Journal of Modern Optics ›
Volume 65, 2018 - Issue 5-6: SI: Quantum optics, cooling and collisions of ions and atoms

Laser Spectroscopy of Trapped Ions

Absolute frequency measurement of the $^2S_{1/2} \rightarrow {}^2F_{7/2}$ optical clock transition in $^{171}Yb^+$ with an uncertainty of 4×10^{-16} using a frequency link to international atomic time

Charles F. A. Baynham, Rachel M. Godun, Jonathan M. Jones, Steven A. King, Peter B. R. Nisbet-Jones, Fred Baynes, ...show all

Pages 585-591 | Received 30 Jun 2017, Accepted 06 Sep 2017, Published online: 06 Oct 2017

Cite this article https://doi.org/10.1080/09500340.2017.1384514 Check for updates

Full Article Figures & data References Citations Metrics
Reprints & Permissions Read this article Share

Abstract

The highly forbidden 2S1/2→2F7/2 electric octupole transition in 171Yb+ is a potential candidate for a redefinition of the SI second. We present a measurement of the absolute frequency of this optical transition, performed using a frequency link to International Atomic Time to provide traceability to the SI second. The 171Yb+ optical frequency standard was operated for 76% of a 25-day period, with the absolute frequency measured to be 642 121 496 772 645.14(26) Hz. The fractional uncertainty of 4.0×10-16 is comparable to that of the best previously reported measurement, which was made by a direct comparison to local caesium primary frequency standards.

Keywords:

Frequency metrology optical frequency standards international atomic time

View correction statement:

Publisher’s Note

Acknowledgements

We thank Peter Whibberley for helpful discussions and E. Anne Curtis for critical review of the manuscript prior to submission. We also note that our absolute frequency measurement derives its accuracy from the primary standards operated at other national measurement institutes around the world.

Notes

No potential conflict of interest was reported by the authors.

Additional information

Funding

This work was financially supported by the UK Department for Business, Energy and Industrial Strategy as part of the National Measurement System Programme; the European Metrology Research Programme (EMRP) project SIB55-ITOC; and the European Metrology Programme for Innovation and Research (EMPIR) project 15SIB03-OC18. This project has received funding from the EMPIR programme co-financed by the Participating States and from the European Union’s Horizon 2020 research and innovation programme. The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union.

Single-ion, transportable optical atomic clocks >

Marion Delehaye et al.
Journal of Modern Optics
Published online: 7 Mar 2018