Structured illumination is a new development in electron microscopy, with the advantage such as longer column channeling distances in crystals by donut-shaped illumination of atomic scale vortex electron beams [1]. In this paper, we introduce a controlled way to realize C shaped structured illumination. Analytical equations determining the parameters of the C shaped illumination pattern have been derived using phase gradient analysis, allowing independent control of the C-opening angle and radius of the C shape. Experimentally, we have used computer generated hologram (CGH) method to generate C shaped structured illumination in a 200 keV transmission electron microscope. Both amplitude and phase CGH masks have been used and comparisons with simulations show a strong match between the theoretical results and the experimentally recorded electron microscope images. C-shaped illumination has promises in potential applications such as electron beam lithography for production of metamaterials which utilise split ring resonance structures [2]. Physical dimensions of the artificial electromagnetic resonance structures as small as nanometres should now be possible. Furthermore the orientation of the C shape illumination can be readily identified, allowing the easy identification of the Faraday rotational effects of the vortex beams [3].


Acknowledgement: We wish to thank the UK Engineering and Physical Science Research Council (EPSRC) for financial support to this research by a grant (EP/J022098) and M. Ward of Leeds Electron Microscopy and Spectroscopy Centre, University of Leeds for the help with focused ion beam experiment.