# TEST REPORT

For

**IoT Gateway**

In conformity with

**FCC Part15 Subpart B (October 01, 2020)**

| | |
|---|---|
| **Model:** | **GW-402, GW-404, GW-402i, GW-404i** |
| **Test Item:** | **IoT Gateway** |
| **Report No:** | **WE220209AB9-12** |
| **Issue Date:** | **August 23, 2022** |

**Prepared for**

GUGEN, Inc.
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**Prepared by**

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# History

| Report No. | Issued date | Revision Contents | Issued by |
|---|---|---|---|
| WE190911AB9-21 | October 28, 2019 | Initial Issue | R. Kojima |
| WE220209AB9-11 | March 1, 2022 | Changed manufacturer name to GUGEN, Inc.<br>Addition of family models (GW-402i, GW-404i) | R. Kojima |
| WE220209AB9-12 | August 23, 2022 | Retest Section 2.<br>Section 1.7 revised. | R. Kojima |





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# 1 General information

## 1.1 *Product description*

| | |
|---|---|
| Test item | : IoT Gateway |
| Manufacturer | : GUGEN, Inc. |
| Address | : 4F Shinanobashi Toyo Building, 1-12-4 Utsubohonmachi, Nishi-ku, Osaka 550-0004 JAPAN |
| Tested Model(s) | : GW-402, GW-404 |
| Max. Internal Frequency | : 168 MHz |
| Receipt date of EUT | : August 18, 2022 |
| Rating | : 12 Vdc (-10%) to 24 Vdc (+20%) (when supplied from serial communication interface 5 Vdc (±5%)) |
| Tested Voltage | : 24 Vdc (Worst case) |
| Serial numbers | : 5902-8142-8129-798 (GW-402), 5902-9336-9317-088 (GW-404) |
| Hardware Version | : MP |
| Software Version | : hwtest ver. |

***Information is based on manufacturer's information**

## 1.2 *Family model(s)*

| | |
|---|---|
| Model(s) | : GW-402i, GW-404i |
| Difference from tested model | : Difference in connected carriers of installed eSIM<br>Front membrane sheet design |

***Information is based on manufacturer's information**





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## 1.3 *Test(s) performed/ Summary of test result*

| | |
|---|---|
| Applicable Standard(s) | : Part15 Subpart B (October 01, 2020) |
| Test method(s) | : ANSI C63.4: 2014 |
| Test(s) started | : August 18, 2022 |
| Test(s) completed | : August 23, 2022 |
| Summary of test result | : Complied |

Note: The above judgment is only based on the measurement data and it does not include the measurement uncertainty. Accordingly, the statement below is applied to the test result.
The EUT complies with the limit required in the standard in case that the margin is not less than the measurement uncertainty in the Laboratory.
Compliance of the EUT is more probable than non-compliance is case that the margin is less than the measurement uncertainty in the Laboratory.

Engineer :
Ryo Kojima
Engineer
EMC Laboratory

Reviewer :
Takanori Zettsu
Engineer
EMC Laboratory





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## 1.4 *Test facility*

The federal Communications Commission has reviewed the technical characteristics of the test facilities at SGS Japan Inc. Kitayamata Lab, located in 3-5-23, Kitayamata, Tsuzuki-ku Yokohama 224-0021 JAPAN and has found these test facilities to be in compliance with the requirements of 47 CFR part 15, section 2.948.

The description of the test facilities has been filed under registration number 319924 at the Office of the Federal Communications Commission. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.
The list of all public test facilities is available on the Internet at http://www.fcc.gov.

Registered by Innovation, Science and Economic Development Canada (ISED):
The registered CAB identifier is JP0009.

Accredited by **National Voluntary Laboratory Accreditation Program** (NVLAP) for the emission tests stated in the scope of the certificate under Certificate Number 200780-0.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

TESTING
NVLAP LAB CODE 200780-0





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## 1.5 *Measurement uncertainty*

The treatment of uncertainty is based on the general matters on the definition of uncertainty in "Guide to the expression of uncertainty in measurement (GUM)" published by ISO. The Lab's uncertainty is determined by referring UKAS Publication LAB34: 2002 "The Expression of Uncertainty in EMC Testing" and CISPR16-4-2: 2011 "Uncertainty in EMC Measurements".
The uncertainty of the measurement result in the level of confidence of approximately 95% (k=2) is as follows;

AC Power line emission : ± 3.3 dB
Radiated emission (30 MHz – 1000 MHz) : ± 5.9 dB
Radiated emission (1.0 GHz - 2.0 GHz) : ± 4.0 dB

## 1.6 *Description of essencial requirements and test results*

An overview of test requirements, as laid out in FCC Part15 Subpart B

### 1.6.1 Test requirements (FCC Part15 Subpart B)

| Test Description | Section in this report | Applicable | Result |
|---|---|---|---|
| Conducted emission (FCC Part15.107) 0.15 MHz – 30 MHz | 2.1 | Yes | Passed |
| Radiated emission (FCC Part15.109) 30 MHz – 2.0 GHz*Note | 2.2 | Yes | Passed |

*Note: The EUT has 168 MHz internal highest frequencies.

### 1.6.2 Normal test conditions

Temperature : +15 degC to +35 degC
Relative humidity : 20 % to 75 %
Supply voltage : 24 Vdc





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## 1.7 *Setup of equipment under test (EUT)*

### 1.7.1 Test configuration of EUT (GW-402 / RS-232C mode)

**Equipment(s) under test**

| | Equipment | Model No. | Manufacturer | Serial No. | Remark |
|---|---|---|---|---|---|
| 1 | IoT Gateway | GW-402 | GUGEN, Inc. | 5902-8142-8129-798 | - |

**Auxiliary equipment (s):**

| | Equipment | Model No. | Manufacturer | Serial No. | Remark |
|---|---|---|---|---|---|
| 2 | PC | Vostro 3582 | DELL | 35166090278 | - |
| 3 | AC adaptor 1 | LA45NM140 | DELL | CN-0KXTTW-LOC00-953-76CB-A09 | - |
| 4 | Switching Power Supply (24V) | MS2-H50 | KEYENCE | #G7L021514 | - |
| 5 | HUB | LAN-SW05/PC | Logitec | 53L220700631C | - |
| 6 | PLC 1 | KV-7300 | KEYENCE | #6Q020057 | - |
| 7 | PLC 2 | KV-7000C | KEYENCE | #6Q020038 | - |
| 8 | Serial Interface Module | KV-L21V | KEYENCE | #G6L122170 | - |
| 9 | IO Unit | KV-B8XTD | KEYENCE | #7P020277 | - |
| 10 | AC adaptor 2 | LA-5W5S-1 | Logitec | - | - |

**The following cables were used and connected to the EUT**

| No | Cable Name | Length (m) | Shielded | Ferrite core / Turns |
|---|---|---|---|---|
| A | USB cable | 1.8 | Yes | - |
| B | DC power 1 | 1.7 | No | - |
| C | DIDO | 3.0 | Yes | - |
| D | RS-232C | 15.0 | Yes | - |
| E | LAN | 3.0 | No | - |
| F | DC power (24V) 1 | 0.7 | No | - |
| G | DC power (24V) 2 | 0.2 | No | - |
| H | AC power 1 | 2.0 | No | - |
| I | DC power 4 | 2.0 | No | - |
| J | AC power 2 | 0.9 | No | - |
| K | DC power 3 | 0.1 | No | - |

### 1.7.2 Operating condition

Test operation with internal firmware.





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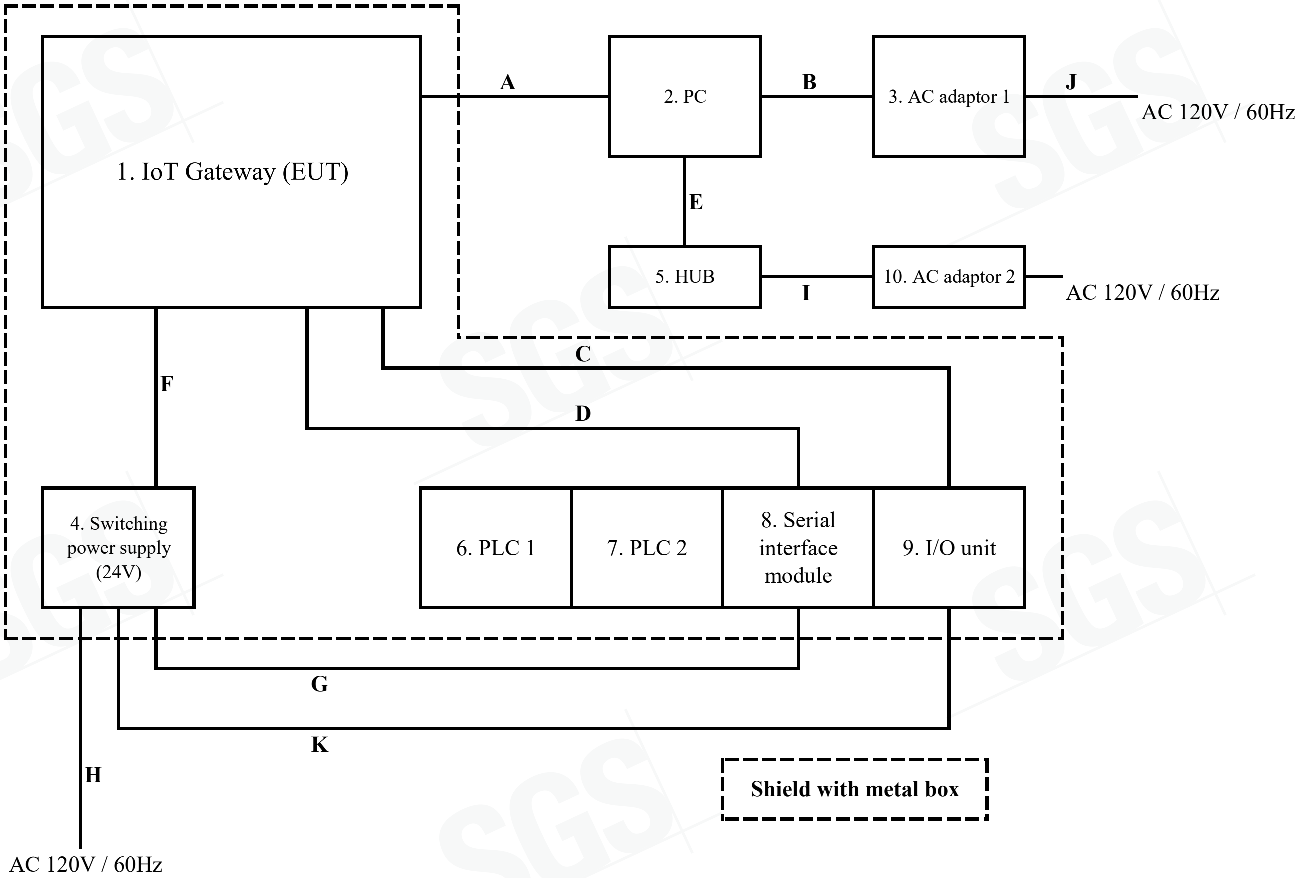
## 1.7.3 Setup diagram of tested system (GW-402 / RS-232C mode)




***Information is based on manufacturer's information**





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## 1.7.4 Test configuration of EUT (GW-404 / RS485 mode)

**Equipment(s) under test**

| | Equipment | Model No. | Manufacturer | Serial No. | Remark |
|---|---|---|---|---|---|
| 1 | IoT Gateway | GW-404 | GUGEN, Inc. | 5902-9336-9317-088 | - |

**Auxiliary equipment (s):**

| | Equipment | Model No. | Manufacturer | Serial No. | Remark |
|---|---|---|---|---|---|
| 2 | PC | Vostro 3582 | DELL | 35166090278 | - |
| 3 | AC adaptor 1 | LA45NM140 | DELL | CN-0KXTTW-LOC00-953-76CB-A09 | - |
| 4 | Switching Power Supply (24V) | MS2-H50 | KEYENCE | #G7L021514 | - |
| 5 | HUB | LAN-SW05/PC | Logitec | 53L220700631C | - |
| 6 | PLC 1 | KV-7300 | KEYENCE | #6Q020057 | - |
| 7 | PLC 2 | KV-7000C | KEYENCE | #6Q020038 | - |
| 8 | Serial Interface Module | KV-L21V | KEYENCE | #G6L122170 | - |
| 9 | IO Unit | KV-B8XTD | KEYENCE | #7P020277 | - |
| 10 | AC adaptor 2 | LA-5W5S-1 | Logitec | - | - |

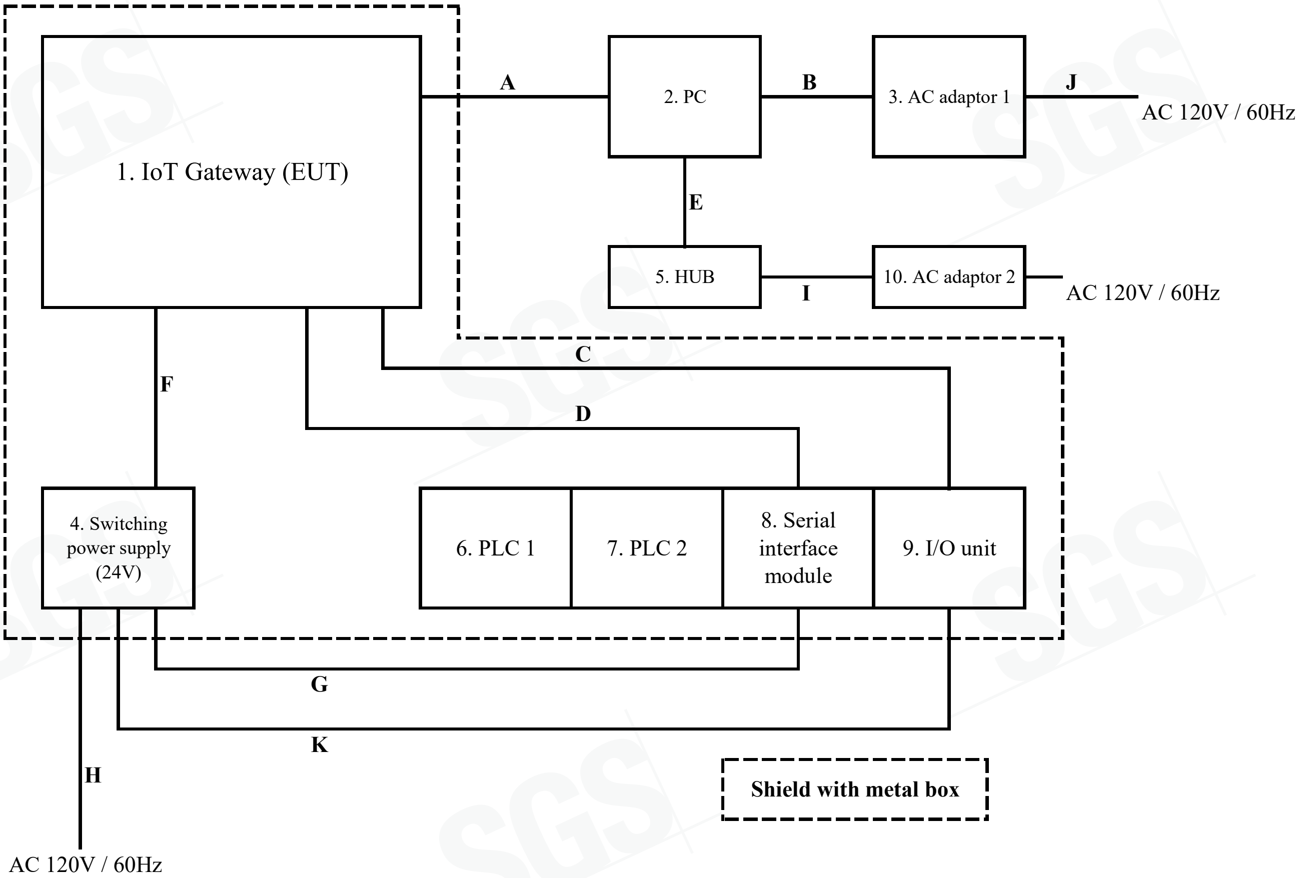
**The following cables were used and connected to the EUT**

| No | Cable Name | Length (m) | Shielded | Remarks |
|---|---|---|---|---|
| A | USB cable | 1.8 | Yes | - |
| B | DC power 1 | 1.7 | No | - |
| C | DIDO | 3.0 | Yes | - |
| D | RS485 | 3.0 | Yes | - |
| E | LAN | 3.0 | No | - |
| F | DC power (24V) 1 | 0.7 | No | - |
| G | DC power (24V) 2 | 0.2 | No | - |
| H | AC power 1 | 2.0 | No | - |
| I | DC power 4 | 2.0 | No | - |
| J | AC power 2 | 0.9 | No | - |
| K | DC power (24V) 3 | 0.1 | No | - |

## 1.7.5 Operating condition

Test operation with internal firmware.

### 1.7.6 Setup diagram of tested system (GW-404 / RS485 mode)




***Information is based on manufacturer's information**

## 1.8 *Equipment modifications*

No modifications have been made to the equipment in order to achieve compliance with the applicable standards described in clause 1.2.

## 1.9 *Deviation from the standard*

No deviations from the standards described in clause 1.2.





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# 2 Test procedure and result

## 2.1 *AC power line conducted emissions*

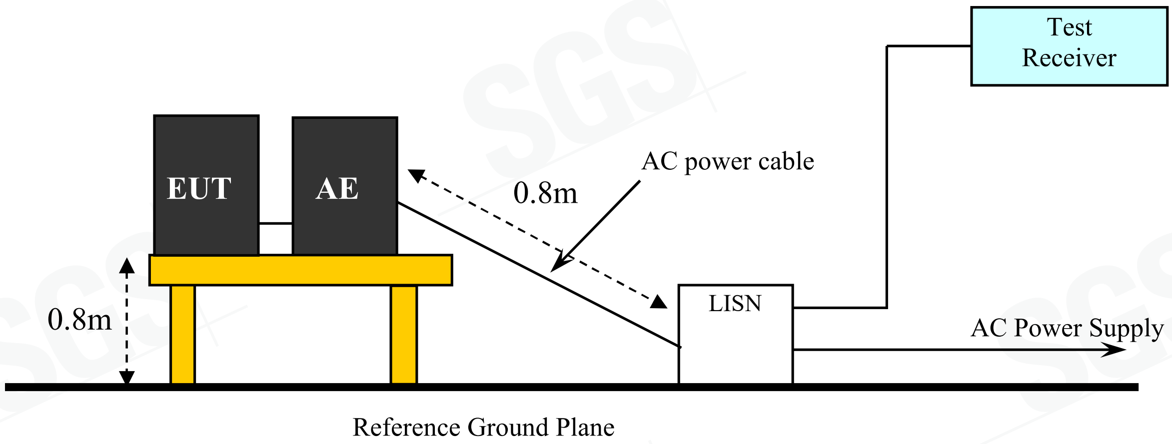
**Reference Standard**
FCC Part15.107

**Test Conditions**

| | |
|---|---|
| Date: | August 18, 2022 |
| Ambient Temperature: | 23 deg. C |
| Relative humidity: | 50 % |
| Atmosphere: | 995 hPa |

**Test Method**
a) The EUT was running.
b) AC power (AE side) is supplied to through LISN.
c) AC Power Line emission is measured by EMI receiver.
The disturbance voltage was measured using a LISN with a quasi-peak (QP) and average (AV) detector of receiver

**Test Setup**





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**Limit**
**(Class A Digital devices)**

| Frequency [MHz] | Limit QP [dBμV] | Limit AV [dBμV] |
|---|---|---|
| 0.15 - 0.5 | 79 | 66 |
| 0.5 - 5 | 73 | 60 |
| 5 - 30 | 73 | 60 |





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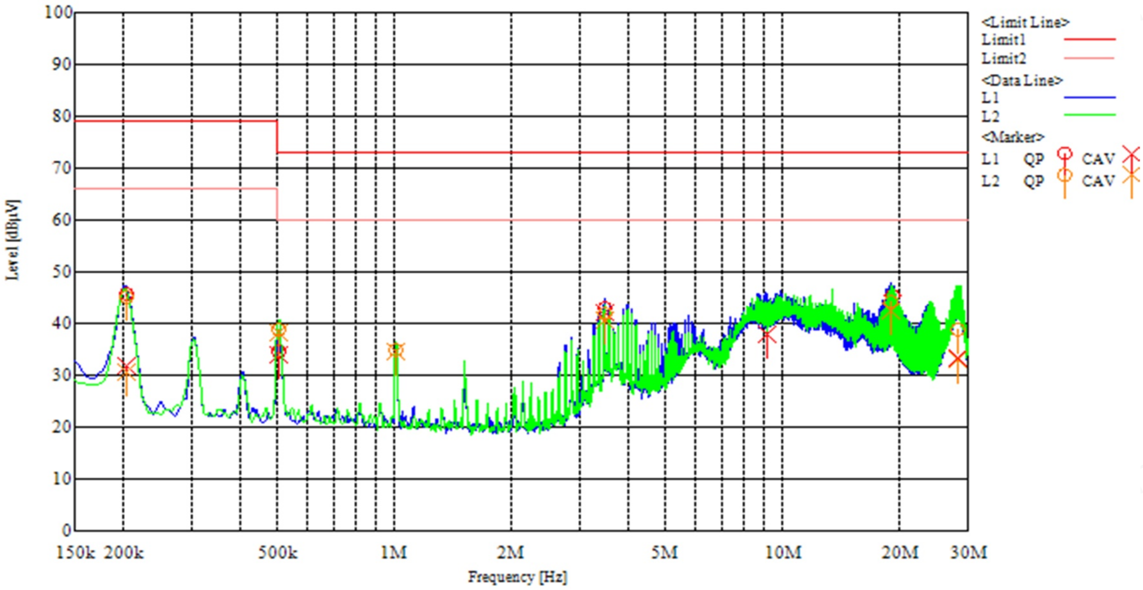
## Test Results AC power ports(AE side) / GW-402(RS-232C) mode, 24V mode (Worst)

| No. | Frequency [MHz] | QP Reading [dBμV] | AV Reading [dBμV] | C.Factor [dB] | QP Result [dBμV] | AV Result [dBμV] | QP Limit [dBμV] | AV Limit [dBμV] | QP Margin [dB] | AV Margin [dB] | Line |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.20514 | 35.3 | 21.5 | 10.3 | 45.6 | 31.8 | 79.0 | 66.0 | 33.4 | 34.2 | L1 |
| 2 | 0.50725 | 24.4 | 23.7 | 10.2 | 34.6 | 33.9 | 73.0 | 60.0 | 38.4 | 26.1 | L1 |
| 3 | 3.48612 | 32.9 | 32.0 | 10.2 | 43.1 | 42.2 | 73.0 | 60.0 | 29.9 | 17.8 | L1 |
| 4 | 9.12599 | 30.7 | 27.6 | 10.3 | 41.0 | 37.9 | 73.0 | 60.0 | 32.0 | 22.1 | L1 |
| **5** | **19.27509** | **35.1** | **33.7** | **10.2** | **45.3** | **43.9** | **73.0** | **60.0** | **27.7** | **16.1** | **L1** |
| 6 | 28.50300 | 28.5 | 23.2 | 10.2 | 38.7 | 33.4 | 73.0 | 60.0 | 34.3 | 26.6 | L1 |
| 7 | 0.20514 | 34.9 | 20.4 | 10.3 | 45.2 | 30.7 | 79.0 | 66.0 | 33.8 | 35.3 | L2 |
| 8 | 0.50707 | 28.5 | 28.0 | 10.2 | 38.7 | 38.2 | 73.0 | 60.0 | 34.3 | 21.8 | L2 |
| 9 | 1.01419 | 24.7 | 24.3 | 10.2 | 34.9 | 34.5 | 73.0 | 60.0 | 38.1 | 25.5 | L2 |
| 10 | 3.48638 | 31.5 | 30.5 | 10.2 | 41.7 | 40.7 | 73.0 | 60.0 | 31.3 | 19.3 | L2 |
| 11 | 19.07254 | 34.0 | 32.0 | 10.3 | 44.3 | 42.3 | 73.0 | 60.0 | 28.7 | 17.7 | L2 |
| 12 | 28.40384 | 28.6 | 22.9 | 10.2 | 38.8 | 33.1 | 73.0 | 60.0 | 34.2 | 26.9 | L2 |

The Correction Factors and RESULT are calculated as followings.
Examples: 19.27509 MHz (AV): Reading (33.7dBuV) + C.F (10.2dB) = Result (43.9dBuV)
C.F = Cable Loss (dB) + LISN Factor (dB)

## Graphical Data




Limit 1: QP
Limit 2: AV





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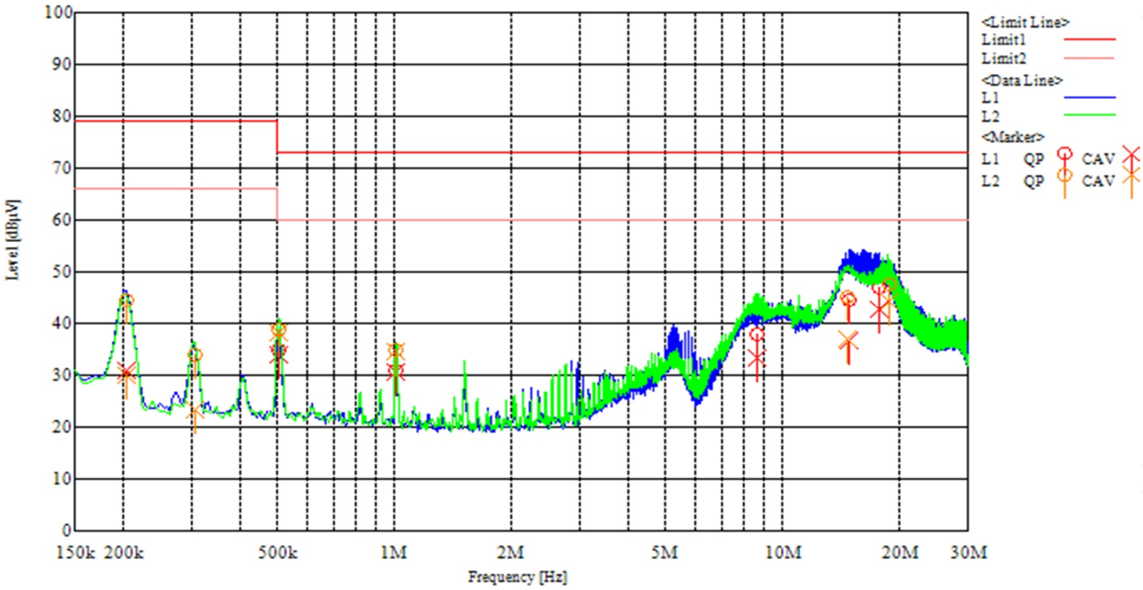
## Test Results AC power ports (AE side) / GW-404(RS485) mode, 24V mode (Worst)

| No. | Frequency [MHz] | QP Reading [dBµV] | AV Reading [dBµV] | C.Factor [dB] | QP Result [dBµV] | AV Result [dBµV] | QP Limit [dBµV] | AV Limit [dBµV] | QP Margin [dB] | AV Margin [dB] | Line |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.20510 | 34.2 | 20.7 | 10.3 | 44.5 | 31.0 | 79.0 | 66.0 | 34.5 | 35.0 | L1 |
| 2 | 0.50717 | 24.5 | 23.8 | 10.2 | 34.7 | 34.0 | 73.0 | 60.0 | 38.3 | 26.0 | L1 |
| 3 | 1.01422 | 20.8 | 20.4 | 10.2 | 31.0 | 30.6 | 73.0 | 60.0 | 42.0 | 29.4 | L1 |
| 4 | 8.61528 | 27.7 | 23.1 | 10.3 | 38.0 | 33.4 | 73.0 | 60.0 | 35.0 | 26.6 | L1 |
| 5 | 14.86205 | 34.3 | 26.3 | 10.3 | 44.6 | 36.6 | 73.0 | 60.0 | 28.4 | 23.4 | L1 |
| 6 | 17.84590 | 36.5 | 32.5 | 10.3 | 46.8 | 42.8 | 73.0 | 60.0 | 26.2 | 17.2 | L1 |
| 7 | 0.20513 | 34.1 | 19.8 | 10.3 | 44.4 | 30.1 | 79.0 | 66.0 | 34.6 | 35.9 | L2 |
| 8 | 0.30769 | 23.6 | 13.2 | 10.2 | 33.8 | 23.4 | 79.0 | 66.0 | 45.2 | 42.6 | L2 |
| 9 | 0.50714 | 28.7 | 28.1 | 10.2 | 38.9 | 38.3 | 73.0 | 60.0 | 34.1 | 21.7 | L2 |
| 10 | 1.01437 | 24.6 | 24.3 | 10.2 | 34.8 | 34.5 | 73.0 | 60.0 | 38.2 | 25.5 | L2 |
| 11 | 14.79008 | 34.8 | 26.7 | 10.3 | 45.1 | 37.0 | 73.0 | 60.0 | 27.9 | 23.0 | L2 |
| **12** | **18.86941** | **37.3** | **33.9** | **10.3** | **47.6** | **44.2** | **73.0** | **60.0** | **25.4** | **15.8** | **L2** |

The Correction Factors and RESULT are calculated as followings.
Examples: 18.86941 MHz (AV): Reading (33.9dBuV) + C.F (10.3dB) = Result (44.2dBuV)
C.F = Cable Loss (dB) + LISN Factor (dB)

## Graphical Data




Limit 1: QP
Limit 2: AV





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## Test Equipment Used

| RFT ID No. | Kind of Equipment and Precision | Manufacturer | Model No. | Serial Number | Calibration Date | Calibrated until |
|---|---|---|---|---|---|---|
| LN17 | LISN | Kyoritsu | TNW-407F2 | 12-15-53 | 2022/4/22 | 2023/4/30 |
| LN13 | LISN (For AE side) | Kyoritsu | KNW-407F | 8-2003-3 | 2022/7/15 | 2023/7/31 |
| TA21 | Dummy Load (For AE side) | HIROSE | BNC-TMP-1(52) | - | 2022/1/11 | 2023/1/31 |
| CL72 | RF Cable for CE | RFT | - | - | 2022/1/11 | 2023/1/31 |
| TR10 | Test Receiver (F/W : 3.66) | Rohde & Schwarz | ESR26 | 101313 | 2022/4/1 | 2023/4/30 |
| SW19 | EMI measurement software | SGS Japan | EMI1 (Ver. 6.2) | - | - | - |

## Final Result

The EUT met the requirements of the standard for this test





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## 2.2 *Radiated Emissions*

**Reference Standard**
FCC Part15.109

**Test Conditions for 30-1000 MHz**

| | |
|---|---|
| Date: | August 23, 2022 |
| Ambient Temperature: | 22 deg. C |
| Relative humidity: | 65 % |
| Atmosphere: | 1004 hPa |

**Test Method (30-1000 MHz)**
a) The EUT was running.
b) Radiated spurious emission is received by receive antenna.
c) Turn table is rotated 360deg.
d) Maximum level of each spurious is measured by test receiver.
e) RBW of test receiver is set to 120kHz for 30 - 1000MHz.
f) Level is measured with QP detect for 30 - 1000MHz.

**Test Method (1-2 GHz)**
a) The EUT was running.
b) Radiated spurious emission is received by receive antenna.
c) Turn table is rotated 360deg.
d) Maximum level of each spurious is measured by test receiver.
e) RBW of test receiver is set to 1MHz for 1-2 GHz.
f) Level is measured with PK detect and AV detect for above 1GHz





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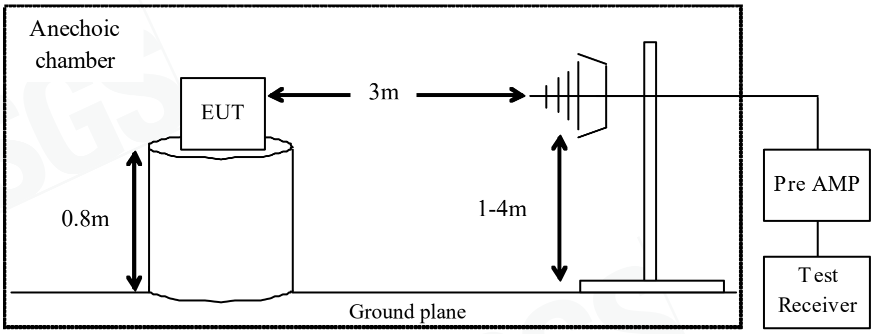
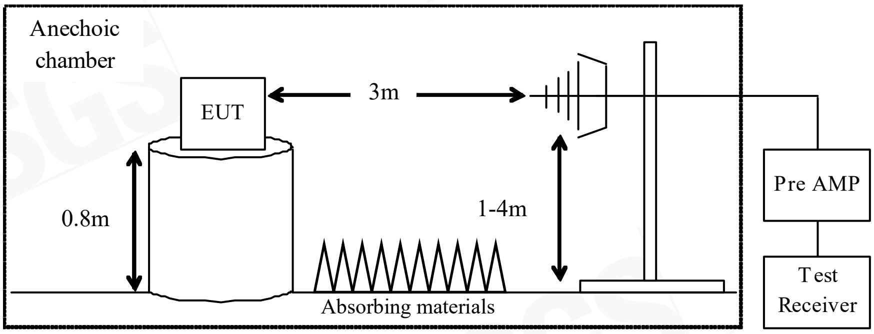
**Test Setup**




**30-1000 MHz**




**1-2 GHz**





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**Limit**
**(Class A Digital devices) (Measurement distance: 3m)**

| Frequency [MHz] | Distance [m] | Field strength [dBµV/m] (QP) @ 3m FCC 15.109 |
|---|---|---|
| 30 - 88 | 3 | 49.4 |
| 88 - 216 | 3 | 53.9 |
| 216 - 960 | 3 | 56.8 |
| above 960 | 3 | 59.9 |

| Frequency [GHz] | Distance [m] | Field strength [dBµV/m] (AV) @ 3m FCC 15.109 | Field strength [dBµV/m] (PK) @ 3m FCC 15.109 |
|---|---|---|---|
| 1 – 2 | 3 | 59.9 | 79.9 |





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## Test Results

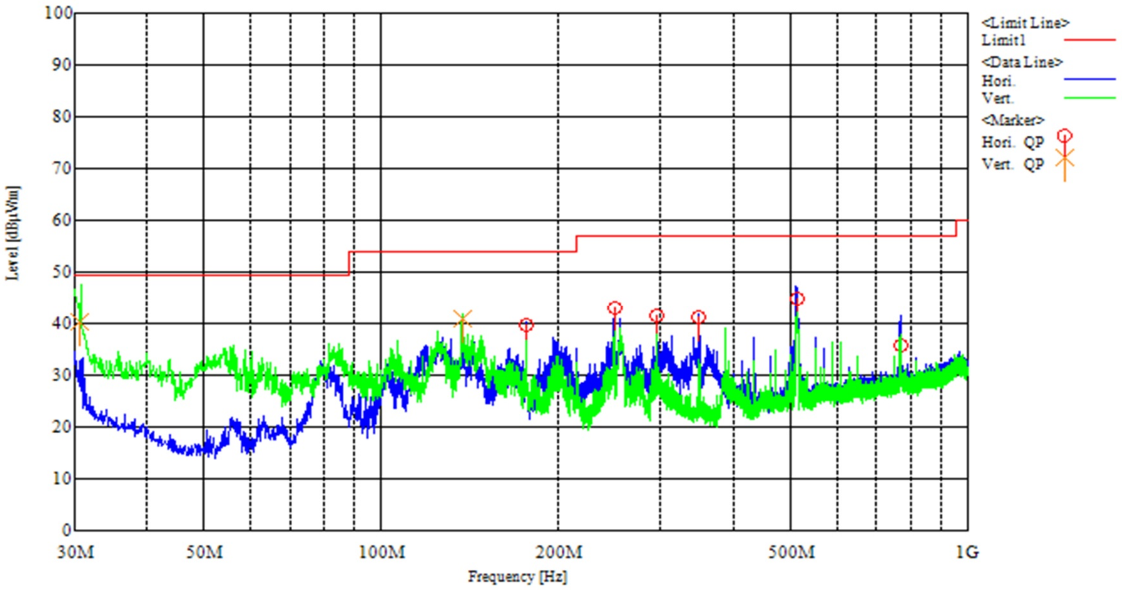
### (30-1000 MHz) / GW-402(RS-232C) mode, 24V mode (Worst)

| No. | Frequency [MHz] | Reading [dBμV] | Antenna factor [dB/m] | Cable Loss [dB] | Gain [dB] | Result [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Ant. polarization |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 176.947 | 53.3 | 9.2 | 7.1 | 30.0 | 39.6 | 53.9 | 14.3 | Hori. |
| 2 | 249.998 | 53.1 | 12.4 | 7.4 | 29.9 | 43.0 | 56.8 | 13.8 | Hori. |
| 3 | 294.912 | 50.9 | 13.0 | 7.6 | 29.9 | 41.6 | 56.8 | 15.2 | Hori. |
| 4 | 347.996 | 49.0 | 14.3 | 7.8 | 29.9 | 41.2 | 56.8 | 15.6 | Hori. |
| 5 | 512.098 | 48.1 | 18.0 | 8.2 | 29.5 | 44.8 | 56.8 | 12.0 | Hori. |
| 6 | 769.082 | 35.1 | 22.1 | 8.8 | 30.2 | 35.8 | 56.8 | 21.0 | Hori. |
| **7** | **30.580** | **45.5** | **18.8** | **6.3** | **30.3** | **40.3** | **49.4** | **9.1** | **Vert.** |
| 8 | 137.626 | 52.2 | 11.7 | 7.0 | 30.0 | 40.9 | 53.9 | 13.0 | Vert. |

**Calculation method**

Examples: 30.580 MHz: Reading (45.5dBuV) + Antenna Factor (18.8dB/m) + Cable loss (6.3dB) – Gain (30.3 dB) = Result (40.3 dBuV/m)

## Test chart (30-1000 MHz)




Limit 1 = QP





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## Test Results

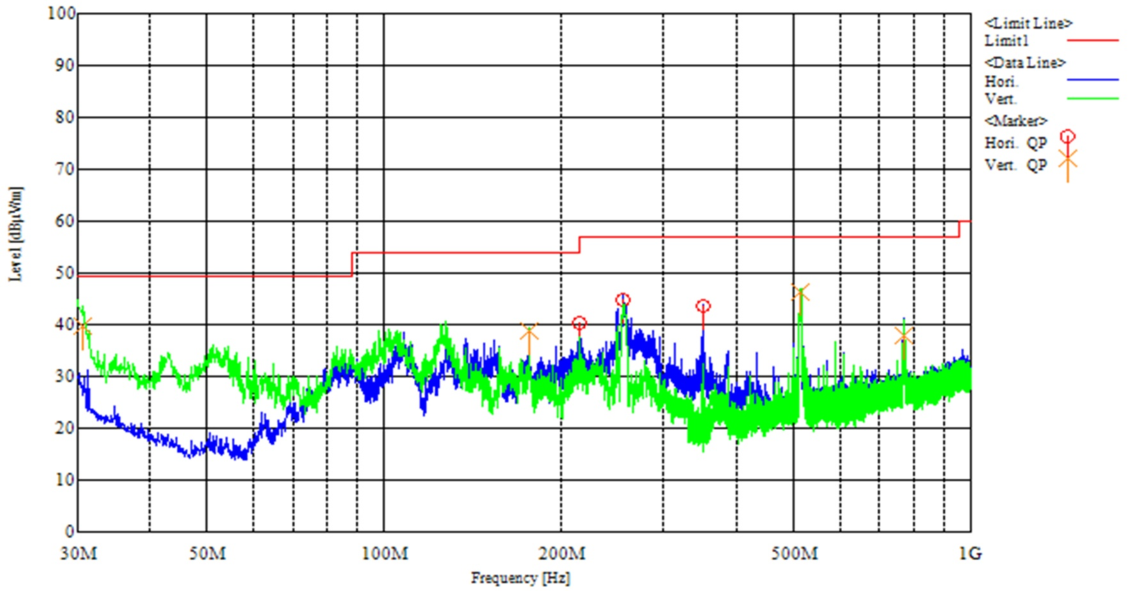
### (30-1000 MHz) / GW-404(RS485) mode, 24V mode (Worst)

| No. | Frequency [MHz] | Reading [dBµV] | Antenna factor [dB/m] | Cable Loss [dB] | Gain [dB] | Result [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Ant. polarization |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 216.269 | 53.9 | 8.9 | 7.3 | 29.9 | 40.2 | 56.8 | 16.6 | Hori. |
| 2 | 255.591 | 54.1 | 13.2 | 7.4 | 29.9 | 44.8 | 56.8 | 12.0 | Hori. |
| 3 | 350.198 | 51.3 | 14.4 | 7.8 | 29.9 | 43.6 | 56.8 | 13.2 | Hori. |
| **4** | **30.580** | **45.0** | **18.8** | **6.3** | **30.3** | **39.8** | **49.4** | **9.6** | **Vert.** |
| 5 | 176.947 | 52.6 | 9.2 | 7.1 | 30.0 | 38.9 | 53.9 | 15.0 | Vert. |
| 6 | 513.803 | 49.6 | 18.0 | 8.2 | 29.5 | 46.3 | 56.8 | 10.5 | Vert. |
| 7 | 770.827 | 37.2 | 22.1 | 8.8 | 30.2 | 37.9 | 56.8 | 18.9 | Vert. |

**Calculation method**

Examples: 30.580 MHz: Reading (45.0dBuV) + Antenna Factor (18.8dB/m) + Cable loss (6.3dB) – Gain (30.3 dB) = Result (49.4 dBuV/m)

## Test chart (30-1000 MHz)




Limit 1 = QP





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## Test Results (1-2 GHz) / GW-402(RS-232C) mode, 24V mode (Worst)

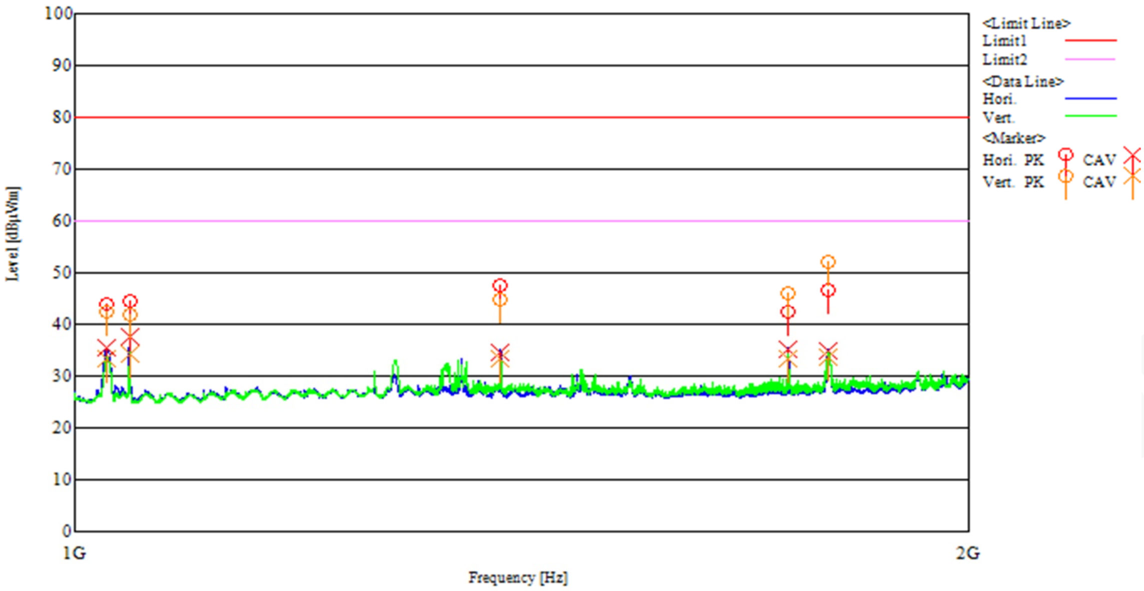
| No. | Frequency [MHz] | QP Reading [dBµV] | AV Reading [dBµV] | C.Factor [dB/m] | QP Result [dBµV/m] | AV Result [dBµV/m] | QP Limit [dBµV/m] | AV Limit [dBµV/m] | QP Margin [dB] | AV Margin [dB] | Ant. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1025.795 | 51.7 | 43.1 | -7.8 | 43.9 | 35.3 | 79.9 | 59.9 | 36.0 | 24.6 | Hori. |
| **2** | **1043.987** | **52.1** | **45.2** | **-7.7** | **44.4** | **37.5** | **79.9** | **59.9** | **35.5** | **22.4** | **Hori.** |
| 3 | 1391.986 | 54.1 | 41.1 | -6.6 | 47.5 | 34.5 | 79.9 | 59.9 | 32.4 | 25.4 | Hori. |
| 4 | 1739.987 | 48.5 | 41.3 | -6.2 | 42.3 | 35.1 | 79.9 | 59.9 | 37.6 | 24.8 | Hori. |
| 5 | 1795.041 | 52.7 | 40.7 | -6.0 | 46.7 | 34.7 | 79.9 | 59.9 | 33.2 | 25.2 | Hori. |
| 6 | 1025.995 | 50.2 | 41.1 | -7.8 | 42.4 | 33.3 | 79.9 | 59.9 | 37.5 | 26.6 | Vert. |
| 7 | 1043.983 | 49.4 | 41.9 | -7.7 | 41.7 | 34.2 | 79.9 | 59.9 | 38.2 | 25.7 | Vert. |
| 8 | 1391.986 | 51.5 | 39.9 | -6.6 | 44.9 | 33.3 | 79.9 | 59.9 | 35.0 | 26.6 | Vert. |
| 9 | 1739.982 | 52.1 | 39.6 | -6.2 | 45.9 | 33.4 | 79.9 | 59.9 | 34.0 | 26.5 | Vert. |
| 10 | 1795.241 | 58.2 | 39.5 | -6.0 | 52.2 | 33.5 | 79.9 | 59.9 | 27.7 | 26.4 | Vert. |

## Calculation method

Examples: 1043.987 MHz (AV): Reading (45.2dBuV) + C.Factor (-7.7dB/m) = Result (37.5 dBuV/m)

C.Factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Gain (dB)

## Test chart (1-2 GHz)




Limit 1 = QP
Limit 2 = AV





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## Test Results (1-2 GHz) / GW-404(RS485) mode, 24V mode (Worst)

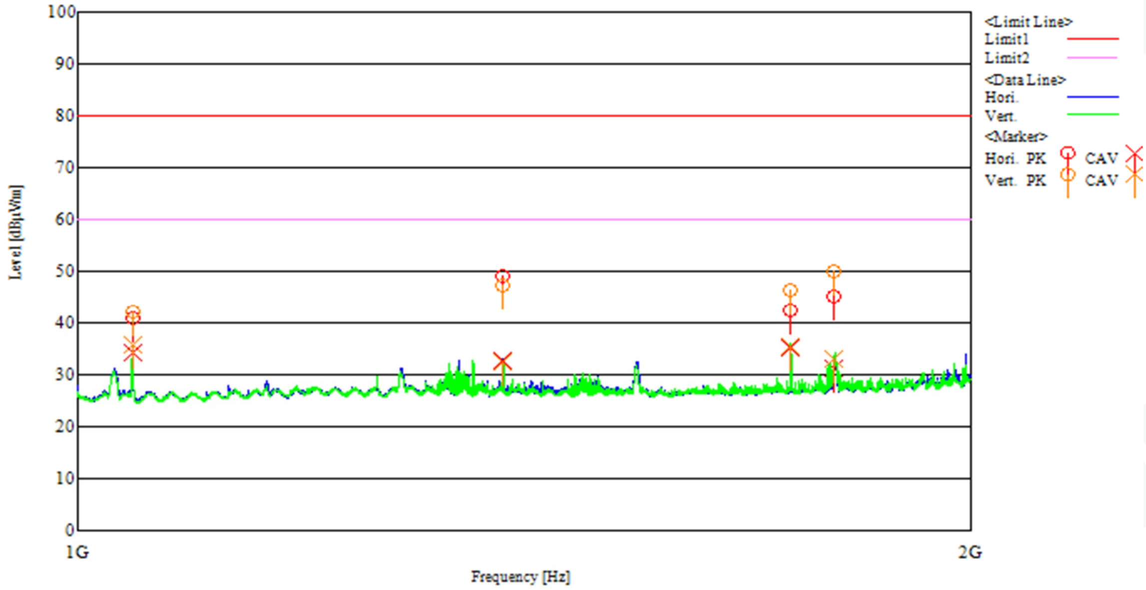
| No. | Frequency [MHz] | QP Reading [dBµV] | AV Reading [dBµV] | C.Factor [dB/m] | QP Result [dBµV/m] | AV Result [dBµV/m] | QP Limit [dBµV/m] | AV Limit [dBµV/m] | QP Margin [dB] | AV Margin [dB] | Ant. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1043.990 | 48.7 | 42.0 | -7.7 | 41.0 | 34.3 | 79.9 | 59.9 | 38.9 | 25.6 | Hori. |
| 2 | 1391.984 | 55.6 | 39.3 | -6.6 | 49.0 | 32.7 | 79.9 | 59.9 | 30.9 | 27.2 | Hori. |
| 3 | 1739.981 | 48.5 | 41.4 | -6.2 | 42.3 | 35.2 | 79.9 | 59.9 | 37.6 | 24.7 | Hori. |
| 4 | 1798.812 | 51.0 | 37.2 | -6.0 | 45.0 | 31.2 | 79.9 | 59.9 | 34.9 | 28.7 | Hori. |
| **5** | **1043.989** | **49.7** | **43.3** | **-7.7** | **42.0** | **35.6** | **79.9** | **59.9** | **37.9** | **24.3** | **Vert.** |
| 6 | 1391.985 | 53.9 | 39.1 | -6.6 | 47.3 | 32.5 | 79.9 | 59.9 | 32.6 | 27.4 | Vert. |
| 7 | 1739.982 | 52.5 | 41.6 | -6.2 | 46.3 | 35.4 | 79.9 | 59.9 | 33.6 | 24.5 | Vert. |
| 8 | 1799.946 | 55.9 | 39.1 | -6.0 | 49.9 | 33.1 | 79.9 | 59.9 | 30.0 | 26.8 | Vert. |

## Calculation method

Examples: 1043.989 MHz (AV): Reading (43.3dBuV) + C.Factor (-7.7dB/m) = Result (35.6 dBuV/m)

C.Factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Gain (dB)

## Test chart (1-2 GHz)




Limit 1 = QP
Limit 2 = AV





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## Test Equipment Used

| RFT ID No. | Kind of Equipment and Precision | Manufacturer | Model No. | Serial Number | Calibration Date | Calibrated until |
|---|---|---|---|---|---|---|
| AC11 (EM) | Anechoic Chamber | TDK | - | - | 2022/8/08 | 2023/8/31 |
| AC11 (EG) | Anechoic Chamber | TDK | - | - | 2022/7/30 | 2023/7/31 |
| BA10 | Bilogical Antenna | TESEQ | CBL6111D | 32342 | 2022/6/21 | 2023/6/30 |
| DH07 | DRG Horn Antenna | A.H. Systems | SAS-571 | 1939 | 2021/2/27 | 2023/2/28 |
| AT18 | Attenuator | JFW | 50HF-006N | ― | 2022/1/11 | 2023/1/31 |
| CL71 | RF Cable for RE | RFT | - | - | 2022/1/14 | 2023/1/31 |
| CL35 | RF Cable 2 m | Junkosha | MWX221 | 1502S020 | 2022/3/23 | 2023/3/31 |
| CL36 | RF Cable 2 m | Junkosha | MWX221 | 1502S021 | 2022/3/23 | 2023/3/31 |
| CL80 | RF Cable 8 m | HUBER&SUHNER | SUCOFLEX104PE | MY3792/4PE | 2022/3/23 | 2023/3/31 |
| PR15 | Pre. Amplifier | Anritsu | MH648A | 6201156141 | 2022/6/24 | 2023/6/30 |
| PR16 | Pre. Amplifier (1-26G) | Agilent Technologies | 8449B | 3008A01538 | 2022/3/18 | 2023/3/31 |
| TR10 | Test Receiver (F/W : 3.66) | Rohde & Schwarz | ESR26 | 101313 | 2022/4/1 | 2023/4/30 |
| SW19 | EMI measurement software | SGS Japan | EMI1 (Ver. 6.2) | - | - | - |

## Final Result

The EUT met the requirements of the standard for this test.





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