EMI TEST REPORT

Test Report No. : 27DE0139-HO-F-R1

Applicant	:	**OMRON Corporation Okayama factory**
Type of Equipment	:	**FA Wireless LAN Unit**
Model No.	:	**WE70-CL**
Test standard	:	**FCC Part 15 Subpart E: 2007** **Section 15.407 (DFS test only)**
FCC ID	:	**RXEWE70CL**
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 above regulation.
4. The test results in this report are traceable to the national or international standards.
5. Original test report number of this report is 27DE0139-HO-F.

Date of test:
February 2, 2007

Tested by:
T. Hatakeda
Takahiro Hatakeda
EMC Services

Approved by :
H. Shimoji
Hironobu Shimoji
Assistant Manager of
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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.htm

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CONTENTS PAGE

SECTION 1: Client information

Company Name	:	OMRON Corporation Okayama factory
Address	:	2075 Miyoshi Okayama-city, Okayama, 703-8502, Japan
Telephone Number	:	+81-86-276-1797
Facsimile Number	:	+81-86-276-1520
Contact Person	:	Shinji Ueno

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

2.1 Identification of E.U.T.

Type of Equipment	:	FA Wireless LAN Unit
Model No.	:	WE70-CL
Serial No.	:	277351000204
Rating	:	DC 24V (20.4V to 26.4V)
Country of Manufacture	:	JAPAN
Receipt Date of Sample	:	January 19, 2007
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: WE70-CL is the, FA Wireless LAN Unit (Client).
WE70-CL has a variant model: WE70-AP (Master). They are identical in radio specification
The difference between two models is the presence or absence of RSSI button (for receiving status indication) only.
(WE70-AP does not have the button, but WE70-CL does.)

Clock Frequencies are 20MHz(CPU Clock), 25MHz(LAN Clock), 80MHz(Memory Clock) and 40MHz (Wireless LAN).

IEEE802.11b / 11g / 11a WLAN

Equipment Type	Transceiver		
Frequency of Operation	11b/11g	2412MHz - 2462MHz *1)	
	11a	Low	5180MHz - 5240MHz *2)
		Mid	5260MHz - 5320MHz *2)
		Add	5500MHz - 5700MHz *2)
		Upper	5745MHz - 5805MHz *2)
			5825MHz *1)
Type of Modulation	DSSS, DBPSK, DQPSK, CCK (11b) OFDM, BPSK, QPSK, 16QAM, 64QAM, CCK (11g, 11a)		
Bandwidth	20MHz		
Channel spacing	5MHz (11b/11g), 20MHz (11a)		
Power Supply (inner)	DC 3.3V		
Antenna Connector Type	Reverse SMA connector (ANT A and ANT B)		
Antenna Information	Type : Dual Band Diversity Antenna Model name : ANT-S-789 Gain : 2.14dBi (max), 0dBi (AV)		
	Type : Magnetic Pedestal Antenna *3) Model name : WE70-AT001H(OMR04-220100) Gain : 2.4GHz band: 4.5dBi (max), 2.5dBi(AV) 5GHz band: 7dBi (max), 5dBi(AV)		
	Type : Magnetic Pedestal Antenna with extension cable of 5.0m *4) Model name : WE70-AT001H (OMR04-220100) Gain : 2.4GHz band: 4.5dBi (max), 2.5dBi(AV) 5GHz band: 7dBi (max), 5dBi(AV)		

*1) Refer to 27DE0139-HO-B, FCC Part 15C (FCC 15.247) report.
*2) Refer to 27DE0139-HO-D, FCC Part 15E (FCC 15.407) report (Other parts than DFS)
*3) Magnetic Pedestal Antenna is connected direclty with the cable of 2.0m.
*4) Magnetic Pedestal Antenna can be used with extension cable of 5.0 m (Total length of cable: 7.0m).

[Remarks]
The circuits for 2.4GHz and 5GHz bands are included in one chip of FA Wireless LAN Unit.

SECTION 3: Scope of Report

This report only covers DFS requirement, as specified by the following referenced procedures.

SECTION 4: Test specification, procedures & results

4.1 Test Specification

Test Specification	:	FCC Part15 Subpart E : 2006
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart E Unlicensed National Information Infrastructure Devices Section 15.407 General technical requirements
Test Specification	:	FCC 06-96 APPENDIX
Title	:	COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVICES OPERATING IN THE 5250-5350 MHz AND 5470-5725MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION

4.2 Procedures and results

Table 1: Applicability of DFS Requirements

Requirement	Operating Mode Client without Radar Detection	Test Procedures & Limits	Deviation	Results
U-NII Detection Bandwidth	Not required	FCC 06-96 Appendix 7.8.1	N/A	N/A
Initial Channel Availability Check Time	Not required	FCC15.407 (h) FCC 06-96 Appendix 7.8.2.1	N/A	N/A
Radar Burst at the Beginning of the Channel Availability Check Time	Not required	FCC15.407 (h) FCC 06-96 Appendix 7.8.2.2	N/A	N/A
Radar Burst at the End of the Channel Availability Check Time	Not required	FCC15.407 (h) FCC 06-96 Appendix 7.8.2.3	N/A	N/A
In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time	Yes	FCC15.407 (h) FCC 06-96 Appendix 7.8.3	N/A	Complied
In-Service Monitoring for Non-Occupancy period	Not required	FCC15.407 (h) FCC 06-96 Appendix 7.8.3	N/A	N/A
Statistical Performance Check	Not required	FCC15.407 (h) FCC 06-96 Appendix 7.8.4	N/A	N/A

Table 2: DFS Detection Thresholds for Master Devices and Client Devices With Radar

Maximum Transmit Power	Value (See Notes 1 and 2)
≥ 200 milliwatt	-64 dBm
< 200 milliwatt	-62 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.	

Table 3 DFS Response Requirement Values

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2
U-NII Detection Bandwidth	Minimum 80% of the U-NII 99% transmission power bandwidth See Note 3

Note 1: The instant that the Channel Move Time and the Channel Closing Transmission Time begins is as follows:

- For the Short Pulse Radar Test Signals this instant is the end of the *Burst*.
- For the Frequency Hopping radar Test Signal, this instant is the end of the last radar *Burst* generated
- For the Long Pulse Radar Test Signal this instant is the end of the 12 second period defining the *Radar Waveform*.

Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signal will not count quiet periods in between transmissions.

Note 3: During the U-NII Detection Bandwidth detection test, radar type 1 is used and for each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

Table 4 Short Pulse Radar Test Waveform

Radar Type	Pulse Width (µsec)	PRI (µsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Traials
1	1	1428	18	60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Rader Types 1-4)				80%	120

Table 5 Long Pulse Radar Test Waveform

Radar Type	Pulse Width (µsec)	Chip Width (MHz)	PRI (µsec)	Number of Pulses per *Burst*	Number of *Burst*	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

Table 6 Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (µsec)	PRI (µsec)	Pulse per Hop (kHz)	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

4.3 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	IC4247A	19.2 x 11.2 x 7.7m	7.0 x 6.0m	Preparation room
No.2 semi-anechoic chamber	655103	IC4247A-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	IC4247A-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	IC4247A-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	-
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	N/A	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	2.0 x 2.0 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 5.4 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	-

* 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.
Our Company name was changed from “UL Apex co., Ltd.” to “UL Japan, Inc.” on April 26, 2007.

4.4 Test set up and Test instruments of DFS

Refer to APPENDIX 1 to 2.

SECTION 5: Operation of E.U.T. during testing

5.1 Operating Modes

OVERVIEW WITH RESPECT TO 15.407(h) REQUIREMENTS

The EUT, which is a Client Device without Radar detection capability, operates over the 5180-5320MHz and 5500-5825MHz ranges.

The highest power level is 16.2dBm EIRP in the 5250-5350MHz band and 17.13dBm EIRP in the 5470-5725MHz band. The lowest power level is 2.94dBm EIRP in the 5250-5350MHz band and 5.75dBm EIRP in the 5470-5725MHz band.

Power level(EIRP) of the EUT[dBm]

Antenna Type	Antenna Gain		5250-5350MHz Band *1)		5470-5725MHz Band*1)	
			Output Power (Min)	Output Power(Max)	Output Power(Min)	Output Power(Max)
	[dBi]		5.07	12.80	7.88	13.73
Dual Band Diversity Antenna	Min	0.00	5.07	12.80	7.88	13.73
	Max	2.14	7.21	14.94	10.02	15.87
Magnetic Pedestal Antenna	Min	1.20	6.27	14.00	9.08	14.93
	Max	3.40	8.47	**16.20**	11.28	**17.13**
Magnetic Pedestal Antenna with extension cable of 5.0m	Min	-2.13	**2.94**	10.67	**5.75**	11.60
	Max	0.07	5.14	12.87	7.95	13.80

*1). Refer to 27DE0139-HO-D, FCC Part 15E (FCC 15.407) report for other parts than DFS

The EUT uses one transmitter connected to two 50-ohm coaxial antenna ports via a diversity switch. Both antenna ports are connected to the test system via a power divider to perform conducted tests.

WLAN traffic is generated by streaming the MPEG Testfile "6 ½ Magic Hours" from the Master to the Client in full motion video mode using the media player with the V2.61 Codec package.

TPC is not required since the maximum EIRP is less than 500mW(27dBm).

The EUT utilizes the 802.11a architecture, with a nominal channel bandwidth of 20MHz.

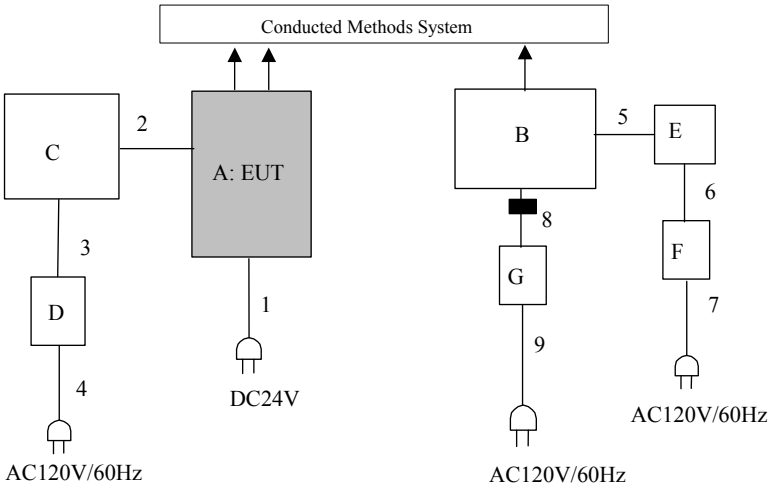
OVERVIEW WITH RESPECT TO 15.407(h) REQUIREMENTS for Master Device

The FCC ID for the Master Device used with EUT for DFS testing is LDK102056.

The rated output power of the Master Device is >200mW(23dBm) and the required interference threshold level is –64 dBm. After correction for antenna gain and procedural adjustments, the required conducted threshold at the antenna port is –64 + 1 + 3.5=-59.5 dBm.

The calibrated conducted DFS detection Threshold level is set to –64dBm. The tested level is lower than the required level and therefore it has enough margin to the limit.

5.2 Configuration and peripherals



■ : Standard Ferrite Core

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	FA Wireless LAN Unit	WE70-CL	277351000204	OMRON	EUT
B	Access Point	AIR-AP1242AG-A-K9	FTX1045B9L0	Cisco Systems	FCC ID : LDK102056
C	Note PC	2366-LJ7	97-99D4A	IBM	-
D	AC Adapter	02K7095	11S02K6750Z1Z2UP 29909T	IBM	-
E	Note PC	2366-8J6	97-1DZ8M	IBM	-
F	AC Adapter	02K7095	11S02K6750Z1Z2UP 29L0PS	IBM	-
G	AC Adapter	ADP-18PB	PZT0639562214	Delta Electronics	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	2.5	Unshielded	Unshielded	-
2	LAN Cable	1.0	Unshielded	Unshielded	-
3	DC Cable	1.8	Unshielded	Unshielded	-
4	AC Cable	1.0	Unshielded	Unshielded	-
5	LAN Cable	1.0	Unshielded	Unshielded	-
6	DC Cable	1.8	Unshielded	Unshielded	-
7	AC Cable	1.0	Unshielded	Unshielded	-
8	DC Cable	1.8	Unshielded	Unshielded	-
9	AC Cable	2.0	Unshielded	Unshielded	-

5.3 Test and Measurement System

SYSTEM OVERVIEW

The measurement system is based on a conducted test method.

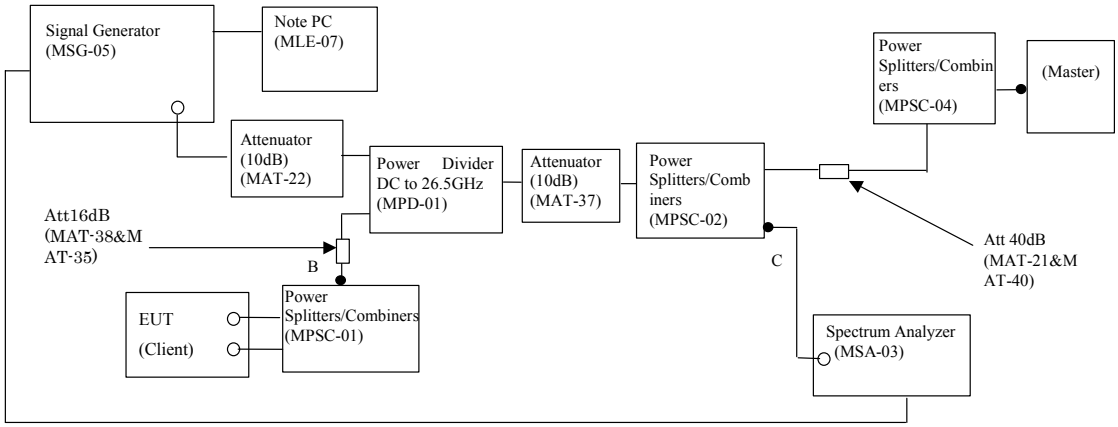
The software selects waveform parameters from within the bounds of the signal type on a random basis using uniform distribution. The short pulse types 2, 3, and 4, the long pulse type 5, and the frequency hopping type 6 parameters are randomized at run-time.

The signal monitoring equipment consists of a spectrum analyzer with the capacity to display 8192 bins on the horizontal axis. A time-domain resolution of 2 msec/bin is achievable with a 16 second sweep time, meeting the 10 seconds short pulse reporting criteria. The aggregate ON time is calculated by multiplying the number of bins above a threshold during a particular observation period by the dwell time per bin, with the analyzer set to peak detection. A time-domain resolution of 3 msec/bin is achievable with a 24 second sweep time, meeting the 22 second long pulse reporting criteria and allowing a minimum of 10 seconds after the end of the long pulse waveform.

FREQUENCY HOPPING RADAR WAVEFORM GENERATING SUBSYSTEM

The first 100 frequencies are selected out of the hopping sequence of the randomized 475 hop frequencies.
Only a *Burst* that has the frequency falling within the receiver bandwidth of the tested U-NII device is selected among those frequencies. (Frequency-domain simulation). The radar waveform generated at the start time of the selected *Burst* (Time-domain simulation) is download to the Signal Generator.
If all of the randomly selected 100 frequencies do not fall within the receiver bandwidth of the U-NII device, the radar waveform is not used for the test.

CONDUCTED METHODS SYSTEM BLOCK DIAGRAM



MEASUREMENT SYSTEM FREQUENCY REFERENCE

Lock the signal generator and the spectrum analyzer to the same reference sources as follows: Connect the 10MHz OUT on the signal generator to the 10MHz IN on the spectrum analyzer and set the spectrum analyzer 10MHz In to On.

SYSTEM CALIBRATION

Step 1: Set the system as shown in Figure 3 of FCC 06-96 7.2.1.

Step 2: Adjust each attenuator to fulfill the following three conditions:
- WLAN can be communicated, and
- Rader detection threshold level is bigger than Client Device traffic level on the spectrum analyzer, and
- Master Device traffic level is not displayed on the spectrum analyzer.

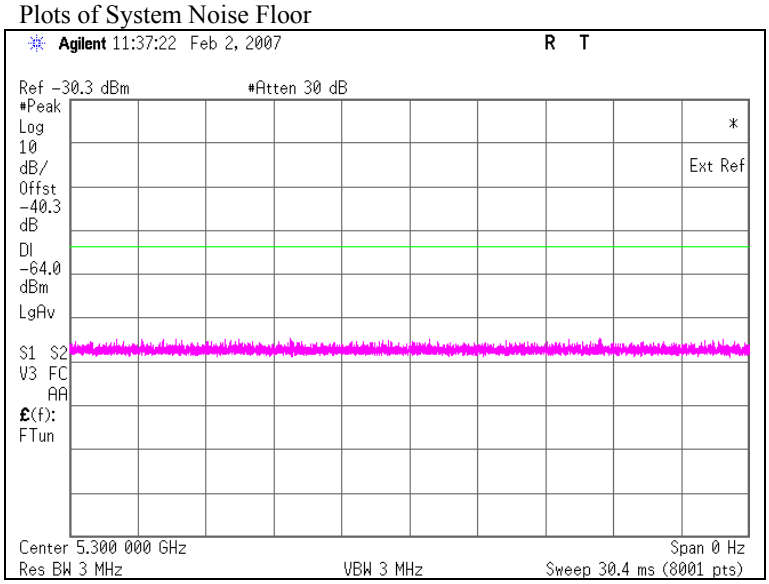
Step 3: Terminate at the points, B and C and connect the spectrum analyzer to the point A. (See the figure on page 13) At the point A, adjust the signal generator and spectrum analyzer to the center frequency of the channel to be measured. Download the applicable radar waveforms to the signal generator. Select the radar waveform, trigger a burst manually and measure the amplitude on the spectrum analyzer. Readjust the amplitude of the signal generator as required so that the peak level of the waveform is at a displayed level equal to the required or desired interference detection threshold. Separate signal generator amplitude settings are determined as required for each radar type.

Step 4: Without changing any of the instrument settings, restore the system setting to Step 2 and adjust the Reference Level Offset of the spectrum analyzer to the level at Step 3.

By taking the above steps 1 to 4, the spectrum analyzer displays the level of the signal generator as received at the antenna ports of the Master Device.

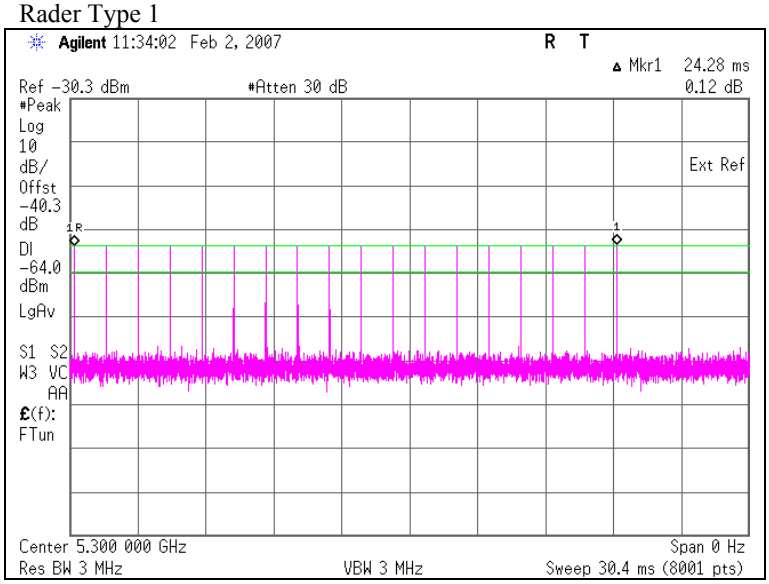
5.4 Plots of Noise, Rader Waveforms, and WLAN signals

Plots of System Noise Floor

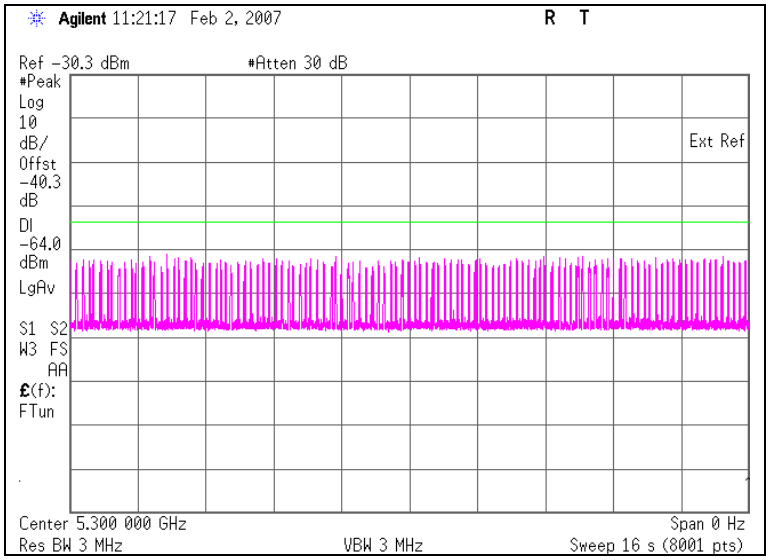


Plots of Radar Waveforms

Rader Type 1



Plots of WLAN Traffic from Master



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SECTION 6: In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time

6.1 Operating environment

Test place : No.6 measurement room
Temperature : 23deg.C.
Humidity : 31%

6.2 Test Procedure

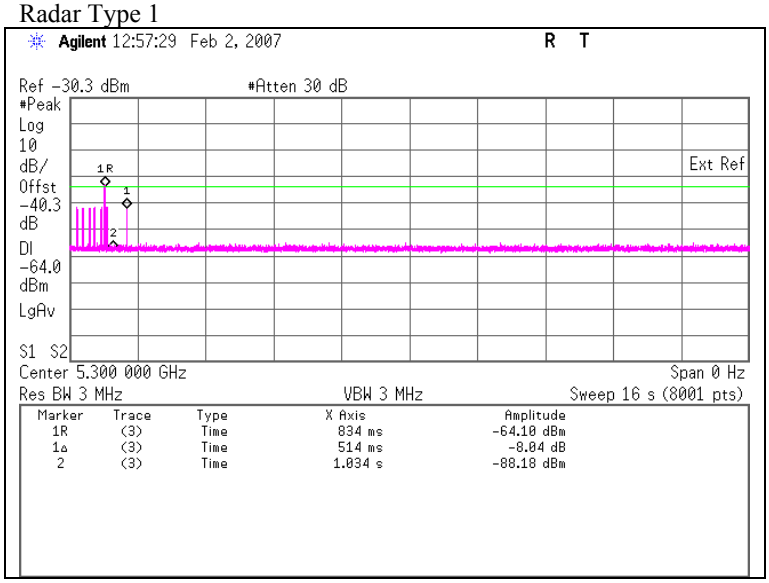
Stream the MPEG test file from the Master Device to the Client Device on the test Channel for the entire period of the test.
The Radar Waveform generator sends a Burst of pulses for one of the Short Pulse Radar Types 1-4 at levels defined , on the Operating Channel. An additional 1 dB is added to the radar test signal to ensure it is at or above the DFS Detection Threshold, accounting for equipment variations/errors.
Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds.

6.3 Test data

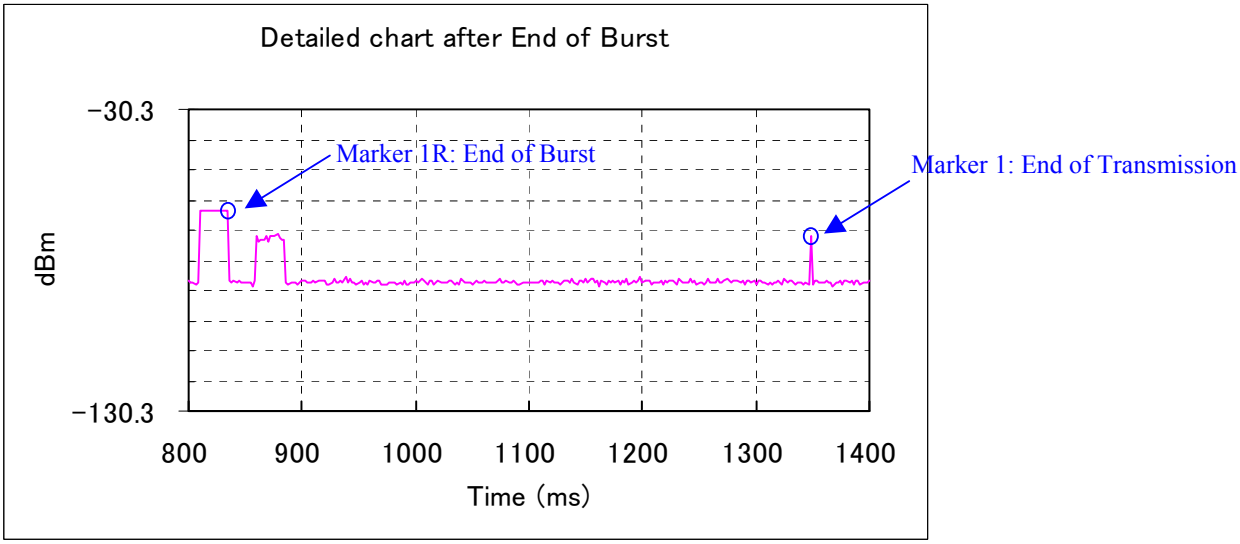
Test Item	Unit	Measurement Time	Limit	Results
Channel Move Time	[sec]	0.514	10.000	Pass
Channel Closing Transmission Time *1)	[msec]	2	60	Pass

*1). Channel Closing Transmission Time is calculated from (End of Burst + 200msec) to (End of Burst + 10sec)
(Channel Closing Time) = (Number of analyzer bins showing transmission) * (dwell time per bin)

Radar Type 1



Marker 1R : End of Burst : 834 ms
Marker 2 : End of Burst + 200 msec : 1034 ms
Marker 1 : End of Transmission : 1348 ms



6.4 Test result

Test result: Pass
Date : 02 /02 / 2007 Test engineer : Takahiro Hatakeda