

Virial shocks in galaxy clusters

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In the theory of structure formation in the Universe, galaxy clusters are thought to grow by accreting surrounding material, resulting in strong surrounding, so-called virial shocks. Such a shock is expected to accelerate relativistic electrons, thus generating a spectrally-flat leptonic virial ring. Recently, we have detected ($> 5\sigma$) virial shock signals around the expected shock radius, $\sim(2-3)\theta_{500}$, for example by stacking gamma-ray data from Fermi LAT around >100 nearby clusters. We investigate virial shock signals in a wide range of wavelengths, to better understand these shocks and their implications for astrophysics, cosmology, and plasma physics. In particular, we estimate the energies the shock deposits in relativistic particles and magnetic fields.

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