RADIO TEST REPORT

Test Report No. : 10622710S-G

Applicant	:	**Murata Manufacturing Co., Ltd.**
Type of Equipment	:	**Communication Module**
Model No.	:	**Type1DR**
FCC ID	:	**VPYLB1DR**
Test regulation	:	**FCC Part 15 Subpart E: 2015 (DFS test only)**
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 limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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6. The opinions and the interpretations to the result of the description in this report are outside scopes where Japan has been accredited.

Date of test : February 18, 2015

Representative test engineer:

Tatsuya Arai
Engineer
Consumer Technology Division

Approved by :

Toyokazu Imamura
Leader
Consumer Technology Division

JAB Testing RTL02610

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☒ There is no testing item of "Non-accreditation".

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REVISION HISTORY

Original Test Report No.: 10622710S-G

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10622710S-G	March 9, 2015	-	-
1	10622710S-G	March 11, 2015	5	Correction of description
2	10622710S-G	April 9, 2015	5	Correction of description

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CONTENTS **PAGE**

SECTION 1: Customer information

Company Name	:	Murata Manufacturing Co., Ltd.
Address	:	10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555 Japan
Telephone Number	:	+81-75-955-6173
Facsimile Number	:	+81-75-955-7096
Contact Person	:	Noriko Ueno

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

2.1 Identification of E.U.T.

Type of equipment	:	Communication Module
Model No.	:	Type1DR
Serial No.	:	Refer to 4.2 in this report.
Rating	:	3.2(VBAT), 1.8(VDDXO), 1.8 or 3.3(VIO)
Country of Mass-production	:	China, 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.
Receipt Date of Sample	:	December 22, 2014

2.2 Product description

Model: Type1DR (referred to as the EUT in this report) is Communication Module.

Clock frequency(ies) in the system : 37.4MHz

Radio Specification

Equipment type	:	Transceiver
Frequency of operation	:	2.4GHz: 2402-2480MHz (Bluetooth BDR/EDR/Low Energy (LE)) 2412-2462MHz (IEEE 802.11b, 11g, 11n (HT20))
		W52: 5180-5240MHz (IEEE 802.11a, 11n (HT20), 11ac (VHT20)) 5190-5230MHz (IEEE 802.11n (HT40), 11ac (VHT40)) 5210MHz (IEEE 802.11ac (VHT80))
		W53: 5260-5320MHz (IEEE 802.11a, 11n (HT20), 11ac (VHT20)) 5270-5310MHz (IEEE 802.11n (HT40) , 11ac (VHT40)) 5290MHz (IEEE 802.11ac (VHT80))
		W56: 5500-5700MHz (IEEE 802.11a, 11n (HT20), 11ac (VHT20)) 5510-5670MHz (IEEE 802.11n (HT40), 11ac (VHT40)) 5530-5610MHz (IEEE 802.11ac (VHT80))
		W58: 5745-5825MHz (IEEE 802.11a, 11n (HT20), 11ac (VHT20)) 5755-5795MHz (IEEE 802.11n (HT40) , 11ac (VHT40)) 5775MHz(IEEE 802.11ac (VHT80))
Bandwidth	:	20MHz (IEEE 802.11a/b/g/n/ac), 40MHz (IEEE 802.11n/ac), 80MHz(IEEE 802.11ac) , 79MHz (Bluetooth BDR/EDR), 1MHz (Bluetooth LE)
Channel spacing	:	5MHz (Wi-Fi 2.4GHz), 20MHz/40MHz/80MHz (Wi-Fi 5GHz), 1MHz (Bluetooth BDR/EDR), 2MHz (Bluetooth LE)
Type of modulation	:	DSSS (IEEE 802.11b), OFDM (IEEE 802.11a/g/n/ac), FHSS (Bluetooth BDR/EDR), GFSK (Bluetooth LE)
Antenna type	:	[2.4GHz] Monopole antenna/Dipole antenna/Dual monopole antenna [5GHz] Monopole antenna/ Dual monopole antenna
Antenna connector type	:	spring
Antenna gain	:	[2.4GHz] Monopole antenna:+0.91dBi [2.4GHz] Dipole antenna:-0.15dBi [2.4GHz] Dual monopole antenna:-1.1dBi [5GHz] Monopole antenna:+1.0dBi [5GHz] Dual monopole antenna:+0.28dBi
ITU code	:	F1D, G1D (Bluetooth BDR/EDR), F1D (Bluetooth LE) D1D, G1D (IEEE802.11b/g/n/a/ac)
Operation temperature range	:	-20 to +85 deg.C

* For Bluetooth BDR/EDR part, refer to the test report: 10622710S-A.
For other than the range which is not covered by this report, refer to the following report:
Wireless LAN part (2.4GHz, W58): 10622710S-C, Bluetooth part: 10622710S-A.

FCC 15.31 (e)
The RF Module has its own regulator.
The RF Module is constantly provided voltage (DC 1.2, 1.35, 2.5 and 3.0V) through the regulator regardless of input voltage. Therefore, this EUT complies with the requirement of 15.212.

FCC 15.203
It is impossible for end users to replace the antenna, because it is soldered on the circuit board.
Therefore the equipment complies with the requirement of 15.203/212.

SECTION 3: Scope of Report

The EUT has the channels from 5180 to 5320MHz, 5500 to 5700MHz and 5725 to 5875MHz..
This report only covers DFS requirement subject to 5250-5350MHz and 5500 to 5700MHz bands, as specified by the following referenced procedures.

SECTION 4: Test specification, procedures & results

4.1 Test Specification

Test Specification	:	FCC Part 15 Subpart E: 2015 , final revised on January 21, 2015
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart E Unlicensed National Information Infrastructure Devices Section 15.407 General technical requirements
Test Specification	:	KDB905462 D02 UNII DFS Compliance Procedures New Rules v01r01
Title	:	COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVICES OPERATING IN THE 5250-5350MHz AND 5470-5725MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION
Test Specification	:	KDB905462 D03 Client Without DFS New Rules v01r01
Title	:	U-NII CLIENT DEVICES WITHOUT RADAR DETECTION CAPABILITY

4.2 Procedures and results

Table 2: Applicability of DFS Requirements

Requirement	Operating Mode Client without Radar Detection	Test Procedures & Limits	Deviation	Results
U-NII Detection Bandwidth	Not required	FCC, KDB 905462 D02 Section 7.8.1	N/A	N/A
Initial Channel Availability Check Time	Not required	FCC15.407 (h)(2) FCC, KDB 905462 D02 Section 7.8.2.1 RSS-210 A9.3	N/A	N/A
Radar Burst at the Beginning of the Channel Availability Check Time	Not required	FCC15.407 (h)(2) FCC, KDB 905462 D02 Section 7.8.2.2 RSS-210 A9.3	N/A	N/A
Radar Burst at the End of the Channel Availability Check Time	Not required	FCC15.407 (h)(2) FCC, KDB 905462 D02 Section 7.8.2.3 RSS-210 A9.3	N/A	N/A
In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time	Yes	FCC15.407 (h)(2) FCC, KDB 905462 D02 Section 7.8.3 RSS-210 A9.3	N/A	Complied
In-Service Monitoring for Non-Occupancy period	Yes *	FCC15.407 (h)(2) FCC, KDB 905462 D02 Section 7.8.3 RSS-210 A9.3	N/A	Complied
Statistical Performance Check	Not required	FCC15.407 (h)(2) FCC, KDB 905462 D02 Section 7.8.4	N/A	N/A

*Although this test was not required in FCC, KDB 905462 D02, it was performed as additional test.

Table 3: DFS Detection Thresholds for Master Devices and Client Devices With Radar

Maximum Transmit Power	Value (See Notes 1, 2 and 3)
E.I.R.P. ≥ 200 milliwatt	-64 dBm
E.I.R.P. < 200 milliwatt and power spectral density < 10dBm/MHz	-62 dBm
E.I.R.P. < 200 milliwatt that do not meet the power spectral density requirement	-64 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. Note 3: E.I.R.P. is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

Table 4 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 100% of the U-NII 99% transmission power bandwidth See Note 3
Note 1: The Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. **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 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

Table 5 Short Pulse Radar Test Waveform

Radar Type	Pulse Width (µsec)	PRI (µsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Traials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	Roundup ((1 / 360) x ((19 x 10^6) / PRI [micro sec.]))	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 micro sec., with a minimum increment of 1 micro sec., excluding PRI values selected in Test A			
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
Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.					

Table 5a Pulse Repetition Interval Values for Test A

Pulse Repetition Frequency Number	Pulse Repetition Frequency (Pulses Per Second)	Pulse Repetition Interval (Micro seconds)
1	1930.5	518
2	1858.7	538
3	1792.1	558
4	1730.1	578
5	1672.2	598
6	1618.1	618
7	1567.4	638
8	1519.8	658
9	1474.9	678
10	1432.7	698
11	1392.8	718
12	1355	738
13	1319.3	758
14	1285.3	778
15	1253.1	798
16	1222.5	818
17	1193.3	838
18	1165.6	858
19	1139	878
20	1113.6	898
21	1089.3	918
22	1066.1	938
23	326.2	3066

Table 6 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 7 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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	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
☐ No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
☐ No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
☐ No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
☐ No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
☐ No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
☐ No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
☒ No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
☐ No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
☐ No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

4.4 Uncertainty

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

Time Measurement uncertainty for this test was: (±) 0.012%

4.5 Test set up, Data of DFS test, and Test instruments of DFS

Refer to APPENDIX.

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

5.1 Operating Modes

The EUT, which is a Client Device without Radar detection capability, operates over the 5260-5320MHz and 5500-5700MHz.

Power level of the EUT (High power setting) [dBm]

Antenna	Band	Output Power (Min)	Output Power(Max)
Monopole Antenna *1)	W53	12.97	14.43
	W56	12.36	13.77

*1) Refer to 10622710S-E FCC Part 15E (FCC 15.407) report for other parts than DFS.

WLAN traffic is generated by the software to ping from the Master to the Client. That software has random ping intervals. (Channel loading was over 17%)
Software name & version: ExPing Version 1.33

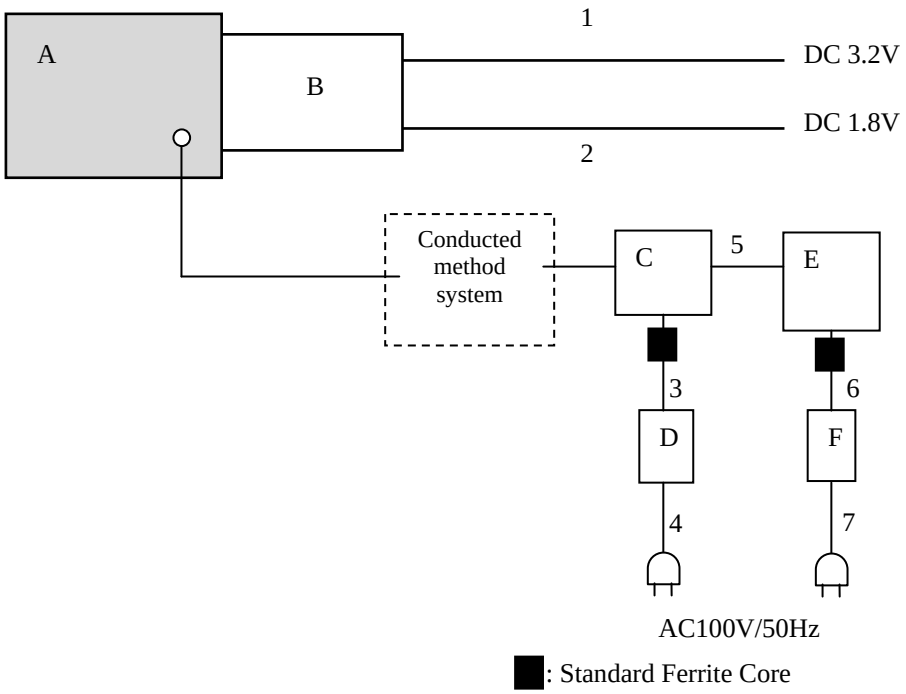
The EUT utilizes the 802.11a, 802.11n and 802.11ac architecture, with a nominal channel bandwidth.
The EUT had used IEEE 802.11ac (VHT20) and 802.11ac (VHT80) (widest mode) .

The FCC ID for the Master Device used with EUT for DFS testing is LDK102087.

The rated output power of the Master unit is >200mW(23dBm). Therefore 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 + 0 =-63 dBm (threshold level + additional 1dB + antenna gain).

It is impossible for users to change DFS control, because the DFS function is written on the firmware and users cannot access it.

5.2 Configuration and peripherals



Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Module	Type1DR	31	Murata Manufacturing Co., Ltd.	EUT
B	Jig	-	-	Murata Manufacturing Co., Ltd.	-
C	Wireless LAN access point (Master Device)	AIR-CAP3702E-A-K9	FTX18227609	Cisco Systems	FCC ID: LDK102087
D	AC Adapter	AA25480L	ALD02510FEW	Cisco Systems	-
E	Notebook Computer	DELL LATITUDE D505	19700575125	Dell	-
F	AC Adaptor	HA65NS0-00	-	Dell	-

List of cables used

No.	Cable Name	Length (m)	Shield	
			Cable	Connector
1	DC cable	1.4	Unshielded	Unshielded
2	DC cable	1.1	Unshielded	Unshielded
3	Access Point DC Power	1.8	Unshielded	Unshielded
4	Access Point AC Power	2.0	Unshielded	Unshielded
5	LAN	3.0	Unshielded	Unshielded
6	DELL PC DC Power	1.8	Unshielded	Unshielded
7	DELL PC AC Power	0.7	Unshielded	Unshielded

5.3 Test and Measurement System

SYSTEM OVERVIEW

The measurement system is based on a conducted test method.

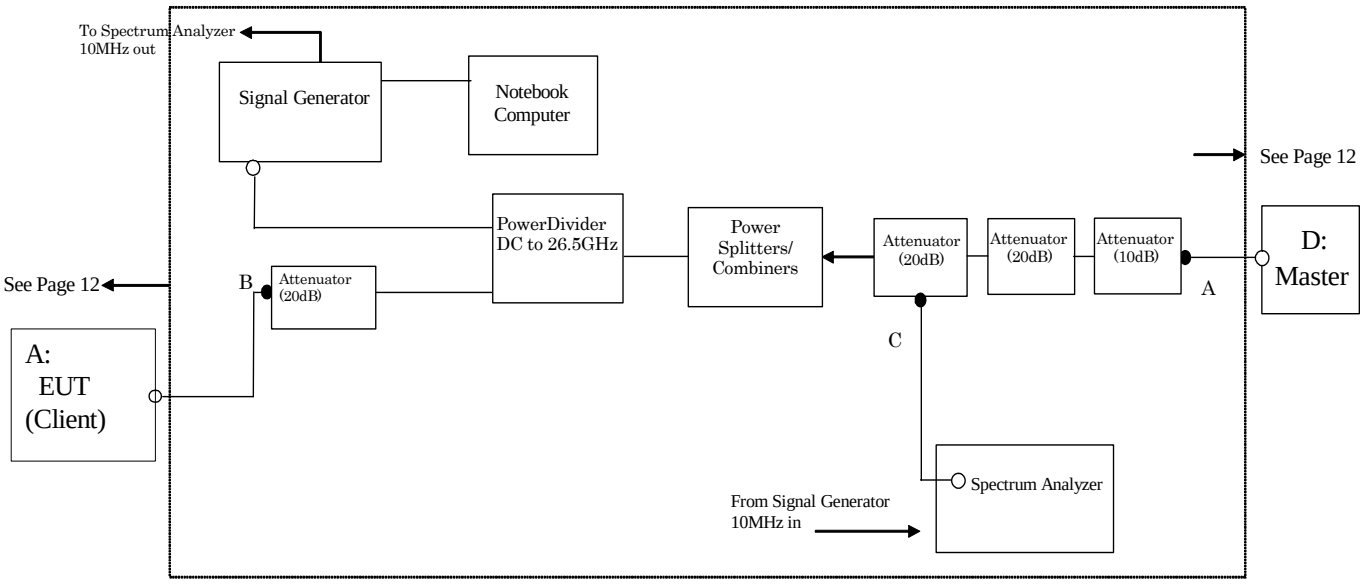
The software selects waveform parameters from within the bounds of the signal type on a random basis using uniform distribution. The short pulse types 2, 3, and 4, the long pulse type 5, and the frequency hopping type 6 parameters are randomized at run-time.

The signal monitoring equipment consists of a spectrum analyzer with the capacity to display 8001 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 DIAGRM



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, KDB 905462 Section 7.2.2.

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 50 ohm at B and C points, and connect the spectrum analyzer to the point A.
(See the figure on page 12)
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.

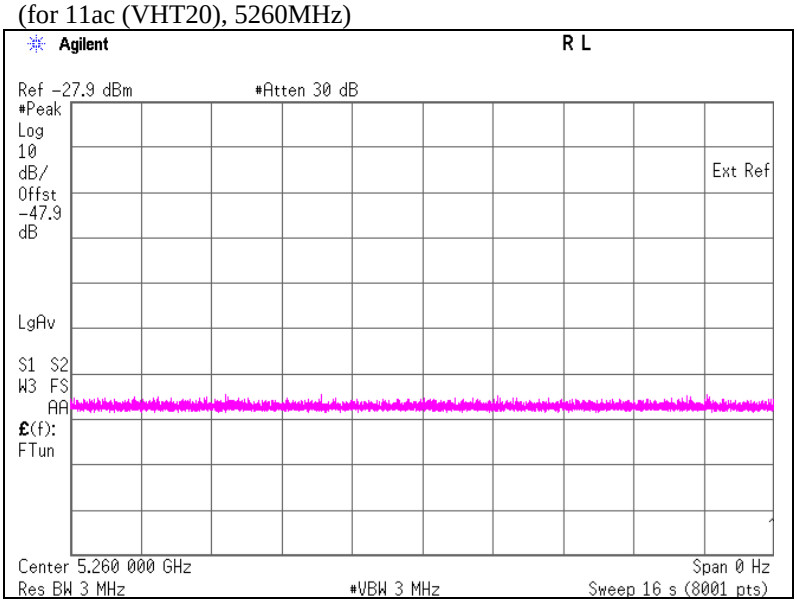
Step 4: Without changing any of the instrument settings, restore the system setting to Step 2 and adjust the Reference Level Offset of the spectrum analyzer to the level at Step 3.

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.

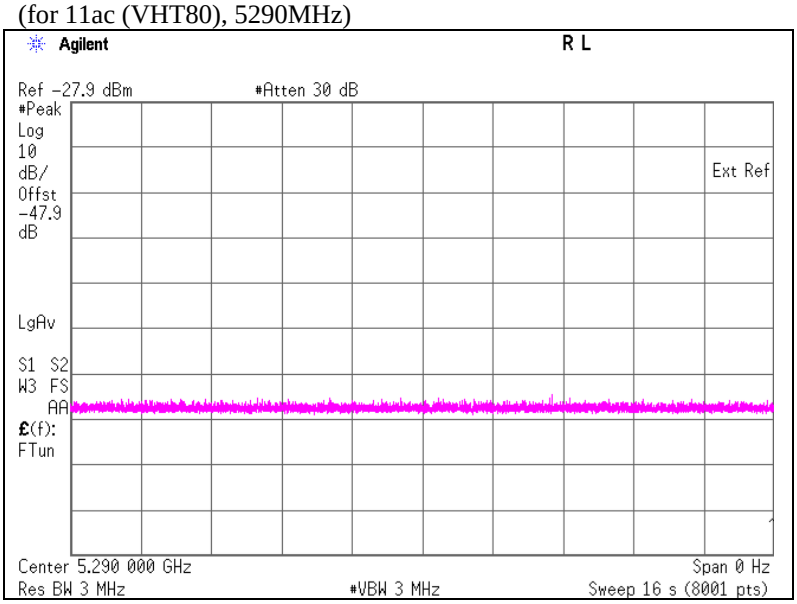
See Clause 5.4 for Plots of Noise, Rader Waveforms, and WLAN signals.

5.4 Plots of Noise, Rader Waveforms, and WLAN signals

Plots of System Noise Floor
(for 11ac (VHT20), 5260MHz)



(for 11ac (VHT80), 5290MHz)

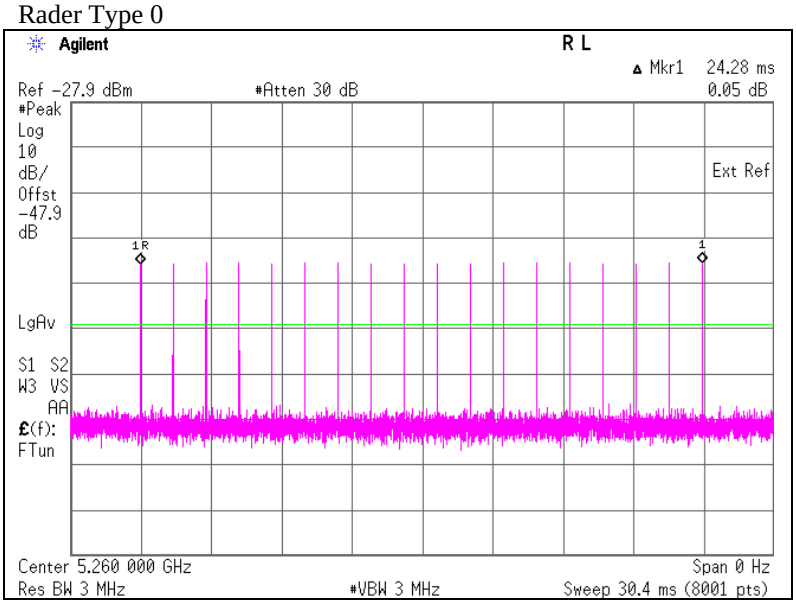


It was confirmed that the EUT did not transmit before having received appropriate control signals from a Master Device.

Plots of Radar Waveforms

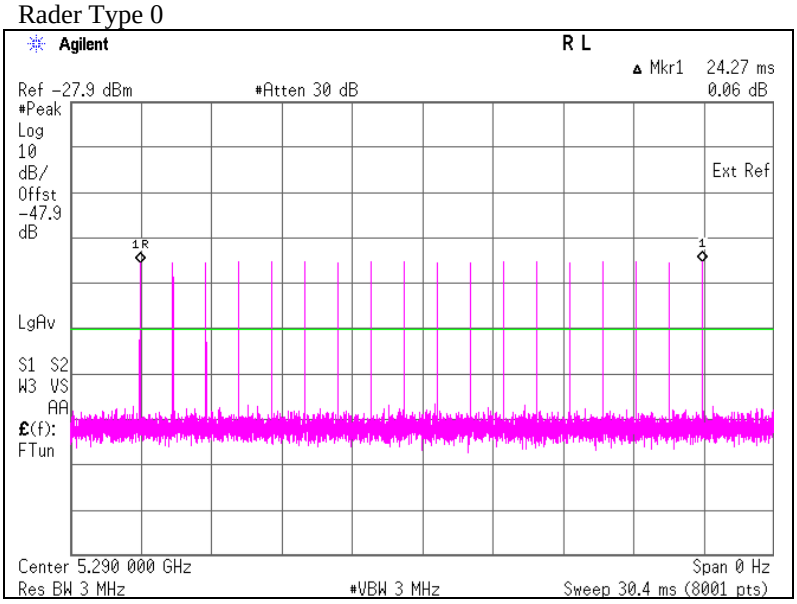
(for 11ac(VHT20), 5260MHz)

Rader Type 0



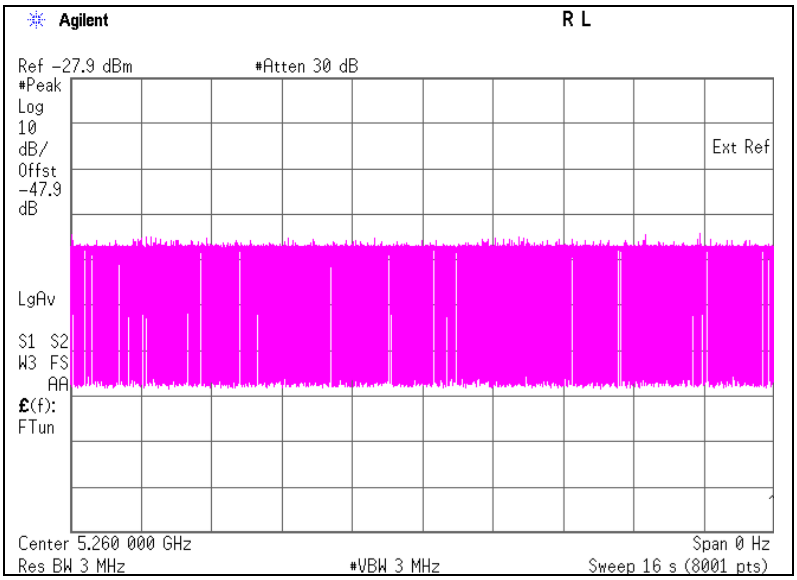
(for 11ac (VHT80), 5290MHz)

Rader Type 0



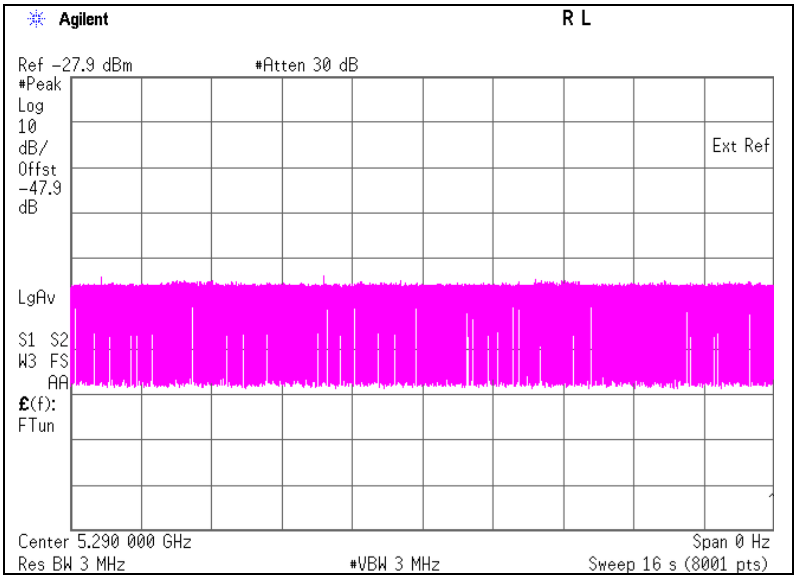
(for 11ac (VHT20), 5260MHz)

Plots of WLAN Traffic



(for 11ac (VHT80), 5290MHz)

Plots of WLAN Traffic



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

6.1 Operating environment

Test place : No.5 Shielded Room
Temperature : 25 deg.C
Humidity : 31 %RH

6.2 Test Procedure

Transfer files from the Master Device to the Client Device on the tested channel during the entire period of the test. The Radar Waveform generator sends a Burst of pulses for one of the Short Pulse Radar Types 0-4 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

(for 11ac (VHT20), 5260MHz)

Test Item	Unit	Measurement Time	Limit	Results
Channel Move Time *1)	[sec]	0.054	10.000	Pass
Channel Closing Transmission Time *2)	[msec]	0	60	Pass

*1) Channel Move Time is calculated as follows:
(Channel Move Time) = (End of Transmission) - (End of Burst) = 2.496 – 2.442

*2) Channel Closing Transmission Time is calculated from (End of Burst + 200msec) to (End of Burst + 10sec)
(Channel Closing Transmission Time) = (Number of analyzer bins showing transmission) × (dwell time per bin)
= 0 × 2[msec]

(for 11ac (VHT80), 5290MHz)

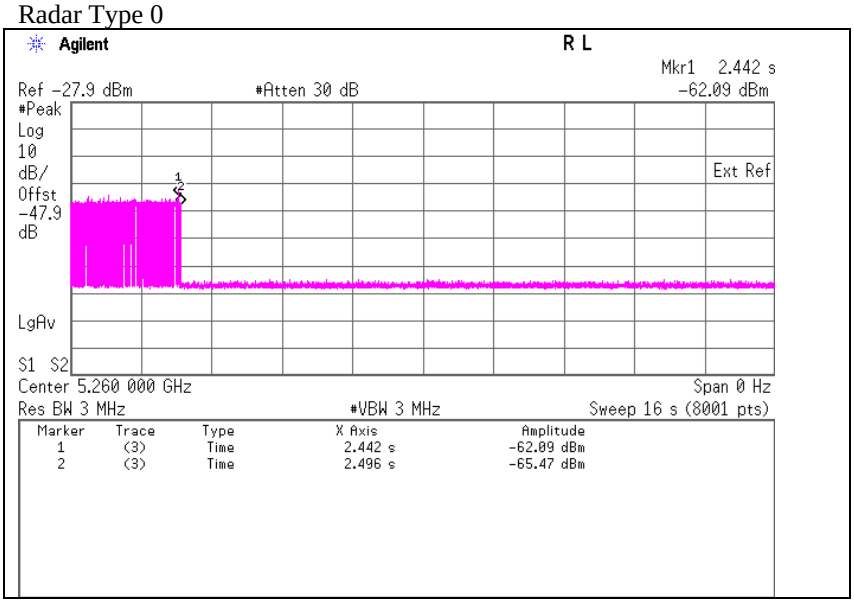
Test Item	Unit	Measurement Time	Limit	Results
Channel Move Time *1)	[sec]	0.048	10.000	Pass
Channel Closing Transmission Time *2)	[msec]	0	60	Pass

*1) Channel Move Time is calculated as follows:
(Channel Move Time) = (End of Transmission) - (End of Burst) = 2.478 – 2.43

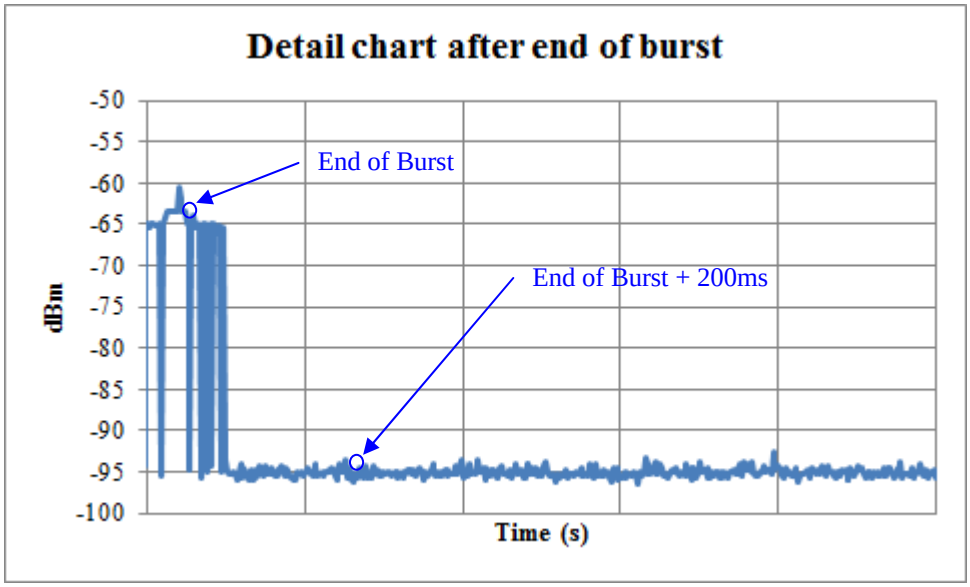
*2) Channel Closing Transmission Time is calculated from (End of Burst + 200msec) to (End of Burst + 10sec)
(Channel Closing Transmission Time) = (Number of analyzer bins showing transmission) × (dwell time per bin)
= 0 × 2[msec]

(for 11ac (VHT20), 5260MHz)

Radar Type 0

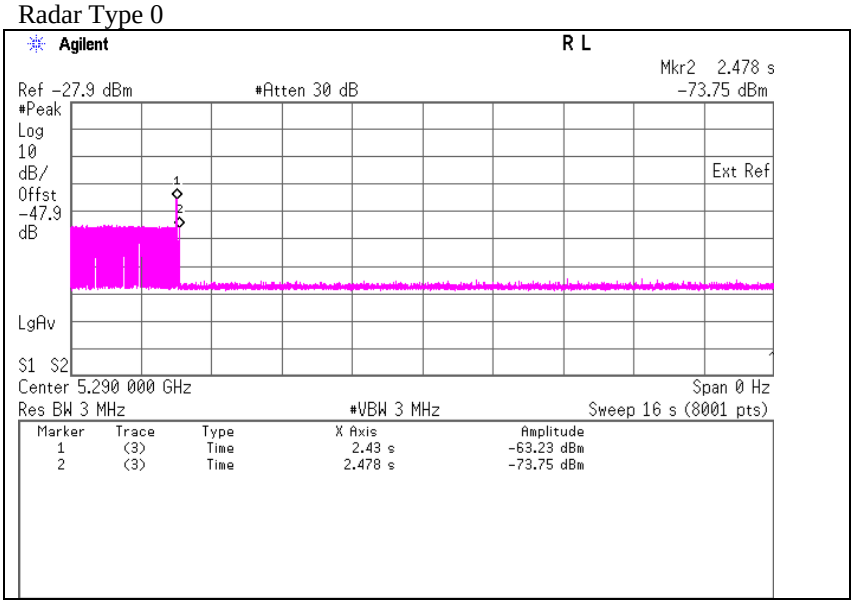


Marker 1: - End of Burst : 2.442s
Marker 2: - End of Transmission : 2.496 s

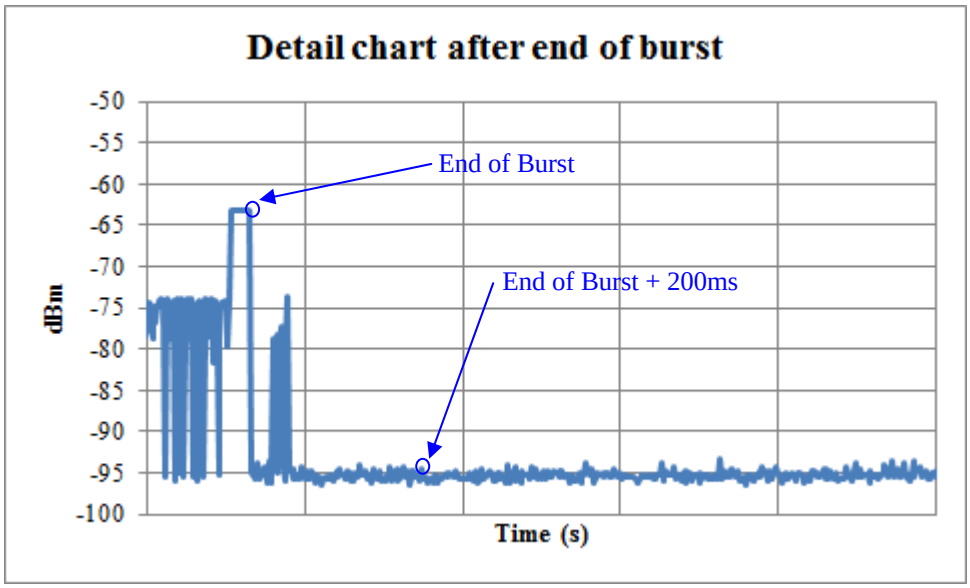


(for 11ac (VHT80), 5290MHz)

Radar Type 0



Marker 1 : End of Burst : 2.43 s
Marker 2 : End of Transmission : 2.478 s



6.4 Test result

Test result: Pass

Date : February 18, 2015 Test engineer : Tatsuya Arai

SECTION 7: In-Service Monitoring for Non-Occupancy Period

7.1 Operating environment

Test place : No.5 Shielded Room
Temperature : 25 deg.C
Humidity : 31 %RH

7.2 Test Procedure

The following two tests are performed:

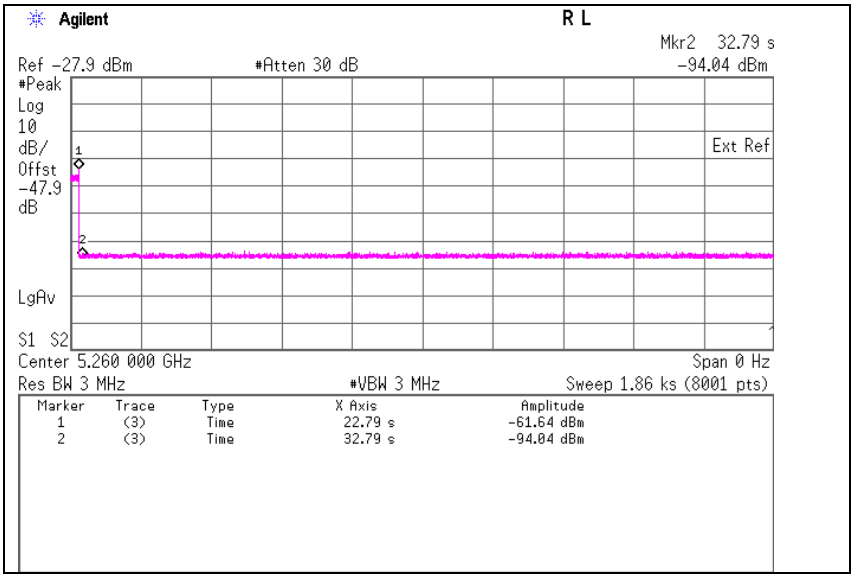
1). Transfer files from the Master Device to the Client Device on the tested channel during the entire period of the test. The Radar Waveform generator sends a Burst of pulses for one of the Radar Types 0-6 at levels defined on the Operating Channel. An additional 1 dB is added to the radar test signal to ensure it is at or above the DFS Detection Threshold, accounting for equipment variations/errors.
Observe the transmissions of the EUT after the Channel Move Time on the Operating Channel for duration greater than 30 minutes.

2). Transfer files from the Master Device to the Client Device on the tested channel during the entire period of the test. Observe the transmissions of the EUT on the Operating Channel for duration greater than 30 minutes after the Master Device is shut off.

7.3 Test data

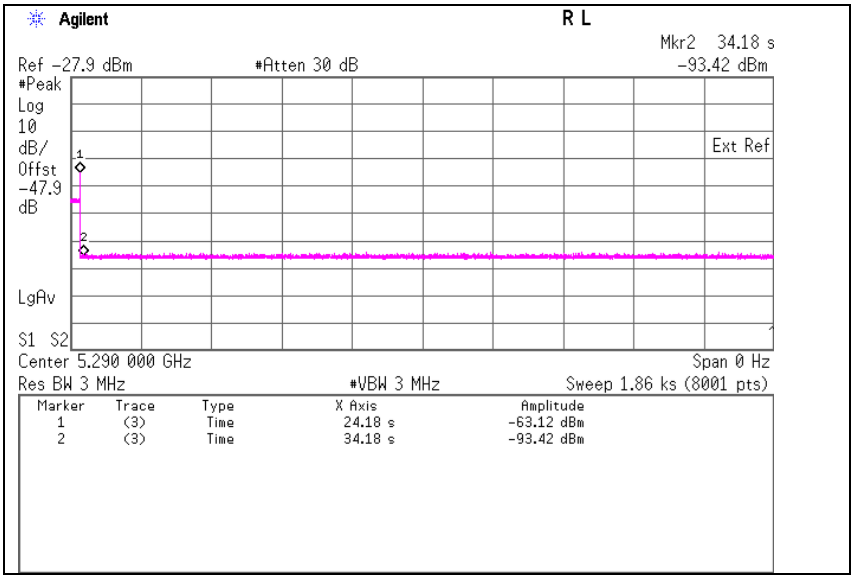
1).Radar Type 1

(for 11ac (VHT20), 5260MHz)



Marker 1 : End of Burst : 22.79 sec
Marker 2 : End of Burst +10sec : 32.79 sec

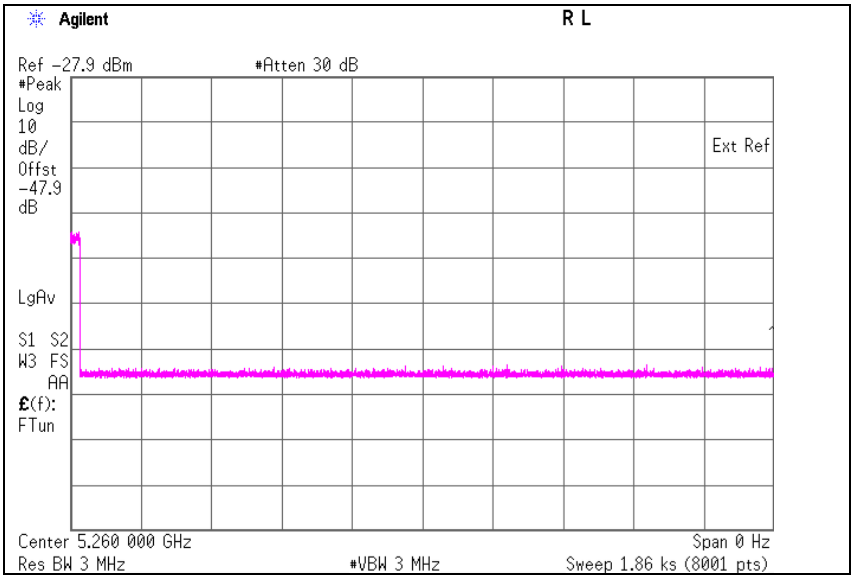
(for 11ac (VHT80), 5290MHz)



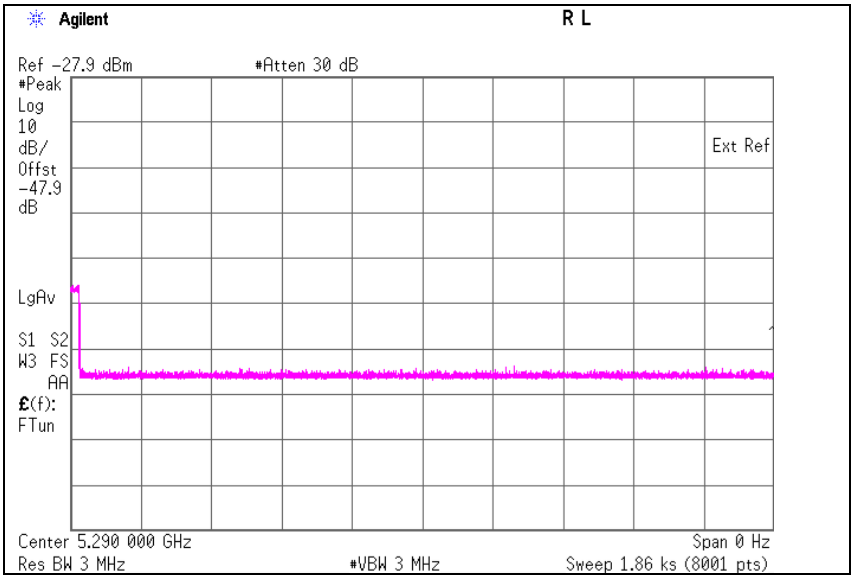
Marker 1 : End of Burst **: 24.18 sec**
Marker 2 : End of Burst +10sec **: 34.18 sec**

2).Master is shut off

(for 11ac (VHT20), 5260MHz)



(for 11ac (VHT80), 5290MHz)



7.4 Test result

Test result: Pass

Date : February 18, 2015 Test engineer : Tatsuya Arai

APPENDIX 1: Test instruments

EMI Test Equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SSG-01	Signal Generator	Agilent	E4438C	MY47271584	DFS	2014/03/03 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	DFS	2014/03/17 * 12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	DFS	2014/03/13 * 12
SCC-G14	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	DFS	2014/03/13 * 12
SCC-G31	Coaxial Cable	Junkosha	MWX241-01000KM SKMS	OCT-08-13-04 6	DFS	2014/05/15 * 12
SCC-G32	Coaxial Cable	Junkosha	MWX241-02000KM SKMS	OCT-09-13-00 5	DFS	2014/10/23 * 12
SPD-01	Power Divider	Agilent	11636B	56998	DFS	2014/04/22 * 12
SPSC-02	Power Splitters/Combiners	Mini-Circuits	ZFSC-2-10G+	-	DFS	2014/04/22 * 12
SAT20-05	Attenuator	Weinschel Corp.	54A-20	Y5649	DFS	2014/11/21 * 12
SAT20-06	Attenuator	Weinschel Corp.	54A-20	31506	DFS	2014/04/22 * 12
SAT20-07	Attenuator	Weinschel Corp.	54A-20	31484	DFS	2014/04/22 * 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	DFS	2014/04/22 * 12
STM-G3	Terminator	Weinschel	M1459A	U6569	DFS	2014/07/10 * 12
STM-G4	Terminator	Weinschel	M1459A	U6592	DFS	2014/07/10 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	DFS	2014/12/24 * 12

The expiration date of the calibration is the end of the expired month.
As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test Item:

DFS: Dynamic Frequency Selection