Testing CPT with the Anti-hydrogen Molecular Ion\textsuperscript{1} EDMUND MYERS, DAVID FINK, JORDAN SMITH, Florida State University — High precision radio-frequency, microwave and infra-red spectroscopic measurements of the anti-hydrogen molecular ion \( \bar{H}_2^- \) (\( \bar{p}\bar{p}e^+ \)), compared with its normal matter counterpart, can provide direct tests of the CPT theorem. The fractional precision that can be achieved with such measurements can exceed that from comparing anti-protons with protons or anti-hydrogen with hydrogen. Schemes are outlined for measurements on a single \( \bar{H}_2^- \) ion in a Penning trap, that use non-destructive state identification by measuring the cyclotron frequency and positron spin-flip frequency, and also methods for creating an \( \bar{H}_2^- \) ion and initializing its quantum state.

\textsuperscript{1}Supported in part by the National Science Foundation