Group 3
Oral

Stability Measurements between two Hg LITE 12-pole Clocks

John D. Prestage, Eric Burt, Sang Chung, Lute Maleki, Robert Tjoelker
Frequency Standards Lab
Jet Propulsion Laboratory
Pasadena, CA 91109

We are currently operating two Hg ion clocks based on the LITE 12-pole architecture developed at JPL. The 12-pole architecture is expected to show excellent long-term stability since the ion-number sensitivity and the temperature coefficient for these clocks are both much lower than the previous 4-pole ion clock architecture. Noise floors close to 10^{-16} should be possible from these 10 to 100-fold reductions in sensitivity.

Both clocks are operating with short-term stability $\sigma_y(\tau) \sim 10^{-13}/S\tau$ and are contained inside two separate test chambers where ambient temperature is carefully regulated.

Both Hg clocks are referenced to a common H-maser LO so that the difference of the measured Hg clock frequencies provides a direct measure of the relative stability of the two Hg ion clocks, independent of long-term maser noise. In this way H-maser frequency drifts do not degrade the Hg clock comparison. This is important because the Hg ion clock stability generally becomes better than the H-maser after about 2-3 hours averaging.

We will summarize the elements of the operation of the ion clocks, describe the measurement techniques, and present the results of the long-term frequency comparison where frequency stability to below 5×10^{-16} has been recently achieved with these 12-pole based clocks.