"PIN"-ning Down a Nonthermal Component in the Hard X-ray Emission of the Coma Cluster with Suzaku HXD/XIS and XMM-Newton Observations

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The brightest radio halo known resides in the Coma cluster of galaxies, which is also the X-ray brightest non-cooling core cluster. The diffuse, cluster-wide radio halo is due to synchrotron emission from relativistic electrons, which also produce inverse Compton emission that becomes competitive with thermal emission from the ICM at hard X-ray energies. Thus far, claimed detections of this emission in the Coma cluster are controversial (Fusco-Femiano et al. 2004; Rossetti & Molendi 2004). In this poster, we present a 180 ks observation of the Coma cluster with Suzaku, in order to nail down its nonthermal hard X-ray content, as well as a mosaic XMM-Newton observation that covers the entire HXD-PIN field of view. Because Coma’s ICM is hot (T~8 keV), a clear detection of nonthermal emission in the HXD-PIN detector requires the thermal component within the same field of view to be completely censused. XMM-Newton EPIC-PN spectra over the HXD field of view are weighted according to the spatial sensitivity of the HXD-PIN detector and combined so as to directly represent the HXD-detected thermal emission. The Suzaku HXD-PIN and XIS spectra are simultaneously fit with this XMM-Newton spectrum to pin down the thermal and nonthermal components of the X-ray emission. Combined with radio observations, the level of nonthermal emission will constrain the strength of the cluster-wide magnetic field and the relativistic energy content of the Coma cluster. These results will be interpreted within the framework of relativistic particle re-acceleration, driven by cluster mergers, as the origin of radio halos. Also, the hard X-ray thermal emission will be discussed in light of previous results, including recent INTEGRAL observations (Eckert et al. 2007).