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The First Astronomical Seeing Measurements from ATA50 Telescope Site

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ABSTRACT

The seeing of a site is the fundamental astronomical factor for determining the quality of an observatory site. All sites continuously have to monitor this value to keep track of the quality. The monitoring are made with the analyse of seeing monitor (SM) images by means of using both hardware and software tools. A simple seeing monitor device (SBIG/SM) has been used to record the local seeing values of ATA50 Telescope in Atatürk University Campus. ATA50 Telescope is operated under Eastern Anatolia Observatory (DAG) Project.

Keywords: Seeing, Seeing monitor

1 INTRODUCTION

The performance of large telescope is highly dependent upon image quality, and selecting sites with good seeing conditions has become an increasingly important matter [1]. In order to obtain for good opinion values in observatory, it is essential to have a good seeing of the atmospheric quality. All well know observatories in the world, was founded high mountain peakson where heat change layer and atmospheric turvulence, no effect of the wind has a low moisture content. Professional observatories often employ a monitor to determine the quality of seeing each night. This can be useful in helping to decide whether to take certain kinds of images, or whether to image at all. One of these is seeing monitor (SM).

In this study performed in the context of Eastern Anatolia Observatory (DAG) project which is run by Atatürk University Research and Application Center of Astrophysics (ATASAM), SM called observation system was been employed in order to determine seeing parameters. The goal of this study is to search whether Ataturk University ATA50 Telescope and its environment is appropriate for astronomical observations.

2 SEEING MONITOR (SM)

In the selecting of observatory site on which telescopes is established on purpose of astronomical observation, one of the fundamental defining factor is the results of seeing observations. Performance of large telescope is highly dependent upon quality, and selecting sites with good seeing conditions has become an increasingly important matter.

The inside of the seeing monitor given in Figure 1. SBIG has developed an automated unit for monitoring and logging the seeing throughout a night. The SM, pictured on the right, uses an ST-402ME camera. The SM is intended to be set up once and left outdoors for an indefinite period. The SM lens is a 150 mm f/5.3 lens mounted to the ST-402 electronics, all contained inside a weatherproof box. The window in the top of the box is clear. The window is heated to prevent condensation on the outside. The lens and box is permanently pointed at Polaris by the user. The reason for that, the Polaris star is visible entire the night in about the same place. CCD camera features used in SM: Camera: CCD Kodak KAF – 0402ME, Pixel: 765 x 510 pixel, CCD size: 6.9 x 4.3 mm, Pixel size: 9 x 9 mikron, Gain (elektron/ADU): 1.5-2.0, Quantum effect: 85%, Force: 3 A, 12 V DC, Windows 7 (32 bit ve 64 bit), Camera body: 50 x 100 x 127 mm, Weight: ~ 800 gr.

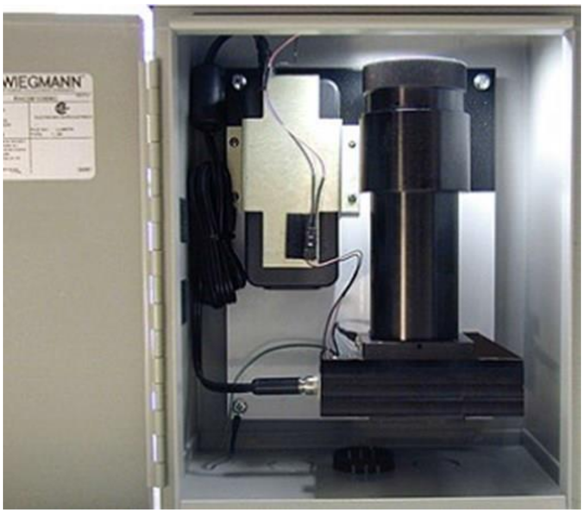

Figure 1: The inside of the seeing monitor

3 RESULTS AND DISCUSSION

The SM in ATA50 telescope site as shown in Figure 2.

Figure 2: The SM in ATA50 Telescope

The image of Polaris in seeing as shown in Figure 3.

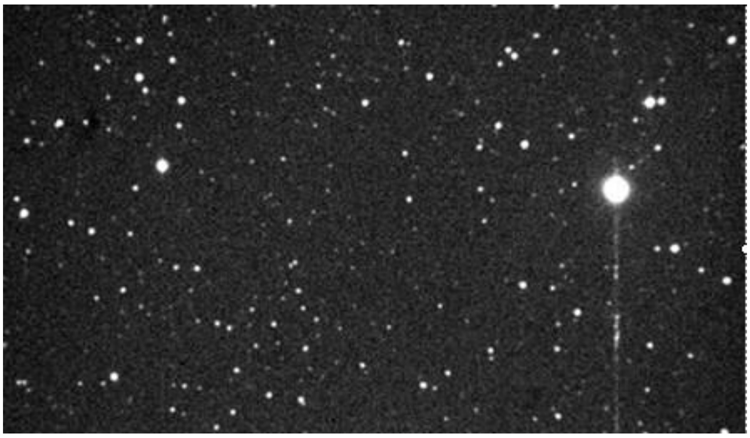

Figure 3: The image of Polaris in seeing

The field of view is just large enough that the entire orbit of Polaris about the north celestial pole can be captured no matter what time of night the measurements are taken with the camera set up on a fixed mount as shown in Figure 4. The streaks below Polaris in these images are dur to the fact that the camera is shutterless and Polaris is exposing the CCD while it is being read out. This has no effect on the calculations fort his application. This system is used to measure the seeing by measuring the horizontal jitter in the position of Polaris at high speed.

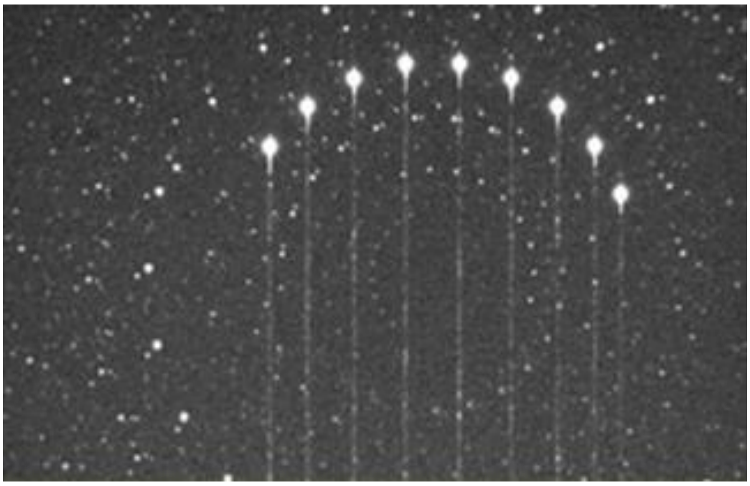

Figure 4: The field of view for the entire orbit of Polaris

A set of Eqs. (1) then can be used to calculate the zenith Full Width Half Maximum (FWHM) that one will obtain in a long exposure image from the rms jitter. The jitter is measuremed by reading out the CCD while it is being exposed by the light from Polaris in Time Delay and Integration (TDI) mode. An example of the resulting image is shown in Figure 5.

$$FWHM = \frac{0.98\,\lambda}{r_0} \tag{1}$$

where r_0 is fried parameter and λ is wavelength. The derived FWHM is for Polaris, which is low in the sky.

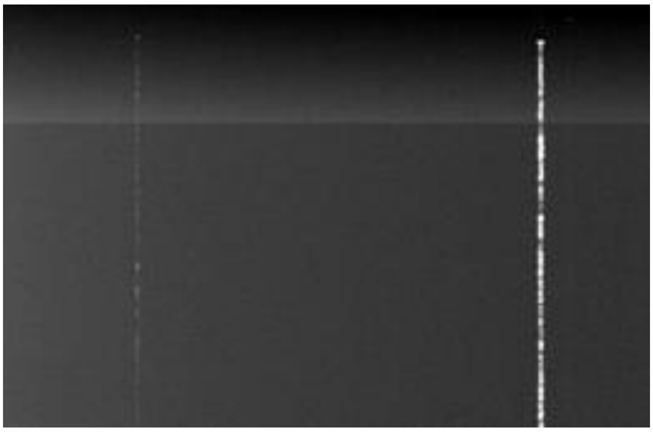

Figure 5: An example of the resulting image for seeing analysis

Some samples for seeing values are given in Table 1.

Table 1 Samples seeing values

Date	Hour	Seeing (“)	Wind speed (m/s)	Humidity (%)
13.5.2014	20:23	1,06	1	35
18.5.2014	02:00	1,77	8	85
20.5.2014	01:15	1,21	6	80
5.3.2015	23:35	0,73	0	30
26.3.2015	02:30	0,67	1	5
12.6.2015	22:32	0,83	2	75

4 ACKNOWLEDGMENTS

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