



Test Document

Document Number: REC-001F15C247
Revision: A
Date: 12/30/2010
Page: 1 of 19
FCC ID: YQN-AT10A

Product: Asset Tracker
Model Number: P1-0001
Serial Number: 18
Client: Recon Dynamics, LLC
Address: 2300 Carillion Point, Kirkland, WA 98033
FCC Rule Part(s): FCC Rules Part 15.247; Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz
FCC Guidance: Measurement of Digital transmission Systems Operating under Section 15.247, March 23, 2005
FCC Classification: DSS - Part 15 Spread Spectrum Transmitter
Test Date: 5, 15, 20, 29 Dec 2010
Test Result: Pass

Prepared By:

A handwritten signature in cursive script that reads 'Tim Blom'.

Tim Blom - RF Engineer

Reviewed By:

A handwritten signature in cursive script that reads 'David A. Mitchell'.

David A Mitchell - President



Test Document

Document Number: REC-001F15C247
Revision: A
Date: 12/30/2010
Page: 2 of 19
FCC ID: YQN-AT10A

Table of Contents

| | | |
|----------|--|----------|
| 1 | INTRODUCTION | 3 |
| 2 | FCC PART 2.1033 APPLICATION FOR CERTIFICATION | 3 |
| 3 | FCC PART 15 | 4 |
| 4 | TEST SUMMARY FCC PART 15.247 | 4 |
| 5 | TEST EQUIPMENT | 5 |
| 6 | TEST SETUP DIAGRAM | 5 |
| 7 | TEST RESULTS | 6 |
| 7.1 | 6DB BANDWIDTH | 6 |
| 7.2 | MAXIMUM PEAK CONDUCTED RF POWER | 7 |
| 7.3 | TRANSMITTER BAND EDGE AND CONDUCTED SPURIOUS EMISSIONS MEASUREMENT | 11 |
| 7.4 | POWER SPECTRAL DENSITY MEASUREMENT..... | 18 |

TABLE OF FIGURES

| | |
|--|---|
| Figure 1: Conducted RF Measurements Test Setup | 5 |
|--|---|



Test Document

Document Number: REC-001F15C247
 Revision: A
 Date: 12/30/2010
 Page: 3 of 19
 FCC ID: YQN-AT10A

1 Introduction

This test report supports an application for certification of a transmitter operating pursuant to 47 CFR 15.247.

Conducted RF measurements have been performed by NextGen RF Design at their design lab located in Waseca, Minnesota. Radiated spurious emissions measurements were performed by TÜV SÜD America at their Taylors Falls, MN test facility (FCC registration number 90983). Radiated spurious emissions information is supplied in a separate test document exhibit.

2 FCC Part 2.1033 Application for Certification

2.1033(b): Applications for equipment operating under Parts 11, 15 and 18 of the rules shall be accompanied by a technical report containing the following information:

| FCC Rule Part | | | |
|---------------|----------------------|--------------------------|--|
| 2.1033(b)(1) | Applicant | Company Name: | Recon Dynamics, LLC |
| | | Address: | 2300 Carillon Point |
| | | Phone: | 425-828-8051 |
| | | Fax: | 425-828-8060 |
| | | Contact Name: | Elliott Hoole |
| | Manufacturer | Email: | ehoole@recondynamics.com |
| | | Company Name: | Recon Dynamics, LLC |
| | | Address: | 2300 Carillon Point |
| | | Phone: | 425-828-8051 |
| | | Fax: | 425-828-8060 |
| 2.1033(b)(2) | Equipment | Contact Name: | Elliott Hoole |
| | | Email: | ehoole@recondynamics.com |
| | | FCC ID: | YQN-AT10A |
| 2.1033(b)(2) | Equipment | EUT Model Number: | P1-0001 |
| | | EUT Serial Number: | 18 |
| | | | |
| 2.1033(b)(3) | | User Information | Attached as separate exhibit |
| 2.1033(b)(4) | | Circuit description | Attached as separate exhibit |
| 2.1033(b)(5) | | Block diagram - detailed | Attached as separate exhibit |
| 2.1033(b)(6) | | Test Report | Attached as separate exhibit |
| 2.1033(b)(7) | | Internal Photographs | Attached as separate exhibit |
| 2.1033(b)(7) | | External Photographs | Attached as separate exhibit |
| 2.1033(b)(8) | Peripheral Equipment | Can be used | No |
| | | Commercially available | N/A |
| 2.1033(b)(9) | | Transition rules apply | No |
| 2.1033(b)(10) | | Scanning Receiver | No |
| 2.1033(b)(11) | | 59-64 GHz band | No |
| 2.1033(b)(12) | | Software defined radio | No |



Test Document

Document Number: REC-001F15C247
 Revision: A
 Date: 12/30/2010
 Page: 4 of 19
 FCC ID: YQN-AT10A

3 FCC Part 15

| Part 15 requirements | Comment |
|----------------------|--|
| 15.15(b) | There are no controls available or accessible to the user that allow for changing the RF output power. |
| 15.19 | Two part statement located in user information documentation. |
| 15.21 | Information to the user is displayed in the <i>user information</i> exhibit. |
| 15.27 | No special accessories required. |
| 15.31 | The DUT was tested in accordance with the measurement standards in this section. |
| 15.33 | The frequency range was verified according to the requirements listed in this section. |
| 15.35 | Emissions were measured using the measurement detector and bandwidths specified in this section or as specified in 15.247. |
| 15.203 | The antenna for this device is not removable. |
| 15.205 / 15.209 | The fundamental emission is not in a Restricted band and the spurious and harmonic emissions that fall in a Restricted band comply with the general emission limits of 15.209. |
| 15.207 | The DUT power supply meets the AC line conducted emissions requirements of 15.207 |
| 15.247 | See table below |

4 Test Summary FCC Part 15.247

| Requirement | Test | Pass/Fail or N/A |
|------------------|--|------------------|
| FCC 15.247(a)(2) | 6dB Bandwidth | Pass |
| FCC 15.247(b)(3) | Maximum peak conducted power | Pass |
| FCC 15.247(b)(4) | Antenna Gain | Pass |
| FCC 15.247(c) | Antenna gain greater than 6 dB | N/A |
| FCC 15.247(d) | 100 kHz Bandwidth of Frequency Band Edges and Conducted Spurious Emissions | Pass |
| FCC 15.247(e) | Power Spectral Density | Pass |
| FCC 15.247(f) | Hybrid Systems | N/A |
| FCC 15.247(g) | Frequency Hopping | N/A |
| FCC 15.247(h) | Intelligent Frequency Hopping | N/A |
| FCC 15.247(i) | Radio Frequency Exposure (separate exhibit) | Pass |



Test Document

Document Number: REC-001F15C247
Revision: A
Date: 12/30/2010
Page: 5 of 19
FCC ID: YQN-AT10A

5 Test Equipment

| Equipment | Manufacturer | Model | S/N | Cal Due |
|----------------------|----------------------|-------------|------------|---------------------------|
| Spectrum Analyzer | Agilent | EXA N9010A | MY49060542 | 19 Feb 2011 |
| Spectrum Analyzer | HP/ Agilent | 8563E | 3221A00149 | 23 Sept 2012 |
| Attenuator | Mini-Circuits | BW-N30W5 | 0521 | Calibrated at time of use |
| Temperature/humidity | La Crosse Technology | WS-9023U-IT | N/A | N/A |

6 Test Setup Diagram

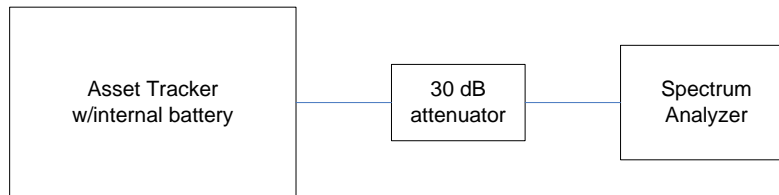


Figure 1: Conducted RF Measurements Test Setup

All measurements performed using the Agilent EXA N9010A spectrum analyzer with the exception of the spurious emissions from 7000 - 10,000 MHz which used the HP/Agilent 8563E spectrum analyzer.



Test Document

Document Number: REC-001F15C247
 Revision: A
 Date: 12/30/2010
 Page: 6 of 19
 FCC ID: YQN-AT10A

7 Test Results

7.1 6dB Bandwidth

Procedure: OET Measurement of Digital transmission Systems Operating under Section 15.247, March 23, 2005
 Tested by: Tim Blom
 Date: 15 Dec 2010
 Humidity: 8 %
 Temperature: 21.9 °C

FCC Rule: 15.247(a)(2)

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

| Results | |
|--------------------------|-----------|
| Transmit Frequency: | 910 MHz |
| Measured 6 dB Bandwidth: | 3.19 MHz |
| Requirement: | > 500 kHz |
| Margin: | 2690 kHz |
| Result: | Pass |



6dB Bandwidth



Test Document

Document Number: REC-001F15C247
 Revision: A
 Date: 12/30/2010
 Page: 7 of 19
 FCC ID: YQN-AT10A

7.2 Maximum Peak Conducted RF Power

Procedure: OET Measurement of Digital transmission Systems Operating under Section 15.247, March 23, 2005
 Tested by: Tim Blom
 Date: 05, 15 Dec 2010
 Humidity: 12, 8%
 Temperature: 21.3, 21.9 °C

FCC Rule: 15.247(b)(3)

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

Using the *OET Measurement of Digital transmission Systems Operating under Section 15.247, March 23, 2005* measurement procedure, the transmitter power was measured with the guidance of Power Output Option 2 Method #1. For this measurement procedure, the following conditions are required:

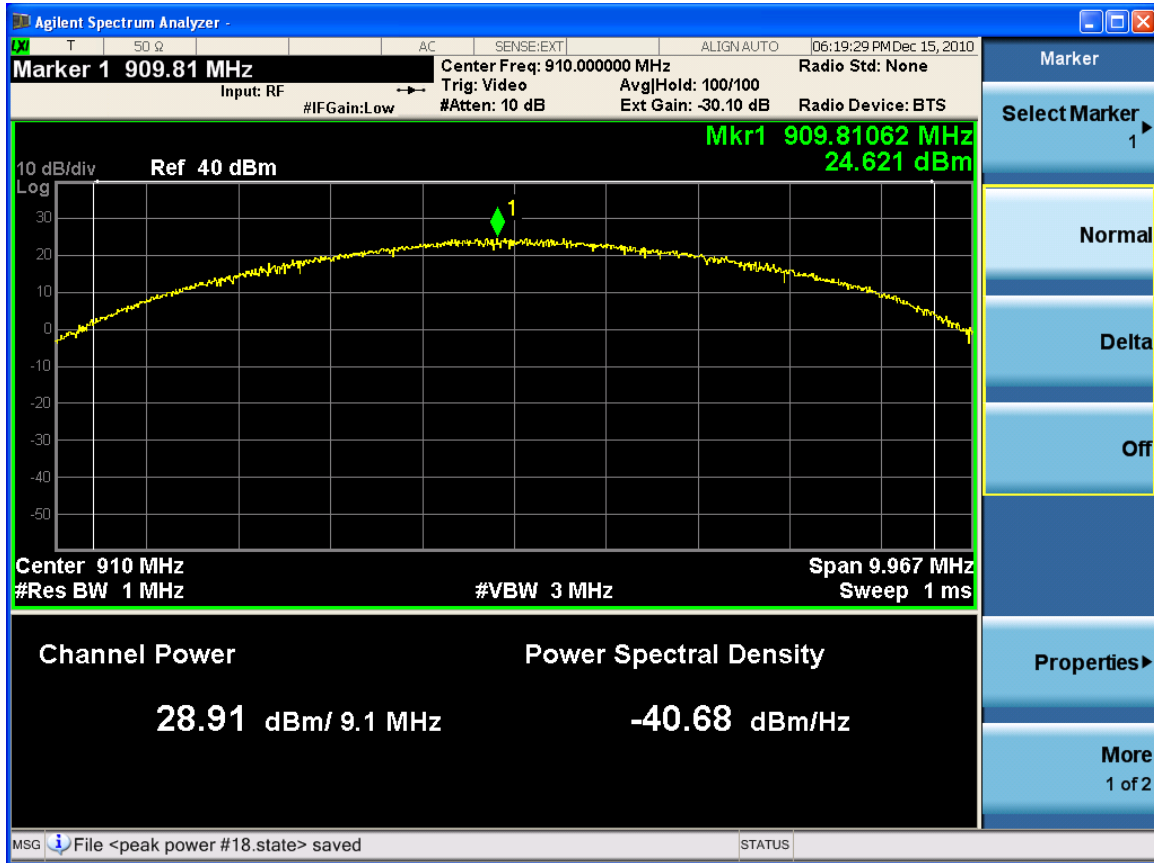
| Requirement | Actual Conditions |
|--|--|
| Sweep time $\leq T$ | Auto sweep time = 1 msec, T = 95 msec |
| Span \geq EBW of signal | Span = 9.967 MHz |
| 26 dB EBW | 9.03 MHz |
| Sample detector if span/# points in spectrum display $< 0.5 \cdot RBW$ | Span = 9.967 MHz # points = 1001 $9.967 \times 10^6 / 1001 = 9957 < 0.5 \cdot 1 \times 10^6 = 500,000$ |

| Results | |
|--------------------------------|-------------------------|
| Transmit Frequency: | 910 MHz |
| Measured Peak conducted power: | 28.91 dBm or 0.778 watt |
| Requirement: | ≤ 30 dBm or 1 watt |
| Margin: | 1.09 dB or 0.222 watt |
| Result: | Pass |



Test Document

Document Number: REC-001F15C247
Revision: A
Date: 12/30/2010
Page: 8 of 19
FCC ID: YQN-AT10A

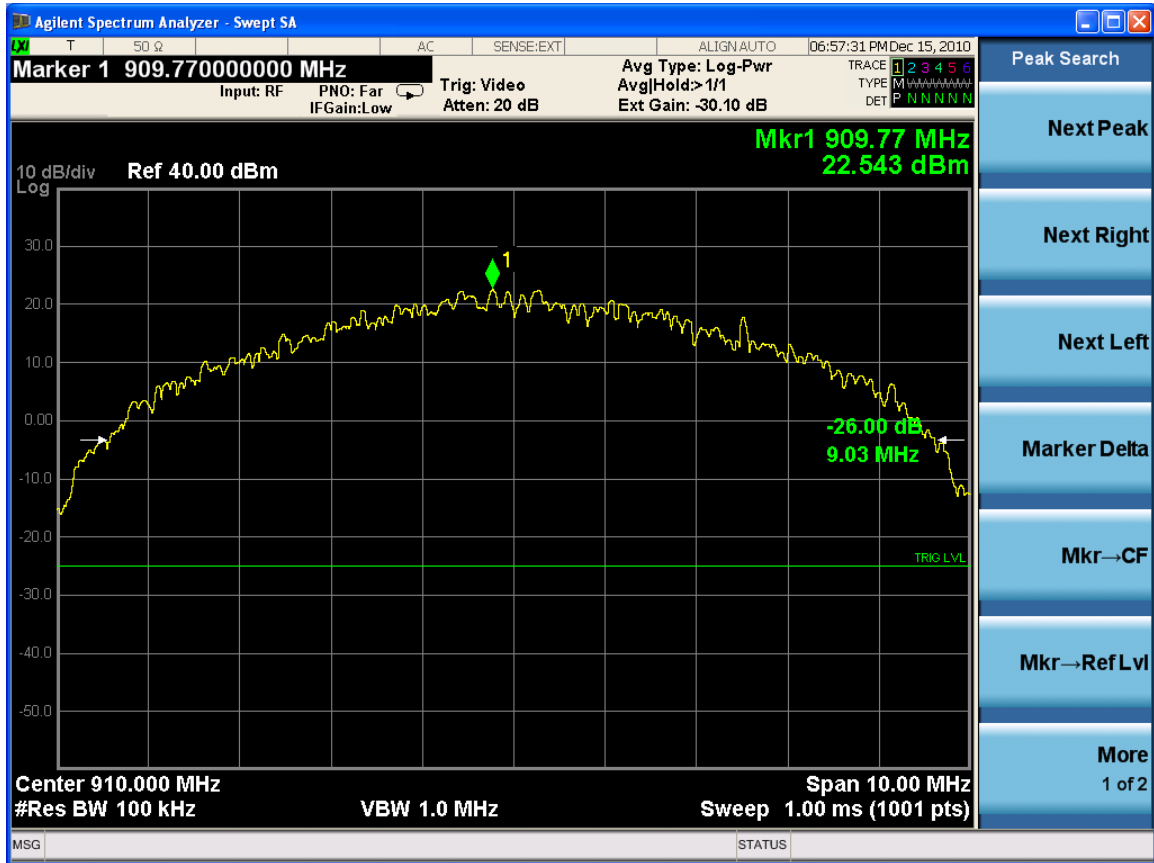


Peak Conducted RF Power



Test Document

Document Number: REC-001F15C247
Revision: A
Date: 12/30/2010
Page: 9 of 19
FCC ID: YQN-AT10A

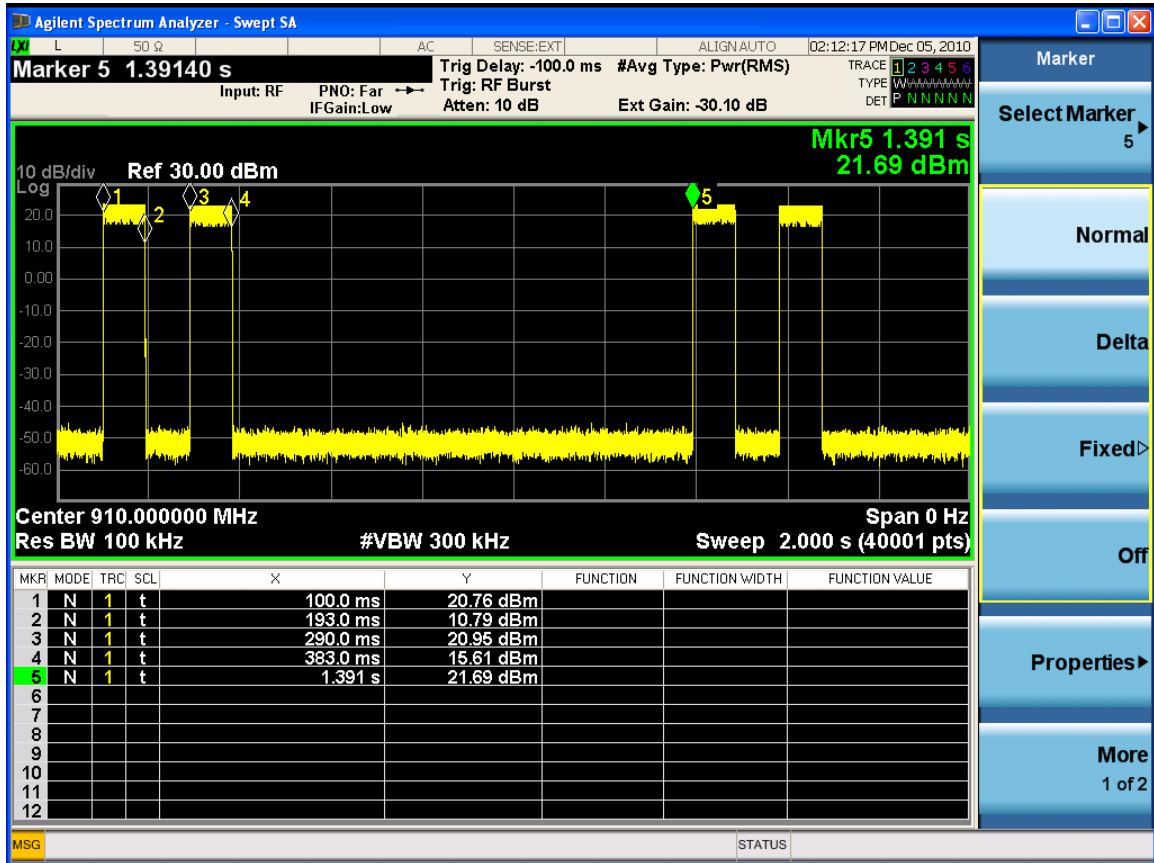


26dB Emission Bandwidth Measurement



Test Document

Document Number: REC-001F15C247
 Revision: A
 Date: 12/30/2010
 Page: 10 of 19
 FCC ID: YQN-AT10A



Burst Timing



Test Document

Document Number: REC-001F15C247
 Revision: A
 Date: 12/30/2010
 Page: 11 of 19
 FCC ID: YQN-AT10A

7.3 Transmitter Band Edge and Conducted Spurious Emissions Measurement

Procedure: OET Measurement of Digital transmission Systems Operating under Section 15.247, March 23, 2005
 Tested by: Tim Blom
 Date: 5, 15, 20, 29 Dec 2010
 Humidity: 12, 8, 14, 38 %
 Temperature: 21.3, 21.9, 22.0, 22.4 °C

FCC Rule: 15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205 (a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Results:

| Band Edge Attenuation | | | |
|----------------------------|------------|-------------|--|
| Peak inband 100 kHz power: | 22.495 dBm | | |
| Required attenuation: | 30 dB | | |
| Maximum out of band power: | -7.505 dBm | (22.495-30) | |

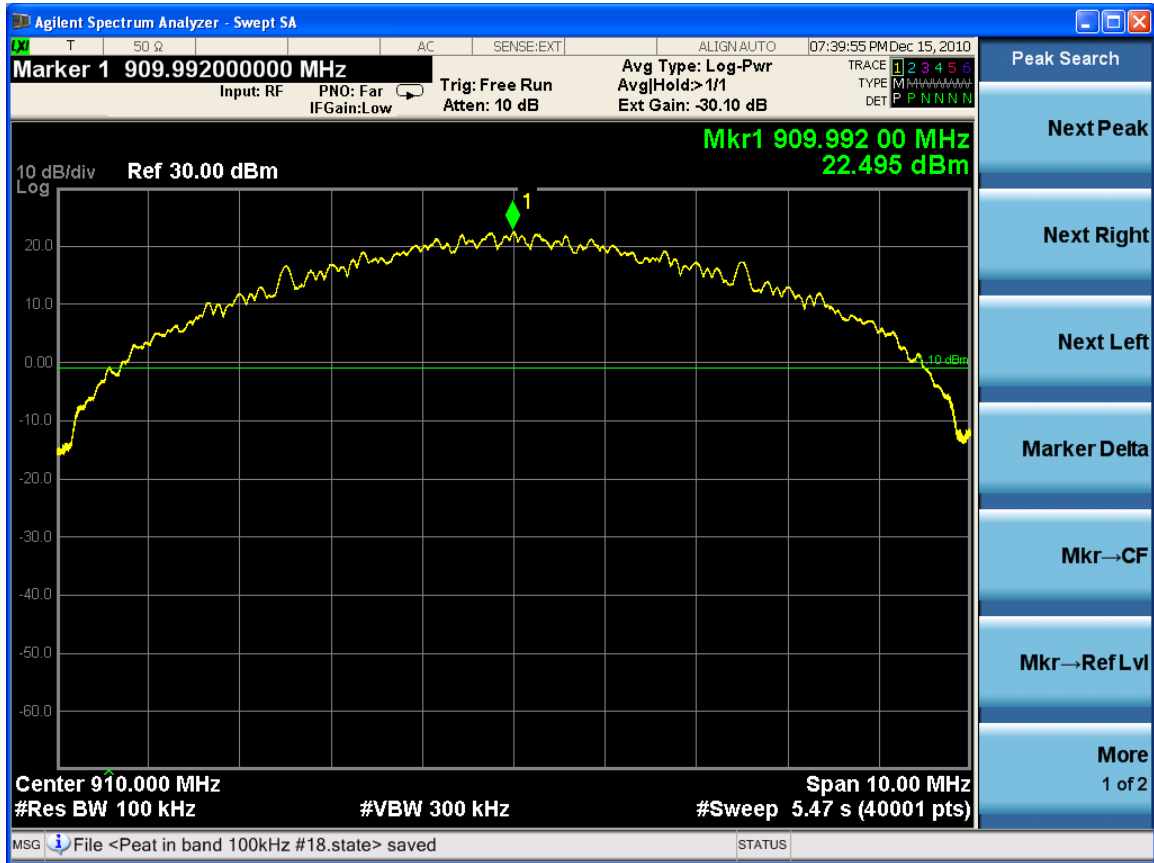
| Band Edge Emissions | | | | | |
|-------------------------|-----------------|-------------------------------|-------------|-------------|--------|
| Channel Frequency (MHz) | Band Edge | Measured Spurious Level (dBm) | Limit (dBm) | Margin (dB) | Result |
| 910 | Lower Band Edge | -10.397 | -7.505 | 2.892 | Pass |
| | Upper Band Edge | -35.605 | -7.505 | 28.100 | Pass |

| Conducted Spurious Emissions | | | | | |
|------------------------------|--------------------------|-------------------------------|-------------|-------------|--------|
| Channel Frequency (MHz) | Spurious Frequency (MHz) | Measured Spurious Level (dBm) | Limit (dBm) | Margin (dB) | Result |
| 910 | 1820 | -37.477 | -7.505 | 29.972 | Pass |



Test Document

Document Number: REC-001F15C247
Revision: A
Date: 12/30/2010
Page: 12 of 19
FCC ID: YQN-AT10A



Peak inband 100 kHz power



Test Document

Document Number: REC-001F15C247
Revision: A
Date: 12/30/2010
Page: 13 of 19
FCC ID: YQN-AT10A



Lower Band Edge Emissions



Test Document

Document Number: REC-001F15C247
Revision: A
Date: 12/30/2010
Page: 14 of 19
FCC ID: YQN-AT10A

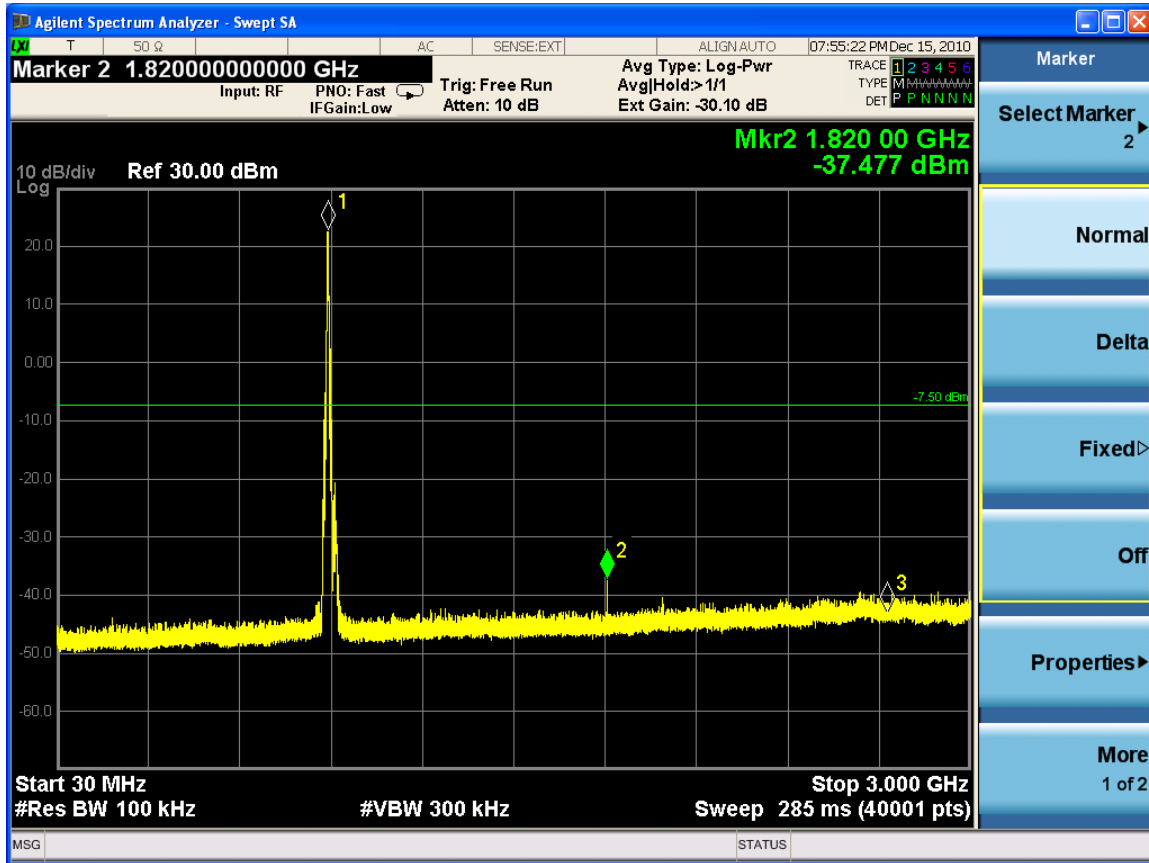


Upper Band Edge Emissions



Test Document

Document Number: REC-001F15C247
Revision: A
Date: 12/30/2010
Page: 15 of 19
FCC ID: YQN-AT10A

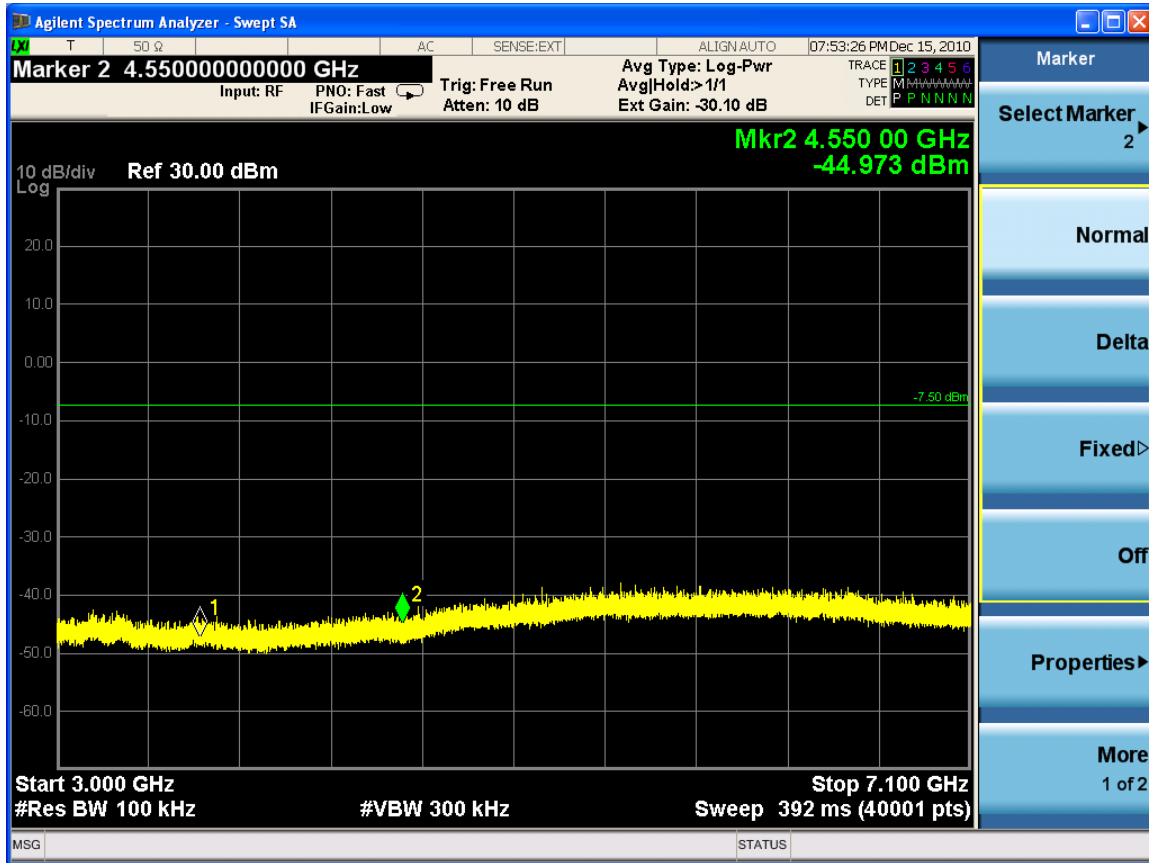


Spurious Emissions, 30 - 3000 MHz



Test Document

Document Number: REC-001F15C247
Revision: A
Date: 12/30/2010
Page: 16 of 19
FCC ID: YQN-AT10A

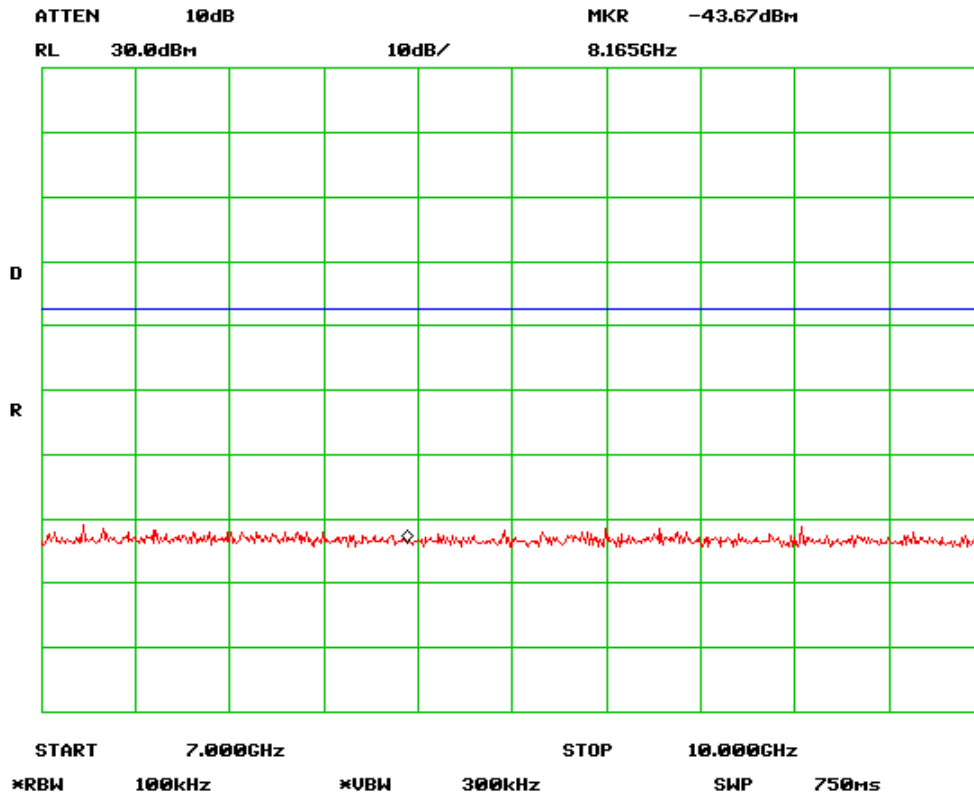


Spurious Emissions, 3000 - 7000 MHz



Test Document

Document Number: REC-001F15C247
Revision: A
Date: 12/30/2010
Page: 17 of 19
FCC ID: YQN-AT10A



Spurious Emissions, 7000 - 10,000 MHz (measured with HP 8563E Spectrum Analyzer)



Test Document

Document Number: REC-001F15C247
Revision: A
Date: 12/30/2010
Page: 18 of 19
FCC ID: YQN-AT10A

7.4 Power Spectral Density Measurement

Procedure: OET Measurement of Digital transmission Systems Operating under Section 15.247, March 23, 2005
Tested by: Tim Blom
Date: 15 Dec 2010
Humidity: 8 %
Temperature: 21.9 °C

FCC Rule: 15.247(e)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

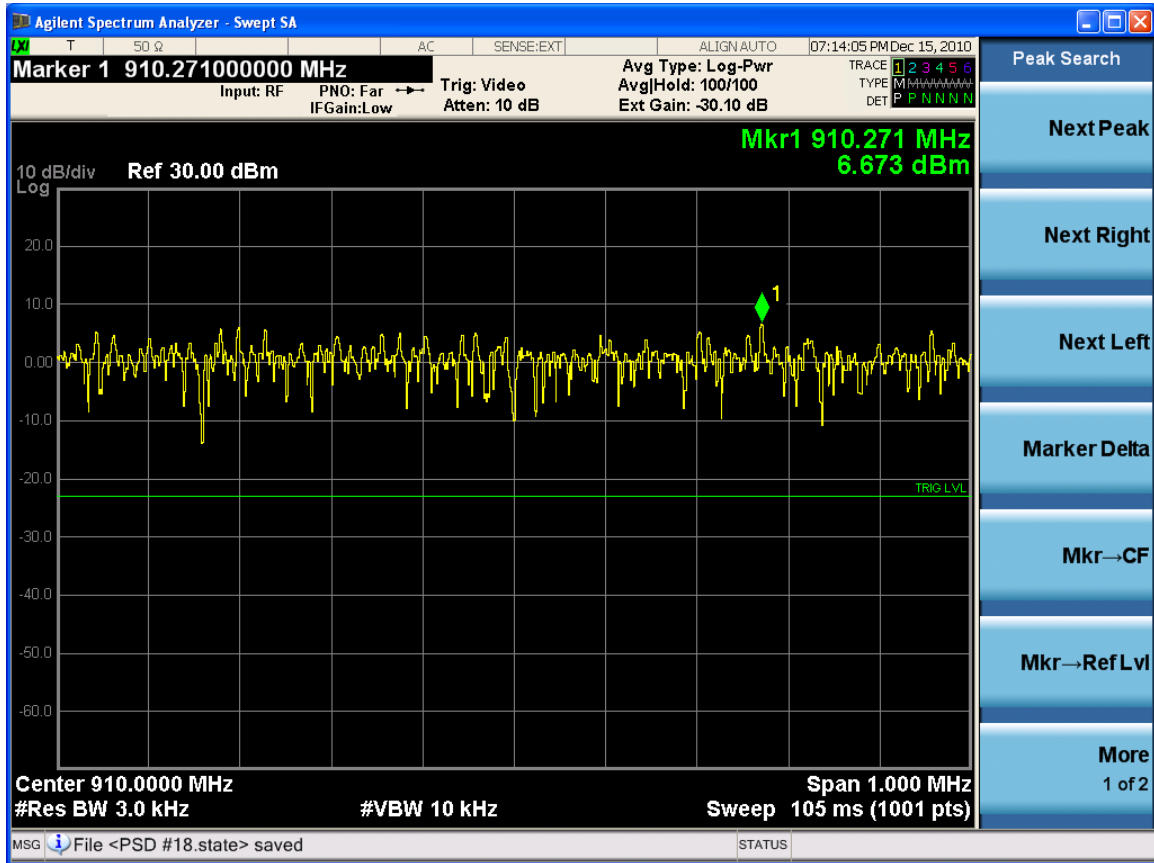
Results:

| Results | |
|----------------------------------|-----------|
| Transmit Frequency: | 910 MHz |
| Requirement: | < 8 dBm |
| Measured Power Spectral Density: | 6.673 dBm |
| Margin: | 1.327 dB |
| Result: | Pass |



Test Document

Document Number: REC-001F15C247
Revision: A
Date: 12/30/2010
Page: 19 of 19
FCC ID: YQN-AT10A



Power Spectral Density