

## Turn Your Spectrum Analyzer into a Drive Test Tool

### Introduction

This article describes how Public Safety and Commercial Land Mobile Radio operators can easily collect, plot and archive their signal coverage using a spectrum analyzer and Summitek Instruments OASIS software. Utilizing hardware that customers may already own, users can generate detailed maps displaying the received signal strength of a specified frequency overlaid on street level mapping. Utilizing this information, operators have a cost effective way of evaluating their system performance and coverage.

### The Problem

Public safety communications systems provide mission critical communication to their users in the field who depend on the availability of the system to support their work. Police, Fire and EMS personnel entrust not only the safety and lives of the people they are protecting and assisting but also their own lives in the ability to communicate reliably and consistently. In an emergency, not being able to call for assistance or relay vital information can have dire consequences, simply because a radio was located in an area with poor base station coverage. Understanding where these potential coverage problems may be located and resolving them before a critical situation occurs in or near those locations is the job of the system operator.

Public Safety, Land Mobile communications systems are methodically planned and validated from the design inception, through to the commissioning of the network. Network plans are developed using state of the art coverage planning software utilizing topographical information as well as complex path loss and multi-path analysis software. These tools allow designers to optimize system performance and coverage to meet their end users communications requirements, ensuring the highest quality of service to their users.

During the deployment of a new communication system, representatives of the manufacturer as well as future users of the system “drive test” the system. In this testing stage, signal strength and other parameters are collected by an automated system designed to store this information as this collection system is driven throughout the service area. In the process of accepting the system, the future system users and manufacturer representatives evaluate the actual performance of the system in comparison to the theoretical performance generated from the planning software. This review stage is where any additional coverage characteristics are optimized or changed in order to meet contractual performance requirements.

After the systems are accepted, support for the communications systems transfers to the end user or their representative. Unfortunately, the environment changes, hardware ages, buildings are constructed, new wireless services are deployed, all of which can change the performance and coverage of a communications system. In addition to man made events which can change the performance of a system, weather, sun and thermal

effects can cause damage to antenna systems, allowing water ingress in cables and antennas, radiating elements to crack and connectors to loosen. All of these factors can create significant changes in the coverage of a communications system. It is important to note, while some of the electrical and physical changes in a system can be seen using standard test procedures (VSWR, power measurements, etc.) at the base station, understanding the effects of buildings, new collocated antennas and urban sprawl are far more difficult to predict and cannot be seen using standard test procedures. So how can one cost-effectively evaluate the “actual” performance of the system, verify that it continues to operate within its parameters and provide the network coverage our first responders rely upon?



**Figure 1: OASIS software uses equipment you may already own**

### A Practical Solution

Using equipment that an operator already owns such as a portable spectrum analyzer, a GPS receiver and a laptop, the OASIS software allows operators to collect the necessary information to evaluate their system performance or support FCC interference filings. The OASIS software with the optional Drive Test Tool allows operators to collect and manage data from their spectrum analyzer and GPS in a convenient application. As all of the data is automatically logged by the OASIS software, user interaction is not required while performing the drive test, eliminating potentially distracting user interaction. When the data has been collected, the flexibility of the OASIS Drive Test Tool allows users to select the frequencies of interest, and export the pertinent signal strength or channel power data.



Figure 2: Screenshot of OASIS Drive Test Mapping.

This data can then be imported into third party mapping software such as Google Earth Pro<sup>i</sup> or MapInfo<sup>ii</sup> to provide a graphical overlay of the information.

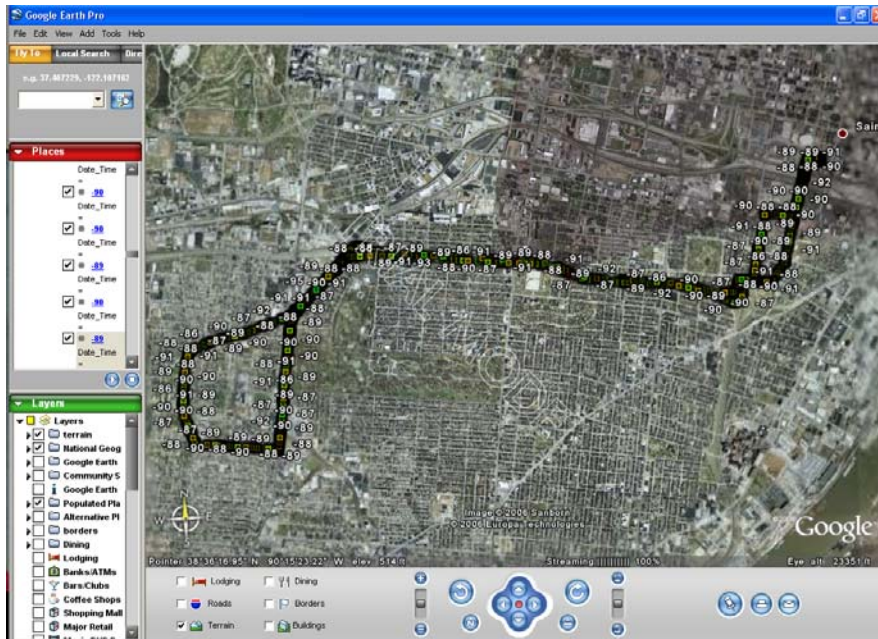


Figure 3: A sample of OASIS Drive Test data plotted in Google Earth Pro

## Additional Analysis Capabilities

One key differentiation between using OASIS with a spectrum analyzer and a regular drive test tool is that with OASIS, users are not limited to the frequency range of a “banded” solution. The OASIS software allows users to collect a wider span of channels or frequencies based on the operator’s desire into a log file. This capability provides the operator more information about their operating environment, in addition to the basic “I don’t have any signal here”. By reviewing the adjacent frequencies, the user can actually see what the spectrum looked like when the desired signal went down. Operators can also use this capability to identify areas where an adjacent signal may potentially cause interference by desensitizing the receiver front end, thus preventing problems before they arise. OASIS helps answer questions like: ‘What adjacent frequencies are in use here?’, ‘Are there any other high power carriers near by?’, ‘What is the signal strength of my competition?’, ‘What does the noise floor look like here?’ all can be answered with OASIS because the user has the ability to collect data pertaining to more than just their channels.

## The Total Solution Provided by OASIS

In addition to displaying the mapping of signal strength or channel power, OASIS allows users to replay the data collected, providing users an opportunity to evaluate events and changes as if it were real-time. Post processing capabilities such as limit break, alarm analysis, markers, emitter look-up, screen shots and report generation are all available with OASIS. Archival storage of the logged data allows users to compare data and changes as a function of time. Additionally, users may replay and compare two log files in OASIS to see how the signals and corresponding adjacent spectrum has changed, providing instant identification of changes in a system. The OASIS software with its affordable, powerful tools allows users to ensure system performance while utilizing existing hardware and minimizing expense.

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