

FCC ID: 2AO93-NM0824-I

FCC Test Report (Part 15 Subpart C)

Client Information:

Applicant: System Level Solutions (India) Pvt. Ltd.

Applicant add.: Plot no. 32, Zone-D4, Phase 1 GIDC Estate, V.U. Nagar, Anand – 388121,
Gujarat, India

Manufacturer: System Level Solutions (India) Pvt. Ltd.

Manufacturer add.: Plot no. 32, Zone-D4, Phase 1 GIDC Estate, V.U. Nagar, Anand – 388121,
Gujarat, India

Product Information:

Product Name: mPCIe LoRa Concentrator Board

Model No.: NM0824-I

Derivative model No.: N/A

Brand Name: SLS

Applied Standard:

FCC Part 15 Subpart C 15.247

Laboratory Details:

AA Electro Magnetic Test Laboratory Private Limited
PlotNo174, Udyog Vihar-Phase4, Sector18, Gurgaon, Haryana, India

Date of Receipt: Aug. 17, 2022

Date of Test: Aug. 17, 2022 ~ Nov. 24, 2022

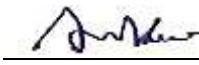
Date of Issue: Dec. 08, 2022

Test Result: In Compliance/Pass

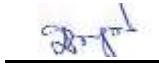
This device has been tested and found to comply with the stated standard(s), which is (are) required by the council directive of 2014/53/EU and indicated in the test report and are applicable only to the tested sample identified in the report.

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Prepared By (+ signature) Ankur Kumar:



Reviewed & Approved by: (+ signature)



Dr. Lenin Raja (Authorized Representative)

(/ lenin83/)

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2 Test Summary

2.1 Compliance with FCC Part 15 subpart C

| Test | Test Requirement | Standard Paragraph | Result |
|---|--|------------------------|-------------|
| Antenna Requirement | FCC Part 15 C:2013 | Section 15.247(c) | PASS |
| Conduction Emissions | FCC Part 15 C:2013 | Section 15.207(a) | PASS |
| Radiated Emissions | FCC Part 15 C:2013 | Section 15.247(d) | PASS |
| Maximum conducted (Average) output power | FCC Part 15 C:2013 | Section 15.247(b) | PASS |
| Maximum Power Spectral Density | FCC Part 15 C:2013 | Section 15.247(e) | PASS |
| DTS Bandwidth | FCC Part 15 C:2013 | Section 15.247 (a) (2) | PASS |
| Band edge | FCC Part 15 C:2013 | Section 15.247(d) | PASS |
| Conducted Spurious Emissions | FCC Part 15 C:2013 | Section 15.247(d) | PASS |
| Note: N/A is an abbreviation for Not Applicable. | | | |
| Model description: N/A | | | |
| (1) | Reference to the FCC Public Notice DA 00-705 | | |
| (2) | Reference to ANSI C63.4:2013. | | |

2.2 Test Location

All tests were performed at:

AA Electro Magnetic Test Laboratory Private Limited

Plot No 174, Udyog Vihar - Phase 4, Sector 18, Gurgaon, Haryana, India

Tel.: +91-0124-4235350

2.3 Measurement Uncertainty

All measurements involve certain levels of uncertainties, The following measurements uncertainty Levels have estimated based on ANSI C63.4:2013, the maximum value of the uncertainty as below

| No. | Item | Uncertainty |
|-----|-------------------------|-------------|
| 1 | Conducted Emission Test | 2.82dB |
| 2 | Radiated Emission Test | 2.77dB |

3 Test Facility

ILAC / NABL Accreditation No.: TC-8597

Three 3m Semi-Anechoic Chamber, 1 full-Anechoic chamber and 2 Shielding Rooms of AA Electro Magnetic Test Laboratory Private Limited have been registered by National Accreditation Board for Testing and Calibration Laboratories (NABL).

ILAC –A2LA Accreditation No.: 5593.01

Three 3m Semi-Anechoic Chamber, 1 full-Anechoic chamber and 2 Shielding Rooms of AA Electro Magnetic Test Laboratory Private Limited have been registered American Association of Laboratory Accreditation (A2LA.)

FCC- Recognition No.: 137777

Three 3m Semi-Anechoic Chamber, 1 full-Anechoic chamber and 2 Shielding Rooms of AA Electro Magnetic Test Laboratory Private Limited have been registered by Federal Communications Commission (FCC).

ISED Recognition No.: 26046

Three 3m Semi-Anechoic Chamber, 1 full-Anechoic chamber and 2 Shielding Rooms of AA Electro Magnetic Test Laboratory Private Limited have been registered by Institute for Social and Economic Development.(ISED)

VCCI- Registration No: 4053

Three 3m Semi-Anechoic Chamber, 1 full-Anechoic chamber and 2 Shielding Rooms of AA Electro Magnetic Test Laboratory Private Limited have been registered by Voluntary Control Council for Interference.(VCCI)

TEC Designation No.: IND063

Three 3m Semi-Anechoic Chamber, 1 full-Anechoic chamber and 2 Shielding Rooms of AA Electro Magnetic Test Laboratory Private Limited have been registered by Telecommunication Engineering (TEC) Center.

BIS Recognition No: 816586

BIS recognized as per CRS scheme for IT electronics, LED control gears, Lamp, Inverter / UPS are recognized as per LRS 2020.

3.1 Deviation from standard

None

3.2 Abnormalities from standard conditions

None

4 General Information

4.1 General Description of EUT

| | |
|---------------------------------|--|
| Manufacturer: | System Level Solutions (India) Pvt. Ltd. |
| Manufacturer Address: | Plot no. 32, Zone-D4, Phase 1 GIDC Estate, V.U. Nagar, Anand – 388121, Gujarat, India |
| EUT Name: | mPCIe LoRa Concentrator Board |
| Model No.: | NM0824-I |
| Brand Name: | SLS |
| Derivative model No.: | N/A |
| Serial No.: | 1531221900004 |
| Operation frequency: | 902.3MHz to 914.9MHz 903.0MHz to 927.5MHz |
| Number Of Channel: | 64+8+8 |
| Modulation Technology: | CSS |
| Channel Spacing : | 200kHz(DSS) 1.6MHz(DTS) |
| Antenna Gain: | 2.7 dBi |
| H/W No.: | 1A |
| S/W No.: | V2.1.0 |
| Power Supply Range: | Input of EUT: Powered through Adapter Input for adapter: AC 100-240VAC,50/60Hz,0.8A Max Output: DC 5V, 6A Total (Each 2.4A Max) |
| Condition of Sample on receipt: | Good |
| Note: | 1 .For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2. Antenna gain and antenna type provided by manufacturer. |

Description of Channel/frequency:

| Frequency Band (GHz) | Channel No. | Frequency (MHz) |
|----------------------------------|----------------|--------------------|
| Sub-GHz (903 MHz – 927.5 MHz) | Low | 903.0 |
| | ⋮ | ⋮ |
| | Mid | 923.5 |
| | ⋮ | ⋮ |
| | High | 927.5 |

Channel used for SubGHz testing

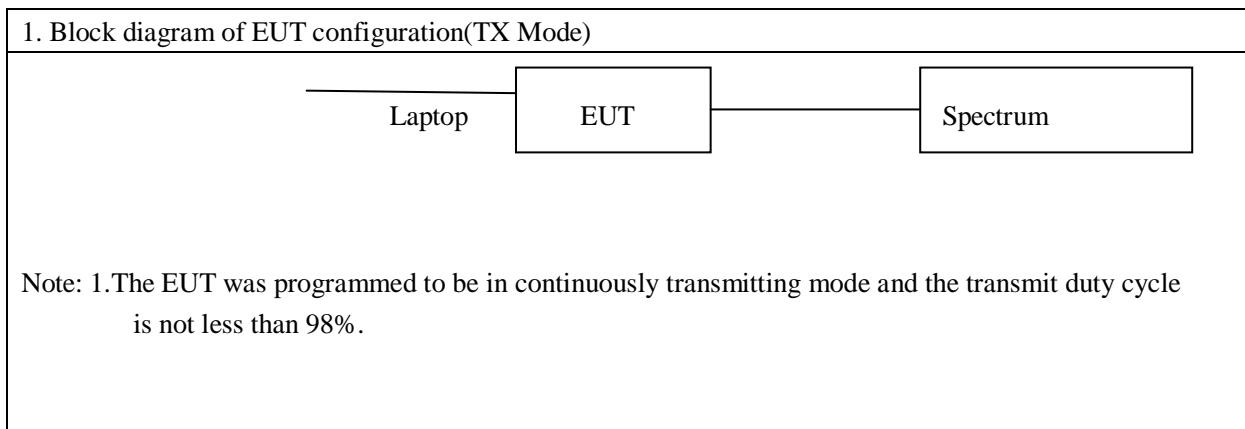
Channel Low : 903.0MHz

Channel Mid : 923.5MHz

Channel High : 927.5MHz

4.2 Description of Test conditions

(1) EUT was tested in normal configuration (Please See following Block diagram)



(2) E.U.T. test conditions:

15.31(e): For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

(3) Test frequencies:

According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and. If required reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

| Frequency range over which device operates | Number of frequencies | Location in the range of operation |
|--|-----------------------|---|
| 1 MHz or less | 1 | Middle |
| 1 to 10 MHz | 2 | 1 near top and 1 near bottom |
| More than 10 MHz | 3 | 1 near top, 1 near middle and 1 near bottom |

(4) Frequency range of radiated measurements:

According to the 15.33, the test range will be up to the tenth harmonic of the highest fundamental frequency.

(5) Pre-test the EUT in all transmitting mode at the lowest (2402 MHz), middle (2441 MHz) and highest (2480 MHz) channel with different data packet and conducted to determine the worst-case mode, only the worst-case results(1Mbps/2Mbps/3Mbps) are recorded in this report.

4.3 Test Peripheral List

| No. | Equipment | Manufacturer | EMC Compliance | Model No. | Serial No. | Power cord | signal cable |
|-----|-----------|--------------|----------------|-----------|---------------|------------|--------------|
| 1 | Laptop | DELL | Latitude 3490 | 5M2Z1W 2 | 2m unshielded | N/A | 1 |

4.4 EUT Peripheral List

| No. | Equipment | Manufacturer | Model No. | Serial No. | Power cord | signal cable |
|-----|-----------|--------------|-----------|------------|------------|--------------|
| 1. | N/A | N/A | N/A | N/A | N/A | N/A |

5 Equipments List for All Test Items

| No | Test Equipment | Manufacturer | Model No | Serial No | Cal. Date | Cal.Due Date |
|----|-----------------------------|-------------------|-------------|------------|------------|--------------|
| 1 | Spectrum Analyzer | Rohde and Schwarz | FSP40 | 101163 | 2020/12/11 | 2022/12/10 |
| 2 | Loop antenna | DAZE Beijing | ZN30900C | 18052 | 2021/01/29 | 2023/01/28 |
| 3 | Hi power horn antenna | DAZE Beijing | ZN30700 | 18012 | 2021/01/30 | 2023/01/29 |
| 4 | Horn antenna | DAZE Beijing | ZN30702 | 18006 | 2021/01/30 | 2023/01/29 |
| 5 | Horn antenna | DAZE Beijing | ZN30703 | 18005 | 2021/01/30 | 2023/01/29 |
| 6 | Pre amplifier | KELIANDA | LNA-0009295 | - | 2021/01/13 | 2023/01/13 |
| 7 | Pre amplifier | KELIANDA | CF-00218 | - | 2021/01/13 | 2023/01/13 |
| 8 | Biconical Antenna | DAZE Beijing | ZN30505C | 17038 | 2021/01/13 | 2023/01/13 |
| 9 | EMI-RECEIVER | Schwarzbeck | FCKL | 1528194 | 2021/01/13 | 2023/01/13 |
| 10 | Spectrum Analyzer | ADVANTEST | R3361 | - | 2021/01/13 | 2023/01/13 |
| 11 | LISN | Kyoritsu | KNW-407 | 8-1789-5 | 2021/01/13 | 2023/01/13 |
| 12 | Network-LISN | SCHWAR ZBECK | NNBM8125 | 81251314 | 2021/01/13 | 2023/01/13 |
| 13 | Network-LISN | SCHWAR ZBECK | NNBM8125 | 81251315 | 2021/01/13 | 2023/01/13 |
| 14 | PULSELIMITER | Rohde and Schwarz | ESH3-Z2 | 100681 | 2022/05/13 | 2023/05/12 |
| 15 | 50ΩCoaxialSwitch | DAIWA | 1565157 | - | 2022/05/13 | 2023/05/12 |
| 16 | 50ΩCoaxialSwitch | - | - | - | 2022/05/13 | 2023/05/12 |
| 17 | Wireless signal power meter | DARE!! | RPR3006W | RFSW190220 | 2021/01/13 | 2023/01/13 |
| 18 | Signal Generator | KEYSIGHT | N5181A | 512071 | 2021/01/13 | 2023/01/13 |



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| | | | | | | |
|----|----------------------------|----------|------------|--------------------------|------------|------------|
| 19 | RF Vector Signal Generator | Keysight | N5182B | 512094 | 2021/01/13 | 2023/01/13 |
| 20 | Spectrum analyzer | R&S | FSV-40N | 101385 | 2021/01/13 | 2023/01/13 |
| 21 | Radio Communication Tester | R&S | CMW 500 | 124589 | 2022/05/15 | 2023/05/14 |
| 22 | Signal Generator | R&S | SMP02 | 837017/004 836593/005 | 2022/05/15 | 2023/05/14 |
| 23 | DC Power Supply | Guanker | JK15040K | TNC/ET/C/0 01/15 | 2021/02/02 | 2023/02/01 |
| 24 | Pro. Temp & Humi. Chamber | MENTEK | MHP-150-1C | MAA081125 01 | 2021/02/02 | 2023/02/01 |
| 25 | Attenuators | AGILENT | 8494B | - | - | - |
| 26 | Attenuators | AGILENT | 8495B | - | - | - |

6 Test Result

6.1 Antenna Requirement

6.1.1 Standard requirement

15.203 requirement: For intentional device, according to 15.203: 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.

15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

6.1.2 EUT Antenna

The ANT-915-IPW1-RPS antenna is a hinged-whip IP67-rated dipole antenna designed for use in 915 MHz frequency bands for low-power, wide-area (LPWA) applications such as LoRaWAN® and WiFi HaLow™ as well as ISM and remote control applications.

The ANT-915-IPW1-RPS provides a ground plane independent dipole antenna solution. The hinged design allows for the antenna to be positioned for optimum performance and reduces the potential for damage from impact compared to a fixed whip design. The antenna attaches with an RP-SMA plug (female socket) connector.

6.2 Conduction Emissions Measurement

6.2.1 Applied procedures / Limit

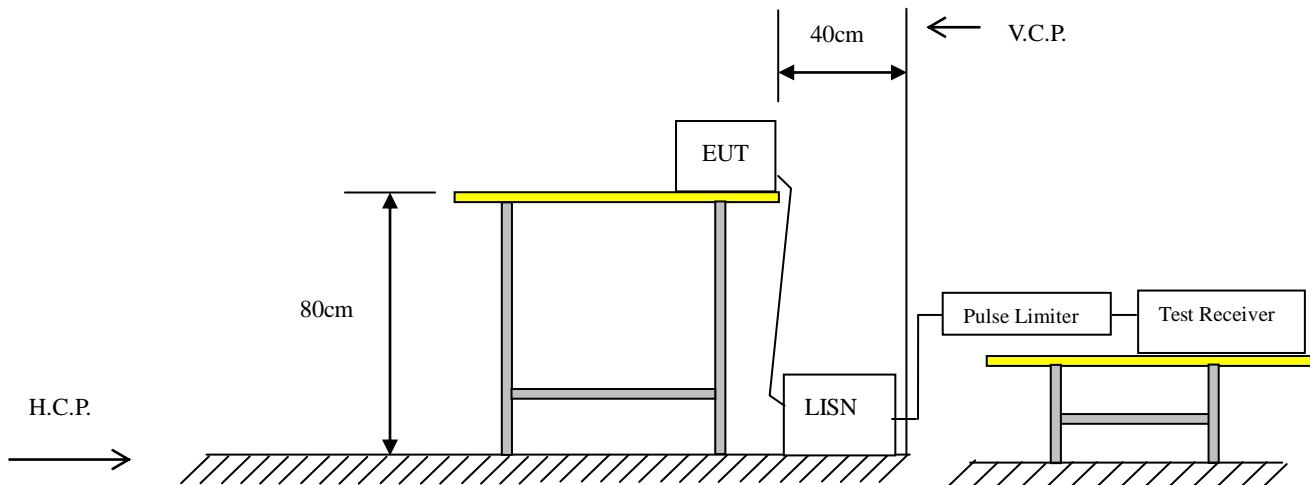
| Frequency of Emission (MHz) | Conducted Limit (dB μ V) | |
|-----------------------------|------------------------------|------------|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56 * | 56 to 46 * |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

Note: Decreases with the logarithm of the frequency.

6.2.2 Test procedure

EUT was placed upon a wooden test table 0.8m above the horizontal metal reference plane and 0.4m from the Vertical ground plane, and it was connected to an LISN/AMN. The closest distance between the boundary of the EUT and the surface of the LISN/AMN is 0.8m. All peripherals were connected to another LISN/AMN, and placed at a distance of 10cm from each other. A spectrum and receiver was connected to the RF output port of the LISN/AMN. Both average and quasi-peak value were detected.

6.2.3 Test setup

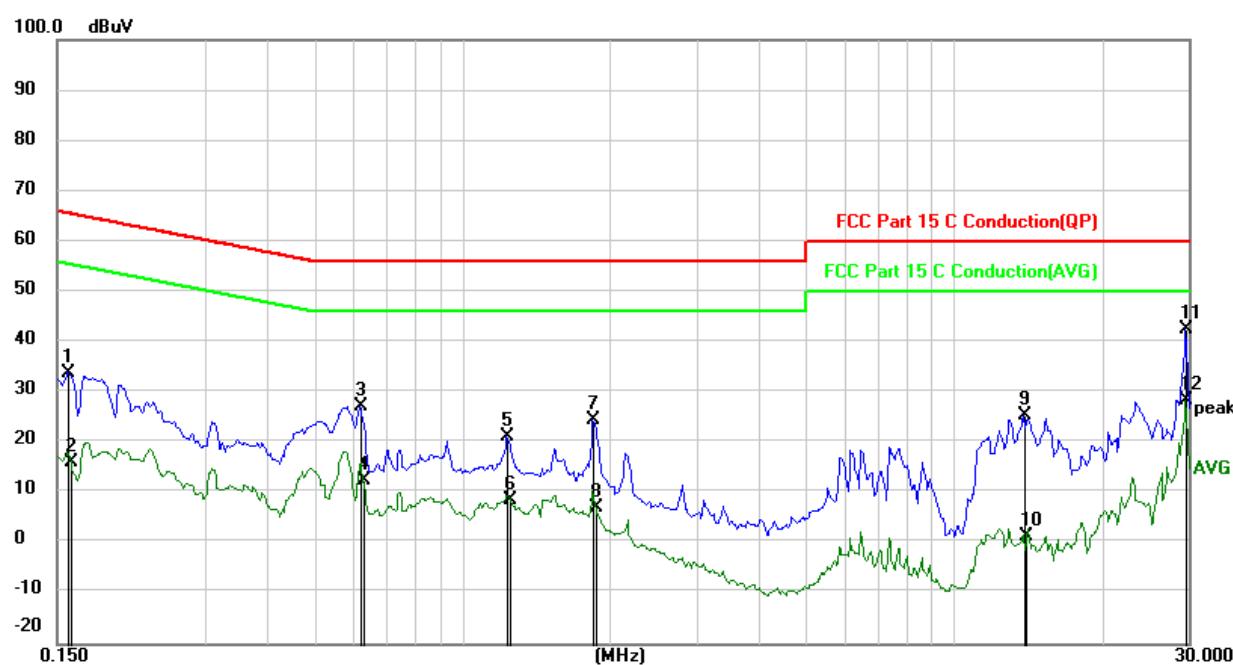


6.2.4 Test results

| | | | |
|-----------------------|-------------------------------|--------------------|------------|
| EUT: | mPCIe LoRa Concentrator Board | Model Name. : | NM0824-I |
| Temperature: | 24°C | Relative Humidity: | 52% |
| Pressure: | 1010hPa | Test Date : | 2022-09-29 |
| Test Mode: | TX (worst case) | Phase : | Line |
| Test Voltage : | 110Vac,60Hz | | |

| | MHz | dBuV | dB | dBuV | dBuV | dB | Detector |
|------|---------|-------|--------|-------|-------|--------|----------|
| 1 | 0.1578 | 44.01 | -10.01 | 34.00 | 65.57 | -31.57 | QP |
| 2 | 0.1598 | 26.09 | -10.00 | 16.09 | 55.47 | -39.38 | AVG |
| 3 | 0.6180 | 37.11 | -9.86 | 27.25 | 56.00 | -28.75 | QP |
| 4 | 0.6297 | 22.36 | -9.86 | 12.50 | 46.00 | -33.50 | AVG |
| 5 | 1.2342 | 31.04 | -9.82 | 21.22 | 56.00 | -34.78 | QP |
| 6 | 1.2554 | 18.38 | -9.82 | 8.56 | 46.00 | -37.44 | AVG |
| 7 | 1.8426 | 34.33 | -9.87 | 24.46 | 56.00 | -31.54 | QP |
| 8 | 1.8680 | 16.96 | -9.87 | 7.09 | 46.00 | -38.91 | AVG |
| 9 | 13.8585 | 35.19 | -9.86 | 25.33 | 60.00 | -34.67 | QP |
| 10 | 14.0628 | 11.43 | -9.86 | 1.57 | 50.00 | -48.43 | AVG |
| 11 * | 29.6067 | 34.14 | 8.51 | 42.65 | 60.00 | -17.35 | QP |
| 12 | 29.6067 | 19.89 | 8.51 | 28.40 | 50.00 | -21.60 | AVG |

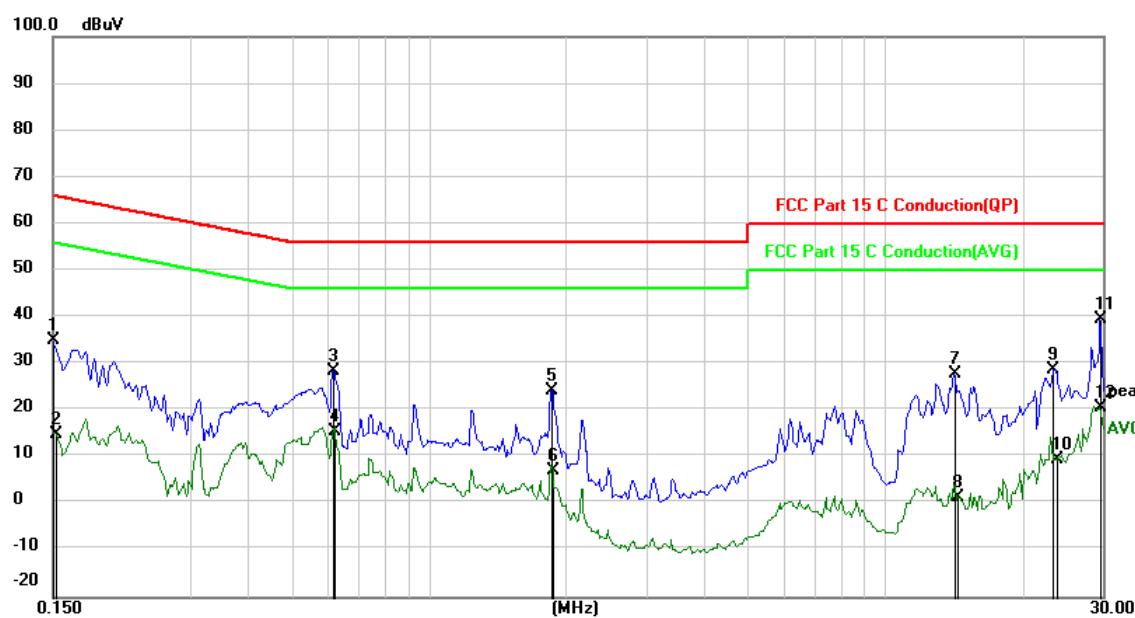
Remark: Factor = LISN factor + Cable Loss + Pulse limiter factor.



| | | | |
|-----------------------|-------------------------------|--------------------|------------|
| EUT: | mPCIe LoRa Concentrator Board | Model Name. : | NM0824-I |
| Temperature: | 24°C | Relative Humidity: | 52% |
| Pressure: | 1010hPa | Test Date : | 2022-09-29 |
| Test Mode: | TX (worst case) | Phase : | Neutral |
| Test Voltage : | 110Vac,60Hz | | |

| No. | Mk. | Freq. MHz | Reading | Correct Factor | Measure- ment | Limit | Over | |
|-----|-----|--------------|---------------|-------------------|------------------|-------|--------|-----|
| | | | Level dBuV | | | | | |
| 1 | | 0.1500 | 45.06 | -10.05 | 35.01 | 65.99 | -30.98 | QP |
| 2 | | 0.1524 | 24.85 | -10.04 | 14.81 | 55.86 | -41.05 | AVG |
| 3 | | 0.6141 | 38.36 | -9.86 | 28.50 | 56.00 | -27.50 | QP |
| 4 | | 0.6238 | 25.53 | -9.86 | 15.67 | 46.00 | -30.33 | AVG |
| 5 | | 1.8543 | 34.10 | -9.87 | 24.23 | 56.00 | -31.77 | QP |
| 6 | | 1.8698 | 17.09 | -9.87 | 7.22 | 46.00 | -38.78 | AVG |
| 7 | | 14.1939 | 37.85 | -9.86 | 27.99 | 60.00 | -32.01 | QP |
| 8 | | 14.4403 | 11.20 | -9.87 | 1.33 | 50.00 | -48.67 | AVG |
| 9 | | 23.3745 | 38.95 | -10.08 | 28.87 | 60.00 | -31.13 | QP |
| 10 | | 23.7021 | 19.69 | -10.08 | 9.61 | 50.00 | -40.39 | AVG |
| 11 | * | 29.6222 | 31.04 | 8.57 | 39.61 | 60.00 | -20.39 | QP |
| 12 | | 29.6222 | 12.07 | 8.57 | 20.64 | 50.00 | -29.36 | AVG |

Remark: Factor = LISN factor + Cable Loss + Pulse limiter factor.



6.3 Radiated Emissions Measurement

6.3.1 Applied procedures / Limit

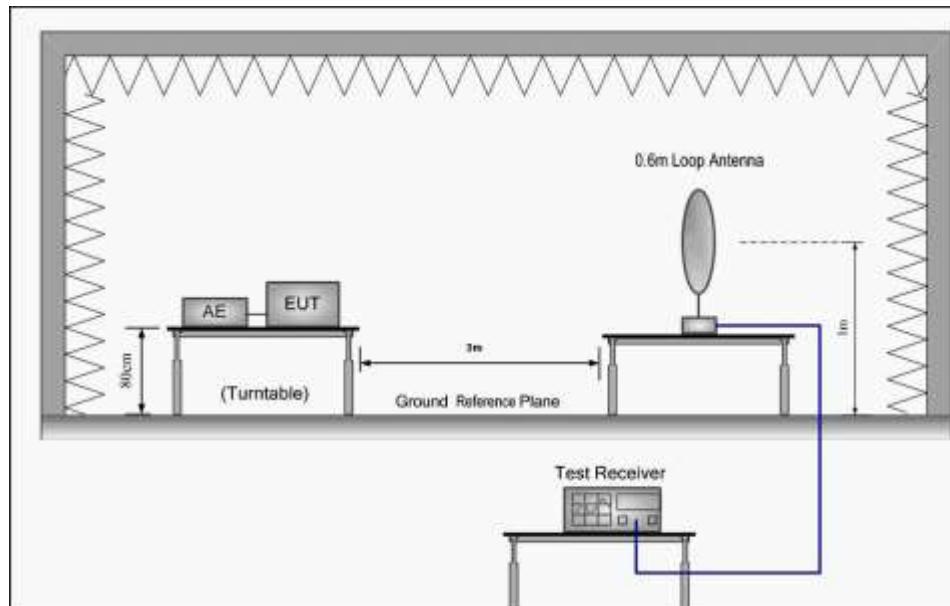
15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

| Frequency of Emission (MHz) | Field Strength | | Measurement Distance (meters) |
|-----------------------------|-----------------|--------------------------|-------------------------------|
| | $\mu\text{V/m}$ | $\text{dB}\mu\text{V/m}$ | |
| 0.009-0.49 | 2400/F(kHz) | | 300 |
| 0.49-1.705 | 24000/F(kHz) | | 30 |
| 1.705-30 | 30 | | 30 |
| 30-88 | 100 | 40 | 3 |
| 88-216 | 150 | 43.5 | 3 |
| 216-960 | 200 | 46 | 3 |
| Above 960 | 500 | 54 | 3 |

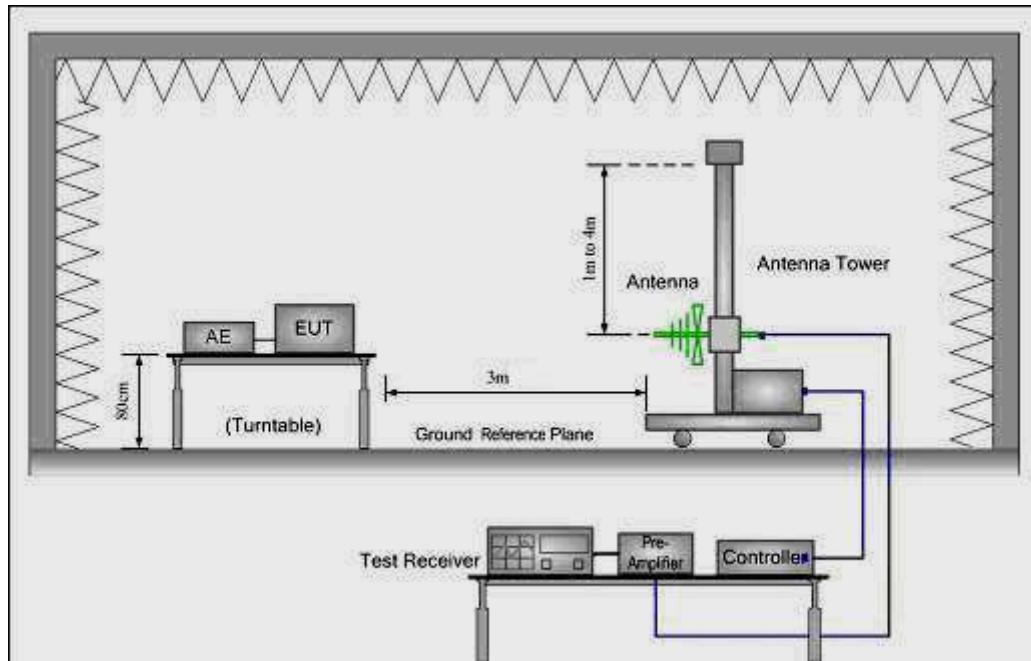
6.3.2 Test setup

Test Configuration:

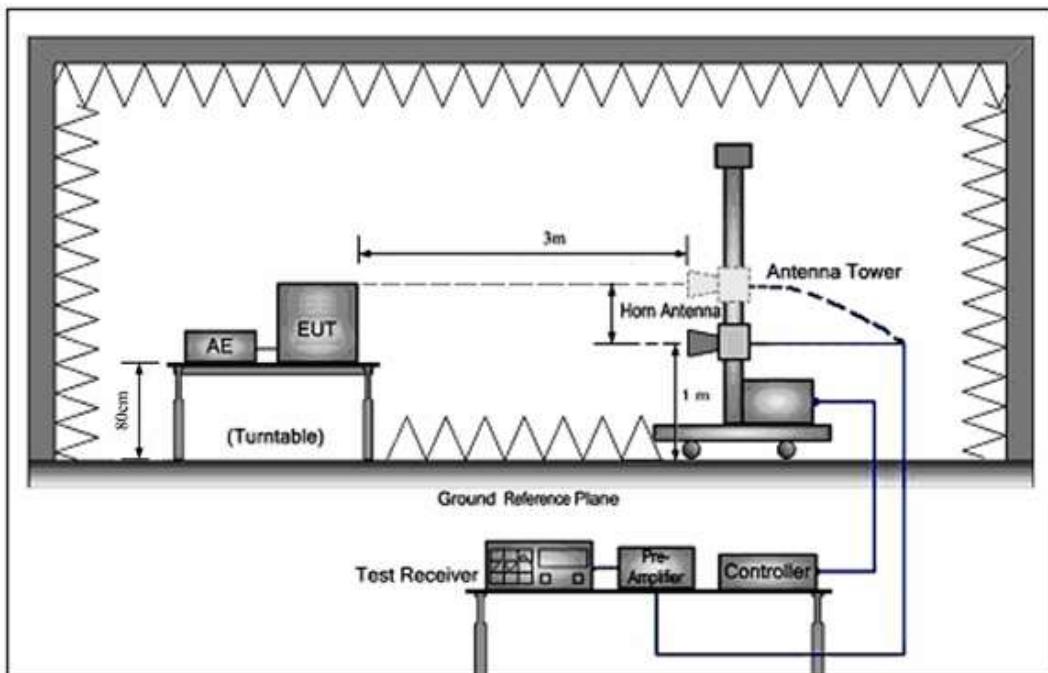
- 1) 9 kHz to 30 MHz emissions:



2) 30 MHz to 1 GHz emissions:



3) Above 1 GHz missions:



6.3.3 Test procedure

EUT was placed upon a wooden test table which was placed on the turn table 0.8m above the horizontal metal ground plane, and operating in the mode as mentioned above. A receiving antenna was placed 3m away from the EUT. During testing, turn around the turn table and move the antenna from 1m to 4m to find the maximum field-strength reading. All peripherals were placed at a distance of 10cm between each other. Both horizontal and Vertical antenna polarities were tested. The worst case emissions were reported.

For measurement at frequency above 1GHz

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

6.3.4 Test Result

Radiated Emissions Test Data Below 30MHz

| | | | |
|----------------------|--|--------------------|---------------|
| EUT: | mPCIe LoRa Concentrator Board | Model Name. : | NM0824-I |
| Temperature: | 24.5°C | Test Data | 2022-08-17 |
| Pressure: | 1010hPa | Relative Humidity: | 51% |
| Test Mode : | TX (worst case) | Test Voltage : | AC 110V, 60Hz |
| Measurement Distance | 3 m | Frequency Range | 9KHz to 30MHz |
| RBW/VBW | 9KHz~150KHz/RB 200Hz for QP, 150KHz~30MHz/RB 9KHz for QP | | |

No emission found between lowest internal used/generated frequencies to 30MHz.

Radiated Emissions Test Data Below 1GHz

| | | | |
|----------------------|--|--------------------|---------------|
| EUT: | mPCIe LoRa Concentrator Board | Model Name. : | NM0824-I |
| Temperature: | 24.5°C | Test Data | 2022-08-17 |
| Pressure: | 1010hPa | Relative Humidity: | 51% |
| Test Mode : | TX (worst case) | Test Voltage : | AC 110V, 60Hz |
| Measurement Distance | 3 m | Frequency Range | 30MHz to 1GHz |
| RBW/VBW | 100KHz / 300KHz for spectrum, RBW=120KHz for receiver. | | |

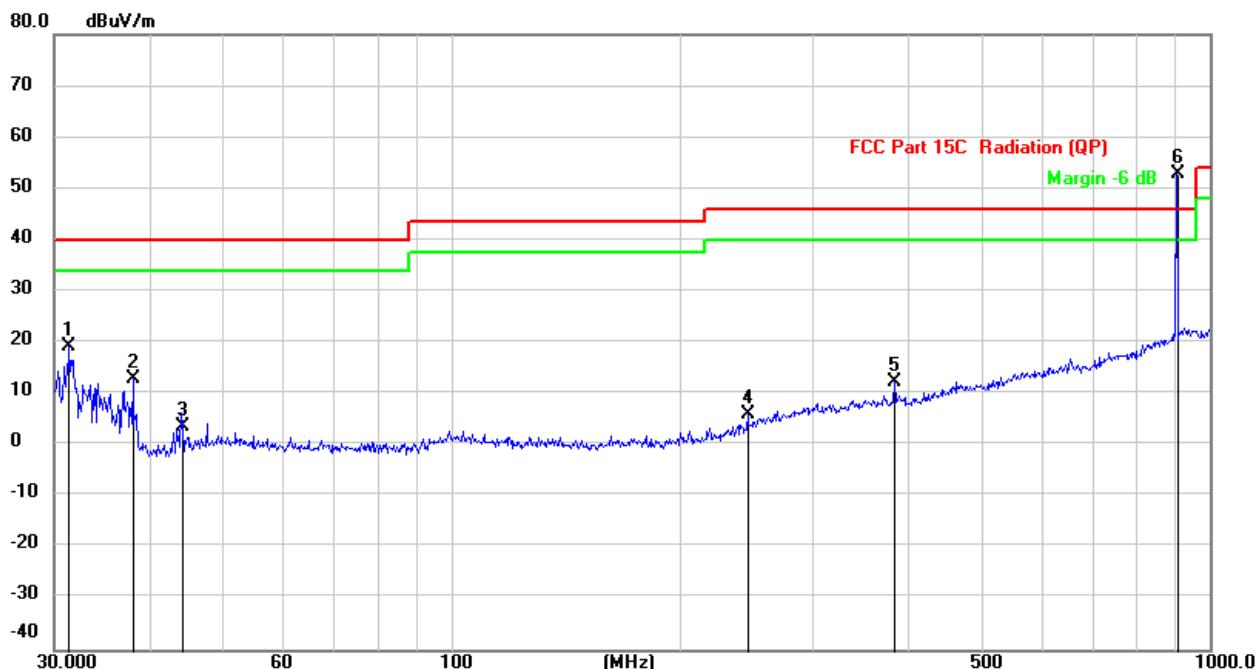
Test at Channel (903.0 MHz) in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Vertical:

Peak scan

Level (dB μ V/m)



Quasi-peak measurement

| No. | Mk. | Freq. | Reading | Correct | Measure- | Limit | Over |
|-----|----------|-------|------------|---------|--------------|--------|----------|
| | | | Level | Factor | ment | | |
| | | MHz | dB μ V | dB | dB μ V/m | dB | Detector |
| 1 | 31.3992 | 30.69 | -11.33 | 19.36 | 40.00 | -20.64 | QP |
| 2 | 38.0783 | 30.15 | -17.05 | 13.10 | 40.00 | -26.90 | QP |
| 3 | 44.2752 | 20.98 | -17.35 | 3.63 | 40.00 | -36.37 | QP |
| 4 | 245.9509 | 17.07 | -10.91 | 6.16 | 46.00 | -39.84 | QP |
| 5 | 383.9318 | 18.73 | -6.37 | 12.36 | 46.00 | -33.64 | QP |
| 6 * | 903.3094 | 46.51 | 6.43 | 52.94 | 46.00 | 6.94 | QP |

Note: '*' means the worst case

Measurement Level = Reading Level + Factor

Factor= Ant Factor + Cable Loss - Pre-amplifier

Note:-Marker 6 is intentional desired frequency of EUT Hence considered as PASS.

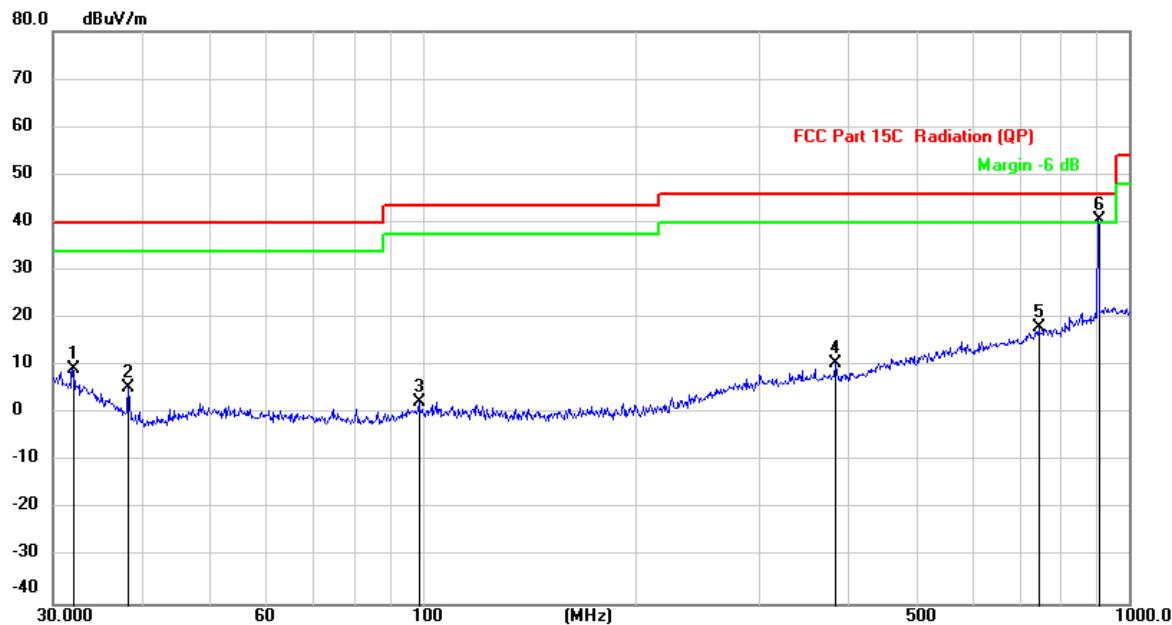
Test at Channel (903.0 MHz) in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Horizontal:

Peak scan

Level (dB μ V/m)



Quasi-peak measurement

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure- ment | Limit | Over | |
|-----|-----|----------|---------------|----------------|------------------|--------|--------|----------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 31.9546 | 20.98 | -11.55 | 9.43 | 40.00 | -30.57 | QP |
| 2 | | 38.3462 | 22.65 | -17.24 | 5.41 | 40.00 | -34.59 | QP |
| 3 | | 98.8326 | 16.43 | -14.03 | 2.40 | 43.50 | -41.10 | QP |
| 4 | | 383.9318 | 16.40 | -5.95 | 10.45 | 46.00 | -35.55 | QP |
| 5 | | 744.8661 | 15.84 | 2.18 | 18.02 | 46.00 | -27.98 | QP |
| 6 | * | 903.3094 | 34.07 | 6.43 | 40.50 | 46.00 | -5.50 | QP |

Note: '*' means the worst case

Measurement Level = Reading Level + Factor

Factor= Ant Factor + Cable Loss - Pre-amplifier

Note:-Marker 6 is intentional desired frequency of EUT Hence considered as PASS.

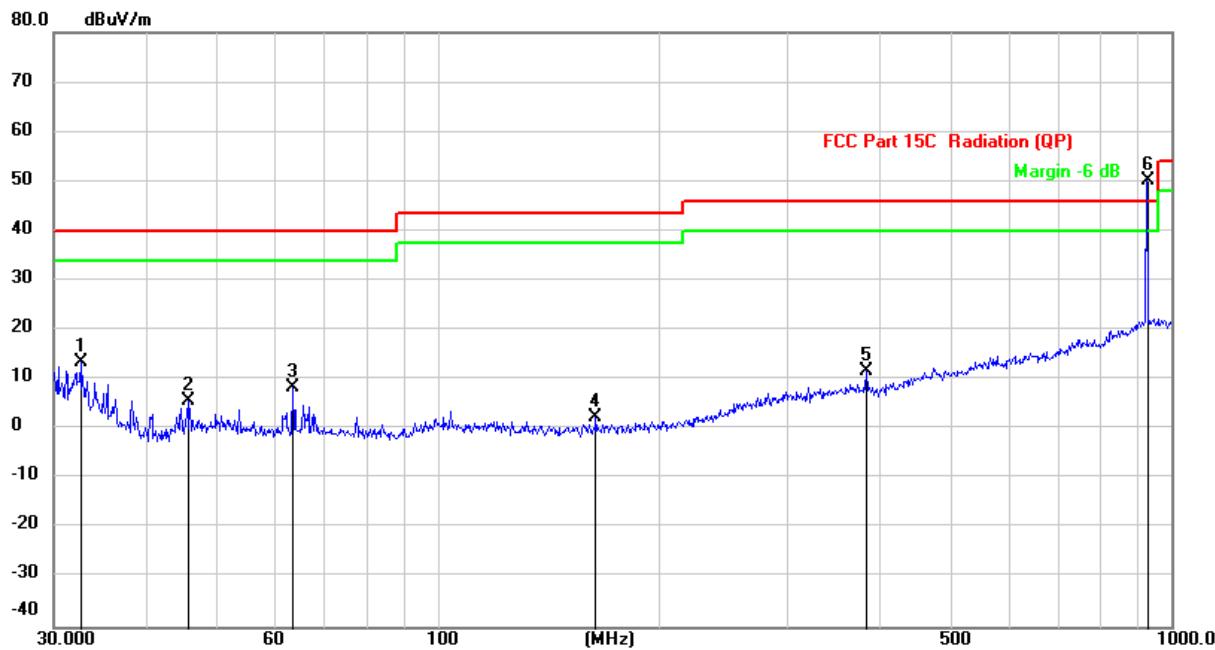
Test at Channel (923.5 MHz) in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Vertical:

Peak scan

Level (dB μ V/m)



Quasi-peak measurement

| No. | Mk. | Freq. | Reading | Correct | Measure- | Limit | Over | | |
|-----|-----|----------|---------|---------|----------|--------|--------|----|----------|
| | | | Level | Factor | ment | | | | |
| | | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 32.6340 | 25.89 | -12.36 | 13.53 | 40.00 | -26.47 | QP | |
| 2 | | 45.6948 | 22.53 | -16.88 | 5.65 | 40.00 | -34.35 | QP | |
| 3 | | 63.5356 | 24.73 | -16.20 | 8.53 | 40.00 | -31.47 | QP | |
| 4 | | 164.3301 | 16.68 | -14.30 | 2.38 | 43.50 | -41.12 | QP | |
| 5 | | 383.9318 | 18.24 | -6.37 | 11.87 | 46.00 | -34.13 | QP | |
| 6 | * | 925.7563 | 43.72 | 6.48 | 50.20 | 46.00 | 4.20 | QP | |

Note: '*' means the worst case

Measurement Level = Reading Level + Factor

Factor= Ant Factor + Cable Loss - Pre-amplifier

Note:-Marker 6 is intentional desired frequency of EUT Hence considered as PASS.

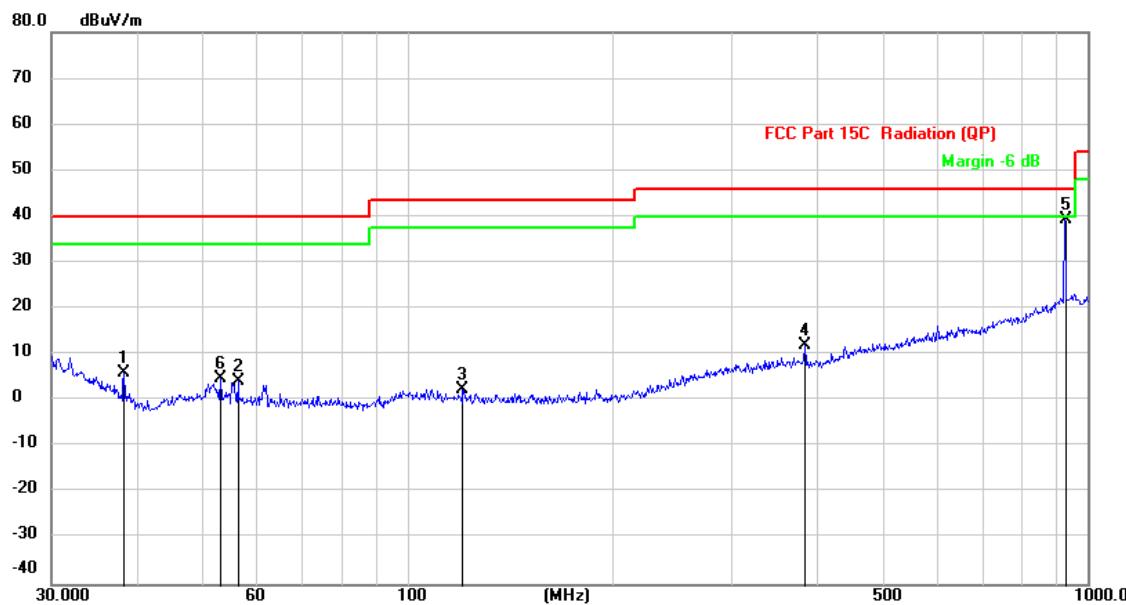
Test at Channel (923.5 MHz) in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Horizontal:

Peak scan

Level (dB μ V/m)



Quasi-peak measurement

| No. | Mk. | Freq. | Reading | Correct | Measure- | Limit | Over |
|-----|-----|----------|------------|---------|--------------|-------|-----------|
| | | | Level | Factor | ment | | |
| | | MHz | dB μ V | dB | dB μ V/m | dB | Detector |
| 1 | | 38.3462 | 23.38 | -17.24 | 6.14 | 40.00 | -33.86 QP |
| 2 | | 56.3948 | 19.90 | -15.70 | 4.20 | 40.00 | -35.80 QP |
| 3 | | 120.6991 | 17.23 | -14.76 | 2.47 | 43.50 | -41.03 QP |
| 4 | | 383.9318 | 17.88 | -5.95 | 11.93 | 46.00 | -34.07 QP |
| 5 | * | 925.7563 | 32.74 | 6.48 | 39.22 | 46.00 | -6.78 QP |
| 6 | | 53.1313 | 20.26 | -15.48 | 4.78 | 40.00 | -35.22 QP |

Note: '*' means the worst case

Measurement Level = Reading Level + Factor

Factor= Ant Factor + Cable Loss - Pre-amplifier

Note:-Marker 6 is intentional desired frequency of EUT Hence considered as PASS.

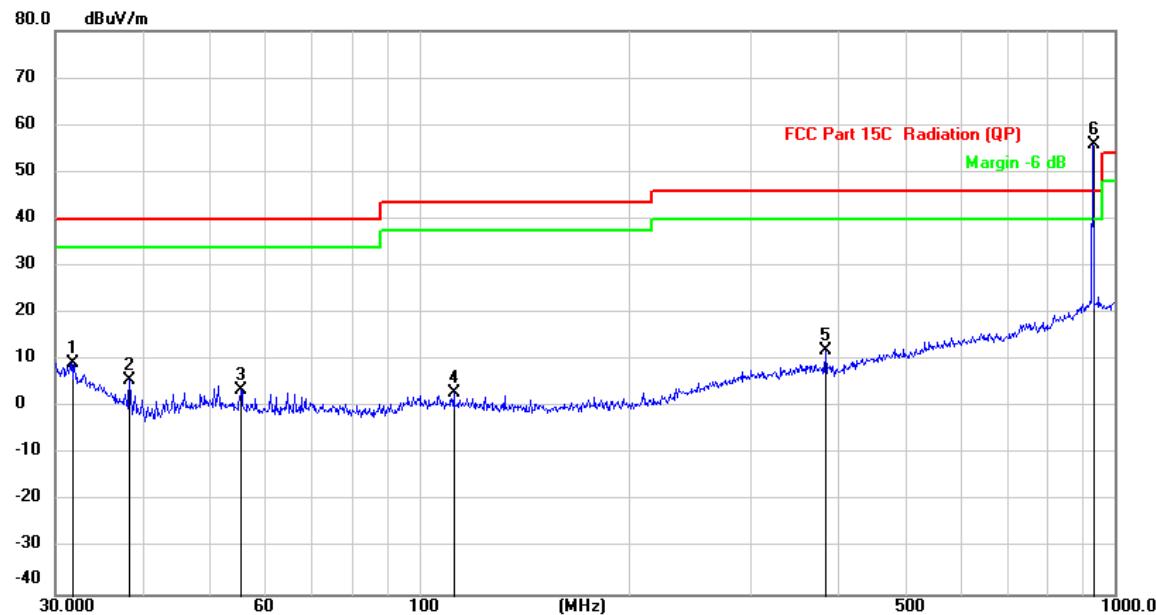
Test at Channel (927.5 MHz) in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Vertical:

Peak scan

Level (dB μ V/m)



Quasi-peak measurement

| No. | Mk. | Freq. | Reading | Correct | Measure- | Limit | Over | |
|-----|-----|----------|------------|---------|--------------|--------------|--------|----------|
| | | | Level | Factor | ment | | | |
| | | MHz | dB μ V | dB | dB μ V/m | dB μ V/m | dB | Detector |
| 1 | | 31.6202 | 20.86 | -11.52 | 9.34 | 40.00 | -30.66 | QP |
| 2 | | 38.3462 | 23.04 | -17.28 | 5.76 | 40.00 | -34.24 | QP |
| 3 | | 55.4147 | 19.62 | -15.83 | 3.79 | 40.00 | -36.21 | QP |
| 4 | | 112.1305 | 18.09 | -15.15 | 2.94 | 43.50 | -40.56 | QP |
| 5 | | 383.9318 | 18.33 | -6.37 | 11.96 | 46.00 | -34.04 | QP |
| 6 | * | 929.0082 | 49.32 | 6.49 | 55.81 | 46.00 | 9.81 | QP |

Note: '*' means the worst case

Measurement Level = Reading Level + Factor

Factor= Ant Factor + Cable Loss - Pre-amplifier

Note:-Marker 6 is intentional desired frequency of EUT Hence considered as PASS.

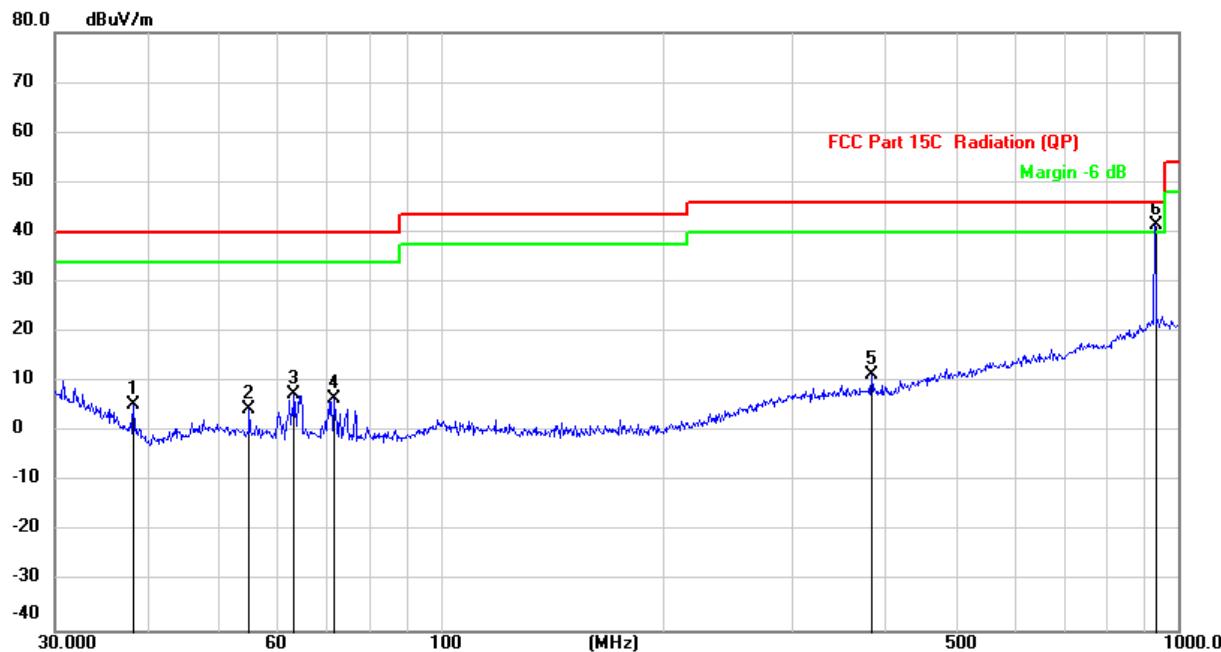
Test at Channel (927.5 MHz) in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Horizontal:

Peak scan

Level (dB μ V/m)



Quasi-peak measurement

| No. | Mk. | Freq. | Reading | Correct | Measure- | Limit | Over |
|-----|-----|----------|------------|---------|--------------|-------|-----------|
| | | | Level | Factor | ment | | |
| | | MHz | dB μ V | dB | dB μ V/m | dB | Detector |
| 1 | | 38.3462 | 22.72 | -17.24 | 5.48 | 40.00 | -34.52 QP |
| 2 | | 55.0274 | 20.10 | -15.61 | 4.49 | 40.00 | -35.51 QP |
| 3 | | 63.3132 | 23.62 | -16.02 | 7.60 | 40.00 | -32.40 QP |
| 4 | | 71.5806 | 22.73 | -16.22 | 6.51 | 40.00 | -33.49 QP |
| 5 | | 383.9318 | 17.53 | -5.95 | 11.58 | 46.00 | -34.42 QP |
| 6 * | | 929.0082 | 34.97 | 6.49 | 41.46 | 46.00 | -4.54 QP |

Note: '*' means the worst case

Measurement Level = Reading Level + Factor

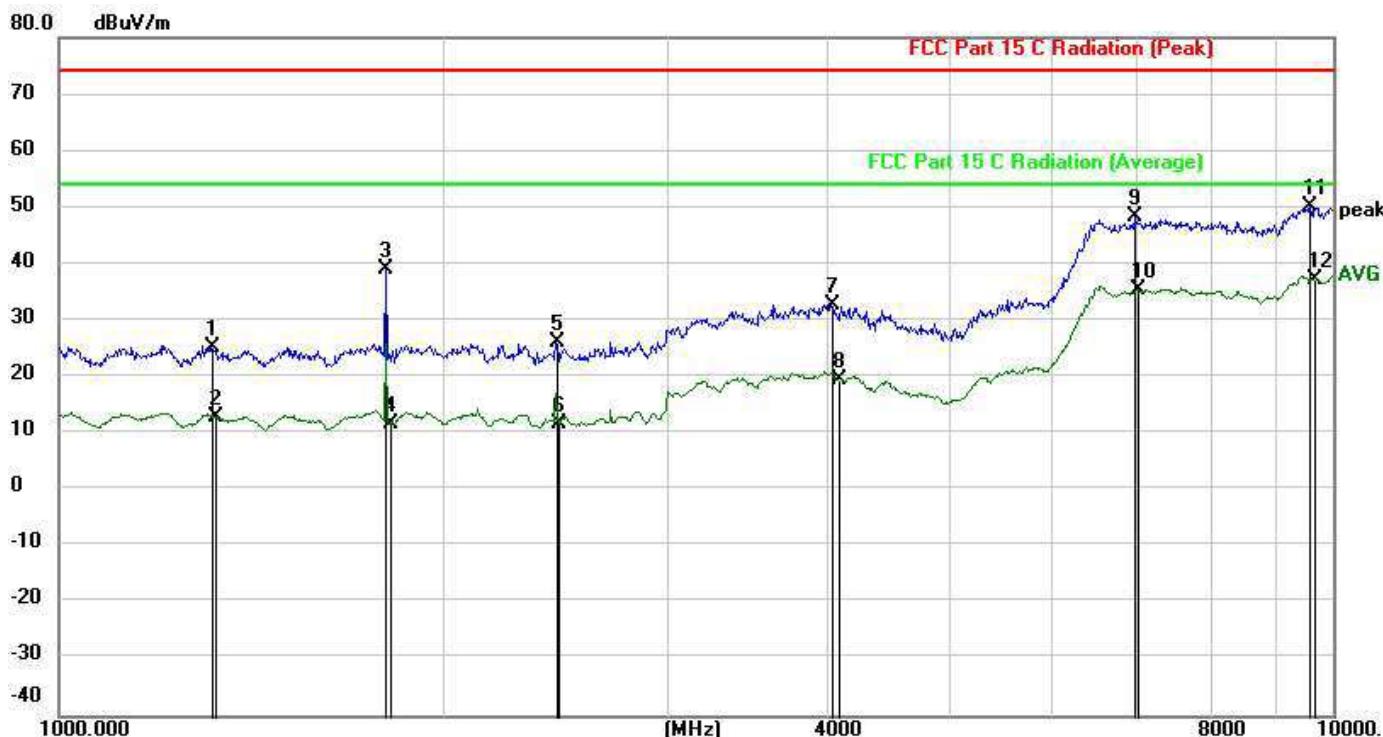
Factor= Ant Factor + Cable Loss - Pre-amplifier

Note:-Marker 6 is intentional desired frequency of EUT Hence considered as PASS.

Radiated Emissions Test Data Above 1GHz

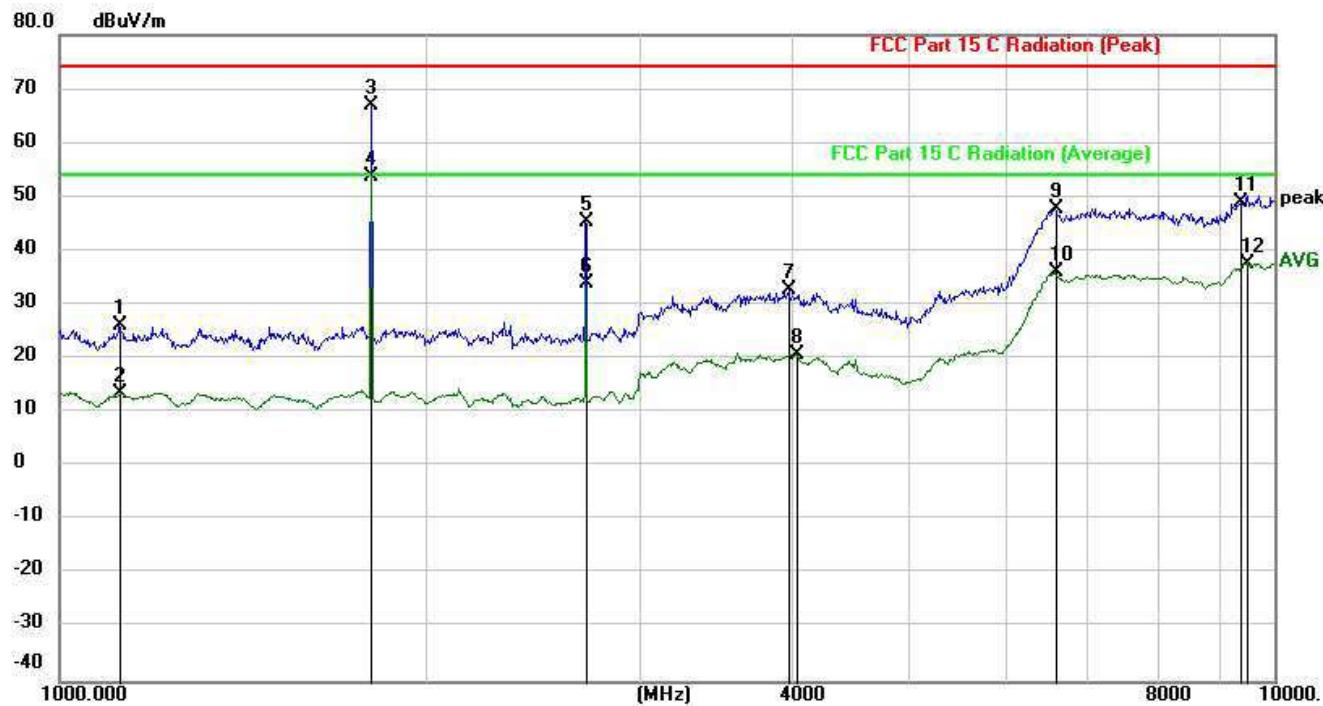
| | | | |
|----------------------|---|--------------------|---------------|
| EUT: | mPCIe LoRa Concentrator Board | Model Name. : | NM0824-I |
| Temperature: | 24.5°C | Test Data | 2022-08-17 |
| Pressure: | 1010hPa | Relative Humidity: | 51% |
| Test Mode : | TX (903MHz) | Test Voltage : | AC 110V, 60Hz |
| Measurement Distance | 3 m | Frequency Range | 1GHz to 25GHz |
| RBW/VBW | Spurious emission: 1MHz/1MHz for Peak, 1MHz/10Hz for Average. non-restricted band: 100KHz/300KHz for Peak. | | |

(a) Antenna polarization: Horizontal



| No. | Mk. | Freq. | Reading | Correct | Measure- | Limit | Over |
|-----|-----|----------|---------|---------|----------|-------|-------------|
| | | | Level | Factor | ment | | |
| 1 | | 1315.225 | 33.31 | -8.17 | 25.14 | 74.00 | -48.86 peak |
| 2 | | 1324.342 | 21.26 | -8.21 | 13.05 | 54.00 | -40.95 AVG |
| 3 | | 1803.018 | 48.07 | -8.93 | 39.14 | 74.00 | -34.86 peak |
| 4 | | 1815.516 | 20.75 | -8.93 | 11.82 | 54.00 | -42.18 AVG |
| 5 | | 2454.709 | 35.74 | -9.54 | 26.20 | 74.00 | -47.80 peak |
| 6 | | 2471.724 | 21.42 | -9.55 | 11.87 | 54.00 | -42.13 AVG |
| 7 | | 4036.454 | 38.07 | -5.37 | 32.70 | 74.00 | -41.30 peak |
| 8 | | 4083.194 | 25.19 | -5.54 | 19.65 | 54.00 | -34.35 AVG |
| 9 | | 6982.324 | 37.60 | 10.83 | 48.43 | 74.00 | -25.57 peak |
| 10 | | 7030.723 | 24.57 | 10.85 | 35.42 | 54.00 | -18.58 AVG |
| 11 | | 9594.006 | 36.01 | 14.09 | 50.10 | 74.00 | -23.90 peak |
| 12 | * | 9660.509 | 23.27 | 14.09 | 37.36 | 54.00 | -16.64 AVG |

(b) Antenna polarization: Vertical



| No. | Mk. | Freq. | Reading | Correct | Measure- | Limit | Over | Detector |
|-----|-----|----------|---------|---------|----------|-------|--------|----------|
| | | | Level | Factor | ment | | | |
| | | MHz | dBuV | dB | dBuV/m | | | |
| 1 | | 1119.438 | 33.59 | -7.49 | 26.10 | 74.00 | -47.90 | peak |
| 2 | | 1122.018 | 20.91 | -7.50 | 13.41 | 54.00 | -40.59 | AVG |
| 3 | | 1803.018 | 75.81 | -8.93 | 66.88 | 74.00 | -7.12 | peak |
| 4 | * | 1803.018 | 62.73 | -8.93 | 53.80 | 54.00 | -0.20 | AVG |
| 5 | | 2710.192 | 54.88 | -9.40 | 45.48 | 74.00 | -28.52 | peak |
| 6 | | 2710.192 | 43.31 | -9.40 | 33.91 | 54.00 | -20.09 | AVG |
| 7 | | 3981.072 | 37.92 | -5.29 | 32.63 | 74.00 | -41.37 | peak |
| 8 | | 4036.454 | 26.27 | -5.37 | 20.90 | 54.00 | -33.10 | AVG |
| 9 | | 6591.739 | 37.15 | 10.65 | 47.80 | 74.00 | -26.20 | peak |
| 10 | | 6591.739 | 25.36 | 10.65 | 36.01 | 54.00 | -17.99 | AVG |
| 11 | | 9375.620 | 35.66 | 13.26 | 48.92 | 74.00 | -25.08 | peak |
| 12 | | 9484.185 | 23.71 | 13.98 | 37.69 | 54.00 | -16.31 | AVG |

Note:

10~25GHz at least have 20dB margin. No recording in the test report.

Measurement Level = Reading Level + Factor

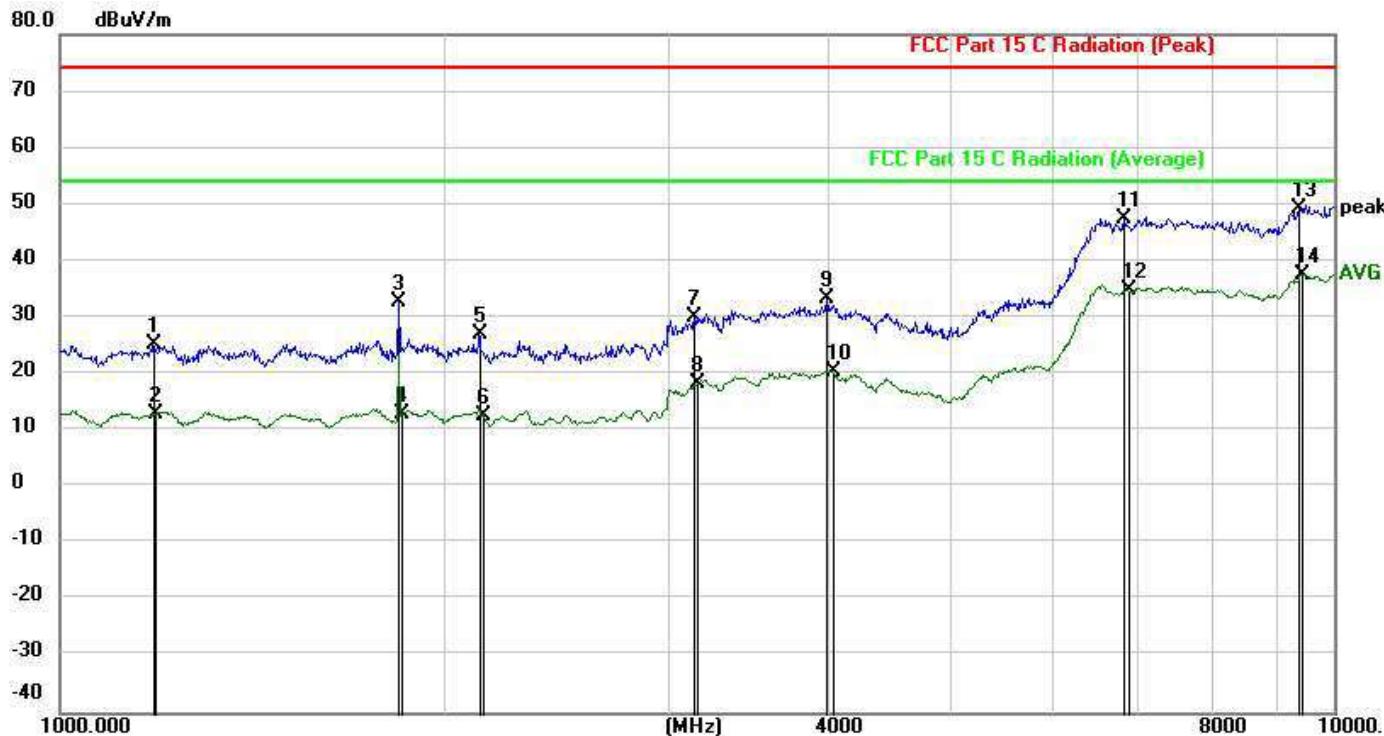
Remark: Factor = Antenna Factor + Cable Loss–Pre-amplifier

Highest channel: 903.0MHz

Report No.: AAEMT/EMC/220817-01-04

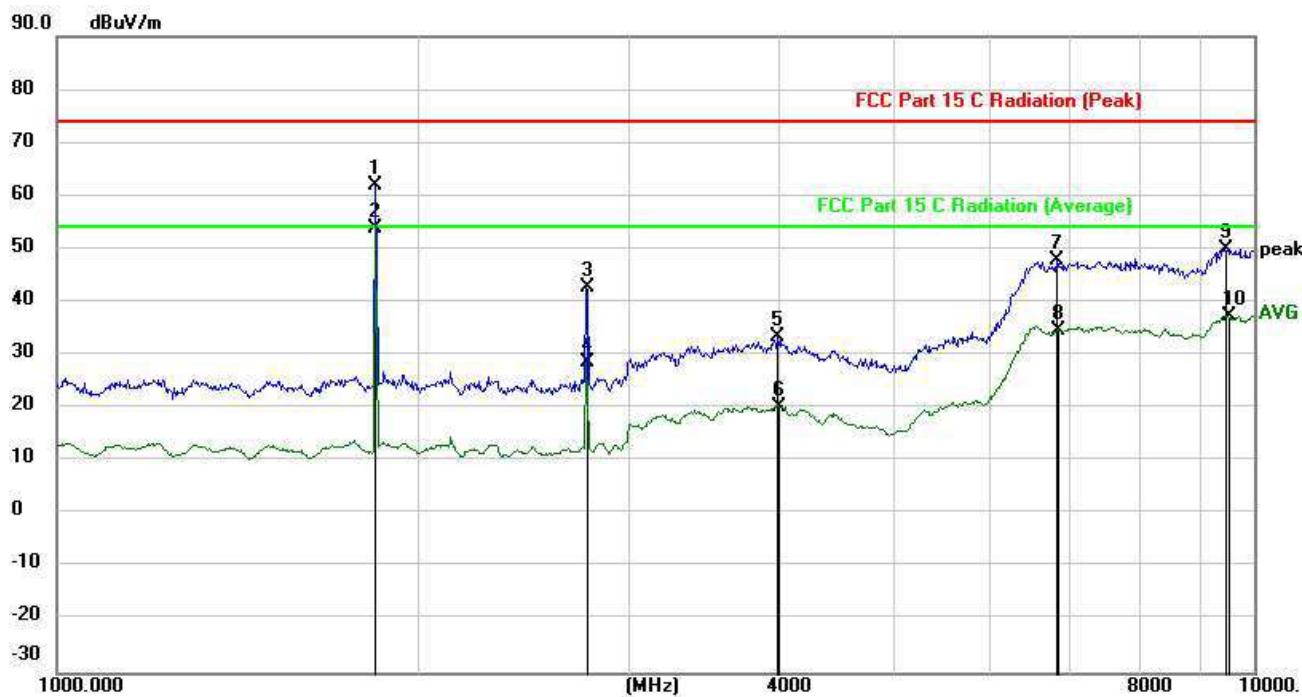
| | | | |
|----------------------|---|--------------------|---------------|
| EUT: | mPCIe LoRa Concentrator Board | Model Name. : | NM0824-I |
| Temperature: | 24.5°C | Test Data | 2022-08-17 |
| Pressure: | 1010hPa | Relative Humidity: | 51% |
| Test Mode : | TX (923.5MHz) | Test Voltage : | AC 110V, 60Hz |
| Measurement Distance | 3 m | Frequency Range | 1GHz to 25GHz |
| RBW/VBW | Spurious emission: 1MHz/1MHz for Peak, 1MHz/10Hz for Average. non-restricted band: 100KHz/300KHz for Peak. | | |

(a) Antenna polarization: Horizontal



| No. | Mk. | Freq. | Reading | Correct Factor | Measure- ment | Limit | Over | Detector |
|-----|----------|-------|---------|----------------|------------------|--------|------|----------|
| | | | Level | | | | | |
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector |
| 1 | 1183.042 | 32.95 | -7.71 | 25.24 | 74.00 | -48.76 | peak | |
| 2 | 1185.769 | 20.61 | -7.72 | 12.89 | 54.00 | -41.11 | AVG | |
| 3 | 1845.015 | 41.57 | -8.94 | 32.63 | 74.00 | -41.37 | peak | |
| 4 | 1857.804 | 22.00 | -8.94 | 13.06 | 54.00 | -40.94 | AVG | |
| 5 | 2133.045 | 36.09 | -9.15 | 26.94 | 74.00 | -47.06 | peak | |
| 6 | 2142.891 | 21.95 | -9.17 | 12.78 | 54.00 | -41.22 | AVG | |
| 7 | 3147.748 | 38.56 | -8.38 | 30.18 | 74.00 | -43.82 | peak | |
| 8 | 3169.567 | 26.75 | -8.28 | 18.47 | 54.00 | -35.53 | AVG | |
| 9 | 3999.447 | 38.58 | -5.23 | 33.35 | 74.00 | -40.65 | peak | |
| 10 | 4036.454 | 25.69 | -5.37 | 20.32 | 54.00 | -33.68 | AVG | |
| 11 | 6839.116 | 36.71 | 10.76 | 47.47 | 74.00 | -26.53 | peak | |
| 12 | 6886.523 | 23.94 | 10.78 | 34.72 | 54.00 | -19.28 | AVG | |
| 13 | 9397.233 | 35.98 | 13.41 | 49.39 | 74.00 | -24.61 | peak | |

(b) Antenna polarization: Vertical



| No. | Mk. | Freq. | Reading | Correct | Measure- | Limit | Over | Detector |
|-----|-----|----------|---------|---------|----------|--------|--------|----------|
| | | | Level | Factor | ment | | | |
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | |
| 1 | | 1845.015 | 70.97 | -8.94 | 62.03 | 74.00 | -11.97 | peak |
| 2 | * | 1845.015 | 62.94 | -8.94 | 54.00 | 54.00 | 0.00 | AVG |
| 3 | | 2766.942 | 52.09 | -9.35 | 42.74 | 74.00 | -31.26 | peak |
| 4 | | 2766.942 | 38.13 | -9.35 | 28.78 | 54.00 | -25.22 | AVG |
| 5 | | 3999.447 | 38.58 | -5.23 | 33.35 | 74.00 | -40.65 | peak |
| 6 | | 4008.667 | 25.55 | -5.27 | 20.28 | 54.00 | -33.72 | AVG |
| 7 | | 6839.116 | 36.96 | 10.76 | 47.72 | 74.00 | -26.28 | peak |
| 8 | | 6870.684 | 24.02 | 10.77 | 34.79 | 54.00 | -19.21 | AVG |
| 9 | | 9440.609 | 36.20 | 13.70 | 49.90 | 74.00 | -24.10 | peak |
| 10 | | 9506.048 | 23.29 | 14.08 | 37.37 | 54.00 | -16.63 | AVG |

Note:

10~25GHz at least have 20dB margin. No recording in the test report.

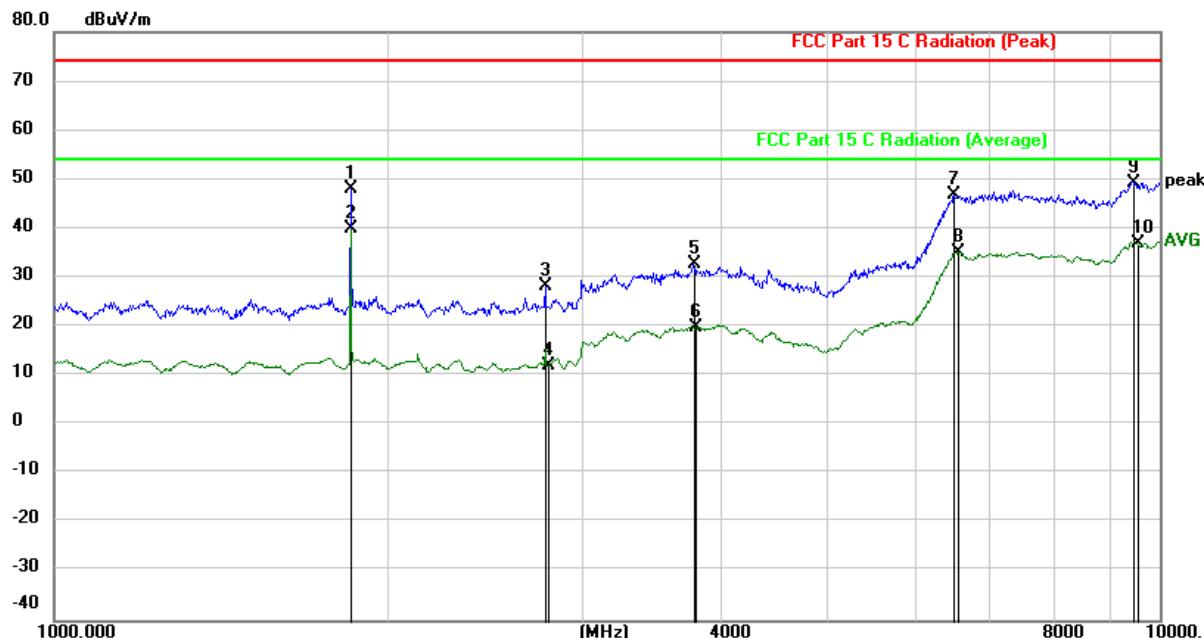
Measurement Level = Reading Level + Factor

Remark: Factor = Antenna Factor + Cable Loss–Pre-amplifier

Highest channel: 923.5MHz

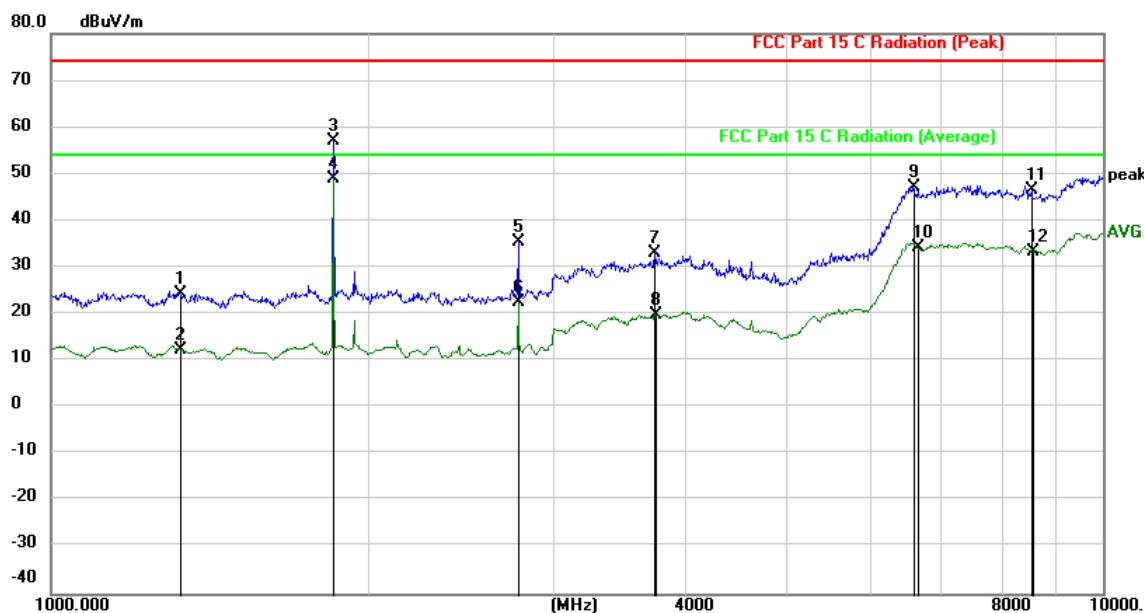
| | | | |
|----------------------|---|--------------------|---------------|
| EUT: | mPCIe LoRa Concentrator Board | Model Name. : | NM0824-I |
| Temperature: | 24.5°C | Test Data | 2022-08-17 |
| Pressure: | 1010hPa | Relative Humidity: | 51% |
| Test Mode : | TX (927.5MHz) | Test Voltage : | AC 110V, 60Hz |
| Measurement Distance | 3 m | Frequency Range | 1GHz to 25GHz |
| RBW/VBW | Spurious emission: 1MHz/1MHz for Peak, 1MHz/10Hz for Average. non-restricted band: 100KHz/300KHz for Peak. | | |

(a) Antenna polarization: Horizontal



| No. | Mk. | Freq. | Reading | Correct Factor | Measure- ment | Limit | Over | |
|-----|-----|----------|---------|----------------|------------------|--------|--------|----------|
| | | | Level | | | | | |
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 1853.532 | 57.13 | -8.95 | 48.18 | 74.00 | -25.82 | peak |
| 2 | * | 1853.532 | 48.93 | -8.95 | 39.98 | 54.00 | -14.02 | AVG |
| 3 | | 2779.713 | 37.62 | -9.33 | 28.29 | 74.00 | -45.71 | peak |
| 4 | | 2798.981 | 21.30 | -9.32 | 11.98 | 54.00 | -42.02 | AVG |
| 5 | | 3784.426 | 38.55 | -5.84 | 32.71 | 74.00 | -41.29 | peak |
| 6 | | 3810.658 | 25.52 | -5.77 | 19.75 | 54.00 | -34.25 | AVG |
| 7 | | 6516.284 | 36.17 | 10.61 | 46.78 | 74.00 | -27.22 | peak |
| 8 | | 6561.453 | 24.39 | 10.63 | 35.02 | 54.00 | -18.98 | AVG |
| 9 | | 9440.609 | 35.70 | 13.70 | 49.40 | 74.00 | -24.60 | peak |
| 10 | | 9527.962 | 22.86 | 14.09 | 36.95 | 54.00 | -17.05 | AVG |

(b) Antenna polarization: Vertical



| No. | Mk. | Freq. MHz | Reading | Correct | Measure- | Limit | Over | |
|-----|-----|--------------|---------------|--------------|----------|-------|--------|----------|
| | | | Level dBuV | Factor dB | m | | dB | Detector |
| 1 | | 1324.342 | 32.66 | -8.21 | 24.45 | 74.00 | -49.55 | peak |
| 2 | | 1327.394 | 20.63 | -8.22 | 12.41 | 54.00 | -41.59 | AVG |
| 3 | | 1853.532 | 65.88 | -8.95 | 56.93 | 74.00 | -17.07 | peak |
| 4 | * | 1853.532 | 57.80 | -8.95 | 48.85 | 54.00 | -5.15 | AVG |
| 5 | | 2779.713 | 44.81 | -9.33 | 35.48 | 74.00 | -38.52 | peak |
| 6 | | 2779.713 | 31.78 | -9.33 | 22.45 | 54.00 | -31.55 | AVG |
| 7 | | 3749.730 | 38.86 | -5.93 | 32.93 | 74.00 | -41.07 | peak |
| 8 | | 3758.374 | 25.82 | -5.91 | 19.91 | 54.00 | -34.09 | AVG |
| 9 | | 6591.739 | 36.45 | 10.65 | 47.10 | 74.00 | -26.90 | peak |
| 10 | | 6652.732 | 23.61 | 10.68 | 34.29 | 54.00 | -19.71 | AVG |
| 11 | | 8550.667 | 35.80 | 10.61 | 46.41 | 74.00 | -27.59 | peak |
| 12 | | 8590.135 | 22.85 | 10.62 | 33.47 | 54.00 | -20.53 | AVG |

Note:

10~25GHz at least have 20dB margin. No recording in the test report.

Measurement Level = Reading Level + Factor

Remark: Factor = Antenna Factor + Cable Loss—Pre-amplifier

Highest channel: 927.5MHz

6.4 Occupied Bandwidth

6.4.1 Applied procedures / Limit

Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz..

6.4.2 Test procedure

- The testing follows FCC KDB publication No. 558074 D01 DTS Meas. Guidance v03r03
- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting: RBW= 10KHz, VBW \geq 3 \times RBW, Sweep time = Auto, Detector Function = Peak, Mark the peak frequency and -6 dB points bandwidth.

6.4.3 Deviation from standard

No deviation.

6.4.4 Test setup



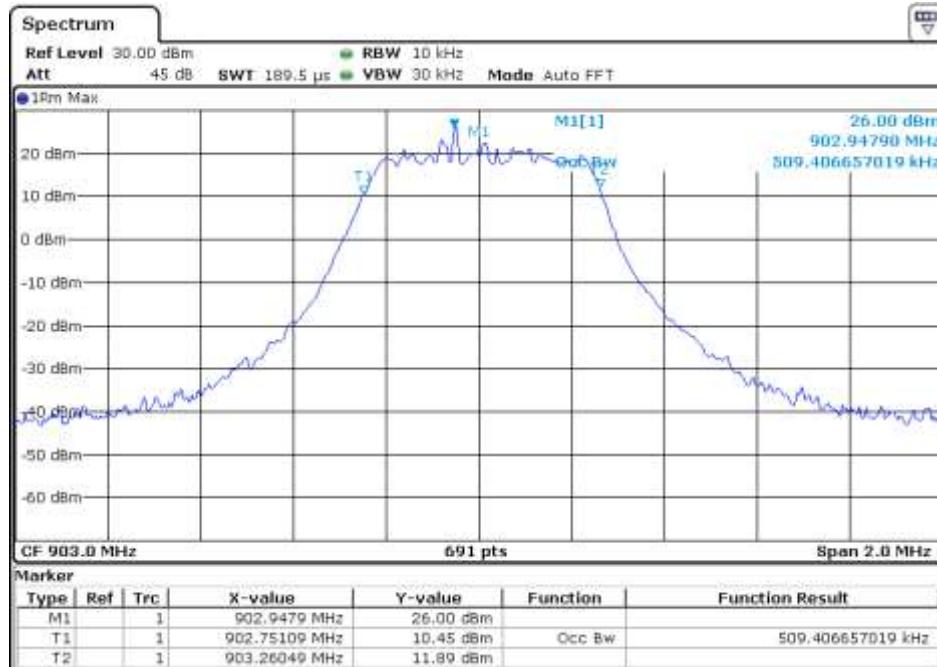
6.4.5 Test results

| | | | |
|--------------|-------------------------------|--------------------|----------|
| EUT: | mPCIe LoRa Concentrator Board | Model Name. : | NM0824-I |
| Temperature: | 24.8 °C | Relative Humidity: | 52% |
| Test Mode : | TX | | |

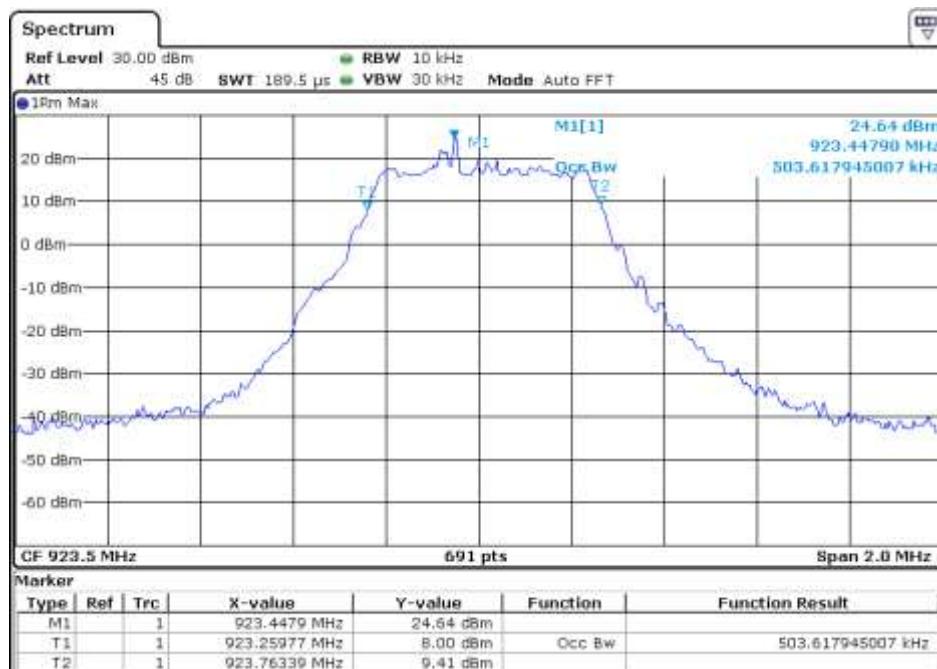
| Channel | Channel frequency (MHz) | 6dB bandwidth (KHz) | 99% OBW (KHz) | Minimum 6dB Limit (KHz) | Conclusion |
|---------|-------------------------|---------------------|---------------|-------------------------|------------|
| Low | 903.0 | 671.50 | 509.40 | ≥500 | Pass |
| Middle | 923.5 | 564.40 | 503.61 | | Pass |
| High | 927.5 | 593.30 | 526.77 | | Pass |

Report No.: AAEMT/EMC/220817-01-04

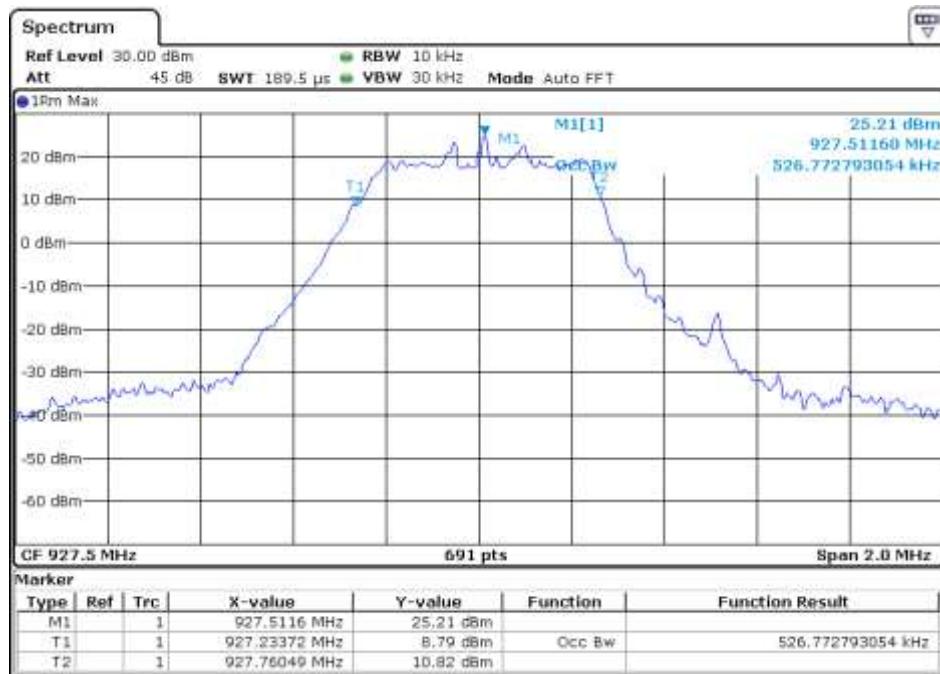
99% OBW @903.0MHz



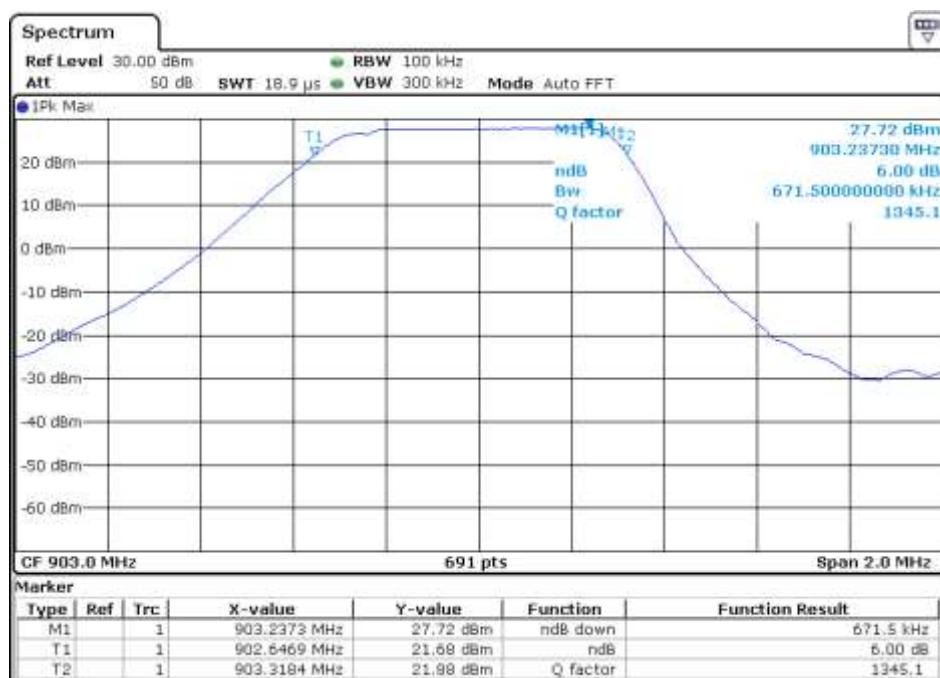
99% OBW @923.5MHz



99% OBW @927.5MHz

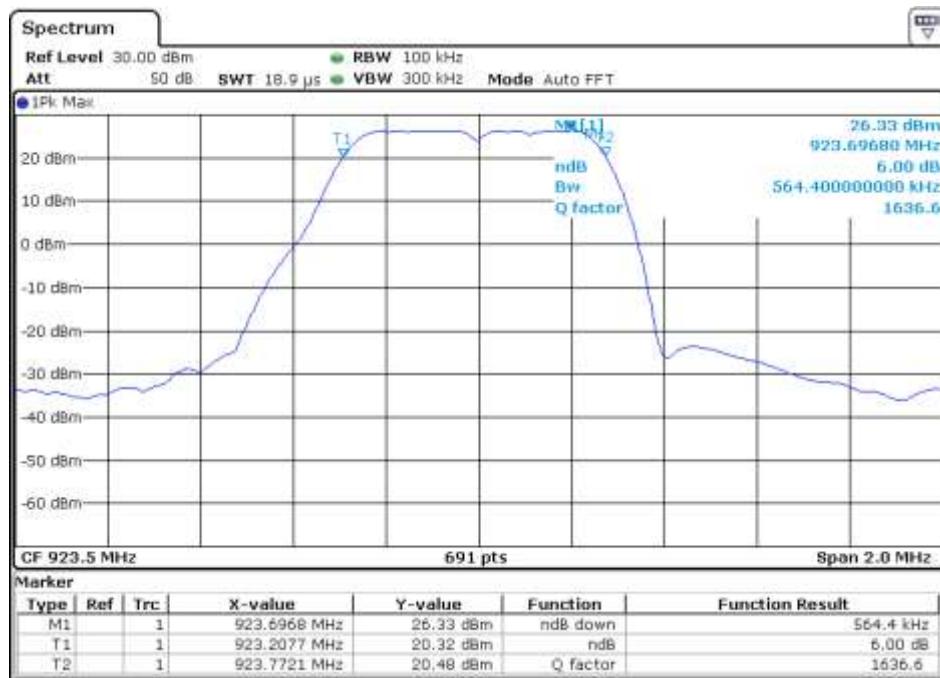


6dB Bandwidth @903.0MHz

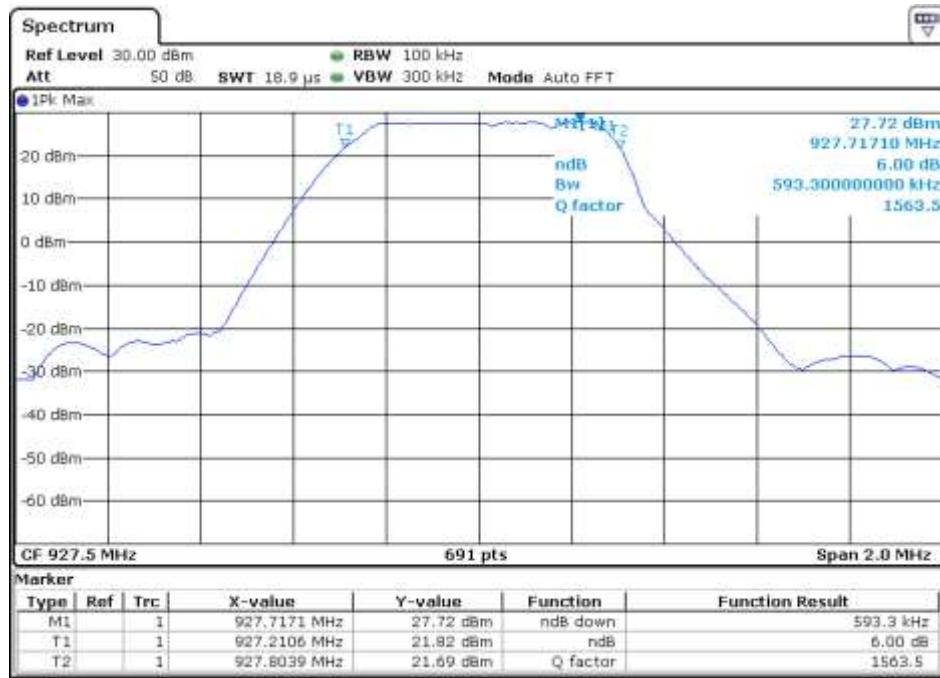


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6dB Bandwidth @923.5MHz



6dB Bandwidth @927.5MHz



6.5 Power Spectral Density

6.5.1 Applied procedures / Limit

15.247(a) (e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

6.5.2 Test procedure

- a. The testing follows Measurement procedure 10.2 Method PKPSD of FCC KDB publication No. 558074 D01 DTS Meas. Guidance v03r03
- b. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- c. Connected the antenna port to the Spectrum Analyzer, set the Spectrum Analyzer as center frequency to channel center frequency, span=1.5 times the bandwidth, detector = peak
 $3\text{kHz} \leq \text{RBW} \leq 100\text{kHz}$, $\text{VBW} \geq 3 \times \text{RBW}$ kHz, Sweep time=Auto.
- d. Trace mode = max hold. Mark the peak.
- e. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

□

6.5.3 Deviation from standard

No deviation.

6.5.4 Test setup



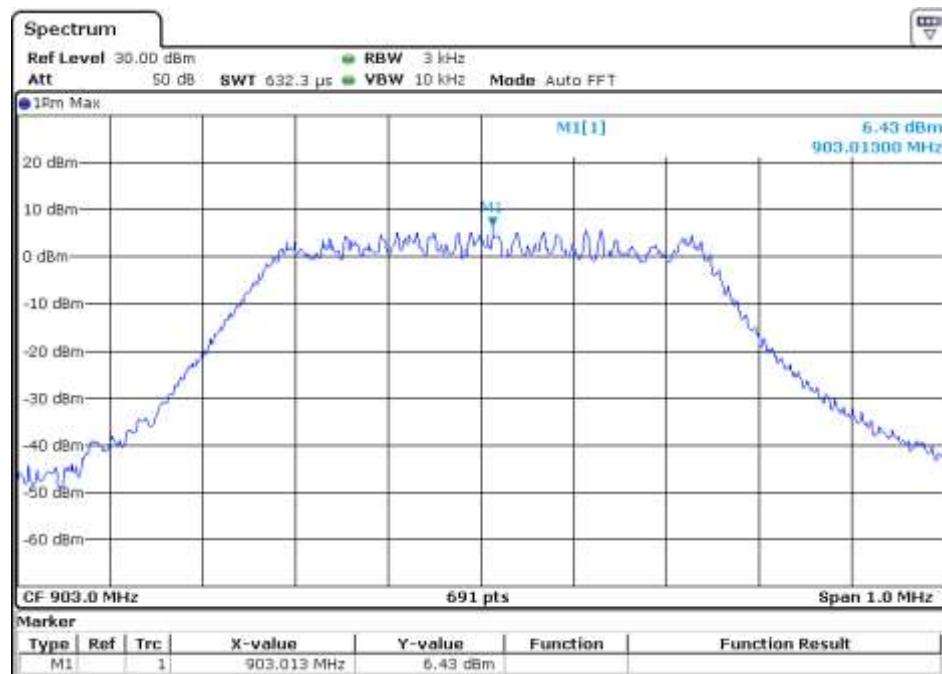
6.5.5 Test results

| | | | |
|--------------|-------------------------------|--------------------|----------|
| EUT: | mPCIe LoRa Concentrator Board | Model Name. : | NM0824-I |
| Temperature: | 25.3 °C | Relative Humidity: | 51% |
| Test Mode : | TX | | |

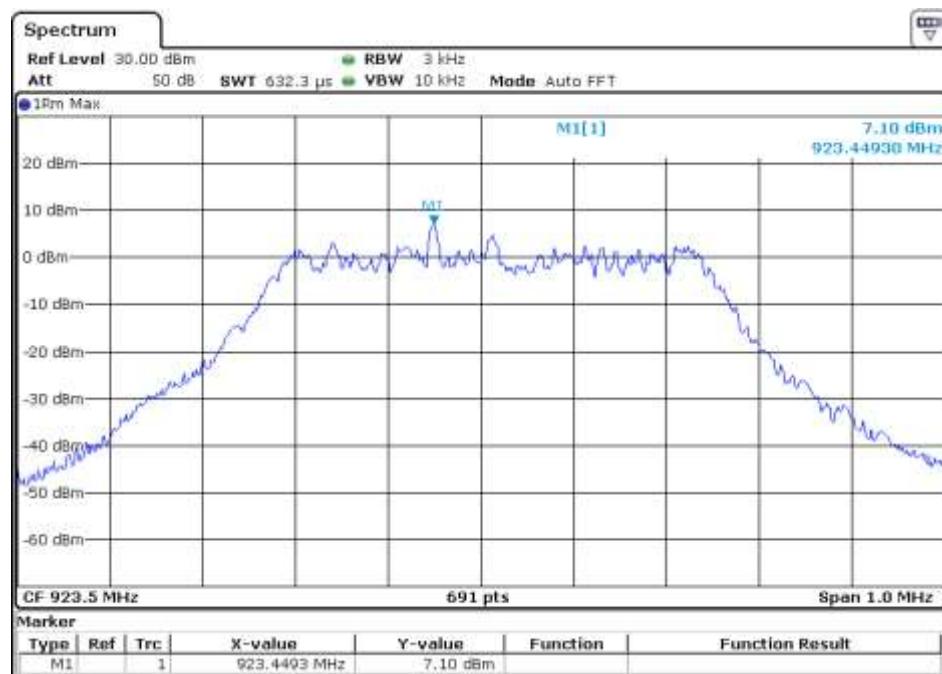
| Test Mode | Channel frequency (MHz) | Power Density (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|-----------|-------------------------|--------------------------|------------------|--------|
| TX | 903.0 | 6.43 | 8 | Pass |
| | 923.5 | 7.10 | 8 | Pass |
| | 927.5 | 6.75 | 8 | Pass |

Note: The cable loss is 0.9dB

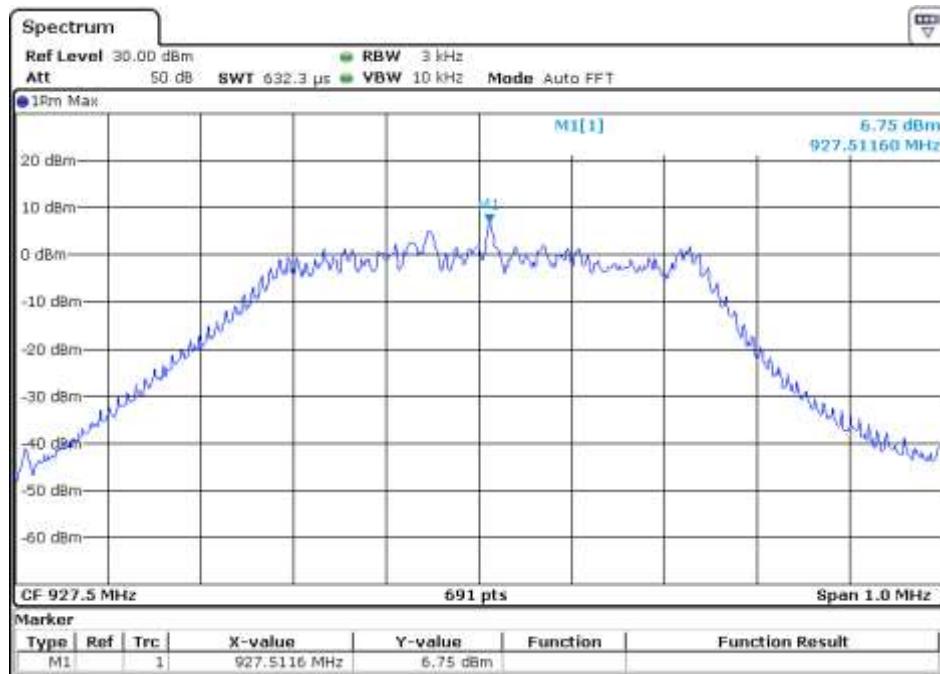
@903.0MHz



@923.5MHz



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@927.5MHz

6.6 Maximum Average Conducted Output Power

6.6.1 Applied procedures / Limit

15.247(b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode

Requirement

Power \leq 1 W (30 dBm)

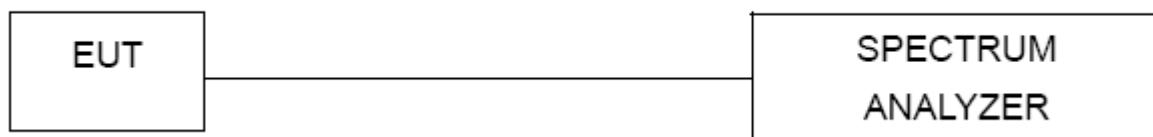
6.6.2 Test procedure

- a. The testing follows FCC KDB publication No. 558074 D01 DTS Meas. Guidance v03r03
- b. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- c. Spectrum Setting: $RBW \geq \text{Bandwidth}$, $VBW \geq 3 \times RBW$, Sweep time = Auto, $\text{Span} \geq 3 \times RBW$,
- d. Detector = peak. Trace mode = max hold.
- e. Use peak marker function to determine the peak amplitude level.

6.6.3 Deviation from standard

No deviation.

6.6.4 Test setup



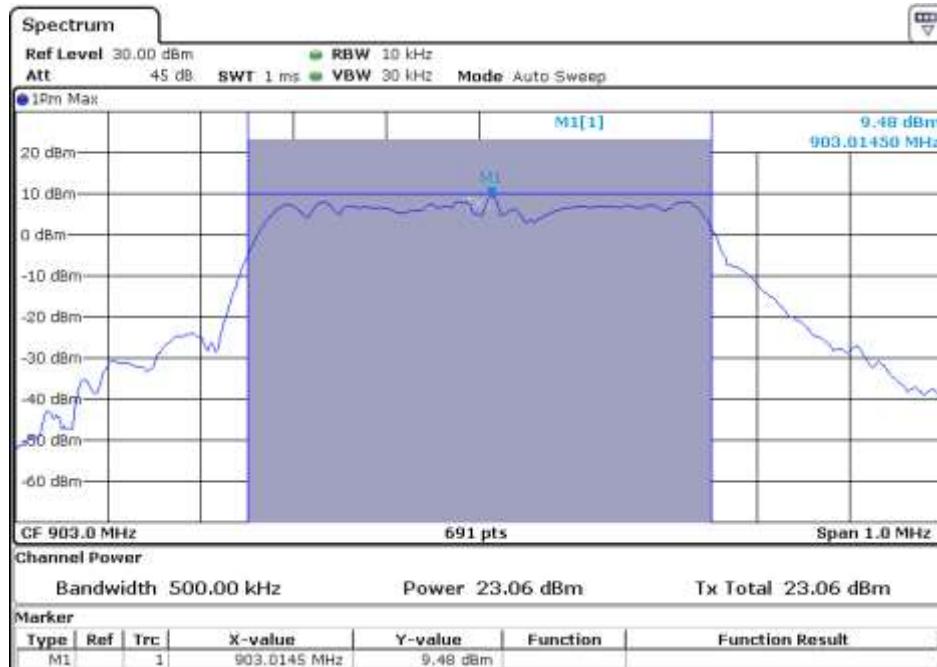
6.6.5 Test results

| | | | |
|--------------|-------------------------------|--------------------|----------|
| EUT: | mPCIe LoRa Concentrator Board | Model Name. : | NM0824-I |
| Temperature: | 24.9°C | Relative Humidity: | 51% |
| Test Mode : | TX | | |

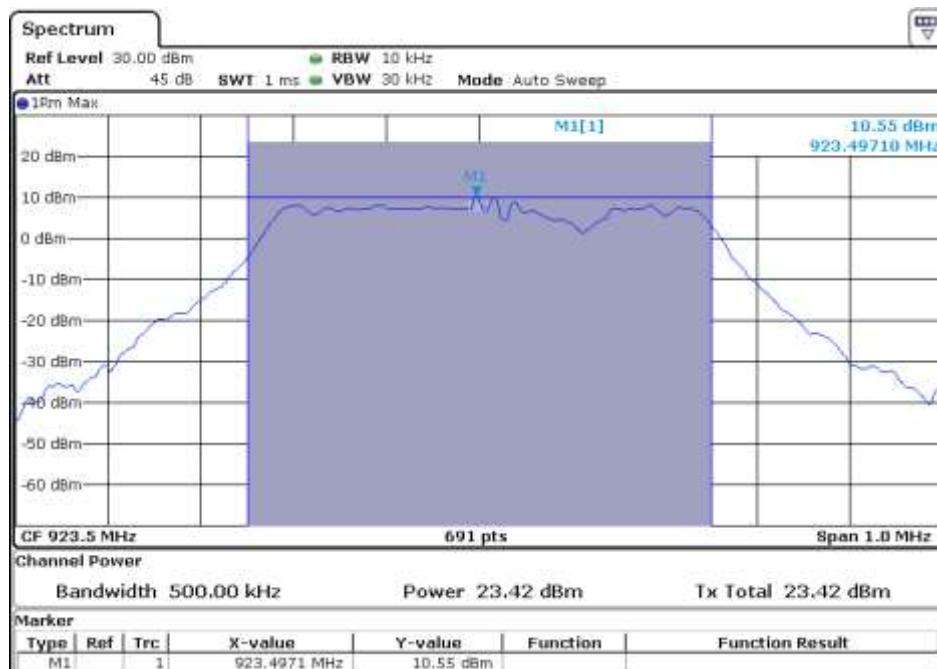
| Channel | Channel frequency (MHz) | Measured Average Output Power (dBm) | Measured e.i.r.p (dBm) | Power Limit (dBm) | e.i.r.p Limit (dBm) | Result |
|---------------------|-------------------------|-------------------------------------|------------------------|-------------------|---------------------|--------|
| Low | 903.0 | 23.06 | 26.66 | 30 | 36 | Pass |
| Middle | 923.5 | 23.42 | 27.02 | 30 | 36 | Pass |
| High | 927.5 | 23.72 | 27.32 | 30 | 36 | Pass |
| Cable loss = 0.9dBm | | | | | | |

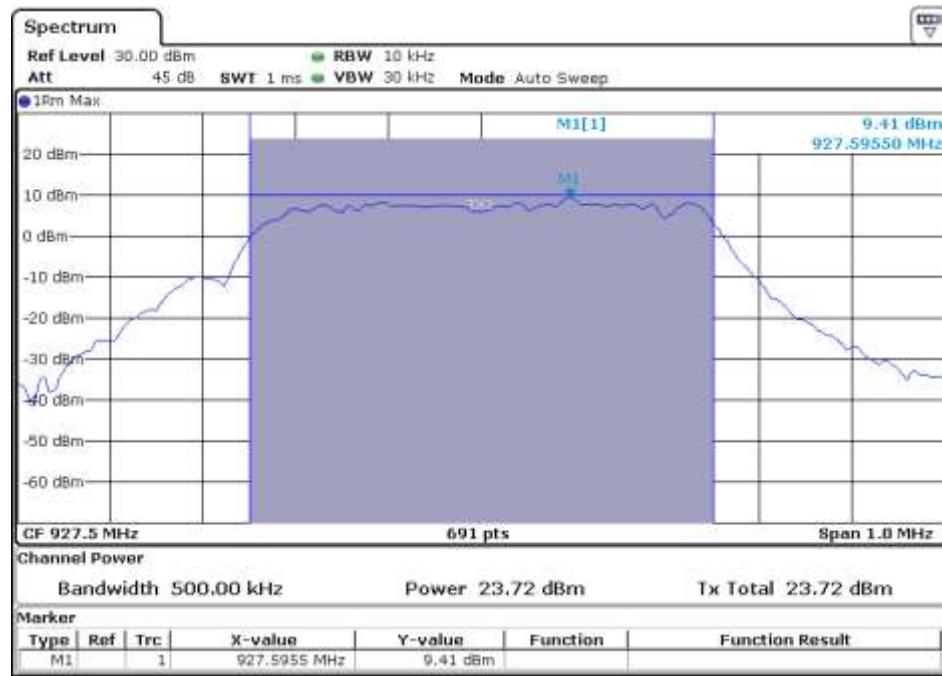
Measured e.i.r.p (dBm)= Measured Average Output power (dBm) + Cable loss (0.9dB)+Antenna gain

@903.0MHz



@923.5MHz



@927.5MHz

6.7 Band edge

6.7.1 Applied procedures / Limit

15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.7.2 Test procedure

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation, $RBW \geq 1\%$ of the span, $VBW \geq RBW$, Sweep = auto,
Detector function = peak, Trace = max hold

6.7.3 Deviation from standard

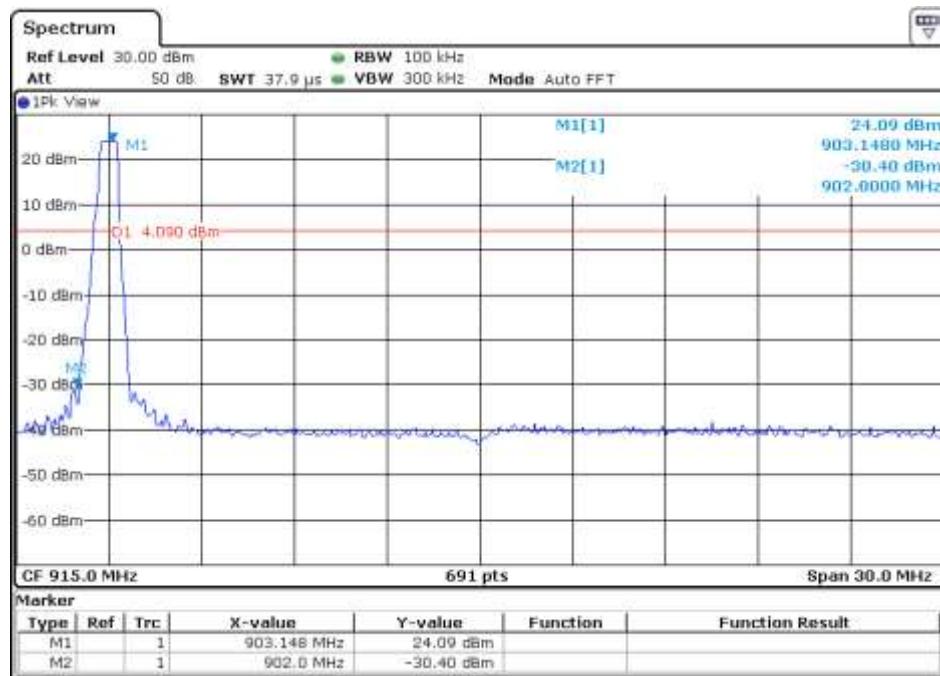
No deviation.

6.7.4 Test setup

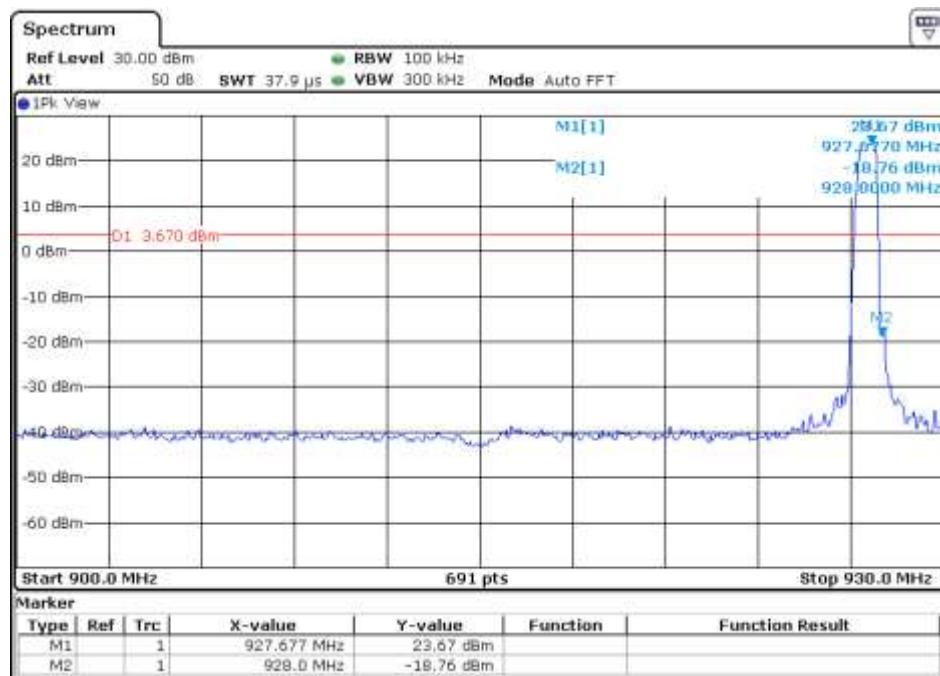


6.7.5 Test results

@903.0MHz



@927.5MHz



6.8 Conducted Spurious Emissions

6.8.1 Applied procedures / Limit

15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

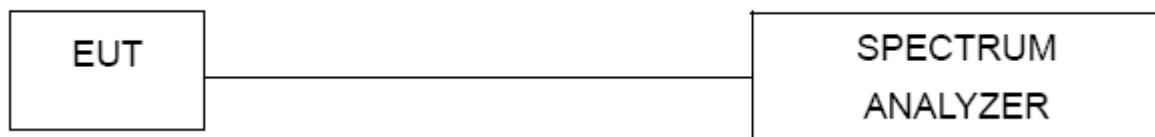
6.8.2 Test procedure

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span. RBW = 100 kHz
 $VBW \geq RBW$, Sweep = auto, Detector function = peak, Trace = max hold
sweep points \geq investigated frequency range/RBW.

6.8.3 Deviation from standard

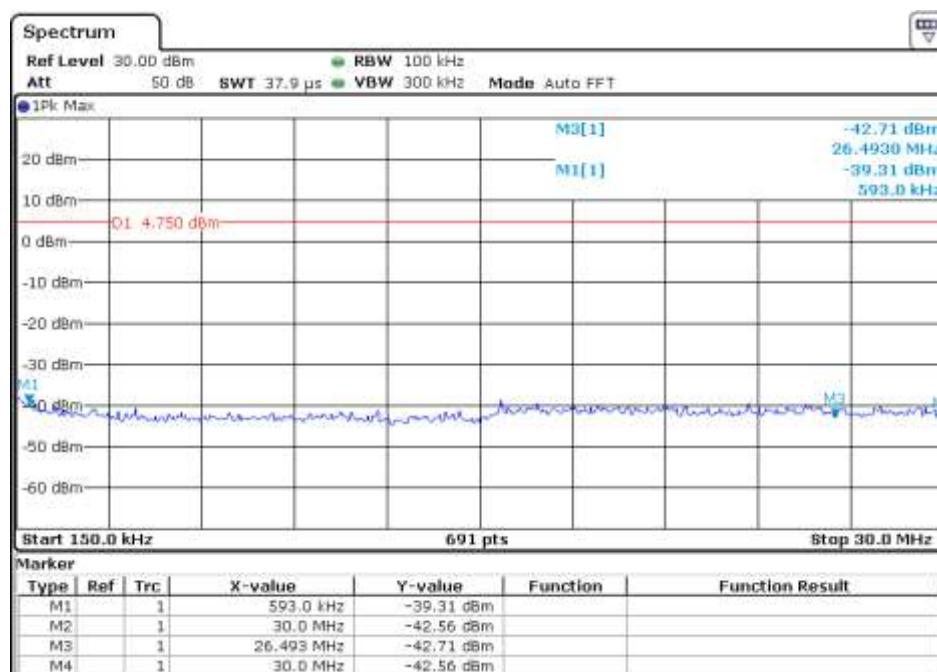
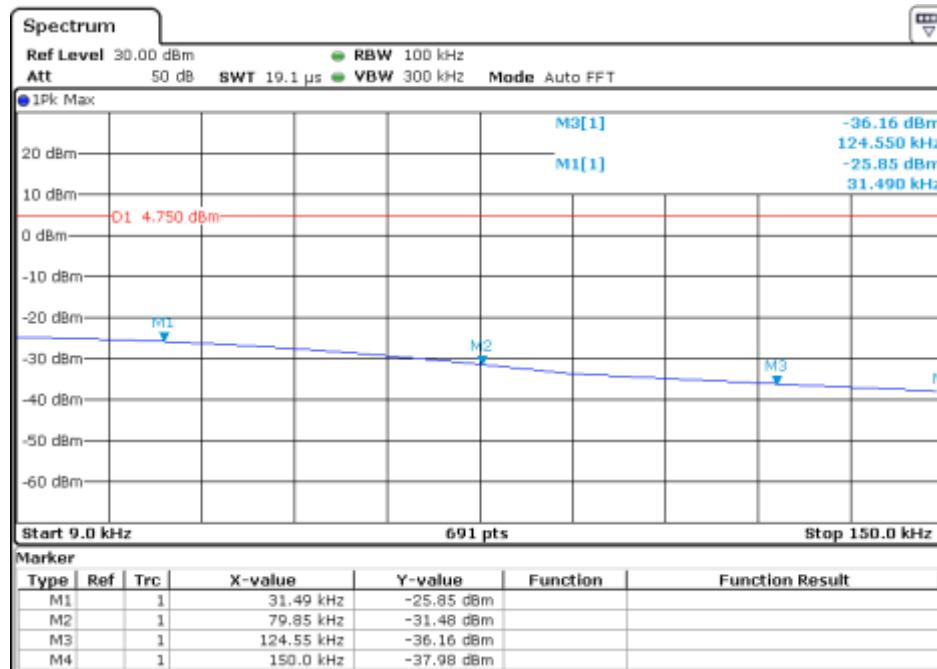
No deviation.

6.8.4 Test setup

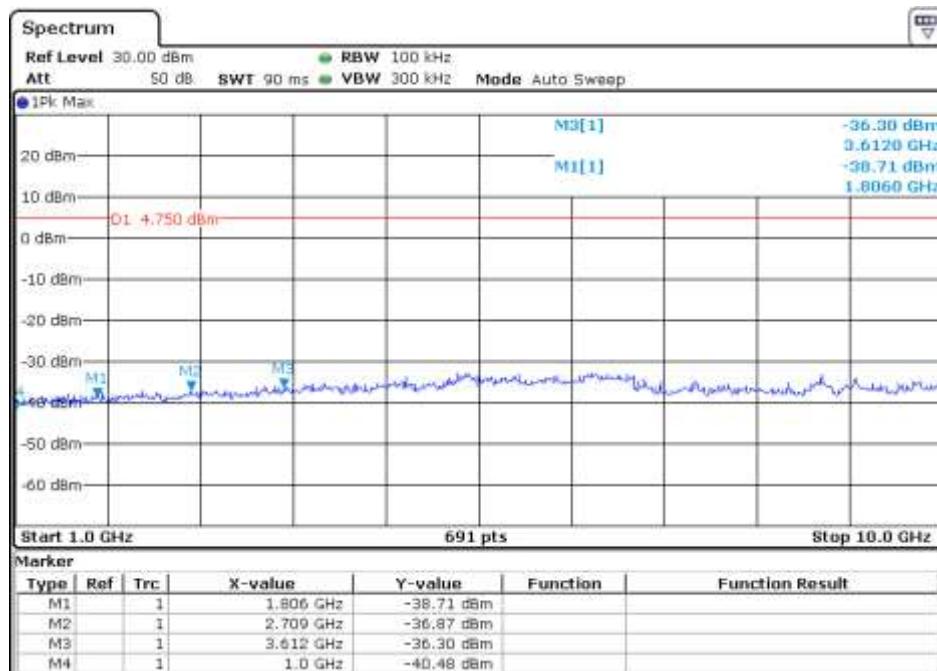
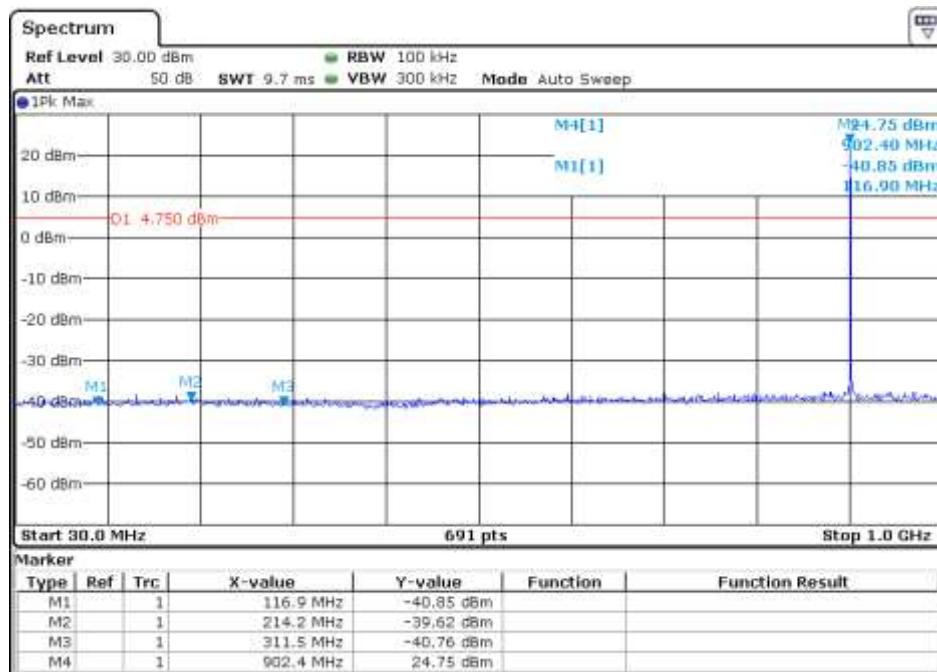


6.8.5 Test results

@903.0MHz

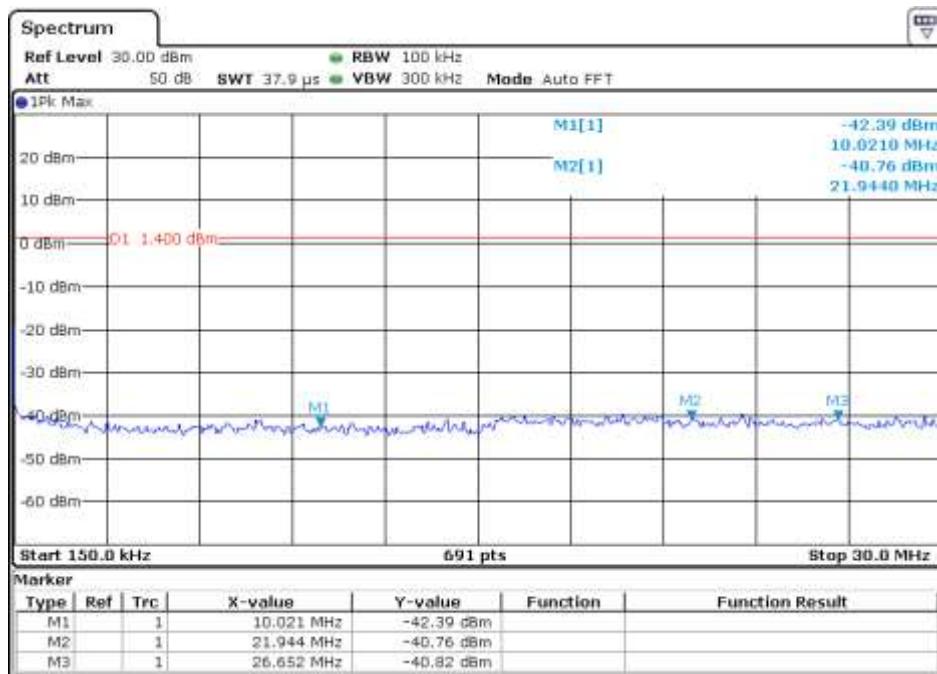
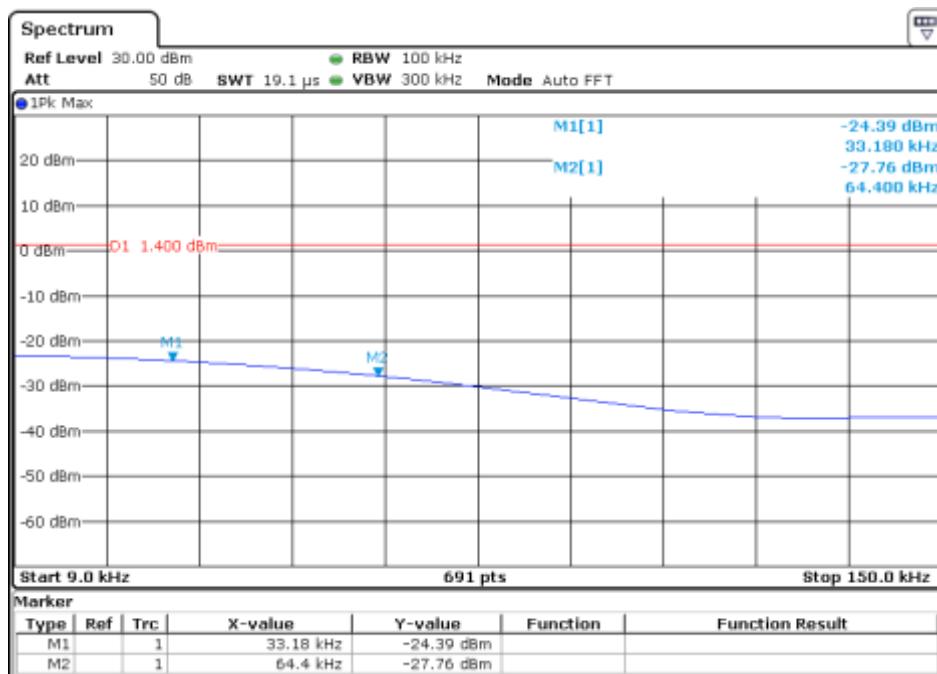


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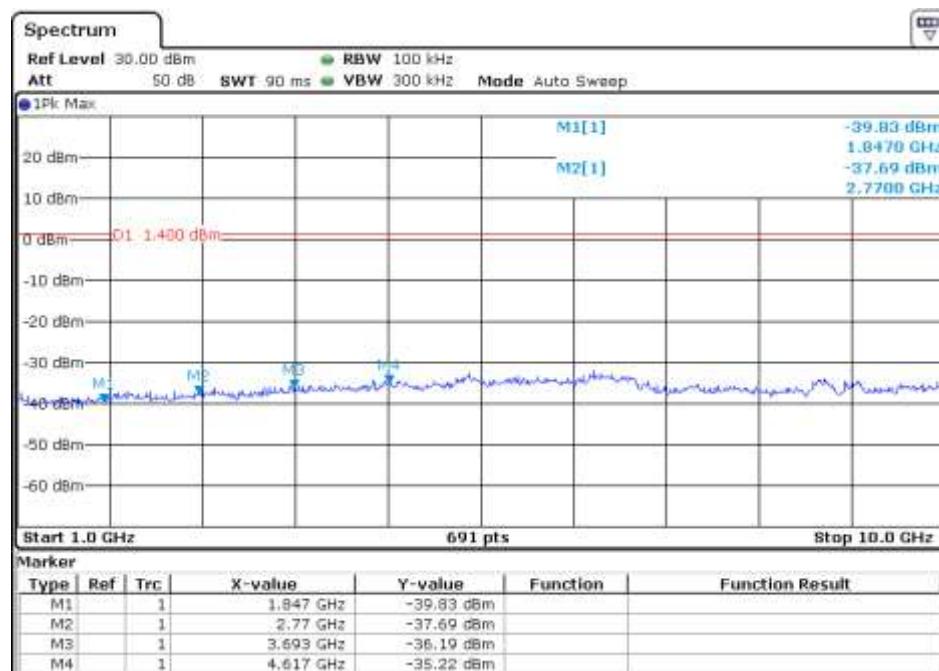
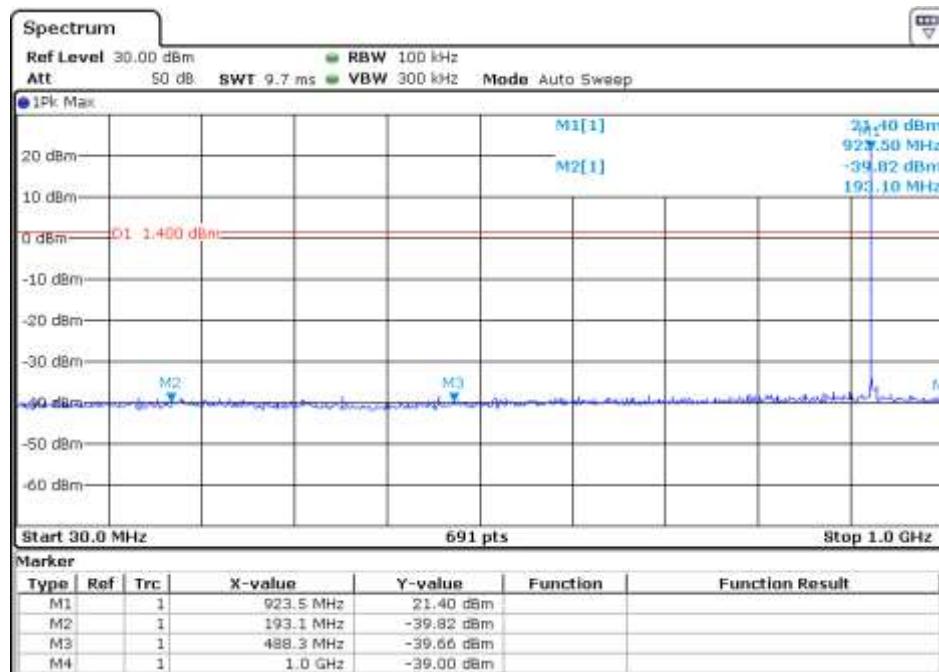


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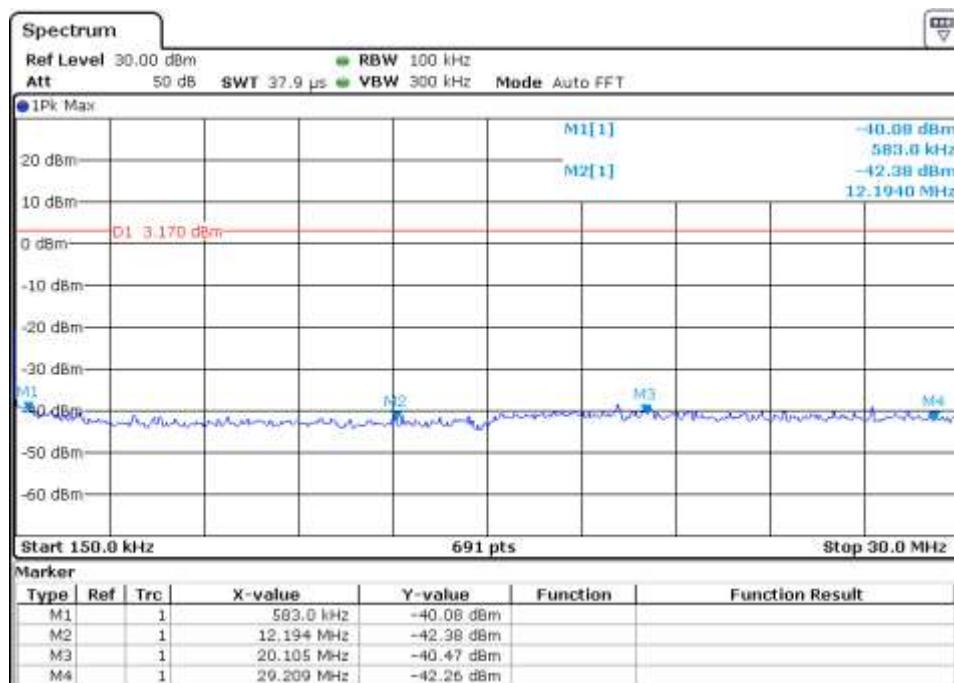
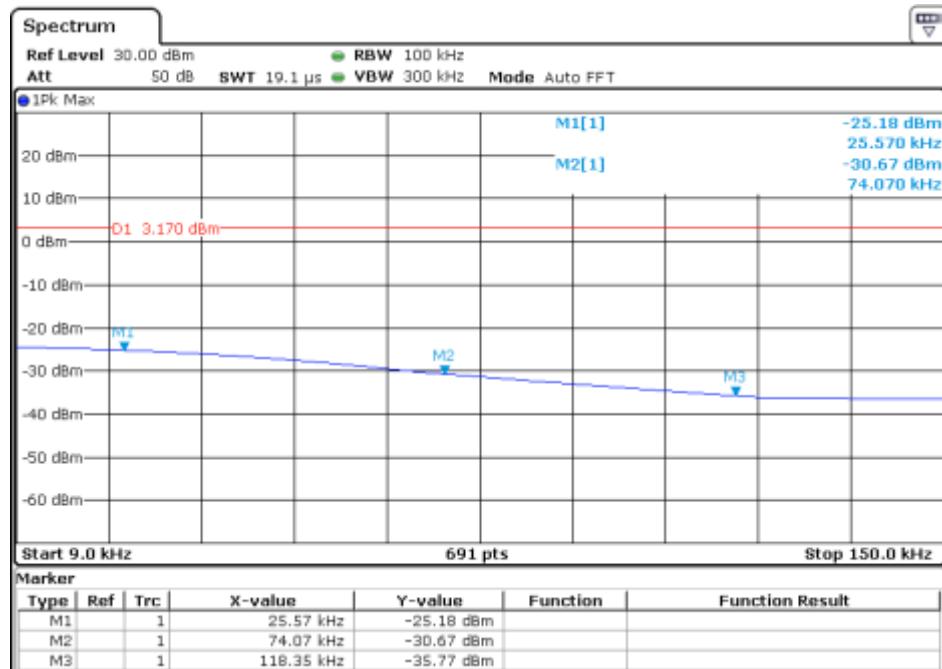
@923.5MHz



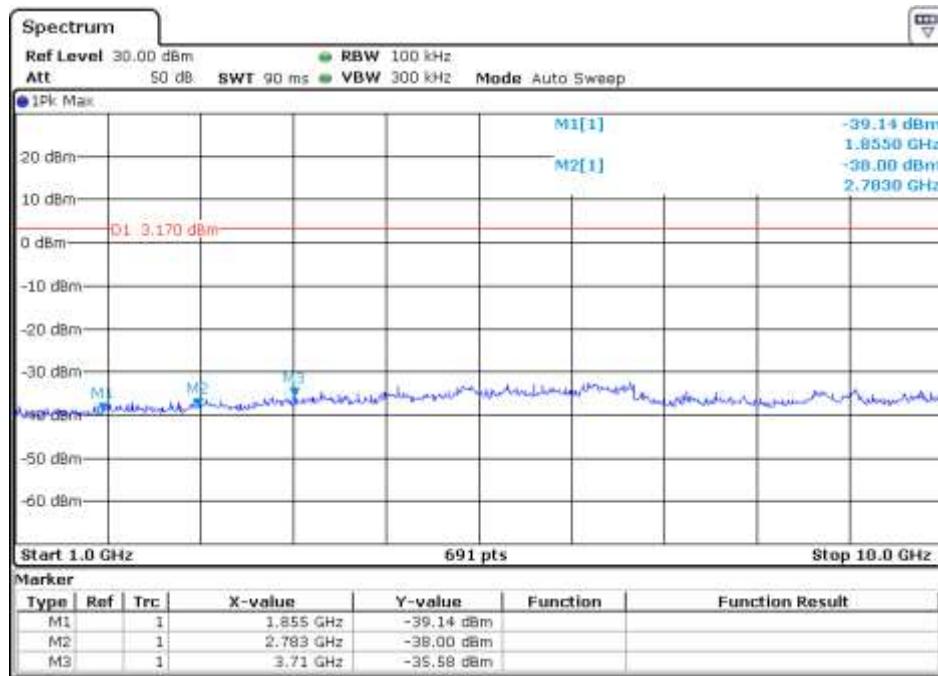
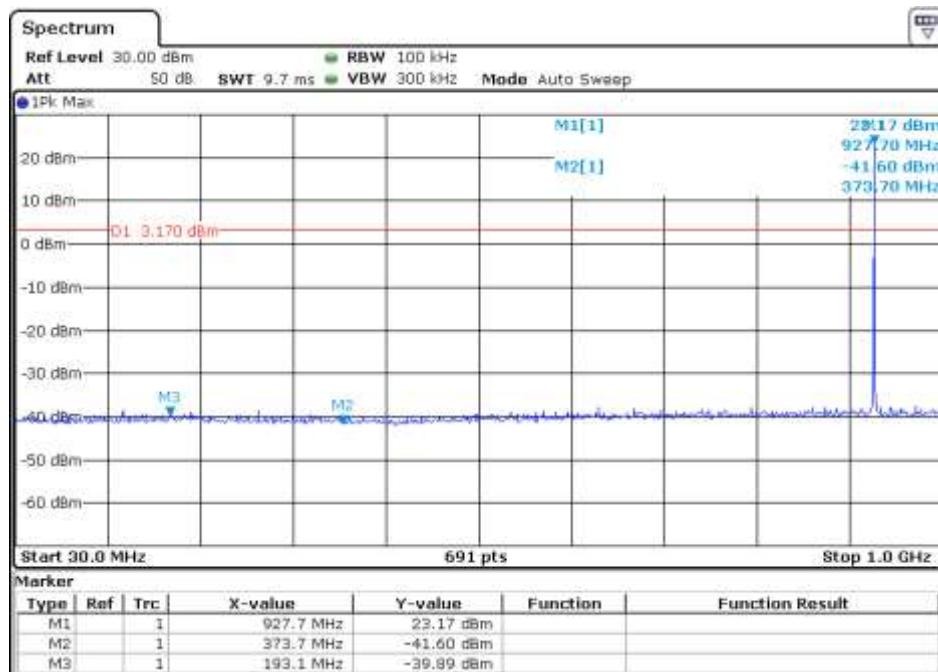
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@927.5.MHz



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End of Report