

**FCC 15.247
2.4 GHz Report**

for

Elitegroup Computer Systems Co., Ltd.

No. 239, Sec. 2, TiDing Blvd,
Taipei, Taiwan 11493

Brand : ECS
Product Name : 12" Multi Function Pad
Model Name : mPAD-12.....
(The "." in the model name can be 0 to 9, A to Z,
a to z, "-", "_", "\", "/" or blank for marketing
use only)
FCC ID : WL6TC12A-W

Prepared by: : AUDIX Technology Corporation,
EMC Department



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APPENDIX A TEST PLOTS

APPENDIX B TEST PHOTOGRAPHS

TEST REPORT CERTIFICATION

Applicant : Elitegroup Computer Systems Co., Ltd.
Product Name : 12" Multi Function Pad
Model No. : mPAD-12.....
(The "." in the model name can be 0 to 9, A to Z, a to z, "-", "_", "\",
"/" or blank for marketing use only)
Serial No. : N/A
Brand : ECS

Applicable Standards:

47 CFR FCC Part 15 Subpart C:2015
ANSI C63.10:2013
FCC Public Notice DA 00-705

AUDIX Technology Corp. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report. **AUDIX Technology Corp.** does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens and samples.

Date of Test: 2016. 05. 20 ~ 06. 06

Date of Report: 2016. 06. 17

Producer: Annie Yu
(Annie Yu/Administrator)

Signatory: Jarwei Wang
(Jarwei Wang/Section Manager)

1. REPORT HISTORY

Revision	Date	Revision Summary	Report Number
0	2016. 06. 17	Original Report.	EM-F160346

2. SUMMARY OF TEST RESULTS

Rule	Description	Results
15.207	Conducted Emission	PASS
15.247(d)/15.205	Radiated Band Edge and Radiated Spurious Emission	PASS
15.247(a)(1)	20dB Bandwidth	PASS
15.247(a)(1)	Carrier Frequency Separation	PASS
15.247(a)(1)(iii)	Time of Occupancy	PASS
15.247(a)(1)(iii)	Number of Hopping Channels	PASS
15.247(b)(1)	Maximum Peak Output Power	PASS
15.247(d)	Conducted Band Edges and Conducted Spurious Emission	PASS
15.203	Antenna Requirement	PASS

3. GENERAL INFORMATION

3.1. Description of EUT

Product	12" Multi Function Pad
Model Number	mPAD-12..... (The "." in the model name can be 0 to 9, A to Z, a to z, "-", "_", "\", "/" or blank for marketing use only)
Test Model	mPAD-12-CHT4-I
Serial Number	N/A
Brand Name	ECS
Applicant	Elitegroup Computer Systems Co., Ltd. No. 239, Sec. 2., TiDing Blvd., Taipei, Taiwan 11493
RF Features	WLAN: 802.11a/b/g/n/ac Bluetooth: BT and BLE NFC
Date of Receipt of Sample	2016. 05. 19

3.2. Description of Key Component Lists

Item	Supplier	Model / Type	Character
Main Board	ECS	TC71A	---
CPU (Socket: BGA1380)	Intel	Z8550	1.44GHz, up to 2.4GHz
Memory (On Board)	SK hynix	H9CCNNNBPTBL	LPDDR3 1600MHz 4GB
12" LCD Panel	Starry	20811220560001	.ZC-122A-0776AT
Touch Module	TOPGROUP EETI	ZC-122A-0776AT EXC3102	Support 10-points multi-touch(Capacitive)
Storage	SandDisk	SDIN9DW4-32G	32GB
Front Camera	KINGCOME	O6P2-TC12A-WFHQ	Front Camera : 2.0M
Rear Camera	KINGCOME	O9B8-TC12A-WBHQ	Rear Camera: 8.0M
Wi-Fi +BT Module	Qualcomm (Azurewave)	QCNFA324 (AW-CM217NF)	Wi-Fi 802.11 a/b/g/n/ac + BT 4.0
GPS	Boradcam	BCM4752	GPS&GLONASS
NFC	NXP	NPC100	---
BATTREY	SUNWODA	TC12A-W	3.7Vdc,12600mAh / 46.62Wh
AC Adapter (Wall-mount, 2C)	Asian Power Devices Inc.	WA-36A12R	I/P: AC 100-240V, 50-60Hz, 0.9A Max. O/P: DC 12V, 3A
		DC Power Cord: Unshielded, Undetachable, 1.8m With one ferrite core	
mPad Module (Option)	ECS	Barcode Scanner mPAD	Barcode Scanner
	ECS	SCR mPAD	Smart Card Reader (SCR)
	ECS	MSR mPAD	Magnetic Stripe Reader (MSR)
	ECS	USB Ethernet mPAD	Giga LAN Port
12" Pad Docking (Option)	ECS	DOCKING mPAD-12	Docking

Remark: For more detailed features description, please refer to the manufacturer's specifications or the user manual.

3.3. EUT Specifications Assessed in Current Report

Mode	Fundamental Range (MHz)	Channel Number	Modulation	Data Rate (Mbps)
Bluetooth	2402-2480	79	FHSS (GFSK, $\pi/4$ DQPSK, 8-DPSK)	1/2/3

Channel List					
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

3.4. Antenna Information

GPS Antenna					
No.	Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain (dBi)
1	TC12	JEM	PCB	1510 to 1602	0.84

2.4G Antenna						
No.	Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain (dBi)	Directional Gain (dBi)
1	IAH150100 (Tx1 Antenna)	Joinsoon Electronics MFG. CO.,LTD	PIFA	2400 to 2500	0.41	2.82 ^{Note1}
2	IAH150101 (Tx2 Antenna)	Joinsoon Electronics MFG. CO.,LTD	PIFA	2400 to 2500	-0.83	
Note 1. Directional gain = 10 log[(10 ^{0.41/20} + 10 ^{-0.83/20}) ² / 2]=2.82dBi						

5G Antenna						
No.	Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain (dBi)	Directional Gain (dBi)
1	IAH150100 (Tx1 Antenna)	Joinsoon Electronics MFG. CO.,LTD	PIFA	5150 to 5350	-3.18	2.046 ^{Note1}
2				5470 to 5725	1.58	3.91 ^{Note2}
3				5725 to 5850	1.58	3.90 ^{Note2}
4	IAH150101 (Tx2 Antenna)	Joinsoon Electronics MFG. CO.,LTD	PIFA	5150 to 5350	0.84	2.046 ^{Note1}
5				5470 to 5725	0.18	3.91 ^{Note2}
6				5725 to 5850	0.15	3.90 ^{Note2}
Note 1. Directional gain = $10 \log[(10^{-3.18/20} + 10^{0.84/20})^2 / 2]$ =2.046dBi						
Note 2. Directional gain = $10 \log[(10^{1.58/20} + 10^{0.18/20})^2 / 2]$ =3.91dBi						
Note 3. Directional gain = $10 \log[(10^{1.58/20} + 10^{0.15/20})^2 / 2]$ =3.90 dBi						

3.5. Test Configuration

AC Conduction	
Test Case	Normal operation

Item		Modulation	Data Rate	Test Channel
Radiated Test Case	Radiated Band Edge ^{Note1}	GFSK	1Mbps	00/78
		8-DPSK	3Mbps	00/78
	Radiated Spurious Emission ^{Note1}	GFSK	1Mbps	00/39/78
Conducted Test Case ^{Note2}	20dB Bandwidth	GFSK	1Mbps	00/39/78
		8-DPSK	3Mbps	00/39/78
	Carrier Frequency Separation	GFSK	1Mbps	00/39/78
		8-DPSK	3Mbps	00/39/78
	Time of Occupancy	GFSK	1Mbps	00/39/78
		8-DPSK	3Mbps	00/39/78
	Number of Hopping Channels	GFSK	1Mbps	39
		8-DPSK	3Mbps	39
	Maximum Peak Output Power	GFSK	1Mbps	00/39/78
		8-DPSK	3Mbps	00/39/78
	Band Edges	GFSK	1Mbps	00/78
		8-DPSK	3Mbps	00/78
	Spurious Emission	GFSK	1Mbps	00/39/78
		8-DPSK	3Mbps	00/39/78

Note 1:

☒ Mobile Device: Device was pre-assessed with docking and portable (3 axis), the worst case is tested with docking.

☐ Portable Device, and 3 axis were assessed.

☐ Lie

☐ Side

☐ Stand

Note 2: We performed testing of the highest and lowest data rate.

3.6. Setup Configuration

3.6.1. EUT Configuration for Power Line and Radiated Emission



3.6.2. EUT Configuration for Conducted Test Items



3.7. Operating Condition of EUT

Test program “QCA Radio Control Toolkit” is used for enabling EUT RF function under continues transmitting and choosing data rate / channel.

3.8. Description of Test Facility

Test Firm Name	:	AUDIX Technology Corporation EMC Department No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan
Test Location & Facility	:	No. 8 Shielded Room No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan Semi-Anechoic Chamber No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan Fully Anechoic Chamber No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan IC Test Site Registration No.: 5183B-4 Renewal on August 31, 2015
NVLAP Lab. Code	:	200077-0
TAF Accreditation No	:	1724
FCC OET Designation	:	TW1004 & TW1090

3.9. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
Conduction Test	150kHz~30MHz	±3.5dB
Radiation Test (Distance: 3m)	30MHz~1000MHz	± 3.68dB
	Above 1GHz	± 5.82dB

Remark : Uncertainty = $k_{uc}(y)$

Test Item	Uncertainty
20dB Bandwidth	±0.2kHz
Carrier Frequency Separation	±0.2kHz
Time of Occupancy	±0.03sec
Maximum peak Output power	± 0.52dB
Conducted Emission Limitations	± 0.13dB

4. MEASUREMENT EQUIPMENT LIST

4.1. Conducted Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
1.	Test Receiver	R&S	ESR3	101774	2016. 02. 04	2017. 02. 03
2.	A.M.N.	R&S	ENV4200	100169	2015. 11. 17	2016. 11. 16
3.	L.I.S.N.	Kyoritsu	KNW-407	8-855-9	2015. 12. 23	2016. 12. 22
4.	Pulse Limiter	R&S	ESH3-Z2	100354	2016. 01. 17	2017. 01. 16
5.	Test Software	Audix	e3	V.6.120424	N.C.R.	N.C.R.

4.2. Radiated Emission Measurement

4.2.1. Frequency Range 9kHz~1000MHz (Semi Anechoic Chamber)

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
1.	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2015. 09. 14	2016. 09. 13
2.	Test Receiver	R & S	ESCS30	100338	2015. 06. 24	2016. 06. 23
3.	Amplifier	HP	8447D	2944A06305	2016. 02. 23	2017. 02. 22
4.	Bilog Antenna	CHASE	CBL6112D	33821	2016. 01. 30	2017. 01. 29
5.	Loop Antenna	R&S	HFH2-Z2	891847/27	2015. 12. 24	2016. 12. 23
6.	Test Software	Audix	e3	V.6.110601	N.C.R.	N.C.R.

4.2.2. Frequency Range Above 1000MHz (Fully Anechoic Chamber)

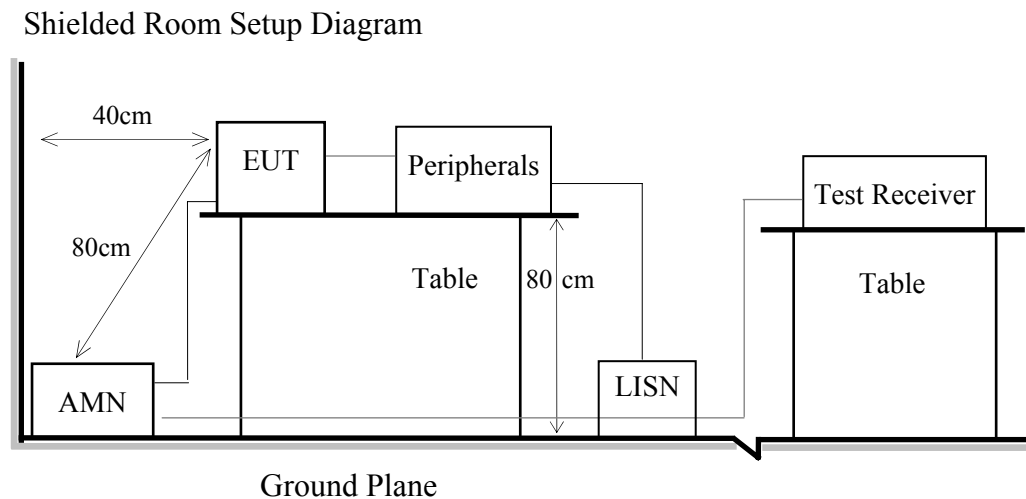
Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
1.	Spectrum Analyzer	Agilent	E4446A	US44300366	2015. 08. 20	2016. 08. 19
2.	Amplifier	Sonoma	310N	187161	2015. 06. 17	2016. 06. 16
3.	2.4GHz Notch Filter	K&L	7NSL10-244 1.5E130.5-00	1	2015. 07. 28	2016. 07. 27
4.	Horn Antenna	ETS-Lindgren	3117	00135902	2016. 03. 05	2017. 03. 04
5.	Loop Antenna	R&S	HFH2-Z2	891847/27	2015. 12. 24	2016. 12. 23
6.	Test Software	Audix	e3	V.6.110601	N.C.R.	N.C.R.

4.3. RF Conducted Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
1.	Spectrum Analyzer	Agilent	N9010A-507	MY52220264	2015. 08. 20	2016. 08. 19

5. CONDUCTED EMISSION MEASUREMENT

5.1. Block Diagram of Test Setup



5.2. Power Line Conducted Emission Limit

Frequency	Conducted Limit	
	Quasi-Peak Level	Average Level
150kHz ~ 500kHz	66 ~ 56 dB μ V	56 ~ 46 dB μ V
500kHz ~ 5MHz	56 dB μ V	46 dB μ V
5MHz ~ 30MHz	60 dB μ V	50 dB μ V

Remark 1.: If the average limit is met when using a Quasi-Peak detector, the measurement using the average detector is not required.

2.: The lower limit applies to the band edges.

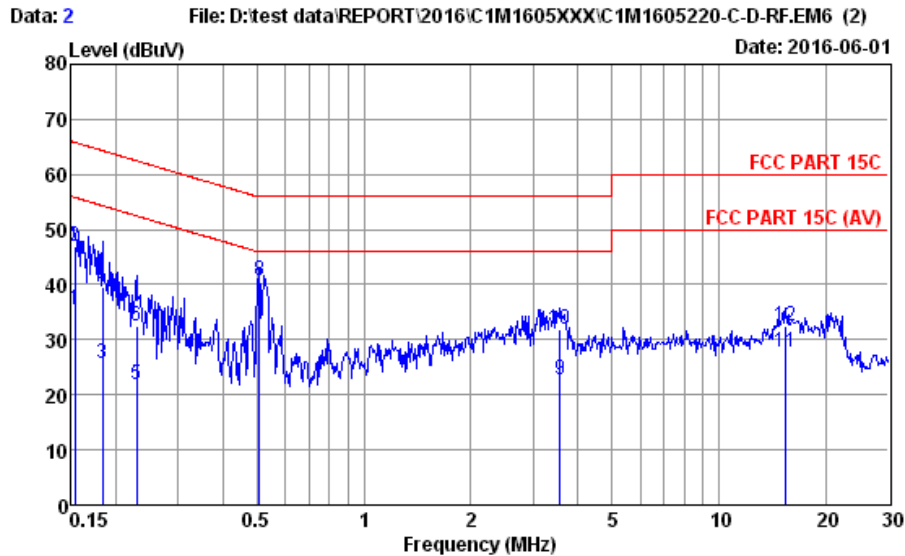
5.3. Test Procedure

- 5.3.1. To set up the EUT as indicated in ANSI C 63.10. The EUT was placed on the table which has 80 cm height to the ground and 40 cm distance to the conducting wall.
- 5.3.2. Power supplier of the EUT was connected to the AC mains through an Artificial Mains Network (A.M.N.).
- 5.3.3. The AC power supplies to all peripheral devices must be provided through line impedance stabilization network (L.I.S.N.)
- 5.3.4. Checking frequency range from 150 kHz to 30 MHz and record the emission which does not have 20 dB below limit.

5.4. Conducted Emission Measurement Results

PASSED.

Test Date	2016/06/01	Temp./Hum.	25°C/60%
Test Voltage	AC 120V, 60Hz		



Site no. : No.8 Shielded Room Data no. : 2
Condition : ENV4200 100169 Phase : NEUTRAL
Limit : FCC PART 15C
Env. / Ins. : 25°C / 60% ESR3 (1774) Engineer : Tim
EUT : mPAD-12-CHT4-I
Power Rating : 120Vac/60Hz
Test Mode : Operating

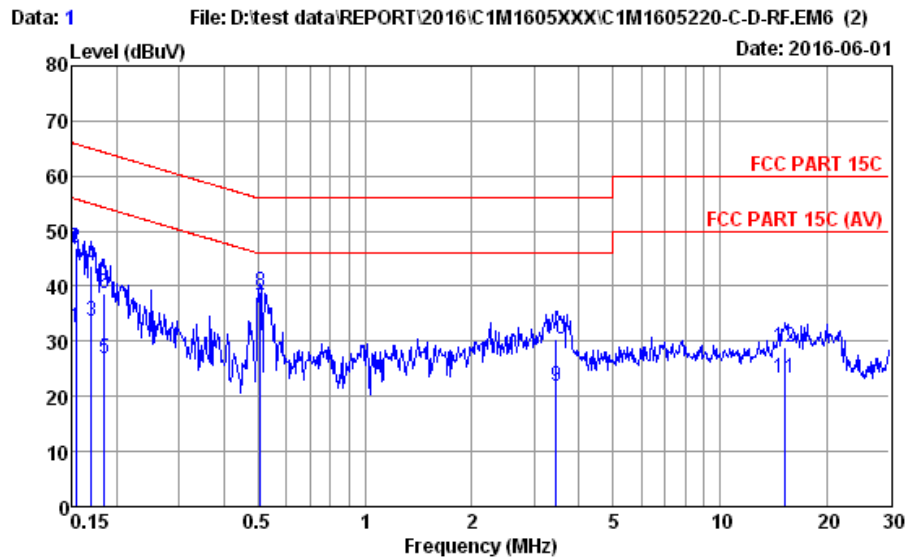
	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBμV)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
1	0.153	11.43	0.03	9.86	13.97	35.29	55.82	20.53	Average
2	0.153	11.43	0.03	9.86	25.63	46.95	65.82	18.87	QP
3	0.183	11.31	0.03	9.86	4.36	25.56	54.33	28.77	Average
4	0.183	11.31	0.03	9.86	18.32	39.52	64.33	24.81	QP
5	0.229	11.20	0.03	9.86	0.89	21.98	52.48	30.50	Average
6	0.229	11.20	0.03	9.86	11.30	32.39	62.48	30.09	QP
7	0.507	10.99	0.04	9.86	18.45	39.34	46.00	6.66	Average
8	0.507	10.99	0.04	9.86	19.95	40.84	56.00	15.16	QP
9	3.565	11.14	0.12	9.87	1.58	22.71	46.00	23.29	Average
10	3.565	11.14	0.12	9.87	10.71	31.84	56.00	24.16	QP
11	15.388	13.41	0.25	9.90	4.15	27.71	50.00	22.29	Average
12	15.388	13.41	0.25	9.90	8.93	32.49	60.00	27.51	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.

AUDIX Technology Corp.
No. 53-11, Dingfu, Linkou, Dist.,
New Taipei City244, Taiwan

Tel: +886 2 26099301
Fax: +886 2 26099303

Test Date	2016/06/01	Temp./Hum.	25°C/60%
Test Voltage	AC 120V, 60Hz		



Site no. : No.8 Shielded Room Data no. : 1
Condition : ENV4200 100169 Phase : LINE
Limit : FCC PART 15C
Env. / Ins. : 25°C / 60% ESR3 (1774) Engineer : Tim
EUT : mPAD-12-CHT4-I
Power Rating : 120Vac/60Hz
Test Mode : Operating

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBμV)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
1	0.153	10.75	0.03	9.86	11.80	32.44	55.82	23.38	Average
2	0.153	10.75	0.03	9.86	26.19	46.83	65.82	18.99	QP
3	0.169	10.73	0.03	9.86	12.97	33.59	54.99	21.40	Average
4	0.169	10.73	0.03	9.86	23.09	43.71	64.99	21.28	QP
5	0.184	10.70	0.03	9.86	6.35	26.94	54.28	27.34	Average
6	0.184	10.70	0.03	9.86	18.05	38.64	64.28	25.64	QP
7	0.507	10.55	0.04	9.86	15.50	35.95	46.00	10.05	Average
8	0.507	10.55	0.04	9.86	18.42	38.87	56.00	17.13	QP
9	3.454	10.63	0.12	9.87	1.37	21.99	46.00	24.01	Average
10	3.454	10.63	0.12	9.87	9.71	30.33	56.00	25.67	QP
11	15.226	12.36	0.25	9.90	0.94	23.45	50.00	26.55	Average
12	15.226	12.36	0.25	9.90	6.36	28.87	60.00	31.13	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.

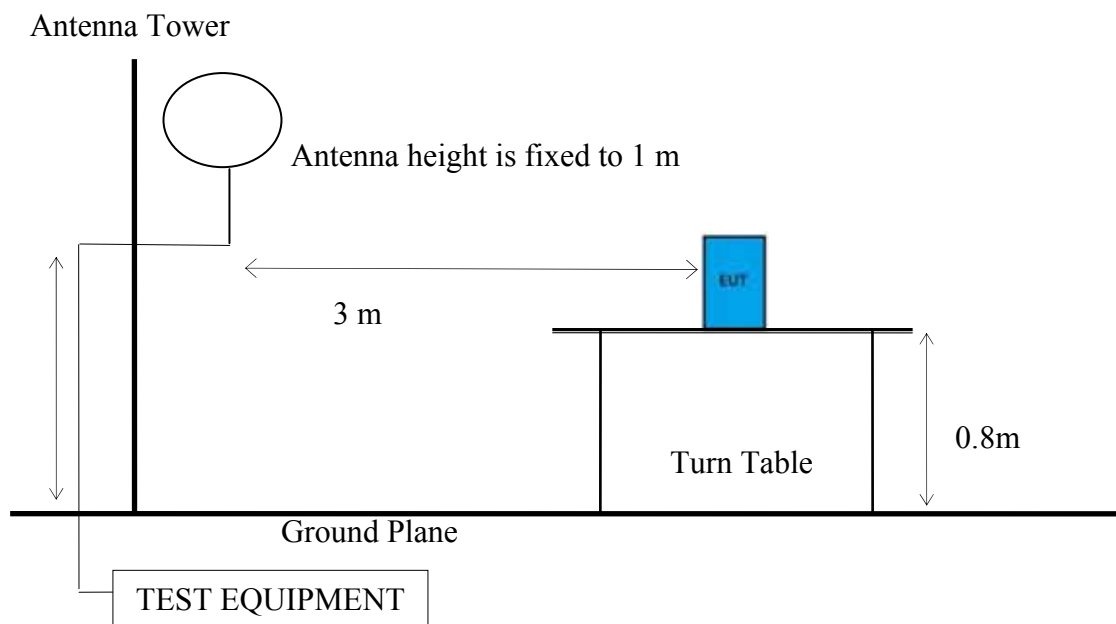
6. RADIATED EMISSION MEASUREMENT

6.1. Block Diagram of Test Setup

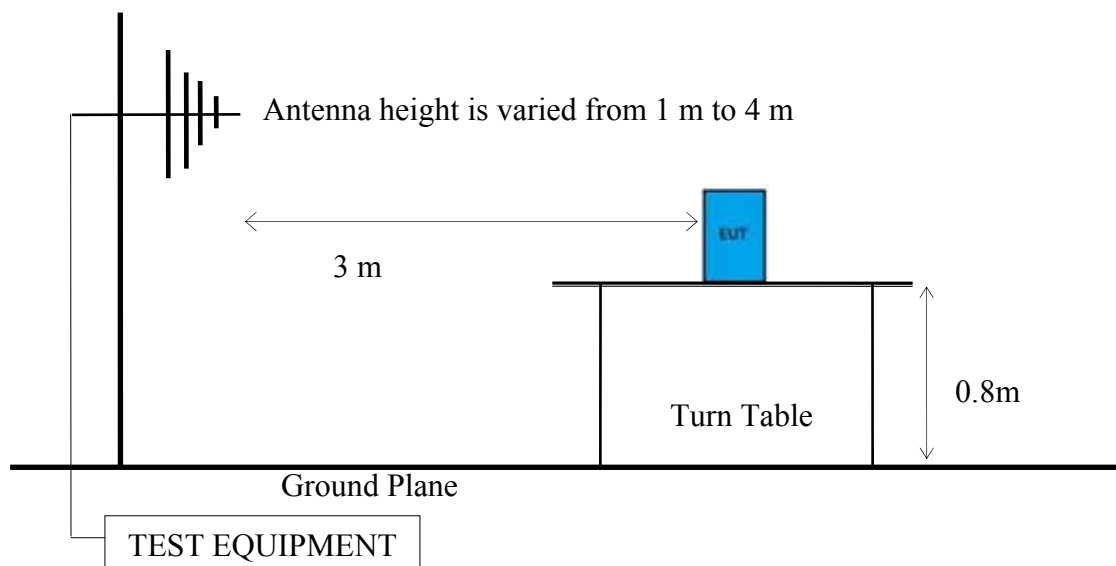
6.1.1. Block Diagram of EUT

Indicated as section 3.7

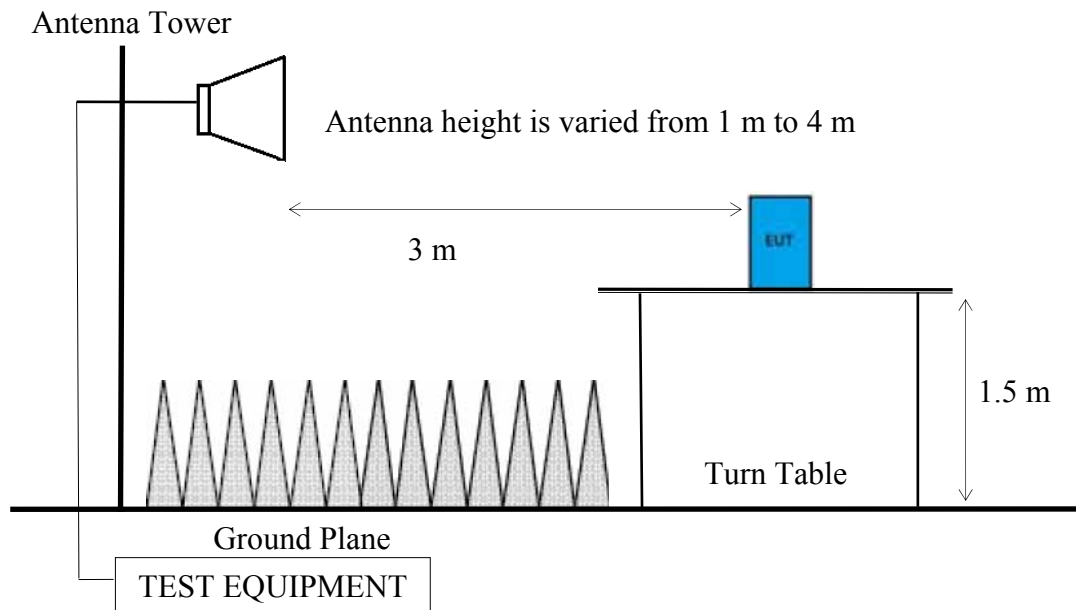
6.1.2. Semi Anechoic Chamber (3m) Setup Diagram for 9kHz-30MHz



6.1.3. Semi Anechoic Chamber (3m) Setup Diagram for 30-1000 MHz



6.1.4. Fully Anechoic Chamber (3m) Setup Diagram for above 1GHz



6.2. Radiated Emission Limits

In any 100kHz bandwidth outside the frequency band, the radio frequency power produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified as below.

Frequency (MHz)	Distance (m)	Field Strengths Limits	
		$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$
0.009 - 0.490	300	67.6	2400/kHz
0.490 - 1.705	30	87.6	24000/kHz
1.705 - 30	30	29.5	30
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
Above 960	3	500	54.0
Above 1000	3	74.0 $\text{dB}\mu\text{V/m}$ (Peak) 54.0 $\text{dB}\mu\text{V/m}$ (Average)	

Remark : (1) $\text{dB}\mu\text{V/m} = 20 \log (\mu\text{V/m})$

- (2) The tighter limit applies to the edge between two frequency bands.
- (3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
- (4) Fundamental and emission fall within operation band are exempted from this section.
- (5) Pursuant to ANSI C63.10: 6.6.4.3, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

6.3. Test Procedure

Frequency Range 9kHz~30MHz:

The EUT setup on the turn table which has 0.8 m height to the ground. The turn table rotated 360 degrees and antenna fixed to 1 m to find the maximum emission level. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

- (1) RBW = 9kHz with peak and average detector.
- (2) Detector: average and peak (9kHz-490kHz)
Q.P. (490kHz-30MHz)

Frequency Range 30MHz ~ 40GHz:

The EUT setup on the turn table which has 1.5m height to the ground. The turn table rotated 360 degrees and antenna varied from 1 m to 4 m to find the maximum emission level. Both horizontal and vertical polarization are required. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

Frequency below 1 GHz:

Spectrum Analyzer is used for pre-testing with following setting:

- (1) RBW = 120KHz
- (2) VBW $\geq 3 \times$ RBW.
- (3) Detector = Peak.
- (4) Sweep time = auto.
- (5) Trace mode = max hold.
- (6) Allow sweeps to continue until the trace stabilizes.
- (7) When peak-detected value is lower than limit that the measurement using the Q.P. detector is not required. Otherwise using Q.P. for finally measurement.

Frequency above 1GHz to 10th harmonic:

Peak Detector:

- (1) RBW = 120KHz
- (2) VBW $\geq 3 \times$ RBW.
- (3) Detector = Peak.
- (4) Sweep time = auto.
- (5) Trace mode = max hold.
- (6) Allow sweeps to continue until the trace stabilizes.
- (7) When peak-detected value is lower than limit that the measurement using the average detector is not required. Otherwise using average for finally measurement.

Average Measurement:**■ Option 1:**

- (1) RBW = 1 MHz
- (2) VBW = 1/T
- (3) Detector = Peak.
- (4) Sweep time = auto.
- (5) Trace mode = max hold.
- (6) Allow sweeps to continue until the trace stabilizes.

□ Option 2:

Average Emission Level = Peak Emission Level + D.C.C.F.

6.4. Measurement Result Explanation

■ Peak Emission Level = Antenna Factor + Cable Loss + Meter Reading

■ Average Emission Level = Antenna Factor + Cable Loss + Meter Reading

□ Average Emission Level = Peak Emission Level + DCCF

Duty Cycle Correction Factor (DCCF) = $20\log(TX_{on}/100ms)$ presented in section 3.5

□ ERP = Peak Emission Level - 95.2 dB - 2.14 dB

6.5. Test Results

PASSED.

Test Date	2016/06/03	Temp./Hum.	22°C/58%
Test Voltage	AC 120V, 60Hz		

6.5.1. Emissions within Restricted Frequency Bands

6.5.1.1. Frequency 9kHz~30MHz

The emissions (9kHz~30MHz) not reported for there is no emission be found.

6.5.1.2. Frequency Below 1 GHz

Modulation	8-DPSK	Frequency	TX 2480MHz
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Antenna at Horizontal Polarization

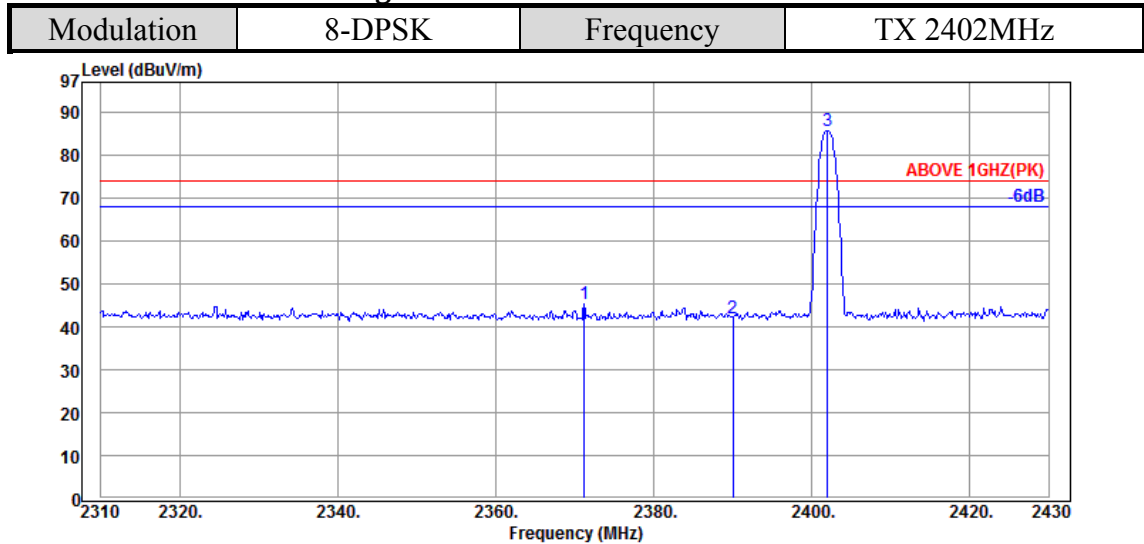
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
308.39	13.37	4.76	19.15	37.28	46.00	8.72	Peak
385.02	15.23	5.53	17.63	38.39	46.00	7.61	Peak
461.65	16.46	6.17	14.80	37.43	46.00	8.57	Peak
924.34	20.72	7.69	8.93	37.34	46.00	8.66	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
40.67	12.98	2.52	17.40	32.90	40.00	7.10	Peak
385.02	15.23	5.53	21.11	41.87	46.00	4.13	Peak
461.65	16.46	6.17	22.32	44.95	46.00	1.05	Peak
539.25	17.53	6.47	16.39	40.39	46.00	5.61	Peak

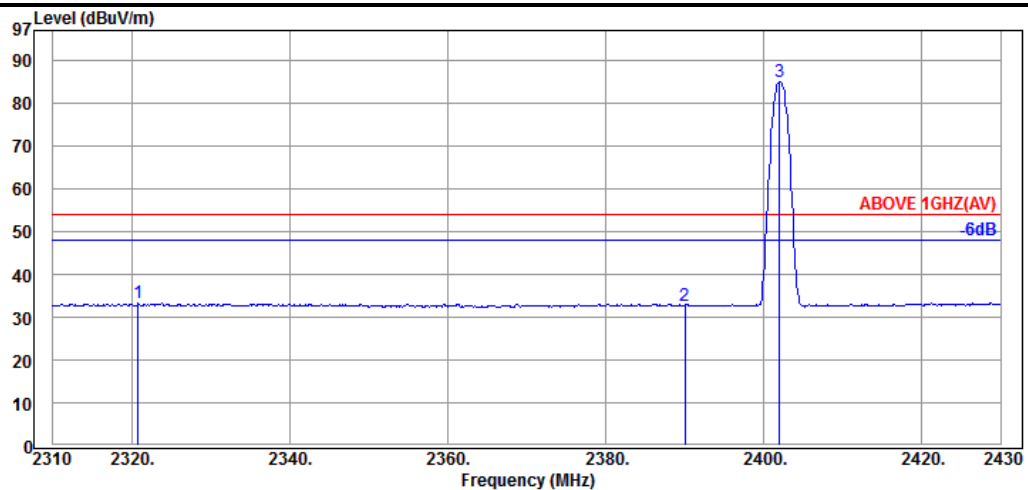
6.5.1.3. Frequency Above 1 GHz to 10th harmonics

Band Edge:



Antenna at Horizontal Polarization

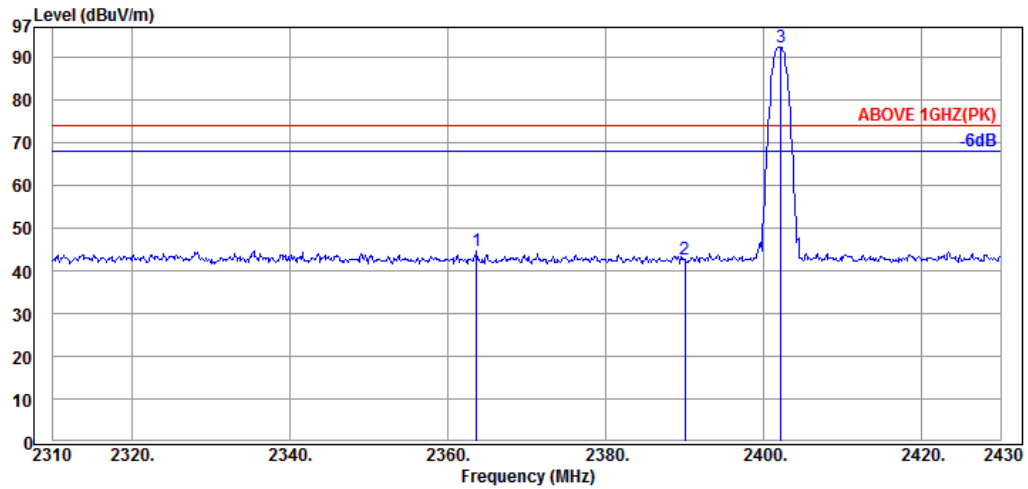
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2371.20	32.13	5.71	7.43	45.27	74.00	28.73	Peak
2390.04	32.16	5.72	4.16	42.04	74.00	31.96	Peak
2402.04	32.16	5.72	47.85	85.73	---	---	Peak



Antenna at Horizontal Polarization

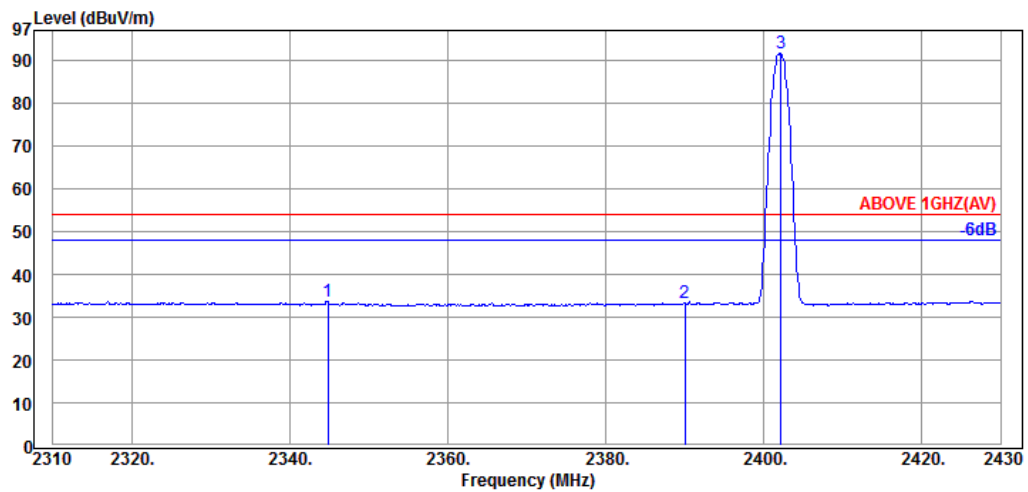
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2320.80	32.06	5.67	-4.50	33.23	54.00	20.77	Average
2390.04	32.16	5.72	-5.06	32.82	54.00	21.18	Average
2402.04	32.16	5.72	47.23	85.11	---	---	Average

Modulation	8-DPSK	Frequency	TX 2402MHz
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Antenna at Vertical Polarization

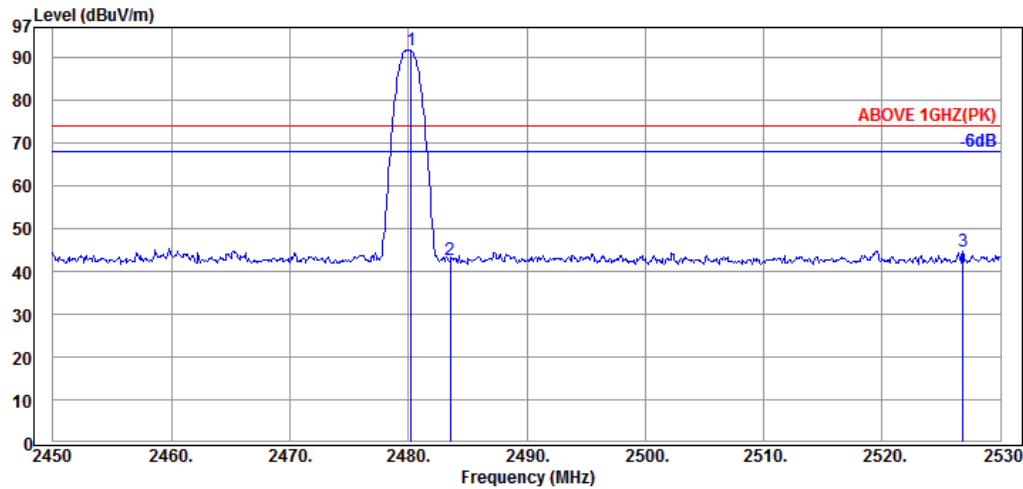
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2363.64	32.11	5.69	6.82	44.62	74.00	29.38	Peak
2390.04	32.16	5.72	4.66	42.54	74.00	31.46	Peak
2402.16	32.16	5.72	54.56	92.44	---	---	Peak



Antenna at Vertical Polarization

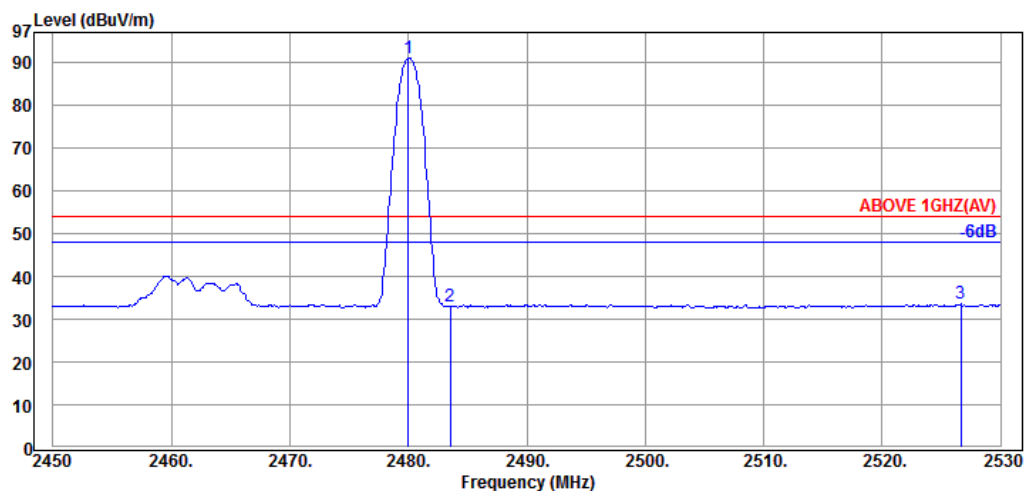
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2344.80	32.08	5.68	-4.16	33.60	54.00	20.40	Average
2390.04	32.16	5.72	-4.54	33.34	54.00	20.66	Average
2402.16	32.16	5.72	53.80	91.68	---	---	Average

Modulation	8-DPSK	Frequency	TX 2480MHz
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Antenna at Horizontal Polarization

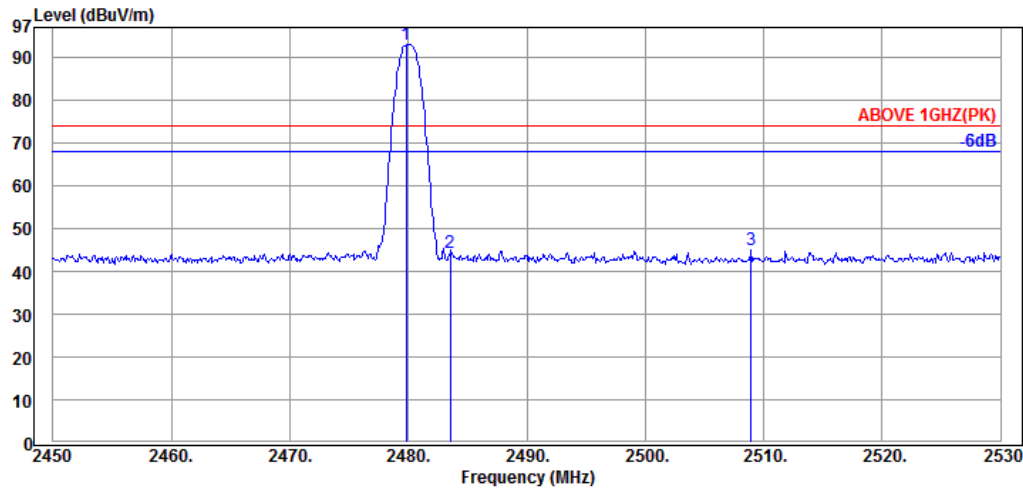
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2480.24	32.28	5.82	53.62	91.72	---	---	Peak
2483.52	32.28	5.82	4.70	42.80	74.00	31.20	Peak
2526.80	32.34	5.89	6.57	44.80	74.00	29.20	Peak



Antenna at Horizontal Polarization

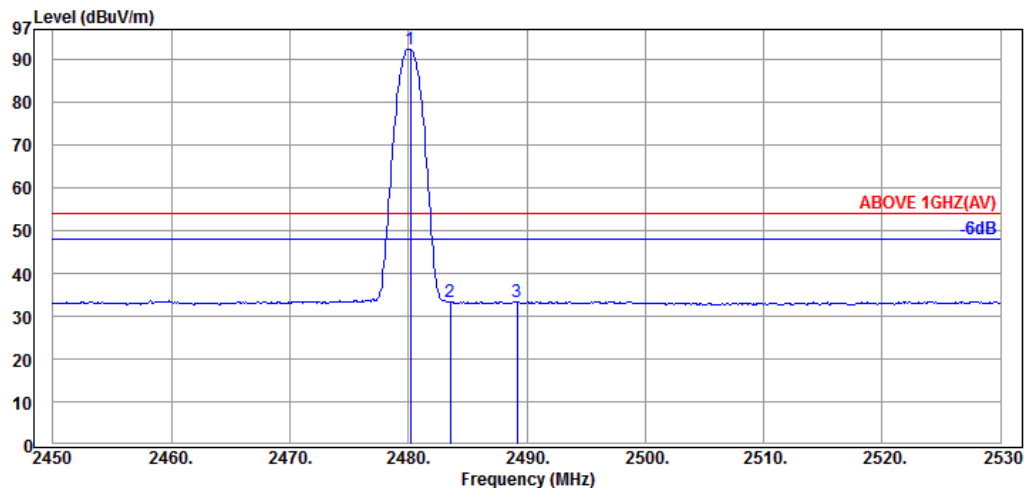
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2480.00	32.28	5.82	52.96	91.06	---	---	Average
2483.52	32.28	5.82	-5.20	32.90	54.00	21.10	Average
2526.64	32.34	5.89	-4.69	33.54	54.00	20.46	Average

Modulation	8-DPSK	Frequency	TX 2480MHz
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Antenna at Vertical Polarization

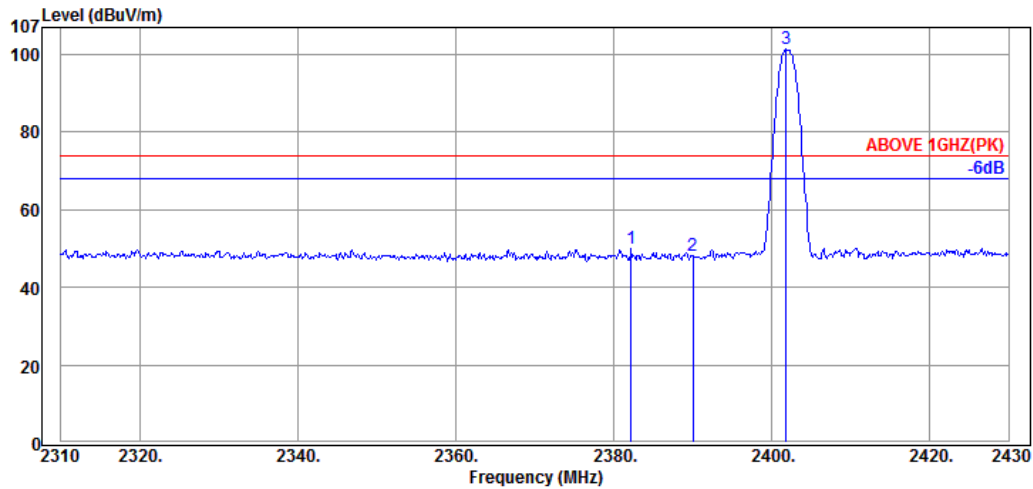
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2479.84	32.28	5.82	54.96	93.06	---	---	Peak
2483.52	32.28	5.82	6.28	44.38	74.00	29.62	Peak
2508.96	32.32	5.87	6.77	44.96	74.00	29.04	Peak



Antenna at Vertical Polarization

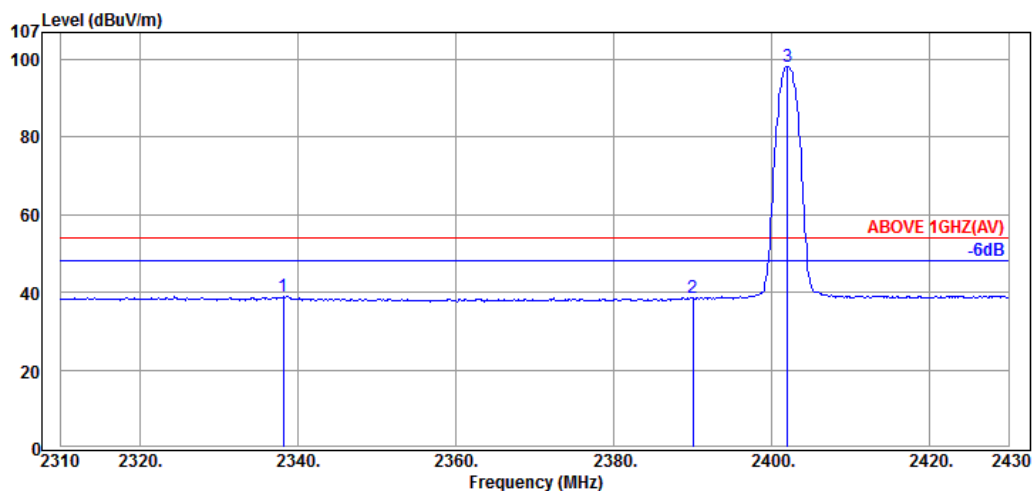
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2480.16	32.28	5.82	54.27	92.37	---	---	Average
2483.52	32.28	5.82	-4.88	33.22	54.00	20.78	Average
2489.20	32.30	5.84	-4.72	33.42	54.00	20.58	Average

Modulation	GFSK	Frequency	TX 2402MHz
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Antenna at Horizontal Polarization

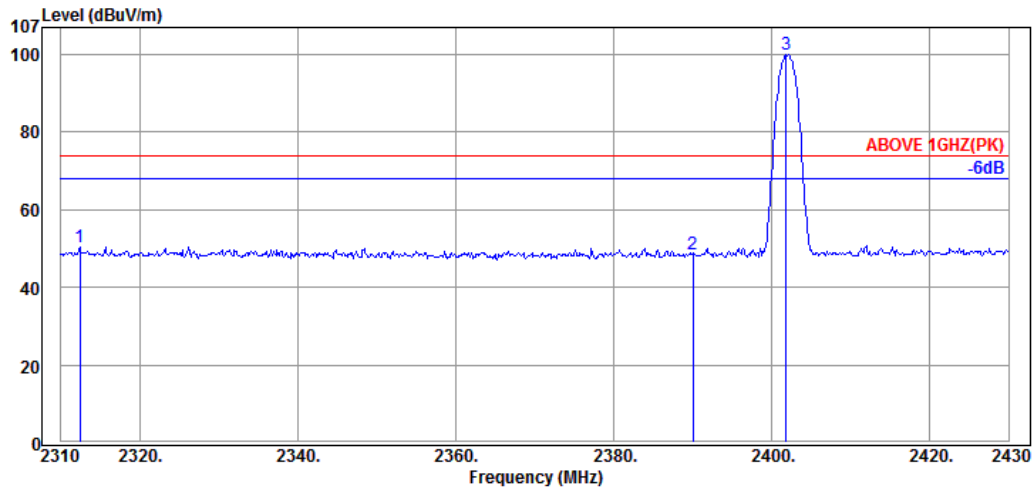
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2382.24	32.13	5.71	12.33	50.17	74.00	23.83	Peak
2390.04	32.16	5.72	10.21	48.09	74.00	25.91	Peak
2401.80	32.16	5.72	63.49	101.37	---	---	Peak



Antenna at Horizontal Polarization

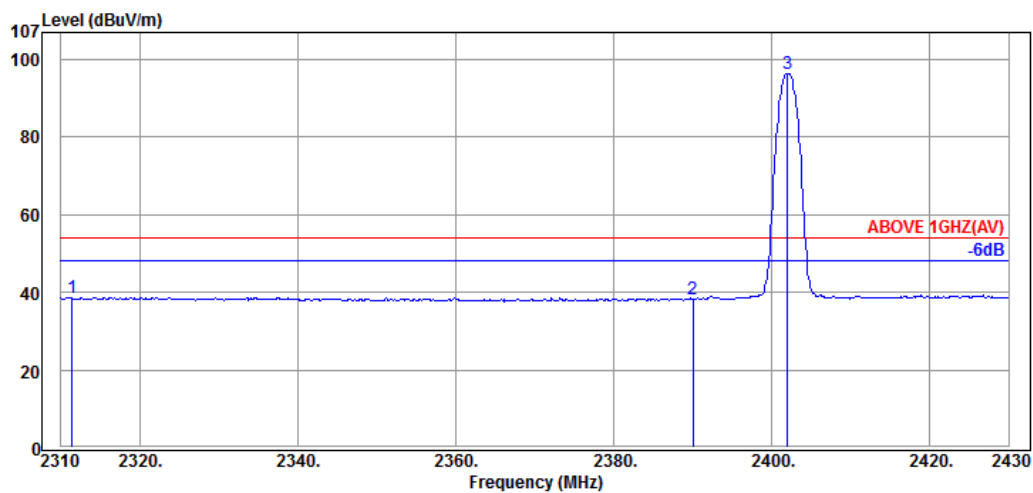
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2338.20	32.08	5.68	1.15	38.91	54.00	15.09	Average
2390.04	32.16	5.72	0.56	38.44	54.00	15.56	Average
2402.04	32.16	5.72	60.36	98.24	---	---	Average

Modulation	GFSK	Frequency	TX 2402MHz
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Antenna at Vertical Polarization

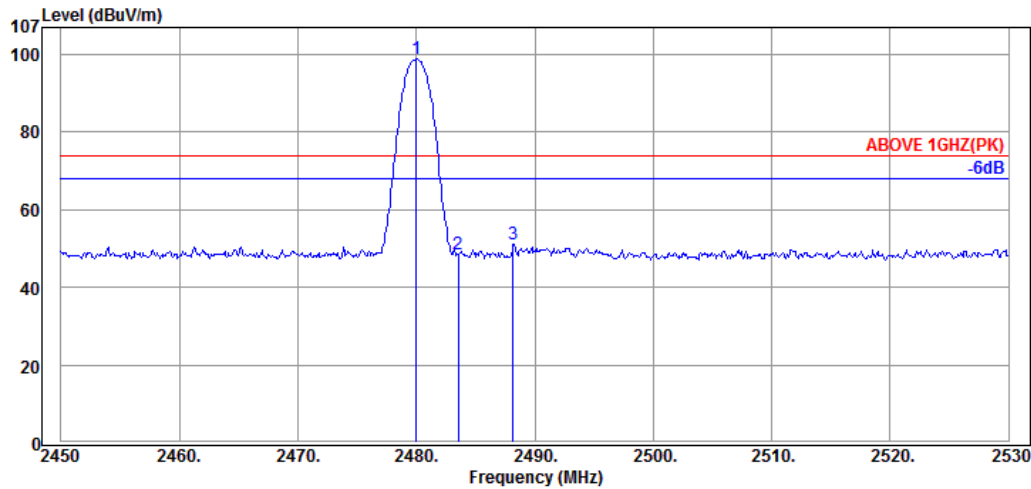
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2312.40	32.03	5.65	12.84	50.52	74.00	23.48	Peak
2390.04	32.16	5.72	10.74	48.62	74.00	25.38	Peak
2401.80	32.16	5.72	62.21	100.09	---	---	Peak



Antenna at Vertical Polarization

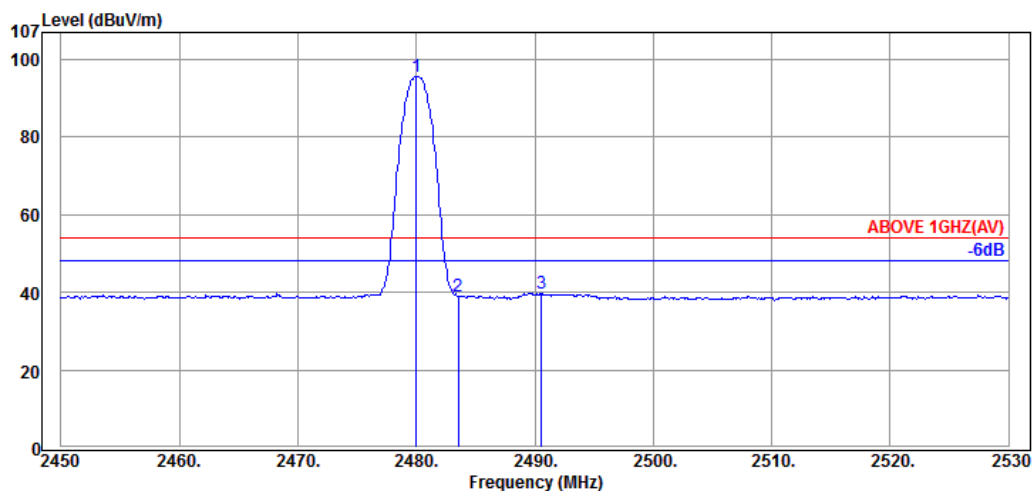
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2311.44	32.03	5.65	1.09	38.77	54.00	15.23	Average
2390.04	32.16	5.72	0.29	38.17	54.00	15.83	Average
2402.04	32.16	5.72	58.59	96.47	---	---	Average

Modulation	GFSK	Frequency	TX 2480MHz
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Antenna at Horizontal Polarization

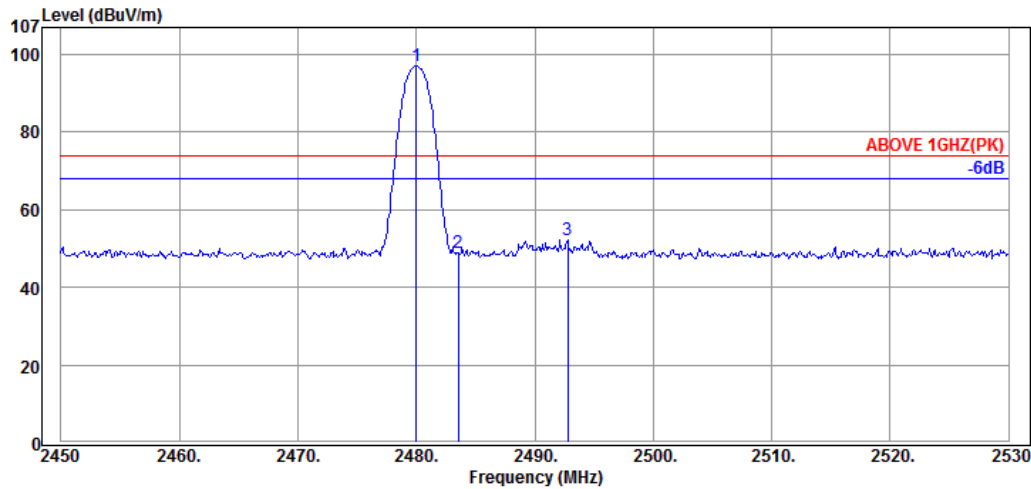
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2480.00	32.28	5.82	60.71	98.81	---	---	Peak
2483.52	32.28	5.82	10.43	48.53	74.00	25.47	Peak
2488.16	32.30	5.84	13.00	51.14	74.00	22.86	Peak



Antenna at Horizontal Polarization

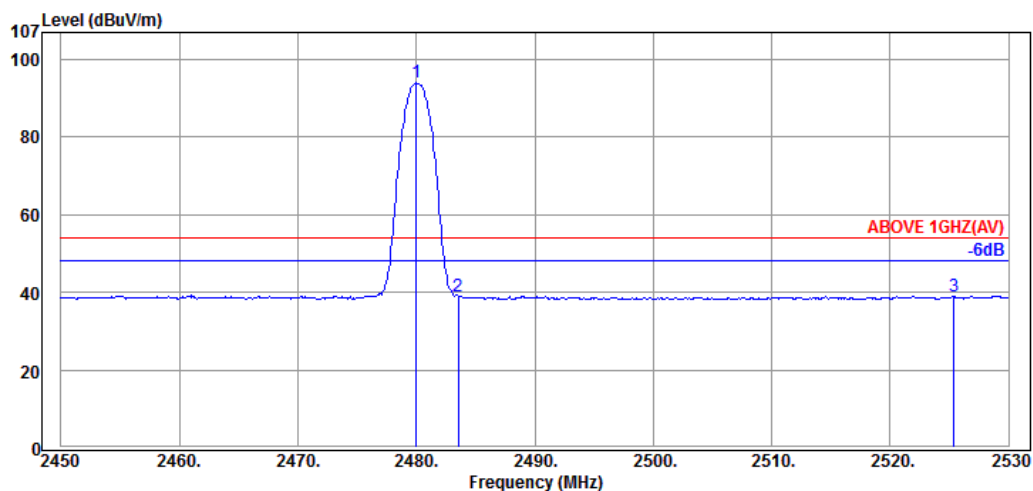
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2480.00	32.28	5.82	57.63	95.73	---	---	Average
2483.52	32.28	5.82	0.88	38.98	54.00	15.02	Average
2490.56	32.30	5.84	1.60	39.74	54.00	14.26	Average

Modulation	GFSK	Frequency	TX 2480MHz
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Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2480.00	32.28	5.82	58.90	97.00	---	---	Peak
2483.52	32.28	5.82	10.67	48.77	74.00	25.23	Peak
2492.80	32.30	5.84	14.12	52.26	74.00	21.74	Peak



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2480.00	32.28	5.82	55.86	93.96	---	---	Average
2483.52	32.28	5.82	1.01	39.11	54.00	14.89	Average
2525.36	32.34	5.89	0.78	39.01	54.00	14.99	Average

6.5.2. Emissions outside the frequency band:

The emissions (up to 25GHz) not reported for there is no emission be found.

Modulation	8-DPSK	Frequency	TX 2402MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4805.00	34.22	7.86	0.45	42.53	54.00	11.47	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4805.00	34.22	7.86	0.41	42.49	54.00	11.51	Peak

Modulation	8-DPSK	Frequency	TX 2441MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4880.00	34.25	8.35	0.21	42.81	54.00	11.19	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4880.00	34.25	8.35	0.54	43.14	54.00	10.86	Peak

Modulation	8-DPSK	Frequency	TX 2480MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
4960.00	34.29	8.68	0.13	43.10	54.00	10.90	Peak

Antenna at Vertical Polarization

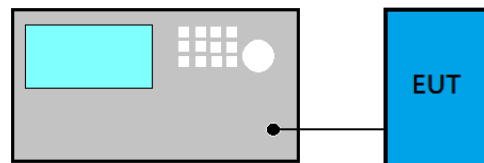
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
4960.00	34.29	8.68	-0.17	42.80	54.00	11.20	Peak

6.5.3. Emissions in Non-restricted Frequency Bands

All emission levels below the 15.209 general radiated emissions limits is not required.

7. 20dB BANDWIDTH MEASUREMENT

7.1. Block Diagram of Test Setup



7.2. Specification Limits

Alternatively, frequency hopping systems operating in the 2400-2483.5MHz band may have hopping channel carrier frequencies that are separated by 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

7.3. Test Procedure

Following measurement procedure is reference to DA00-705:

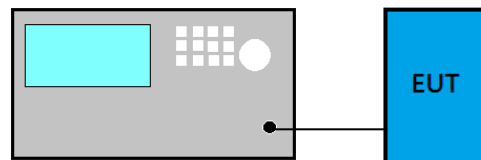
- (1) Set RBW close to 1% of OBW.
- (2) Set $VBW \geq RBW$.
- (3) Detector = Peak.
- (4) Trace mode = max hold.
- (5) Sweep = auto couple.
- (6) Allow the trace to stabilize.
- (7) Setting channel bandwidth function x dB to -20 dB to record the final bandwidth.

7.4. Test Results

Please refer to Appendix A

8. CARRIER FREQUENCY SEPARATION MEASUREMENT

8.1. Block Diagram of Test Setup



8.2. Specification Limits

Alternatively, frequency hopping systems operating in the 2400-2483.5MHz band may have hopping channel carrier frequencies that are separated by 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output no greater than 125mW.

8.3. Test Procedure

Following measurement procedure is reference to DA00-705:

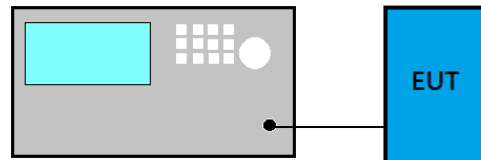
- (1) Span = wide enough to capture the peaks of two adjacent channels
- (2) RBW $\geq$ 1% of the span
- (3) VBW $\geq$ RBW
- (4) Sweep = auto
- (5) Detector function = peak
- (6) Trace = max hold

8.4. Test Results

Please refer to Appendix A

9. TIME OF OCCUPANCY MEASUREMENT

9.1. Block Diagram of Test Setup



9.2. Specification Limits

Frequency hopping systems in the 2400-2483.5MHz shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by number of hopping channels employed.

9.3. Test Procedure

Following measurement procedure is reference to DA00-705:

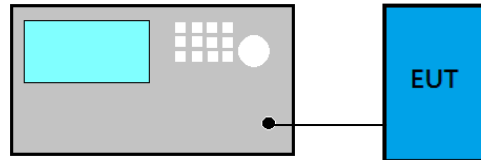
- (1) Span = zero span, centered on a hopping channel
- (2) RBW = 1 MHz
- (3) VBW $\geq$ RBW
- (4) Sweep = as necessary to capture the entire dwell time per hopping channel
- (5) Detector function = peak
- (6) Trace = max hold

9.4. Test Results

Please refer to Appendix A

10. NUMBER OF HOPPING CHANNELS MEASUREMENT

10.1. Block Diagram of Test Setup



10.2. Specification Limits

Frequency hopping systems which use fewer than 20 hopping frequencies may employ intelligent hopping techniques to avoid interference to other transmissions. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 non-overlapping channels.

10.3. Test Procedure

Following measurement procedure is reference to DA00-705:

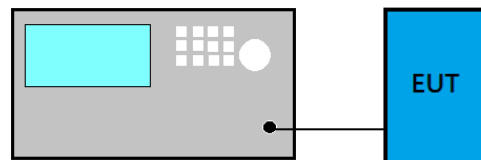
- (1) Span = the frequency band of operation
- (2) RBW $\geq$ 1% of the span
- (3) VBW $\geq$ RBW
- (4) Sweep = auto
- (5) Detector function = peak
- (6) Trace = max hold

10.4. Test Results

Please refer to Appendix A

11. MAXIMUM PEAK OUTPUT POWER MEASUREMENT

11.1. Block Diagram of Test Setup



11.2. Specification Limits

The Limits of maximum Peak Output Power for frequency hopping systems in 2400-2483.5MHz is: 0.125Watt. (21dBm)

11.3. Test Procedure

Following measurement procedure is reference to DA00-705:

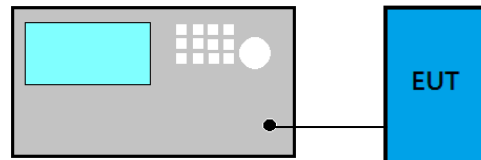
- (1) Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
- (2) RBW $\geq$ 1% of the span
- (3) VBW $\geq$ RBW
- (4) Sweep = auto
- (5) Detector function = peak
- (6) Trace = max hold

11.4. Test Results

Please refer to Appendix A

12. EMISSION LIMITATIONS MEASUREMENT

12.1. Block Diagram of Test Setup



12.2. Specification Limits

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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, that the required attenuation shall be 30 dB instead of 20 dB.

Attenuation below the general limits specified in Section 15.209(a)/RSS-Gen Section 8.9 table 4

is not required. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205(a)/RSS-Gen Section 8.10 table 6, must also comply with the radiated emission limits specified in Section 15.209(a)/RSS-Gen Section 8.9 table 4 (See Section 15.205(c)).

12.3. Test Procedure

Following measurement procedure is reference to DA00-705:

- (1) Set span wide enough to capture the peak level of the in-band emission and all spurious emissions; up to 10th harmonic.
- (2) RBW = 100 kHz
- (3) VBW ≥ RBW
- (4) Sweep = auto
- (5) Detector function = peak
- (6) Trace = max hold

12.4. Test Results

Please refer to Appendix A

13.DEVIATION TO TEST SPECIFICATIONS

【NONE】