Contribution ID: **226**   Type: **Oral Presentation**

Light Sheet Microscope Development

Monday, 26 July 2021 15:15 (15 minutes)

Light sheet fluorescence microscopy is a powerful tool within the field of microscopy. The inherent advantages over other fluorescence microscopy techniques inclue high sectioning capabilities, reduced photo-damage in the sample and short data acquisition times.

In this presentation, the development of a light sheet microscope is described. The system relies on the use of a thin sheet of light to illuminate a fluorescent sample. The light sheet can be generated using a cylindrical lens or by rapidly scanning a circular beam using a galvonometer. Two dimensional images are acquired perpendicular the the illumination path. The sample can be translated through the light sheet, acquiring images at different depths in the sample. The images are then used to reconstruct a three dimentional fluorescence image of the sample.

The light sheet microscope system is developed to allow for the incorporation of various light sheet generation techniques, allowing for the parameters of the light sheet to be tailored for various applications. The implementation of the scanned beams to generate light sheets allow for the use of non-diffracting beams. A comparison of the results for various light sheet generation techniques are presented. Using the microscope, images are acquired and analysed to demonstrate the systems capabilities and limitations. Image restoration is implemented by the deconvolution of the point spread function and the images. Using the deconvolved images, three dimensional fluorescence images of the sample are obtained. The result is a multi-purpose light sheet microscope for use in biological imaging.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

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Session Classification: Photonics

Track Classification: Track C - Photonics