

TEST REPORT FCC ID:ZHZLHT52 Report Number.....: ZKT-2203011243E-1 Date of Test Mar. 01, 2022 to Apr. 27, 2022 Date of issue: Apr. 27, 2022 Test Result..... PASS Testing Laboratory......: Shenzhen ZKT Technology Co., Ltd. 1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Address Avenue, Fuhai Street, Bao'an District, Shenzhen, China Applicant's name : Dragino Technology Co., Limited Room 202, Block B, BCT Incubation Bases, No.8 CaiYunRoad Address LongCheng Street, LongGang District ; Shenzhen 518116, China Manufacturer's name : Dragino Technology Co., Limited. Room 202, Block B, BCT Incubation Bases, No.8 CaiYunRoad Address LongCheng Street, LongGang District ; Shenzhen 518116, China Test specification: Standard FCC CFR Title 47 Part 15 Subpart C Section 15.247 Test procedure: / Non-standard test method: N/A Test Report Form No.....: TRF-EL-110_V0 Test Report Form(s) Originator : ZKT Testing Master TRF : Dated: 2020-01-06 This device described above has been tested by ZKT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report. This report shall not be reproduced except in full, without the written approval of ZKT, this document may be altered or revised by ZKT, personal only, and shall be noted in the revision of the document. Product name.....: : LoRaWAN Temperature & Humidity Sensor Trademark: DRAGINO

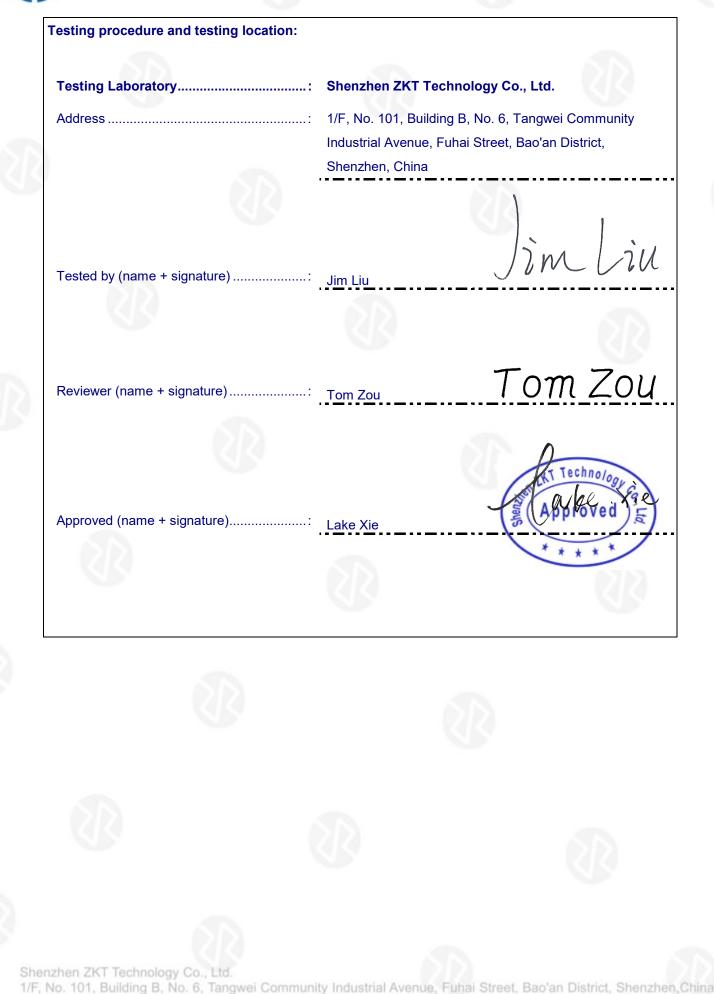
Model/Type reference..... LHT52

Ratings.....: Input: DC 3 by Battery

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1.Version

Report No.	Version	Description	Approved
ZKT-2203011243E	Rev.01	Initial issue of report	Apr. 27, 2022







2. Test Summary

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	N/A
Conducted Peak Output Power	15.247 (b)(1)	Pass
-6dB Occupied Bandwidth	15.247 (a)(1)	Pass
Radiated Emission	15.205/15.209	Pass
Band Edge	15.247(d)	Pass
Power Spectral Density	15.247 (e)	Pass

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report





2.1 TEST FACILITY

Shenzhen ZKT Technology Co., Ltd. Add. : 1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China

FCC Test Firm Registration Number: 692225 Designation Number: CN1299 IC Registered No.: 27033

2.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U_{3}$ where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty	
1	3m camber Radiated spurious emission(9KHz-30MHz)	U=4.5dB	
2	3m chamber Radiated spurious emission(30MHz-1GHz)	U=4.8dB	
3	3m chamber Radiated spurious emission(1GHz-6GHz)	U=4.9dB	
4	3m chamber Radiated spurious emission(6GHz-40GHz)	U=5.0dB	
5	Conducted disturbance	U=3.2dB	
6	RF Band Edge	U=1.68dB	
7	RF power conducted	U=1.86dB	
8	RF conducted Spurious Emission	U=2.2dB	
9	RF Occupied Bandwidth	U=1.8dB	
10	RF Power Spectral Density	U=1.75dB	
11	humidity uncertainty	U=5.3%	
12	Temperature uncertainty	U=0.59 ℃	







3. General Information

3.1 General Description of EUT

Product Name:	LoRaWAN Temperature & Humidity Sensor
Model No.:	LHT52
Test sample(s) ID:	ZKT-2203011243-1
Sample(s) Status:	Engineer sample
Serial No.:	N/A
Hardware Version:	N/A
Software Version:	N/A
Operation Frequency:	903MHz~914.2MHz
Channel numbers:	8
Channel separation:	600KHz
Modulation type:	Lora
Antenna Type:	Internal antenna
Antenna gain:	2dBi
Power supply:	DC 3V by Battery



600KHz for DTS:

Operation Frequence	Operation Frequency each of channel						
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)		
1	903.00	4	907.80	7	912.60		
2	904.60	5	909.40	8	914.20		
3	906.20	6	911.00				

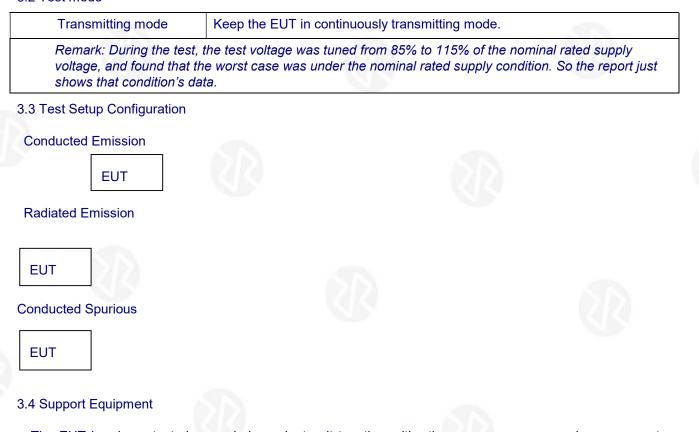
Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency(600KHz)
The lowest channel	903.00MHz
The middle channel	909.40MHz
The Highest channel	914.20MHz



3.2 Test mode



The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ltem	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	LoRaWAN Temperature & Humidity Sensor	DRAGINO	LHT52	N/A	EUT
A-1					

Item	Shielded Type	Ferrite Core	Length	Note
	5			

Note: (1)

(2)

The support equipment was authorized by Declaration of Confirmation.

For detachable type I/O cable should be specified the length in cm in [Length] column.

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3.5 Test Instruments list

Radiation Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	KEYSIGHT	9020A	MY45109572	Sep. 22, 2021	Sep. 21, 2022
2	Spectrum Analyzer (1GHz-40GHz)	Agilent	E4446A	100363	Sep. 22, 2021	Sep. 21, 2022
3	Test Receiver (9kHz-7GHz)	R&S	ESCI7	101169	Sep. 22, 2021	Sep. 21, 2022
4	Bilog Antenna (30MHz-1400MHz)	Schwarzbeck	VULB9168	00877	Sep. 22, 2021	Sep. 21, 2022
5	Horn Antenna (1GHz-18GHz)	SCHWARZBEC K	BBHA9120D	1541	Sep. 22, 2021	Sep. 21, 2022
6	Horn Antenna (18GHz-40GHz)	A.H. System	SAS-574	588	Sep. 22, 2021	Sep. 21, 2022
7	Amplifier (30-1000MHz)	EM Electronics	EM330 Amplifier	N/A	Sep. 22, 2021	Sep. 21, 2022
8	Amplifier (1GHz-40GHz)	全聚达	DLE-161	097	Sep. 22, 2021	Sep. 21, 2022
9	Loop Antenna (9KHz-30MHz)	SCHWARZBEC K	FMZB1519B	014	Sep. 22, 2021	Sep. 21, 2022
10	RF cables1 (9kHz-30MHz)	N/A	9kHz-30MHz	N/A	Sep. 22, 2021	Sep. 21, 2022
11	RF cables2 (30MHz-1GHz)	N/A	30MHz-1GHz	N/A	Sep. 22, 2021	Sep. 21, 2022
12	RF cables3 (1GHz-40GHz)	N/A	1GHz-40GHz	N/A	Sep. 22, 2021	Sep. 21, 2022
13	CMW500 Test	R&S	CMW500	106504	Sep. 22, 2021	Sep. 21, 2022
14	ESG Signal Generator	Agilent	E4421B	GB40051203	Sep. 22, 2021	Sep. 21, 2022
15	Signal Generator	Agilent	N5182A	MY47420215	Sep. 22, 2021	Sep. 21, 2022
16	D.C. Power Supply	LongWei	TPR-6405D	1	١	
17	Software	Frad	EZ-EMC	FA-03A2 RE	\	/

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	LISN	R&S	ENV216	101471	Sep. 22, 2021	Sep. 21, 2022
2	LISN	CYBERTEK	EM5040A	E1850400149	Sep. 22, 2021	Sep. 21, 2022
3	Test Cable	N/A	C01	N/A	Sep. 22, 2021	Sep. 21, 2022
4	Test Cable	N/A	C02	N/A	Sep. 22, 2021	Sep. 21, 2022
5	EMI Test Receiver	R&S	ESRP3	101946	Sep. 22, 2021	Sep. 21, 2022
6	Absorbing Clamp	DZ	ZN23201	N/A	Sep. 22, 2021	Sep. 21, 2022





4 Test Items for DTS

4.1 Conducted Peak Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)				
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance v05r02				
Limit:	30dBm				
Test setup:	Spectrum Analyzer E.U.T Non-Conducted Table Ground Reference Plane				
Test Instruments: Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details				
Test results:	Pass				

Measurement Data

600KHz Bandwidth	5
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Test channel	Peak Output Power (dBm)	Limit(dBm)	Result
Lowest	13.882		
Middle	15.735	30.00	Pass
Highest	15.602		

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Lowest channel



Middle channel



Highest channel











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4.2 Channel Bandwidth

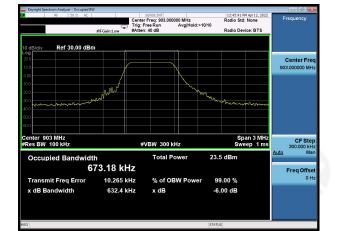
Test Requirement:	FCC Part15 C Section 15.247 (a)(2)		
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance v05r02		
Limit:	>500KHz		
Test setup:	Spectrum Analyzer E.U.T Non-Conducted Table Ground Reference Plane		
Test Instruments:	Refer to section 6.0 for details		
Test mode:	Refer to section 5.2 for details		
Test results:	Pass		

Measurement Data 600KHz Bandwidth:

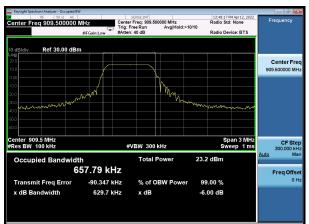
Test channel	Channel Bandwidth (KHz)	Limit(KHz)	Result
Lowest	632.4		
Meddle	629.7	>500	Pass
Highest	624.4		



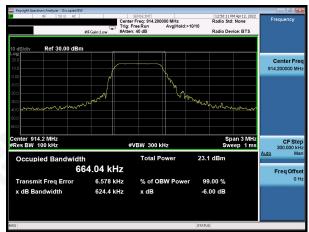




Lowest channel



Meddle channel



Highest channel





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4.3 Power Spectral Density

Test Requirement:	FCC Part15 C Section 15.247 (e)			
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance v05r02			
Limit:	8dBm/3kHz			
Test setup:	Spectrum Analyzer E.U.T Non-Conducted Table Ground Reference Plane			
Test Instruments:	Refer to section 6.0 for details			
Test mode:	Refer to section 5.2 for details			
Test results:	Pass			

Measurement Data

Test channel	Power Spectral Density (dBm/3kHz)	Limit(dBm/3kHz)	Result
Lowest	5.523		
Middle	4.857	8.00	Pass
Highest	4.330		



Test plot as follows:



Lowest channel



Medlle channel



Highest channel















4.4 Band edges

Test Requirement:	FCC Part15 C Section 15.247 (d)		
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance v05r02		
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.		
Test setup:	Spectrum Analyzer E.U.T Non-Conducted Table		
	Ground Reference Plane		
Test Instruments:	Refer to section 6.0 for details		
Test mode:	Refer to section 5.2 for details		
Test results:	Pass		

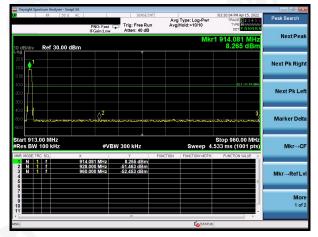




Test plot as follows:



Lowest Channel



Highest Channel







4.5 Spurious Emission

Conducted Emission Method

Conducted Emission Method	
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance v05r02
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	Spectrum Analyzer E.U.T Non-Conducted Table Ground Reference Plane
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

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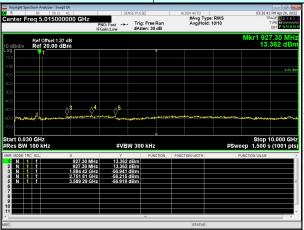




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Test channel:

Lowest channel



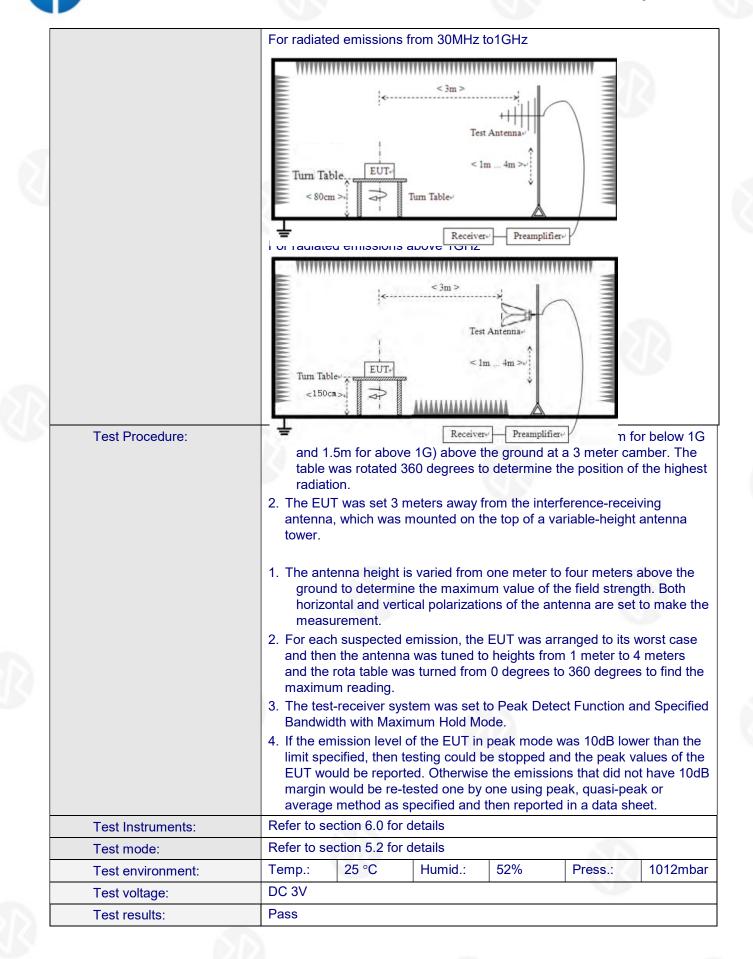
	840	
	30MHz~10GHz	
Test channel:	Middle channel	
	Brought Statute Statute Statute Comparison Comparis	
	Stat Stop Marker Deta Stat Stop 0.000 CHz Marker Deta #Res BW 100 kHz #VBW 300 kHz Sweep 952.9 ms (1001 pts) MkrCF More NOCE HICLSSL X Y POLICTON PULCTON WOTH MkrCF M 1 1 917.33 MHz 8.224 dBm MkrRef Lvt MkrRef Lvt	
Test channel:	30MHz~10GHz Highest channel	
	Registre Section Markages: New 15 Section Markages: New 15 Allow Markages: New 15 Center Freq 5.015000000 GHz Section Markages: New 15 Center Freq 5.015000000 GHz Section Markages: New 15 Markages: New 15 Markages: New 15	



Radiated	Emission	Method
ruuuuuuu		mounou

Test Requirement: FCC Part15 C Section 15.209									
	Test Method:	ANSI C63.10:2013						2.2	
	Test Frequency Range:	9kHz to 25GHz							
	Test site:	Measurement Distan	ice: 3	3m					
	Receiver setup:	Frequency	D	etector	RB	W	VBW	Value	
		9KHz-150KHz	Qu	iasi-peak	200	Hz	600Hz	Quasi-peak	
		150KHz-30MHz	Qu	iasi-peak	9Kł	Ηz	30KHz	Quasi-peak	
		30MHz-1GHz	Qu	iasi-peak	120k	(Hz	300KHz	Quasi-peak	
				Peak	1MI	Ηz	3MHz	Peak	
		Above 1GHz		Peak	1MI	Ηz	10Hz	Average	
	Limit:	Frequency		Limit (u\	//m)	V	alue	Measurement Distance	
		0.009MHz-0.490M	Hz	2400/F(ŀ	(Hz)		QP	300m	
		0.490MHz-1.705M	Hz	24000/F(KHz)	QP		30m	
		1.705MHz-30MHz 30MHz-88MHz		30			QP	30m	
				100		QP			
		88MHz-216MHz		150		QP			
		216MHz-960MHz	Z	200 500			QP	3m	
		960MHz-1GHz					QP	5111	
		Above 1GHz		500		Average			
				5000		Peak			
	Test setup:	For radiated emissio	<	< 3m >	Antenna Im	0			





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Measurement data:

Remark:

Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

9kHz~30MHz

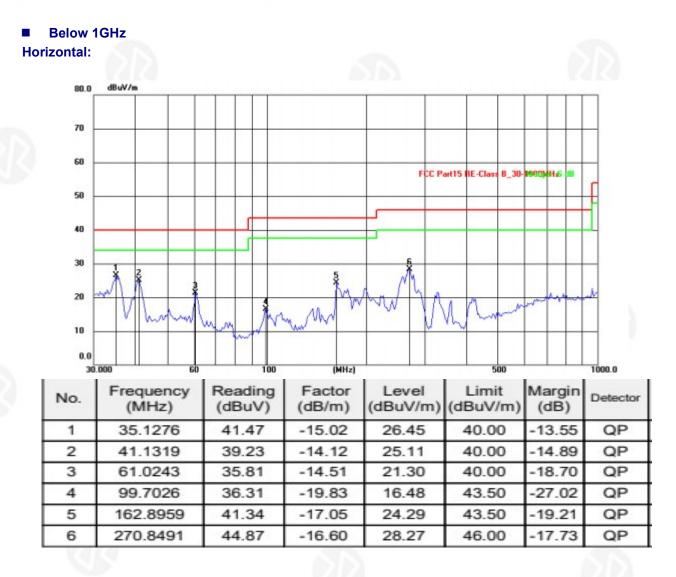
The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.



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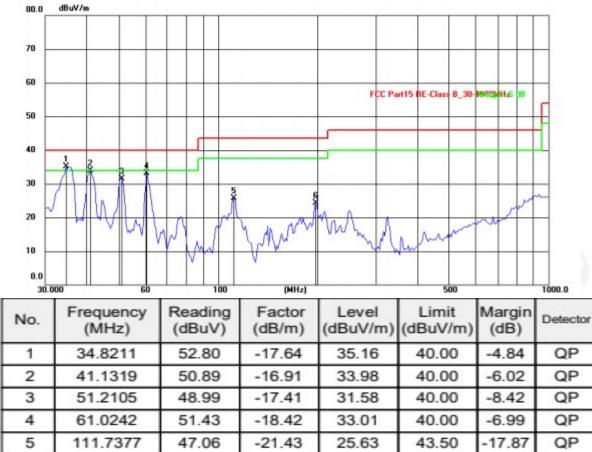


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Vertical:





-21.56

24.34

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197.5459

6

45.90

43.50

-19.16

QP



Above 1GHz

Test channel:				Lowest channel					
Peak value:									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization	
1806.00	42.53	25.25	4.85	34.08	38.37	74.00	-35.63	Vertical	
2709.00	35.71	28.12	5.66	33.68	35.87	74.00	-38.13	Vertical	
3612.00	33.97	29.19	7.25	37.37	32.86	74.00	-41.14	Vertical	
4515.00	*					74.00		Vertical	
5418.00	*					74.00		Vertical	
6321.00	*					74.00		Vertical	
1806.00	39.98	25.25	4.85	34.08	35.91	74.00	-38.09	Horizontal	
2709.00	34.6	28.12	5.66	33.68	35.06	74.00	-38.94	Horizontal	
3612.00	32.45	29.19	7.25	37.37	31.61	74.00	-42.39	Horizontal	
4515.00	*					74.00		Horizontal	
5418.00	*					74.00		Horizontal	
6321.00	*					74.00		Horizontal	
Average val	ue:								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization	
1806.00	30.24	25.25	4.85	34.08	26.44	54.00	-27.56	Vertical	
2709.00	23.35	28.12	5.66	33.68	23.93	54.00	-30.07	Vertical	
3612.00	23.85	29.19	7.25	37.37	22.65	54.00	-31.35	Vertical	
4515.00	*					54.00		Vertical	
5418.00	*					54.00		Vertical	
6321.00	*					54.00		Vertical	
1806.00	29.34	25.25	4.85	34.08	25.45	54.00	-28.55	Horizontal	
2709.00	23.56	28.12	5.66	33.68	23.65	54.00	-30.35	Horizontal	

ß

6321.00

Remarks:

3612.00

4515.00

5418.00

22.99

*

*

*

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

7.25

2. The emission levels of other frequencies are very lower than the limit and not show in test report.

37.37

21.56

3. "*", means this data is the too weak instrument of signal is unable to test.

29.19





-32.44

Horizontal

Horizontal

Horizontal

Horizontal

54.00

54.00

54.00

54.00



Test channe	l:			Hig	hest			
Peak value:								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
1831.60	40.39	25.43	4.89	34.12	36.59	74.00	-37.41	Vertical
2747.40	35.96	28.34	5.68	33.57	36.41	74.00	-37.59	Vertical
3663.20	34.18	29.42	7.29	37.66	33.23	74.00	-40.77	Vertical
4579.00	*		2			74.00		Vertical
5494.80	*					74.00		Vertical
6410.60	*					74.00		Vertical
1831.60	40.78	25.43	4.89	34.12	36.98	74.00	-37.02	Horizontal
2747.40	36.87	28.34	5.68	33.57	37.32	74.00	-36.68	Horizontal
3663.20	34.54	29.42	7.29	37.66	33.59	74.00	-40.41	Horizontal
4579.00	*					74.00		Horizontal
5494.80	*					74.00		Horizontal
6410.60	*					74.00		Horizontal
Average val	ue:		I					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
1831.60	31.16	25.43	4.89	34.12	27.36	54.00	-26.64	Vertical
2747.40	23.34	28.34	5.68	33.57	23.79	54.00	-30.21	Vertical
3663.20	23.51	29.42	7.29	37.66	22.56	54.00	-31.44	Vertical
4579.00	*					54.00		Vertical
5494.80	*			()		54.00		Vertical
6410.60	*					54.00		Vertical
1831.60	30.85	25.43	4.89	34.12	27.05	54.00	-26.95	Horizontal
2747.40	22.97	28.34	5.68	33.57	23.42	54.00	-30.58	Horizontal
3663.20	23.72	29.42	7.29	37.66	22.77	54.00	-31.23	Horizontal
4579.00	*					54.00		Horizontal
5494.80	*					54.00		Horizontal
6410.60	*					54.00		Horizontal

Remarks:

1. Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

2. The emission levels of other frequencies are very lower than the limit and not show in test report.

3. "*", means this data is the too weak instrument of signal is unable to test.

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5. Antenna Requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)						
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.							
15.247(c) (1)(i) requirement:							
(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may							
employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of							
the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.							
EUT Antenna:							
The antenna is Internal antenna, th	e best case gain of the antennas is 2dBi, reference to the appendix II for details						

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6. Test Setup Photo

Reference to the appendix I for details.

7. EUT Constructional Details

Reference to the appendix II for details.

***** END OF REPORT *****