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Accretion vs. Pulsar Wind Models for the TeV Gamma-ray Binary LS I +61 303

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Among four TeV ($= 10^{12}$ eV) gamma-ray binaries, three have Be stars as the optical counterpart, which are early-type stars with a polar wind and a dense equatorial disk. Although the presence of the circumstellar material of the Be star makes the interaction with the compact object significantly complicated, 3D dynamical modeling is crucial to understanding the nature of the interaction and the origin of the high energy emission in these systems . Indeed, using data from 3D SPH simulations for the TeV binary PSR B1259-63 (Okazaki et al. 2011), which consists of a Be star and a radio pulsar with a pulsar wind, Takata et al. (2011) showed that if the Be disk is very dense, the interaction with the pulsar wind results in double-peaked light curves in high energy bands, which are roughly similar to observed ones.

Given the variety of the orbital parameters and in particular the unknown nature of the compact object in TeV binaries other than PSR B1259-63, it is not clear whether there is a unified model for these systems.

In this talk, I will discuss the nature of the interaction in another TeV binary with a Be star, LS I +61 303. Since the nature of the compact object is not established in this system, I will report on the results from 3D SPH simulations based on two competing models, the accretion model and the pulsar wind model. I will show how similar/different the effect of the compact object in these two models is on the Be disk.