Ultracold Electron Source

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Ultracold electron sources, which are based on near-threshold photo- and fieldionization of a cloud of laser-cooled atoms, offer the unique combination of low emittance and extended source size, enabling pulsed operation in unprecedented brightness regimes*. Possible applications are single-shot, ultrafast electron diffraction of macromolecules and X-ray quantum free electron lasers. Here we present measurements of the effective temperature of such a pulsed electron source employing rubidium atoms that are magneto-optically trapped at the center of an accelerator structure**. Transverse source temperatures ranging from 200K down to 10K are demonstrated, controllable with the wavelength of the ionization laser.

**** B. J. Claessens et al., Phys. Rev. Lett. 95, 164801 (2005).***
***** G. Taban et al., EPL 91, 46004(2010).***