Institute of Spectroscopy RAS

http://www.isan.troitsk.ru/win/das.htm

Partner contact person : Prof. A.N.Ryabtsev

Institute for Spectroscopy RAS (ISRAN) is an Establishment of the Russian Academy of Sciences. Director of the Institute - Prof. E.A.Vinogradov, Corresponding member of the Russian Academy of Sciences The Institute carries out spectral investigations of atoms, multicharged ions, plasma, molecules (both the simplest molecules in gas phase and complex organic ones in solid matrices), liquids, crystals and films, multilayer thin structures, superlattices, quantum wells, other nanostructures, high temperature superconductors, solid state surfaces, biological objects. The studied spectra cover a wide spectral range from X-rays to microwaves. The Institute has a series of unique spectral instruments and setups: 1) instruments having high spectral resolution up to 10-6cm-1, time resolution up to 3x10-14s, and local resolution up to 5 nm, 2) methods and instruments for ultrasensitive detection of atom traces (isotopes) and molecules in gaseous, liquid and solid samples with detection limit up to several femtograms (10-15gram) in a sample, 3) methods and instruments for investigation of ultra thin films (down to monolayers) on the surface of metals and dielectrics and for new surface physics data.

Scientific structure of ISRAN includes 9 scientific departments. One of them is Atomic Spectroscopy Department, chief of department - Prof. A.N.Ryabtsev. The purpose of the department is the receiving of experimental and theoretical data about energy structures of atoms and ions which are necessary for astrophysics, for works on controlled thermo-nuclear synthesis, for the creation of vacuum ultra-violet and X-ray lasers, and also for the development of spectral diagnostics of high temperature plasma.

For 40 years ISRAN is involved in laboratory analysis of the atomic and ionic spectra throughout

the Periodic Table from the light elements such as boron to heavy elements of palladium group. More than 30000 spectral lines were identified in about 290 atomic and ionic spectra. The work is based on a high resolution spectroscopic equipment and on the theoretical calculations of atomic spectra using a variety of theoretical approaches (Hartree – Fock, Dirac – Fock, orthogonal operator technique and others). A Database of Bibliography on Atomic Spectra (BIBL) was created and maintained. It is accessible on line from the site http://das101.isan.troitsk.ru/bibl.htm The topics covered by BIBL are:

- Spectra of atoms and atomic ions: ionization potentials, line classification, energy levels, wavelengths, hyperfine structure, isotopic effects, broadening and shifts of spectral lines, the Stark and Zeeman effects, plasma diagnostics, astrophysical spectra, theory of atomic spectra, radiation and autoionization rates, oscillator strengths, QED and relativistic effects in atoms and ions, atomic-spectroscopy tests of the fundamental principles, spectral sources, techniques of spectral measurements.

- Cross sections of the collision processes: excitation and ionization by electrons and photons, multiphoton processes, Auger decay, ion-electron recombination. To less extent - charge exchange, excitation and ionization in collisions with heavy particles - if any new data related to the atomic structure are obtained in these publications.

The bibliography related to experimental and theoretical papers on identification and prediction of atomic and ionic structure should be complete from 1983, the year of the last issue of NBS Special Publication "Bibliography on Atomic Energy Levels and Spectra", but the experimental spectrum analysis can be traced back to about 1970. On the other topics, it is systematically maintained since 1989. For the last decade ISRAN is involved in the analysis of ion spectra of the rare earth elements, production and critical evaluation of atomic data (energy levels, wavelengths, transition probabilities and magnetic g-factors) for Vienna Atomic Line Database (VALD).

Key persons :

Prof. A.N.Ryabtsev, head of Department of Atomic Spectroscopy ISRAN

Expertise : Atomic data production, critical evaluation of published atomic data, bibliography database maintenance.

Role in VAMDC project : SA2, JRA1

Dr. R.R.Kildiyarova, senior scientific worker, ISRAN

Expertise : Atomic data production, critical evaluation of published atomic data, preparation of

the data for incorporation into VALD

Role in VAMDC project : SA2, JRA1

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