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P17 - Development of a new light collection and detection system optimized for ion beam induced fluorescence microscopy

Friday, 11 July 2014 13:00 (1 hour)

Ion beam induced fluorescence microscopy can potentially outperform existing light microscopy imaging techniques due to its high resolution (sub-50 nm) and the ability to combine it with other quantitative techniques such as STIM. Such high-resolution fluorescence microscopy is vital for understanding the function of sub cellular structures within a single cell. Although the current state-of the-art spatial resolution using MeV ions is of the order of 20 nm [1], the same spatial resolution has not been achieved using ion beam induced fluorescence imaging techniques. The main limitation is in the collection and detection of emitted photons from the sample. In this work, a new light collection system based on a custom made parabolic mirror is employed to improve the efficiency thus allowing us to reduce the beam current and achieve higher resolution. A detailed simulation study has been carried out to optimize the mirror design. This custom made mirror not only enhances the collection of fluorescence signal but also allows us to perform the simultaneous structural (Scanning Transmission Ion Microscopy) imaging. A detailed simulation and the experimental results will be presented and compared with existing systems.

[1] Watt, F., Chen, X., Chen, C.-B., Udalagama, C.N.B., Van Kan, J.A., Bettiol, A.A. Whole cell structural imaging at 20 nanometre resolutions using MeV ions, (2013) Nuclear Instruments and Methods in Physics Research, Section B: Beam Interactions with Materials and Atoms, 306, pp. 6-11.

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