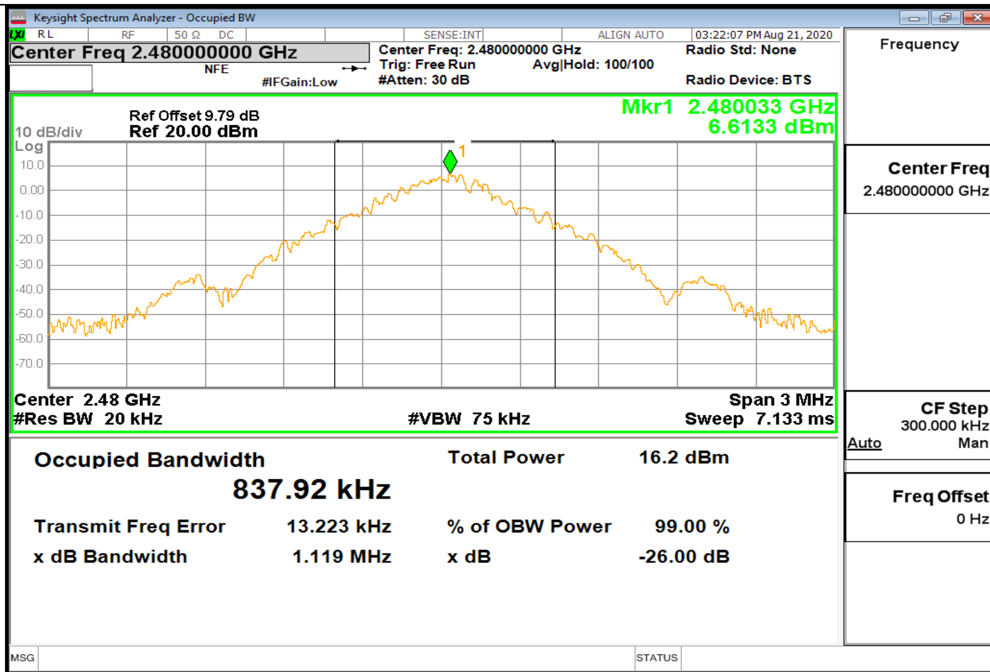
Test Graphs



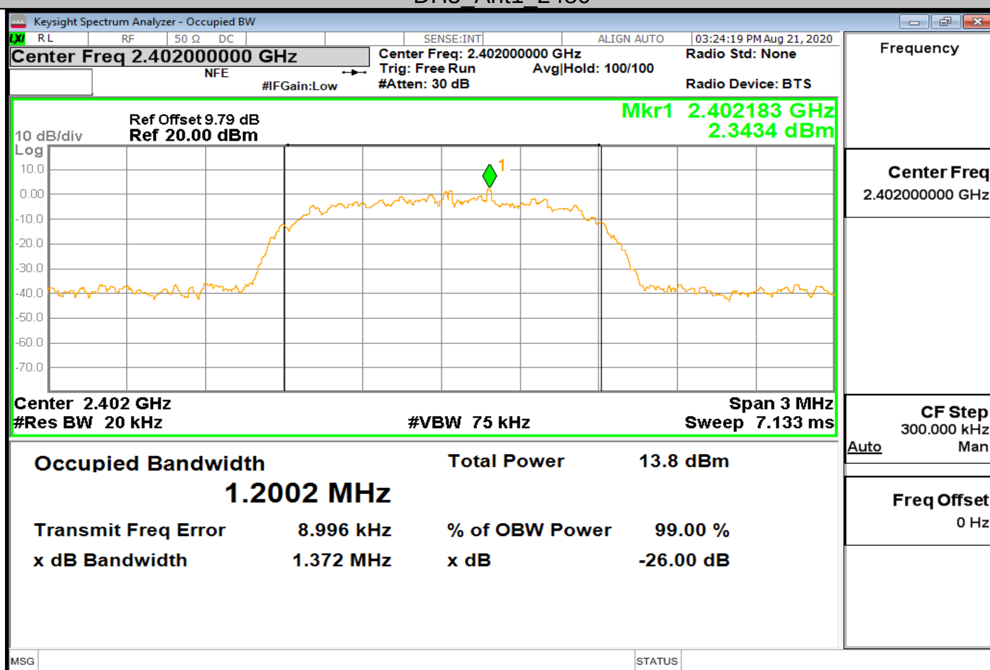
DH5_Ant1_2402



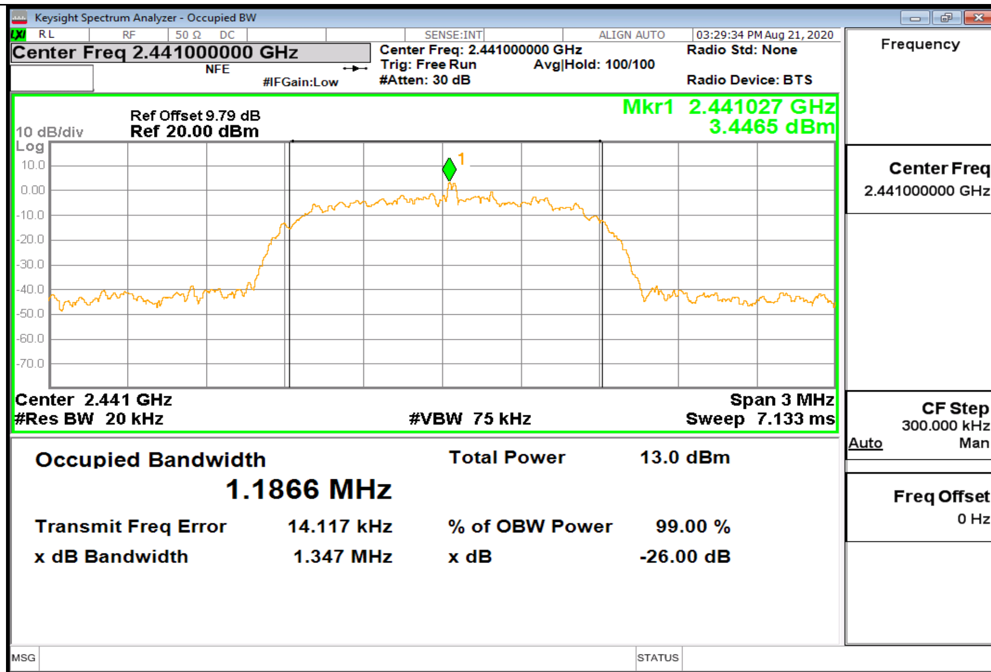
DH5_Ant1_2441



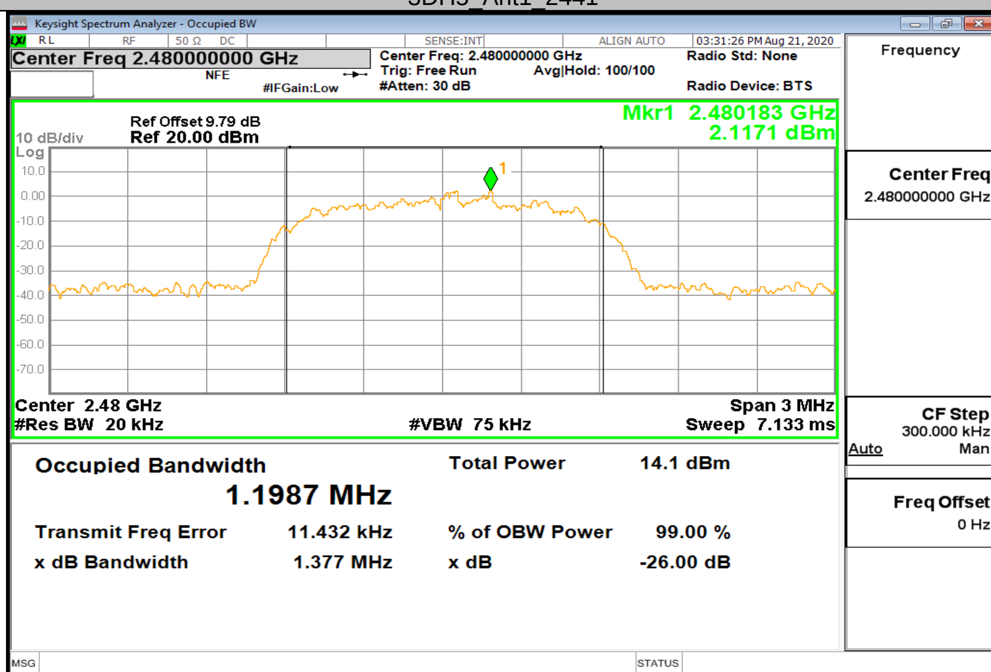
DH5_Ant1_2480



3DH5_Ant1_2402



3DH5_Ant1_2441



3DH5_Ant1_2480

APPENDIX D: PEAK CONDUCTED OUTPUT POWER

Test Result

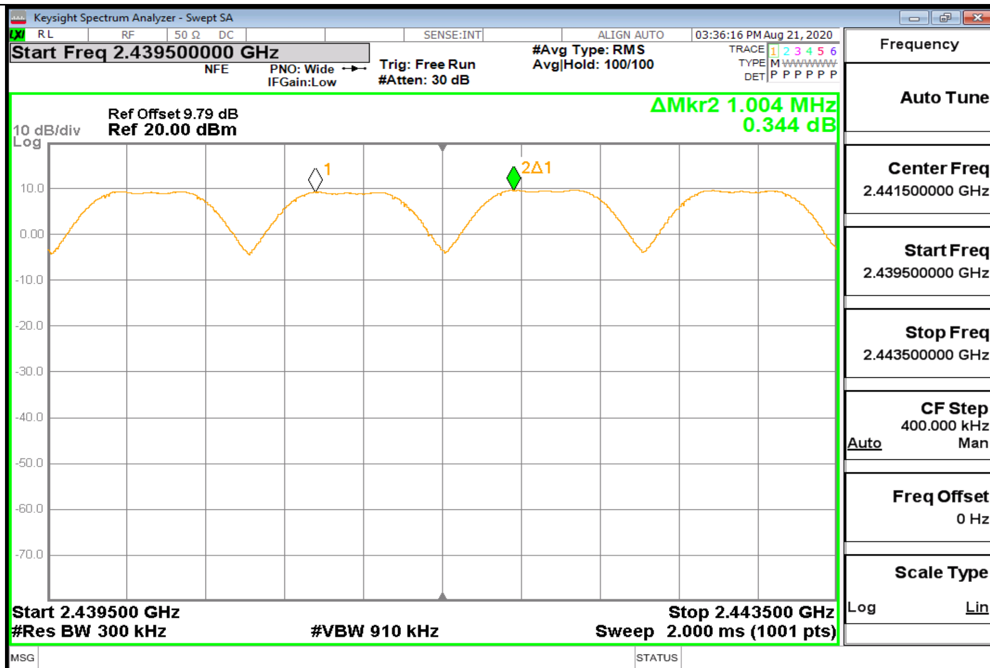
Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	2402	9.91	30	PASS
		2441	9.33	30	PASS
		2480	9.88	30	PASS
3DH5	Ant1	2402	9.70	21	PASS
		2441	8.97	21	PASS
		2480	9.67	21	PASS

APPENDIX E: CARRIER FREQUENCY SEPARATION

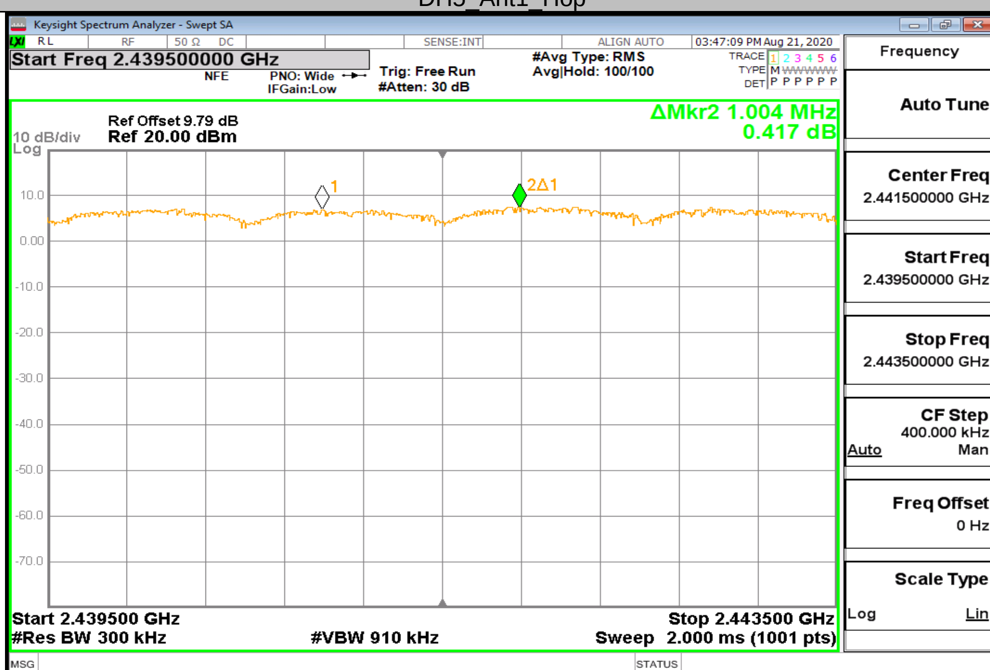
Test Result

Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	Hop	1.004	>=0.930	PASS
3DH5	Ant1	Hop	1.004	>=0.848	PASS

Test Graphs



DH5_Ant1_Hop



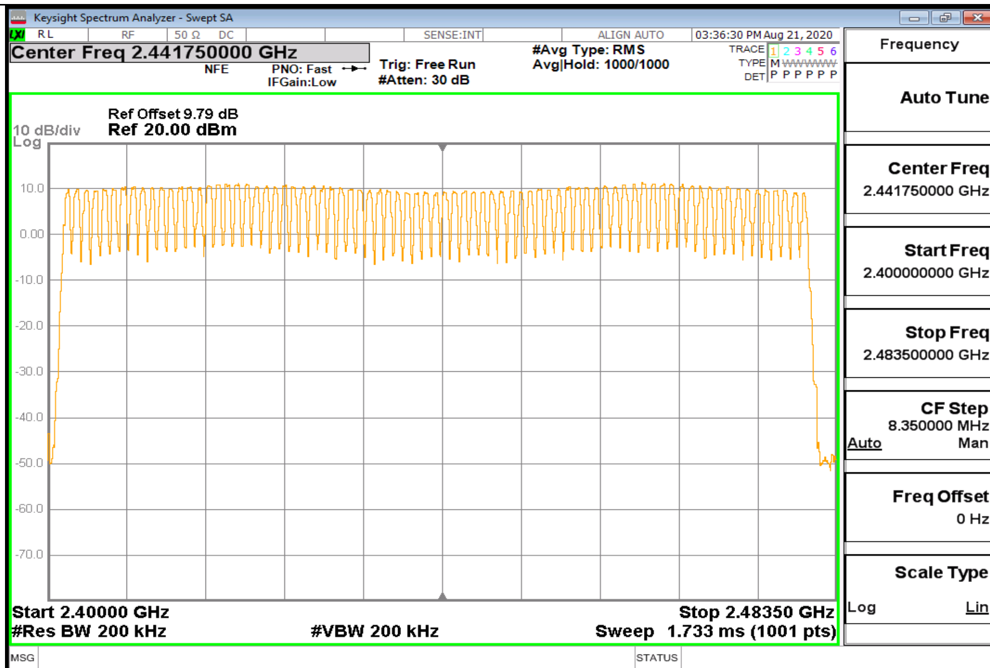
3DH5_Ant1_Hop

APPENDIX F: NUMBER OF HOPPING FREQUENCIES

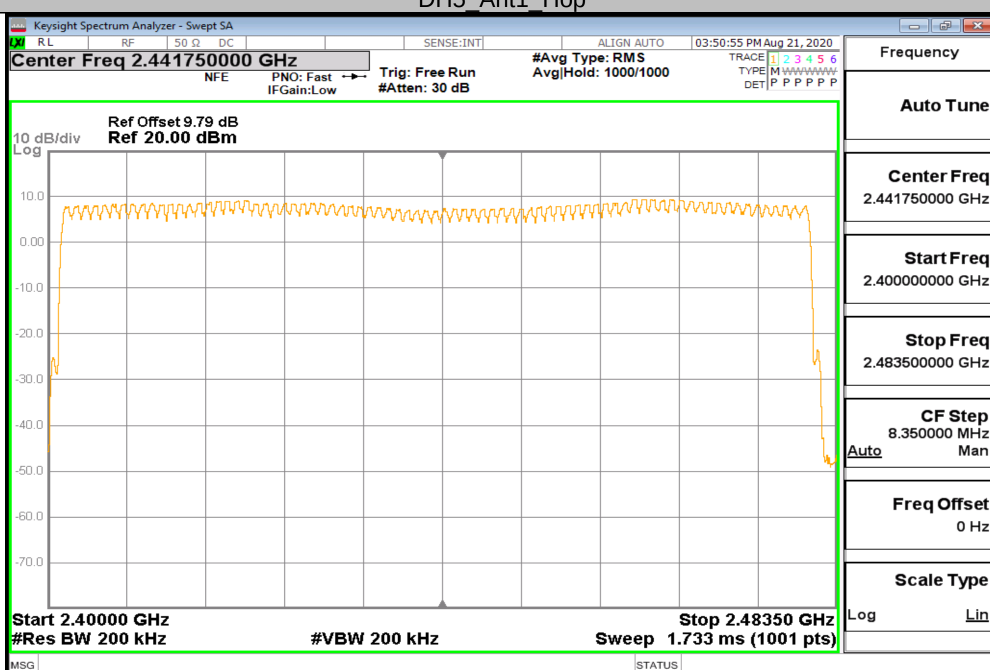
Test Result

Test Mode	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH5	Ant1	Hop	79	>=15	PASS
3DH5	Ant1	Hop	79	>=15	PASS

Test Graphs



DH5_Ant1_Hop



3DH5_Ant1_Hop

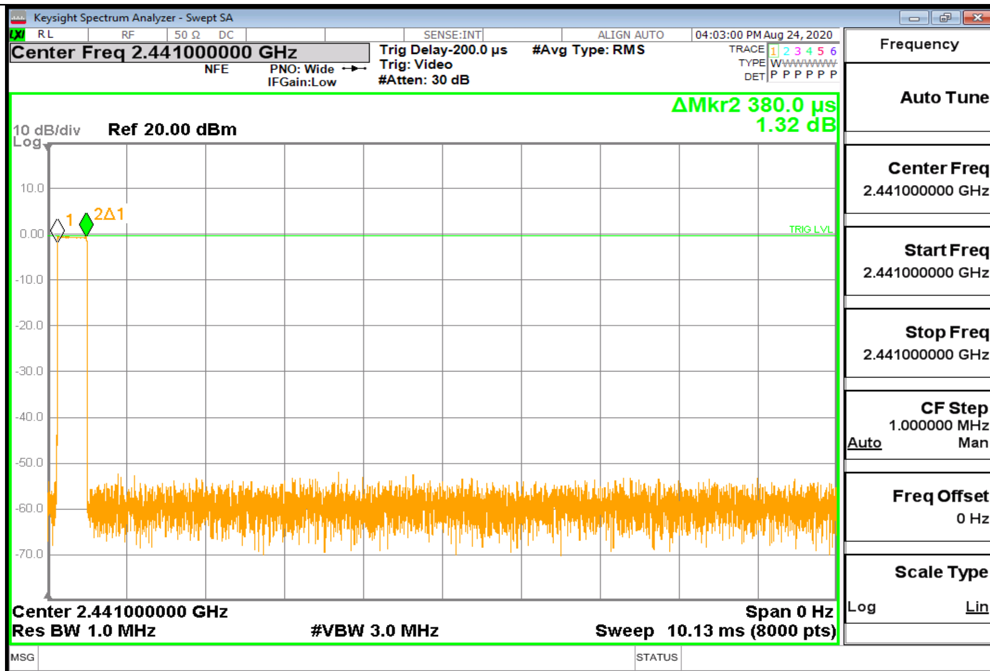
APPENDIX G: TIME OF OCCUPANCY (DWELL TIME)

Test Result

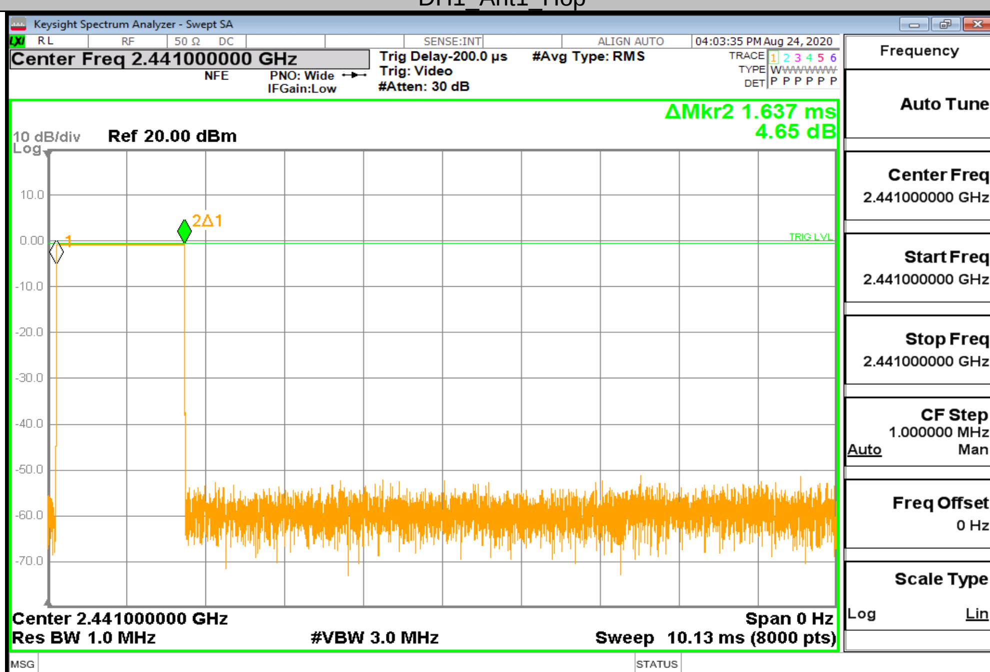
FHSS Mode						
Test Mode	Antenna	Channel	Burst Width [ms]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.38	0.122	<=0.4	PASS
DH3	Ant1	Hop	1.64	0.262	<=0.4	PASS
DH5	Ant1	Hop	2.88	0.307	<=0.4	PASS
3DH1	Ant1	Hop	0.39	0.125	<=0.4	PASS
3DH3	Ant1	Hop	1.64	0.262	<=0.4	PASS
3DH5	Ant1	Hop	2.89	0.308	<=0.4	PASS

AFHSS Mode						
Test Mode	Antenna	Channel	Burst Width [ms]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.38	0.061	<=0.4	PASS
DH3	Ant1	Hop	1.64	0.131	<=0.4	PASS
DH5	Ant1	Hop	2.88	0.1536	<=0.4	PASS
3DH1	Ant1	Hop	0.39	0.0624	<=0.4	PASS
3DH3	Ant1	Hop	1.64	0.131	<=0.4	PASS
3DH5	Ant1	Hop	2.89	0.154	<=0.4	PASS

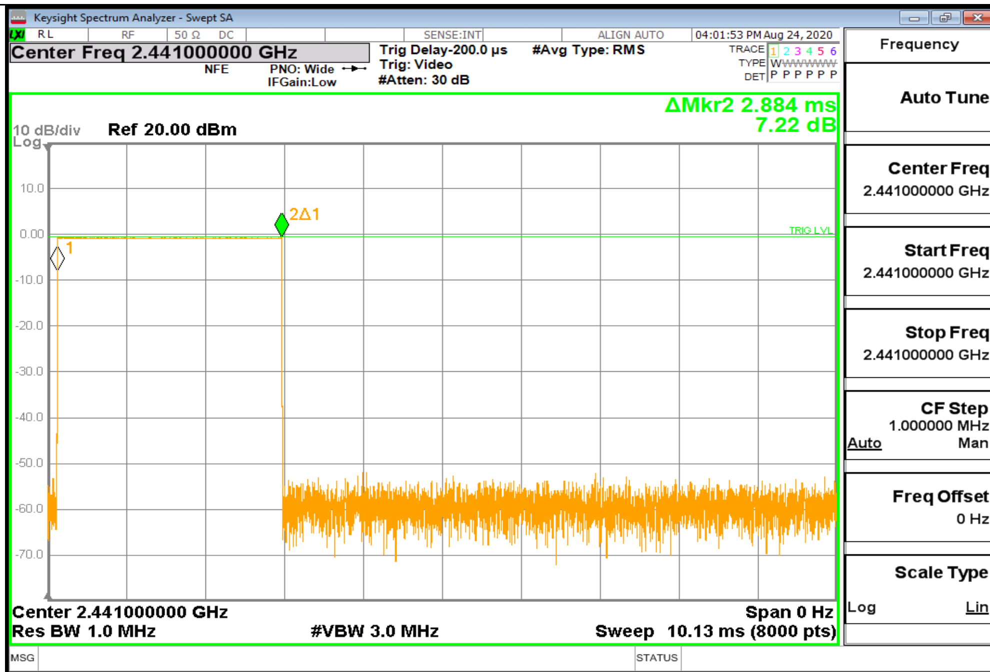
Test Graphs



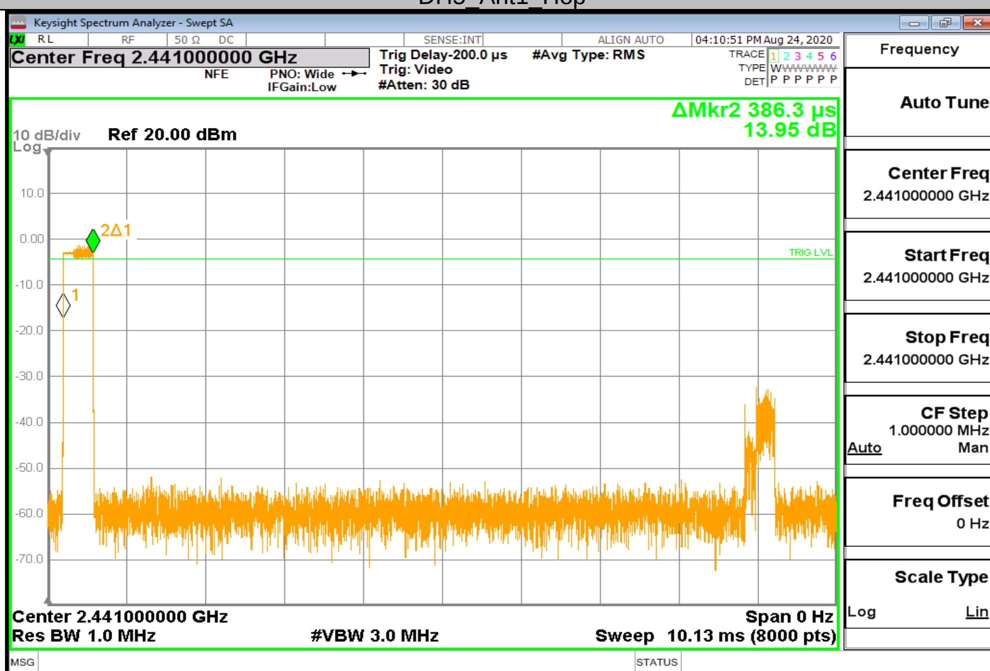
DH1_Ant1_Hop



DH3_Ant1_Hop

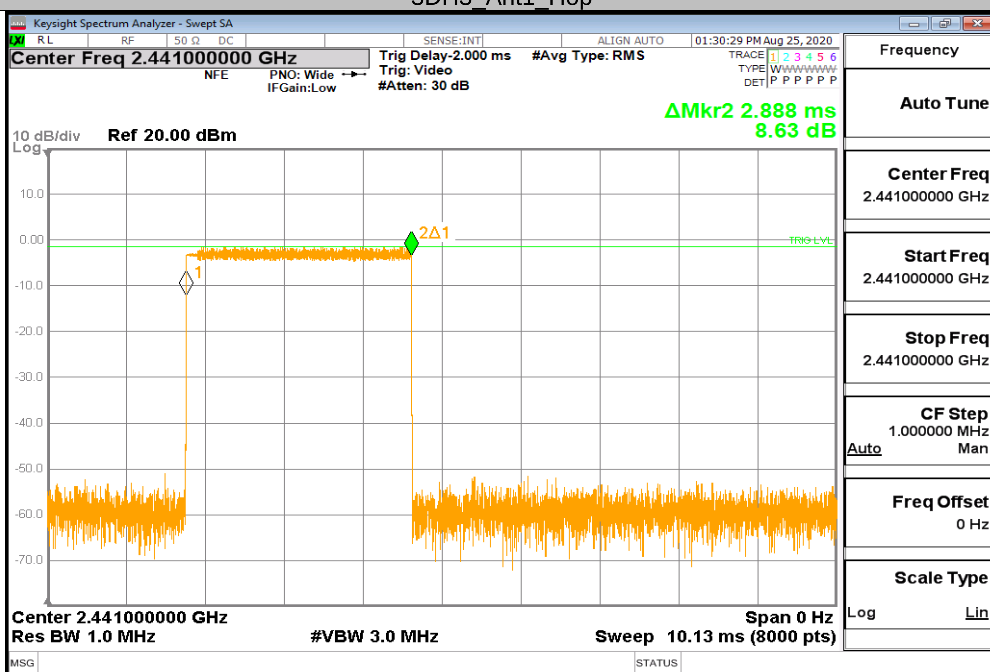


DH5_Ant1_Hop



3DH1_Ant1_Hop

3DH3_Ant1_Hop



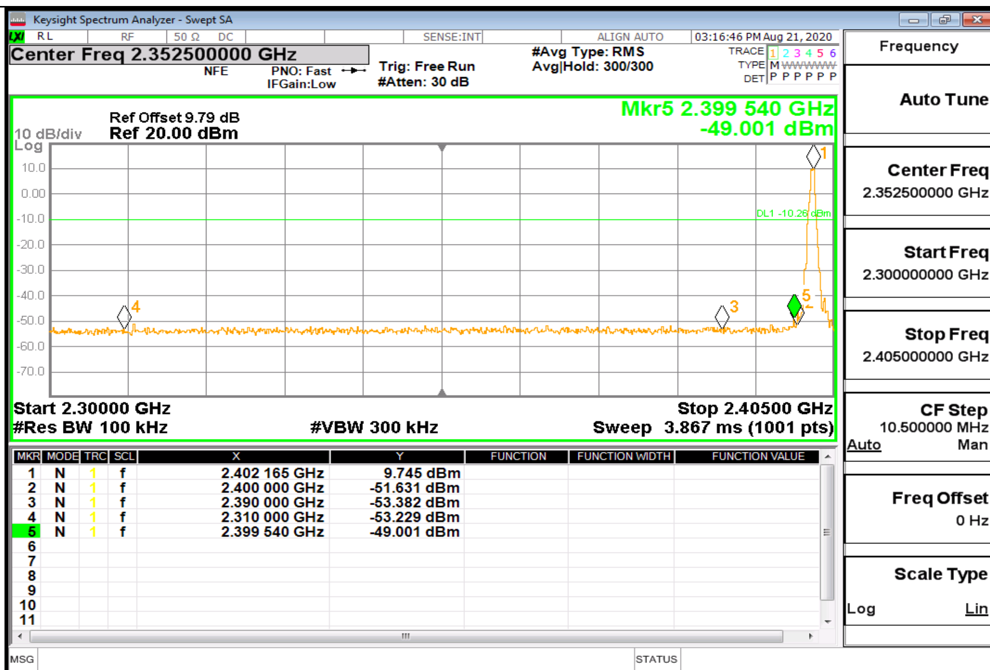
3DH5_Ant1_Hop

APPENDIX H: BAND EDGE MEASUREMENTS

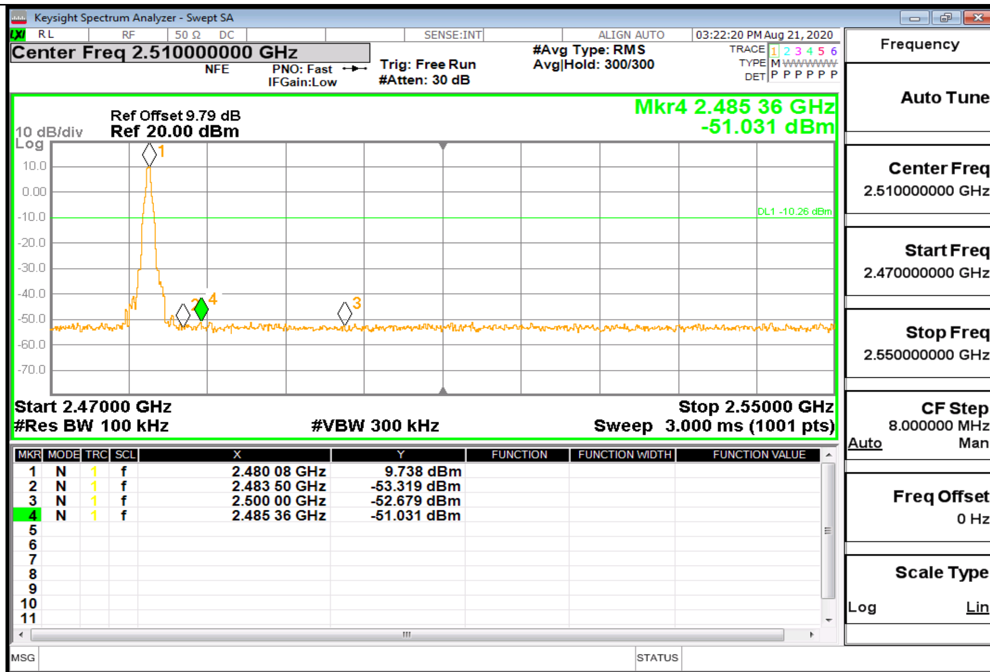
Test Result

Test Mode	Antenna	Ch Name	Channel	Ref Level [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	9.74	-49	<=-10.26	PASS
		High	2480	9.74	-51.03	<=-10.26	PASS
		Low	Hop_2402	9.37	-50.84	-10.64	PASS
		High	Hop_2480	10.09	-50.18	-9.91	PASS
3DH5	Ant1	Low	2402	7.69	-47.66	<=-12.31	PASS
		High	2480	7.75	-50.23	<=-12.25	PASS
		Low	Hop_2402	6.27	-50.65	-13.73	PASS
		High	Hop_2480	7.60	-50.2	-12.4	PASS

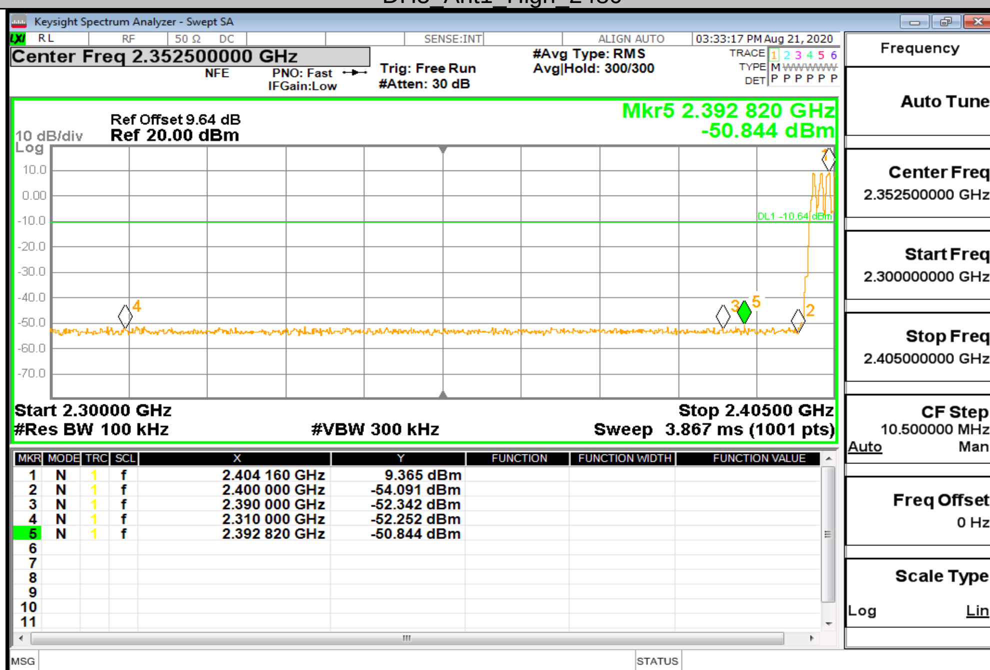
Test Graphs



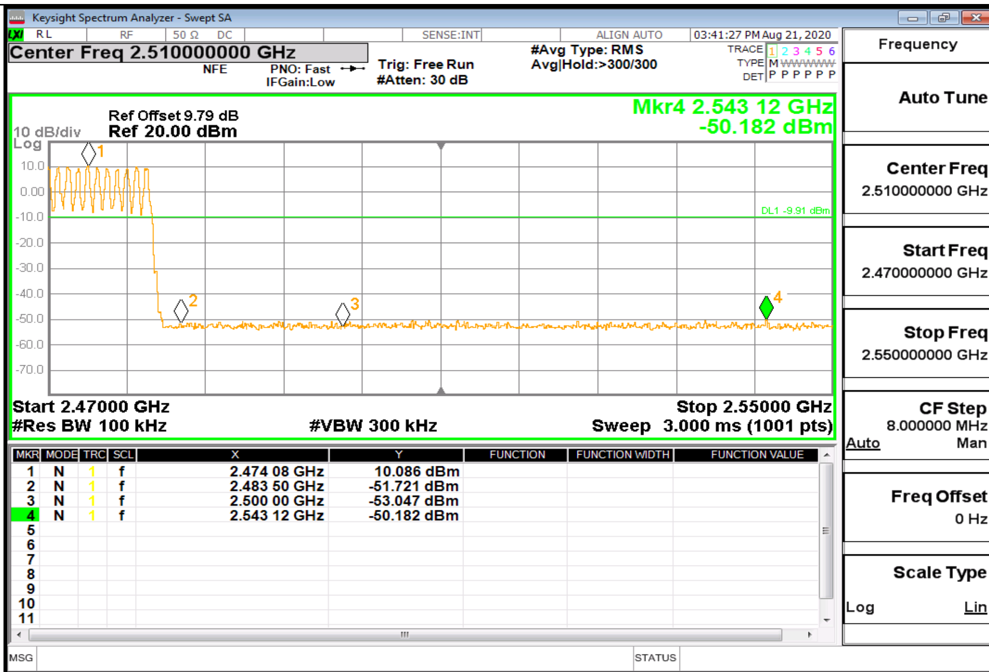
DH5_Ant1_Low_2402



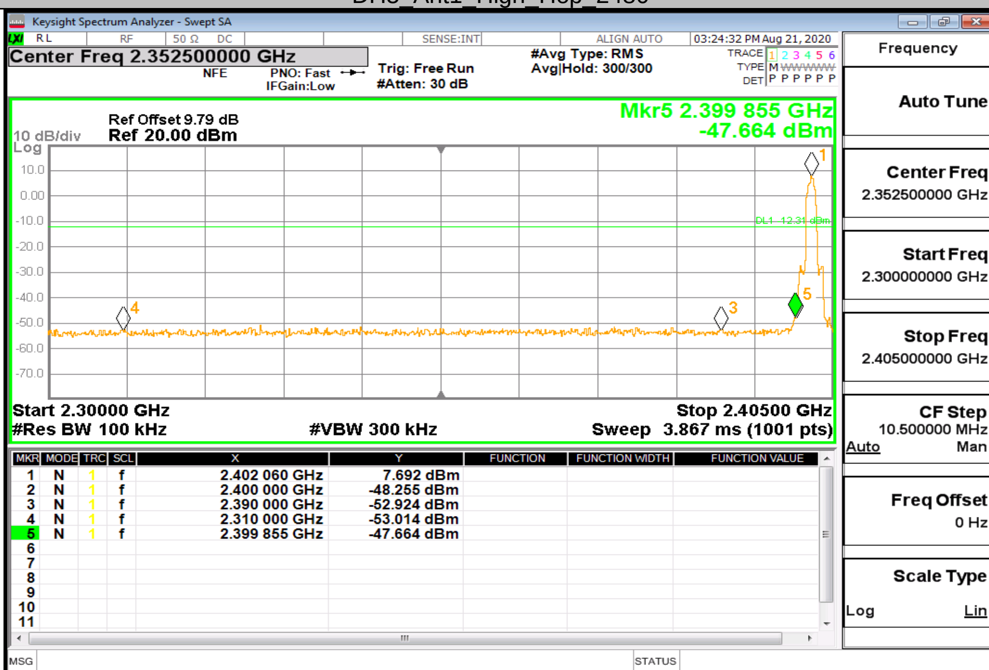
DH5_Ant1_High_2480



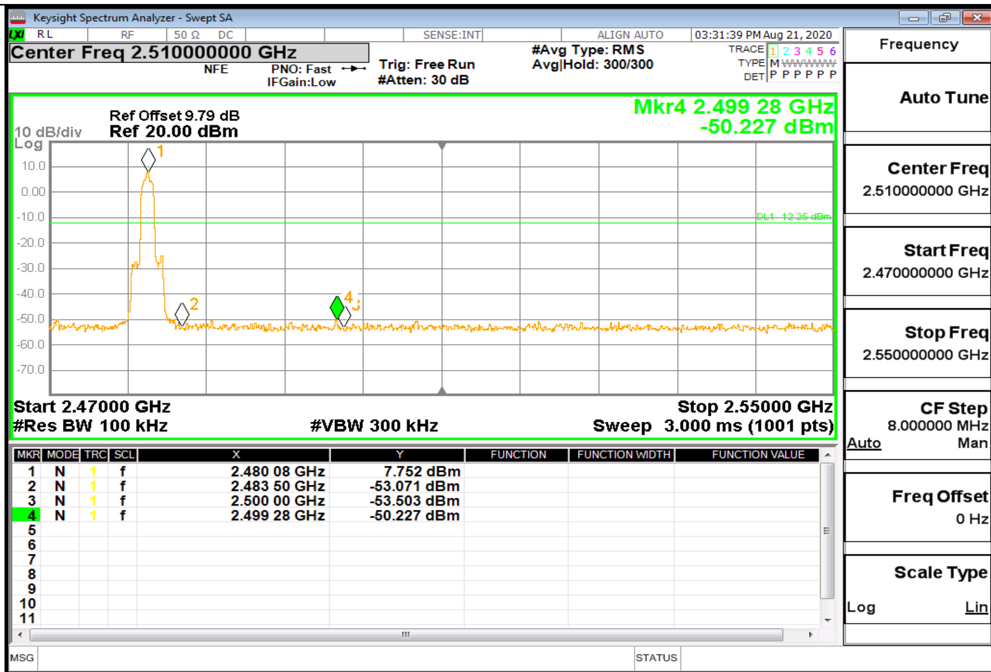
DH5_Ant1_Low_Hop_2402



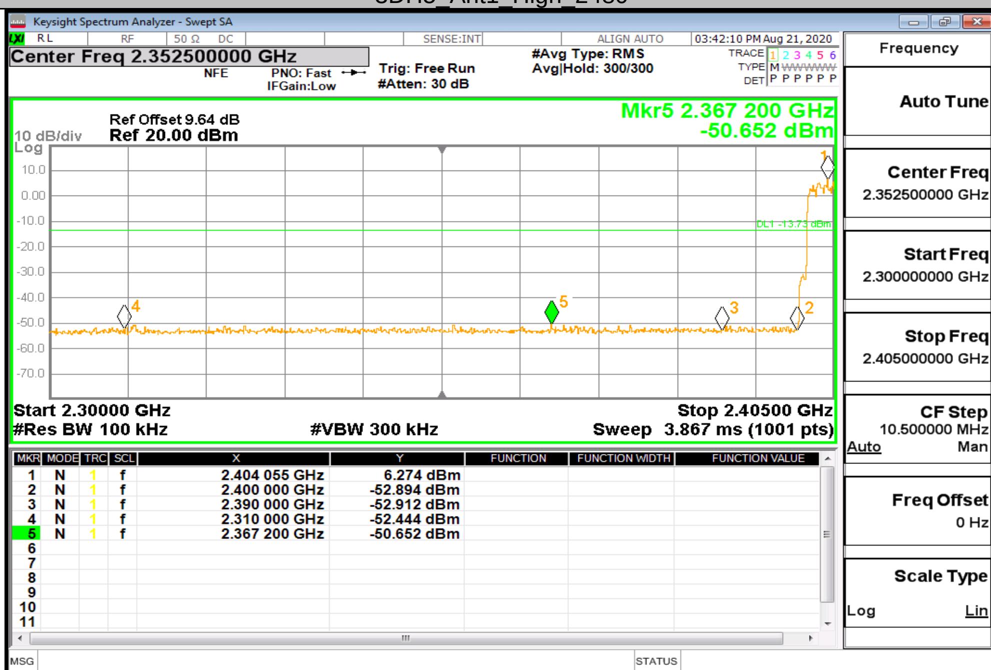
DH5_Ant1_High_Hop_2480



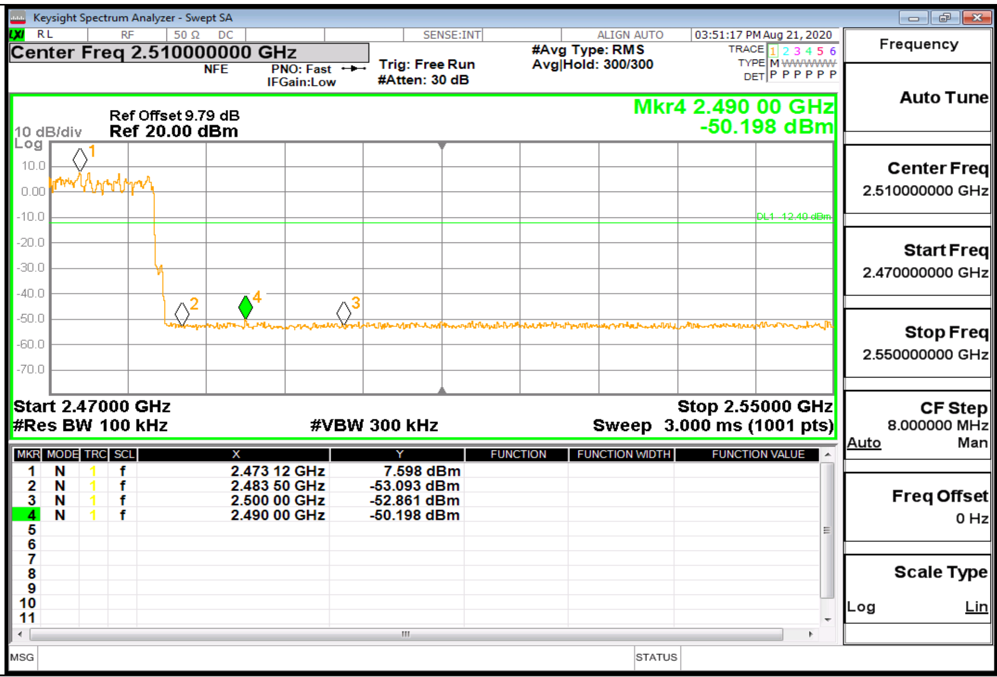
3DH5_Ant1_Low_2402



3DH5_Ant1_High_2480



3DH5_Ant1_Low_Hop_2402



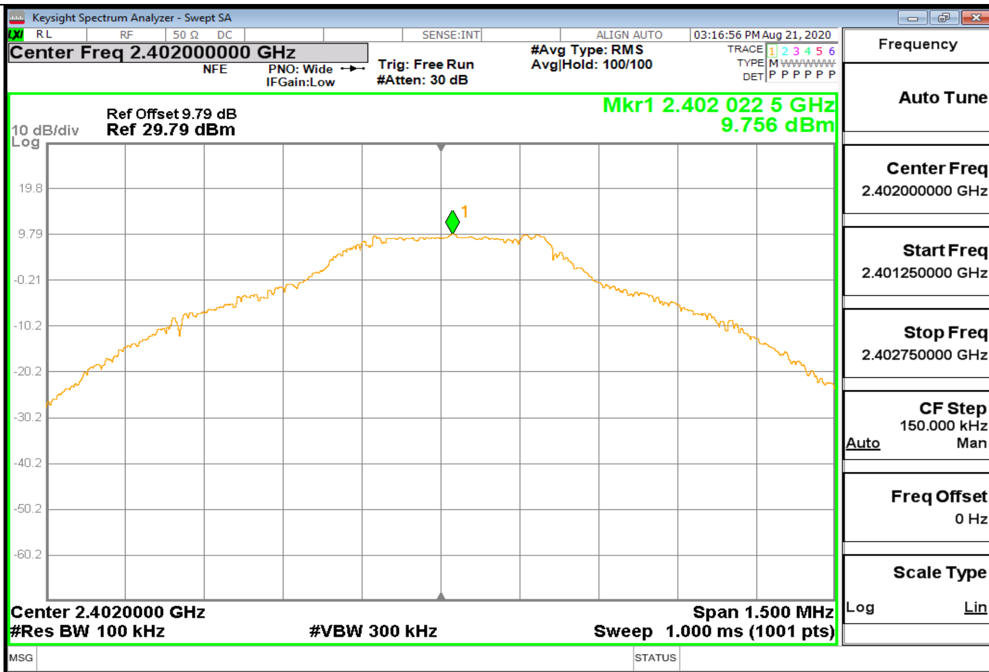
3DH5_Ant1_High_Hop_2480

APPENDIX I: CONDUCTED SPURIOUS EMISSION

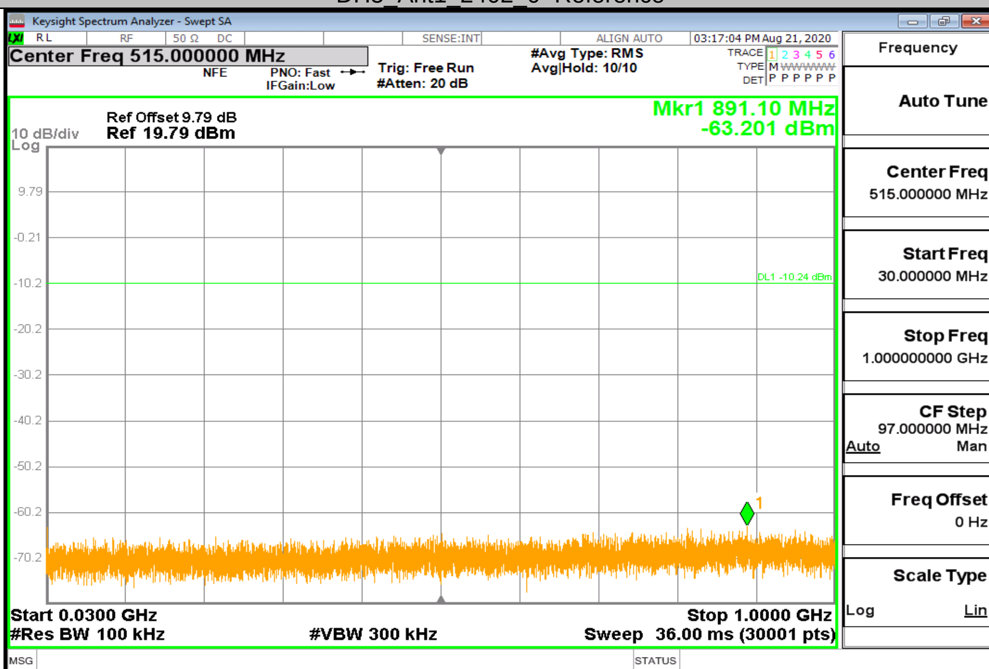
Test Result

Test Mode	Antenna	Channel	Freq Range [MHz]	Ref Level [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	Reference	9.76	9.76	---	PASS
			30~1000	---	-63.201	<=-10.244	PASS
			1000~26500	---	-53.342	<=-10.244	PASS
		2441	Reference	8.78	8.78	---	PASS
			30~1000	---	-62.764	<=-11.221	PASS
			1000~26500	---	-54.29	<=-11.221	PASS
		2480	Reference	9.43	9.43	---	PASS
			30~1000	---	-63.33	<=-10.575	PASS
			1000~26500	---	-54.478	<=-10.575	PASS
3DH5	Ant1	2402	Reference	7.37	7.37	---	PASS
			30~1000	---	-63.064	<=-12.631	PASS
			1000~26500	---	-53.971	<=-12.631	PASS
		2441	Reference	6.06	6.06	---	PASS
			30~1000	---	-63.557	<=-13.937	PASS
			1000~26500	---	-54.382	<=-13.937	PASS
		2480	Reference	7.47	7.47	---	PASS
			30~1000	---	-63.317	<=-12.53	PASS
			1000~26500	---	-53.828	<=-12.53	PASS

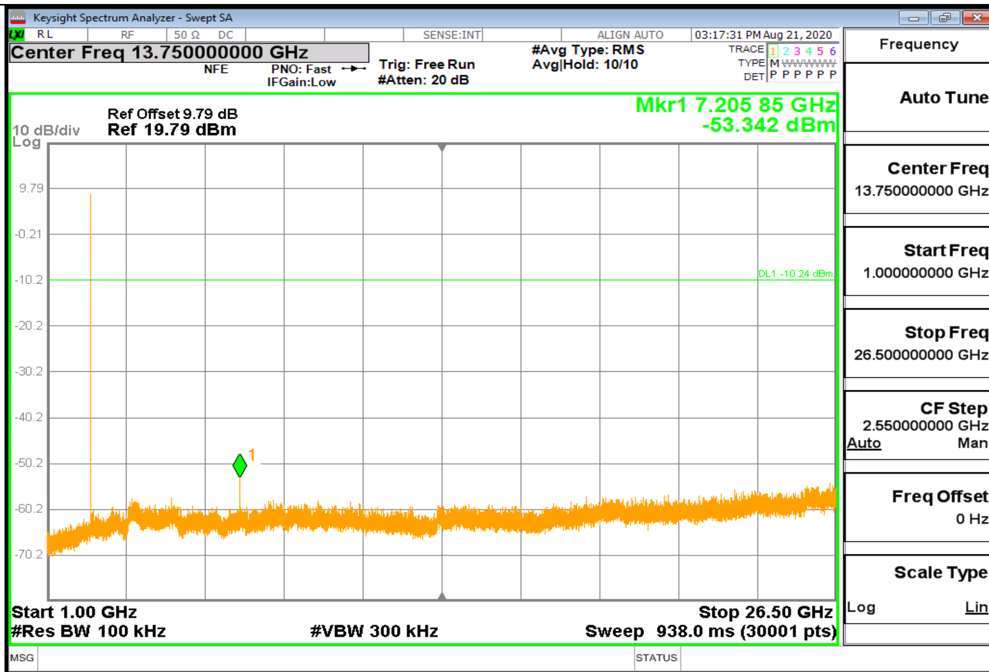
Test Graphs



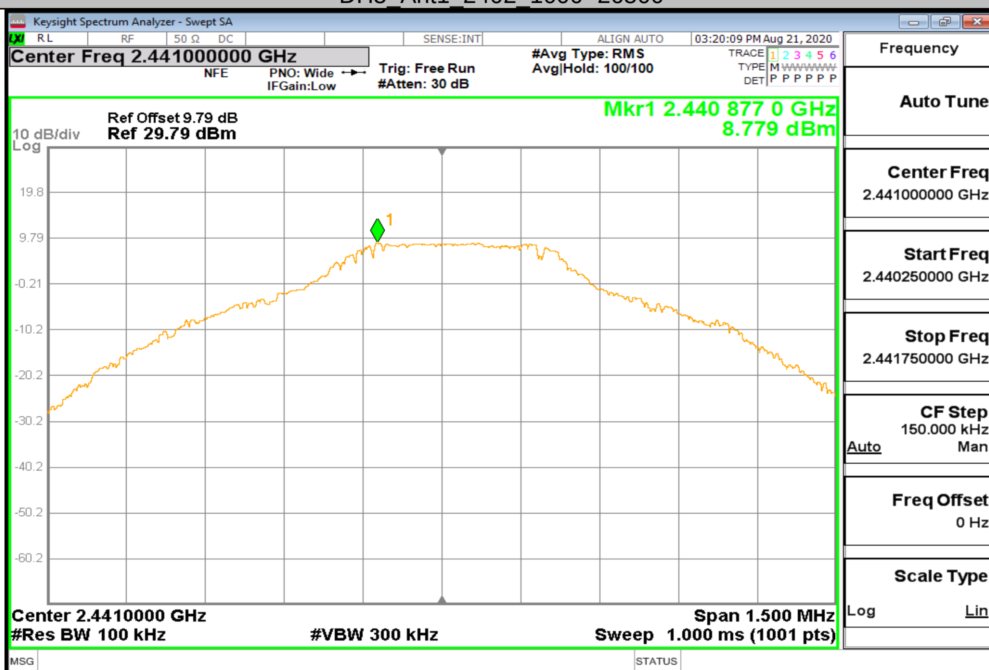
DH5_Ant1_2402_0~Reference



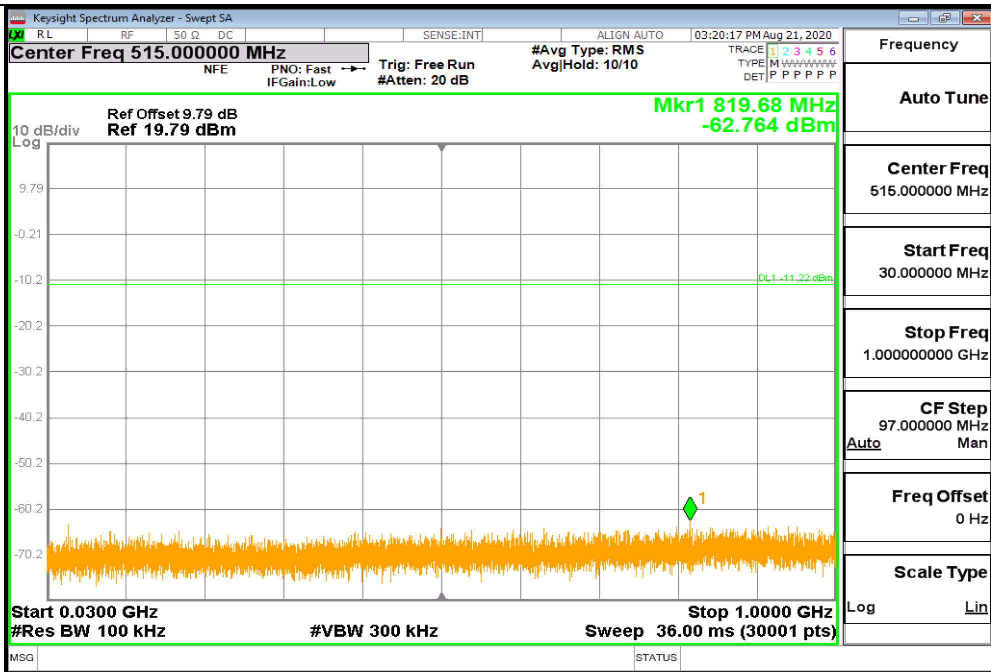
DH5_Ant1_2402_30~1000



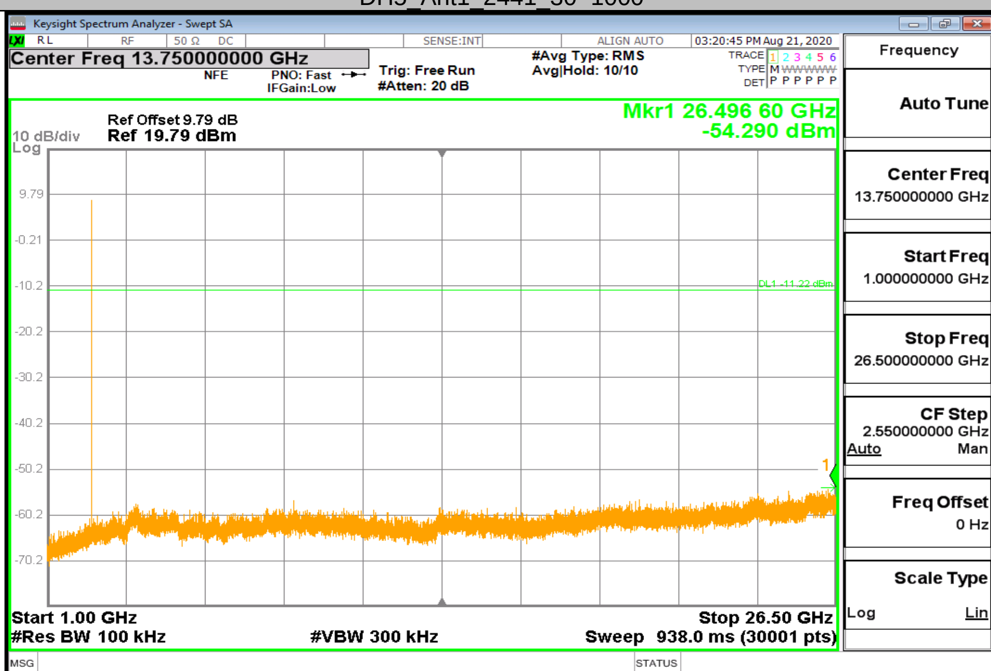
DH5_Ant1_2402_1000~26500



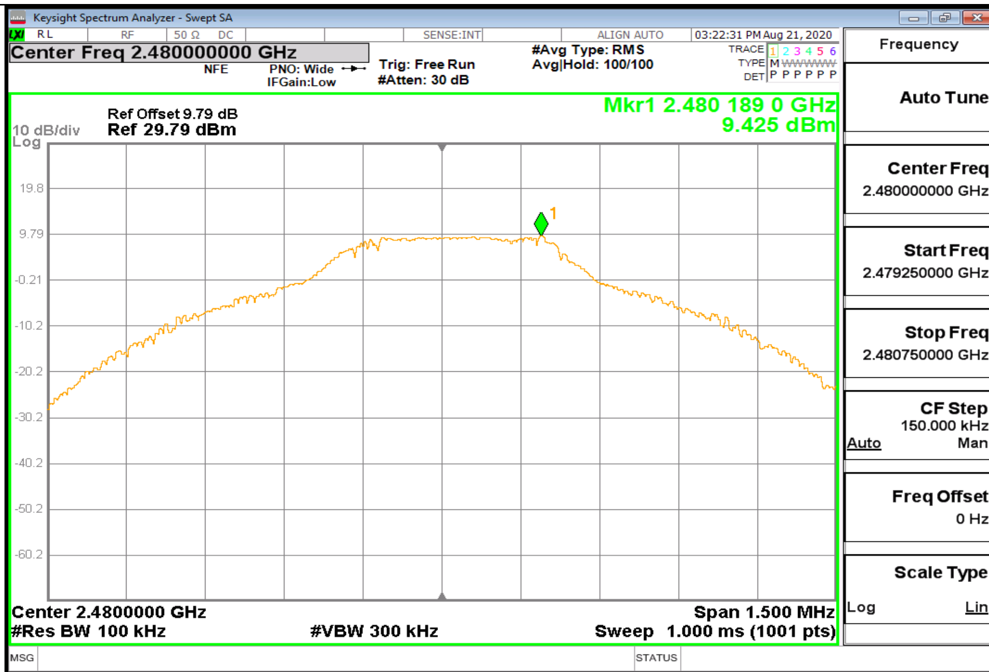
DH5_Ant1_2441_0~Reference



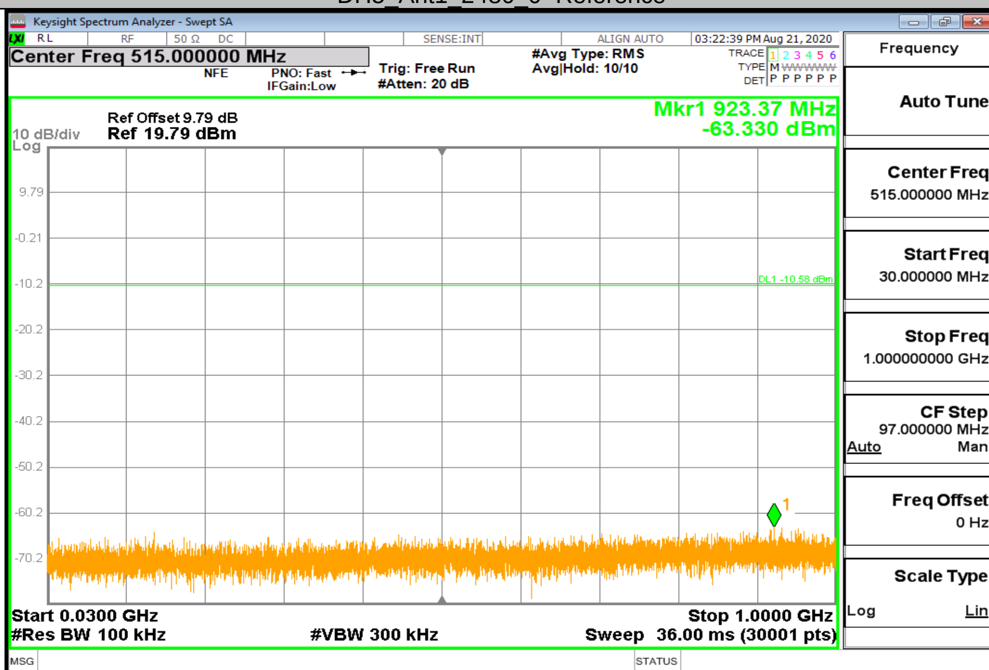
DH5_Ant1_2441_30~1000



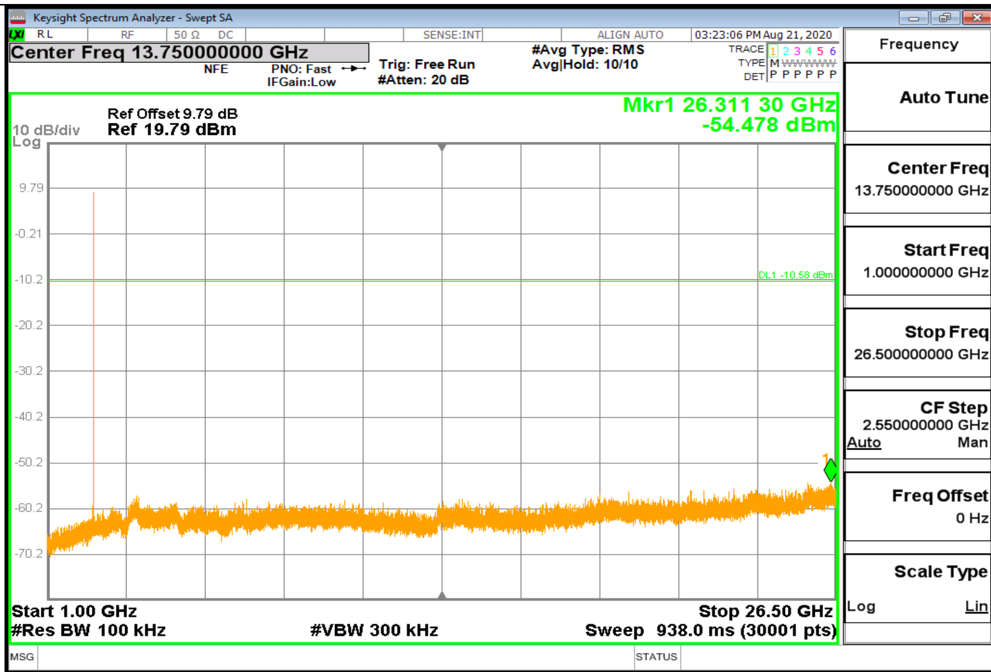
DH5_Ant1_2441_1000~26500



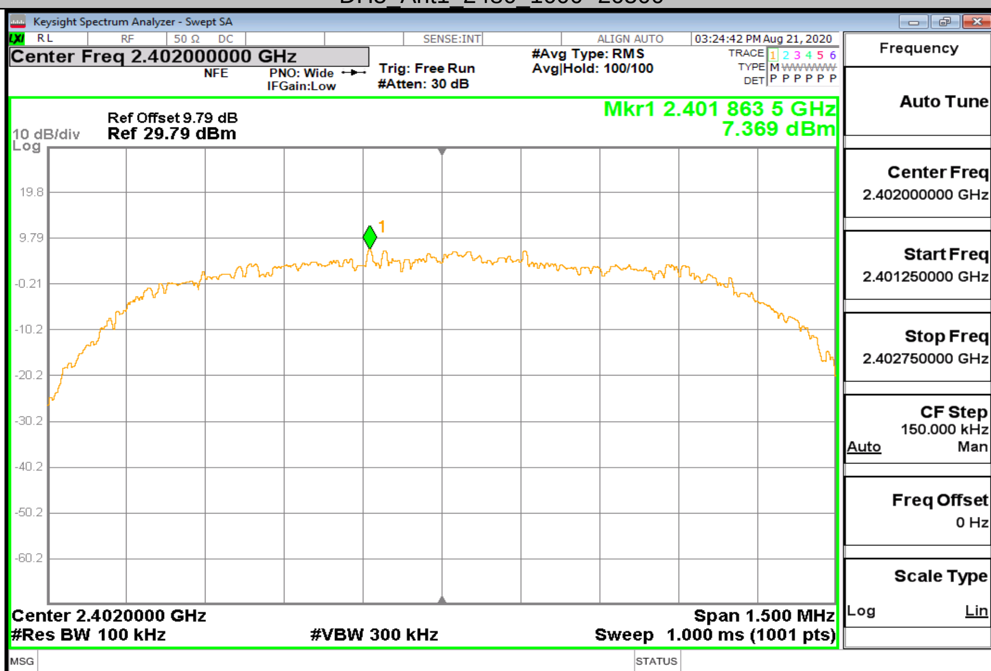
DH5_Ant1_2480_0~Reference



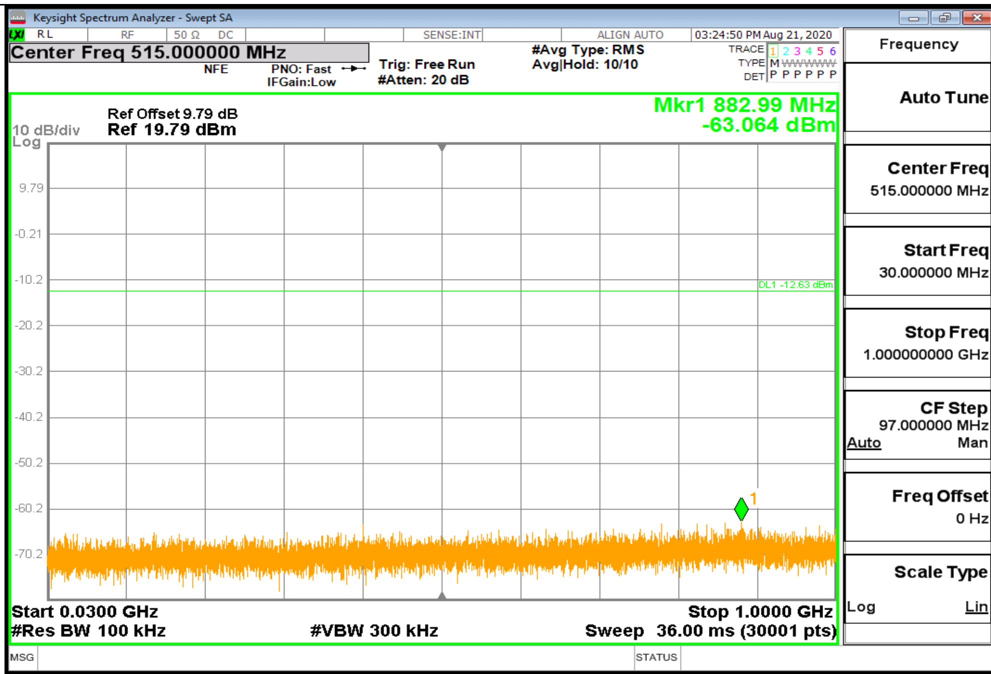
DH5_Ant1_2480_30~1000



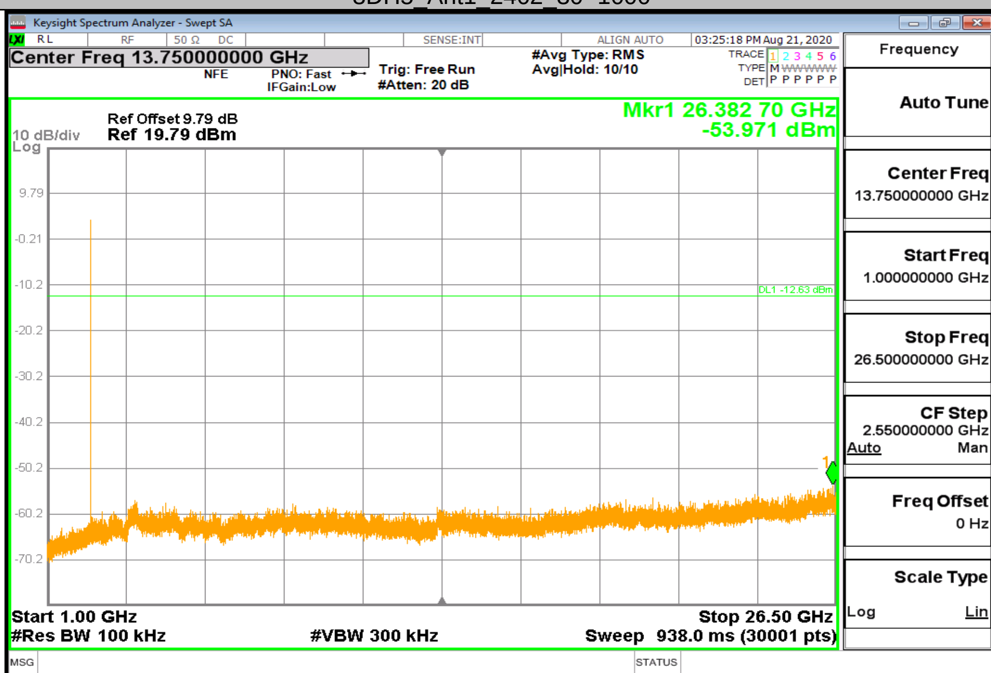
DH5_Ant1_2480_1000~26500



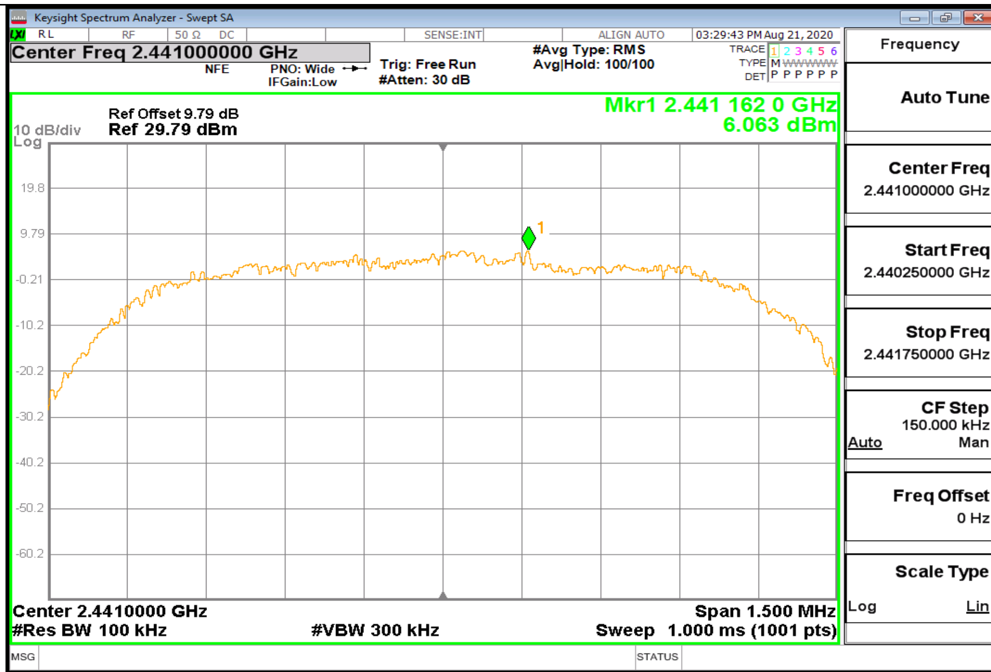
3DH5_Ant1_2402_0~Reference



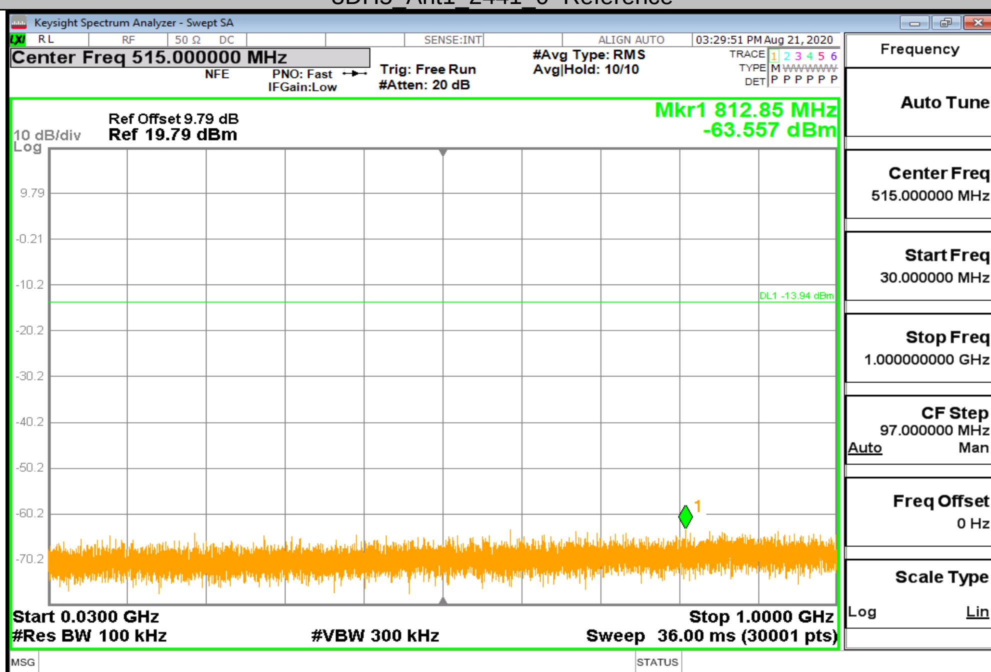
3DH5_Ant1_2402_30~1000



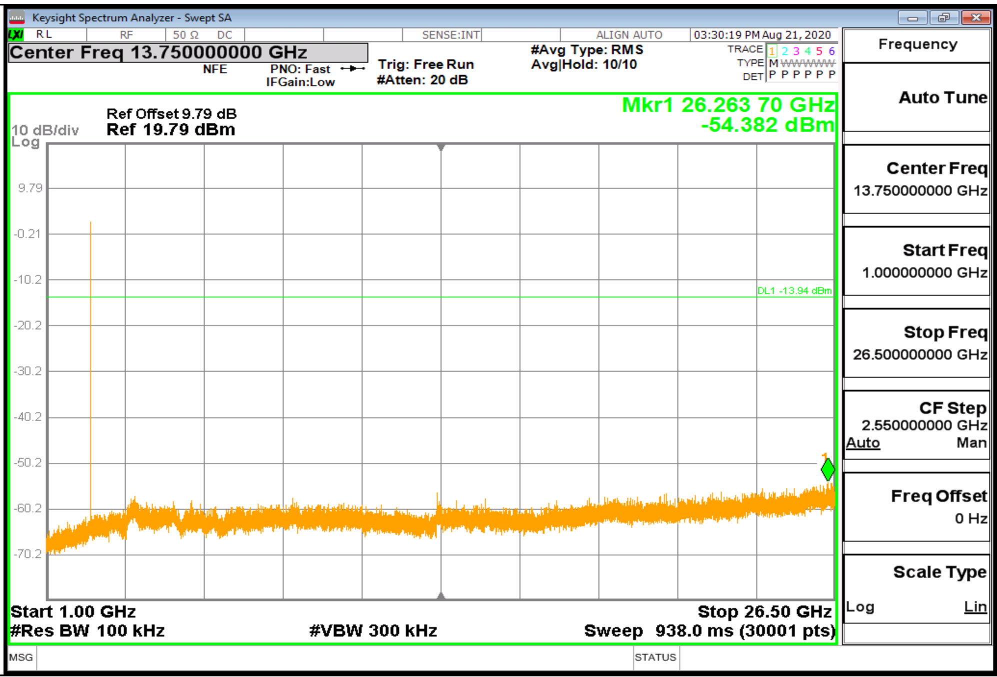
3DH5_Ant1_2402_1000~26500



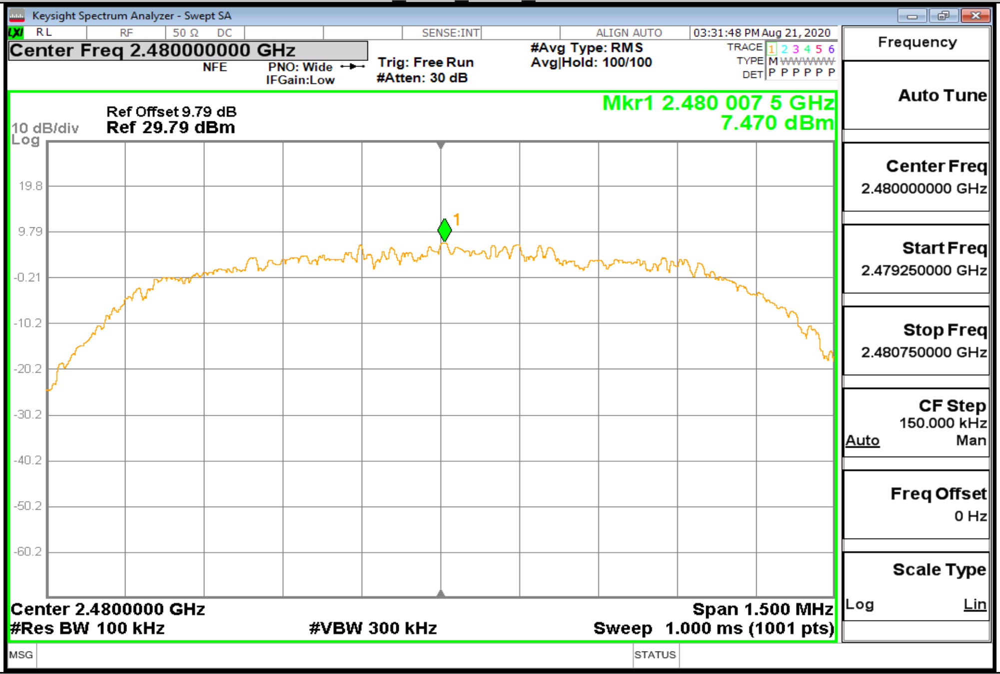
3DH5_Ant1_2441_0~Reference



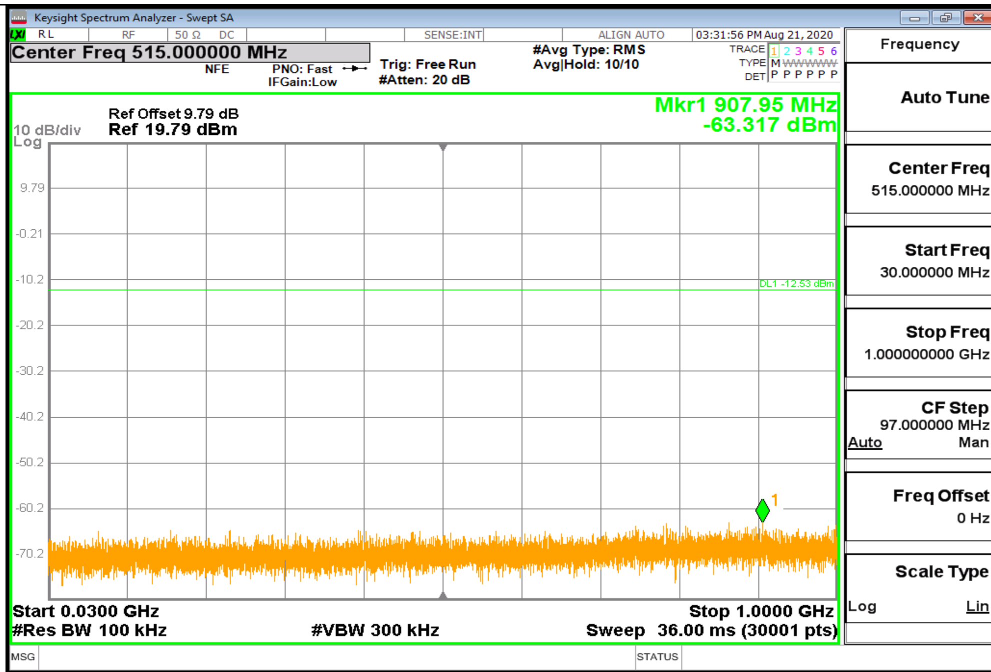
3DH5_Ant1_2441_30~1000



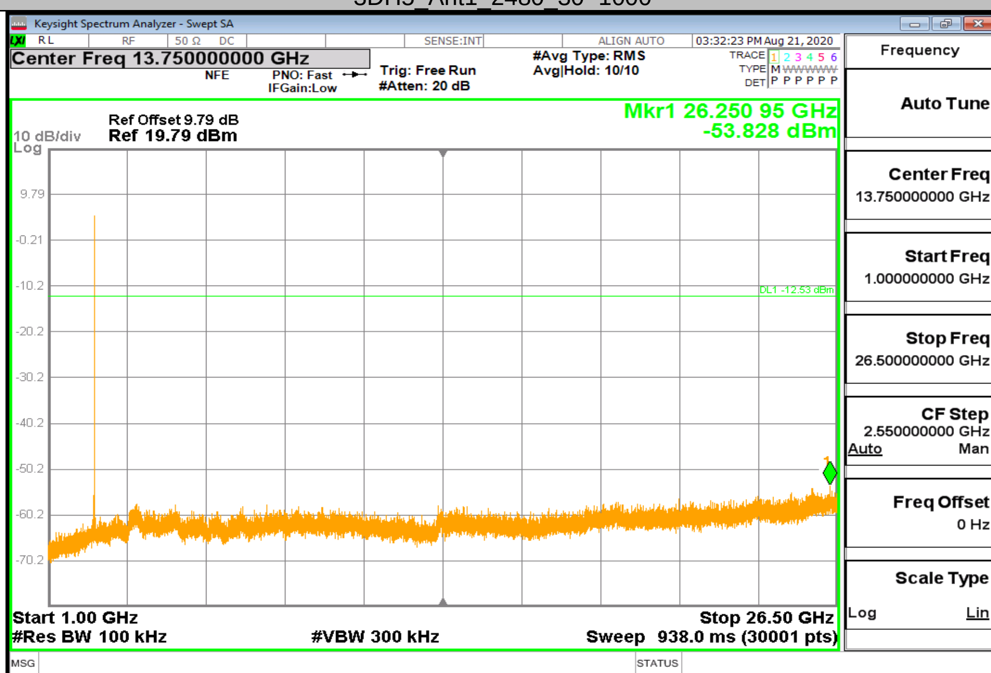
3DH5_Ant1_2441_1000~26500



3DH5_Ant1_2480_0~Reference



3DH5_Ant1_2480_30~1000



3DH5_Ant1_2480_1000~26500

END OF REPORT