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Relativistic Stream Collisions in Tidal Disruption Events[1] GAURI BATRA, Cornell University, WENBIN LU, STERL PHINNEY, California Institute of Technology — In a tidal disruption event (TDE), a star approaching a black hole is torn apart by the black hole's tidal force, resulting in the squeezing of the star to form a stream of tidally disrupted material. Some of this material is bound and keeps orbiting the black hole while some is unbound and escapes. To understand the outcome of TDEs, it is crucial to find where the bound stream intersects itself since intersection can lead to potentially observable shocks, accretion disks and secondary outflows. We compute the intersection points for a Schwarzschild (non-spinning) black hole and a Kerr (spinning) black hole, first for the equatorial case where the stream lies in a plane and then for the general case where the stream evolution is in three dimensions. We numerically integrate the geodesic equations of motion to find the path of the stream and discuss the algorithm used to find the region of self-intersection. This algorithm takes into account various aspects of the model including stream thickness and energy distribution of the stream material. As a result, we obtain the dependence of the self-intersection region on multiple parameters such as angular momentum, black hole spin, and stream thickness.

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