BRISTOL INNOVATIONS Collaboration/Licensing Opportunity

University of BRISTOL Research and Enterprise

Quantum-enhanced spectroscopy

QET Labs

A novel sub-shot noise absorbance spectroscopy system delivering high precision

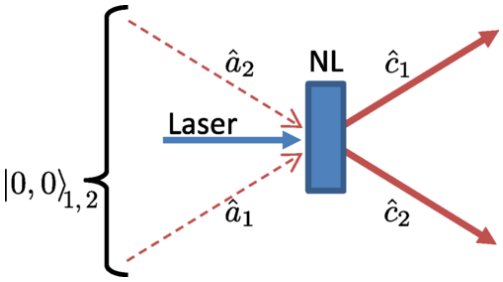

Figure 1

Problem

The precision of optical spectrometers is limited by shot noise – a fundamental physical phenomenon caused by random fluctuations in the number of photons in the optical beam, resulting in electrical noise being received by the detector.

Solution

A team at the University of Bristol's Quantum Engineering Technology Labs has developed a novel absorbance spectroscopy technique that overcomes the problem of shot noise by using single photons to give near optimal precision and a better order of magnitude than classical spectroscopy techniques.

A laser beam is focussed onto a nonlinear crystal (NL), generating a pair of photons (Fig.1). The photons can be separated using a polarisation beam splitter, and their correlated wavelengths can be controlled by temperature tuning the NL. This technique enables the team to estimate the absorption.

The team, led by Dr Jonathan Matthews, has recently demonstrated that their technique can discriminate between different types of Haemoglobin with high sensitivity. It has broad applicability in providing precise chemical sensing in optically noisy environments, including identifying trace amounts of hazardous samples, thus reducing the false alarm rate in these scenarios.

Key Benefits

- Precision 10x better than classical methods
- Does not require bulky external monochrometer or broadband source
- Can be used on samples that are highly sensitive to light exposure
- Compact, integrated format

Applications

- Measuring light sensitive biological samples
- Chemical sensing in an optically noisy environment
- Identifying trace amounts of hazardous samples

IP Status

US patent granted: US10031398

UK patent pending: GB2528958

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