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Search of the primordial gravitational waves with Very Long Baseline Interferometry

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Some models of the expanding Universe predict that the astrometric proper motion of distant radio sources embedded in space-time are non-zero as radial distance from observer to the source grows. Systematic proper motion effects would produce a predictable quadrupole pattern on the sky that could be detected using Very Long Baseline Interferometry (VLBI) technique. This quadrupole pattern can be interpreted either as an anisotropic Hubble expansion, or as an indication of the primordial gravitational waves in the early Universe.

We have analyzed a large set of geodetic VLBI data spanning from 1979 till 2015 to estimate the quadrupole harmonics in the expansion of the vector field of the proper motions of quasars in the sky. We estimated the vector spherical harmonics (three parameters for the dipole and ten - for the quadrupole systematic) by means of analysis of the intermediate individual proper motion. Additionally, the same estimates have been obtained separately for different red shift zones. The results of analysis are presented in this paper.

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