OPTICS & PHOTONICS
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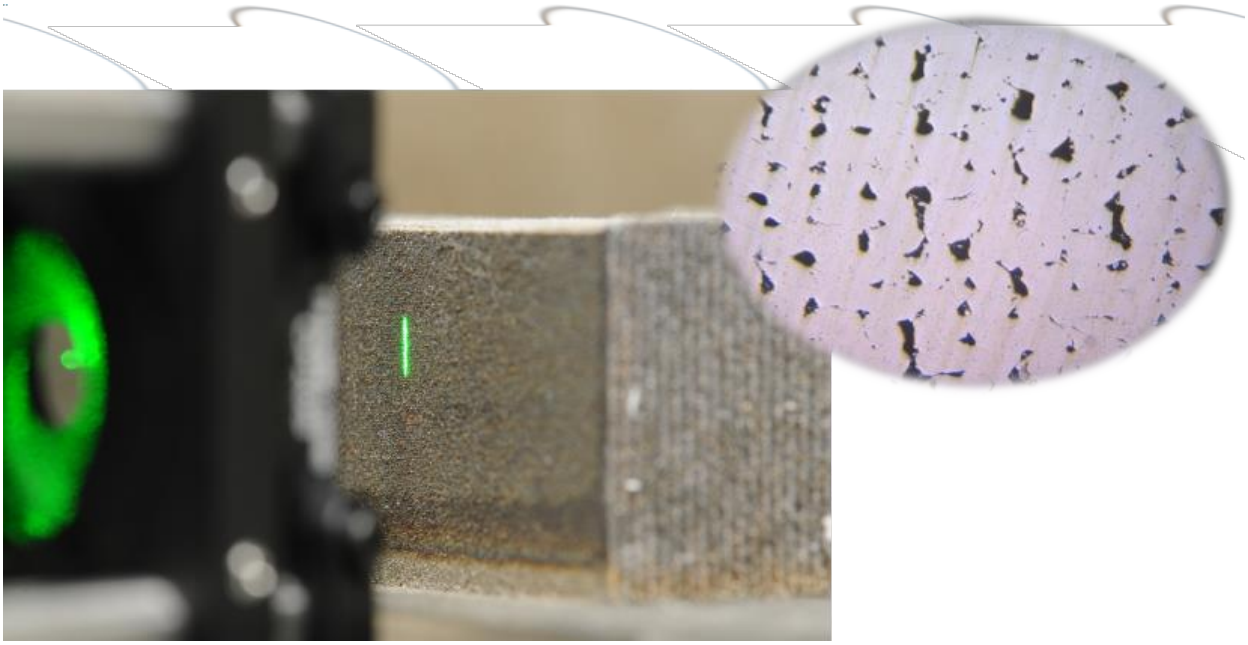
Optics and Photonics Group
Lunchtime Seminar

"Laser ultrasonic generated Rayleigh waves for controlling AM porous samples"

Célia Millon



13:00pm Friday 26th October 2018
B13 Engineering and Science Learning Centre
All Welcome

http://optics.nottingham.ac.uk/wiki/Talks_2018

Abstract

"Laser ultrasonic generated Rayleigh waves for controlling AM porous samples"

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Laser metal deposition (LMD) is one of the metallic additive manufacturing (AM) processes based on making a piece layer-by-layer using a computer-aided design. The process consists in focusing a laser beam and simultaneously injecting metallic powder particles onto a substrate to create a molten pool. Laser-ultrasonics (LU) is a promising technology to fulfil surface and subsurface inspections downstream the melt pool during the fabrication. Most of studies, which have been carried on regarding this application, focus on the detection of machined flaws under polished surfaces. However, variation of process parameter (hatch) gives rise to porosities inside media that can be critical for mechanical properties of the sample.

To fulfil the detection of flaws in AM samples, I use Rayleigh waves induced by a laser line source and I will remain some characteristic of Rayleigh waves and how their generation can be optimized. Then, as a proof of concept, I will see how those waves interact with surface breaking cracks and subsurface porous flaws, and especially with $100\mu m$ flaws' dimensions. Finally, I will focus on detecting real flaws created by the variation of the hatch parameter that give rise to a porous media. A signal processing has been developed which is based on cross-correlation and principal component analysis methods to discriminate between porous sample and a bulk sample.