

## **Project 4.5. Laser spectroscopy of diatomic molecules (experimental)**

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**Institute:** IFPAN

**Unit:** ON2.5

**WWW:** <https://dimer.ifpan.edu.pl>

### **Background:**

The main goal of the scientific work performed in our laboratory is to investigate excited electronic states of homo- and heteronuclear alkali metal dimers, and diatomic open-shell molecules (LiSr mainly) using modern laser spectroscopy techniques. We find molecular constants and shapes of potential energy curves of chosen electronic states with high accuracy. Results of our work allow for improvement of theoretical models. Precise knowledge of molecular energy levels is also important for understanding of possible optical excitation schemes. This knowledge is crucial in experiments from the field of „ultracold physics”, during planning and analysing of experimental data.

The research methodology is based on a laser polarization labelling spectroscopy technique, which allows to record high resolution spectra of the investigated molecules, as well as other spectroscopic techniques like thermoluminescence and laser induced fluorescence. The experimental resources available in our laboratories include state-of-the art laser systems, specialized detection systems and spectroscopic cells designed for production of specific alkali metal dimers. The numerical Pointwise Inverted Perturbation Approach method developed in our group enables construction of molecular potentials for investigated electronic states basing on experimental spectra, even for states with exotic shapes of potential curves.

### **Aim:**

Group of laser spectroscopy offers a possibility to enter into Ph.D project on laser spectroscopy of diatomic molecules. The project is focused on investigation of structure of selected excited electronic states of heavy diatomic alkali molecules like Rb<sub>2</sub>, Cs<sub>2</sub>, and RbCs, and diatomic open-shell molecules like NaSr or LiSr, including determination of corresponding molecular constants and potential energy curves.

### **Requirements:**

- MSc university degree in one of the following disciplines: Atomic Physics, Molecular Physics, Optics, Laser Physics.
- Good spoken and written English skills
- Experience in laboratory work
- Strong motivation for scientific work, particularly experimental work

### **Funding:**

Scholarship: a standard Polish PhD scholarship (about 2100 PLN/month net in years 1-2, 3240 PLN/month net in years 3-4) is guaranteed. A grant related to the project is currently under assessment and has passed to the 2nd round. If it is won there will be grant funding of 5000 PLN per month for the scholarship, before subtracting obligatory employer and employee social security contributions (~15%), for 33 months.