



Test Report

FCC Part15 Subpart C

Product Name : KEY FOB
Model No. : RKE2.0
FCC ID : 2AVYXPKE20

Applicant : SAIC GM Wuling Automobile Co., Ltd.
Address : No.18 Hexi Road, Liuzhou City, Guangxi
Zhuang Autonomous Region, China

Date of Receipt : Mar. 31 , 2020
Test Date : Apr. 02 , 2020~ Apr. 24, 2020
Issued Date : Jun. 29, 2020
Report No. : 2032201R-RF-US-P07V01
Report Version : V1.1

The test results presented in this report relate only to the object tested.

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The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to calculate the uncertainty associated with the measurement result.

This report is not used for social proof in China (or Mainland China) market.

Test Report Certification

Issued Date : Jun. 29, 2020
 Report No. : 2032201R-RF-US-P07V01



Product Name : KEY FOB
 Applicant : SAIC GM Wuling Automobile Co., Ltd.
 Address : No.18 Hexi Road, Liuzhou City, Guangxi Zhuang Autonomous Region, China
 Manufacturer : United Automotive Electronic Systems Co., Ltd.
 Address : 555 Rongqiao Road, Pudong Shanghai 201206, P.R.China
 Factory : United Automotive Electronic Systems Co., Ltd.
 Address : No. 8, cheyuanheng fifth road yufeng area, Liuzhou City, Guangxi Province, 516006, P.R. China.
 Model No. : RKE2.0
 FCC ID : 2AVYXPKE20
 EUT Voltage : DC 3V
 Test Voltage : DC 3V
 Brand Name : SGMW
 Applicable Standard : FCC CFR Title 47 Part 15 Subpart C;
 ANSI C63.10: 2013
 Test Result : Complied
 Performed Location : DEKRA Testing and Certification (Suzhou) Co., Ltd.
 No.99 Hongye Rd., Suzhou Industrial Park, Suzhou, 215006, Jiangsu, China
 TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098
 FCC Designation Number: CN1199; IC Lab Code: 4075B

Documented By : Kitty Li
 (Adm. Specialist: Kitty Li)

Reviewed By : Frank He
 (Senior Project Manager: Frank He)

Approved By : Jack Zhang
 (Engineering Supervisor: Jack Zhang)

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
2032201R-RF-US-P07V01	V1.0	Initial Issued Report	Apr. 28, 2020
2032201R-RF-US-P07V01	V1.1	1. Modify product name 2. Add test data graph	Jun. 29, 2020

1. General Information

1.1. EUT Description

Product Name	KEY FOB
Model No.	RKE2.0
Working Voltage	DC 3V
Carrier Frequency	433.92MHz
Type of Modulation	ASK
Number of Channels	1

1.2. Antenna information

Model No.	N/A		
Antenna manufacturer	N/A		
Antenna Delivery	<input checked="" type="checkbox"/> 1*TX+1*RX	<input type="checkbox"/> 2*TX+2*RX	<input type="checkbox"/> 3*TX+3*RX
Antenna technology	<input checked="" type="checkbox"/> SISO		
	<input type="checkbox"/> MIMO	<input type="checkbox"/> Basic	
		<input type="checkbox"/> CDD	
		<input type="checkbox"/> Sectorized	
		<input type="checkbox"/> Beam-forming	
Antenna Type	<input type="checkbox"/> External	<input type="checkbox"/> Dipole	
		<input type="checkbox"/> Sectorized	
	<input checked="" type="checkbox"/> Internal	<input type="checkbox"/> PIFA	
		<input checked="" type="checkbox"/> PCB	
		<input type="checkbox"/> Ceramic Chip Antenna	
		<input type="checkbox"/> Loop antenna	
		<input type="checkbox"/> Metal antenna	

1.3. Mode of Operation

DEKRA has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: Transmit

Note:

1. Regards to the frequency band operation: the lowest, middle and highest frequency of channel were selected to perform the test, then shown on this report.
2. For portable device, radiated spurious emission was verified over X, Y, Z Axis, and shown the worst case on this report.

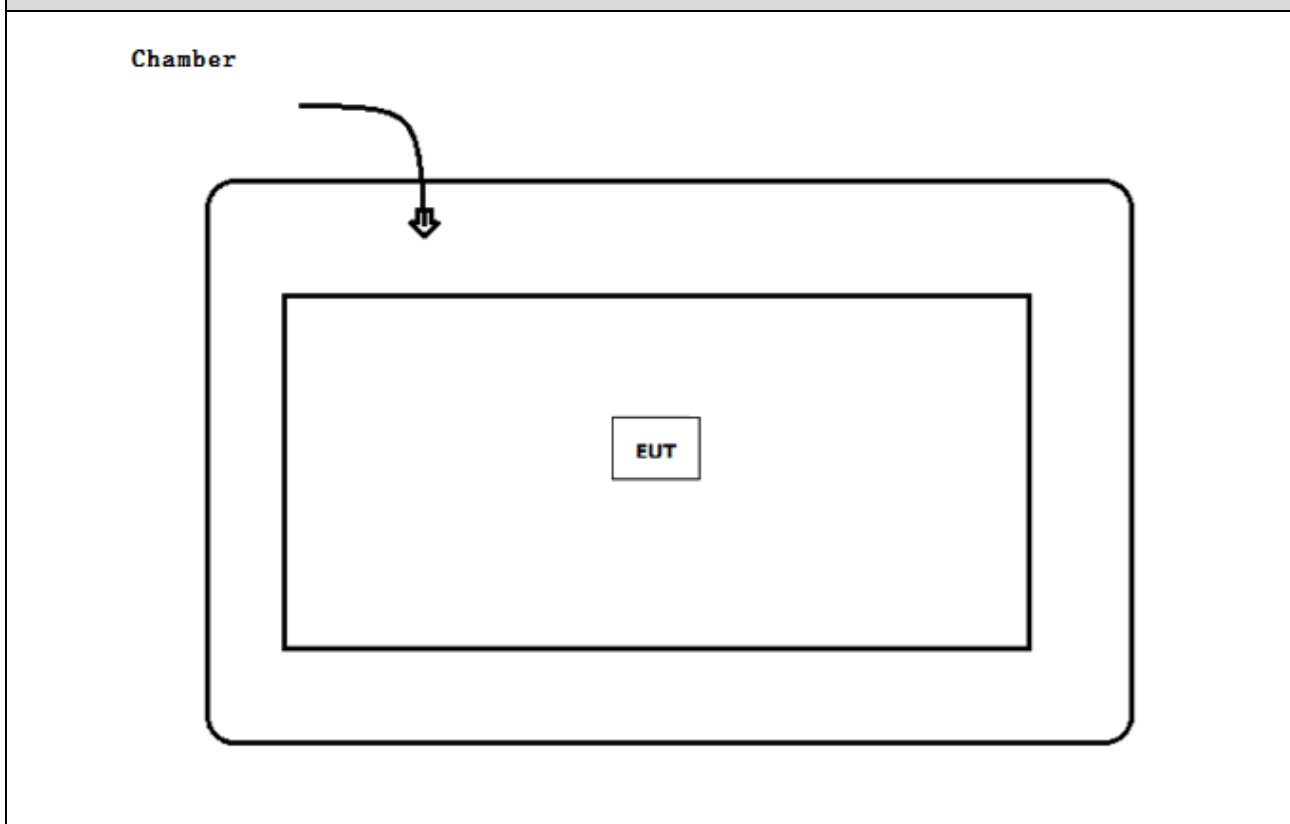
1.4. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
1 N/A	N/A	N/A	N/A	N/A

1.5. Configuration of Tested System

Test setup Diagram- Radiated Emission



1.6. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of equipment.
3	Start to continue transmit.

2. Technical Test

2.1. Summary of Test Result

- No deviations from the test standards
 Deviations from the test standards as below description:

Performed Test Item	Normative References	Limit	Result
Conducted Emission	FCC CFR Title 47 Part 15 Subpart C Section 15.207	FCC 15.207	N/A
Field Strength of Spurious	FCC CFR Title 47 Part 15 Subpart C Section 15.209/15.231	FCC 15.209 /15.231(b)	PASS
Channel Bandwidth	FCC CFR Title 47 Part 15 Subpart C Section 15.231(c)	FCC 15.231	PASS
Antenna Requirement	FCC CFR Title 47 Part 15 Subpart C: Section 15.203	FCC 15.203	PASS

2.2. Test Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	21
Humidity (%RH)	25-75	50
Barometric pressure (mbar)	860-1060	950-1000

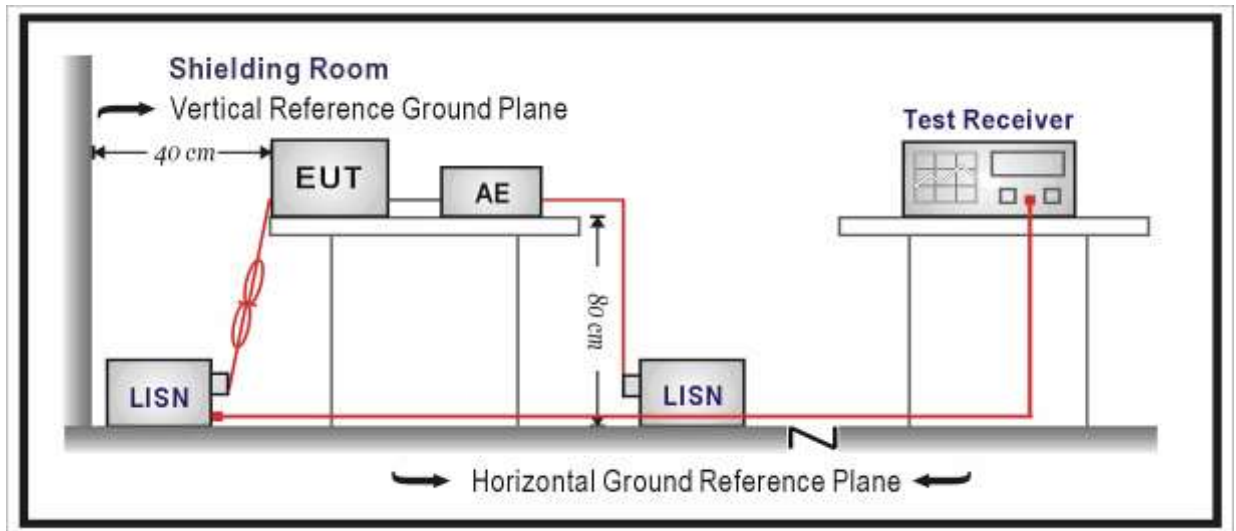
3. Conducted Emission

3.1. Test Equipment

Conducted Emission / TR-1					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100726	2020.03.29	2021.03.28
Two-Line V-Network	R&S	ENV216	100043	2020.03.29	2021.03.28
Two-Line V-Network	R&S	ENV216	100044	2019.09.17	2020.09.16
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2020.03.02	2021.03.01
50ohm Termination	SHX	TF2	07081401	2019.09.17	2020.09.16
Temperature/Humidity Meter	zhicheng	ZC1-2	TR1-TH	2020.01.04	2021.01.03

Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

3.2. Test Setup



3.3. Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 – 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

3.4. Test Procedure

The EUT was setup according to ANSI C63.10 requirements. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs) Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

3.5. Uncertainty

The measurement uncertainty is defined as ± 2.02 dB

3.6. Test Result

Note: The product is DC powered, so it is not evaluated Conducted Emission.

4. Radiated Emission

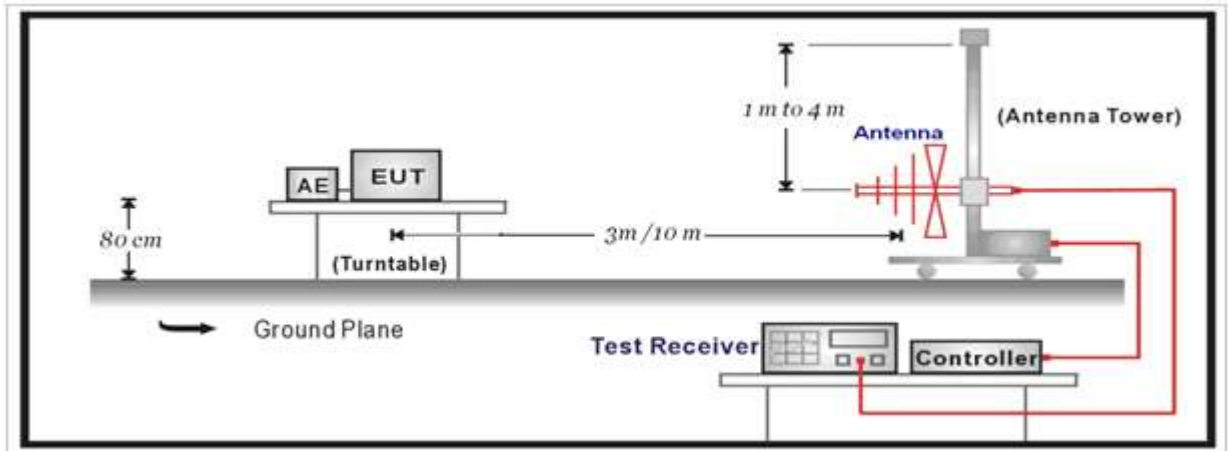
4.1. Test Equipment

AC1

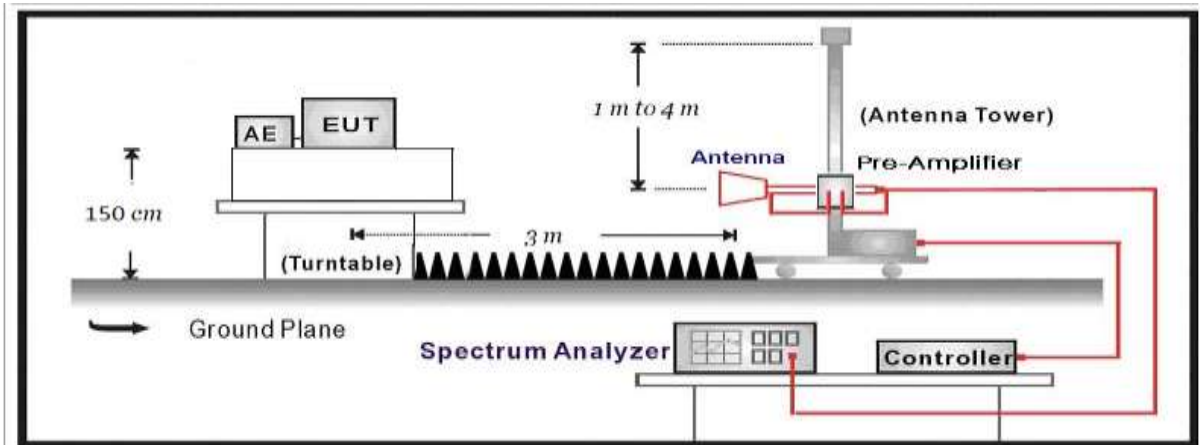
Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100175	2020.05.24
Preamplifier	Quietek	AP-025C	CHM-0602008	2021.04.12
Coaxial Cable	Huber+Suhner	RG 214_U	AC1-R	2021.04.12
Loop Antenna	R&S	HFH2-Z2	833799/003	2021.01.27
Temperature/Humidity Meter	zhichen	ZC1-2	AC1-TH	2020.08.20

4.2. Test Setup

30MHz~1GHz Test Setup:



Above 1GHz



4.3. Limit

Field strength of emissions from intentional radiators operated under 15.209(a) shall not exceed the following:

FCC Part 15.209(a)		
Fundamental frequency (MHz)	Field strength of fundamental ($\mu\text{V}/\text{m}$)	Field strength of spurious emissions ($\mu\text{V}/\text{m}$)
0.009-0.490	$2400/F(\text{kHz})$	300
0.490-1.705	$24000/F(\text{kHz})$	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

(1) The tighter limits apply at the band edges.

(2) Measurements were performed at 10m and the data was extrapolated to the specified measurement distance of 300m using the square of an inverse linear distance extrapolation factor (40 dB/decade) as specified in §15.31(f)(2). Extrapolation Factor = $40 \log_{10}(300/10) = 59\text{dB}$ for example.

Measurements were performed at 10m and the data was extrapolated to the specified measurement distance of 30m using the square of an inverse linear distance extrapolation factor (40 dB/decade) as specified in §15.31(f)(2). Extrapolation Factor = $40 \log_{10}(30/10) = 19\text{dB}$ for example.

(3) All measurements were performed using a loop antenna. The antenna was positioned in three orthogonal positions (X front, Y side, Z top) and the position with the highest emission level was recorded.

4.4. Test Procedure

The EUT was setup according to ANSI C63.10 for compliance to FCC 47CFR 15.209 requirements.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 10 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This

is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10 on radiated measurement.

The frequency range from 9kHz to 10th harmonic is checked.

4.5. Uncertainty

The measurement uncertainty is defined as ± 3.80 dB

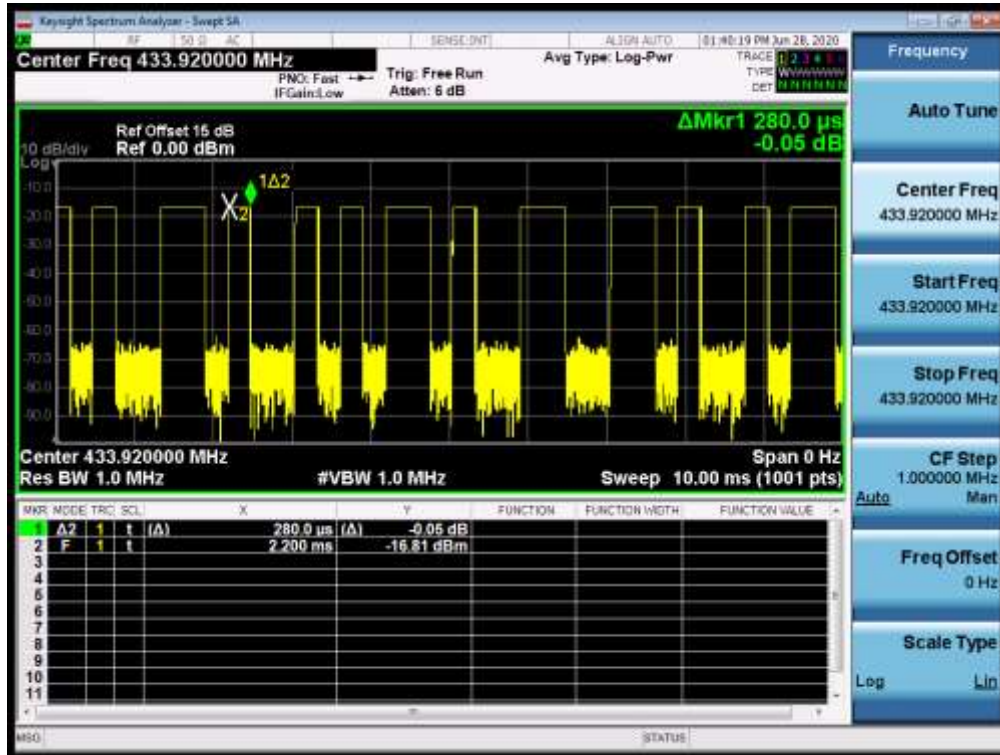
4.6. Test Result

Frequency (MHz)	Measure Level (dBuV/m)	Read Level (dBuV)	Factor (dB)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Type
433.920	75.322	48.864	26.458	100.83	-25.508	Horizontal	PK
433.920	72.095	45.637	26.458	100.83	-28.735	Vertical	PK

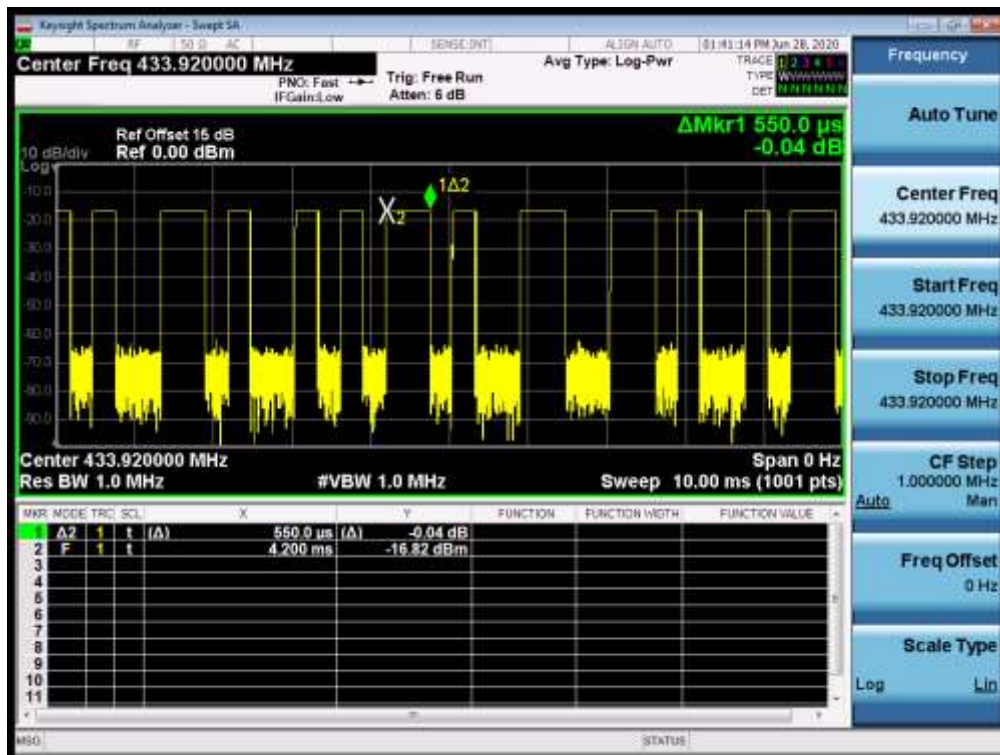
Frequency (MHz)	Measure Level (dBuV/m)	Duty cycle Factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Type
433.920	75.322	-6.29	69.032	80.83	-11.798	Horizontal	AV
433.920	72.095	-6.29	65.805	80.83	-15.025	Vertical	AV

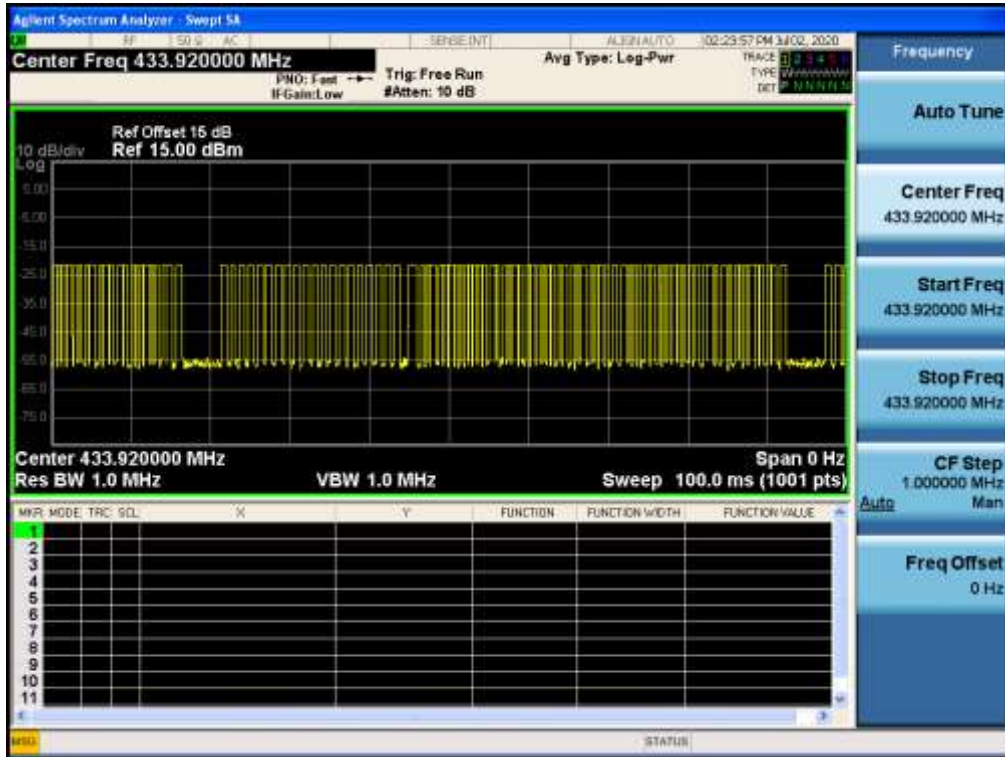
Average value=Peak value + Duty Cycle Factor
 Duty cycle factor = 20log(Duty cycle)
 Duty cycle = on time/100 milliseconds or period, whichever is less
 T on time =48.5(ms)
 Duty cycle =48.5%
 Duty cycle factor = 20log(Duty cycle) = -6.29
 T on time =T1*75+T2*50=0.28*75+0.55*50=48.5ms

T1

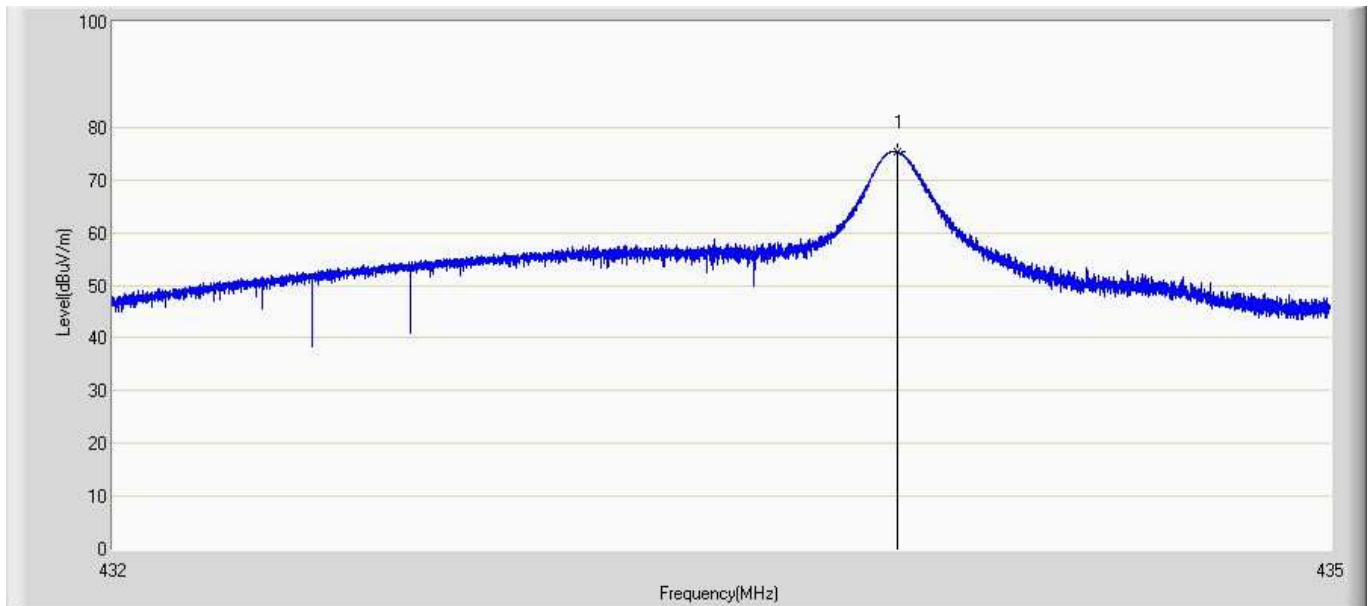


T2



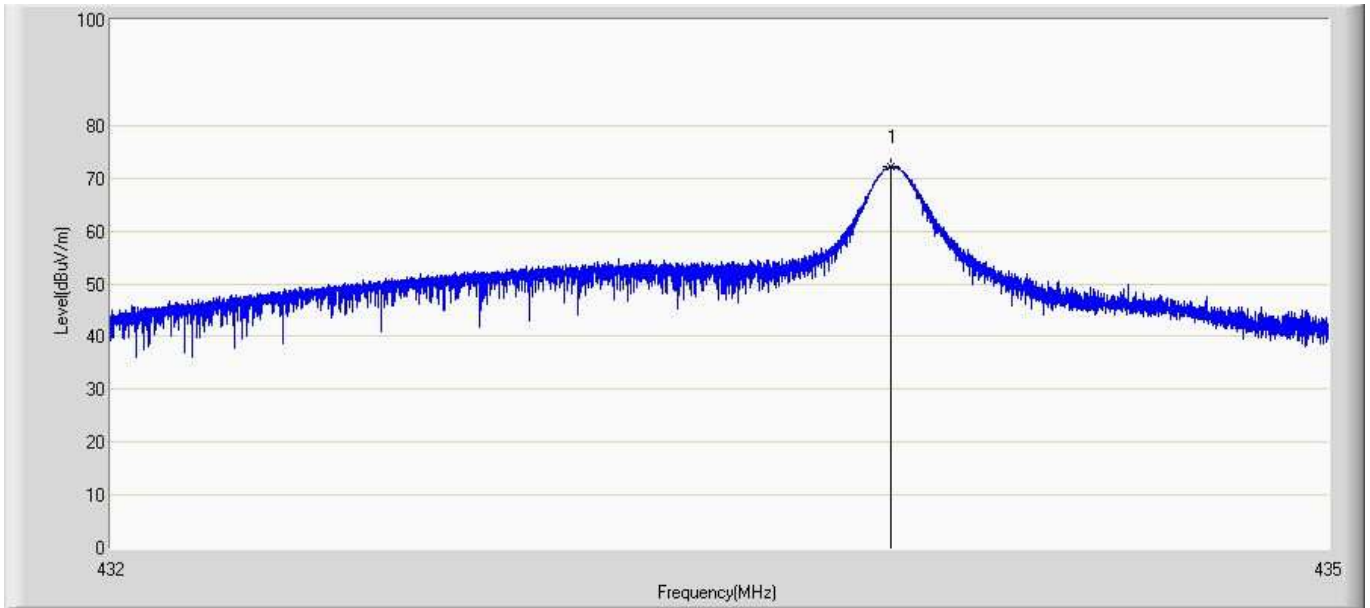


Horizontal



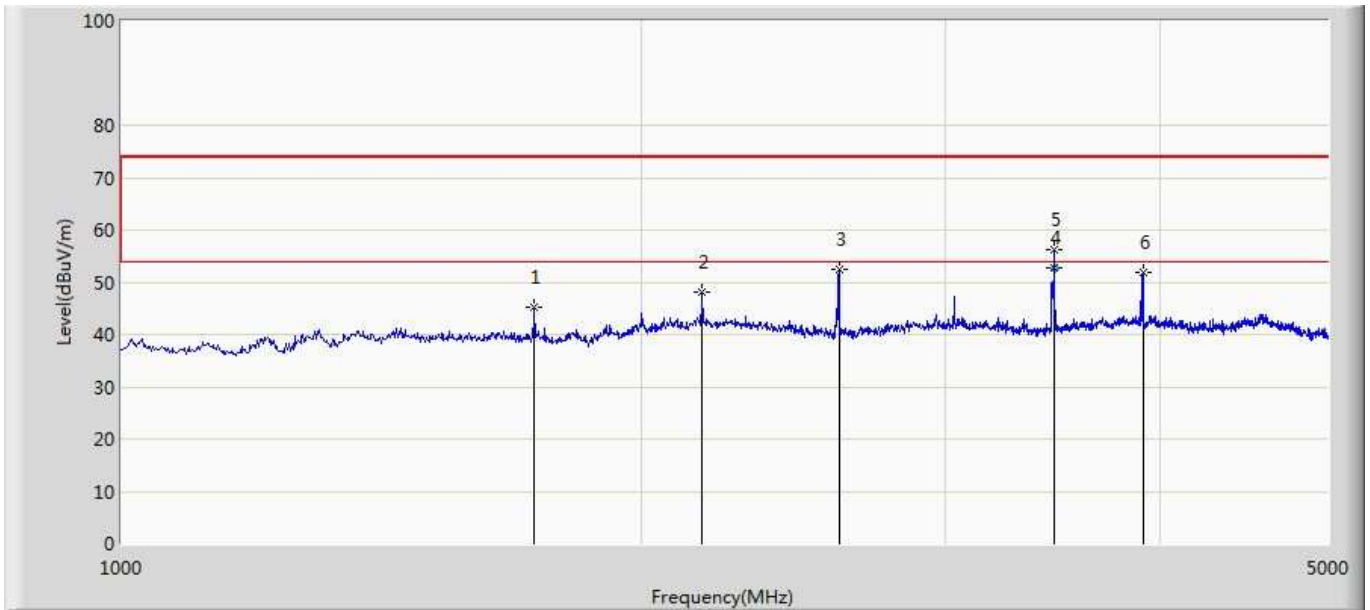
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		433.920	75.322	48.864	--	--	26.458	PK

Vertical



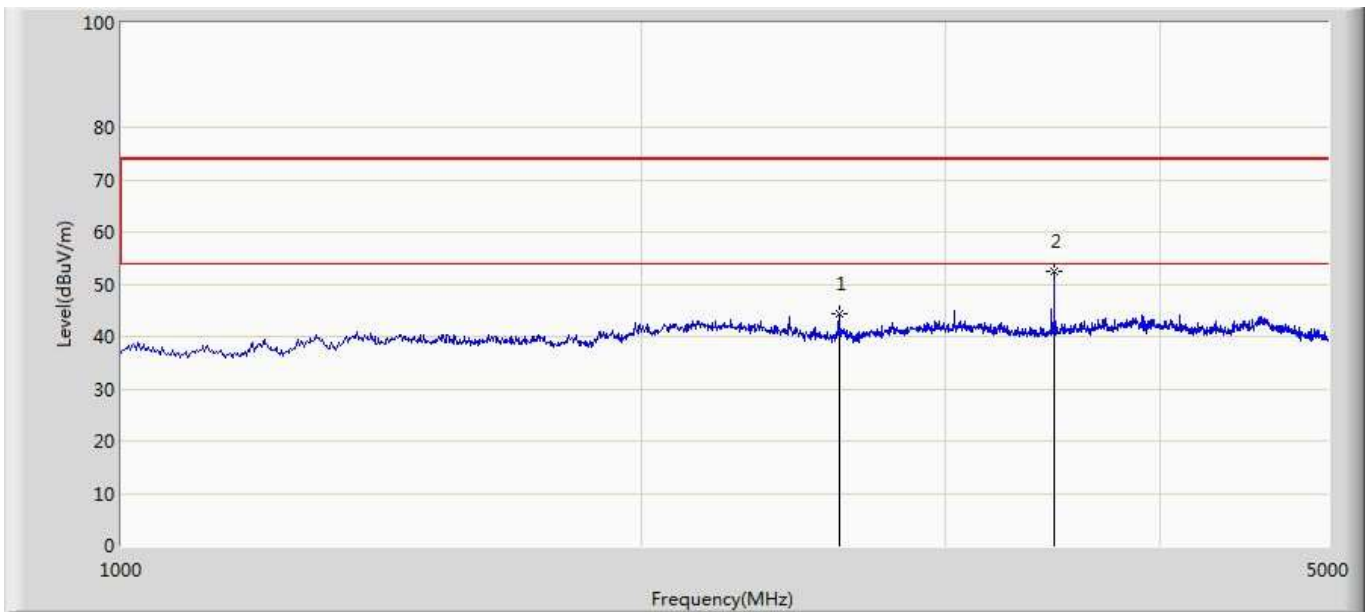
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		433.920	72.095	45.637	--	--	26.458	PK

Profile: 2032201R	Page No.: 1
Engineer: Simon	
Site: AC5	Time: 2020/04/27 - 09:04
Limit: FCC_Part15.209_RE	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: KEY FOB	Power: DC 3V
Note: Mode 1	



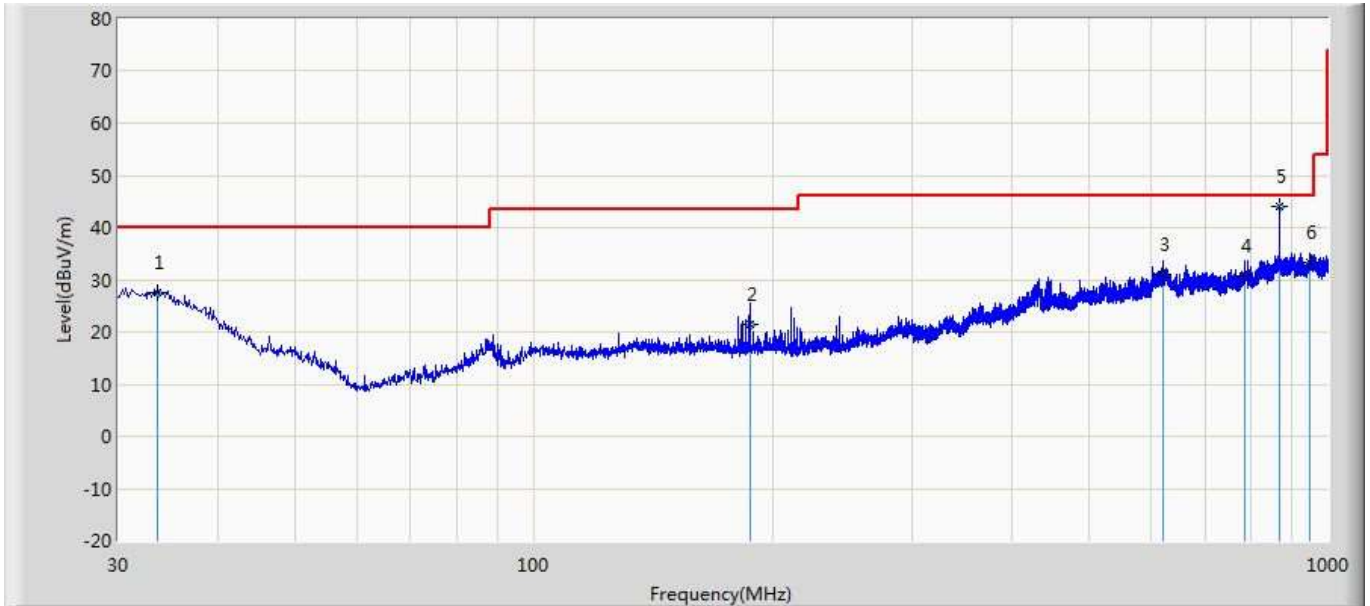
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1736.000	45.332	45.877	-28.668	74.000	-0.545	PK
2		2170.000	48.149	46.648	-25.851	74.000	1.501	PK
3		2604.000	52.529	51.170	-21.471	74.000	1.359	PK
4	*	3471.390	52.851	50.260	-1.149	54.000	2.590	AV
5		3472.000	56.345	53.754	-17.655	74.000	2.591	PK
6		3906.000	51.807	47.923	-22.193	74.000	3.885	PK

Profile: 2032201R	Page No.: 2
Engineer: Simon	
Site: AC5	Time: 2020/04/27 - 09:14
Limit: FCC_Part15.209_RE	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: KEY FOB	Power: DC 3V
Note: Mode 1	



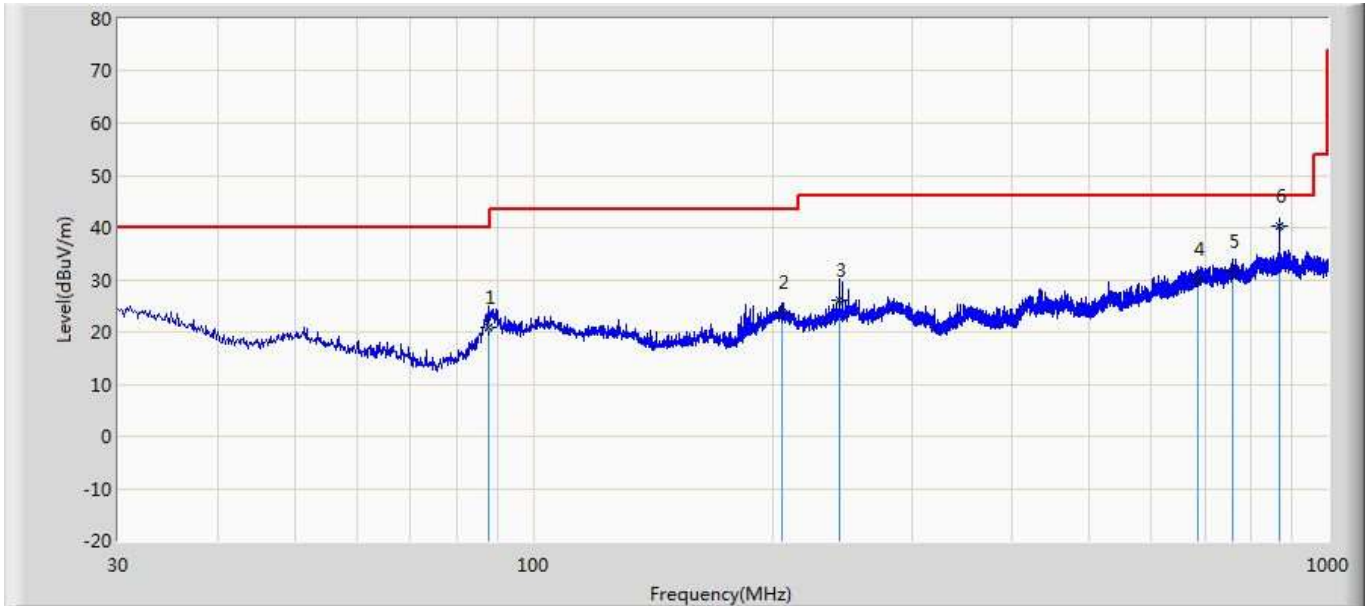
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2604.000	44.223	42.864	-29.777	74.000	1.359	PK
2	*	3472.000	52.412	49.821	-21.588	74.000	2.591	PK

Engineer: Lucas	
Site: AC2	Time: 2020/04/10
Limit: FCC_Part15.209_RE	Margin: 0
Probe: AC2_3M(30-1000M)	Polarity: Horizontal
EUT: Car key	Power: DC 3VDC 3V
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1		33.638	27.463	0.100	-12.537	40.000	20.705	6.658	0.000	100	46	QP
2		187.019	21.404	4.200	-22.096	43.500	9.890	7.314	0.000	100	242	QP
3		620.850	31.039	0.200	-14.961	46.000	22.280	8.559	0.000	100	35	QP
4		786.236	30.855	0.300	-15.145	46.000	21.581	8.974	0.000	100	240	QP
5	*	867.847	44.042	11.100	-1.958	46.000	23.844	9.098	0.000	100	23	QP
6		948.950	33.322	0.100	-12.678	46.000	23.874	9.348	0.000	100	20	QP

Engineer: Lucas	
Site: AC2	Time: 2020/04/10
Limit: FCC_Part15.209_RE	Margin: 0
Probe: AC2_3M(30-1000M)	Polarity: Vertical
EUT: Car key	Power: DC 3VDC 3V
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1		87.957	20.889	4.200	-19.111	40.000	9.961	6.727	0.000	100	60	QP
2		205.085	23.686	0.100	-19.814	43.500	16.222	7.365	0.000	100	140	QP
3		243.036	26.227	2.500	-19.773	46.000	16.190	7.537	0.000	100	76	QP
4		685.840	30.163	0.100	-15.837	46.000	21.348	8.715	0.000	100	302	QP
5		760.167	31.527	0.200	-14.473	46.000	22.421	8.906	0.000	100	252	QP
6	*	867.885	40.266	7.300	-5.734	46.000	23.869	9.098	0.000	200	51	QP

5. 20dB Occupied Bandwidth

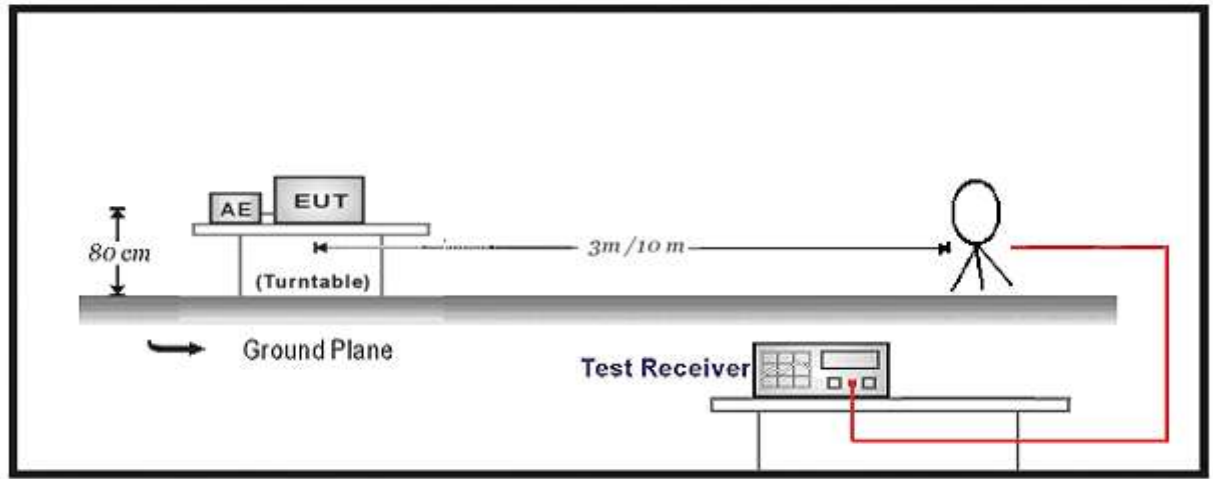
5.1. Test Equipment

AC1

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100175	2020.05.24
Preamplifier	Quietek	AP-025C	CHM-0602008	2021.04.12
Coaxial Cable	Huber+Suhner	RG 214_U	AC1-R	2021.04.12
Loop Antenna	R&S	HFH2-Z2	833799/003	2021.01.27
Temperature/Humidity Meter	zhichen	ZC1-2	AC1-TH	2020.08.20

5.2. Test Setup

9kHz~30MHz Test Setup:



5.3. 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.

5.4. Test Procedure

The bandwidth of the fundamental frequency was measured by spectrum analyzer with the RBW 1%~5% of 20dBc bandwidth and the VBW three times of the RBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

5.5. Uncertainty

The measurement uncertainty is defined as ± 10 Hz

5.6. Test Result

Product	Base		
Test Item	20dB Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2020/04/27	Test Site	AC-1

Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
433.92	0.0106	0.0869



Test Result	Pass
-------------	------

6. Duration Time

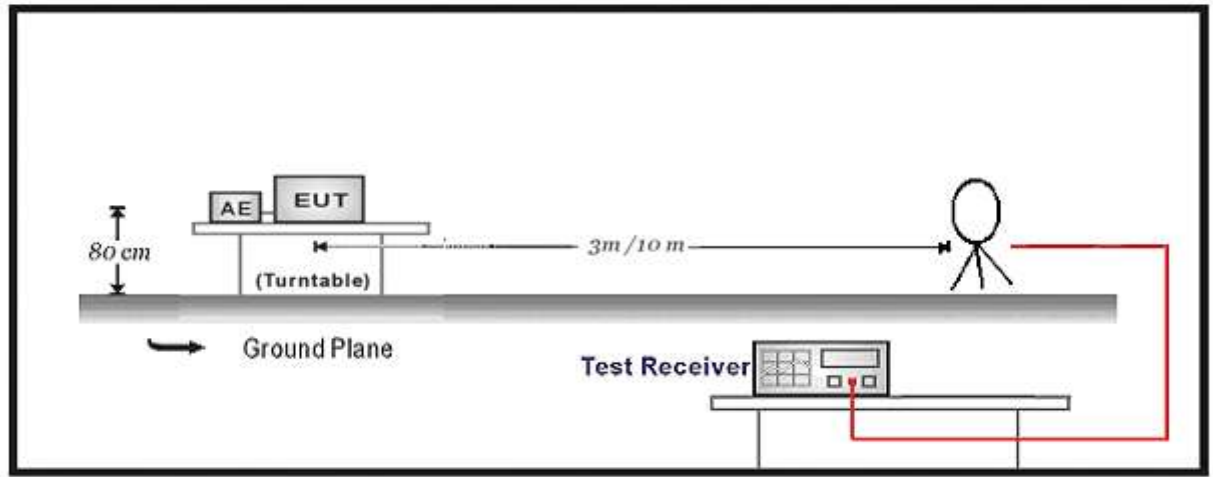
6.1. Test Equipment

AC1

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100175	2020.05.24
Preamplifier	Quietek	AP-025C	CHM-0602008	2021.04.12
Coaxial Cable	Huber+Suhner	RG 214_U	AC1-R	2021.04.12
Loop Antenna	R&S	HFH2-Z2	833799/003	2021.01.27
Temperature/Humidity Meter	zhichen	ZC1-2	AC1-TH	2020.08.20

6.2. Test Setup

9kHz~30MHz Test Setup:



6.3. Limit

A transmitter activated automatically shall cease transmission within 5 seconds after activation

6.4. 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.

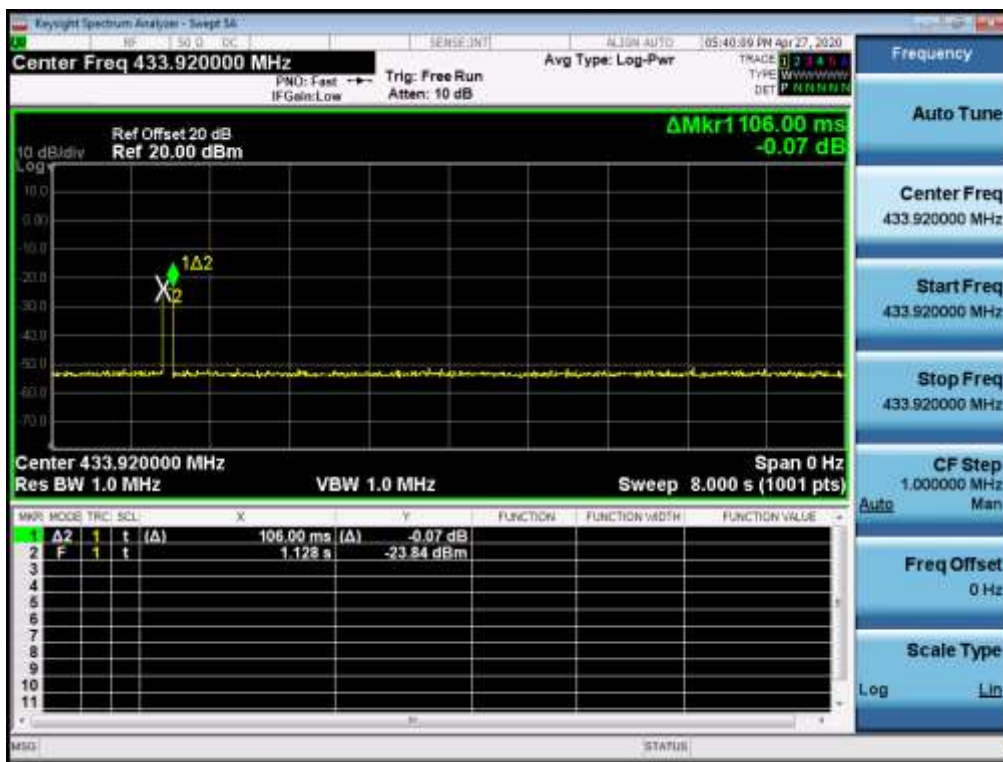
6.5. Uncertainty

The measurement uncertainty is defined as ± 10 Hz

6.6. Test Result

Product	Base		
Test Item	Duration Time		
Test Mode	Mode 1: Transmit		
Date of Test	2020/04/27	Test Site	AC-1

Frequency (MHz)	Duration Time (S)	Limit (S)	Result
433.92	0.11	<5.0	Pass



7. Antenna Requirement

7.1. Requirement

Antenna Requirement Limit
<p>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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.</p>

7.2. Result

Antenna Connector Construction	
<input checked="" type="checkbox"/>	The use of a permanently attached antenna
<input type="checkbox"/>	The antenna use of a unique coupling to the intentional radiator
<input type="checkbox"/>	The use of a nonstandard antenna jack or electrical connector
Please refer to the attached document "Internal Photograph" to show the antenna connector.	

————— The End —————