

Scientists discover vast intergalactic plasma cloud

Combining the world's largest radio telescope at Arecibo, Puerto Rico with a precision imaging, seven-antenna synthesis radio telescope at the Dominion Radio Astrophysical Observatory (DRAO), a team of researchers led by Los Alamos scientist Philipp Kronberg have discovered a new giant in the heavens, a giant in the form of a previously undetected cloud of intergalactic plasma that stretches more than 6 million light years across.

The diffuse, magnetized intergalactic zone of high energy electrons may be evidence for galaxy-sized black holes as sources for the mysterious cosmic rays that continuously zip through the Universe.

In research reported in the April issue of *Astrophysical Journal*, the team of researchers from Los Alamos, Arecibo, and DRAO in Penticton, British Columbia describe their discovery of a 2-3 megaparsec zone of diffuse, intergalactic plasma located beside the Coma cluster of galaxies. The combined use of the 305 meter Arecibo radio telescope to make a base scan of 50 square degrees of sky, and the DRAO, making 24 separate 12 hour observations over 24 days of the same sky area, resulted in an image comparable to that of a 1000 meter diameter radio telescope. After Arecibo mapped the larger cloud structure, DRAO data was used to enhance the resolution of the image.

According to Kronberg, "One of the most exciting aspects of the discovery is the new questions it poses. For example, what kind of mechanism could create a cloud of such enormous dimensions that does not coincide with any single galaxy, or galaxy cluster? Is that same mechanism connected to the mysterious source of the ultra high energy cosmic rays that come from beyond our galaxy? And separately, could the newly discovered fluctuating radio glow be related to unwanted foregrounds of the Cosmic Microwave Background (CMB) radiation?"

The synchrotron-radiating plasma cloud is spread across a vast region of space that may contain several black hole harboring radio galaxies. The cloud may be evidence that black holes in galaxies convert and transfer their enormous gravitational energy, by a yet unknown process, into magnetic fields and cosmic rays in the vast intergalactic regions of the Universe.

Kronberg's work also provides the first preview of small (arc minute - level) features that could be associated with unwanted and confusing foregrounds to the CMB radiation. Because these same radiation frequencies are to be imaged by the PLANCK CMB Explorer, corrections to the observed CMB for foreground fluctuations (the so-called microwave "cirrus clouds") are vitally important to using CMB fluctuations as a probe of the early Universe.

Source: Los Alamos National Laboratory

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