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"Synchrotron Radiation X-Ray Imaging for Life Sciences & Cultural Heritage"

High resolution coherent diffractive imaging of the malaria parasite *P. falciparum*

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Coherent diffractive imaging (CDI) is a lensless imaging technique that can provide resolution beyond the resolution of optics in the system. Instead of obtaining a direct image of the object, a diffraction pattern is obtained in the far field, which is then iteratively propagated between the sample and detector planes to solve for the lost phase information. With the phase information retrieved, an image of the object can be obtained. The resolution in the object is dependent on the highest angle of scatter detected, which is largely a function of the dose and the experimental geometry. Often, without *a priori* information, the algorithms can stagnate or lead to incorrect solutions. A variation of CDI is Fresnel CDI (FCDI), which illuminated the sample with a divergent wavefield. If the incident wavefield is known, then this information can be used in the iterative algorithm as *a priori* information, leading to a high quality unique solution with fewer iterations[1]. Recent developments in FCDI, such as Phase-diverse CDI, have lead to increases in contrast while reducing the dose delivered to the sample and therefore the data acquisition time[2, 3]. More recently, FCDI has been extended to tomography and to low energies in the water window. This presentation will outline key developments in FCDI, and outline some preliminary results of the current 'state of the art'.

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[2] C. T. Putkunz, J. N. Clark, D. J. Vine, G. J. Williams, M. A. Pfeifer, E. Balaur, I. McNulty, K. A. Nugent, and A. G. Peele, Physical Review Letters 106 (2011) 013903.

[3] J. N. Clark, C. T. Putkunz, M. A. Pfeifer, A. G. Peele, G. J. Williams, B. Chen, K. A. Nugent, C. Hall, W. Fullagar, S. Kim, and I. McNulty, Optics Express 18 (2010) 1981.