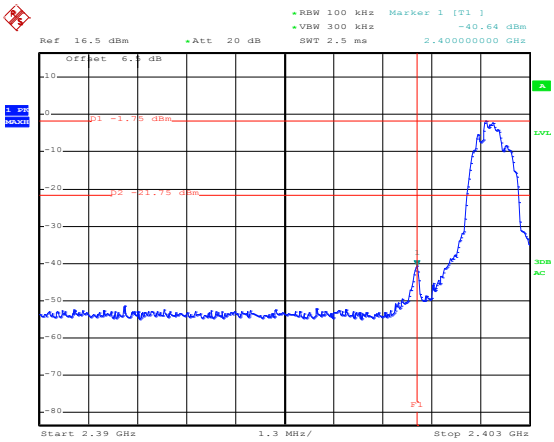
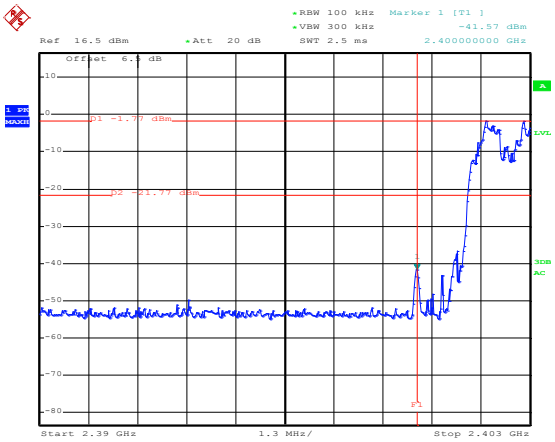
8DPSK

Lowest Channel



Date: 7.JUL.2020 15:48:20

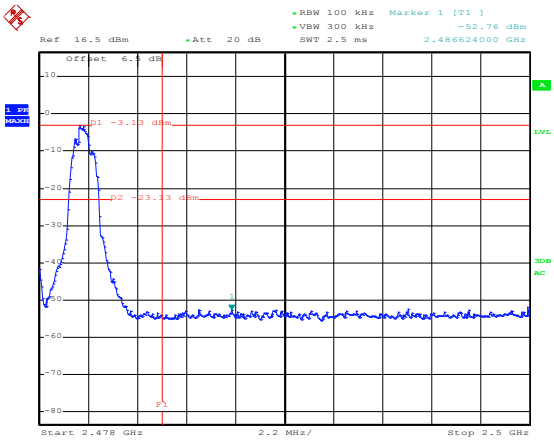
No-hopping mode



Date: 7.JUL.2020 15:49:16

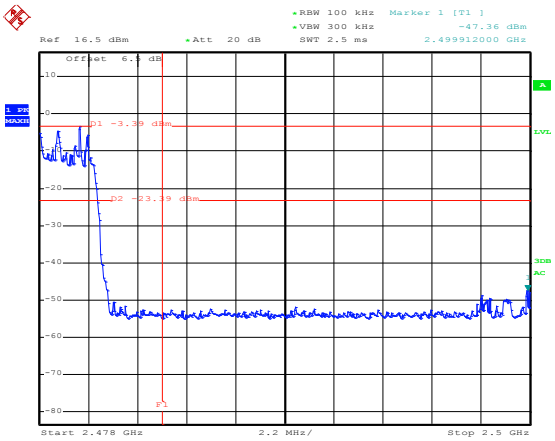
Hopping mode

Highest Channel



Date: 7.JUL.2020 15:54:40

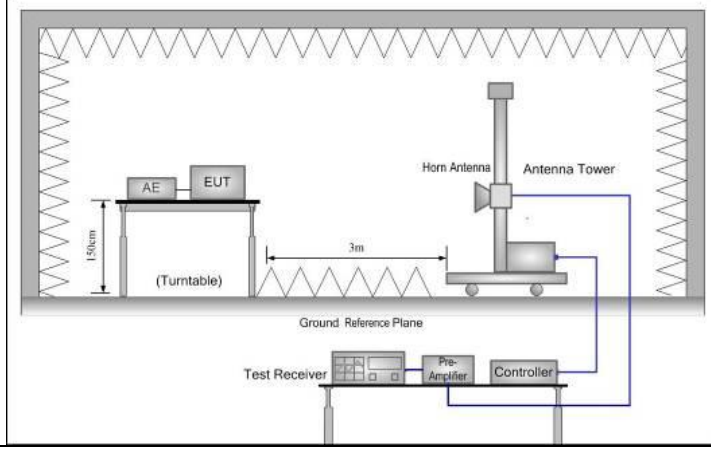
No-hopping mode



Date: 7.JUL.2020 15:55:30

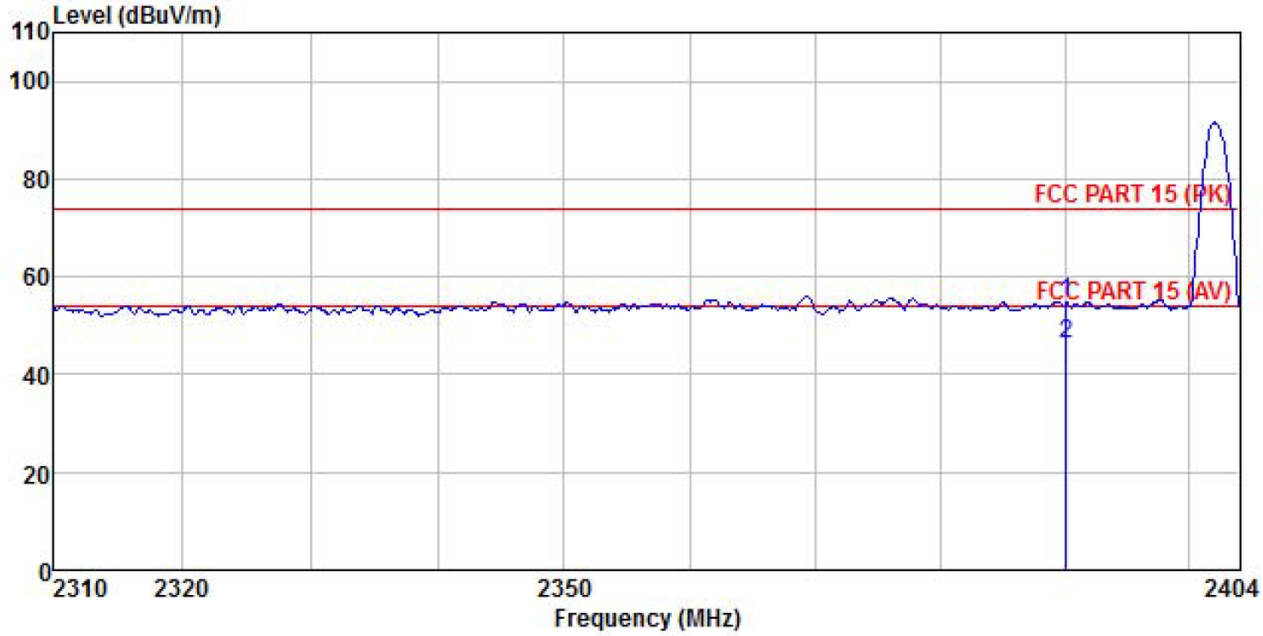
Hopping mode

6.9.2 Radiated Emission Method

Test Requirement:	FCC Part 15 C Section 15.209 and 15.205				
Test Frequency Range:	2310 MHz to 2390 MHz and 2483.5 MHz to 2500 MHz				
Test Distance:	3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		RMS	1MHz	3MHz	Average Value
Limit:	Frequency	Limit (dBuV/m @3m)	Remark		
	Above 1GHz	54.00	Average Value		
		74.00	Peak Value		
Test setup:					
Test Procedure:	1. The EUT was placed on the top of a rotating table 1.5meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. 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. 4. 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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.				
Test Instruments:	Refer to section 5.9 for details				
Test mode:	Non-hopping mode				
Test results:	Passed				

GFSK Mode:

Product Name:	Wireless Speaker & Charging Hub	**Product Model:**	WSP1000
Test By:	Mike	**Test mode:**	DH1 Tx mode
Test Channel:	Lowest channel	**Polarization:**	Vertical
Test Voltage:	AC 120V/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

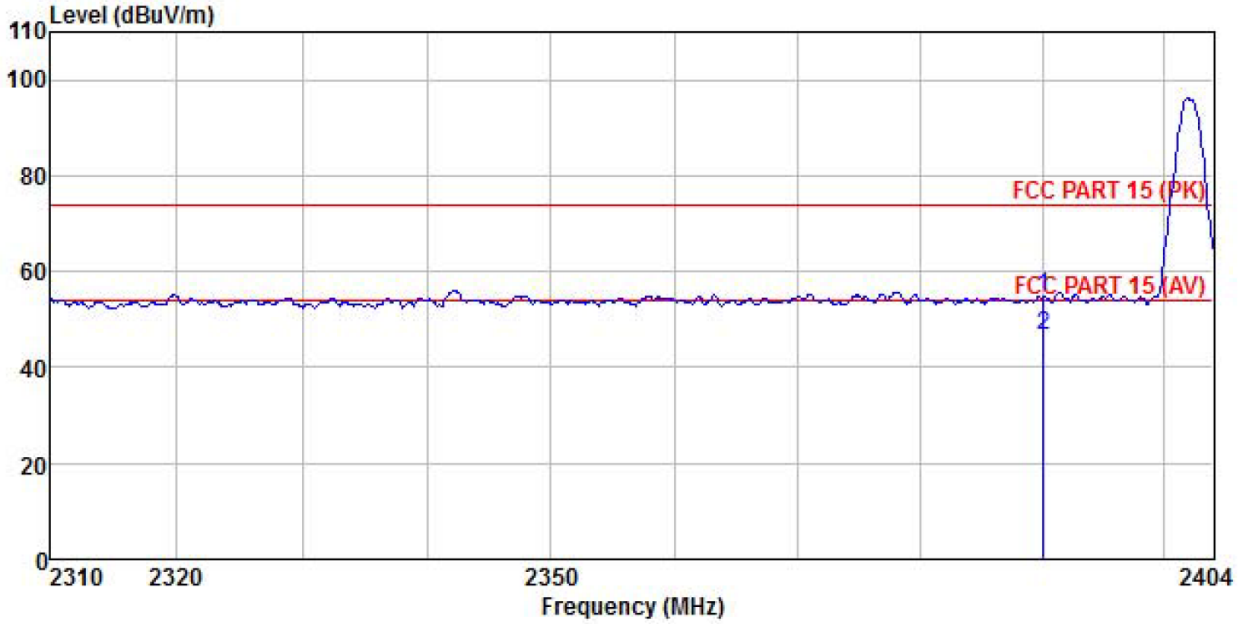


	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	2390.000	21.70	27.03	4.28	1.68	0.00	54.69	74.00	-19.31	Peak
2	2390.000	13.35	27.03	4.28	1.68	0.00	46.34	54.00	-7.66	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are lower than the limit 20dB and not show in test report.*

Product Name:	Wireless Speaker & Charging Hub	**Product Model:**	WSP1000
Test By:	Mike	**Test mode:**	DH1 Tx mode
Test Channel:	Lowest channel	**Polarization:**	Horizontal
Test Voltage:	AC 120V/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

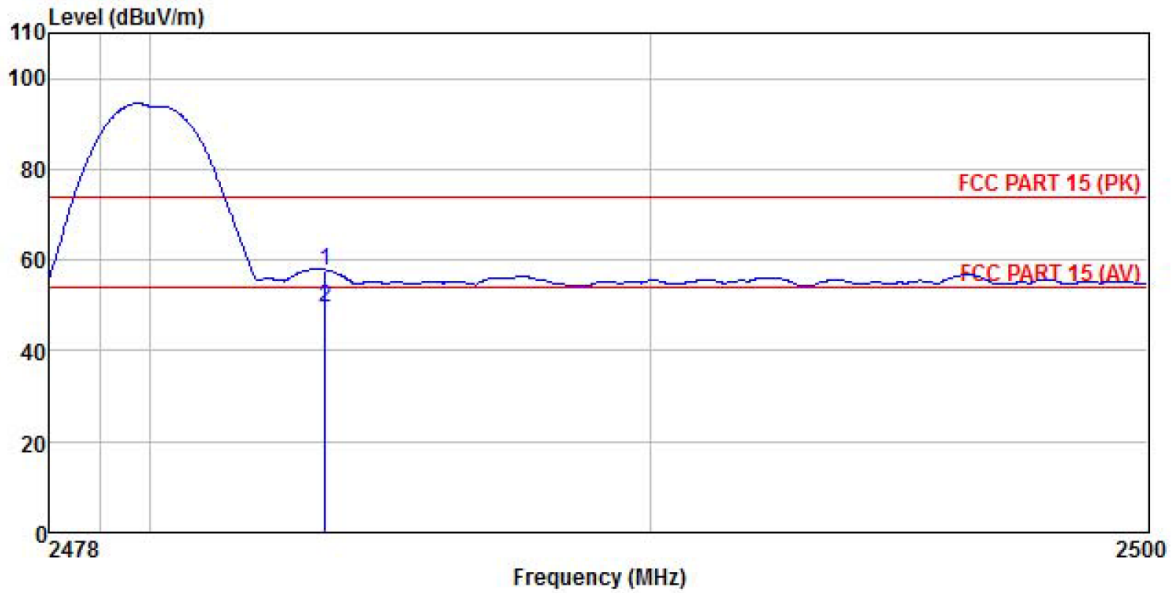


	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	2390.000	21.75	27.03	4.28	1.68	0.00	54.74	74.00	-19.26	Peak
2	2390.000	13.65	27.03	4.28	1.68	0.00	46.64	54.00	-7.36	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are lower than the limit 20dB and not show in test report.*

Product Name:	Wireless Speaker & Charging Hub	**Product Model:**	WSP1000
Test By:	Mike	**Test mode:**	DH1 Tx mode
Test Channel:	Highest channel	**Polarization:**	Vertical
Test Voltage:	AC 120V/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

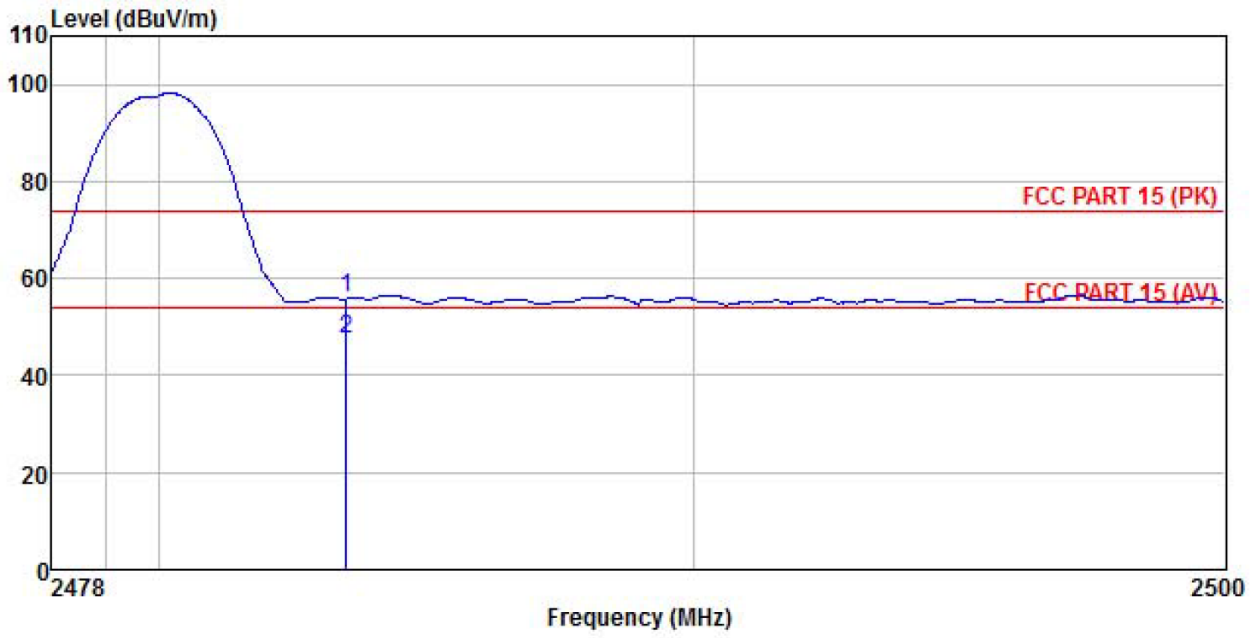


	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	2483.500	24.42	27.27	4.38	1.70	0.00	57.77	74.00	-16.23	Peak
2	2483.500	16.15	27.27	4.38	1.70	0.00	49.50	54.00	-4.50	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are lower than the limit 20dB and not show in test report.*

Product Name:	Wireless Speaker & Charging Hub	**Product Model:**	WSP1000
Test By:	Mike	**Test mode:**	DH1 Tx mode
Test Channel:	Highest channel	**Polarization:**	Horizontal
Test Voltage:	AC 120V/60Hz	**Environment:**	Temp: 24℃ Huni: 57%



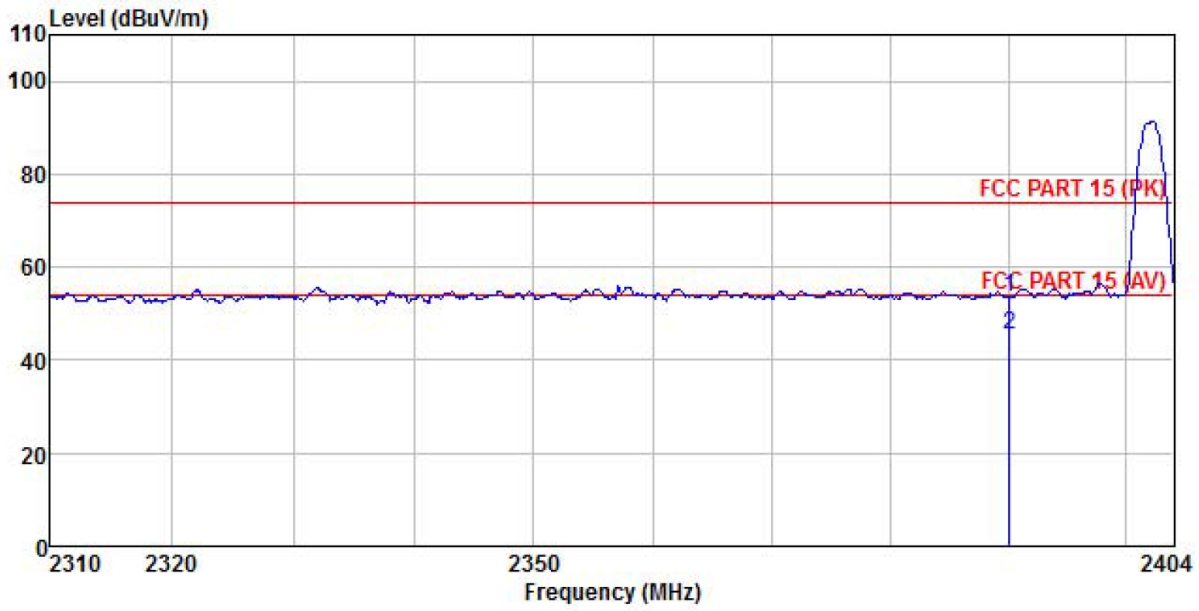
	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	2483.500	22.56	27.27	4.38	1.70	0.00	55.91	74.00	-18.09	Peak
2	2483.500	14.14	27.27	4.38	1.70	0.00	47.49	54.00	-6.51	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are lower than the limit 20dB and not show in test report.*

π/4-DQPSK mode

Product Name:	Wireless Speaker & Charging Hub	**Product Model:**	WSP1000
Test By:	Mike	**Test mode:**	2DH1 Tx mode
Test Channel:	Lowest channel	**Polarization:**	Vertical
Test Voltage:	AC 120V/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

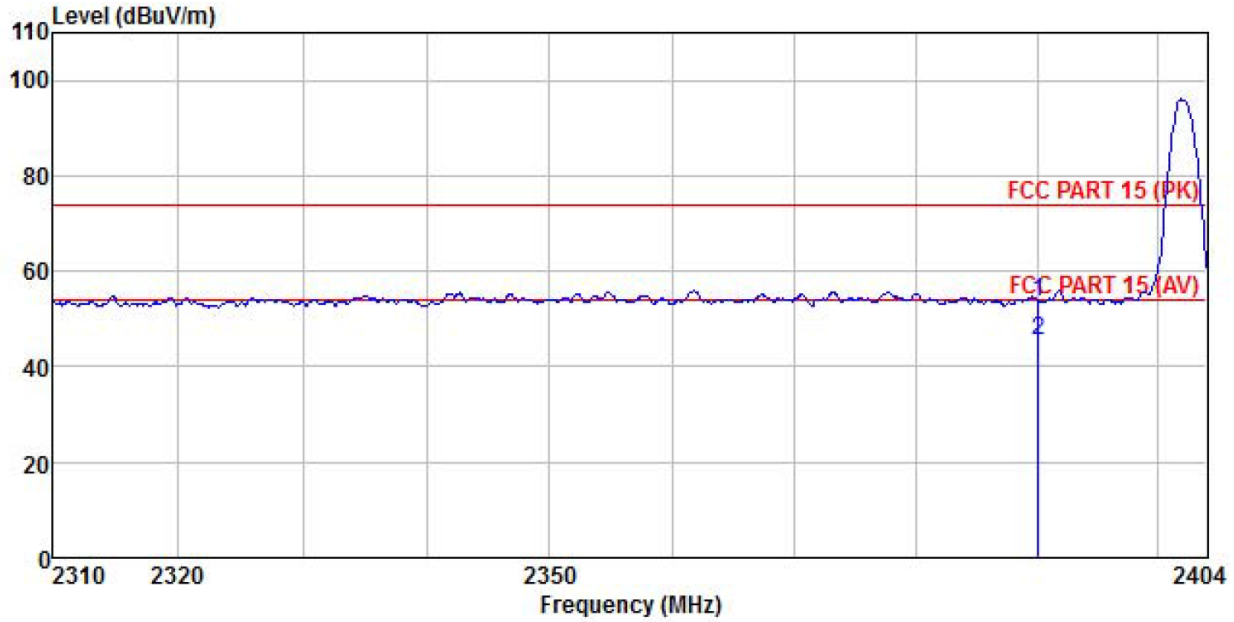


	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	2390.000	20.55	27.03	4.28	1.68	0.00	53.54	74.00	-20.46	Peak
2	2390.000	12.29	27.03	4.28	1.68	0.00	45.28	54.00	-8.72	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are lower than the limit 20dB and not show in test report.*

Product Name:	Wireless Speaker & Charging Hub	**Product Model:**	WSP1000
Test By:	Mike	**Test mode:**	2DH1 Tx mode
Test Channel:	Lowest channel	**Polarization:**	Horizontal
Test Voltage:	AC 120V/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

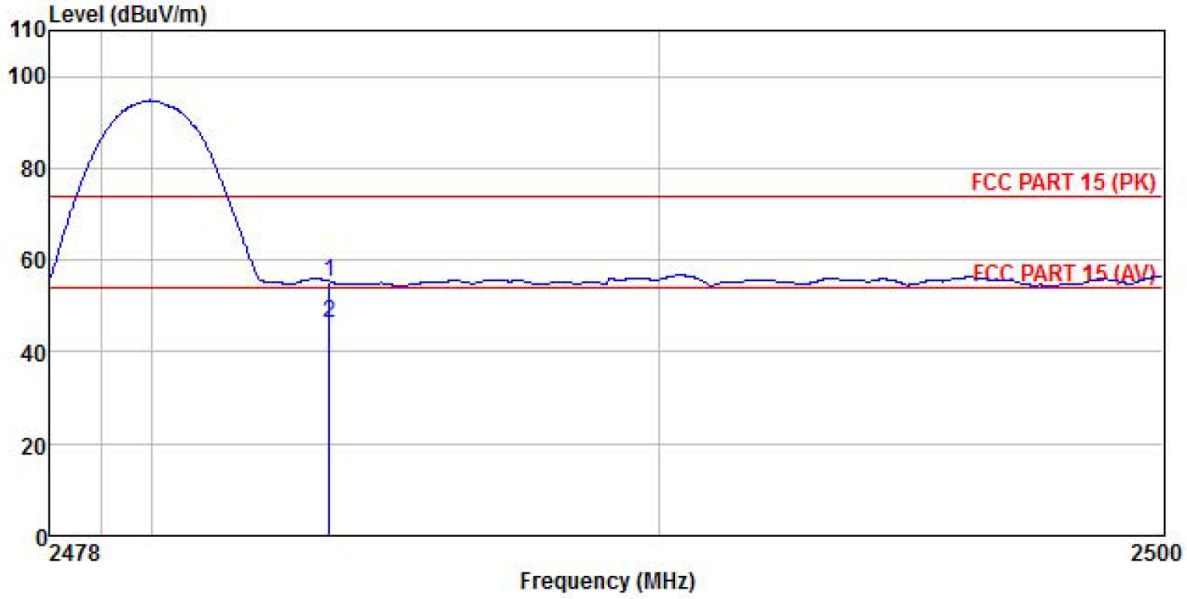


	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	2390.000	20.60	27.03	4.28	1.68	0.00	53.59	74.00	-20.41	Peak
2	2390.000	12.37	27.03	4.28	1.68	0.00	45.36	54.00	-8.64	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are lower than the limit 20dB and not show in test report.*

Product Name:	Wireless Speaker & Charging Hub	**Product Model:**	WSP1000
Test By:	Mike	**Test mode:**	2DH1 Tx mode
Test Channel:	Highest channel	**Polarization:**	Vertical
Test Voltage:	AC 120V/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

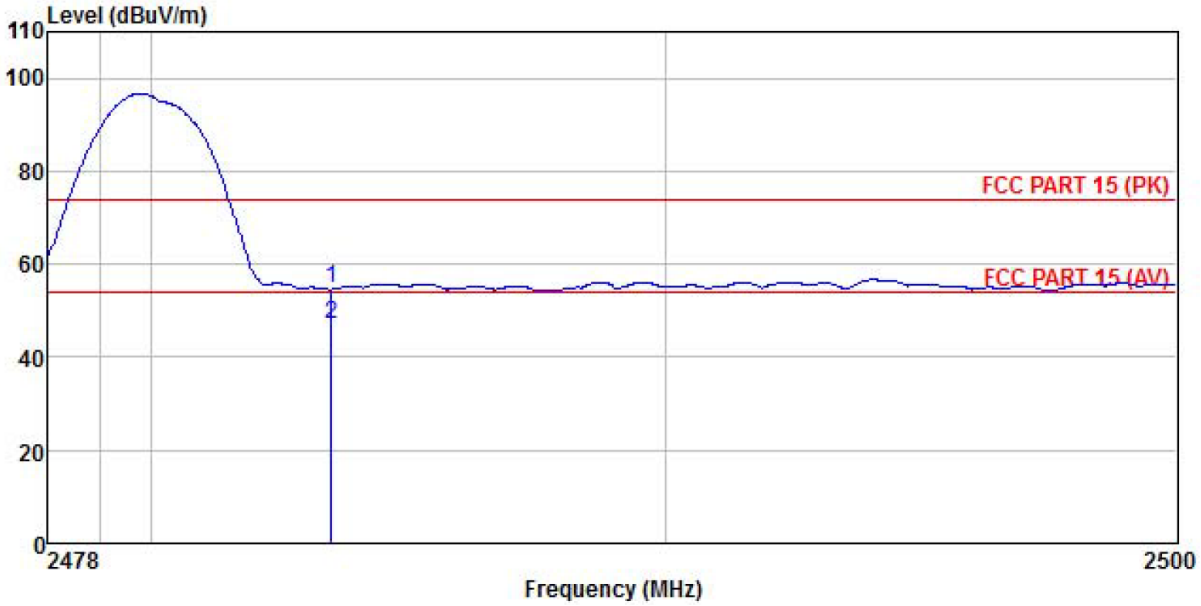


	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	2483.500	21.90	27.27	4.38	1.70	0.00	55.25	74.00	-18.75	Peak
2	2483.500	13.10	27.27	4.38	1.70	0.00	46.45	54.00	-7.55	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are lower than the limit 20dB and not show in test report.*

Product Name:	Wireless Speaker & Charging Hub	**Product Model:**	WSP1000
Test By:	Mike	**Test mode:**	2DH1 Tx mode
Test Channel:	Highest channel	**Polarization:**	Horizontal
Test Voltage:	AC 120V/60Hz	**Environment:**	Temp: 24℃ Huni: 57%



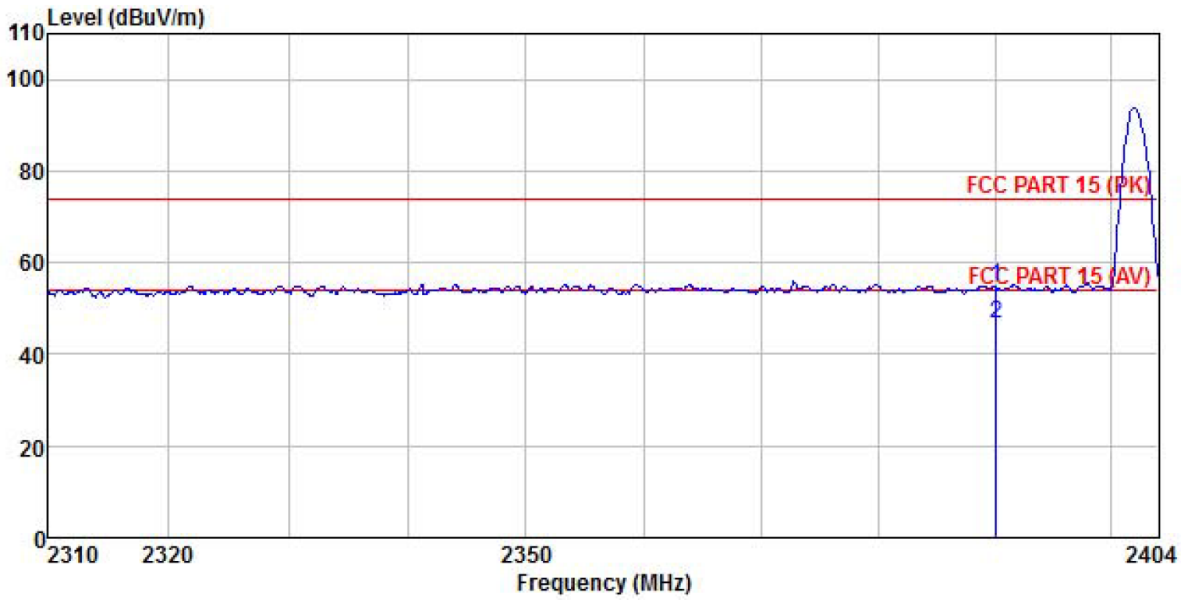
	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	2483.500	21.36	27.27	4.38	1.70	0.00	54.71	74.00	-19.29	Peak
2	2483.500	13.66	27.27	4.38	1.70	0.00	47.01	54.00	-6.99	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are lower than the limit 20dB and not show in test report.*

8DPSK mode

Product Name:	Wireless Speaker & Charging Hub	**Product Model:**	WSP1000
Test By:	Mike	**Test mode:**	3DH1 Tx mode
Test Channel:	Lowest channel	**Polarization:**	Vertical
Test Voltage:	AC 120V/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

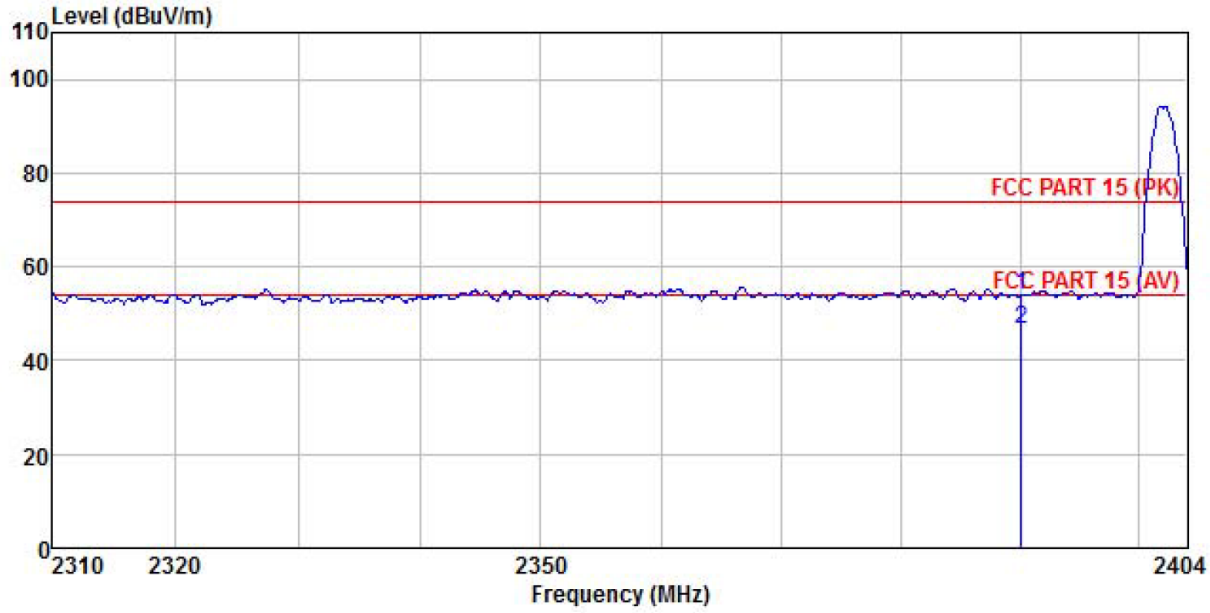


	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	2390.000	21.77	27.03	4.28	1.68	0.00	54.76	74.00	-19.24	Peak
2	2390.000	13.74	27.03	4.28	1.68	0.00	46.73	54.00	-7.27	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are lower than the limit 20dB and not show in test report.*

Product Name:	Wireless Speaker & Charging Hub	**Product Model:**	WSP1000
Test By:	Mike	**Test mode:**	3DH1 Tx mode
Test Channel:	Lowest channel	**Polarization:**	Horizontal
Test Voltage:	AC 120V/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

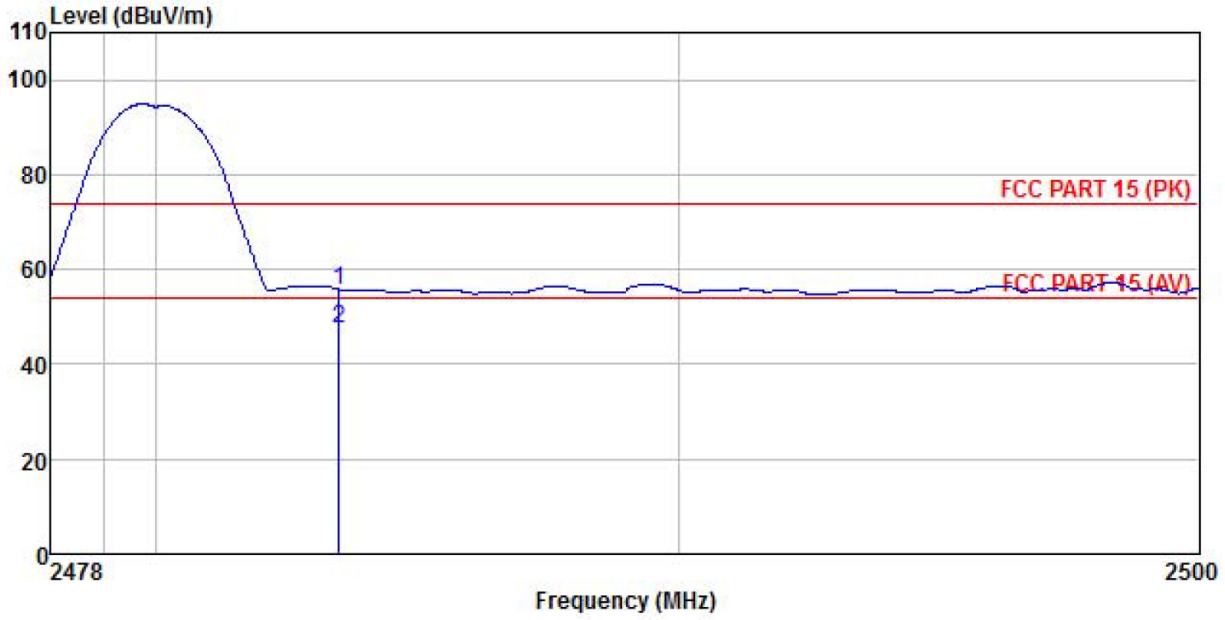


	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	2390.000	21.18	27.03	4.28	1.68	0.00	54.17	74.00	-19.83	Peak
2	2390.000	13.86	27.03	4.28	1.68	0.00	46.85	54.00	-7.15	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are lower than the limit 20dB and not show in test report.*

Product Name:	Wireless Speaker & Charging Hub	**Product Model:**	WSP1000
Test By:	Mike	**Test mode:**	3DH1 Tx mode
Test Channel:	Highest channel	**Polarization:**	Vertical
Test Voltage:	AC 120V/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

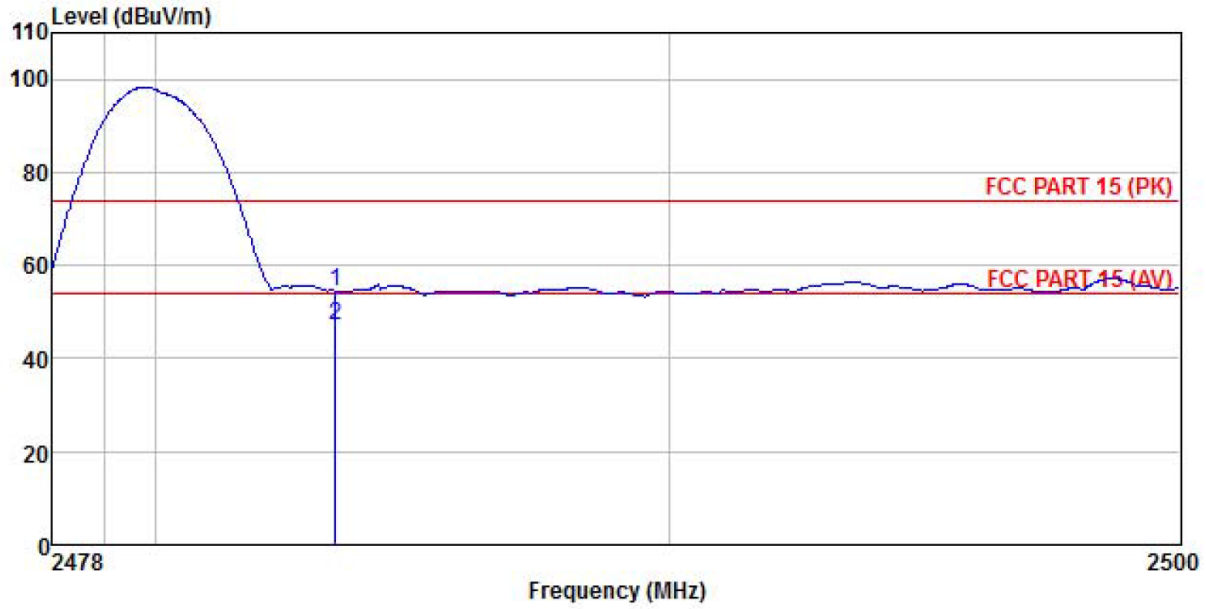


	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	2483.500	22.46	27.27	4.38	1.70	0.00	55.81	74.00	-18.19	Peak
2	2483.500	14.26	27.27	4.38	1.70	0.00	47.61	54.00	-6.39	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are lower than the limit 20dB and not show in test report.*

Product Name:	Wireless Speaker & Charging Hub	**Product Model:**	WSP1000
Test By:	Mike	**Test mode:**	3DH1 Tx mode
Test Channel:	Highest channel	**Polarization:**	Horizontal
Test Voltage:	AC 120V/60Hz	**Environment:**	Temp: 24℃ Huni: 57%



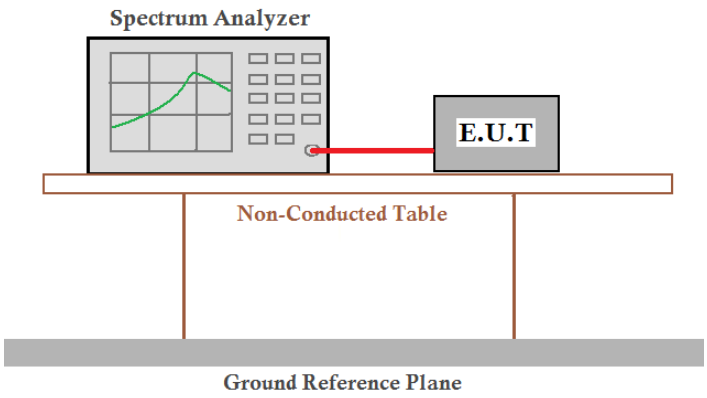
	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	2483.500	21.20	27.27	4.38	1.70	0.00	54.55	74.00	-19.45	Peak
2	2483.500	13.55	27.27	4.38	1.70	0.00	46.90	54.00	-7.10	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are lower than the limit 20dB and not show in test report.*

6.10 Spurious Emission

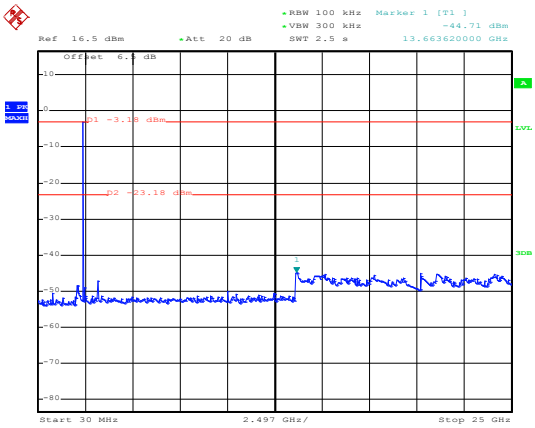
6.10.1 Conducted Emission Method

Test Requirement:	FCC Part 15 C Section 15.247 (d)
Limit:	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, based on either an RF conducted or a radiated measurement.
Test setup:	
Test Instruments:	Refer to section 5.9 for details
Test mode:	Non-hopping mode
Test results:	Pass

Test plot as follows:

GFSK

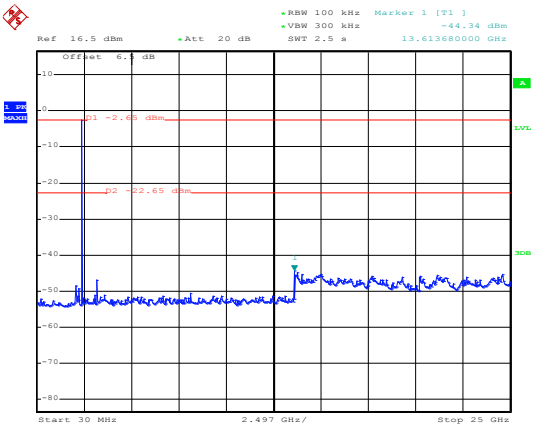
Lowest channel



Date: 7.JUL.2020 17:20:55

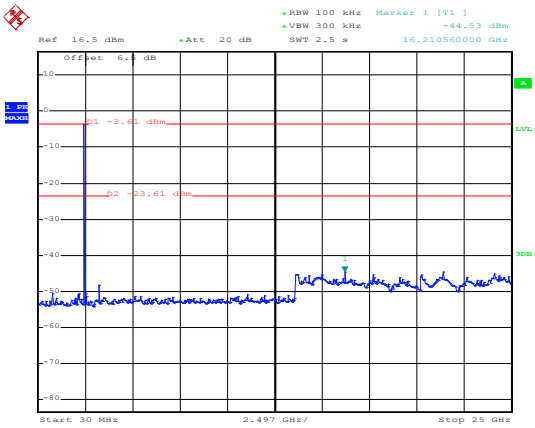
π/4-DQPSK

Lowest channel



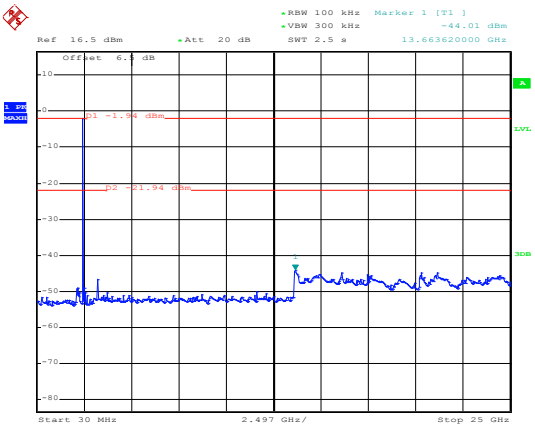
Date: 7.JUL.2020 17:25:25

Middle channel



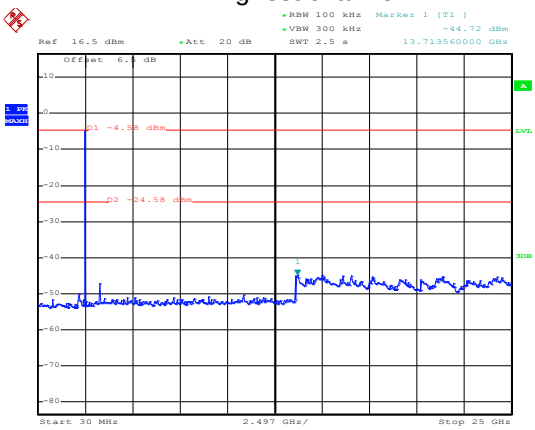
Date: 7.JUL.2020 17:22:03

Middle channel



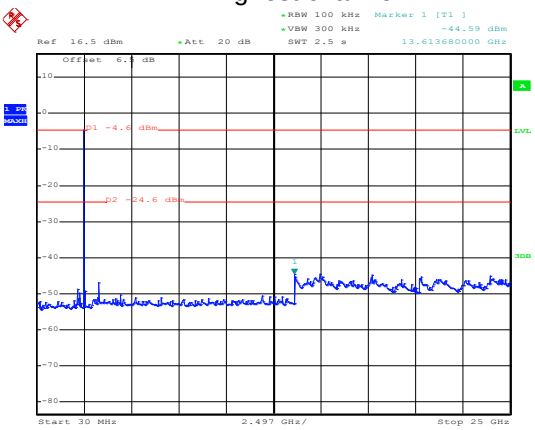
Date: 7.JUL.2020 17:28:22

Highest channel



Date: 7.JUL.2020 17:23:30

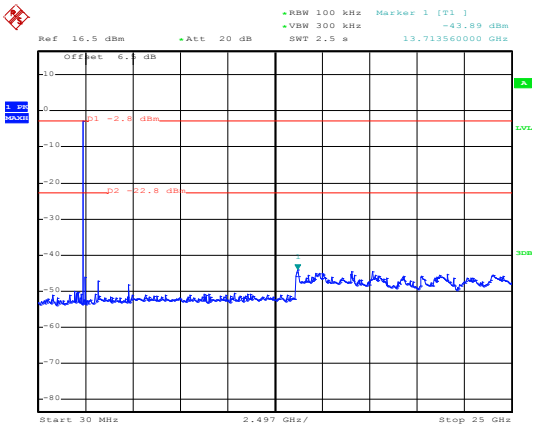
Highest channel



Date: 7.JUL.2020 17:32:53

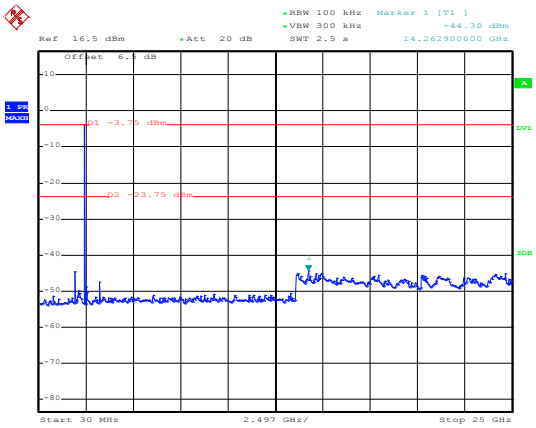
8DPSK

Lowest channel



Date: 7.JUL.2020 17:34:20

Middle channel



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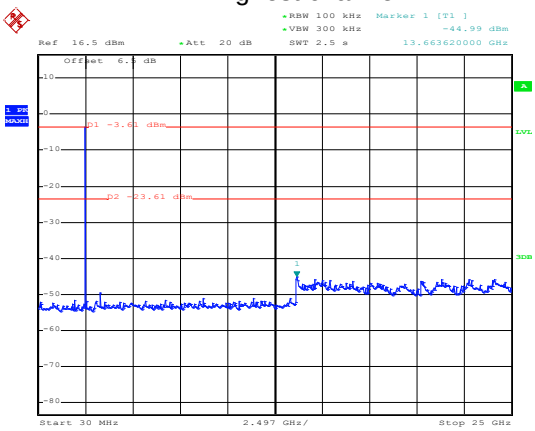
Highest channel



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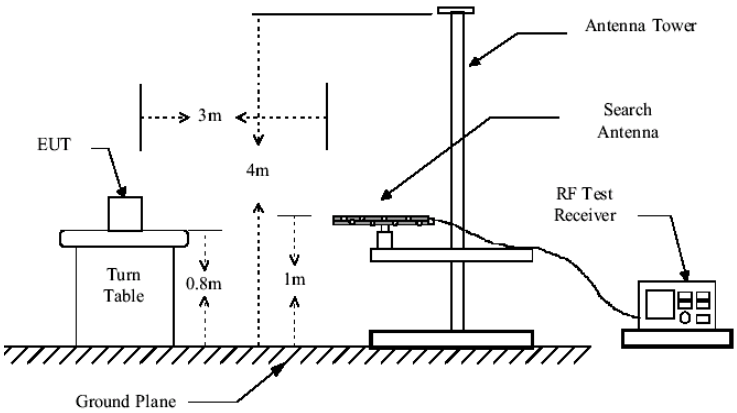
6.10.2 Radiated Emission Method

Test Requirement:	FCC Part 15 C Section 15.209				
Test Frequency Range:	9 kHz to 25 GHz				
Test Distance:	3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		RMS	1MHz	3MHz	Average Value

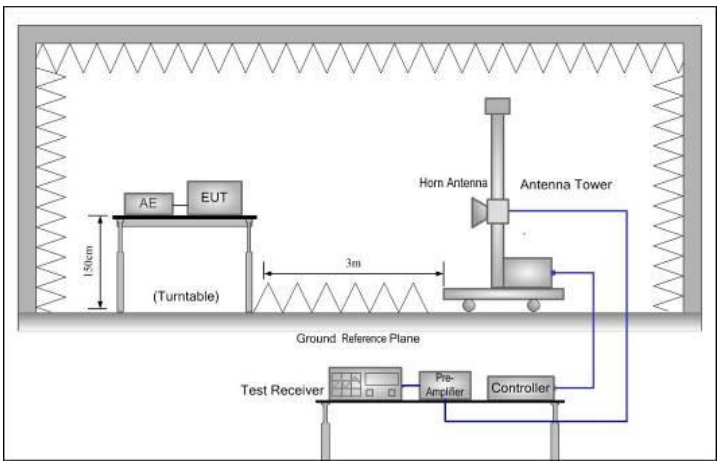
Limit:	Frequency	Limit (dBuV/m @3m)	Remark
	30MHz-88MHz	40.0	Quasi-peak Value
	88MHz-216MHz	43.5	Quasi-peak Value
	216MHz-960MHz	46.0	Quasi-peak Value
	960MHz-1GHz	54.0	Quasi-peak Value
	Above 1GHz	54.0	Average Value
		74.0	Peak Value

Test setup:

Below 1GHz



Above 1GHz



Test Procedure:

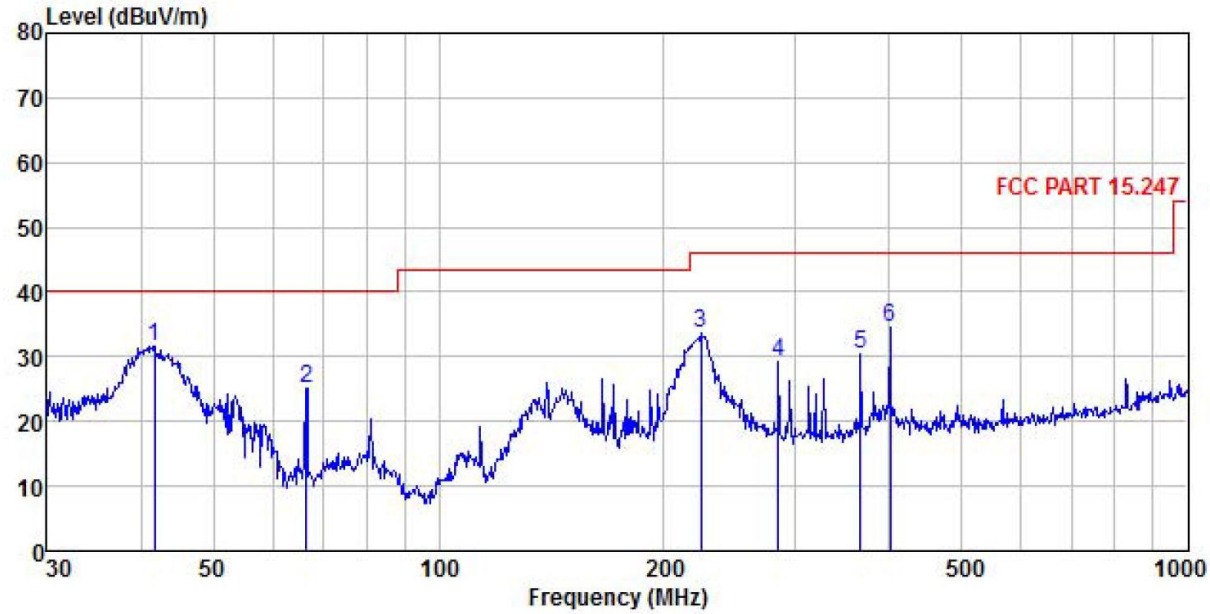
1. The EUT was placed on the top of a rotating table 0.8m(below 1GHz) /1.5m(above 1GHz) above the ground at a 3 meter chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna

	tower. 3. 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. 4. 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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test Instruments:	Refer to section 5.9 for details
Test mode:	Non-hopping mode
Test results:	Pass
Remark:	1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case. 2. 9 kHz to 30 MHz is noise floor and lower than the limit 20dB, so only shows the data of above 30MHz in this report.

Measurement Data (worst case):

Below 1GHz:

Product Name:	Wireless Speaker & Charging Hub	**Product Model:**	WSP1000
Test By:	Mike	**Test mode:**	BT Tx mode
Test Frequency:	30 MHz ~ 1 GHz	**Polarization:**	Vertical
Test Voltage:	AC 120V/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

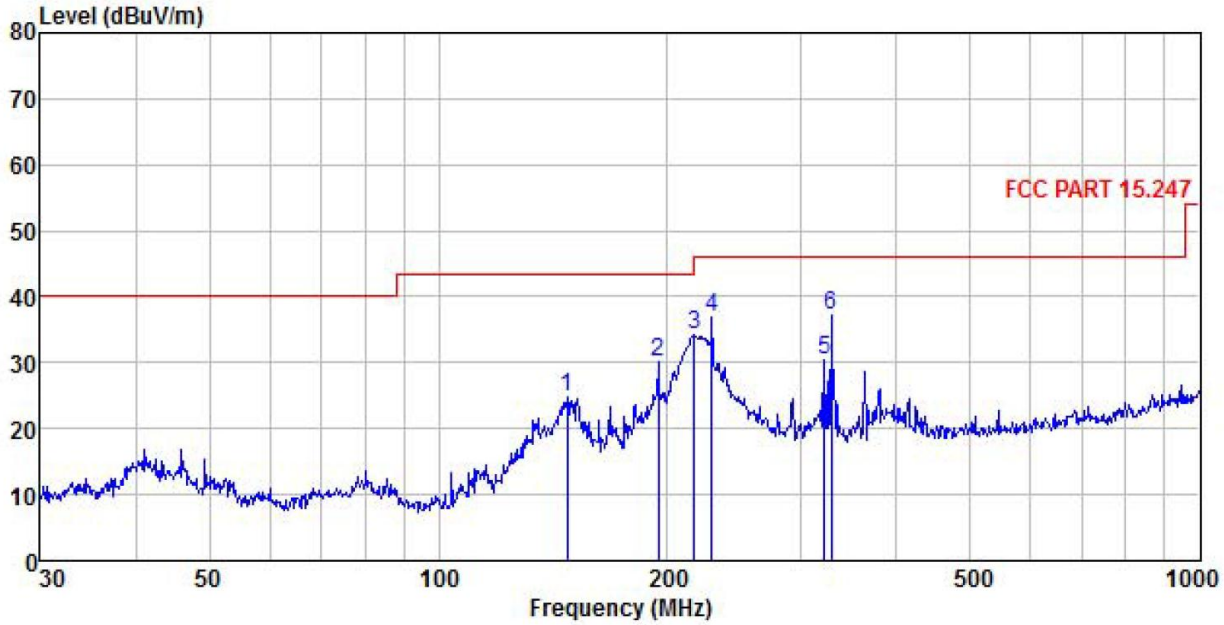


	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	41.713	48.21	12.84	0.36	0.00	29.89	31.52	40.00	-8.48	QP
2	66.499	44.59	9.90	0.43	0.00	29.75	25.17	40.00	-14.83	QP
3	223.733	43.19	18.40	0.74	0.00	28.69	33.64	46.00	-12.36	QP
4	283.979	38.32	18.64	0.84	0.00	28.48	29.32	46.00	-16.68	QP
5	365.539	39.07	18.89	0.95	0.00	28.63	30.28	46.00	-15.72	QP
6	400.432	43.10	19.10	0.99	0.00	28.78	34.41	46.00	-11.59	QP

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are lower than the limit 20dB and not show in test report.*

Product Name:	Wireless Speaker & Charging Hub	**Product Model:**	WSP1000
Test By:	Mike	**Test mode:**	BT Tx mode
Test Frequency:	30 MHz ~ 1 GHz	**Polarization:**	Horizontal
Test Voltage:	AC 120V/60Hz	**Environment:**	Temp: 24℃ Huni: 57%



	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	147.404	39.45	14.10	0.61	0.00	29.23	24.93	43.50	-18.57	QP
2	194.453	40.63	17.75	0.71	0.00	28.87	30.22	43.50	-13.28	QP
3	216.783	43.96	18.37	0.74	0.00	28.73	34.34	46.00	-11.66	QP
4	228.490	46.41	18.42	0.75	0.00	28.66	36.92	46.00	-9.08	QP
5	321.061	39.25	18.74	0.89	0.00	28.50	30.38	46.00	-15.62	QP
6	327.887	45.98	18.76	0.90	0.00	28.51	37.13	46.00	-8.87	QP

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are lower than the limit 20dB and not show in test report.*

Above 1GHz:

Test channel: Lowest channel									
Detector: Peak Value									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Aux Factor (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4804.00	49.50	30.78	6.80	2.44	41.81	47.71	74.00	-26.29	Vertical
4804.00	48.15	30.78	6.80	2.44	41.81	46.36	74.00	-27.64	Horizontal
Detector: Average Value									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Aux Factor (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4804.00	41.52	30.78	6.80	2.44	41.81	39.73	54.00	-14.27	Vertical
4804.00	40.23	30.78	6.80	2.44	41.81	38.44	54.00	-15.56	Horizontal
Test channel: Middle channel									
Detector: Peak Value									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Aux Factor (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4882.00	50.47	30.96	6.86	2.47	41.84	48.92	74.00	-25.08	Vertical
4882.00	49.96	30.96	6.86	2.47	41.84	48.41	74.00	-25.59	Horizontal
Detector: Average Value									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Aux Factor (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4882.00	40.25	30.96	6.86	2.47	41.84	38.70	54.00	-15.30	Vertical
4882.00	41.77	30.96	6.86	2.47	41.84	40.22	54.00	-13.78	Horizontal
Test channel: Highest channel									
Detector: Peak Value									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Aux Factor (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4960.00	49.62	31.11	6.91	2.49	41.87	48.26	74.00	-25.74	Vertical
4960.00	48.87	31.11	6.91	2.49	41.87	47.51	74.00	-26.49	Horizontal
Detector: Average Value									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Aux Factor (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4960.00	40.15	31.11	6.91	2.49	41.87	38.79	54.00	-15.21	Vertical
4960.00	41.27	31.11	6.91	2.49	41.87	39.91	54.00	-14.09	Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss + Aux Factor – Preamplifier Factor.*
2. *The emission levels of other frequencies are lower than the limit 20dB and not show in test report.*