

Ernazar Abdikamalov

Curriculum Vitae

Current Appointment:

Associate Professor
Department of Physics, School of Sciences and Humanities
Nazarbayev University (since 08/2014)

Current Address:

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Academic Degrees

Ph.D. in Astrophysics (2009)
International School for Advanced Studies, Trieste, Italy
Advisors: J. C. Miller, L. Rezzolla
B.S. in Physics (with distinction, 2005)
National University of Uzbekistan, Tashkent
Advisor: B. Ahmedov

Previous Positions

05/2014 – 07/2014 Postdoctoral Scholar, Oak Ridge National Laboratory
Oak Ridge National Laboratory, Advisor: Raphael Hix
03/2011 – 04/2014 Postdoctoral Scholar, Theoretical Astrophysics
California Institute of Technology, Advisor: Christian Ott
02/2010 – 02/2011 Postdoctoral Scholar
Center for Computation and Technology
Louisiana State University, Advisor: Erik Schnetter
11/2005 – 11/2009 Graduate Student, Astrophysics Sector
International School for Advanced Studies, Italy
09/2001 – 01/2005 Bachelor student, Physics Department,
National University of Uzbekistan, Uzbekistan

Key scientific achievements:

- Development of a linear formalism for studying the interaction of shock waves with turbulence (Abdikamalov *et al.* 2016, Huete, Abdikamalov, Radice, 2018, Abdikamalov & Foglizzo 2020).
- Development and implementation of a new efficient, robust, and massively parallel Monte Carlo method for energy-, time-, and velocity-dependent radiation transport (Abdikamalov *et al.* 2012, Murchikova, Abdikamalov, Urbatsch, 2018).
- Development of new methods for measuring the angular momentum distribution in core-collapse supernova progenitors with gravitational waves (Abdikamalov *et al.* 2014).
- Three-dimensional high-resolution simulations of core-collapse supernovae in general relativity. New insights on the role of the standing accretion shock instability and neutrino-driven turbulent convection (Abdikamalov *et al.* 2015, Ott, Abdikamalov *et al.* 2013).
- Discovery of the correlation between the gravitational and neutrino signal from rapidly rotating core collapse supernovae (Ott, Abdikamalov *et al.* 2012).
- Demonstration of the existence of runaway instability in accretion disks around black holes (Korobkin, Abdikamalov *et al.* 2013).

Scientific Interests and Expertise

- Computational methods for multi-dimensional radiation transport. Deterministic and Monte Carlo approaches.
- Scientific high-performance computing. Application and development of simulation software to petascale parallel supercomputers and beyond.

- Core-collapse supernova theory. Numerical and analytical modeling of stellar core-collapse, postbounce evolution, explosion, nucleosynthesis. Connection to long gamma-ray bursts. Gravitational wave signature. Protoneutron star evolution. Nuclear and neutrino physics and astrophysics. Accretion-induced collapse of white dwarfs.
- Gravitational wave astronomy. Numerical and analytical modeling of astrophysical sources of gravitational radiation.

Research Funding Awards

- NU ORAU Grant, "*Probing Fundamental Physics via Core-Collapse Supernovae*", Role: **PI**, Funding period: 2015-2018
- MES Grant, "*Understanding Fast Radio Bursts and Exploiting Them as Probes of New Physics and Cosmology*", Role: **sub-project Leader**, Funding period: 2018-2021. Review score: 34.33 (highest in Kazakhstan).
- MES Target Program, "*Center of Excellence for Fundamental and Applied Physics*. Role: **co-PI**". Funding period: 2018-2021. Review core 32.
- Julian Schwinger Foundation Grant for the organization of the workshop "*Phenomenology of Strong Gravity*", 14-16 September, 2016. Role: **co-PI**.
- NU small ORAU grant "*Quantum gravity from outer space and the search for new extreme astrophysical phenomena*", Role: **Co-I**. Funding Period 2018-2021.
- NU Social Policy Grant, "*Novel Approaches to Radiation Transport*", Role: **PI**, 2015-2016
- NVIDIA Corporation Hardware Grant, "*Monte Carlo Radiation Transport on GPUs*", Role: **PI**, 2015-2016

Computer Time Awards

- NSF XSEDE computer time grant, XRAC, Co-I, 41 million service units, 2013-2014
- NSF XSEDE computer time grant, XRAC, Co-I, 9.5 million service units, 2012-2013
- NSF Teragrid computer time grant, TRAC, Co-I, 10.5 million service units, 2011-2012
- NSF Teragrid computer time grant, TRAC, Co-I, 7.6 million service units, 2010-2011
- LONI computer time grant, Co-I, 4.0 million service units, 2011-2012
- NERSC computer time grant, Co-I, 6 million service unit , 2012-2013

Teaching experience

- Physics I for Scientists and Engineers (Nazarbayev University, Fall 2014, 2016, 2017).
- Astronomy I (Nazarbayev University, Fall 2015).
- Computational Physics (Nazarbayev University, Spring 2015, 2016, 2017, 2018).
- Computational Modeling and Simulation, Graduate Course, (Nazarbayev University, Fall 2016, 2017).
- Physics II for Scientists and Engineers Recitations (Nazarbayev University, Spring 2015).

Other activities

- Creator and maintainer of the pages of the Department of Physics of Nazarbayev University on social media platforms facebook and twitter. 2015-present.
- Organizer of General Relativity Day at Nazarbayev University, 25/4/2015
- Organizer of Theoretical Astrophysics (TAPIR) seminars at Caltech. 9/2012-12/2013.
- Moderator of Friday morning astro-ph discussions at Caltech. 5/2013-3/2014.

Journal Referee

- Astrophysical Journal

- MNRAS, MNRAS Letters
- International Journal of Heat and Mass Transfer
- Journal of Physics G: Nuclear and Particle Physics

Languages

- English (fluent), Russian (fluent), Kazakh (basic), Karakalpak (native)

Refereed Publications (*h*-index: 20. Number of citations > 1,300. Source: google scholar)

- **E. Abdikamalov** and T. Foglizzo, *Acoustic Wave Generation in Collapsing Massive Stars with Convective Shells*, MNRAS, 493, 3496, 2020
- R. Kazeroni and **E. Abdikamalov**, *The impact of progenitor asymmetries on the neutrino-driven convection in core-collapse supernovae*, MNRAS, 2020
- C. Huete and **E. Abdikamalov**, *Response of nuclear-dissociating shocks to vorticity perturbations*, Physica Scripta 94, 094002, 2019
- D. Alina, I. Ristorcelli, L. Montier, **E. Abdikamalov**, M Juvela, J.-Ph. Bernard, E. R. Micelotta, *Statistical analysis of the interplay between magnetic fields and filaments hosting Planck Galactic Cold Clumps*, MNRAS, 485, 2825, 2019
- **E. Abdikamalov**, C. Huete, A. Nussupbekov, S. Berdibek, *Turbulence Generation by Shock-Acoustic-Wave Interaction in Core-Collapse Supernovae*, MDPI Particles, 1, 1, 7, 2018
- D. Radice, **E. Abdikamalov**, C. D. Ott, P. Mösta, S. Couch, L. Roberts, *Turbulence in Core-Collapse Supernovae*, Journal of Physics G, 45, 053003, 2018
- C. Huete, **E. Abdikamalov**, D. Radice, *The impact of vorticity waves on the shock dynamics in core-collapse supernovae*, MNRAS, 475, 3305, 2018
- E. Murchikova, **E. Abdikamalov**, T. Urbatsch, *Analytic closures for M1 neutrino transport*, MNRAS, 469, 1127, 2017,
- S. Richers, C. D. Ott, **E. Abdikamalov**, E. O'Connor, C. Sullivan, *Equation of state effects on gravitational waves from rotating core collapse*, Physical Review D, 95, 063019, 2017
- **E. Abdikamalov**, A. Zhakyslykov, D. Radice, S. Berdibek, *Shock-turbulence interaction in core-collapse supernovae*, MNRAS, 461:3864, 2016.
- D. Alina, L. Montier, I. Ristorcelli, J.-P. Bernard, F. Levrier, **E. Abdikamalov**, *Polarization measurement analysis III. Analysis of the polarization angle dispersion function with high precision, polarization data*, Astronomy & Astrophysics, 595, 57, 2016,
- D. Radice, C. D. Ott, **E. Abdikamalov**, S. M. Couch, R. Haas, E. Schnetter *Neutrino-Driven Convection in Core-Collapse Supernovae: High-Resolution Simulations*, ApJ 820:76, 2016
- J. Fuller, H. Klion, **E. Abdikamalov**, C. D. Ott, *Supernova Seismology: Gravitational Wave Signatures of Rapidly Rotating Core Collapse*, MNRAS, 450, 414, 2015
- **E. Abdikamalov**, C. D. Ott, D. Radice, L. Roberts, R. Haas, C. Reisswig, P. Mösta, H. Klion, and E. Schnetter, *Neutrino-driven Turbulent Convection and Standing Accretion Shock Instability in Three-Dimensional Core-Collapse Supernovae*, ApJ 808:70, 2015
- P. Mösta, S. Richers, C. D. Ott, R. Haas, T. Piro, K. Boydston, **E. Abdikamalov**, C. Reisswig, and E. Schnetter, *Magnetorotational Core-Collapse Supernovae in Three Dimensions*, 2014, Astrophysical Journal Letter 785:L29

- **E. Abdikamalov**, S. Gossan, A. DeMaio, C. D. Ott, *Measuring the Angular Momentum Distribution in Core-Collapse Supernova Progenitors with Gravitational Waves*, 2014, Physical Review D, 90, 044001
- C. Reisswig, C. D. Ott, **E. Abdikamalov**, R. Haas, P. Mösta, and E. Schnetter, *Formation and Coalescence of Cosmological Supermassive Black Hole Binaries in Supermassive Star Collapse*, Physical Review Letters, 111:151101, 2013
- C. Reisswig, C. D. Ott, R. Haas, **E. Abdikamalov**, P. Mösta, D. Pollney, E. Schnetter, *Three-Dimensional General-Relativistic Hydrodynamic Simulations of Binary Neutron Star Coalescence and Stellar Collapse with Multipatch Grids*, Physical review D 87:064023, 2013
- C. D. Ott, E. O'Connor, S. Gossan, **E. Abdikamalov**, U. C. T. Gamma, S. Drasco, *Core-collapse supernovae, neutrinos, and gravitational waves*, Nuclear Physics B – Proceedings Supplements, 235:381, 2013
- C. D. Ott, **E. Abdikamalov**, P. Mösta, R. Haas, S. Drasco, E. O'Connor, C. Reisswig, C. Meakin, E. Schnetter, *General-Relativistic Simulations of Three-Dimensional Core-Collapse Supernovae*, Astrophysical Journal 768:115, 2013
- O. Korobkin, **E. Abdikamalov**, N. Stergioulas, E. Schnetter, B. Zink, S. Rosswog, C. D. Ott, *The runaway instability in general-relativistic accretion disks*, MNRAS, 431:349, 2013
- D. Radice, **E. Abdikamalov**, L. Rezzolla, C. D. Ott, *A New Spherical Harmonics Scheme for Multi-Dimensional Radiation Transport I. Static Matter Configurations*, Journal of Computational Physics, 242:648, 2013
- **E. Abdikamalov**, A. Burrows, C. D. Ott, F. Lffler, E. O'Connor, J. Dolence, E. Schnetter, *A New Monte Carlo Method for Time-dependent Neutrino Radiation Transport*, The Astrophysical Journal, 755:111, 2012
- C. D. Ott, **E. Abdikamalov**, E. O'Connor, C. Reisswig, R. Haas, P. Kalmus, S. Drasco, A. Burrows, E. Schnetter, *Correlated gravitational wave and neutrino signals from general-relativistic rapidly rotating iron core collapse*, Physical Review D, 86:024026, 2012
- C. D. Ott, C. Reisswig, E. Schnetter, E. O'Connor, U. Sperhake, F. Löffler, P. Diener, **E. Abdikamalov**, I. Hawke, A. Burrows, *Dynamics and Gravitational Wave Signature of Collapsar Formation*, Physical Review Letters, 106:161103, 2011
- C. D. Ott, E. O'Connor, F. Peng, C. Reisswig, U. Sperhake, E. Schnetter, **E. Abdikamalov**, P. Diener, F. Lffler, I. Hawke, C. Meakin, A. Burrows, *New open-source approaches to the modeling of stellar collapse and the formation of black holes*, Ap&SS 336:151, 2011
- O. Korobkin, **E. Abdikamalov**, E. Schnetter, N. Stergioulas, B. Zink, *Stability of general-relativistic accretion disks*, Physical Review D, 83:043007, 2011
- **E. Abdikamalov**, C. D. Ott, L. Rezzolla, L. Dessart, H. Dimmelmeier, A. Marek, and H.-T. Janka, *Axisymmetric General Relativistic Simulations of the Accretion-Induced Collapse of White Dwarfs*, Physical Review D 81, 044012, 2010.
- **E. Abdikamalov**, H. Dimmelmeier, L. Rezzolla and J. C. Miller, *Relativistic Simulations of the Phase-Transition-Induced Collapse of Neutron stars*, MNRAS, 392:52, 2009.
- **E. Abdikamalov**, B. J. Ahmedov and J. C. Miller, *The Magnetosphere of Oscillating Neutron Stars in General Relativity*, MNRAS, 395:443, 2009.

Semi-popular articles

- C. Reisswig, C. D. Ott, **E. Abdikamalov**, R. Haas, P. Mösta, E. Schnetter, *The Formation of Two Supermassive Black Holes from a Single Collapsing Supermassive Star*, 2Physics, Dec 22, 2013

Invited Talks

- Seminar, *Hydrodynamic Instabilities in Supernovae*, University Carlos III of Madrid, October 3, 2019, Madrid Spain.
- Colloquium, *Core-Collapse Supernovae*, Albert Einstein Institute, March 26, 2019, Potsdam, Germany.
- Colloquium, *Core-Collapse Supernovae and Gravitational Waves*, GRAPPA, University of Amsterdam, December 10, 2018, Amsterdam, Netherlands.
- Invited Talk, *Impact of pre-collapse instabilities in core-collapse supernovae*. International workshop SNeGWv2018, October 8-10, 2018, Toyama, Japan
- Invited Lecture "Explosions of massive stars and formation of neutron stars", Helmholtz International Summer School (HISS), Dubna, 20-31 August, 2018
- Plenary Talk, *The Explosions of Massive Stars*, Petrov School 2017, November 27, 2017, Kazan, Russia.
- Plenary Talk, *Turbulence in Core-Collapse Supernovae*, Modern Physics of Compact Stars and Relativistic Gravity, Yerevan, Armenia, September 18, 2017
- Physics Lecture, *Turbulence in Core-Collapse Supernovae*, July 11, 2017, Moscow Institute of Physics and Technology, Moscow, Russia
- Physics Seminar, *The Explosions of Massive Stars*, June 13, 2016, University of Crete
- Seminar *Probing Core-Collapse Supernova Central Engine with Gravitational Waves*, 3rd International Workshop "Nuclear Physics and Astrophysics", Almaty, Kazakhstan, 14-16 April, 2016
- Physics Seminar, *Core-Collapse Supernovae*, Kazakh National University, Almaty, Kazakhstan, October 15, 2015
- Astrophysics Seminar, *Gravitational Waves from Core-Collapse Supernovae*, Albert Einstein Institute, Potsdam, Germany, August 5, 2015
- USA-Uzbekistan Conference in Physical Sciences and Engineering, *Core-Collapse Supernovae*, California State University Fullerton, May 21.
- CASA/JILA Astrophysics Lunch Seminar, JILA, University of Colorado Boulder *Core-Collapse Supernovae and Gravitational Waves* Boulder, February 7, 2014
- Physics Colloquium. California State University Los Angeles, *The Death of Massive Stars and Gravitational Waves*, Los Angeles, January 30, 2014,
- SIAM conference on computational science and engineering. *A New Monte Carlo method for radiation transport*, Boston, February 23, 2013
- LVC (LIGO-VIRGO Collaboration) extrig telecon talk. April 19, 2012. *Gravitational Waves from Core Collapse Supernovae*.
- Physics colloquium. Florida Atlantic University. April 8, 2011. *Computational Models of Long Gamma-Ray Burst Central Engines*.
- FAUST Seminar. Florida Atlantic University. April 7, 2011. *Accretion-Induced Collapse of White Dwarfs*.