



Test Report No.:
FCC2021-0003-1

TEST REPORT

FCC ID	:	2AR82-SKIWB921AU1
IC	:	24728-SKIWB921AU1
Applicant	:	Guangzhou Shikun Electronics Co., Ltd
Product Name	:	Module
Mode No.	:	SKI.WB921AU.1

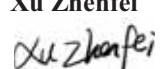
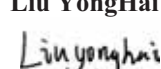
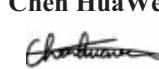
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Applicant	Name: Guangzhou Shikun Electronics Co., Ltd Address: NO.6 Liankun Road,Huangpu District,Guangzhou,China		
Manufacturer	Name: Guangzhou Shikun Electronics Co., Ltd Address: NO.6 Liankun Road,Huangpu District,Guangzhou,China		
Equipment Under Test	Product Name : Module Model No. : SKI.WB921AU.1 Trade mark : / Serial no. : — Sampling : —		
Date of Receipt.	2021.02.25	Date of Testing	2021.02.25~2021.04.12
Test Specification		Test Result	
FCC CFR47 Part 15C (2020) Radio Frequency Devices RSS-247 Issue 2 RSS-Gen Issue 5 ANSI C63.10 (2013) DA00-705 Filing and Frequency Measurement Guidelines For Frequency Hopping Spread Spectrum System (2000).		PASS	
Evaluation of Test Result	The equipment under test was found to comply with the requirements of the standards applied. 		
Tested by: Xu Zhenfei 	Reviewed by: Liu YongHai 	Approved by: Chen HuaWen 	
Other Aspects: NONE.			
Abbreviations:OK, Pass= passed Fail = failed N/A= not applicable EUT= equipment, sample(s) under tested			
This test report relates only to the EUT, and shall not be reproduced except in full, without written approval of CVC . Note: The report was originally issued on April 20, 2021, and was modified for the first time on May 17, 2021. The modification contents are as follows: Add the description of the worst case; the modification is involved The page is the whole certification report with (XG1) symbol after the corresponding original report number.			

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1. General Product Information

1.1 General information

Product Name	Module	
Model No.	SKI.WB921AU.1	
Power Supply	DC 3.3V	
Serial Number(SN)	B4ADA3CE77D8	
Power Supply	Adapter	/
	Battery	/
Antenna Type	External Antenna	
Antenna Connector	A permanently attached antenna (meet with the standard FCC Part 15.203 requirement)	
Antenna Gain	Antenna 1: 1.5 dBi (provided by client) Antenna 2: 1.5 dBi (provided by client)	
Frequency Range	2402MHz~2480MHz	
Bluetooth Version:	BT5.2	
Channel Number	79	
Type of Modulation	GFSK, π/4DQPSK, 8DPSK	
Hopping Channel Type:	Adaptive Frequency Hopping systems	
Max. Conducted Power	DH5:16.47 2DH5:16.32 3DH5:16.56	
Operate Temp.Range	-40°C to +125°C	
Note: 1. The information of the EUT is declared by the manufacturer. 2. The laboratory is not responsible for the product technical specification provided by the client.		

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2. Test Sites

2.1 Test Facilities

The tests and measurements refer to this report were performed by EMC testing Lab. of CVC Testing Technology Co., Ltd.

Add.: No.3, Tiantaiyi Road, Kaitai Avenue, Science City, Guangzhou, Guangdong, 510663, People's Republic of China

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FCC(Test firm designation number: CN1282)

IC(Test firm CAB identifier number: CN0103)

2.2 Description of Non-standard Method and Deviations

The testing and measurement methods used in this report are applied by all standard methods. Not any non-standard method or deviation from the used standards was used.

2.3 List of Test and Measurement Instruments

Refer to **Appendix E**.

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3. Test Configuration

3.1 Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

In order to find the worst case condition, Pre-tests are needed at the presence of different data rate. Preliminary tests have been done on all the configuration for confirming worst case. Data rate below means worst-case rate of each test item.

Worst-case data rates are shown as following table.

Test Mode	Antenna Delivery	Test Channel
DH5/2DH5/3DH5	2TX / 2RX	0,39,78

Test Mode	Test Modes
Conducted Emissions	3DH5
Radiated Emissions	3DH5
Peak Power Output -Conducted	DH5/2DH5/3DH5
20dB Emission Bandwidth	DH5/2DH5/3DH5
Occupied Channel Bandwidth	DH5/2DH5/3DH5
Frequency Separation	DH5/2DH5/3DH5
Time of Occupancy (Dwell Time)	DH5/2DH5/3DH5
Band Edge Compliance	DH5/2DH5/3DH5
Number of Hopping Frequency	DH5/2DH5/3DH5
Spurious RF Conducted Emissions	DH5/2DH5/3DH5

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3.2 Duty cycle

TestMode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Limit	Verdict
DH5	Ant1	2402	2.86	3.73	76.68	---	PASS
	Ant2	2402	2.86	3.73	76.68	---	PASS
	Ant1	2441	2.86	3.73	76.68	---	PASS
	Ant2	2441	2.86	3.73	76.68	---	PASS
	Ant1	2480	2.86	3.73	76.68	---	PASS
	Ant2	2480	2.86	3.73	76.68	---	PASS
2DH5	Ant1	2402	2.86	3.73	76.68	---	PASS
	Ant2	2402	2.86	3.73	76.68	---	PASS
	Ant1	2441	2.86	3.73	76.68	---	PASS
	Ant2	2441	2.86	3.73	76.68	---	PASS
	Ant1	2480	2.86	3.73	76.68	---	PASS
	Ant2	2480	2.86	3.73	76.68	---	PASS
3DH5	Ant1	2402	2.87	3.73	76.94	---	PASS
	Ant2	2402	2.87	3.73	76.94	---	PASS
	Ant1	2441	2.87	3.73	76.94	---	PASS
	Ant2	2441	2.87	3.73	76.94	---	PASS
	Ant1	2480	2.87	3.73	76.94	---	PASS
	Ant2	2480	2.87	3.73	76.94	---	PASS

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4. Summary of measurement results

Summary of measurements of results	Clause in FCC rules	Clause in IC rules	Verdict	Note
Conducted Emissions	15.207	RSS-Gen 8.8	PASS	/
Radiated Emissions	15.247(d),15.205,15.209	RSS-Gen 8.9	PASS	/
Peak Power Output -Conducted	15.247(b)(1)	RSS-247-5.4(2)	PASS	/
20dB Emission Bandwidth	15.247(a)(1)	RSS-247-5.1(2)	PASS	/
Occupied Channel Bandwidth	15.247(a)(1)	RSS-247-5.1(2)	PASS	/
Frequency Separation	15.247(a)(1)	RSS-247-5.1(2)	PASS	/
Time of Occupancy (Dwell Time)	15.247(a)(1)(iii)	RSS-247-5.1(4)	PASS	/
Band Edge Compliance	15.247(d)	RSS-247-5.5	PASS	/
Number of Hopping Frequency	15.247(a)(1)(iii)	RSS-247-5.1(4)	PASS	/
Spurious RF Conducted Emissions	15.247(d)	RSS-247-5.5	PASS	/

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5. Measurement procedure

5.1 Conducted Emission

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

The EUT was setup according to ANSI C63.10, 2013 for compliance to FCC 47CFR 15.247 requirements. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs) Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

Limits:

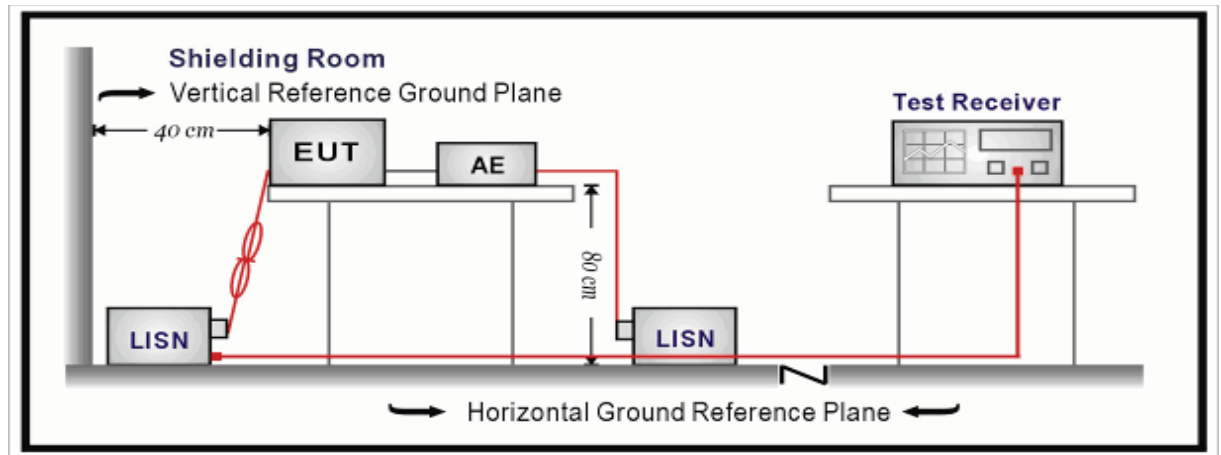
Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46*
0.5 - 5	56	46
5 - 30	60	50
Note 1: The lower limit shall apply at the transition frequencies.		
Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.		

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Test Setup:



Note: AC Power source is used to change the voltage 220V/60Hz.

Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Level = Reading + Factor.

Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$. $U = 3.12$ dB.

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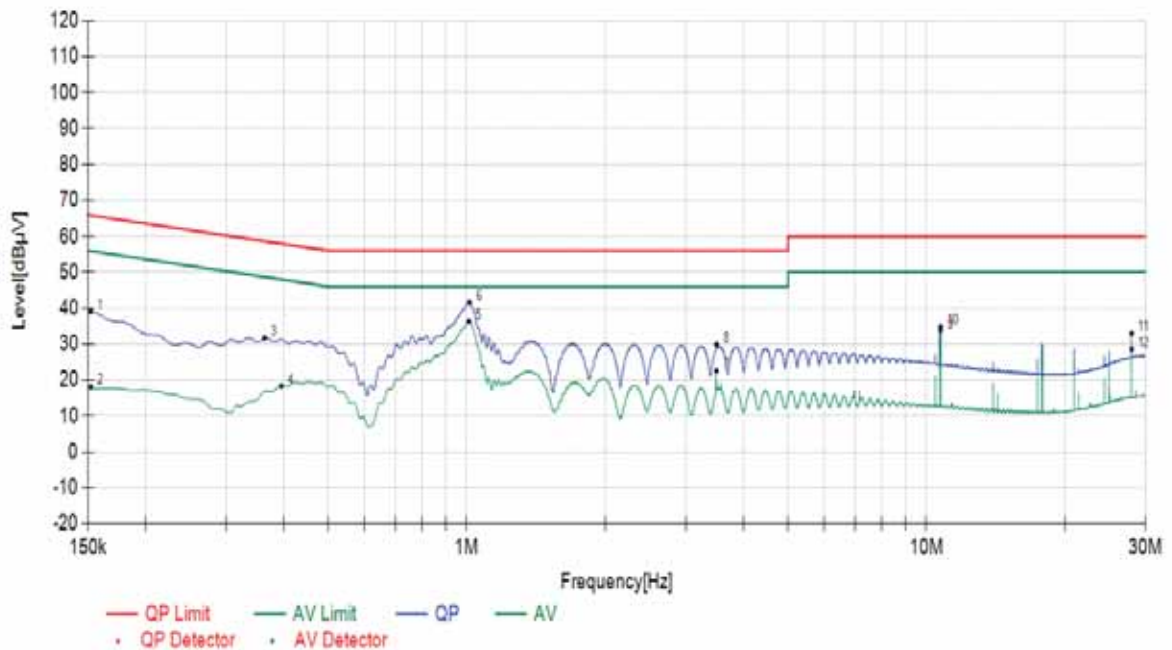
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Test Results:

During the test, the Conducted Emission from 150KHz to 30MHz was performed in all modes with all channels, and all antenna. BT 8DPSK Channel 78, antenna 1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Power Line	L
Test channel	Worst-Case

Suspected List								
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV]	Limit [dBμV]	Margin [dB]	Detector	Pass/Fail
1	0.1523	10.16	28.96	39.12	65.88	26.76	QP	PASS
10	10.7385	10.36	24.45	34.81	60.00	25.19	QP	PASS
11	27.9645	10.59	22.36	32.95	60.00	27.05	QP	PASS
8	3.4958	10.21	19.66	29.87	56.00	26.13	QP	PASS
6	1.0140	10.17	31.54	41.71	56.00	14.29	QP	PASS
3	0.3638	10.15	21.57	31.72	58.64	26.92	QP	PASS
9	10.7385	10.36	23.42	33.78	50.00	16.22	AV	PASS
2	0.1523	10.16	7.99	18.15	55.88	37.73	AV	PASS
4	0.3953	10.15	8.19	18.34	47.95	29.61	AV	PASS
5	1.0118	10.17	26.17	36.34	46.00	9.66	AV	PASS
7	3.4958	10.21	12.43	22.64	46.00	23.36	AV	PASS
12	27.9645	10.59	18.02	28.61	50.00	21.39	AV	PASS



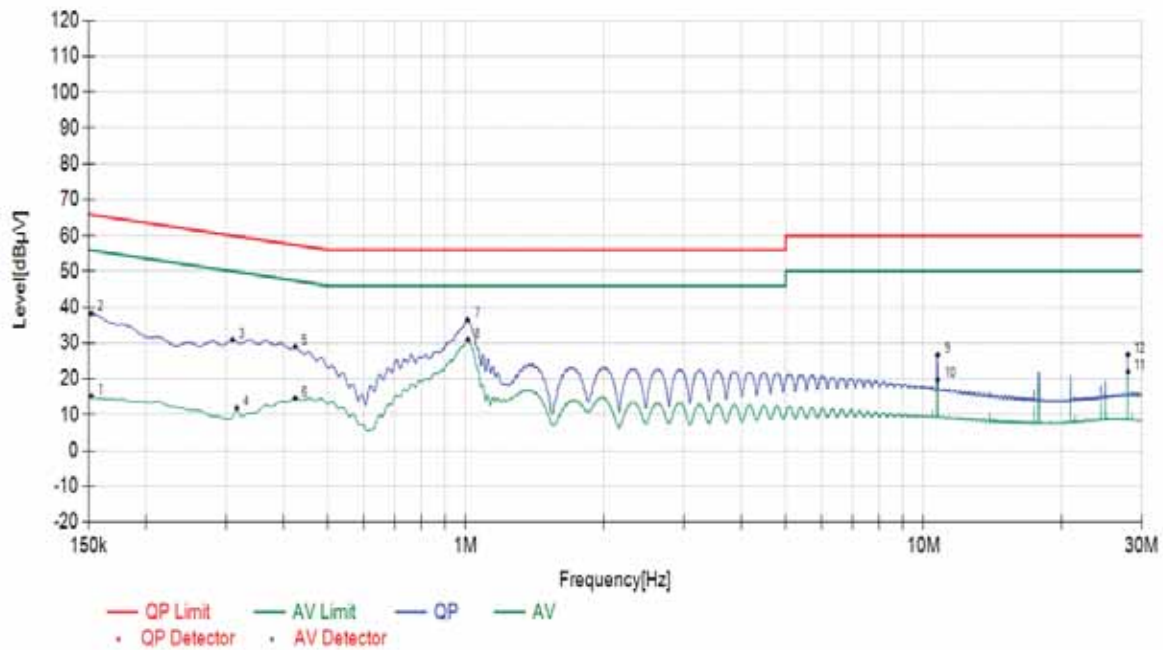
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Power Line	N
Test channel	Worst-Case

Suspected List								
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV]	Limit [dBμV]	Margin [dB]	Detector	Pass/Fail
12	27.9645	10.67	16.60	26.77	60.00	33.23	QP	PASS
3	0.3098	10.14	21.22	30.86	59.98	29.12	QP	PASS
7	1.0095	10.17	26.85	36.52	56.00	19.48	QP	PASS
2	0.1523	10.15	28.66	38.31	65.88	27.57	QP	PASS
9	10.7385	10.37	16.76	26.63	60.00	33.37	QP	PASS
5	0.4245	10.15	19.33	28.98	57.36	28.38	QP	PASS
4	0.3165	10.14	1.76	11.90	49.80	37.90	AV	PASS
6	0.4245	10.15	4.45	14.60	47.36	32.76	AV	PASS
10	10.7385	10.37	9.41	19.78	50.00	30.22	AV	PASS
11	27.9645	10.67	11.30	21.97	50.00	28.03	AV	PASS
8	1.0118	10.17	20.74	30.91	46.00	15.09	AV	PASS
1	0.1523	10.15	5.07	15.22	55.88	40.66	AV	PASS



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5.2 Radiated Emission

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

The EUT was setup and tested according to ANSI C63.10, 2013.

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from Antenna to the EUT was 3 meters.

The Antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the Antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

The frequency range from 30MHz to 10th harmonic is checked.

Note: When doing emission measurement above 1GHz, the horn Antenna will be bended down a little (as horn

Antenna has the narrow beamwidth) in order to keeping the Antenna in the “cone of radiation” of EUT. The 3dB beamwidth is 10~60 degrees for H-plane and 10~90 degrees for E-plane.

Limits:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Frequency	Limit (dBμV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Level
88MHz-216MHz	43.5	Quasi-peak Level
216MHz-960MHz	46.0	Quasi-peak Level
960MHz-1GHz	54.0	Quasi-peak Level

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Above 1GHz	54.0	Average Level
	74.0	Peak Level

Spurious Radiated Emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
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.
12.57675-12.57725	322-335.4	3600-4400	/
13.36-13.41	/	/	/

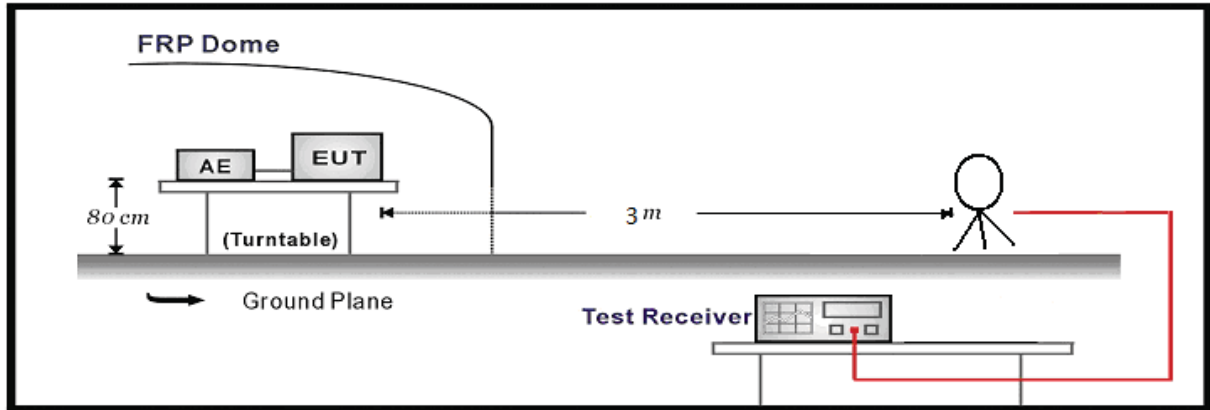
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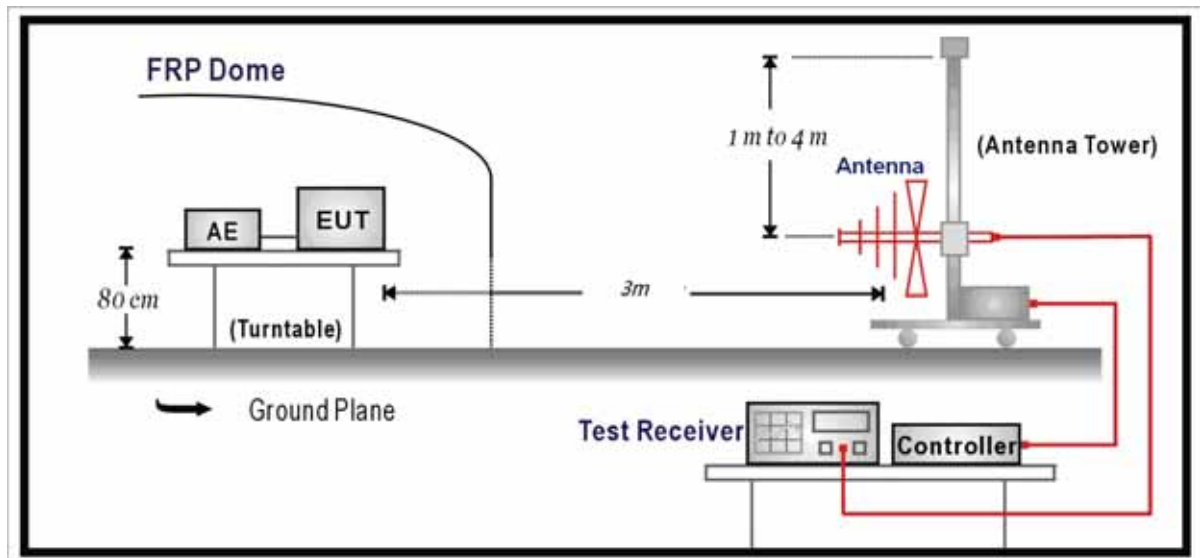
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Test Setup:

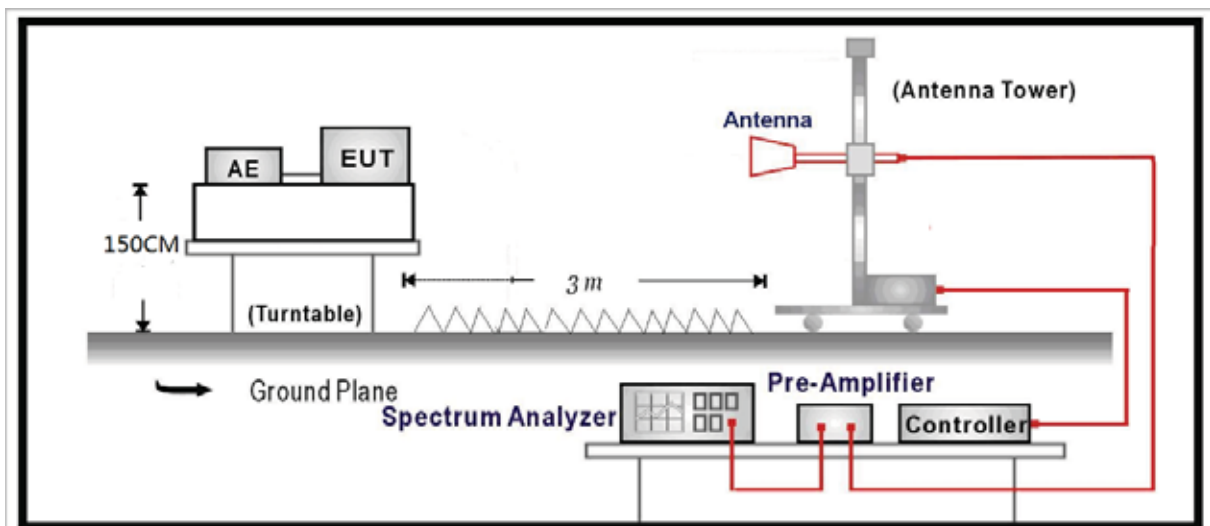
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



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Measurement Data:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Level = Reading - Factor

Factor = Preamplifier Factor – Antenna Factor–Cable Loss

Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
9KHz-30MHz	3.55 dB
30MHz-200MHz	4.19 dB
200MHz-1GHz	3.63 dB
Above 1GHz	3.68 dB

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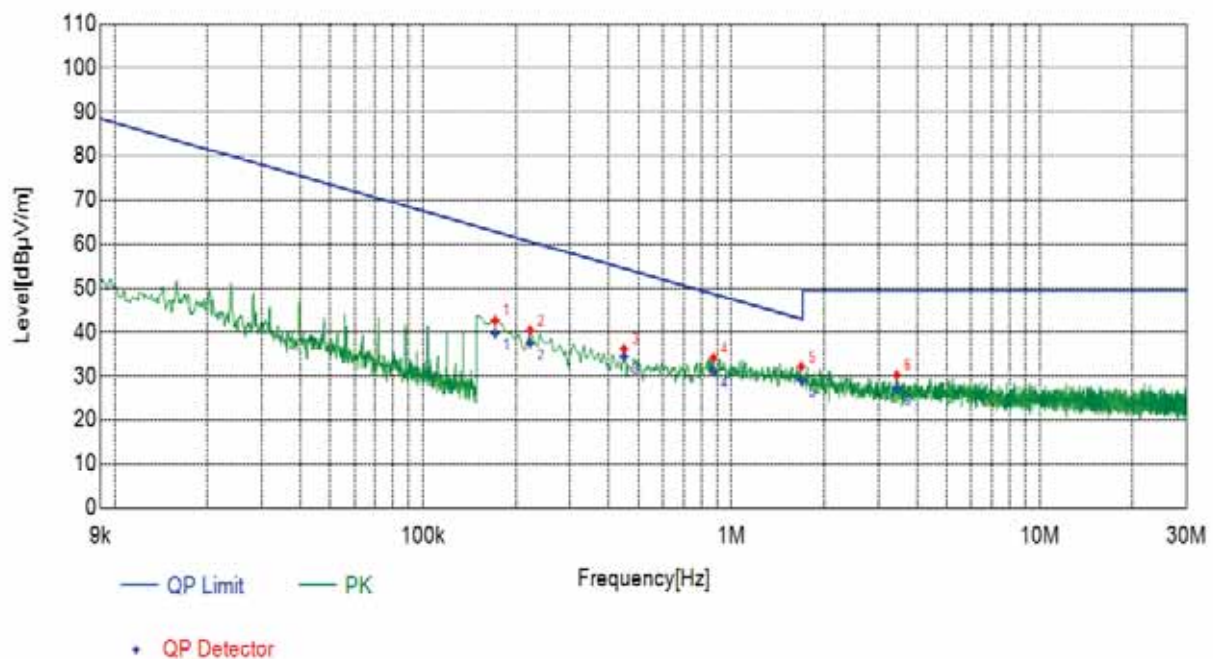
Test Results:

During the test, the Radiates Emission from 9KHz to 40GHz was performed in all modes with all channels, and all antenna, BT 8DPSK Channel 78, antenna 1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

SPURIOUS EMISSIONS:

Radiated Emission	9KHz-30MHz
Polarity	X axis
Test channel	Worst-Case

Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
0.1713	X axis	20.40	39.78	62.85	23.07	100	150	PASS
0.2225	X axis	20.37	37.61	60.57	22.96	100	90	PASS
0.4485	X axis	20.41	34.47	54.47	20.00	100	250	PASS
0.8750	X axis	20.59	31.21	48.68	17.47	100	320	PASS
1.6854	X axis	20.73	29.14	43.00	13.86	100	40	PASS
3.4425	X axis	20.99	27.26	49.50	22.24	100	0	PASS



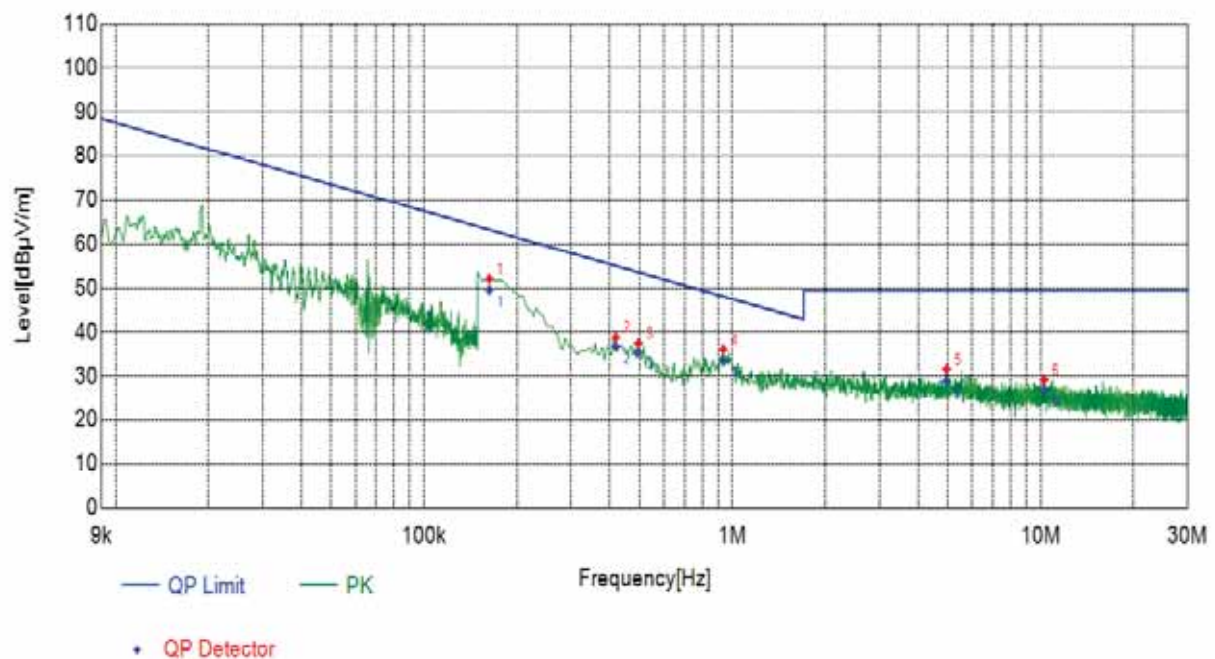
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Radiated Emission	9KHz-30MHz
Polarity	Y axis
Test channel	Worst-Case

Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dB μ V/m]	QP Limit [dB μ V/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
0.1628	Y axis	20.41	49.61	63.29	13.68	100	270	PASS
0.4187	Y axis	20.32	36.75	55.07	18.32	100	300	PASS
0.4955	Y axis	20.56	35.47	53.60	18.13	100	320	PASS
0.9347	Y axis	20.56	33.49	48.11	14.62	100	90	PASS
4.9480	Y axis	21.13	28.87	49.50	20.63	100	270	PASS
10.2578	Y axis	20.95	26.98	49.50	22.52	100	230	PASS



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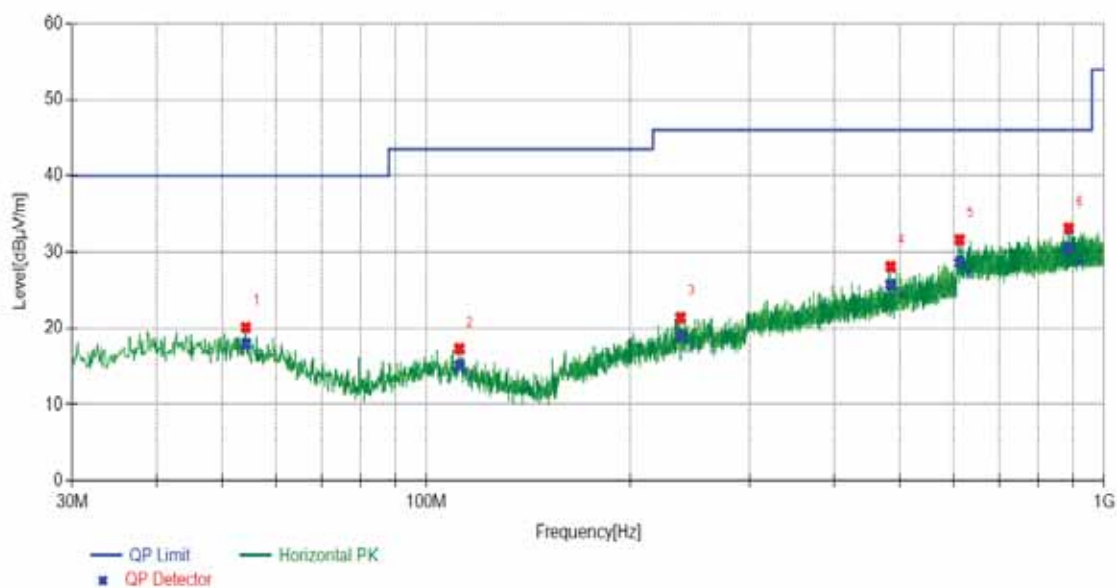
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Radiates Emission	30M~1G
Test channel	Worst-Case

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
54.1554	Horizontal	14.03	6.08	20.11	40.00	19.89	PK	100	60	PASS
111.8762	Horizontal	12.25	5.08	17.33	43.52	26.19	PK	100	30	PASS
237.2127	Horizontal	14.32	7.07	21.39	46.02	24.63	PK	100	30	PASS
484.4904	Horizontal	18.90	9.20	28.10	46.02	17.92	PK	100	70	PASS
612.3492	Horizontal	21.21	10.45	31.66	46.02	14.36	PK	100	20	PASS
887.1777	Horizontal	24.39	8.74	33.13	46.02	12.89	PK	100	40	PASS

Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
54.1554	Horizontal	14.03	17.93	40.00	22.07	102	60	PASS
111.8762	Horizontal	12.25	15.15	43.52	28.37	130	30	PASS
237.2127	Horizontal	14.32	19.04	46.02	26.98	160	30	PASS
484.4904	Horizontal	18.90	25.75	46.02	20.27	230	70	PASS
612.3492	Horizontal	21.21	28.67	46.02	17.35	140	20	PASS
887.1777	Horizontal	24.39	30.50	46.02	15.52	302	40	PASS



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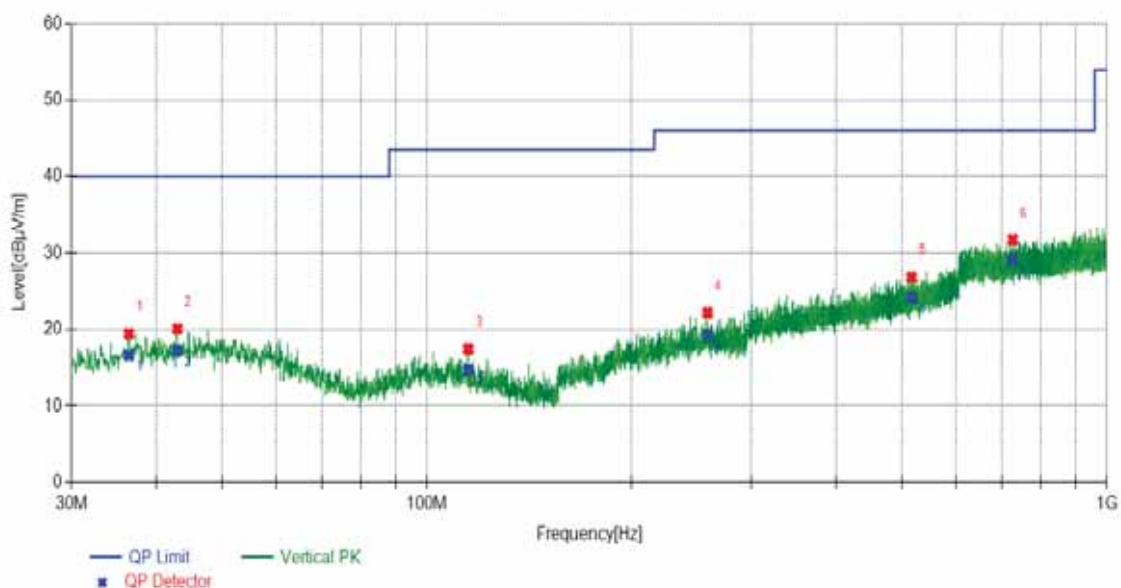
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Radiates Emission	30M~1G
Test channel	Worst-Case

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
36.4480	Vertical	13.18	6.26	19.44	40.00	20.56	PK	100	30	PASS
42.9531	Vertical	14.13	5.95	20.08	40.00	19.92	PK	100	30	PASS
115.0226	Vertical	11.94	5.54	17.48	43.52	26.04	PK	100	40	PASS
258.7623	Vertical	15.00	7.18	22.18	46.02	23.84	PK	100	30	PASS
516.3980	Vertical	19.48	7.37	26.85	46.02	19.17	PK	100	40	PASS
727.1857	Vertical	22.56	9.18	31.74	46.02	14.28	PK	100	30	PASS

Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
36.4480	Vertical	13.18	16.63	40.00	23.37	110	30	PASS
42.9531	Vertical	14.13	17.27	40.00	22.73	146	30	PASS
115.0226	Vertical	11.94	14.67	43.52	28.85	182	40	PASS
258.7623	Vertical	15.00	19.21	46.02	26.81	204	30	PASS
516.3980	Vertical	19.48	24.24	46.02	21.78	256	40	PASS
727.1857	Vertical	22.56	29.13	46.02	16.89	310	30	PASS



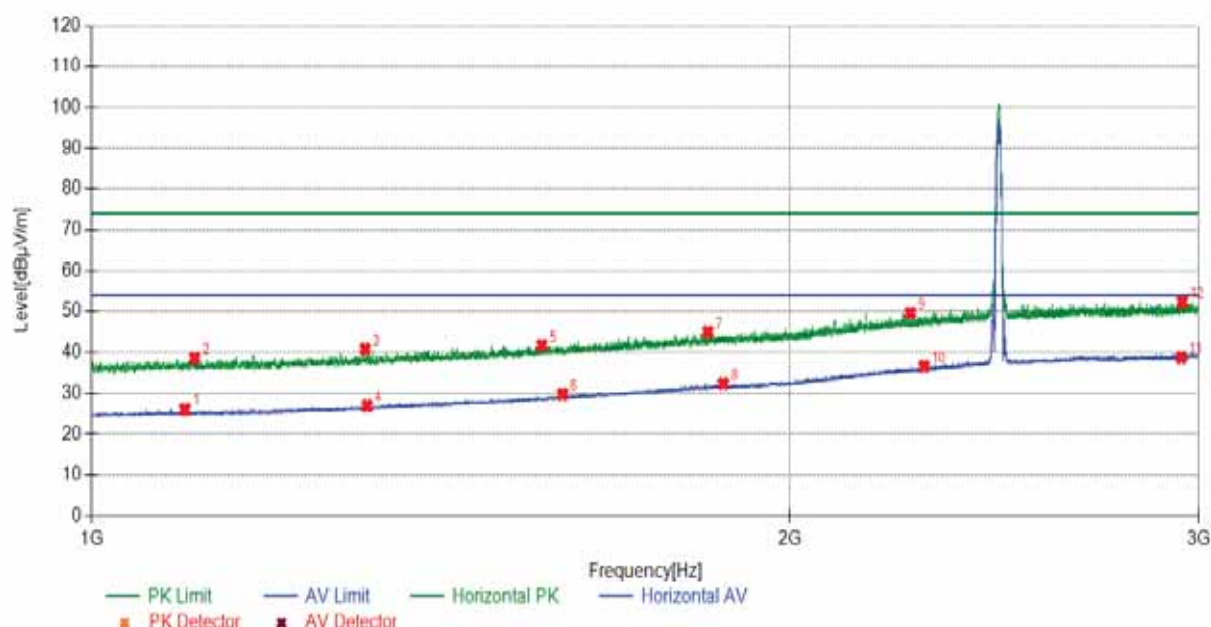
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Radiates Emission	1G~3G
Test channel	Worst-Case

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
2951.99	Horizontal	37.80	14.56	52.36	74.00	21.64	PK	100	190	PASS
1312.03	Horizontal	26.90	13.92	40.82	74.00	33.18	PK	100	180	PASS
1843.48	Horizontal	31.15	13.88	45.03	74.00	28.97	PK	100	190	PASS
1107.81	Horizontal	25.84	12.68	38.52	74.00	35.48	PK	100	40	PASS
2253.92	Horizontal	34.70	14.96	49.66	74.00	24.34	PK	100	130	PASS
1563.45	Horizontal	28.75	13.03	41.78	74.00	32.22	PK	100	40	PASS
1314.63	Horizontal	26.91	0.08	26.99	54.00	27.01	AV	100	10	PASS
1596.05	Horizontal	29.03	0.74	29.77	54.00	24.23	AV	100	10	PASS
2284.72	Horizontal	34.95	1.72	36.67	54.00	17.33	AV	100	10	PASS
2948.99	Horizontal	37.79	0.95	38.74	54.00	15.26	AV	100	180	PASS
1871.68	Horizontal	31.30	1.10	32.40	54.00	21.60	AV	100	10	PASS
1097.00	Horizontal	25.80	0.26	26.06	54.00	27.94	AV	100	10	PASS



Note: The signal beyond the limit is carrier

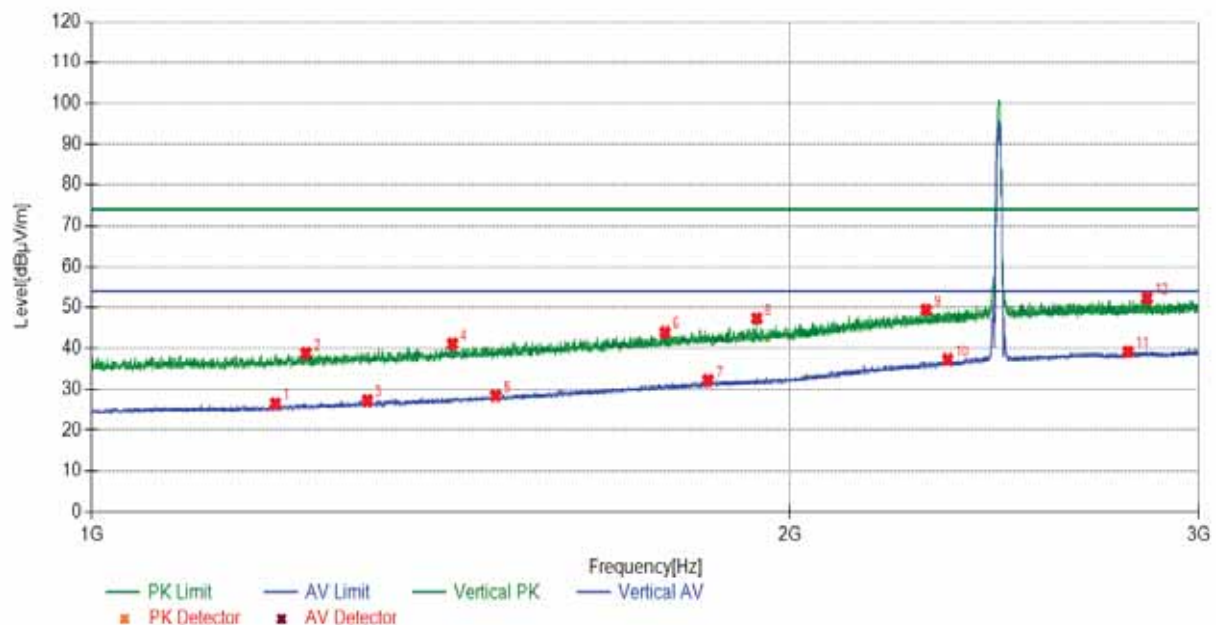
CVC Testing Technology Co., Ltd.

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Radiates Emission	1G~3G
Test channel	Worst-Case

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
2850.38	Vertical	37.48	14.80	52.28	74.00	21.72	PK	100	10	PASS
1237.02	Vertical	26.44	12.37	38.81	74.00	35.19	PK	100	20	PASS
1766.87	Vertical	30.61	13.29	43.90	74.00	30.10	PK	100	30	PASS
1935.09	Vertical	31.63	15.73	47.36	74.00	26.64	PK	100	70	PASS
2289.12	Vertical	34.98	14.48	49.46	74.00	24.54	PK	100	60	PASS
1430.64	Vertical	27.66	13.45	41.11	74.00	32.89	PK	100	40	PASS
2796.97	Vertical	37.31	1.92	39.23	54.00	14.77	AV	100	10	PASS
1493.44	Vertical	28.14	0.28	28.42	54.00	25.58	AV	100	10	PASS
1314.83	Vertical	26.91	0.35	27.26	54.00	26.74	AV	100	10	PASS
1843.68	Vertical	31.15	1.12	32.27	54.00	21.73	AV	100	10	PASS
2338.73	Vertical	35.38	1.95	37.33	54.00	16.67	AV	100	10	PASS
1200.22	Vertical	26.22	0.28	26.50	54.00	27.50	AV	100	10	PASS



Note: The signal beyond the limit is carrier

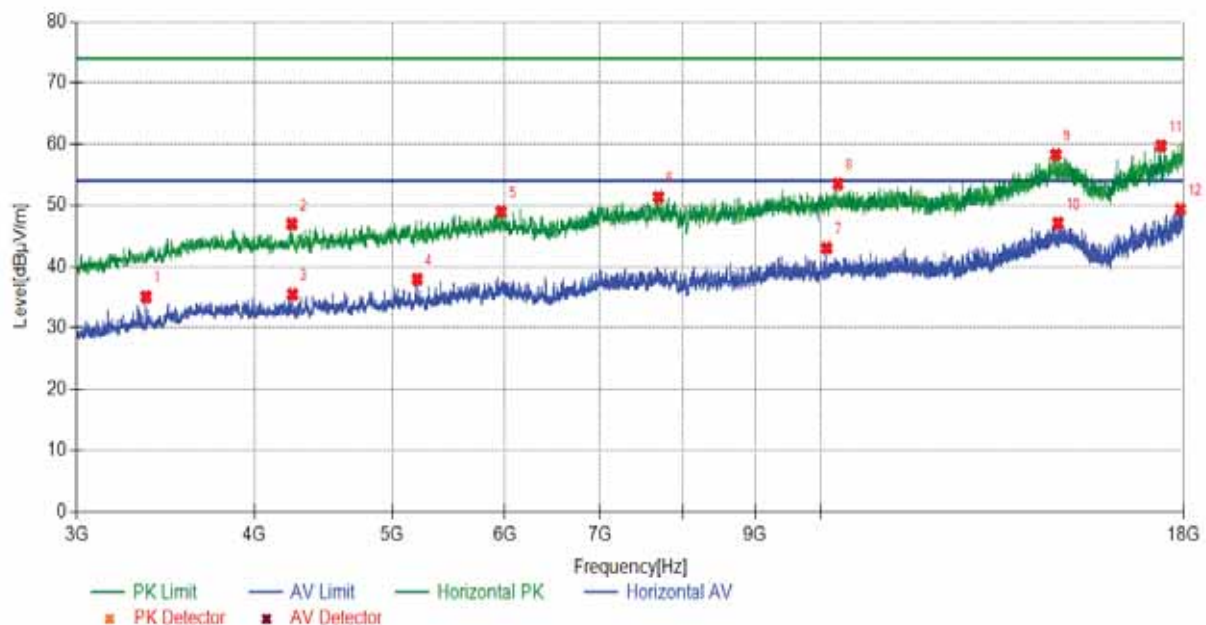
CVC Testing Technology Co., Ltd.

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Radiates Emission	3G~18G
Test channel	Worst-Case

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
7693.96	Horizontal	-0.26	51.63	51.37	74.00	22.63	PK	100	350	PASS
14638.1	Horizontal	8.62	49.69	58.31	74.00	15.69	PK	100	40	PASS
17354.9	Horizontal	12.07	47.67	59.74	74.00	14.26	PK	100	190	PASS
10286.2	Horizontal	4.29	49.21	53.50	74.00	20.50	PK	100	260	PASS
4251.12	Horizontal	-6.36	53.32	46.96	74.00	27.04	PK	100	330	PASS
5964.29	Horizontal	-4.14	53.12	48.98	74.00	25.02	PK	100	320	PASS
5206.72	Horizontal	-5.60	43.53	37.93	54.00	16.07	AV	100	10	PASS
17908.4	Horizontal	14.97	34.44	49.41	54.00	4.59	AV	100	10	PASS
4255.62	Horizontal	-6.36	41.87	35.51	54.00	18.49	AV	100	10	PASS
10103.2	Horizontal	3.84	39.19	43.03	54.00	10.97	AV	100	10	PASS
14690.6	Horizontal	8.62	38.46	47.08	54.00	6.92	AV	100	10	PASS
3357.03	Horizontal	-8.26	43.39	35.13	54.00	18.87	AV	100	10	PASS



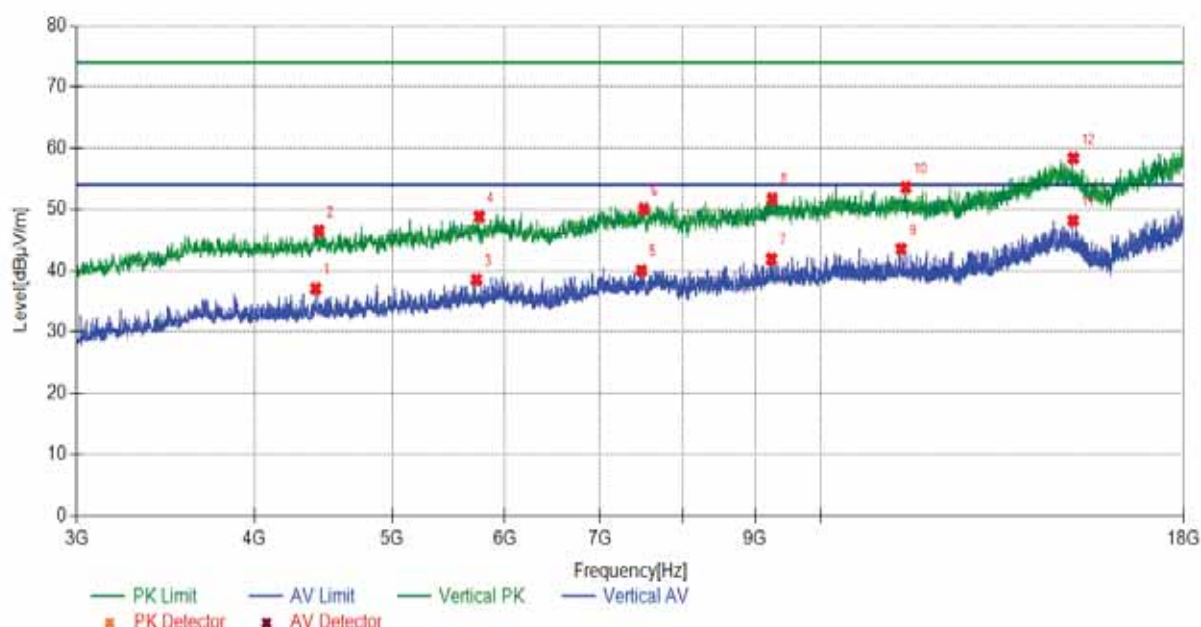
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Radiates Emission	3G~18G
Test channel	Worst-Case

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
15058.2	Vertical	8.47	49.92	58.39	74.00	15.61	PK	100	220	PASS
11483.3	Vertical	5.03	48.56	53.59	74.00	20.41	PK	100	180	PASS
7512.45	Vertical	-0.32	50.37	50.05	74.00	23.95	PK	100	210	PASS
9249.62	Vertical	2.10	49.62	51.72	74.00	22.28	PK	100	320	PASS
4441.64	Vertical	-6.22	52.70	46.48	74.00	27.52	PK	100	170	PASS
5757.27	Vertical	-4.81	53.60	48.79	74.00	25.21	PK	100	120	PASS
15053.7	Vertical	8.48	39.69	48.17	54.00	5.83	AV	100	10	PASS
7485.44	Vertical	-0.35	40.40	40.05	54.00	13.95	AV	100	10	PASS
5730.27	Vertical	-4.90	43.45	38.55	54.00	15.45	AV	100	10	PASS
9239.12	Vertical	2.08	39.82	41.90	54.00	12.10	AV	100	10	PASS
11394.8	Vertical	5.07	38.46	43.53	54.00	10.47	AV	100	10	PASS
4417.64	Vertical	-6.24	43.33	37.09	54.00	16.91	AV	100	10	PASS



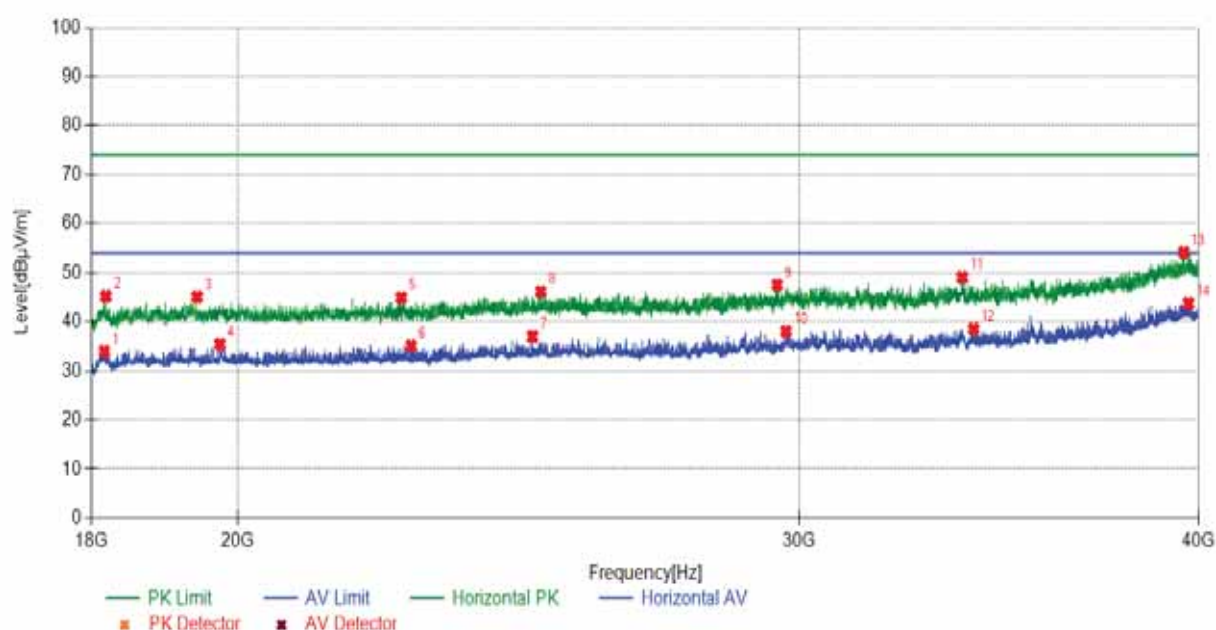
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Radiates Emission	18G~40G
Test channel	Worst-Case

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
19423.5	Horizontal	1.33	43.74	45.07	74.00	28.93	PK	100	100	PASS
24888.8	Horizontal	4.06	42.06	46.12	74.00	27.88	PK	100	60	PASS
39575.3	Horizontal	10.78	43.33	54.11	74.00	19.89	PK	100	150	PASS
18187.0	Horizontal	1.15	44.03	45.18	74.00	28.82	PK	100	60	PASS
33731.5	Horizontal	6.52	42.56	49.08	74.00	24.92	PK	100	180	PASS
22506.0	Horizontal	2.41	42.47	44.88	74.00	29.12	PK	100	90	PASS
29515.9	Horizontal	6.36	41.10	47.46	74.00	26.54	PK	100	170	PASS
19744.7	Horizontal	1.31	34.14	35.45	54.00	18.55	AV	100	10	PASS
22666.6	Horizontal	2.57	32.56	35.13	54.00	18.87	AV	100	10	PASS
24739.2	Horizontal	4.00	32.99	36.99	54.00	17.01	AV	100	10	PASS
39709.5	Horizontal	10.79	32.95	43.74	54.00	10.26	AV	100	10	PASS
29705.1	Horizontal	6.49	31.53	38.02	54.00	15.98	AV	100	10	PASS
34008.8	Horizontal	6.60	31.94	38.54	54.00	15.46	AV	100	10	PASS
18167.2	Horizontal	1.14	32.82	33.96	54.00	20.04	AV	100	10	PASS



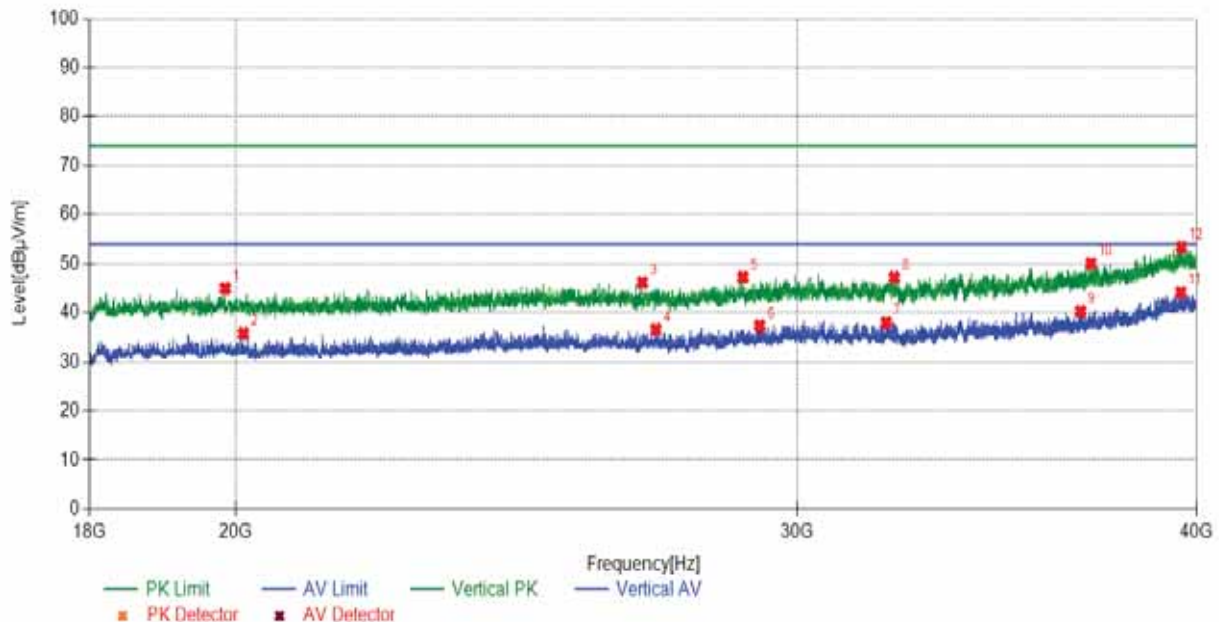
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Radiates Emission	18G~40G
Test channel	Worst-Case

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
39564.3	Vertical	10.78	42.57	53.35	74.00	20.65	PK	100	50	PASS
37064.9	Vertical	7.93	42.16	50.09	74.00	23.91	PK	100	120	PASS
19850.3	Vertical	1.31	43.64	44.95	74.00	29.05	PK	100	120	PASS
32162.8	Vertical	5.97	41.22	47.19	74.00	26.81	PK	100	20	PASS
28838.2	Vertical	5.90	41.35	47.25	74.00	26.75	PK	100	70	PASS
26818.4	Vertical	4.83	41.34	46.17	74.00	27.83	PK	100	70	PASS
39548.9	Vertical	10.78	33.39	44.17	54.00	9.83	AV	100	10	PASS
20112.2	Vertical	1.34	34.44	35.78	54.00	18.22	AV	100	10	PASS
27082.5	Vertical	4.94	31.62	36.56	54.00	17.44	AV	100	10	PASS
36789.8	Vertical	7.72	32.59	40.31	54.00	13.69	AV	100	10	PASS
31975.7	Vertical	5.91	32.08	37.99	54.00	16.01	AV	100	10	PASS
29185.9	Vertical	6.13	31.27	37.40	54.00	16.60	AV	100	10	PASS



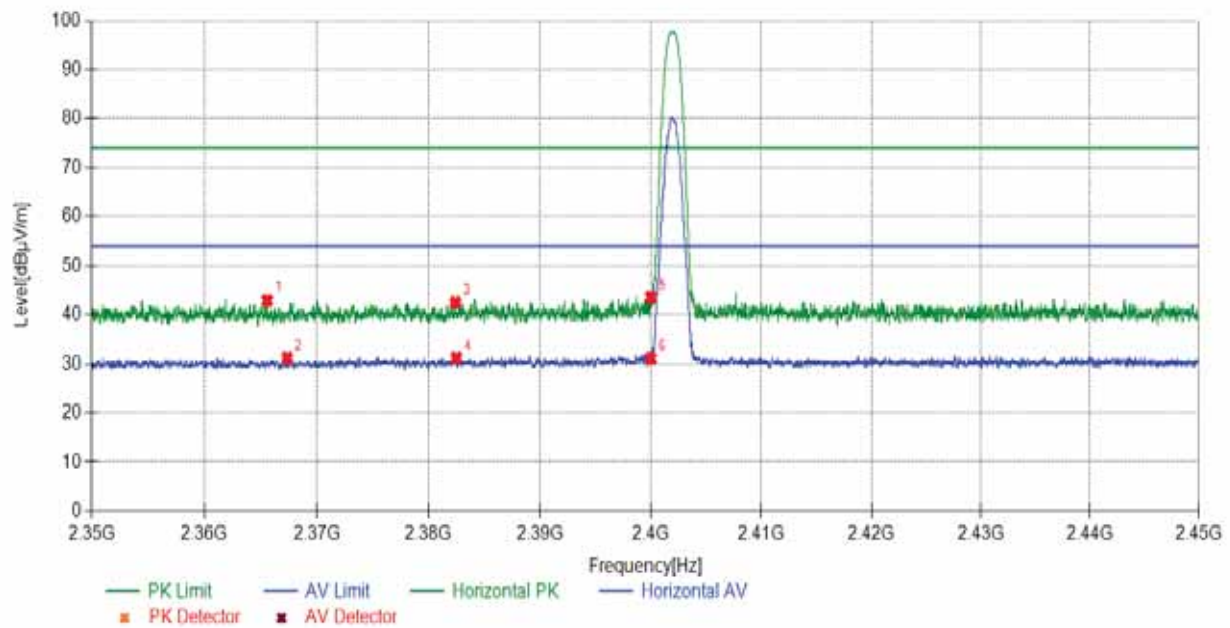
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Band Edge:

Test mode			3DH5							
Test channel			LOW channel							
Suspected List										
Frequen cy [MHz]	Polarity	Factor [dB]	Readin g [dBμV/ m]	Level [dBμV/ m]	Limit [dBμV/ m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/F ail
2365.59	Horizontal	29.58	13.32	42.90	74.00	31.10	PK	100	10	PASS
2382.41	Horizontal	29.62	12.88	42.50	74.00	31.50	PK	100	20	PASS
2400.00	Horizontal	29.67	13.86	43.53	74.00	30.47	PK	100	20	PASS
2367.37	Horizontal	29.58	1.62	31.20	54.00	22.80	AV	100	10	PASS
2382.49	Horizontal	29.62	1.57	31.19	54.00	22.81	AV	100	10	PASS
2400.00	Horizontal	29.67	1.43	31.10	54.00	22.90	AV	100	20	PASS

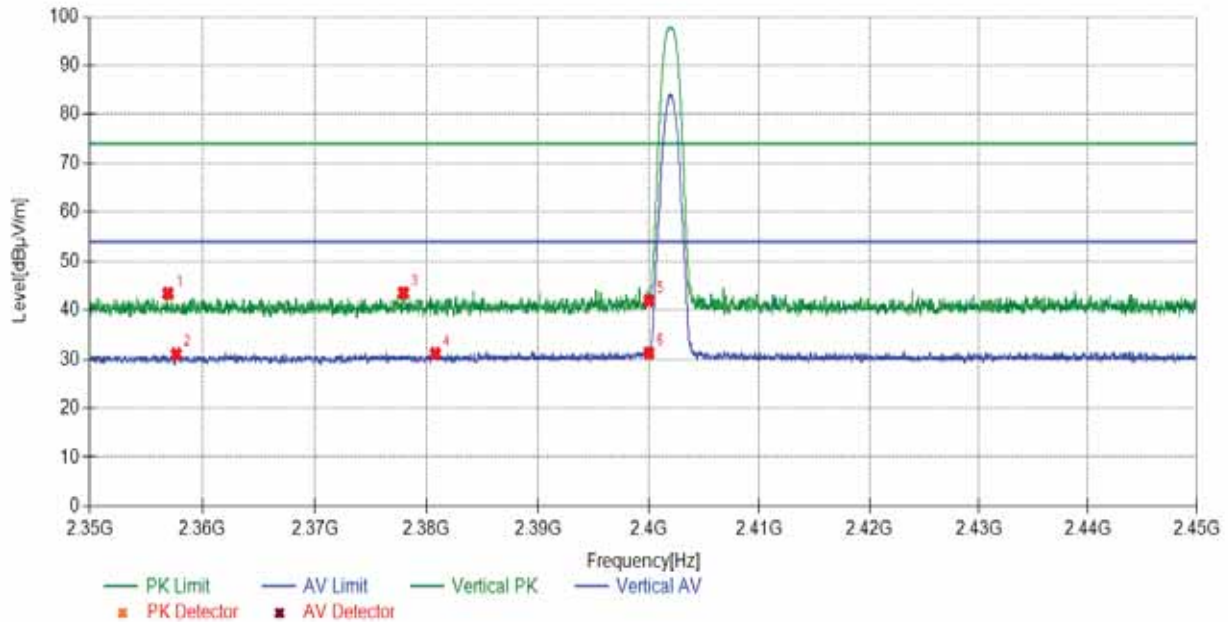


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Test mode			3DH5							
Test channel			LOW channel							
Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
2356.94	Vertical	29.55	13.83	43.38	74.00	30.62	PK	100	30	PASS
2377.93	Vertical	29.61	13.91	43.52	74.00	30.48	PK	100	20	PASS
2400.00	Vertical	29.67	12.32	41.99	74.00	32.01	PK	100	20	PASS
2357.68	Vertical	29.55	1.54	31.09	54.00	22.91	AV	100	20	PASS
2380.78	Vertical	29.62	1.58	31.20	54.00	22.80	AV	100	20	PASS
2400.00	Vertical	29.67	1.62	31.29	54.00	22.71	AV	100	20	PASS

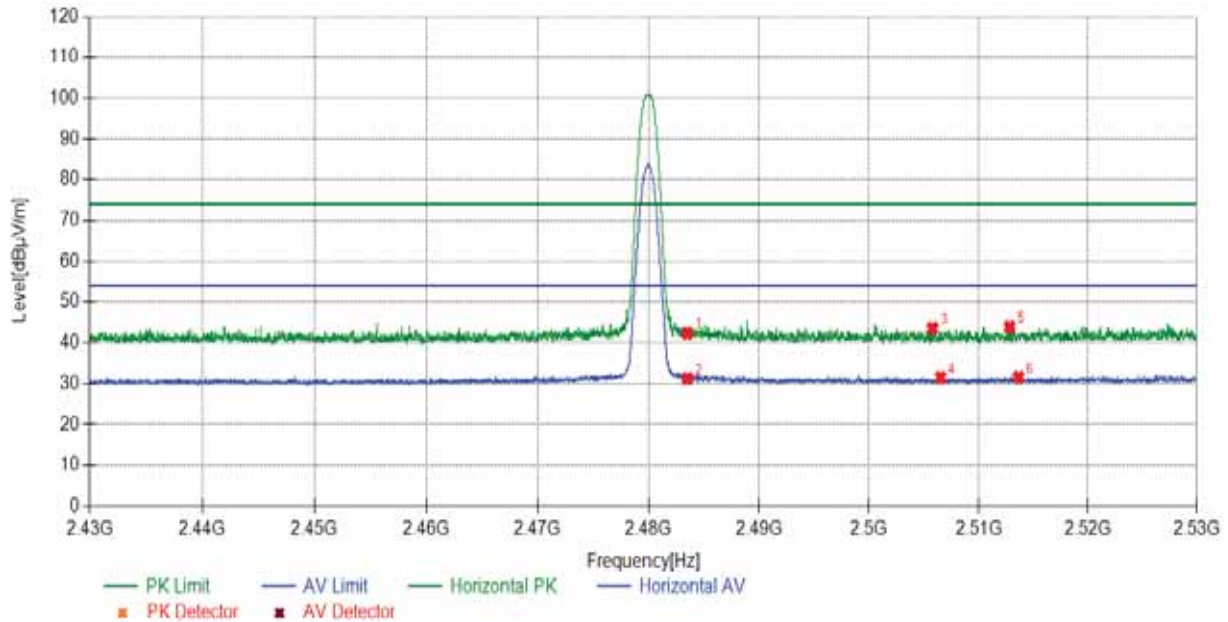


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Test mode			3DH5							
Test channel			HIGH channel							
Suspected List										
Frequen cy [MHz]	Polarity	Factor [dB]	Readin g [dBμV/ m]	Level [dBμV/ m]	Limit [dBμV/ m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/F ail
2483.50	Horizontal	29.91	12.50	42.41	74.00	31.59	PK	100	30	PASS
2505.78	Horizontal	29.98	13.60	43.58	74.00	30.42	PK	100	50	PASS
2512.82	Horizontal	30.01	13.86	43.87	74.00	30.13	PK	100	20	PASS
2483.50	Horizontal	29.91	1.41	31.32	54.00	22.68	AV	100	40	PASS
2506.52	Horizontal	29.99	1.57	31.56	54.00	22.44	AV	100	30	PASS
2513.64	Horizontal	30.02	1.63	31.65	54.00	22.35	AV	100	20	PASS

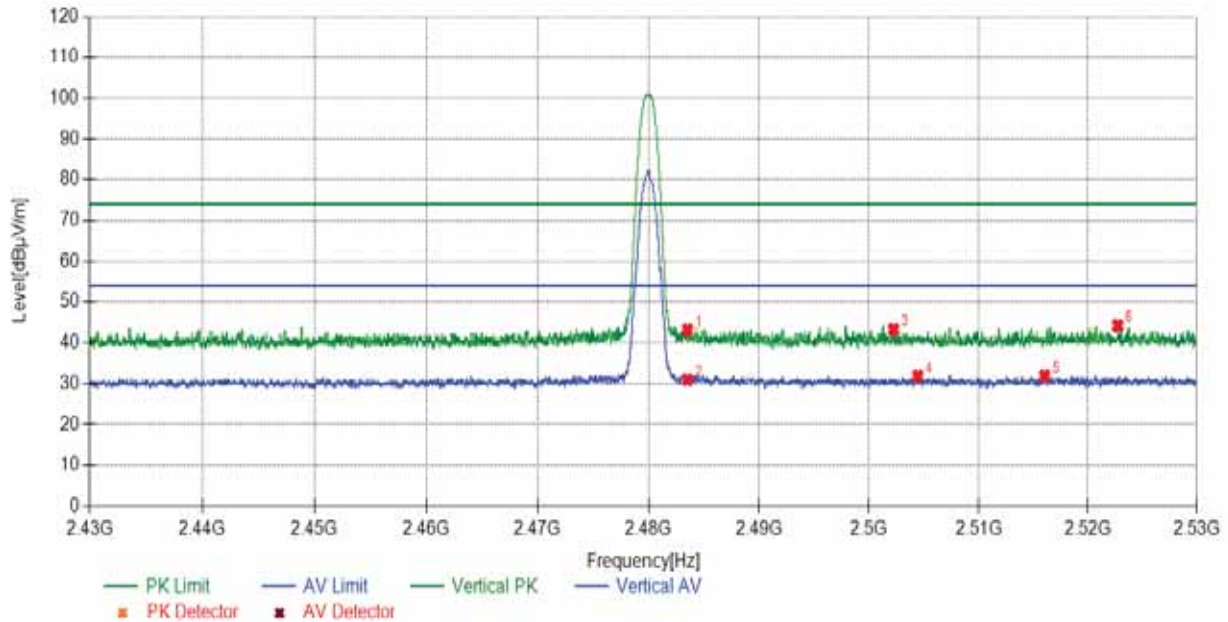


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Test mode			3DH5							
Test channel			HIGH channel							
Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
2522.74	Vertical	30.05	14.14	44.19	74.00	29.81	PK	100	20	PASS
2483.50	Vertical	29.91	13.28	43.19	74.00	30.81	PK	100	20	PASS
2502.22	Vertical	29.97	13.30	43.27	74.00	30.73	PK	100	20	PASS
2504.43	Vertical	29.98	1.93	31.91	54.00	22.09	AV	100	10	PASS
2516.03	Vertical	30.03	1.93	31.96	54.00	22.04	AV	100	10	PASS
2483.50	Vertical	29.91	1.08	30.99	54.00	23.01	AV	100	10	PASS



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5.3 Peak Power Output -Conducted

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

During the process of the testing, The EUT was connected to the spectrum analyzer and Bluetooth test set via a power splitter with a known loss. The EUT is controlled by the Bluetooth test set to ensure max power transmission with proper modulation. The peak detector is used.

Limits:

Rule Part 15.247 (b) (1) specifies that " For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts."

Peak Output Power	$\leq 0.125\text{W}$ (21dBm)
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Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 0.44$ dB.

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Test Results:

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	2402	16.31	<=30	PASS
	Ant2	2402	14.08	<=30	PASS
	Ant1	2441	16.47	<=30	PASS
	Ant2	2441	14.17	<=30	PASS
	Ant1	2480	16.05	<=30	PASS
	Ant2	2480	14.12	<=30	PASS
2DH5	Ant1	2402	16.11	<=20.97	PASS
	Ant2	2402	13.84	<=20.97	PASS
	Ant1	2441	16.32	<=20.97	PASS
	Ant2	2441	13.99	<=20.97	PASS
	Ant1	2480	15.92	<=20.97	PASS
	Ant2	2480	13.96	<=20.97	PASS
3DH5	Ant1	2402	16.39	<=20.97	PASS
	Ant2	2402	14.09	<=20.97	PASS
	Ant1	2441	16.56	<=20.97	PASS
	Ant2	2441	14.16	<=20.97	PASS
	Ant1	2480	16.03	<=20.97	PASS
	Ant2	2480	14.06	<=20.97	PASS

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5.4 20dB Emission Bandwidth

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable. RBW is set to 20 kHz; VBW is set to 100 kHz on spectrum analyzer.

Detector=Peak, Trace mode=Max hold.

Limits:

No specific occupied bandwidth requirements in part 15.247(a) (1).

Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 936$ Hz.

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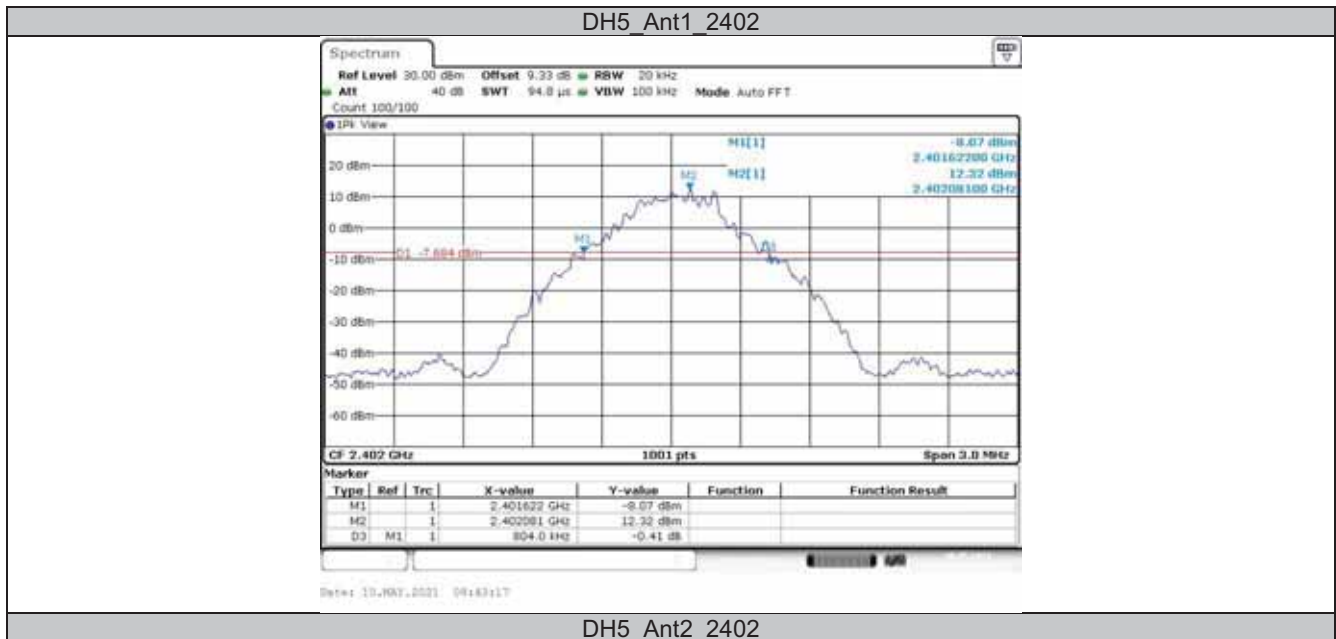
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Test Results:

TestMode	Antenna	Channel	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.804	2401.622	2402.426	---	PASS
	Ant2	2402	0.804	2401.622	2402.426	---	PASS
	Ant1	2441	0.804	2440.622	2441.426	---	PASS
	Ant2	2441	0.804	2440.622	2441.426	---	PASS
	Ant1	2480	0.804	2479.622	2480.426	---	PASS
	Ant2	2480	0.804	2479.622	2480.426	---	PASS
2DH5	Ant1	2402	1.209	2401.421	2402.630	---	PASS
	Ant2	2402	1.209	2401.421	2402.630	---	PASS
	Ant1	2441	1.209	2440.421	2441.630	---	PASS
	Ant2	2441	1.209	2440.421	2441.630	---	PASS
	Ant1	2480	1.209	2479.421	2480.630	---	PASS
	Ant2	2480	1.209	2479.421	2480.630	---	PASS
3DH5	Ant1	2402	1.263	2401.382	2402.645	---	PASS
	Ant2	2402	1.245	2401.391	2402.636	---	PASS
	Ant1	2441	1.245	2440.391	2441.636	---	PASS
	Ant2	2441	1.245	2440.391	2441.636	---	PASS
	Ant1	2480	1.242	2479.394	2480.636	---	PASS
	Ant2	2480	1.242	2479.394	2480.636	---	PASS

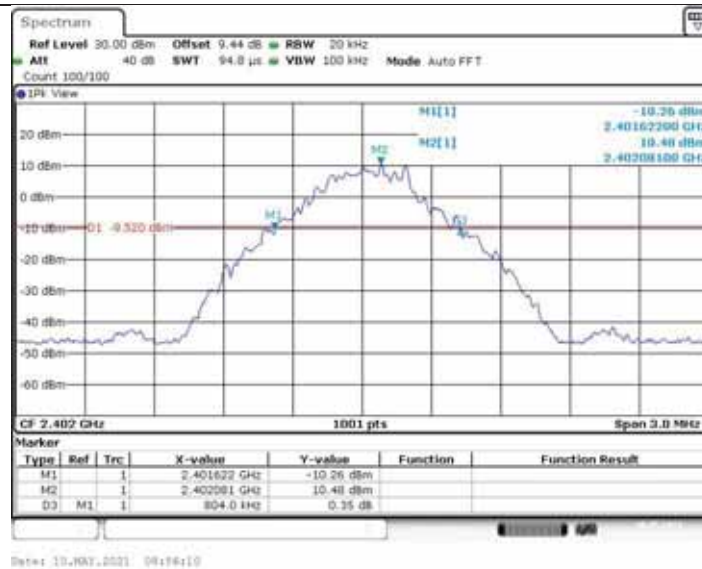
Test Graphs



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DH5_Ant1_2441

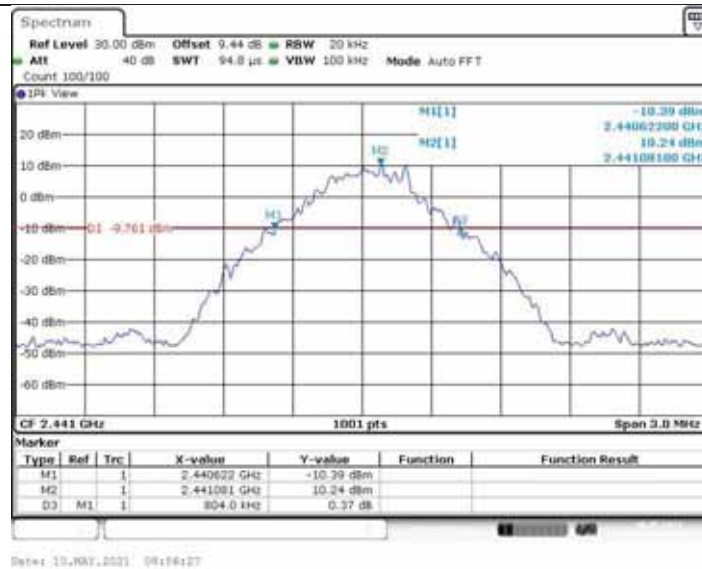


DH5_Ant2_2441

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DH5_Ant1_2480

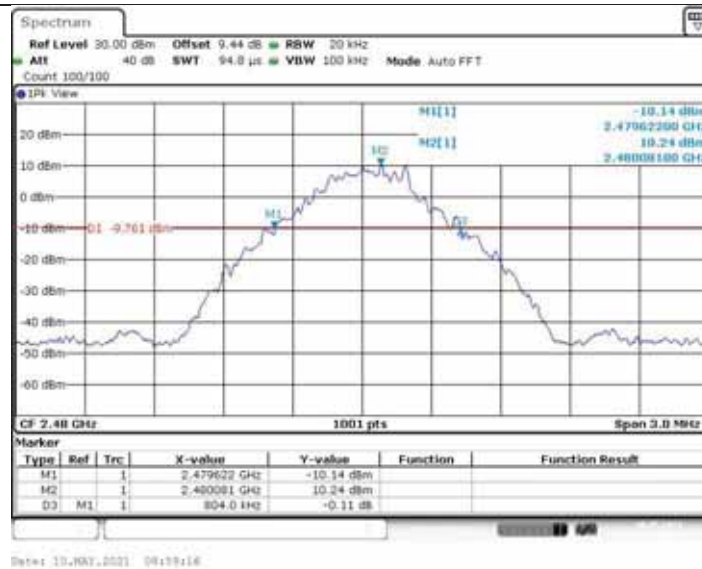


DH5_Ant2_2480

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2DH5_Ant1_2402



2DH5_Ant2_2402

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2DH5_Ant1_2441



2DH5_Ant2_2441

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2DH5_Ant1_2480



2DH5_Ant2_2480

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3DH5_Ant1_2402



3DH5_Ant2_2402

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3DH5_Ant1_2441



3DH5_Ant2_2441

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3DH5_Ant1_2480



3DH5_Ant2_2480

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5.5 Occupied Channel Bandwidth

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable. RBW is set to 20 kHz; VBW is set to 100 kHz on spectrum analyzer.

Detector=Peak, Trace mode=Max hold.

Limits:

No specific occupied bandwidth requirements in part 15.247(a) (1).

Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 936$ Hz.

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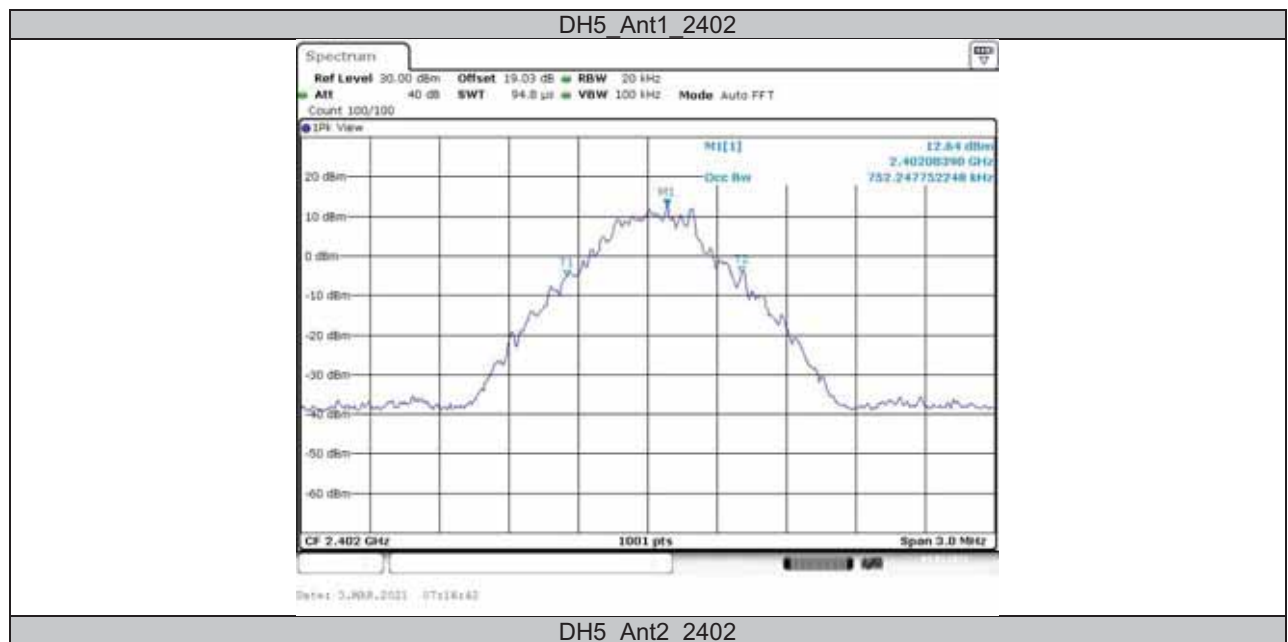
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Test Results:

TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.752	2401.652	2402.405	---	PASS
	Ant2	2402	0.749	2401.652	2402.402	---	PASS
	Ant1	2441	0.752	2440.652	2441.405	---	PASS
	Ant2	2441	0.752	2440.649	2441.402	---	PASS
	Ant1	2480	0.752	2479.652	2480.405	---	PASS
	Ant2	2480	0.752	2479.649	2480.402	---	PASS
2DH5	Ant1	2402	1.142	2401.452	2402.593	---	PASS
	Ant2	2402	1.142	2401.449	2402.590	---	PASS
	Ant1	2441	1.142	2440.452	2441.593	---	PASS
	Ant2	2441	1.142	2440.449	2441.590	---	PASS
	Ant1	2480	1.142	2479.452	2480.593	---	PASS
	Ant2	2480	1.142	2479.449	2480.590	---	PASS
3DH5	Ant1	2402	1.145	2401.455	2402.599	---	PASS
	Ant2	2402	1.142	2401.455	2402.596	---	PASS
	Ant1	2441	1.142	2440.458	2441.599	---	PASS
	Ant2	2441	1.142	2440.455	2441.596	---	PASS
	Ant1	2480	1.142	2479.458	2480.599	---	PASS
	Ant2	2480	1.142	2479.455	2480.596	---	PASS

Test Graphs



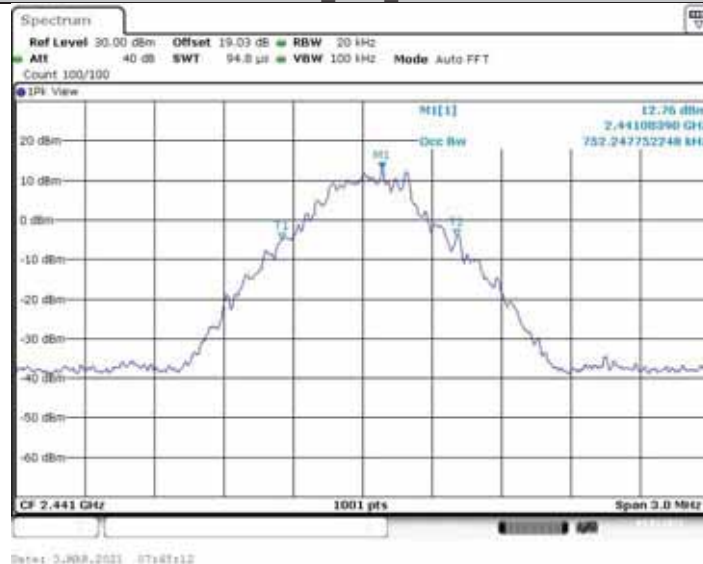
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DH5 Ant1 2441



DH5 Ant2 2441



DH5 Ant1 2480

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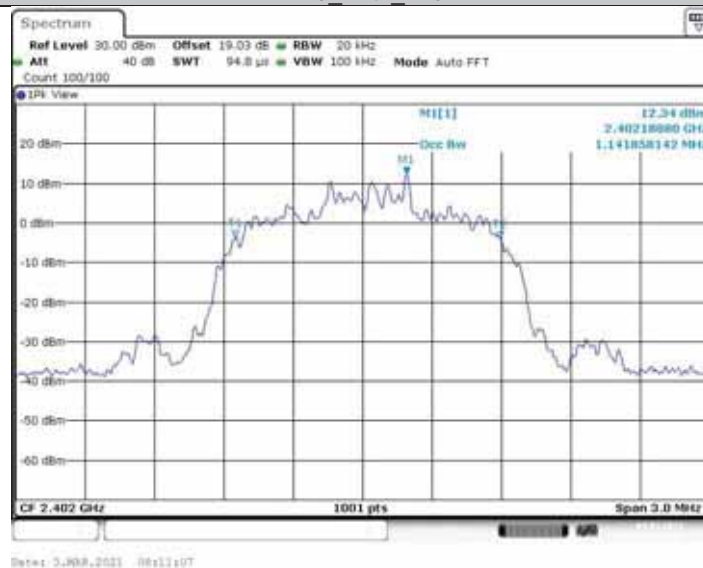
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DH5_Ant2_2480



2DH5_Ant1_2402



2DH5_Ant2_2402

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2DH5_Ant1_2441



2DH5_Ant2_2441

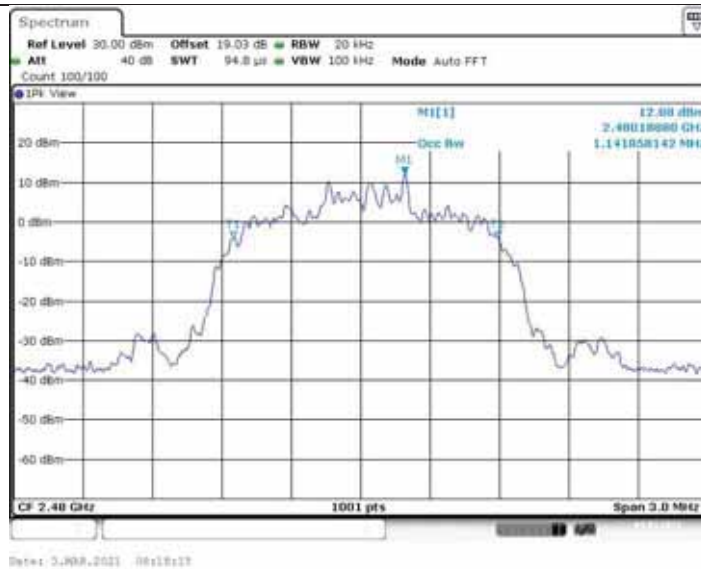


2DH5_Ant1_2480

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2DH5_Ant2_2480



3DH5_Ant1_2402



3DH5_Ant2_2402

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3DH5_Ant1_2441



3DH5_Ant2_2441



3DH5_Ant1_2480

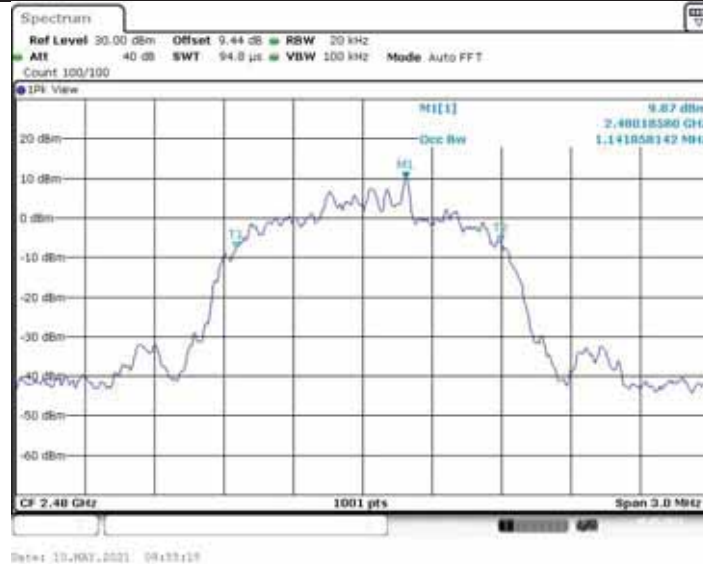
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3DH5_Ant2_2480



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5.6 Frequency Separation

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable the band edge of the lowest and highest channels were measured. The peak detector is used and RBW is set to 100 kHz and VBW is set to 300 kHz on spectrum analyzer.

Limits:

Rule Part 15.247(a)(1) specifies that "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, whichever is greater, provided the systems operate with an output power no greater than 125 mW. "

Note: The value of two-thirds of 20 dB bandwidth is always greater than 25 kHz.

Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U=936$ Hz.

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Test Results:

TestMode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Hop	1.003	≥ 0.990	PASS
	Ant2	Hop	0.846	≥ 0.804	PASS
2DH5	Ant1	Hop	1.136	≥ 0.878	PASS
	Ant2	Hop	1.31	≥ 1.209	PASS
3DH5	Ant1	Hop	1.003	≥ 0.896	PASS
	Ant2	Hop	1	≥ 0.842	PASS

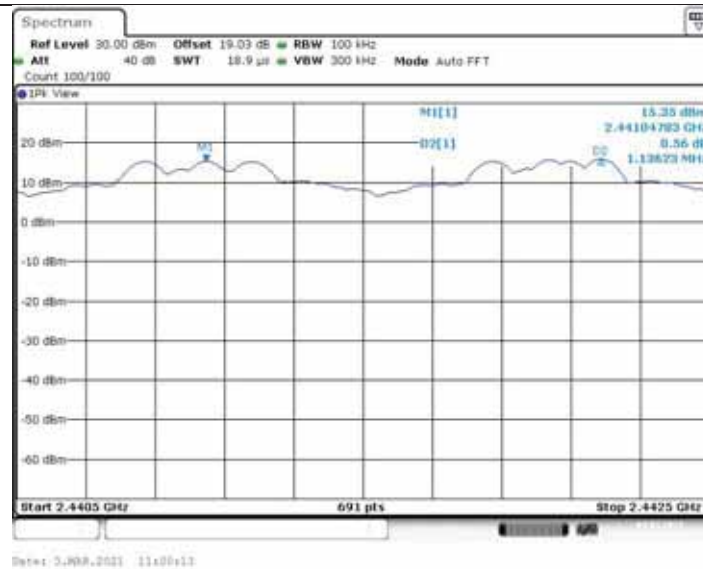
Test Graphs



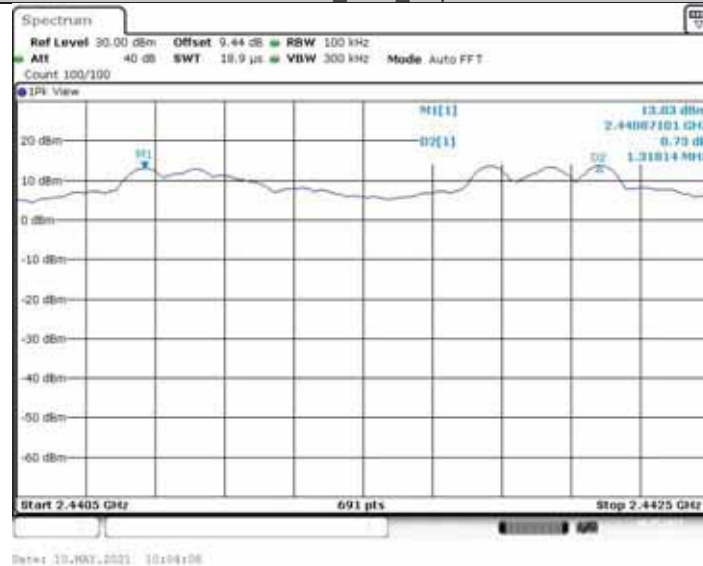
CVC Testing Technology Co., Ltd.

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2DH5_Ant2_Hop

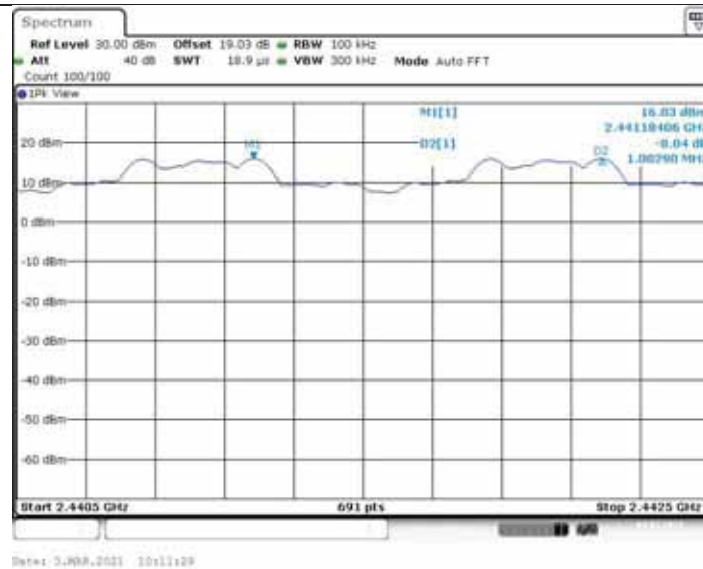


3DH5_Ant1_Hop

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3DH5_Ant2_Hop



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5.7 Time of Occupancy (Dwell Time)

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

The EUT was connected to the spectrum analyzer and Bluetooth test set via a power splitter with a known loss. RBW is set to 1MHz and VBW is set to 3MHz on spectrum analyzer. The dwell time is calculated by:

Dwell time = time slot length * hop rate * 0.4s with:

The selected EUT Packet type uses a slot type of 5-Tx&1-Rx and a hopping rate of 1600(ch*hop/s) for all channels. So the final hopping rate for all channel is $1600/6=266.67(\text{ch*hop/s})$

Limits:

Rule Part15.247(a) specifies that " Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. 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."

Dwell time	$\leq 400\text{ms}$
------------	---------------------

Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$.

Requirements	Uncertainty					
Dwell Time	DH5	U=0.70ms	2DH5	U=0.70ms	3DH5	U=0.70ms

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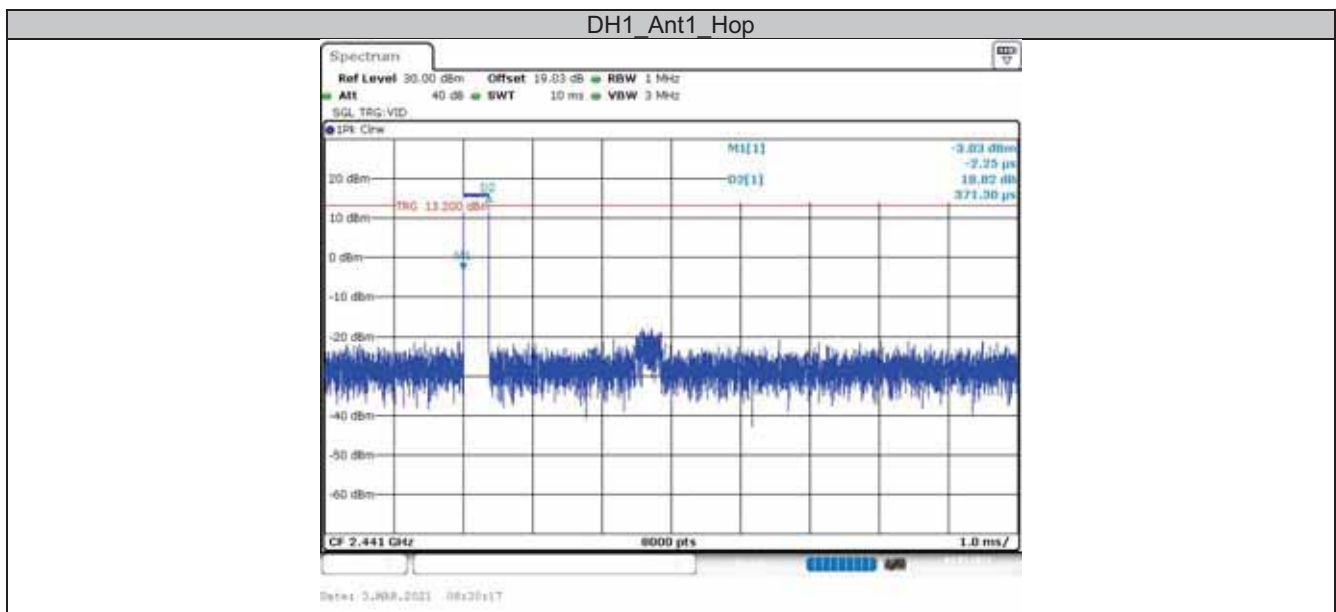
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Test Results:

TestMode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.37	320	0.119	<=0.4	PASS
	Ant2	Hop	0.37	320	0.119	<=0.4	PASS
DH3	Ant1	Hop	1.62	200	0.324	<=0.4	PASS
	Ant2	Hop	1.62	160	0.259	<=0.4	PASS
DH5	Ant1	Hop	2.86	60	0.172	<=0.4	PASS
	Ant2	Hop	2.86	90	0.257	<=0.4	PASS
2DH1	Ant1	Hop	0.38	310	0.118	<=0.4	PASS
	Ant2	Hop	0.38	320	0.121	<=0.4	PASS
2DH3	Ant1	Hop	1.62	170	0.276	<=0.4	PASS
	Ant2	Hop	1.62	140	0.227	<=0.4	PASS
2DH5	Ant1	Hop	2.86	100	0.286	<=0.4	PASS
	Ant2	Hop	2.86	40	0.115	<=0.4	PASS
3DH1	Ant1	Hop	0.38	330	0.125	<=0.4	PASS
	Ant2	Hop	0.38	310	0.117	<=0.4	PASS
3DH3	Ant1	Hop	1.62	170	0.276	<=0.4	PASS
	Ant2	Hop	1.62	160	0.26	<=0.4	PASS
3DH5	Ant1	Hop	2.87	80	0.229	<=0.4	PASS
	Ant2	Hop	2.87	60	0.172	<=0.4	PASS

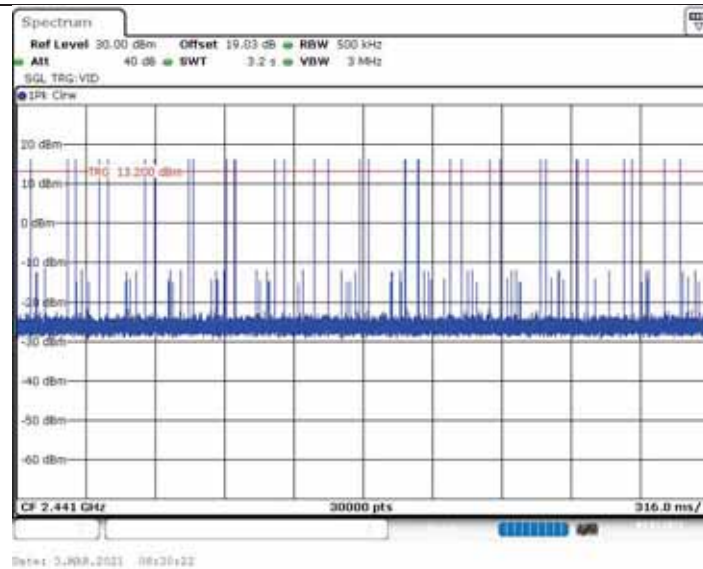
Test Graphs:



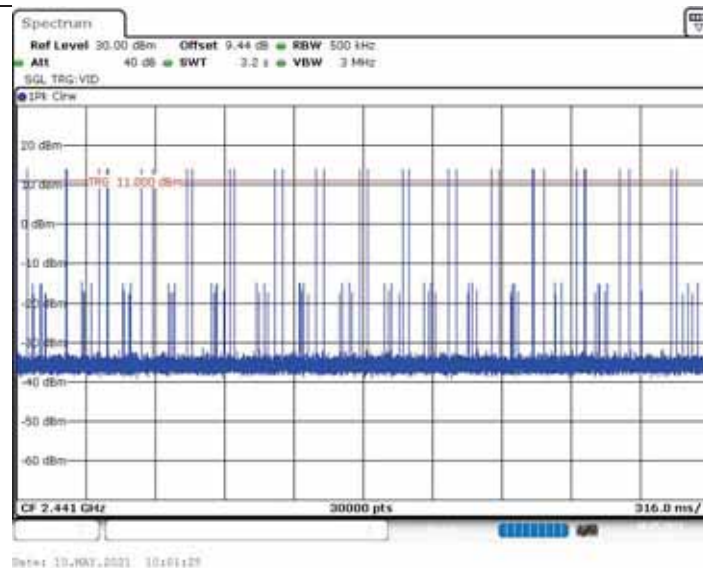
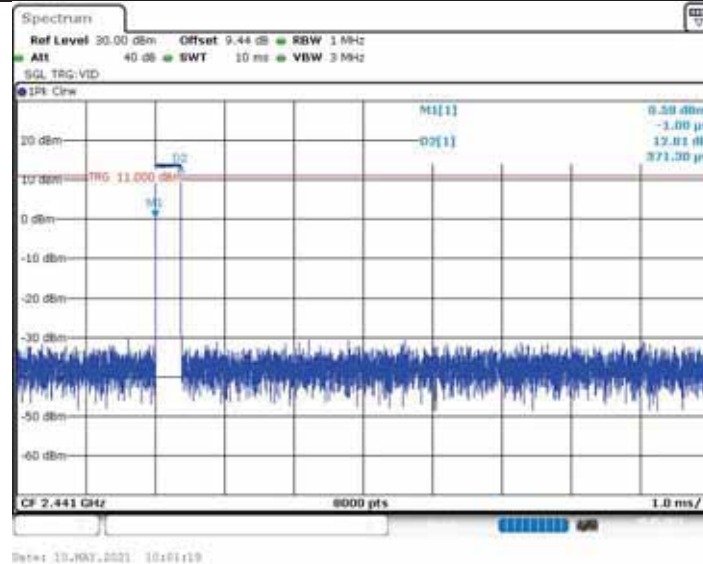
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DH1_Ant2_Hop

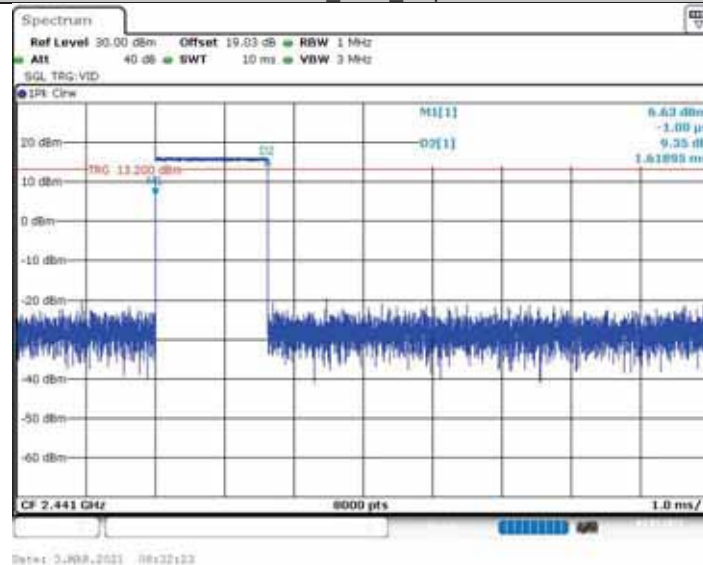


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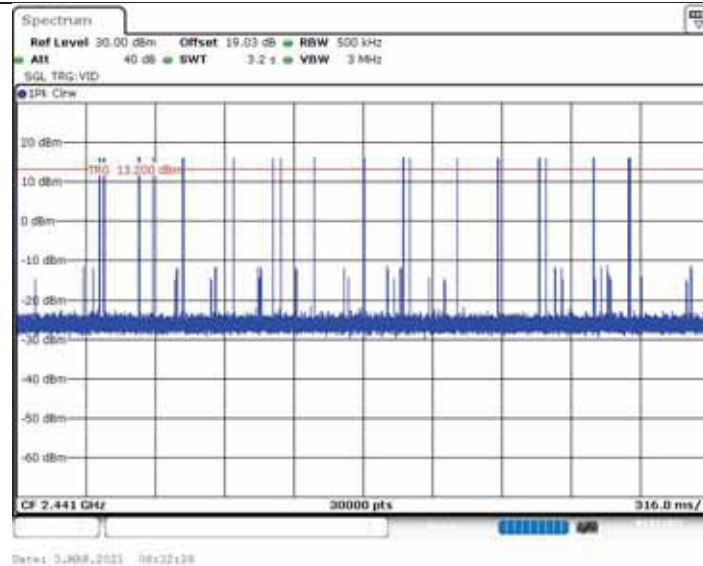
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DH3_Ant1_Hop



Date: 3, APR, 2021 08:22:23



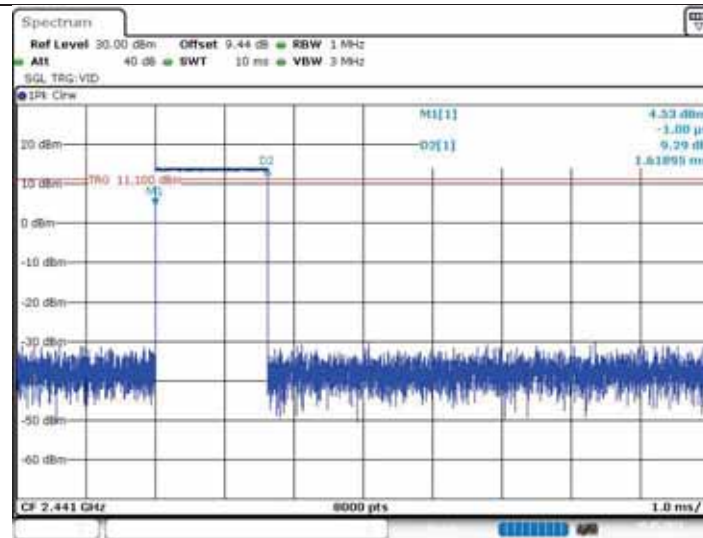
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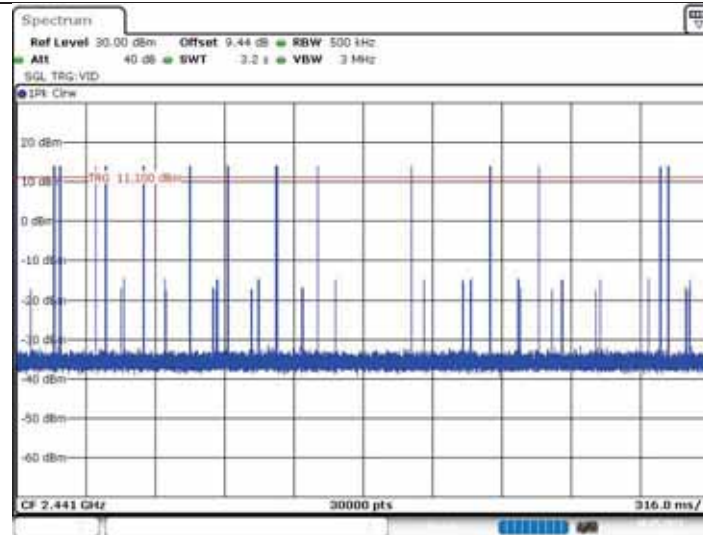
CVC Testing Technology Co., Ltd.

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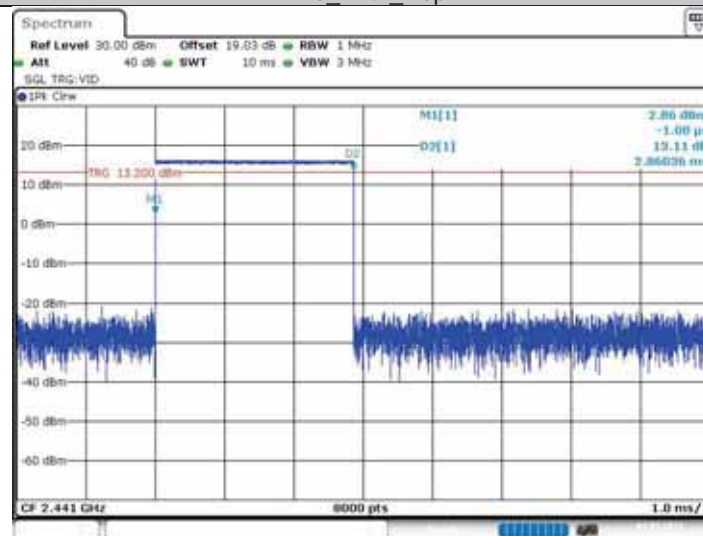


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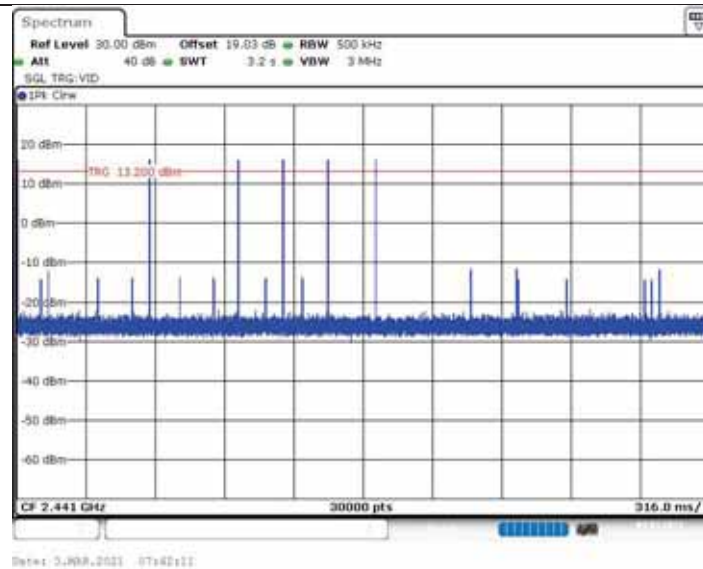


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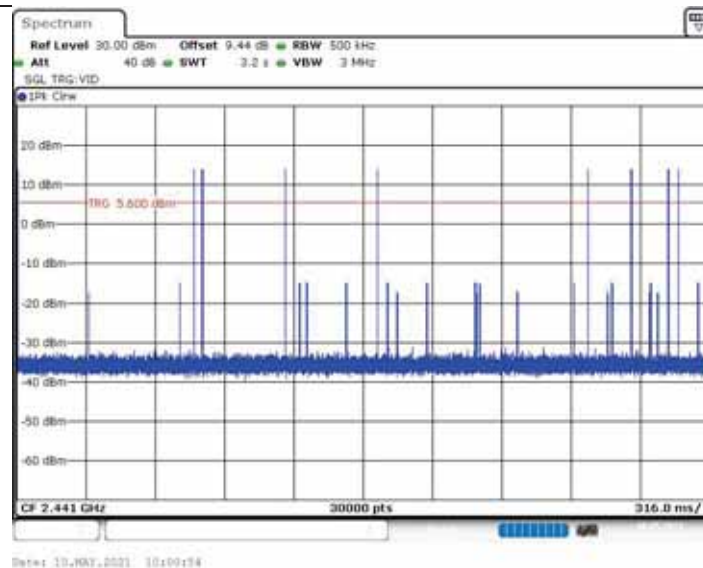
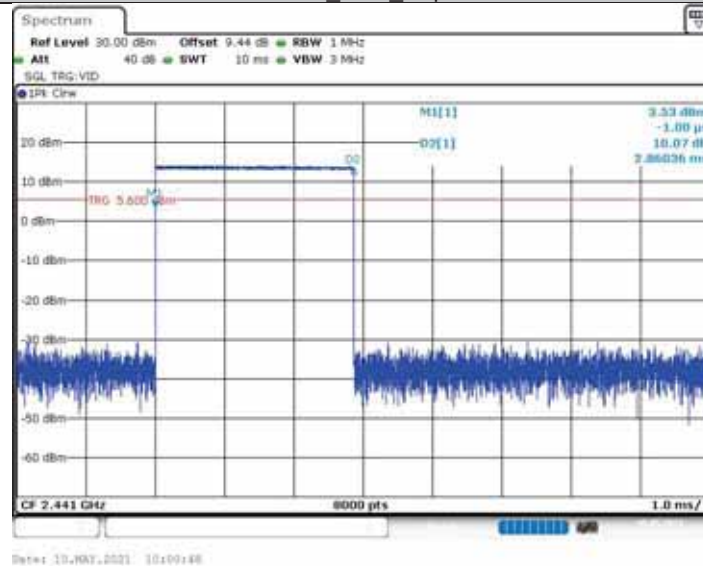
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DH5_Ant2_Hop

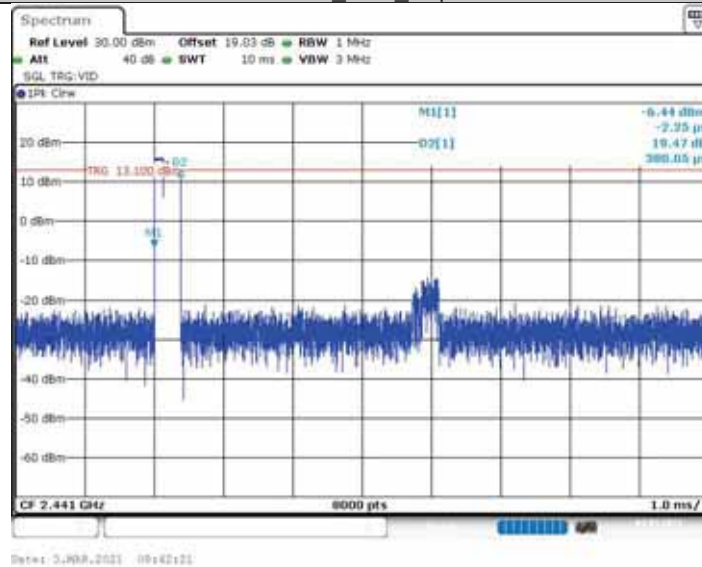


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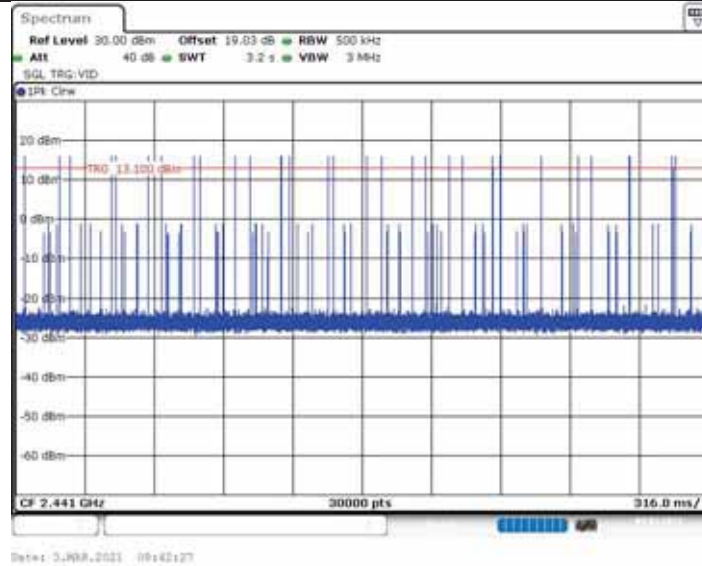
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2DH1_Ant1_Hop



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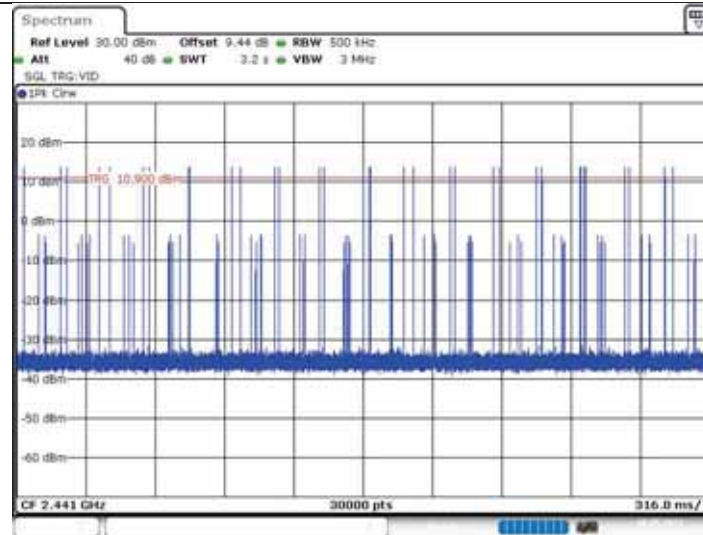
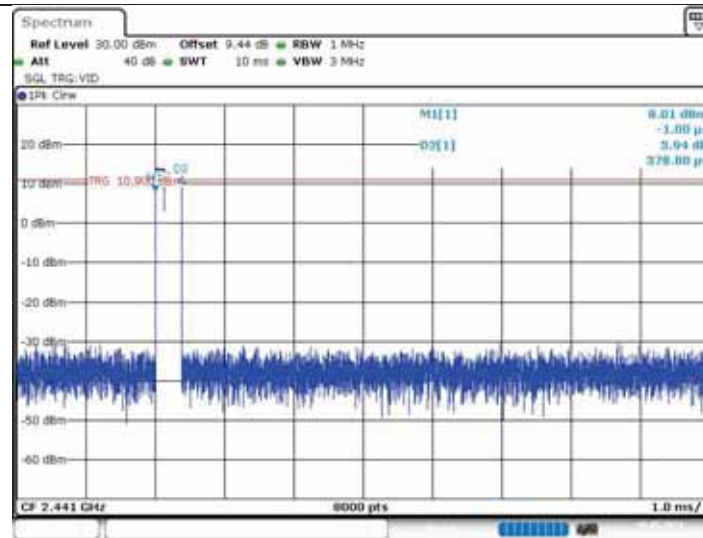
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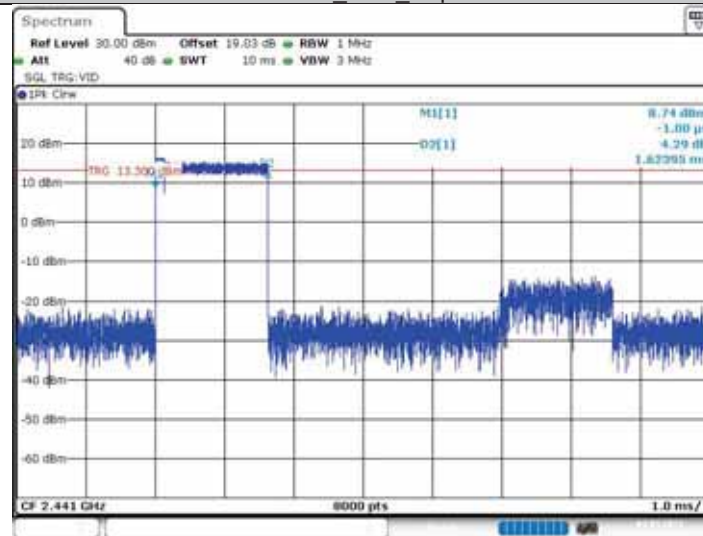
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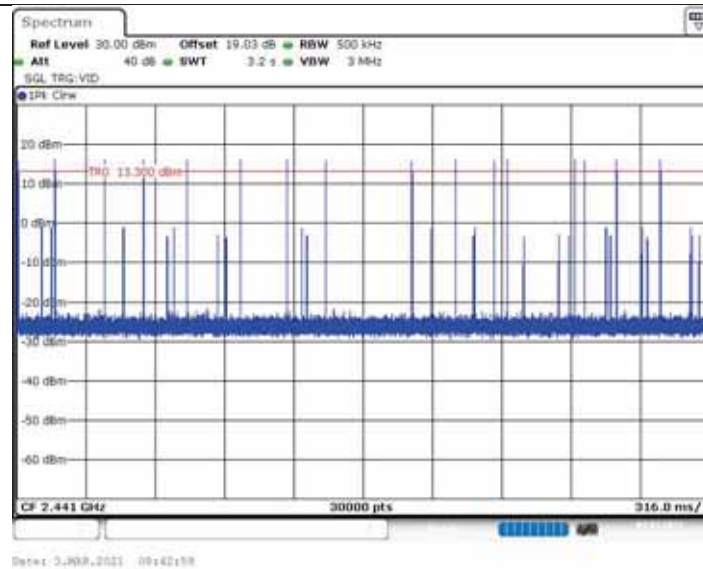
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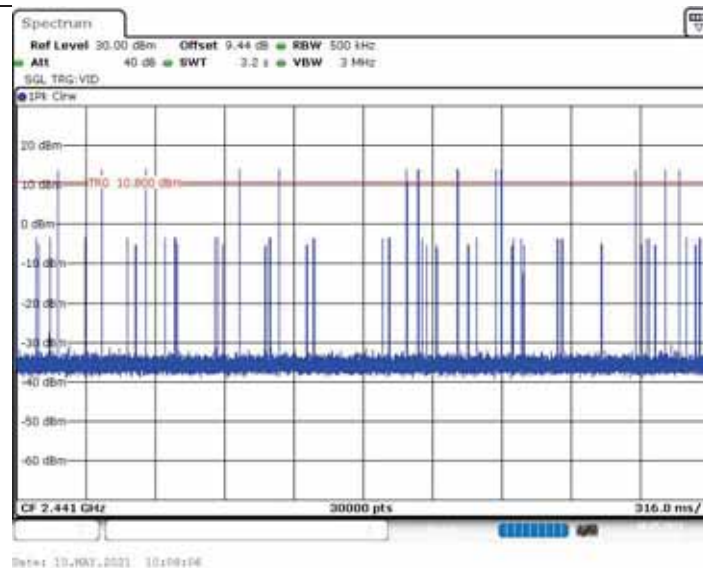
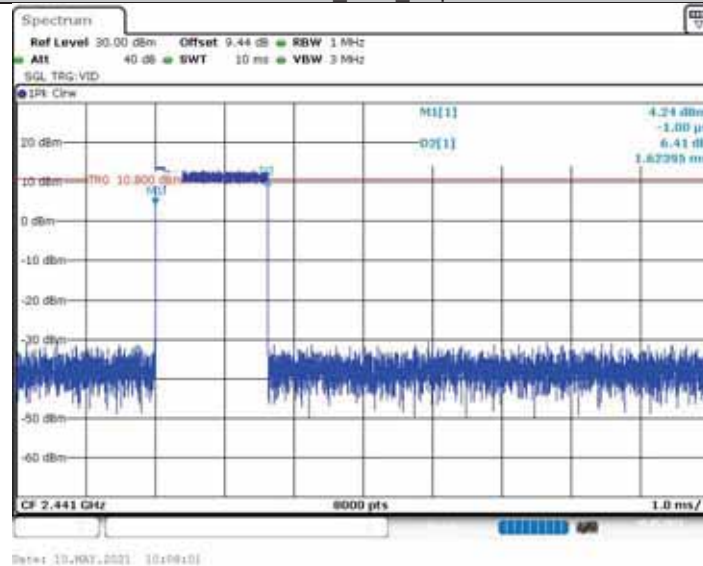
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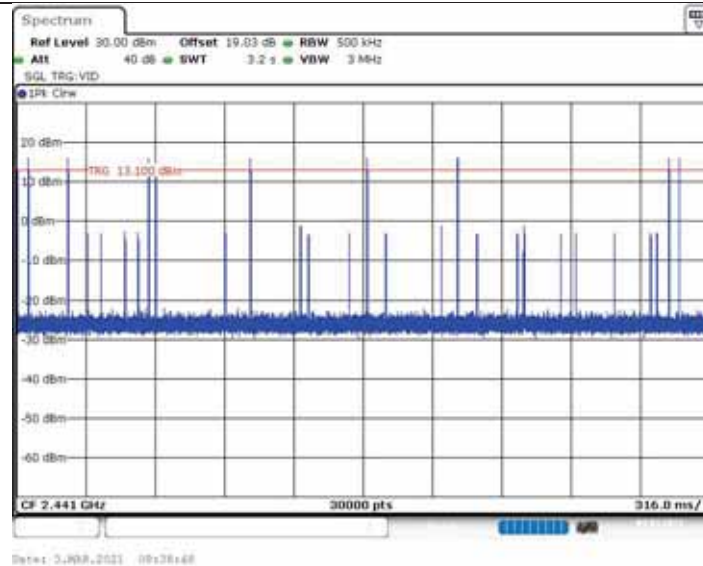
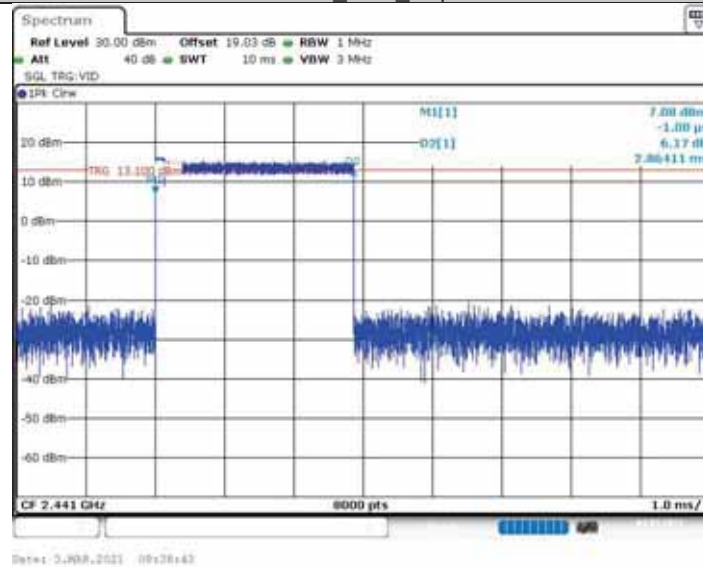


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2DH5_Ant1_Hop

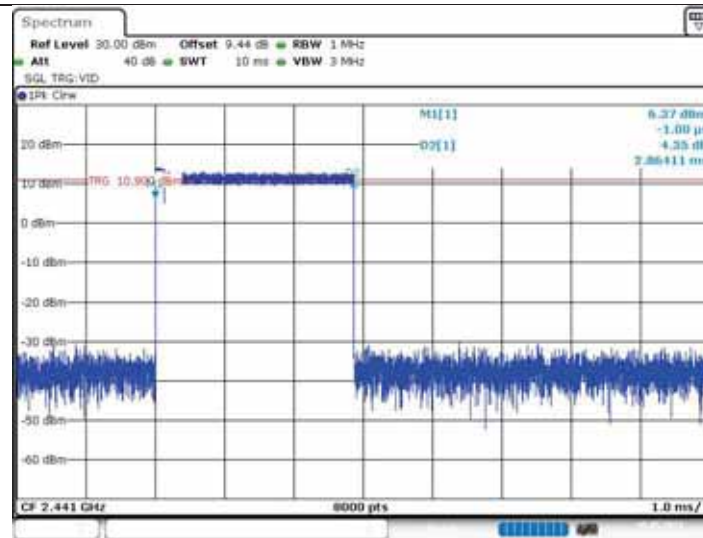


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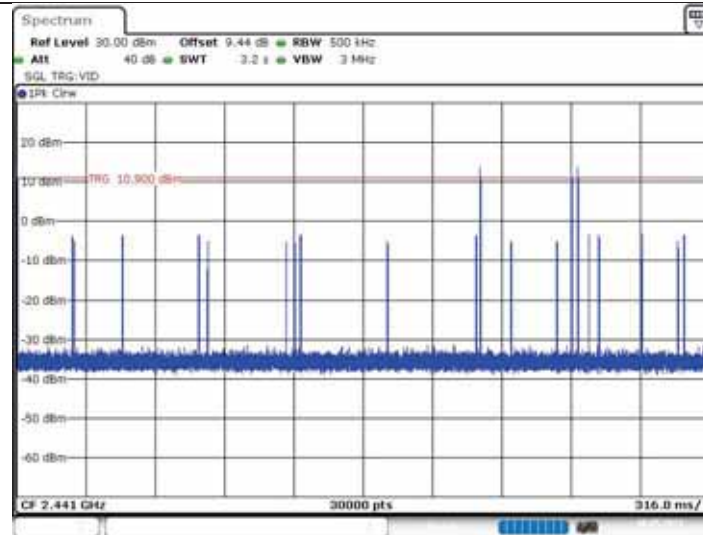
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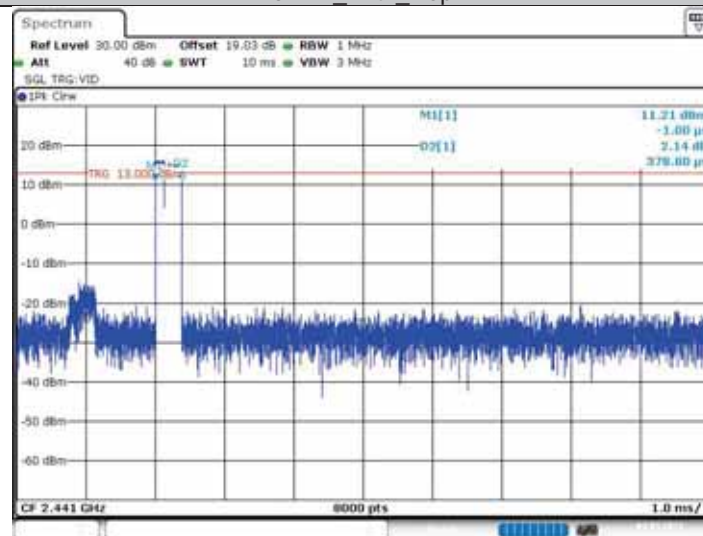


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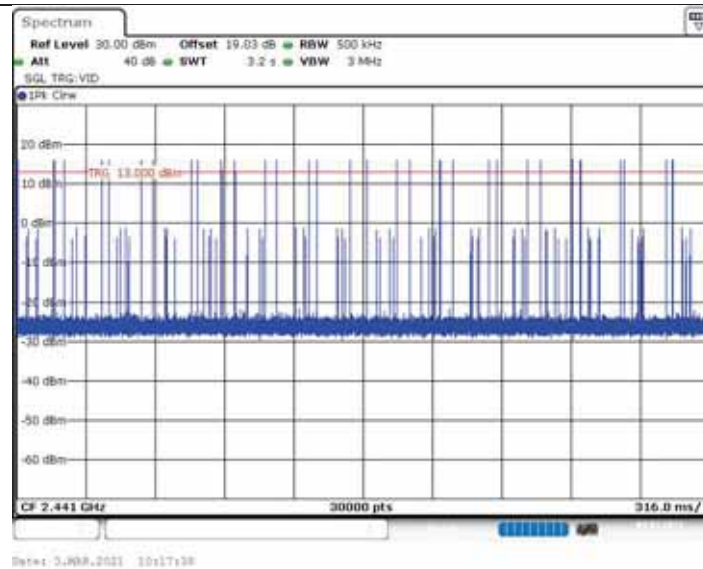


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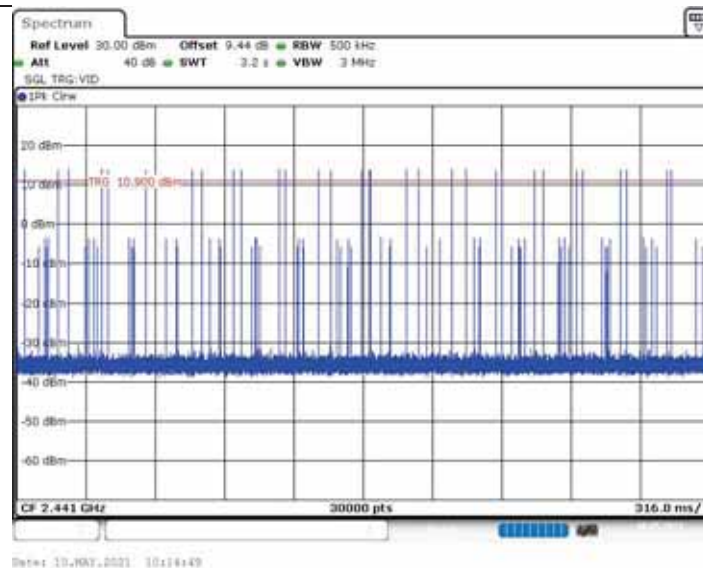
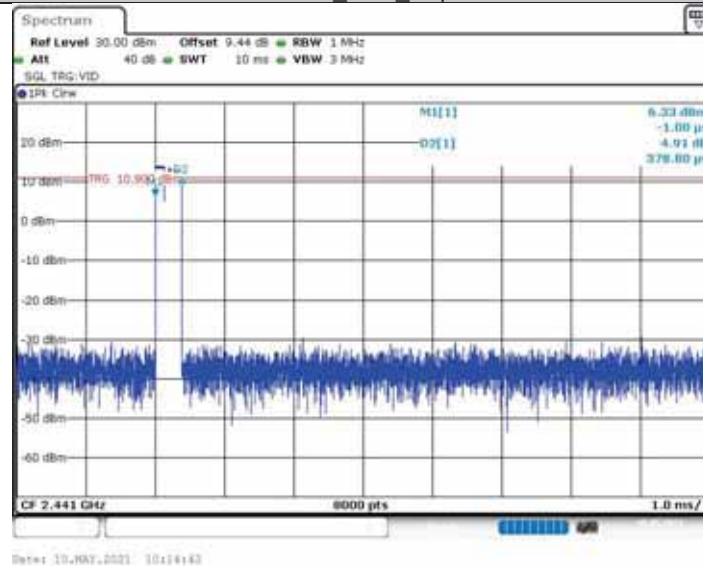
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3DH1_Ant2_Hop

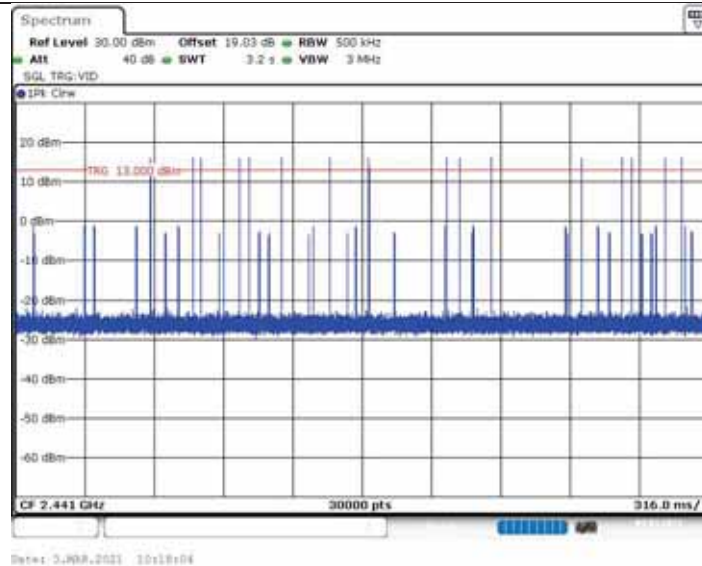
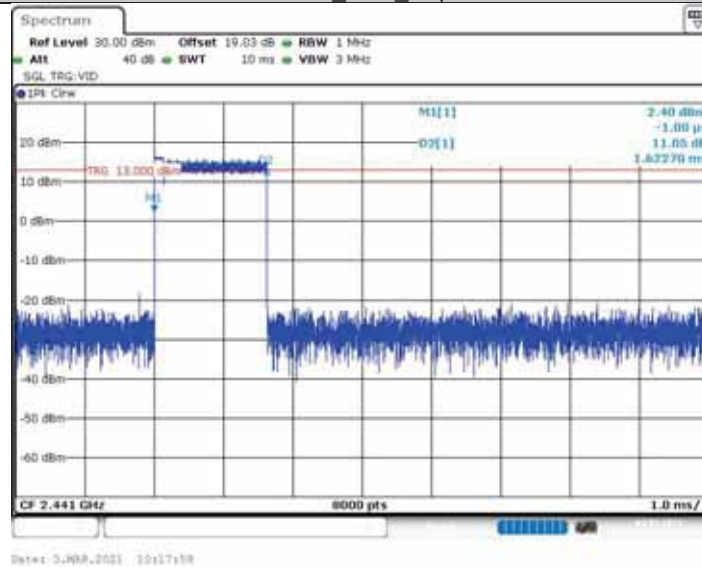


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3DH3_Ant1_Hop

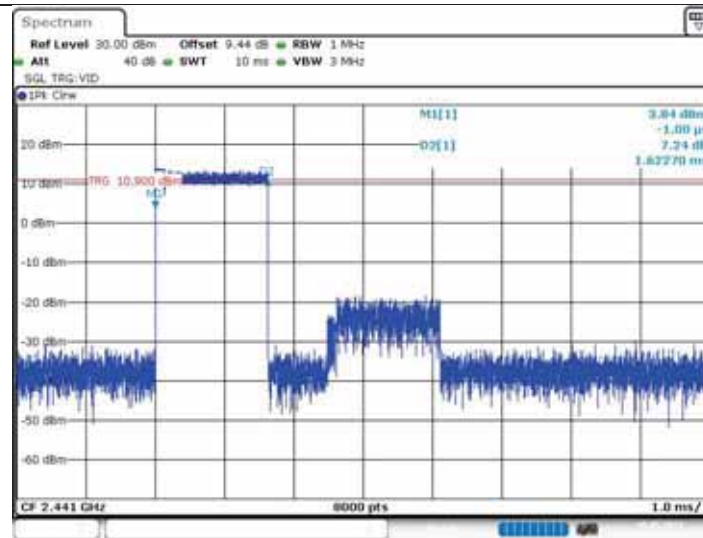


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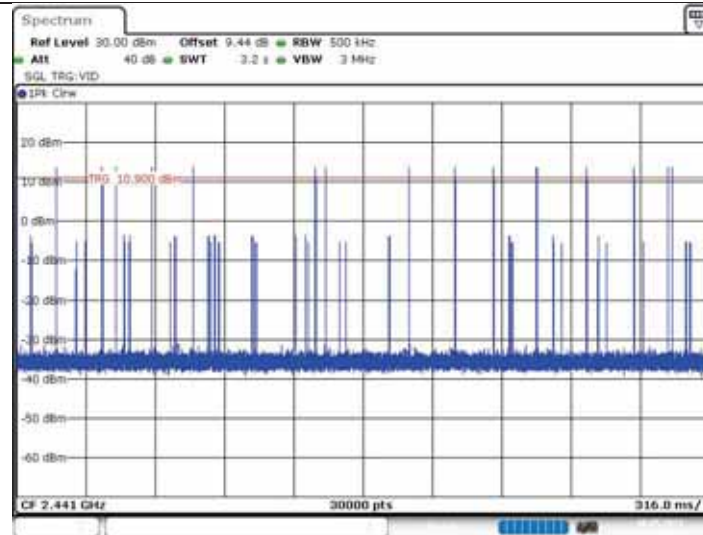
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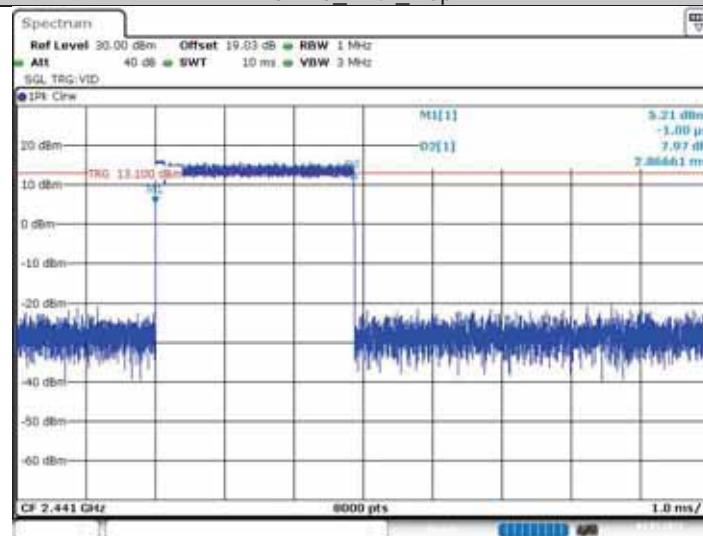


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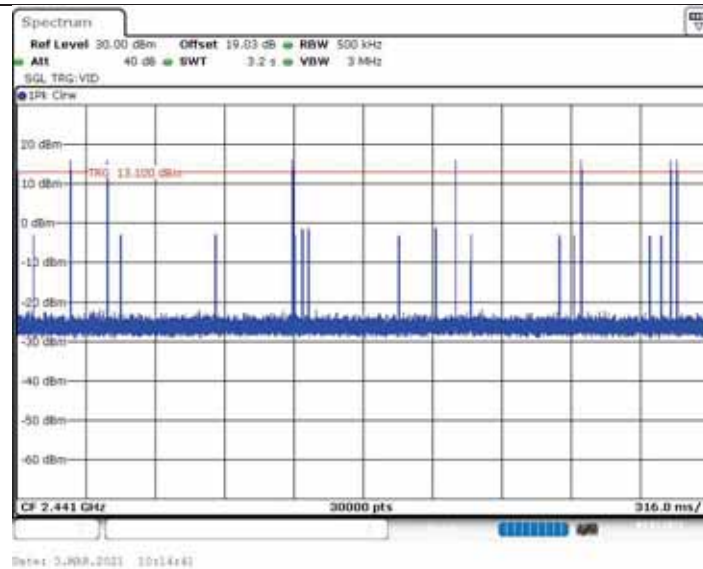


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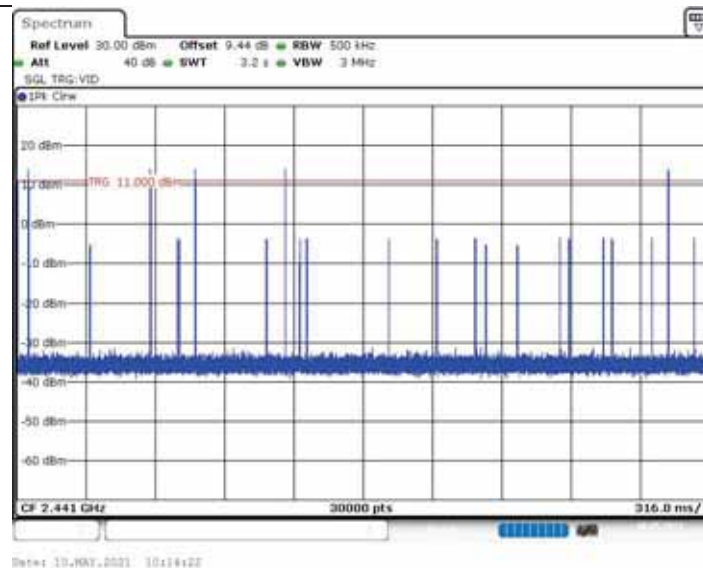
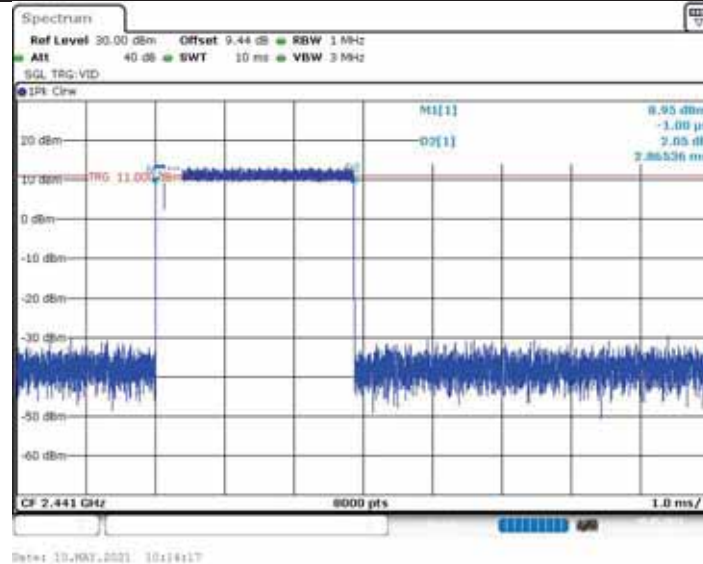
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5.8 Band Edge Measurement

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable the band edge of the lowest and highest channels were measured. The peak detector is used and RBW is set to 100 kHz and VBW is set to 300 kHz on spectrum analyzer.

Limits:

Rule Part 15.247(d) specifies that "In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$, $U = 936 \text{ Hz}$, $2 \text{ GHz} - 3 \text{ GHz} = 1.407 \text{ dB}$.

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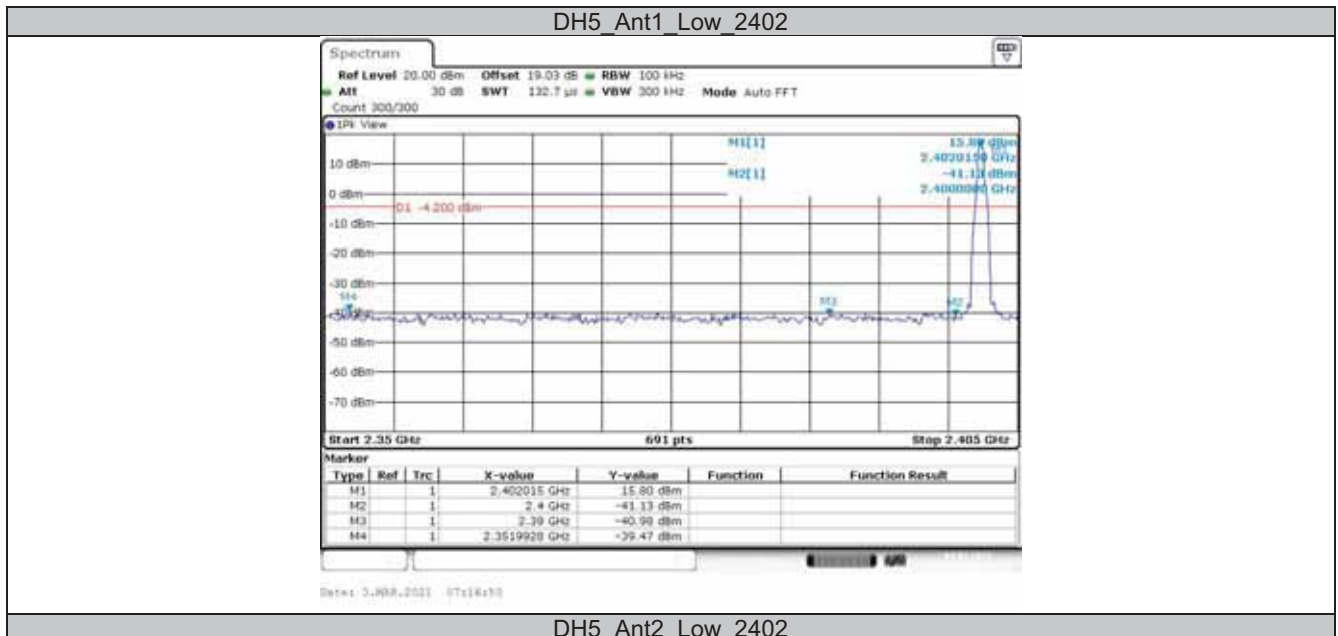
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Test Result:

TestMode	Antenna	ChName	Channel	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	15.80	-39.47	<=-4.2	PASS
	Ant2	Low	2402	13.67	-48.73	<=-6.33	PASS
	Ant1	High	2480	15.45	-37.76	<=-4.55	PASS
	Ant2	High	2480	13.45	-47.54	<=-6.55	PASS
	Ant1	Low	Hop 2402	15.42	-39.48	<=-4.58	PASS
	Ant2	Low	Hop 2402	13.41	-48.92	<=-6.59	PASS
	Ant1	High	Hop 2480	15.12	-38.09	<=-4.88	PASS
	Ant2	High	Hop 2480	13.26	-46.96	<=-6.74	PASS
2DH5	Ant1	Low	2402	15.62	-38.74	<=-4.38	PASS
	Ant2	Low	2402	13.48	-45.19	<=-6.52	PASS
	Ant1	High	2480	15.48	-37.98	<=-4.52	PASS
	Ant2	High	2480	13.56	-47.75	<=-6.44	PASS
	Ant1	Low	Hop 2402	12.41	-38.63	<=-7.59	PASS
	Ant2	Low	Hop 2402	10.89	-49.57	<=-9.11	PASS
	Ant1	High	Hop 2480	14.82	-38.31	<=-5.18	PASS
	Ant2	High	Hop 2480	13.49	-47.39	<=-6.51	PASS
3DH5	Ant1	Low	2402	15.87	-39.32	<=-4.13	PASS
	Ant2	Low	2402	13.76	-45.04	<=-6.24	PASS
	Ant1	High	2480	15.54	-37.66	<=-4.46	PASS
	Ant2	High	2480	13.55	-47.38	<=-6.45	PASS
	Ant1	Low	Hop 2402	15.70	-39.15	<=-4.3	PASS
	Ant2	Low	Hop 2402	10.51	-49.36	<=-9.49	PASS
	Ant1	High	Hop 2480	15.06	-38.48	<=-4.94	PASS
	Ant2	High	Hop 2480	13.31	-47.78	<=-6.69	PASS

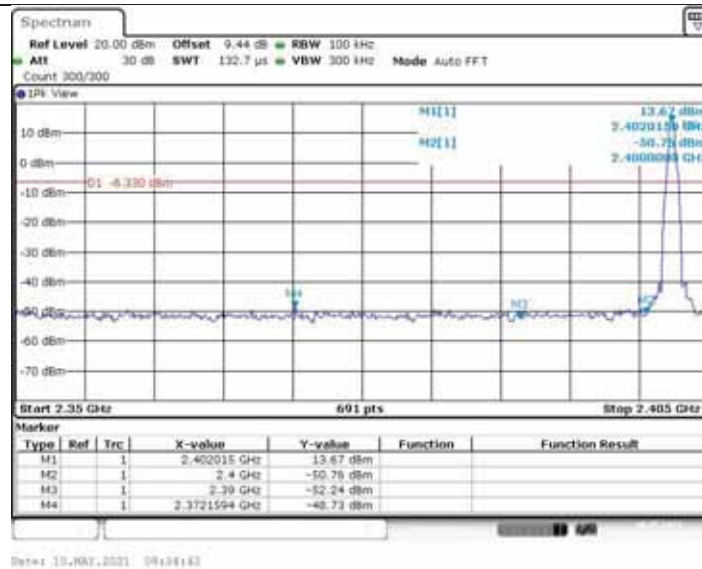
Test Graphs:



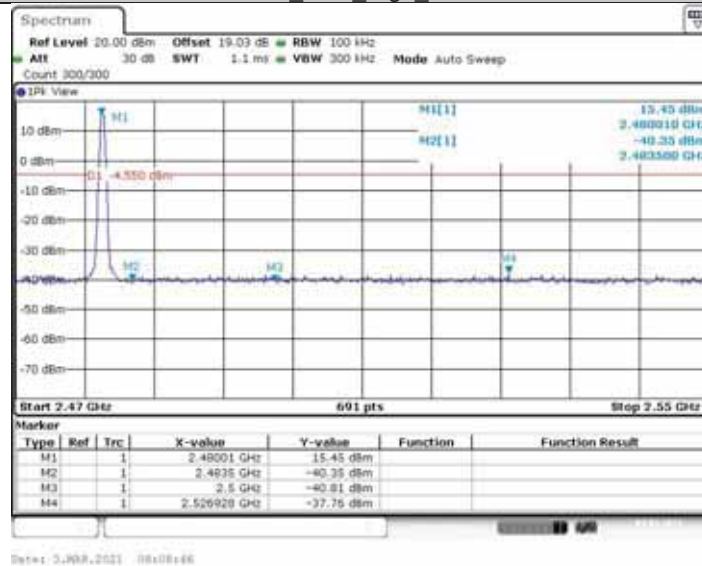
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DH5_Ant1_High_2480

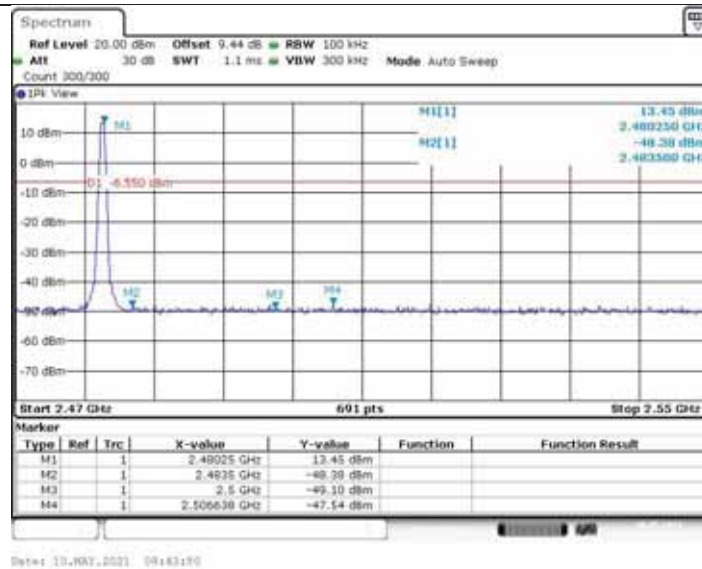


DH5_Ant2_High_2480

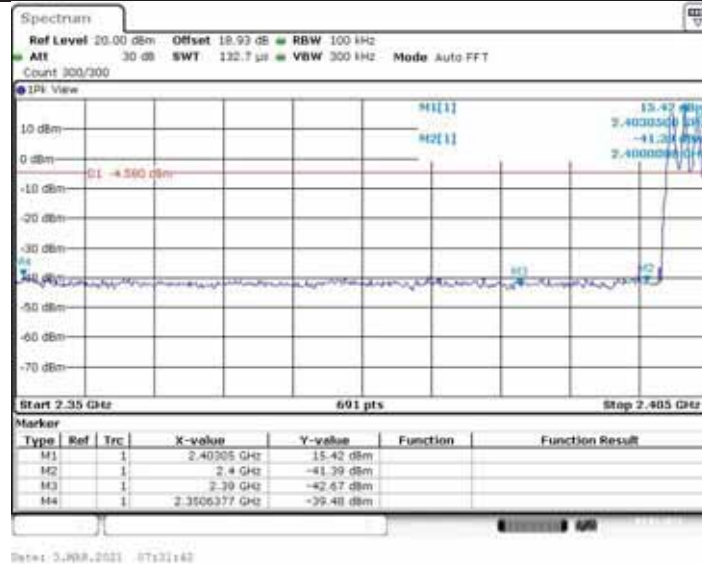
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DH5 Ant1 Low Hop 2402

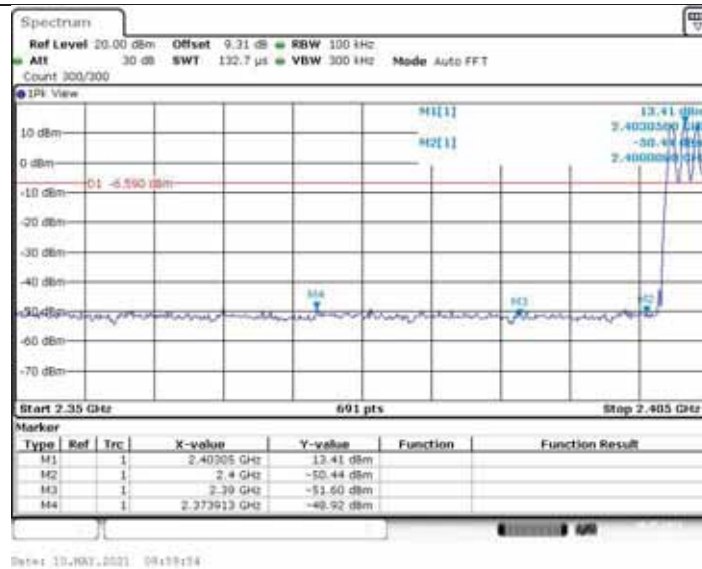


DH5 Ant2 Low Hop 2402

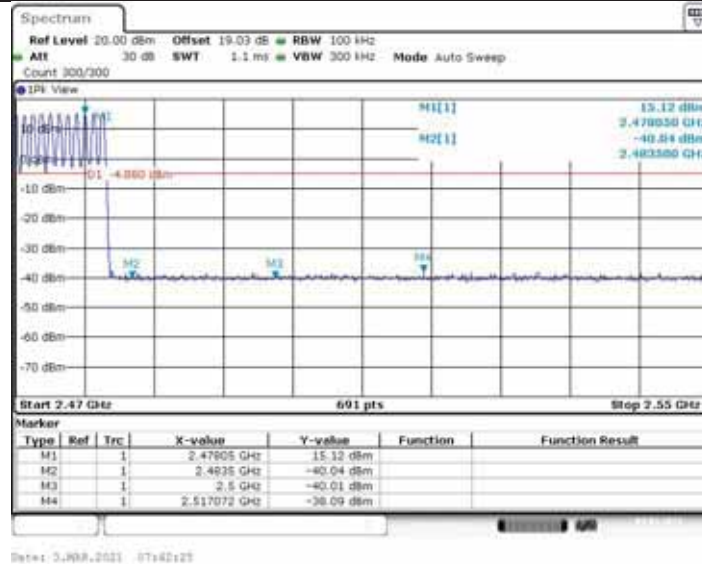
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DH5_Ant1_High_Hop_2480

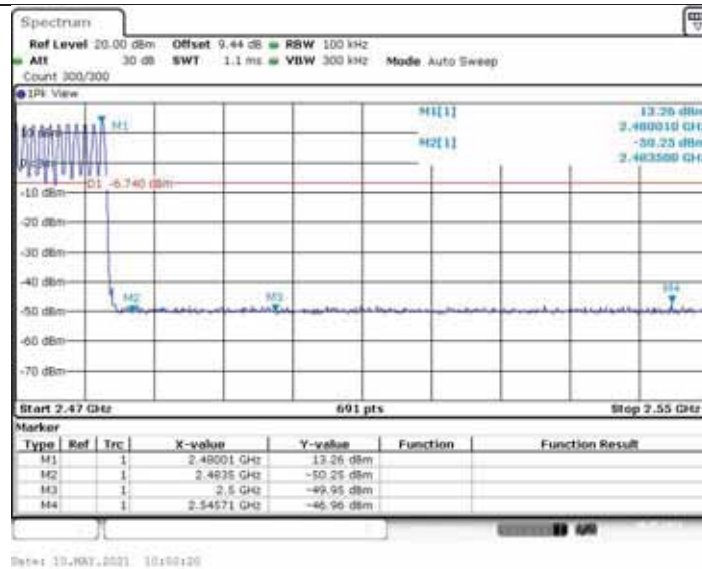


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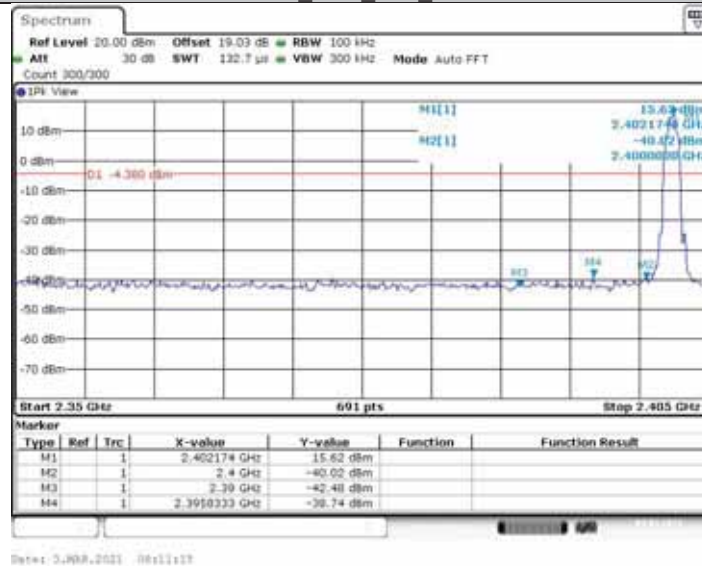
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2DH5_Ant1_Low_2402

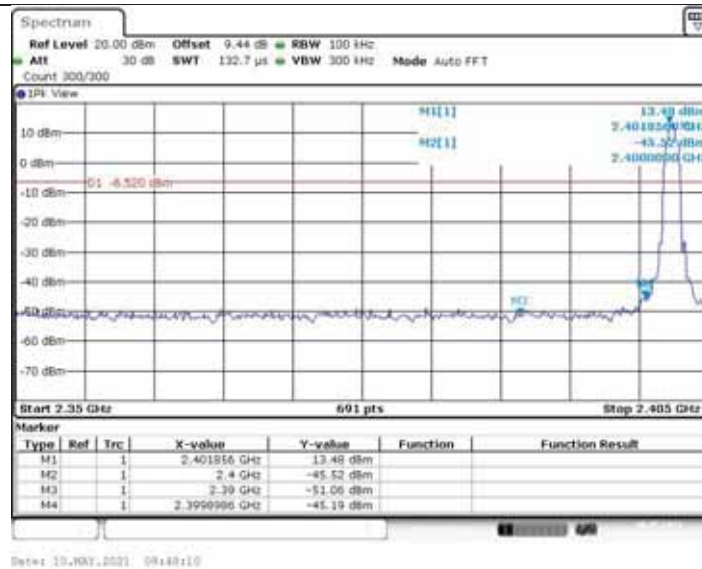


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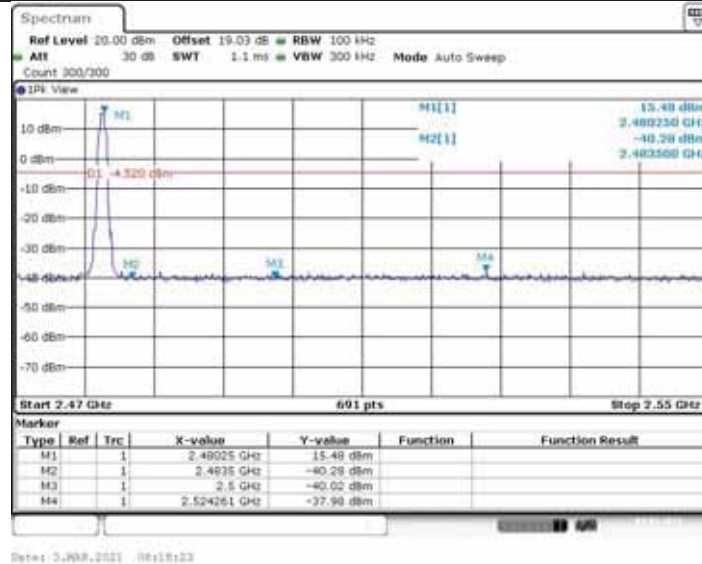
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2DH5_Ant1_High_2480

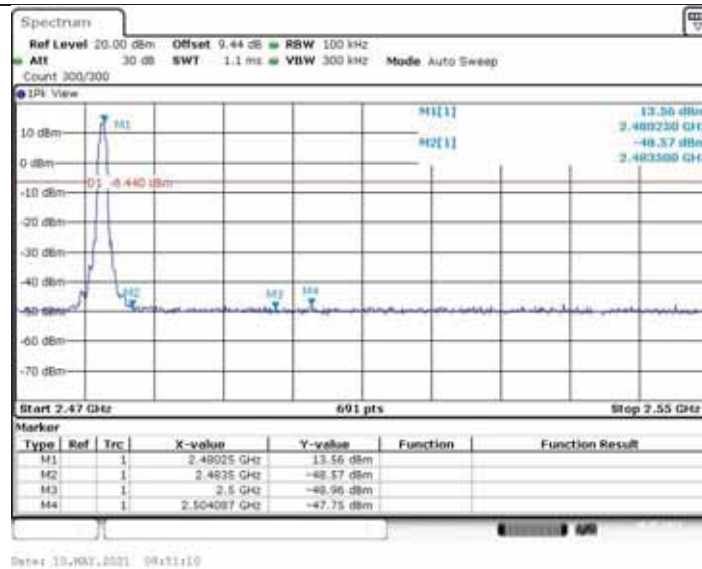


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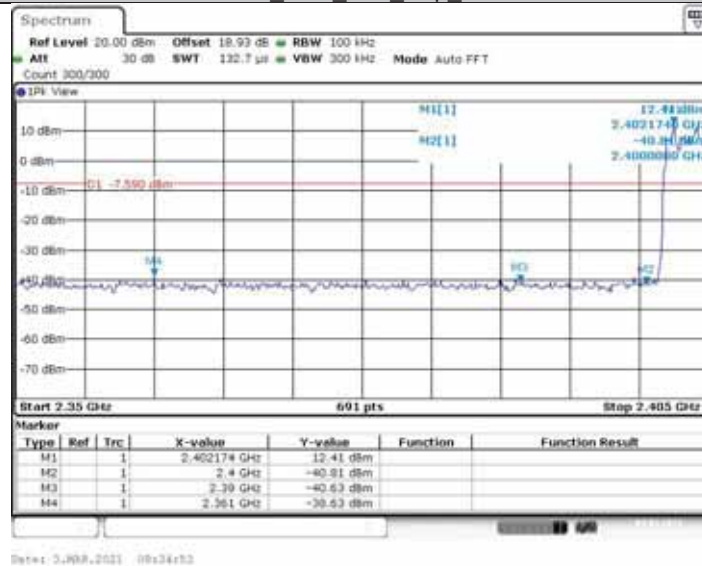
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2DH5_Ant1_Low_Hop_2402

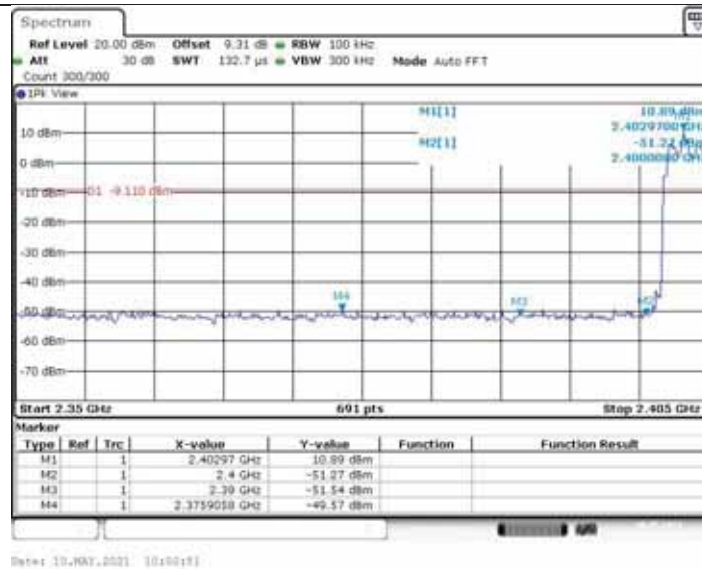


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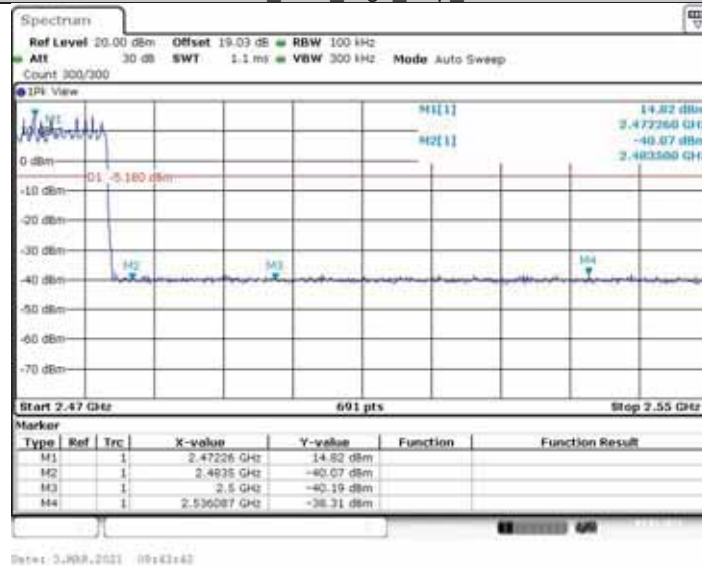
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2DH5_Ant1_High_Hop_2480

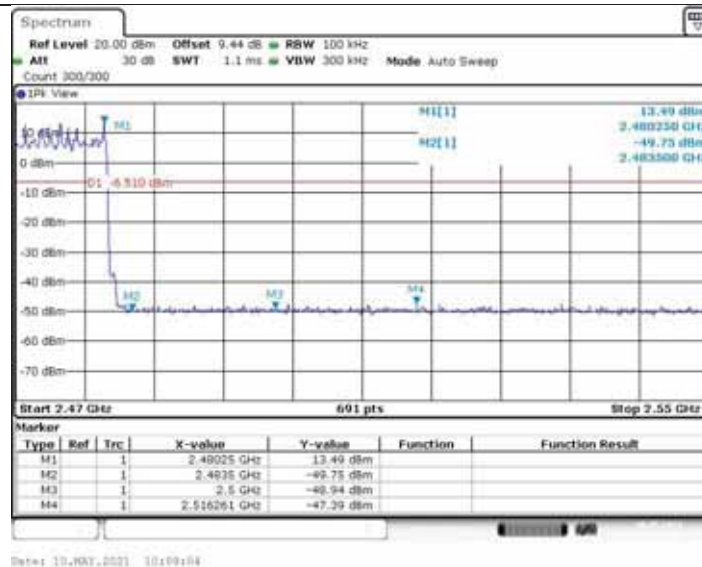


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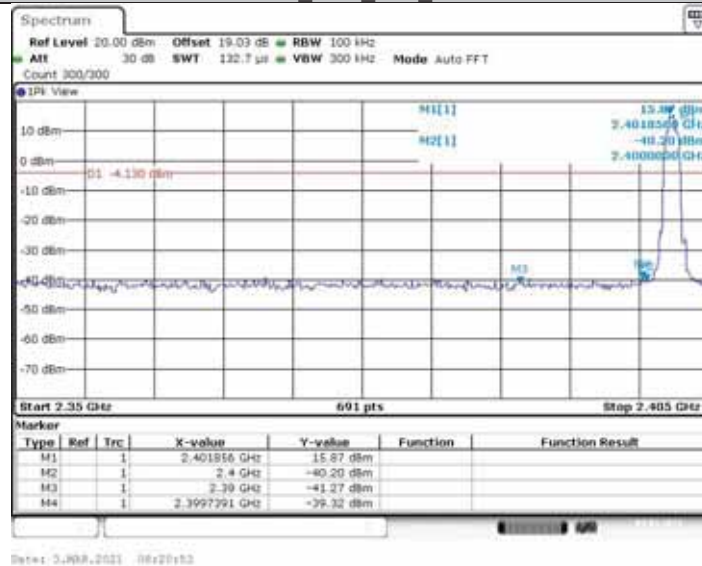
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3DH5_Ant1_Low_2402

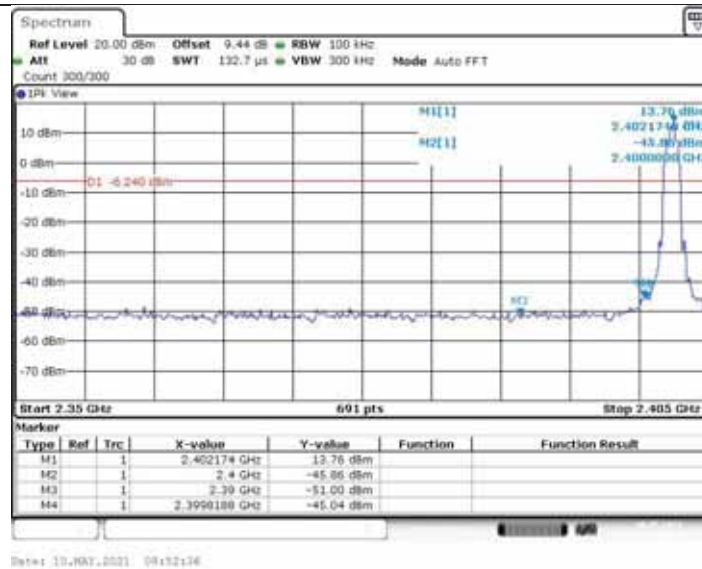


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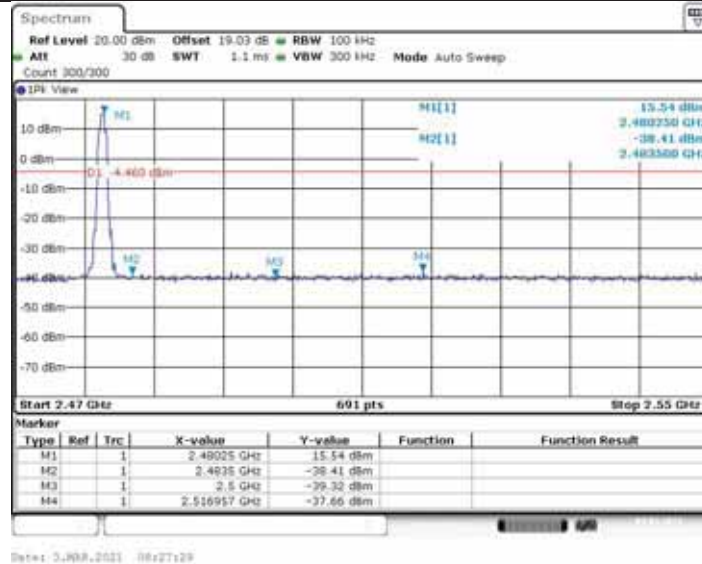
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3DH5_Ant1_High_2480

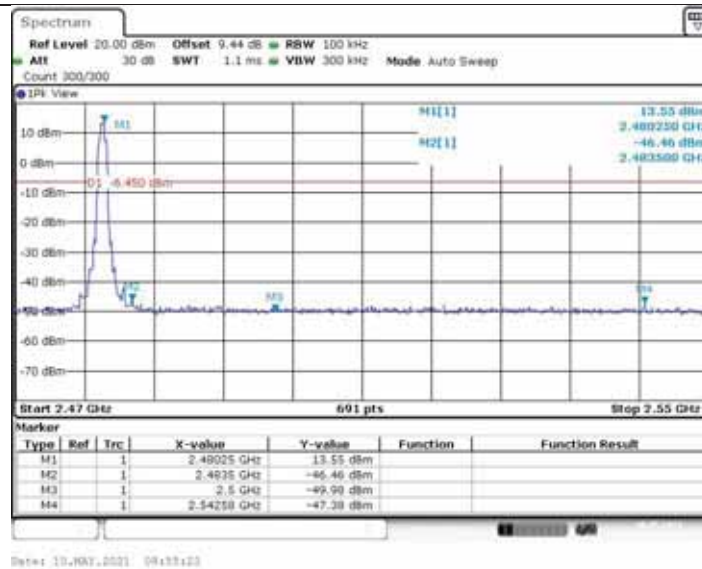


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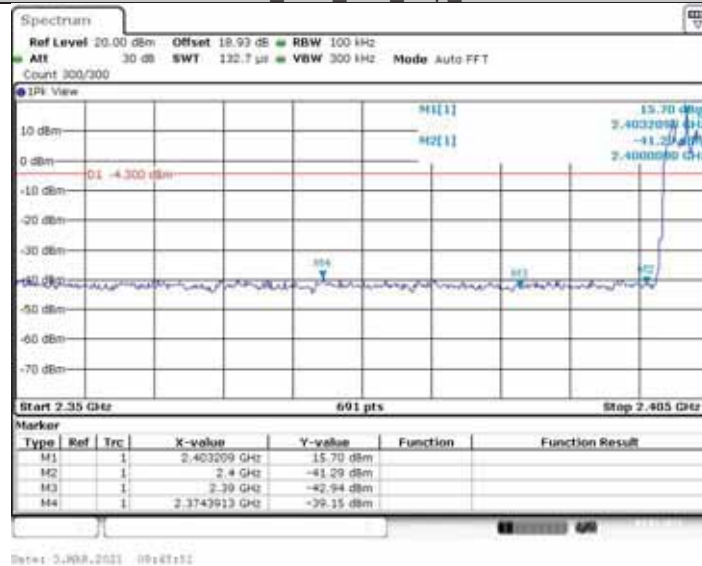
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3DH5_Ant1_Low_Hop_2402

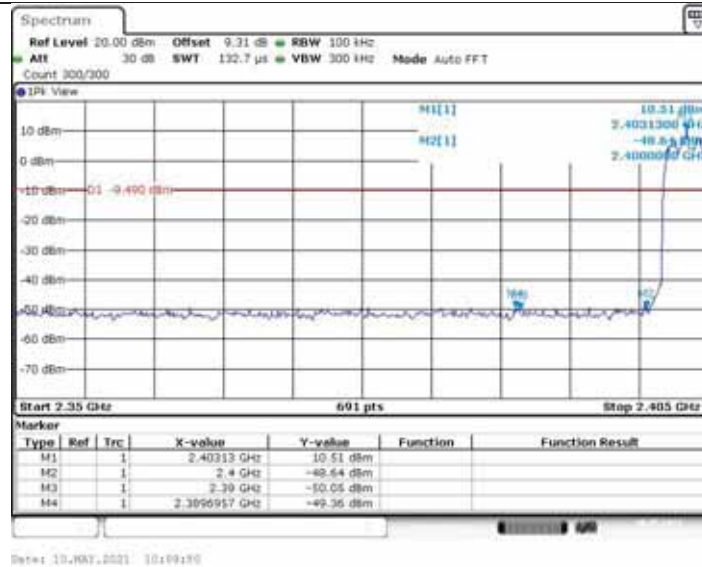


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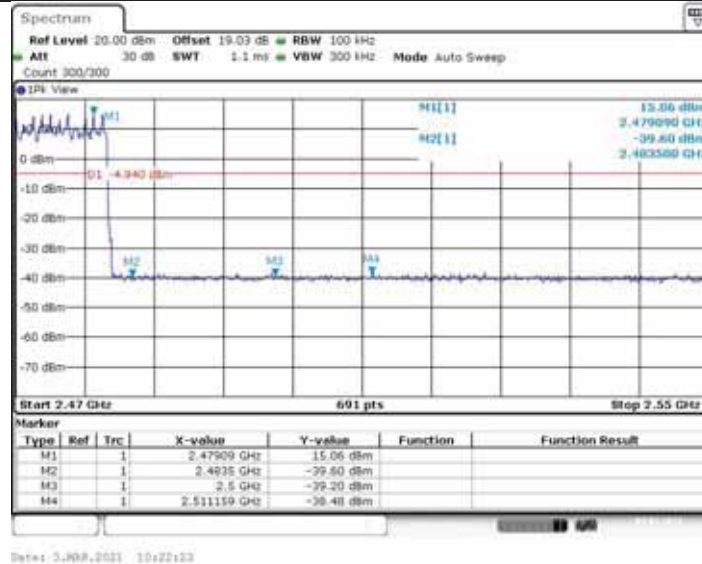
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3DH5_Ant1_High_Hop_2480

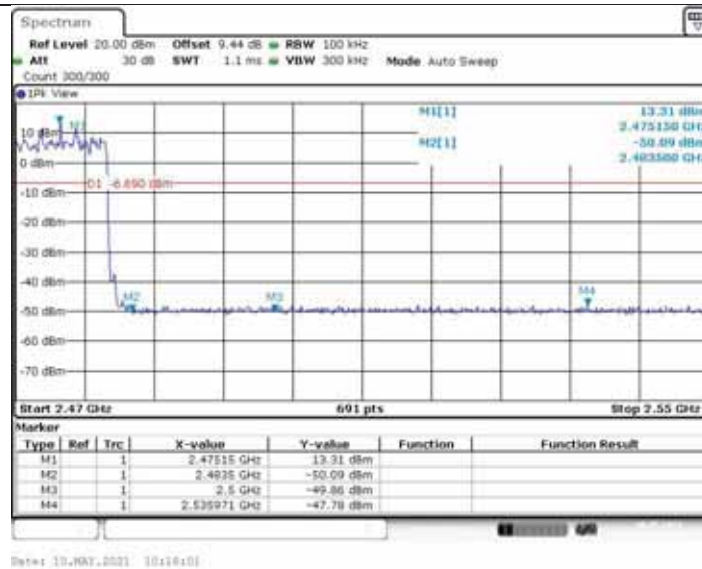


3DH5_Ant2_High_Hop_2480

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5.9 Number of hopping Frequency

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

The EUT was connected to the spectrum analyzer and Bluetooth test set via a power splitter with a known loss. RBW is set to 100KHz and VBW is set to 300KHz on spectrum analyzer. Set EUT on Hopping on mode.

Limits:

Rule Part 15.247(a) (1) (iii) specifies that” Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.”

Limits	≥ 15 channels
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Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 0.75\text{dB}$.

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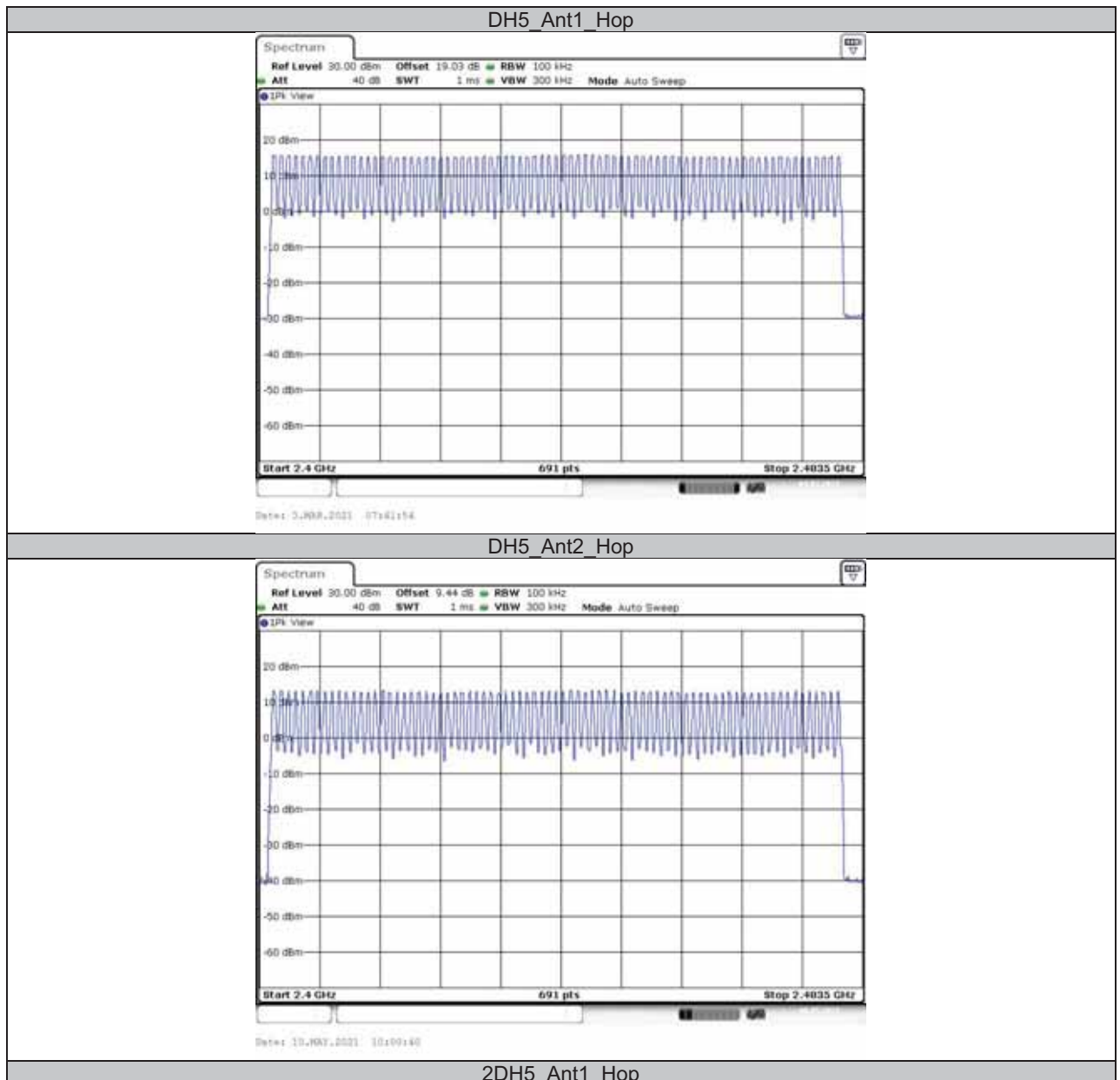
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Test Results:

TestMode	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH5	Ant1	Hop	79	≥ 15	PASS
	Ant2	Hop	79	≥ 15	PASS
2DH5	Ant1	Hop	79	≥ 15	PASS
	Ant2	Hop	79	≥ 15	PASS
3DH5	Ant1	Hop	79	≥ 15	PASS
	Ant2	Hop	79	≥ 15	PASS

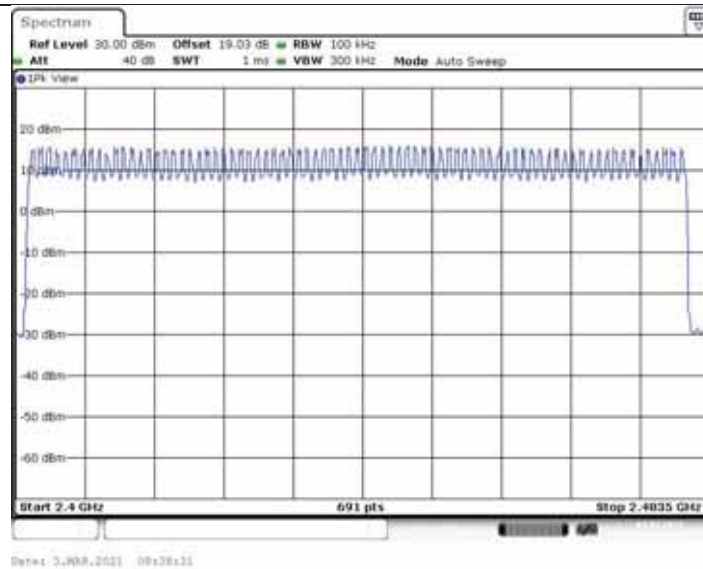
Test Graphs:



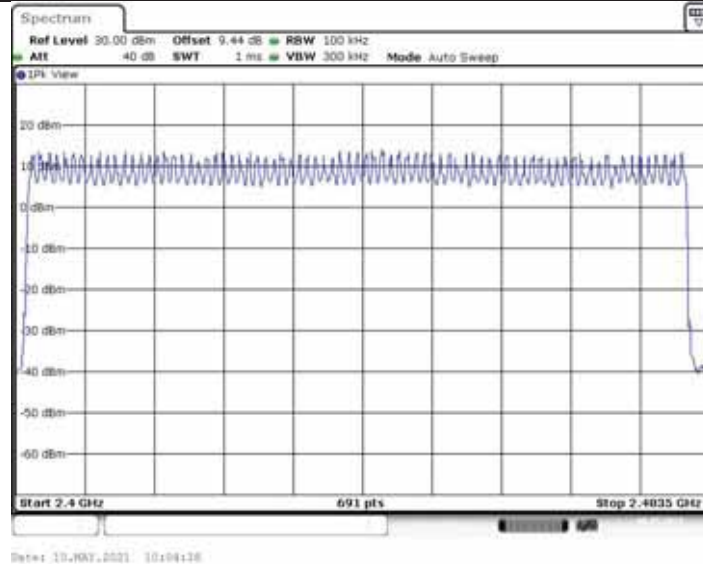
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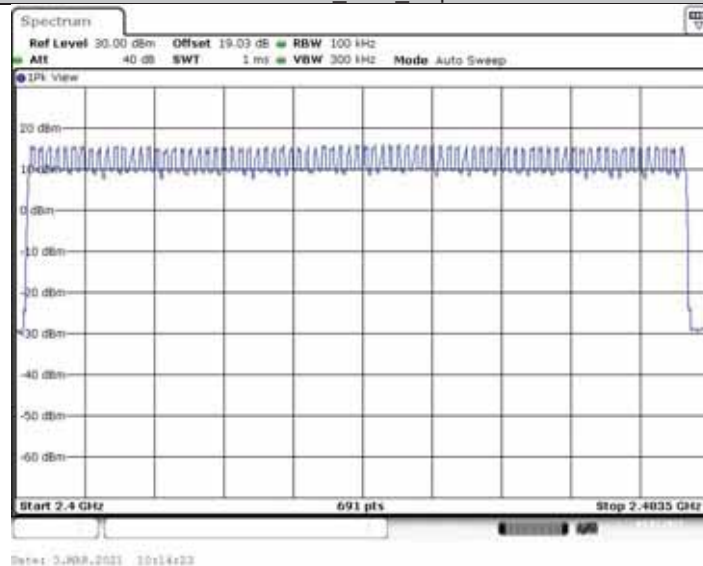
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2DH5_Ant2_Hop



3DH5_Ant1_Hop

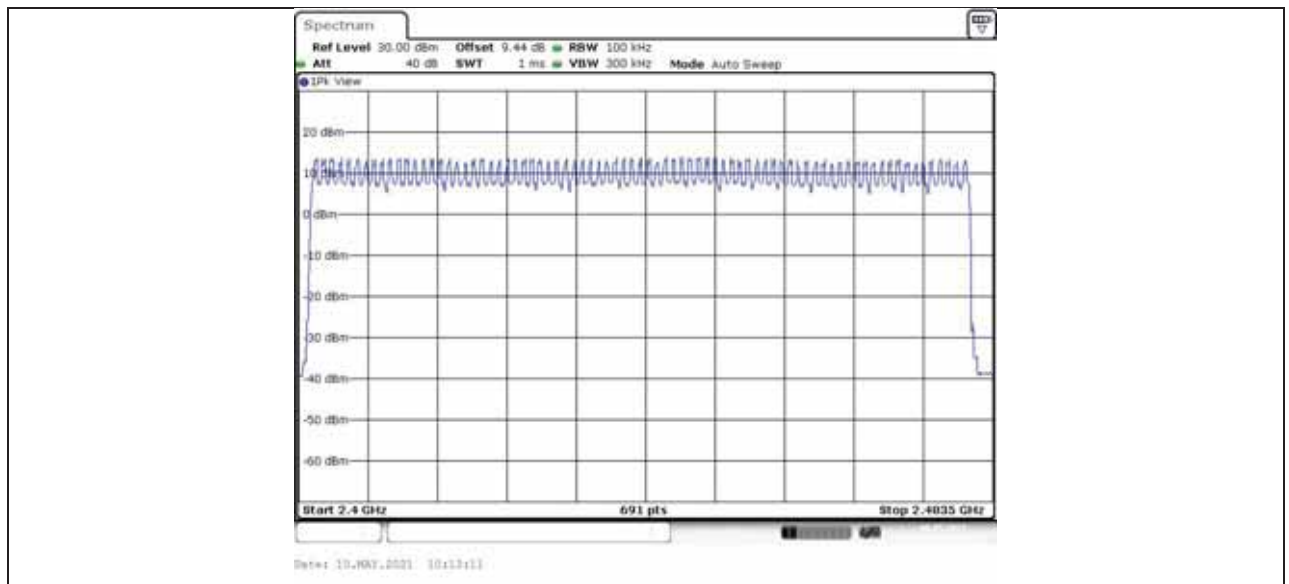


3DH5_Ant2_Hop

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5.10 Spurious RF Conducted Emissions

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

The EUT was connected to the spectrum analyzer with a known loss. The spectrum analyzer scans from 30MHz to the 10th harmonic of the carrier. The peak detector is used. Set RBW to 100kHz and VBW to 300 kHz, Sweep is set to AUTO .The test is in transmitting mode.

Limits:

Rule Part 15.247(d) specifies that "In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
100kHz-2GHz	0.684 dB
2GHz-26GHz	1.407 dB

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Test Results:

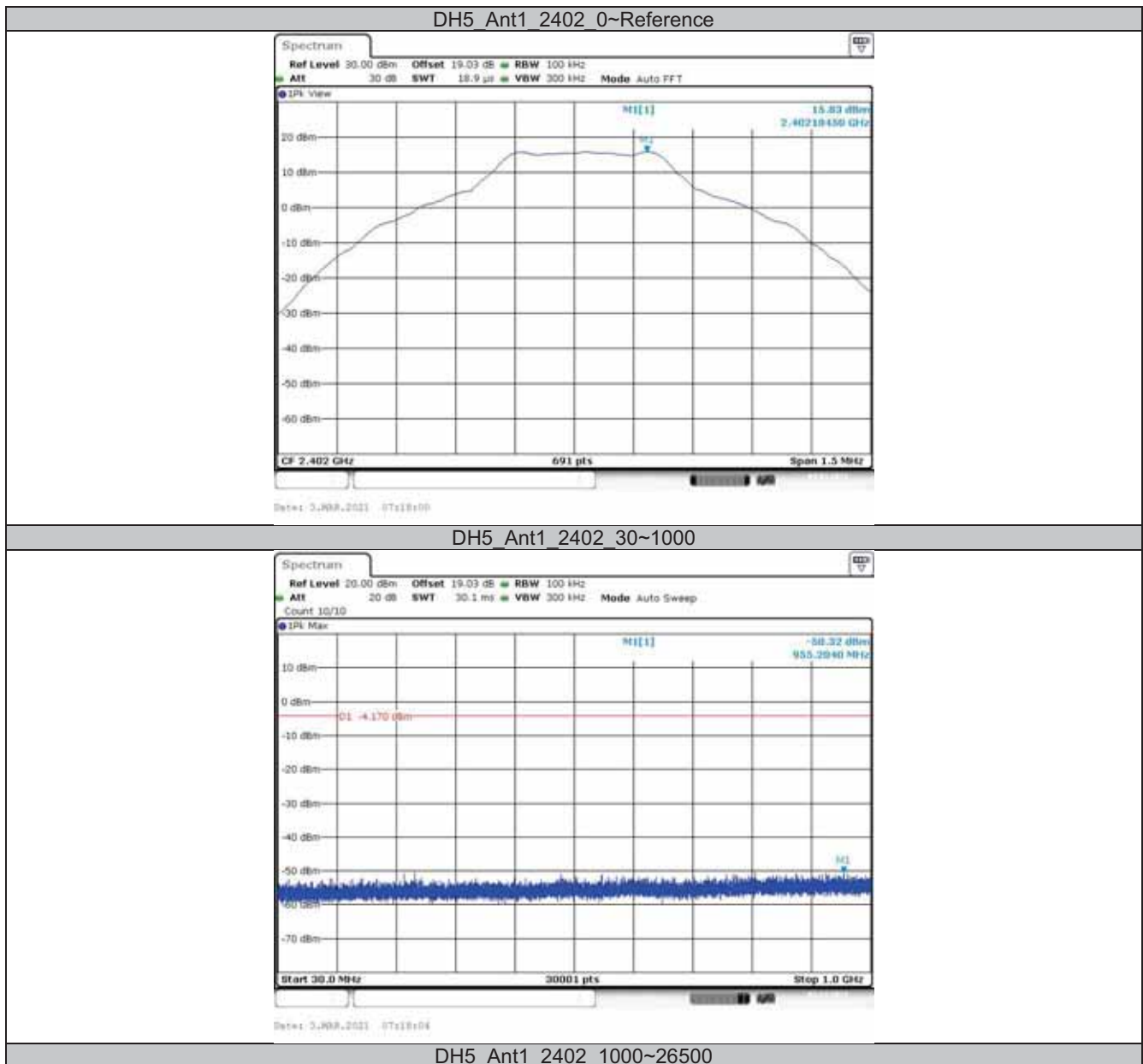
TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	Reference	15.83	15.83	---	PASS
			30~1000	15.83	-50.32	<=-4.17	PASS
			1000~26500	15.83	-39.54	<=-4.17	PASS
	Ant2	2402	Reference	13.70	13.70	---	PASS
			30~1000	13.70	-59.56	<=-6.3	PASS
			1000~26500	13.70	-43.11	<=-6.3	PASS
	Ant1	2441	Reference	15.90	15.90	---	PASS
			30~1000	15.90	-50.03	<=-4.1	PASS
			1000~26500	15.90	-39.53	<=-4.1	PASS
	Ant2	2441	Reference	13.58	13.58	---	PASS
			30~1000	13.58	-59.43	<=-6.42	PASS
			1000~26500	13.58	-41.23	<=-6.42	PASS
2DH5	Ant1	2402	Reference	15.97	15.97	---	PASS
			30~1000	15.97	-50.09	<=-4.03	PASS
			1000~26500	15.97	-39.63	<=-4.03	PASS
	Ant2	2402	Reference	13.68	13.68	---	PASS
			30~1000	13.68	-59.31	<=-6.32	PASS
			1000~26500	13.68	-48.08	<=-6.32	PASS
	Ant1	2441	Reference	16.16	16.16	---	PASS
			30~1000	16.16	-50.47	<=-3.84	PASS
			1000~26500	16.16	-39.57	<=-3.84	PASS
	Ant2	2441	Reference	13.75	13.75	---	PASS
			30~1000	13.75	-60.19	<=-6.25	PASS
			1000~26500	13.75	-46.85	<=-6.25	PASS
3DH5	Ant1	2402	Reference	15.99	15.99	---	PASS
			30~1000	15.99	-50.11	<=-4.01	PASS
			1000~26500	15.99	-39.45	<=-4.01	PASS
	Ant2	2402	Reference	13.78	13.78	---	PASS
			30~1000	13.78	-59.07	<=-6.22	PASS
			1000~26500	13.78	-46.23	<=-6.22	PASS
	Ant1	2441	Reference	16.10	16.10	---	PASS
			30~1000	16.10	-49.36	<=-3.9	PASS
			1000~26500	16.10	-39.38	<=-3.9	PASS
	Ant2	2441	Reference	13.83	13.83	---	PASS
			30~1000	13.83	-59.93	<=-6.17	PASS
			1000~26500	13.83	-39.21	<=-6.17	PASS
	Ant1	2480	Reference	15.57	15.57	---	PASS
			30~1000	15.57	-49.4	<=-4.43	PASS
			1000~26500	15.57	-39.41	<=-4.43	PASS
	Ant2	2480	Reference	13.73	13.73	---	PASS
			30~1000	13.73	-60.06	<=-6.27	PASS
			1000~26500	13.73	-45.46	<=-6.27	PASS

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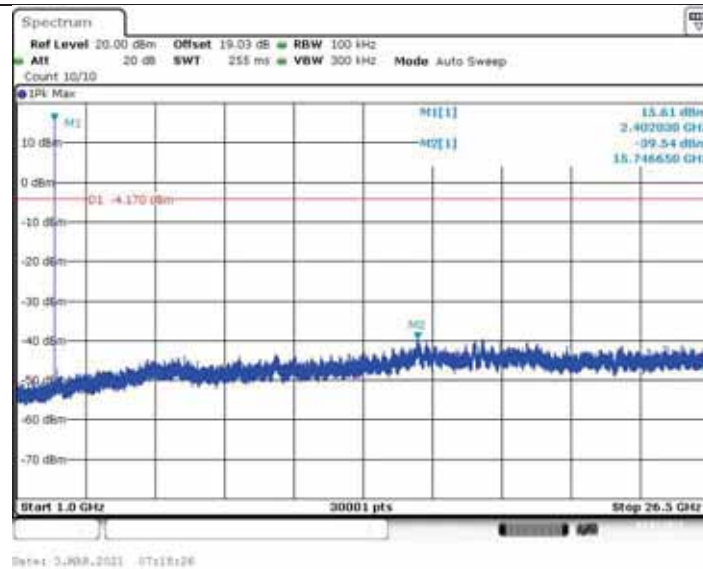
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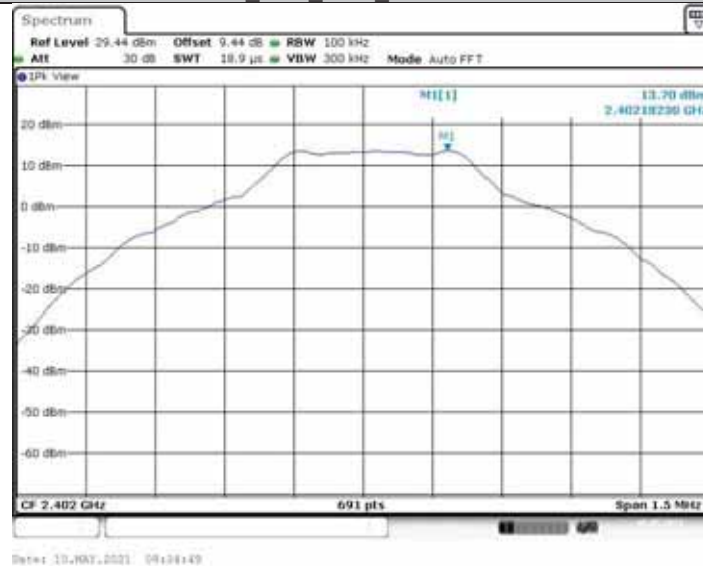
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DH5_Ant2_2402_0~Reference

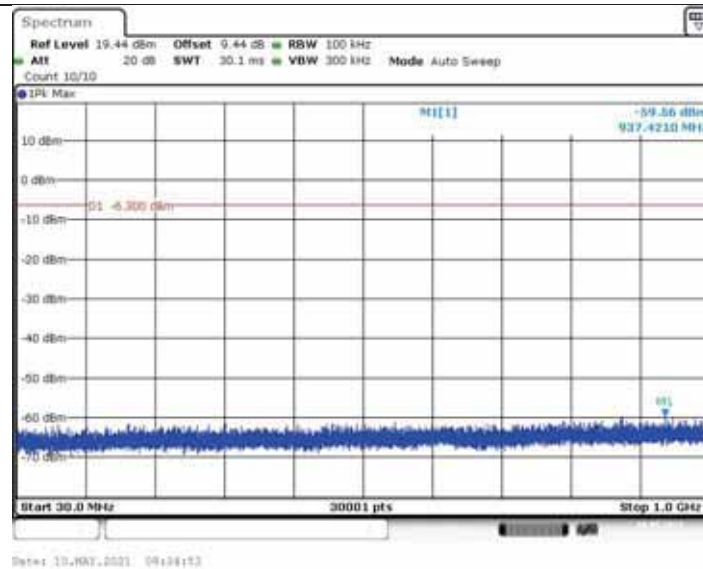


DH5_Ant2_2402_30~1000

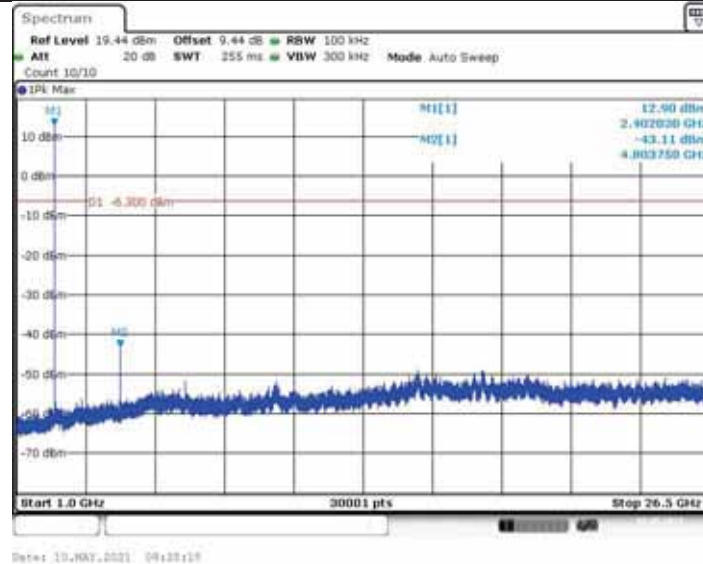
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DH5_Ant2_2402_1000~26500

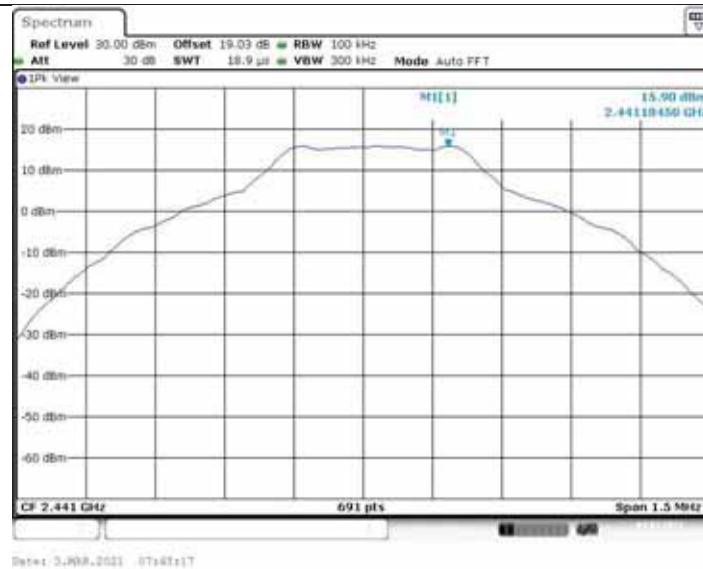


DH5_Ant1_2441_0~Reference

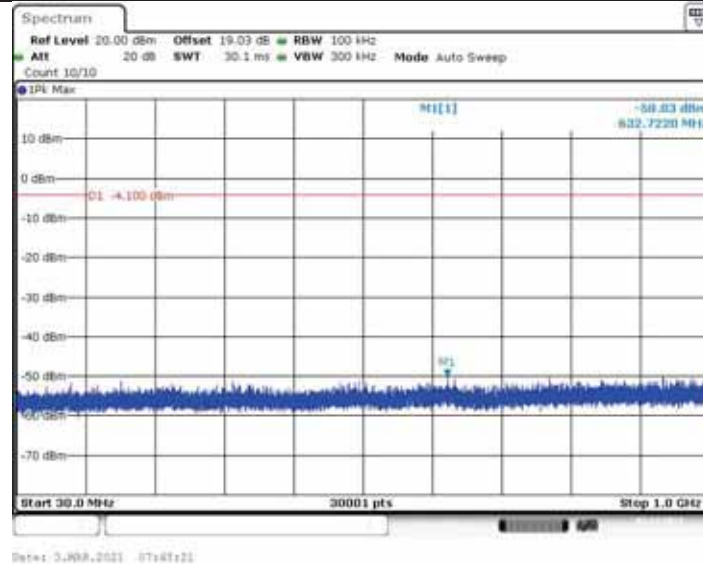
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DH5_Ant1_2441_30~1000

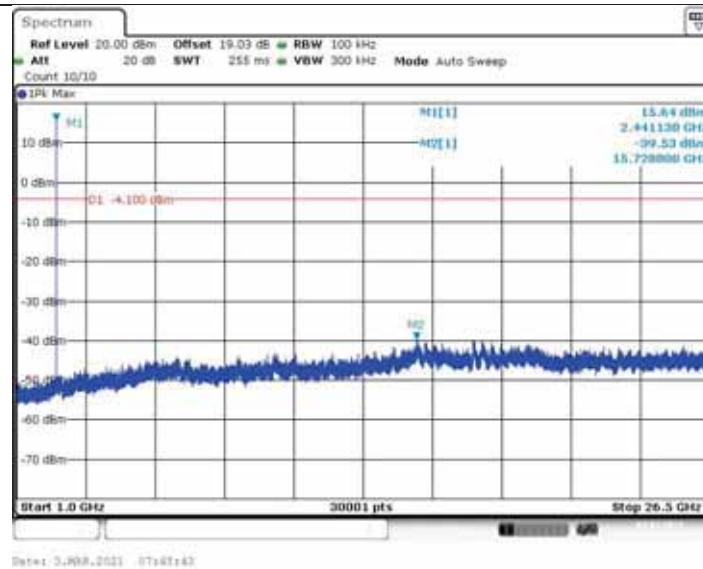


DH5_Ant1_2441_1000~26500

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DH5_Ant2_2441_0~Reference

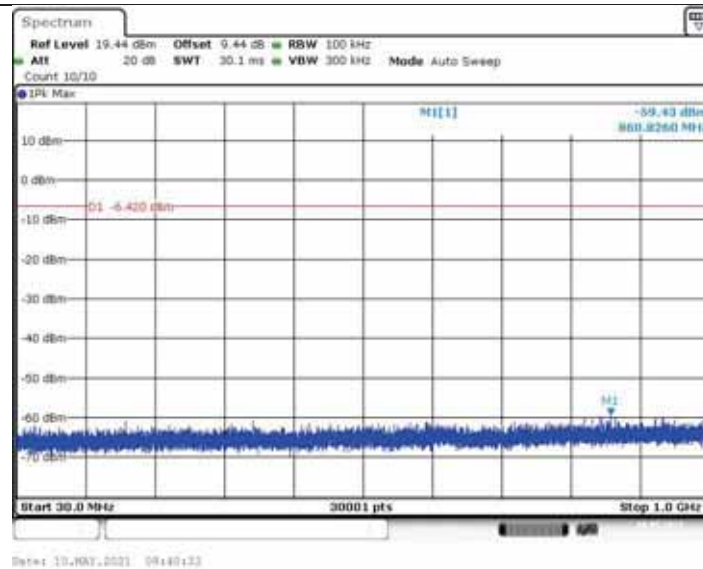


DH5_Ant2_2441_30~1000

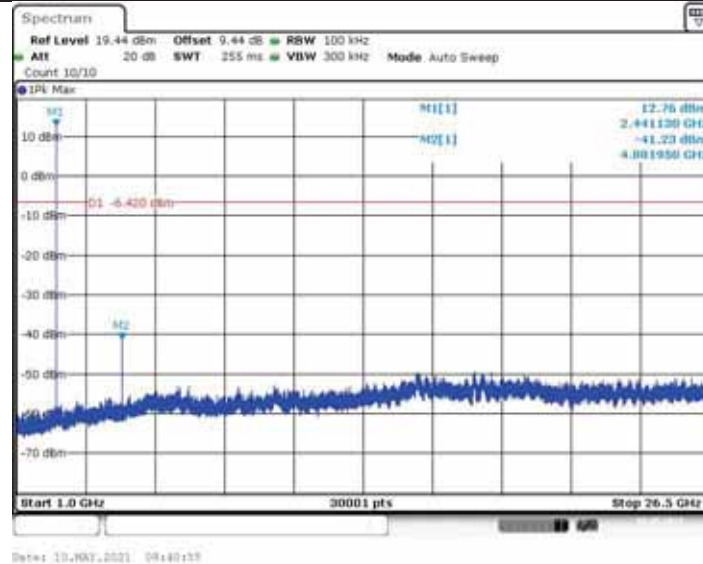
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DH5_Ant2_2441_1000~26500

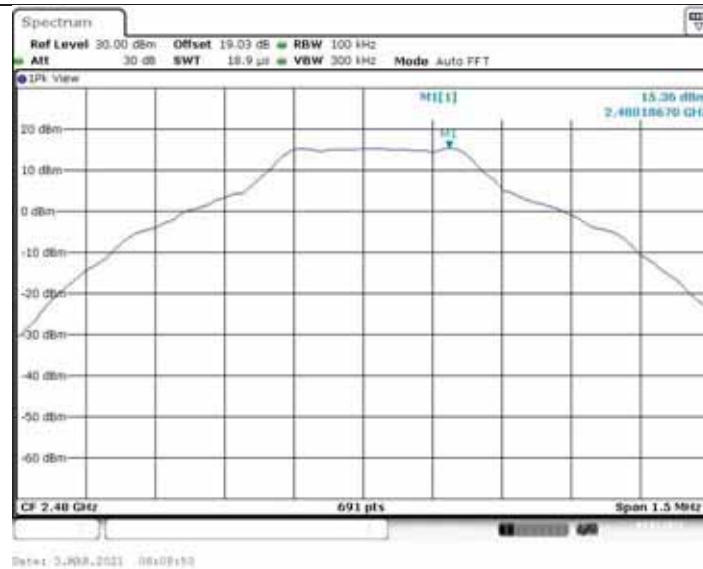


DH5_Ant1_2480_0~Reference

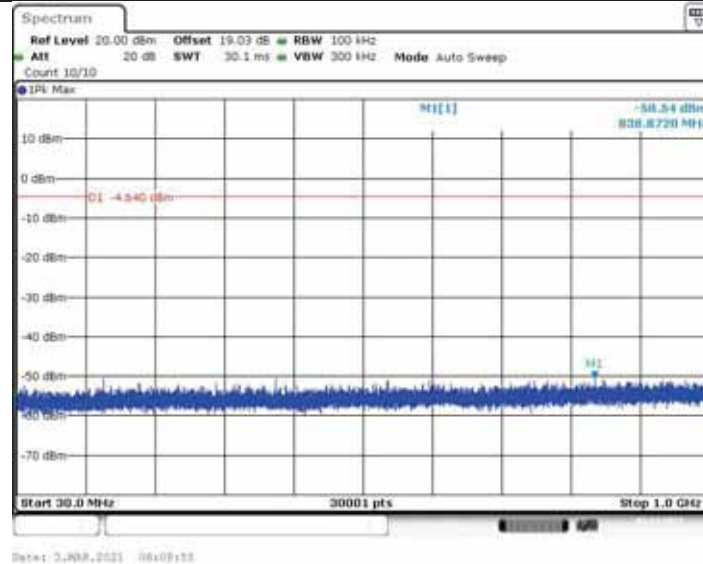
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DH5_Ant1_2480_30~1000

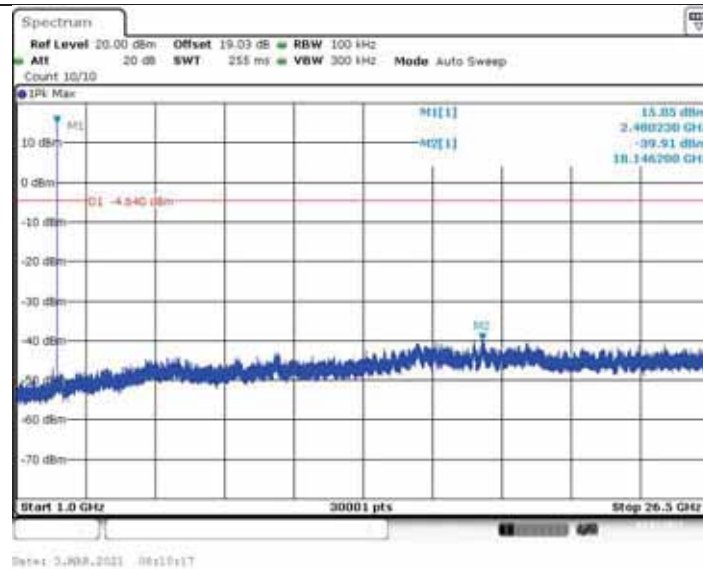


DH5_Ant1_2480_1000~26500

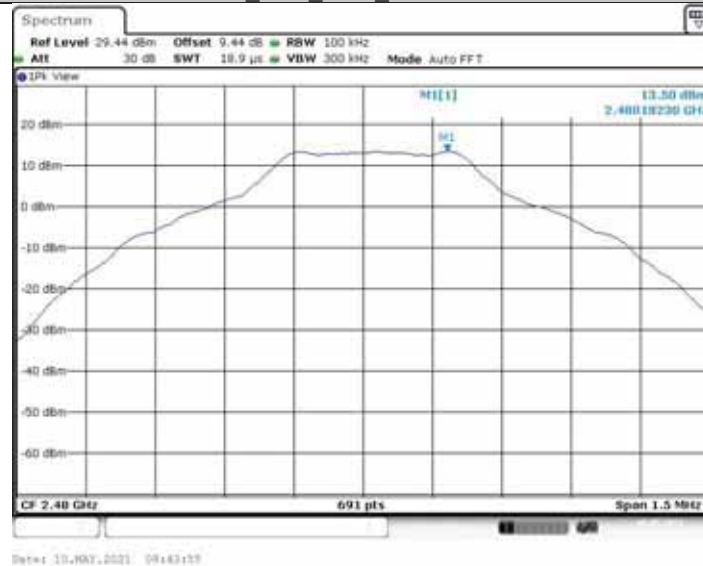
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DH5_Ant2_2480_0~Reference

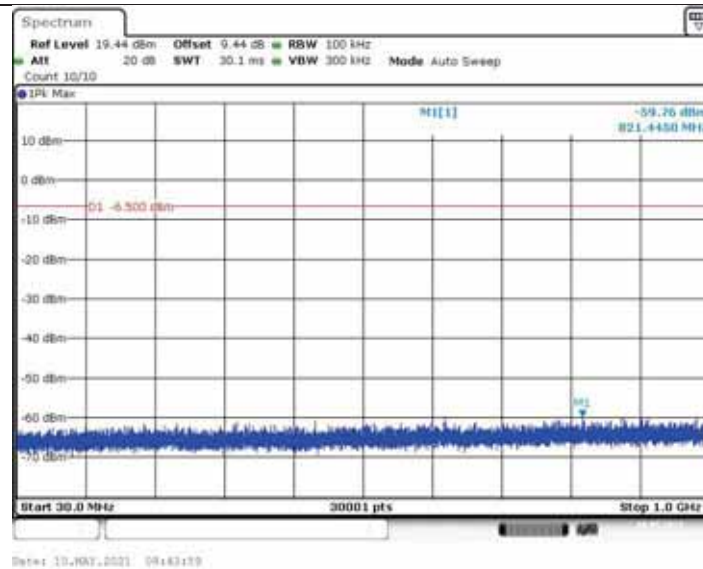


DH5_Ant2_2480_30~1000

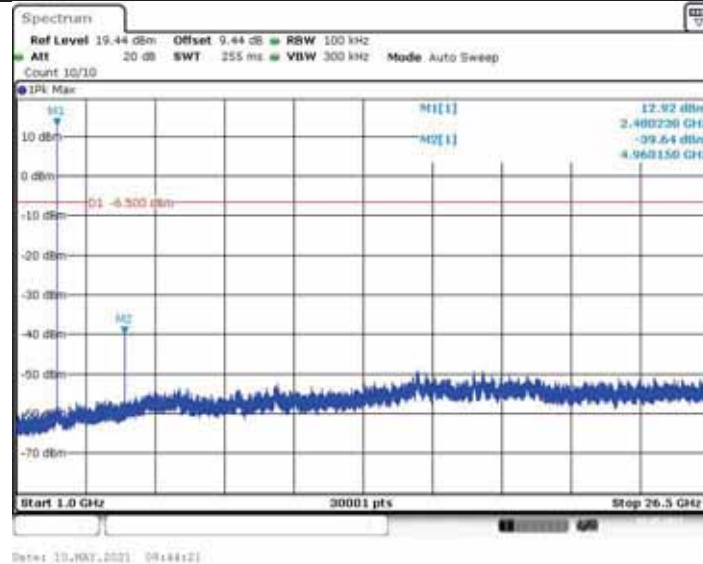
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DH5_Ant2_2480_1000~26500

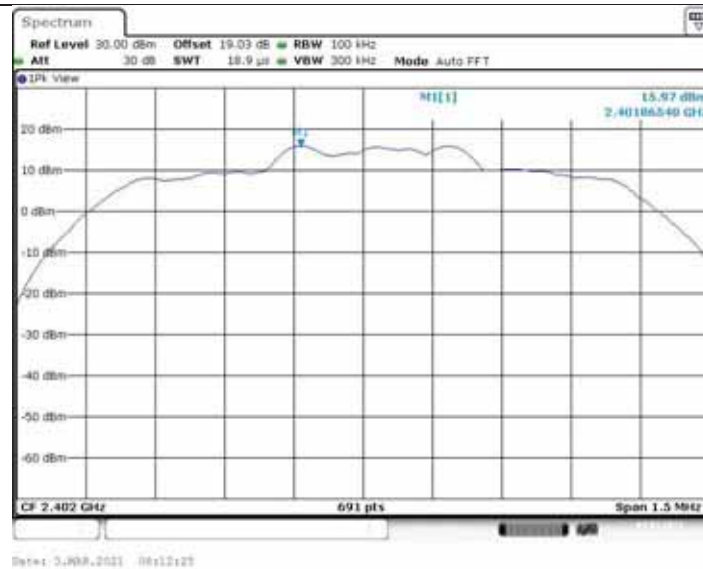


2DH5_Ant1_2402_0~Reference

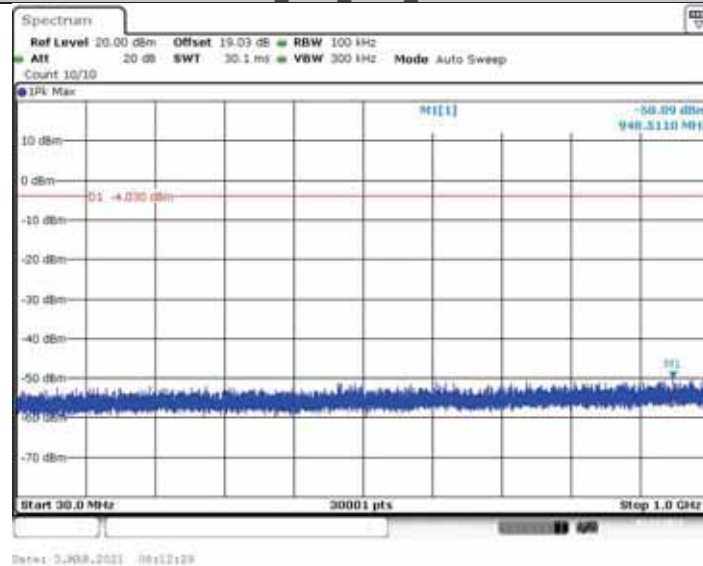
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2DH5_Ant1_2402_30~1000

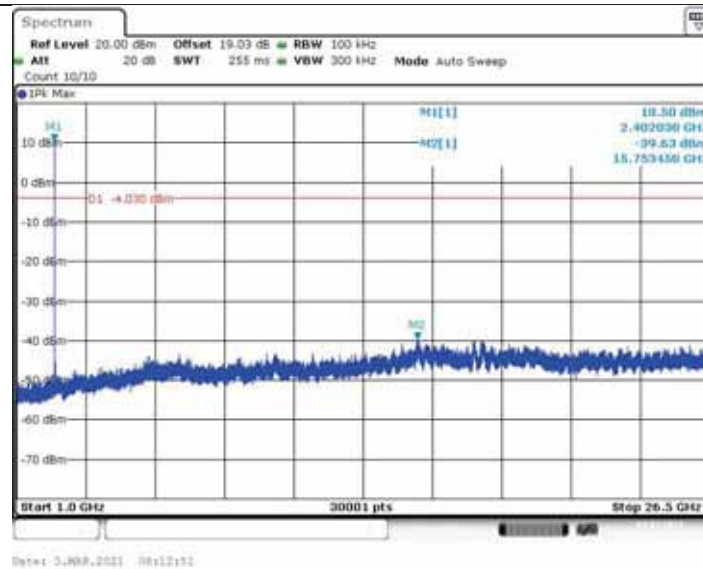


2DH5_Ant1_2402_1000~26500

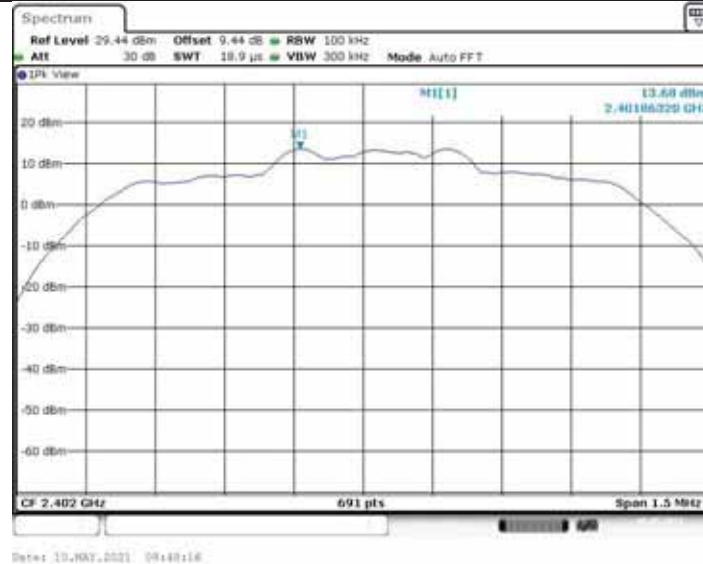
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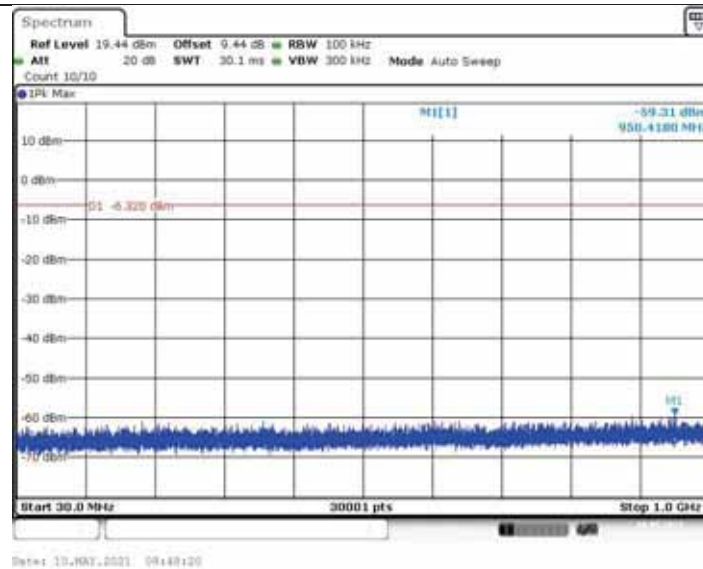


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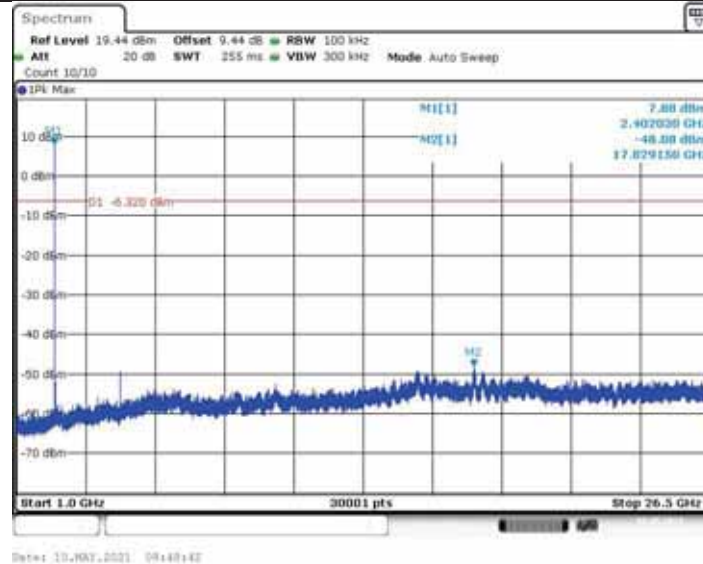
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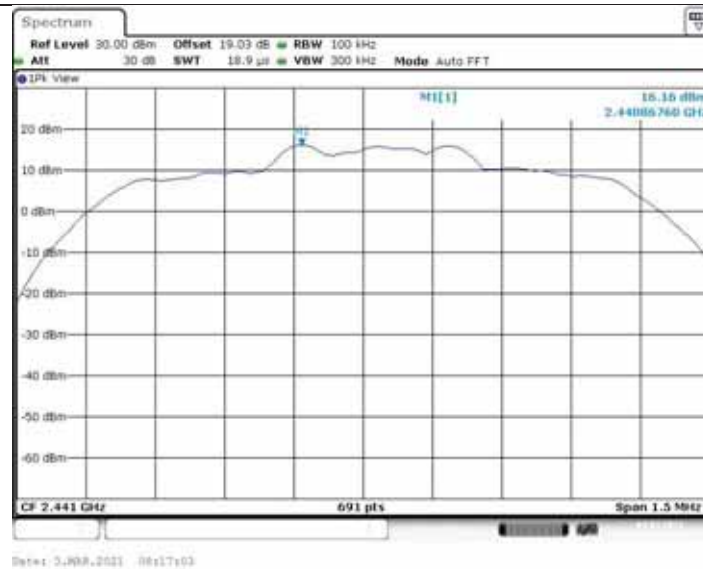


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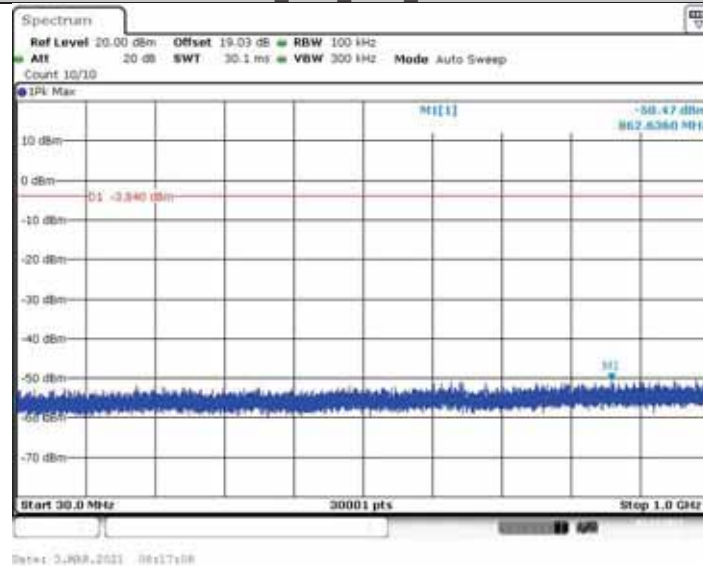
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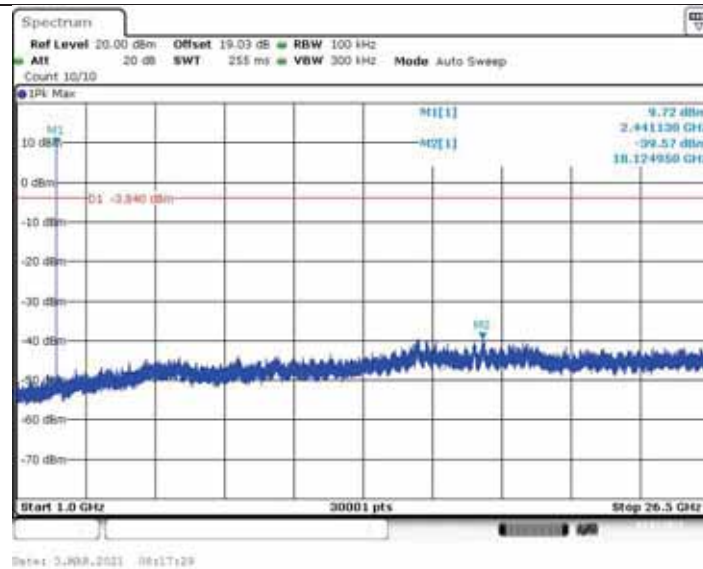


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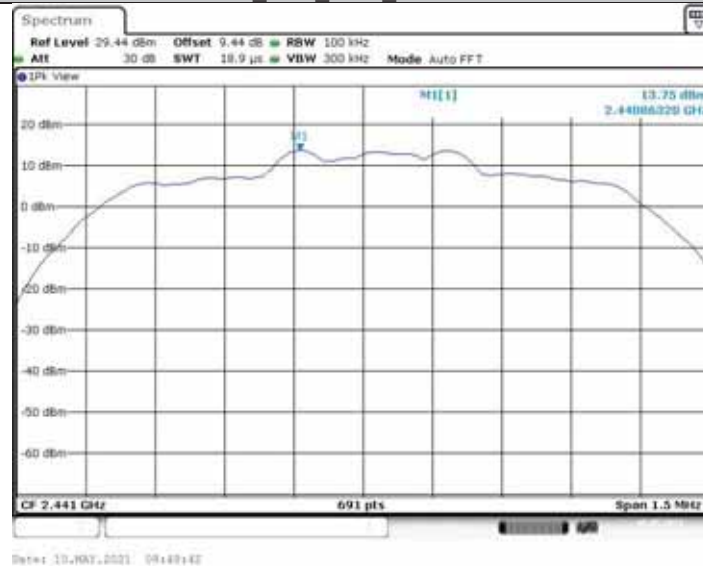
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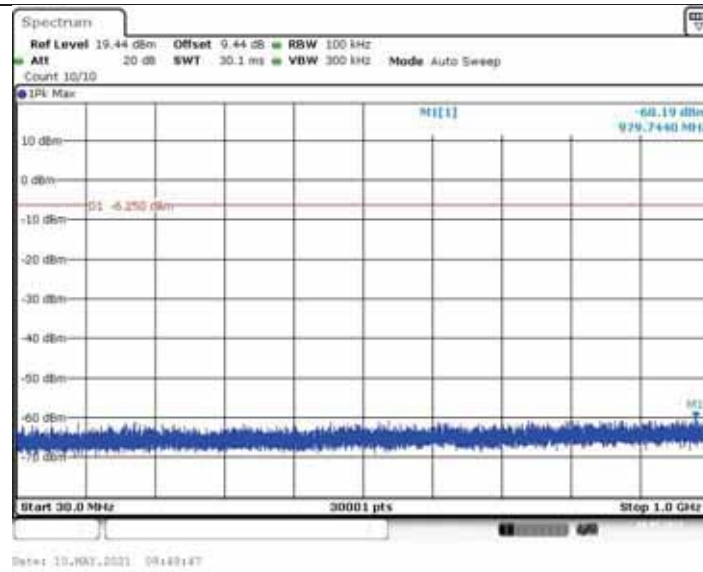


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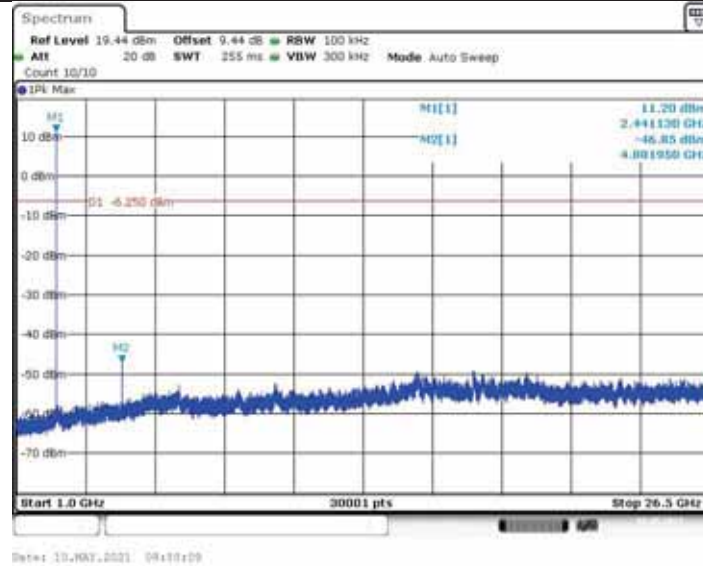
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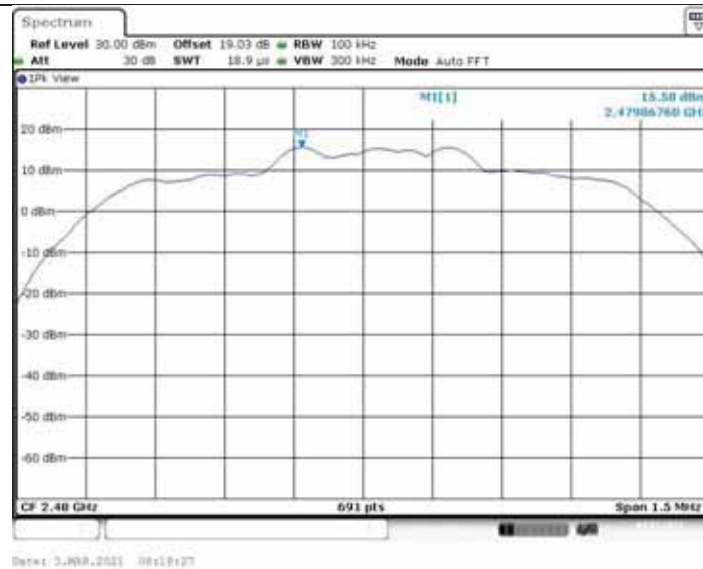


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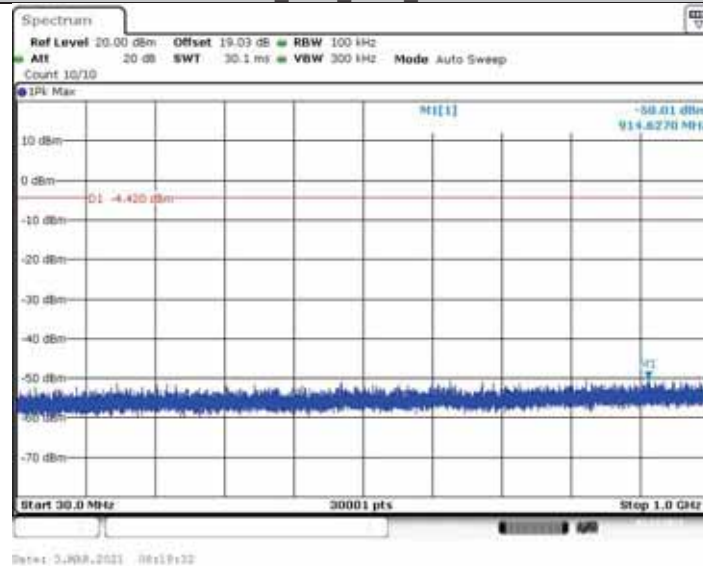
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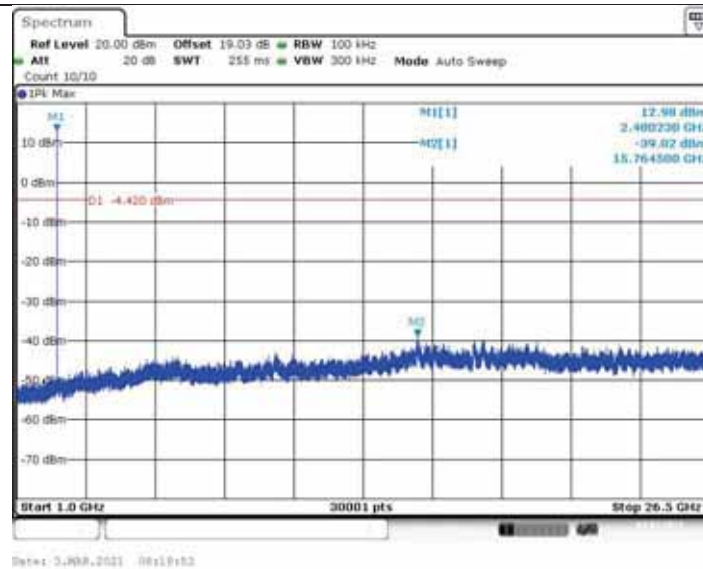


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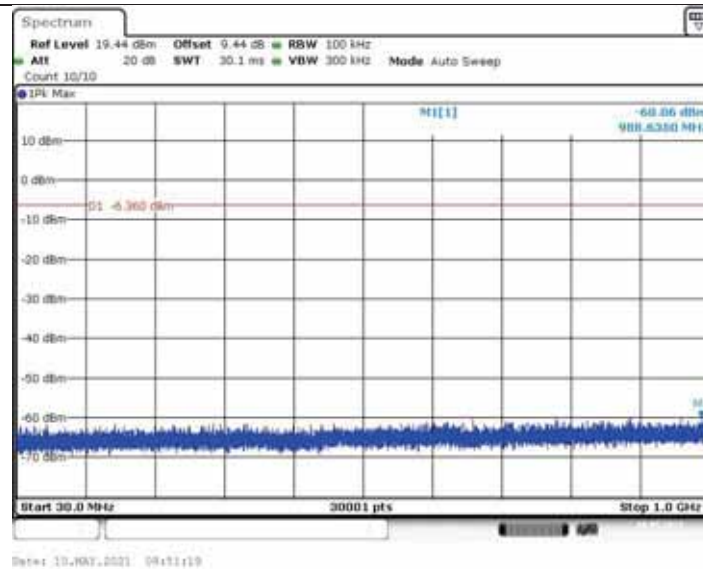


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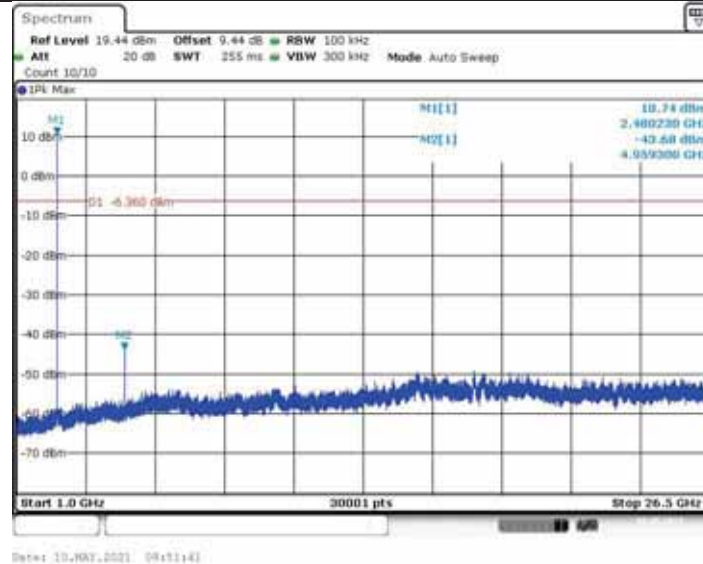
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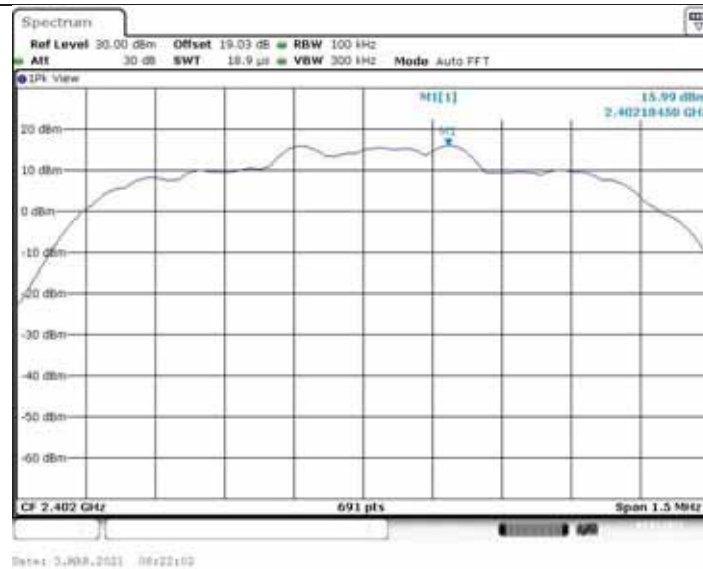


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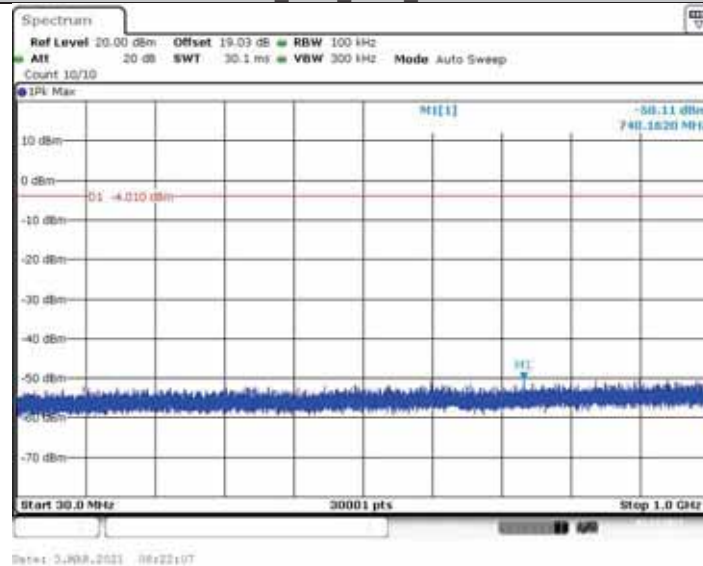
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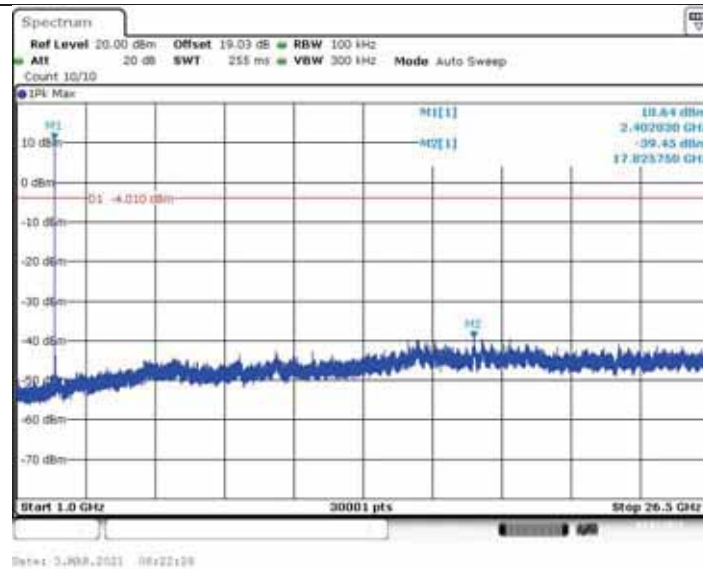


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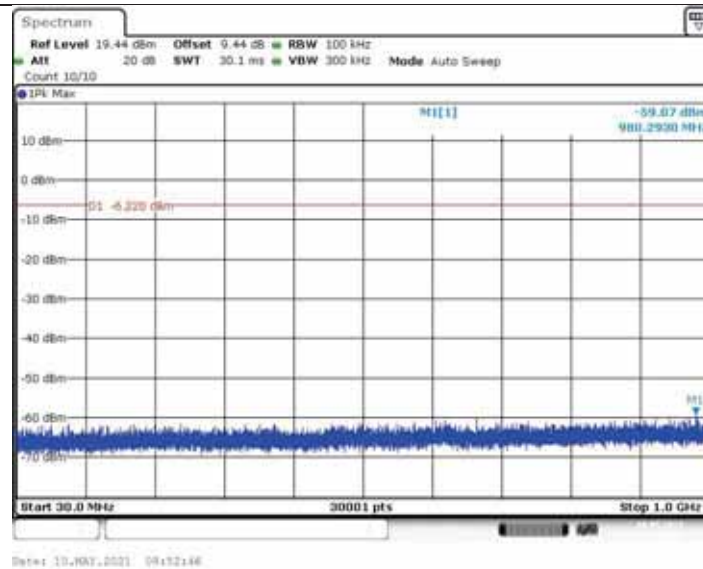


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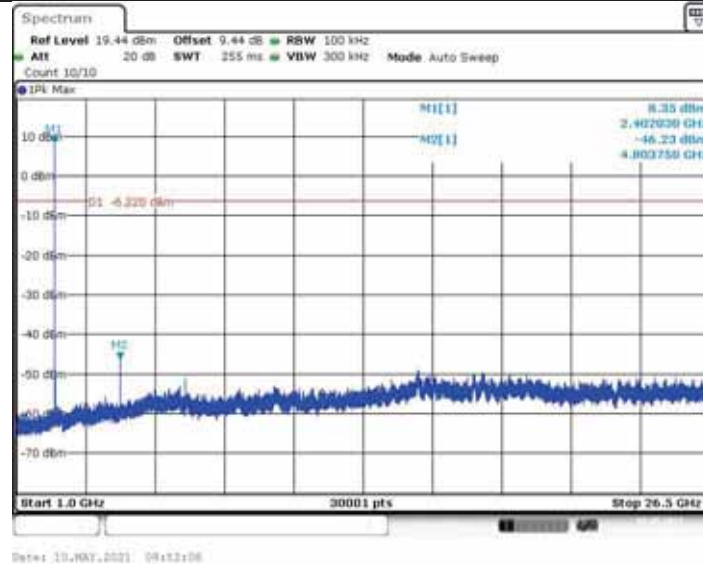
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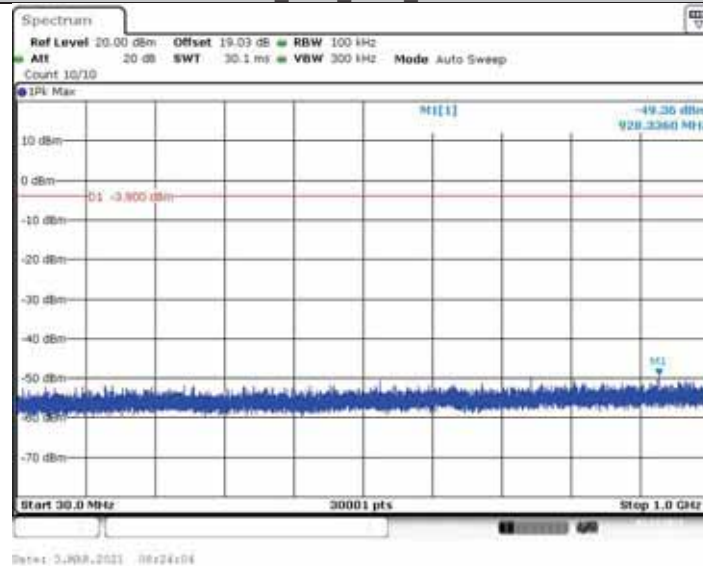
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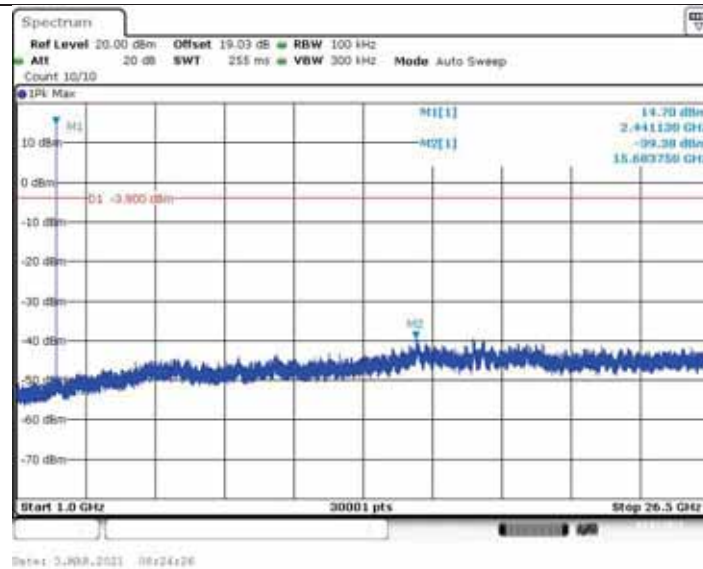


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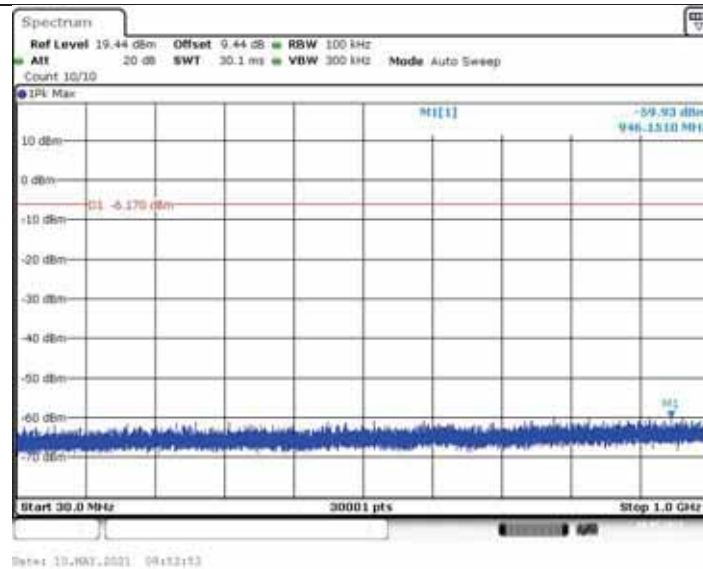


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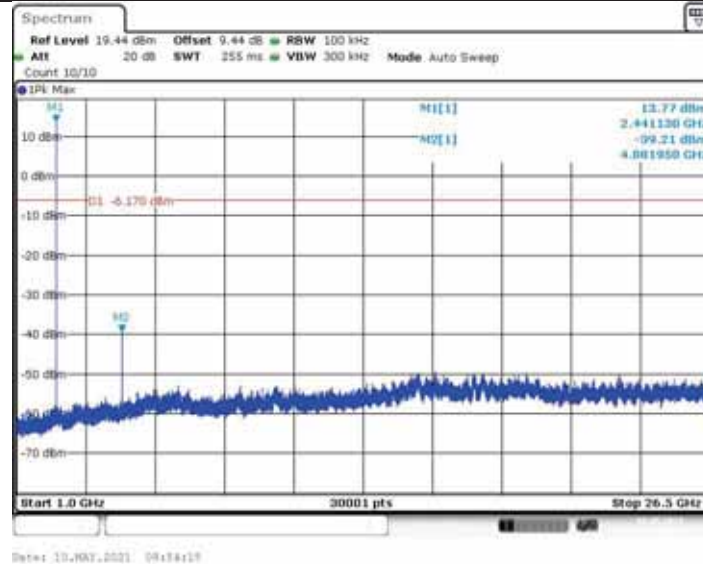
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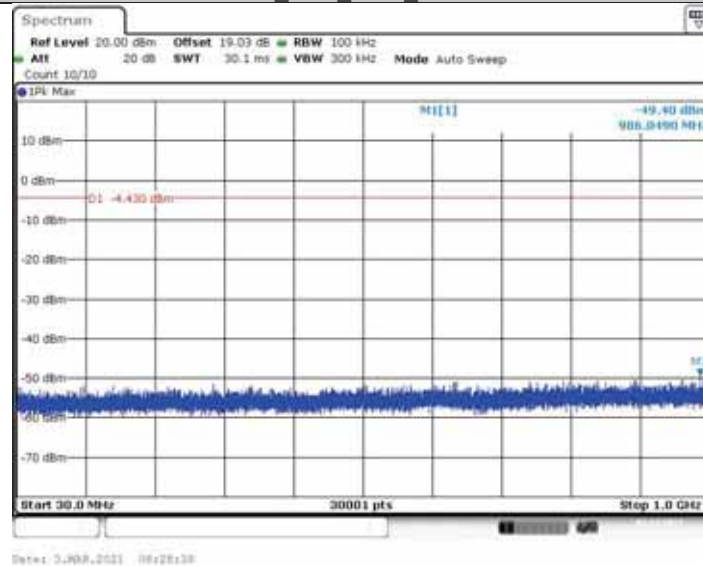
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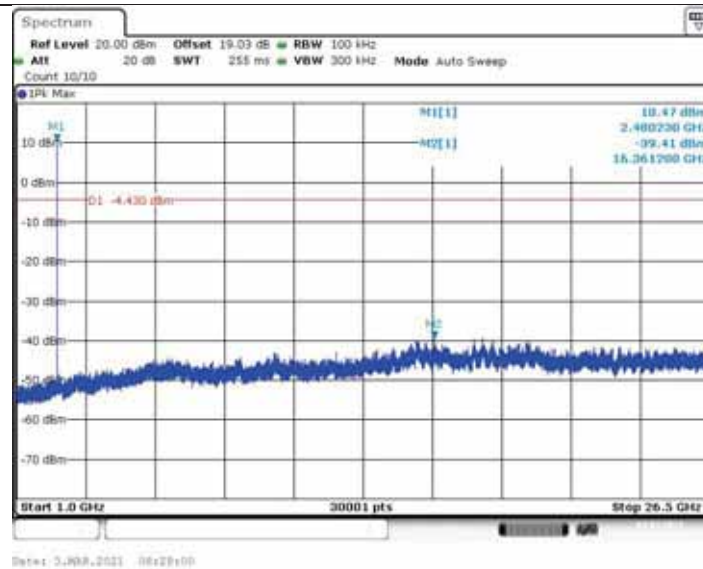


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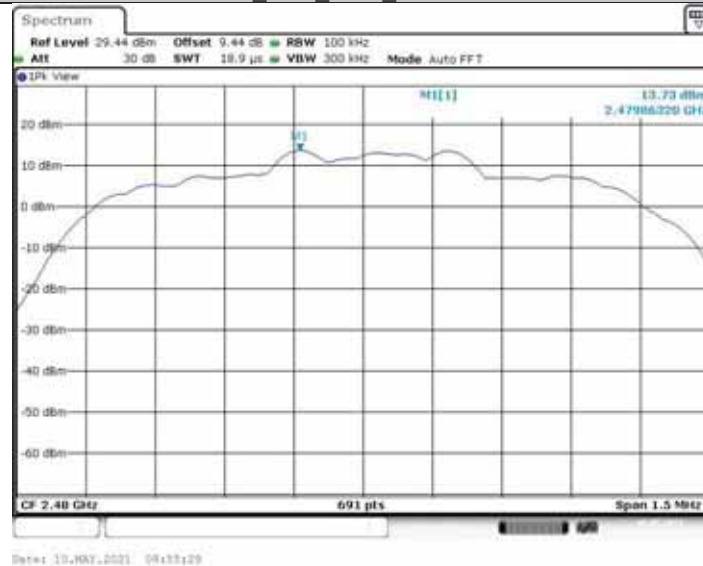
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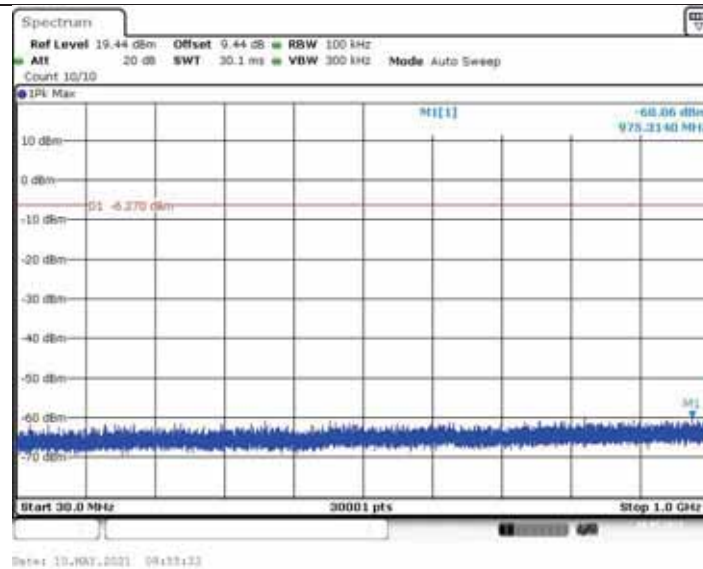


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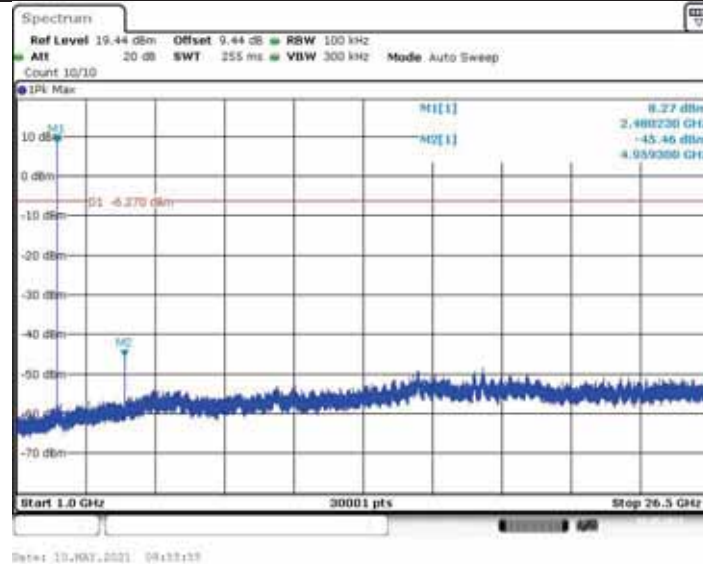
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3DH5_Ant2_2480_1000-26500



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6. Appendix E

Test Equipment	Type/Mode	SERIAL NO.	Equipment No.	Manufacturer	Cal. Due
Spectrum Analyzer	FSV40	101580	DZ-000238-3	R&S	2021/07/20
Comprehensive Test Instrument	CMW270	100304	DZ-000240-1	R&S	2021/12/08
Analog Signal Generator	SMB100A	181858	DZ-000238-2	R&S	2021/07/20
Vector Signal Generator	SGT100A	111661	DZ-000238-1	R&S	2021/07/20
RF Radio Frequency Switch	JS0806-2	19H9080187	DZ-000241	Tonscend	2021/07/20
Programmable DC Power Supply	E3644A	MY58036222	DZ-000178	KEYSIGHT	2022/04/24
3m Semi-Anechoic Chamber	FACT-4	ST08035	WKNA-0024	ETS	2024/12/12
Spectrum Analyzer	N9010B	MY57470323	DZ-000174	KEYSIGHT	2022/03/05
EMI Test Receiver	N9038A-508	MY532290079	EM-000397	Agilent	2022/03/05
Broadband Antenna	VULB 9163	9163-530	EM-000342	SCHWARZBECK	2021/07/11
Waveguide Horn Antenna	HF906	360306/008	WKNA-0024-8	R&S	2022/03/05
Waveguide Horn Antenna	BBHA9170	00949	EM-000383	SCHWARZBECK	2021/07/24
Bandstop Filters	SW-BSF-2400-100-7-A1	/	EM-000495	/	2021/09/04
5G Bandstop Filters	WRCJV12-4900-5100-5900-6100-50EE	1	DZ-000186	WI	2021/12/16

The End