



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

The testing 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



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FCC ID : 2AHSE-2045

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR631725-02E	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	≤ 30 dBm	Pass
3.2	15.407(b)	Unwanted Emissions	15.407(b)(4)(i) & 15.209(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 Product 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 FR631725-01E. 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	5745 MHz ~ 5825 MHz
Maximum Output Power	<Ant. 1> 802.11a : 17.97 dBm / 0.0627 W 802.11n HT20 : 17.91 dBm / 0.0618 W 802.11n HT40 : 18.02 dBm / 0.0634 W <Ant. 2> 802.11a : 19.03 dBm / 0.0800 W 802.11n HT20 : 19.07 dBm / 0.0807 W 802.11n HT40 : 18.02 dBm / 0.0634 W
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)
Antenna Type / Gain	<Ant. 1> : Fixed internal Antenna with gain 4.60 dBi <Ant. 2> : Fixed internal Antenna with gain 4.99 dBi

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 1 st 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).

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5725-5850 MHz Band 4 (U-NII-3)	149	5745	159*	5795
	151*	5755	161	5805
	153	5765	165	5825
	157	5785		

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

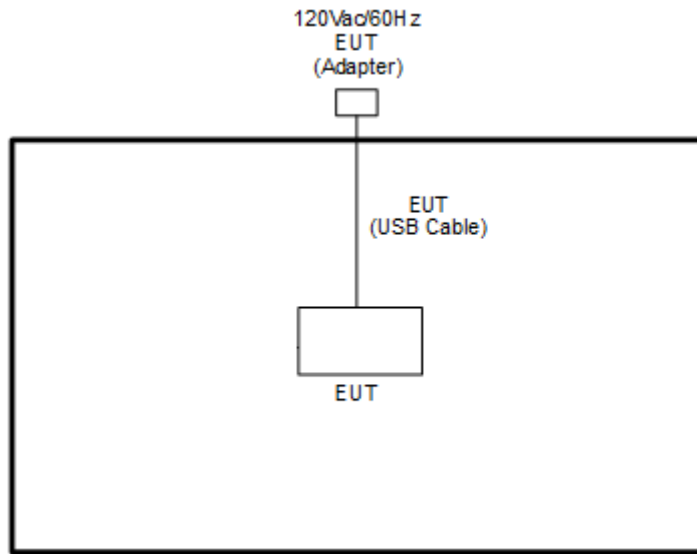
2.2 Test Mode

Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates as below table.

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

Ch. #	Band IV : 5725-5850 MHz		
	802.11a	802.11n HT20	802.11n HT40
L Low	149	149	151
M Middle	157	157	-
H High	165	165	159

2.3 Connection Diagram of Test System



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.

3 Test Result

3.1 Maximum Conducted Output Power Measurement

3.1.1 Limit of Maximum Conducted Output Power

For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

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.

3.1.2 Measuring Instruments

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

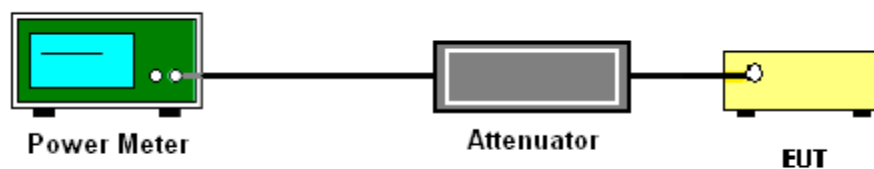
3.1.3 Test Procedures

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 5.725-5.85 GHz band:
15.407(b)(4)(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
- (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.

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



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

(3) KDB 789033 D02 General UNII Test Procedures New Rules 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

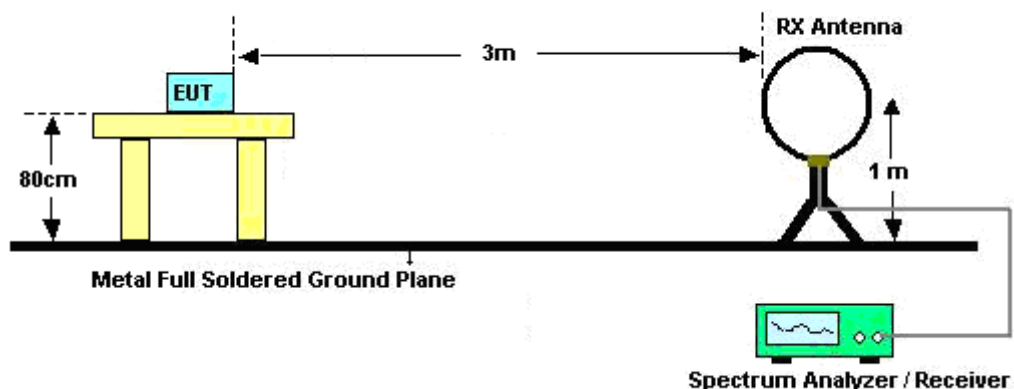
(3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

- 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.

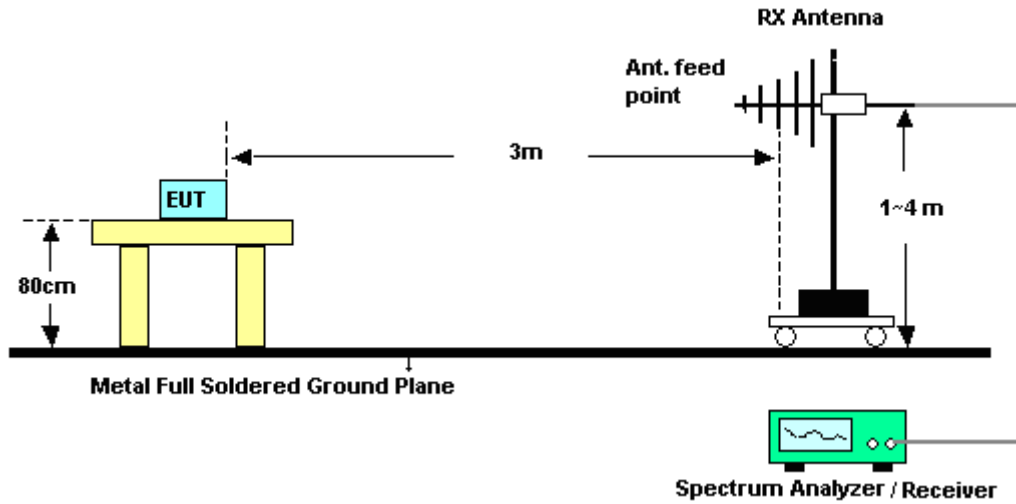
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband 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

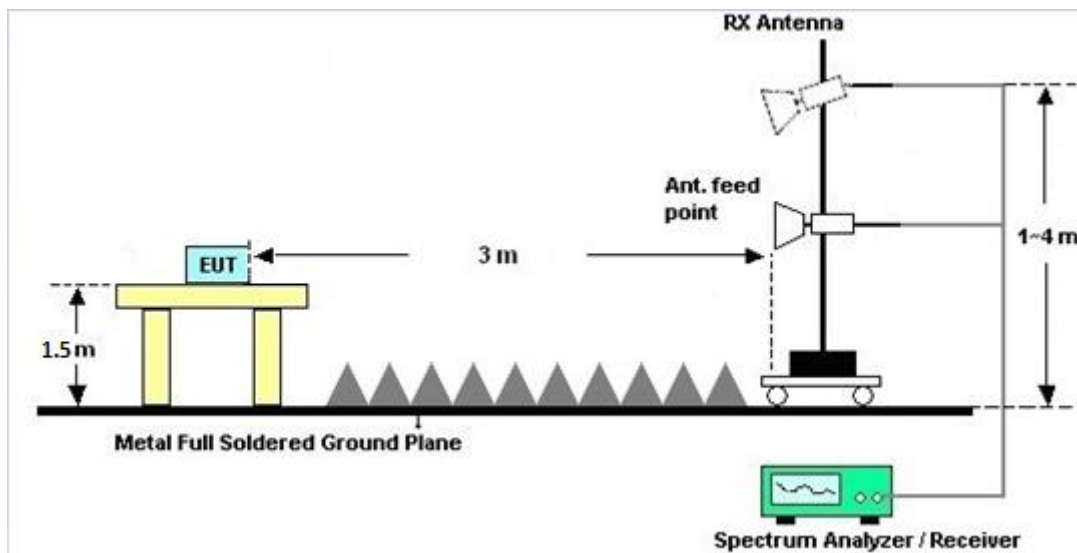
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz





3.2.5 Test Results of Radiated Spurious 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 Spurious at 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 Radiated Spurious Emissions (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)
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-0010 1800-30-10P	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)
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	JS44-1800400 0-33-8P	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% ($U = 2Uc(y)$)	5.1
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.2
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.7
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Appendix A. Conducted Test Results

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

Band IV														
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	149	5745	0.53	0.53	17.97	19.03		30.00	30.00	4.60	4.99	Pass
11a	6Mbps	1	157	5785	0.53	0.53	17.84	18.93		30.00	30.00	4.60	4.99	Pass
11a	6Mbps	1	165	5825	0.53	0.53	17.93	18.93		30.00	30.00	4.60	4.99	Pass
HT20	MCS0	1	149	5745	0.56	0.56	17.91	19.07		30.00	30.00	4.60	4.99	Pass
HT20	MCS0	1	157	5785	0.56	0.56	17.83	18.94		30.00	30.00	4.60	4.99	Pass
HT20	MCS0	1	165	5825	0.56	0.56	17.81	18.95		30.00	30.00	4.60	4.99	Pass
HT40	MCS0	1	151	5755	1.08	1.06	18.02	17.87		30.00	30.00	4.60	4.99	Pass
HT40	MCS0	1	159	5795	1.08	1.06	18.01	18.02		30.00	30.00	4.60	4.99	Pass



Appendix B. Radiated Spurious Emission

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

<Ant. 1>

Band 4 - 5725~5850MHz
WIFI 802.11a (Band Edge @ 3m)

WIFI Ant.	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 165 5825MHz	*	5824	112.51	-	-	99.07	32.46	12.03	31.05	100	275	P	H	
	*	5824	102	-	-	88.56	32.46	12.03	31.05	100	275	A	H	
		5850.6	72.07	-48.76	120.83	58.62	32.48	12.03	31.06	100	275	P	H	
		5856.2	67.71	-42.75	110.46	54.23	32.51	12.03	31.06	100	275	P	H	
		5876.6	61.26	-42.75	104.01	47.63	32.53	12.17	31.07	100	275	P	H	
		5929.4	60.99	-7.21	68.2	47.17	32.6	12.31	31.09	100	275	P	H	
														H
														H
	*	5824	112.93	-	-	99.49	32.46	12.03	31.05	100	152	152	P	V
	*	5824	102.37	-	-	88.93	32.46	12.03	31.05	100	152	152	A	V
		5853	73.19	-42.17	115.36	59.74	32.48	12.03	31.06	100	152	152	P	V
		5855.8	67.02	-43.56	110.58	53.54	32.51	12.03	31.06	100	152	152	P	V
		5905	63.11	-19.85	82.96	49.3	32.58	12.31	31.08	100	152	152	P	V
		5938	60.62	-7.58	68.2	46.8	32.6	12.31	31.09	100	152	152	P	V
													V	
													V	
													V	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.													



Band 4 5725~5850MHz

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 165 5825MHz		11650	47.99	-26.01	74	47.41	39.8	18.58	57.8	100	0	P	H
		17472	48.36	-19.84	68.2	40.59	42.39	23.36	57.98	100	0	P	H
													H
													H
		11650	50.25	-23.75	74	49.67	39.8	18.58	57.8	100	0	P	V
		17472	48.15	-20.05	68.2	40.38	42.39	23.36	57.98	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 4 5725~5850MHz

Emission below 1GHz

5GHz WIFI 802.11a (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)	
5GHz 802.11a LF		30	23.49	-16.51	40	29.07	26.1	0.78	32.46			P	H	
		150.42	27.99	-15.51	43.5	40.96	17.7	1.75	32.42			P	H	
		194.16	28.1	-15.4	43.5	43.05	15.76	1.7	32.41			P	H	
		746.6	40.12	-5.88	46	41.03	27.43	3.97	32.31	100	0	P	H	
		856.5	31.9	-14.1	46	30.77	28.7	4.28	31.85			P	H	
		946.8	33.61	-12.39	46	30.1	29.92	4.75	31.16			P	H	
														H
														H
														H
														H
														H
			35.13	33.5	-6.5	40	41.88	23.3	0.78	32.46	100	0	P	V
			74.28	25.29	-14.71	40	43.49	13.19	1.06	32.45			P	V
			175.53	25.57	-17.93	43.5	40.42	15.82	1.75	32.42			P	V
			746.6	33.08	-12.92	46	33.99	27.43	3.97	32.31			P	V
			839	31.45	-14.55	46	30.59	28.53	4.28	31.95			P	V
			976.9	33.07	-20.93	54	29.21	30	4.75	30.89			P	V
														V
														V
													V	
													V	
													V	
													V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.													



<Ant. 2>

**Band 4 5725~5850MHz
WIFI 802.11a (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)	
802.11a CH 165 5825MHz	*	5825	110.64	-	-	97.2	32.46	12.03	31.05	100	92	P	H	
	*	5825	99.76	-	-	86.32	32.46	12.03	31.05	100	92	A	H	
		5853	76.46	-38.9	115.36	63.01	32.48	12.03	31.06	100	92	P	H	
		5855.2	74.75	-35.99	110.74	61.27	32.51	12.03	31.06	100	92	P	H	
		5887	61.02	-35.27	96.29	47.4	32.53	12.17	31.08	100	92	P	H	
		5932	60.23	-7.97	68.2	46.41	32.6	12.31	31.09	100	92	P	H	
														H
														H
	*	5824	111.58	-	-	98.14	32.46	12.03	31.05	100	207	P	V	
	*	5824	101.16	-	-	87.72	32.46	12.03	31.05	100	207	A	V	
		5850.2	77.26	-44.48	121.74	63.81	32.48	12.03	31.06	100	207	P	V	
		5855.2	73.09	-37.65	110.74	59.61	32.51	12.03	31.06	100	207	P	V	
		5882.4	60.46	-39.24	99.7	46.83	32.53	12.17	31.07	100	207	P	V	
		5925	60.14	-8.06	68.2	46.32	32.6	12.31	31.09	100	207	P	V	
														V
														V
													V	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.													



Band 4 5725~5850MHz

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 165 5825MHz		11650	46.67	-27.33	74	46.09	39.8	18.58	57.8	100	0	P	H	
		17472	48.46	-19.74	68.2	40.69	42.39	23.36	57.98	100	0	P	H	
													H	
													H	
			11650	50.24	-23.76	74	49.66	39.8	18.58	57.8	100	0	P	V
			17472	47.96	-20.24	68.2	40.19	42.39	23.36	57.98	100	0	P	V
														V
														V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.													



Emission below 1GHz
5GHz WIFI 802.11a (LF @ 3m)

Table with 14 columns: WIFI Ant., 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). Rows include test results for 5GHz 802.11a LF and a Remark section.



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	Peak or Average
H/V	Horizontal or Vertical



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.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

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

For Peak Limit @ 2390MHz:

- 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)
- Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 55.45(dBμV/m) – 74(dBμV/m)
= -18.55(dB)

For Average Limit @ 2390MHz:

- 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)
- 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 Plots

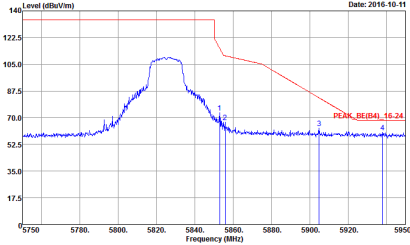
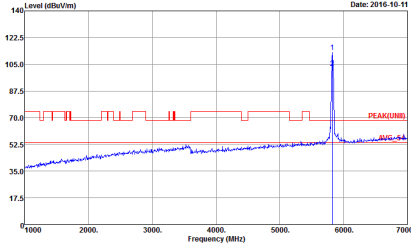
Test Engineer :	Peter Chiu , Karl Ho, and Nick Yu	Temperature :	22~24°C
		Relative Humidity :	53~56%

<Ant. 1>

Band 4 - 5725~5850MHz
WIFI 802.11a (Band Edge @ 3m)

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH165 5825MHz	
1	Horizontal	Fundamental
Peak	<p>Site : 03CH12-HY Condition : PEAK_BE(84)_16-24 3m HORN_9120D_1328 HORIZONTAL : RES:1000.000KHz VIEW:3000.000KHz SWT:Auto Detector : Peak Project : 631725-02 Mode : 7</p>	<p>Site : 03CH12-HY Condition : PEAK(UNI) 3m HORN_9120D_1328 HORIZONTAL : RES:1000.000KHz VIEW:3000.000KHz SWT:Auto Detector : Peak Project : 631725-02 Mode : 7</p>



WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH165 5825MHz	
1	Vertical	Fundamental
<p>Peak</p>	 <p>Date: 2016-10-11</p> <p>Site : 03CH12-HY Condition : PEAK_BE(B4)_16-24 3m HORN_9120D_1328 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 631725-02 : 7</p>	 <p>Date: 2016-10-11</p> <p>Site : 03CH12-HY Condition : PEAK(UNI) 3m HORN_9120D_1328 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 631725-02 : 7</p>



Band 4 - 5725~5850MHz
WIFI 802.11a (Harmonic @ 3m)

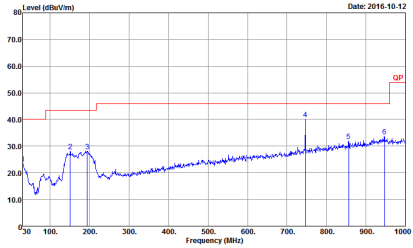
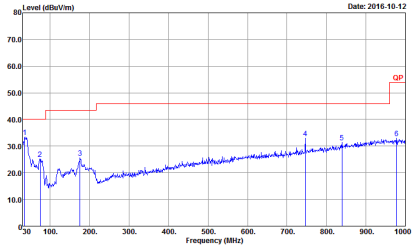
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH165 5825MHz	
1	Horizontal	Vertical
<p>Peak Avg.</p>	<p>Site : 03CH12-HY Condition : PEAK(UMI) 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 631725-02 Mode : 7</p>	<p>Site : 03CH12-HY Condition : PEAK(UMI) 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 631725-02 Mode : 7</p>



Band 4 5725~5850MHz

Emission below 1GHz

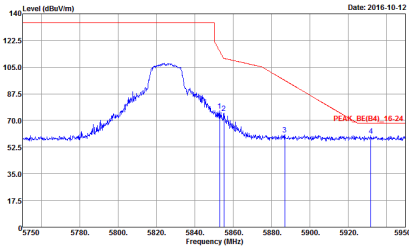
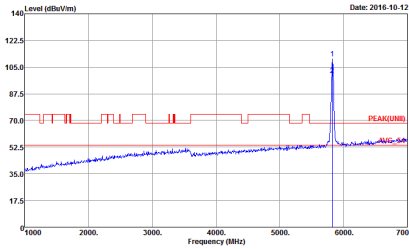
5GHz WIFI 802.11a (LF)

WIFI	5GHz 5725~5850MHz	
ANT	802.11a LF	
1	Horizontal	Vertical
<p>QP / Peak</p>	 <p>Site : 03CH12-HY Condition : QP 3m BILLOG_6111D_37059 HORIZONTAL Detector : Peak Project : 631725-02 Mode : 9</p>	 <p>Site : 03CH12-HY Condition : QP 3m BILLOG_6111D_37059 VERTICAL Detector : Peak Project : 631725-02 Mode : 9</p>

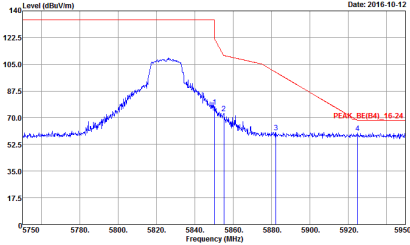
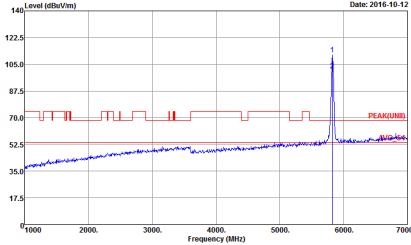


<Ant. 2>

Band 4 - 5725~5850MHz
WIFI 802.11a (Band Edge @ 3m)

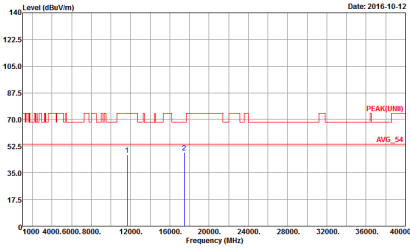
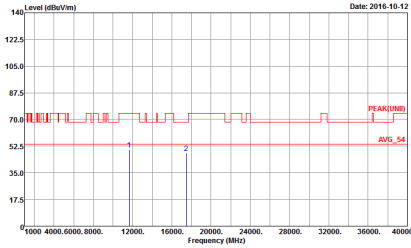
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH165 5825MHz	
2	Horizontal	Fundamental
Peak	 <p>Date: 2016-10-12</p> <p>Site : 03CH12-HY Condition : PEAK_BE(B4)_16-24 3m HORN_9120D_1328 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 631725-02 Mode : 8</p>	 <p>Date: 2016-10-12</p> <p>Site : 03CH12-HY Condition : PEAK(UWB) 3m HORN_9120D_1328 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 631725-02 Mode : 8</p>



WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH165 5825MHz	
2	Vertical	Fundamental
Peak	 <p>Date: 2016-10-12</p> <p>Site : 03CH12-HY Condition : PEAK_BE(B4)_16-24 3m HORN_9120D_1328 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 631725-02 : 0</p>	 <p>Date: 2016-10-12</p> <p>Site : 03CH12-HY Condition : PEAK(UNI) 3m HORN_9120D_1328 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 631725-02 : 0</p>



Band 4 - 5725~5850MHz
WIFI 802.11a (Harmonic @ 3m)

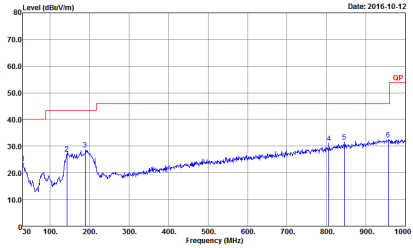
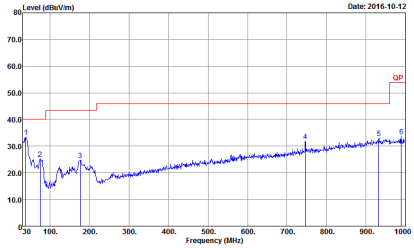
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH165 5825MHz	
2	Horizontal	Vertical
<p>Peak</p> <p>Avg.</p>	 <p>Site : 03CH12-HY Condition : PEAK(UNI) 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 631725-02 Mode : 8</p>	 <p>Site : 03CH12-HY Condition : PEAK(UNI) 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 631725-02 Mode : 8</p>



Band 4 5725~5850MHz

Emission below 1GHz

5GHz WIFI 802.11a (LF)

WIFI	5GHz 5725~5850MHz	
ANT	802.11a LF	
2	Horizontal	Vertical
<p>QP / Peak</p>	 <p>Site : 03CH12-HY Condition : QP 3m BILLOG_6111D_37059 HORIZONTAL Detector : Peak Project : 631725-02 Mode : 10</p>	 <p>Site : 03CH12-HY Condition : QP 3m BILLOG_6111D_37059 VERTICAL Detector : Peak Project : 631725-02 Mode : 10</p>



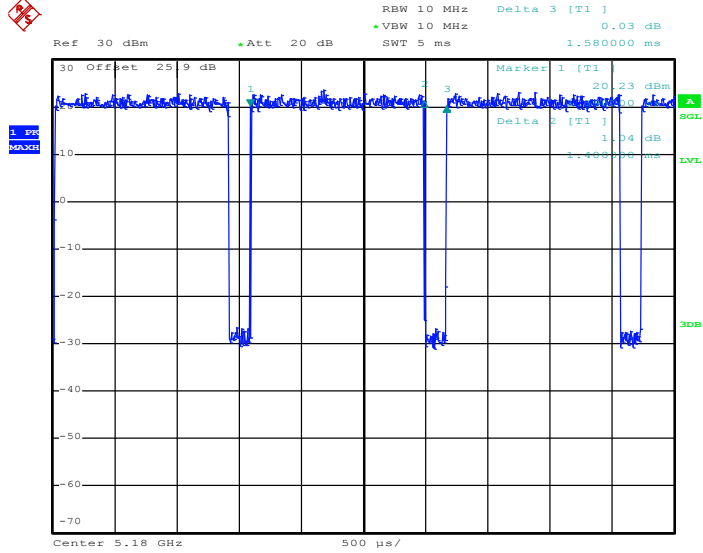
Appendix D. Duty Cycle Plots

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>

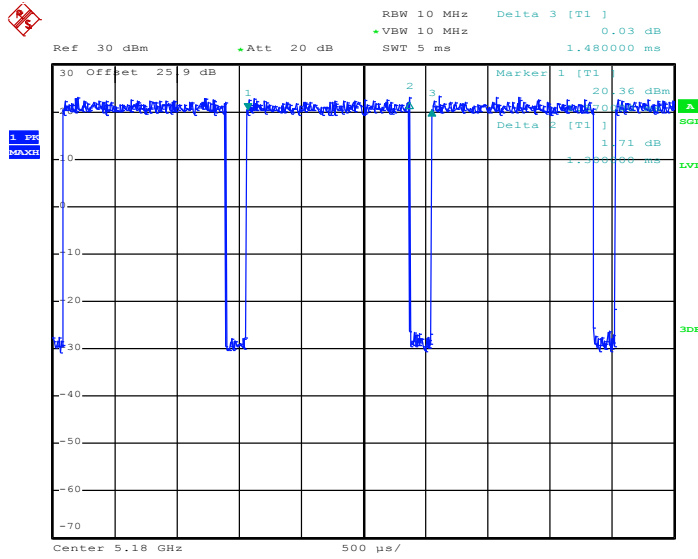
802.11a



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

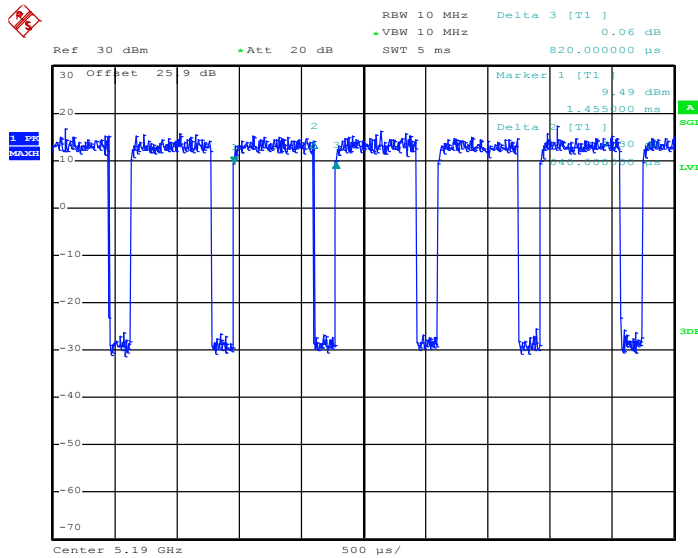


802.11n HT20



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

802.11n HT40

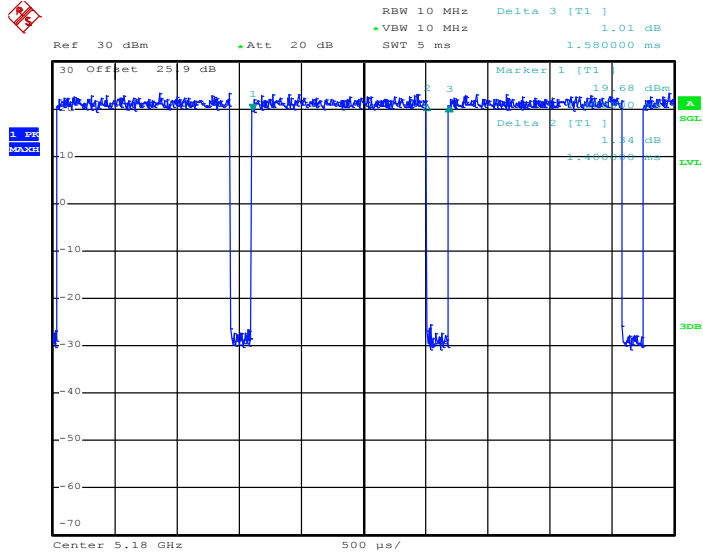


Date: 5.OCT.2016 23:24:28



<Ant. 2>

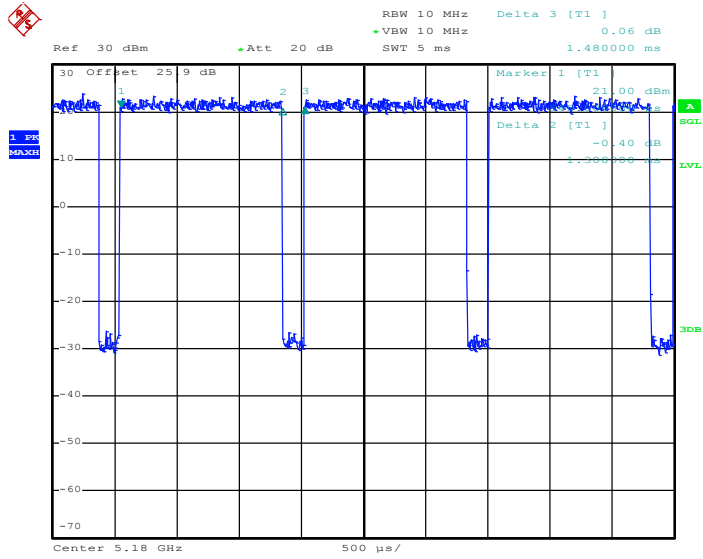
802.11a



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

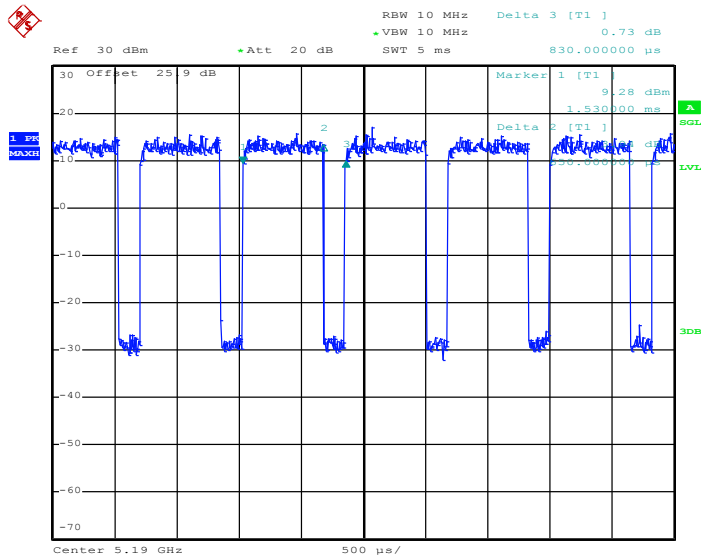


802.11n HT20



Date: 5.OCT.2016 23:07:55

802.11n HT40



Date: 5.OCT.2016 23:27:15