TEST REPORT

Product	:	LoRaWAN Barometric Pressure Sensor - US915
Trade mark	:	Seeed studio
Model/Type reference	:	LoRa-S-915-Baro-01
Serial Number	:	N/A
Report Number	:	EED32L00335501
FCC ID	:	Z4T-WSNNODE01
Date of Issue	:	May 14, 2020
Test Standards	:	47 CFR Part 15 Subpart C
Test result	:	PASS

Prepared for:

Seeed Technology Co., Ltd.
9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C

Prepared by:

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Tested By:	mark. chen.	Compiled by:	Smile Zhong
	Mark Chen		Smile Zhong
Reviewed by:	Ware Xin	Approved by:	Sam Chuang
	Ware Xin		Sam Chuang
Date:	May 14, 2020		Check No.:3096332299

CENTRE TESTING INTERNATIONAL GROUP CO.,LTD. CTI Report Seal

2 Version

Version No.	Date	Description
00	May 14, 2020	Original

3 Test Summary

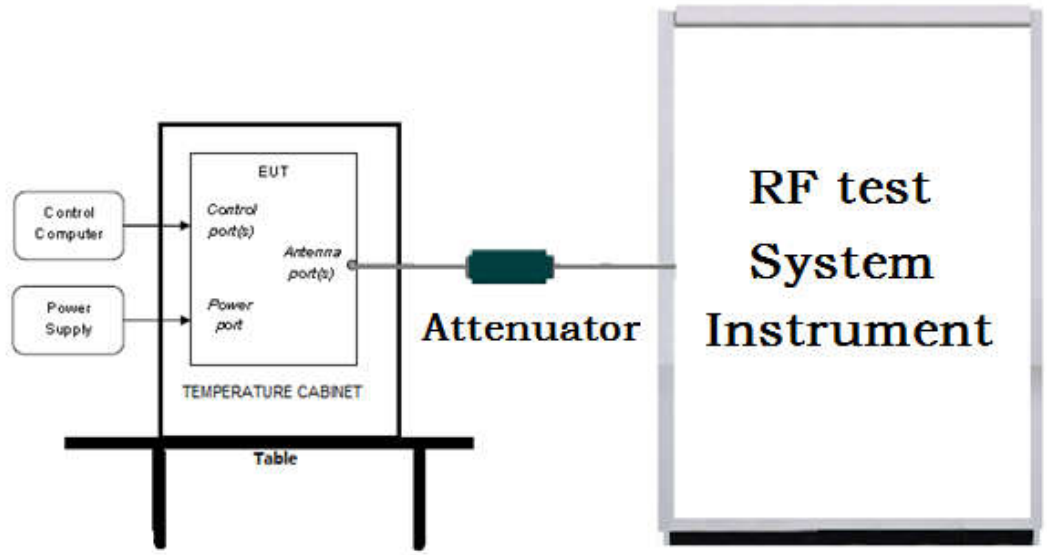
Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15Subpart C Section 15.203/15.247 (c)	ANSI C63.10-2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15Subpart C Section 15.207	ANSI C63.10-2013	N/A
Conducted Peak Output Power	47 CFR Part 15Subpart C Section 15.247 (b)(3)	ANSI C63.10-2013	PASS
6dB Occupied Bandwidth	47 CFR Part 15Subpart C Section 15.247 (a)(2)	ANSI C63.10-2013	PASS
Power Spectral Density	47 CFR Part 15Subpart C Section 15.247 (e)	ANSI C63.10-2013	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15Subpart C Section 15.247(d)	ANSI C63.10-2013	PASS
RF Conducted Spurious Emissions	47 CFR Part 15Subpart C Section 15.247(d)	ANSI C63.10-2013	PASS
Radiated Spurious Emissions	47 CFR Part 15Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
Remark: Test according to ANSI C63.4-2014 & ANSI C63.10-2013. The tested sample(s) and the sample information are provided by the client.			

4 Content

5 Test Requirement

5.1 Test setup

5.1.1 For Conducted test setup



5.1.2 For Radiated Emissions test setup

Radiated Emissions setup:

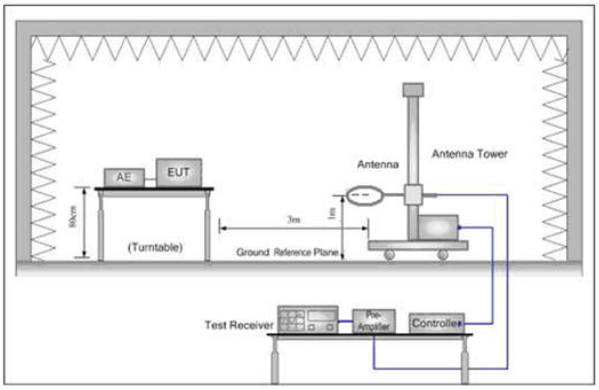


Figure 1. Below 30MHz

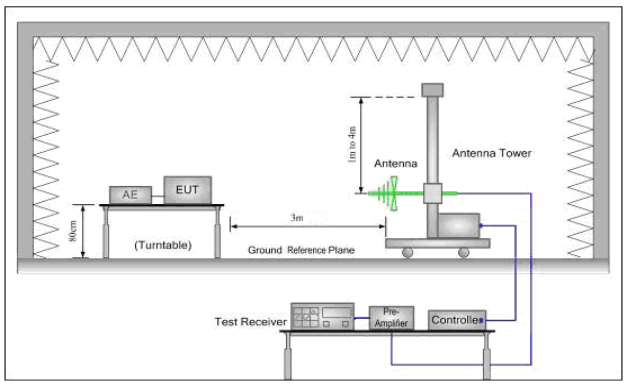


Figure 2. 30MHz to 1GHz

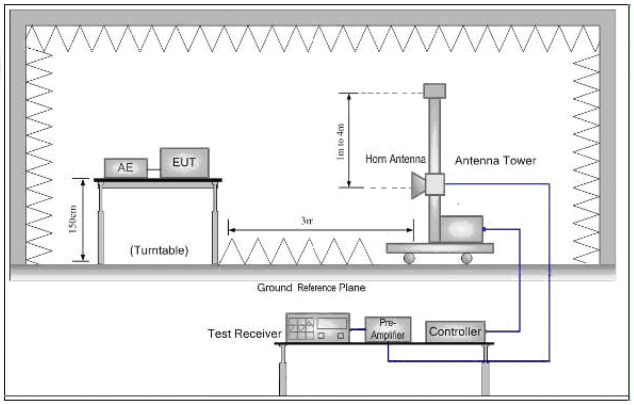


Figure 3. Above 1GHz

5.1.3 For Conducted Emissions test setup

Conducted Emissions setup

N/A

5.2 Test Environment

Operating Environment:	
Temperature:	23.0 °C
Humidity:	53 % RH
Atmospheric Pressure:	101kPa

5.3 Test Condition

Test channel:

Test Mode	Tx/Rx	RF Channel		
		Low(L)	Middle(M)	High(H)
LoRa	903.9MHz ~905.3 MHz	Channel 1	Channel 5	Channel 8
		903.9MHz	904.7MHz	905.3MHz

6 General Information

6.1 Client Information

Applicant:	Seeed Technology Co., Ltd.
Address of Applicant:	9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C
Manufacturer:	Seeed Technology Co., Ltd.
Address of Manufacturer:	9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C

6.2 General Description of EUT

Product Name:	LoRaWAN Barometric Pressure Sensor - US915
Model No.(EUT):	LoRa-S-915-Baro-01
Trade mark:	Seeed studio
EUT Supports Radios application:	903.9MHz, 904.1MHz, 904.3MHz, 904.5MHz, 904.7MHz, 904.9MHz, 905.1MHz, 905.3MHz
Power Supply:	Battery:3.6V
Sample Received Date:	Nov. 12, 2019
Sample tested Date:	Nov. 12, 2019 to Apr. 26, 2020

6.3 Product Specification subjective to this standard

Operation Frequency:	903.9MHz, 904.1MHz, 904.3MHz, 904.5MHz, 904.7MHz, 904.9MHz, 905.1MHz, 905.3MHz
Modulation Type:	LoRa
Number of Channel:	8
Test Power Grade:	Default
Test Software of EUT:	Default
Antenna Type and Gain:	Type: FPC antenna Gain:-2dBi
Test Voltage:	DC 3.6V

Operation Frequency each of channel

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	903.9MHz	3	904.3MHz	5	904.7MHz	7	905.1MHz
2	904.1MHz	4	904.5MHz	6	904.9MHz	8	905.3MHz

6.4 Description of Support Units

The EUT has been tested independently

6.5 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd
Building C, Hongwei Industrial Park Block 70, Bao'an District, Shenzhen, China
Telephone: +86 (0) 755 33683668 Fax:+86 (0) 755 33683385
No tests were sub-contracted.
FCC Designation No.: CN1164

6.6 Deviation from Standards

None.

6.6 Abnormalities from Standard Conditions

None.

6.7 Other Information Requested by the Customer

None.

6.8 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.9×10^{-8}
2	RF power, conducted	0.46dB (30MHz-1GHz)
		0.55dB (1GHz-18GHz)
3	Radiated Spurious emission test	4.3dB (30MHz-1GHz)
		4.5dB (1GHz-12.75GHz)
4	Conduction emission	3.5dB (9kHz to 150kHz)
		3.1dB (150kHz to 30MHz)
5	Temperature test	0.64°C
6	Humidity test	3.8%
7	DC power voltages	0.026%

7 Equipment List

RF test system					
Equipment	**Manufacturer**	**Mode No.**	**Serial Number**	**Cal. Date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
Spectrum Analyzer	Keysight	N9010A	MY54510339	03-01-2019 02-17-2020	02-29-2020 02-16-2021
Signal Generator	Keysight	N5182B	MY53051549	03-01-2019 02-17-2020	02-29-2020 02-16-2021
Temperature/ Humidity Indicator	biaozhi	HM10	1804186	07-26-2019	07-25-2020
High-pass filter	Sinoscite	FL3CX03WG18N M12-0398-002	---	---	---
High-pass filter	MICRO-TRONICS	SPA-F-63029-4	---	---	---
DC Power	Keysight	E3642A	MY56376072	03-01-2019 02-17-2020	02-29-2020 02-16-2021
PC-1	Lenovo	R4960d	---	---	---
BT&WI-FI Automatic control	R&S	OSP120	101374	03-01-2019 02-17-2020	02-29-2020 02-16-2021
RF control unit	JS Tonscend	JS0806-2	158060006	03-01-2019 02-17-2020	02-29-2020 02-16-2021
BT&WI-FI Automatic test software	JS Tonscend	JS1120-3	---	---	---

3M Semi/full-anechoic Chamber					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
3M Chamber & Accessory Equipment	TDK	SAC-3	---	05-24-2019	05-23-2022
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-618	07-26-2019	07-25-2020
Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-076	04-25-2018	04-24-2021
Receiver	R&S	ESCI7	100938-003	10-21-2019	10-20-2020
Multi device Controller	maturo	NCD/070/10711112	---	---	---
Temperature/ Humidity Indicator	Shanghai qixiang	HM10	1804298	07-26-2019	07-25-2020
Cable line	Fulai(7M)	SF106	5219/6A	---	---
Cable line	Fulai(6M)	SF106	5220/6A	---	---
Cable line	Fulai(3M)	SF106	5216/6A	---	---
Cable line	Fulai(3M)	SF106	5217/6A	---	---

3M full-anechoic Chamber					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
RSE Automatic test software	JS Tonscend	JS36-RSE	10166	06-19-2019	06-18-2020
Receiver	Keysight	N9038A	MY57290136	03-27-2019 03-05-2020	03-26-2020 03-04-2021
Spectrum Analyzer	Keysight	N9020B	MY57111112	03-27-2019 03-05-2020	03-26-2020 03-04-2021
Spectrum Analyzer	Keysight	N9030B	MY57140871	03-27-2019 03-05-2020	03-26-2020 03-04-2021
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	9163-1148	04-25-2018	04-24-2021
Horn Antenna	Schwarzbeck	BBHA 9170	9170-832	04-25-2018	04-24-2021
Horn Antenna	ETS-LINDGREN	3117	00057407	07-10-2018	07-09-2021
Preamplifier	EMCI	EMC184055SE	980596	05-22-2019	05-21-2020
Preamplifier	EMCI	EMC001330	980563	05-08-2019	05-07-2020
Preamplifier	JS Tonscend	980380	EMC051845 SE	01-16-2019 01-09-2020	01-15-2020 01-08-2021
Temperature/ Humidity Indicator	biaozhi	GM1360	EE1186631	04-30-2019	04-29-2020
Fully Anechoic Chamber	TDK	FAC-3	---	01-17-2018	01-16-2021
Filter bank	JS Tonscend	JS0806-F	188060094	04-10-2018	04-09-2021
Cable line	Times	SFT205-NMSM-2.50M	394812-0001	---	---
Cable line	Times	SFT205-NMSM-2.50M	394812-0002	---	---
Cable line	Times	SFT205-NMSM-2.50M	394812-0003	---	---
Cable line	Times	SFT205-NMSM-2.50M	393495-0001	---	---
Cable line	Times	EMC104-NMNM-1000	SN160710	---	---
Cable line	Times	SFT205-NMSM-3.00M	394813-0001	---	---
Cable line	Times	SFT205-NMNM-1.50M	381964-0001	---	---
Cable line	Times	SFT205-NMSM-7.00M	394815-0001	---	---
Cable line	Times	HF160-KMKM-3.00M	393493-0001	---	---

8 Radio Technical Requirements Specification

Reference documents for testing:

No.	Identity	Document Title
1	FCC Part15C	Subpart C-Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicesed Wireless Devices

Test Results List:

Test Requirement	Test method	Test item	Verdict	Note
Part15C Section 15.247 (a)(2)	ANSI C63.10	6dB Occupied Bandwidth	PASS	Appendix A)
Part15C Section 15.247 (b)(3)	ANSI C63.10	Conducted Peak Output Power	PASS	Appendix B)
Part15C Section 15.247(d)	ANSI C63.10	Band-edge for RF Conducted Emissions	PASS	Appendix C)
Part15C Section 15.247(d)	ANSI C63.10	RF Conducted Spurious Emissions	PASS	Appendix D)
Part15C Section 15.247 (e)	ANSI C63.10	Power Spectral Density	PASS	Appendix E)
Part15C Section 15.203/15.247 (c)	ANSI C63.10	Antenna Requirement	PASS	Appendix F)
Part15C Section 15.207	ANSI C63.10	AC Power Line Conducted Emission	PASS	N/A
Part15C Section 15.205/15.209	ANSI C63.10	Restricted bands around fundamental frequency (Radiated Emission)	PASS	Appendix G)
Part15C Section 15.205/15.209	ANSI C63.10	Radiated Spurious Emissions	PASS	Appendix H)

Appendix A): 6dB Occupied Bandwidth

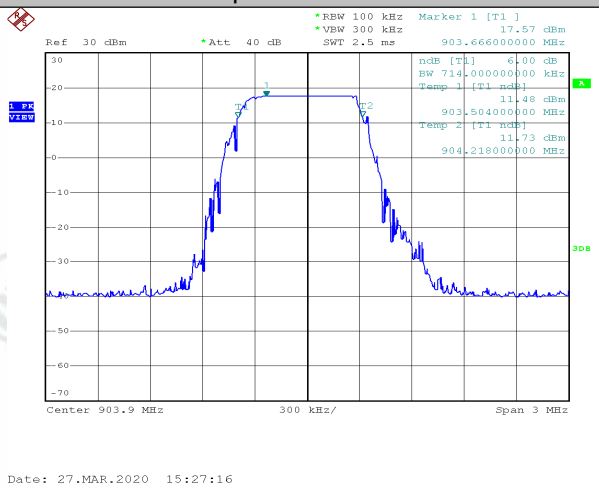
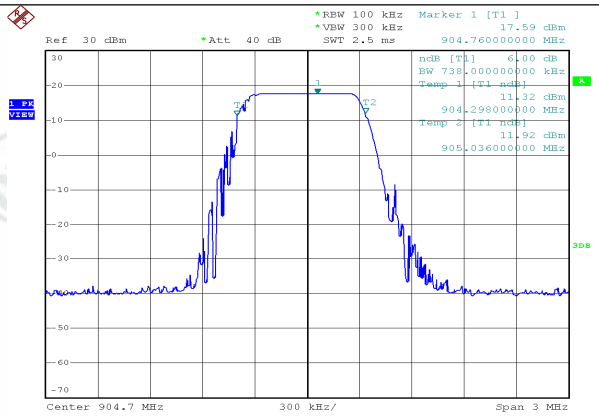
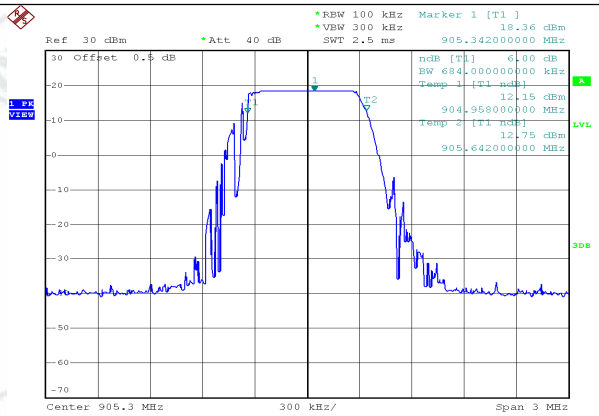
Test Result

6dB Bandwidth

Channel	6dB Bandwidth [MHz]	Verdict
903.9MHz	0.714	PASS
904.7MHz	0.738	PASS
905.3MHz	0.684	PASS

Test Graphs

6dB Bandwidth

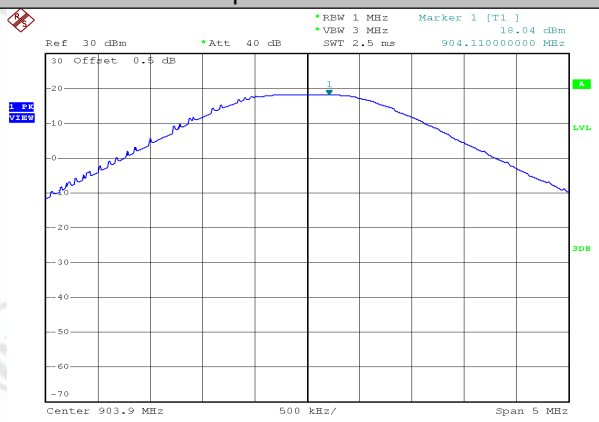
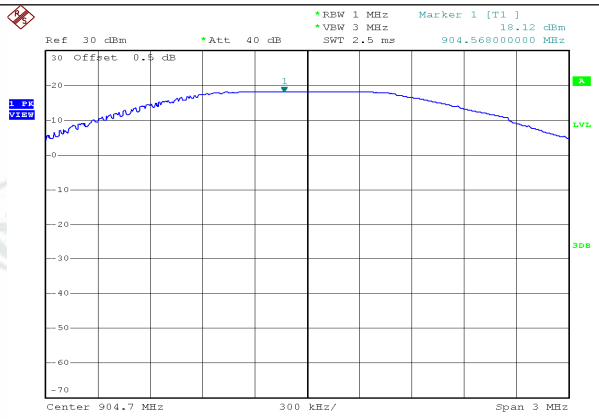
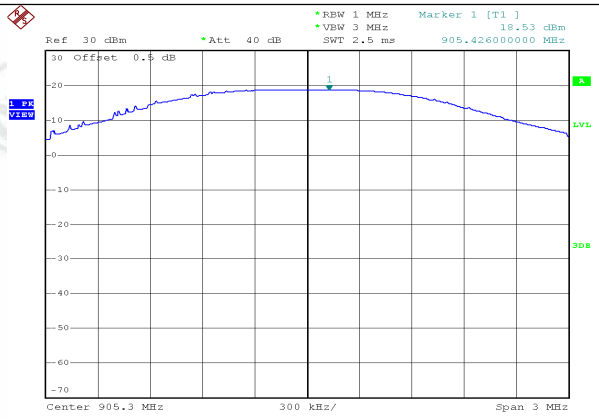
Graphs	
903.9MHz	
904.7MHz	
905.3MHz	

Appendix B): Conducted Peak Output Power

Test Result

Channel	Conduct Peak Power[dBm]	Verdict
903.9MHz	18.04	PASS
904.7MHz	18.12	PASS
905.3MHz	18.53	PASS

Test Graphs

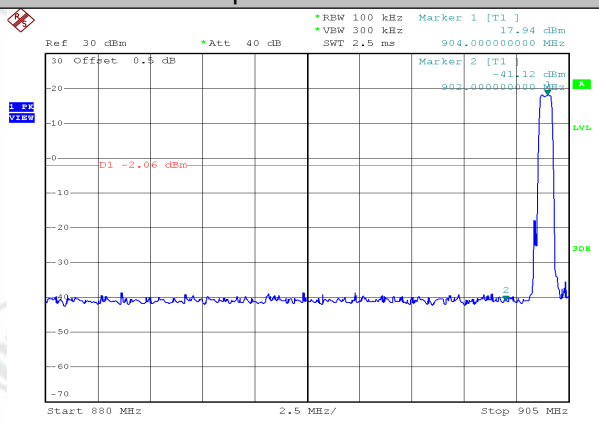
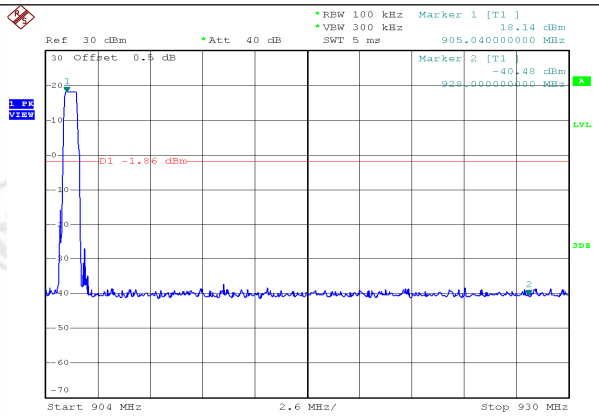
Graphs	
903.9MHz	
904.7MHz	
905.3MHz	

Appendix C): Band-edge for RF Conducted Emissions

Result Table

Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
903.9MHz	17.94	-41.12	-2.06	PASS
905.3MHz	18.14	-40.48	-1.86	PASS

Test Graphs

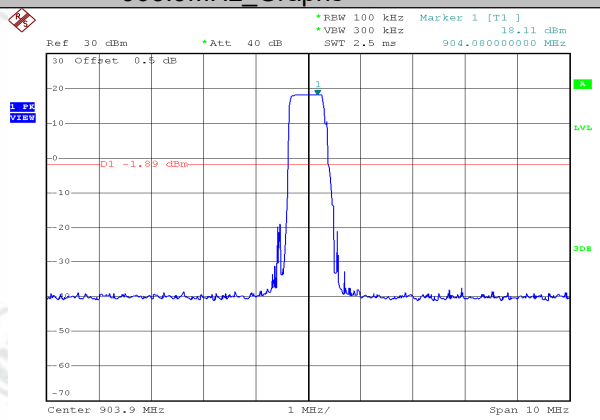
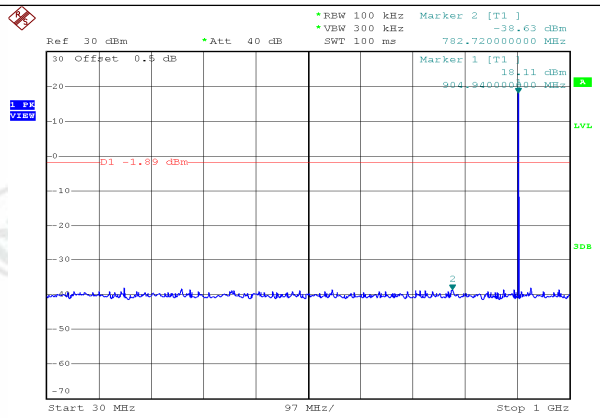
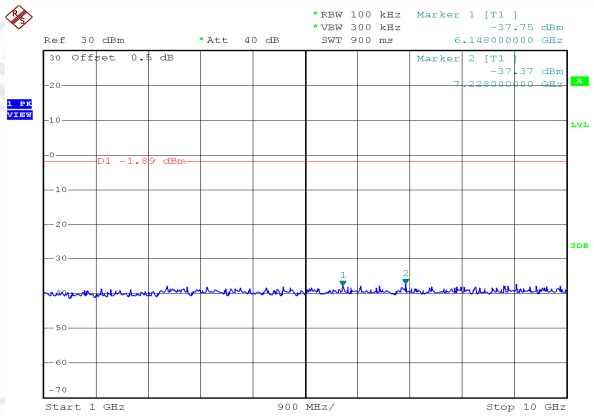
Graphs	
903.9MHz	 Date: 27.MAR.2020 18:56:38
905.3MHz	 Date: 27.MAR.2020 19:19:00

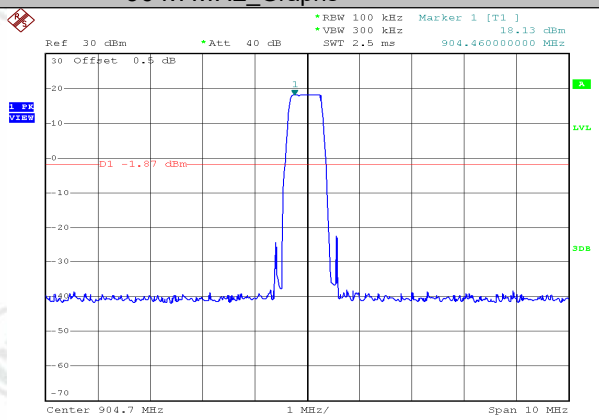
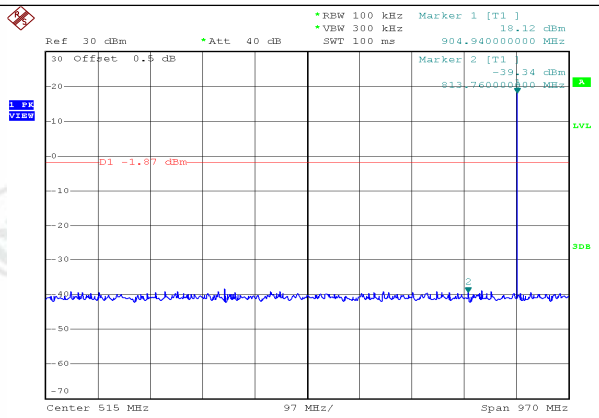
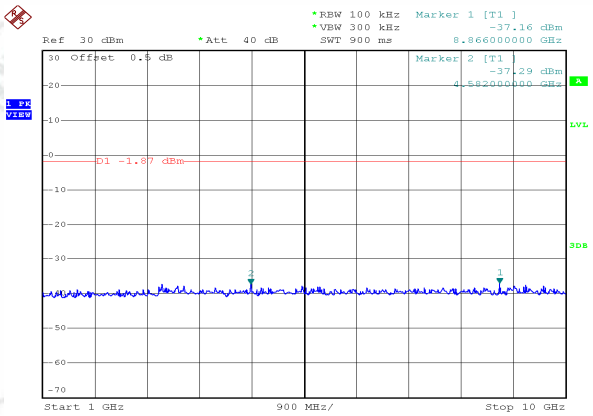
Appendix D): RF Conducted Spurious Emissions

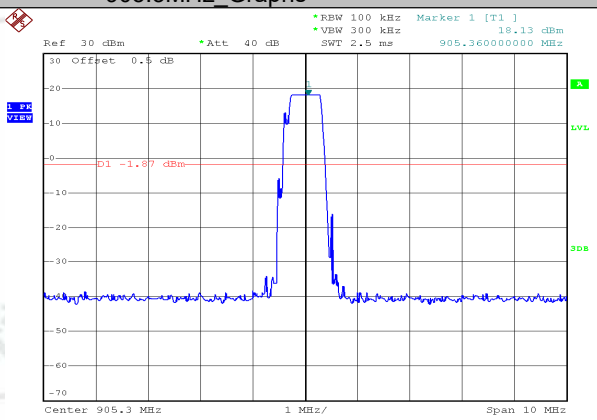
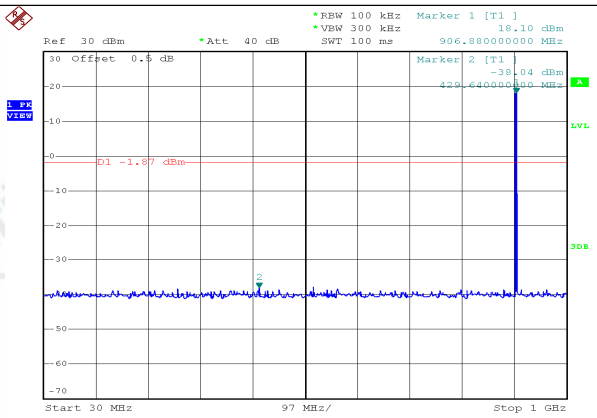
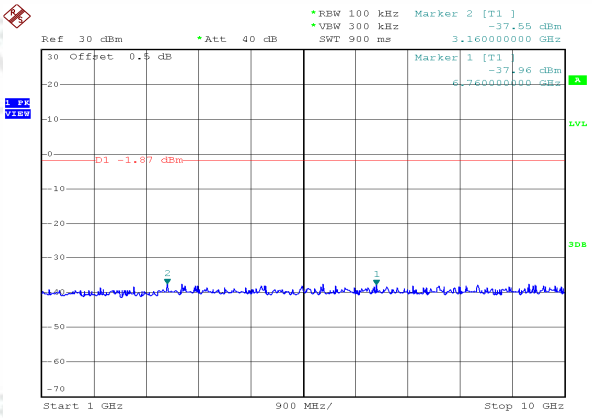
Result Table

Channel	Pref [dBm]	Puw[dBm]	Verdict
903.9MHz	18.11	<Limit	PASS
904.7MHz	18.13	<Limit	PASS
905.3MHz	18.13	<Limit	PASS

Test Graphs

903.9MHz_Graphs	
Pref	 Date: 27.MAR.2020 19:01:52
Puw	 Date: 27.MAR.2020 19:04:31  Date: 27.MAR.2020 19:06:00

904.7MHz_Graphs	
Pref	 Date: 27.MAR.2020 19:13:29
Puw	 Date: 27.MAR.2020 19:14:46  Date: 27.MAR.2020 19:16:01

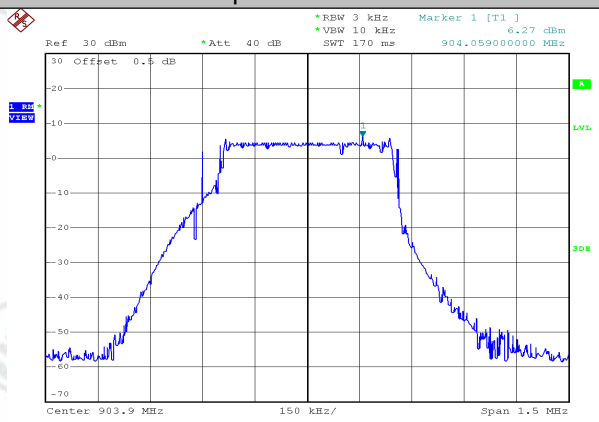
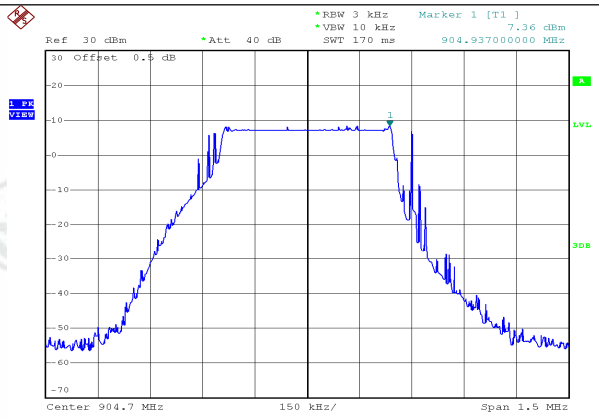
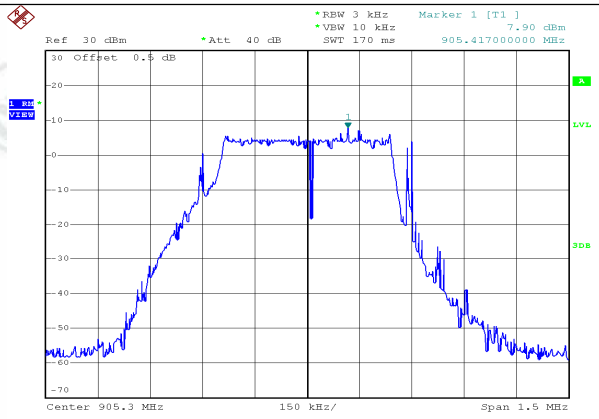
905.3MHz_Graphs	
Pref	
Puw	
	

Appendix E): Power Spectral Density

Result Table

Channel	PSD [dBm]	Verdict
903.9MHz	6.27	PASS
904.7MHz	7.36	PASS
905.3MHz	7.90	PASS

Test Graphs

Graphs	
903.9MHz	
904.7MHz	
905.3MHz	

Appendix F): Antenna Requirement

15.203 requirement:

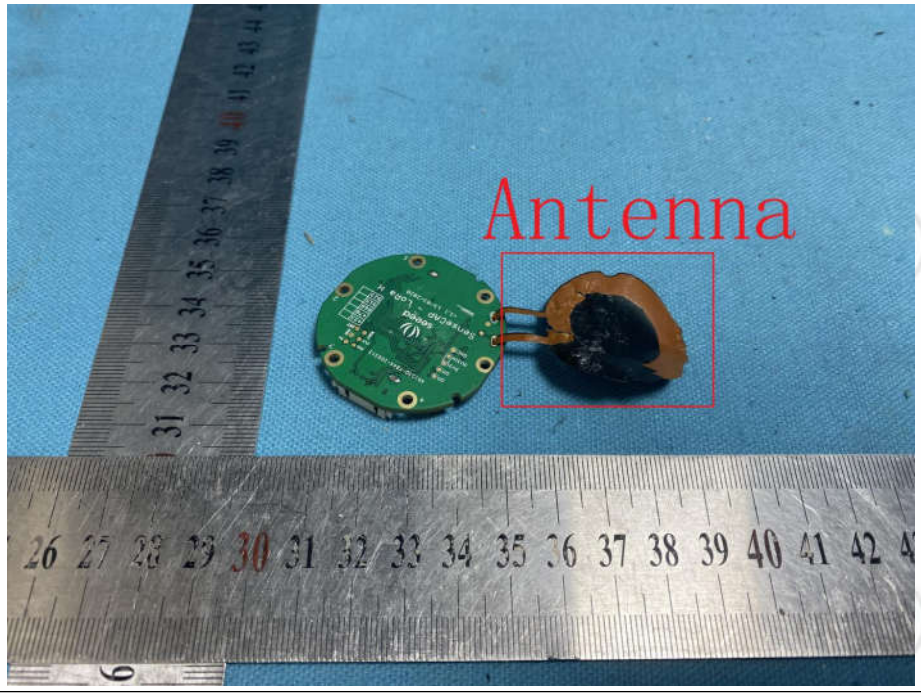
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:	

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is -2dBi.



Appendix G): Restricted bands around fundamental frequency (Radiated)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Test Procedure:

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
h. . Test the EUT in the lowest channel , the Highest channel
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
j. Repeat above procedures until all frequencies measured was complete.

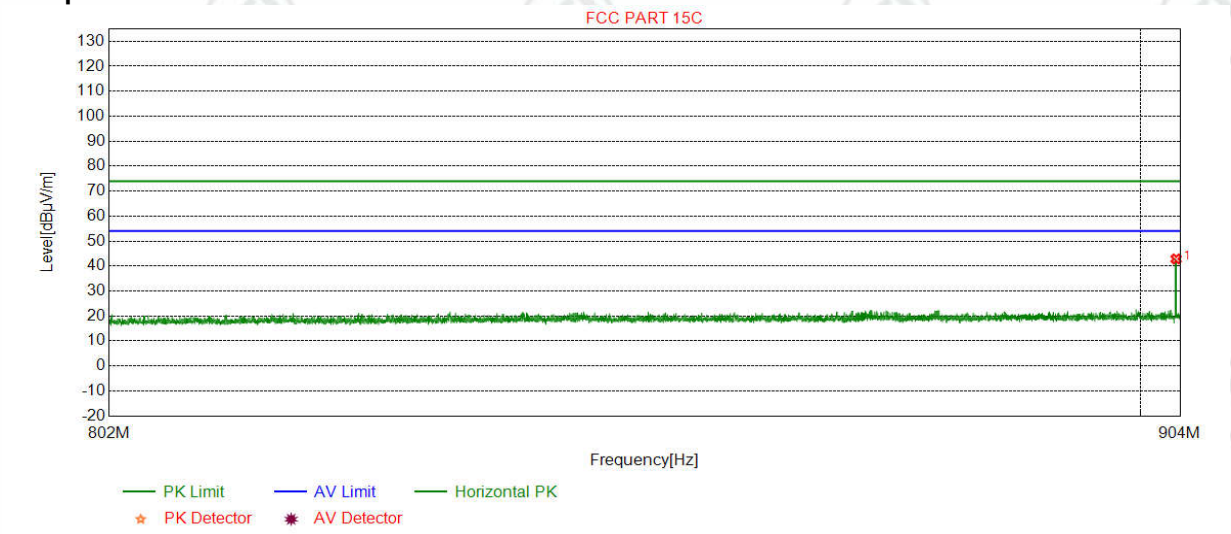
Limit:

Frequency	Limit (dBμV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

Test plot as follows:

Mode:	LoRa	Channel:	903.9MHz
Remark:	PK		

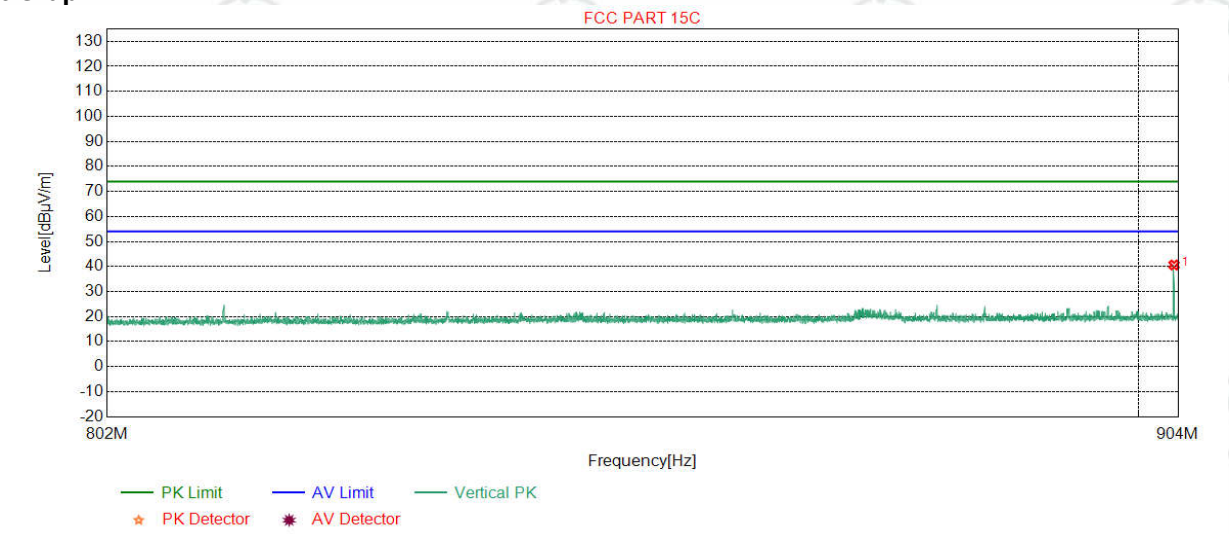
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	903.6124	22.12	3.60	-31.43	48.55	42.84	74.00	31.16	Pass	Horizontal

Mode:	LoRa	Channel:	903.9MHz
Remark:	PK		

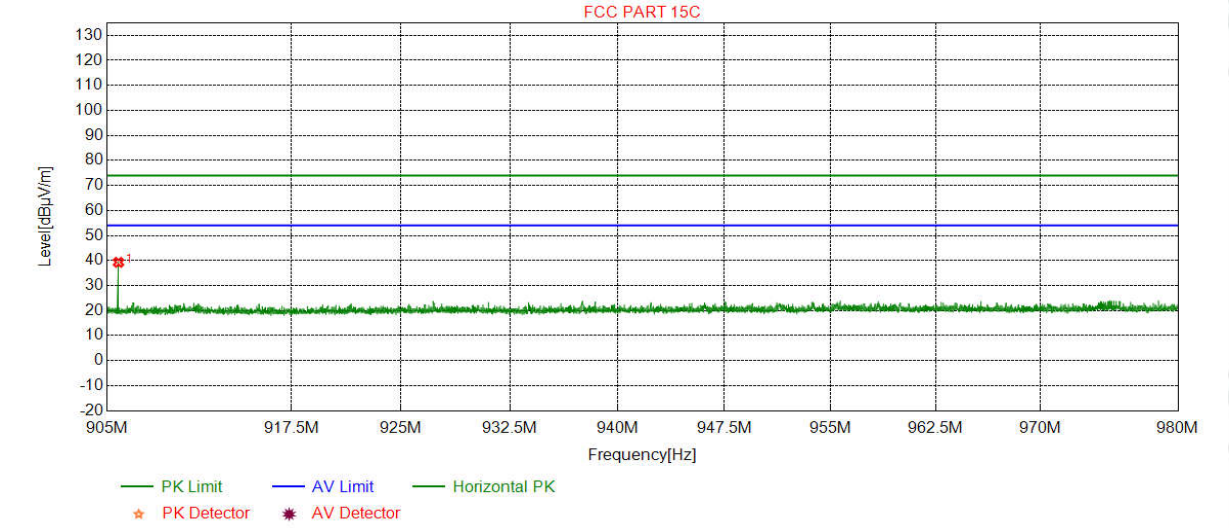
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	903.6022	22.12	3.60	-31.43	46.32	40.61	74.00	33.39	Pass	Vertical

Mode:	LoRa	Channel:	905.3MHz
Remark:	PK		

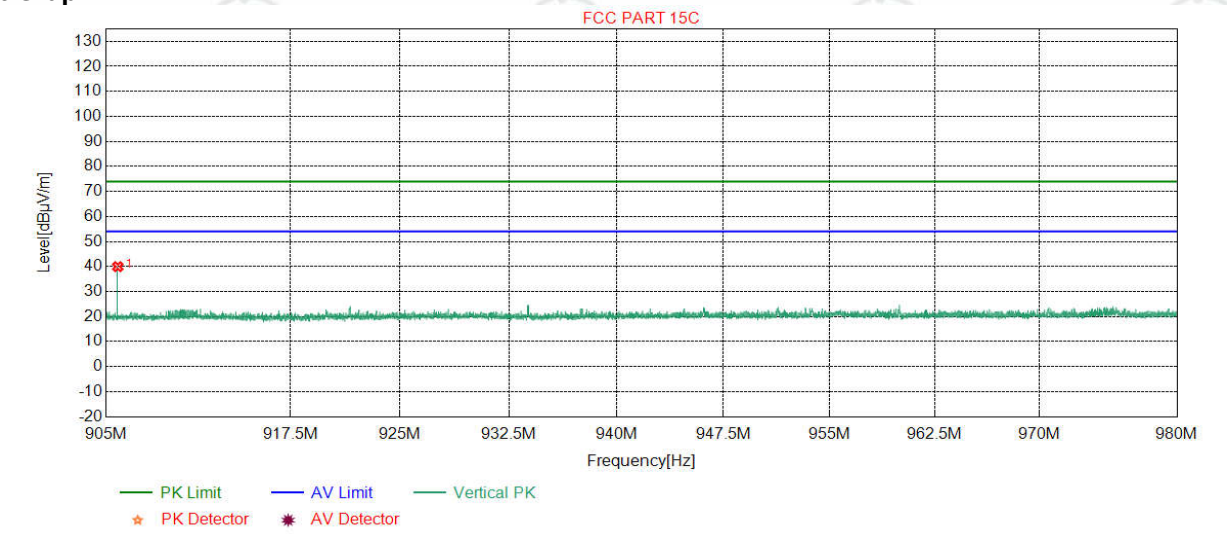
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	905.7651	22.13	3.60	-31.44	45.00	39.29	74.00	34.71	Pass	Horizontal

Mode:	LoRa	Channel:	905.3MHz
Remark:	PK		

Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	905.7876	22.13	3.60	-31.44	45.67	39.96	74.00	34.04	Pass	Vertical

Note:
1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level =Receiver Reading -Correct Factor

Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

Appendix H) Radiated Spurious Emissions

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Test Procedure:

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, whichwas mounted on the top of a variable-height antenna tower.
c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
j. Repeat above procedures until all frequencies measured was complete.

Limit:

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Radiated Spurious Emissions test Data:

Radiated Emission below 1GHz

Mode:		LoRa	Channel:		903.9		Remark:	Air Pressure Sensor			
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	36.0146	11.02	0.66	-31.39	36.86	17.15	40.00	22.85	Pass	H	PK
2	140.0090	7.20	1.39	-31.99	40.33	16.93	43.50	26.57	Pass	H	PK
3	208.8859	11.13	1.71	-31.94	40.43	21.33	43.50	22.17	Pass	H	PK
4	240.0260	11.94	1.84	-31.90	39.86	21.74	46.00	24.26	Pass	H	PK
5	360.0270	14.52	2.27	-31.84	43.84	28.79	46.00	17.21	Pass	H	PK
6	649.8920	19.40	3.10	-32.07	40.01	30.44	46.00	15.56	Pass	H	PK
7	35.2385	10.78	0.65	-31.42	44.68	24.69	40.00	15.31	Pass	V	PK
8	57.4537	12.01	0.87	-31.88	38.24	19.24	40.00	20.76	Pass	V	PK
9	150.0010	7.55	1.45	-32.01	48.14	25.13	43.50	18.37	Pass	V	PK
10	195.0135	10.43	1.64	-31.94	45.69	25.82	43.50	17.68	Pass	V	PK
11	360.0270	14.52	2.27	-31.84	41.38	26.33	46.00	19.67	Pass	V	PK
12	649.9890	19.40	3.10	-32.07	40.07	30.50	46.00	15.50	Pass	V	PK

Mode:		LoRa	Channel:		904.7		Remark:	Air Pressure Sensor			
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	70.7441	8.86	0.96	-32.04	35.04	12.82	40.00	27.18	Pass	H	PK
2	140.0090	7.20	1.39	-31.99	40.26	16.86	43.50	26.64	Pass	H	PK
3	195.0135	10.43	1.64	-31.94	40.34	20.47	43.50	23.03	Pass	H	PK
4	240.0260	11.94	1.84	-31.90	38.98	20.86	46.00	25.14	Pass	H	PK
5	360.0270	14.52	2.27	-31.84	44.99	29.94	46.00	16.06	Pass	H	PK
6	649.9890	19.40	3.10	-32.07	39.66	30.09	46.00	15.91	Pass	H	PK
7	35.8206	10.96	0.66	-31.40	43.48	23.70	40.00	16.30	Pass	V	PK
8	52.5063	12.80	0.82	-32.04	39.06	20.64	40.00	19.36	Pass	V	PK
9	150.0010	7.55	1.45	-32.01	48.05	25.04	43.50	18.46	Pass	V	PK
10	195.0135	10.43	1.64	-31.94	45.46	25.59	43.50	17.91	Pass	V	PK
11	360.0270	14.52	2.27	-31.84	42.95	27.90	46.00	18.10	Pass	V	PK
12	649.9890	19.40	3.10	-32.07	39.94	30.37	46.00	15.63	Pass	V	PK

Mode:		LoRa	Channel:		905.3		Remark:	Air Pressure Sensor			
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	36.5967	11.21	0.67	-31.38	39.16	19.66	40.00	20.34	Pass	H	PK
2	71.1321	8.78	0.96	-32.02	33.88	11.60	40.00	28.40	Pass	H	PK
3	140.0090	7.20	1.39	-31.99	39.98	16.58	43.50	26.92	Pass	H	PK
4	195.0135	10.43	1.64	-31.94	41.32	21.45	43.50	22.05	Pass	H	PK
5	360.0270	14.52	2.27	-31.84	43.90	28.85	46.00	17.15	Pass	H	PK
6	649.9890	19.40	3.10	-32.07	40.17	30.60	46.00	15.40	Pass	H	PK
7	35.5296	10.87	0.66	-31.41	43.79	23.91	40.00	16.09	Pass	V	PK
8	52.6033	12.78	0.82	-32.03	38.56	20.13	40.00	19.87	Pass	V	PK
9	150.0010	7.55	1.45	-32.01	48.16	25.15	43.50	18.35	Pass	V	PK
10	195.0135	10.43	1.64	-31.94	45.76	25.89	43.50	17.61	Pass	V	PK
11	360.0270	14.52	2.27	-31.84	43.13	28.08	46.00	17.92	Pass	V	PK
12	649.9890	19.40	3.10	-32.07	39.80	30.23	46.00	15.77	Pass	V	PK

Mode:		LoRa	Channel:		905.3		Remark:	TH Sensor			
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	36.5967	11.21	0.67	-31.38	39.27	19.77	40.00	20.23	Pass	H	PK
2	52.6033	12.78	0.82	-32.03	31.45	13.02	40.00	26.98	Pass	H	PK
3	140.0090	7.20	1.39	-31.99	42.40	19.00	43.50	24.50	Pass	H	PK
4	195.0135	10.43	1.64	-31.94	40.96	21.09	43.50	22.41	Pass	H	PK
5	360.0270	14.52	2.27	-31.84	43.09	28.04	46.00	17.96	Pass	H	PK
6	653.9664	19.43	3.08	-32.04	44.06	34.53	46.00	11.47	Pass	H	PK
7	35.5296	10.87	0.66	-31.41	44.67	24.79	40.00	15.21	Pass	V	PK
8	53.5734	12.63	0.83	-32.01	40.15	21.60	40.00	18.40	Pass	V	PK
9	150.0010	7.55	1.45	-32.01	47.73	24.72	43.50	18.78	Pass	V	PK
10	195.0135	10.43	1.64	-31.94	45.50	25.63	43.50	17.87	Pass	V	PK
11	360.0270	14.52	2.27	-31.84	43.51	28.46	46.00	17.54	Pass	V	PK
12	649.9890	19.40	3.10	-32.07	35.87	26.30	46.00	19.70	Pass	V	PK

Mode:		LoRa	Channel:		905.3		Remark:	Co2 Sensor			
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	36.5967	11.21	0.67	-31.38	36.31	16.81	40.00	23.19	Pass	H	PK
2	140.0090	7.20	1.39	-31.99	41.85	18.45	43.50	25.05	Pass	H	PK
3	195.0135	10.43	1.64	-31.94	40.76	20.89	43.50	22.61	Pass	H	PK
4	240.0260	11.94	1.84	-31.90	39.25	21.13	46.00	24.87	Pass	H	PK
5	360.0270	14.52	2.27	-31.84	43.93	28.88	46.00	17.12	Pass	H	PK
6	654.3544	19.43	3.08	-32.04	38.44	28.91	46.00	17.09	Pass	H	PK
7	34.8505	10.69	0.65	-31.43	43.22	23.13	40.00	16.87	Pass	V	PK
8	53.2823	12.67	0.83	-32.01	38.12	19.61	40.00	20.39	Pass	V	PK
9	150.0010	7.55	1.45	-32.01	47.42	24.41	43.50	19.09	Pass	V	PK
10	195.0135	10.43	1.64	-31.94	45.62	25.75	43.50	17.75	Pass	V	PK
11	360.0270	14.52	2.27	-31.84	43.42	28.37	46.00	17.63	Pass	V	PK
12	649.9890	19.40	3.10	-32.07	35.75	26.18	46.00	19.82	Pass	V	PK

Mode:		LoRa	Channel:		905.3		Remark:	Light Sensor			
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	36.5967	11.21	0.67	-31.38	39.47	19.97	40.00	20.03	Pass	H	PK
2	140.0090	7.20	1.39	-31.99	42.99	19.59	43.50	23.91	Pass	H	PK
3	195.0135	10.43	1.64	-31.94	40.67	20.80	43.50	22.70	Pass	H	PK
4	240.0260	11.94	1.84	-31.90	38.55	20.43	46.00	25.57	Pass	H	PK
5	360.0270	14.52	2.27	-31.84	43.90	28.85	46.00	17.15	Pass	H	PK
6	649.9890	19.40	3.10	-32.07	36.56	26.99	46.00	19.01	Pass	H	PK
7	36.3056	11.12	0.67	-31.40	43.75	24.14	40.00	15.86	Pass	V	PK
8	52.8943	12.74	0.82	-32.03	38.19	19.72	40.00	20.28	Pass	V	PK
9	150.0010	7.55	1.45	-32.01	47.48	24.47	43.50	19.03	Pass	V	PK
10	195.0135	10.43	1.64	-31.94	46.16	26.29	43.50	17.21	Pass	V	PK
11	360.0270	14.52	2.27	-31.84	42.68	27.63	46.00	18.37	Pass	V	PK
12	649.9890	19.40	3.10	-32.07	36.97	27.40	46.00	18.60	Pass	V	PK

Transmitter Emission above 1GHz

Mode:		LoRa	Channel:		903.9		Remark:	Air Pressure Sensor			
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1414.9766	28.31	2.92	-42.74	51.68	40.17	74.00	33.83	Pass	H	PK
2	1807.5523	30.43	3.02	-42.73	62.75	53.47	74.00	20.53	Pass	H	PK
3	4060.5224	33.88	4.19	-42.97	49.99	45.09	74.00	28.91	Pass	H	PK
4	5015.3606	34.52	4.76	-42.80	50.74	47.22	74.00	26.78	Pass	H	PK
5	7523.1409	36.59	6.03	-42.11	49.19	49.70	74.00	24.30	Pass	H	PK
6	9160.0864	37.67	6.43	-42.03	50.03	52.10	74.00	21.90	Pass	H	PK
7	1311.9325	28.21	2.96	-42.77	51.69	40.09	74.00	33.91	Pass	V	PK
8	1808.1123	30.43	3.02	-42.72	66.18	56.91	74.00	17.09	Pass	V	PK
9	2711.9885	32.74	3.70	-43.10	57.77	51.11	74.00	22.89	Pass	V	PK
10	5003.0401	34.50	4.74	-42.79	52.06	48.51	74.00	25.49	Pass	V	PK
11	6096.7639	35.82	5.43	-42.58	49.24	47.91	74.00	26.09	Pass	V	PK
12	7575.2230	36.57	5.95	-42.11	49.63	50.04	74.00	23.96	Pass	V	PK
13	1808.1116	30.43	3.02	-42.73	62.01	52.73	54.00	1.27	Pass	V	AV

Mode:		LoRa	Channel:		904.7		Remark:	Air Pressure Sensor			
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1809.2324	30.44	3.03	-42.74	62.11	52.84	74.00	21.16	Pass	H	PK
2	2714.2286	32.74	3.70	-43.10	53.22	46.56	74.00	27.44	Pass	H	PK
3	5017.0407	34.52	4.76	-42.80	51.84	48.32	74.00	25.68	Pass	H	PK
4	5479.0592	34.98	5.08	-42.61	50.51	47.96	74.00	26.04	Pass	H	PK
5	7858.0343	36.46	6.14	-42.17	49.49	49.92	74.00	24.08	Pass	H	PK
6	9067.6827	37.69	6.48	-42.01	49.71	51.87	74.00	22.13	Pass	H	PK
7	1809.2324	30.44	3.03	-42.74	68.00	58.73	74.00	15.27	Pass	V	PK
8	2714.2286	32.74	3.70	-43.10	54.43	47.77	74.00	26.23	Pass	V	PK
9	3927.2371	33.74	4.16	-43.02	50.39	45.27	74.00	28.73	Pass	V	PK
10	5013.1205	34.51	4.75	-42.79	50.86	47.33	74.00	26.67	Pass	V	PK
11	6407.0163	35.88	5.40	-42.52	50.62	49.38	74.00	24.62	Pass	V	PK
12	7586.9835	36.57	5.94	-42.12	49.53	49.92	74.00	24.08	Pass	V	PK
13	1809.2324	30.44	3.03	-42.74	62.23	52.96	54.00	1.04	Pass	V	AV

Mode:		LoRa	Channel:		905.3		Remark:	Air Pressure Sensor			
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1810.3524	30.45	3.03	-42.74	61.82	52.56	74.00	21.44	Pass	H	PK
2	2715.9086	32.75	3.70	-43.11	52.73	46.07	74.00	27.93	Pass	H	PK
3	3797.3119	33.64	4.22	-43.05	50.05	44.86	74.00	29.14	Pass	H	PK
4	5026.0010	34.53	4.77	-42.80	51.37	47.87	74.00	26.13	Pass	H	PK
5	6880.7952	36.05	5.77	-42.27	49.94	49.49	74.00	24.51	Pass	H	PK
6	8537.9015	36.68	6.25	-41.99	49.95	50.89	74.00	23.11	Pass	H	PK
7	1810.9124	30.45	3.03	-42.74	69.37	60.11	74.00	13.89	Pass	V	PK
8	2715.9086	32.75	3.70	-43.11	54.23	47.57	74.00	26.43	Pass	V	PK
9	3083.8434	33.23	3.72	-43.10	50.69	44.54	74.00	29.46	Pass	V	PK
10	5006.4003	34.51	4.75	-42.80	51.06	47.52	74.00	26.48	Pass	V	PK
11	6498.2999	35.90	5.60	-42.50	50.27	49.27	74.00	24.73	Pass	V	PK
12	9748.1099	37.70	6.80	-42.11	50.76	53.15	74.00	20.85	Pass	V	PK
13	1810.9116	30.45	3.03	-42.74	63.11	53.85	54.00	0.15	Pass	V	AV

Mode:		LoRa	Channel:		905.3		Remark:	Light Sensor			
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1810.3524	30.45	3.03	-42.74	55.65	46.39	74.00	27.61	Pass	H	PK
2	2598.3039	32.56	3.53	-43.10	52.47	45.46	74.00	28.54	Pass	H	PK
3	3879.0752	33.70	4.18	-43.02	50.32	45.18	74.00	28.82	Pass	H	PK
4	5023.2009	34.52	4.76	-42.78	51.23	47.73	74.00	26.27	Pass	H	PK
5	6404.2162	35.88	5.40	-42.52	50.62	49.38	74.00	24.62	Pass	H	PK
6	9092.3237	37.68	6.47	-42.01	50.17	52.31	74.00	21.69	Pass	H	PK
7	1810.9124	30.45	3.03	-42.74	59.85	50.59	74.00	23.41	Pass	V	PK
8	3000.4000	33.20	3.88	-43.10	52.06	46.04	74.00	27.96	Pass	V	PK
9	5012.5605	34.51	4.75	-42.79	50.96	47.43	74.00	26.57	Pass	V	PK
10	6495.4998	35.90	5.60	-42.51	50.16	49.15	74.00	24.85	Pass	V	PK
11	7677.7071	36.53	6.00	-42.13	49.39	49.79	74.00	24.21	Pass	V	PK
12	9081.6833	37.68	6.48	-42.02	50.19	52.33	74.00	21.67	Pass	V	PK

Mode:		LoRa	Channel:		905.3		Remark:	Co2 Sensor			
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1810.3524	30.45	3.03	-42.74	61.90	52.64	74.00	21.36	Pass	H	PK
2	2715.3486	32.74	3.70	-43.10	55.13	48.47	74.00	25.53	Pass	H	PK
3	5013.1205	34.51	4.75	-42.79	50.88	47.35	74.00	26.65	Pass	H	PK
4	5997.0799	35.80	5.10	-42.60	49.58	47.88	74.00	26.12	Pass	H	PK
5	7231.3693	36.33	5.74	-42.16	50.16	50.07	74.00	23.93	Pass	H	PK
6	9760.4304	37.70	6.79	-42.09	49.87	52.27	74.00	21.73	Pass	H	PK
7	1810.3524	30.45	3.03	-42.74	64.55	55.29	74.00	18.71	Pass	V	PK
8	2715.9086	32.75	3.70	-43.11	53.69	47.03	74.00	26.97	Pass	V	PK
9	4416.1366	34.38	4.29	-42.84	50.35	46.18	74.00	27.82	Pass	V	PK
10	5013.1205	34.51	4.75	-42.79	51.04	47.51	74.00	26.49	Pass	V	PK
11	6888.0755	36.06	5.81	-42.27	49.73	49.33	74.00	24.67	Pass	V	PK
12	9165.1266	37.67	6.43	-42.04	50.09	52.15	74.00	21.85	Pass	V	PK
13	1810.3524	30.45	3.03	-42.74	63.15	53.89	54.00	0.11	Pass	V	AV

Mode:		LoRa	Channel:		905.3		Remark:	TH Sensor			
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1810.3524	30.45	3.03	-42.74	52.01	42.75	74.00	31.25	Pass	H	PK
2	2893.4357	33.03	3.85	-43.10	50.78	44.56	74.00	29.44	Pass	H	PK
3	4992.3997	34.50	4.72	-42.80	51.12	47.54	74.00	26.46	Pass	H	PK
4	6860.0744	36.04	5.65	-42.28	50.28	49.69	74.00	24.31	Pass	H	PK
5	8419.7368	36.57	6.41	-42.03	49.67	50.62	74.00	23.38	Pass	H	PK
6	10363.014	38.31	7.10	-42.03	50.07	53.45	74.00	20.55	Pass	H	PK
7	1810.3524	30.45	3.03	-42.74	56.93	47.67	74.00	26.33	Pass	V	PK
8	2388.8556	32.24	3.42	-43.11	52.14	44.69	74.00	29.31	Pass	V	PK
9	3059.2024	33.22	3.73	-43.10	51.51	45.36	74.00	28.64	Pass	V	PK
10	5036.6415	34.54	4.78	-42.79	51.38	47.91	74.00	26.09	Pass	V	PK
11	6490.4596	35.90	5.58	-42.50	49.94	48.92	74.00	25.08	Pass	V	PK
12	8393.4157	36.56	6.40	-42.05	49.83	50.74	74.00	23.26	Pass	V	PK

Note:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading -Correct Factor

Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

2) Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.