Detection of monochromatic quasi-periodic oscillations in optical spectrum of the intermediate polar RX J0558.0+5353 (V405 Aur)

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Abstract.
We present the results of optical dynamic spectropolarimetry and spectroscopy of the intermediate polar RX J0558.0+5353 (V405 Aur) obtained at the 6 m telescope (BTA) with the multichannel photon-counting system (scanner) in a high time resolution mode from March, 1996 to December, 1998. As a result of analysis of the photoelectron events which were tagged by polarization, wavelength and time, the Monochromatic Quasi-Periodic Oscillations (MQPOs) or the statistically significant features in the spectral composition of photoelectron noise in the narrow wavelength passbands (1 Å) were detected in power spectra. The strong (amplitude up to 60% in 2000 s exposures) polarized (dominating alternatively only in one of the two circularly or linearly polarized spectra) monochromatic (FWHM in power spectra 2-3 Å) oscillations with periods of 273 ±6 s corresponding to the first harmonic of the spin frequency of white dwarf, mainly in the profiles of emission lines with the time of coherence 1500-2000 s were discovered. On the basis of properties of the MQPOs and the hypothesis of physical reality of the electromagnetic waves with the Pointing vector equal to zero, we associate the MQPOs with electromagnetic wave packets or the low-energy photon-like elementary particles named MQPO-photons. Prom our point of view, the MQPOs are signatures of the MQPO-photons which show up their corpuscular properties at the wavelength equal to 273 light seconds and their wave properties in the optical wavelength range. The corpuscular part of the MQPO-photons or its energy is determined by the first harmonic of the spin frequency of the oblique magnetic rotator, while the wave part of them or the optical wavelength corresponds to radiation from the strong resonance magnetic fields. The low energy of the MQPO-photons directly points to the low temperature (~ 10^{-14} K) which can be attributed only to the black hole as the source of radiation of these particles.