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APPLYING CCD CAMERA ST10ME FOR DOUBLE STARS MEASUREMENTS

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Abstract. On the basis of the first images obtained by using a CCD camera, SBIG ST–10ME, with the Zeiss 65/1055 cm Refractor of Belgrade Observatory it is possible to notice the advantages offered by using this camera in the realisation of Double–Star–Measuring Programme. The parameters of the limiting possibilities concerning the Large Refractor and Belgrade conditions are communicated.

1. INTRODUCTION

Figure 1: CCD Camera SBIG ST 10ME.

Thanks to the Ministry of Science, Technology and Development of the Republic of Serbia we have acquired a very qualitative CCD camera SBIG ST-10ME (Fig. 1) with pixel array of 2184 x 1472 and pixel size of 6.8 μm. According to the technical documentation this camera model uses CCD chip KAF-3200ME (Fig. 2) with a sensitivity enlarged up to 30% compared to older models. We have used this camera for double-star observing with the Zeiss Refractor 65/1055 cm of the Belgrade Observatory.

2. OBSERVATIONS

The CCD camera SBIG ST–10ME can be operated in three working regimes, depending on how many pixels are used as a single entity, which is presented in Table 1.

Table 1: Working Regimes of CCD Camera ST–10ME and its Resolving Power.

Binned	Resolving power
1×1	$0\overset{''}{.}13$
2×2	$0\overset{''}{.}26$
3×3	$0\overset{''}{.}40$

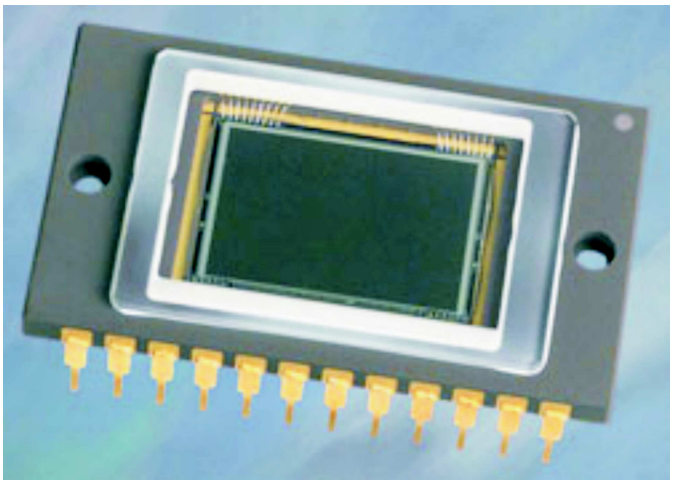

Figure 2: CCD KAF–3200ME.

All the three working regimes of the camera are applied to a few double stars (Table 2) in order to examine the limits of its possibilities, to determine the maximal exposure and the working regime depending on the magnitude, as well as to estimate the accuracy of the measurements (ρ,θ). According to our first experiences the diffuse image (Fig. 4c) obtained in camera regime 1×1 enables more accurate measurements than in the case of the other two regimes. From Fig. 4b, where the separation between the components is $1\overset{''}{.}86$, it is clearly seen that pairs with separation of $1''$ can be measured.

Table 2: A few frames of double stars for different binned exposures.

Object	Binned	ρ	Exposure	Picture Fig. 4
ADS 9031	3×3	$3\overset{''}{.}22$	1s	a
mag: 7.05–7.51				
ADS 15971	2×2	$1\overset{''}{.}86$	0.1s	b
mag: 4.36–4.57				
ADS 9031	1×1	$3\overset{''}{.}22$	1s	c
ADS 16519	1×1	$8\overset{''}{.}4$	0.7s	d
mag: 6.13–7.74				
ADS 16519	1×1	$8\overset{''}{.}4$	5s	e

On the basis of relatively small number of captured objects (2–3) the dependence exposure–limiting magnitude (Fig. 3) is obtained, however it can be completed with new points. It is seen from the plot that all stars fainter than 12.6 require exposures longer than 1^s, as well as that stars brighter than 7.5 can be captured with exposures under 0.05.

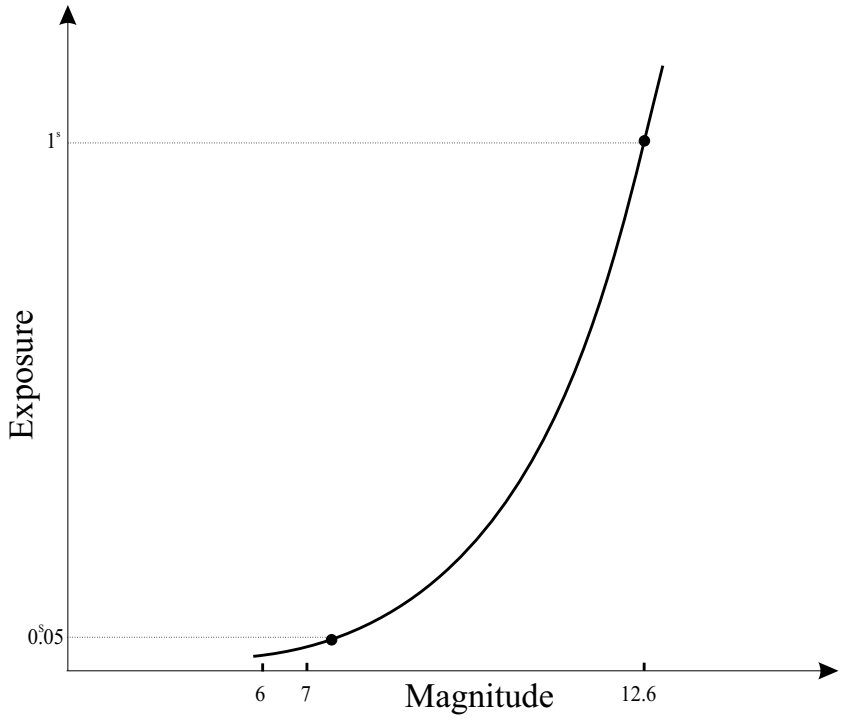

Figure 3: Dependence exposure limiting magnitude.

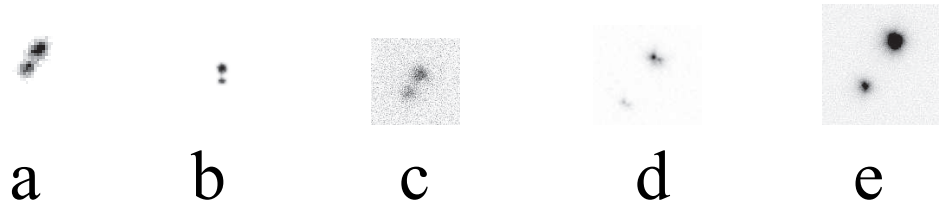

Figure 4: Frames of double stars from Table 2.

The accuracy of the measurements is considered for double star ADS 16519 for which we have the highest number of captures (13). All of them are measured by both of us and the obtained values are $\rho = 8\overset{''}{.}39 \pm 0\overset{''}{.}12$ and $\theta = 145\overset{\circ}{.}3 \pm 2\overset{\circ}{.}1$. The error of determination in ρ practically coincides with the size of one pixel in the regime of maximal resolution. The error of determination in the position angle is largely dependent of the quality of the component images, of magnitude and of the CCD camera working regime because the error of determining the direction towards the north pole is negligible; its amount is $\pm 0\overset{\circ}{.}05$.

With the existing equipment delivered with the camera the time necessary to read one frame is about 2–2.5 minutes. This time can be 8 to 10 times shortened by mounting a USB device. The present authors have already initiated the procedure for obtaining this improvement.

References

Santa Barbara Instrument Group: 1998, *Model ST–10 Professional CCD Imaging Camera*, Operating Manual.