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Examining Accretion Disk Properties of Sgr A* Via Stellar Wind Interactions

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A recent method has been proposed for probing the properties of the accretion disk surrounding Sgr A* located at our galactic center. This is based on a study of the collision between the disk fluid and the wind of the star, S2. We expand upon the previous work by constructing a semi-analytical model for the shock formation in the stellar wind. This takes into account the thermal pressure of the disk and employs the conservation of momentum flux in the shocked region for deriving the shape of the shock. Our analysis yields semi-analytical expressions for the system as a function of the accretion disk density. For typical values of the latter, we find that the temperature of the shocked stellar wind reaches a few keV. The shocked gas cools via thermal bremsstrahlung emission with a luminosity of $\sim 10^{33} erg/s$, assuming solar metallicity. These results have so far been validated by numerical simulations and are within the detection range of current instruments. Ultimately, the detection of these interactions can constrain the density of the disk around the pericenter of the orbit of S2, which will occur in 2018.

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