

THE CCD CAMERA WITHOUT COOLING

O.Sh. Shahrukhanov

Department of Astronomy, Odessa State University
T.G.Shevchenko Park, Odessa 65014 Ukraine

ABSTRACT. The device with the parameters taking one's intermediate stand between the standard TV and CCD cameras with cooling is developed. This camera works without cooling. Accumulation time can be established in the limits from 1 up to 16 TV frames. The results of trial measurements and possibilities for using of the given device are illustrated in this work.

Key words: Devices: CCD cameras

1. Introduction

In modern astronomical observations the CCD cameras with cooling Peltie elements have a broad distribution, that enables to accumulate the signal of observing object during long time. For the fast processes researches the cameras working in the TV standard with accumulation time of 40 milliseconds have been used. These cameras do not require cooling, that considerably simplifies their design and makes them much more economically on the expendable power. The block diagram of the device, possibilities to use it in the various fields of astronomy and the results of trial observations are discussed.

2. Device's structure and observations

For this device author has an attempt to keep the preferences of the both types cameras. For the author's device the accumulation time could be set within the limits of 1 up to 16 TV frames with step-type behaviour in one TV frame (from 40 up to 640 milliseconds). An information's input from the camera is carried out in the format of TV signal. This fact gives the possibility to use the camera as well with computer and videomonitor, respectively, and it is very important for the objects guiding in a manual mode. This device has high profitability (its power expend is about 1,2 Volt.), and it allows to supply it from the independent sources. For example, in the field conditions the camera can work from the storage battery of the automobile.

Possibilities of the using of this device are extensive enough. Let's consider some of them.

1. Sky objects photometry: it is possible to ob-

serve the objects with quickly brightness variability. Preferences in comparison with TV cameras, – higher sensitivity, and for the cooling ones, – faster informations input.

2. Atmosphere's researching. The range of accumulation times allows to receive stable fibrous structure around the stars, caused by the atmospheric turbulence effects. From the research of the given structures it is possible to determine their characteristic frequencies and other parametrs.
3. Guiding. Guiding of the objects by the using oh this camera is possible as in the automatic mode (at presence of computer system of telescope guiding), and in the manual one with the observer's visual control (it is especially important for old telescopes which work without computer's guiding systems).

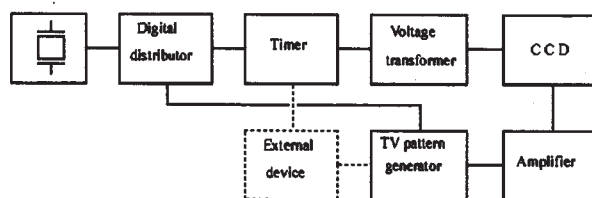


Figure 1: Block diagram of the device

The block diagram of the device is represented in Figure 1.

Digital distributor forms the series of the signals required for the matrix control and for the output signal conversion.

Timer operates by the process of accumulation. For this case it formats the signals of the previous block being depended on the information coming in from the outside device or from the panel of the manual control's block.

Voltage transformer converts input signals by the level of voltage what could be need for the CCD matrix control.

Amplifier strengthens a signal from the matrix output both for amplitude and for current.

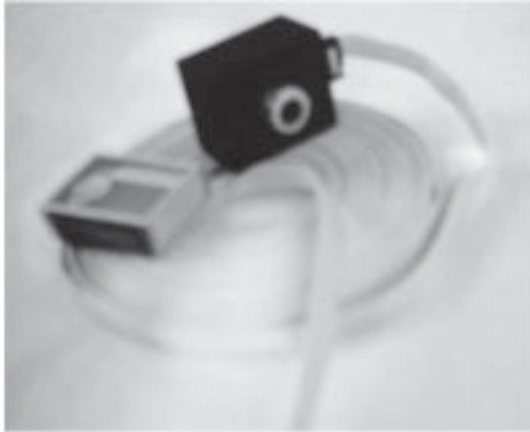


Figure 2: CCD device without cooling

TV pattern generator translates the amplified signal to the standard of the televisional one. As the outside devices could be a computer (if a digital processing is required, and control of the device or a telescope too) or the videomonitor if is need the visual control (guiding, visual search of the objects etc.).

Trial observations were carried out on the territory of the Astronomical Observatory of Odessa National University, situated in the central part of the city of Odessa. At that an objective lens with diameter of inlet 5 cm, and focal length 8 cm.

At maximal time of accumulation (16 TV of the staff) the sensitivity of this CCD matrix allows to observe the objects of 10.5 mag without additional information processing.

An appearance of device is given in Figure 2.