

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-HD094B, RT-HD095B

FCC ID: 2AOKM-HD09

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

Date of sample receipt: 29 Oct., 2021

Date of Test: 30 Oct., to 31 Dec., 2021

Date of report issue: 05 Jan., 2022

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	16 Dec., 2021	Original
01	30 Dec., 2021	<ol style="list-style-type: none"> 1. Updated test data on page 12 to 18. 2. Updated test data on page 19. 3. Updated test requirement on page 21.
02	05 Jan., 2022	<ol style="list-style-type: none"> 1. Updated test data on page 14/15.

Prepared By:

Janet Wei

Date:

05 Jan., 2022

Test Engineer

Check By:

Winner Zhang

Date:

05 Jan., 2022

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-HD094B, RT-HD095B
Operation Frequency:	433.96MHz
Channel numbers:	1
Modulation type:	FSK
Antenna Type:	PCB antenna
Antenna gain:	-5.0 dBi
Power supply:	DC 3V (CR2032 battery)
Test Sample Condition:	The test samples were provided in good working order with no visible defects.
Remark:	Model No.: RT-HD094B, RT-HD095B All models are identical inside, including the electrical circuit design, layout, components used and internal wiring. Models RT-HD094B, RT-HD095B represent appearance of the key with 4 and 5 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)	71.03	72.10	73.72
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

Parameter	Expanded Uncertainty (Confidence of 95%)
Radiated Emission (30MHz ~ 1GHz) for 3m SAC	4.45 dB
Radiated Emission (1GHz ~ 18GHz) for 3m SAC	5.34 dB
Radiated Emission (18GHz ~ 40GHz) for 3m SAC	5.34 dB

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 and 10m 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.

● **CNAS - Registration No.: CNAS L15527**

JianYan Testing Group Shenzhen Co., Ltd. is accredited to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L15527.

● **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

Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
3m SAC	ETS	RFD-100	Q1984	04-14-2021	04-13-2024
BiConiLog Antenna	SCHWARZBECK	VULB9163	9163-1246	03-07-2021	03-06-2022
Biconical Antenna	SCHWARZBECK	VUBA 9117	9117#359	06-17-2021	06-17-2022
Horn Antenna	SCHWARZBECK	BBHA9120D	912D-916	03-07-2021	03-06-2022
Broad-Band Horn Antenna	SCHWARZBECK	BBHA9170	1067	04-02-2021	04-01-2022
Broad-Band Horn Antenna	SCHWARZBECK	BBHA9170	1068	04-02-2021	04-01-2022
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-03-2021	03-02-2022
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-03-2021	03-02-2022
Spectrum analyzer	Keysight	N9010B	MY60240202	10-27-2021	10-26-2022
Low Pre-amplifier	SCHWARZBECK	BBV9743B	00305	03-07-2021	03-06-2022
High Pre-amplifier	SKET	LNPA_0118G-50	MF280208233	03-07-2021	03-06-2022
Cable	Qualwave	JYT3M-1G-NN-8M	JYT3M-1	03-07-2021	03-06-2022
Cable	Qualwave	JYT3M-18G-NN-8M	JYT3M-2	03-07-2021	03-06-2022
Cable	Qualwave	JYT3M-1G-BB-5M	JYT3M-3	03-07-2021	03-06-2022
Cable	Bost	JYT3M-40G-SS-8M	JYT3M-4	04-02-2021	04-01-2022
EMI Test Software	Tonscend	TS+		Version:3.0.0.1	

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(a) 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	
	433.96MHz	80.83		Average Value	
		100.83		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>				

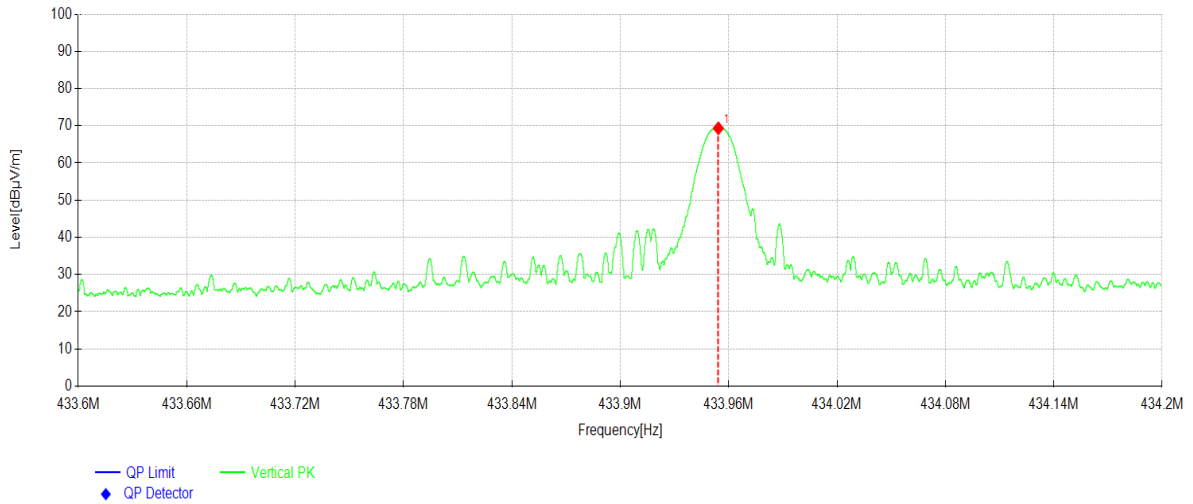
<p>Test setup:</p>	<p>Below 1GHz</p> <p>Above 1GHz</p>
<p>Test Instruments:</p>	<p>Refer to section 5.9 for details</p>
<p>Test mode:</p>	<p>Refer to section 5.3 for details</p>
<p>Test results:</p>	<p>Pass</p>

6.2.1 Field Strength Of The Fundamental Signal

Peak value						
Frequency (MHz)	Read Level (dBuV)	Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
433.95	50.53	18.78	69.31	100.83	31.52	Vertical
433.95	54.94	18.78	73.72	100.83	27.11	Horizontal

Test Plots:

Product Name:	Smart key	Product Model:	RT-HD094B
Test By:	Janet	Test mode:	Tx mode
Test Frequency:	433.96 MHz	Polarization:	Vertical
Test Voltage:	DC 3V	Environment:	Temp: 24°C Huni: 57%

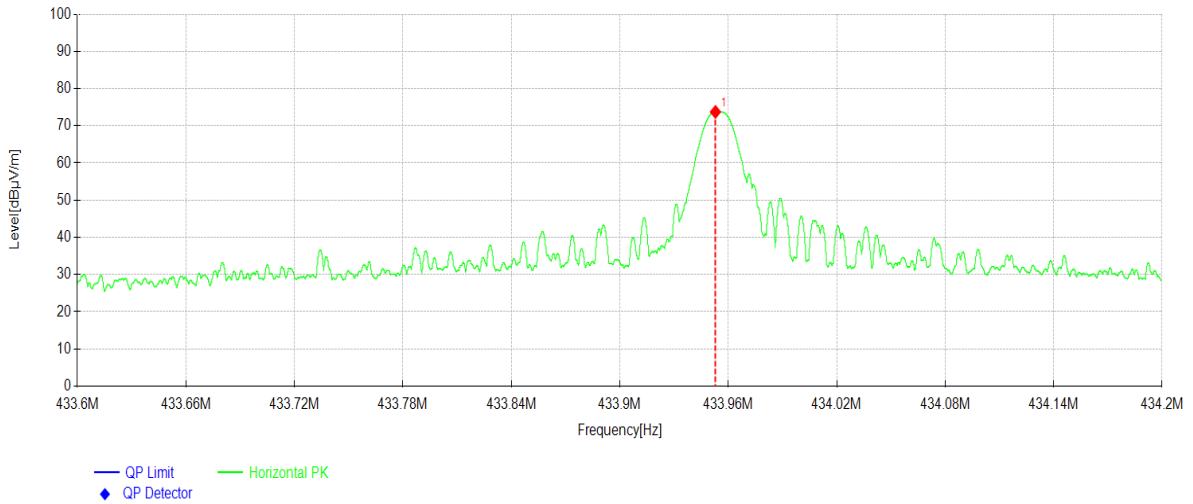


Suspected Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Trace	Polarity
1	433.954	50.53	69.31	18.78	100.83	31.52	PK	Vertical

Remark:

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

Product Name:	Smart key	Product Model:	RT-HD094B
Test By:	Janet	Test mode:	Tx mode
Test Frequency:	433.96 MHz	Polarization:	Horizontal
Test Voltage:	DC 3V	Environment:	Temp: 24°C Huni: 57%



Suspected Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Trace	Polarity
1	433.952	54.94	73.72	18.78	100.83	27.11	PK	Horizontal

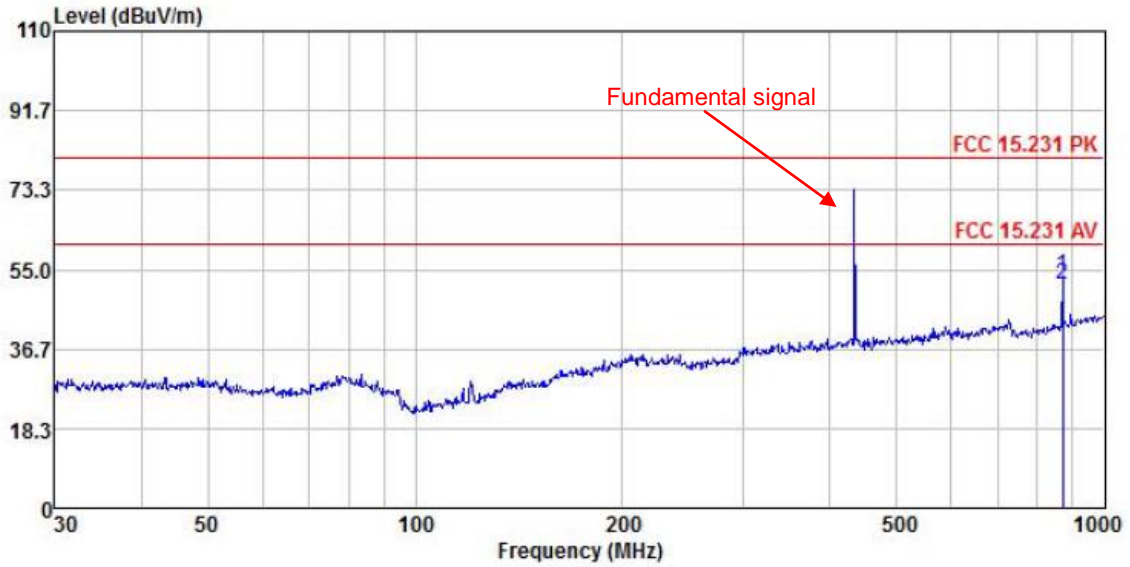
Remark:

- Final Level = Receiver Read level + Factor.(Antenna Factor + Cable Loss – Preamplifier Factor).

6.2.2 Spurious Emissions

Test Plots:

Product Name:	Smart key	Product Model:	RT-HD094B
Test By:	Janet	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical
Test Voltage:	DC 3V	Environment:	Temp: 24°C Humi: 57%

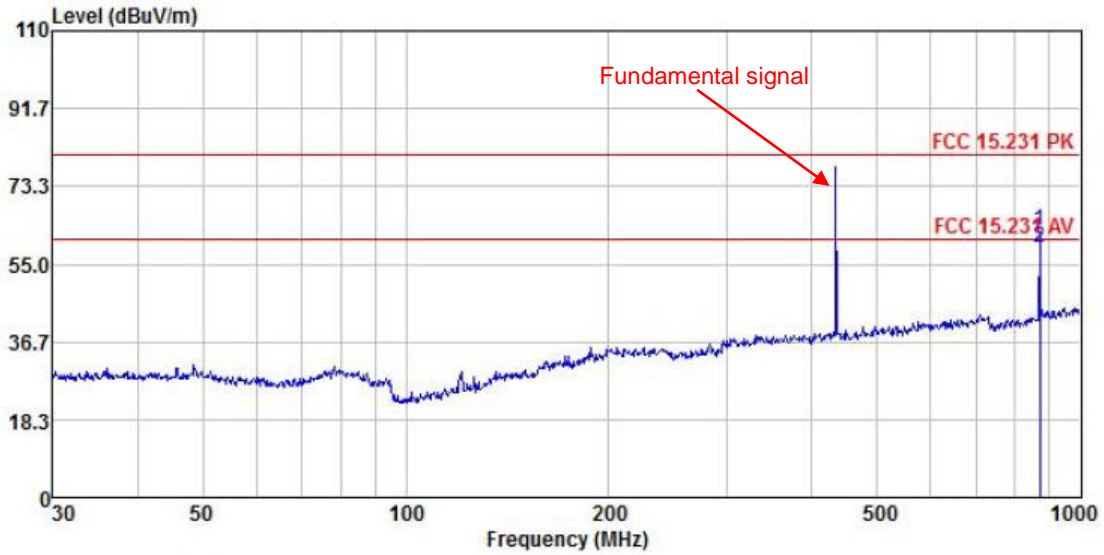


	Read	Antenna	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Level	Line	Limit Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	869.130	28.26	21.85	3.27	0.00	53.38	80.86 -27.48 Peak
2	869.130	26.26	21.85	3.27	0.00	51.38	60.86 -9.48 Average

Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor
- 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-HD094B
Test By:	Janet	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Horizontal
Test Voltage:	DC 3V	Environment:	Temp: 24°C Huni: 57%

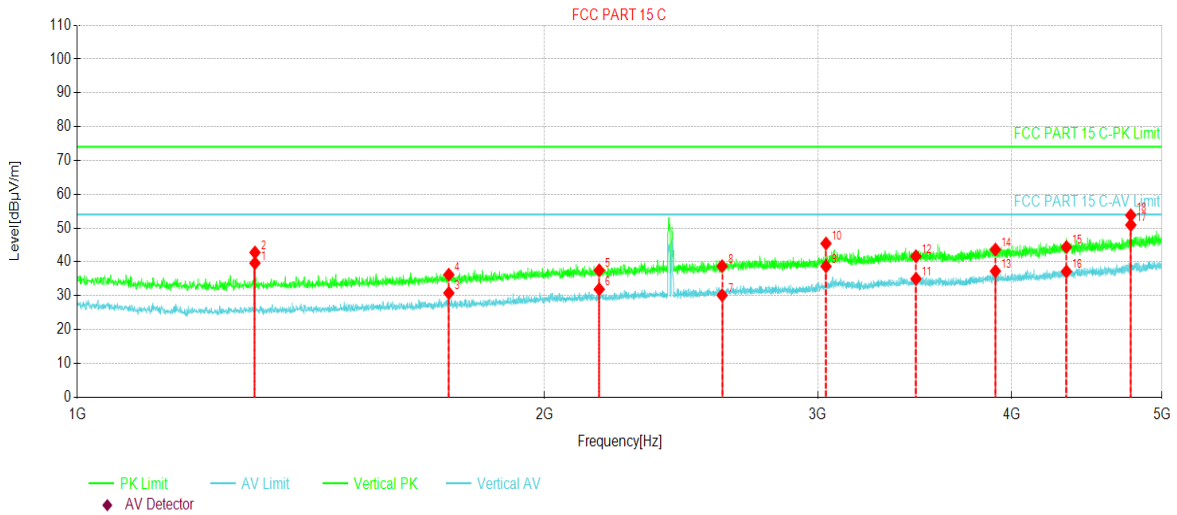


	Read	Antenna	Cable	Preamp	Level	Limit	Over	
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	869.130	37.81	21.85	3.27	0.00	62.93	80.86	-17.93 Peak
2	869.130	33.81	21.85	3.27	0.00	58.93	60.86	-1.93 Average

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.

Product Name:	Smart key	Product Model:	RT-HD094B
Test By:	Janet	Test mode:	Tx mode
Test Frequency:	1 GHz ~ 5 GHz	Polarization:	Vertical
Test Voltage:	DC 3V	Environment:	Temp: 24°C Huni: 57%

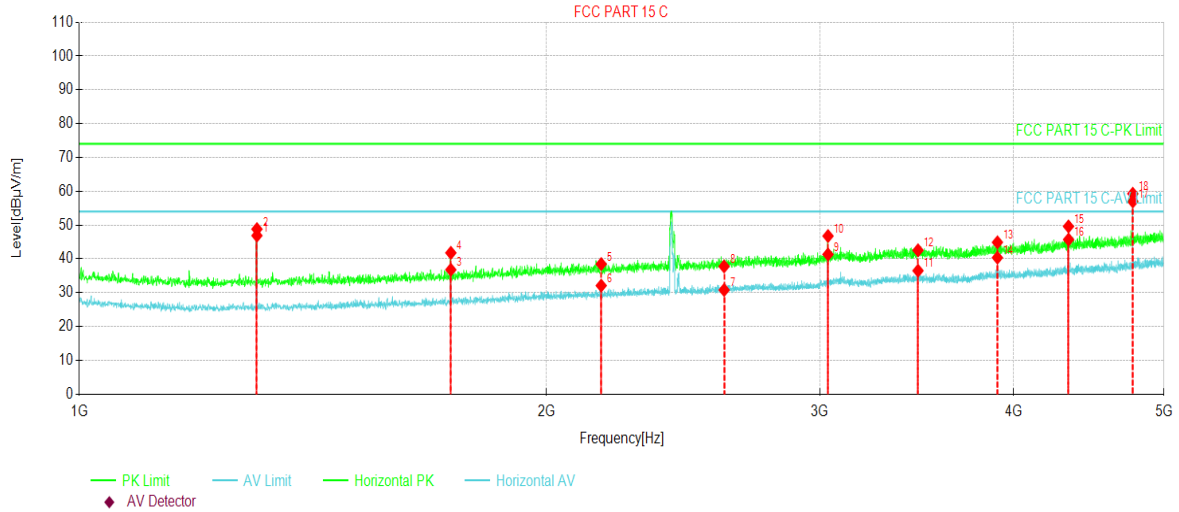


Suspected Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Trace	Polarity
1	1301.70	62.78	39.62	-23.16	54.00	14.38	AV	Vertical
2	1301.70	65.94	42.78	-23.16	74.00	31.22	PK	Vertical
3	1735.60	52.45	30.79	-21.66	54.00	23.21	AV	Vertical
4	1735.60	57.86	36.20	-21.66	74.00	37.80	PK	Vertical
5	2169.50	57.12	37.49	-19.63	74.00	36.51	PK	Vertical
6	2169.50	51.53	31.90	-19.63	54.00	22.10	AV	Vertical
7	2603.40	48.16	30.12	-18.04	54.00	23.88	AV	Vertical
8	2603.40	56.76	38.72	-18.04	74.00	35.28	PK	Vertical
9	3037.30	55.21	38.68	-16.53	54.00	15.32	AV	Vertical
10	3037.30	61.97	45.44	-16.53	74.00	28.56	PK	Vertical
11	3471.20	49.96	34.99	-14.97	54.00	19.01	AV	Vertical
12	3471.20	56.61	41.64	-14.97	74.00	32.36	PK	Vertical
13	3905.10	50.74	37.25	-13.49	54.00	16.75	AV	Vertical
14	3905.10	57.13	43.64	-13.49	74.00	30.36	PK	Vertical
15	4339.00	55.84	44.38	-11.46	74.00	29.62	PK	Vertical
16	4339.00	48.61	37.15	-11.46	54.00	16.85	AV	Vertical
17	4774.00	60.26	50.91	-9.35	54.00	3.09	AV	Vertical
18	4774.00	63.12	53.77	-9.35	74.00	20.23	PK	Vertical

Remark:

- Final Level = Receiver Read level + Factor. (Antenna Factor + Cable Loss – Preamplifier Factor).
- 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-HD094B
Test By:	Janet	Test mode:	Tx mode
Test Frequency:	1 GHz ~ 5 GHz	Polarization:	Horizontal
Test Voltage:	DC 3V	Environment:	Temp: 24°C Huni: 57%

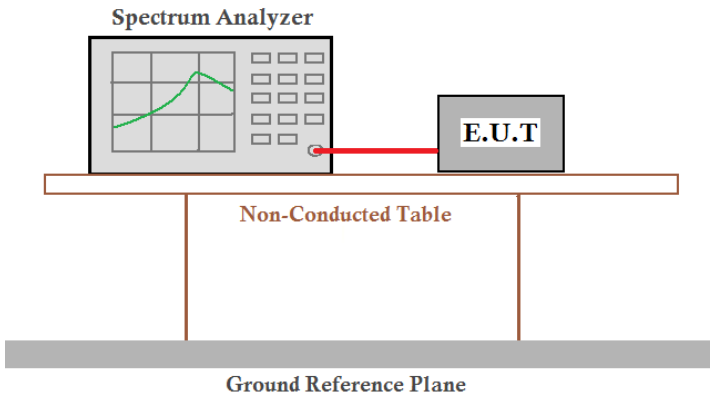


Suspected Data List								
NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Factor [dB]	Limit [dBuV/m]	Margin [dB]	Trace	Polarity
1	1301.70	70.04	46.88	-23.16	54.00	7.12	AV	Horizontal
2	1301.70	71.96	48.80	-23.16	74.00	25.20	PK	Horizontal
3	1735.60	58.44	36.78	-21.66	54.00	17.22	AV	Horizontal
4	1735.60	63.44	41.78	-21.66	74.00	32.22	PK	Horizontal
5	2169.50	58.10	38.47	-19.63	74.00	35.53	PK	Horizontal
6	2169.50	51.72	32.09	-19.63	54.00	21.91	AV	Horizontal
7	2603.40	48.84	30.80	-18.04	54.00	23.20	AV	Horizontal
8	2603.40	55.82	37.78	-18.04	74.00	36.22	PK	Horizontal
9	3037.30	57.85	41.32	-16.53	54.00	12.68	AV	Horizontal
10	3037.30	63.28	46.75	-16.53	74.00	27.25	PK	Horizontal
11	3471.20	51.47	36.50	-14.97	54.00	17.50	AV	Horizontal
12	3471.20	57.51	42.54	-14.97	74.00	31.46	PK	Horizontal
13	3905.10	58.38	44.89	-13.49	74.00	29.11	PK	Horizontal
14	3905.10	53.84	40.35	-13.49	54.00	13.65	AV	Horizontal
15	4339.50	61.06	49.60	-11.46	74.00	24.40	PK	Horizontal
16	4340.00	57.17	45.71	-11.46	54.00	8.29	AV	Horizontal
17	4774.00	66.34	56.99	-9.35	54.00	-2.99	AV	Horizontal
18	4774.00	68.62	59.27	-9.35	74.00	14.73	PK	Horizontal

Remark:

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

6.3 20dB Bandwidth

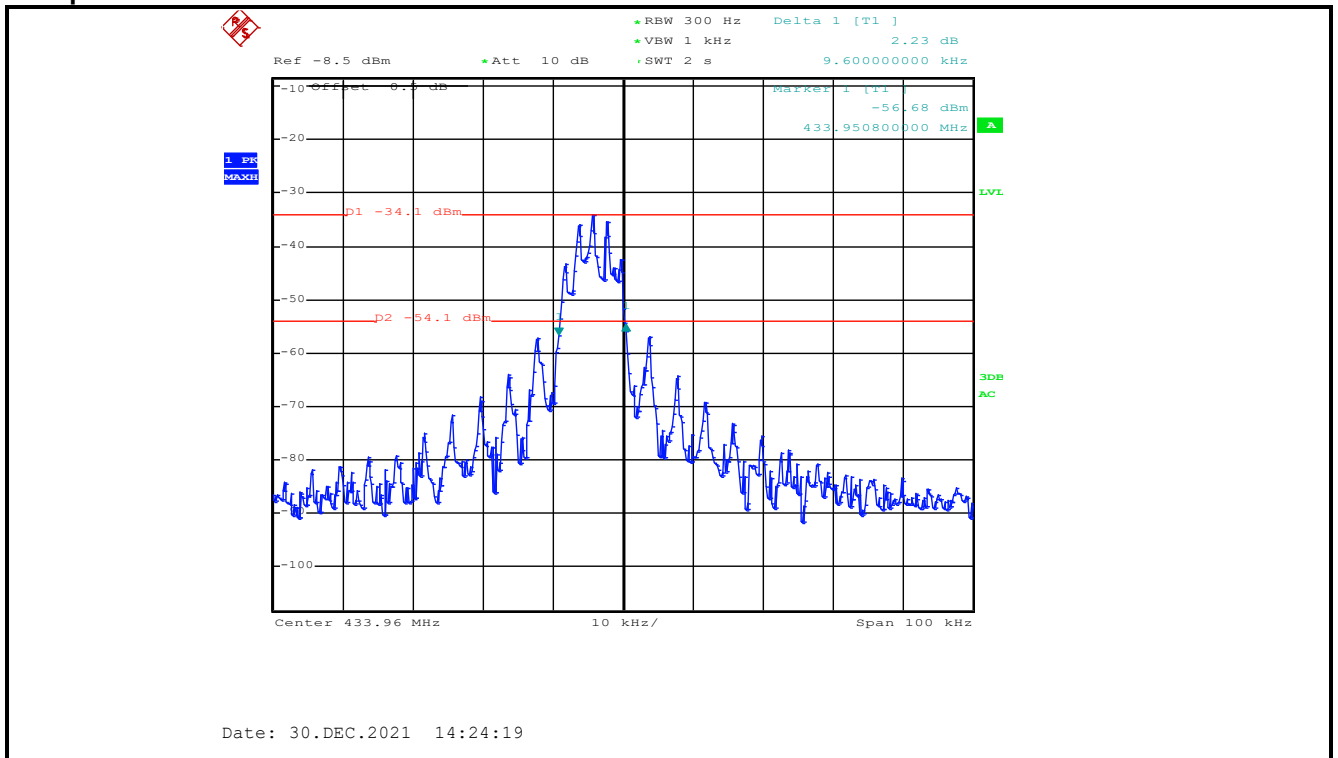
Test Requirement:	FCC Part15 C Section 15.231 (c)
Receiver setup:	RBW=1kHz, VBW=3kHz, detector: Peak
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall 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:	<ol style="list-style-type: none"> 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:	 <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

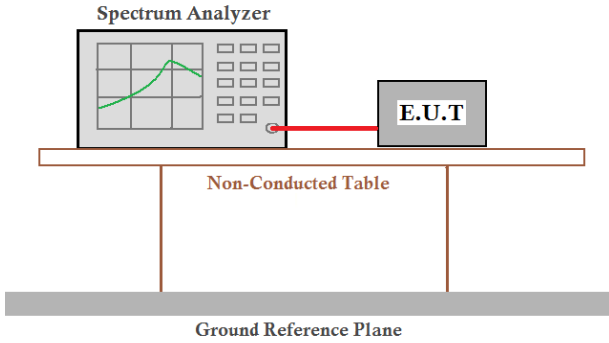
20dB bandwidth (MHz)	Limit (MHz)	Results
0.0096	1.0849	Passed

Note: Limit= Fundamental frequency×0.25%=433.96×0.25%=1.0849MHz

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:	<ol style="list-style-type: none"> 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:	 <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
0.200	<5.0	Pass

Test plot as follows:

