

FCC Co-Location Test Report

FCC ID : MXF-WAPD246ACN
Equipment : WAPD-246ACN_LoRa gateway
Model No. : WAPD-246ACN
Brand Name : Gemtek
Applicant : Gemtek Technology Co., Ltd.
Address : No.15-1 Zhonghua Road, Hsinchu Industrial
Park, Hukou, Hsinchu, Taiwan, 30352
Standard : 47 CFR FCC Part 15.247
Received Date : Jul. 26, 2017
Tested Date : Aug. 23, 2017

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:



Along Chen / Assistant Manager

Approved by:



Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
FR780201CO	Rev. 01	Initial issue	Sep. 06, 2017

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 44.56MHz 38.99 (Margin -0.01dB) - QP	Pass

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

LoRa	
Operating Frequency	923.3 MHz ~ 927.5 MHz
Modulation Type	CSS

1.1.2 Antenna Details

Ant. No.	Type	Connector	Gain (dBi)	Remark
1	Dipole	N type	0	---

1.1.3 Specification of the LTE Certified Module

The device contains a certified wireless LTE modules as below

FCC ID	QISME936
Operating Frequency Band and Channel Bandwidth	1850 MHz – 1910 MHz: 1.4 / 3 / 5 / 10 / 15 / 20 MHz 1710 MHz – 1755 MHz: 1.4 / 3 / 5 / 10 / 15 / 20 MHz 2500 MHz – 2570 MHz: 5 / 10 / 15 / 20 MHz
Antenna Type and Gain	Dipole antenna 1850 MHz – 1910 MHz: -0.05 dBi 1710 MHz – 1755 MHz: 0.34 dBi 2500 MHz – 2570 MHz: 1.89 dBi

1.1.4 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	55Vdc from POE
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1.2 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101498	Nov. 25, 2016	Nov. 24, 2017
Receiver	R&S	ESR3	101658	Nov. 24, 2016	Nov. 23, 2017
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jul. 25, 2017	Jul. 24, 2018
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 21, 2016	Dec. 20, 2017
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Oct. 25, 2016	Oct. 24, 2017
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 10, 2016	Nov. 09, 2017
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 09, 2016	Dec. 08, 2017
Preamplifier	EMC	EMC02325	980225	Jul. 28, 2017	Jul. 27, 2018
Preamplifier	Agilent	83017A	MY39501308	Oct. 06, 2016	Oct. 05, 2017
Preamplifier	EMC	EMC184045B	980192	Aug. 22, 2017	Aug. 21, 2018
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 09, 2016	Dec. 08, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 09, 2016	Dec. 08, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 09, 2016	Dec. 08, 2017
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	16052	Dec. 09, 2016	Dec. 08, 2017
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 09, 2016	Dec. 08, 2017
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 09, 2016	Dec. 08, 2017
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.3 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.247

ANSI C63.10-2013

FCC KDB 558074 D01 DTS Meas Guidance v04

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

Measurement Uncertainty	
Parameters	Uncertainty
Radiated emission $\leq$ 1GHz	± 3.66 dB
Radiated emission $>$ 1GHz	± 5.63 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
Radiated Emissions	03CH01-WS	24°C / 63%	Kevin Lee

- FCC Designation No.: TW2732
- FCC site registration No.: 181692
- IC site registration No.: 10807A-1

2.2 The Worst Test Modes and Channel Details

Test item	Test Mode
Radiated Emissions	Lora0 923.3 + Lora1 927.5 + LTE B2 QPSK 15M CH18900 1RB Offset74 (1886.8MHz)
	Lora0 923.3 + Lora1 927.5 + LTE B4 QPSK 15M CH20325 1RB Offset0 (1740.8MHz)
	Lora0 923.3 + Lora1 927.5 + LTE B7 QPSK 15M CH21375 1RB Offset0 (2555.8MHz)

Note: The selected channel is the maximum power channel of each function

3 Transmitter Test Results

3.1 Unwanted Emissions into Restricted Frequency Bands

3.1.1 Limit of Unwanted Emissions into Restricted Frequency Bands

Restricted Band Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9~90 kHz, 110~490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit

Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.1.2 Test Procedures

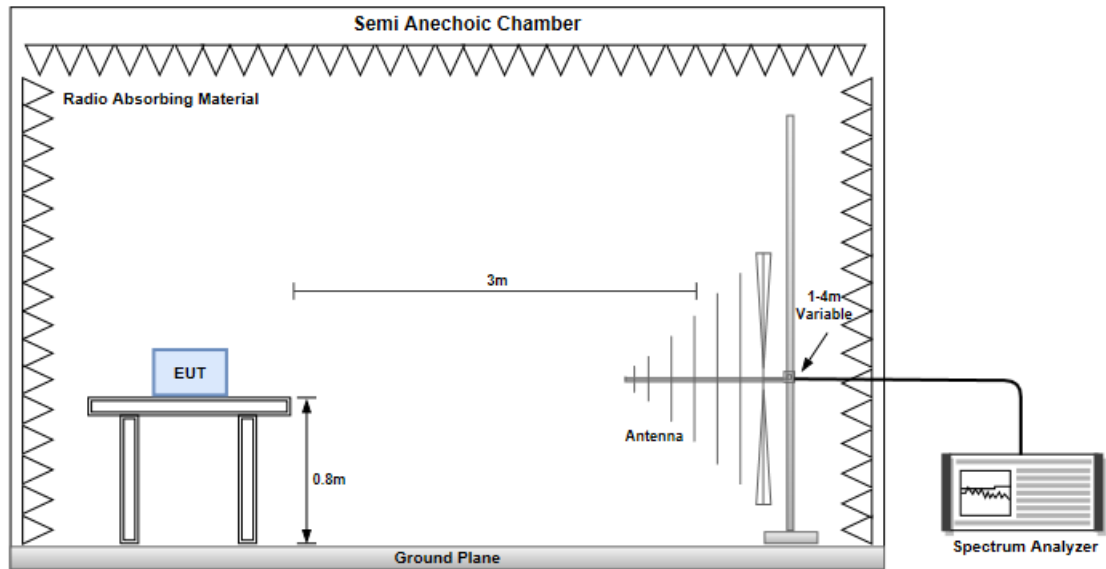
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m.
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

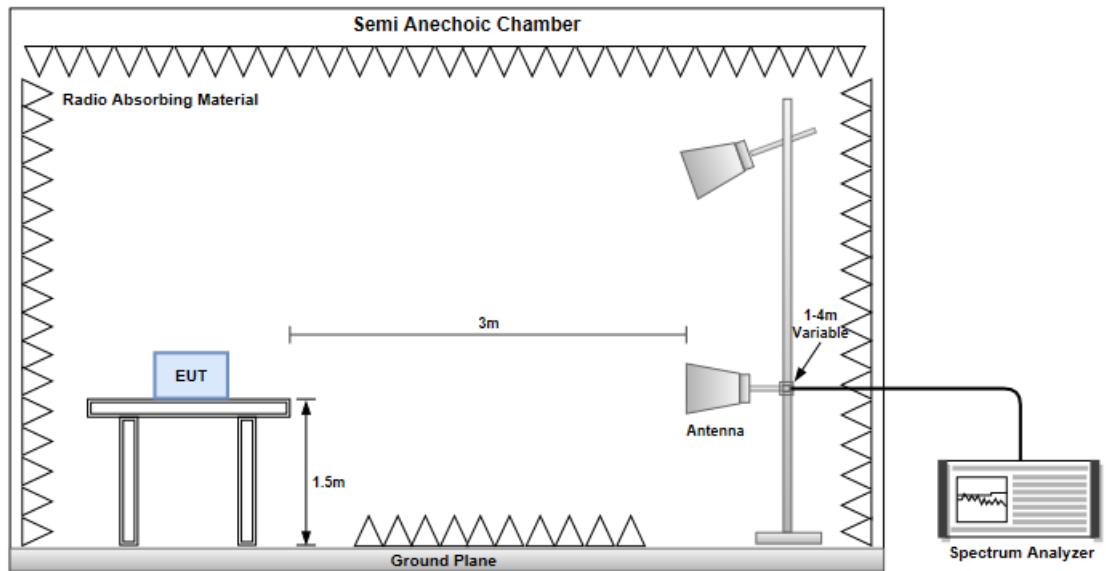
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

3.1.3 Test Setup

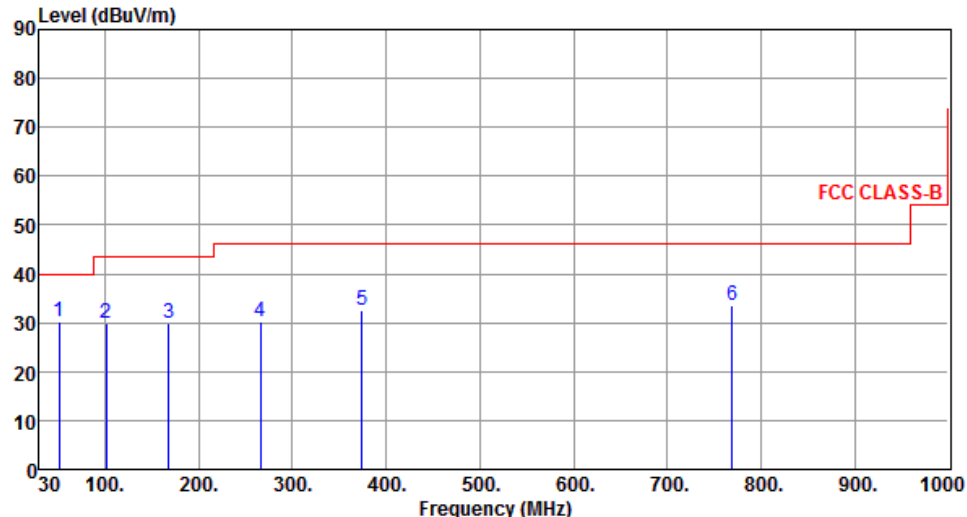
Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz



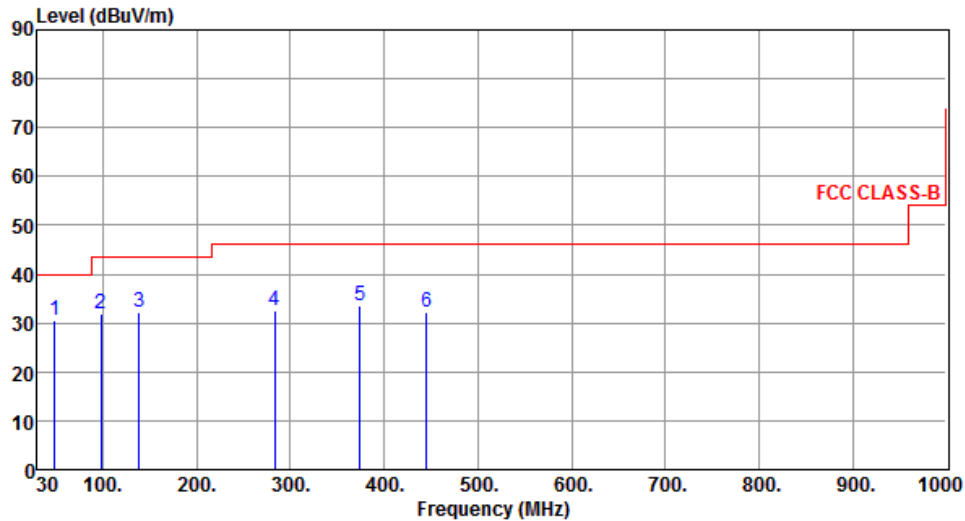
3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	Lora0 923.3 + Lora1 927.5 + LTE B2 QPSK 15M CH18900 1RB Offset74 (1886.8MHz)																																																																														
Polarization	Horizontal																																																																														
Level (dBuV/m)  <table><thead><tr><th></th><th>Freq. MHz</th><th>Emission level dBuV/m</th><th>Limit dBuV/m</th><th>Margin dB</th><th>SA reading dBuV</th><th>Factor dB</th><th>Remark</th><th>ANT High cm</th><th>Turn Table deg</th></tr></thead><tbody><tr><td>1</td><td>51.34</td><td>30.11</td><td>40.00</td><td>-9.89</td><td>37.93</td><td>-7.82</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>2</td><td>101.78</td><td>29.87</td><td>43.50</td><td>-13.63</td><td>42.56</td><td>-12.69</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>3</td><td>167.74</td><td>29.86</td><td>43.50</td><td>-13.64</td><td>38.38</td><td>-8.52</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>4</td><td>265.71</td><td>30.06</td><td>46.00</td><td>-15.94</td><td>38.80</td><td>-8.74</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>5</td><td>374.35</td><td>32.69</td><td>46.00</td><td>-13.31</td><td>38.39</td><td>-5.70</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>6</td><td>769.14</td><td>33.70</td><td>46.00</td><td>-12.30</td><td>31.75</td><td>1.95</td><td>Peak</td><td>---</td><td>---</td></tr></tbody></table>											Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg	1	51.34	30.11	40.00	-9.89	37.93	-7.82	Peak	---	---	2	101.78	29.87	43.50	-13.63	42.56	-12.69	Peak	---	---	3	167.74	29.86	43.50	-13.64	38.38	-8.52	Peak	---	---	4	265.71	30.06	46.00	-15.94	38.80	-8.74	Peak	---	---	5	374.35	32.69	46.00	-13.31	38.39	-5.70	Peak	---	---	6	769.14	33.70	46.00	-12.30	31.75	1.95	Peak	---	---
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Polarization	Vertical								
Level (dBuV/m) <									

Modulation	Lora0 923.3 + Lora1 927.5 + LTE B4 QPSK 15M CH20325 1RB Offset0 (1740.8MHz)
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Polarization	Horizontal
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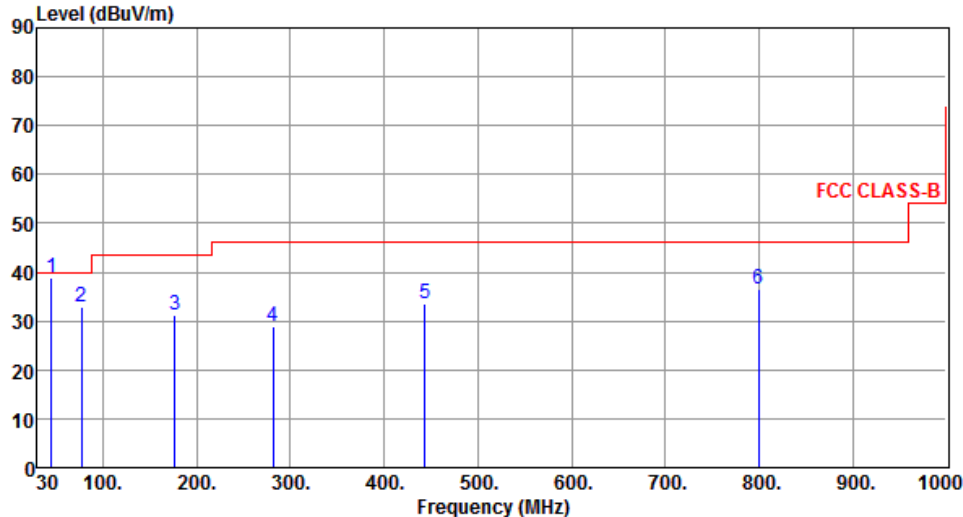
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	48.43	30.45	40.00	-9.55	38.21	-7.76	Peak	---	---
2	97.90	31.98	43.50	-11.52	45.25	-13.27	Peak	---	---
3	138.64	32.16	43.50	-11.34	40.94	-8.78	Peak	---	---
4	283.17	32.38	46.00	-13.62	40.42	-8.04	Peak	---	---
5	374.35	33.55	46.00	-12.45	39.25	-5.70	Peak	---	---
6	445.16	32.23	46.00	-13.77	36.13	-3.90	Peak	---	---

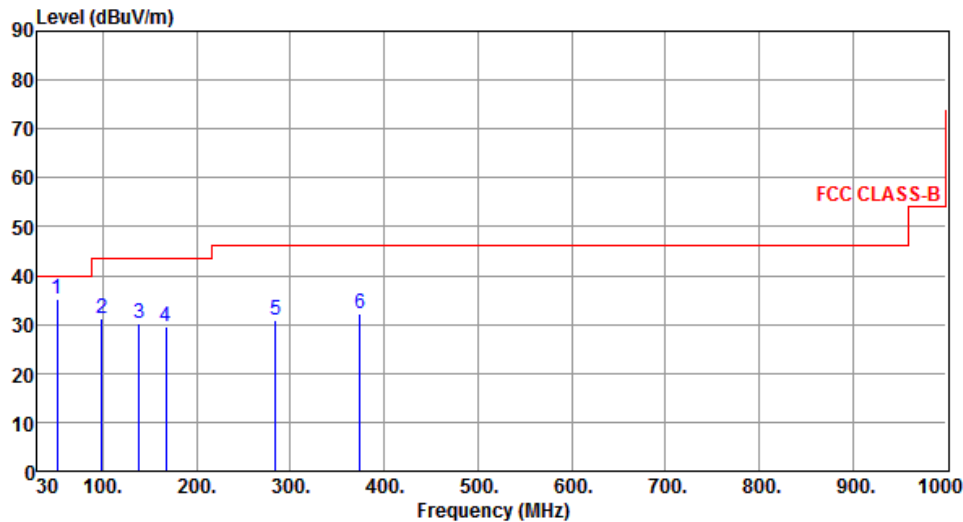
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

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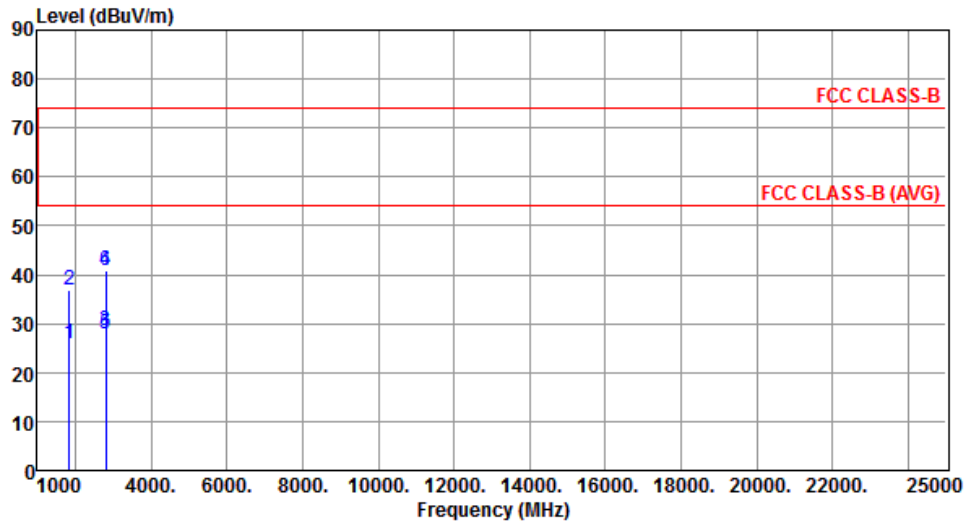
Modulation	Lora0 923.3 + Lora1 927.5 + LTE B7 QPSK 15M CH21375 1RB Offset0 (2555.8MHz)																																																																														
Polarization	Vertical																																																																														
Level (dBuV/m) <table><tr><th></th><th>Freq. MHz</th><th>Emission level dBuV/m</th><th>Limit dBuV/m</th><th>Margin dB</th><th>SA reading dBuV</th><th>Factor dB</th><th>Remark</th><th>ANT High cm</th><th>Turn Table deg</th></tr><tr><td>1</td><td>44.56</td><td>38.99</td><td>40.00</td><td>-1.01</td><td>46.85</td><td>-7.86</td><td>QP</td><td>100</td><td>2</td></tr><tr><td>2</td><td>77.53</td><td>33.75</td><td>40.00</td><td>-6.25</td><td>46.15</td><td>-12.40</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>3</td><td>158.04</td><td>31.03</td><td>43.50</td><td>-12.47</td><td>39.27</td><td>-8.24</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>4</td><td>217.21</td><td>30.67</td><td>46.00</td><td>-15.33</td><td>41.51</td><td>-10.84</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>5</td><td>437.40</td><td>32.81</td><td>46.00</td><td>-13.19</td><td>36.89</td><td>-4.08</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>6</td><td>800.18</td><td>38.47</td><td>46.00</td><td>-7.53</td><td>36.22</td><td>2.25</td><td>Peak</td><td>---</td><td>---</td></tr></table>											Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg	1	44.56	38.99	40.00	-1.01	46.85	-7.86	QP	100	2	2	77.53	33.75	40.00	-6.25	46.15	-12.40	Peak	---	---	3	158.04	31.03	43.50	-12.47	39.27	-8.24	Peak	---	---	4	217.21	30.67	46.00	-15.33	41.51	-10.84	Peak	---	---	5	437.40	32.81	46.00	-13.19	36.89	-4.08	Peak	---	---	6	800.18	38.47	46.00	-7.53	36.22	2.25	Peak	---	---
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg																																																																						
1	44.56	38.99	40.00	-1.01	46.85	-7.86	QP	100	2																																																																						
2	77.53	33.75	40.00	-6.25	46.15	-12.40	Peak	---	---																																																																						
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6	800.18	38.47	46.00	-7.53	36.22	2.25	Peak	---	---																																																																						
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m). Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.																																																																															

3.1.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation	Lora0 923.3 + Lora1 927.5 + LTE B2 QPSK 15M CH18900 1RB Offset74 (1886.8MHz)								
Polarization	Horizontal								
Level (dBuV/m) <									

Modulation	Lora0 923.3 + Lora1 927.5 + LTE B2 QPSK 15M CH18900 1RB Offset74 (1886.8MHz)
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Polarization	Vertical
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	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1850.80	25.96	54.00	-28.04	31.25	-5.29	Average	100	118
2	1850.80	37.02	74.00	-36.98	42.31	-5.29	Peak	100	118
3	2810.10	28.54	54.00	-25.46	30.23	-1.69	Average	100	172
4	2810.10	40.74	74.00	-33.26	42.43	-1.69	Peak	100	172
5	2814.30	27.81	54.00	-26.19	29.49	-1.68	Average	100	165
6	2814.30	40.74	74.00	-33.26	42.42	-1.68	Peak	100	165

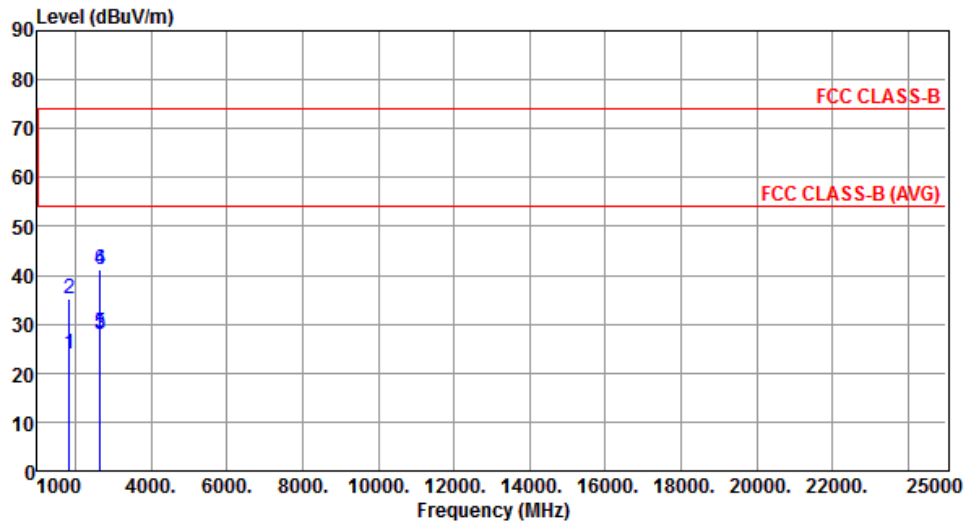
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Modulation	Lora0 923.3 + Lora1 927.5 + LTE B4 QPSK 15M CH20325 1RB Offset0 (1740.8MHz)
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Polarization	Horizontal
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	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1850.80	23.96	54.00	-30.04	29.25	-5.29	Average	100	78
2	1850.80	35.16	74.00	-38.84	40.45	-5.29	Peak	100	78
3	2664.10	27.90	54.00	-26.10	30.08	-2.18	Average	100	63
4	2664.10	41.30	74.00	-32.70	43.48	-2.18	Peak	100	63
5	2668.30	28.32	54.00	-25.68	30.49	-2.17	Average	100	130
6	2668.30	41.08	74.00	-32.92	43.25	-2.17	Peak	100	130

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	Lora0 923.3 + Lora1 927.5 + LTE B4 QPSK 15M CH20325 1RB Offset0 (1740.8MHz)								
Polarization	Vertical								
Level (dBUV/m) <									

Modulation	Lora0 923.3 + Lora1 927.5 + LTE B7 QPSK 15M CH21375 1RB Offset0 (2555.8MHz)								
Polarization	Horizontal								
Level (dBuV/m)									

Modulation	Lora0 923.3 + Lora1 927.5 + LTE B7 QPSK 15M CH21375 1RB Offset0 (2555.8MHz)								
Polarization	Vertical								
Level (dBuV/m) </									

4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <http://www.icertifi.com.tw>.

Linkou

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No. 30-2, Ding Fwu Tsuen, Lin
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Taiwan, R.O.C.

Kwei Shan

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Tel: 886-3-271-8640

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If you have any suggestion, please feel free to contact us as below information

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