



TEST REPORT

Product Name: WIRELESS SYSTEM
FCC ID: 2ARWY-WS70
Trademark: SWIFF AUDIO
Model Number: WS-70, WS-50, WS-55, WS-60, WS-65, WS-70, WS-75, WS-80, WS-85, WS-90, WS-95, WS-100, WS-200, WS-300, WS-500, WS-600, WS-700, WS-800, WS-900, WS-1000
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Sample Received Date: Mar. 19, 2024
Sample tested Date: Mar. 19, 2024 to May. 15, 2024
Issue Date: May. 15, 2024
Report No.: CTB240515084RFX
Test Standards: FCC CFR Title 47 Part 15 Subpart C Section 15.249
ANSI C63.10:2013
Test Results: PASS
Remark: This is 900MHz radio test report.

Compiled by:

Reviewed by:

Approved by:

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Arron Liu



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Note: If there is any objection to the inspection results in this report, please submit a written report to the company within 15 days from the date of receiving the report. The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen CTB Testing Technology Co., Ltd. this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client. "*" indicates the testing items were fulfilled by subcontracted lab. "#" indicates the items are not in CNAS accreditation scope.

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(Note: N/A means not applicable)

1. VERSION

Report No.	Issue Date	Description	Approved
CTB240515084RFX	May., 2024	Original	Valid

2. TEST SUMMARY

The Product has been tested according to the following specifications:

Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.215	20dB Bandwidth	PASS	
15.249	Fundamental &Radiated Spurious Emission Measurement	PASS	
15.205	Band Edge Emission	PASS	
15.203	Antenna Requirement	PASS	

Remark:

Test according to ANSI C63.10-2013.

3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Item	Uncertainty
Occupancy bandwidth	54.3kHz
Conducted output power Above 1G	0.9dB
Conducted output power below 1G	0.9dB
Power Spectral Density , Conduction	0.9dB
Conduction spurious emissions	2.0dB
Out of band emission	2.0dB
3m chamber Radiated spurious emission(9KHz-30MHz)	4.8dB
3m chamber Radiated spurious emission(30MHz-1GHz)	4.6dB
3m chamber Radiated spurious emission(1GHz-18GHz)	5.1dB
3m chamber Radiated spurious emission(18GHz-40GHz)	3.4dB
humidity uncertainty	5.5%
Temperature uncertainty	0.63°C
frequency	1×10 ⁻⁷
Conducted Emission (150KHz-30MHz)	3.2 dB
Radiated Emission(30MHz ~ 1000MHz)	4.8 dB
Radiated Emission(1GHz ~6GHz)	4.9 dB

4. PRODUCT INFORMATION AND TEST SETUP

4.1 Product Information

Model(s):	WS-70, WS-50, WS-55, WS-60, WS-65, WS-70, WS-75, WS-80, WS-85, WS-90, WS-95, WS-100, WS-200, WS-300, WS-500, WS-600, WS-700, WS-800, WS-900, WS-1000
Model Description:	All the model are the same circuit and RF module, only for model name. Test sample model: WS-70
Hardware Version:	V1.0
Software Version:	V1.0
Operation Frequency:	915.08-920.48MHz
Type of Modulation:	GFSK
Antenna installation:	Spring antenna
Antenna Gain:	1dBi
Ratings:	DC 5V charging from adapter DC 3.7V by battery

4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

4.3 Support Equipment

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
1	Adapter	JIYIN	JY-05100C	/	/

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Channel List

CH No.	Frequency (MHz)	CH No.	Frequency (MHz)	CH No.	Frequency (MHz)	CH No.	Frequency (MHz)
1	915.08	2	915.68	3	916.28	4	916.88
5	917.48	6	918.08	7	918.68	8	919.28
9	919.88	10	920.48	/	/	/	/

4.5 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Low channel	Middle channel	High channel
Transmitting GFSK	915.08MHz	918.08MHz	920.48MHz

4.6 Test Environment

Humidity(%):	54
Atmospheric Pressure(kPa):	101
Normal Voltage(DC):	3.7V
Normal Temperature(°C)	23
Low Temperature(°C)	0
High Temperature(°C)	40

5. TEST FACILITY AND TEST INSTRUMENT USED

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at 1&2F., Building A, No. 26, Xinh Road, Xinqiao, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

5.2 Test Instrument Used

No.	Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Calibrated until
1	Spectrum Analyzer	Agilent	N9020A	MY52090073	A.14.16	2024.07.05
2	Power Sensor	Agilent	U2021XA	MY56120032	/	2024.07.05
3	Power Sensor	Agilent	U2021XA	MY56120034	/	2024.07.05
4	Communication test set	R&S	CMW500	108058	V3.5.80	2024.07.05
5	Spectrum Analyzer	KEYSIGHT	N9020A	MY51289897	A.14.16	2024.07.05
6	Signal Generator	Agilent	N5181A	MY50140365	A.01.60	2024.07.05
7	Vector signal generator	Agilent	N5182A	MY47420195	A.01.87	2024.07.05
8	Communication test set	Agilent	E5515C	MY50102567	B.19.07 (E1962B)	2024.07.06
9	2.4 GHz Filter	Shenxiang	MSF2400-24 83.5MS-1154	20181015001	/	2024.07.05
10	5 GHz Filter	Shenxiang	MSF5150-58 50MS-1155	20181015001	/	2024.07.06
11	Filter	Xingbo	XBLBQ-DZA 120	190821-1-1	/	2024.07.06
12	BT&WI-FI Automatic test software	Microwave	MTS8000	Ver. 2.0.0.0	/	/
13	Rohde & Schwarz SFU Broadcast Test System	R&S	SFU	101017	/	2024.10.30
14	Temperature humidity chamber	Hongjing	TH-80CH	DG-15174	/	2024.07.05
15	234G Automatic test software	Microwave	MTS8200	Ver. 2.0.0.0	/	/
16	966 chamber	C.R.T.	966	/	/	2024.08.11
17	Receiver	R&S	ESPI	100362	RF_ATTEN_7 (104489/003)	2024.07.05
18	Amplifier	HP	8447E	2945A02747	/	2024.07.05
19	Amplifier	Agilent	8449B	3008A01838	/	2024.07.05
20	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	00869	/	2024.07.08
21	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA9120D	01911	/	2024.07.08
22	EMI test software	Fala	EZ-EMC	FA-03A2 RE	/	/
23	Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-224	/	2024.07.08

24	loop antenna	ZHINAN	ZN30900A	GTS534	/	/
25	40G Horn antenna	A/H/System	SAS-574	588	/	2024.10.30
26	Amplifier	AEROFLEX	Aeroflex	097	/	2024.07.05

Continuous disturbance

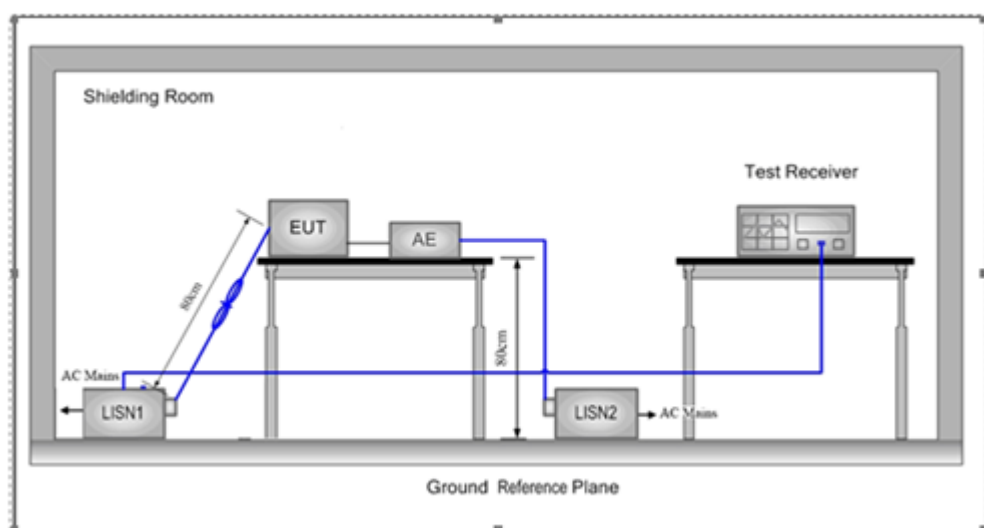
No.	Equipment	Manufacturer	Model No.	Serial No.	Firmware Version	Calibrated until
1	LISN	ROHDE&SCHWARZ	ESH3-Z5	100318	/	2024.07.05
2	Pulse limiter	ROHDE&SCHWARZ	ESH3Z2	357881052	/	2024.07.05
3	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100428/003	V4.42.SP3	2024.07.05
4	Coaxial cable	ZDECL	Z302S-NJ-SM AJ-12M	18091905	/	2024.07.05
5	ISN	Schwarzbeck	NTFM8158	183	/	2024.07.05
6	Communication test set	Agilent	E5515C	MY50102567	B.19.07 (E1962B)	2024.07.05
7	Communication test set	R&S	CMW500	108058	V3.5.80	2024.07.05
8	EZ-EMC	Frad	EMC-con3A1.1	/	/	/

Radiated emission

No.	Equipment	Manufacturer	Model No.	Serial No.	Firmware Version	Calibrated until
1	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120 D	01911	/	2024.07.08
2	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	00869	/	2024.07.08
3	Amplifier	Agilent	8449B	3008A01838	/	2024.07.05
4	Amplifier	HP	8447E	2945A02747	/	2024.07.05
5	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100428/003	V4.42.SP3	2024.07.05
6	Coaxial cable	ETS	RFC-SNS-100-N MS-80 NI	/	/	2024.07.05
7	Coaxial cable	ETS	RFC-SNS-100-N MS-20 NI	/	/	2024.07.05
8	Coaxial cable	ETS	RFC-SNS-100-S MS-20 NI	/	/	2024.07.05
9	Coaxial cable	ETS	RFC-NNS-100- NMS-300 NI	/	/	2024.07.05
10	Communication test set	Agilent	E5515C	MY50102567	B.19.07 (E1962B)	2024.07.05
11	Communication test set	R&S	CMW500	108058	V3.5.80	2024.07.05
12	EZ-EMC	Frad	EMC-con3A1.1	/	/	/

6. AC POWER LINE CONDUCTED EMISSION

6.1 Block Diagram Of Test Setup



6.2 Limit

Table 4 - AC power-line conducted emissions limits

Frequency (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 ^{Note 1}	56 to 46 ^{Note 1}
0.5 - 5	56	46
5 - 30	60	50

Note 1: The level decreases linearly with the logarithm of the frequency.

* Decreasing linearly with the logarithm of the frequency

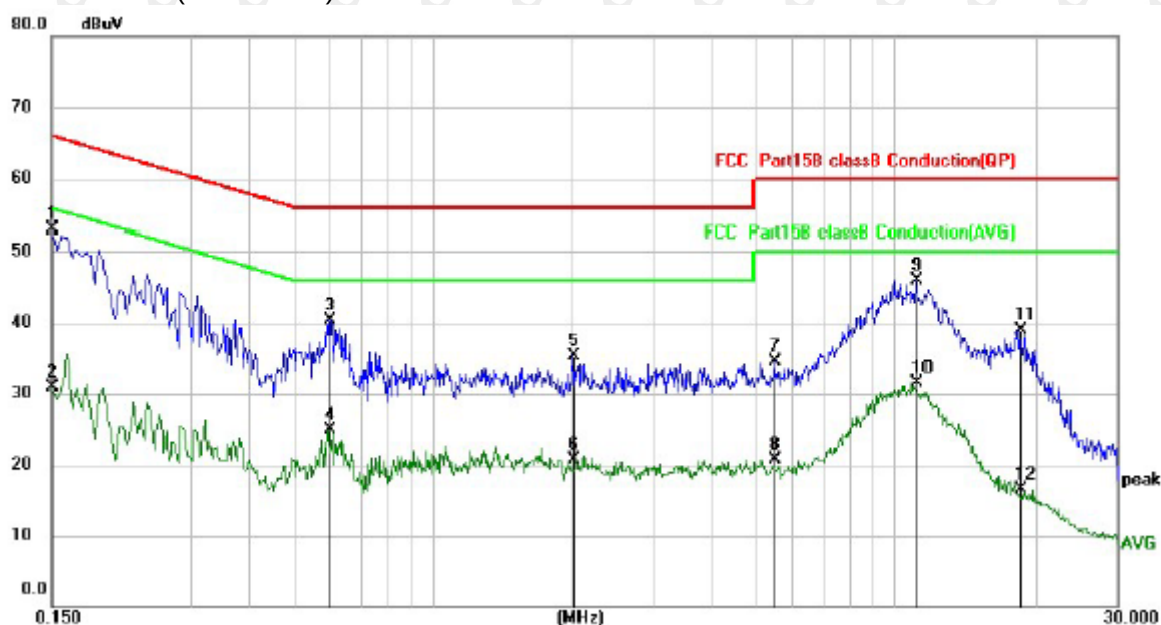
6.3 Test procedure

- 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 $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 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.
- 6) All modes were tested at AC 120V and 240V, only the worst result of AC 120V 60Hz was reported.
- 7) If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.

6.4 Test Result

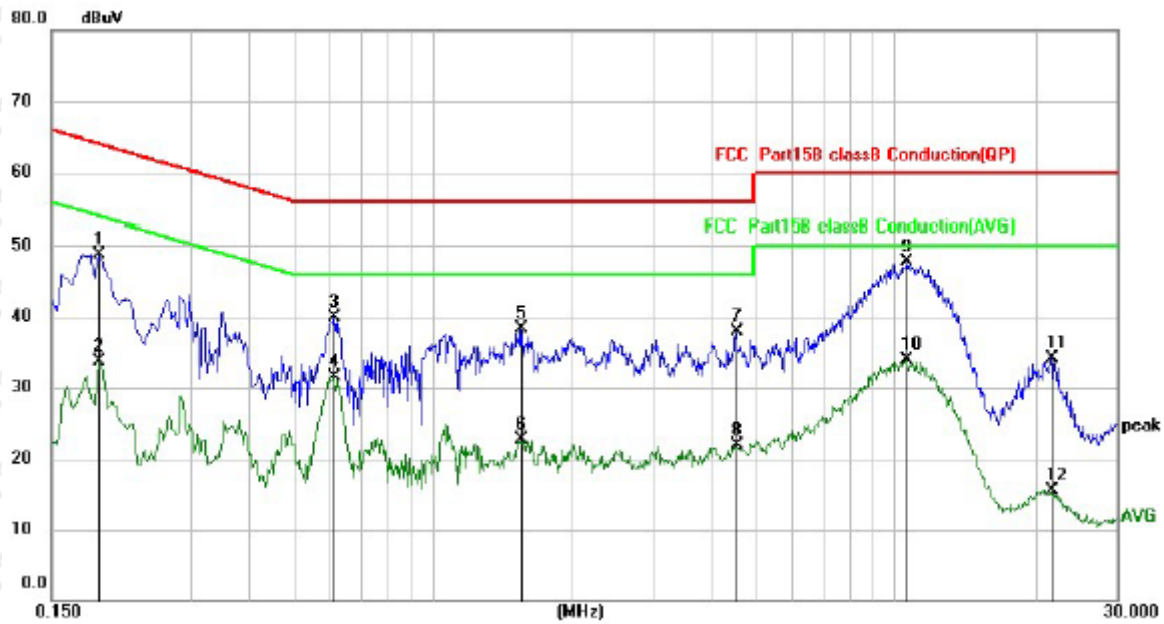
L: Worst case-GFSK(low channel)



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
		MHz	dBuV	Factor	ment	dBuV	dB	Detector
1	*	0.1500	42.98	9.95	52.93	66.00	-13.07	QP
2		0.1500	21.00	9.95	30.95	56.00	-25.05	AVG
3		0.5980	30.25	10.00	40.25	56.00	-15.75	QP
4		0.5980	14.95	10.00	24.95	46.00	-21.05	AVG
5		2.0220	25.20	10.09	35.29	56.00	-20.71	QP
6		2.0220	10.61	10.09	20.70	46.00	-25.30	AVG
7		5.5140	23.99	10.42	34.41	60.00	-25.59	QP
8		5.5140	10.27	10.42	20.69	50.00	-29.31	AVG
9		11.1820	35.28	10.62	45.90	60.00	-14.10	QP
10		11.1820	20.81	10.62	31.43	50.00	-18.57	AVG
11		18.5940	28.12	10.79	38.91	60.00	-21.09	QP
12		18.5940	5.69	10.79	16.48	50.00	-33.52	AVG

Remark: Factor = Cable loss + LISN factor, Margin = Measurement – Limit

N:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1		0.1900	38.67	9.95	48.62	64.04	-15.42	QP
2		0.1900	23.79	9.95	33.74	54.04	-20.30	AVG
3		0.6140	29.82	10.01	39.83	56.00	-16.17	QP
4		0.6140	21.42	10.01	31.43	46.00	-14.57	AVG
5		1.5540	28.30	10.05	38.35	56.00	-17.65	QP
6		1.5540	12.66	10.05	22.71	46.00	-23.29	AVG
7		4.5420	27.59	10.34	37.93	56.00	-18.07	QP
8		4.5420	11.59	10.34	21.93	46.00	-24.07	AVG
9	*	10.6260	37.11	10.60	47.71	60.00	-12.29	QP
10		10.6260	23.27	10.60	33.87	50.00	-16.13	AVG
11		21.6299	23.30	10.88	34.18	60.00	-25.82	QP
12		21.6299	4.71	10.88	15.59	50.00	-34.41	AVG

Remark: Factor = Cable loss + LISN factor, Margin = Measurement – Limit

7. RADIATED SPURIOUS EMISSION

7.1 Block Diagram Of Test Setup

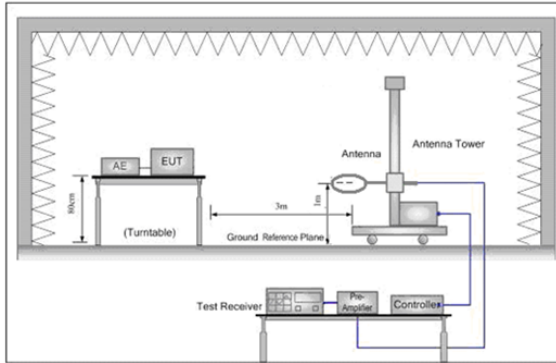


Figure 1. Below 30MHz

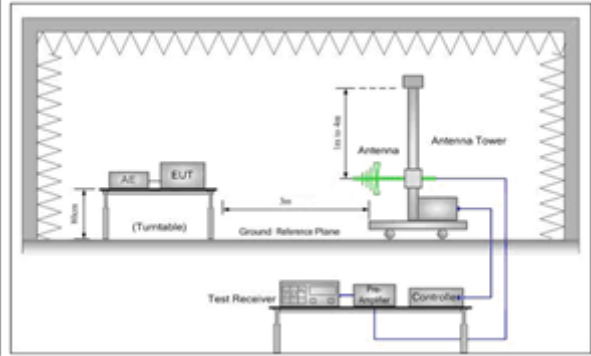
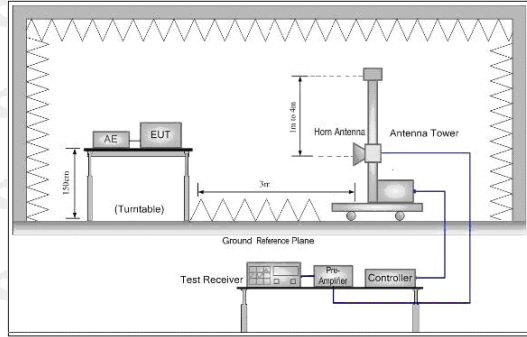


Figure 2. 30MHz to 1GHz



7.2 Limit

Spurious Emissions:

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

7.3 Test procedure

Below 1GHz test procedure as below:

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 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.

Above 1GHz test procedure as below:

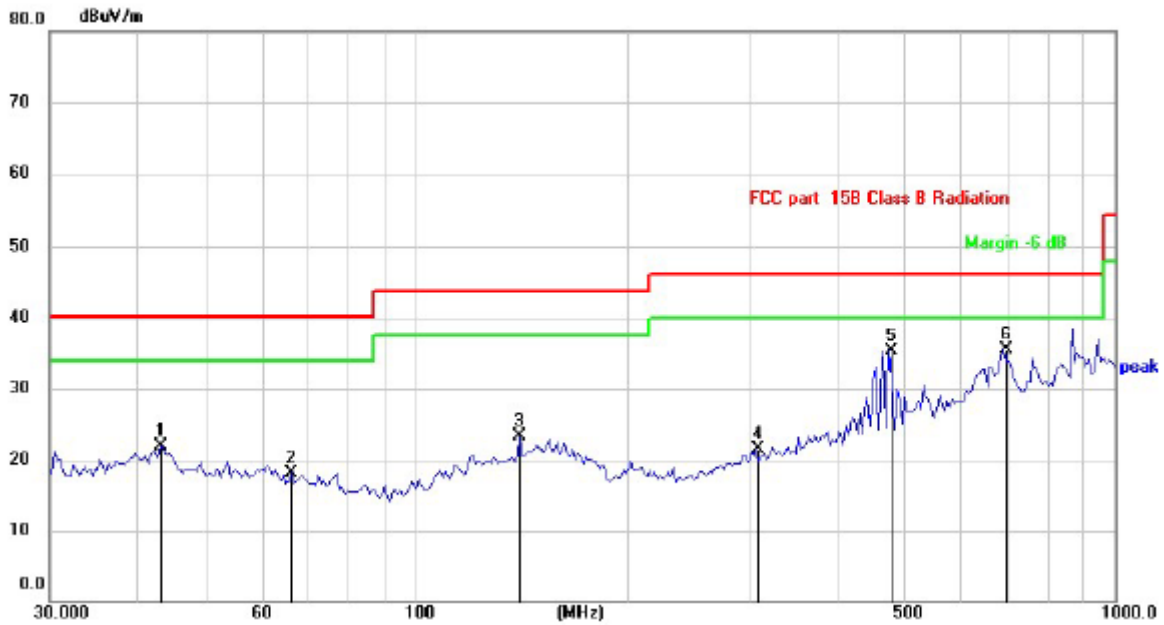
- Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
- Test the EUT in the lowest channel ,the middle channel ,the Highest channel
- Repeat above procedures until all frequencies measured was complete.
- Full battery is used during test

Receiver set:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30KHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30KHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30KHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30KHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30KHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120 kHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

7.4 Test Result

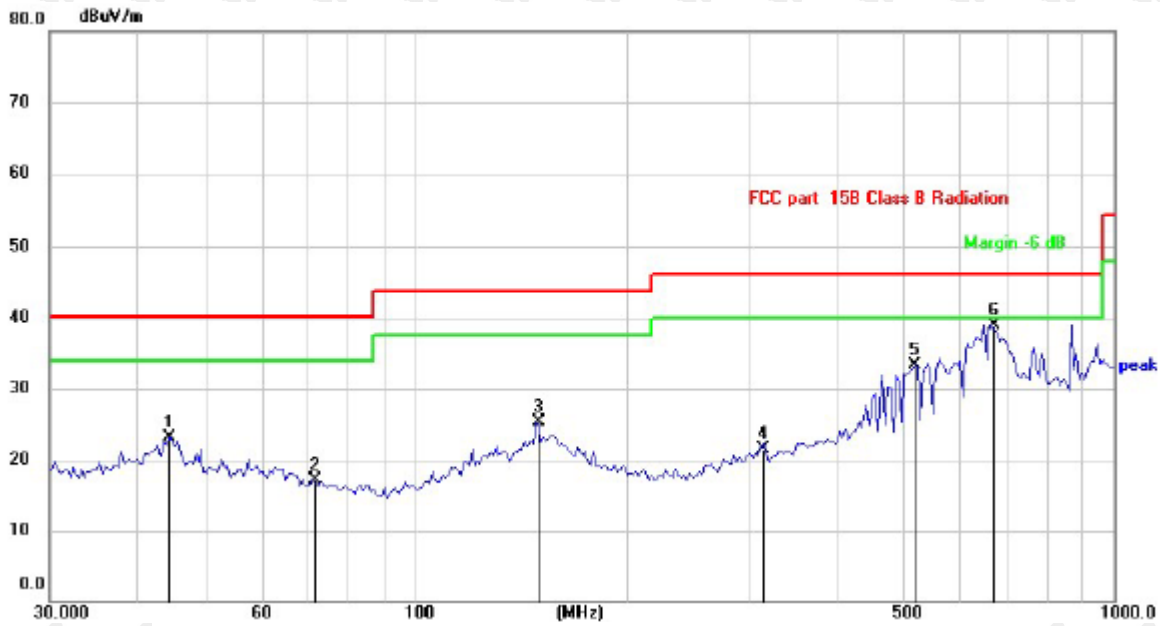
Below 1GHz Test Results:
Antenna polarity: H



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		43.3534	27.31	-5.40	21.91	40.00	-18.09	QP
2		66.6156	25.73	-7.60	18.13	40.00	-21.87	QP
3		141.5777	27.55	-4.20	23.35	43.50	-20.15	QP
4		306.2164	26.01	-4.58	21.43	46.00	-24.57	QP
5		474.6662	35.86	-0.51	35.35	46.00	-10.65	QP
6	*	691.9867	31.19	4.40	35.59	46.00	-10.41	QP

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Measurement - Limit

Antenna polarity: V



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
		MHz	Level	Factor	ment			Detector
			dBuV	dB	dBuV/m	dB/m	dB	
1		44.5087	28.80	-5.61	23.19	40.00	-16.81	QP
2		71.4552	25.24	-8.20	17.04	40.00	-22.96	QP
3		149.2239	28.49	-3.26	25.23	43.50	-18.27	QP
4		311.6326	25.91	-4.44	21.47	46.00	-24.53	QP
5		518.1556	32.82	0.51	33.33	46.00	-12.67	QP
6	*	668.1423	35.06	3.94	39.00	46.00	-7.00	QP

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Measurement - Limit

Above 1 GHz Test Results:
CH Low (915.08MHz)

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
V	1830.16	59.99	-3.54	56.45	74	-17.55	Pk
V	1830.16	48.86	-3.23	45.63	54	-8.37	AV
V	2745.24	58.61	-3.64	54.97	74	-19.03	Pk
V	2745.24	48.67	-3.46	45.21	54	-8.79	AV
V	3660.32	58.34	-4.44	53.90	74	-20.10	Pk
V	3660.32	49.09	-4.23	44.86	54	-9.14	AV
H	1830.16	62.18	-3.53	58.65	74	-15.35	Pk
H	1830.16	49.50	-3.20	46.30	54	-7.70	AV
H	2745.24	61.92	-3.76	58.16	74	-15.84	Pk
H	2745.24	50.55	-3.89	46.66	54	-7.34	AV
H	3660.32	60.66	-3.25	57.41	74	-16.59	Pk
H	3660.32	48.27	-3.27	45.00	54	-9.00	AV
Remark: Absolute Level= ReadingLevel+ Factor, Margin= Limit- Absolute Level Other harmonics emissions are lower than 20dB below the allowable limit.							

CH Middle (918.1MHz)

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
V	1836.16	60.02	-3.20	56.82	74	-17.18	Pk
V	1836.16	48.68	-3.48	45.20	54	-8.80	AV
V	2754.24	58.60	-3.60	55.00	74	-19.00	Pk
V	2754.24	48.44	-3.58	44.85	54	-9.15	AV
V	3672.32	58.61	-4.41	54.20	74	-19.80	Pk
V	3672.32	48.63	-4.21	44.42	54	-9.58	AV
H	1836.16	61.97	-3.15	58.82	74	-15.18	Pk
H	1836.16	49.62	-3.34	46.28	54	-7.72	AV
H	2754.24	62.25	-3.79	58.46	74	-15.54	Pk
H	2754.24	50.57	-3.67	46.90	54	-7.10	AV
H	3672.32	60.58	-3.23	57.35	74	-16.65	Pk
H	3672.32	48.60	-3.46	45.15	54	-8.85	AV
Remark: Absolute Level= ReadingLevel+ Factor, Margin= Limit- Absolute Level Other harmonics emissions are lower than 20dB below the allowable limit.							

CH High (920.5MHz)

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
V	1840.96	60.00	-3.19	56.81	74	-17.19	Pk
V	1840.96	48.54	-3.25	45.29	54	-8.71	AV
V	2761.44	58.82	-3.54	55.28	74	-18.72	Pk
V	2761.44	48.42	-3.57	44.85	54	-9.15	AV
V	3681.92	58.24	-4.33	53.91	74	-20.09	Pk
V	3681.92	48.76	-4.51	44.25	54	-9.75	AV
H	1840.96	62.05	-3.36	58.70	74	-15.30	Pk
H	1840.96	49.78	-3.62	46.16	54	-7.84	AV
H	2761.44	61.92	-3.80	58.13	74	-15.87	Pk
H	2761.44	50.89	-3.78	47.11	54	-6.89	AV
H	3681.92	60.53	-3.20	57.33	74	-16.67	Pk
H	3681.92	48.56	-3.33	45.23	54	-8.77	AV
Remark: Absolute Level= ReadingLevel+ Factor, Margin= Limit- Absolute Level Other harmonics emissions are lower than 20dB below the allowable limit.							

8. BAND EDGE AND RF CONDUCTED SPURIOUS EMISSIONS

8.1 Block Diagram Of Test Setup

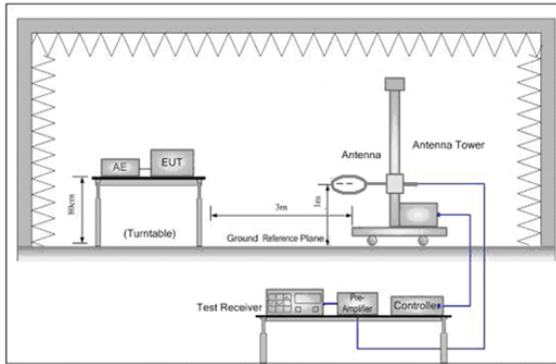


Figure 1. Below 30MHz

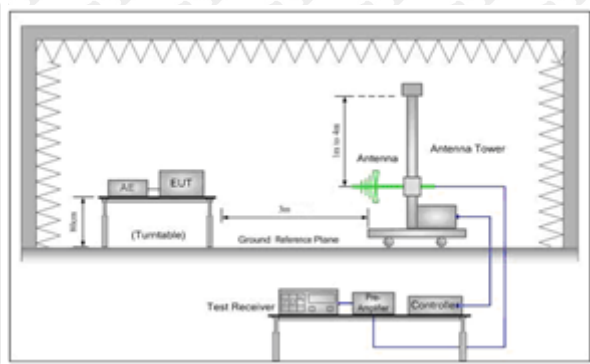
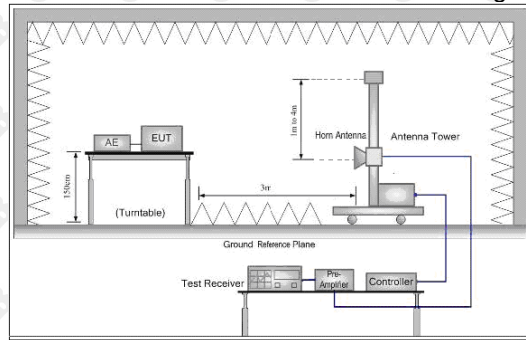


Figure 2. 30MHz to 1GHz



8.2 Limit

Spurious Emissions:

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

8.3 Test procedure

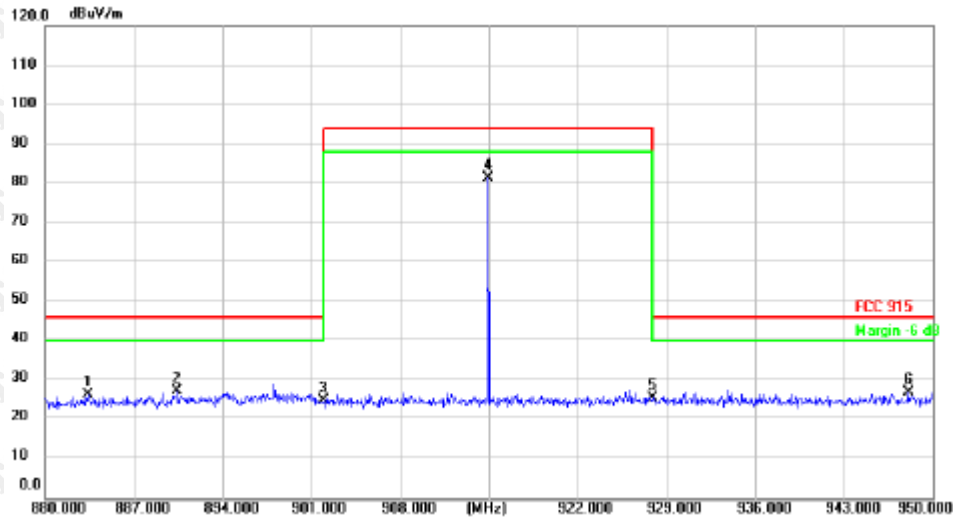
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. 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.
- d. 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 rotating table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. 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.

Frequency	Detector	RBW	VBW	Remark
880MHz-902MHz	peak	1MHz	3MHz	peak
928MHz-950MHz	peak	1MHz	3MHz	peak

8.4 Test Result

Below 1GHz Test Results:

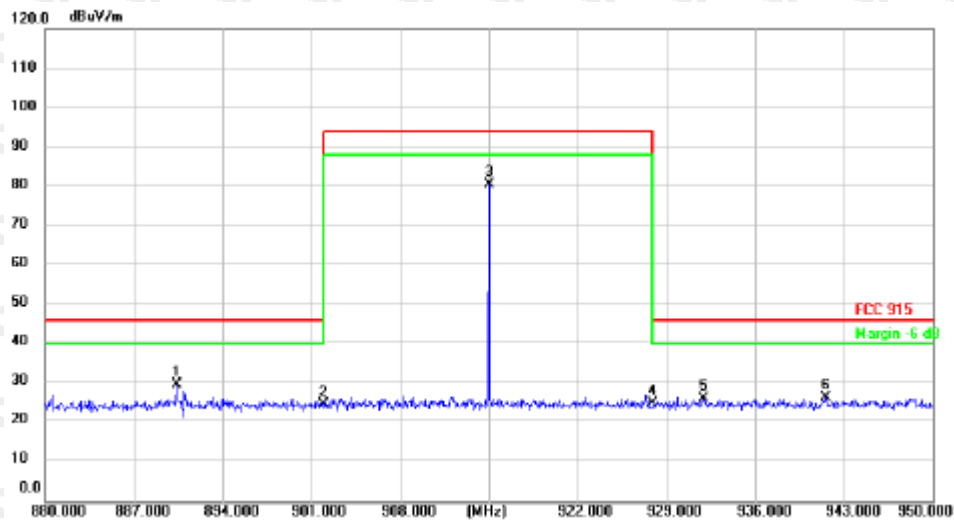
Antenna polarity: H



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	883.4300	25.45	0.97	26.42	46.00	-19.58	peak
2	890.4300	26.16	1.16	27.32	46.00	-18.68	peak
3	902.0000	23.56	1.40	24.96	46.00	-21.04	peak
4 *	914.9300	80.10	1.30	81.40	94.00	-12.60	peak
5	928.0000	24.33	1.21	25.54	46.00	-20.46	peak
6	948.0400	26.13	1.06	27.19	46.00	-18.81	peak

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Measurement – Limit

Antenna polarity: V

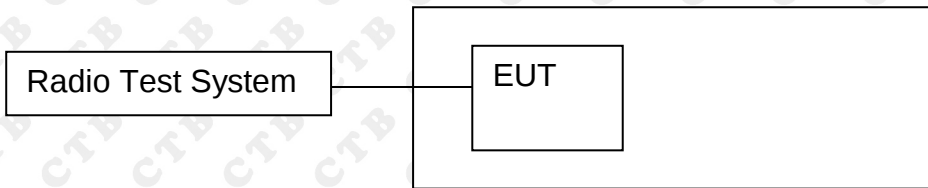


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	890.3800	28.62	1.16	29.78	46.00	-16.22	peak
2	902.0000	23.46	1.40	24.86	46.00	-21.14	peak
3 *	915.0000	79.21	1.29	80.50	94.00	-13.50	peak
4	928.0000	23.95	1.21	25.16	46.00	-20.84	peak
5	931.9400	25.00	1.18	26.18	46.00	-19.82	peak
6	941.5300	25.54	1.11	26.65	46.00	-19.35	peak

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Measurement – Limit

9. BANDWIDTH TEST

9.1 Block Diagram Of Test Setup



9.2 Limit

FCC Part15 (15.249) , Subpart C			
Section	Test Item	Frequency Range (MHz)	Result
15.249	Bandwidth	902~928	PASS

9.3 Test procedure

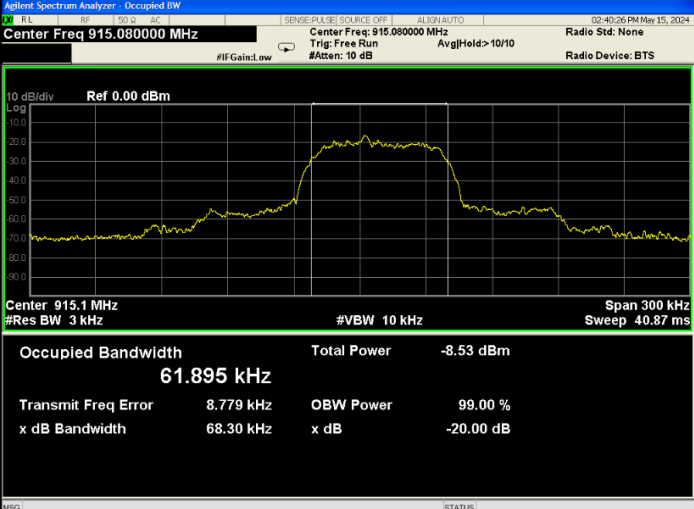
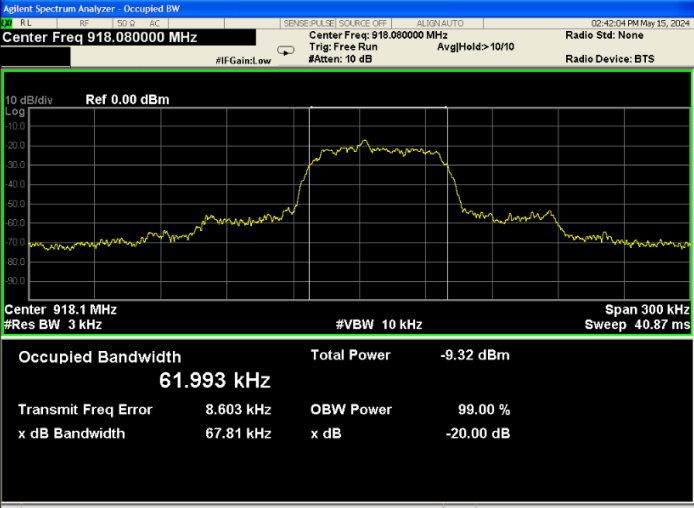
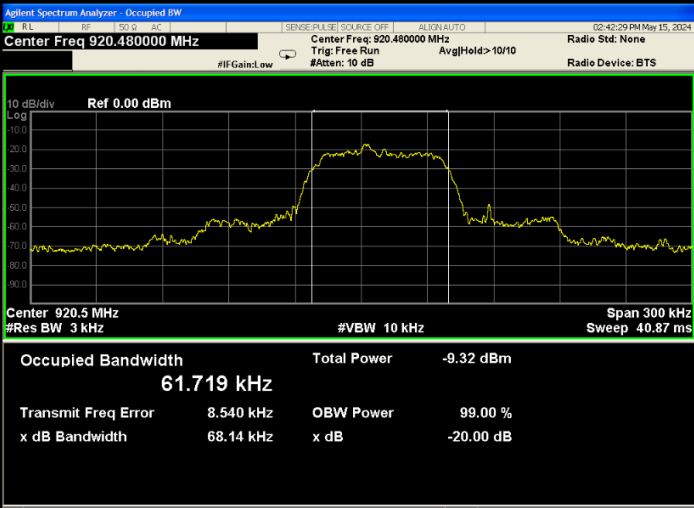
1. Set resolution bandwidth (RBW) = 1-5% or DTS BW, not to exceed 100 kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

9.4 Test Result

Test Mode	Frequency (MHz)	99% Bandwidth (MHz)	20dB Bandwidth (MHz)	Result
GFSK	Low channel	0.062	0.068	PASS
	Mid channel	0.062	0.068	PASS
	High channel	0.062	0.068	PASS

Note: All modes of operation were Pre-scan and the worst-case emissions are reported.

Test Graph:

GFSK Low channel	 Agilent Spectrum Analyzer - Occupied BW Center Freq 915.080000 MHz Center Freq: 915.080000 MHz Trig: Free Run #Att: 10 dB Avg/Hold: 10/10 Radio Std: None Radio Device: BTS Ref 0.00 dBm Center 915.1 MHz #Res BW 3 kHz #VBW 10 kHz Span 300 kHz Sweep 40.87 ms Occupied Bandwidth 61.895 kHz Total Power -8.53 dBm Transmit Freq Error 8.779 kHz OBW Power 99.00 % x dB Bandwidth 68.30 kHz x dB -20.00 dB
GFSK Mid channel	 Agilent Spectrum Analyzer - Occupied BW Center Freq 918.080000 MHz Center Freq: 918.080000 MHz Trig: Free Run #Att: 10 dB Avg/Hold: 10/10 Radio Std: None Radio Device: BTS Ref 0.00 dBm Center 918.1 MHz #Res BW 3 kHz #VBW 10 kHz Span 300 kHz Sweep 40.87 ms Occupied Bandwidth 61.993 kHz Total Power -9.32 dBm Transmit Freq Error 8.603 kHz OBW Power 99.00 % x dB Bandwidth 67.81 kHz x dB -20.00 dB
GFSK High channel	 Agilent Spectrum Analyzer - Occupied BW Center Freq 920.480000 MHz Center Freq: 920.480000 MHz Trig: Free Run #Att: 10 dB Avg/Hold: 10/10 Radio Std: None Radio Device: BTS Ref 0.00 dBm Center 920.5 MHz #Res BW 3 kHz #VBW 10 kHz Span 300 kHz Sweep 40.87 ms Occupied Bandwidth 61.719 kHz Total Power -9.32 dBm Transmit Freq Error 8.540 kHz OBW Power 99.00 % x dB Bandwidth 68.14 kHz x dB -20.00 dB

10. ANTENNA REQUIREMENT

15.203 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 permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is Spring antenna. The best case gain of the antenna is 1dBi.

11. EUT TEST SETUP PHOTOGRAPHS

Radiated Emissions

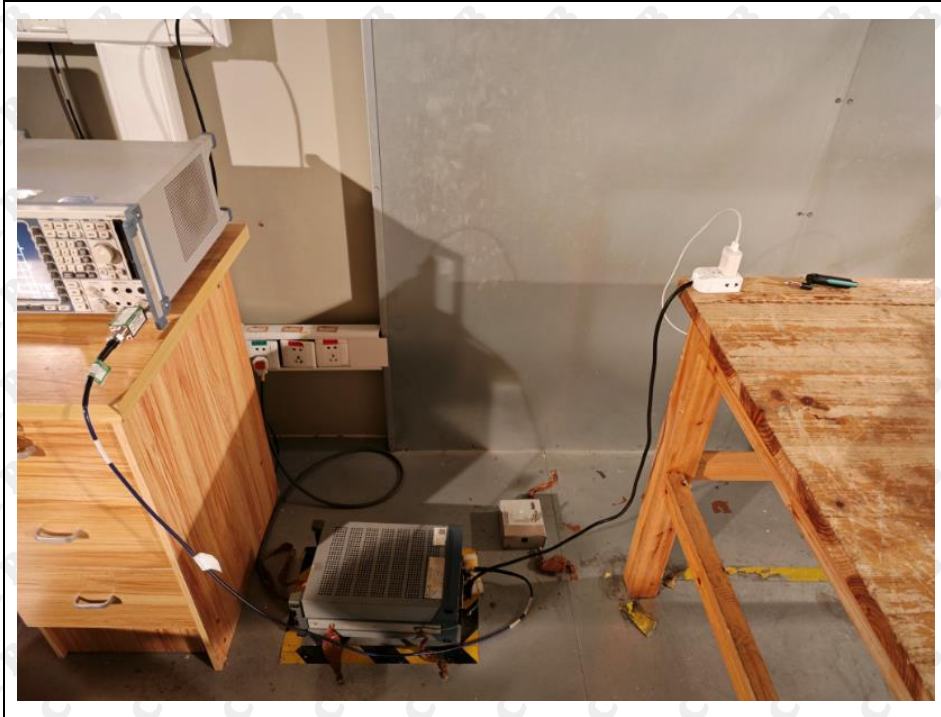
Below 1G



Above 1G



Conducted emission



***** END OF REPORT *****