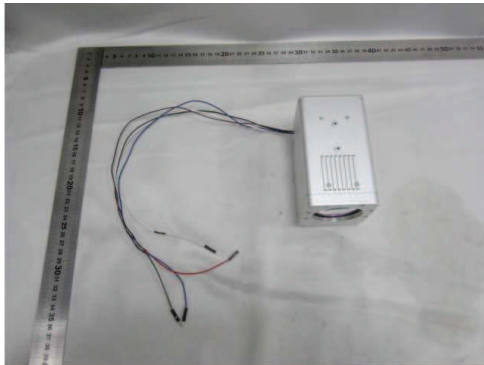


Prüfbericht-Nr.: <i>Test Report No.:</i>	50273170 001	Auftrags-Nr.: <i>Order No.:</i>	244157744	Seite 1 von 16 <i>Page 1 of 16</i>
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	683344	Auftragsdatum: <i>Order date.:</i>	26.03.2019	
Auftraggeber: <i>Client:</i>	Hesai Photonics Technology Co., Ltd. Room J385, Building 6, No. 1288 Yecheng Rd., Jiading District, Shanghai City, P.R. China			
Prüfgegenstand: <i>Test item:</i>	Drone-mounted Remote Methane Leak Detector			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	DM100			
Auftrags-Inhalt: <i>Order content:</i>	EMC test			
Prüfgrundlage: <i>Test specification:</i>	FCC 47 CFR Part 15, Subpart B:2018 Class B			
Wareneingangsdatum: <i>Date of receipt:</i>	27.03.2019			
Prüfmuster-Nr.: <i>Test sample No.:</i>	A000896406-001			
Prüfzeitraum: <i>Testing period:</i>	Refer to test report			
Ort der Prüfung: <i>Place of testing:</i>	EMC laboratory			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von / tested by:		kontrolliert von / reviewed by:		
				
16.07.2019	Jessie Xu/Senior project engineer	16.07.2019	Hexiong Liu/Department manager	
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>
Sonstiges / Other:				
FCC ID: 2ASO2DM100				
Test Firm Registration Number: 958801				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende: 1 = sehr gut 2 = gut P(ass) = entspricht o.g. Prüfgrundlage(n)		3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)		
Legend: 1 = very good 2 = good P(ass) = passed a.m. test specifications(s)		4 = ausreichend N/A = nicht anwendbar		
		5 = mangelhaft N/T = nicht getestet		
		4 = sufficient N/A = not applicable		
		5 = poor N/T = not tested		
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

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TEST SUMMARY

4.1.1 MAINS TERMINAL CONTINUOUS DISTURBANCE VOLTAGE

Result:

N/A

4.2.1 RADIATED EMISSION IN THE FREQUENCY RANGE UP 1GHZ

Result:

Passed

4.2.2 RADIATED EMISSION IN THE FREQUENCY RANGE ABOVE 1GHZ

Result:

Passed

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1 Test Sites

1.1 Test Facilities

Laboratory: TÜV Rheinland (Shanghai) Co., Ltd.

Address: No.177, 178, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China

The used test equipment is in accordance with CISPR 16-1 series standards for measurement of radio interference.

1.2 List of Test and Measurement Instruments

Table 1: List of test and measurement equipment

No.	Equipment	Model	Serial no./ software version	Cal. Due date	Cal. interval
1.	3m modified semi-anechoic chamber	SAC3	FJ129002	05.02.2020	4 years
2.	EMI test receiver	ESCI	100280	02.11.2019	1 year
3.	Bilog antenna	CBL 6112D	40530	14.02.2020	3 years
4.	Log periodic antenna	HL050	100692	17.02.2020	3 years
5.	Preamplifier	EMC051845SE	980612	06.03.2021	2 years
6.	Spectrum analyser	FSV40	101258	22.11.2019	2 years
7.	EMC measurement software	EMC32	10.20.01	N/A	N/A

2 General Product Information

2.1 Product Function and Intended Use

The EUT (equipment under test) is an ordinary drone-mounted remote methane leak detector.
For the further information, refer to the user's manual.

2.2 Ratings and System Details

System input : DC 7-12V
Protection class : III

2.3 Independent Operation Modes

The basic operation modes are: "ON" and "OFF" etc.

2.4 Description of interconnecting cables

No.	Interface and name	Shielded or not	Specified length (mm)
1	DC mains	Unshielded	<300
2	Singal cable	Unshielded	<300

2.5 Noise Generating and Noise Suppressing Parts

Refer to the circuit diagram for further information.

2.6 Highest frequency generated or used in the device or on which the device operates or tunes

The highest frequency used in the EUT is 200MHz.

2.7 Submitted Documents

User's manual, circuit diagrams and label.

3 Test Set-up and Operation Modes

3.1 Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible emission level. The test conditions were adapted accordingly in reference to the instructions for use.

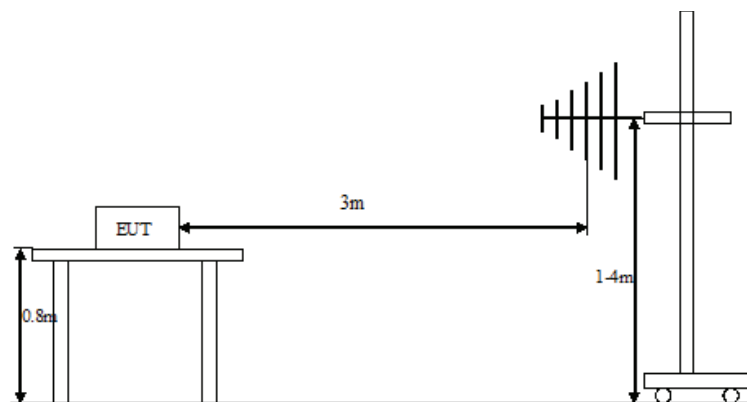
Refer to the related paragraph of this report.

The sequence of testing:

1. Radiated emission tests were performed on 11.06.2019-20.06.2019;

3.2 Equipment and cable arrangement

Block diagram for radiated emission test is as follows:



(Radiated emission)

Also refer to photographs on section 5 for test setups for radiated emission test.

3.3 Test Software

During the test, the software “Serial Port Utility” that provided by the manufacturer was used.

3.4 Special Accessories and Auxiliary Equipment

During the test, the battery pack (Model: INR18650HE4, manufacturer: LG CHEM LTD) and the laptop (model: Pro 15.6, brand: MI) were used as auxiliary equipment which provided by manufacturer.

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3.5 Countermeasures to achieve EMC Compliance

No other special measure is employed to achieve the requirement.

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4 Test Results EMISSION

4.1 Emission in the Frequency Range up to 30 MHz

4.1.1 Mains Terminal Continuous Disturbance Voltage

Result:	N/A
----------------	------------

The equipment under test (EUT) is not connected to the mains supply. Therefore, this test is not applicable to this product.

4.2 Emission in the Frequency Range above 30 MHz

4.2.1 Radiated emission in the frequency range up 1GHz

Result:	Passed
----------------	---------------

Date of testing	: 11.06.2019
Test procedure	: FCC 47 CFR Part 15, Subpart B:2018 and CISPR 16-1 series standards
Frequency range	: 30 – 1000MHz
Product classification	: Class B
Limits	: Quasi-peak limits (3m distance): 30-88MHz, 40dB μ V/m; 88-216MHz, 43.5dB μ V/m; 216-960MHz, 46dB μ V/m; Above 960MHz, 54dB μ V/m.
Bandwidth of EMI receiver for final measurement	: 120 kHz
Measurement time for final measurement	: 1 s
Kind of test site	: Semi-anechoic chamber
Operational mode	: Continuously working
Ambient condition	: Temperature: 24.1°C; Relative humidity: 47.2%
Expanded measurement uncertainty ($k=2$)	: 5.49dB

The radiated disturbance test was carried out in a semi-anechoic chamber. The test distance from the receiving antenna to the EUT is 3m. The normalized site attenuation of the semi-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on a wooden table, which is 0.8m high. The wooden table was rotated 360° around and the height of the antenna was varied from 1m to 4m to find the maximum disturbance. The test was performed with the antenna both in its horizontal and vertical polarizations.

The following figures and tables were those measured by an automatic measurement system. A preview test was firstly performed with peak detector. The final test was performed with quasi-peak at those critical frequencies during the preview test. In the following spectral diagram, “x” means quasi-peak test results.

Notes on following tables of radiated emission results and conversions:

QuasiPeak (dB μ V/m): final measurement results by using quasi-peak detector
Corr. (dB): correction factor including: antenna factor, cable loss, and gain of pre-amplifier (if used)
Margin: Limit (dB μ V/m) - QuasiPeak (dB μ V/m)

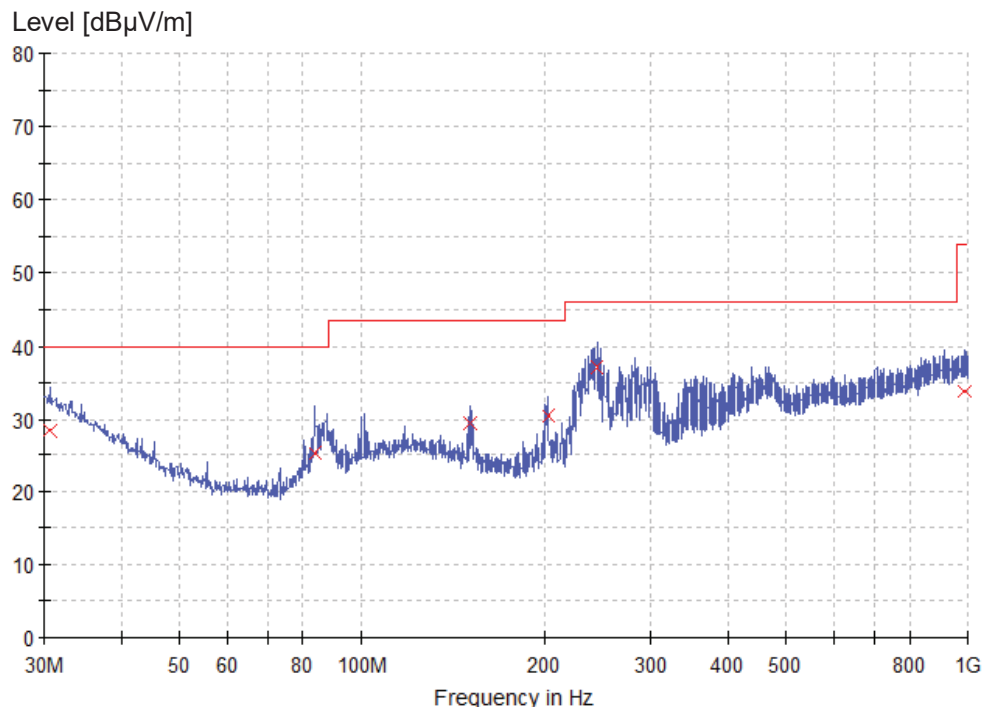
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Figure 1: Spectral Diagrams and measurement results, 30-1000MHz, horizontal polarization



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
30.606250	28.3	1000.0	120.000	200.0	H	90.0	25.1	11.7	40.0
83.956250	25.4	1000.0	120.000	150.0	H	180.0	14.6	14.6	40.0
151.371250	29.3	1000.0	120.000	150.0	H	-180.0	17.3	14.2	43.5
203.023750	30.4	1000.0	120.000	200.0	H	-180.0	16.6	13.1	43.5
243.763750	37.0	1000.0	120.000	100.0	H	-90.0	18.9	9.0	46.0
986.541250	33.6	1000.0	120.000	200.0	H	90.0	29.5	20.4	54.0

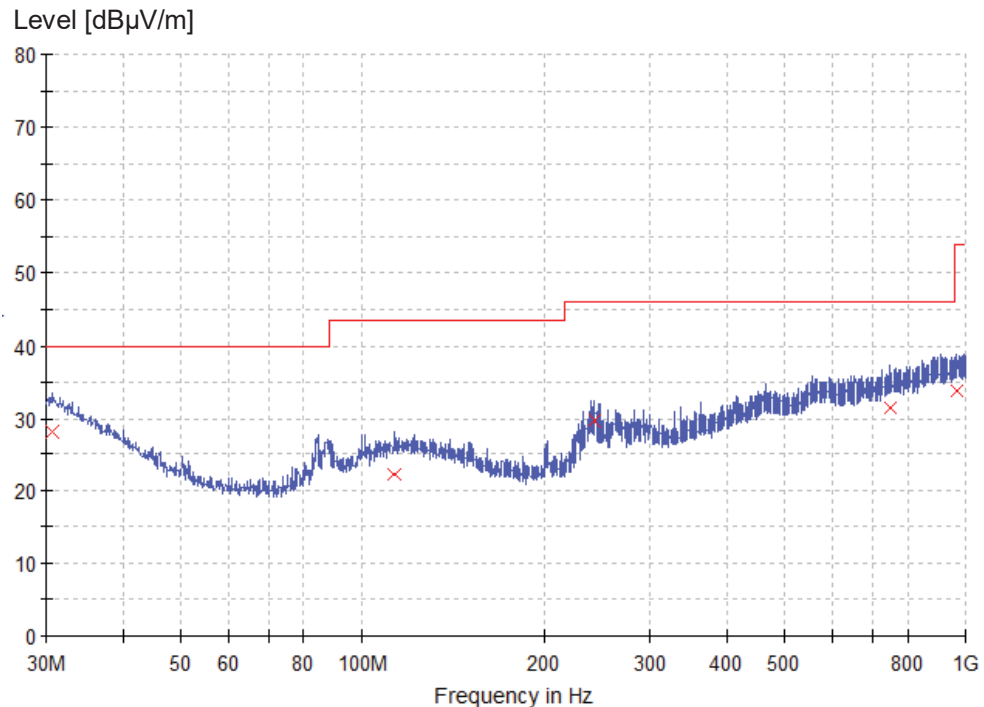
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Figure 2: Spectral Diagrams and measurement results, 30-1000MHz, vertical polarization



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30.727500	28.2	1000.0	120.000	200.0	V	-180.0	25.0	11.8	40.0
113.177500	22.1	1000.0	120.000	200.0	V	-180.0	19.1	21.4	43.5
242.915000	29.7	1000.0	120.000	150.0	V	-135.0	18.8	16.3	46.0
750.103750	31.5	1000.0	120.000	200.0	V	-180.0	28.0	14.5	46.0
968.596250	33.6	1000.0	120.000	200.0	V	-180.0	29.3	20.4	54.0

4.2.2 Radiated Emission in the frequency range above 1GHz

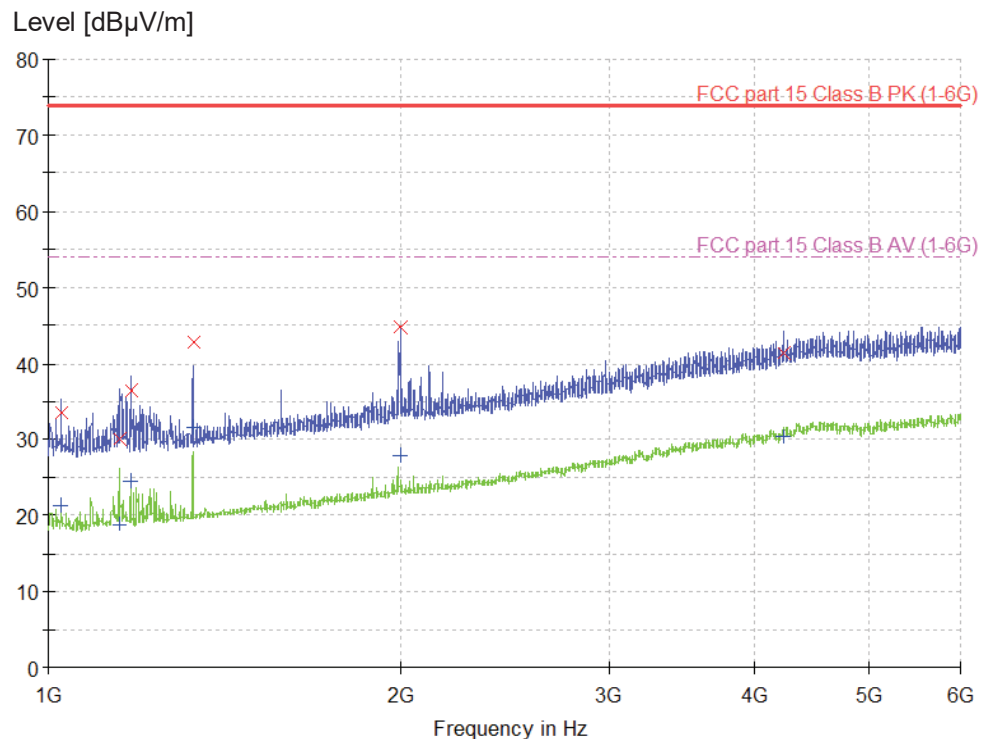
Result:	Passed
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Date of testing	: 20.06.2019
Port	: Enclosure
Test procedure	: FCC 47 CFR Part 15, Subpart B:2018 and CISPR 16-1 series standards
Product classification	: Class B
Frequency range	: 1GHz-6GHz
Limit	: 1GHz-6GHz: Peak 74dBμV/m Average 54dBμV/m
Kind of test site	: Fully anechoic chamber
Test distance	: 3m
Test voltage	: DC 8V
Operational mode	: Continuously working
Ambient condition	: Temperature: 24.1°C; Relative humidity: 47.2%
Expanded measurement uncertainty ($k=2$)	: 5.17dB

The radiated disturbance test was carried out in a fully anechoic room. The test distance from the receiving antenna to the EUT is 3m. The normalized site attenuation of the fully-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on a wooden support, which is 1.5m high. And the wooden support was rotated 360° around and the height of the antenna was varied from 1m to 4m to find the maximum disturbance. The test was performed with the antenna both in its horizontal and vertical polarizations.

The following figures and tables were those measured by an automatic measurement system. The final test was performed with peak detector and average detector at those critical frequencies during the preview test. In the following figure, “ $\times$ (red)” means measurement results with peak detector and “ $+$ (blue)” means measurement results with average detector.

Figure 3: Spectral Diagrams and measurement results, 1GHz-6GHz, horizontal polarization



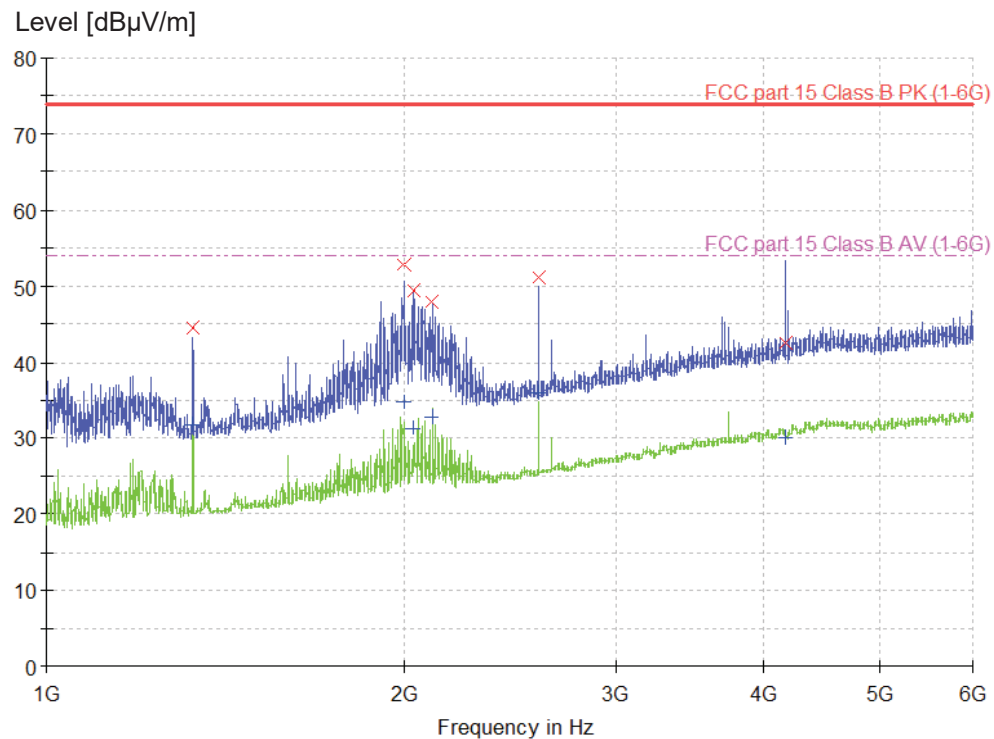
Final peak measurement result:

Frequency (MHz)	MaxPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - PK+ (dB)	Limit - PK+ (dB μ V/m)
1027.000000	33.6	1000.0	1000.000	150.0	H	0.0	-23.8	40.4	74.0
1153.500000	30.2	1000.0	1000.000	150.0	H	-90.0	-23.0	43.8	74.0
1178.500000	36.5	1000.0	1000.000	150.0	H	0.0	-22.8	37.5	74.0
1330.000000	42.7	1000.0	1000.000	150.0	H	0.0	-21.7	31.3	74.0
1996.000000	44.7	1000.0	1000.000	200.0	H	-90.0	-18.0	29.3	74.0
4240.000000	41.4	1000.0	1000.000	200.0	H	-90.0	-9.1	32.6	74.0

Final average measurement result

Frequency (MHz)	Average (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dB μ V/m)
1027.000000	21.2	1000.0	1000.000	150.0	H	0.0	-23.8	32.8	54.0
1153.500000	18.9	1000.0	1000.000	150.0	H	-90.0	-23.0	35.1	54.0
1178.500000	24.6	1000.0	1000.000	150.0	H	0.0	-22.8	29.4	54.0
1330.000000	31.7	1000.0	1000.000	150.0	H	0.0	-21.7	22.4	54.0
1996.000000	28.0	1000.0	1000.000	200.0	H	-90.0	-18.0	26.0	54.0
4240.000000	30.3	1000.0	1000.000	200.0	H	-90.0	-9.1	23.7	54.0

Figure 4: Spectral Diagrams and measurement results, 1GHz-6GHz, vertical polarization



Final peak measurement result:

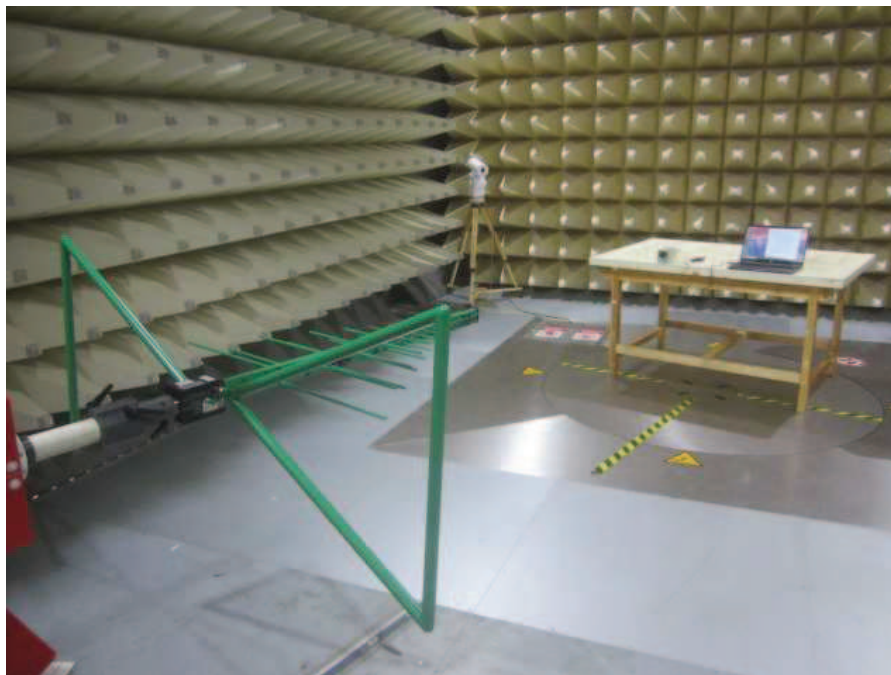
Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - PK+ (dB)	Limit - PK+ (dBμV/m)
1327.500000	44.6	1000.0	1000.000	200.0	V	-90.0	-21.7	29.4	74.0
1995.500000	52.9	1000.0	1000.000	150.0	V	-45.0	-18.0	21.1	74.0
2035.000000	49.4	1000.0	1000.000	150.0	V	-45.0	-17.8	24.6	74.0
2107.000000	47.9	1000.0	1000.000	150.0	V	-45.0	-17.5	26.1	74.0
2589.000000	51.2	1000.0	1000.000	200.0	V	0.0	-15.4	22.8	74.0
4179.000000	42.6	1000.0	1000.000	200.0	V	-180.0	-9.3	31.4	74.0

Final average measurement result:

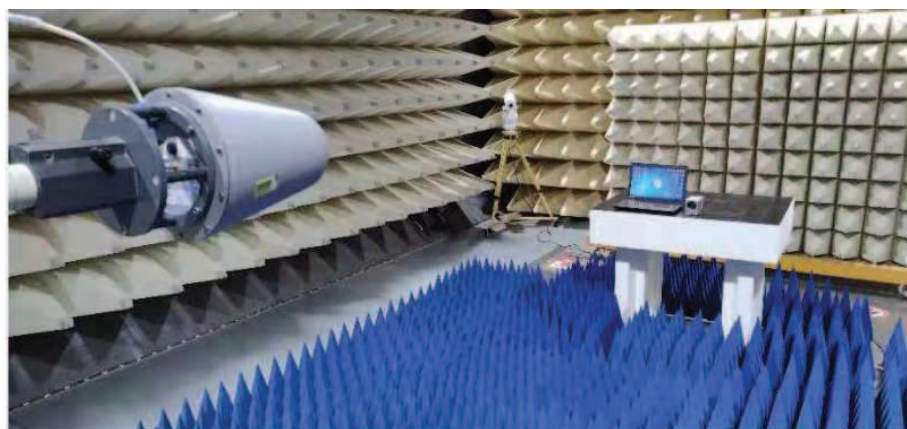
Frequency (MHz)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBμV/m)
1327.500000	31.9	1000.0	1000.000	200.0	V	-90.0	-21.7	22.1	54.0
1995.500000	34.6	1000.0	1000.000	150.0	V	-45.0	-18.0	19.4	54.0
2035.000000	31.2	1000.0	1000.000	150.0	V	-45.0	-17.8	22.8	54.0
2107.000000	32.9	1000.0	1000.000	150.0	V	-45.0	-17.5	21.1	54.0
2589.000000	36.0	1000.0	1000.000	200.0	V	0.0	-15.4	18.0	54.0
4179.000000	30.0	1000.0	1000.000	200.0	V	-180.0	-9.3	24.0	54.0

5 Photographs of the Test Set-Up

Photograph 1: Set-up for measurement of radiated emission



(30-1000MHz)



(1GHz-6GHz)

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End of test report