

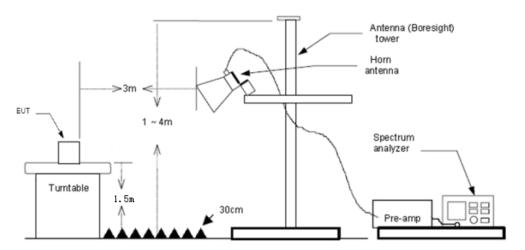


3.8. Band Edge Emissions(Radiated)

Limit

Postrioted Fraguency Pand (MUz)	(dBuV/m)(at 3m)					
Restricted Frequency Band (MHz)	Peak	Average				
2310 ~2390	74	54				
2483.5 ~2500 74 54						
Note: All restriction hands have been tested, only the worst case is reported						

Test Configuration



Test Procedure

- 1. The EUT was setup and tested according to ANSI C63.10:2020 requirements.
- The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- 3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
- 4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2020on radiated measurement.
- 5. The receiver set as follow:

RBW=1MHz, VBW=3MHz PEAK detector for Peak value.

RBW=1MHz, VBW=10Hz with PEAK Detector for Average Value.

Test Mode

Please refer to the clause 2.2.

TRF No. FCC Part 15.247_R1

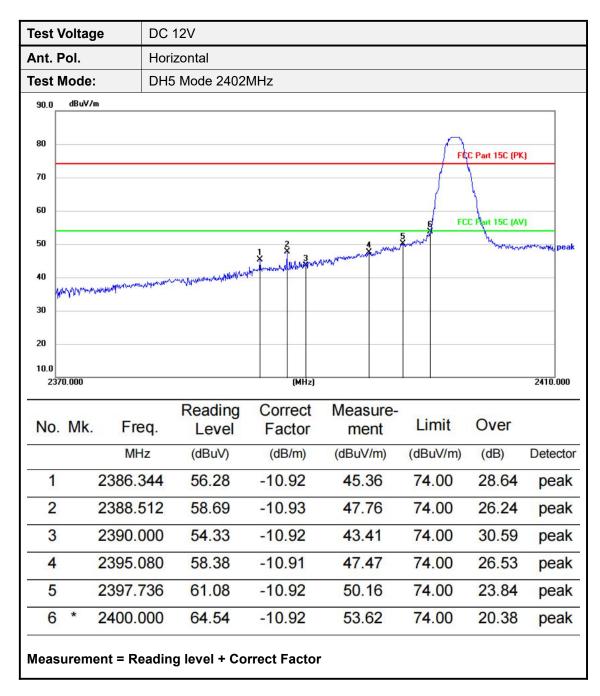
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Test Results

Note:

- 1.Measurement = Reading level + Correct Factor
- 2. Correct Factor=Antenna Factor + Cable Loss Preamplifier Factor
- 3.Pre-scan DH5, 2DH5 and 3DH5 modulation, and found the DH5 modulation which it is worse case, so only show the test data for worse case.



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DC 12V Test Voltage Ant. Pol. Vertical Test Mode: DH5 Mode 2402 MHz dBuV/m 90.0 80 FCC Part 15C (PK) 70 60 FCC Plant 15C (AV) 50 40 30 20 10.0 2370.000 (MHz) 2410.000 Reading Correct Measure-Limit Over No. Mk. Freq. Level Factor ment MHz (dBuV) (dB/m) (dBuV/m) (dBuV/m) (dB) Detector 2378.080 46.61 -10.9235.69 74.00 38.31 1 peak 2 2388.488 49.80 -10.9238.88 74.00 35.12 peak 3 2390.000 46.63 -10.9235.71 74.00 38.29 peak 4 2393.600 52.34 -10.9241.42 74.00 32.58 peak 5 2396.732 28.83 56.09 -10.9245.17 74.00 peak

Measurement = Reading level + Correct Factor

63.95

-10.92

53.03

74.00

20.97

peak

2400.000

6

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Test Voltage DC 12V Ant. Pol. Horizontal DH5 Mode 2480MHz **Test Mode:** 90.0 80 FCC Part 15C (PK) 70 60 FCC Part 15C (AV) 50 40 30 20 10.0 2475.000 (MHz) 2500.000

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1	*	2483.500	59.34	-10.88	48.46	74.00	25.54	peak
2		2486.642	58.13	-10.88	47.25	74.00	26.75	peak
3		2488.990	56.31	-10.89	45.42	74.00	28.58	peak
4		2493.128	57.56	-10.89	46.67	74.00	27.33	peak
5		2497.185	52.89	-10.88	42.01	74.00	31.99	peak
6		2500.000	46.52	-10.88	35.64	74.00	38.36	peak

Measurement = Reading level + Correct Factor

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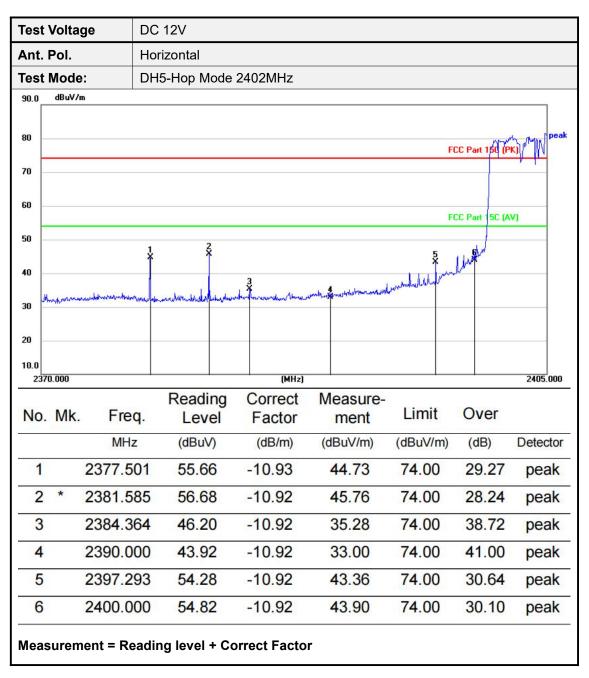


DC 12V Test Voltage Ant. Pol. Vertical Test Mode: DH5 Mode 2480 MHz dBuV/m 80 FCC Part 15C (PK) 70 60 FCC Part 15C (AV) 50 40 30 20 10.0 2475.000 (MHz) 2500.000 Reading Correct Measure-Limit Over No. Mk. Freq. Level Factor ment MHz (dBuV) (dB/m) (dBuV/m) (dBuV/m) (dB) Detector 2483.500 58.21 -10.8847.33 74.00 26.67 1 peak 2 2485.613 55.38 -10.8844.50 74.00 29.50 peak 3 2487.390 53.84 74.00 31.04 -10.8842.96 peak 50.97 4 2489.690 -10.8940.08 74.00 33.92 peak 48.52 5 2492.617 37.63 36.37 -10.8974.00 peak 6 2500.000 43.76 -10.8832.88 74.00 41.12 peak

Measurement = Reading level + Correct Factor

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Test Voltage DC 12V Ant. Pol. Vertical Test Mode: DH5-Hop Mode 2402 MHz dBuV/m 90.0 80 FCC Part 70 60 15C (AV) why when the same of the same 50 40 30 20 10.0 2370.000 (MHz) 2405.000 Reading Correct Measure-Limit Over Freq. No. Mk. Level Factor ment MHz (dBuV) (dB/m) (dBuV/m) (dBuV/m) (dB) Detector 1 2380.906 55.78 -10.9344.85 74.00 29.15 peak 2 2390.000 43.18 -10.9232.26 74.00 41.74 peak 3 2395.235 52.67 -10.9141.76 74.00 32.24 peak 4 2397.223 56.27 -10.9245.35 74.00 28.65 peak

Measurement = Reading level + Correct Factor

58.35

50.01

-10.92

-10.92

47.43

39.09

74.00

74.00

26.57

34.91

peak

peak

2398.956

2400.000

5

6

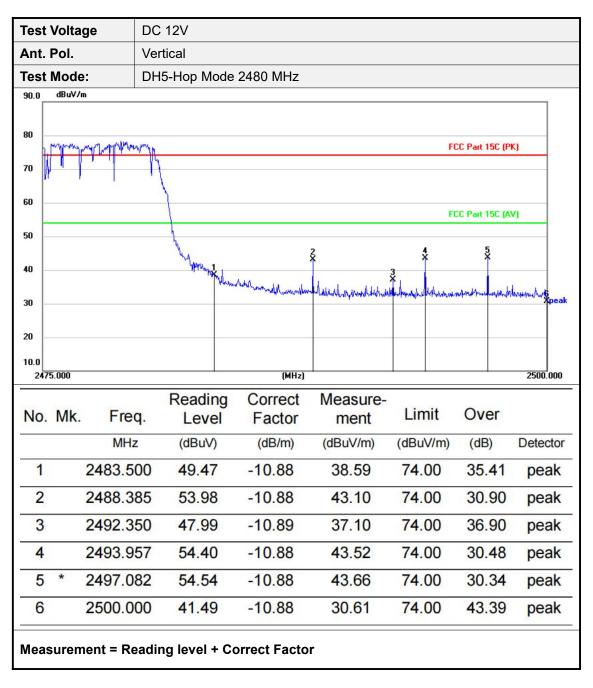
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DC 12V Test Voltage Horizontal Ant. Pol. Test Mode: DH5-Hop Mode 2480MHz dBuV/m 80 FCC Part 15C (PK) 70 60 FCC Part 15C (AV) 50 40 30 20 10.0 (MHz) 2475.000 2500.000 Correct Reading Measure-Limit Over No. Mk. Freq. Level Factor ment MHz (dBuV) (dB/m) (dBuV/m) (dBuV/m) (dB) Detector 1 2483.500 56.06 -10.8845.18 74.00 28.82 peak 2 2485.055 59.72 -10.8848.84 74.00 25.16 peak 3 2485.900 59.49 -10.8848.61 74.00 25.39 peak 4 2491.205 50.85 -10.8939.96 74.00 34.04 peak 5 2496.265 51.58 -10.8840.70 74.00 33.30 peak 6 2500.000 32.21 41.79 43.09 -10.8874.00 peak Measurement = Reading level + Correct Factor

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3.9. Radiated Spurious Emissions

Limit

Radiated Emission Limits (9 kHz~1000 MHz)

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

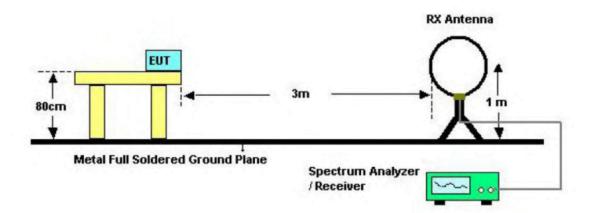
Radiated Emission Limit (Above 1000MHz)

Frequency	Distance Meters(at 3m)				
(MHz)	Peak	Average			
Above 1000	74	54			

Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission Level (dBuV/m)=20log Emission Level (uV/m).

Test Configuration

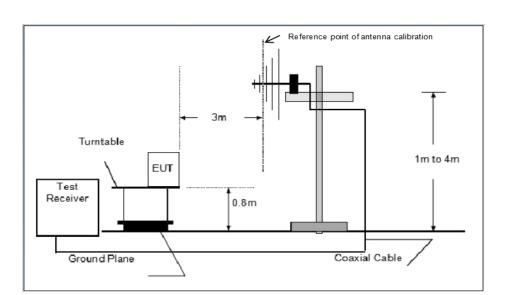


Below 30MHz Test Setup

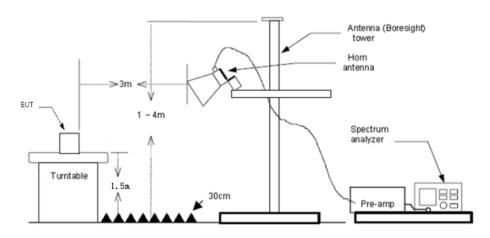
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Below 1000MHz Test Setup



Above 1GHz Test Setup

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Test Procedure

- 1. The EUT was setup and tested according to ANSI C63.10:2020
- 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.
- 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.
- 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 Peak value.

Test Mode

Please refer to the clause 2.2.

Test Result

9 KHz~30 MHz and 18GHz~25GHz

From 9 KHz~30 MHz and 18GHz~25GHz: Conclusion: PASS

Note:

- Measurement = Reading level + Correct Factor
 Correct Factor=Antenna Factor + Cable Loss -Preamplifier Factor
- 2) The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test
- 3) The emission levels of other frequencies are very lower than the limit and not show in test report.
- 4) The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
- 5) Pre-scan DH5, 2DH5 and 3DH5 modulation, found the DH5-CH00 Channel Below 1GHz and found the DH5 modulation which it is worse case for above 1GHz, so only show the test data for worse case.

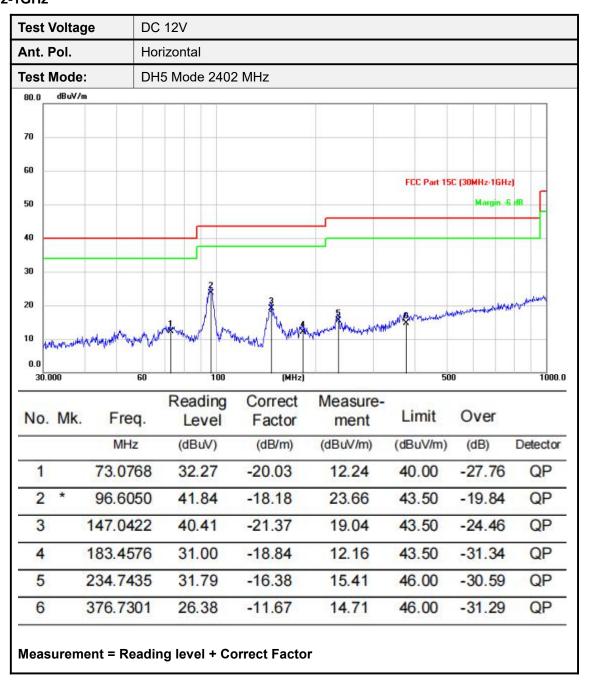
RADIATED EMISSION BELOW 30MHZ

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

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30MHz-1GHz



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Test Voltage DC 12V Ant. Pol. Vertical **Test Mode:** DH5 Mode 2402 MHz dBuV/m 70 60 FCC Part 15C (30MHz-1GHz) 50 40 30 20 10 0.0 30.000 60 (MHz) 500 1000.0 Reading Correct Measure-No. Mk. Freq. Limit Over Factor Level ment MHz (dBuV) (dB/m) (dBuV/m) (dBuV/m) (dB) Detector 1 49.4979 36.36 -15.6720.69 40.00 -19.31QP 2 72.1096 45.58 -19.9225.66 40.00 -14.34QP 3 84.8208 42.12 -20.6021.52 40.00 -18.48QP 4 95.3935 38.16 -18.3919.77 43.50 -23.73QP 5 140.9832 38.73 -21.2817.45 43.50 -26.05QP 223.8118 6 33.38 -16.9316.45 46.00 -29.55QP Measurement = Reading level + Correct Factor

Test \	Volta	age		12V						
Ant. F	1									
Test I	est Mode: TX DH5 Mode 2402MHz									
80.0	dBu∀	/m							FCC Part 15C (P	K)
70										
60									FCC Part 15C (A	vi
50					1	2 X	3 X	4 × 5		b
40							And who drawly with high	production of the state of	workenhannedways	
30	walestan	haliper for how we have many common to	ralantara	AND	all hadanika	and the second second				
20										
10										
0.0	0.000				000.000	(MHz)	6000.000	9000	1000	18000.000
1000	<i></i> 000			999	Corr	.TV. CO. SEET. 11	Measure	(37,71,71	.000	10000.000
No.	Mk	. Fre	eq.	Reading Level	Fac		ment	Limi	t Over	
		MH	lz	(dBuV)	(dB	/m)	(dBuV/m)	(dBuV/	(m) (dB)	Detecto
1		3203.2	200	55.31	-10.	22	45.09	74.00	28.91	peak
2		4003.9	900	56.70	-8.4	2	48.28	74.00	25.72	peak
3		4804.6	600	51.95	-5.9	2	46.03	74.00	27.97	peak
4		7205.0		47.88	-0.0	1,6720	47.79	74.00	740 3750 Television	peak
5		9608.8		43.19	3.2		46.40	74.00		<u> </u>
6	*	16782.8	300	37.56	13.3	37	50.93	74.00	23.07	peak
Meas	urei	ment = R	eadir	ig level + C	orrect F	acto	•			

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Test Voltage DC 12V Vertical Ant. Pol. Test Mode: TX DH5 Mode 2402MHz dBuV/m 80.0 FCC Part 15C (PK) 70 60 FCC Part 15C (AV) 50 40 30 20 10 0.0 1000.000 3000.000 (MHz) 6000.000 9000.000 18000.000 Reading Correct Measure-Limit Over No. Mk. Freq. Level Factor ment MHz (dBuV) (dB/m) (dBuV/m) (dBuV/m) (dB) Detector 1 3203.200 49.01 -10.2238.79 74.00 35.21 peak 2 3725.100 -9.1274.00 50.65 41.53 32.47 peak 3 4996.700 46.24 -5.4040.84 74.00 33.16 peak 27.24 5977.600 50.61 -3.8546.76 74.00 4 peak 5 14095.100 37.82 74.00 25.08 11.10 48.92 peak

Measurement = Reading level + Correct Factor

37.54

13.30

50.84

74.00

23.16

peak

16827.000

6

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Test Voltage DC 12V Ant. Pol. Horizontal Test Mode: TX DH5 Mode 2441MHz dBuV/m FCC Part 15C (PK) 70 60 FCC Part 15C (AV) 50 40 30 20 10 1000.000 3000.000 (MHz) 18000.000 6000.000 9000.000 Reading Correct Measure-Over Limit No. Mk. Freq. Level Factor ment MHz (dBuV) (dB/m) (dBuV/m) (dBuV/m) (dB) Detector 3254.200 -10.131 50.76 40.63 74.00 33.37 peak 2 3371.500 51.55 -9.9141.64 74.00 32.36 peak 3 -8.2074.00 25.52 4068.500 56.68 48.48 peak 4 4881.100 49.78 -5.7144.07 74.00 29.93 peak 5 8077.100 41.77 2.05 43.82 74.00 30.18 peak 6 17219.700 37.35 13.19 50.54 74.00 23.46 peak

Measurement = Reading level + Correct Factor

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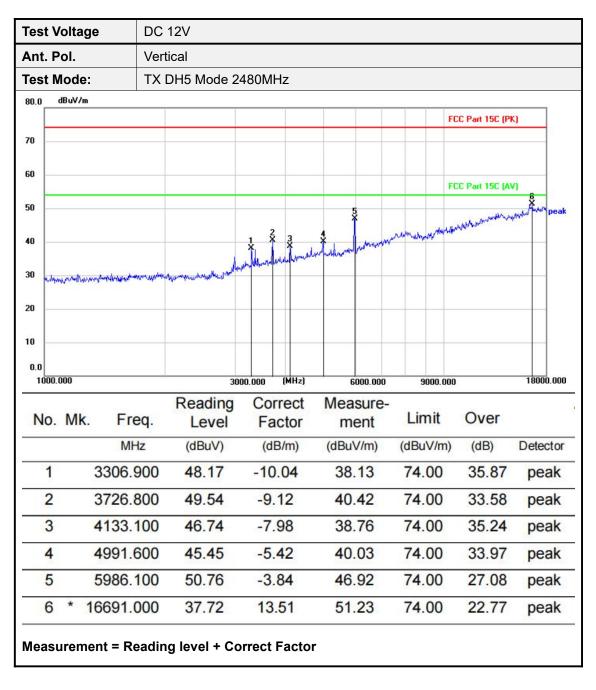
Test Voltage DC 12V Vertical Ant. Pol. Test Mode: TX DH5 Mode 2441MHz dBuV/m 80.0 FCC Part 15C (PK) 70 60 FCC Part 15C (AV) 50 40 30 20 10 1000.000 (MHz) 18000.000 3000.000 6000.000 9000.000 Reading Correct Measure-No. Mk. Limit Over Freq. Level Factor ment MHz (dBuV) (dB/m) (dBuV/m) (dBuV/m) (dB) Detector 1 3369.800 49.65 -9.9239.73 74.00 34.27 peak 2 3728.500 49.85 -9.1240.73 74.00 33.27 peak 3 45.94 33.48 4989.900 -5.4240.52 74.00 peak 5986.100 50.67 74.00 27.17 4 -3.8446.83 peak 41.44 5 8080.500 30.50 2.06 43.50 74.00 peak 16524.400 37.34 13.77 6 51.11 74.00 22.89 peak Measurement = Reading level + Correct Factor



DC 12V Test Voltage Ant. Pol. Horizontal Test Mode: TX DH5 Mode 2480MHz dBuV/m FCC Part 15C (PK) 70 60 FCC Part 15C (AV) 50 40 30 20 10 0.0 18000.000 1000.000 3000.000 (MHz) 6000.000 9000.000 Reading Correct Measure-Over Limit No. Mk. Freq. Factor Level ment MHz (dBuV) (dB/m) (dBuV/m) (dBuV/m) (dB) Detector 3305.200 51.39 -10.0441.35 74.00 32.65 1 peak 2 4133,100 -7.9848.82 74.00 25.18 56.80 peak 3 4959.300 47.17 -5.5141.66 74.00 32.34 peak 4 8191.000 41.14 2.01 43.15 74.00 30.85 peak 5 14001.600 38.21 11.23 49.44 74.00 24.56 peak 17665.100 37.80 74.00 22.73 6 13.47 51.27 peak Measurement = Reading level + Correct Factor

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Note:

- 1.All test modes had been tested. The GFSK(DH5) modulation is the worst case and recorded in the report.
- 2. 18GHz-26.5GHz is the background of the site, there is no radiated spurious.

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3.10. Conducted Emission

Limit

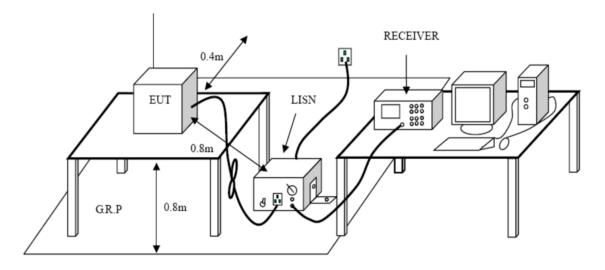
Conducted Emission Test Limit

Fraguanay	Maximum RF Line Voltage (dBμV)					
Frequency	Quasi-peak Level	Average Level				
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *				
500kHz~5MHz	56	46				
5MHz~30MHz	60	50				

Notes:

- (1) *Decreasing linearly with logarithm of the frequency.
- (2) The lower limit shall apply at the transition frequencies.
- (3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

Test Configuration



Test Procedure

- 1. The EUT was setup according to ANSI C63.10:2020 requirements.
- 2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
- 3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50ohm /50uH coupling impedance for the measuring equipment.
 - The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
- 4. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
- 5. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
- 6. Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
- 7. During the above scans, the emissions were maximized by cable manipulation.

Test Mode:

Please refer to the clause 2.2

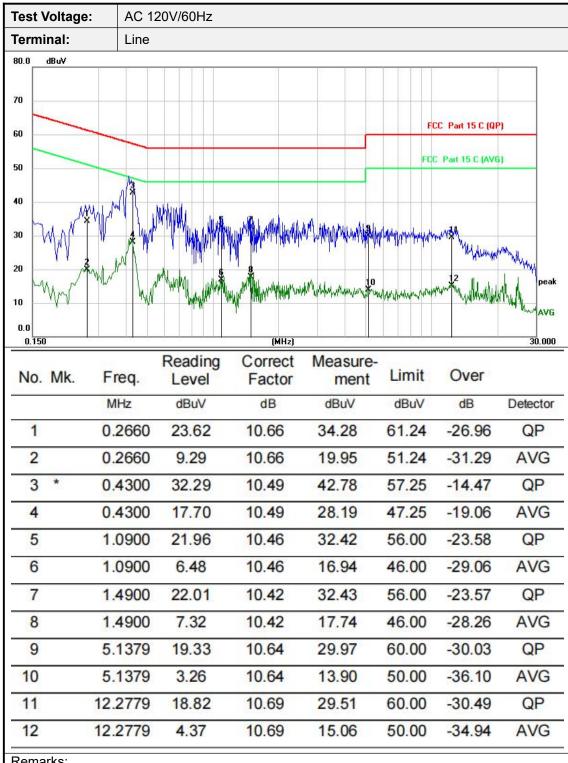
TRF No. FCC Part 15.247_R1

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Test Results

Pre-scan DH5, 2DH5,3DH5 modulation, and found the DH5 modulation 2402MHz which it is worse case, so only show the test data for worse case.



Remarks:

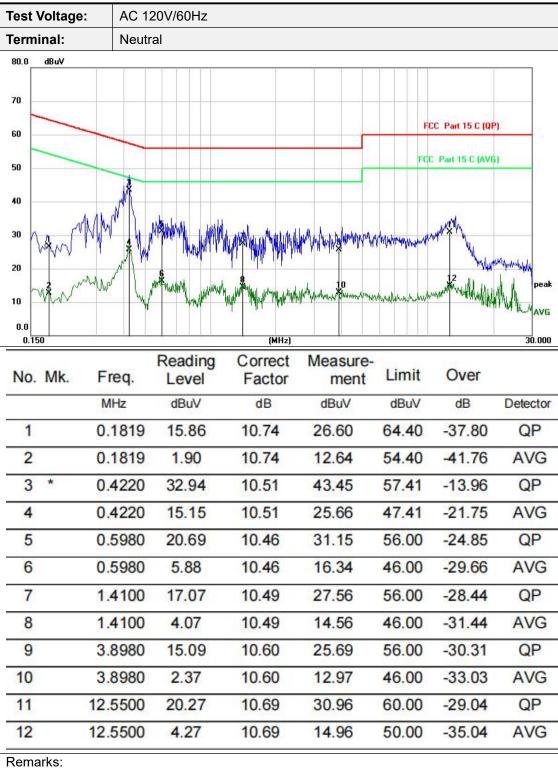
TRF No. FCC Part 15.247_R1

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^{1.}Measurement = Reading Level+ Correct Factor

^{2.}Over = Measurement -Limit





^{1.}Measurement = Reading Level+ Correct Factor

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^{2.}Over = Measurement -Limit



3.11. Pseudorandom Frequency Hopping Sequence

LIMIT

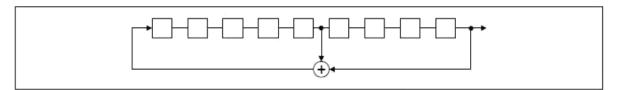
FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Al-ternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their cor-responding transmitters and shall shift frequencies in synchronization with the transmitted signals.

TEST RESULTS

The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5^{th} and 9^{th} stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the friststage. The sequence begins with the frist one of 9 consecutive ones, for example: the shift register is initialized with nine ones.

- Number of shift register stages: 9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An explame of pseudorandom frequency hopping sequence as follows:

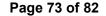


Each frequency used equally one the average by each transmitter.

The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

TRF No. FCC Part 15.247_R1

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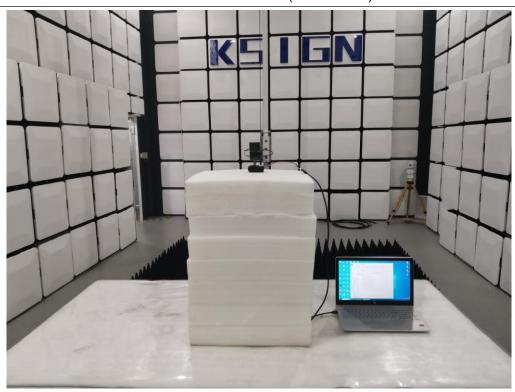


4.EUT TEST PHOTOS

Radiated Measurement (Below 1GHz)

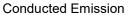


Radiated Measurement (Above 1GHz)



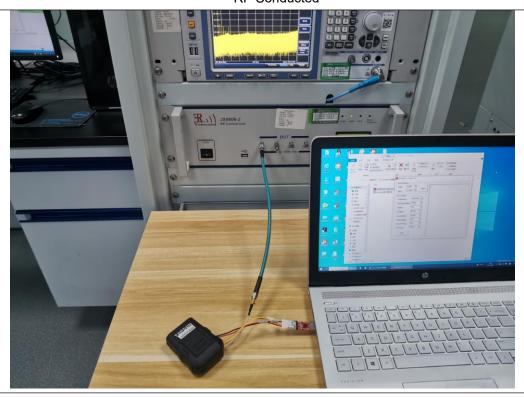
Add: Building 5, No. 316, Jianghong South Road Binjiang District, Hangzhou 310052, China



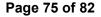




RF Conducted



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5.PHOTOGRAPHS OF EUT CONSTRUCTIONAL

External Photographs



Photo 2



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Photo 4



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Photo 6



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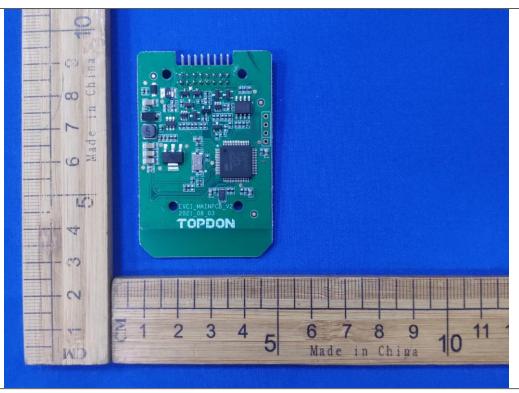


Internal Photographs





Photo 2



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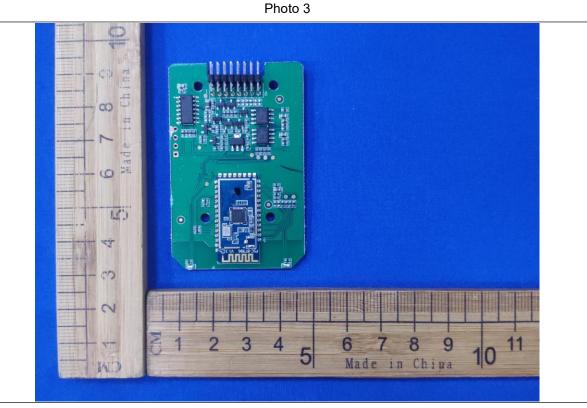


Photo 4



Add: Building 5, No. 316, Jianghong South Road Binjiang District, Hangzhou 310052, China





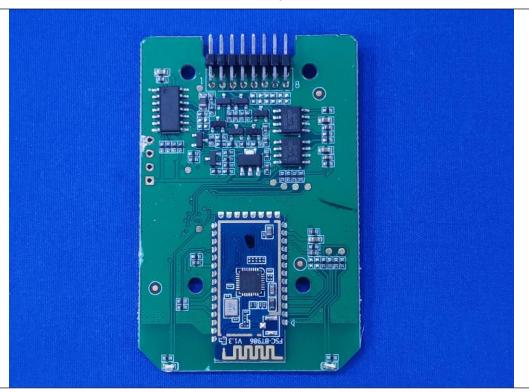
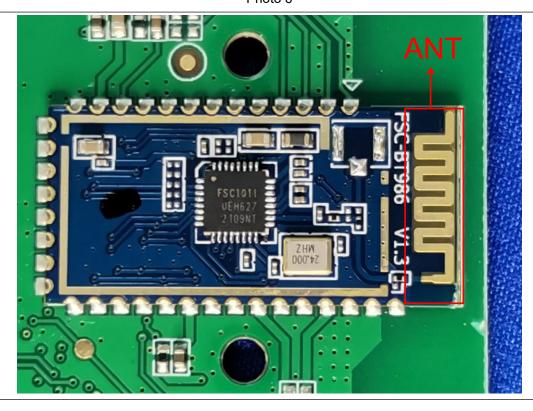


Photo 6



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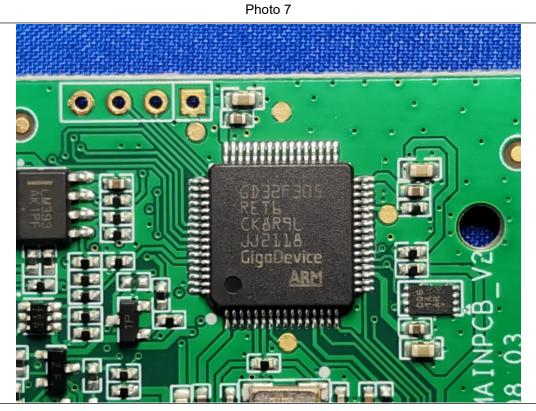
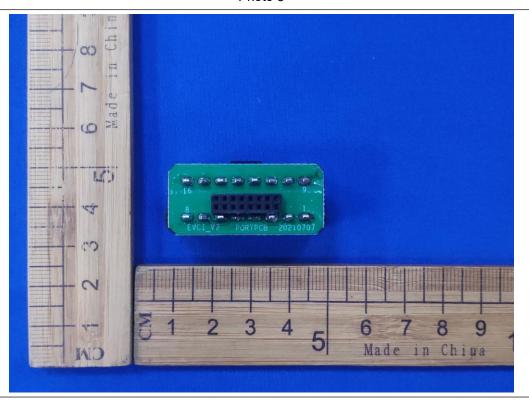
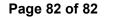


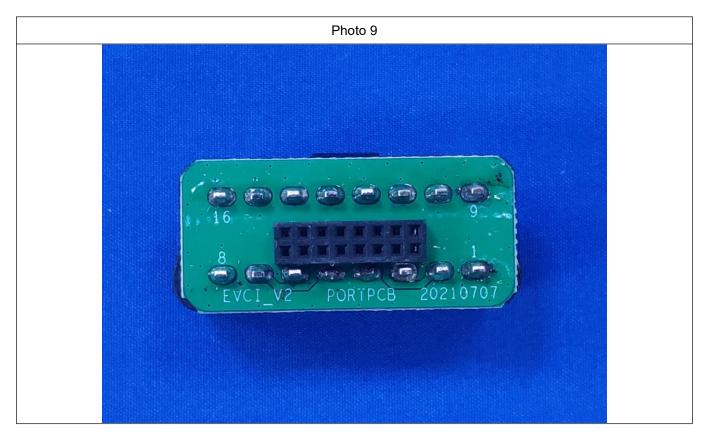
Photo 8



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--THE END--

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