



Project No: Report No.: TM-2305000094P TMWK2305001437KR FCC ID: P27-SLIMG01

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# RADIO TEST REPORT FCC 47 CFR PART 15 SUBPART C

Test Standard	FCC Part 15.247
Product name	Image sensor with LoRa module
Brand Name	Sercomm
Model No.	SL-IMG01
Test Result	Pass
Statements of Conformity	Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.

The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc. (Wugu Laboratory)

Approved by:

and la

Shawn Wu Supervisor

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部份複製。

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## **Revision History**

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	June 8, 2023	Initial Issue	ALL	Doris Chu
01	June 16, 2023	See the following Note Rev. (01)	P.4, P.31-36, P.39-44	Doris Chu

Rev. (01)

1. Modify power supply in section 1.1.

2. Added remark in page 31-36.

3. Added Average and remark in page 39-44



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## **1. GENERAL INFORMATION**

## **1.1 EUT INFORMATION**

Applicant	Sercomm Corporation 8F, No. 3-1, YuanQu St., NanKang, Taipei 115, Taiwan			
ManufacturerSercomm Corporation 8F, No. 3-1, YuanQu St., NanKang, Taipei 115, Taiwan				
Equipment Image sensor with LoRa module				
Model No. SL-IMG01				
Model Discrepancy N/A				
Trade Name	Sercomm			
Received Date	May 9, 2023			
Date of TestMay 15 ~ June 2, 2023				
Power Supply	Power from Battery. (DC 6V)			

#### Remark:

1. For more details, please refer to the User's manual of the EUT.

2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.



## **1.2 EUT CHANNEL INFORMATION**

Frequency Range	903 MHz-914.2 MHz		
Modulation Type	LoRa		
Number of channels	8 Channels		

#### Remark:

Refer as ANSI C63.10: 2013 clause 5.6.1 Table 4 for test channels

Number of frequencies to be tested					
Frequency range inNumber ofLocation in frequencywhich device operatesfrequenciesrange of operation					
1 MHz or less	1	Middle			
1 MHz to 10 MHz	2	1 near top and 1 near bottom			
More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom			

## **1.3 ANTENNA INFORMATION**

Antenna Type	CHIP Z PIFA PCB Dipole Coils
Antenna Gain	Gain: -2.8 dBi
Antenna Connector	N/A

#### Remark:

1. The industrial epoxy adhesive is used making Antenna connection permanently prior to shipping. It complies with rule 15.203.



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## **1.4 MEASUREMENT UNCERTAINTY**

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	± 2.1183
Channel Bandwidth	± 2.1863
Power Spectral density	± 2.1855
Conducted Bandedge	± 2.1866
Conducted Spurious Emission	± 2.1859
Radiated Emission_9kHz-30MHz	± 3.842
Radiated Emission_30MHz-200MHz	± 4.517
Radiated Emission_200MHz-1GHz	± 4.844
Radiated Emission_1GHz-6GHz	± 5.411
Radiated Emission_6GHz-18GHz	± 5.266

Remark:

1.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2

2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

## **1.5 FACILITIES AND TEST LOCATION**

All measurement facilities used to collect the measurement data are located at

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

No. 12, Ln. 116, Wugong 3rd Rd., Wugu Dist., New Taipei City, Taiwan 24803 CAB identifier: TW1309

Test site	Test Engineer	Remark
AC Conduction Room	-	Not applicable, because EUT doesn't connect to AC Main Source direct.
Radiation	Czerny Lin	-
RF Conducted	Jack Chen	-

**Remark:** The lab has been recognized as the FCC accredited lab. under the KDB 974614 D01 and is listed in the FCC pubic Access Link (PAL) database, FCC Registration No. :444940, the FCC Designation No.:TW1309



## **1.6 INSTRUMENT CALIBRATION**

RF Conducted Test Site								
Equipmen	Equipment Manufacturer Model Serial Number Calibration Date						Cali	ibration Due
Power Sens	or Anrits	I	MA2411B	1911386	2022-	)22-08-08		023-08-07
Power Sens	or Anrits	I	MA2411B	1911387	2022-08-08		2	023-08-07
EXA Signa Analyzer	Keysig	nt	N9010B	MY55460167	2022-	09-07	09-07 2023-09-06	
EXA Signa Analyzer	l Keysig	nt	N9010A	MY54200716	2022-	10-13	2	023-10-12
Power Mete	er Anrits	ı	ML2496A	2136002	2022-	11-24	2	023-11-23
Software			Radi	o Test Software	Ver. 21			
			3M 966 Cham	ber Test Site				
Equipment	Manufacturer		Model	Serial Nu	mber	Calibrat Date		Calibration Due
Antenna	SHWARZBECK		VULB 9168	1277		2023-01	-13	2024-01-12
Pre-Amplifier	EMCI	E	MC118A45SE	98082	0	2022-12	2-23	2023-12-22
Pre-Amplifier	EMCI		EMC330N	98085	3	2022-12	2-23	2023-12-22
Coaxial Cable	EMC	EM	C101G-KM-KM-9 000	220407+211228+2302 05		2023-03	8-21	2024-03-20
Signal Generator	Agilent		N9010A	MY52220817		2023-03	8-09	2024-03-08
Coaxial Cable			EMCCFD400	211212+2112 20	22+2110	2023-03	8-21	2024-03-20
Thermo-Hygr o Meter	EDSDS		EDS-A49	966D <sup>-</sup>	1	2023-05-1		2024-05-10
Pre-Amplifier	EMCI	E	MC184045SE	98087	2	2023-01-03		2024-01-02
Horn Antenna	RF SPIN		DRH18-E	210301A18ES 2		2023-02-03		2024-02-02
Horn Antenna	SHWARZBECK		BBHA 9170	1134	1134 202		2-30	2023-12-29
Loop Antenna	SCHWARZBEC K	F	MZB 1513-60	1513-60-	028	2022-12	2-27	2023-12-26
High Pass Filter	TITAN	T04	H10001000060S 01	DS 211215-7-2 2023-02-02		2-02	2024-02-01	
Software			ea	6.11-20180413	3			

AC Conducted Emissions Test Site							
Equipment	Equipment Manufacturer Model S/N Cal Date Cal Due						
N/A							

Remark:

Each piece of equipment is scheduled for calibration once a year.
 N.C.R. = No Calibration Required.



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## **1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT**

	EUT Accessories Equipment								
No.	No. Equipment Brand Model Series No. FCC ID								
	N/A								

Support Equipment								
No.	No. Equipment Brand Model Series No. FCC ID							
1	NB(E)	Lenovo	T460	N/A	N/A			

## **1.8 TEST METHODOLOGY AND APPLIED STANDARDS**

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.247.



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## 2. TEST SUMMARY

FCC Standard Section	Report Section	Test Item	Result
15.203	1.3	Antenna Requirement	Pass
15.207(a)	4.1	AC Conducted Emission	N/A
15.247(a)(2)	4.2	6 dB Bandwidth	Pass
-	4.2	Occupied Bandwidth (99%)	Pass
15.247(b)(3)	4.3	Output Power Measurement	Pass
15.247(e)	4.4	Power Spectral Density	Pass
15.247(d)	4.5	Conducted Spurious Emission	Pass
15.247(d)	4.5	Conducted Emission	Pass
15.247(d)	4.6	Radiation Band Edge	Pass
15.247(d)	4.6	Radiation Spurious Emission	Pass



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## 3. DESCRIPTION OF TEST MODES

### **3.1 THE WORST MODE OF OPERATING CONDITION**

Operation mode	LoRa with 500kHz Bandwidth.		
Test Channel Frequencies1.Lowest Channel: 903 MHz 2.Middle Channel: 907.8 MHz 3.Highest Channel: 914.2 MHz			
	Channel	Frequency (MHz)	
	CH64	903	
	CH65	904.6	
	CH66	906.2	
Channel List	CH67	907.8	
	CH68	909.4	
	CH69	911	
	CH70	912.6	
	CH71	914.2	

#### Remark:

1. The device supports hybrid mode.

2. RF output power was measured with Average detector



## **3.2 THE WORST MODE OF MEASUREMENT**

Radiated Emission Measurement Above 1G					
Test Condition	Test Condition Radiated Emission Above 1G				
Power supply Mode	Mode 1: EUT power by Battery				
Worst Mode I Mode 1 Mode 2 Mode 3 Mode 4					
Worst Position	<ul> <li>Placed in fixed position.</li> <li>Placed in fixed position at X-Plane (E2-Plane)</li> <li>Placed in fixed position at Y-Plane (E1-Plane)</li> <li>Placed in fixed position at Z-Plane (H-Plane)</li> </ul>				

Radiated Emission Measurement Below 1G					
Test Condition	Test Condition Radiated Emission Below 1G				
Power supply Mode Mode 1: EUT power by Battery					
Worst Mode         Mode 1         Mode 2         Mode 3         Mode 4					

Remark:

1. The worst mode was record in this test report.

2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(Y-Plane) were recorded in this report



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## **3.3 EUT DUTY CYCLE**

Temperature:	<b>22.8 ~ 26.8</b> ℃	Test date:	May 15 ~ June 2, 2023
Humidity:	52 ~ 61% RH	Tested by:	Jack Chen

Duty Cycle						
Configuration	Duty Cycle (%)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)		
LoRa-500kHz	100.00	0.00	0.33	0.01		

		nalyzer - Swept SA						
XI RL	RF	50 Ω DC	RALI_		SENSE:INT	ALIGN AUTO Avg Type: Voltage	12:22:13 PM May 15, 2023 TRACE 1 2 3 4 5 6	Frequency
Center i	-req 9	03.000000	PNO: Fast IFGain:Lot	t ↔ N	<ul> <li>Trig: Free Run #Atten: 30 dB</li> </ul>	Avg Type. Voltage		
10 dB/div		Offset 10.5 dB 30.00 dBm				Δ	Mkr3 3.000 ms 0.01 dB	Auto Tune
Log		<u>30.00 dB</u> m						
20.0	₂</td <td>¥</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Center Freq</td>	¥						Center Freq
10.0								903.000000 MHz
0.00								
-10.0								Start Freq
-20.0								903.000000 MHz
-30.0								500.000000 11112
-40.0								
-50.0								Stop Freq
-60.0								903.000000 MHz
Center 9 Res BW		0000 MHz	#\	/BW	8.0 MHz	Sweep 2	Span 0 Hz 0.00 ms (1001 pts)	CF Step 8.000000 MHz Auto Man
	RC SCL	× (Δ)	3.000 ms	(Δ)	Y FU	INCTION FUNCTION WIDTH		<u>Auto</u> Man
2 F 3 Δ4	1 t 1 t	(Δ)	1.000 ms 3.000 ms	(A)	20.67 dBm 0.01 dB			Freq Offset
4 F	i t	(Δ)	1.000 ms	(Δ)	20.67 dBm			0 Hz
5 6 7							E	
7 8 9								Scale Type
10 11								Log <u>Lin</u>
•							•	

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## 4. TEST RESULT

## **4.1 AC POWER LINE CONDUCTED EMISSION**

### 4.1.1 Test Limit

According to §15.207(a),

Frequency Range	Limits(dBµV)		
(MHz)	Quasi-peak	Average	
0.15 to 0.50	66 to 56*	56 to 46*	
0.50 to 5	56	46	
5 to 30	60	50	

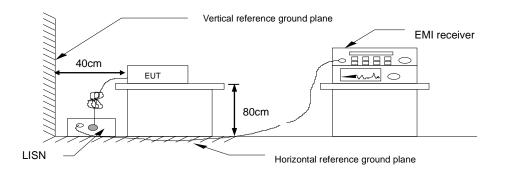
\* Decreases with the logarithm of the frequency.

### 4.1.2 Test Procedure

Test method Refer as ANSI C63.10: 2013 clause 6.2,

- 1. The EUT was placed above horizontal ground plane and 0.4m above vertical ground plane
- 2. EUT connected to the line impedance stabilization network (LISN)
- 3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
- 4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 5. Recorded Line for Neutral and Line.

### 4.1.3 Test Setup



### 4.1.4 Test Result

Not applicable, because EUT not connect to AC Main Source direct.



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## 4.26dB BANDWIDTH AND OCCUPIED BANDWIDTH (99%)

### 4.2.1 Test Limit

According to §15.247(a)(2),

#### 6 dB Bandwidth :

Limit

Shall be at least 500kHz

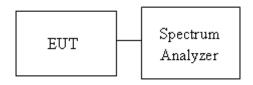
**Occupied Bandwidth(99%)** : For reporting purposes only.

### 4.2.2 Test Procedure

Test method Refer as ANSI C63.10: 2013 clause 6.9.2,

- 1. The EUT RF output connected to the spectrum analyzer by RF cable.
- 2. Setting maximum power transmit of EUT.
- 3. SA set RBW = 100kHz, VBW = 300 kHz and Detector = Peak, to measurement 6 dB Bandwidth.
- 4. SA set RBW = 1% ~ 5% OBW, VBW = three times the RBW and Detector = Peak, to measurement 99% Bandwidth.
- 5. Measure and record the result of 6 dB Bandwidth and 99% Bandwidth. in the test report.

### 4.2.3 Test Setup





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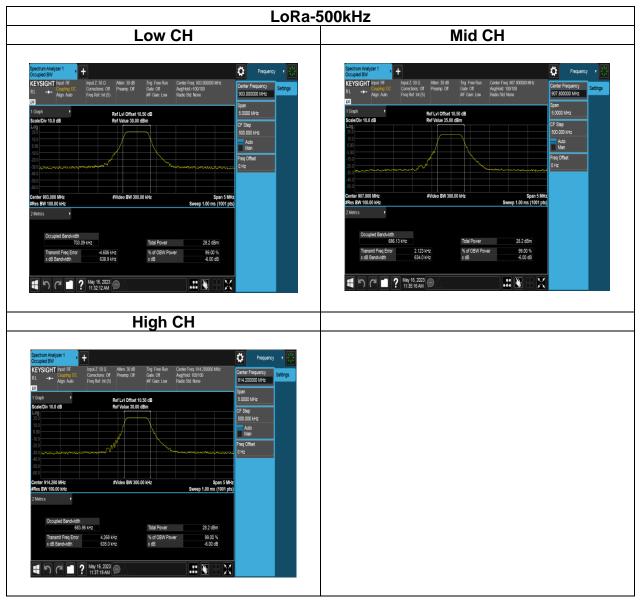
### 4.2.4 Test Result

Temperature:	<b>22.8 ~ 26.8</b> °C	Test date:	May 15 ~ June 2, 2023
Humidity:	52 ~ 61% RH	Tested by:	Jack Chen

Test mode: LoRa-500kHz / 903-914.2 MHz							
ChannelFrequency (MHz)OBW (99%) (MHz)6dB BW (MHz)6dB lim (kHz)							
Low	903	0.51510	0.6389				
Mid	907.8	0.51228	0.6340	>500			
High	914.2	0.51057	0.6350				

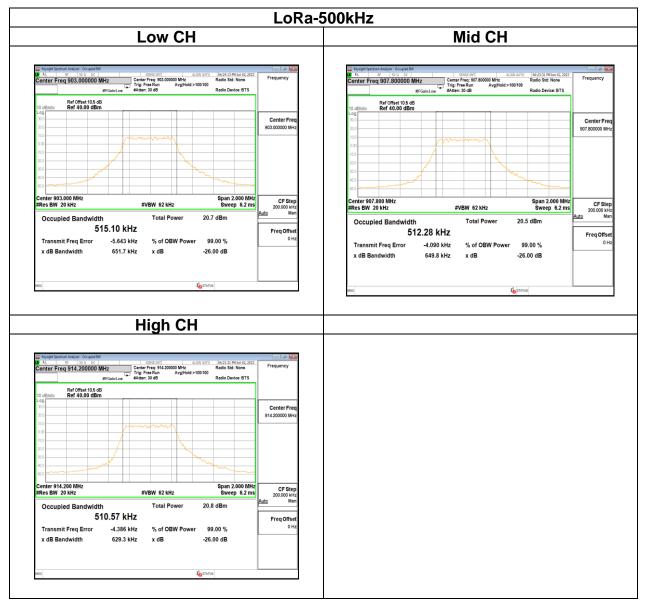


## 6dB BANDWIDTH Test Data





## BANDWIDTH (99%) Test Data





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## 4.3 OUTPUT POWER MEASUREMENT

### 4.3.1 Test Limit

According to §15.247(b)(3).

For systems using digital modulation in the 902-928 MHz: 1 Watt(30 dBm), base on the use of antennas with directional gain not exceed 6 dBi If transmitting antennas of directional gain greater than 6dBi are used the peak output power the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

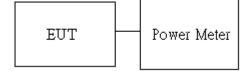
Limit $\bigtriangleup$ Antenna not exceed 6 dBi : 30dBmLimit $\square$ Antenna with DG greater than 6 dBi[ Limit = 30 - (DG - 6) ] $\square$ Point-to-point operation	
---	--

### 4.3.2 Test Procedure

Test method Refer as ANSI C63.10:2013.

- 1. The EUT RF output connected to the power meter by RF cable.
- 2. Setting maximum power transmit of EUT.
- 3. The path loss was compensated to the results for each measurement.
- 4. Measure and record the result of Average output power. in the test report.

### 4.3.3 Test Setup





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### 4.3.4 Test Result

Temperature:	<b>22.8 ~ 26.8</b> ℃	Test date:	May 15 ~ June 2, 2023
Humidity:	52 ~ 61% RH	Tested by:	Jack Chen

#### LoRa-500kHz:

СН	Frequency (MHz)	Power set	Maximum Output power (dBm)	Required Limit (dBm)
Low	903	22	20.33	30
Mid	907.8	22	20.36	30
High	914.2	22	20.38	30



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## 4.4 POWER SPECTRAL DENSITY

### 4.4.1 Test Limit

According to §15.247(e),

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Limit

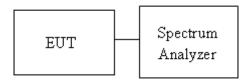
Antenna not exceed 6 dBi : 8dBm Antenna with DG greater than 6 dBi [Limit = 8 - (DG - 6)] Point-to-point operation :

### 4.4.2 Test Procedure

Test method Refer as ANSI C63.10:2013.

- 1. The EUT RF output connected to the spectrum analyzer by RF cable.
- 2. Setting maximum power transmit of EUT
- 3. SA set RBW = 3kHz, VBW = 10kHz, Span = 1.5 times DTS Bandwidth (6 dB BW), Detector = RMS, Sweep Time = Auto and Trace = Max hold.
- 4. The path loss and Duty Factor were compensated to the results for each measurement by SA.
- 5. Mark the maximum level.
- 6. Measure and record the result of power spectral density. in the test report.

### 4.4.3 Test Setup





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### 4.4.4 Test Result

Temperature:	<b>22.8 ~ 26.8</b> °C	Test date:	May 15 ~ June 2, 2023
Humidity:	52 ~ 61% RH	Tested by:	Jack Chen

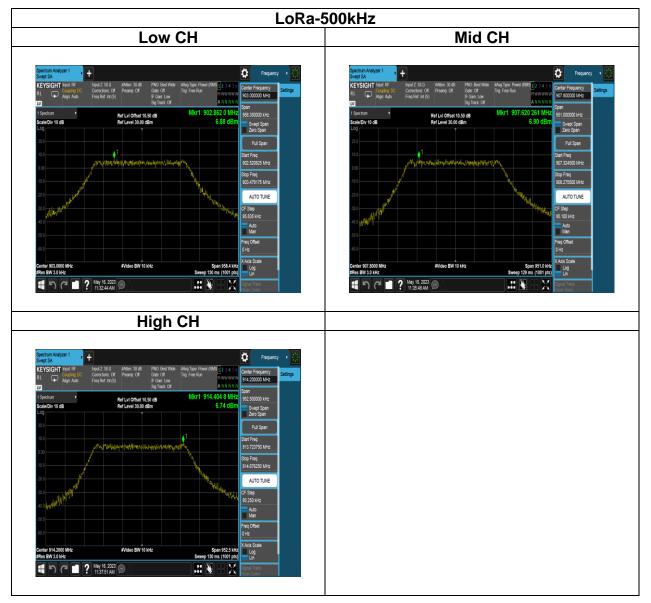
#### LoRa-500kHz

Frequency (MHz)	RF Power Density (dBm/3kHz)	Maximum Limit (dBm/3kHz)	Result
903	6.880	8	PASS
907.8	6.900	8	PASS
914.2	6.740	8	PASS



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## Test Data





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## 4.5 CONDUCTED BAND EDGE AND SPURIOUS EMISSION

### 4.5.1 Test Limit

According to §15.247(d),

In any 100 kHz bandwidth outside the authorized frequency band,

Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

### 4.5.2 Test Procedure

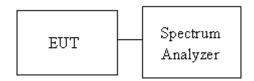
Test method Refer as ANSI C63.10:2013.

1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.

2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.

3. In any 100 kHz bandwidth outside the authorized frequency band, shall be attenuated at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when conducted power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

### 4.5.3 Test Setup



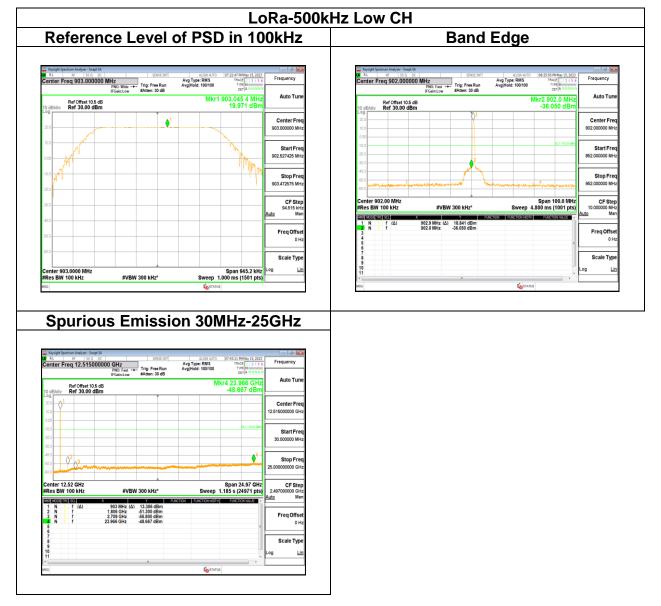


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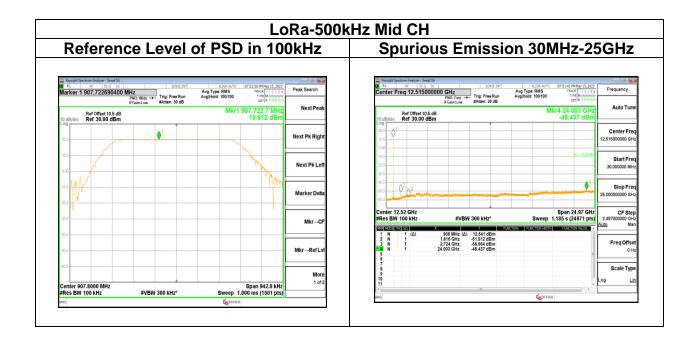
### 4.5.4 Test Result

Temperature:	<b>22.8 ~ 26.8</b> °C	Test date:	May 15 ~ June 2, 2023
Humidity:	52 ~ 61% RH	Tested by:	Jack Chen

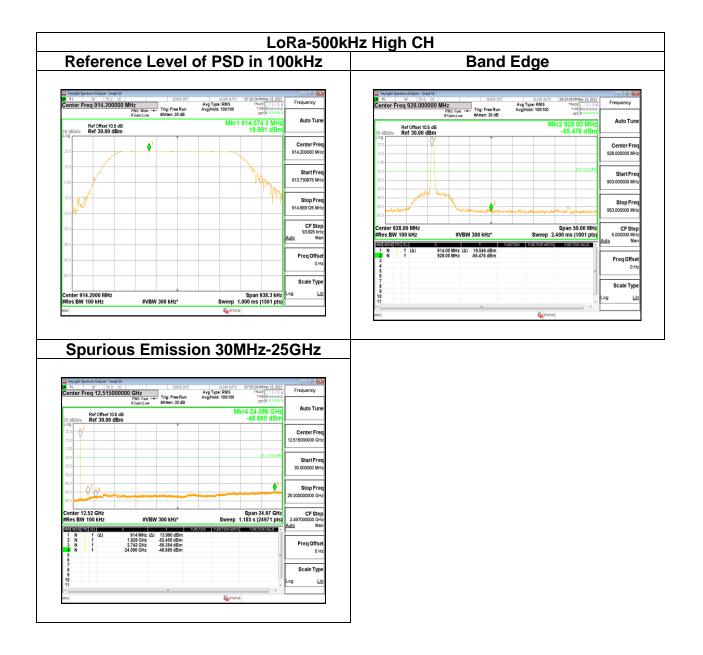
### Test Data













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## 4.6 RADIATION BANDEDGE AND SPURIOUS EMISSION

### 4.6.1 Test Limit

FCC according to §15.247(d), §15.209 and §15.205,

In any 100 kHz bandwidth outside the authorized frequency band, all harmonic and spurious must be least 20 dB below the highest emission level with the authorized frequency band. Radiation emission which fall in the restricted bands must also follow the FCC section 15.209 as below limit in table.

#### Below 30 MHz

Frequency	Field Strength (microvolts/m)	Magnetic H-Field (microamperes/m)	Measurement Distance (metres)
9-490 kHz	2,400/F (F in kHz)	2,400/F (F in kHz)	300
490-1,705 kHz	24,000/F (F in kHz)	24,000/F (F in kHz)	30
1.705-30 MHz	30	N/A	30

#### Above 30 MHz

Frequency	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)				
(MHz)	Transmitters	Receivers			
30-88	100 (3 nW)	100 (3 nW)			
88-216	150 (6.8 nW)	150 (6.8 nW)			
216-960	200 (12 nW)	200 (12 nW)			
Above 960	500 (75 nW)	500 (75 nW)			

Remark:

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.



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### 4.6.2 Test Procedure

Test method Refer as ANSI C63.10:2013.

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m and below 1 GHz is 0.8m above ground plane. The EUT Configured un accordance with ANSI C63.10: 2013, and the EUT set in a continuous mode.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. And EUT is set 3m away from the receiving antenna, which is scanned from 1m to 4m above the ground plane to find out the highest emissions. Measurement are made polarized in both the vertical and the horizontal positions with antenna.

3. Span shall wide enough to full capture the emission measured. The SA from 9KHz to 26.5GHz set to the low, Mid and High channels with the EUT transmit.

Remark:

 Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
 No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

- 4. The SA setting following :
  - (1) Below 1G : RBW = 100kHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.
  - (2) Above 1G:
    - (2.1) For Peak measurement : RBW = 1MHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.
    - (2.2) For Average measurement : RBW = 1MHz, VBW

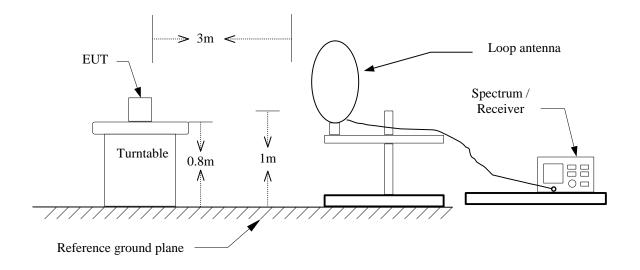
If Duty Cycle  $\geq$  98%, VBW=10Hz.

'If Duty Cycle < 98%, VBW=1/T.

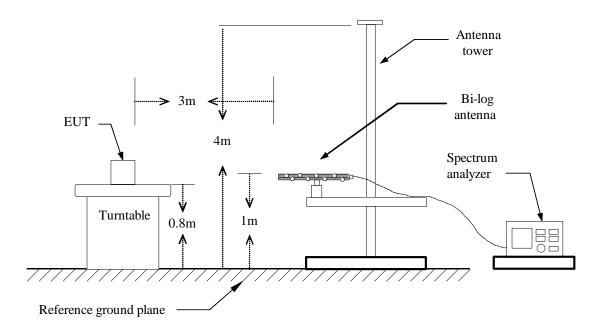


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### 4.6.3 Test Setup <u>9kHz ~ 30MHz</u>

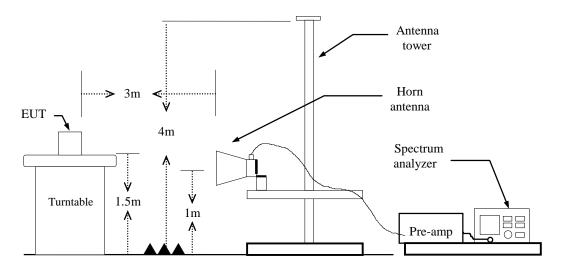


#### <u>30MHz ~ 1GHz</u>





### Above 1 GHz





### 4.6.4 Test Result

### Band Edge Test Data

Test Item Polarize	Band Edge	Test Data	
		Test Date	May 22, 2023
	Vertical	Test Engineer	Czerny Lin
Detector	Peak / Average	U U	<b>_</b>
120 Level (dBuV/ 105.0 90.0 75.0 60.0 45.0 30.0	/m)		
15.0			
0 825	860. 895. Frequency	930. 96 (MHz)	5. 1000

Frequency	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
(MHz)	(PK/QP/AV)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
871.11	Peak	40.88	-1.24	39.64	81.77 <sup>1</sup>	-42.13
902.00	QP	57.73	-0.84	56.89	80.47 <sup>1</sup>	-23.58
902.00	Peak	60.33	-0.84	59.50	81.77 <sup>1</sup>	-22.27
903.00	QP	111.30	-0.83	110.47		
903.00	Peak	112.60	-0.83	111.77		
903.00	Average	103.90	-0.83	103.07		
928.01	Peak	34.13	-0.19	33.94	81.77 <sup>1</sup>	-47.83
934.83	Peak	39.58	-0.01	39.57	81.77 <sup>1</sup>	-42.20

Remark:

1. The limit is fundamental signal – 30 dB since the frequency of the unwanted emission was not in restricted band.



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Test Mode		Low CH 904 MHz		um	25.5(℃) / 54%RH
Test Item	Bar	nd Edge	Test Da	te	May 22, 2023
Polarize		rizontal	Test Engi	neer	Czerny Lin
Detector	Peak	/ Average			
120 Level (dBu	ıV/m)				
105.0					
90.0					
75.0					
60.0					
45.0	a hay a surface state of the	Name I	Manual		
30.0					
15.0					
0 825	860.	895. Frequer	930. cy (MHz)	965	. 1000

Frequency	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
(MHz)	(PK/QP/AV)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
870.82	QP	42.60	-1.24	41.36	87.97 <sup>1</sup>	-46.61
870.82	Peak	47.98	-1.24	46.74	89.37 <sup>1</sup>	-42.63
902.00	QP	62.80	-0.84	61.96	87.97 <sup>1</sup>	-26.01
902.00	Peak	68.22	-0.84	67.38	89.37 <sup>1</sup>	-21.99
903.00	QP	118.80	-0.83	117.97		
903.00	Peak	120.20	-0.83	119.37		
903.00	Average	111.40	-0.83	110.57		
928.00	Peak	38.28	-0.19	38.09	89.37 <sup>1</sup>	-51.28
934.88	Peak	44.49	-0.01	44.48	89.37 <sup>1</sup>	-44.89

Remark:

1. The limit is fundamental signal – 30 dB since the frequency of the unwanted emission was not in restricted band.



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Test Mod	le	Mid CH 907.8 MHz		Temp/Hum		25.5(℃) / 54%RF	
Test Iter	n	Band Edge		Т	est Date	May 2	22, 2023
Polarize	<b>;</b>	Vertical		Tes	t Engineer		rny Lin
Detecto	r	Peak / Average					
120 Leve	el (dBuV/m)					1	]
105.0							
90.0							
75.0							
60.0			$\wedge$				
45.0			<b>₩</b>				
30.0		and the second s					
15.0							
0 825	860		uency	93( / (MHz		965.	1000
Frequency	Detector	Spectrum	Fa	ctor	Actual	Limit	Margin
	Mode	Reading Level			FS	@3m	-
(MHz)	(PK/QP/AV	-		IB)	(dBµV/m)	(dBµV/m)	(dB)
875.96	Peak	40.55		.20	39.35	81.06 <sup>1</sup>	-41.71

-0.84

-0.74

-0.74

-0.74

-0.19

0.15

43.04

109.66

111.06

102.26

32.94

39.79

81.06<sup>1</sup>

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81.06<sup>1</sup>

81.06<sup>1</sup>

-38.02

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-48.12

-41.27

Remark:

902.00

907.80

907.80

907.80

928.00

939.89

Peak

QP

Peak

Average

Peak

Peak

1. The limit is fundamental signal – 30 dB since the frequency of the unwanted emission was not in restricted band.

43.88

110.40

111.80

103.00

33.13

39.64



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Test Mode	Mid CH 907.8 MHz	Temp/Hum	25.5(℃) / 54%RH
Test Item	Band Edge	Test Date	May 22, 2023
Polarize	Horizontal	Test Engineer	Czerny Lin
Detector	Peak / Average	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	•
120 Level (dBu 105.0 90.0 75.0 60.0 45.0 30.0 15.0	V/m)		
825	860. 895. Frequency	930. 96 (MHz)	5. 1000
	,	,,	

Frequency	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
(MHz)	(PK/QP/AV)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
876.01	QP	44.87	-1.20	43.67	87.46 <sup>1</sup>	-43.79
876.01	Peak	48.74	-1.20	47.55	88.86 <sup>1</sup>	-41.31
902.00	QP	48.90	-0.84	48.06	87.46 <sup>1</sup>	-39.40
902.00	Peak	52.64	-0.84	51.80	88.86 <sup>1</sup>	-37.06
907.80	QP	118.20	-0.74	117.46		
907.80	Peak	119.60	-0.74	118.86		
907.80	Average	110.90	-0.74	110.16		
928.01	Peak	39.02	-0.19	38.83	88.86 <sup>1</sup>	-50.03
939.78	Peak	43.91	0.14	44.05	88.86 <sup>1</sup>	-44.81

Remark:

1. The limit is fundamental signal – 30 dB since the frequency of the unwanted emission was not in restricted band.



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Test Mo	ode		High CH 914.2 MHz	Т	emp/Hum	<b>25.5(</b> ℃	) / 54%RH	
Test Ite	em		Band Edge		est Date	May 2	May 22, 2023	
Polariz	ze		Vertical	Tes	st Engineer		rny Lin	
Detect	or	P	eak / Average					
120	vel (dBu)	//m)						
105.0				<b> </b>				
90.0								
75.0								
60.0								
45.0								
30.0	. Herester					a him da an		
15.0								
0 825	5	860.	895. Freq	93 uency (MH		65.	1000	
Frequency	Det	ector	Spectrum	Factor	Actual	Limit	Margin	
	M	ode	Reading Level		FS	@3m		
			( ·= · · ·	(	1			
(MHz)	(PK/0	QP/AV)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	
(MHz) 882.44		<b>QP/AV)</b> eak	(dBµV) 41.37	( <b>dB)</b> -1.16	(dBµV/m) 40.21	(dBµV/m) 81.06 <sup>1</sup>	(dB) -40.85	

-0.84

-0.64

-0.64

-0.64

-0.19

0.23

37.46

109.66

111.06

102.26

34.75

38.88

81.06<sup>1</sup>

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81.06<sup>1</sup>

81.06<sup>1</sup>

-43.60

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-46.31

-42.18

Remark:

902.00

914.20

914.20

914.20

927.99

946.18

1. The limit is fundamental signal – 30 dB since the frequency of the unwanted emission was not in restricted band.

38.30

110.30

111.70

102.90

34.94

38.65

Peak

QP

Peak

Average

Peak

Peak



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Test Item     Band Edge     Test Date     May 22, 2023       Polarize     Horizontal     Test Engineer     Czerny Lin       Detector     Peak / Average     Image: Close of the second s	Test Mode	High CH 914.2 MHz	Temp/Hum	25.5(℃) / 54%RH
Polarize Horizontal Test Engineer Czerny Lin Detector Peak / Average	Test Item	Band Edge	Test Date	May 22, 2023
Detector         Peak / Average           120         Level (dBuV/m)           105.0         90.0           90.0         75.0           60.0         45.0           15.0         860.         895.         930.         965.         1000	Polarize	Horizontal	Test Engineer	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Detector	Peak / Average		
15.0 0 825 860. 895. 930. 965. 1000	105.0       90.0       75.0       60.0	V/m)		
0 825 860. 895. 930. 965. 1000	30.0			h- Hits in a faire the
825 860. 895. 930. 965. 1000	15.0			
	0 825	860. 895. Frequ	930. ency (MHz)	965. 1000

Frequency	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
(MHz)	(PK/QP/AV)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
882.20	QP	47.44	-1.16	46.28	87.36 <sup>1</sup>	-41.08
882.20	Peak	51.28	-1.16	50.12	88.76 <sup>1</sup>	-38.64
902.00	Peak	41.62	-0.84	40.78	88.76 <sup>1</sup>	-47.98
914.20	QP	118.00	-0.64	117.36		
914.20	Peak	119.40	-0.64	118.76		
914.20	Average	112.24	-0.64	111.61		
927.99	Peak	38.75	-0.19	38.55	88.76 <sup>1</sup>	-50.21
946.02	Peak	44.02	0.23	44.24	88.76 <sup>1</sup>	-44.52
946.02	Peak	44.02	0.23	44.24	88.76'	-44.52

Remark:

1. The limit is fundamental signal – 30 dB since the frequency of the unwanted emission was not in restricted band.



### Below 1G Test Data

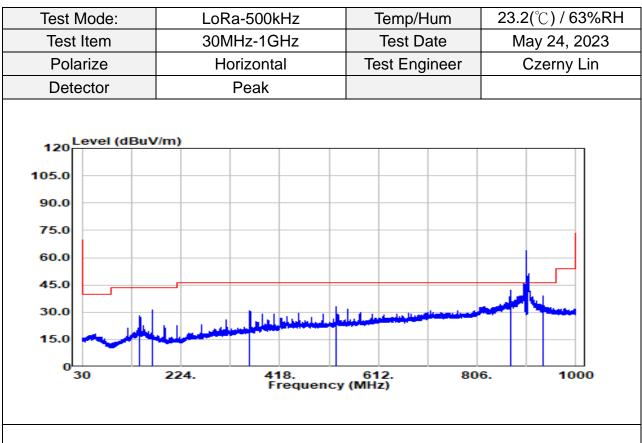
Test Mode:	LoRa-50	0kHz	Temp/Hu	m	<b>23.2(</b> °℃	) / 63%R
Test Item	30MHz-1	1GHz	Test Date	е	May	24, 2023
Polarize	Vertic	al	Test Engineer		Cze	erny Lin
Detector	Pea	k	5			
120 Level (dBu	V/m)					
105.0						
90.0						
75.0						
60.0						
45.0						
30.0						
	ملطسا بسيرين المطله	and the second se	and the state of the			
15.0						
0 <mark></mark> 30	224.	418. Frequency	612. / (MHz)	806		1000

Frequency	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
(MHz)	(PK/QP/AV)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
142.52	Peak	36.03	-13.35	22.68	43.50	-20.82
168.03	Peak	36.53	-13.33	23.20	43.50	-20.30
345.64	Peak	36.79	-11.18	25.61	46.00	-20.39
532.75	Peak	36.52	-6.85	29.67	46.00	-16.33
870.89	Peak	38.10	-1.24	36.85	46.00	-9.15
934.91	Peak	37.48	-0.01	37.47	46.00	-8.53

Note: No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).



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Frequency	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
(MHz)	(PK/QP/AV)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
143.98	Peak	41.12	-13.18	27.93	43.50	-15.57
167.93	Peak	44.40	-13.32	31.08	43.50	-12.42
359.99	Peak	42.04	-11.10	30.94	46.00	-15.06
528.00	Peak	40.10	-7.01	33.09	46.00	-12.91
871.09	Peak	43.49	-1.24	42.25	46.00	-3.75
935.20	Peak	38.99	0.00	38.99	46.00	-7.01
	•			•		

Note: No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).



### Above 1G Test Data

Test Mode:	Low CH	Temp/Hum	25.5(℃) / 54%RF	
Test Item	Harmonic	Test Date	May 22, 2023	
Polarize	Vertical	Test Engineer	Czerny Lin	
Detector	Peak / Average			
120 Level (dBuV	//m)			
105.0				
90.0				
75.0				
60.0				
45.0				
30.0				
15.0				
0 1000	2800. 4600. Frequency	6400. 82 / (MHz)	00. 10000	

Frequency	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
(MHz)	(PK/QP/AV)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1806.00	Peak	56.98	-7.34	49.65	81.77 <sup>2</sup>	-32.13
1806.00	Average	53.61	-7.34	46.27	73.07 <sup>2</sup>	-26.80
2709.00	Peak	52.89	-4.41	48.48	74.00	-25.52
2709.00	Average	47.29	-4.41	42.88	54.00	-11.12

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. The limit is fundamental signal 30 dB since the frequency of the unwanted emission was not in restricted band.



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Test Mod	le:	Low CH	Т	emp/Hum	<b>25.5(°</b> ℃)	/ 54%Rł
Test Iter	n	Harmonic	-	Test Date	May 2	2, 2023
Polariz	Э	Horizontal	Те	st Engineer	Cze	rny Lin
Detecto	)r	Peak / Average				
120 Leve	el (dBuV/m)					
105.0						
90.0						
75.0						
60.0						
45.0						
30.0						
15.0						
9	2800	. 4600.	640	20 9	200.	10000
1000	2000		Jency (MH		2001	
Frequency	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
	INIQUE	Reauling Level		гэ		
(MHz)	(PK/QP/AV)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
<b>(MHz)</b> 1806.00		(dBμV) 55.68	(dB) -7.34	(dBµV/m) 48.35	(dBµV/m) 89.37 <sup>2</sup>	(dB) -41.02
	(PK/QP/AV)					
1806.00	(PK/QP/AV) Peak	55.68	-7.34	48.35	89.37 <sup>2</sup>	-41.02
1806.00 1806.00	(PK/QP/AV)PeakAverage	55.68 52.16	-7.34 -7.34	48.35 44.83	89.37 <sup>2</sup> 80.57 <sup>2</sup>	-41.02 -35.74

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. The limit is fundamental signal 30 dB since the frequency of the unwanted emission was not in restricted band.



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Test Mode	e:	Mid CH	Т	emp/Hum	<b>25.5(</b> °C)	) / 54%Rł
Test Item	ı	Harmonic	-	Test Date	May 2	22, 2023
Polarize	!	Vertical	Te	st Engineer	Cze	rny Lin
Detector	· F	Peak / Average				
120 Leve	l (dBuV/m)					
105.0						
90.0						
75.0						
60.0						
45.0						
30.0						
15.0						
0	2800.	4600.	64	00 8	200.	10000
1000	2000.	Frequ	ency (MH	z)	200.	10000
Frequency	Detector	Spectrum	Factor	Actual	Limit	Margin
requeitcy	Mode	Reading Level	I actor	FS	@3m	wargin
(MHz)	(PK/QP/AV)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1815.60	Peak	56.87	-7.31	49.56	81.06 <sup>2</sup>	-31.50
1815.60	Average	53.63	-7.31	46.33	72.26 <sup>2</sup>	-25.93
2723.40	Peak	52.68	-4.36	48.32	74.00	-25.68
2723.40						

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. The limit is fundamental signal 30 dB since the frequency of the unwanted emission was not in restricted band.



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Test Mod	e:	Mid CH		emp/Hum	25.5(°C) / 54%R	
Test Item		Harmonic		Test Date	May 22, 2023	
Polarize	•	Horizontal		st Engineer	Czerny Lin	
Detecto	r F	Peak / Average				
Leve	l (dBuV/m)					
105.0						
90.0						
75.0						
60.0						
45.0						
30.0						
15.0						
1000	2800.	2800. 4600. 6400 Frequency (MHz)				
Frequency	Detector	Spectrum	Factor	Actual	Limit	Margin
(8411-)	Mode	Reading Level		FS	@3m	
(MHz) 1815.60	(PK/QP/AV) Peak	(dBµV) 58.13	(dB) -7.31	(dBµV/m) 50.83	(dBµV/m) 88.86 <sup>2</sup>	(dB) -38.03
1815.60	Average	55.12	-7.31	47.82	80.16 <sup>2</sup>	-32.34
2723.40	Peak	51.72	-4.36	47.37	74.00	-26.63
2120.40		45.56	-4.36	41.21	54.00	-20.03
2723.40	Average	45 56				

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. The limit is fundamental signal 30 dB since the frequency of the unwanted emission was not in restricted band.



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Test Mode:		High CH		emp/Hum	25.5(°C) / 54%R	
Test Item		Harmonic		Fest Date	May 22, 2023	
Polarize		Vertical		st Engineer	Czerny Lin	
Detector	r F	Peak / Average				
	•				-	
120Leve	l (dBuV/m)					
105.0						
90.0						
75.0						
60.0						
45.0						
30.0						
15.0						
9	2800.		640		200.	10000
		Frequ	ency (MH)	2)		
Frequency	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
(MHz)	(PK/QP/AV)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1828.40	Peak	52.68	-7.32	45.36	81.06 <sup>2</sup>	-35.70
1828.40	Average	48.41	-7.32	41.10	72.26 <sup>2</sup>	-31.16
2742.60	Peak	52.23	-4.17	48.06	74.00	-25.94
2742.00						

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. The limit is fundamental signal 30 dB since the frequency of the unwanted emission was not in restricted band.



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Test Mod	e:	High CH		emp/Hum	25.5(°C) / 54%RH		
Test Item		Harmonic		Test Date	May 2	May 22, 2023	
Polarize	•	Horizontal		st Engineer	Czerny Lin		
Detecto	r F	Peak / Average					
4 20 Leve	el (dBuV/m)						
105.0							
90.0							
75.0						_	
60.0							
45.0							
30.0							
15.0							
1000	2800.	4600. Frequ	640 Jency (MH)	00. 8 z)	200.	10000	
Frequency	Detector	Spectrum	Factor	Actual	Limit	Margin	
	Mode	Reading Level		FS	@3m		
(MHz)	(PK/QP/AV)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	
1828.40	Peak	60.88	-7.32	53.56	88.76 <sup>2</sup>	-35.20	
1828.40	Average	58.12	-7.32	50.80	81.61 <sup>2</sup>	-30.81	
2742.60	Peak	50.91	-4.17	46.74	74.00	-27.26	
		44.35	-4.17	40.18	54.00	-13.82	
2742.60	Average	44.55		10110	0 1100	10102	

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. The limit is fundamental signal 30 dB since the frequency of the unwanted emission was not in restricted band.

--End of Test Report--