FCC Co-Location Test Report

FCC ID	:	**MXF-WMDS183**
Equipment	:	**LoRa RF Board**
Model No.	:	**WMDS-183**
Brand Name	:	**Gemtek**
Applicant	:	**Gemtek Technology Co., Ltd.**
Address	:	**No.15-1 Zhoughua Rd, Hsinchu Industrial Park, Hukou, Hsinchu, Taiwan, R.O.C**
Standard	:	**47 CFR FCC Part 15.247**
Received Date	:	**Sep. 12, 2018**
Tested Date	:	**Nov. 06, 2018**

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

Testing Laboratory 2732

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Release Record

Report No.	Version	Description	Issued Date
FR782401-04CO	Rev. 01	Initial issue	Nov. 21, 2018

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 1000.10MHz 52.77 (Margin -1.23dB) - AV	Pass

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

Operating Frequency	902 MHz ~ 928 MHz
Modulaton Type	CSS

1.1.2 Information of Host

Brand Name	machineQ
Product name	8-Channel LoRa Gateway
Model name	HXQX1AP0S
Certified module (installed in the system)	FCC ID: XMR201605EC25A

1.1.2.1 Antenna of Host

For LoRa

Ant. No.	Brand	Type	Gain (dBi)	Connector	Remark
1	LoRa antenna (External)	Dipole	0.96	SMA	---
2	LoRa antenna (Internal)	Monopole	-1.65	UFL	---

For LTE / WCDMA

Ant. No.	Type	Connector	Gain (dBi)	Operating Band
1	PIFA	UFL	4.49	LTE Band 2 / WCDMA Band II
			3.59	LTE Band 4 / WCDMA Band IV
			2.05	LTE Band 12 / WCDMA Band V

1.2 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	Nov. 06, 2018				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101498	Dec. 04, 2017	Dec. 03, 2018
Receiver	R&S	ESR3	101658	Nov. 20, 2017	Nov. 19, 2018
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jul. 18, 2018	Jul. 17, 2019
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 20, 2017	Dec. 19, 2018
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 23, 2017	Nov. 22, 2018
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 13, 2017	Nov. 12, 2018
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 07, 2017	Dec. 06, 2018
Preamplifier	EMC	EMC02325	980225	Jul. 20, 2018	Jul. 19, 2019
Preamplifier	Agilent	83017A	MY39501308	Oct. 04, 2018	Oct. 03, 2019
Preamplifier	EMC	EMC184045B	980192	Aug. 09, 2018	Aug. 08, 2019
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16140/4	May 09, 2018	May 08, 2019
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 07, 2017	Dec. 06, 2018
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 07, 2017	Dec. 06, 2018
LF cable 1M	EMC	EMCCFD400-NM-NM-1000	16052	Dec. 07, 2017	Dec. 06, 2018
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 07, 2017	Dec. 06, 2018
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 07, 2017	Dec. 06, 2018
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 15.247 Meas Guidance v05
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 ≤ 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	23°C / 63%	Aska Huang Akun Chung

- 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	Test mode
Radiated Emissions	WCDMA Band V + LoRa 923.3MHz	1, 2
	LTE Band 2 + LoRa 923.3MHz	
	LTE Band 4 + LoRa 923.3MHz	
	LTE Band 12 + LoRa 923.3MHz	

Note:
1. Test configuration are listed as listed as follows:
   Test mode 1: Lora / external antenna
   Test mode 2: Lora / Internal antenna

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

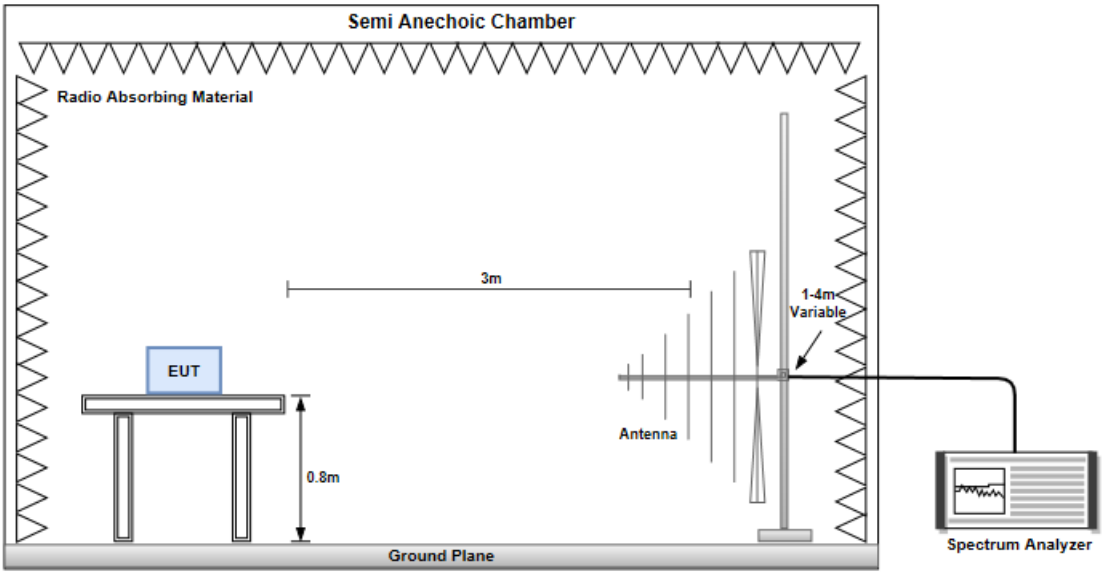
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission 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:

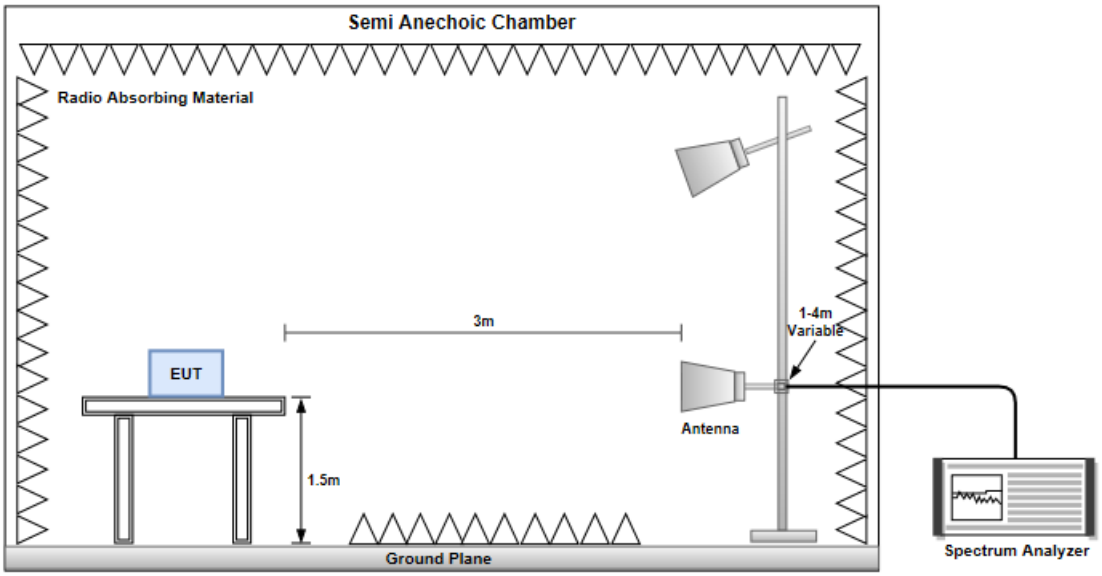
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.1.3 Test Setup

Radiated Emissions below 1 GHz



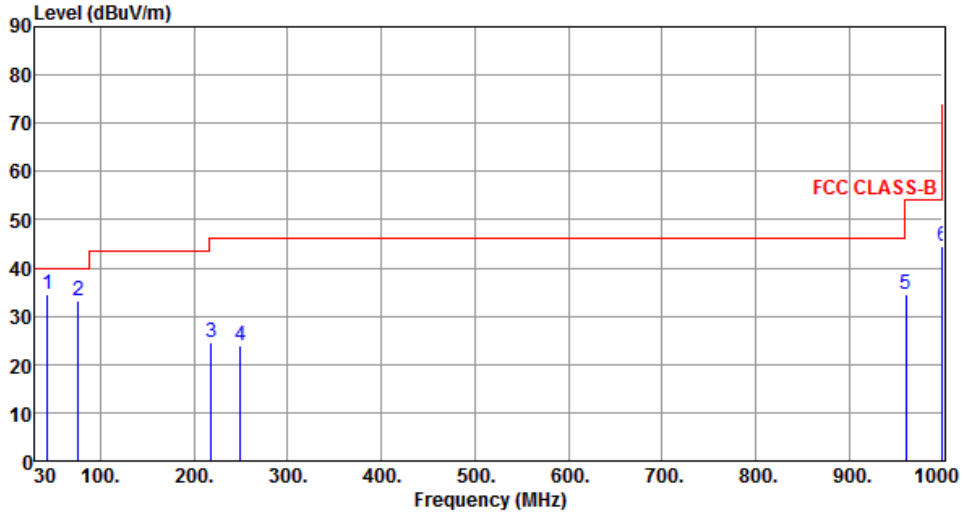
Radiated Emissions above 1 GHz



Configuration 1: external antenna

3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

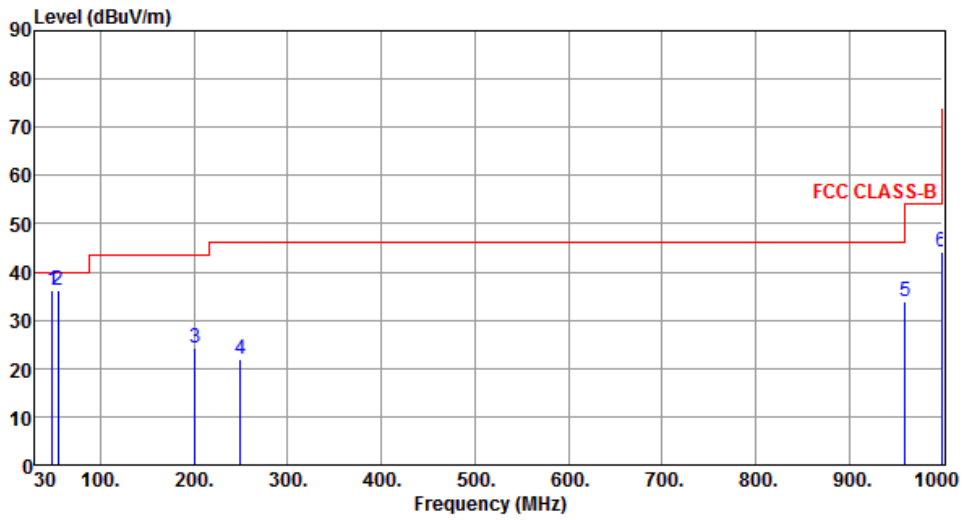
Test Mode	WCDMA Band V + LoRa 923.3MHz
Polarization	Horizontal



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	43.21	34.48	40.00	-5.52	42.46	-7.98	Peak	---	---
2	76.23	33.25	40.00	-6.75	45.47	-12.22	Peak	---	---
3	218.40	24.46	46.00	-21.54	35.40	-10.94	Peak	---	---
4	249.60	23.87	46.00	-22.13	33.36	-9.49	Peak	---	---
5	960.40	34.51	54.00	-19.49	30.30	4.21	Peak	---	---
6	999.68	44.54	54.00	-9.46	39.84	4.70	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.

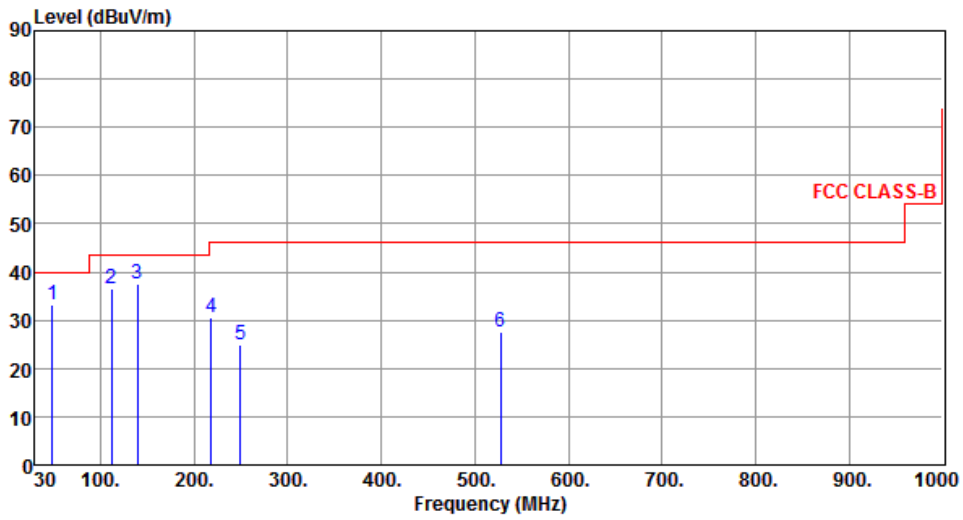
Test Mode	WCDMA Band V + LoRa 923.3MHz
Polarization	Vertical



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	48.21	36.14	40.00	-3.86	44.00	-7.86	Peak	---	---
2	54.87	36.11	40.00	-3.89	44.24	-8.13	Peak	---	---
3	200.80	24.38	43.50	-19.12	35.37	-10.99	Peak	---	---
4	249.60	21.81	46.00	-24.19	31.30	-9.49	Peak	---	---
5	960.20	33.83	54.00	-20.17	29.62	4.21	Peak	---	---
6	999.20	44.29	54.00	-9.71	39.59	4.70	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.

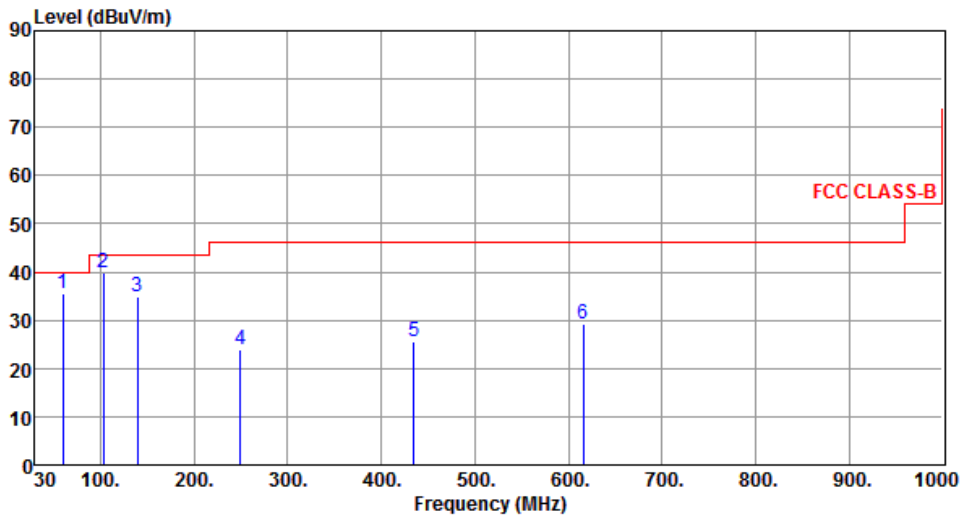
Test Mode	LTE Band 2 + LoRa 923.3MHz
Polarization	Horizontal



	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	33.23	40.00	-6.77	41.11	-7.88	Peak	---	---
2	111.48	36.47	43.50	-7.03	47.89	-11.42	Peak	---	---
3	139.61	37.38	43.50	-6.12	46.14	-8.76	Peak	---	---
4	218.18	30.69	46.00	-15.31	41.63	-10.94	Peak	---	---
5	249.22	25.04	46.00	-20.96	34.54	-9.50	Peak	---	---
6	527.61	27.66	46.00	-18.34	30.11	-2.45	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.

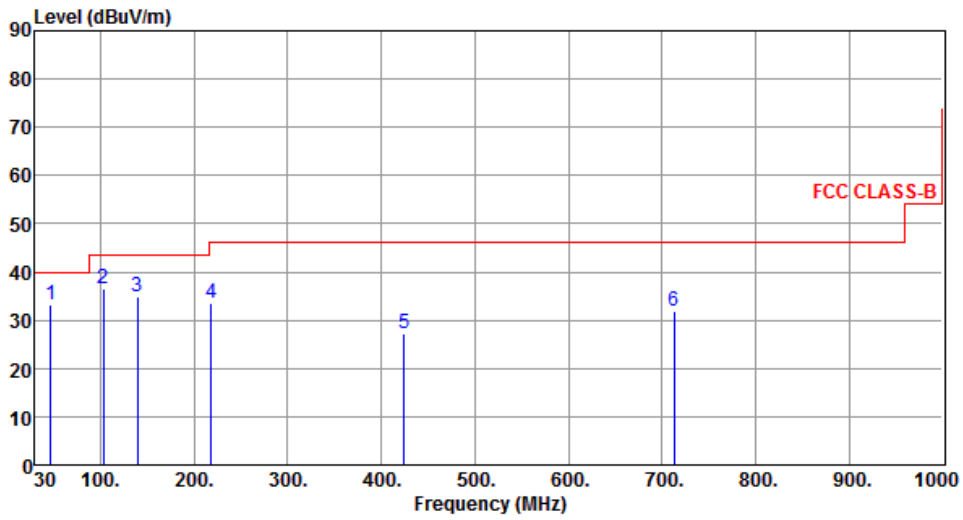
Test Mode	LTE Band 2 + LoRa 923.3MHz
Polarization	Vertical



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	60.07	35.52	40.00	-4.48	44.23	-8.71	Peak	---	---
2	102.75	39.79	43.50	-3.71	52.42	-12.63	Peak	---	---
3	139.61	34.99	43.50	-8.51	43.75	-8.76	Peak	---	---
4	249.22	23.99	46.00	-22.01	33.49	-9.50	Peak	---	---
5	434.49	25.44	46.00	-20.56	29.97	-4.53	Peak	---	---
6	615.88	29.08	46.00	-16.92	29.76	-0.68	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.

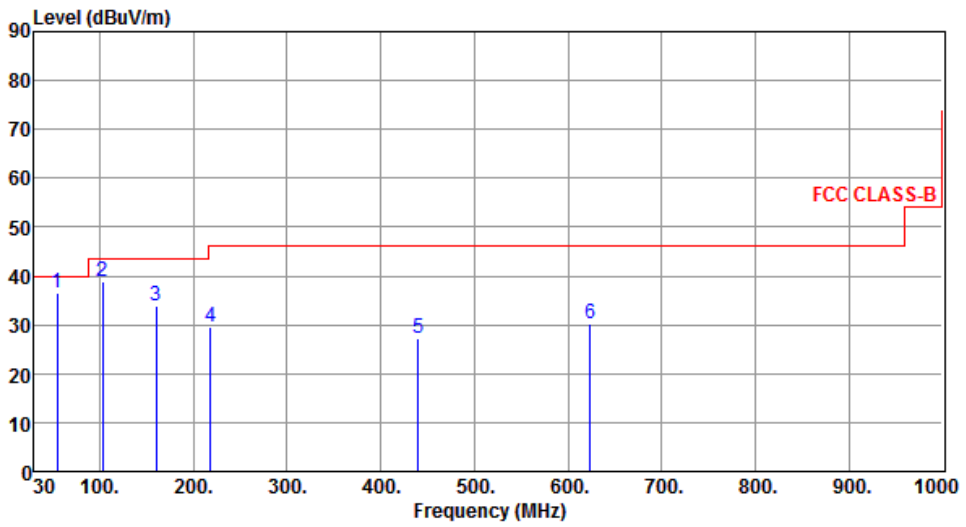
Test Mode	LTE Band 4 + LoRa 923.3MHz
Polarization	Horizontal



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	46.49	33.10	40.00	-6.90	40.99	-7.89	Peak	---	---
2	102.75	36.42	43.50	-7.08	49.05	-12.63	Peak	---	---
3	139.61	34.98	43.50	-8.52	43.74	-8.76	Peak	---	---
4	218.18	33.62	46.00	-12.38	44.56	-10.94	Peak	---	---
5	424.79	27.15	46.00	-18.85	31.81	-4.66	Peak	---	---
6	712.88	31.74	46.00	-14.26	31.09	0.65	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.

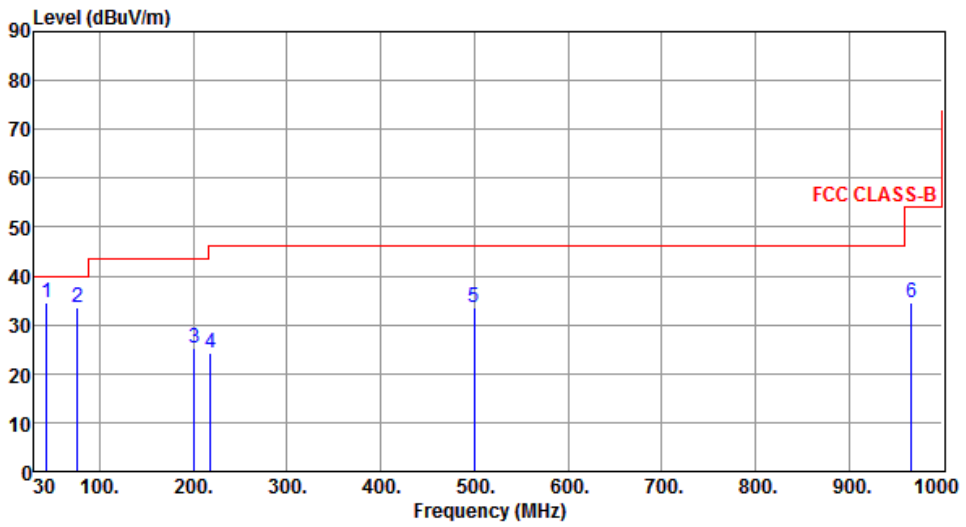
Test Mode	LTE Band 4 + LoRa 923.3MHz
Polarization	Vertical



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	54.25	36.38	40.00	-3.62	44.51	-8.13	Peak	---	---
2	102.75	38.86	43.50	-4.64	51.49	-12.63	Peak	---	---
3	159.98	34.04	43.50	-9.46	42.29	-8.25	Peak	---	---
4	218.18	29.47	46.00	-16.53	40.41	-10.94	Peak	---	---
5	440.31	27.31	46.00	-18.69	31.71	-4.40	Peak	---	---
6	623.64	30.25	46.00	-15.75	30.77	-0.52	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.

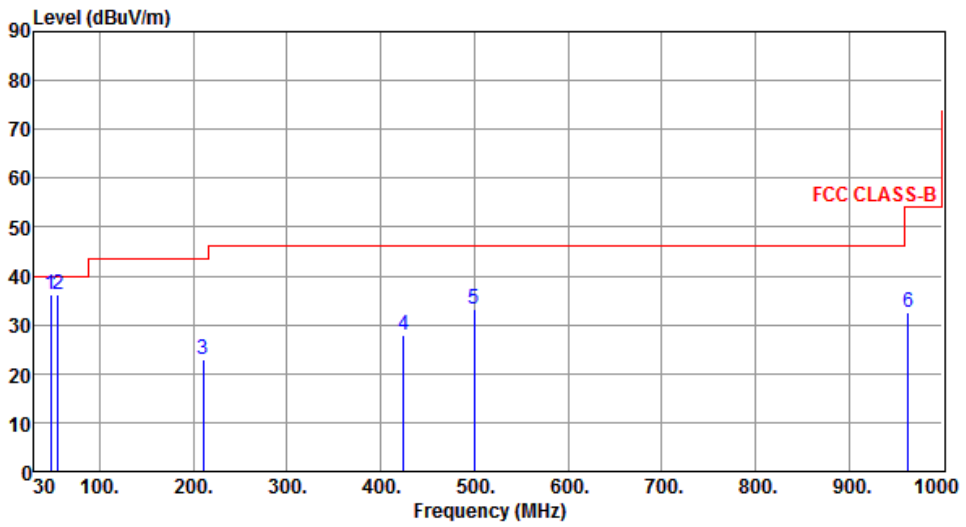
Test Mode	LTE Band 12 + LoRa 923.3MHz
Polarization	Horizontal



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	43.52	34.49	40.00	-5.51	42.50	-8.01	Peak	---	---
2	76.48	33.49	40.00	-6.51	45.78	-12.29	Peak	---	---
3	200.80	25.18	43.50	-18.32	36.17	-10.99	Peak	---	---
4	218.40	24.31	46.00	-21.69	35.25	-10.94	Peak	---	---
5	500.00	33.38	46.00	-12.62	36.49	-3.11	Peak	---	---
6	966.40	34.69	54.00	-19.31	30.40	4.29	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.

Test Mode	LTE Band 12 + LoRa 923.3MHz
Polarization	Vertical

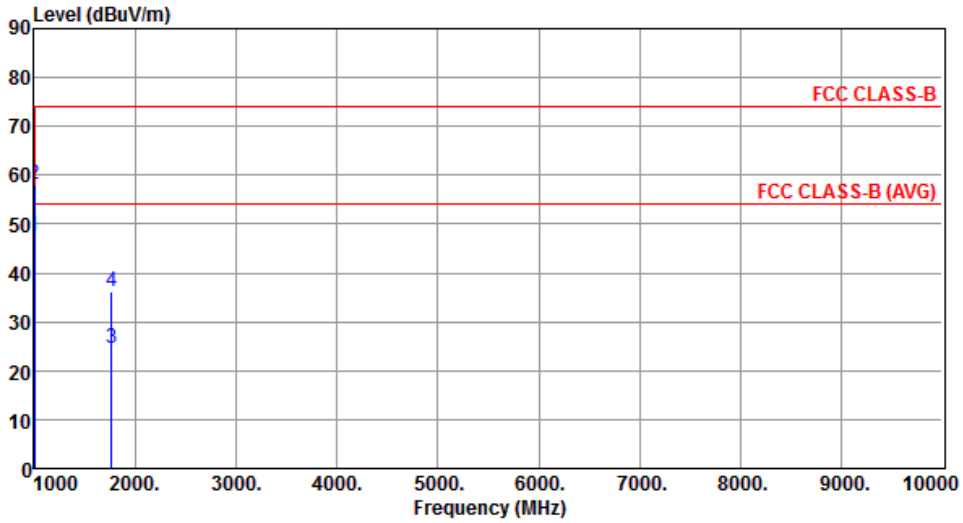


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	47.54	36.33	40.00	-3.67	44.22	-7.89	Peak	---	---
2	55.41	36.24	40.00	-3.76	44.41	-8.17	Peak	---	---
3	210.40	22.93	43.50	-20.57	33.97	-11.04	Peak	---	---
4	424.80	27.73	46.00	-18.27	32.39	-4.66	Peak	---	---
5	500.00	33.17	46.00	-12.83	36.28	-3.11	Peak	---	---
6	963.20	32.66	54.00	-21.34	28.42	4.24	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)

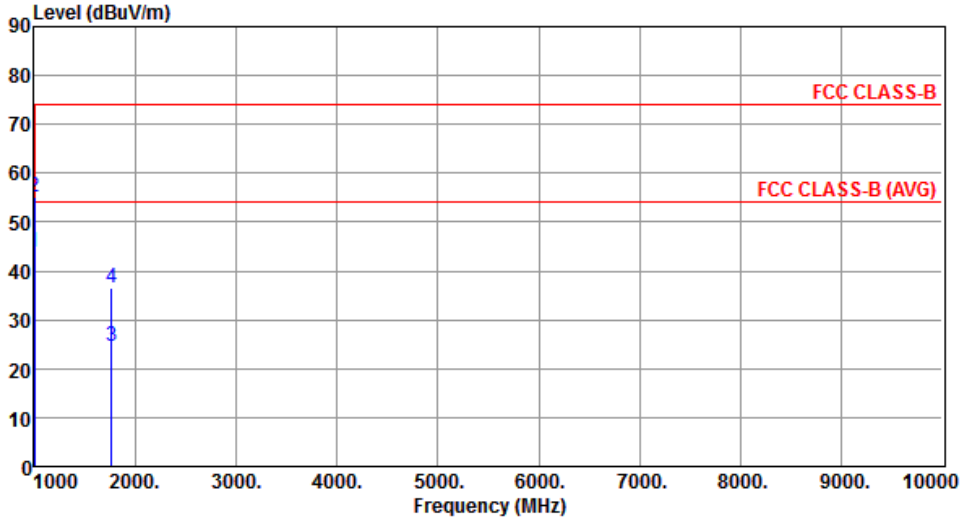
Test Mode	WCDMA Band V + LoRa 923.3MHz
Polarization	Horizontal



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1000.10	47.38	54.00	-6.62	58.03	-10.65	Average	144	61
2	1000.10	58.16	74.00	-15.84	68.81	-10.65	Peak	144	61
3	1769.90	24.52	54.00	-29.48	30.45	-5.93	Average	100	173
4	1769.90	36.23	74.00	-37.77	42.16	-5.93	Peak	100	173

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).

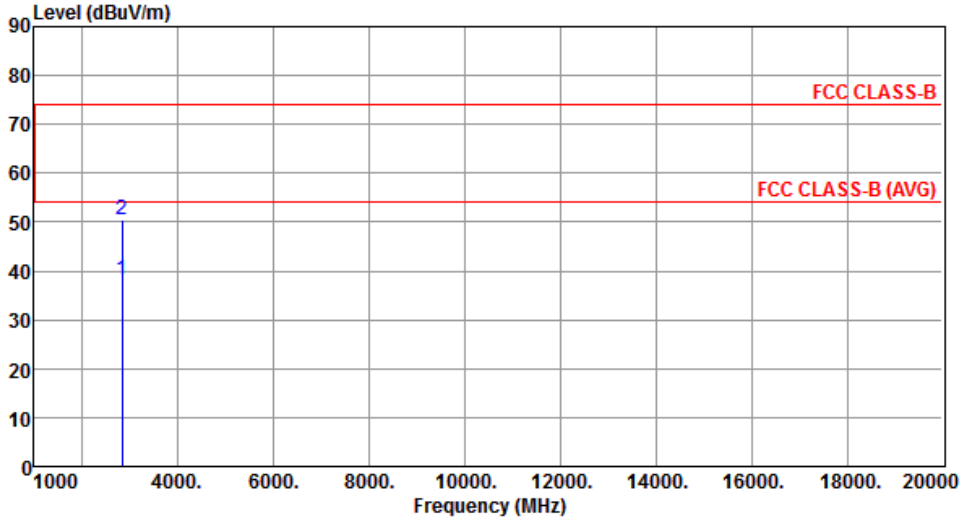
Test Mode	WCDMA Band V + LoRa 923.3MHz
Polarization	Vertical



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1000.10	43.98	54.00	-10.02	54.63	-10.65	Average	155	128
2	1000.10	55.21	74.00	-18.79	65.86	-10.65	Peak	155	128
3	1769.90	24.64	54.00	-29.36	30.57	-5.93	Average	100	163
4	1769.90	36.65	74.00	-37.35	42.58	-5.93	Peak	100	163

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).

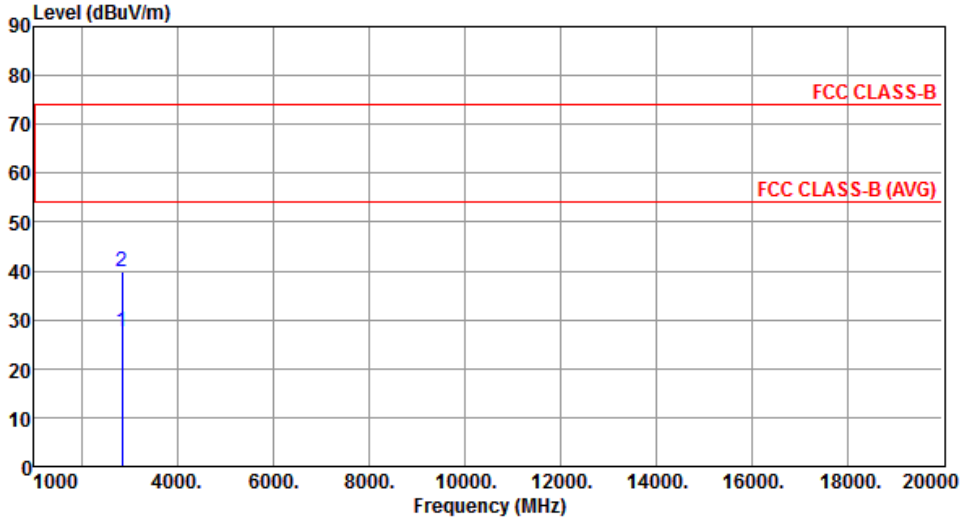
Test Mode	LTE Band 2 + LoRa 923.3MHz
Polarization	Horizontal



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2830.55	38.24	54.00	-15.76	39.91	-1.67	Average	100	74
2	2830.55	50.54	74.00	-23.46	52.21	-1.67	Peak	100	74

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).

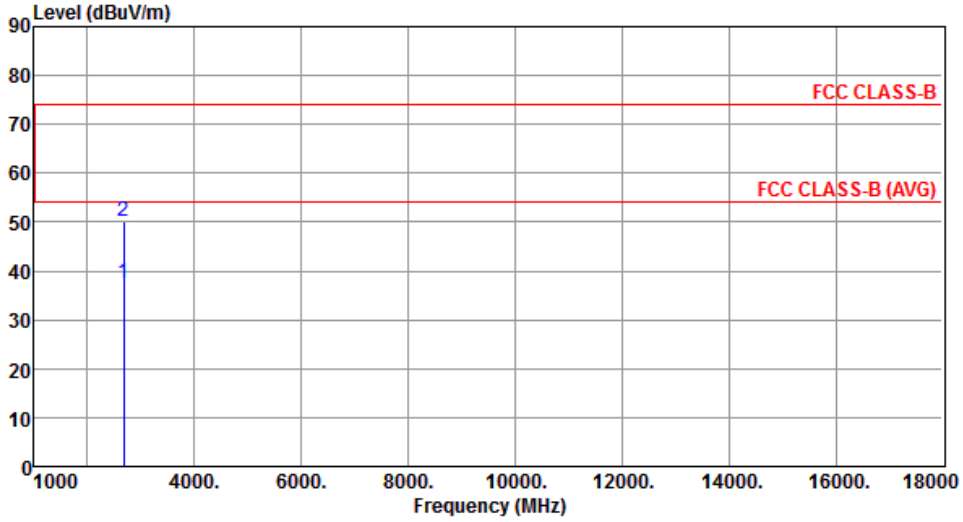
Test Mode	LTE Band 2 + LoRa 923.3MHz
Polarization	Vertical



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2830.55	27.42	54.00	-26.58	29.09	-1.67	Average	100	89
2	2830.55	39.71	74.00	-34.29	41.38	-1.67	Peak	100	89

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).

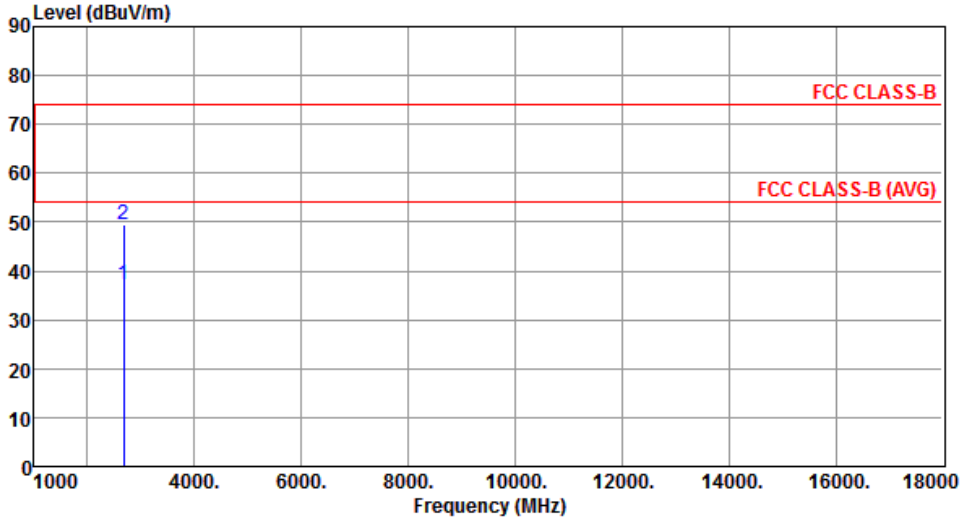
Test Mode	LTE Band 4 + LoRa 923.3MHz
Polarization	Horizontal



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2677.70	37.66	54.00	-16.34	39.90	-2.24	Average	100	143
2	2677.70	50.05	74.00	-23.95	52.29	-2.24	Peak	100	143

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).

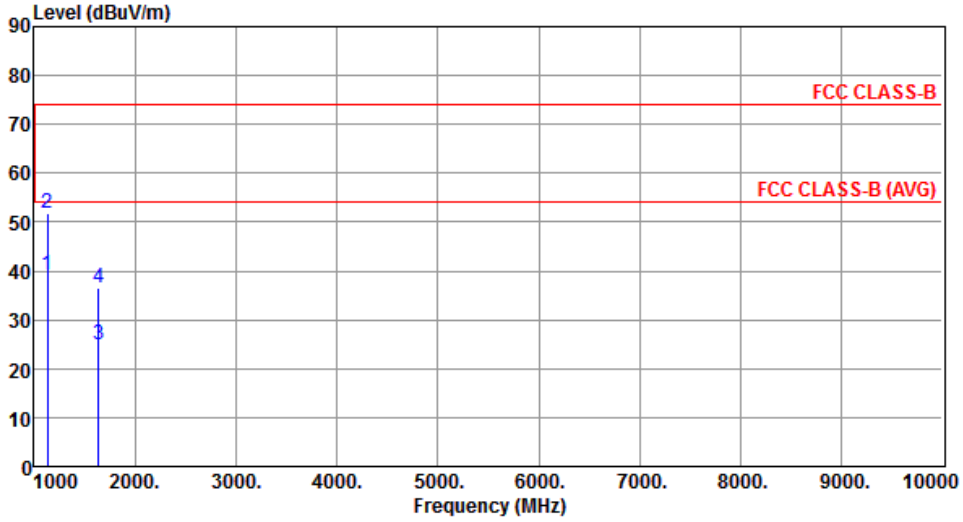
Test Mode	LTE Band 4 + LoRa 923.3MHz
Polarization	Vertical



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2677.70	37.34	54.00	-16.66	39.58	-2.24	Average	100	216
2	2677.70	49.46	74.00	-24.54	51.70	-2.24	Peak	100	216

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).

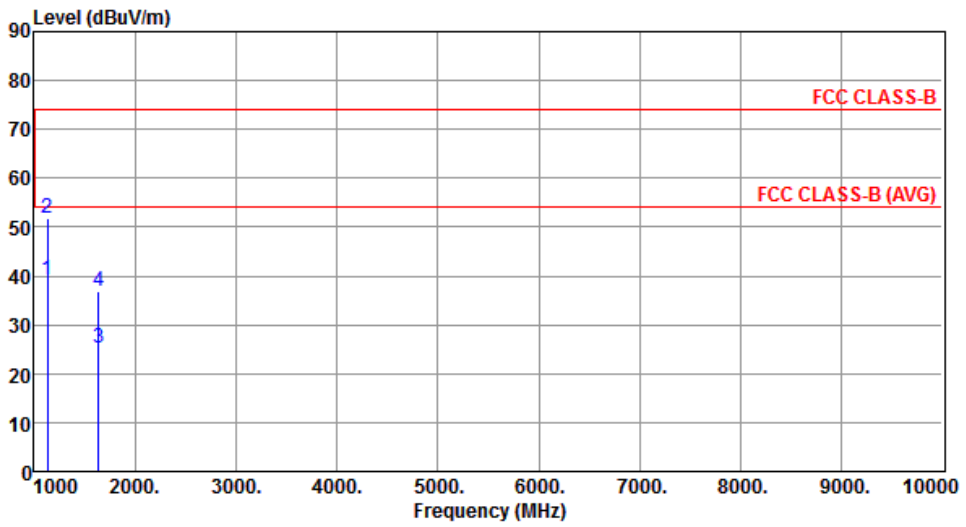
Test Mode	LTE Band 12 + LoRa 923.3MHz
Polarization	Horizontal



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1134.70	39.19	54.00	-14.81	48.85	-9.66	Average	100	156
2	1134.70	51.79	74.00	-22.21	61.45	-9.66	Peak	100	156
3	1635.20	24.97	54.00	-29.03	31.40	-6.43	Average	100	37
4	1635.20	36.43	74.00	-37.57	42.86	-6.43	Peak	100	37

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).

Test Mode	LTE Band 12 + LoRa 923.3MHz
Polarization	Vertical



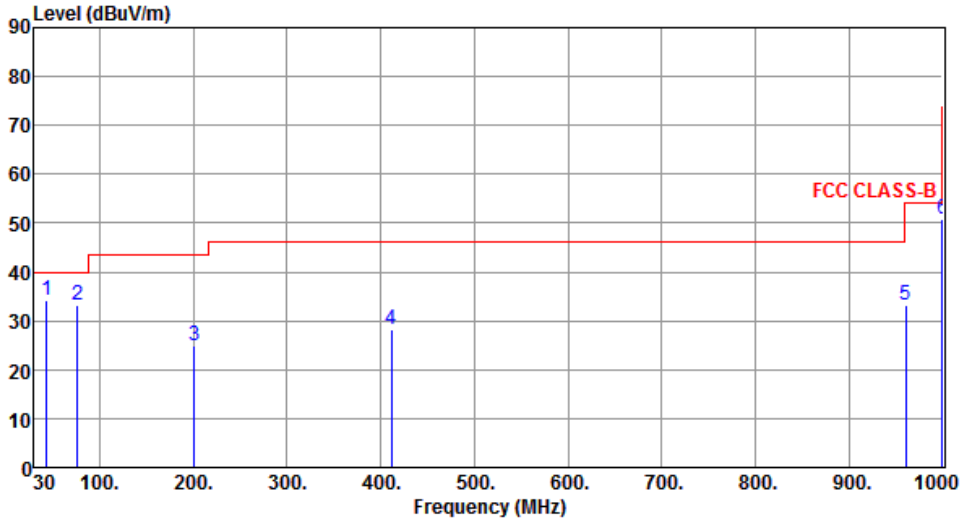
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1134.70	39.03	54.00	-14.97	48.69	-9.66	Average	100	123
2	1134.70	51.76	74.00	-22.24	61.42	-9.66	Peak	100	123
3	1635.20	25.25	54.00	-28.75	31.68	-6.43	Average	100	13
4	1635.20	37.02	74.00	-36.98	43.45	-6.43	Peak	100	13

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).

Configuration 2: internal antenna

3.1.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

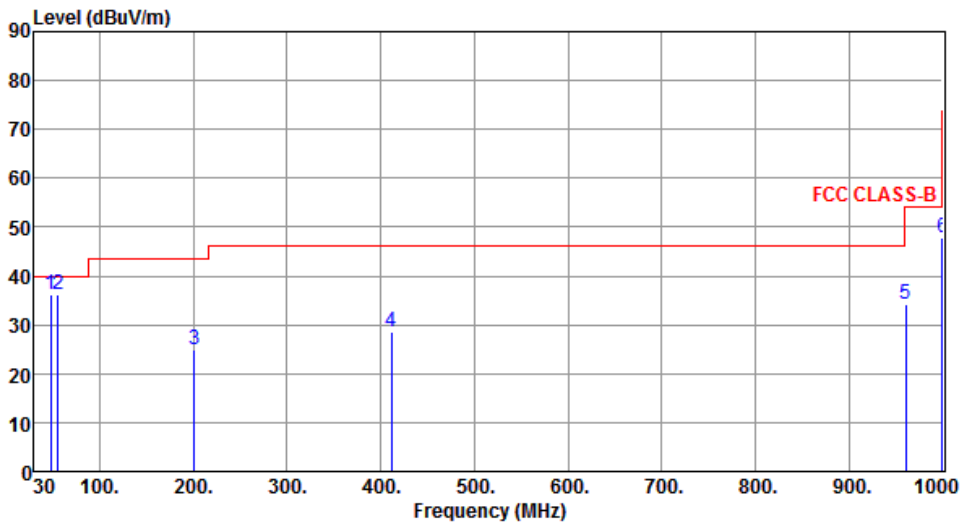
Test Mode	WCDMA Band V + LoRa 923.3MHz
Polarization	Horizontal



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	43.60	34.36	40.00	-5.64	14.19	20.17	Peak	---	---
2	76.07	33.14	40.00	-6.86	17.09	16.05	Peak	---	---
3	200.80	25.04	43.50	-18.46	36.03	-10.99	Peak	---	---
4	411.20	28.39	46.00	-17.61	33.46	-5.07	Peak	---	---
5	960.80	33.23	54.00	-20.77	29.02	4.21	Peak	---	---
6	999.50	50.86	54.00	-3.14	46.16	4.70	QP	100	270

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.

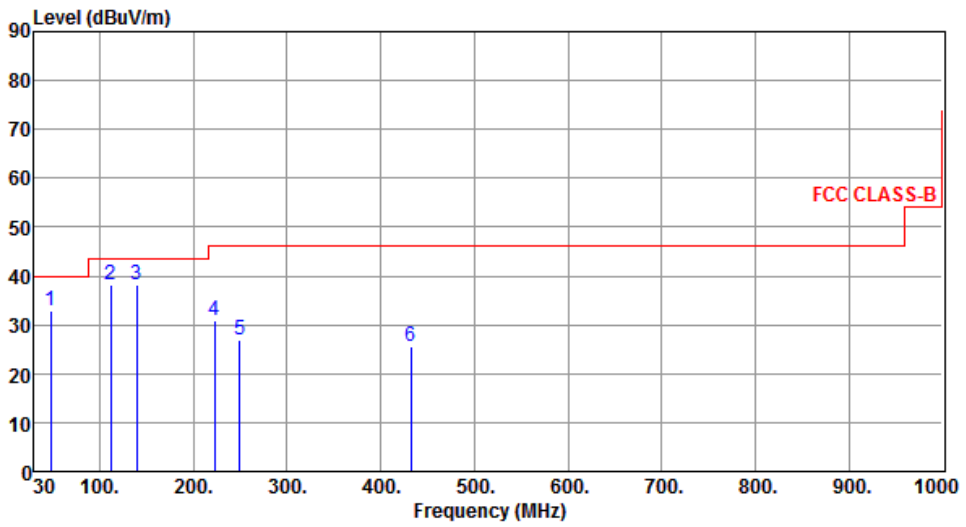
Test Mode	WCDMA Band V + LoRa 923.3MHz
Polarization	Vertical



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	47.68	36.28	40.00	-3.72	15.96	20.32	Peak	---	---
2	55.84	36.14	40.00	-3.86	16.14	20.00	Peak	---	---
3	200.80	24.92	43.50	-18.58	35.91	-10.99	Peak	---	---
4	411.20	28.54	46.00	-17.46	33.61	-5.07	Peak	---	---
5	960.54	34.15	54.00	-19.85	29.94	4.21	Peak	---	---
6	999.41	47.78	54.00	-6.22	43.08	4.70	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.

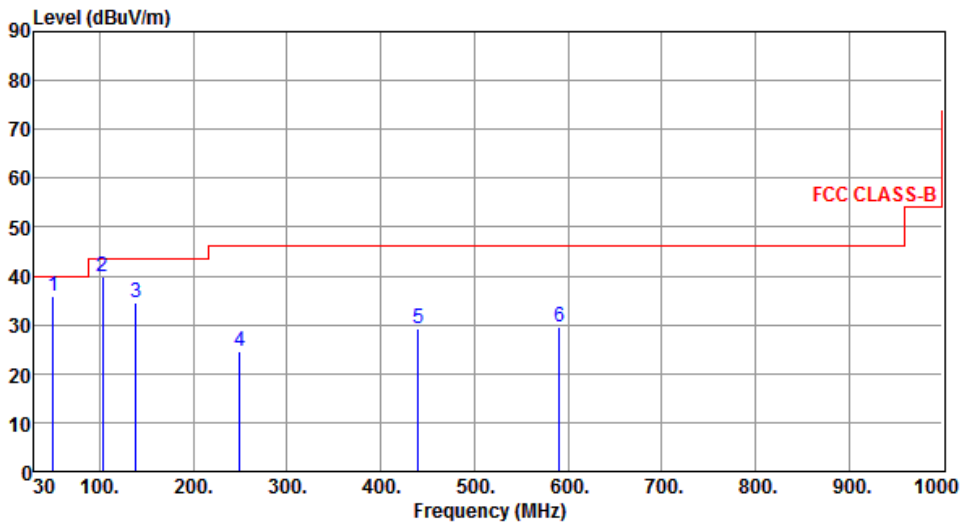
Test Mode	LTE Band 2 + LoRa 923.3MHz
Polarization	Horizontal



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	47.46	32.87	40.00	-7.13	40.76	-7.89	Peak	---	---
2	111.48	38.05	43.50	-5.45	49.47	-11.42	Peak	---	---
3	139.61	38.06	43.50	-5.44	46.82	-8.76	Peak	---	---
4	223.03	30.96	46.00	-15.04	41.89	-10.93	Peak	---	---
5	249.22	26.77	46.00	-19.23	36.27	-9.50	Peak	---	---
6	432.55	25.52	46.00	-20.48	30.05	-4.53	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.

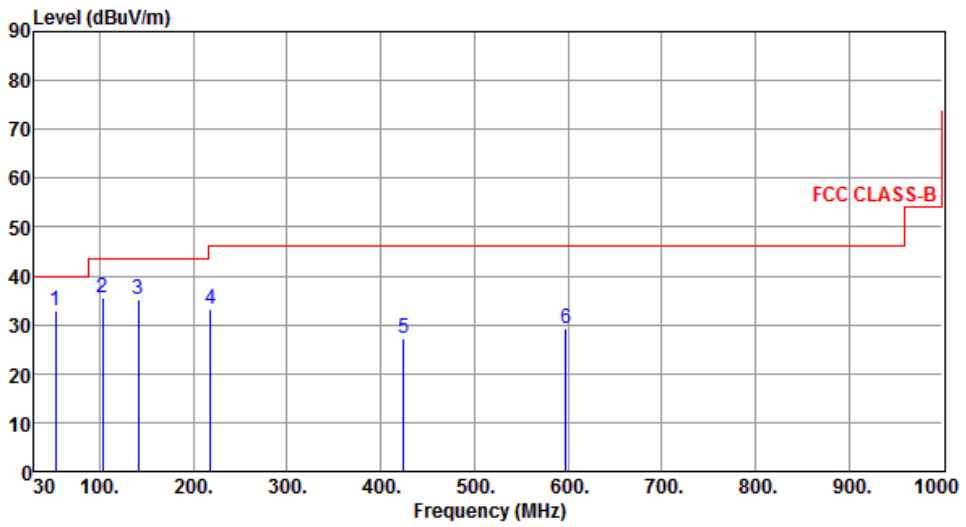
Test Mode	LTE Band 2 + LoRa 923.3MHz
Polarization	Vertical



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	50.37	36.03	40.00	-3.97	43.86	-7.83	Peak	---	---
2	102.75	39.81	43.50	-3.69	52.44	-12.63	Peak	---	---
3	138.64	34.67	43.50	-8.83	43.47	-8.80	Peak	---	---
4	249.22	24.61	46.00	-21.39	34.11	-9.50	Peak	---	---
5	440.31	29.33	46.00	-16.67	33.73	-4.40	Peak	---	---
6	590.66	29.41	46.00	-16.59	30.57	-1.16	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.

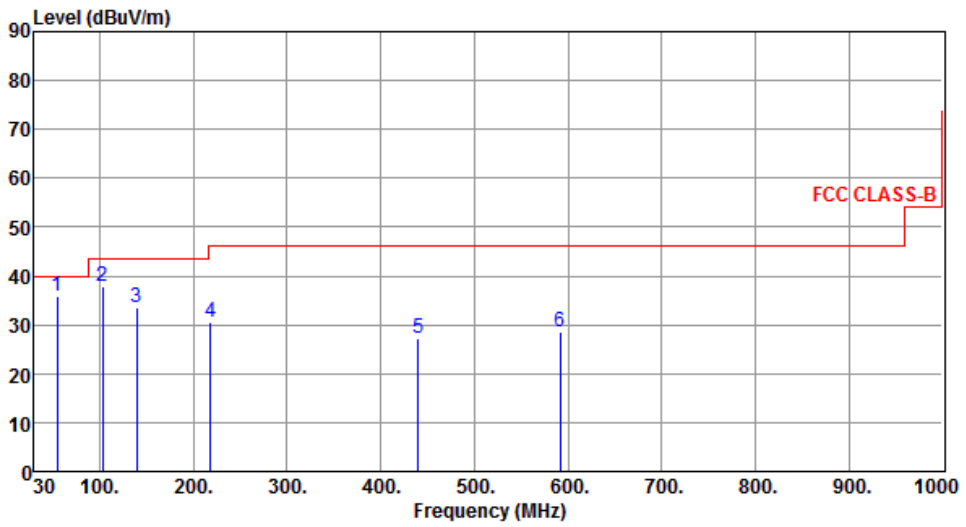
Test Mode	LTE Band 4 + LoRa 923.3MHz
Polarization	Horizontal



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	53.28	32.82	40.00	-7.18	40.80	-7.98	Peak	---	---
2	102.75	35.48	43.50	-8.02	48.11	-12.63	Peak	---	---
3	141.55	35.18	43.50	-8.32	43.84	-8.66	Peak	---	---
4	218.18	33.18	46.00	-12.82	44.12	-10.94	Peak	---	---
5	424.79	27.35	46.00	-18.65	32.01	-4.66	Peak	---	---
6	597.45	29.15	46.00	-16.85	30.15	-1.00	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.

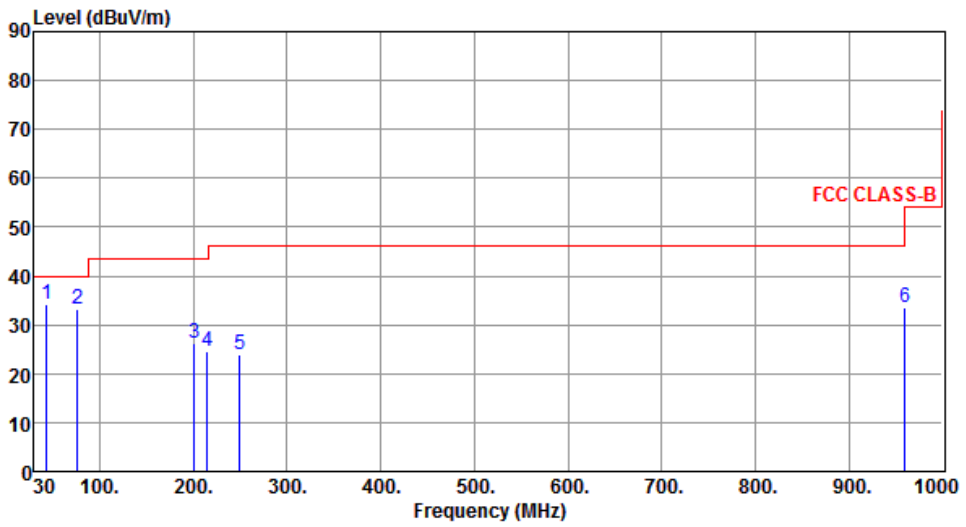
Test Mode	LTE Band 4 + LoRa 923.3MHz
Polarization	Vertical



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	54.25	35.96	40.00	-4.04	44.09	-8.13	Peak	---	---
2	102.75	37.99	43.50	-5.51	50.62	-12.63	Peak	---	---
3	139.61	33.50	43.50	-10.00	42.26	-8.76	Peak	---	---
4	218.18	30.60	46.00	-15.40	41.54	-10.94	Peak	---	---
5	440.31	27.30	46.00	-18.70	31.70	-4.40	Peak	---	---
6	591.63	28.55	46.00	-17.45	29.69	-1.14	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.

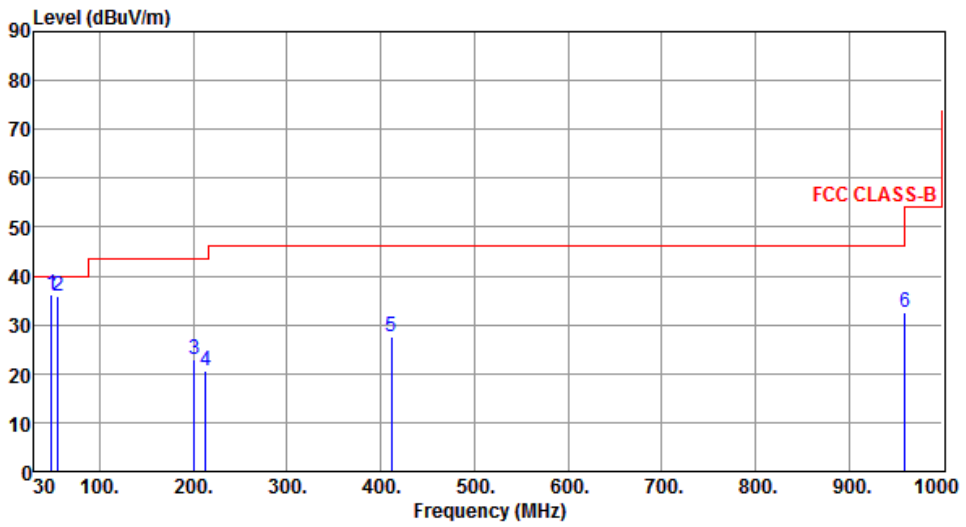
Test Mode	LTE Band 12 + LoRa 923.3MHz
Polarization	Horizontal



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	43.54	34.19	40.00	-5.81	42.20	-8.01	Peak	---	---
2	76.27	33.21	40.00	-6.79	45.44	-12.23	Peak	---	---
3	200.80	26.20	43.50	-17.30	37.19	-10.99	Peak	---	---
4	215.20	24.56	43.50	-18.94	35.50	-10.94	Peak	---	---
5	249.60	23.80	46.00	-22.20	33.29	-9.49	Peak	---	---
6	960.07	33.59	54.00	-20.41	29.38	4.21	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.

Test Mode	LTE Band 12 + LoRa 923.3MHz
Polarization	Vertical

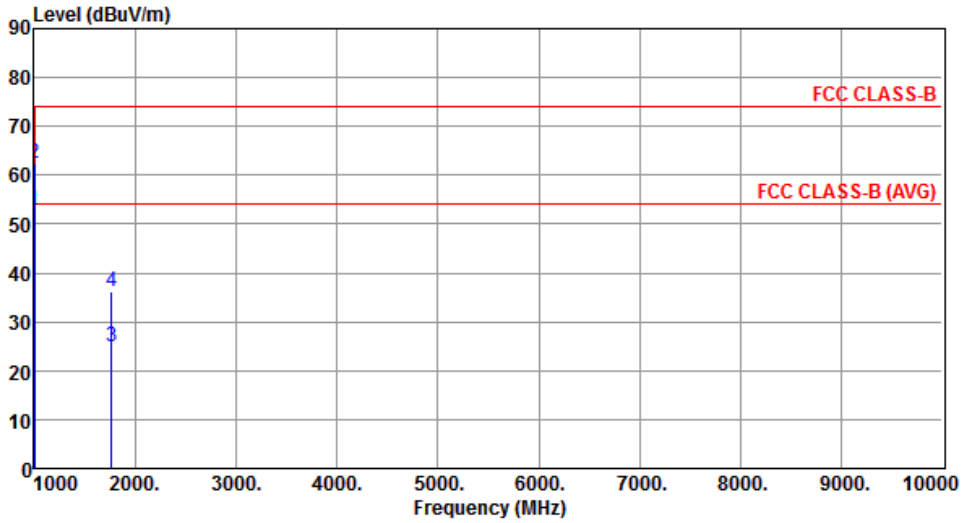


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	48.57	36.20	40.00	-3.80	44.10	-7.90	Peak	---	---
2	55.41	35.95	40.00	-4.05	44.12	-8.17	Peak	---	---
3	200.80	22.95	43.50	-20.55	33.94	-10.99	Peak	---	---
4	212.80	20.68	43.50	-22.82	31.67	-10.99	Peak	---	---
5	411.20	27.59	46.00	-18.41	32.66	-5.07	Peak	---	---
6	960.20	32.62	54.00	-21.38	28.41	4.21	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.

3.1.7 Transmitter Radiated Unwanted Emissions (Above 1GHz)

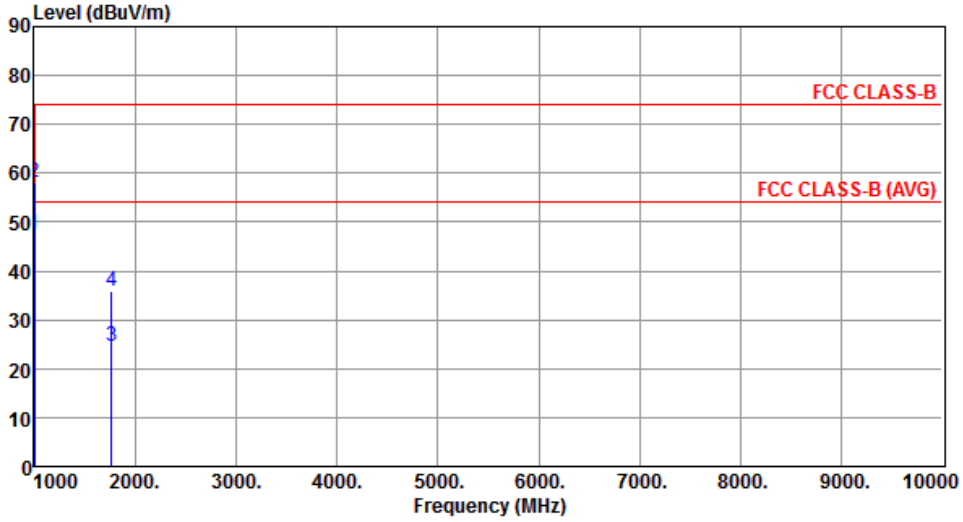
Test Mode	WCDMA Band V + LoRa 923.3MHz
Polarization	Horizontal



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1000.10	52.77	54.00	-1.23	63.42	-10.65	Average	184	7
2	1000.10	62.54	74.00	-11.46	73.19	-10.65	Peak	184	7
3	1769.90	24.77	54.00	-29.23	30.70	-5.93	Average	100	165
4	1769.90	36.23	74.00	-37.77	42.16	-5.93	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).

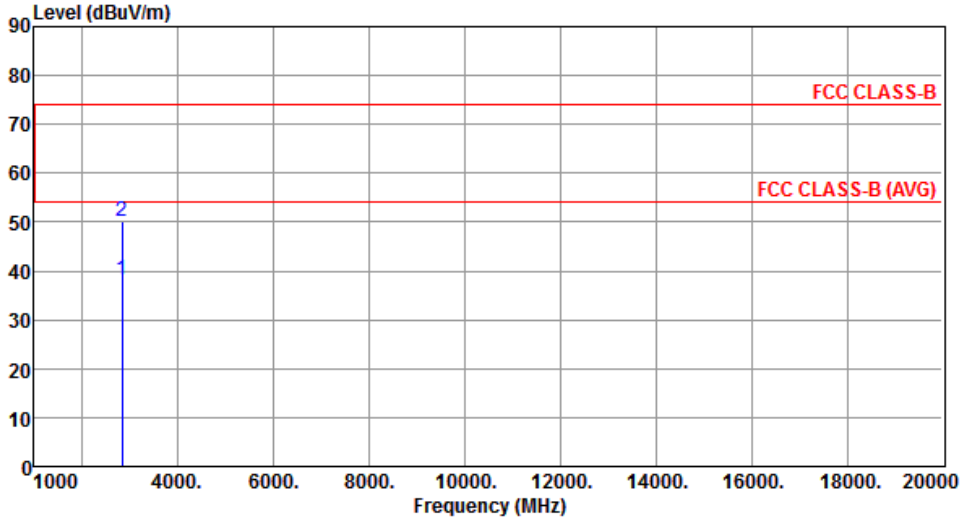
Test Mode	WCDMA Band V + LoRa 923.3MHz
Polarization	Vertical



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1000.10	47.45	54.00	-6.55	58.10	-10.65	Average	222	330
2	1000.10	58.22	74.00	-15.78	68.87	-10.65	Peak	222	330
3	1769.90	24.63	54.00	-29.37	30.56	-5.93	Average	100	185
4	1769.90	36.03	74.00	-37.97	41.96	-5.93	Peak	100	185

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).

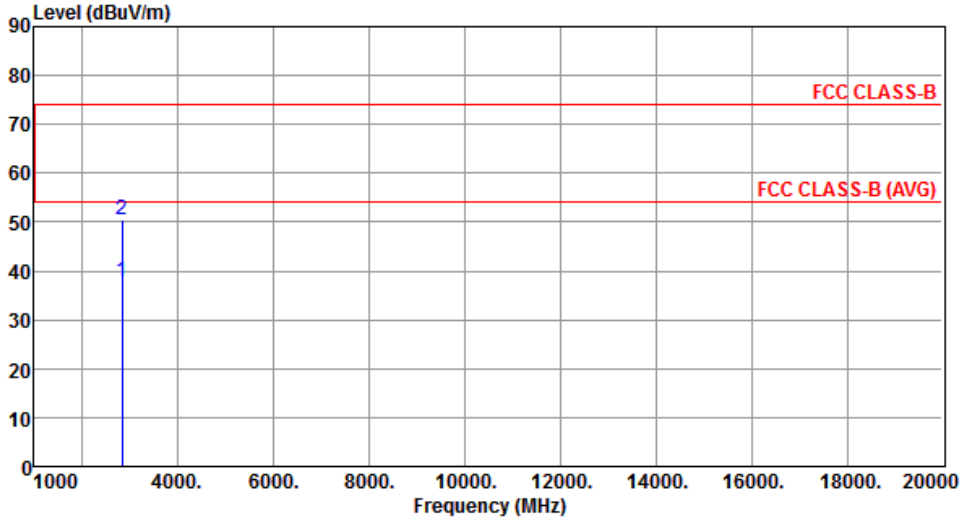
Test Mode	LTE Band 2 + LoRa 923.3MHz
Polarization	Horizontal



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2830.55	38.21	54.00	-15.79	39.88	-1.67	Average	100	21
2	2830.55	50.29	74.00	-23.71	51.96	-1.67	Peak	100	21

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).

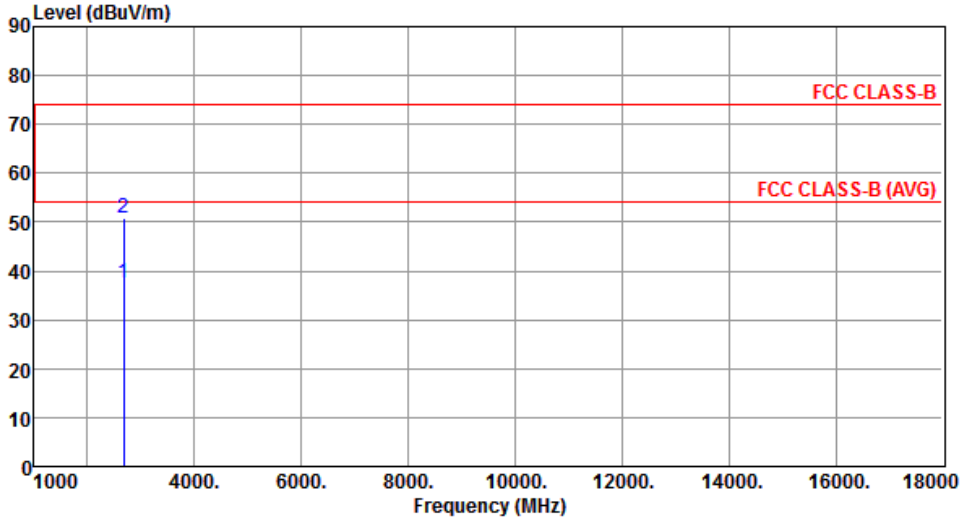
Test Mode	LTE Band 2 + LoRa 923.3MHz
Polarization	Vertical



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2830.55	37.79	54.00	-16.21	39.46	-1.67	Average	100	23
2	2830.55	50.44	74.00	-23.56	52.11	-1.67	Peak	100	23

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).

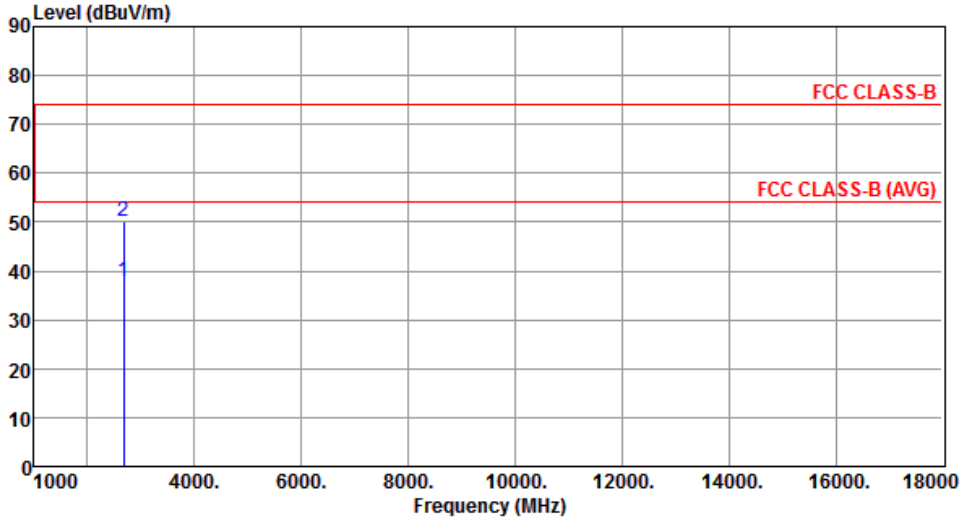
Test Mode	LTE Band 4 + LoRa 923.3MHz
Polarization	Horizontal



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2677.70	37.50	54.00	-16.50	39.74	-2.24	Average	100	156
2	2677.70	50.69	74.00	-23.31	52.93	-2.24	Peak	100	156

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).

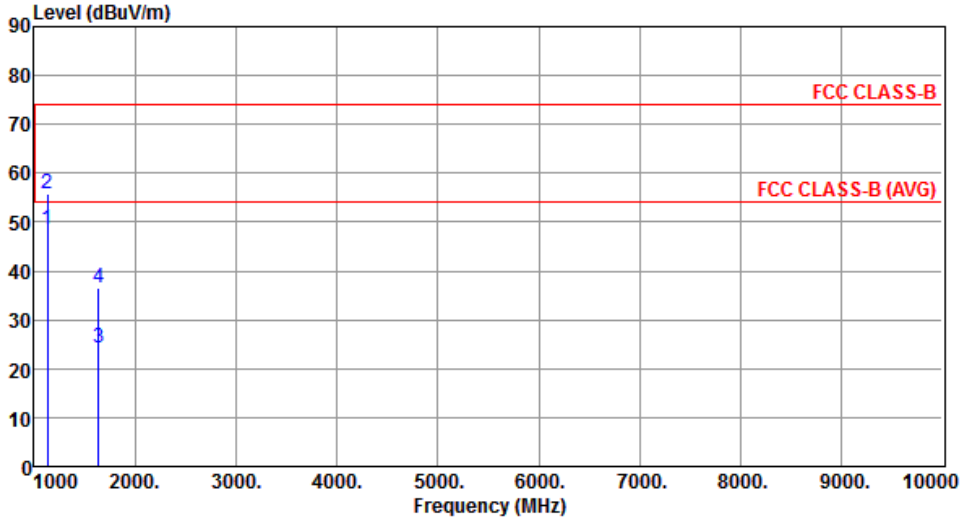
Test Mode	LTE Band 4 + LoRa 923.3MHz
Polarization	Vertical



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2677.70	37.84	54.00	-16.16	40.08	-2.24	Average	100	50
2	2677.70	50.12	74.00	-23.88	52.36	-2.24	Peak	100	50

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).

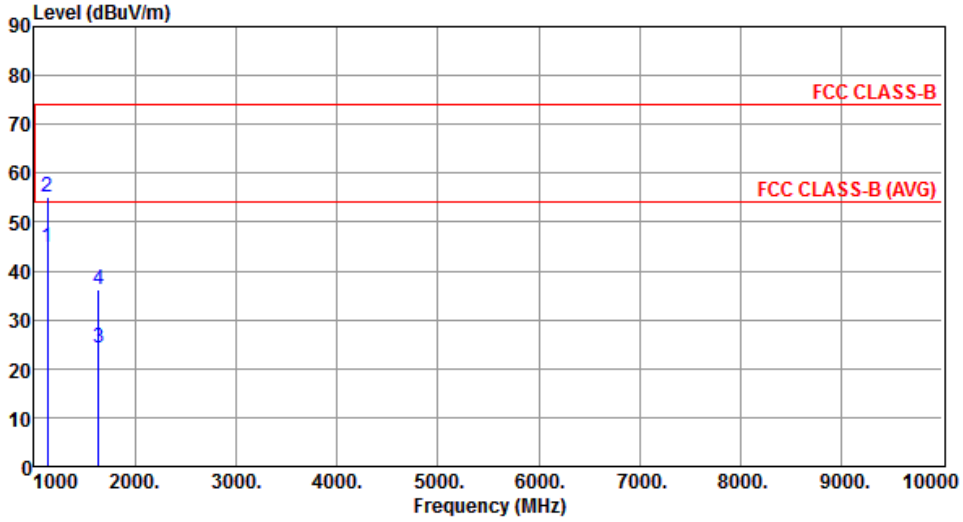
Test Mode	LTE Band 12 + LoRa 923.3MHz
Polarization	Horizontal



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1134.70	48.48	54.00	-5.52	58.14	-9.66	Average	184	10
2	1134.70	55.95	74.00	-18.05	65.61	-9.66	Peak	184	10
3	1635.20	24.18	54.00	-29.82	30.61	-6.43	Average	100	177
4	1635.20	36.44	74.00	-37.56	42.87	-6.43	Peak	100	177

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).

Test Mode	LTE Band 12 + LoRa 923.3MHz
Polarization	Vertical



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1134.70	44.91	54.00	-9.09	54.57	-9.66	Average	232	313
2	1134.70	55.17	74.00	-18.83	64.83	-9.66	Peak	232	313
3	1635.20	24.16	54.00	-29.84	30.59	-6.43	Average	100	144
4	1635.20	36.29	74.00	-37.71	42.72	-6.43	Peak	100	144

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).

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	**Kwei Shan**	**Kwei Shan Site II**
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If you have any suggestion, please feel free to contact us as below information

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