

Caltech Submillimeter Observatory



Submillimeter astronomy

With the CSO, astronomers from all over the world observe light naturally emitted by celestial objects at submillimeter wavelengths. This spectral range, between infrared and radio, is particularly suited to studying the molecular gases and small solid dust particles that fill the densest regions of the interstellar medium, where stars form as gas clouds contract and collapse under the pull of gravity. Star formation is best studied in the submillimeter and infrared because interstellar dust absorbs shorter wavelength light. Near the end of their lives, certain stars eject copious amounts of material, forming circumstellar envelopes with a rich assortment of molecules. Submillimeter observations of galaxies outside the Milky Way trace the history of star formation during the evolution of the universe. Light from the most distant galaxy observed with the CSO was emitted 12 billion years ago.

Telescope characteristics

Aperture Diameter	10.4 m (34 ft)
Observing Wavelength	2 mm–350 μm
Angular Resolution	8 arcsec @ 350 μm
Pointing Accuracy	3 arcsec rms
Surface Accuracy	< 15 μm rms
Altitude	4070 m (13360 ft)

The telescope and its instrumentation

The CSO, designed and built at Caltech, was installed on Mauna Kea in 1985-7. Eighty four lightweight hexagonal aluminum honeycomb panels make up the primary mirror. An active system aligns these panels to maintain the smooth surface needed for submillimeter observations.

Spectrometers and cameras at the CSO use detectors developed at Caltech and other universities. For maximum sensitivity, these detectors are cooled close to absolute zero temperature. New instruments are deployed as detector technology advances.

Because atmospheric water vapor absorbs submillimeter radiation, the CSO is located high on Mauna Kea to take advantage of the very dry conditions. Most observations are made at night when the atmosphere is driest and most stable.

As a university facility, the CSO has a strong educational tradition: over 100 students from 25 institutions have used the CSO for doctoral research projects.

The California Institute of Technology operates the CSO in partnership with the East Asian Core Observatories Association. The CSO is located on Mauna Kea through an agreement with the University of Hawai'i.

For more information, please visit: cso.caltech.edu

