The SOC2 transportable ^{171}Yb lattice clock

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Optical lattice clocks based on elements with two valence electrons like Sr, Hg, Mg and Yb are strong competitors in the quest for next generation time and frequency standards. Recently, a stability and accuracy in the 10^{-18} range has been reported for lattice clocks using Sr[1] and Yb[2] for stationary setups.

In the framework of the SOC2 project[3], we are developing a transportable Yb lattice clock demonstrator, since the development of transportable optical lattice clocks is desirable for both performance evaluation and applications, e.g. in a microgravity environment. To ensure transportability, our setup is based entirely on diode and fiber lasers and features an intra-vacuum enhancement resonator to allow the formation of a large volume lattice using moderate laser power.

Here we present a characterization of our clock setup, as well as our plans for a transport of the apparatus from the University of Düsseldorf to INRIM and LSM.

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1 B. J. Bloom et al. "An optical lattice clock with accuracy and stability at the 10^{-18} level." Nature 506, 71-75 (2014)

2 N. Hinkley et al. "An Atomic Clock with 10^{-18} Instability." Science 341, 1215-1218 (2013)

3 S. Schiller et al. “Towards Neutral-atom Space Optical Clocks (SOC2): Development of high-performance transportable and breadboard optical clocks and advanced sub-systems” on “Let’s embrace space, volume II” 45, 452-463 (2012). ISBN 978-92-79-22207-8; www.soc2.eu