The Simons Observatory

Searching For Our Cosmic Origins

Project Update - May 2024

OVERVIEW

The Simons Observatory (SO) will provide scientists with an unprecedented platform to study the nature of the fundamental physical processes that have governed the origin and evolution of the Universe via high-precision measurements of the temperature and polarization of the Cosmic Microwave Background – the oldest light in the Universe. Located at an elevation of 5190 meters on Cerro Toco in the Atacama Desert of Northern Chile, SO currently consists of three 0.4 meter diameter Small Aperture Telescopes (SATs), and one six-meter diameter Large Aperture Telescope (LAT). In the coming years, UK collaborators will add two more SATs (SO:UK) and Japanese collaborators will add a sixth SAT (SO:JP). Moreover, an NSF-funded initiative – the Advanced Simons Observatory (ASO) – is underway to maximize the capabilities of the LAT, develop enhanced data management, and provide the Observatory with a new, renewable source of energy. Over 350 physicists, engineers, and technologists from more than 50 institutions around the world have contributed to the design, construction, and commissioning of SO.

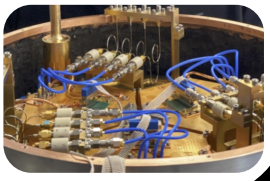
SMALL APERTURE TELESCOPES (SATs)

Optical Design: Cryogenic Refracting Telescope

Total SATs: 3 for SO nominal; 3 additional from collaborators from the UK and Japan in coming years.

Clear Aperture Diameter: 0.4 meters

Half Wave Plate: Cryogenic (40K), Rotating



Detector Count: 36,000 (for three SO SATs); 61,000 (for six total SATs including SO:UK and SO:JP)

Focal Plane Temp: 0.1 K

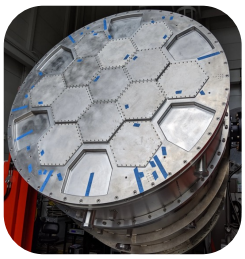
Frequency Bands: 90/150 GHz (2x), 220/270 GHz (1x) (for SO nominal)

LARGE APERTURE TELESCOPES (LAT)

Optical Design: Cross Dragone

Primary Mirror Diameter: 6 meters

Secondary Mirror Diameter: 6 meters



Optics Tubes: 7 for SO nominal; 13 total for ASO

Detector Count: 31,000 for SO nominal; 62,000 total for ASO

Focal Plane Temp: 0.1 K

Frequency Bands: 30/40 GHz (1x), 90/150 GHz (8x), 220/270 GHz (4x) (for ASO)

PROJECT STATUS

MAY 2024: The Simons Observatory will begin operations on 01 May 2024, with much of the project construction phase complete. Presently, two SATs have been deployed both operating in the SO 90 and 150 GHz bands (mid-frequency), which is the SO primary science band. The SO data pipeline team is currently analyzing commissioning data, including maps of Jupiter, the Moon, and the Milky Way, and is generating initial CMB polarization maps. A third SAT, operating in the SO 220 and 270 GHz bands (ultra-high frequency) is also on site and aims to have first light in the next few months.

The LAT structure is built and has passed all pointing testing. The LAT receiver is integrated and installed on the LAT with four mid-frequency and two ultra-high frequency optics tubes integrated. The LAT receiver has made "dark" maps of the sky, with excellent detector yield and dark noise characteristics. The LAT mirrors are under construction with a production schedule that will enable first-light observations to take place by early-2025.

The NSF-funded Advanced Simons Observatory (ASO) is underway. ASO will fully populate the LAT with optics tubes, develop advanced data management tools, and install a photovoltaic power plant to ensure a sustainable future for SO operations. Additionally, collaborators in the United Kingdom and Japan will develop and deploy three additional SATs, bringing the total number of SATs on site to six.

SO SUPPORT

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