I.   INTRODUCTION

<u>*YOU are the key to the success of your citizen scientists in the search for asteroids.*</u>

There are two things you must master, and if you do, your citizen scientists will make important measurements of near-Earth objects and might discover a Main Belt asteroid or two as they participate in an IASC asteroid search campaign. You must:

1. Be able to use *Astrometrica* to conduct a manual search.
2. Be able to distinguish between a true and false signature for moving objects.

Once you have *Astrometrica* up and running on your computer, it will take a couple hours of your time to master the above tasks. They are not difficult to do. But, you must prepare yourself ahead of time before receiving image sets in an IASC asteroid search campaign.

In this document you will find instructions on how to do a manual search using *Astrometrica*. You will learn how to measure true signatures and determine if they are unknown objects.

To learn how to distinguish between a true and false signature for a moving object, you need to review the document entitled *Signature Guide*. This is very important. Measuring and reporting false signatures is the most common mistake made by citizen scientists as they first learn to search for asteroids.

Citizen scientists often confuse what appear to be moving objects on the images (e.g., hot pixels, background fluctuations) with asteroids. Not all things that appear to move on the images will actually be asteroids. They must learn to know the difference and only measure asteroids (i.e., true signatures) and not the false signatures.

II.   MANUAL SEARCH – BLINK UTILITY

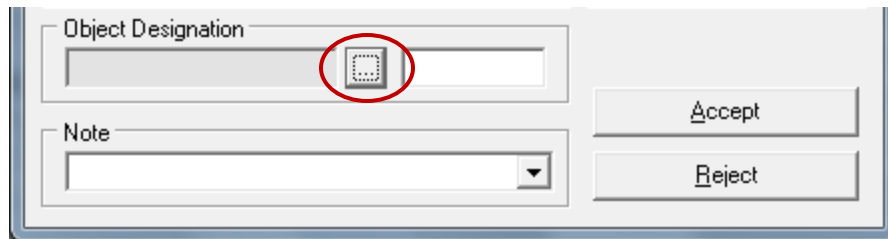- Start *Astrometrica*. The following is the *Astrometrica* menu bar with its various functions:
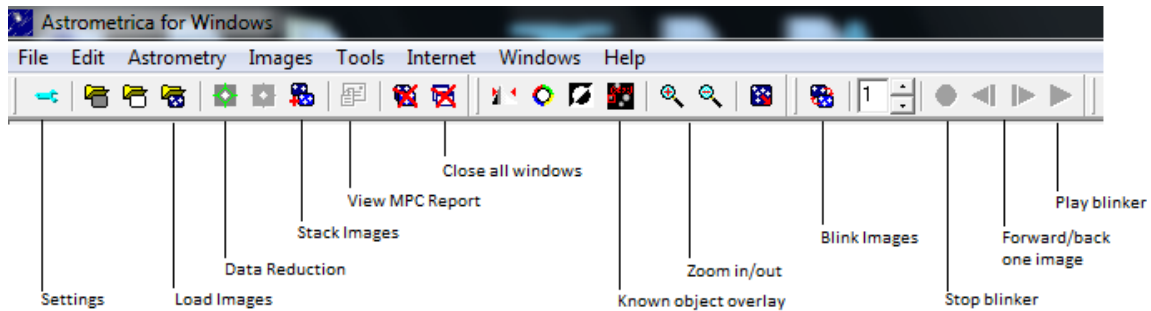
- *Astrometrica* may ask you to overwrite the MPC report. Click "**Yes**" only if you have completed the MPC report. Click "**No**" If you have not completed the search on the image.
- Verify and change as necessary the configuration file used to analyze the image. The name of the configuration file is found on the bottom right hand corner of the screen. It should be PS1.cfg for all of the images, because our images come from the Pan-STARRS telescope.
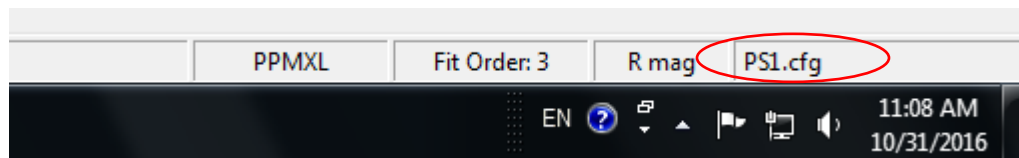
To change the configuration file, select Settings on the menu bar. Click "**Open**" and select the correct configuration file from the program files, then click "**OK**." Make sure your team has downloaded the newest version of the PS1.cfg file, if you are participating in an asteroid search campaign.

- Download your image sets from your team page and unzip onto the Desktop or designated folder. In *Astrometrica* select **Load Images** on the menu bar and load your image set (3 or 4 images per set) and click "**Open**".

- Select **Data Reduction** on the menu bar and select **OK** in the box that appears. This function will find reference stars in your images.

- Select **Known Object Overlay** on the menu bar, then select the **Blink Images** button and zoom in twice to enlarge the image.

- Visually scan the blinking image for moving objects.

<u>MANUAL MEASUREMENT</u>:

- When a moving object is detected, select **Stop Blinker** on the menu bar.
- Begin by forwarding to Image 1, by clicking on the Forward or Back button.
- Center the object with the cross-hair and click on the object.
- Click on **Object Designation** and check for an object close to 0.00 in dRA and dDec, then select that object and click "OK", then click "Accept". If there is **not** an object (should be 0.2 or less), then give the object a name by typing 3 initials to represent your group and a 4 number designation.

*The name must consist of 3-letters 4-numbers. For example, Hardin-Simmons University might enter HSU0001 for the first discovery, HSU0002 for the second discovery, and so on. This must be a <u>unique</u> name for each discovery during a 30-day campaign. No spaces or other special characters are allowed in the name! Only letters and numbers.

- Repeat the procedure for images 2, 3, and 4 by forwarding to Image 2 and then to Image 3, and finally to Image 4, repeating the same procedure as with Image 1.

- Continue searching the image until all asteroids have been measured.

III.   MINOR PLANET CENTER (MPC) REPORT

- One MPC report must be prepared for <u>each</u> image set and submitted on your IASC team page. If more than one group of citizen scientists analyzes the image set, only submit one report listing up to five people.

- In *Astrometrica,* select the **View MPC Report** from the file menu. Copy the entire MPC report to the clipboard.

- Paste the copied report into the submission box on your team page. Make sure the correct image set name is selected in the drop-down menu. Make sure your citizen scientist names are checked. This process can be seen in more detail in the PDF titled *Submitting Reports.*

- When all the information is correct (image set name, citizen scientist names, copied MPC report), click **Submit Report**.

MPC REPORT FOR AN IMAGE SET WITH NO MOVING OBJECTS FOUND

If an image set does not have any moving objects detected, an MPC report must still be prepared. To generate the complete heading in *Astrometrica*, you need to click on "something", (any star will do) in the image and take a measurement, assign it a generic designation number like xxx0000. This will create the full header in the MPC report. When you copy and paste the report into the box on your team page, you can delete the measurement and add the line "No moving objects detected". The report should look similar to the one below.

```
COD F51
OBS N. Primak, A. Schultz, S. Watters, J. Thiel, T. Goggia
MEA T. Vorobjov, PS1 Science Consortium
TEL 1.8-m f/4.4 Ritchey-Chretien + CCD
ACK MPCReport file updated 2020.02.29 20:26:20
NET PPMXL

    "No moving objects detected"

----- end -----
```

Submit all completed MPC reports to your team page on the IASC website.
Do not submit the MPC reports to any other location!!