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Nano-fabricated SiN holograms for probing matter with structured waves

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Structuring matter is typically associated with structuring the particle nature of matter in its physical form. At the micro and nano scales, such matter manipulation is typically achieved through the use of a focused ion beam (FIB) instrument, allowing for applications within transmission electron microscopy (TEM), micro-machining, semiconductor ion implantation, and many others. Here, we demonstrate the creation of a FIB manufactured SiN diffraction grating for use in a TEM, allowing us to structure the wave nature of electrons, where as an example we demonstrate the creation of an angularly accelerating electron Bessel beam. These SiN gratings can act as holograms for matter waves, and have already opened up prospects for probing deeper into complex material properties than is currently possible with standard TEM techniques.

Summary

We've shown the development of a hologram for matter waves and have used a particular hologram to structure an angularly accelerating electron beam within a TEM. The procedure for generating the hologram as well as the necessary materials required are highlighted, along with the procedure required in order to control the resulting beam shape.

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

Yes

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

Hons

Main supervisor (name and email)
and his / her institution

Andrew Forbes
University of the Witwatersrand
andrew.forbes@wits.ac.za

Would you like to
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No

Primary author: Mr WEBSTER, Jason (University of Stellenbosch)

Co-authors: Prof. FORBES, Andrew (CSIR); Dr MCMORRAN, Benjamin (University of Oregon); Mr PIERCE, Jordan (University of Oregon); Dr MCLAREN, Melanie (University of Witwatersrand)

Presenter: Mr WEBSTER, Jason (University of Stellenbosch)

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