

## MO 25 Poster: Electronic Spectroscopy

Zeit: Dienstag 16:30–18:30

Raum: Labsaal

MO 25.1 Di 16:30 Labsaal

**Laser induced emission of the fully correlated electron pair from a quantum dot.** — ●OLEG KIDUN and DIETER BAUER — Max-Planck-Institut fuer Kernphysik, Heidelberg,

The exactly solvable problems of two electrons coupled by the Coulomb interaction can be used as unique tests for any approximate theory that deals with few-body systems and related experiments [1,2]. We use the two-electron states of the parabolic potential well and the two-electron states in a strong electromagnetic field to calculate the time evolution of the emission probability of electron pairs. As an example, we compare the sequential double ionization, which is the conventional one-particle description of multielectron ejection, and the solution based on two-electron correlated states [3]. The entanglement and the conditions of separability of these correlated states are discussed.

[1] M. Taut, A. Ernst, H. Eschrig, J. Phys. B 31, 2689 (1998)

[2] D. Bauer, Phys. Rev. A 56, 3028 (1997)

[3] O. Kidun, N. Fominykh, J. Berakdar, J. Phys. B 36, 1 (2003)

MO 25.2 Di 16:30 Labsaal

**Lifetime vibrational interference effects studied in the  $\text{NO}^+(\text{A}^1\Pi \rightarrow \text{X}^1\Sigma^+)$  fluorescence after  $1s^{-1}\pi^*$  resonance excitation** — ●S KLUMPP<sup>1</sup>, L WERNER<sup>1</sup>, A EHRESMANN<sup>1</sup>, PH V DEMEKHIN<sup>2</sup>, M P LEMESHKO<sup>2</sup>, V L SUKHORUKOV<sup>2,3</sup>, K-H SCHARNTNER<sup>4</sup>, and H SCHMORANZER<sup>3</sup> — <sup>1</sup>Institut für Physik, Universität Kassel — <sup>2</sup>Rostov State University of Transport Communications, Rostov-on-Don — <sup>3</sup>Fachbereich Physik, TU Kaiserslautern — <sup>4</sup>I. Physikalisches Institut, Universität Giessen

$\text{NO}^+(\text{A}^1\Pi \rightarrow \text{X}^1\Sigma^+)$  fluorescence after the de-excitation of the  $1s^{-1}\pi^*$  resonance of  $\text{N}^*\text{O}$  and  $\text{NO}^*$  has been studied in the fluorescence range between 118 nm and 142 nm. The measured cross sections for the  $\text{A}^1\Pi(v') \rightarrow \text{X}^1\Sigma^+(v'')$  fluorescence were compared with calculated ones taking into account lifetime vibrational interference (LVI) between pathways connected with different vibrational  $1s^{-1}\pi^*(v_r)$  levels. Especially in the case for the  $\text{NO}^*$  core-excited state the complex dependence of the computed cross sections for the A-X fluorescence on the exciting-photon energy and on  $v'$  and  $v''$  is connected with LVI.

MO 25.3 Di 16:30 Labsaal

**B state vibrational progression and predissociation of  $\text{Br}_2$  in Ar matrix** — ●HEIDE IBRAHIM<sup>1</sup>, MARKUS GÜHR<sup>1,2</sup>, and NIKOLAUS SCHWENTNER<sup>1</sup> — <sup>1</sup>Institut für Experimentalphysik, Freie Universität Berlin, D-14195 Berlin — <sup>2</sup>Stanford Synchrotron Radiation Laboratory, Menlo Park, California 94025-7015

Using a narrow linewidth dyelaser in the visible range (530 nm to 640 nm) we record high resolution excitation spectra of  $\text{Br}_2$  in solid Ar, covering the whole vibrationally structured region of the electronic B state. We find narrow features (Zero Phonon Lines with isotope splitting) and structured Phonon Side Bands, reflecting the phonon density of states of the Ar crystal. We detect NIR fluorescence of A, A' and B state simultaneously with a broadband detector. A two dimensional plot of highly resolved fluorescence versus scanned excitation wavelength illustrates the B state vibrational progression and population transfer from B to the deeper lying A and A' states. From the systematic behaviour of zero phonon linewidth, vibrational spacing and intensities we identify two cross regions with repulsive states and the corresponding coupling strength.

MO 25.4 Di 16:30 Labsaal

**REMPI-Spektroskopie von Methylamin** — ●MOANA NOLDE und KARL-MICHAEL WEITZEL — Philipps-Universität Marburg, FB Chemie, Hans-Meerwein-Str, 35032 Marburg

Die Spektren der Rydbergzustände für Ammoniak sind in den letzten Jahrzehnten gut durch die REMPI-Spektroskopie untersucht worden. In vorhergehenden Arbeiten [1] haben wir die Spektren des  $\tilde{C}'$ -Rydbergzustands aller Ammoniakisotopomere erhalten und charakterisiert. Durch die Substitution eines Wasserstoffatoms im  $\text{NH}_3$  durch eine Methylgruppe erhält man Methylamin ( $\text{CH}_3\text{NH}_2$ ), dessen Rydbergzustände bisher wesentlich weniger gut beschrieben sind als die des Ammoniaks. Durch die zusätzlichen Schwingungsfreiheitsgrade erwartet man eine wesentlich komplexere Schwingungsstruktur als beim  $\text{NH}_3$ . In diesem Beitrag untersuchen wir die REMPI-Spektren des

Methylamins ( $\text{CH}_3\text{NH}_2$ ). Diese zeigen klare Progressionen der  $\nu_9$ -,  $\nu_7$ -Schwingungen und der  $\nu_7 + n \cdot \nu_9$ -Kombinationsschwingung. Zur Aufklärung von Tunnel-Effekten in der Moleküldynamik werden derzeit Experimente mit deuteriertem Methylamin durchgeführt.

[1] M. Nolde, K.-M. Weitzel, C. M. Western, PCCP 7 (2005), 1527-1533.

MO 25.5 Di 16:30 Labsaal

**Excitation Spectroscopy of ClF in an Argon Matrix** — ●NINA OWSCHIMIKOW, MIZUHO FUSHITANI und NIKOLAUS SCHWENTNER — Institut für Experimentalphysik, Freie Universität Berlin, Arnimallee 14, 14195 Berlin

We investigate the B state dynamics of chlorine monofluoride (ClF) molecules embedded in a solid Argon (Ar) matrix at liquid helium temperature for laser excitation wavelengths below and above the gas phase dissociation limit (476 nm). The ClF molecule occupies a single substitutional site in the Ar lattice, and is therefore capable of librational motion [1] and rapid reorientation [2] upon excitation. Frequency resolved excitation spectra of the B state were obtained by monitoring the intensity of the A' fluorescence. In contrast to results for the non-rotating molecules Cl<sub>2</sub> and Br<sub>2</sub> the excitation spectra of ClF show no resolved vibrational progression even below the gas dissociation limit. This indicates a large contribution of librational modes to the vibronic transition. Therefore we study the depolarization and thus dynamics of reorientation on ultrafast (ps) and slow (ms) timescales. Additionally, we investigate the bleaching efficiency and its dependence on the excitation wavelength.

[1] T. Kiljunen, M. Bargheer, M. Gühr, N. Schwentner, and B. Schmidt, PCCP 6, 2932 (2004)

[2] M. Bargheer, M. Gühr, and N. Schwentner, J. Chem. Phys. 117, 5 (2002)