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A NuSTAR and Chandra Study of Late Stage Galaxy Cluster Merger CL 0217+70 and Its Tell-Tale Radio Halo

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Mergers of galaxy clusters are the most energetic events in the Universe since the Big Bang. They drive shock and cold fronts, generating turbulence into the intracluster medium (ICM), while also (re)accelerating electrons and cosmic rays through Fermi-like acceleration processes that create radio halos and relics. How and when radio halos are generated in a merger and their X-ray signatures are poorly understood. Galaxy cluster CL 0217+70 is a remarkable, late-stage merger, with two extended radio relics and a well-studied radio halo (Hoang et al. 2021). A recent Chandra study (Zhang et al. 2020) reveals surface brightness edges in the ICM that correspond to features in the halo, making the cluster one of very few systems where surface brightness edges are associated with the halo edge. Upon this discovery, we studied the cluster in detail with our deep (180 ks) NuSTAR observation. In this talk, I will present our findings on the nature of these edges as well as the discovery of a hot spot (~ 13 keV), which is even hotter than the center of the cluster and discuss its origin and implications on the merger history. In addition, I will discuss our results on the inverse Compton emission search associated with the radio halo.