



USER GUIDE

cnHeat

System Release 1.0



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# cnHeat Overview

Built upon Cambium Networks' expertise in RF planning, propagation, and modeling as seen in LINKPlanner and integrated with GIS data down to 1-meter precision, cnHeat generates highly accurate RF predictions and derivative services that accurately represent the reality of the RF world.

## How to login

cnHeat can be accessed via a supported web browser at <https://cnheat.cambiumnetworks.com>.



### Note

Currently Chrome and Firefox are the only supported web browsers.

At the prompt, enter your cnHeat account name and password:

Figure 1: Login screen

Please enter your cnHeat account name and password

Account Name

Password

Go



### Note

The account name and password are provided after an order has been placed and the account has been properly activated. For more information, visit the Cambium Networks website at <https://www.cambiumnetworks.com/products/software/cnheat>.

## How to navigate

The following types of navigations are supported:

- Mouse
- Keyboard
- Onscreen

## Mouse

- **Pan:** Click + Drag
- **Zoom In:** Double Left Click
- **Zoom Out:** Double Right Click
- **Zoom In/Out:** Wheel Scroll

## Keyboard

- **Pan:** Arrows
- **Page Pan:** Home/End/Page Up/Page Down
- **Zoom In:** (+)
- **Zoom Out:** (-)

## Onscreen

**Zoom In/Out:** +/- buttons (Bottom right corner of the screen).

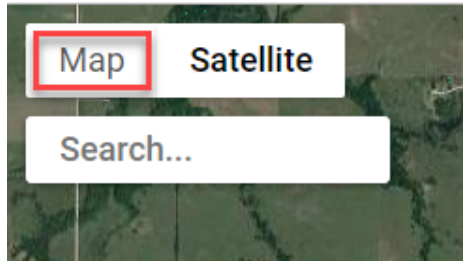
*Figure 2 : Zoom In/Out options*



## How to toggle between base maps

cnHeat supports the standard Road and Satellite base maps from Google. By default, Satellite view is selected. To select the Road map, click the **Map** button in the upper left corner of the **Screen**.

Figure 3 : Toggle between base Maps



Click **Satellite** to revert to the Satellite base map.

## How to search for a location

A search bar has been added to assist in navigation. When the address is known click the **Search** button, type the address, and hit the Enter key on the keyboard. The map will attempt to place a red marker and navigate to the location identified.

Figure 4 : Search location

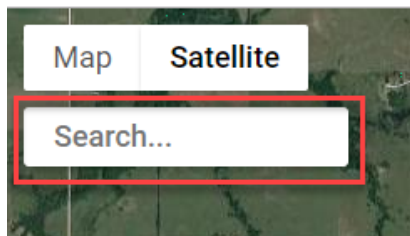
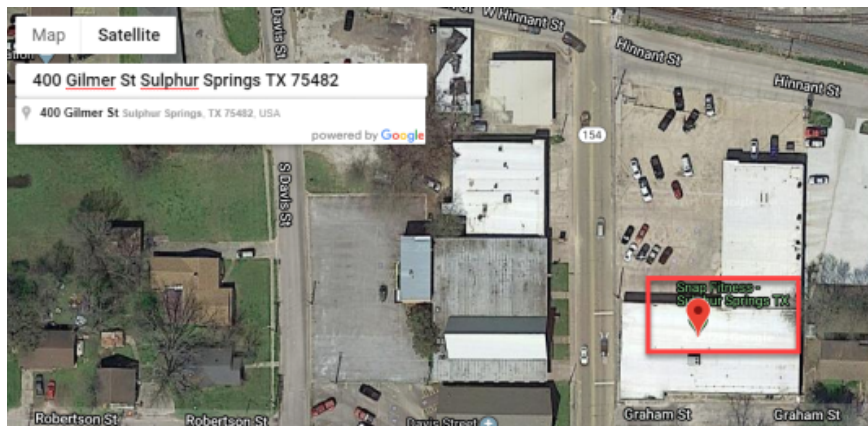


Figure 5 : Search location (Sample)





#### Note

All locations provided through the **Search** button are the best effort and as such the accuracy is not guaranteed. When possible seek additional means to verify the position of the address. (e.g. customer description of the property or turn by turn directions from the customer).

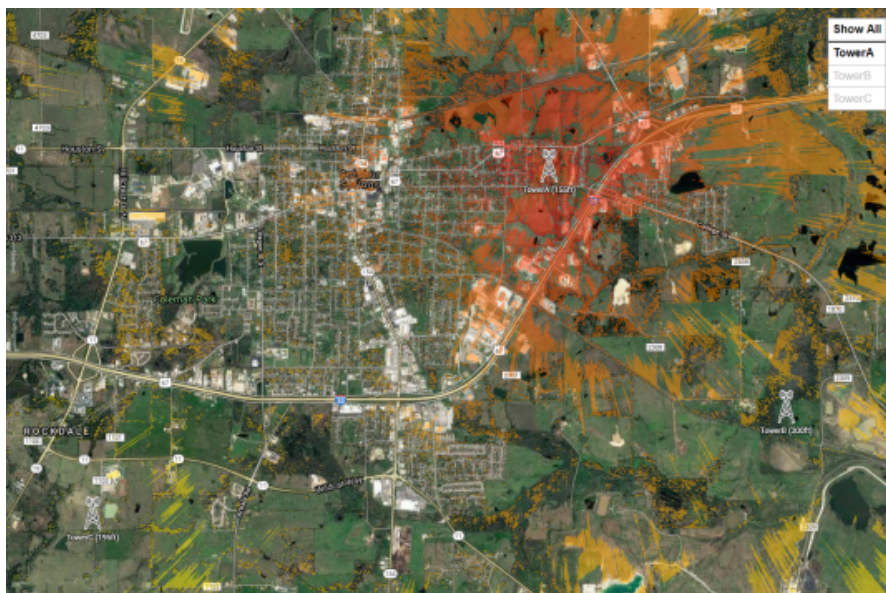
## How to enable/disable coverage

Because it may be desirable to hide coverage from certain towers when reviewing connectivity options, the coverage for each tower can be enabled/disabled by Left Clicking the tower name in the top right corner of the screen. Bold black font indicates the coverage is enabled and gray normal font indicates the coverage is disabled.

In the below example, Tower A is enabled while Towers B and C are disabled.

All the towers can be shown at the same time by Left Clicking **Show All** in the top right corner of the screen. If all towers are selected, then **Show All** is changed to **Hide All**. Left Clicking **Hide All** causes all towers to be unselected.

Figure 6 : Enable/Disable coverage

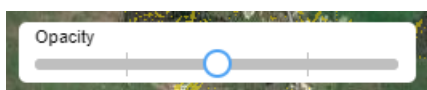


## How to adjust the opacity of coverage

A slider has been provided in the bottom center of the screen to allow the user to adjust the opacity of the coverage maps. This can be important when the coverage obscures the base map below it.

Sliding to the left reduces opacity while sliding to the right increase opacity.

Figure 7 : Adjust the opacity of coverage





## How to adjust installation height and signal strength

Two sliders on the bottom left of the screen allow the user to adjust coverage based on the maximum installation height allowed (vertical slider) and the minimum downlink signal strength (horizontal slider).

These two sliders work in conjunction to determine what coverage is and is not visible. A given pixel must meet BOTH requirements for it to be displayed as coverage.

Figure 8 : Adjusting Installation Height and Signal Strength filters



### Note

cnHeat utilizes height above clutter when viewing a LOS prediction and height above the ground when viewing a NLOS prediction. The height slider will either be referenced above clutter or above ground depending on which mode is selected.

## How to switch between LOS and NLOS mode

For cnHeat accounts that contain NLOS predictions the user can switch between LOS (Height above Clutter) mode and NLOS (Height above Ground) mode by clicking the box at the top of the height slider. The install height will change between height above clutter and height above the ground when making this change.

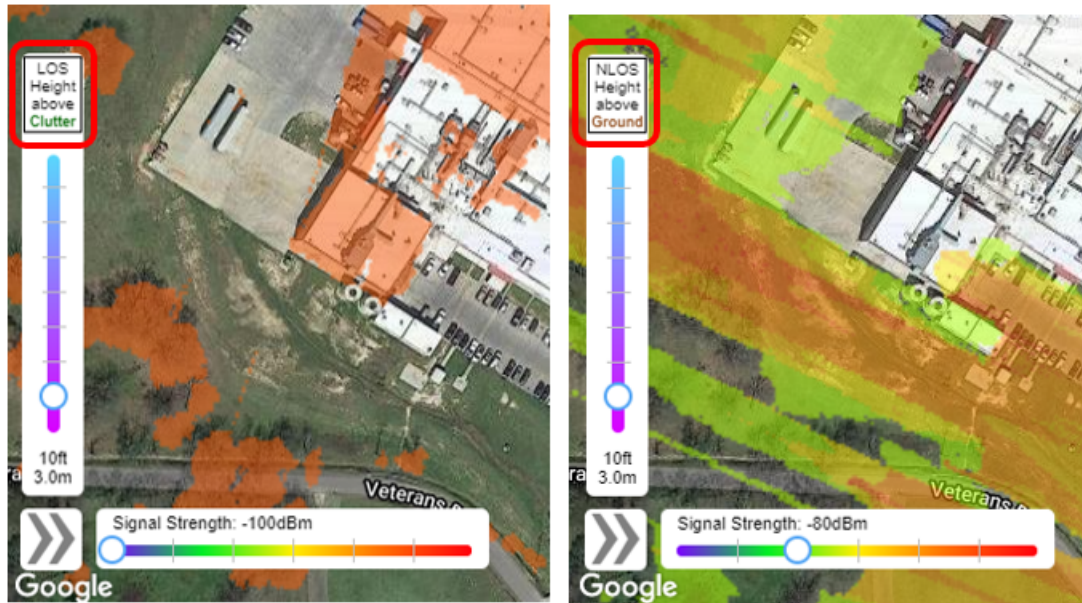


### Note

cnHeat uses a less traditional Height above Clutter approach to height in LOS mode to increase accuracy of predictions. Coverage in this mode follows the height of the clutter. An installer interested in a J-mount install can set the height to 2ft. The prediction at 2ft will follow the height of the roof so that a user is not required to try to extrapolate the height of each building to determine coverage. (That is, the predictions in LOS mode automatically take into account the height of each building and also the height of the roofline at the various points for each square meter.



Figure 9 : Switching between heatmap views



#### Note

Currently NLOS support is only available for 3 GHz band predictions. Any LOS only predictions will automatically be disabled when in NLOS mode..

## How to use the Distance Tool

A distance tool has been added to help the user analyze installation points.

Simply left-click on the map to activate the tool. Click the “X” in the upper-right corner of the dialog to close.

For each tower within 20km the tool identifies three pieces of information.

- The distance from each tower.
- An NLOS table (if NLOS predictions exist).
- A LOS table.



#### Note

Signal Strength values are estimates based on link budget calculations using the information that the customer provides when submitting a cnHeat order. For additional information or to try to model a path more precisely Cambium Networks recommends planning the link in LINKPlanner.

Figure 10 : Using the Distance Tool to evaluate an installation point



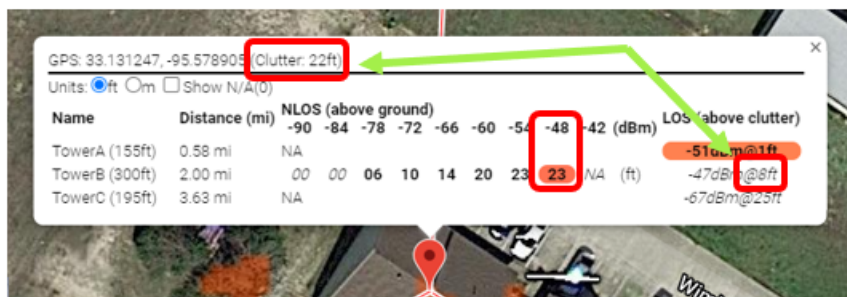
The NLOS table shows the heights (above ground) a subscriber module would require to achieve each of the nine preselected RSL levels (-90dBm, -84dBm, -78dBm, -72dBm, -66dBm, -60dBm, -54dBm, -48dBm, -42dBm).

The LOS table shows the expected RSL and the height (**above clutter**) a subscriber would require to obtain LOS to the tower from that location.

For NLOS predictions the clutter height is shown in the top of the distance tool and can help to correlate between “above clutter” and “above ground” install heights.

### Example:

Notice in the figure below that Tower B shows a NLOS connection of -48dBm at 23ft above ground. LOS is achievable at 8ft above the clutter. Also notice that the clutter height for this point is 22ft. 22ft(clutter) + 8ft(above clutter) = 30ft(above ground) and provides a -47dBm. In this example LOS is achievable at 30ft above the ground with a -47dBm. An NLOS signal of -48dBm is achievable 7ft lower at 23ft above ground.



By default any towers without valid coverage to the point selected will be hidden from the table. To show these hidden towers click **Show N/A** checkbox.

Also either imperial or metric units can be selected from the Units radio button.



#### Note

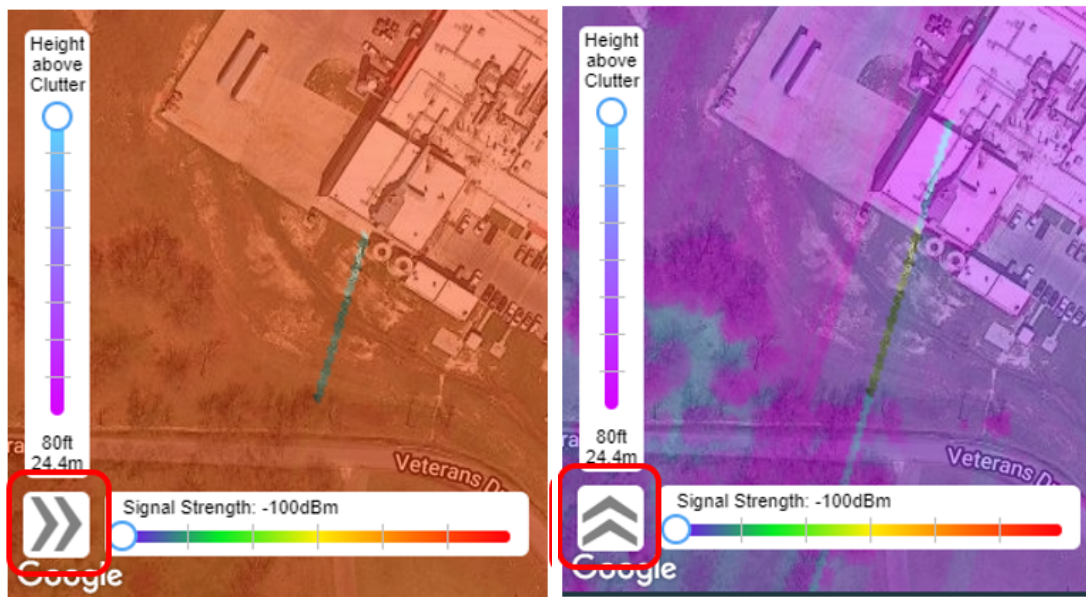
When a given cell in the table meets both the Signal Strength and Installation Height filters then the cell is marked **bold** indicating its viability. Otherwise the cell in the table is marked in *italics*.

## How to switch between the two heatmap views

Each prediction can either be viewed as a traditional signal strength heatmap (Red to Purple) or as an installation heatmap (Magenta to Cyan). The signal strength heatmap is generally used when zoomed out. The installation heatmap can be very beneficial when zooming in. When used properly it can help installers understand the best place on a property to install showing shadows from obstructions more clearly.

To switch between both views click the arrow button in the bottom left of the screen. Arrows to the right indicate the Signal Strength view (default) while arrows up indicate the Installation Height view.

Figure 11: Switching between heatmap views







#### Note

Colors on the map correlate to the legend built into each of the sliders dependent on which view is active. (Signal Strength or Installation Height).

## How to interpret data



#### Note

The cnHeat service provides estimates of wireless coverage based on information provided by the customer and publicly available GIS data. The maps produced by the cnHeat service are maps of estimated coverage and should be used for informational purpose only. Cambium makes no guarantees that such maps are accurate.

This section provides the following details:

- "Trees" below
- "Phantom coverage" below
- Interior Building Shadows (NLOS mode only)

## Trees

cnHeat takes into account the height of all terrestrial features (buildings, trees, terrain). For LOS predictions coverage is generated ABOVE CLUTTER for all points where an SM could be placed and have connectivity to the tower. When coverage is shown above trees it is an indication that if the SM were mounted ABOVE the tree that it would be able to connect to the tower.

Figure 12 : Coverage ABOVE Trees



## Phantom coverage

cnHeat is a composite of multiple data sets taken over different points in time. As such, datasets will not always align and sometimes phantom coverage is created.

#### Example:

A tree was present in RF prediction data but is missing in the Google satellite base map. Consequently, cnHeat appears to falsely show coverage at this location.

Figure 13 : Phantom coverage

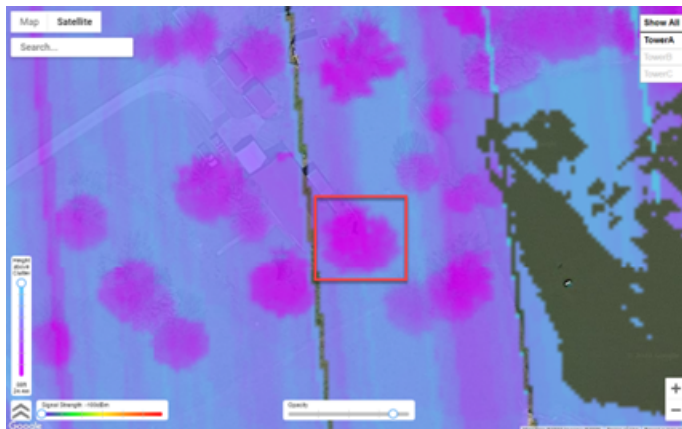


This anomaly can typically be identified because coverage in trees tends to show a distinctive “shotgun” pattern. Also, in this case coverage starts in the yard and extends over a portion of the home which is unlikely given that no other buildings in the area have coverage.

Additionally if a NLOS prediction exists in this region then the Distance Tool can be used to measure the clutter height to determine the fidelity of the coverage shown.

This is further evidenced when we switch to Installation Height view, max out the height, and increase opacity.

Figure 14 : Installation Height view



## Interior building shadows (NLOS mode only)

When evaluating coverage for buildings in NLOS mode the install height must be configured high enough to properly represent an install height ABOVE the building. If proper care is not taken then interior shadows will appear in the coverage. To correct this raise the height sufficiently to model the highest point on the building.

Example:





# Cambium Networks

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