Λ -DOUBLING IN HIGH ANGULAR MOMENTUM STATES: THE PURE ROTATIONAL SPECTRUM OF CoF ($X^3\Phi_i$)

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The pure rotational spectrum of CoF ($X\ ^3\Phi_i$) has been recorded in the frequency range 270-650 GHz - the first high-resolution study to include all three spin components (Ω = 4, 3, and 2). CoF was created by reacting cobalt vapor with a mixture of 10% F_2 in He. Fourteen rotational transitions were recorded. Λ-doubling was observed in both the Ω = 3 (5 MHz separation) and Ω = 2 (100 MHz) spin components, an unexpected result for a Φ state. In addition, the spectrum is further complicated by the presence of hyperfine interactions arising from both Co (I = 7/2) and F (I = 1/2) nuclei. The complete data set has been fit with a Hund case (a) Hamiltonian, and rotational, fine structure, Λ-doubling, and hyperfine parameters have been determined. The observation of Λ-doubling is in contrast to CoCl ($X\ ^3\Phi_i$), where the effect was not observed.