Manipulating Matter-Waves in Wave-Guides

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We have recently demonstrated Coherent Matterwave guides can transmit atoms over macroscopic distances (40 cm) without decohering their internal or external quantum states [1]. We use optimal control theory to accelerate the atom clouds with minimal heating. The BECs move at speeds of many times the critical velocity of superfluidity. We then use a series of gravitomagnetic matter-wave lenses to manipulate the BECs, to focus and collimate them to very low kinetic energies down to 800 kK [2].

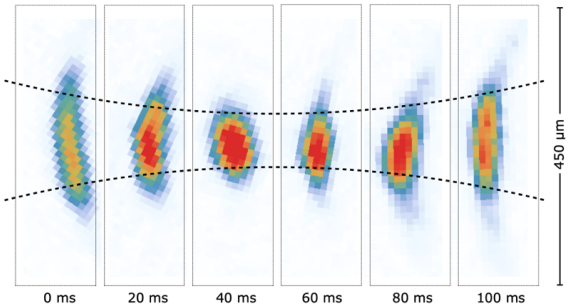

Figure 1:

References

[1] S Pandey, H Mas, G Drougakis, P Thekkeppatt, V Bolpasi, G Vasilakis, K Poulios and W von Klitzing, Nature **570**, 205 (2019)

[2] S Pandey, H Mas H, G Vasilakis and W von Klitzing, Phys. Rev. Let. **126**, 170402 (2021)