Abstract Submitted
for the DAMOP08 Meeting of
The American Physical Society

Measurement of NaK $3^1\Pi \rightarrow X^1\Sigma^+, A^1\Sigma^+$ Absolute Transition Dipole Moment Functions using Autler-Townes Spectroscopy and Calibrated Fluorescence S.J. SWEENEY, Lehigh U., E. AHMED, U. Penn, P. QI, A.M. LYYRA, Temple U., J. HUENNEKENS, Lehigh U. — We describe a two-laser experiment using OODR and Autler-Townes splittings to determine NaK $3^1\Pi \rightarrow X^1\Sigma^+, A^1\Sigma^+$ absolute transition dipole moment functions. Resolved $3^1\Pi \rightarrow A^1\Sigma^+$ and $3^1\Pi \rightarrow X^1\Sigma^+$ fluorescence is recorded with the frequencies of a Ti:Sapphire laser (L1) and a ring dye laser (L2) fixed to excite particular $3^1\Pi\,(19, 11, f) \leftarrow 2\,(A)^1\,\Sigma^+\,(v', 11, e) \leftarrow 1\,(X)^1\,\Sigma^+\,(v'', J \pm 1, e)$ transitions. The coefficients of a trial transition dipole moment function $\mu\,(R) = a_0 + a_1 R^{-2} + a_2 R^{-4} + ...$ are adjusted to match the relative intensities of resolved spectral lines terminating on $A^1\Sigma^+\,(v', 11, e)$ and $X^1\Sigma^+\,(v'', 11, e)$ levels. These data provide a *relative* measure of the function $\mu\,(R)$ over a broad range of R. Next L2 is tuned to the specific $3^1\Pi\,(19, 11, f) \leftarrow A^1\Sigma^+\,(10, 11, e)$ transition and focused to an intensity large enough to split the levels via the Autler-Townes effect. L1 is scanned over the $A^1\Sigma^+\,(10, 11, e) \leftarrow X^1\Sigma^+\,(1, J \pm 1, e)$ transition to probe the AT lineshape, which is fit using density matrix equations to yield an *absolute* value for $|\langle 3^1\Pi\,(19, 11, f)\,|\mu\,(R)|\,A^1\Sigma^+\,(10, 11, e)\rangle|$. This value is used to place the relative $\mu\,(R)$ obtained with resolved fluorescence onto an absolute scale. We compare with recent theoretical results.

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Date submitted: 31 Jan 2008 Electronic form version 1.4