



FCC RF Test 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- FDFP4B
FCC ID: 2AOKM-FD17
Applicable Standards: FCC CFR Title 47 Part 15C (§15.249)
Date of Sample Receipt: 25 Apr., 2023
Date of Test: 26 Apr., to 17 May, 2023
Date of Report Issue: 17 May, 2023
Test Result: PASS

Tested by:

Lucas Ding
Test Engineer

Date:

17 May, 2023

Reviewed by:

Wenwen Zhang
Project Engineer

Date:

17 May, 2023

Approved by:

Wenwen Zhang
Manager

Date:

17 May, 2023

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in above the application standard version. Test results reported herein relate only to the item(s) tested.

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2 Version

Version No.	Date	Description
00	09 May, 2023	Original
01	17 May, 2023	Update Page 12, 15, 16.

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4 General Information

4.1 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

4.2 General Description of E.U.T.

Product Name:	Smart Key
Model No.:	RT- FDFP4B
Operation Frequency:	902.8 MHz
Channel Numbers:	1
Modulation Type:	FSK
Antenna Type:	PCB Antenna
Antenna Gain:	-11.25 dBi
Power Supply:	DC3V(CR2032 battery)
Test Sample Condition:	The test samples were provided in good working order with no visible defects.

4.3 Test Mode and Environment

Test Mode:	
Transmitting mode:	Keep the EUT in transmitting mode with modulation
Remark: The EUT was placed on three different polar directions tested: i.e. X axis, Y axis, Z axis, and found the test results are both the "worst case" and "worst setup": Y axis, so the report only reflects the test data of worst mode.	
Operating Environment:	
Temperature:	15°C ~ 35°C
Humidity:	20 % ~ 75 % RH
Atmospheric Pressure:	1010 mbar

4.4 Description of Support Units

N/A

4.5 Measurement Uncertainty

Parameter	Expanded Uncertainty (Confidence of 95%(U = 2Uc(y)))
Radiated Emission (1GHz ~ 18GHz) (3m SAC)	3.6 dB
Radiated Emission (18GHz ~ 40GHz) (3m SAC)	5.34 dB
Radiated Emission (30MHz ~ 1GHz) (10m SAC)	3.7 dB
Remark: All the measurement uncertainty value were shown with a coverage k=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.	

4.6 Additions to, Deviations, or Exclusions From the Method

No

4.7 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
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4.8 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://jyt.lets.com

4.9 Test Instruments List

Radiated Emission(3m SAC):					
Test Equipment	Manufacturer	Model No.	Manage No.	Cal.Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	ETS	9m*6m*6m	WXJ001-1	04-14-2021	04-13-2024
BiConiLog Antenna	Schwarzbeck	VULB9163	WXJ002	02-09-2023	02-08-2024
Biconical Antenna	Schwarzbeck	VUBA9117	WXJ002-1	07-01-2021	07-01-2024
Horn Antenna	Schwarzbeck	BBHA9120D	WXJ002-2	02-09-2023	02-08-2024
Horn Antenna	Schwarzbeck	BBHA9120D	WXJ002-3	01-09-2023	01-08-2024
Loop Antenna	Schwarzbeck	FMZB 1519 B	WXJ002-4	02-09-2023	02-08-2024
Pre-amplifier (30MHz ~ 1GHz)	Schwarzbeck	BBV9743B	WXJ001-2	01-10-2023	01-09-2024
Pre-amplifier (1GHz ~ 18GHz)	SKET	LNPA_0118G-50	WXJ001-3	01-10-2023	01-09-2024
Pre-amplifier (18GHz ~ 40GHz)	RF System	TRLA-180400G45B	WXJ002-7	01-11-2023	01-10-2024
EMI Test Receiver	Rohde & Schwarz	ESRP7	WXJ003-1	01-11-2023	01-10-2024
Spectrum Analyzer	KEYSIGHT	N9010B	WXJ004-2	10-17-2022	10-16-2023
Band Reject Filter Group	Tonscend	JS0806-F	WXJ089	N/A	
Coaxial Cable (30MHz ~ 1GHz)	JYTSZ	JYT3M-1G-NN-8M	WXG001-4	01-18-2023	01-17-2024
Coaxial Cable (1GHz ~ 18GHz)	JYTSZ	JYT3M-18G-NN-8M	WXG001-5	01-18-2023	01-17-2024
Coaxial Cable (18GHz ~ 40GHz)	JYTSZ	JYT3M-40G-SS-8M	WXG001-7	01-18-2023	01-17-2024
Coaxial Cable (9kHz ~ 30MHz)	JYT	JYT3M-1G-BB-5M	WXG001-6	01-18-2023	01-17-2024
Test Software	Tonscend	TS+	Version: 3.0.0.1		

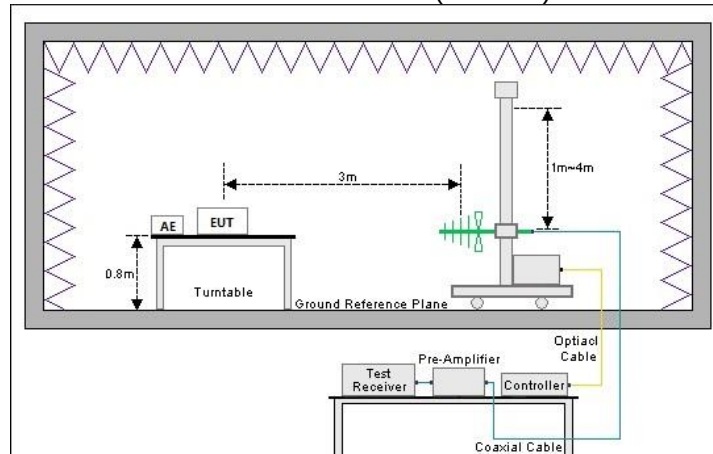
Conducted Method:					
Test Equipment	Manufacturer	Model No.	Manage No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
EMI Test Receiver	Rohde & Schwarz	ESCI3	WXJ003	01-10-2023	01-09-2024

5 Measurement Setup and Procedure

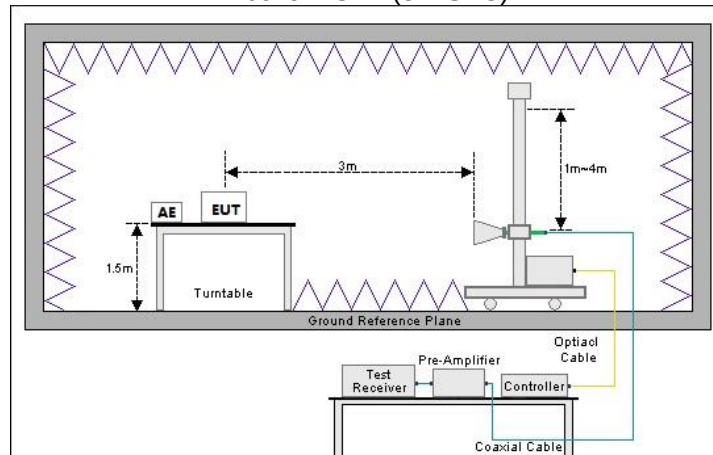
5.1 Test Setup

Radiated emission measurement:

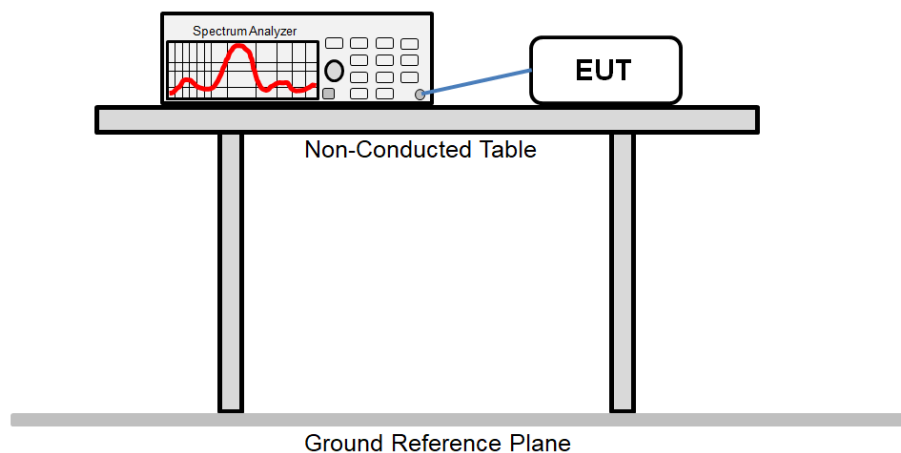
30 MHz – 1000 MHz (3m SAC)



Above 1 GHz (3m SAC)



Conducted test method:



5.2 Test Procedure

Test method	Test step
Radiated emission	1. The EUT was placed on the tabletop of a rotating table 0.8 m the ground at a 3 m semi anechoic chamber. The measurement distance from the EUT to the receiving antenna is 3 m. 2. EUT works in each mode of operation that needs to be tested, and having the EUT continuously working, respectively on 3 axis (X, Y & Z) and considered typical configuration to obtain worst position. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations. 3. Open the test software to control the test antenna and test turntable. Perform the test, save the test results, and export the test data.
Conducted test method	1. The antenna port of EUT was connected to the RF port of the spectrum analyzer through an RF cable. 2. The EUT is keeping in continuous transmission mode and tested in all modulation modes. 3. The test data is saved by the screenshot function of the spectrum analyzer.

6 Test Results

6.1 Summary

6.1.1 Clause and Data Summary

Test items	Standard clause	Test data	Result
Antenna Requirement	15.203	See Section 6.2	Pass
AC Power Line Conducted Emission	15.207	N/A	N/A
20dB Bandwidth	15.215	See Section 6.3	Pass
Field Strength of Fundamental	15.249	See Section 6.4	Pass
Field Strength of Spurious Emissions	15.209, 15.249	See Section 6.5	Pass
Remark: 1. Pass: The EUT complies with the essential requirements in the standard. 2. N/A: This product is battery powered, so no testing is Conducted Emission.			
Test Method:	ANSI C63.10-2013		

6.1.2 Test Limit

Test items	Limit																																						
20dB Bandwidth	Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.																																						
Field Strength of Fundamental Field Strength of Spurious Emissions	<table><thead><tr><th>Fundamental frequency</th><th>Field strength of fundamental (millivolts/meter)</th><th>Field strength of harmonics (microvolts/meter)</th></tr></thead><tbody><tr><td>902-928 MHz</td><td>50</td><td>500</td></tr><tr><td>2400-2483.5 MHz</td><td>50</td><td>500</td></tr><tr><td>5725-5875 MHz</td><td>50</td><td>500</td></tr><tr><td>24.0-24.25 GHz</td><td>250</td><td>2500</td></tr></tbody></table> (1) The above field strength limits are specified at a distance of 3 meters. (2) As shown in § 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth. (3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in § 15.209, whichever limit permits a higher field strength: <table><thead><tr><th>Frequency (MHz)</th><th>Limit (dBµV/m) @ 3m</th><th>Detector</th></tr></thead><tbody><tr><td>30 – 88</td><td>40.0</td><td>Quasi-peak</td></tr><tr><td>88 – 216</td><td>43.5</td><td>Quasi-peak</td></tr><tr><td>216 – 960</td><td>46.0</td><td>Quasi-peak</td></tr><tr><td>960 – 1000</td><td>54.0</td><td>Quasi-peak</td></tr></tbody></table> Note: The more stringent limit applies at transition frequencies. <table><thead><tr><th rowspan="2">Frequency</th><th colspan="2">Limit (dBµV/m) @ 3m</th></tr><tr><th>Average</th><th>Peake</th></tr></thead><tbody><tr><td>Above 1 GHz</td><td>54.0</td><td>74.0</td></tr></tbody></table> Note: The measurement bandwidth shall be 1 MHz or greater.	Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)	902-928 MHz	50	500	2400-2483.5 MHz	50	500	5725-5875 MHz	50	500	24.0-24.25 GHz	250	2500	Frequency (MHz)	Limit (dBµV/m) @ 3m	Detector	30 – 88	40.0	Quasi-peak	88 – 216	43.5	Quasi-peak	216 – 960	46.0	Quasi-peak	960 – 1000	54.0	Quasi-peak	Frequency	Limit (dBµV/m) @ 3m		Average	Peake	Above 1 GHz	54.0	74.0
Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)																																					
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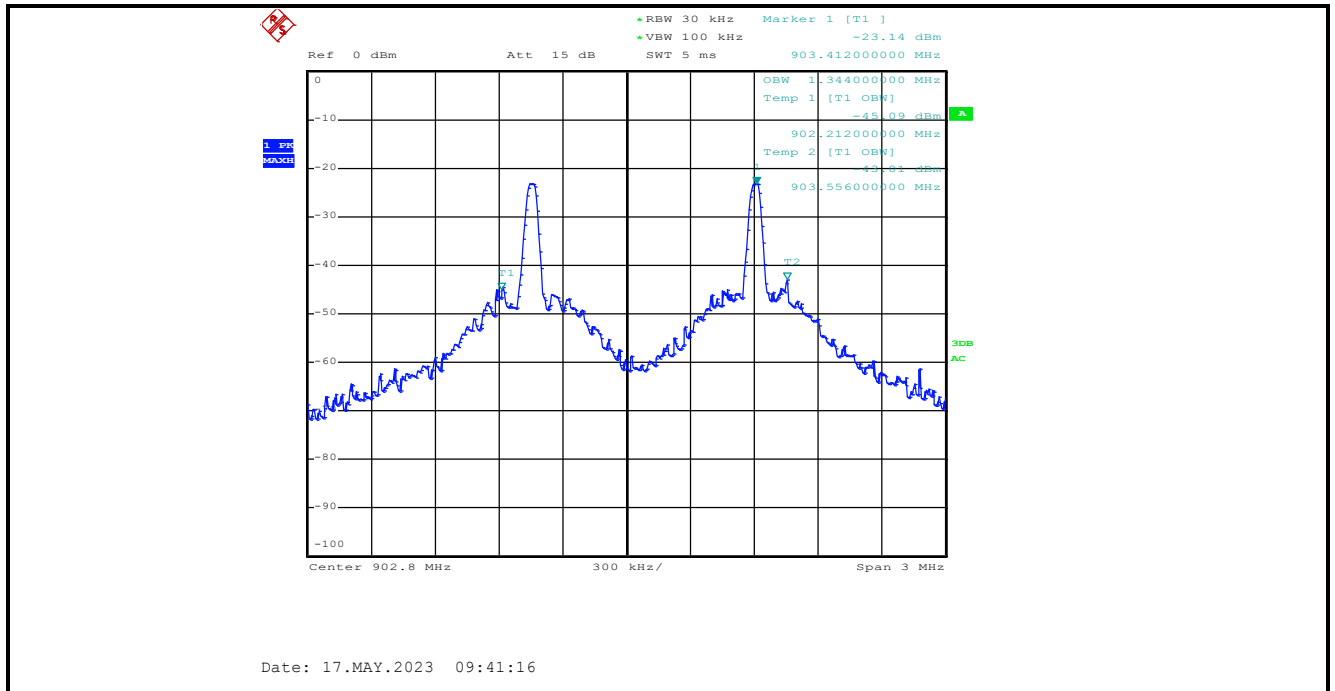
6.2 Antenna Requirement

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 PCB antenna is an Internal antenna which cannot replace by end-user, the best case gain of the antenna is -11.25 dBi. See product internal photos for details.

6.3 20dB Bandwidth

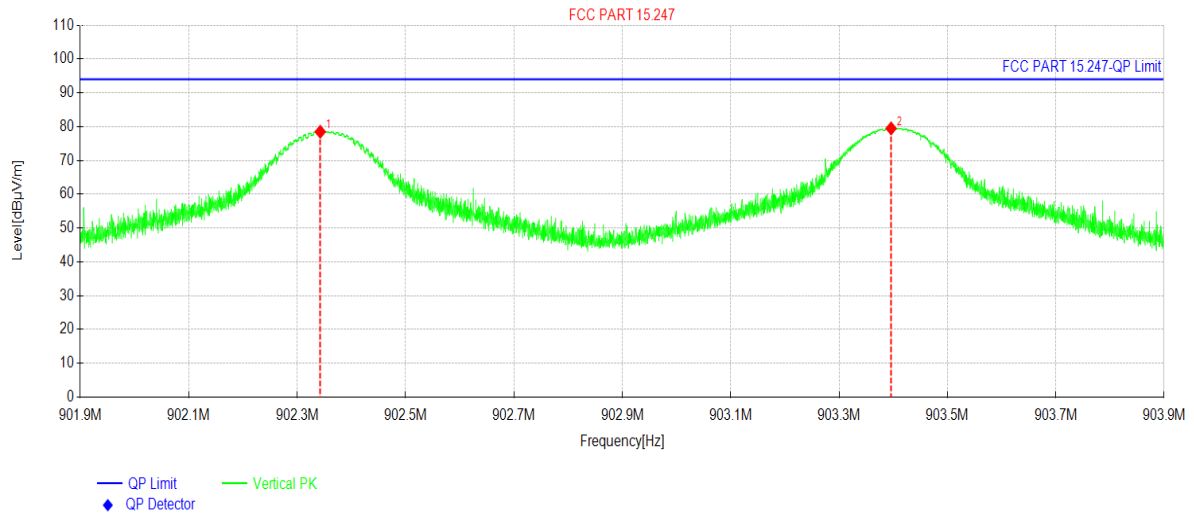
20dB bandwidth (MHz)	Limit (MHz)	Results
1.344	902<within<928	Pass

Test plot as follows:



6.4 Field Strength of Fundamental

Product Name:	Smart Key	Product Model:	RT- FDFP4B
Test By:	Lucas	Test mode:	Tx mode
Test Frequency:	901.9 MHz – 903.9 MHz	Polarization:	Vertical
Test Voltage:	DC 3.0V		



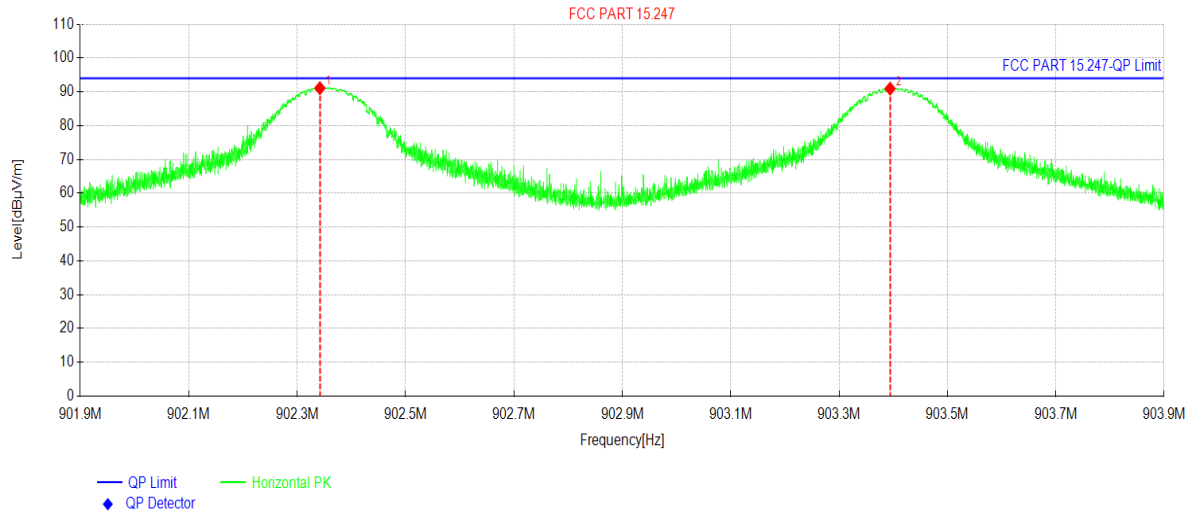
Suspected Data List

NO.	Freq. [MHz]	Reading[dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	902.342	53.71	78.48	24.77	94.00	15.52	PK	Vertical
2	903.396	54.67	79.46	24.79	94.00	14.54	PK	Vertical

Remark:

- Level = Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
- PK Level is less than AV limit(94dBuV/m), Pass.

Product Name:	Smart Key	Product Model:	RT- FDFP4B
Test By:	Lucas	Test mode:	Tx mode
Test Frequency:	901.9 MHz – 903.9 MHz	Polarization:	Horizontal
Test Voltage:	DC 3.0V		



Suspected Data List

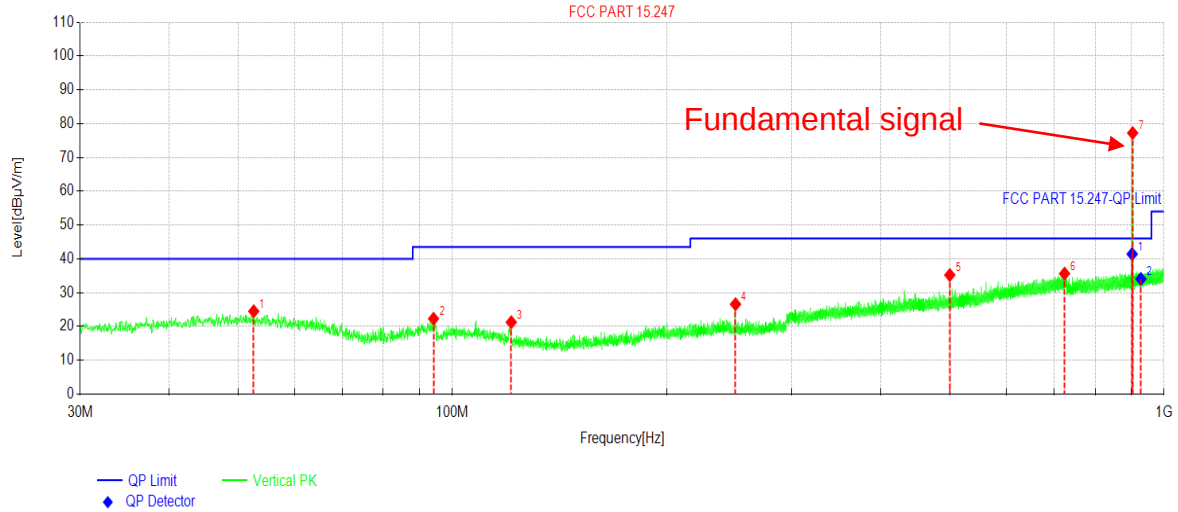
NO.	Freq. [MHz]	Reading[dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	902.342	66.32	91.09	24.77	94.00	2.91	PK	Horizontal
2	903.394	66.13	90.92	24.79	94.00	3.08	PK	Horizontal

Remark:

- Level = Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
- PK Level is less than AV limit(94dBμV/m), Pass.

6.5 Field Strength of Spurious Emissions

Product Name:	Smart Key	Product Model:	RT- FDFP4B
Test By:	Lucas	Test mode:	Tx mode
Test Frequency:	30 MHz – 1000 MHz	Polarization:	Vertical
Test Voltage:	DC 3.0V		



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	52.6010	37.23	24.51	-12.72	40.00	15.49	PK	Vertical
2	94.1170	37.92	22.30	-15.62	43.50	21.20	PK	Vertical
3	121.034	38.16	21.27	-16.89	43.50	22.23	PK	Vertical
4	249.996	40.08	26.59	-13.49	46.00	19.41	PK	Vertical
5	500.013	44.19	35.23	-8.96	46.00	10.77	PK	Vertical
6	724.859	40.23	35.66	-4.57	46.00	10.34	PK	Vertical
7	903.436	79.96	77.22	-2.74	46.00	-31.22	PK	Vertical

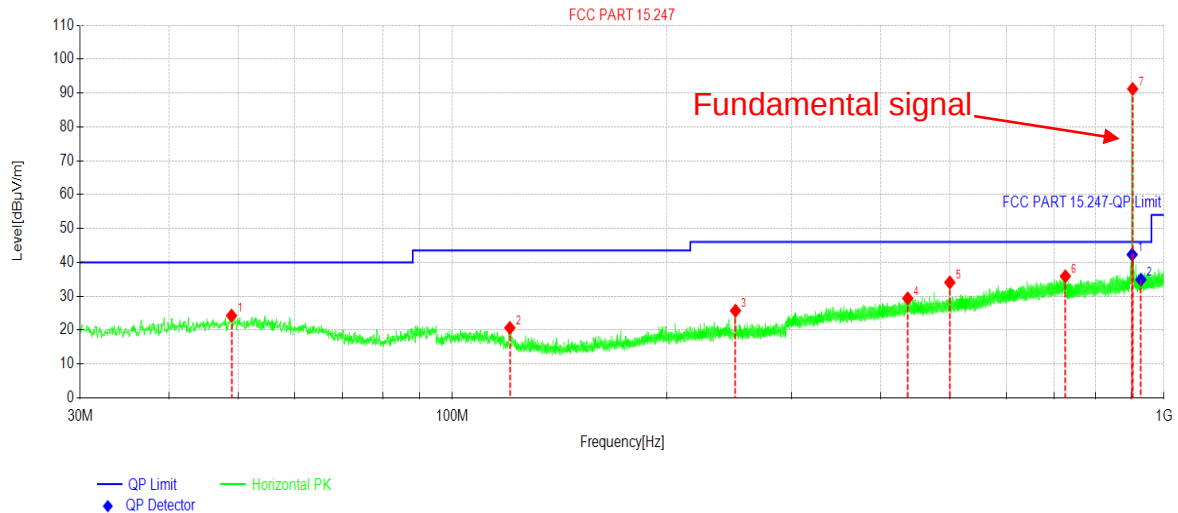
Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	QP Reading [dBμV/m]	Angle [°]	Verdict
1	902.000	-2.75	41.43	46.00	4.57	44.18	87	PASS
2	928.000	-2.31	34.05	46.00	11.95	36.36	154	PASS

Remark:

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

Product Name:	Smart Key	Product Model:	RT- FDFP4B
Test By:	Lucas	Test mode:	Tx mode
Test Frequency:	30 MHz – 1000 MHz	Polarization:	Horizontal
Test Voltage:	DC 3.0V		



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	48.9635	36.94	24.28	-12.66	40.00	15.72	PK	Horizontal
2	120.452	37.46	20.66	-16.80	43.50	22.84	PK	Horizontal
3	249.996	39.21	25.72	-13.49	46.00	20.28	PK	Horizontal
4	436.430	39.12	29.38	-9.74	46.00	16.62	PK	Horizontal
5	500.013	43.03	34.07	-8.96	46.00	11.93	PK	Horizontal
6	726.654	40.45	35.90	-4.55	46.00	10.10	PK	Horizontal
7	903.436	93.94	91.20	-2.74	46.00	-45.20	PK	Horizontal

Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	QP Reading [dBμV/m]	Angle [°]	Verdict
1	902.000	-2.75	42.30	46.00	3.70	45.05	80	PASS
2	928.000	-2.31	34.91	46.00	11.09	37.22	255	PASS

Remark:

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

Above 1GHz:

Tx mode						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
1806.62	61.62	-20.78	40.84	74.00	33.16	Vertical
1806.62	58.50	-20.78	37.72	74.00	36.28	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
1806.62	52.41	-20.77	31.64	54.00	22.36	Vertical
1806.62	50.07	-20.78	29.29	54.00	24.71	Horizontal

Note: Above 1GHz , test from 1GHz to 10GHz , only worse case is reported .

-----End of report-----