Photoionization cross-sections for Li 2 $^2P_{3/2}$ and Na 3 $^2P_{3/2}$

V. Wippel[1], C. Binder[1], W. Huber[1], L. Windholz[1],
M. Allegrini[2,3], F. Fuso[2], and E. Arimondo[2]

[1] *Institut für Experimentalphysik, Technische Universität Graz*
Petersgasse 16, A-8010 Graz, Austria
[2] *INFM, Dipartimento di Fisica, Università di Pisa,*
Via F. Buonarroti, 2, I-56127, Pisa
[3] *On sabbatical leave from Dipartimento di Fisica MTFA, Università di Messina*
I-98166 Sant'Agata, Messina, Italy

Lithium or Sodium atoms have been captured in a magneto-optical trap (MOT). By applying an additional ionization uv laser beam, atomic ions have been formed. The ionization process leads to an additional trap loss, therefore the fluorescence intensity emitted by the cold atomic cloud is decreased. Also the MOT loading rate is modified by the presence of the photoionization loss channel. Modifications in both the MOT laoding rate and the steady state number of trapped atoms allowed us to calculate the photoionization cross-section, using a model taking into account also the decreased capturing rate in a volume ionized by the uv laser beam outside the trapped atomic cloud [1].

For Li, where an ionizing wavelength shorter than 349.7 nm is needed, we could use only two wavelengths, the 334.4 nm and the 335.8 nm radiation of an Argon-ion-laser. For Na, a wavelength shorter than 408.4 nm is needed, and the additional Ar+ UV lines at 351 nm and 363.8 nm are also ionizing the atoms. Moreover, we were able to produce tunable radiation between 399.5 and 409 nm by means of a ring dye laser using Exalite 402. For Li we have determined the cross-sections for 334.4 nm to be 16(4) Mbarn and for 335.8 nm to be 18(5) Mbarn in agreement with calculations [2].

The results for Na are shown in Fig. 1. Besides the statistical errors, measurements of the (low) UV power and the beam profile are responsible for the large uncertainties. All measured values for Na agree reasonably well with theoretical predictions [3], with the exception of the value measured at 351 nm. Up to now we are not able explain this discrepancy.

[1] F. Fuso, D. Ciampini, E. Arimondo, C. Gabbanini, *Optics Commun.* **173** 223 (2000).
[2] J. Lahiri, S.T. Manson, *Phys. Rev. A* **48** 3674 (1993).
[3] J.M. Preses, C.E. Burkhardt, R.L. Corey, D.L. Earsom, T.L. Daulton, W.P. Garver, J.J. Leventhal, A.Z. Msezane, S.T. Manson, *Phys. Rev. A* **32** 1264 (1985).

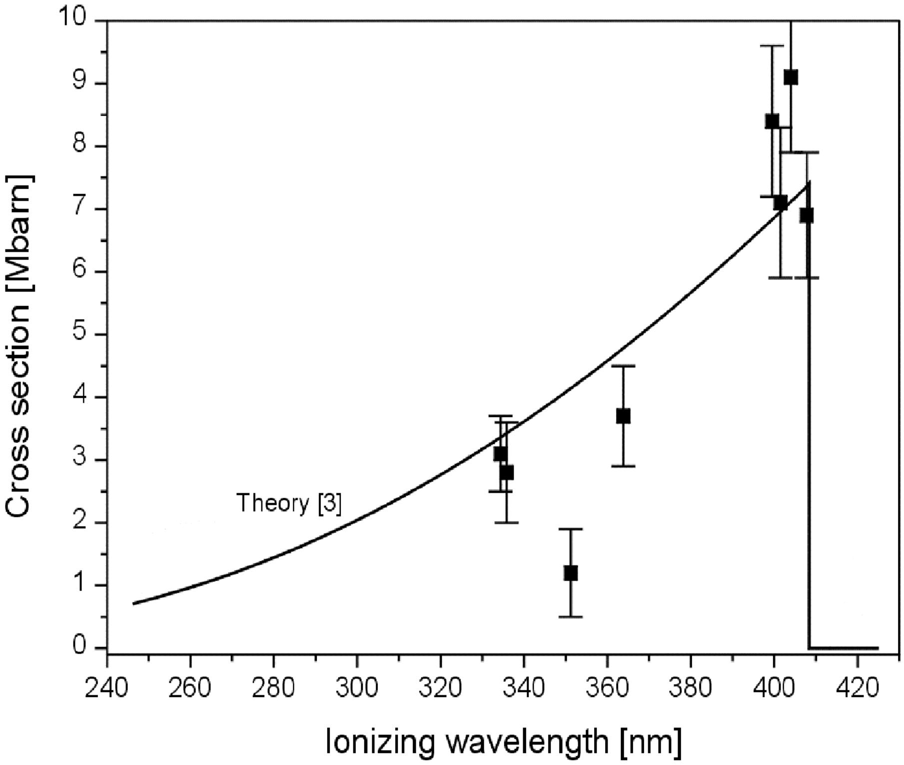

Figure 1: Photoionization cross-section for Na 3 $^2P_{3/2}$