CCAT Newsletter

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From the CCAT Director

The past six months have been an exciting time for the CCAT Project. The telescope design has been successfully reviewed, the first CCAT instruments have been identified, and land access has been granted by the Chilean government for the telescope and access road. Simply put, CCAT is ready to commence construction! In this issue of the CCAT Newsletter and in the coming months, we look forward to presenting an overview of the CCAT science, instruments, and telescope designs.

Riccardo Giovanelli, Cornell University

Telescope

CCAT is a 25-m diameter submillimeter telescope that will enable a broad range of astronomical studies focused on the origin of stars, galaxies and galaxy clusters. Located at an elevation of 5600 m near the summit of Cerro Chajnantor in the Atacama Desert of northern Chile, CCAT is designed to provide sensitive high angular resolution observations at submillimeter wavelengths (3.5″ at 350μm) over a 1° field-of-view. The combination of the large aperture telescope, on a prime observing site, with a wide field-of-view, and a suite of large-format cameras and spectrometers makes CCAT a powerful discovery instrument.

Engineering Design Phase

With support from the CCAT partners and a $4.5M award from the National Science Foundation, the Project completed an Engineering Design Phase (EDP) study that produced a design of the telescope, enclosure, facilities, and instruments. Key aspects of the telescope design include an actively controlled primary that will correct for gravitational deformations and produce a high surface accuracy for sensitive submillimeter observations, and a large field-of-view to accommodate the rapid growth in detector array size.

Instruments

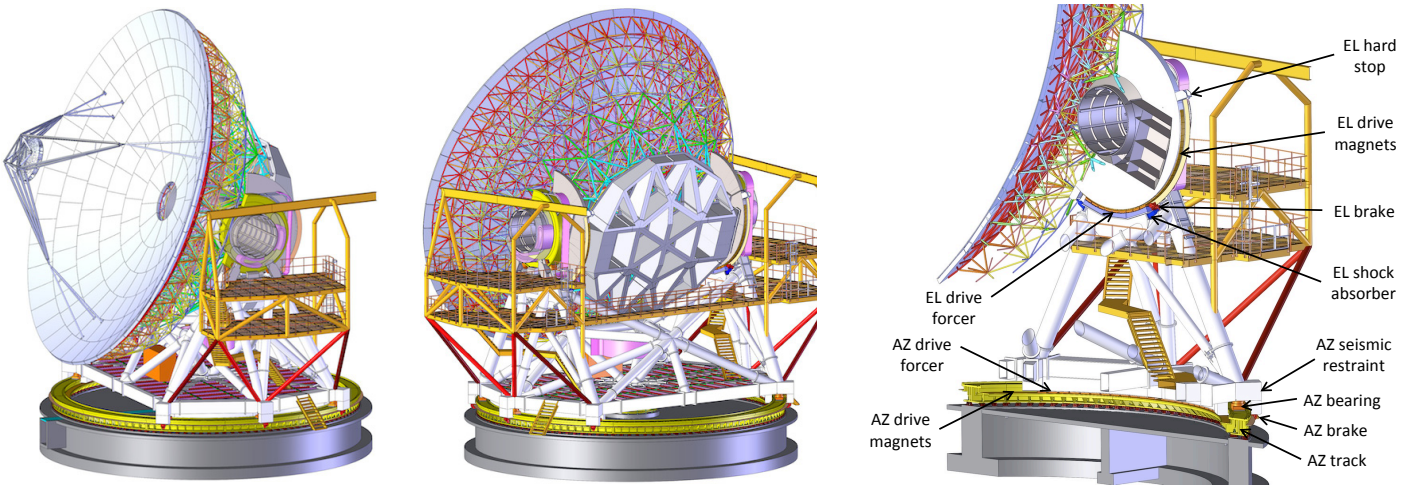
The EDP produced extensive studies of four instruments for early CCAT science: SWCam, LWCam, X-Spec, and CHAI.

- SWCam will observe the submillimeter continuum primarily in the 200-450μm atmospheric bands to measure the star formation rate and dust mass in galaxies through cosmic time, and to measure the mass function of cores in molecular clouds.
- LWCam will observe six continuum bands between 750μm and 3300μm to study the structure of galaxy clusters through observations of the Sunyaev-Zel'dovich effect and to search for very high redshift galaxies.
- X-Spec is a broadband (600-1600μm at $\lambda/\Delta\lambda$=700), multi-object (85 elements) spectrometer that will measure redshifts and the physical conditions in the interstellar medium.
- CHAI is a heterodyne array designed to trace the kinematics and structure of the interstellar medium, especially through observations of carbon monoxide and neutral carbon spectral lines in the 350, 650, and 850μm bands.

A prototype camera for SWCam that demonstrates many of the technologies shared by SWCam, LWCam, and X-Spec had a successful commissioning run on the Caltech Submillimeter Observatory (CSO) in April 2013. A prototype array for CHAI will be completed by the end of the year.

Path Toward Construction

The EDP culminated in September 2013 when the design and overall technical readiness of the project were favorably reviewed by an international panel of experts in engineering, science, operations, management, and software. In January 2014, the Chilean government granted the use of land on Cerro Chajnantor to the CCAT consortium for the telescope and the road to the mountain summit.



The CCAT telescope design and drive details produced from the engineering study.