



**QUANTIC**

The UK Quantum Technology Hub  
in Quantum Enhanced Imaging



# GasSight : Low-cost Gas Imaging



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**How can one detect and image invisible gases? Although gases are invisible to the naked eye, they do interact with light, just not at wavelengths one can see. The key to imaging invisible gases is making a camera that can see at the correct wavelength.**

Gas sensing has relevant applications in sectors such as oil and gas, building and construction, food processing, inspection of industrial plant and water treatment. The global gas sensing market was estimated at USD 1.78 billion in 2013 and is projected to be worth USD 2.32 billion by 2018. There is a gap in the market for a low-cost, small-sized, low-power and highly portable remote gas detection system.

Working with M-Squared Lasers Ltd., QuantIC has developed a low-cost imager that can produce real time video of methane gas. The system combines state of the art laser systems with single-pixel infrared cameras based on the same technology as found in a data projector. The advantage of the single-pixel approach is that it is much cheaper than a multimillion infrared pixel array.

GasSight uses a telecoms laser diode to illuminate a scene at 1.65 $\mu$ m, exactly the wavelength corresponding to the absorption of methane gas. This image of the methane cloud is overlaid upon a high resolution RGB image of the overall scene, giving a composite full colour image where the methane appears as a red cloud.

The prototype camera has already demonstrated pure methane detection in a laboratory setting. Our challenge for the next stage will be to increase the sensitivity of the system so that its operational range can be increased to 3 meters or more.

QuantIC will continue to develop the single pixel camera system whilst also evaluating other sensors for gas imaging.

Application area	Low cost imaging of gases
Estimated Component Cost	As laboratory demonstrator $\approx$ £10K In volume < £500 (componentry similar to commercial digital light projector)
Present Performance Specs	Resolution and frame rate: 32x32 @ >20 FPS, 64x64 @ >5 FPS, 128x128 @ >1 FPS Approximate imaging sensitivity (in plane of DMD): 0.1 $\mu$ W/cm <sup>2</sup> Camera size: 80 x 80 x 60 mm Gas detection: 10mm Sample of 25% methane @ 1m, 0.5 litres/min real-time leak @ 1m
Latest Publications	Improving the signal-to-noise ratio of single-pixel imaging using digital microscanning, M-J Sun et al., Opt. Express, 24, 10476-10 (2016)  Simultaneous real-time visible and infrared video with single-pixel detectors, M P Edgar et al., Scientific Reports, 5, 10669 (2015)

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