Cooling and trapping of radioactive atoms: the Legnaro francium magneto-optical trap

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A magneto-optical trap for francium radioactive atoms has been set up at the Istituto Nazionale di Fisica Nucleare, Legnaro laboratories, and its characterization and optimization are under way. The main features of the Fr⁺ beam line, of the target, and of the magneto-optical trap are described in detail. Measurements of the Fr⁺ ion production rate as a function of the target temperature, the primary beam intensity, and energy have been made. Preliminary tests with other stable alkali atoms aimed at an improvement of the magneto-optical trap collection efficiency are reported. Fast and efficient trap loading of rubidium has been obtained through the light-induced atomic desorption from an organic coating. A larger number of sodium atoms, as compared with a monochromatic trapping laser, has been trapped by use of a broadband laser. © 2003 Optical Society of America.

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