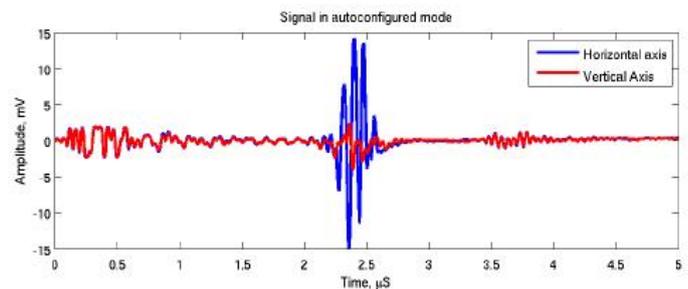


# SKED: speckle knife edge detector for detection of ultrasound on rough surfaces

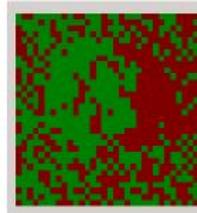
**Dr. Samuel Achamfuo-Yeboah**  
(Applied Optics Group, University of Nottingham)



SKED printed circuit board, with SKED chip outlined.



Configuration data (Vertical Axis)



Configuration data (Horizontal Axis)



Top: traces from a sample, showing sensitivity to orientation of the propagating surface acoustic wave depending on the axis of sensitivity set by the user.

**1.00pm Tuesday 18<sup>th</sup> Mar 2014**  
2nd Floor Lecture Theatre  
Tower Building. All welcome

## **Applied Optics Group Lunchtime Seminar:**

### **SKED: speckle knife edge detector for detection of ultrasound on rough surfaces**

The optical detection of laser ultrasound from optically rough surfaces is severely limited using a conventional setup because the detected light is speckled. This means that complicated and expensive setups are required to detect laser ultrasound on rough surfaces. We present a CMOS integrated circuit that can detect laser ultrasound in the presence of speckle. The detector circuit is based on the simple knife edge detector. It is self-adapting and is fast, cheap, compact and robust.

The CMOS circuit is implemented as a widefield camera with 1024 pixels. Each pixel pairs up with one of two adjacent pixels and depending on the light intensity distribution over the array, a decision is made as to the output. The angular deflection of the surface due to the ultrasound preserves the speckle distribution whilst shifting it. The spatial disturbance of the speckle pattern due to the ultrasound is detected by considering each pair of pixels as a knife edge detector. The sensor can adapt itself to match the received optical speckle pattern in 0.1 $\mu$ s or even less, and then detect the ultrasound within 0.5 $\mu$ s of adaption. This makes it possible to detect ultrasound from optically rough surfaces very quickly.

Because it is setup just like a camera, it is cheap, robust and easy to use. The detector is capable of independent operation controlled by a microcontroller (on the host printed circuit board), or it may be connected to a computer for more complicated configuration and control.