

Gennady Smirnov

National Research Center “Kurchatov Institute”,
Laboratory of Quantum Nucleonics,
Kurchatov Sq. 1, Moscow, 123182, Russia,
Email: g.smirnov@gmx.net



Education: 1955-1961 Moscow Physical Engineering Institute
(M. Sc., Experimental Nuclear Physics)

Research and Qualifications:

1960-present scientific research in Kurchatov Institute of Atomic Energy,
1970 Ph. D. Degree,
1980 Doctor Degree of Phys.-Math. Sciences,
1997 Professor, Academic rank awarded by the state Higher Attestation Commission.

The scientific results

Generally: Development of γ -ray Optics - *Coherent Nuclear Resonance Fluorescence*

Particularly:

- Detection of *pure nuclear diffraction* of gamma radiation in crystals; the phenomenon is presently employed for generation of Synchrotron Mössbauer radiation
- Detection of *coherent enhancement of the radiative channel* of nuclear scattering
- Observation and experimental study of the effect of *anomalous transmission of Mössbauer radiation through a perfect single crystal* – Kagan-Afanas'ev effect
- Observation of *superradiance and subradiance of nuclear ensemble* in a perfect crystal
- Development of a technique of *nanosecond switching* of Mössbauer radiation
- Observation of *nuclear exciton-polariton* and comprehensive study of its properties.
- Studing external influence on the nuclear exciton polariton, such as pulse switching of hyperfine magnetic field, pulse and stationary coherent ultrasonic excitation
- Detection of the *echo phenomena of a nuclear exciton-polariton*
- Studing dynamics of nuclear exciton-polariton created by a pulse of synchrotron radiation
- Observation of *speedup effect in the coherent nuclear resonant scattering of synchrotron radiation*
- Investigation of the resonance properties of perfect regular nuclear ensembles-*macroscopic quantum resonators*, particularly tremendous broadening of resonance lines and angular dependencies upon diffraction
- Measuring the collision time upon nuclear resonance scattering
- Development of the theory of nuclear resonant coherent and incoherent scattering of synchrotron radiation in the presence of diffusive motion of nuclei.
- Development of the theory of the time domain nuclear resonance interferometer
- Development of the theory of Synchrotron Mössbauer Source

Selected Publications

"Synchrotron Mössbauer source of Fe-57 radiation"

G.V. Smirnov, *Hyperfine Interactions* 125 (2000) 91-111.

"Dynamics of electron density in a medium revealed by Mössbauer time-domain interferometry"

G.V. Smirnov, V.G. Kohn, and W. Petry, *Phys. Rev. B* 63 (2001) 144303.

"Propagation of nuclear polaritons through a two-target system: Effect of inversion of targets"

G. V. Smirnov, U. van Bürck, W. Potzel, P. Schindelmann, S. L. Popov, E. Gerdau,
Yu. V. Shvyd'ko, H. D. Rüter, and O. Leupold, *Phys. Rev. A* 71 (2005) 023804

"Currents and fields reveal the propagation of nuclear polaritons through a resonant target"

G. V. Smirnov, U. van Bürck, J. Arthur, G. S. Brown, A. I. Chumakov, A. Q. R. Baron,
W. Petry, and S. L. Ruby, *Phys. Rev. A* 76 (2007) 043811

“Multispace quantum interference in a ^{57}Fe synchrotron Mössbauer source”

G. V. Smirnov, A. I. Chumakov, V. B. Potapkin, R. Rueffer, and S. L. Popov
Phys. Rev. A **84** (2011) 053851

“The ^{57}Fe Synchrotron Moessbauer Source at the ESRF”

Vasily Potapkin, Aleksandr I. Chumakov, Gennadii V. Smirnov,
Jean-Philippe Celse, Rudolf Rueffer, Catherine McCammon and Leonid Dubrovinsky
J. of Synchrotron Radiation, **19**, (2012) 559

“Coherent Nuclear Resonance Fluorescence”

G. V. Smirnov, Chapter 16 In “*The Rudolf Moessbauer Story*” Springer-Verlag 2012

“Peculiar features of nuclear resonant Bragg scattering”

G.V. Smirnov and A.I Chumakov, Phys. Rev. A **100** (2019) 043830

“Interference of γ Radiation in the Spin Space during Nuclear Resonance Scattering”

G. V. Smirnov, JETP to be published in June 2021

The articles, reports, monographs in physical journals and books are presented in the social research network *ResearchGate*.

Honors and Awards

1976 State Award for the set of works: "Prediction, discovery and investigation of the Effect of Suppression of nuclear reaction in perfect crystals".

1993,2003,2012 – I.V. Kurchatov Atomic Energy Institute Award for Research in Physics of nuclear resonant coherent.

2017 granted by IBAME Fellow Status.

International scientific cooperation

As an **invited scientist** had a collaborative work with
Physical Institute of the Czechoslovakian Academy of Science, Prague, since 1967 to 1980,
München Technical University - TUM, Physical Departments E15, E13 since 1976 to 2007,
Brookhaven National Laboratory - BNL, August 1991,
Stanford Synchrotron Radiation Lightsource – SSRL 1991-1993.

As a **visiting professor** worked in
Stanford University 1991,
Katholieke Universiteit Leuven (1993-1994),
Hamburg University (1996),
München Technical University (1996, 1998-1999).

For several years a member of International Advisory Committee of the
International Conference on the Applications of the Mössbauer Effect and
International Conference on Hyperfine Interactions, a member of Associate Editorial Board,
Journal "Hyperfine Interactions" and of “Mössbauer Effect Reference and Data Journal”.