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NEWS FROM THE UNIVERSITY OF TASMANIA, AUSTRALIA

Media Release

Chiefs of Staff, News Directors

Wednesday 17 September 2014

Alcohol test may hold key to life

Alcohol molecules found in a distant galaxy may help to show if a 'fundamental constant' of nature is really constant — and if we could only have existed at this point in the history of the Universe.

Using a CSIRO radio telescope, astronomers from the University of Tasmania and CSIRO detected radio waves from molecules of methanol, a form of alcohol, in the Sculptor galaxy. The galaxy lies 11.4 million light-years away in the southern constellation of Sculptor.

"What we've found is a maser — the natural equivalent of a laser, but emitting radio waves instead of light," said Associate Professor Simon Ellingsen, University of Tasmania, who led the work.

The methanol molecules sit in a gas cloud in the galaxy. Conditions in the cloud are just right for the methanol to absorb energy from the surrounding gas and re-emit it at specific radio wavelengths.

CSIRO's Dr Shari Breen, a member of the research team, said: "Methanol masers are common in our galaxy, but this is the first one of its kind ever found in another galaxy."

Finding more galaxies that have methanol masers could help astronomers check if one of the 'fundamental constants' of physics is really constant.

Fundamental constants are numbers that, for physical theories to work, we assume are the same throughout time and space. But is this really true?

Laboratory experiments haven't found evidence for these numbers changing. But scientists also want to check if they've changed during the history of the Universe.

Because light travels at a finite speed, looking out into space is also looking back in time. So by studying distant galaxies, scientists may be able to learn if some of the fundamental constants have changed over long periods of time.

One of the fundamental constants is the ratio of the mass of the proton to the mass of the electron.

If this number were different in space to what it is in the laboratory that might be a clue to the nature of 'dark energy.'

Such a difference would show up in the pattern of methanol's spectral lines: for instance, some lines would be more widely separated in frequency than they are on Earth.

The Sculptor galaxy was targeted because it's a galaxy that is very actively forming stars. If more star formation leads to more methanol maser emission, then scientists might be able to detect such emission from galaxies that are much further away — galaxies that existed and were forming stars much earlier on in the history of the Universe.

"In turn, that would give us a good chance to determine if the proton-electron mass ratio has changed over time," said Associate Professor Ellingsen.

So what would it mean if it had changed? It would be a "very big deal," he said.

"One of the strange things about the universe is that if you changed the physical constants even slightly, life like us wouldn't be possible."

"So perhaps we could only have existed at this particular point in the history of the Universe."

To read the full scientific paper, visit: http://stacks.iop.org/2041-8205/790/L28

Information released by:
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