Abstract Submitted
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Quantum Diffractive Collision Universality[1] JAMES BOOTH, Dept. of Physics, British Columbia Inst of Tech, PINRUI SHEN, Dept. of Physics, University of British Columbia, ROMAN KREMS, Dept. of Chemistry, University of British Columbia, KIRK MADISON, Dept. of Physics, University of British Columbia — We have demonstrated that quantum diffractive collisions are governed by a universal scaling law characterized by a single, *experimentally determined* parameter [1]. We report the quantitative form of the universal, cumulative energy distribution transferred to stationary sensor particles via quantum diffractive collisions. The distributions characteristic energy scale is the localization length associated with the collision-induced quantum measurement and its characteristic shape is determined solely by the form of the long-range interaction potential between the collision partners. We have observed the universal function specific to van der Waals collisions by using cold ^{87}Rb confined in a shallow magnetic trap as an energy/momentum spectrometer for quantum diffractive collisions. This universal function realizes a *self-defining* particle flux/pressure sensor for any ambient gas species. This work represents the first primary and quantum definition of the Pascal, a fundamental advance for vacuum and pressure metrology. This new standard was compared to an existing orifice flow standard by calibrating an ionization gauge for N_2 gas against each standard. The two values agree at the 0.5% level. [1]Booth *et al*, New J. Phys. **21** (2019).

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