

# Astrometric CCD Observations of Three Double Stars Measurements

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**Abstract:** CCD astrometric observations of three double star groups from the Orion constellation were made. Position angles and separations of corresponding pairs were obtained from the data acquired and compared to previous observations listed in the Washington Double Star Catalog. Present data agrees with previous observational data.

## Introduction

As a child I have always wondered about the stars and planets glowing above me. When I grew into my teenage years I found a love for astronomy. I used to watch any type of documentaries that would come on television as well as read up and look at all the pictures in text books. Two years ago, enrolling in an astronomy class at Leeward Community College rekindled my curiosity and passion for stars that has been a fantasy luxuriated by watching plenty of colorful astronomy programs on TV during my school years.

After completing the course I was able to enroll into an independent study class for hands on experience on operating telescopes and observing the night sky, eventually leading to an opportunity to conduct research in astronomy as well. Using the Eagle Creek Observatory web site, I chose three binary stars from the Orion constellation for their appearance near zenith and visibility, thus making them ideal double stars to take good images.

## Instrumentation and Data Acquisition Methods

Observations were made on a 0.5 meter f/8.1 Ritchey-Chretien Optical Guidance Systems telescope at the Leeward Community College Observatory. Images of interested objects were captured using an Apogee Alta U6 CCD camera with 24 micron pixels cooled to  $-10^{\circ}\text{C}$ . No filters were used for these observations. After cooling the camera to the desired temperature, with the help of Sky6 software from Software Bisque, the telescope was slewed and centered on the first target, and a sample star field was captured using suitable exposure time (special care was taken to not saturate

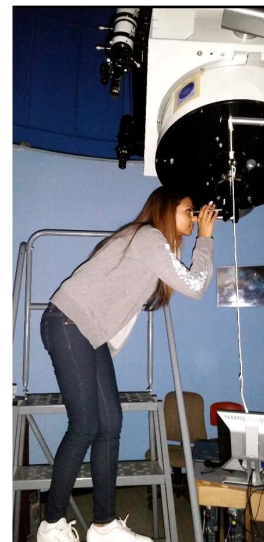


Figure 1. The author at the telescope.

the star field). The exposure time was 10 seconds. The camera software was CCDSoft, also from Software Bisque. Using the same exposure time, ten dark background exposures were captured and the average of these ten frames was obtained for image processing. A sample image plate after background processing for star system SAO 113315 is shown in Figure 2.

The software used for determining the astrometric solutions also provided the plate scale and orientation of the camera. For the observational set up, the plate scale was computed to be  $1.21''/\text{pixel}$  and the camera angle to be  $357.32$  degrees respectively.

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Figure 2: Background corrected Plate for SAO 113315 in Orion.

#### Results

Astrometric solutions for the acquired pairs of double stars were obtained by analyzing the collected data using the CCDSoft software in conjunction with the Sky6 software. Separation between the primary and secondary stars and their Position Angles were determined for each ten sets of observations, their average was computed, and the results are presented in the Table 1. The last column, current data, is compared to the last observed data provided in the Washington Double Star Catalog.

#### Conclusion

Three sets of double star astrometric measurements using a CCD camera were successfully made and their separation and position angles were determined. The observational data agrees with previous reported data (WDS). This unique opportunity has helped me understand and appreciate astronomy more than before.

#### Acknowledgments

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Eagle Creek Observatory on Double Stars. Finally, I am grateful to the Leeward Community College Math and Science Department for allowing me to conduct this research program.

#### References

- Eagle Creek Observatory, 2016; <http://www.eaglecreekobservatory.org/eco/doubles>
- Mason, B., Wycoff, G., and Hartkopf, W. The Washington Double Star Catalog, <http://ad.usno.navy.mil/proj/WDS>

Table 1: Present Observational Data compared to their last reported values in WDS Catalog.

Double Star ID	Separation (arc sec)			Position Angle (degrees)		
	SAO Number	Last	Present	Difference	Last	Present
SAO 95002 05561+1356s 503BC	24.1	24.27	.17	166	167.18	1.18
SAO 113315 05584+0150ARN	36.5	37.15	0.65	206	205.55	0.45
SAO 113435 06051+0053STF	40.5	40.24	0.25	329	328.82	0.18