

Certification Test Report

FCC ID: W6E-HS-100101

FCC Rule Part: Part 90, DA-02-545A1

ACS Report Number: 09-0058 - LD

**Manufacturer: HySky Communications, LLC
Model: AD20-100101**

Test Begin Date: February 5, 2009

Test End Date: March 2, 2009

Report Issue Date: April 24, 2009



FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report is not be used to claim certification, approval, or endorsement by NVLAP, NIST or any government agency.

Prepared by: 

**Ken Rivers
Wireless Certifications Technician
ACS, Inc.**

Reviewed by: 

**Kirby Munroe
Director, Wireless Certifications
ACS, Inc.**

This test report shall not be reproduced except in full. This report may be reproduced in part with prior written consent of ACS, Inc. The results contained in this report are representative of the sample(s) submitted for evaluation.

This report contains 18 pages

Table of Contents

| | |
|---|----|
| 1.0 General | 3 |
| 1.1 Purpose | 3 |
| 1.2 Product Description | 3 |
| 1.2.1 General | 3 |
| 1.2.2 Intended Use | 3 |
| 1.3 Test Methodology and Considerations | 3 |
| 2.0 Test Facilities | 4 |
| 2.1 Location | 4 |
| 2.2 Laboratory Accreditations/Recognitions/Certifications | 4 |
| 3.0 Applicable Standards and References | 5 |
| 4.0 List of Test Equipment | 5 |
| 5.0 Support Equipment | 6 |
| 6.0 EUT Setup Block Diagrams | 6 |
| 7.0 Summary of Tests | 7 |
| 7.1 Power Output | 7 |
| 7.2.1 Test Methodology | 7 |
| 7.2.2 Test Results | 7 |
| 7.2 Occupied Bandwidth | 9 |
| 7.2.1 Test Methodology | 9 |
| 7.2.2 Test Results | 9 |
| 7.3 Antenna Conducted Emissions | 11 |
| 7.3.1 Test Methodology | 11 |
| 7.3.2 Test Results | 11 |
| 7.4 Frequency Stability | 14 |
| 7.4.1 Test Methodology | 14 |
| 7.4.2 Test Results | 14 |
| 8.0 CONCLUSION | 18 |

Additional Exhibits Included In Filing

Internal Photographs

External Photographs

Test Setup Photographs

Label Information

Schematics

Tune Up Procedure

Manual

Theory of Operation

Parts List

RF Exposure

System Block Diagram

1.0 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with the FCC Report and Order DA-02-545 dated March 7, 2002.

1.2 Product Description

1.2.1 General

The Intelligent Transceiver Unit or ITU is a half duplex data transceiver. The outbound RF path for the data is a phase modulated (2K80G1D) High Frequency (HF) transmitter, capable of transmitting from 3-30 MHz with an output power of 10 Watts. The actual frequencies used are assigned in accordance with the FCC license WPKU683. An internal automatic antenna tuner allows the ITU to effectively couple to a very electrically short (inefficient) HF "whip" antenna, allowing operation over the entire HF range.

Manufacturer Information:
HySky Communications
7341 Office Park Place
Melbourne, FL 32940

Test Sample Serial Number(s):
ACS#1

Test Sample Condition:
Test sample was in good working condition

Detailed photographs of the EUT are filed separately with this filing.

1.2.2 Intended Use

The HySky Intelligent Transceiver Unit (ITU) is a sophisticated two-way communication device that is designed to be easily setup and simple to operate.

1.3 Test Methodology and Considerations

Each HF transmitter used by the system must be of a type that has received a grant of certification pursuant to the Equipment Authorization Procedures set forth in Part 2, Subpart J of the FCC rules (47 C.F.R. part 2, subpart J). Grant of certification will be based on compliance with the equipment technical specifications found in DA-02-545 Section IV. The equipment authorization waiver approval is shown in exhibit 09-0058 – FCC License.

See test setup photographs for additional information.

2.0 TEST FACILITIES

2.1 Location

The conducted tests were performed at the following address:

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

Rubicom Systems Inc.
284 West Dr. Suite B
Melbourne FL 32904
Phone: (321) 951-1710
Fax: (321) 951-2362

2.2 Laboratory Accreditations/Recognitions/Certifications

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment. In addition, ACS is compliant to ISO 17025 as certified by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program. The following certification numbers have been issued in recognition of these accreditations and certifications:

Advanced Compliance Solutions, Inc
FCC Registration Number: 894540
Industry Canada Lab Code: IC 4175
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

NVLAP Lab Code: 200612-0

Rubicom Systems Inc.
FCC Registration Number: 90911
Industry Canada Lab Code: IC 4175B

3.0 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ❖ TIA-603-C: Land Mobile FM or PM – Communications Equipment – Measurement and Performance Standards, December 2004.
- ❖ US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2008
- ❖ Federal Communication Commission Report and Order DA-02-545, March 7, 2002

4.0 LIST OF TEST EQUIPMENT

All test equipment used for regulatory testing is calibrated yearly or according to manufacturer's specifications.

Table 4-1: Test Equipment

| Equipment Calibration Information | | | | | |
|-----------------------------------|-----------------|--------------------|---------------|-------------------------|------------|
| ACS# | Mfg. | Eq. type | Model | S/N | Cal. Due |
| RE32 1 | Agilent | Spectrum Analyzer | 7405A | MY42000128 | 9/3/2009 |
| N/A | OK Electronics | Power Supply | PS732 | 36095 | N/A |
| N/A | Dell | Computer | Latitude D505 | CN0H2049-48643-46F-1251 | N/A |
| 283 | Rohde & Schwarz | Spectrum Analyzers | FSP40 | 1000033 | 09-19-2009 |

5.0 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

| Item | Equipment Type | Manufacturer | Model Number | Serial Number | FCC ID |
|------|----------------|--------------|--------------|---------------|--------|
| 1 | EUT | HySky | AD20-100101 | ACS#1 | |
| 2 | Antenna Load | HySky | AD30-100104 | N/A | N/A |

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAMS

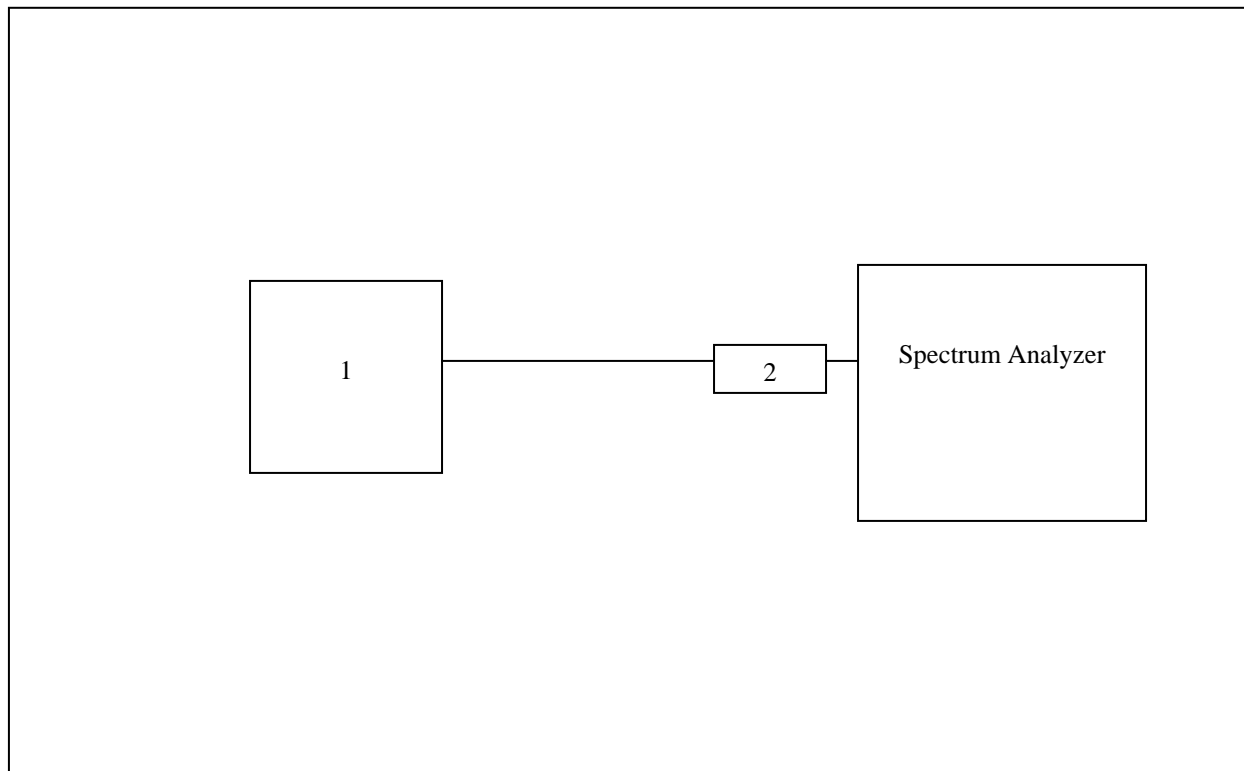


Figure 6-1: EUT Test Setup – Part 15.249

*See Test Setup photographs for additional detail.

7.0 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Power Output

7.1.1 Test Methodology

The power transmitted directly into the antenna was measured by connecting the output of the test item into a spectrum analyzer through the HySky antenna match/attenuator (AD30-100104). The measured loss through the AD30-100104 at 15.0MHz was 38.6dB. The readings were made with peak detection. A 10kHz bandwidth was used, which exceeded the emissions bandwidth of the test signal.

7.1.2 Test Results

In accordance to FCC Document DA-02-545, Section IV, the maximum output power that will be authorized for Intelligent Transceiver Unit Transmitters is 15 watts.

Results of the test are shown below in Table 7.2-1 and Figures 7.1.2-1 – 7.1.2-3.

Table 7.2-1: Power Output

| Frequency (MHz) | Power Output [Watts] |
|-----------------|----------------------|
| 4.488 | 7.037 |
| 15 | 7.858 |
| 23.469 | 5.809 |

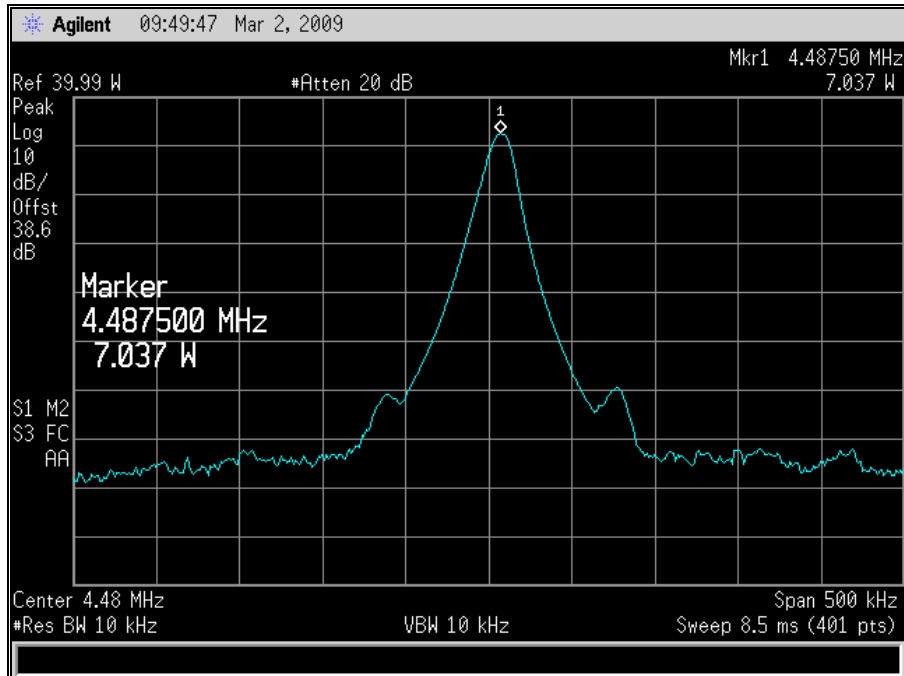


Figure 7.1.2-1: Power Out - Low Channel

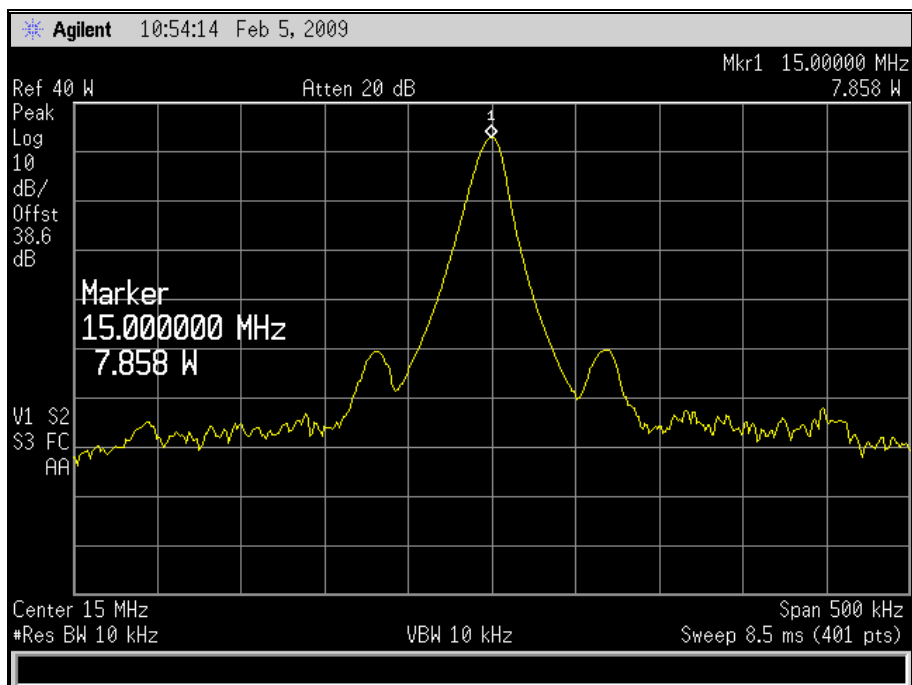


Figure 7.1.2-2: Power Out - Mid Channel

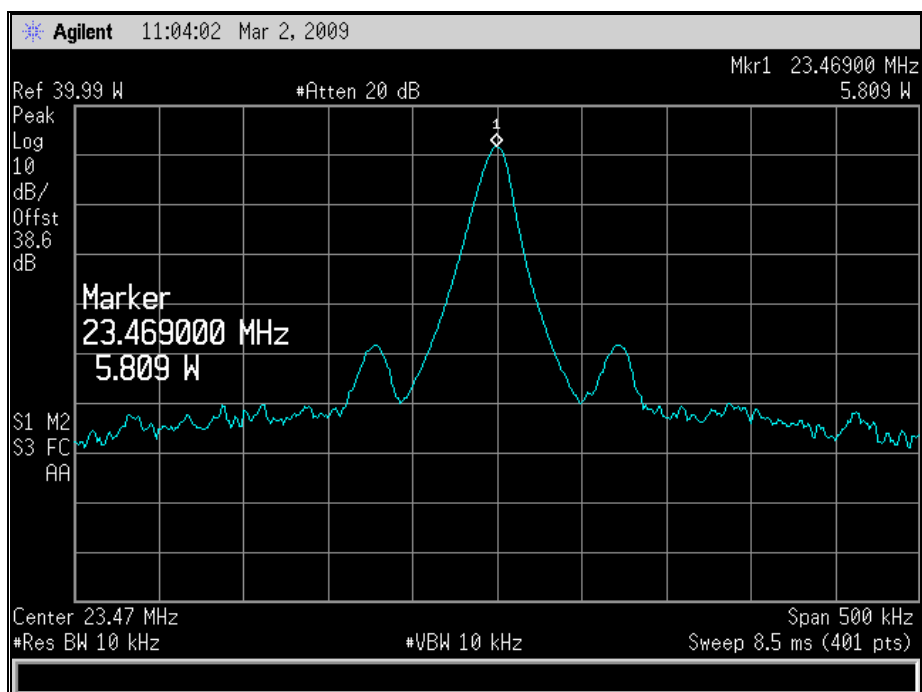


Figure 7.1.2-3: Power Out - High Channel

7.2 Occupied Bandwidth

7.2.1 Test Methodology

The measurement equipment was connected to the test item's antenna port through the HySky antenna match network (AD30-100104). The unit was set to transmit continuously. The test item signal was modulated at the maximum level available. The measurement bandwidth was set to 30 Hz (1% of authorized bandwidth of 3kHz). The emissions near the fundamental frequency were plotted.

In accordance with FCC Document DA-02-545, the authorized bandwidth of the Intelligent Transceiver unit transmitter is 3.0 kHz. The power of emissions outside of the authorized bandwidth must be attenuated below the power of the un-modulated carrier wave in accordance with the following schedule:

- (1) On any frequency removed from the carrier frequency by 50% up to 150% of the authorized bandwidth, at least 25dB.
- (2) On any frequency removed from the carrier frequency by 150% up to 250% of the authorized bandwidth, at least 35dB.
- (3) On any frequency removed from the carrier frequency by 250% or more of the authorized bandwidth, at least 43dB.

7.2.2 Test Results

Results of the test are given in Figures 7.2.2-1 – 7.2.2-3 below:

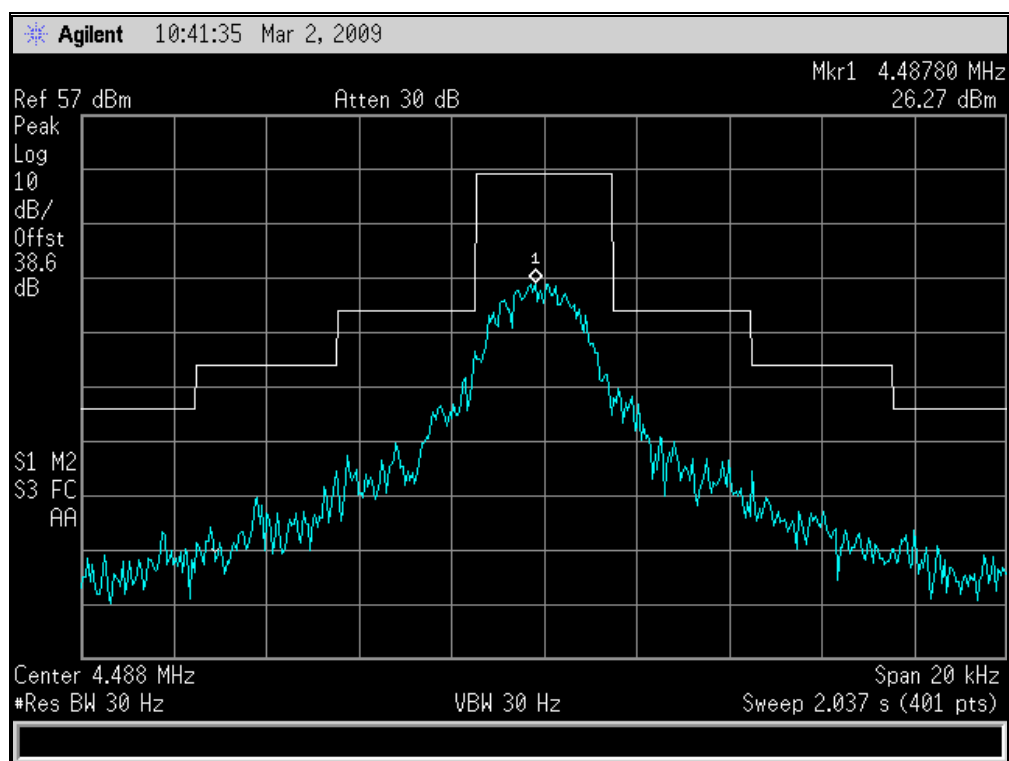


Figure 7.2.2-1: Emissions Mask - Low Channel

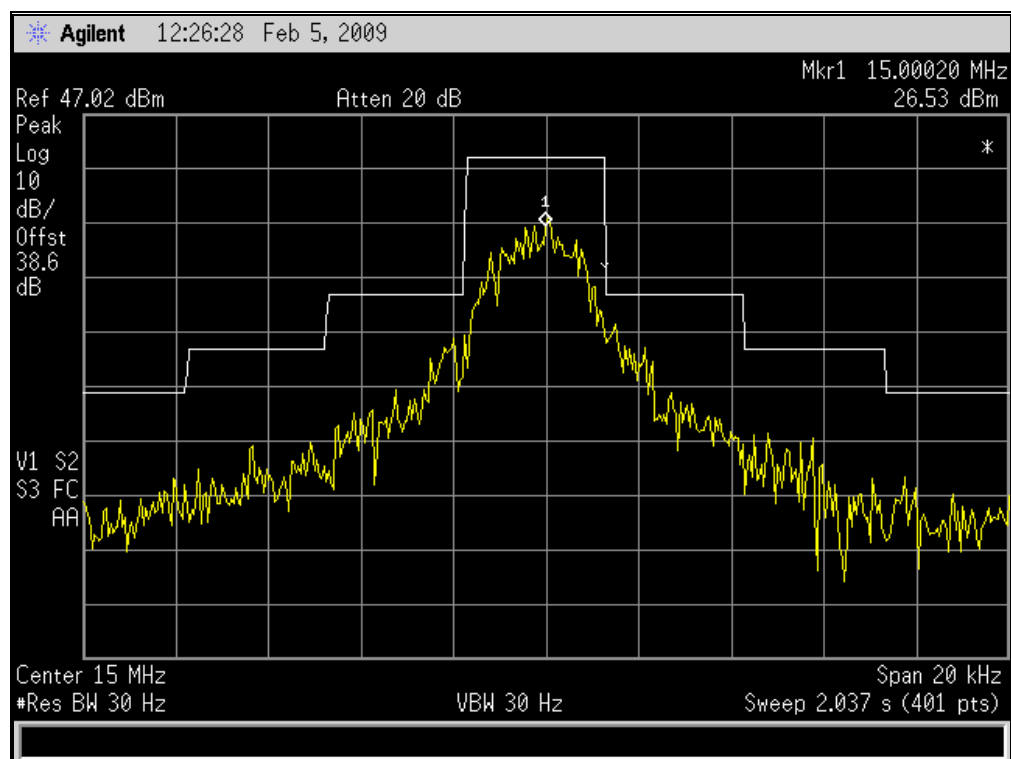


Figure 7.2.2-2: Emissions Mask – Mid Channel

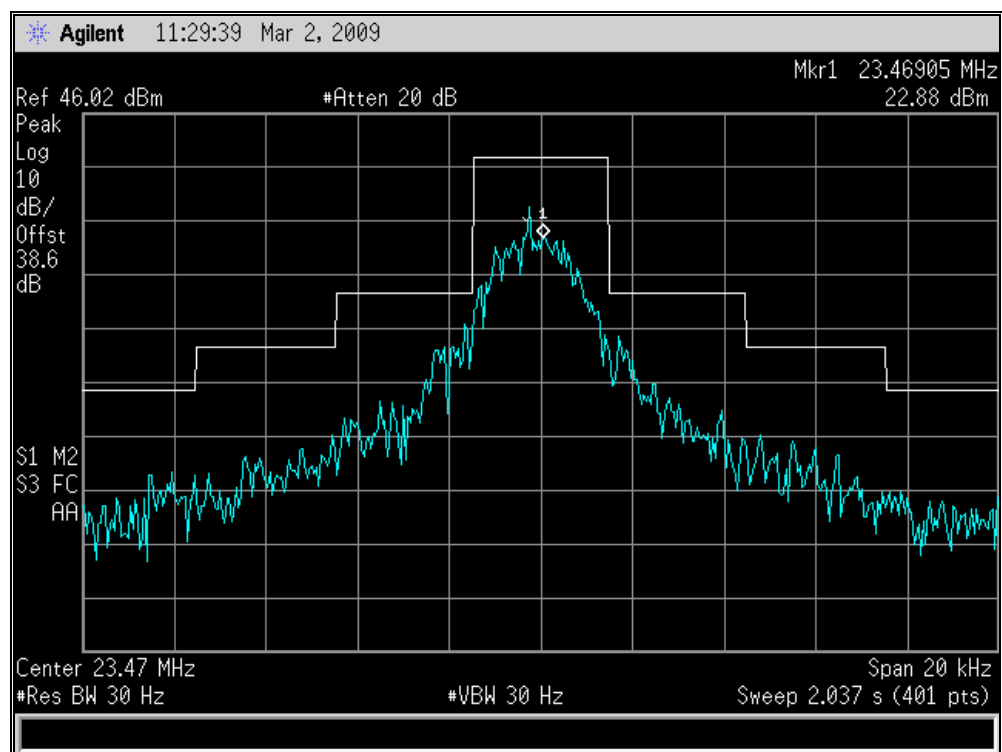


Figure 7.2.2-3: Emissions Mask – High Channel

7.3 Antenna Conducted Emissions

7.3.1 Test Methodology

This test will measure spurious emissions at the antenna terminals.

(a) The test item was connected to the spectrum analyzer through the HySky antenna match/attenuator (AD30-100104).

In accordance with FCC Document DA-02-545, emissions on any frequency removed from the carrier frequency by 250% or more of the authorized bandwidth, shall be at least 43dB below the power of the un-modulated carrier wave.

7.3.2 Test Results

Only those harmonics which were found are presented.

Results are shown below in Figures 7.3.2-1 to 7.3.2-6

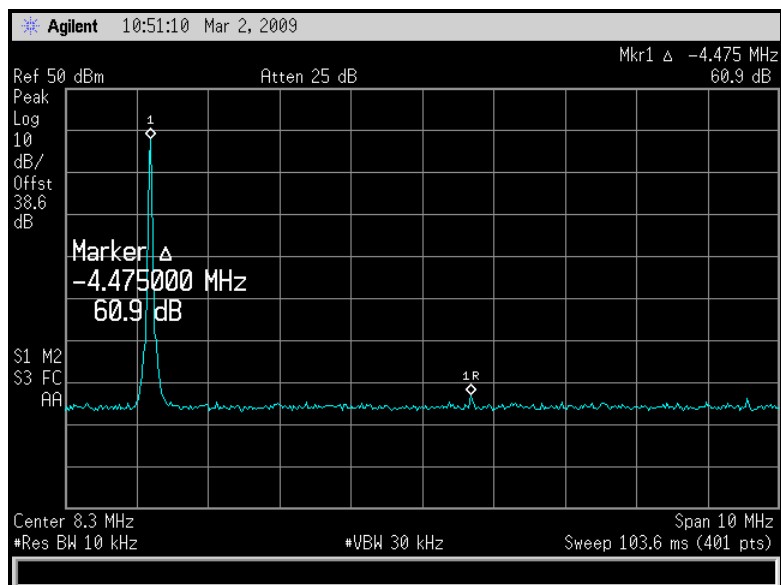


Figure 7.3.2-1: Plot 1 Low Channel

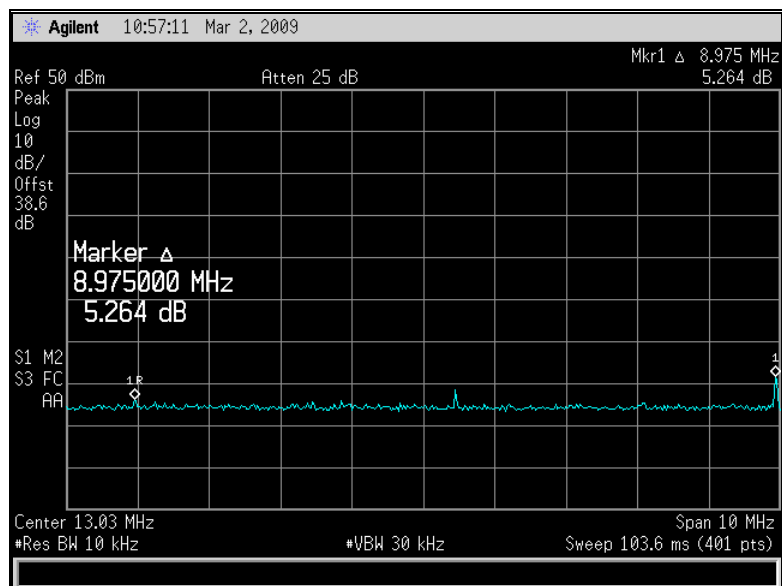


Figure 7.3.2-2: Plot 2 Low Channel

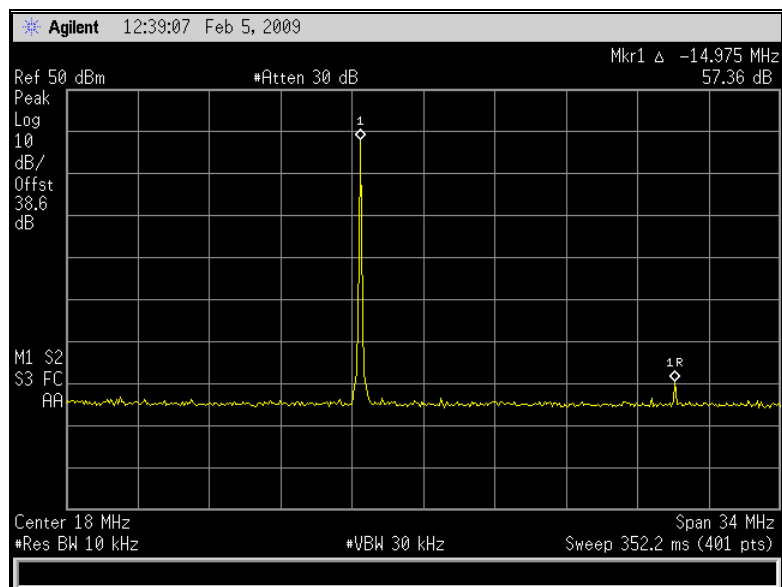


Figure 7.3.2-3: Plot 1 Mid Channel

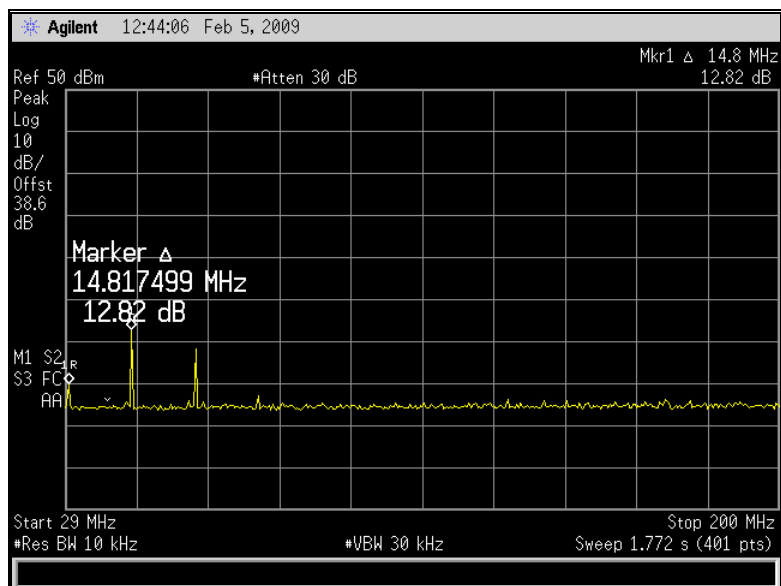


Figure 7.3.2-4: Plot 2 Mid Channel

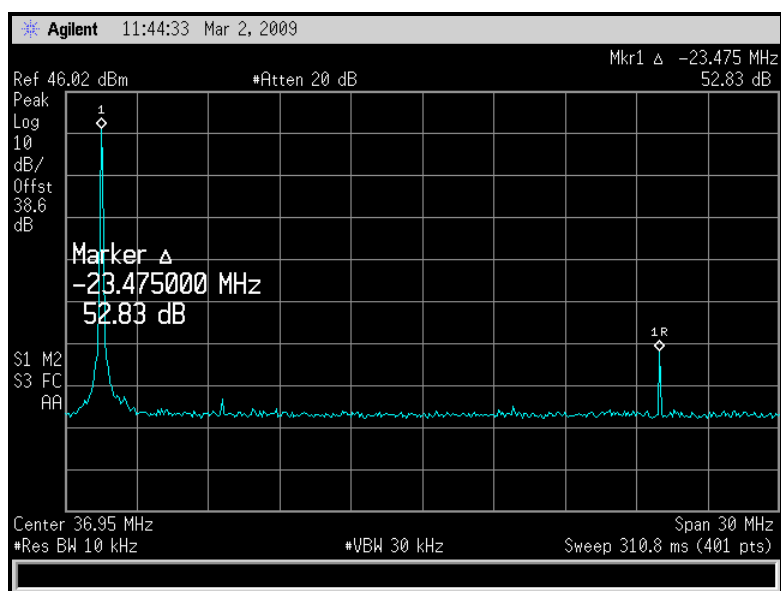


Figure 7.3.2-5: Plot 1 High Channel

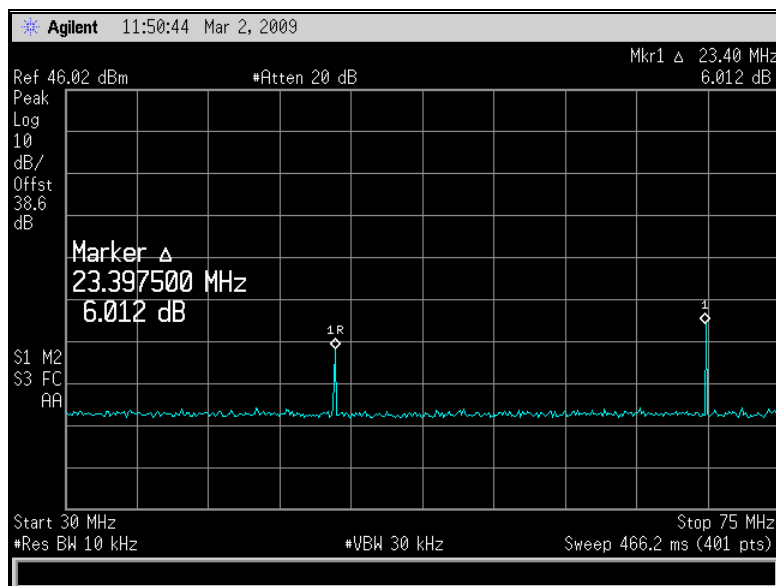


Figure 7.3.2-6: Plot 2 High Channel

7.4 Frequency Stability

7.4.1 Test Methodology

The equipment under test is placed inside an environmental chamber. The RF output is directly coupled to the input of the measurement equipment through the antenna match/attenuator (AD30-100104) and a power supply is attached to the primary supply voltage.

Frequency measurements were made at the extremes of the of temperature range -20°C to $+70^{\circ}\text{C}$ and at intervals of 10°C at normal supply voltage. A period of time sufficient to stabilize all components of the equipment was allowed at each frequency measurement. The maximum variation of frequency was recorded.

7.4.2 Test Results

In accordance to FCC Document DA-02-545, Section IV, the carrier frequency must be stable to ± 10 parts per million over an environmental temperature range of -20 to $+70$ degrees Celsius.

Results are shown below in Figures 7.4.2-1 to 7.4.2-3:

Frequency Stability

Frequency (MHz): 3
Deviation Limit (PPM): 10.0ppm

| Temperature C | Frequency MHz | Frequency Error (PPM) | Voltage (%) | Voltage (VDC) |
|------------------|------------------|--------------------------|----------------|------------------|
| -30 C | 2.9999939 | -2.033 | 100% | 13.80 |
| -20 C | 2.9999936 | -2.133 | 100% | 13.80 |
| -10 C | 2.9999937 | -2.100 | 100% | 13.80 |
| 0 C | 2.9999941 | -1.967 | 100% | 13.80 |
| 10 C | 2.9999939 | -2.033 | 100% | 13.80 |
| 20 C | 2.9999938 | -2.067 | 100% | 13.80 |
| 30 C | 2.9999939 | -2.033 | 100% | 13.80 |
| 40 C | 2.9999936 | -2.133 | 100% | 13.80 |
| 50 C | 2.9999935 | -2.167 | 100% | 13.80 |
| 60 C | 2.9999932 | -2.267 | 100% | 13.80 |
| 70 C | 2.9999940 | -2.000 | 100% | 13.80 |
| 20 C | 2.9999938 | -2.067 | 85% | 11.73 |
| 20 C | 2.9999937 | -2.100 | 115% | 15.87 |

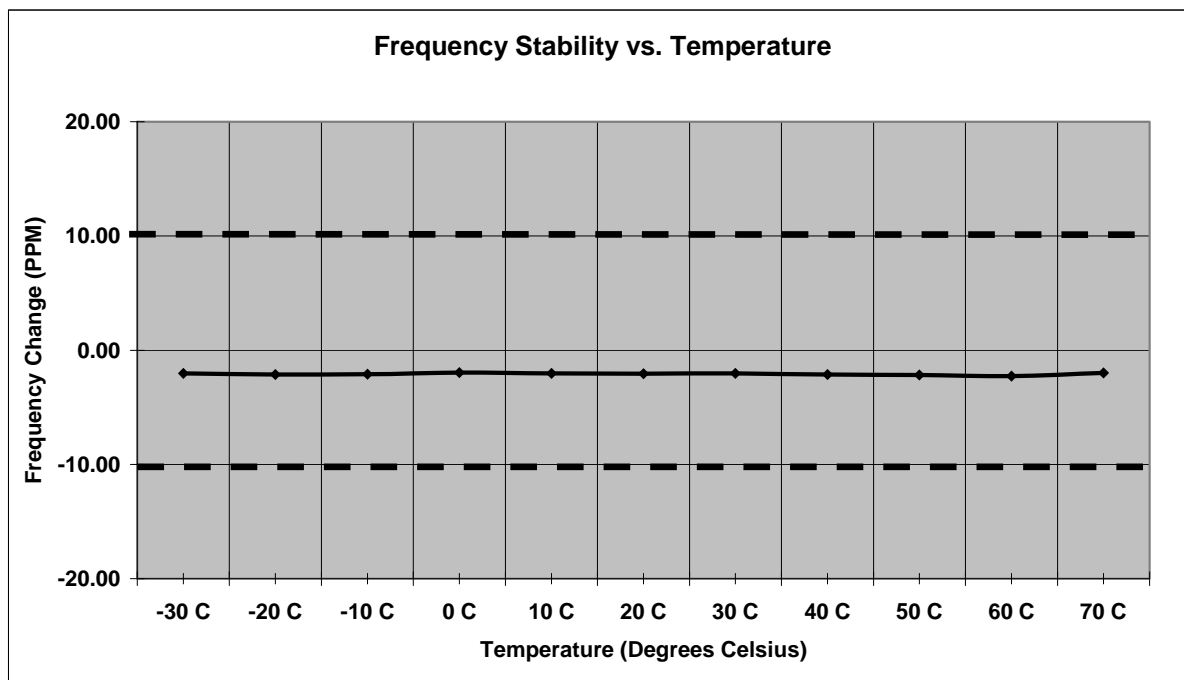


Figure 7.4.2-1: Frequency Stability – Low Channel

Frequency Stability

Frequency (MHz): 15

Deviation Limit (PPM): 10.0ppm

| Temperature C | Frequency MHz | Frequency Error (PPM) | Voltage (%) | Voltage (VDC) |
|------------------|------------------|--------------------------|----------------|------------------|
| -30 C | 14.9999678 | -2.147 | 100% | 13.80 |
| -20 C | 14.9999669 | -2.207 | 100% | 13.80 |
| -10 C | 14.9999676 | -2.160 | 100% | 13.80 |
| 0 C | 14.9999689 | -2.073 | 100% | 13.80 |
| 10 C | 14.9999684 | -2.107 | 100% | 13.80 |
| 20 C | 14.9999674 | -2.173 | 100% | 13.80 |
| 30 C | 14.9999679 | -2.140 | 100% | 13.80 |
| 40 C | 14.9999668 | -2.213 | 100% | 13.80 |
| 50 C | 14.9999654 | -2.307 | 100% | 13.80 |
| 60 C | 14.9999638 | -2.413 | 100% | 13.80 |
| 70 C | 14.9999721 | -1.860 | 100% | 13.80 |
| 20 C | 14.9999671 | -2.193 | 85% | 11.73 |
| 20 C | 14.9999669 | -2.207 | 115% | 15.87 |

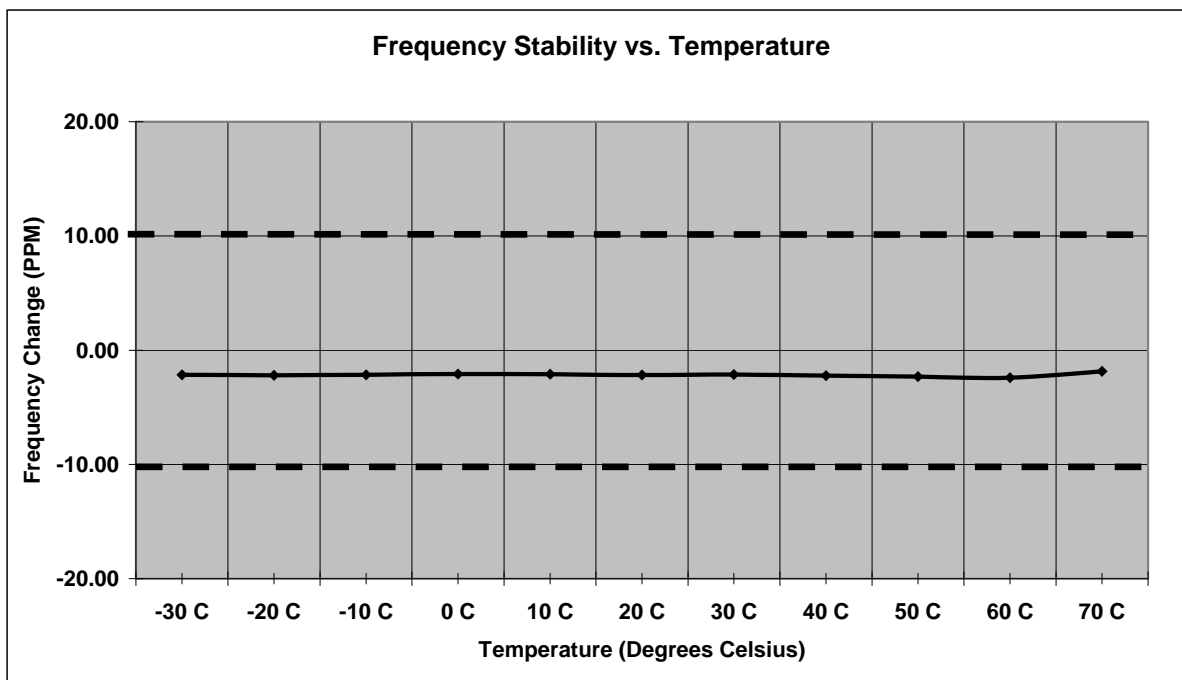


Figure 7.4.2-2: Frequency Stability – Mid Channel

Frequency Stability

Frequency (MHz): 25

Deviation Limit (PPM): 10.0ppm

| Temperature C | Frequency MHz | Frequency Error (PPM) | Voltage (%) | Voltage (VDC) |
|------------------|------------------|--------------------------|----------------|------------------|
| -30 C | 24.9999462 | -2.152 | 100% | 13.80 |
| -20 C | 24.9999459 | -2.164 | 100% | 13.80 |
| -10 C | 24.9999469 | -2.124 | 100% | 13.80 |
| 0 C | 24.9999486 | -2.056 | 100% | 13.80 |
| 10 C | 24.9999486 | -2.056 | 100% | 13.80 |
| 20 C | 24.9999482 | -2.072 | 100% | 13.80 |
| 30 C | 24.9999473 | -2.108 | 100% | 13.80 |
| 40 C | 24.9999455 | -2.180 | 100% | 13.80 |
| 50 C | 24.9999437 | -2.252 | 100% | 13.80 |
| 60 C | 24.9999463 | -2.148 | 100% | 13.80 |
| 70 C | 24.9999571 | -1.716 | 100% | 13.80 |
| 7x | | | | |
| 20 C | 24.9999470 | -2.120 | 85% | 11.73 |
| 20 C | 24.9999466 | -2.136 | 115% | 15.87 |

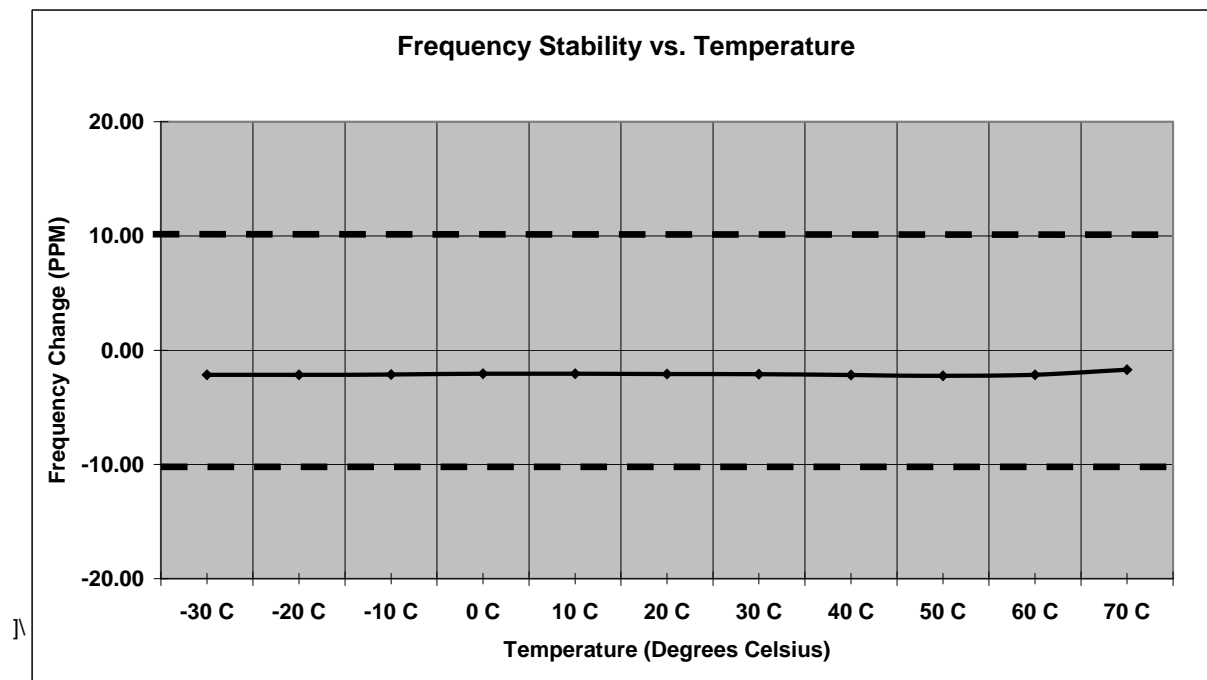


Figure 7.4.2-3: Frequency Stability – High Channel

8.0 CONCLUSION

In the opinion of ACS, Inc. the Intelligent Transceiver Unit manufactured by HySky Communications, LLC meet the requirements of FCC DA-02-545.

END REPORT