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Spectroscopy of high-L Rydberg levels of nickel¹ JULIE A. KEELE, SHANNON L. WOODS, MARK E. HANNI, KRISTEN VOIGT, STEPHEN R. LUNDEEN, Colorado State University — The complex fine structure pattern in high-L ($L > 4$) Rydberg levels of nickel were studied using the Resonant Excitation Stark Ionization Spectroscopy (RESIS) technique. A beam of Ni^+ ions, obtained from a Colutron ion source, captured a single electron from a Rb 9F Rydberg target to become highly excited Rydberg levels of neutral Ni. Levels with $n=9$ and $L=5,6,7$, and 8 were excited to $n=19$ or 20 using a Doppler-tuned CO_2 laser, resolving the $n=9$ fine structure pattern, which consists of six levels for each value of L . Analysis of the pattern using the long-range polarization model determined several properties of the $3d^9 \ ^2D_{5/2}$ ground state of Ni^+ , including its permanent quadrupole moment and its scalar and tensor dipole polarizabilities.

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