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Lifetime Measurements of the $2^1\Sigma_u^+$ and $4^1\Sigma_g^+$ states of Na_2 LUTZ HUWEL, ROY ANUNCIADO, Wesleyan University — We have measured lifetimes of individual ro-vibrational levels in the excited states of Na_2 using pump-probe resonant ionization. For the double well $2^1\Sigma_u^+$ state, we use a 2-photon scheme. Ground state Na_2 produced in a molecular beam is excited resonantly by the doubled output of a suitably tuned dye laser and then ionized by a photon (532 nm) from a delayed Nd:YAG laser. By adjusting the delay of the second laser, the population decay of the excited state was observed and its lifetime can be extracted. Moreover, by tuning the first laser to different ro-vibrational level, we were able to measure the lifetime as a function of vibrational quantum number. Initial data show a noticeable and systematic variation especially near the potential barrier. The overall magnitude of our results is consistent with the average value of 52.5 ns reported for states below the barrier.[1] For the $4^1\Sigma_g^+$ state, we employed a double resonance technique via the $A^1\Sigma_u^+$ (v=19, J=20) state followed by one-photon (1064 nm) delayed ionization from a third laser. Our experimental method, analysis and results, showing vibrational state dependence here as well, will be presented.

[1]Mehdizadeh, E., et. al., Appl. Phys. B, 509-515 (1994)

Lutz Huwel
Wesleyan University

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