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The CHARIS Data Extraction Software: Integral Field Spectroscopy at High Contrast

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I will present the design of a custom data extraction software package for the Coronagraphic High Angular Resolution Imaging Spectrograph (CHARIS) under development for the Subaru Telescope. Integral field spectrographs (IFSs) are the instrument of choice for high contrast imaging. With both spatial and spectral information, IFS data cubes can both suppress starlight to increase contrast beyond the limits of simple cameras, and directly measure exoplanet spectra. Current IFSs gain an order or magnitude or more in contrast from post-processing of the data cubes, making both hardware and software critical to their success. I will describe the data extraction software to reconstruct $\sim$20,000 spectra from each raw detector readout, producing a 3-dimensional (x, y, λ) data cube that will achieve a high level of spectrophotometric precision ($\sim$0.06 mag) for atmospheric characterization, astrometric precision ($\sim$3 mas) for orbital characterization, with a fast reconstruction (< 5 s) for focal plane wavefront sensing.

Direct imaging offers one of the only ways to take spectra of, and to characterize, young gas giant exoplanet atmospheres. A key goal for the field is to use high-contrast integral-field spectroscopy to detect, and understand, young analogs to the gas giants in the solar system. CHARIS has been design for these goals, and in combination with the AO188 and SCExAO adaptive optics systems, the suite of high contrast instrumentation at Subaru will form the premier high contrast imaging system. CHARIS will be added to Subaru in late 2015.