TEST REPORT

Product Name	:	PilotPano Panoramic Camera
Brand Mark	:	Labpano
Model No.	:	PIP221
Extension Model	:	PIP221+
Report Number	:	BLA-EMC-202207-A1502
FCC ID	:	2ARZ2 -PIP221
Date of Sample Receipt	:	2022/8/1
Date of Test	:	2022/8/1 to 2022/9/5
Date of Issue	:	2022/9/5
Test Standard	:	47 CFR Part 15, Subpart C 15.247
Test Result	:	Pass

Prepared for:

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Date: 2022/9/5

BlueAsia of Technical Services(Shenzhen) Co., Ltd. BLA

REPORT REVISE RECORD

Version No.	Date	Description
00	2022/9/5	Original

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1 TEST SUMMARY

Test item	Test Requirement	Test Method	Class/Severity	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.6 & Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass
20dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.7	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.8 & Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Dwell Time	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Hopping Channel Number	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Carrier Frequencies Separation	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass

2 GENERAL INFORMATION

Applicant	Shenzhen Pisoftware Technology Co., Ltd.
Address	C11-B, TCL International E City, 1001 Zhongshanyuan Road,,Nanshan District, Shenzhen City, 518057, P.R.China
Manufacturer	Shenzhen Pisoftware Technology Co., Ltd.
Address	C11-B, TCL International E City, 1001 Zhongshanyuan Road, Nanshan District, Shenzhen City, 518057, P.R.China
Factory	SHENZHEN AONI ELECTRONIC CO,LTD
Address	2F、3F、6F、7F、The half laye of 8F 、9F,Honghui Industrial Park,2nd Liuxian Road,Xinan street,Baoan District,Shenzhen
Product Name	PilotPano Panoramic Camera
Test Model No.	PIP221
Extension Model	PIP221+
Remark	All above models are identical in the same PCB layout, interior structure and electrical circuits. The differences are model name for commercial purpose.

3 GENERAL DESCRIPTION OF E.U.T.

Hardware Version	N/A
Software Version	N/A
Operation Frequency:	2402MHz-2480MHz
Modulation Type:	GFSK, pi/4DQPSK, 8DPSK
Channel Spacing:	1MHz
Number of Channels:	79
Antenna Type:	FPC Antenna
Antenna Gain:	0.5dBi(Provided by the customer)

4 TEST ENVIRONMENT

Environment	Temperature	Voltage
Normal	25℃	3.8Vdc

5 TEST MODE

TEST MODE	TEST MODE DESCRIPTION
TX	Keep the EUT in continuously transmitting mode with modulation. (hopping and non hopping mode all have been tested, non hopping mode is worse case for RE)
Remark: Full battery is used during all test except ac conducted emission, DH1,DH3, DH5 all have been tested, during the test, GFSK, Pi/4QPSK, 8-DPSK modulation were all pre-scanned Only the 8-DPSK of the worst mode would be recorded in this report.	

6 MEASUREMENT UNCERTAINTY

Parameter	Expanded Uncertainty (Confidence of 95%)
Radiated Emission(9kHz-30MHz)	±4.34dB
Radiated Emission(30Mz-1000MHz)	±4.24dB
Radiated Emission(1GHz-18GHz)	±4.68dB
AC Power Line Conducted Emission(150kHz-30MHz)	±3.45dB

7 DESCRIPTION OF SUPPORT UNIT

Device Type	Manufacturer	Model Name	Serial No.	Remark
AC Adapter	UGREEN	CD112	N/A	N/A
PC	HASEE	K610D	N/A	N/A

8 LABORATORY LOCATION

All tests were performed at:
BlueAsia of Technical Services(Shenzhen) Co., Ltd.
Building C, No. 107, Shihuan Road, Shiyan Sub-District, Baoan District, Shenzhen, Guangdong Province, China
Telephone: TEL: +86-755-28682673 FAX: +86-755-28682673
No tests were sub-contracted.

9 TEST INSTRUMENTS LIST

Test Equipment Of Radiated Spurious Emissions					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Chamber	SKET	966	N/A	10/11/2020	9/11/2023
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Receiver	R&S	ESR7	101199	24/9/2021	23/9/2022
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	26/9/2020	25/9/2022
Horn Antenna	Schwarzbeck	9120D	01892 P:00331	26/9/2020	25/9/2022
Amplifier	SKET	LNPA-0118-45	N/A	24/9/2021	23/9/2022
EMI software	EZ	EZ-EMC	N/A	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	26/9/2020	25/9/2022

Test Equipment Of Radiated Emissions which fall in the restricted bands					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Chamber	SKET	966	N/A	10/11/2020	9/11/2023
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Receiver	R&S	ESR7	101199	24/9/2021	23/9/2022
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	26/9/2020	25/9/2022
Horn Antenna	Schwarzbeck	9120D	01892 P:00331	26/9/2020	25/9/2022
Amplifier	SKET	LNPA-0118-45	N/A	24/9/2021	23/9/2022
EMI software	EZ	EZ-EMC	N/A	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	26/9/2020	25/9/2022

Test Equipment Of Conducted Band Edges Measurement					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Spectrum	Agilent	N9020A	MY49100060	24/9/2021	23/9/2022
Signal Generator	Agilent	N5182A	MY49060650	24/9/2021	23/9/2022
Signal Generator	Agilent	E8257D	MY44320250	24/9/2021	23/9/2022

Test Equipment Of Conducted Spurious Emissions					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Spectrum	Agilent	N9020A	MY49100060	24/9/2021	23/9/2022
Signal Generator	Agilent	N5182A	MY49060650	24/9/2021	23/9/2022
Signal Generator	Agilent	E8257D	MY44320250	24/9/2021	23/9/2022

Test Equipment Of Dwell Time					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Spectrum	Agilent	N9020A	MY49100060	24/9/2021	23/9/2022
Signal Generator	Agilent	N5182A	MY49060650	24/9/2021	23/9/2022
Signal Generator	Agilent	E8257D	MY44320250	24/9/2021	23/9/2022

Test Equipment Of Hopping Channel Number					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022

Spectrum	Agilent	N9020A	MY49100060	24/9/2021	23/9/2022
Signal Generator	Agilent	N5182A	MY49060650	24/9/2021	23/9/2022
Signal Generator	Agilent	E8257D	MY44320250	24/9/2021	23/9/2022

Test Equipment Of Carrier Frequencies Separation					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Spectrum	Agilent	N9020A	MY49100060	24/9/2021	23/9/2022
Signal Generator	Agilent	N5182A	MY49060650	24/9/2021	23/9/2022
Signal Generator	Agilent	E8257D	MY44320250	24/9/2021	23/9/2022

Test Equipment Of 20dB Bandwidth					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Spectrum	Agilent	N9020A	MY49100060	24/9/2021	23/9/2022
Signal Generator	Agilent	N5182A	MY49060650	24/9/2021	23/9/2022
Signal Generator	Agilent	E8257D	MY44320250	24/9/2021	23/9/2022

Test Equipment Of Conducted Peak Output Power					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Spectrum	Agilent	N9020A	MY49100060	24/9/2021	23/9/2022
Signal Generator	Agilent	N5182A	MY49060650	24/9/2021	23/9/2022
Signal Generator	Agilent	E8257D	MY44320250	24/9/2021	23/9/2022

Test Equipment Of Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Shield room	SKET	833	N/A	25/11/2020	24/11/2023
Receiver	R&S	ESPI3	101082	24/9/2021	23/9/2022
LISN	R&S	ENV216	3560.6550.15	24/9/2021	23/9/2022
LISN	AT	AT166-2	AKK1806000003	26/9/2021	25/9/2022
EMI software	EZ	EZ-EMC	N/A	N/A	N/A

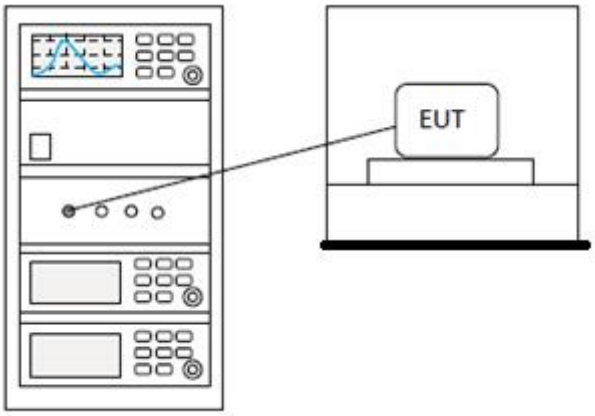
10 CONDUCTED SPURIOUS EMISSIONS

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.6 & Section 11.11
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

10.1 LIMITS

Limit:	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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

10.2 BLOCK DIAGRAM OF TEST SETUP



10.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

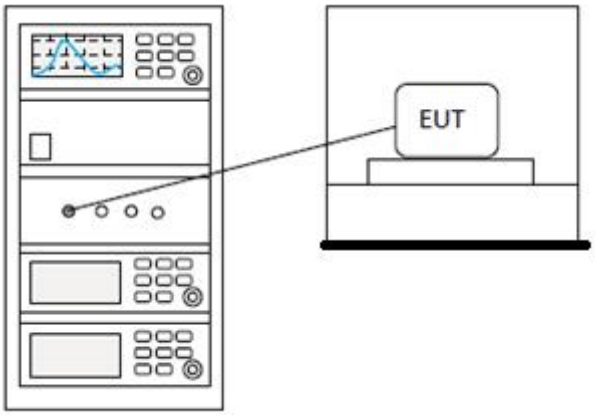
11 CONDUCTED BAND EDGES MEASUREMENT

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.8 & Section 11.13.3.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

11.1 LIMITS

Limit:	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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

11.2 BLOCK DIAGRAM OF TEST SETUP



11.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

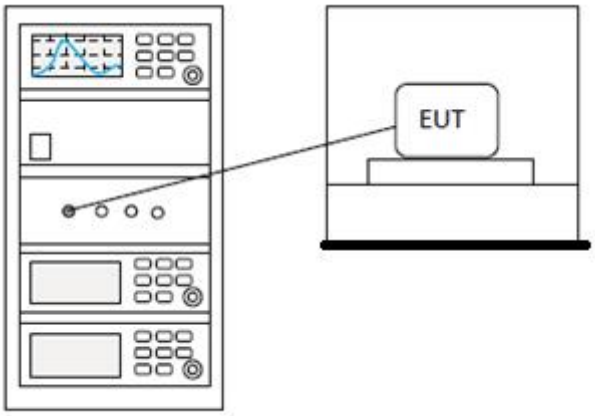
12 DWELL TIME

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.4
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

12.1 LIMITS

Frequency(MHz)	Limit
902-928	0.4S within a 20S period(20dB bandwidth<250kHz)
	0.4S within a 10S period(20dB bandwidth≥250kHz)
2400-2483.5	0.4S within a period of 0.4S multiplied by the number of hopping channels
5725-5850	0.4S within a 30S period

12.2 BLOCK DIAGRAM OF TEST SETUP



12.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

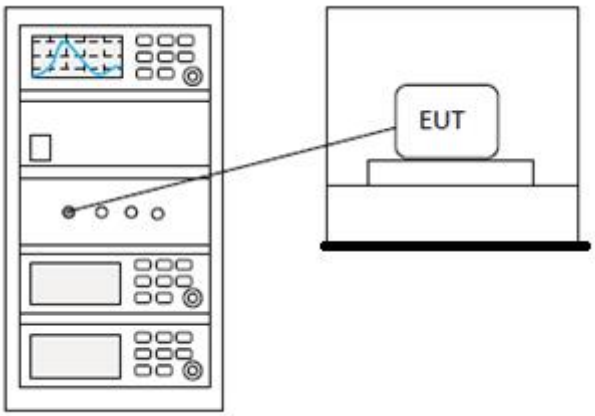
13 HOPPING CHANNEL NUMBER

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.3
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

13.1 LIMITS

Frequency range(MHz)	Number of hopping channels (minimum)
902-928	50 for 20dB bandwidth <250kHz
	25 for 20dB bandwidth ≥250kHz
2400-2483.5	15
5725-5850	75

13.2 BLOCK DIAGRAM OF TEST SETUP



13.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

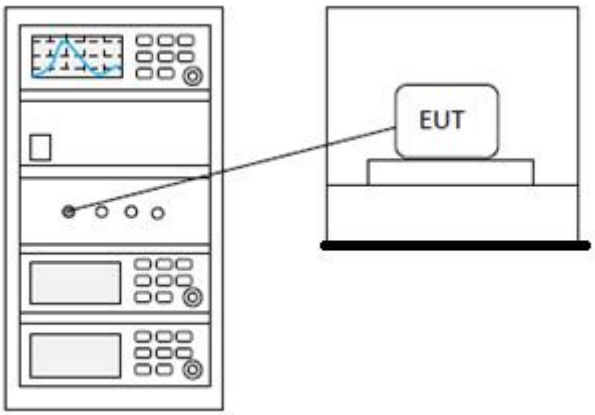
14 CARRIER FREQUENCIES SEPARATION

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

14.1 LIMITS

Limit:	2/3 of the 20dB bandwidth base on the transmission power is less than 0.125W

14.2 BLOCK DIAGRAM OF TEST SETUP



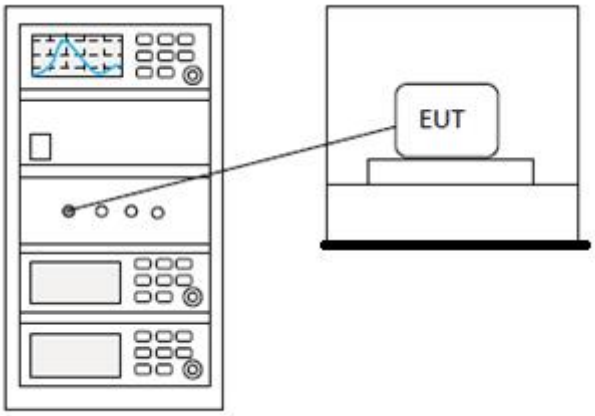
14.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

15 20DB BANDWIDTH

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.7
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

15.1 BLOCK DIAGRAM OF TEST SETUP



15.2 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

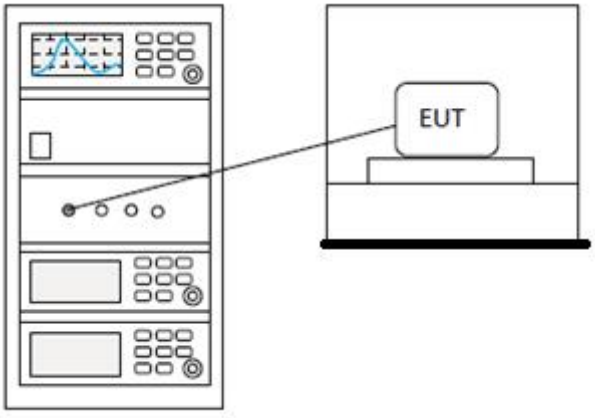
16 CONDUCTED PEAK OUTPUT POWER

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.5
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

16.1 LIMITS

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥50 hopping channels
	0.25 for 25≤ hopping channels <50
	1 for digital modulation
2400-2483.5	1 for ≥75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

16.2 BLOCK DIAGRAM OF TEST SETUP



16.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

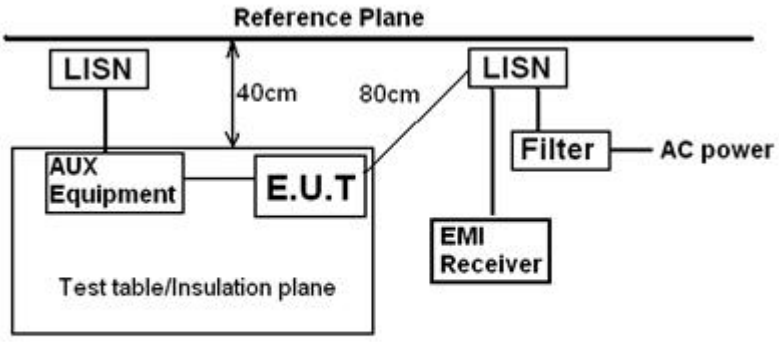
17 CONDUCTED EMISSIONS AT AC POWER LINE (150KHZ-30MHZ)

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

17.1 LIMITS

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
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.		

17.2 BLOCK DIAGRAM OF TEST SETUP



Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m

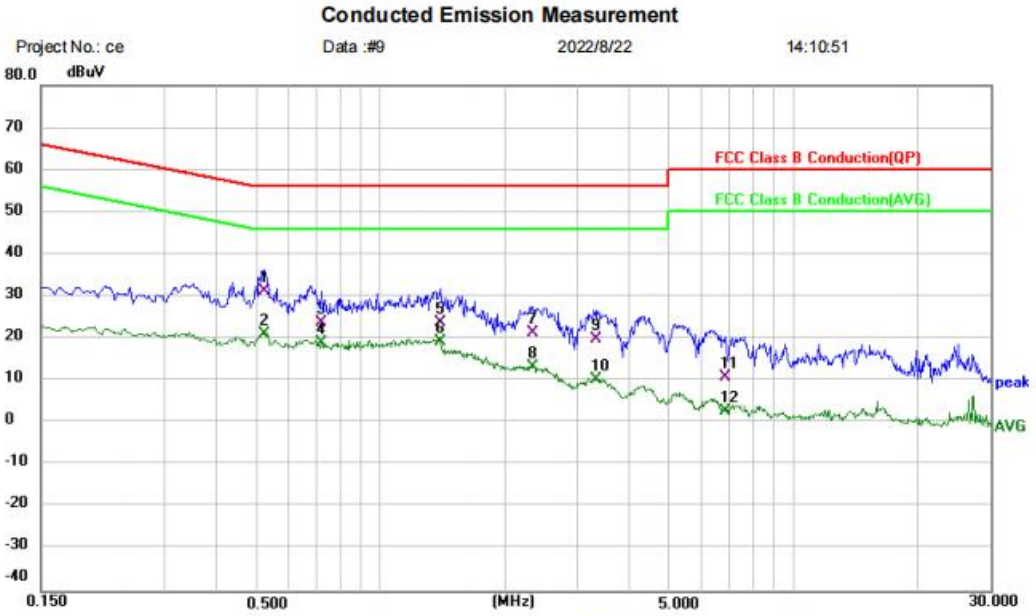
17.3 PROCEDURE

1) The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50H + 5ohm 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.

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,
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.
5) 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 on conducted measurement.
Remark: LISN=Read Level+ Cable Loss+ LISN Factor

17.4 TEST DATA

[TestMode: TX]; [Line: Neutral] ; [Power:120V/60Hz]



Site
Limit: FCC Class B Conduction(QP)
EUT: panoramic camera
M/N: pilot pano
Mode: BT-TX Mode
Note:

Phase: N
Power:

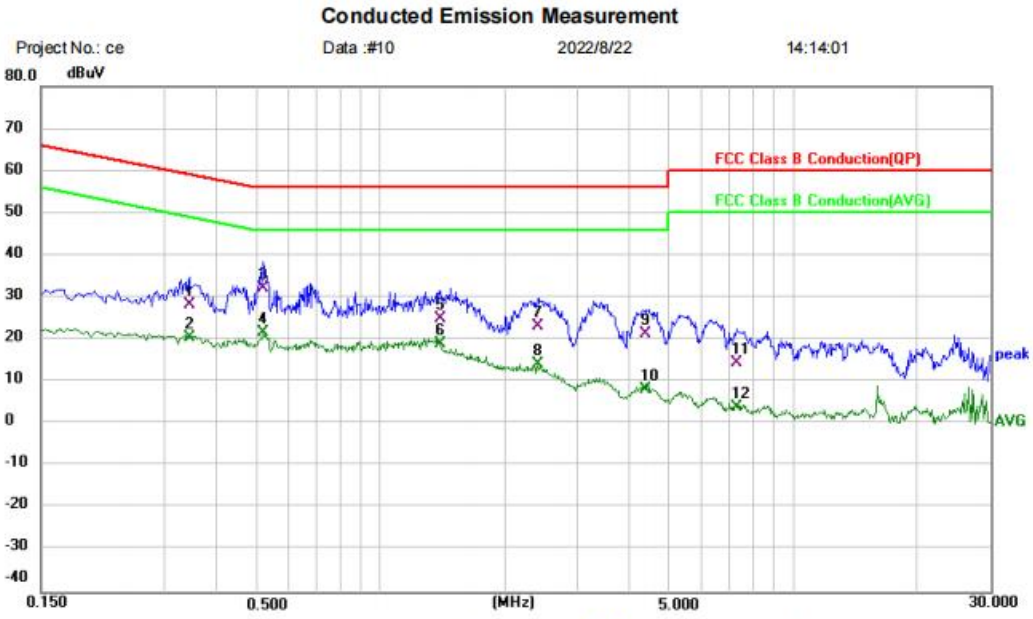
Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.5220	21.57	9.79	31.36	56.00	-24.64	QP	
2		0.5220	11.12	9.79	20.91	46.00	-25.09	AVG	
3		0.7180	13.97	9.82	23.79	56.00	-32.21	QP	
4		0.7180	9.03	9.82	18.85	46.00	-27.15	AVG	
5		1.3900	13.83	9.85	23.68	56.00	-32.32	QP	
6		1.3900	9.26	9.85	19.11	46.00	-26.89	AVG	
7		2.3340	11.56	9.87	21.43	56.00	-34.57	QP	
8		2.3340	3.31	9.87	13.18	46.00	-32.82	AVG	
9		3.3420	9.81	9.90	19.71	56.00	-36.29	QP	
10		3.3420	0.44	9.90	10.34	46.00	-35.66	AVG	
11		6.8300	0.81	10.02	10.83	60.00	-49.17	QP	
12		6.8300	-7.27	10.02	2.75	50.00	-47.25	AVG	

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

[TestMode: TX]; [Line: Line] ; [Power:120V/60Hz]



Site
Limit: FCC Class B Conduction(QP)
EUT: panoramic camera
M/N: pilot pano
Mode: BT-TX Mode
Note:

Phase: L1
Power:

Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.3420	18.28	9.85	28.13	59.15	-31.02	QP	
2		0.3420	10.74	9.85	20.59	49.15	-28.56	AVG	
3	*	0.5180	22.20	9.87	32.07	56.00	-23.93	QP	
4		0.5180	11.76	9.87	21.63	46.00	-24.37	AVG	
5		1.3980	15.08	9.93	25.01	56.00	-30.99	QP	
6		1.3980	9.05	9.93	18.98	46.00	-27.02	AVG	
7		2.4060	13.23	9.95	23.18	56.00	-32.82	QP	
8		2.4060	4.21	9.95	14.16	46.00	-31.84	AVG	
9		4.3780	11.33	9.93	21.26	56.00	-34.74	QP	
10		4.3780	-1.86	9.93	8.07	46.00	-37.93	AVG	
11		7.2660	4.37	10.10	14.47	60.00	-45.53	QP	
12		7.2660	-6.24	10.10	3.86	50.00	-46.14	AVG	

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

18 RADIATED SPURIOUS EMISSIONS

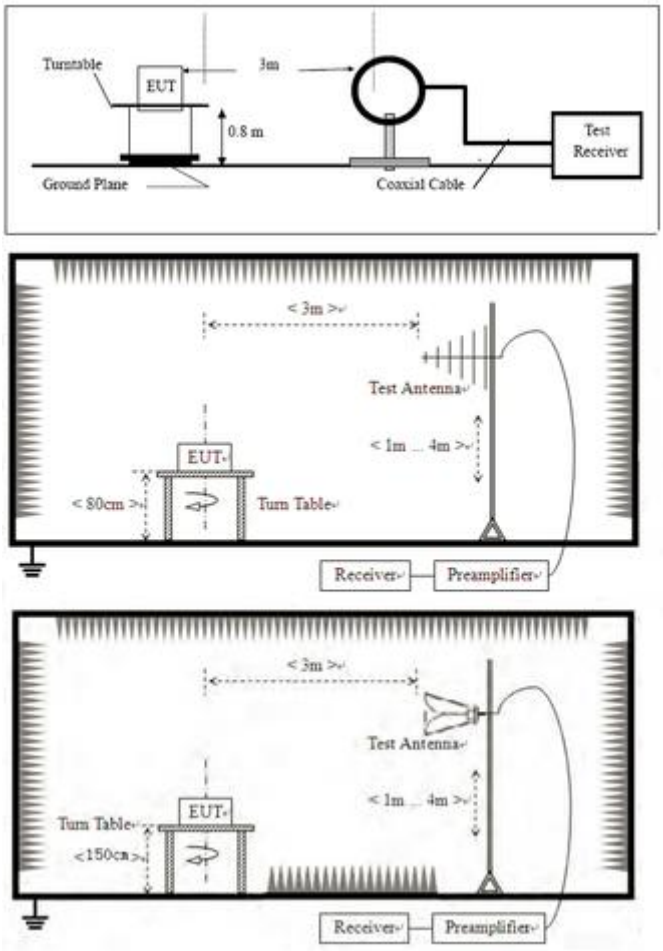
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.4,6.5,6.6
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

18.1 LIMITS

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

18.2 BLOCK DIAGRAM OF TEST SETUP



18.3 PROCEDURE

a. 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.
b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
c. 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.
d. 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.
e. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
g. 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.

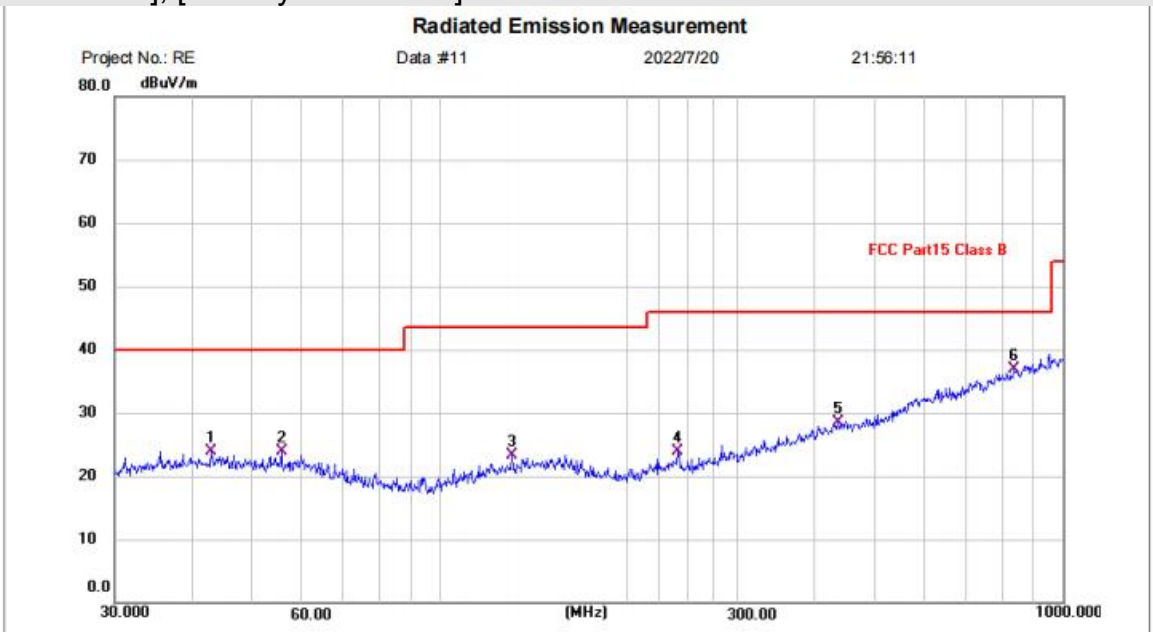
h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
j. Repeat above procedures until all frequencies measured was complete.

Remark:
1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level =Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor
3) Scan from 9kHz to 25GHz, the disturbance above 12.75GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported. fundamental frequency is blocked by filter, and only spurious emission is shown.
4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

18.4 TEST DATA

Below 1GHz

[TestMode: TX]; [Polarity: Horizontal]



Site
Limit: FCC Part15 Class B
EUT: panoramic camera
M/N: Pilot pano
Mode: BT-TX
Note:

Polarization: *Horizontal*
Power:

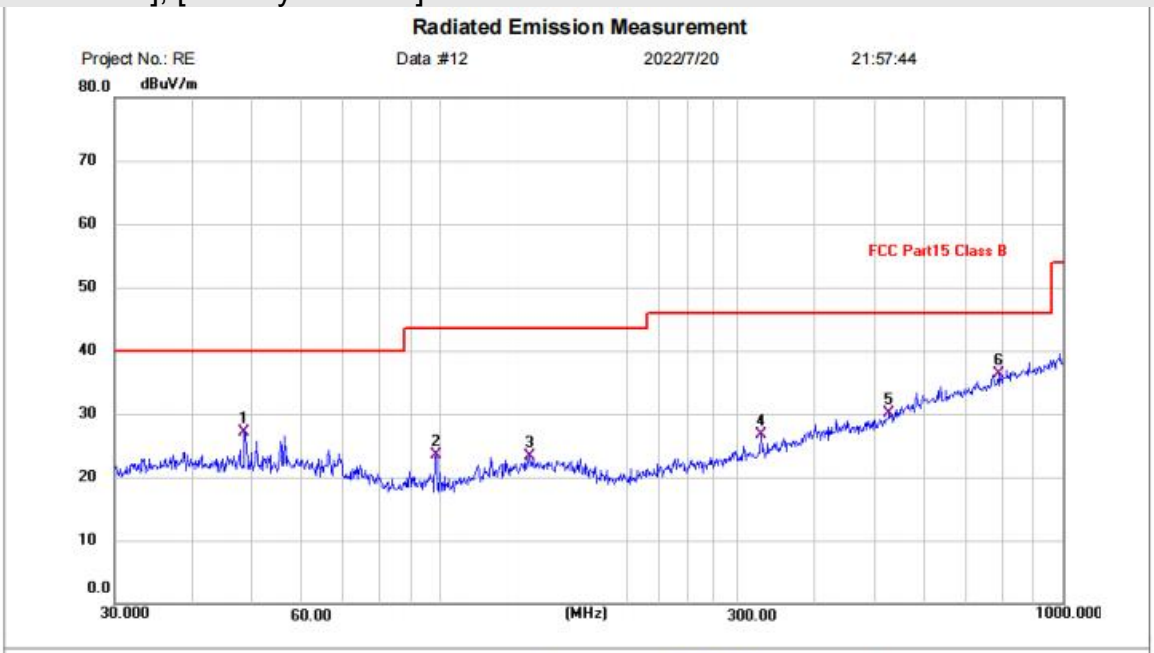
Temperature: (C)
Humidity: %RH

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	42.8997	-0.06	23.88	23.82	40.00	-16.18	QP	P	
2	55.6093	0.36	23.58	23.94	40.00	-16.06	QP	P	
3	130.3789	-0.15	23.52	23.37	43.50	-20.13	QP	P	
4	240.8303	0.56	23.43	23.99	46.00	-22.01	QP	P	
5	435.5898	0.09	28.49	28.58	46.00	-17.42	QP	P	
6 *	833.3171	0.96	36.00	36.96	46.00	-9.04	QP	P	

*:Maximum data x:Over limit !:over margin

Test Result: Pass

[TestMode: TX]; [Polarity: Vertical]



Site
Limit: FCC Part15 Class B
EUT: panoramic camera
M/N: Pilot pano
Mode: BT-TX
Note:

Polarization: *Vertical*
Power:

Temperature: (C)
Humidity: %RH

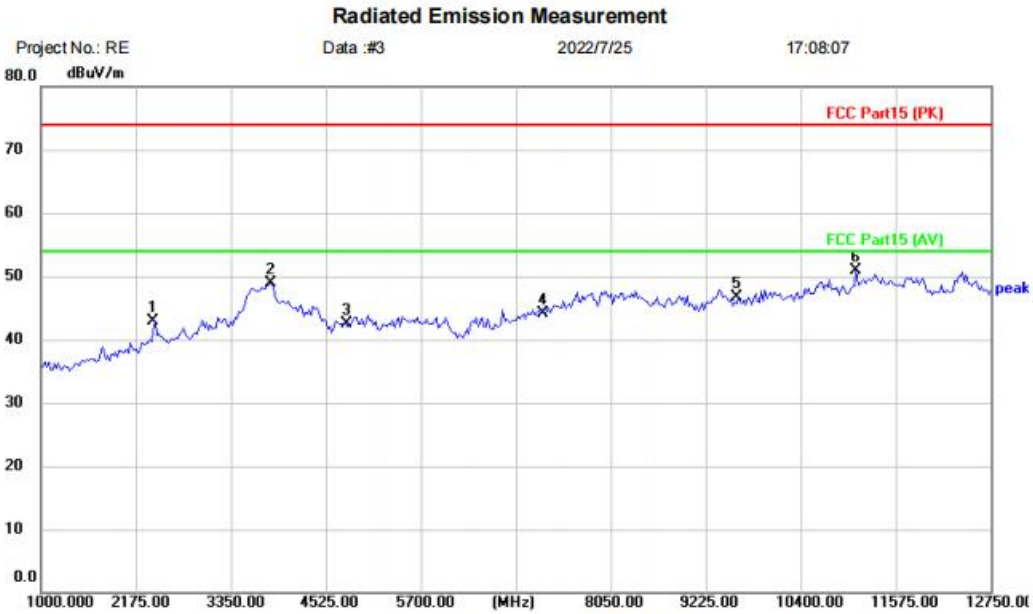
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	48.5016	3.41	23.74	27.15	40.00	-12.85	QP	P	
2	98.4866	2.88	20.63	23.51	43.50	-19.99	QP	P	
3	139.3613	-0.61	23.90	23.29	43.50	-20.21	QP	P	
4	327.8873	1.19	25.51	26.70	46.00	-19.30	QP	P	
5	526.3967	-0.15	30.17	30.02	46.00	-15.98	QP	P	
6 *	787.8513	0.94	35.34	36.28	46.00	-9.72	QP	P	

*:Maximum data x:Over limit !:over margin

Test Result: Pass

Above 1GHz

[TestMode: TX lowest channel]; [Polarity: Horizontal]



Site
Limit: FCC Part15 (PK)
EUT: panoramic camera
M/N: Pilot pano
Mode: TX-L
Note:

Polarization: *Horizontal*
Power:

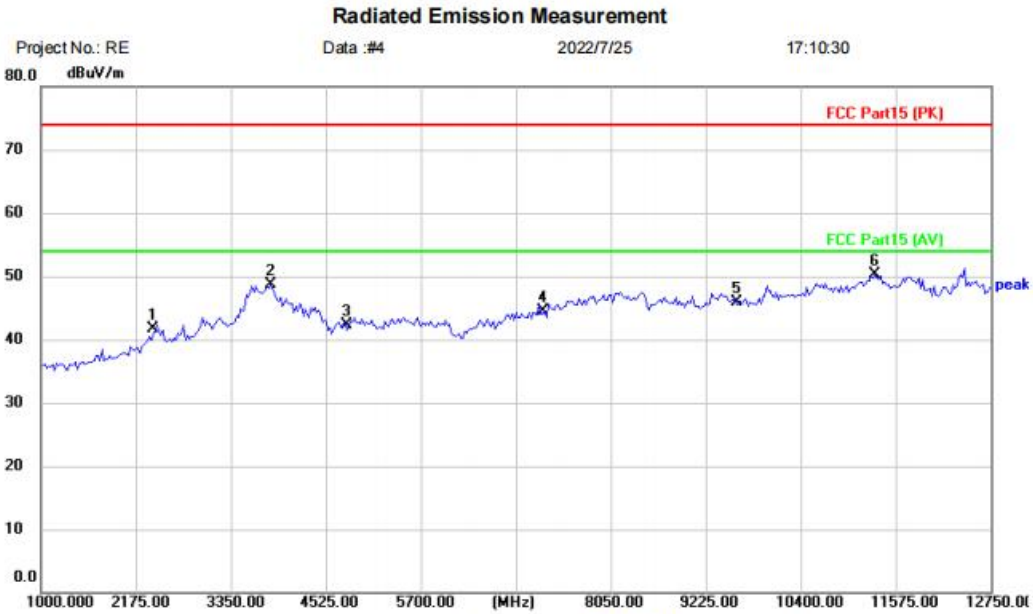
Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1		2402.000	43.76	-0.93	42.83	74.00	-31.17	peak	
2		3843.500	41.80	7.12	48.92	74.00	-25.08	peak	
3		4804.000	38.88	3.71	42.59	74.00	-31.41	peak	
4		7206.000	38.06	5.96	44.02	74.00	-29.98	peak	
5		9608.000	37.45	9.29	46.74	74.00	-27.26	peak	
6	*	11081.500	38.84	12.01	50.85	74.00	-23.15	peak	

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

[TestMode: TX lowest channel]; [Polarity: Vertical]



Site
Limit: FCC Part15 (PK)
EUT: panoramic camera
M/N: Pilot pano
Mode: TX-L
Note:

Polarization: *Vertical*
Power:

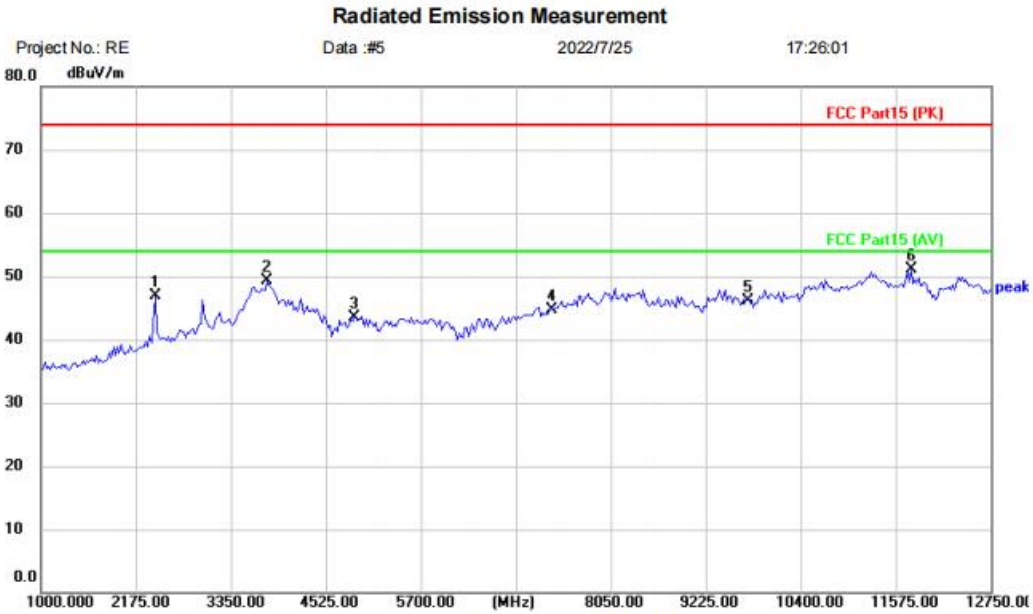
Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1		2402.000	42.64	-0.93	41.71	74.00	-32.29	peak	
2		3843.500	41.54	7.12	48.66	74.00	-25.34	peak	
3		4804.000	38.68	3.71	42.39	74.00	-31.61	peak	
4		7206.000	38.56	5.96	44.52	74.00	-29.48	peak	
5		9608.000	36.62	9.29	45.91	74.00	-28.09	peak	
6	*	11316.500	38.36	11.88	50.24	74.00	-23.76	peak	

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

[TestMode: TX middle channel]; [Polarity: Vertical]



Site
Limit: FCC Part15 (PK)
EUT: panoramic camera
M/N: Pilot pano
Mode: TX-M
Note:

Polarization: *Vertical*
Power:

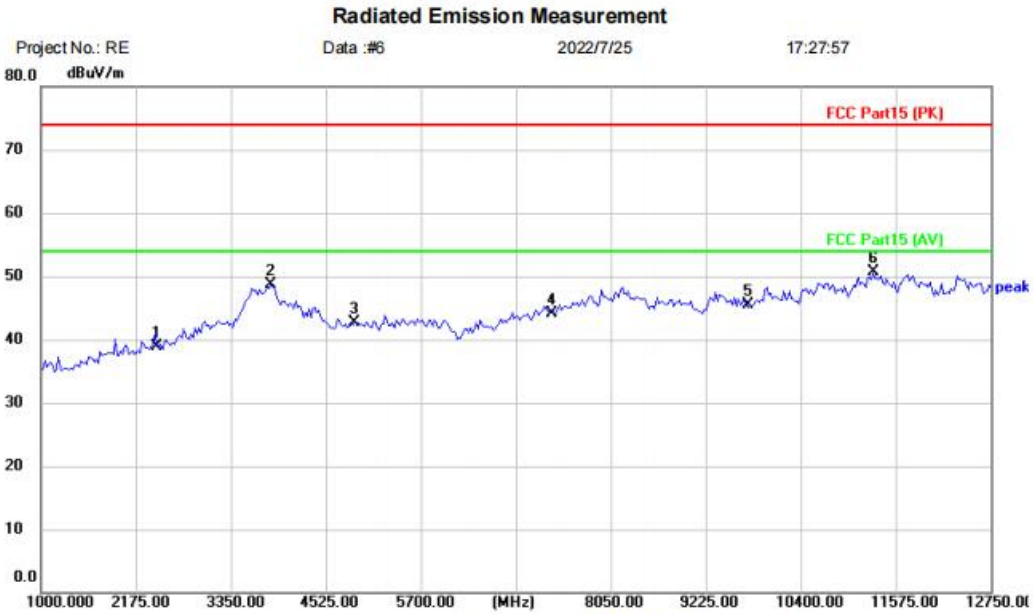
Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1		2410.000	47.91	-0.96	46.95	74.00	-27.05	peak	
2		3796.500	41.62	7.65	49.27	74.00	-24.73	peak	
3		4882.000	40.20	3.36	43.56	74.00	-30.44	peak	
4		7323.000	38.27	6.43	44.70	74.00	-29.30	peak	
5		9764.000	36.42	9.63	46.05	74.00	-27.95	peak	
6	*	11763.000	39.54	11.63	51.17	74.00	-22.83	peak	

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

[TestMode: TX middle channel]; [Polarity: Horizontal]



Site
Limit: FCC Part15 (PK)
EUT: panoramic camera
M/N: Pilot pano
Mode: TX-M
Note:

Polarization: *Horizontal*
Power:

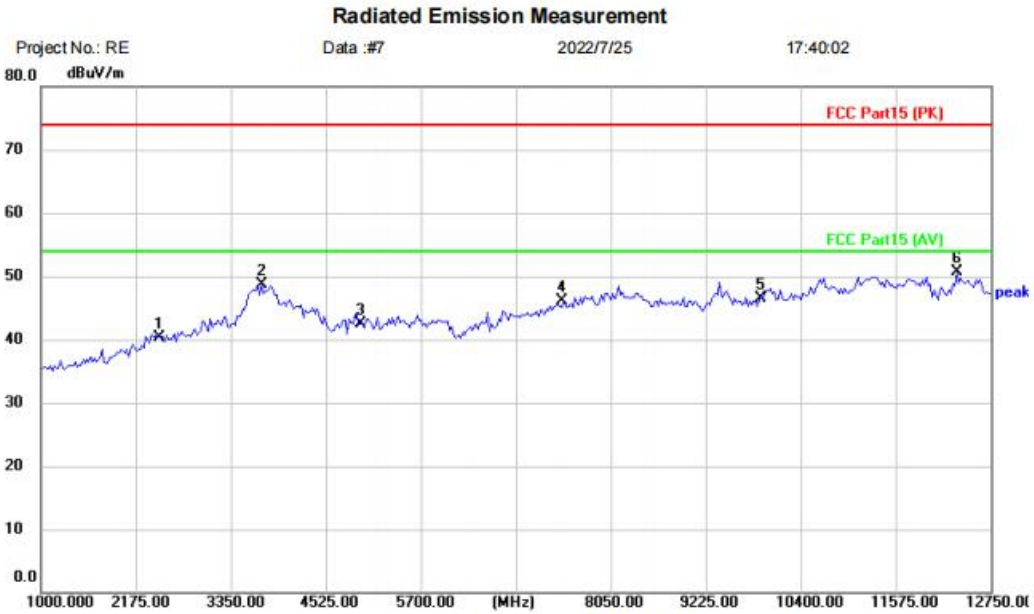
Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1		2441.000	40.01	-1.08	38.93	74.00	-35.07	peak	
2		3843.500	41.60	7.12	48.72	74.00	-25.28	peak	
3		4882.000	39.34	3.36	42.70	74.00	-31.30	peak	
4		7323.000	37.59	6.43	44.02	74.00	-29.98	peak	
5		9764.000	35.91	9.63	45.54	74.00	-28.46	peak	
6	*	11293.000	38.83	11.91	50.74	74.00	-23.26	peak	

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

[TestMode: TX highest channel]; [Polarity: Horizontal]



Site
Limit: FCC Part15 (PK)
EUT: panoramic camera
M/N: Pilot pano
Mode: TX-H
Note:

Polarization: *Horizontal*
Power:

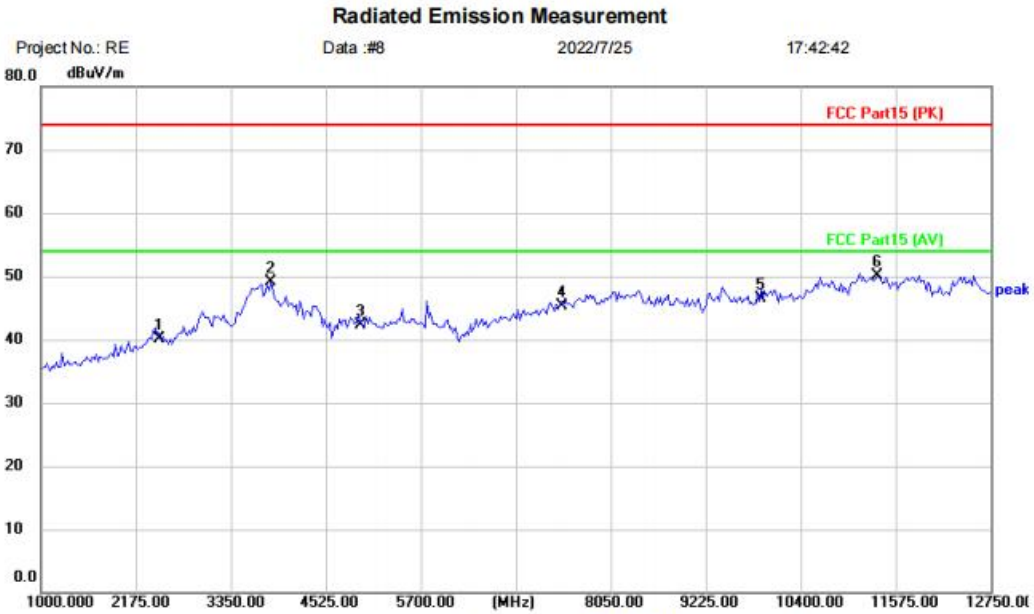
Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1		2480.000	41.49	-1.26	40.23	74.00	-33.77	peak	
2		3726.000	40.92	7.70	48.62	74.00	-25.38	peak	
3		4960.000	38.84	3.75	42.59	74.00	-31.41	peak	
4		7440.000	39.19	6.86	46.05	74.00	-27.95	peak	
5		9920.000	36.28	10.16	46.44	74.00	-27.56	peak	
6	*	12327.000	39.18	11.62	50.80	74.00	-23.20	peak	

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

[TestMode: TX highest channel]; [Polarity: Vertical]



Site
Limit: FCC Part15 (PK)
EUT: panoramic camera
M/N: Pilot pano
Mode: TX-H
Note:

Polarization: *Vertical*
Power:

Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1		2480.000	41.31	-1.26	40.05	74.00	-33.95	peak	
2		3843.500	41.98	7.12	49.10	74.00	-24.90	peak	
3		4960.000	38.46	3.75	42.21	74.00	-31.79	peak	
4		7440.000	38.35	6.86	45.21	74.00	-28.79	peak	
5		9920.000	36.34	10.16	46.50	74.00	-27.50	peak	
6	*	11340.000	38.23	11.85	50.08	74.00	-23.92	peak	

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

19 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS

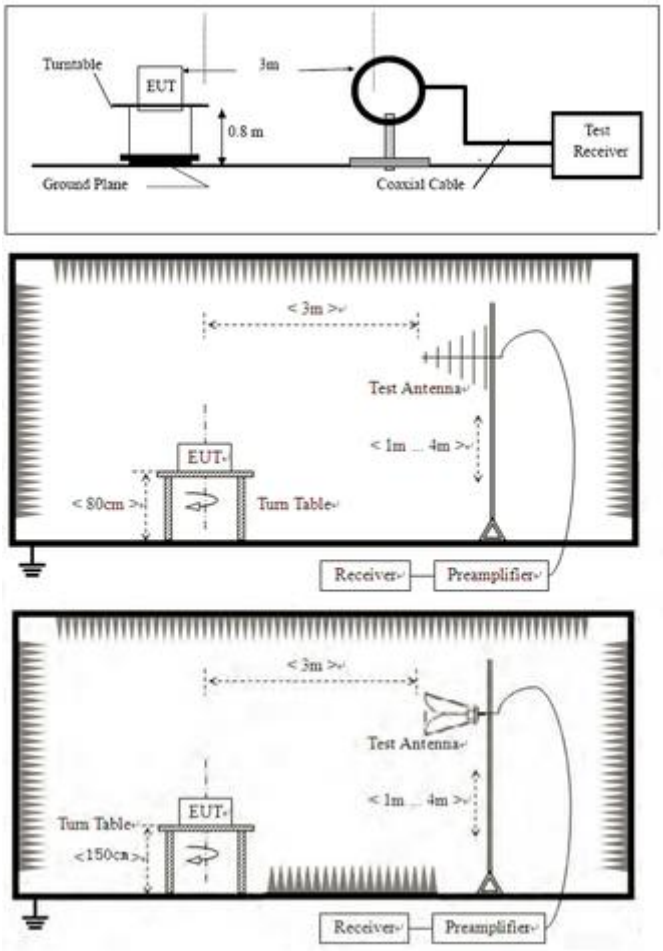
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.10.5
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

19.1 LIMITS

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

19.2 BLOCK DIAGRAM OF TEST SETUP



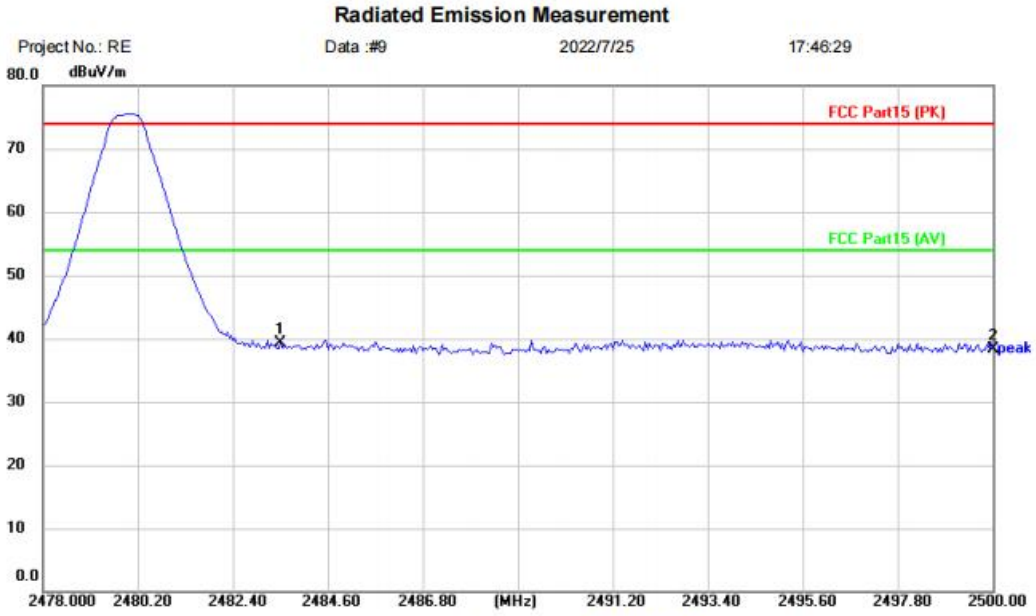
19.3 PROCEDURE

a. 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.
b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
c. 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.
d. 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.
e. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
g. 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.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
j. Repeat above procedures until all frequencies measured was complete.
Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

19.4 TEST DATA

[TestMode: TX highest channel]; [Polarity: Horizontal]



Site
Limit: FCC Part15 (PK)
EUT: panoramic camera
M/N: Pilot pano
Mode: TX-H
Note:

Polarization: *Horizontal*
Power:

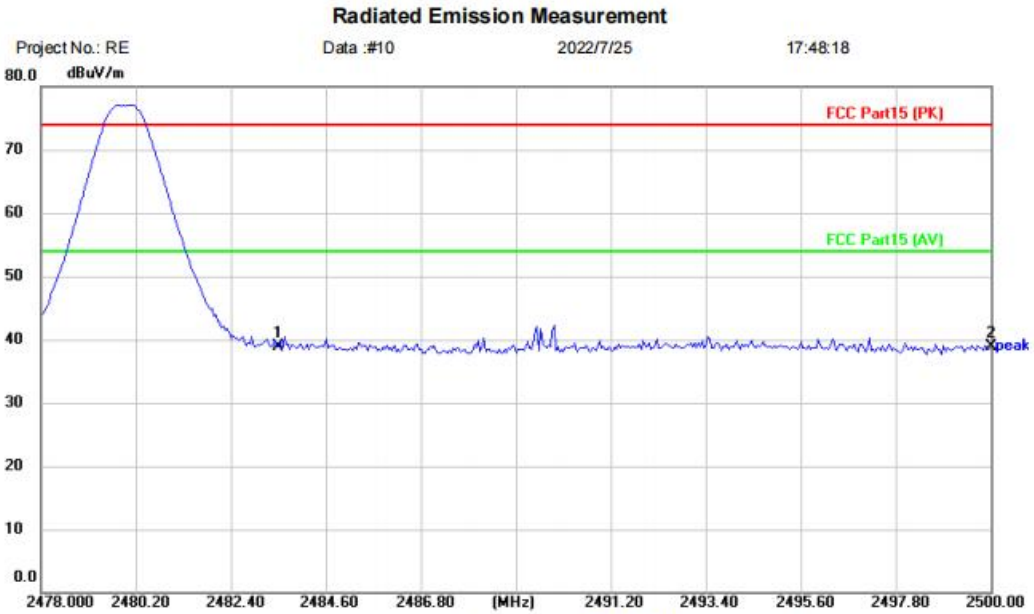
Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2483.500	42.43	-3.14	39.29	74.00	-34.71	peak	
2		2500.000	41.43	-3.08	38.35	74.00	-35.65	peak	

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

[TestMode: TX highest channel]; [Polarity: Vertical]



Site
Limit: FCC Part15 (PK)
EUT: panoramic camera
M/N: Pilot pano
Mode: TX-H
Note:

Polarization: *Vertical*
Power:

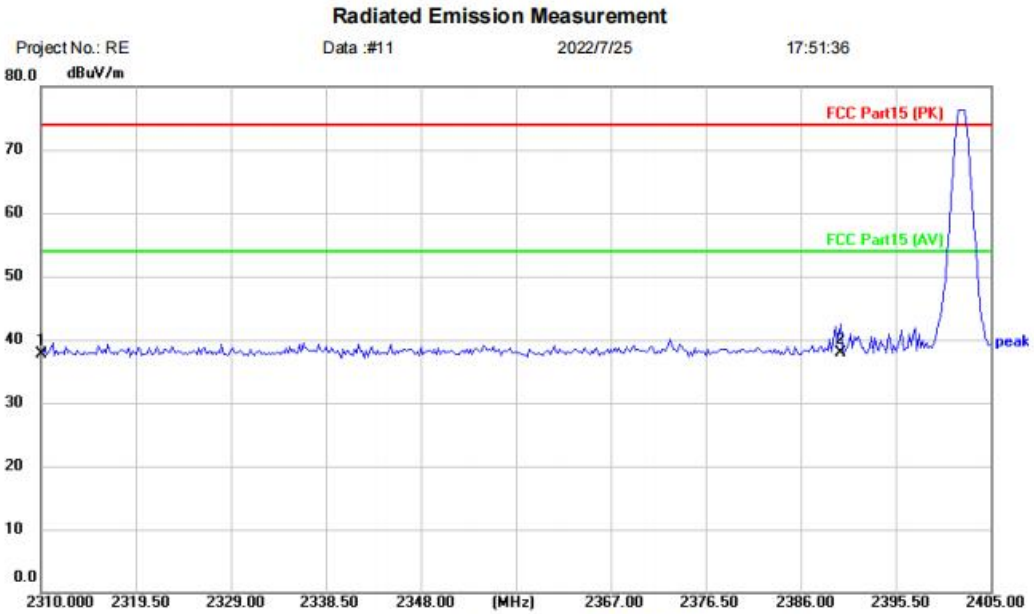
Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2483.500	42.12	-3.14	38.98	74.00	-35.02	peak	
2		2500.000	41.96	-3.08	38.88	74.00	-35.12	peak	

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

[TestMode: TX lowest channel]; [Polarity: Horizontal]



Site
Limit: FCC Part15 (PK)
EUT: panoramic camera
M/N: Pilot pano
Mode: TX-L
Note:

Polarization: *Horizontal*
Power:

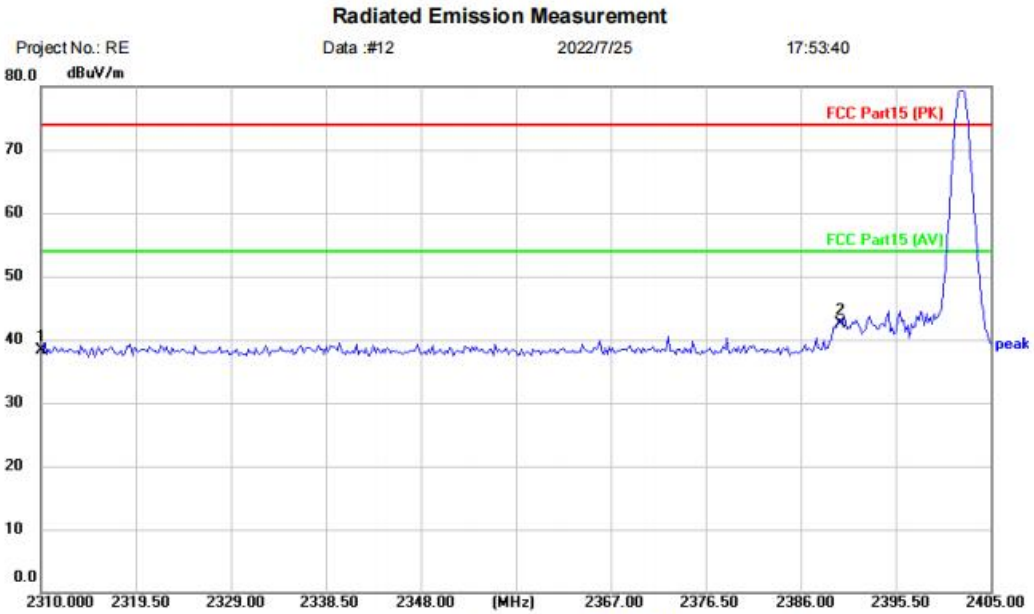
Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1		2310.000	41.72	-3.93	37.79	74.00	-36.21	peak	
2	*	2390.000	41.44	-3.58	37.86	74.00	-36.14	peak	

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

[TestMode: TX lowest channel]; [Polarity: Vertical]



Site
Limit: FCC Part15 (PK)
EUT: panoramic camera
M/N: Pilot pano
Mode: TX-L
Note:

Polarization: *Vertical*
Power:

Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1		2310.000	42.24	-3.93	38.31	74.00	-35.69	peak	
2	*	2390.000	46.08	-3.58	42.50	74.00	-31.50	peak	

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

20 ANTENNA REQUIREMENT

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	N/A

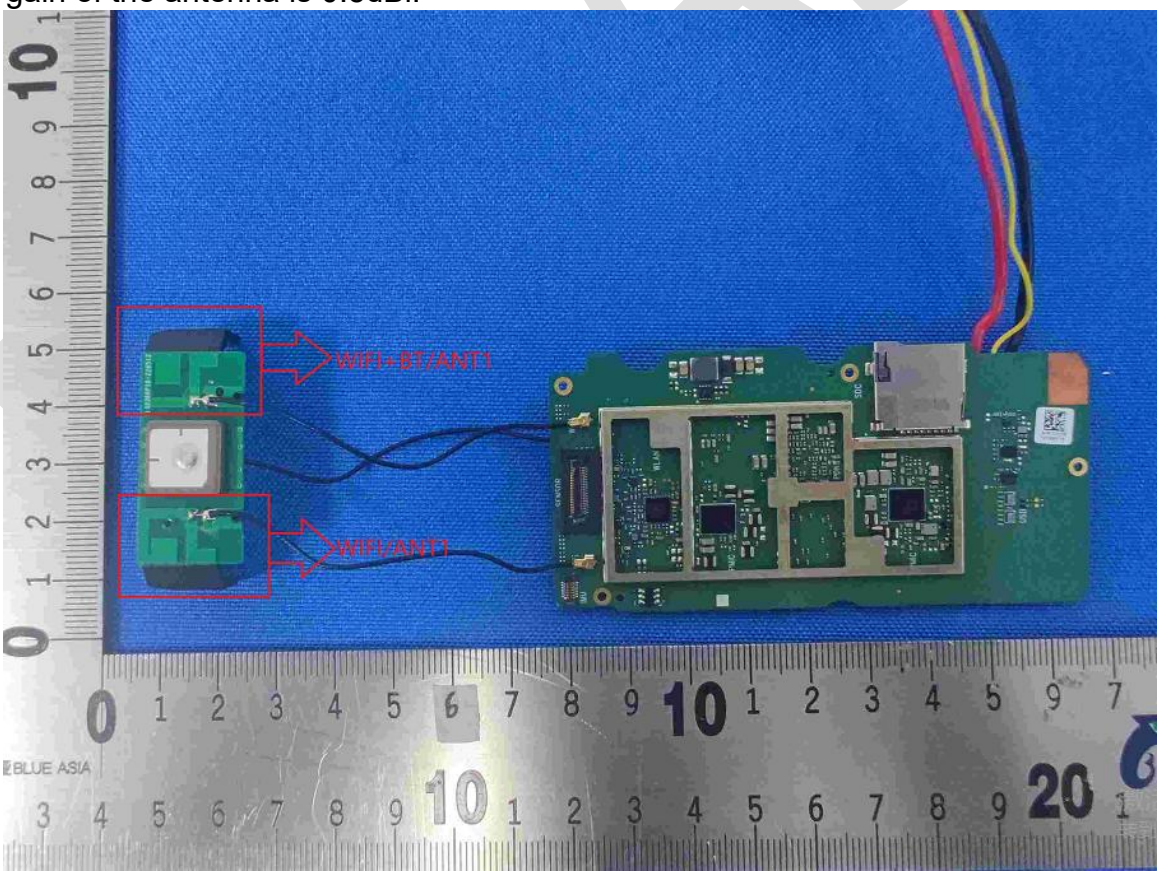
20.1 CONCLUSION

Standard Requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0.5dBi.



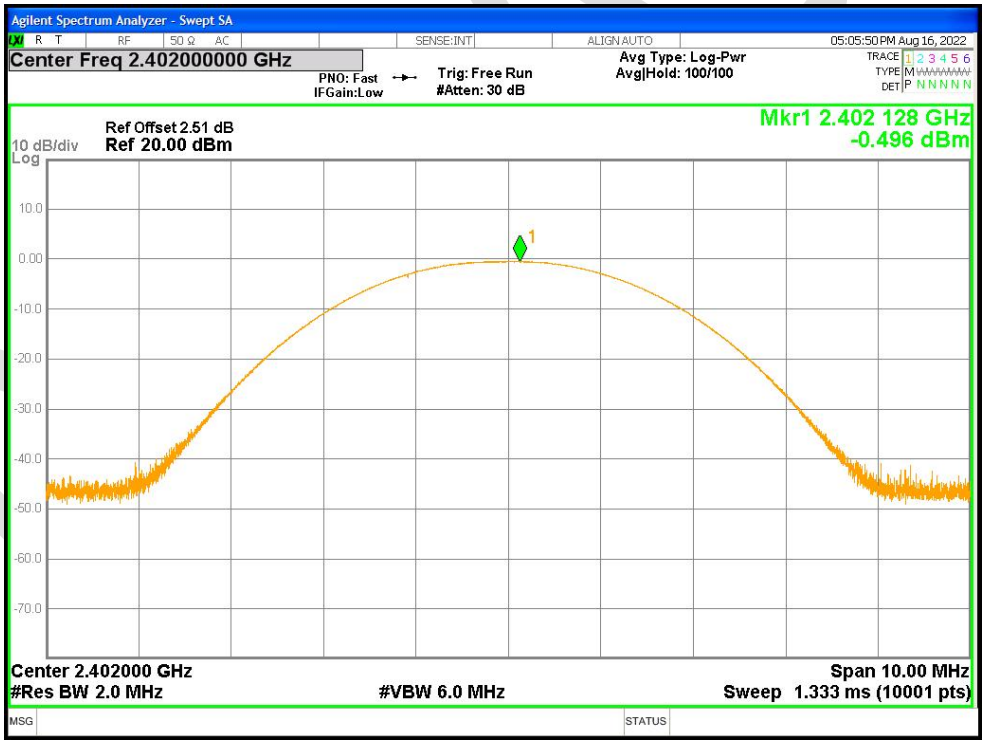
21 APPENDIX

Appendix1

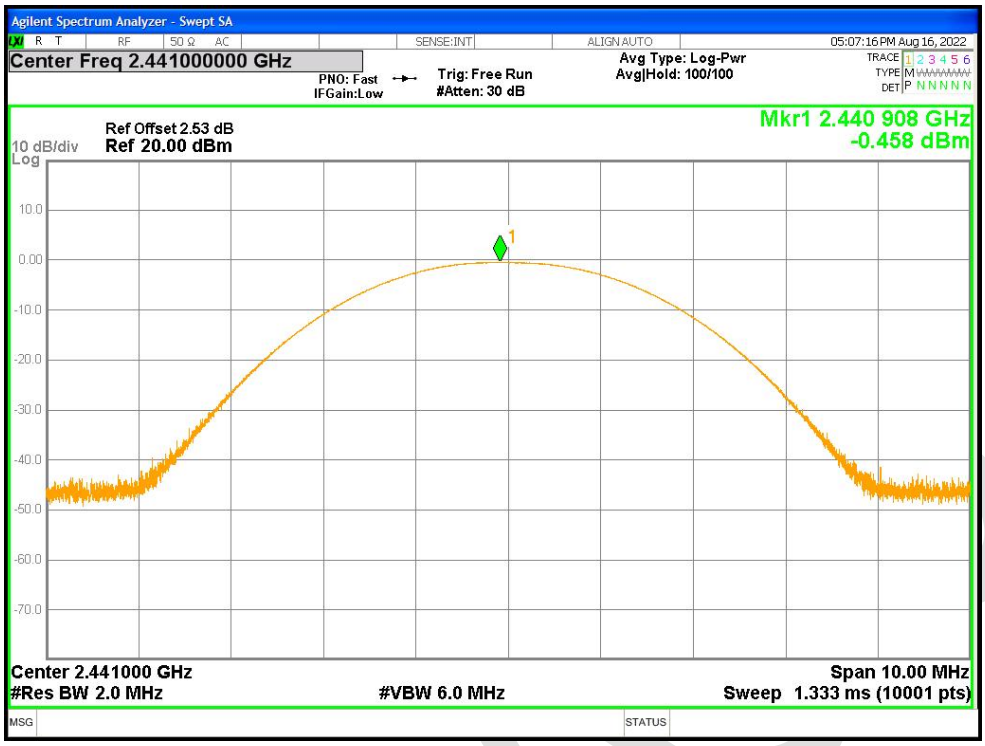
Maximum Conducted Output Power

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	1-DH1	2402	Ant1	-0.496	21	Pass
NVNT	1-DH1	2441	Ant1	-0.458	21	Pass
NVNT	1-DH1	2480	Ant1	-1.473	21	Pass
NVNT	2-DH1	2402	Ant1	-1.151	21	Pass
NVNT	2-DH1	2441	Ant1	-1.359	21	Pass
NVNT	2-DH1	2480	Ant1	-2.209	21	Pass
NVNT	3-DH1	2402	Ant1	-0.898	21	Pass
NVNT	3-DH1	2441	Ant1	-1.052	21	Pass
NVNT	3-DH1	2480	Ant1	-1.892	21	Pass

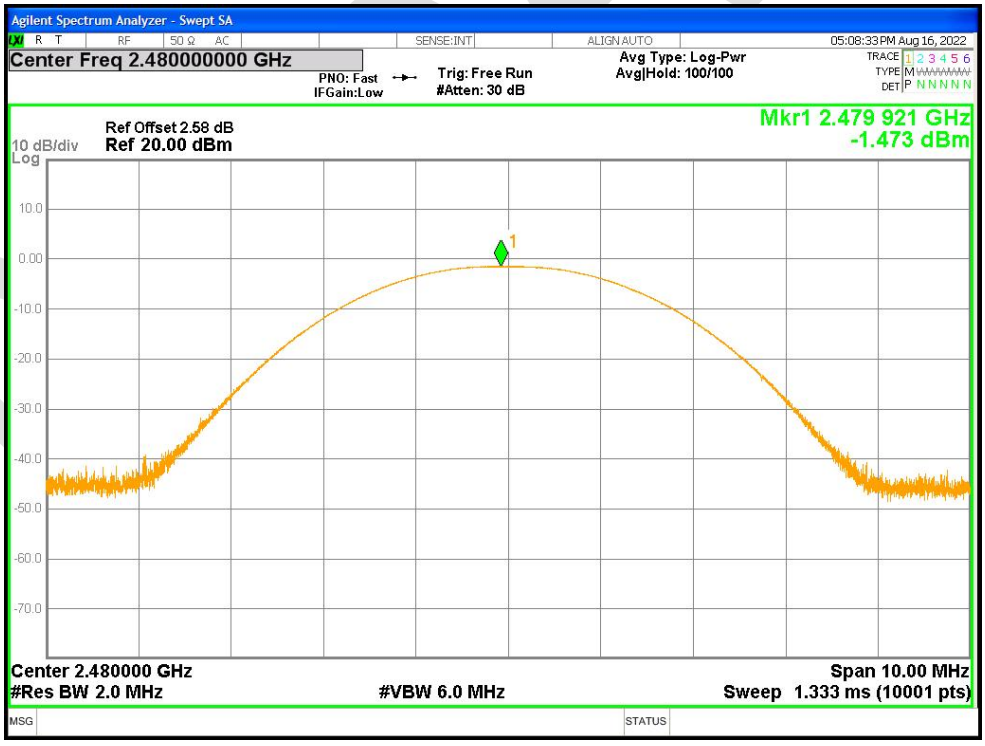
Power NVNT 1-DH1 2402MHz Ant1



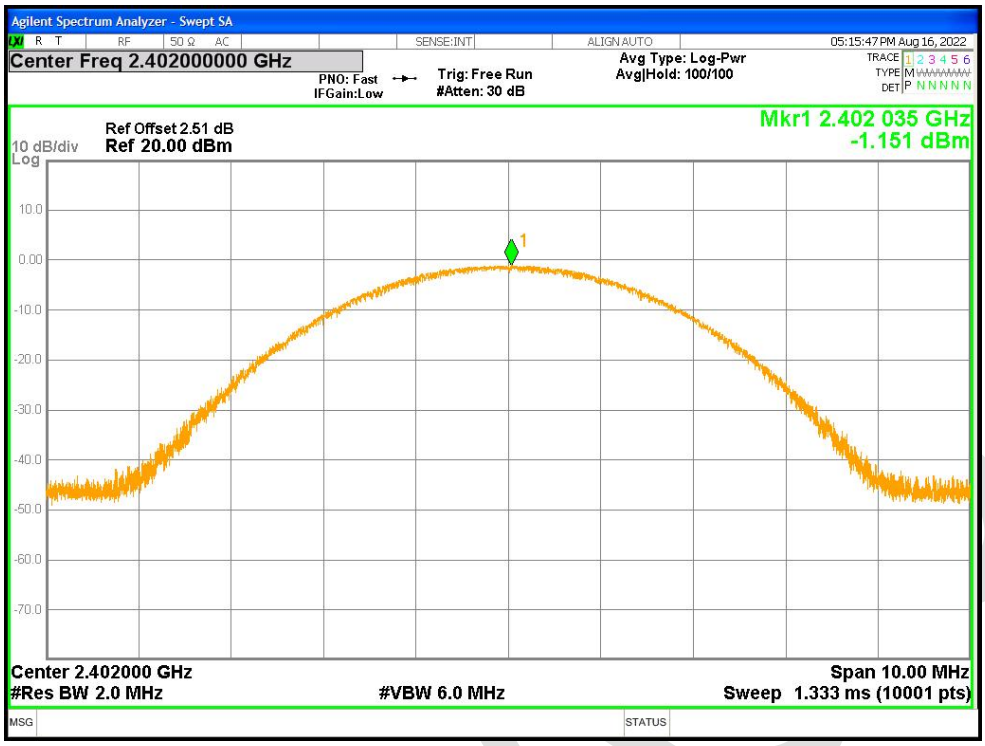
Power NVNT 1-DH1 2441MHz Ant1



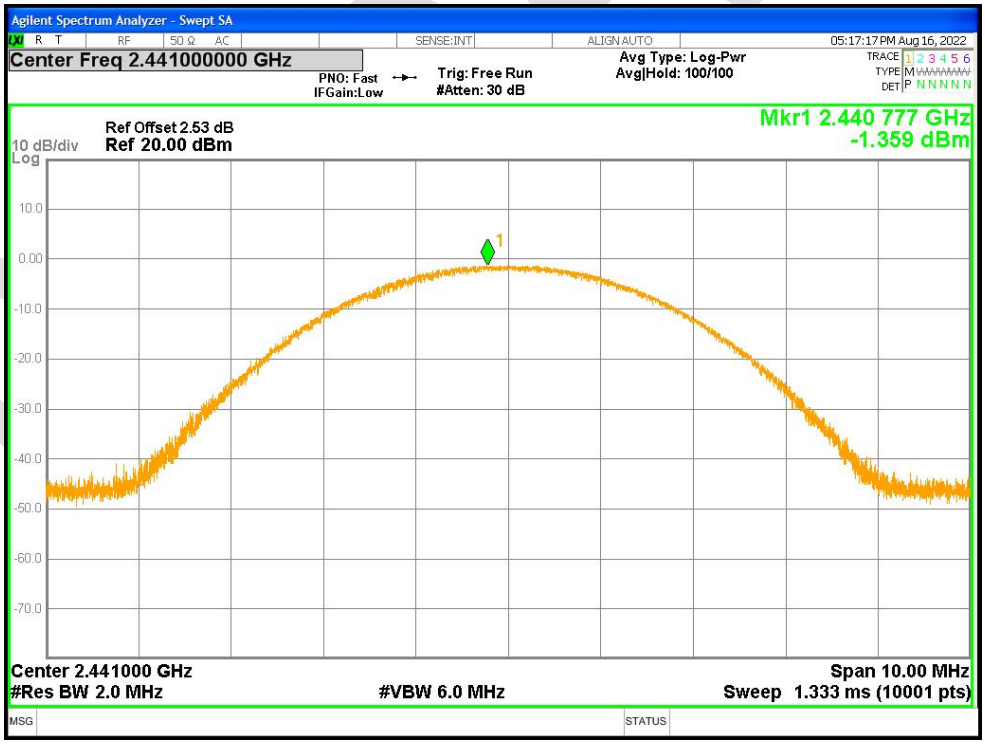
Power NVNT 1-DH1 2480MHz Ant1



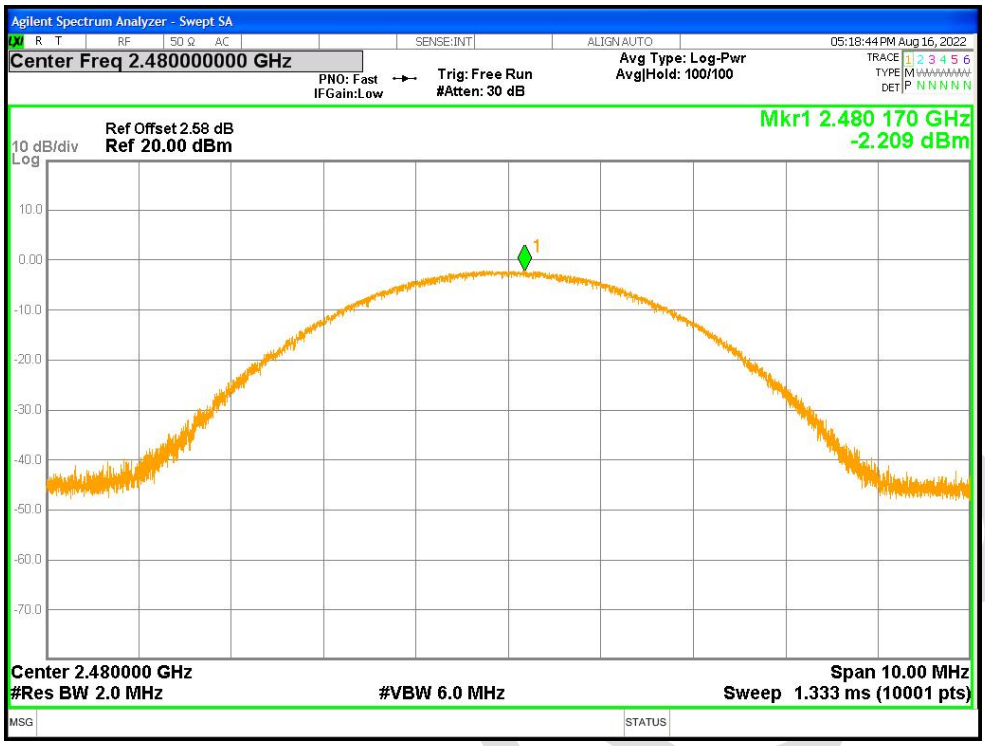
Power NVNT 2-DH1 2402MHz Ant1



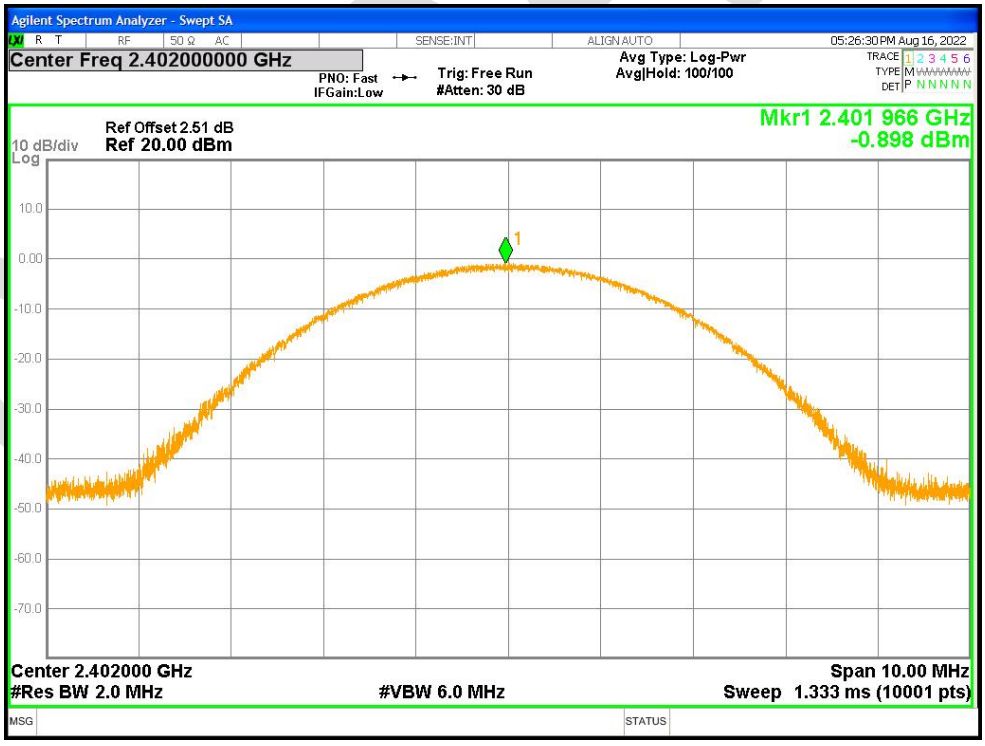
Power NVNT 2-DH1 2441MHz Ant1



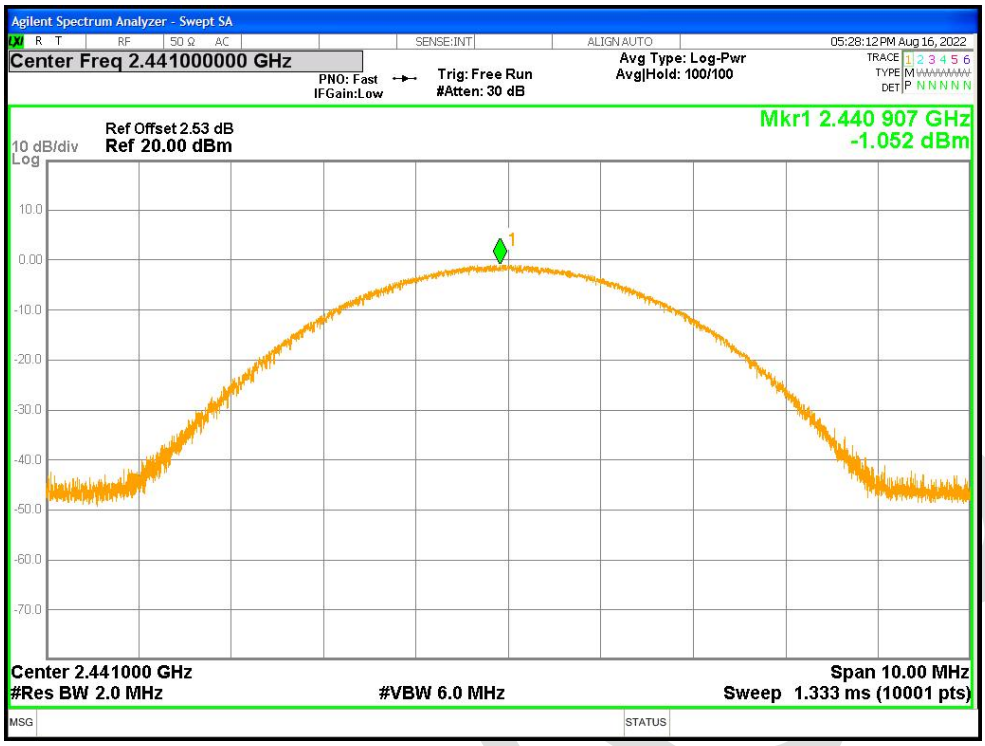
Power NVNT 2-DH1 2480MHz Ant1



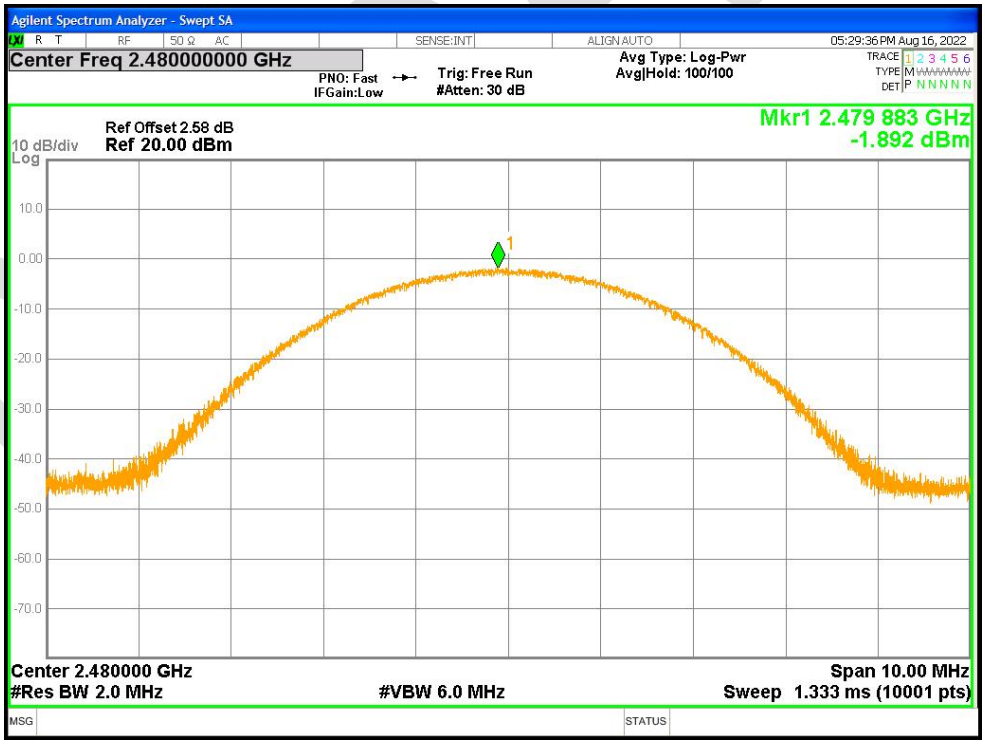
Power NVNT 3-DH1 2402MHz Ant1



Power NVNT 3-DH1 2441MHz Ant1



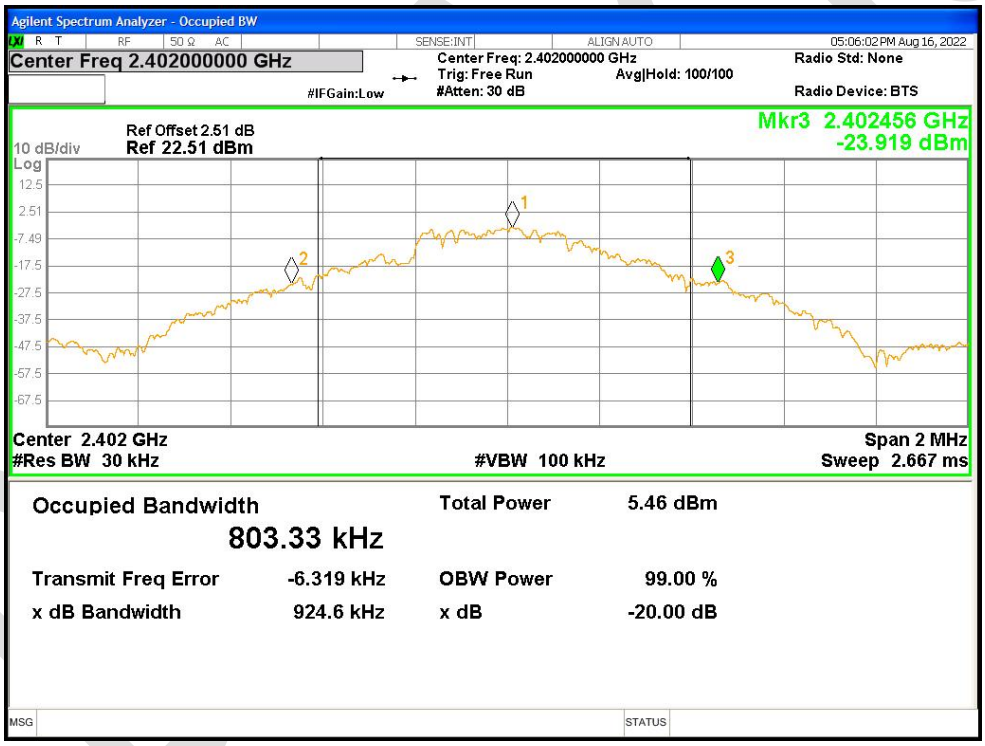
Power NVNT 3-DH1 2480MHz Ant1



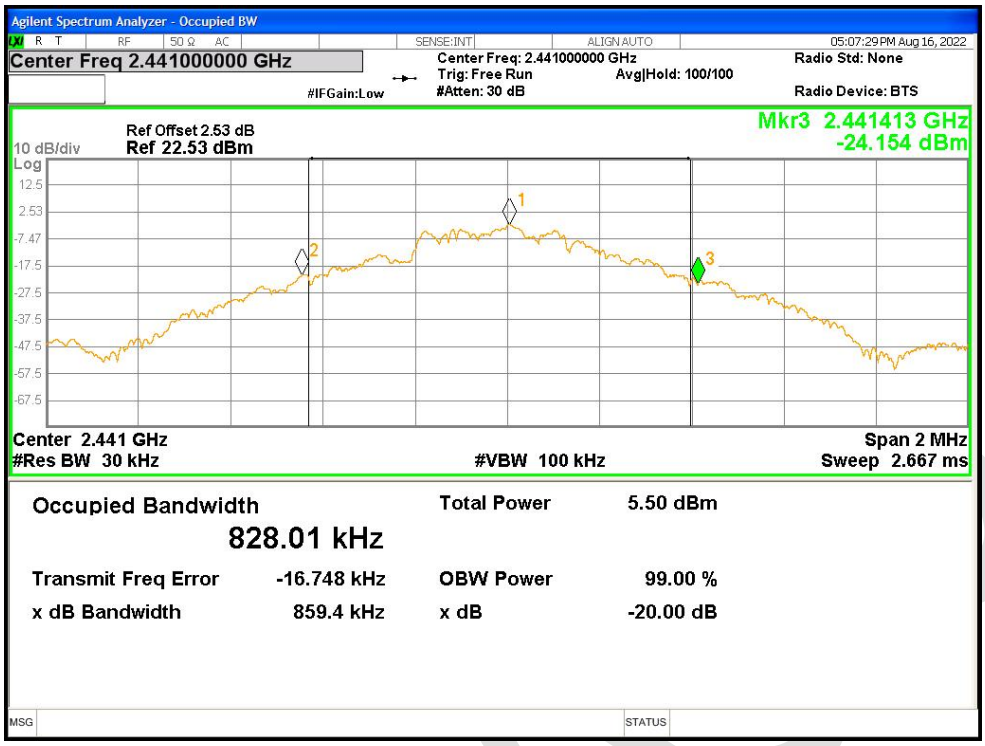
-20dB Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	-20 dB Bandwidth (MHz)	Limit -20 dB Bandwidth (MHz)	Verdict
NVNT	1-DH1	2402	Ant1	0.925	0	Pass
NVNT	1-DH1	2441	Ant1	0.859	0	Pass
NVNT	1-DH1	2480	Ant1	0.853	0	Pass
NVNT	2-DH1	2402	Ant1	1.24	0	Pass
NVNT	2-DH1	2441	Ant1	1.256	0	Pass
NVNT	2-DH1	2480	Ant1	1.229	0	Pass
NVNT	3-DH1	2402	Ant1	1.217	0	Pass
NVNT	3-DH1	2441	Ant1	1.221	0	Pass
NVNT	3-DH1	2480	Ant1	1.206	0	Pass

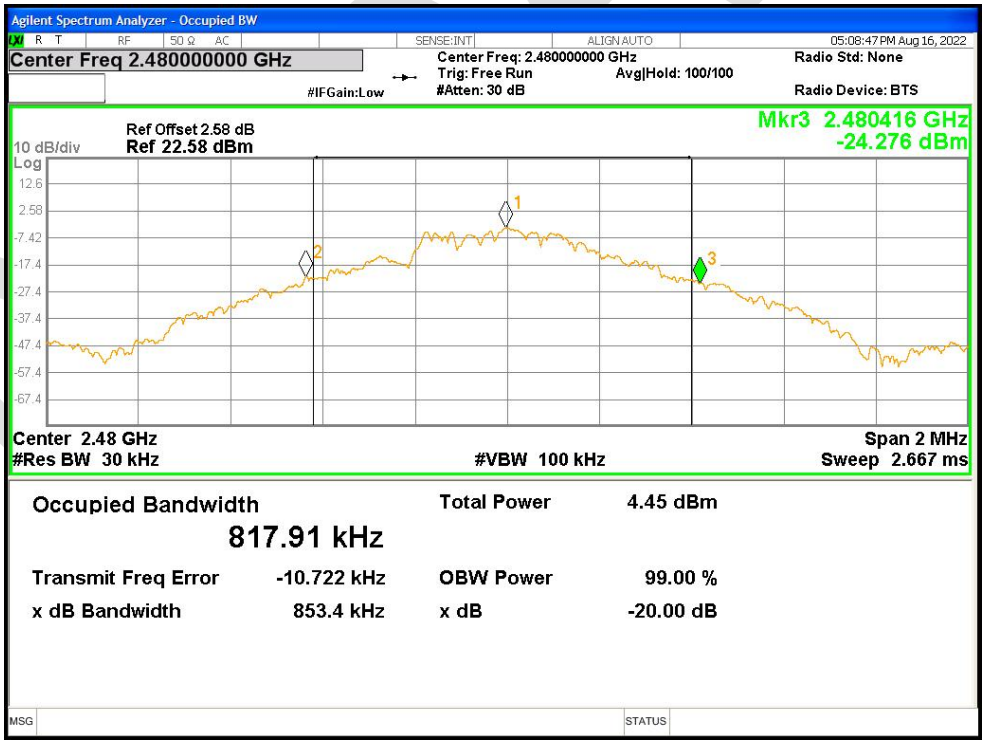
-20dB Bandwidth NVNT 1-DH1 2402MHz Ant1



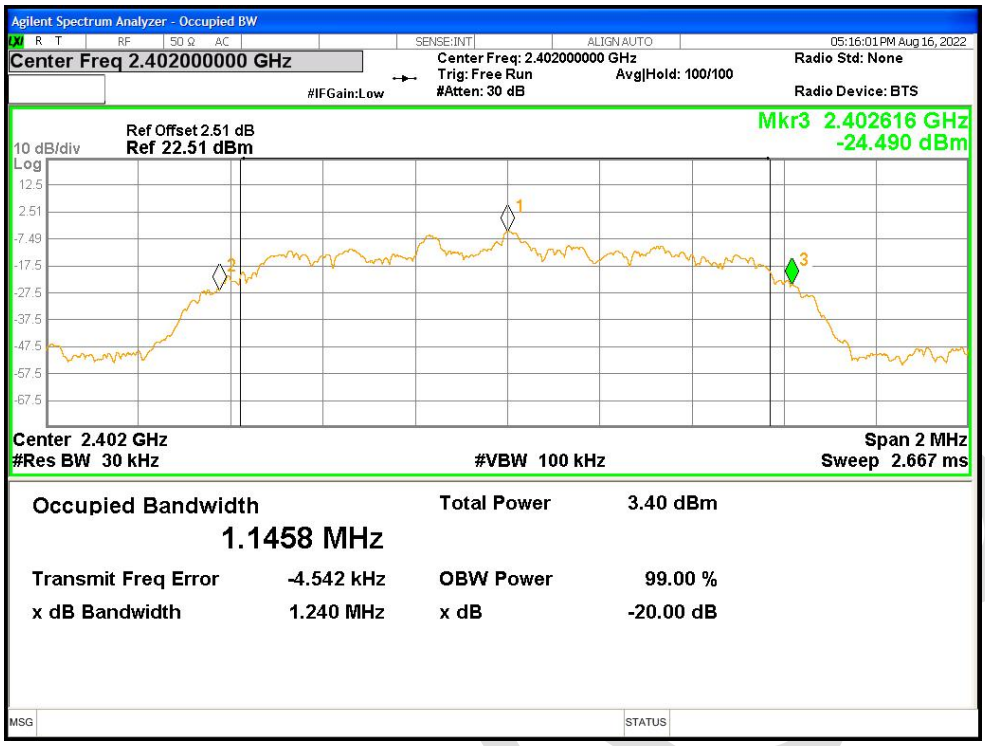
-20dB Bandwidth NVNT 1-DH1 2441MHz Ant1



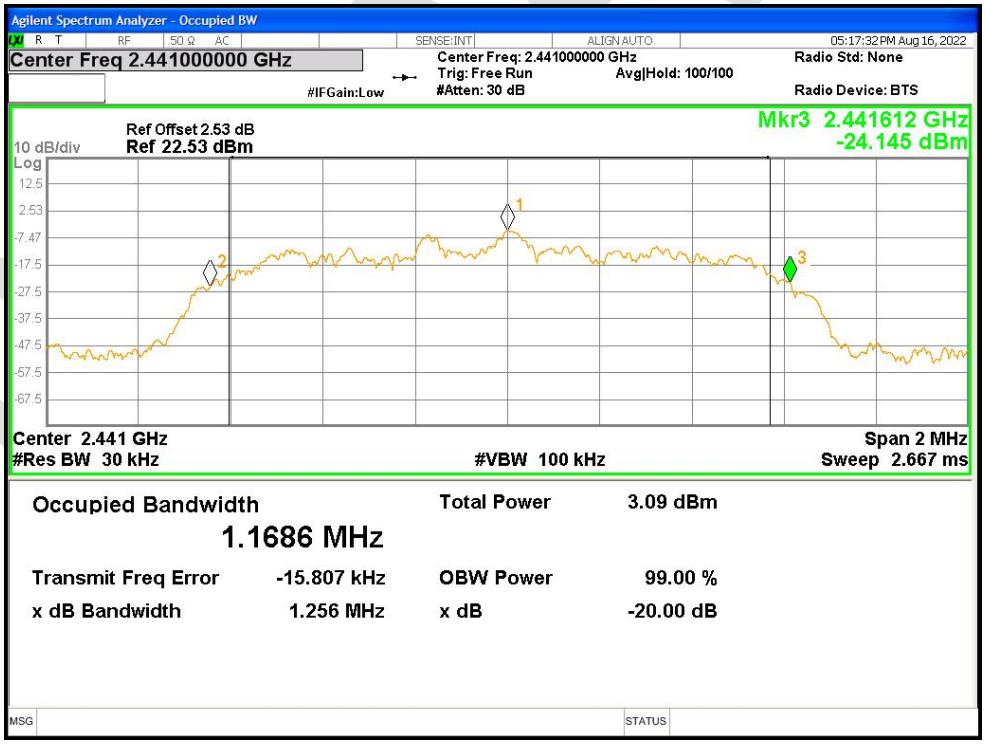
-20dB Bandwidth NVNT 1-DH1 2480MHz Ant1



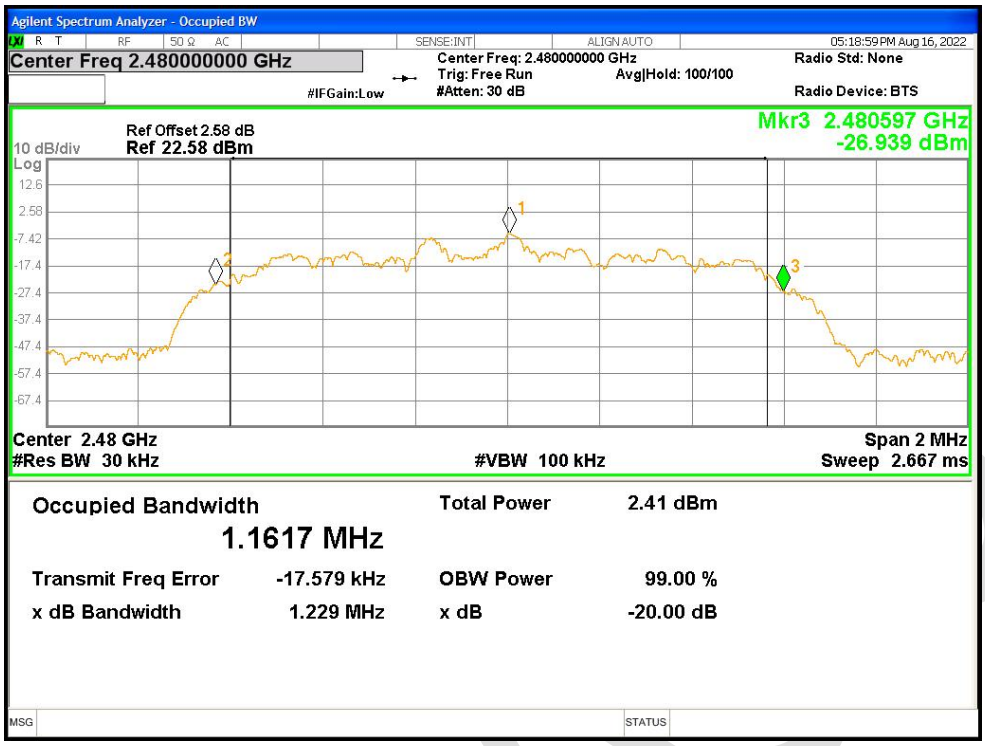
-20dB Bandwidth NVNT 2-DH1 2402MHz Ant1



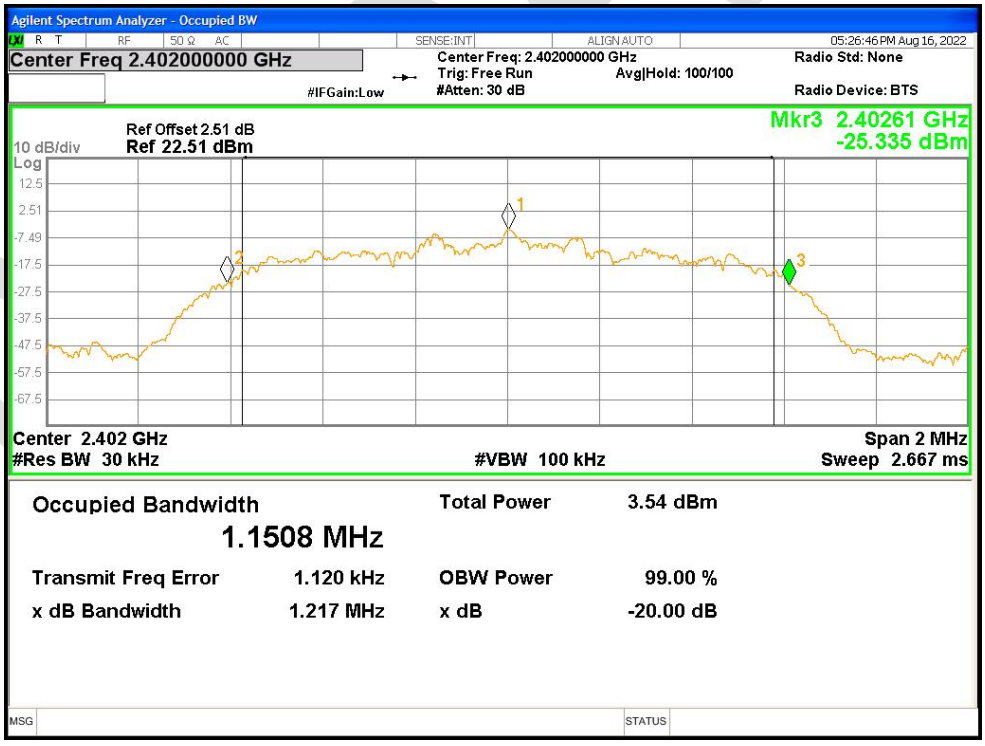
-20dB Bandwidth NVNT 2-DH1 2441MHz Ant1



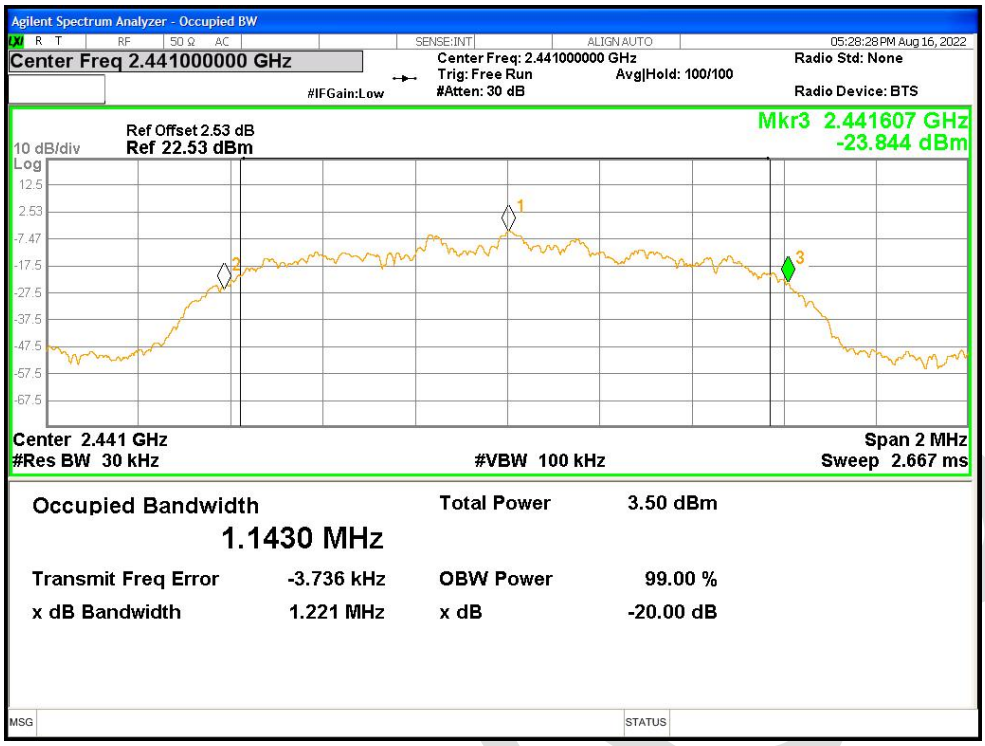
-20dB Bandwidth NVNT 2-DH1 2480MHz Ant1



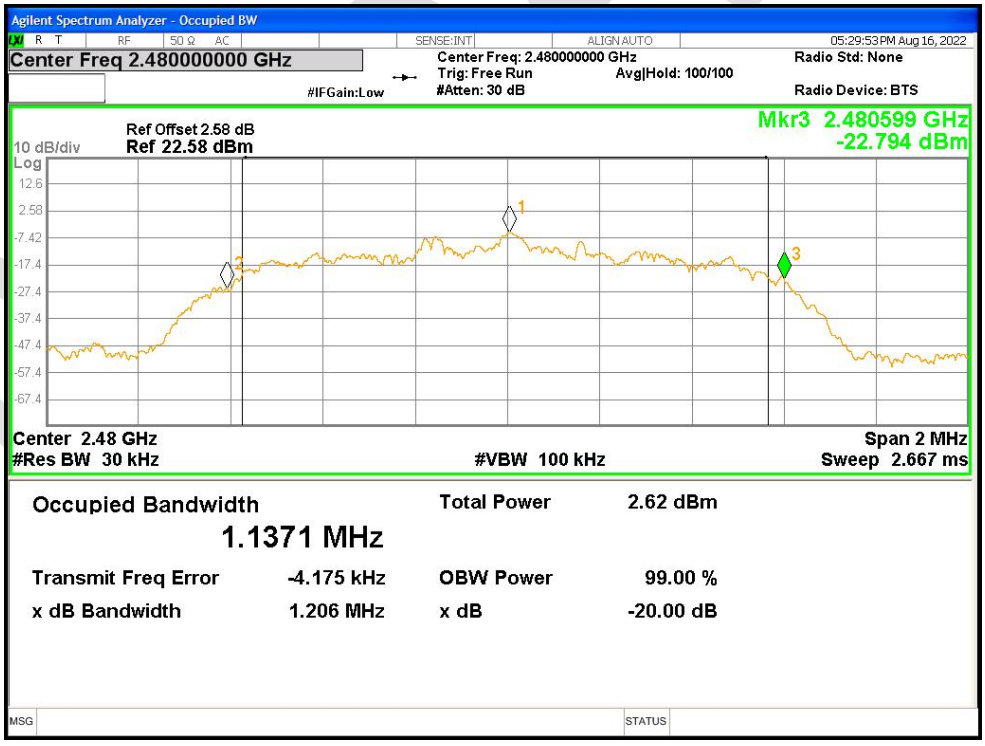
-20dB Bandwidth NVNT 3-DH1 2402MHz Ant1



-20dB Bandwidth NVNT 3-DH1 2441MHz Ant1



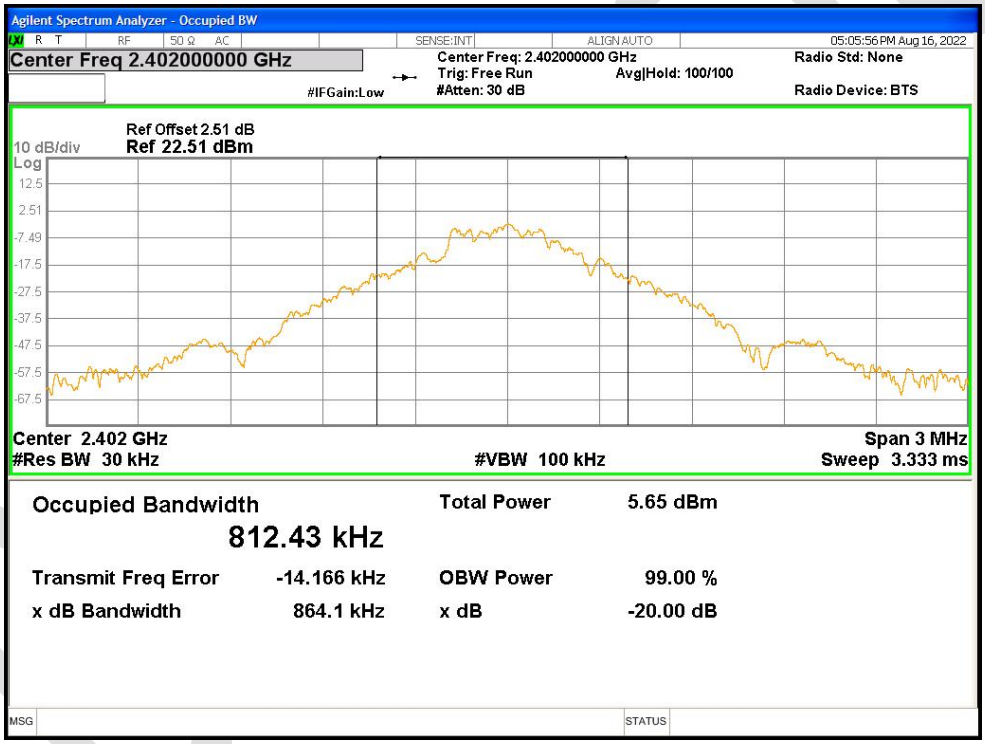
-20dB Bandwidth NVNT 3-DH1 2480MHz Ant1



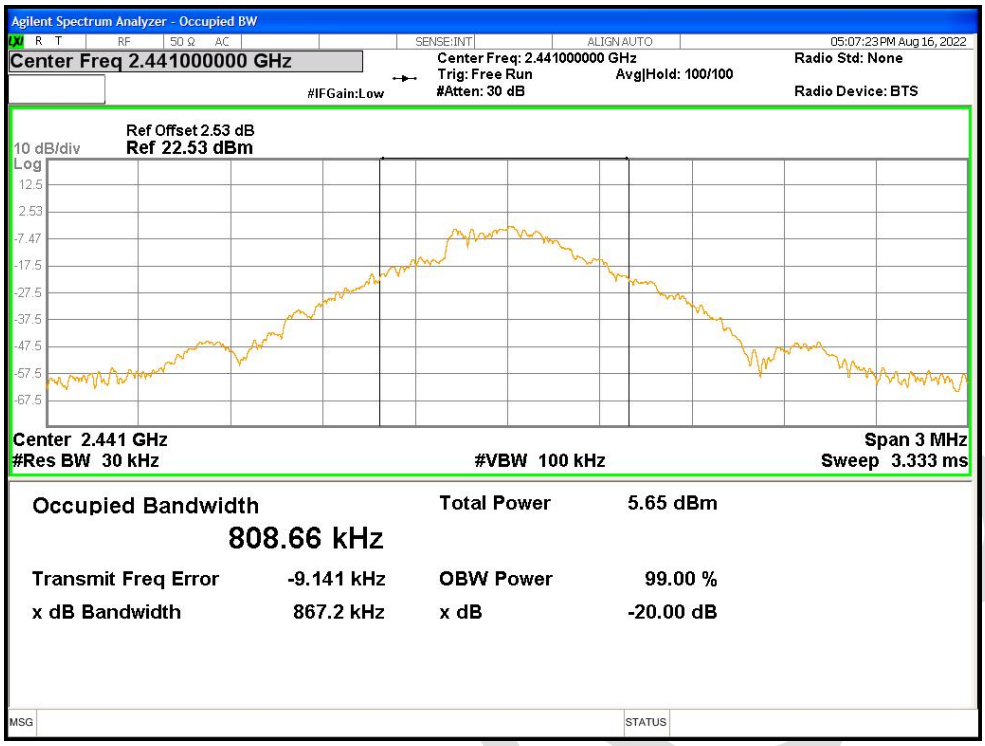
Occupied Channel Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	1-DH1	2402	Ant1	0.81243
NVNT	1-DH1	2441	Ant1	0.80866
NVNT	1-DH1	2480	Ant1	0.80240
NVNT	2-DH1	2402	Ant1	1.1706
NVNT	2-DH1	2441	Ant1	1.1611
NVNT	2-DH1	2480	Ant1	1.1575
NVNT	3-DH1	2402	Ant1	1.1446
NVNT	3-DH1	2441	Ant1	1.1476
NVNT	3-DH1	2480	Ant1	1.1421

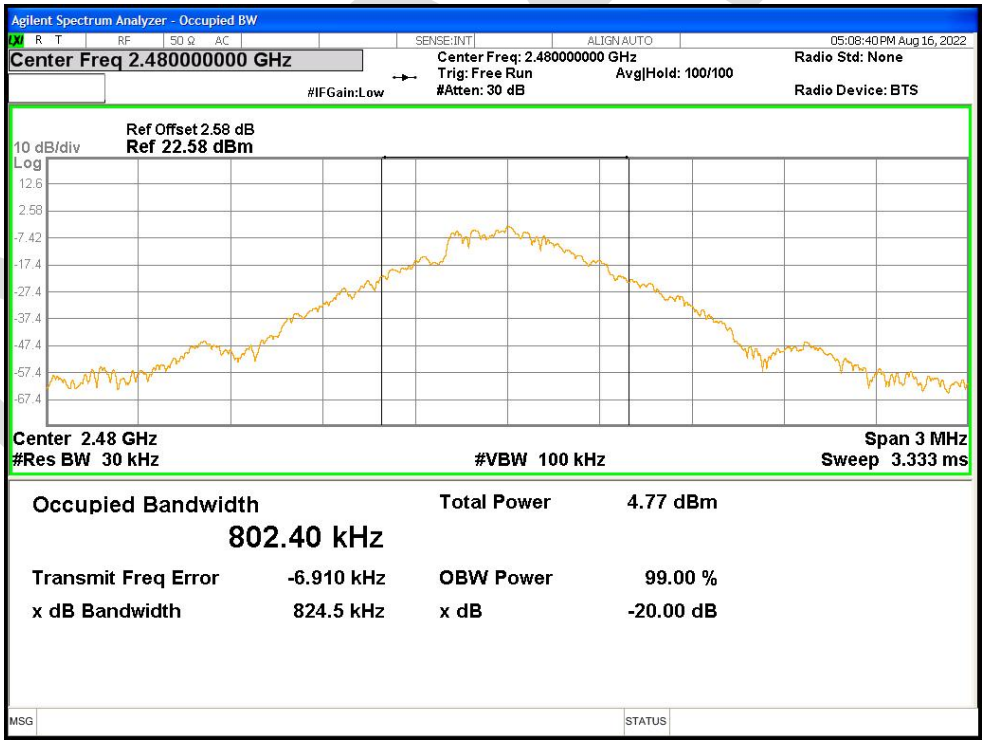
OBW NVNT 1-DH1 2402MHz Ant1



OBW NVNT 1-DH1 2441MHz Ant1



OBW NVNT 1-DH1 2480MHz Ant1



OBW NVNT 2-DH1 2402MHz Ant1