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The Cluster Soft X-ray Excess from a Cosmic Axion Background

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Observations have revealed diffuse excess emission in a large number of galaxy clusters in the ~200 eV soft X-ray band: the Cluster Soft X-ray Excess. In this talk I will discuss how a primordially generated background of relativistic axion-like particles can explain this puzzling feature of galaxy cluster observations. Such a background is generically predicted to be produced from the decays of string moduli fields in the early universe, and can form the Dark Radiation component of the universe, of which there a tentative hints. The conversion of these axion-like particles in the magnetic fields of galaxy clusters can give rise to the Cluster Soft Excess. Here I will discuss how simulations of cluster magnetic fields can be used to compare the predicted and observed morphology of soft X-rays across several clusters. The simulations can also be used to constrain the axion-photon coupling and the energy of the Cosmic Axion Background spectrum.

Primary author: Mr POWELL, Andrew J. (University of Oxford)

Co-authors: Dr MARSH, David (University of Oxford); Dr CONLON, Joseph P. (University of Oxford); Dr WITKOWSKI, Lukas (Heidelberg University); Mr ANGUS, Stephen (University of Oxford)

Presenter: Mr POWELL, Andrew J. (University of Oxford)

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