

QUANTUM GAS SENSING

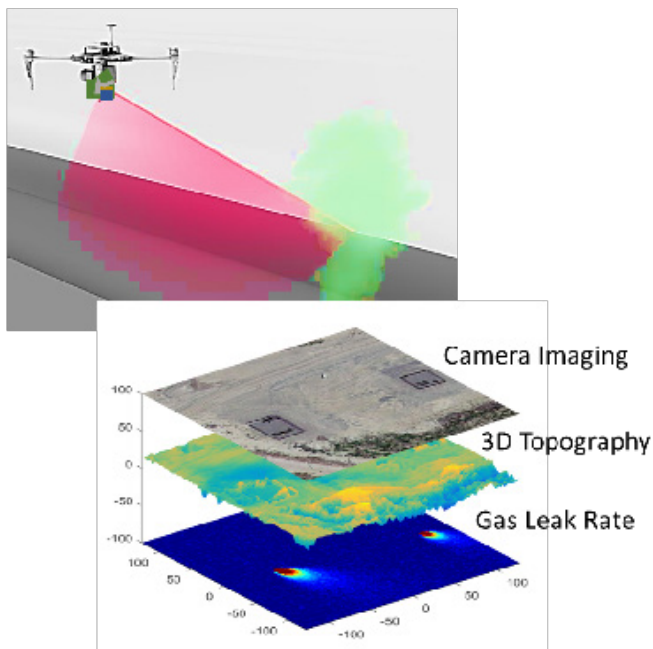


In 2019, ID Quantique (IDQ), in close collaboration with partners QLM and the University of Bristol, successfully completed the Innovate UK SPRINGS project, demonstrating highly sensitive remote detection of methane gas leaks.

Based on differential absorption LiDAR (DIAL), a combination of LiDAR (Light Detection And Ranging) and optical spectroscopy, the technique has been demonstrated to provide successful remote detection of methane at a distance of >50m whilst mounted (as a fully operational version weighing 2.5kg approx.) on an industrial drone. There is significant potential to extend the capabilities to detect chemical/biological/explosive vapours, or to monitor air quality in agricultural and the built environment.

We welcome discussions with potential end-users and development partners to bring this technology to market.

Drone-Mounted Methane Leak Imaging System



What is LiDAR?

LiDAR is a proven technique for 3D imaging. Pulses of light from a laser are transmitted toward the area of interest; some of this light reflects from any object in view back to a detector. The time taken for this round-trip is used, along with the speed of light, to calculate the object distance. A typical LiDAR includes an emitter, a receiver, and a processing/control unit: these three components make up the LiDAR transceiver, which is combined with an optical scanning system to map out 3D scenes. The technique is widely available commercially but commercial systems are configured for imaging applications in sectors such as autonomous vehicles, industrial robotics etc.

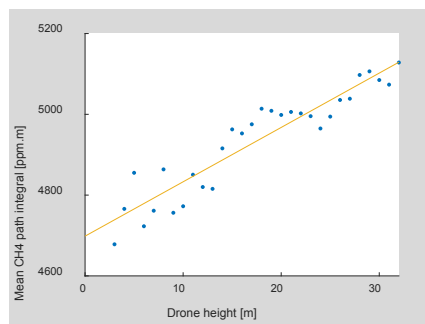
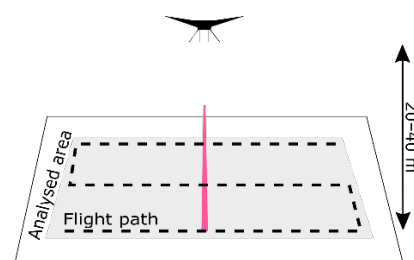
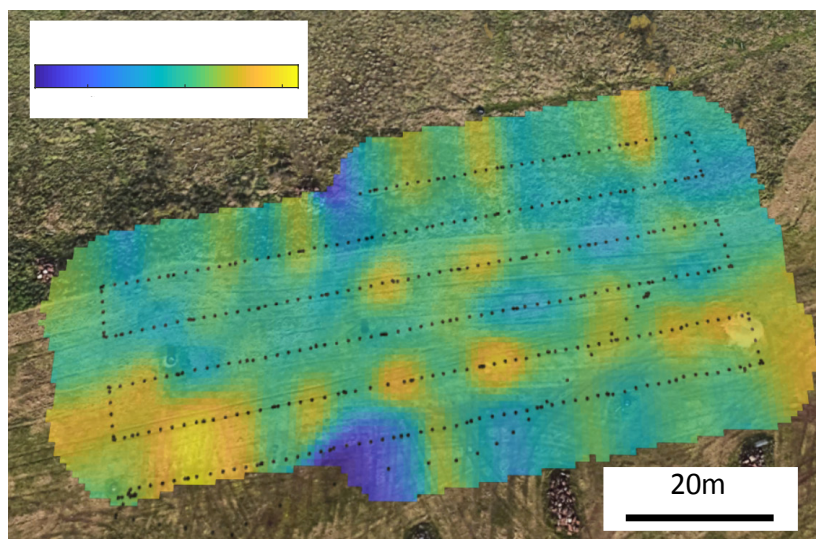
Why use it for gas sensing?

By incorporating stand-off spectroscopy (exploiting optical absorption at specific wavelengths which form the 'fingerprint' of many gases) with a LiDAR approach, the IDQ technology has enormous potential to enable imaging of gas leaks and dangerous vapours, or alternatively to perform quantified remote mapping of gases to monitor air quality in agricultural and metropolitan areas.

In the methane-sensing variant already demonstrated, the spectral absorption at 1651nm is used to obtain precise quantitative measurements of methane gas concentration under wide surface elevation and reflectivity variations. A single photon detector gives 10-fold sensitivity gain compared with laser gas sensor devices already in the market allowing more detailed, remote and higher speed gas mapping.

The technology has been shown to be sufficiently small and light (and the power consumption to be low enough) to be well within the 10kg capacity of an industrial drone and flight trials of a prototype system were demonstrated successfully in Q2 2019. The design could also be adapted for use as a hand-held detector or for permanent pole-mounting in an industrial setting.

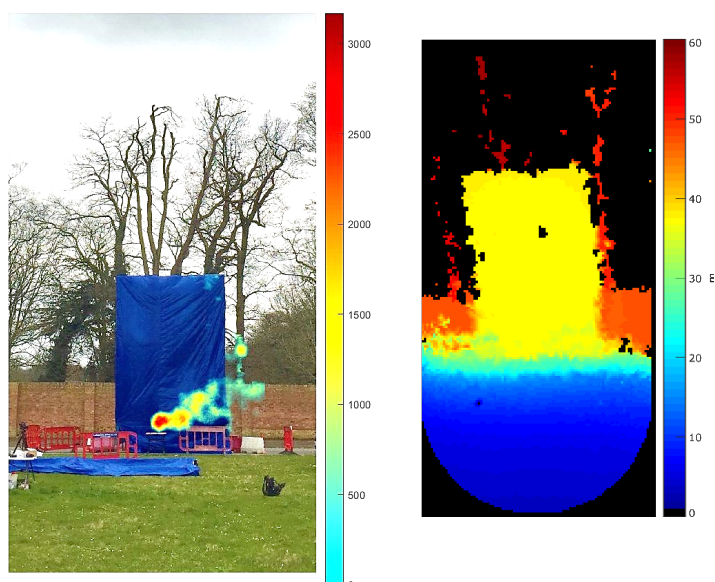
Drone Gas Mapping



How can IDQ help?

With its established reputation in Quantum Key Distribution (QKD) hardware solutions, alongside a history of quality products for precision timing and single-photon detection, and successful delivery of complex sensor development projects based on its single-photon technologies, IDQ is well placed to develop and industrialize LiDAR and other optical sensor systems. For a LiDAR development project in 2018, IDQ utilized its in-house expertise in high-speed electronics for single-photon detection, optical systems design, back-end & GUI software, and FPGA programming. The result was a 1550nm, single-photon LiDAR system that could detect an object with 10% reflectivity at a distance of more than 300 metres, representing a significant advance on conventional LiDAR technology.

In the recently-completed Innovate UK gas sensing project, ID Quantique worked with project partners QLM (www.qlmtec.com) and the University of Bristol to add the ability to resolve characteristic optical absorption lines and hence detect target gases and measure their concentrations. ID Quantique is now preparing to develop commercial versions of the sensor technology and welcomes approaches from collaborators and end-users with an interest in this application.



About ID Quantique

ID Quantique (IDQ) is the world leader in quantum-safe cryptography solutions, designed to protect data for the long-term future. The company provides quantum-safe network encryption, secure quantum key generation and quantum key distribution solutions and services to the financial industry, enterprises and government organisations globally. IDQ also produces a quantum random number generator which is now the reference in the security, simulation and gaming industries.

Additionally, IDQ is a leading provider of optical instrumentation products, most notably photon counters and related electronics. The company's innovative photonic solutions are used in both commercial and research applications.

In 2018 IDQ set up a solutions development group and a laboratory based in Bristol, UK, from where several successful projects in LiDAR, optical communications and gas sensing have been delivered. We are the first Quantum company to have set up such a solutions-focused capability. The highly multidisciplinary group has expertise from basic physics through hardware engineering and soft/firmware, along with commercialisation of complex optical sensor systems in harsh environments.

We welcome approaches from organisations interested in learning more about If you would like to discuss potential applications for LiDAR-based gas sensing and/or potential collaboration in their development, please contact Andrew Strong at ID Quantique:

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Special thanks to QLM and Bristol University