ON CAMPUS

Astronomers Join Galactic Watch For Gamma Rays

Star Search

A group of amateur astronomers from the Santa Barbara area are teaming up with a UC Riverside research group on a galactic fishing trip to catch the most mysterious of astronomical phenomena—the source of gamma ray bursts.

The bursts—short, intense pulses of high energy radiation that give off more energy than the sun—are mysterious because they are emitted from points in space where there are no obvious sources, such as a star.

Working with equipment developed at UC Riverside's Institute of Geophysics and Planetary Physics, the Santa Barbara Astronomy Group hopes to make a prize catch, to become the first astronomers ever to record visible light from a gamma ray burst.

"A visible light burst counterpart would be internationally significant and of immediate and intense interest to the entire astronomical community," said Richard Schwartz, organizer and leader of the astronomy group.

Gamma ray bursts were first detected in the 1970s by a group at the Los Alamos National Laboratory using U.S. nuclear test detection satellites. Instead of unauthorized bomb tests on earth, the satellites accidentally found gamma ray bursts from outer space. It was then determined that a burst lasting just a few seconds or less can give off more energy than the sun does in a day.

Mark Jennings, associate research astronomer with UC Riverside's Institute of Geophysics and Planetary Physics, said this type of monitoring project to record a gamma ray burst could not be undertaken by paid professional astronomers using conventional telescopes because of the unpredictable nature of the phenomenon.

"It would be impossible to get this amount of time on telescopes at a facility observatory such as Kitt Peak," said Jennings. Gamma ray bursts are infrequent, brief, and unpredictable, resulting in a large amount of unproductive time spent waiting, he said. Specialized telescopes designed to search for visible light transients are under development but are not expected to be fully operational for several years.

With six observatories stationed about 10 kilometers apart in the Santa Barbara area, the amateur astronomers are searching outer space in areas where the gamma ray bursts have previously been detected by spacecraft experiments. They

Michael Barber (seated), Allen Deforrest, and Jack Brooks, at Barber's Celestron C-11, a 28 cm Schmidt-Cassegrain-design refracting-reflecting telescope.

hope a burst will occur while they are watching a spot, so they can record an optical counterpart.

The six observatories are equipped with 12- and 14-inch telescopes, cameras, computers, and light sensors developed by the amateurs in cooperation with Jennings and Tummay Tumer at UCR and Brad Schaeffer of NASA's Goddard Space Flight Center. Each clear night, gamma ray burst sites are simultaneously monitored by two separate observatories.

The computerized equipment designed by the amateurs uses a photo multiplier tube supplied by the Institute of Geophysics and Planetary Physics at UCR. The instrument records bursts of light and their intensities. A flash of light lasting at least 1/1,000 of a second triggers a system that records the next two minutes of the light curve.

If the astronomers observe a flash of light, they check with the other observatory trained on the same area of space. In an event originating in outer space, the two would have received equal, simultaneous readings.

If the two observatories match up, Los Alamos, NASA Goddard, and the Naval Observatory at Flagstaff, Arizona are notified to look for a gamma ray burst from that area of space and to perform follow-up deep optical observations. Only if all the data fit together, do they have a possible catch. "A flash in the sky means nothing," said Jennings, "unless it is confirmed by another observatory. Linking the flash to a coincident gamma ray event would give us real confidence that we had observed a burst source."

Recording visible light from a gamma ray burst would help astronomers unravel the mystery of the radiation pulses, Jennings said. "There's a tremendous amount of energy and the physics of how it is generated and released is fascinating," he said. "A lot of theories currently in vogue connect highly magnetized neutron stars to the origin of gamma ray bursts. But, frankly, none of them fully explains the rich variety of observed burst properties."