

FCC TEST REPORT

Client Name : Autel Intelligent Tech. Corp., Ltd.

Address : 7th-8th, 10th Floor, Bldg. B1, Zhiyuan, Xueyuan Rd. Xili,
Nanshan Shenzhen China

Product Name : UNIVERSAL SMART KEY

Date : Jun. 07, 2022

Shenzhen Anbotech Compliance Laboratory Limited



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TEST REPORT

Applicant : Autel Intelligent Tech. Corp., Ltd.
Manufacturer : Autel Intelligent Tech. Corp., Ltd.
Product Name : UNIVERSAL SMART KEY
Model No. : IKEYHD005AL, IKEYHD004AL, IKEYHD004BL
Trade Mark : AUTEL
Rating(s) : Input: DC 3V with "CR2032" battery inside

Test Standard(s) : FCC Part15 Subpart C, Section 15.231

Test Method(s) : ANSI C63.10: 2020

The device described above is tested by Shenzhen Anbotech Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotech Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotech Compliance Laboratory Limited.

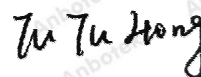
Date of Receipt

Apr. 29, 2022

Date of Test

Apr. 29~May 16, 2022

Prepared by



(TuTu Hong)

Approved & Authorized Signer



(Kingkong Jin)

1. General Information

1.1. Client Information

Applicant	:	Autel Intelligent Tech. Corp., Ltd.
Address	:	7th-8th, 10th Floor, Bldg. B1, Zhiyuan,Xueyuan Rd. Xili, Nanshan Shenzhen China
Manufacturer	:	Autel Intelligent Tech. Corp., Ltd.
Address	:	7th-8th, 10th Floor, Bldg. B1, Zhiyuan,Xueyuan Rd. Xili, Nanshan Shenzhen China
Factory 1	:	Autel Intelligent Technology Corp., Ltd. Guangming Branch
Address	:	7F&6F, East Wing, Building 2, and 6F of Electronical Building, Yanxiang Industrial Zone, Gaoxin Rd, Dongzhou Community of Guangming New District, Shenzhen
Factory 2	:	AUTEL VIETNAM COMPANY LIMITED
Address	:	4th Floor, Factory#6, Land#CN1, An Duong Industrial Zone, Hong Phong Township, An Duong County, Hai Phong, Viet Nam

1.2. Description of Device (EUT)

Product Name	:	UNIVERSAL SMART KEY
Model No.	:	IKEYHD005AL, IKEYHD004AL, IKEYHD004BL (Note: All samples are the same except the appearance and buttons' number and position, so we prepare all model for radiated emission test. Other items are test for "IKEYHD005AL" only.)
Trade Mark	:	AUTEL
Test Power Supply	:	DC 3V battery inside
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)
Product Description	Operation Frequency:	315MHz, 434MHz
	Number of Channel:	2 Channels
	Modulation Type:	FSK, ASK
	Antenna Type:	PCB antenna
	Antenna Gain(Peak):	434MHz: -1dBi(Provided by customer) 315 MHz: -1dBi(Provided by customer)
	Adapter:	N/A

Remark: 1)For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2) This report is for SRD module.

1.3. Auxiliary Equipment Used During Test

N/A	:	
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1.4. Description of Test Modes

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Frequency
TX Mode	434 MHz(ASK)
TX Mode	434 MHz(FSK)
TX Mode	315 MHz(ASK)
TX Mode	315 MHz(FSK)

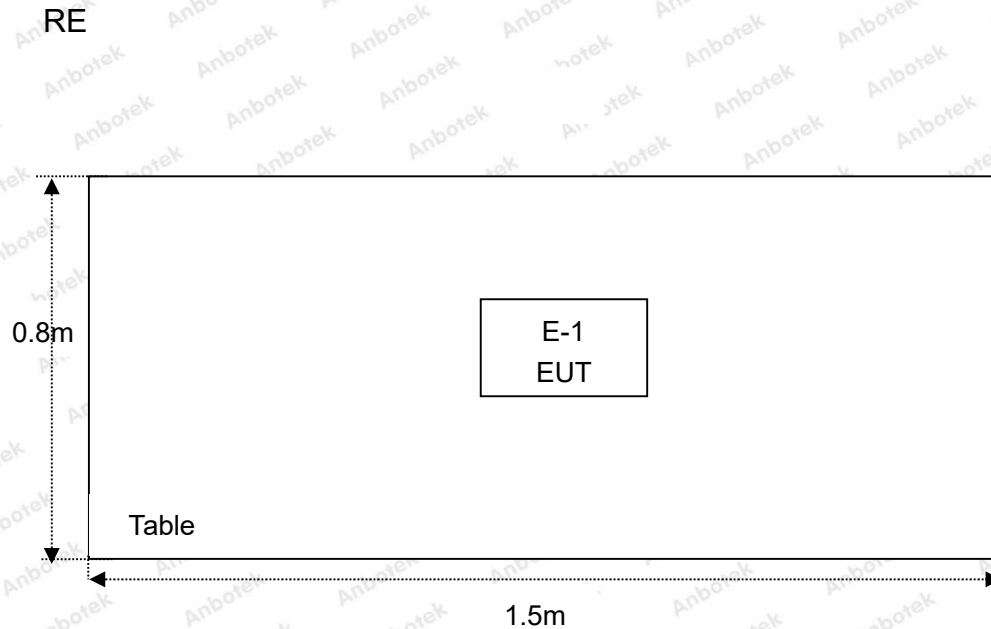
For Radiated Emission	
Final Test Mode	Frequency
TX Mode	434 MHz(ASK)
TX Mode	434 MHz(FSK)
TX Mode	315 MHz(ASK)
TX Mode	315 MHz(FSK)

Note:

1. During the test, the EUT was keeping continuous transmission.

1.5. List of Channels

Channel	Frequency
01	315 MHz
02	434 MHz

1.6. Description of Test Setup

1.7. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Three Phase V-type Artificial Power Network	CYBERTEK	EM5040DT	E215040DT001	Jul 05, 2021	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 22, 2021	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	Oct. 22, 2021	1 Year
4.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Oct. 22, 2021	1 Year
5.	MAX Spectrum Analysis	Agilent	N9020A	MY51170037	Oct. 22, 2021	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30D	KD17503	Oct. 22, 2021	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Oct. 22, 2021	2 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Oct. 22, 2021	2 Year
9.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Oct. 22, 2021	2 Year
10.	Horn Antenna	A-INFO	LB-180400-KF	J211060628	Oct. 22, 2021	2 Year
11.	Pre-amplifier	SONOMA	310N	186860	Oct. 22, 2021	1 Year
12.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
13.	RF Test Control System	YIHENG	YH3000	2017430	Oct. 22, 2021	1 Year
14.	Power Sensor	DAER	RPR3006W	15I00041SN045	Oct. 22, 2021	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN046	Oct. 22, 2021	1 Year
16.	MXA Spectrum Analysis	KEYSIGHT	N9020A	MY53280032	Oct. 22, 2021	1 Year
17.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Oct. 22, 2021	1 Year
18.	Signal Generator	Agilent	E4421B	MY41000743	Oct. 22, 2021	1 Year
19.	DC Power Supply	IVYTECH	IV3605	1804D360510	Oct. 22, 2021	1 Year
20.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80B	N/A	Oct. 22, 2021	1 Year



1.8. Description of Test Facility

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

FCC-Registration No.: 184111

Shenzhen Anbotech Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111.

ISED-Registration No.: 8058A-1

Shenzhen Anbotech Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A.

Test Location

Shenzhen Anbotech Compliance Laboratory Limited.

1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China. 518102



2. Summary of Test Results

Standard Section	Test Item	Result
15.203	Antenna Requirement	PASS
15.207	Conducted Emission	N/A
15.205/15.209/15.231(b)	Spurious Emission	PASS
15.231(c)	20dB Occupied Bandwidth	PASS
15.231(a)	Dwell time	PASS
Remark: "N/A" is an abbreviation for Not Applicable.		



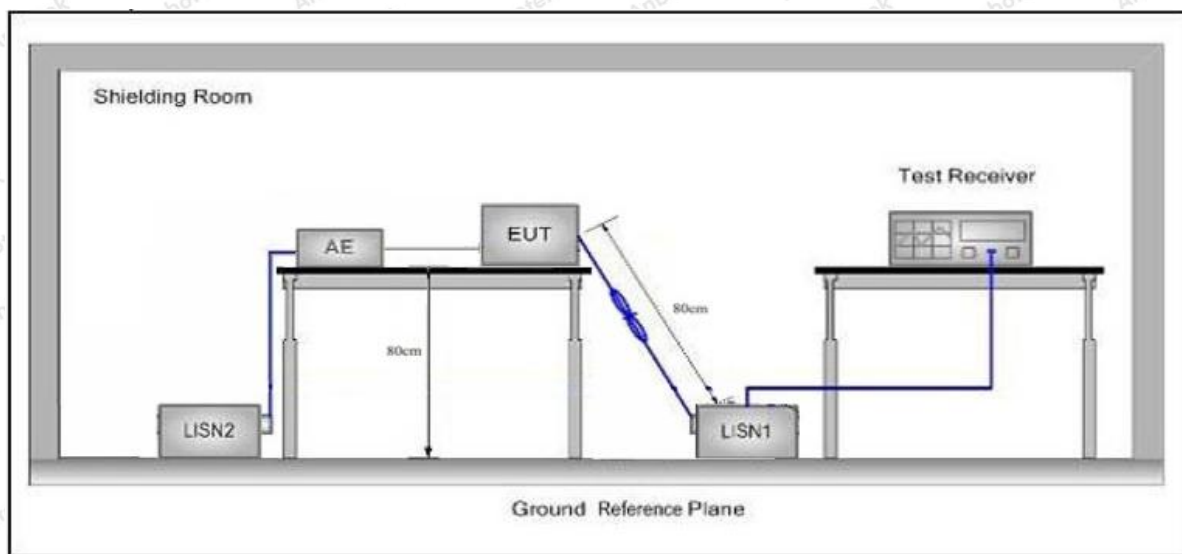
3. Conducted Emission Test

3.1. Test Standard and Limit

Test Standard	FCC Part15 Section 15.207		
Test Limit	Frequency	Maximum RF Line Voltage (dBuV)	
		Quasi-peak Level	Average Level
	150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
	500kHz~5MHz	56	46
	5MHz~30MHz	60	50

Remark: (1) *Decreasing linearly with logarithm of the frequency.
(2) The lower limit shall apply at the transition frequency.

3.2. Test Setup



3.3. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10: 2020 on Conducted Emission Measurement.

The bandwidth of test CAR REMOTE (ESCI) set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

3.4. Test Data

Not applicable for equipment operated with DC power supply.



4. Radiated Emission and Band Edge

4.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.209, 15.205 and 15.231(b)				
Test Limit	Frequency (MHz)	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz~0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz~88MHz	100	40.0	Quasi-peak	3
	88MHz~216MHz	150	43.5	Quasi-peak	3
	216MHz~960MHz	200	46.0	Quasi-peak	3
	960MHz~1000MHz	500	54.0	Quasi-peak	3
	Above 1000MHz	500	54.0	Average	3
		-	74.0	Peak	3

Remark:

(1) The lower limit shall apply at the transition frequency.

(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

the formulas for calculating the maximum permitted fundamental field strengths are as follows:

for the band 260-470 MHz, $\mu\text{V/m}$ at 3 meters = $41.6667(F) - 7083.3333$.

The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level

Emission Level (dBuV/m) = $20 \log$ Emission Level ($\mu\text{V/m}$)

The field strength of emission limits have been calculated in below table:

Fundamental Frequency (MHz)	Field Strength of Fundamental (dBuV/m)@3m
315	75.62 (AVG)
315	95.62 (Peak)
434	80.82 (AVG)
434	100.82 (Peak)

4.2. Test Setup

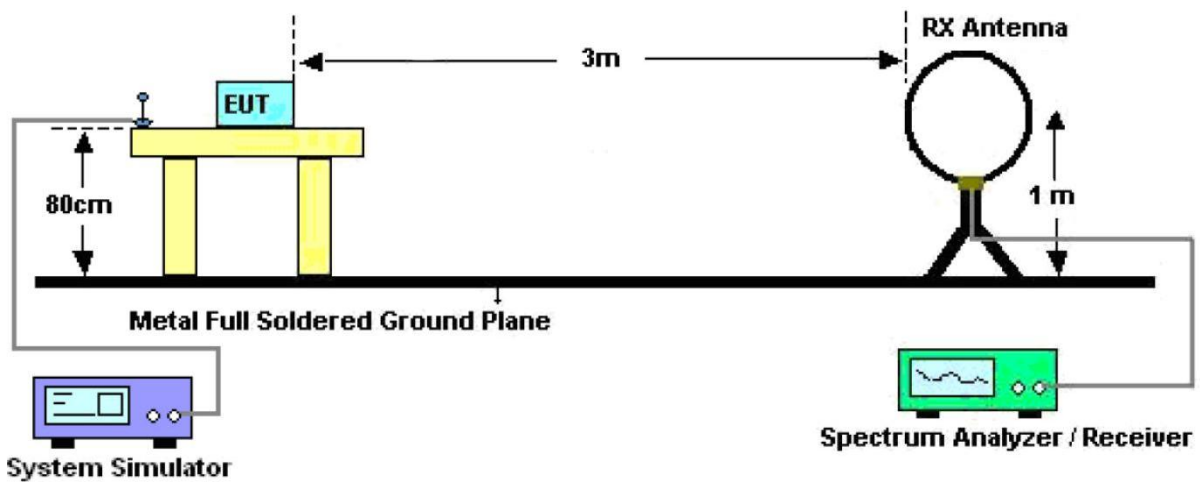


Figure 1. Below 30MHz

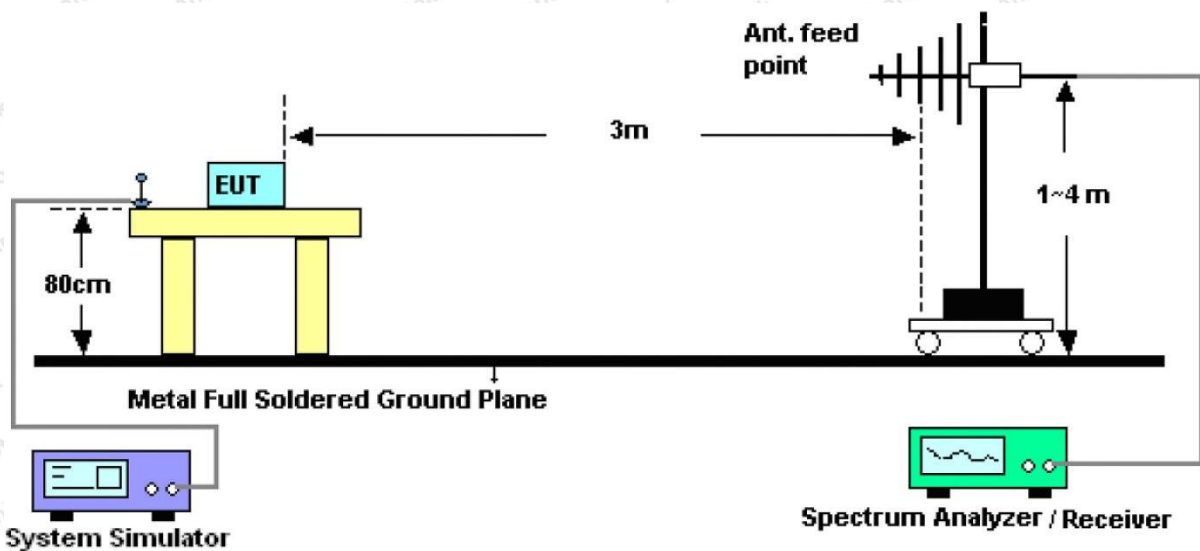


Figure 2. 30MHz to 1GHz

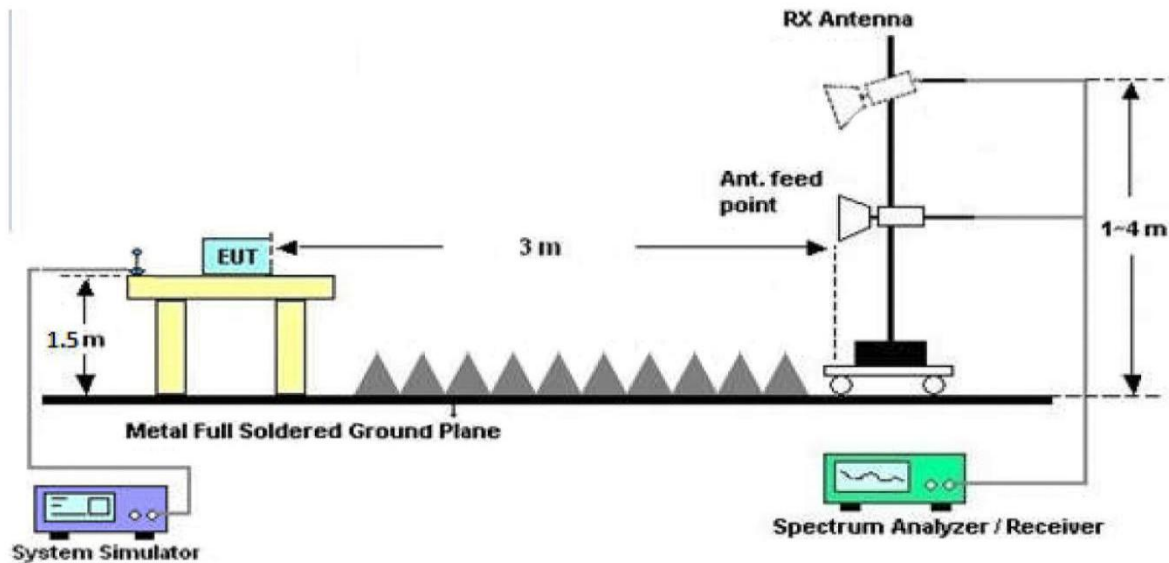


Figure 3. Above 1 GHz

4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.

For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.

The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on an antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

For 9kHz to 150kHz, Set the spectrum analyzer as:

RBW = 200Hz, VBW = 1kHz, Detector = Quasi-Peak, Trace mode = Max hold, Sweep - auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:

RBW = 9kHz, VBW = 30kHz, Detector = Quasi-Peak, Trace mode = Max hold, Sweep - auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:

RBW = 100kHz, VBW = 300kHz, Detector = Quasi-Peak, Trace mode = Max hold, Sweep - auto couple.

For above 1GHz, Set the spectrum analyzer as:

RBW = 1MHz, VBW = 1MHz, Detector = Peak, Trace mode = Max hold, Sweep - auto couple.

RBW = 1MHz, VBW = 10Hz, Detector = Average, Trace mode = Max hold, Sweep - auto couple.

4.4. Test Data

PASS

During the test, Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis is the worst case.

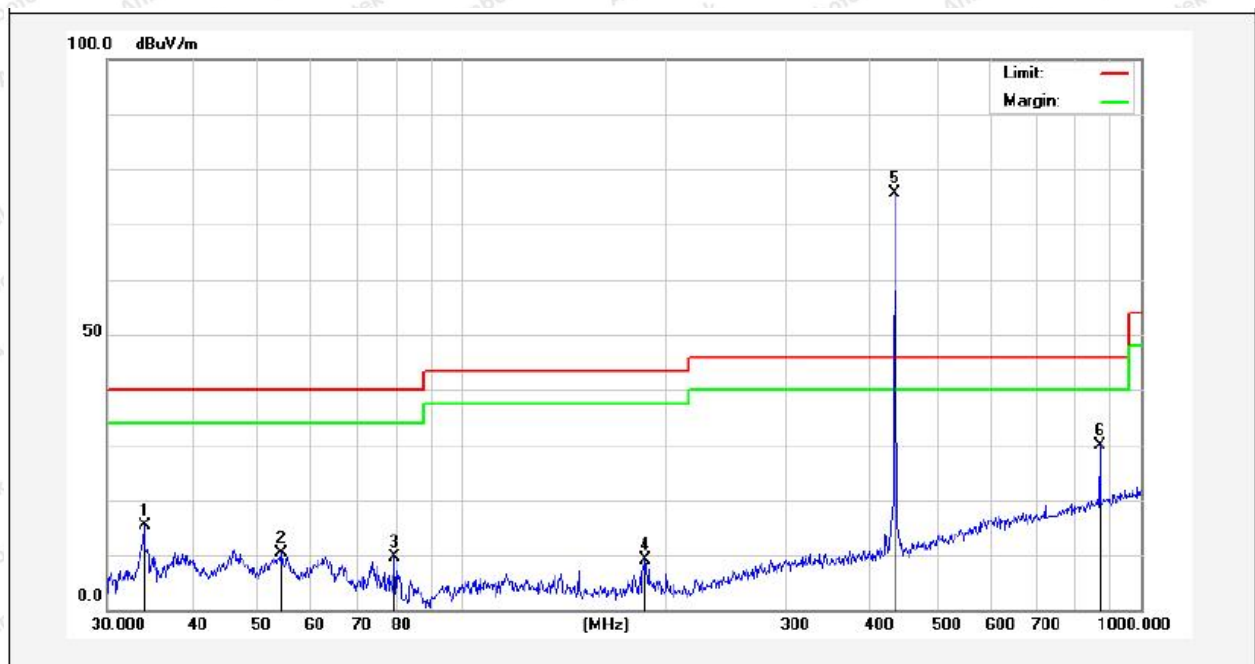
The test results of 9kHz-30MHz are attenuated more than 20dB below the permissible limits, so the results don't record in the report.

During the test, pre-scan all models, only the worst case (model: IKEYFD005AL) is recorded in the report.



Test Results (30~1000MHz)

Test Model: IKEYHD005AL
Test Mode: 434MHz(ASK)
Power Source: DC 3V battery inside
Polarization: Horizontal
Temp.(°C)/Hum.(%RH): 23.6°C/47%RH

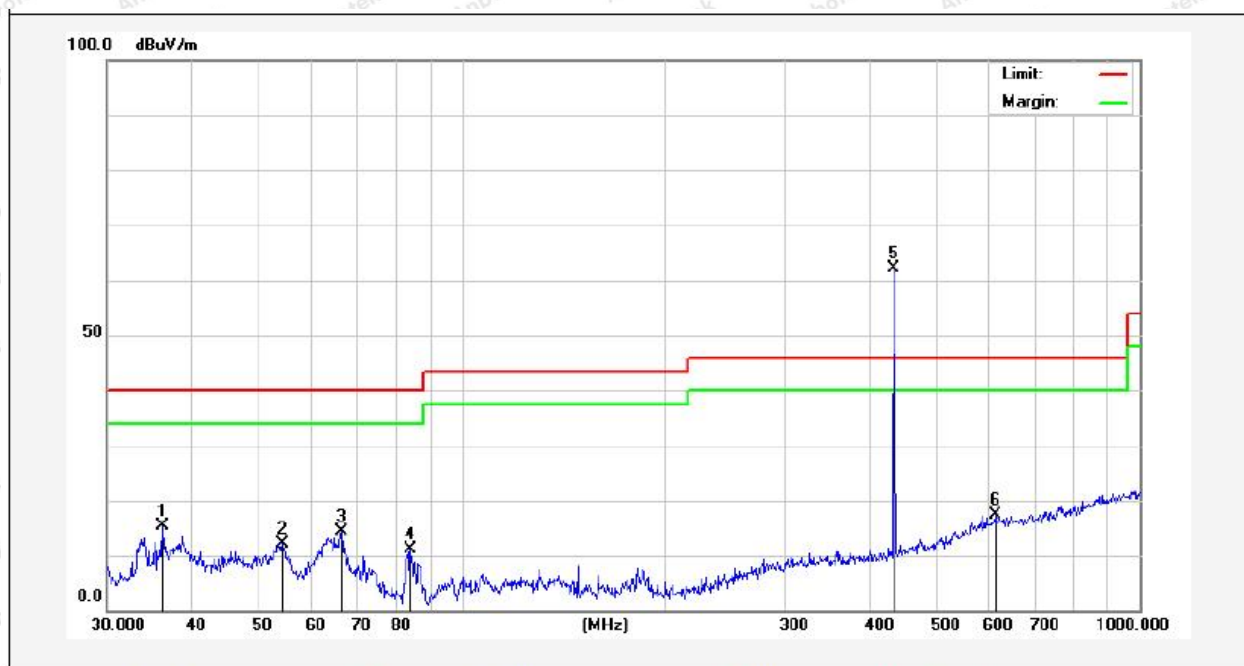


No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	34.0365	34.13	-18.80	15.33	40.00	-24.67	QP			
2	54.2610	27.82	-17.35	10.47	40.00	-29.53	QP			
3	79.5209	32.89	-23.23	9.66	40.00	-30.34	QP			
4	186.4409	31.92	-22.91	9.01	43.50	-34.49	QP			
5	434.0651	91.31	-15.70	75.61	/	/	peak			
6	869.1302	36.79	-7.00	29.79	/	/	peak			



Test Results (30~1000MHz)

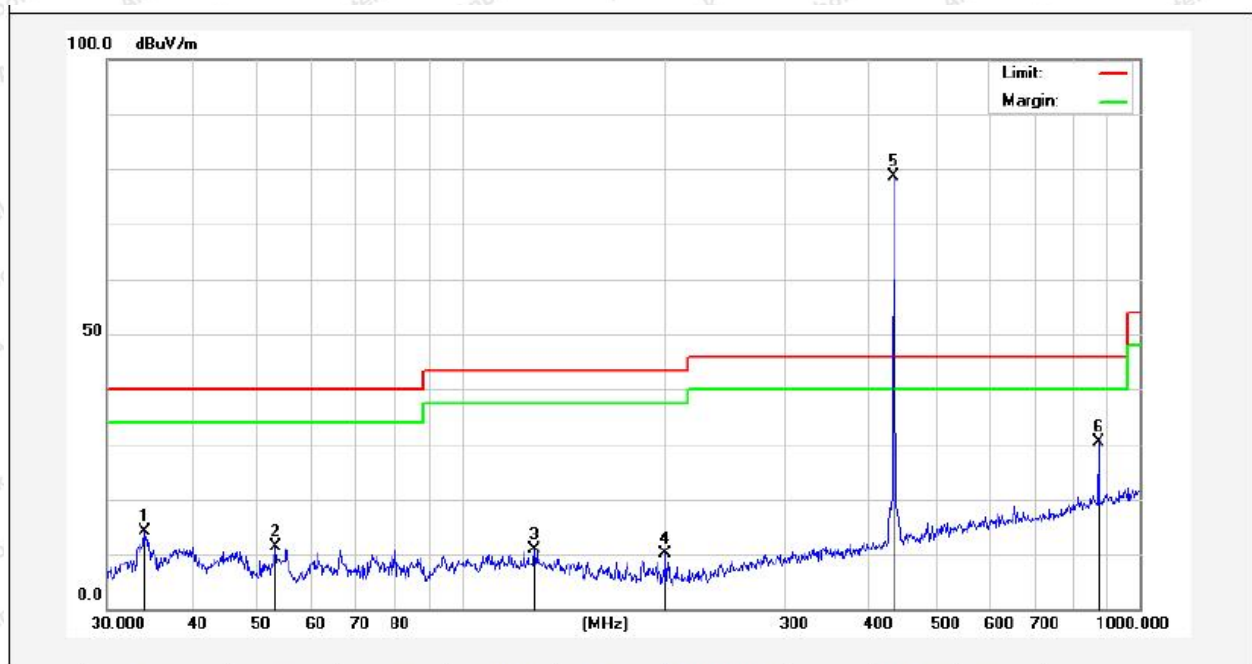
Test Model: IKEYHD005AL
 Test Mode: 434MHz(ASK)
 Power Source: DC 3V battery inside
 Polarization: Vertical
 Temp.(°C)/Hum.(%RH): 23.6°C/47%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	36.2541	31.88	-16.49	15.39	40.00	-24.61	QP			
2	54.4516	29.52	-17.42	12.10	40.00	-27.90	QP			
3	66.4989	33.86	-19.51	14.35	40.00	-25.65	QP			
4	84.1100	29.76	-18.68	11.08	40.00	-28.92	QP			
5	434.0651	76.07	-13.93	62.14	/	/	peak			
6	612.0642	27.88	-10.55	17.33	46.00	-28.67	QP			

Test Results (30~1000MHz)

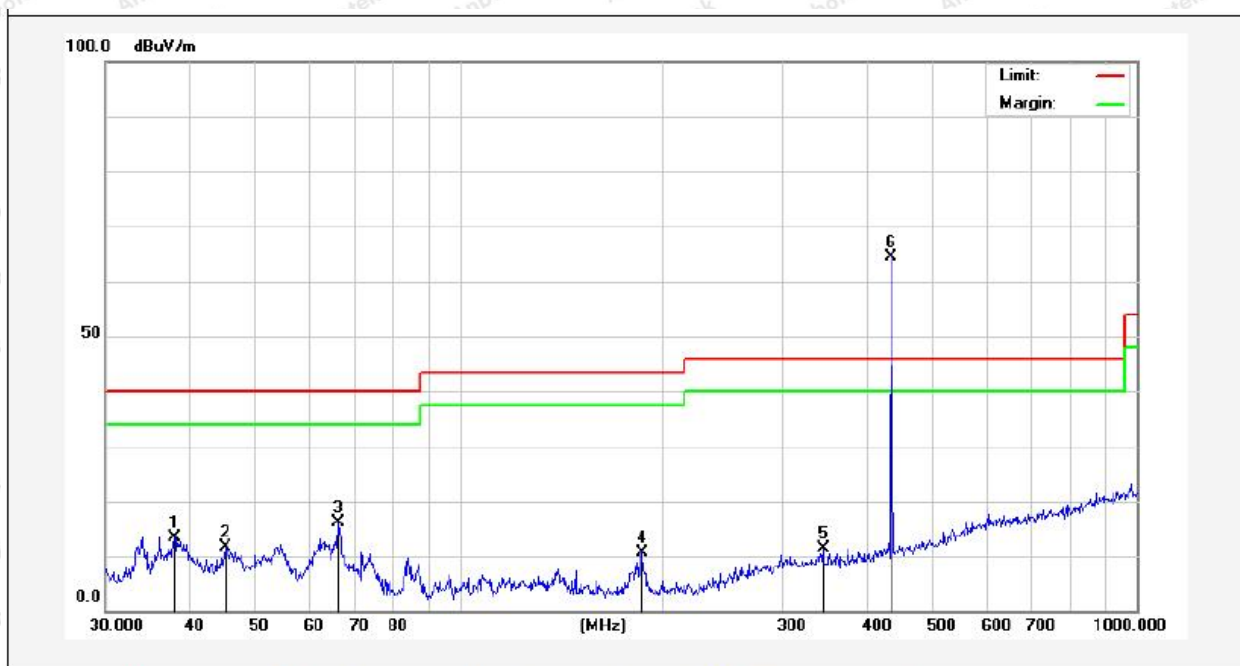
Test Model: IKEYHD005AL
Test Mode: 434MHz(FSK)
Power Source: DC 3V battery inside
Polarization: Horizontal
Temp.(°C)/Hum.(%RH): 23.6°C/47%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	34.0365	32.91	-18.80	14.11	40.00	-25.89	QP			
2	53.1313	28.37	-16.93	11.44	40.00	-28.56	QP			
3	128.1130	33.58	-22.77	10.81	43.50	-32.69	QP			
4	199.9856	32.52	-22.33	10.19	43.50	-33.31	QP			
5	434.0651	94.33	-15.70	78.63	/	/	peak			
6	869.1302	37.34	-7.00	30.34	/	/	peak			

Test Results (30~1000MHz)

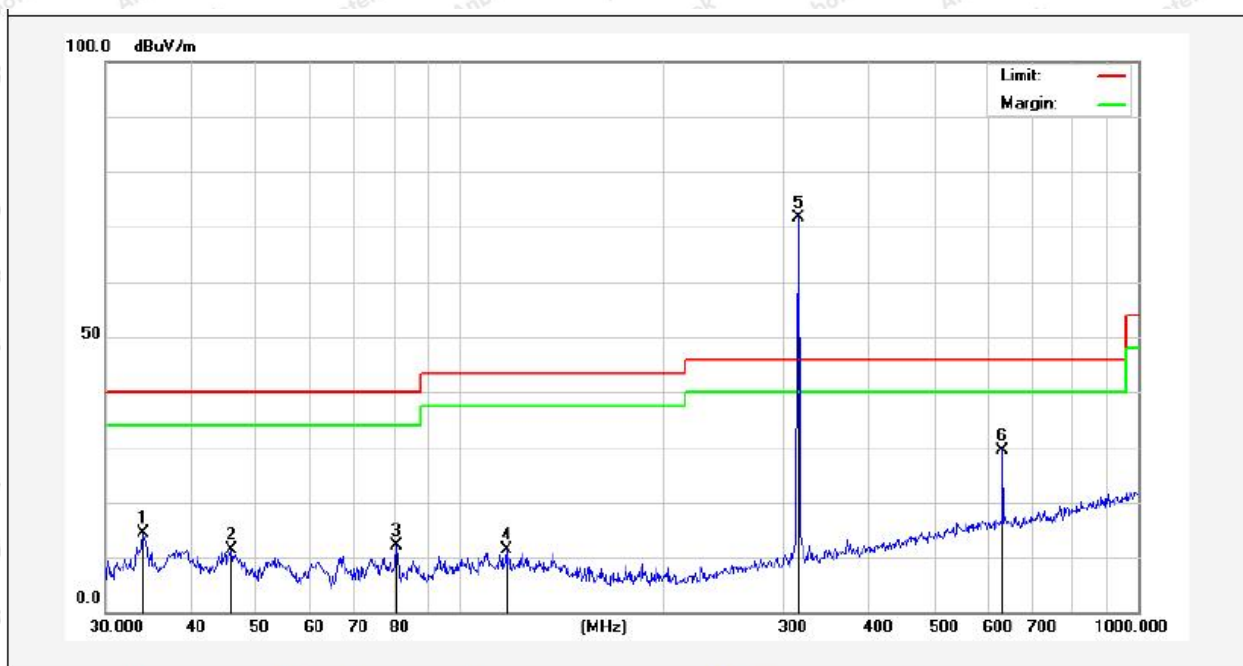
Test Model: IKEYHD005AL
Test Mode: 434MHz(FSK)
Power Source: DC 3V battery inside
Polarization: Vertical
Temp.(°C)/Hum.(%RH): 23.6°C/47%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	37.9450	28.95	-15.63	13.32	40.00	-26.68	QP			
2	45.2166	26.75	-15.08	11.67	40.00	-28.33	QP			
3	66.2662	35.52	-19.49	16.03	40.00	-23.97	QP			
4	185.7882	30.96	-20.32	10.64	43.50	-32.86	QP			
5	344.3855	26.63	-15.14	11.49	46.00	-34.51	QP			
6	434.0651	78.23	-13.93	64.30	/	/	peak			

Test Results (30~1000MHz)

Test Model: IKEYHD005AL
Test Mode: 315MHz(ASK)
Power Source: DC 3V battery inside
Polarization: Horizontal
Temp.(°C)/Hum.(%RH): 23.6°C/47%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	34.0365	33.19	-18.80	14.39	40.00	-25.61	QP			
2	46.0164	26.68	-15.31	11.37	40.00	-28.63	QP			
3	80.6442	35.25	-23.19	12.06	40.00	-27.94	QP			
4	116.9495	35.04	-23.72	11.32	43.50	-32.18	QP			
5	315.4808	88.55	-16.80	71.75	/	/	peak			
6	631.6884	40.00	-10.62	29.38	/	/	peak			

