**ZWO ASI1600MM Camera: Photometry of Unbinned and Binned, Defocussed Images**

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**Test targets:** Four 11th magnitude (in V) Landolt stars in one field (see below for list). 10 consecutive images were taken of the field unbinned, and 10 consecutive images binned 2x2

**Telescope:** 120mm f/7.5 refractor. Obviously, this is a small aperture. Even an 8 inch Celestron SCT would image stars at about the same precision, but one magnitude fainter. Clearly, many AAVSO observers have larger apertures, such as 11 – 14 inch SCTs or RCs.

**Filter:** Johnson V

**Exposures:** 180 seconds

**Binning:** Unbinned; and binned 2x2

**Preprocessing:** Dark substraction and flat fielding; alignment of images.

**Software:** AstroimageJ

**Target Star IDs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Landolt Catalogue Number** | **RA** | **Dec** | **V** | **B-V** |
| 112 595 | 20 41 18 | +00 16 28 | 11.352 | 1.601 |
| 112 704 | 20 42 02 | +00 19 10 | 11.452 | 1.536 |
| 112 223 | 20 42 14 | +00 09 01 | 11.424 | 0.454 |
| 112 822 | 20 42 55 | +00 15 04 | 11.549 | 1.031 |

**Full Width Half Maximum (FWHM) Values for Unbinned and Binned Star Images**

|  |  |  |
| --- | --- | --- |
| **V Mag Star** | **FWHM Unbinned** | **FWHM Binned** |
| 11.352 | 26.88 | 14.16 |
| 11.452 | 26.14 | 13.84 |
| 11.424 | 25.84 | 13.52 |
| 11.549 | 26.28 | 14.10 |

**Procedure for Photometry**

Instrumental magnitudes in v were calculated for each of the four stars in each image.

Simple differential photometry was used to test precision, i.e., the difference between the instrumental v magnitudes for pairs of stars. The results are listed below. SD is standard deviation of the differential v magnitudes.

|  |  |  |
| --- | --- | --- |
| **V Mags of Star Pairs** | **SD Unbinned** | **SD Binned** |
| 11.549 11.424 | 0.008 | 0.009 |
| 11.452 11.424 | 0.010 | 0.011 |
| 11.452 11.352 | 0.012 | 0.009 |
| 11.549 11.352 | 0.012 | 0.009 |
|  |  |  |
| **Mean** | 0.011 | 0.010 |

**Conclusion**

Although it is possible that a more exhaustive test may reveal a systematic benefit of binning for photometric precision, this preliminary test did not.