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NAME M. A. Sadovnikov, V. D. Shargorodskiy

EMAIL msadovnikov@gmail.com

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ABSTRACT Methods to increase the ranging performance and accuracy implemented in the Russian new generation laser station «Tochka»

M. A. Sadovnikov[1], V. D. Shargorodskiy[1]

[1] Joint-stock Company «Research-and-Production Corporation

«Precision Systems and Instruments», JC «RPC «PSI»

new generation station «Tochka» is designed to perform ranging to geodetic and navigation satellites at a submillimeter level of accuracy, as well as to take laser and radio-frequency pseudoranging measurements to the navigation satellites equipped with laser pulse re-ception modules at a subnanosecond level of accuracy. By now the station «Tochka» has been developed, produced and has successfully passed the initial bench tests. Installation of the station at an operating site will be completed at the end of 2017, followed by its further tests under natural conditions. The report addresses key methods to increase the ranging performance and accuracy imple-mented in the Russian new generation laser station «Tochka», including: - methods for high-accuracy control over a laser beam in space and high-accuracy laser beam pointing at space objects; - methods for automatic laser beam pointing control and monitoring over coaxial alignment of transmit-receive optical paths;- methods for detection and processing of single-electron laser pulses reflected by on-board retroreflectors under night and daytime tracking conditions; - methods to achieve a submillimeter accuracy of the systematic measurement error; - methods to achieve a submillimeter measurement error of normal point generation; - methods for station activity automation and increase of ranging performance under mostly cloudy conditions. The report also represents key results of the initial bench tests the laser station «Tochka» has been put to.