



Lunar CRater Observation and Sensing Satellite

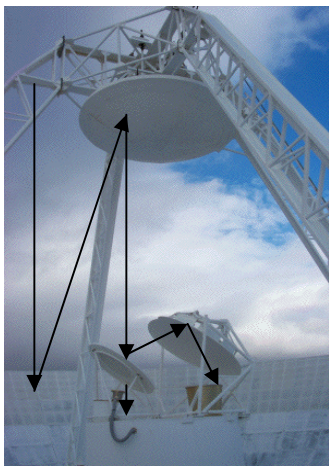
Radio Telescopes

Radio waves from objects in space can be detected on the surface of the Earth. These electromagnetic waves¹ can make charged particles move back and forth, and in this way, produce an alternating current in conductors of electricity. A radio telescope is a conductor. It intercepts radio waves and amplifies the weak current in a radio receiver until it is strong enough to measure.

The astronomical radio receiver can also operate much like a spectrometer², giving information about how much radiation the antenna receives at a particular wavelength.



Deep Space Station 12
Goldstone, CA



Incoming radio waves are reflected from the dish⁵. X-band radio waves pass through a Dichroic Plate⁶ to an X-band feed horn⁷. The Dichroic Plate acts like a mirror to the S-band waves which are in turn reflected to a S-band feed horn.

A radio-reflecting telescope consists of a dish, which is a concave metal reflector. The radio waves are collected by the dish and reflected to a focus, where they can be directed to a receiver and analyzed.

The bigger a telescope's collecting area, the more electromagnetic radiation³ it can gather. By increasing the size of a telescope, fainter signals can be detected.

A spacecraft might have a transmitter with less power than your local radio station. Such a small signal can be detected on Earth only because of the large aperture⁴ reflectors of NASA's Deep Space Network (DSN). The DSN provides two-way communications that guides and controls planetary explorer missions.

The Goldstone Apple Valley Radio Telescope (GAVRT) Program permits students in grades K-12 to remotely control a state-of-the-art radio telescope, located at the Goldstone Deep Space Communications Complex in the Mojave Desert (DSN) near Barstow, CA, via the Internet. Students connect from their classroom to Mission Control at the Lewis Center for Educational Research in Apple Valley, CA.



GAVRT Students in a classroom at
Opelika Middle School, AL

1: Electromagnetic waves - waves that are propagated by simultaneous periodic variations of electric and magnetic field intensity and that include radio waves, infrared, visible light, ultraviolet, X rays, and gamma rays. 2: Spectrometer - an instrument that separates the radio signals into different frequencies, producing a spectrum. 3: Electromagnetic radiation - radiation consisting of waves propagated through the building up and breaking down of electric and magnetic fields; include radio, infrared, light, ultraviolet, x-rays, and gamma rays. 4: Aperture - area of the reflector 5: Dish - a device used to redirect radio waves into feedcones from the radio antenna dish surface. 6: Dichroic Plate - the dichroic plate is used to reflect signals in one frequency band and to pass signals in another frequency band. 7: Feed horn - a horn antenna used to convey radio waves between a transmitter or receiver and the reflector.

