Developing a new laser to detect methane leaks

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(Phys.org) —University of Adelaide researchers are developing a new type of laser system that will monitor methane, the main component of natural gas, levels across large areas. This will provide a useful tool for monitoring greenhouse gas emissions.

The system has the potential to detect methane leaks from long-distance underground gas pipelines and gas fields, including coal seam gas extraction operations, and to measure methane emissions from animal production.

The researchers, based in the University's Institute for Photonics and Advanced Sensing, have conducted a preliminary study and are developing the laser system for further testing.

"We hope to accurately measure methane concentrations up to a distance of 5km," says project leader Dr David Ottaway, Senior Lecturer in the School of Chemistry and Physics.

"This will give us an ability to map methane over an area as large as 25 square kilometres in a very short time. At the moment current technology only allows detection at a single point source as it blows past the detector."

The system uses laser-based remote sensing technology called DIAL. Laser pulses are emitted with alternate frequencies, one of which is absorbed by the methane. The methane concentration is measured by

observing the difference between the amounts of light scattered back to the detector. The laser system will then be swept through a circle to determine the methane concentration over a wide area.

To produce a powerful cost-effective laser system, the researchers are developing an erbium-YAG laser source. These lasers have the advantage of emitting light that cannot be seen by humans and is not hazardous to the human eye ? important when the lasers are to be used in the environment and not confined to a regulated laboratory.

"We believe we are the only group working on an erbium-YAG DIAL system and we are very excited about the possibilities that this system could offer for reducing greenhouse gas emissions in a cost-effective manner," Dr Ottaway says.

"Methane is a very important gas in terms of climate change. It absorbs radiation, which warms the atmosphere, at a rate more than 20 times larger than that of carbon dioxide. This technology has great potential to help reduce our methane emissions from gas pipeline leaks or from coal seam gas operations, and may be important for monitoring agricultural emissions over time."

Provided by University of Adelaide