

The Radioactive Francium Magneto - Optical Trap in Legnaro: search for new lines in an isotopic series

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There are Four facilities where an experiment on Francium either has being performed or is in preparation. At ISOLDE (CERN) the magnetic dipole moments and changes in mean-square charge radii of the neutron-rich ^{218m,219,229,231}Fr isotopes were measured with the newly-installed Collinear Resonance Ionization Spectroscopy (CRIS) beam line [1]. At RCNP/CYRIC in Sendai, Japan, an experiment will search for Permanent Electric Dipole Moments of Francium Atom [2]. At TRIUMPH, Canada, a collaboration has successfully trapped ²⁰⁷Fr, ²⁰⁹Fr and ²²¹Fr, as a preparation of studies of the weak interaction through measurements of atomic parity non-conservation [3].

At Legnaro National Laboratories of INFN, we have recently introduced a simple detection method devoted to the measurement of hyperfine splittings of a series of Francium isotopes, again in the framework of possible Atomic Parity Violation developments [4]. At the moment, we studied the $7P_{3/2} \rightarrow 7D_{3/2,5/2}$ transitions for both ^{209,210}Fr [5]. We will apply the same scheme, using different laser sources, to magnetic dipole and electric quadrupole lines, in order to get useful information of the nucleus structures and to progressively go towards the weakest intensities, interesting for APV. At the same time we have successfully used Light Induced Atom Desorption in order to optimize the trapping efficiency [6].

References

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