



RADIO TEST REPORT

Test Report No. : 30CE0183-HO-01-A

Applicant : SANYO Electric Co., Ltd.
Type of Equipment : WLAN Module
Model No. : 1AV4U19B25500
FCC ID : NPK19B255
Test regulation : FCC Part 15 Subpart C 2009
Section 15.207, Section 15.247
(Class II Permissive Change Application)
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 20 to December 1, 2009

Tested by: T. Nakagawa
Tomohisa Nakagawa
EMC Services

H. Ohnishi
Hironobu Ohnishi
EMC Services

Approved by: Makoto Kosaka
Makoto Kosaka
EMC Services



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UL Japan, Inc.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

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SECTION 1: Customer information

Company Name : SANYO Electric Co., Ltd.
Brand Name : SANYO
Address : 1-1 Sanyo-cho, Daito City, Osaka 574-8534, Japan
Telephone Number : +81-72-870-6132
Facsimile Number : +81-72-875-9358
Contact Person : Keiji Hirao

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

2.1 Identification of E.U.T.

Type of Equipment : WLAN Module
Model No. : 1AV4U19B25500
Serial No. : Refer to Section 4, Clause 4.2
Receipt Date of Sample : November 14, 2009
Country of Mass-production : China
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: 1AV4U19B25500 (referred to as the EUT in this report) is the WLAN Module which is installed in the Projector (host device) manufactured by SANYO Electric Co., Ltd.

General Specification

Clock frequency(ies) in the system : 40MHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 2412-2462MHz
Modulation : DSSS: CCK, DQPSK, DBPSK
OFDM: 64QAM, 16QAM, QPSK, BPSK
Bandwidth & Channel spacing : 20/40MHz & 5MHz
Antenna Type : PWB pattern antenna
Antenna Gain : 2.5dBi (Peak)
Antenna Connector Type : UFL
Power Supply (radio part input) : DC 5.0V
Method of Frequency Generation : Crystal
Operatong Temperature : 0 deg.C. to 40 deg.C.

<Previous test report number and contents of the Change from previous the report>

Previous Test Report Number	29FE0119-HO-01-A-R1
Contents of the Change	The change of host device from Projector (PCL-WXU700) to Projector (PLC-XU116 / LC-XB43N (OEM Model)).

* There was no change on the WLAN Molule (1AV4U19B25500).

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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.

* Remarks: 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 ----- IC: RSS-Gen 7.2.2	FCC: Section 15.207 ----- IC: RSS-Gen 7.2.2	[Tx] QP 13.5dB, 0.15042MHz, N AV 4.8dB, 0.15056MHz, N 4.8dB, 0.15042MHz, N [Rx] QP 14.5dB, 0.15109MHz, N AV 5.7dB, 0.15109MHz, N	Complied	-
6dB Bandwidth	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: RSS-Gen 4.6.2	FCC: Section 15.247(a)(2) ----- IC: RSS-210 A8.2(a)	See data.	N/A *1)	N/A
Maximum Peak Output Power	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: RSS-Gen 4.8	FCC: Section 15.247(b)(3) ----- IC: RSS-210 A8.4(4)		Complied	Conducted
Power Density	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: -	FCC: Section 15.247 (e) ----- IC: RSS-210 A8.2(b)		N/A *1)	N/A
Spurious Emission Restricted Band Edges	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: RSS-Gen 4.9 RSS-Gen 4.10	FCC: Section15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 7w.2.1 and 7.2.3	[Tx] 1.1dB 959.999MHz, QP, Vertical [Rx] 5.7dB 3250.368MHz, AV, Vertical	Complied	Radiated *2)

Note: UL Japan, Inc.'s EMI Work Procedures No.QPM05 and QPM15.

*1) The test was not performed since it had been performed at 29FE0119-HO-01-A-R1 for WLAN Module issued by UL Japan, Inc.

*2) The conducted test was not performed since it had been performed at 29FE0119-HO-01-A-R1 for WLAN Module issued by UL Japan, Inc.

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

FCC 15.31 (e)

The RF Module has own regulator.

The RF Module is constantly provided voltage (DC3.3V, DC 1.5V) through own regulator regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

The EUT has a unique coupling/antenna connector (UFL Connector). Therefore the equipment complies with the requirement of 15.203/212.

UL Japan, Inc.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

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 *1)	N/A
*1) The test was not performed since it had been performed at 29FE0119-HO-01-A-R1 for WLAN Module issued by UL Japan, Inc.					

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.

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Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

3.5 Test Location

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
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 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)

Mode	Remarks*
IEEE 802.11b (11b)	11Mbps, PN
IEEE 802.11n, 20HT (11n-20)	MCS0 PN
IEEE 802.11n, 40HT (11n-40)	MCS0 PN
*Transmitting duty was 100% on all tests.	

* As a result of preliminary test, the formal test was performed with the above modes, which had the maximum rated power.

*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Conducted Emission	11b Tx	2412MHz* 2462MHz*
	11b Rx	2437MHz
Maximum Peak Output Power	11n-20 Tx	2412MHz
		2437MHz
		2462MHz
Spurious Emission (Radiated)	11n-40 Tx	2422MHz* 2452MHz*
	11b Rx	2437MHz

* The test was performed on Low/High channel which was the worst mode, since the host device of LMA was changed.

*Information of the representative host device.

Type of Equipment : Projector
Model No. : PLC-XU116
Serial No. : 0028
Operating Voltage : AC 120V/60Hz

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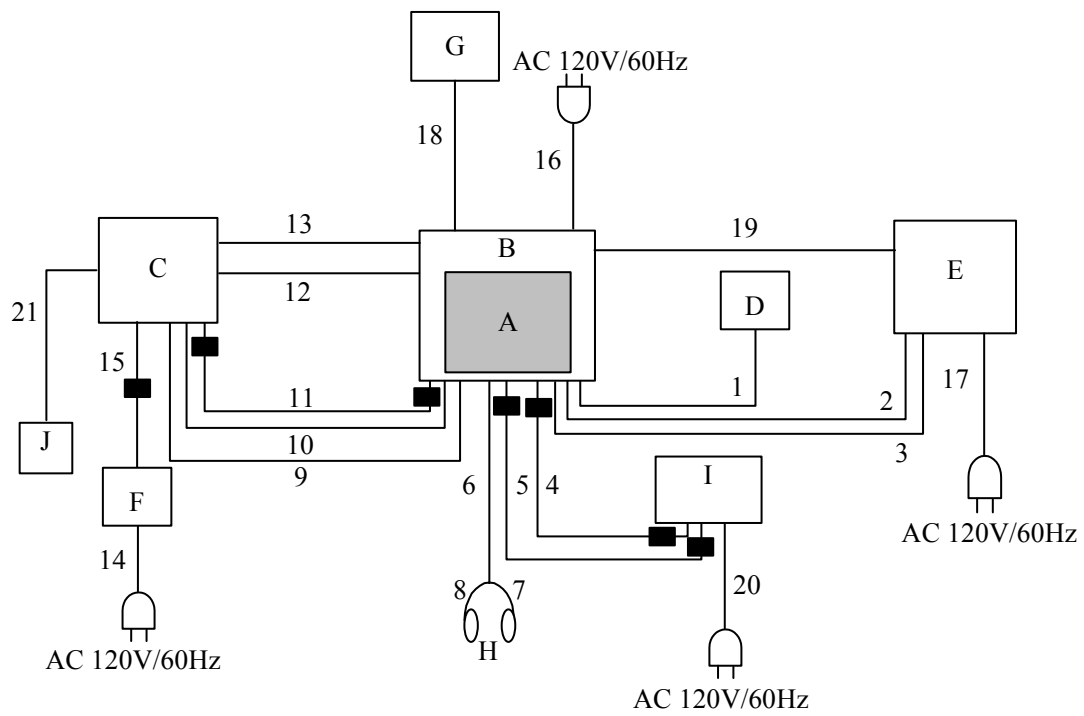
Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

4.2 Configuration and peripherals



■ : Standard Ferrite Core

* 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	WLAN Module	1AV4U19B25500	001F1F3E707B *1) 001F1F3E7077 *2)	SANYO	EUT
B	Projector	PLC-XU116	0028	SANYO	-
C	Personal Computer	2647-LJ3	97-ALT9W	IBM	-
D	USB Memory	MF-AU202GSV	E7081506615	ELECOM	-
E	DVD Player	DV-600AV-S	HEKD013328LS	Pioneer	-
F	AC Adapter	02K6750	11S02K6750Z1Z2 UP3561HY	IBM	-
G	Controller	-	-	SANYO	-
H	Earphones	-	-	-	-
I	LCD Display	FTD-W924HSR/BK	89708974719115	BUFFALO	-
J	MOUSE	M-S48a	HCA13824997	Logitech	-

*1) Used for Conducted emission, Radiated Spurious emission tests

*2) Used for Antenna terminal Conducted tests

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB Cable	1.5	Shielded	Shielded	-
2	Audio Cable	1.5	Unshielded	Shielded	-
3	S-Video Cable	3.0	Shielded	Shielded	-
4	Monitor Cable	2.0	Shielded	Shielded	-
5	DVI Cable	2.0	Shielded	Shielded	-
6	Audio Cable	0.4	Shielded	Shielded	-
7	Audio Cable	0.6	Shielded	Shielded	-
8	Audio Cable	0.2	Shielded	Shielded	-
9	LAN Cable	0.9	Unshielded	Unshielded	-
10	Audio Cable	1.0	Shielded	Shielded	-
11	Monitor Cable	1.8	Shielded	Shielded	-
12	USB Cable	1.8	Shielded	Shielded	-
13	Serial Cable	3.0	Shielded	Shielded	-
14	AC Cable	2.0	Unshielded	Unshielded	-
15	DC Cable	1.8	Unshielded	Unshielded	-
16	AC Cable	3.0	Unshielded	Unshielded	-
17	AC Cable	2.0	Unshielded	Unshielded	-
18	Signal Cable	1.5	Shielded	Shielded	-
19	Video and Audio Cable	1.5	Shielded	Shielded	-
20	AC Cable	1.8	Unshielded	Unshielded	-
21	Mouse Cable	1.8	Shielded	Shielded	-

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Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0m by 2.0m, 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

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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Facsimile : +81 596 24 8124

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, 1.0m by 2.0m, 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	
Test Distance	3m	3m (below 10GHz), 1m*1) (above 10GHz), 0.5m*2) (above 26.5GHz)	

*1) Distance Factor: $20 \times \log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

*2) Distance Factor: $20 \times \log(3.0\text{m}/0.5\text{m}) = 15.6\text{dB}$

The test was made on EUT at the normal use position.

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

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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
Maximum Peak Output Power	-	-	-	Auto	Peak	-	Power Meter (Sensor: 50MHz BW)

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

Test data : APPENDIX

Test result : Pass