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Rubidium Cloud Size in a Magneto-Optical Trap A. CHATWIN-DAVIES, Dept. of Applied Math, U. Waterloo, ON, Canada, T. KONG, Dept. of Physics, U. British Columbia, Canada, J. A. BEHR, A. GORELOV, M. PEARSON, TRIUMF, Vancouver, BC, Canada — Preparations for a search for exotic 20 - 556 keV-mass particles emitted during the nuclear 2-body decay of ^{86}Rb confined in a magneto-optical trap (MOT) are underway at TRIUMF. Such emissions would correspond to a peak in the recoil momentum distribution at a momentum lower than that caused by 556 keV γ emission. The stable isotope ^{85}Rb is being used to optimize the experimental apparatus since its atomic hyperfine splitting is similar to that of ^{86}Rb, producing similar laser cooling properties. The size of the cloud of trapped atoms directly affects the achievable momentum resolution of the recoil and must hence be minimized. A Doppler-limited model for cloud size ignoring cooling beyond that generated by the photon scattering force is presented and compared with experimental data. Analysis suggested reducing the intensity and red-detuning from resonance of the trapping light from optimal values for atom collection. We also better balanced the power in the trapping beams. Recent data in disagreement with a Doppler-limited theory indicate sub-Doppler cooling mechanisms (J. Dalibard and C. Cohen-Tannoudji, J. Opt. Soc. Am. B 6, 2023 (1989)) are now at work. A cloud full width at half-maximum of less than 0.25 mm has since been achieved.

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