

Probing of interstellar plasma distribution in the direction to pulsars PSR 0525+21 and 1919+21 with RadioAstron mission

A. S. Andrianov^{1*}, T. V. Smirnova^{2†}, V. I. Shishov^{2‡}, M. V. Popov^{1§}, C. Gwinn^{3¶}

¹Astro Space Center, Lebedev Physical Institute, Russian Academy Of Sciences, Profsoyuznaya 84/32, 117997, Russian Federation

²Pushchino Radio Astronomy Observatory, Astro Space Center, Lebedev Physical Institute, Russian Academy of Sciences, Pushchino, Moscow oblast', 142290, Russia

³Department of Physics, University of California, Santa Barbara, California 93106, USA

We carried out observations of pulsars PSR 0525+21 and 1919+21 at 1668 MHz and 324 MHz to study the distribution of interstellar plasma in the direction to these pulsars. We used RadioAstron space telescope together with large ground telescopes: Arecibo, Green Bank and Westerbork. The maximum baseline projections for the space-ground interferometer were 60000 km for 1919+21 and 233600 km for PSR 0525+21. We measured the scattering angles in the direction to PSR 0525+21 as $\theta_{sc} = 0.028$ mas at 1668 MHz and $\theta_{sc} = 0.7$ mas at 324 MHz in the direction to PSR 1919+21. We found for the first time that two scattering regimes are realized in the direction to PSR 1919+21: diffractive scintillations from inhomogeneities in a layer of turbulent plasma at a distance $z_1 = 440$ pc from observer and weak scintillations from a screen located at $z_2 = 0.14$ pc. We also found that prism with a distance $z \leq 2$ pc exist in this direction. We had shown that the scattering of emission from PSR 0525+21 takes place on the screen located close to pulsar: $0.1D$, where D is a distance to pulsar. For $D = 1.6$ kpc we have $z = 1.44$ kpc from the observer.

*E-mail: andrian@asc.rssi.ru

†E-mail: tania@prao.ru

‡E-mail: shishov@prao.ru

§E-mail: mwpopov@gmail.com

¶E-mail: cgwinn@ucsb.edu