



# EMI TEST REPORT

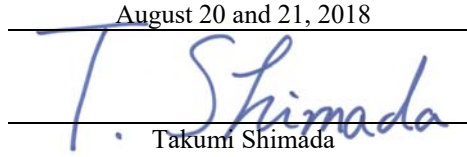
**Test Report No. : 12441050H-A-R1**

**Applicant** : DENSO CORPORATION  
**Type of Equipment** : Remote Keyless Entry System and TPMS (Receiver)  
**Model No.** : 23ABL  
**FCC ID** : HYQ23ABL  
**Test regulation** : FCC Part 15 Subpart B: 2018  
**Test Result** : Complied


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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 limits of the above regulation.
4. The test results in this test 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.
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8. This report is a revised version of 12441050H-A . 12441050H-A is replaced with this report.

**Date of test:** August 20 and 21, 2018

**Representative test engineer:**

  
Takumi Shimada  
Engineer  
Consumer Technology Division

**Approved by:**

  
Motoya Imura  
Leader  
Consumer Technology Division



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- The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.  
 There is no testing item of "Non-accreditation".

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13-EM-F0429

## REVISION HISTORY

**Original Test Report No.: 12441050H-A**

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12441050H-A	September 10, 2018	-	-
1	12441050H-A-R1	November 6, 2018	P.7	Addition of note sentence in Clause 4.2.
1	12441050H-A-R1	November 6, 2018	P.10	Correction of IF Bandwidth in Clause 6.4; From VBW: 100 kHz to VBW: 300 kHz
1	12441050H-A-R1	November 6, 2018	P.46	Correction of Last Calibration Date for LIMS ID: 142004 of Test instruments.
1	12441050H-A-R1	November 6, 2018	P.46	Addition of LIMS ID: 142006 and 141902.
1	12441050H-A-R1	November 6, 2018	P.46	Deletion of “AT” from LIMS ID: 141512.

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## **SECTION 1: Customer information**

Company Name : DENSO CORPORATION  
Address : 1-1, Showa-cho, Kariya-shi, Aichi-ken, 448-8661, Japan  
Telephone Number : +81-566-63-7723  
Facsimile Number : +81-566-25-4837  
Contact Person : KOUJI MURAYAMA

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

### **2.1 Identification of E.U.T.**

Type of Equipment : Remote Keyless Entry System and TPMS (Receiver)  
Model No. : 23ABL  
Serial No. : Refer to Section 4, Clause 4.2  
Receipt Date of Sample : August 4, 2018  
Country of Mass-production : Japan, China, United States of America  
Condition of EUT : Engineering 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 No: 23ABL (referred to as the EUT in this report) is the Remote Keyless Entry System and TPMS (Receiver). 23ABL has 15 variations. For details of variations, see "Theory of Operation".

Feature of EUT:

<RKES mode>

RKE System is mainly used for locking or unlocking the doors of the vehicle. The transmitter sends a radio wave signal, while the button is pushed. The receiver becomes active in response to the signal from the transmitter.

<TPMS mode>

Tire Pressure Monitoring System is used for monitoring and indicating information of air pressure in vehicle's tires. Transmitter sends receiver the data that informs air pressure in vehicle's tire to the receiver. The data also includes the information of temperature, battery voltage and identity code of transmitter. The receiver judges the data, and if the data of air pressure and others is not in a normal condition, the receiver sends signal to a warning lamp. Then, the warning lamp warns drivers.

Type of receiving system : Super-heterodyne  
Frequency of Operation : RKES(CH1): 314.35 MHz  
RKES(CH2): 312.10 MHz  
TPMS: 314.98 MHz  
Oscillator Frequency : 30.265 MHz Crystal  
Type of Modulation : RKES: FSK (F1D)  
TPMS: FSK (F1D)  
Power Supply : DC 12.0 V  
Antenna Type : ANT1: Internal antenna (Inverse F antenna / Inverse L antenna)  
ANT2: External antenna (Connector)

\* RKES : Remote Keyless Entry System  
TPMS : Tire Pressure Monitoring System

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## **SECTION 3: Test specification, procedures & results**

### **3.1 Test specification**

Test Specification : FCC Part 15 Subpart B  
FCC Part 15 final revised on March 12, 2018 and effective April 11, 2018

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	FCC: ANSI C63.4: 2014 7. AC power - line conducted emission measurements	FCC:Part 15 Subpart B 15.107(a)	N/A *1)	N/A	N/A
	IC: RSS-Gen 8.8	IC: RSS-Gen 8.8			
Radiated emission	FCC: ANSI C63.4: 2014 8. Radiated emission measurements	FCC: Part 15 Subpart B 15.109(a)	N/A	18.7 dB 30.265 MHz, Vertical, QP	Complied
	IC: RSS-Gen 7	IC: RSS-Gen 7.1.2			
Antenna Terminal	FCC: ANSI C63.4: 2014 12. Measurement of unintentional radiators other than ITE	FCC: Part 15 Subpart B 15.111(a)	N/A	27.7 dB 1870.920 MHz, PK	Complied
	IC: RSS-Gen 7	IC: RSS-Gen 7.1.3			

\*Note: UL Japan, Inc's EMI Work Procedure 13-EM-W0420.

\*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.

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.

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### 3.4 Uncertainty

#### EMI

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

Polarity	Radiated emission (Below 1 GHz)			
	(3 m*)(+/-)		(10 m*)(+/-)	
	30 MHz to 200 MHz	200 MHz to 1000 MHz	30 MHz to 200 MHz	200 MHz to 1000 MHz
Horizontal	4.8 dB	5.2 dB	4.8 dB	5.0 dB
Vertical	5.0 dB	6.3 dB	4.9 dB	5.0 dB

Radiated emission (Above 1 GHz)				
(3 m*)(+/-)		(1 m*)(+/-)		(10 m*)(+/-)
1 GHz to 6 GHz	6 GHz to 18 GHz	10 GHz to 26.5 GHz	26.5 GHz to 40 GHz	1 GHz to 18 GHz
5.0 dB	5.3 dB	5.8 dB	5.8 dB	5.2 dB

\* Measurement distance

Antenna terminated conducted emission / Power density / Burst power (+dB)
2.7 dB

### 3.5 Test Location

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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	N/A	-	-
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.

#### UL Japan, Inc.

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

### **4.1 Operating modes**

The mode used: 1. RKES Receiving mode (312.10 MHz)  
2. RKES Receiving mode (314.35 MHz)  
3. TPMS Receiving mode (314.98 MHz)

\* Refer to the table in “Theory of Operation\_Variation\_23ABL” for test mode.

Regarding RKES Receiving mode (314.35 MHz / 312.10 MHz), internal antenna receiving was tested with Variation No. 2, because Variation No. 2 had the highest emission level compared to the other representative variants (Variation No. 2, 3, 5, 8, 11 and 14) of the table in “Theory of Operation”.

Regarding TPMS Receiving mode (314.98 MHz), internal antenna receiving was tested with Variation No. 2 which was the worst-variation of RKES Receiving mode.

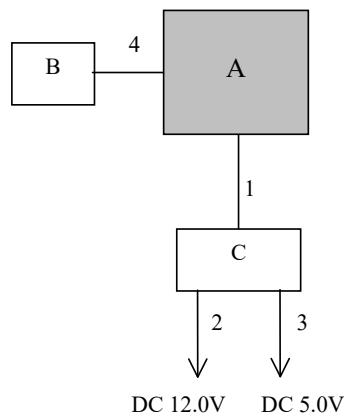
Also, external antenna receiving (Test mode 1, 2, 3) was tested with Variation No. 3 as representative, because there was no difference in circuit construction by variations.

Among Variation No.1 to 15,

- the difference due to the feeding point and antenna variation of the internal antenna was confirmed with Variation No. 2, 3, 5, 8, 11, and 14.
- regarding External antenna, variants with External antenna were tested, which were the worst condition for EMI.

As a result, enough margin for the limit was observed.

### **4.2 Configuration and peripherals**



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

\*Based on § 15.111 (a), when measuring radiated emission, The state where the external antenna was terminated and the state where the typical external antenna was attached were confirmed by the precheck test, as there was no difference in the result, the radiated emission test was conducted with the external antenna attached.

**Description of EUT and Support equipment**

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Remote Keyless Entry System and TPMS (Receiver)	23ABL	001 (Variation No. 2) *1)	DENSO CORPORATION	EUT
			002 (Variation No. 3)		
			003 (Variation No. 5)		
			004 (Variation No. 8)		
			005 (Variation No. 11)		
			006 (Variation No. 14)		
B	External Antenna	-	6F30	DENSO CORPORATION	-
C	Checker	-	1	DENSO CORPORATION	-

**List of cables used**

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	1.0	Unshielded	Unshielded	-
2	DC Cable	1.1	Unshielded	Unshielded	-
3	DC Cable	2.5	Unshielded	Unshielded	-
4	Antenna Cable	1.8	Shielded	Shielded	-

\*1) Variations owing to antenna matching (Inverse F Antenna Type) \*See "Theory of Operation" for details. TYPE1 which was used for the tests has C44 "Nothing" and C45 "Nothing".

The result of Radiated emission test was mainly from characteristics of Local Oscillator.

If the range of C44 and C45 becomes "Capacitor 0.1-1000pF", there is no influence on the result of Radiated emission test.

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## **SECTION 5: Radiated Emission**

### **5.1 Operating environment**

Test place : No.2 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 EUT was set on the center 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.

### **5.3 Test conditions**

Frequency range : 30 MHz - 200 MHz (Biconical antenna) / 200 MHz - 1000 MHz (Logperiodic antenna)  
1000 MHz - 2000 MHz (Horn antenna)  
Test distance : 3 m  
EUT position : Table top  
EUT operation mode : See Clause 4.1

### **5.4 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 1 GHz	Above 1 GHz *1)
Instrument used	Test Receiver	Spectrum Analyzer
IF Bandwidth	QP: BW 120 kHz	PK: RBW: 1 MHz / VBW: 3 MHz AV *2): RBW: 1 MHz / VBW: 10 Hz

\*1) The measurement data was adjusted to a 3 m distance using the following Distance Factor.

Distance Factor:  $20 \times \log(3.4 \text{ m} / 3 \text{ m}) = 1.09 \text{ dB}$

\*2) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

### **5.5 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: August 20, 2018  
August 21, 2018

Test engineer:

Toshifumi Yoneshige  
Takumi Shimada

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## **SECTION 6: Antenna Terminal**

### **6.1 Operating environment**

Test place : No.2 semi anechoic chamber  
Temperature : See data  
Humidity : See data

### **6.2 Test configuration**

EUT was placed on a wooden table of nominal size, 1.0 m by 1.5 m, raised 0.8 m from the ground.

### **6.3 Test conditions**

Frequency range : 30 MHz - 1000 MHz / 1000 MHz - 2000 MHz  
Test distance : N / A  
EUT position : Table top  
EUT operation mode : See Clause 4.1

### **6.4 Test procedure**

The Antenna Terminal was measured with a spectrum analyzer connected to the antenna port.

Frequency	Below 1 GHz	Above 1 GHz
Instrument used	Spectrum Analyzer	Spectrum Analyzer
IF Bandwidth	PK: RBW: 100 kHz / VBW: 300 kHz	PK: RBW: 1 MHz / VBW: 3 MHz

### **6.5 Test result**

Summary of the test results: Pass

Date: August 21, 2018

Test engineer:

Takumi Shimada

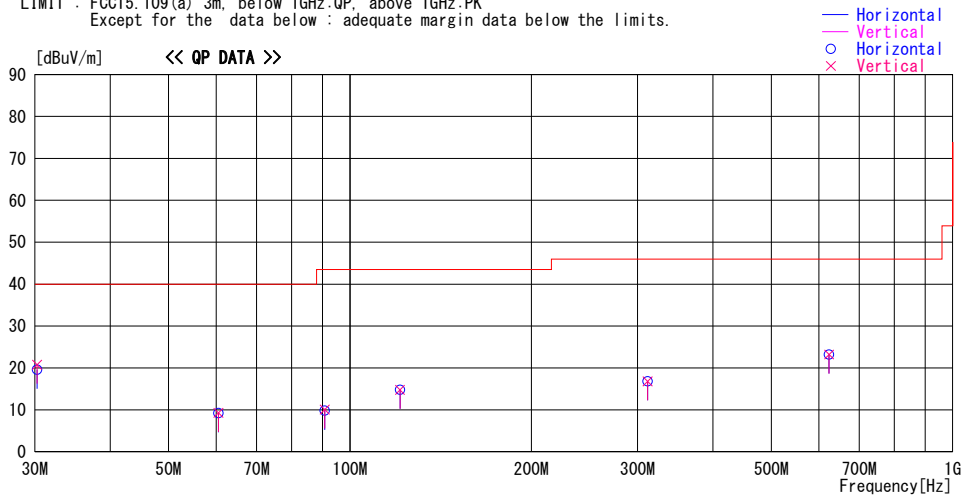
**APPENDIX 1: Test data**

**Radiated Emission**

**RKES(312.10 MHz) Variation No.2 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 20, 2018  
Temperature / Humidity 23 deg. C / 51 % RH  
Engineer Toshifumi Yoneshige  
(Below 1GHz)  
Mode Mode 1

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK  
Except for the data below : adequate margin data below the limits.



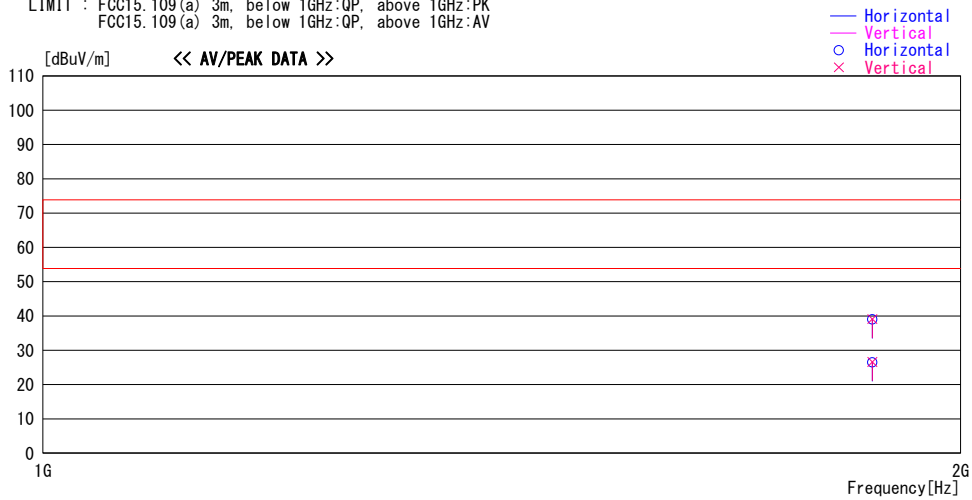
Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
30.265	25.0	QP	18.4	-23.8	19.6	0	300	Hor i.	40.0	20.4	
30.265	26.2	QP	18.4	-23.8	20.8	0	100	Vert.	40.0	19.2	
60.528	24.6	QP	7.9	-23.3	9.2	0	300	Hor i.	40.0	30.8	
60.528	24.7	QP	7.9	-23.3	9.3	0	100	Vert.	40.0	30.7	
90.792	24.5	QP	8.2	-22.9	9.8	0	300	Hor i.	43.5	33.7	
90.792	24.8	QP	8.2	-22.9	10.1	0	100	Vert.	43.5	33.4	
121.056	24.2	QP	13.1	-22.5	14.8	0	300	Hor i.	43.5	28.7	
121.056	24.2	QP	13.1	-22.5	14.8	0	100	Vert.	43.5	28.7	
311.820	23.3	QP	13.8	-20.3	16.8	0	100	Hor i.	46.0	29.2	
311.820	23.3	QP	13.8	-20.3	16.8	0	100	Vert.	46.0	29.2	
623.640	23.2	QP	19.3	-19.3	23.2	0	100	Hor i.	46.0	22.8	
623.640	23.2	QP	19.3	-19.3	23.2	0	100	Vert.	46.0	22.8	

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 + ATT - GAIN(AMP))

**Radiated Emission**  
**RKES(312.10 MHz) Variation No.2 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Above 1GHz)  
Mode Mode 1

LIMIT : FCC15.109 (a) 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.109 (a) 3m, below 1GHz:QP, above 1GHz:AV



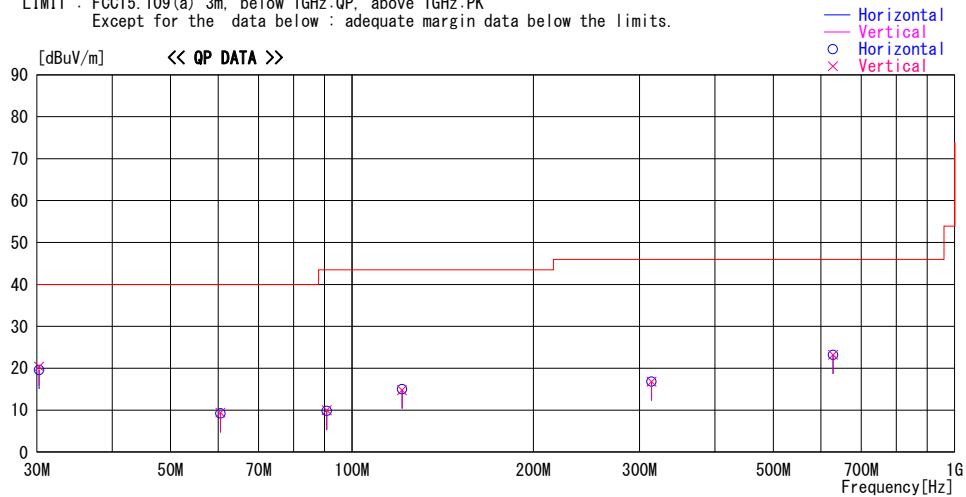
Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
1870.920	44.7	PK	25.6	-31.3	39.0	0	100	Hori.	73.9	34.9	
1870.920	44.8	PK	25.6	-31.3	39.1	0	100	Vert.	73.9	34.8	
1870.920	32.2	AV	25.6	-31.3	26.5	0	100	Hori.	53.9	27.4	
1870.920	32.3	AV	25.6	-31.3	26.6	0	100	Vert.	53.9	27.3	

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)

**Radiated Emission**  
**RKES(314.35 MHz) Variation No.2 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 20, 2018  
Temperature / Humidity 23 deg. C / 51 % RH  
Engineer Toshifumi Yoneshige  
(Below 1GHz)  
Mode Mode 2

LIMIT : FCC15.109(a) 3m. below 1GHz:QP, above 1GHz:PK  
Except for the data below : adequate margin data below the limits.



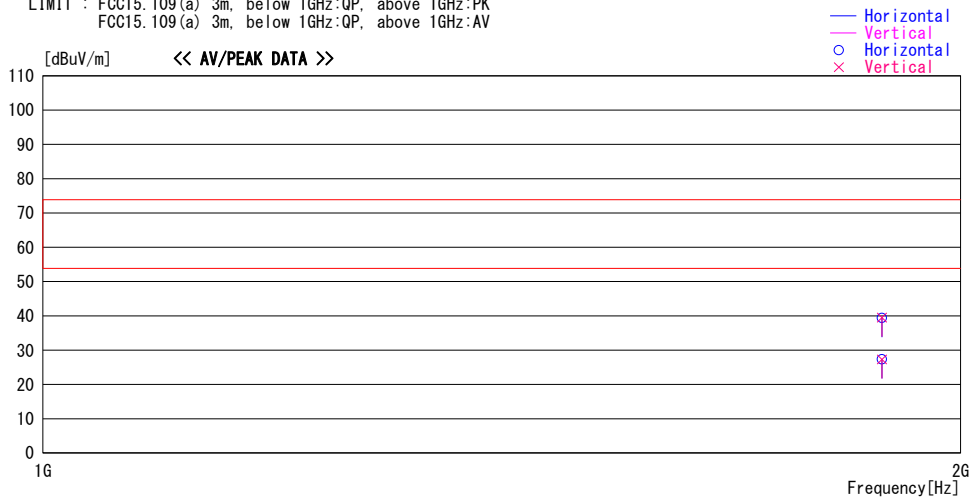
Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
30.265	25.0	QP	18.4	-23.8	19.6	0	300	Hori.	40.0	20.4	
30.265	25.8	QP	18.4	-23.8	20.4	0	100	Vert.	40.0	19.6	
60.528	24.6	QP	7.9	-23.3	9.2	0	300	Hori.	40.0	30.8	
60.528	24.8	QP	7.9	-23.3	9.4	0	100	Vert.	40.0	30.6	
90.792	24.5	QP	8.2	-22.9	9.8	0	300	Hori.	43.5	33.7	
90.792	24.7	QP	8.2	-22.9	10.0	0	100	Vert.	43.5	33.5	
121.056	24.4	QP	13.1	-22.5	15.0	0	300	Hori.	43.5	28.5	
121.056	24.2	QP	13.1	-22.5	14.8	0	100	Vert.	43.5	28.7	
314.070	23.3	QP	13.8	-20.3	16.8	0	100	Hori.	46.0	29.2	
314.070	23.3	QP	13.8	-20.3	16.8	0	100	Vert.	46.0	29.2	
628.140	23.2	QP	19.3	-19.3	23.2	0	100	Hori.	46.0	22.8	
628.140	23.2	QP	19.3	-19.3	23.2	0	100	Vert.	46.0	22.8	

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 + ATT - GAIN(AMP))

**Radiated Emission**  
**RKES(314.35 MHz) Variation No.2 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Above 1GHz)  
Mode Mode 2

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.109(a) 3m, 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]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
1884.420	45.0	PK	25.7	-31.3	39.4	0	100	Hori.	73.9	34.5	
1884.420	45.1	PK	25.7	-31.3	39.5	0	100	Vert.	73.9	34.4	
1884.420	32.9	AV	25.7	-31.3	27.3	0	100	Hori.	53.9	26.6	
1884.420	32.9	AV	25.7	-31.3	27.3	0	100	Vert.	53.9	26.6	

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

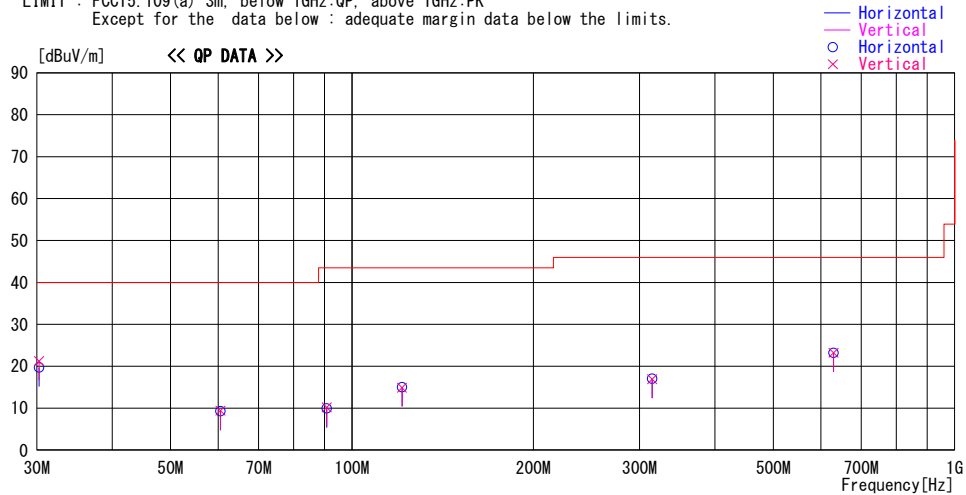
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

**Radiated Emission**  
TPMS(314.98 MHz) Variation No.2 Internal Antenna

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 20, 2018  
Temperature / Humidity 23 deg. C / 51 % RH  
Engineer Toshifumi Yoneshige  
(Below 1GHz)  
Mode Mode 3

LIMIT : FCC15.109(a) 3m. below 1GHz:QP, above 1GHz:PK  
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
30.265	25.1	QP	18.4	-23.8	19.7	0	300	Hori.	40.0	20.3	
30.265	26.6	QP	18.4	-23.8	21.2	0	100	Vert.	40.0	18.8	
60.528	24.7	QP	7.9	-23.3	9.3	0	300	Hori.	40.0	30.7	
60.528	24.8	QP	7.9	-23.3	9.4	0	100	Vert.	40.0	30.6	
90.792	24.6	QP	8.2	-22.9	9.9	0	300	Hori.	43.5	33.6	
90.792	24.9	QP	8.2	-22.9	10.2	0	100	Vert.	43.5	33.3	
121.056	24.4	QP	13.1	-22.5	15.0	0	300	Hori.	43.5	28.5	
121.056	24.3	QP	13.1	-22.5	14.9	0	100	Vert.	43.5	28.6	
314.700	23.4	QP	13.9	-20.3	17.0	0	100	Hori.	46.0	29.0	
314.700	23.3	QP	13.9	-20.3	16.9	0	100	Vert.	46.0	29.1	
629.400	23.2	QP	19.3	-19.3	23.2	0	100	Hori.	46.0	22.8	
629.400	23.2	QP	19.3	-19.3	23.2	0	100	Vert.	46.0	22.8	

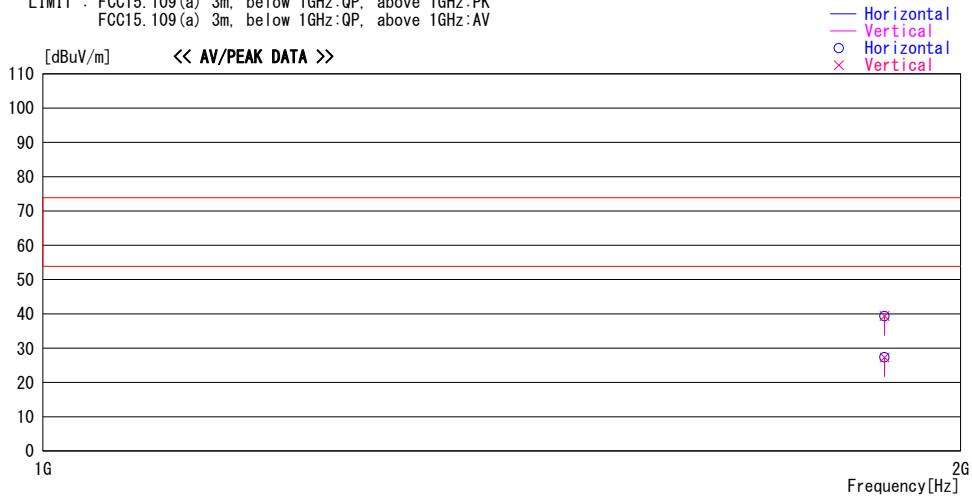
CHART: WITH FACTOR

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 + ATT - GAIN(AMP))

**Radiated Emission**  
TPMS(314.98 MHz) Variation No.2 Internal Antenna

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Above 1GHz)  
Mode Mode 3

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.109(a) 3m, 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]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
1888.200	44.8	PK	25.8	-31.3	39.3	0	100	Hori.	73.9	34.6	
1888.200	44.9	PK	25.8	-31.3	39.4	0	100	Vert.	73.9	34.5	
1888.200	32.8	AV	25.8	-31.3	27.3	0	100	Hori.	53.9	26.6	
1888.200	32.8	AV	25.8	-31.3	27.3	0	100	Vert.	53.9	26.6	

CHART: WITH FACTOR

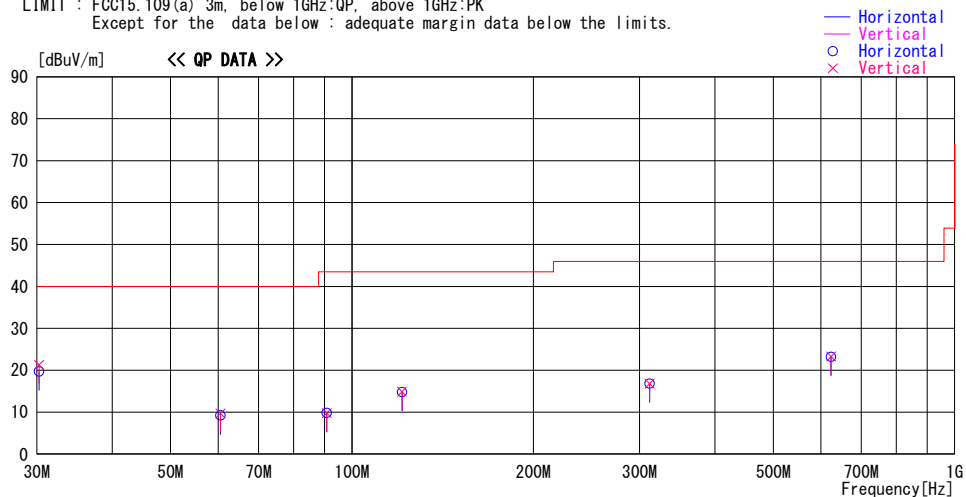
ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN  
CALCULATION: RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE - GAIN(AMP) + D-factor)



**Radiated Emission**  
**RKES(312.10 MHz) Variation No.3 External Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 20, 2018  
Temperature / Humidity 23 deg. C / 51 % RH  
Engineer Toshifumi Yoneshige  
(Below 1GHz)  
Mode Mode 1

LIMIT : FCC15.109(a) 3m. below 1GHz:QP, above 1GHz:PK  
Except for the data below : adequate margin data below the limits.



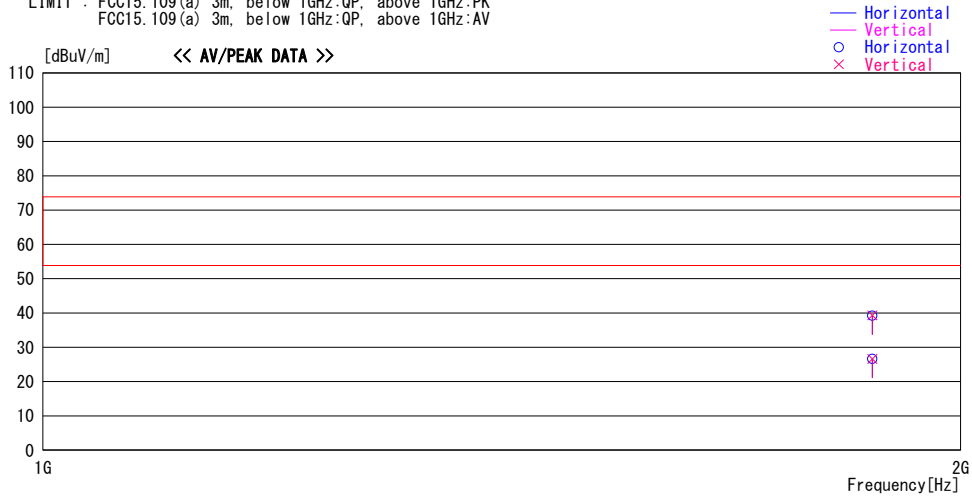
Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
30.265	25.1	QP	18.4	-23.8	19.7	0	300	Hori.	40.0	20.3	
30.265	26.7	QP	18.4	-23.8	21.3	0	100	Vert.	40.0	18.7	
60.528	24.6	QP	7.9	-23.3	9.2	0	300	Hori.	40.0	30.8	
60.528	25.1	QP	7.9	-23.3	9.7	0	100	Vert.	40.0	30.3	
90.792	24.5	QP	8.2	-22.9	9.8	0	300	Hori.	43.5	33.7	
90.792	24.5	QP	8.2	-22.9	9.8	0	100	Vert.	43.5	33.7	
121.056	24.2	QP	13.1	-22.5	14.8	0	300	Hori.	43.5	28.7	
121.056	24.3	QP	13.1	-22.5	14.9	0	100	Vert.	43.5	28.6	
311.820	23.3	QP	13.8	-20.3	16.8	0	100	Hori.	46.0	29.2	
311.820	23.3	QP	13.8	-20.3	16.8	0	100	Vert.	46.0	29.2	
623.640	23.2	QP	19.3	-19.3	23.2	0	100	Hori.	46.0	22.8	
623.640	23.3	QP	19.3	-19.3	23.3	0	100	Vert.	46.0	22.7	

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 + ATT - GAIN(AMP))

**Radiated Emission**  
**RKES(312.10 MHz) Variation No.3 External Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Above 1GHz)  
Mode Mode 1

LIMIT : FCC15.109 (a) 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.109 (a) 3m, below 1GHz:QP, above 1GHz:AV



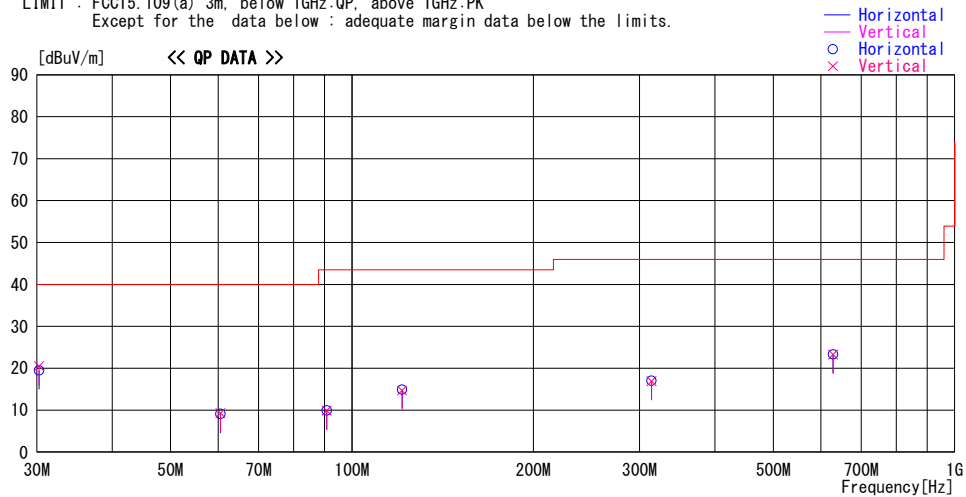
Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
1870.920	44.9	PK	25.6	-31.3	39.2	0	100	Hori.	73.9	34.7	
1870.920	45.0	PK	25.6	-31.3	39.3	0	100	Vert.	73.9	34.6	
1870.920	32.3	AV	25.6	-31.3	26.6	0	100	Hori.	53.9	27.3	
1870.920	32.3	AV	25.6	-31.3	26.6	0	100	Vert.	53.9	27.3	

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)

**Radiated Emission**  
**RKES(314.35 MHz) Variation No.3 External Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 20, 2018  
Temperature / Humidity 23 deg. C / 51 % RH  
Engineer Toshifumi Yoneshige  
(Below 1GHz)  
Mode Mode 2

LIMIT : FCC15.109(a) 3m. below 1GHz:QP, above 1GHz:PK  
Except for the data below : adequate margin data below the limits.



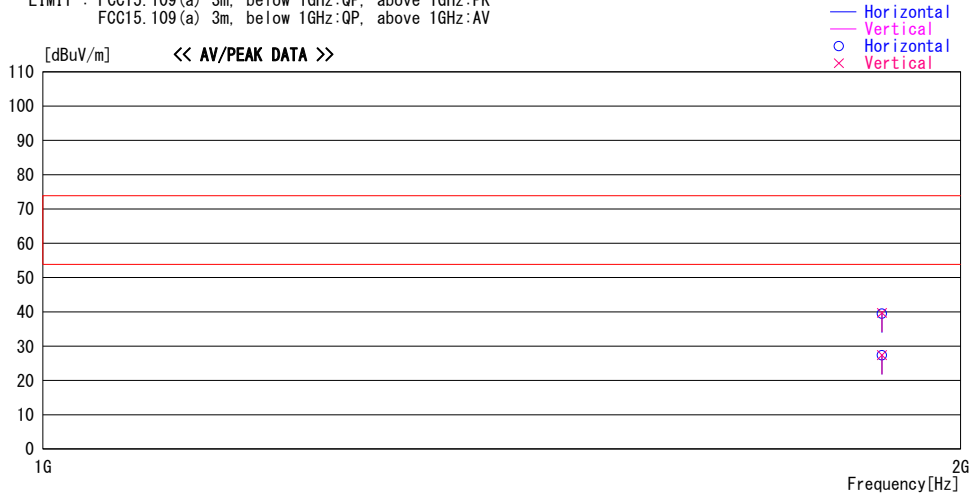
Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
30.265	24.9	QP	18.4	-23.8	19.5	0	300	Hori.	40.0	20.5	
30.265	25.9	QP	18.4	-23.8	20.5	0	100	Vert.	40.0	19.5	
60.528	24.5	QP	7.9	-23.3	9.1	0	300	Hori.	40.0	30.9	
60.528	24.7	QP	7.9	-23.3	9.3	0	100	Vert.	40.0	30.7	
90.792	24.6	QP	8.2	-22.9	9.9	0	300	Hori.	43.5	33.6	
90.792	24.6	QP	8.2	-22.9	9.9	0	100	Vert.	43.5	33.6	
121.056	24.3	QP	13.1	-22.5	14.9	0	300	Hori.	43.5	28.6	
121.056	24.1	QP	13.1	-22.5	14.7	0	100	Vert.	43.5	28.8	
314.070	23.5	QP	13.8	-20.3	17.0	0	100	Hori.	46.0	29.0	
314.070	23.4	QP	13.8	-20.3	16.9	0	100	Vert.	46.0	29.1	
628.140	23.3	QP	19.3	-19.3	23.3	0	100	Hori.	46.0	22.7	
628.140	23.3	QP	19.3	-19.3	23.3	0	100	Vert.	46.0	22.7	

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 + ATT - GAIN(AMP))

**Radiated Emission**  
**RKES(314.35 MHz) Variation No.3 External Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Above 1GHz)  
Mode Mode 2

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



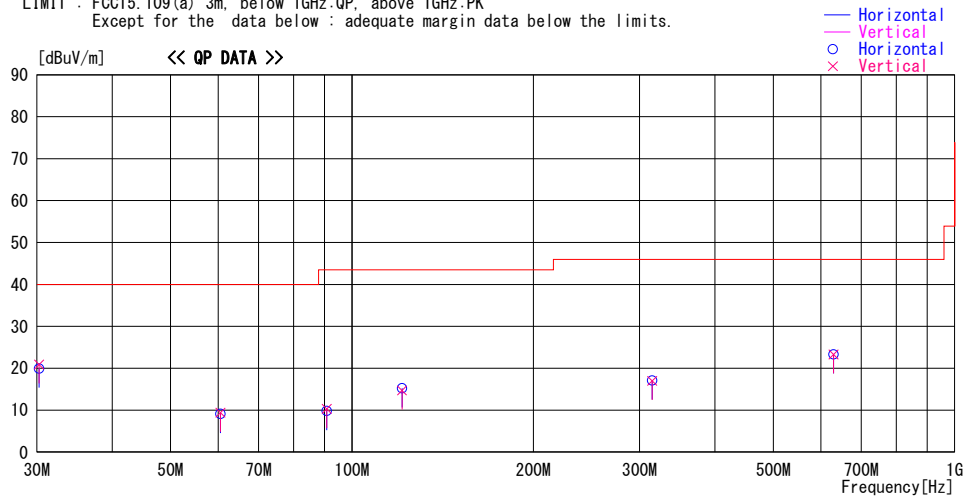
Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
1884.420	45.1	PK	25.7	-31.3	39.5	0	100	Hori.	73.9	34.4	
1884.420	45.3	PK	25.7	-31.3	39.7	0	100	Vert.	73.9	34.2	
1884.420	32.9	AV	25.7	-31.3	27.3	0	100	Hori.	53.9	26.6	
1884.420	33.0	AV	25.7	-31.3	27.4	0	100	Vert.	53.9	26.5	

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)

**Radiated Emission**  
TPMS(314.98 MHz) Variation No.3 External Antenna

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 20, 2018  
Temperature / Humidity 23 deg. C / 51 % RH  
Engineer Toshifumi Yoneshige  
(Below 1GHz)  
Mode Mode 3

LIMIT : FCC15.109(a) 3m. below 1GHz:QP, above 1GHz:PK  
Except for the data below : adequate margin data below the limits.



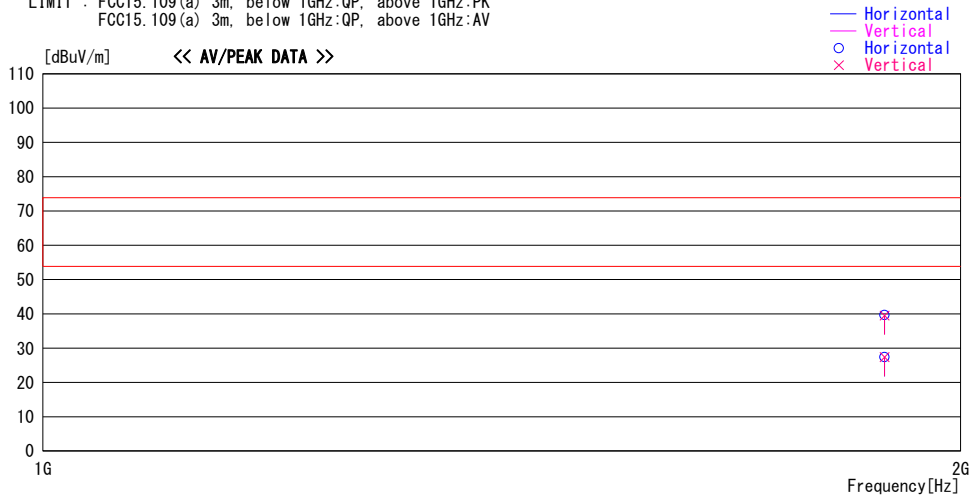
Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
30.265	25.3	QP	18.4	-23.8	19.9	0	300	Hori.	40.0	20.1	
30.265	26.3	QP	18.4	-23.8	20.9	0	100	Vert.	40.0	19.1	
60.528	24.5	QP	7.9	-23.3	9.1	0	300	Hori.	40.0	30.9	
60.528	24.8	QP	7.9	-23.3	9.4	0	100	Vert.	40.0	30.6	
90.792	24.5	QP	8.2	-22.9	9.8	0	300	Hori.	43.5	33.7	
90.792	25.0	QP	8.2	-22.9	10.3	0	100	Vert.	43.5	33.2	
121.056	24.6	QP	13.1	-22.5	15.2	0	300	Hori.	43.5	28.3	
121.056	24.1	QP	13.1	-22.5	14.7	0	100	Vert.	43.5	28.8	
314.700	23.5	QP	13.9	-20.3	17.1	0	100	Hori.	46.0	28.9	
314.700	23.4	QP	13.9	-20.3	17.0	0	100	Vert.	46.0	29.0	
629.400	23.3	QP	19.3	-19.3	23.3	0	100	Hori.	46.0	22.7	
629.400	23.3	QP	19.3	-19.3	23.3	0	100	Vert.	46.0	22.7	

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 + ATT - GAIN(AMP))

**Radiated Emission**  
TPMS(314.98 MHz) Variation No.3 External Antenna

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Above 1GHz)  
Mode Mode 3

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.109(a) 3m, 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]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
1888.200	45.2	PK	25.8	-31.3	39.7	0	100	Hori.	73.9	34.2	
1888.200	45.0	PK	25.8	-31.3	39.5	0	100	Vert.	73.9	34.4	
1888.200	32.9	AV	25.8	-31.3	27.4	0	100	Hori.	53.9	26.5	
1888.200	32.9	AV	25.8	-31.3	27.4	0	100	Vert.	53.9	26.5	

CHART: WITH FACTOR

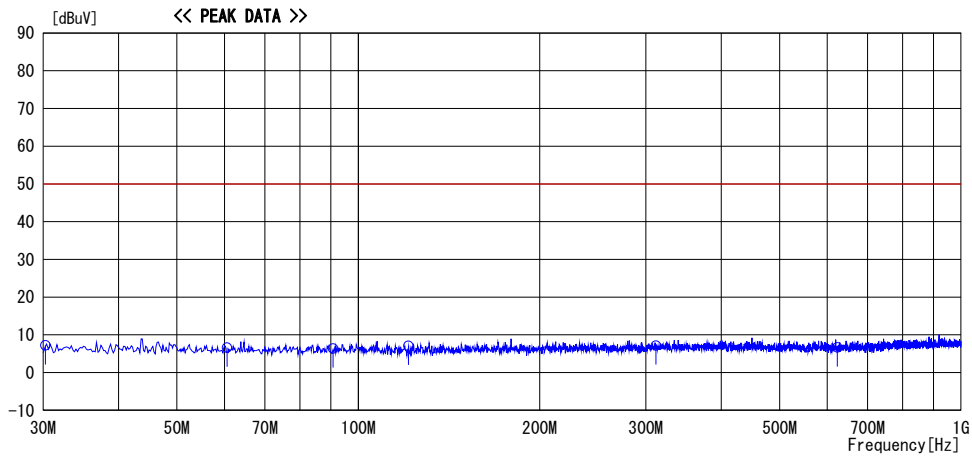
ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN  
CALCULATION: RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE - GAIN(AMP) + D-factor)

**Antenna Terminal Conducted Emission**  
**RKES(312.10 MHz) Variation No.3 External Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Below 1GHz)  
Mode Mode 1

LIMIT : FCC15.111 Antenna terminal measurement  
Except for the data below : adequate margin data below the limits.

— Horizontal



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV]	Polar.	Limit *1) [dBuV]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]					
30.265	31.7	PK	0.0	-24.5	7.2	-	50.0	42.8	
60.530	30.9	PK	0.0	-24.3	6.6	-	50.0	43.4	
90.795	30.6	PK	0.0	-24.2	6.4	-	50.0	43.6	
121.060	31.1	PK	0.0	-24.0	7.1	-	50.0	42.9	
311.820	30.1	PK	0.0	-23.0	7.1	-	50.0	42.9	
623.640	29.7	PK	0.0	-23.1	6.6	-	50.0	43.4	

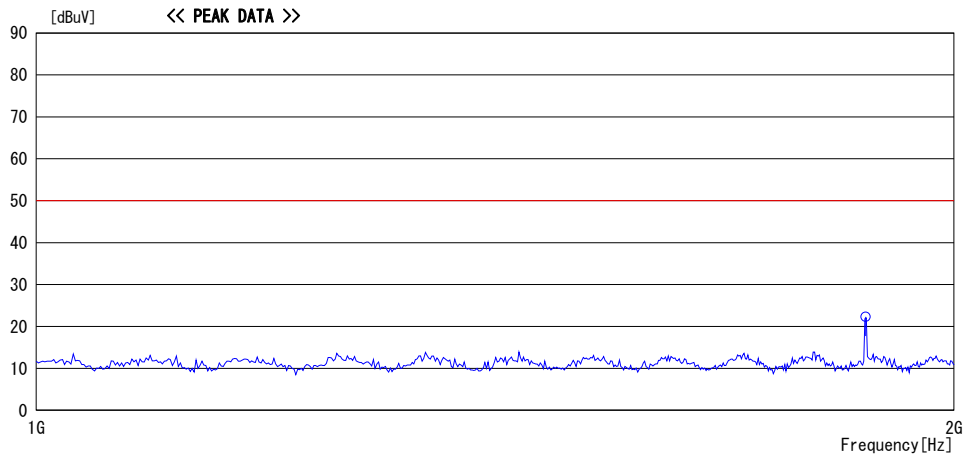
\*1) 2nW = -57dBm = 50dBuV

CHART: WITH FACTOR  
CALCULATION: RESULT = READING + LOSS & GAIN (CABLE - GAIN(AMP))

**Antenna Terminal Conducted Emission**  
**RKES(312.10 MHz) Variation No.3 External Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Above 1GHz)  
Mode Mode 1

LIMIT : FCC15.111 Antenna terminal measurement  
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV]	Polar.	Limit *1) [dBuV]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]					
1870.920	54.7	PK	0.0	-32.4	22.3	-	50.0	27.7	

\*1) 2nW = -57dBm = 50dBuV

CHART: WITH FACTOR  
CALCULATION: RESULT = READING + LOSS & GAIN (CABLE - GAIN(AMP))

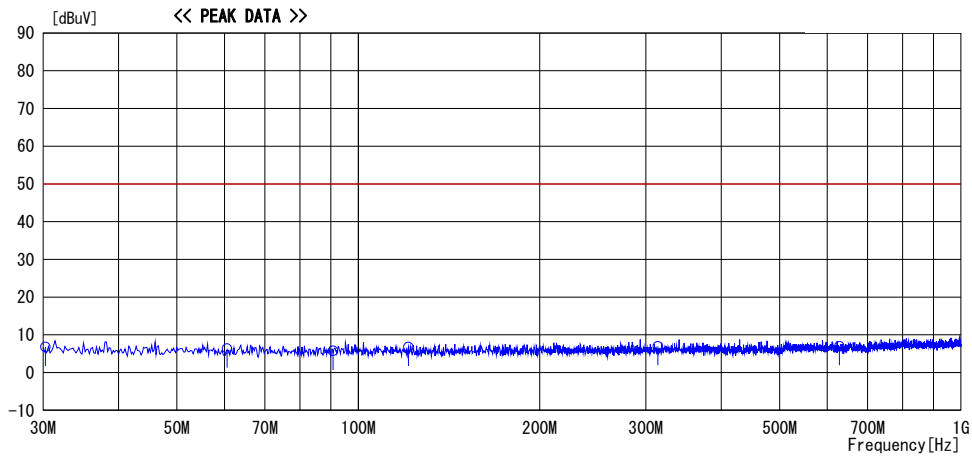


**Antenna Terminal Conducted Emission**  
**RKES(314.35 MHz) Variation No.3 External Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Below 1GHz)  
Mode Mode 2

LIMIT : FCC15.111 Antenna terminal measurement  
Except for the data below : adequate margin data below the limits.

— Horizontal



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV]	Polar.	Limit *1) [dBuV]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]					
30.265	31.3	PK	0.0	-24.5	6.8	-	50.0	43.2	
60.530	30.7	PK	0.0	-24.3	6.4	-	50.0	43.6	
90.795	29.9	PK	0.0	-24.2	5.7	-	50.0	44.3	
121.060	30.8	PK	0.0	-24.0	6.8	-	50.0	43.2	
314.070	30.0	PK	0.0	-23.0	7.0	-	50.0	43.0	
628.140	30.1	PK	0.0	-23.1	7.0	-	50.0	43.0	

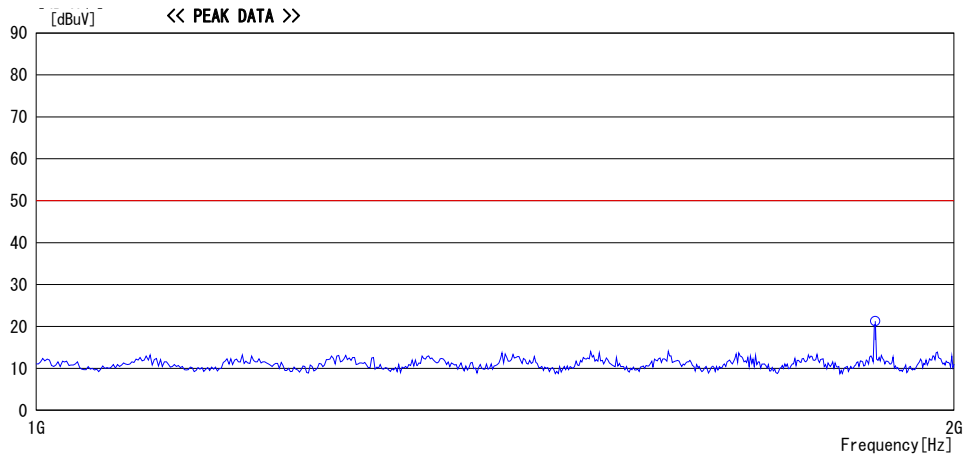
\*1) 2nW = -57dBm = 50dBuV

CHART: WITH FACTOR  
CALCULATION: RESULT = READING + LOSS & GAIN (CABLE - GAIN(AMP))

**Antenna Terminal Conducted Emission**  
**RKES(314.35 MHz) Variation No.3 External Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Above 1GHz)  
Mode Mode 2

LIMIT : FCC15.111 Antenna terminal measurement  
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV]	Polar.	Limit *1) [dBuV]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]					
1884.420	53.7	PK	0.0	-32.4	21.3	-	50.0	28.7	

\*1) 2nW = -57dBm = 50dBuV

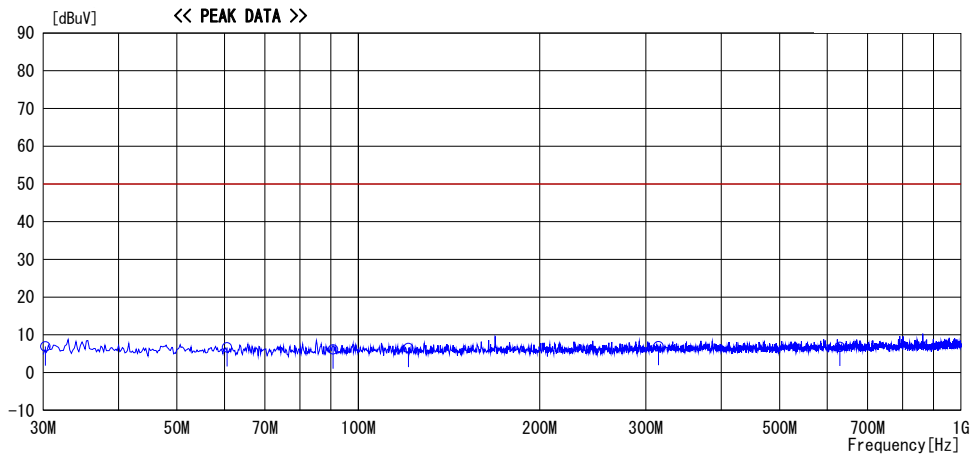
CHART: WITH FACTOR  
CALCULATION: RESULT = READING + LOSS & GAIN (CABLE - GAIN(AMP))

**Antenna Terminal Conducted Emission**  
TPMS(314.98 MHz) Variation No.3 External Antenna

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Below 1GHz)  
Mode Mode 3

LIMIT : FCC15.111 Antenna terminal measurement  
Except for the data below : adequate margin data below the limits.

— Horizontal



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV]	Polar.	Limit *1) [dBuV]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]					
30.265	31.4	PK	0.0	-24.5	6.9	-	50.0	43.1	
60.530	31.0	PK	0.0	-24.3	6.7	-	50.0	43.3	
90.795	30.3	PK	0.0	-24.2	6.1	-	50.0	43.9	
121.060	30.5	PK	0.0	-24.0	6.5	-	50.0	43.5	
314.700	30.0	PK	0.0	-23.0	7.0	-	50.0	43.0	
629.400	29.9	PK	0.0	-23.1	6.8	-	50.0	43.2	

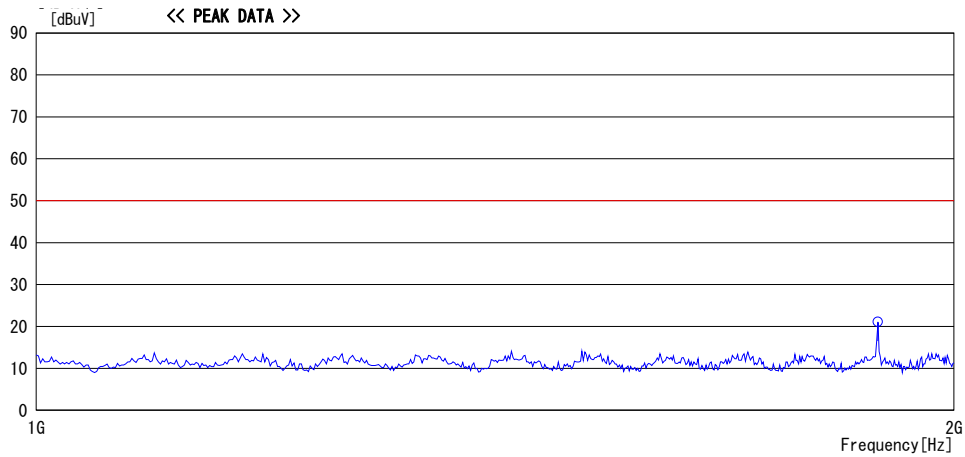
\*1) 2nW = -57dBm = 50dBuV

CHART: WITH FACTOR  
CALCULATION: RESULT = READING + LOSS & GAIN (CABLE - GAIN(AMP))

**Antenna Terminal Conducted Emission**  
TPMS(314.98 MHz) Variation No.3 External Antenna

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Above 1GHz)  
Mode Mode 3

LIMIT : FCC15.111 Antenna terminal measurement  
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV]	Polar.	Limit *1) [dBuV]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]					
1888.200	53.5	PK	0.0	-32.4	21.1	-	50.0	28.9	

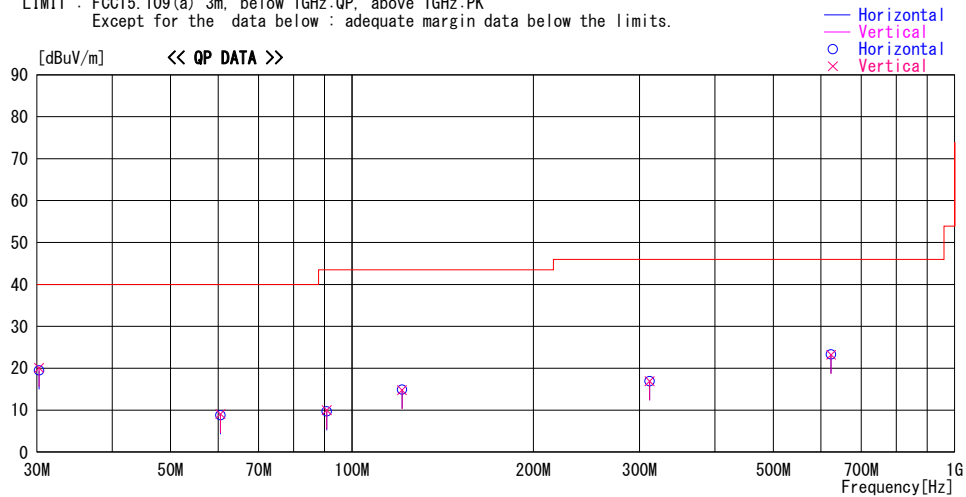
\*1) 2nW = -57dBm = 50dBuV

CHART: WITH FACTOR  
CALCULATION: RESULT = READING + LOSS & GAIN (CABLE - GAIN(AMP))

**Radiated Emission (Reference data)**  
**RKES(312.10 MHz) Variation No.5 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 20, 2018  
Temperature / Humidity 23 deg. C / 51 % RH  
Engineer Toshifumi Yoneshige  
(Below 1GHz)  
Mode Mode 1

LIMIT : FCC15.109(a) 3m. below 1GHz:QP, above 1GHz:PK  
Except for the data below : adequate margin data below the limits.



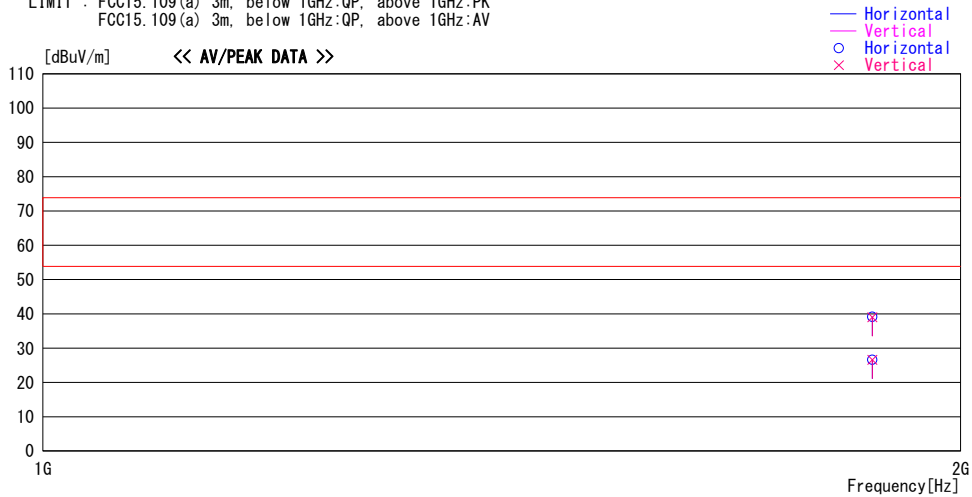
Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
30.265	24.9	QP	18.4	-23.8	19.5	0	300	Hori.	40.0	20.5	
30.265	25.5	QP	18.4	-23.8	20.1	0	100	Vert.	40.0	19.9	
60.528	24.2	QP	7.9	-23.3	8.8	0	300	Hori.	40.0	31.2	
60.528	24.5	QP	7.9	-23.3	9.1	0	100	Vert.	40.0	30.9	
90.792	24.4	QP	8.2	-22.9	9.7	0	300	Hori.	43.5	33.8	
90.792	24.7	QP	8.2	-22.9	10.0	0	100	Vert.	43.5	33.5	
121.056	24.3	QP	13.1	-22.5	14.9	0	300	Hori.	43.5	28.6	
121.056	24.2	QP	13.1	-22.5	14.8	0	100	Vert.	43.5	28.7	
311.820	23.4	QP	13.8	-20.3	16.9	0	100	Hori.	46.0	29.1	
311.820	23.4	QP	13.8	-20.3	16.9	0	100	Vert.	46.0	29.1	
623.640	23.3	QP	19.3	-19.3	23.3	0	100	Hori.	46.0	22.7	
623.640	23.2	QP	19.3	-19.3	23.2	0	100	Vert.	46.0	22.8	

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 + ATT - GAIN(AMP))

**Radiated Emission (Reference data)**  
**RKES(312.10 MHz) Variation No.5 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Above 1GHz)  
Mode Mode 1

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.109(a) 3m, 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]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
1870.920	44.8	PK	25.6	-31.3	39.1	0	100	Hori.	73.9	34.8	
1870.920	44.7	PK	25.6	-31.3	39.0	0	100	Vert.	73.9	34.9	
1870.920	32.3	AV	25.6	-31.3	26.6	0	100	Hori.	53.9	27.3	
1870.920	32.3	AV	25.6	-31.3	26.6	0	100	Vert.	53.9	27.3	

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.**

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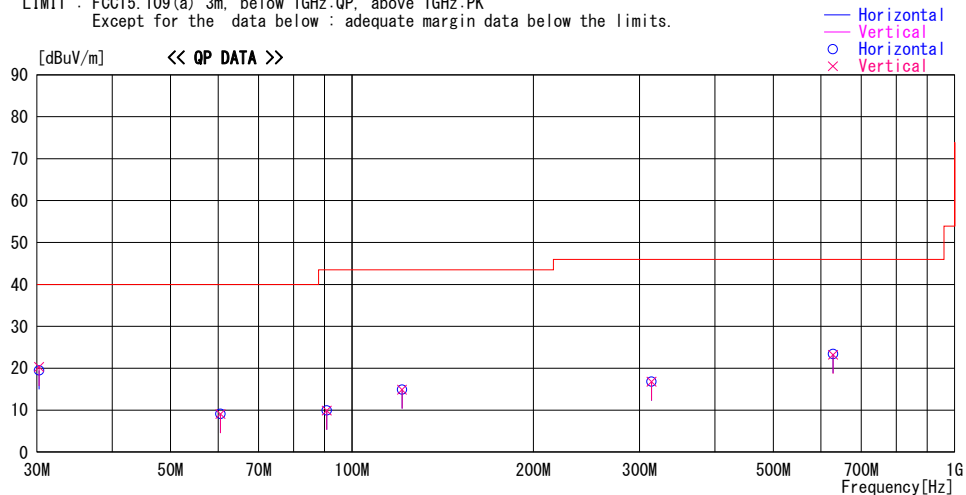
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

**Radiated Emission (Reference data)**  
**RKES(314.35 MHz) Variation No.5 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 20, 2018  
Temperature / Humidity 23 deg. C / 51 % RH  
Engineer Toshifumi Yoneshige  
(Below 1GHz)  
Mode Mode 2

LIMIT : FCC15.109(a) 3m. below 1GHz:QP, above 1GHz:PK  
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
30.265	24.9	QP	18.4	-23.8	19.5	0	300	Hori.	40.0	20.5	
30.265	25.7	QP	18.4	-23.8	20.3	0	100	Vert.	40.0	19.7	
60.528	24.5	QP	7.9	-23.3	9.1	0	300	Hori.	40.0	30.9	
60.528	24.5	QP	7.9	-23.3	9.1	0	100	Vert.	40.0	30.9	
90.792	24.6	QP	8.2	-22.9	9.9	0	300	Hori.	43.5	33.6	
90.792	24.6	QP	8.2	-22.9	9.9	0	100	Vert.	43.5	33.6	
121.056	24.3	QP	13.1	-22.5	14.9	0	300	Hori.	43.5	28.6	
121.056	24.3	QP	13.1	-22.5	14.9	0	100	Vert.	43.5	28.6	
314.070	23.3	QP	13.8	-20.3	16.8	0	100	Hori.	46.0	29.2	
314.070	23.3	QP	13.8	-20.3	16.8	0	100	Vert.	46.0	29.2	
628.140	23.4	QP	19.3	-19.3	23.4	0	100	Hori.	46.0	22.6	
628.140	23.2	QP	19.3	-19.3	23.2	0	100	Vert.	46.0	22.8	

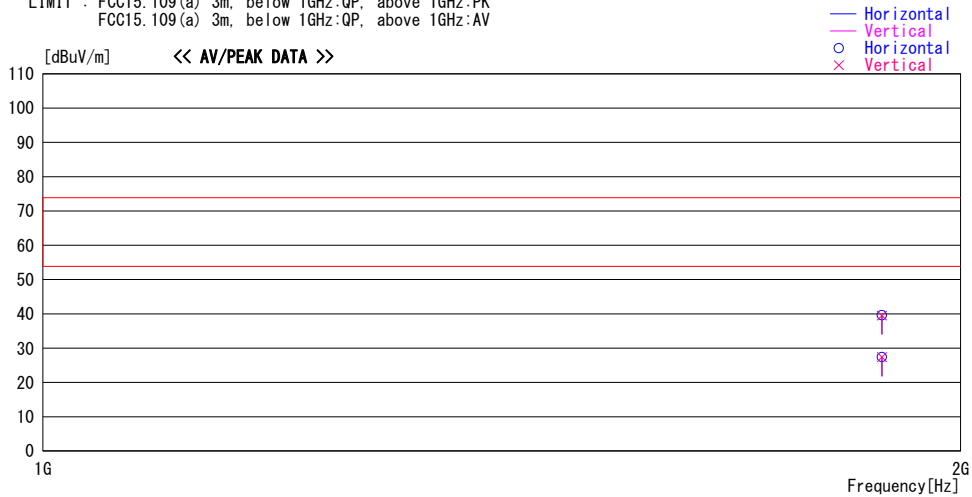
CHART: WITH FACTOR

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 + ATT - GAIN(AMP))

**Radiated Emission (Reference data)**  
**RKES(314.35 MHz) Variation No.5 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Above 1GHz)  
Mode Mode 2

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.109(a) 3m, 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]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
1884.420	45.2	PK	25.7	-31.3	39.6	0	100	Hori.	73.9	34.3	
1884.420	45.1	PK	25.7	-31.3	39.5	0	100	Vert.	73.9	34.4	
1884.420	33.0	AV	25.7	-31.3	27.4	0	100	Hori.	53.9	26.5	
1884.420	33.0	AV	25.7	-31.3	27.4	0	100	Vert.	53.9	26.5	

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.**

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Telephone : +81 596 24 8999

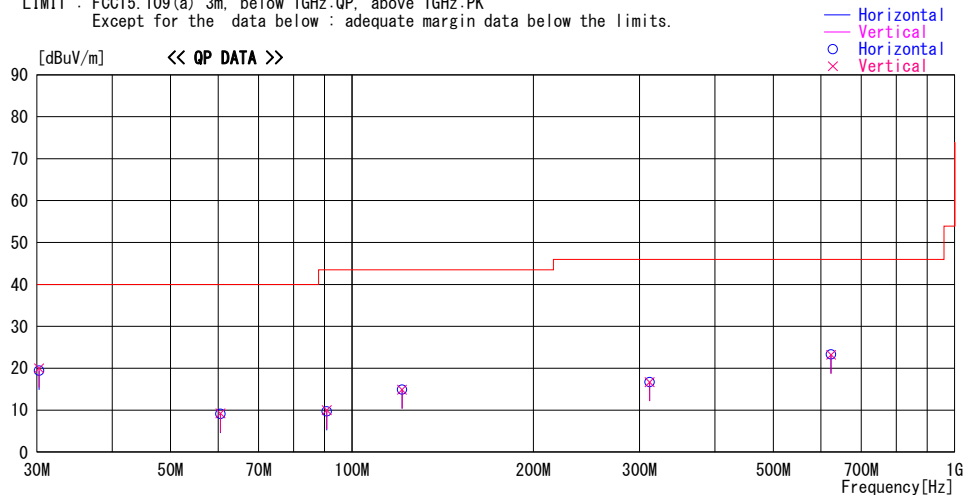
Facsimile : +81 596 24 8124



**Radiated Emission (Reference data)**  
**RKES(312.10 MHz) Variation No.8 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 20, 2018  
Temperature / Humidity 23 deg. C / 51 % RH  
Engineer Toshifumi Yoneshige  
(Below 1GHz)  
Mode Mode 1

LIMIT : FCC15.109(a) 3m. below 1GHz:QP, above 1GHz:PK  
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
30.265	24.8	QP	18.4	-23.8	19.4	0	300	Hori.	40.0	20.6	
30.265	25.4	QP	18.4	-23.8	20.0	0	100	Vert.	40.0	20.0	
60.528	24.5	QP	7.9	-23.3	9.1	0	300	Hori.	40.0	30.9	
60.528	24.6	QP	7.9	-23.3	9.2	0	100	Vert.	40.0	30.8	
90.792	24.4	QP	8.2	-22.9	9.7	0	300	Hori.	43.5	33.8	
90.792	24.7	QP	8.2	-22.9	10.0	0	100	Vert.	43.5	33.5	
121.056	24.3	QP	13.1	-22.5	14.9	0	300	Hori.	43.5	28.6	
121.056	24.3	QP	13.1	-22.5	14.9	0	100	Vert.	43.5	28.6	
311.820	23.2	QP	13.8	-20.3	16.7	0	100	Hori.	46.0	29.3	
311.820	23.2	QP	13.8	-20.3	16.7	0	100	Vert.	46.0	29.3	
623.640	23.3	QP	19.3	-19.3	23.3	0	100	Hori.	46.0	22.7	
623.640	23.2	QP	19.3	-19.3	23.2	0	100	Vert.	46.0	22.8	

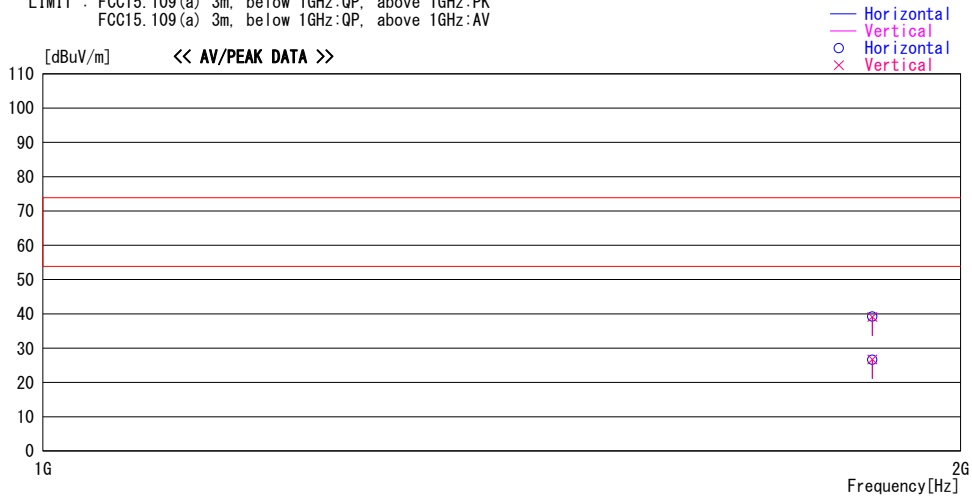
CHART: WITH FACTOR

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 + ATT - GAIN(AMP))

**Radiated Emission (Reference data)**  
**RKES(312.10 MHz) Variation No.8 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Above 1GHz)  
Mode Mode 1

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.109(a) 3m, 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]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
1870.920	44.9	PK	25.6	-31.3	39.2	0	100	Hori.	73.9	34.7	
1870.920	44.8	PK	25.6	-31.3	39.1	0	100	Vert.	73.9	34.8	
1870.920	32.3	AV	25.6	-31.3	26.6	0	100	Hori.	53.9	27.3	
1870.920	32.4	AV	25.6	-31.3	26.7	0	100	Vert.	53.9	27.2	

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

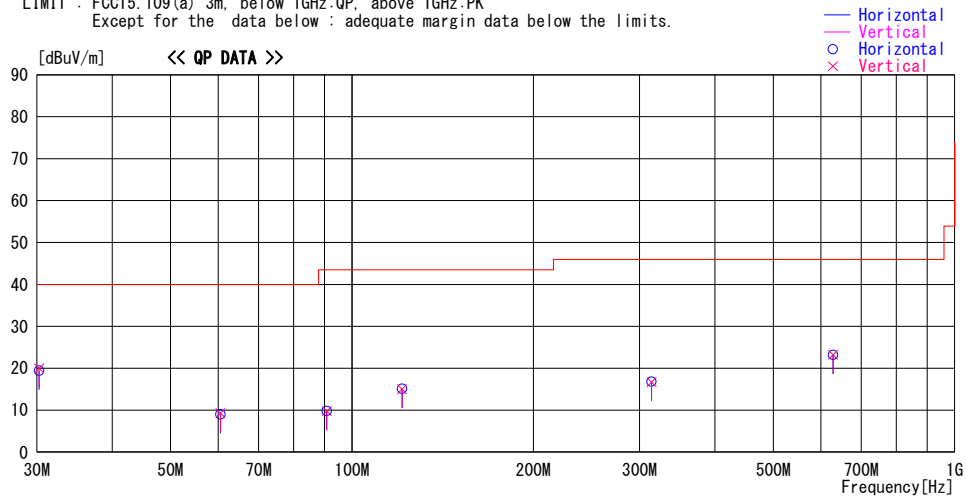
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

**Radiated Emission (Reference data)**  
**RKES(314.35 MHz) Variation No.8 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 20, 2018  
Temperature / Humidity 23 deg. C / 51 % RH  
Engineer Toshifumi Yoneshige  
(Below 1GHz)  
Mode Mode 2

LIMIT : FCC15.109(a) 3m. below 1GHz:QP, above 1GHz:PK  
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
30.265	24.8	QP	18.4	-23.8	19.4	0	300	Hori.	40.0	20.6	
30.265	25.4	QP	18.4	-23.8	20.0	0	100	Vert.	40.0	20.0	
60.528	24.4	QP	7.9	-23.3	9.0	0	300	Hori.	40.0	31.0	
60.528	24.7	QP	7.9	-23.3	9.3	0	100	Vert.	40.0	30.7	
90.792	24.5	QP	8.2	-22.9	9.8	0	300	Hori.	43.5	33.7	
90.792	24.5	QP	8.2	-22.9	9.8	0	100	Vert.	43.5	33.7	
121.056	24.5	QP	13.1	-22.5	15.1	0	300	Hori.	43.5	28.4	
121.056	24.4	QP	13.1	-22.5	15.0	0	100	Vert.	43.5	28.5	
314.070	23.3	QP	13.8	-20.3	16.8	0	100	Hori.	46.0	29.2	
314.070	23.2	QP	13.8	-20.3	16.7	0	100	Vert.	46.0	29.3	
628.140	23.2	QP	19.3	-19.3	23.2	0	100	Hori.	46.0	22.8	
628.140	23.2	QP	19.3	-19.3	23.2	0	100	Vert.	46.0	22.8	

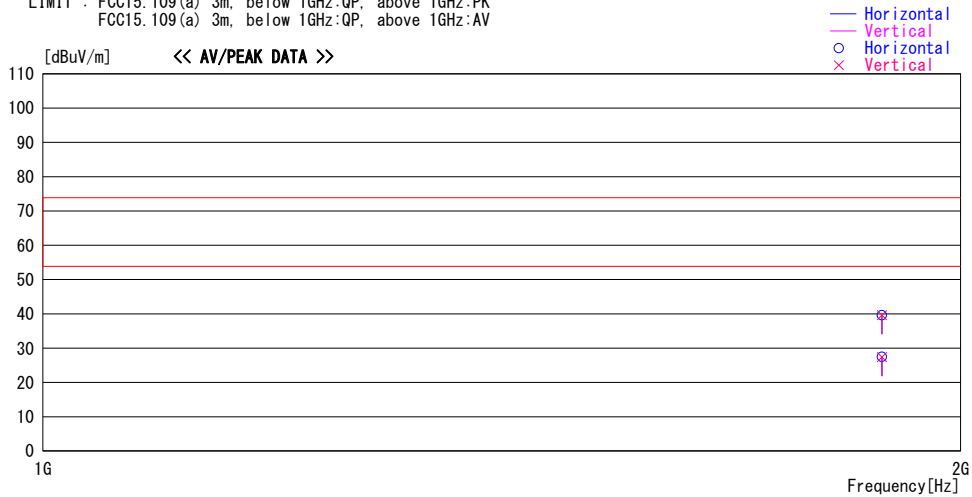
CHART: WITH FACTOR

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 + ATT - GAIN(AMP))

**Radiated Emission (Reference data)**  
**RKES(314.35 MHz) Variation No.8 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Above 1GHz)  
Mode Mode 2

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.109(a) 3m, 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]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
1884.420	45.2	PK	25.7	-31.3	39.6	0	100	Hori.	73.9	34.3	
1884.420	45.2	PK	25.7	-31.3	39.6	0	100	Vert.	73.9	34.3	
1884.420	33.1	AV	25.7	-31.3	27.5	0	100	Hori.	53.9	26.4	
1884.420	33.0	AV	25.7	-31.3	27.4	0	100	Vert.	53.9	26.5	

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

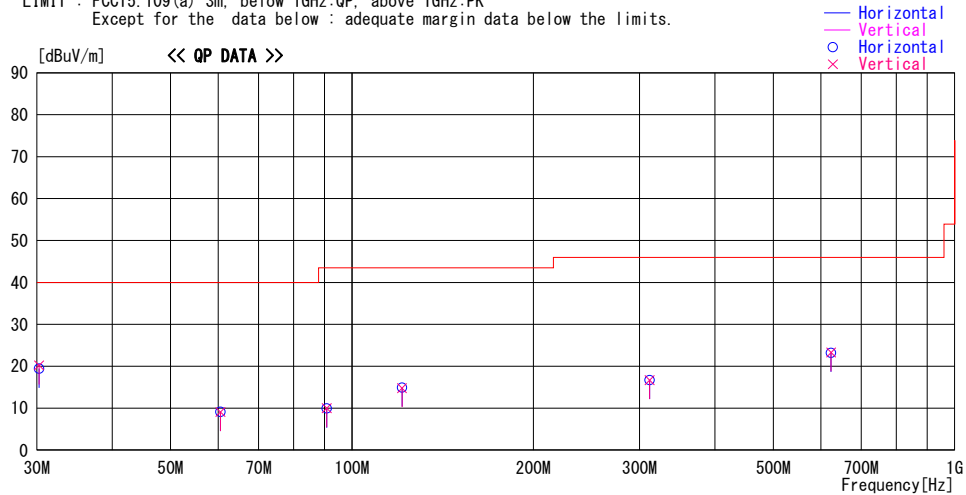
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

**Radiated Emission (Reference data)**  
**RKES(312.10 MHz) Variation No.11 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 20, 2018  
Temperature / Humidity 23 deg. C / 51 % RH  
Engineer Toshifumi Yoneshige  
(Below 1GHz)  
Mode Mode 1

LIMIT : FCC15.109(a) 3m. below 1GHz:QP, above 1GHz:PK  
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
30.265	24.8	QP	18.4	-23.8	19.4	0	300	Hori.	40.0	20.6	
30.265	25.6	QP	18.4	-23.8	20.2	0	100	Vert.	40.0	19.8	
60.528	24.5	QP	7.9	-23.3	9.1	0	300	Hori.	40.0	30.9	
60.528	24.5	QP	7.9	-23.3	9.1	0	100	Vert.	40.0	30.9	
90.792	24.6	QP	8.2	-22.9	9.9	0	300	Hori.	43.5	33.6	
90.792	24.7	QP	8.2	-22.9	10.0	0	100	Vert.	43.5	33.5	
121.056	24.3	QP	13.1	-22.5	14.9	0	300	Hori.	43.5	28.6	
121.056	24.2	QP	13.1	-22.5	14.8	0	100	Vert.	43.5	28.7	
311.820	23.2	QP	13.8	-20.3	16.7	0	100	Hori.	46.0	29.3	
311.820	23.2	QP	13.8	-20.3	16.7	0	100	Vert.	46.0	29.3	
623.640	23.2	QP	19.3	-19.3	23.2	0	100	Hori.	46.0	22.8	
623.640	23.3	QP	19.3	-19.3	23.3	0	100	Vert.	46.0	22.7	

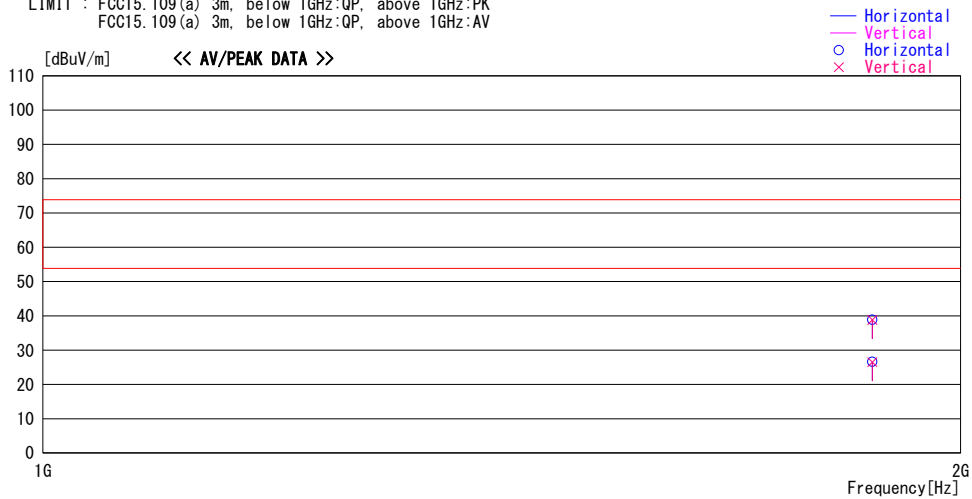
CHART: WITH FACTOR

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 + ATT - GAIN(AMP))

**Radiated Emission (Reference data)**  
**RKES(312.10 MHz) Variation No.11 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Above 1GHz)  
Mode Mode 1

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.109(a) 3m, 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]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
1870.920	44.6	PK	25.6	-31.3	38.9	0	100	Hori.	73.9	35.0	
1870.920	44.5	PK	25.6	-31.3	38.8	0	100	Vert.	73.9	35.1	
1870.920	32.3	AV	25.6	-31.3	26.6	0	100	Hori.	53.9	27.3	
1870.920	32.2	AV	25.6	-31.3	26.5	0	100	Vert.	53.9	27.4	

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)

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**Ise EMC Lab.**

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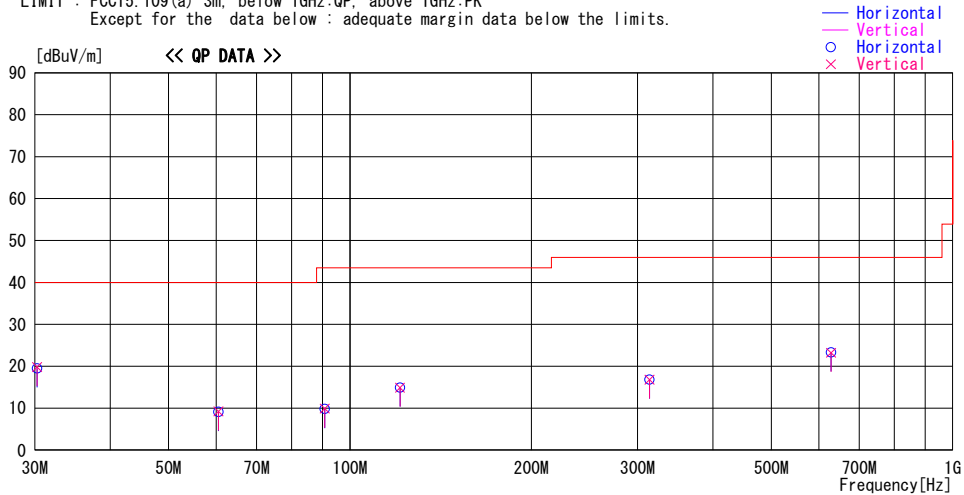
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

**Radiated Emission (Reference data)**  
**RKES(314.35 MHz) Variation No.11 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 20, 2018  
Temperature / Humidity 23 deg. C / 51 % RH  
Engineer Toshifumi Yoneshige  
(Below 1GHz)  
Mode Mode 2

LIMIT : FCC15.109(a) 3m. below 1GHz:QP, above 1GHz:PK  
Except for the data below : adequate margin data below the limits.



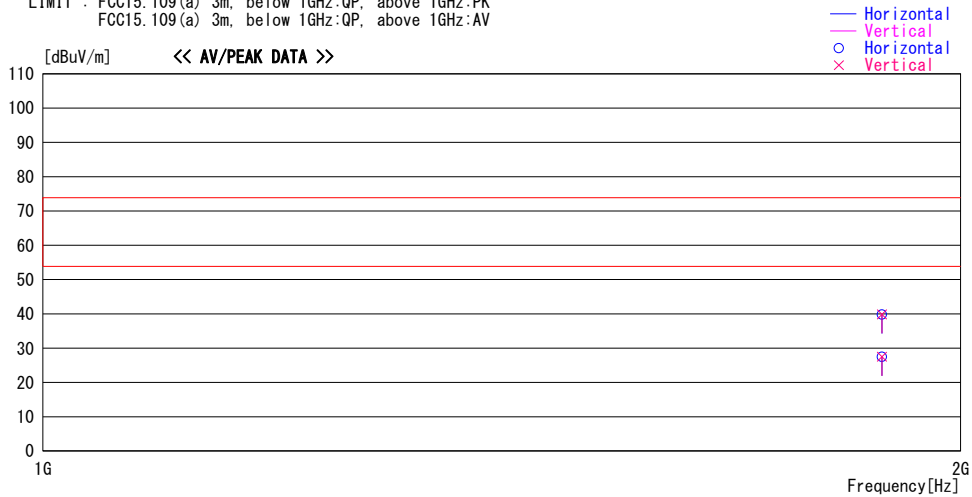
Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
30.265	24.9	QP	18.4	-23.8	19.5	0	300	Hori.	40.0	20.5	
30.265	25.2	QP	18.4	-23.8	19.8	0	100	Vert.	40.0	20.2	
60.528	24.5	QP	7.9	-23.3	9.1	0	300	Hori.	40.0	30.9	
60.528	24.6	QP	7.9	-23.3	9.2	0	100	Vert.	40.0	30.8	
90.792	24.5	QP	8.2	-22.9	9.8	0	300	Hori.	43.5	33.7	
90.792	24.6	QP	8.2	-22.9	9.9	0	100	Vert.	43.5	33.6	
121.056	24.3	QP	13.1	-22.5	14.9	0	300	Hori.	43.5	28.6	
121.056	24.3	QP	13.1	-22.5	14.9	0	100	Vert.	43.5	28.6	
314.070	23.3	QP	13.8	-20.3	16.8	0	100	Hori.	46.0	29.2	
314.070	23.3	QP	13.8	-20.3	16.8	0	100	Vert.	46.0	29.2	
628.140	23.3	QP	19.3	-19.3	23.3	0	100	Hori.	46.0	22.7	
628.140	23.2	QP	19.3	-19.3	23.2	0	100	Vert.	46.0	22.8	

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 + ATT - GAIN(AMP))

**Radiated Emission (Reference data)**  
**RKES(314.35 MHz) Variation No.11 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Above 1GHz)  
Mode Mode 2

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.109(a) 3m, 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]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
1884.420	45.4	PK	25.7	-31.3	39.8	0	100	Hori.	73.9	34.1	
1884.420	45.5	PK	25.7	-31.3	39.9	0	100	Vert.	73.9	34.0	
1884.420	33.1	AV	25.7	-31.3	27.5	0	100	Hori.	53.9	26.4	
1884.420	33.1	AV	25.7	-31.3	27.5	0	100	Vert.	53.9	26.4	

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

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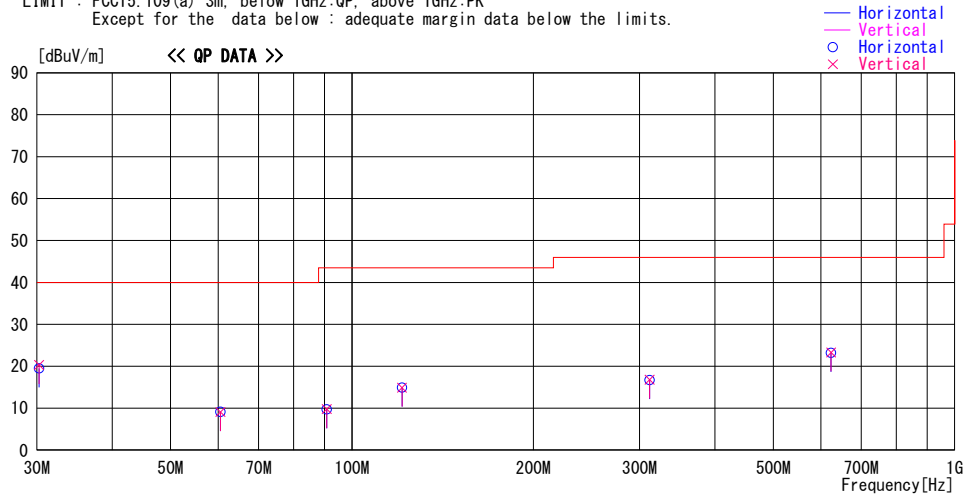
Facsimile : +81 596 24 8124



**Radiated Emission (Reference data)**  
**RKES(312.10 MHz) Variation No.14 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 20, 2018  
Temperature / Humidity 23 deg. C / 51 % RH  
Engineer Toshifumi Yoneshige  
(Below 1GHz)  
Mode Mode 1

LIMIT : FCC15.109(a) 3m. below 1GHz:QP, above 1GHz:PK  
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
30.265	24.9	QP	18.4	-23.8	19.5	0	300	Hori.	40.0	20.5	
30.265	25.7	QP	18.4	-23.8	20.3	0	100	Vert.	40.0	19.7	
60.528	24.5	QP	7.9	-23.3	9.1	0	300	Hori.	40.0	30.9	
60.528	24.5	QP	7.9	-23.3	9.1	0	100	Vert.	40.0	30.9	
90.792	24.4	QP	8.2	-22.9	9.7	0	300	Hori.	43.5	33.8	
90.792	24.5	QP	8.2	-22.9	9.8	0	100	Vert.	43.5	33.7	
121.056	24.3	QP	13.1	-22.5	14.9	0	300	Hori.	43.5	28.6	
121.056	24.3	QP	13.1	-22.5	14.9	0	100	Vert.	43.5	28.6	
311.820	23.2	QP	13.8	-20.3	16.7	0	100	Hori.	46.0	29.3	
311.820	23.3	QP	13.8	-20.3	16.8	0	100	Vert.	46.0	29.2	
623.640	23.2	QP	19.3	-19.3	23.2	0	100	Hori.	46.0	22.8	
623.640	23.3	QP	19.3	-19.3	23.3	0	100	Vert.	46.0	22.7	

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 + ATT - GAIN(AMP))

**UL Japan, Inc.**

**Ise EMC Lab.**

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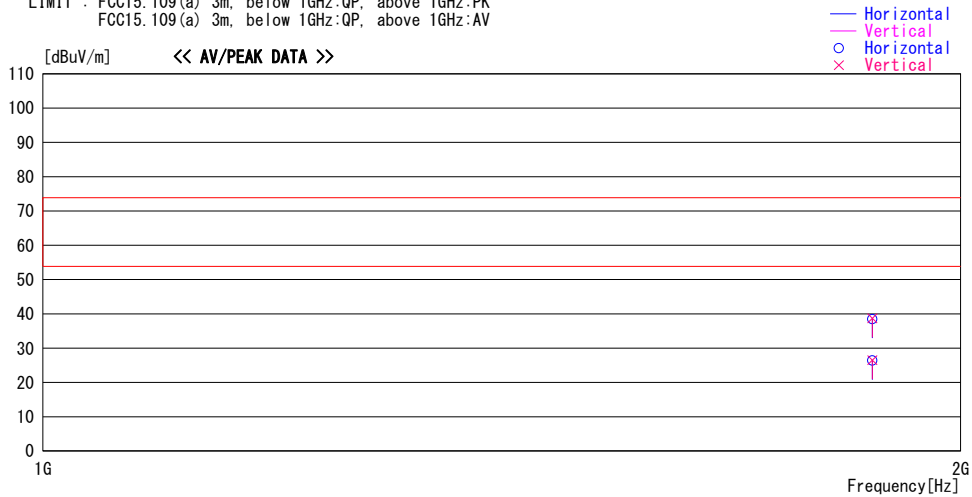
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

**Radiated Emission (Reference data)**  
**RKES(312.10 MHz) Variation No.14 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Above 1GHz)  
Mode Mode 1

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.109(a) 3m, 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]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
1870.920	44.2	PK	25.6	-31.3	38.5	0	100	Hori.	73.9	35.4	
1870.920	44.4	PK	25.6	-31.3	38.7	0	100	Vert.	73.9	35.2	
1870.920	32.1	AV	25.6	-31.3	26.4	0	100	Hori.	53.9	27.5	
1870.920	32.2	AV	25.6	-31.3	26.5	0	100	Vert.	53.9	27.4	

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.**

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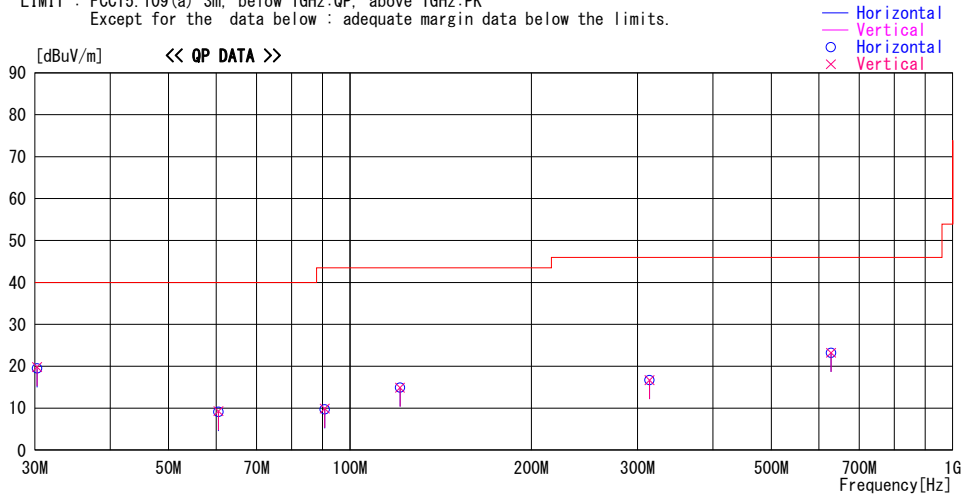
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

**Radiated Emission (Reference data)**  
**RKES(314.35 MHz) Variation No.14 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 20, 2018  
Temperature / Humidity 23 deg. C / 51 % RH  
Engineer Toshifumi Yoneshige  
(Below 1GHz)  
Mode Mode 2

LIMIT : FCC15.109(a) 3m. below 1GHz:QP, above 1GHz:PK  
Except for the data below : adequate margin data below the limits.



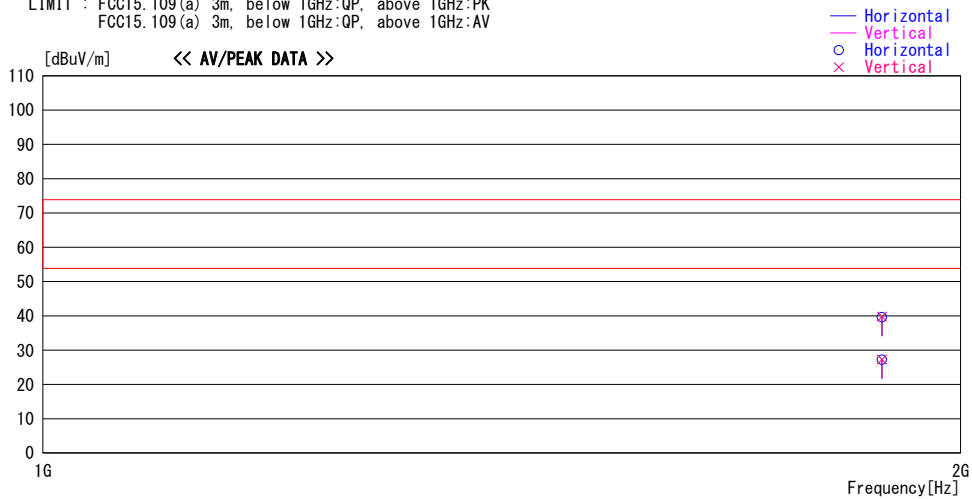
Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
30.265	24.9	QP	18.4	-23.8	19.5	0	300	Hori.	40.0	20.5	
30.265	25.2	QP	18.4	-23.8	19.8	0	100	Vert.	40.0	20.2	
60.528	24.5	QP	7.9	-23.3	9.1	0	300	Hori.	40.0	30.9	
60.528	24.7	QP	7.9	-23.3	9.3	0	100	Vert.	40.0	30.7	
90.792	24.4	QP	8.2	-22.9	9.7	0	300	Hori.	43.5	33.8	
90.792	24.6	QP	8.2	-22.9	9.9	0	100	Vert.	43.5	33.6	
121.056	24.3	QP	13.1	-22.5	14.9	0	300	Hori.	43.5	28.6	
121.056	24.3	QP	13.1	-22.5	14.9	0	100	Vert.	43.5	28.6	
314.070	23.2	QP	13.8	-20.3	16.7	0	100	Hori.	46.0	29.3	
314.070	23.2	QP	13.8	-20.3	16.7	0	100	Vert.	46.0	29.3	
628.140	23.2	QP	19.3	-19.3	23.2	0	100	Hori.	46.0	22.8	
628.140	23.2	QP	19.3	-19.3	23.2	0	100	Vert.	46.0	22.8	

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 + ATT - GAIN(AMP))

**Radiated Emission (Reference data)**  
**RKES(314.35 MHz) Variation No.14 Internal Antenna**

Report No. 12441050H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date August 21, 2018  
Temperature / Humidity 22 deg. C / 56 % RH  
Engineer Takumi Shimada  
(Above 1GHz)  
Mode Mode 2

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.109(a) 3m, 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]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
1884.420	45.2	PK	25.7	-31.3	39.6	0	100	Hori.	73.9	34.3	
1884.420	45.4	PK	25.7	-31.3	39.8	0	100	Vert.	73.9	34.1	
1884.420	32.8	AV	25.7	-31.3	27.2	0	100	Hori.	53.9	26.7	
1884.420	32.9	AV	25.7	-31.3	27.3	0	100	Vert.	53.9	26.6	

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.**

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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**

### **Test equipment**

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE/AT	141203	Attenuator(6dB)	Weinschel Corp	2	BK7970	11/14/2017	11/30/2018	12
RE	141427	Biconical Antenna	Schwarzbeck	VHA9103B	8031	5/31/2018	5/31/2019	12
RE	141317	Coaxial Cable	Fujikura/Agilent	-	-	2/23/2018	2/28/2019	12
RE	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	8/21/2018	8/31/2019	12
RE	142228	Measure	KOMELON	KMC-36	-	-	-	-
RE/AT	141578	Pre Amplifier	AGILENT	8447D	2944A10845	9/19/2018	9/30/2019	12
RE	142004	AC2 Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	6/29/2018	6/30/2020	24
RE	141942	Test Receiver	Rohde & Schwarz	ESCI	100300	8/8/2018	8/31/2019	12
RE	141556	Thermo-Hygrometer	CUSTOM	CTH-201	0003	12/21/2017	12/31/2018	12
RE	141265	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-190	5/31/2018	5/31/2019	12
RE/AT	141392	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	8/8/2018	8/31/2019	12
RE	141512	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	6/6/2018	6/30/2019	12
AT	158180	Coaxial Cable	UL Japan Inc.	SUCOFLEX 106 (2 m)	001	9/8/2017	9/30/2018	12
AT	141395	Coaxial Cable	UL Japan	-	-	12/15/2017	12/31/2018	12
RE/AT	141579	Pre Amplifier	AGILENT	8449B	3008A02142	1/23/2018	1/31/2019	12
RE	142006	AC2 Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-06902	4/2/2018	4/30/2019	12
RE/AT	141902	Spectrum Analyzer	AGILENT	E4440A	MY46187105	10/16/2017	10/31/2018	12

\*Hyphens for Last Calibration Date, Calibration Due Date and Cal Int (month) 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:**

**RE: Radiated emission**  
**AT: Antenna Terminal**

**UL Japan, Inc.**

**Ise EMC Lab.**

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