EMERSON SMART WIRELESS

RADIO SILENCE REPORT

05.21.10

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For

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1 Introduction

1.1 Purpose & Scope

The purpose of this document is to provide a summary of results from radio silence testing for the Emerson Smart Wireless Gateway and its corresponding Rosemount HART 7 devices. Three devices were connected to the gateway and tested to ensure no transmission occurs after the gateway is powered down. The results are provided in this document.

1.2 Applicable Documents

The reader should be familiar with the following documentation before proceeding:

- *Emerson Radio Silence Procedure Rev. A*
- *Emerson Smart Wireless Gateway Quick Setup Document*

1.3 Revision History

Date	Change Description	Revision
5/17/2010	Preliminary Report Draft	0.1
5/18/2010	Updated Summary Report	1.0
5/20/2010	Summary Report Preliminary Release	1.1
5/21/2010	Final Report Release, Minor Clarifications	2.0

Table 1: Revision History

2 Background and Research

2.1 INTRODUCTION

The Emerson Smart Wireless Gateway and corresponding Rosemount HART 7 devices were provided to be tested for Radio Silence. This testing was done in a RF screen room (Faraday cage) in order to ensure any emissions detected would be only those from the devices themselves and not from the ambient environment. Screen captures were taken from a spectrum analyzer to verify proper compliance.

2.2 TEST EQUIPMENT AND SETUP USED

In order to implement this test, proper equipment was used to monitor the signals in an isolated environment. An Agilent E4407B Spectrum Analyzer was set to monitor the 2.4 GHz ISM band during the duration of the test. The analyzer is calibrated yearly, with a calibration date of March 15th, 2010. Its calibration expires March 15th, 2011. Serial number is US39160256.

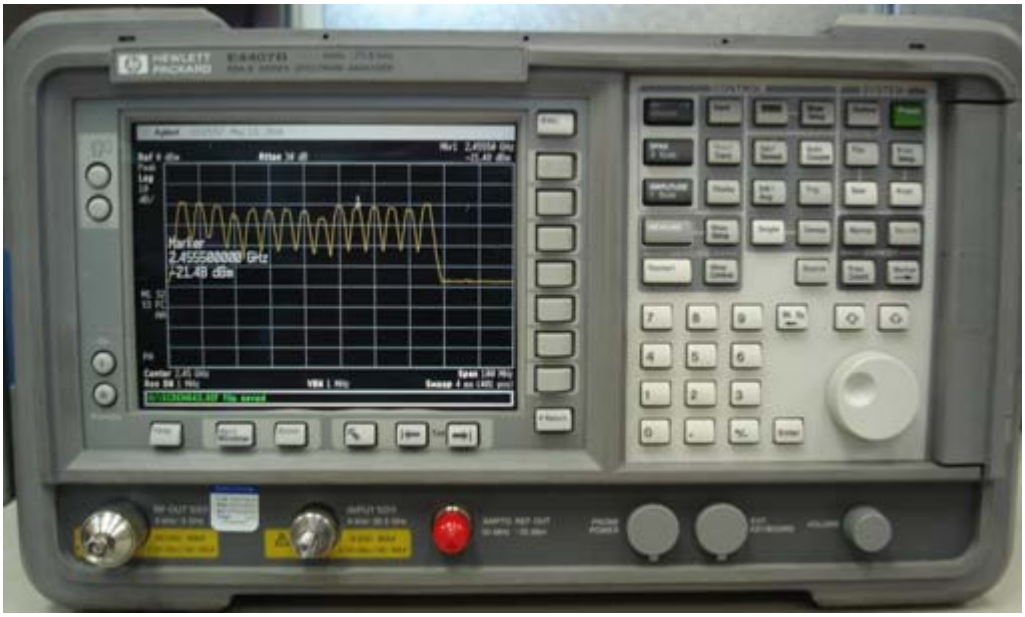

Figure 1 - Agilent E4407B Spectrum Analyzer

A screen room (Faraday cage) was also necessary to ensure complete isolation of the devices from the ambient environment. The room is routinely used to ensure silence for packet error rate testing of various devices, and prohibits any RF from entering or exiting, except via bulkhead connectors. In this test, we connected the spectrum analyzer via cable into the screen room. Inside, an antenna was attached on a platform to sit near the devices in question. A picture of both the exterior of the room as well as the test setup inside are shown below for reference.

Figure 2 – LS Research RF Screen Room

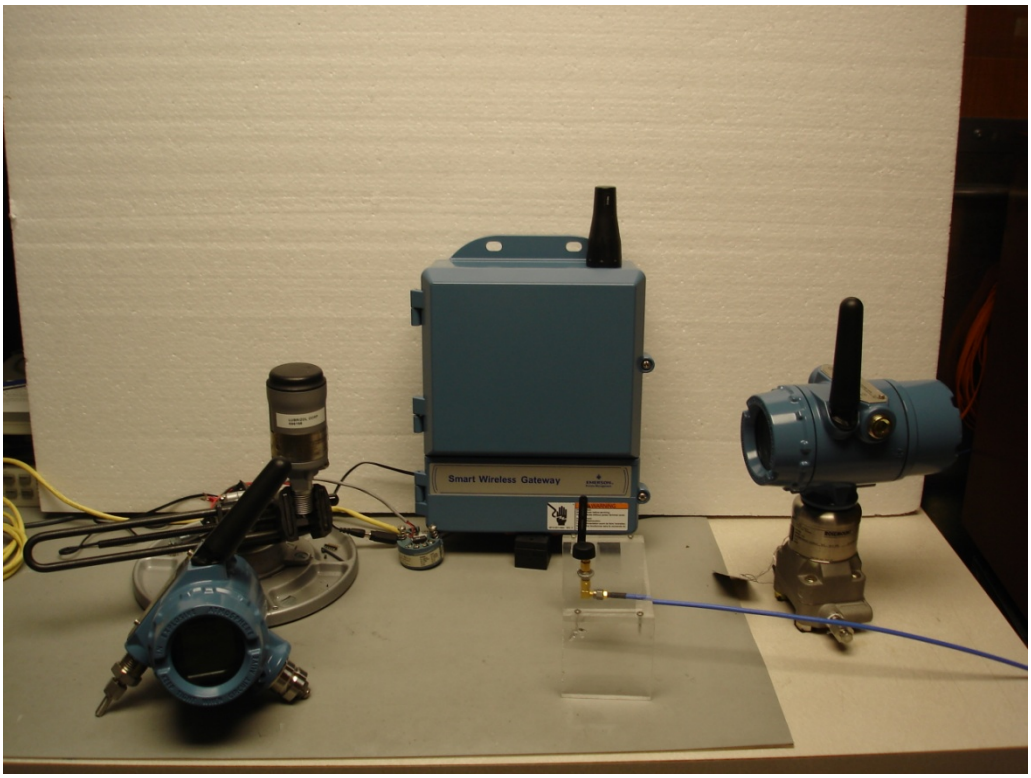

Figure 3 - Emerson Radio Setup in Screen Room

The devices were set up in manner so that the test could be repeated if necessary. All antennas were approximately 10 inches from the antenna being used to monitor the interior of the room from the spectrum analyzer. The tested devices include:

- Emerson Smart Wireless Gateway P/N: 01420-5000-3001, Manufacture Date 18.12.09, Revision 3.8.9
- Rosemount 648DX1D1I1WA3WK1M5 S/N: 0237352
- Rosemount 300S5AXWA1WK1M5 S/N: 0285901
- Emerson Smart Wireless Thum Adapter 775XD11I5WA3WK9 S/N: 0246092

2.3 System Test Procedure

At this point, the test procedure was reviewed and the system was run again to ensure proper operation prior to beginning the test. The following sections illustrate every major step in order to provide a level of credibility to the test results. Timestamps are provided whenever relevant, as well as screen captures from the spectrum analyzer.

2.3.1 Noise Floor Measurement

The Emerson system was set up to automatically join the network once the base station was plugged into AC power. Operation was verified on the bench prior to moving the test setup into the screen room. All units were powered down to take a noise floor measurement. All measurements made on the spectrum analyzer are time and date stamped. The noise floor was verified to be no greater than -59.6 dBm with no equipment running and the screen room door shut. Following this point, any emissions greater than the noise floor will be from the various Emerson devices.

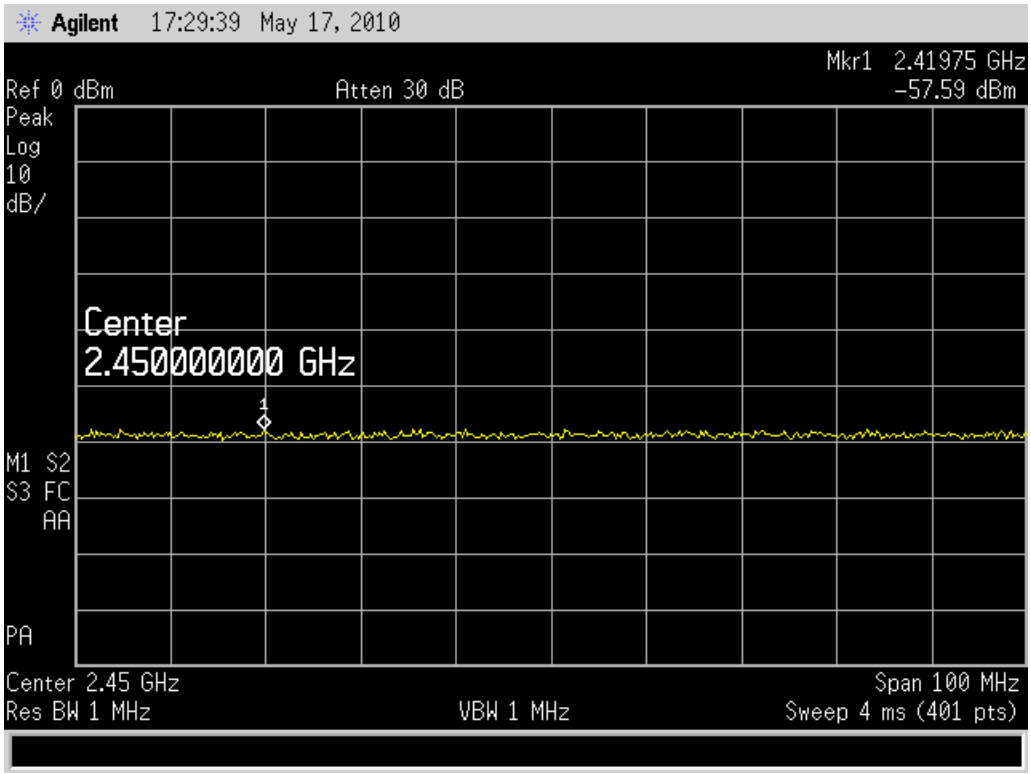

Figure 4 - Noise Floor Inside Screen Room

2.3.2 Normal Operation Verification

All units were powered back up again to verify that transmission is occurring before initiating silence. The capture below was taken after all three units had long enough to reestablish communication with the gateway. Transmissions occurred regularly as all three devices communicated with the radio gateway. Each peak in the following capture indicates a detected transmission from the devices.

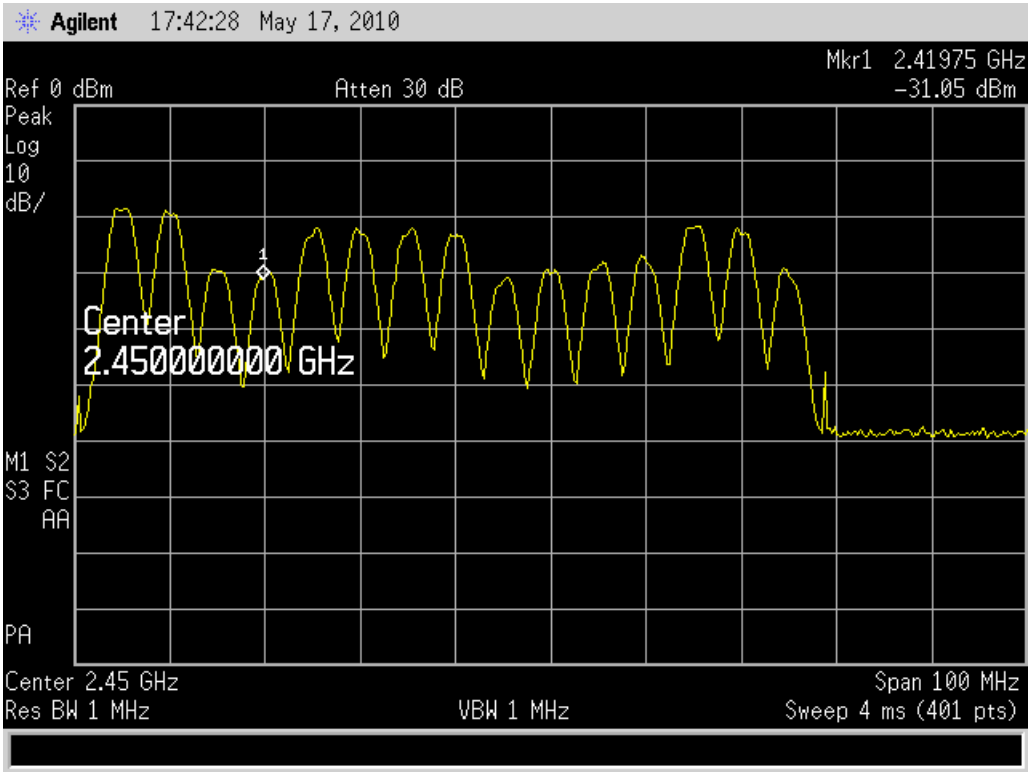

Figure 5 - System in Normal Operation

2.3.3 Silence Period Commencement

At this point, the radio silence procedure was referenced. The gateway was unplugged, and the spectrum analyzer was observed. All unit behavior mirrored the descriptions found in the Radio Silence Test Procedure. The gateway was unplugged at 17:43 CDT and silence was observed to start at approximately 17:49 CDT on Monday, May 17th, 2010. The Max Hold function of the analyzer was employed, which will record the maximum activity until cancelled. The capture below illustrates the beginning of the silence testing period. Note that the noise floor is easily within the margin of error of the spectrum analyzer's accuracy, showing that no transmission is occurring above -57.22 dBm.

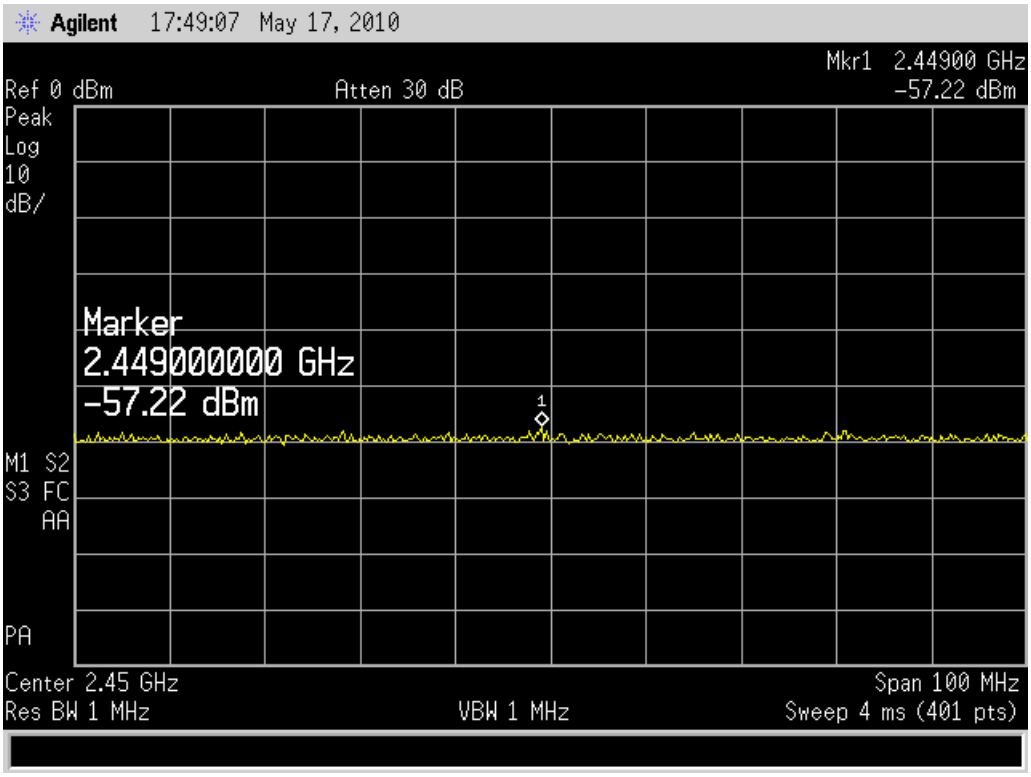

Figure 6 - Beginning of Silence Period

2.3.4 Duration and End of Silence Period

After the initiation of silence, the equipment was observed prior to running an extended test. Another screen capture was made at 10:30 CDT on Tuesday, May 18th, 2010 prior to the screen room door being opened. Since the Max Hold function had been enabled this entire time, any radio signals during the entire time would appear on the screen. There were none. This indicates that the hardware is behaving properly and did not transmit during the silence period. This signifies the end of the test period at a length of 16 hours 41 minutes.

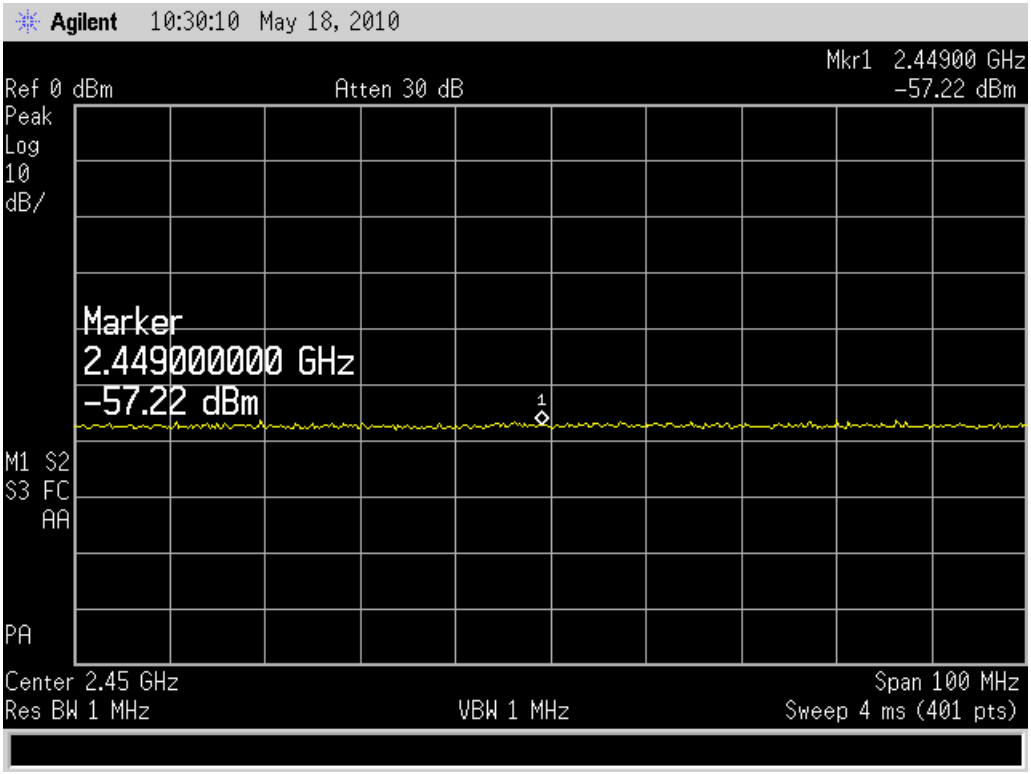

Figure 7 - End of Silence Period

2.3.5 Verification of Hardware Functionality

Since the test was a success and no emissions occurred during the silence period, power was returned to the gateway to ensure that the radios had been functioning the entire time. The following capture illustrates the return of activity after the gateway was active, showing that the three devices were communicating with it again and had not locked up nor had their batteries died. This signifies the end of a successful test.

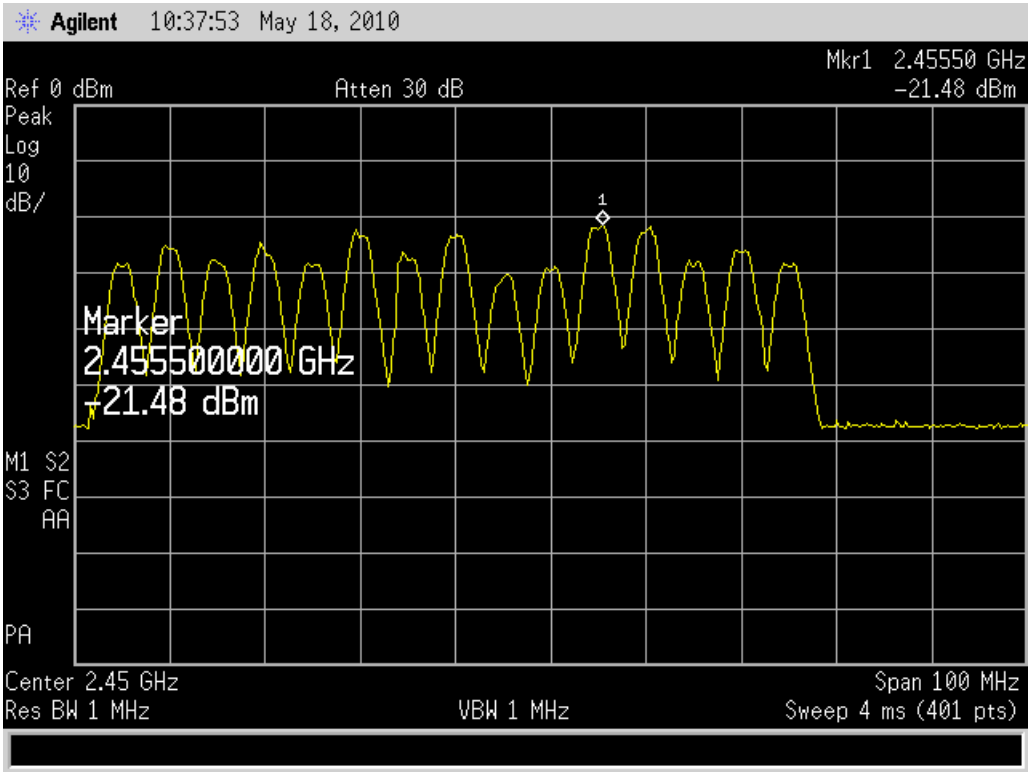

Figure 8 - Activity Resumes Upon Restoring Gateway Power

3 Concluding Summary

The execution of the Radio Silence Test for the Emerson Smart Wireless Gateway and its corresponding Rosemount HART 7 devices was successful. Proper steps were taken to ensure that the devices were isolated from any outside interference. Additionally, the devices and their network were validated before and after the test to ensure that there was no loss of normal functionality at any time during the test. This ensures that the units did not transmit due to following their normal programming rather than due to any type of hardware or battery failure.