Home computers discover pulsar with Arecibo data

Cornell University

By putting their home computers to work when they would otherwise be idle, three people on two continents have discovered a lone pulsar approximately 17,000 light years away in the constellation Vulpecula.

The finding, from data collected by the Cornell-managed Arecibo Observatory's ongoing Pulsar ALFA (PALFA) survey and archived and processed by the Cornell Center for Advanced Computing, is the first deep-space discovery by Einstein@Home [1], which uses donated time from the home and office computers of 250,000 volunteers from 192 countries.

Credited with the discovery are Chris and Helen Colvin, both information technology professionals of Ames, Iowa, and systems analyst Daniel Gebhardt of Universität Mainz, Musikinformatik, Germany. Their computers, along with 500,000 others from around the world, analyze data for Einstein@Home [1]. (On average, donors contribute about two computers each.)

Einstein@Home [1] was originally organized to find gravitational waves -- ripples in space-time -- using the Laser Interferometer Gravitational Wave Observatory (LIGO). In 2009, data from the Arecibo Observatory were included in the processing.

The newly discovered pulsar, PSR J2007+2722, is an isolated neutron star that rotates 41 times per second and has an unusually low magnetic field.

Jim Cordes, Cornell professor of astronomy, said the object is particularly interesting because it is likely a recycled pulsar: a neutron star that once had a companion star from which it acquired mass; but whose companion exploded, kicking it free.

"We think there should be more of these disrupted binary pulsars ... but there haven't been that many found," said Cordes, who is also chair of the PALFA Consortium, an international group of astronomers conducting the survey. "No matter what else we find out about it, this pulsar is bound to be extremely interesting for understanding the basic physics of neutron stars and how they form."

The discovery demonstrates the power of the network used to collect and sort through vast amounts of data, Cordes said.

Einstein@Home [1] is based at the Center for Gravitation and Cosmology at the University of Wisconsin-Milwaukee and at the Max Planck Institute for Gravitational Physics (Albert Einstein Institute, or AEI) in Hannover, Germany. About one-third of Einstein@Home [1]'s computing capacity is used to search Arecibo data. From Arecibo, data are sent from the Cornell Center for Advanced Computing to AEI via

high-bandwidth Internet links. At AEI they are preprocessed and then distributed to computers around the world. The results are returned to AEI and Cornell for further investigation.

"This is a thrilling moment for Einstein@Home [1] and our volunteers. It proves that public participation can discover new things in our universe," said Bruce Allen, leader of the Einstein@Home [1] project, AEI director and adjunct professor of physics at the University of Wisconsin-Milwaukee. "I hope it inspires more people to join us to help find other secrets hidden in the data."

Gebhardt and the Colvins and meanwhile, will receive plaques noting their discovery, and all plan to stay involved.

Luckily for the Colvins, at least, the project doesn't require any extra work on their part. The couple will likely have their hands full soon: they're expecting a baby Aug. 20.

The Arecibo Observatory is funded by the National Science Foundation, which collaborates with the Max Planck Gesellschaft to support Einstein@Home [1].

SOURCE [2]

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[1] mailto:Einstein@Home
[2] http://www.news.cornell.edu/stories/Aug10/einsteinPulsar.html