

TEST REPORT

Report number : Z101C-14044

Issue date : June 19, 2014

The device, as described herewith, was tested pursuant to applicable test procedure and complies with the requirements of;

FCC Part15 Subpart E**IC RSS-210****- Class II Permissive Change -**

The test results are traceable to the international or national standards.

Applicant : Japan Radio Co., Ltd.

Equipment under test (EUT) : WLAN MODULE

Model number : CMN-851

FCC ID : CKECMN851

IC Certification Number : 768B-CMN851

Date of test : June 3-6, 9, 2014

Test place : TÜV SÜD Zacta Ltd. Yonezawa Testing Center
4149-7 Hachimanpara 5-chome
Yonezawa-shi Yamagata 992-1128 Japan
Phone: +81-238-28-2880 Fax: +81-238-28-2888

Test results : Complied

The results in this report are applicable only to the equipment tested.

This report shall not be re-produced except in full without the written approval of TÜV SÜD Zacta Ltd.

This test report must not be used by client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

Tested by : Chiaki Kanno
Chiaki KannoTested by : Taiki Watanabe
Taiki WatanabeAuthorized by : Hiroaki Suzuki
Hiroaki Suzuki
Manager of EMC Technical Department

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1. Summary of Test

1.1 Purpose of test

EUT, FCC ID:CKECMN851, has been granted on Oct, 13, 2011.
Purpose of test is retest of EUT by adding antenna type.

1.2 Standards

CFR47 FCC Part 15 Subpart E, RSS-210

1.2.1 Test Methods

ANSI C63.4-2003, KDB789033

1.2.2 Deviation from standards

None

1.3 List of applied test to the EUT

Test items Section	Test items	Condition	Result
15.407(d) 15.205 15.209 IC RSS-210 A8.5&A9.2 RSS-Gen 4.9&4.10	Radiated emissions (Restricted Bands of Operation)	Radiated	PASS

NOTE: Since there is no change in EUT, only the Radiated test items were performed.

1.3.1 Test set up

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1.4 Modification to the EUT by laboratory

None

2. Equipment Under Test

2.1 General Description of equipment

EUT is the WLAN MODULE.

2.2 EUT information

Applicant	: Japan Radio Co., Ltd. 1011 SW Klickitat Way, Suite 201B, Seattle, WA 98134 U.S.A. Phone: 206-654-5644 Fax: 206-654-7030
Equipment under test	: WLAN MODULE
Trade name	: JRC
Model number	: CMN-851
Serial number	: 983108010011
EUT condition	: Pre-Production
Power ratings	: DC 3.3V
Size	: (W) 30 × (D) 26.8 × (H) 4.75 mm
Environment	: Indoor only use
Terminal limitation	: 0°C to 50°C
RF Specification Protocol	: IEEE802.11a, IEEE802.11n (HT20), IEEE802.11n (HT40)
Frequency range	: IEEE802.11a/n (HT20): 5180MHz-5320MHz, 5500MHz-5700MHz IEEE802.11n (HT40): 5190MHz-5310MHz, 5510MHz-5670MHz
Number of RF Channels	: IEEE802.11a/n (HT20): 19 Channels IEEE802.11n (HT40): 9 Channels
Modulation type	: IEEE802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM)
Data rate	: IEEE802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps IEEE802.11n (HT20 1S): 6.5, 13, 19.5, 26, 39, 52, 58.5, 65Mbps IEEE802.11n (HT20 2S): 13, 26, 39, 52, 78, 104, 117, 130Mbps IEEE802.11n (HT40 1S): 13.5, 27, 40.5, 54, 81, 108, 121.5, 135Mbps IEEE802.11n (HT40 2S): 27, 54, 81, 108, 162, 216, 243, 270Mbps

Channel separation : IEEE802.11a/n (HT20): 20MHz
IEEE802.11n (HT40): 40MHz

Antenna type : PIFA antenna

Antenna gain : 4.47dBi

2.3 Variation of the family model(s)

Not applicable.

2.4 Operating channels and frequencies

[IEEE802.11a/n (HT20)]

Channel	Frequency [MHz]
36	5180
40	5200
44	5220
48	5240
52	5260
56	5280
60	5300
64	5320
100	5500
104	5520
108	5540
112	5560
116	5580
132	5660
136	5680
140	5700

[IEEE802.11n (HT40)]

Channel	Frequency [MHz]
38	5190
46	5230
54	5270
62	5310
102	5510
110	5550
134	5670

2.5 Operating mode

The EUT had been tested under operating condition.
There are three channels have been tested as following:

Band	IEEE802.11a/n (HT20)		IEEE802.11n (HT40)	
	Channel	Frequency [MHz]	Channel	Frequency [MHz]
5.2GHz Band	36	5180	38	5190
	44	5200	-	-
	48	5240	46	5230
5.3GHz Band	52	5260	54	5270
	60	5280	-	-
	64	5320	62	5310
5.6GHz Band	100	5500	102	5510
	120	5580	118	5550
	140	5700	134	5670

The pre-test has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates.

Band	Modulation Type	Data Rate
5.2GHz Band	IEEE802.11a: OFDM	6Mbps
	IEEE802.11n (HT20): OFDM	MCS0 (6.5Mbps)
	IEEE802.11n (HT40): OFDM	MCS0 (13.5Mbps)
5.3GHz Band	IEEE802.11a: OFDM	6Mbps
	IEEE802.11n (HT20): OFDM	MCS0 (6.5Mbps)
	IEEE802.11n (HT40): OFDM	MCS0 (13.5Mbps)
5.6GHz Band	IEEE802.11a: OFDM	6Mbps
	IEEE802.11n (HT20): OFDM	MCS0 (6.5Mbps)
	IEEE802.11n (HT40): OFDM	MCS0 (13.5Mbps)

2.6 Operating mode

[Tx mode]

- i) Test program setup to the ART tool
- ii) Select a Test mode
Operating frequency: 5.2GHz Band, 5.3GHz Band, 5.6GHz Band
- iii) Start test mode

[Rx mode]

- i) Test program setup to the ART tool
- ii) Select a Test mode
Operating frequency: 5.2GHz Band, 5.3GHz Band, 5.6GHz Band
- iii) Start test mode

3. Configuration of equipment

3.1 Equipment(s) used

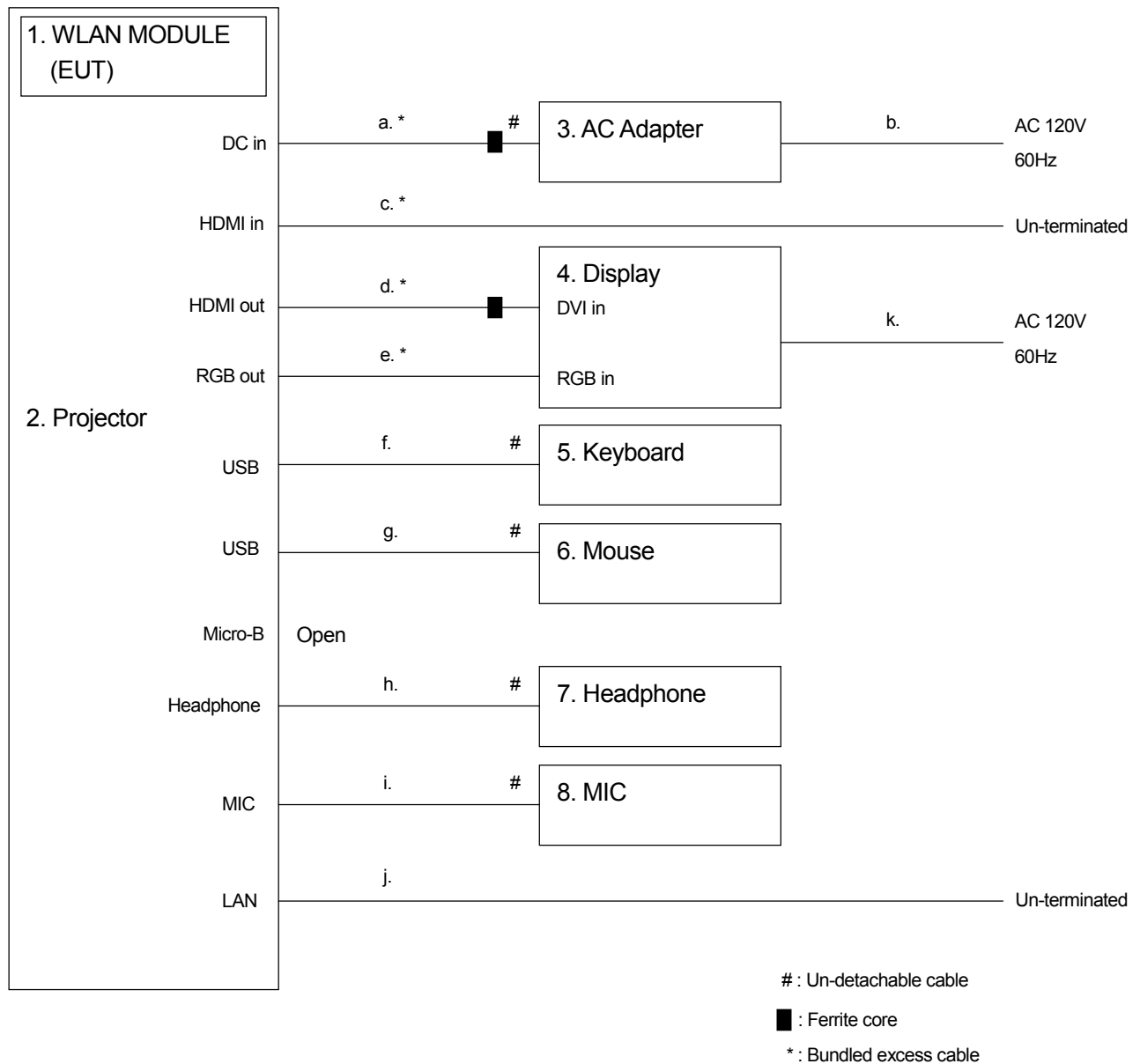
No.	Equipment	Company	Model No.	Serial No.	FCC ID / DoC	Comment
1	WLAN MODULE	Japan Radio Co., Ltd,	CMN-851	983108010011	CKECMN851	EUT
2	Projector	RICOH	P3500	48CZ-100203	N/A	Host device
3	AC adapter for Projector	RICOH	3A-905DA19	J031500C140400207	DoC	Accessory
4	Display	NEC	LCD-231WMi	04000080NJ	DoC	-
5	Keyboard	Logicool	Y-UR83	868017-0116 SY750UK	N/A	-
6	Mouse	Logitech	M-BT85	LNA43400219	DoC	-
7	Headphone	SONY	N/A	N/A	N/A	-
8	MIC	NEC	N/A	N/A	N/A	-

3.2 Cable(s) used

No.	Cable	Length[m]	Shield	Connector	Comment
a	AC adapter cord for Projector	1.5	YES	Metal	Accessory With one ferrite core *
b	AC power cord for AC adapter	0.9	NO	Plastic	Accessory
c	HDMI cable	0.9	YES	Metal	*
d	HDMI to DVI conversion cable	1.5	YES	Metal	With one ferrite core *
e	RGB cable	1.7	YES	Metal	*
f	Keyboard cable	1.5	YES	Metal	-
g	Mouse cable	1.6	YES	Metal	-
h	Headphone cable	1.7	YES	Metal	-
i	MIC cable	1.8	YES	Metal	-
j	LAN cable	2.1	NO	Plastic	*
k	AC power cord for Display	1.6	NO	Plastic	-

*Bundled excess cable

3.3 System configuration



Note 1: Numbers assigned to equipment or cables on this diagram correspond to the list in "3.1 Equipment(s) used" and "3.2 Cable(s) used".

Note 2: AC adapter cord (No.a) with one ferrite core is supplied with EUT.

Note 3: One ferrite core for AC Adapter cord (No.a) is not added during testing.

Note 4: One ferrite core for HDMI to DVI conversion cable (No.d) is not added during testing.

4. Radiated Emissions (Restricted Bands of Operation)

4.1 Measurement procedure

[FCC 407(d), 15.205, 15.209, KDB789033, IC RSS-210 A8.5&A9.2, RSS-Gen 4.9&4.10]

Test was applied by following conditions.

Frequency range	: 30MHz to 40GHz
Test place	: 3m Semi-anechoic chamber
EUT was placed on	: FRP table / (W)2.0m × (D)1.0m × (H)0.8m
Antenna distance	: 3m
Test receiver setting	Below 1GHz
- Detector	: Quasi-peak
- Bandwidth	: 120kHz
Spectrum analyzer setting	Above 1GHz
- Peak	: RBW=1MHz, VBW=1MHz, Span=0Hz, Sweep=auto
- Average	: RBW=1MHz, VBW=10Hz, Span=0Hz, Sweep=auto
	Display mode=Linear

Radiated emission measurements are performed at 3m distance with the broadband antenna (Biconical antenna, Log periodic antenna and Double ridged guide antenna). The antenna is positioned both the horizontal and vertical planes of polarization and height is varied 1m to 4m and stopped at height producing the maximum emission.

The EUT is Placed on a turntable, which is 0.8m above ground plane. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. The test results represent the worst case emission for each emission with manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation. Sufficient time for the EUT, support equipment, and test equipment are allowed in order for them to warm up to their normal operating condition.

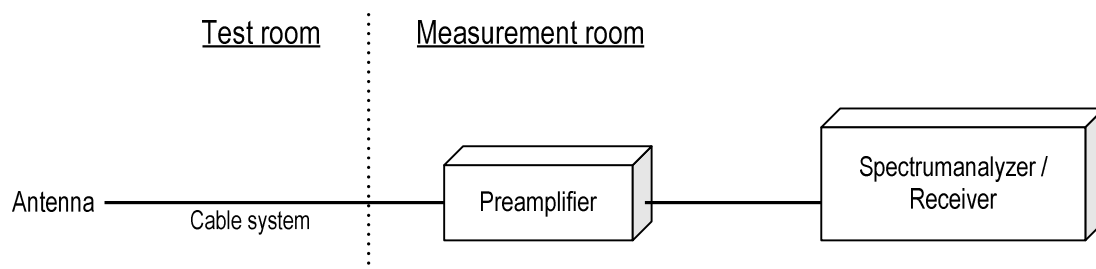
The EUT was set to operate with following conditions.

- 5.2GHz Band, 5.3GHz Band, 5.6GHz Band

The test mode of EUT is as follows.

- Tx mode, Rx mode

- Test configuration



4.2 Calculation method

Emission level = Reading + (Ant. factor + Cable system loss – Amp. Gain)

Margin = Limit – Emission level

4.3 Limit

- (1) For transmitters operating in the 5.15-5.25GHz band: all emissions outside of the 5.15-5.35GHz band shall not exceed an EIRP of -27dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35GHz band: all emissions outside of the 5.15-5.35GHz band shall not exceed an EIRP of -27dBm/MHz.
Devices operating in the 5.25-5.35GHz band that generate emissions in the 5.15-5.25GHz band must meet all applicable technical requirements for operation in the 5.15-5.25GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27dBm/MHz in the 5.15-5.25GHz band.
- (3) For transmitters operating in the 5.47-5.725GHz band: all emissions outside of the 5.47-5.725GHz band shall not exceed an EIRP of -27dBm/MHz.
- (4) For transmitters operating in the 5.725-5.825GHz band: all emissions within the frequency range from the band edge to 10MHz above or below the band edge shall not exceed an EIRP of -17dBm/MHz; for frequencies 10MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27dBm/MHz.

Frequency [MHz]	Field strength		Distance [m]
	[uV/m]	[dBuV/m]	
0.009-0.490	2400 / F [kHz]	20logE [uV/m]	300
0.490-1.705	24000 / F [kHz]	20logE [uV/m]	30
1.705-30	30	29.5	30
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	300	54.0	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level [dBuV/m] = 20log Emission [uV/m]
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition modulation.

4.4 Test data

Date	: Jun. 3, 2014		
Temperature	: 20.3 [°C]		
Humidity	: 50.1 [%]	Tested by	:
Test place	: 3m Semi-anechoic chamber		<u>Taiki Watanabe</u>
Date	: Jun. 4, 2014		
Temperature	: 23.8 [°C]		
Humidity	: 52.3 [%]	Tested by	:
Test place	: 3m Semi-anechoic chamber		<u>Taiki Watanabe</u>
Date	: Jun. 6, 2014		
Temperature	: 22.8 [°C]		
Humidity	: 62.8 [%]	Tested by	:
Test place	: 3m Semi-anechoic chamber		<u>Taiki Watanabe</u>
Date	: Jun. 9, 2014		
Temperature	: 21.2 [°C]		
Humidity	: 69.2 [%]	Tested by	:
Test place	: 3m Semi-anechoic chamber		<u>Taiki Watanabe</u>

**[IEEE802.11a]
(5.2GHz Band)**

Mode	Channel	Frequency (MHz)	Frequency (MHz)	ANT H/V	Detector QP	Reading (dBμV)	C.F (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
802.11a	44	5220	35.980	V	QP	32.5	-6.5	26.0	40.0	14.0
			59.300	V	QP	37.8	-14.0	23.8	40.0	16.2
			222.740	H	QP	37.8	-4.3	33.5	46.0	12.5
			668.256	H	QP	44.0	-2.3	41.7	46.0	4.3
			965.241	H	QP	48.0	2.0	50.0	54.0	4.0

Mode	Channel	Frequency (MHz)	Frequency (MHz)	ANT H/V	Detector PK/AV	Reading (dBμV)	C.F (dB)	DCF (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
802.11a	36	5180	5148.00	H	PK	44.4	14.5		58.9	74.0	15.1
			5148.00	H	AV	25.8	14.5		40.3	54.0	13.7
			5148.36	V	PK	48.7	14.5		63.2	74.0	10.8
			5148.36	V	AV	29.6	14.5		44.1	54.0	9.9
			10360.00	H	PK	37.4	24.9		62.3	74.0	11.7
			10360.00	V	PK	37.4	24.9		62.3	74.0	11.7
	44	5220	10440.00	H	PK	38.0	25.0		63.0	74.0	11.0
			10440.00	V	PK	37.5	25.0		62.5	74.0	11.5
	48	5240	10480.00	H	PK	37.8	25.0		62.8	74.0	11.2
			10480.00	V	PK	37.6	25.0		62.6	74.0	11.4

Note:

1. Emission Level (Margin) = Limit - [Reading + C.F (Antenna + Cable – Amp)] + DCF (If transmit duty cycle < 98 percent)
2. DCF = 20log (1/x) , x = On time / (On + Off time)
3. No emission were detected in frequency range GHz band at the 3 meters distance. Measurement is the floor noise.
4. No emission was detected in the receive mode.

(5.3GHz Band)

Mode	Channel	Frequency (MHz)	Frequency (MHz)	ANT H/V	Detector PK/AV	Reading (dBμV)	C.F (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
802.11a	60	5300	35.980	V	QP	33.3	-6.5	26.8	40.0	13.2
			60.760	V	QP	36.2	-14.3	21.9	40.0	18.1
			222.742	H	QP	38.3	-4.3	34.0	46.0	12.0
			668.258	H	QP	42.0	-2.3	39.7	46.0	6.3
			965.241	H	QP	47.0	2.0	49.0	54.0	5.0

Mode	Channel	Frequency (MHz)	Frequency (MHz)	ANT H/V	Detector PK/AV	Reading (dBμV)	C.F (dB)	DCF (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
802.11a	52	5260	10520.00	H	PK	40.3	21.3		61.6	74.0	12.4
			10520.00	V	PK	41.2	21.3		62.5	74.0	11.5
	60	5300	10600.00	H	PK	40.2	21.5		61.7	74.0	12.3
			10600.00	V	PK	40.9	21.5		62.4	74.0	11.6
	64	5320	5353.15	H	PK	55.0	12.7		67.7	74.0	6.3
			5353.15	H	AV	35.8	12.7		48.5	54.0	5.5
			5353.53	V	PK	57.0	12.7		69.7	74.0	4.3
			5353.53	V	AV	36.2	12.7		48.9	54.0	5.1
			10640.00	H	PK	41.5	21.6		63.1	74.0	10.9
			10640.00	V	PK	41.1	21.6		62.7	74.0	11.3

Note:

1. Emission Level (Margin) = Limit - [Reading + C.F (Antenna + Cable – Amp)] + DCF (If transmit duty cycle < 98 percent)
2. DCF = 20log (1/x) , x = On time / (On + Off time)
3. No emission were detected in frequency range GHz band at the 3 meters distance. Measurement is the floor noise.
4. No emission was detected in the receive mode.

(5.6GHz Band)

Mode	Channel	Frequency (MHz)	Frequency (MHz)	ANT H/V	Detector PK/AV	Reading (dBμV)	C.F (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
802.11a	100	5500	35.970	V	QP	33.2	-6.5	26.7	40.0	13.3
			60.730	V	QP	36.6	-14.3	22.3	40.0	17.7
			222.751	H	QP	39.8	-4.3	35.5	46.0	10.5
			668.244	H	QP	41.0	-2.3	38.7	46.0	7.3
			965.251	H	QP	45.0	2.0	47.0	54.0	7.0

Mode	Channel	Frequency (MHz)	Frequency (MHz)	ANT H/V	Detector PK/AV	Reading (dBμV)	C.F (dB)	DCF (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
802.11a	100	5500	5458.17	H	PK	44.1	13.0		57.1	74.0	16.9
			5458.17	H	AV	29.7	13.0		42.7	54.0	11.3
			5448.43	V	PK	45.6	12.9		58.5	74.0	15.5
			5448.43	V	AV	32.4	12.9		45.3	54.0	8.7
			11000.00	H	PK	40.5	22.2		62.7	74.0	11.3
			11000.00	V	PK	41.5	22.2		63.7	74.0	10.3
	120	5600	11200.00	H	PK	39.4	22.8		62.2	74.0	11.8
			11200.00	V	PK	39.4	22.8		62.2	74.0	11.8
	140	5700	5725.80	H	PK	56.2	13.0		69.2	74.0	4.8
			5725.80	H	AV	36.3	13.0		49.3	54.0	4.7
			5725.70	V	PK	53.5	13.0		66.5	74.0	7.5
			5725.70	V	AV	32.1	13.0		45.1	54.0	8.9
			11400.00	H	PK	39.7	23.1		62.8	74.0	11.2
			11400.00	V	PK	40.2	23.1		63.3	74.0	10.7

Note:

1. Emission Level (Margin) = Limit - [Reading + C.F (Antenna + Cable – Amp)] + DCF (If transmit duty cycle < 98 percent)
2. DCF = 20log (1/x) , x = On time / (On + Off time)
3. No emission were detected in frequency range GHz band at the 3 meters distance. Measurement is the floor noise.
4. No emission was detected in the receive mode.

[IEEE802.11n (HT20)]
(5.2GHz Band)

Mode	Channel	Frequency (MHz)	Frequency (MHz)	ANT H/V	Detector PK/AV	Reading (dBμV)	C.F (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
802.11n (20MHz)	44	5220	36.070	V	QP	32.4	-6.6	25.8	40.0	14.2
			60.730	V	QP	37.4	-14.3	23.1	40.0	16.9
			222.750	H	QP	42.8	-4.3	38.5	46.0	7.5
			668.244	H	QP	44.0	-2.3	41.7	46.0	4.3
			965.250	H	QP	48.0	2.0	50.0	54.0	4.0

Mode	Channel	Frequency (MHz)	Frequency (MHz)	ANT H/V	Detector PK/AV	Reading (dBμV)	C.F (dB)	DCF (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
802.11n (20MHz)	36	5180	5140.00	H	PK	40.9	14.5		55.4	74.0	18.6
			5140.00	H	AV	27.6	14.5		42.1	54.0	11.9
			5147.00	V	PK	43.9	14.5		58.4	74.0	15.6
			5147.00	V	AV	28.0	14.5		42.5	54.0	11.5
			10360.00	H	PK	38.7	24.9		63.6	74.0	10.4
			10360.00	V	PK	37.8	24.9		62.7	74.0	11.3
	44	5220	10440.00	H	PK	38.2	25.0		63.2	74.0	10.8
			10440.00	V	PK	37.7	25.0		62.7	74.0	11.3
	48	5240	10480.00	H	PK	38.4	25.0		63.4	74.0	10.6
			10480.00	V	PK	38.4	25.0		63.4	74.0	10.6

Note:

1. Emission Level (Margin) = Limit - [Reading + C.F (Antenna + Cable – Amp)] + DCF (If transmit duty cycle < 98 percent)
2. DCF = 20log (1/x) , x = On time / (On + Off time)
3. No emission were detected in frequency range GHz band at the 3 meters distance. Measurement is the floor noise.
4. No emission was detected in the receive mode.

(5.3GHz Band)

Mode	Channel	Frequency (MHz)	Frequency (MHz)	ANT H/V	Detector PK/AV	Reading (dBμV)	C.F (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
802.11n (20MHz)	60	5300	35.984	V	QP	33.2	-6.5	26.7	40.0	13.3
			60.730	V	QP	37.3	-14.3	23.0	40.0	17.0
			222.750	H	QP	43.5	-4.3	39.2	46.0	6.8
			668.244	H	QP	42.0	-2.3	39.7	46.0	6.3
			965.250	H	QP	46.0	2.0	48.0	54.0	6.0

Mode	Channel	Frequency (MHz)	Frequency (MHz)	ANT H/V	Detector PK/AV	Reading (dBμV)	C.F (dB)	DCF (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
802.11n (20MHz)	52	5260	10520.00	H	PK	40.9	21.3		62.2	74.0	11.8
			10520.00	V	PK	40.5	21.3		61.8	74.0	12.2
	60	5300	10600.00	H	PK	39.8	21.5		61.3	74.0	12.7
			10600.00	V	PK	40.2	21.5		61.7	74.0	12.3
	64	5320	5353.15	H	PK	48.9	12.7		61.6	74.0	12.4
			5353.15	H	AV	32.0	12.7		44.7	54.0	9.3
			5353.53	V	PK	47.0	12.7		59.7	74.0	14.3
			5353.53	V	AV	32.5	12.7		45.2	54.0	8.8
			10640.00	H	PK	40.5	21.6		62.1	74.0	11.9
			10640.00	V	PK	40.4	21.6		62.0	74.0	12.0

Note:

1. Emission Level (Margin) = Limit - [Reading + C.F (Antenna + Cable – Amp)] + DCF (If transmit duty cycle < 98 percent)
2. DCF = 20log (1/x) , x = On time / (On + Off time)
3. No emission were detected in frequency range GHz band at the 3 meters distance. Measurement is the floor noise.
4. No emission was detected in the receive mode.

(5.6GHz Band)

Mode	Channel	Frequency (MHz)	Frequency (MHz)	ANT H/V	Detector PK/AV	Reading (dBμV)	C.F (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
802.11n (20MHz)	100	5500	35.952	V	QP	32.5	-6.5	26.0	40.0	14.0
			60.760	V	QP	36.4	-14.3	22.1	40.0	17.9
			222.750	H	QP	43.5	-4.3	39.2	46.0	6.8
			668.255	H	QP	42.0	-2.3	39.7	46.0	6.3
			965.250	H	QP	46.0	2.0	48.0	54.0	6.0

Mode	Channel	Frequency (MHz)	Frequency (MHz)	ANT H/V	Detector PK/AV	Reading (dBμV)	C.F (dB)	DCF (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
802.11n (20MHz)	100	5500	5424.80	H	PK	45.5	12.9		58.4	74.0	15.6
			5424.80	H	AV	30.0	12.9		42.9	54.0	11.1
			5455.09	V	PK	45.0	13.0		58.0	74.0	16.0
			5455.09	V	AV	30.0	13.0		43.0	54.0	11.0
			11000.00	H	PK	40.6	22.2		62.8	74.0	11.2
			11000.00	V	PK	40.1	22.2		62.3	74.0	11.7
	120	5600	11200.00	H	PK	40.1	22.8		62.9	74.0	11.1
			11200.00	V	PK	39.3	22.8		62.1	74.0	11.9
	140	5700	5725.80	H	PK	45.4	13.0		58.4	74.0	15.6
			5725.80	H	AV	30.3	13.0		43.3	54.0	10.7
			5725.70	V	PK	49.1	13.0		62.1	74.0	11.9
			5725.70	V	AV	31.6	13.0		44.6	54.0	9.4
			11400.00	H	PK	40.0	23.1		63.1	74.0	10.9
			11400.00	V	PK	40.1	23.1		63.2	74.0	10.8

Note:

1. Emission Level (Margin) = Limit - [Reading + C.F (Antenna + Cable – Amp)] + DCF (If transmit duty cycle < 98 percent)
2. DCF = 20log (1/x) , x = On time / (On + Off time)
3. No emission were detected in frequency range GHz band at the 3 meters distance. Measurement is the floor noise.
4. No emission was detected in the receive mode.

[IEEE802.11n (HT40)]
(5.2GHz Band)

Mode	Channel	Frequency (MHz)	Frequency (MHz)	ANT H/V	Detector PK/AV	Reading (dBμV)	C.F (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
802.11n (40MHz)	38	5190	36.001	V	QP	33.1	-6.5	26.6	40.0	13.4
			222.745	H	QP	42.3	-4.3	38.0	46.0	8.0
			668.251	H	QP	43.1	-2.3	40.8	46.0	5.2
			965.250	H	QP	47.5	2.0	49.5	54.0	4.5

Mode	Channel	Frequency (MHz)	Frequency (MHz)	ANT H/V	Detector PK/AV	Reading (dBμV)	C.F (dB)	DCF (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
802.11n (40MHz)	38	5190	5148.80	H	PK	50.8	14.5		65.3	74.0	8.7
			5148.80	H	AV	35.1	14.5		49.6	54.0	4.4
			5148.36	V	PK	52.1	14.5		66.6	74.0	7.4
			5148.36	V	AV	34.3	14.5		48.8	54.0	5.2
			10380.00	H	PK	38.1	25.0		63.1	74.0	10.9
			10380.00	V	PK	38.9	25.0		63.9	74.0	10.1
	46	5230	10460.00	H	PK	36.9	25.0		61.9	74.0	12.1
			10460.00	V	PK	37.3	25.0		62.3	74.0	11.7

Note:

1. Emission Level (Margin) = Limit - [Reading + C.F (Antenna + Cable – Amp)] + DCF (If transmit duty cycle < 98 percent)
2. DCF = 20log (1/x) , x = On time / (On + Off time)
3. No emission were detected in frequency range GHz band at the 3 meters distance. Measurement is the floor noise.
4. No emission was detected in the receive mode.

(5.3GHz Band)

Mode	Channel	Frequency (MHz)	Frequency (MHz)	ANT H/V	Detector PK/AV	Reading (dBμV)	C.F (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
802.11n (40MHz)	54	5270	60.640	V	QP	35.5	-6.5	29.0	40.0	11.0
			222.745	H	QP	43.5	-4.3	39.2	46.0	6.8
			668.251	H	QP	43.0	-2.3	40.7	46.0	5.3
			965.250	H	QP	47.0	2.0	49.0	54.0	5.0

Mode	Channel	Frequency (MHz)	Frequency (MHz)	ANT H/V	Detector PK/AV	Reading (dBμV)	C.F (dB)	DCF (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
802.11n (40MHz)	54	5270	10540.00	H	PK	39.6	21.4		61.0	74.0	13.0
			10540.00	V	PK	39.9	21.4		61.3	74.0	12.7
	62	5310	5350.80	H	PK	57.1	12.7		69.8	74.0	4.2
			5350.80	H	AV	36.7	12.7		49.4	54.0	4.6
			5351.01	V	PK	57.0	12.7		69.7	74.0	4.3
			5351.01	V	AV	36.3	12.7		49.0	54.0	5.0
			10620.00	H	PK	40.3	21.6		61.9	74.0	12.1
			10620.00	V	PK	39.7	21.6		61.3	74.0	12.7

Note:

1. Emission Level (Margin) = Limit - [Reading + C.F (Antenna + Cable – Amp)] + DCF (If transmit duty cycle < 98 percent)
2. DCF = 20log (1/x) , x = On time / (On + Off time)
3. No emission were detected in frequency range GHz band at the 3 meters distance. Measurement is the floor noise.
4. No emission was detected in the receive mode.

(5.6GHz Band)

Mode	Channel	Frequency (MHz)	Frequency (MHz)	ANT H/V	Detector PK/AV	Reading (dBμV)	C.F (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
802.11n (40MHz)	118	5590	60.720	V	QP	36.0	-14.3	21.7	40.0	18.3
			222.745	H	QP	44.6	-4.3	40.3	46.0	5.7
			668.248	H	QP	43.0	-2.3	40.7	46.0	5.3
			965.250	H	QP	47.5	2.0	49.5	54.0	4.5

Mode	Channel	Frequency (MHz)	Frequency (MHz)	ANT H/V	Detector PK/AV	Reading (dBμV)	C.F (dB)	DCF (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
802.11n (40MHz)	102	5510	5431.50	H	PK	45.6	12.9		58.5	74.0	15.5
			5431.50	H	AV	30.2	12.9		43.1	54.0	10.9
			5431.20	V	PK	45.2	12.9		58.1	74.0	15.9
			5431.20	V	AV	31.1	12.9		44.0	54.0	10.0
			11020.00	H	PK	41.2	22.3		63.5	74.0	10.5
			11020.00	V	PK	40.4	22.3		62.7	74.0	11.3
	118	5590	11180.00	H	PK	40.1	22.8		62.9	74.0	11.1
			11180.00	V	PK	39.6	22.8		62.4	74.0	11.6
	134	5670	5763.78	H	PK	44.7	13.0		57.7	74.0	16.3
			5763.78	H	AV	31.0	13.0		44.0	54.0	10.0
			5732.15	V	PK	42.4	13.0		55.4	74.0	18.6
			5732.15	V	AV	29.2	13.0		42.2	54.0	11.8
			11340.00	H	PK	40.6	23.1		63.7	74.0	10.3
			11340.00	V	PK	40.5	23.1		63.6	74.0	10.4

Note:

1. Emission Level (Margin) = Limit - [Reading + C.F (Antenna + Cable – Amp)] + DCF (If transmit duty cycle < 98 percent)
2. DCF = 20log (1/x) , x = On time / (On + Off time)
3. No emission were detected in frequency range GHz band at the 3 meters distance. Measurement is the floor noise.
4. No emission was detected in the receive mode.

5. Duty Cycle

5.1 Measurement procedure [KDB789033]

The duty cycle is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to;

- RBW=8MHz, VBW=8MHz, Span=0Hz, Sweep=Auto, Detector=Peak, Trace mode=Single

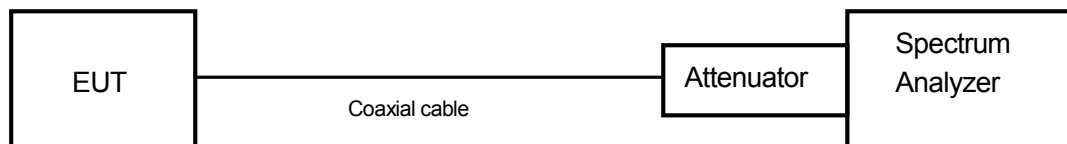
The EUT was set to operate with following conditions.

- 5.2GHz Band, 5.3GHz Band, 5.6GHz Band

The test mode of EUT is as follows.

- Tx mode

- Test configuration



5.2 Limit

None

5.3 Measurement result

Date : Jun. 4, 2014

Temperature : 23.6 [°C]

Humidity : 56.9 [%]

Test place : Shielded room No.4

Tested by :

Chiaki Kanno

Mode	Channel	Frequency (MHz)	Duty Cycle			DCF (dB) 10log(1/x)	DCF (dB) 20log(1/x)
			Tx On Time(ms)	Tx Off Time(ms)	X		
802.11a Chain A	36	5180	3.136	0.012	0.996	0.017	0.033
	44	5220	3.136	0.012	0.996	0.017	0.033
	48	5240	3.136	0.012	0.996	0.017	0.033
	52	5260	3.136	0.016	0.995	0.022	0.044
	60	5300	3.136	0.012	0.996	0.017	0.033
	64	5320	3.136	0.012	0.996	0.017	0.033
	100	5500	3.136	0.012	0.996	0.017	0.033
	120	5600	3.136	0.016	0.995	0.022	0.044
	140	5700	3.136	0.012	0.996	0.017	0.033

Note: X = On time / (On + Off time)

Mode	Channel	Frequency (MHz)	Duty Cycle			DCF (dB) 10log(1/x)	DCF (dB) 20log(1/x)
			Tx On Time(ms)	Tx Off Time(ms)	X		
802.11n (20MHz) Chain A	36	5180	1.476	0.014	0.991	0.041	0.082
	44	5220	1.476	0.016	0.989	0.047	0.094
	48	5240	1.476	0.014	0.991	0.041	0.082
	52	5260	1.476	0.014	0.991	0.041	0.082
	60	5300	1.474	0.016	0.989	0.047	0.094
	64	5320	1.476	0.014	0.991	0.041	0.082
	100	5500	1.476	0.014	0.991	0.041	0.082
	120	5600	1.476	0.014	0.991	0.041	0.082
	140	5700	1.476	0.016	0.989	0.047	0.094

Note: X = On time / (On + Off time)

Mode	Channel	Frequency (MHz)	Duty Cycle			DCF (dB) 10log(1/x)	DCF (dB) 20log(1/x)
			Tx On Time(ms)	Tx Off Time(ms)	X		
802.11n (20MHz) Chain B	36	5180	1.476	0.014	0.991	0.041	0.082
	44	5220	1.476	0.016	0.989	0.047	0.094
	48	5240	1.476	0.014	0.991	0.041	0.082
	52	5260	1.476	0.014	0.991	0.041	0.082
	60	5300	1.476	0.014	0.991	0.041	0.082
	64	5320	1.476	0.014	0.991	0.041	0.082
	100	5500	1.474	0.016	0.989	0.047	0.094
	120	5600	1.476	0.016	0.989	0.047	0.094
	140	5700	1.476	0.016	0.989	0.047	0.094

Note: X = On time / (On + Off time)

Mode	Channel	Frequency (MHz)	Duty Cycle			DCF (dB) 10log(1/x)	DCF (dB) 20log(1/x)
			Tx On Time(ms)	Tx Off Time(ms)	X		
802.11n (40MHz) Chain A	38	5190	0.732	0.014	0.981	0.082	0.165
	46	5230	0.732	0.014	0.981	0.082	0.165
	54	5270	0.732	0.014	0.981	0.082	0.165
	62	5310	0.732	0.014	0.981	0.082	0.165
	102	5510	0.731	0.014	0.981	0.082	0.165
	118	5590	0.732	0.014	0.981	0.082	0.165
	134	5670	0.732	0.015	0.980	0.088	0.176

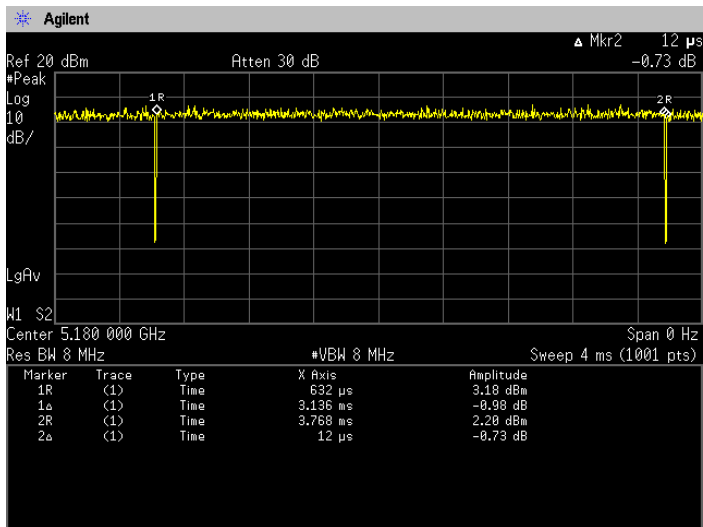
Note: $X = \text{On time} / (\text{On} + \text{Off time})$

Mode	Channel	Frequency (MHz)	Duty Cycle			DCF (dB) 10log(1/x)	DCF (dB) 20log(1/x)
			Tx On Time(ms)	Tx Off Time(ms)	X		
802.11n (40MHz) Chain B	38	5190	0.732	0.014	0.981	0.082	0.165
	46	5230	0.732	0.014	0.981	0.082	0.165
	54	5270	0.732	0.014	0.981	0.082	0.165
	62	5310	0.732	0.014	0.981	0.082	0.165
	102	5510	0.732	0.014	0.981	0.082	0.165
	118	5590	0.732	0.014	0.981	0.082	0.165
	134	5670	0.732	0.014	0.981	0.082	0.165

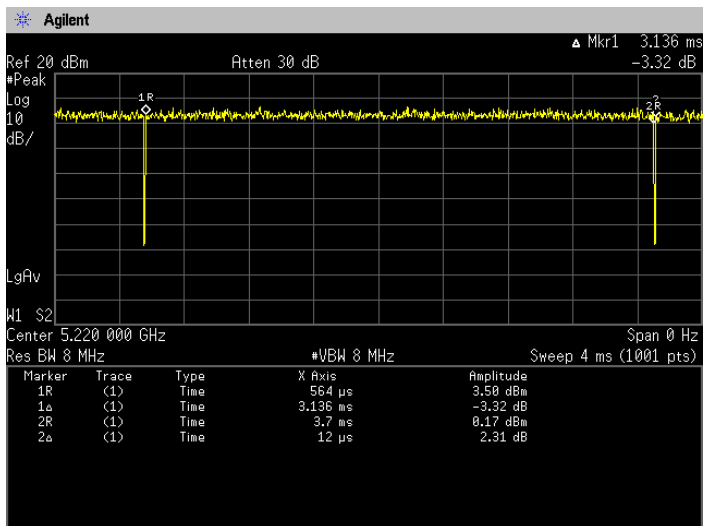
Note: $X = \text{On time} / (\text{On} + \text{Off time})$

5.4 Trace data
[IEEE802.11a]

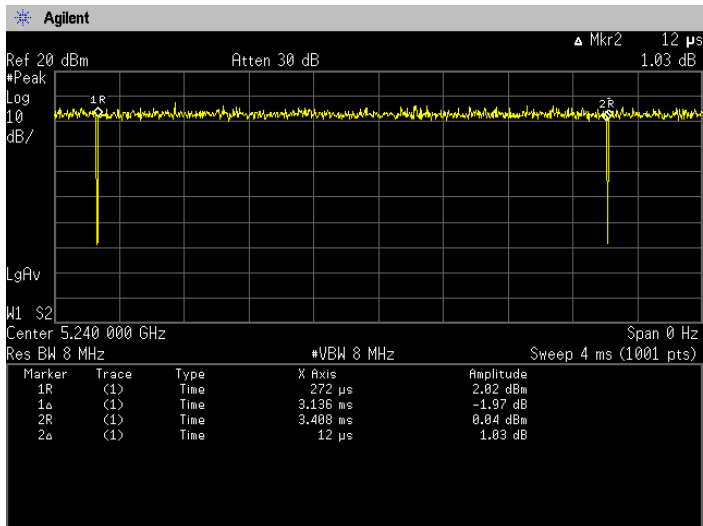
Channel: 36



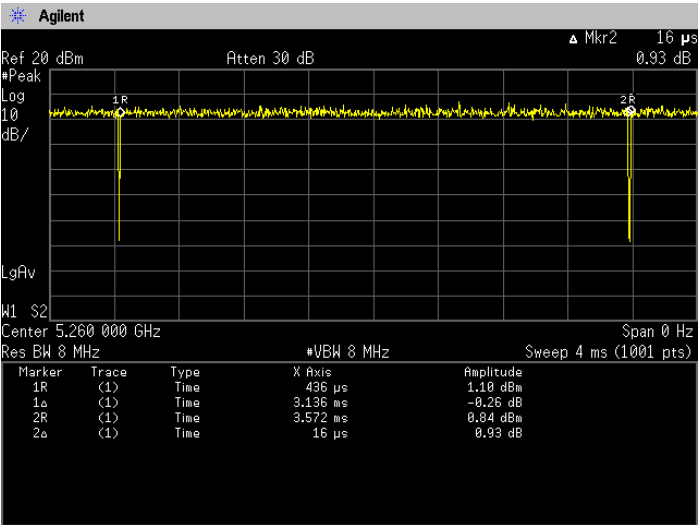
Channel: 44



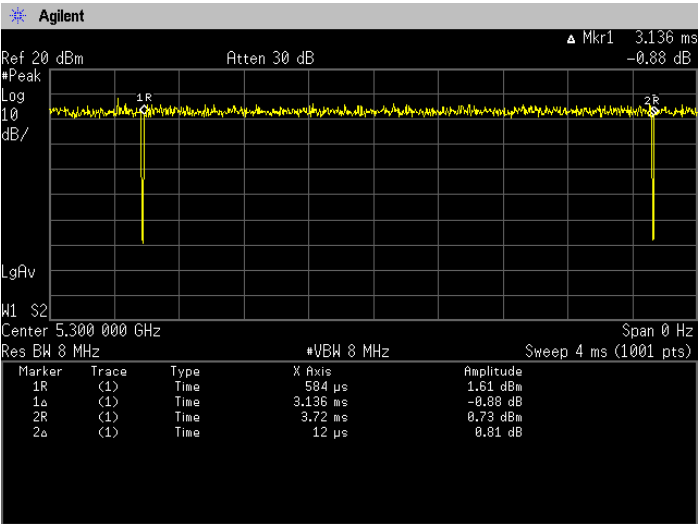
Channel: 48



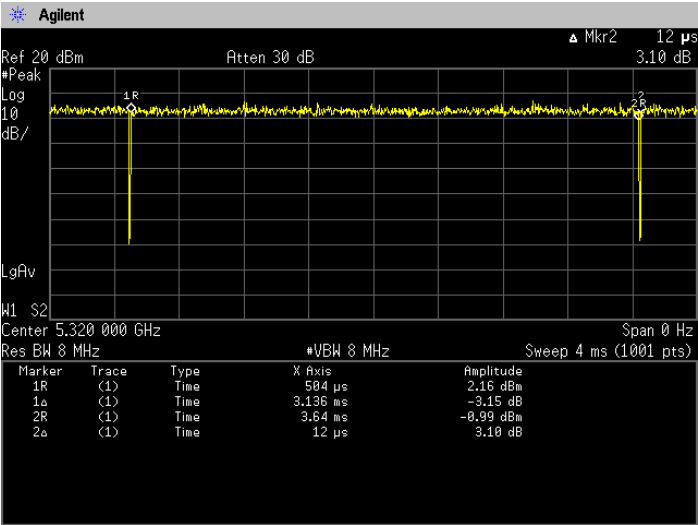
Channel: 52

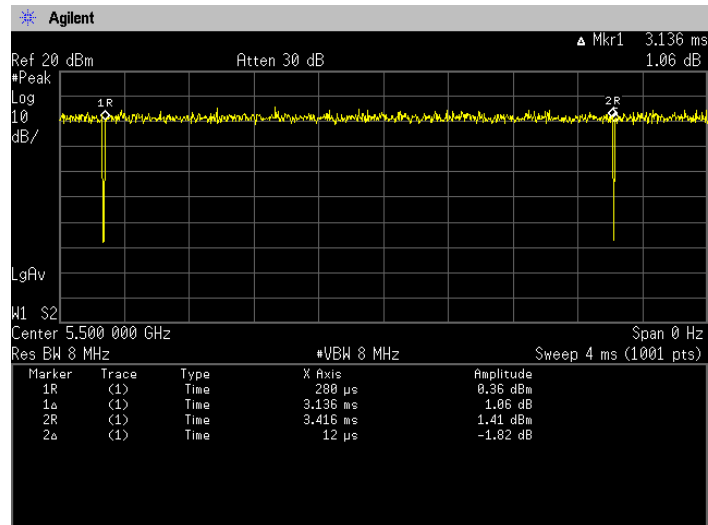
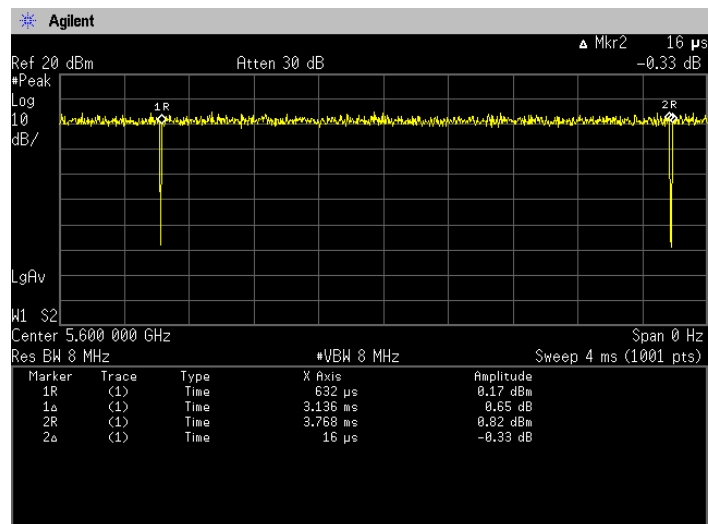
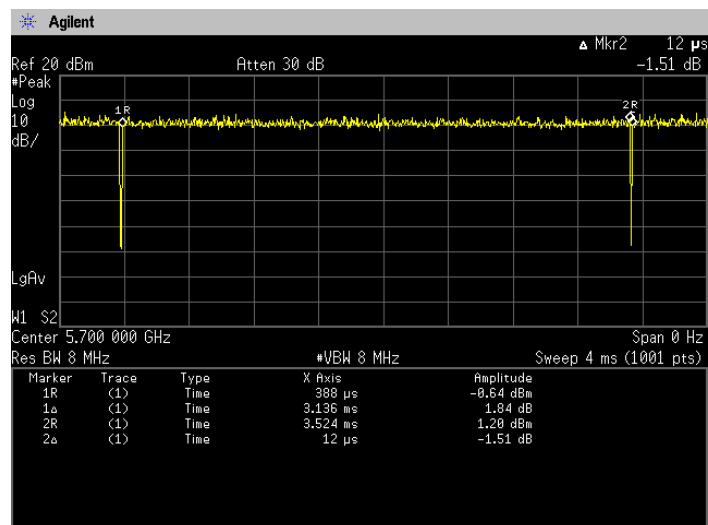


Channel: 60



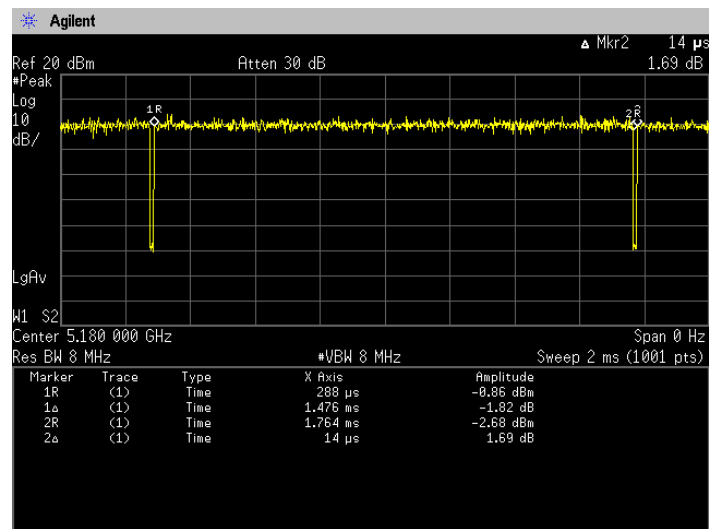
Channel: 64



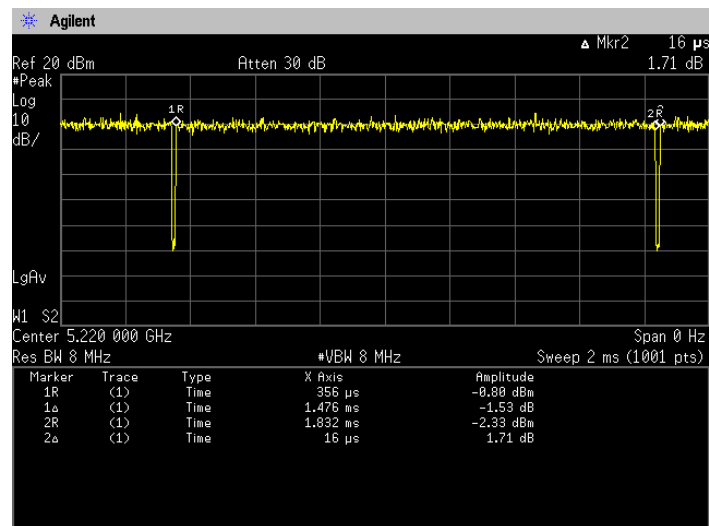
Channel: 100**Channel: 120****Channel: 140**

[IEEE802.11n (HT20)] Chain A

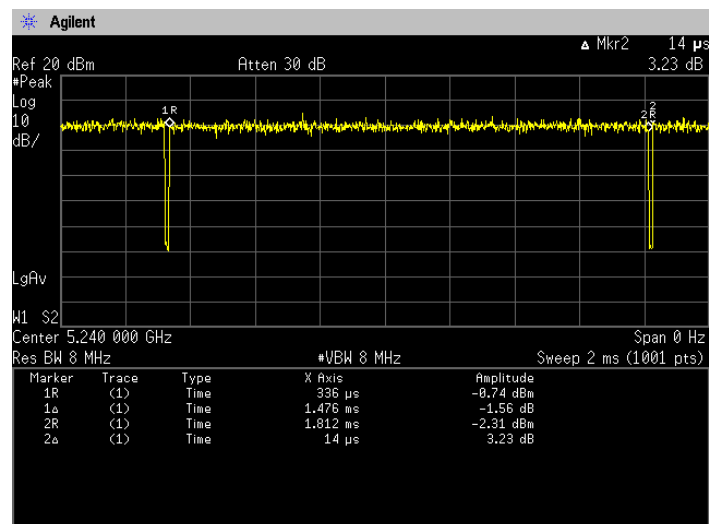
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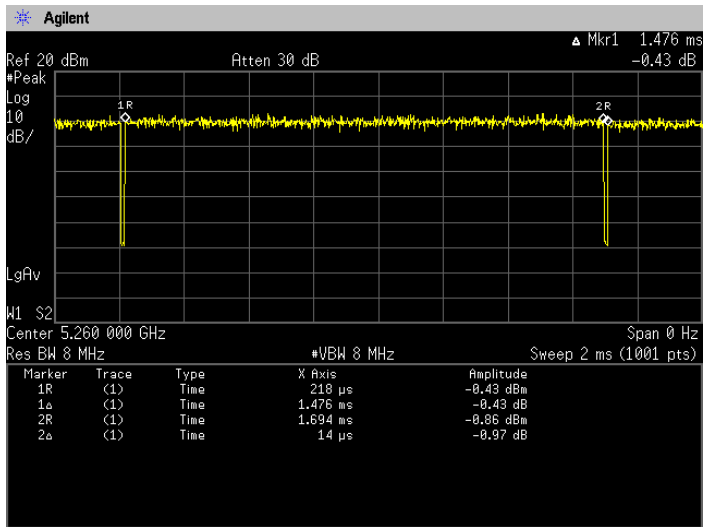
Channel: 44



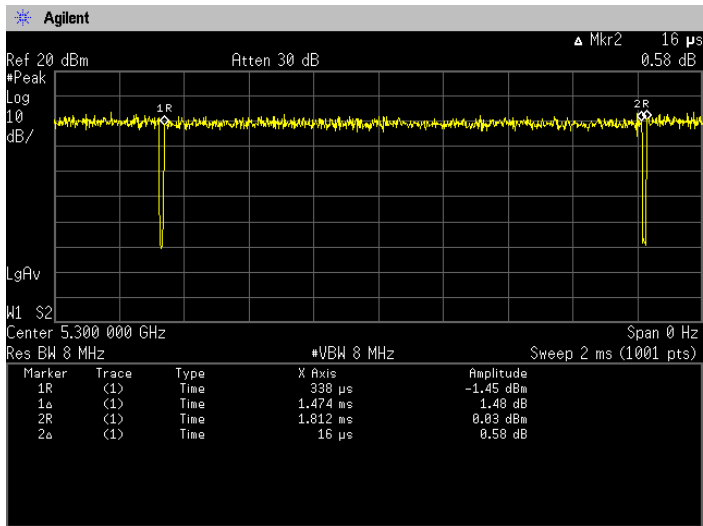
Channel: 48



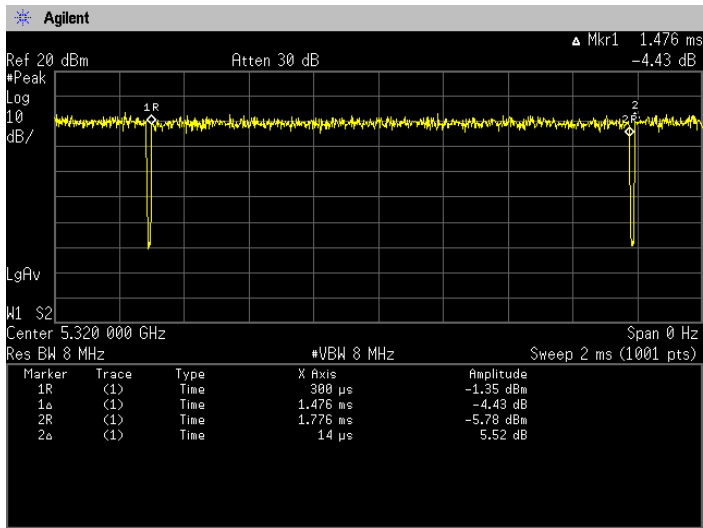
Channel: 52



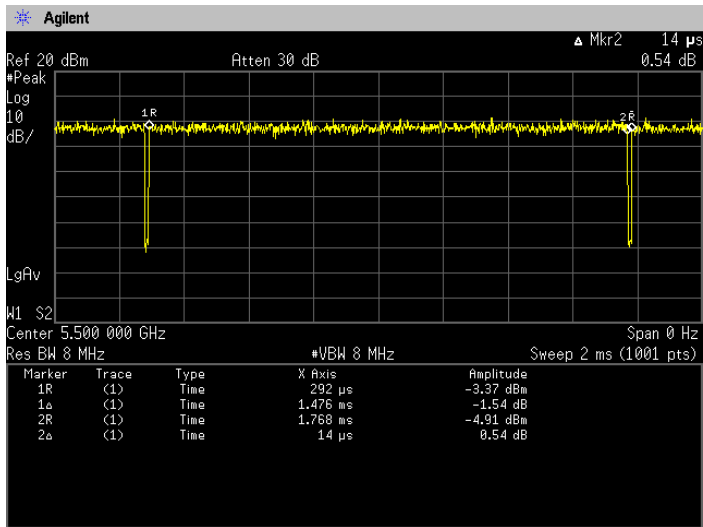
Channel: 60



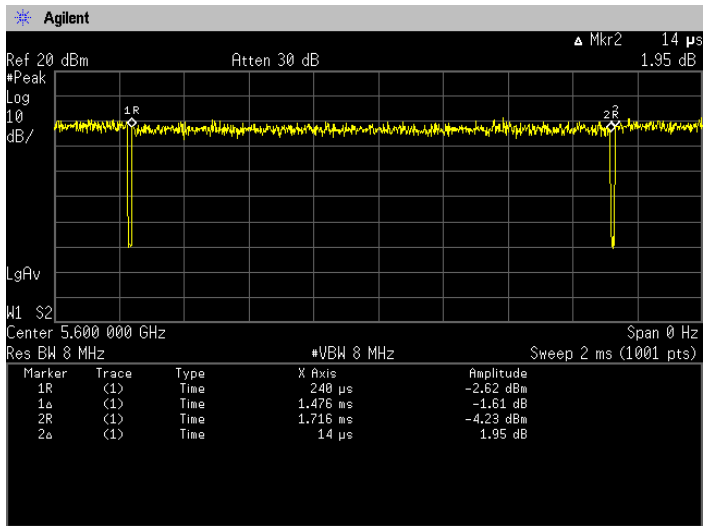
Channel: 64



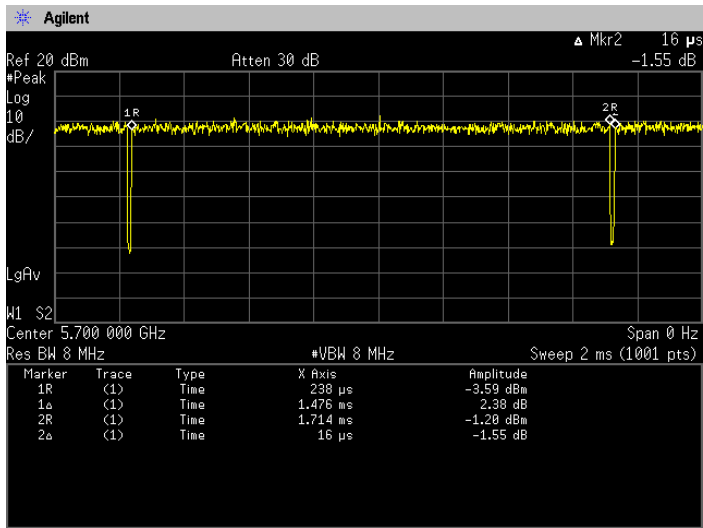
Channel: 100



Channel: 120

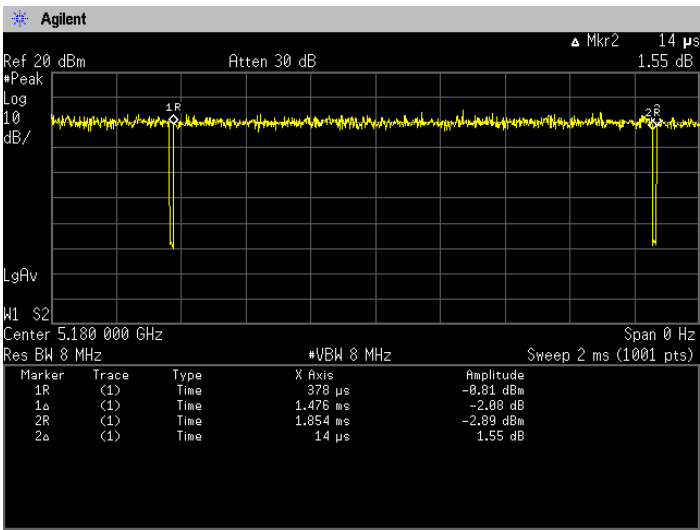


Channel: 140

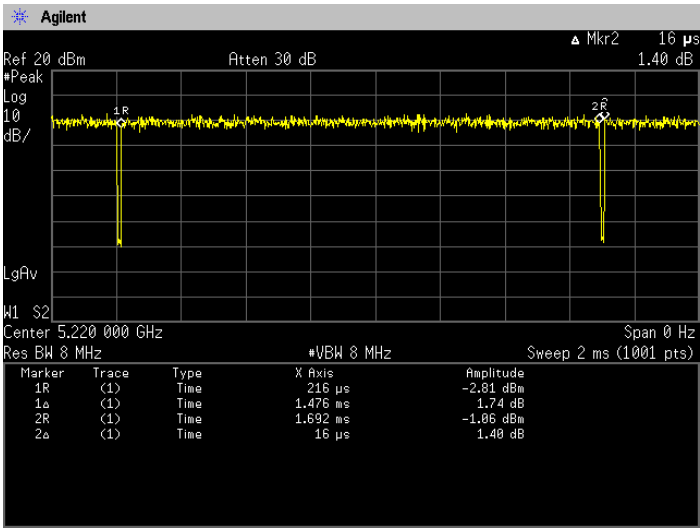


[IEEE802.11n (HT20)] Chain B

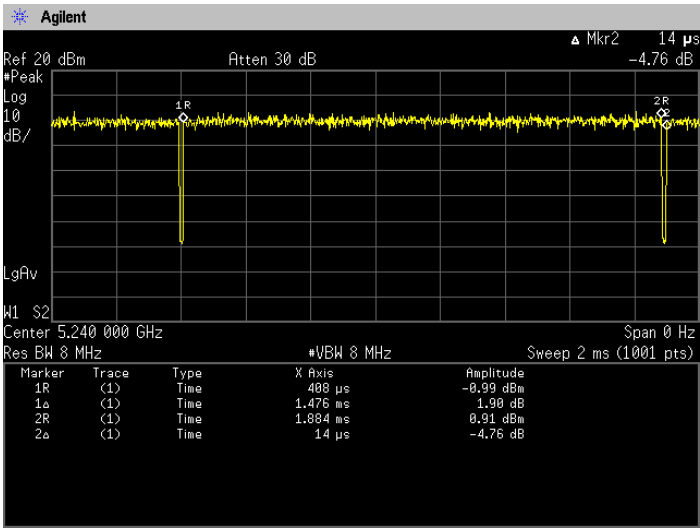
Channel: 36

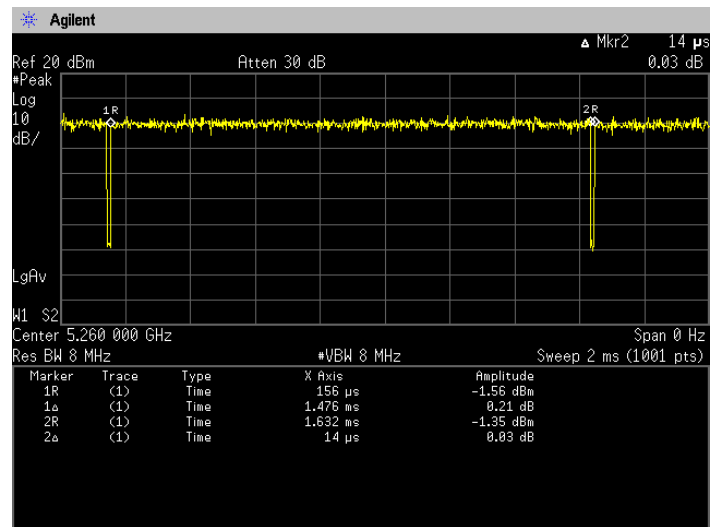
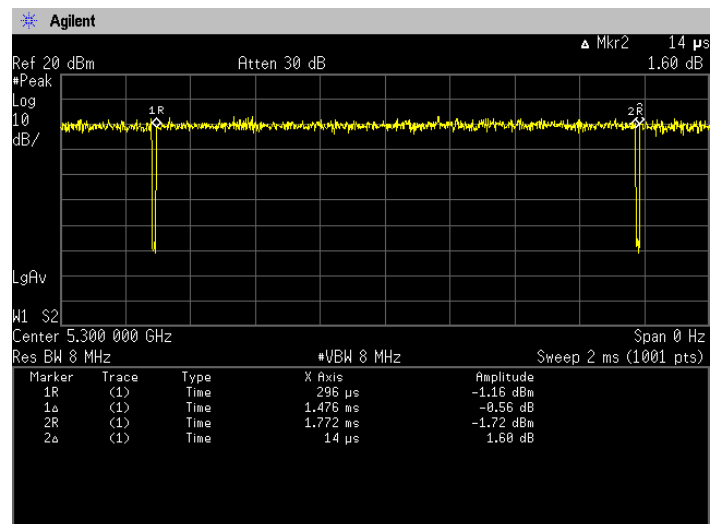
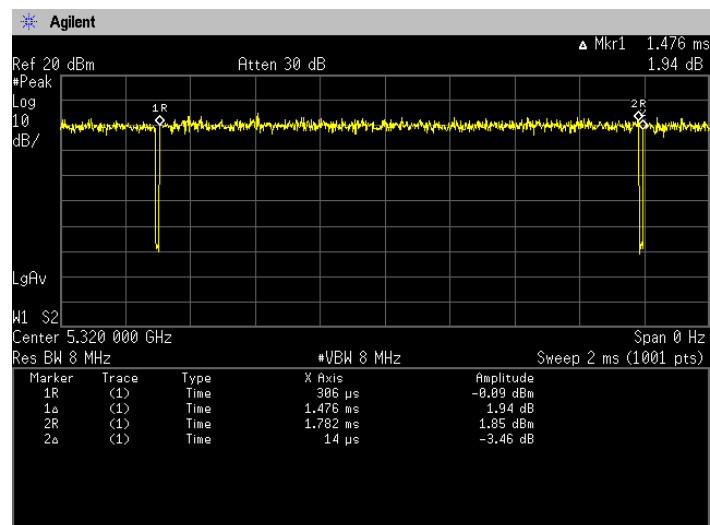


Channel: 44

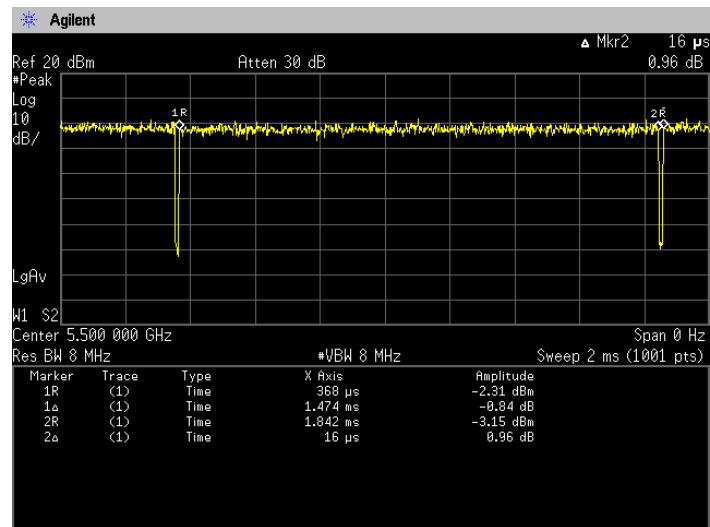


Channel: 48

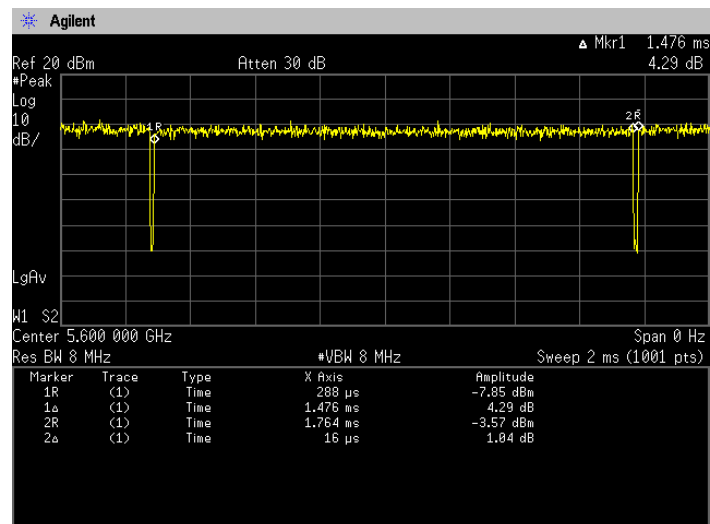


Channel: 52**Channel: 60****Channel: 64**

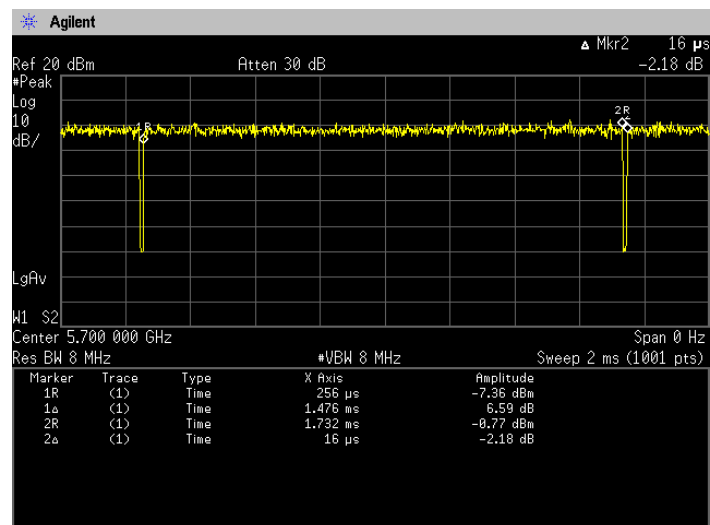
Channel: 100



Channel: 120

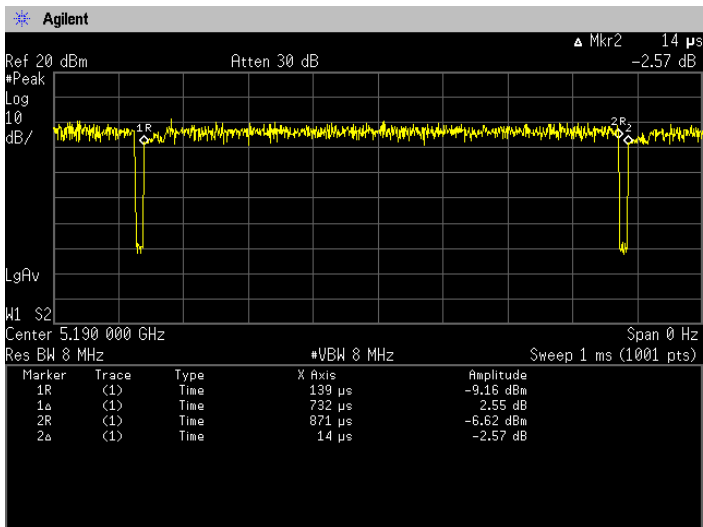


Channel: 140

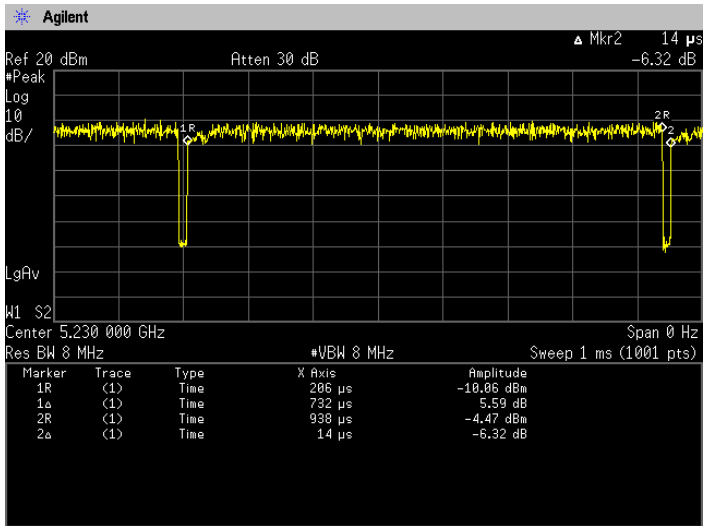


[IEEE802.11n (HT40)] Chain A

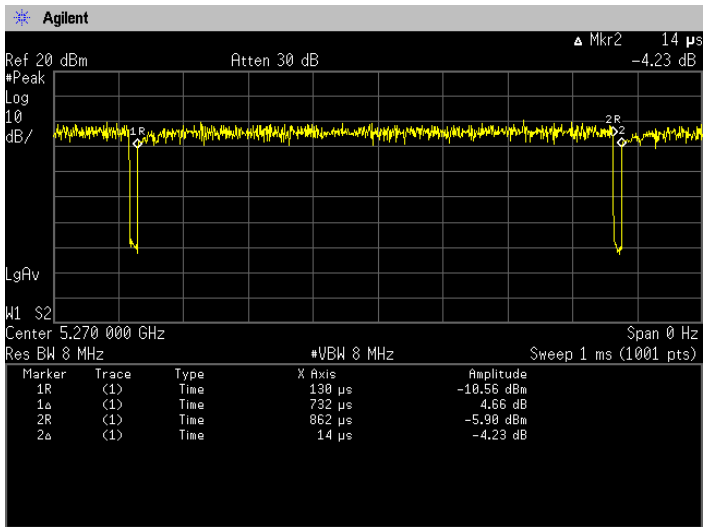
Channel: 38



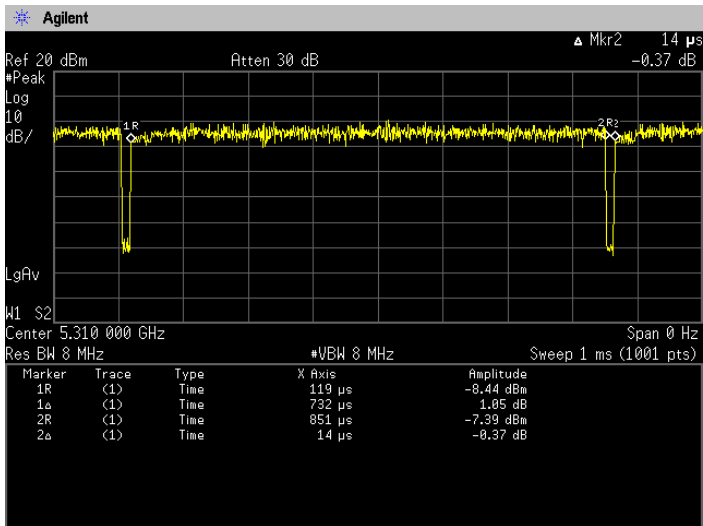
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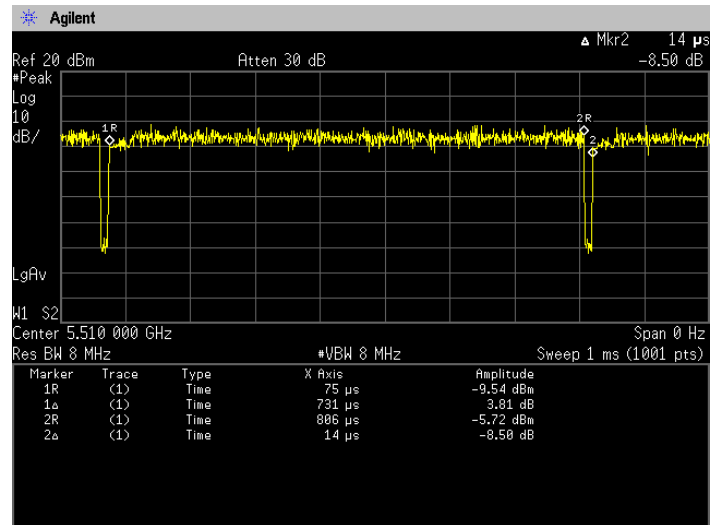
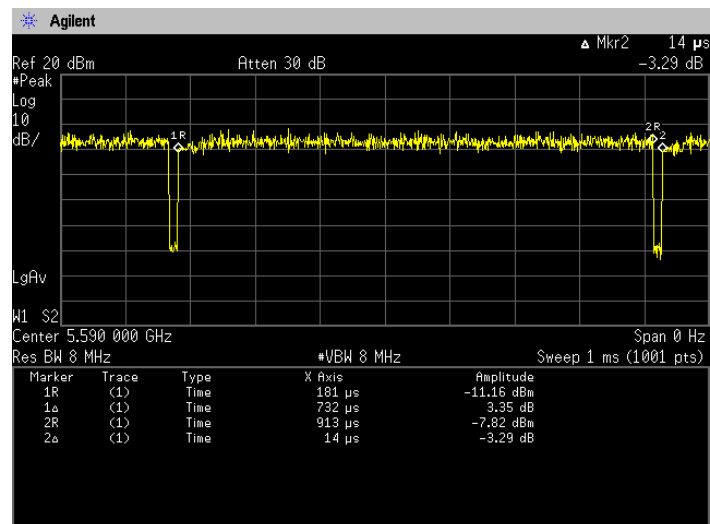
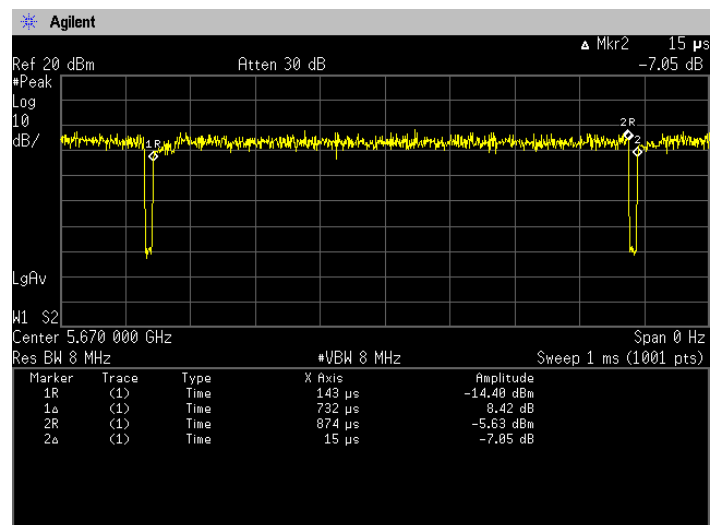


Channel: 54



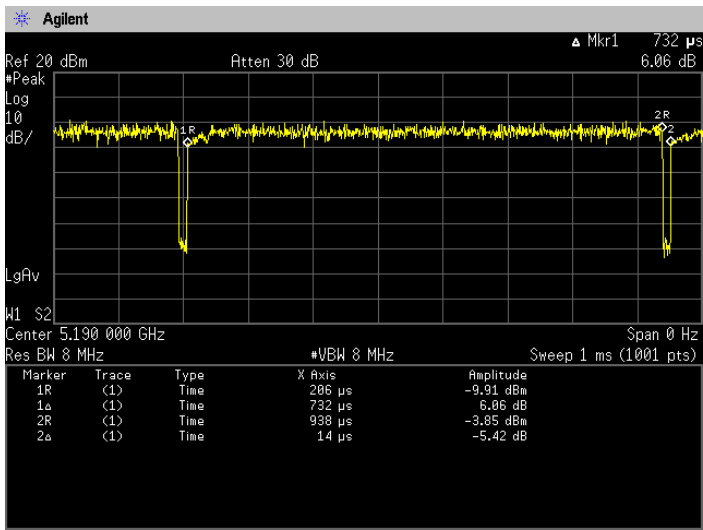
Channel: 62



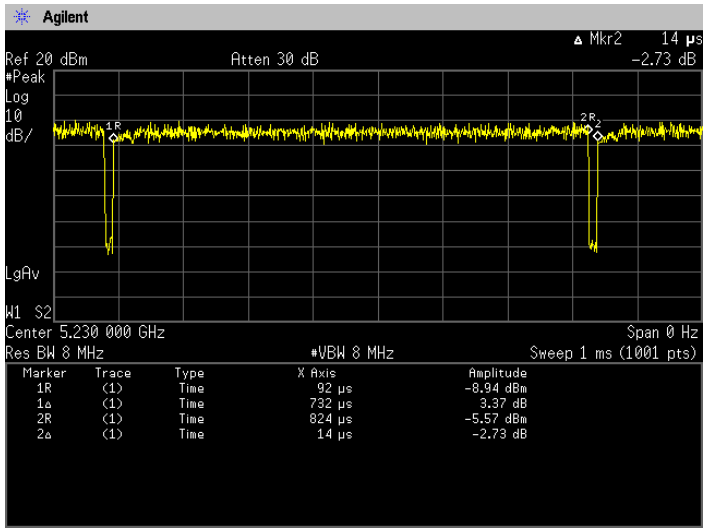
Channel: 102**Channel: 118****Channel: 134**

[IEEE802.11n (HT40)] Chain B

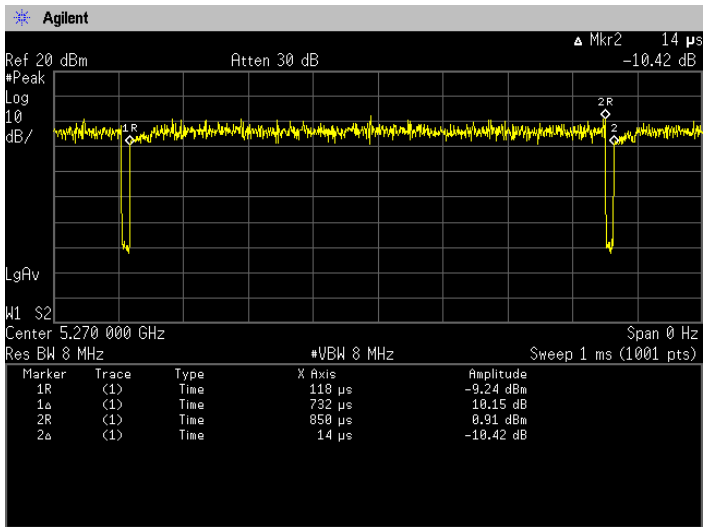
Channel: 38



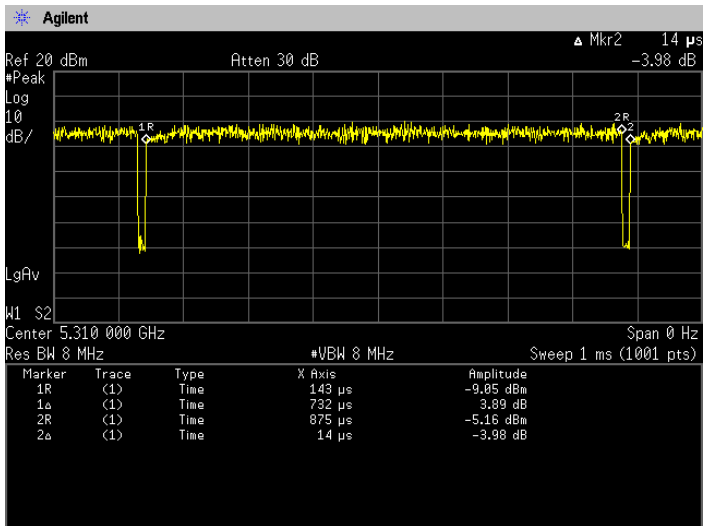
Channel: 46



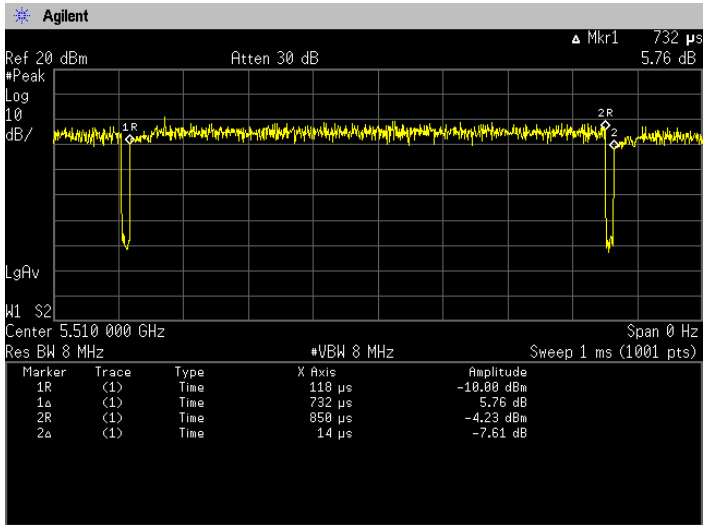
Channel: 54



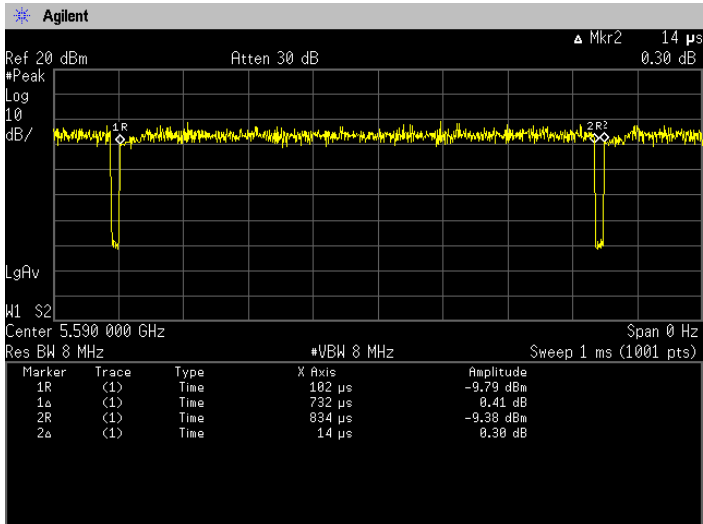
Channel: 62



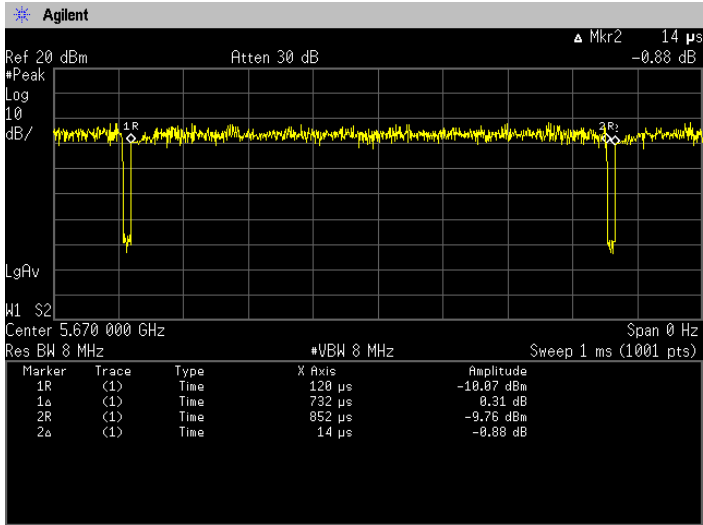
Channel: 102



Channel: 118



Channel: 134





Zacta

6. Antenna requirement

According to FCC section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

The antenna is a special antenna mounted inside of the EUT. Therefore, the EUT complies with the antenna requirement of FCC section 15.203.

7. Uncertainty of measurement

Expanded uncertainties stated are calculated with a coverage Factor $k=2$.

Please note that these results are not taken into account when determining compliance or non-compliance with test result.

Test item	Measurement uncertainty
Conducted emission at mains port	$\pm 3.0\text{dB}$
Radiated emission (9kHz – 30MHz)	$\pm 4.4\text{dB}$
Radiated emission (30MHz – 1000MHz)	$\pm 4.5\text{dB}$
Radiated emission (1000MHz – 26GHz)	$\pm 3.9\text{dB}$

8. Laboratory description

1. Location:

TÜV SÜD Zacta Ltd. Yonezawa Testing Center
4149-7 Hachimanpara 5-chome Yonezawa-shi Yamagata 992-1128 Japan
Phone: +81-238-28-2880 Fax: +81-238-28-2888

2. Facility filing information:

1) NVLAP accreditation: NVLAP Lab. code: 200306-0

2) VLAC accreditation: Lab. code: VLAC-013

Site name	Radiated emission	Conducted emission for mains port	Conducted emission for telecom port	Radiated emission (CMAD)	Expiry Date
3m Semi-anechoic chamber	VLAC-013	VLAC-013	VLAC-013	-	Jul. 3, 2015
10m Semi-anechoic chamber No.1				VLAC-013	
10m Semi-anechoic chamber No.2				VLAC-013	
Shielded room No.1	-	VLAC-013	-	-	

3) FCC filing:

Site name	Registration Number	Expiry Date
Site 3	91065	Oct.31, 2014
3m Semi-anechoic chamber	540072	Feb. 20, 2017
10m Semi-anechoic chamber No.1		
10m Semi-anechoic chamber No.2		
Shielded room No.1		

4) Industry Canada Oats site filing:

Site name	Sites on file: Oats 3m/10m	Expiry Date
Site 3	4224A-3	Jan. 23, 2015
3m Semi-anechoic chamber	4224A-4	
10m Semi-anechoic chamber No.1	4224A-5	
10m Semi-anechoic chamber No.2	4224A-6	Jan. 15, 2017

5) VCCI site filing:

Site name	Radiated emission	Conducted emission for mains port	Conducted emission for telecom port	Expiry Date
Site 3	R-138	C-134	T-1222	Nov. 16, 2014 Nov. 28, 2014* (*:Telecom port)
3m Semi-anechoic chamber	A-0166	A-0166	A-0166	Jul. 3, 2015
10m Semi-anechoic chamber No.1				
10m Semi-anechoic chamber No.2				
Shielded room No.1	-	A-0166		

6) TÜV SÜD PS authorization:

Authorized as an EMC test laboratory

7) TÜV Rheinland authorization:

Authorized as an EMC test laboratory

Appendix A. Test equipment

Radiated emission

Equipment	Company	Model No.	Serial No.	Cal. Due	Cal. Date
EMI Receiver	ROHDE&SCHWARZ	ECSI	100451	Nov. 2014	Nov. 16, 2013
Preamplifier	ANRITSU	MH648A	M96057	Jun. 2014	Jun. 12, 2013
Loop antenna	ROHDE&SCHWARZ	HFH2-Z2	892246/010	Oct. 2014	Oct. 5, 2013
Biconical Antenna	Schwarzbeck	VHA9103/BBA9106	2155	May 2015	May 7, 2014
Log periodic Antenna	Schwarzbeck	UHALP9108A	0560	May 2015	May 7, 2014
Attenuator	TME	CFA-01NPJ-6	N/A (S275)	Jun. 2015	Jun. 9, 2014
Attenuator	TME	CFA-01NPJ-3	N/A (S272)	Jun. 2015	Jun. 9, 2014
Notch Filter	Micro-Tronics	BRM50716	006	Jul. 2014	Jul. 12 2013
Spectrum analyzer	Agilent Technologies	E4440A	US44302655	May 2015	May 30, 2014
Preamplifier	Agilent Technologies	8449B	3008A1008	Dec. 2014	Dec. 9, 2013
Double ridged guide antenna	EMCO	3115	5205	Dec. 2014	Dec. 10, 2013
Attenuator	AEROFLEX	40A-03	081217-20	Feb. 2015	Feb. 23, 2014
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170189	May 2015	May 2, 2013
Preamplifier	TSJ	MLA-1840-B03-35	1240332	May 2015	May 2, 2013
Microwave cable	SUHNER	SUCOFLEX104/9m	346316/4	Oct. 2014	Oct. 6, 2013
		SUCOFLEX104/1m	322084/4	Oct. 2014	Oct. 6, 2013
		SUCOFLEX104/1.5m	317226/4	Oct. 2014	Oct. 6, 2013
		SUCOFLEX104/7m	41625/6	Oct. 2014	Oct. 6, 2013
PC	DELL	DIMENSION E521	75465BX	N/A	N/A
Software	TOYO Corporation	EP5/RE-AJ	0611193/V5.3.61	N/A	N/A
3m Semi-anechoic chamber	TOKIN	N/A	N/A (9002-NSA)	May 2015	May 6, 2014
3m Semi-anechoic chamber	TOKIN	N/A	N/A (9002-SVSWR)	May 2015	May 6, 2014