

Three-Photon Transfer and Inelastic Collisions in ^{84}Sr

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This work describes how we achieve a coherent three-photon transfer [1] between the internal states $^1\text{S}_0$ and $^3\text{P}_0$ of ^{84}Sr and how two-body inelastic collisions occur between these states. Despite challenges in achieving a complete transfer, we highlight the potential uses for outcoupling atoms into a continuous atom laser beam [2] and for quantum computing. Our method allows us to prepare a high phase-space density cloud of $^3\text{P}_0$ atoms. This was previously difficult due to an unfavorable elastic-to-inelastic ratio, making traditional evaporative cooling impractical. Additionally, we pioneer the measurement of inelastic collisional loss rates for $^3\text{P}_0$ atoms [3] [4] [5] in ^{84}Sr . Our method opens up new possibilities for realizing quantum degenerate samples in the metastable $^3\text{P}_0$ and $^3\text{P}_2$ states of alkaline-earth-like atoms.

References

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