TEST REPORT

Part 15C & RSS-210(Issue 8)

Equipment under test	Medical Image Processing Unit
Model name	1417WGC
Derivative model	1417WCC
Trademark	Rayence
FCC ID // IC	QIIRY1417W // 10742A-1417W
Applicant	Rayence Co., Ltd
Manufacturer	Rayence Co., Ltd
Date of test(s)	2014.04.21 ~ 2014.05.05
Date of issue	2014.05.27

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Test and report completed by :	Report approval by :
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Revision history

Revision	Date of issue	Test report No.	Description
-	2014.05.27	KES-RF-14T0029	Initial

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1. General information

1.1. EUT description

Equipment under test	Medical Image Processing Unit
Model name	1417WCC
Serial number	N/A
Frequency range	2 412 ㎒ ~ 2 462 ㎒(802.11b/g/n_HT20), 2 422 ㎒ ~ 2 452 ㎒(802.11n_HT40) 5 745 ㎒ ~ 5 825 ㎒(802.11a/n_HT20), 5 755 ㎒ ~ 5 795 ㎒(802.11n_HT40) 5 180 ㎒ ~ 5 240 ㎒(802.11a/n_HT20), 5 190 ㎒ ~ 5 230 ㎒(802.11n_HT40)
Modulation technique	CCK(DBPSK, DQPSK), OFDM (BPSK, QPSK, 16QAM, 64QAM)
Number of channels	2 412 ㎒ ~ 2 462 ㎒(802.11b/g/n_HT20) : 11 ch 2 422 ㎒ ~ 2 452 ㎒(802.11n_HT40) : 7 ch 5 745 ㎒ ~ 5 825 ㎒(802.11a/n_HT20) : 5 ch 5 755 ㎒ ~ 5 795 ㎒(802.11n_HT40) : 2 ch 5 180 ㎒ ~ 5 240 ㎒(802.11a/n_HT20) : 4 ch 5 190 ㎒ ~ 5 230 ㎒(802.11n_HT40) : 2 ch
Antenna type	PCB antenna(I-PEX)
Power source	Battery (DC 11.1 V // 3500 mAh)
Note	- Contains transmitter Module. (FCC ID : PPD-AR5BHB116, IC : 4104A-AR5BHB116) - Contains transmitter Module does not use DFS band.

1.2. Test frequency

	Low channel	**Middle channel**	**High channel**	**Mode**
Frequency (㎒)	2 412	2 432	2 462	802.11b/g/n_HT20
	2 422	2 437	2 452	802.11n_HT40
	5 745	5 785	5 825	802.11a/n_HT20
	5 755	-	5 795	802.11n_HT40

1.3. Information about derivative model

This is to notify that 1417WGC / 1417WCC are same Hardware, Software and components. But *scintillator layer are different. Scintillator is a phosphor that produces scintillations.

Model	Scintillator layer
1417WCC	CsI (Cesium Iodide)
1417WGC	Gd_2O_2S:Tb (Gadolinium Oxysulfide)

1.4. Device modifications

N/A

1.5 Device information

1.6. Test facility

C-3701, Simin-daero 365-40, Dongan-gu, Anyang-si, Gyeonggi-do,431-716, Korea
473-29, Gayeo-ro, Yeoju-si, Gyeonggi-do, Korea

The open area test site is constructed in conformance with the requirements ANSI C63.4-2003/2009.

1.7. Laboratory accreditations and listings

Country	Agency	Scope of accreditation	Certificate No.
USA	FCC	3 & 10 meter Open Area Test Sites and one conducted site to perform FCC Part 15/18 measurements.	343818
KOREA	KC	EMI (10 meter Open Area Test Site and two conducted sites) Radio (3 & 10 meter Open Area Test Sites and one conducted site)	KR0100
CANADA	IC	3 & 10 meter Open Area Test Sites and one conducted site	4769B-1

1.8. Directional antenna gain for MIMO (correlated)

Model : RY-PCB-iDual-14v01 [Rayence]

ANT1 Gain (dBi)	ANT2 Gain (dBi)	Total Gain (dBi)	Note
-1.32	-1.32	1.69	For 2.4 ㎓
5.10	5.10	8.11	For 5.7 ㎓

-Ant Gain = G_{ANT} + 10 log(N)

2.1 Summary of tests

FCC Part Sections	RSS Sections	Parameter	Test results
15.205 15.209	RSS-Gen [7.2.5]	Radiated spurious emission	Pass
15.207	RSS-Gen [7.2.4]	AC conducted emissions	Pass

Test procedures;
The measurement procedures described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 ㎑ to 40 ㎓ (ANSI C63.4-2003/2009), the guidance provided in KDB 558074_v03r01, KDB 662911 D01 v02r01, RSS-Gen (Issue 3) and RSS-210 (Issue 8) were used in the measurement of the EUT.

2.2 Worst-Case and Mode

The worst-case data rates are determined to be as follows for each mode, based on the investigations by measuring the average power, peak power across all the data rates.
all tests were made with following data rates:

802.11b mode : 5.5 Mbps.
802.11g mode : 9 Mbps.
802.11a mode : 9 Mbps.
802.11n HT20 mode : MCS0.
802.11n HT40 mode : MCS0.

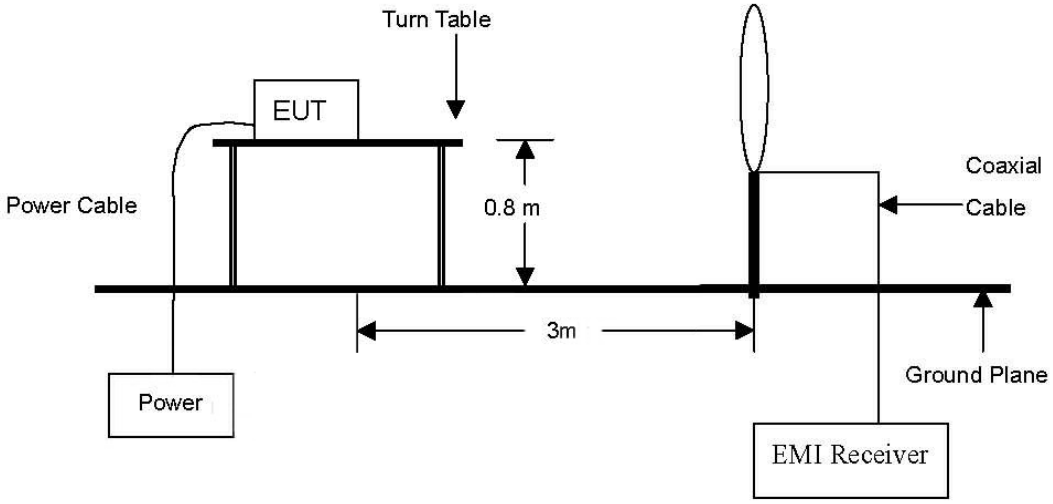
The EUT antenna has been tested in X, Y and Z axis.
The worst case position is Y-axis(below 1㎓), X-axis(above 1㎓). Each axis were recorded in this report.

3. Test results

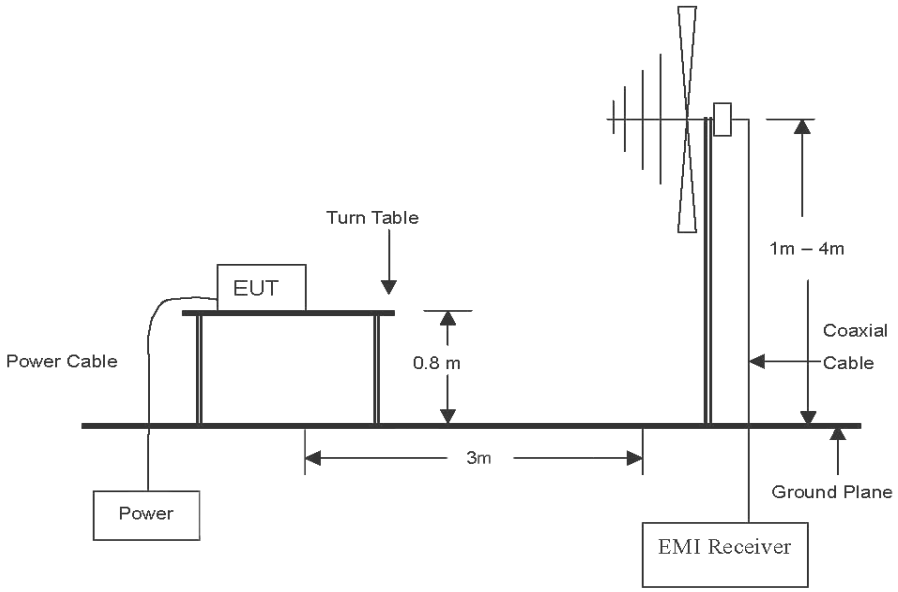
3.1 Radiated spurious emissions

Test setup

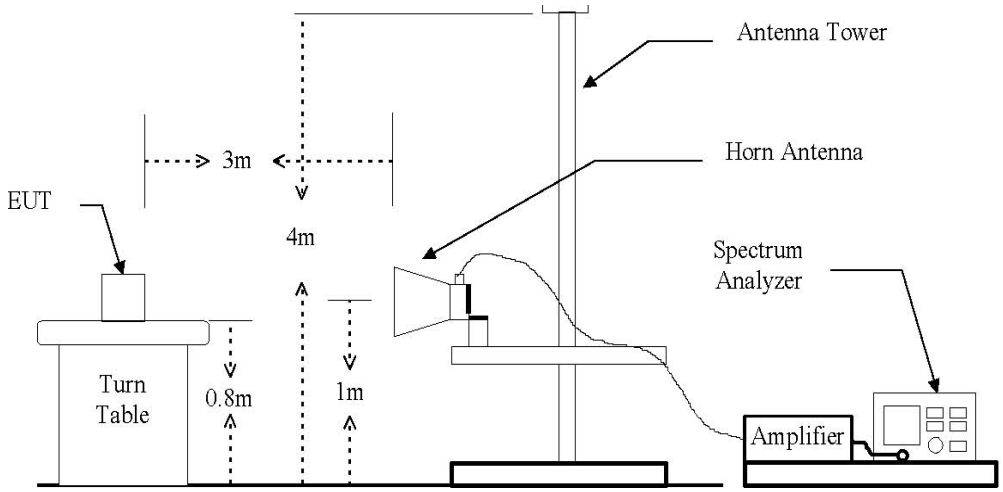
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 ㎓ to 24 ㎓ emissions.



Test procedure

Radiated emissions from the EUT were measured according to the dictates in section 12.0 of KDB 558074_v03r01 and ANSI C63.4-2003/2009

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site or open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1㎓, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. During performing radiated emission above 1 ㎓, the EUT was set 3 meter away from the interference receiving antenna.
3. The antenna is a broadband antenna, and its height is varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test receiver system was set to peak detect function and specified bandwidth with maximum hold mode.
6. If the emission level of the EUT in peak mode was 10 ㏈lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have10 ㏈ margin would be retested one by one using peak,quasi-peak or average method as specified and then reported in a data sheet

Note.
All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

The spectrum analyzer is set to:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer 200 ㎐ for Quasi-peak detection (QP) at frequency below 9 ㎑~ 150 ㎑.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer 9 ㎑ for Quasi-peak detection (QP) at frequency below 150 ㎑~ 30 ㎒.
3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer 120 ㎑ for Peak detection (PK) or Quasi-peak detection (QP) at frequency below 1 ㎓.
4. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 ㎒ and video bandwidth is 3 ㎒ for Peak detection at frequency above 1 ㎓.
5. The resolution bandwidth of test receiver/spectrum analyzer is 1 ㎒ and the video bandwidth is 3 ㎒ for Average detection (AV) at frequency above 1 ㎓. (Detect mode: RMS(power), Averaging 100)

To get a maximum emission level from the EUT, the EUT is manipulated through three orthogonal planes.

Limit
According to 15.209(a), for an intentional radiator devices, the general required of field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

Frequency (㎒)	Distance (Meters)	Radiated (㎶/m)
0.009 ~ 0.490	300	2 400 / F(㎑)
0.490 ~ 1.705	30	24 000 / F(㎑)
1.705 ~ 30.0	30	30
30 ~ 88	3	100**
88 ~ 216	3	150**
216 ~ 960	3	200**
Above 960	3	500

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 ~ 72 ㎒, 76 ~ 88 ㎒, 174 ~ 216 ㎒ or 470 ~ 806 ㎒. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

Test results (Below 30 ㎒)

The frequency spectrum from 9 ㎑ to 30 ㎒ was investigated. Emission levels are not reported much lower than the limits by over 20 ㏈.

Radiated emissions		Ant.	Correction factors			Total	Limit	
Frequency (㎒)	Reading (㏈㎶)	Pol.	Ant. factor (㏈/m)	Cable loss (㏈)	F_d (㏈)	Actual (㏈㎶/m)	Limit (㏈㎶/m)	Margin (㏈)
Not detected for above 30 ㎒								

Note.

1. All spurious emission at channels are almost the same below 30 ㎒, so that 802.11b 2432 ㎒ and 802.11a 5785 ㎒ were chosen at representative in final test.
2. Actual = Reading + Ant. factor + Cable loss + F_d
3. $F_d = 40\log(D_m / D_s)$

   Where:

   F_d = Distance factor in ㏈

   D_m = Measurement distance in meters

   D_s = Specification distance in meters

Test results (Below 1 000 ㎒)

The frequency spectrum from 30 ㎒ to 1 000 ㎒ was investigated. Emission levels are not reported much lower than the limits by over 20 ㏈.

802.11b / 2432 ㎒

Radiated emissions		Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (㏈㎶)	Pol.	Ant. factor (㏈/m)	Cable loss (㏈)	Actual (㏈㎶/m)	Limit (㏈㎶/m)	Margin (㏈)
136.7	11.59	H	12.51	2.37	26.47	43.5	17.03
352.5	9.97	V	14.54	4.43	28.94	46.0	17.06
405.9	20.15	H	15.71	4.93	40.79	46.0	5.21

802.11a / 5785 ㎒

Radiated emissions		Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (㏈㎶)	Pol.	Ant. factor (㏈/m)	Cable loss (㏈)	Actual (㏈㎶/m)	Limit (㏈㎶/m)	Margin (㏈)
136.8	11.92	H	12.51	2.37	26.80	43.5	16.70
352.2	8.61	V	14.54	4.43	27.58	46.0	18.42
406.0	19.35	H	15.71	4.93	39.99	46.0	6.01

Note.

1. All spurious emission at channels are almost the same below 30 ㎒, so that 802.11b 2432 ㎒ and 802.11a 5785 ㎒ were chosen at representative in final test.
2. Actual = Reading + Ant. factor + Cable loss
3. Detector mode: Quasi peak

Test results (Above 1 000 ㎒)

The frequency spectrum from 1 ㎓ to 25 ㎓ was investigated. No Emissions were found above 20 dB below the limit.

802.11b / 2412 ㎒

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 389.75	41.94	PK	H	-3.24	-	38.70	74.00	35.30
2 389.90	40.85	PK	V	-3.24	-	37.61	74.00	36.39
4 824.20	39.21	PK	H	5.33	-	44.54	74.00	29.46
4 824.20	38.63	PK	V	5.33	-	43.96	74.00	30.04

802.11b / 2437 ㎒

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
4 860.30	39.37	PK	H	5.50	-	44.87	74.00	29.13
4 860.30	37.98	PK	V	5.50	-	43.48	74.00	30.52

802.11b / 2462 ㎒

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 483.86	49.56	PK	H	-3.03	-	46.53	74.00	27.47
2 483.78	41.23	PK	V	-3.03	-	38.20	74.00	35.80
4 925.50	39.10	PK	H	5.82	-	44.92	74.00	29.08
4 925.50	38.53	PK	V	5.82	-	44.35	74.00	29.65

Note.

1. Measuring frequencies from 1 ㎓ to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Actual = Reading + AFCL(Ant. factor – Amp. gain + Cable loss) + DCF(Duty cycle Correction Factor)
5. DCF(Duty cycle Correction Factor) = 10log(1/Duty cycle)

802.11g / 2412 ㎒

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 389.49	60.39	PK	H	-3.24	-	57.15	74.00	16.85
2 389.78	46.52	AVG	H	-3.24	0.21	43.49	54.00	10.51
2 389.78	49.10	PK	V	-3.24	-	45.86	74.00	28.14
2 389.85	34.65	AVG	V	-3.24	0.21	31.62	54.00	22.38
4 827.10	39.11	PK	H	5.34	-	44.45	74.00	29.55
4 827.30	38.81	PK	V	5.34	-	44.15	74.00	29.85

802.11g / 2437 ㎒

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
4 861.80	42.35	PK	H	5.51	-	47.86	74.00	26.14
4 861.80	37.85	PK	V	5.51	-	43.36	74.00	30.64

802.11g / 2462 ㎒

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 483.71	71.93	PK	H	-3.03	-	68.90	74.00	5.10
2 483.71	54.72	AVG	H	-3.03	0.21	51.90	54.00	2.10
2 483.86	61.84	PK	V	-3.03	-	58.81	74.00	15.19
2 483.64	46.52	AVG	V	-3.03	0.21	43.70	54.00	10.30
4 919.70	38.35	PK	H	5.79	-	44.14	74.00	29.86
4 919.70	36.26	PK	V	5.79	-	42.05	74.00	31.95

Note.

1. Measuring frequencies from 1 ㎓ to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Actual = Reading + AFCL(Ant. factor – Amp. gain + Cable loss) + DCF(Duty cycle Correction Factor)
5. DCF(Duty cycle Correction Factor) = 10log(1/Duty cycle)

802.11n_HT20 / 2412 ㎒

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 389.78	63.65	PK	H	-3.24	-	60.41	74.00	13.59
2 389.78	44.52	AVG	H	-3.24	0.15	41.43	54.00	12.57
2 388.84	50.85	PK	V	-3.24	-	47.61	74.00	26.39
2 389.92	34.52	AVG	V	-3.24	0.15	31.43	54.00	22.57
4 818.80	39.60	PK	H	5.30	-	44.90	74.00	29.10
4 818.80	36.83	PK	V	5.30	-	42.13	74.00	31.87

802.11n_HT20 / 2437 ㎒

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
4 865.10	38.69	PK	H	5.53	-	44.22	74.00	29.78
4 865.10	37.97	PK	V	5.53	-	43.50	74.00	30.50

802.11n_HT20 / 2462 ㎒

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 483.78	70.96	PK	H	-3.03	-	67.93	74.00	6.07
2 483.57	53.60	AVG	H	-3.03	0.15	50.72	54.00	3.28
2 483.71	61.24	PK	V	-3.03	-	58.21	74.00	15.79
2 483.57	45.78	AVG	V	-3.03	0.15	42.90	54.00	11.10
4 928.80	37.80	PK	H	5.84	-	43.64	74.00	30.36
4 928.80	36.41	PK	V	5.84	-	42.25	74.00	31.75

Note.

1. Measuring frequencies from 1 ㎓ to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Actual = Reading + AFCL(Ant. factor – Amp. gain + Cable loss) + DCF(Duty cycle Correction Factor)
5. DCF(Duty cycle Correction Factor) = 10log(1/Duty cycle)

802.11n_HT40 / 2422 ㎒

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 388.70	63.32	PK	H	-3.24	-	60.08	74.00	13.92
2 389.12	45.34	AVG	H	-3.24	0.21	42.31	54.00	11.69
2 389.71	48.99	PK	V	-3.34	-	45.75	74.00	28.25
4 844.64	36.49	PK	H	5.43	-	41.92	74.00	32.08

802.11n_HT40 / 2437 ㎒

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
4 864.13	36.48	PK	H	5.43	-	41.91	74.00	32.09

802.11n_HT40 / 2452 ㎒

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
2 483.73	66.68	PK	H	-3.03	-	63.65	74.00	10.35
2 483.73	51.90	AVG	H	-3.03	0.21	49.08	54.00	4.92
2 484.19	55.19	PK	V	-3.03	-	52.16	74.00	21.84
4 904.65	35.45	PK	H	5.72	-	41.17	74.00	32.83

Note.

1. Measuring frequencies from 1 ㎓ to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Actual = Reading + AFCL(Ant. factor – Amp. gain + Cable loss) + DCF(Duty cycle Correction Factor)
5. DCF(Duty cycle Correction Factor) = 10log(1/Duty cycle)

802.11a / 5745 ㎒

Radiated emissions			Ant.	Correction factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Distance (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
11 485.60	64.79	PK	H	15.95	-	-9.54	71.20	74.00	2.80
11 490.01	45.10	AVG	H	15.97	0.19	-9.54	51.72	54.00	2.28
11 490.38	52.90	PK	V	15.97	-	-9.54	59.33	74.00	14.67
11 490.54	32.90	AVG	V	15.97	0.19	-9.54	39.52	54.00	14.48

802.11a / 5785 ㎒

Radiated emissions			Ant.	Correction factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Distance (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
11 566.11	65.25	PK	H	15.81	-	-9.54	71.52	74.00	2.48
11 569.73	44.80	AVG	H	15.82	0.19	-9.54	51.27	54.00	2.73
11 567.42	53.47	PK	V	15.81	-	-9.54	59.74	74.00	14.26
11 568.12	33.10	AVG	V	15.81	0.19	-9.54	39.56	54.00	14.44

802.11a / 5825 ㎒

Radiated emissions			Ant.	Correction factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Distance (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
11 648.82	64.34	PK	H	16.09	-	-9.54	70.89	74.00	3.11
11 649.47	44.21	AVG	H	16.09	0.19	-9.54	50.95	54.00	3.05
11 648.12	52.14	PK	V	16.09	-	-9.54	58.69	74.00	15.31
11 642.64	31.64	AVG	V	16.07	0.19	-9.54	38.36	54.00	15.64

Note.

1. Measuring frequencies from 1 ㎓ to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Actual = Reading + AFCL(Ant. factor – Amp. gain + Cable loss) + DCF(Duty cycle Correction Factor)+Distance
5. DCF(Duty cycle Correction Factor) = 10log(1/Duty cycle)
6. For measuring above 10 ㎓, measurement distance is 1 m.
7. Distance Factor = 20log(1m/3m) = -9.54

802.11n_HT20 / 5745 ㎒

Radiated emissions			Ant.	Correction factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Distance (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
11 487.47	62.98	PK	H	15.96	-	-9.54	69.40	74.00	4.60
11 489.11	44.25	AVG	H	15.96	0.14	-9.54	50.81	54.00	3.19
11 489.38	51.04	PK	V	15.96	-	-9.54	57.46	74.00	16.54
11 488.94	30.78	AVG	V	15.96	0.14	-9.54	37.34	54.00	16.66

802.11n_HT20 / 5785 ㎒

Radiated emissions			Ant.	Correction factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Distance (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
11 568.41	63.59	PK	H	15.81	-	-9.54	69.86	74.00	4.14
11 569.10	43.34	AVG	H	15.82	0.14	-9.54	49.76	54.00	4.24
11 568.23	51.28	PK	V	15.81	-	-9.54	57.55	74.00	16.45
11 569.02	32.61	AVG	V	15.82	0.14	-9.54	39.03	54.00	14.97

802.11n_HT20 / 5825 ㎒

Radiated emissions			Ant.	Correction factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Distance (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
11 648.62	62.47	PK	H	16.09	-	-9.54	69.02	74.00	4.98
11 649.20	42.25	AVG	H	16.09	0.14	-9.54	48.94	54.00	5.06
11 648.85	51.34	PK	V	16.09	-	-9.54	57.89	74.00	16.11
11 641.74	30.33	AVG	V	16.06	0.14	-9.54	36.99	54.00	17.01

Note.

1. Measuring frequencies from 1 ㎓ to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Actual = Reading + AFCL(Ant. factor – Amp. gain + Cable loss) + DCF(Duty cycle Correction Factor)+Distance
5. DCF(Duty cycle Correction Factor) = 10log(1/Duty cycle)
6. For measuring above 10 ㎓, measurement distance is 1 m.
7. Distance Factor = 20log(1m/3m) = -9.54

802.11n_HT40 / 5755 ㎒

Radiated emissions			Ant.	Correction factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Distance (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
11 508.90	61.88	PK	H	15.61	-	-9.54	67.95	74.00	6.05
11 510.91	40.50	AVG	H	15.62	0.20	-9.54	46.78	54.00	7.22
11 510.42	50.42	PK	V	15.62	-	-9.54	56.50	74.00	17.50
11 510.38	28.65	AVG	V	15.62	0.20	-9.54	34.93	54.00	19.07

802.11n_HT40 / 5795 ㎒

Radiated emissions			Ant.	Correction factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detector mode	Pol.	AFCL (dB)	DCF (dB)	Distance (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
11 589.26	64.69	PK	H	15.89	-	-9.54	71.04	74.00	2.96
11 590.86	46.23	AVG	H	15.89	0.20	-9.54	52.78	54.00	1.22
11 590.44	51.97	PK	V	15.89	-	-9.54	58.32	74.00	15.68
11 590.78	34.14	AVG	V	15.89	0.20	-9.54	40.69	54.00	13.31

Note.

1. Measuring frequencies from 1 ㎓ to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Actual = Reading + AFCL(Ant. factor – Amp. gain + Cable loss) + DCF(Duty cycle Correction Factor)+Distance
5. DCF(Duty cycle Correction Factor) = 10log(1/Duty cycle)
6. For measuring above 10 ㎓, measurement distance is 1 m.
7. Distance Factor = 20log(1m/3m) = -9.54

3.2. AC conducted emissions

Frequency range of measurement
150 ㎑ to 30 ㎒

Instrument settings
IF Band Width: 9 ㎑

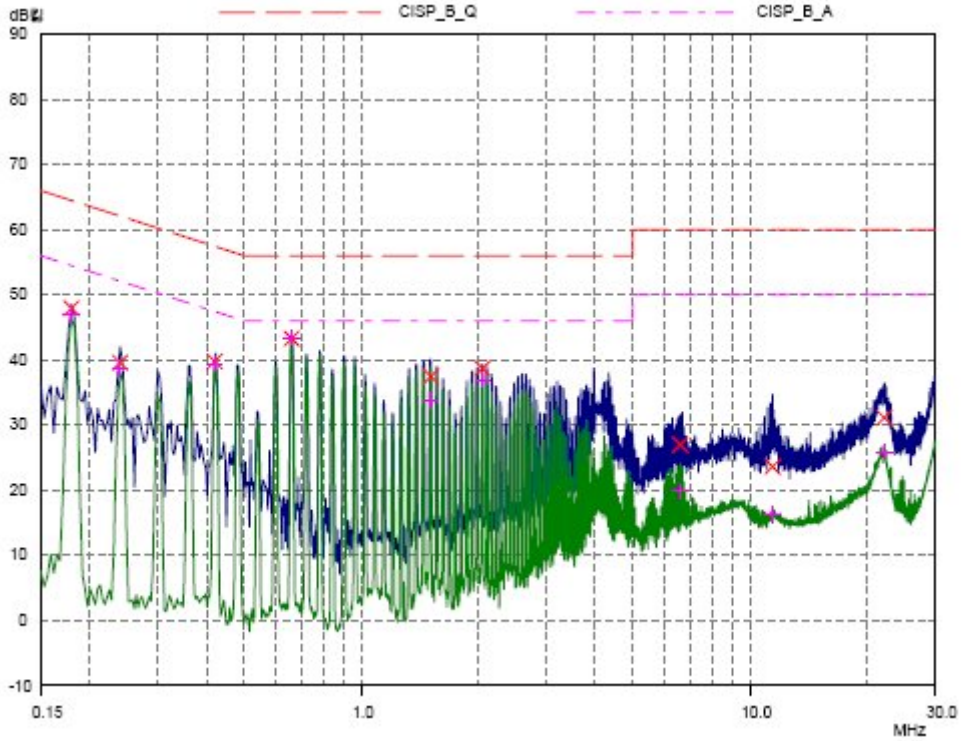
Test procedures
The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m. Amplitude measurements were performed with a quasi-peak detector and an average detector.

Limit
According to 15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 ㎑ to 30 ㎒, shall not exceed the limits in the following table, as measured using a 50uH/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

Frequency of Emission (㎒)	Conducted limit (dB㎶/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

Note.
a) Decreases with the logarithm of the frequency.
b) All spurious emission at channels are almost the same below 30 ㎒, so that 802.11b 2432 ㎒ and 802.11a 5785 ㎒ were chosen at representative in final test.

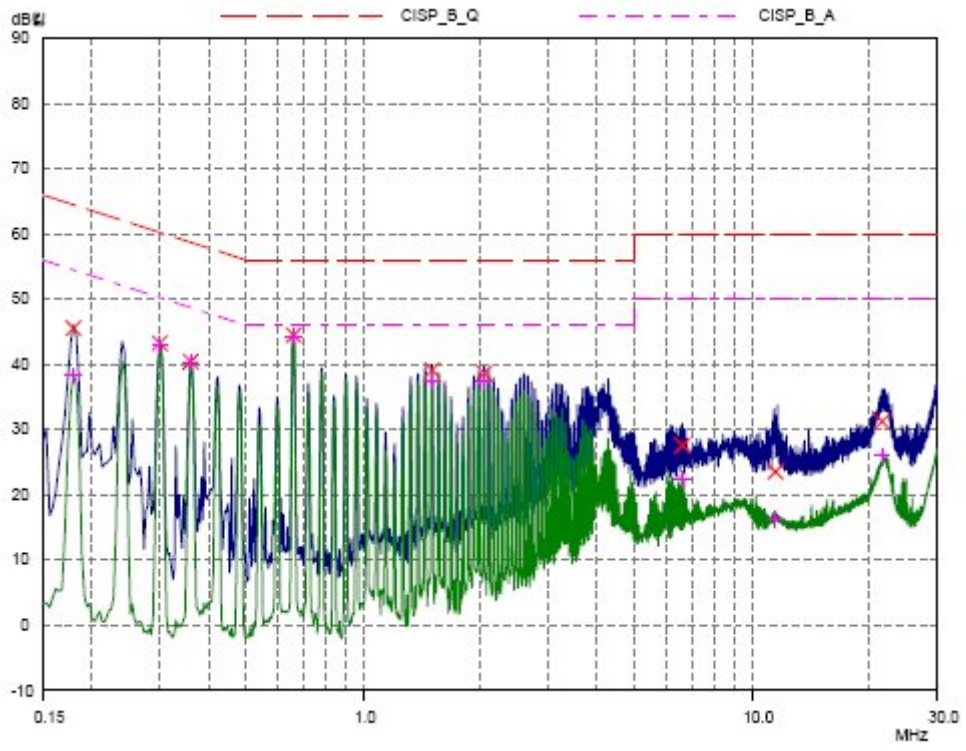
Test results



Frequency MHz	QP Level dBµV	QP Limit dBµV	QP Delta dB
0.18	47.93	64.49	16.56
0.24	39.61	62.10	22.49
0.42	39.80	57.45	17.65
0.663	43.28	56.00	12.72
1.512	37.46	56.00	18.54
2.052	38.71	56.00	17.29
6.627	26.96	60.00	33.04
11.451	23.61	60.00	36.39
22.215	31.12	60.00	28.88

Frequency MHz	AV Level dBµV	AV Limit dBµV	AV Delta dB
0.18	46.99	54.49	7.50
0.24	38.64	52.10	13.46
0.42	39.40	47.45	8.05
0.663	43.40	46.00	2.60
1.512	33.80	46.00	12.20
2.052	37.00	46.00	9.00
6.627	19.85	50.00	30.15
11.451	16.27	50.00	33.73
22.215	25.87	50.00	24.13

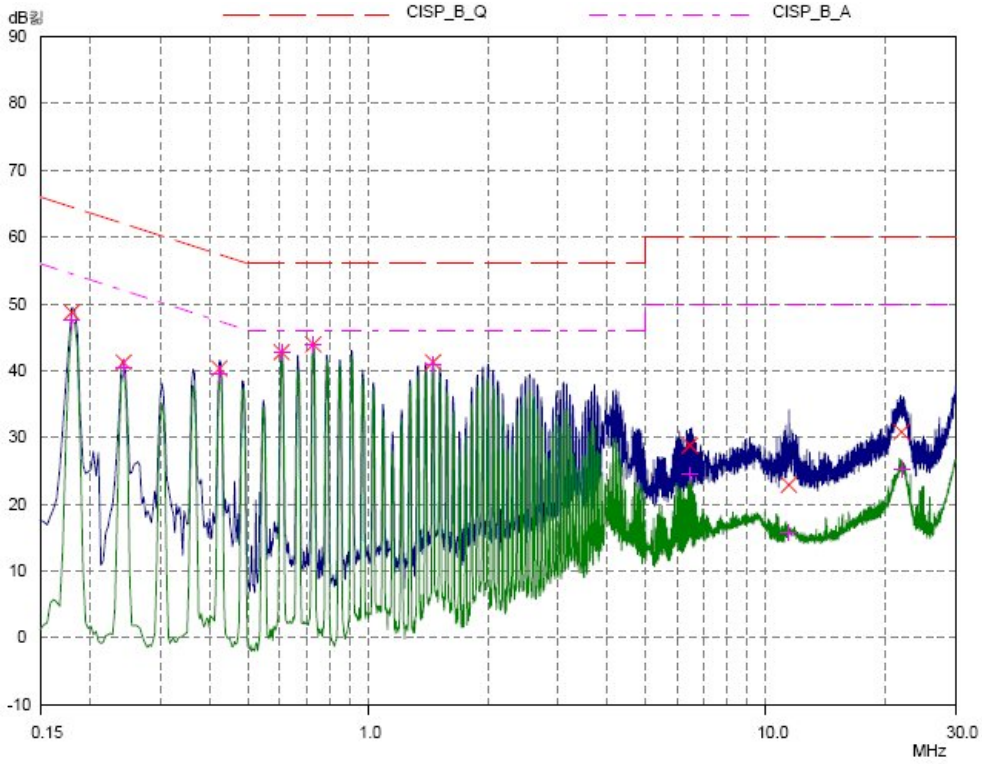
Note: Hot Line (2.4 ㎓)
Both Cable loss and LISN factor are included in measurement level(QP Level or AV Level).



Frequency MHz	QP Level dBµV	QP Limit dBµV	QP Delta dB
0.18	45.55	64.49	18.94
0.3	43.26	60.24	16.98
0.36	40.43	58.73	18.30
0.663	44.51	56.00	11.49
1.503	39.16	56.00	16.84
2.04599	38.63	56.00	17.37
6.627	27.56	60.00	32.44
11.514	23.57	60.00	36.43
21.666	31.25	60.00	28.75

Frequency MHz	AV Level dBµV	AV Limit dBµV	AV Delta dB
0.18	38.28	54.49	16.21
0.3	42.94	50.24	7.30
0.36	40.32	48.73	8.41
0.663	44.35	46.00	1.65
1.503	37.54	46.00	8.46
2.04599	37.48	46.00	8.52
6.627	22.43	50.00	27.57
11.514	16.33	50.00	33.67
21.666	26.00	50.00	24.00

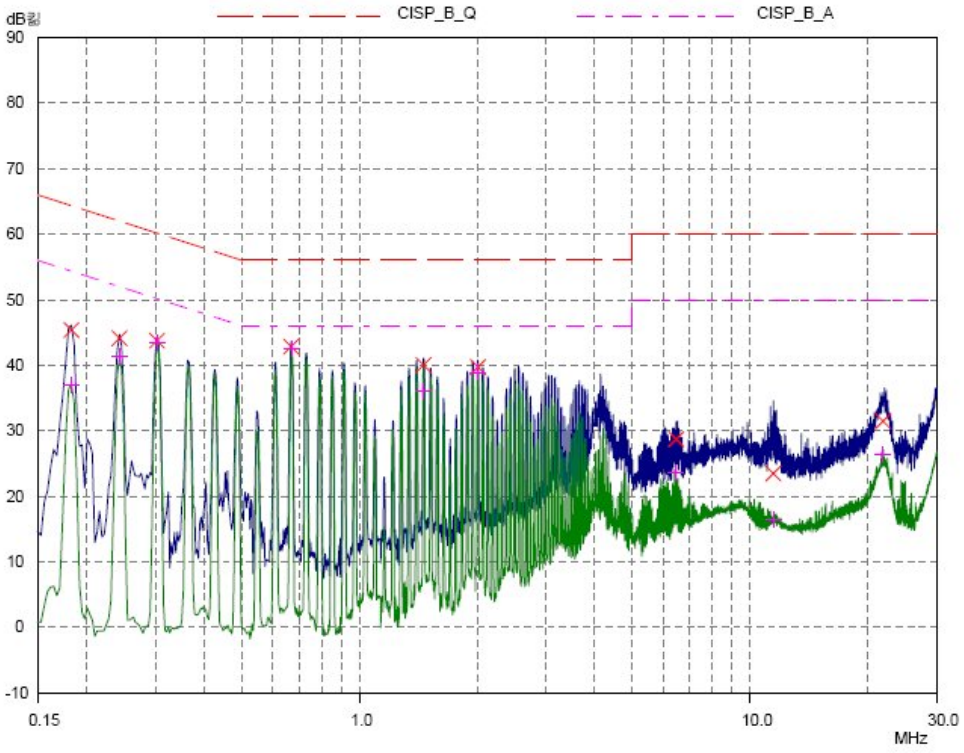
Note: Neutral Line (2.4 ㎓)
Both Cable loss and LISN factor are included in measurement level(QP Level or AV Level).



Frequency MHz	QP Level dBㅀ	QP Limit dBㅀ	QP Delta dB
0.18	48.70	64.49	15.79
0.243	41.22	61.99	20.77
0.423	40.31	57.39	17.08
0.606	42.73	56.00	13.27
0.729	43.90	56.00	12.10
1.458	41.25	56.00	14.75
6.447	28.80	60.00	31.20
11.442	22.89	60.00	37.11
21.954	30.79	60.00	29.21

Frequency MHz	AV Level dBㅀ	AV Limit dBㅀ	AV Delta dB
0.18	47.46	54.49	7.03
0.243	40.33	51.99	11.66
0.423	39.56	47.39	7.83
0.606	42.78	46.00	3.22
0.729	43.78	46.00	2.22
1.458	40.81	46.00	5.19
6.447	24.40	50.00	25.60
11.442	15.76	50.00	34.24
21.954	25.31	50.00	24.69

Note: Hot Line (5 ㎓)
Both Cable loss and LISN factor are included in measurement level(QP Level or AV Level).



Frequency MHz	QP Level dB㎶	QP Limit dB㎶	QP Delta dB
0.183	45.37	64.35	18.98
0.243	44.10	61.99	17.89
0.303	43.73	60.16	16.43
0.669	42.82	56.00	13.18
1.458	40.02	56.00	15.98
2.00999	39.72	56.00	16.28
6.465	28.69	60.00	31.31
11.46	23.47	60.00	36.53
21.909	31.46	60.00	28.54

Frequency MHz	AV Level dB㎶	AV Limit dB㎶	AV Delta dB
0.183	37.04	54.35	17.31
0.243	41.40	51.99	10.59
0.303	43.42	50.16	6.74
0.669	42.40	46.00	3.60
1.458	36.12	46.00	9.88
2.00999	38.93	46.00	7.07
6.465	23.65	50.00	26.35
11.46	16.46	50.00	33.54
21.909	26.27	50.00	23.73

Note: Neutral Line (5 ㎓)
Both Cable loss and LISN factor are included in measurement level(QP Level or AV Level).

Appendix A. Measurement equipment

Equipment	Manufacturer	Model	Serial No.	Calibration interval	Calibration due.
Spectrum analyzer	R&S	FSV30	101389	1 year	2015.04.30
Spectrum analyzer	R&S	FSW43	100637	1 year	2014.07.26
Wideband Power Sensor	R&S	NRP-Z81	1137.9009.02-101886-ds	1 year	2015.01.07
Vector signal generator	R&S	SMBV2100A	1407.6004K02	1 year	2015.01.06
8360B Series Swept Signal Generator	HP	83630B	3844A00786	1 year	2015.04.30
Loop antenna	R&S	HFH2-Z2.335.4711.52	826532	2 years	2015.04.25
Trilog-broadband antenna	Schwarzbeck	VULB 9168	9168-385	2 years	2015.05.09
Horn antenna	A.H.	SAS-571	414	2 years	2015.02.28
Horn antenna	Schwarzbeck	BBHA 9170	BBHA9170551	2 years	2015.09.04
Preamplifier	HP	8447F	2805A02570	1 year	2015.04.30
Brodband coaxial preamplifier	Schwarzbeck Mess-Elektronik	BB9718	9168-385	2 years	2014.09.23
Preamplifier	Schwarzbeck	BBV 9721	9721-003	2 years	2015.09.04
Attenuator	HP	8494B	2630A12857	1 year	2015.04.30
EMI Test Receiver	LIG NEX1	ISA-80	L0912K014	1 year	2014.11.15
EMI Test Receiver	R & S	ESHS10	862970/018	1 year	2014.05.06
LISN	SCHWARZBECK	2823-568-1	8126157	1 year	2015.01.29
HIGH PASS FILTER	WAINWRIGHT INSTRUMENT	WHNX6.0/26.5G-6SS	1	1 year	2015.02.11
HIGH PASS FILTER	WAINWRIGHT INSTRUMENT	WHJS3000-10TT	1	1 year	2014.11.11
LOW PASS FILTER	WEINSCHEL	WLK1.0/18G-10TT	1	1 year	2014.08.05

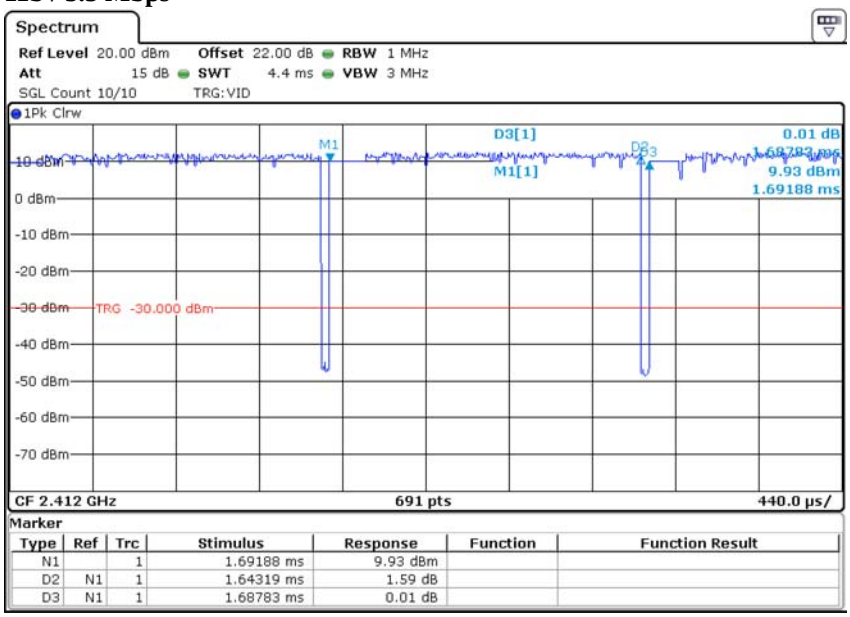
Peripheral devices

Device	Manufacturer	Model No.	Serial No.
Notebook Computer	LG Electronics	LG15U53	310NZGK019135

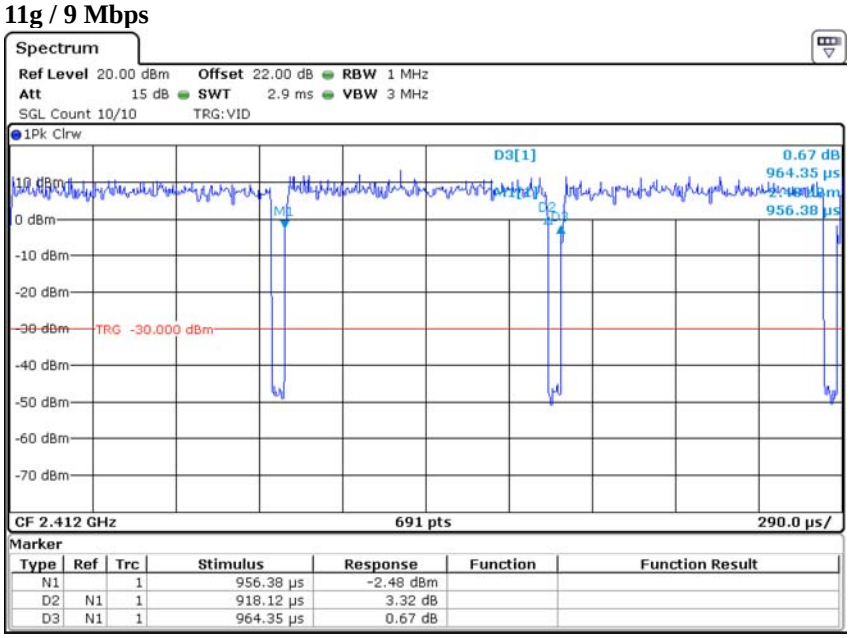
Appendix B. Duty Cycle

Frequency (㎒)	Mode / Data rate	Duty cycle(X) = Tx_{on} time / (Tx_{on} time + Tx_{off} time)		
		Tx_{on} time (㎳)	Tx_{on} + Tx_{off} time (㎳)	X
2 412	11b / 5.5 Mbps	1.643 19	1.687 83	0.974
2 412	11g / 9 Mbps	0.918 12	0.964 35	0.952
2 412	11n_HT20 / MCS0	1.277 83	1.324 06	0.965
2 422	11n_HT40 / MCS0	0.637 83	0.670 14	0.952
5 745	11a / 9 Mbps	0.916 09	0.957 10	0.957
5 745	11n_HT20 / MCS0	1.275 51	1.316 52	0.969
5 755	11n_HT40 / MCS0	0.632 03	0.662 03	0.955

11b / 5.5 Mbps



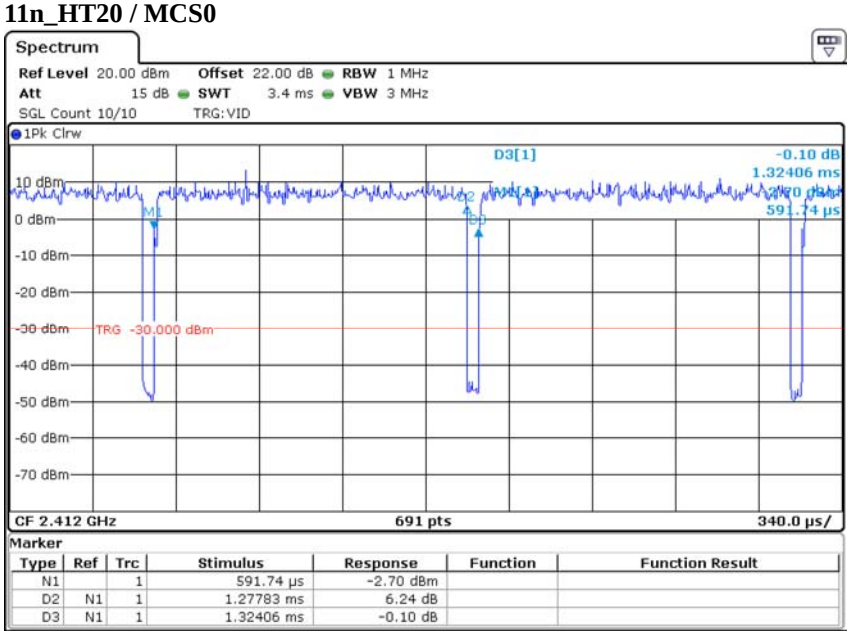
11g / 9 Mbps



Marker

Type	Ref	Trc	Stimulus	Response	Function	Function Result
N1		1	956.38 µs	-2.48 dBm		
D2	N1	1	918.12 µs	3.32 dB		
D3	N1	1	964.35 µs	0.67 dB		

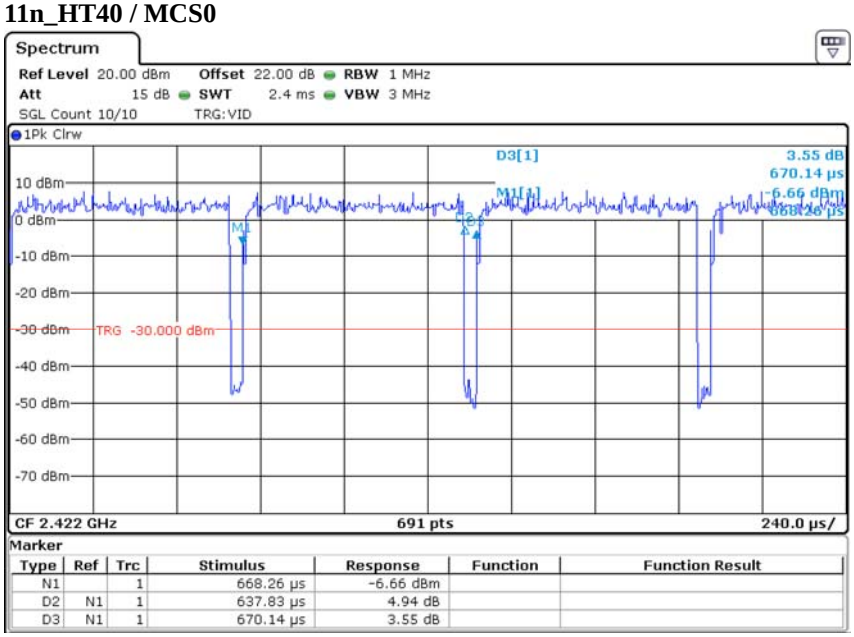
11n_HT20 / MCS0



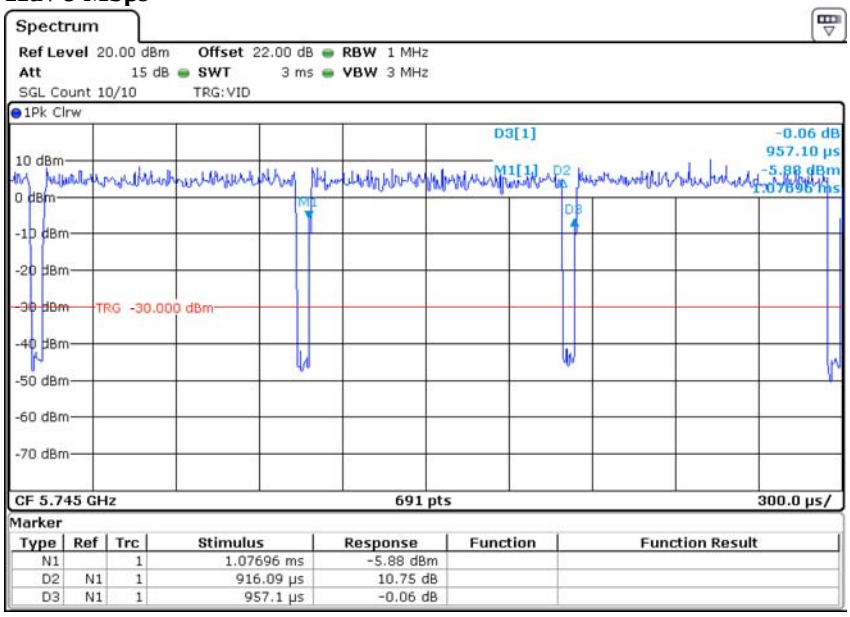
Marker

Type	Ref	Trc	Stimulus	Response	Function	Function Result
N1		1	591.74 µs	-2.70 dBm		
D2	N1	1	1.27783 ms	6.24 dB		
D3	N1	1	1.32406 ms	-0.10 dB		

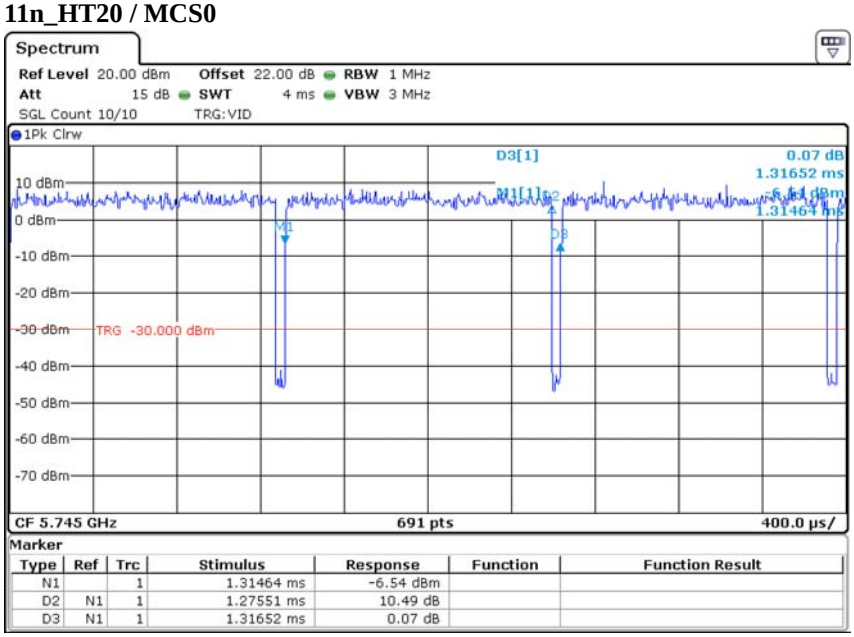
11n_HT40 / MCS0



11a / 9 Mbps



11n_HT20 / MCS0



11n_HT40 / MCS0