



## RADIO TEST REPORT

Test Report No. : 29FE0119-HO-01-A-R1

**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

**Test Result** : Complied

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 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. Original test report number of this report is 29FE0119-HO-01-A.

**Date of test:** March 3 to April 25, 2009

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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/emo/nvlap.html>

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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. : 001F1F3E707B: used for Conducted emission, Radiated Spurious emission tests  
001F1F3E7077: used for Antenna Terminal Conducted tests  
Receipt Date of Sample : March 3 and April 1, 2009  
Country of Mass-production : China  
Condition of EUT : Production model  
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.

Equipment Type : Transceiver  
Frequency of Operation : 2412-2462MHz  
Clock frequency in the system : 40MHz  
Type of 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 : DC5.0V  
Method of Frequency Generation : Crystal  
Operating Temperature : 0 deg. C to 40 deg. C

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## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : FCC Part15 Subpart C: 2009, final revised on February 27, 2009

Title : FCC 47CFR Part15 Radio Frequency Devices Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz

\* Remarks: The EUT complies with FCC Part 15 Subpart B: 2009, final revised on February 27, 2009.

#### **FCC 15.31 (e)**

The RF Module has own regulator.

The RF Module is constantly provided voltage (DC3.3V, DC1.5V) 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.

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### 3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	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	Conducted	N/A	[QP] 6.3dB, L, Tx, 8.52800MHz  [AV] 6.3dB, L, Tx, 8.52800MHz	Complied
2	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)	Conducted	N/A	See data.	Complied
3	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)	Conducted	N/A		Complied
4	Restricted Band Edges	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247"  IC: -	FCC: Section 15.247 (d)  IC: RSS-210 A8.5	Conducted/Radiated	N/A		Complied
5	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)	Conducted	N/A		Complied
6	Spurious Emission	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 7.2.1 and 7.2.3	Conducted/Radiated	N/A	[Tx] 0.5dB 479.939MHz, QP, Vertical [Rx] 0.3dB 479.940MHz, QP, Vertical	Complied

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.

### 3.3 Addition to standard

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	RSS-Gen 4.6.1	RSS-Gen 4.6.1	Conducted	N/A	N/A	N/A

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	Conducted emission	Radiated emission (10m*)			Radiated emission (3m*)			Radiated emission (3m*)	
		150kHz-30MHz	9kHz-30MHz	30MHz-300MHz	300MHz-1GHz	9kHz-30MHz	30MHz-300MHz	300MHz-1GHz	1GHz-18GHz
No.1 semi-anechoic chamber (±)	3.7dB	3.1dB	4.4dB	4.2dB	3.2dB	3.8dB	3.9dB	5.9dB	6.1dB
No.2 semi-anechoic chamber (±)	3.7dB	-	-	-	3.2dB	4.4dB	4.0dB	5.9dB	6.1dB
No.3 semi-anechoic chamber (±)	3.7dB	-	-	-	3.2dB	4.6dB	4.0dB	5.9dB	6.1dB
No.4 semi-anechoic chamber (±)	3.7dB	-	-	-	3.2dB	3.9dB	3.9dB	5.9dB	6.1dB

\*10m/3m = Measurement distance

#### 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.

#### Other test except Conducted Emission and Spurious Emission (Radiated)

The measurement uncertainty for this test is 3.0dB.

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### 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 1 to 3.

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

### **4.1 Operating Mode(s)**

<b>Test Item</b>	<b>Operating Mode</b>	<b>Tested frequency</b>
Conducted emission	IEEE802.11b Transmitting (Tx), 11Mbps, PN	2412MHz(L)
Spurious Emission (Conducted/Radiated)	IEEE802.11g Transmitting (Tx), 6Mbps, PN	2437MHz(M)
	IEEE802.11n (20HT) Transmitting (Tx), MCS0, PN	2462MHz(H)
	IEEE802.11n (40HT) Transmitting (Tx), MCS0, PN	2422MHz(L)
	IEEE802.11b/g Receiving (Rx)	2437MHz(M)
	IEEE802.11n (20HT/40HT) Receiving (Rx)	2452MHz(H)
6dB Bandwidth	IEEE802.11b Transmitting (Tx), 11Mbps, PN	2412MHz(L)
Maximum Peak Output Power	IEEE802.11g Transmitting (Tx), 6Mbps, PN	2437MHz(M)
Power Density	IEEE802.11n (20HT) Transmitting (Tx), MCS0, PN	2462MHz(H)
99% Occupied Bandwidth	IEEE802.11n (40HT) Transmitting (Tx), MCS0, PN	2422MHz(L)
		2437MHz(M)
		2452MHz(H)
Restricted Band Edge (Conducted/Radiated)	IEEE802.11b Transmitting (Tx), 11Mbps, PN	2412MHz(L)
	IEEE802.11g Transmitting (Tx), 6Mbps, PN	2462MHz(H)
	IEEE802.11n (20HT) Transmitting (Tx), MCS0, PN	2422MHz(L)
	IEEE802.11n (40HT) Transmitting (Tx), MCS0, PN	2452MHz(H)

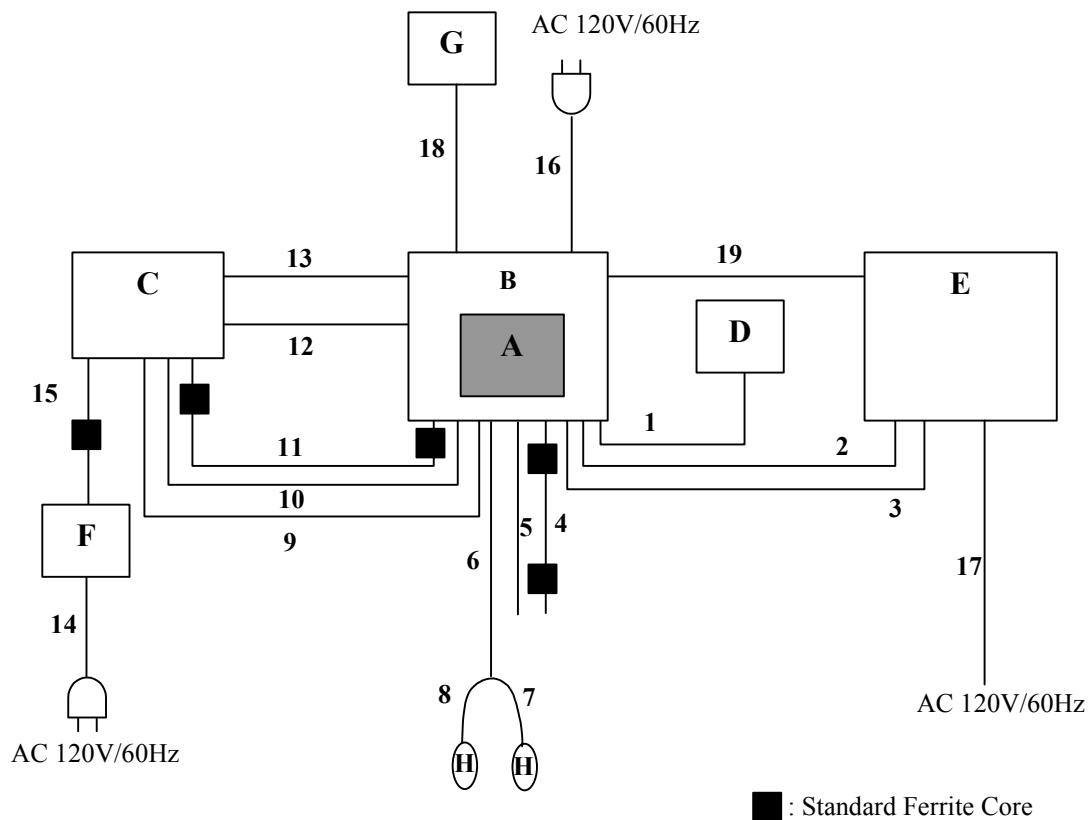
\*Transmitting duty was 100% on all tests.

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

\*Information of the representative host device.

Type of Equipment : Projector  
 Model No. : PLC-WXU700  
 Serial No. : 00042  
 Operating Voltage : AC 120V/60Hz

#### 4.2 Configuration and peripherals



\* Cabling and setup(s) 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	Remarks
A	WLAN Module	1AV4U19B25500	001F1F3E707B *1) 001F1F3E7077 *2)	SANYO	EUT
B	Projector	PLC-WXU700	00042	SANYO	-
C	PC	T30	97-99D7K	IBM	-
D	USB Memory	Auto Capture	0902A	-	-
E	DVD Player	DV-600AV-S	HEKD013328LS	Pioneer	-
F	AC Adapter	02K6750	11S02K6750Z1Z2 UP29POF7	IBM	-
G	Controler	-	-	SANYO	-
H	Earphones	-	-	-	-

\*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		Remark
			Cable	Connector	
1	USB Cable	3.0	Shielded	Shielded	-
2	HDMI Cable	1.9	Shielded	Shielded	-
3	S-Video Cable	1.4	Shielded	Shielded	-
4	Monitor Cable	1.8	Shielded	Shielded	-
5	Audio Cable	3.0	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	1.0	Unshielded	Unshielded	-
10	Audio Cable	1.5	Shielded	Shielded	-
11	Monitor Cable	1.8	Shielded	Shielded	-
12	USB Cable	1.8	Shielded	Shielded	-
13	Serial Cable	2.0	Shielded	Shielded	-
14	AC Cable	1.8	Unshielded	Unshielded	-
15	DC Cable	1.0	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	3.0	Shielded	Shielded	-

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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 1.5m, 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 cable and AC 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.

<b>Detector</b>	: quasi-peak and average detector (IF BW 9 kHz)
<b>Measurement range</b>	: 0.15-30MHz
<b>Test data</b>	: APPENDIX 2
<b>Test result</b>	: Pass

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## **SECTION 6: Spurious Emission**

### **[Conducted]**

#### **Test Procedure**

The Out of Band Emission was measured with a spectrum analyzer connected to the antenna port. It was measured based on "1. RF antenna conducted test" of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247".

The following spectrum analyzer setting was used:

- RBW: 100kHz
- VBW: 300kHz
- Sweep: Auto
- Detector: Peak
- Trace: Max Hold

**Test data : APPENDIX 2**  
**Test result : Pass**

### **[Radiated]**

#### **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 1.5m, raised 0.8m above the conducting ground plane.

The Radiated Electric Field Strength intensity has been measured in a Semi Anechoic Chamber with a ground plane and at a distance of 3m(Below 10GHz) and 1m(Upper 10GHz).

The height of the measuring varied between 1 and 4m 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, or the Spectrum Analyzer.

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

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 *1)
Detector IF Bandwidth	QP: BW 120kHz(T/R)	PK: RBW: 1MHz/VBW: 1MHz AV *2): RBW: 1MHz/VBW: 10Hz 20dBc: RBW: 100kHz/VBW: 300kHz

\*1) The Spectrum Analyzer was used in 3dB resolution bandwidth.

\*2) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

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

**Test data : APPENDIX 2**  
**Test result : Pass**

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## **SECTION 7: Bandwidth**

### **6dB Bandwidth**

#### **Test Procedure**

The bandwidth was measured with a spectrum analyzer connected to the antenna port.  
It was measured based on "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247".

The following spectrum analyzer setting was used:

	[IEEE802.11b/g/n (20HT)]	[IEEE802.11n (40HT)]
- Span	: 20MHz	: 75MHz
- RBW	: 100kHz	: 100kHz
- VBW	: 300kHz	: 300kHz
- Sweep	: Auto	: Auto
- Detector	: Peak	: Peak
- Trace	: Max Hold	: Max Hold

**Test data** : APPENDIX 2  
**Test result** : Pass

### **99% Occupied Bandwidth**

#### **Test Procedure**

The bandwidth was measured with a spectrum analyzer connected to the antenna port.  
The following spectrum analyzer setting was used:

- Span: Enough width to display 20dB Bandwidth
- RBW: as close to 1% of the Span as is possible without being below 1%
- VBW: Three times of RBW
- Sweep: Auto
- Detector: Peak
- Trace: Max Hold

**Test data** : APPENDIX 2  
**Test result** : Pass

## **SECTION 8: Maximum Peak Output Power**

### **Test Procedure**

The Maximum Peak Output Power was measured with a power meter (tested bandwidth: 50MHz) connected to the antenna port.

It was measured based on "Power Output Option 1" of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247".

<b>Test data</b>	<b>: APPENDIX 2</b>
<b>Test result</b>	<b>: Pass</b>

## **SECTION 9: Peak Power Density**

### **[Conducted]**

### **Test Procedure**

The Peak Power Density was measured with a spectrum analyzer connected to the antenna port.

It was measured based on "PSD Option 1" of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247".

	<b>[IEEE802.11b]</b>	<b>[IEEE802.11g]</b>	<b>[IEEE802.11n (20HT)]</b>	<b>[IEEE802.11n (40HT)]</b>
-	Span : 9MHz	: 18MHz	: 20MHz	: 38MHz
-	RBW : 30kHz *)	: 30kHz *)	: 30kHz *)	: 30kHz *)
-	VBW : 100kHz	: 100kHz	: 100kHz	: 100kHz
-	Sweep : 300sec	: 600sec	: 666.7sec	: 1.267ksec
-	Detector : Peak	: Peak	: Peak	: Peak
-	Trace : Max Hold	: Max Hold	: Max Hold	: Max Hold

\*) The test was not performed at RBW: 3kHz that was stated in the Regulation.

However, the measurement value with RBW:3kHz is less than the value of RBW:30kHz and the test data met the limit with RBW:3kHz.

<b>Test data</b>	<b>: APPENDIX 2</b>
<b>Test result</b>	<b>: Pass</b>

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