3DGS Measurement Tool Operation Guide

This guide provides a step-by-step workflow for using the 3D Gaussian Splatting (3DGS) Measurement web application to perform high-accuracy 3D measurements and geometry creation.

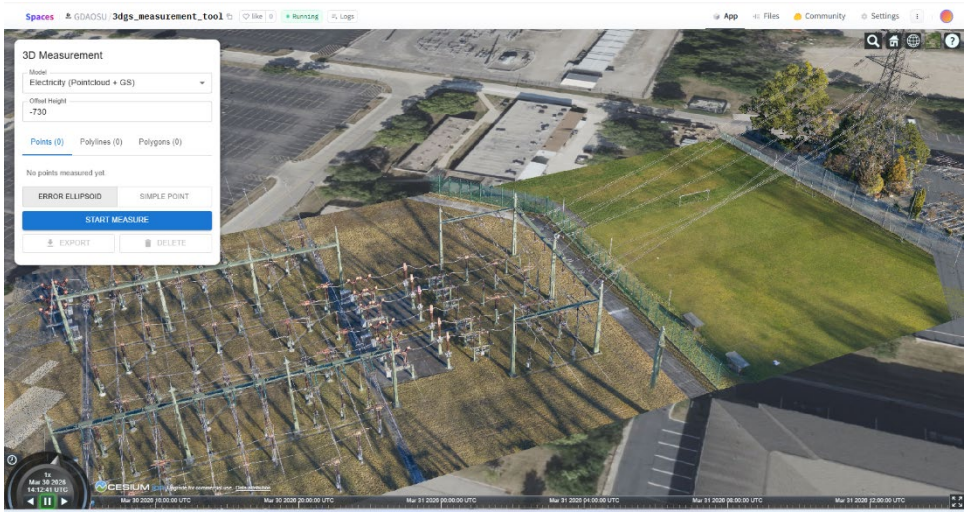

Figure 1. Web application layout

1. Select a Model

1. In the left panel, open the **Model** dropdown menu to see loading options.
2. Choose one of the following methods:
    - **Select a built-in model**: Simply choose one from the list.
    - **Load from Custom S3**: Select this option, click **Edit**, provide your S3 Bucket, Prefix, and Tileset file name, set an optional height offset, and click **Save**.

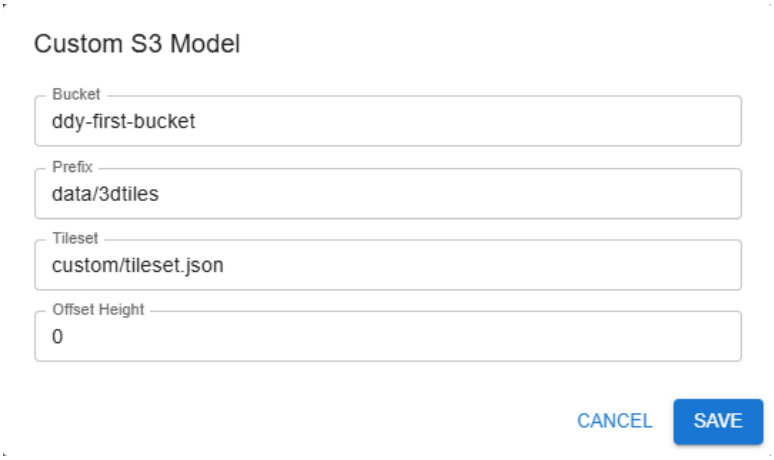

Figure 2. Load mode from Amazon S3 bucket

- **Load from URL**: Select this option, click **Edit**, paste the tileset URL, set an optional height offset, and click **Save**.

Figure 3. Load model from a given url

- **Upload a local file**: Select this option, click **Upload**, enter the model's Latitude and Longitude, set an optional height offset, and then choose a .ply, .splat, or .spz file from your computer.

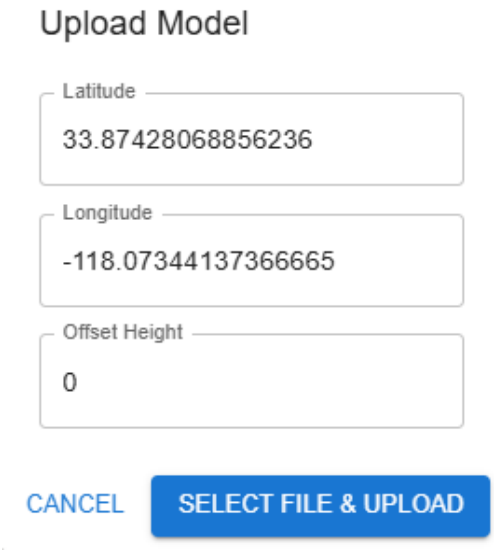

Figure 4. Create model from local splats.

3. The **Offset Height** value can be adjusted at any time from the model panel to vertically shift the model for better alignment.

2. Measure Points

1. Go to the **Points** tab.
2. Click **Start Measure** to begin.
3. In the 3D viewer, click on your target point. A ray is cast from the camera.

4. Change the camera view (rotate/pan/zoom) and click the *same* point from a different angle.
5. Repeat at least once. More clicks from varied viewpoints improve the measurement's stability.
6. Click **End Measure**. The system triangulates the clicks to compute and save the 3D point.
7. The measured point appears in the list with coordinates and an Iz accuracy metric.

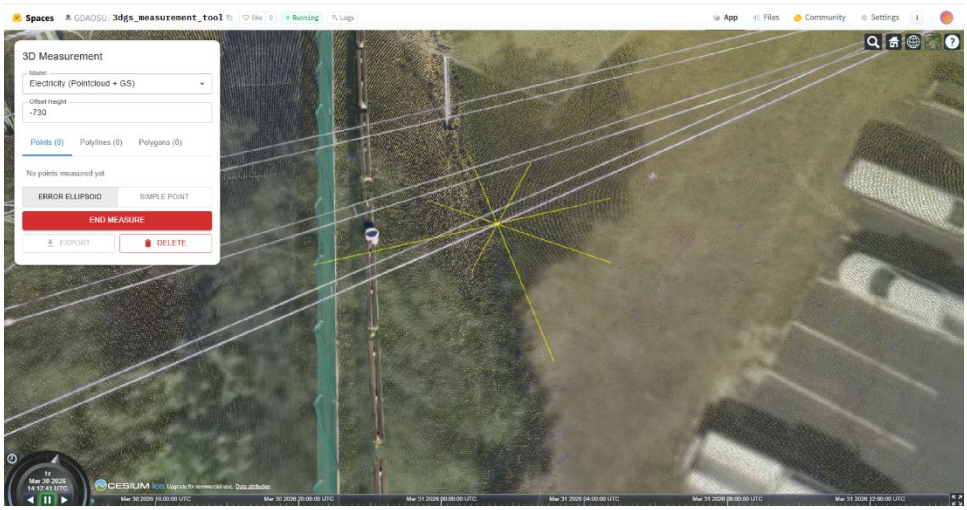

Figure 5. Point measurement

3. View Error Ellipsoid

In the **Points** tab, you can switch between two visualization modes for measured points:

- **Error Ellipsoid**: Shows the uncertainty of each point as a 3D ellipsoid. This is useful for visually assessing measurement quality.
- **Simple Point**: Shows a simple marker for a cleaner view.

Use the toggle to switch between these modes.

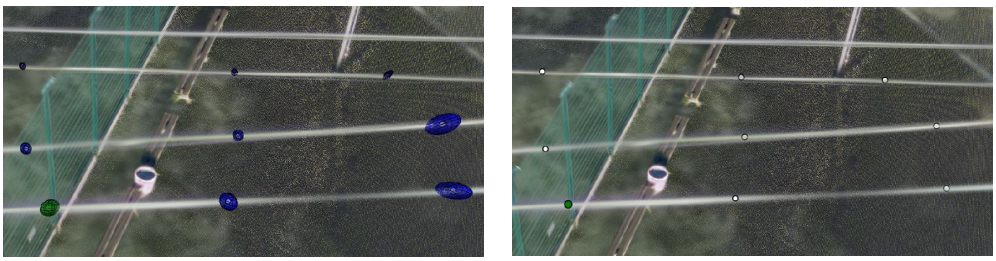

Figure 6. Point view modes, Left: Error Ellipsoid, Right: Simple Point.

4. Create Polylines

1. Go to the **Polylines** tab.
2. Click **Create Polyline**. A geometry creation panel will appear on the right.
3. Build the polyline by adding existing measured points to it. You can do this in two ways:
    - Click on measured points directly in the 3D view.
    - In the geometry panel, select points from the "Available Measured Points" list and click **Add Selected**.
4. (Optional) In the geometry panel, drag and drop points within the "Selected Points for Geometry" list to reorder them.
5. Click **Finish Polyline** to save the new geometry.

Figure 7. Polyline measurement

5. Create Polygons

1. Go to the **Polygons** tab.
2. Click **Create Polygon**. A geometry creation panel will appear on the right.
3. Build the polygon by adding at least 3 existing measured points. You can do this in two ways:
    - Click on measured points directly in the 3D view.
    - In the geometry panel, select points from the "Available Measured Points" list and click **Add Selected**.

4. (Optional) In the geometry panel, drag and drop points to reorder the polygon's vertices.
5. Click **Finish Polygon** to save the new geometry.

6. Export Points, Polylines, and Polygons

Each tab (**Points**, **Polylines**, **Polygons**) has its own **Export** button.

1. Go to the tab containing the data you want to export.
2. Click the **Export** button.
3. Choose your desired format: **GeoJSON**, **CSV**, or **KML**.
4. Your browser will download the file.

7. Select and Delete Items

- **To select**: In any list, click on a point, polyline, or polygon to select it. The item will be highlighted in the 3D view.
- **To delete**: Select an item from the list and click the **Delete** button in its corresponding tab.
- **To clear during creation**: While creating a polyline or polygon, click **Clear All** in the geometry panel to remove all points from the current selection.