RADIO TEST REPORT

Test Report No. : 29DE0043-HO-A

Applicant	:	**ISHIDA CO., LTD.**
Type of Equipment	:	**RF board**
Model No.	:	**DMS001**
FCC ID	:	**XXJDMS001**
Test regulation	:	**FCC Part 15 Subpart C 2009 Section 15.207, Section 15.247**
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.

Date of test: November 16 to 21, 2009

Tested by:

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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://uljapan.co.jp/emc/nvlap.html

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SECTION 1: Customer information

Company Name	:	ISHIDA CO., LTD.
Address	:	959-1 Shimomagari, Ritto-shi, Shiga, 520-3026 Japan
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Contact Person	:	Kazuhiko Takemura

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

2.1 Identification of E.U.T.

Type of Equipment	:	RF board
Model No.	:	DMS001
Serial No.	:	Refer to Clause 4.2
Receipt Date of Sample	:	November 16, 2009
Country of Mass-production	:	Japan
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model No: DMS001 (referred to as the EUT in this report) is the RF board.

Feature of EUT: DMS001 has Type-1 and Type-2.

[Type-1]
Antenna Type: Multilayer antenna, Inverted F (Chip)
Antenna gain: 2 dBi
Antenna Connector Type: Soldered component

Type-1 has an antenna connector for the test between Chip antenna and RF circuit.
The specification of antenna connector for the test is as follows.
<The specification of antenna connector for the test>
Antenna connector: RF coaxial switches connector
Parts number: MM8130-2600
Manufacture: Murata Manufacturing Co., Ltd.
* This connector can be connected to the specific probe only.

[Type-2]
Antenna Type: 1/2λ Dipole antenna (External)
Antenna gain: 2.15 dBi
Connector: U.FL (on RF board), RP-SMA(M) (Antenna side)

Clock frequency(ies) in the system : 26MHz

Equipment Type	: Transceiver
Frequency of Operation	: 2405-2480MHz
Channel Spacing	: 0.625MHz
Type of Modulation	: GFSK
Power Supply	: 3.0V (2.7V-3.3V)
Operating temperature range	: +5 to +35 deg.C.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part15 Subpart C: 2009, final revised on December 2, 2009
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz

* The revision on December 2, 2009 does not influence the test specification applied to the EUT.
* The EUT complies with FCC Part 15 Subpart B: 2009, final revised on December 2, 2009.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.4:2003 7. AC powerline Conducted Emission measurements	**FCC:** Section 15.207	**[Tx]** **QP** 5.7dB, 0.18466MHz, L **AV** 10.6dB, 0.18260MHz, N 0.18234MHz, L **[Rx]** **QP** 6.2dB, 0.18660MHz, L **AV** 10.7dB, 0.18568MHz, N	Complied	-
	IC: RSS-Gen 7.2.2	**IC:** RSS-Gen 7.2.2			
6dB Bandwidth	**FCC:** "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247"	**FCC:** Section 15.247(a)(2)	See data.	Complied	Conducted
	IC: RSS-Gen 4.6.2	**IC:** RSS-210 A8.2(a)			
Maximum Peak Output Power	**FCC:** "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247"	**FCC:** Section 15.247(b)(3)		Complied	Conducted
	IC: RSS-Gen 4.8	**IC:** RSS-210 A8.4(4)			
Power Density	**FCC:** "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247"	**FCC:** Section 15.247 (e)		Complied	Conducted
	IC: -	**IC:** RSS-210 A8.2(b)			
Spurious Emission Restricted Band Edges	**FCC:** "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247"	**FCC:** Section15.247(d)	**[Tx]** 1.7dB 2483.500MHz, AV, Hori. **[Rx]** 4.1dB 4879.251MHz, AV, Hori.	Complied	Conducted/ Radiated
	IC: RSS-Gen 4.9 RSS-Gen 4.10	**IC:** RSS-210 A8.5 RSS-Gen 7.2.1 and 7.2.3			
Note: UL Japan, Inc.'s EMI Work Procedures No.QPM05 and QPM15.					

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

FCC 15.31 (e)

This EUT provides stable voltage(DC3.0V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

[Type-1] It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. This antenna connector for the test is a unique connector connected to specific probe only.
[Type-2] The EUT has a unique coupling/antenna connector.
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	N/A	Conducted

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)	**Conducted emission (±dB)**
	150kHz-30MHz
No.1	3.7dB
No.2	3.7dB
No.3	3.7dB
No.4	3.7dB

Test room (semi-anechoic chamber)	**Radiated emission (10m*)(±dB)**			**Radiated emission (3m*)(±dB)**					
	9kHz-30MHz	30MHz-300MHz	300MHz-1GHz	9kHz-30MHz	30MHz-300MHz	300MHz-1GHz	1GHz-18GHz	18GHz-26.5GHz	26.5GHz-40GHz
No.1	3.1dB	4.4dB	3.9dB	3.2dB	3.8dB	3.9dB	5.0dB	5.0dB	5.4dB
No.2	-	-	-	3.2dB	4.4dB	4.0dB	5.0dB	5.2dB	5.4dB
No.3	-	-	-	3.2dB	4.2dB	3.8dB	5.0dB	5.3dB	5.3dB
No.4	-	-	-	3.2dB	4.0dB	3.8dB	5.0dB	5.3dB	5.3dB

*10m/3m = Measurement distance

Power meter (±dB)	
Below 1GHz	Above 1GHz
1.0dB	1.0dB

Antenna terminal conducted emission and Power density (±dB)			**Antenna terminal conducted emission (±dB)**		**Channel power (±dB)**
Below 1GHz	1GHz-3GHz	3GHz-18GHz	18GHz-26.5GHz	26.5GHz-40GHz	
1.0dB	1.1dB	2.7dB	3.2dB	3.3dB	1.5dB

Conducted Emission test
The data listed in this test report has enough margin, more than the site margin.

Radiated emission test(3m)
The data listed in this report meets the limits unless the uncertainty is taken into consideration.

3.5 Test Location

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	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 Test set up, Data of EMI, and Test instruments

Refer to APPENDIX.

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

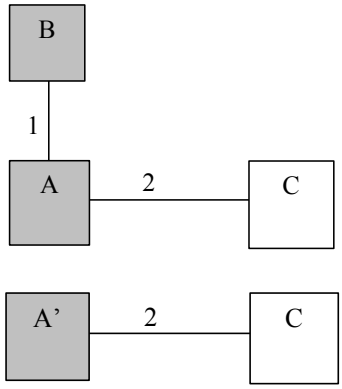
4.1 Operating Mode(s)

*The details of Operating mode(s)

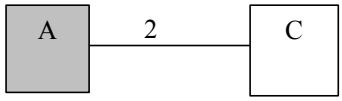
Test Item	Operating Mode	Tested Antenna	Tested frequency
Conducted Emission, Radiated Spurious Emission	Tx	Type-1 Type-2	2405MHz 2440MHz 2480MHz
	Rx	Type-1 Type-2	2440MHz
6dB Bandwidth, Maximum Peak Output Power, Power Density, 99% Occupied Bandwidth, Conducted Spurious Emission	Tx	Type-2 *1)	2405MHz 2440MHz 2480MHz
Conducted Emission Band Edge compliance	Tx	Type-2 *1)	2405MHz 2480MHz
*1) Since RF Part of Type-1 and Type-2 was identical, Antenna Terminal conducted Tests were performed on Type-2 as a representative.			

4.2 Configuration and peripherals

[Spurious Emission tests]



[Antenna Terminal Conducted tests]



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

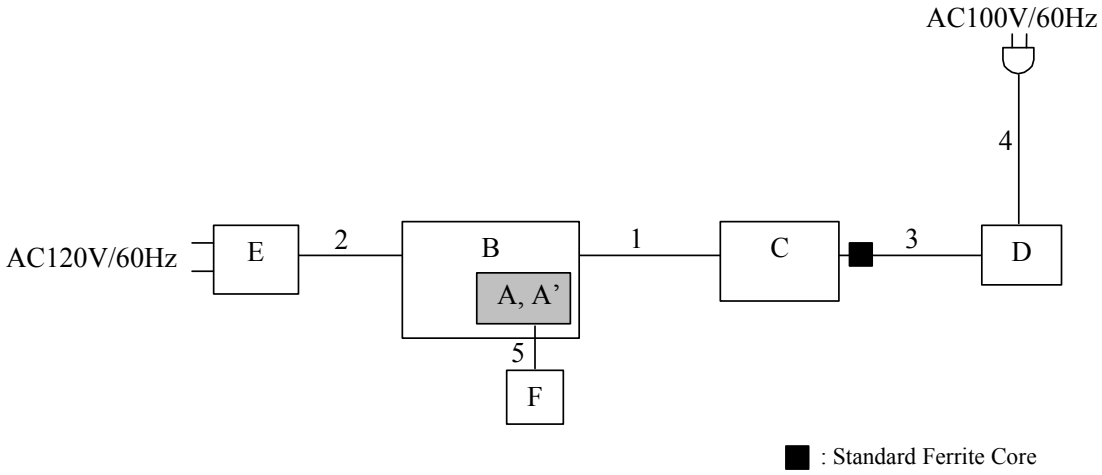
Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	RF board	DMS001 [Type-2]	1	ISHIDA CO., LTD.	EUT
A'	RF board	DMS001 [Type-1]	1	ISHIDA CO., LTD.	EUT
B	Antenna	WSS002	001	ISHIDA CO., LTD.	EUT
C	Battery	-	-	-	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable	0.04	Shielded	Shielded	-
2	DC Cable	0.3	Unshielded	Unshielded	-

[Conducted Emission test]



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

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	RF board	DMS001 [Type-1]	1	ISHIDA CO., LTD.	EUT *1)
A'	RF board	DMS001 [Type-2]	1	ISHIDA CO., LTD.	EUT *1)
B	Access Point	DMWAP-01	8060861	ISHIDA CO., LTD.	-
C	Note PC	PP03S	KR-09X869-36521-33R-2093	DELL	-
D	AC Adaptor	ADP-50FH	TH-00R334-17971-33B-12KQ	DELL	-
E	AC Adaptor	US300520	901-0306936	UNIFIVE	-
F	Antenna	WSS002	001	ISHIDA CO., LTD.	EUT *2)

*1) The test was performed for both A and A'.
*2) Used for RF board [Type-2] only.

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	LAN Cable	0.7	Unshielded	Unshielded	-
2	DC Cable	1.8	Unshielded	Unshielded	-
3	DC Cable	1.8	Unshielded	Unshielded	-
4	AC Cable	0.9	Unshielded	Unshielded	-
5	Antenna Cable	0.04	Shielded	Shielded	*1)

*1) Used for RF board [Type-2] only.

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane.
The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber or a Measurement Room.
The EUT was connected to a LISN (AMN).
An overview sweep with peak detection has been performed.

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

Detector : QP and AV
Measurement range : 0.15-30MHz
Test data : APPENDIX
Test result : Pass

SECTION 6: Radiated Spurious Emission

Test Procedure
It was measured based on "2. Radiated emission test" of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247 ".
EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, 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 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	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Biconical	Logperiodic	Horn

In any 100kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

20dBc was applied to the frequency over the limit of FCC 15.209 / Table 2 of RSS-210 2.7 (IC) and outside the restricted band of FCC15.205 / Table 1 of RSS-210 2.7 (IC).

Frequency	Below 1GHz	Above 1GHz	
Instrument used	Test Receiver / Spectrum Analyzer	Spectrum Analyzer	
Detector	QP	PK	AV
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz VBW: 1MHz	RBW: 1MHz VBW: 10Hz
	20dBc : RBW: 100kHz VBW: 300kHz (S/A)	20dBc : RBW:100kHz/VBW:300kHz	
Test Distance	3m	3m (below 10GHz), 1m*1) (above 10GHz), 0.5m*2) (above 18GHz)	

*1) Distance Factor: 20 x log (3.0m/1.0m) = 9.5dB
*2) Distance Factor: 20 x log (3.0m/0.5m) = 15.6dB

- 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.

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

Measurement range : 30M-26.5GHz
Test data : APPENDIX
Test result : Pass

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	3MHz	100kHz	300kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 to 3% of Span	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak	-	Power Meter (Sensor: 50MHz BW)
Peak Power Density	1.5MHz	3kHz	100kHz	500sec	Peak	Max Hold	Spectrum Analyzer *1)
Conducted Spurious Emission	Less or equal to 5GHz (Range: 30MHz-25GHz)	100kHz	300kHz	Auto	Peak	Max Hold	Spectrum Analyzer
*1) PSD Option 1 of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247 ".							

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

Test data : APPENDIX
Test result : Pass