

# FCC REPORT

**Applicant:** Remote Tech LLC

**Address of Applicant:** 310 ALDER RD, DOVER DE 19904 USA

**Equipment Under Test (EUT)**

Product Name: Smart key

Model No.: RT-MB2

**FCC ID:** 2AOKM-MB2

**Applicable standards:** FCC CFR Title 47 Part 15 Subpart C Section 15.231

**Date of sample receipt:** 01 Apr., 2021

**Date of Test:** 02 Apr., to 30 Apr., 2021

**Date of report issue:** 17 May, 2021

**Test Result:** PASS\*

\* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Bruce Zhang  
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the JYT product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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## 2 Version

Version No.	Date	Description
00	06 May, 2021	Original
01	14 May, 2021	<ol style="list-style-type: none"> <li>1. Updated Field Strength power on page 5.</li> <li>2. Updated test requirement on page 8.</li> <li>3. Updated Field Strength on page 10.</li> <li>4. Updated spurious emissions on page 12.</li> <li>5. Updated page 15/16.</li> </ol>
02	17 May, 2021	<ol style="list-style-type: none"> <li>1. Updated test data on page 12.</li> <li>2. Updated test mode information on page 19.</li> </ol>

Prepared By:

*Tanet Wei*

Date:

17 May, 2021

Test Engineer

Check By:

*Winner Zhang*

Date:

17 May, 2021

Project Engineer

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## 4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
Field strength of the fundamental signal	15.231 (b)	Pass
Spurious emissions	15.231 (b)/15.209	Pass
20dB Bandwidth	15.231 (c)	Pass
Duration Time	15.231 (a)(1)	Pass
Conducted Emission	15.207	N/A
<b>Remarks:</b> 1. Pass: The EUT complies with the essential requirements in the standard. 2. N/A: The EUT not applicable of the test item. 3. The cable insertion loss used by "RF Output Power" and other conduction measurement items is 0.5dB (provided by the customer).		
<b>Test Method:</b>	ANSI C63.4-2014 ANSI C63.10-2013	

## 5 General Information

### 5.1 Client Information

Applicant:	Remote Tech LLC
Address:	310 ALDER RD, DOVER DE 19904 USA
Manufacturer:	Remote Tech LLC
Address:	310 ALDER RD, DOVER DE 19904 USA

### 5.2 General Description of E.U.T.

Product Name:	Smart key
Model No.:	RT-MB2
Operation Frequency:	315MHz
Channel numbers:	1
Modulation type:	ASK
Antenna Type:	Internal antenna
Antenna gain:	0 dBi
Power supply:	DC 3V (CR2032 battery)
Test Sample Condition:	The test samples were provided in good working order with no visible defects.

### 5.3 Test mode

Transmitting mode:	Keep the EUT in transmitting mode with modulation (new battery used)		
<b>Pre-Test Mode:</b>			
JYT has verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:			
Axis	X	Y	Z
Field Strength(dBuV/m)	62.67	62.13	64.30
<b>Final Test Mode:</b>			
According to ANSI C63.4 standards, the test results are both the "worst case" and "worst setup": Z axis (see the test setup photo)			

### 5.4 Description of Support Units

N/A
-----

### 5.5 Measurement Uncertainty

Parameters	Expanded Uncertainty
Radiated Emission (9kHz ~ 30MHz)	±3.12 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	±4.32 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.16 dB (k=2)
Radiated Emission (18GHz ~ 40GHz)	±3.20 dB (k=2)

### 5.6 Additions to, deviations, or exclusions from the method

No
----

## 5.7 Laboratory Facility

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

- **FCC - Designation No.: CN1211**

JianYan Testing Group Shenzhen Co., Ltd. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Registration No. is 727551.

- **ISED – CAB identifier.: CN0021**

The 3m Semi-anechoic chamber of JianYan Testing Group Shenzhen Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

- **A2LA - Registration No.: 4346.01**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: <https://portal.a2la.org/scopepdf/4346-01.pdf>

## 5.8 Laboratory Location

JianYan Testing Group Shenzhen Co., Ltd.

Address: No.101, Building 8, Innovation Wisdom Port, No.155 Hongtian Road, Huangpu Community, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, People's Republic of China.

Tel: +86-755-23118282, Fax: +86-755-23116366

Email: info@ccis-cb.com, Website: <http://www.ccis-cb.com>

## 5.9 Test Instruments list

Radiated Emission:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	SAEMC	9m*6m*6m	966	01-19-2021	01-18-2024
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-03-2021	03-02-2022
Broadband Antenna	SCHWARZBECK	VUBA9117	359	06-18-2020	06-17-2021
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-03-2021	03-02-2022
Horn Antenna	SCHWARZBECK	BBHA9120D	1805	06-18-2020	06-17-2021
Horn Antenna	SCHWARZBECK	BBHA9170	582	11-18-2020	11-17-2021
Loop Antenna	SCHWARZBECK	FMZB1519B	00044	03-03-2021	03-02-2022
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-03-2021	03-02-2022
Pre-amplifier	CD	PAP-1G18	11804	03-03-2021	03-02-2022
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-03-2021	03-02-2022
Spectrum analyzer	Rohde & Schwarz	FSP40	100363	11-18-2020	11-17-2021
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-03-2021	03-02-2022
Simulated Station	Anritsu	MT8820C	6201026545	03-03-2021	03-02-2022
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-03-2021	03-02-2022
Cable	MICRO-COAX	MFR64639	K10742-5	03-03-2021	03-02-2022
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-03-2021	03-02-2022

## 6 Test results and Measurement Data

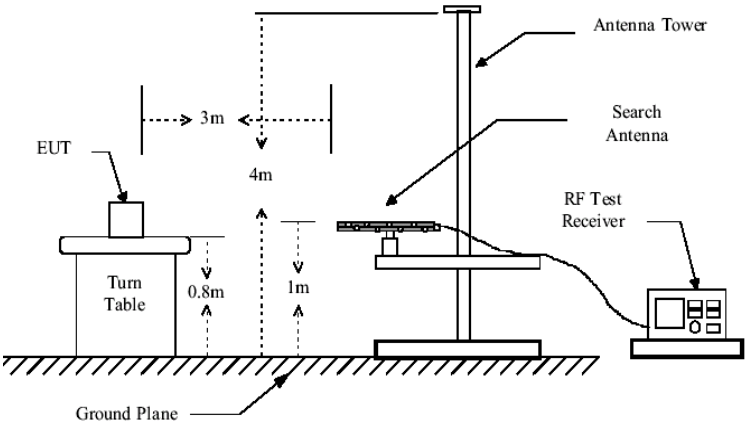
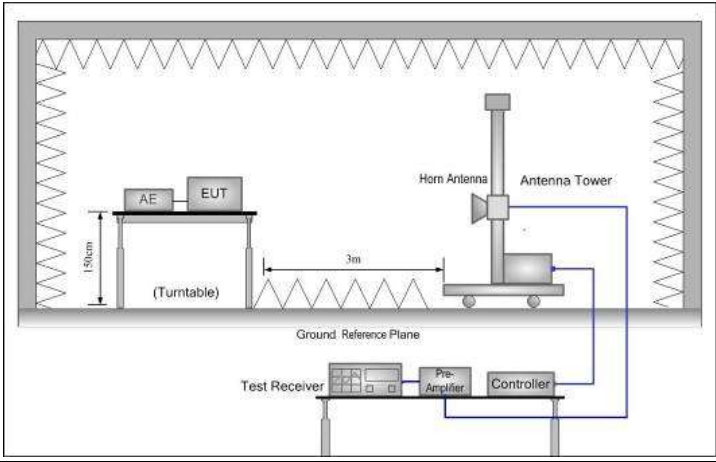
### 6.1 Antenna requirement

<b>Standard requirement:</b>	FCC Part15 C Section 15.203
<p>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.</p>	
<b>E.U.T Antenna:</b>	
The EUT make use of a PCB antenna, The typical gain of the antenna is 0dBi.	

## 6.2 Radiated Emission

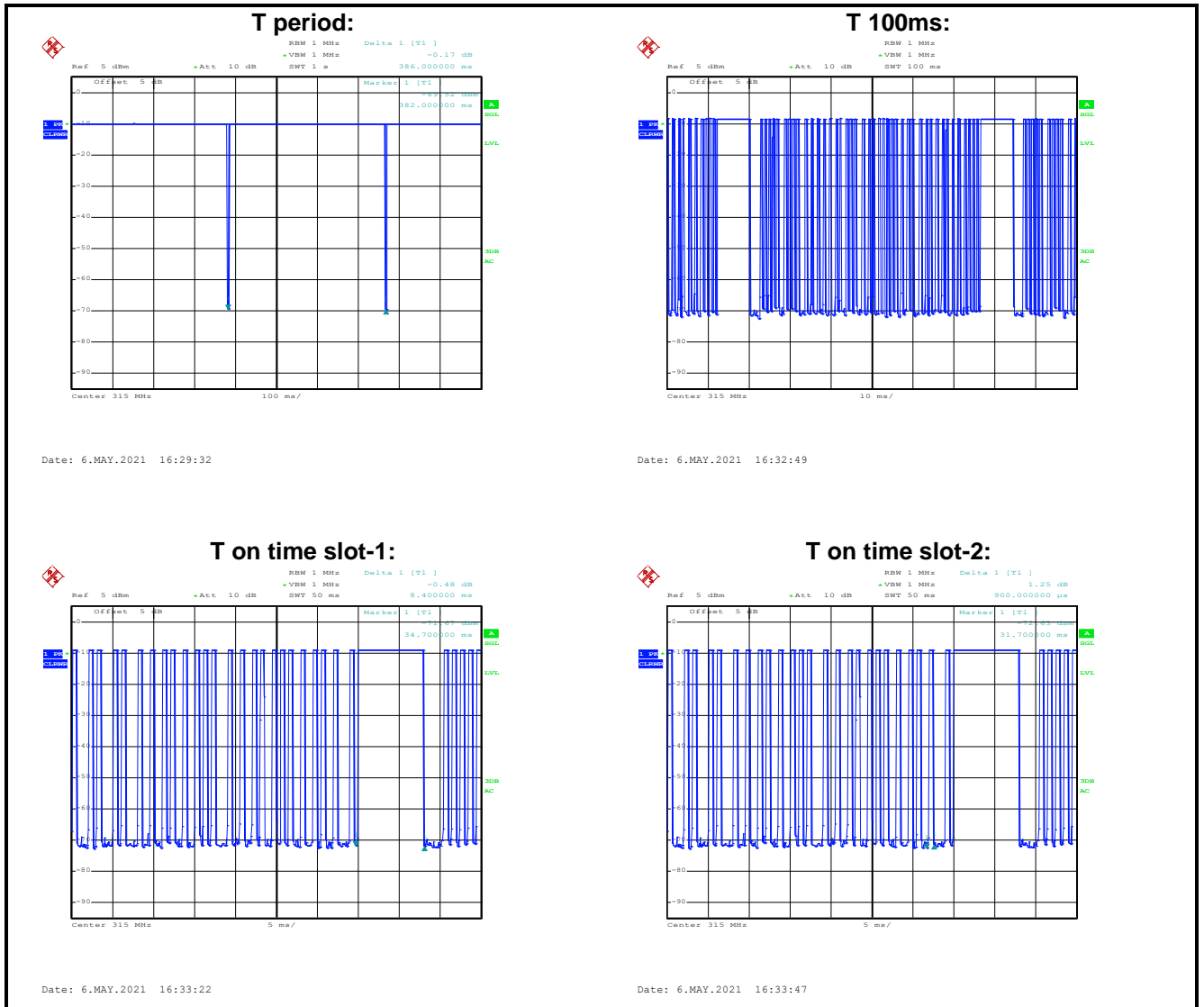
Test Requirement:	FCC Part15 C Section 15.231(b) and 15.209				
Test Frequency Range:	30MHz to 5000MHz				
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
Limit: (Field strength of the fundamental signal)	Frequency	Limit (dBuV/m @3m)		Remark	
	315.00MHz	75.62		Average Value	
		95.62		Peak Value	
Limit: (Spurious Emissions)	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	
		74.0		Peak Value	
Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits higher field strength.					
Test Procedure:	<p>a. The EUT was placed on the top of a rotating table 0.8m(below 1GHz) /1.5m(above 1GHz) above the ground at a 3 meter chamber. The table was rotated 360 degrees to determine the position of the highest radiation.</p> <p>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.</p> <p>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.</p> <p>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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.</p> <p>e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>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, quasi-peak or average method as specified and then reported in a data sheet.</p>				



<p>Test setup:</p>	<p><b>Below 1GHz</b></p>  <p><b>Above 1GHz</b></p> 
<p>Test Instruments:</p>	<p>Refer to section 5.9 for details</p>
<p>Test mode:</p>	<p>Refer to section 5.3 for details</p>
<p>Test results:</p>	<p>Pass</p>

**6.2.1 Field Strength Of The Fundamental Signal**

Peak value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
315.00	26.61	18.73	1.8	0.00	47.14	95.62	-48.48	Vertical
315.00	43.77	18.73	1.8	0.00	64.30	95.62	-31.32	Horizontal
Average value								
Frequency (MHz)	Level (dBuV/m)	Duty Cycle factor	Average value (dBuV/m)		Limit Line (dBuV/m)	Over Limit (dB)	Polarization	
315.00	47.14	-1.67	45.47		75.62	-30.15	Vertical	
315.00	64.30	-1.67	62.63		75.62	-12.99	Horizontal	
Calculate Formula:		Average value=Peak value + Duty Cycle Factor						
		Duty cycle factor = 20log(Duty cycle)						
		Duty cycle = on time/100 milliseconds or period, whichever is less						
Test data:		T on time =8.4*2+0.9*73=82.50(ms)						
		T period =100(ms)						
		Duty cycle = T on time/T period = T on time /100=82.50%						
		Duty cycle factor = 20log(Duty cycle) = -1.67						

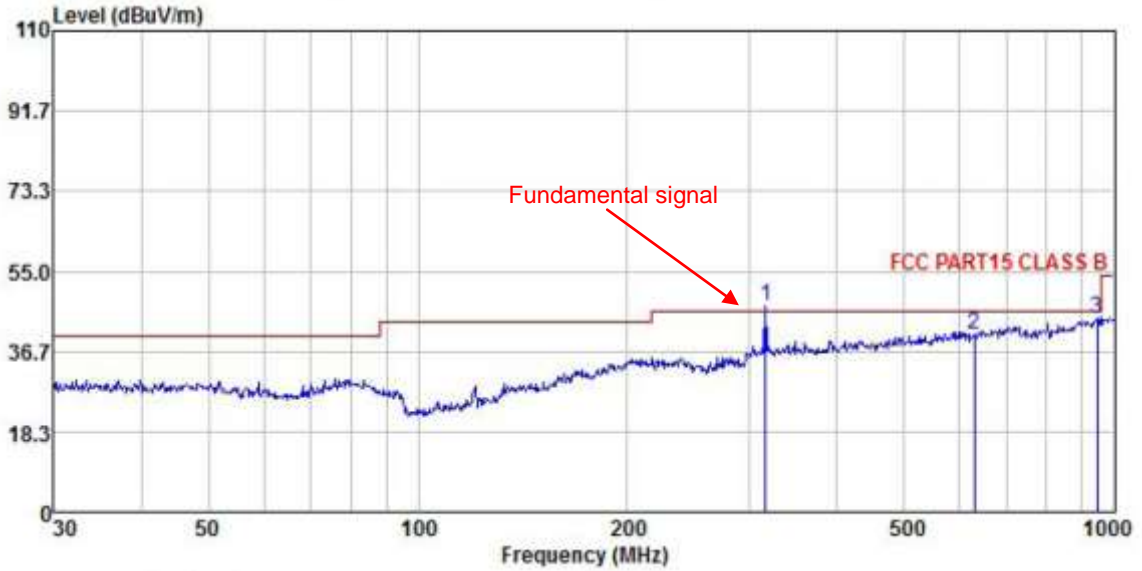


6.2.2 Spurious Emissions

Below 1GHz (30MHz-1000MHz)								
Peak value								
Frequency (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
630.00	17.88	20.02	2.66	0.00	40.56	75.62	-35.06	Vertical
945.00	17.83	22.79	3.46	0.00	44.08	75.62	-31.54	Vertical
630.00	17.29	20.02	2.66	0.00	39.97	75.62	-35.65	Horizontal
945.00	18.01	22.79	3.46	0.00	44.26	75.62	-31.36	Horizontal
Average value								
Frequency (MHz)	Level (dBuV/m)	Duty cycle factor	Average value (dBuV/m)		Limit Line (dBuV/m)	Over Limit (dB)	Polarization	
630.00	40.56	-1.67	38.89		55.62	-16.73	Vertical	
945.00	44.08	-1.67	42.41		55.62	-13.21	Vertical	
630.00	39.97	-1.67	38.30		55.62	-17.32	Horizontal	
945.00	44.26	-1.67	42.59		55.62	-13.03	Horizontal	
<i>Remark: Average value=Peak value + Duty Cycle Factor.</i>								

Test Plots:

Product Name:	Smart key	Product Model:	RT-MB2
Test By:	Janet	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical
Test Voltage:	DC 3V	Environment:	Temp: 24°C Huni: 57%

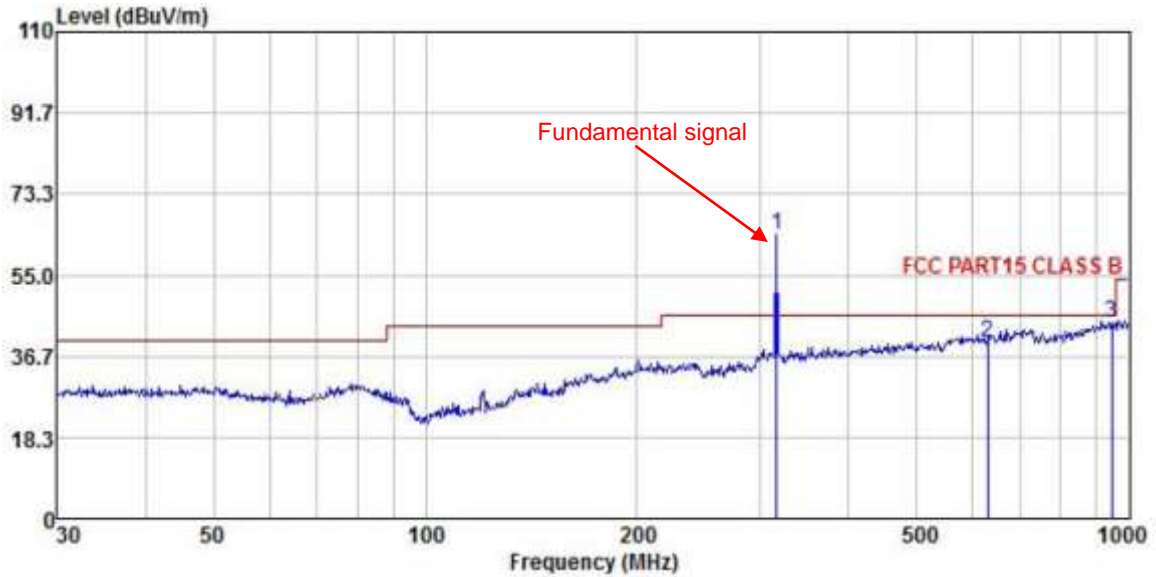


	ReadAntenna	Cable Preamp	Limit	Over					
Freq	Level	Loss	Line	Limit	Remark				
MHz	dBuV	dB/m	dB	dB	dBuV/m				
1 *	315.481	26.61	18.73	1.80	0.00	47.14	46.00	1.14	
2	629.477	17.88	20.02	2.66	0.00	40.56	46.00	-5.44	
3	945.440	17.83	22.79	3.46	0.00	44.08	46.00	-1.92	

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

<b>Product Name:</b>	Smart key	<b>Product Model:</b>	RT-MB2
<b>Test By:</b>	Janet	<b>Test mode:</b>	Tx mode
<b>Test Frequency:</b>	30 MHz ~ 1 GHz	<b>Polarization:</b>	Horizontal
<b>Test Voltage:</b>	DC 3V	<b>Environment:</b>	Temp: 24°C Huni: 57%

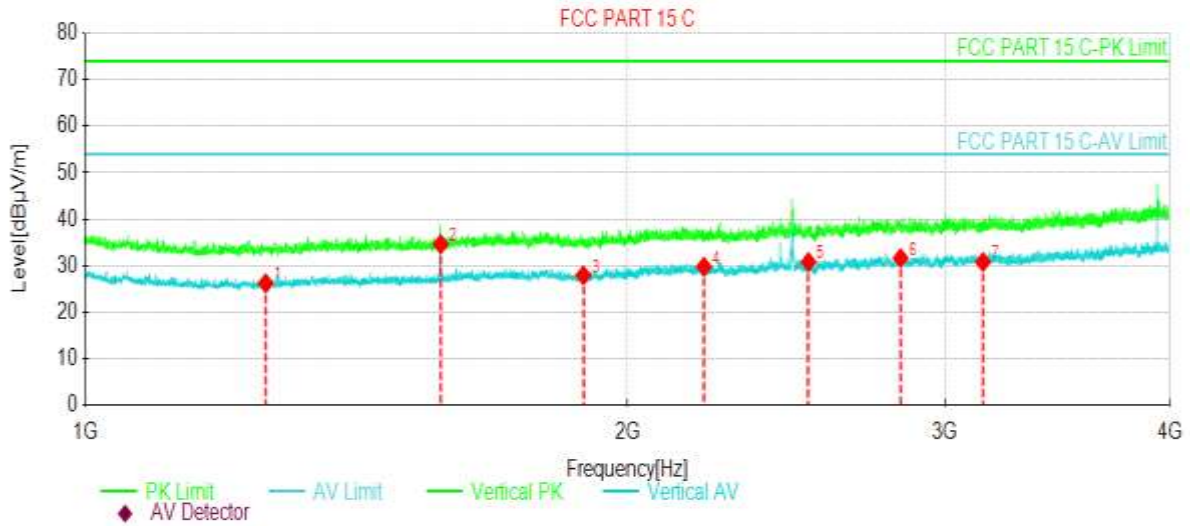


	ReadAntenna	Cable Preamp	Limit	Over					
Freq	Level	Loss	Line	Limit	Remark				
MHz	dBuV	dB/m	dB	dB	dBuV/m				
1 *	315.481	43.77	18.73	1.80	0.00	64.30	46.00	18.30	
2	629.477	17.29	20.02	2.66	0.00	39.97	46.00	-6.03	
3	945.440	18.01	22.79	3.46	0.00	44.26	46.00	-1.74	

**Remark:**

1. Final Level = Receiver Read level + 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.

<b>Product Name:</b>	Smart key	<b>Product Model:</b>	RT-MB2
<b>Test By:</b>	Janet	<b>Test mode:</b>	Tx mode
<b>Test Frequency:</b>	1 GHz ~ 5 GHz	<b>Polarization:</b>	Vertical
<b>Test Voltage:</b>	DC 3V	<b>Environment:</b>	Temp: 24°C Huni: 57%

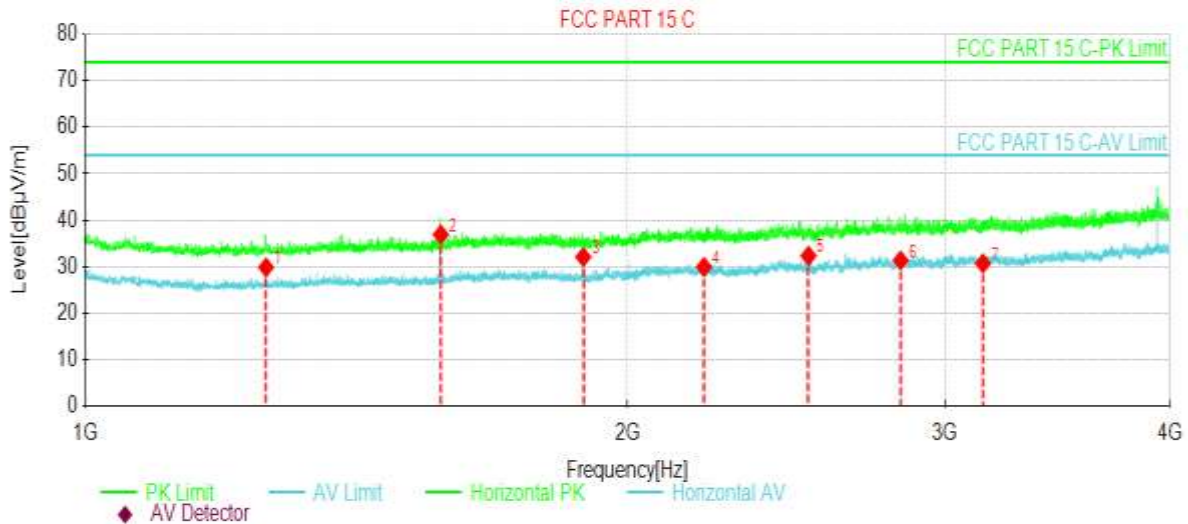


Suspected Data List						
NO.	Freq. [MHz]	Final PK Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	1259.2259	26.18	-23.44	54.00	27.82	Vertical
2	1574.8575	34.62	-22.06	54.00	19.38	Vertical
3	1890.1890	27.92	-21.39	54.00	26.08	Vertical
4	2205.2205	29.78	-20.16	54.00	24.22	Vertical
5	2520.2520	30.78	-19.43	54.00	23.22	Vertical
6	2835.2835	31.63	-18.44	54.00	22.37	Vertical
7	3150.0150	30.79	-17.70	54.00	23.21	Vertical

**Remark:**

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
- The emission levels of other frequencies are very lower than the limit and not show in test report.
- worse AV value = PK+duty cycle factor = 32.95<60.83

<b>Product Name:</b>	Smart key	<b>Product Model:</b>	RT-MB2
<b>Test By:</b>	Janet	<b>Test mode:</b>	Tx mode
<b>Test Frequency:</b>	1 GHz ~ 5 GHz	<b>Polarization:</b>	Horizontal
<b>Test Voltage:</b>	DC 3V	<b>Environment:</b>	Temp: 24°C Huni: 57%



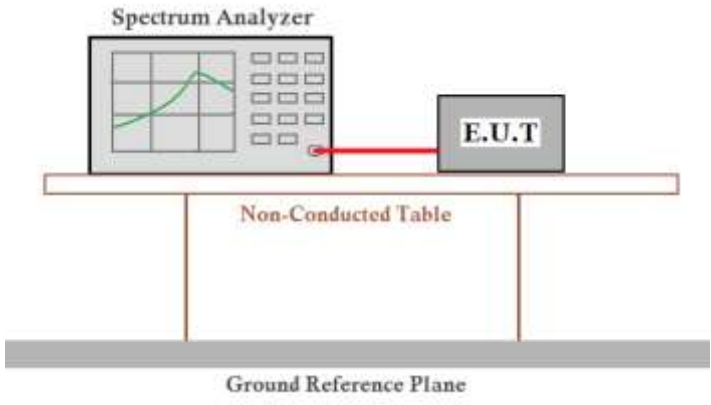
Suspected Data List						
NO.	Freq. [MHz]	Final PK Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	1259.8260	29.84	-23.43	54.00	24.16	Horizontal
2	1575.1575	36.91	-22.06	54.00	17.09	Horizontal
3	1889.8890	32.08	-21.39	54.00	21.92	Horizontal
4	2205.2205	29.93	-20.16	54.00	24.07	Horizontal
5	2520.2520	32.34	-19.43	54.00	21.66	Horizontal
6	2835.2835	31.34	-18.44	54.00	22.66	Horizontal
7	3150.0150	30.69	-17.70	54.00	23.31	Horizontal

**Remark:**

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
- The emission levels of other frequencies are very lower than the limit and not show in test report.
- worse AV value = PK+duty cycle factor = 35.24<60.83



### 6.3 Bandwidth

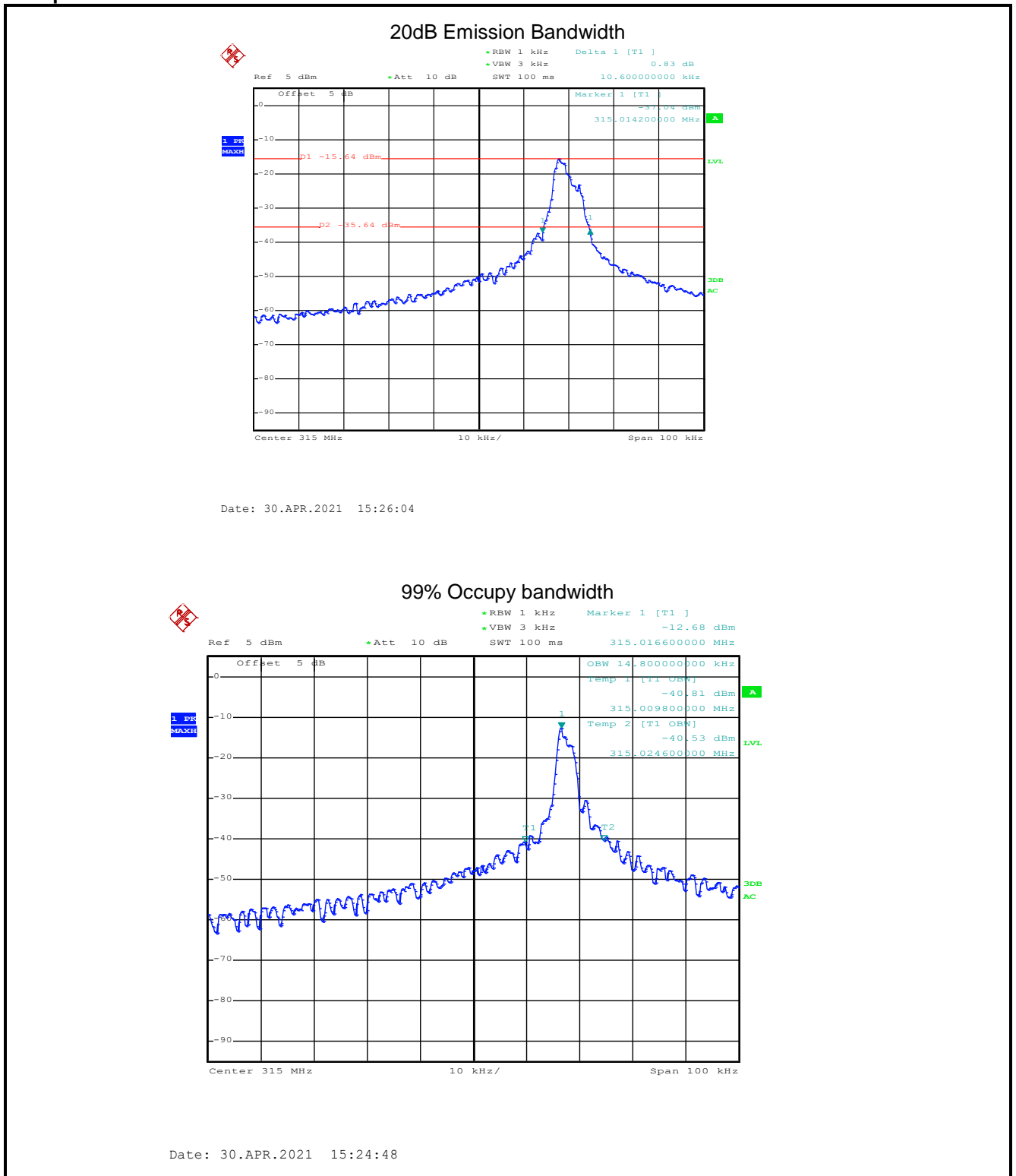
Test Requirement:	FCC Part15 C Section 15.231 (c)
Receiver setup:	RBW=1kHz, VBW=3kHz, detector: Peak
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.
Test Procedure:	<ol style="list-style-type: none"> <li>1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT.</li> <li>2. Set the EUT to proper test channel.</li> <li>3. Max hold the radiated emissions, mark the peak power frequency point and the -20dB upper and lower frequency points.</li> <li>4. Read 20dB bandwidth.</li> </ol>
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

#### Measurement Data

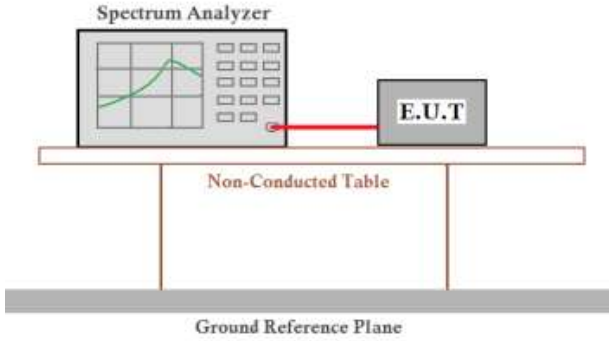
20dB bandwidth (MHz)	99% Occupy bandwidth (MHz)	Limit (MHz)	Results
0.0106	0.0148	0.7875	Passed

Note: Limit= Fundamental frequency×0.25%=315×0.25%=0.7875MHz

Test plot as follows:



### 6.4 Duration Time

Test Requirement:	FCC Part15 C Section 15.231 (a) (1)
Receiver setup:	RBW=1MHz, VBW=3MHz, span=0Hz, detector: Peak
Limit:	Not more than 5 seconds
Test mode:	Transmitting mode
Test Procedure:	<ol style="list-style-type: none"> <li>1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT.</li> <li>2. Set the EUT to proper test channel.</li> <li>3. Single scan the transmission, and read the transmission time.</li> </ol>
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

### Measurement Data

Duration time (second)	Limit (second)	Result
0.3105	<5.0	Pass

Test plot as follows:

