

|                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                    |                                                            |                                           |                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------|------------------------------------|
| <b>Prüfbericht-Nr.:</b><br><i>Test report no.:</i>                                                                                                                                                                                                                                                                                                                                                                                                         | <b>CN23WJ7J 002</b>                                                                                                                                                                                                                | <b>Auftrags-Nr.:</b><br><i>Order no.:</i>                  | 168424086                                 | Seite 1 von 30<br>Page 1 of 30     |
| <b>Kunden-Referenz-Nr.:</b><br><i>Client reference no.:</i>                                                                                                                                                                                                                                                                                                                                                                                                | <b>N/A</b>                                                                                                                                                                                                                         | <b>Auftragsdatum:</b><br><i>Order date:</i>                | 2023-04-25                                |                                    |
| <b>Auftraggeber:</b><br><i>Client:</i>                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Shenzhen HAC Telecom Technology Co., LTD</b><br>Floor 9, Block A, Building 1, Shenzhen International Innovation Valley, Xingke 1st Street, Nanshan District, Shenzhen, China                                                    |                                                            |                                           |                                    |
| <b>Prüfgegenstand:</b><br><i>Test item:</i>                                                                                                                                                                                                                                                                                                                                                                                                                | LoRaWAN Gateway                                                                                                                                                                                                                    |                                                            |                                           |                                    |
| <b>Bezeichnung / Typ-Nr.:</b><br><i>Identification / Type no.:</i>                                                                                                                                                                                                                                                                                                                                                                                         | HAC-GWW1-M<br>(Trademark: HAC)                                                                                                                                                                                                     |                                                            |                                           |                                    |
| <b>Auftrags-Inhalt:</b><br><i>Order content:</i>                                                                                                                                                                                                                                                                                                                                                                                                           | Type Test                                                                                                                                                                                                                          |                                                            |                                           |                                    |
| <b>Prüfgrundlage:</b><br><i>Test specification:</i>                                                                                                                                                                                                                                                                                                                                                                                                        | *CFR47 FCC Part 15: Subpart C Section 15.247    *RSS-247 Issue 2<br>*CFR47 FCC Part 22    *RSS-130 Issue 2<br>*CFR47 FCC Part 24    *RSS-132 Issue 3<br>*CFR47 FCC Part 27    *RSS-133 Issue 6<br>*RSS-139 Issue 3                 |                                                            |                                           |                                    |
| <b>Wareneingangsdatum:</b><br><i>Date of sample receipt:</i>                                                                                                                                                                                                                                                                                                                                                                                               | 2021-10-25                                                                                                                                                                                                                         | Refer to photos documents                                  |                                           |                                    |
| <b>Prüfmuster-Nr.:</b><br><i>Test sample no.:</i>                                                                                                                                                                                                                                                                                                                                                                                                          | A003147238                                                                                                                                                                                                                         |                                                            |                                           |                                    |
| <b>Prüfzeitraum:</b><br><i>Testing period:</i>                                                                                                                                                                                                                                                                                                                                                                                                             | 2021-10-26 – 2021-11-08                                                                                                                                                                                                            |                                                            |                                           |                                    |
| <b>Ort der Prüfung:</b><br><i>Place of testing:</i>                                                                                                                                                                                                                                                                                                                                                                                                        | TÜV Rheinland (Shenzhen) Co., Ltd.                                                                                                                                                                                                 |                                                            |                                           |                                    |
| <b>Prüflaboratorium:</b><br><i>Testing laboratory:</i>                                                                                                                                                                                                                                                                                                                                                                                                     | TÜV Rheinland (Shenzhen) Co., Ltd.                                                                                                                                                                                                 |                                                            |                                           |                                    |
| <b>Prüfergebnis*:</b><br><i>Test result*:</i>                                                                                                                                                                                                                                                                                                                                                                                                              | Pass                                                                                                                                                                                                                               |                                                            |                                           |                                    |
| <b>geprüft von:</b><br><i>tested by:</i>                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>genehmigt von:</b><br><i>authorized by:</i>                                                                                                                                                                                     |                                                            |                                           |                                    |
| <b>Datum:</b><br><i>Date:</i> 2023-05-09                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Ausstellungsdatum:</b><br><i>Issue date:</i> 2023-05-10                                                                                                                                                                         |                                                            |                                           |                                    |
| <b>Stellung / Position</b>                                                                                                                                                                                                                                                                                                                                                                                                                                 | Project Manager                                                                                                                                                                                                                    | <b>Stellung / Position</b>                                 | Reviewer                                  |                                    |
| <b>Sonstiges / Other:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                  | * The LTE module, Wi-Fi module and BLE module are combination in a new host, the co-located radiated spurious emission is arrange re-assessment.<br>* * This product contains transmitter module, refer to clause 3.1 for details. |                                                            |                                           |                                    |
| <b>Zustand des Prüfgegenstandes bei Anlieferung:</b><br><i>Condition of the test item at delivery:</i>                                                                                                                                                                                                                                                                                                                                                     | Prüfmuster vollständig und unbeschädigt<br><i>Test item complete and undamaged</i>                                                                                                                                                 |                                                            |                                           |                                    |
| <b>* Legende:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1 = sehr gut<br>P(ass) = entspricht o.g. Prüfgrundlage(n)                                                                                                                                                                          | 2 = gut<br>F(ail) = entspricht nicht o.g. Prüfgrundlage(n) | 3 = befriedigend<br>N/A = nicht anwendbar | 4 = ausreichend<br>N/T = nicht     |
| <b>* Legend:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1 = very good<br>P(ass) = passed a.m. test specification(s)                                                                                                                                                                        | 2 = good<br>F(ail) = failed a.m. test specification(s)     | 3 = satisfactory<br>N/A = not applicable  | 4 = sufficient<br>N/T = not tested |
| <b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b><br><i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i> |                                                                                                                                                                                                                                    |                                                            |                                           |                                    |

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## ***Test Summary***

***5.1 Co-Located Radiated Spurious Emissions***

***RESULT:*** Pass

***5.2 Conducted emissions***

***RESULT:*** Pass

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# 1 General Remarks

## 1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:  
None.

# 2 Test Sites

## 2.1 Test Facilities

**TÜV Rheinland (Shenzhen) Co., Ltd.**

No.362, Huanguan Middle Road, Songyuansha Community, Guanhu Subdistrict, Longhua District, Shenzhen, Guangdong, China/518110

FCC Registration No.: 694916

IC Registration No.: 25069, CAB identifier: CN0078

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## 2.2 List of Test and Measurement Instruments

**Table 1: List of Test and Measurement Equipment**

| Unwanted Emission Testing (TS9975)           |              |                      |              |            |
|----------------------------------------------|--------------|----------------------|--------------|------------|
| Equipment                                    | Manufacturer | Model                | Serial No.   | Cal. until |
| EMI Test Receiver                            | R&S          | ESR 7                | 102021       | 2024-08-02 |
| Signal Analyzer                              | R&S          | FSV 40               | 101439       | 2024-08-01 |
| System Controller Interface                  | R&S          | SCI-100              | S10010038    | N/A        |
| Filterbank                                   | R&S          | Wlan                 | 100759       | 2024-08-01 |
| OSP                                          | R&S          | OSP 120              | 102040       | N/A        |
| Pre-amplifier                                | R&S          | SCU08F1              | 08320031     | 2024-08-02 |
| Amplifier                                    | R&S          | SCU-18F              | 180070       | 2024-08-02 |
| Amplifier                                    | R&S          | SCU40A               | 100475       | 2024-08-02 |
| Trilog Broadband Antenna<br>(30 MHz - 7 GHz) | Schwarzbeck  | VULB 9162            | 193          | 2024-08-06 |
| Double-Ridged Antenna (1 -18<br>GHz)         | ETS-LINDGREN | 3117                 | 00218717     | 2024-08-06 |
| Wideband Ridged Horn Antenna<br>(18-40 GHz)  | Steatite     | QMS-00880            | 19067        | 2024-08-27 |
| Active Loop Antenna                          | Schwarzbeck  | FMZB 1513            | 302          | 2024-08-06 |
| Test software                                | R&S          | EMC32<br>(V10.60.10) | N/A          | N/A        |
| Control PC                                   | Dell         | OptiPlex 7050        | 36NV9P2      | N/A        |
| 3m Semi-Anechoic Chamber                     | Albatross    | SAC-3m               | APC17151-SAC | 2024-06-22 |

| Conducted Emissions testing           |              |                     |            |            |
|---------------------------------------|--------------|---------------------|------------|------------|
| Equipment                             | Manufacturer | Model No.           | Serial No. | Cal. Until |
| EMI Test Receiver                     | R&S          | ESR3                | 102428     | 2023-07-31 |
| Artificial Mains<br>Network           | R&S          | ENV216              | 102333     | 2023-08-01 |
| Impedance<br>Stabilisation<br>Network | R&S          | ENY81               | 100323     | 2023-08-01 |
| EMC32 test<br>software                | R&S          | EMC32(Ver.10.50.00) | N/A        | N/A        |

## 2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

## 2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

## 2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table

| Test                          | Parameters                            | uncertainty                    |
|-------------------------------|---------------------------------------|--------------------------------|
| Conducted Emission            | Conducted emission 150kHz-30MHz (AMN) | $\pm 3.70$ dB<br>$\pm 3.30$ dB |
| Radiated Emission<br>(3m SAC) | Radiated emission 30MHz-1GHz          | $\pm 4.52$ dB                  |
|                               | Radiated emission 1GHz-18GHz          | $\pm 4.37$ dB                  |

## 2.6 Location of Original Data

The original copies of all test data taken during actual testing were at this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) file for certification follow-up purposes.

## 2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. Test facility located at No. 362 Huanguan Road Middle, Longhua District, Shenzhen 518110, People's Republic of China. is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

## 3 General Product Information

### 3.1 Product Function and Intended Use

The EUT is a WisGate Edge Pro, which supports 2.4GHz Wi-Fi, Lora, GNSS and LTE functions.

Note: This product contains transmitter modules.

|                             |                                  |
|-----------------------------|----------------------------------|
| LTE module<br>Model: EG95NA | Contains FCC ID: XMR201807EG95NA |
| 2.4GHz Wi-Fi module         | Contains FCC ID: WMUHAC-WF       |
| Lora module                 | Contains FCC ID: WMUHAC-MLWR     |

Note: The test standard for frequency Bands 698-756 MHz and 777-787 MHz in LTE module test report is RSS-130 issue 1 and the essential requirements remain unchanged in the updated version RSS-130 issue 2, hence it has been updated in current test report without additional test.

For details refer to the User Manual, Technical Description and Circuit Diagram.

### 3.2 Ratings and System Details

Table 2: Technical Specification of EUT

| General Information of EUT | Value                                                                                       |
|----------------------------|---------------------------------------------------------------------------------------------|
| Kind of Equipment          | LoRaWAN Gateway                                                                             |
| Type Designation           | HAC-GWW1-M                                                                                  |
| Trade Mark                 | HAC                                                                                         |
| Input Voltage              | DC 12V via DC source or<br>DC 37 ~57V via POE adapter                                       |
| Testing Voltage            | AC 120V, 60Hz or DC 12V                                                                     |
| POE Adapter information    | Model:R012-4800500<br>Input: AC 100-240V, 50/60Hz, 0.6A Max<br>Output: DC 48.0V, 0.5A 24.0W |

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**Technical Specification of Wi-Fi**

|                     |                                                                                                  |
|---------------------|--------------------------------------------------------------------------------------------------|
| Operating Frequency | 2412 - 2462 MHz for 802.11b/g/n(HT20)<br>2422 - 2452 MHz for 802.11n(HT40)                       |
| Type of Modulation  | DSSS(DBPSK/DQPSK/CCK)<br>OFDM(BPSK/QPSK/16QAM/64QAM)                                             |
| Data Rate           | 1/2/5.5/11 Mbps for 802.11b<br>6/9/12/18/24/36/48/54 Mbps for 802.11g<br>MCS0 ~ MCS7 for 802.11n |
| Channel Number      | 11 channels for 802.11b/g/n(HT20)<br>7 channels for 802.11n(HT40)                                |
| Channel Separation  | 5 MHz                                                                                            |
| Number of Antenna:  | 2                                                                                                |
| Antenna Gain:       | 5.4dBi for Ant0<br>5.0dBi for Ant1                                                               |

**Technical Specification of Lora DTS**

|                     |                                                |
|---------------------|------------------------------------------------|
| Operating Frequency | 923.3 - 927.5MHz                               |
| Type of Modulation  | Lora                                           |
| Data Rate           | SF7 – SF12 / DR8 – DR13                        |
| Channel Number      | 8 channels                                     |
| Channel Separation  | 600 KHz                                        |
| Occupied Bandwidth  | 500 KHz                                        |
| Antenna Gain:       | 5.0dBi or 5.8dBi or 8dBi (Fiber Glass Antenna) |

**Technical Specification of Lora Hybrid**

|                    |                                                |
|--------------------|------------------------------------------------|
| Frequency Range    | 903.9MHz - 905.3MHz                            |
| Type of Modulation | Lora                                           |
| Data Rate          | SF7 – SF10 / DR0 –DR3                          |
| Channel Number     | 8 channels                                     |
| Channel Separation | 200 KHz                                        |
| Occupied Bandwidth | 125 KHz                                        |
| Antenna Gain:      | 5.0dBi or 5.8dBi or 8dBi (Fiber Glass Antenna) |

**Technical Specification of LTE**

|                             |                                                    |
|-----------------------------|----------------------------------------------------|
| Wireless Technology:        | LTE & WCDMA                                        |
| Operation Frequency band(s) | WCDMA Band: II, IV, V<br>LTE Band: 2, 4, 5, 12, 13 |
| Power Class:                | Class 4                                            |
| Type of Modulation:         | BPSK, QPSK                                         |
| Type of Antenna:            | Internal Antenna                                   |
| Antenna number:             | 2                                                  |
| Antenna Gain:               | 4.0dBi                                             |



### 3.3 Independent Operation Modes

The basic operation modes are:

A, On, WIFI link + LTE link + Lora link + GNSS link

### 3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

### 3.5 Submitted Documents

- |                 |                  |
|-----------------|------------------|
| - Block Diagram | - Photo Document |
| - Schematics    | - User Manual    |

## 4 Test Set-up and Operation Modes

### 4.1 Principle of Configuration Selection

**Radio Spectrum:** The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

**Emission:** The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

### 4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All tests were performed according to the procedures in ANSI C63.10 and ANSI C63.26.

### 4.3 Special Accessories and Auxiliary Equipment

Table 3: List of Accessories and Auxiliary Equipment

| Description                         | Manufacturer    | Model No.     | Serial Number |
|-------------------------------------|-----------------|---------------|---------------|
| Wideband Radio Communication Tester | Rohde & Schwarz | CMW500        | 166305        |
| Portable Laptop                     | Lenovo          | ThinkPad T480 | 10Q67059      |

### 4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

## 4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

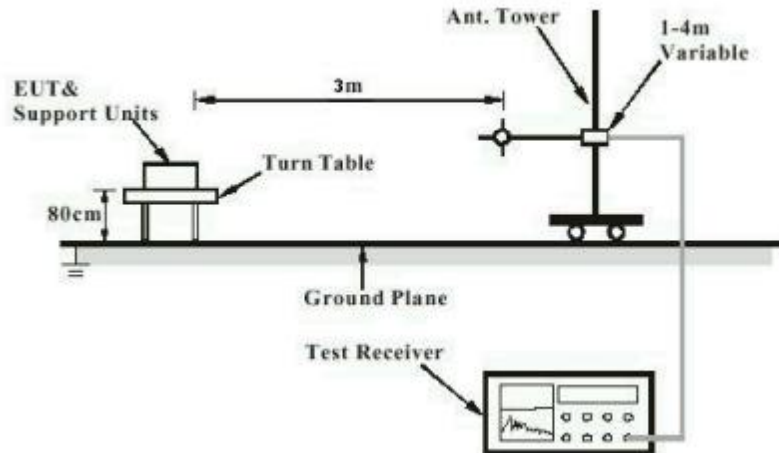


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

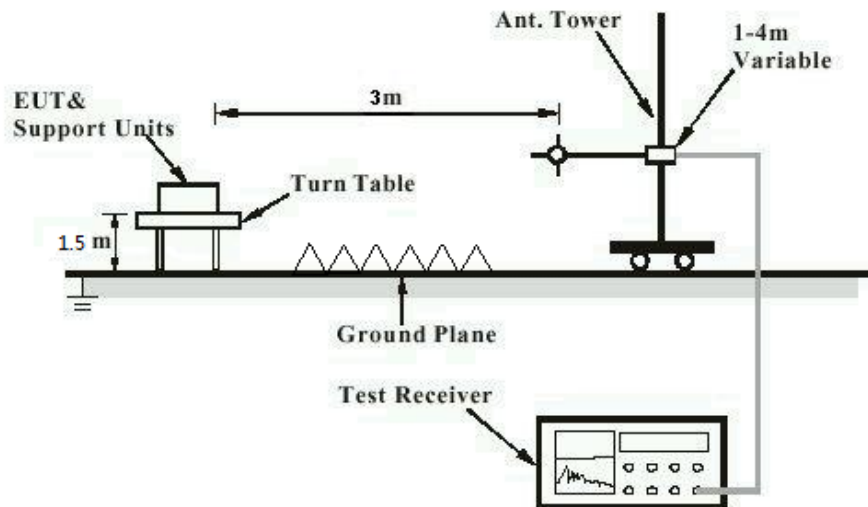
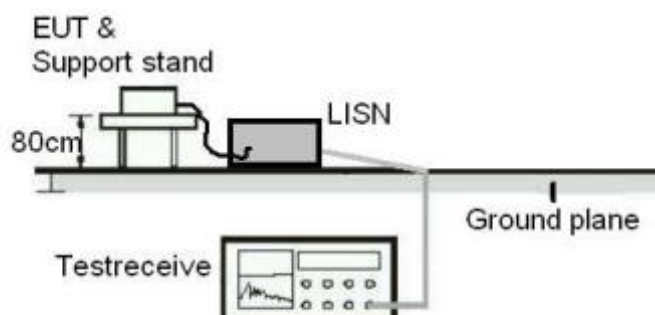


Diagram of Measurement Configuration for Mains Conduction Measurement



## 5 Test Results

### 5.1 Co-Located Radiated Spurious Emissions

**RESULT:**

**Pass**

#### Test Specification

|                   |   |                                             |
|-------------------|---|---------------------------------------------|
| Test standard     | : | CFR47 FCC Part 15: Subpart C Section 15.247 |
|                   |   | CFR47 FCC Part 22                           |
|                   | : | CFR47 FCC Part 24                           |
|                   |   | CFR47 FCC Part 27                           |
|                   |   | RSS-247 Issue 2                             |
|                   |   | RSS-130 Issue 2                             |
|                   |   | RSS-132 Issue 3                             |
|                   |   | RSS-133 Issue 6                             |
|                   |   | RSS-139 Issue 3                             |
| Basic standard    | : | ANSI C63.10 & ANSI C63.26                   |
| Limit             | : | KDB 996369 D04                              |
|                   |   | The emissions not exceed the highest limit. |
| Kind of test site | : | 3m Semi-anechoic Chamber                    |

#### Test Setup

|                      |   |               |
|----------------------|---|---------------|
| Date of testing      | : | 2021-11-08    |
| Input voltage        | : | AC 120V, 60Hz |
| Operation mode       | : | A             |
| Earthing             | : | Connected     |
| Ambient temperature  | : | 24. °C        |
| Relative humidity    | : | 50 %          |
| Atmospheric pressure | : | 101 kPa       |

Note: The test plots of Co-located radiated spurious emissions beyond the limit are the fundamental radio frequency of Lora, Wi-Fi and LTE.

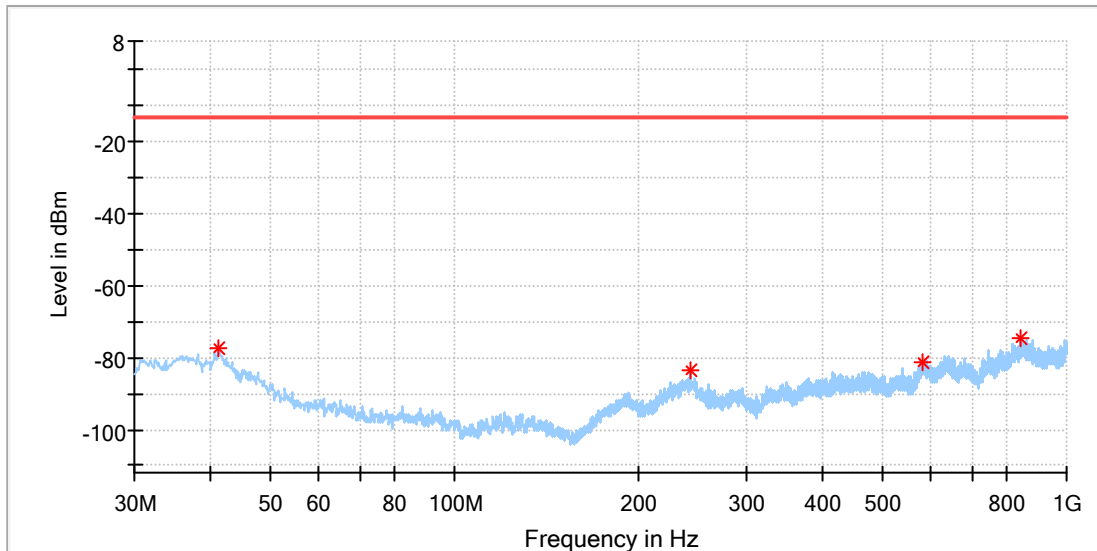
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## Lora 5dBi

### EUT Information

|                     |                                                    |
|---------------------|----------------------------------------------------|
| EUT Name:           | LoRaWAN Gateway                                    |
| Model:              | HAC-GWW1-M                                         |
| Test Mode:          | WIFI 2.4G_11b + Lora DTS 500K + LTE Band 5_QPSK10M |
| Order No/Sample No: | 168339882/A003147238-003                           |
| Test Voltage::      | 120V/60Hz                                          |
| Remark:             | Temp 24 Humi:50%                                   |
| Test Standard:      | FCC Part 22                                        |
| Tested By:          | Kei Zhang                                          |
| Reviewed By:        | Terry Yin                                          |



### Critical\_Freqs

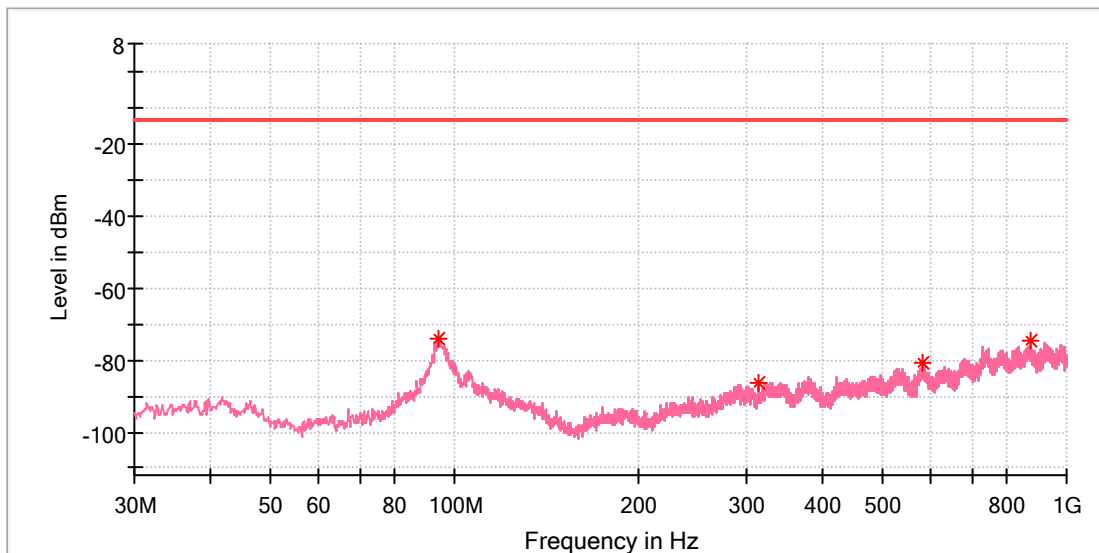
| Frequency (MHz) | MaxPeak (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|---------------|-------------|-------------|-------------|-----|---------------|------------|
| 41.033750       | -77.56        | -13.00      | 64.56       | 100.0       | H   | 74.0          | -112.5     |
| 243.400000      | -83.59        | -13.00      | 70.59       | 100.0       | H   | 91.0          | -109.9     |
| 582.415000      | -81.17        | -13.00      | 68.17       | 100.0       | H   | 237.0         | -106.0     |
| 839.101250      | -74.52        | -13.00      | 61.52       | 100.0       | H   | 129.0         | -100.7     |

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## EUT Information

|                     |                                                    |
|---------------------|----------------------------------------------------|
| EUT Name:           | LoRaWAN Gateway                                    |
| Model:              | HAC-GWW1-M                                         |
| Test Mode:          | WIFI 2.4G_11b + Lora DTS 500K + LTE Band 5_QPSK10M |
| Order No/Sample No: | 168339882/A003147238-003                           |
| Test Voltage::      | 120V/60Hz                                          |
| Remark:             | Temp 24 Humi:50%                                   |
| Test Standard:      | FCC Part 22                                        |
| Tested By:          | Kei Zhang                                          |
| Reviewed By:        | Terry Yin                                          |



## Critical Freqs

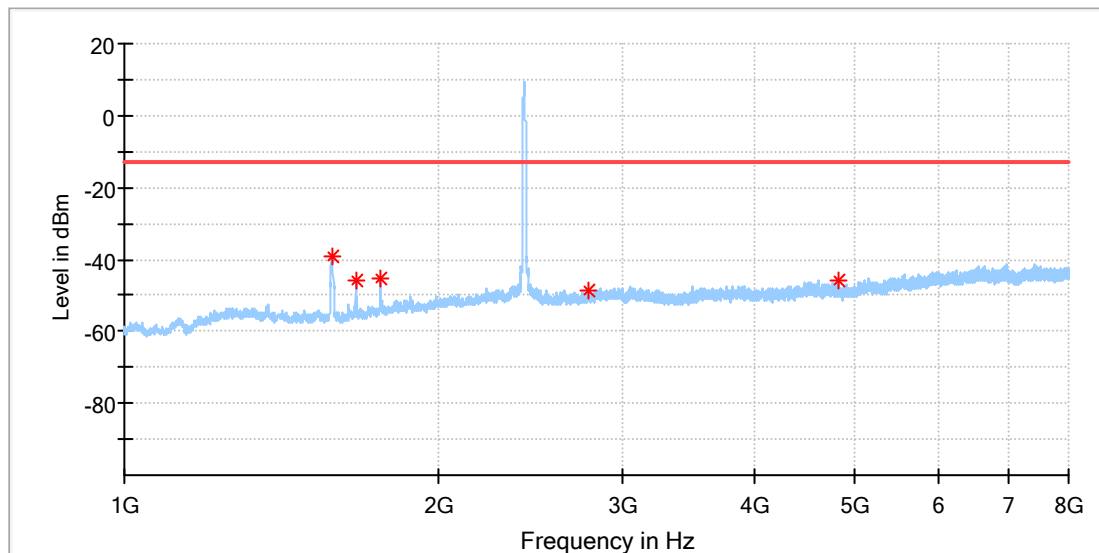
| Frequency (MHz) | MaxPeak (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|---------------|-------------|-------------|-------------|-----|---------------|------------|
| 94.262500       | -74.08        | -13.00      | 61.08       | 100.0       | V   | 4.0           | -99.7      |
| 314.816250      | -86.56        | -13.00      | 73.56       | 100.0       | V   | 136.0         | -111.4     |
| 581.445000      | -80.81        | -13.00      | 67.81       | 100.0       | V   | 26.0          | -106.4     |
| 874.506250      | -74.88        | -13.00      | 61.88       | 100.0       | V   | 288.0         | -100.8     |

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*Test report no.*

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## EUT Information

|                     |                                                    |
|---------------------|----------------------------------------------------|
| EUT Name:           | LoRaWAN Gateway                                    |
| Model:              | HAC-GWW1-M                                         |
| Test Mode:          | WIFI 2.4G_11b + Lora DTS 500K + LTE Band 5_QPSK10M |
| Order No/Sample No: | 168339882/A003147238-003                           |
| Test Voltage::      | 120V/60Hz                                          |
| Remark:             | Temp 24 Humi:50%                                   |
| Test Standard:      | FCC Part 22                                        |
| Tested By:          | Kei Zhang                                          |
| Reviewed By:        | Terry Yin                                          |



## Critical\_Freqs

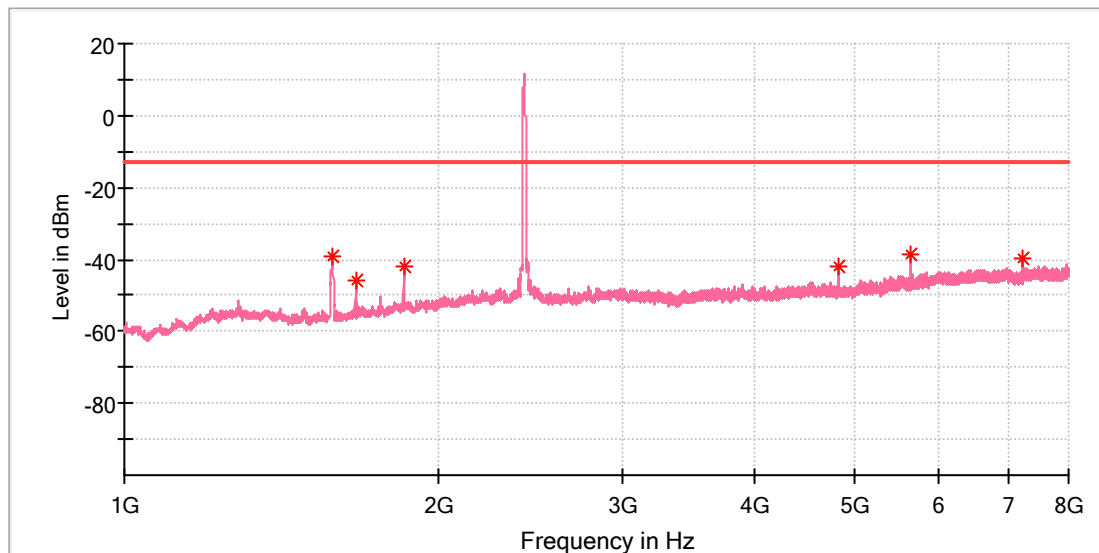
| Frequency (MHz) | MaxPeak (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|---------------|-------------|-------------|-------------|-----|---------------|------------|
| 1581.500000     | -38.96        | -13.00      | 25.96       | 150.0       | H   | 218.0         | -92.9      |
| 1664.000000     | -45.63        | -13.00      | 32.63       | 150.0       | H   | 114.0         | -92.7      |
| 1757.000000     | -45.45        | -13.00      | 32.45       | 150.0       | H   | 99.0          | -90.8      |
| 2776.000000     | -48.86        | -13.00      | 35.86       | 150.0       | H   | 24.0          | -87.6      |
| 4824.000000     | -45.89        | -13.00      | 32.89       | 150.0       | H   | 124.0         | -85.9      |

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## EUT Information

EUT Name: LoRaWAN Gateway  
Model: HAC-GWW1-M  
Test Mode: WIFI 2.4G\_11b + Lora DTS 500K + LTE Band 5\_QPSK10M  
Order No/Sample No: 168339882/A003147238-003  
Test Voltage:: 120V/60Hz  
Remark: Temp 24 Humi:50%  
Test Standard: FCC Part 22  
Tested By: Kei Zhang  
Reviewed By: Terry Yin



## Critical Freqs

| Frequency (MHz) | MaxPeak (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|---------------|-------------|-------------|-------------|-----|---------------|------------|
| 1581.000000     | -39.30        | -13.00      | 26.30       | 150.0       | V   | 170.0         | -93.0      |
| 1664.500000     | -45.74        | -13.00      | 32.74       | 150.0       | V   | 147.0         | -92.2      |
| 1850.000000     | -42.06        | -13.00      | 29.06       | 150.0       | V   | 206.0         | -90.2      |
| 4824.000000     | -41.88        | -13.00      | 28.88       | 150.0       | V   | 151.0         | -85.9      |
| 5656.000000     | -38.38        | -13.00      | 25.38       | 150.0       | V   | 170.0         | -83.8      |
| 7234.500000     | -39.86        | -13.00      | 26.86       | 150.0       | V   | 170.0         | -79.8      |

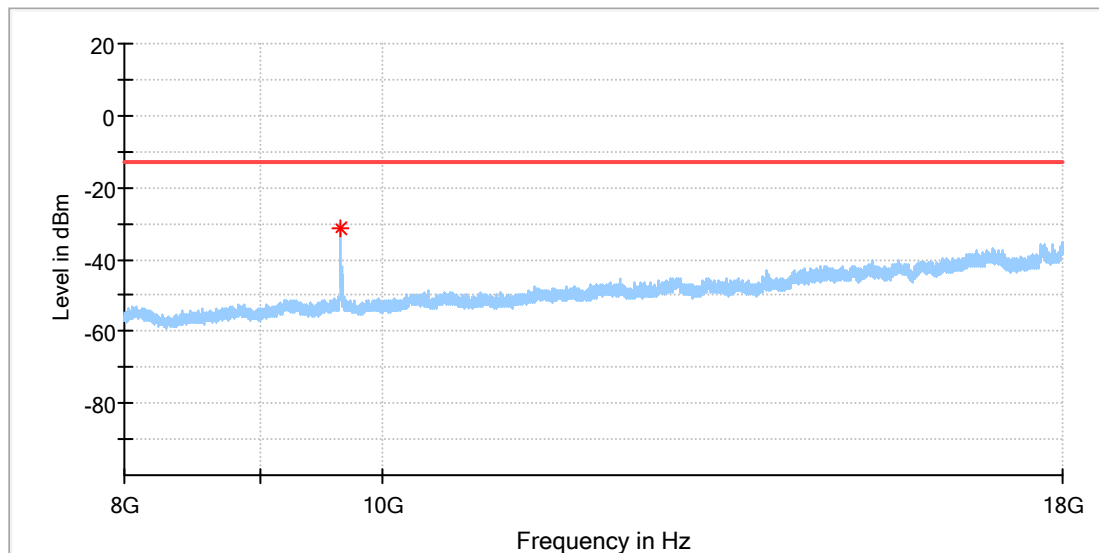


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## EUT Information

|                     |                                                    |
|---------------------|----------------------------------------------------|
| EUT Name:           | LoRaWAN Gateway                                    |
| Model:              | HAC-GWW1-M                                         |
| Test Mode:          | WIFI 2.4G_11b + Lora DTS 500K + LTE Band 5_QPSK10M |
| Order No/Sample No: | 168339882/A003147238-003                           |
| Test Voltage::      | 120V/60Hz                                          |
| Remark:             | Temp 24 Humi:50%                                   |
| Test Standard:      | FCC Part 22                                        |
| Tested By:          | Kei Zhang                                          |
| Reviewed By:        | Terry Yin                                          |



## Critical\_Freqs

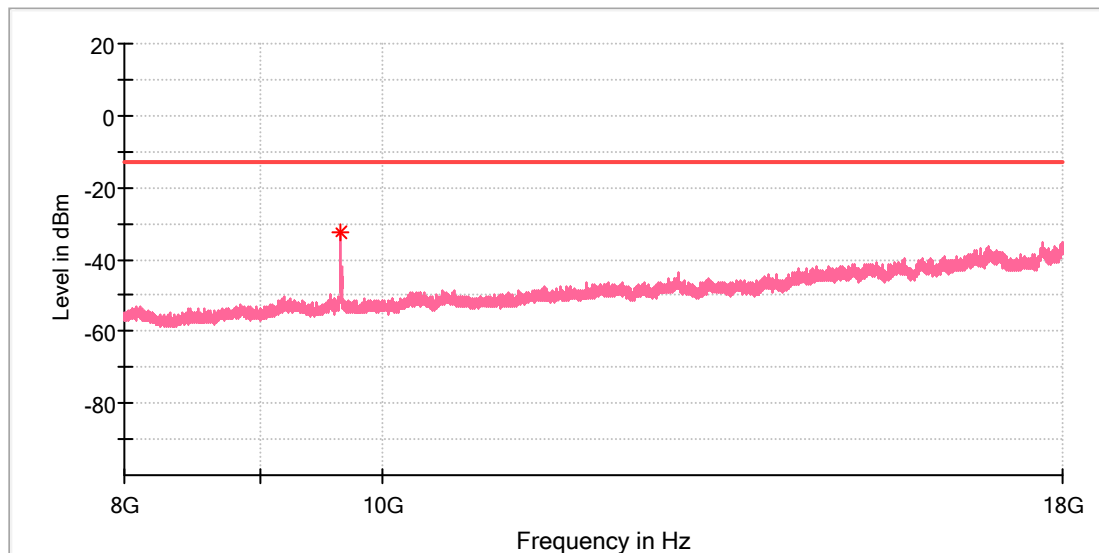
| Frequency (MHz) | MaxPeak (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|---------------|-------------|-------------|-------------|-----|---------------|------------|
| 9648.000000     | -31.60        | -13.00      | 18.60       | 150.0       | H   | 229.0         | -83.3      |

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## EUT Information

EUT Name: LoRaWAN Gateway  
Model: HAC-GWW1-M  
Test Mode: WIFI 2.4G\_11b + Lora DTS 500K + LTE Band 5\_QPSK10M  
Order No/Sample No: 168339882/A003147238-003  
Test Voltage:: 120V/60Hz  
Remark: Temp 24 Humi:50%  
Test Standard: FCC Part 22  
Tested By: Kei Zhang  
Reviewed By: Terry Yin



## Critical\_Freqs

| Frequency (MHz) | MaxPeak (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|---------------|-------------|-------------|-------------|-----|---------------|------------|
| 9648.000000     | -32.42        | -13.00      | 19.42       | 150.0       | V   | 214.0         | -83.5      |

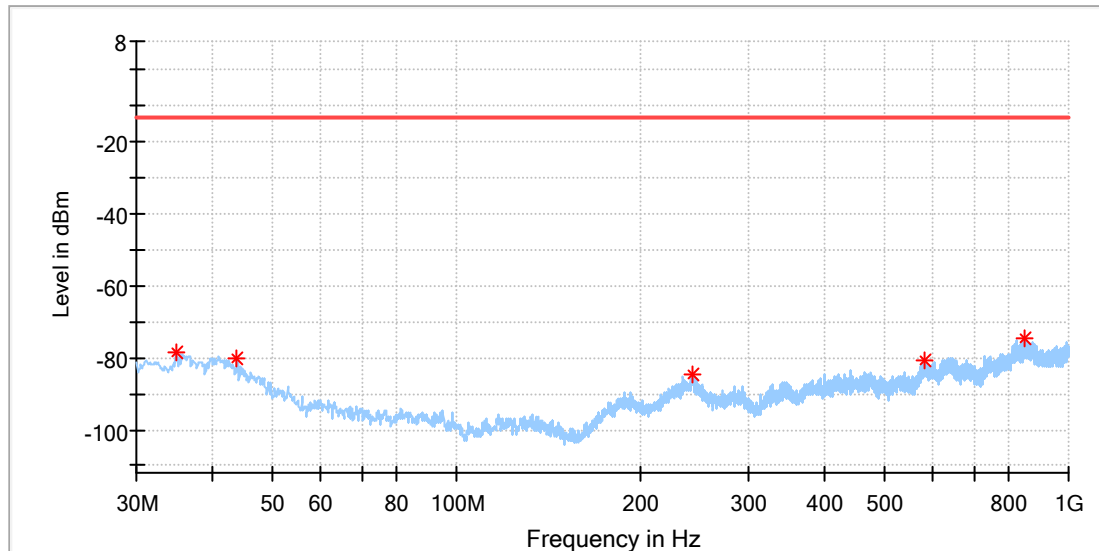
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## Lora 8dBi

### EUT Information

|                     |                                                    |
|---------------------|----------------------------------------------------|
| EUT Name:           | LoRaWAN Gateway                                    |
| Model:              | HAC-GWW1-M                                         |
| Test Mode:          | WIFI 2.4G_11b + Lora DTS 500K + LTE Band 5_QPSK10M |
| Order No/Sample No: | 168339882/A003147238-003                           |
| Test Voltage::      | 120V/60Hz                                          |
| Remark:             | Temp 24 Humi:50%                                   |
| Test Standard:      | FCC Part 22                                        |
| Tested By:          | Kei Zhang                                          |
| Reviewed By:        | Terry Yin                                          |



### Critical Freqs

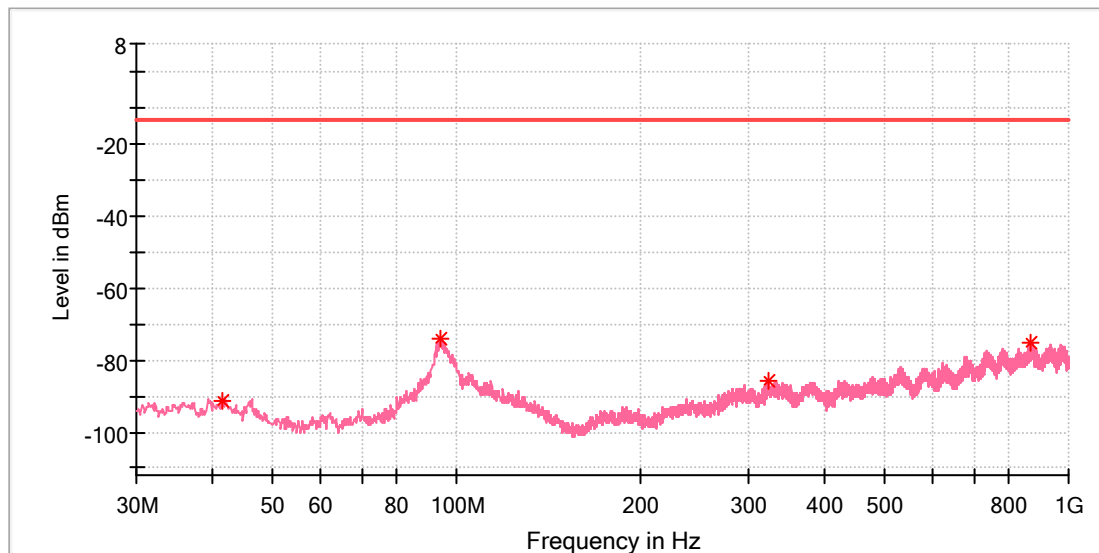
| Frequency (MHz) | MaxPeak (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|---------------|-------------|-------------|-------------|-----|---------------|------------|
| 34.971250       | -78.37        | -13.00      | 65.37       | 100.0       | H   | 334.0         | -115.0     |
| 43.822500       | -79.99        | -13.00      | 66.99       | 100.0       | H   | 83.0          | -114.3     |
| 242.793750      | -84.82        | -13.00      | 71.82       | 100.0       | H   | 17.0          | -109.9     |
| 580.111250      | -80.50        | -13.00      | 67.50       | 100.0       | H   | 0.0           | -106.1     |
| 847.346250      | -74.66        | -13.00      | 61.66       | 100.0       | H   | 0.0           | -99.4      |

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## EUT Information

|                     |                                                    |
|---------------------|----------------------------------------------------|
| EUT Name:           | LoRaWAN Gateway                                    |
| Model:              | HAC-GWW1-M                                         |
| Test Mode:          | WIFI 2.4G_11b + Lora DTS 500K + LTE Band 5_QPSK10M |
| Order No/Sample No: | 168339882/A003147238-003                           |
| Test Voltage::      | 120V/60Hz                                          |
| Remark:             | Temp 24 Humi:50%                                   |
| Test Standard:      | FCC Part 22                                        |
| Tested By:          | Kei Zhang                                          |
| Reviewed By:        | Terry Yin                                          |



## Critical\_Freqs

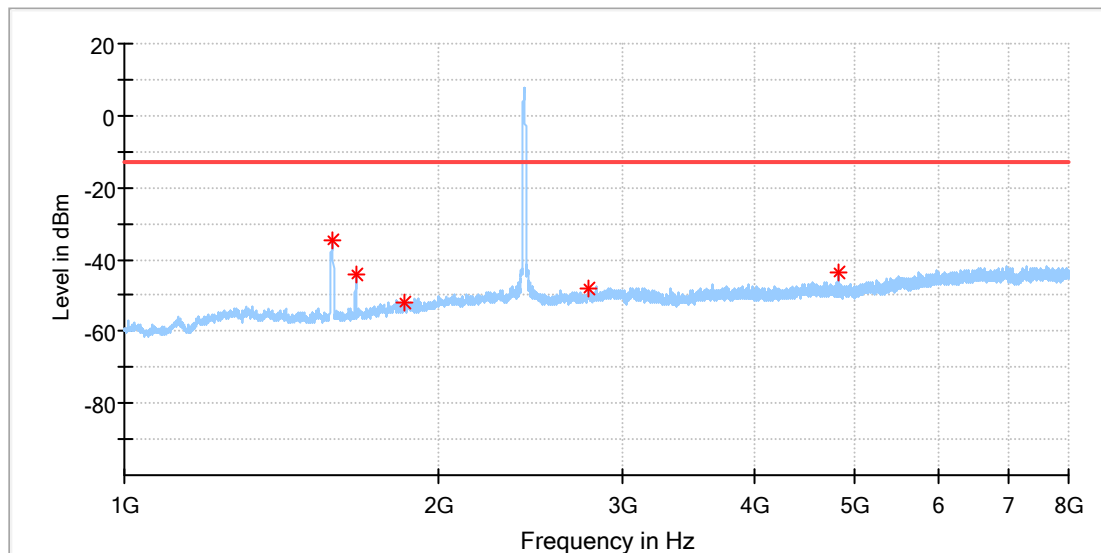
| Frequency (MHz) | MaxPeak (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|---------------|-------------|-------------|-------------|-----|---------------|------------|
| 41.518750       | -91.10        | -13.00      | 78.10       | 100.0       | V   | 192.0         | -123.4     |
| 94.141250       | -74.02        | -13.00      | 61.02       | 100.0       | V   | 89.0          | -99.8      |
| 323.303750      | -86.04        | -13.00      | 73.04       | 100.0       | V   | 42.0          | -112.0     |
| 864.442500      | -75.05        | -13.00      | 62.05       | 100.0       | V   | 331.0         | -99.6      |

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Test report no.

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## EUT Information

|                     |                                                    |
|---------------------|----------------------------------------------------|
| EUT Name:           | LoRaWAN Gateway                                    |
| Model:              | HAC-GWW1-M                                         |
| Test Mode:          | WIFI 2.4G_11b + Lora DTS 500K + LTE Band 5_QPSK10M |
| Order No/Sample No: | 168339882/A003147238-003                           |
| Test Voltage::      | 120V/60Hz                                          |
| Remark:             | Temp 24 Humi:50%                                   |
| Test Standard:      | FCC Part 22                                        |
| Tested By:          | Kei Zhang                                          |
| Reviewed By:        | Terry Yin                                          |



## Critical Freqs

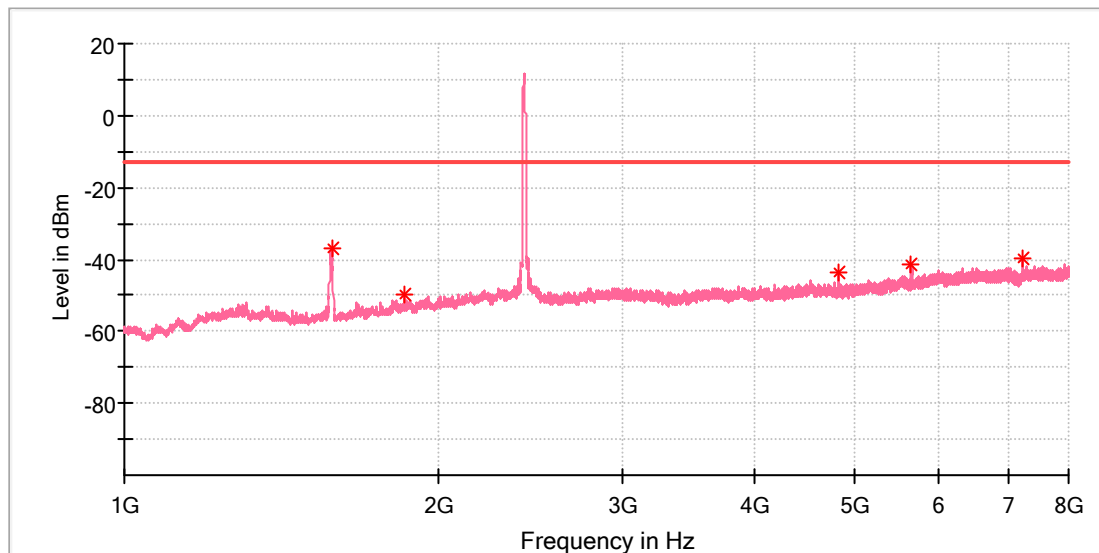
| Frequency (MHz) | MaxPeak (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|---------------|-------------|-------------|-------------|-----|---------------|------------|
| 1581.000000     | -34.66        | -13.00      | 21.66       | 150.0       | H   | 214.0         | -93.0      |
| 1664.500000     | -44.10        | -13.00      | 31.10       | 150.0       | H   | 93.0          | -92.7      |
| 1850.500000     | -51.82        | -13.00      | 38.82       | 150.0       | H   | 301.0         | -90.5      |
| 2773.500000     | -48.22        | -13.00      | 35.22       | 150.0       | H   | 279.0         | -87.6      |
| 4824.000000     | -43.43        | -13.00      | 30.43       | 150.0       | H   | 115.0         | -85.9      |

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Test report no.

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## EUT Information

|                     |                                                    |
|---------------------|----------------------------------------------------|
| EUT Name:           | LoRaWAN Gateway                                    |
| Model:              | HAC-GWW1-M                                         |
| Test Mode:          | WIFI 2.4G_11b + Lora DTS 500K + LTE Band 5_QPSK10M |
| Order No/Sample No: | 168339882/A003147238-003                           |
| Test Voltage::      | 120V/60Hz                                          |
| Remark:             | Temp 24 Humi:50%                                   |
| Test Standard:      | FCC Part 22                                        |
| Tested By:          | Kei Zhang                                          |
| Reviewed By:        | Terry Yin                                          |



## Critical\_Freqs

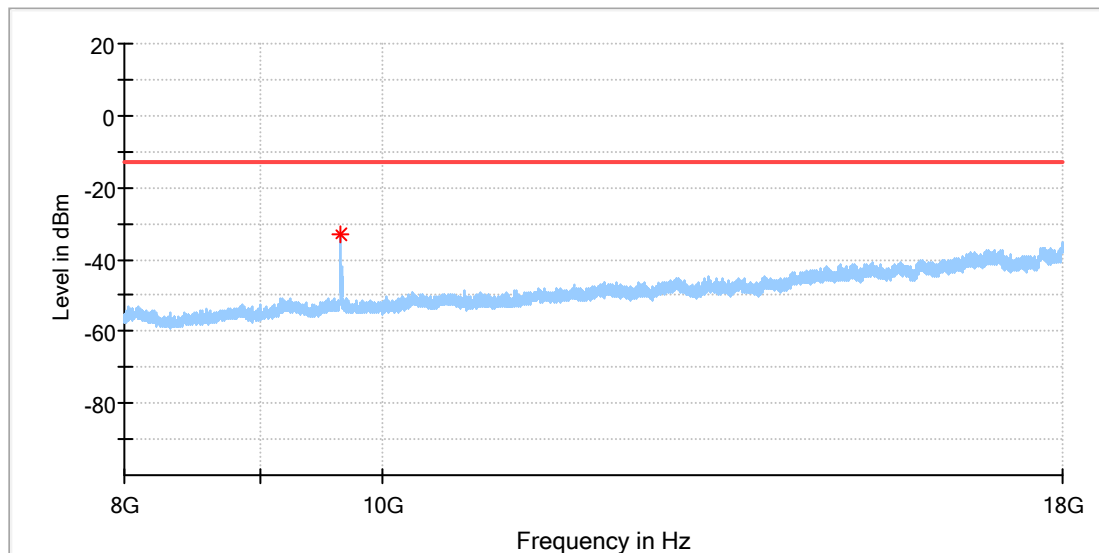
| Frequency (MHz) | MaxPeak (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|---------------|-------------|-------------|-------------|-----|---------------|------------|
| 1578.500000     | -37.01        | -13.00      | 24.01       | 150.0       | V   | 184.0         | -93.0      |
| 1850.500000     | -49.56        | -13.00      | 36.56       | 150.0       | V   | 153.0         | -90.2      |
| 4823.500000     | -43.75        | -13.00      | 30.75       | 150.0       | V   | 186.0         | -85.9      |
| 5658.000000     | -41.67        | -13.00      | 28.67       | 150.0       | V   | 177.0         | -83.8      |
| 7234.500000     | -39.72        | -13.00      | 26.72       | 150.0       | V   | 177.0         | -79.8      |

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## EUT Information

EUT Name: LoRaWAN Gateway  
Model: HAC-GWW1-M  
Test Mode: WIFI 2.4G\_11b + Lora DTS 500K + LTE Band 5\_QPSK10M  
Order No/Sample No: 168339882/A003147238-003  
Test Voltage:: 120V/60Hz  
Remark: Temp 24 Humi:50%  
Test Standard: FCC Part 22  
Tested By: Kei Zhang  
Reviewed By: Terry Yin



## Critical Freqs

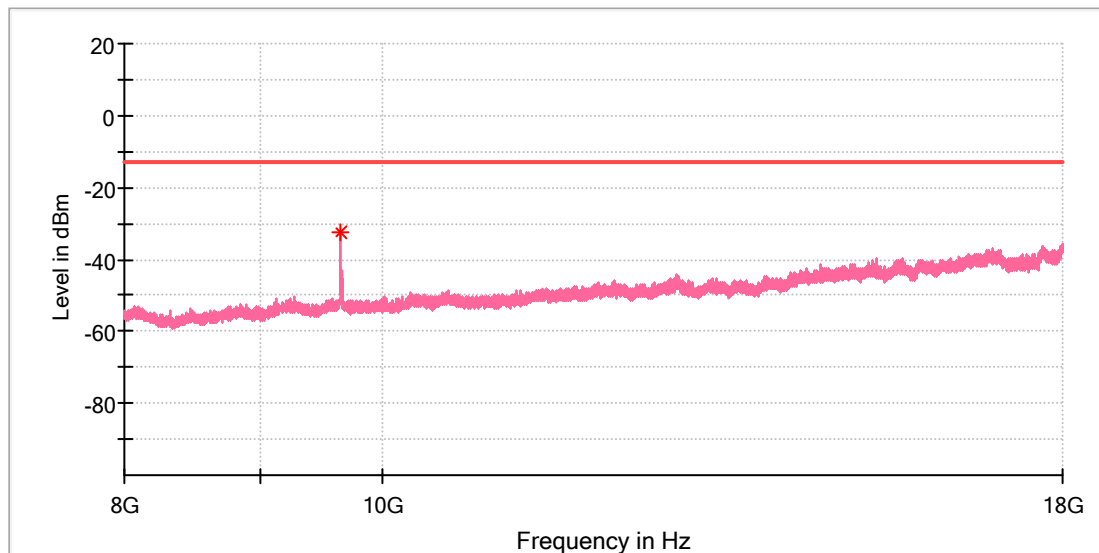
| Frequency (MHz) | MaxPeak (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|---------------|-------------|-------------|-------------|-----|---------------|------------|
| 9648.000000     | -32.81        | -13.00      | 19.81       | 150.0       | H   | 222.0         | -83.3      |

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## EUT Information

EUT Name: LoRaWAN Gateway  
Model: HAC-GWW1-M  
Test Mode: WIFI 2.4G\_11b + Lora DTS 500K + LTE Band 5\_QPSK10M  
Order No/Sample No: 168339882/A003147238-003  
Test Voltage:: 120V/60Hz  
Remark: Temp 24 Humi:50%  
Test Standard: FCC Part 22  
Tested By: Kei Zhang  
Reviewed By: Terry Yin



## Critical Freqs

| Frequency (MHz) | MaxPeak (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|---------------|-------------|-------------|-------------|-----|---------------|------------|
| 9648.000000     | -32.72        | -13.00      | 19.72       | 150.0       | V   | 212.0         | -83.5      |



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## 5.2 Conducted emissions

**RESULT:**

**Pass**

### Test Specification

|                   |                      |
|-------------------|----------------------|
| Test standard     | : FCC Part 15.207(a) |
|                   | : RSS-Gen Clause 8.8 |
| Basic standard    | : ANSI C63.10: 2013  |
| Frequency range   | : 150KHz - 30MHz     |
| Classification    | : Class B            |
| Limit             | : FCC Part 15.207(a) |
|                   | : RSS-Gen Table 4    |
| Kind of test site | : Shielded Room      |

### Test Setup

|                      |                 |
|----------------------|-----------------|
| Date of testing      | : 2021-11-04    |
| Input voltage        | : AC 120V, 60Hz |
| Operation mode       | : B             |
| Earthing             | : Connected     |
| Ambient temperature  | : 24.5 °C       |
| Relative humidity    | : 57 %          |
| Atmospheric pressure | : 101 kPa       |

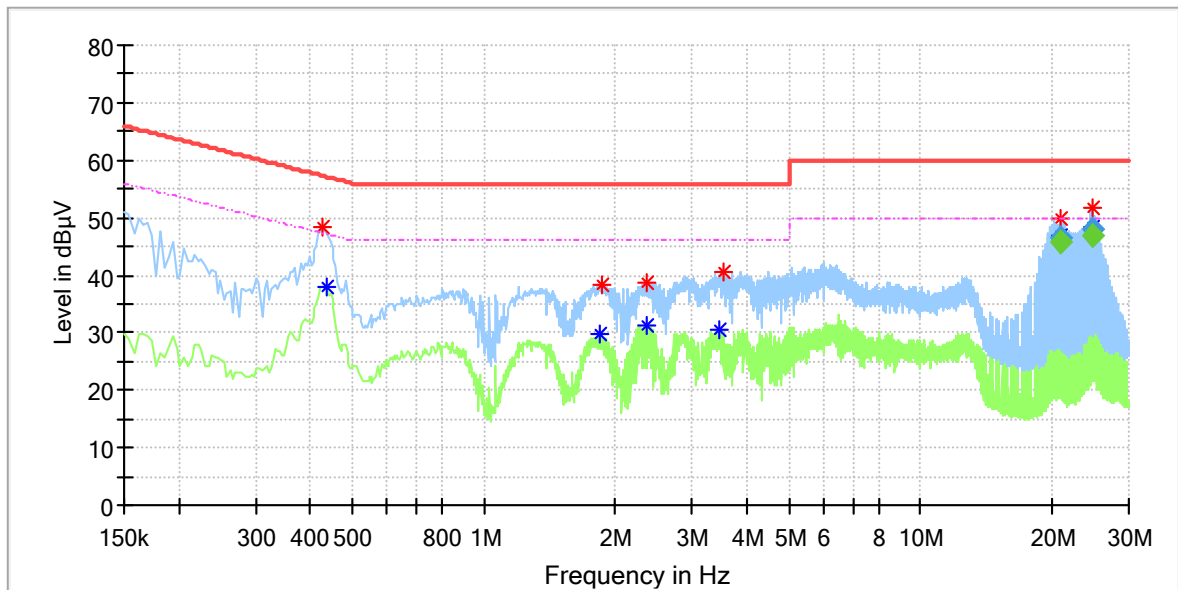
For the measurement records, refer to the following plots, only the worst case mode are shown in this report.

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## EUT Information

EUT Name: LoRaWAN Gateway  
Model: WMUHAC-GWW1-M  
Test Mode: operating  
Test Voltage: AC 120V/60Hz  
Test By: Kevin Zhou  
Review By: Gary Chen  
Remark: SR1



## Critical Freqs

| Frequency (MHz) | MaxPeak (dBµV) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Line | Corr. (dB) |
|-----------------|----------------|----------------|--------------|-------------|------|------------|
| 0.426000        | 48.33          | ---            | 57.33        | 9.00        | L1   | 9.7        |
| 0.438000        | ---            | 37.92          | 47.10        | 9.18        | L1   | 9.7        |
| 1.844000        | ---            | 29.62          | 46.00        | 16.38       | L1   | 9.8        |
| 1.872000        | 38.48          | ---            | 56.00        | 17.52       | L1   | 9.8        |
| 2.360000        | ---            | 31.18          | 46.00        | 14.82       | L1   | 9.8        |
| 2.368000        | 38.87          | ---            | 56.00        | 17.13       | L1   | 9.8        |
| 3.464000        | ---            | 30.66          | 46.00        | 15.34       | L1   | 9.9        |
| 3.532000        | 40.50          | ---            | 56.00        | 15.50       | L1   | 9.9        |
| 21.042500       | 49.90          | ---            | 60.00        | 10.10       | L1   | 10.3       |
| 21.042500       | ---            | 47.01          | 50.00        | 2.99        | L1   | 10.3       |
| 24.822500       | 51.64          | ---            | 60.00        | 8.36        | L1   | 10.4       |
| 24.822500       | ---            | 48.20          | 50.00        | 1.80        | L1   | 10.4       |

## Final Result

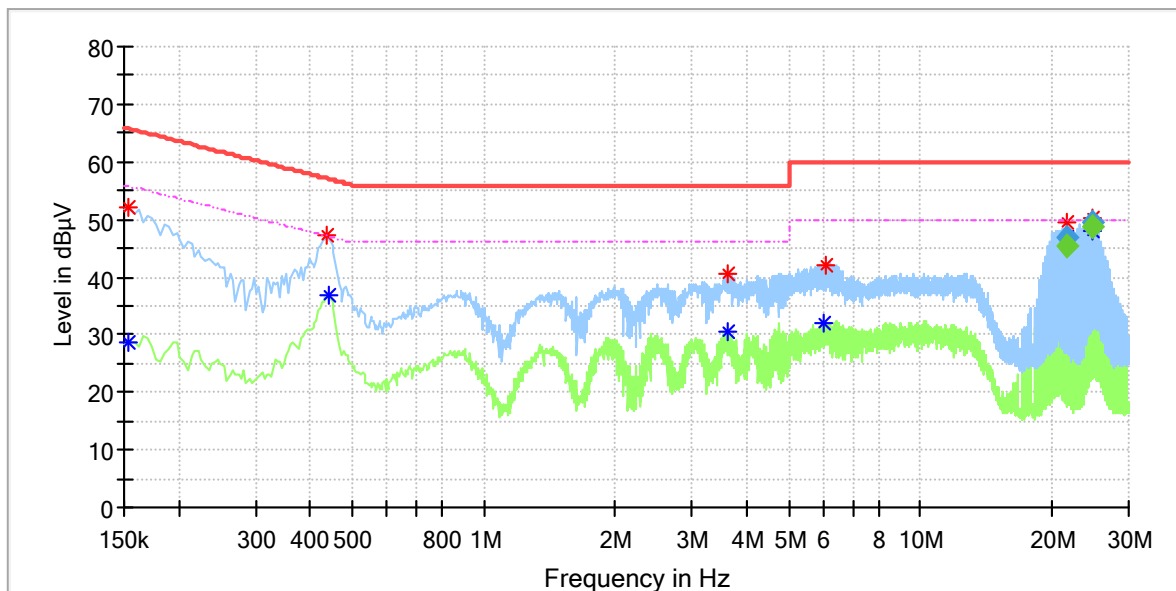
| Frequency (MHz) | QuasiPeak (dBµV) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 21.042500       | 46.35            | ---            | 60.00        | 13.65       | 1000.0          | 9.000           | L1   | 10.3       |
| 21.042500       | ---              | 45.92          | 50.00        | 4.08        | 1000.0          | 9.000           | L1   | 10.3       |
| 24.822500       | ---              | 46.82          | 50.00        | 3.18        | 1000.0          | 9.000           | L1   | 10.4       |
| 24.822500       | 48.05            | ---            | 60.00        | 11.95       | 1000.0          | 9.000           | L1   | 10.4       |

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## EUT Information

EUT Name: LoRaWAN Gateway  
Model: WMUHAC-GWW1-M  
Test Mode: operating  
Test Voltage: AC 120V/60Hz  
Test By: Kevin Zhou  
Review By: Gary Chen  
Remark: SR1



## Critical\_Freqs

| Frequency (MHz) | MaxPeak (dBμV) | Average (dBμV) | Limit (dBμV) | Margin (dB) | Line | Corr. (dB) |
|-----------------|----------------|----------------|--------------|-------------|------|------------|
| 0.154000        | ---            | 28.73          | 55.78        | 27.06       | L1   | 9.6        |
| 0.154000        | 51.94          | ---            | 65.78        | 13.84       | L1   | 9.6        |
| 0.438000        | 47.09          | ---            | 57.10        | 10.01       | L1   | 9.7        |
| 0.442000        | ---            | 36.66          | 47.02        | 10.36       | L1   | 9.7        |
| 3.624000        | ---            | 30.35          | 46.00        | 15.65       | L1   | 9.9        |
| 3.636000        | 40.43          | ---            | 56.00        | 15.57       | L1   | 9.9        |
| 6.032000        | ---            | 32.00          | 50.00        | 18.00       | L1   | 10.0       |
| 6.100000        | 42.09          | ---            | 60.00        | 17.91       | L1   | 10.0       |
| 21.742500       | ---            | 46.74          | 50.00        | 3.26        | L1   | 10.3       |
| 21.746500       | 49.37          | ---            | 60.00        | 10.63       | L1   | 10.3       |
| 24.818500       | ---            | 48.14          | 50.00        | 1.86        | L1   | 10.4       |
| 24.818500       | 50.25          | ---            | 60.00        | 9.75        | L1   | 10.4       |

## Final\_Result

| Frequency (MHz) | QuasiPeak (dBμV) | Average (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 21.742500       | ---              | 45.56          | 50.00        | 4.44        | 1000.0          | 9.000           | L1   | 10.3       |
| 21.746500       | 46.81            | ---            | 60.00        | 13.19       | 1000.0          | 9.000           | L1   | 10.3       |
| 24.818500       | ---              | 47.62          | 50.00        | 2.38        | 1000.0          | 9.000           | L1   | 10.4       |
| 24.818500       | 49.31            | ---            | 60.00        | 10.69       | 1000.0          | 9.000           | L1   | 10.4       |

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