

## BOLOCAM OPTICAL DESIGN AND PERFORMANCE

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Bolocam is a millimeter-wave (1.1 mm and 2.1 mm) camera with a monolithic array of one hundred and forty-four 300-mK bolometers. Bolocam is used on the 10.4-m Caltech Submillimeter Observatory (CSO) for observations of submillimeter galaxies, galaxy clusters, secondary anisotropies in the cosmic microwave background radiation, and Galactic star formation regions. Bolocam has a hexagonal field-of-view of 8 arcminutes. The neutron transmutation doped Ge bolometers with silicon nitride micromesh absorbers reside between an array of close-packed, straight-walled, conical feedhorns and a reflecting backshort, optimized for each waveband. The feedhorns are coupled to the telescope by a double-parabolic cryogenic lens and a room-temperature ellipsoidal mirror. The mirror reimages the CSO primary mirror onto a cryogenic cold stop, which apodizes the beams. The bandpasses are formed by the waveguides and a stack of metal-mesh filters. Bolocam has been fully characterized and commissioned at the CSO.

I will describe the optical design, simulations, and results of laboratory and telescope optical characterization, including: beam maps over the bolometer array, diffraction by the cold stop, and optical loading. Good agreement is found between the optical performance and beam parameters, as predicted using Zemax EE (trademark), and the measured performance, including diffraction in the near field of the cold stop. The system exhibits mild distortion, which is corrected for in software when pointing corrections are applied. The optical performance is good over the entire field-of-view and the design serves as the baseline for Bolocam II, which is being built for use on the 50-m Large Millimeter Telescope in Mexico.

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5. No special instructions