

SAIP2014



Contribution ID : 364

Coupled Optical Resonance Laser Frequency Stabilization

Wednesday 09 Jul 2014 at 14:20 (00h20')

Abstract :

We have demonstrated simultaneous laser frequency stabilization of a UV and IR laser, to coupled transitions of ions in the same spectroscopic sample, by monitoring only the absorption of the UV laser. Separate signals for locking the different lasers are obtained by modulating each laser at a different frequency and using lock-in detection of the single photodiode signal. Error signals can be generated for both lasers using phase modulation transfer. Experimentally, we simultaneously lock a 369nm and a 935nm laser to the $^2S_{1/2} \rightarrow ^2P_{1/2}$ and $^2D_{3/2} \rightarrow ^3D_{3/2}$ transitions respectively, of $174Yb^+$ ions generated in a hollow cathode discharge lamp. Stabilized lasers at these frequencies are required for cooling and trapping Yb^+ ions in quantum information and precision metrology experiments. We use a rate equation model incorporating velocity changing collisions to explain the experimental results. This technique should be readily applicable to other ion and neutral atom systems.

Award :

Yes

Level :

MSc

Supervisor :

Hermann Uys (HUys@csir.co.za) National Laser Centre, CSIR

Paper :

No

Primary authors : Mr. BURD, Shaun (CSIR)

Co-authors : Dr. UYS, Hermann (CSIR) ; Mr. DU TOIT, Pieter (University of Pretoria / iThemba LABS)

Presenter : Mr. BURD, Shaun (CSIR)

Session classification : Photonics

Track classification : Track C - Photonics

Type : Oral Presentation