FCC RF Test Report

APPLICANT	:	**Altocumulous LLC**
EQUIPMENT	:	**Digital Media Receiver**
MODEL NAME	:	**RS03QR**
FCC ID	:	**2AHSE-2045**
STANDARD	:	**FCC Part 15 Subpart E §15.407**
CLASSIFICATION	:	**(NII) Unlicensed National Information Infrastructure**

This is a variant report which is only valid together with the original test report. The product was completed on Oct. 12, 2016. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager

Testing Laboratory 1190

SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR631725-02D	Rev. 01	Initial issue of report	Oct. 14, 2016

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result
3.1	15.407(a)	Maximum Conducted Output Power	FCC ≤ 24 dBm (depend on band)	Pass
3.2	15.407(b)	Unwanted Emissions	≤ -17, -27 dBm (depend on band)&15.209(a)	Pass
3.3	15.203 & 15.407(a)	Antenna Requirement	N/A	Pass

1 General Description

1.1 Applicant

Altocumulous LLC
300 E. Business Way, Suite 200, Summit Woods Corporate Center Cincinnati, Ohio 45241

1.2 Feature of Equipment Under Test

Product Feature	
Equipment	Digital Media Receiver
Model Name	RS03QR
FCC ID	2AHSE-2045
EUT supports Radios application	WLAN 11b/g/n HT20 WLAN 11a/n HT20/HT40 Bluetooth v4.1 EDR/LE

Remark: This is a variant report by adding 2nd RF crystal. All the test cases were performed on original report which can be referred to Sporton Report Number FR631725-01D. Based on the original report, only conducted output power and Unwanted Emissions were verified.

1.3 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	5180 MHz ~ 5240 MHz
Maximum Output Power	**<Ant. 1>** 802.11a : 17.88 dBm / 0.0614 W 802.11n HT20 : 17.92 dBm / 0.0619 W 802.11n HT40 : 18.44 dBm / 0.0698 W **<Ant. 2>** 802.11a : 18.28 dBm / 0.0673 W 802.11n HT20 : 18.11 dBm / 0.0647 W 802.11n HT40 : 17.57 dBm / 0.0571 W
Antenna Type / Gain	**Ant. 1 :** Fixed internal Antenna with gain 4.08 dBi **Ant. 2 :** Fixed internal Antenna with gain 3.20 dBi
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)
Antenna Function Description	

	Ant. 1	Ant. 2
802.11 a	V	V
802.11 n	V	V

1.4 Modification of EUT

No modifications are made to the EUT during all test items.

1.5 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	**Sporton Site No.**
	TH02-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH12-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

1.6 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r03
- ANSI C63.10-2013

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2 Test Configuration of Equipment Under Test

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conducted emission (150 kHz to 30 MHz) and radiated emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

The final configuration from all the combinations and the worst-case data rates were investigated by measuring the maximum power across all the data rates and modulation modes under section 2.2.

Based on the worst configuration found above, the RF power setting is set individually to meet FCC compliance limit for the final conducted and radiated tests shown in section 2.3.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5150-5250 MHz Band 1 (U-NII-1)	36	5180	44	5220
	38*	5190	46*	5230
	40	5200	48	5240

Note: The above Frequency and Channel in "*" were 802.11n HT40.

2.2 Test Mode

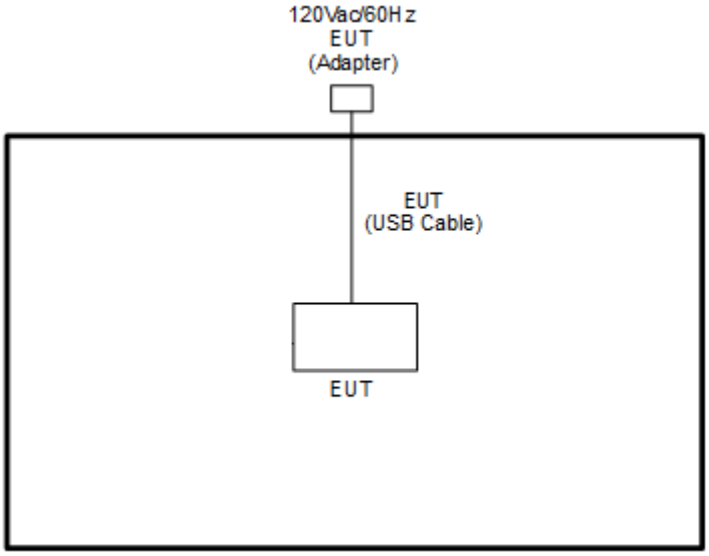
Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates from the power table described in section 2.2.

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0

Ch. #		Band I：5150-5250 MHz	Band I：5150-5250 MHz	Band I：5150-5250 MHz
		802.11a	802.11n HT20	802.11n HT40
L	Low	36	36	38
M	Middle	44	44	-
H	High	48	48	46

2.3 Connection Diagram of Test System

<WLAN Tx Mode>



2.4 EUT Operation Test Setup

For WLAN function, programmed RF utility, “Cpmpliance.exe” installed in the notebook make the EUT provide functions like channel selection and power level for continuous transmitting and receiving signals.

2.5 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 4.2 + 10 = 14.2 (dB)

3 Test Result

3.1 Maximum Conducted Output Power Measurement

3.1.1 Limit of Maximum Conducted Output Power

<FCC 14-30 CFR 15.407>

For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note that U-NII-2 band, devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

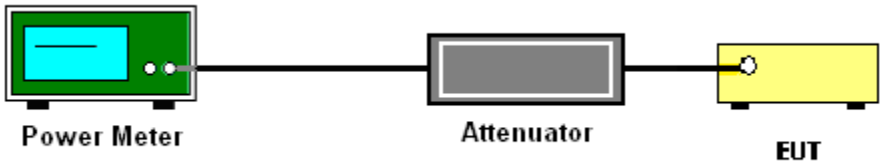
3.1.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r03.

Method PM (Measurement using an RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor, 10 log(1/x), where x is the duty cycle.

3.1.4 Test Setup



3.1.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.

3.2 Unwanted Emissions Measurement

This section as specified in FCC Part 15.407(b) is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement. The unwanted emissions shall comply with 15.407(b)(1) to (6), and restricted bands per FCC Part15.205.

3.2.1 Limit of Unwanted Emissions

(1) For transmitters operating in the 5150-5250 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of –27dBm/MHz.

(2) Unwanted spurious emissions fallen in restricted bands per FCC Part15.205 shall comply with the general field strength limits set forth in § 15.209 as below table,

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

Note: The following formula is used to convert the EIRP to field strength.

$$E=\frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts)

EIRP (dBm)	Field Strength at 3m (dBμV/m)
-17	78.3
- 27	68.3

(3) KDB789033 D02 v01r03 G)2)c) As specified in 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in 15.407(b)(4)). However, an out-of-band emission that complies with both the average and peak limits of 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz peak emission limit.

3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r03. Section G) Unwanted emissions measurement.

   (1) Procedure for Unwanted Emissions Measurements Below 1000MHz

   - RBW = 120 kHz
   - VBW = 300 kHz
   - Detector = Peak
   - Trace mode = max hold

   (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz

   - RBW = 1 MHz
   - VBW ≥ 3 MHz
   - Detector = Peak
   - Sweep time = auto
   - Trace mode = max hold

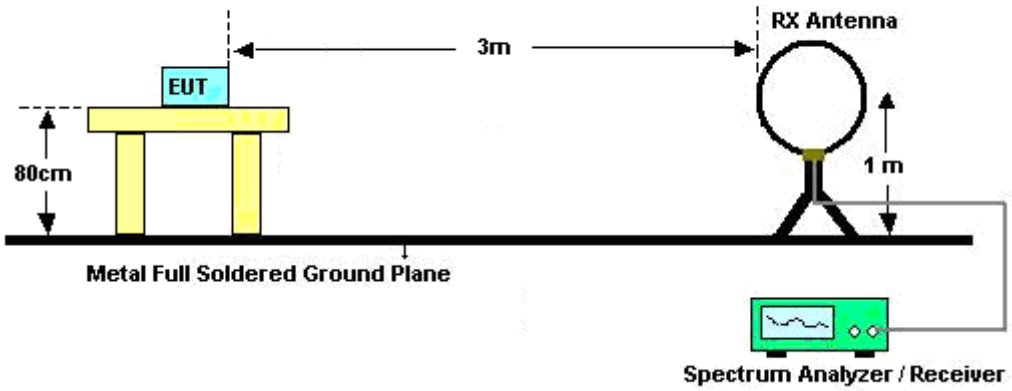
   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

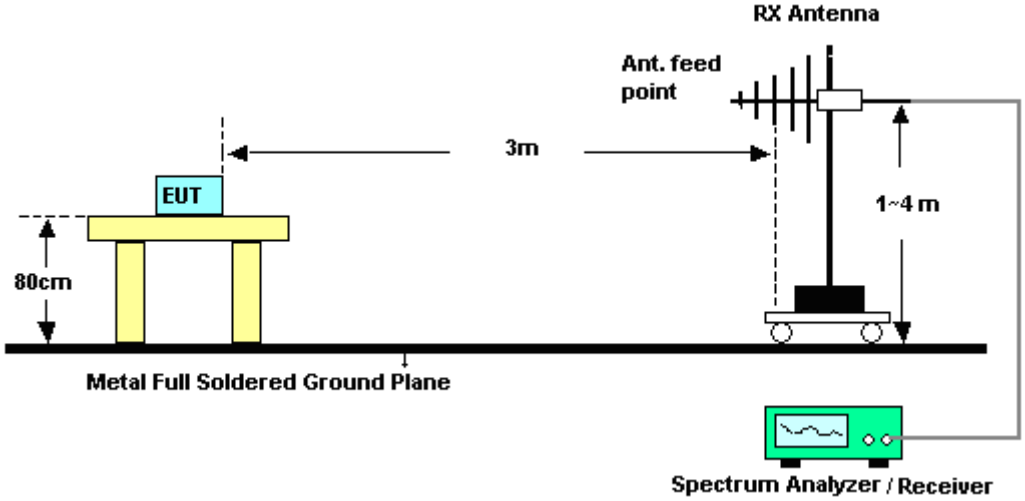
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.2.4 Test Setup

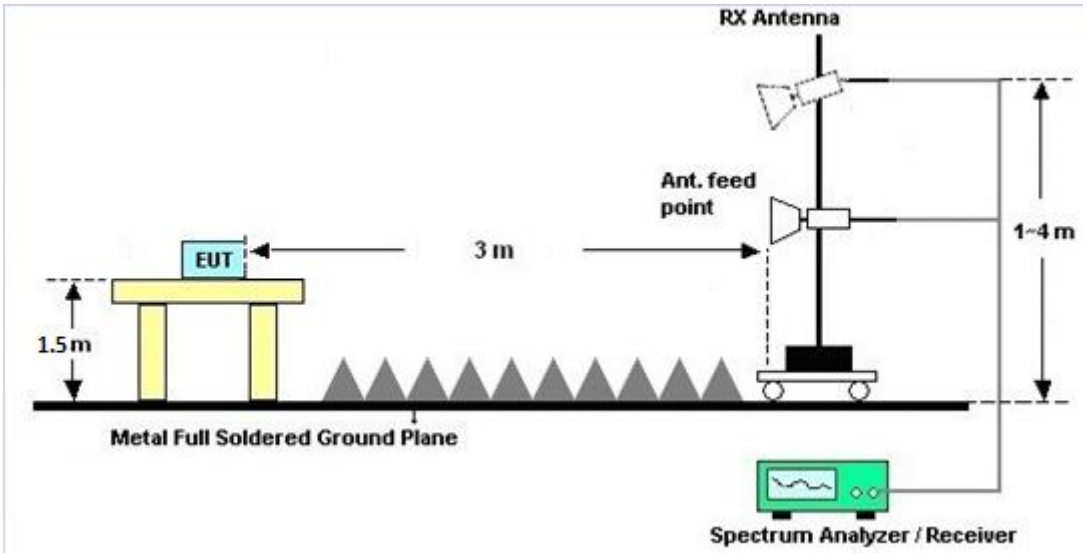
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.2.5 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

3.2.6 Test Result of Radiated Band Edges

Please refer to Appendix B and C.

3.2.7 Duty Cycle

Please refer to Appendix D.

3.2.8 Test Result of Unwanted Radiated Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix B and c.

3.3 Antenna Requirements

3.3.1 Standard Applicable

According to FCC 47 CFR Section 15.407(a)(1)(2) ,if transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.3.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.3.3 Antenna Gain

The antenna gain is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Power Meter	Anritsu	ML2495A	1132003	300MHz~40GHz	Aug. 04, 2016	Oct. 05, 2016 ~ Oct. 06, 2016	Aug. 03, 2017	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	1126017	300MHz~40GHz	Aug. 04, 2016	Oct. 05, 2016 ~ Oct. 06, 2016	Aug. 03, 2017	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100057	9kHz-40GHz	Nov. 23, 2015	Oct. 05, 2016 ~ Oct. 06, 2016	Nov. 22, 2016	Conducted (TH05-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Sep. 02, 2015	Oct. 11, 2016 ~ Oct. 12, 2016	Sep. 01, 2017	Radiation (03CH12-HY)
Loop Cable	Rohde & Schwarz	N/A	N/A	9KHz~30MHz	Dec. 03, 2015	Oct. 11, 2016 ~ Oct. 12, 2016	Dec. 02, 2016	Radiation (03CH12-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800 N1D01N-06	35413&02	30MHz~1GHz	Jan. 13, 2016	Oct. 11, 2016 ~ Oct. 12, 2016	Jan. 12, 2017	Radiation (03CH12-HY)
Amplifier	SONOMA	310N	187312	9kHz~1GHz	Nov. 20, 2015	Oct. 11, 2016 ~ Oct. 12, 2016	Nov. 19, 2016	Radiation (03CH12-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100390	20Hz~26.5GHz	Dec. 21, 2015	Oct. 11, 2016 ~ Oct. 12, 2016	Dec. 20, 2016	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1328	1GHz ~ 18GHz	Nov. 02, 2015	Oct. 11, 2016 ~ Oct. 12, 2016	Nov. 01, 2016	Radiation (03CH12-HY)
Preamplifier	MITEQ	AMF-7D-00101800-30-10P	1815698	1GHz~18GHz	Dec. 14, 2015	Oct. 11, 2016 ~ Oct. 12, 2016	Dec. 13, 2016	Radiation (03CH12-HY)
Preamplifier	Keysight	83017A	MY53270148	1GHz~26.5GHz	Jan. 30, 2016	Oct. 11, 2016 ~ Oct. 12, 2016	Jan. 29, 2017	Radiation (03CH12-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	Oct. 11, 2016 ~ Oct. 12, 2016	N/A	Radiation (03CH12-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Oct. 11, 2016 ~ Oct. 12, 2016	N/A	Radiation (03CH12-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Oct. 11, 2016 ~ Oct. 12, 2016	N/A	Radiation (03CH12-HY)
Preamplifier	MITEQ	JS44-18004000-33-8P	1840917	18GHz ~ 40GHz	Jun. 14, 2016	Oct. 11, 2016 ~ Oct. 12, 2016	Jun. 13, 2017	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz- 40GHz	Nov. 02, 2015	Oct. 11, 2016 ~ Oct. 12, 2016	Nov. 01, 2016	Radiation (03CH12-HY)

5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.10**

Appendix A. Conducted Test Results

Report Number : FR631725-02D

Test Engineer:	Derek Hsu	Temperature:	21~25	°C
Test Date:	2016/10/05 ~ 2016/10/06	Relative Humidity:	51~54	%

TEST RESULTS DATA
Average Power Table

FCC Band I															
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)			Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2		
11a	6Mbps	1	36	5180	0.53	0.53	17.88	18.28		24.00	24.00	4.08	3.20		Pass
11a	6Mbps	1	44	5220	0.53	0.53	17.75	18.12		24.00	24.00	4.08	3.20		Pass
11a	6Mbps	1	48	5240	0.53	0.53	17.63	18.11		24.00	24.00	4.08	3.20		Pass
HT20	MCS0	1	36	5180	0.56	0.56	17.92	17.01		24.00	24.00	4.08	3.20		Pass
HT20	MCS0	1	44	5220	0.56	0.56	17.90	18.11		24.00	24.00	4.08	3.20		Pass
HT20	MCS0	1	48	5240	0.56	0.56	17.76	16.96		24.00	24.00	4.08	3.20		Pass
HT40	MCS0	1	38	5190	1.08	1.06	13.12	12.51		24.00	24.00	4.08	3.20		Pass
HT40	MCS0	1	46	5230	1.08	1.06	18.44	17.57		24.00	24.00	4.08	3.20		Pass

Appendix B. Radiated Spurious Emission

Test Engineer :	Peter Chiu , Karl Ho, and Nick Yu	**Temperature :**	22~24°C
		Relative Humidity :	53~56%

Band 1 5150~5250MHz

WIFI 802.11a (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 44 5220MHz		10440	47.24	-26.76	74	47.66	39.69	17.22	57.33	100	0	P	H
		15660	53.82	-20.18	74	52.3	38.11	21.7	58.29	112	334	P	H
		15660	43.02	-10.98	54	41.5	38.11	21.7	58.29	112	344	A	H
													H
		10440	47.11	-26.89	74	47.53	39.69	17.22	57.33	100	0	P	V
		15660	53.69	-20.31	74	52.17	38.11	21.7	58.29	110	334	P	V
		15660	47.11	-6.89	54	45.59	38.11	21.7	58.29	110	334	A	V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 1 5150~5250MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 38 5190MHz		5149.5	65.78	-8.22	74	53.87	31.65	11.21	30.95	114	274	P	H
		5149.5	52.71	-1.29	54	40.8	31.65	11.21	30.95	114	274	A	H
	*	5194	104.08	-	-	92.15	31.7	11.18	30.95	114	274	P	H
	*	5194	93.86	-	-	81.93	31.7	11.18	30.95	114	274	A	H
		5460	59.36	-14.64	74	46.72	31.95	11.64	30.95	114	274	P	H
		5445.6	49.03	-4.97	54	36.39	31.95	11.64	30.95	114	274	A	H
		5148.46	64.94	-9.06	74	53.03	31.65	11.21	30.95	106	206	P	V
		5149.76	52.55	-1.45	54	40.64	31.65	11.21	30.95	106	206	A	V
	*	5194	103.65	-	-	91.72	31.7	11.18	30.95	106	206	P	V
	*	5194	93.42	-	-	81.49	31.7	11.18	30.95	106	206	A	V
		5438.64	59.32	-14.68	74	46.7	31.93	11.64	30.95	106	206	P	V
		5459.76	49.03	-4.97	54	36.39	31.95	11.64	30.95	106	206	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 1 5150~5250MHz

Emission below 1GHz

WIFI 802.11n HT40 (LF @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n HT40 LF		30	23.6	-16.4	40	29.18	26.1	0.78	32.46			P	H
		149.34	27.87	-15.63	43.5	40.81	17.73	1.75	32.42			P	H
		192.27	28.44	-15.06	43.5	43.47	15.68	1.7	32.41			P	H
		727	28.69	-17.31	46	30.19	26.96	3.89	32.35			P	H
		860.7	31.84	-14.16	46	30.51	28.7	4.45	31.82	100	0	P	H
		971.3	33.04	-20.96	54	29.24	30	4.75	30.95			P	H
													H
													H
													H
													H
													H
													H
		35.13	32.85	-7.15	40	41.23	23.3	0.78	32.46	100	0	P	V
		75.63	25.32	-14.68	40	43.39	13.31	1.06	32.44			P	V
		177.42	24.78	-18.72	43.5	39.75	15.69	1.75	32.41			P	V
		720	28.79	-17.21	46	30.5	26.77	3.89	32.37			P	V
		817.3	30.43	-15.57	46	30.2	28.18	4.14	32.09			P	V
		952.4	33.04	-12.96	46	29.4	30	4.75	31.11			P	V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against limit line.

Band 1 5150~5250MHz

WIFI 802.11a (Harmonic @ 3m)

WIFI Ant. 2	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 44 5220MHz		10440	47.42	-26.58	74	47.84	39.69	17.22	57.33	100	0	P	H
		15660	48.34	-25.66	74	46.82	38.11	21.7	58.29	100	0	P	H
													H
													H
		10440	47.4	-26.6	74	47.82	39.69	17.22	57.33	100	0	P	V
		15660	49.18	-24.82	74	47.66	38.11	21.7	58.29	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 1 5150~5250MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI Ant. 2	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 38 5190MHz		5148.98	65.26	-8.74	74	53.35	31.65	11.21	30.95	114	277	P	H
		5149.76	51.84	-2.16	54	39.93	31.65	11.21	30.95	114	277	A	H
	*	5194	103.32	-	-	91.39	31.7	11.18	30.95	114	277	P	H
	*	5194	92.44	-	-	80.51	31.7	11.18	30.95	114	277	A	H
		5436.24	59.71	-14.29	74	47.09	31.93	11.64	30.95	114	277	P	H
		5414.88	48.91	-5.09	54	36.34	31.92	11.6	30.95	114	277	A	H
		5147.16	63.07	-10.93	74	51.16	31.65	11.21	30.95	100	295	P	V
		5150	51.98	-2.02	54	40.07	31.65	11.21	30.95	100	295	A	V
	*	5188	103.02	-	-	91.11	31.68	11.18	30.95	100	295	P	V
	*	5188	92.63	-	-	80.72	31.68	11.18	30.95	100	295	A	V
		5408.64	60.44	-13.56	74	47.89	31.9	11.6	30.95	100	295	P	V
		5449.2	48.84	-5.16	54	36.2	31.95	11.64	30.95	100	295	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 1 5150~5250MHz

Emission below 1GHz

WIFI 802.11n HT40 (LF @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
2		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n HT40 LF		30.27	24.04	-15.96	40	29.62	26.1	0.78	32.46			P	H
		150.69	27.9	-15.6	43.5	40.87	17.7	1.75	32.42			P	H
		194.97	28.5	-15	43.5	43.41	15.8	1.7	32.41			P	H
		746.6	37.15	-8.85	46	38.06	27.43	3.97	32.31	100	0	P	H
		844.6	31.91	-14.09	46	30.93	28.62	4.28	31.92			P	H
		998.6	33.14	-20.86	54	29.92	30	3.92	30.7			P	H
													H
													H
													H
													H
													H
													H
		37.83	33.11	-6.89	40	43.17	21.62	0.78	32.46	100	0	P	V
		72.66	26.03	-13.97	40	44.47	12.95	1.06	32.45			P	V
		174.18	25.1	-18.4	43.5	39.89	15.88	1.75	32.42			P	V
		746.6	37.49	-8.51	46	38.4	27.43	3.97	32.31			P	V
		860.7	31.71	-14.29	46	30.38	28.7	4.45	31.82			P	V
		958	32.97	-13.03	46	29.28	30	4.75	31.06			P	V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
2		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBµV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBµV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBµV/m) – Limit Line(dBµV/m)

For Peak Limit @ 2390MHz:

1. Level(dBµV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBµV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBµV) – 35.86 (dB)

= 55.45 (dBµV/m)

2. Over Limit(dB)

= Level(dBµV/m) – Limit Line(dBµV/m)

= 55.45(dBµV/m) – 74(dBµV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBµV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBµV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBµV) – 35.86 (dB)

= 43.54 (dBµV/m)

2. Over Limit(dB)

= Level(dBµV/m) – Limit Line(dBµV/m)

= 43.54(dBµV/m) – 54(dBµV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is "PASS".

Appendix C. Radiated Spurious Emission

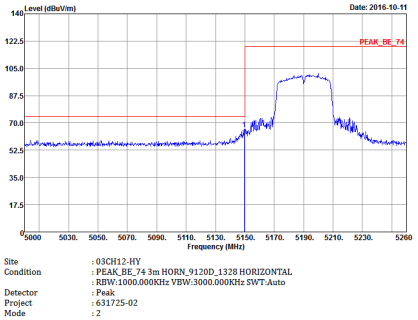
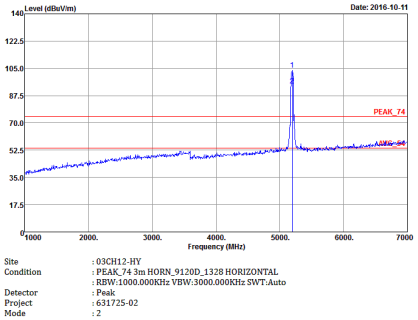
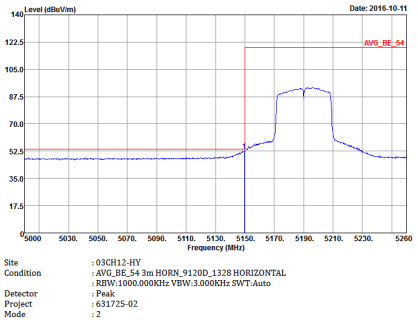
Test Engineer :	Peter Chiu , Karl Ho, and Nick Yu	**Temperature :**	22~24°C
		Relative Humidity :	53~56%

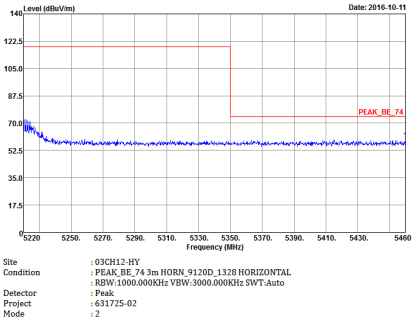
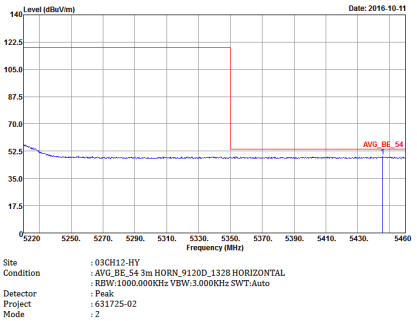
Note symbol

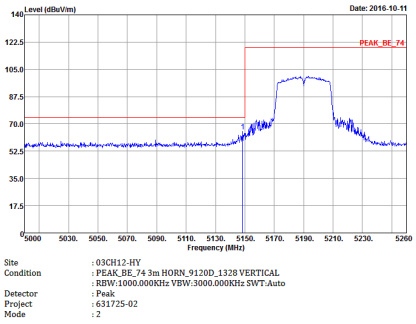
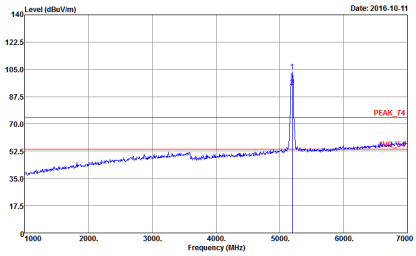
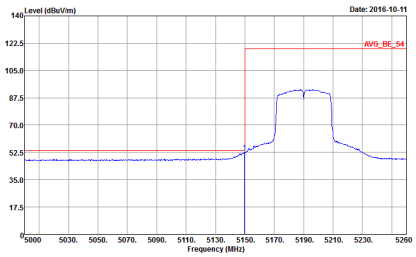
-L	**Low channel location**
-R	**High channel location**

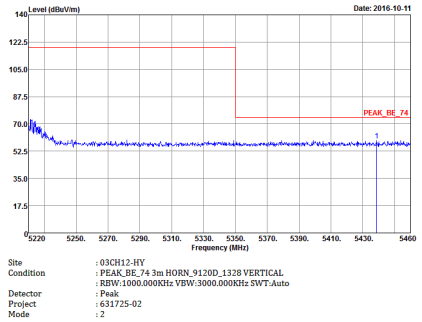
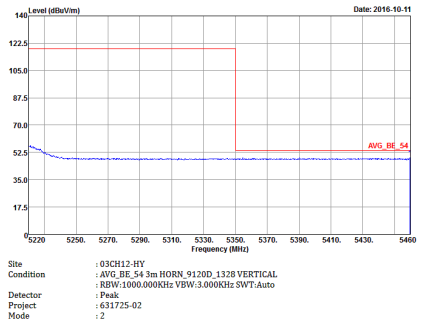
Band 1 - 5150~5250MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11n HT40 CH38 5190MHz - L	
1	Horizontal	Fundamental
Peak		
Avg.		Left blank

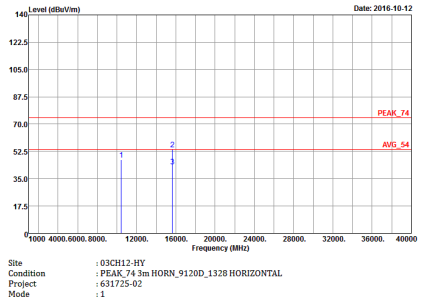
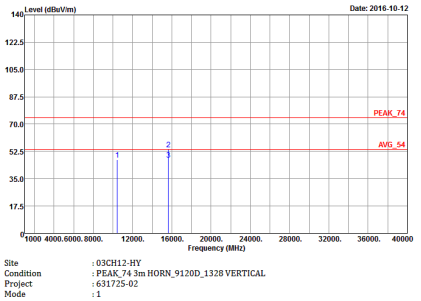
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11n HT40 CH38 5190MHz - R	
1	Horizontal	Fundamental
Peak	 Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 631725-02 Mode : 2	Left blank
Avg.	 Site : 03CH12-HY Condition : AVG_BE_54 3m HORN_9120D_1328 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 631725-02 Mode : 2	Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11n HT40 CH38 5190MHz - L	
1	Vertical	Fundamental
Peak	 Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 631725-02 Mode : 2	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_9120D_1328 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 631725-02 Mode : 2
Avg.	 Site : 03CH12-HY Condition : AVG_BE_54 3m HORN_9120D_1328 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 631725-02 Mode : 2	Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11n HT40 CH38 5190MHz - R	
1	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

Band 1 - 5150~5250MHz

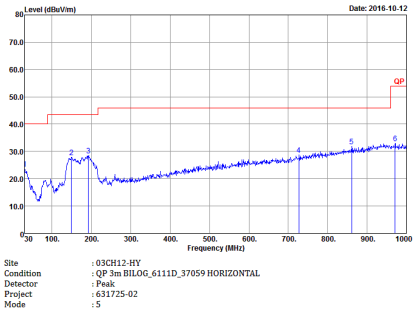
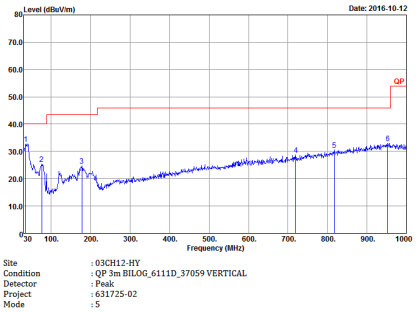
WIFI 802.11a (Harmonic @ 3m)

WIFI	Band 1 5150~5250MHz Harmonic @ 3m	
ANT	802.11a CH44 5220MHz	
1	Horizontal	Vertical
Peak Avg.		

Band 1 5150~5250MHz

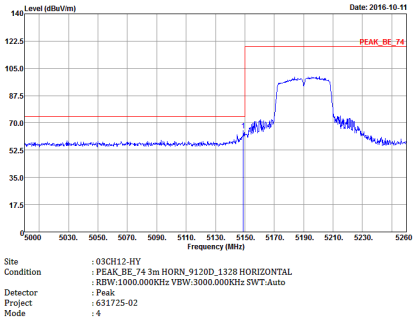
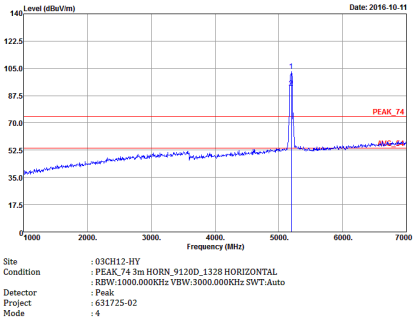
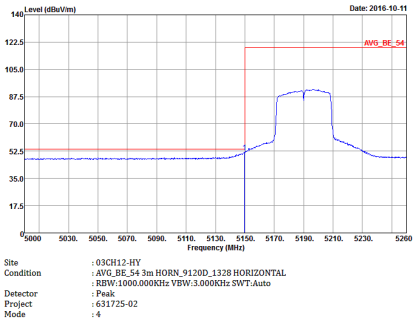
Emission below 1GHz

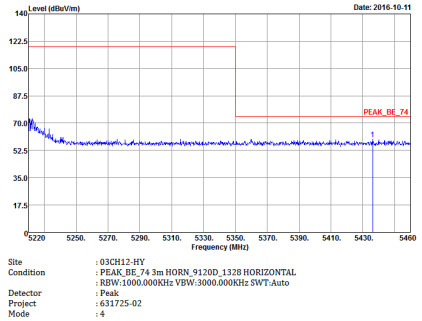
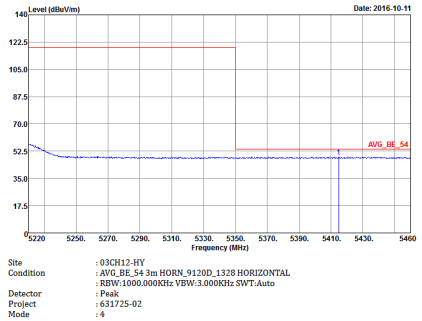
5GHz WIFI 802.11n HT40 (LF)

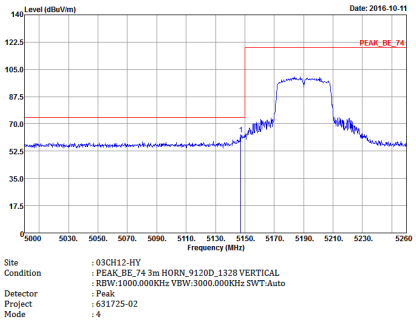
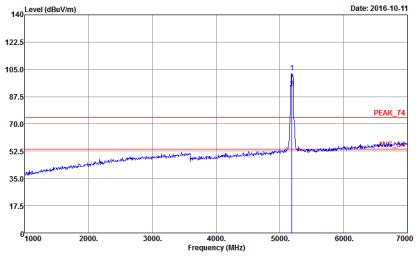
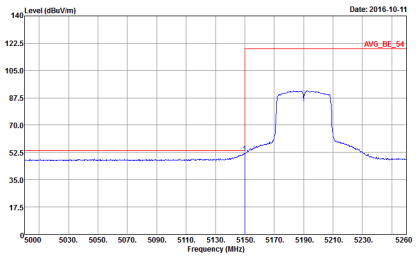
WIFI	5GHz WIFI	
ANT	802.11n HT40 LF	
1	Horizontal	Vertical
QP / Peak		

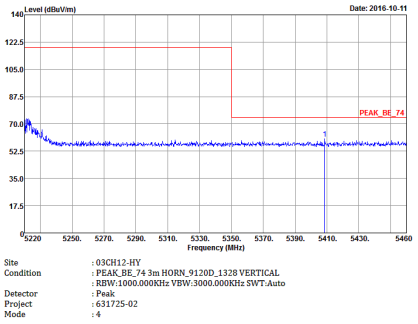
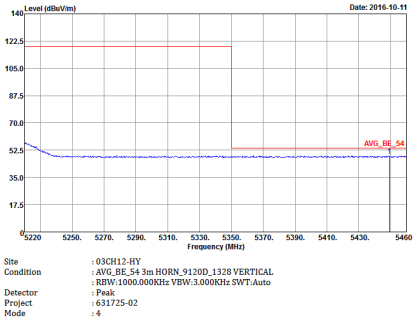
Band 1 - 5150~5250MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11n HT40 CH38 5190MHz - L	
2	Horizontal	Fundamental
Peak		
Avg.		Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11n HT40 CH38 5190MHz - R	
2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

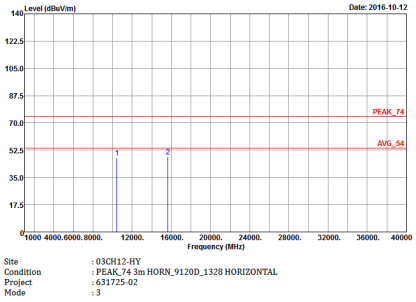
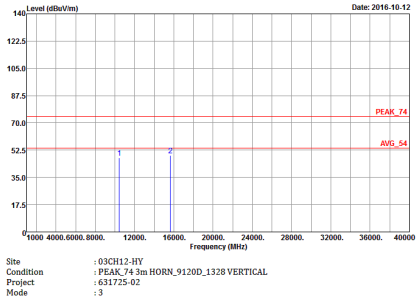
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11n HT40 CH38 5190MHz - L	
2	Vertical	Fundamental
Peak	 Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 631725-02 Mode : 4	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_9120D_1328 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 631725-02 Mode : 4
Avg.	 Site : 03CH12-HY Condition : AVG_BE_54 3m HORN_9120D_1328 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 631725-02 Mode : 4	Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11n HT40 CH38 5190MHz - R	
2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

Band 1 5150~5250MHz

Band 1 - 5150~5250MHz

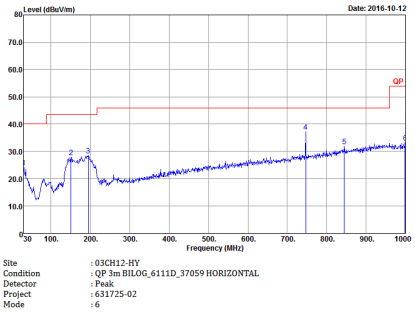
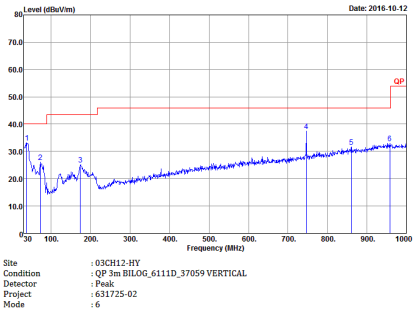
WIFI 802.11a (Harmonic @ 3m)

WIFI	Band 1 5150~5250MHz Harmonic @ 3m	
ANT	802.11a CH44 5220MHz	
2	Horizontal	Vertical
Peak Avg.		

Band 1 5150~5250MHz

Emission below 1GHz

5GHz WIFI 802.11n HT40 (LF)

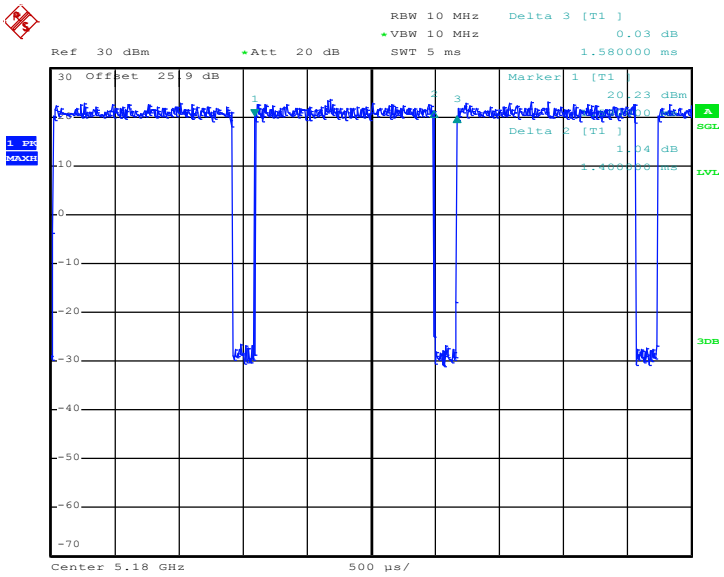
WIFI	5GHz WIFI	
ANT	802.11n HT40 LF	
2	Horizontal	Vertical
QP / Peak		

Appendix D. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
1	802.11a	88.61	1400	0.71	1kHz
1	5GHz 802.11n HT20	87.84	1300	0.77	1kHz
1	5GHz 802.11n HT40	78.05	640	1.56	3kHz
2	802.11a	88.61	1400	0.71	1kHz
2	5GHz 802.11n HT20	87.84	1300	0.77	1kHz
2	5GHz 802.11n HT40	78.31	650	1.54	3kHz

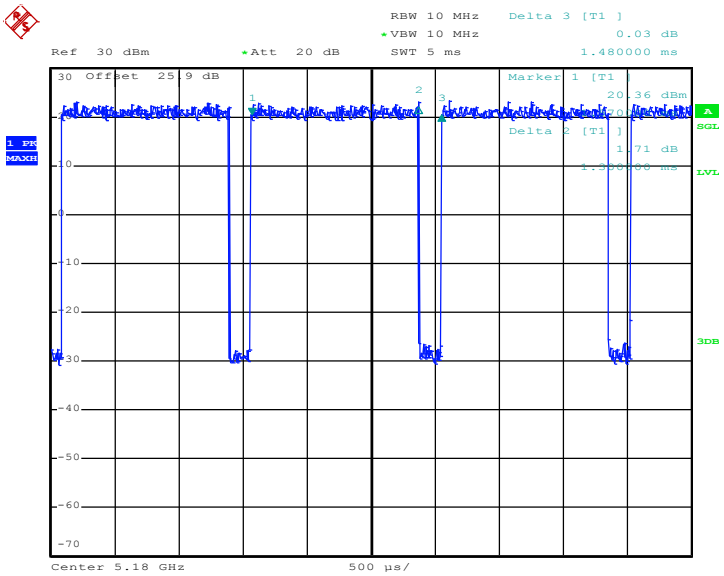
<Ant. 1>

802.11a



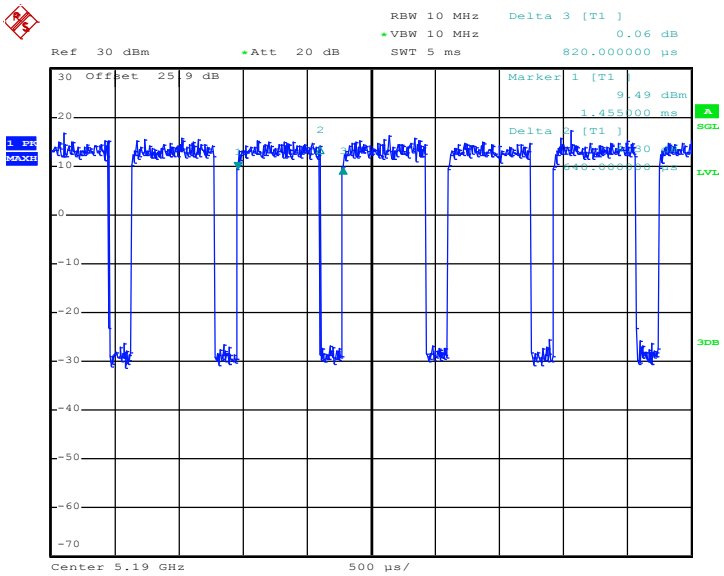
Date: 5.OCT.2016 22:46:12

802.11n HT20



Date: 5.OCT.2016 23:03:50

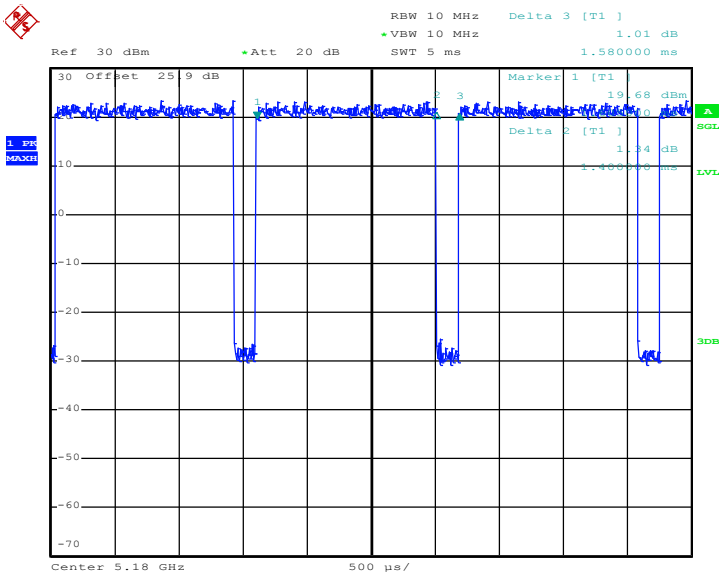
802.11n HT40



Date: 5.OCT.2016 23:24:28

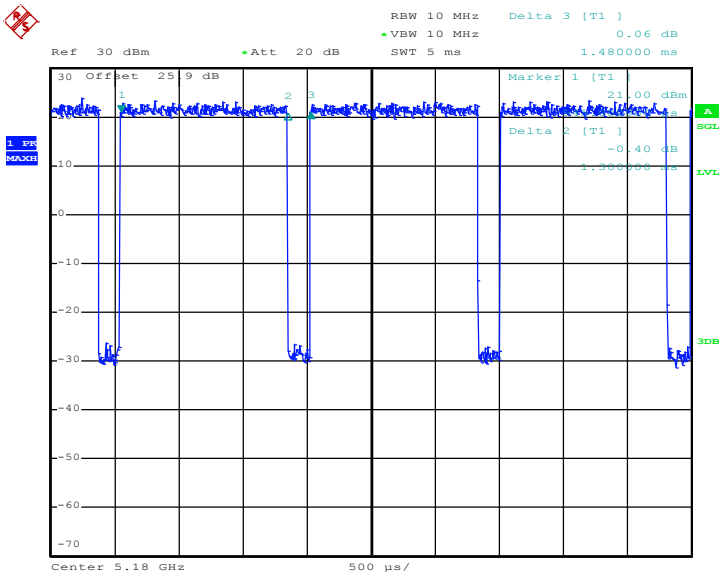
<Ant. 2>

802.11a



Date: 5.OCT.2016 22:48:13

802.11n HT20



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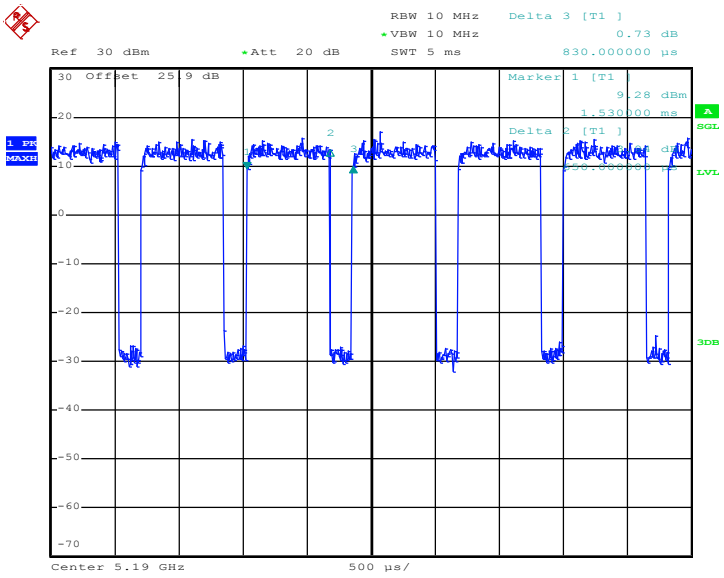
802.11n HT40



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