DragNet (Fixed WiMAX)
802.16d Manual version 1.1

Projector

Projector runs on a Windows PC or Tablet PC (model dependent). The basic idea of the Projector is to import an image of a floor plan or a map. A projection is then created to convert the pixels of the image into actual distances for meaningful site data.
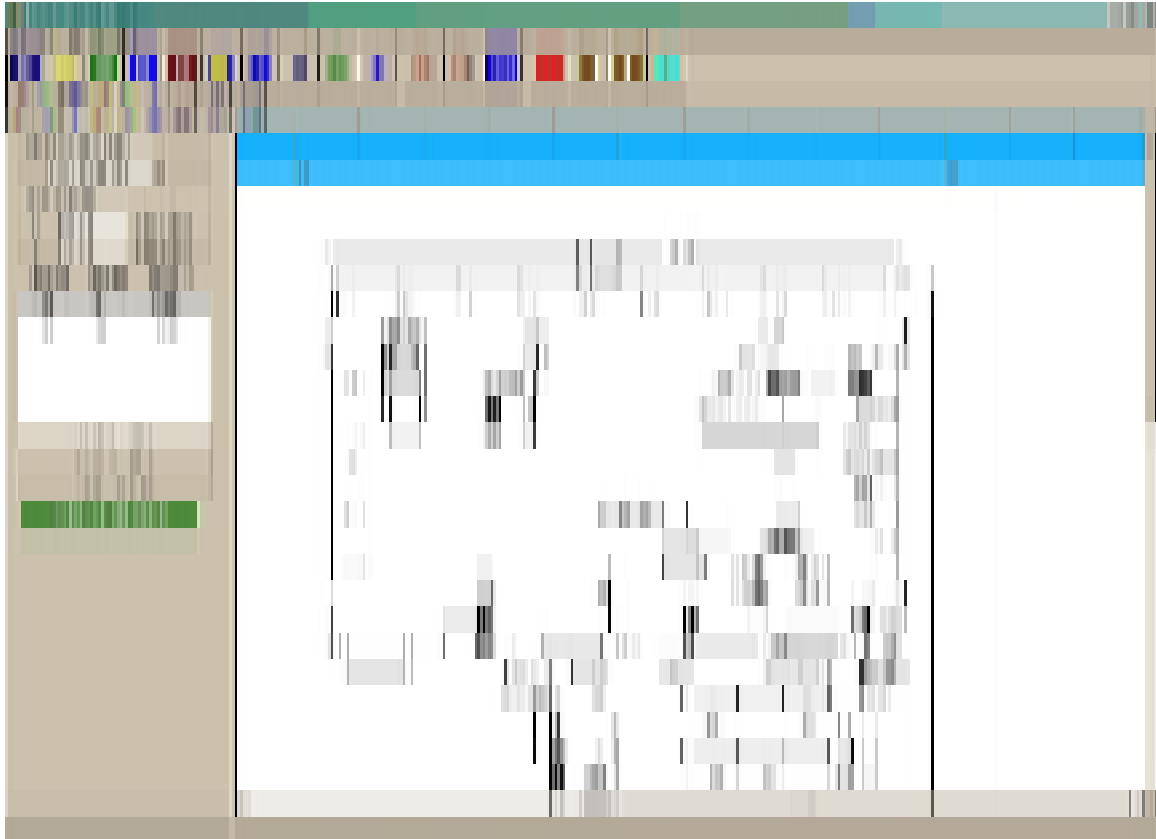
Figure 1 – Linear Projector

The Projector also allows you to add 2.4 and 5 GHz objects such as access points and interferers. Text can also be added to the floor plan. The projection file is then saved for use with the Collector program to perform interference analysis.

INSTALLATION

To install the application from a CD or SD card (model dependent), place the Projector CD or SD card in the drive. Choose the Linear Projector button. Follow the installation instructions on the screen from this point.

QUICK START

Creating a projection file that is ready for use with the Collector requires the following steps. See the sections below for individual explanations. Projector can import any of the following file formats: Monochrome BMP, 16-bit color BMP, 256 color BMP, 24-bit BMP, GIF, ICO, TIF, JPG and PNG.

CREATE A PROJECTION IMAGE SET THE DIMENSIONS FOR THE ASPECT RATIO ADJUST SIZE OF FLOOR PLAN IF NECESSARY ADD STATIC OBJECTS TO FLOOR PLAN IF NECESSARY ADD CUSTOM IMAGES AS STATIC OBJECTS ADD WALLS, WINDOWS, AND DOORS SAVE FILE

CREATE A PROJECTION

Use FILE/NEW on the menu to create a new projection file. Choose a floor plan from the popup window to use as a base for your site. You may use a .bmp, .jpg, .gif etc.

SET THE DIMENSIONS FOR THE ASPECT RATIO

Click the ruler icon in the toolbox. Look for a location on the projection that you know the distance. Click on the first point of the measurement. A flag will mark the spot. Click on the second point of the measurement.

Now enter the distance and units for the measurement. Repeat steps 2 thru 4 for a second measurement. Make sure that the second measurement is in a different orientation from the first point. Keep repeating until you receive a message saying that a valid projection exists. Points used for the projection may be deleted from the listbox on the left status bar.

ADJUST THE SIZE OF THE FLOOR PLAN

There are two types of image reduction available in Projector. There are multiple algorithms used to achieve the reduction.

SCALING

Scaling the image reduces the size of the image while attempting to keep all of the features of the floor plan. In effect, the image is shrunk. Scaling the image can be done in different ways. Different interpolation modes for scaling the image are listed below. These modes use different techniques to determine how to reduce groups of pixels into one which is representative of the group.

Interpolation Modes
D is the destination image and S is the source image. Here are simple explanations of some of the interpolation modes. Trying all of the modes will give a better understanding of what changes the image will incur. Remember, the higher-quality reduction, the slower the process. The lower the quality, the faster the reduction.

Bicubic - D takes on a color value from a source matrix (S) based on a polynomial function.
Bilinear - D takes on an average of colors from the nearest region of S (for example, a 2x2 matrix)
High Quality Bicubic - D takes on a color value from a source matrix (S) based on a polynomial function.
Higher quality Bicubic (will run slower)
High Quality Bilinear - D takes on an average of colors from the nearest region of S (higher quality than simple Bilinear)
Nearest Neighbor - D simply takes on the color value of the nearest pixel in the source.

CROPPING

Cropping the image will clip off the part of an image not specified in the new dimensions of the image.

ADD STATIC OBJECTS

A number of static objects can be permanently added to the site. Inserting each type of object is explained in the following passages.

ADD AN ACCESS POINT

Existing Access Points may be added to the floor plan to simply show their location. First, decide whether you want to represent an 802.11a, 802.11b, or 802.11g access point. Choose the icon from the toolbar with the correct letter on it (A,B,G). Now click on the part of the floor plan where you would like to represent the access point.

INSERT TEXT

- Click on the text insertion button on the toolbox.
- Click on the location where you wish to insert the text.
- Enter the text.
- Press OK.

MICROWAVE/DIRECTIONAL ANTENNA/2.4 GHz PHONE/COMPASS

Any of these objects may be placed on the floor plan. Simply click on the desired object. Then click on the floor plan where you wish the object to be placed.

ADD CUSTOM IMAGES AS STATIC OBJECTS

Any custom bitmap may be added to the floor plan. Click on the "IMG" icon on the top toolbar. Then choose an image file. Then click on the floor plan where you would like the image.

ADD WALLS, WINDOWS, AND DOORS

Additional walls, doors, and windows can be added to the floor plan.

WALLS

Click on the wall icon on the top toolbar. Then click where you would like the wall to begin. Then click on where you want the wall to end. A new wall has now been added to the floor plan.

DOORS

Click on the door on the top toolbar. Choose a single or double door using the appropriate icon. Then click on where you would like the doorway to begin. Then click on the other side of the new doorway.

NOTE: The doors will swing differently based on start and stop clicks. If the finishing click on the doorway had been the starting click, the door would then swing in the opposite direction.

WINDOWS

Similar to the procedure for doors and walls, click on the window icon on the top toolbar. Then click where you would like the window to begin. Then click on where you want the window to end. A new window has now been added to the floor plan.

SAVE THE PROJECTION

1.   Choose FILE/SAVE from the menu.
2.   Enter a name for your projection file.
3.   You now have a projection file for use with the Collector.

STATUS BAR (Left)
On the left of the screen are different statistics. They are the pixels / foot (meter) ratio. You can also adjust whether or not the measurement units are in feet or meters.

MENUS

There are 5 submenus located in the main menu at the top of the screen.
The FILE submenu lets you open or save site files.

NEW creates a new site file.
OPEN opens an existing site file.
SAVE saves a site file under the previously saved filename.
SAVE AS saves a site file under a new filename.
The EDIT submenu has editing options.
UNDO lets you undo up to 3 previous edits to the site.
The OPTIONS submenu contains system options.
SHOW GRID overlays a grid of lines on top of the site.

The SCALE submenu contains scaling options (see "Adjust the size of the floor plan")
Bicubic
Bilinear
High
High Quality Bicubic
High Quality Bilinear
Low
Nearest Neighbor

The HELP submenu contains help options.

ABOUT pulls up the about box.

RULERS

The rulers along the vertical and horizontal planes of the projection represent a scale of the projection. These are set using the ruler toolbox option.

ZOOM MODES

There are four different modes for zooming in and out of the floor plan.

ZOOM IN

Click on the magnifying glass with the '+' sign. Then create a zoom rectangle by clicking-and holding on an area of the floor plan. Then drag the mouse (while holding down the mouse button) to the next point. A dashed rectangle will appear. When the zoom rectangle is the appropriate size, release the mouse button. The floor plan will now be zoomed into that rectangle.

ZOOM OUT

Clicking on the magnifying glass with the '-' sign will reduce the image resolution by a factor of 2, thereby making the image zoom out.

GETTING A QUICK PROJECTION

Steps:
1.   Clear all the pairs.
2.   Measure a horizontal distance.
3.   Measure a distance where the line is at least 45 degrees off-parallel from the first distance. Less than 90 degrees. Using different directions helps to validate the projection quicker.

Make sure the distances are fairly accurate. You should be able to get a projection within a small number of points.
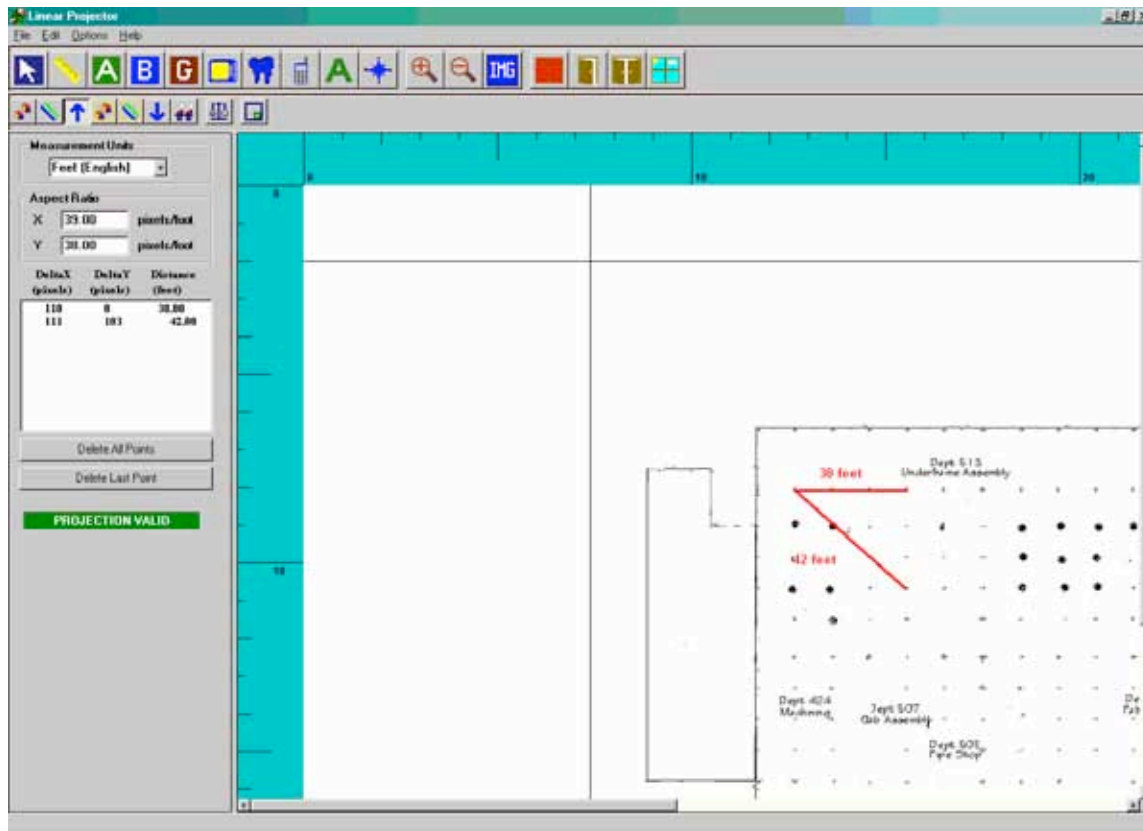

Figure 2 – Quick Projection

Procedure for creating a BVS GPS Projection File

1. Find the area of interest on GoogleEarth.

2. Select Alt-Print Screen to copy the current screen to the clipboard.

2a. Do not close GoogleEarth, you will need it later.

3. Open MS Paint.

4. Choose Edit/Paste. The screen shot is now in Paint.

5. Use the crop tool (dashed rectangle) to select only the satellite image portion of the screenshot.

6. Choose Edit/Copy.

7. Choose File/New. Do not save the current image.

8. Choose Edit/Paste. The satellite portion of the original is now in the new image.

9. Save this image as a bitmap.

10. Open up BVS GPS Projector.

11. Choose File/New and select the bitmap. You will see a red circle in the upper-right hand corner, this tells you the file is not geo-coded as of yet.

12. Choose "Input Options" from the iconic toolbar under the main menu. Set the resulting popup box to "degree:minute:second".

12a. Leave BVS GPS Projector running.

13. Go back to GoogleEarth. You will need the positions of at least 6 points on the map to create a valid projection in BVS Projector.

14. Choose the pushpin icon "Add Placemark".

15. Move the resulting pushpin to your first location. Write down the latitude and longitude of the location.

NOTE: North is positive and South is negative. East is positive and West is negative. This is important when entering degrees in BVS Projector.

16. Go to BVS Projector and click on the 'set points' icon.
17. Click on the same location as you did on GoogleEarth.

18. Enter the latitude and longitude that you wrote down, keeping in mind to put a negative sign in front of the degrees when needed.

19. The point will be numerically marked.

20. If a popup box stating that the projection is now valid appears, proceed to step 21. A green circle would now appear in the upper right corner. If not, repeat steps 14-20 until a valid projection is obtained.

21. Save the resulting projection in BVS GPS Projector as a GEO-coded map.

Dragnet Collector User Manual

INTRODUCTION

The Dragnet Collector runs on a Tablet PC that is connected to a BVS YellowFin system. The Collector allows you to import a projection file that was created using BVS Projector software. You then use this file to walk/drive around a survey site and collect survey points. These points create a data file of information on your WiMAX network.

The information is then saved back to a collection file for use with the Dragnet Analyzer program on the Tablet PC. You can also zoom in and out on points, delete existing points, pull up survey information on any point, and scroll throughout the entire site.
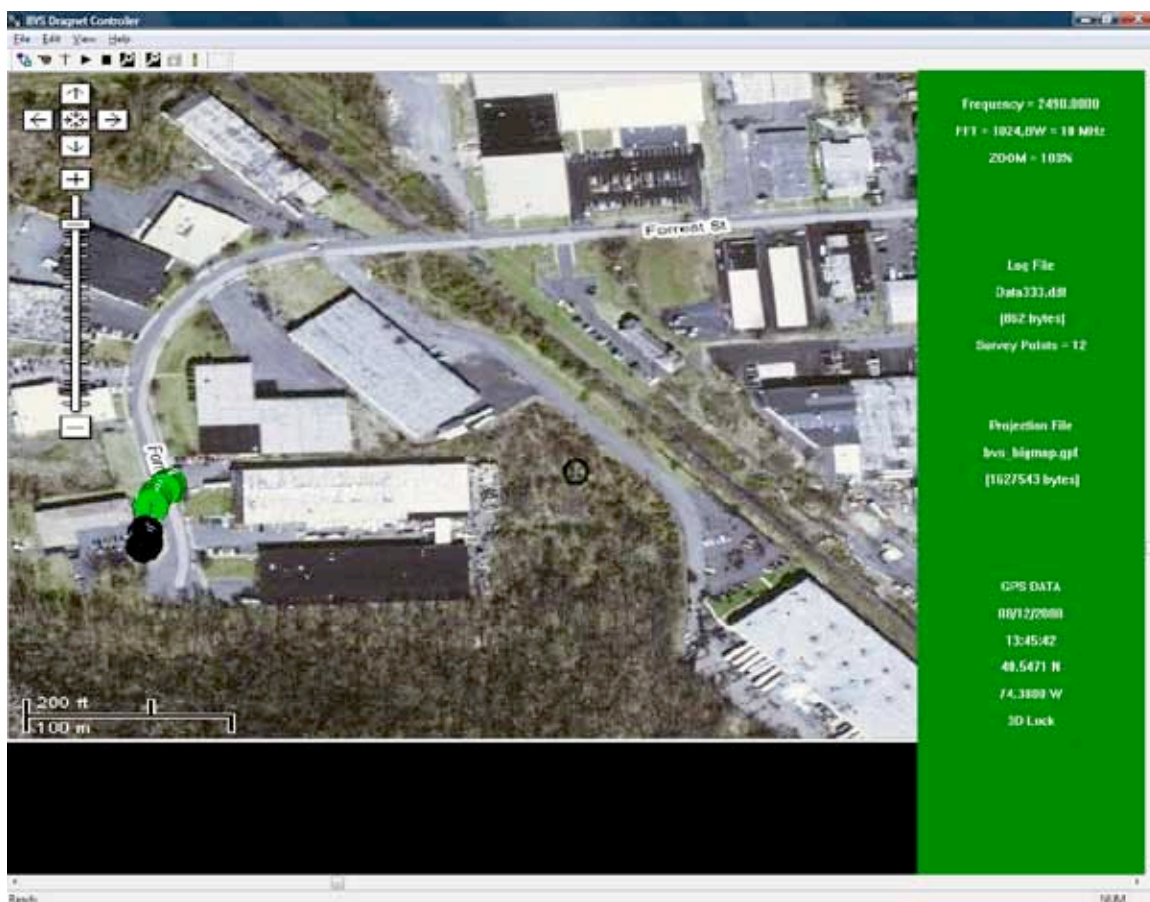
Dragnet Collector

REGISTRATION CODE

The first time that Dragnet Collector is run, a dialog box will show up asking for the registration code. This code is located on the paperwork you received from the factory. Each unit has its own registration code that is unique to the serial number.

It is very important that the Tablet PC is connected to the YellowFin when running the Dragnet application. Dragnet asks the hardware for its serial number. If it is not talking to the hardware, the registration code will not be verified and the application disabled.

"THE TOOL BAR"

The tool bar runs along the top of the display and performs the following functions (from left to right):

- Opening a projection file (linear or GPS)
- Opening a collection file
- Setting scan parameters
- Starting an automatic scan
- Stopping an automatic scan
- Zoom in on the survey area
- Zoom out of the survey area
- Initiate an information lookup

OPENING A PROJECTION FILE

The first step in surveying data is opening a projection file created with the BVS Projector application. Tap on the leftmost icon on the tool bar to open an existing projection file.

Since the scan will be performed using GPS Data, a GPF file needs to be loaded.

OPENING A COLLECTION FILE

The user will be prompted to choose a previously saved collection file (with previously recorded data) or to start a new collection file. This is the second icon from the left. If CANCEL is chosen instead of a file, data collection will not be allowed.

SETTING SCAN PARAMETERS

The following scan parameters need to be set. The frequency and bandwidth. Choose the frequency/FFT. The correct FFT (Fast Fourier Transform) sample size will be selected based on the bandwidth.

FREQUENCY LIST

Choose the "Frequency List" toolbar option. Up to 16 frequencies can be placed in a scan list. Enter a number in the top edit field. Then choose the appropriate units such as "GHz" or "MHz". After the list has been entered, the information will be sent to the hardware when "Set as Current List" is chosen. The list can also be saved or retrieved to/from a file.

BANDWIDTH

The bandwidth can be chosen by choosing "Bandwidth" from the toolbar. The choices are 3,5,10, and 20 MHz.
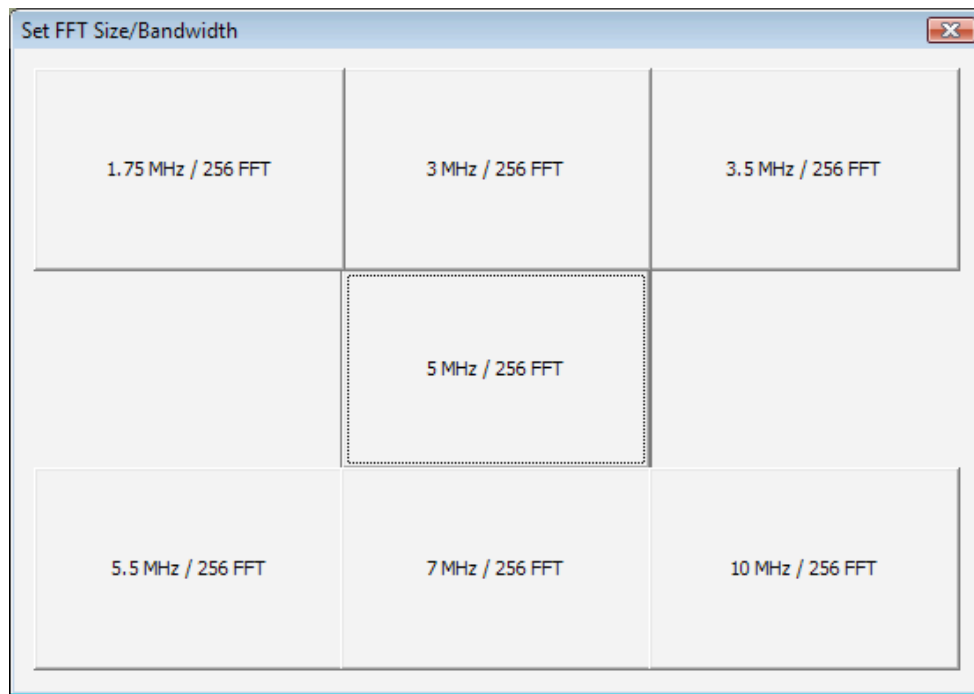
Scan Parameters

Setting scan parameters is not available during a scan. It is only available when there is no active scan.

STARTING AN AUTOMATIC SCAN

Scanning for base ids is done automatically. As long as the internal GPS Receiver has a 3D position lock, a scan may be started at any time after a projection file and data collection file have been loaded.

If both these files have been selected and the GPS receiver has a 3D position fix (green bar in the right information box), the user may choose to start an automatic scan by pressing the 'Play' icon in the tool bar.

An automatic scan will place a data point at the current GPS position based on data collected since the the last GPS record arrived (1 second intervals).   The strongest RSSI received on any base id during this time interval will be used to generate a color-coded circle at this location.

If GPS lock is lost (red or yellow bar), the current scan will be completed and then scanning will stop. Clear out the warning dialogs that may pop up and then start automatic scanning again when GPS lock has been reacquired.

INFORMATION BOX

The information box located on the right side of the display will show the following information during scanning:

- Current frequency
- FFT Sample size
- Channel bandwidth
- Zoom level (100% is normal depth)
- Data collection file name
- Data collection file size
- Survey points in data collection file
- Projection file name
- Projection file size
- GPS Date
- GPS Time
- GPS Latitude (in decimal degrees)
- GPS Longitude (in decimal degrees)
- GPS Status

The color of the information box will depend on the status of the internal GPS receiver as follows:

- Green indicates a 3D position lock (needed for scanning)
- Yellow indicates a 2D position lock
- Red indicates that GPS position is not locked.

STOPPING AN AUTOMATIC SCAN

Pressing the 'Stop' button on the tool bar will stop an automatic scan if one has been started. The current data point will be completed.

ZOOM IN

Pressing on this option will increase the magnification of the site by a factor of 2.

ZOOM OUT

Pressing on this option will reduce the magnification of the site by a factor of 2.

WALK/DRIVE PATH

A dashed line will show up between points on the survey. This dashed line represents the walk/drive path for the survey.
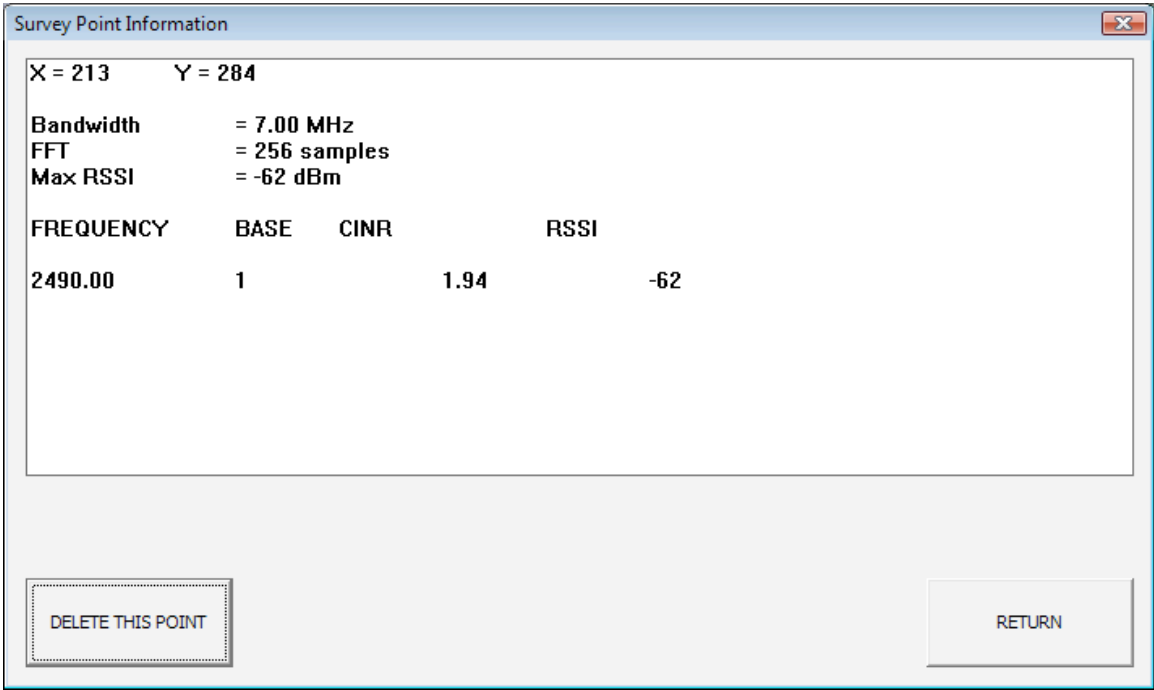
COMPLETE SURVEY

When you have covered the entire site with survey points, you can transfer the file back to the PC for use with Dragnet Analyzer. Points are saved as they are taken. No final save of the file is needed.

Transfer the projection and collection files back to the PC for analysis.

INFORMATION SCREEN

Press the tool bar button that has an 'i' icon. Now tap (or click) on a a data point. Information on the current data point is given as shown in the figure below.

Data Point Information Screen

The X and Y position in pixels on the projected map are shown. The frequency,bandwidth, and FFT size are then shown. The Maximum RSSI level attained from a base id is next. This is followed by information on any base ids seen. This information includes CINR1,CINR3, and the RSSI value in dBm.

DELETE A POINT

To delete a data point from the survey, press the 'Delete This Point' button when looking at its information dialog.

SCROLL BARS

The scroll bars aid in navigating throughout the site.

SURVEYING TIPS

In order for the Dragnet Analyzer to be effective, enough points must be taken so that a clear picture of site coverage is given. Obviously, the more points, the better the reporting will be in Analyzer.

Dragnet Analyzer User Manual

Introduction

Dragnet Analyzer is the analysis component of the YellowFin Dragnet software package for WiMAX 802.16e networks. It provides coverage analysis of data collected with Dragnet Collector.

Figure 1 – Dragnet Analyzer

The Dragnet Analyzer is installed on a Windows Vista based PC. It imports data from GPS Projector and Dragnet Collector in order to create a detailed analysis of the coverage area.

Installation

To install Dragnet Analyzer on your PC, simply use the supplied SD (Secure Digital) installation card with the USB SD Card Driver.

Dragnet Collector for the Tablet PC as well as Dragnet Analyzer for the PC is all contained on the included Secure Digital card (SD). Insert this SD into the provided USB SD Card Driver. Then insert into any open USB port.

The USB Card Driver will look like the next available drive letter in Windows Explorer. Simply run the setup file for Analyzer to begin installation.

Analysis Layers

Dragnet Analyzer analyzes the information given by the projection and collection files which had been created before and during a drive study.

This information is layered into the application before analysis. After an analysis has been generated using the other layers, the results will be overlaid on top of the

ANALYSIS FILE LAYER

The Dragnet Analyzer will reference layer files with a separate analysis file. To begin using the Dragnet Analyzer an analysis file should first be generated.

Create a New Analysis

Choose File/New/Analysis to select a filename for your analysis. Any information on projection or collection files currently open will be stored.

Opening an Existing Analysis

To open an existing Dragnet analysis select File/Open/Analysis from the File menu. A dialog box will appear to allow selection of the analysis file (*.daf).

Saving an Analysis File

At anytime after an analysis has been created, it can be saved to a file. The projection and data file used will be stored as well as any analysis that has been performed on the data. To save an analysis, select Save or Save as… from the File menu or click on the button.

If the analysis has been previously saved the Save option will overwrite the existing file while the Save as… will allow a new file name to be selected.

PROJECTION FILE LAYER

Dragnet Analyzer uses a geo-projected map from BVS Projector. BVS Projector generates a Geo Projection File (*.gpf) that contains the map of the survey.
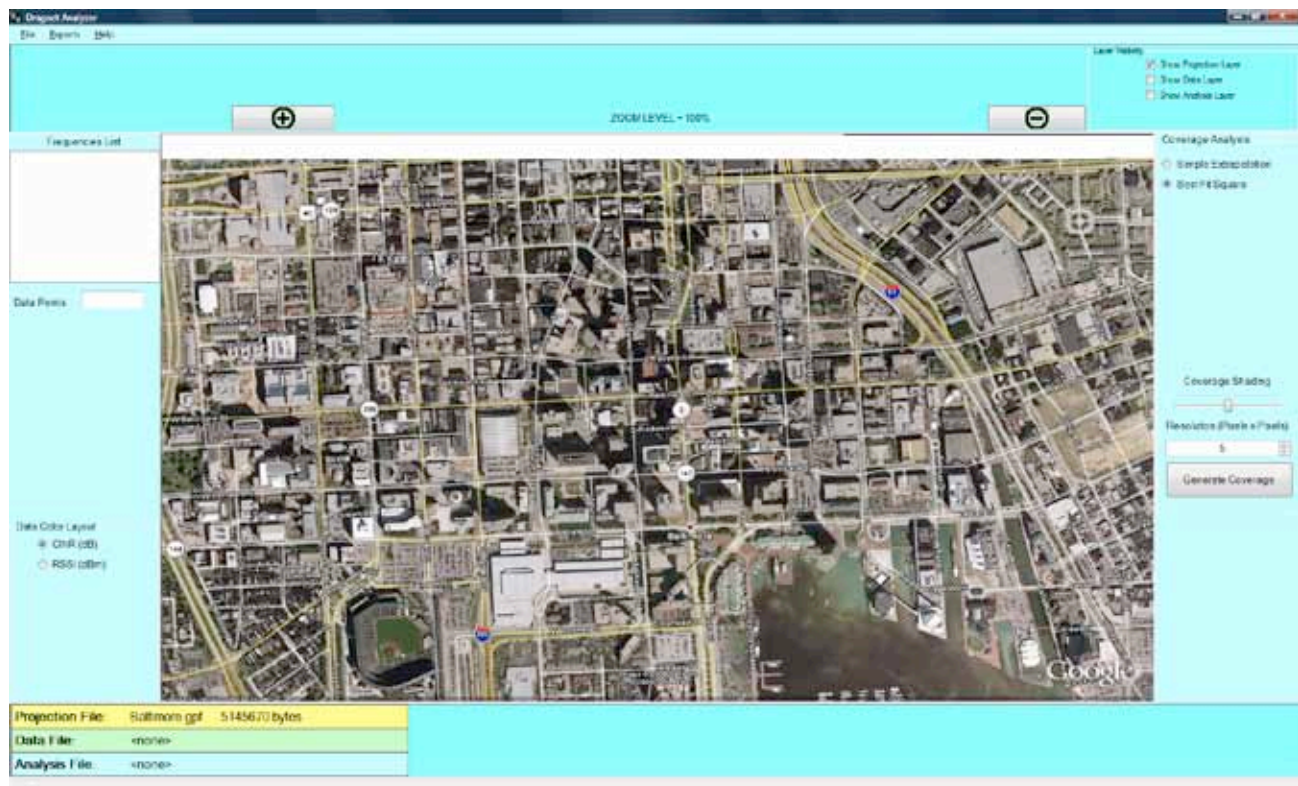
FIGURE 2 – Projection Layer

Load a projection file by using File/Open/Projection and select the appropriate file for your analysis.
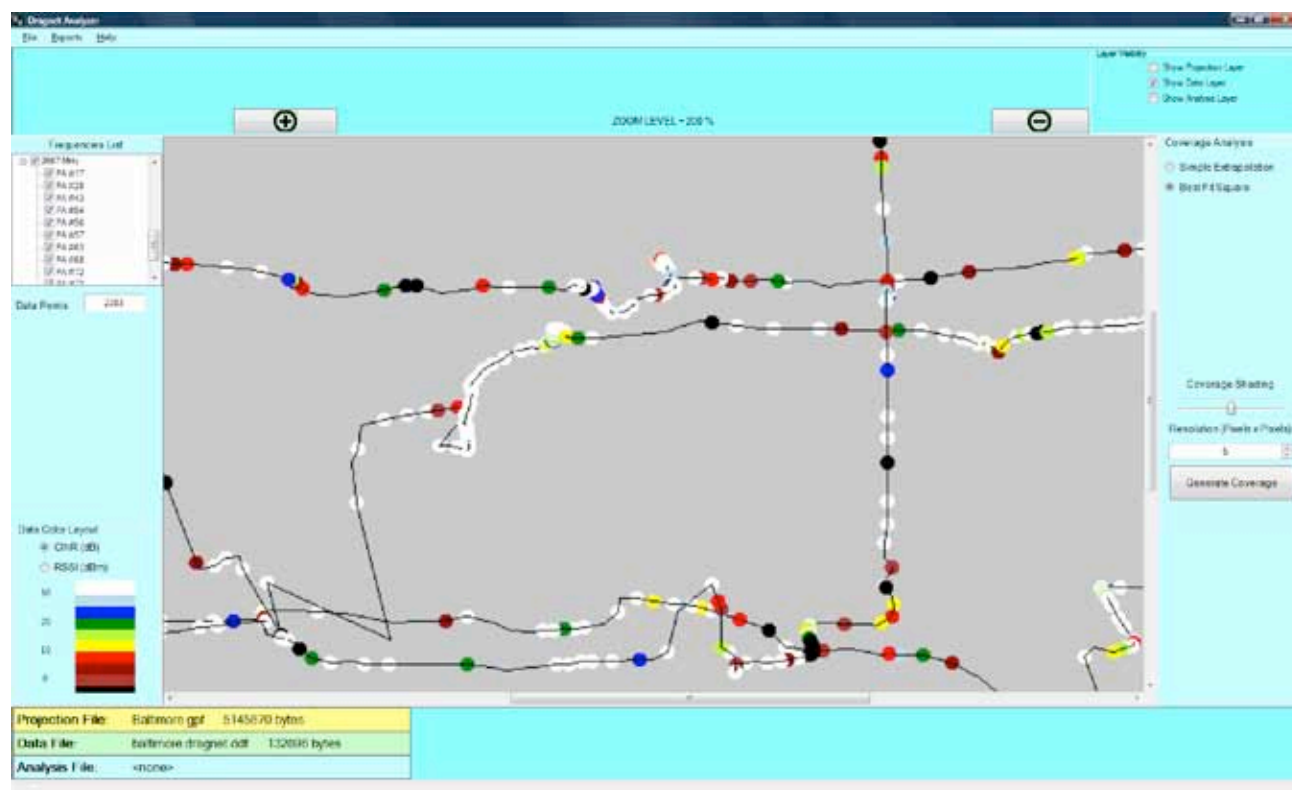
COLLECTION FILE LAYER

FIGURE 3 – Data Collection File

Dragnet Collector produces a Dragnet Site Survey data file (*.ddf) that contains the collected data with the use of the YellowFin.

The data collection file is loaded in a similar manner. Choose File/Open/Data and select the data file which was collected within the GPS coordinates of the projection file selected.

When the data file has been loaded, the number of data points in the file will be located on the left side of the application. The frequencies and base ids located within the file will show up in the list box directly above the data point value.

DATA VALUES BY COLOR

The data shown in Analyzer can be displayed based on the maximum RSSI value seen and also by the strongest CINR value seen at that location. Simply use the radio button control on the left side of the application.

The color scale underneath this control will change based on what measurement is being shown.

DATA POPUP WINDOW

Information can be viewed about a single data point. Click on the data point of interest with the left mouse button. While holding the left mouse button down, the nearest data point information popup will appear. This box includes information such as Latitude and Longitude, and RSSI value for this point.

If there is no data point within a reasonable distance, no popup window will appear.

FIGURE 4 – Information Popup Window

COVERAGE ANALYSIS

After all of the necessary file have been loaded, the analysis of the data can be completed. After the analysis is complete, a report can be generated on the analysis or a KML layer can be created.

There are two types of analysis available, simple extrapolation and best square. To begin the analysis, press the 'GENERATE COVERAGE' button.

CINR or RSSI

The analysis can be generated based on CINR or RSSI values. Whichever option is selected for data color layout will be used for the analysis.

FREQUENCIES and BASE IDS

The frequencies and/or base ids to use for the analysis can be selected/deselected by using the check boxes provided in the frequency list box.

Any frequencies or base ids not selected will be left out of the analysis.

SIMPLE EXTRAPOLATION ANALYSIS

The 'Simple Extrapolation' analysis will scan through the projected area in a grid-like manner. Each grid point will search for the closest point. After the closest point has been calculated, an extrapolated value based on the distance/value from the closest point is attained. This results in a values covering the entire projected area.
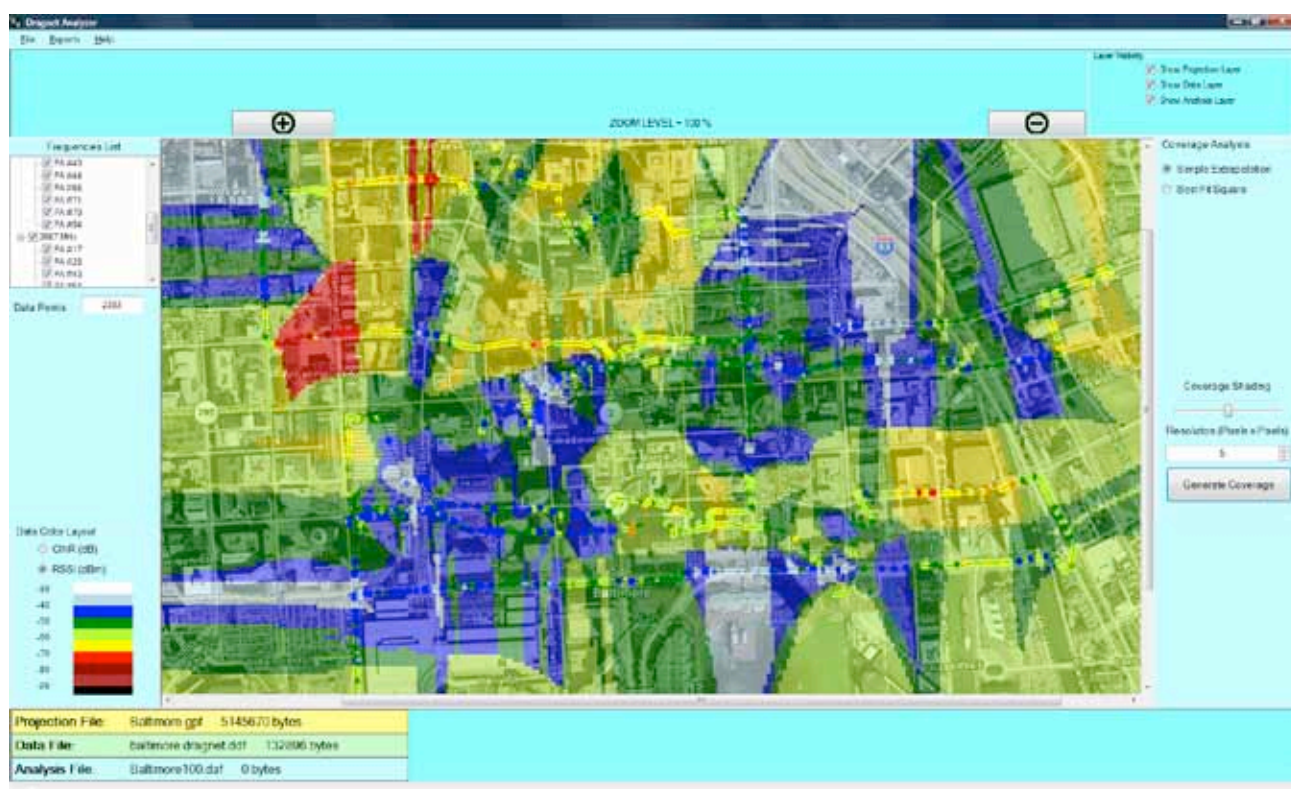

FIGURE 5 – Simple Extrapolation
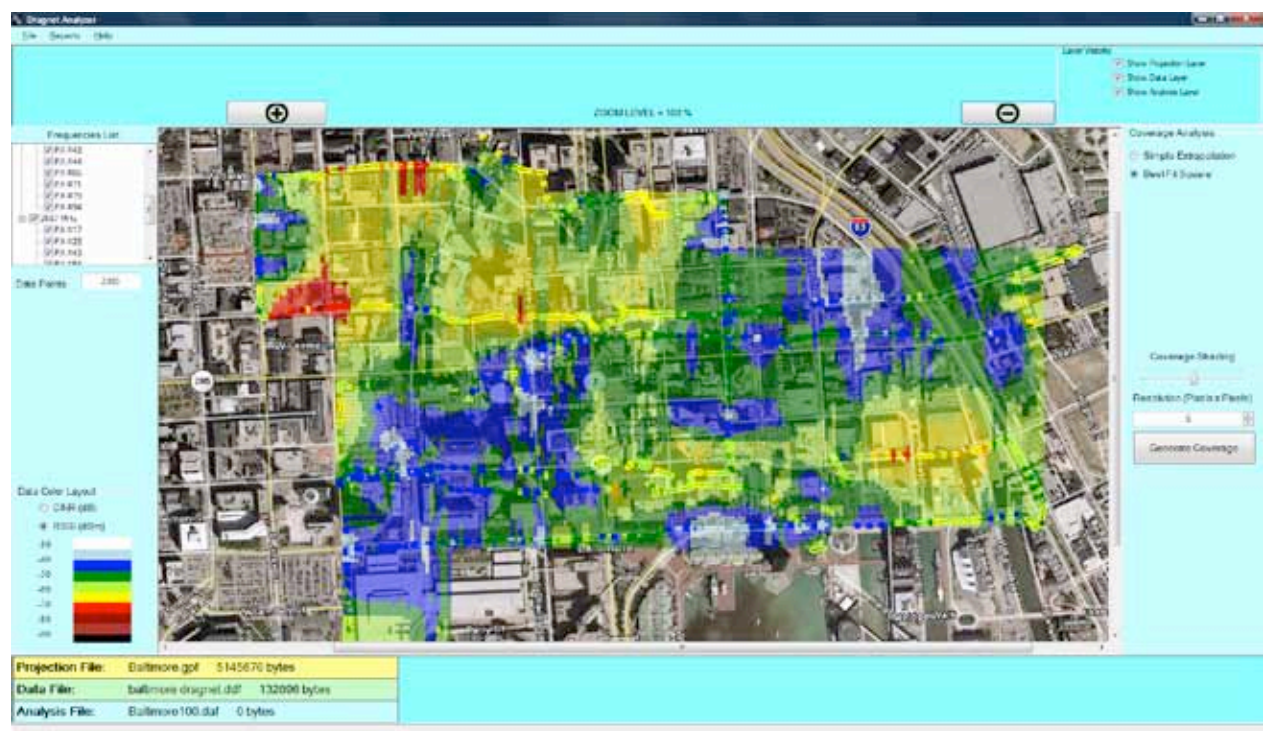
BEST SQUARE ANALYSIS

FIGURE 6 – Best Square

The 'Best Square' analysis will scan through the area in a similar manner to the extrapolation method. However, this method searches for the closest data point in each of four quadrants around the individual point to be analyzed.

If a point in all four quadrants can not be found, no extrapolated point will be created. If a point can be located in all four quadrants, the desired point will be calculated based on a weighted distance/power scheme.

The resulting plot will show extrapolations within the drive area but not outside.

Resolution Control (Pixels by Pixels)

The Resolution Control is located on the right side of the application above the 'GENERATE COVERAGE' button.

The resolution control shows the size of the points calculated during the analysis. This value can be incremented or decremented by 5's. Increasing the value reduce the calculation time and decrease the resolution. The value relates to the area of the individual analysis points created. A value of 5 will generate analysis points that have an area of 5x5 pixels.

This feature can be used to get a general feel of the coverage analysis. It can also be used to speed up an analysis over a large area.

To get the best detail out of an analysis, choose lower values for the resolution.

Coverage Shading

The Coverage Shading control is located on the right side of the application above the 'GENERATE' button.

The Coverage Shading control adjusts the transparency of the analysis layer as compared with the data and projection layers.

Move the slider towards the left to increase the transparency. Move the slider to the right to increase the analysis layer opacity.

REPORTS

A report can be generated based on the analysis created. This report will be based on CINR if CINR was selected as the analysis basis or RSSI if RSSI was selected as the analysis basis.

This color report can then be printed out. The report can also be saved into an Adobe PDF file that can be read with the free Adobe Acrobat Reader.

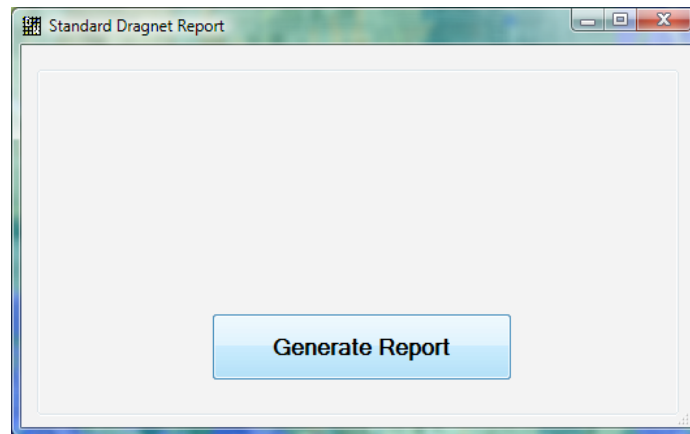Any report can also be saved into a Microsoft Excel format or saved into a GoogleEarth KML layer.

Figure 7 - Sample Dragnet Report

PDF/Excel/Print

To create a report that can be saved in PDF or Excel and is printable, choose the "Reports/PDF/Excel/Print" option from the main menu.
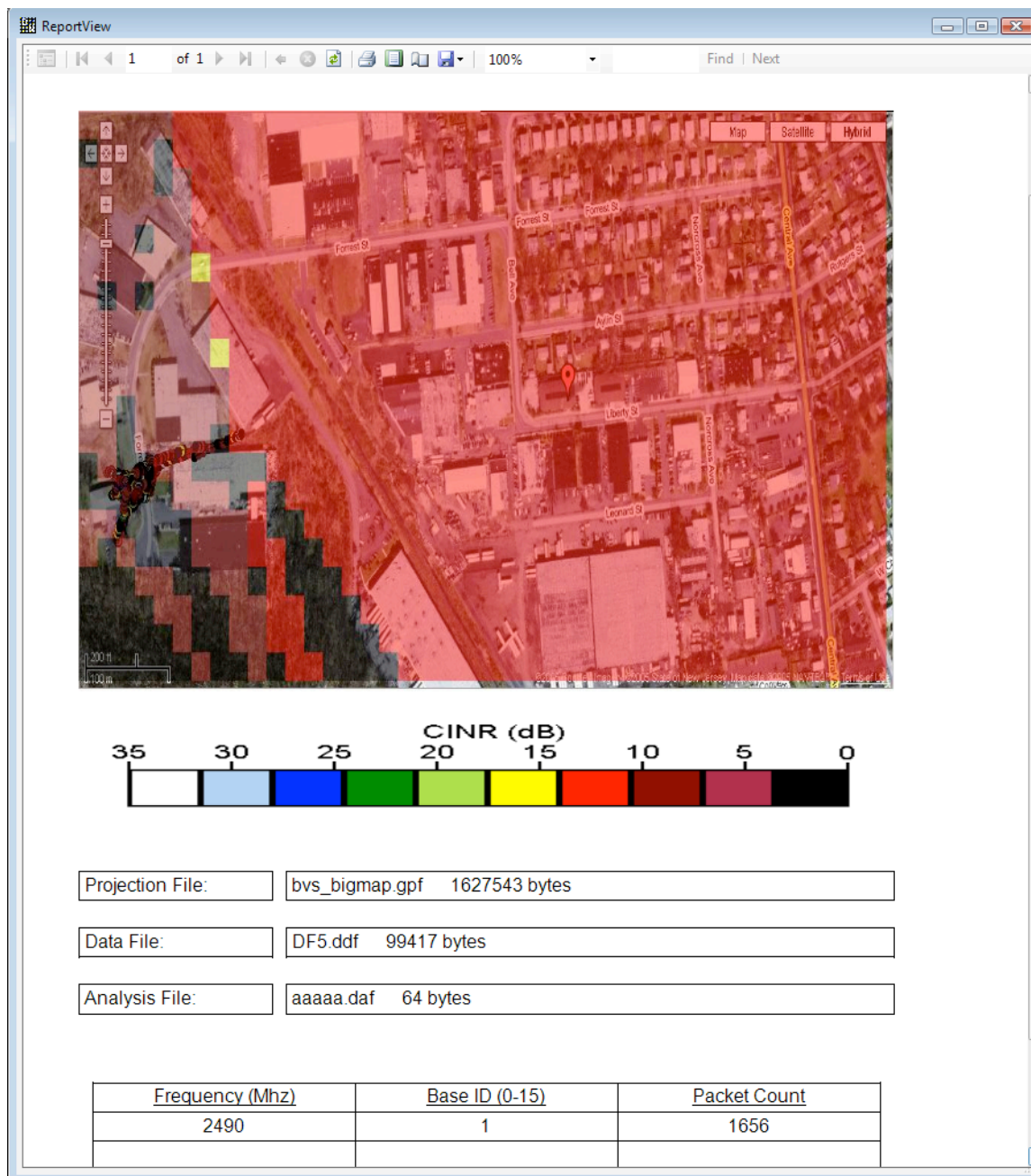
Figure 8– Generate Report Dialog

A popup box as shown above will appear. Simply press the 'GENERATE' button to create the report.

KML Layer

Keyhole Markup Language (KML) files can be opened by **Google EarthTM** and the current analysis will be shown on top of GoogleEarth.

Select "Reports/Create KML Layer" and then choose a filename to store the file when the dialog box appears. After creating a KML file right click on the file and select "GoogleEarth" to open it. Pull down the scroll button at "Places" to the bottom and check the box before "Dragnet RF Coverage", the view will be shown on top of GoogleEarth and the transparency can also be adjusted by the slider control underneath. It can also be saved in "My Places".
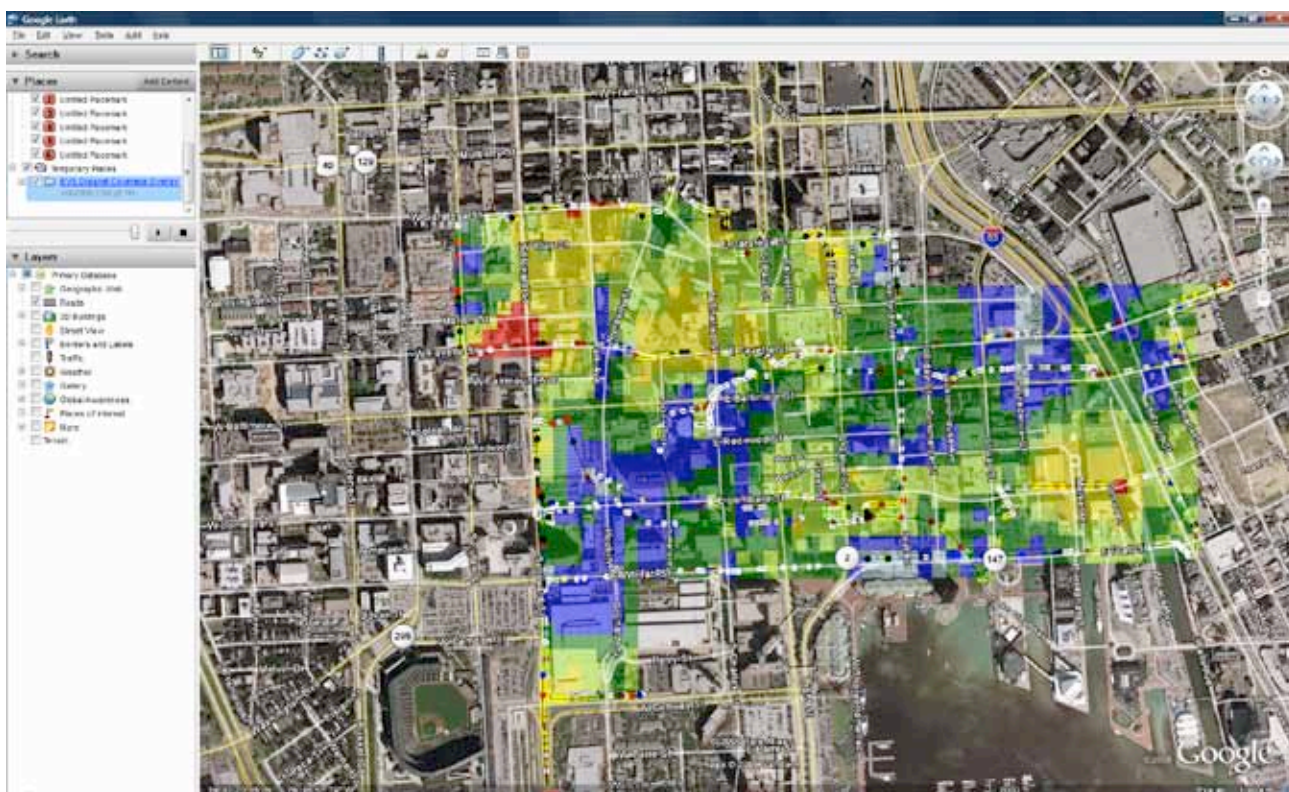

Figure 9 – KML Layer displayed in GoogleEarth

GoogleEarth can be downloaded for free from http://earth.google.com.

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