MAPAN
Journal of Metrology Society of India

DOI 10.1007/s12647-015-0140-6

Springer

Original Paper

Design of the Ion Trap and Vacuum System for ^{171}Yb-ion Optical Frequency Standard

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Received: 12 March 2015 / **Accepted:** 27 May 2015 / **Published online:** 18 June 2015

Abstract

We are developing a frequency standard based on the ultra-narrow electric octupole transition of the ytterbium-ion ($^{171}Yb^{+}$), which is in the optical wavelength region. In this article, we describe optimized design of our end-cap type Paul trap which will be used for trapping single ions for precision frequency metrology. Selection of the materials for fabricating different parts of the trap assembly is also described. Customized design of the ultra-high vacuum chamber, which houses the ion trap, oven producing ytterbium atomic beam, compensation electrodes and high numerical aperture fluorescence collection lens together with four pairs of optical viewports is lastly described.

Keywords

Ion trap – Ultra-high vacuum – Frequency standard – Optical clock