

Colliding Relativistic Shells: New Insights

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Shock waves are abundant in astrophysical sources, and are responsible for much of the electromagnetic emission that we observe from many sources. Therefore, the shock dynamics can significantly affect the observable signatures, and are important to account for when interpreting the observations. I will first discuss a planar collision between two cold shells, which may be relevant either for internal shocks within an outflow (e.g. in GRBs or AGN) or for an ejected shell colliding with a preexisting external shell (e.g. in magnetar giant flares, superluminous supernovae or possibly also in FRBs). Both the bulk velocity of the two shells and their relative velocity can range from Newtonian to ultra-relativistic, within the same formalism. The possible observable implications for prompt GRB emission from internal shocks will be outlined as an important case study, and the effects of a locally spherical geometry will be outlined. Finally, I will discuss an oblique collision between two cold shells, and its relation to the classical problem of shock reflection, as well as the conditions required for the production of a pair-annihilation line and its implications for the B.O.A.T, GRB 221009A.

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