

Maximilian Beyer

CONTACT INFORMATION	Department of Physics and Astronomy Vrije Universiteit (VU) Amsterdam De Boelelaan 1081 1081 HV Amsterdam, The Netherlands	<i>Phone:</i> +31 20 598 38 40 <i>E-mail:</i> m.beyer@vu.nl
NATIONALITY	German	
DATE OF BIRTH	4 th January, 1989	
PLACE OF BIRTH	Forst (Lausitz), Germany	
APPOINTMENTS	Department of Physics and Astronomy, Vrije Universiteit Amsterdam, The Netherlands Assistant Professor (tenured since October 2022)	11/2020 – present
	Department of Physics, Yale University, USA Postdoctoral Associate in the group of Prof. David DeMille	08/2018 – 10/2020
EDUCATION	ETH Zurich, Switzerland Ph.D. in Physical Chemistry Title: "Precision spectroscopy and dynamics of molecular hydrogen and its ion" Advisor: Prof. Frédéric Merkt MSc. Chemistry BSc. Chemistry	09/2012 – 07/2018 02/2011 – 09/2012 09/2008 – 02/2012
	Max-Steenbeck-Gymnasium, Cottbus, Germany High-school diploma	2003 – 2008
HONORS AND AWARDS	Dutch Research Council NWO Talent Programme Veni ETH Zurich, Switzerland ETH Medal for outstanding Doctoral Thesis ETH Medal for outstanding Master Thesis Oskar-Jeger Scholarship Swiss Chemical Society, Bern, Switzerland Best Poster Presentation, SCS Fall Meeting German Academic Scholarship Foundation, Bonn, Germany Scholarship	2020 2019 2013 2011 – 2012 2016 2008 – 2012

	40th International Chemistry Olympiad Budapest, Hungary	2008
	Bronze medal	
	4th European Union Science Olympiad Brussels, Belgium	2006
	1st place, gold medal	
	3th European Union Science Olympiad Galway, Ireland	2005
	2nd place, gold medal	
GRANTS	<ul style="list-style-type: none"> • "Quantum-engineered precision measurements of simple atoms and molecules - what fundamental physics is hiding in the next decimal place?", Dutch Research Council (NWO), ENW XL 2021, Co-PI, 2319 kEUR • "What is wrong with the deuteron? Searching for new physics by swapping protons and deuterons in a molecular clock", Dutch Research Council (NWO), ENW M21-2, Co-PI, 700 kEUR • "Weakly bound molecular ions to probe fundamental physics", Dutch Research Council (NWO), NWO Talent Programme Veni, 04/21-04/24, 250 kEUR 	
TEACHING	Lecturer	2021 – present
	VU Amsterdam, The Netherlands	
	<ul style="list-style-type: none"> • System Analysis, 2021-2023, Bachelor-level course • Engineering Thermodynamics, 2022, Bachelor-level course • Atomic, molecular and optical physics workshop, 2021-2023, Bachelor-level course 	
	Teaching Assistant	2010 – 2018
	ETH Zurich, Switzerland	
	<ul style="list-style-type: none"> • Teaching assistant for courses in general chemistry, thermodynamics, chemical kinetics, spectroscopy, statistical thermodynamics and organic chemistry 	
ACADEMIC ACTIVITIES	<ul style="list-style-type: none"> • Referee for Physical Review Letters, Physical Review A, Journal of Chemical Physics, Molecular Physics, Annalen der Physik. • Referee of proposals for the French National Research Agency, Dutch Research Council. • Program committee, NWO Physics 2023 (Physics in the Netherlands) • Member of the American Physical Society, Deutsche Physikalische Gesellschaft, Deutsche Bunsen-Gesellschaft, Förderverein Chemie-Olympiade. 	
UNIVERSITY AND DEPARTMENT SERVICE	<ul style="list-style-type: none"> • Colloquium Committee, Department of Physics and Astronomy, <i>2021 - present.</i> • DEI Committee, Department of Physics and Astronomy, <i>2021 - present.</i> • Board of Studies, BSc. Physics and Astronomy (VU and UvA) , <i>2022 - present.</i> 	

PROFESSIONAL
EXPERIENCE

Supervision of Students in Research

2015 – present

VU Amsterdam, Netherlands

- Supervision of 2 PhD students (1 completed, 1 ongoing)
- Supervision of 6 Bachelor/Master theses / research projects (5 completed, 1 ongoing)

Yale University, USA

- Supervision of an undergraduate and a postgraduate research project.

ETH Zurich, Switzerland

- Supervision of two Bachelor theses, two semester projects and one undergraduate research assistant.

LANGUAGE SKILLS

- German (native)
- English (advanced)

TALKS

1. "Precision measurement of the ionization energy of the $GK\ 1\Sigma_g^+$ ($\nu = 1, N = 1$) state of molecular hydrogen",
68th International Symposium on Molecular Spectroscopy (ISMS), Ohio State University, Columbus (OH), USA, June 17-21, 2013.
2. "Molecular hydrogen",
Physical Chemistry Colloquium, ETH Zürich, Switzerland, May 2, 2017.
3. "Formation of H_2^+ and its isotopomers by radiative association: the role of shape and Feshbach resonances",
72nd International Symposium on Molecular Spectroscopy (ISMS), Champaign-Urbana (IL), USA, June 19-23, 2017.
4. "Observation of heavy Rydberg states in H_2 and HD",
72nd International Symposium on Molecular Spectroscopy (ISMS), Champaign-Urbana (IL), USA, June 19-23, 2017.
5. "High-resolution spectroscopy of molecular hydrogen",
Atomic Physics Seminar, Yale University, USA, July 27, 2017. *Invited*
6. "High precision spectroscopy of molecular hydrogen and its ion",
4th MOLIM Training School, Torun, Poland, June 30, 2018. *Invited*
7. "Precision spectroscopy of molecular hydrogen and its ion through molecular Rydberg states and MQDT-assisted extrapolation of Rydberg series",
APS March Meeting, Boston (MA), USA, March 4-8, 2018.
8. "Precision spectroscopy of molecular hydrogen",
Molecular Physics Seminar, Fritz-Haber-Institut der Max-Planck-Gesellschaft, Berlin, Germany, July 5, 2019. *Invited*
9. "Precision spectroscopy of molecular hydrogen",
VU Amsterdam, Amsterdam, The Netherlands, September 5, 2019. *Invited*
10. "Measuring nuclear-spin-dependent parity violation with molecules",
Weak Interaction Discussion Group Seminar, Yale, New Haven, USA, December 3rd, 2019. *Invited*

11. "Frequency-comb-calibrated laser spectroscopy of H₂ Rydberg states and the spin-rovibrational structure of para-H₂⁺",
1st Workshop: Precision Spectroscopy of Molecular Hydrogen, online, June 22, 2020. *Invited*
12. "Theory of quasi-bound states in H₂ and the H+H scattering potential",
2nd Workshop: Precision Spectroscopy of Molecular Hydrogen, online, June 8, 2021. *Invited*
13. "Precision measurement of the ionization and dissociation energies of the deuterium molecule",
74th International Symposium on Molecular Spectroscopy (ISMS), online, June 21-25, 2021.
14. "Quantum defects for molecular Rydberg states and precision spectroscopy of H₂⁺",
ETH Zurich, Zurich, Switzerland, November 5, 2021. *Invited*
15. "Quantum defects for molecular Rydberg states and precision spectroscopy of H₂⁺",
Workshop on Cold Rydberg Chemistry, online, November 22-23, 2021. *Invited*
16. "Rydberg states and quantum defects for precision measurements",
PSAS2022 - International Conference on Precision Physics of Simple Atomic Systems, Warsaw, Poland, May 16-20, 2022. *Invited*
17. "High-precision spectroscopy of hydrogen molecules",
PREN2022 - International STRONG-2020 Workshop on the Proton Charge Radius and Related Topics, Paris, France, June 20-23, 2022. *Invited*

PUBLICATIONS

1. "Precision measurements of ionization and dissociation energies by extrapolation of Rydberg series: From H₂ to larger molecules",
D. Sprecher, M. Beyer, and F. Merkt, *Chimia* **67**(4), 257-261 (2013).
2. "Precision measurement of the ionisation energy of the 3dσ GK state of H₂",
D. Sprecher, M. Beyer, and F. Merkt, *Mol. Phys.* **111**(14-15), 2100-2107 (2013).
3. "The fundamental rotational interval of para-H₂⁺ by MQDT-assisted Rydberg spectroscopy of H₂",
Ch. Haase, M. Beyer, Ch. Jungen, and F. Merkt, *J. Chem. Phys.* **142**(6), 064310 (2015).
4. "Observation and calculation of the quasibound rovibrational levels of the electronic ground state of H₂⁺",
M. Beyer and F. Merkt, *Phys. Rev. Lett.* **116**(9), 093001 (2016).
5. "Structure and dynamics of H₂⁺ near the dissociation threshold: A combined experimental and computational investigation",
M. Beyer and F. Merkt, *J. Mol. Spectrosc.* **330**, 147-157 (2016).
6. "High-resolution photoelectron spectroscopy and calculations of the highest bound levels of D₂⁺ below the first dissociation threshold",
M. Beyer and F. Merkt, *J. Phys. B: At. Mol. Opt. Phys.* **50**(15), 154005 (2017).
7. "Metrology of high-*n* Rydberg states of molecular hydrogen with $\Delta\nu/\nu = 2 \times 10^{-10}$ accuracy",
M. Beyer, N. Hölsch, J. A. Agner, J. Deiglmayr, H. Schmutz and F. Merkt, *Phys. Rev. A* **97**, 012501 (2018).
8. "Dissociation energy of the hydrogen molecule at 10⁻⁹ accuracy",
C.-F. Cheng, J. Hussels, M. Niu, H. L. Bethlem, K. S. E. Eikema, E. J. Salumbides, W. Ubachs, M. Beyer, N. Hölsch, J. A. Agner, F. Merkt, L.-G. Tao, S.-M. Hu, and C. Jungen, *Phys. Rev. Lett.* **121**, 013001 (2018).
9. "Communication: Heavy Rydberg states of HD and the electron affinity of the deuterium atom",
M. Beyer and F. Merkt, *J. Chem. Phys.* **149**, 031102 (2018).
10. "Half-collision approach to cold chemistry: Shape resonances, elastic scattering and radiative association in the H⁺ + H and D⁺ + D collision systems",
M. Beyer and F. Merkt, *Phys. Rev. X* **8**, 031085 (2018).
11. "Nondiabatic effects on the positions and lifetimes of the low-lying rovibrational levels of the GK ¹Σ_g⁺ and H ¹Σ_g⁺ states of H₂",
N. Hölsch, M. Beyer, and F. Merkt, *Phys. Chem. Chem. Phys.* **20**, 26837 (2018).
12. "Hyperfine-interaction-induced g/u mixing and its implication on the existence of the first excited vibrational level of the A⁺ ²Σ_u⁺ state of H₂⁺ and on the scattering length of the H + H⁺ collision",
M. Beyer and F. Merkt, *J. Chem. Phys.* **149**, 214301 (2018).
13. "Benchmarking theory with an improved measurement of the ionization and dissociation energies of H₂",
N. Hölsch, M. Beyer, E. J. Salumbides, K. S. E. Eikema, W. Ubachs, Ch. Jungen, and F. Merkt, *Phys. Rev. Lett.* **122**, 103002 (2019).

14. "Determination of the interval between the ground states of para- and ortho- H_2 ",
M. Beyer, N. Hölsch, J. Hussels, C.-F. Cheng, E. J. Salumbides, K. S. E. Eikema,
W. Ubachs, Ch. Jungen, and F. Merkt, *Phys. Rev. Lett.* **123**, 163002 (2019).
15. "Photolysis Production and Spectroscopic Investigation of the Highest Vibrational States in H_2 ($X^1\Sigma_g^+ \nu = 13, 14$)",
K.-F. Lai, E. J. Salumbides, M. Beyer, and W. Ubachs, *J. Phys. Chem. A* **125**,
1221 (2021).
16. "Frequency-doubled Nd:YAG MOPA laser system with programmable rectangular pulses up to 200 microseconds",
M. Beyer, J. C. Roth, E. Edwards, and D. DeMille, *Optics Express* **29**, 20370
(2021).
17. "Shape resonances in H_2 as photolysis reaction intermediates",
K.-F. Lai, E. J. Salumbides, W. Ubachs, and M. Beyer, *Phys. Rev. Lett.* **127**,
183001 (2021).
18. "Precision measurement of quasi-bound resonances in H_2 and the H+H scattering length",
K.-F. Lai, E. J. Salumbides, M. Beyer, and W. Ubachs, *Mol. Phys.* e2018063
(2021).
19. "Improved ionization and dissociation energies of the deuterium molecule",
J. Hussels, N. Hölsch, C.-F. Cheng, E. J. Salumbides, H. L. Bethlem, K. S. E. Eikema,
Ch. Jungen, M. Beyer, F. Merkt and W. Ubachs, *Phys. Rev. A* **105**,
022820 (2022).
20. "Structure and dynamics of HD^+ in the vicinity of the $\text{H}^+ + \text{D}$ and $\text{D}^+ + \text{H}$
dissociation thresholds: Feshbach resonances and the role of g/u-symmetry
breaking",
M. Beyer and F. Merkt, *Mol. Phys.* , e2048108 (2022).
21. "Precision millimetre-wave spectroscopy and calculation of the Stark manifolds
in high Rydberg states of para- H_2 ",
N. Hölsch, I. Doran, M. Beyer and F. Merkt, *J. Mol. Spectrosc.* **387**, 111648
(2022).
22. "Black-body radiation-induced photodissociation and population redistribution of
weakly bound states in H_2^+ ",
A. D. Ochoa Franco and M. Beyer, *Mol. Phys.* , e2133750 (2022).