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Testing
NVLAP LAB CODE 600222-0

FCC TEST REPORT

FCC CFR Title 47 Part 15 Subpart B:2017 Class A /ICES 003 Issue 6 2017 Class A

Report No.: S202004217556E02
Report Version: V02
Issue Date: 12-27-2021

Applicant:	Hesai Technology Co., Ltd.
Address:	No. 2 Building, No. 468 Xinlai Road, Jiading District, Shanghai City, China

Application Type:	FCC ID Certification
FCC ID:	2ASO2HSPANDAR128
Product:	Rangefinder
Model No.:	Pandar128
FCC Rule Part(s):	CFR Title 47 Part 15 Subpart B:2017 Class A
IC Rule Part(s):	ICES 003 Issue 6 2017 Class A
Test Procedure(s):	ANSI C63.4: 2014
Result:	Pass
Test Date:	April 30, 2020

Compiled By: Line Chen
(Line Chen)
Senior Test Engineer

Approved By: Kerry Zhou
(Kerry Zhou)
Senior Test Engineer

The test results relate only to the samples tested.
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 ANSI C63.4-2014. Test results reported herein relate only to the item(s) tested.

Revision History

Report No.	Version	Description	Issue Date
S202004217556E02	Rev. 01	/	05-15-2020
S202004217556E02	Rev. 02	1、Revised the name and address of the applicant 2、Deleted the EUT photos	12-27-2021

CONTENTS

Description Page

1. General Information

Applicant:	Hesai Technology Co., Ltd.
Applicant Address:	No. 2 Building, No. 468 Xinlai Road, Jiading District, Shanghai City, China
Manufacturer:	Hesai Technology Co., Ltd.
Manufacturer Address:	No. 2 Building, No. 468 Xinlai Road, Jiading District, Shanghai City, China
Factory:	Hesai Technology Co., Ltd.
Factory Address:	No. 2 Building, No. 468 Xinlai Road, Jiading District, Shanghai City, China
Test Site:	Fangguang Inspection & Testing Co., Ltd. Wuxi Branch
Test Site Address:	200 Linghu Avenue, Xinwu District, Wuxi City, China
Test Device Serial No.:	N/A ☒ Production ☐ Pre-Production ☐ Engineering

2. INTRODUCTION

2.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

2.2. Fangguang Test Location

These measurement tests were performed at the Fangguang Inspection and testing Co.,Ltd. Wuxi Branch located at 200 Linghu Avenue, Xinwu District, Wuxi City, Jiangsu, China. The detailed description of the measurement facility was found to be in compliance with the requirements of ANSI C63.4-2014.

3. PRODUCT INFORMATION

3.1. Equipment Description

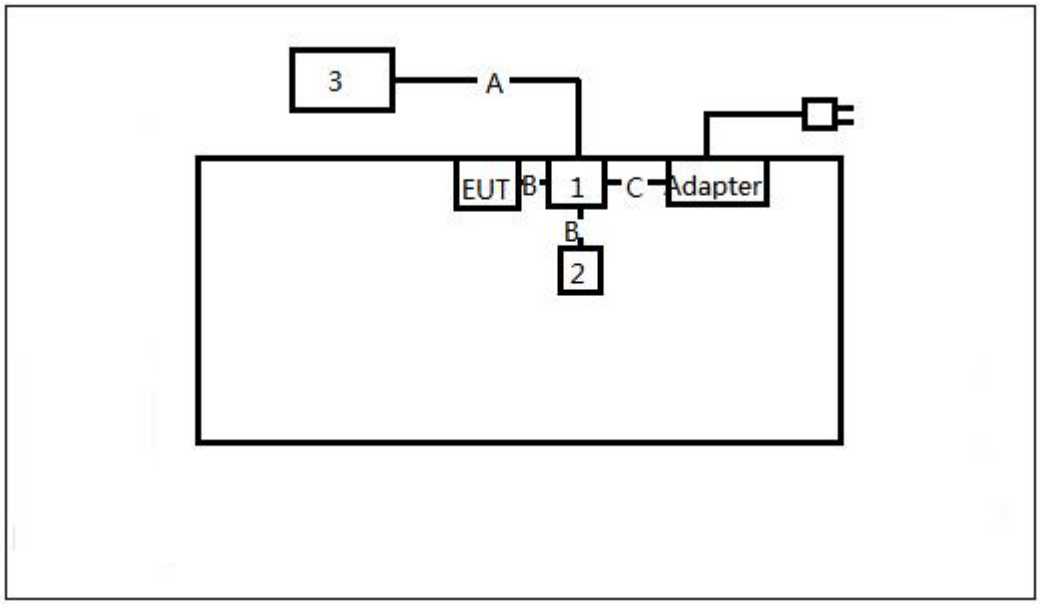
Product Name:	Rangefinder
Model Name:	Pandar128
Input Voltage Range:	DC 9-48V, 3.5A, 25W (at 0.1° horizonal resolution), 20W (at 0.2° horizonal resolution)
Trade Mark:	HESAI “HESAI” “禾赛”
Adapter Information:	Model: GST40A12 Rated Input: AC 100-240V, 50/60Hz , Max. Input current: 1.0A, Rated Output: DC 12V, 3.34A
Note:	The Connection box, Rangefinder and power adapter are shipped to the buyer together. GPS antenna is used as a load test. The Notebook is used to check whether the point cloud output by the radar is affected by external interference and the image

3.2. Configuration of Tested System

The **Rangefinder** was tested per the guidance FCC CFR Title 47 Part 15 Subpart B:2017 Class A and ANSI C63.4: 2014 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

3.3. Test Mode

Test Mode	
EMI Mode	Mode 1: power on and the sample is in real-time detection state

Connection Diagram (Mode 1)


Signal Cable Type		Signal Cable Description
A	LAN Cable	Non-Shielded, >6m
B	Signal cable	Shielded, 2m
C	power cable	Shielded, 2m

3.4. Description of Auxiliary Equipment

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	Connection box	HESAI	/	/	/
2	GPS antenna	/	GPSU7/U28	/	/
3	Notebook	DELL	Latitude 3490	/	/

3.5. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

4. DESCRIPTION OF TEST

4.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical Equipment in the Range of 9kHz to 18GHz (ANSI C63.4-2014) was used in the measurement of the **Rangefinder.**

Deviation from measurement procedure…….....None

4.2. AC Line Conducted Emissions

The line-conducted facility is located inside an shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150 kHz to 30 MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or resolution, clock or data exchange speed, scrolling H pattern to the EUT and/or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions are used for final measurements on the same test site.

4.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30 MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30 MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 0.8 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB beam-width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

5. LIST OF USED TEST EQUIPMENT

Conducted Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	FWXGJC-2016-181	1 year	2021/05/16
Two-Line V-Network	R&S	ENV 216	FWXGJC-2016-182	1 year	2021/03/15
AMN	AFJ	LT32C/10	FWXGJC-2016-179	1 year	2021/04/29
Thermohygrometer	Yuhuaze	HTC-1	FWXDA-2016-385	1 year	2021/02/28

Radiated Emission

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Loop Antenna	Schwarzbeck	FMZB 1519B	FWXGJC-2018-015	1 year	2021/08/23
Bi-Log Antenna	R&S	HL562E	FWXGJC-2016-267-06	3 year	2021/03/21
Broadband Horn Antenna	R&S	HF907	FWXGJC-2016-267-07	1 year	2021/04/06
Broadband Horn Antenna	Schwarzbeck	BBHA9170	FWXGJC-2018-016	1 year	2021/08/19
EMI Receiver	R&S	ESR26	FWXGJC-2016-267-01	1 year	2021/05/16
Pre-Amplifier	R&S	SCU-18D	FWXGJC-2016-267-05	1 year	2021/04/09
Pre-Amplifier	R&S	EMC184055 SE			2020/08/09
Thermohygrometer	Yuhuaze	HTC-1	FWXDA-2016-386	1 year	2021/02/28
Anechoic Chamber	Aimuke	EMCCT-3	FWXGJC-2016-270	1 year	2021/04/10

Test Software	Manufacturer	Version	Asset No.	Function
EMI Test Software	tonscend	V2.5.0.0	FWXWA-2018-004	Emission Test

6. TEST RESULT

6.1. Summary

FCC Part Section(s)	IC Part Section(s)	Test Description	Test Result
FCC CFR Title 47 Part 15 Subpart B:2017 15.107 Class A, ANSI C63.4: 2014	ICES 003 Issue 6 2017 Class A	Conducted Emissions	Pass
FCC CFR Title 47 Part 15 Subpart B:2017 15.109 Class A, ANSI C63.4: 2014	ICES 003 Issue 6 2017 Class A	Radiated Emissions	Pass

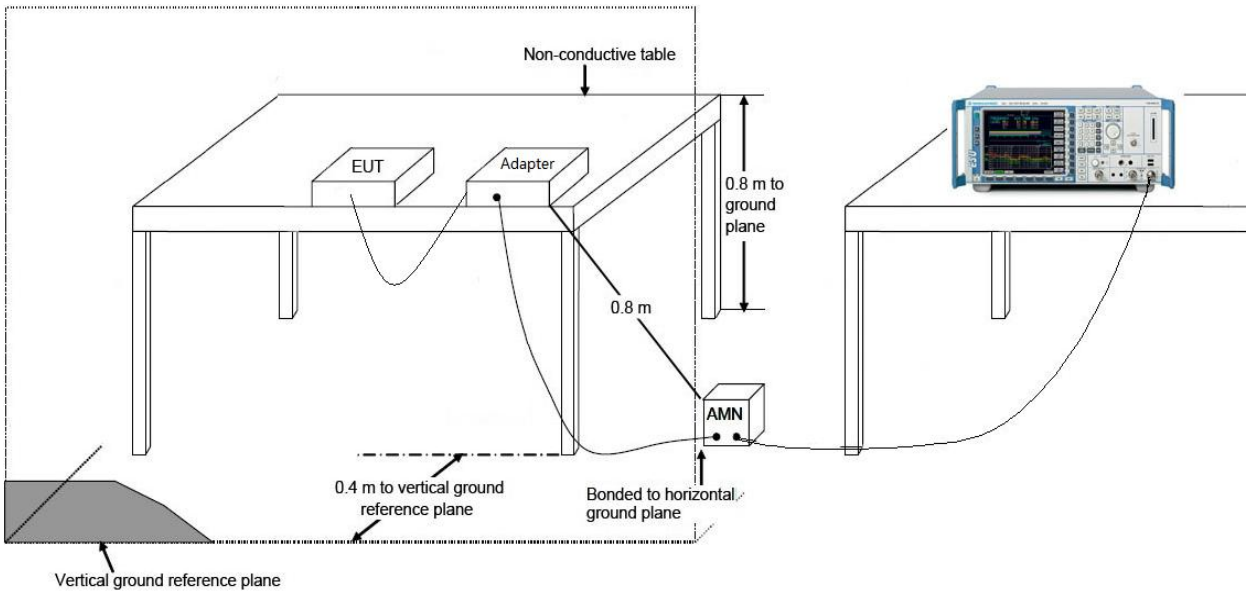
6.2. Conducted Emission Measurement

6.2.1. Test Limit

FCC Part 15.107 Class A Limits		
Frequency (MHz)	QP (dBμV)	AV (dBμV)
0.15 - 0.50	79	66
0.50 - 30	73	60

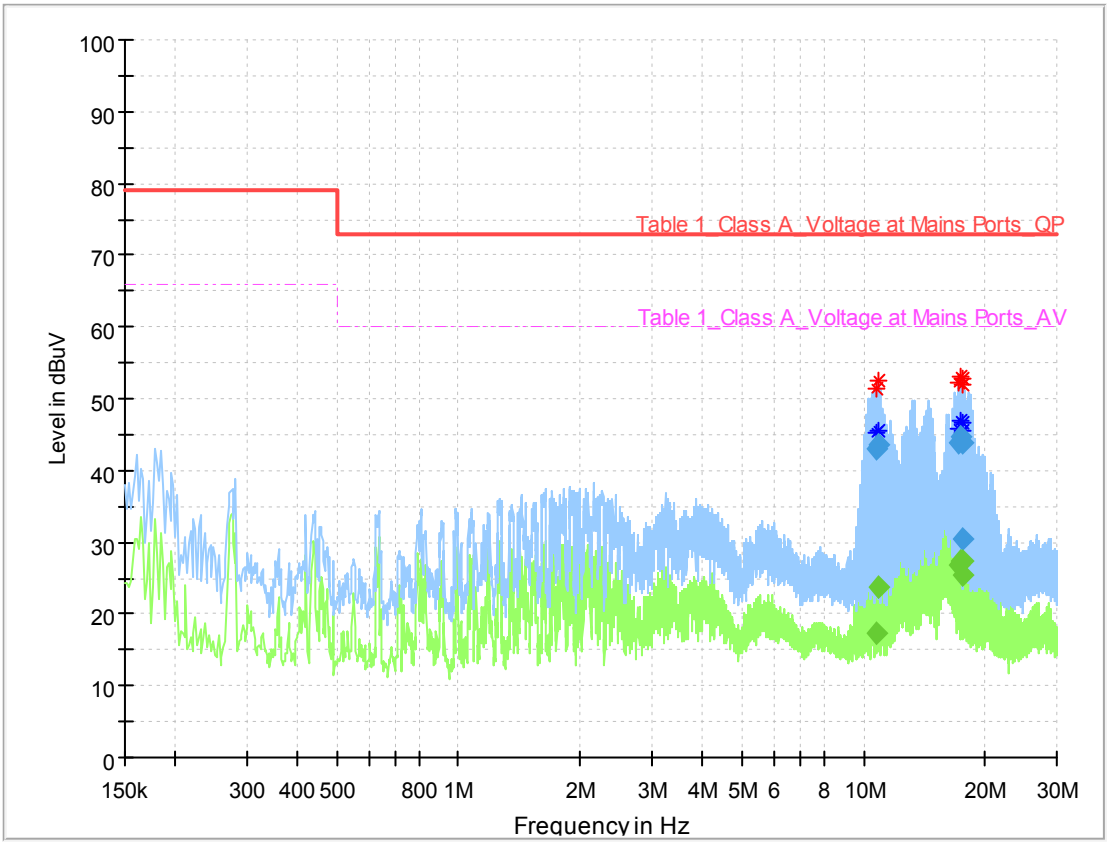
Note 1: The lower limit shall apply at the transition frequencies.

6.2.2. Test Setup



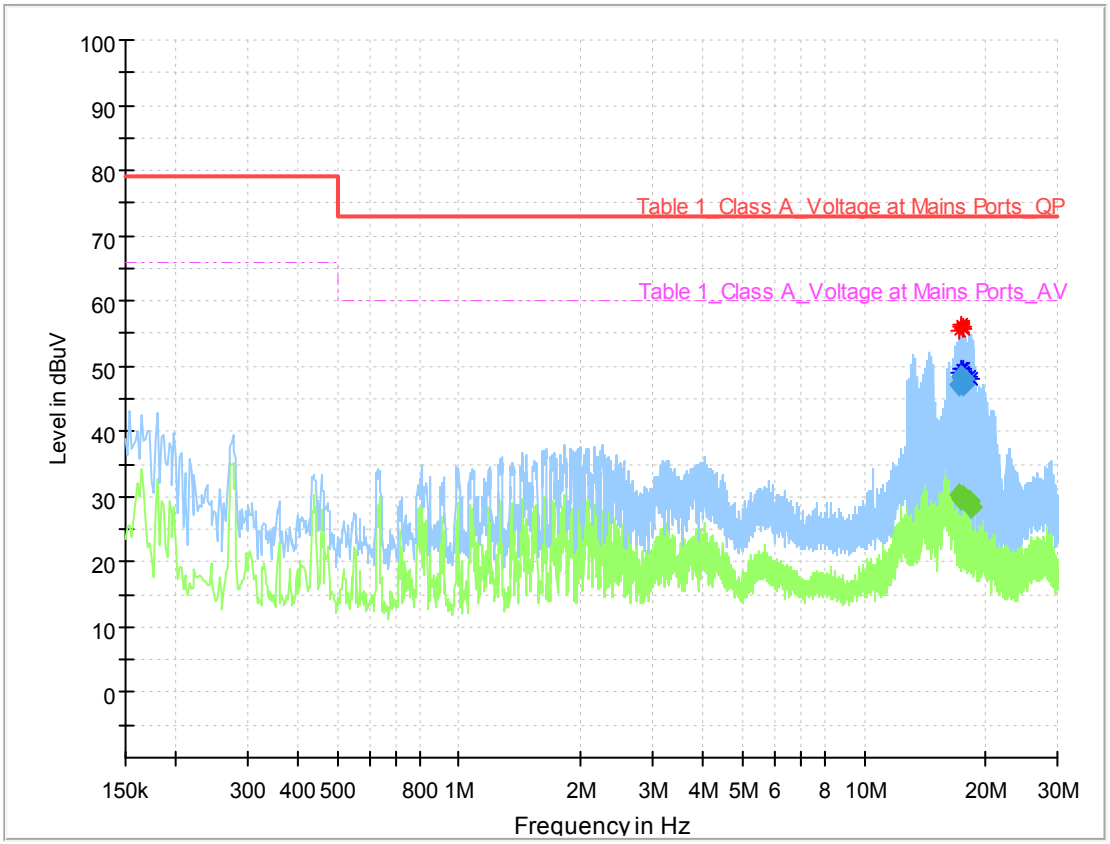
6.2.3. Test Result of Conducted Emissions

EUT:	Rangefinder	Polarity:	LINE
Model:	Pandar128	SN:	P1283ACB58993ACB51
Mode:	Mode 1	Voltage:	120V/60Hz
Environment:	Temp: 25℃; Humi:60%	Engineer:	Line Chen



Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Line	Filter	Corr. (dB)
10.770000	---	17.30	60.00	42.70	1000.	9.000	L1	ON	9.8
10.772000	42.89	---	73.00	30.11	1000.	9.000	L1	ON	9.8
10.886000	---	23.85	60.00	36.15	1000.	9.000	L1	ON	9.8
10.886000	43.63	---	73.00	29.37	1000.	9.000	L1	ON	9.8
17.250000	---	26.89	60.00	33.11	1000.	9.000	L1	ON	9.8
17.252000	43.81	---	73.00	29.19	1000.	9.000	L1	ON	9.8
17.370000	44.59	---	73.00	28.41	1000.	9.000	L1	ON	9.8
17.370000	---	27.29	60.00	32.71	1000.	9.000	L1	ON	9.8
17.486000	43.78	---	73.00	29.22	1000.	9.000	L1	ON	9.8
17.488000	---	25.48	60.00	34.52	1000.	9.000	L1	ON	9.8
17.602000	30.32	---	73.00	42.68	1000.	9.000	L1	ON	9.8
17.606000	---	27.49	60.00	32.51	1000.	9.000	L1	ON	9.8

EUT:	Rangefinder	Polarity:	NEUTRAL
Model:	Pandar128	SN:	P1283ACB58993ACB51
Mode:	Mode 1	Voltage:	120V/60Hz
Environment:	Temp: 25℃; Humi:60%	Engineer:	Line Chen



Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Line	Filter	Corr. (dB)
17.244000	---	30.24	60.00	29.76	1000.	9.000	N	ON	9.9
17.246000	47.30	---	73.00	25.70	1000.	9.000	N	ON	9.9
17.360000	48.27	---	73.00	24.73	1000.	9.000	N	ON	9.9
17.362000	---	29.75	60.00	30.25	1000.	9.000	N	ON	9.9
17.364000	48.29	---	73.00	24.71	1000.	9.000	N	ON	9.9
17.478000	48.18	---	73.00	24.82	1000.	9.000	N	ON	9.9
17.480000	---	30.02	60.00	29.98	1000.	9.000	N	ON	9.9
17.482000	48.10	---	73.00	24.90	1000.	9.000	N	ON	9.9
17.600000	---	30.02	60.00	29.98	1000.	9.000	N	ON	9.9
17.600000	47.29	---	73.00	25.71	1000.	9.000	N	ON	9.9
18.190000	---	29.30	60.00	30.70	1000.	9.000	N	ON	9.9
18.306000	---	28.49	60.00	31.51	1000.	9.000	N	ON	9.9

6.3. Radiated Emission Measurement

6.3.1. Test Limit

FCC Part 15.109 Class A Limits		
Frequency (MHz)	Distance (m)	Level (dBμV/m)
30 - 88	3	50
88 - 216	3	53.5
216 - 960	3	56
Above 960	3	60

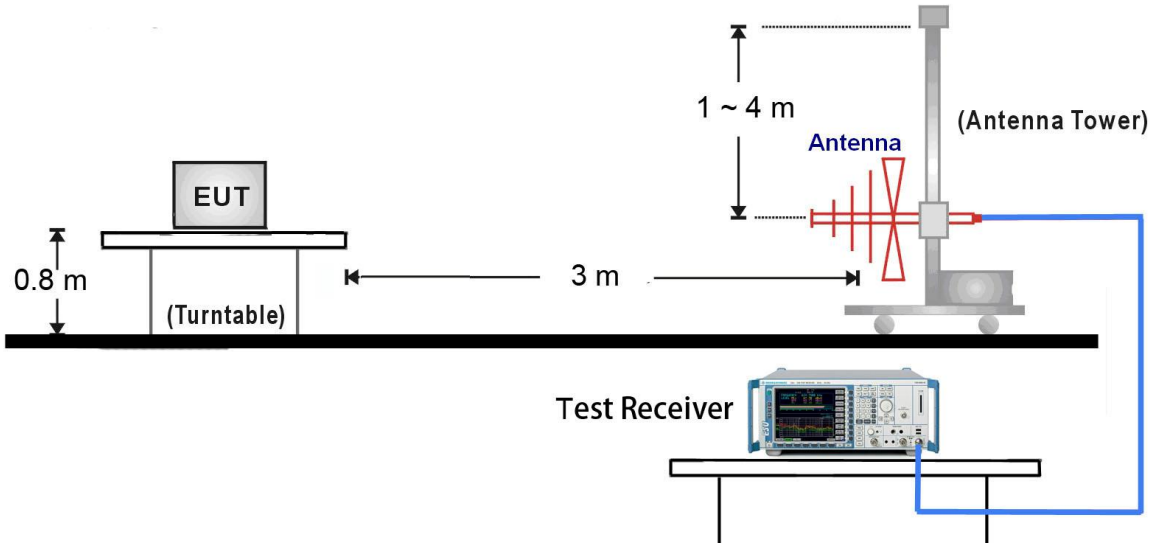
Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

Note 3: E field strength (dBμV/m) = 20 log E field strength (uV/m)

6.3.2. Test Setup

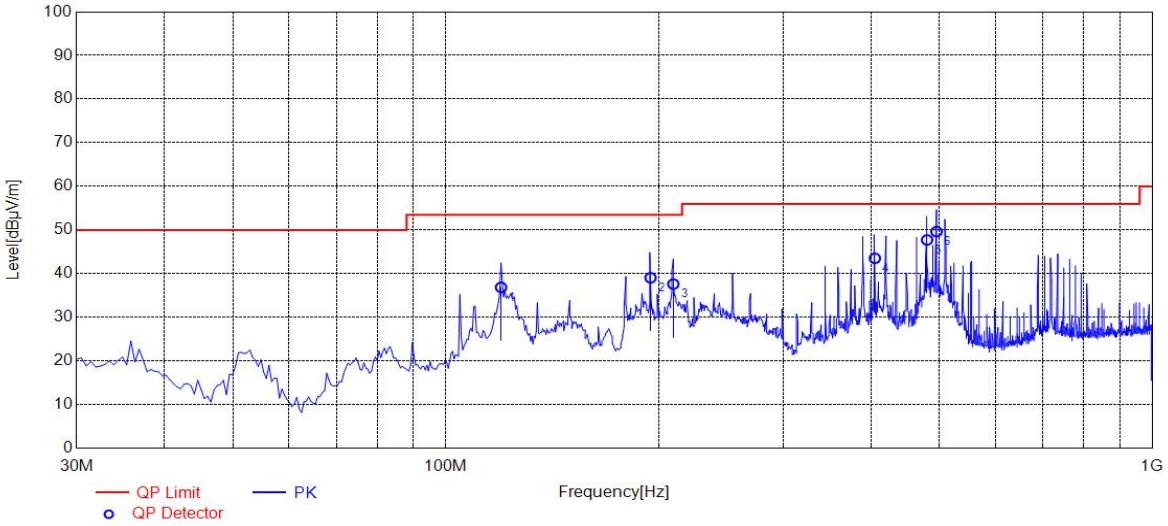
30MHz ~ 1GHz Test Setup:



6.3.3. Test Result of Radiated Emissions

EUT:	Rangefinder	Polarity:	Horizontal
Model:	Pandar128	SN:	P1283ACB58993ACB51
Mode:	Mode 1	Voltage:	120V/60Hz
Environment:	Temp: 25℃; Humi:60%	Engineer:	Line Chen

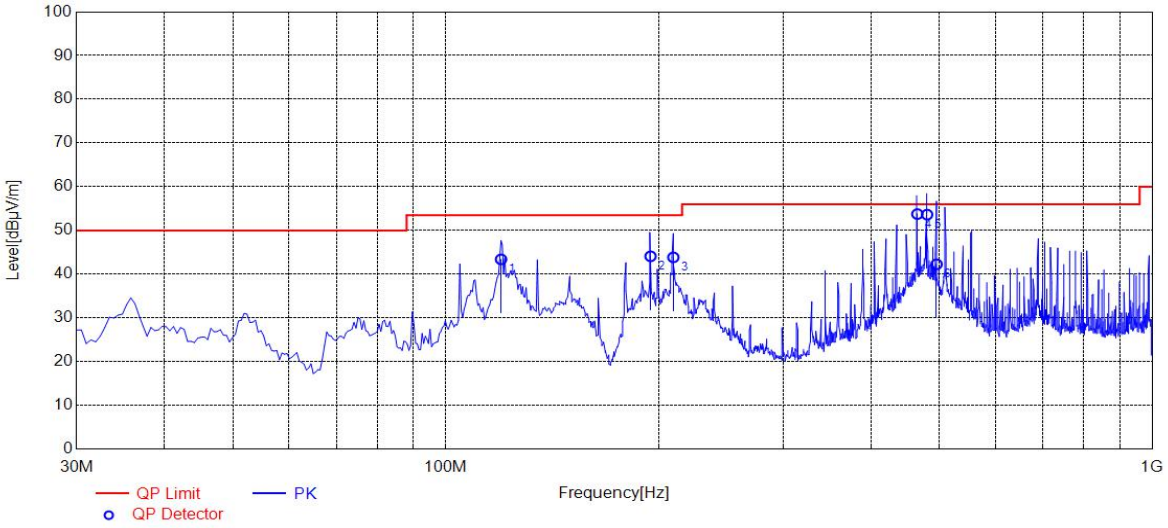
Test Graph



Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	119.725	11.25	36.86	53.50	16.64	200	272	Horizontal
2	194.900	9.12	39.05	53.50	14.45	200	264	Horizontal
3	209.935	9.52	37.60	53.50	15.90	200	25	Horizontal
4	404.905	16.39	43.51	56.00	12.49	100	143	Horizontal
5	480.080	17.79	47.73	56.00	8.27	200	12	Horizontal
6	495.115	17.88	49.63	56.00	6.37	200	14	Horizontal

EUT:	Rangefinder	Polarity:	Vertical
Model:	Pandar128	SN:	P1283ACB58993ACB51
Mode:	Mode 1	Voltage:	120V/60Hz
Environment:	Temp: 25℃; Humi:60%	Engineer:	Line Chen

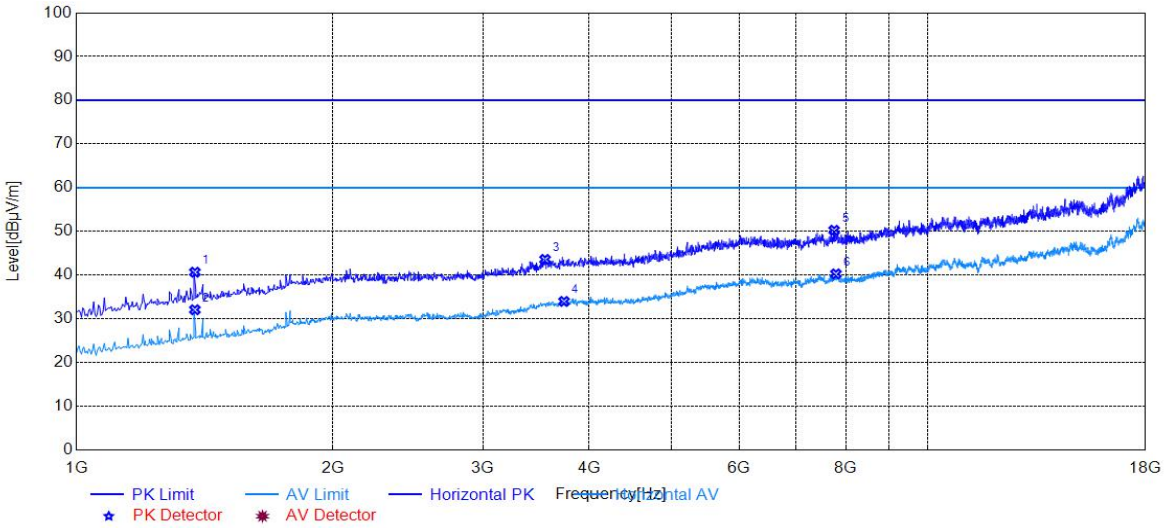
Test Graph



Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	119.725	11.25	43.39	53.50	10.11	100	40	Vertical
2	194.900	9.12	44.09	53.50	9.41	100	360	Vertical
3	209.935	9.52	43.85	53.50	9.65	100	330	Vertical
4	465.044	17.69	53.75	56.00	2.25	99.9	109.1	Vertical
5	480.080	17.79	53.62	56.00	2.38	99.9	201.7	Vertical
6	495.115	17.88	42.27	56.00	13.73	99.9	157.4	Vertical

EUT:	Rangefinder	Polarity:	Horizontal
Model:	Pandar128	SN:	P1283ACB58993ACB51
Mode:	Mode 1	Voltage:	120V/60Hz
Environment:	Temp: 25℃; Humi:60%	Engineer:	Line Chen

Test Graph

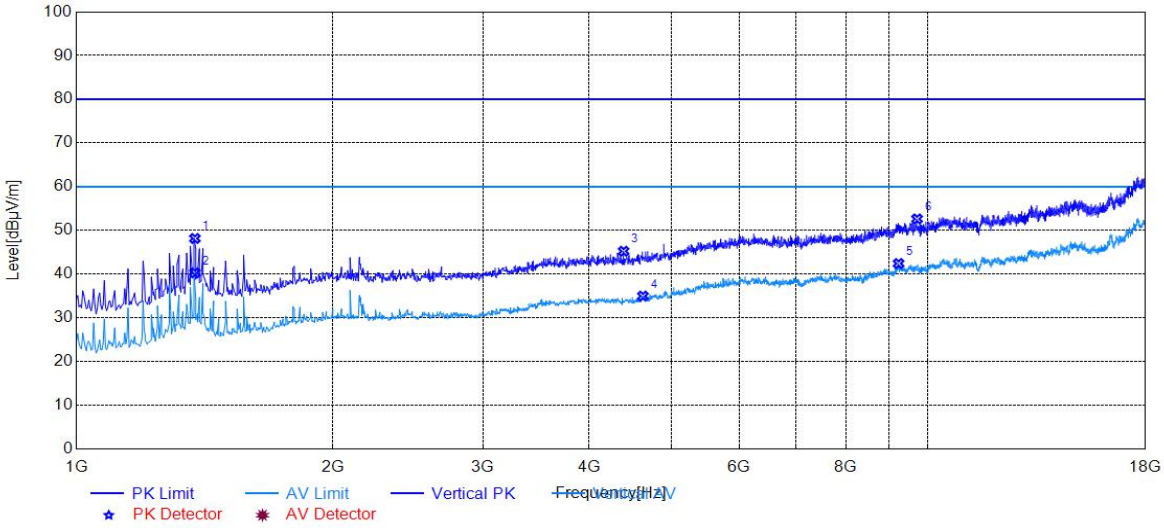


Final Data List

NO.	Freq. [MHz]	Factor [dB]	Value [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detection Mode
1	1377.40	40.67	-3.94	80.00	39.33	100	52	PK
2	1377.40	32.09	-3.94	60.00	27.91	100	110	AV
3	3550.00	43.59	4.47	80.00	36.41	100	79	PK
4	3737.00	33.99	4.67	60.00	26.01	100	166	AV
5	7755.80	50.27	12.11	80.00	29.73	100	317	PK
6	7793.20	40.28	12.20	60.00	19.72	100	149	AV

EUT:	Rangefinder	Polarity:	Vertical
Model:	Pandar128	SN:	P1283ACB58993ACB51
Mode:	Mode 1	Voltage:	120V/60Hz
Environment:	Temp: 25℃; Humi:60%	Engineer:	Line Chen

Test Graph



Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Detection Mode
1	1377.40	48.16	-3.94	80.00	31.84	100	138	PK
2	1377.40	40.30	-3.94	60.00	19.70	100	111	AV
3	4389.80	45.24	5.48	80.00	34.76	100	310	PK
4	4624.40	34.98	5.90	60.00	25.02	100	200	AV
5	9231.40	42.43	14.59	60.00	17.57	100	100	AV
6	9704.00	52.63	14.75	80.00	27.37	100	15	PK

7. CONCLUSION

The data collected relate only the item(s) tested and show that the **Rangefinder (Model:Pandar128)**has been tested to comply with the requirements specified in §15.107 / §15.109 of the FCC CFR Title 47 Part 15 Subpart B:2017.

The End