



RADIO TEST REPORT

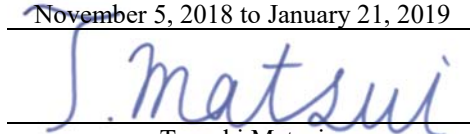
Test Report No. : 12541456H

Applicant : Panasonic Corporation of North America
Type of Equipment : PESS FOB
Model No. : IK4310E
FCC ID : ACJ932IK4310E
Test regulation : FCC Part 15 Subpart C: 2018
Test Result : Complied (Refer to SECTION 3.2)

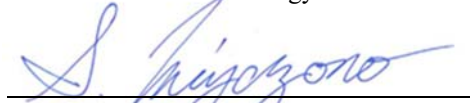
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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not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

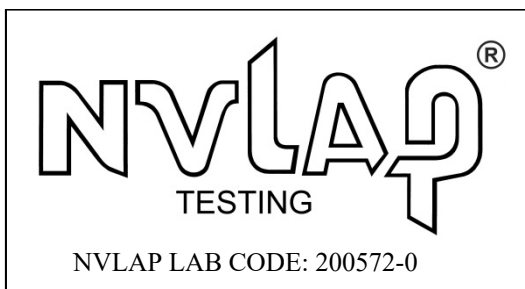
Date of test: November 5, 2018 to January 21, 2019

Representative test engineer:


Tomoki Matsui
Engineer
Consumer Technology Division

Approved by:


Shinichi Miyazono
Engineer
Consumer Technology Division



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☒ There is no testing item of "Non-accreditation".

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13-EM-F0429

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SECTION 1: Customer information

Company Name	:	Panasonic Corporation of North America ^{*1)}
Address	:	Two Riverfront Plaza, 9th Floor Newark, NJ 07102-5490
Telephone Number	:	+1-201-348-7760
Facsimile Number	:	+1-201-348-7760
Contact Person	:	Ben Botros

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.

*1) Panasonic Corporation of North America designates Panasonic Automotive Systems Asia Pacific Co.,Ltd as manufacturer of the product (PESS FOB).

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

2.1 Identification of E.U.T.

Type of Equipment	:	PESS FOB
Model No.	:	IK4310E
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 3.0 V
Receipt Date of Sample (Information from test lab.)	:	October 30, 2018
Country of Mass-production	:	Thailand
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: IK4310E (referred to as the EUT in this report) is a PESS FOB.

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	433.92 MHz
Modulation	:	FSK
Antenna type	:	PCB pattern and plate antenna
Clock frequency (Maximum)	:	27.6 MHz
Radio Type	:	Receiver
Frequency of Operation	:	125 kHz *1)

*1) The test of receiver part was performed separately from this test report, and the conformability is confirmed.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

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

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.231 Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.207	N/A *1)	N/A	-
	IC: RSS-Gen 8.8	IC: RSS-Gen 8.8			
Automatically Deactivate	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.231(a)(1)	N/A	Complied a)	Radiated
	IC: -	IC: RSS-210 A1.1			
Electric Field Strength of Fundamental Emission	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.231(b)	0.0 dB 433.920 MHz Horizontal PK with Duty factor	Complied# b)	Radiated
	IC: RSS-Gen 6.12	IC: RSS-210 A1.2			
Electric Field Strength of Spurious Emission	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.205 Section 15.209 Section 15.231(b)	0.5 dB 4339.200 MHz Vertical PK with Duty factor	Complied# c)	Radiated
	IC: RSS-Gen 6.13	IC: RSS-210 A1.2, 4.4 RSS-Gen 8.9			
-20dB Bandwidth	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.231(c)	N/A	Complied d)	Radiated
	IC: -	IC: Reference data			

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

*1) The test is not applicable since the EUT does not have AC Mains.

- a) Refer to Appendix 1 (data of Automatically Deactivate)
- b) Refer to Appendix 1 (data of Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission))
- c) Refer to Appendix 1 (data of Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission))
- d) Refer to Appendix 1 (data of -20dB and 99% Occupied Bandwidth)

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.

FCC 15.31 (e)

This test was performed with the New Battery (DC 3.0 V) during the tests. Therefore, the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99 % Occupied Bandwidth	IC: RSS-Gen 6.7	IC: RSS-210 A1.3	N/A	Complied a)	Radiated
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.					
a) Refer to Appendix 1 (data of -20dB and 99% Occupied Bandwidth)					
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.				
Other than above, no addition, exclusion nor deviation has been made from the standard.					

3.4 Uncertainty

EMI

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 $k = 2$.

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

Automatically Deactivate
0.10 %

Bandwidth
0.96 %

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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

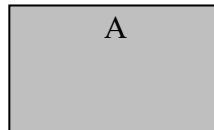
Refer to APPENDIX.

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

4.1 Operating Mode(s)

Test Item*	Mode
Automatically Deactivate	Normal use mode *2)
Electric Field Strength of Fundamental Emission Electric Field Strength of Spurious Emission -20 dB & 99 % Occupied Bandwidth	Transmitting mode (Tx) *1)
* The system was configured in typical fashion (as a user would normally use it) for testing. *1) The software of this mode is the same as one of normal product, except that EUT continues to transmit when transmitter button is being pressed (For Normal use mode, EUT stops to transmit in a given time, even if transceiver button is being pressed.) End users cannot change the settings of the output power of the product. *2) Normal use mode has the following two operations; - Transmission by a button-pressed operation - Smart operation to transmit after LF signal is received The test was performed by a button-pressed operation as representative, since they are completely identical in RF characteristics.	

4.2 Configuration and peripherals



* Setup was taken into consideration and test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	PESS FOB	IK4310E	6422630 *1) 6422548 *2)	Panasonic Automotive Systems Asia Pacific Co.,Ltd	EUT

*1) Used for Transmitting mode

*2) Used for Normal use mode

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SECTION 5: Radiated emission (Electric Field Strength of Fundamental and Spurious Emission)

Test Procedure and conditions

[For below 30 MHz]

The noise level was checked by moving a search-coil (Loop Antenna) close to the EUT.

[For 30 MHz to 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

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

The measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detector function of the test receiver / spectrum analyzer.

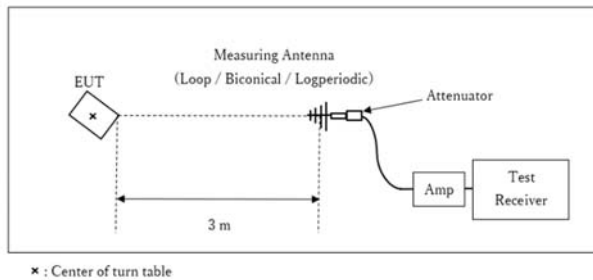
Test Antennas are used as below;

Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

	From 9 kHz to 90 kHz and From 110 kHz to 150 kHz	From 90 kHz to 110 kHz	From 150 kHz to 490 kHz	From 490 kHz to 30 MHz	From 30 MHz to 1 GHz	Above 1 GHz
Detector Type	Peak	Peak	Peak	Peak	Peak and Peak with Duty factor	Peak and Peak with Duty factor
IF Bandwidth	200 Hz	200 Hz	9.0 kHz	9.0 kHz	120 kHz	PK: S/A: RBW 1 MHz, VBW: 3 MHz

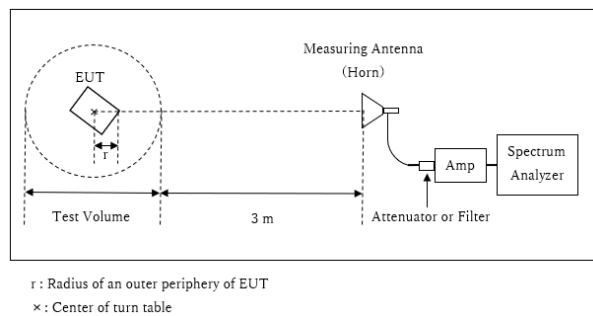
[Test Setup]

Below 1 GHz



Test Distance: 3 m

1 GHz - 10 GHz



Distance Factor: $20 \times \log (3.75 \text{ m} / 3.0 \text{ m}) = 1.94 \text{ dB}$

* Test Distance: $(3 + \text{Test Volume} / 2) - r = 3.75 \text{ m}$

Test Volume : 1.5 m

(Test Volume has been calibrated based on CISPR 16-1-4.)

$r = 0.0 \text{ m}$

* The test was performed with $r = 0.0 \text{ m}$ since EUT is small and it was the rather conservative condition.

- The carrier level (or, noise levels) was (or were) measured at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined.

Noise levels of all the frequencies were measured at the position.

This EUT has two modes which mechanical key is inserted or not. The worst case was confirmed with and without mechanical key, as a result, the test with mechanical key was the worst case. Therefore the test with mechanical key was performed only.

*The result is rounded off to the second decimal place, so some differences might be observed.

Measurement range	: 9 kHz – 4.4 GHz
Test data	: APPENDIX
Test result	: Pass

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SECTION 6: Automatically deactivate

Test Procedure

The measurement was performed with Electric field strength using a spectrum analyzer.

Test data : APPENDIX

Test result : Pass

SECTION 7: -20 dB and 99 % Occupied Bandwidth

Test Procedure

The test was measured with a spectrum analyzer using a test fixture.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20 dB Bandwidth	300 kHz	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Peak hold was applied as Worst-case measurement.							

Test data : APPENDIX

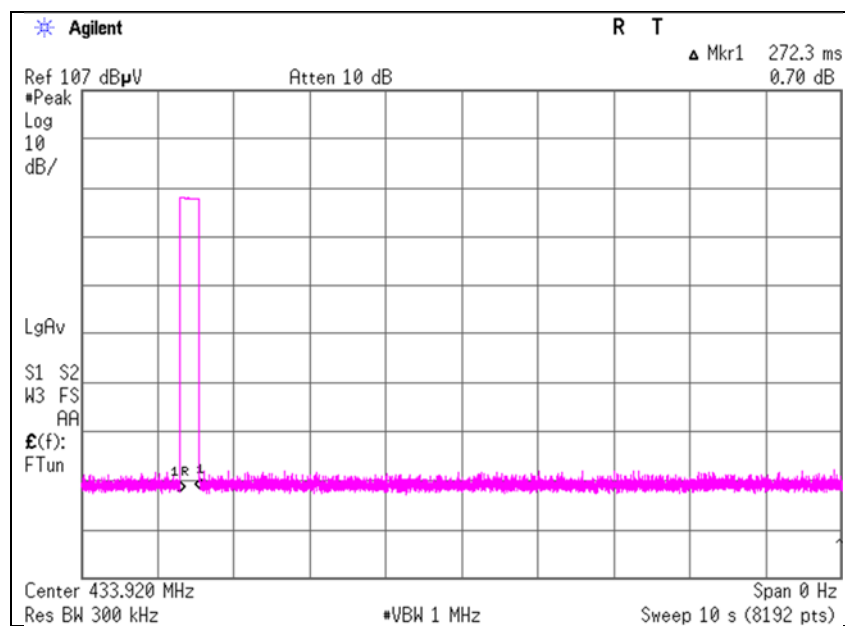
Test result : Pass

APPENDIX 1: Test data

Automatically deactivate

Report No.	12541456H
Test place	Ise EMC Lab.
Shielded Room	No.6
Date	January 21, 2019
Temperature / Humidity	24 deg. C / 33% RH
Engineer	Hiroyiuki Furutaka
Mode	Normal use mode

Time of Transmitting [sec]	Limit [sec]	Result
0.2723	5.00	Pass



* The EUT transmits UHF when LF signal is received from a car or a button on the EUT is pressed. In both cases, the UHF transmission is stopped within 5 seconds. So the test was performed by a button-pressed operation as the worst case. Please refer to the “Theory of Operation” for details.

Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)

Report No.	12541456H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	November 5, 2018	November 26, 2018
Temperature / Humidity	25 deg. C / 41 % RH	20 deg. C / 40 % RH
Engineer	Junki Nagatomi	Tomoki Matsui
	Below 1GHz	Above 1GHz
Mode	Transmitting mode (Tx)	

QP or PK

Frequency [MHz]	Detector	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]		Remark Inside or Outside of Restricted Bands
		Hor	Ver					Hor	Ver		Hor	Ver	
433.920	PK	85.4	84.8	16.5	11.0	32.1	-	80.8	80.2	100.8	20.0	20.6	Carrier
867.840	PK	43.0	40.6	22.0	13.5	31.2	-	47.3	44.9	80.8	33.5	35.9	Outside
1301.760	PK	45.2	45.0	25.9	3.8	35.3	-	39.6	39.4	73.9	34.3	34.5	Inside
1735.680	PK	47.4	46.4	25.5	4.1	34.8	-	42.2	41.2	80.8	38.6	39.6	Outside
2169.600	PK	44.5	44.7	28.3	4.4	34.5	-	42.7	42.9	80.8	38.1	37.9	Outside
2603.520	PK	46.0	45.5	27.9	4.6	34.4	-	44.1	43.6	80.8	36.7	37.2	Outside
3037.440	PK	45.9	46.5	28.9	4.8	34.3	-	45.3	45.9	80.8	35.5	34.9	Outside
3471.360	PK	49.4	52.1	29.1	5.0	33.9	-	49.6	52.3	80.8	31.2	28.5	Outside
3905.280	PK	47.2	48.4	30.0	5.2	33.6	-	48.8	50.0	73.9	25.1	23.9	Inside
4339.200	PK	50.2	50.9	30.7	5.4	33.6	-	52.7	53.4	73.9	21.2	20.5	Inside

PK with Duty factor

Frequency [MHz]	Detector	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]		Remark
		Hor	Ver					Hor	Ver		Hor	Ver	
433.920	PK	85.4	84.8	16.5	11.0	32.1	0.0	80.8	80.2	80.8	0.0	0.6	Carrier
867.840	PK	43.0	40.6	22.0	13.5	31.2	0.0	47.3	44.9	60.8	13.5	15.9	Outside
1301.760	PK	45.2	45.0	25.9	3.8	35.3	0.0	39.6	39.4	53.9	14.3	14.5	Inside
1735.680	PK	47.4	46.4	25.5	4.1	34.8	0.0	42.2	41.2	60.8	18.6	19.6	Outside
2169.600	PK	44.5	44.7	28.3	4.4	34.5	0.0	42.7	42.9	60.8	18.1	17.9	Outside
2603.520	PK	46.0	45.5	27.9	4.6	34.4	0.0	44.1	43.6	60.8	16.7	17.2	Outside
3037.440	PK	45.9	46.5	28.9	4.8	34.3	0.0	45.3	45.9	60.8	15.5	14.9	Outside
3471.360	PK	49.4	52.1	29.1	5.0	33.9	0.0	49.6	52.3	60.8	11.2	8.5	Outside
3905.280	PK	47.2	48.4	30.0	5.2	33.6	0.0	48.8	50.0	53.9	5.1	3.9	Inside
4339.200	PK	50.2	50.9	30.7	5.4	33.6	0.0	52.7	53.4	53.9	1.2	0.5	Inside

Sample calculation:

Result of PK = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + Distance factor) - Gain (Amplifier)

Result of PK with Duty factor = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + Distance factor) - Gain (Amplifier) + Duty factor

For above 1GHz : Distance Factor: $20 \times \log(3.75 \text{ m}/3.0 \text{ m}) = 1.94 \text{ dB}$

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

Since the peak emission result satisfied the average limit, duty factor was omitted.

Although Duty of this product was 100% or less, the result of AV (PK with Duty factor) was calculated by applying Duty 100% as worst.

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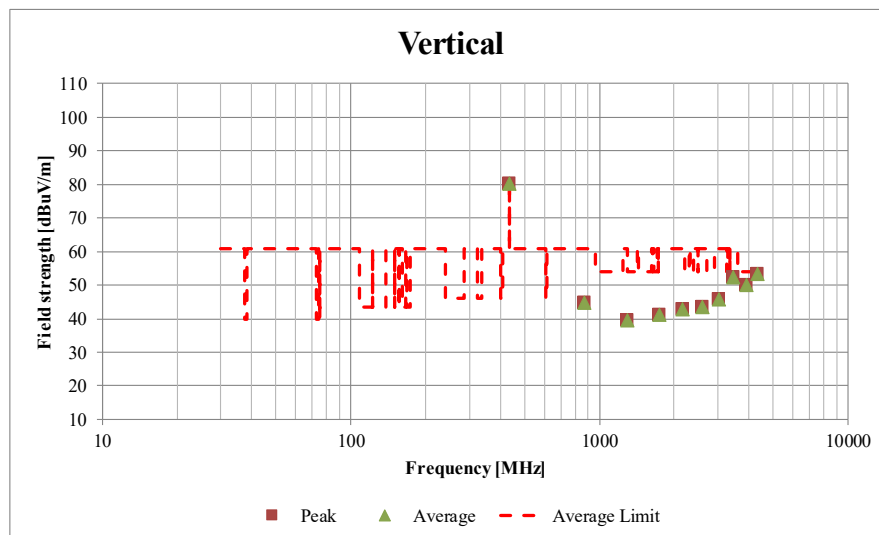
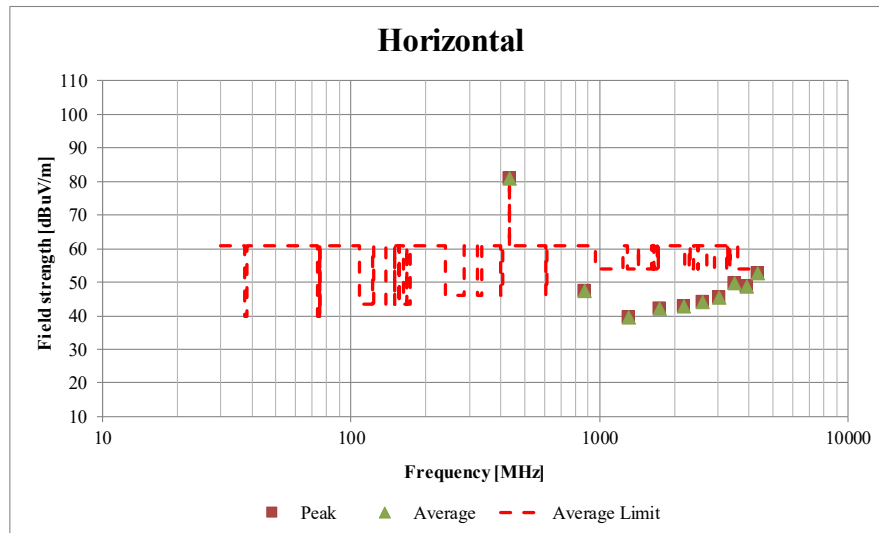
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Radiated Spurious Emission (Plot data, Worst case)

Report No.	12541456H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	November 5, 2018	November 26, 2018
Temperature / Humidity	25 deg. C / 41% RH	20 deg. C / 40% RH
Engineer	Junki Nagatomi	Tomoki Matsui
	Below 1GHz	Above 1GHz
Mode	Transmitting mode (Tx)	



*These plots data contains sufficient number to show the trend of characteristic features for EUT.

-20dB and 99% Occupied Bandwidth

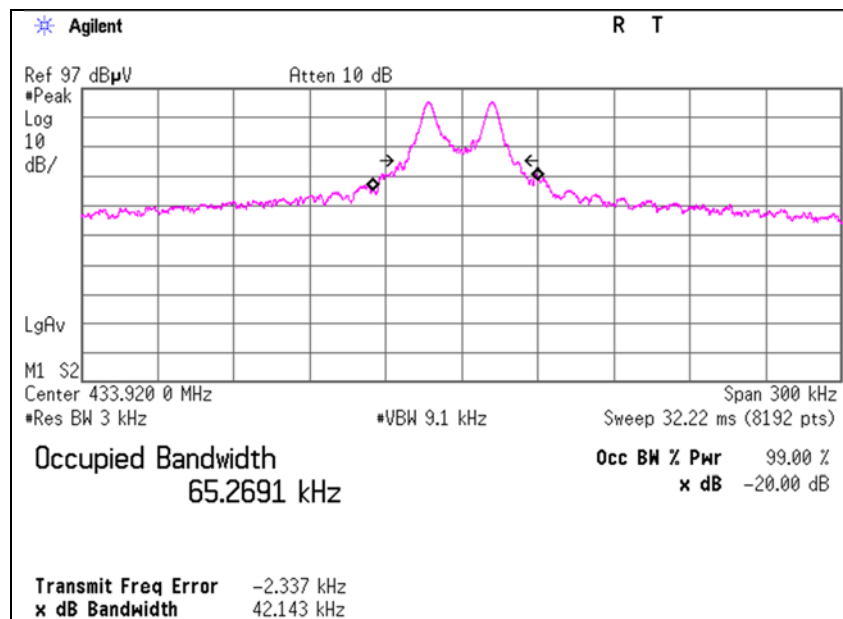
Report No.	12541456H
Test place	Ise EMC Lab.
Shielded Room	No.6
Date	January 21, 2019
Temperature / Humidity	24 deg. C / 33% RH
Engineer	Hiroiyuki Furutaka
Mode	Transmitting mode (Tx)

Bandwidth Limit : Fundamental Frequency **433.92** MHz x 0.25% = 1084.80 kHz

* The above limit was calculated from more stringent nominal frequency.

-20dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
42.14	1084.80	Pass

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
65.27	1084.80	Pass



APPENDIX 2: Test instruments

Test Instruments

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	141323	Coaxial cable	UL Japan	-	-	7/3/2018	7/31/2019	12
RE	141532	DIGITAL HiTESTER	HIOKI	3805	51201197	1/9/2018	1/31/2019	12
RE	141266	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	6/4/2018	6/30/2019	12
RE	142183	Measure	KOMELON	KMC-36	-	-	-	-
RE	148897	Attenuator	KEYSIGHT	8491A	MY52462349	12/20/2018	12/31/2019	12
RE	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	6/26/2018	6/30/2020	24
RE	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	8/6/2018	8/31/2019	12
RE	141554	Thermo-Hygrometer	CUSTOM	CTH-180	1301	1/24/2018	1/31/2019	12
RE	141424	Biconical Antenna	Schwarzbeck	BBA9106	1915	6/4/2018	6/30/2019	12
RE	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	2/27/2018	2/28/2019	12
RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	141556	Thermo-Hygrometer	CUSTOM	CTH-201	0003	12/5/2018	12/31/2019	12
RE	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	6/29/2018	6/30/2020	24
RE	141579	Pre Amplifier	AGILENT	8449B	3008A02142	1/21/2019	1/31/2020	12
RE	141392	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	8/8/2018	8/31/2019	12
RE	142228	Measure	KOMELON	KMC-36	-	-	-	-
RE	141507	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	6/7/2018	6/30/2019	12
RE	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	8/21/2018	8/31/2019	12
RE	142006	AC2_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-06902	4/1/2018	4/30/2019	12
RE	141900	Spectrum Analyzer	AGILENT	E4440A	MY46185823	11/15/2018	11/30/2019	12
RE	142645	Loop Antenna	UL Japan	-	-	-	-	-
RE	141561	Thermo-Hygrometer	CUSTOM	CTH-201	1401	1/11/2019	1/31/2020	12
RE	142645	Loop Antenna	UL Japan	-	-	-	-	-

*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, 99 % Occupied Bandwidth, -20 dB bandwidth, and Automatically deactivate tests

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