Andrey Geondzhian | Theoretical physicist

25/02/1992

andrey.geondzhian@esrf.fr

+33(0)768417684, +7(915)2894388

https://geonda.github.io

European Synchrotron

Radiation Facility (ESRF)

71, avenue des Martyrs, CS 40220

38043 Grenoble Cedex 9, France

Education

PhD physics, (**2019**), Université Grenoble Alpes, Grenoble, France

MSc physics, (**2015**), National Research Nuclear University "MEPhI", Moscow, Russia

Skills and expertise

- Scientific interests: **Excited state problems**, dynamical effects (phonons, plasmons), **electron and exciton-phonon** interactions, **quantum information**, theoretical spectroscopy
- **First-principle methods**:
  DFT (plane-waves, pseudo-potentials/all electron), DFT+U, TDDFT, DFTPT, MD
- Many-body Green's functions techniques:
  GW, **Cumulant**, BSE
- Machine Learning and Neural Networks
- Programming:
  Python, Fortran, Matlab, bash, C++, version control (GitLab, GitHub)
- Scientific packages:
  QUANTUM ESPRESSO, ABINIT, OCEAN, PHONOPY, VASP, WEIN2K
- Python libraries: Numpy, Scipy, scikit-learn, TensorFlow, **Qiskit**, **PennyLane**, Plotly/Dash, Dask
- Model approaches: Fröhlich, Holstein, Ising and Hubbard models, Multiplet calculations

Experience

2019–2020 **Visiting Scientist**, Theory Group, ESRF - European Synchrotron Radiation Facility, Grenoble, France.

- Studied electron-lattice interaction in low dimensional systems (graphite, cuprates).
- Generalized analytically solvable models to obtain vibrational contribution in resonant inelastic X-ray scattering.
- Published an open-source package for spectroscopy's data analysis.

2015–2019 **Associate researcher (PhD student)**, Theory Group, ESRF - European Synchrotron Radiation Facility, Grenoble, France.

- Developed a new theoretical approach to treat dynamical contributions in resonant inelastic X-ray scattering based on many-body Green's functions technique and *ab initio* calculations.
- Developed a framework to account many-body contributions using time-dependent molecular dynamics simulations in X-ray photo-emission and X-ray absorption spectroscopies.
- Applied cumulant ansatz to an exciton-phonon problem.
- Studied electron-lattice interaction in transition metal oxides (titanites, cuprates).
- Participated in code development.
- Managed several projects on the international level.
- Guided master students.
- Presented results at international conferences and wrote a Ph.D. thesis.

2013–2015 **Associate researcher (Master student)**, Condensed Matter department, NRNU 'MEPhI' National Research Nuclear University, Moscow, Russia.

- Numerically and experimentally studied pressure-induced electronic phase transitions in the materials with elements in the intermediate oxidation state.
- Participated in national and international. collaborations.

Publications

8. A. Geondzhian A. Sambri, G. M. De Luca, R. Di Capua, E. Di Gennaro, D. Betto, M. Rossi, Y. Y. Peng, R. Fumagalli, N. B. Brookes, L. Braicovich, K. Gilmore, G. Ghiringhelli, M. Salluzzo, Large polarons as key quasiparticles in SrTiO3 and SrTiO3-based heterostructures, *arXiv:2005.02054*, 2020

7. A. Geondzhian and K. Gilmore, Generalization of the Franck-Condon model for phonon excitations by resonant inelastic X-ray scattering, *Physical Review B* 101, 214307, 2020

6. A. Geondzhian and K. Gilmore, Demonstration of RIXS as a probe of exciton-phonon coupling, *Physical Review B* 98, 214305, 2018

5. A. P. Menushenkov, A. A. Yaroslavtsev, A. Y. Geondzhian, R. V. Chernikov, L. Nataf, X. Tan, and M. Shatruk. Driving the europium valence state in $EuCo_2As_2$ by external and internal impact. *Journal of Superconductivity and Novel Magnetism*, 30(1):75–78, 2017

4. X. Tan, V. Ovidiu, P. Chai, A. Y. Geondzhian, A. Yaroslavtsev, Y. Xin, A. Menushenkov, R. Chernikov, and M. Shatruk. Synthesis, crystal structure, and magnetism of $A_2Co_{12}As_7$ ($A = Ca, Y, Ce - Yb$). *Journal of Solid State Chemistry*, 236:147–158, 2016

3. X. Tan, A. A. Yaroslavtsev, H. Cao, A. Y. Geondzhian, A. P. Menushenkov, R. V. Chernikov, L. Nataf, V. O. Garlea, and M. Shatruk. Controlling magnetic ordering in $Ca_{1-x}Eu_xCo_2As_2$ by chemical compression. *Chemistry of Materials*, 28(20):7459–7469, 2016

2. A. Y. Geondzhian, A. A. Yaroslavtsev, P. A. Alekseev, R. V. Chernikov, B. R. Gaynanov, F. Baudelet, L. Nataf, and A. P. Menushenkov. Pressure-induced electronic phase transition in compound $EuCu_2Ge_2$. *Journal of Physics: Conference Series*, 712(1):012112, 2016

1. A. P. Menushenkov, A. A. Yaroslavtsev, A. Y. Geondzhian, R. V. Chernikov, Y. V. Zubavichus, X. Tan, and M. Shatruk. Local electronic and crystal structure of magnetic RCo_2As_2 ($R = La, Ce, Pr, Eu$). *Journal of Superconductivity and Novel Magnetism*, 28(3):995–997, 2015

Conferences and Schools

2018 17th International Conference on X-ray Absorption Fine Structure, Krakow, Poland (poster), *Green's function approach to vibrational contributions in X-ray spectroscopy*

2018 Workshop on Resonant Inelastic and Elastic X-ray Scattering meeting, Diamond Light Source, UK (talk), *Implicit spectral function approach to vibrational contributions in RIXS*

2018 European Synchrotron Radiation Facility User Meeting, Grenoble, France (poster), *Vibrational contribution in RIXS using Green's approach*

2017 14th ETSF Young Researchers' Meeting, Tarragona, Spain (talk), *Understanding electron-phonon coupling in RIXS measurements*

2016 **EUSpec Winter School on core-level spectroscopies**, Ajdovscina, Slovenia

2016 European Synchrotron Radiation Facility User Meeting, Grenoble, France (talk), *Phonon contribution in RIXS: ab-initio*

2015 16th International Conference on X-ray Absorption Fine Structure, Karlsruhe, Germany (poster), *Pressure induced electronic phase transition in $EuCu_2Ge_2$*

2014 European XFEL User Meeting, Hamburg, Germany (poster) *Local electronic and crystal structure of magnetic $RCo_2As_2(R = La, Ce, Pr, Eu)$*

2014 **DESY summer school**, Hamburg, Germany, Software development *X-ray tracing: XRT*

Awards and Scholarships

2014-2015 Research achievements scholarship

2010-2012 University scholarship

2009 Presidential Grant

Other

2016-2018 Organizing committee member of a theory seminar

2011-2015 Private tutor, teacher in middle and high-school (math)

2010-2015 Teacher in summer schools on advanced physics and math

Languages: Russian, English (C), French (A)

References

Dr. Keith Gilmore

Scientist, Condensed Matter Physics and Materials Science Department,

Brookhaven National Laboratory,

Upton, NY 11973, USA

kgilmore@bnl.gov

Dr. Timothy Ziman

Directeur de recherche CNRS

Theory Group ILL (Institute Laue Langevin)

71 avenue des Martyrs, CS 20156

38042 Grenoble Cedex 9, France

ziman@ill.fr

Dr. Nicholas Brookes

Beamline Scientist, ESRF

(European Synchrotron Radiation Facility)

71, avenue des Martyrs, CS 40220

38043 Grenoble Cedex 9, France

brookes@esrf.fr