OBSERVATION OF THE ROTATIONAL SPECTRA OF ^{4}HeH$^+$, ^{4}HeD$^+$, ^{3}H eH$^+$, and ^{3}HeD$^+$

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Low J rotational transitions of ^{4}HeH$^+$, ^{4}HeD$^+$, ^{3}HeH$^+$, and ^{3}HeD$^+$ have been observed in the 2-5 THz frequency region with a high-precision far-infrared spectrometer using a tunable radiation source. Observed frequencies have been incorporated with previous infrared measurements to determine Dunham coefficients Y_{kl} and isotopically independent parameters U_{kl}, $\Delta_{kl}^{\mathrm{He}}$, and Δ_{kl}^{H}. In particular, constants with k=0 and l=1 and 2 have been determined with unprecedented accuracy and will provide important information for breakdown of the Born-Oppenheimer approximation. The lowest J=1$\leftarrow$0 transition of ^{4}HeH$^+$ observed at 2010.1839(2) GHz will be an important future probe for detecting the species in space.