# THE PURE ROTATIONAL SPECTRUM OF MgCl IN THE $(2)^2\Pi_i$ EXCITED STATE

TYLER J HERMAN, *Department of Chemistry and Biochemistry, University of Arizona, Tucson, AZ, USA*; PARKER CROWTHER, *Chemistry and Biochemistry, University of Arizona, Tucson, AZ, USA*; LUCY M. ZIURYS, *Dept. of Astronomy, Dept. of Chemistry, Arizona Radio Observatory, The University of Arizona, Tucson, AZ, USA*.

The millimeter/submillimeter spectrum of magnesium chloride (MgCl) has been measured in an electronic excited state, using direct absorption spectroscopy in the range of 240-310 GHz. The molecule was synthesized by reacting chlorine gas ($Cl_2$) with magnesium vapor, produced using a Broida-type oven in the presence of argon carrier gas. Seven rotational transitions in each of six isotopologues ($^{24}Mg^{35}Cl$, $^{24}Mg^{37}Cl$, $^{25}Mg^{35}Cl$, $^{25}Mg^{37}Cl$, $^{26}Mg^{35}Cl$, $^{26}Mg^{37}Cl$) were measured in the ground vibrational state, with a number of vibrationally excited satellite lines (v=1-4) also being observed for each species. From the data, rotational, fine structure, and $^{25}Mg$ hyperfine ($^{25}MgCl$ only) parameters were determined for the six isotopologues in this state, as well as equilibrium constants and the equilibrium bond length, $r_e$ = 2.54 Å. Based on theoretical calculations, this excited state has been identified as $(2)^2\Pi_i$, which has never before been observed experimentally. The excited state manifold of MgCl has been the subject of a number of computational studies, and is of interest for laser cooling experiments.