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Evolution of Rydberg atom clouds in a linear magnetic trap[1] MALLORY TRAXLER, GEORG RAITHEL, University of Michigan — A linear magnetic guide provides a unique environment in which to perform studies on dense, elongated Rydberg atom samples. In our setup, we utilize a long, high-gradient atom guide for ^{87}Rb atoms with a transverse temperature of 400 μK, a longitudinal temperature of 1 mK, and a flux of 3x10^7 atoms/s. We measure the spatial and temporal evolution of elongated Rydberg atom samples excited in the guiding potential. The evolution is monitored by detecting ions that arise from Penning ionization and from blackbody-induced thermal ionization of the Rydberg atoms. As such, the signal exhibits two main components. We present detailed numerical simulations that indicate a well-localized, early-time, high-density component is due to an initial collapse of the Rydberg atom distribution in the guiding potential and Penning ionization. The diffuse, long-lived, low-density component is due to slow thermal ionization of the remaining, magnetically guided Rydberg atoms.

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