HIGH RESOLUTION SPECTRAL MEASUREMENTS ON ENRICHED $^{10}BF_3$ FROM 400 TO 4000 cm^{-1}

T. MASIELLO, *Pacific Northwest National Laboratory, Richland, WA 99352*; ARTHUR MAKI, *15012 24th Ave. S. E. Mill Creek, WA 98012*.

We have been engaged in the measurement and analysis of high-resolution infrared spectra of enriched samples of $^{10}BF_3$ and $^{11}BF_3$. The Fourier transform spectrometer at the Pacific Northwest National Laboratory (PNNL) facilities has been used to obtain measurements that range in resolution from 0.0015 to 0.0035 cm^{-1} with pathlengths of up to 32 m. Depending on the symmetry of the vibrational state, where allowed, the A_1-A_2 rotational splittings of the lowest *K* levels were observed and measured.

At this time, 21 combination/overtone states have been measured so that almost all of the quadratic anharmonic vibrational constants have been determined. Our spectra also make it possible to directly characterize the ν_1 state for the first time by means of the transitions (110^00^0)-(000^00^0) A_2''-A_1' and (110^00^0)-(100^00^0) A_2''-A_1'. A number of weak interactions were observed that help to locate levels that could not be observed directly as transitions from the ground state. For example, the $(001^11^1)^2$ E′ level is perturbed through *l*-type resonance coupling with the $(001^{\pm1}1^{\mp1})^0$ A_1' and A_2' vibrational levels. In this case the A_1' vibrational level is nearly 16 cm^{-1} above the A_2' vibrational level.

Rovibrational constants are deduced for the combination/overtone states, and eventually, we expect to be able to give an improved set of ground state rotational constants. Without counting the transitions in the fundamental bands, there are over 18,000 transitions included in the least-squares fits made at this time.