



EMI TEST REPORT

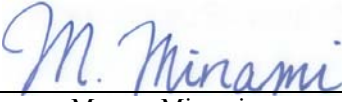
Test Report No. : 12572108H-A-R1

Applicant : Mitsubishi Electric Corporation Kyoto works
Type of Equipment : LED UNIT
Model No. : VS-12NP180F
VS-12NP180FD
FCC ID : 2APT9DWVS-12NP180
Test regulation : FCC Part 15 Subpart B: 2018 Class A
Test Result : Complied (Refer to Section 3.2)


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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report covers EMC technical requirements. It does not cover administrative issues such as Manual or non-EMC test related Requirements. (if applicable)
6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
7. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
8. The information provided from the customer for this report is identified in SECTION 1.
9. This report is a revised version of 12572108H-A. 12572108H-A is replaced with this report.

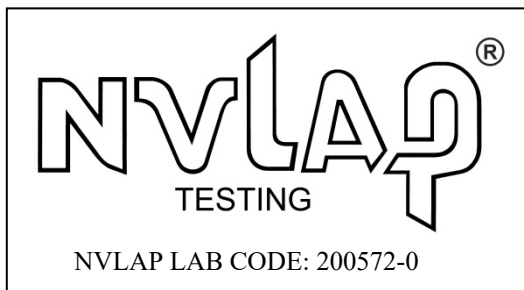
Date of test: December 17 and 18, 2018

Representative test engineer:


Masaya Minami
Engineer
Consumer Technology Division

Approved by:


Satofumi Matsuyama
Engineer
Consumer Technology Division



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- The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
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Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

REVISION HISTORY

Original Test Report No.: 12572108H-A

| Revision | Test report No. | Date | Page revised | Contents |
|-----------------|-----------------|------------------|--------------|--|
| - (Original) | 12572108H-A | January 10, 2019 | - | - |
| 1 | 12572108H-A-R1 | January 22, 2019 | P.1 | Correction of note No.8. |
| 1 | 12572108H-A-R1 | January 22, 2019 | P.4 | SECTION 1: Addition of note. |
| 1 | 12572108H-A-R1 | January 22, 2019 | P.4 | SECTION 2.1: Addition of note for Receipt Date of Sample. |
| 1 | 12572108H-A-R1 | January 22, 2019 | P. 8, 9 | - Correction of Configuration and peripherals - Addition of Non-Standard Ferrite Core information |
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SECTION 1: Customer information

Company Name : Mitsubishi Electric Corporation Kyoto works
Address : 1 Zusho Baba Nagaokakyo Kyoto, 617-8550 Japan
Telephone Number : +81-75-958-3120
Facsimile Number : +81-75-958-3728
Contact Person : Haruo Kobayashi

The information provided from the customer is as follows;

- Applicant, Type of Equipment, Model No. on the cover and other relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (E.U.T.)
- SECTION 4: Operation of E.U.T. during testing

* The laboratory is exempted from liability of any test results affected from the information in SECTION 2 and 4.

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : LED UNIT
Model No. : VS-12NP180F
VS-12NP180FD
Serial No. : Refer to Section 4, Clause 4.2
Rating : AC 100 V - 120 V, 50 / 60 Hz
AC 220 V - 240 V, 50 / 60 Hz
Receipt Date of Sample : December 13, 2018
(Information from test lab.)
Country of Mass-production : Japan
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

2.2 Product Description

Model: VS-12NP180F and VS-12NP180FD (referred to as the EUT in this report) are LED UNITS.

Feature of EUT:

Clock frequency(ies) in the system : 148.5 MHz (max.)

There are 12 models in the LED UNITS, VS-12NP180F, VS-12NP180F1, VS-12NP180R, VS-12NP180R1, VS-12NP180FH, VS-12NP180FH1, VS-12NP180RH, VS-12NP180RH1, VS-12NP180FD, VS-12NP180FD1, VS-12NP180RD, VS-12NP180RD1.

They have only minor mechanical difference that does not affect the EMC performance.

Under such condition, the EMC performance has been evaluated with the representative models, VS-12NP180F and VS-12NP180FD.

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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test Specification : FCC Part 15 Subpart B
Title : FCC 47CFR Part15 Radio Frequency Device
Subpart B Unintentional Radiators

3.2 Procedures and results

| Item | Test Procedure | Limits | Deviation | Worst margin | Result |
|---|--|---------|-----------|---|--------------|
| Conducted emission | ANSI C63.4: 2014 7. AC power - line conducted emission measurements | Class A | N/A | <u>VS-12NP180F</u> [QP] 20.3 dB 0.19274 MHz, L, Mode 1 [AV] 11.4 dB 0.19274 MHz, L, Mode 1 <u>VS-12NP180FD</u> [QP] 21.6 dB 0.19528 MHz, N, Mode 1 [AV] 13.5 dB 0.19528 MHz, N, Mode 1 | Complied a) |
| Radiated emission | ANSI C63.4: 2014 8. Radiated emission measurements | Class A | N/A | <u>VS-12NP180F</u> 2.1 dB 55.766 MHz, Vertical, Mode 1 <u>VS-12NP180FD</u> 4.0 dB 55.366 MHz, Vertical, Mode 1 | Complied# b) |
| *Note: UL Japan, Inc's EMI Work Procedure 13-EM-W0420. a) Refer to APPENDIX 1 (data of Conducted emission) b) Refer to APPENDIX 1 (data of Radiated emission) | | | | | |
| Symbols: Complied The data of this test item has enough margin, more than the measurement uncertainty. Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration. | | | | | |

3.3 Addition to standard

No addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the following results are derived depending on whether or not laboratory uncertainty is applied.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k = 2$.

Conducted emission

| using Item | Frequency range | Uncertainty (+/-) |
|------------|-----------------------|-------------------|
| AMN (LISN) | 0.009 MHz to 0.15 MHz | 3.8 dB |
| | 0.15 MHz to 30 MHz | 3.4 dB |

Radiated emission

| Measurement distance | Frequency range | Uncertainty (+/-) | |
|----------------------|---------------------|-------------------|--------|
| 10 m | 30 MHz to 200 MHz | (Horizontal) | 4.8 dB |
| | | (Vertical) | 4.9 dB |
| | 200 MHz to 1000 MHz | (Horizontal) | 5.0 dB |
| | | (Vertical) | 5.0 dB |
| 10 m | 1 GHz to 18 GHz | 5.2 dB | |

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3.5 Test Location

UL Japan, Inc. Ise EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
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NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967

| Test site | IC Registration Number | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Other rooms | Maximum measurement distance |
|----------------------------|------------------------|----------------------------|--|------------------------|------------------------------|
| No.1 semi-anechoic chamber | 2973C-1 | 19.2 x 11.2 x 7.7 | 7.0 x 6.0 | No.1 Power source room | 10 m |
| No.2 semi-anechoic chamber | 2973C-2 | 7.5 x 5.8 x 5.2 | 4.0 x 4.0 | - | 3 m |
| No.3 semi-anechoic chamber | 2973C-3 | 12.0 x 8.5 x 5.9 | 6.8 x 5.75 | No.3 Preparation room | 3 m |
| No.3 shielded room | - | 4.0 x 6.0 x 2.7 | N/A | - | - |
| No.4 semi-anechoic chamber | 2973C-4 | 12.0 x 8.5 x 5.9 | 6.8 x 5.75 | No.4 Preparation room | 3 m |
| No.4 shielded room | - | 4.0 x 6.0 x 2.7 | N/A | - | - |
| No.5 semi-anechoic chamber | - | 6.0 x 6.0 x 3.9 | 6.0 x 6.0 | - | - |
| No.6 shielded room | - | 4.0 x 4.5 x 2.7 | 4.0 x 4.5 | - | - |
| No.6 measurement room | - | 4.75 x 5.4 x 3.0 | 4.75 x 4.15 | - | - |
| No.7 shielded room | - | 4.7 x 7.5 x 2.7 | 4.7 x 7.5 | - | - |
| No.8 measurement room | - | 3.1 x 5.0 x 2.7 | 3.1 x 5.0 | - | - |
| No.9 measurement room | - | 8.8 x 4.6 x 2.8 | 2.4 x 2.4 | - | - |
| No.11 measurement room | - | 6.2 x 4.7 x 3.0 | 4.8 x 4.6 | - | - |

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 m x 2.0 m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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SECTION 4: Operation of E.U.T. during testing

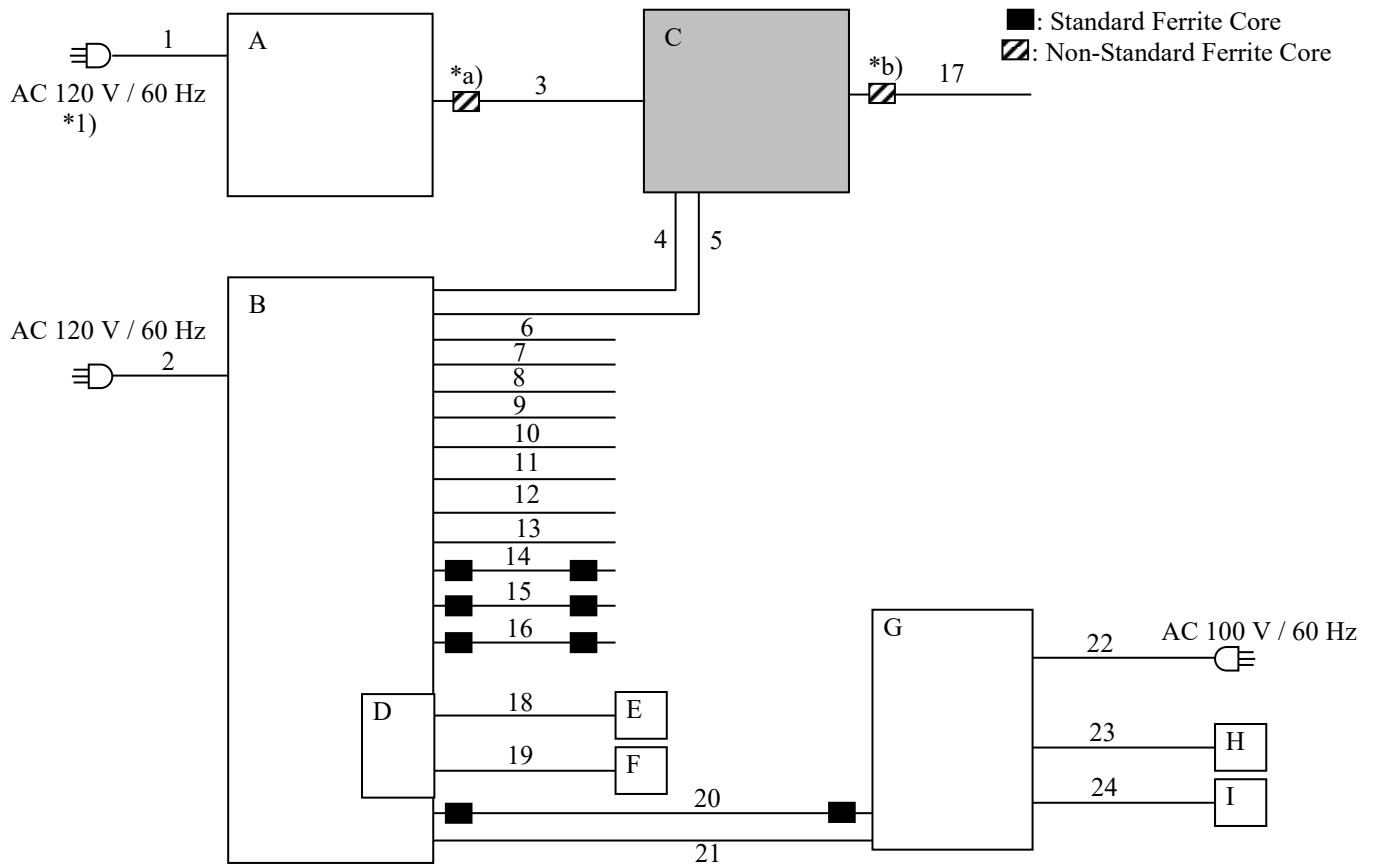
4.1 Operating modes

The mode(s) : 1. DVI Input 1

Justification : The system was configured in typical fashion (as a user would normally use it) for testing.

4.2 Configuration and peripherals

VS-12NP180F



*Cabling and setup were taken into consideration and test data was taken under worse case conditions.

*1) Conducted emission test was performed on AC input port of ADAPTER since AC power of LED UNIT is supplied from ADAPTER.

<Notes for Ferrite cores>

*a) 1 Ferrite Core, Model No. NFT-10 (Manufacturer: TKK), 12 cm from Item A, 1 turn

*b) 1 Ferrite Core, Model No. NFT-10 (Manufacturer: TKK), 12 cm from Item C, 1 turn

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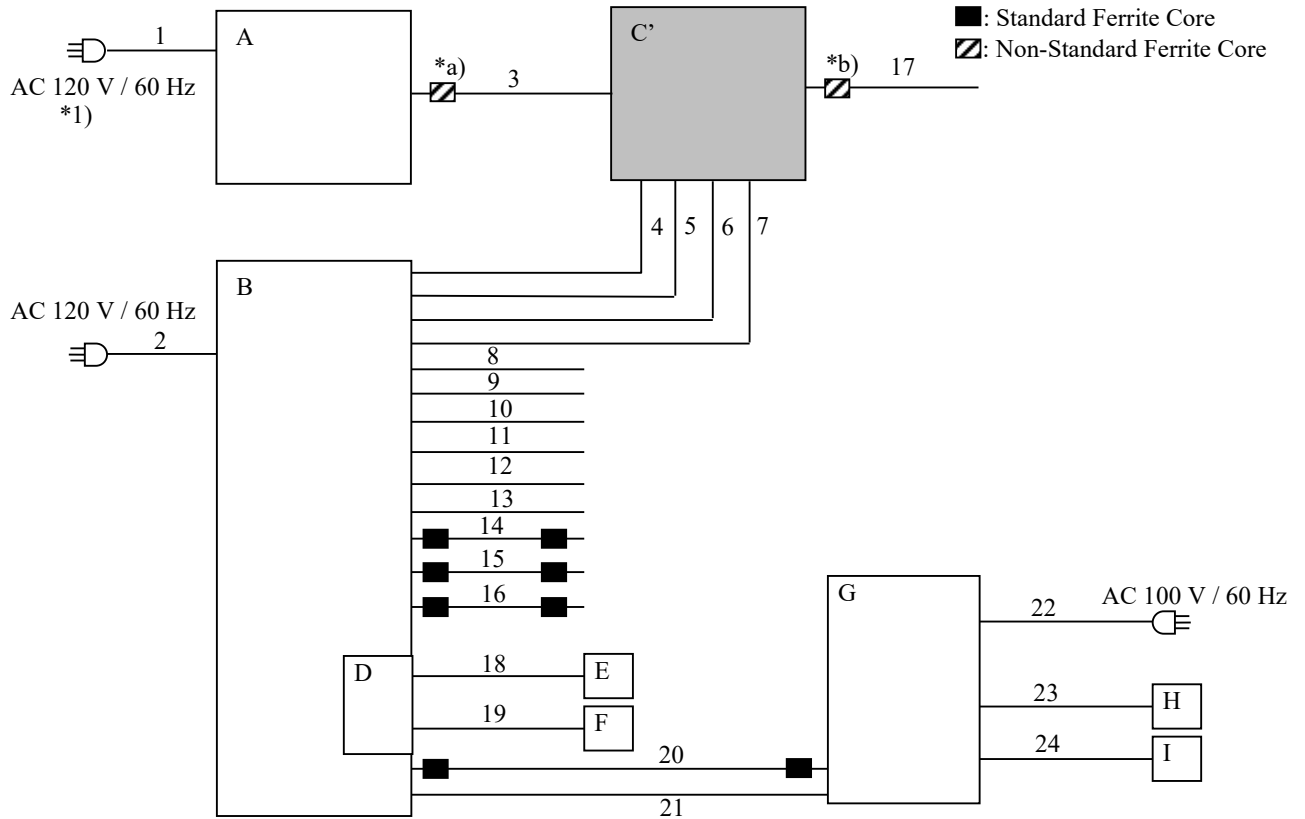
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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

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VS-12NP180FD



*Cabling and setup were taken into consideration and test data was taken under worse case conditions.

*1) Conducted emission test was performed on AC input port of ADAPTER since AC power of LED UNIT is supplied from ADAPTER.

<Notes for Ferrite cores>

*a) 1 Ferrite Core, Model No. NFT-10 (Manufacturer: TKK), 12 cm from Item A, 1 turn

*b) 1 Ferrite Core, Model No. NFT-10 (Manufacturer: TKK), 12 cm from Item C', 1 turn

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Telephone : +81 596 24 8999

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Description of EUT and Support equipment

| No. | Item | Model number | Serial number | Manufacturer | Remark |
|-----|--------------|----------------|-----------------|---|--------|
| A | ADAPTER | S-NP18ACS | 0000009 | Mitsubishi Electric Corporation Kyoto works | - |
| B | CONTROL UNIT | VC-NP1000 | 6001047 | Mitsubishi Electric Corporation Kyoto works | - |
| C | LED UNIT | VS-12NP180F | 0800008 | Mitsubishi Electric Corporation Kyoto works | EUT |
| C' | LED UNIT | VS-12NP180FD | 0800002 | Mitsubishi Electric Corporation Kyoto works | EUT |
| D | OPS PC | DS280GB1701E-T | KSE0090252 | ADVANTECH CO LTD | - |
| E | Keyboard | KU-1156 | BDMJA0CGA | Hewlett-Packard Company | - |
| F | Mouse | 265988-007 | F5320B0N3WJ0066 | Hewlett-Packard Company | - |
| G | PC | EW315AV | JPA74805VW | Hewlett-Packard Company | - |
| H | Keyboard | KB-0316 | BC3480CGAV5354 | Hewlett-Packard Company | - |
| I | Mouse | 334684-003 | F93AA0AN3V301BB | Hewlett-Packard Company | - |

List of cables used

| No. | Name | Length (m) | Shield | | Remark |
|-----|----------------|------------|------------|------------|---------|
| | | | Cable | Connector | |
| 1 | AC Power Cable | 2.9 | Unshielded | Unshielded | 3 wires |
| 2 | AC Power Cable | 2.9 | Unshielded | Unshielded | 3 wires |
| 3 | AC Power Cable | 0.8 | Unshielded | Unshielded | 3 wires |
| 4 | LAN Cable | 2.0 | Shielded | Shielded | - |
| 5 | LAN Cable | 2.0 | Shielded | Shielded | - |
| 6 | LAN Cable | 2.0 | Shielded | Shielded | - |
| 7 | LAN Cable | 2.0 | Shielded | Shielded | - |
| 8 | LAN Cable | 2.0 | Shielded | Shielded | - |
| 9 | LAN Cable | 2.0 | Shielded | Shielded | - |
| 10 | LAN Cable | 2.0 | Shielded | Shielded | - |
| 11 | LAN Cable | 2.0 | Shielded | Shielded | - |
| 12 | LAN Cable | 2.0 | Shielded | Shielded | - |
| 13 | LAN Cable | 2.0 | Shielded | Shielded | - |
| 14 | Control Cable | 2.9 | Shielded | Shielded | - |
| 15 | Control Cable | 2.9 | Shielded | Shielded | - |
| 16 | DVI Cable | 1.9 | Shielded | Shielded | - |
| 17 | AC Power Cable | 0.8 | Unshielded | UnShielded | 3 wires |
| 18 | Keyboard Cable | 1.7 | Shielded | Shielded | - |
| 19 | Mouse Cable | 1.8 | Shielded | Shielded | - |
| 20 | DVI Cable | 1.9 | Shielded | Shielded | - |
| 21 | LAN Cable | 1.9 | Unshielded | Unshielded | - |
| 22 | AC Power Cable | 1.9 | Unshielded | Unshielded | 3 wires |
| 23 | Keyboard Cable | 1.7 | Shielded | Shielded | - |
| 24 | Mouse Cable | 1.7 | Shielded | Shielded | - |

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SECTION 5: Conducted Emission

5.1 Operating environment

Test place: No.3 semi anechoic chamber
Temperature: See data
Humidity: See data

5.2 Test configuration

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT and its peripherals was aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from the LISN/AMN and excess AC cable was bundled in center. I/O cables that were connected to the other peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN/AMN to the input power source. All unused 50 ohm connectors of the LISN/AMN were resistivity terminated in 50 ohm when not connected to the measuring equipment. Photographs of the set up are shown in Appendix 3.

Frequency range : 0.15 MHz - 30 MHz
EUT position : Table top
EUT operation mode : See Clause 4.1

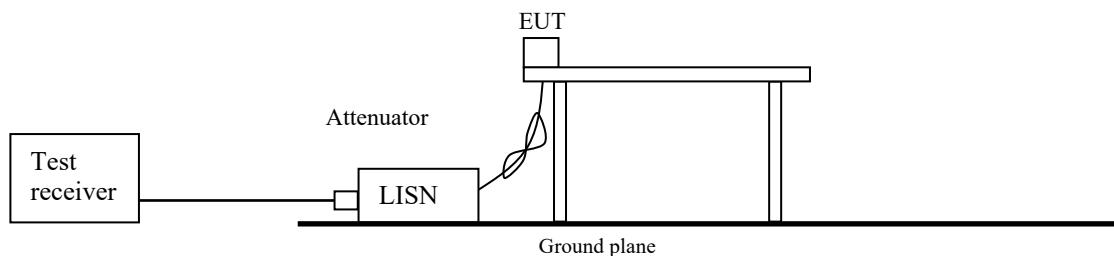
5.3 Test procedure

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT within a semi anechoic chamber. The EUT was connected to a Line Impedance Stabilization Network (LISN)/ Artificial Mains network (AMN). An overview sweep with peak detection has been performed. The measurements have been performed with a quasi-peak detector and if required, with an average detector.

The conducted emission measurements were made with the following detector function of the test receiver.

Detector Type : Quasi-Peak and CISPR AV
IF Bandwidth : 9 kHz

Figure 1: Test Setup



5.4 Test result

Summary of the test results: Pass

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Date: December 18, 2018

Test engineer: Masaya Minami

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

SECTION 6: Radiated Emission

6.1 Operating environment

Test place: No.1 semi anechoic chamber
Temperature: See data
Humidity: See data

6.2 Test configuration

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The EUT was set on the edge of the tabletop. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength. Photographs of the set up are shown in Appendix 3.

6.3 Test conditions

Frequency range : 30 MHz - 200 MHz (Biconical antenna) / 200 MHz - 1000 MHz (Logperiodic antenna)
1000 MHz - 2000 MHz (Horn antenna)
Test distance : 10 m
EUT position : Table top
EUT operation mode : See Clause 4.1

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6.4 Test procedure

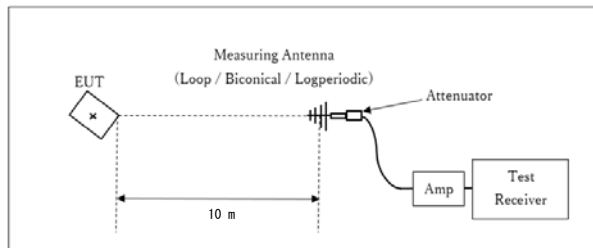
The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver. The radiated emission measurements were made with the following detector function of the Test Receiver.

| Frequency | Below 1GHz | Above 1GHz *1) |
|-----------------|----------------|----------------------------------|
| Instrument used | Test Receiver | Test Receiver |
| IF Bandwidth | QP: BW 120 kHz | PK: BW 1 MHz, CISPR AV: BW 1 MHz |

Figure 2: Test Setup

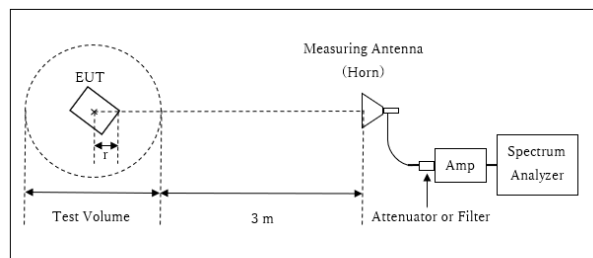
Below 1 GHz



* : Center of turn table

Test Distance: 10 m

1 GHz - 2 GHz



r : Radius of an outer periphery of EUT
* : Center of turn table

*1) Distance Factor: $20 \times \log(3.3 \text{ m} / 10.0 \text{ m}) = -9.63 \text{ dB}$

* Test Distance: $(3 + \text{Test Volume} / 2) - r = 3.3 \text{ m}$

Test Volume : 2.0 m

(Test Volume has been calibrated based on CISPR 16-1-4.)
 $r = 0.7 \text{ m}$

The test was made on EUT at the normal use position.

6.5 Test result

Summary of the test results: Pass

*The limit is rounded down to one decimal place.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Date: December 17, 2018

Test engineer: Masaya Minami (Below 1 GHz)

Date: December 18, 2018

Test engineer: Toshifumi Yoneshige (Above 1 GHz)

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Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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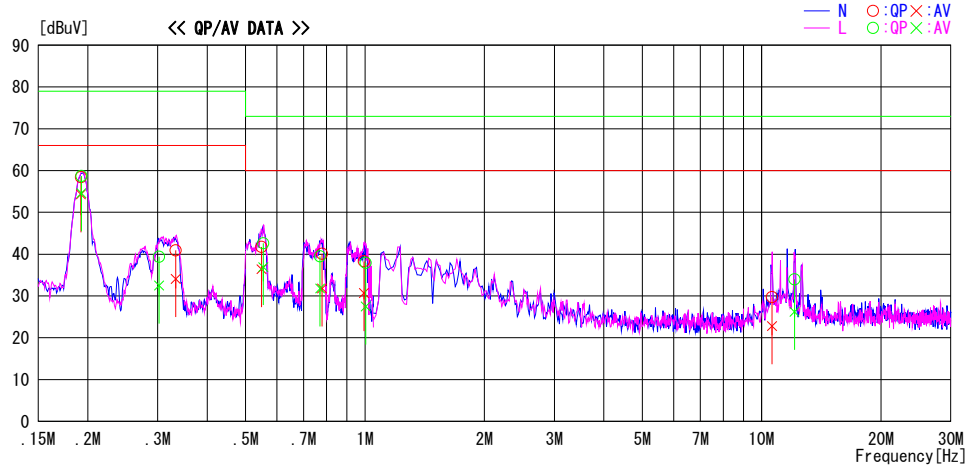
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APPENDIX 1: Test data

Conducted Emission
(VS-12NP180F)

Report No. 12572108H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date December 18, 2018
Temperature / Humidity 22 deg. C / 41 % RH
Engineer Masaya Minami
Mode Mode 1

LIMIT : FCC15.107 (b) QP ClassA
FCC15.107 (b) AV ClassA



| Frequency [MHz] | Reading Level | | Corr. Factor | Results | | Limit | | Margin | | Phase |
|--------------------|---------------|--------------|-----------------|--------------|--------------|--------------|--------------|------------|------------|-------|
| | QP [dBuV] | AV [dBuV] | | QP [dBuV] | AV [dBuV] | QP [dBuV] | AV [dBuV] | QP [dB] | AV [dB] | |
| 0.19214 | 45.1 | 41.0 | 13.3 | 58.4 | 54.3 | 79.0 | 66.0 | 20.6 | 11.7 | N |
| 0.33326 | 27.6 | 20.8 | 13.3 | 40.9 | 34.1 | 79.0 | 66.0 | 38.1 | 31.9 | N |
| 0.54826 | 28.4 | 23.1 | 13.3 | 41.7 | 36.4 | 73.0 | 60.0 | 31.3 | 23.6 | N |
| 0.77866 | 26.8 | 18.5 | 13.3 | 40.1 | 31.8 | 73.0 | 60.0 | 32.9 | 28.2 | N |
| 0.99371 | 25.0 | 17.4 | 13.3 | 38.3 | 30.7 | 73.0 | 60.0 | 34.7 | 29.3 | N |
| 10.62092 | 15.8 | 8.9 | 13.9 | 29.7 | 22.8 | 73.0 | 60.0 | 43.3 | 37.2 | N |
| 0.19274 | 45.4 | 41.3 | 13.3 | 58.7 | 54.6 | 79.0 | 66.0 | 20.3 | 11.4 | L |
| 0.30261 | 26.1 | 19.2 | 13.3 | 39.4 | 32.5 | 79.0 | 66.0 | 39.6 | 33.5 | L |
| 0.55385 | 29.3 | 23.6 | 13.3 | 42.6 | 36.9 | 73.0 | 60.0 | 30.4 | 23.1 | L |
| 0.77029 | 26.2 | 18.5 | 13.3 | 39.5 | 31.8 | 73.0 | 60.0 | 33.5 | 28.2 | L |
| 1.00442 | 24.6 | 14.2 | 13.3 | 37.9 | 27.5 | 73.0 | 60.0 | 35.1 | 32.5 | L |
| 12.09609 | 20.0 | 12.2 | 14.0 | 34.0 | 26.2 | 73.0 | 60.0 | 39.0 | 33.8 | L |

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + CABLE + ATT)
Except for the above table: adequate margin data below the limits.

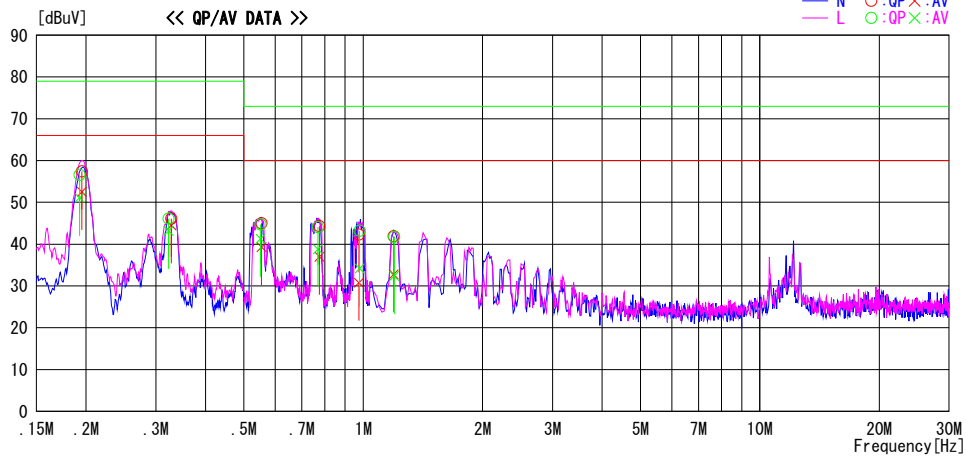
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Conducted Emission
(VS-12NP180FD)

Report No. 12572108H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date December 18, 2018
Temperature / Humidity 22 deg. C / 41 % RH
Engineer Masaya Minami
Mode Mode 1

LIMIT : FCC15.107 (b) QP ClassA
FCC15.107 (b) AV ClassA



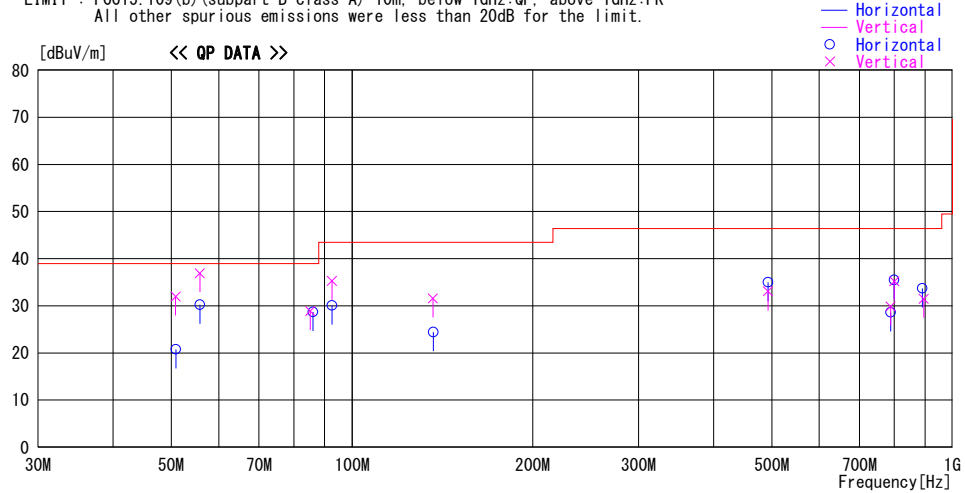
| Frequency [MHz] | Reading Level | | Corr. Factor [dB] | Results | | Limit | | Margin | | Phase |
|--------------------|---------------|--------------|-------------------------|--------------|--------------|--------------|--------------|------------|------------|-------|
| | QP [dBuV] | AV [dBuV] | | QP [dBuV] | AV [dBuV] | QP [dBuV] | AV [dBuV] | QP [dB] | AV [dB] | |
| 0.19528 | 44.1 | 39.2 | 13.3 | 57.4 | 52.5 | 79.0 | 66.0 | 21.6 | 13.5 | N |
| 0.32825 | 32.8 | 31.2 | 13.3 | 46.1 | 44.5 | 79.0 | 66.0 | 32.9 | 21.5 | N |
| 0.55385 | 31.7 | 26.0 | 13.3 | 45.0 | 39.3 | 73.0 | 60.0 | 28.0 | 20.7 | N |
| 0.77546 | 31.0 | 23.7 | 13.3 | 44.3 | 37.0 | 73.0 | 60.0 | 28.7 | 23.0 | N |
| 0.97484 | 29.0 | 17.5 | 13.3 | 42.3 | 30.8 | 73.0 | 60.0 | 30.7 | 29.2 | N |
| 1.19339 | 28.5 | 19.4 | 13.4 | 41.9 | 32.8 | 73.0 | 60.0 | 31.1 | 27.2 | N |
| 0.19279 | 43.3 | 37.8 | 13.3 | 56.6 | 51.1 | 79.0 | 66.0 | 22.4 | 14.9 | L |
| 0.32325 | 32.8 | 29.9 | 13.3 | 46.1 | 43.2 | 79.0 | 66.0 | 32.9 | 22.8 | L |
| 0.55085 | 31.4 | 28.0 | 13.3 | 44.7 | 41.3 | 73.0 | 60.0 | 28.3 | 18.7 | L |
| 0.76885 | 30.8 | 25.5 | 13.3 | 44.1 | 38.8 | 73.0 | 60.0 | 28.9 | 21.2 | L |
| 0.97908 | 29.9 | 20.9 | 13.3 | 43.2 | 34.2 | 73.0 | 60.0 | 29.8 | 25.8 | L |
| 1.19723 | 28.3 | 19.0 | 13.4 | 41.7 | 32.4 | 73.0 | 60.0 | 31.3 | 27.6 | L |

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + CABLE + ATT)
Except for the above table: adequate margin data below the limits.

Radiated Emission
(VS-12NP180F)

Report No. 12572108H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date December 17, 2018
Temperature / Humidity 20 deg. C / 39 % RH
Engineer Masaya Minami
(Below 1 GHz)
Mode Mode 1

LIMIT : FCC15.109(b) (subpart B class A) 10m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



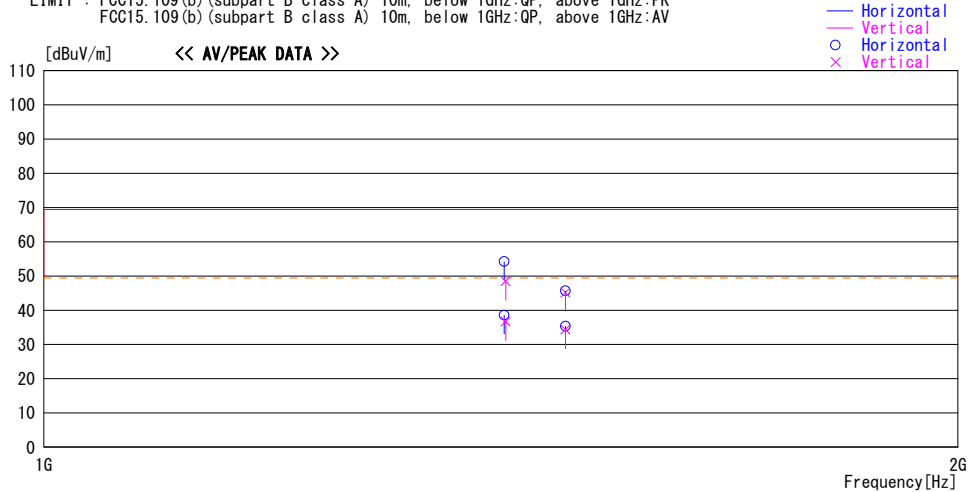
| Frequency [MHz] | Reading [dBuV] | DET | Antenna | Loss& | Level [dBuV/m] | Angle [Deg] | Height [cm] | Polar. | Limit [dBuV/m] | Margin [dB] |
|--------------------|-------------------|-----|------------------|--------------|-------------------|----------------|----------------|--------|-------------------|----------------|
| | | | Factor [dB/m] | Gain [dB] | | | | | | |
| 50.835 | 52.5 | QP | 10.6 | -31.1 | 32.0 | 0 | 100 | Vert. | 39.0 | 7.0 |
| 50.892 | 41.3 | QP | 10.6 | -31.1 | 20.8 | 0 | 400 | Hori. | 39.0 | 18.2 |
| 55.760 | 52.3 | QP | 8.9 | -31.0 | 30.2 | 0 | 400 | Hori. | 39.0 | 8.8 |
| 55.766 | 59.0 | QP | 8.9 | -31.0 | 36.9 | 1 | 100 | Vert. | 39.0 | 2.1 |
| 86.035 | 51.5 | QP | 7.7 | -30.5 | 28.7 | 0 | 400 | Hori. | 39.0 | 10.3 |
| 85.220 | 52.0 | QP | 7.5 | -30.6 | 28.9 | 64 | 213 | Vert. | 39.0 | 10.1 |
| 92.635 | 51.7 | QP | 8.8 | -30.4 | 30.1 | 1 | 400 | Hori. | 43.5 | 13.4 |
| 92.611 | 57.0 | QP | 8.7 | -30.4 | 35.3 | 112 | 100 | Vert. | 43.5 | 8.2 |
| 136.341 | 47.5 | QP | 14.1 | -30.0 | 31.6 | 234 | 100 | Vert. | 43.5 | 11.9 |
| 136.562 | 40.3 | QP | 14.1 | -30.0 | 24.4 | 297 | 400 | Hori. | 43.5 | 19.1 |
| 492.800 | 43.6 | QP | 17.8 | -26.4 | 35.0 | 213 | 162 | Hori. | 46.4 | 11.4 |
| 492.801 | 41.7 | QP | 17.8 | -26.4 | 33.1 | 7 | 223 | Vert. | 46.4 | 13.3 |
| 788.930 | 32.1 | QP | 20.7 | -24.2 | 28.6 | 142 | 151 | Hori. | 46.4 | 17.8 |
| 788.932 | 33.4 | QP | 20.7 | -24.2 | 29.9 | 186 | 206 | Vert. | 46.4 | 16.5 |
| 800.000 | 38.8 | QP | 20.8 | -24.1 | 35.5 | 210 | 100 | Hori. | 46.4 | 10.9 |
| 800.000 | 38.5 | QP | 20.8 | -24.1 | 35.2 | 185 | 184 | Vert. | 46.4 | 11.2 |
| 891.000 | 35.2 | QP | 22.0 | -23.5 | 33.7 | 150 | 262 | Hori. | 46.4 | 12.7 |
| 895.600 | 33.0 | QP | 22.0 | -23.5 | 31.5 | 191 | 141 | Vert. | 46.4 | 14.9 |

CHART: WITH FACTOR ANT TYPE: -30MHz: LOOP, 30-200MHz: BICONICAL, 200-1000MHz: LOGPERIODIC, 1000MHz-: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE + ATT - GAIN(AMP))

Radiated emission
(VS-12NP180F)

Report No. 12572108H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date December 18, 2018
Temperature / Humidity 22 deg. C / 41 % RH
Engineer Toshifumi Yoneshige
(Above 1 GHz)
Mode Mode 1

LIMIT : FCC15.109(b) (subpart B class A) 10m, below 1GHz:QP, above 1GHz:PK
FCC15.109(b) (subpart B class A) 10m, below 1GHz:QP, above 1GHz:AV



| Frequency [MHz] | Reading [dBuV] | DET | Antenna | | Level [dBuV/m] | Angle [Deg] | Height [cm] | Polar. | Limit [dBuV/m] | Margin [dB] |
|--------------------|-------------------|-----|------------------|-----------------------|-------------------|----------------|----------------|--------|-------------------|----------------|
| | | | Factor [dB/m] | Loss& Gain [dB] | | | | | | |
| 1417.692 | 57.4 | AV | 25.9 | -44.7 | 38.6 | 86 | 100 | Hori. | 49.5 | 10.9 |
| 1417.692 | 73.0 | PK | 25.9 | -44.7 | 54.2 | 86 | 100 | Hori. | 69.5 | 15.3 |
| 1419.247 | 55.5 | AV | 25.9 | -44.7 | 36.7 | 131 | 100 | Vert. | 49.5 | 12.8 |
| 1419.247 | 67.3 | PK | 25.9 | -44.7 | 48.5 | 131 | 100 | Vert. | 69.5 | 21.0 |
| 1484.999 | 64.6 | PK | 25.2 | -44.6 | 45.2 | 182 | 100 | Vert. | 69.5 | 24.3 |
| 1484.999 | 53.8 | AV | 25.2 | -44.6 | 34.4 | 182 | 100 | Vert. | 49.5 | 15.1 |
| 1485.000 | 54.8 | AV | 25.2 | -44.6 | 35.4 | 218 | 100 | Hori. | 49.5 | 14.1 |
| 1485.000 | 65.1 | PK | 25.2 | -44.6 | 45.7 | 218 | 100 | Hori. | 69.5 | 23.8 |

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE - GAIN(AMP) + D-factor)

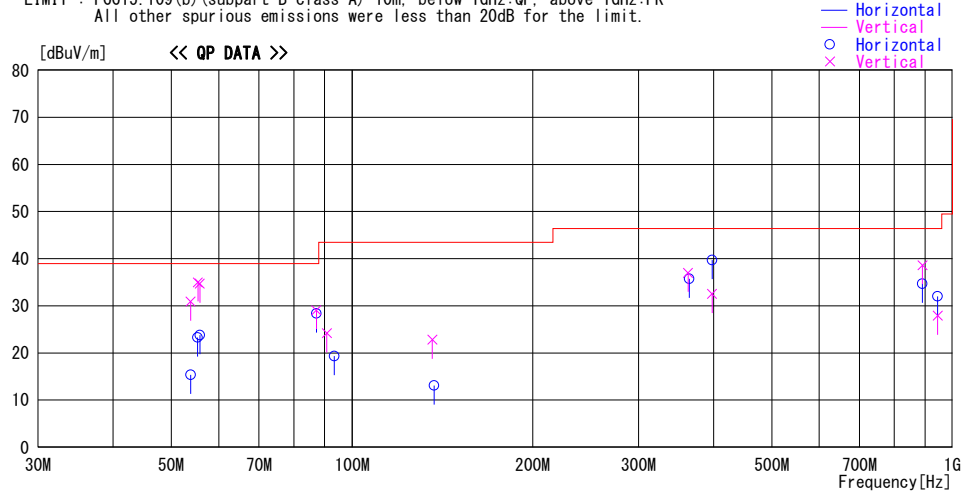
UL Japan, Inc.
Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

Radiated Emission
(VS-12NP180FD)

Report No. 12572108H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date December 17, 2018
Temperature / Humidity 20 deg. C / 39 % RH
Engineer Masaya Minami
(Below 1 GHz)
Mode Mode 1

LIMIT : FCC15.109(b) (subpart B class A) 10m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



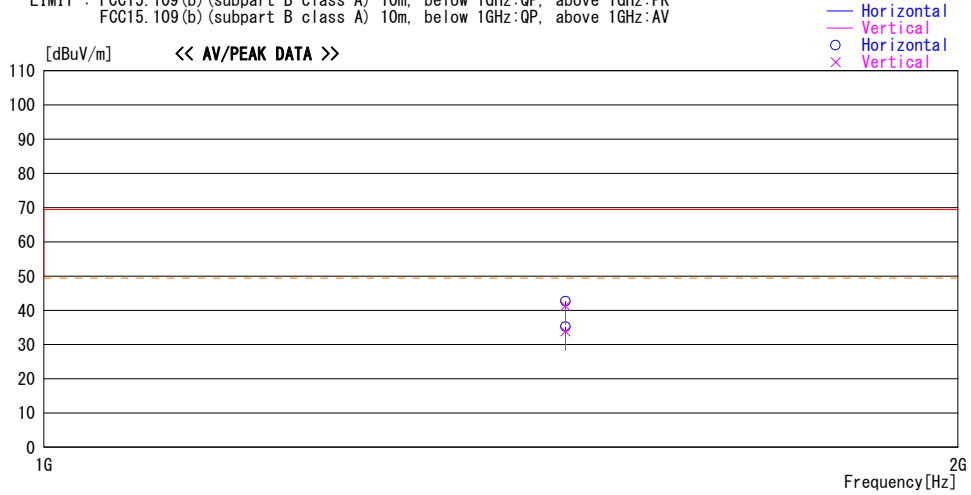
| Frequency [MHz] | Reading [dBuV] | DET | Antenna | | Level [dBuV/m] | Angle [Deg] | Height [cm] | Polar. | Limit [dBuV/m] | Margin [dB] |
|--------------------|-------------------|-----|------------------|---------------------|-------------------|----------------|----------------|--------|-------------------|----------------|
| | | | Factor [dB/m] | Loss & Gain [dB] | | | | | | |
| 53.848 | 52.5 | QP | 9.5 | -31.1 | 30.9 | 0 | 100 | Vert. | 39.0 | 8.1 |
| 53.846 | 37.0 | QP | 9.5 | -31.1 | 15.4 | 0 | 400 | Hori. | 39.0 | 23.6 |
| 55.336 | 45.3 | QP | 9.1 | -31.1 | 23.3 | 0 | 400 | Hori. | 39.0 | 15.7 |
| 55.366 | 57.0 | QP | 9.1 | -31.1 | 35.0 | 1 | 100 | Vert. | 39.0 | 4.0 |
| 55.774 | 56.8 | QP | 8.9 | -31.0 | 34.7 | 4 | 100 | Vert. | 39.0 | 4.3 |
| 55.772 | 45.9 | QP | 8.9 | -31.0 | 23.8 | 3 | 400 | Hori. | 39.0 | 15.2 |
| 87.224 | 51.7 | QP | 7.9 | -30.5 | 29.1 | 85 | 100 | Vert. | 39.0 | 9.9 |
| 87.231 | 51.0 | QP | 7.9 | -30.5 | 28.4 | 359 | 400 | Hori. | 39.0 | 10.6 |
| 90.789 | 46.3 | QP | 8.4 | -30.5 | 24.2 | 72 | 100 | Vert. | 43.5 | 19.3 |
| 93.436 | 40.8 | QP | 8.9 | -30.4 | 19.3 | 314 | 400 | Hori. | 43.5 | 24.2 |
| 136.023 | 38.8 | QP | 14.0 | -30.0 | 22.8 | 0 | 100 | Vert. | 43.5 | 20.7 |
| 136.889 | 29.0 | QP | 14.1 | -30.0 | 13.1 | 5 | 400 | Hori. | 43.5 | 30.4 |
| 362.693 | 49.4 | QP | 15.0 | -27.4 | 37.0 | 334 | 100 | Vert. | 46.4 | 9.4 |
| 364.310 | 48.1 | QP | 15.0 | -27.4 | 35.7 | 21 | 154 | Hori. | 46.4 | 10.7 |
| 397.800 | 44.1 | QP | 15.6 | -27.2 | 32.5 | 314 | 256 | Vert. | 46.4 | 13.9 |
| 397.800 | 51.3 | QP | 15.6 | -27.2 | 39.7 | 22 | 143 | Hori. | 46.4 | 6.7 |
| 891.000 | 36.2 | QP | 22.0 | -23.5 | 34.7 | 133 | 100 | Hori. | 46.4 | 11.7 |
| 891.000 | 40.1 | QP | 22.0 | -23.5 | 38.6 | 170 | 150 | Vert. | 46.4 | 7.8 |
| 945.000 | 33.1 | QP | 21.9 | -23.0 | 32.0 | 130 | 100 | Hori. | 46.4 | 14.4 |
| 945.000 | 29.0 | QP | 21.9 | -23.0 | 27.9 | 192 | 212 | Vert. | 46.4 | 18.5 |

CHART: WITH FACTOR ANT TYPE: -30MHz: LOOP, 30-200MHz: BICONICAL, 200-1000MHz: LOGPERIODIC, 1000MHz-: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE + ATT - GAIN(AMP))

Radiated emission
(VS-12NP180FD)

Report No. 12572108H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date December 18, 2018
Temperature / Humidity 22 deg. C / 41 % RH
Engineer Toshifumi Yoneshige
(Above 1 GHz)
Mode Mode 1

LIMIT : FCC15.109 (b) (subpart B class A) 10m, below 1GHz:QP, above 1GHz:PK
FCC15.109 (b) (subpart B class A) 10m, below 1GHz:QP, above 1GHz:AV



| Frequency [MHz] | Reading [dBuV] | DET | Antenna | Loss& | Level [dBuV/m] | Angle [Deg] | Height [cm] | Polar. | Limit [dBuV/m] | Margin [dB] |
|--------------------|-------------------|-----|------------------|--------------|-------------------|----------------|----------------|--------|-------------------|----------------|
| | | | Factor [dB/m] | Gain [dB] | | | | | | |
| 1484.998 | 60.7 | PK | 25.2 | -44.6 | 41.3 | 184 | 100 | Vert. | 69.5 | 28.2 |
| 1484.998 | 53.2 | AV | 25.2 | -44.6 | 33.8 | 184 | 100 | Vert. | 49.5 | 15.7 |
| 1485.003 | 62.1 | PK | 25.2 | -44.6 | 42.7 | 217 | 100 | Hori. | 69.5 | 26.8 |
| 1485.003 | 54.6 | AV | 25.2 | -44.6 | 35.2 | 217 | 100 | Hori. | 49.5 | 14.3 |

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE - GAIN(AMP) + D-factor)

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

APPENDIX 2: Test instruments

EMI test equipment

| Test Item | LIMS ID | Description | Manufacturer | Model | Serial | Last Calibration Date | Calibration Due Date | Cal Int |
|-----------|---------|-----------------------------------|--------------------------|------------------------------------|--------------------------------|-----------------------|----------------------|---------|
| RE | 141213 | Attenuator(6dB) | Weinschel Corp | 2 | BK7971 | 11/05/2018 | 11/30/2019 | 12 |
| RE | 141566 | Thermo-Hygrometer | CUSTOM | CTH-201 | A08Q26 | 01/24/2018 | 01/31/2019 | 12 |
| RE | 141350 | Coaxial Cable | Suhner/storm/Agilent/TSJ | - | - | 06/04/2018 | 06/30/2019 | 12 |
| RE | 141530 | Digital Tester | Fluke Corporation | FLUKE 26-3 | 78030621 | 08/21/2018 | 08/31/2019 | 12 |
| RE | 141950 | EMI Test Receiver | Rohde & Schwarz | ESU26 | 100412 | 06/15/2018 | 06/30/2019 | 12 |
| RE/CE | 141152 | EMI measurement program | TSJ | TEPTO-DV | - | - | - | - |
| RE | 141264 | Logperiodic Antenna (200-1000MHz) | Schwarzbeck | VUSLP9111B | 911B-189 | 06/01/2018 | 06/30/2019 | 12 |
| RE | 142226 | Measure | KOMELON | KMC-36 | - | - | - | - |
| RE | 141585 | Pre Amplifier | MITEQ | MLA-10K01-B01-35 | 1237616 | 02/19/2018 | 02/28/2019 | 12 |
| RE | 141998 | AC1_Semi Anechoic Chamber(NSA) | TDK | Semi Anechoic Chamber 10m | DA-06881 | 06/18/2018 | 06/30/2020 | 24 |
| CE | 141247 | Attenuator(13dB) | JFW Industries, Inc. | 50FP-013H2 N | - | 12/06/2018 | 12/31/2019 | 12 |
| CE | 141216 | Coaxial cable | Fujikura/Suhner/TSJ | 5D-2W/SFM14/sucoform141-PE/421-010 | -/00640 | 07/03/2018 | 07/31/2019 | 12 |
| CE | 141532 | DIGITAL HiTESTER | HIOKI | 3805 | 51201197 | 01/09/2018 | 01/31/2019 | 12 |
| CE | 141357 | LISN(AMN) | Schwarzbeck | NSLK8127 | 8127-729 | 07/24/2018 | 07/31/2019 | 12 |
| CE | 141358 | LISN(AMN) | Schwarzbeck | NSLK8127 | 8127-730 | 07/25/2018 | 07/31/2019 | 12 |
| CE | 142183 | Measure | KOMELON | KMC-36 | - | - | - | - |
| CE | 142008 | AC3_Semi Anechoic Chamber(NSA) | TDK | Semi Anechoic Chamber 3m | DA-10005 | 06/26/2018 | 06/30/2020 | 24 |
| CE | 141927 | Terminator | TME | CT-01 | - | 10/26/2018 | 10/31/2019 | 12 |
| CE | 141949 | Test Receiver | Rohde & Schwarz | ESCI | 100767 | 08/06/2018 | 08/31/2019 | 12 |
| CE | 141554 | Thermo-Hygrometer | CUSTOM | CTH-180 | 1301 | 01/24/2018 | 01/31/2019 | 12 |
| RE | 141994 | AC1_Semi Anechoic Chamber(SVSWR) | TDK | Semi Anechoic Chamber 10m | DA-06881 | 04/04/2018 | 04/30/2019 | 12 |
| RE | 141511 | Horn Antenna 1-18GHz | Schwarzbeck | BBHA9120D | 253 | 06/04/2018 | 06/30/2019 | 12 |
| RE | 141510 | Horn Antenna 18-26.5GHz | EMCO | 3160-09 | 1266 | 06/06/2018 | 06/30/2019 | 12 |
| RE | 141393 | Microwave Cable | Junkosha | MWX221 | 1604S254(1 m) 1608S088(5 m) | 08/08/2018 | 08/31/2019 | 12 |
| RE | 141576 | Pre Amplifier | AGILENT | 8449B | 3008A01671 | 02/16/2018 | 02/28/2019 | 12 |
| RE | 141198 | Biconical Antenna | Schwarzbeck | BBA9106 | 2513 | 06/01/2018 | 06/30/2019 | 12 |

*Hyphens for Last Calibration Date, Calibration Due Date and Cal Int are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test item:

CE: Conducted emission

RE: Radiated emission

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124