

We present the main results from a selection of optical spectra of Seyfert and LINER galaxies taken from the 9th release of the SDSS with detectable emission of forbidden high ionization lines (FHILs), better known as coronal lines. A catalog of 345 Seyfert 1 (Sy1) and Seyfert 2 (Sy2) galaxies with FHILs emission is presented. By analyzing their spectra and utilizing data from the literature we found the following results: (1) The flux ratios between FHILs suggests anisotropy of emission between Sy1 and Sy2 galaxies, which agrees with the results found by Nagao et al. (2002) and Portilla (2012). Sy1 seems to emit more FHILs than Sy2. (2) This anisotropy suggests the idea that an important, but not the majority, of the emission of FHILs comes from the inner part of the obscuring torus. (3) We present diagnostic diagrams between FHILs lines which indicate clear correlations between the flux ratios. (4) It is observed that the ratio of Ne V/Fe VII is of the order of 3 to 10, while the ratios between iron lines (i.e., Fe VII, Fe X, Fe XI) are roughly around the unity. (5) At least in the optical spectra, the present study continues to support the general idea that LINERs are not energetic enough to present FHILs. A complete version of this study including the catalog with the objects of study, and diagnosis diagrams using only this kind of lines can be found in Vera & Portilla (in prep).

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HIGH ENERGY ASTROPHYSICS

DECAY OF MAGNETIC FIELD IN BLACK WIDOW PULSARS

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A small fraction of the binary relativistic systems display the “black widow” effect: the companion is being ablated by the (recycled) pulsar wind. In these binary systems the evolution of the companion star (of the solar-type) reaches the point of filling its Roche lobe, thus initiating the process of mass accretion onto the pulsar. Accretion is generally believed to result in magnetic field decay, while isolated neutron star fields decay very slowly, if at all. We shall show that the very long evolution of the “black

widow” system, starting from a solar-type star and lasting > 5 Gyr to reach the observed position in the plane, allows us to conclude that the magnetic field does not decay below the bottom value, extending the previous conclusions drawn from younger systems. In addition, the masses of the “black widow” pulsars are naturally predicted to be > 2 Mo due to the accretion history, in full agreement with recent measurements.

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RADIATION-HYDRODYNAMIC MODEL OF HIGH-MASS X-RAY BINARIES

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The topic of circumstellar matter in the X-ray binaries and its spectroscopic diagnostics is addressed by method of generating synthetic Dopplergrams for direct comparison with observations. The presented results were obtained using our improved three-dimensional radiation-hydrodynamic model of the stellar wind in HMXBs. We use the model to simulate dynamics, anisotropy and other characteristics of the wind, e.g. the density distribution and ionization structure. We adopt parameters of Cygnus X-1 in our simulations and use the Doppler tomography to probe the structure of radiation-emitting material in the system. We introduce a data interpretation method of observed Doppler tomograms via direct comparison with synthetic Dopplergrams obtained from our model. We test the reliability of the model as well as set constraints on various physical parameters and processes, e.g. the accretion rate. We take into account the Coriolis force, the ionization structure of the medium, the gravity darkening, and we investigate the effects these phenomena have on the accretion process. E.g. the Coriolis force substantially influences the mass-loss of the donor and by that the accretion rate of the compact companion. Additionally, focusing of the stellar wind by the gravitational field of the compact companion leads to the formation of an unstable gaseous tail behind the companion. This tail shows signs of quasi-periodic oscillations and its existence presents us with other means to explain the switching mechanism among the various X-ray states.