EMI TEST REPORT

Test Report No. : 12541464H-B-R1

Applicant	:	**Panasonic Corporation of North America**
Type of Equipment	:	**WAM HI**
Model No.	:	**IM1135AA**
FCC ID	:	**ACJ932IM1135AA**
Test regulation	:	**FCC Part 15 Subpart B: 2018**
Test Result	:	**Complied (Refer to Section 3.2)**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
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 12541464H-B. 12541464H-B is replaced with this report.

Date of test: January 23, 2019

Representative test engineer:
Toshifumi Yoneshige
Engineer
Consumer Technology Division

Approved by:
Shinichi Miyazono
Engineer
Consumer Technology Division

NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
http://japan.ul.com/resources/emc_accredited/

☐ 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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REVISION HISTORY

Original Test Report No.: 12541464H-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12541464H-B	February 15, 2019	-	-
1	12541464H-B-R1	March 26, 2019	P.7, 8	Correction of Configuration diagram and list of Clause 4.2
1	12541464H-B-R1	March 26, 2019	P.13, 14	Replacement of test setup photo

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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

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

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 above information in SECTION 2 and 4.

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

2.1 Identification of E.U.T.

Type of Equipment	:	WAM HI
Model No.	:	IM1135AA
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12.0 V
Receipt Date of Sample (Information from test lab.)	:	December 27, 2019
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: IM1135AA (referred to as the EUT in this report) is a WAM HI.

Radio Specification

[Transmitter]

Radio Type	:	Transmitter	
Frequency of Operation	:	125 kHz	
Modulation	:	ASK	
Antenna type	:	Immobilizer:	Air core coil inductive antenna
		Other:	Ferrite core coil inductive antenna
Clock frequency (Maximum)	:	16 MHz	

[Receiver]

Radio Type	:	Receiver
Frequency of Operation	:	433.92 MHz

FCC15.111(b)

The receiving antenna (of this EUT) is installed inside the EUT and cannot be removed (permanently attached). Therefore, Radiated emission test was performed.

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	Remarks
Conducted emission	**FCC:** ANSI C63.4: 2014 7. AC power - line conducted emission measurements	**FCC:**Part 15 Subpart B 15.107(a)	N/A	N/A	N/A	*1)
	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	25.3 dB 1650.001 MHz, Horizontal, AV	Complied a)	-
	IC: RSS-Gen 7	**IC:** RSS-Gen 7.1.2				

*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.

a) 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.

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

3.5 Test Location

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
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.

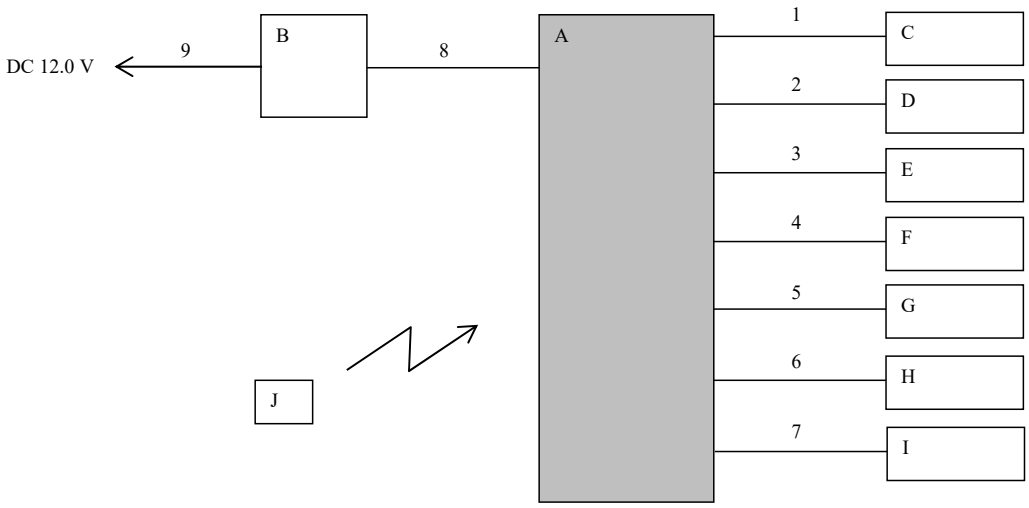
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Mode(s)

Mode	Remarks
1) Normal keyless operation mode	-

*The test signal level was confirmed to be sufficient to stabilize the local oscillator of the EUT.
* It was confirmed by using checker that the EUT receives the signal from the transmitter (pair of EUT).

4.2 Configuration and peripherals



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.
* Item No. A includes Receiver Antenna.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	WAM HI	IM1135AA	500091-0 181031	Panasonic Automotive Systems Asia Pacific Co.,Ltd	EUT
B	Antenna Test Box	-	-	-	-
C	LF Antenna (CENTER Ant)	EMU7117401	002	Panasonic Automotive Systems Asia Pacific Co.,Ltd	-
D	LF Antenna (REAR DR Ant)	EMU7117401	001	Panasonic Automotive Systems Asia Pacific Co.,Ltd	-
E	LF Antenna (DOOR DR Ant)	EMU7117301	001	Panasonic Automotive Systems Asia Pacific Co.,Ltd	-
F	LF Antenna (DOOR AS Ant)	EMU7117401	005	Panasonic Automotive Systems Asia Pacific Co.,Ltd	-
G	LF Antenna (BUMPER Ant)	EMU7117401	003	Panasonic Automotive Systems Asia Pacific Co.,Ltd	-
H	LF Antenna (REAR AS Ant)	EMU7117401	004	Panasonic Automotive Systems Asia Pacific Co.,Ltd	-
I	Immobilizer (Start Switch)	EMU470602	001	Panasonic Automotive Systems Asia Pacific Co.,Ltd	-
J	PESS FOB	IK4310E	6422548	Panasonic Automotive Systems Asia Pacific Co.,Ltd	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable	2.0	Unshielded	Unshielded	-
2	Antenna Cable	2.0	Unshielded	Unshielded	-
3	Antenna Cable	2.0	Unshielded	Unshielded	-
4	Antenna Cable	2.0	Unshielded	Unshielded	-
5	Antenna Cable	2.0	Unshielded	Unshielded	-
6	Antenna Cable	2.0	Unshielded	Unshielded	
7	Signal and DC Cable	0.8	Unshielded	Unshielded	-
8	Signal and DC Cable	2.0	Unshielded	Unshielded	-
9	DC cable	1.2	Unshielded	Unshielded	-

SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No.4 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 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.

5.3 Test conditions

Frequency range : 30 MHz - 200 MHz (Biconical antenna) / 200 MHz - 1000 MHz (Logperiodic antenna)
1000 MHz - 6000 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 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

*1) The measurement data was adjusted to a 3 m distance using the following Distance Factor.
Distance Factor: 20 x log (3.40 m / 3 m) = 1.1 dB

- The 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

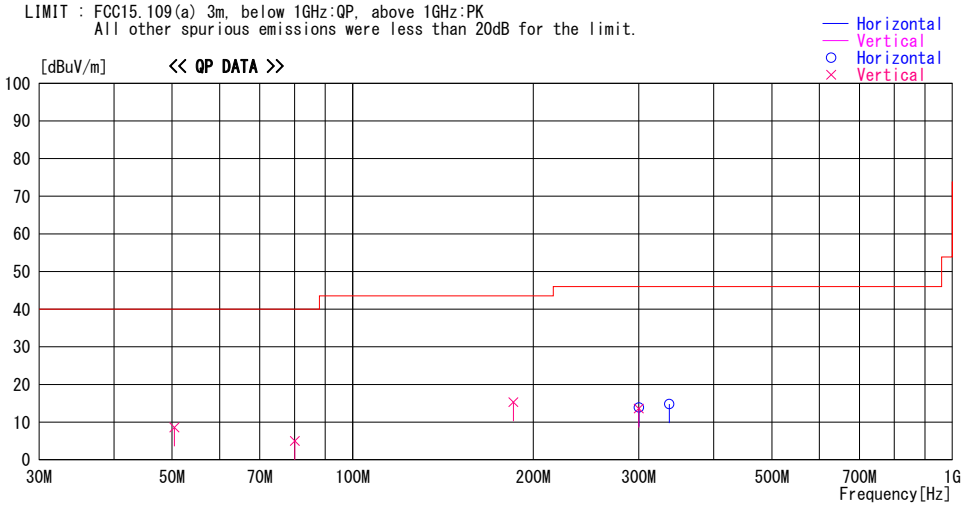
The limit is rounded down to one decimal place.
The test result is rounded off to one or two decimal places, so some differences might be observed.

Date: January 23, 2019 Test engineer: Toshifumi Yoneshige

APPENDIX 1: Test data

Radiated emission

Report No.	12541464H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	January 23, 2019
Temperature / Humidity	24 deg. C / 43 % RH
Engineer	Toshifumi Yoneshige
	(Below 1 GHz)
Mode	Mode 1

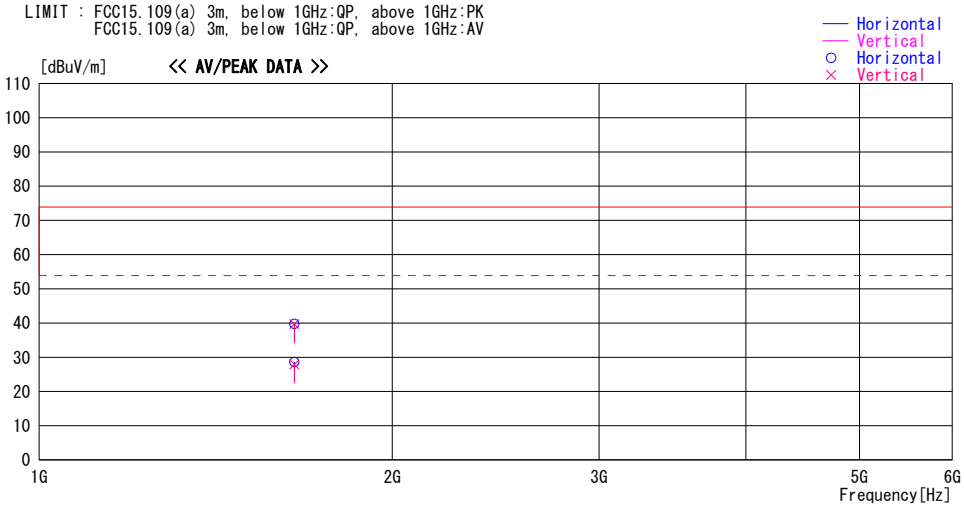


Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
50.441	22.2	QP	10.9	-24.5	8.6	359	100	Vert.	40.0	31.4	
80.080	22.2	QP	6.9	-24.1	5.0	358	100	Vert.	40.0	35.0	
185.351	21.8	QP	16.4	-22.9	15.3	23	100	Vert.	43.5	28.2	
300.181	22.3	QP	13.6	-22.0	13.9	359	100	Hori.	46.0	32.1	
299.973	22.0	QP	13.6	-22.0	13.6	359	100	Vert.	46.0	32.4	
337.161	21.8	QP	14.8	-21.8	14.8	359	200	Hori.	46.0	31.2	

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 + ATT - GAIN(AMP))

Radiated emission

Report No.	12541464H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	January 23, 2019
Temperature / Humidity	24 deg. C / 43 % RH
Engineer	Toshifumi Yoneshige (Above 1 GHz)
Mode	Mode 1



Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
1650.000	31.8	AV	25.0	-28.9	27.9	359	100	Vert.	53.9	26.0	
1650.000	43.6	PK	25.0	-28.9	39.7	359	100	Vert.	73.9	34.2	
1650.001	43.6	PK	25.0	-28.9	39.7	359	100	Hori.	73.9	34.2	
1650.001	32.5	AV	25.0	-28.9	28.6	359	100	Hori.	53.9	25.3	

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)

APPENDIX 2: Test instruments

Test Instruments

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	141562	Thermo-Hygrometer	CUSTOM	CTH-201	0010	1/11/2019	1/31/2020	12
RE	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	6/28/2018	6/30/2020	24
RE	141412	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	6/14/2018	6/30/2019	12
RE	141581	MicroWave System Amplifier	AGILENT	83017A	650	10/4/2018	10/31/2019	12
RE	142227	Measure	KOMELON	KMC-36	-	-	-	-
RE	141506	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	6/8/2018	6/30/2019	12
RE	141508	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	6/8/2018	6/30/2019	12
RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	142017	AC4_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	4/7/2018	4/30/2019	12
RE	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	2/27/2018	2/28/2019	12
RE	141267	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-192	6/1/2018	6/30/2019	12
RE	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	1/30/2018	1/31/2019	12
RE	141397	Coaxial Cable	UL Japan	-	-	6/13/2018	6/30/2019	12
RE	148898	Attenuator	KEYSIGHT	8491A	MY52462282	10/3/2018	10/31/2019	12
RE	141425	Biconical Antenna	Schwarzbeck	BBA9106	1302	6/1/2018	6/30/2019	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