

The interacting galaxy cluster "El Gordo" a massive blow to LCDM cosmology

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El Gordo (ACT-CL J0102-4915) is an extremely massive galaxy cluster ($M_{200} = 2e15 M_{\text{sun}}$) at redshift $z=0.87$ composed of two subclusters with mass ratio 2 merging at speed $V_{\text{infall}} = 3000 \text{ km/s}$. Such a fast collision between individually rare massive clusters is unexpected in Lambda cold dark matter (LCDM) cosmology at such high z . Here, we determine the probability of finding a similar object in a LCDM context using the Jubilee simulation box with side length $6/h \text{ Gpc}$. We search for galaxy cluster pairs that have turned around from the cosmic expansion with properties similar to El Gordo in terms of total mass, mass ratio, redshift, and collision velocity relative to virial velocity. We fit the distribution of pair total mass quite accurately, with the fits used in two methods to infer the probability of observing El Gordo in the surveyed region. Detecting one pair with its mass and redshift rules out LCDM cosmology at 5.14σ . Using a chi squared approach, the combined tension with the Bullet Cluster can be estimated as 5.50σ . These systems arise naturally in a Milgromian dynamics (MOND) cosmology with light sterile neutrinos.

Presenter: Ms ASECIO, Elena (University of Bonn)