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Towards atom diffraction through graphene

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In recent years, the introduction of large momentum transfer beam splitters to matter-wave interference experiments led to an increase in the sensitivity of a given interferometric measurement [1,2]. For nanomechanical gratings this corresponds to a reduction of the grating period. However, the stability and fabrication precision of those gratings limit the minimal grating period possible. To overcome this limitation the use of the crystalline structure of single-layer graphene as the grating is proposed, achieving a lattice period of 246 pm [3]. This will allow the study of atom-graphene interactions in an unprecedented regime. Among others, the time-resolved study of modifications of graphene membranes by introducing foreign atoms or defects will be possible, as well as investigating of couplings to the electronic structure of graphene in detail. The experimental set-up, current status of the experiment, and scientific goals will be presented in this contribution.

- [1] R. Parker, C. Yu, et al., *Science* **360**, 191 (2018)
- [2] M. Gebbe, J.-N. Siemß, et al. *Nat. Commun.* **12**, 2544 (2021)
- [3] C. Brand, M. Debiossac, et al., *New J. Phys.* **21**, 033004 (2019)

Category

Other

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