

FCC RADIO TEST REPORT

For

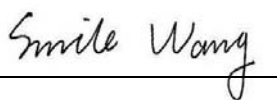
FCC ID: 2ATNI-KLJSQ-3001

Report Reference No. : 19EFAS09003 1861
 Date of issue : 2019-09-17
 Testing Laboratory : DongGuan ShuoXin Electronic Technology Co., Ltd.
 Address : Zone A, 1F, No. 6, XinGang Road YuanGang Street, XinAn District, ChangAn Town, DongGuan City, GuangDong, China
 Applicant's name : Huizhou Kunli Electronic Co Ltd
 Address : Xin wu zai villagers group Dongsheng Village Chenjiang Street Huizhou, Guangdong 516229 CHINA
 Manufacturer : Huizhou Kunli Electronic Co Ltd

Test specification:

Test item description : Control
 Trade Mark : N/A
 Model/Type reference : kljsq-3001
 Ratings : I/P: DC 12V

Responsible Engineer :


 Smile Wang

Authorized Signatory:

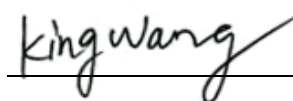

 King Wang

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TEST REPORT DECLARE

Applicant	:	Huizhou Kunli Electronic Co Ltd
Address	:	Xin wu zai villagers group Dongsheng Village Chenjiang Street Huizhou, Guangdong 516229 CHINA
Equipment under Test	:	Control
Test Model No	:	kljsq-3001
Manufacturer	:	Huizhou Kunli Electronic Co Ltd
Address	:	Xin wu zai villagers group Dongsheng Village Chenjiang Street Huizhou, Guangdong 516229 CHINA

Test Standard Used: FCC Rules and Regulations Part 15 Subpart C (15.231)

Test procedure used: ANSI C63.10:2013

We Declare:

The equipment described above is tested by DongGuan ShuoXin Electronic Technology Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and DongGuan ShuoXin Electronic Technology Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.

Report No:	19EFAS09003 1861		
Date of Test:	2019-08-29 To 2019-09-13	Date of Report:	2019-09-17

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of DongGuan ShuoXin Electronic Technology Co., Ltd.

1. Summary of test Standards and results

The EUT have been tested according to the applicable standards as referenced below.

Description of Test Item	Standard	Results
20dB Occupied Bandwidth	FCC Part 15.231(c)	PASS
Field Strength of Fundamental and Field Strength of Spurious Emissions	FCC Part 15.209,15.231(b)	PASS
Duration Time	15.231(a)	PASS
AC Line Conducted Emissions	FCC Part 15.207 (a)	N/A
Antenna requirement	FCC Part 15: 15.203	PASS

2. General test information

2.1. Description of EUT

EUT* Name	:	Control
Model Number	:	kljsq-3001
EUT function description	:	Please reference user manual of this device
Power supply	:	DC12V
Adaptor	:	N/A
Radio Technology	:	SRD
Operation frequency	:	303.82MHz
Modulation	:	FSK
Antenna Type	:	Internal Antenna, maximum PK gain: 0dBi
Date of Receipt	:	2019/08/29
Sample Type	:	Single production

Note: EUT is the ab. of equipment under test.

2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number or Type	Other
/	/	/	/

2.3. Assistant equipment used for test

Description of Assistant equipment	Manufacturer	Model number or Type	Other

2.4. Block diagram of EUT configuration for test



New battery is used during all test

EUT enters the engineering interface by clicking the system version to control EUT work in test mode as blow table.

2.5. Test environment conditions

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

Temperature range:	21-25℃
Humidity range:	40-75%
Pressure range:	86-106kPa

2.6. Measurement uncertainty

Test Item	Uncertainty
Uncertainty for Conduction emission test (9kHz-150kHz)	3.7 dB
Uncertainty for Conduction emission test (150kHz-30MHz)	3.3 dB
Uncertainty for Radiation Emission test (30MHz-200MHz)	4.60 dB (Polarize: V)
	4.60 dB (Polarize: H)
Uncertainty for Radiation Emission test (200MHz-1GHz)	6.10 dB (Polarize: V)
	5.08 dB (Polarize: H)
Uncertainty for Radiation Emission test (1GHz-6GHz)	5.01 dB (Polarize: V)
	5.01 dB (Polarize: H)
Uncertainty for Radiation Emission test (6GHz-18GHz)	5.26 dB (Polarize: V)
	5.26 dB (Polarize: H)
Uncertainty for Radiation Emission test (18GHz-40GHz)	5.06 dB (Polarize: V)
	5.06 dB (Polarize: H)
Uncertainty for radio frequency	$\pm 0.048\text{kHz}$
Uncertainty for conducted RF Power	$\pm 0.32\text{dB}$

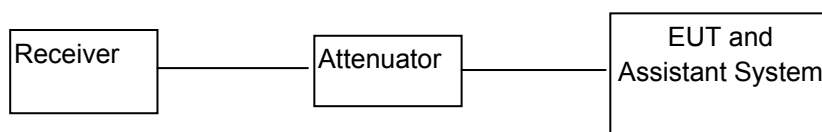
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3. 20dB Occupied Bandwidth

3.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Calibrated Date
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27	2019/05/28
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16	2018/12/17
3	RF Cable	Micable	C10-01-01-1	100309	2019/12/16	2018/12/17

3.2. Block diagram of test setup



3.3. Limits

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

3.4 Test Procedure

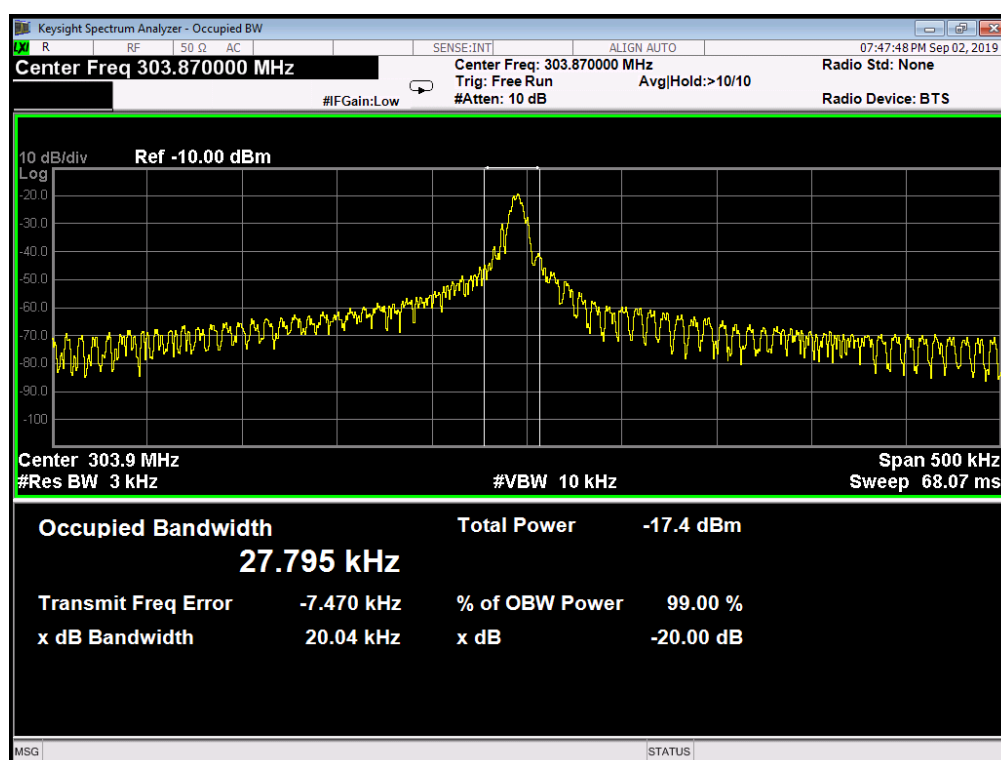
- (1) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- (2) Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- (3) Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.

3.5. Test Result

20dB bandwidth (MHz)	Limit (MHz)	Results
0.02004	0.75955	Pass

Note: Limit= Fundamental frequency $\times$ 0.25%=303.82 $\times$ 0.25%=0.75955MHz

3.6. Original test data



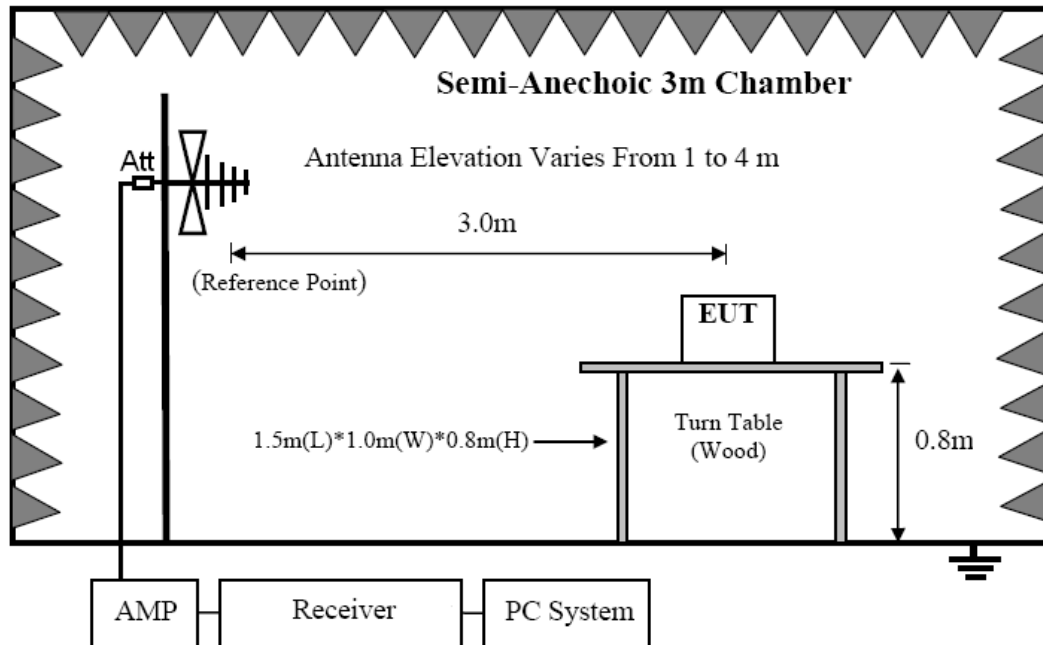
4. Field Strength of Fundamental And Field Strength of Spurious Emissions

4.1. Test equipment

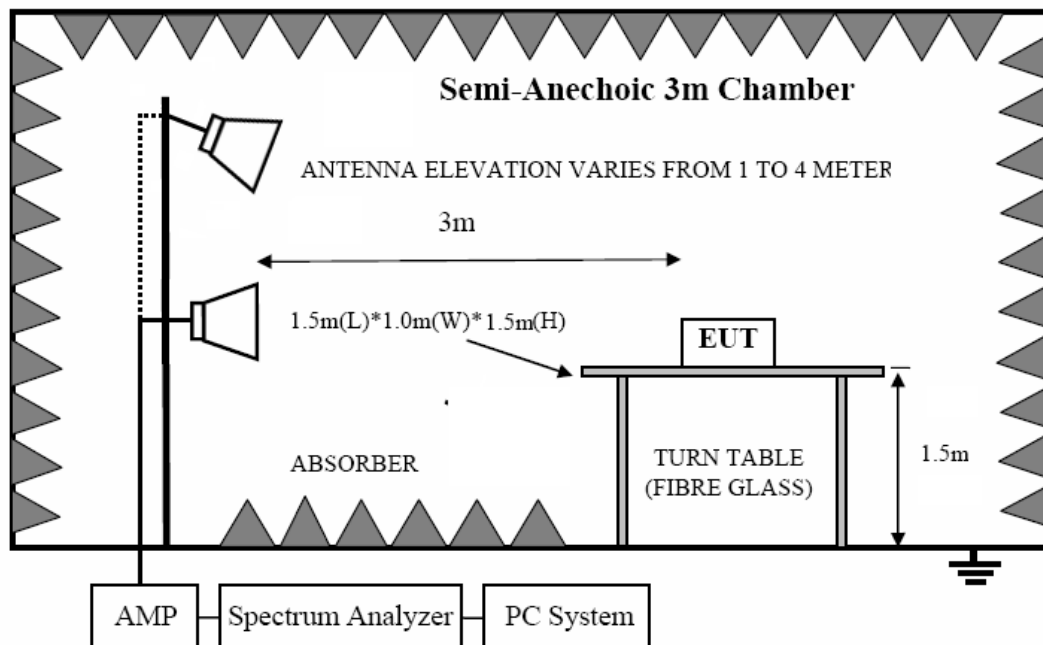
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	EMI Test Receiver	R&S	ESCI	101307	2019/12/16	1 Year
2	Spectrum Analyzer	Agilent	E4407B	US40240708	2019/11/20	1 Year
3	Spectrum analyzer	R&S	FSU	1166.1660.2 6	2019/12/16	1 Year
4	Loop antenna	TESEQ	HLA6120	20129	2019/12/16	1 Year
5	Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	2019/12/16	1 Year
6	Double Ridged Horn Antenna	Schwarzbeck	BBHA9120D	9120D 1065	2019/12/16	1 Year
7	Horn Antenna	Schwarzbeck	BBHA 9170	9170 1248	2019/12/16	1 Year
8	Pre-amplifier	A.H.	PAM-1840VH	562	2019/12/16	1 Year
9	Pre-amplifier	R&S	AFS33-18002 650-30-8P-44	SEL0080	2019/12/16	1 Year
10	Pre-Amplifier	HP	8449B	3274A06298	2019/12/16	1 Year
11	RF Cable	R&S	R01	10403	2019/12/16	1 Year
12	RF Cable	R&S	R02	10512	2019/12/16	1 Year
13	Measurement Software	Farad	EZ-EMC (Ver.ATT-03A)	N/A	N/A	N/A

4.2. Block diagram of test setup

In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

4.3. Limit

FCC 15.209 Limit

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V/m}$	$\text{dB}(\mu\text{V})/\text{m}$
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak) 54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average)	

FCC 15.231(a) limit

Fundamental Frequency (MHz)	Field strength of fundamental (millivolts/meter)	Field strength of spurious emissions (millivolts/meter)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750(see Note 1)	125 to 375(see Note 1)
174-260	3750	375
260-470	3750 to 12500(see Note 1)	375 to 1250(see Note 1)
Above 470	12500	1250

Note 1: For 130MHz-174MHz: Field Strength($\mu\text{V/m}$) = $(56.82 \cdot f) - 6136$

For 260MHz-470MHz: Field Strength($\mu\text{V/m}$) = $(41.67 \cdot f) - 7083$

$\text{dB}\mu\text{V/m} = 20 \log \mu\text{V/m}$

Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions.

$303.87\text{MHz limit} = 20 \log(41.67 \cdot 303.87) - 7083 \approx 74.9 \text{dB}\mu\text{V/m}$

$\text{AVG} = \text{peak} + 20 \log(\text{Duty Cycle})$

4.4. Test Procedure

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.
- (2) Setup EUT and assistant system according clause 2.4 and 8.2
- (3) Test antenna was located 3m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
 - (a) Change work frequency or channel of device if practicable.
 - (b) Change modulation type of device if practicable.
 - (c) Change power supply range from 85% to 115% of the rated supply voltage
 - (d) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions
- (4) Spectrum frequency from 9MHz to 4GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 9KHz to 30MHz, so below final test was performed with frequency range from 30MHz to 4GHz.
- (5) For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 2013 on Radiated Emission test.
- (6) For emissions from 30MHz to 1GHz, Quasi-Peak values were measured with EMI Receiver and the bandwidth of Receiver is 120 KHz.
- (7) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure, Detector is at PK; RBW is set at 1MHz, VBW is set at 3MHz for Average measure, Detector is at RMS..
- (8) For Field Strength of Fundamental were measured with Spectrum Analyzer, and the RBW is set at above 99% Occupied Bandwidth , VBW is set at equal to RBW for Peak measure, Detector is at PK

4.5. Test result(For 15.205)

Below 30M

EUT:	Control	Model No.:	Kljsq-3001
Temperature:	24℃	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 12V
Polarization:	--	Test Result:	Pass
Test Mode:	Keeping TX mode	Test By:	Smile

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	P
--	--	--	--	P

Note:

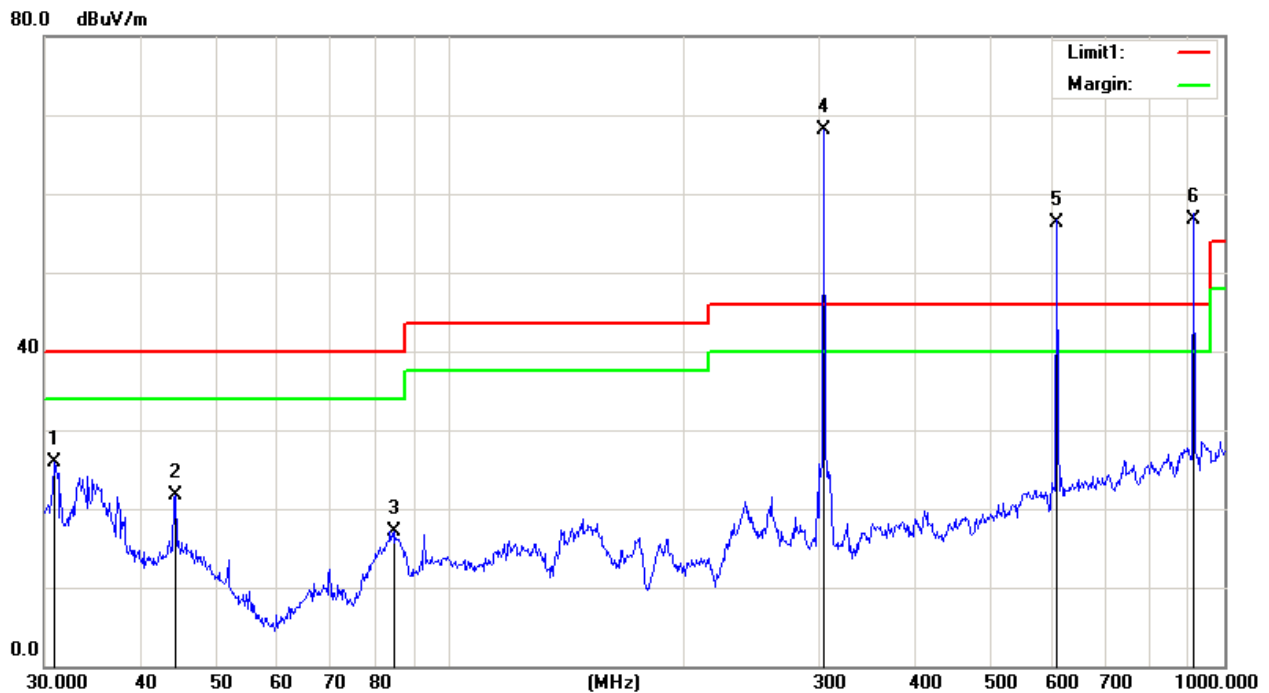
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $20 \log (\text{specific distance/test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor

Between 30M – 1000 MHz

EUT:	Control	Model No.:	kljsq-3001
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 12V
Polarization:	Vertical	Test Result:	Pass
Test Time:	2019-9-6	Test By:	
Standard:	(RE)FCC PART 15 class B 3m		
Test Mode:	TX		
Note:			

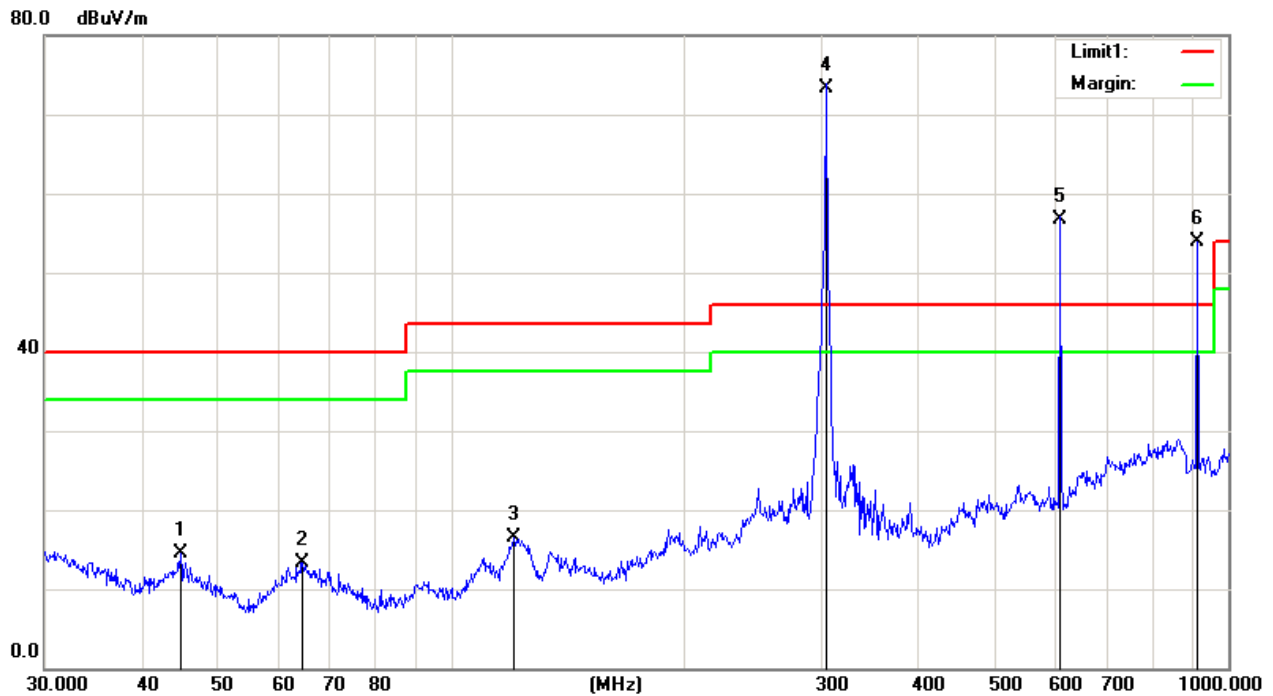


No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.8535	37.49	-11.56	25.93	40.00	-14.07	peak
2	44.2751	33.45	-11.81	21.64	40.00	-18.36	peak
3	84.7018	27.64	-10.56	17.08	40.00	-22.92	peak
4	303.5437	78.20	-10.01	68.19	46.00	22.19	peak
5	607.7866	32.92	23.30	56.22	46.00	10.22	peak
6	912.8619	27.53	29.11	56.64	46.00	10.64	peak

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

EUT:	Control	Model No.:	kljsq-3001
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 12V
Polarization:	Horizontal	Test Result:	Pass
Test Time:	2019-9-6	Test By:	
Standard:	(RE)FCC PART 15 class B 3m		
Test Mode:	TX		
Note:			



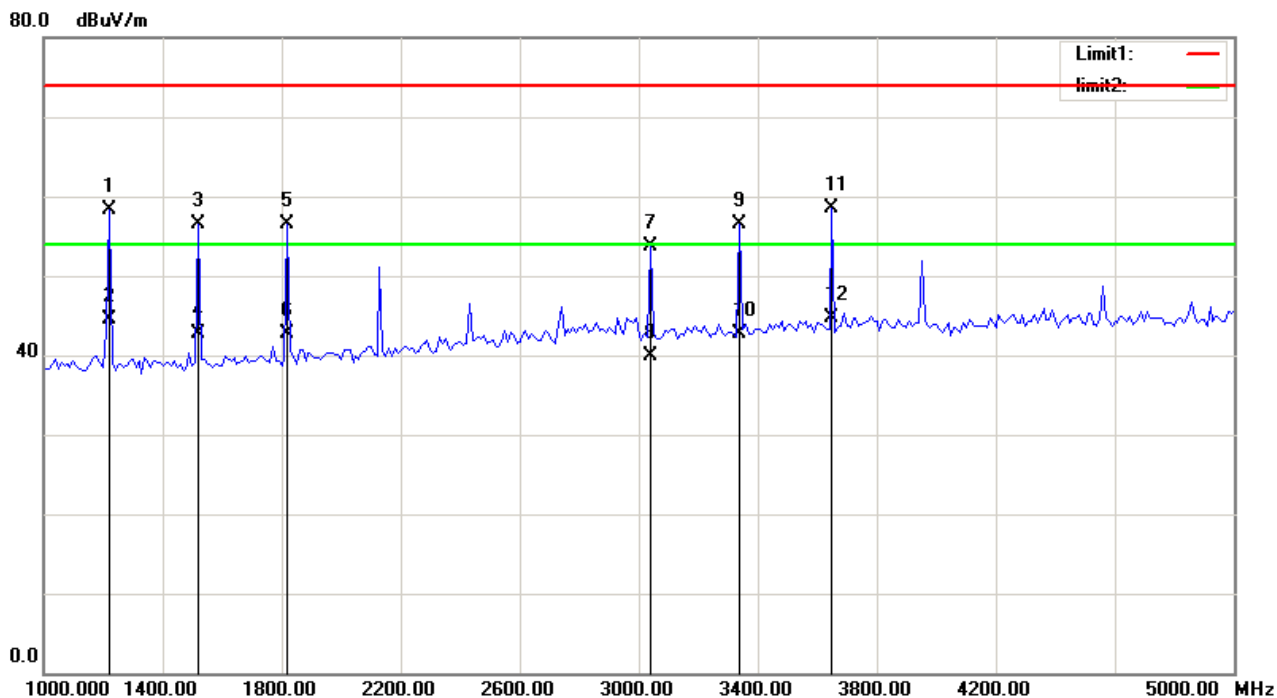
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	44.9004	28.65	-14.23	14.42	40.00	-25.58	peak
2	64.4330	27.38	-14.01	13.37	40.00	-26.63	peak
3	120.6991	29.00	-12.52	16.48	43.50	-27.02	peak
4	303.5437	81.84	-8.46	73.38	46.00	27.38	peak
5	607.7866	32.74	23.95	56.69	46.00	10.69	peak
6	912.8619	26.32	27.59	53.91	46.00	7.91	peak

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

Between 1000M – 5000 MHz

EUT:	Control	Model No.:	kljsq-3001
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 12V
Polarization:	Vertical	Test Result:	Pass
Test Time:	2019-9-11	Test By:	
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	TX		
Note:			

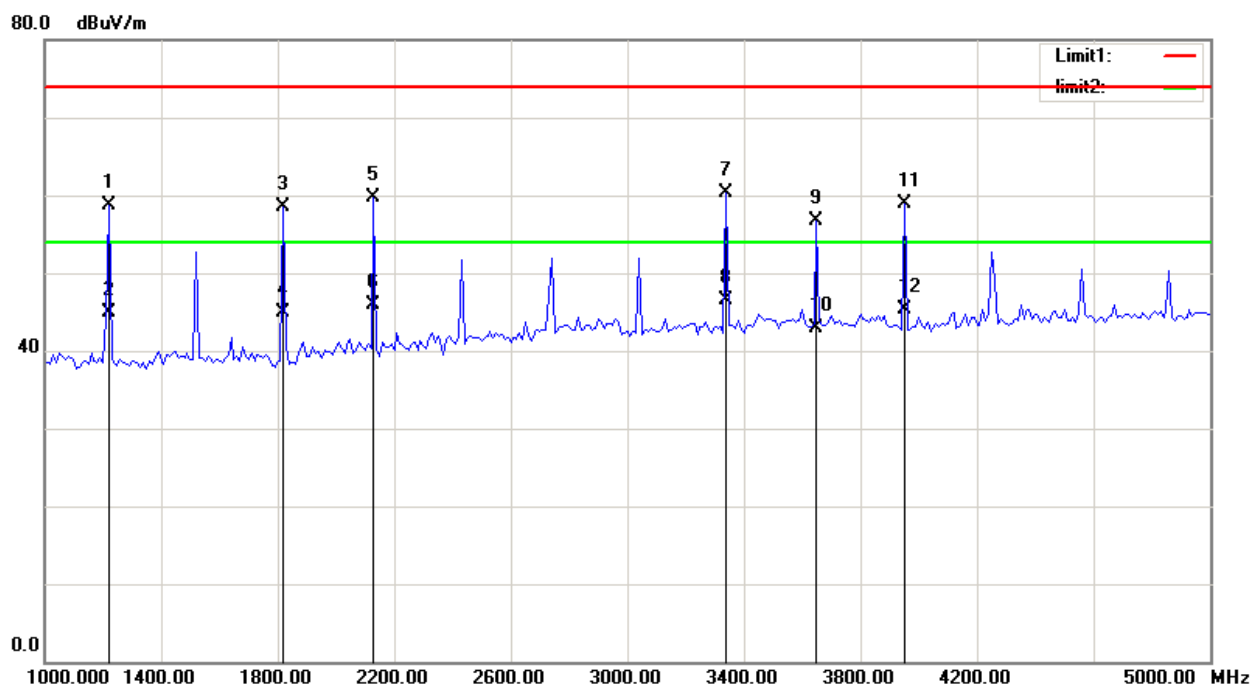


No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1220.000	72.20	-13.90	58.30	74.00	-15.70	peak
2	1220.000			45.65	54.00	-8.35	AVG
3	1520.000	69.82	-13.39	56.43	74.00	-17.57	peak
4	1520.000			43.78	54.00	-10.22	AVG
5	1820.000	68.84	-12.41	56.43	74.00	-17.57	peak
6	1820.000			43.78	54.00	-10.22	AVG
7	3040.000	61.78	-8.08	53.70	74.00	-20.30	peak
8	3040.000			41.05	54.00	-12.95	AVG
9	3340.000	64.03	-7.60	56.43	74.00	-17.57	peak
10	3340.000			43.78	54.00	-10.22	AVG
11	3650.000	65.36	-6.89	58.47	74.00	-15.53	peak
12	3650.000			45.82	54.00	-8.18	AVG

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

EUT:	Control	Model No.:	kljsq-3001
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 12V
Polarization:	Horizontal	Test Result:	Pass
Test Time:	2019-9-11	Test By:	
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	TX		
Note:			



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1220.000	72.60	-13.90	58.70	74.00	-15.30	peak
2	1220.000			46.05	54.00	-7.95	AVG
3	1820.000	70.94	-12.41	58.53	74.00	-15.47	peak
4	1820.000			45.88	54.00	-8.12	AVG
5	2130.000	70.63	-10.95	59.68	74.00	-14.32	peak
6	2130.000			47.03	54.00	-9.97	AVG
7	3340.000	67.92	-7.60	60.32	74.00	-13.68	peak
8	3340.000			47.67	54.00	-6.33	AVG
9	3650.000	63.57	-6.89	56.68	74.00	-17.32	peak
10	3650.000			44.03	54.00	-9.97	AVG
11	3950.000	64.94	-6.00	58.94	74.00	-15.06	peak
12	3950.000			46.29	54.00	-7.71	AVG

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

4.6 Test result(For 15.231)

EUT:	Control	Model No.:	kljsq-3001
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 12V
Polarization:	Vertical	Test Result:	Pass
Test Time:	2019-9-11	Test By:	
Standard:	FCC PART 15 C 30M-1G PEAK		
Test Mode:	TX		
Note:			

Frequency	Reading	Correct	Result	Limit	Margin	Remark
(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
303.5437	78.20	-10.01	68.19	94.9	-26.71	peak
303.5437			55.54	74.9	-19.36	AVG
607.7866	32.92	23.30	56.22	74.9	-18.68	peak
607.7866			43.57	54.9	-11.33	AVG
912.8619	27.33	29.11	56.64	74.9	-18.26	peak
912.8619			43.99	54.9	-10.91	AVG

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

Note: AVG=peak+20log (Duty Cycle)

Duty Cycle=on time/Total Time=(0.680ms*2+0.360*11)/22.8ms≈0.233=23.3%

AVG=peak+20log0.233=peak-12.65

EUT:	Control	Model No.:	kljsq-3001
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 12V
Polarization:	Horizontal	Test Result:	Pass
Test Time:	2019-9-11	Test By:	
Standard:	FCC PART 15 C 30M-1G PEAK		
Test Mode:	TX		
Note:			

Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
303.5437	81.84	-8.46	73.38	94.9	-21.52	peak
303.5437			60.73	74.9	-14.17	AVG
607.7866	32.74	23.95	56.69	74.9	-18.21	peak
607.7866			44.04	54.9	-10.86	AVG
912.8619	26.32	27.59	53.91	74.9	-20.99	peak
912.8619			41.26	54.9	-13.64	AVG

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

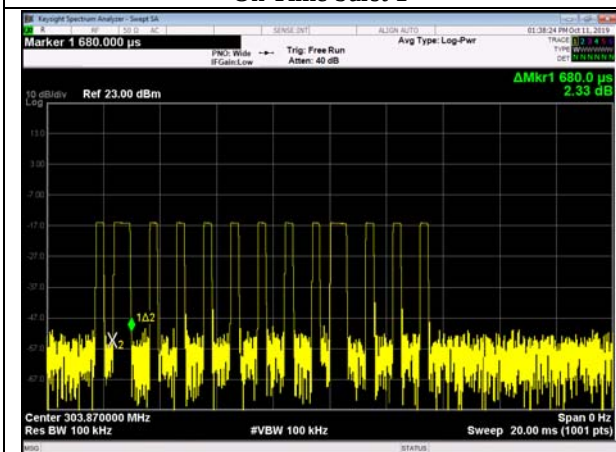
Note: AVG=peak+20log (Duty Cycle)

Duty Cycle=on time/Total Time=(0.680ms*2+0.360*11)/22.8ms≈0.233=23.3%

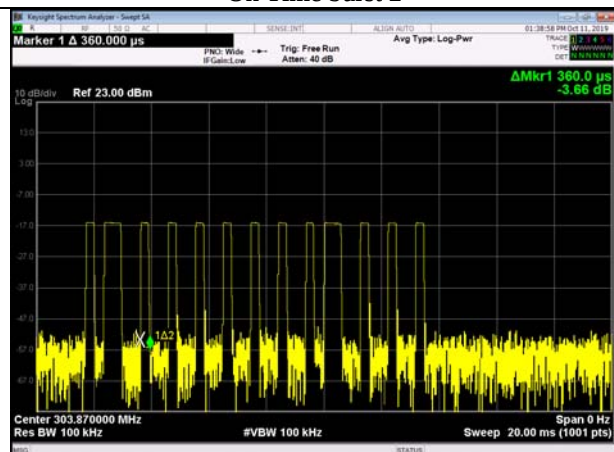
AVG=peak+20log0.233=peak-12.65

Duty Cycle

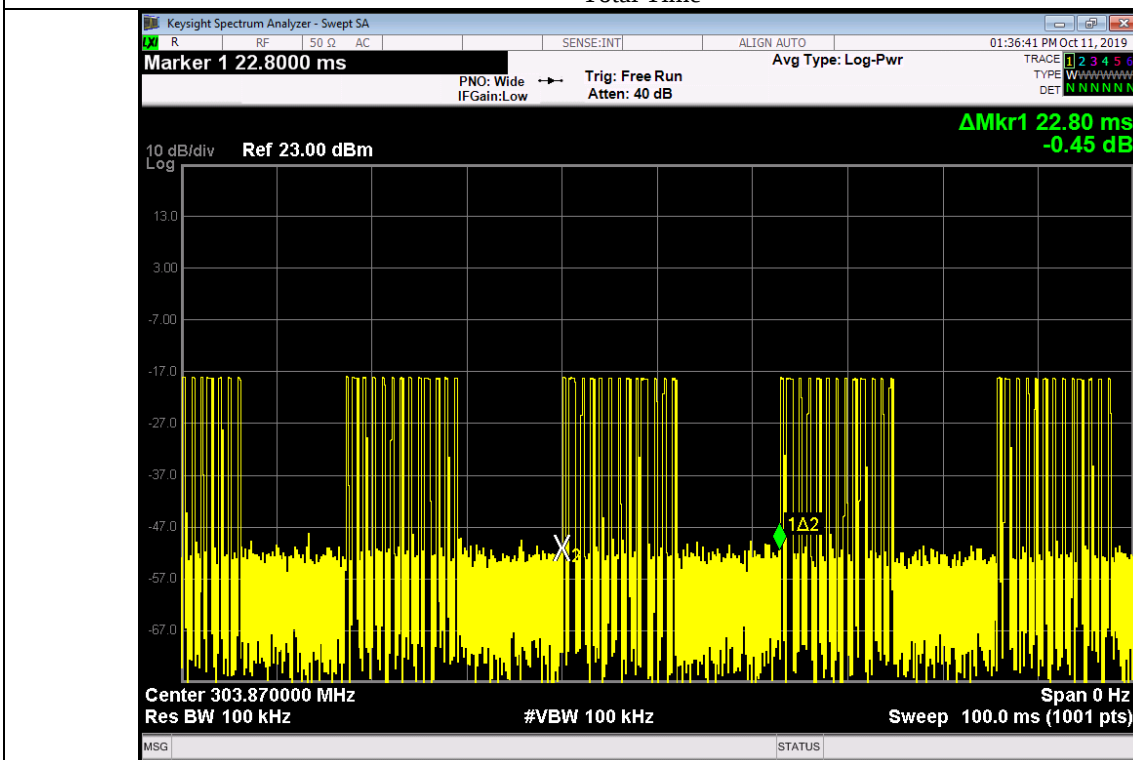
On Time burst 1



On Time burst 2



Total Time

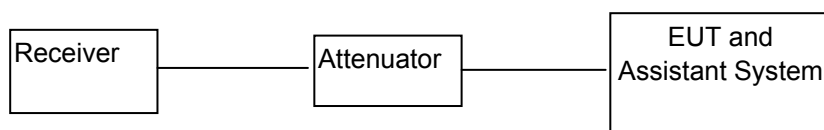


5 Duration Time

5.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Calibrated Date
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27	2019/05/28
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16	2018/12/17
3	RF Cable	Micable	C10-01-01-1	100309	2019/12/16	2018/12/17

5.2 Block diagram of test setup



5.3 Limits

Not more than 5 seconds

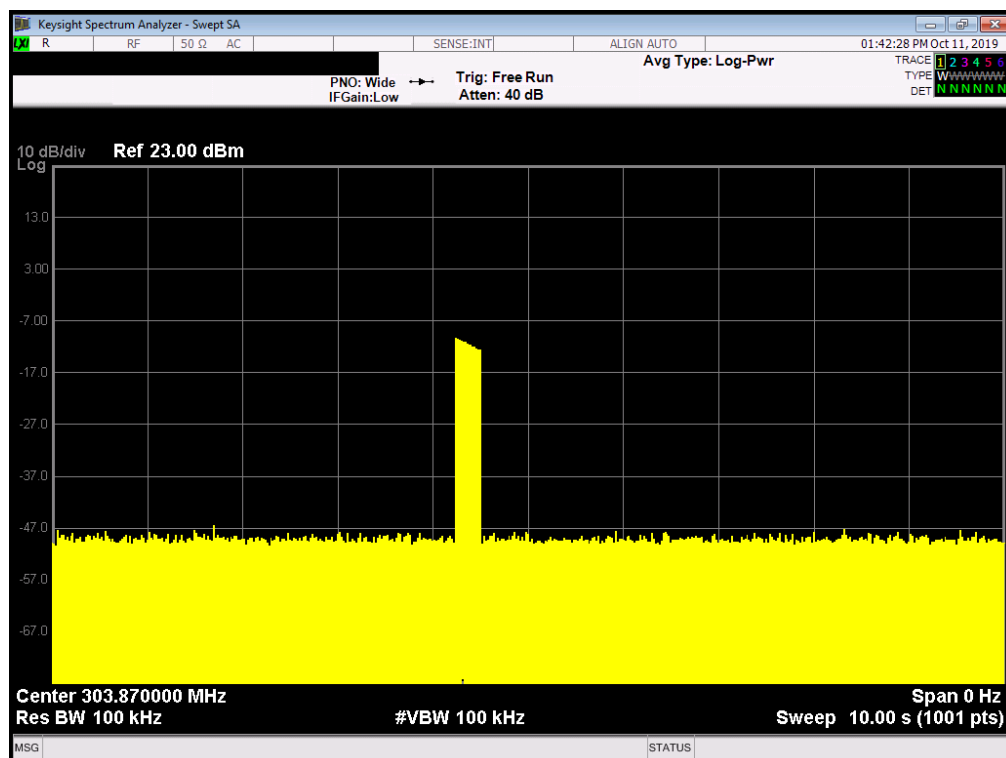
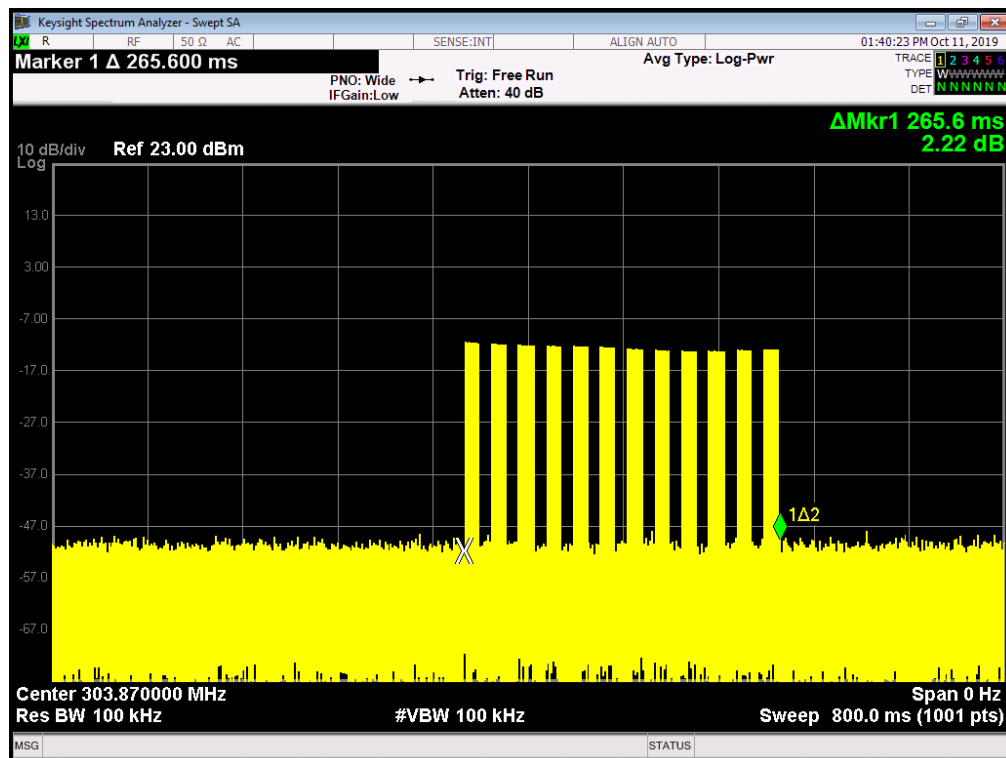
5.4 Test Procedure

1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT.
2. Set the EUT to proper test channel.
3. Single scan the transmission, and read the transmission time.

5.5 Test Result

Duration time (second)	Limit (second)	Result
0.266	5	pass

5.6 Original test data



6. Antenna Requirements

6.1. Limit

For intentional device, according to FCC 47 CFR 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

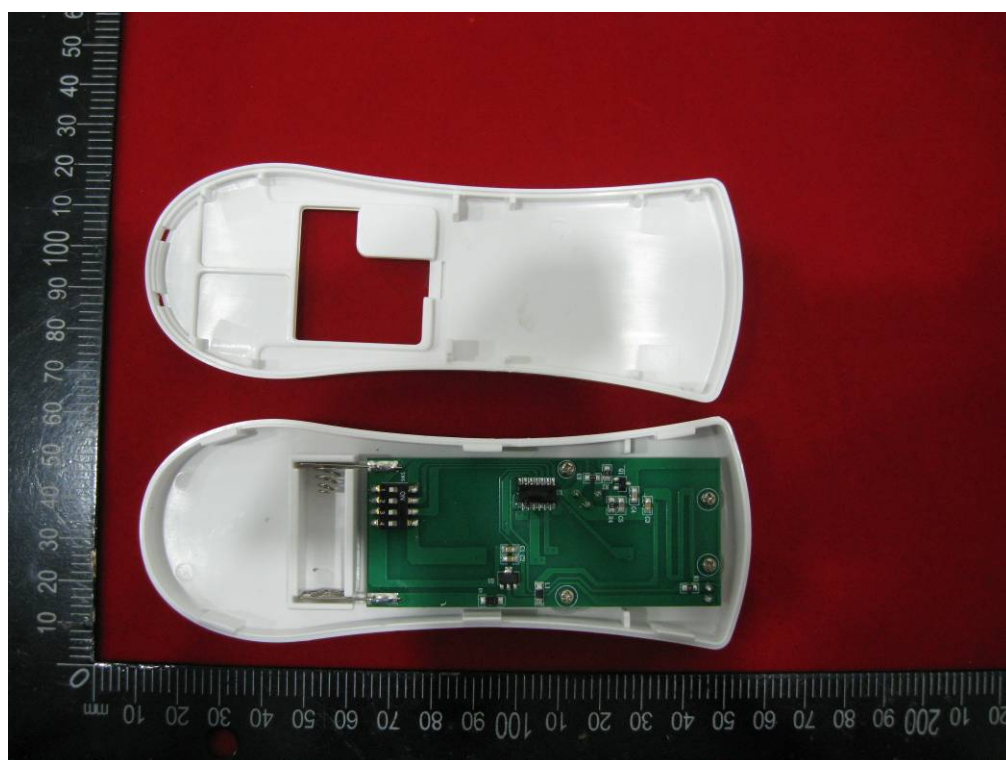
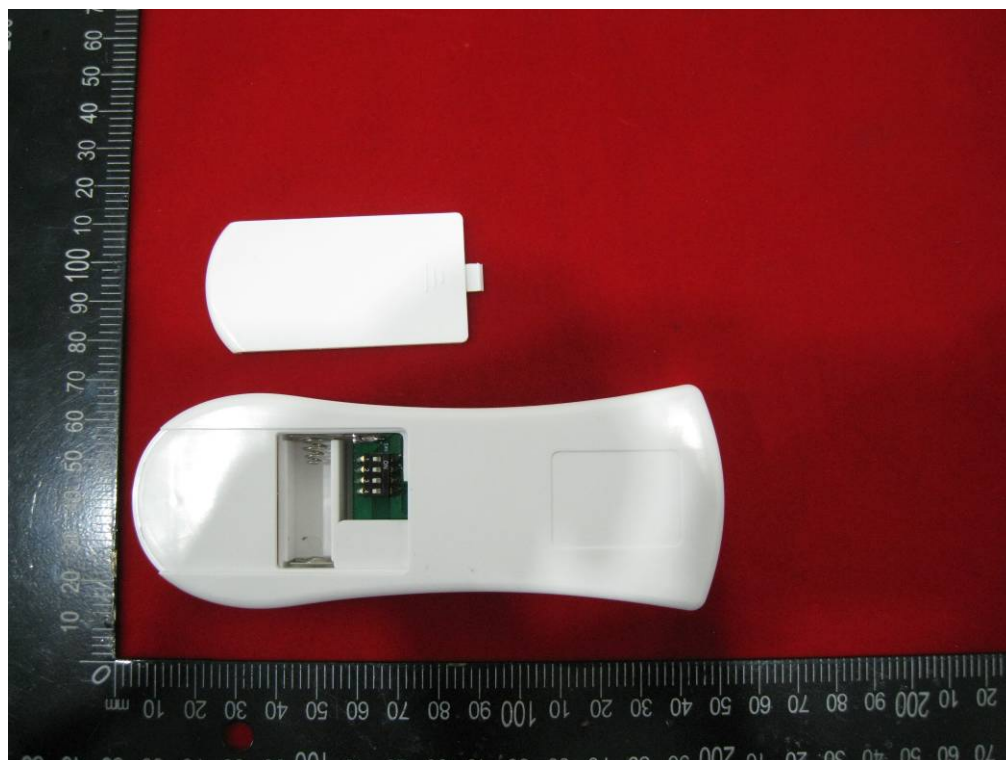
6.2. Result

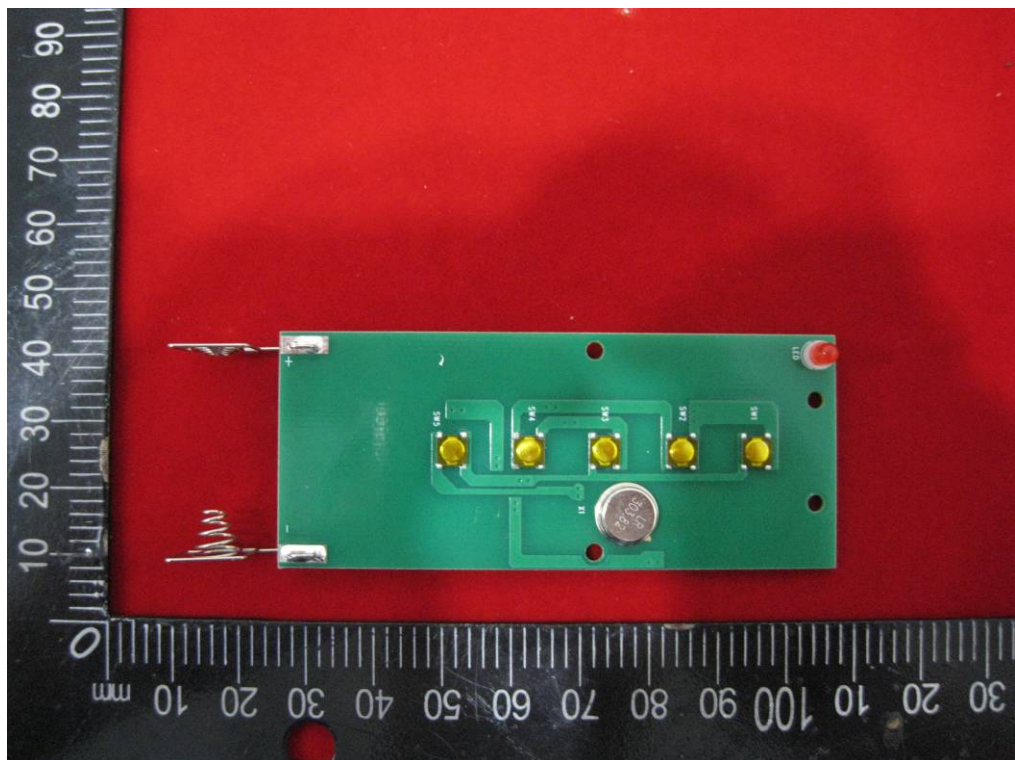
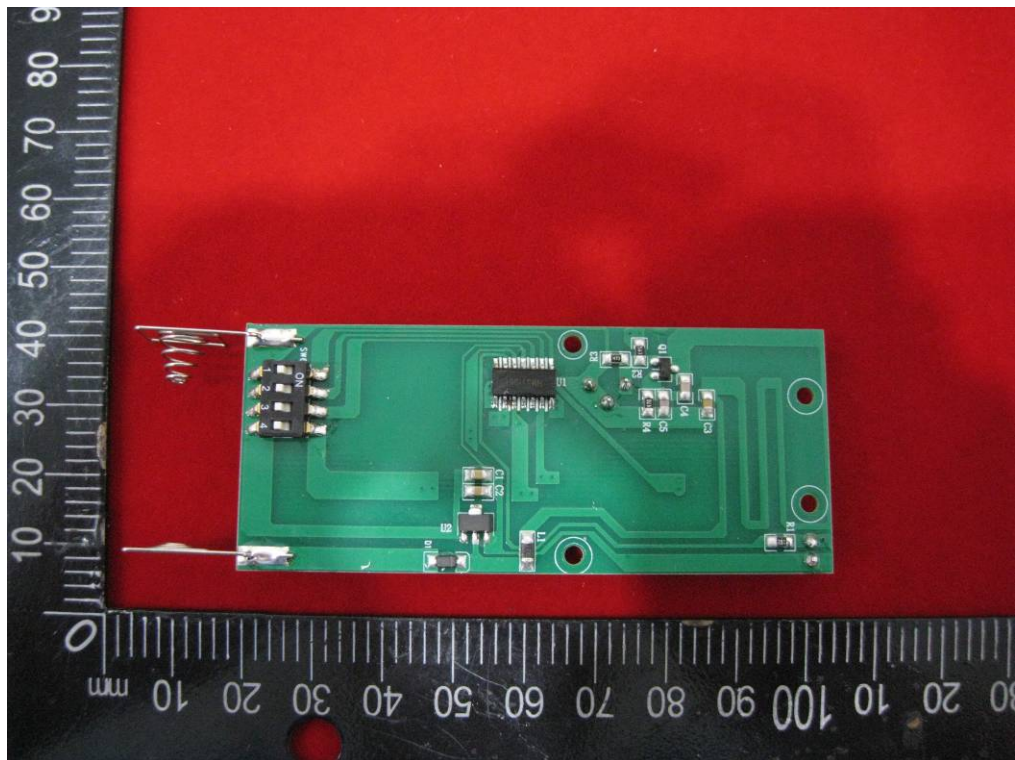
The antennas used for this product are built-in undetachable dipole antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 0dBi. The EUT has an internal antenna, the directional gain of antenna is 0 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

7.EUT Test Photo

EUT Photos







End of Report