Horizon Link Planner (HLP) Quick Start Guide

Overview

The Horizon Link Planner (HLP) is a web application which allows for the link engineering of microwave links utilizing DragonWave Horizon Compact and Horizon Quantum products.

The application runs within a web browser and requires no separate application installation. Since HLP is a web application network access to the public Internet is required in order to use its functionality. Since the web application makes heavy use of Javascript the performance of the application can be impacted by the performance of the underlying web browser's Javascript engine. This application has been tested on the Mozilla Firefox 3.x, Google Chrome 4.x/5.x and Microsoft Internet Explorer 7/8 web browsers. Cookies are required to be supported and enabled in order to use the web application. The web application will work on other web browsers that support Javascript and cookies but it is possible due to web standards that the layout of application pages can vary.

Accessing the Web Application

The Horizon Link Planner (HLP) can be accessed at the URL: http://planning.dragonwaveinc.com/DWLinkPlanner. Accessing this link will redirect you to the application URL. The application URL itself cannot be bookmarked. Bookmarks must point to the http://planning.dragonwaveinc.com/DWLinkPlanner URL.

Contacting Customer Support

Customer support for the HLP is offered via email at hlp@dragonwaveinc.com. When contacting support for issues or problems experienced when using the HLP application please include the following:

1. Username for the account.
2. The project name for which the issues occurred.
3. The error message experienced (if one is shown).
4. The detailed set of steps to reproduce the problem (if known).

Logging Into the Application

In order to the HLP you must obtain a username and password from DragonWave. This username and password will be used to provide access to the application as well as an identifier for saving projects.

To log onto the application click on the **[Log On]** link. You will then be presented with a form allowing for you to enter your Username and Password.
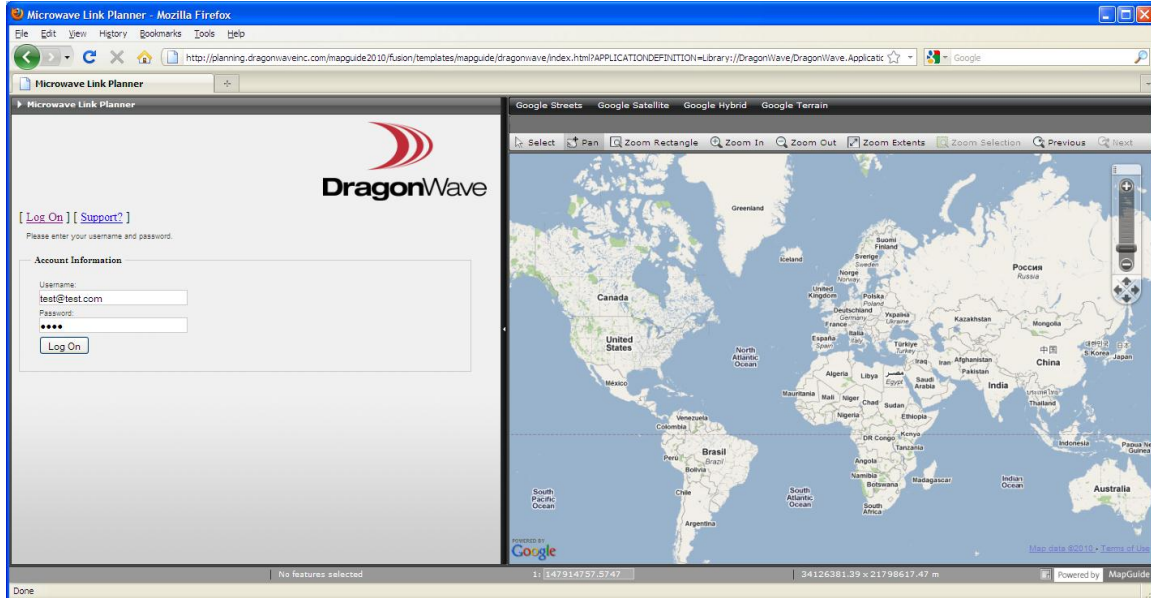
Figure 1

Clicking the **Log On** button will initiate the log in process. A successful login will resulted in the user being presented with the accounts project listing.

Performing Microwave Link Design with HLP

The workflow for performing microwave link design with HLP involves the following:

- Define the sites (i.e. name, height, latitude, longitude…)
- Define the links (i.e. from site, to site, configuration…)
- Generate options for links based on configuration criteria
- Select options for links
- Generate a Bill of Materials (BoM) or reports

The following tutorial will guide you through the design of a link and the generation of reports.

Step 1: Creating a project

The application makes use of the project concept to group a set of related designs. From the main project page users can open, delete and create projects. Once a project is deleted it cannot be retrieved as the associated data for the project is removed from the system. In order to **Delete** and **Open** a project the associated buttons are used. To create a new project the **New** link is utilized.

Figure 2

Clicking the **New** link opens the project definition page. This is where the details for the projects settings are entered.
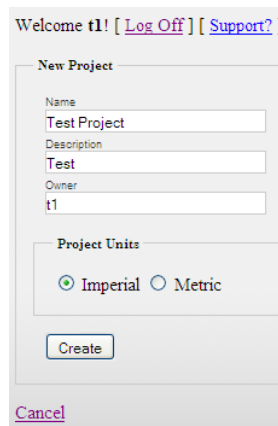

Figure 3

The following fields exist for this page:
- **Name**: This is a mandatory field.
- **Description**: This is an optional field which offers metadata description for a project.
- **Owner**: This field cannot be edited by the user. It indicates the current user for which the project will be created for.

The following options exist for this page:
- **Project Units:** This can either be **Imperial** or **Metric**. For Imperial heights and distances will be in feet (ft) and miles (miles). For Metric heights and distances will be in meters (m) and kilometers (km). The rain rate is always in mm/hr.

Clicking the **Create** button initiates the project creation process.

Step 2: Adding sites

There are two ways to bring site information into HLP. The simplest option is to perform site addition in the graphical user interface by entering the site

information into a page. Sites can be added by expanding the **Sites** accordion and clicking the **New** button. This is shown in Figure 4.
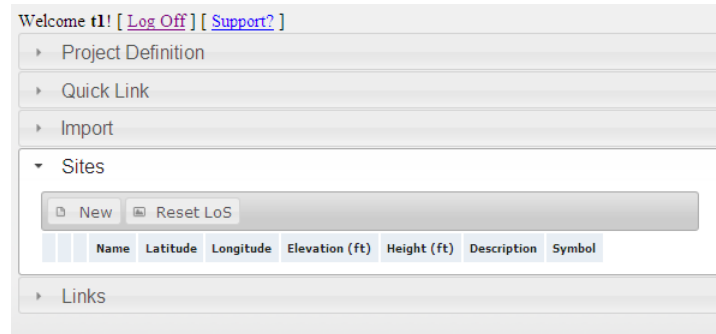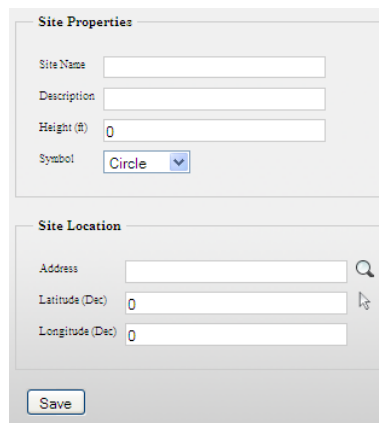

Figure 4

Clicking the **New** button causes the site properties page to be loaded. This is shown in Figure 5.

Figure 5

The following fields exist for this page:
- **Site Name**: This is a mandatory field. Each unique site must have a unique name.
- **Description**: This is an optional field which offers metadata description for a site.
- **Height (ft/m)**: This is the height where the antenna would be located. The above mean sea-level height of the site is calculated from underlying elevation data.
- **Symbol**: This is defines the symbol that will show on the map to represent the site (i.e. a marker).
- **Address**: This field is only used for those who don't know the latitude and longitude coordinates of a site but would like to lookup the location. Clicking the magnifying glass causes the **Latitude** and **Longitude** fields to be automatically populated should the address exist in the underlying database. Currently, this feature uses a Google database for address lookup.

- **Latitude (Dec)**: This is the latitude value in decimal format. Currently, only decimal format is accepted. North values are positive and south are negative.
- **Longitude (Dec)**: This is the longitude value in decimal format. Currently, only decimal format is accepted. East values are positive and west are negative.

Once the data has been entered click **Save** to create the site. Figure 6 shows an example of the **Sites** accordion after it has been populated with two sites.
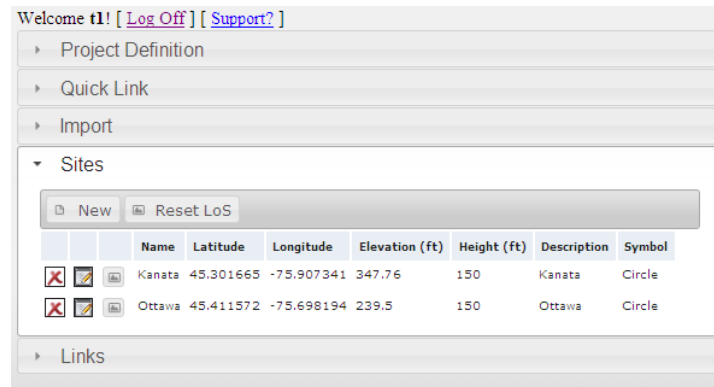

Figure 6

Step 3: Setting the project defaults

This step is necessary to define the project settings that will be applied to links. If the defaults won't be used then this step can be skipped. The types of settings are shown in Figure 7.
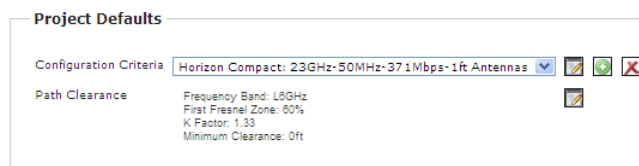

Figure 7

Configuration Criteria: This allows you to select the default configuration criteria for a project. It is a pull-down menu which lists a set of default configuration criteria as well as custom created configuration criteria which is unique for each user. Custom criteria is available in all user projects and not just within the project in which it was created (i.e. it is a user setting and not a project setting). For **Configuration Criteria** you can do the following:

1. **Edit Link Configuration ( )**: This allows for the editing of currently selected criteria. In order to copy configurations this option is selected and then a new name for the configuration is chosen before saving. Also, note that built-in configurations cannot be changed but they can be copied by changing their name and then saving the modified configuration.

2. **New Link Configuration (⊕)**: This allows for the creation of a new configuration criteria.
3. **Delete Link Configurations (✗)**: This allows for the deletion of configuration criteria. Note that criteria which are currently assigned to a link or links cannot be deleted without first removing these configuration criteria from all links for which they are currently assigned.

To create a configuration criteria click on the ⊕ icon. You will be presented with the **Link Configuration Criteria** page as show in Figure 8.
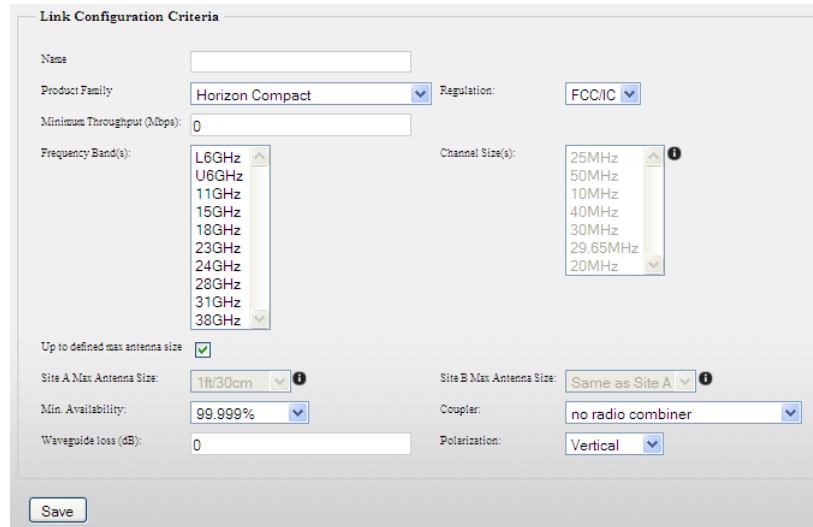

Figure 8

The following are the fields that exist on this page:
- **Name**: This is the unique name for the configuration criteria. It must be unique on a per user basis and it cannot be the same name as any of the built-in configuration criteria.
- **Product Family**: This can be one of three choices; "Horizon Compact", "Horizon Quantum, dual-carrier" and "Horizon Quantum, single carrier".
- **Regulation**: There are currently two options; "FCC/IC" and "ETSI". "FCC/IC" denotes Federal Communications Commission and Industry Canada. "ETSI" denotes European Telecommunications Standards Institute.
- **Minimum Throughput (Mbps)**: This is the minimum throughput requirement of the link in Mbps. Note that setting a value in this field will effect the other settable options as available frequency and channel size options are filtered based on the desired throughput requirement.
- **Frequency Band(s)**: This allows for the selection of frequency bands which should be considered as candidates for the options generation. Multiple bands can be selected by holding the Ctrl (control) key when selecting. Also, multiple selections with the Shift key is supported.

- **Channel Size(s)**: This allows for the selection of candidate channel sizes. The options available in this menu depend upon both the **Minimum Throughput** and the **Frequency Band(s)**. If a channel size doesn't meet the minimum throughput requirement or if it isn't available within a frequency band then it will not be listed as an option.
- **Up to defined max antenna size**: This check box affects how antenna combinations are generated during options generation. If this is checked then all combinations from the lowest available antenna size up to the max defined in the following two fields will be considered.
  - **Site A Max Antenna Size**: This is the **maximum** antenna size at site A to be considered for options.
  - **Site B Max Antenna Size**: This is the **maximum** antenna size at site B to be considered for options.

  If this is not checked then only the specified antenna sizes will be used and the following two fields are considered:
  - **Site A Max Antenna Size**: This is the **only** antenna size at site A to be considered for options.
  - **Site B Max Antenna Size**: This is the **only** antenna size at site B to be considered for options.
- **Min. Availability**: This sets the minimum availability requirement for the generated options. The following are possible selections:
  - **99.999%**: Five nines.
  - **99.995%**: Four nines and a five.
  - **99.99%**: Four nines.
  - **No Minimum**: No availability requirement is imposed on the options. Thus, all options with availabilities between 0% and 100% will be generated and shown.
  - **User Defined**: This allows for setting a custom minimum availability requirement. When chosen a new field appears allowing for a custom value between 0 and 100 to be entered. Values should be entered without a "%".
- **Coupler**: This allows for the selection of the type of coupler which should be considered for options. These settings affect the overall system losses. The following are the available selections:
  - **no radio combiner**: No radio combiner configured for this criteria.
  - **DPRM (2+0)**: A DPRM radio combiner is configured for this criterion.
  - **PSRM Primary to Primary**: A PSRM radio combiner is configured for this criterion in a primary to primary configuration.
  - **PSRM Secondary to Secondary**: A PSRM radio combiner is configured for this criterion in a secondary to secondary configuration.
  - **PSRM Primary to Secondary**: A PSRM radio combiner is configured for this criterion in a primary to secondary configuration.

- **Waveguide loss (dB)**: This is the total waveguide loss for an entire link. Thus, if there are two waveguide losses (one at each end) then these should be summed and placed in this field.
- **Polarization**: The polarization can either be **Vertical** or **Horizontal**.

Click the **Save** button to save a configuration after selecting and setting the appropriate options.

Path Clearance (📝): These are the path clearance criteria which are used to generate the path profiles for a link.

- **Frequency Band**: This allows for the selection of a frequency to base the path profile upon. This selection will impact the Fresnel Zone.
- **Fresnel Zone (%)**: This is a value between 0 and 100 which defines what percentage of the Fresnel Zone will be shown on the path profile and also affects the line-of-sight calculations.
- **K Factor**: This is a value (in decimal) which defines the ratio of the effective Earth radius to the actual Earth radius. A typical K Factor value of 1.33 is the default value.
- **Minimum Clearance (ft/m)**: This is a positive real value which indicates the required minimum clearance. This affects the line-of-sight calculations and will be shown as a line on the link path profile.

Step 4: Adding links

There are two ways to bring link information into HLP. The simplest option is to perform link addition in the graphical user interface by entering the site information into a page. The page found in Figure 9 shows the information that can be entered for a link.
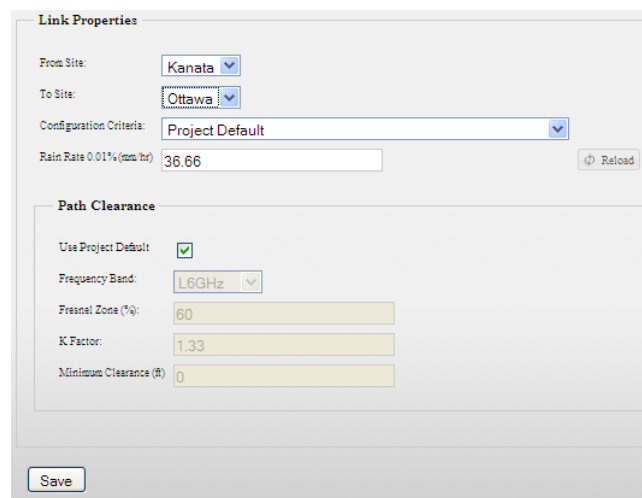

Figure 9

The following fields exist for this page:

- **From Site**: This pull-down contains all the sites which exist within the project. The one selected denotes the links "From Site".
- **To Site**: This pull-down contains all the sites which exist within the project. The one selected denotes the links "To Site". Note that this selection cannot be the same site as the "From Site".
- **Configuration Criteria**: This selection is what the configuration options will be generated against. Choosing the project default will cause the options to be generated against the criteria specified in the projects default configuration criteria. Selecting named criteria will cause this links options to be generated against the selected criteria.
- **Rain Rate (mm/hr)**: This rain rate is automatically populated based on the mid point location of a link. The value is populated from the ITU-R P.837-5 rain database. The pre-populated value can be overridden.
- **Path Clearance:** See Step 3: Setting the project defaults for the path clearance criteria which can be set.
  - o **Use Project Default:** Checking this option will cause the link to use the path clearance criteria which is set as a project default.

Click the **Save** button to save a configuration after selecting and setting the appropriate options.

Once a link is created it will appear in the **Links** accordion. An example is shown in Figure 10.
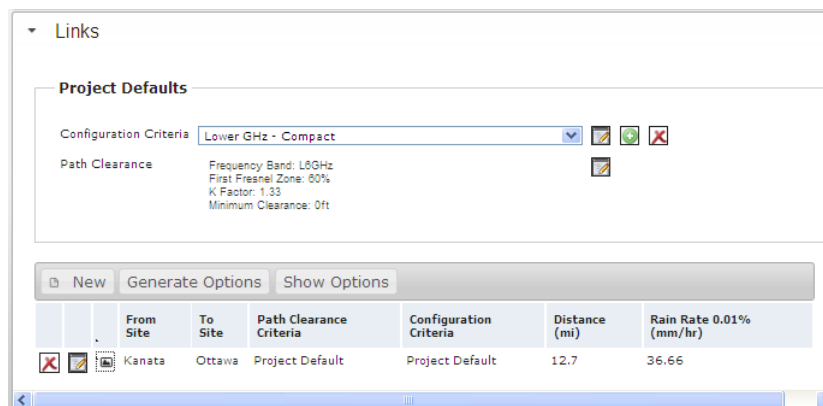

Figure 10

Step 5: Editing and viewing link properties

Once a link is created the link properties can be edited by clicking on the 🖉 icon. This will show the link properties page as shown in Figure 9. A link can be deleted by clicking the ✗ icon. Once a link is deleted this operation cannot be undone.

Certain link properties such as the **From Site**, **To Site**, **Path Clearance Criteria**, **Configuration Criteria**, **Distance (mi/km)**, and **Rain Rate 0.01% (mm/hr)** are shown for each link within the **Links** accordion.

Step 6: Showing a path profile

A path profile can be shown by clicking the ▣ icon. An example profile is shown in Figure 11. The path profile shows the following lines:

- **Path Profile**: This line shows the terrain.
- **Path Profile Corrected:** This is the corrected path profile considering the specified K Factor.
- **Line of Sight:** This is the direct line of sight between the two antennas at the end points.
- **Fresnel Zone:** This line represents the percentage of the first Fresnel Zone according to the setting set for the path clearance criteria.
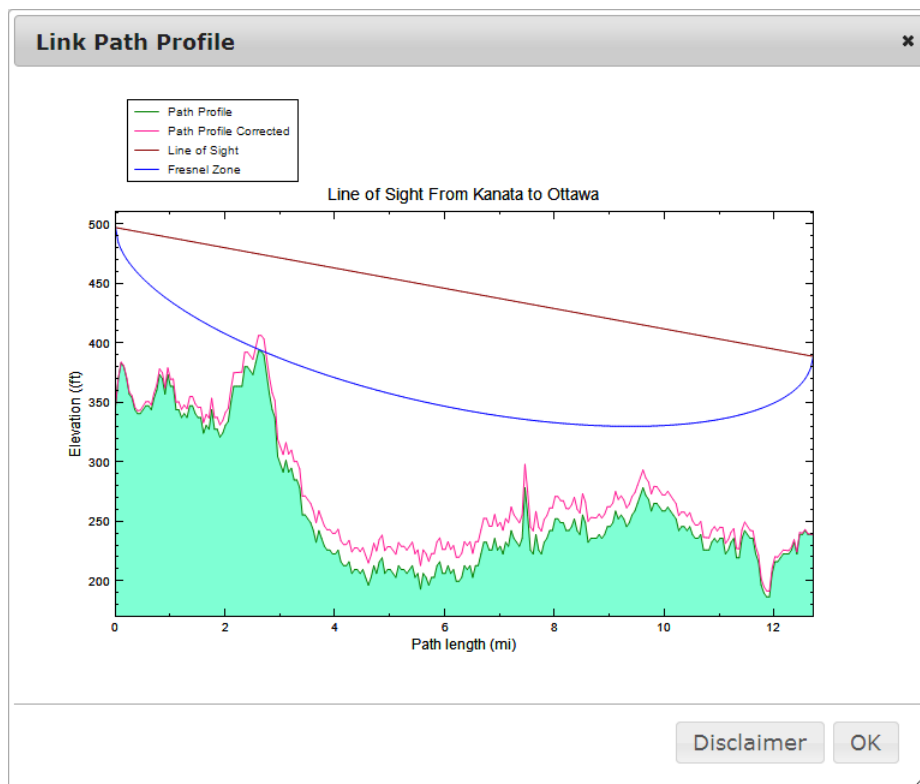

Figure 11

Step 7: Generating options

Based on the configuration criteria set for a link one can then generate the possible options for a link. This is done by expanding the **Links** section and clicking the **Generate Options** button. See Figure 10 for the button location.

The time required to generate options depends on a number of factors but the largest contributor to calculation time is the number of options that have to be considered for a particular set of configuration criteria.
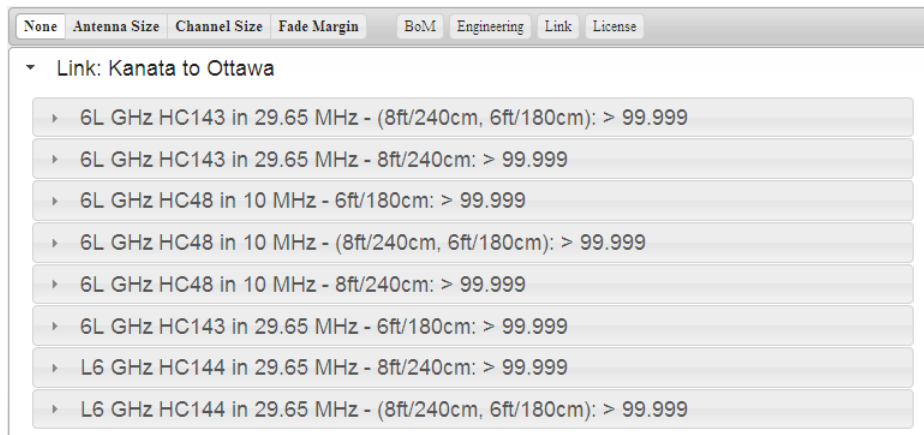

Figure 12

While the options are being generated an indicator saying "*Loading*" is displayed. Once the option generation has completed the link list is presented and selecting a link will display the available options. An example link with options is shown in Figure 12. Clicking on an option displays it details.

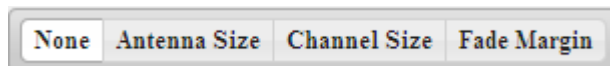The results of option generation can be optimized by selecting one of the buttons shown in Figure 13.

Figure 13

There are four buttons that control the optimization. The following are the results of clicking each of the optimization buttons:

- **None:** No optimization to the options is done. Thus, all options are shown.
- **Antenna Size:** The options will be optimized based on the smallest antenna size combinations. Thus, only the smallest antenna options will be shown.
- **Channel Size:** The options will be optimized based on the smallest channel sizes to meet the throughput requirements.
- **Fade Margin:** The options will be optimized based on the highest fade margin.

Figure 14 shows a selected option and its details. Each option can be expanded and viewed independently. The options can be modified and the results of these changes can be seen by clicking the **Recalculate** button.

The following fields exist for this page:

- **Use This Option**: Selecting this causes this option to be selected for the link and all other options are then hidden. This option will then become the option output to reports.
- **Configuration Properties**:
  - o **Radio**: This allows you to change the radio for this option. Any radio which is part of the matching configuration criteria can be selected.
  - o **Coupler**: See Step 3: Setting the project defaults.
  - o **Polarization**: See Step 3: Setting the project defaults.
  - o **Transmitter Back Off (dB)**: This is a value between 0 and 20. It will back off the power by the specified amount and all calculations will be based upon the transmit power minus the back off amount.
  - o **Waveguide Loss (dB)**: This is informational only and is based upon the settings within the link configuration criteria. See Step 3: Setting the project defaults.
  - o **ATPC**: This setting controls the Automatic Power Control features of the Horizon radios. When checked it is turned on and it will adjust the radio's output power such that the maximum receive signal is not exceeded. If the maximum receive signal is not exceeded then this setting has no affect on the calculations.
  - o **Automatic Adaptive Modulation**: When this option is selected the availabilities for the alternative supported modes are shown.
  - o **Site 1 Options**:
    - ▪ **Antenna**: This lists the current antenna at Site 1. It can be adjusted based on the available antennas for the current radio configuration.
    - ▪ **Options**: If a shroud is available for the current antenna size then it will be listed here.
  - o **Site 2 Options**:
    - ▪ **Antenna**: This lists the current antenna at Site 2. It can be adjusted based on the available antennas for the current radio configuration.
    - ▪ **Options**: If a shroud is available for the current antenna size then it will be listed here.
- **Availability**: This section lists the results of the selected options within the **Configuration Properties**. The initial values are based on the generated option. If any property of the configuration is changed then the **Recalculate** button must be clicked to generate new results. See Figure 14 for the current list of results. More details about a design can be viewed by generating reports.

Figure 14

Note that options are selected independently for each link.

Step 8: Creating reports

The HLP allows for the generation of reports which can be saved and viewed outside of the web application. There are three types of reports that can be saved. These reports are generated by clicking on their respective buttons as shown in Figure 15.
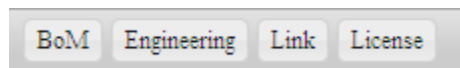

Figure 15

- **Engineering Details Report:** This is a PDF file which contains path profiles and detailed path engineering information.
- **Link Details Report:** This is an XLSX (Microsoft Excel) file which contains detailed path engineering information on a per link basis. Those with Microsoft Office 2000 and 2003 can open XLSX files with the "Microsoft Office Compatibility Pack for Word, Excel, and PowerPoint File Formats". This can be downloaded from the following URL: http://www.microsoft.com/downloads/details.aspx?familyid=941B3470-3AE9-4AEE-8F43-C6BB74CD1466&displaylang=en

- **License Coordination Report:** This is an XLSX (Microsoft Excel) file which contains information which aids in the license coordination effort.