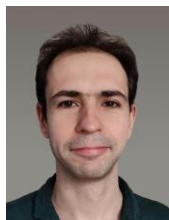


# Curriculum Vitae: Kirill Sheberstov



CNRS Research Scientist  
École Normale Supérieure, Paris  
Département de chimie  
24, rue Lhomond  
75005 Paris

kirill.sheberstov@ens.psl.eu  
06 99 83 01 42

## Education and working experience

- Since 2024      CNRS research scientist at the Chimie Physique et Chimie du Vivant (CPCV, UMR 8228), Département de Chimie, École Normale Supérieure, PSL Université, Sorbonne Université, CNRS, Paris, France.
- 11/2025      Habilitation à Diriger des Recherches (HDR),  
École Normale Supérieure (ENS), Paris, France.  
Thesis title: Spin physics of proton singlet states in aliphatic chains.
- 2021 – 2023      Postdoctoral research fellow at the Laboratoire des Biomolécules, Département de Chimie, École Normale Supérieure, PSL Université, Paris, France.  
Work direction: Development of NMR for high-throughput drug screening.  
Group of Prof. Geoffrey Bodenhausen
- 2018 – 2021      Early-stage research fellow (Marie Curie) at the Johannes Gutenberg-Universität (JGU), Mainz, Germany.  
Work direction: Zero- to ultralow field (ZULF) NMR and photochemically induced dynamic nuclear polarization (photo-CIDNP)  
Group of Prof. Dmitry Budker
- 2016 – 2019      PhD in chemical physics at the International Tomography Center of the Siberian Branch of the Russian Academy of Sciences (ITC SB RAS), Novosibirsk, Russia.  
PhD thesis: Long-lived states in nuclear spin systems close to equivalence  
Supervisor: Prof. Alexandra V. Yurkovskaya
- 01/2016–08/2016      Internship at the University of Geneva (UNIGE), Geneva, Switzerland.  
Supervisor: Dr. Damien Jeanneart
- 2013-2019      Junior research associate at the State Research Institute for Chemistry and Technology of Organoelement Compounds, Laboratory of NMR spectroscopy, Moscow, Russia.
- 2010 – 2012      Master's degree in chemistry at the Faculty of Material Sciences at the Moscow State University (MSU), Moscow, Russia.  
Master thesis: Standardization of registration conditions and processing parameters of NMR spectra of biofluids  
Supervisor: Prof. Nickolay M. Sergeev
- 2006 – 2010      Bachelor's degree in "Chemistry, physics and mechanics of materials" at the Faculty of Material Sciences at the Moscow State University

(MSU), Moscow, Russia.

Bachelor thesis:  $^1\text{H}$  NMR spectroscopy and principal component analysis for the biological fluids research

Supervisor: Prof. Nickolay M. Sergeyev

## Research interests

Chemical physics • Nuclear magnetic resonance (NMR) • Quantum Information Theory • Spin hyperpolarization • Long-lived spin states • Photochemistry • Dynamic nuclear polarization (DNP) • Drug screening via NMR

## Summary of expertise

I specialize in harnessing hyperpolarization techniques and long-lived spin states to push the limits of nuclear magnetic resonance. My work spans both methodological development and instrumentation:

- **Long-Lived Spin States**
  - Discovered and characterized proton long-lived states in aliphatic chains.
  - Developed robust manipulation schemes compatible with standard NMR/MRI platforms.
- **Hyperpolarization Methods**
  - Advanced parahydrogen-induced polarization (PHIP), photochemically induced dynamic nuclear polarization (photo-CIDNP) and DNP.
  - Applied these techniques to zero- to ultralow-field NMR, unlocking high-sensitivity detection without large magnets.
- **Software & Data Processing**
  - Contributed to NMR total-lineshape analysis software, enabling precise simulation and fitting of complex spectra.
  - Implemented reference-deconvolution workflows for phase-sensitive 2D correlation experiments, improving resolution and artifact suppression.
- **Hardware & Automation**
  - Designed zero-field NMR spectrometers and bespoke hardware components.
  - Proposed and prototyped low-cost robotic automation of NMR experiments to enhance throughput and reproducibility.

## Co-supervision of PhD students

Currently I am a co-supervisor (co-encadrement) of 5 PhD students at ENS: Coline Wiame, Sebastiaan van Dyck, Hao Xuan, and Aiky Razanahoera, Felicia Cilenov

## Peer-reviewed journal publications:

1. C. Wiame, S. Van Dyck, K.F. Sheberstov\*, A. Razanahoera, G. Bodenhausen, “*Long-lived states involving a manifold of fluorine-19 spins in fluorinated aliphatic chains*” // Magn. Reson. 6 (**2025**), 273–279. (corresponding author)
2. K.F. Sheberstov\*, E.V. Dyke, J. Xu, R. Kircher, L. Chuchkova, Y. Hu, S. Alvi, D. Budker, D.A. Barskiy\*, “*Robotic arms for hyperpolarization-enhanced NMR experiments*” // J. Magn. Reson. Open 23 (**2025**), 100194. (shared corresponding author)
3. D.A. Barskiy, J. W. Blanchard, D. Budker, J. Eills, S. Pustelny, K. F. Sheberstov, M.C.D. Tayler, A. H. Trabesinger, “*Zero- to Ultralow-Field Nuclear Magnetic Resonance*” // Prog. Nucl. Magn. Reson. Spectrosc. 148–149 (**2025**), 101558.

4. E.V. Dyke, J. Eills, K.F. Sheberstov, J. Blanchard, M. Wagner, A. E. Wedenig, K. Gaul, R. Berger, R. Pietschnig, D. Kargin, D.A. Barskiy, D. Budker, "Towards Detection of Molecular Parity Violation via Chiral Co-sensing: the  $^1\text{H}/^{31}\text{P}$  Model System" // *Phys. Chem. Chem. Phys.* 27 (2025), 6092-6103
5. K. F. Sheberstov\*, A. Sonnefeld, G. Bodenhausen\*, "Collective Long-Lived Zero-Quantum Coherences in Aliphatic Chains" // *J. Chem. Phys.* 160 (2024), 144308, (shared corresponding author)
6. R. Picazo-Frutos, K. F. Sheberstov, J. W. Blanchard, E. Van Dyke, M. Reh, T. Sjoelander, A. Pines, D. Budker, D. A. Barskiy, "Zero-Field J-spectroscopy of Quadrupolar Nuclei" // *Nat. Commun.* 15 (2024), 4487.
7. Z. Pang, K. Sheberstov, B. A. Rodin, J. Lumsden, U. Banerjee, D. Abergel, F. Mentink-Vigier, G. Bodenhausen, and K.O. Tan, "Hypershifted spin spectroscopy with dynamic nuclear polarization at 1.4 K" // *Sci. Adv.* 10 (2024), eadr7160.
8. A. Razanahoera, A. Sonnefeld, K. Sheberstov\*, P. Narwal, M. Minaei, K. Kouřil\*, G. Bodenhausen, and B. Meier\*, "Hyperpolarization of Long-Lived States of Protons in Aliphatic Chains by Bullet Dynamic Nuclear Polarization, Revealed on the Fly by Spin-Lock-Induced Crossing" // *J. Phys. Chem. Lett.* 15 (2024), 9024–9029. (shared corresponding author)
9. L. Chuchkova, S. Bodenstedt, R. Picazo-Frutos, J. Eills, O. Tretiak, Y. Hu, D. A. Barskiy, J. de Santis, M. C. D. Tayler\*, D. Budker, K. F. Sheberstov\*, "Magnetometer-Detected Nuclear Magnetic Resonance of Photochemically Hyperpolarized Molecules" // *J. Phys. Chem. Lett.* 14 (2023), 6814 – 6822. doi: 10.1021/acs.jpcclett.3c01310 (shared corresponding author)
10. A. Razanahoera, A. Sonnefeld, G. Bodenhausen, K. Sheberstov\*. "Paramagnetic Relaxivity of Delocalized Long-Lived States of Protons in Chains of CH<sub>2</sub> Groups" // *Magn. Reson.* 4 (2023), 47 – 56. doi: 10.5194/mr-4-47-2023 (corresponding author)
11. Q. Stern, K. Sheberstov, "Simulation of NMR spectra at zero- and ultra-low field from A to Z – a tribute to Prof. Konstantin L'vovich Ivanov" // *Magn. Reson.* 4 (2023), 87 – 109. 10.5194/mr-4-87-2023.
12. A. Sonnefeld, A. Razanahoera, P. Pelupessy, G. Bodenhausen, K. Sheberstov\*. "Long-lived states of methylene protons in achiral molecules" // *Sci. Adv.* 8 (2022), eade2113. doi: 10.1126/sciadv.ade2113 (corresponding author)
13. A. Sonnefeld, G. Bodenhausen, K. Sheberstov\*. "Polychromatic Excitation of Delocalized Long-Lived Proton Spin States in Aliphatic Chains". // *Phys. Rev. Lett.* 129 (2022), 183203. doi: 10.1103/PhysRevLett.129.183203. (corresponding author)
14. E. T. Van Dyke, J. Eills, R. Picazo-Frutos, K. F. Sheberstov, Y. Hu, D. Budker, D. A. Barskiy, "Relayed Hyperpolarization for Zero-Field Nuclear Magnetic Resonance" // *Sci. Adv.* 8 (2022), eabp9242. doi: 10.1126/sciadv.abp9242.
15. K.F. Sheberstov\*, L. Chuchkova, Y. Hu, I.V. Zhukov, A.S. Kiryutin, A.V. Eshtukov, D.A. Cheshkov, D.A. Barskiy, J.W. Blanchard, D. Budker, K.L. Ivanov, A.V. Yurkovskaya "Photochemically induced dynamic nuclear polarization of heteronuclear singlet order" // *J. Phys. Chem. Lett.* 12 (2021), 4686-4691. doi: 10.1021/acs.jpcclett.1c00503 (corresponding author)
16. K. Sheberstov\*, V. Kozinenko, A. Kiryutin, H.-M. Vieth, H. Zimmermann, K. Ivanov, A. Yurkovskaya "Hyperpolarization of cis- $^{15}\text{N}_2$ -azobenzene by parahydrogen at ultralow magnetic

fields" // ChemPhysChem 22 (2021), 1527–1534. doi: 10.1002/cphc.202100160 (corresponding author)

17. B.A. Rodin, J. Eills, R. Picazo-Frutos, K.F. Sheberstov, D. Budker, K.L. Ivanov. "Constant-adiabaticity ultralow magnetic field manipulations of parahydrogen-induced polarization: application to an AA'X spin system" // Phys. Chem. Chem. Phys. 23 (2021), 7125-7134, doi: 10.1039/d0cp06581a
18. K.F. Sheberstov, E.S. Guardiola, M. Pupier, D. Jeannerat. "SAN plot: a Graphical representation of the signal, noise and artifacts content of spectra" // Magn. Reson. Chem. 58 (2020), 466-472.
19. K.F. Sheberstov, E.S. Guardiola, D. Jeannerat, "Everything you wanted to know about phase and reference frequency in one- and two-dimensional NMR spectroscopy" // Magn. Reason. Chem. 58, (2020), 376-389. doi: 10.1002/mrc.4938
20. B.A. Rodin, C. Bengs, A.S. Kiryutin, K.F. Sheberstov, L.J. Brown, R.C.D. Brown, A.V. Yurkovskaya, K.L. Ivanov, M.H. Levitt. "Algorithmic cooling of nuclear spins using long-lived singlet order" // J. Chem. Phys. 152 (2020), 164201. doi: 10.1063/5.0006742
21. K.F. Sheberstov\*, H.-M. Vieth, H. Zimmermann, B.A. Rodin, K.L. Ivanov, A.S. Kiryutin, A.V. Yurkovskaya\*, "Generating and sustaining long-lived spin states in  $^{15}\text{N}$ ,  $^{15}\text{N}'$ -azobenzene" // Sci. Rep., 9 (2019), 20161. doi: 10.1038/s41598-019-56734-y (shared corresponding author)
22. K.F. Sheberstov\*, A.S. Kiryutin, C. Bengs, J.T. Hill-Cousins, L.J. Brown, R.C.D. Brown, G. Pileio, M.H. Levitt, A.V. Yurkovskaya, K.L. Ivanov\* "Excitation of singlet–triplet coherences in pairs of nearly-equivalent spins" // Phys. Chem. Chem. Phys., 21 (2019) 6087-6100. doi: 10.1039/C9CP00451C (shared corresponding author)
23. B.A. Rodin, K.F. Sheberstov, A.S. Kiryutin, L.J. Brown, R.C.D. Brown, M. Sabba, M.H. Levitt, A.V. Yurkovskaya, K.L. Ivanov, "Fast destruction of singlet order in NMR experiments" // J. Chem. Phys., 151 (2019), 234203. doi: 10.1063/1.5131730
24. B.A. Rodin, K.F. Sheberstov, A.S. Kiryutin, J.T. Hill-Cousins, L.J. Brown, R.C.D. Brown, B. Jamain, H. Zimmermann, R.Z. Sagdeev, A.V. Yurkovskaya, K.L. Ivanov, "Constant-adiabaticity radiofrequency pulses for generating long-lived singlet spin states in NMR" // J. Chem. Phys., 150 (2019) 064201. doi: 10.1063/1.5079436
25. K.F. Sheberstov, H.-M. Vieth, H. Zimmermann, K.L. Ivanov, A.S. Kiryutin, A. V. Yurkovskaya, "Cis- versus trans-azobenzene: precise determination of NMR parameters and analysis of long-lived states of  $^{15}\text{N}$  spin pairs" // Appl. Magn. Reson., 49 (2018) 293-207. doi: 10.1007/s00723-017-0968-8
26. D.A. Cheshkov, K.F. Sheberstov, D.O. Sinitsyn, V.A. Chertkov, "ANATOLIA: NMR software for spectral analysis of total lineshape" // Magn. Reson. Chem., 56 (2018), 449-457. doi: 10.1002/mrc.4689
27. M. Brucka, K.F. Sheberstov, D. Jeannerat, "Homonuclear decoupling in the  $^{13}\text{C}$  indirect dimension of HSQC experiments for  $^{13}\text{C}$ -enriched compounds" // Magn. Reson. Chem., 56 (2018), 1021-1028. doi: 10.1002/mrc.469
28. K.F. Sheberstov, D.O. Sinitsyn, D.A. Cheshkov, D. Jeannerat, "Elimination of signals tilting caused by  $B_0$  field inhomogeneity using 2D-lineshape reference deconvolution" // J. Magn. Reson., 281 (2017) 229–240. doi: 10.1016/j.jmr.2017.06.005
29. D. A. Cheshkov, D. O. Sinitsyn, K. F. Sheberstov, V. A. Chertkov, "Total lineshape analysis of

*high-resolution NMR spectra powered by simulated annealing* // J. Magn. Reson., 272 (2016) 10–19. doi: 10.1016/j.jmr.2016.08.012

30. K. F. Sheberstov V.A. Chertkov. “Additivity of molecular magnetic susceptibility for chlorosubstituted naphthalenes” // Rus. Chem. Bull., 4 (2015) 794–799. doi: 10.1007/s11172-015-0935-1

## Oral presentations at conferences and online seminars:

1. “Long-Lived Spin Order in Aliphatic Chains: From Quantum Delocalization to Biomedical Applications” // Global NMR discussion meetings, **2025**.
2. “Precise vicinal J-couplings to determine rotamer populations in aliphatic chains by spin-chain zero-quantum spectroscopy” // EUROMAR **2025**, Oulu, Finland.
3. “Hyperpolarization of heteronuclear long-lived states by photo-CIDNP” // Webinar on light-coupled NMR and photohyperpolarization for life-sciences organized by ETHZ and NexMR **2025**.
4. “Long-Lived Coherences in Chains of Methylene Protons” // EUROMAR **2023**, Glasgow, UK.
5. *Delocalized long-lived proton spin states in aliphatic chains* // ENS chemistry Department Day **2023**, Paris, France.
6. *Delocalized long-lived proton spin states in aliphatic chains* // International Council on Magnetic Resonance in Biological Systems for Early Career Researchers **2022**, online meeting.
7. *Delocalized long-lived proton spin states in aliphatic chains* // Intercontinental NMR seminar **2022**, online meeting.
8. *Ultralow-field NMR detection of photochemically induced dynamic nuclear polarization* // EUROMAR **2022**, Utrecht, Netherlands.
9. *Reference deconvolution and total lineshape analysis of 2D NMR spectra* // Intercontinental NMR seminar **2021**, online meeting.
10. *Photo-chemically induced dynamic nuclear polarization of heteronuclear singlet order* // Parahydrogen Enhanced Resonance Meeting **2021**, online conference.
11. *Long-lived states and SABRE hyperpolarization of  $^{15}\text{N}$  spins in azobenzene* // Intercontinental NMR seminar **2020**, online meeting.
12. *Singlet-triplet coherences in nuclear magnetic resonance* // Searching for new physics with cold and controlled molecules **2018**, Mainz, Germany.

## Conference poster presentations:

1. Kirill F. Sheberstov, Liubov Chuchkova, Ivan V. Zhukov, Alexey S. Kiryutin, Artur V. Eshtukov, Dmitry A. Cheshkov, John W. Blanchard, Dmitry Budker, Konstantin L. Ivanov, Alexandra V. Yurkovskaya, „Photo-chemically induced dynamic nuclear polarization of heteronuclear singlet order“ // EUROMAR-2020
2. Kirill Sheberstov, John W. Blanchard, Konstantin Ivanov, Alexey Kiryutin, Hans-Martin Vieth, Alexandra Yurkovskaya, Herbert Zimmermann, Dmitry Budker, „Zero- to ultralow- field NMR spectroscopy of azobenzene hyperpolarized by SABRE“ // PERM-2020.
3. K. F. Sheberstov, H.-M. Vieth, H. Zimmermann, B.A. Rodin, A.S. Kiryutin, K. L. Ivanov, A. V. Yurkovskaya, “Long-lived nuclear spin states in  $^{15}\text{N}$  labeled trans-azobenzene” // EUROMAR-2019, Berlin, Germany, Magnetic Resonance Conference. Book of Abstracts, p. 639.
4. K. F. Sheberstov, J. W. Blanchard, D. Budker, “Photo-chemically induced dynamic nuclear polarization detected by zero and ultra-low field NMR” // WOPM-2019, Mainz, Germany, Workshop on Optically-pumped magnetometry.
5. K. F. Sheberstov, C. Bengs, J. T. Hill-Cousins, L. J. Brown, R. C. D. Brown, G. Pileio, M. H. Levitt, A. V. Yurkovskaya, K. L. Ivanov, “Excitation of singlet-triplet coherences in the NMR of near-equivalent spin pairs”// EUROMAR-2018, Nantes, France, Magnetic Resonance

- Conference. Book of Abstracts, p. 406.
6. K.F. Sheberstov, A.N. Pravdivtsev, A.S. Kiryutin, H.-M. Vieth, K.L. Ivanov, A.V. Yurkovskaya, “*Nuclear long-lived state in <sup>15</sup>N-enriched azobenzenes*” // IX International Voevodsky Conference, “Physics and Chemistry of Elementary Chemical Processes”, Novosibirsk, **2017**, Book of Abstracts, p. 159.
  7. K. F. Sheberstov, D. O. Sinitsyn, D. Jeannerat, “*2D lineshape reference deconvolution for elimination of signal tilting*” // EUROMAR-**2016** Magnetic Resonance Conference. Book of Abstracts, p. 208.
  8. D. A. Cheshkov, D. O. Sinitsyn, K. F. Sheberstov, V. A. Chertkov, “*Total lineshape analysis of NMR spectra by simulated annealing*” // EUROMAR-**2016** Magnetic Resonance Conference. Book of Abstracts, p. 210.

## Funding and scholarship

1. Agence Nationale de la Recherche, THROUGH-NMR (ANR-24-CE93-0011-01, 361 kEuro), 2025 – 2028.
2. CIFRE PhD with Sanofi & ANRT (300 k€) — 2025–2028.
3. Internal University Research Funding Stufe I at the JGU Mainz (15 kEuro), 2020
4. Marie Skłodowska-Curie Early-Stage Researcher Fellowship for the ZULF ITN, 2018
5. Russian Foundation for Basic Research project to support PhD, 2017-2018

## Organizing activity

Member of the organizing committee of the 1<sup>st</sup> international conference on ZULF NMR, August 2020: <https://conference.zulf.eu/>

## Referees

### PhD supervisor

Prof. Alexandra V. Yurkovskaya  
International Tomography  
Center, Siberian Branch of  
Russian Academy of Sciences  
(ITC SB RAS)  
Novosibirsk  
630090  
Russia  
[yurk@tomo.nsc.ru](mailto:yurk@tomo.nsc.ru)

### Research supervisor

Prof. Dmitry Budker  
Helmholtz Institute Mainz  
JGU Mainz  
Mainz  
55128  
Germany  
[budker@uni-mainz.de](mailto:budker@uni-mainz.de)

### Research supervisor

Prof. Geoffrey Bodenhausen  
École Normale Supérieure  
Paris  
75005  
France  
[geoffrey.bodenhausen@ens.psl.eu](mailto:geoffrey.bodenhausen@ens.psl.eu)