

DAMOP19-2019-000345

Abstract for an Invited Paper  
for the DAMOP19 Meeting of  
the American Physical Society

### **Frequency comparisons of individual Yb+ ions**

EKKEHARD PEIK, Physikalisch-Technische Bundesanstalt

In the development of single-ion optical frequency standards with  $^{171}\text{Yb}^+$  we use two reference transitions (E2 and E3) in the same ion for the diagnosis and correction of systematic shifts, and comparisons between ions in different traps to test their agreement. We have observed agreement of two frequency standards on the E3 transition to within their combined systematic uncertainty of  $3.6 \times 10^{-18}$  and have obtained more stringent limits on violations of Lorentz symmetry. Using a clock laser with mHz-linewidth, it will be possible to interrogate the E3 transition with Ramsey times of many seconds. We plan to use sympathetic cooling of  $\text{Yb}^+$  with  $\text{Sr}^+$  to reduce the effects of ion heating. Together with a consortium ([www.opticlock.de](http://www.opticlock.de)) with industrial partners we are building a demonstrator  $^{171}\text{Yb}^+$  E2 frequency standard for autonomous operation outside of specialized metrology laboratories.