

3.10 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205		
Test Method:	ANSI C63.10: 2013 Section 11.12		
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)		
Limit:	Frequency	Limit (dBuV/m)	Remark
	30MHz-88MHz	40.0	Quasi-peak
	88MHz-216MHz	43.5	Quasi-peak
	216MHz-960MHz	46.0	Quasi-peak
	960MHz-1GHz	54.0	Quasi-peak
	Above 1GHz	54.0	Average Value
		74.0	Peak Value
Test Setup:			

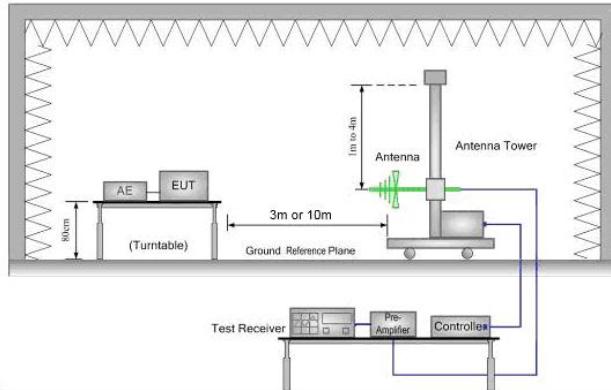


Figure 1. 30MHz to 1GHz

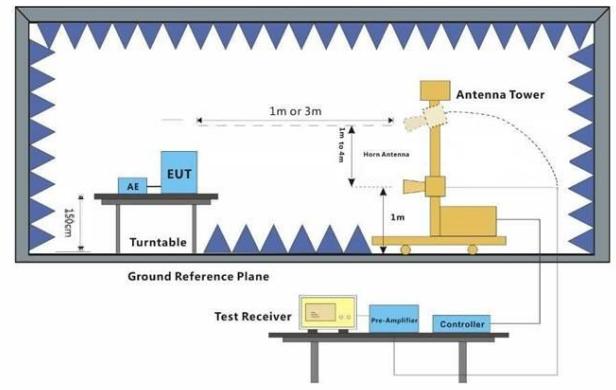


Figure 2. Above 1 GHz

Test Procedure:	<ol style="list-style-type: none"> For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel Test the EUT in the lowest channel , the Highest channel The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case. Repeat above procedures until all frequencies measured was complete.
Test Configuration:	Measurements Below 1000MHz

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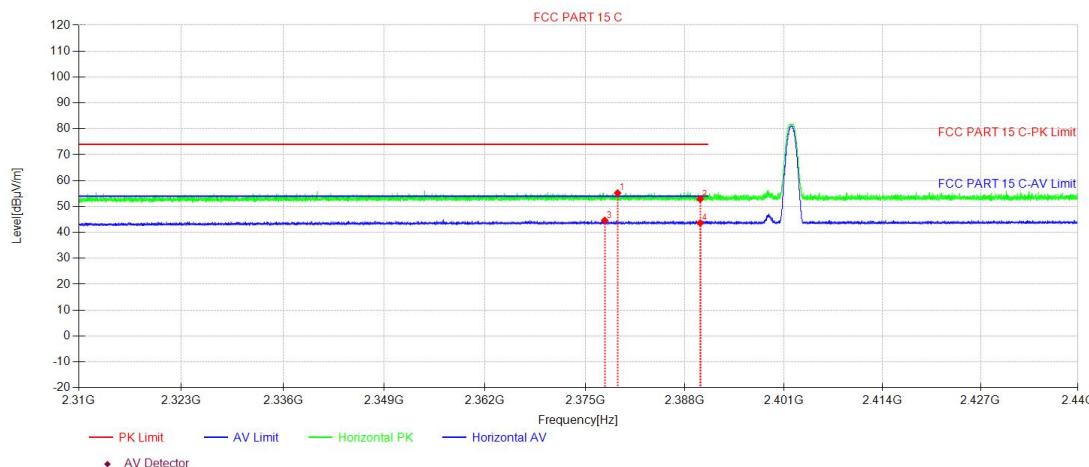


	<ul style="list-style-type: none">• RBW = 120 kHz• VBW = 300 kHz• Detector = Peak• Trace mode = max hold <p>Peak Measurements Above 1000 MHz</p> <ul style="list-style-type: none">• RBW = 1 MHz• VBW ≥ 3 MHz• Detector = Peak• Sweep time = auto• Trace mode = max hold <p>Average Measurements Above 1000MHz</p> <ul style="list-style-type: none">• RBW = 1 MHz• VBW = 10 Hz, when duty cycle is no less than 98 percent.• VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum <p>transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.</p>
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Transmitting mode.
Final Test Mode:	Pretest the EUT Transmitting mode. Through Pre-scan, find the DH5 of data type is the worst case of all modulation type. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 2.9 for details
Test Results:	Pass

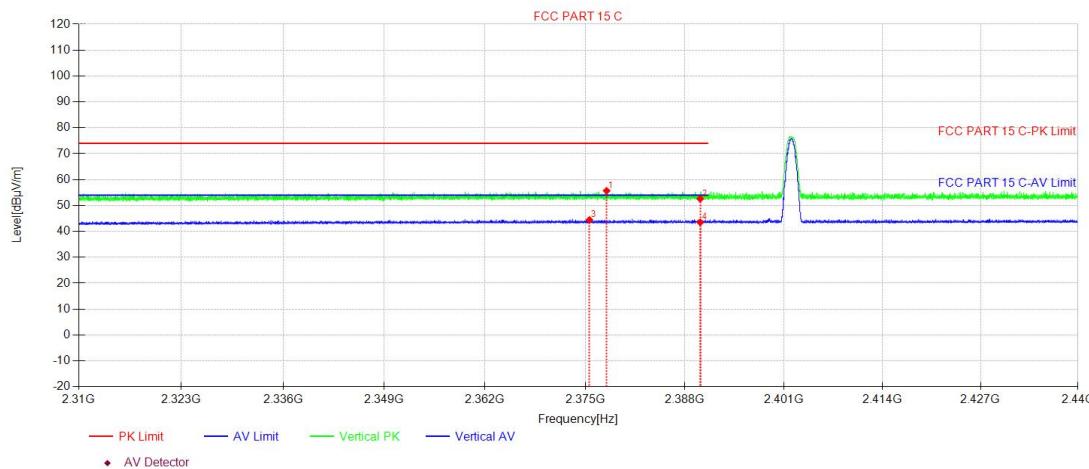


Test Date

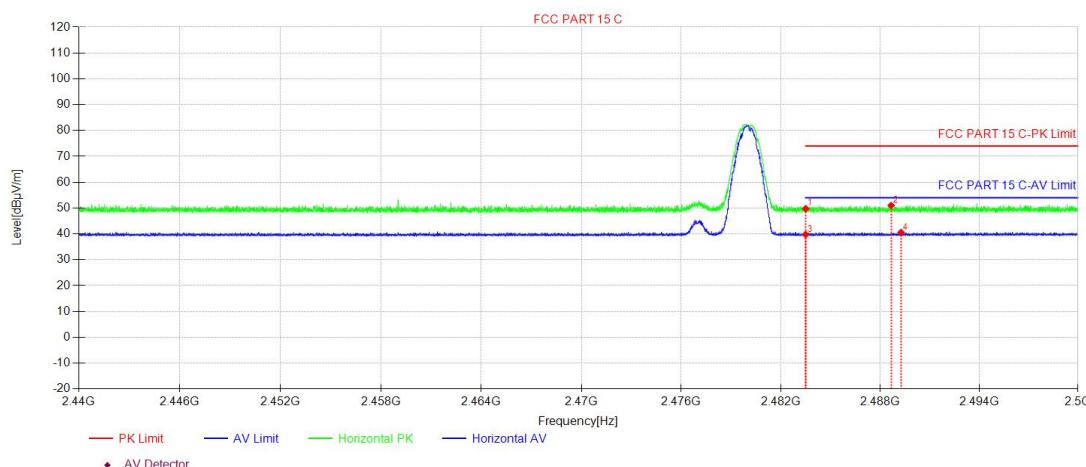
DH5 2402MHz



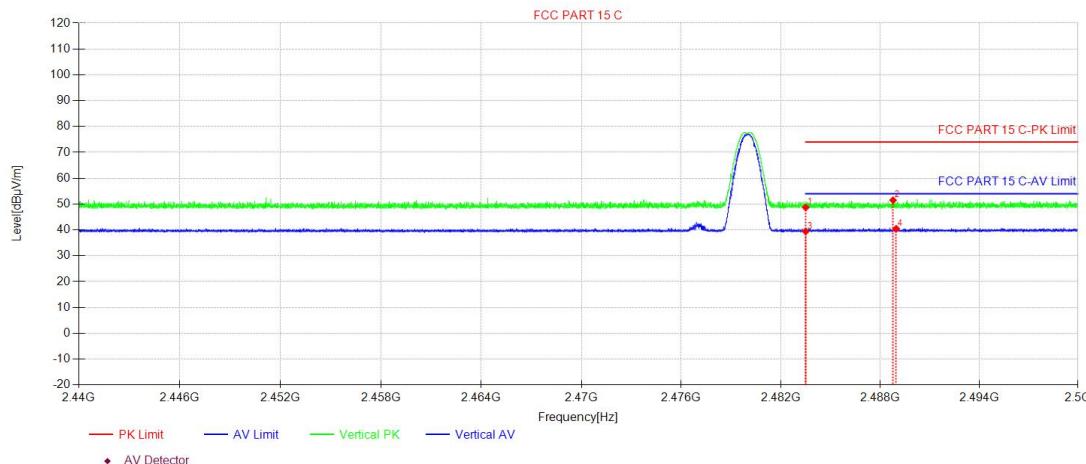
NO.	Freq. [MHz]	Reading Level [dB μ V]	Correct Factor [dB/m]	Result Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [°]	Remark	Polarity
1	2379.22	56.02	-0.84	55.18	74.00	18.82	150	330	PK	H
2	2390.01	53.64	-0.80	52.84	74.00	21.16	150	142	PK	H
3	2377.54	45.44	-0.84	44.60	54.00	9.40	150	4	AV	H
4	2390.01	44.42	-0.80	43.62	54.00	10.38	150	330	AV	H



NO.	Freq. [MHz]	Reading Level [dB μ V]	Correct Factor [dB/m]	Result Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [°]	Remark	Polarity
1	2377.79	56.52	-0.84	55.68	74.00	18.32	150	302	PK	V
2	2390.01	53.35	-0.80	52.55	74.00	21.45	150	335	PK	V
3	2375.55	45.29	-0.85	44.44	54.00	9.56	150	357	AV	V
4	2390.01	44.30	-0.80	43.50	54.00	10.50	150	313	AV	V

**DH5 2480MHz**

NO.	Freq. [MHz]	Reading Level [dB μ V]	Correct Factor [dB/m]	Result Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [°]	Remark	Polarity
1	2483.50	50.06	-0.29	49.77	74.00	24.23	150	38	PK	H
2	2488.67	51.25	-0.25	51.00	74.00	23.00	150	71	PK	H
3	2483.50	40.06	-0.29	39.77	54.00	14.23	150	128	AV	H
4	2489.27	40.79	-0.24	40.55	54.00	13.45	150	360	AV	H



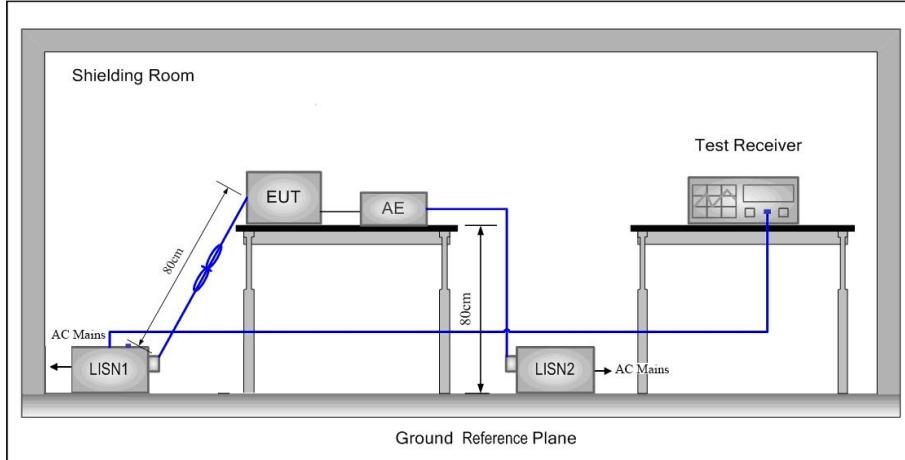
NO.	Freq. [MHz]	Reading Level [dB μ V]	Correct Factor [dB/m]	Result Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [°]	Remark	Polarity
1	2483.50	48.98	-0.29	48.69	74.00	25.31	150	41	PK	V
2	2488.78	51.74	-0.24	51.50	74.00	22.50	150	151	PK	V
3	2483.50	39.71	-0.29	39.42	54.00	14.58	150	162	AV	V
4	2488.98	40.71	-0.24	40.47	54.00	13.53	150	182	AV	V

Note:

1. All channels had been pre-test, DH5 is the worst case, only the worst case was reported
2. The Measurement (Result Level) is calculated by Reading Level adding the Correct Factor(maybe including Ant.Factor and the Cable Factor etc.), The basic equation is as follows:

Result Level= Reading Level + Correct Factor(including Ant.Factor ,Cable Factor etc.)

3.11 AC Power Line Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207		
Test Method:	ANSI C63.10: 2013		
Test Frequency Range:	150kHz to 30MHz		
Limit:	Frequency range (MHz)		Limit (dBuV)
			Quasi-peak
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
* Decreases with the logarithm of the frequency.			
Test Procedure:	<p>1) The mains terminal disturbance voltage test was conducted in a shielded room.</p> <p>2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.</p> <p>3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,</p> <p>4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 2013 on conducted measurement.</p>		
Test Setup:			
Exploratory Test Mode:	<p>Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.</p> <p>Charge + Transmitting mode.</p>		
Final Test Mode:	Through Pre-scan, find the the worst case.		



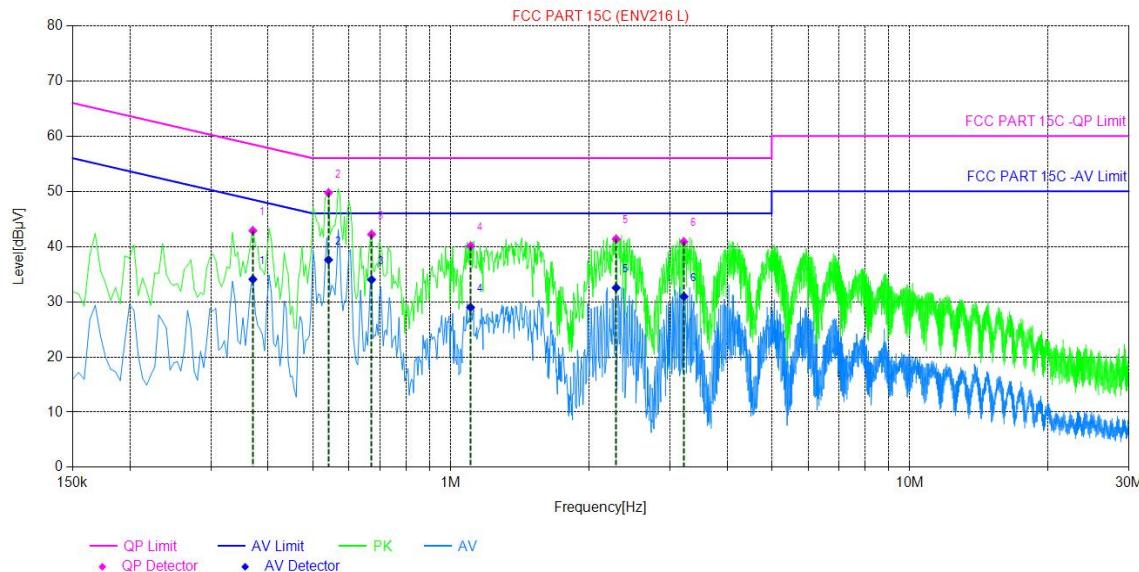
Instruments Used:	Refer to section 2.9 for details
Test Results:	PASS

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.

Live Line:

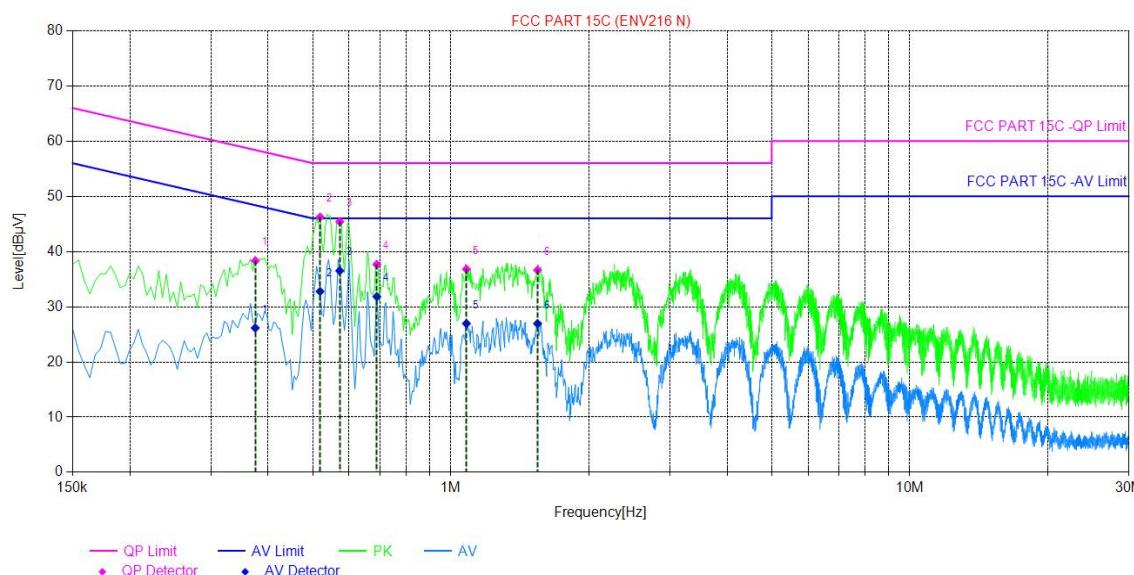


Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Value [dB μ V]	QP Limit [dB μ V]	QP Margin [dB]	AV Value [dB μ V]	AV Limit [dB μ V]	AV Margin [dB]	Verdict
1	0.3705	9.80	42.86	58.49	15.63	34.07	48.49	14.42	PASS
2	0.5415	9.85	49.72	56.00	6.28	37.59	46.00	8.41	PASS
3	0.672	9.78	42.20	56.00	13.80	33.99	46.00	12.01	PASS
4	1.104	9.72	40.07	56.00	15.93	28.99	46.00	17.01	PASS
5	2.292	9.74	41.35	56.00	14.65	32.53	46.00	13.47	PASS
6	3.219	9.74	40.87	56.00	15.13	30.95	46.00	15.05	PASS



Neutral Line:



Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Verdict
1	0.375	9.88	38.34	58.39	20.05	26.16	48.39	22.23	PASS
2	0.519	9.72	46.23	56.00	9.77	32.78	46.00	13.22	PASS
3	0.573	9.76	45.41	56.00	10.59	36.52	46.00	9.48	PASS
4	0.69	9.85	37.66	56.00	18.34	31.83	46.00	14.17	PASS
5	1.0815	9.69	36.80	56.00	19.20	26.96	46.00	19.04	PASS
6	1.545	9.73	36.63	56.00	19.37	26.95	46.00	19.05	PASS

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. The Measurement (Result Level) is calculated by Reading Level adding the Correct Factor(maybe including LISN Factor and the Cable Factor etc.), The basic equation is as follows:
Result Level= Reading Level + Correct Factor(including LISN Factor, Cable Factor etc.)



4 Appendix

Appendix A: 20dB Emission Bandwidth

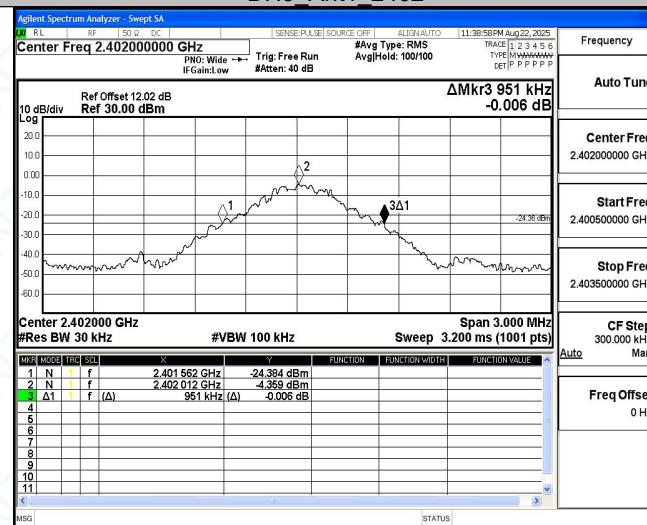
Test Result

TestMode	Antenna	Freq(MHz)	20dB EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.951	2401.562	2402.513	---	---
		2441	0.957	2440.559	2441.516	---	---
		2480	0.948	2479.559	2480.507	---	---
2DH5	Ant1	2402	1.287	2401.391	2402.678	---	---
		2441	1.320	2440.361	2441.681	---	---
		2480	1.311	2479.367	2480.678	---	---
3DH5	Ant1	2402	1.314	2401.370	2402.684	---	---
		2441	1.287	2440.382	2441.669	---	---
		2480	1.311	2479.370	2480.681	---	---

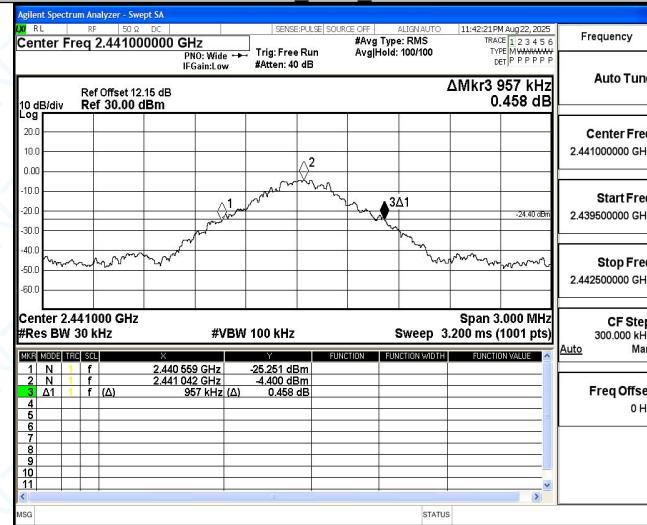


Test Graphs

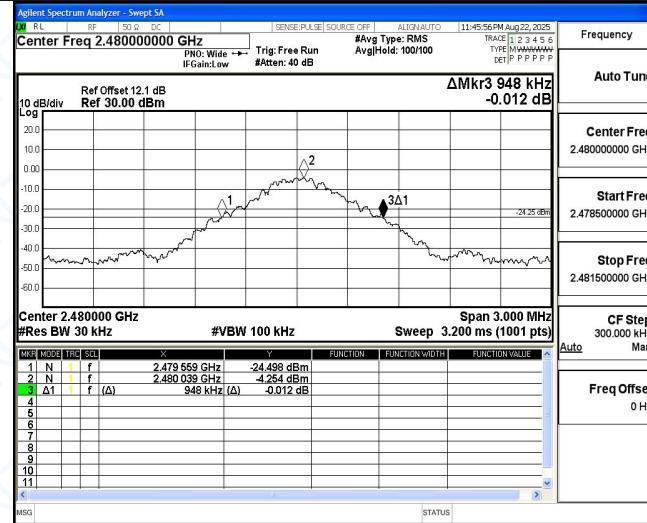
DH5 Ant1_2402



DH5 Ant1_2441



DH5 Ant1_2480



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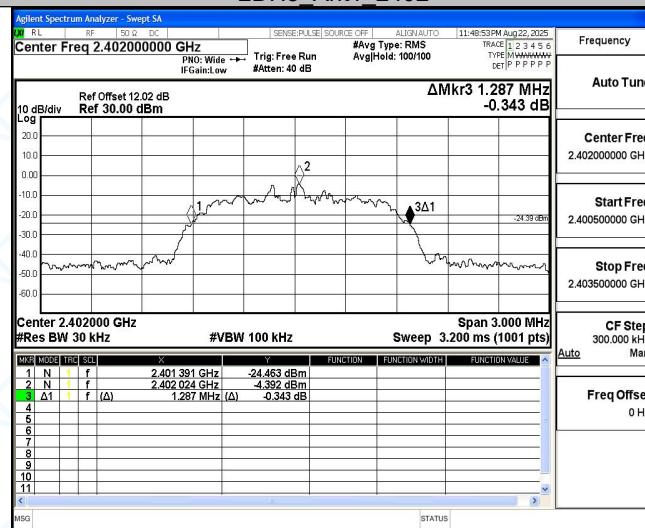
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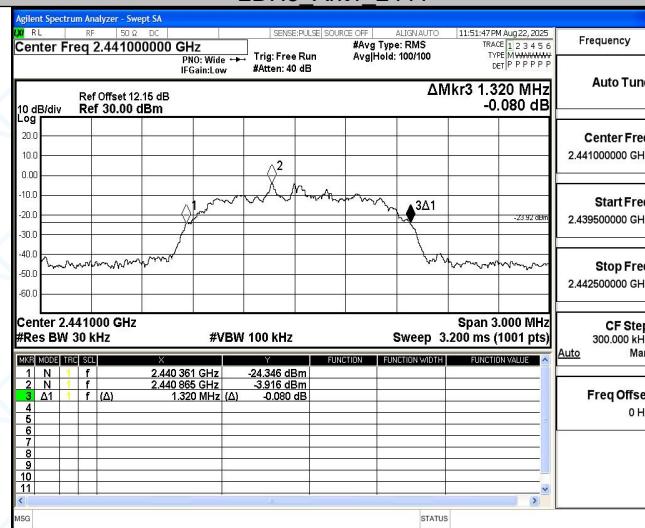
E-mail: service@dn-testing.com



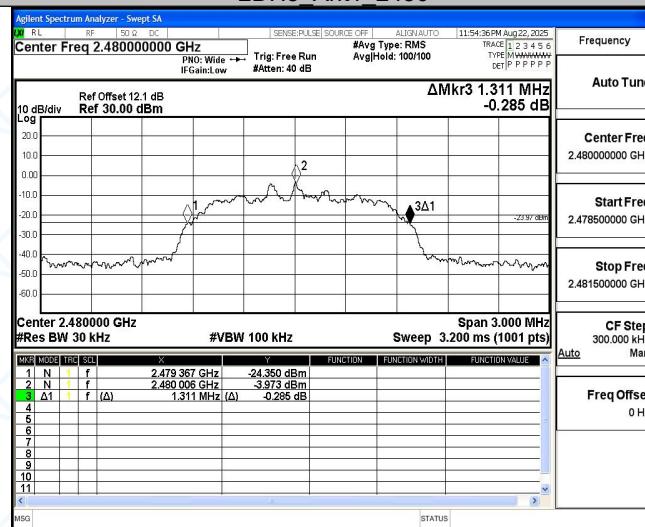
2DH5 Ant1 2402



2DH5 Ant1 2441

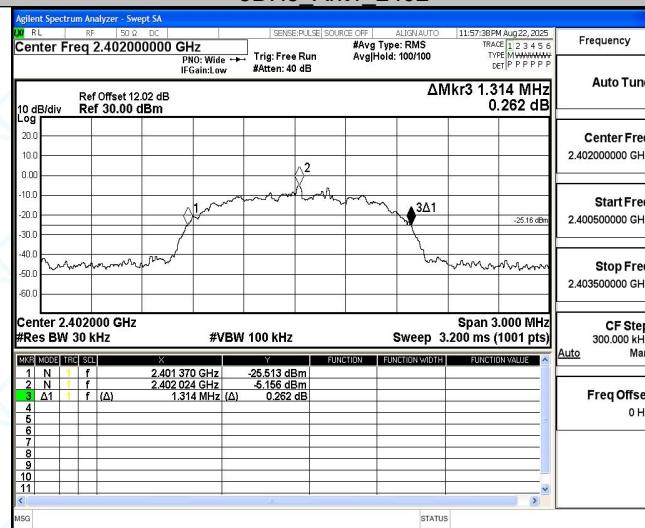


2DH5 Ant1 2480

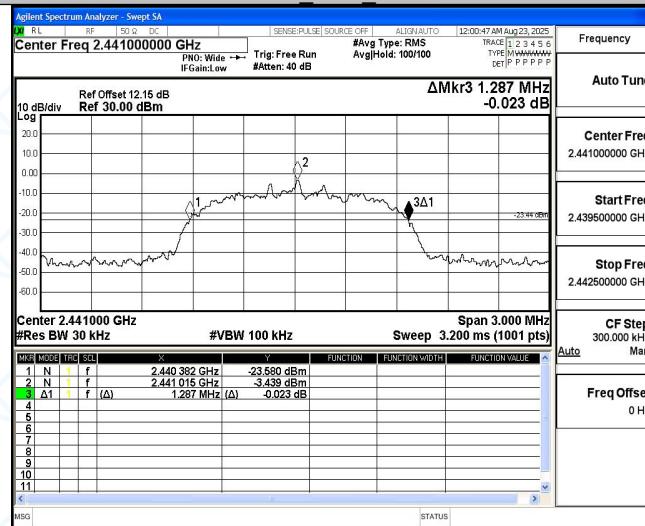




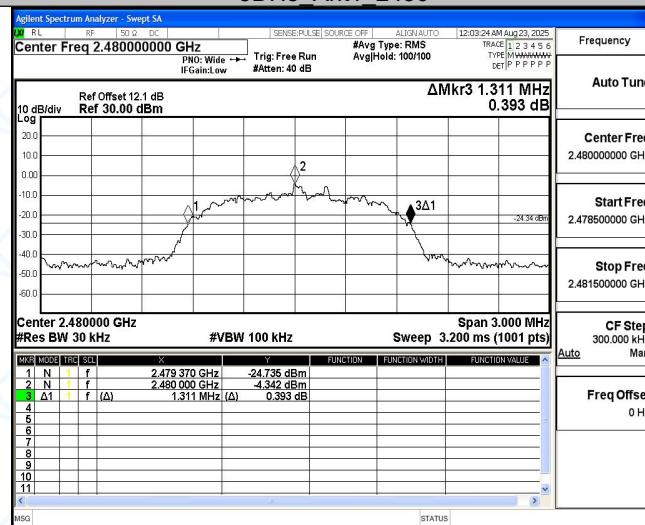
3DH5 Ant1 2402



3DH5 Ant1 2441



3DH5 Ant1 2480





Appendix B: Maximum conducted output power

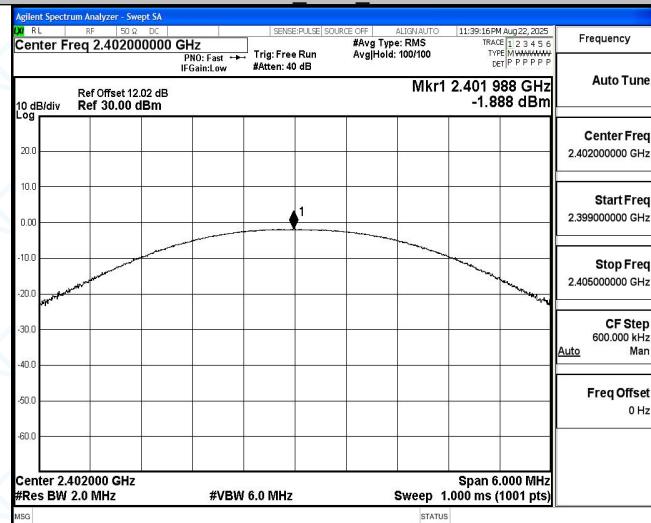
Test Result

Test Mode	Antenna	Freq(MHz)	Conducted Peak Power[dBm]	Conducted Limit[dBm]	Verdict
DH5	Ant1	2402	-1.89	≤20.97	PASS
		2441	-1.33	≤20.97	PASS
		2480	-1.30	≤20.97	PASS
2DH5	Ant1	2402	-0.72	≤20.97	PASS
		2441	-0.22	≤20.97	PASS
		2480	-0.64	≤20.97	PASS
3DH5	Ant1	2402	-0.43	≤20.97	PASS
		2441	0.12	≤20.97	PASS
		2480	-0.44	≤20.97	PASS

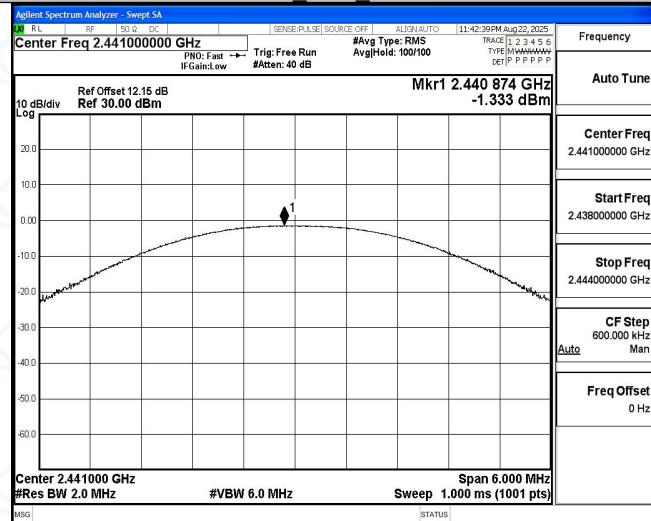


Test Graphs

DH5 Ant1_2402



DH5 Ant1_2441



DH5 Ant1_2480

