RADIO TEST REPORT

Test Report No. : 32JE0171-HO-02-A-R1

Applicant	:	**DENSO CORPORATION**
Type of Equipment	:	**Millimeter Wave Radar Sensor**
Model No.	:	**DNMWR007**
FCC ID	:	**HYQDNMWR007**
Test regulation	:	**FCC Part 15 Subpart C: 2012**
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 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 report is a revised version of 32JE0171-HO-02-A. 32JE0171-HO-02-A is replaced with this report.

Date of test: June 18 to 22, 2012

Representative test engineer:

Hironobu Ohnishi
Engineer of WiSE Japan,
UL Verification Service

Approved by:

Masanori Nishiyama
Leader of WiSE Japan,
UL Verification Service

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://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

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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	:	+81-566-25-5947
Facsimile Number	:	+81-566-25-4548
Contact Person	:	Madoka Shimotsuru

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

2.1 Identification of E.U.T.

Type of Equipment	:	Millimeter Wave Radar Sensor
Model No.	:	DNMWR007
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12V (Car battery), DC10V to 16V(Operating range)
Receipt Date of Sample	:	June 18, 2012
Country of Mass-production	:	Japan
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

This radar sensor (DNMWR007) is the 76GHz - 77GHz vehicle-mounted field disturbance sensor that is a millimeter wave frequency modulated continuous wave (FM-CW) radar operating at 76.0GHz to 77.0GHz (Nominal: 76.5GHz).

General Specification

Clock frequency(ies) in the system	:	Microcomputer: 10MHz

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	76-77GHz
Modulation	:	FM-CW
Antenna Type	:	Internal Antenna
Antenna Connector	:	None
Antenna Gain	:	21.1dBi
Antenna beam width (-3dB)	:	+/-10deg. (Horizontal), +/-2.5deg. (Vertical)
Steerable Antenna	:	Electronically (Receiving Part only)
Usage location	:	Forward-looking, vehicle-mounted
Power Supply (inner)	:	DC -4.5V, DC 5V, DC6.5V

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C: 2012, final revised on May 17, 2012 and effective June 18, 2012
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.253 Operation within the bands 46.7-46.9GHz and 76.0-77.0GHz.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.4:2003 7. AC power line Conducted Emission measurements	**FCC:** Section 15.207	N/A	N/A	*1)
	IC: RSS-Gen 7.2.4	**IC:** RSS-Gen 7.2.4			
26dB Bandwidth	**FCC:** "MILLIMETER WAVE TEST PROCEDURES"	**FCC:** Section 15.253(e)	See data.	Complied	Radiated
	IC: -	**IC:** RSS-210 A13.1.5			
Power Density	**FCC:** "MILLIMETER WAVE TEST PROCEDURES"	**FCC:** Section 15.253(b), (d)		Complied	Radiated
	IC: -	**IC:** RSS-210 A13.1.2(1)			
Spurious Emissions	**FCC:** ANSI C63.4:2003, "MILLIMETER WAVE TEST PROCEDURES"	**FCC:** Section 15.253(c) , (d)	9.6dB 164.800MHz, QP, Hori.	Complied	Radiated
	IC: RSS-Gen 4.9	**IC:** RSS-210 A13.1.2(2), A13.1.4, RSS-Gen 7.2.3			
Frequency Stability	**FCC:** "MILLIMETER WAVE TEST PROCEDURES"	**FCC:** Section 15.253(e)	See data.	Complied	Radiated
	IC: RSS-Gen 4.7, 7.2.4	**IC:** RSS-210 A13.1.5			
RF Exposure	**FCC:** -	**FCC:** Section 15.253(f)	See Appendix.	Complied	-
	IC: RSS-Gen 5.5	**IC:** RSS-102 4.2			

*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

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.
Millimeter wave measurement was performed accordance with FCC KDB 200443 (MILLIMETER WAVE TEST PROCEDURES).

* In case any questions arise about test procedure, ANSI C63.4: 2003 is also referred.

FCC 15.31 (e)

This EUT provides stable voltage(DC -4.5V, DC 5V, DC6.5V) constantly to RF part regardless of input voltage. Therefore, this EUT complies with the requirement. As for the Frequency Stability, the test was performed based on 15.253 (e).

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.

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	**IC:** RSS-Gen 4.6.1	**IC:** RSS-Gen 4.6.1	N/A	-	Radiated

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

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

Test room (semi-anechoic chamber)	**Radiated emission**						
	(3m*)(±dB)				**(1m*)(±dB)**		**(0.5m*)(±dB)**
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.2dB	5.0dB	5.1dB	4.7dB	5.7dB	4.4dB	4.3dB
No.2	4.1dB	5.2dB	5.1dB	4.8dB	5.6dB	4.3dB	4.2dB
No.3	4.5dB	5.0dB	5.2dB	4.8dB	5.6dB	4.5dB	4.2dB
No.4	4.7dB	5.2dB	5.2dB	4.8dB	5.6dB	5.1dB	4.2dB

*3m/1m/0.5m = Measurement distance

Radiated emission (±dB)	
40GHz-50GHz	3.9dB
50GHz-75GHz	5.1dB
75GHz-110GHz	5.4dB
110GHz-170GHz	5.2dB
170GHz-260GHz	5.2dB

Radiated emission test(3m)
The data listed in this test report has enough margin, more than the site margin.

3.5 Test Location

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Telephone : +81 596 24 8116 Facsimile : +81 596 24 8124

	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.75 x 5.4 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.0 x 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

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

3.6 Data of EMI, Duty Cycle, Test instruments, and Test set up

Refer to APPENDIX.

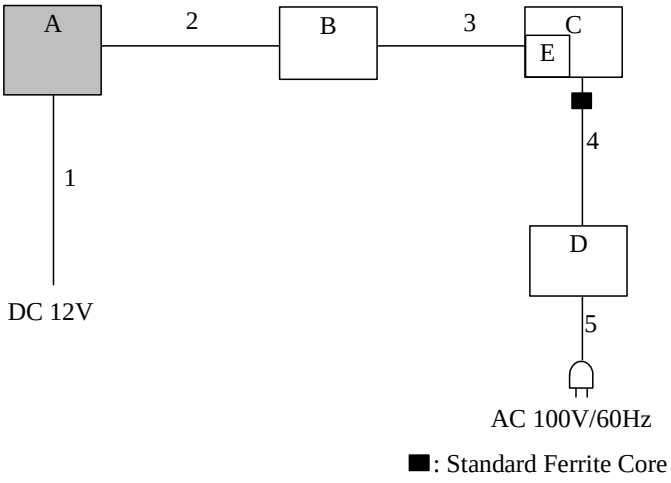
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Mode(s)

Mode	Test Item
Operating mode (In motion) *1)	26dB Bandwidth Power Density Spurious Emission Frequency Stability
Operating mode (Not in motion)	Power Density
Power of the EUT was set by the software as follows; Software: mwr_gen4_0018_t042 This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product. *1) All test items were performed on "In motion" mode, since output power is higher than "Not in motion" mode.	

Detail of Operation: DNMWR007 is using an electric scanning called Digital Beam Forming (DBF) to determine azimuth angle of objects.

4.2 Configuration and peripherals



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Millimeter Wave Radar Sensor	DNMWR007	001	DENSO CORPORATION	EUT
B	CAN Cab	251	-	Vector	-
C	PC	CF-B5ER8S	1BKSA01852	Panasonic	-
D	AC Adaptor	CF-AA1639A M3	030600424 B	Panasonic	-
E	CANcardXL	007100	027872	Vector	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	-
2	Signal Cable	2.3	Unshielded	Unshielded	-
3	Signal Cable	0.3	Shielded	Shielded	-
4	DC Cable	1.8	Unshielded	Unshielded	-
5	AC Cable	1.7	Unshielded	Unshielded	-

SECTION 5: Radiated Emission (Spurious Emission, Power Density)

Test Procedure
[Up to 40GHz]
EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m(9kHz - 10GHz), 0.5m by 1.0m(10GHz - 40GHz), raised 0.8m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane. The height of the measuring antenna varied between 1 and 4m (frequency 9kHz – 30MHz: loop antenna was fixed height at 1.0m) 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 with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table. When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

Frequency	Below 30MHz	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

Frequency	9kHz-150kHz	150kHz–30MHz	30MHz-1GHz	1GHz-231GHz	
Instrument used	Test Receiver	Test Receiver	Test Receiver	Spectrum Analyzer	
Detector	QP, AV	QP, AV	QP	PK	AV
IF Bandwidth	BW 200Hz	BW 9kHz	BW 120kHz	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz *1)
Test Distance	3m	3m	3m	3m (below 10GHz), 1m*2) (10GHz - 26.5GHz), 0.5m*3) (26.5GHz - 40GHz)	

*1) Except for the carrier frequency.
Peak with duty factor was applied to average measurement of carrier frequency.
*2) Distance Factor: 20 x log (3.0m/1.0m) = 9.5dB
*3) Distance Factor: 20 x log (3.0m/0.5m) = 15.6dB

[Above 40GHz]
The test was performed based on "MILLIMETER WAVE TEST PROCEDURES".
The EUT was placed on a urethane platform, raised 1.5m above the conducting ground plane.
The measurements were performed on handheld method.

Set spectrum analyzer RBW, VBW, span, etc., to the proper values. Note these values. Enable two traces—one set to "clear write," and the other set to "max hold."
Begin hand-held measurements with the test antenna (horn) at a distance of 1 m from the EUT in a horizontally polarized position. Slowly adjust its position, entirely covering the plane 1 m from the EUT.
Observation of the two active traces on the spectrum analyzer will allow refined horn positioning at the point(s) of maximum field intensity. Repeat with the horn in a vertically polarized position. If the emission cannot be detected at 1 m, reduce the RBW to increase system sensitivity. Note the value. If the emission still cannot be detected, move the horn closer to the EUT, noting the distance at which a measurement is made.

Note the maximum level indicated on the spectrum analyzer. Adjust this level, if necessary, by the antenna gain, conversion loss of the external mixer and gain of LNA used, at the frequency under investigation. Calculate the field strength of the emission at the measurement distance from the Friis' transmission equation.

[About carrier measurement]
The carrier levels were confirmed at maximum direction of transmission. The maximum direction was searched under carefully since beam-widths are extremely narrow.

The carrier levels were measured in the far field. The distance of the far field was calculated from follow equation.

$$r = \frac{2D^2}{\lambda}$$

where

r is the distance from the radiating element of the EUT to the edge of the far field, in m
D is the largest dimension of both the radiating element and the test antenna (horn), in m
Lambda is the wavelength of the emission under investigation [300/f (MHz)], in m

Frequency	Lambda	Maximum Dimention			Far Field
		H	V	Diagonal	Boundary
[GHz]	[mm]	[mm]	[mm]	D [m]	r [m]
77.0	3.9	57.6	10.0	0.058	1.8

The test was made on EUT at the normal use position except for carrier measurement.
For the carrier measurement, the EUT was placed on the jig because the antenna array was mounted on angularly-tilted.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Measurement range : 9k-231GHz
Test data : APPENDIX
Test result : Pass

SECTION 6: Frequency Stability

Test Procedure
The external mixer was placed in side of the temperature chamber drain hole.

The power supply set to 100 % nominal setting, raise EUT operating temperature to 50 deg. C.
Record the frequency excursion of the EUT emission mask.
Repeat measurements at each 10 deg. C increment down to –20 deg. C.

Varied EUT power supply between 85 % and 115 % of nominal and record the frequency excursion of the EUT emission mask when temperature is 20 deg. C.

Emission mask was measured 26dB bandwidth.

Test data : APPENDIX
Test result : Pass

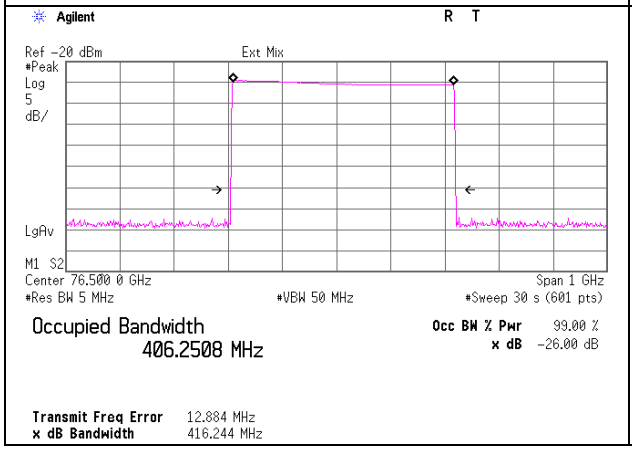
APPENDIX 1: Data of EMI test

26dB and 99% Bandwidth

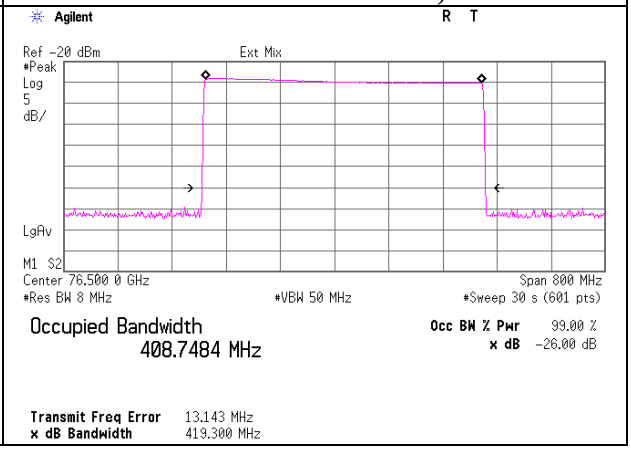
Test place	Head Office EMC Lab. No.6 Shielded room
Report No.	32JE0171-HO-02
Date	06/22/2012
Temperature/ Humidity	20 deg. C / 30% RH
Engineer	Hironobu Ohnishi
Mode	Operating mode (In motion)

Frequency [GHz]	26dB Bandwidth [MHz]	99% Occupied Bandwidth [MHz]
76.500	416.244	408.7484

26dB bandwidth



99% bandwidth *1)



*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100%.

Power Density

Test place	Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No.	32JE0171-HO-02
Date	06/18/2012
Temperature/ Humidity	24 deg. C / 71% RH
Engineer	Hironobu Ohnishi
Mode	Operating mode (In motion / Not in motion)

Mode	Frequency [GHz]	Measurement Distance [m]	Measured Power [dBm]	Rx Antenna Gain [dBi]	System Loss [dB]	LNA Gain [dB]	Free field Attenuation [dB]
In motion	76.3167	3.0	-68.50	22.31	41.61	0.00	79.64
Not in motion	76.3107	3.0	-74.60	22.30	41.59	0.00	79.64

Mode	Peak EIRP		Specification Distance [m]	Power Density Pk [uW/cm2]	Limit Pk [uW/cm2]	Margin Pk [dB]
	[dBm]	[mW]				
In motion	30.44	1106.6	3.0	0.978	6000	37.88
Not in motion	24.33	270.8	3.0	0.239	20	19.22

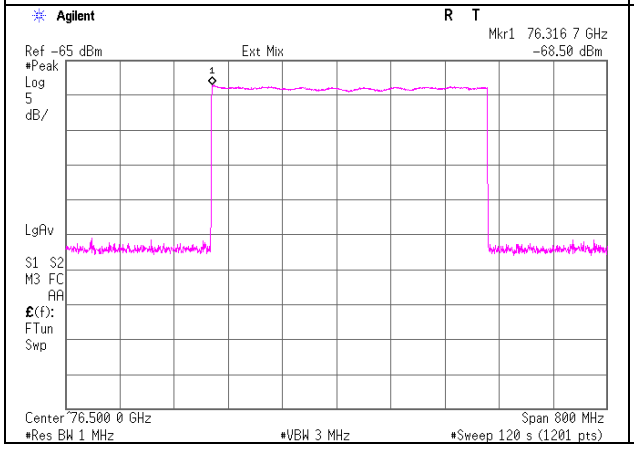
Mode	Duty Factor * [dB]	Average EIRP (Peak with Duty Factor)		Specification Distance [m]	Power Density Av [uW/cm2]	Limit Av [uW/cm2]	Margin Av [dB]
		[dBm]	[mW]				
In motion	-2.34	28.10	645.1	3.0	0.570	60	20.22
Not in motion	-2.34	21.98	157.9	3.0	0.140	0.2	1.56

* Refer to APPENDIX 2

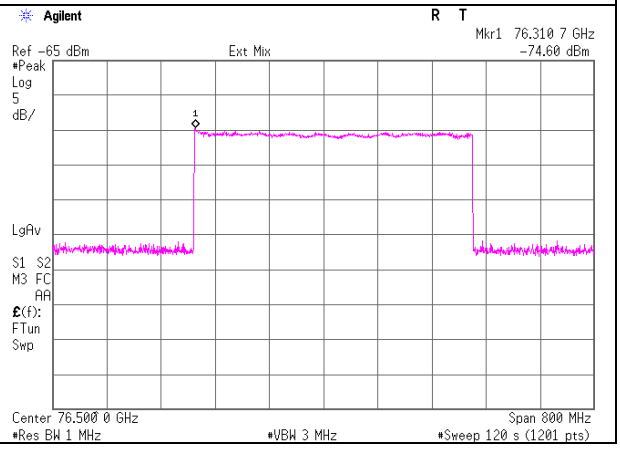
Calculating formula:

Free Field Attenuation = 10 * log((4 * pi * Measurement Distance / lambda) ^ 2)
Peak EIRP = Measured Power - Rx Antenna Gain + System Loss - LNA Gain + Free Field Attenuation
Average EIRP = Peak EIRP + Duty Factor
Power Density = EIRP / (4 * pi * Specification Distance ^ 2)

In Motion



Not In Motion



Spurious Emission

Test place	Head Office EMC Lab. No.4 Semi Anechoic Chamber	
Report No.	32JE0171-HO-02	
Date	06/18/2012	06/19/2012
Temperature/ Humidity	24 deg. C / 71% RH	23 deg. C / 78% RH
Engineer	Hironobu Ohnishi (Above 18GHz)	Hironobu Ohnishi (Below18GHz)
Mode	Operating mode (In motion)	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	128.002	QP	39.4	13.6	8.4	32.0	29.4	43.5	14.1	
Hori	164.800	QP	41.6	15.6	8.7	32.0	33.9	43.5	9.6	
Hori	432.066	QP	35.1	18.1	10.5	32.0	31.7	46.0	14.3	
Hori	528.055	QP	29.1	19.4	11.1	32.0	27.6	46.0	18.4	
Hori	624.032	QP	25.1	20.9	11.5	32.1	25.4	46.0	20.6	
Hori	38250.000	PK	45.9	41.5	-9.0	24.0	54.4	73.9	19.5	NS
Hori	38250.000	AV	31.7	41.5	-9.0	24.0	40.2	53.9	13.7	NS
Vert	44.200	QP	33.9	13.1	7.3	32.1	22.2	40.0	17.8	
Vert	64.001	QP	39.8	7.4	7.6	32.1	22.7	40.0	17.3	
Vert	128.002	QP	34.8	13.6	8.4	32.0	24.8	43.5	18.7	
Vert	164.800	QP	41.1	15.6	8.7	32.0	33.4	43.5	10.1	
Vert	432.066	QP	38.6	18.1	10.5	32.0	35.2	46.0	10.8	
Vert	528.055	QP	36.9	19.4	11.1	32.0	35.4	46.0	10.6	
Vert	624.032	QP	32.0	20.9	11.5	32.1	32.3	46.0	13.7	
Vert	38250.000	PK	44.6	41.5	-9.0	24.0	53.1	73.9	20.8	NS
Vert	38250.000	AV	31.7	41.5	-9.0	24.0	40.2	53.9	13.7	NS

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

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

NS: No signal.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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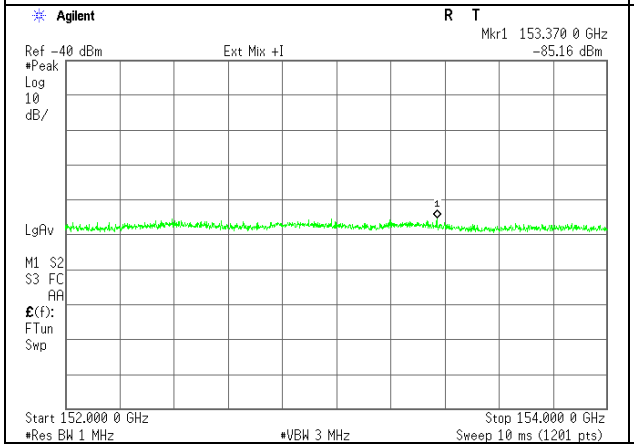
Spurious Emission (above 40GHz)

Test place	Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No.	32JE0171-HO-02
Date	06/18/2012
Temperature/ Humidity	24 deg. C / 71% RH
Engineer	Hironobu Ohnishi
Mode	Operating mode (In motion)

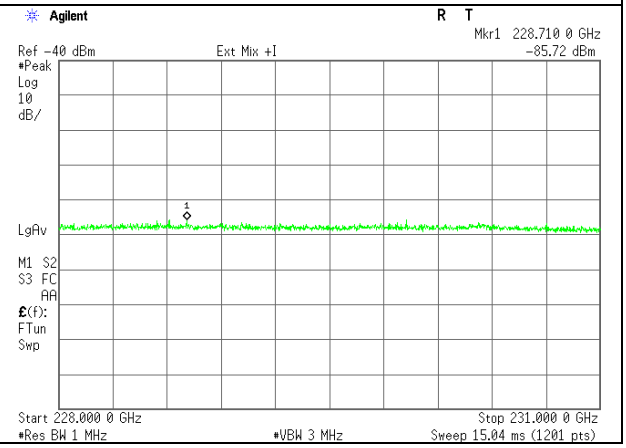
* The peak density is less than the average limit.
There is no spurious emission from 40GHz to 231GHz except for operating band.

The following shows the measurement results of the harmonics.

2nd harmonics



3rd harmonics



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Frequency Stability

Test place	Head Office EMC Lab. No.6 Shielded room
Report No.	32JE0171-HO-02
Date	06/22/2012
Temperature/ Humidity	20 deg. C / 30% RH
Engineer	Hironobu Ohnishi
Mode	Operating mode (In motion)

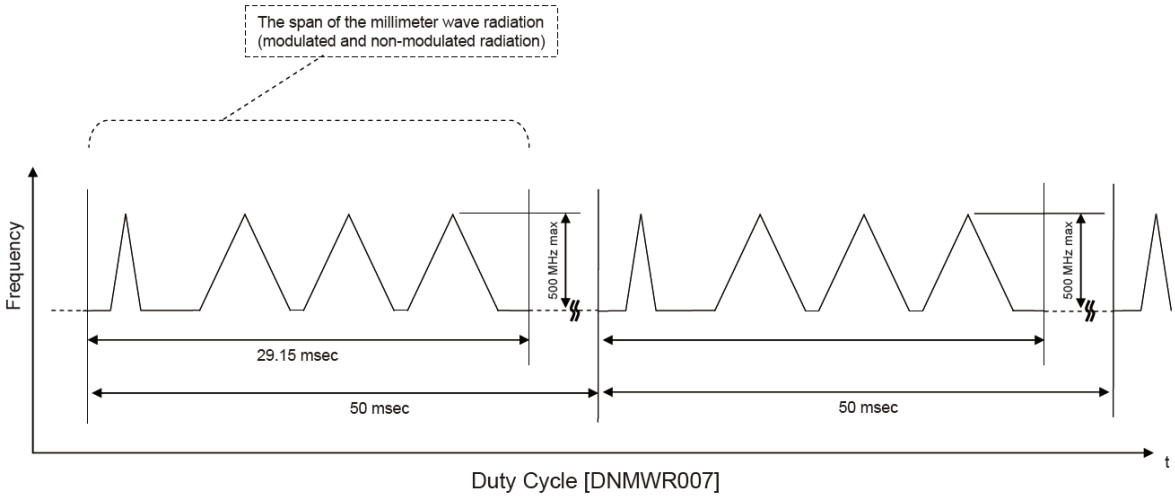
Test Condition		Center	Frequency	26dB	Lower	Upper
Temperature	Power Supply	Frequency	Error	Bandwitdh	Frequency	Frequency
[deg. C]	[V]	[GHz]	[MHz]	[MHz]	[GHz]	[GHz]
50	12.0	76.500	47.805	416.133	76.340	76.756
40	12.0	76.500	29.412	414.625	76.322	76.737
30	12.0	76.500	21.108	416.486	76.313	76.729
20	12.0	76.500	12.884	416.244	76.305	76.721
10	12.0	76.500	14.534	418.742	76.305	76.724
0	12.0	76.500	20.992	421.588	76.310	76.732
-10	12.0	76.500	7.966	422.162	76.297	76.719
-20	12.0	76.500	27.653	421.596	76.317	76.738
20	10.2	76.500	13.311	416.302	76.305	76.721
20	13.8	76.500	14.475	416.321	76.306	76.723
20	10.0	76.500	13.061	416.622	76.305	76.721
20	16.0	76.500	13.467	416.186	76.305	76.722

Calculating formula:

Lower Frequency = Center Frequency + Frequency Error - 26dB Bandwidth / 2
Upper Frequency = Center Frequency + Frequency Error + 26dB Bandwidth / 2

APPENDIX 2: Duty Cycle

[Technical document for the Duty Cycle]



Duty Cycle [DNMWR007]

[Duty Factor for average measurements]

Pulse On time [ms]	Period [ms]	Duty [%]	Duty Factor [dB]
29.15	50.00	58.3	-2.34

Calculating formula:

Duty = Pulse On time / Period * 100

Duty Factor = 10 * log (Total Pulse On time / Period)

* This Duty is the worst case. Transmitting time does not exceed it.

APPENDIX 3: Test instruments

EMI test equipment(1/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2012/02/29 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2012/02/06 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE	-
MLDM-04	Digital laser distance meter	BOSCH	DLE 50	781422774	RE	2010/06/10 * 36
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2011/11/23 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2011/06/17 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1203S212(1m) / 1204S062(5m)	RE	2012/04/23 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2012/03/28 * 12
MPA-03	Microwave System Power Amplifier	Agilent	83050A	3950M00205	RE	2011/06/15 * 12
MCC-140	Microwave Cable	Junkosha	J12J101596-00	JAN-31-12-001	RE	2012/02/24 * 12
MHA-07	Horn Antenna	Custom	HO22R	10766-01	RE	2011/10/31 * 12
MHA-10	Horn Antenna	WiseWave	ARH1523-02	10766-02	RE	2011/10/31 * 12
MPA-08	Pre Amplifier	WiseWave	ALN-61226028-51	11576-01-071	RE	2011/08/27 * 12
MMX-01	Preselected Millimeter Mixer	Agilent	11974V-E01	3001A00412	RE	2011/06/13 * 12
MHA-11	Horn Antenna	WiseWave	ARH1023-02	10766-01	RE	2011/10/31 * 12
MHF-15	High Pass Filter 81-110GHz	VCSS	HPF-10-778030	201	RE	2011/08/27 * 12
MPA-18	Pre Amplifier	AmTechs Corporation	LNA-7511025	9601	RE	2011/08/27 * 12
MMX-02	Harmonic Mixer	Agilent	11970W	2521 A01909	RE	2011/06/14 * 12
MCC-66	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28636/2	RE	2012/04/25 * 12
MCC-67	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28635/2	RE	2012/04/25 * 12
MHA-24	Horn Antenna	Custom Microwave Inc.	HO6R	-	RE	2011/09/19 * 12
MMX-03	Harmonic Mixer	OML Inc.	M06HWD	D100709-1	RE	2011/09/30 * 12
MHA-27	Horn Antenna	Custom Microwave Inc.	HO4R	-	RE	2011/09/19 * 12
MMX-04	Harmonic Mixer	OML Inc.	M04HWD	Y100709-1	RE	2011/09/30 * 12
MCC-135	Microwave Cable	HUBER+SUHNER	SUCOFLEX102	37511/2	RE	2011/08/31 * 12
MDPLX-01	Diplexer	OML Inc.	DPL26	-	RE	2011/09/19 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2012/04/03 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2011/10/19 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2011/11/02 * 12
MCC-31	Coaxial cable	UL Japan	-	-	RE	2011/07/28 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2012/03/05 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(5m)/ 421-010(1m)/sucoform141-PE(1m)/RFM-E121 (Switcher)	-/04178	RE	2011/07/04 * 12

EMI test equipment(2/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2011/11/16 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2011/11/16 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2012/06/01 * 12
AT-38	Attenuator	Anritsu	MP721B	6200961025	RE	2011/12/08 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2011/08/11 * 12
MCH-04	Temperature and Humidity Chamber	Tabai Espec	PL-2KP	14015723	RE	2011/08/22 * 12
MMM-11	Digital HiTESTER	Hioki	3805	060100600	RE	2012/05/18 * 12
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2012/04/06 * 12

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

[Below 40GHz]
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

[Above 40GHz]
Acceptance criteria for untraceable equipment was formulated according to ISO/IEC 17025 5.6.2.2.2, and the regular inspection was performed based on it annually.
For 40-110GHz, power sensor is calibrated by manufacturer, and the measured calibration data is used as in-house reference. The calibration data by manufacturer is checked for acceptance by a calorie meter except for some frequency bands.
For above 110GHz, output level of millimeter wave source module is used as the reference, and inspection by the calorie meter is performed.
Electric power is checked with the calorie meter by measuring resistance and voltage of reference resistor.

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