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**Atom-optics knife-edge: Measuring sub-nanokelvin momentum distributions** RAMON RAMOS, DAVID SPIERINGS, AEPHRAIM STEINBERG, Univ of Toronto — Temperatures below 1 nanokelvin have been achieved in the recent years, enabling new classes of experiments which benefit from the resulting long coherence times. This achievement comes hand in hand with the challenge of measuring such low temperatures. By employing the equivalent of a knife-edge measurement for matter-waves, we have been able to characterize ultra-low momentum widths. We measured a momentum width corresponding to an effective temperature of 900 $\pm$ 200 pK, only limited by our cooling performance. We show that this technique compares favourably with more traditional methods, which would require expansion times of 100s of ms or frequency stability of 10s of Hz. Finally, we show that the effective knife-edge, created by a potential barrier, begins to become "blunt" due to tunneling for thin barriers, and we obtain quantitative agreement with a theoretical model. This method is a useful tool for atomic interferometry and other areas in ultracold atoms where a robust and precise technique for characterizing the momentum distribution is required.

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