Path Loss Testing Procedure

This document describes how to use the DSA815 Spectrum Analyzer, generating a known signal source, and the Tait/Harris radio RSSI Radio Signal Strength Indication to calculate Path Loss. Path loss (or path attenuation) is the reduction in power density (attenuation) of radio waves as they propagate through space and materials. Path loss is a major component in the analysis and design of the link budget of a DAS.

This test is particularly useful in determining losses between floors and through building materials of unknown construction.

Sample Units:

- Test Antenna: 700/800MHz Public Safety Band
- Test Radio: 700/800MHz Tait/Harris TP9400

Sub-Procedures:

1. Set the Spectrum Analyzer - Frequency Span
2. Set the Spectrum Analyzer - Tracking Generator Setup
3. Measure Path Loss

Requirements:

- Radio Solutions, Inc. (RSI) Test Accessory Kit
- Rigol DSA-815 Spectrum Analyzer with Tracking Generator (TG)

Note: **Bold, green text** indicates a selection on the Spectrum Analyzer

1. Set the Spectrum Analyzer – Frequency Span

Spectrum analyzers are used to measure a frequency range defined by a beginning and end point. This can be done by picking a start and stop frequency or by picking a center frequency and defining the deviation from it. A tracking generator produces a RF signal on the exact frequency where the spectrum analyzer is receiving at the same time. In this case we are using the tracking generator to generate a signal on one frequency which is the same frequency the radio is programmed to receive.

The procedure can be done on VHF, UHF and 700/800 bands with a corresponding correct test antenna and radio.

Described is the procedure for 700-band. Use frequencies that will not interfere with local public safety operations. There are itinerant portable only radio channels that could be used.

NEVER USE A LOCAL SYSTEM'S CONTROL CHANNEL FOR THIS PROCEDURE. THIS WILL INTERFERE WITH THE TEST AND PUBLIC SAFETY RADIO SYSTEMS.

Procedure:

1. Power up the Spectrum Analyzer, which will default to factory settings

2. Set the Center Frequency:
   FREQ > Center Freq > 774.99375 > MHz

3. Set the Span Frequency:
   SPAN > Span > 1 > KHz

2. Set the Spectrum Analyzer – Tracking Generator

The Tracking Generator ("TG") is a signal producer that creates a radio signal on the same frequency as the one received by the spectrum analyzer.

1. **TG > TG Level**

2. Use the **rotary knob** to adjust the desired level to **0dBm**

1. Measure Path Loss

Procedure:

1. Connect the test cable to the "Gen Output" on spectrum analyzer and connect the other end of the test cable to the test antenna (see Figure 1 for setup).

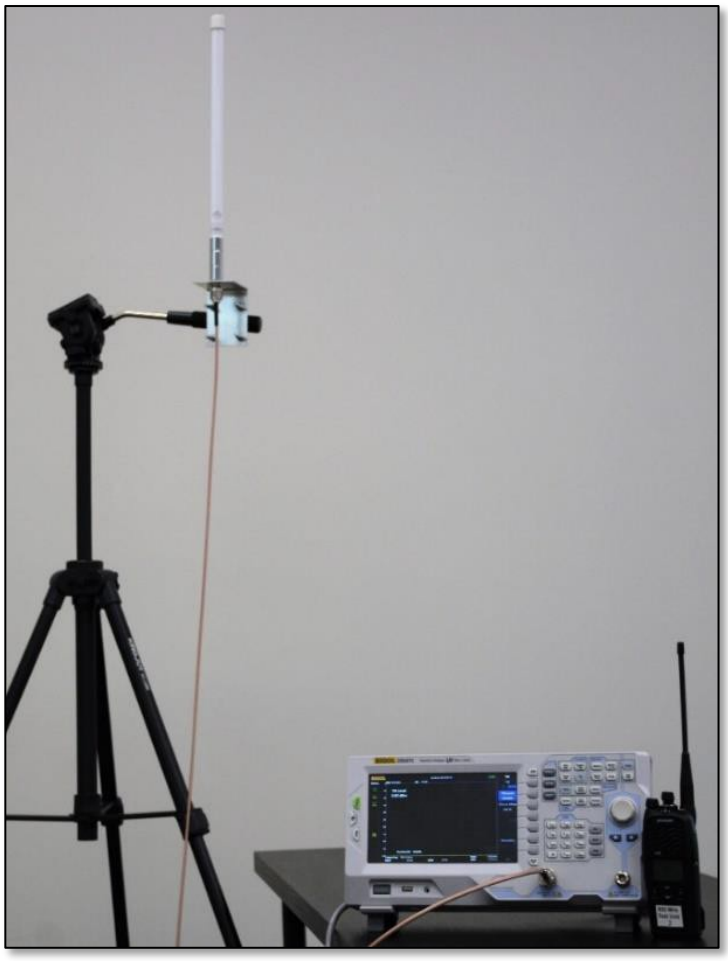

Figure 1

2. **TG ON**

3. Place signal generator setup at a test point within the building.

The test points and reading locations are specifically dependent on building configuration and construction. The RSI Project Manager will help to ascertain the best locations to place the test signal and where to obtain RSSI readings from. Share the results of the desired readings with the RSI Project Manager so they can determine the best possible locations for each antenna in the building.

Also shown in Figure 2 below is a test with two signal sources to illustrate the possible need for multiple test points on a single floor. This figure displays the general signal expectations (depicted I color gradient) as one moves further from the signal source, throughout the area.

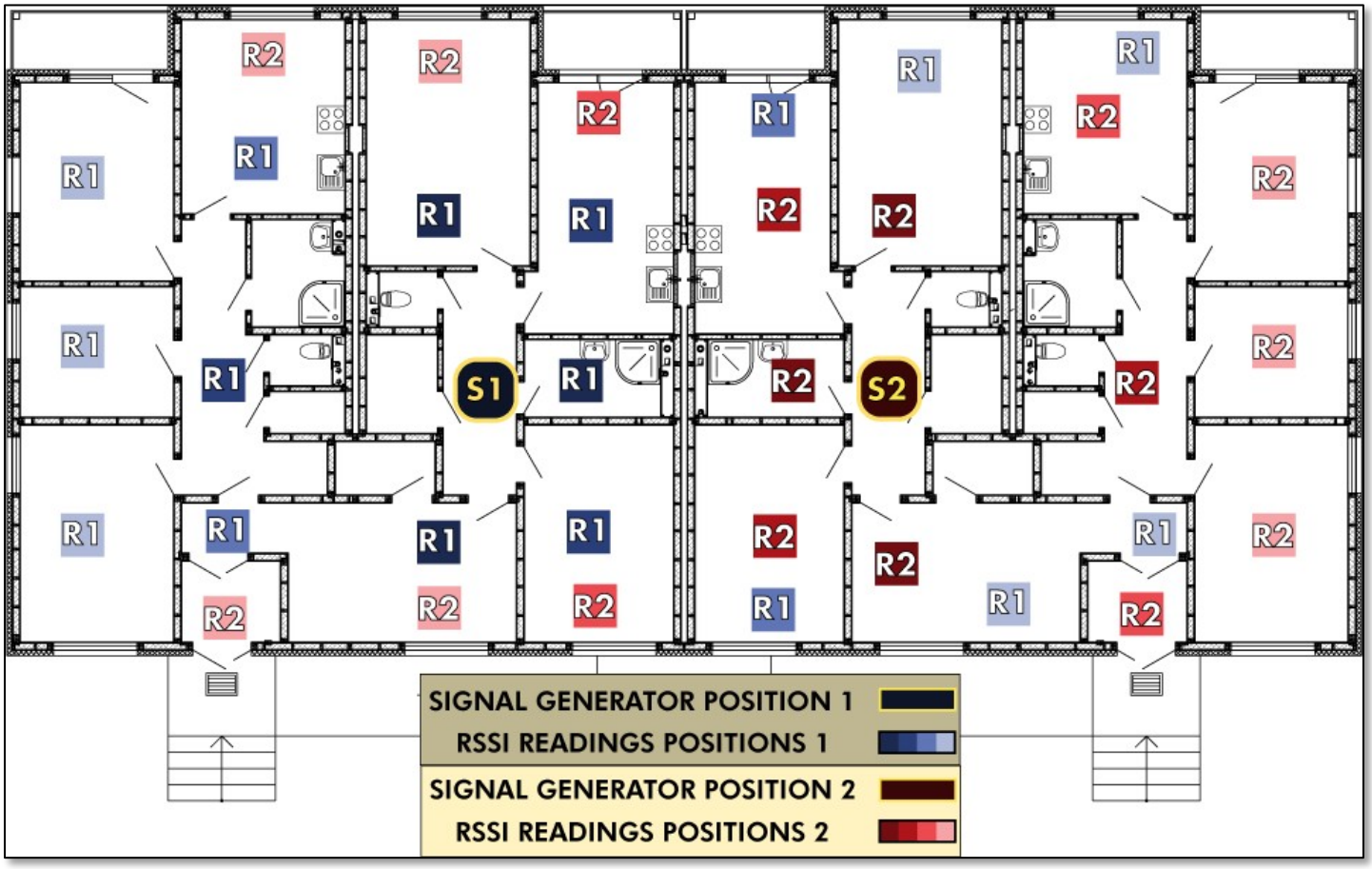

Figure 2

Obstructions such as walls and floors will naturally be in the path between the signal generator and receiving radio as readings are conducted. Generating a known signal and measuring the RSSI at a point on the far side of these obstructions will give an indication of the signal levels expected accounting for total path losses. The Figure 3 and Figure 4 will illustrate how this may look.

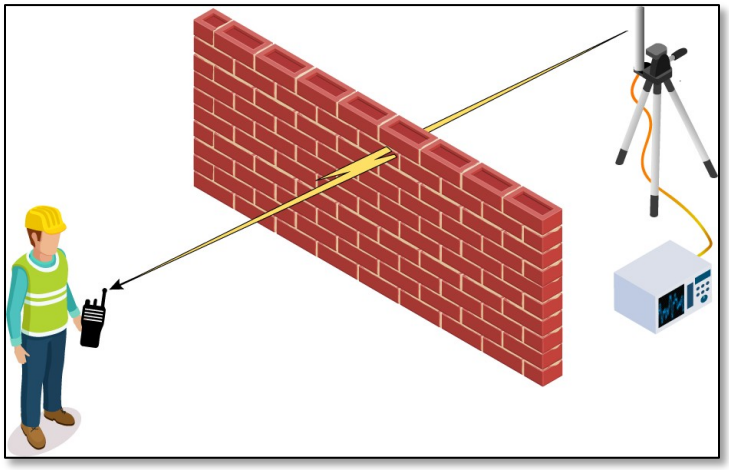

Figure 3

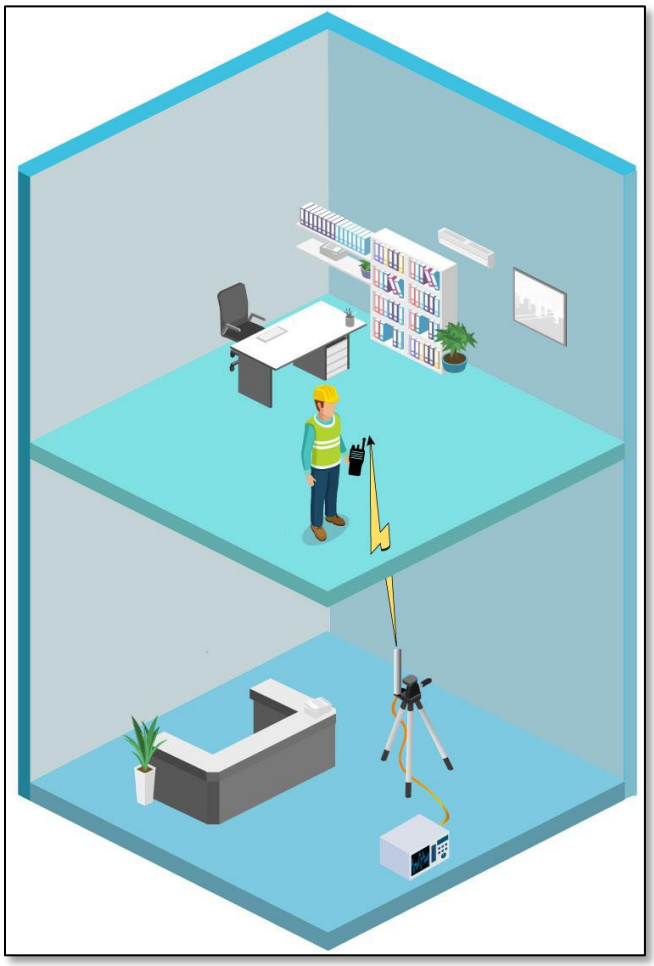

Figure 4