

JAPAN MIC TEST REPORT

Project No. : DST1901-0008

Test Report No. : DST-RR19-T002

Applicant : **PLNetworks, Inc.**
1501, KINS TOWER, 8, Seongnam-daero 331 beon-gil Bundang-gu, Seongnam-si,
Gyeonggi-do, Korea (13558)

Manufacturer : **Wave Electronics Co., Ltd.**
47, Suin-ro, Gwonseon-gu, Suwon-si, Gyeonggi-do, Korea

Product name : LoRa Tracker

Model name : **PLS110**
(Please see P6 for all the model numbers)

Date of receipt : January 4, 2019

Date of issue : January 18, 2019


Test Result : PASS ☒ FAIL ☐

The results in this report are applicable only to the equipment tested.

This test report shall not be re-produced except in full without the written approval of DSTech Co., Ltd.

This test report is prepared according to the requirements of ISO / IEC 17025

Tested by : 
JungTae Kim / Testing Engineer

Reviewed by: 
SeungBum Cho / Chief Engineer

DSTech Co., Ltd.

Revision History of Report

| Rev. | Revisions | Effect page | Reviewed by | Date |
|------|---------------|-------------|--------------|------------------|
| - | Initial issue | All | SeungBum Cho | January 18, 2019 |

TABLE OF CONTENTS

| | | |
|----------|---|-----------|
| 1 | Summary of Test | 4 |
| 2 | Facilities and accreditations | 5 |
| 2.1. | Facilities..... | 5 |
| 2.2 | Certificated | 5 |
| 2.3. | List of test and measurement instruments..... | 5 |
| 3 | EUT(Equipment Under Test) Information..... | 6 |
| 4 | Test and measurement conditions | 7 |
| 4.1. | Test configuration (arrangement of EUT) | 7 |
| 4.2. | Description of support units (accessory equipment)..... | 7 |
| 4.3. | Interconnection and I/O cables..... | 7 |
| 4.4. | Measurement Uncertainty (U) | 7 |
| 4.5. | Test Date | 7 |
| 5 | Measurement results | 8 |
| 5.1. | Frequency tolerance..... | 8 |
| 5.2. | Occupied bandwidth (99%) | 10 |
| 5.3. | RF Output Power..... | 12 |
| 5.4. | Transmitter spurious emissions..... | 14 |
| 5.5. | Adjacent Channel Leakage power..... | 23 |
| 5.6. | Receiver spurious emissions..... | 25 |
| 5.7. | Carrier Sensing Level..... | 30 |
| 5.8. | carrier sense time | 31 |
| 6 | Photographs of the test setup | 33 |
| 7 | Photographs of EUT | 34 |

1 Summary of Test

Standards:

Ordinance concerning Technical Regulations Conformity Certification etc.
of Specified Radio Equipment,
(テレメータ用、テレコントロール用及びデータ伝送用 (920MHz帯)
特定無線設備の技術基準適合証明等に関する規則
第2条第1項第8号の無線設備)

Test Methods:

According to Table 22-3 of Notification No.88 of MIC

List of applied test to the EUT

| No | Classification of EUT | Condition | Result |
|----|------------------------------------|-----------|--------|
| 1 | Frequency Tolerance | Conducted | PASS |
| 2 | Occupied Bandwidth | Conducted | PASS |
| 3 | Transmitter spurious emissions | Conducted | PASS |
| 4 | RF Output Power | Conducted | PASS |
| 5 | Adjacent Channel Leakage power | Conducted | PASS |
| 6 | Receiver spurious emissions | Conducted | PASS |
| 7 | Carrier Sensing level & sense time | Conducted | PASS |
| 8 | Transmission time limited | Conducted | PASS |

2 Facilities and accreditations

2.1. Facilities

25, 2565beon-gil, jungbu-daero, Yangji-myun, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17162
TEL : 82-31-336-1798, FAX : 82-31-336-3451

2.2 Certificated

FCC Site Registration No.: 325242
VCCI Site Registration No.: R-3420, C-3794
IC Site Registration No.: 9147A-1

2.3. List of test and measurement instruments

| USE | Equipment | Company | Model No. | Serial No. | Cal. Due | Calibrated by |
|-----|--|----------------------|-----------|------------|------------|---------------|
| X | SIGNAL ANALYZER | ROHDE&SCHWARZ | FSV13 | 101496 | 2018.06.22 | HCT Co.,Ltd. |
| | UNIVERSAL COUNTER | AGILENT | 53131A | KR01206279 | 2018.07.03 | HCT Co.,Ltd. |
| | SYNTHESIZED SIGNAL GENERATOR | ANRITSU | 68367C | #012926 | 2018.07.04 | HCT Co.,Ltd. |
| | MODULATION ANALYZER | H.P | 8901B | 3005A02523 | 2018.07.03 | HCT Co.,Ltd. |
| X | SIGNAL GENERATOR | AGILENT | E4438C | MY47271725 | 2018.07.03 | HCT Co.,Ltd. |
| X | USB WIDEBAND POWER SENSOR | KEYSIGHT | U2021XA | MY56040015 | 2018.06.01 | HCT Co.,Ltd. |
| | 15 MHz FUNCTION/ARBITRARY WAVEFORM GENERATOR | H.P | 33120A | US36024435 | 2018.07.03 | HCT Co.,Ltd. |
| X | Hygro/Thermo Graph | CAS | T004 | - | 2018.08.09 | HCT Co.,Ltd. |
| X | Attenuator (10dB) | Agilent Technologies | 8493C | 16219 | 2019.01.16 | HCT Co.,Ltd. |
| | Attenuator (20dB) | Agilent Technologies | 8491B | 27488 | 2019.01.16 | HCT Co.,Ltd. |
| X | DC Power supply | Agilent Technologies | E3631A | MY40012658 | 2019.01.09 | HCT Co.,Ltd. |

c) : Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated

3 EUT(Equipment Under Test) Information

Product: LoRa Tracker
Model: PLS110
Serial number: None (prototype)

Model differences:

| Model name | Difference | Tested (checked) |
|------------|------------|-------------------------------------|
| PLS110 | Original | <input checked="" type="checkbox"/> |
| | | |

Note: All the differences were compared with the test sample

Technical data:

| | | | | |
|----------------------------|--|----------------------|---------------------------|---------------------------|
| Operating frequency range: | 920.6 MHz ~ 928 MHz | | | |
| Type of modulation: | GFSK | | | |
| Type of emission: | F1D | | | |
| Type of Antenna | FPCB antenna(Peak Gain: -1.53 dBi) | | | |
| RF output power: | 0.02 W | | | |
| Number of Channels: | 38 channels (channel spacing: 200 kHz) | | | |
| Power source:* | Nominal: DC 3.7 V | Voltage (normal): | Extreme upper Voltage: | Extreme lower Voltage: |
| | | DC 3.7 V | DC 4.2 V | DC 3.33 V |
| S/W Version | V1.0 | | | |
| H/W Version | V1.0 | | | |
| Test Soft ware | Tera Term ver 4.91 | | | |
| Connection to PSTN: | No | | | |

Note: The test were performed at each voltage(battery input terminal)

| I/O port | Type | Q'ty | Remark |
|----------|---------------|------|--------|
| USB | USB interface | 1 | |

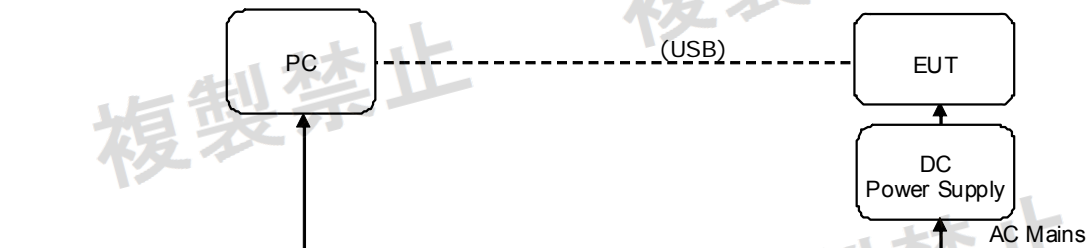
EUT Modifications

- None

4 Test and measurement conditions

4.1. Test configuration (arrangement of EUT)

The measurements were taken in continuous transmitting/receiving mode using the TEST MODE.



The measurements were taken in TEST MODE provided by the applicant for controlling the EUT.

- Test software installed in the EUT: Tera Term ver 4.91

4.2. Description of support units (accessory equipment)

The following support units or accessories were used to form a representative test configuration during the tests.

| # | Equipment | Manufacturer | Model No. | Serial No. |
|---|-----------|--------------|-----------|------------|
| 1 | NotePC | H.P | TPN-C129 | CND80962L4 |
| | | | - | - |

4.3. Interconnection and I/O cables

The following support units or accessories were used to form a representative test configuration during the tests.

| # | Start | | End | | Cable | |
|---|-----------------|----------|-----------------|----------|------------|----------------|
| | Name | I/O port | Name | I/O port | length (m) | shielded (Y/N) |
| 1 | EUT | DC IN | DC power supply | DC OUT | 0.5 | N |
| 2 | DC power supply | AC IN | AC mains | AC mains | 1.8 | N |

- Note:**
- 1) All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
 - 2) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4. Measurement Uncertainty (U)

Refer to Measurement Results (The confidence level is 95 %, $k = 2$)

4.5. Test Date

| | |
|-------------|-------------------------------------|
| Date Tested | January 16, 2019 – January 17, 2019 |
|-------------|-------------------------------------|

5 Measurement results

5.1. Frequency tolerance

According to Table 22-3 of Notification No.88 of MIC

5.1.1 Test Data

PASS

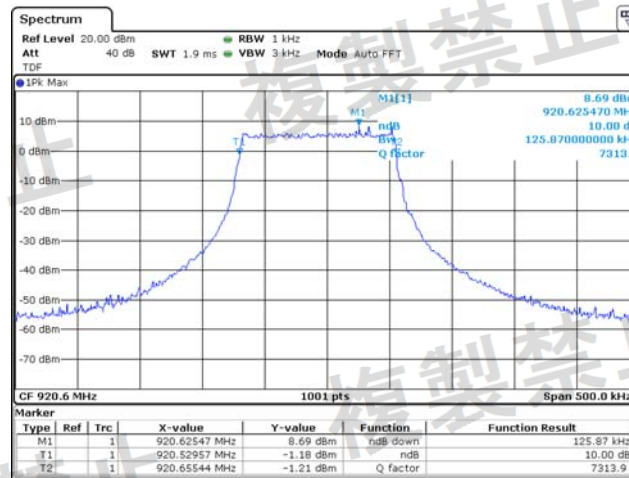
| Test Conditions (Conducted) | | | | |
|---|----------------------------|----------------------|--------------------|----------------|
| Temperature: (26 ± 3) °C | | TEST RESULTS | | |
| Rel. Humidity: (54 ± 3) % R.H. | | Measured ** (MHz) | Tolerance (ppm) | Limit (ppm) |
| | | | | |
| Low Frequency: 920.6 MHz | V _{MAX} DC 4.20 V | 920.59226 | -8.41 | ± 20 |
| | V _{NOM} DC 3.70 V | 920.59251 | -8.14 | |
| | V _{MIN} DC 3.33 V | 920.59226 | -8.41 | |
| Middle Frequency: 924 MHz | V _{MAX} DC 4.20 V | 923.99251 | -8.11 | |
| | V _{NOM} DC 3.70 V | 923.99251 | -8.11 | |
| | V _{MIN} DC 3.33 V | 923.99251 | -8.11 | |
| High Frequency: 928 MHz | V _{MAX} DC 4.20 V | 927.99251 | -8.08 | |
| | V _{NOM} DC 3.70 V | 927.99251 | -8.08 | |
| | V _{MIN} DC 3.33 V | 927.99251 | -8.08 | |
| Measurement uncertainty: ± 2 × 10 ⁻⁷ | | | | |

** Measured = FC

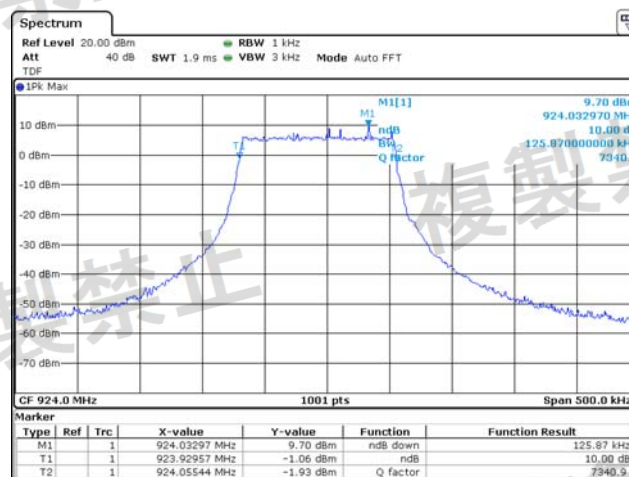
- FL : Lowest frequency
- FH: Highest frequency
- FC : (FL + FH) / 2

5.1.2 Test Plot (Normal Voltage)

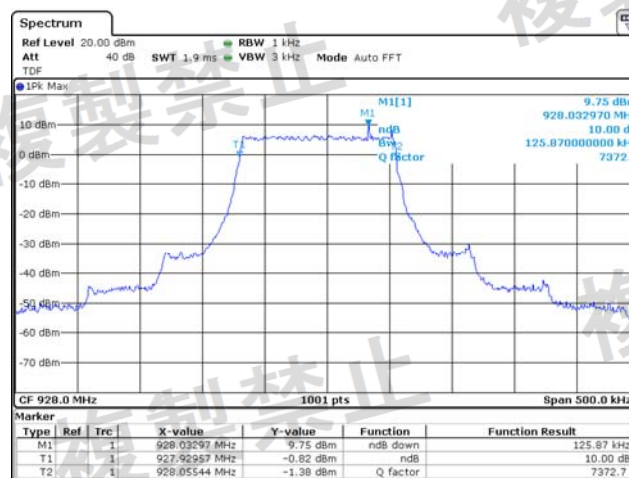
Low Channel
(920.6 MHz)



Middle Channel
(924 MHz)



High Channel
(928 MHz)



5.2. Occupied bandwidth (99%)

According to Table 22-3 of Notification No.88 of MIC

5.2.1 Test Data

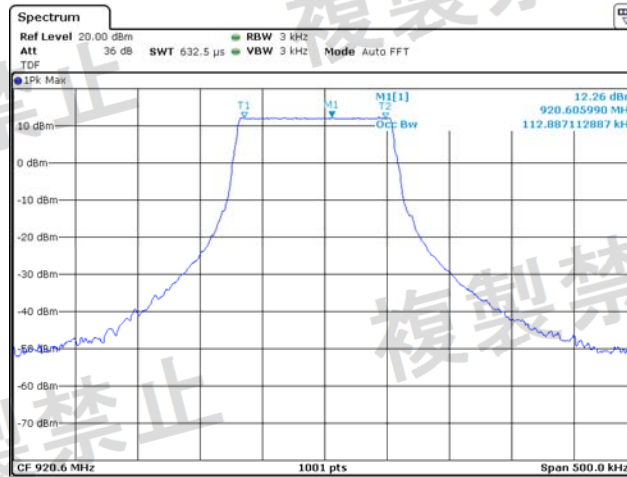
PASS

| Test Conditions (Conducted) | | | |
|---|----------------------------|--------------------------|-----------------|
| Temperature: (26 ± 3) °C | | TEST RESULTS | |
| Rel. Humidity: (54 ± 3) % R.H. | | Occupied bandwidth (kHz) | Limit |
| | | | |
| Low Frequency: 920.6 MHz | V _{MAX} DC 4.20 V | 112.89 | 200kHz or below |
| | V _{NOM} DC 3.70 V | 112.89 | |
| | V _{MIN} DC 3.33 V | 112.89 | |
| Middle Frequency: 924 MHz | V _{MAX} DC 4.20 V | 112.89 | |
| | V _{NOM} DC 3.70 V | 112.89 | |
| | V _{MIN} DC 3.33 V | 112.89 | |
| High Frequency: 928 MHz | V _{MAX} DC 4.20 V | 112.89 | |
| | V _{NOM} DC 3.70 V | 112.89 | |
| | V _{MIN} DC 3.33 V | 112.89 | |
| Measurement uncertainty: ± 3 × 10 ⁻⁴ | | | |

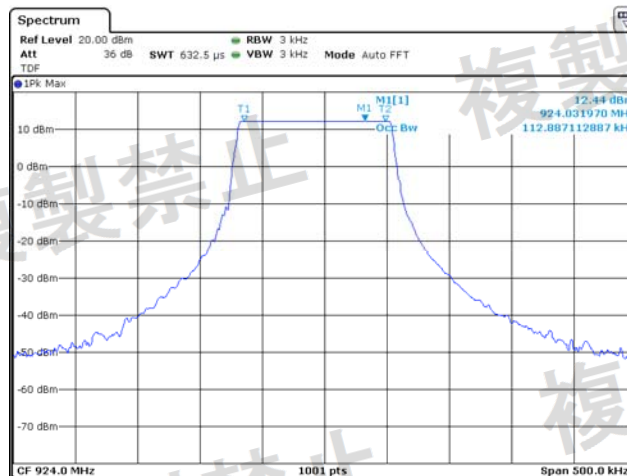
5.2.2 Test Plot (Normal Voltage)

Occupied bandwidth (99%)

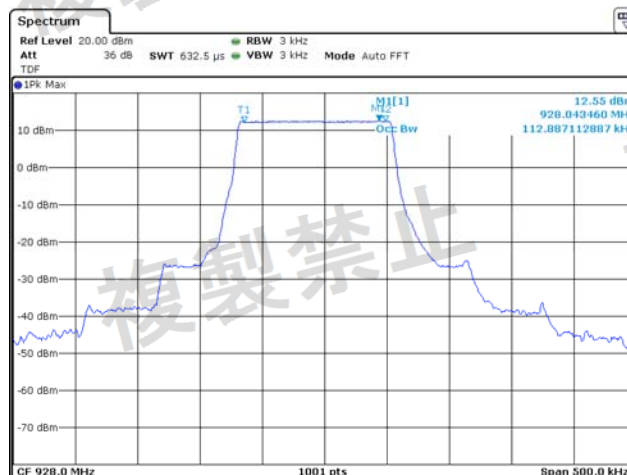
920.6 MHz



924 MHz



928 MHz



5.3. RF Output Power

According to Table 22-3 of Notification No.88 of MIC

5.3.1 Test Data

PASS

| Test Conditions (Conducted) | | | | | | | | |
|-----------------------------------|------------------|-----------|----------------|-----------------|---------|-------|-----------------------|--|
| RF output power (declared): | | | 0.02 W | | | | | |
| Temperature: (26 ± 3) °C | | | TEST RESULTS | | | | | |
| Rel. Humidity: (54 ± 3) % R.H. | | | Measured (dBm) | Ant. Gain (dBi) | e.i.r.p | | Tolerance (%) (NOTE1) | Limit |
| | | | | | dBm | mW | | |
| Low Frequency: 920.6 MHz | V _{MAX} | DC 4.20 V | 13.00 | -1.53 | 11.47 | 14.03 | -29.86 | (RF Output Power) 0.02W or below (tolerance) +20 % and -80 % |
| | V _{NOM} | DC 3.70 V | 13.47 | -1.53 | 11.94 | 15.63 | -21.84 | |
| | V _{MIN} | DC 3.33 V | 13.57 | -1.53 | 12.04 | 16.00 | -20.02 | |
| Middle Frequency: 924 MHz | V _{MAX} | DC 4.20 V | 13.21 | -1.53 | 11.68 | 14.72 | -26.38 | |
| | V _{NOM} | DC 3.70 V | 12.94 | -1.53 | 11.41 | 13.84 | -30.82 | |
| | V _{MIN} | DC 3.33 V | 13.27 | -1.53 | 11.74 | 14.93 | -25.36 | |
| High Frequency: 928 MHz | V _{MAX} | DC 4.20 V | 13.30 | -1.72 | 11.58 | 14.39 | -28.06 | |
| | V _{NOM} | DC 3.70 V | 12.91 | -1.72 | 11.19 | 13.15 | -34.24 | |
| | V _{MIN} | DC 3.33 V | 13.12 | -1.72 | 11.40 | 13.80 | -30.98 | |
| Measurement uncertainty: ± 1.4 dB | | | | | | | | |

** Measured value (dBm) is the average output power of the transmitter; the power meter reading and corrected for the cable loss. The measured power was only performed about the burst-on time excluding burst-off time using the trigger function of the peak power meter.

NOTE 1: Tolerance (%) in normal mode = 100 × (Antenna power (mW) - Declared power (mW)) / Declared power (mW)

5.3.2 Test Plot (Normal Voltage)

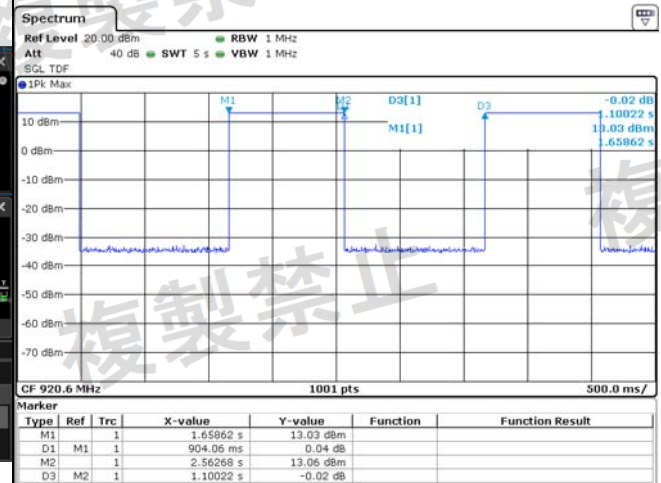
Measured

920.6 MHz



On/ Off Time

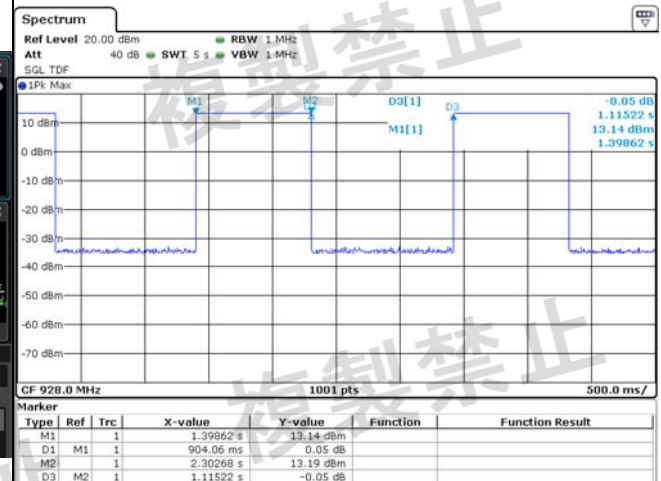
920.6 MHz



924 MHz



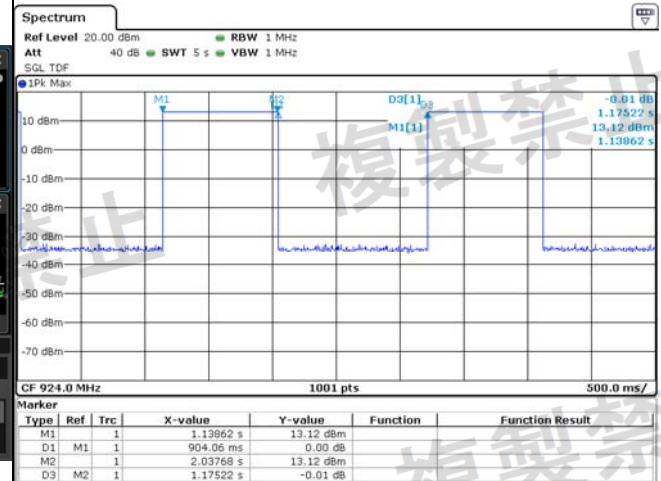
924 MHz



928 MHz



928 MHz



5.4. Transmitter spurious emissions

According to Table 22-3 of Notification No.88 of MIC

5.4.1 Test Data

PASS

| Test Conditions (Conducted) | | | | | |
|--------------------------------|----------------------------|--------------------|----------------|---------|---------------------|
| Temperature: (26 ± 3) °C | | TEST RESULTS | | | |
| Rel. Humidity: (54 ± 3) % R.H. | | Measured frequency | Measured Value | Limit | Reference bandwidth |
| 920.6 MHz | | (MHz) | (dBm) | | |
| 30 MHz ~ 710 MHz | V _{MAX} DC 4.20 V | 701.51 | -68.55 | -36 dBm | 100 kHz |
| | V _{NOM} DC 3.70 V | 40.53 | -68.37 | | |
| | V _{MIN} DC 3.33 V | 677.73 | -67.82 | | |
| 710 MHz ~ 900 MHz | V _{MAX} DC 4.20 V | 806.14 | -59.78 | -55 dBm | 1 MHz |
| | V _{NOM} DC 3.70 V | 800.25 | -60.44 | | |
| | V _{MIN} DC 3.33 V | 792.85 | -59.37 | | |
| 900 ~ 915 MHz | V _{MAX} DC 4.20 V | 912.60 | -62.55 | -55 dBm | 100 kHz |
| | V _{NOM} DC 3.70 V | 912.67 | -62.19 | | |
| | V _{MIN} DC 3.33 V | 912.67 | -60.17 | | |
| 930 ~ 1000 MHz | V _{MAX} DC 4.20 V | 940.59 | -60.03 | -55 dBm | 100 kHz |
| | V _{NOM} DC 3.70 V | 940.73 | -60.19 | | |
| | V _{MIN} DC 3.33 V | 940.80 | -60.36 | | |
| 1000 MHz ~ 1215 MHz | V _{MAX} DC 4.20 V | 1129.84 | -54.91 | -45 dBm | 1 MHz |
| | V _{NOM} DC 3.70 V | 1131.77 | -54.56 | | |
| | V _{MIN} DC 3.33 V | 1006.98 | -54.26 | | |
| 1215 MHz ~ 5000 MHz | V _{MAX} DC 4.20 V | 1840.80 | -38.19 | -30 dBm | 1 MHz |
| | V _{NOM} DC 3.70 V | 1840.80 | -37.97 | | |
| | V _{MIN} DC 3.33 V | 1840.80 | -38.18 | | |
| 915 ~ 930 MHz* | V _{MAX} DC 4.20 V | 920.30 | -38.78 | -36 dBm | 100 kHz** |
| | V _{NOM} DC 3.70 V | 920.30 | -39.12 | | |
| | V _{MIN} DC 3.33 V | 920.27 | -38.86 | | |

- * "n" is the number of channels to be used simultaneously as a single radio channel.

Center frequency (200 + 100×n)kHz are excluded.

- ** RBW/VBW 3 kHz Correction factor : 15.2 dB

| | | | | | | |
|--------------------------------|------------------|-----------|---------|--------|---------|-----------|
| 924 MHz | | | | | | |
| 30 MHz ~ 710 MHz | V _{MAX} | DC 4.20 V | 522.85 | -69.75 | -36 dBm | 100 kHz |
| | V _{NOM} | DC 3.70 V | 599.61 | -69.20 | | |
| | V _{MIN} | DC 3.33 V | 580.59 | -70.49 | | |
| 710 MHz ~ 900 MHz | V _{MAX} | DC 4.20 V | 823.79 | -61.10 | -55 dBm | 1 MHz |
| | V _{NOM} | DC 3.70 V | 797.60 | -60.39 | | |
| | V _{MIN} | DC 3.33 V | 803.86 | -60.10 | | |
| 900 ~ 915 MHz | V _{MAX} | DC 4.20 V | 905.64 | -63.58 | -55 dBm | 100 kHz |
| | V _{NOM} | DC 3.70 V | 905.94 | -63.90 | | |
| | V _{MIN} | DC 3.33 V | 905.69 | -63.28 | | |
| 930 ~ 1000 MHz | V _{MAX} | DC 4.20 V | 931.85 | -60.25 | -55 dBm | 100 kHz |
| | V _{NOM} | DC 3.70 V | 931.92 | -60.97 | | |
| | V _{MIN} | DC 3.33 V | 931.99 | -60.12 | | |
| 1000 MHz ~ 1215 MHz | V _{MAX} | DC 4.20 V | 1189.33 | -54.53 | -45 dBm | 1 MHz |
| | V _{NOM} | DC 3.70 V | 1159.48 | -54.85 | | |
| | V _{MIN} | DC 3.33 V | 1006.55 | -55.41 | | |
| 1215 MHz ~ 5000 MHz | V _{MAX} | DC 4.20 V | 1848.40 | -39.05 | -30 dBm | 1 MHz |
| | V _{NOM} | DC 3.70 V | 1848.40 | -38.77 | | |
| | V _{MIN} | DC 3.33 V | 1848.40 | -39.21 | | |
| 915 ~ 930 MHz* | V _{MAX} | DC 4.20 V | 923.70 | -39.08 | -36 dBm | 100 kHz** |
| | V _{NOM} | DC 3.70 V | 924.30 | -39.55 | | |
| | V _{MIN} | DC 3.33 V | 924.31 | -39.18 | | |

- * "n" is the number of channels to be used simultaneously as a single radio channel.

Center frequency (200 + 100×n)kHz are excluded.

- ** RBW/VBW 3 kHz Correction factor : 15.2 dB

| 928 MHz | | | | | | |
|--------------------------------|------------------|-----------|---------|--------|---------|-----------|
| 30 MHz ~ 710 MHz | V _{MAX} | DC 4.20 V | 596.89 | -70.34 | -36 dBm | 100 kHz |
| | V _{NOM} | DC 3.70 V | 675.69 | -69.63 | | |
| | V _{MIN} | DC 3.33 V | 703.55 | -70.49 | | |
| 710 MHz ~ 900 MHz | V _{MAX} | DC 4.20 V | 794.75 | -59.87 | -55 dBm | 1 MHz |
| | V _{NOM} | DC 3.70 V | 814.49 | -59.55 | | |
| | V _{MIN} | DC 3.33 V | 799.50 | -59.63 | | |
| 900 ~ 915 MHz | V _{MAX} | DC 4.20 V | 914.35 | -67.06 | -55 dBm | 100 kHz |
| | V _{NOM} | DC 3.70 V | 914.53 | -66.35 | | |
| | V _{MIN} | DC 3.33 V | 913.49 | -66.73 | | |
| 930 ~ 1000 MHz | V _{MAX} | DC 4.20 V | 930.32 | -57.45 | -55 dBm | 100 kHz |
| | V _{NOM} | DC 3.70 V | 930.18 | -58.44 | | |
| | V _{MIN} | DC 3.33 V | 930.04 | -58.38 | | |
| 1000 MHz ~ 1215 MHz | V _{MAX} | DC 4.20 V | 1000.75 | -54.22 | -45 dBm | 1 MHz |
| | V _{NOM} | DC 3.70 V | 1051.44 | -54.49 | | |
| | V _{MIN} | DC 3.33 V | 1189.98 | -55.36 | | |
| 1215 MHz ~ 5000 MHz | V _{MAX} | DC 4.20 V | 1855.90 | -39.87 | -30 dBm | 1 MHz |
| | V _{NOM} | DC 3.70 V | 1855.90 | -39.68 | | |
| | V _{MIN} | DC 3.33 V | 1855.90 | -39.74 | | |
| 915 ~ 930 MHz* | V _{MAX} | DC 4.20 V | 927.69 | -37.35 | -36 dBm | 100 kHz** |
| | V _{NOM} | DC 3.70 V | 927.69 | -37.50 | | |
| | V _{MIN} | DC 3.33 V | 927.69 | -37.68 | | |
| Measurement uncertainty: ± 3.0 | | | | | | |

- * "n" is the number of channels to be used simultaneously as a single radio channel.

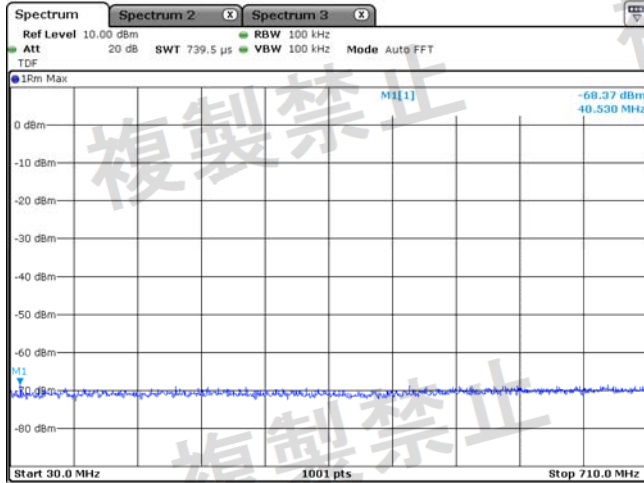
Center frequency (200 + 100 × n) kHz are excluded.

- ** RBW/VBW 3 kHz Correction factor : 15.2 dB

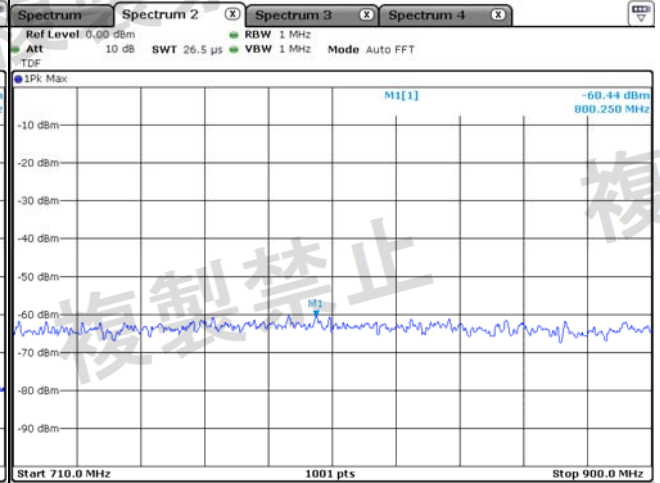
5.4.2 Test Plot (Normal Voltage)

920.6 MHz

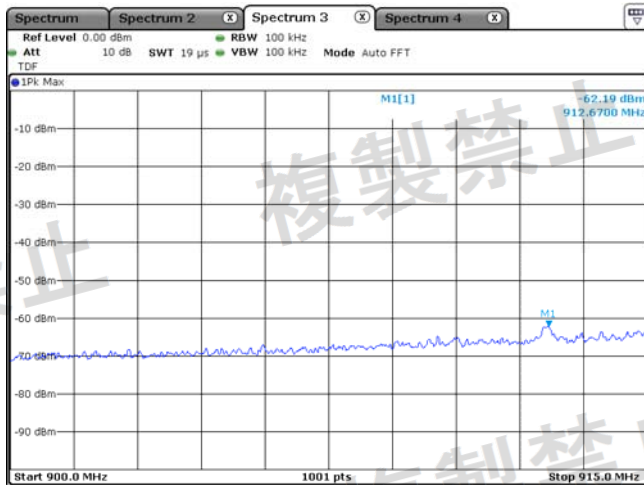
30 ~ 710 MHz



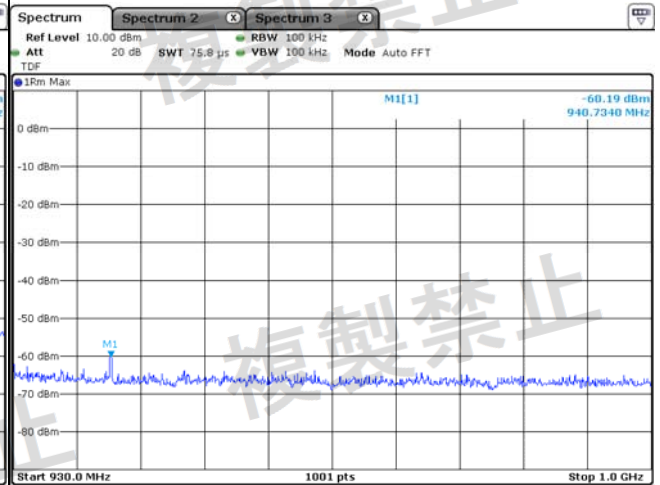
710 ~ 900 MHz



900 ~ 915 MHz

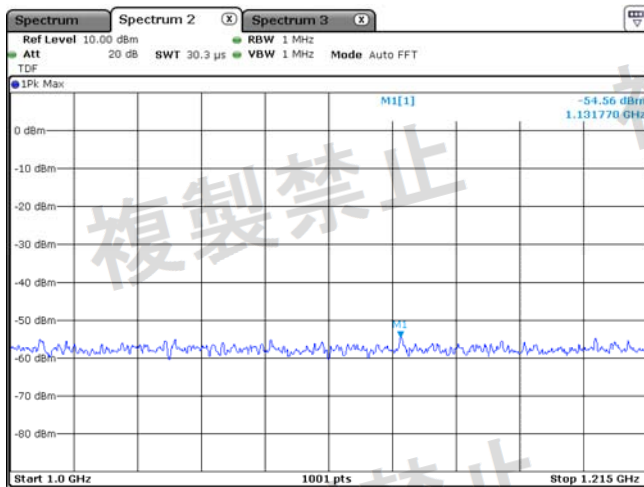


930 ~ 1000 MHz

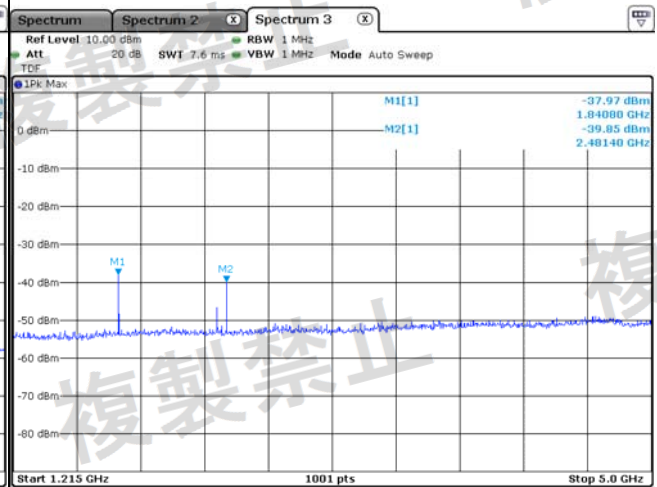


920.6 MHz

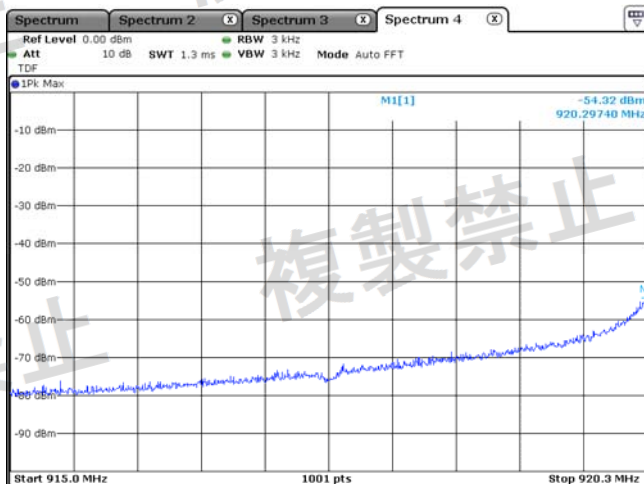
1000 ~ 1215 MHz



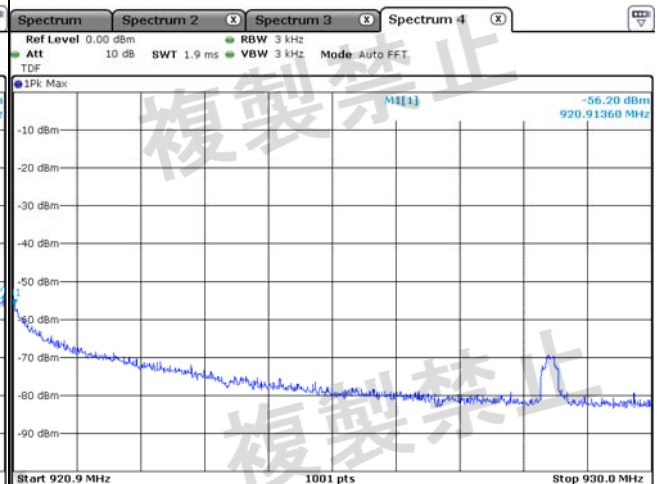
1215 ~ 5000 MHz



915 ~ 930 MHz (RBW/VBW 3 kHz)

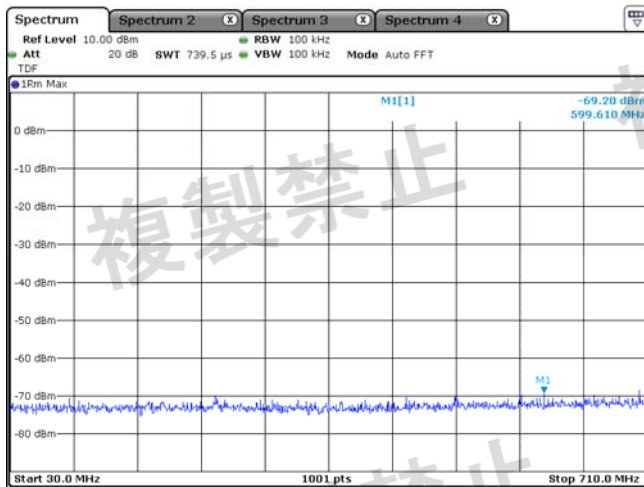


915 ~ 930 MHz (RBW/VBW 3 kHz)

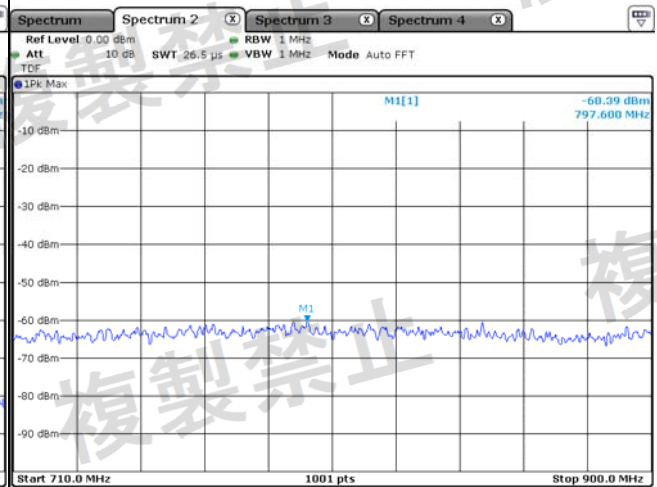


924 MHz

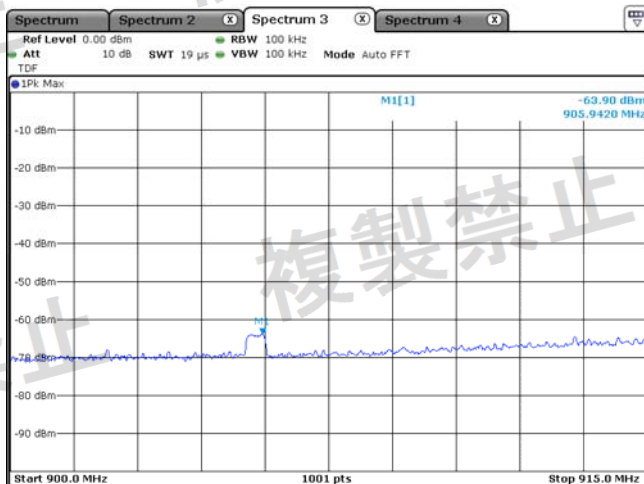
30 ~ 710 MHz



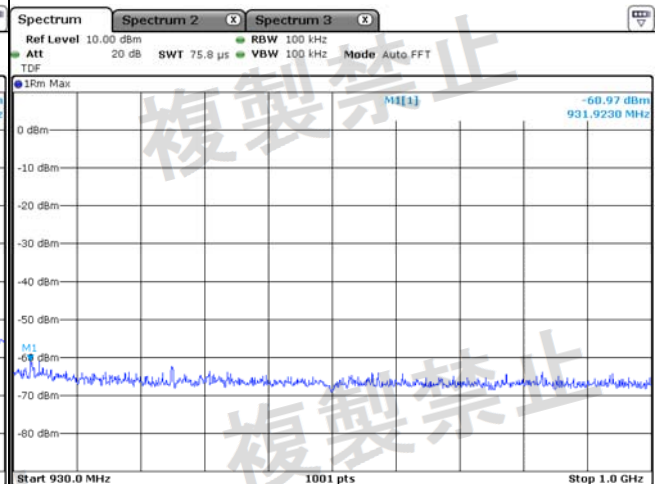
710 ~ 900 MHz



900 ~ 915 MHz

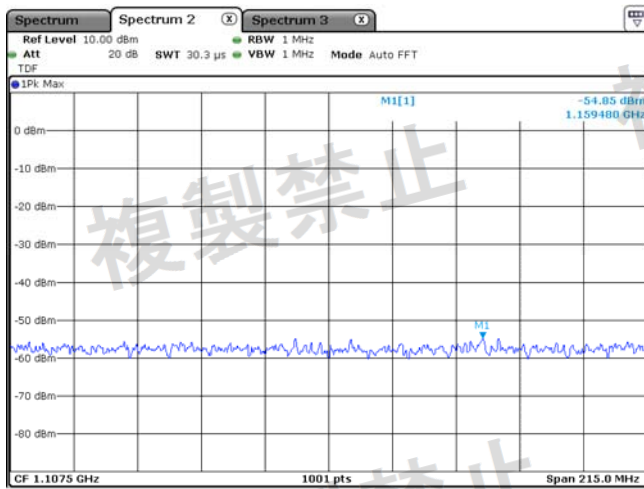


930 ~ 1000 MHz

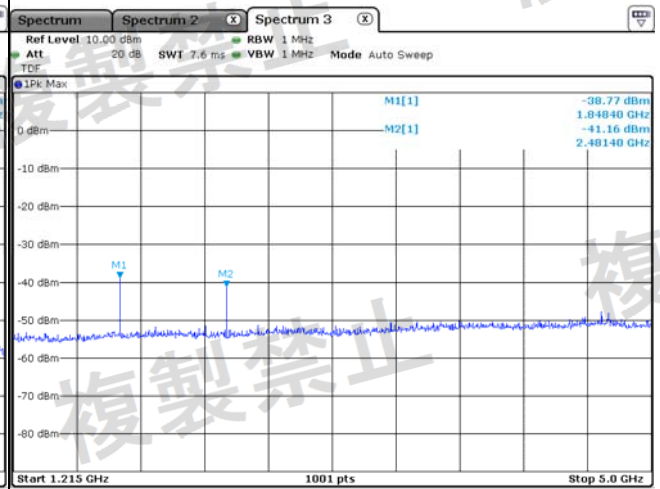


924 MHz

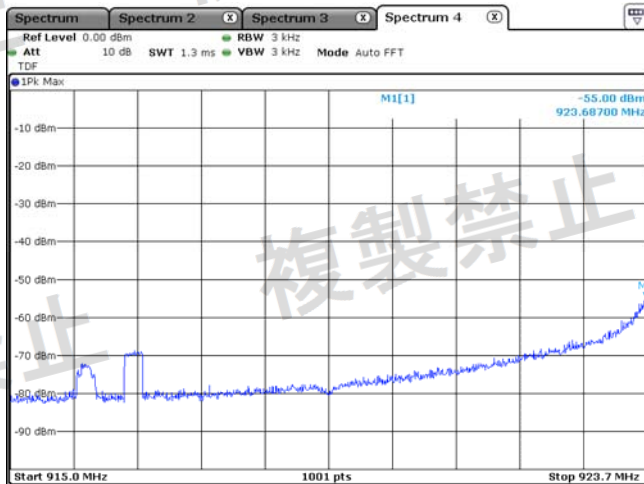
1000 ~ 1215 MHz



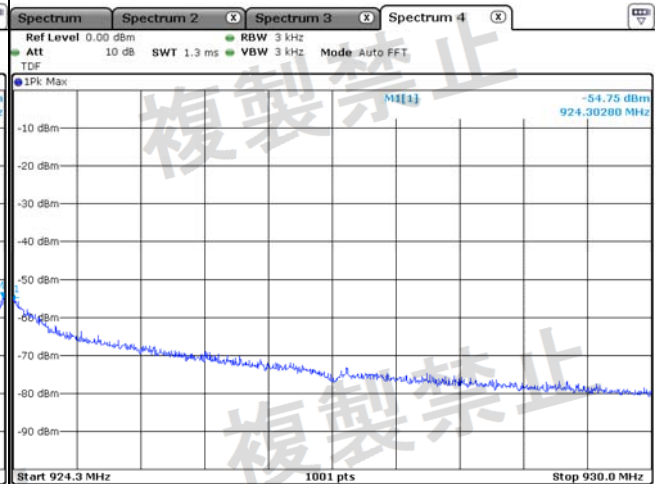
1215 ~ 5000 MHz



915 ~ 930 MHz (RBW/VBW 3 kHz)

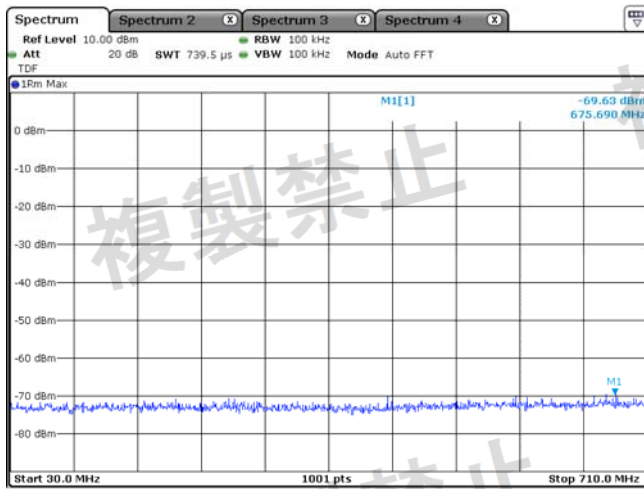


915 ~ 930 MHz (RBW/VBW 3 kHz)

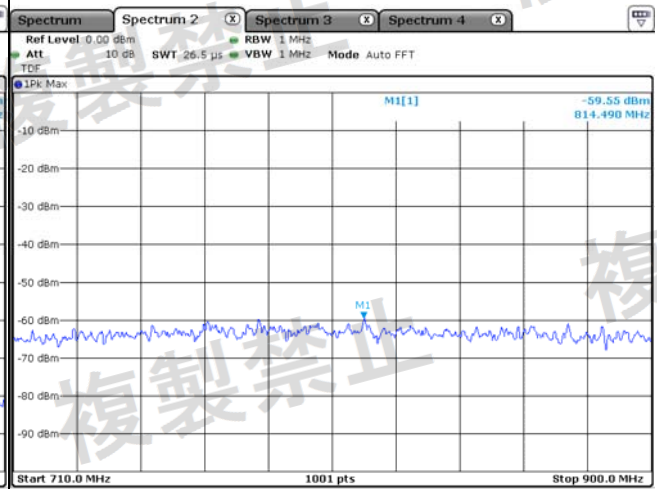


928 MHz

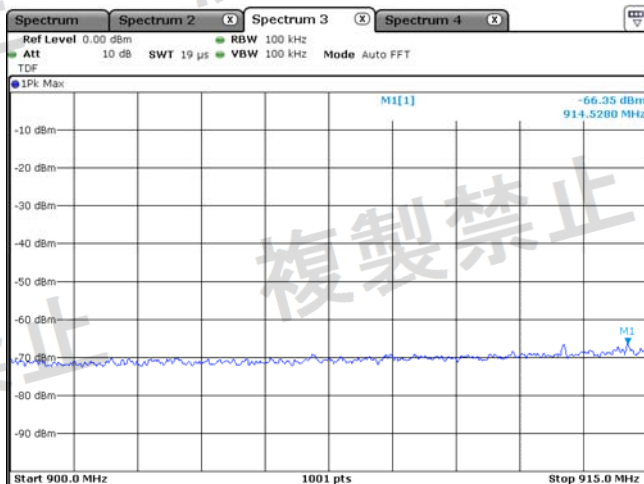
30 ~ 710 MHz



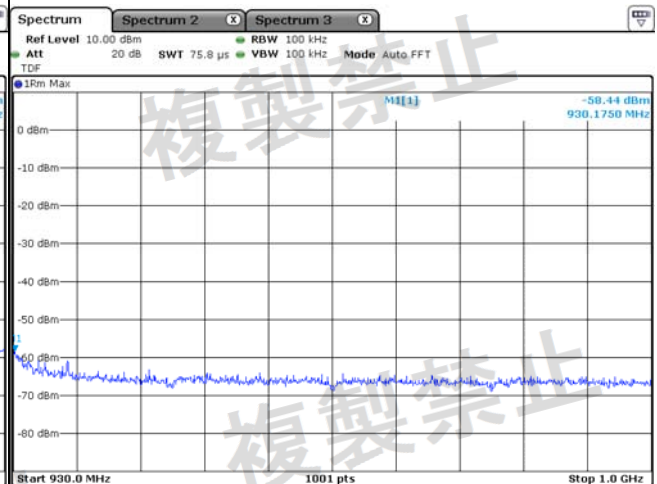
710 ~ 900 MHz



900 ~ 915 MHz

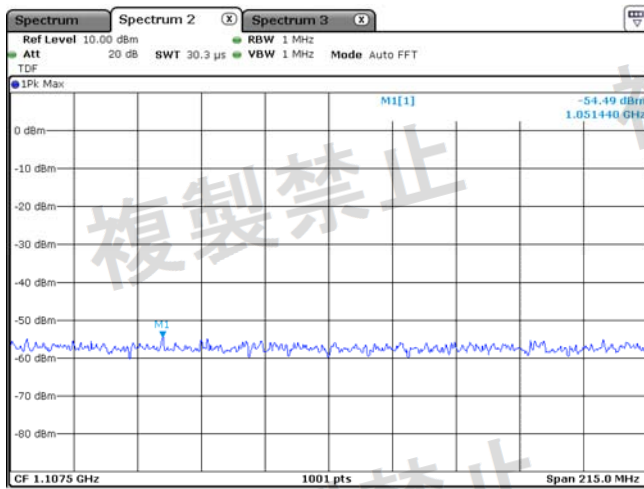


930 ~ 1000 MHz

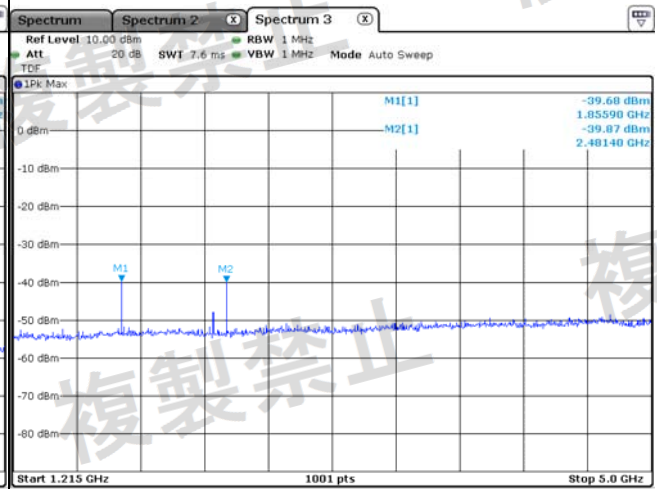


928 MHz

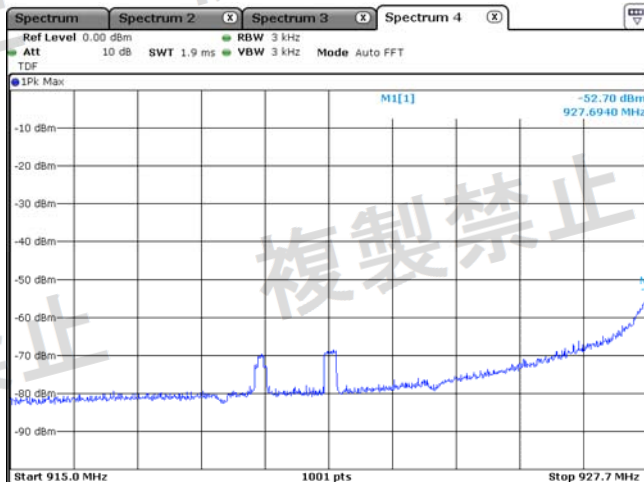
1000 ~ 1215 MHz



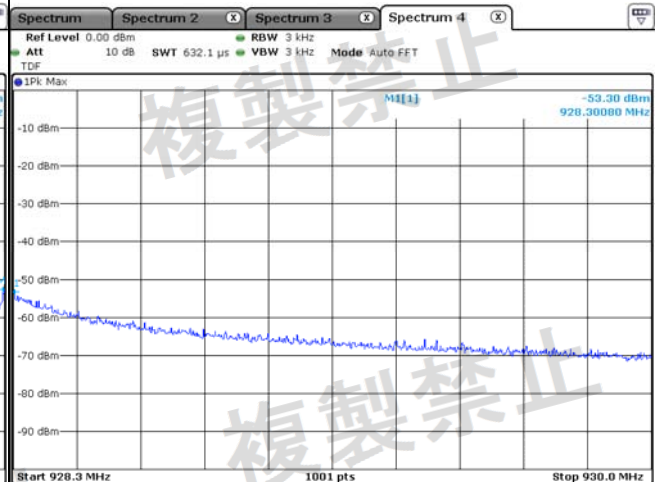
1215 ~ 5000 MHz



915 ~ 930 MHz (RBW/VBW 3 kHz)



915 ~ 930 MHz (RBW/VBW 3 kHz)



5.5. Adjacent Channel Leakage power

According to Table 22-3 of Notification No.88 of MIC

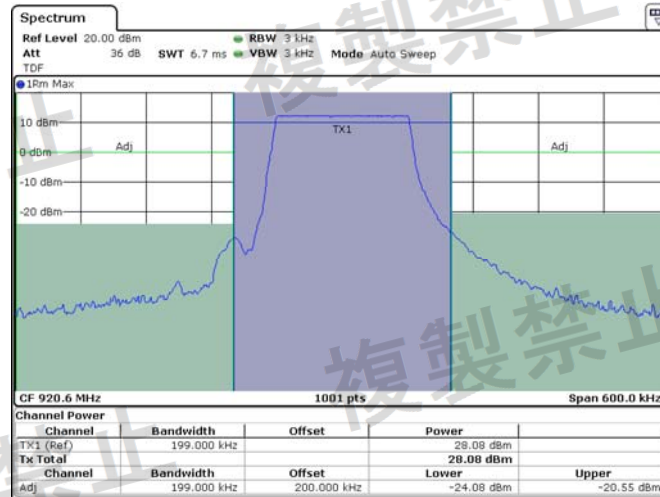
5.5.1 Test Data

PASS

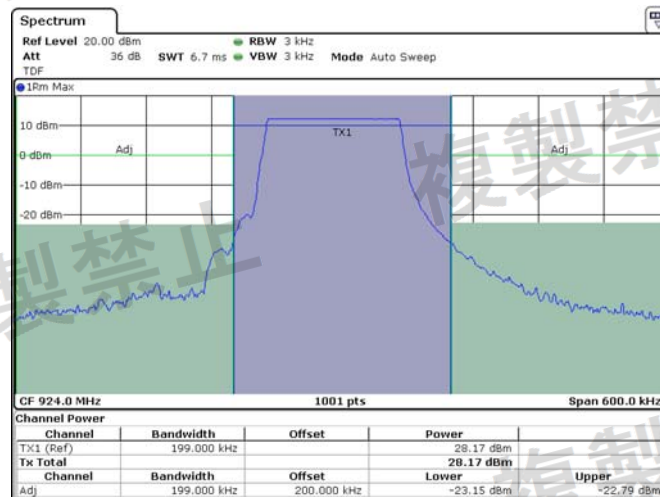
| Test Conditions (Conducted) | | | | |
|-----------------------------------|------------------|-----------------------------|-----------------------------|--------|
| Temperature: | | (26 ± 3) °C | | |
| Rel. Humidity: | | (54 ± 3) % R.H. | | |
| | | Lower Adjacent Unit Channel | Upper Adjacent Unit Channel | Limit |
| | | (dBm) | (dBm) | |
| Low Frequency: 920.6 MHz | V _{MAX} | DC 4.20 V | -21.50 | -20.20 |
| | V _{NOM} | DC 3.70 V | -24.08 | -20.55 |
| | V _{MIN} | DC 3.33 V | -25.44 | -20.55 |
| Middle Frequency: 924 MHz | V _{MAX} | DC 4.20 V | -24.71 | -22.72 |
| | V _{NOM} | DC 3.70 V | -23.15 | -22.79 |
| | V _{MIN} | DC 3.33 V | -22.29 | -22.76 |
| High Frequency: 928 MHz | V _{MAX} | DC 4.20 V | -17.07 | -19.38 |
| | V _{NOM} | DC 3.70 V | -17.32 | -19.35 |
| | V _{MIN} | DC 3.33 V | -17.57 | -19.33 |
| Measurement uncertainty: ± 1.4 dB | | | | |

5.5.2 Test Plot (Normal Voltage)

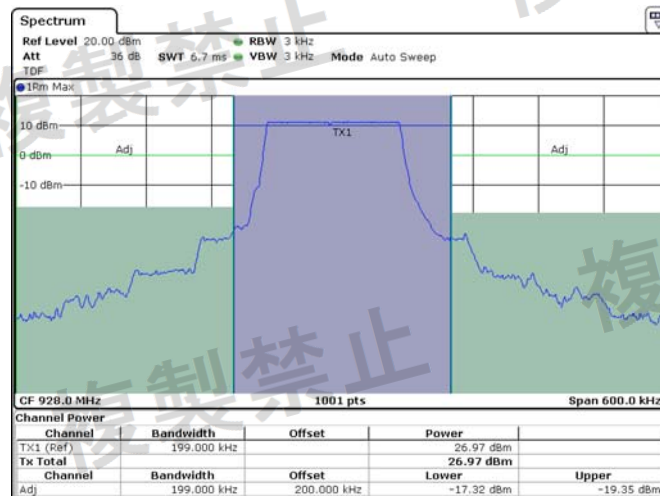
Low Channel
(920.6 MHz)



Middle Channel
(924 MHz)



High Channel
(928 MHz)



5.6. Receiver spurious emissions

According to Table 22-3 of Notification No.88 of MIC

5.6.1 Test Data

PASS

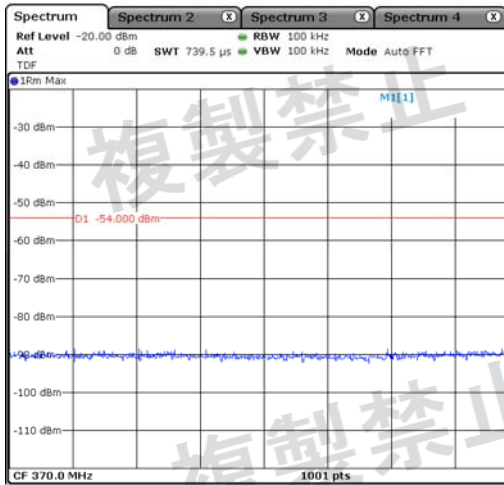
| Test Conditions (Conducted) | | | | |
|--------------------------------|----------------------------|--------------------|----------------|------------------------|
| Temperature: (26 ± 3) °C | | TEST RESULTS | | |
| Rel. Humidity: (54 ± 3) % R.H. | | Measured frequency | Measured Value | Limit |
| 920.6 MHz | | (MHz) | (dBm) | |
| 30 MHz ~ 710 MHz | V _{MAX} DC 4.20 V | 685.20 | -88.92 | -54dBm/100kHz or below |
| | V _{NOM} DC 3.70 V | 610.48 | -87.72 | |
| | V _{MIN} DC 3.33 V | 586.02 | -89.03 | |
| 710 MHz ~ 900 MHz | V _{MAX} DC 4.20 V | 869.35 | -72.97 | -55dBm/1MHz or below |
| | V _{NOM} DC 3.70 V | 890.41 | -73.48 | |
| | V _{MIN} DC 3.33 V | 889.66 | -73.63 | |
| 900 MHz ~ 915 MHz | V _{MAX} DC 4.20 V | 902.18 | -82.33 | -55dBm/100kHz or below |
| | V _{NOM} DC 3.70 V | 902.63 | -82.30 | |
| | V _{MIN} DC 3.33 V | 902.33 | -82.64 | |
| 915 MHz ~ 930 MHz | V _{MAX} DC 4.20 V | 927.07 | -83.03 | -54dBm/100kHz or below |
| | V _{NOM} DC 3.70 V | 917.45 | -82.70 | |
| | V _{MIN} DC 3.33 V | 918.17 | -82.51 | |
| 930 MHz ~ 1000 MHz | V _{MAX} DC 4.20 V | 968.50 | -82.75 | -55dBm/100kHz or below |
| | V _{NOM} DC 3.70 V | 999.99 | -82.75 | |
| | V _{MIN} DC 3.33 V | 951.64 | -82.35 | |
| 1000 MHz ~ 5000 MHz | V _{MAX} DC 4.20 V | 4522.50 | -68.53 | -47dBm/1MHz or below |
| | V _{NOM} DC 3.70 V | 4618.40 | -67.94 | |
| | V _{MIN} DC 3.33 V | 4686.30 | -68.97 | |

| 924 MHz | | | | | |
|--------------------------------|------------------|-----------|---------|--------|------------------------|
| 30 MHz ~ 710 MHz | V _{MAX} | DC 4.20 V | 661.43 | -88.63 | -54dBm/100kHz or below |
| | V _{NOM} | DC 3.70 V | 665.50 | -88.34 | |
| | V _{MIN} | DC 3.33 V | 660.75 | -88.33 | |
| 710 MHz ~ 900 MHz | V _{MAX} | DC 4.20 V | 826.64 | -72.39 | -55dBm/1MHz or below |
| | V _{NOM} | DC 3.70 V | 832.90 | -73.25 | |
| | V _{MIN} | DC 3.33 V | 863.84 | -73.76 | |
| 900 MHz ~ 915 MHz | V _{MAX} | DC 4.20 V | 901.21 | -82.30 | -55dBm/100kHz or below |
| | V _{NOM} | DC 3.70 V | 901.69 | -82.64 | |
| | V _{MIN} | DC 3.33 V | 904.25 | -81.90 | |
| 915 MHz ~ 930 MHz | V _{MAX} | DC 4.20 V | 915.32 | -82.03 | -54dBm/100kHz or below |
| | V _{NOM} | DC 3.70 V | 924.18 | -82.40 | |
| | V _{MIN} | DC 3.33 V | 922.98 | -82.63 | |
| 930 MHz ~ 1000 MHz | V _{MAX} | DC 4.20 V | 961.64 | -83.30 | -55dBm/100kHz or below |
| | V _{NOM} | DC 3.70 V | 956.60 | -82.78 | |
| | V _{MIN} | DC 3.33 V | 941.50 | -82.66 | |
| 1000 MHz ~ 5000 MHz | V _{MAX} | DC 4.20 V | 4730.30 | -68.86 | -47dBm/1MHz or below |
| | V _{NOM} | DC 3.70 V | 4726.30 | -69.47 | |
| | V _{MIN} | DC 3.33 V | 4706.30 | -69.04 | |
| 928 MHz | | | | | |
| 30 MHz ~ 710 MHz | V _{MAX} | DC 4.20 V | 638.33 | -88.76 | -54dBm/100kHz or below |
| | V _{NOM} | DC 3.70 V | 649.88 | -88.85 | |
| | V _{MIN} | DC 3.33 V | 610.48 | -87.72 | |
| 710 MHz ~ 900 MHz | V _{MAX} | DC 4.20 V | 862.89 | -73.57 | -55dBm/1MHz or below |
| | V _{NOM} | DC 3.70 V | 762.48 | -73.54 | |
| | V _{MIN} | DC 3.33 V | 726.99 | -72.86 | |
| 900 MHz ~ 915 MHz | V _{MAX} | DC 4.20 V | 907.14 | -82.61 | -55dBm/100kHz or below |
| | V _{NOM} | DC 3.70 V | 907.59 | -81.66 | |
| | V _{MIN} | DC 3.33 V | 909.75 | -82.27 | |
| 915 MHz ~ 930 MHz | V _{MAX} | DC 4.20 V | 916.81 | -82.86 | -54dBm/100kHz or below |
| | V _{NOM} | DC 3.70 V | 922.14 | -81.49 | |
| | V _{MIN} | DC 3.33 V | 928.00 | -82.08 | |
| 930 MHz ~ 1000 MHz | V _{MAX} | DC 4.20 V | 952.69 | -83.31 | -55dBm/100kHz or below |
| | V _{NOM} | DC 3.70 V | 979.48 | -83.08 | |
| | V _{MIN} | DC 3.33 V | 966.89 | -82.44 | |
| 1000 MHz ~ 5000 MHz | V _{MAX} | DC 4.20 V | 4606.40 | -69.34 | -47dBm/1MHz or below |
| | V _{NOM} | DC 3.70 V | 4870.10 | -69.07 | |
| | V _{MIN} | DC 3.33 V | 4762.20 | -69.08 | |
| Measurement uncertainty: ± 3.0 | | | | | |

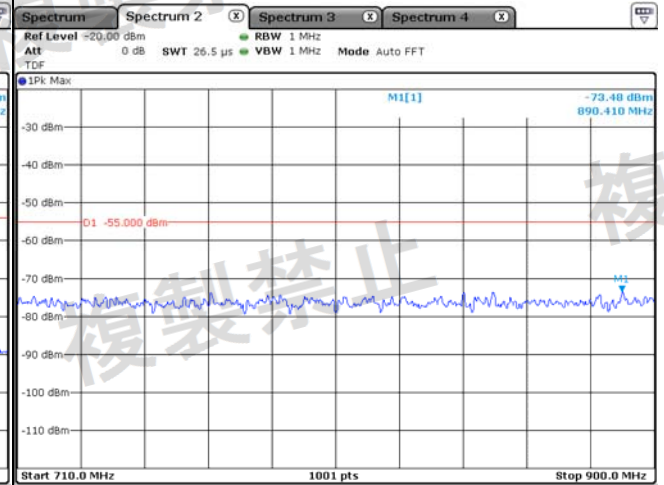
5.6.2 Test Plot (Normal Voltage)

920.6 MHz

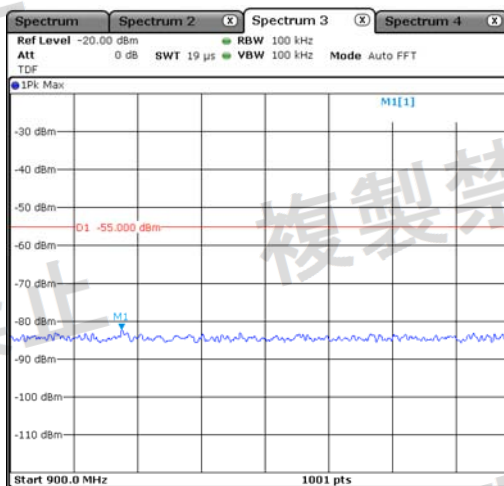
30 MHz ~ 710 MHz



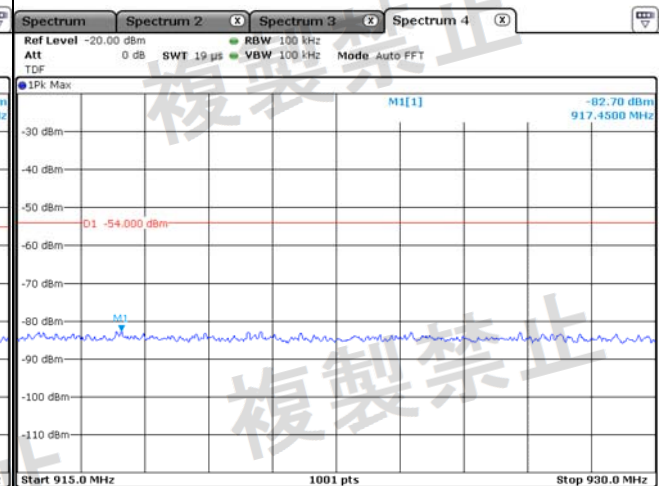
710 MHz ~ 900 MHz



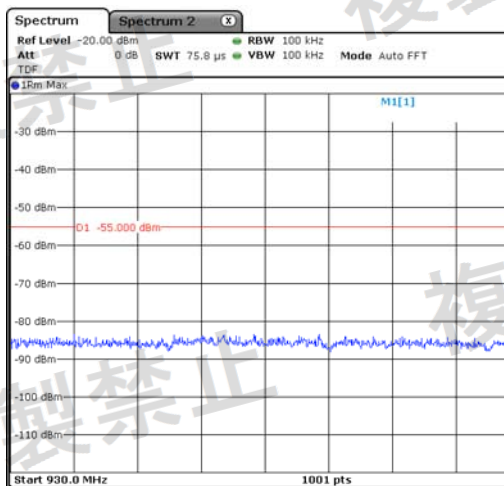
900 MHz ~ 915 MHz



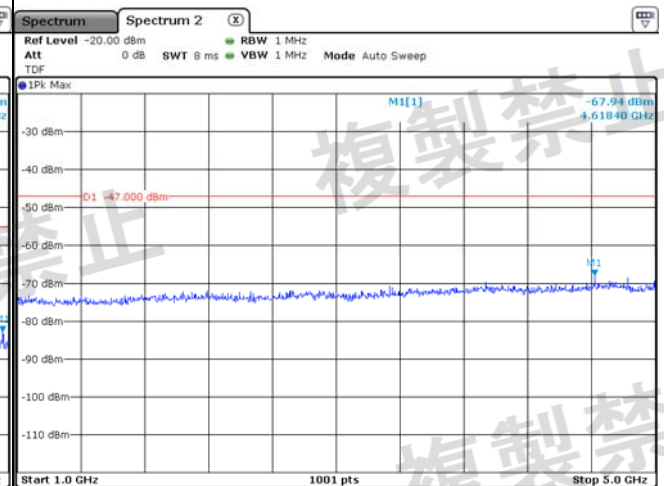
915 MHz ~ 930 MHz



930 MHz ~ 1000 MHz

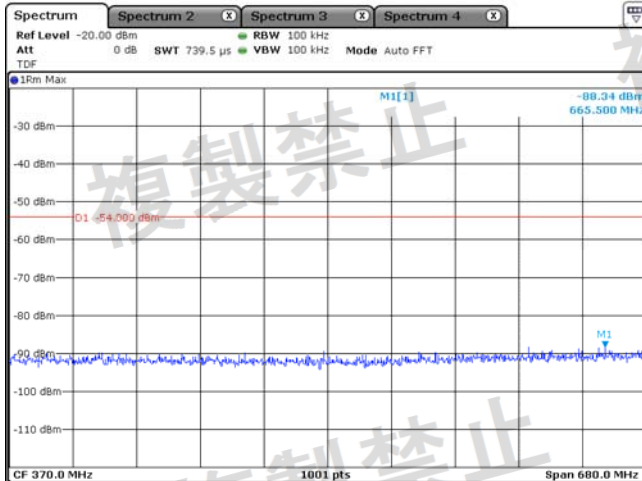


1000 MHz ~ 5000 MHz

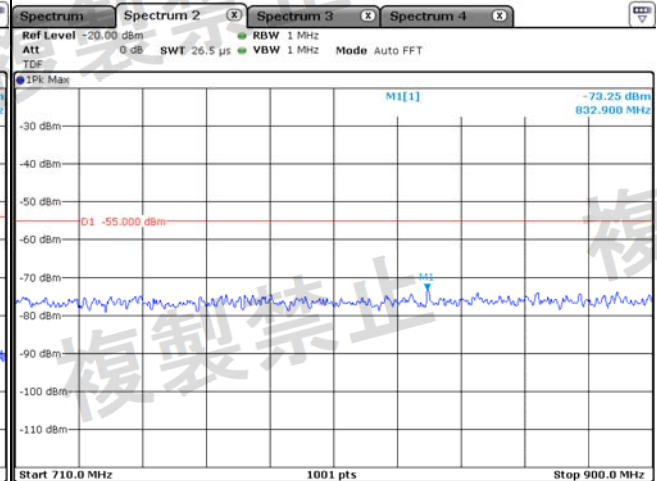


924 MHz

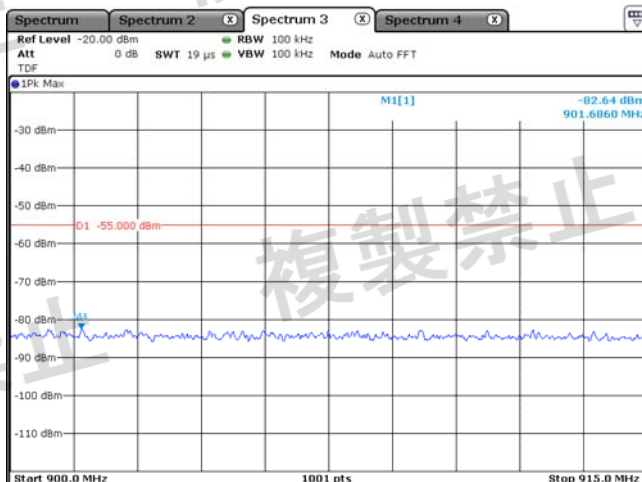
30 MHz ~ 710 MHz



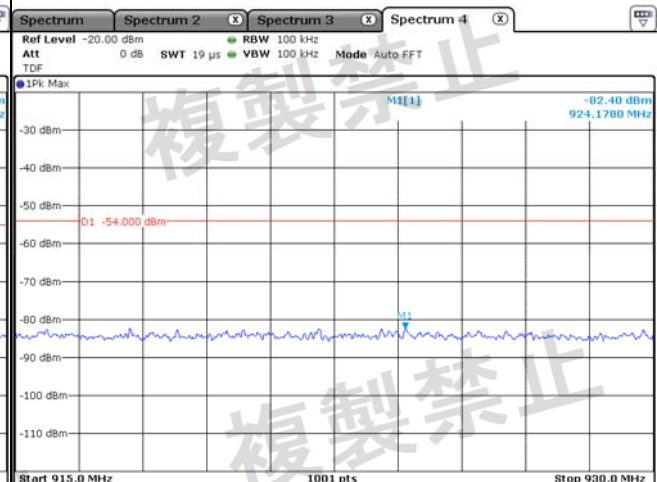
710 MHz ~ 900 MHz



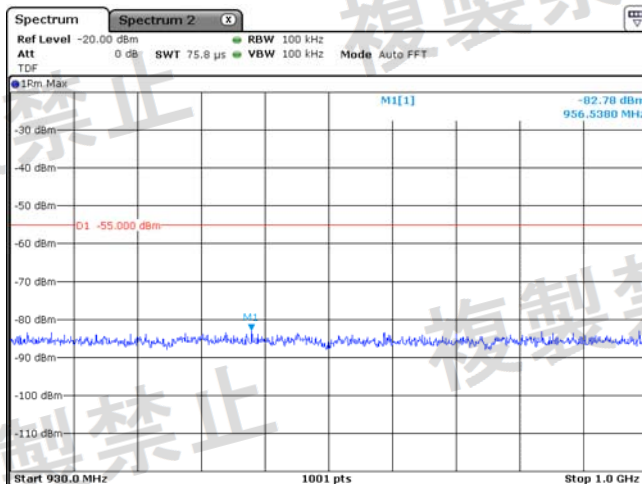
900 MHz ~ 915 MHz



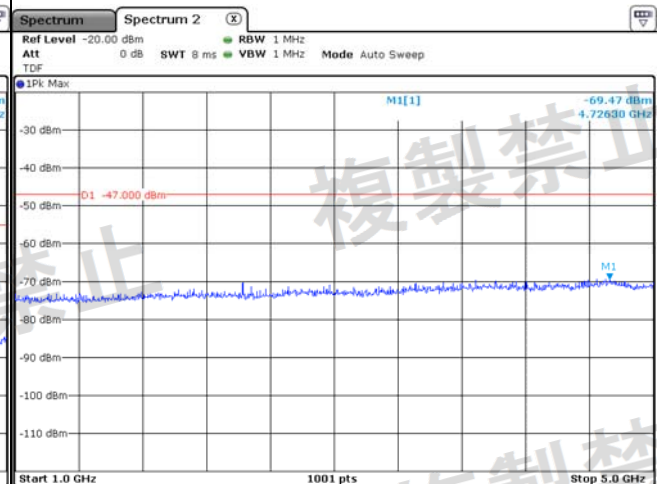
915 MHz ~ 930 MHz



930 MHz ~ 1000 MHz

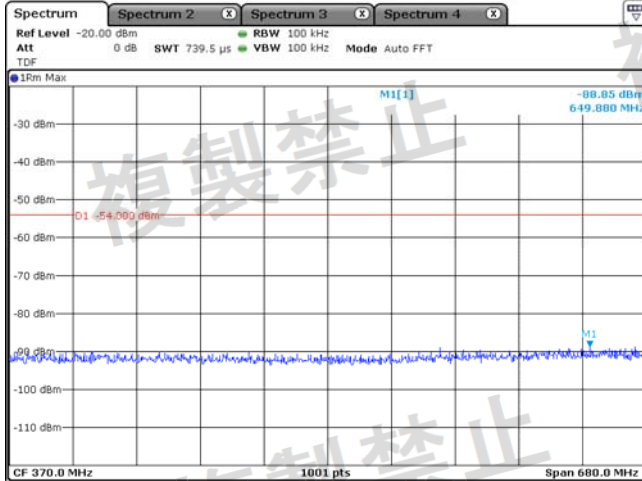


1000 MHz ~ 5000 MHz

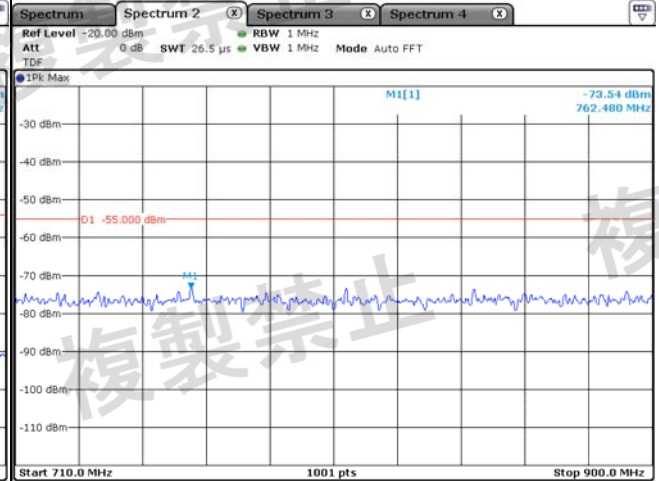


928 MHz

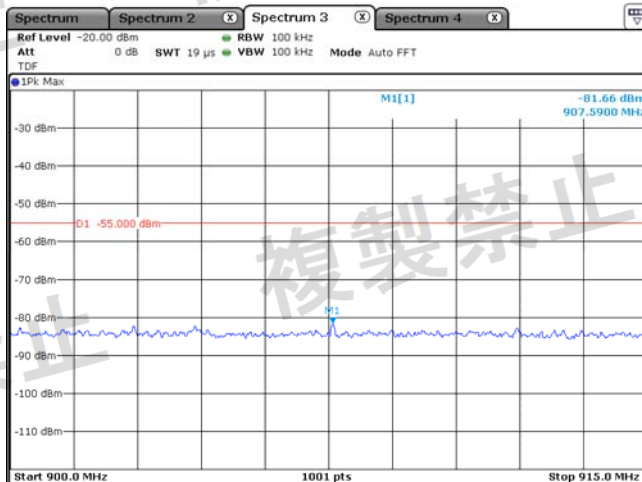
30 MHz ~ 710 MHz



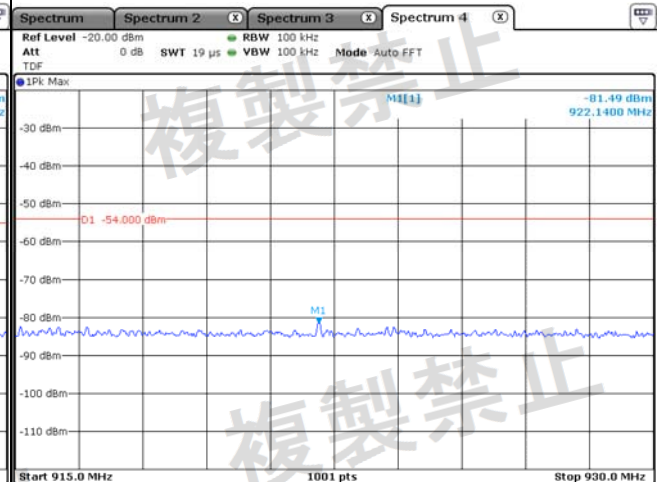
710 MHz ~ 900 MHz



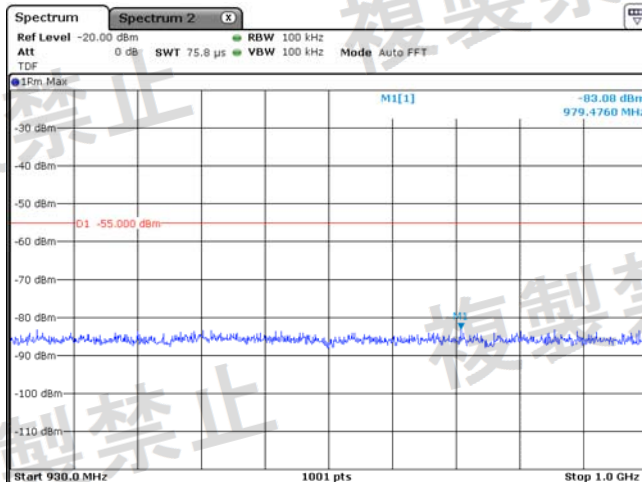
900 MHz ~ 915 MHz



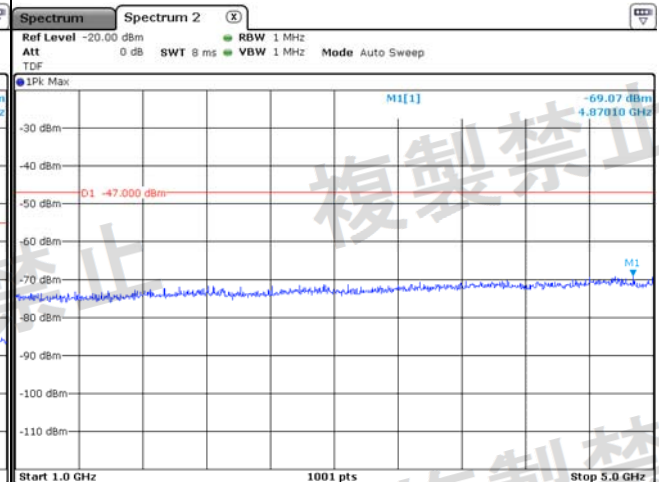
915 MHz ~ 930 MHz



930 MHz ~ 1000 MHz



1000 MHz ~ 5000 MHz



5.7. Carrier Sensing Level

According to Table 22-3 of Notification No.88 of MIC

5.6.1 Test Data

PASS

| Test Conditions (Conducted) | | | |
|--------------------------------|----------------------------|---------------------------|--------------------------------------|
| Temperature: (26 ± 3) °C | | TEST RESULTS | |
| Rel. Humidity: (54 ± 3) % R.H. | | carrier sense level (dBm) | Limit |
| Low Frequency: 920.6 MHz | V _{NOM} DC 3.70 V | -85.2 dBm | carrier sense level -80 dBm Below |
| Middle Frequency: 924 MHz | V _{NOM} DC 3.70 V | -84.8 dBm | |
| High Frequency: 928 MHz | V _{NOM} DC 3.70 V | -85.2 dBm | |

5.8. carrier sense time

According to Table 22-3 of Notification No.88 of MIC

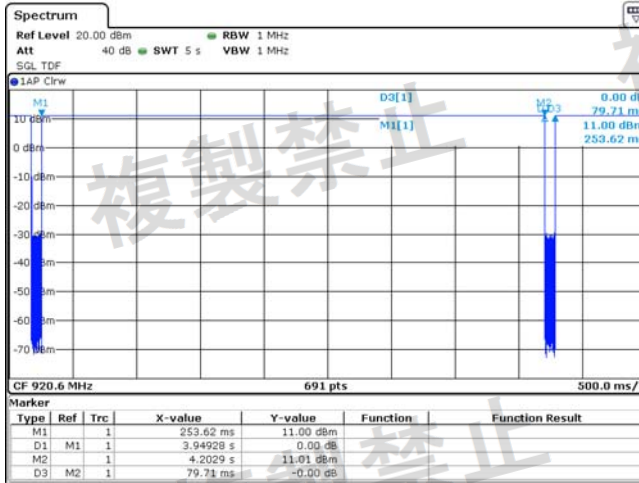
5.8.1 Test Data

PASS

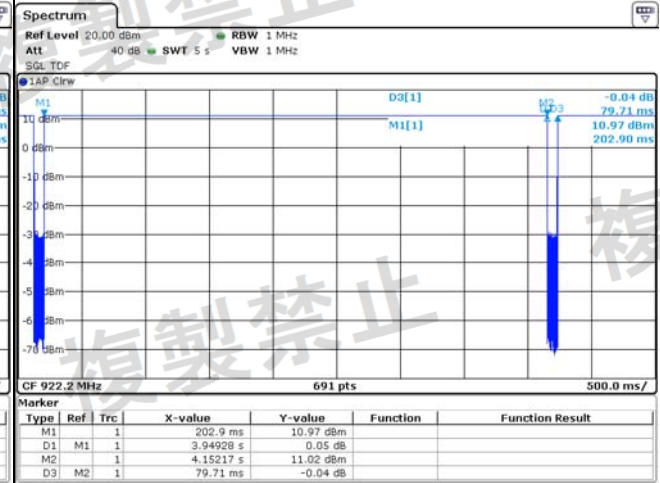
| Test Conditions (Conducted) | | | | | | | |
|--------------------------------|------------------|-----------|--------------------|------------------|----------------|--------------------|-------------------------|
| Temperature: (26 ± 3) °C | | | TEST RESULTS | | | | |
| Rel. Humidity: (54 ± 3) % R.H. | | | Carrier Sense time | Sending duration | Pause duration | Limit | |
| | | | (ms) | (ms) | (ms) | Carrier Sense time | Pause duration |
| Low Frequency: 920.6 MHz | V _{NOM} | DC 3.70 V | 5 | 3949.28 | 79.71 | 5 ms more | 4s below |
| Middle Frequency: 922.2 MHz | V _{NOM} | DC 3.70 V | 5 | 3949.28 | 79.71 | | |
| Middle Frequency: 922.4 MHz | V _{NOM} | DC 3.70 V | 5 | 364.51 | 4026.09 | 128 us more | 200 ms and 400 ms below |
| High Frequency: 928 MHz | V _{NOM} | DC 3.70 V | 5 | 368.75 | 4018.84 | | |

5.8.2 Test Plot (Normal Voltage)

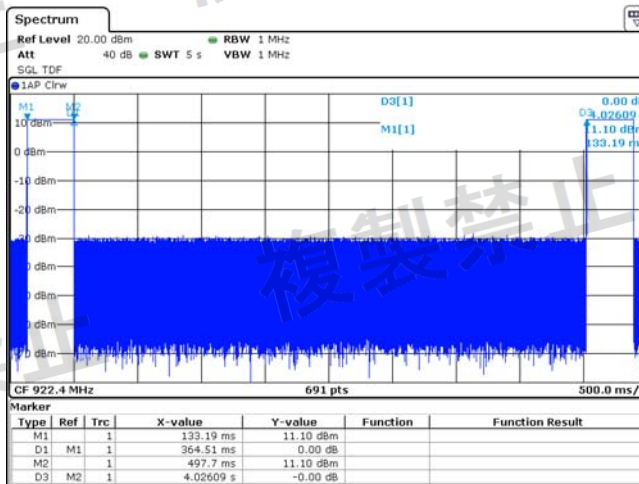
920.6 MHz



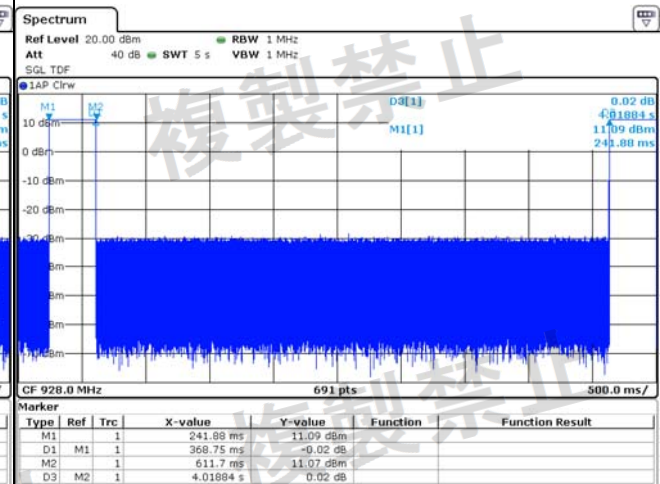
922.2 MHz



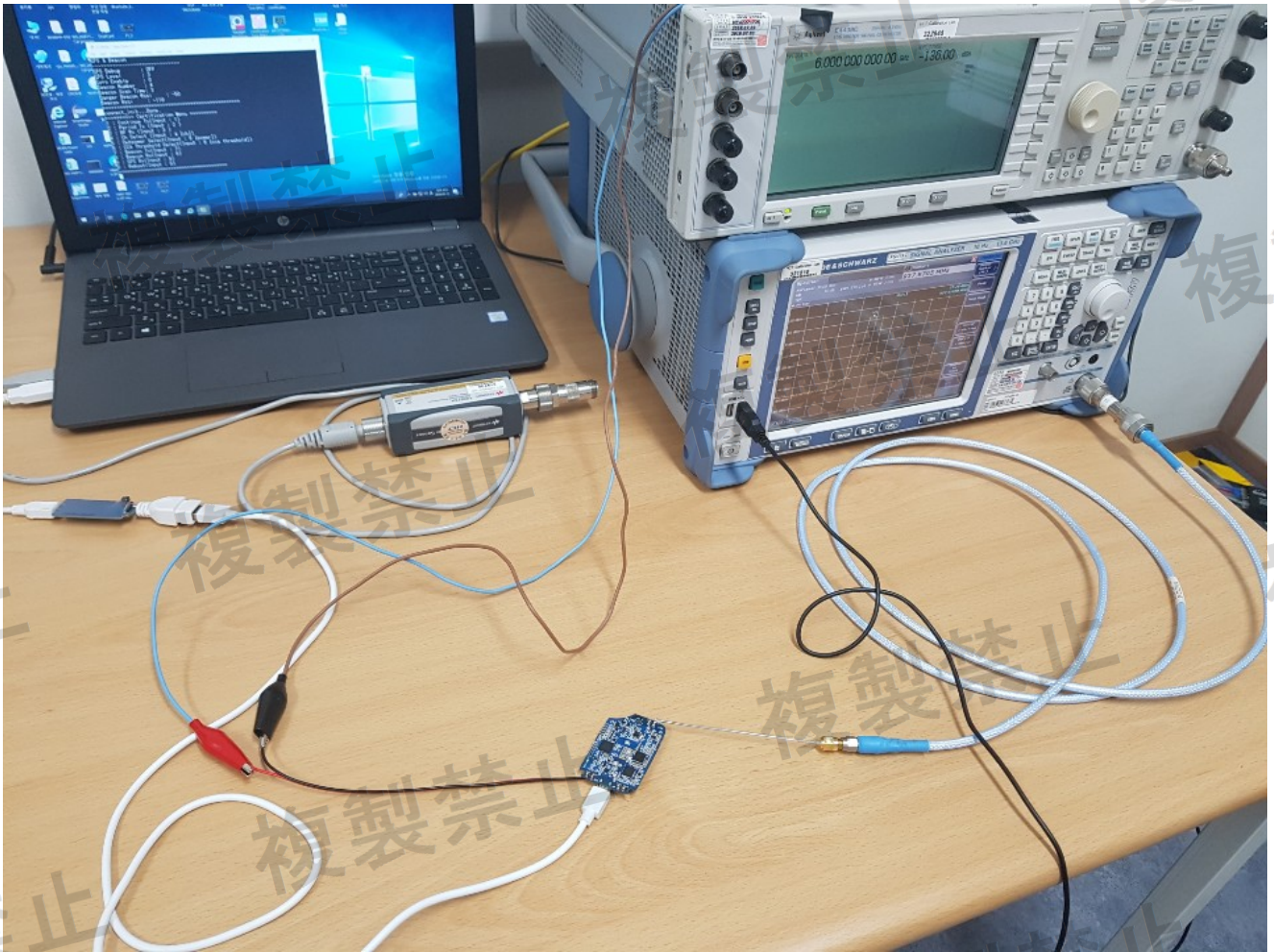
922.4 MHz



928 MHz



6 Photographs of the test setup



7 Photographs of EUT

