

TEST REPORT

Report No...... : **KS2203S1087E**
FCC ID..... : **2A6Q4-HFY403-117S**
Applicant..... : Shenzhen Huafangyuan Electronics Co., Ltd.
Address..... : 2F, No. 2, Fukang Road, Building 36, Fumin Industrial Zone, Pinghu Town, Shenzhen, China
Manufacturer..... : Shenzhen Huafangyuan Electronics Co., Ltd.
Address..... : 2F, No. 2, Fukang Road, Building 36, Fumin Industrial Zone, Pinghu Town, Shenzhen, China
Product Name..... : **Wireless Remote Control**
Trade Mark..... : HFY
Model/Type reference..... : HFY403-117S
Listed Model(s)..... : HFY-TX85, HFY-614, HFY-520, HFY-TX25, HFY-TX28, HFY-556
Standard..... : **FCC CFR Title 47 Part 15 Subpart C Section 15.231**
Date of Receipt..... : Mar. 28, 2022
Date of Test Date..... : Mar. 28, 2022~June 13, 2022
Date of issue..... : June 13, 2022
Test result..... : **Pass**

Prepared by:
 (Printed name+ signature)

Sky Dong



Approved by:
 (Printed name+signature)

Neil Wan



Testing Laboratory Name..... : **KSIGN(Guangdong) Testing Co., Ltd.**

Address..... : West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, People's Republic of China

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1. TEST SUMMARY

1.1. Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.231: Periodic operation in the band 40.66–40.70 MHz and above 70 MHz.

ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.

1.2. Report version

Revised No.	Date of issue	Description
01	June 13,2022	Original

1.3. Test Description

FCC Rules Part 15.231			
Test Item	Standard Section	Result	Test Engineer
	FCC		
Antenna requirement	15.203	Pass	Rory Huang
Conducted Emissions	15.207	N/A	N/A
Radiated Spurious Emissions	15.209(a)/15.231(b)	Pass	Rory Huang
Deactivation Time	15.231(a)(1)	Pass	Rory Huang
Duty Cycle	15.231	N/A	Rory Huang
Occupied Bandwidth	15.231(c)	Pass	Rory Huang

Note: 1. The measurement uncertainty is not included in the test result.

2.N/A: means this test item is not applicable

3.The product is dry battery power supply.

1.4. Test Facility

Address of the report laboratory

KSIGN(Guangdong) Testing Co., Ltd.

West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, People's Republic of China

Laboratory accreditation

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

CNAS-Lab Code: L13261

KSIGN(Guangdong) Testing Co., Ltd. has been assessed and proved to be in Compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No.: 5457.01

KSIGN(Guangdong) Testing Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

IC Registration No.: CN0096

The 3m alternate test site of KSIGN(Guangdong) Testing Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: CN0096

FCC-Registration No.: 860752

KSIGN(Guangdong) Testing Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

1.5. Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the KSIGN(Guangdong) Testing Co., Ltd. system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. Below is the best measurement capability for KSIGN(Guangdong) Testing Co., Ltd.

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.42 dB	(1)
Transmitter power Radiated	2.14 dB	(1)
Conducted spurious emissions 9kHz~40GHz	1.60 dB	(1)
Radiated spurious emissions 9kHz~40GHz	2.20 dB	(1)
Conducted Emissions 9kHz~30MHz	3.20 dB	(1)
Radiated Emissions 30~1000MHz	4.70 dB	(1)
Radiated Emissions 1~18GHz	5.00 dB	(1)
Radiated Emissions 18~40GHz	5.54 dB	(1)
Occupied Bandwidth	2.80 dB	(1)

Note (1): This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=1.96$.

1.6. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35°C
Relative Humidity:	30~60 %
Air Pressure:	950~1050mba

2. GENERAL INFORMATION

2.1. Client Information

Applicant:	Shenzhen Huafangyuan Electronics Co., Ltd.
Address:	2F, No. 2, Fukang Road, Building 36, Fumin Industrial Zone, Pinghu Town, Shenzhen, China
Manufacturer:	Shenzhen Huafangyuan Electronics Co., Ltd.
Address:	2F, No. 2, Fukang Road, Building 36, Fumin Industrial Zone, Pinghu Town, Shenzhen, China

2.2. General Description of EUT

Test Sample Number:	1-1-1(Normal Sample),1-1-2(Engineering Sample)
Product Name:	Wireless Remote Control
Model/Type reference:	HFY403-117S
Trademark:	HFY
Listed models:	HFY-TX85,HFY-614,HFY-520,HFY-TX25,HFY-TX28,HFY-556
Model Difference:	All models have the same circuit and RF module · except the appearance is different.
Power supply:	N/A
Power supply(Battery):	DC 3V
Hardware version:	V1.0
Software version:	V1.0
RF Specification	
Operation frequency:	434.0325MHz
Modulation Type:	ASK
Channel number:	1
Antenna type:	PCB antenna
Antenna gain:	0 dBi

2.3. Test Mode

The EUT was operated at continuous transmitting mode that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode	Description	Remark
1	TX	DC 3V

2.4. Measurement Instruments List

Tonscend JS0806-2 Test system					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
1	Spectrum Analyzer	R&S	FSV40-N	101798	03/04/2023
2	Vector Signal Generator	Agilent	N5182A	MY50142520	03/04/2023
3	Analog Signal Generator	HP	83752A	3344A00337	03/04/2023
4	Power Sensor	Agilent	E9304A	MY50390009	03/04/2023
5	Power Sensor	Agilent	E9300A	MY41498315	03/04/2023
6	Wideband Radio Communication Tester	R&S	CMW500	157282	03/04/2023
7	Climate Chamber	Angul	AGNH80L	1903042120	03/04/2023
8	Dual Output DC Power Supply	Agilent	E3646A	MY40009992	03/04/2023
9	RF Control Unit	Tonscend	JS0806-2	/	03/04/2023

Transmitter spurious emissions & Receiver spurious emissions					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
1	EMI Test Receiver	R&S	ESR	102525	03/04/2023
2	High Pass Filter	Chengdu E-Microwave	OHF-3-18-S	0E01901038	03/04/2023
3	High Pass Filter	Chengdu E-Microwave	OHF-6.5-18-S	0E01901039	03/04/2023
4	Spectrum Analyzer	HP	8593E	3831U02087	03/04/2023
5	Ultra-Broadband logarithmic period Antenna	Schwarzbeck	VULB 9163	01230	12/04/2023
6	Loop Antenna	Beijin ZHINAN	ZN30900C	18050	03/04/2023
7	Spectrum Analyzer	R&S	FSV40-N	101798	03/04/2023
8	Horn Antenna	Schwarzbeck	BBHA 9120 D	2023	03/29/2023
9	Pre-Amplifier	Schwarzbeck	BBV 9745	9745#129	03/04/2023
10	Pre-Amplifier	EMCI	EMC051835SE	980662	03/04/2023

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
1	LISN	R&S	ENV432	1326.6105.02	03/04/2023
2	EMI Test Receiver	R&S	ESR	102524	03/04/2023
3	Manual RF Switch	JS TOYO	/	MSW-01/002	03/04/2023

Note:

1)The Cal. Interval was one year.

2)The cable loss has calculated in test result which connection between each test instruments.

2.5. Test Software

Software name	Model	Version
Conducted emission Measurement Software	EZ-EMC	EMC-Con 3A1.1
Radiated emission Measurement Software	EZ-EMC	FA-03A.2.RE
Bluetooth and WIFI Test System	JS1120-3	2.5.77.0418

3. TEST ITEM AND RESULTS

3.1. Antenna requirement

Requirement

FCC CFR Title 47 Part 15 Subpart C Section 15.203:

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.

Test Result

The directional gain of the antenna less than 6dBi, please refer to the EUT internal photographs antenna photo.

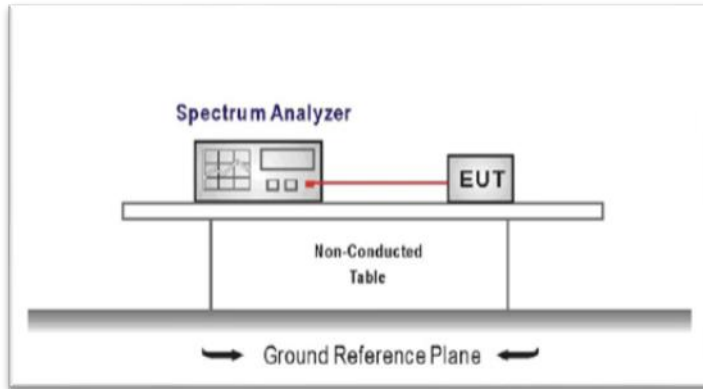
Note: The antenna is permanently fixed to the EUT

3.2. Occupied Bandwidth

Limit

The bandwidth of the emission shall be no wider than 0.25% of the center frequency

Test Configuration



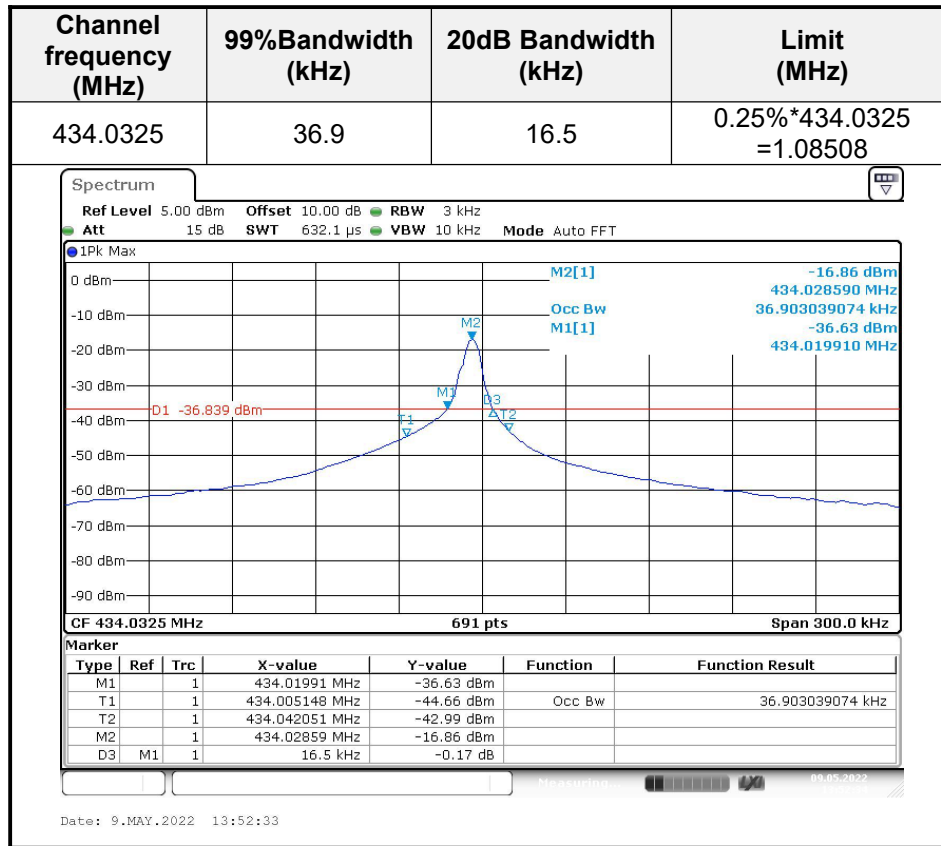
Test Procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
 Span = approximately 2 to 3 times the 99% bandwidth, centered on a operation channel
 RBW $\geq$ 1% of the 20 dB bandwidth, VBW $\geq$ RBW
 Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

Test Mode

Please refer to the clause 2.3.

Test Results



TRF No. FCC Part 15.231_R1

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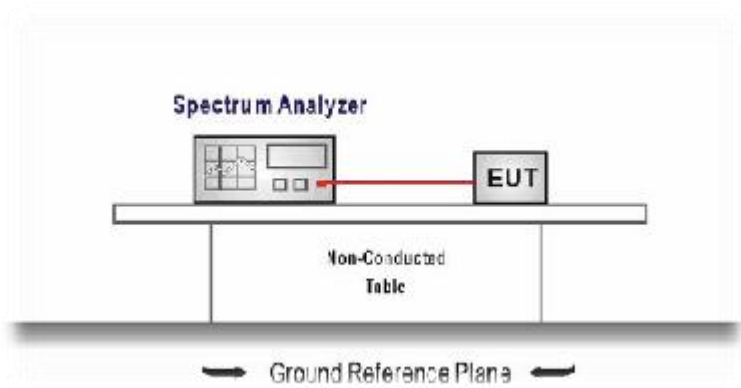
Tel : +(86) 0755-2985 2678 Fax: +(86) 0755-2985 2397 E-mail : info@gdkesign.cn Web: www.gdkesign.com

3.3. Deactivation Time

Limit

A manually operated transmitter shall employ a switch that will auto-matically deactivate the transmitter within not more than 5 seconds of being released.

Test Configuration



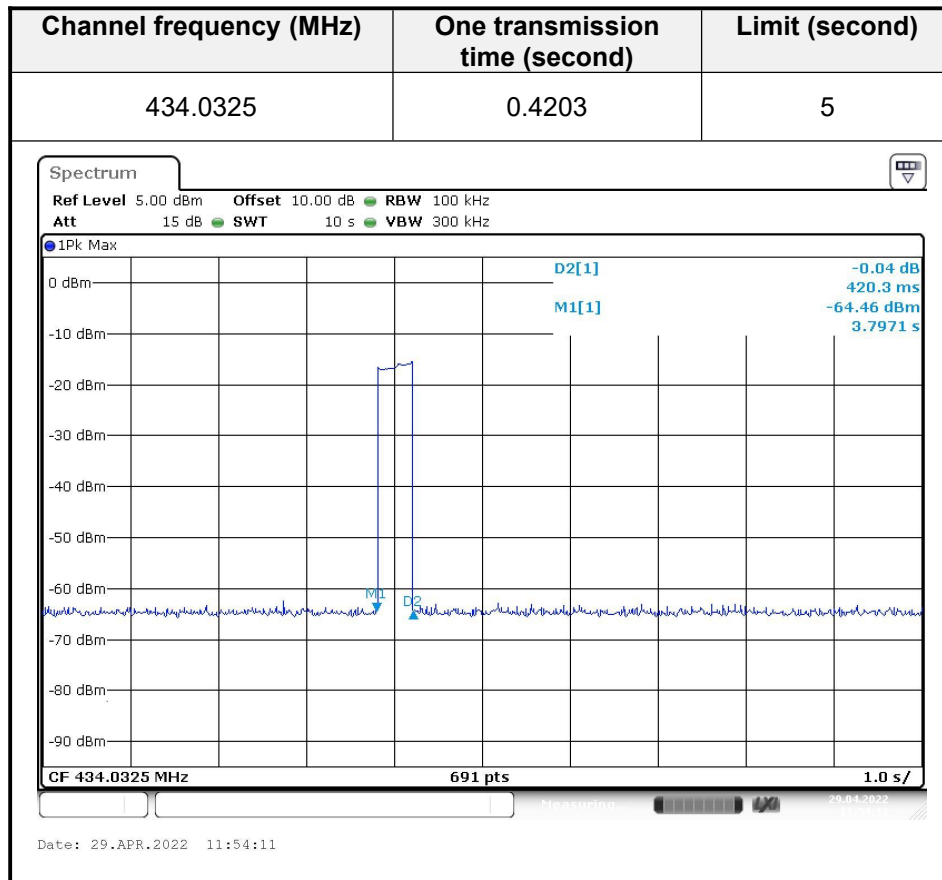
Test Procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
Frequency=Center carrier frequency
RBW=100KHz, VBW=300KHz, Span= 0,
Sweep time= 10 second, Detector function = peak, Trace = single
4. Measure and record the results in the test report.

Test Mode

Please refer to the clause 2.3.

Test Results



TRF No. FCC Part 15.231_R1

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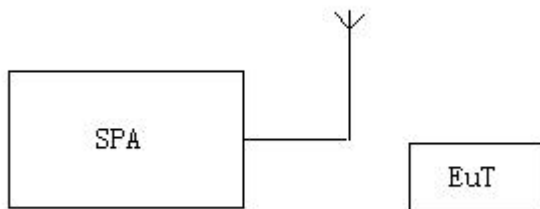
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3.4. Duty Cycle Correction factor

Test Procedure

1. Set the parameters of SPA as below:
Centre frequency = Operation Frequency
RBW=100KHz; VBW=300KHz
Span: 0Hz
Sweep time: more than two pulse trains or more than each type of pulse occupancy time
2. Set the EUT to transmit by manually operated. Use the “Delta mark” function of SPA to find the period time between two pulse trains and each type of pulse occupancy time.
3. Record the plots and Reported.

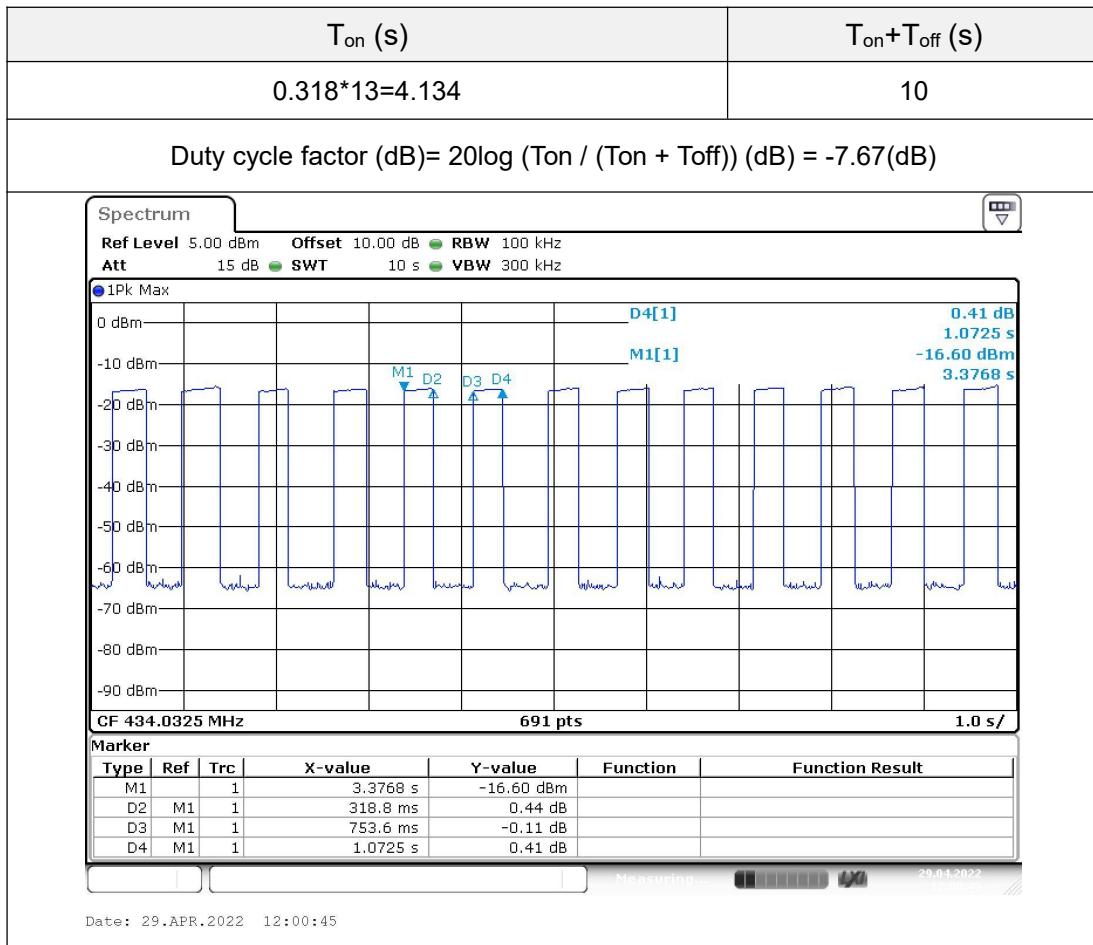
Test Configuration



Test Mode

Please refer to the clause 2.3.

Test Results



3.5. Spurious Emission (radiated)

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.209

Radiated Emission Limits (9 kHz~1000 MHz)

Frequency (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009~0.490	$2400/F(\text{KHz})$	300
0.490~1.705	$24000/F(\text{KHz})$	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

FCC CFR Title 47 Part 15 Subpart C Section 15.213(b)

The field strength of emissions from intentional radiators operated **average value** under this section shall not exceed the following

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
260 - 470 MHz	3,750 to 12,500 **	375 to 1,250 **

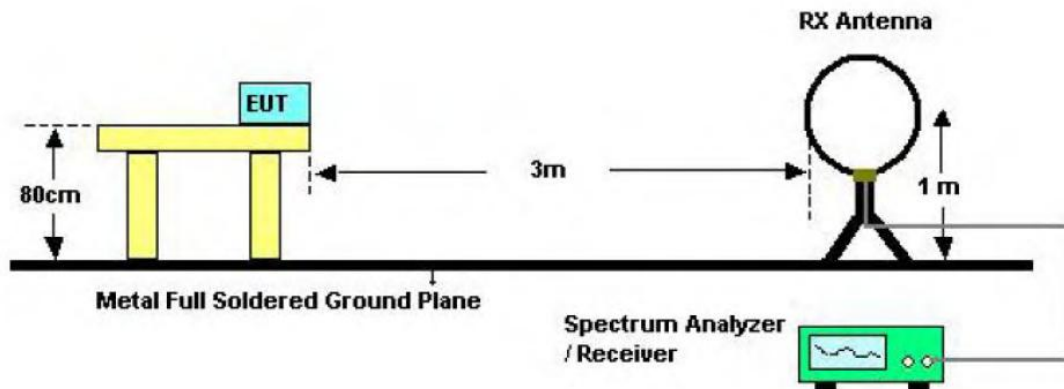
** linear interpolations

F is 434.0325MHz

Field strength of fundamental: $\mu\text{V/m}$ at 3 meters = $41.6667(F) - 7083.3420$

Field strength of harmonics: $\mu\text{V/m}$ at 3 meters = $4.16667(F) - 708.3342$

Test Configuration

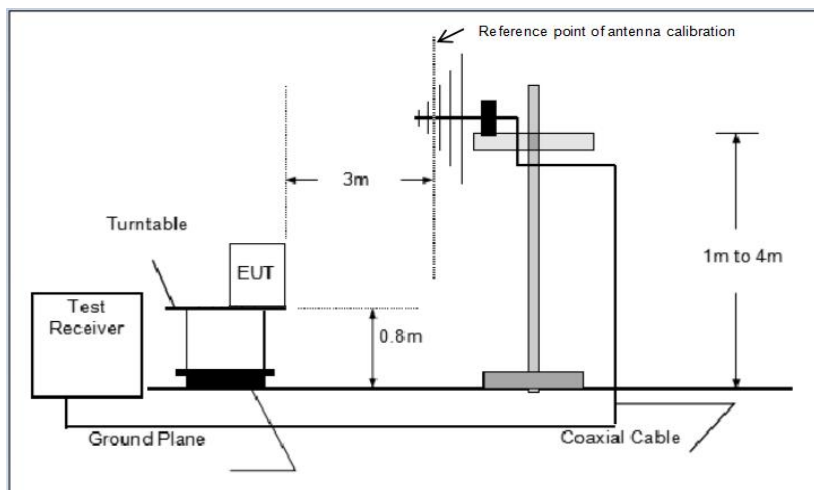


TRF No. FCC Part 15.231_R1

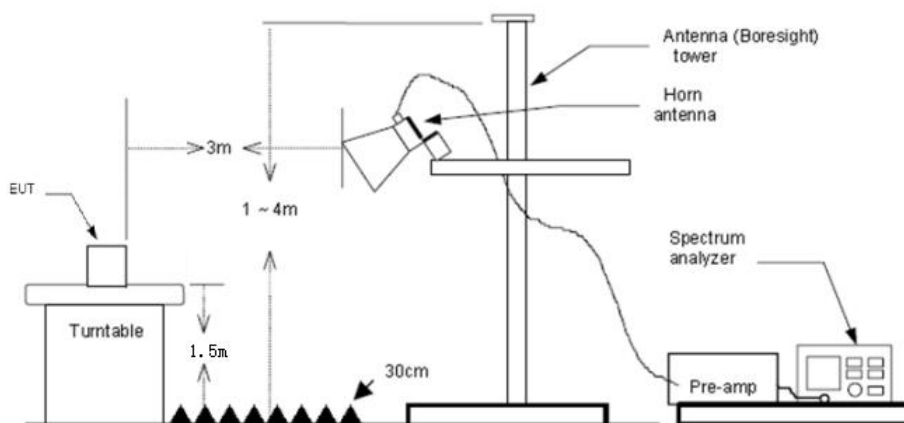
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Below 30MHz Test Setup



Below 1000MHz Test Setup



Above 1GHz Test Setup

Test Procedure

1. The EUT was setup and tested according to ANSI C63.10:2013
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Below 1 GHz:
RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
 - (3) From 1 GHz to 10th harmonic:
RBW=1MHz, VBW=3MHz Peak detector for Peak value.
RBW=1MHz, VBW=10Hz Peak detector for Average value.

Test Mode

Please refer to the clause 2.3.

Test Result**9 KHz~30 MHz , 30MHz-1GHz and 1GHz~5GHz**

From 9 KHz~30 MHz, 30MHz-1GHz and 1GHz~5GHz: Conclusion: PASS

Note:

- 1) Final level = Reading level + Correct Factor
Correct Factor=Antenna Factor + Cable Loss -Preamplifier Factor
- 2) The emission levels of other frequencies are very lower than the limit and not show in test report.
- 3) The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

RADIATED EMISSION BELOW 30MHZ

No emission found between lowest internal used/generated frequencies to 30MHz.

■ 30MHz~ 1000MHz

Field Strength of Fundamental, Harmonic

Frequency (MHz)	Peak Level (dBuV/m)	Peak Level Limit (dBμV/m)	Margin (dB)	Polarization
434.0325	75.18	100.83	-25.65	Vertical
868.0650	47.25	80.83	-33.58	Vertical
434.0325	77.39	100.83	-23.44	Horizontal
868.0650	56.18	80.83	-24.66	Horizontal

Frequency (MHz)	Peak Level (dBuV/m)	Duty cycle factor(dB)	AV Level (dBuV/m)	AV Level Limit (dBμV/m)	Margin (dB)	Polarization
434.0325	75.18	-7.67	67.51	80.83	-13.32	Vertical
868.0650	48.61	-7.67	40.94	60.83	-19.89	Vertical
434.0325	78.76	-7.67	71.09	80.83	-9.74	Horizontal
868.0650	57.51	-7.67	49.84	60.83	-10.99	Horizontal

Note:

Duty cycle factor = $20\log(\text{Duty cycle})$, Duty cycle = $T_{on} / (T_{on} + T_{off})$

AV Level=Peak Level +Duty cycle factor

1GHz~ 5GHz

Field Strength of Harmonic

Test Channel				433.90MHz			
Frequency (MHz)	Reading Level (dBuV/m)	Correct Factor (dB)	Final level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization	Test value
1301.70	55.607	-10.502	45.105	80.83	-35.725	Vertical	Peak
1735.60	56.512	-10.113	46.399	80.83	-34.431	Vertical	
2169.520	60.641	-10.262	50.379	80.83	-30.451	Vertical	
2603.482	63.213	-10.537	52.676	80.83	-28.154	Vertical	
3471.250	49.296	-9.113	40.183	80.83	-40.647	Vertical	
1301.70	56.412	-10.578	45.834	80.83	-34.996	Horizontal	
1735.60	56.493	-10.162	46.331	80.83	-34.499	Horizontal	
2169.520	63.354	-10.292	53.062	80.83	-27.768	Horizontal	
2603.482	67.468	-9.905	57.563	80.83	-23.267	Horizontal	
3471.250	57.336	-9.073	48.263	80.83	-32.567	Horizontal	

Correct Factor=Antenna Factor + Cable Loss -Preamplifier Factor

Frequency (MHz)	Peak Level (dBuV/m)	Duty cycle Factor	AV Level (dBuV/m)	FCC Limit (dBuV/m)	Margin (dB)	Polarization
1301.70	45.105	-7.67	37.435	60.83	-23.395	Vertical
1735.60	46.399	-7.67	38.729	60.83	-22.101	Vertical
2169.520	50.379	-7.67	42.709	60.83	-18.121	Vertical
2603.482	52.676	-7.67	45.006	60.83	-15.824	Vertical
3471.250	40.183	-7.67	32.513	60.83	-28.317	Vertical
1301.70	45.834	-7.67	38.164	60.83	-22.666	Horizontal
1735.60	46.331	-7.67	38.661	60.83	-22.169	Horizontal
2169.520	53.062	-7.67	45.392	60.83	-15.438	Horizontal
2603.482	57.563	-7.67	49.893	60.83	-10.937	Horizontal
3471.250	48.263	-7.67	40.593	60.83	-20.237	Horizontal

Correct Factor=Antenna Factor + Cable Loss -Preamplifier Factor

Spurious Emission

Test Channel				433.90MHz			
Frequency (MHz)	Reading Level (dBuV/m)	Correct Factor (dB)	Final level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization	Test value
1302.357	49.721	-10.569	39.152	74	-34.848	Vertical	Peak
1735.999	40.023	-10.913	29.110	74	-44.890	Vertical	
2169.611	49.358	-9.892	39.466	74	-34.534	Vertical	
1302.357	51.29	-10.452	40.838	74	-33.162	Horizontal	
1735.999	41.963	-10.687	31.276	74	-42.724	Horizontal	
2169.611	41.072	-9.801	31.271	74	-42.729	Horizontal	

Correct Factor=Antenna Factor + Cable Loss -Preamplifier Factor

Frequency (MHz)	Peak Level (dBuV/m)	Duty cycle factor	AV Level (dBuV/m)	FCC Limit (dBuV/m)	Margin (dB)	Polarization
1302.357	39.152	-7.67	31.482	54	-22.518	Vertical
1735.999	29.110	-7.67	21.440	54	-32.560	Vertical
2169.611	39.466	-7.67	31.796	54	-22.204	Vertical
1302.357	40.838	-7.67	33.168	54	-20.832	Horizontal
1735.999	31.276	-7.67	23.606	54	-30.394	Horizontal
2169.611	31.271	-7.67	23.601	54	-30.399	Horizontal

Note:

Duty cycle factor = $20\log(\text{Duty cycle})$, Duty cycle = $\text{Ton} / (\text{Ton} + \text{Toff})$

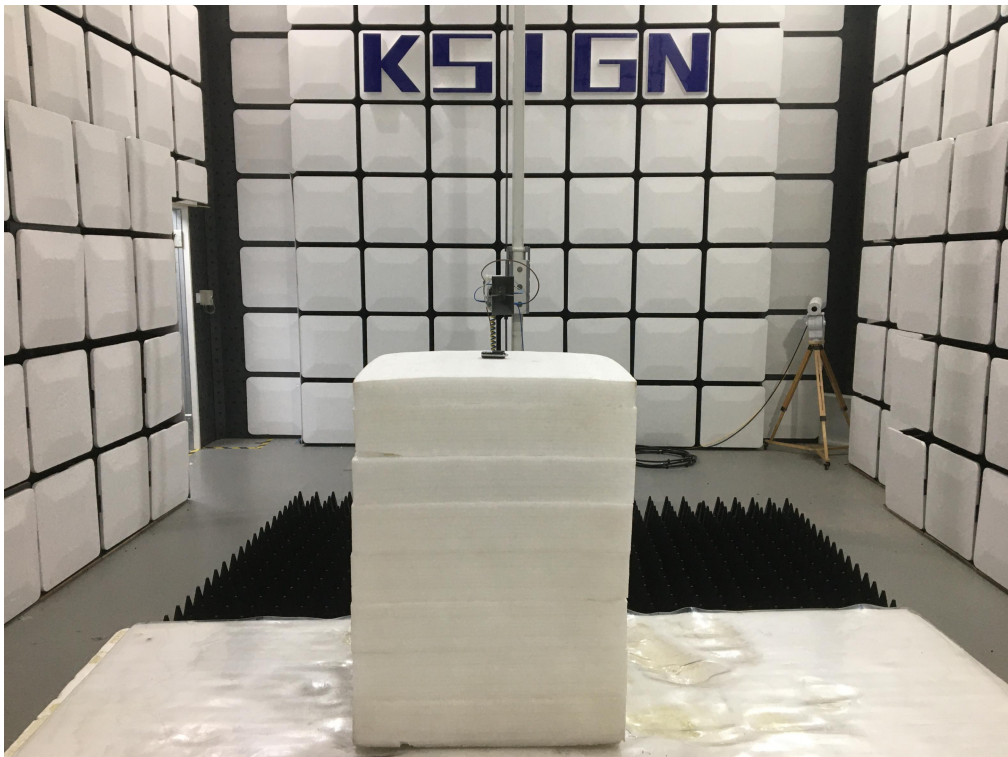
AV Level=Peak Level +Duty cycle factor

4.EUT TEST PHOTOS

Radiated Measurement (Below 1GHz)



Radiated Measurement (Above 1GHz)



5. PHOTOGRAPHS OF EUT CONSTRUCTIONAL

Reference to the document No.: External Photos and Internal Photos.

--THE END--