

# Gemini South Laser Guide Stars



Gemini Observatory Legacy Image

Image Credits: Gemini Observatory/AURA/Manuel Paredes  
(Inset Image: Maxime Boccas)



The Gemini Observatory is operated by the Association of Universities for Research in Astronomy, Inc., under a cooperative agreement with the National Science Foundation on behalf of the Gemini Partnership.



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## *Gemini South Laser Guide Stars*

On January 22, 2011, a new era in high-resolution astronomy began with the successful propagation of a 5-star sodium laser guide star “constellation” in the skies over Cerro Pachón in Chile. The images here clearly show this monumental event and the five laser-produced stars shining in the sky (inset).

This first propagation of the Gemini South telescope laser system marked the beginning of on-sky commissioning for the next-generation adaptive optics system called the Gemini Multi-conjugate adaptive optics System (GeMS), allowing relatively wide-field imaging at extremely high resolution over an exceptionally large portion of the sky.

Gemini Observatory captured the event using a digital camera and 500-mm lens as the laser, split into five beams, caused sodium atoms about 90 kilometers overhead to glow. The distinctive 5-point pattern resembles that on a die or domino. Computers analyze the atmosphere’s effect on this pattern, and then use that data to change the shape of a series of deformable mirrors and produce remarkably sharp images.

Astronomers use GeMS to study a wide variety of topics ranging from the birth and evolution of stars to the dynamics of distant galaxies.

## **Gemini Observatory Facts**

### **PRIMARY MIRRORS:**

Diameter: 8.1 meters; 26.57 feet; 318.84 inches

Mass: 22.22 metric tonnes; 24.5 U.S. tons

Composition: Corning Ultra-Low Expansion (ULE) Glass

Surface Accuracy: 15.6 nm RMS (between 1/1000 - 1/10,000 thickness of human hair)

### **TELESCOPE STRUCTURES:**

Height: 21.7 meters; 71.2 feet; 7 stories (from “Observing Floor”)

Weight: 380 metric tonnes; 419 U.S. tons

Optomechanical Design: Cassegrain; Alt-azimuth

### **DOMES:**

Height: 46 meters; 151 feet; 15 stories (from ground)

Weight: 780 metric tonnes; 860 U.S. tons (moving mass)

Rotation: 360 degrees in 2 minutes

Thermal Vents: 10 meters; 32.8 feet (width – fully open)

### **GEOGRAPHICAL DATA:**

Elevation: Gemini North: 4,214 meters; 13,824 feet / Gemini South: 2,737 meters; 8,980 feet

Location: Gemini North: 19°49.4’N; 155°28.1’W / Gemini South: 30°14.5’S; 70°44.8’W

To see this, and many other images, please visit: <http://www.gemini.edu/legacyph>