High performance Non-dispersive x-ray spectrometers for Charge Exchange measurements

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Currently, the only measurements of cosmological charge exchange have been made using low resolution, non-dispersive spectrometers like the PSPC on ROSAT and the CCD instruments on Chandra and XMM/Newton. However, upcoming cryogenic spectrometers on Astro-H and IXO will add vast new capabilities to investigate charge exchange in local objects such as comets and planetary atmospheres. They may also allow us to observe charge exchange in extra-solar objects such as galactic supernova remnants. With low spectral resolution instruments such as CCDs, x-ray emission due to charge exchange recombination really only provides information on the acceptor species, such as the solar wind. With the new breed of x-ray calorimeter instruments, emission from charge exchange becomes highly diagnostic allowing one to uniquely determine the acceptor species, ionization state, donor species and ionization state, and the relative velocity of the interaction. We will describe x-ray calorimeter instrumentation and its potential for charge exchange measurements in the near term. We will also touch on the instrumentation behind a decade of high resolution measurements of charge exchange using an x-ray calorimeter at the Lawrence Livermore National Laboratory.