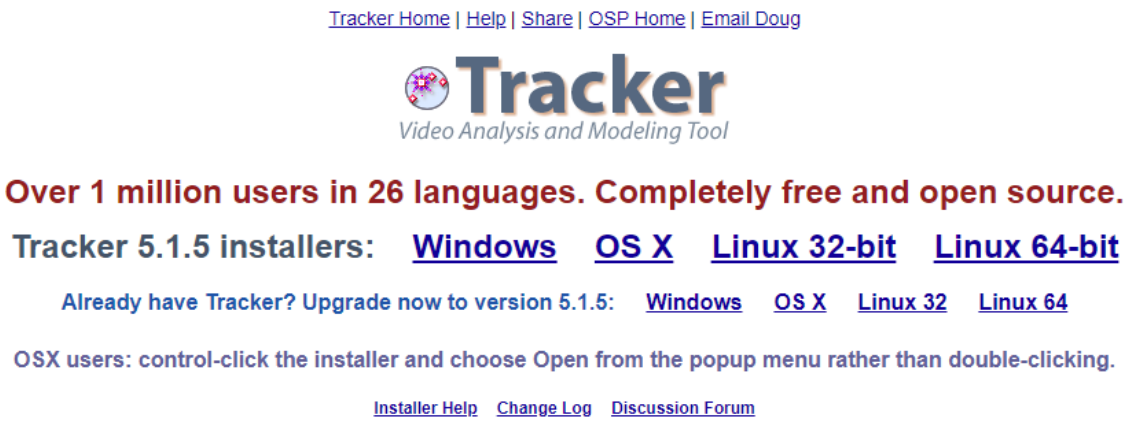
Tracker Reference Guide

The following guide shows how to do the most common tasks in Tracker. The different topics are ordered in the sequence you will typically use them in, although, if you want to jump to a specific topic, you can use the table of contents to navigate there directly.

Table of Contents:

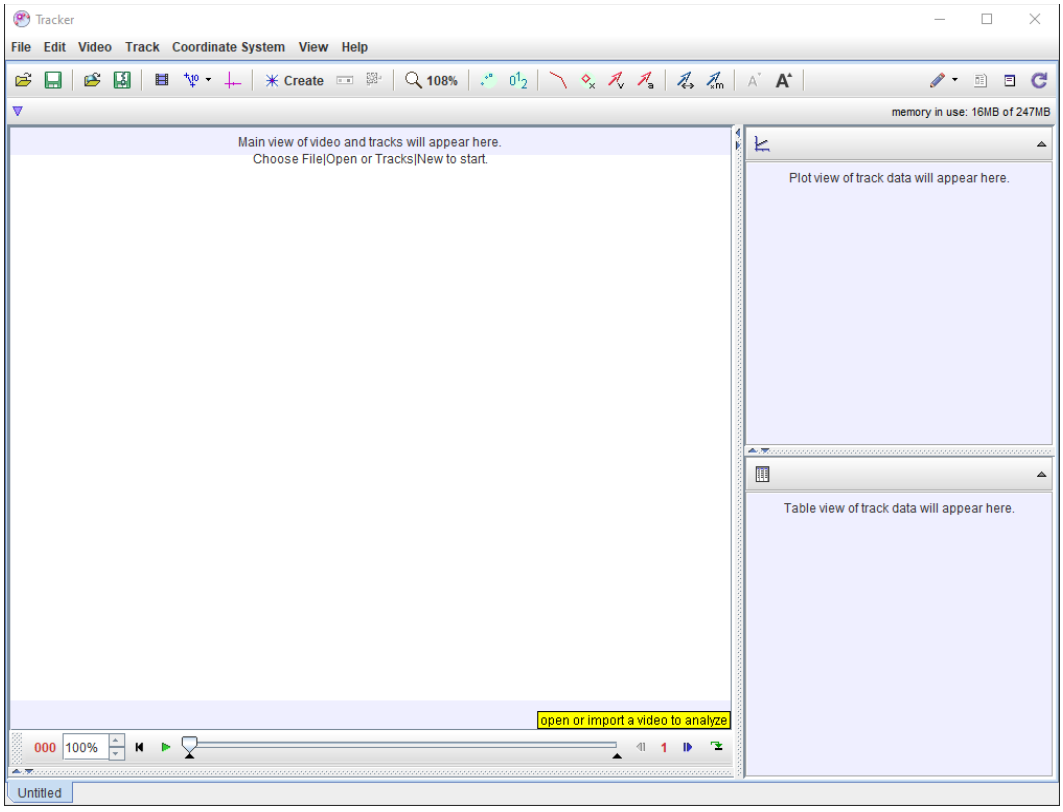
Download and Install Tracker

1. Go to https://physlets.org/tracker/ and download the installer for your computer's operating system (Windows, MacOS, or Linux).



2. Run the installer. This will walk you through the installation steps to install Tracker on your computer.

3. Open Tracker.

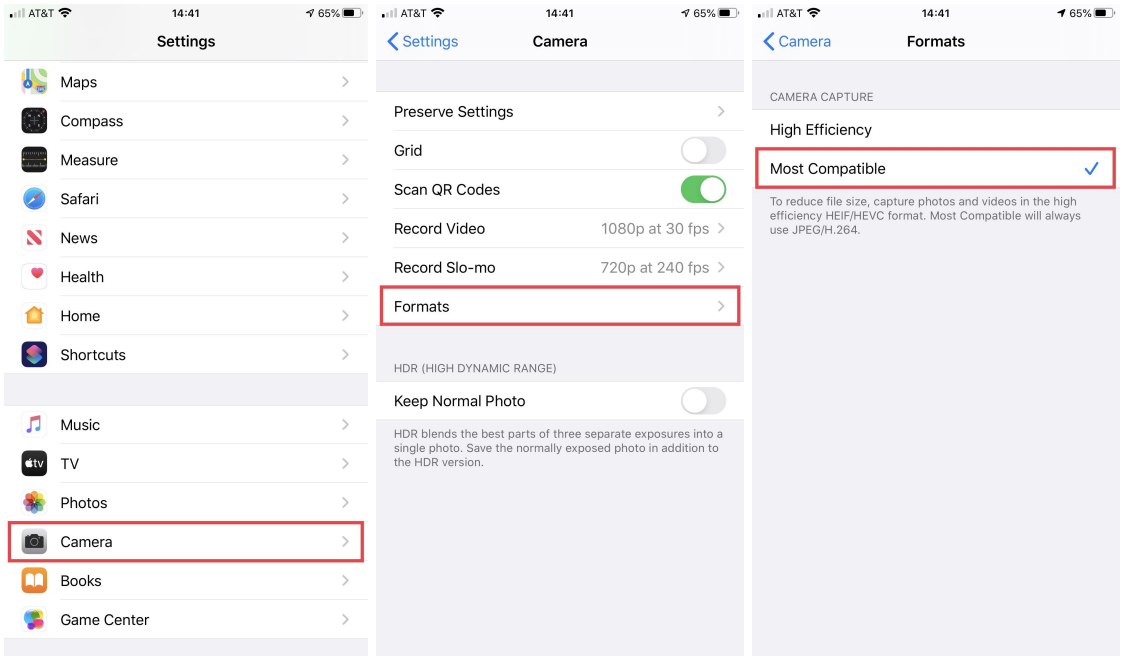


Warning to iPhone/iPad Users

If you use an iPhone or iPad to record videos for the experiment, the camera format must be set to “Most Compatible”. Otherwise, Tracker will not recognize the files.

1. Open the Settings App

2. Go to Camera > Formats and select Most Compatible.

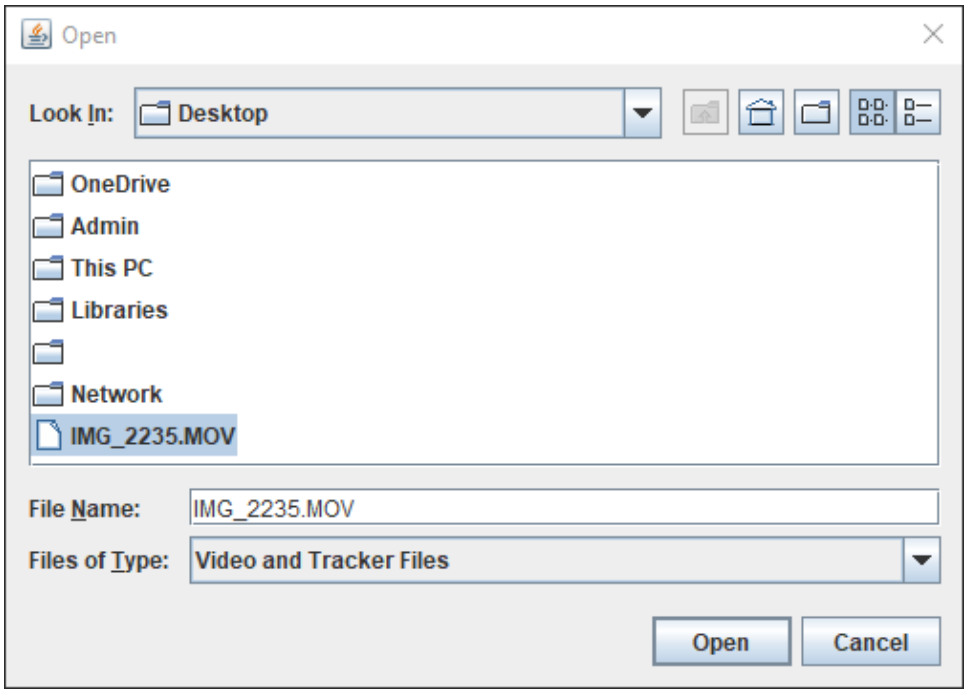


Note: These instructions are accurate as of iOS/iPadOS 13. With future updates to the OS, the location of this setting may change. If you cannot find this setting, simply search the settings app for “Camera” or “Formats”.

Open Video File

1. Click the Open File icon.

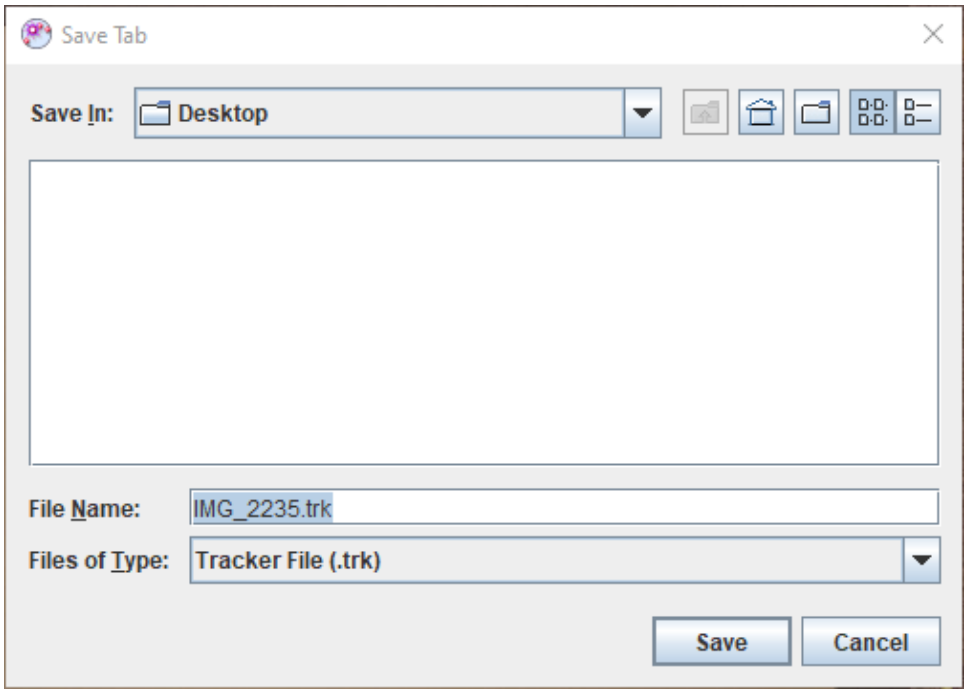
2. Select the video file you want to open and click Open.



Save the Tracker File

1. Click the Save File icon.

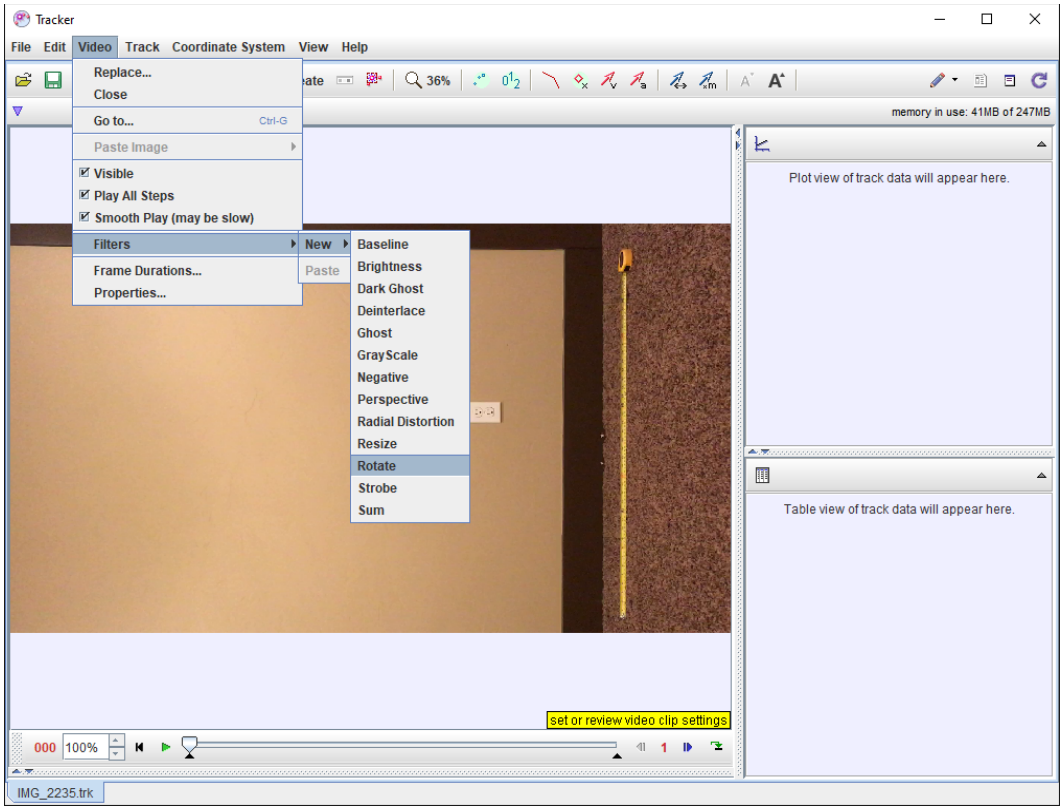
2. Choose a file location, name the file, and click Save.



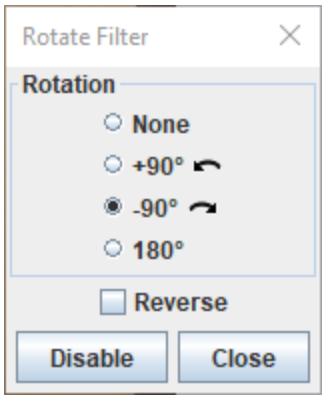
Rotate the Video

If your video was filmed vertically or upside-down, use the video filters to rotate it.

1. Click Video on the top menu bar.
2. Go to Filters > New > Rotate



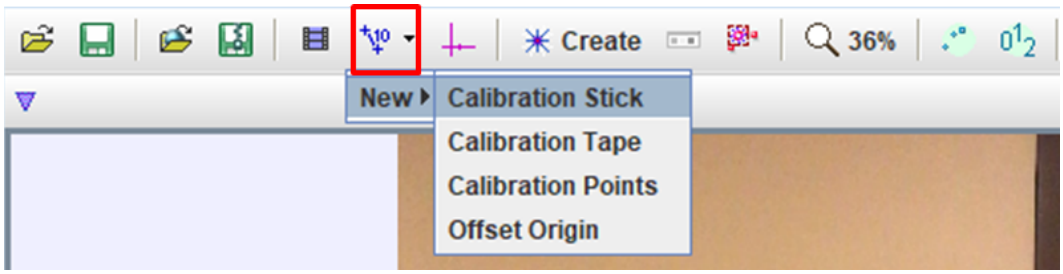
3. Choose the appropriate rotation option and click Close.



Calibration

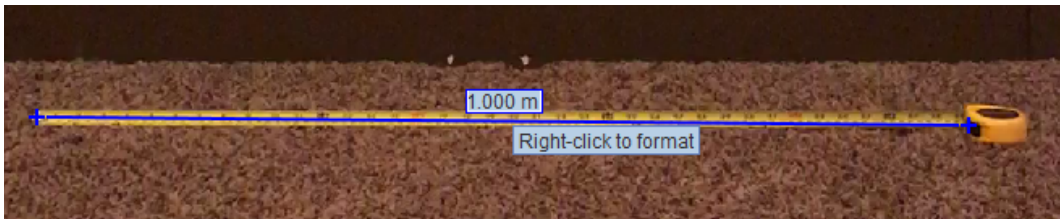
In order for Tracker to accurately determine position, velocity, acceleration. from your video, you need to label the size of something that is close to the object you will track. In the experiments, you will use a ruler, measuring tape, or meter stick if you have one.

1. Go to Calibration Tools > New > Calibration Stick.

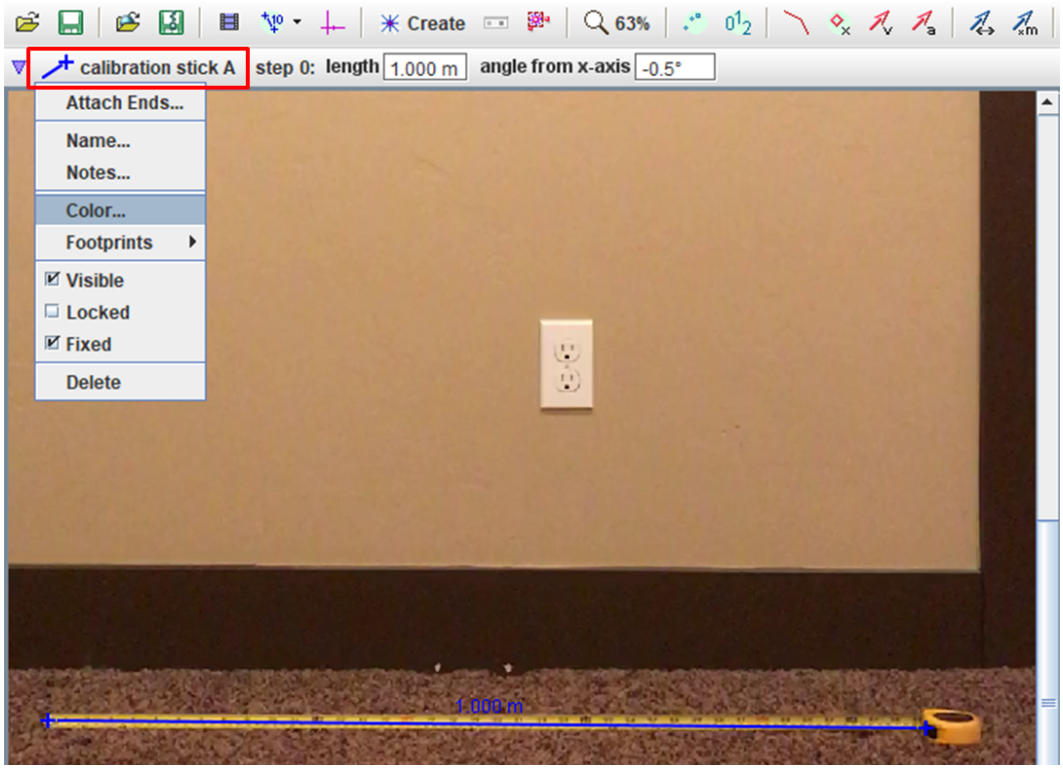


2. Hold down Shift on the keyboard and Click on the end points of your ruler, measuring tape, meter stick, etc.

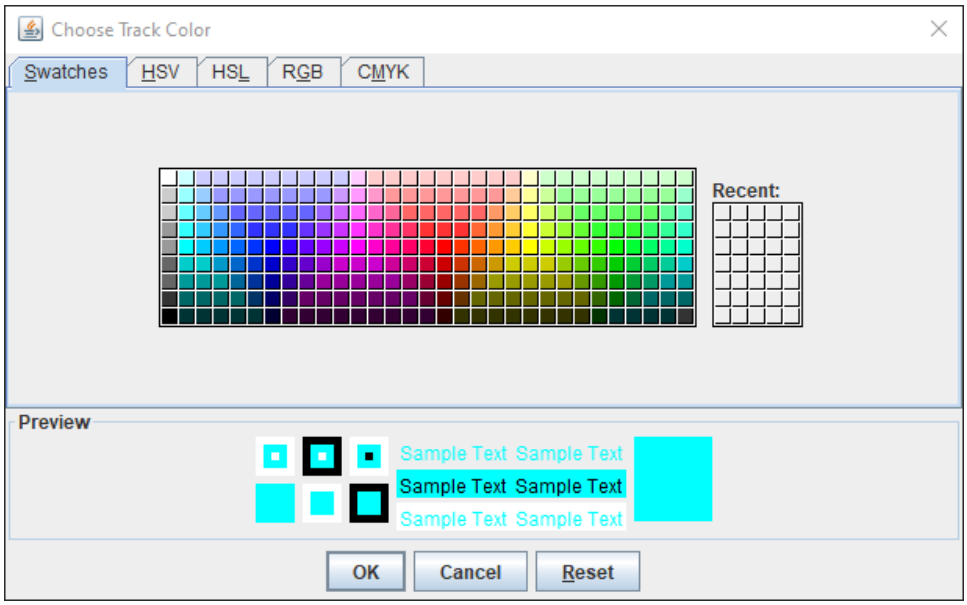
3. Type in the provided box to change the length of the Calibration Stick. Enter the length of the physical object. In this example, the measuring tape was set to 1 meter, so you would set the Calibration stick to 1 meter.



4. If you want to change the color of the Calibration Stick (if it is hard to see), go to Calibration Stick A > Color.



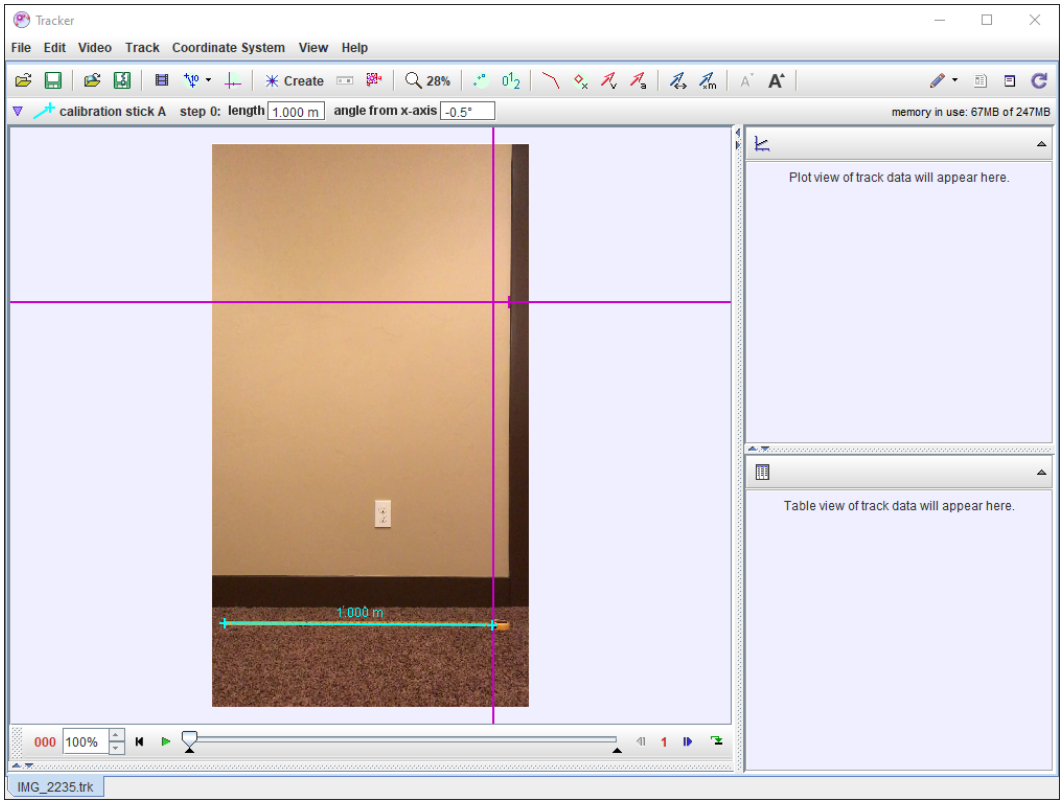
5. Select a color from the palette and click OK.



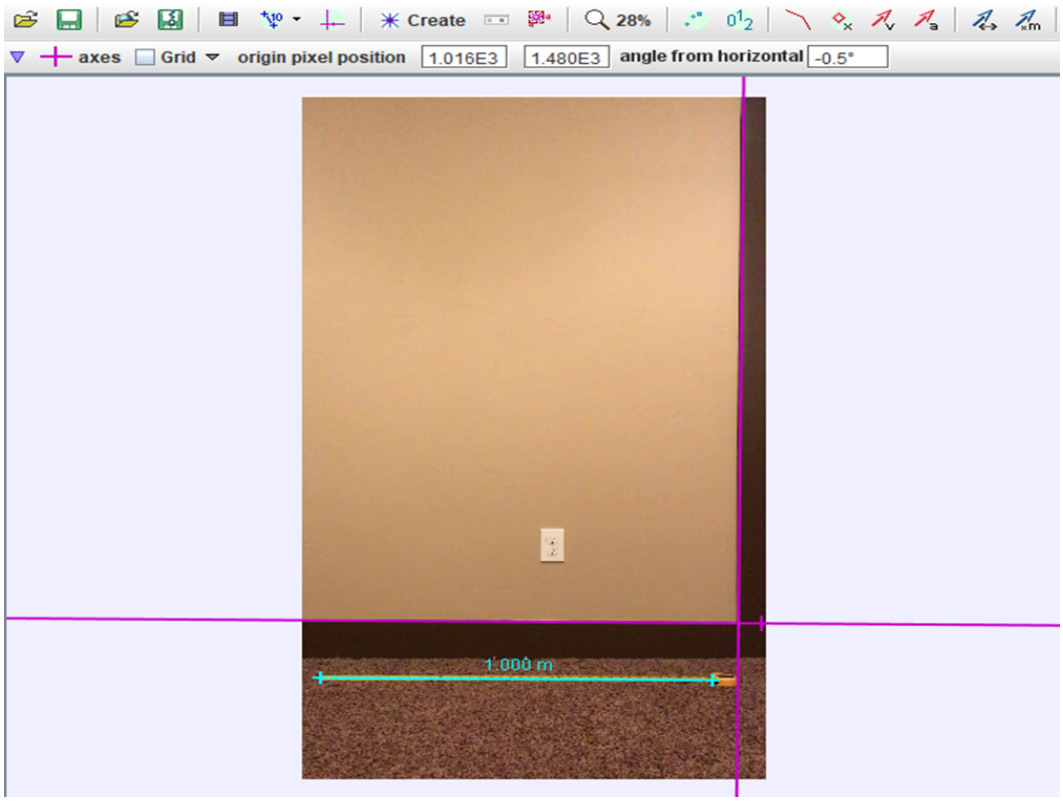
Coordinate Axes

In addition to the Calibration Stick, you need to add the Coordinate Axes to your video so Tracker can determine the x and y positions relative to the origin.

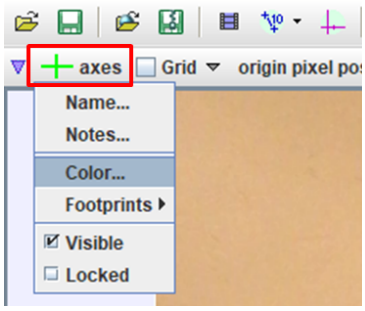
1. Click the Coordinate Axes button to add the axes to the video.



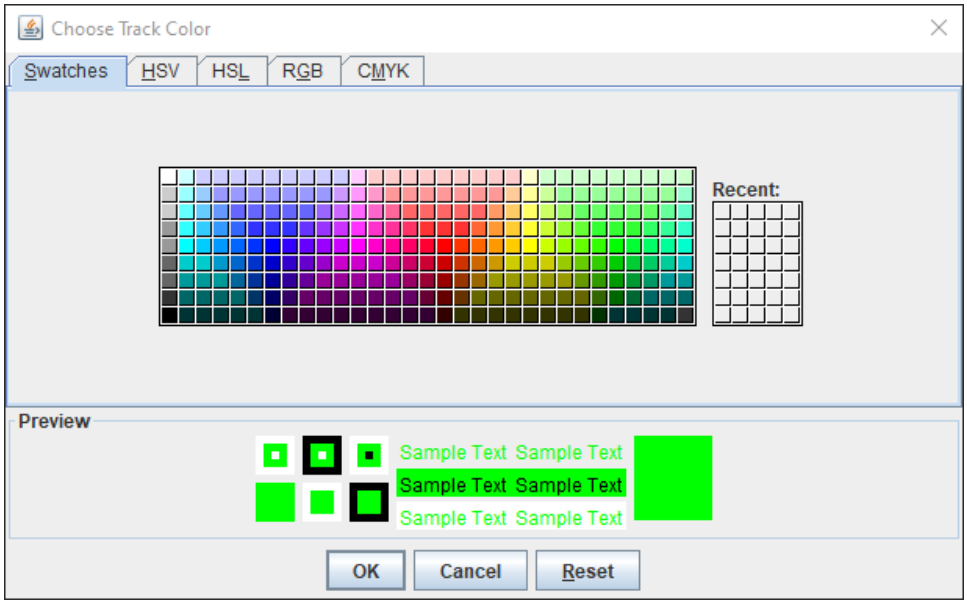
2. Move the axes to line up with the horizontal and vertical lines in your video. If the reference lines in your video are rotated a little bit, grab the positive x-axis and rotate the axes to match the video.



3. If you want to change the color of the Axes (if they are hard to see), go to Axes > Color.



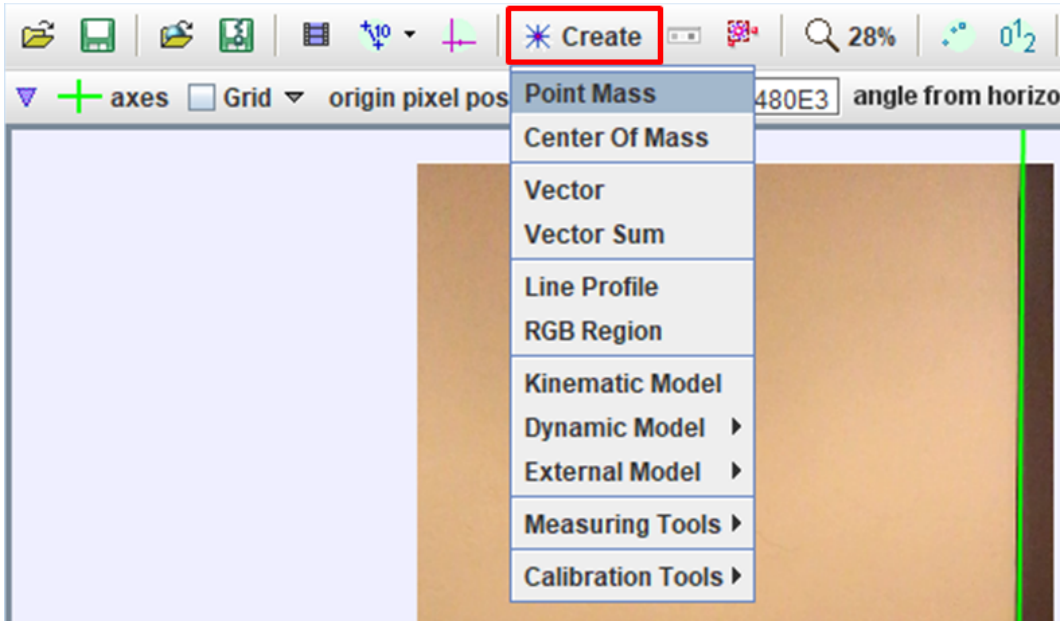
4. Select a color from the palette and click OK.



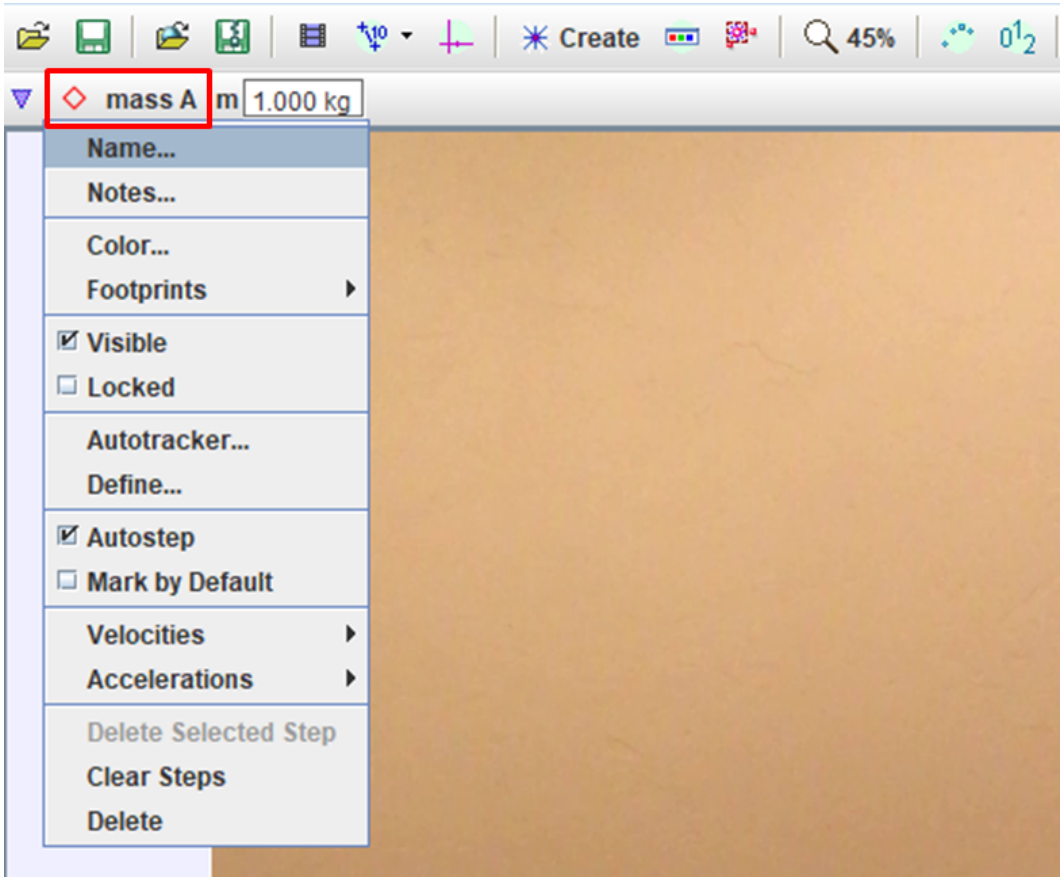
Create a Point Mass

For every object that you track, you will need to create a Point Mass.

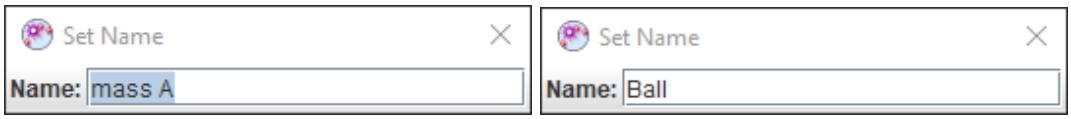
1. Click Create > Point Mass.



2. Name the Point Mass. This is especially useful for experiments when you are tracking multiple objects.
3. Click the current name of the Point Mass. In this case, mass A. Then click Name.



4. Type the new name and hit Enter on the keyboard.



Don't bother entering the object's mass for the Point Mass unless you plan to do the analysis in Tracker. Analyzing data in Tracker is not very easy, so it is probably best to analyze the data elsewhere (Excel, Google Sheets, etc.).

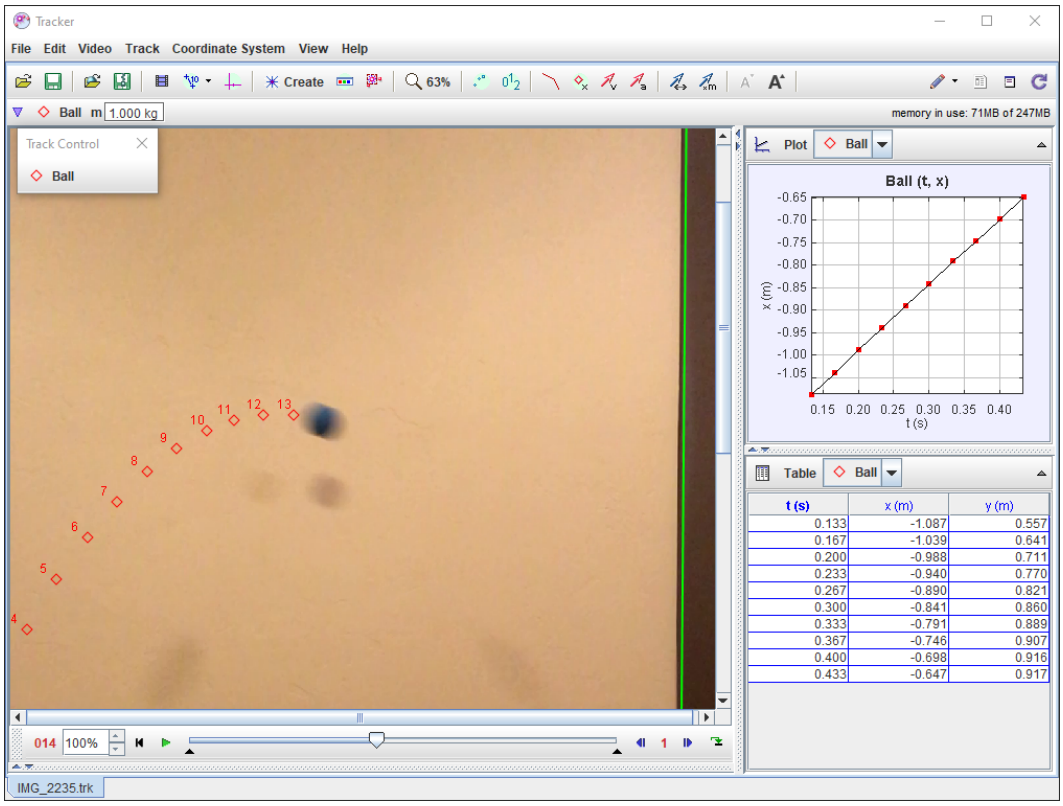
Track the Object

After creating your Point Mass, you will mark the object's position for each frame of the video that you need.

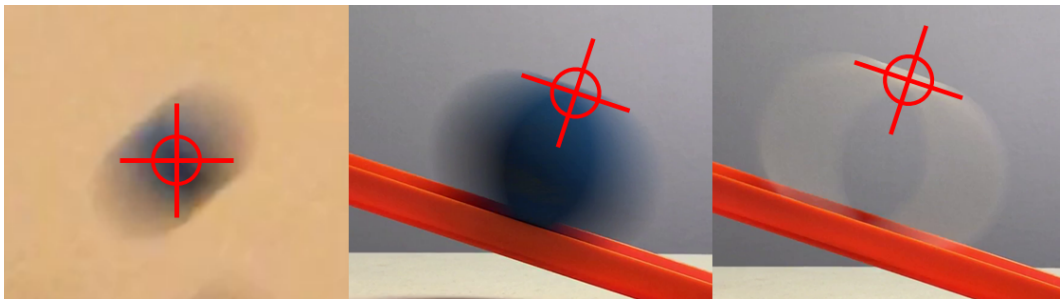
1. Slide through the video to find the first frame you want to track. Use the slider on the bottom of the video to move quickly through the video and use the Step buttons to move by 1 frame at a time. If the camera moved from where it was when you aligned the axes, you may need to adjust their position/angle.

2. To add a tracking point, hold down Shift on the keyboard and click on the object to add a mark at that position. The video then automatically advances to the next frame so you can add the next point.

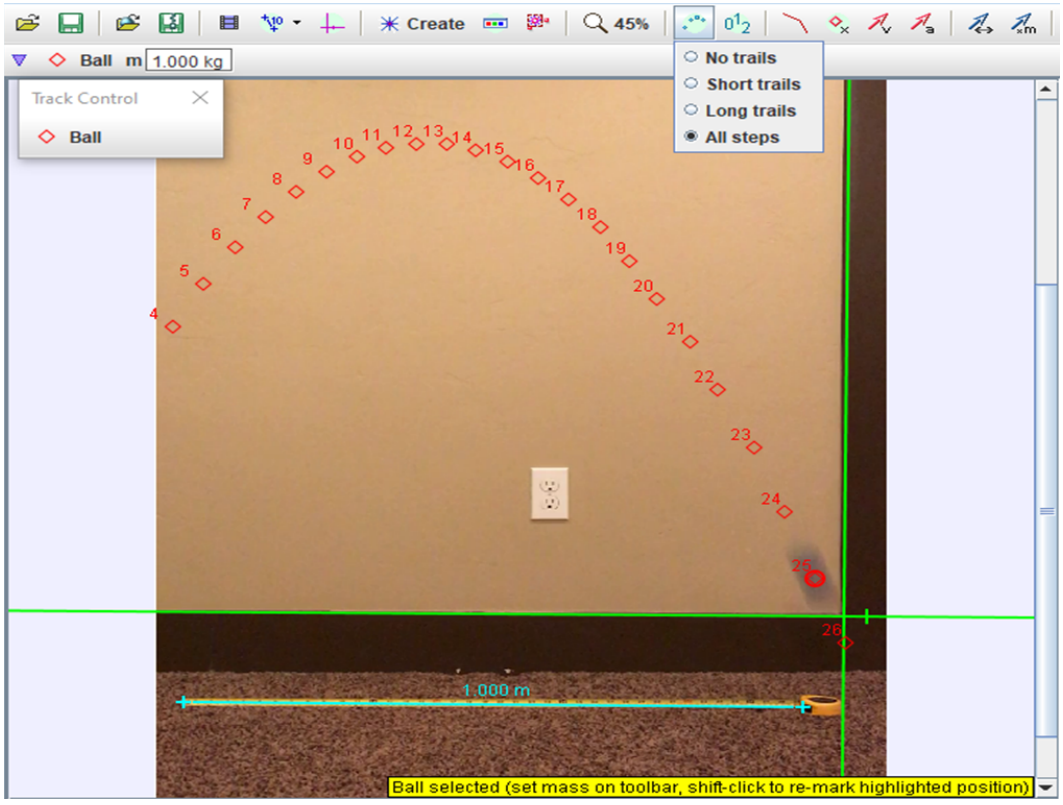
   Use the scroll wheel to zoom in and see the object better.



3. Always choose the same point to track on the object for each frame of the video. Choose a mark that is easy to see, such as the middle, edge, or corner of the object.



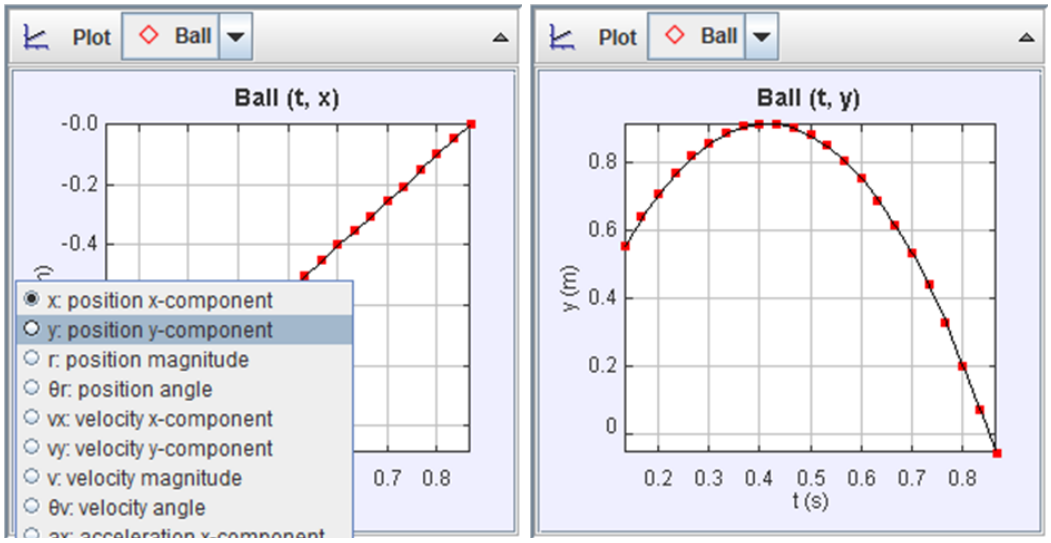
4. When you finish tracking the object, some of the tracking marks will be hidden. If you want to change how many you can see at a time, click the button for Trail Length and change it accordingly.



Graph

Although you probably won't do any analysis in Tracker, it can sometimes be useful to see the graph of the data while you are tracking the objects.

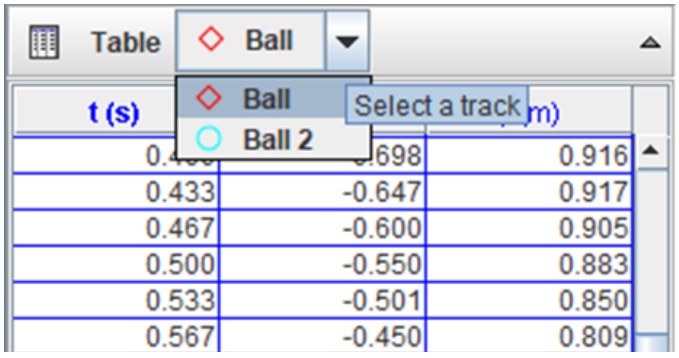
If you want to change which variable the graph displays, click the axis you want to change and select the new variable.



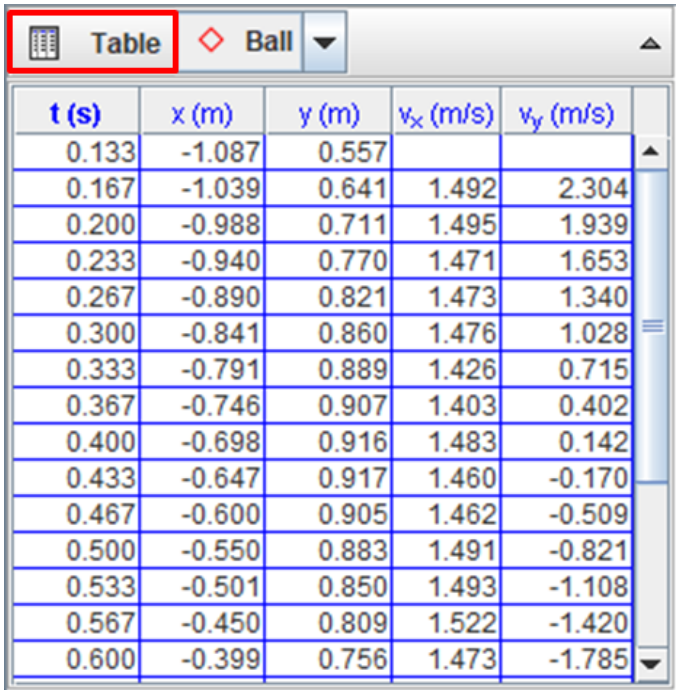
Data Table

Before exporting the data from Tracker, you will need to select the data in the table.

1. If you tracked more than one object, select the object in the drop-down menu above the table.

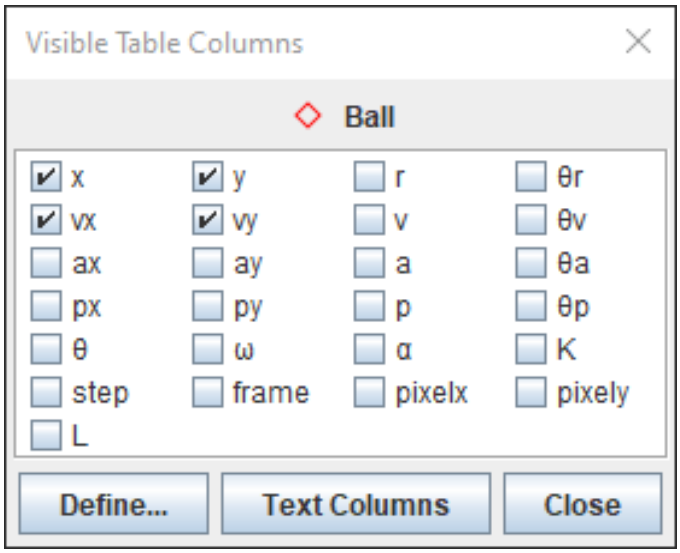


2. Click the Table button to bring up the column selection window.



t (s)	x (m)	y (m)	v_x (m/s)	v_y (m/s)
0.133	-1.087	0.557		
0.167	-1.039	0.641	1.492	2.304
0.200	-0.988	0.711	1.495	1.939
0.233	-0.940	0.770	1.471	1.653
0.267	-0.890	0.821	1.473	1.340
0.300	-0.841	0.860	1.476	1.028
0.333	-0.791	0.889	1.426	0.715
0.367	-0.746	0.907	1.403	0.402
0.400	-0.698	0.916	1.483	0.142
0.433	-0.647	0.917	1.460	-0.170
0.467	-0.600	0.905	1.462	-0.509
0.500	-0.550	0.883	1.491	-0.821
0.533	-0.501	0.850	1.493	-1.108
0.567	-0.450	0.809	1.522	-1.420
0.600	-0.399	0.756	1.473	-1.785

3. Select the columns you need for the experiment and click Close.

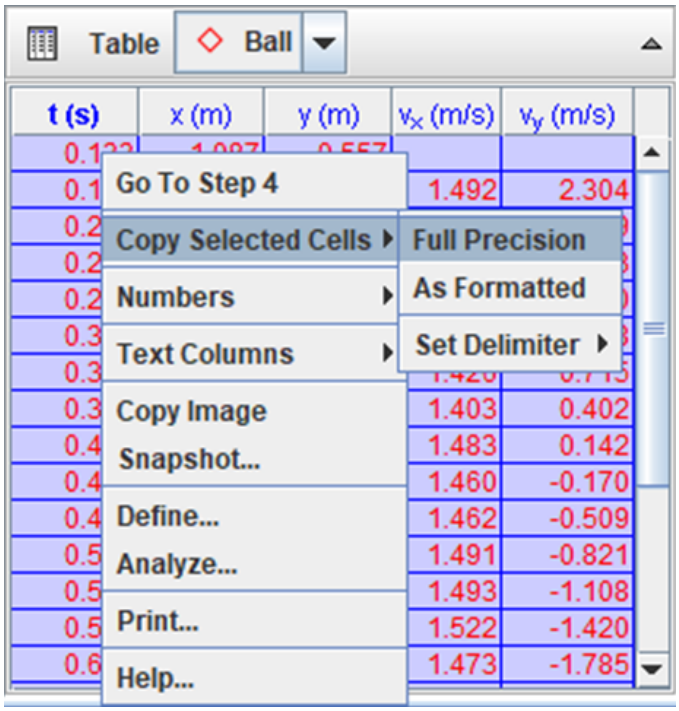


Export Data

After selecting the variables you want in the table, export the data either via Copy & Paste or in a CSV file.

Export Data via Copy & Paste

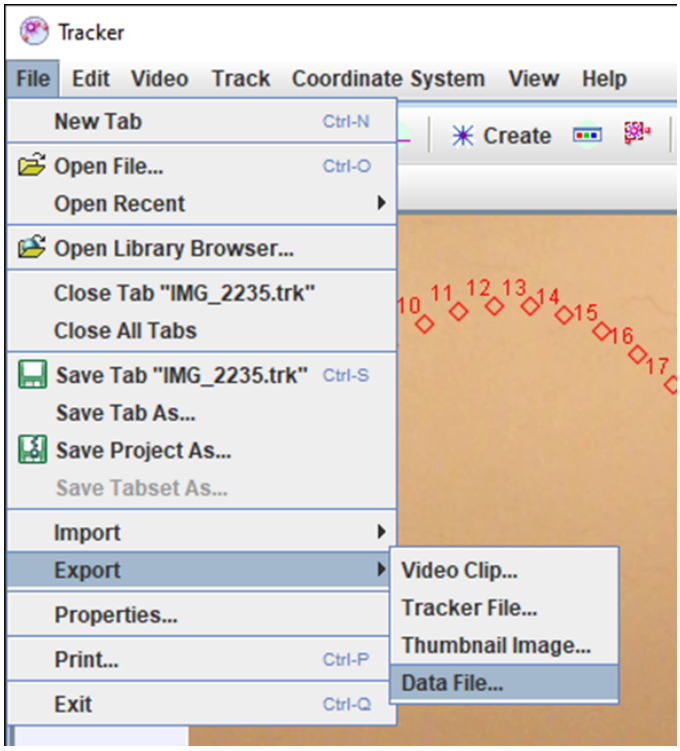
1. Double Click on the data in the table to select it all.
2. Right Click on the data and go to Copy Selected Cells > Full Precision.



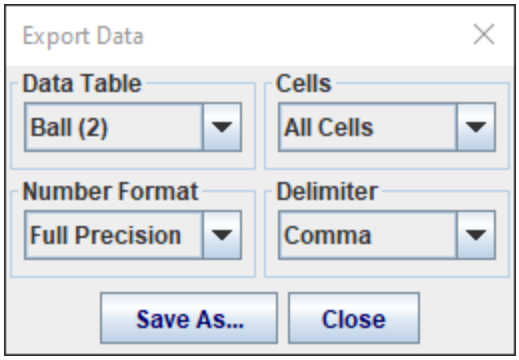
3. Paste the data into a spreadsheet (Excel, Google Sheets, etc.).

Export Data via CSV File

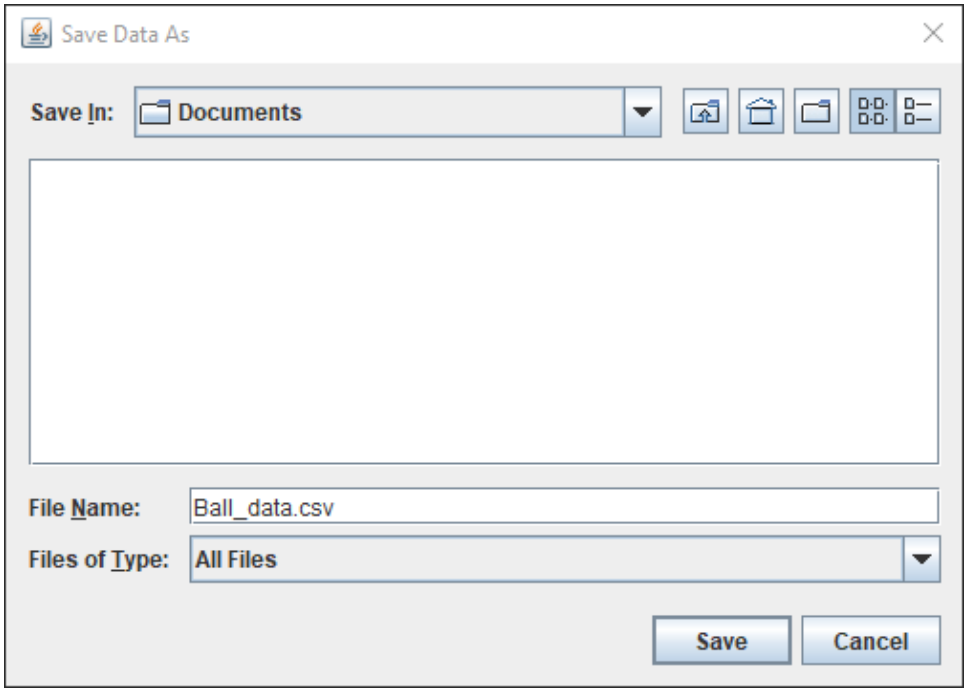
1. Go to File > Export > Data File



2. Set the export parameters as shown below and click Save As.



3. Choose a file location, name the file with the extension ".csv", and click Save.

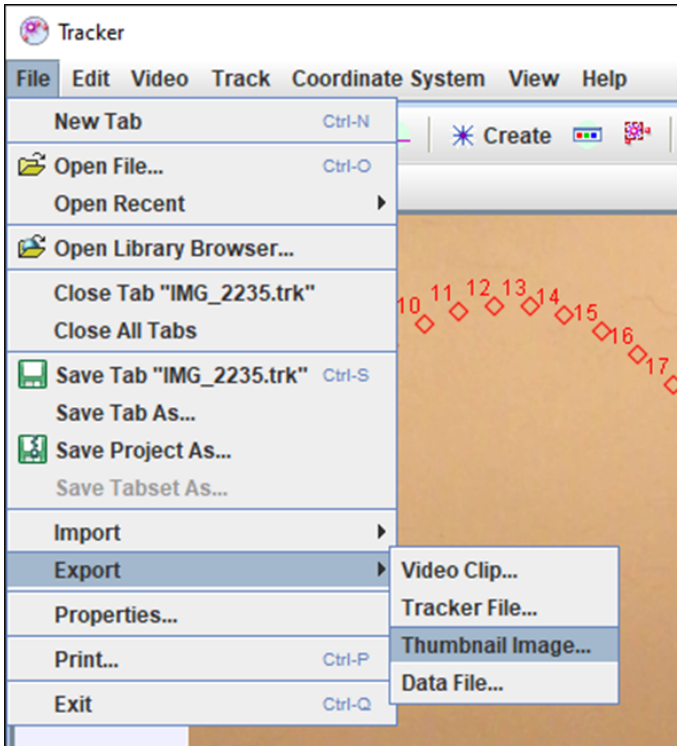


4. Use your spreadsheet (Excel, Google Sheets, etc.) to import the CSV file. Follow the video demonstration for Google Sheets or look up instructions online if you don't know how to do it.

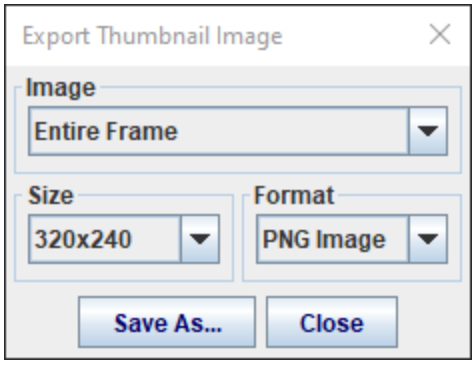
Export Thumbnail Image

If you want to export an image from Tracker showing the video with tracking marks, you can take a screenshot or export a thumbnail image.

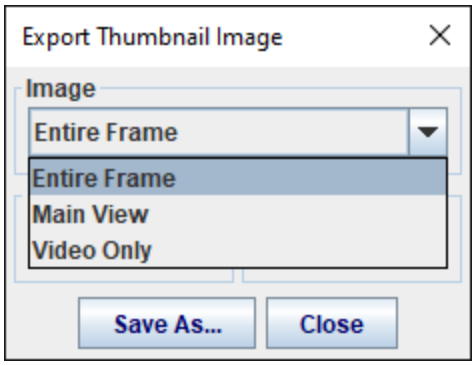
1. Go to File > Export > Thumbnail Image



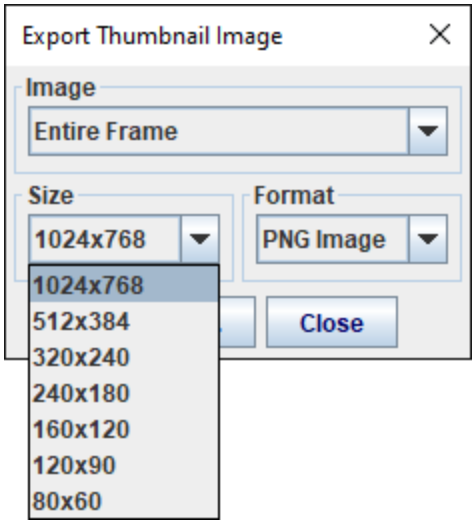
2. In the pop-up window, you can choose the type of thumbnail to export, the image resolution, and the file type.



3. For the type of thumbnail, you can choose between Entire Frame, Main View, and Video Only.



4. You can choose from a variety of image resolutions. It would be good to select something large so you get a high quality image.



5. For the file type, you can choose between PNG and JPEG. Either one is fine.