

FCC RADIO TEST REPORT

For
FCC ID: 2A4WH-QSF007

Report Reference No. : 22EFSS02061 01281

Date Sample(s) Received : 2022-02-25

Date of tested : From 2022-02-25 to 2022-03-03

Date of issue : 2022-03-03

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 : Zhongshan QUSUN Electric Co., Ltd

Address : No. 11 First Street, Wencheng West Rd, Xiaolan,
Zhongshan, Guangdong, China 528415

Manufacturer : Zhongshan QUSUN Electric Co., Ltd

Test specification:

Test item description : Wireless Call Button

Trade Mark : None

Model/Type reference : QSF007

Ratings : I/P: DC 12V

O/P: --

Test Engineer:



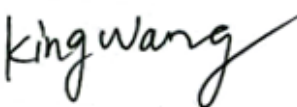
Blue Qiu

Responsible Engineer :



Smile Wang

Authorized Signatory:



King Wang

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TEST REPORT DECLARE

Applicant	:	Zhongshan QUSUN Electric Co., Ltd
Address	:	No. 11 First Street, Wencheng West Rd, Xiaolan, Zhongshan, Guangdong, China 528415
Equipment under Test	:	Wireless Call Button
Test Model No	:	QSF007
Manufacturer	:	Zhongshan QUSUN Electric Co., Ltd
Address	:	No. 11 First Street, Wencheng West Rd, Xiaolan, Zhongshan, Guangdong, China 528415

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(ATT). 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.(ATT) is assumed of full responsibility for the accuracy and completeness of these tests.

ATT is not responsible for the sampling stage, so the results only apply to the sample as received.

ATT's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. ATT shall have no liability for any declarations, inferences or generalizations drawn by the client or others from ATT issued reports.

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)	PASS
Antenna requirement	FCC Part 15: 15.203	PASS

2. General test information

2.1. Description of EUT

EUT* Name	:	Wireless Call Button
Model Number	:	QSF007
EUT function description	:	Please reference user manual of this device
Power supply	:	12V
Adaptor	:	N/A
Radio Technology	:	SRD
Operation frequency	:	315 MHz
Modulation	:	ASK
Antenna Type	:	Internal Antenna, maximum PK gain: 0dBi
Date of Receipt	:	2022/03/02
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	$\pm 0.32\text{dB}$

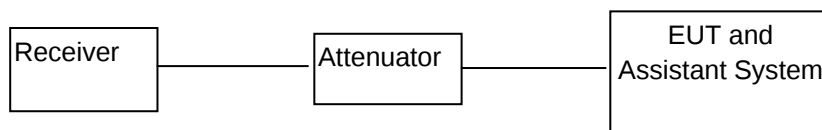
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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	2022/05/28	2021/05/29
2	Attenuator	Mini-Circuits	BW-S10W2	101109	N/A	N/A
3	RF Cable	Micable	C10-01-01-1	100309	N/A	N/A

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

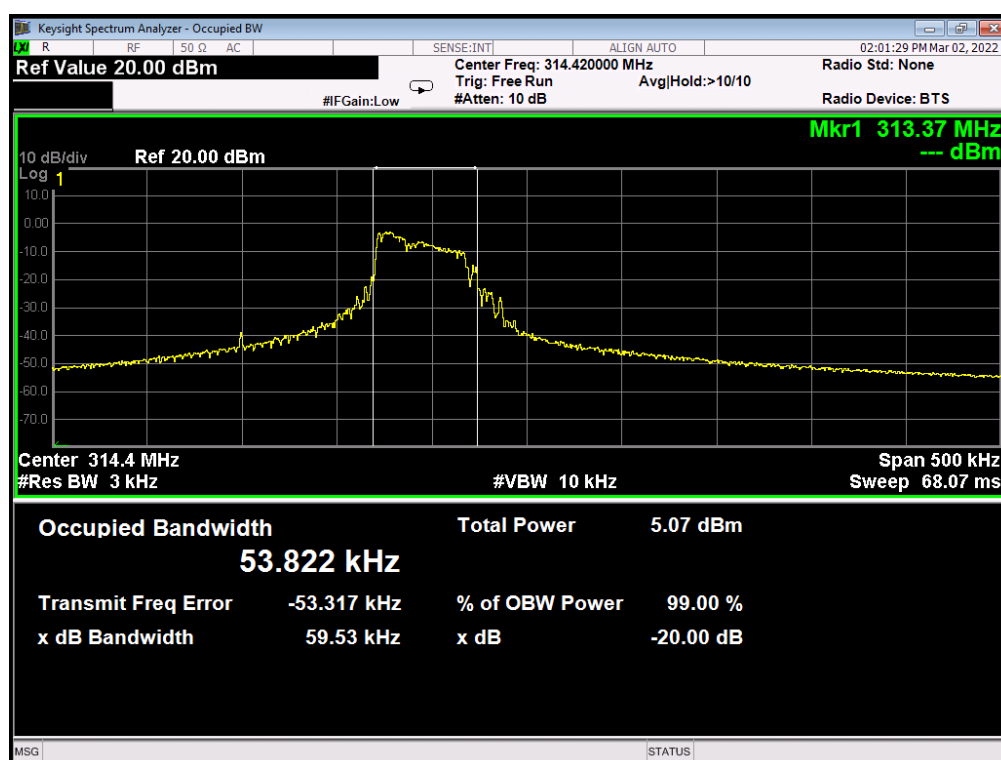
- (1) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- (2) Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency 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
0.005953	0.7875	Pass

Note: Limit= Fundamental frequency $\times$ 0.25%=315 $\times$ 0.25%=0.7875MHz

3.6. Original test data



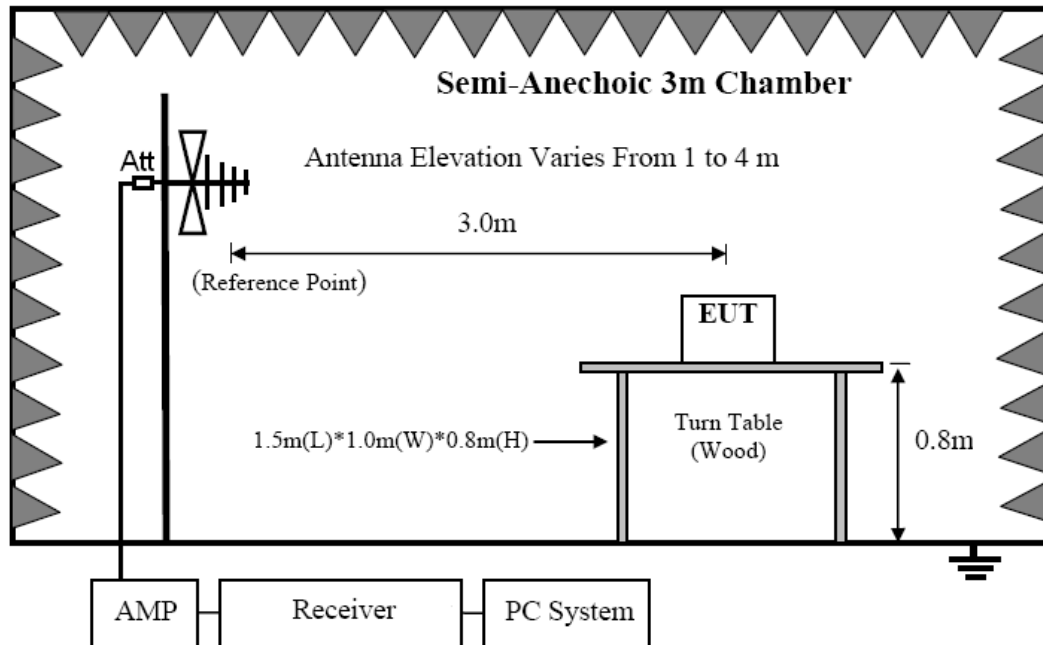
4. Field Strength of Fundamental And Field Strength of Spurious Emissions

4.1. Test equipment

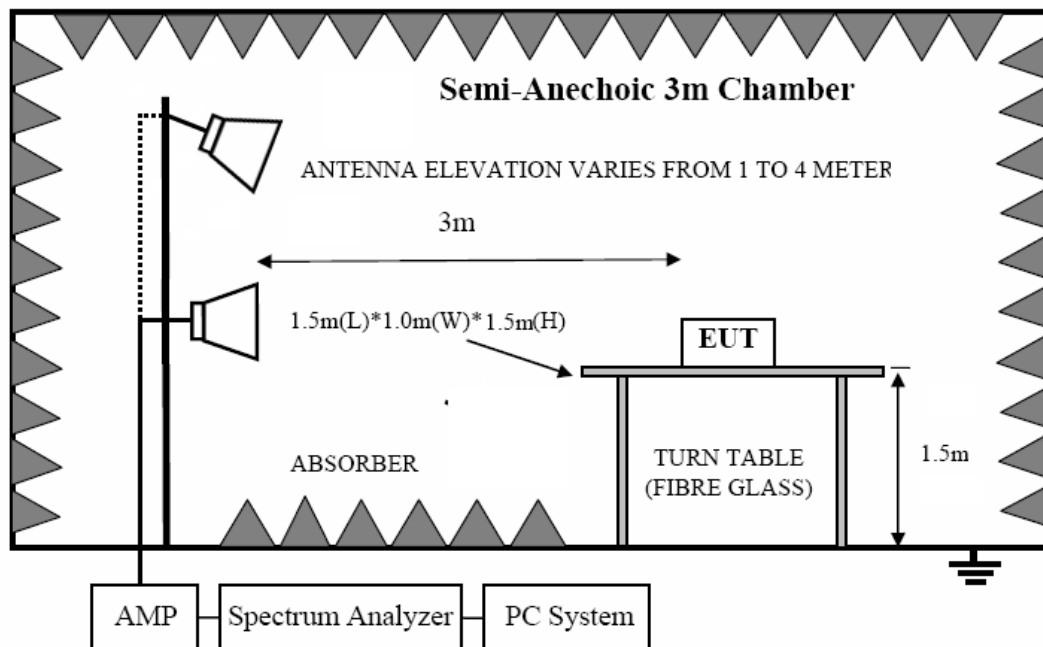
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	EMI Test Receiver	R&S	ESCI	101307	12/17/2022
2	Spectrum Analyzer	Agilent	E4407B	US40240708	11/16/2022
3	Loop antenna	SCHWARZBECK	FMZB1519	1519-062	01/15/2024
4	Broadband antenna	SCHWARZBECK	VULB9168	VULB9168-192	08/05/2022
5	HORN ANTENNA	SCHWARZBECK	BBHA9120D	9120D 1065	05/06/2022
6	Preamplifier Amplifier	HP	8447F	3113A05680	12/17/2022
7	PRE-AMPLIFIER	CY	EMC011830	980136	12/11/2022
8	RF Cable	R&S	Test Cable 4	4	12/11/2022
9	RF Cable	R&S	Test Cable 5	5	12/11/2022
10	RF Cable	R&S	Test Cable 9	9	04/19/2022
11	RF Cable	R&S	Test Cable 10	10	12/11/2022
12	Measurement Software	Farad	EZ-EMC (Ver.ATT-03A)	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(b) 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.

315MHz limit = $20 \log(41.67 \cdot 315) - 7083 \approx 75.62 \text{ dB}\mu\text{V/m}$

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

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:	Wireless Call Button	Model No.:	QSF007
Temperature:	24℃	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 12V
Polarization:	--	Test Result:	Pass
Test Mode:	Keeping TX mode	Test By:	Blue

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

Note:

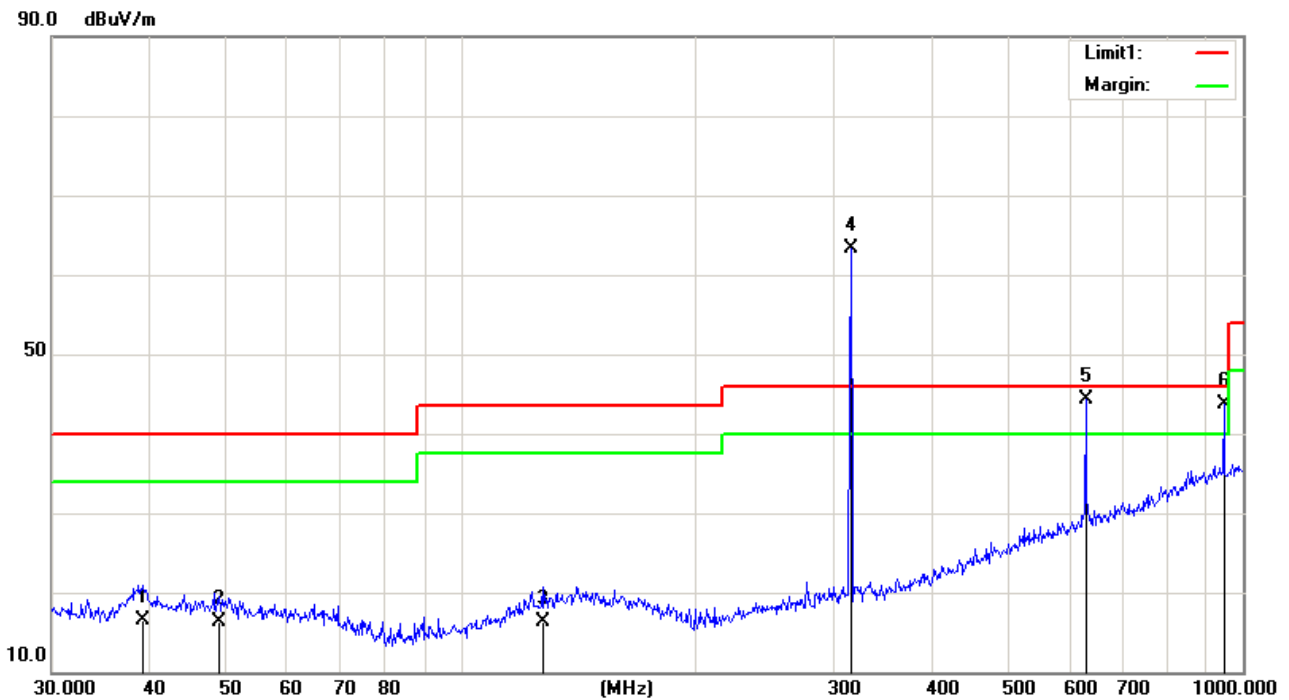
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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

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

Between 30M – 1000 MHz

EUT:	Wireless Call Button	Model No.:	QSF007
Temperature:	23℃	Relative Humidity:	54%
Distance:	3m	Test Power:	DC 12V
Polarization:	Vertical	Test Result:	Pass
Test Time:	2022-03-01	Test By:	Blue
Standard:	FCC PART 15 class B		
Test Mode:	TX		

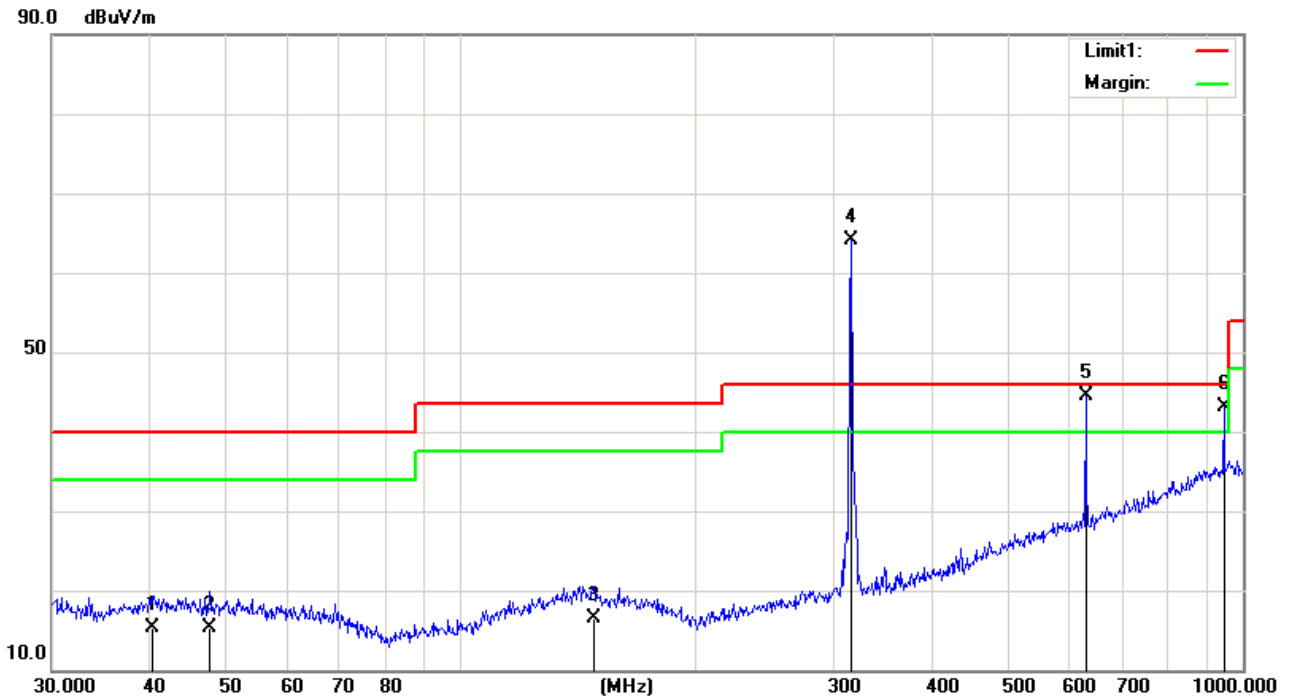


No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	39.1613	23.49	-6.94	16.55	40.00	-23.45	QP
2	49.1865	23.38	-7.08	16.30	40.00	-23.70	QP
3	127.2176	22.59	-6.34	16.25	43.50	-27.25	QP
4	315.4806	67.66	-4.39	63.27	46.00	17.27	peak
5	629.4772	41.03	3.23	44.26	46.00	-1.74	peak
6	945.4397	33.67	10.02	43.69	46.00	-2.31	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:	Wireless Call Button	Model No.:	QSF007
Temperature:	23℃	Relative Humidity:	54%
Distance:	3m	Test Power:	DC 12V
Polarization:	Horizontal	Test Result:	Pass
Test Time:	2022-03-01	Test By:	Blue
Standard:	FCC PART 15 class B		
Test Mode:	TX		



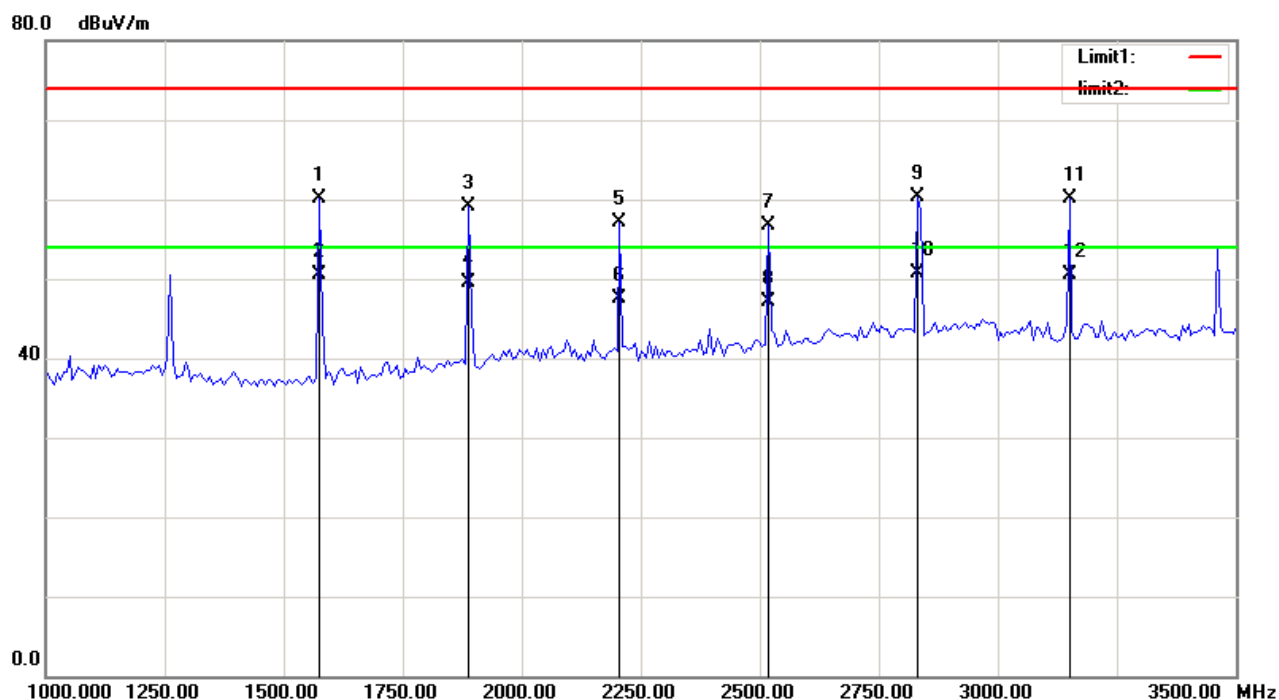
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	40.2757	22.08	-6.84	15.24	40.00	-24.76	QP
2	47.8260	22.34	-7.04	15.30	40.00	-24.70	QP
3	147.9214	22.06	-5.50	16.56	43.50	-26.94	QP
4	315.4806	68.41	-4.39	64.02	46.00	18.02	peak
5	629.4772	41.29	3.23	44.52	46.00	-1.48	peak
6	945.4397	33.05	10.02	43.07	46.00	-2.93	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:	Wireless Call Button	Model No.:	QSF007
Temperature:	23℃	Relative Humidity:	54%
Distance:	3m	Test Power:	DC 12V
Polarization:	Vertical	Test Result:	Pass
Test Time:	2022-02-21	Test By:	Blue
Standard:	FCC PART 15 class B 1-3.5GHz		
Test Mode:	TX		

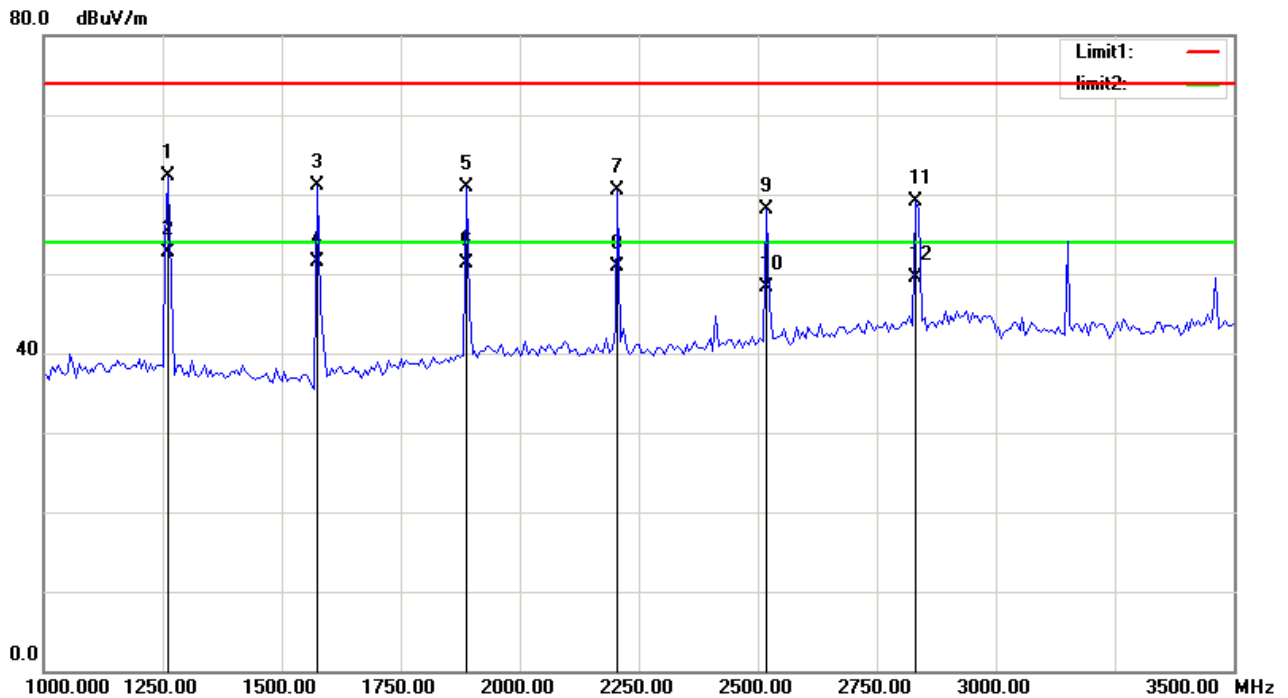


No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1575.000	74.71	-14.54	60.17	74.00	-13.83	peak
2	1575.000			50.53	54.00	-3.47	AVG
3	1887.500	72.89	-13.81	59.08	74.00	-14.92	peak
4	1887.500			49.44	54.00	-4.56	AVG
5	2206.250	69.72	-12.62	57.10	74.00	-16.90	peak
6	2206.250			47.46	54.00	-6.54	AVG
7	2518.750	68.26	-11.60	56.66	74.00	-17.34	peak
8	2518.750			47.02	54.00	-6.98	AVG
9	2831.250	70.96	-10.66	60.30	74.00	-13.70	peak
10	2831.250			50.66	54.00	-3.34	AVG
11	3150.000	70.18	-10.13	60.05	74.00	-13.95	peak
12	3150.000			50.41	54.00	-3.59	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:	Wireless Call Button	Model No.:	QSF007
Temperature:	23℃	Relative Humidity:	54%
Distance:	3m	Test Power:	DC 12V
Polarization:	Horizontal	Test Result:	Pass
Test Time:	2022-02-21	Test By:	Blue
Standard:	FCC PART 15 class B 1-3.5GHz		
Test Mode:	TX		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1262.500	77.13	-14.82	62.31	74.00	-11.69	peak
2	1262.500			52.67	54.00	-1.33	AVG
3	1575.000	75.61	-14.54	61.07	74.00	-12.93	peak
4	1575.000			51.43	54.00	-2.57	AVG
5	1887.500	74.73	-13.81	60.92	74.00	-13.08	peak
6	1887.500			51.28	54.00	-2.72	AVG
7	2206.250	73.20	-12.62	60.58	74.00	-13.42	peak
8	2206.250			50.94	54.00	-3.06	AVG
9	2518.750	69.61	-11.60	58.01	74.00	-15.99	peak
10	2518.750			48.37	54.00	-5.63	AVG
11	2831.250	69.83	-10.66	59.17	74.00	-14.83	peak
12	2831.250			49.53	54.00	-4.47	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:	Wireless Call Button	Model No.:	QSF007
Temperature:	24℃	Relative Humidity:	54%
Distance:	3m	Test Power:	DC 12V
Polarization:	Vertical	Test Result:	Pass
Test Time:	2022-03-01	Test By:	Blue
Standard:	FCC PART 15 C 30M-1G PEAK		
Test Mode:	TX		

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	315.4806	67.66	-4.39	63.27	75.62	-12.35	peak
2				53.63	55.62	-1.99	AVG
3	629.4772	41.03	3.23	44.26	55.62	-11.36	peak
4				34.62	35.62	-1.00	AVG
5	945.4397	33.67	10.02	43.69	55.62	-11.93	peak
6				34.05	35.62	-1.57	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=(0.3253ms*17+0.976ms*8)/40.45ms=13.3381ms/40.45ms=32.97%

AVG=Peak+20log0.3297=Peak-9.64

EUT:	Wireless Call Button	Model No.:	QSF007
Temperature:	24	Relative Humidity:	54%
Distance:	3m	Test Power:	DC 12V
Polarization:	Horizontal	Test Result:	Pass
Test Time:	2022-03-01	Test By:	Blue
Standard:	FCC PART 15 C 30M-1G PEAK		
Test Mode:	TX		

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	315.4806	68.41	-4.39	64.02	75.62	-11.60	peak
2				54.38	55.62	-1.24	AVG
3	629.4772	41.29	3.23	44.52	55.62	-11.10	peak
4				34.88	35.62	-0.74	AVG
5	945.4397	33.05	10.02	43.07	55.62	-12.55	peak
6				33.43	35.62	-2.19	AVG

The test result is calculated as the following:

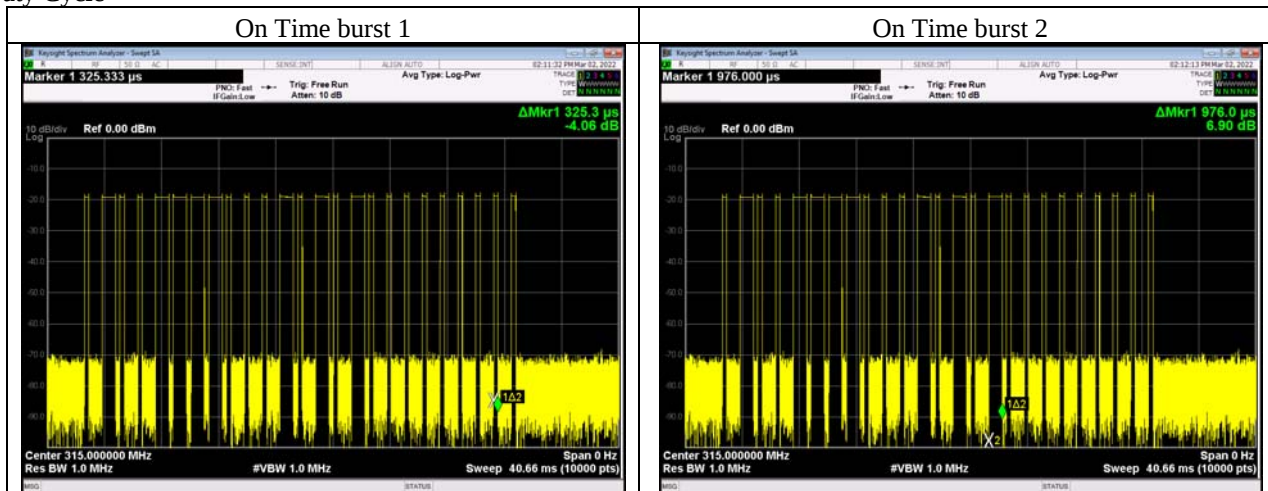
- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

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

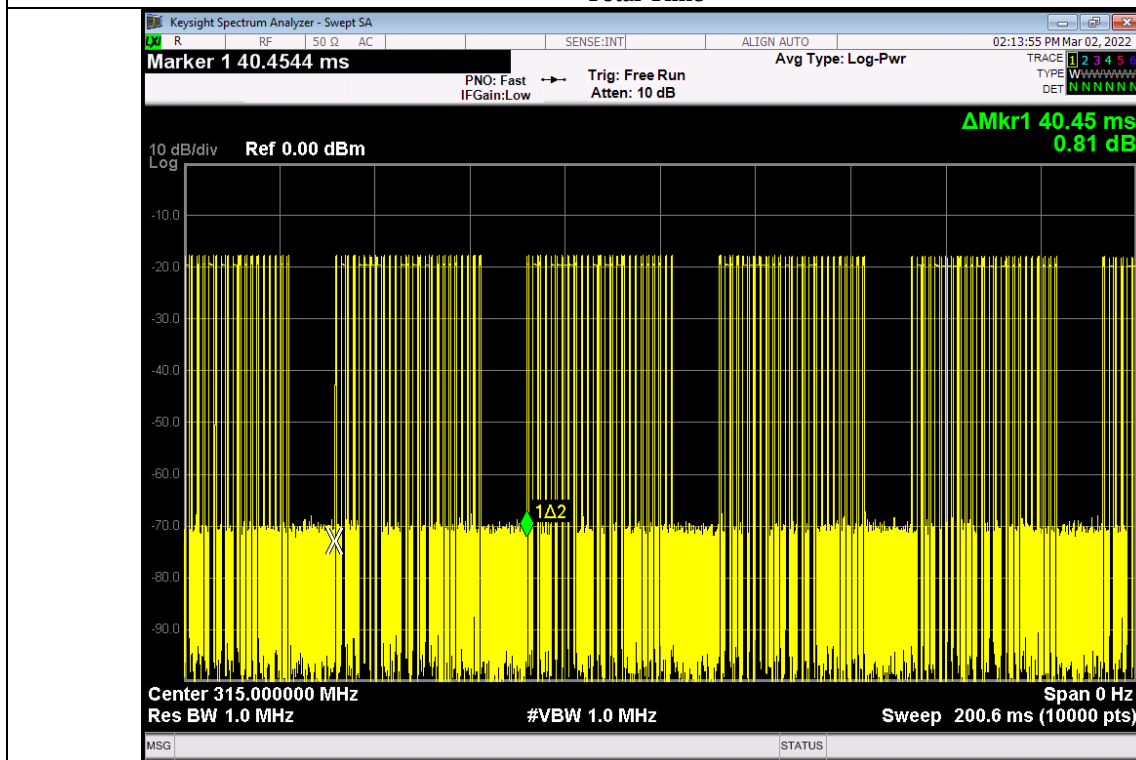
Duty Cycle = on time / Total Time = $(0.3253ms \times 17 + 0.976ms \times 8) / 40.45ms = 13.3381ms / 40.45ms = 32.97\%$

$AVG = Peak + 20 \log 0.3297 = Peak - 9.64$

Duty Cycle



Total Time

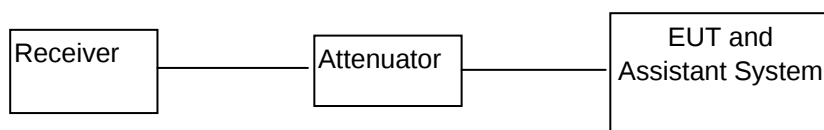


5 Duration Time

5.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Calibrated Date
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2022/05/28	2021/05/29
2	Attenuator	Mini-Circuits	BW-S10W2	101109	N/A	N/A
3	RF Cable	Micable	C10-01-01-1	100309	N/A	N/A

5.2 Block diagram of test setup



5.3 Limits

Not more than 5 seconds

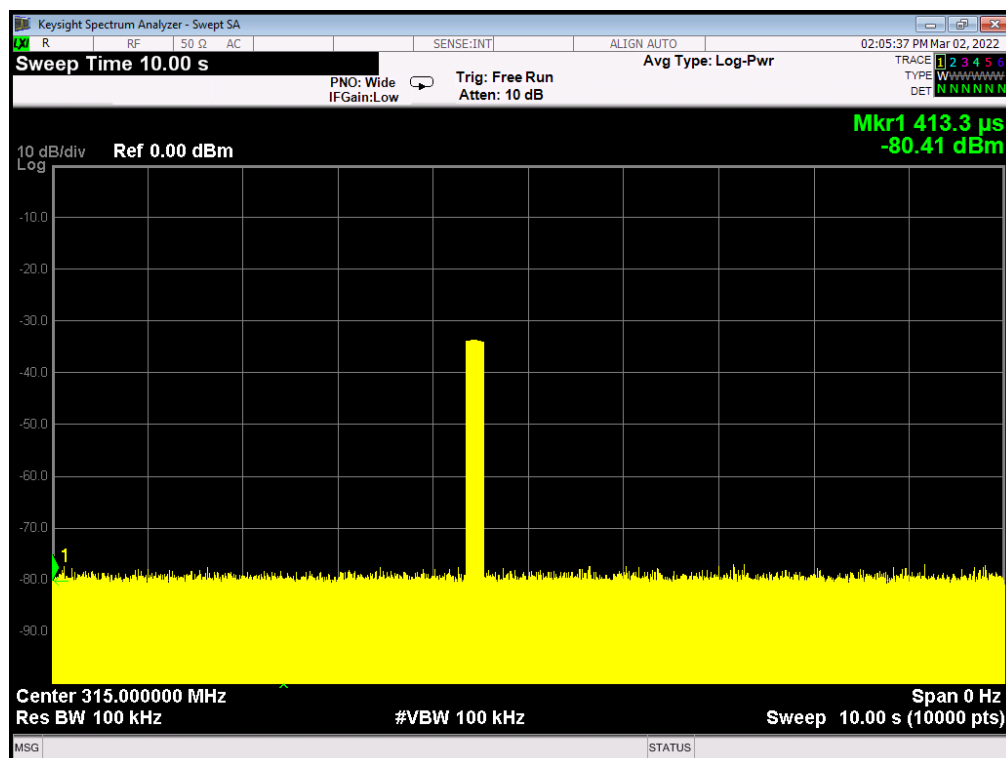
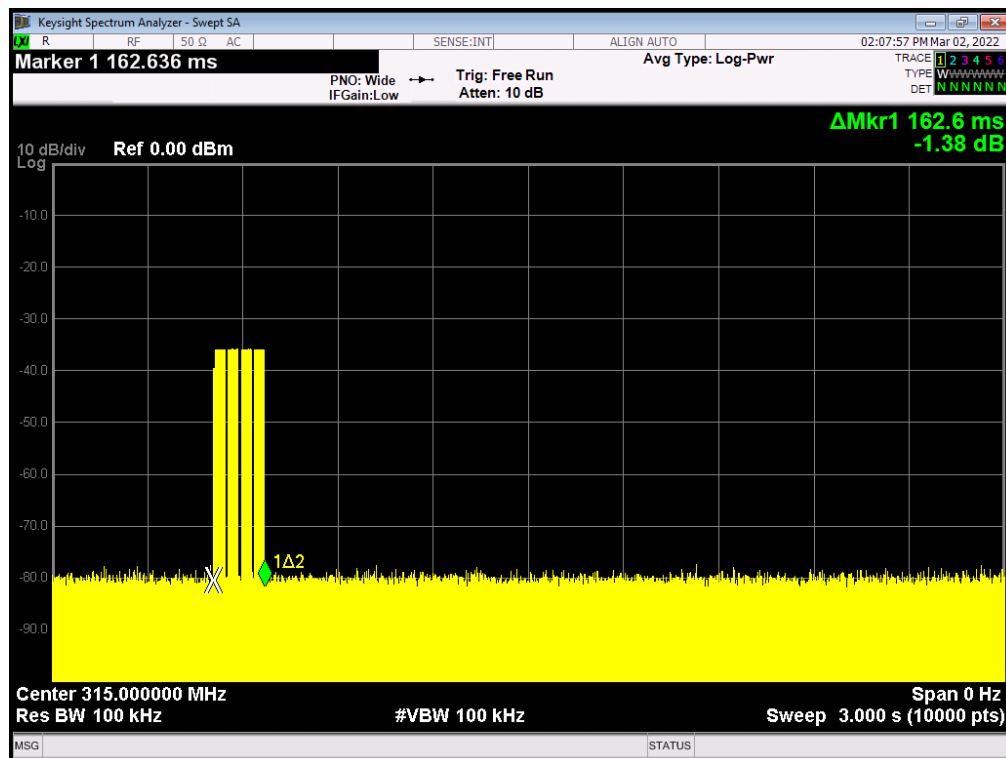
5.4 Test Procedure

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
0.1626	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 15.231 (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 1 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.

END OF REPORT