

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

SHEM-TRF-001 Rev. 02 Sep01, 2023

Report No.: SHCR240600114101

Page: 1 of 39

TEST REPORT

Application No.: SHCR2406001141AT
FCC ID: YWO-MGR10
Applicant: ELECOM CO., LTD.
Address of Applicant: Fushimimachi 4-1-1, Chuo-ku, Osaka City, Osaka, Japan 541-8765
Manufacturer: ELECOM CO., LTD.
Address of Manufacturer: Fushimimachi 4-1-1, Chuo-ku, Osaka City, Osaka, Japan 541-8765
Factory: Nien-Yi Technology(zhuhai) CO.,LTD
Address of Factory: First Floor, Workshop Building 2, No.321, Qiaohu South Road, Baijiao Town, Doumen District, Zhuhai City,GuangDong

Equipment Under Test (EUT):

EUT Name: Receiver unit
Model No.: MGR10, M-GR10BK
Remark: Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Trade Mark: ELECOM
Standard(s) : 47 CFR Part 15, Subpart C 15.249
Date of Receipt: 2024-06-14
Date of Test: 2024-07-01 to 2024-07-14
Date of Issue: 2024-07-16

Test Result:	Pass*
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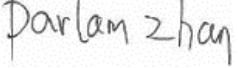
* In the configuration tested, the EUT complied with the standards specified above.

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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.

Revision Record			
Version	Description	Date	Remark
00	Original	2024-07-16	/

Authorized for issue by:			
Tested By		 Wade Zhang	
		Wade Zhang/Project Engineer	
Approved By		 Parlam Zhan	
		Parlam Zhan / Reviewer	

2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.249	N/A	47 CFR Part 15, Subpart C 15.203	Pass

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Field Strength of the Fundamental Signal (15.249(a))		ANSI C63.10 (2013) Section 6.5&6.6	47 CFR Part 15, Subpart C 15.249(a)	Pass
Restricted Band Around Fundamental Frequency		ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209	Pass
Radiated Emissions Below 1GHz		ANSI C63.10 (2013) Section 6.4&6.5	47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)	Pass
Radiated Emissions Above 1GHz		ANSI C63.10 (2013) Section 6.6	47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)	Pass
20dB Bandwidth		ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.215	Pass

Note: There are series models mentioned in this report, and they are the similar in electrical and electronic characters. Only the model MGR10 was tested since their differences were the model number and appearance.

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4 General Information

4.1 Details of E.U.T.

Power supply:	DC 5V 0.1A
Test Voltage:	AC 120V 60Hz
Operating Frequency:	2405MHz-2476MHz
Modulation Type:	GFSK
Number of Channels:	12
Antenna Type:	PCB Antenna
Antenna Gain:	-0.92dBi (Provided by manufacturer)

EUT channels and frequencies list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
5	2405	7	2407	8	2408
22	2422	23	2423	27	2427
47	2447	51	2451	52	2452
73	2473	74	2474	76	2476

Note: Frequency (MHz) = 2400+n, n=channel number.

CH list which is used on Firmware is 5, 7, 8, 22, 23, 27, 47, 51, 52, 73, 74, 76.

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Laptop	LENOVO	L460	-

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	8.4×10^{-8}
2	Timeout	2s
3	Duty cycle	0.4%
4	Occupied Bandwidth	3%
5	RF Radiated power	5.2dB (Below 1GHz) 5.9dB (Above 1GHz)
6	Radiated Spurious emission test	4.2dB (Below 30MHz) 4.5dB (30MHz-1GHz) 5.1dB (1GHz-6GHz) 5.4dB (6GHz-18GHz)
7	Temperature test	1°C
8	Humidity test	3%
9	Supply voltages	1.5%
10	Time	3%

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. E&E Lab

588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China

Tel: +86 21 6191 5666 Fax: +86 21 6191 5678

No tests were sub-contracted.

Note:

1. SGS is not responsible for wrong test results due to incorrect information (e.g. max. clock frequency, highest internal frequency, antenna gain, cable loss, etc) is provided by the applicant. (if applicable).
2. SGS is not responsible for the authenticity, integrity and the validity of the conclusion based on results of the data provided by applicant. (if applicable).
3. Sample source: sent by customer.

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **A2LA (Certificate No. 6332.01)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the American Association for Laboratory Accreditation(A2LA).

- **FCC (Designation Number: CN1301)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized as an accredited testing laboratory.

- **ISED (CAB Identifier: CN0020)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. EMC Laboratory has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory.

Company Number: 8617A

- **VCCI (Member No.: 3061)**

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-13868, C-14336, T-12221, G-10830 respectively.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
RF Conducted Test					
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2023-12-19	2024-12-18
Spectrum Analyzer	Keysight	N9020B	SHEM241-1	2023-12-19	2024-12-18
Spectrum Analyzer	Agilent	N9020A	SHEM181-1	2023-08-01	2024-07-31
Signal Generator	R&S	SMR20	SHEM006-1	2023-08-01	2024-07-31
Signal Generator	Agilent	N5182A	SHEM182-1	2023-08-01	2024-07-31
Communication Tester	R&S	CMW270	SHEM183-1	2024-05-23	2025-05-22
Communication Tester	R&S	CMW500	SHEM268-1	2024-05-23	2025-05-22
Power Sensor	Keysight	U2021XA * 4	SHEM184-1	2023-08-01	2024-07-31
Splitter	Anritsu	MA1612A	SHEM185-1	/	/
Coupler	e-meca	803-S-1	SHEM186-1	/	/
High-low Temp Cabinet	Suzhou Zhihe	TL-40	SHEM087-1	2022-11-08	2024-11-07
AC Power Stabilizer	APC	KDF-31020T-V0-F0	SHEM216-1	2023-12-19	2024-12-18
DC Power Supply	HP	6010A	SHEM222-1	2023-12-19	2024-12-18
Conducted test Cable	/	RF01-RF04	/	2023-12-19	2024-12-18
Switcher	Tonscend	JS0806	SHEM184-1	2023-08-01	2024-07-31
Test software	Tonscend	JS Tonscend BT/WIFI System	Version: 2.6	/	/
Switcher+Power Sensor	TST	TSPS2023R	SHEM263-1	2023-08-01	2024-07-31
Test software	TST	TST PASS	Version: 2.0	/	/
RF Radiated Test					
EMI test Receiver	R&S	ESU40	SHEM051-1	2023-12-19	2024-12-18
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2023-12-19	2024-12-18
Communication Tester	R&S	CMW500	SHEM268-1	2024-05-23	2025-05-22
Loop Antenna (9kHz-30MHz)	Schwarzbeck	FMZB1519	SHEM135-1	2023-12-19	2024-12-18
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM048-1	2023-09-03	2025-09-02
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM202-1	2023-04-17	2025-04-16
Horn Antenna (1-18GHz)	Schwarzbeck	HF906	SHEM009-1	2022-08-11	2024-08-10
Horn Antenna (1-18GHz)	Schwarzbeck	BBHA9120D	SHEM050-1	2023-09-03	2025-09-02
Horn Antenna (14-40GHz)	Schwarzbeck	BBHA 9170	SHEM049-1	2023-09-03	2025-09-02
Pre-Amplifier	HP	8447D	SHEM236-1	2023-12-19	2024-12-18
High-amplifier (14-40GHz)	Schwarzbeck	10001	SHEM049-2	2023-12-19	2024-12-18
Band Filter	LORCH	9BRX-875/X150	SHEM156-1	/	/
Band Filter	LORCH	13BRX-1950/X500	SHEM083-2	/	/
Band Filter	LORCH	5BRX-2400/X200	SHEM155-1	/	/
Band Filter	LORCH	5BRX-5500/X1000	SHEM157-2	/	/
High pass Filter	Wainwright	WHK3.0/18G	SHEM157-1	/	/
High pass Filter	Wainwright	WHKS1700	SHEM157-3	/	/
Semi/Fully Anechoic	ST	11*6*6M	SHEM078-2	2023-05-06	2026-05-05
RE test Cable	/	PT18-NMNM-10M	SHEM217-2	2023-12-19	2024-12-18
Test software	ESE	E3	Version: 6.111221a	/	/

Conducted Emissions at AC Mains Power Port (150kHz-30MHz)						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
EMI test receiver	Rohde & Schwarz	ESR7	SHEM162-1	2023/12/19	2024/12/18	
Line impedance stabilization network	SCHWARZBECK	NSLK8127	SHEM061-1	2023/12/19	2024/12/18	
Line impedance stabilization network	EMCO	3816_2	SHEM019-1	2023/12/19	2024/12/18	
Pulse limiter	Rohde & Schwarz	ESH3-Z2	SHEM029-1	2023/12/19	2024/12/18	
Shielding Room	ZHONGYU	8*4*3M	SHEM079-2	2022/12/20	2025/12/19	
CE test Cable	/	/	SHEM172-1	2023/12/19	2024/12/18	
Test Software	ESE	e3	Version: 6.111221a	N/A	N/A	

6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

6.1.2 Conclusion

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.

EUT Antenna:

The antenna is PCB antenna and no consideration of replacement. The best case gain of the antenna is -0.92dBi.

Antenna location: Refer to Internal photos

7 Radio Spectrum Matter Test Results

7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207

Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

Frequency of emission(MHz)	Conducted limit(dB μ V)	
	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.

Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz

7.1.1 E.U.T. Operation

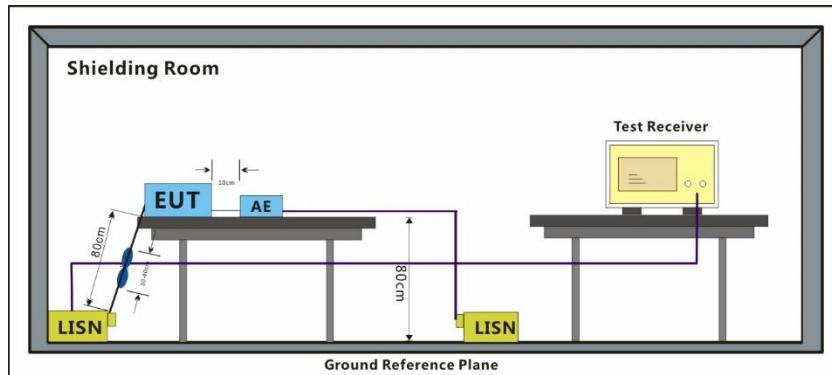
Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in transmitting with modulation mode.

7.1.3 Test Setup Diagram

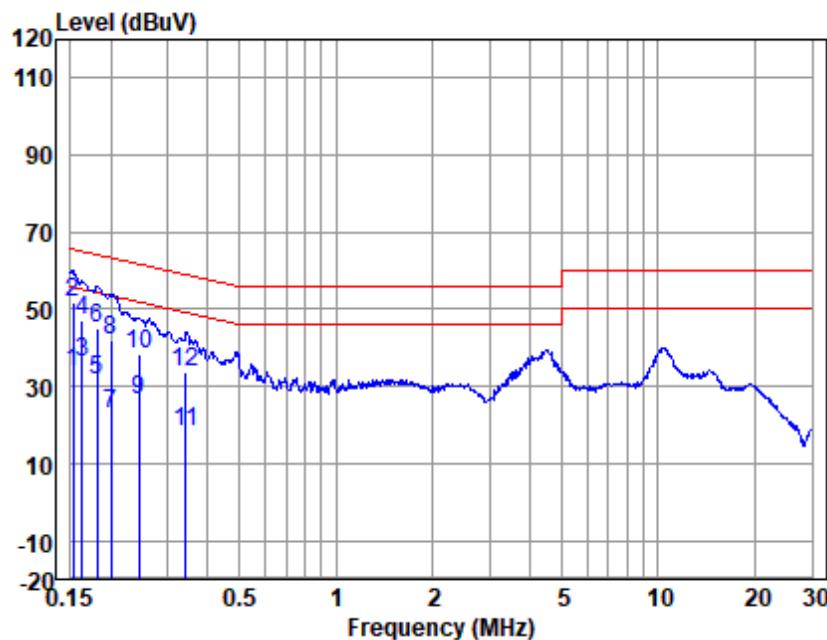


7.1.4 Measurement Procedure and Data

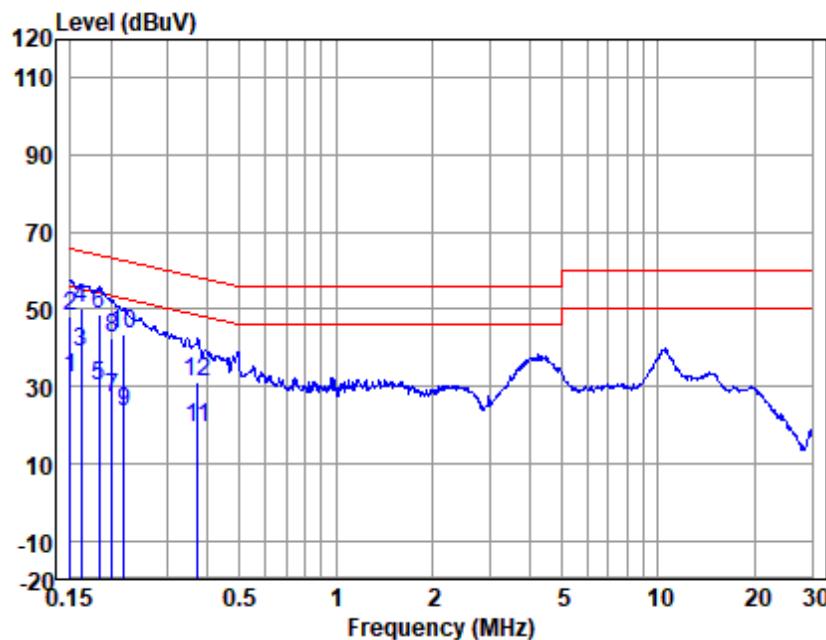
- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50 μ H + 5ohm linear impedance. The power cables of all other units of the EUT were connected 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: Level=Read Level+ Cable Loss+ LISN Factor

Test Mode: 00; Line: Live line



Test Mode: 00; Line: Neutral Line



LISN : NEUTRAL

EUT/Project No : 1141AT

Test Mode : 00

Freq (MHz)	Read level (dBuV)	LISN Factor (dB)	Cable Loss (dB)	Emission Level (dBuV)	Emission Limit (dBuV)	Over Limit (dB)	Remark
1 0.15	21.91	0.34	9.90	32.15	56.00	-23.85	Average
2 0.15	37.74	0.34	9.90	47.98	66.00	-18.02	QP
3 0.16	28.50	0.33	9.90	38.73	55.38	-16.65	Average
4 0.16	39.96	0.33	9.90	50.19	65.38	-15.19	QP
5 0.18	20.02	0.31	9.90	30.23	54.33	-24.10	Average
6 0.18	38.38	0.31	9.90	48.59	64.33	-15.74	QP
7 0.20	16.71	0.30	9.90	26.91	53.54	-26.63	Average
8 0.20	32.56	0.30	9.90	42.76	63.54	-20.78	QP
9 0.22	13.42	0.30	9.90	23.62	52.83	-29.21	Average
10 0.22	33.14	0.30	9.90	43.34	62.83	-19.49	QP
11 0.37	8.84	0.30	9.90	19.04	48.43	-29.39	Average
12 0.37	21.04	0.30	9.90	31.24	58.43	-27.19	QP

Notes: Emission Level = Read Level + LISN Factor + Cable loss

7.2 Field Strength of the Fundamental Signal (15.249(a))

Test Requirement 47 CFR Part 15, Subpart C 15.249(a)

Test Method: ANSI C63.10 (2013) Section 6.5&6.6

Limit:

Fundamental frequency(MHz)	Field strength of fundamental(millivolts/meter)	Field strength of harmonics(microvolts/meter)
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500

Remark: The frequencies above 1000MHz 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 fundamental frequency in "902-928MHz", the field strength of fundamental is based on Quasi-Peak.

7.2.1 E.U.T. Operation

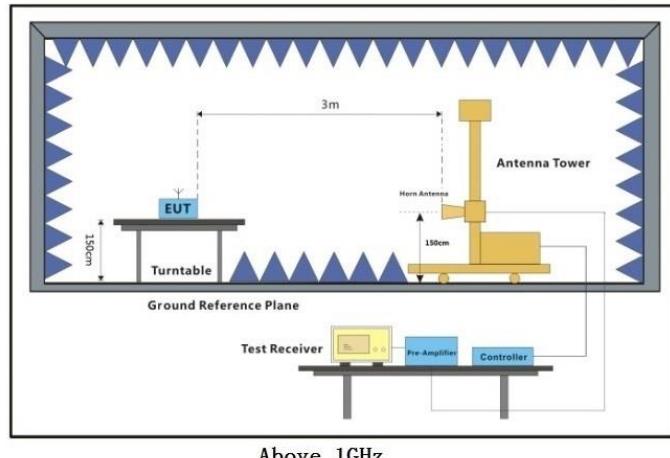
Operating Environment:

Temperature: 26.4 °C Humidity: 64.4 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in transmitting with modulation mode.

7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

- 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: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
2405	87.95	-2.98	84.97	94	-9.03	Peak	Horizontal
	82.05	-2.98	79.07	94	-14.93	Peak	Vertical

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
2447	85.97	-2.91	83.06	94	-10.94	Peak	Horizontal
	78.91	-2.91	76.00	94	-18.00	Peak	Vertical

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
2476	85.04	-2.77	82.27	94	-11.73	Peak	Horizontal
	79.06	-2.77	76.29	94	-17.71	Peak	Vertical

Remark:

1) The basic equation with a sample calculation is as follows: Level = Read Level + Factor.

(The Factor is calculated by adding the Antenna Factor, Cable Loss and Preamp Factor)

If the Peak value below the Average Limit, the Average test doesn't perform for this submission.

7.3 Restricted Band Around Fundamental Frequency

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209

Test Method: ANSI C63.10 (2013) Section 6.10.5

Limit:

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

Emission radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 26.4 °C

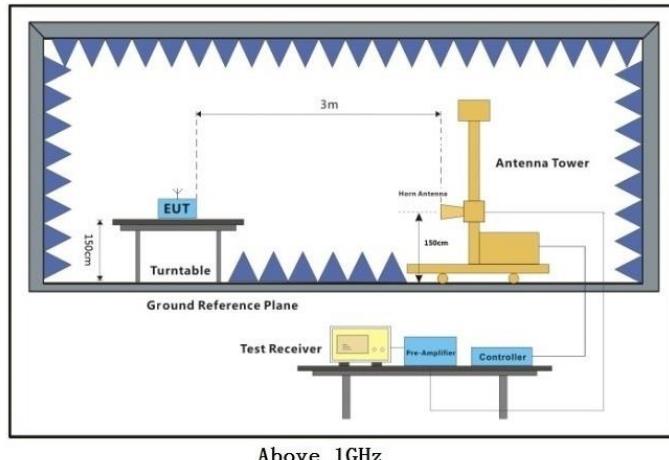
Humidity: 64.6 % RH

Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in transmitting with modulation mode.

7.3.3 Test Setup Diagram

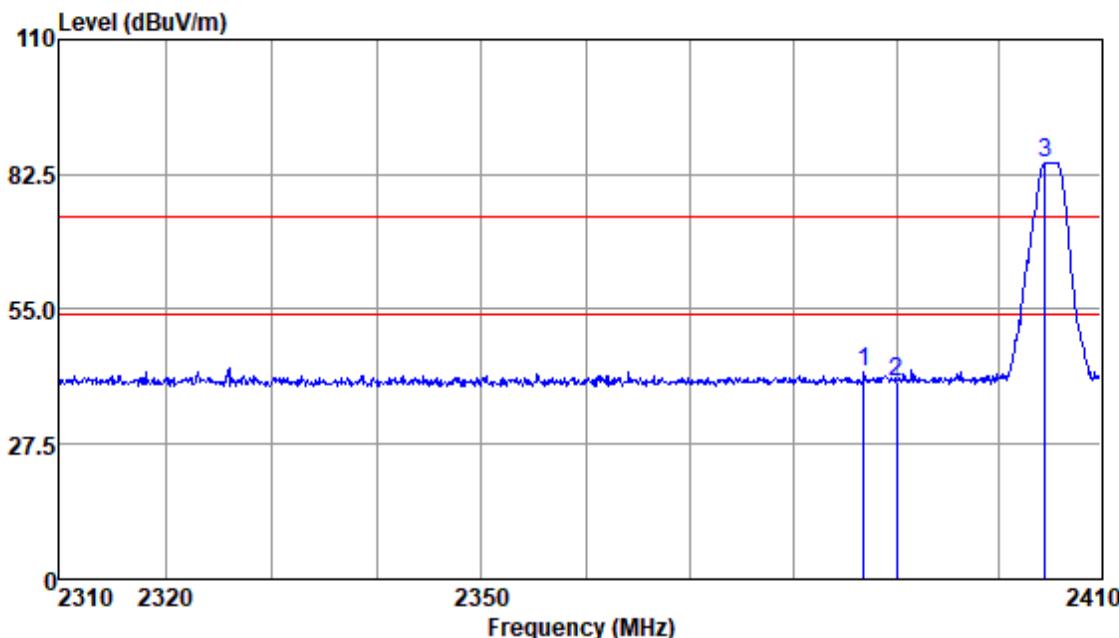


7.3.4 Measurement Procedure and Data

- 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: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



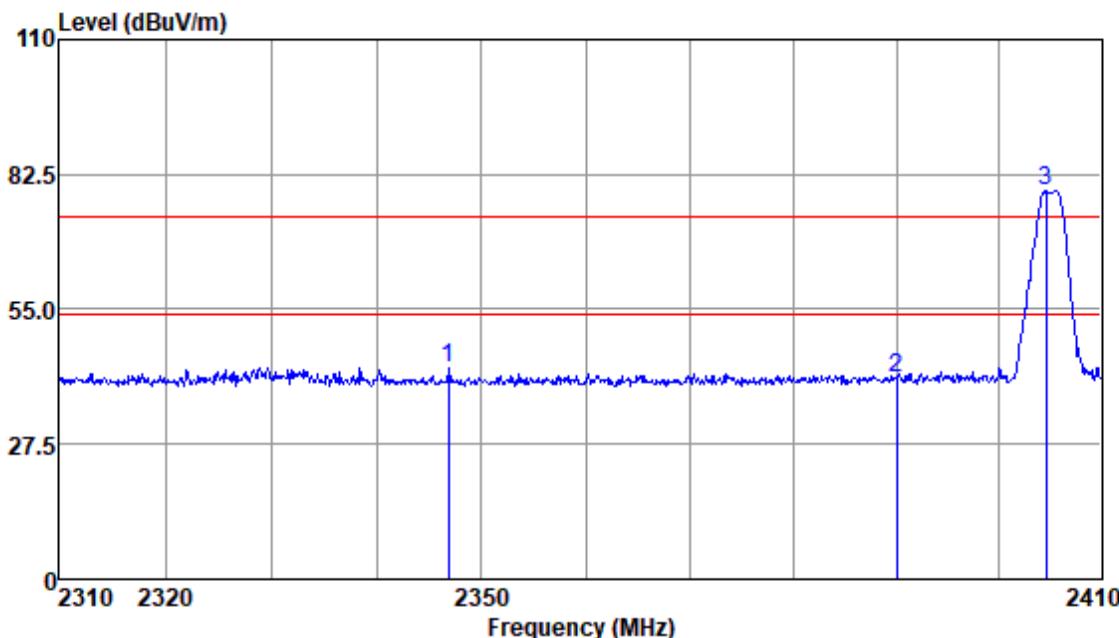
Antenna Polarity :HORIZONTAL

EUT/Project :1141AT

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2386.83	45.30	28.80	3.34	35.18	42.26	74.00	-31.74	Peak
2390.00	43.41	28.80	3.34	35.18	40.37	74.00	-33.63	Peak
2404.49	87.95	28.89	3.33	35.20	84.97	74.00	10.97	Peak

Note: Emission Level=Read Level+Antenna Factor+Cable loss+Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



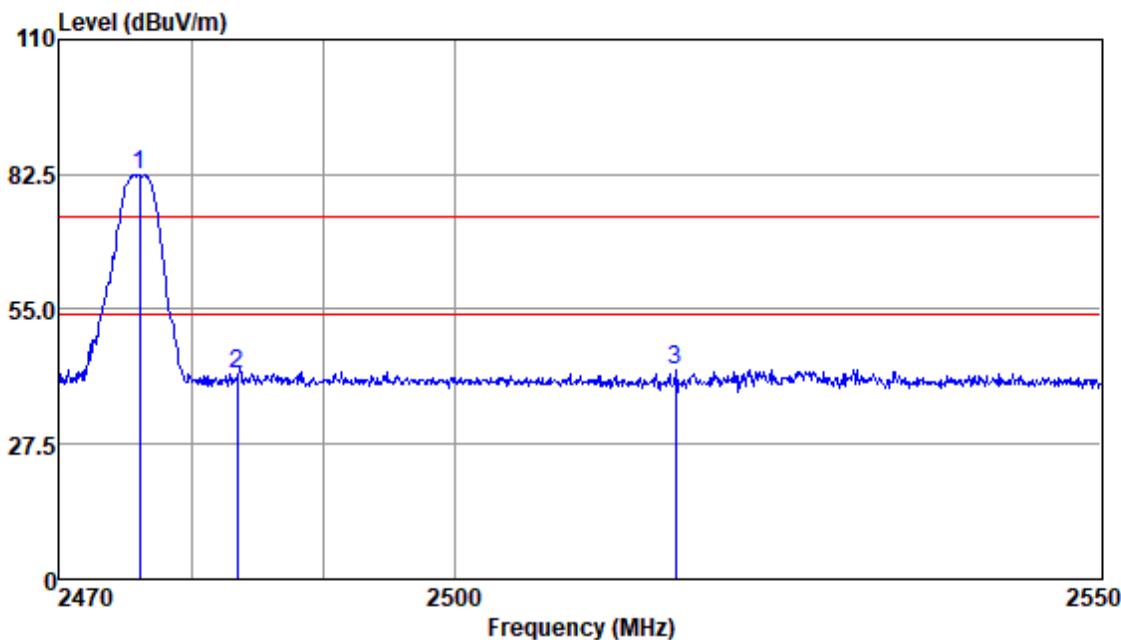
Antenna Polarity : VERTICAL

EUT/Project : 1141AT

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2346.81	46.34	28.58	3.27	35.14	43.05	74.00	-30.95	Peak
2390.00	44.22	28.80	3.34	35.18	41.18	74.00	-32.82	Peak
2404.59	82.05	28.89	3.33	35.20	79.07	74.00	5.07	Peak

Note: Emission Level = Read Level + Antenna Factor + Cable loss - Preamp Factor

Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



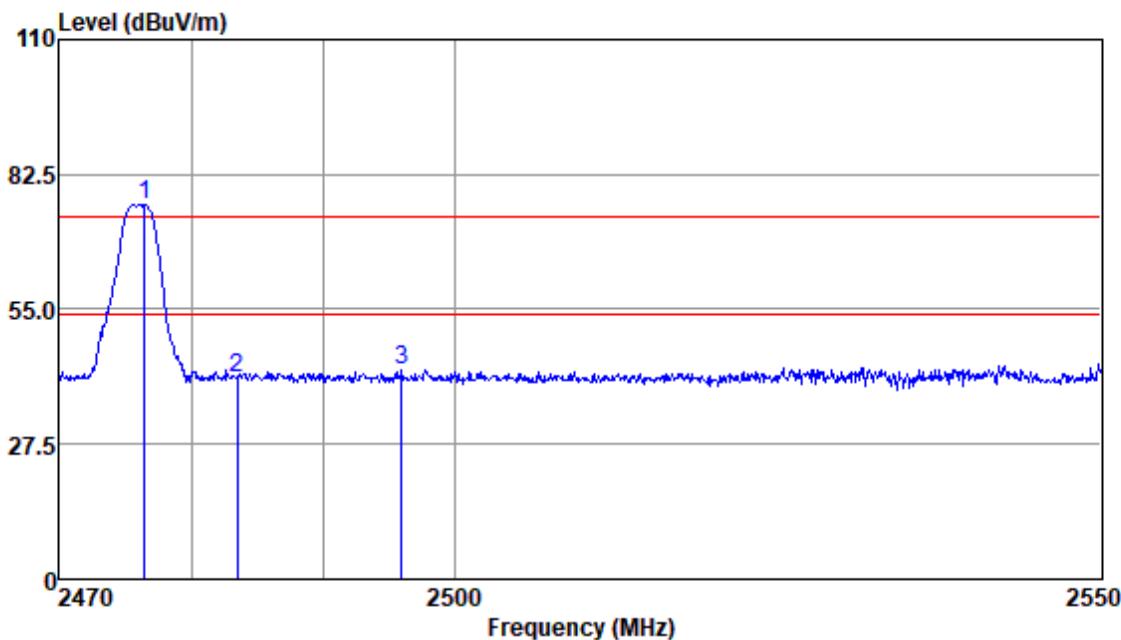
Antenna Polarity :HORIZONTAL

EUT/Project :1141AT

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2476.07	85.04	29.08	3.40	35.25	82.27	74.00	8.27	Peak
2483.50	44.63	29.09	3.36	35.26	41.82	74.00	-32.18	Peak
2516.97	45.35	29.13	3.42	35.29	42.61	74.00	-31.39	Peak

Note: Emission Level=Read Level+Antenna Factor+Cable loss+Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Antenna Polarity : VERTICAL

EUT/Project : 1141AT

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2476.46	79.06	29.08	3.40	35.25	76.29	74.00	2.29	Peak
2483.50	43.76	29.09	3.36	35.26	40.95	74.00	-33.05	Peak
2495.96	45.48	29.10	3.33	35.26	42.65	74.00	-31.35	Peak

Note: Emission Level = Read Level + Antenna Factor + Cable loss - Preamp Factor

7.4 Radiated Emissions Below 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)

Test Method: ANSI C63.10 (2013) Section 6.4&6.5

Limit:

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
960-1000	500	3

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 22.0 °C

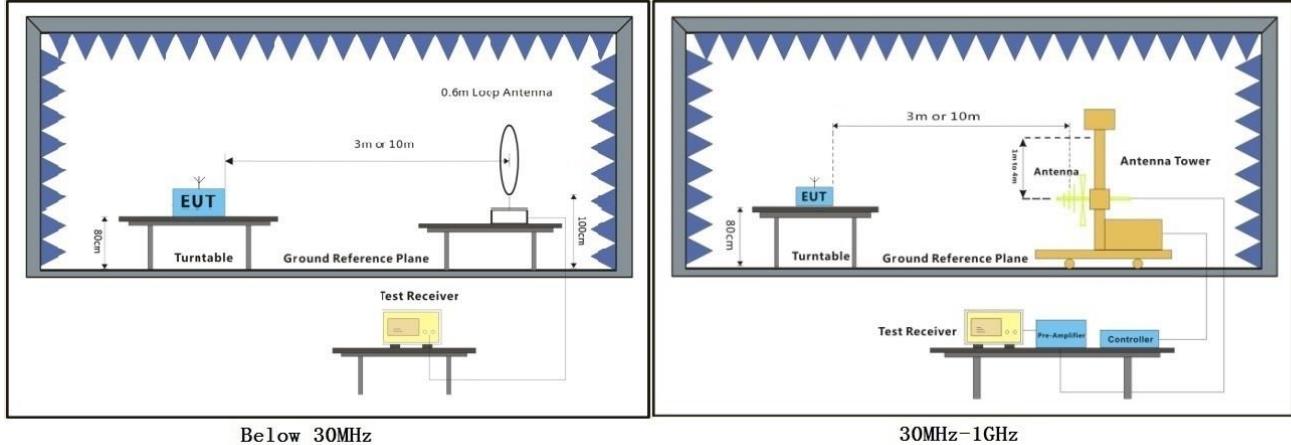
Humidity: 50.0 % RH

Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in transmitting with modulation mode.

7.4.3 Test Setup Diagram



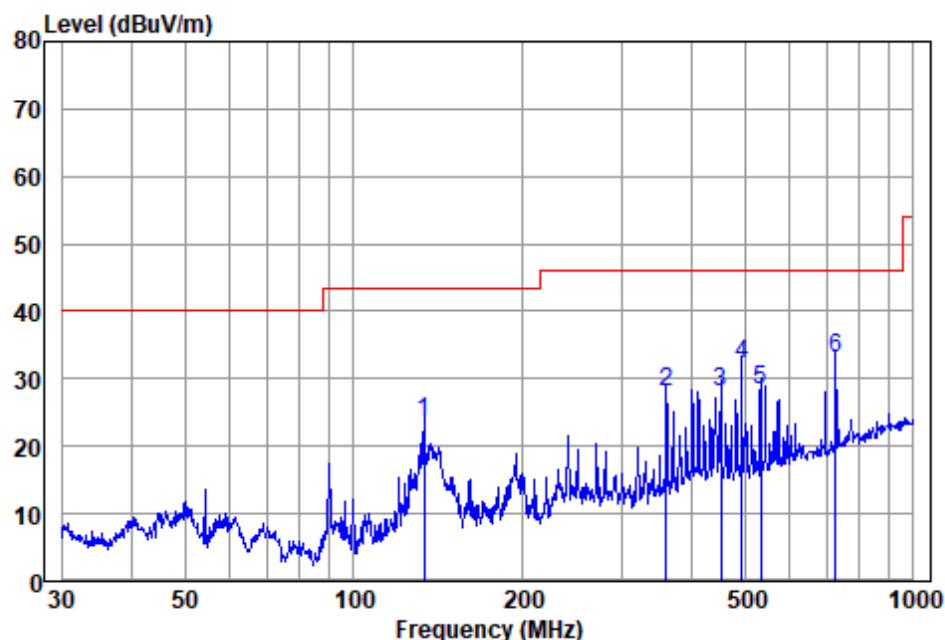
7.4.4 Measurement Procedure and Data

- a. For below 1GHz, 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 or 10 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 rotatable 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 quasi-peak method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. 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.
- i. Repeat above procedures until all frequencies measured was complete.

Remark:

1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
2. Scan from 9kHz to 30MHz, the disturbance 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.

Test Mode: 00; Polarity: Horizontal



Antenna Polarity :HORIZONTAL

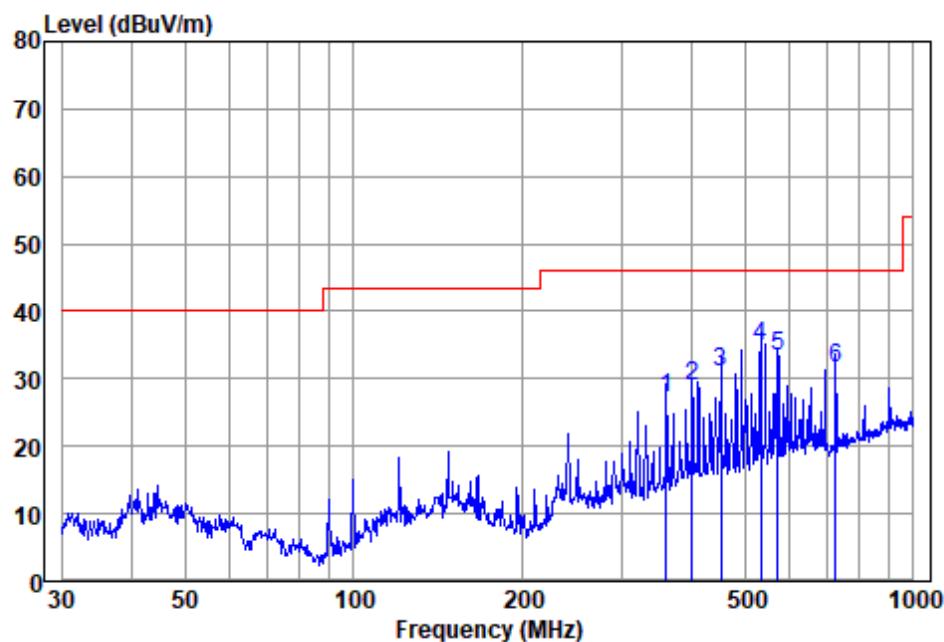
EUT/Project :1141AT

Test mode :00

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	133.619	41.68	12.40	2.65	33.06	23.67	43.50	-19.83	QP
2	361.714	41.83	14.73	4.06	32.72	27.90	46.00	-18.10	QP
3	452.720	38.67	17.26	4.67	32.70	27.90	46.00	-18.10	QP
4	492.469	42.26	17.84	4.87	32.70	32.27	46.00	-13.73	QP
5	533.832	37.26	18.54	5.10	32.70	28.20	46.00	-17.80	QP
6	724.261	37.91	21.60	6.03	32.55	32.99	46.00	-13.01	QP

Note: Emission Level=Read Level+Antenna Factor+Cable loss+Preamp Factor

Test Mode: 00; Polarity: Vertical



Antenna Polarity : VERTICAL

EUT/Project : 1141AT

Test mode : 00

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark

	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	361.714	41.23	14.73	4.06	32.72	27.30	46.00	-18.70	QP
2	401.839	41.54	15.81	4.39	32.80	28.94	46.00	-17.06	QP
3	452.720	41.78	17.26	4.67	32.70	31.01	46.00	-14.99	QP
4	533.832	43.91	18.54	5.10	32.70	34.85	46.00	-11.15	QP
5	572.614	41.37	19.26	5.30	32.70	33.23	46.00	-12.77	QP
6	724.261	36.49	21.60	6.03	32.55	31.57	46.00	-14.43	QP

Note: Emission Level = Read Level + Antenna Factor + Cable loss - Preamp Factor

7.5 Radiated Emissions Above 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)

Test Method: ANSI C63.10 (2013) Section 6.6

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
Above 1000	500	3

7.5.1 E.U.T. Operation

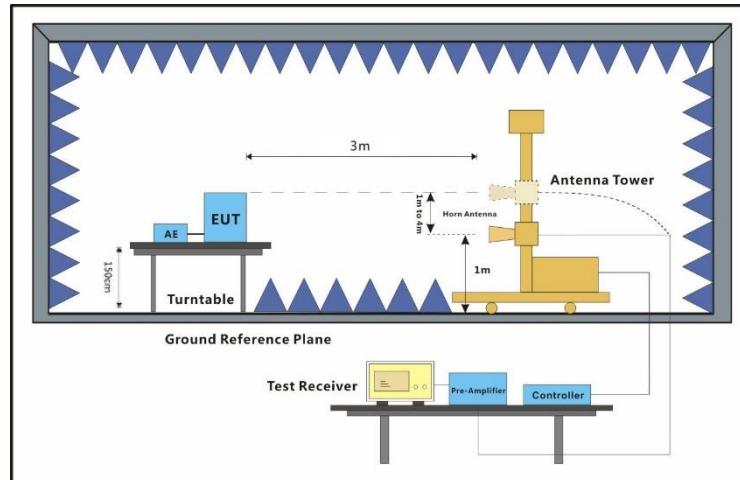
Operating Environment:

Temperature: 26.4 °C Humidity: 64.7 % RH Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in transmitting with modulation mode.

7.5.3 Test Setup Diagram



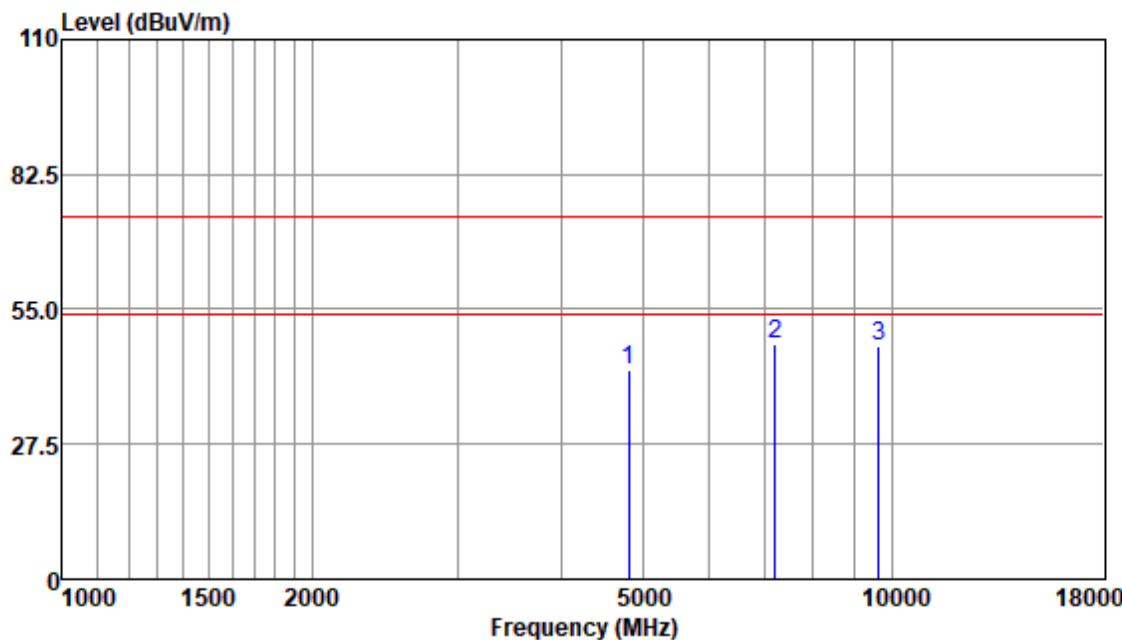
7.5.4 Measurement Procedure and Data

- a. 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.
- 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 rotatable 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 or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. 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.
- i. Repeat above procedures until all frequencies measured was complete.

Remark:

1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
2. Scan from 18GHz to 40GHz, the disturbance above 18GHz 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.
3. As shown in this section, 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.

Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



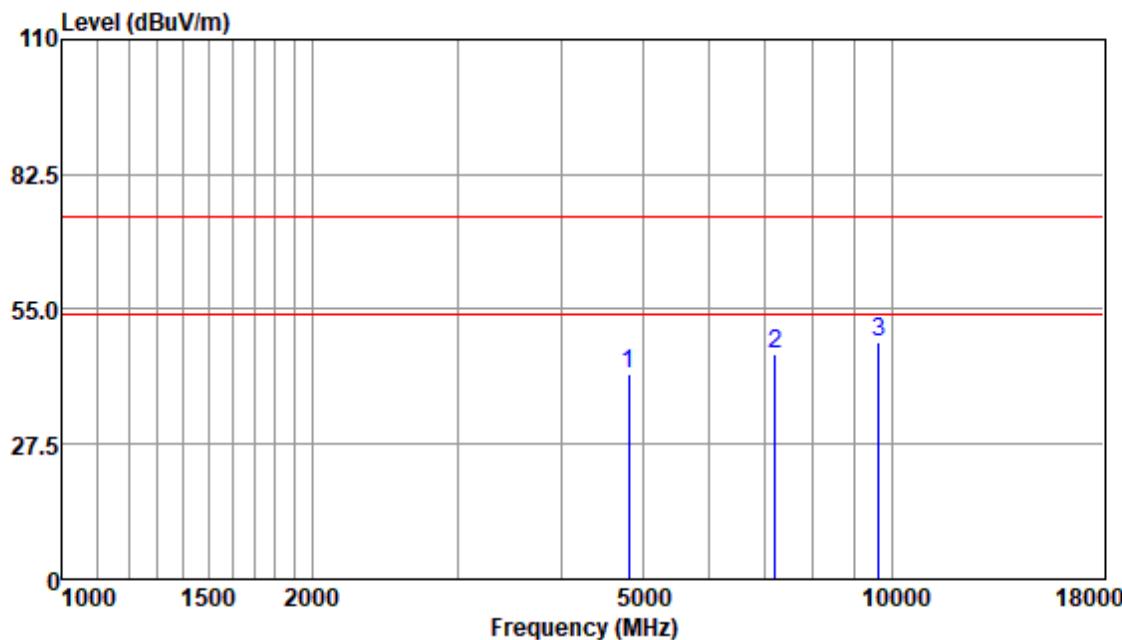
Antenna Polarity :HORIZONTAL

EUT/Project :1141AT

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4810.11	40.67	33.57	5.22	36.79	42.67	74.00	-31.33	Peak
7215.15	39.70	36.26	7.33	35.51	47.78	74.00	-26.22	Peak
9620.43	34.68	37.75	8.66	33.58	47.51	74.00	-26.49	Peak

Note: Emission Level=Read Level+Antenna Factor+Cable loss+Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



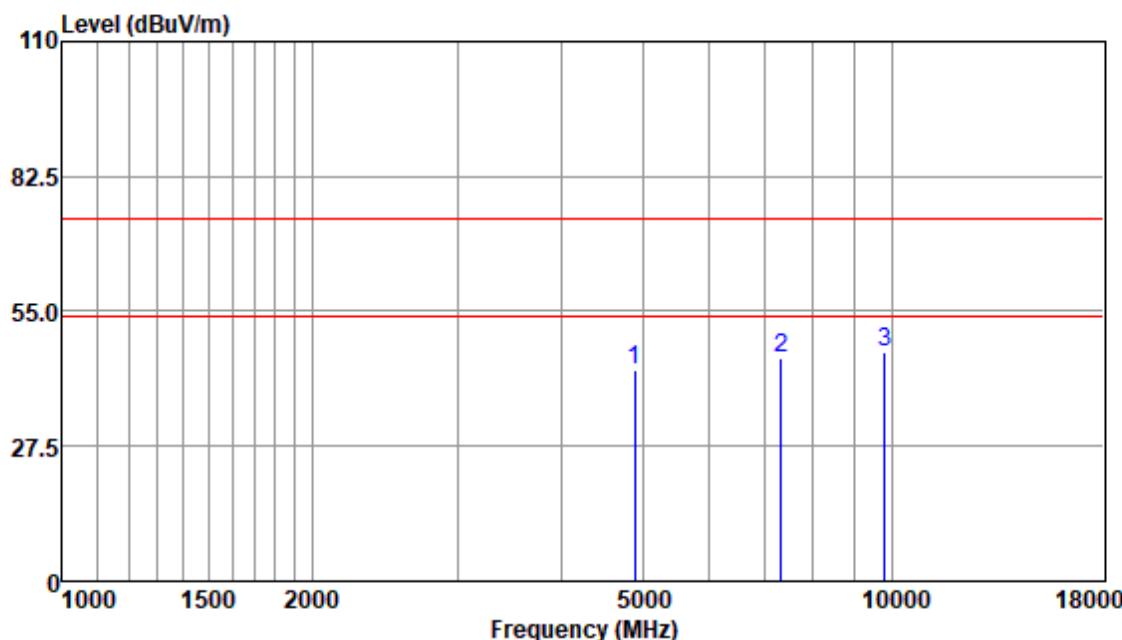
Antenna Polarity : VERTICAL

EUT/Project : 1141AT

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4810.11	39.86	33.57	5.22	36.79	41.86	74.00	-32.14	Peak
7215.15	37.96	36.26	7.33	35.51	46.04	74.00	-27.96	Peak
9620.43	35.50	37.75	8.66	33.58	48.33	74.00	-25.67	Peak

Note: Emission Level = Read Level + Antenna Factor + Cable loss - Preamp Factor

Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:middle



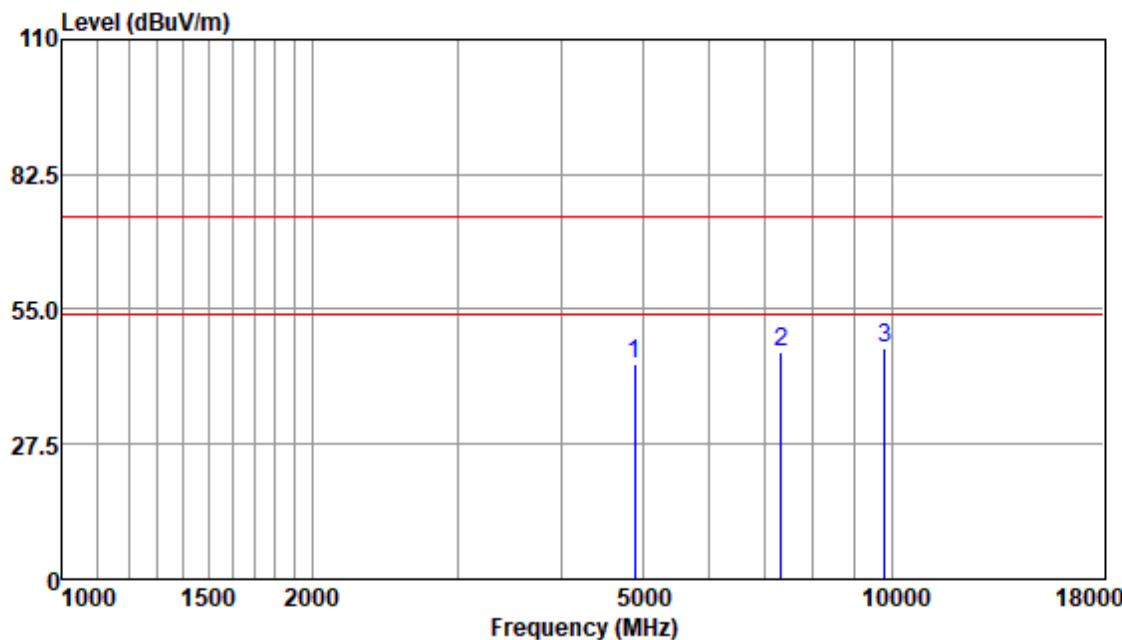
Antenna Polarity :HORIZONTAL

EUT/Project :1141AT

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Emission Limit	Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB		
4894.15	40.75	33.66	5.36	36.81	42.96	74.00	-31.04	Peak	
7341.47	37.08	36.35	7.31	35.41	45.33	74.00	-28.67	Peak	
9788.60	33.90	37.56	8.77	33.49	46.74	74.00	-27.26	Peak	

Note: Emission Level=Read Level+Antenna Factor+Cable loss+Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle



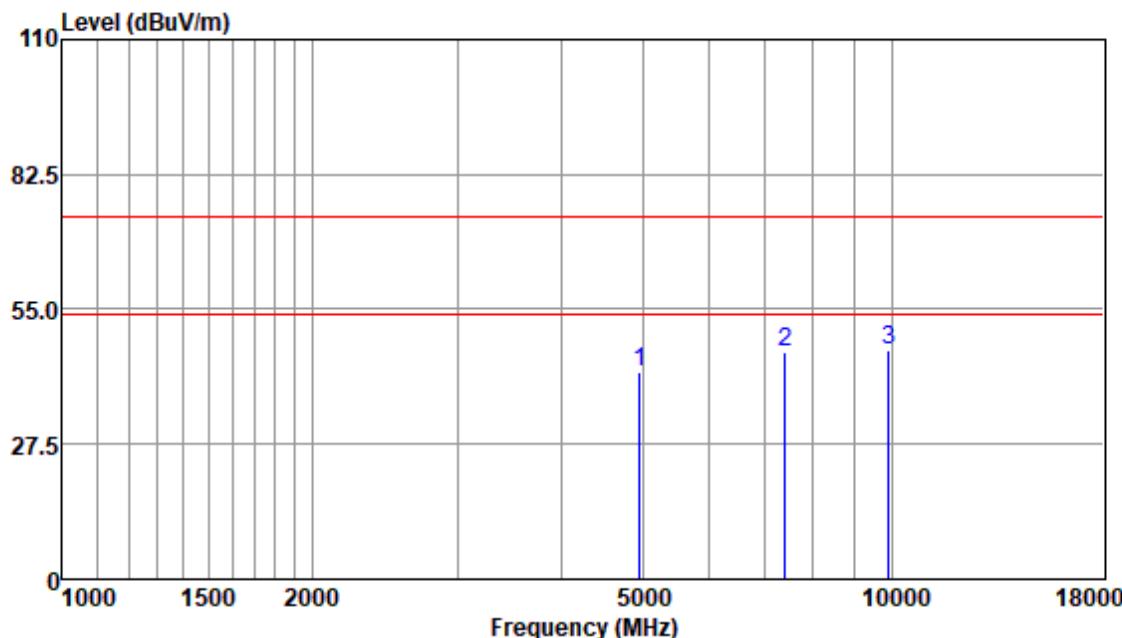
Antenna Polarity : VERTICAL

EUT/Project : 1141AT

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4894.15	41.79	33.66	5.36	36.81	44.00	74.00	-30.00	Peak
7341.47	38.07	36.35	7.31	35.41	46.32	74.00	-27.68	Peak
9788.60	34.42	37.56	8.77	33.49	47.26	74.00	-26.74	Peak

Note: Emission Level = Read Level + Antenna Factor + Cable loss - Preamp Factor

Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



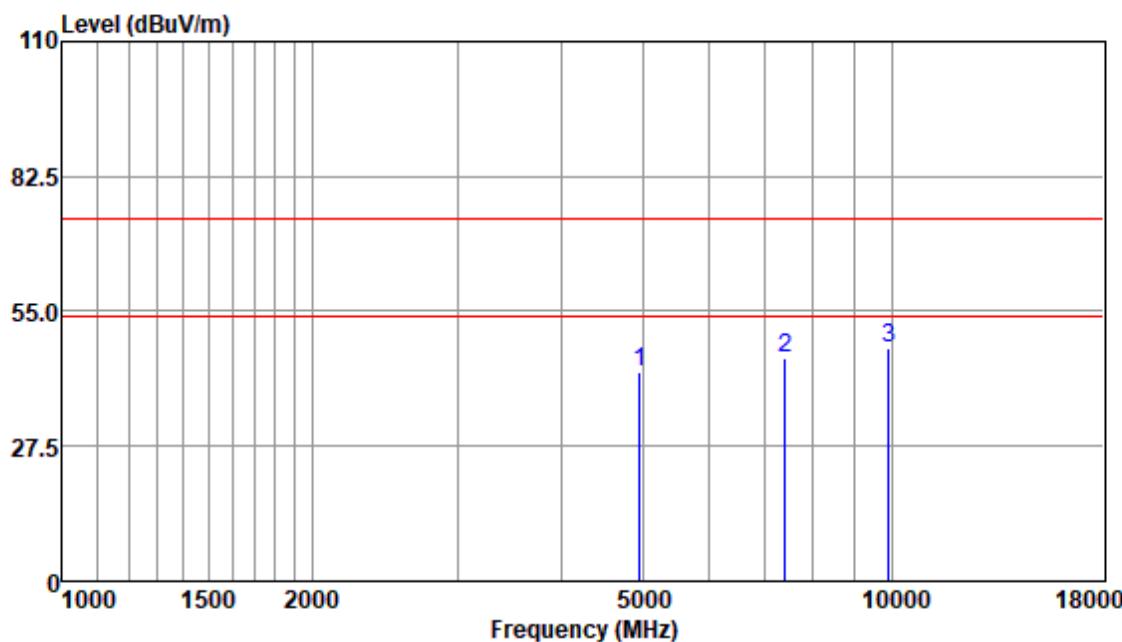
Antenna Polarity :HORIZONTAL

EUT/Project :1141AT

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4952.99	40.00	33.65	5.46	36.83	42.28	74.00	-31.72	Peak
7428.91	37.78	36.31	7.43	35.34	46.18	74.00	-27.82	Peak
9904.35	33.70	37.61	8.66	33.42	46.55	74.00	-27.45	Peak

Note: Emission Level=Read Level+Antenna Factor+Cable loss+Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Antenna Polarity : VERTICAL

EUT/Project : 1141AT

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4952.99	40.54	33.65	5.46	36.83	42.82	74.00	-31.18	Peak
7428.91	37.08	36.31	7.43	35.34	45.48	74.00	-28.52	Peak
9904.35	34.48	37.61	8.66	33.42	47.33	74.00	-26.67	Peak

Note: Emission Level = Read Level + Antenna Factor + Cable loss - Preamp Factor

7.6 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215

Test Method: ANSI C63.10 (2013) Section 6.9

7.6.1 E.U.T. Operation

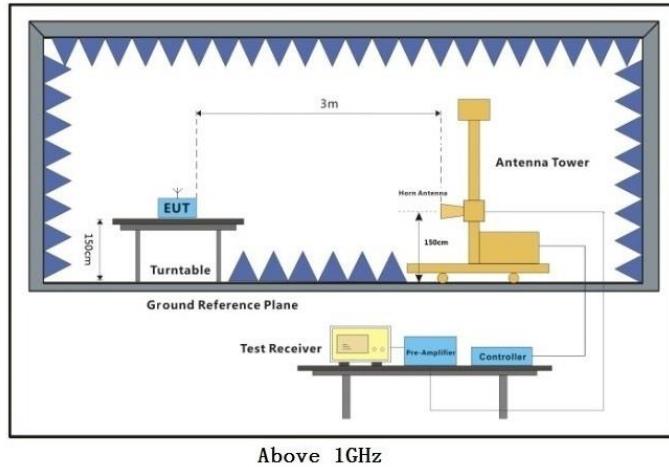
Operating Environment:

Temperature: 26.4 °C Humidity: 64.8 % RH Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in transmitting with modulation mode.

7.6.3 Test Setup Diagram

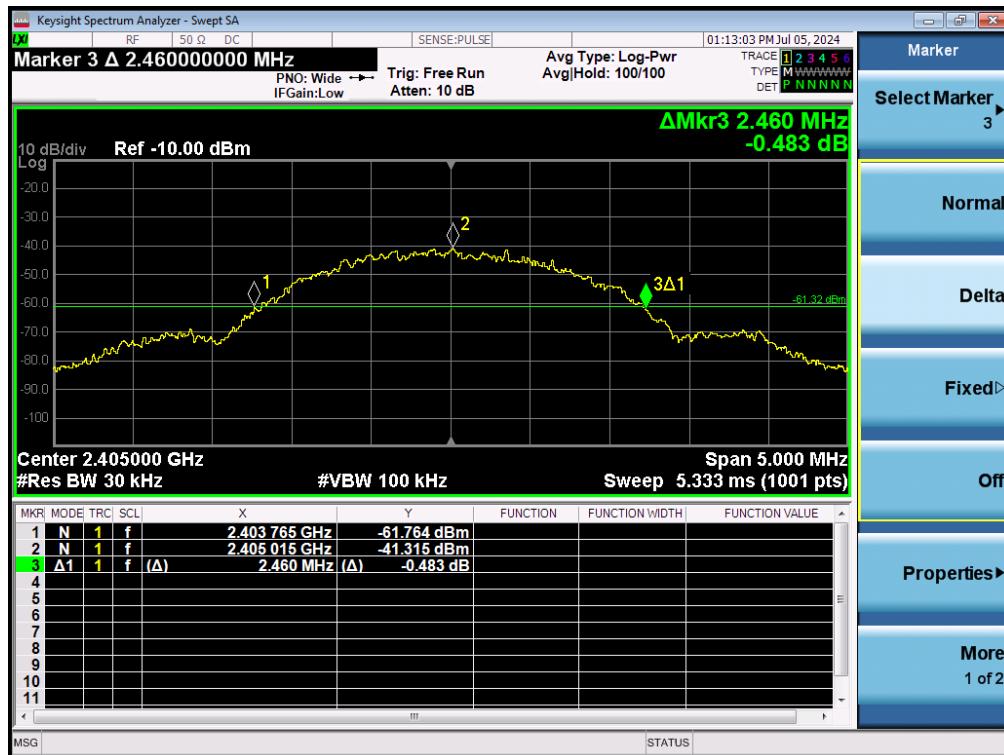


7.6.4 Measurement Procedure and Data

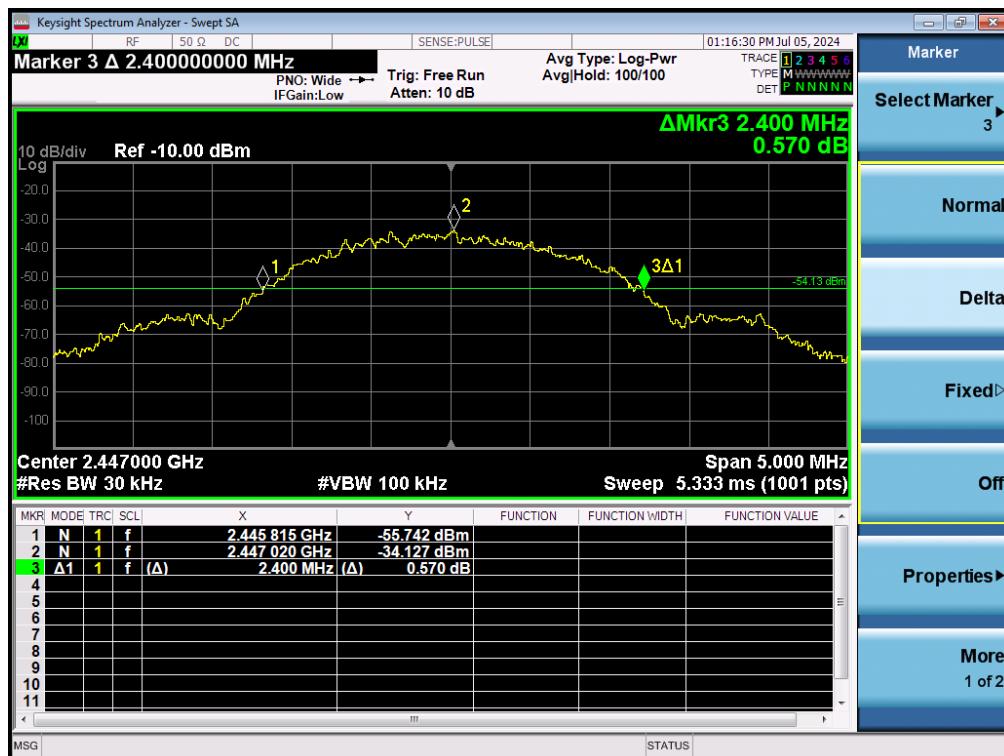
Frequency (MHz)	Bandwidth (MHz)	Result
2405	2.46	PASS
2447	2.40	PASS
2476	2.45	PASS

Test plot as follows:

Channel: 2405MHz



Channel: 2447MHz



Channel: 2476MHz



8 Test Setup Photo

Refer to Appendix - Test Setup Photo for SHCR2406001141AT

9 EUT Constructional Details (EUT Photos)

Refer to Appendix - Photographs of EUT Constructional Details for SHCR2406001141AT

- End of the Report -