



FCC TEST REPORT

FCC ID: 2A6VP-TYD-FX-001

Product Name	:	star projection lamp
Model Name	:	TYD-FX-001 HR-A1 SK20 TYD-YHY-002 TYD-YHY-003 TYD-YHY-004 STAR-XKD-001 STAR-XKD-002 STAR-XKD-003 TYD-YHY-001
Report No.	:	PTC22030802301E-FC01
Sample ID	:	PTC22030802301E-1#
Prepared for		
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Prepared by		
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Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China		



Report No.: PTC22030802301E-FC01

1TEST RESULT CERTIFICATION

Applicant's name : Shenzhen Juzihao Resource Management Co., Ltd.
Address : Room 601A,Building B5,District B3,Zhimei Huizhi,Fuhai Avenue,Fuyong Street,Baoan District, Shenzhen
Manufacture's name : Shenzhen Langweisi Technology Co., Ltd.
Address : 3rd Floor, Building 2, No. 13, Yuanling Street, Yanwu Village, Dalingshan Town, Dongguan City, Guangdong Province
Product name : star projection lamp
Model name : TYD-FX-001 HR-A1 SK20 TYD-YHY-002 TYD-YHY-003
Model name : TYD-YHY-004 STAR-XKD-001 STAR-XKD-002
Model name : STAR-XKD-003 TYD-YHY-001
Standards : FCC CFR47 Part 15 Section 15.247
Test procedure : ANSI C63.10:2013
Test Date : Apr.15, 2022 to May.15, 2022
Date of Issue : May.16, 2022
Test Result : Pass

This device described above has been tested by PTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Test Engineer:

A handwritten signature in black ink that reads "Leo Yang".

Leo Yang / Engineer

Technical Manager:

A handwritten signature in black ink that appears to read "Chris Du".

Chris Du / Manager



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2 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions	15.205(a) 15.209 15.247(d)	PASS
Conducted spurious Emission and Band edge	15.247(d) 15.205(a)	PASS
Conduct Emission	15.207	PASS
20dB Bandwidth	15.247(a)(1)	PASS
Maximum Peak Output Power	15.247(b)(1)	PASS
Frequency Separation	15.247(a)(1)	PASS
Number of Hopping Frequency	15.247(a)(1)(iii)	PASS
Dwell time	15.247(a)(1)(iii)	PASS
Antenna Requirement	15.203	PASS



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3 TEST FACILITY

Precise Testing & Certification Co., Ltd

Address: Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

A2LA Certificate No.: 4408.01

FCC Registration Number: 790290

FCC Designation Number: CN1219

IC Registration Number: 12191A-1

CAB identifier: CN0080



4 General Information

4.1 General Description of E.U.T.

Product Name	:	star projection lamp
Model Name	:	TYD-FX-001 HR-A1 SK20 TYD-YHY-002 TYD-YHY-003 TYD-YHY-004 STAR-XKD-001 STAR-XKD-002 STAR-XKD-003 TYD-YHY-001
Bluetooth Version	:	BT 5.0
Operating frequency	:	2402-2480MHz
Numbers of Channel	:	79 channels
Antenna Type	:	PCB Antenna
Antenna Gain	:	0dBi
Type of Modulation	:	GFSK, $\pi/4$ -DQPSK, 8-DPSK
Power	:	DC 5V 1A
Hardware Version	:	V1.0
Software Version	:	V1.0



4.2 Test Mode

The EUT has been tested under its typical operating condition. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting. Only the worst case data were reported.

The EUT has been associated with peripherals pursuant to ANSI C63.10-2013 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 KHz to the 10th harmonics of the highest fundamental frequency or to 40 GHz, whichever is lower).

The EUT has been tested under TX operating condition.

This EUT is a FHSS system, were conducted to determine the final configuration from all possible combinations. We use software control the EUT, Let EUT hopping on and transmit with highest power, all the modes GFSK, $\pi/4$ -DQPSK have been tested. 79 Channels are provided by EUT. The 3 channels of lower, medium and higher were chosen for test.

This EUT is tested with two adapter, the 2 adapter are checked and only worst case is record with the adapter W&T -AD1818A050300U.



Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	1	2403	2	2404	3	2405
4	2406	5	2407	6	2408	7	2409
8	2410	9	2411	10	2412	11	2413
12	2414	13	2415	14	2416	15	2417
16	2418	17	2419	18	2420	19	2421
20	2422	21	2423	22	2424	23	2425
24	2426	25	2427	26	2428	27	2429
28	2430	29	2431	30	2432	31	2433
32	2434	33	2435	34	2436	35	2437
36	2438	37	2439	38	2440	39	2441
40	2442	41	2443	42	2444	43	2445
44	2446	45	2447	46	2448	47	2449
48	2450	49	2451	50	2452	51	2453
52	2454	53	2455	54	2456	55	2457
56	2458	57	2459	58	2460	59	2461
60	2462	61	2463	62	2464	63	2465
64	2466	65	2467	66	2468	67	2469
68	2470	69	2471	70	2472	71	2473
72	2474	73	2475	74	2476	75	2477
76	2478	77	2479	78	2480	-	-

Channel	Frequency(MHz)
0	2402
39	2441
78	2480



5 Equipment During Test

5.1 Equipments List

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due	interval time
MXG Signal Analyzer	Agilent	N9020A	MY56070279	10Hz-30GHz	Sep. 18, 2022	1 year
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	Sep. 18, 2022	1 year
Power Meter	Anritsu	ML2495A	0949003	300MHz-40GHz	Sep. 18, 2022	1 year
Power Sensor	Anritsu	MA2411B	0917017	300MHz-40GHz	Sep. 18, 2022	1 year

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Radiated Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due	interval time
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Sep. 18, 2022	1 year
Loop Antenna	Schwarzbeck	FMZB 1519	012	9 KHz -30MHz	Sep. 18, 2022	1 year
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	25MHz-2GHz	Sep. 18, 2022	1 year
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	1MHz-1GHz	Sep. 18, 2022	1 year
Cable	Schwarzbeck	PLF-100	549489	9KHz-3GHz	Sep. 18, 2022	1 year
Spectrum Analyzer	Agilent	E4407B	MY45109572	9KHz-40GHz	Sep. 18, 2022	1 year
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	1GHz-18GHz	Sep. 18, 2022	1 year
Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	1GHz-26.5GHz	Sep. 18, 2022	1 year
Horn Antenna	SCHWARZBECK	BBHA 9170	9170-181	14GHz-40GHz	Sep. 18, 2022	1 year
Amplifier	SCHWARZBECK	BBV 9721	9721-205	18GHz-40GHz	Sep. 18, 2022	1 year



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Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	Sep. 18, 2022	1 year
RF Cable	R&S	R204	R21X	1GHz-40GHz	Sep. 18, 2022	1 year

Conducted Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due	interval time
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Sep.19, 2019	1 year
Artificial Mains Network	Rohde&Schwarz	L2-16B	000WX31025	9KHz-300MHz	Sep.19, 2019	1 year
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	9KHz-300MHz	Sep.19, 2019	1 year



5.2 Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	$\pm 1.0\text{dB}$
Power Spectral Density, conducted	$\pm 2.2\text{dB}$
Radio Frequency	$\pm 1 \times 10^{-6}$
Bandwidth	$\pm 1.5 \times 10^{-6}$
Time	$\pm 2\%$
Duty Cycle	$\pm 2\%$
Temperature	$\pm 1^\circ\text{C}$
Humidity	$\pm 5\%$
DC and low frequency voltages	$\pm 3\%$
Conducted Emissions (150kHz~30MHz)	$\pm 3.64\text{dB}$
Radiated Emission(30MHz~1GHz)	$\pm 5.03\text{dB}$
Radiated Emission(1GHz~25GHz)	$\pm 4.74\text{dB}$
Remark: The coverage Factor (k=2), and measurement Uncertainty for a level of Confidence of 95%	



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5.3 Description of Support Units

Equipment	Model No.	Series No.
Adapter	W&T -AD1818A050300U	-



6 Conducted Emission

Test Requirement: : FCC CFR 47 Part 15 Section 15.207
Test Method: : ANSI C63.10:2013
Test Result: : PASS
Frequency Range: : 150kHz to 30MHz
Class/Severity: : Class B
Detector: : Peak for pre-scan (9kHz Resolution Bandwidth)

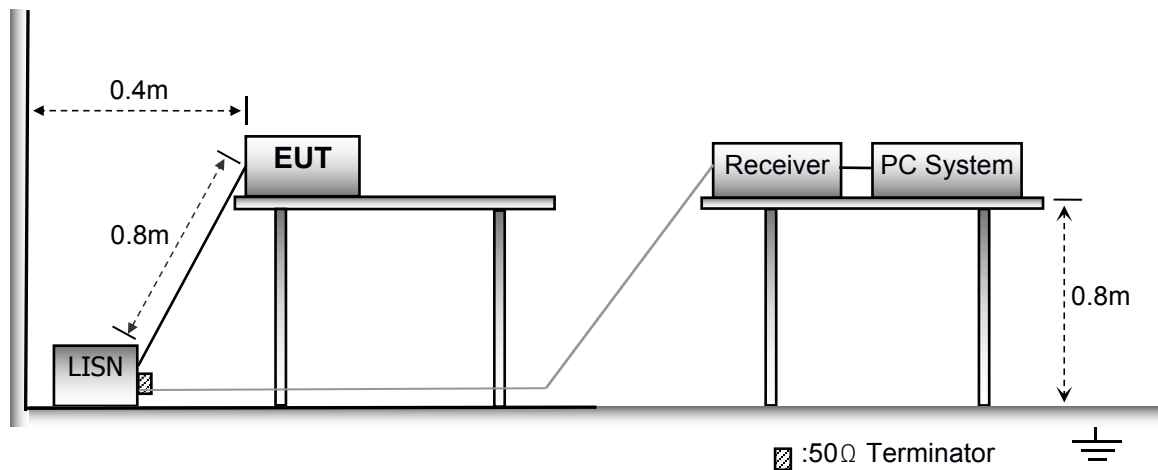
6.1 E.U.T. Operation

Operating Environment :

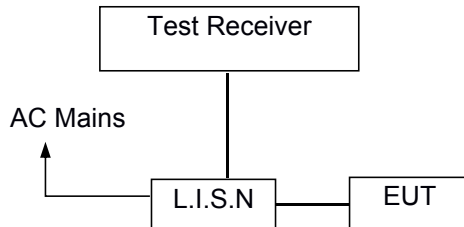
Temperature: : 25.5 °C
Humidity: : 51 % RH
Atmospheric Pressure: : 101.2kPa

6.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10: 2013



6.3 Test SET-UP (Block Diagram of Configuration)



6.4 Measurement Procedure:

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

6.5 Conducted Emission Limit

Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:

1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

6.6 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

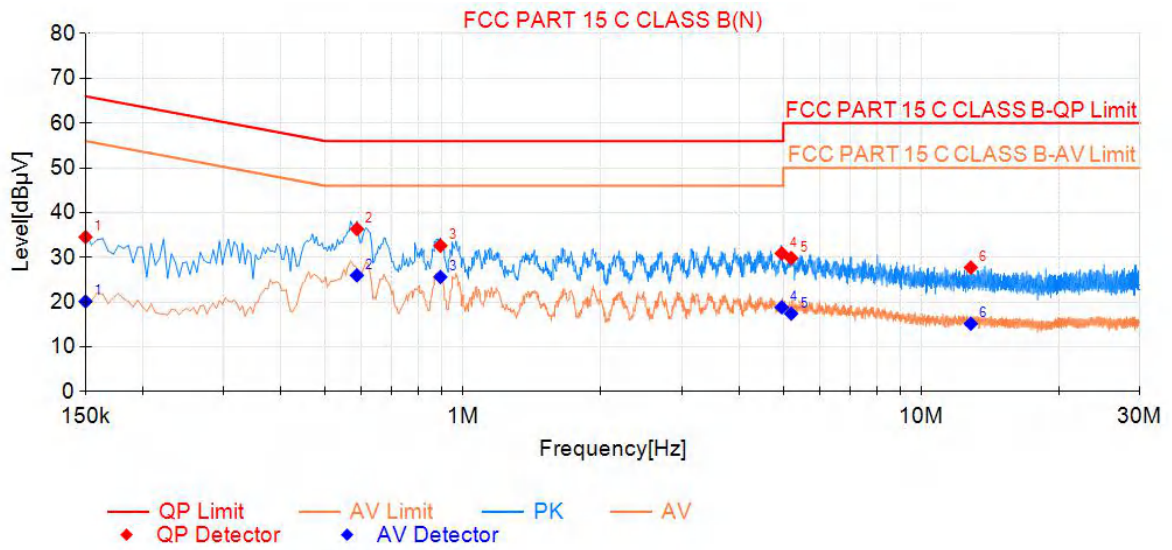
6.7 Conducted Emission Test Result

Pass.

All the modulation modes were tested with both AC230V 50Hz and AC120V 60Hz, the data of the worst mode (AC 120V/60Hz, GFSK TX 2402MHz) are recorded in the following pages and the others modulation methods do not exceed the limits.



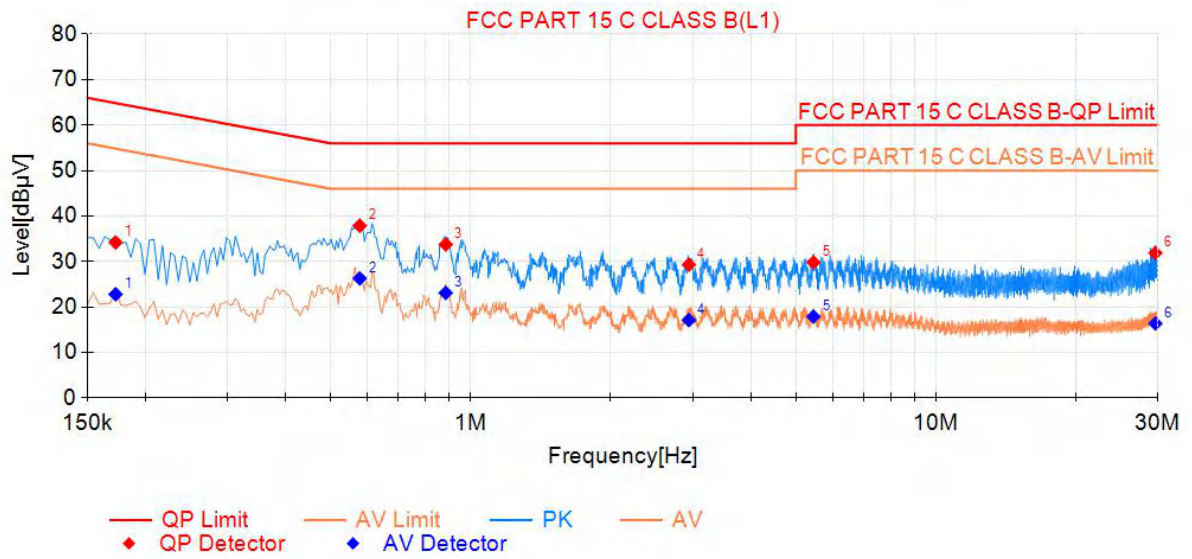
Line -120V/60Hz:



Final Data List								
NO.	Freq. [MHz]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Verdict
1	0.15	34.55	66.00	31.45	20.16	56.00	35.84	PASS
2	0.5865	36.34	56.00	19.66	25.98	46.00	20.02	PASS
3	0.8925	32.61	56.00	23.39	25.62	46.00	20.38	PASS
4	4.9605	30.91	56.00	25.09	18.84	46.00	27.16	PASS
5	5.2035	29.86	60.00	30.14	17.43	50.00	32.57	PASS
6	12.831	27.74	60.00	32.26	15.18	50.00	34.82	PASS



Neutral -120V/60Hz:



Final Data List								
NO.	Freq. [MHz]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Verdict
1	0.1725	34.22	64.84	30.62	22.81	54.84	32.03	PASS
2	0.5775	37.89	56.00	18.11	26.30	46.00	19.70	PASS
3	0.8835	33.77	56.00	22.23	23.11	46.00	22.89	PASS
4	2.9445	29.32	56.00	26.68	17.14	46.00	28.86	PASS
5	5.4555	29.82	60.00	30.18	17.90	50.00	32.10	PASS
6	29.6385	31.90	60.00	28.10	16.39	50.00	33.61	PASS



7 Radiated Spurious Emissions

Test Requirement : FCC CFR47 Part 15 Section 15.209 & 15.247
 Test Method : ANSI C63.10:2013
 Test Result : PASS
 Measurement Distance : 3m
 Limit : See the follow table

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

7.1 EUT Operation

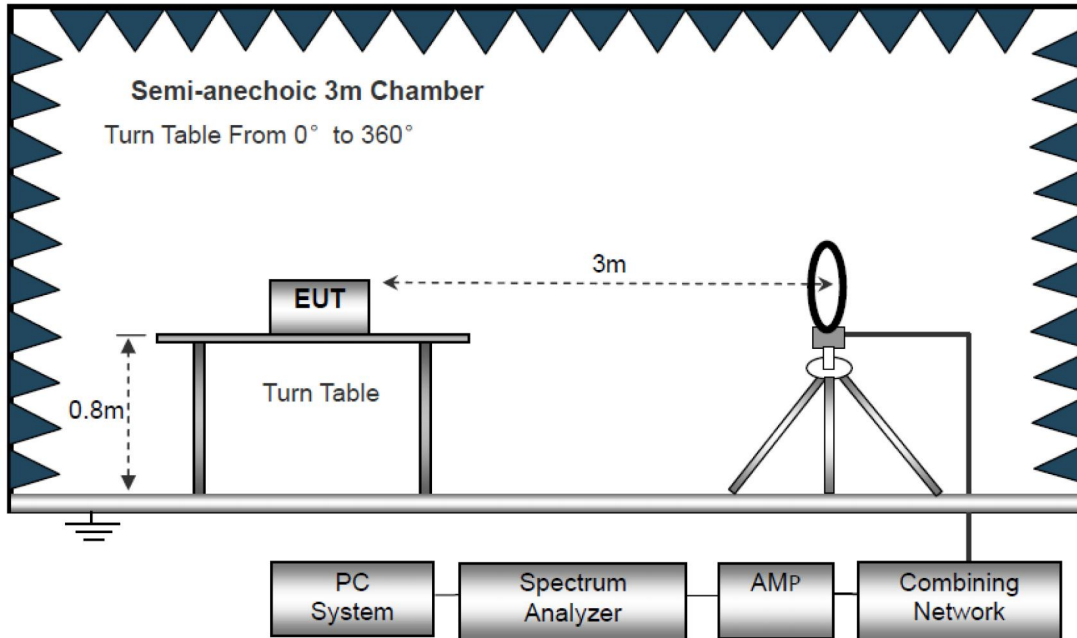
Operating Environment :

Temperature : 23.5 °C
 Humidity : 51.1 % RH
 Atmospheric Pressure : 101.2kPa

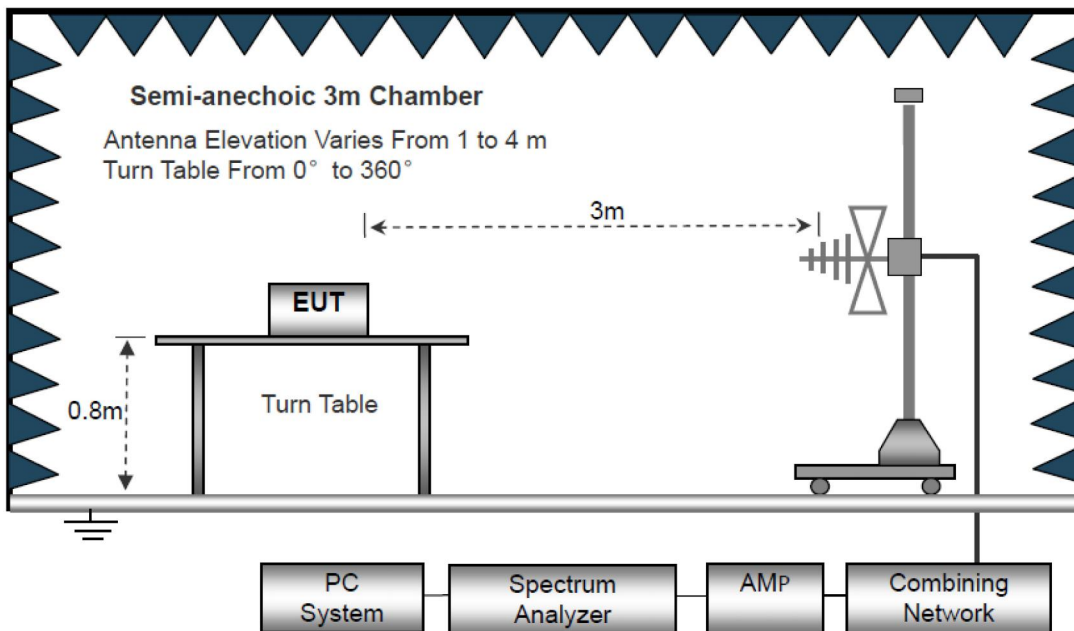
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

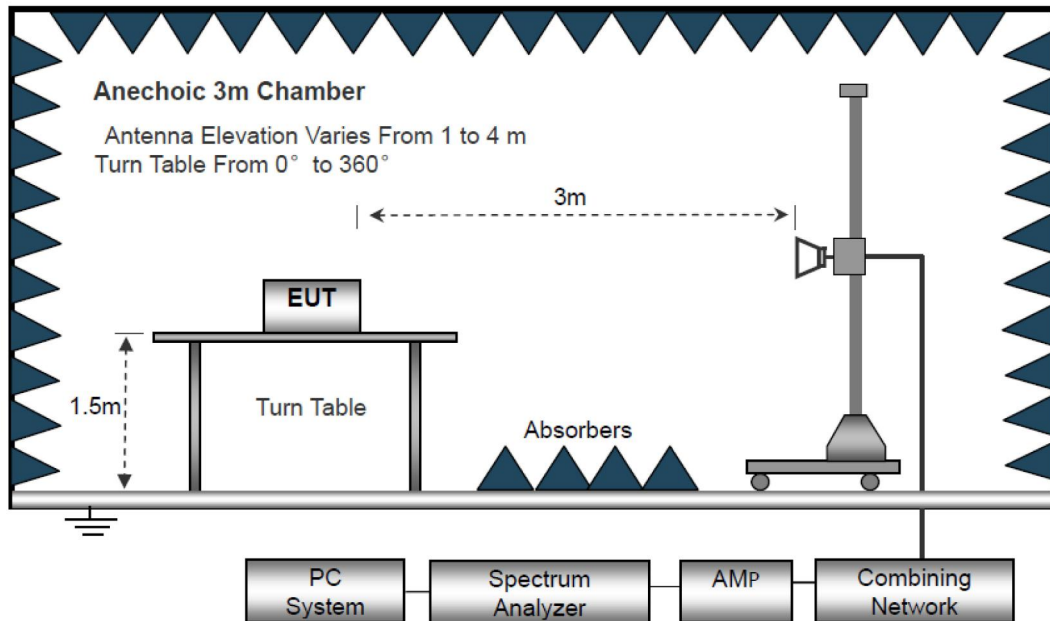
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP



7.4 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2013.
2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) 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 to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.
7. Test Procedure of measurement (For Above 1GHz):
 - 1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).
 - 2) Change the antenna polarization and repeat 1) with vertical polarization.
 - 3) Make a hardcopy of the spectrum.
 - 4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
 - 5) Change the analyser mode to Clear/ Write and found the cone of emission.
 - 6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.
 - 7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.
 - 8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.
7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.



7.5 Summary of Test Results

Test Frequency: 9KHz-30MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	>20

Note:

The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor = $40\log(\text{Specific distance} / \text{test distance})$ (dB);

Limit line = Specific limits (dBuV) + distance extrapolation factor.

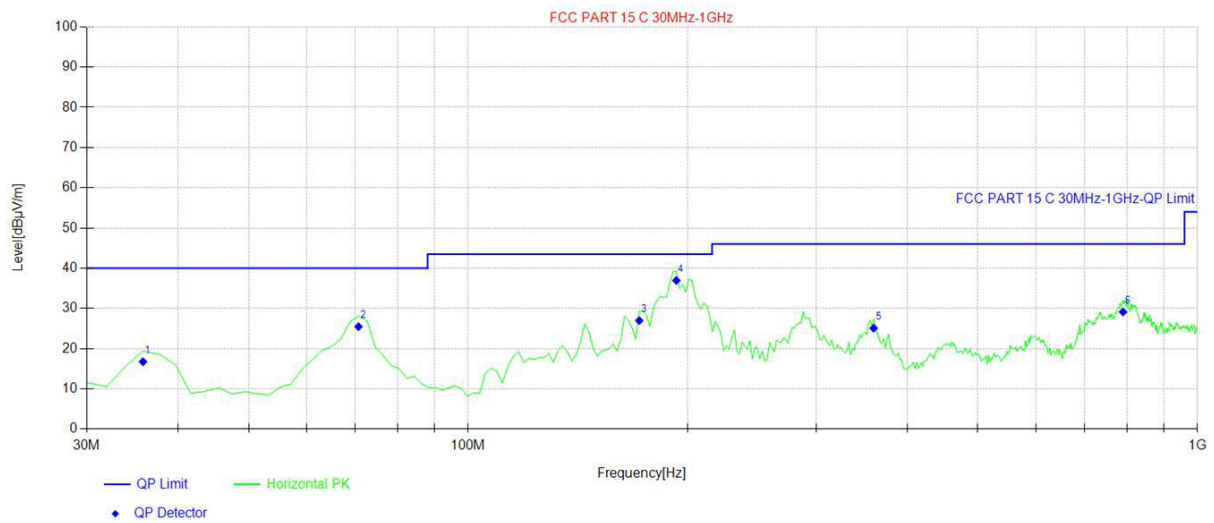
Test Frequency: 30MHz ~ 1GHz

Please refer to the following test plots:

All the modulation modes were tested the data of the worst mode (AC 120V/60Hz, GFSK TX 2402MHz) are recorded in the following pages and the others modulation methods do not exceed the limits.



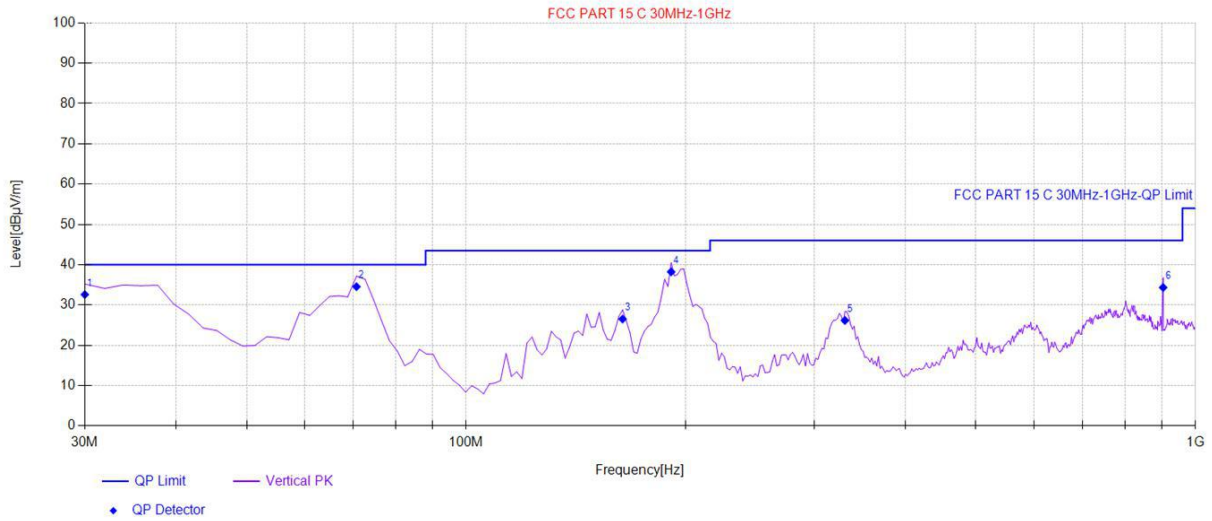
Test plot for Horizontal: GFSK(2402MHz)



Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	35.82	-18.19	16.76	40.00	23.24	100	237	Horizontal
2	70.74	-19.43	25.47	40.00	14.53	100	216	Horizontal
3	171.62	-16.42	26.98	43.50	16.52	100	142	Horizontal
4	192.96	-18.31	36.94	43.50	6.56	100	124	Horizontal
5	359.80	-14.09	25.09	46.00	20.91	100	276	Horizontal
6	790.48	-4.66	29.13	46.00	16.87	100	245	Horizontal



Test plot for Vertical: GFSK(2402MHz)



Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	30.00	-18.35	32.59	40.00	7.41	100	32	Vertical
2	70.74	-19.43	34.55	40.00	5.45	100	334	Vertical
3	163.86	-15.91	26.52	43.50	16.98	100	35	Vertical
4	191.02	-18.17	38.23	43.50	5.27	100	12	Vertical
5	330.70	-14.56	26.17	46.00	19.83	100	249	Vertical
6	903.00	-2.96	34.34	46.00	11.66	100	154	Vertical



Test Frequency 1GHz-25GHz

Low Channel (2402MHz) Worst case GFSK

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4824	28.14	AV	V	8.13	8.26	7.46	37.07	54	-16.93
4824	29.35	AV	H	8.13	8.26	7.46	38.28	54	-15.72
4824	32.66	PK	V	8.13	8.26	7.46	41.59	74	-32.41
4824	35.28	PK	H	8.13	8.26	7.46	44.21	74	-29.79
15447	27.46	AV	V	9.14	9.57	8.62	37.55	54	-16.45
15447	28.28	AV	H	9.14	9.57	8.62	38.37	54	-15.63
15447	30.49	PK	V	9.14	9.57	8.62	40.58	74	-33.42
15447	32.58	PK	H	9.14	9.57	8.62	42.67	74	-31.33

Middle Channel (2441MHz) Worst case $\pi/4$ -DQPSK

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4882	26.43	AV	V	8.24	9.47	11.05	33.09	54	-20.91
4882	28.15	AV	H	8.24	9.47	11.05	34.81	54	-19.19
4882	30.26	PK	V	8.24	9.47	11.05	36.92	74	-37.08
4882	32.19	PK	H	8.24	9.47	11.05	38.85	74	-35.15
15483	28.49	AV	V	9.33	10.46	11.48	36.8	54	-17.2
15483	29.35	AV	H	9.33	10.46	11.48	37.66	54	-16.34
15483	31.45	PK	V	9.33	10.46	11.48	39.76	74	-34.24
15483	32.87	PK	H	9.33	10.46	11.48	41.18	74	-32.82

High Channel (2480MHz) Worst case GFSK

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4960	25.46	AV	V	8.26	8.37	9.46	32.63	54	-21.37
4960	27.35	AV	H	8.26	8.37	9.46	34.52	54	-19.48
4960	30.15	PK	V	8.26	8.37	9.46	37.32	74	-36.68
4960	32.59	PK	H	8.26	8.37	9.46	39.76	74	-34.24
15386	28.43	AV	V	9.44	9.04	11.26	35.65	54	-18.35
15386	29.61	AV	H	9.44	9.04	11.26	36.83	54	-17.17
15386	31.48	PK	V	9.44	9.04	11.26	38.7	74	-35.3
15386	33.68	PK	H	9.44	9.04	11.26	40.9	74	-33.1

Note: 1. The testing has been conformed to $10 \times 2480\text{MHz} = 24800\text{MHz}$.

2. All other emissions more than 30dB below the limit.

3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Emission Level = Reading + Factor



Margin=Emission Level-Limit

Spurious Emission in Restricted Band 2310-2390MHz and 2483.5-2500MHz

Bluetooth (GFSK, Pi/4-DQPSK, 8-DQPSK Hopping)mode have been tested, and the worst result(GFSK, Hopping) was report as below

Test Mode: GFSK Frequency: Channel 0 2402MHz							
Frequency (MHz)	Polarity H/V	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	Over (dB)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)	Over (dB)
2386.960	H	45.39	74	-28.61	32.59	54	-21.41
2384.160	V	44.01	74	-29.99	30.14	54	-23.86

Test Mode: GFSK Frequency: Channel 78 2480MHz							
Frequency (MHz)	Polarity H/V	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	Over (dB)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)	Over (dB)
2484.259	H	42.15	74	-31.85	28.19	54	-25.81
2485.282	V	41.29	74	-32.71	26.58	54	-27.42

Test Mode: GFSK Frequency: Hopping							
Frequency (MHz)	Polarity H/V	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	Over (dB)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)	Over (dB)
2390.00	H	38.15	74	-35.85	27.15	54	-26.85
2483.50	H	45.69	74	-28.31	27.04	54	-26.96
2390.00	V	39.26	74	-34.74	24.13	54	-29.87
2483.50	V	46.28	74	-27.72	26.92	54	-27.08



8 CONDUCTED BAND EDGE EMISSION

8.1 REQUIREMENT

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

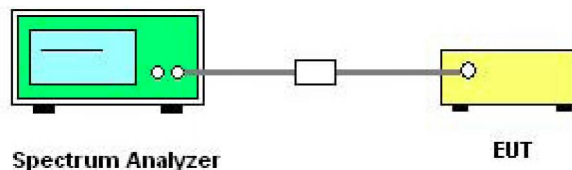
8.2 TEST PROCEDURE

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	30 MHz to 10th carrier harmonic
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

. For Band edge

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	Lower Band Edge: 2300 – 2403 MHz Upper Band Edge: 2479 – 2500 MHz
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

8.3 TEST SETUP



1. The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100KHz. The video bandwidth is set to 300KHz.
2. The spectrum from 30MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.



8.4 EUT OPERATION CONDITIONS

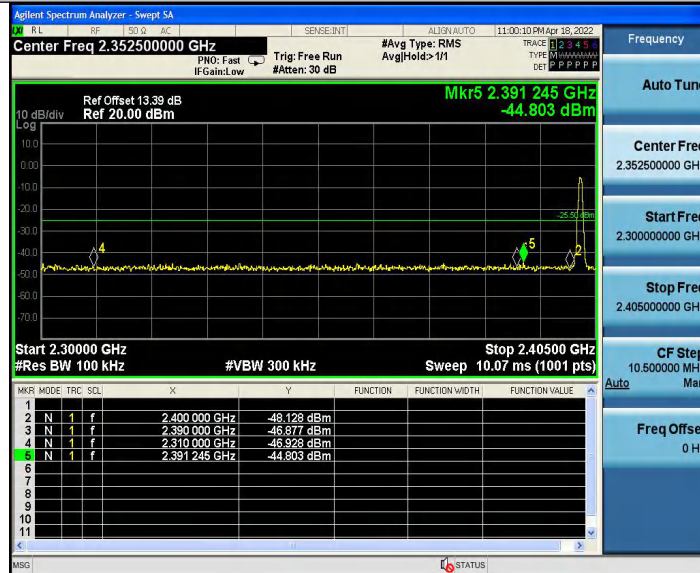
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

8.5 TEST RESULTS

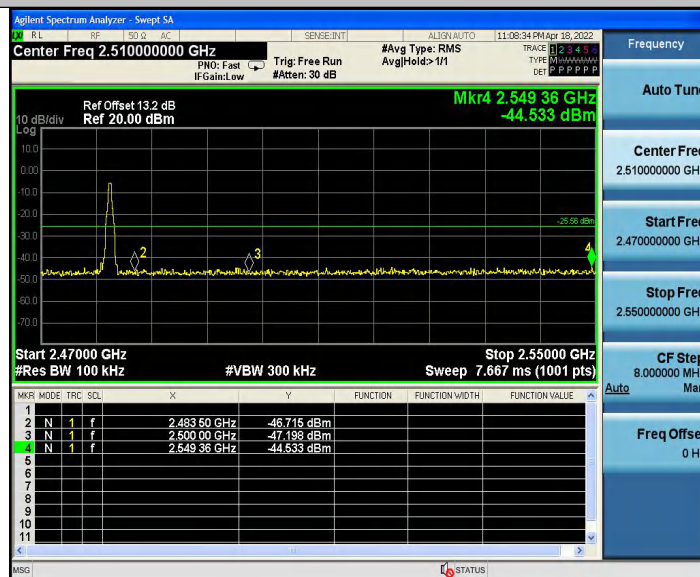
TestMode	Antenna	ChName	Channel	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	-5.50	-44.8	≤ -25.5	PASS
		High	2480	-5.56	-44.53	≤ -25.56	PASS
		Low	Hop_2402	-6.06	-44.55	≤ -26.06	PASS
		High	Hop_2480	-5.67	-44.42	≤ -25.67	PASS
2DH5	Ant1	Low	2402	-5.66	-44.05	≤ -25.66	PASS
		High	2480	-5.70	-44.34	≤ -25.7	PASS
		Low	Hop_2402	-6.89	-44.8	≤ -26.89	PASS
		High	Hop_2480	-5.42	-44.03	≤ -25.42	PASS
3DH5	Ant1	Low	2402	-5.34	-44.14	≤ -25.34	PASS
		High	2480	-5.42	-44.84	≤ -25.42	PASS
		Low	Hop_2402	-8.30	-44.95	≤ -28.3	PASS
		High	Hop_2480	-5.73	-43.41	≤ -25.73	PASS



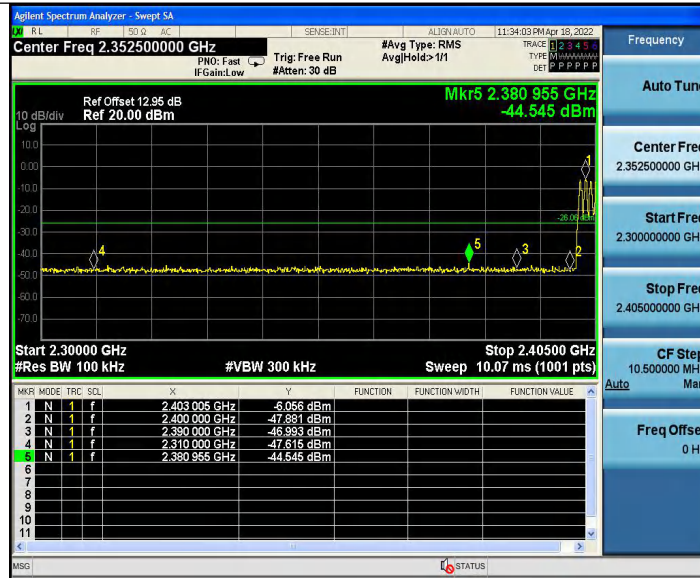
DH5_Ant1_Low_2402



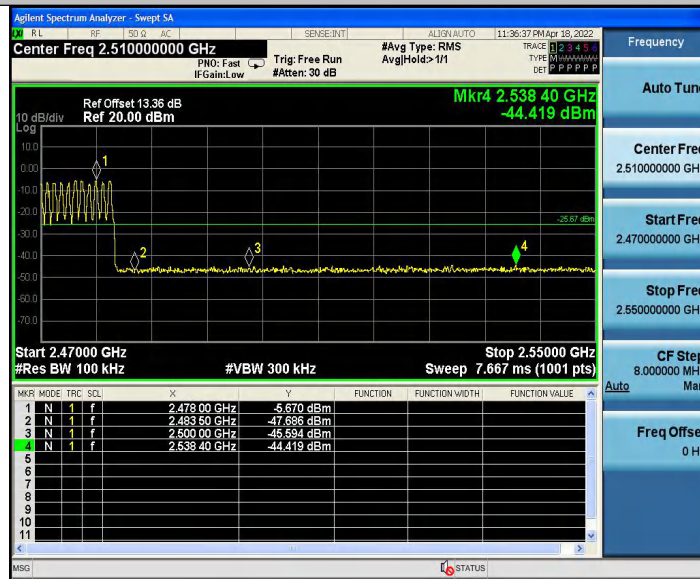
DH5_Ant1_High_2480



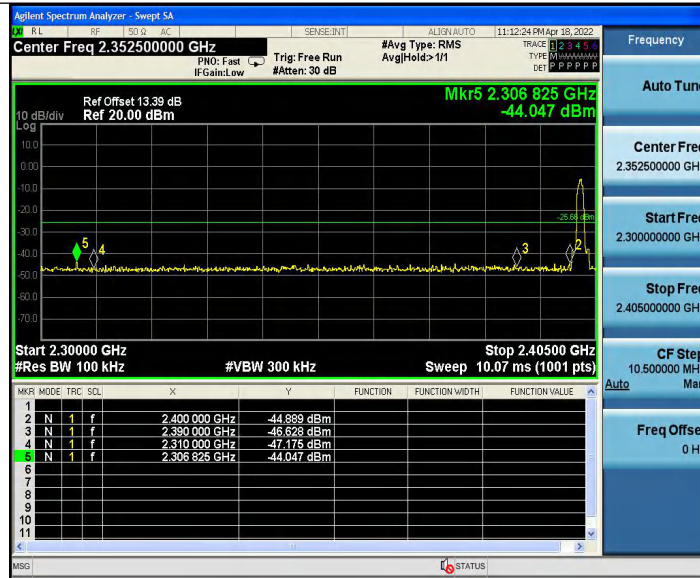
DH5_Ant1_Low_Hop_2402



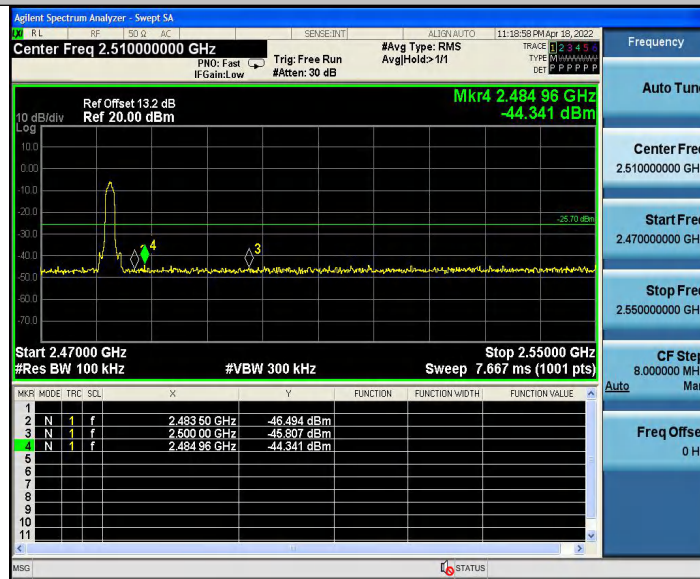
DH5_Ant1_High_Hop_2480



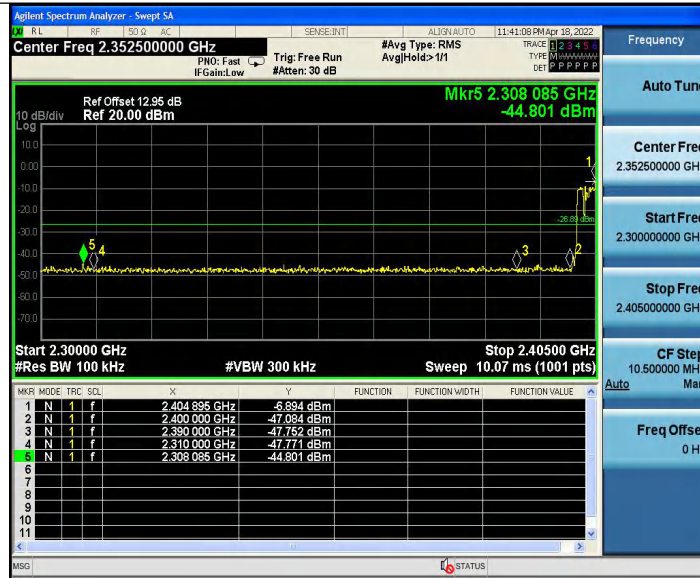
2DH5_Ant1_Low_2402



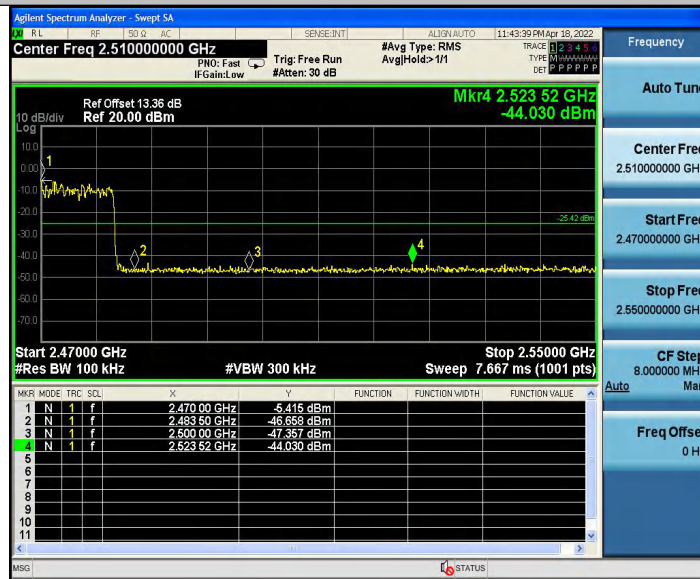
2DH5_Ant1_High_2480



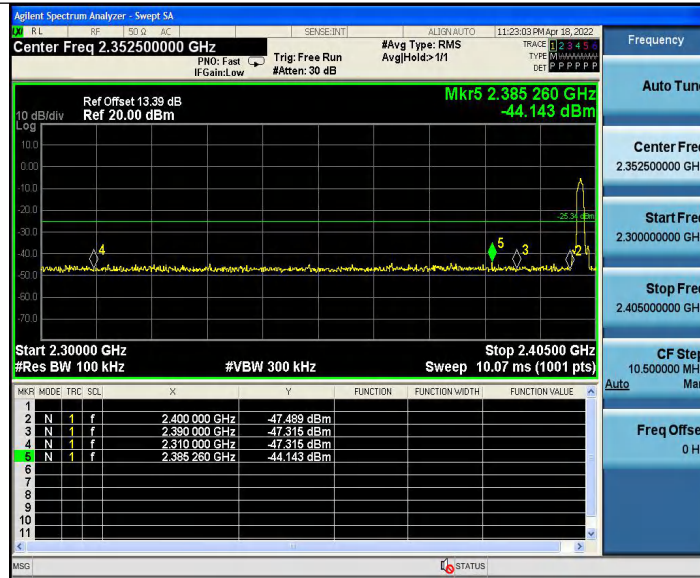
2DH5_Ant1_Low_Hop_2402



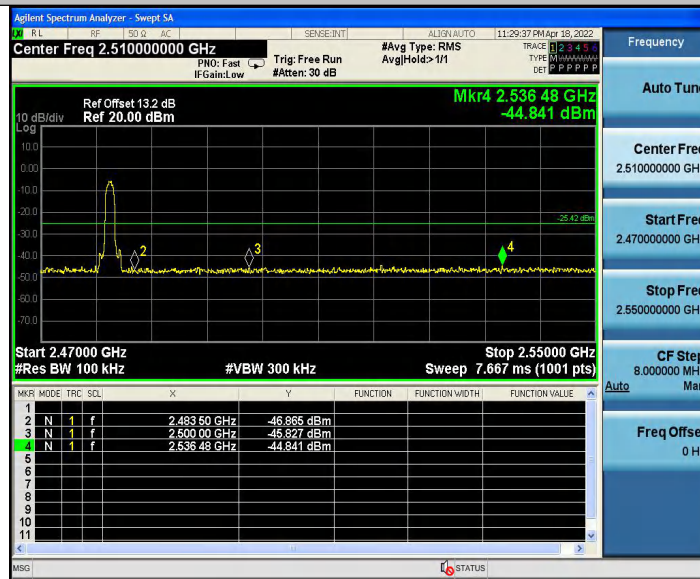
2DH5_Ant1_High_Hop_2480



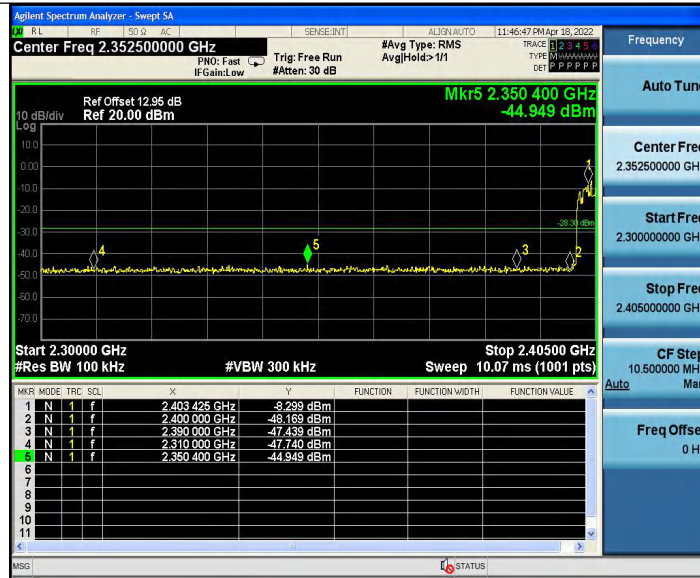
3DH5_Ant1_Low_2402



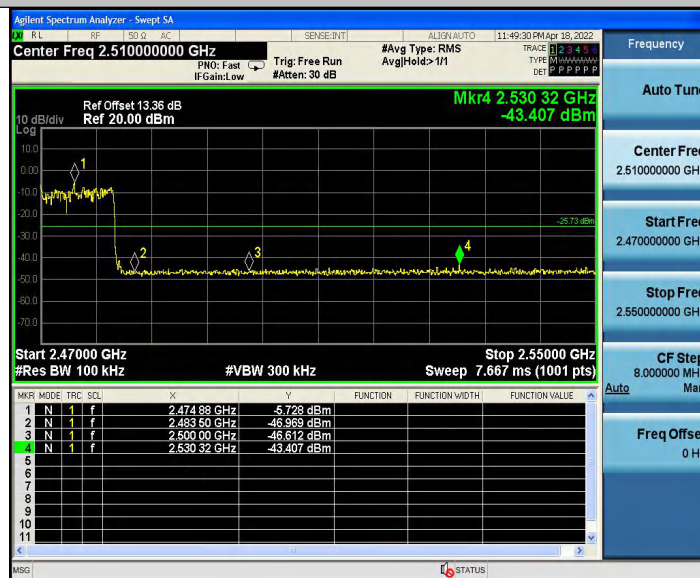
3DH5_Ant1_High_2480



3DH5_Ant1_Low_Hop_2402



3DH5_Ant1_High_Hop_2480



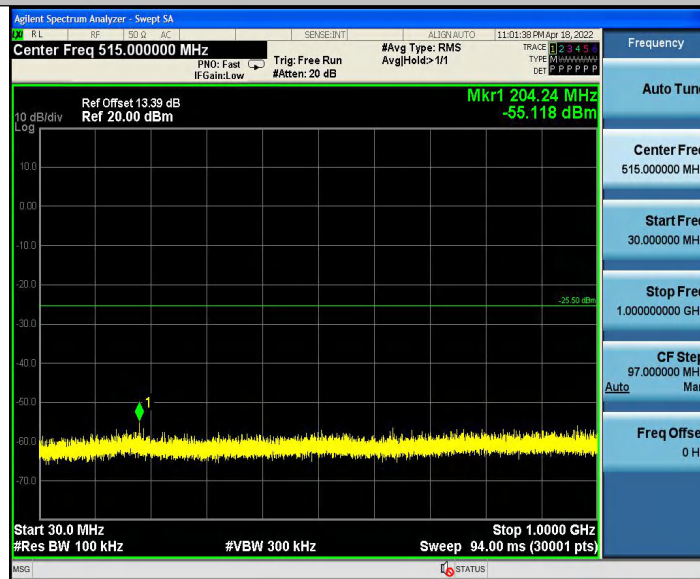


For Conduct spurious emissions.

TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	30~1000	-5.50	-55.12	≤-25.5	PASS
			1000~26500	-5.50	-42.26	≤-25.5	PASS
		2441	30~1000	-5.35	-56.14	≤-25.35	PASS
			1000~26500	-5.35	-42.11	≤-25.35	PASS
		2480	30~1000	-5.56	-55.67	≤-25.56	PASS
			1000~26500	-5.56	-42.62	≤-25.56	PASS
2DH5	Ant1	2402	30~1000	-5.66	-56.15	≤-25.66	PASS
			1000~26500	-5.66	-42.64	≤-25.66	PASS
		2441	30~1000	-5.51	-56.06	≤-25.51	PASS
			1000~26500	-5.51	-42.78	≤-25.51	PASS
		2480	30~1000	-5.70	-55.99	≤-25.7	PASS
			1000~26500	-5.70	-43.2	≤-25.7	PASS
3DH5	Ant1	2402	30~1000	-5.34	-55.87	≤-25.34	PASS
			1000~26500	-5.34	-42.98	≤-25.34	PASS
		2441	30~1000	-5.22	-56.22	≤-25.22	PASS
			1000~26500	-5.22	-43.53	≤-25.22	PASS
		2480	30~1000	-5.42	-56.51	≤-25.42	PASS
			1000~26500	-5.42	-42.59	≤-25.42	PASS



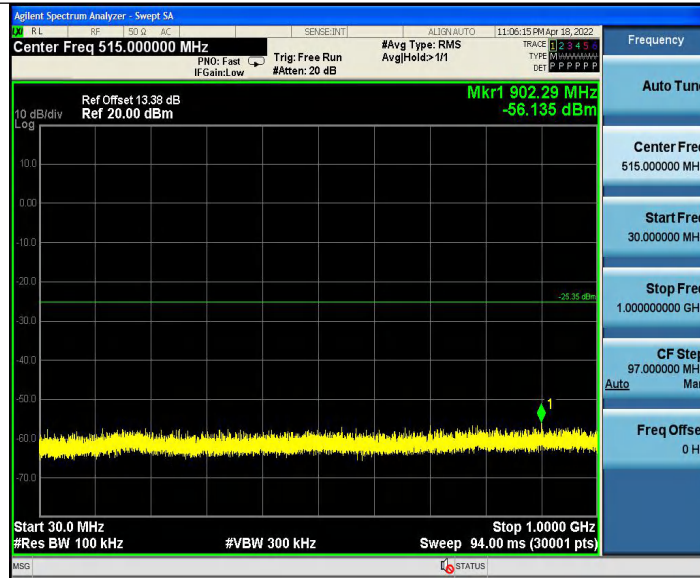
DH5_Ant1_2402_30~1000



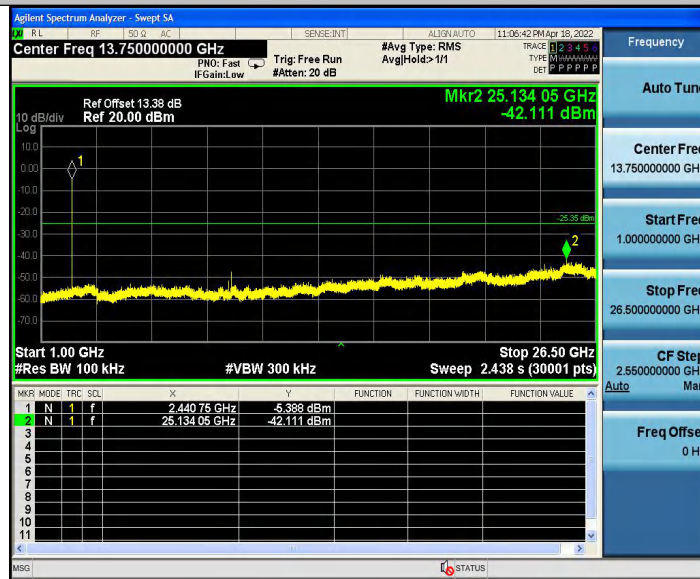
DH5_Ant1_2402_1000~26500



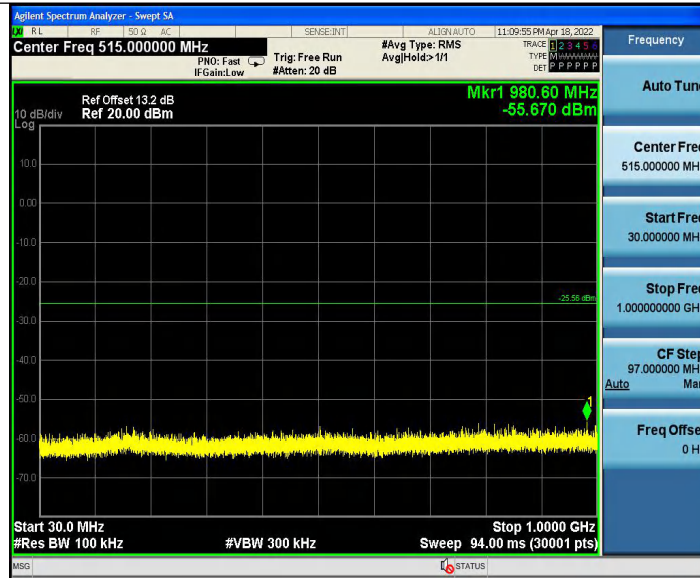
DH5_Ant1_2441_30~1000



DH5_Ant1_2441_1000~26500



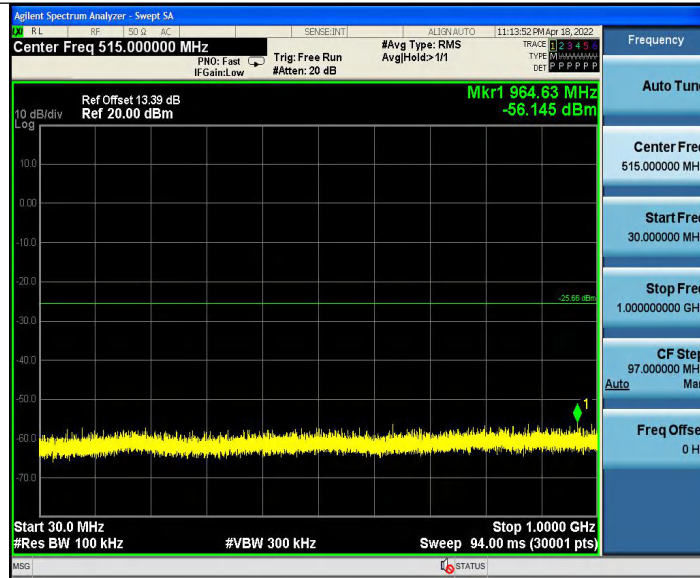
DH5_Ant1_2480_30~1000



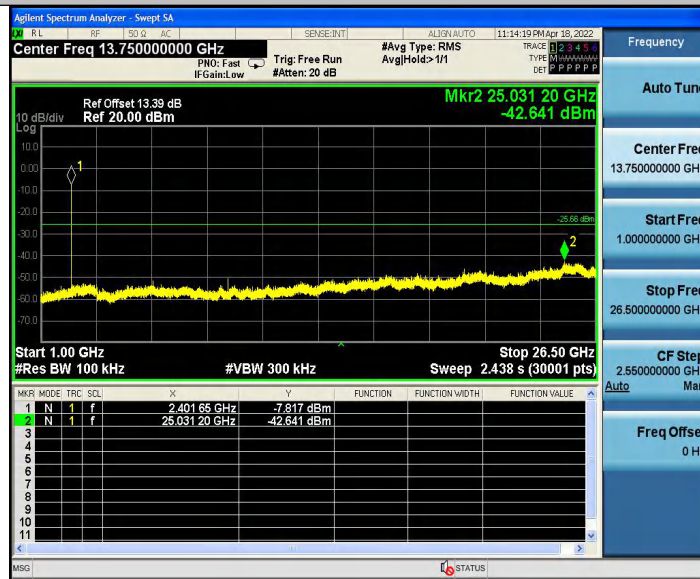
DH5_Ant1_2480_1000~26500



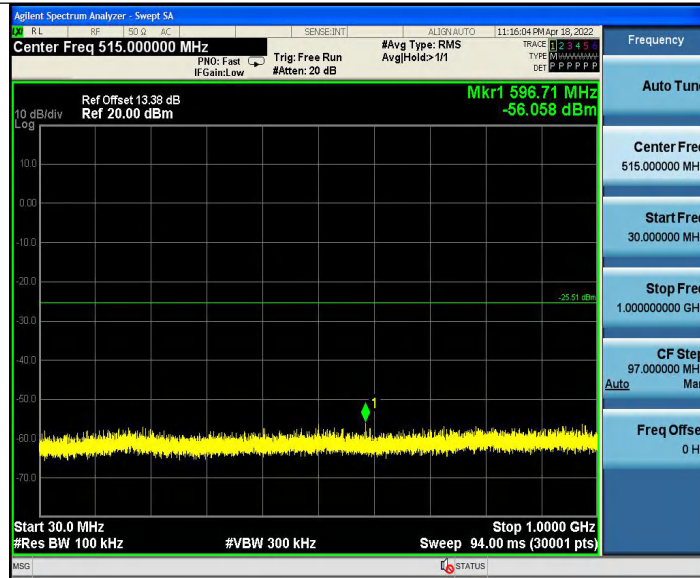
2DH5_Ant1_2402_30~1000



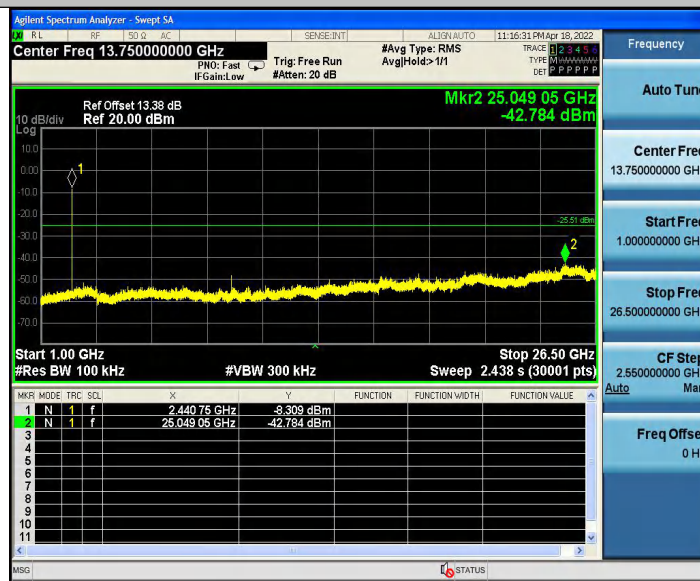
2DH5_Ant1_2402_1000~26500



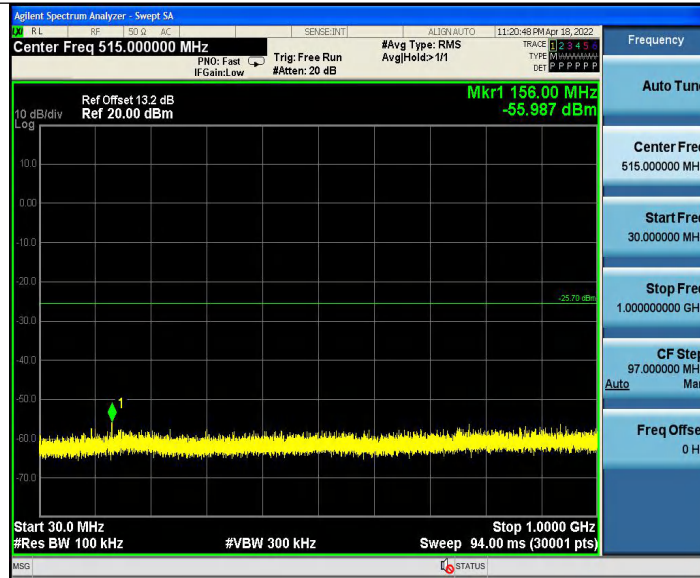
2DH5_Ant1_2441_30~1000



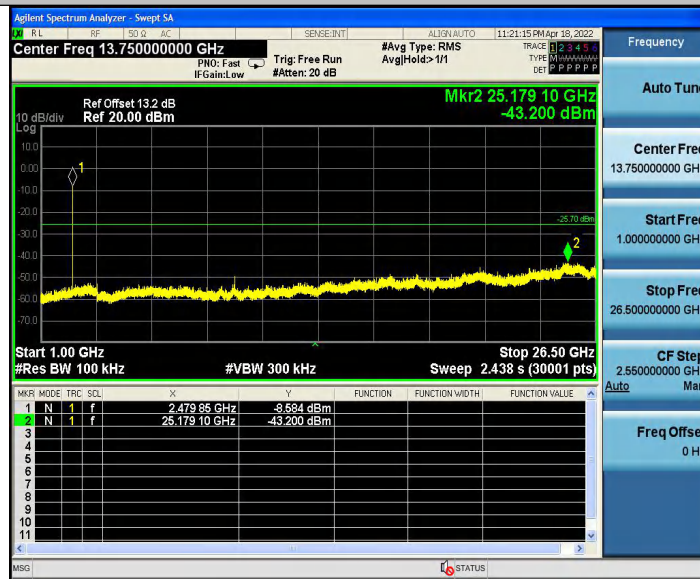
2DH5_Ant1_2441_1000~26500



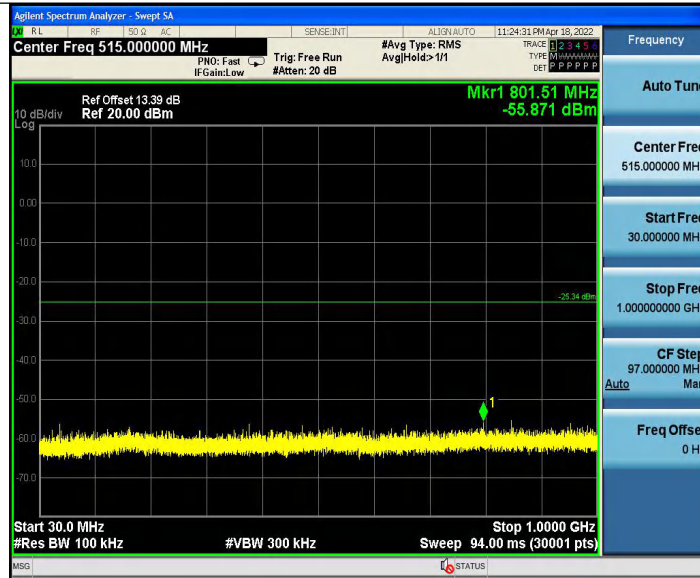
2DH5_Ant1_2480_30~1000



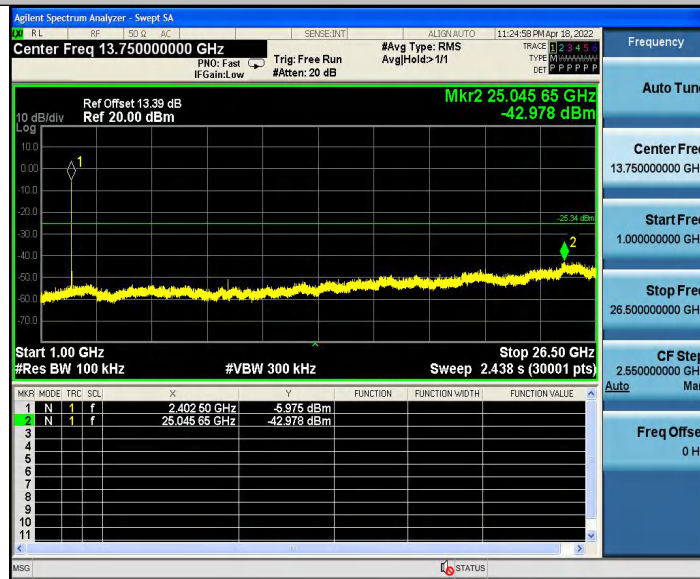
2DH5_Ant1_2480_1000~26500



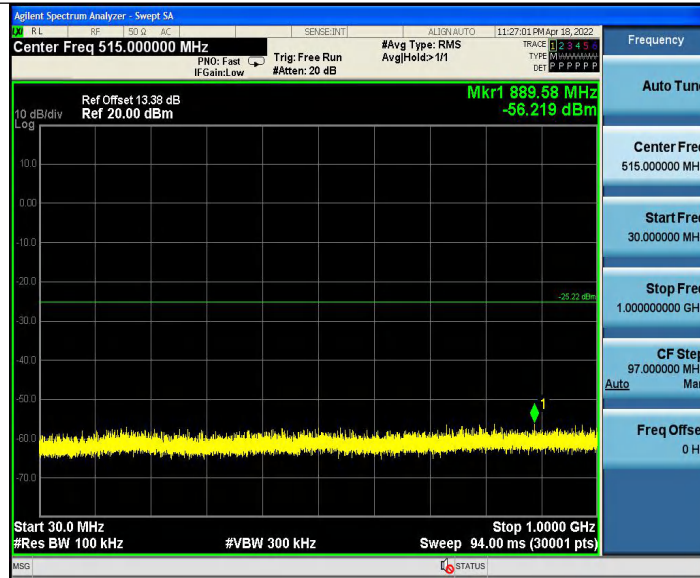
3DH5_Ant1_2402_30~1000



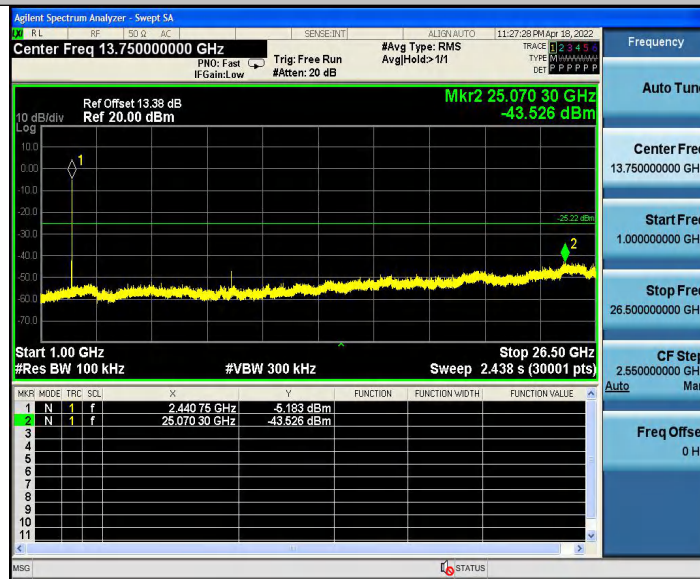
3DH5_Ant1_2402_1000~26500



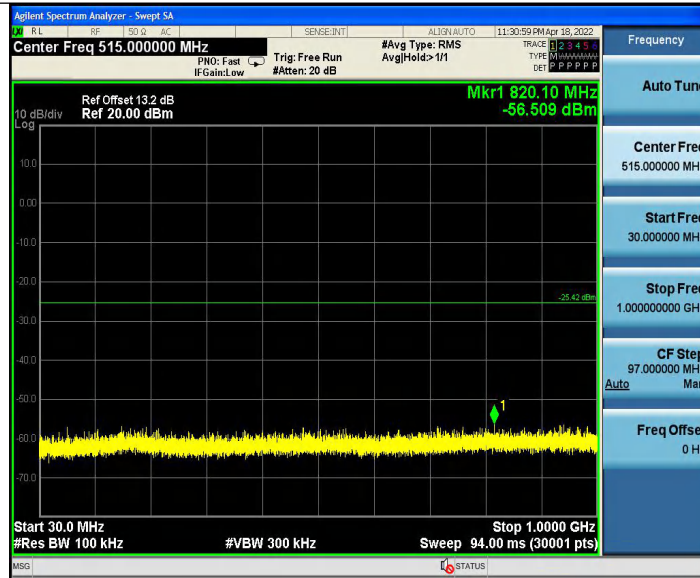
3DH5_Ant1_2441_30~1000



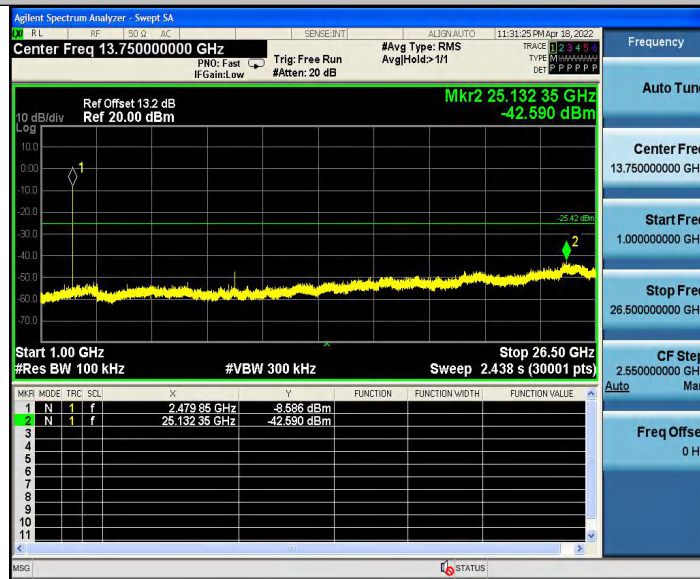
3DH5_Ant1_2441_1000~26500



3DH5_Ant1_2480_30~1000



3DH5_Ant1_2480_1000~26500





Emissions in Restricted Bands

TestMode	Antenna	ChName	Channel	Detector	Freq	Result	Limit	Verdict
DH5	Ant1	Low	2402	AV	2310.000	-43.86	≤-41.20	PASS
				AV	2370.140	-43.49	≤-41.20	PASS
				AV	2390.000	-43.63	≤-41.20	PASS
				Peak	2310.000	-34.68	≤-21.20	PASS
				Peak	2355.335	-31.81	≤-21.20	PASS
				Peak	2390.000	-34.1	≤-21.20	PASS
		High	2480	AV	2483.500	-43.65	≤-41.20	PASS
				AV	2484.080	-43.42	≤-41.20	PASS
				AV	2500.000	-43.5	≤-41.20	PASS
				Peak	2483.500	-34.68	≤-21.20	PASS
				Peak	2499.760	-32.9	≤-21.20	PASS
				Peak	2500.000	-34.39	≤-21.20	PASS
		Low	Hop_2402	Peak	2310.000	-34.54	≤-21.20	PASS
				Peak	2334.020	-32.91	≤-21.20	PASS
				Peak	2390.000	-34.62	≤-21.20	PASS
		High	Hop_2480	Peak	2483.500	-34.53	≤-21.20	PASS
				Peak	2498.880	-32.08	≤-21.20	PASS
				Peak	2500.000	-32.96	≤-21.20	PASS
2DH5	Ant1	Low	2402	AV	2310.000	-43.79	≤-41.20	PASS
				AV	2370.245	-43.54	≤-41.20	PASS
				AV	2390.000	-43.59	≤-41.20	PASS
				Peak	2310.000	-34.62	≤-21.20	PASS
				Peak	2344.835	-32.56	≤-21.20	PASS
				Peak	2390.000	-34.7	≤-21.20	PASS
		High	2480	AV	2483.500	-43.66	≤-41.20	PASS
				AV	2495.600	-43.38	≤-41.20	PASS



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				AV	2500.000	-43.48	≤ -41.20	PASS
				Peak	2483.500	-33.46	≤ -21.20	PASS
				Peak	2484.320	-32.51	≤ -21.20	PASS
				Peak	2500.000	-34.63	≤ -21.20	PASS
		Low	Hop_2402	Peak	2310.000	-34.97	≤ -21.20	PASS
				Peak	2357.540	-32.63	≤ -21.20	PASS
				Peak	2390.000	-34.55	≤ -21.20	PASS
		High	Hop_2480	Peak	2483.500	-34.06	≤ -21.20	PASS
				Peak	2487.280	-32.39	≤ -21.20	PASS
				Peak	2500.000	-33.55	≤ -21.20	PASS
3DH5	Ant1	Low	2402	AV	2310.000	-43.87	≤ -41.20	PASS
				AV	2375.915	-43.51	≤ -41.20	PASS
				AV	2390.000	-43.68	≤ -41.20	PASS
				Peak	2310.000	-34.13	≤ -21.20	PASS
				Peak	2371.295	-31.89	≤ -21.20	PASS
				Peak	2390.000	-33.75	≤ -21.20	PASS
		High	2480	AV	2483.500	-43.57	≤ -41.20	PASS
				AV	2493.520	-43.45	≤ -41.20	PASS
				AV	2500.000	-43.53	≤ -41.20	PASS
				Peak	2483.500	-33.96	≤ -21.20	PASS
				Peak	2486.560	-32.76	≤ -21.20	PASS
				Peak	2500.000	-33.84	≤ -21.20	PASS
		Low	Hop_2402	Peak	2310.000	-34.49	≤ -21.20	PASS
				Peak	2342.945	-32.99	≤ -21.20	PASS
				Peak	2390.000	-34.33	≤ -21.20	PASS
		High	Hop_2480	Peak	2483.500	-32.76	≤ -21.20	PASS
				Peak	2486.720	-32.61	≤ -21.20	PASS
				Peak	2500.000	-33.5	≤ -21.20	PASS



Note:

1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

DH5_Ant1_Low_2402_AV



DH5_Ant1_Low_2402_Peak



DH5_Ant1_High_2480_AV



DH5_Ant1_High_2480_Peak



DH5_Ant1_Low_Hop_2402_Peak



DH5_Ant1_High_Hop_2480_Peak



2DH5_Ant1_Low_2402_AV



2DH5_Ant1_Low_2402_Peak



2DH5_Ant1_High_2480_AV



2DH5_Ant1_High_2480_Peak



2DH5_Ant1_Low_Hop_2402_Peak



2DH5_Ant1_High_Hop_2480_Peak



3DH5_Ant1_Low_2402_AV