

# The Tracking Mode for the RATAN-600 Southern Sector with the Periscope

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**Abstract.** In this paper, we consider the implementation of tracking and fast scanning modes. The issues of modernization of the motion subsystem of the RATAN-600 cabin feed are considered for the implementation of the mode of precise slow motion of the RATAN-600 feed cabin.

**Keywords:** telescopes; techniques: radar astronomy

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In recent decades, there has been a significant increase in interest in the study of fast processes on the Sun, such as oscillations of plasma structures (Nakariakov & Melnikov 2009), microbursts (Yasnov et al. 2017) and microflares (Zaitsev & Kislyakova 2012) of radio emission in the decimeter range, arising in the upper part of coronal magnetic loops. All this stimulates the development of the modes of tracking/scanning of the Sun on the RATAN-600 radio telescope and the modernization of the radio telescope's PCS (Khaikin et al. 2018a). In (Khaikin et al. 2000), the possibilities are considered and the first results of long-term tracking of the Sun with a fixed Primary Mirror in the mode of operation with a reduced aperture in the meridian after the installation of the first intelligent drive on the type 3 cabin feed of the RATAN-600 radio telescope are presented. As was shown in (Khaikin et al. 2018b) that such a regime can be implemented in any azimuth of the arc path with a discrete of 2-4 degrees and a time of tracking the Sun up to 10-12 minutes. After the modernization of the drive of the carriage of the cabin feed type 3 and its testing in the mode of tracking its own motion of the GEOSAT (Khaikin et al. 2015), the scanning mode of the feed carriage was tested. In this mode, preliminary results of monitoring the activity of the Sun were obtained (Storozhenko et al. 2019), as well as promising methodological and instrumental directions, the development of which is required for the successful implementation of the tracking mode at the "South+Flat" antenna system of the RATAN-600, were determined. In the hardware direction in works (Storozhenko

et al. 2020; Lebedev, Ripak, & Bogod 2020). In the methodological direction - the method of reconstructing the images of the Sun when leaving the focus of the antenna system "South+Flat" in the tracking and scanning mode by solving the inverse problem of convolution of an distributed source with a mathematical model of telescope pattern. In this work, the issues of modernizing of feed and carriage motion control system are considered, based on experience and results in the first observations with tracking/scanning mode of the Sun. The standard motion control system has a limit on the accuracy of the setpoint for speed of cabin feed type 3, in the range of speeds between 1-10 mm/s, with a relative tolerance not better than 10% of the speed of the focal spot in the azimuthal direction. The new system project is based on the Siemens S7-1200 controller, which acts as a gateway between the industrial Profinet protocol and the control system and new Bosch servodrive with synchronous motor, both for carriage and the cabin feed type 3. The proposed solutions will improve the characteristics of the movement of the type 3 feed in the speed range 1-10 mm/s.

The implementation of this project will increase the efficiency of the tracking/scanning mode of the Sun on the RATAN-600 radio telescope.

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