

Evaluation of the Radio Navigational Parameters of GNSS Signals in Coherent Adaptive Reception Mode Using the Kalman Sigma-Point Filter Algorithm

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Abstract. An algorithm for constructing a multi-loop tracking system for radio navigation parameters of navigation satellite signals in the GNSS receivers of spacecraft is considered. The examined tracking scheme contains no discriminators for radio navigation parameters. The estimated delay, Doppler shift and phase are formed through the joint processing of quadrature signals of three correlators in the adaptive filter, consisting of several partial channels tuned to different values of the initial phase of the input signal. Quasi-optimal joint estimation of the parameters is performed using the Kalman sigma-point filter algorithm. The RMS error estimates and the probability of tracking failure for different signal-to-noise ratios are studied.

Keywords: parameter estimation, time delay, phase, frequency, Kalman filter, correlator, adaptive filter