Description of research

I study several problems in quantum mechanics and atomic physics using methods of Rayleigh – Schrödinger perturbation theory, semiclassical methods and complex analysis.

I am interested in following topics.

- Calculation of spectra of atoms in plasma using perturbation series in inverse Debye radius
- Perturbation theory for atoms in strong electric and magnetic fields
- Methods of summation of perturbation theory for quasistationary and resonance states
- Perturbation theory for large angular momenta, or alternatively for large dimension of coordinate space, and its application to problems in atomic physics
- Study of transition from a bound to a quasistationary state with change of parameters of a system by semiclassical and perturbative methods
- Summation of perturbation theory in strong coupling regime
- Convergence issues of $1/D$-expansion, where D is number of space dimensions
- Atoms with variable nuclear charge and existence of double negative ions
- Semiclassical approach for overlap integrals in order to estimate rate of vibronic transitions in molecules
- Summation of Møller – Plesset perturbation theory using methods of complex analysis