

Laser Physics Letters 2016 vol.13 N1

Atomic frequency comb memory in an isotopically pure $^{143}\text{Nd}^{3+}:\text{Y}^7\text{LiF}_4$ crystal

Akhmedzhanov R., Gushchin L., Kalachev A., Korableva S., Sobgayda D., Zelensky I.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2016 Astro Ltd. We implemented the atomic frequency comb protocol for optical quantum memory in an isotopically pure crystal of Y^7LiF_4 doped by $^{143}\text{Nd}^{3+}$ ions. Echo signals were observed on the $4I_{9/2}(1)-4F_{3/2}(1)$ transition, which had inhomogeneous broadening much smaller than the hyperfine splitting of the ground and excited states. We performed hole-burning spectroscopy measurements on several transitions, obtaining information about the hyperfine state lifetimes. An intrinsic hole structure was found on some of the transitions, which allowed us to prepare a comb structure with two clearly defined periods and to observe echo pulses with different time delays.

<http://dx.doi.org/10.1088/1612-2011/13/1/015202>

Keywords

atomic frequency comb, inorganic crystals doped with rare earth metal ions, quantum memory