StarBase Utah Telescopes

The StarBase telescopes are two out of seven that were operated as gamma ray detectors at the Dugway Proving Ground until 1997. In storage until 2007, they have been redeployed at Seabase by the Department of Physics of the University of Utah (www.physics.utah.edu & Figure 1). They are being used for the development of new detectors for gamma ray astronomy as well as for a technique of stellar interferometry. Researchers in California, Germany, Illinois, Massachusetts, and Sweden are contributing to the scientific research performed with the StarBase telescopes.

Telescope Optics

The main purpose of a telescope is to gather light over a large area so very faint objects can be observed. The 9ft (3m) StarBase telescopes have a light gathering power 250,000 times greater than the human eye. All the light coming from one precise direction, the direction of a star for example, is focused 9ft away from the mirror, in the focal plane where an image of the sky is formed and can be recorded. Each direction in the sky corresponds to one point in the focal plane (Figure 2). Each of the 19 mirrors must therefore be precisely aligned. For this we use an artificial star, a spot light, placed 300 yards away and we adjust the mirrors until they form a single point-like image in the focal plane.

Telescope Mounts

As the Earth rotates in one day, the Sun, the Moon and the stars rise in the East and set in the West. In this diurnal motion, all the celestial objects seem to follow, in the sky, a circle centered on the celestial North pole. The celestial North pole is the direction of the line of poles, close to the direction of Polaris (Figure 3). This slow motion is revealed in long exposure pictures of the night sky (Figure 3). For most observations, astronomers need to keep their telescopes pointed to the same star for many hours. The StarBase telescopes are on alt-azimuthal mounts (Figure 4). Each telescope can be moved in azimuth, horizontally all around the sky by turning around the vertical axis. Each telescope can also be moved in elevation, straight up and down, by turning around a horizontal axis. As we track stars in the sky, we need to move the telescopes around both their axis simultaneously, at a precise speed to match that of the sky. This motion is controlled by a computer based tracking system located in the operator room between the two telescope buildings.