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Radio Test Report FCC ID: 2A2GJ-HTM7603

Report No.	-	TBR-C-202205-0119-42				
Applicant	: Heltec Automation Technology Co., Ltd					
Equipment Under Test (EUT)						
EUT Name	EUT Name : Heltec Light Hotspot					
Model No.	:	HT-M7603				
Series Model No.	:	THE MOBIL				
Brand Name	:	Heltec				
Sample ID	(PD)	RW-C-202205-0119-4-1#&RW-C-202205-0119-4-2#				
Receipt Date	:	2022-06-07				
Test Date	181	2022-06-07 to 2022-06-20				
Issue Date	:	2022-06-28				
Standards	53	FCC Part 15 Subpart C 15.247				
Test Method	22	ANSI C63.10: 2013				
		KDB 558074 D01 15.247 Meas Guidance v05r02				
Conclusions	1:1	PASS				
		In the configuration tested, the EUT complied with the standards specified above.				

Witness Engineer

Engineer Supervisor

Engineer Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

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TB-RF-074-1.0



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Revision History

Report No.	Version	Description	Issued Date
TBR-C-202205-0119-42	Rev.01	Initial issue of report	2022-06-28
Current U	605	EODIA T	Citor and
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1. General Information about EUT

1.1 Client Information

Applicant		Heltec Automation Technology Co., Ltd			
Address	1st floor, No. 54, 56, 58 zirui North Street, High-tech Zone, Chengdu city, China				
Manufacturer	•	Heltec Automation Technology Co., Ltd			
Address 1st floor, No. 54, 56, 58 zirui North Street, High-tech Zone, Chengdu city, China		1st floor, No. 54, 56, 58 zirui North Street, High-tech Zone, Chengdu city, China			

1.2 General Description of EUT (Equipment Under Test)

EUT Name	:	Heltec Light Hotspot		
Models No.		HT-M7603		
Model Different				
		Operation Frequency:	LoRa(125KHz): 902.3MHz-914.9MHz	
Product		Number of Channel:	64 channels	
Description		Antenna Gain:	3.0dBi Dipole Antenna	
	5	Bit Rate of Transmitter:	5.47kbps	
Power Rating		Adapter(DSS12D-0502000-E) Input: 100-240V~50/60Hz 0.5A Output: 5V2A		
Software Version	2	N/A		
Hardware Version	5	N/A		
Remark:				

Remark:

(1) The antenna gain and adapter provided by the applicant, the verified for the RF conduction test provided by TOBY test lab.

(2) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

(3) Antenna information provided by the applicant. And the type of antenna please see the external photos.

TOBY

(4) Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	902.3	23	906.7	45	911.1
02	902.5	24	906.9	46	911.3
03	902.7	25	907.1	47	911.5
04	902.9	26	907.3	48	911.7
05	903.1	27	907.5	49	911.9
06	903.3	28	907.7	50	912.1
07	903.5	29	907.9	51	912.3
08	903.7	30	908.1	52	912.5
09	903.9	31	908.3	53	912.7
10	904.1	32	908.5	54	912.9
11	904.3	33	908.7	55	913.1
12	904.5	34	908.9	56	913.3
13	904.7	35	909.1	57	913.5
14	904.9	36	909.3	58	913.7
15	905.1	37	909.5	59	913.9
16	905.3	38	909.7	60	914.1
17	905.5	39	909.9	61	914.3
18	905.7	40	910.1	62	914.5
19	905.9	41	910.3	63	914.7
20	906.1	42	910.5	64	914.9
21	906.3	43	910.7	11	6162
22	906.5	44	910.9		



1.3 Block Diagram Showing the Configuration of System Tested

Conducted Test

	EUT ADAPTER	
diated Test	TOPI TOPI TOPI TOPI	UBY CON
	EUT ADAPTE	K

1.4 Description of Support Units

Equipment Information						
Name	Model	FCC ID/SDOC	Manufacturer	Used "√"		
Adapter	DSS12D-0502000-E		DSS	\checkmark		
Cable Information						
Number	Shielded Type	Ferrite Core	Length	Note		
Cable 1	Yes	NO	1.0M	Accessory		

1.5 Description of Test Mode

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

For Conducted Test				
Description				
TX Mode Channel 01				
For Radiated Test				
Description				
TX Mode Channel 01				
TX Mode Channel 01/32/64				
Mode 3 Hopping Mode				

Note:

(1) For all test, we have verified the construction and function in typical operation. And all the test modes were carried out with the EUT in transmitting operation in maximum power with all kinds of data rate.

According to ANSI C63.10 standards, the measurements are performed at the highest, middle, lowest available channels.

- (2) During the testing procedure, the continuously transmitting with the maximum power mode was programmed by the customer.
- (3) The EUT is considered a Mobile unit; in normal use it was positioned on X-plane. The worst case was found positioned on X-plane. Therefore only the test data of this X-plane was used for radiated emission measurement test.

1.6 Description of Test Software Setting

During testing channel& Power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of RF setting.

Test Software Version	anB.	SecureCRT.ex	e
Frequency	902.3MHz	908.5MHz	914.9MHz
LoRa	DEF	DEF	DEF

1.7 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 %.

Test Item	Parameters	Expanded Uncertainty (U _{Lab})
Conducted Emission	Level Accuracy: 9kHz~150kHz 150kHz to 30MHz	±3.50 dB ±3.10 dB
Radiated Emission	Level Accuracy: 9kHz to 30 MHz	±4.60 dB
Radiated Emission	Level Accuracy: 30MHz to 1000 MHz	±4.50 dB
Radiated Emission	Level Accuracy: Above 1000MHz	±4.20 dB



1.8 Test Facility

The testing report were performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at 1/F., Building 6, Rundongsheng Industrial Zone, Longzhu, Xixiang, Bao'an District, Shenzhen, Guangdong, China. At the time of testing, the following bodies accredited the Laboratory:

CNAS (L5813)

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

A2LA Certificate No.: 4750.01

The laboratory has been accredited by American Association for Laboratory Accreditation(A2LA) to ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories for the technical competence in the field of Electrical Testing. And the A2LA Certificate No.: 4750.01.FCC Accredited Test Site Number: 854351. Designation Number: CN1223.

IC Registration No.: (11950A)

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A. CAB identifier: CN0056.

2. Test Summary

Standard Section	To of House		local anno an d	Demen
FCC	Test Item	Test Sample(s)	Judgment	Remark
FCC 15.207(a)	Conducted Emission	RW-C-202205-0119-4-1#	PASS	N/A
FCC 15.209 & 15.247(d)	Radiated Unwanted Emissions	RW-C-202205-0119-4-1#	PASS	N/A
FCC 15.203	Antenna Requirement	RW-C-202205-0119-4-2#	PASS	N/A
FCC 15.247(a)	99% Occupied Bandwidth & 20dB Bandwidth	RW-C-202205-0119-4-2#	PASS	N/A
FCC 15.247(b)(1)	Peak Output Power	RW-C-202205-0119-4-2#	PASS	N/A
FCC 15.247(f)	Power Spectral Density	RW-C-202205-0119-4-2#	PASS	N/A
FCC 15.247(a)(1)	Carrier frequency separation	RW-C-202205-0119-4-2#	PASS	N/A
FCC 15.247(f)	Time of occupancy	RW-C-202205-0119-4-2#	PASS	N/A
FCC 15.247(b)(1)	Number of Hopping Frequency	RW-C-202205-0119-4-2#	PASS	N/A (2)
FCC 15.247(d)	Band Edge	RW-C-202205-0119-4-2#	PASS	N/A
FCC 15.207	Conducted Unwanted Emissions	RW-C-202205-0119-4-2#	PASS	N/A
FCC 15.205	Emissions in Restricted Bands	RW-C-202205-0119-4-2#	PASS	N/A
FCC 15.247(a)(1)	Hopping function Requirements	RW-C-202205-0119-4-2#	PASS	N/A
	On Time and Duty Cycle	RW-C-202205-0119-4-2#		N/A

Note: N/A is an abbreviation for Not Applicable.

3. Test Software

Test Item	Test Software	Manufacturer	Version No.
Conducted Emission	EZ-EMC	EZ	CDI-03A2
Radiation Emission	EZ-EMC	EZ	FA-03A2RE
RF Conducted Measurement	MTS-8310	MWRFtest	V2.0.0.0
RF Test System	JS1120	Tonscend	V2.6.88.0336

4. Test Equipment

Conducted Emissio		l			
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI	100321	Jul. 02, 2021	Jul. 01, 2022
RF Switching Unit	Compliance Direction Systems Inc	RSU-A4	34403	Jul. 02, 2021	Jul. 01, 2022
AMN	SCHWARZBECK	NNBL 8226-2	8226-2/164	Jul. 02, 2021	Jul. 01, 2022
LISN	Rohde & Schwarz	ENV216	101131	Jul. 02, 2021	Jul. 01, 2022
Radiation Emission	Test (A Site)		-		
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Rohde & Schwarz	FSV40-N	102197	Jul. 02, 2021	Jul. 01, 2022
EMI Test Receiver	Rohde & Schwarz	ESPI	100010/007	Jul. 02, 2021	Jul. 01, 2022
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Feb. 27, 2022	Feb. 26, 2024
Horn Antenna	ETS-LINDGREN	3117	00143207	Feb. 26, 2022	Feb. 25, 2024
Horn Antenna	SCHWARZBECK	BBHA 9170	1118	Feb. 26, 2022	Feb. 25, 2024
Loop Antenna	SCHWARZBECK	FMZB 1519 B	1519B-059	Jul. 06, 2021	Jul. 05, 2022
Pre-amplifier	SONOMA	310N	185903	Feb. 26, 2022	Feb. 25, 2023
Pre-amplifier	HP	8449B	3008A00849	Feb. 26, 2022	Feb. 25, 2023
HF Amplifier	Tonscend	TAP0184050	AP21C806129	Sep. 03, 2021	Sep. 02, 2022
Radiation Emission	Test (B Site)	:	<u>-</u>	<u>.</u>	÷
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Rohde & Schwarz	FSV40-N	102197	Jul. 02, 2021	Jul. 01, 2022
MXA Signal Analyzer	Agilent	N9020A	MY47380425	Sep. 03, 2021	Sep. 02, 2022
EMI Test Receiver	Rohde & Schwarz	ESU-8	100472	Feb. 26, 2022	Feb. 25, 2023
Bilog Antenna	SCHWARZBECK	VULB 9168	1225	Dec. 05, 2021	Dec. 04, 2023
Horn Antenna	SCHWARZBECK	BBHA 9120 D	2463	May 20, 2021	May 19, 2023
Horn Antenna	SCHWARZBECK	BBHA 9170	1118	Feb. 26, 2022	Feb. 25, 2024
Loop Antenna	SCHWARZBECK	FMZB 1519 B	1519B-059	Jul. 06, 2021	Jul. 05, 2022
HF Amplifier	Tonscend	TAP9E6343	AP21C806117	Sep. 03, 2021	Sep. 02, 2022
HF Amplifier	Tonscend	TAP051845	AP21C806141	Sep. 03, 2021	Sep. 02, 2022
HF Amplifier	Tonscend	TAP0184050	AP21C806129	Sep. 03, 2021	Sep. 02, 2022
Antenna Conducte	d Emission				
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 02, 2021	Jul. 01, 2022
Spectrum Analyzer	Rohde & Schwarz	FSV40-N	102197	Jul. 02, 2021	Jul. 01, 2022
MXA Signal Analyzer	Agilent	N9020A	MY49100060	Sep. 03, 2021	Sep. 02, 2022
Spectrum Analyzer	KEYSIGT	N9020B	MY60110172	Sep. 03, 2021	Sep. 02, 2022
THE A	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO26	Sep. 03, 2021	Sep. 02, 2022
	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO29	Sep. 03, 2021	Sep. 02, 2022
RF Power Sensor	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO31	Sep. 03, 2021	Sep. 02, 2022
	DARE!! Instruments	RadiPowerRPR3006W	17I00015SNO33	Sep. 03, 2021	Sep. 02, 2022
RF Control Unit	Tonsced	JS0806-2	21F8060439	Sep. 03, 2021	Sep. 02, 2022



5. Conducted Emission

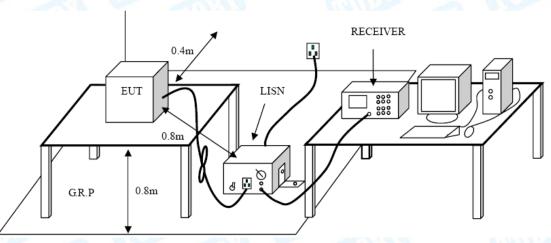
- 5.1 Test Standard and Limit
 - 5.1.1 Test Standard
 - FCC Part 15.207
 - 5.1.2 Test Limit

Francisco	Maximum RF Line Voltage (dBµV)		
Frequency	Quasi-peak Level	Average Level	
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *	
500kHz~5MHz	56	46	
5MHz~30MHz	60	50	

Notes:

- (1) *Decreasing linearly with logarithm of the frequency.
- (2) The lower limit shall apply at the transition frequencies.
- (3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

5.2 Test Setup



5.3 Test Procedure

● The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50 uH of coupling impedance for the measuring instrument.

●Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

●I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

●LISN at least 80 cm from nearest part of EUT chassis.

●The bandwidth of EMI test receiver is set at 9 kHz, and the test frequency band is from 0.15MHz to 30MHz.



5.4 Deviation From Test Standard

No deviation

5.5 EUT Operating Mode

Please refer to the description of test mode.

5.6 Test Data

Please refer to the Attachment A.



6. Radiated and Conducted Unwanted Emissions

- 6.1 Test Standard and Limit
 - 6.1.1 Test Standard

FCC Part 15.209 & FCC Part 15.247(d)

6.1.2 Test Limit

General field strength limits at frequencies Below 30MHz			
Frequency Field Strength Field Strength Measurement		Measurement	
(MHz)	(µA/m)*	(microvolt/meter)**	Distance (meters)
0.009~0.490	6.37/F (F in kHz)	2400/F(KHz)	300
0.490~1.705	63.7/F (F in kHz)	24000/F(KHz)	30
1.705~30.0	0.08	30	30

Note: 1, The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

2, *is for RSS Standard, **is for FCC Standard.

General field strength limits at frequencies above 30 MHz			
Frequency (MHz)	Field strength (µV/m at 3 m)	Measurement Distance (meters)	
30~88	100	3	
88~216	150	3	
216~960	200	3	
Above 960	500	3	

General field strength limits at frequencies Above 1000MHz			
Distance of 3m (dBuV/m)			
Peak	Average		
74	54		
	Distance of 3n Peak		

Note:

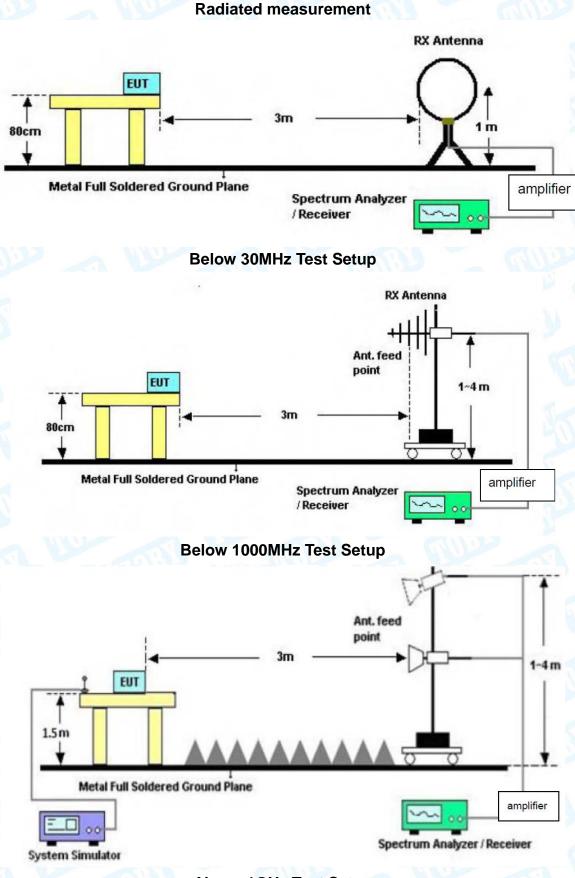
(1) The tighter limit applies at the band edges.

(2) Emission Level(dBuV/m)=20log Emission Level(uV/m)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.



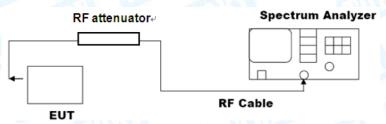
6.2 Test Setup



Above 1GHz Test Setup



Conducted measurement



6.3 Test Procedure

---Radiated measurement

● The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.

• Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.

• The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.

• The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.

● If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Below 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.

● Testing frequency range 30MHz-1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection. Testing frequency range 9KHz-150Hz the measuring instrument use VBW=200Hz with Quasi-peak detection. Testing frequency range 9KHz-30MHz the measuring instrument use VBW=9kHz with Quasi-peak detection.

● Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.

•For the actual test configuration, please see the test setup photo.



--- Conducted measurement

•Reference level measurement

- Establish a reference level by using the following procedure:
- a) Set instrument center frequency to DTS channel center frequency.
- b) Set the span to≥1.5 times the DTS bandwidth.
- c) Set the RBW = 100 kHz.
- d) Set the VBW≥[3*RBW].
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

• Emission level measurement

Establish an emission level by using the following procedure:

- a) Set the center frequency and span to encompass frequency range to be measured.
- b) Set the RBW = 100 kHz.
- c) Set the VBW≥[3*RBW].
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.

h) Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

6.4 Deviation From Test Standard

No deviation

6.5 EUT Operating Mode

Please refer to the description of test mode.

6.6 Test Data

Please refer to the Attachment B.



7. Emissions in nonrestricted frequency bands

7.1 Test Standard and Limit

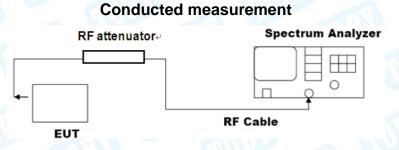
7.1.1 Test Standard

FCC Part 15.205 & FCC Part 15.247(d)

7.1.2 Test Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

7.2 Test Setup



7.3 Test Procedure

Reference level measurement

Establish a reference level by using the following procedure:

- a) Set instrument center frequency to DTS channel center frequency.
- b) Set the span to \geq 1.5 times the DTS bandwidth.
- c) Set the RBW = 100 kHz.
- d) Set the VBW≥[3*RBW].
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.

i) Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.



Emission level measurement

- Establish an emission level by using the following procedure:
- a) Set the center frequency and span to encompass frequency range to be measured.
- b) Set the RBW = 100 kHz.
- c) Set the VBW \geq [3*RBW].
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the peak marker function to determine the maximum amplitude level.

7.4 Deviation From Test Standard

No deviation

7.5 EUT Operating Mode

Please refer to the description of test mode.

7.6 Test Data

Please refer to the Attachment C.



8. 99% Occupied and 20dB Bandwidth

8.1 Test Standard and Limit

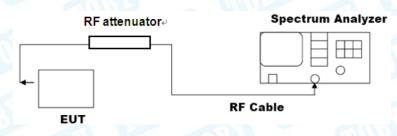
8.1.1 Test Standard

FCC Part 15.205 & FCC Part 15.247(a)

8.1.2 Test Limit

There are no limits for 20dB bandwidth and 99% occupied bandwidth.

8.2 Test Setup



8.3 Test Procedure

• The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:

a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.

c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.

d) Step a) through step c) might require iteration to adjust within the specified range.

e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.

g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequence between these two frequencies.

h) The occupied bandwidth shall be reported by providing plot(s) of the measuring



instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

8.4 Deviation From Test Standard

No deviation

8.5 EUT Operating Mode

Please refer to the description of test mode.

8.6 Test Data

Please refer to the Attachment D.



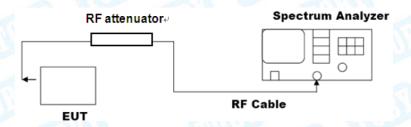
9. Peak Output Power Test

9.1 Test Standard and Limit

- 9.1.1 Test Standard FCC Part 15.247(b)(1)
- 9.1.2 Test Limit

Test Item	Limit	Frequency Range(MHz)	
A TIME	P _{max-pk} ≤ 1 W		
	$N_{ch} \ge 50$		
GUUD A	f ≥ MAX {25 kHz, BW _{20dB} }		
	BW20dB ≤250KHz		
	ower $\frac{tch \le 0.4 \text{ s for } T = 20 \text{s}}{P_{\text{max-pk}} \le 0.25 \text{W}}$	002 028	
Peak Output Power		902~928	
	25≤Nch<50		
	$f \ge MAX \{25 \text{ kHz}, BW_{20dB}\}$		
	250KHz <bw20db td="" ≤500khz<=""><td></td></bw20db>		
	$tch \le 0.4$ s for $T = 10s$		
t_{ch} = average time of occupancy; T = period; N_{ch} = # hopping frequencies; BW = bandwidth;			
1 DEP	f = hopping channel carrier frequency s	separation	

9.2 Test Setup



9.3 Test Procedure

This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test:
 a) Use the following spectrum analyzer settings:

- 1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
- 2) RBW > 20 dB bandwidth of the emission being measured.
- 3) VBW≥ RBW.
- 4) Sweep: Auto.
- 5) Detector function: Peak.
- 6) Trace: Max hold.
- b) Allow trace to stabilize.
- c) Use the marker-to-peak function to set the marker to the peak of the emission.
- d) The indicated level is the peak output power, after any corrections for external attenuators and cables.



e) A plot of the test results and setup description shall be included in the test report.

NOTE-A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

9.4 Deviation From Test Standard

No deviation

9.5 EUT Operating Mode

Please refer to the description of test mode.

9.6 Test Data

Please refer to the Attachment E.



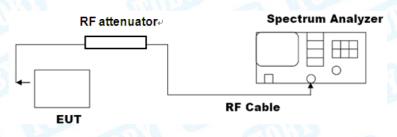
10. Power Spectral Density

10.1 Test Standard and Limit

10.1.1 Test Standard **FCC Part 15.247(f)** 10.1.2 Test Limit

Test Item	Limit
Power Spectral Density	8dBm(in any 3 kHz)

10.2 Test Setup



10.3 Test Procedure

• The following procedure shall be used if maximum peak conducted output power was used to determine compliance, and it is optional if the maximum conducted (average) output power was used to determine compliance:

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to 3 kHz≤RBW≤100 kHz.
- d) Set the VBW \geq [3*RBW].
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.

j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

10.4 Deviation From Test Standard

No deviation

10.5 Antenna Connected Construction

Please refer to the description of test mode.

10.6 Test Data

Please refer to the Attachment F.



11. Carrier frequency separation

11.1 Test Standard and Limit

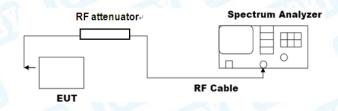
11.1.1 Test Standard

FCC Part 15.247(a)(1)

11.1.2 Test Limit

Test Item	Limit	Frequency Range(MHz)
The second	P _{max-pk} ≤ 1 W	
	$N_{ch} \ge 50$	
GUUD A	f ≥ MAX { 25 kHz, BW20dB }	
6039	BW20dB ≤250KHz	
Carrier frequency	$tch \le 0.4 ext{ s for } T = 20 ext{ s}$	002 028
separation	P _{max-pk} ≤ 0.25W	902~928
	25≤ <i>N</i> _{ch} <50	
	f ≥ MAX { 25 kHz, BW20dB }	
	250KHz <bw20db td="" ≤500khz<=""><td></td></bw20db>	
	$tch \le 0.4 ext{ s for } T = 10 ext{ s}$	
t_{ch} = average time of occupancy; T = period; N_{ch} = # hopping frequencies; BW = bandwidth;		
	f = hopping channel carrier frequency s	eparation

11.2 Test Setup



11.3 Test Procedure

• The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

a) Span: Wide enough to capture the peaks of two adjacent channels.

b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.

c) Video (or average) bandwidth (VBW) \ge RBW.

- d) Sweep: Auto.
- e) Detector function: Peak.
- f) Trace: Max hold.
- g) Allow the trace to stabilize.

Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

Compliance of an EUT with the appropriate regulatory limit shall be determined. A plot of the data shall be included in the test report.



11.4 Deviation From Test Standard

No deviation

11.5 Antenna Connected Construction

Please refer to the description of test mode.

11.6 Test Data

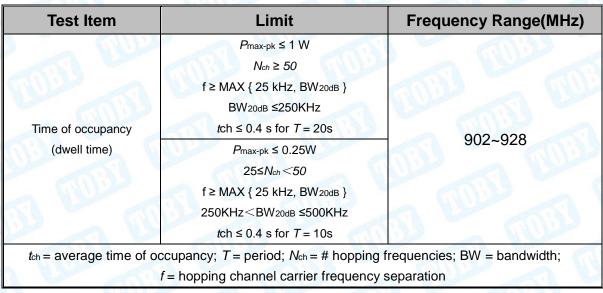
Please refer to the Attachment G.



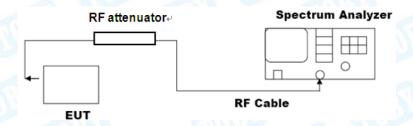
12. Time of occupancy (Dwell time)

12.1 Test Standard and Limit

- 12.1.1 Test Standard FCC Part 15.247(f)
- 12.1.2 Test Limit



12.2 Test Setup



12.3 Test Procedure

• The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

a) Span: Zero span, centered on a hopping channel.

b) RBW shall be \Box channel spacing and where possible RBW should be set >> 1 / T, where

T is the expected dwell time per channel.

c) Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.

d) Detector function: Peak.

e) Trace: Max hold.

Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping



channels, etc.), then repeat this test for each variation in transmit time.

Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

(Number of hops in the period specified in the requirements) =

(number of hops on spectrum analyzer)x(period specified in the requirements / analyzer sweep time)

The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation.

The measured transmit time and time between hops shall be consistent with the values described in the operational description for the EUT.

12.4 Deviation From Test Standard

No deviation

12.5 Antenna Connected Construction

Please refer to the description of test mode.

12.6 Test Data

Please refer to the Attachment H.



13. Number of hopping frequencies

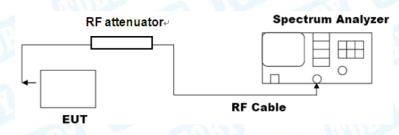
13.1 Test Standard and Limit

13.1.1 Test Standard FCC Part 15.247(b)(1)

13.1.2 Test Limit

Test Item	Limit	Frequency Range(MHz)
	P _{max-pk} ≤ 1 W	
	$N_{ch} \ge 50$	
alles a	f ≥ MAX { 25 kHz, BW20dB }	
	BW20dB ≤250KHz	
Carrier frequency	$tch \le 0.4 ext{ s for } T = 20 ext{ s}$	000 000
separation	$P_{\text{max-pk}} \le 0.25 \text{W}$	902~928
	25≤ <i>N</i> _{ch} <50	
A NULL	f ≥ MAX { 25 kHz, BW20dB }	
	250KHz <bw20db td="" ≤500khz<=""><td></td></bw20db>	
	$tch \le 0.4 ext{ s for } T = 10 ext{ s}$	and a country
tch = average time of oc	ccupancy; $T = period$; $N_{ch} = #$ hopping f	requencies; BW = bandwidth;
	f = hopping channel carrier frequency s	separation
There is no minimum num	ber of hopping channels associated w	ith this type of hybrid system. While
there is not a specific min	imum limit, the hop sequence is require	ed to appear as pseudorandom per

13.2 Test Setup



Section 15.247(a)(1) (see Section 3 of this document).

13.3 Test Procedure

• The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

a) Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.

b) RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.

c) VBW \geq RBW.

- d) Sweep: Auto.
- e) Detector function: Peak.
- f) Trace: Max hold.



g) Allow the trace to stabilize.

It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies.

Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report.

13.4 Deviation From Test Standard

No deviation

13.5 Antenna Connected Construction

Please refer to the description of test mode.

13.6 Test Data

Please refer to the Attachment I.



14. Hopping function Requirements

14.1 Test Standard and Limit

- 14.1.1 Test Standard FCC Part 15.247(a)(1)
- 14.1.2 Test Limit

The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

14.4 Deviation From Test Standard

No deviation

14.6 Test Data

The transmitter follows the LoRa alliance protocol which complies with the pseudo-random hop sequence, equal use of each frequency, and receiver matching bandwidth and synchronization requirements.



15. Antenna Requirement

15.1 Test Standard and Limit

15.1.1 Test Standard FCC Part 15.203

15.1.2 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 shall be considered sufficient to comply with the provisions of this Section. 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.

15.2 Deviation From Test Standard

No deviation

15.3 Antenna Connected Construction

The gains of the antenna used for transmitting is 3.0dBi, and the antenna de-signed with Unique connector antenna and consideration of replacement. Please see the EUT photo for details.

15.4 Test Data

The EUT antenna is a Dipole antenna. It complies with the standard requirement.

Antenna Type									
July 1	Permanent attached antenna								
	Unique connector antenna								
2	Professional installation antenna								

Attachment A-- Conducted Emission Test Data

		6		1	3					_		50	\mathcal{M}	12.30								
Ter	nper	ature		26°	č	1 ale	~			<			Rel	ative	e Hu	umi	idity	/:	54%		611	N.
Tes	st Vo	Itage:		AC 120V/60Hz																		
Terminal:				Line											2							
Test Mode:				Mode 1																		
Remark:				Only worse case is reported.																		
80.	80.0 dBuV												-									
																				QP: AVG:	_	
																						1
					-				-			_				_						1
											×.	M.			×	-						{
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		1	14.	N V	Å.	M.	A	k.	laku.	J	WW	WY Wy	C.a. a	kolv ^a l. u	۸.)HHH	lland, hits	A MANY			peak AVG
	M	MM	mW	hr	1 1/1	VN V	MM Y	W W	AT NW	N ^N Y ^N			"NARD-A"	YHH	W W	William	Why	historia	1 MM	AM A	1,1	
		V.	_					<u> </u>							-			· ·		10		1
								+														
								_														
-20																						
U.	.150				0.5						U	MHz)				5					30.0	UU
						F	Rea	adi	ing		Со	rre	ct	Me	asu	re-				_		
	No.	Mk.	F	Frec	1.		Le	eve	el		Fa	acto	or	n	nen	t	L	imit	(Dver		
				MHz			d	3u\	/		C	dΒ		d	BuV		d	BuV		dB	Detec	ctor
	1		0.3	389	9		26	6.4	7		11	.46	6	37	7.9 3	3	5	8.06	-2	0.13	Q	Ρ
_	2		0.3	389	9		20).4	9		11	.46	6	31	.95	5	4	8.06	-1	6.11	A١	/G
	3		0.8	0.8860		30.91		1		11.27		7	42.18		5	6.00	-1;	3.82	Q	Ρ		
	4		0.8	0.8860			13.89				11.27		7	25.16		4	6.00	-2	0.84	A١	/G	
	5	*	1.	1.7059			9 33.61			10.75		5	44.36		5	6.00	-1	1.64	Q	Ρ		

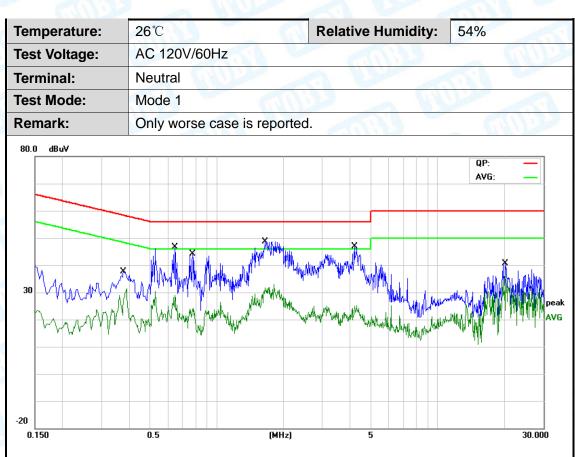
	MHz	dBuV	dB	dBuV	dBuV dB	Detector
1	0.3899	26.47	11.46	37.93	58.06 -20.13	QP
2	0.3899	20.49	11.46	31.95	48.06 -16.11	AVG
3	0.8860	30.91	11.27	42.18	56.00 -13.82	QP
4	0.8860	13.89	11.27	25.16	46.00 -20.84	AVG
5 *	1.7059	33.61	10.75	44.36	56.00 -11.64	QP
6	1.7059	20.03	10.75	30.78	46.00 -15.22	AVG
7	2.8900	24.24	10.28	34.52	56.00 -21.48	QP
8	2.8900	10.76	10.28	21.04	46.00 -24.96	AVG
9	4.2259	28.97	10.12	39.09	56.00 -16.91	QP
10	4.2259	13.24	10.12	23.36	46.00 -22.64	AVG
11	20.2579	30.77	10.21	40.98	60.00 -19.02	QP
12	20.2579	27.46	10.21	37.67	50.00 -12.33	AVG

Remark:

1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)

2. Margin (dB) =QuasiPeak/Average (dBuV)-Limit (dBuV)

TOBY



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.3780	27.66	11.49	39.15	58.32	-19.17	QP
2		0.3780	18.49	11.49	29.98	48.32	-18.34	AVG
3		0.6460	31.71	11.46	43.17	56.00	-12.83	QP
4		0.6460	16.71	11.46	28.17	46.00	-17.83	AVG
5		0.7780	30.33	11.38	41.71	56.00	-14.29	QP
6		0.7780	14.44	11.38	25.82	46.00	-20.18	AVG
7		1.6580	32.66	10.72	43.38	56.00	-12.62	QP
8		1.6580	19.00	10.72	29.72	46.00	-16.28	AVG
9		4.1819	26.69	10.10	36.79	56.00	-19.21	QP
10		4.1819	11.97	10.10	22.07	46.00	-23.93	AVG
11	-	20.2580	30.50	10.57	41.07	60.00	-18.93	QP
12	*	20.2580	27.17	10.57	37.74	50.00	-12.26	AVG

Remark:

1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)

2. Margin (dB) =QuasiPeak/Average (dBuV)-Limit (dBuV)



Attachment B--Unwanted Emissions Data

---Radiated Unwanted Emissions

9 KHz~30 MHz

From 9 KHz to 30 MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB Below the permissible value has no need to be reported.

30MHz~1GHz

Temperature:	24.3 ℃	Relative Hum	nidity: 45%
Fest Voltage:	AC 120V/60Hz		1
Ant. Pol.	Horizontal		
Fest Mode:	Mode 2 (902.3)	vlHz)	
Remark:	Only worse cas	e is reported.	~
80.0 dBuV/m			
70 60 50 40 30 20 10		Fundamental Frequ	Incy (RFJFCC 15C 3M Radiation Margin - 6 dB
-10 -20			
30.000	60.00	(MHz) 300.00	1000.000

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	40.1347	41.17	-23.03	18.14	40.00	-21.86	peak
2	66.7325	57.41	-24.08	33.33	40.00	-6.67	peak
3	69.3568	56.21	-24.26	31.95	40.00	-8.05	peak
4	175.0368	51.66	-22.69	28.97	43.50	-14.53	peak
5 *	239.9874	63.71	-22.53	41.18	46.00	-4.82	peak
6	360.4476	58.61	-19.41	39.20	46.00	-6.80	peak

*:Maximum data x:Over limit !:over margin

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. QuasiPeak (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
- 3. Margin (dB) = QuasiPeak (dBµV/m)-Limit QPK(dBµV/m)

empera	ture:	24.3℃	2	R	elative Hun	nidity:	45%	
est Volt	age:	AC 12	20V/60Hz		615	132		2010
nt. Pol.		Vertica	al		av		5	
est Moo	de:	Mode	2 (902.3MH	lz)		- GI	1.20	
emark:		Only v	worse case i	s reported.	200		T	NOP
80.0 dB	uV/m							· · · · ·
70					Fundamental F	requency		
60 50						(RF)FCC 15 Margin -6 d	iC 3M Radiation B	
40	1	X		3		5	6	
30	and the second	MMV	\mathbb{A}	Marth Will	Mrsh with	wat have a	Approximition	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
10			Mar I we	whe have weather	₹ ³			
			Man Mar Man Landa Araba	PHEN				
0			an derifedende					
-10		60.00		(MHz)	300	.00		1000.00
0 -10 -20	Frequ (Mł	lency	Reading (dBuV)		Level	.00 Limit (dBuV/m)	Margin (dB)	
0 -10 -20 30.000		iency Hz)	Reading	յ MH₂) Factor	Level	Limit		
0 -10 -20 30.000	(MF	uency Hz) 120	Reading (dBuV)	^(MH₂) Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	(dB)	Detector
0 -10 -20 30.000 NO. 1 !	(MH 38.2	uency Hz) 2120 5727	Reading (dBuV) 57.50	(мн₂) Factor (dB/m) -23.04	Level (dBuV/m) 34.46	Limit (dBuV/m) 40.00	(dB) -5.54	Detector peak
0 -10 -20 30.000 No. 1 ! 2 *	(MH 38.2 65.5	uency Hz) 2120 5727 9946	Reading (dBuV) 57.50 60.32	(мн₂) Factor (dB/m) -23.04 -24.00	Level (dBuV/m) 34.46 36.32	Limit (dBuV/m) 40.00 40.00	(dB) -5.54 -3.68	Detector peak peak
0 -10 -20 30.000 No. 1 ! 2 * 3	(MH 38.2 65.5 171.9	uency Hz) 2120 5727 9946 9874	Reading (dBuV) 57.50 60.32 54.96	(мн₂) Factor (dB/m) -23.04 -24.00 -22.42	Level (dBuV/m) 34.46 36.32 32.54	Limit (dBuV/m) 40.00 40.00 43.50	(dB) -5.54 -3.68 -10.96	peak peak

*:Maximum data x:Over limit !:over margin

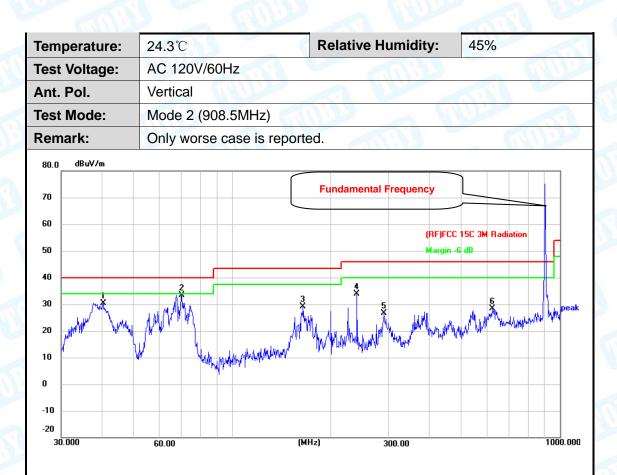
- Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
 QuasiPeak (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = QuasiPeak (dBµV/m)-Limit QPK(dBµV/m)

Tempera	ture:	24.3	°C			Relative Hu	umidity:	45%	
est Volt	age:	AC 1	20V/	60Hz			13.		AU
nt. Pol.	ı	Hori	zonta	1010		aU		12	1
est Mod	de:	Mod	e 2 (9	08.5M	Hz)	22	2 811	1200	-
emark:		Only	wors	se case	is reported.	100		T	ND
80.0 dBu	W/m								
70					F	Fundamental Fr	equency		
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-10									
-20 30.000		60.00			(MHz)	300	.00		1000.0
No.		uency Hz)		eading IBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecto
	`	,	`		. ,	. ,	. ,	, <i>,</i>	

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	40.2757	41.34	-23.03	18.31	40.00	-21.69	peak
2	66.4989	57.47	-24.07	33.40	40.00	-6.60	peak
3	175.0368	55.06	-22.69	32.37	43.50	-11.13	peak
4 !	239.9874	62.95	-22.53	40.42	46.00	-5.58	peak
5 *	* 360.4476	60.99	-19.41	41.58	46.00	-4.42	peak
6	721.7259	43.56	-11.36	32.20	46.00	-13.80	peak

*:Maximum data x:Over limit !:over margin

- Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
 QuasiPeak (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = QuasiPeak (dBµV/m)-Limit QPK(dBµV/m)



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	40.2757	53.38	-23.03	30.35	40.00	-9.65	peak
2 *	70.0903	57.76	-24.32	33.44	40.00	-6.56	peak
3	164.3301	50.93	-21.78	29.15	43.50	-14.35	peak
4	239.9874	56.47	-22.53	33.94	46.00	-12.06	peak
5	290.0172	47.52	-20.98	26.54	46.00	-19.46	peak
6	622.8900	41.29	-12.90	28.39	46.00	-17.61	peak

*:Maximum data x:Over limit !:over margin

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. QuasiPeak (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
- 3. Margin (dB) = QuasiPeak (dBµV/m)-Limit QPK(dBµV/m)

emperature:	24.3 ℃		Relative Hu	midity:	45%	
est Voltage:	AC 120V/6	0Hz			5	
nt. Pol.	Horizontal	AUP	0.0		6 1 M 6	
est Mode:	Mode 2 (91	4.9MHz)	1919	11	Just	-
emark:	Only worse	e case is reported				DE
80.0 dBuV/m						
70			Fundamental I	Frequency		
60			_			-
50				(RFJFCC 1) Margin -64	5C 3M Radiation dB	
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-10						
-20						

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	42.4508	41.09	-22.92	18.17	40.00	-21.83	peak
2 *	70.0903	54.15	-24.32	29.83	40.00	-10.17	peak
3	153.2004	50.34	-21.64	28.70	43.50	-14.80	peak
4	175.0368	53.31	-22.69	30.62	43.50	-12.88	peak
5	303.5437	45.78	-20.62	25.16	46.00	-20.84	peak
6	378.5843	51.69	-18.97	32.72	46.00	-13.28	peak

*:Maximum data x:Over limit !:over margin

- Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
 QuasiPeak (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = QuasiPeak (dBµV/m)-Limit QPK(dBµV/m)

						N					60	
Tem	pera	ture:	24	.3℃				Relative H	umidit	y:	45%	
Test	Volt	age:	A	C 12	20V/6	0Hz		6	677			AUN
Ant.	Pol.		Ve	ertica	al	10	1		2400	1	117	
Test	Мос	le:	M	ode	2 (91	4.9MH	Hz)	132	-	C.K.	120	
Rem	nark:		O	nly v	vorse	e case	is reported	d.	9		III.	NDD
80.0	dBu	V/m										
70								Fundamental	Frequenc	y		
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10 0			Ŷ		NAN	Withelington	aditi ta calar	"Wilder" . Makerie.	104			
-10 -20												
3(D.000		6	0.00			(MH)	z]	300.00	<u> </u>	I	1000.000
N	lo.	Frequ (M	ueno Hz)	у		ading BuV)	Factor (dB/m)			imit uV/m)	Margin (dB)	Detector
	1	38.7	7518	}	53	3.51	-23.05	30.46	40	0.00	-9.54	peak
					-						0.00	

No.	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1	38.7518	53.51	-23.05	30.46	40.00	-9.54	peak
2 *	70.5836	60.63	-24.45	36.18	40.00	-3.82	peak
3	162.6106	50.62	-21.63	28.99	43.50	-14.51	peak
4	364.2595	42.28	-19.31	22.97	46.00	-23.03	peak
5	541.3725	40.47	-14.60	25.87	46.00	-20.13	peak
6	620.7096	40.11	-12.94	27.17	46.00	-18.83	peak

*:Maximum data x:Over limit !:over margin

- Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
 QuasiPeak (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = QuasiPeak (dBµV/m)-Limit QPK(dBµV/m)

Above 1GHz

Temperature:	26 ℃	Relative Humidity:	54%	197
Test Voltage:	AC 120V/60Hz			
Ant. Pol.	Horizontal		132	~
Test Mode:	TX 902.3MHz			12
Remark:	Only worse case is r	reported.	2 44	

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	1804.780	64.17	-7.79	56.38	74.00	-17.62	peak
2 *	1804.922	52.40	-7.79	44.61	54.00	-9.39	AVG

Remark:

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB) 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)

3. Margin (dB) = Peak/AVG (dBµV/m)-Limit PK/AVG(dBµV/m)

4. The tests evaluated1-10GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.

5. No report for the emission which more than 20dB below the prescribed limit.

Temperature:	26 ℃	Relative Humidity:	54%
Test Voltage:	AC 120V/60Hz		TU S
Ant. Pol.	Vertical	COR.	GUE
Test Mode:	TX 902.3MHz	2 19	No.
Remark:	Only worse case is reported	ed.	NUL O

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	1804.847	65.00	-7.79	57.21	74.00	-16.79	peak
2 *	1804.958	53.17	-7.79	45.38	54.00	-8.62	AVG

Remark:

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)

2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)

3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)

4. The tests evaluated1-10GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.

5. No report for the emission which more than 20dB below the prescribed limit.



Temperature:	26 ℃	Relative Humidity:	54%
Test Voltage:	AC 120V/60Hz	aus	2
Ant. Pol.	Horizontal		
Test Mode:	TX 908.5MHz		
Remark:	Only worse case is reported		

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	1817.263	62.97	-7.69	55.28	74.00	-18.72	peak
2 *	1817.374	50.76	-7.69	43.07	54.00	-10.93	AVG

Remark:

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB) 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)

3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m) 4. The tests evaluated1-10GHz,The testing has been conformed to the 10th harmonic of the highest fundamental frequency.

5. No report for the emission which more than 20dB below the prescribed limit.

Temperature:	26 ℃	Relative Humidity:	54%
Test Voltage:	AC 120V/60Hz		NUC
Ant. Pol.	Vertical		and b
Test Mode:	TX 908.5MHz	2	No.
Remark:	Only worse case is reported	ed.	

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	1817.230	63.30	-7.69	55.61	74.00	-18.39	peak
2 *	1817.427	50.54	-7.68	42.86	54.00	-11.14	AVG

Remark:

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)

2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)

3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)

4. The tests evaluated1-10GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.

5. No report for the emission which more than 20dB below the prescribed limit.



Temperature:	26 ℃	Relative Humidity:	54%	and!
Test Voltage:	AC 120V/60Hz		2	No.
Ant. Pol.	Horizontal		133	
Test Mode:	TX 914.9MHz			19
Remark:	Only worse case is r	eported.		NUL ST

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	1830.147	62.26	-7.58	54.68	74.00	-19.32	peak
2 *	1830.231	49.94	-7.58	42.36	54.00	-11.64	AVG

Remark:

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB) 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)

3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m) 4. The tests evaluated1-10GHz,The testing has been conformed to the 10th harmonic of the highest fundamental frequency.

5. No report for the emission which more than 20dB below the prescribed limit.

26 °C	Relative Humidity:	54%
AC 120V/60Hz		NUL S
Vertical		CUL
TX 914.9MHz		No.
Only worse case is reported	ed.	NUL A
	AC 120V/60Hz Vertical TX 914.9MHz	AC 120V/60Hz Vertical

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1 *	1830.135	50.99	-7.58	43.41	54.00	-10.59	AVG
2	1830.231	63.95	-7.58	56.37	74.00	-17.63	peak

Remark:

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)

2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)

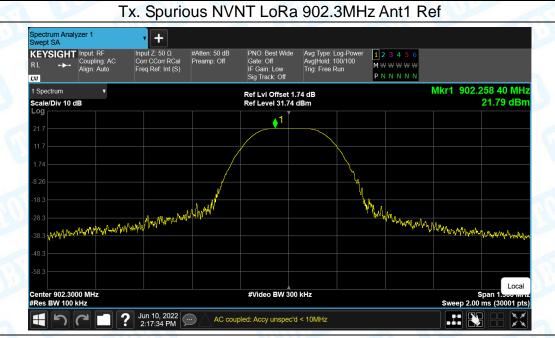
3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)

4. The tests evaluated1-10GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.

5. No report for the emission which more than 20dB below the prescribed limit.



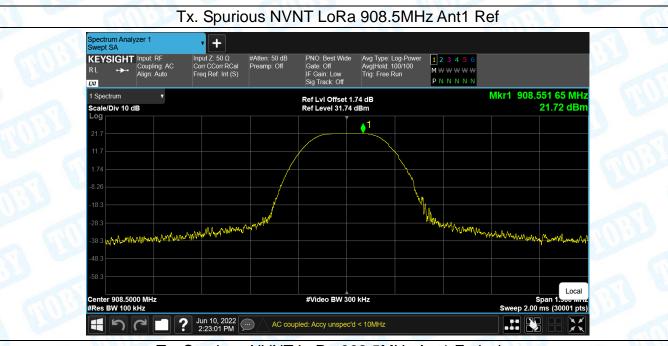
---Conduction Unwanted Emissions



Tx. Spurious NVNT LoRa 902.3MHz Ant1 Emission



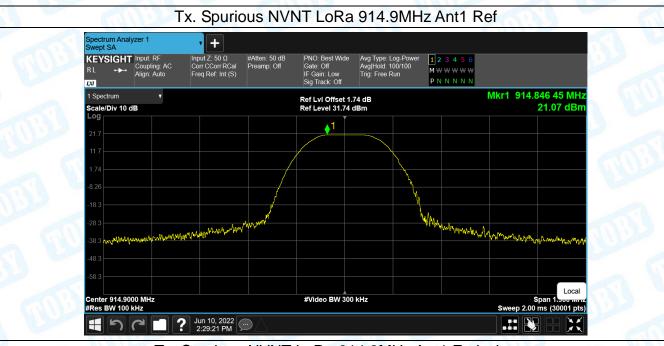




Tx. Spurious NVNT LoRa 908.5MHz Ant1 Emission

EYSIGHT └ +►+ ⊿	Input: RF Coupling: Align: Aut	AC	Input Z: 50 Ω Corr CCorr RCal Freq Ref: Int (S)	#Atten: 50 dB Preamp: Off	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	Avg Type: L Avg Hold: 1/ Trig: Free R	0/10	1 2 3 4 5 6 M W W W W W P N N N N N		
Spectrum	•				Ref LvI Offset	1.74 dB			Mkr1 908.8	
cale/Div 10 d	в				Ref Level 31.74	4 dBm			21.68	dB
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.74									DL1 1.	.72 d
.26										
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art 30 MHz Res BW 100 F	Hz				#Video BW 30	00 kHz			Stop 26.5 Sweep ~2.54 s (3000	
Marker Table		,								
Mode	Trace 3	Scale	Х		Y	Function	Fi	Inction Width	Function Value	
1 N	1	f		08.8 MHz	21.68 dBm					
2 N 3 N	1	f f		11 5 GHz 16 7 GHz	-22.19 dBm -29.25 dBm					
4 N	1	f		04 4 GHz	-34.46 dBm					Loca
5 N	1	f	3.5	87 6 GHz	-36.06 dBm					.uca



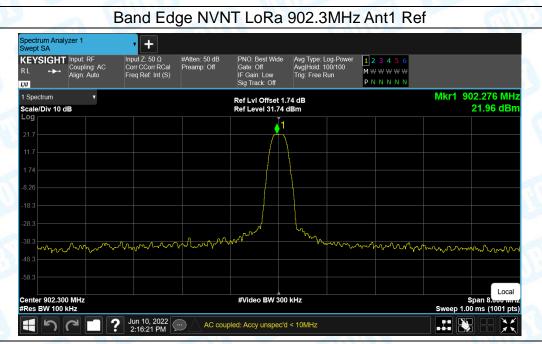


Tx. Spurious NVNT LoRa 914.9MHz Ant1 Emission

pectrum Analy	zer 1	• +							
wept SA									
EYSIGHT	Input: RF Coupling: AC Align: Auto	Input Z: 50 Ω Corr CCorr RCal Freq Ref: Int (S)	#Atten: 50 dB Preamp: Off	PNO: Fast Gate: Off IF Gain: Low	Avg Type: Lo Avg Hold: 10 Trig: Free Ru	v10	1 2 3 4 5 6 M ₩ ₩ ₩ ₩ ₩		
V.	Aligh. Auto			Sig Track: Off	ing. Hee Ku		PNNNN		
Spectrum	•			Ref LvI Offset 1	.74 dB			Mkr1 91	
cale/Div 10 dl	в			Ref Level 31.74	dBm			21.	04 dB
og 1 7				i i					
1.7									
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tart 30 MHz				#Video BW 300	N 1-11-				00 50 0
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Marker Table	v								
marker rable	•								
	Trace Scale	Х		Y	Function	F	unction Width	Function Val	ue
1 N	1 f	9	15.0 MHz	21.04 dBm	Function	F	unction Width	Function Val	ue
1 N 2 N	1 f 1 f	9	712 4 GHz	21.04 dBm -22.33 dBm	Function	F	unction Width	Function Val	ue
1 N 2 N 3 N	1 f 1 f 1 f	9 24.7 1.8	712 4 GHz 330 0 GHz	21.04 dBm -22.33 dBm -29.06 dBm	Function	Fi	unction Width	Function Val	_
1 N 2 N	1 f 1 f	9 24.7 1.8 2.7	712 4 GHz 330 0 GHz 726 4 GHz	21.04 dBm -22.33 dBm -29.06 dBm -34.59 dBm	Function	Fi	unction Width	Function Val	_
1 N 2 N 3 N 4 N	1 f 1 f 1 f 1 f 1 f	9 24.7 1.8 2.7	712 4 GHz 330 0 GHz	21.04 dBm -22.33 dBm -29.06 dBm	Function	F	unction Width	Function Val	
1 N 2 N 3 N 4 N 5 N	1 f 1 f 1 f 1 f 1 f	9 24.7 1.8 2.7 3.4	712 4 GHz 330 0 GHz 726 4 GHz	21.04 dBm -22.33 dBm -29.06 dBm -34.59 dBm	Function	Fi	unction Width	Function Val	



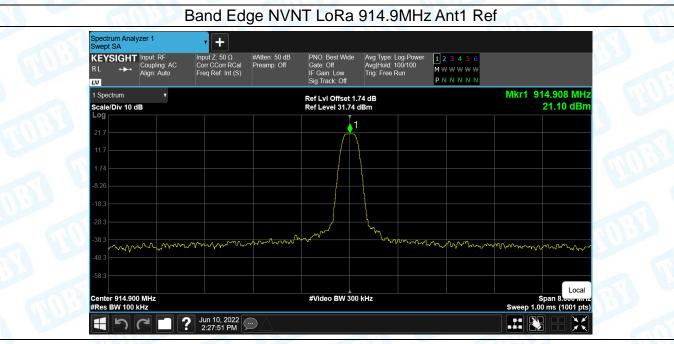
Attachment C—Emissions In Nonrestricted Frequency Data



Band Edge NVNT LoRa 902.3MHz Ant1 Emission

	Couplir Align: A	ig: AC	Input Ζ: 50 Ω Corr CCorr RCal Freq Ref: Int (S)	#Atten: 50 dB Preamp: Off	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	Avg Type: Lo Avg Hold: 10 Trig: Free Ru	0/100	1 2 3 4 5 6 M W W W W W P N N N N N		
Spectrum		•			Ref LvI Offset 1				Mkr	902.3 M
cale/Div 10	dB				Ref Level 31.74	dBm				21.84 di
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										DL1 1 96
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18.3 28.3										
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48.3 58.3 Start 806.30 I Res BW 100 5 Marker Table	MHz kHz	•		ne frank verse verse de	#Video BW 30	00 kHz			Sweep 9	60 ms (1001
48.3 58.3 Etart 806.30 I Res BW 100 5 Marker Table	MHz kHz		x		#Video BW 30	10 kHz Function		nction Width	Sweep 9	
48.3 58.3 Start 806.30 I Res BW 100 5 Marker Table Mode 1 N	MHz kHz	•	× × ×	902.3 MHz	#Video BW 30	0 kHz Function			Sweep 9	60 ms (1001
48.3 58.3 Etart 806.30 I Res BW 100 5 Marker Table	MHz kHz Trace	▼ Scale	X 8		#Video BW 30	0 kHz Function			Sweep 9	60 ms (1001
48.3 59.4 50.4	MHz kHz Trace	▼ Scale f	X 8	902.3 MHz 390.0 MHz	#Video BW 30 Y 21.84 dBm -42.43 dBm	0 kHz Function			Sweep 9	60 ms (1001
48.3 58.3 58.3 58.5 5 Marker Table Mode 1 N 2 N 3 N	MHz kHz Trace	▼ Scale f f	X 8	902.3 MHz 390.0 MHz 902.0 MHz	#Video BW 30 Y 21.84 dBm -42.43 dBm -15.59 dBm	0 kHz Function			Sweep 9	60 ms (1001

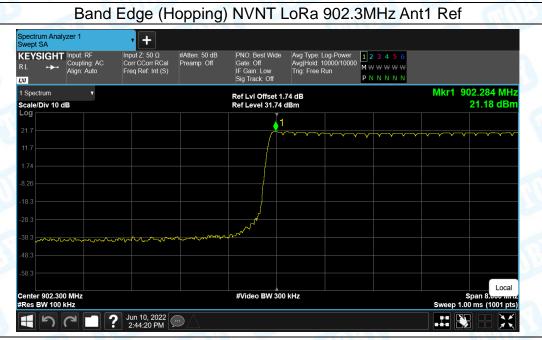




Band Edge NVNT LoRa 914.9MHz Ant1 Emission

RL ++ Coupline	C C	put Z: 50 Ω orr CCorr RCal	#Atten: 50 dB Preamp: Off	PNO: Fast Gate: Off	Avg Type: Log-Pov Avg Hold: 100/100			
Align: A	uto ⊢r	eq Ref: Int (S)		IF Gain: Low Sig Track: Off	Trig: Free Run	PNNNN		
1 Spectrum	•			Ref LvI Offset 1	.74 dB			914.9 MH
Scale/Div 10 dB				Ref Level 31.74	dBm			21.07 dB
.og				ļ į				
11.7								
1.74								DL1 1.10 di
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28.3		4						
38.3	2		the state of the cost		HARDAND ACTURN TARGET AN	๛๚๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛	Mr. Ladaulan, July and	ner a-freedation
48.3								
48.3								
58.3 tart 0.91090 GHz				#Video BW 30	0 kHz		Sto	op 1.01090 G
tart 0.91090 GHz Res BW 100 kHz	v			#Video BW 30	0 kHz		Sto	op 1.01090 G
58.3 tart 0.91090 GHz Res BW 100 kHz	▼ Scale	x		Y	0 kHz Function	Function Width	Sto	op 1.01090 G 0 ms (1001 p
A A A A A A A A A A A A A A A A A A A	Scale f	9	914.9 MHz	Y 21.07 dBm		Function Width	Steep 9.66	op 1.01090 G 0 ms (1001 p
tart 0.91090 GHz Res BW 100 kHz Marker Table Mode Trace		<u> </u>	914.9 MHz 928.0 MHz 926.0 MHz	Y		Function Width	Steep 9.66	op 1.01090 G 0 ms (1001 p
Marker Table Mode Trace 1 N 1 2 N 1 3 N 1 4 N 1	Scale f f	9	928.0 MHz	Y 21.07 dBm -42.18 dBm		Function Width	Steep 9.66	op 1.01090 G 0 ms (1001 p
8.3	Scale f f f	9	928.0 MHz 960.0 MHz	Y 21.07 dBm -42.18 dBm -42.97 dBm		Function Width	Steep 9.66	op 1.01090 G 0 ms (1001 p 1 Value

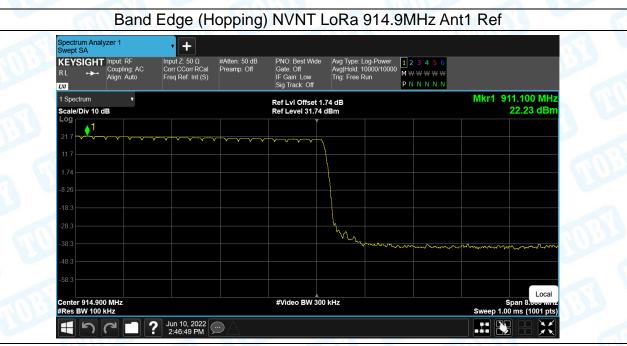




Band Edge (Hopping) NVNT LoRa 902.3MHz Ant1 Hopping Emission

۲L	SIGHT	Input: F Couplir Align: A	ng: AC		#Atten: 50 dB Preamp: Off	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	Avg Type: Log Avg Hold: 300 Trig: Free Ru	0/3000	1 2 3 4 5 6 M W W W W W P N N N N N		
м Spec	trum		•			Ŭ				Mkr	902.3 MI
	Div 10 c					Ref Lvi Offset 1 Ref Level 31.74				WIKI	21.06 dB
_og r		1B				Rei Level 31.74	abm				21.00 00
21.7											
1.74											DL1 1.18 c
8.26											
18.3											
28.3										2	
38.3	مين المراجع المراجع المراجع الم					and the second s	and the second	and the second second second second	والالاليسيان كسنان والمعادية مستانية	X	and the second
48.3											
58.3											
	06.30 M 3W 100					#Video BW 30	0 kHz				Stop 906.30 N 60 ms (1001 p
5 Mark	er Table		•								
	Mode	Trace	Scale	Х		Y	Function	Fu	unction Width	Functi	on Value
	N	1	f		2.3 MHz	21.06 dBm					
1	N	1	f		0.0 MHz	-40.11 dBm					
1 2		1	f		2.0 MHz	-16.14 dBm					
3	Ν		f	90	2.0 MHz	-16.14 dBm					Loca
3 4											
3	Ν										





Band Edge (Hopping) NVNT LoRa 914.9MHz Ant1 Hopping Emission

vept SA EYSIGHT Input: RF Coupling	Input Z: 50 Ω AC Corr CCorr RCal	#Atten: 50 dB Preamp: Off	PNO: Fast Gate: Off	Avg Type: Log-Pow Avg Hold: 5000/500		_
L + Align: Auto			IF Gain: Low Sig Track: Off	Trig: Free Run	M ₩ ₩ ₩ ₩ ₩ P N N N N N	
Spectrum v			Ref LvI Offset 1			Mkr1 910.9 M
cale/Div 10 dB			Ref Level 31.74	dBm		22.19 dE
og 1.7 1						
1.7						
.74						DL1 2.23
.26						
8.3	- 4					
8.3	\\$ ²⁴					
8.3				a an		and a subsection of the second s
8.3						
art 0.91090 GHz			#Video BW 30			Stop 1.01090 (
Res BW 100 kHz			#1060 811 30			Sweep 9.60 ms (1001
Marker Table 🔹 🔻						
Mode Trace S	cale X		Y	Function	Function Width	Function Value
1 N 1		910.9 MHz	22.19 dBm			
2 N 1		928.0 MHz	-40.18 dBm			
3 N 1 4 N 1		960.0 MHz 929.2 MHz	-39.48 dBm -38.25 dBm			
4 N I		323.2 WITIZ	-30.25 UDIII			Loc
6						

Attachment D—99% Occupied and 20dB Bandwidth Data

Temperature:	25 ℃		Relative Humidity:	55%
Test Voltage:	DC 5	SV SV		
Test Mode:	TX N	lode		
Channel frequency		20dB Bandwidth	20dB Bandwidth	Limit
(MHz)		(kHz)	*2/3 (kHz)	(kHz)
902.3		199.6	133.1	
908.5		908.5 189.2		500
914.9		196.6	131.1	

902.3MHz







914.9MHz





Temperature:25°C				Relative Hum	nidity:	55%	111	
Test Voltage:	DC 5	V	100	219		5		
Test Mode:	TX M	lode			10	UPE		
Channel frequency			99% Ba	ndwidth			Limit	
(MHz)		(kHz)				(kHz)		
902.3			167	.80				
908.5		168.33				/		
914.9			164	.86				
								

902.3MHz







914.9MHz

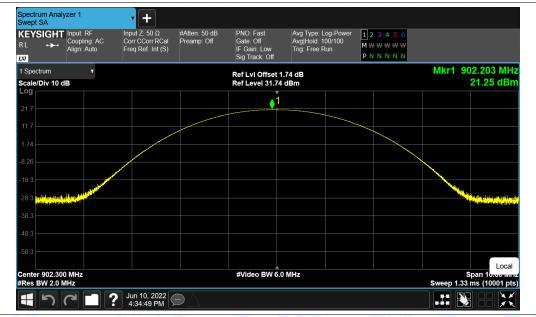




Attachment E—Peak Output Power Data

Temperature:	25 ℃	Relative Hum	idity: 55%
Test Voltage:	DC 5V		
Test Mode:	TX Mode		
Channel frequen	icy (MHz)	Test Result (dBm)	Limit (dBm)
902.3		21.25	
908.5		21.72	30
914.9		21.12	

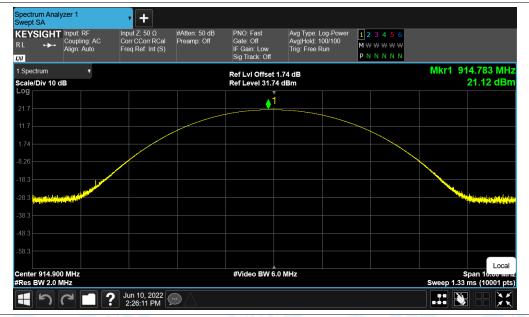
902.3MHz







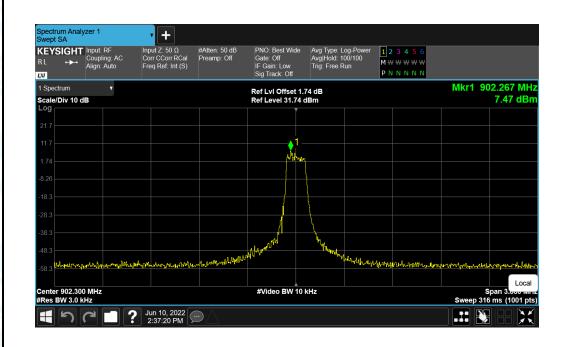
914.9MHz



Attachment F—Power Spectral Density Data

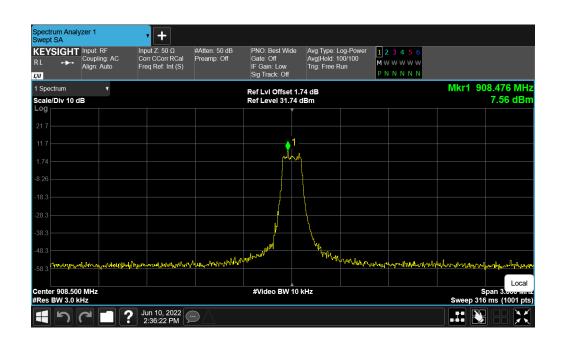
Temperature:	25 ℃	Relative Hu	midity:	55%
Test Voltage:	DC 5V			
Test Mode:	TX Mode			
Channel Frequency		Power Density	Limit	Result
(MHz)		(dBm/3kHz)	(dBm/3kH	z)
902.3		7.47		
908.5		7.56	8	PASS
914.9		5.86		
			1	

902.3MHz

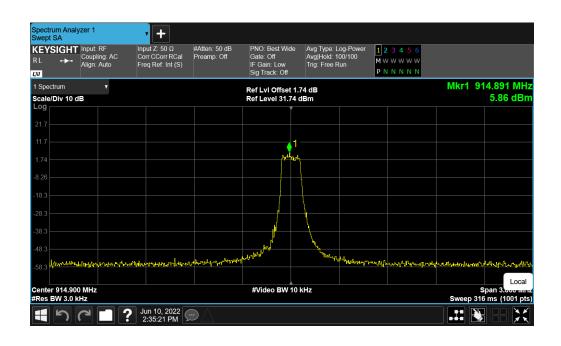




908.5MHz



914.9MHz



Attachment G—Carrier Frequency Separation Data

Temperature:	25 ℃	Relat	ive Humidity:	55%				
Test Voltage:	DC 5V	TUP A						
Test Mode:	Hopping I	Hopping Mode						
Channel freq	uency	Separation Read Val	ue Sep	aration Limit				
(MHz)		(kHz)		(kHz)				
908.5 200.5 126.1								
Hopping Mode								

908.5MHz





Attachment H—Time of Occupancy(Dwell Time) Data

		Observation Paris d	Mary Dynation of	Number of Dunot	August Time of	
	Number of	Observation Period	Max. Duration of	Number of Burst	Average Time of	Limi
Test Mode	Channel	(0.4s* Number of	Each Bust	Repetition During	Occupancy on any	(s)
		Channel) (s)	(s)	Observation Period	Channel	
lopping Mode	64	25.6	0.0265	7	0.1855	0.4
			Burst Duratio	n		
	Spectrum Analyzer 7 Swept SA	• •				
	KEYSIGHT Inpu			rpe: Log-Power 123456		
	Aligr	n: Auto Freq Ref: Int (S)	IF Gain: Low Trig D Sig Track: Off	elay: -1.000 ms		
	1 Spectrum Scale/Div 10 dB	Y	Ref LvI Offset 1.74 dB Ref Level 31.74 dBm	L	Mkr1 26.50 ms 4.17 dB	
	21.7				TRIG LVL	
	11.7					
	-8.26	1Δ2				
	-38.3 X2		nek an elem bilden i fan en en in en den in en den in en den in en in en in en in en in en in de de ster en joert kan de de in en in En in en	tra stralini i nid pitelini i Atria et tra nitra predici para i predici para di traj ne destiti i ne degli de Nitra 11 (1999) nu esti internetti i periodi esti periodi e predici periodi periodi esti periodi esti periodi e Nitra 11 (1999)	Herd Answer and All Answer and Answer and Anna Anna Anna Anna Anna Anna Anna Anna anna a	
	-58.3					
	Center 908.500000 Res BW 1.0 MHz	MHz		Swe	Span 0 Hz ap 100 ms (10001 pts)	
	5 Marker Table					
	Mode Trac 1 Δ2 1 2 F 1	e Scale X <u>t (Δ) 26.50 ms</u> t 940.0 μs	Y Functi (Δ) 4.172 dB -37.02 dBm	on Function Width F	Function Value	
	3 4					
	5 6					
	10	Jun 10, 2022 💬 🛆				
		Burst Repetition	During Observa	tion Period Duration		
	Spectrum Analyzer					
	Swept SA KEYSIGHT Inpu	t: RF Input Ζ: 50 Ω Atten: 40		rpe: Log-Power 1 2 3 4 5 6		
	PI Cou	pling: AC Corr CCorr RCal Preamp: n: Auto Freq Ref: Int (S)	Off Gate: Off Trig: F IF Gain: Low Sig Track: Off	ree Run W W W W W W P N N N N N		
	1 Spectrum	V	Ref LvI Offset 60.00 dB			
	Scale/Div 10 dB		Ref Level 90.00 dBm			
	80.0					
	70.0					
	60.0					
	40.0					
	30.0					
	20.0		Harley Kanartsharper	As to any provide the second sec		
	10.0					
	0.00					
	Center 908.500000	MHz			Span 0 Hz	
	#Res BW 1.0 MHz	Jun 10. 2022 👝 🛆			veep 25.6 s (1001 pts)	
	1 2 6	Jun 10, 2022 💬 🛆				

Attachment I—Number of Hopping Frequency

Temperature:	25 ℃		Rela	tive Humidity:	55%
Test Voltage:	DC 5V	NUCL.		Charles and	
Test Mode:	Hopping	Mode	RUPP		
Frequency Rang	quency Range Test Mode			ty of Hopping Channel	Limit
902MHz~928MH	lz	LoRa		64	50
Spectrum Analyzer 1 Swept SA KEYSIGHT R L +	Input Z: 50 Ω Corr CCorr RCa Freq Ref: Int (S	al Preamp: Off Gate 6) IF G	D: Best Wide Avg Type: I e: Off Avg Hold: 1 sain: Low Trig: Free F Track: Off	10000/10000 M M M M M M	
1 Spectrum Scale/Div 10 dB Log 217 11.7 1.74 -8.26 -18.3 -28.3 -38.3 -38.3 -38.3 -58.3 Start 901.300 MHz #Res BW 100 kHz		Ref I	Lvi Offset 1.74 dB Level 31.74 dBm		Mkr1 902.438 8 MHz 20.88 dBm 2 2 2 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5
5 Marker Table Mode Trace Scale 1 N 1 f 2 N 1 f 3 4 5 6 6	90	4.951 0 MHz :	Function 20.88 dBm 20.25 dBm	Function Width	Function Value

Note: The EUT is hybrid system and there is no minimum number of hopping channels associated with this type of hybrid system.

-----END OF REPORT-----