Detection of monochromatic oscillations in optical spectrum of the intermediate polar RE 0751+14

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Abstract.

We present the results of optical dynamic spectroscopy (Somov, 1988) and spectropolarimetry (Somova et ah, 1992) of the new intermediate polar RE 0751 + 14 (Mason et al, 1992; Patterson, 1994) over a period from February 1993 to March 1996. The observations have been carried out at the 6 m telescope with 2 x 1024 channels photon counting system (BTA scanner) with the temporal resolution 32 ms (Somova et al., 1982; Drabek et al., 1986). The analyzer of the circular polarization has been used in the polarimetric mode of observations in March 1996 (Najdenov and Panchuk, 1996). Narrow-band spectral oscillations in the vicinity of the spin period of the white dwarf (13.9 min) have been investigated. The dependence of the power of oscillations on the wavelengths (3800-5200 Å, 1 Å/channel) and on the period of pulsations in the range 300-2000 s with a mean resolution along the period 10 s has been calculated. Power spectra have revealed strong (amplitude up to 40%, relatively the level of the continuous spectrum), circularly polarized (dominating in one polarization), monochromatic (FWHM in power spectra 2-3 Å) oscillations with periods of 13.3-15.2 min mainly in the profiles of emission lines. The wavelengths of these oscillations (features in power spectra) correspond to the solutions of the Schrodinger equation in strong resonance magnetic fields (quadratic Zeeman effect) (Kemic, 1974). The equation for calculations of resonance magnetic fields for σ transitions is the equality of the wavelength shifts due to the linear and quadratic Zeeman effects.

The physical nature of these oscillations is enigmatic. We put forward and discuss the hypothesis that the monochromatic oscillations of the photoelectron flux can be interpreted on the basis of the hypotheses of Louis de Broglie (1986) about the corpuscular-wave dualism and the double solution of the Schrodinger equation. From this point of view the observed pulsations of the photoelectron flux is the result of local perturbation of quantum efficiency of the photocathode by the external wave of Louis de Broglie, which is presented as a monochromatic coherent electromagnetic wave with the Pointing vector equal to zero during the time of life of about 3000-5000 s. The source of strong radiation of this kind of electromagnetic waves was assigned to an ultrarelativistic macro-quantum-mechanics system in a strong magnetic field with the temperature of radiation very close to zero ($\sim 10^{-14}$ K).

The known analogs of these sources can be magnetic black holes.