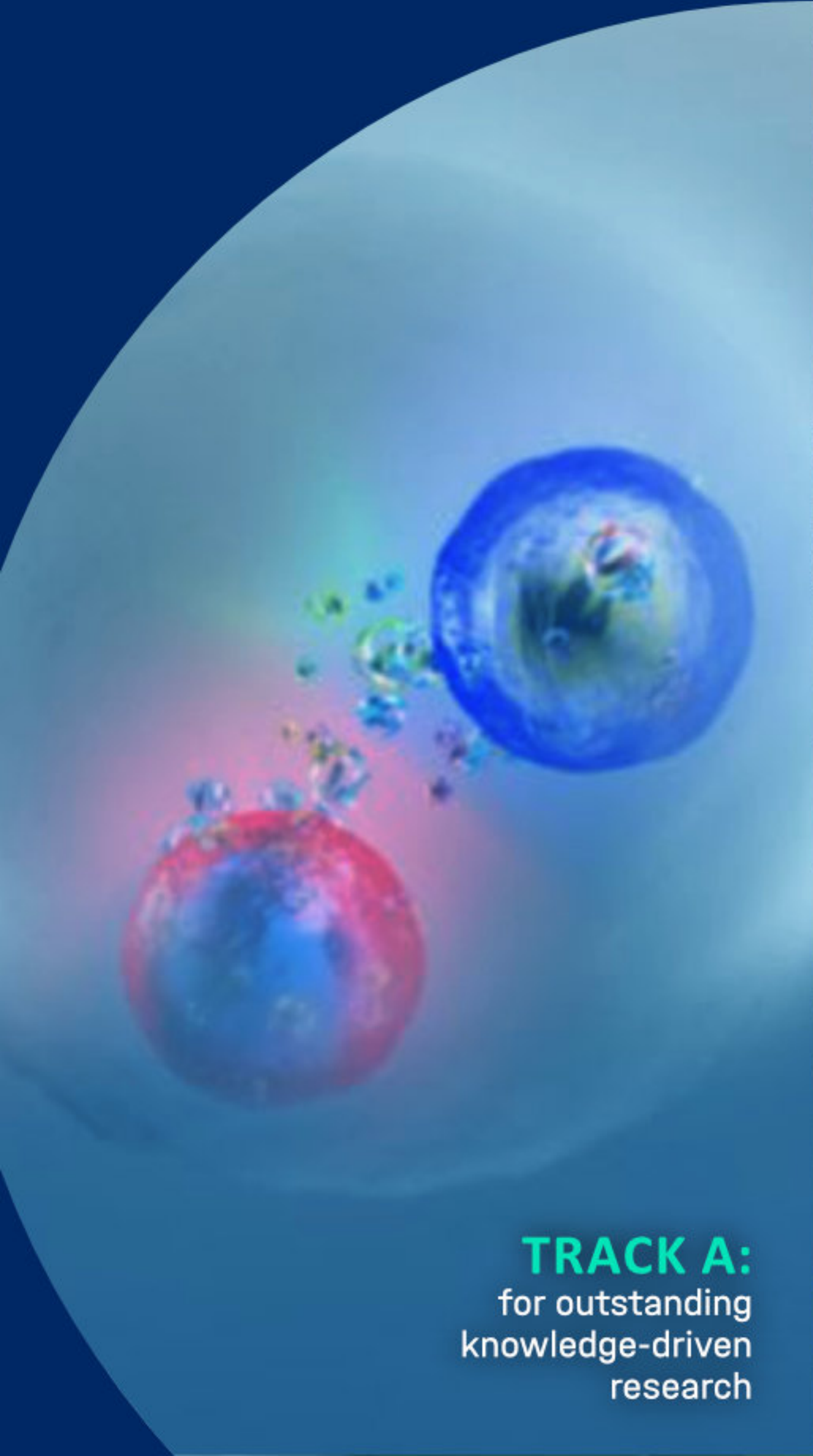


Doctoral Awards 2026



TRACK A:
for outstanding
knowledge-driven
research



TRACK B:
for outstanding
application-oriented
research

„We found something hardly anyone expected to see at the LHC.

Surprises like this are exactly why we do fundamental research.”

Laurids Jeppe (DESY)



A surprise at the LHC: first signs of toponium

Top quarks are the heaviest known elementary particles and decay in less than 10^{-24} seconds. Whether they briefly bind with their antiparticle into a state called “toponium” beforehand was long considered nearly impossible to measure at the LHC.

During his PhD at the CMS experiment at CERN, Laurids Jeppe found exactly this signal: a statistically unambiguous excess of top quark pairs produced with minimal energy. The result has since been confirmed by the ATLAS experiment as well.

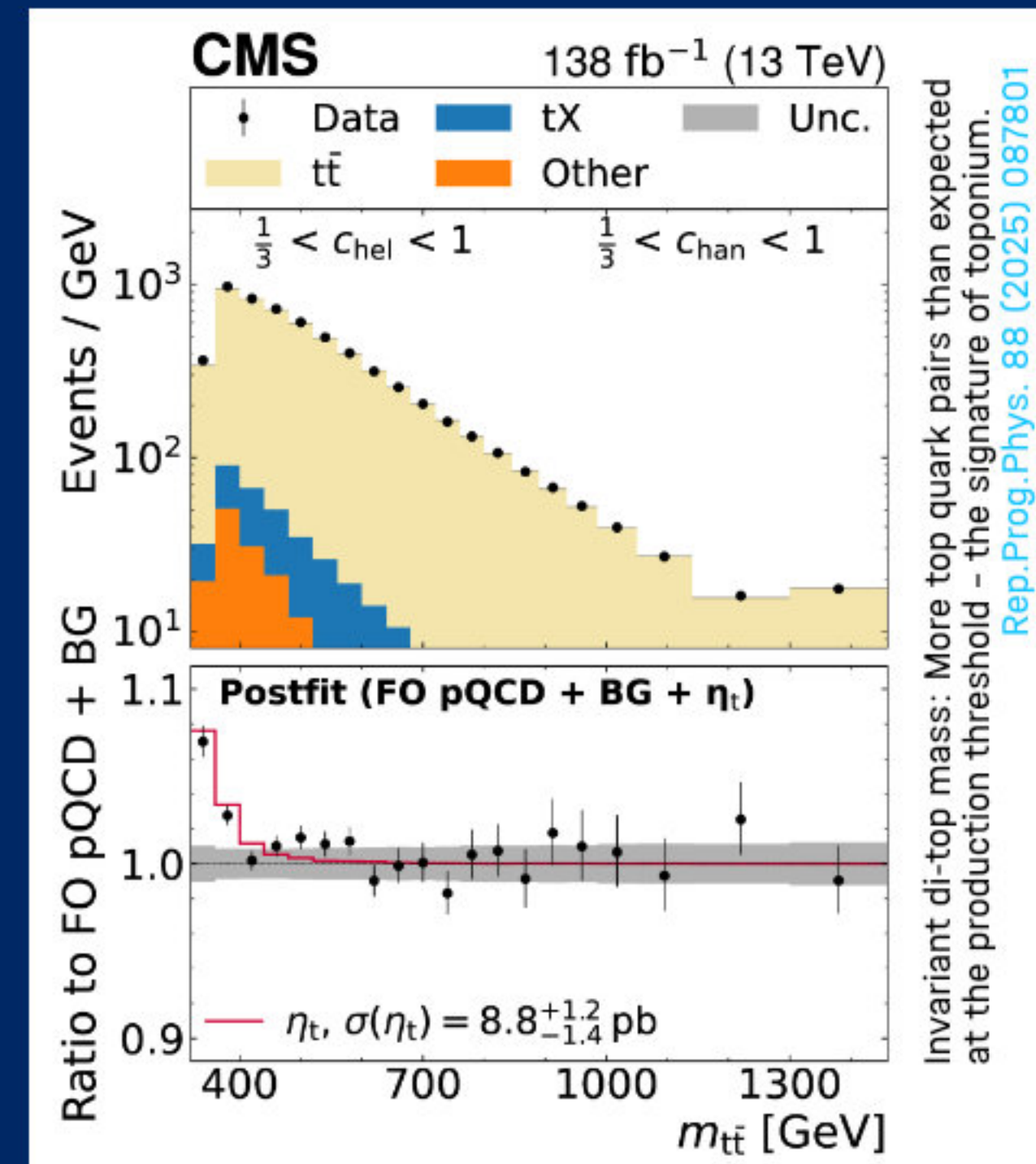
Whether unknown particles also contribute remains open. A future electron-positron collider could settle the question.

Before this, Jeppe presented the very first physics results of CMS at the record energy of 13.6 TeV of the LHC Run 3, only two months after the start of the data acquisition in the summer of 2022.

Laurids Jeppe (DESY, Matter and the Universe)

Measurement of the inclusive $t\bar{t}$ production cross section and search for additional scalars in $t\bar{t}$ production final states at CMS

PhD thesis, DOI: 10.3204/PUBDB-2025-04405



„Thanks to the precise viscosity values of tritium, the design of future fusion facilities such as DEMO can be optimised, thereby shortening development cycles and reducing investment costs.“

Johanna Wydra (KIT)



Viscosity measurement of molecular tritium at cryogenic temperatures for research and industry

Viscosity determines the flow behavior and pumpability of gases and is particularly relevant for the development of tritium pumps in fusion facilities, as well as in astroparticle physics as for the neutrino mass experiment KATRIN.

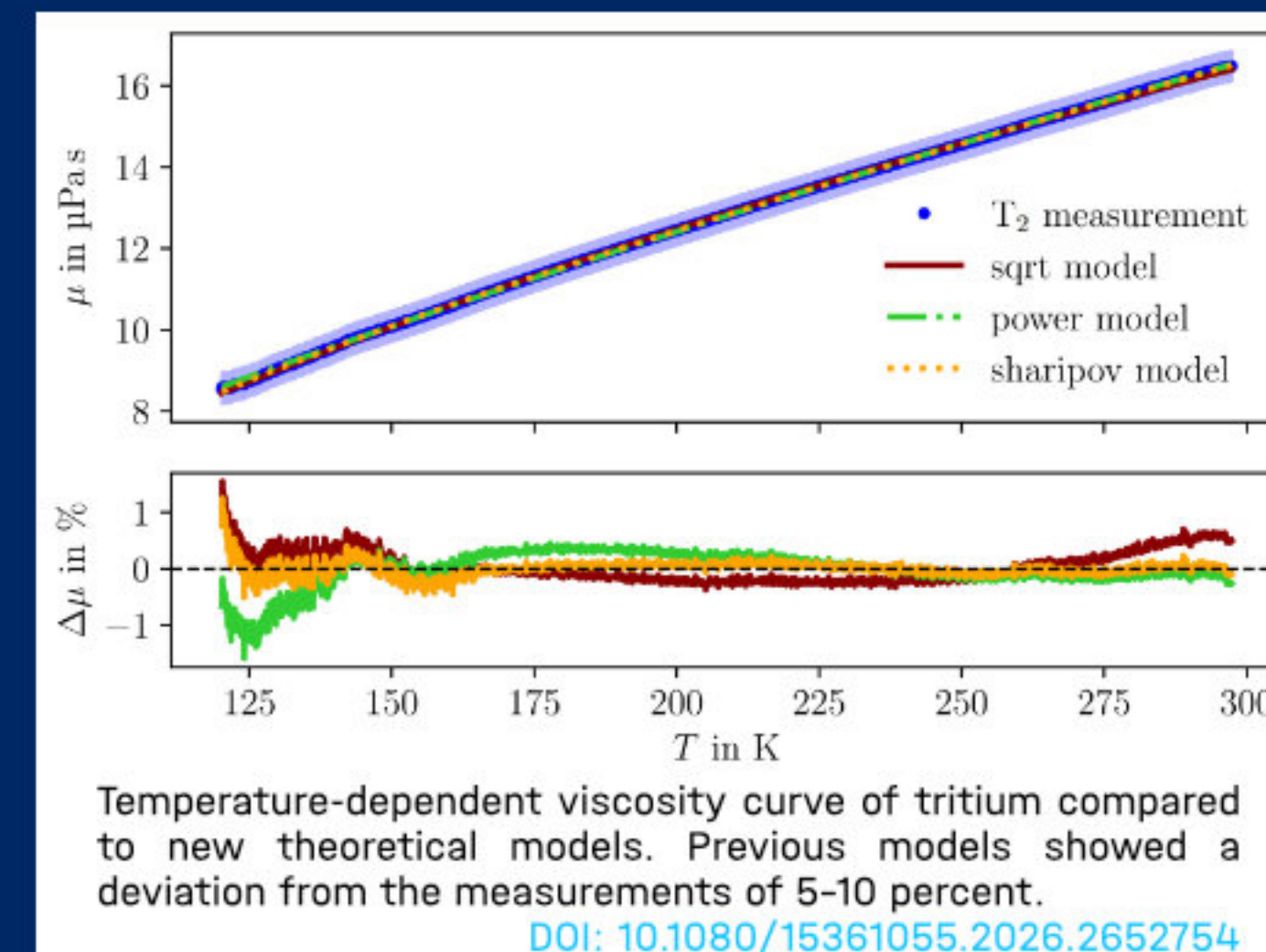
Thanks to the newly developed Cryogenic Viscosity Measurement Apparatus (Cryo-ViMA), Johanna Wydra was able, for the first time, to measure the viscosity of tritium with high precision between 100 K and 300 K, thereby fundamentally correcting previous models by mandatorily incorporating quantum mechanical and radiolytic effects. In doing so, she established a unique cryogenic measurement infrastructure at the Tritium Laboratory Karlsruhe (TLK) at KIT that is of great significance for fusion technology.

She successfully carried out this challenging research project as part of her doctoral work, supported by a family-friendly work environment while caring for her two young children.

Johanna Wydra
(KIT, Matter and the Universe)

First measurement of the tritium viscosity in a temperature range from 100 K to 300 K

PhD thesis, DOI: 10.5445/IR/1000178925



The Centers of
Helmholtz Matter:



The Helmholtz Association's Doctoral Award recognizes outstanding scientific achievements and enables the nomination of exceptional early-career researchers to further highlight their research accomplishments.

The following have been nominated for the 2026 doctoral prizes in Helmholtz Matter:

Peter Feuer-Forson

Track A (HZB, MML), HU Berlin

„Machine Learning Constructed Surrogate Models for Photon Science”

Juan Manuel Gería

Track A (KIT, MT), Double Doctorate KIT and UNSAM Buenos Aires

„The Magnetic Microbolometer: A Novel Cryogenic Detector for Cosmology”

Christopher Heins

Track A (HZDR, MML), TU Dresden

„Nonlinear magnon dynamics: From the discovery of Floquet magnons to CMOS-compatible magnon computing”

Jan Kaiser

Track B (DESY, MT), TU Hamburg

„Reinforcement Learning and Differentiable Simulations for Autonomous Tuning and Control of Linear Particle Accelerators”

Johanna Wydra

(KIT, Matter and the Universe)

“... her work is fundamental to the modeling of tritium cycles in future fusion facilities and to the highly precise determination of the neutrino mass ...”

(K. Valerius, KIT,
PhD supervisor of J. Wydra)

First measurement of the tritium viscosity in a temperature range from 100 K to 300 K
DOI: [10.5445/IR/1000178925](https://doi.org/10.5445/IR/1000178925)

First Experimental Results on the Tritium Viscosity in the Zero-Density Limit from 110 K to 300 K
DOI: [0.1080/15361055.2026.2652754](https://doi.org/10.1080/15361055.2026.2652754)

VACOM-Nachhaltigkeitspreis 2025 in Bronze

„In their work, the award recipients have made innovative use of techniques, methods, or equipment from the field of vacuum-based technologies to enhance the sustainability of technical solutions, processes, or products, or to implement circular processes.”

(The award, sponsored by VACOM Vakuum Komponenten & Messtechnik GmbH, was presented in June 2025 by the DVG—German Vacuum Society.)

Laurids Jeppe

(DESY, Matter and the Universe)

“...his work advances our understanding of the fundamental structure of matter and explores potential connections to physics beyond the Standard Model ...”

C. Schwanenberger,
DESY + U Hamburg,
PhD supervisor of L. Jeppe

Measurement of the inclusive $t\bar{t}$ production cross section and search for additional scalars in $t\bar{t}$ production final states at CMS
DOI: [10.3204/PUBDB-2025-04405](https://doi.org/10.3204/PUBDB-2025-04405)

First measurement of the top quark pair production cross section in proton-proton collisions at $\sqrt{s} = 13.6$ TeV
DOI: [10.1007/JHEP08\(2023\)204](https://doi.org/10.1007/JHEP08(2023)204)

Observation of a pseudoscalar excess at the top quark pair production threshold
DOI: [10.1088/1361-6633/adf7d3](https://doi.org/10.1088/1361-6633/adf7d3)

Search for heavy pseudoscalar and scalar bosons decaying to a top quark pair in proton-proton collisions at $\sqrt{s} = 13$ TeV
DOI: [10.1088/1361-6633/ae2207](https://doi.org/10.1088/1361-6633/ae2207)

Ph.D. candidates at
Helmholtz make
valuable contributions to
solving pressing
societal challenges

