Shamil Shakirov *Curriculum Vitae* *September 2024*

Contact

Shamil Shakirov
Beijing Institute of Mathematical Sciences and Applications
N 544, Hefangkou Village Huaibei Town, Huairou District, Beijing 101408
phone: +8618515096823
e-mail: shakirov@bimsa.cn

Education and Research Experience

2024 – *current* Beijing Institute of Mathematical Sciences and Applications
Assistant Professor, tenure track

2022 – 2024 Institute for Information Transmission Problems, Russia
Senior Researcher

2021 – 2022 University of Geneva, Switzerland
Department of Mathematics
Senior Researcher

2019 – 2020 Uppsala University, Sweden
Department of Mathematics
Researcher

2015 – 2018 Harvard University, Cambridge, USA
Harvard Society of Fellows and Department of Mathematics
Junior Fellow

2011 – 2015 University of California, Berkeley, USA
Department of Mathematics
Graduate student
Advisors: Mina Aganagic, Nikolai Reshetkihin
Ph.D. in Mathematics, June 2015

2009 – 2010 Institute for Theoretical and Experimental Physics (ITEP), Moscow, Russia
Junior Researcher

2007 – 2009 Moscow Institute of Physics and Technology (MIPT), Moscow, Russia
M.S. in Physics, June 2009

2005 – 2007 Moscow Institute of Physics and Technology (MIPT), Moscow, Russia
B.S. in Physics, June 2007

2002 – 2005 Kazan State University (KSU), Kazan, Russia

Honors and Awards

2017 – 2018	Milton Fund Award, Harvard University, USA
2015 – 2018	Harvard Junior Fellowship, Harvard University, USA
2015	Simons Junior Fellowship, Simons Foundation, USA (offer)
2008 – 2009	Moebius Foundation Fellowship, Russia
2008	1st place award at the Russian Moebius contest for the best research paper in mathematics and mathematical physics Paper: *Analogue of the identity Log Det = Trace Log for resultants* [44]
2008	Weisskopf diploma, 46rd International School of Subnuclear Physics, Italy
2007 - 2008	Dynasty Foundation Fellowship, Russia

Research Interests

I am a mathematician working in the field of Representation Theory with focus on relation to geometry, particularly Topology (quantum group invariants of knots, links and 3-manifolds, mapping class groups of surfaces, q-skein and double affine Hecke algebras) and Algebraic Geometry (representations of quantum Virasoro and $\mathcal{W}$-algebras associated with cohomology and K-theory of Nakajima quiver varieties). The role and importance of Mathematical Physics (topological quantum field theory, integrable systems, instantons and the String-Math interaction) in these domains has been increasingly recognized; my research is substantially inspired by advances in mathematical physics and benefits from recurring collaboration with physicists. This picture is complemented by my work on the interface with Probability (integrable probabilistic systems, Macdonald processes and random matrices) and a long-standing interest in Classical Invariant Theory (invariants of curves and surfaces, tensors, discriminants and resultants of algebraic equations). Key recent results that illustrate my research program include construction of a genus two analogue of the double affine Hecke algebra [14], formulation of a double elliptic generalization of Macdonald difference equations [8], development of a new method to compute observables of Macdonald processes [22], proof of a determinantal formula for the Cayley invariant of plane curves [24] among others.

Publication List

1 H.Awata, K.Hasegawa, H.Kanno, R.Ohkawa, Sh.Shakirov, J.Shiraishi, Y.Yamada
Non-stationary difference equation and affine Laumon space II: Quantum Knizhnik-Zamolodchikov equation
SIGMA 20 (2024), 077
https://arxiv.org/abs/2309.15364

2 S. Arthamonov, Sh. Shakirov
An Elliptic Generalization of A1 Spherical DAHA at K=2
International Mathematics Research Notices 19 (2024) 13046–13084
https://doi.org/10.1093/imrn/rnae192
https://arxiv.org/abs/2306.00215

3 H.Awata, K.Hasegawa, H.Kanno, R.Ohkawa, Sh.Shakirov, J.Shiraishi, Y.Yamada
Non-stationary difference equation and affine Laumon space: Quantization of discrete Painlev'e equation
SIGMA 19 (2023), 089
https://arxiv.org/abs/2211.16772

4 Sh. Shakirov
Non-stationary difference equation for q-Virasoro conformal blocks
Letters in Mathematical Physics 114 (2024) 115
https://doi.org/10.1007/s11005-024-01856-2
https://arxiv.org/abs/2111.07939

5 A. Gorsky, P. Koroteev, O. Koroteeva, Sh. Shakirov
Double Inozemtsev Limits of the Quantum DELL System
Phys.Lett.B 826 (2022) 136919
https://doi.org/10.48550/arXiv.2110.02157
https://arxiv.org/abs/2110.02157

6 A.Morozov, A.Popolitov and Sh. Shakirov
Harer-Zagier formulas for knot matrix models
Phys.Lett.B 818 (2021) 136370
https://doi.org/10.1016/j.physletb.2021.136370
https://arxiv.org/abs/2102.11187

7 A.Morozov, A.Popolitov and Sh. Shakirov
Quantization of Harer-Zagier formulas
Phys.Lett.B 811 (2020) 135932
https://doi.org/10.1016/j.physletb.2020.135932
https://arxiv.org/abs/2008.09577

8 P.Koroteev and Sh.Shakirov
The Quantum DELL System
Lett. Math. Phys. 110 (2020) 969–999
https://doi.org/10.1007/s11005-019-01247-y
https://arxiv.org/abs/1906.10354

9 R. Lodin, A. Popolitov, Sh. Shakirov and M. Zabzine
Solving q-Virasoro constraints
Lett. Math. Phys. 110 (2020) 179–210
https://doi.org/10.1007/s11005-019-01216-5
https://arxiv.org/abs/1810.00761

10 C. Kozaz, Sh. Shakirov, C. Vafa and W. Yan
Refined Topological Branes
Comm. Math. Phys. 385 (2021) 937–961
https://doi.org/10.1007/s00220-020-03883-1
http://arxiv.org/abs/1805.00993

11 A. Morozov, A. Popolitov and Sh. Shakirov
On (q,t)-deformation of Gaussian matrix model
Phys. Lett. B 784 (2018) 342-344
https://doi.org/10.1016/j.physletb.2018.08.006
http://arxiv.org/abs/1803.11401

12 C. Kozcaz, Sh. Shakirov and W. Yan
Argyres-Douglas Theories, Modularity of Minimal Models and Refined Chern-Simons
Adv.Theor.Math.Phys. 26 (2022) 3, 643-672
https://dx.doi.org/10.4310/ATMP.2022.v26.n3.a3
http://arxiv.org/abs/1801.08316

13 L. Bishler, An. Morozov, A. Sleptsov and Sh. Shakirov
On the block structure of the quantum R-matrix in the three-strand braids
Int. J. Mod. Phys. A 33 N. 17 (2018) 1850105
https://doi.org/10.1142/S0217751X18501051
http://arxiv.org/abs/1712.07034

14 S.Arthamonov and Sh.Shakirov
Genus Two Generalization of A_1 spherical DAHA
Selecta Mathematica 25 (2019) 17
https://doi.org/10.1007/s00029-019-0447-1
http://arxiv.org/abs/1704.02947

15 Sh. Shakirov and A. Sleptsov
Quantum Racah matrices and 3-strand braids in representation [3,3]
J. Geom. Phys. 166 (2021) 104273
https://doi.org/10.1016/j.geomphys.2021.104273
http://arxiv.org/abs/arXiv:1611.03797

16 Clay Cordova, Ben Heidenreich, Alexandr Popolitov, Shamil Shakirov
Orbifolds and Exact Solutions of Strongly-Coupled Matrix Models
Comm. Math. Phys. 361 (2018) 1235–1274
https://doi.org/10.1007/s00220-017-3072-x
http://arxiv.org/abs/1611.03142

17 S.Arthamonov and Sh.Shakirov
Refined Chern-Simons Theory in Genus Two
J. Knot Theory Ram. 29 N. 07 (2020) 2050044
https://doi.org/10.1142/S0218216520500443
http://arxiv.org/abs/1504.02620

18 M.Aganagic and Sh.Shakirov
Gauge/Vortex duality and AGT
in New Dualities of Supersymmetric Gauge Theories,
Mathematical Physics Studies, Springer, 2016
http://arxiv.org/abs/1412.7132

19 M.Aganagic, N.Haouzi and Sh.Shakirov
A-n Triality
http://arxiv.org/abs/1403.3657

20 M.Aganagic, N.Haouzi, C.Kozcaz and Sh.Shakirov
Gauge/Liouville Triality
Comm.Math.Phys., accepted http://arxiv.org/abs/1309.1687

21 Sh. Shakirov
Colored knot amplitudes and Hall-Littlewood polynomials
http://arxiv.org/abs/1308.3838

22 A. Borodin, I. Corwin, V. Gorin and Sh. Shakirov
Observables of Macdonald processes
Trans. Amer. Math. Soc. 368 (2016) 1517-1558
https://doi.org/10.1090/tran/6359
http://arxiv.org/abs/1306.0659

23 M. Aganagic and Sh. Shakirov
Refined Chern-Simons Theory and Topological String
http://arxiv.org/abs/1210.2733

24 A. Popolitov and Sh. Shakirov
On Undulation Invariants of Plane Curves
Michigan Math. J. 64-1 (2015) 143-153
https://doi.org/10.1307/mmj/1427203288
http://arxiv.org/abs/1208.5775

25 A.Mironov, A.Morozov and Sh.Shakirov
Torus HOMFLY as the Hall-Littlewood Polynomials
J. Phys. A. Math. Theor. 45 (2012) 355202
http://arxiv.org/abs/1203.0667

26 A. Mironov, A. Morozov, Sh. Shakirov and A. Sleptsov
Interplay between MacDonald and Hall-Littlewood expansions of extended torus superpolynomials
JHEP 2012 (2012) 70
http://arxiv.org/abs/1201.3339

27 M. Aganagic and Sh. Shakirov
Knot Homology from Refined Chern-Simons Theory
Comm.Math.Phys. 333 (2015) 187-228
https://doi.org/10.1007/s00220-014-2197-4
http://arxiv.org/abs/1105.5117

28 A.Mironov, A.Morozov, Sh.Shakirov and A.Smirnov
Proving AGT conjecture as HS duality: extension to five dimensions
Nucl. Phys. B 855 (2012) 128-151
https://doi.org/10.1016/j.nuclphysb.2011.09.021
http://arxiv.org/abs/1105.0948

29 A.Mironov, A.Morozov, A.Popolitov and Sh.Shakirov
Resolvents and Seiberg-Witten representation for Gaussian beta-ensemble
Theor. Math. Phys. 171:1 (2012) 505-522
https://doi.org/10.1007/s11232-012-0049-y
http://arxiv.org/abs/1103.5470

30 A.Mironov, A.Morozov and Sh.Shakirov
A direct proof of AGT conjecture at $\beta = 1$
JHEP 1102 (2011) 067
https://doi.org/10.1007/JHEP02(2011)067
http://arxiv.org/abs/1012.3137

31 A.Mironov, A.Morozov and Sh.Shakirov
Towards a proof of AGT conjecture by methods of matrix models
Int. J. Mod. Phys. A 27 (2012) 1230001
https://doi.org/10.1142/S0217751X12300013
http://arxiv.org/abs/1011.5629

32 A.Mironov, A.Morozov and Sh.Shakirov
Brezin-Gross-Witten model as the pure gauge limit of Selberg correlators
JHEP 1103 (2011) 102
https://doi.org/10.1007/JHEP03(2011)102
http://arxiv.org/abs/1011.3481

33 A.Mironov, A.Morozov and Sh.Shakirov
On Dotsenko-Fateev representation of the toric conformal blocks
J. Phys. A 44 (2011) 085401
https://doi.org/10.1088/1751-8113/44/8/085401
http://arxiv.org/abs/1010.1734

34 A.Morozov and Sh.Shakirov
From Brezin-Hikami to Harer-Zagier formulas for Gaussian correlators
http://arxiv.org/abs/1007.4100

35 A.Morozov and Sh.Shakirov
The matrix model version of AGT conjecture and CIV-DV prepotential
JHEP 1008 (2010) 066
https://doi.org/10.1007/JHEP08(2010)066
http://arxiv.org/abs/1004.2917

36 A.Mironov, A.Morozov and Sh.Shakirov
Conformal blocks as Dotsenko-Fateev integral discriminants
Int. J. Mod. Phys. A 25 (2010) 3173-3207
https://doi.org/10.1142/S0217751X10049141
http://arxiv.org/abs/1001.0563

37 Sh.Shakirov
Exact solution for mean energy of 2d Dyson gas at $\beta = 1$
Phys. Lett. A 375 (2011) 984-989
https://doi.org/10.1016/j.physleta.2011.01.004
http://arxiv.org/abs/0912.5520

38 A.Mironov, A.Morozov and Sh.Shakirov
Matrix model conjecture for exact BS periods and Nekrasov Functions
JHEP 1002 (2010) 030
https://doi.org/10.1007/JHEP02(2010)030
http://arxiv.org/abs/0911.5721

39 A.Morozov and Sh.Shakirov
New and Old Results in Resultant theory
Theor. Math. Phys. 163:2 (2010) 587-617
https://doi.org/10.1007/s11232-010-0044-0
http://arxiv.org/abs/0911.5278

40 N.Perminov and Sh.Shakirov
Discriminants of Symmetric Polynomials
http://arxiv.org/abs/0910.5757

41 A.Morozov and Sh.Shakirov
On Equivalence of two Hurwitz Matrix Models
Mod. Phys. Lett. A, Vol. 24, No. 33 (2009) 2659-2666
https://doi.org/10.1142/S0217732309031995
http://arxiv.org/abs/0906.2573

42 A.Morozov and Sh.Shakirov
Exact 2-point function in Hermitian matrix model
JHEP 0912 (2009) 003
http://arxiv.org/abs/0906.0036

43 A.Morozov and Sh.Shakirov
Introduction to Integral Discriminants
JHEP 0912 (2009) 002
https://doi.org/10.1007/JHEP12(2009)002
http://arxiv.org/abs/0903.2595

44 A.Morozov and Sh.Shakirov
Generation of matrix models by W-operators
JHEP 0904 (2009) 064
https://doi.org/10.1007/JHEP04(2009)064
http://arxiv.org/abs/0902.2627

45 A.Anokhina, A.Morozov and Sh.Shakirov
Resultant as the determinant of Koshul complex
Theoretical and Mathematical Physics 160:3 (2009) 1203-1228
https://doi.org/10.1007/s11232-009-0111-6
http://arxiv.org/abs/0812.5013

46 A.Morozov and Sh.Shakirov
Resultants and contour integrals
Funct. Anal. Appl. 46 (2012) 33-40
https://doi.org/10.1007/s10688-012-0004-6
http://arxiv.org/abs/0807.4539

47 A.Morozov and Sh.Shakirov
Analogue of the identity Log Det = Trace Log for resultants
Geom. Phys. 61 (2010) 708-726
https://doi.org/10.1016/J.GEOMPHYS.2010.12.001
http://arxiv.org/abs/0804.4632

48 E.Akhmedov and Sh.Shakirov
Gluing of surfaces with polygonal boundaries
Funct. Anal. Appl. 43 (2009) 245-253
https://doi.org/10.1007/s10688-009-0033-y
http://arxiv.org/abs/0712.2448

49 V.Dolotin, A.Morozov and Sh.Shakirov
Higher nilpotent analogues of A-infinity structure
Phys.Lett.B 651 (2008) 71-73
https://doi.org/10.1016/j.physletb.2007.05.022
http://arxiv.org/abs/0704.2884

50 V.Dolotin, A. Morozov and Sh.Shakirov
A-infinity structure on simplicial complexes
Theor. Math. Phys. 156 (2008) 965-995
https://doi.org/10.1007/s11232-008-0093-9
http://arxiv.org/abs/0704.2609

51 Sh. Shakirov
Higher discriminants of binary forms
Theor. Math. Phys. 153 (2007) 1477-1486
https://doi.org/10.1007/s11232-007-0129-6
http://arxiv.org/abs/math.AG/0609524

Hirsch publication index:

H-index = 18 via Scopus, *https://www.scopus.com/authid/detail.uri?authorId=23019630900*
H-index = 19 via InspireHEP, *http://inspirehep.net/author/profile/S.Shakirov.1*

Schools and Conferences

2023	16th MSJ-SI School and Workshop ”Elliptic Integrable Systems, Representation Theory and Hypergeometric Functions” (Tokyo, Japan)
2021	Workshop ”Randomness, Integrability and Representation Theory in Quantum Field Theory” (Osaka, Japan)
2019	String-Math Conference (Uppsala, Sweden)
2019, organizer	Workshop ”Mathematics and Physics of Knots” (Stockholm, Sweden)
2018	Conference ”Current Progress in Mathematical Physics” (Cambridge, USA)
2017	Conference ”Progress in Quantum Field Theory and String Theory II” (Osaka, Japan)
2016	5th Workshop on Combinatorics of Moduli Spaces (Moscow, Russia)
2015	2015 Program ”Knot homologies, BPS states, and SUSY gauge theories” (Stony Brook, USA)
2014	2014 Summer Simons Workshop in Mathematics and Physics (Stony Brook, USA)
2013	2013 Summer Simons Workshop in Mathematics and Physics (Stony Brook, USA)
2013	Summer School on Link Homology (Montreal, Canada)
2013	String-Math Conference (Stony Brook, USA)
2012	Workshop on Tensors and their Geometry (Berkeley, CA)
2011	2011 Summer Simons Workshop in Mathematics and Physics (Stony Brook, USA)
2010	3rd Workshop on Geometric Methods in Theoretical Physics (Trieste, Italy)
2009	2nd Workshop on Geometric Methods in Theoretical Physics (Trieste, Italy)
2009	Second International Conference on String Field Theory and Related Aspects (Moscow)
2008	46rd International School of Subnuclear Physics (Erice, Italy)
2008	Workshop on Geometric Methods in Theoretical Physics (Trieste, Italy)
2005	43rd International School of Subnuclear Physics (Erice, Italy)
2005	4th International Workshop “Quantum Particles and Fields” (Baku)
2004 - 2009	IV,V,VI,VII,VIII International Schools ITF-ITEP (Kiev)
2004	XVI International Summer Petrov School (Kazan)

Teaching Experience

Course Instructor,
"Combinatorial Methods in Mathematical Physics",
Moscow Institute of Physics and Technology, Moscow, Fall 2009

Mentoring undergratuate student research,
Moscow Institute of Physics and Technology, Moscow, Spring 2010

Graduate Student Instructor,
"Methods of Mathematics: Calculus, Statistics, and Combinatorics",
University of California, Berkeley, Math 10A, Fall 2014, Prof. Per Persson

Course Instructor,
"Matrix models at finite N",
University of Geneva, Switzerland, Spring 2022

Personal Information

Date and place of birth: January 8th, 1986, Kazan, Russia
Citizenship: Russia
Civil Status: Single
Languages: Russian (native), English (fluent), German (basic)