Proposal Title: Do the fundamental constants change with time?

ABSTRACT:

We propose to use the Arecibo L-band receiver to obtain high resolution spectra in the redshifted 18cm OH lines of the $z \sim 0.247$ source, PKS1413+135. The conjugate nature of the satellite OH lines will allow us to use these high precision redshift measurements to measure any evolution in the fundamental constants $\alpha$, $\mu \equiv m_e/m_p$ and $g_p$ over the range $0 < z < 0.247$. The observations will obtain $1\sigma$ sensitivities of $[\Delta \alpha/\alpha] \sim 2.7 \times 10^{-7}$ and $[\Delta \mu/\mu] \sim 5.4 \times 10^{-7}$ to fractional changes in $\alpha$ and $\mu$ respectively, an order-of-magnitude improvement in sensitivity to changes in $\mu$. They will be the first astrophysical measurements with a sensitivity to changes in $\alpha$ comparable to that of the Oklo reactor. They will directly test our tentative detection of changes in these constants, a $2.5\sigma$ result with the WSRT and will provide an avenue to probe fundamental physics. We request a total time of 40 hours for the observations.
Frequency Ranges Planned

1138 - 1382

This proposal requires coordination with Punta Salinas radar within the band 1222-1381 MHz.
This proposal requires coordination with GPS L3 at 1381 MHz.