

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-FD164B, RT-FD163B

FCC ID: 2AOKM-FD16

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

Date of sample receipt: 22 Jul., 2021

Date of Test: 23 Jul, to 27 Aug., 2021

Date of report issue: 30 Aug., 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.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

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2 Version

Version No.	Date	Description
00	30 Aug., 2021	Original

Prepared By: Janet Wei **Date:** 30 Aug., 2021
Test Engineer

Check By: Winner Zhang **Date:** 30 Aug., 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
Remarks: 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).		
Test Method:	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-FD164B, RT-FD163B
Operation Frequency:	315MHz
Channel numbers:	1
Modulation type:	ASK
Antenna Type:	Intranal antenna
Antenna gain:	-5.0 dBi
Power supply:	DC 3V (CR2450 battery)
Test Sample Condition:	The test samples were provided in good working order with no visible defects.
Remark:	All models are identical inside, including the electrical circuit design, layout, components used and internal wiring. Models RT-FD164B, RT-FD163B represent appearance of the key with 3 and 4 buttons on the shell. The PCB function is the same for all these models.

5.3 Test mode

Transmitting mode:	Keep the EUT in transmitting mode with modulation（new battery used）		
Pre-Test Mode:			
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)	64.01	64.30	65.90
Final Test Mode:			
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 (30MHz ~ 1000MHz)	±4.32 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.16 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 17025:2017 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-JYTee@lets.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	07-02-2021	07-01-2022
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-03-2021	03-02-2022
Horn Antenna	SCHWARZBECK	BBHA9120D	1805	06-26-2021	06-25-2022
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

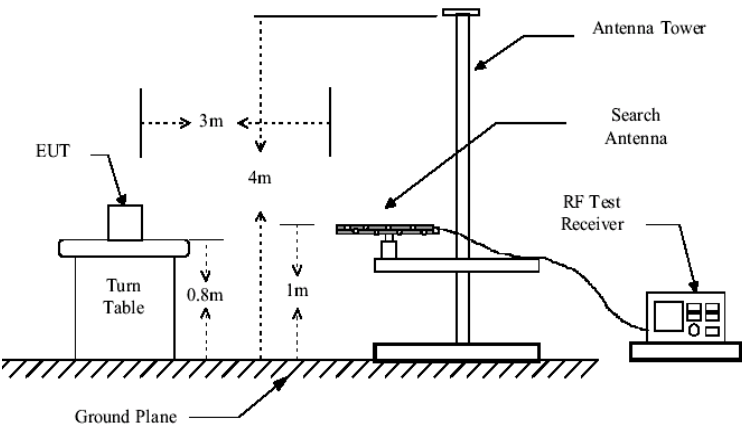
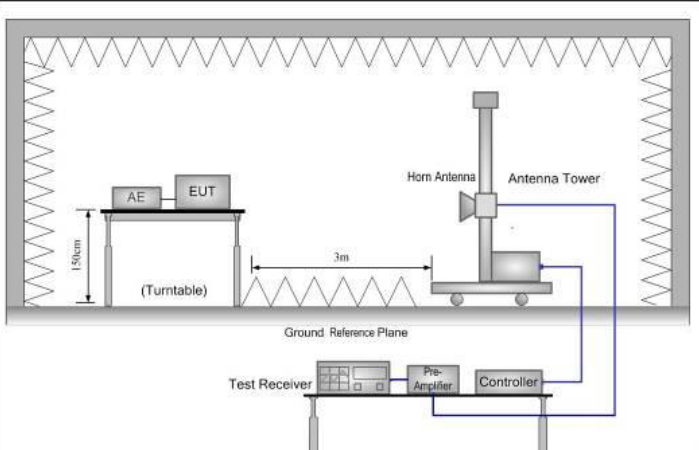
6 Test results and Measurement Data

6.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203
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.	
E.U.T Antenna:	
The EUT make use of a PCB antenna, The typical gain of the antenna is -5.0dBi.	

6.2 Radiated Emission

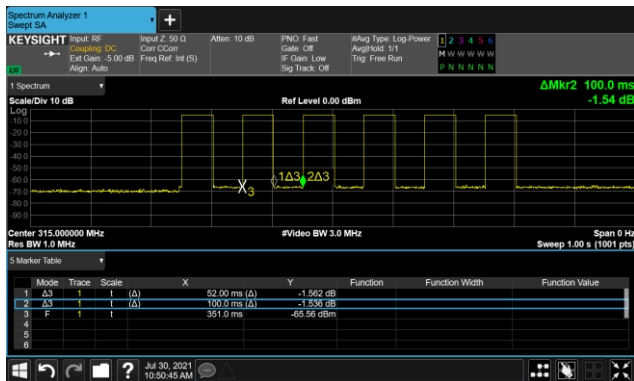
Test Requirement:	FCC Part15 C Section 15.231(b) and 15.209				
Test Frequency Range:	30MHz to 3500MHz				
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
Limit: (Field strength of the fundamental signal)	Frequency		Limit (dBuV/m @3m)		Remark
	315MHz		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:	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.				
	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.				
	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.				
	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.				
	e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.				
	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.				

Test setup:	Below 1GHz  Above 1GHz 
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

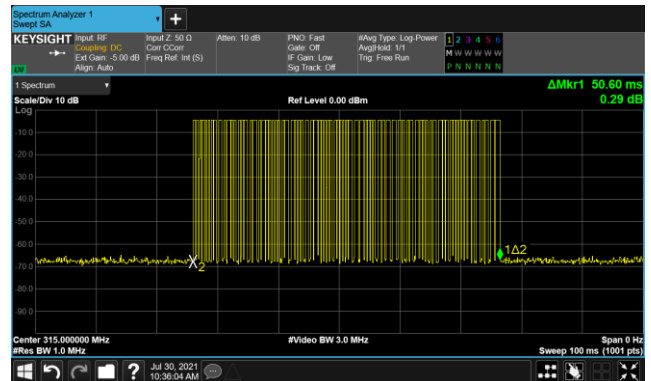
6.2.1 Field Strength Of The Fundamental Signal

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	40.16	18.73	1.8	0.00	60.69	95.62	-34.93	Vertical
315	45.37	18.73	1.8	0.00	65.9	95.62	-29.72	Horizontal
Average value								
Frequency (MHz)	Level (dBuV/m)		Duty Cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)		Over Limit (dB)	Polarization
315	60.69		-11.76	48.93	75.62		-26.69	Vertical
315	65.9		-11.76	54.14	75.62		-21.48	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 =(22*0.5) + (57*0.26)(ms) =25.82(ms)						
		T period =100(ms)=100(ms)						
		Duty cycle =25.82%						
		Duty cycle factor = 20log(Duty cycle) = -11.76						

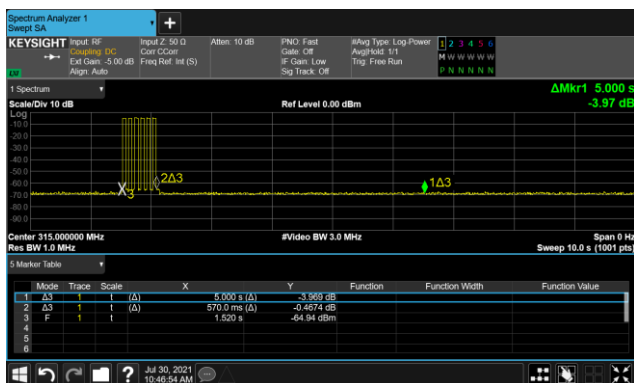
T period:



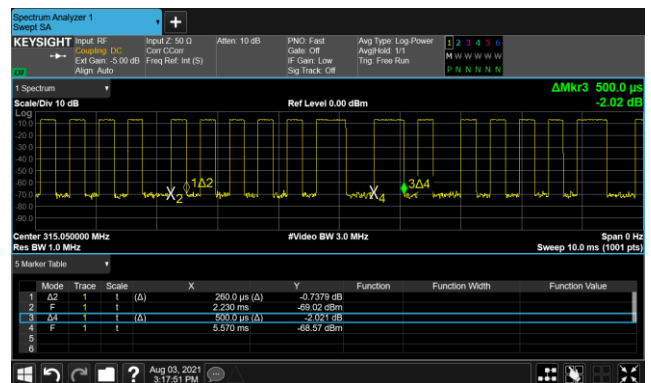
T 100ms:



T 5ms:

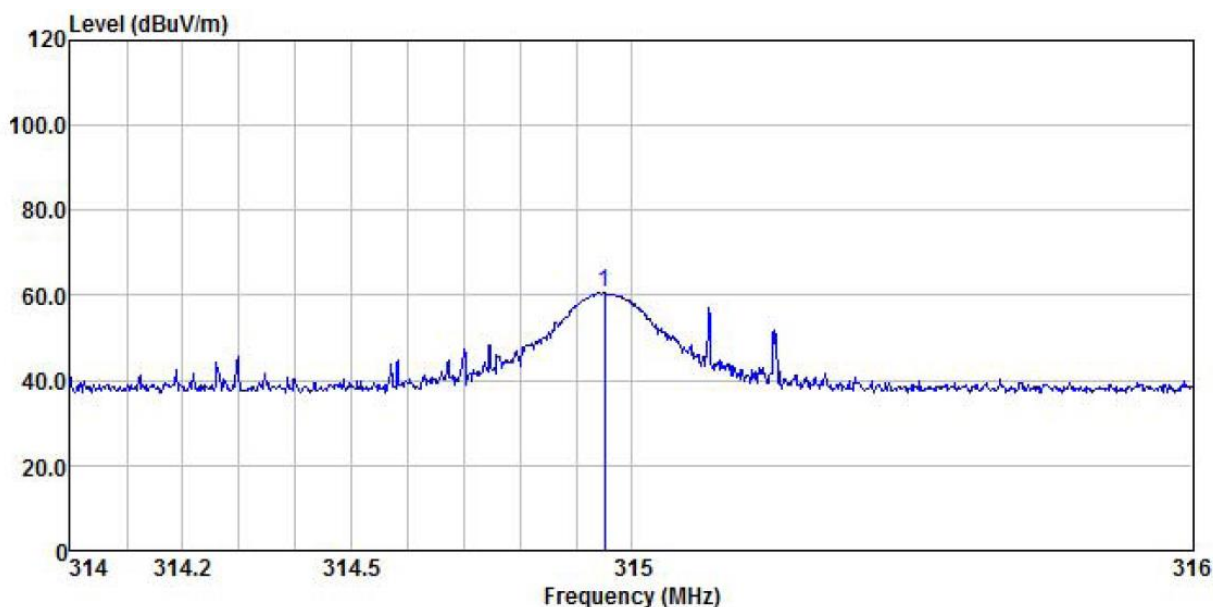


T 10ms:



Test Plots:

Product Name:	Smart key	Product Model:	RT-FD164B
Test By:	Janet	Test mode:	Tx mode
Test Frequency:	315 MHz	Polarization:	Vertical
Test Voltage:	DC 3V	Environment:	Temp: 24°C Humi: 57%

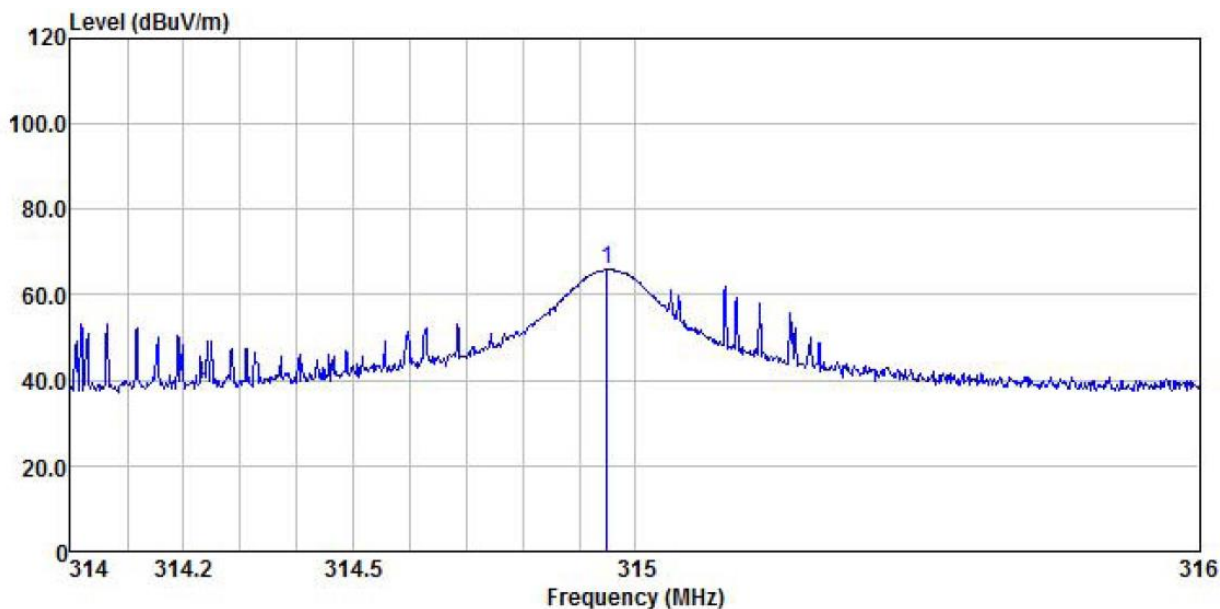


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	314.950	40.16	18.73	1.80	0.00	60.69	-----	-----	Peak

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.

Product Name:	Smart key	Product Model:	RT-FD164B
Test By:	Janet	Test mode:	Tx mode
Test Frequency:	315 MHz	Polarization:	Horizontal
Test Voltage:	DC 3V	Environment:	Temp: 24℃ Huni: 57%



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	314.948	45.37	18.73	1.80	0.00	65.90	-----	-----	Peak

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.

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	
629.48	22.51	20.02	2.66	0.00	45.19	75.62	-30.43	Vertical	
945.44	18.24	22.79	3.46	0.00	44.49	75.62	-31.13	Vertical	
629.48	20.57	20.02	2.66	0.00	43.25	75.62	-32.37	Horizontal	
945.44	18.35	22.79	3.46	0.00	44.60	75.62	-31.02	Horizontal	
Average value									
Frequency (MHz)	Level (dBuV/m)		Duty cycle factor		Average value (dBuV/m)		Limit Line (dBuV/m)	Over Limit (dB)	Polarization
629.48	45.19		-11.76		33.43		55.62	-22.19	Vertical
945.44	44.49		-11.76		32.73		55.62	-22.89	Vertical
629.48	43.25		-11.76		31.49		55.62	-24.13	Horizontal
945.44	44.60		-11.76		32.84		55.62	-22.78	Horizontal
Remark: Average value=Peak value + Duty Cycle Factor.									

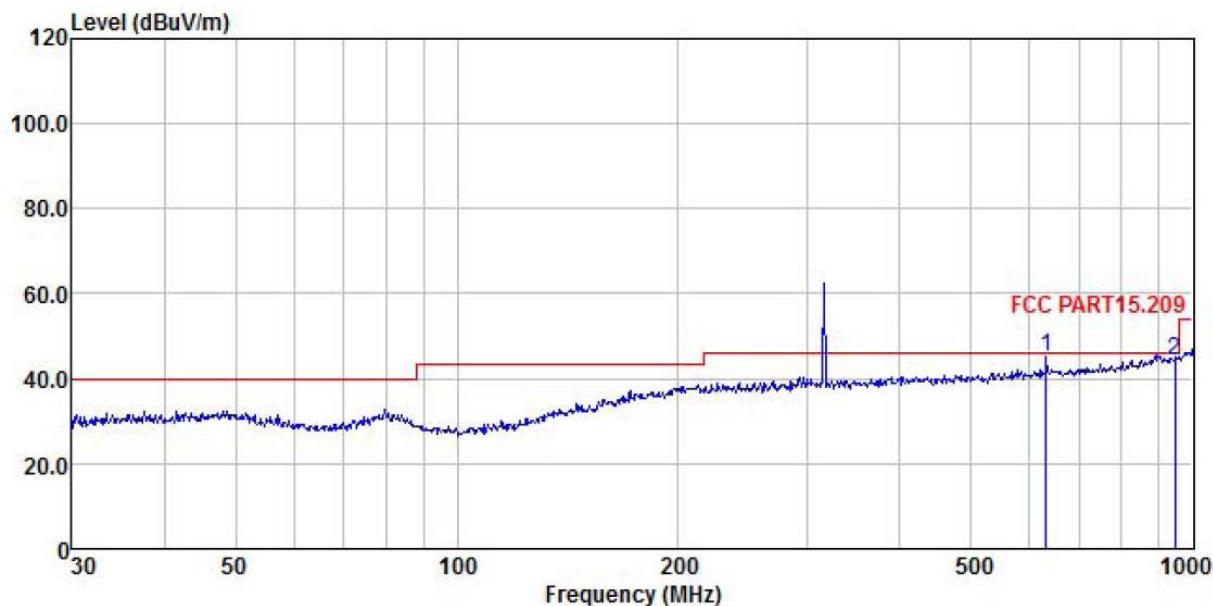
Above 1GHz						
Peak value						
Frequency (MHz)	Read Level (dBuV)	Level (dBuV/m)	Factor (dB)	Limit Line (dBuV/m)	Margin Limit (dB)	polarization
1260	66.64	43.32	-23.32	75.62	32.30	Vertical
1575	55.71	33.36	-22.35	75.62	42.26	Vertical
1890	62.66	41.71	-20.95	75.62	33.91	Vertical
2205	58.54	38.99	-19.55	75.62	36.63	Vertical
2520	60.44	41.94	-18.50	75.62	33.68	Vertical
2835	72.59	55.10	-17.49	75.62	20.52	Vertical
3150	73.29	57.35	-15.94	75.62	18.27	Vertical
1260	62.61	39.29	-23.32	75.62	36.33	Horizontal
1575	56.21	33.86	-22.35	75.62	41.76	Horizontal
1890	59.78	38.83	-20.95	75.62	36.79	Horizontal
2205	59.00	39.45	-19.55	75.62	36.17	Horizontal
2520	57.98	39.48	-18.50	75.62	36.14	Horizontal
2835	61.43	43.94	-17.49	75.62	31.68	Horizontal
3150	66.10	50.16	-15.94	75.62	25.46	Horizontal

Above 1GHz						
Average value						
Frequency (MHz)	Level (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	polarization
1260	43.32	-11.76	31.56	55.62	24.06	Vertical
1575	33.36	-11.76	21.60	55.62	34.02	Vertical
1890	41.71	-11.76	29.95	55.62	25.67	Vertical
2205	38.99	-11.76	27.23	55.62	28.39	Vertical

2520	41.94	-11.76	30.18	55.62	25.44	Vertical
2835	55.10	-11.76	43.34	55.62	12.28	Vertical
3150	57.35	-11.76	45.59	55.62	10.03	Vertical
1260	39.29	-11.76	27.53	55.62	28.09	Horizontal
1575	33.86	-11.76	22.10	55.62	33.52	Horizontal
1890	38.83	-11.76	27.07	55.62	28.55	Horizontal
2205	39.45	-11.76	27.69	55.62	27.93	Horizontal
2520	39.48	-11.76	27.72	55.62	27.90	Horizontal
2835	43.94	-11.76	32.18	55.62	23.44	Horizontal
3150	50.16	-11.76	38.40	55.62	17.22	Horizontal
Remark: Average value=Peak value + Duty Cycle Factor.						

Test Plots:

Product Name:	Smart key	Product Model:	RT-FD164B
Test By:	Janet	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical
Test Voltage:	DC 3V	Environment:	Temp: 24℃ Humi: 57%

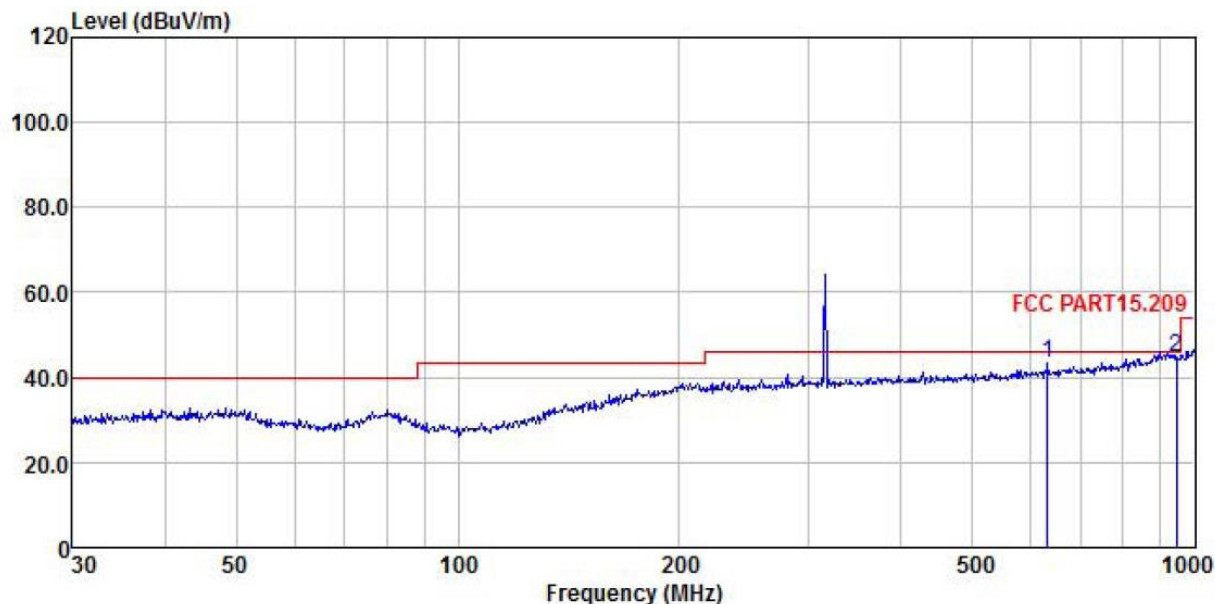


	Freq	ReadAntenna	Cable Preamp		Limit	Over	
	Level	Factor	Loss	Factor	Level	Line	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m
1	631.688	22.51	20.03	2.67	0.00	45.21	46.00
2	945.440	18.24	22.79	3.46	0.00	44.49	46.00

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.

Product Name:	Smart key	Product Model:	RT-FD164B
Test By:	Janet	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Horizontal
Test Voltage:	DC 3V	Environment:	Temp: 24℃ Humi: 57%

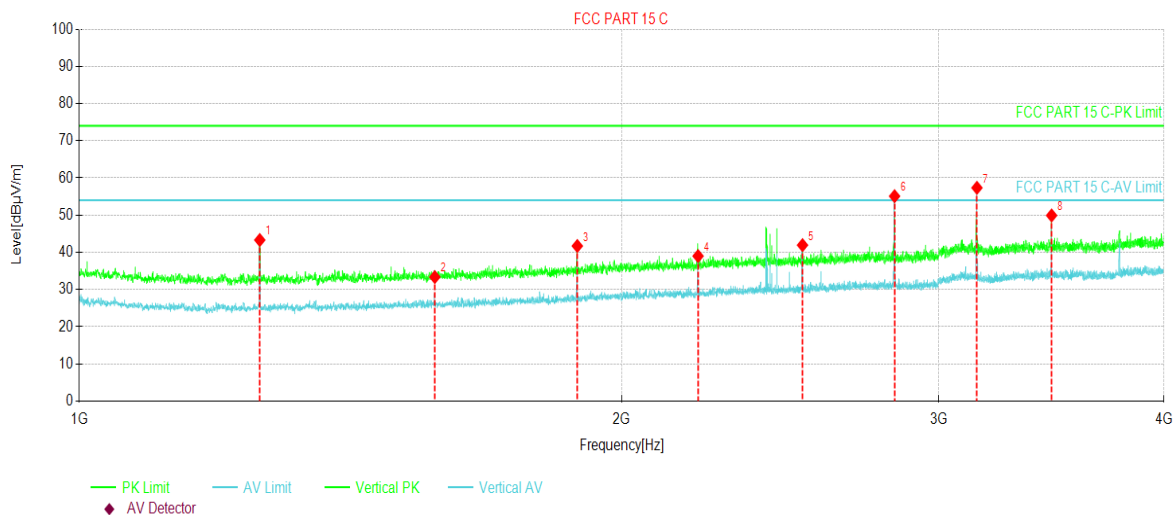


	Freq	Read	Antenna	Cable	Preamp	Level	Limit	Over	
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	631.688	20.57	20.03	2.67	0.00	43.27	46.00	-2.73	Peak
2	945.440	18.35	22.79	3.46	0.00	44.60	46.00	-1.40	Peak

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.

Product Name:	Smart key	Product Model:	RT-FD164B
Test By:	Janet	Test mode:	Tx mode
Test Frequency:	1 GHz ~ 4 GHz	Polarization:	Vertical
Test Voltage:	DC 3V	Environment:	Temp: 24℃ Huni: 57%



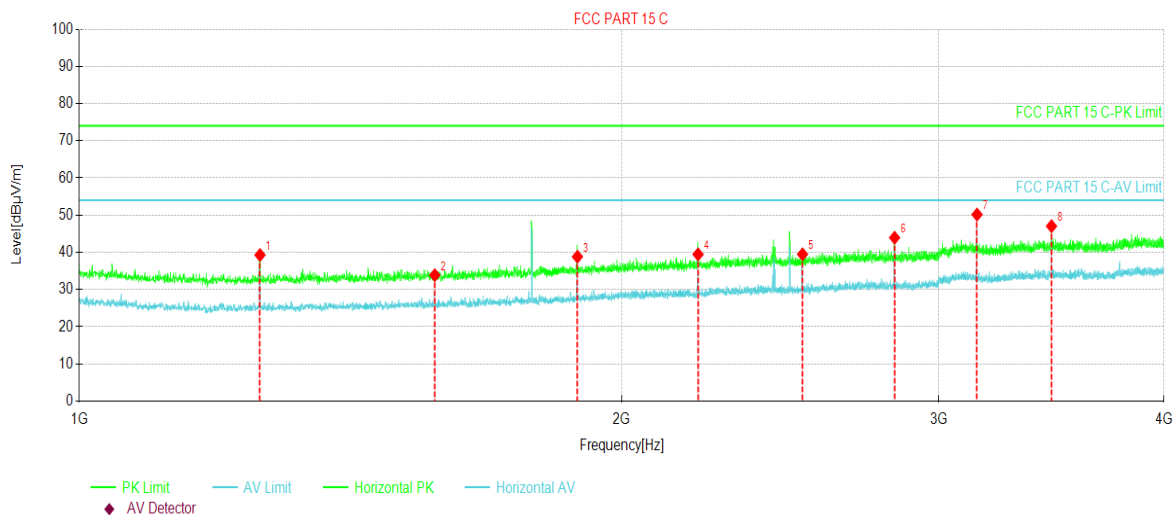
Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	1259.50	66.64	43.32	-23.32	74.00	30.68	PK	Vertical
2	1575.25	55.71	33.36	-22.35	74.00	40.64	PK	Vertical
3	1889.87	62.66	41.71	-20.95	74.00	32.29	PK	Vertical
4	2205.25	58.54	38.99	-19.55	74.00	35.01	PK	Vertical
5	2520.25	60.44	41.94	-18.50	74.00	32.06	PK	Vertical
6	2834.87	72.59	55.10	-17.49	74.00	18.90	PK	Vertical
7	3149.50	73.29	57.35	-15.94	74.00	16.65	PK	Vertical
8	3464.87	64.91	49.91	-15.00	74.00	24.09	PK	Vertical

Remark:

1. Final Level = Receiver Read level + Antenna Factor

Product Name:	Smart key	Product Model:	RT-FD164B
Test By:	Janet	Test mode:	Tx mode
Test Frequency:	1 GHz ~ 4 GHz	Polarization:	Horizontal
Test Voltage:	DC 3V	Environment:	Temp: 24℃ Huni: 57%



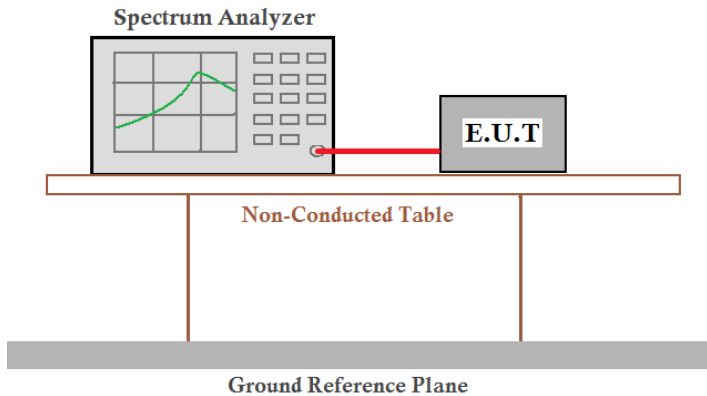
Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	1259.87	62.61	39.29	-23.32	74.00	34.71	PK	Horizontal
2	1575.25	56.21	33.86	-22.35	74.00	40.14	PK	Horizontal
3	1890.25	59.78	38.83	-20.95	74.00	35.17	PK	Horizontal
4	2205.25	59.00	39.45	-19.55	74.00	34.55	PK	Horizontal
5	2520.25	57.98	39.48	-18.50	74.00	34.52	PK	Horizontal
6	2834.87	61.43	43.94	-17.49	74.00	30.06	PK	Horizontal
7	3149.87	66.10	50.16	-15.94	74.00	23.84	PK	Horizontal
8	3464.50	62.04	47.04	-15.00	74.00	26.96	PK	Horizontal

Remark:

1. Final Level = Receiver Read level + Antenna Factor

6.3 20dB Bandwidth

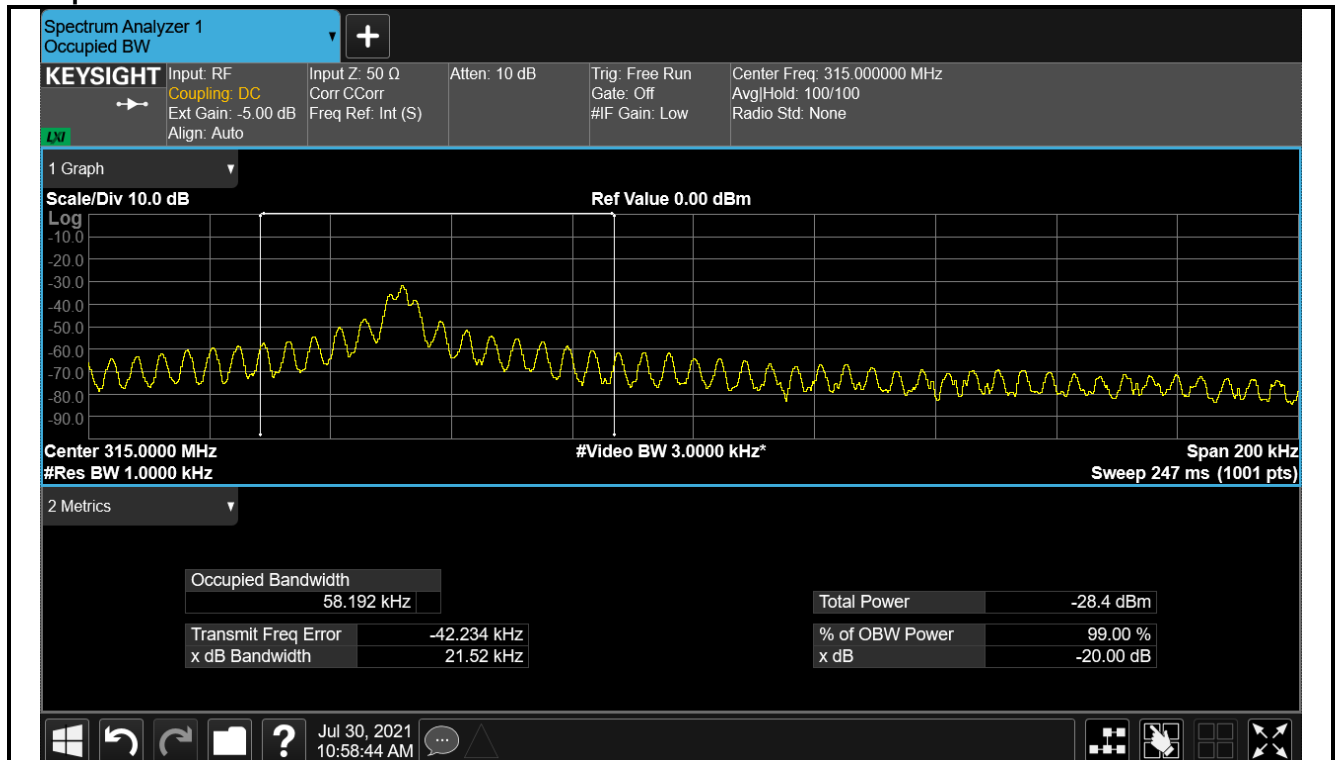
Test Requirement:	FCC Part15 C Section 15.231 (c)
Receiver setup:	RBW=1kHz, VBW=3kHz, detector: Peak
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall 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:	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. Max hold the radiated emissions, mark the peak power frequency point and the -20dB upper and lower frequency points. 4. Read 20dB bandwidth.
Test setup:	 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.
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data

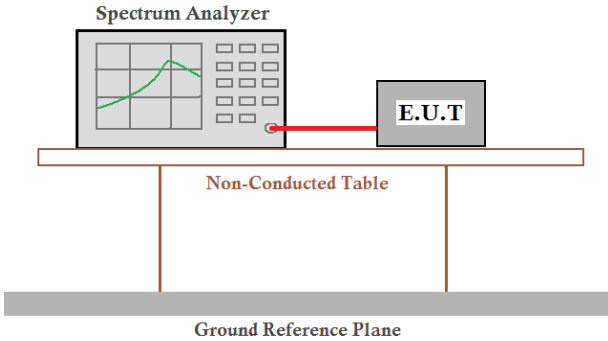
20dB bandwidth (MHz)	Limit (MHz)	99% Occupy Bandwidth (MHz)	Results
0.02152	0.7875	0.058192	Passed

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 (a1)
Receiver setup:	RBW=1MHz, VBW=3MHz, span=0Hz, detector: Peak
Limit:	Not more than 5 seconds
Test mode:	Transmitting mode
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.
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) by a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.
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
0.57	<5.0	Pass

Test plot as follows:

