Master studies in Particle Physics
Siegen University, Germany

https://cpps.physik.uni-siegen.de/master/

Universität Siegen

Outline

CPPS Center for Particle Physics Siegen

1) **Where is Siegen?**

2) Physics in Siegen - - - a) excellent student staff ratio
3) Physics in Siegen - - - b) excellent research
4) Physics in Siegen - - - c) Particle physics

5) Master studies in Siegen

6) Living in Siegen

7) Physics fun in Siegen

8) Summary & How to apply

SUBATOMIC HEROES

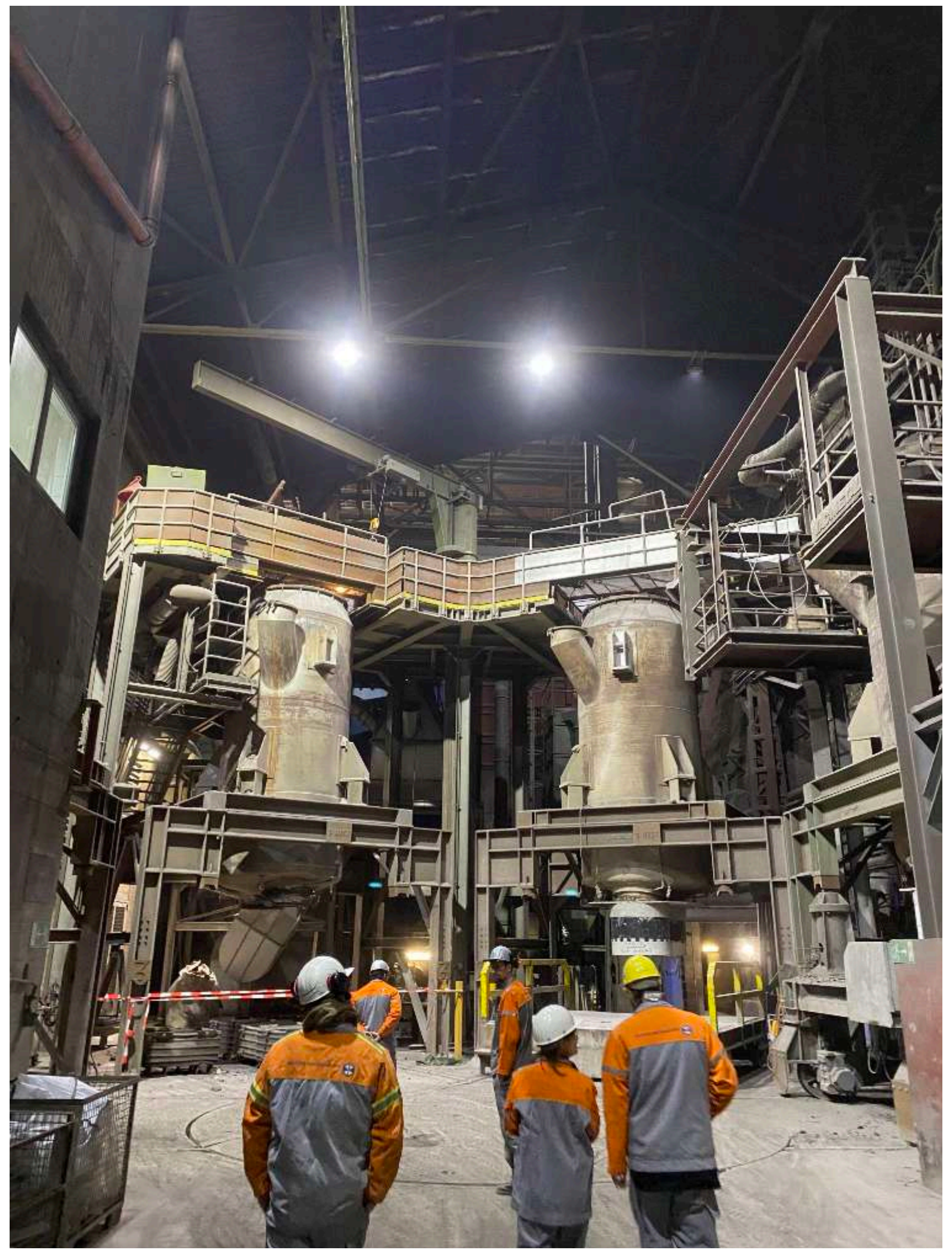
Where is Siegen?

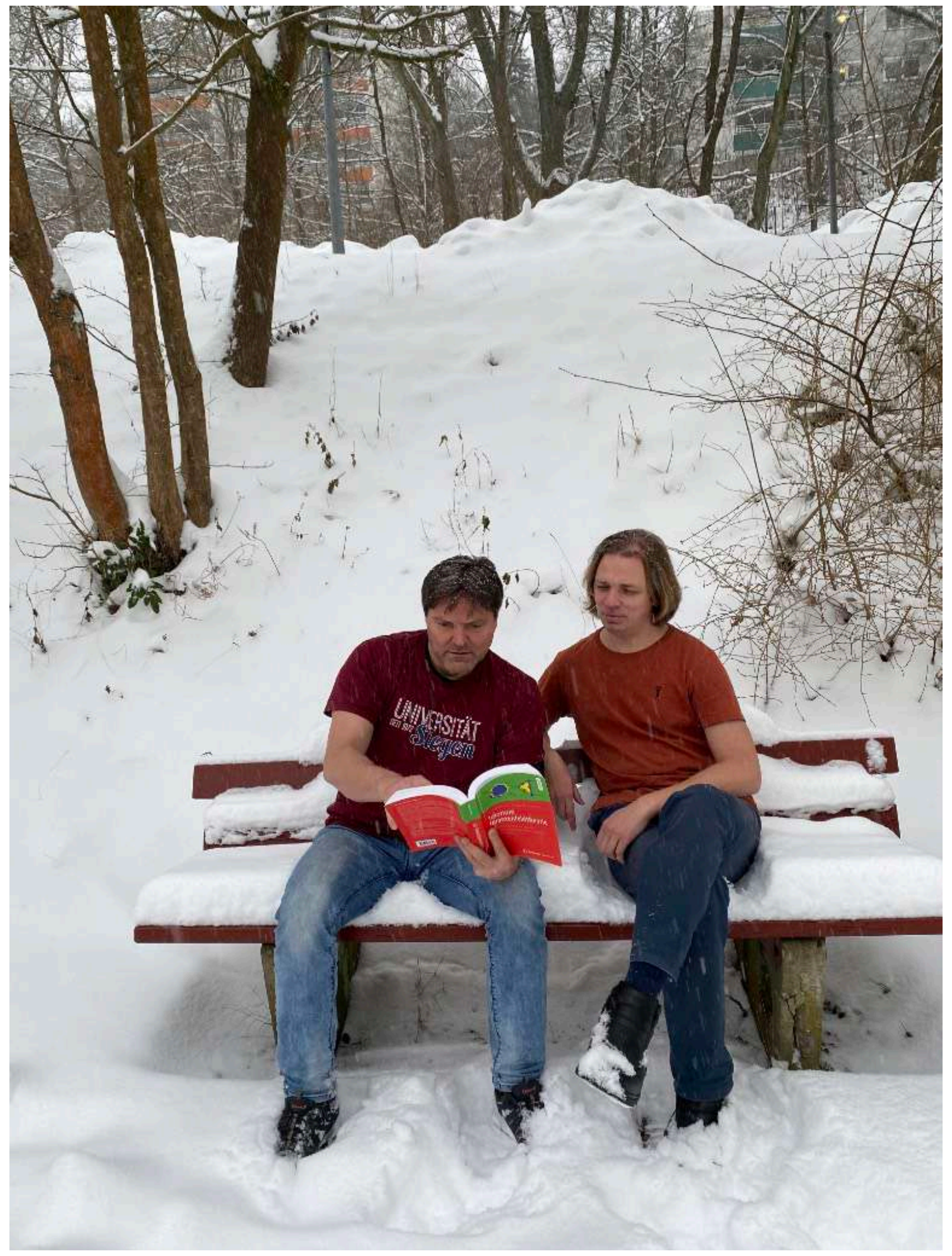
Siegen is located centrally in Germany, around 125 km northwest of Frankfurt and 90 km east of Cologne and can be reached well via train or car. Nearby international airports are in Frankfurt, Cologne and Düsseldorf. Siegen celebrated 2024 the 800th anniversary and it has currently around 100.000 inhabitants. Downtown Siegen offers many pubs, restaurants and cafes, but also theatres, Cinemas and concert halls.

The University of Siegen was founded in 1972 and has currently around 16.000 students.
https://www.uni-siegen.de/start/index.html.en?lang=en

Siegen - downtown

University of Siegen - and local industry





Surroundings of Siegen

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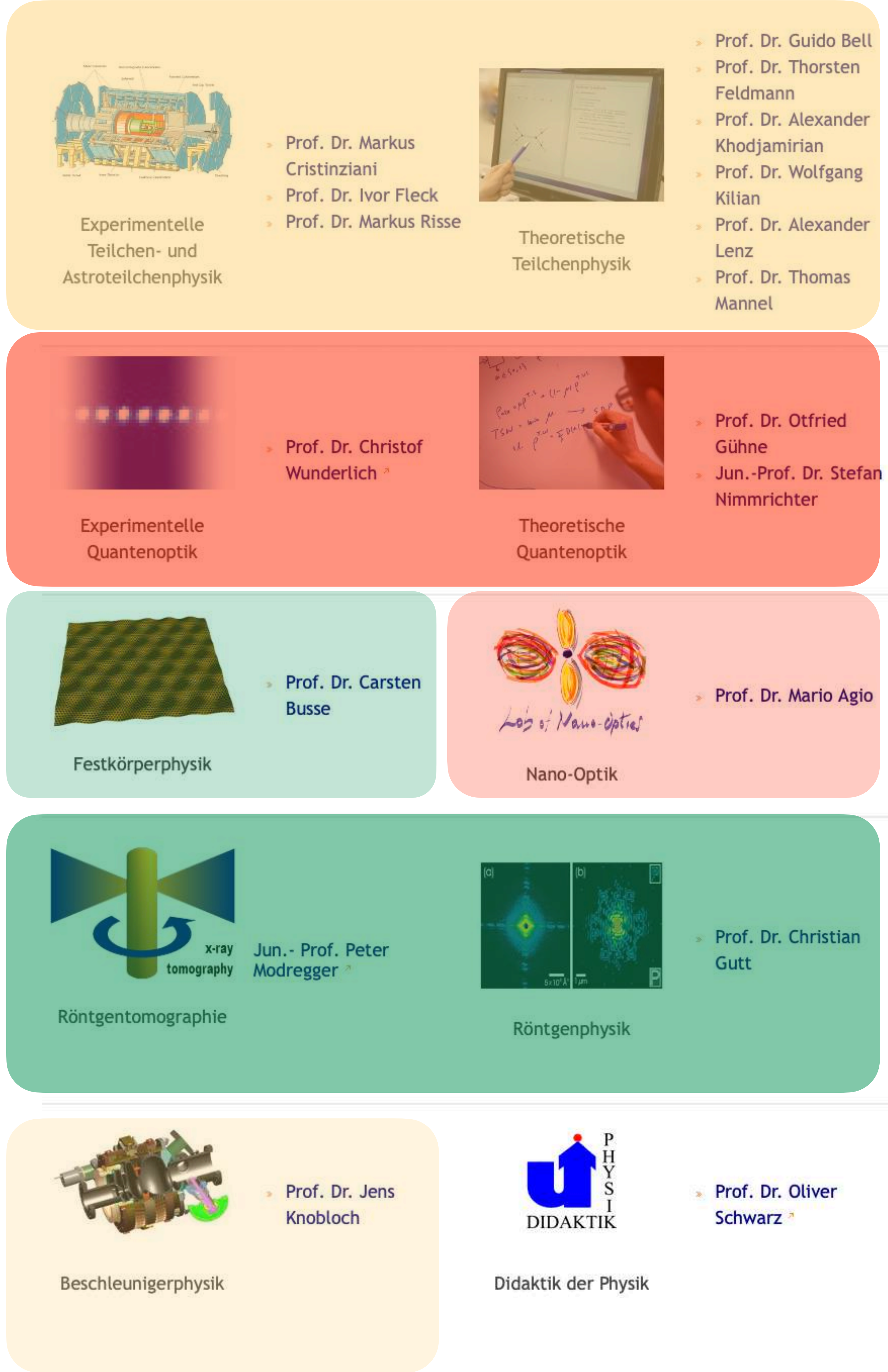
Emmy Noether Campus

Universität Siegen

Physics in Siegen - small but outstanding



Particle physics

Quantum Optics

Solid states and X-ray Physics

Didactics

Amazing staff-student ratio

- **Ca. 30 beginners in bachelor**
- **Ca. 10 beginners in master**
- **Ca. 20 professors**

Physics department: http://www.physik.uni-siegen.de

Students are happy in Siegen

Dein Vergleich Your comparison

Physik, Universität, Master

	Uni Heidelberg Fakultät für Physik und Astronomie Zur Hochschule	TU München/Garching TUM School of Natural Sciences Zur Hochschule	Uni Siegen Fakultät IV: Naturwissenschaftl... Technische Fakultät Zur Hochschule
Studium und Lehre			
General study situation Allgemeine Studiensituation	4.3	4.5	4.5
Support during studies Unterstützung im Studium	3.8	4	4.1
Digital elements in studies Digitale Lehrelemente	3.6	4.1	4.2
Relation to research Forschungsorientierung	4.3	4.3	4.5
Teaching Praxisorientierung in der Lehre	3.5	4.1	4.4
Support by teaching staff Betreuung durch Lehrende	4.1	4.2	4.5

CHE Master-Ranking 2024 (https://studiengaenge.zeit.de/)

Comparing Siegen with

the oldest university (Heidelberg) and

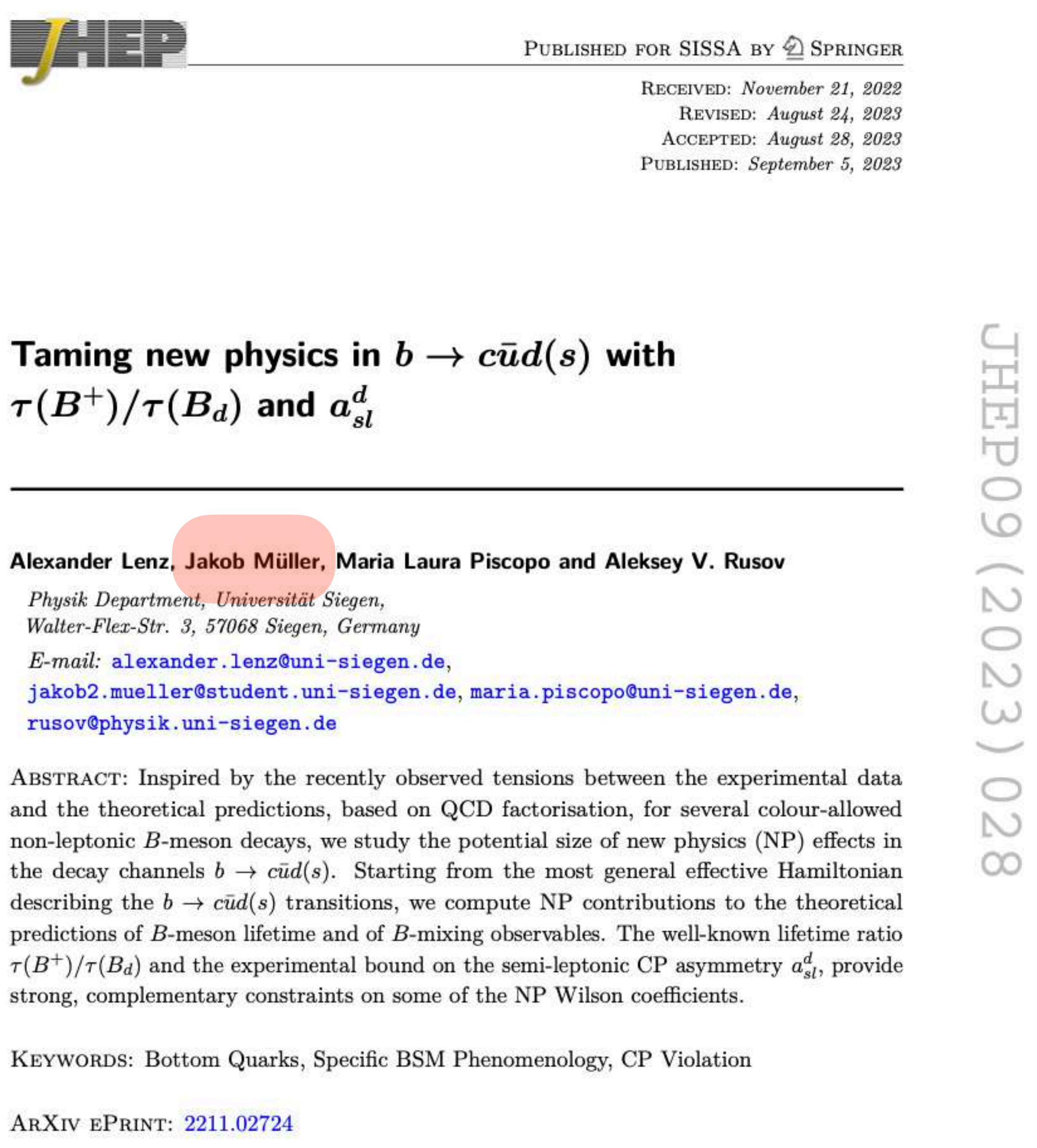
one of the most prestigious universities (TUM) in Germany

5.0 is the highest possible mark

Excellent Supervision

Success indicators

Many times Master theses are published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PUBLISHED: *September 5, 2023*

Taming new physics in $b \to c\bar{u}d(s)$ with $\tau(B^+)/\tau(B_d)$ and a_{sl}^d

Alexander Lenz, Jakob Müller, Maria Laura Piscopo and Aleksey V. Rusov

Physik Department, Universität Siegen, Walter-Flex-Str. 3, 57068 Siegen, Germany

E-mail: alexander.lenz@uni-siegen.de, jakob2.mueller@student.uni-siegen.de, maria.piscopo@uni-siegen.de, rusov@physik.uni-siegen.de

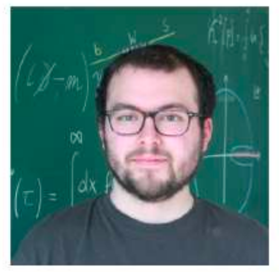
ABSTRACT: Inspired by the recently observed tensions between the experimental data and the theoretical predictions, based on QCD factorisation, for several colour-allowed non-leptonic B-meson decays, we study the potential size of new physics (NP) effects in the decay channels $b \to c\bar{u}d(s)$. Starting from the most general effective Hamiltonian describing the $b \to c\bar{u}d(s)$ transitions, we compute NP contributions to the theoretical predictions of B-meson lifetime and of B-mixing observables. The well-known lifetime ratio $\tau(B^+)/\tau(B_d)$ and the experimental bound on the semi-leptonic CP asymmetry a_{sl}^d, provide strong, complementary constraints on some of the NP Wilson coefficients.

KEYWORDS: Bottom Quarks, Specific BSM Phenomenology, CP Violation

ARXIV EPRINT: 2211.02724

JHEP09(2023)028

Alumni find attractive jobs in science


Matthew Black

PhD in Siegen
-> post-doc in Edinburgh
(Lattice QCD)


Maria Laura Piscopo

PhD in Siegen
-> post-doc in NIKHEF
(Amsterdam) and CERN


Aleksey Rusov

PhD/post-doc in Siegen
-> post-doc in IPPP
(Durham) and TU Munich


Meril Reboud

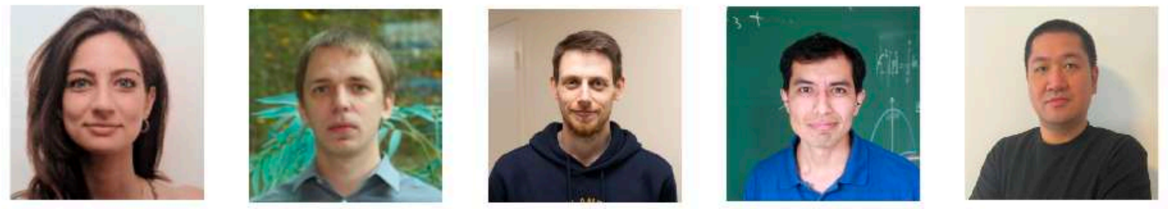
post-doc in Siegen
-> permanent position
in IJCLab Orsay

Alumni find attractive jobs in industry

PhD and post-doc applications from all over the world

- e.g. 2023: 290 applications for 1 post-doc position
- International postdocs


Anshika Bansal | Pia Bredt | Kevin Brune | Jack Jenkins | Martin Lang | Elefther Malam


Maria Laura Piscopo | Aleksey Rusov | Meril Reboud | Gilberto Tetlalmatzi-Xolocotzi | Tom Tong

Universität Siegen

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SUBATOMIC HEROES

Physics in Siegen -
Highlights of research activities

Internationally leading research in several areas:

Universität Siegen

Physics in Siegen - Highlights of research activities

Internationally leading research in several areas:

- **World's largest group in theoretical flavour physics**

Physics in Siegen - Highlights of research activities

Internationally leading research in several areas:

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- **Large experimental group in ATLAS**

Physics in Siegen - Highlights of research activities

Internationally leading research in several areas:

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- **Large group at Pierre Auger Observatory**

Physics in Siegen - Highlights of research activities

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- **Germany's first quantum computer**

Physics in Siegen - Highlights of research activities

Universität Siegen

Internationally leading research in several areas:

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- **We are hosting many international conferences**

Physics in Siegen - Highlights of research activities

Universität Siegen

Internationally leading research in several areas:

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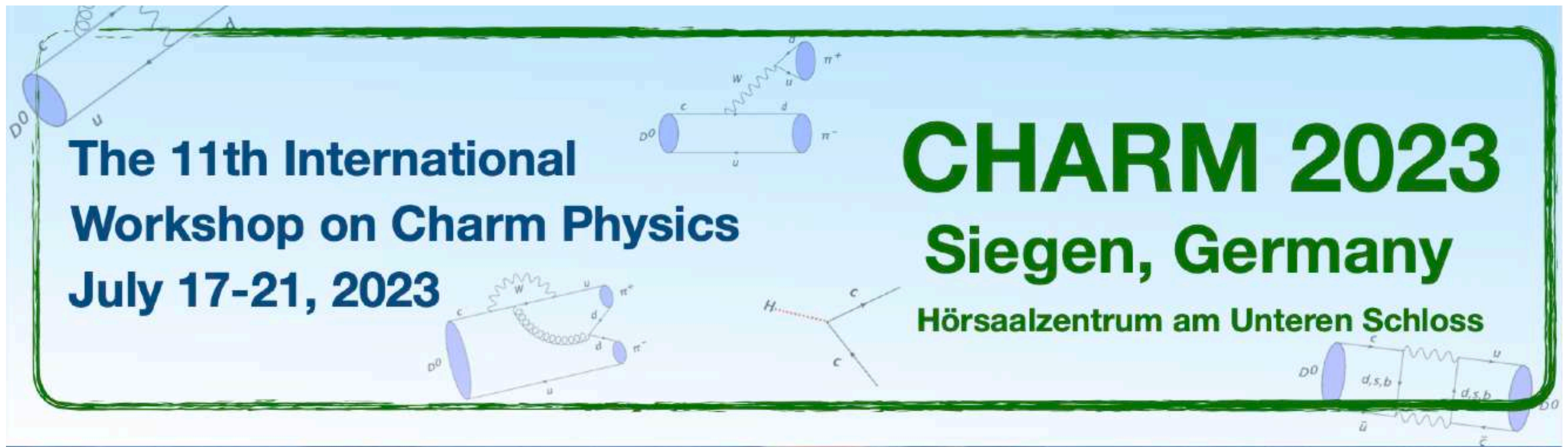
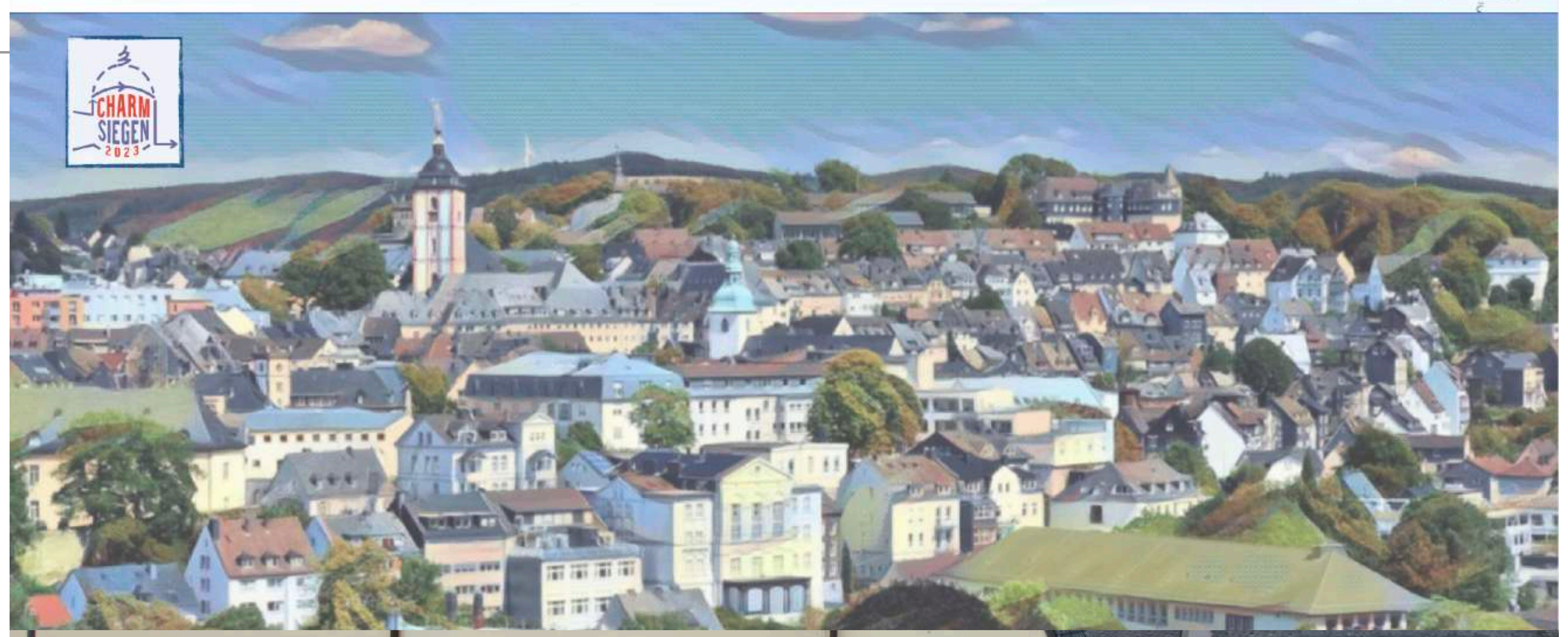
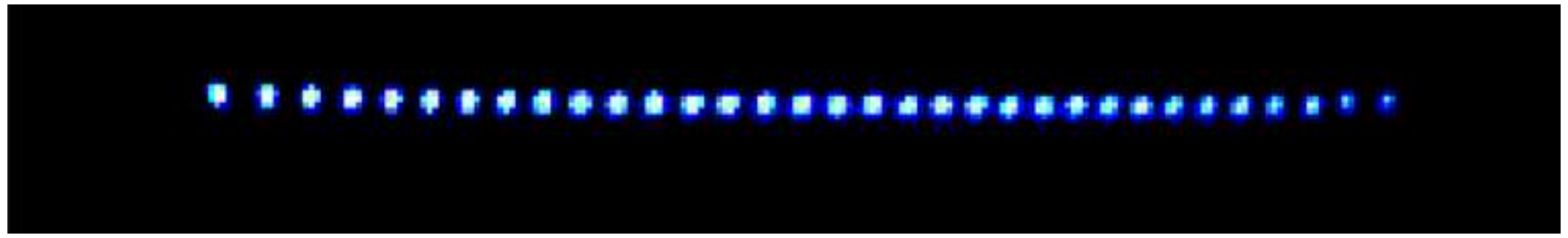




Experimental Quantum- and Nano-Optics

Experimental Quantum Optics

Foundations of Quantum Physics, Quantum Computing



Trapped ions acting as Q-Bits

Company in Siegen: eleQtron

Nano-Optics

- Light and its interaction with matter on Nano-scales
- Investigate individual Quantum Physics
- Development of new light sources or sensors

High level politicians visiting quantum optics in Siegen

Computer Revolution?


START-UP

Ionen in der Falle

VON STEPHAN FINSTERBUSCH - AKTUALISIERT AM 30.11.2023 - 19:54

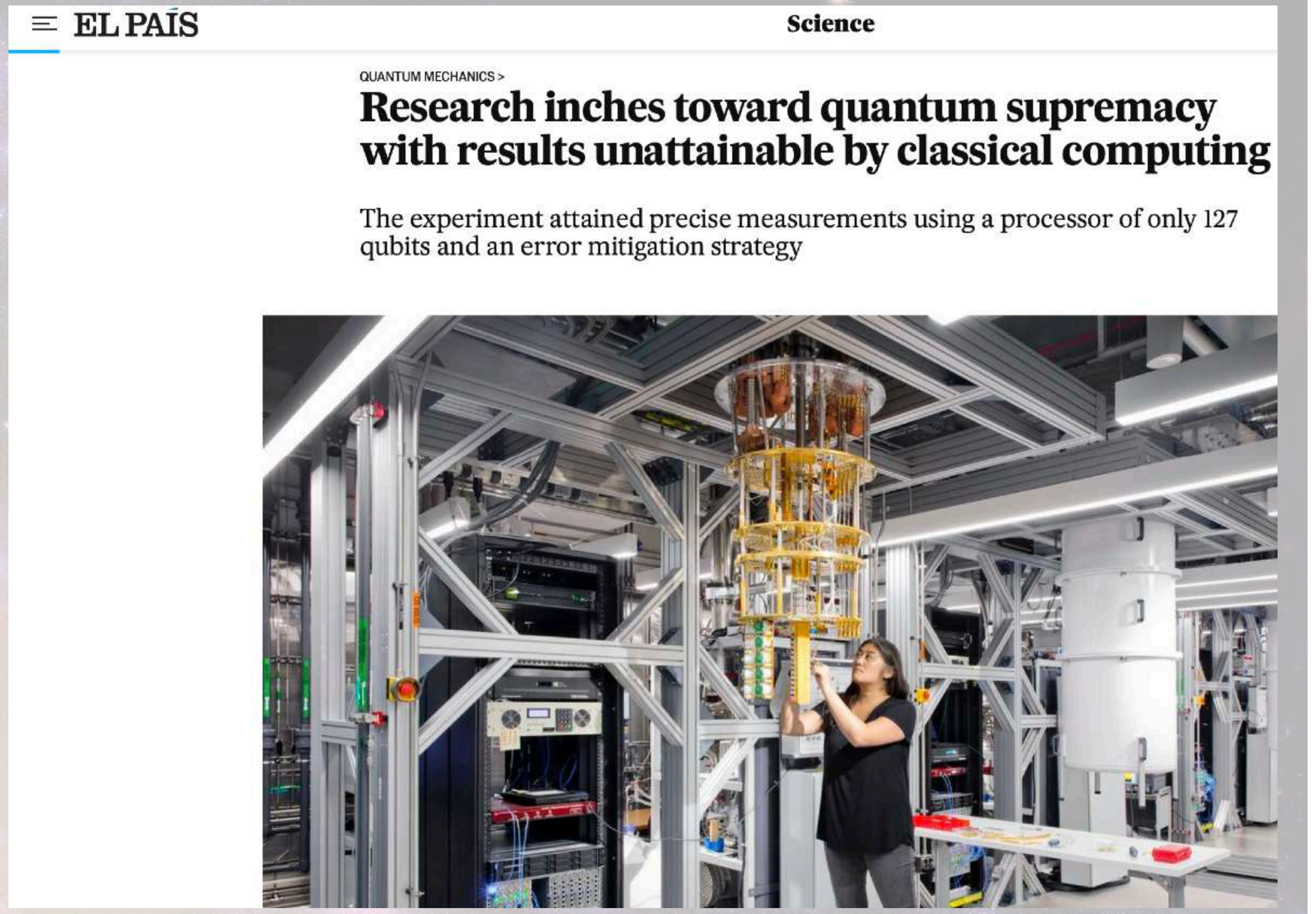
Zurück zum Artikel

1/4

Der Professor und sein Werk: Christof Wunderlich neben dem ersten Quantencomputer Deutschlands auf dem Emmy-Noether-Campus der Universität Siegen

Bild: AARON LEITHÄUSER

2025:
100
Years after
the discovery
of quantum
theory

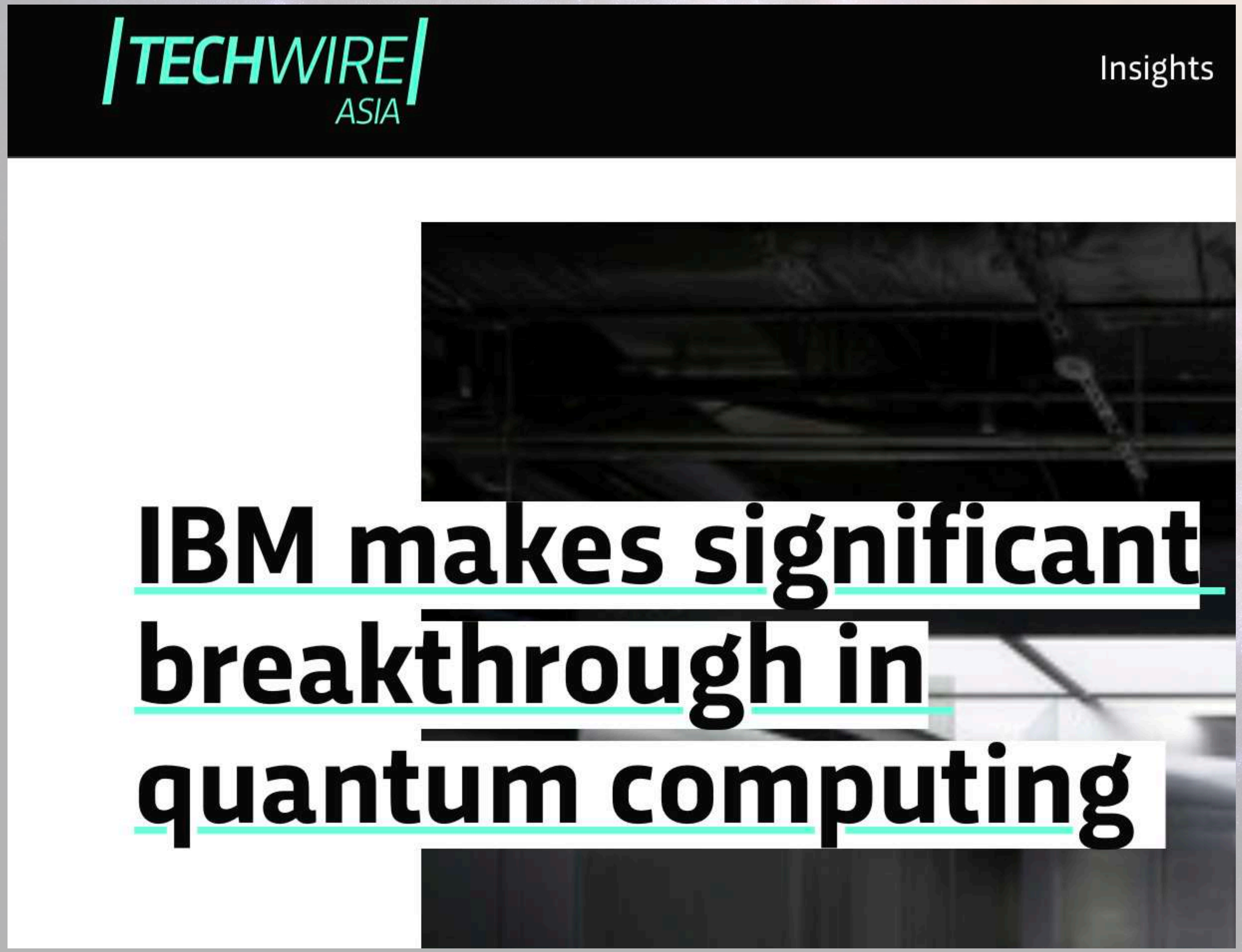

EL PAÍS

Science

QUANTUM MECHANICS >

Research inches toward quantum supremacy with results unattainable by classical computing

The experiment attained precise measurements using a processor of only 127 qubits and an error mitigation strategy


TECHWIRE ASIA

Insights

IBM makes significant breakthrough in quantum computing


Deutscher Quantencomputer

eleQtron erhält ersten »Quantum Effects Award«

12. Oktober 2023, 6:38 Uhr | Heinz Arnold

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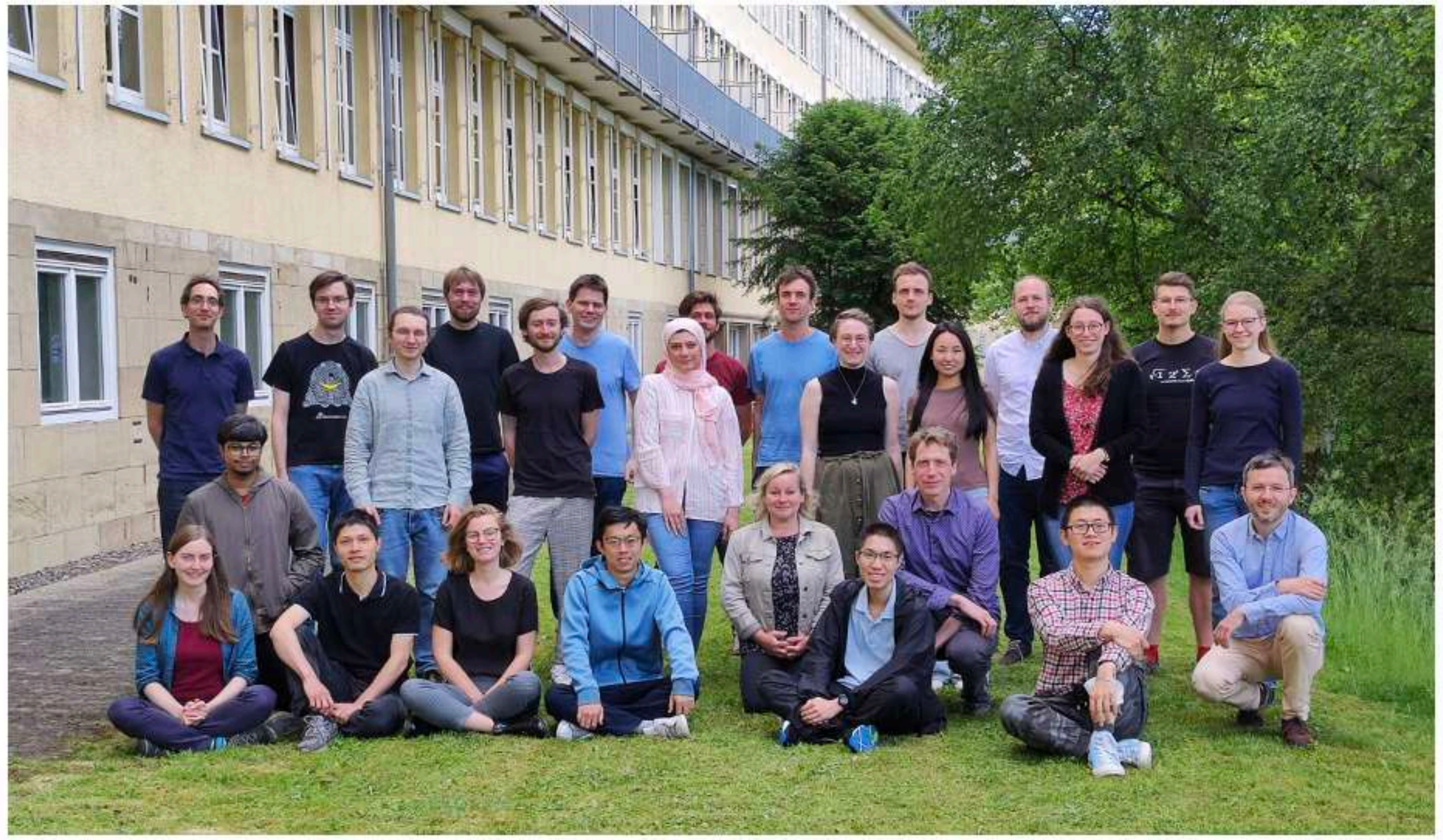
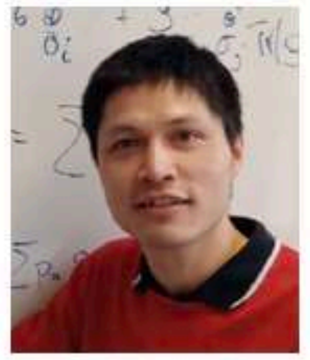
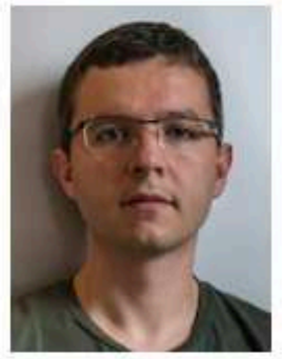
Universität Siegen

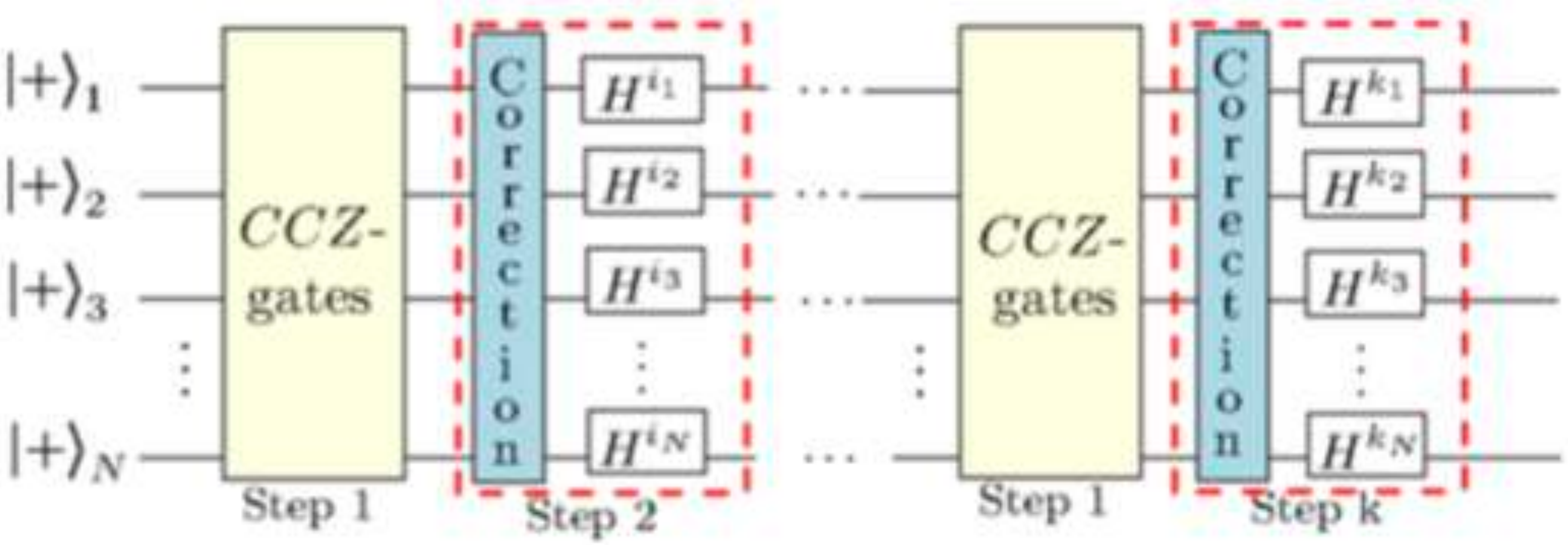
Theoretical Quantum optics




- Study the differences between quantum physics and classical physics

- How can quantum effects be used for computing and cryptography?



Bundesministerium für Bildung und Forschung

DFG

Stiftung Innovation in der Hochschullehre

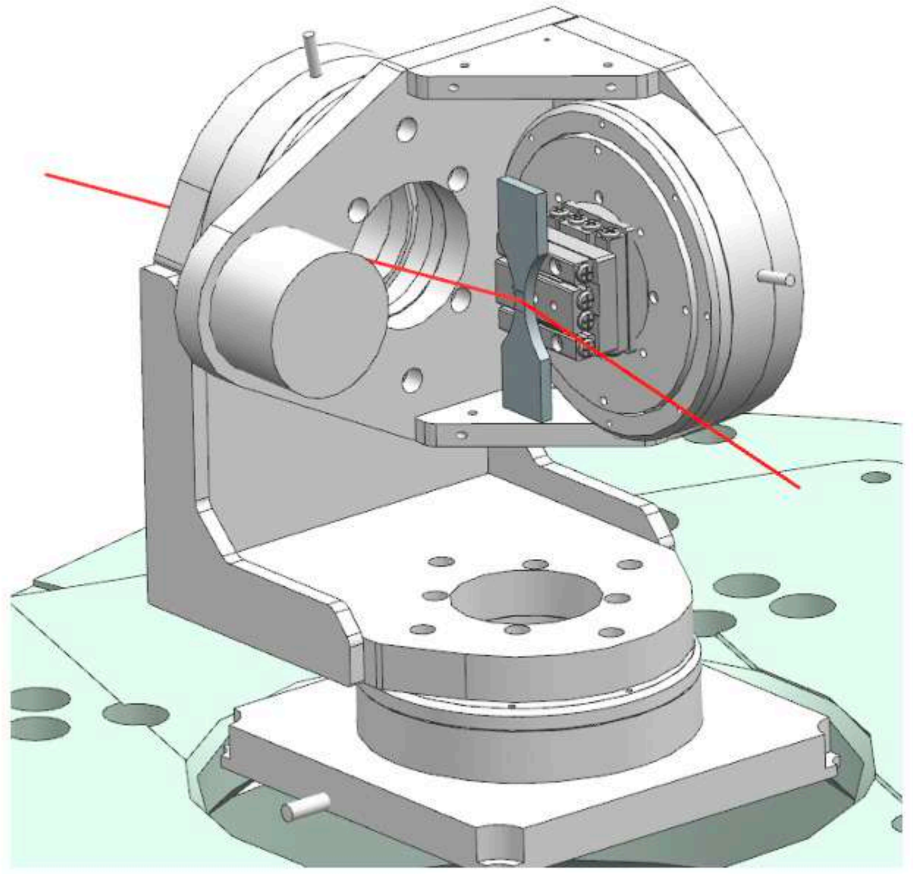
Solid State and x-ray physics

Universität Siegen

Structure and dynamics of 2D materials, biological matter and materials

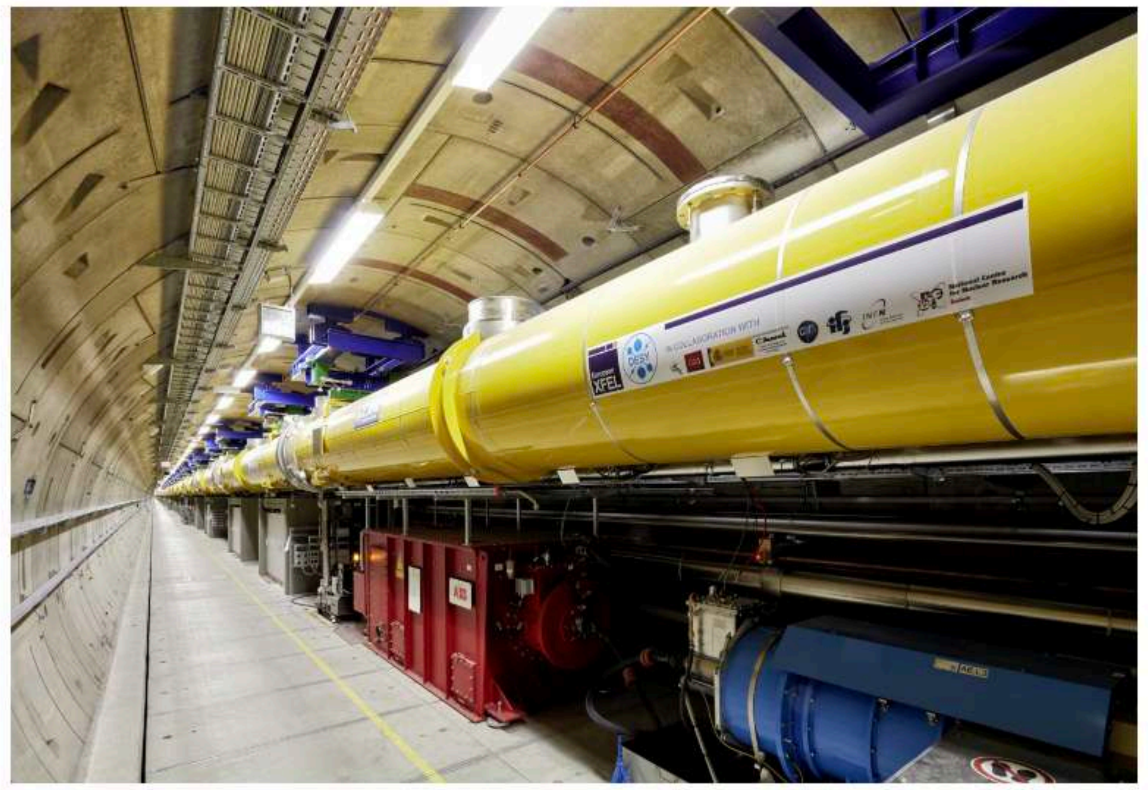
Methods: brilliants synchrotron radiation / ultra-short x-ray pulses / microscopes with atomic resolution

24 scientists



PETRA IIII (Hamburg)

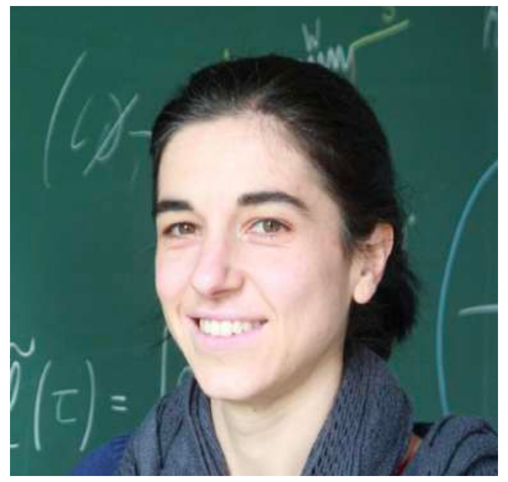
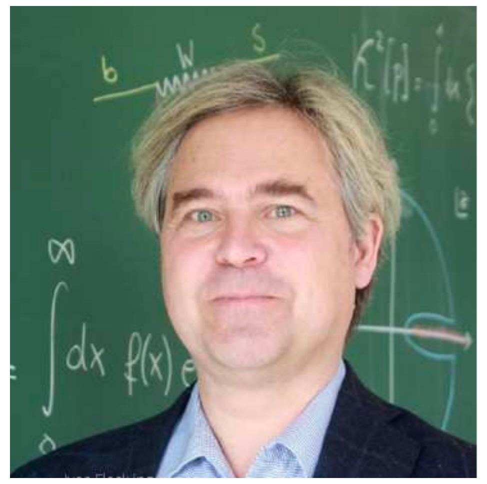
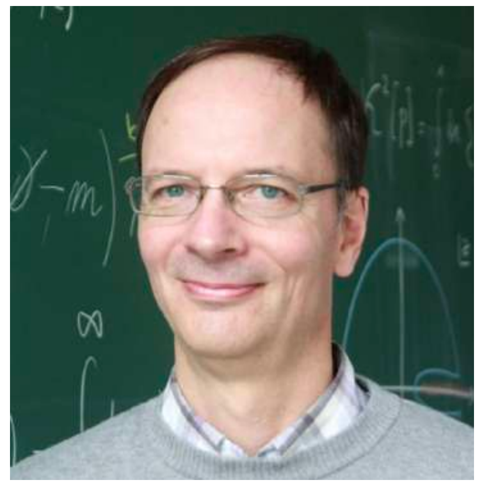
Surface Science Labs (Siegen)
⇒ INCYTE

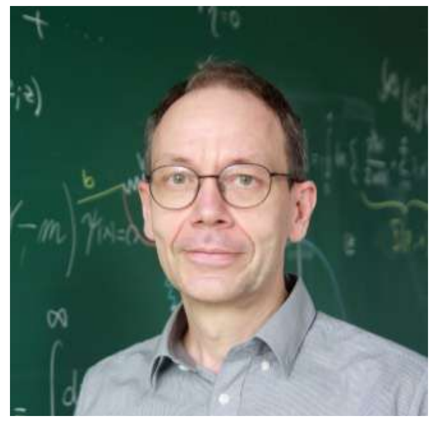
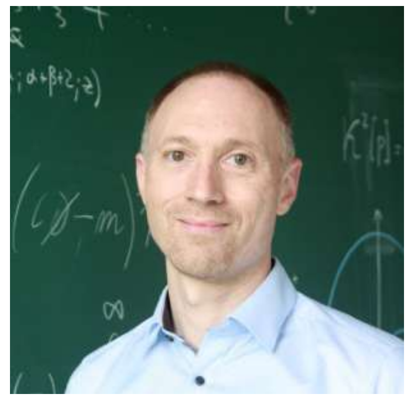


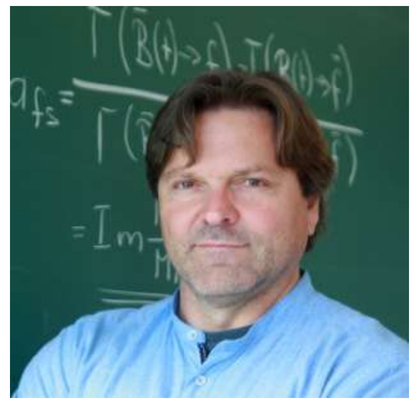
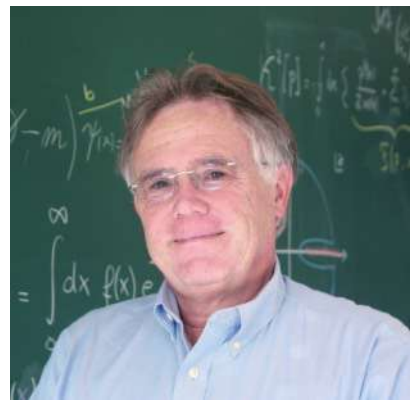
European XFEL (Hamburg)

CPPS Center for Particle Physics Siegen

Particle physics

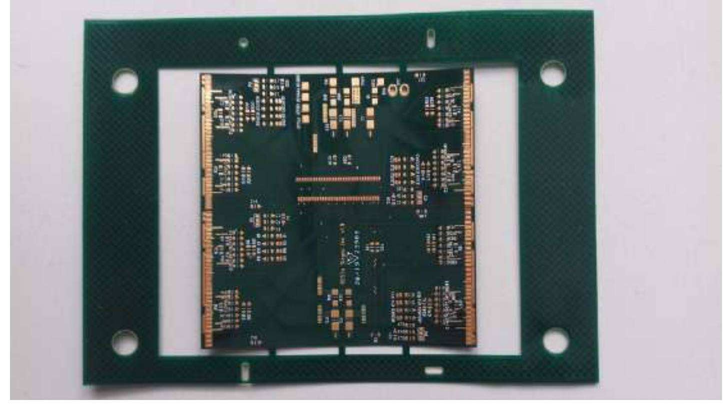
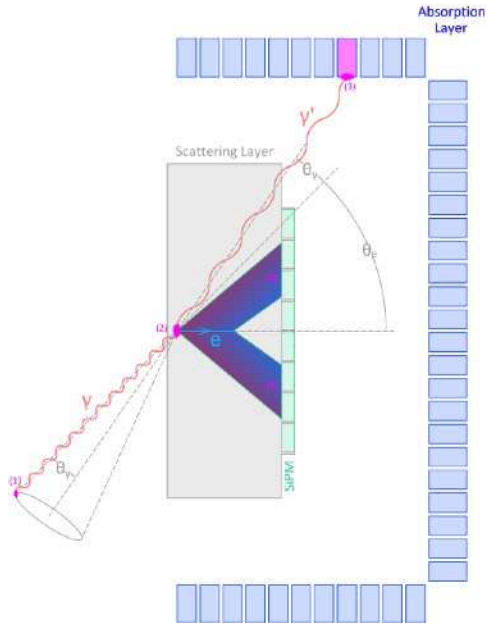
Experimental particle physics

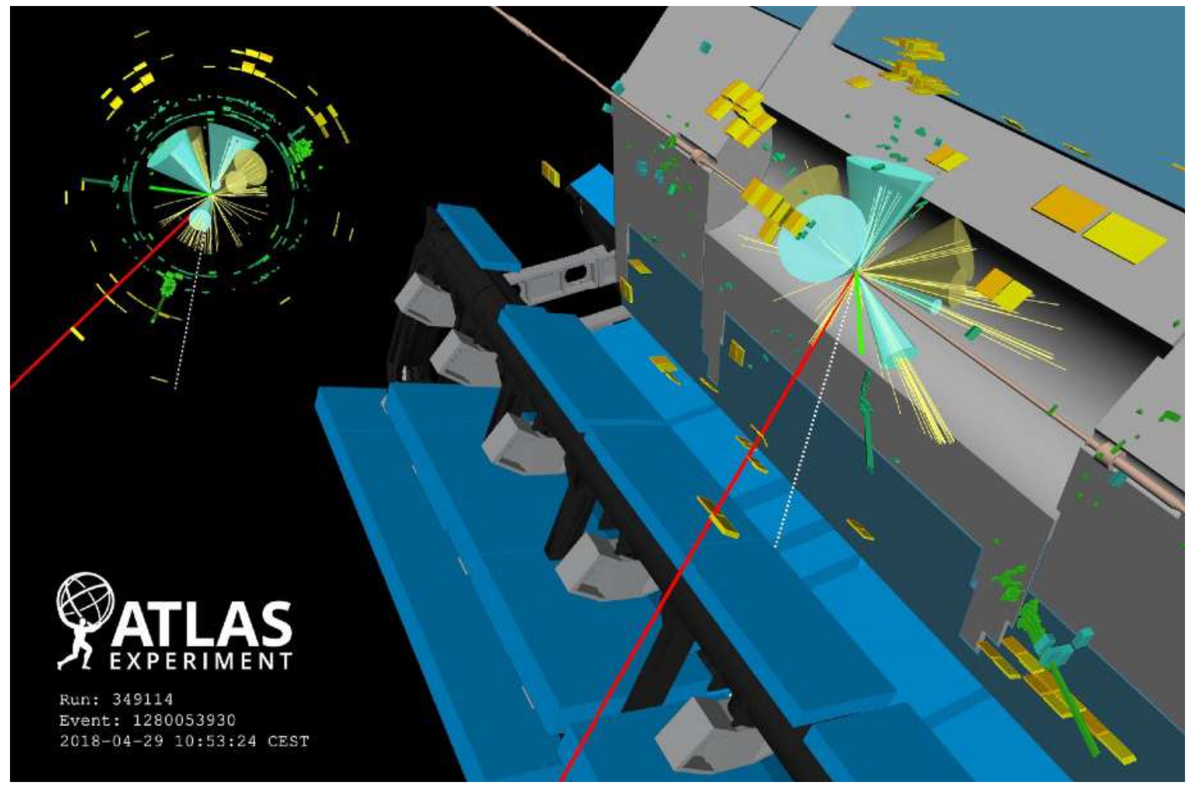
40 scientists and technicians

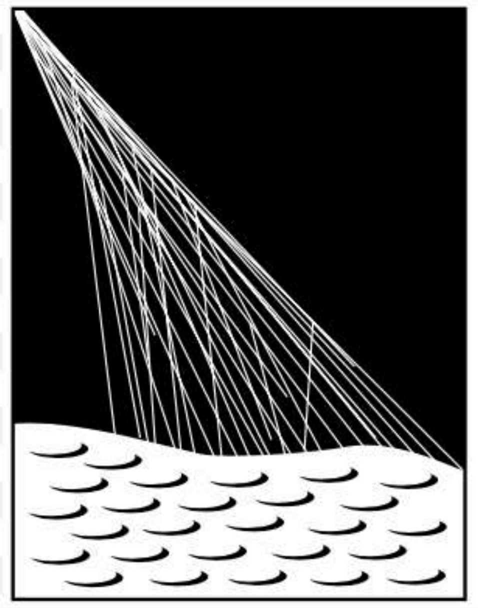
Theoretical particle physics

37 scientists

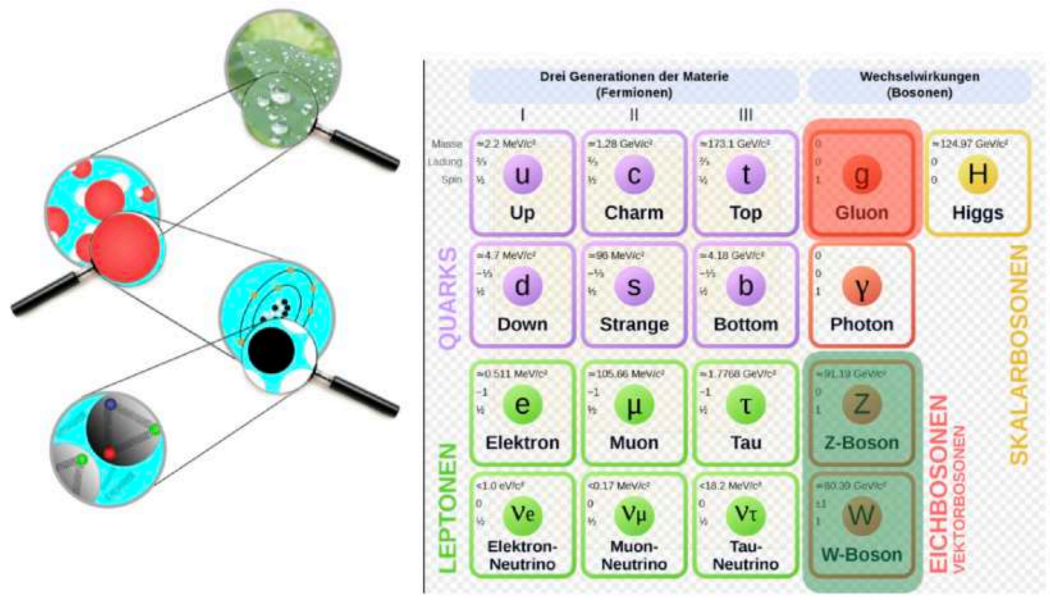
$$W^{\mu\nu} = \frac{1}{4} \sum_{X_u} \frac{1}{2m_B} (2\pi)^3 \langle \bar{B}| J_H^{\dagger\mu} |X_u\rangle \langle X_u| J_H^{\nu} |\bar{B}\rangle \, \delta^{(4)}(p_B - q - p_{X_u})$$

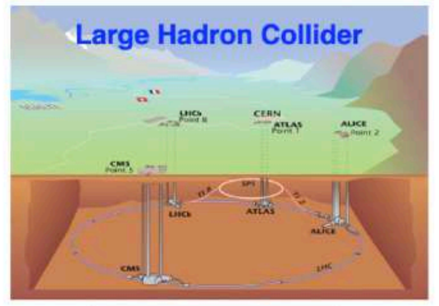







PIERRE AUGER OBSERVATORY





Standardmodel(s)


Elektromagnetic interaction (IA), strong IA, weak IA, (Gravitation)

Color: binds quarks into proton

Flavor: radioactive decay of a neutron to a proton

SM describes thousands of measurement with a very high precision!

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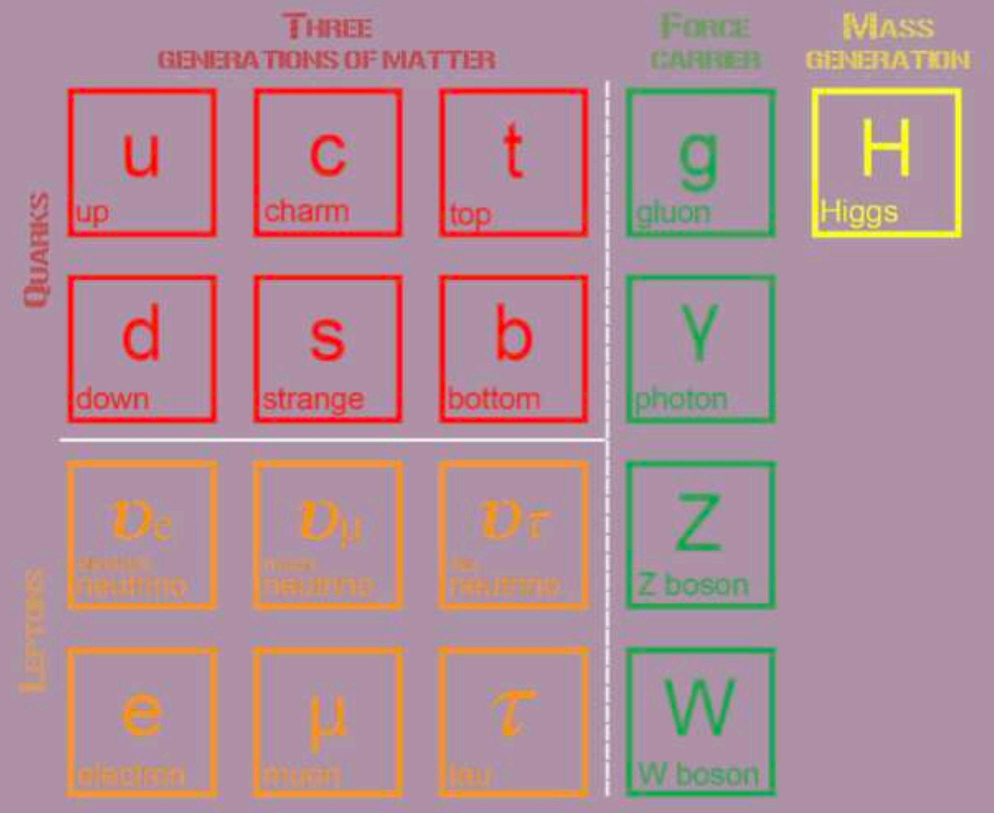
Particle Physics

THE STANDARD MODEL OF PARTICLE PHYSICS

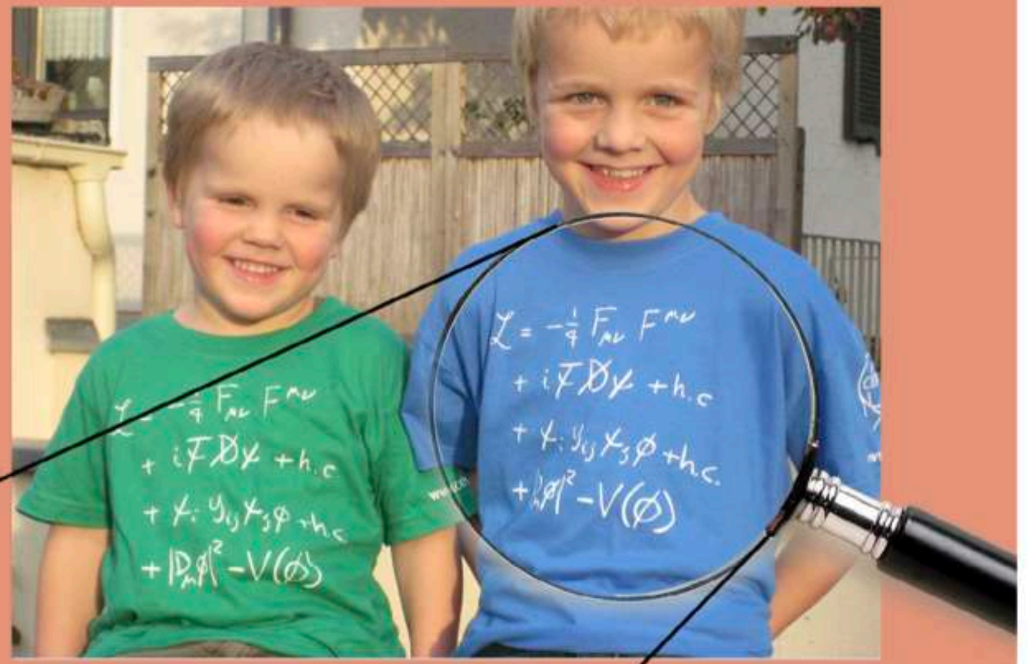
ALL KNOWN FUNDAMENTAL PARTICLES IN THE UNIVERSE CAN BE CLASSIFIED AS MATTER CONSTITUENTS, FORCE CARRIERS AND PARTICLES RESPONSIBLE FOR THE CREATION OF MASS.

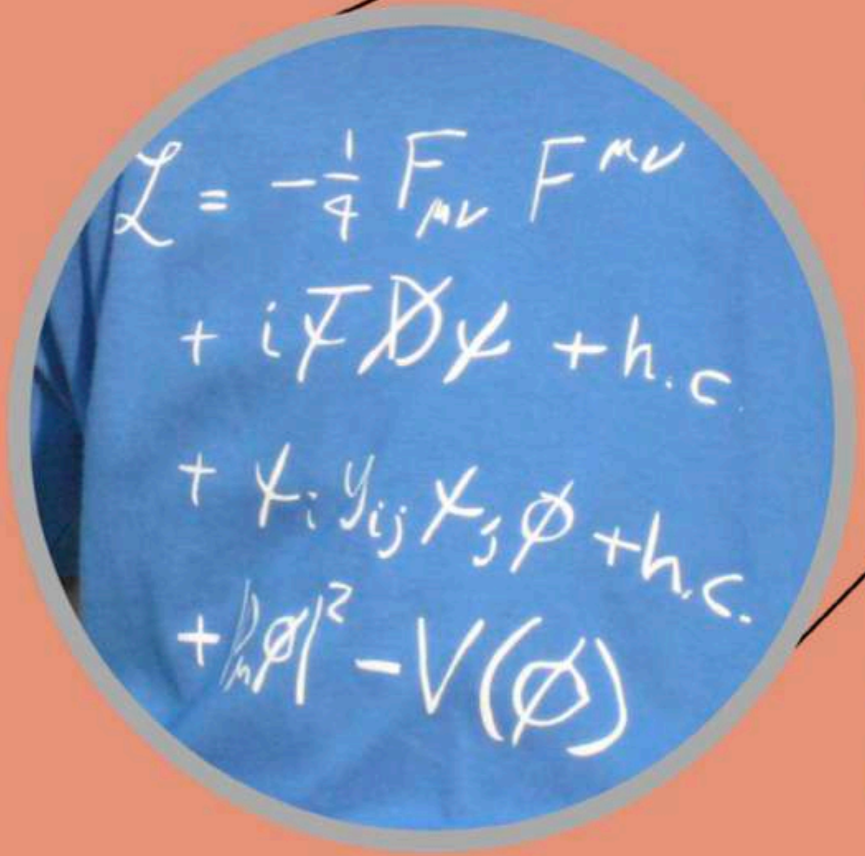
Quarks and leptons are the matter constituents. To a good approximation the proton is made of two **u**p quarks and one **d**own quark. There are also heavier copies of these two quarks: the **c**harm, **s**trange, **b**ottom and **t**op quarks.
The electron is a lepton and it has also heavier copies: the **muon** and the **tau** as well as neutral partners: the neutrinos.
All known fundamental forces are transmitted via force carriers: the electro-magnetic interaction by the **photon**, the strong interaction by the **gluon g** and the weak interaction by the **W** and **Z bosons**.



MASS GENERATION: Having particles with a mass (as we observe in nature) leads to mathematical problems of our theory. A possible solution was the existence of a new, unknown particle, that was finally observed in 2012: the Higgs boson H.

Mathematically all properties of the fundamental particles and interactions can be encoded in the four line formula from page 3 - known as the Standard Model of Particle Physics.





THE FIRST LINE of the formula describes the force carriers.

THE SECOND LINE describes quarks and leptons as well as their interactions.

THE THIRD LINE makes quarks and leptons massive.

THE LAST LINE describes the Higgs particle.

SO WHERE'S GRAVITY? Gravity is not included because we do not have a quantum version of it and its effects are also negligible in the microworld.

Particle Physics

UNIVERSITÄT SIEGEN

CPPS Center for Particle Physics Siegen

HOW DO WE KNOW ALL THIS?

OUR MICROSCOPES FOR LOOKING INTO THE SUB-ATOMIC WORLD ARE PARTICLE ACCELERATORS- THE BIGGEST ONE IS THE LARGE HADRON COLLIDER (LHC)

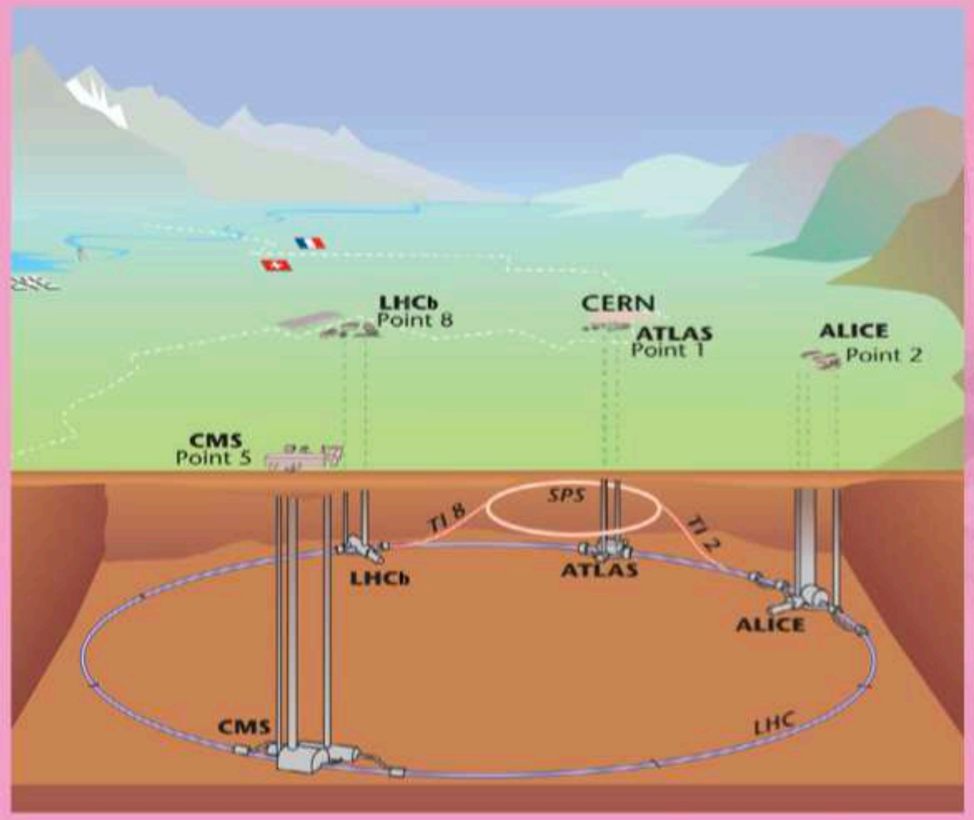
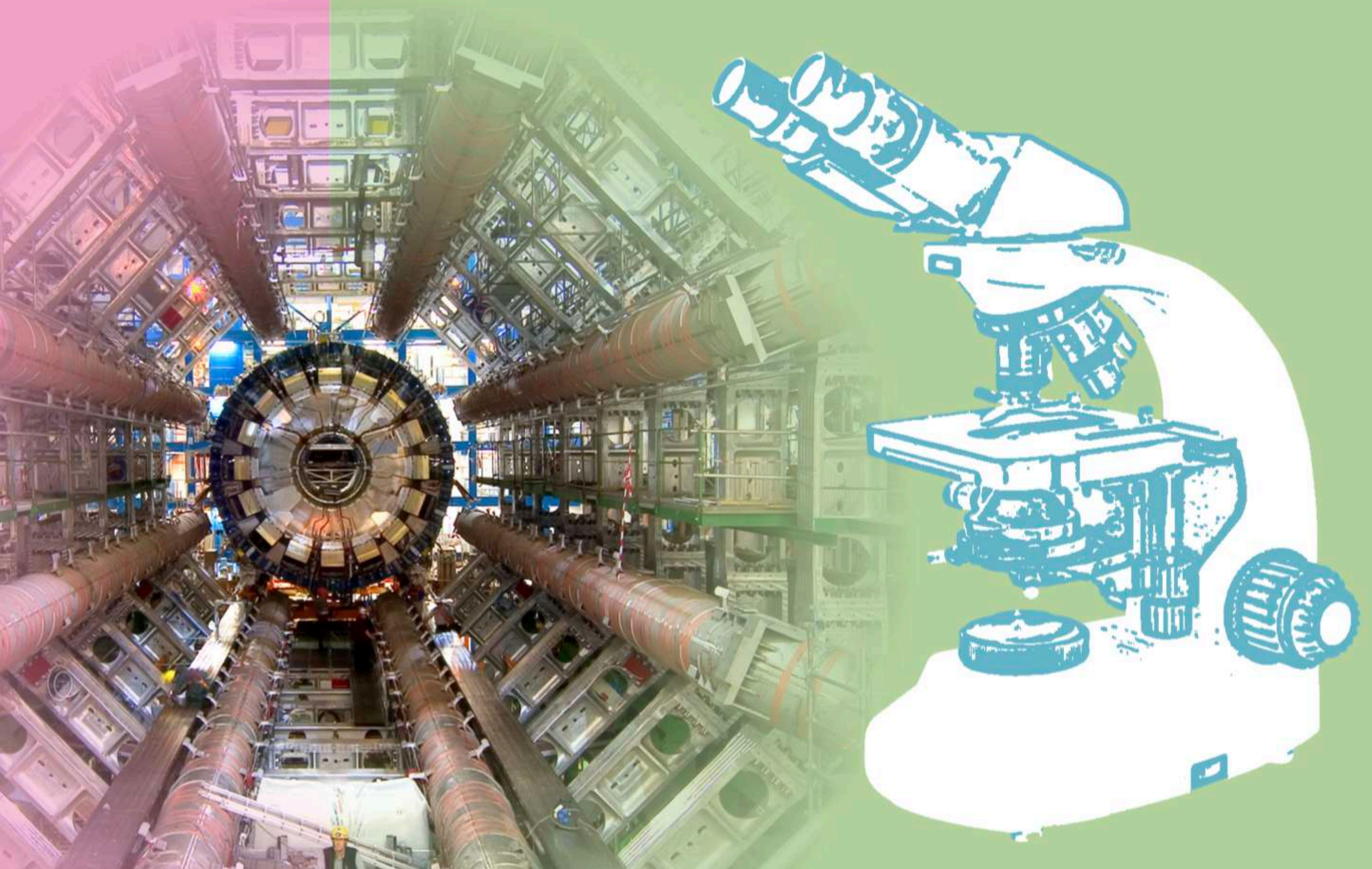


Image credit:CERN



When we see an object, our eyes are working as detectors! Light is emitted by the sun and travels to Earth before bouncing off objects and being recorded in our eyes.

With a normal microscope we can only see objects that are as large as the wavelength of light, which is about the size of small bacteria.

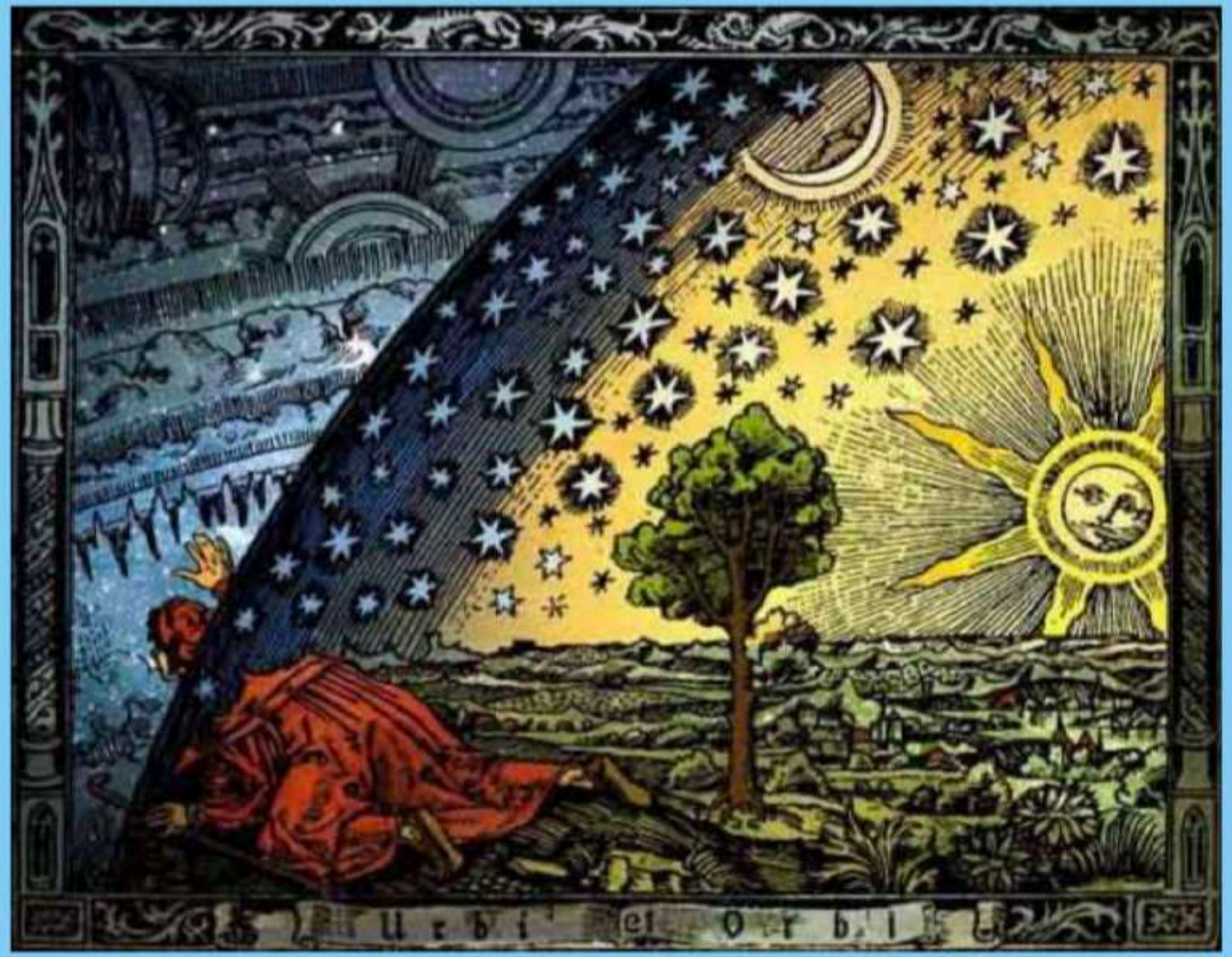
For smaller objects we need shorter wavelengths - which is equivalent to higher energies.

The highest possible energies in the laboratory can currently be created with the LHC, making it our biggest microscope. In every second at the LHC, we can have **600 MILLION COLLISIONS** of a proton with another proton. The energy of the proton beam in the LHC corresponds to the energy of a 200 ton train with a velocity of **MORE THAN 100 MPH!**

With the LHC we can see structures that are more than 100 billion times smaller than bacteria!

Particle Physics

IS THERE ANYTHING BEYOND THE STANDARD MODEL?



Flammarion engraving 1888 (colourised version)

The enquiring mind of humankind is determined to look behind the curtain, representing the limit of current knowledge.
Centuries ago this curtain was given by the borders of the known world - looking beyond these boundaries new countries were discovered, later we even reached out for the whole Universe. Besides making discoveries at larger and larger distance scales, we also started to investigate the smallest building blocks. Now the Standard Model is the limit of knowledge in the micro-world....

....WHAT LIES BEYOND?

THE STANDARD MODEL IS EXTREMELY SUCCESSFUL

it accurately predicts
hundreds of observables at the quantum level

$$a_e = \frac{g-2}{2}$$

Predicted value $= 0.0011596521816(\pm 8)$

Measured value $= 0.0011596521807(\pm 3)$

- g is the strength of the coupling of a photon to an electron
- a_e is the deviation of this coupling from 2
- Experiment and Standard model agree to an extremely high precision

BUT

it leaves many questions open, like

What is the origin of DARK MATTER?
How was MATTER CREATED in the Universe?
Why are NEUTRINOS almost MASSLESS?
Why do we have three copies of Quarks and LEPTONS?
Is there a QUANTUM THEORY OF GRAVITY?
Why is the top QUARK SO MUCH HEAVIER than the ELECTRON?

Particle Physics

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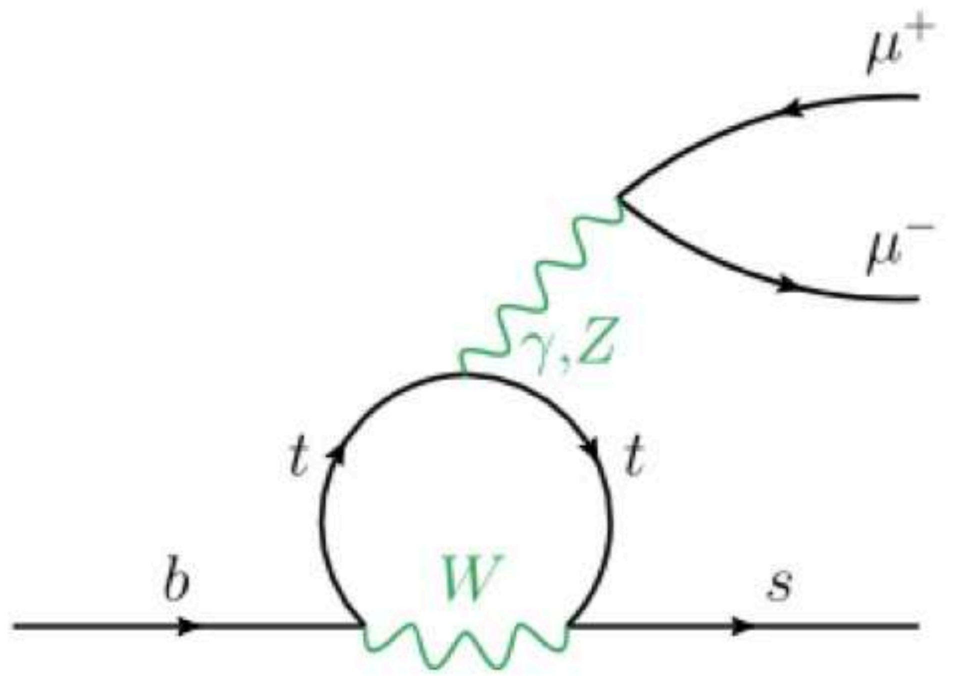
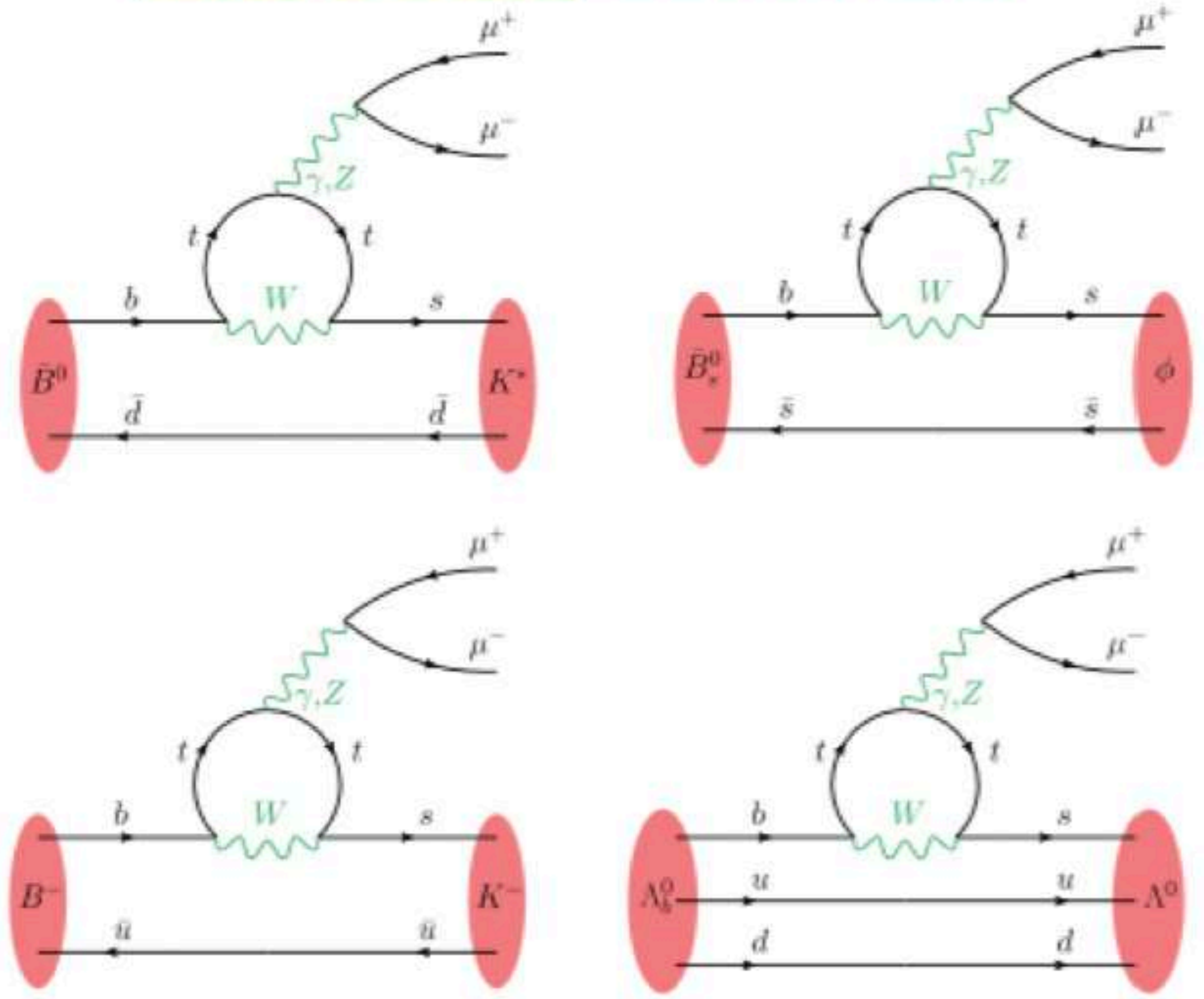
Flavour Physics

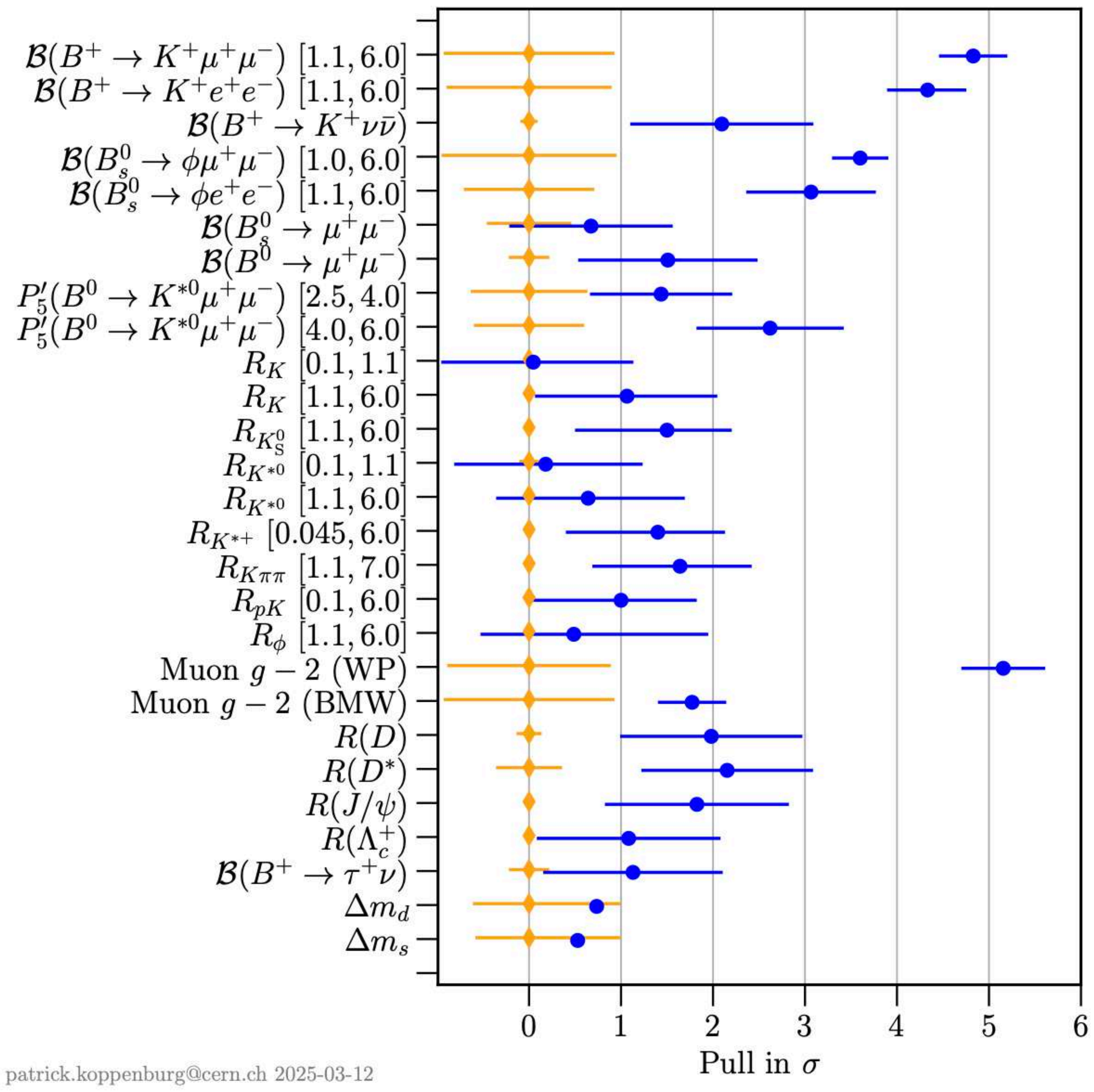
Theory **Experiment**

$b \to s\ l^+l^-$ **weak decay**



Hadronic structure





Deviations **might** point towards new physics, explain matter asymmetry, dark matter,…

Our speciality:
Precise theory calculations

SUBATOMIC HEROES

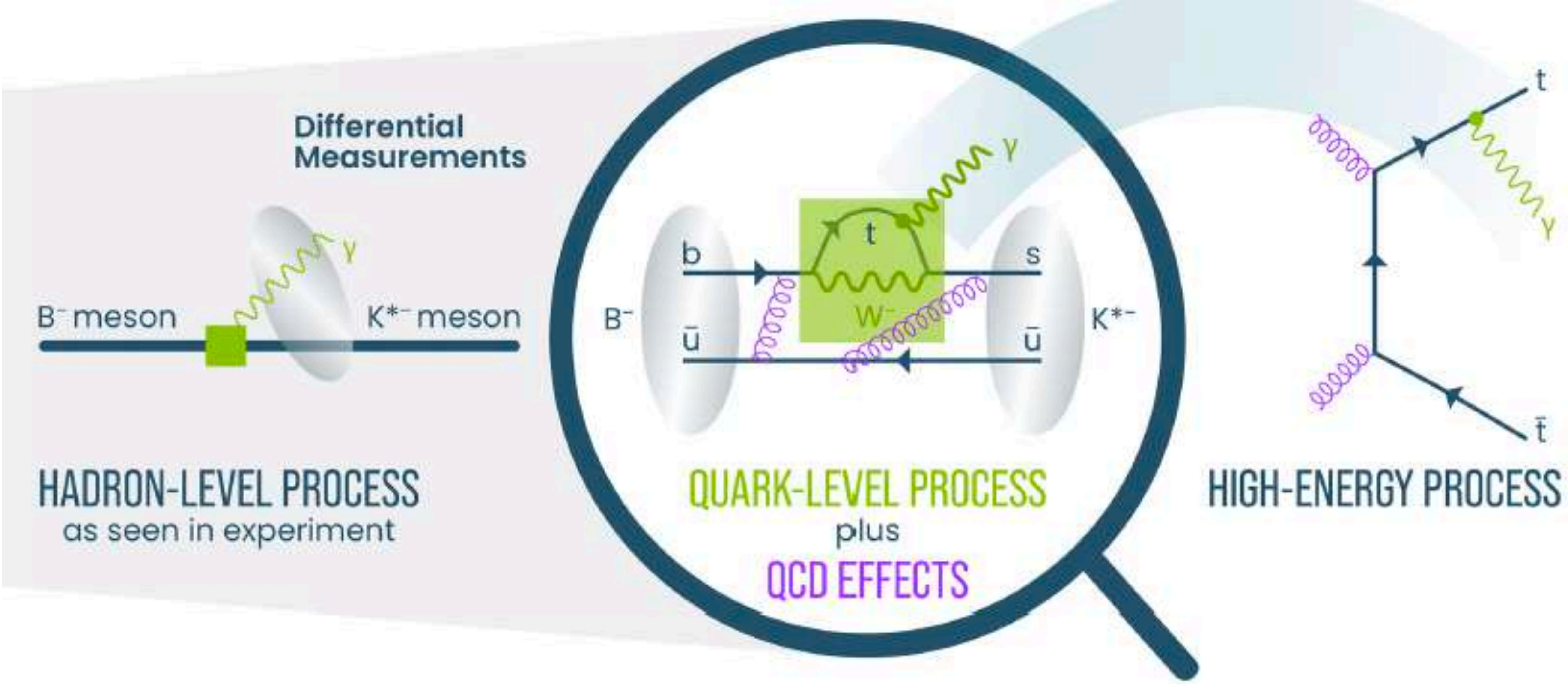
Experiments at CERN (LHCb, ATLAS, CMS), KEK (BelleII) und BESIII

Particle Physics

CPPS Center for Particle Physics Siegen

UNIVERSITÄT SIEGEN

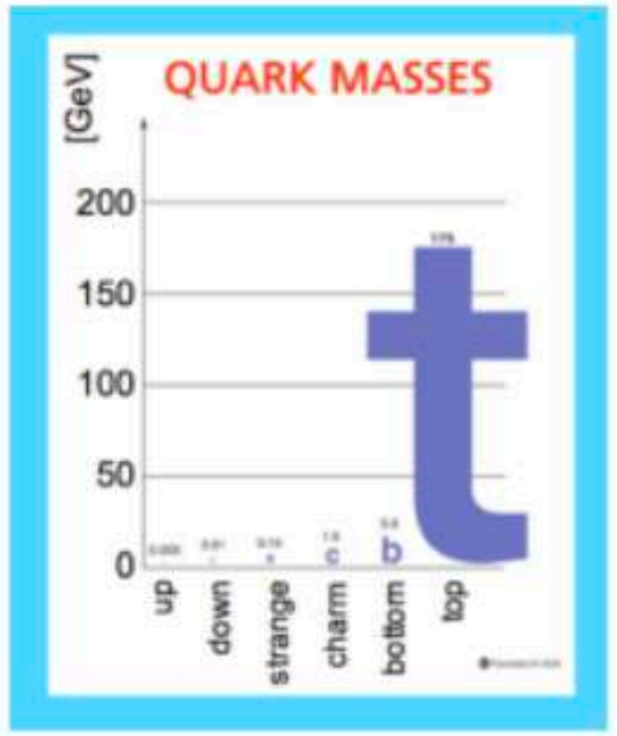
Flavour Physics meets Top Physics



Look for the properties of the top quark at the ATLAS detector

Top Quark : The heaviest Ingredient of our Universe

Since its discovery at the Tevatron in 1995, the top quark has been of major interest in studying the Standard Model (SM) and in the search for New Physics.



With a mass of 172.5 GeV, the top quark is the **heaviest** SM particle known to date.

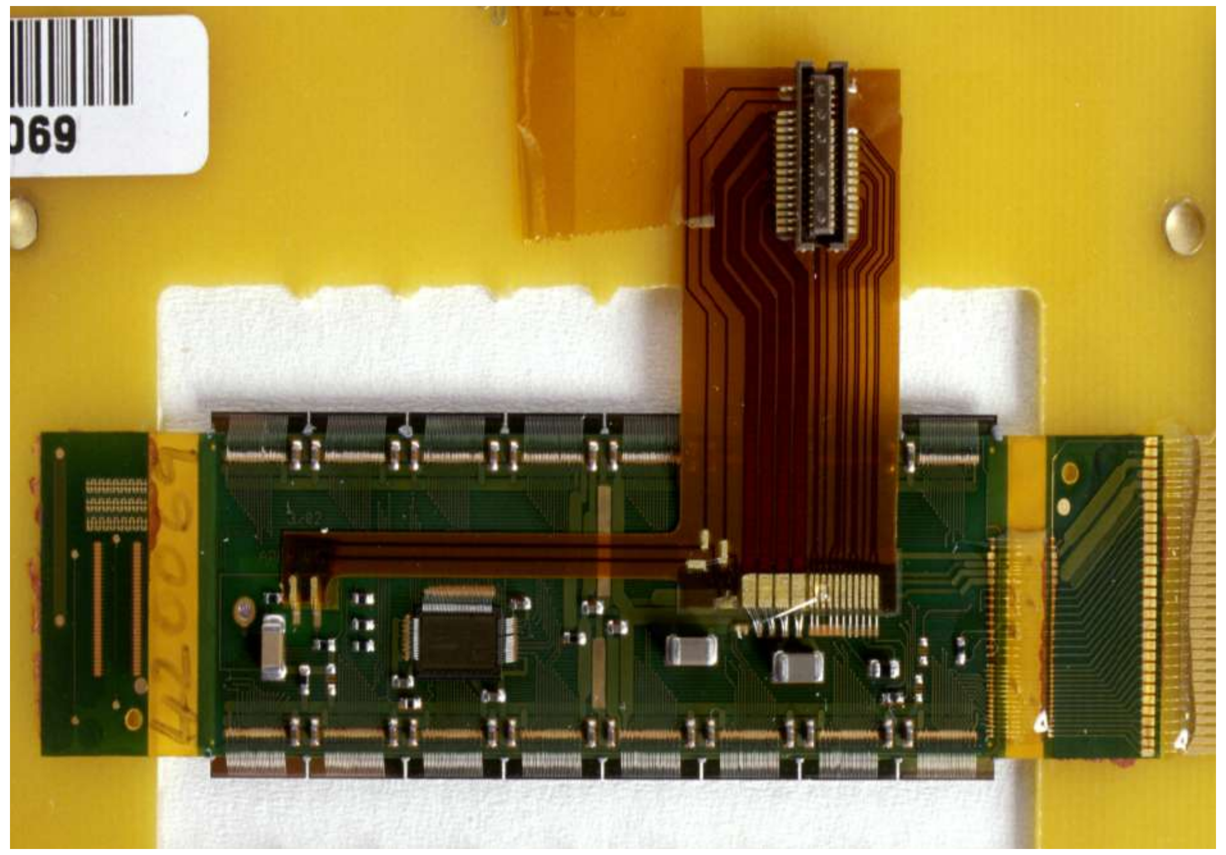
It is a key tool to **probe the SM at high energies** and search for **new phenomena**

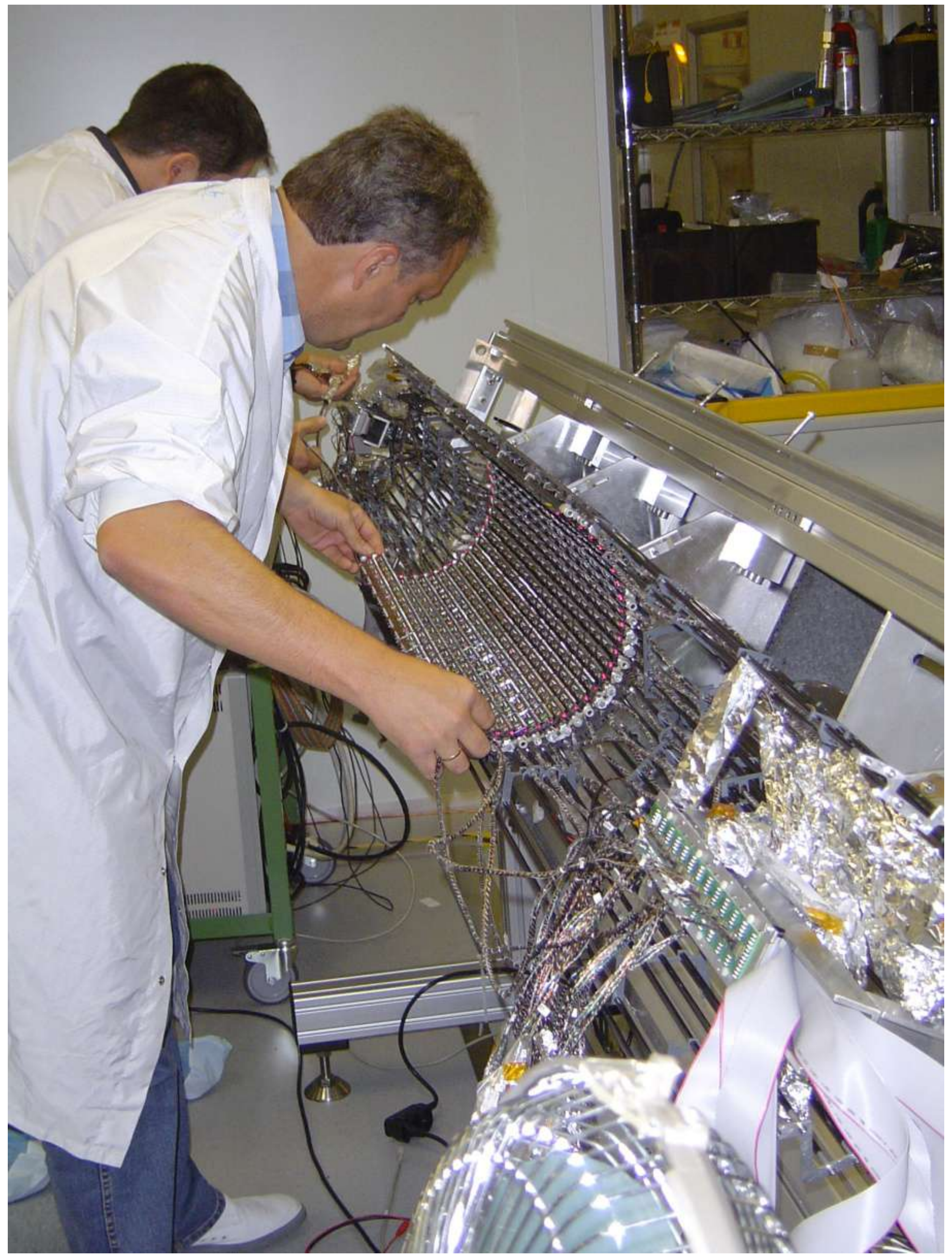
The LHC is a Top Quark Factory

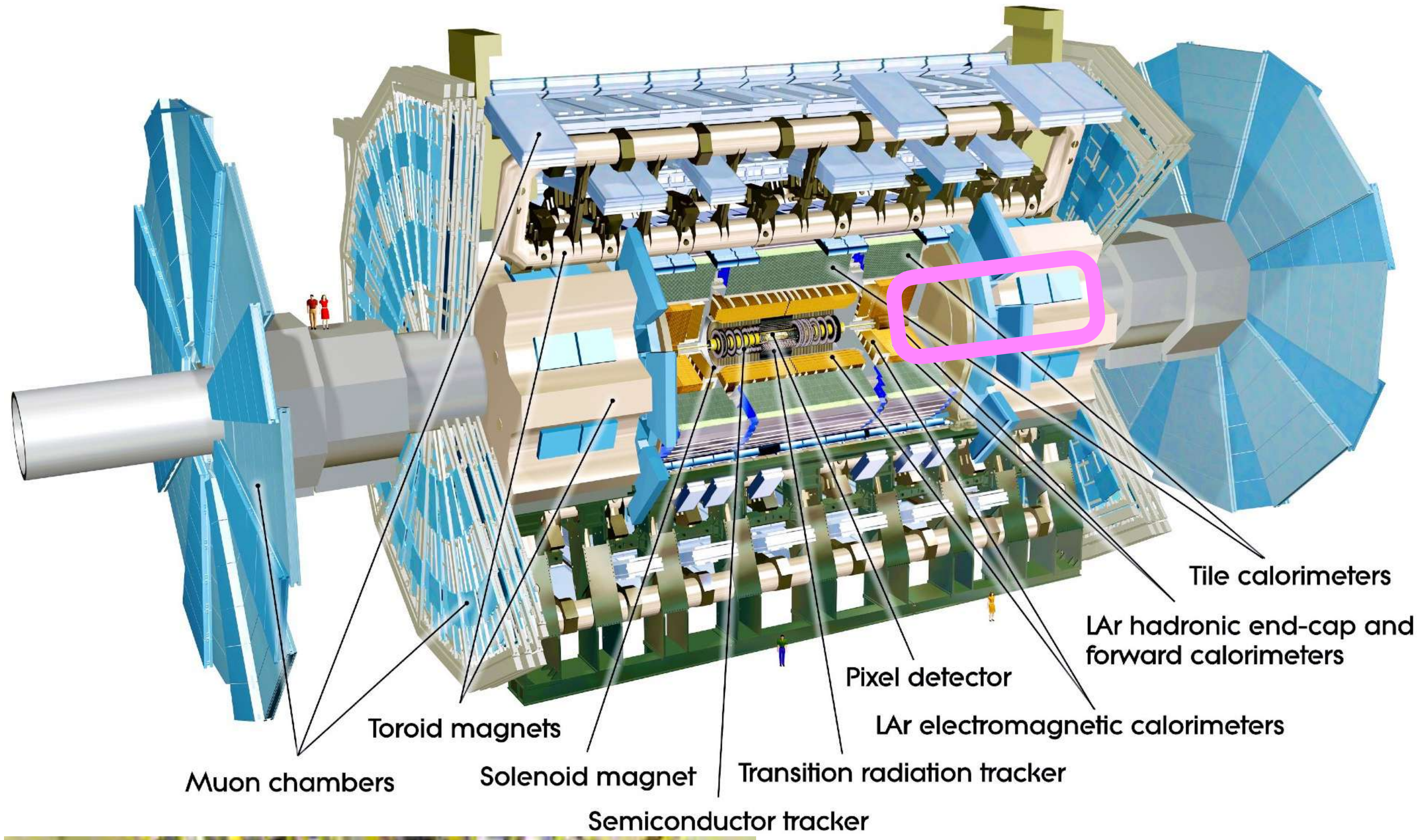
The high centre-of-mass energy of the LHC (13.6 TeV since 2022!) makes it a true top quark factory: more than 300 million top quarks produced!

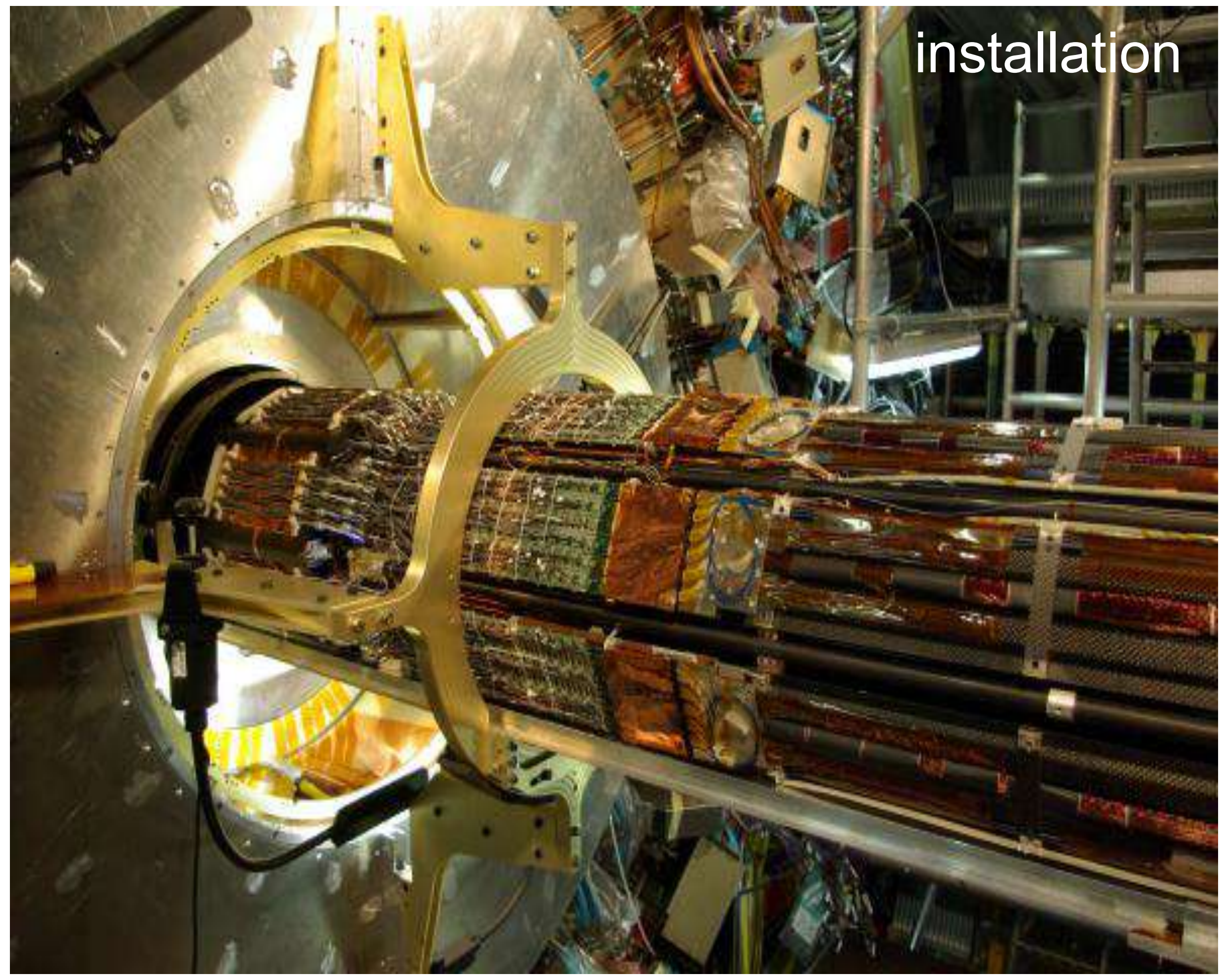
The ATLAS Pixel detector

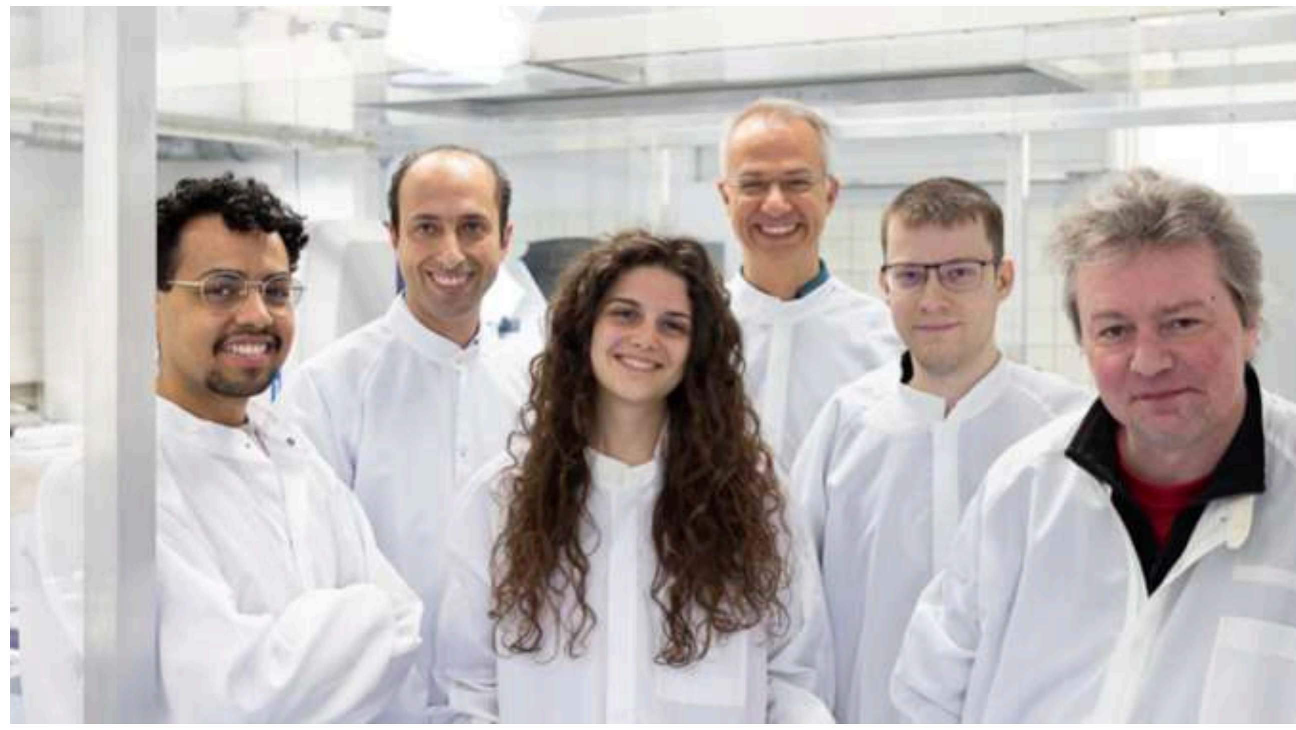
Universität Siegen





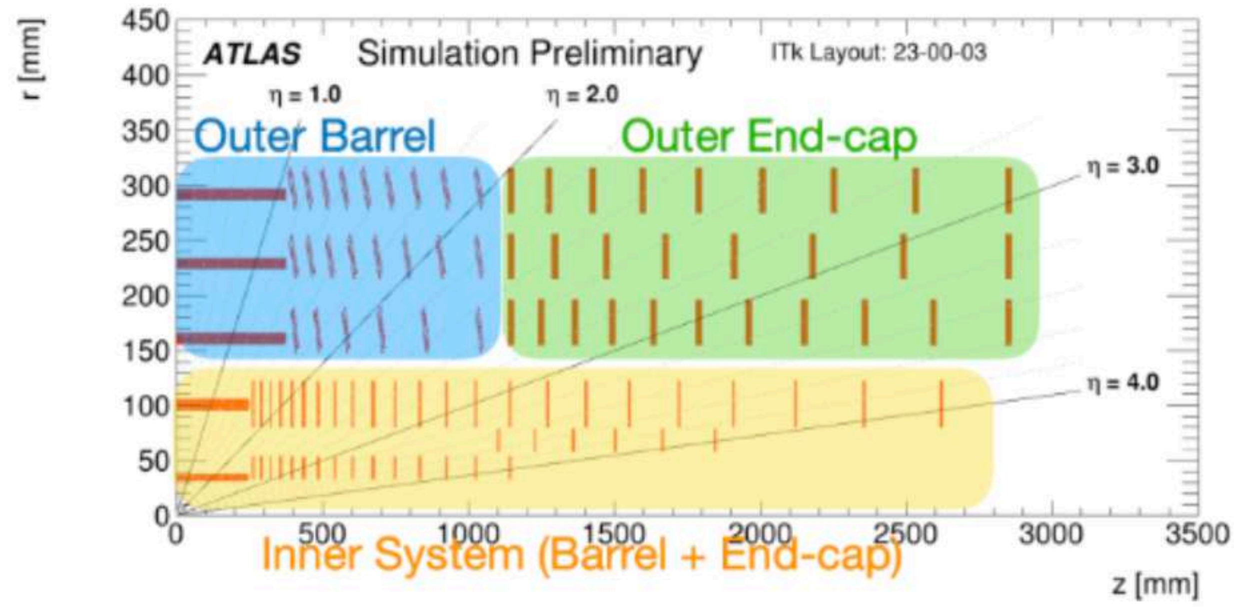






A new pixel detector is required for the High-Lumi LHC phase

- Up to 200 simultaneous collisions
- 2 → 13 m² silicon sensors
- 2000 → 9400 modules
- 92 Mega-Pixel → 5,1 Giga-Pixel

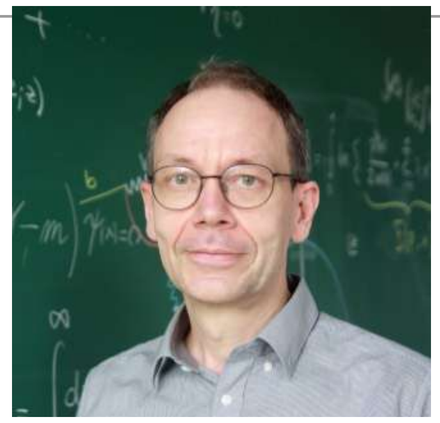
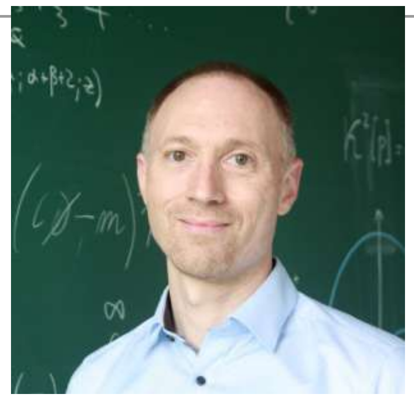
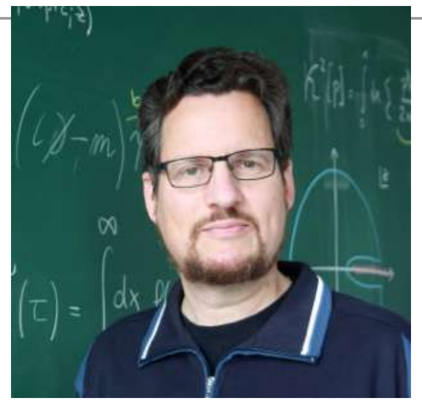
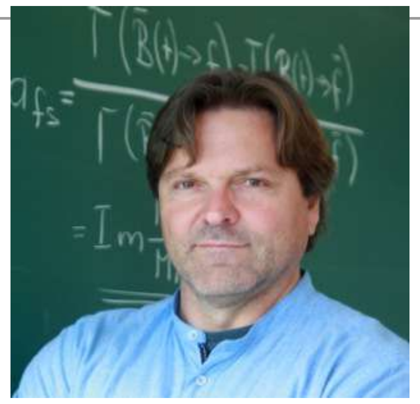
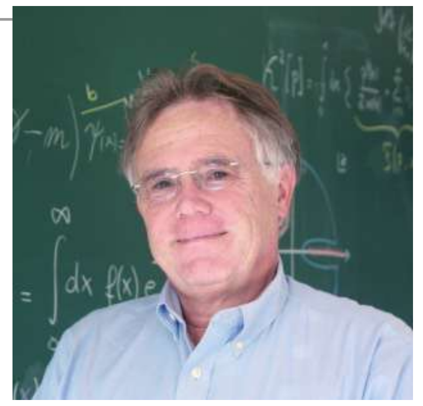


Research groups

UNIVERSITÄT SIEGEN

CPPS Center for Particle Physics Siegen

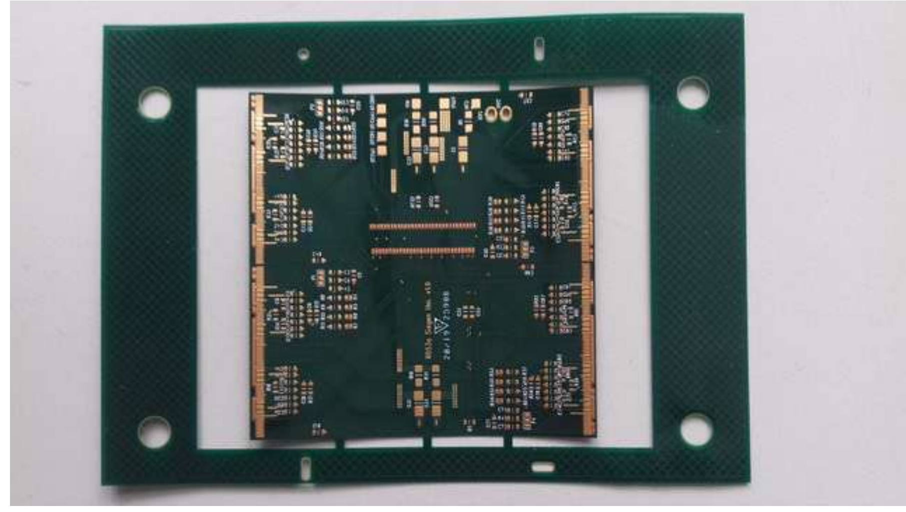
Cristinziani	Diez Pardos	Fleck	Risse
			

Bell	Feldmann	Huber	Kilian	Lenz	Mannel
					

Experimental particle physics 40 scientists and technicians

Detector development

- Silicon pixel detector
- gasgefüllte Detektoren (Timepix)
- Silizium Photommultiplier (SiPM)



Data analysis

Develop methods for reconstruction and analysis (Machine Learning)

Analysis of top quark data at ATLAS

PIERRE AUGER OBSERVATORY

- Search for the highest-energy photons
- Multimessenger astronomy
- Mass composition of cosmic rays
- Studies related to violations of Lorentz invariance in air showers

$$S_0(\tau,\nu) = 1 + \left(\frac{Z_\alpha \alpha_s}{4\pi}\right)(\mu^2\bar\tau^2)^\epsilon (\nu\bar\tau)^\alpha S_R(\epsilon,\alpha) + \left(\frac{Z_\alpha \alpha_s}{4\pi}\right)^2 (\mu^2\bar\tau^2)^{2\epsilon}\left\{(\nu\bar\tau)^\alpha S_{RV}(\epsilon,\alpha) + (\nu\bar\tau)^{2\alpha} S_{RR}(\epsilon,\alpha)\right\} + \mathcal{O}(\alpha_s^3)$$

$$F^{\rm LP}_{\gamma\pi}(Q^2) = \frac{(e_u^2 - e_d^2) f_\pi}{\sqrt{2}\,Q^2}\int_0^1 dx\, T_2(x,Q^2,\mu_F)\,\phi_\pi(x,\mu_F)$$

$$\mathcal{L}_{\rm Y} = -Y_{ij}^{(u)}\bar{Q}_L^i \tilde\Phi_2 u_R^j - Y_{ij}^{(d)}\bar{Q}_L^i \Phi_1 d_R^j - Y_{ij}^{(\ell)}\bar{L}_L^i \Phi_1 \ell_R^j + \text{h.c.},$$

$$\mathcal{M}_{12}(B_q) = \mathcal{M}_{12}(B_q)|_{\rm SM}\left[1 + \frac{4\pi^2 \mathcal{C}_{qq}}{G_F^2 m_W^2 (V_{tb}^* V_{tq})^2 S_0(x_t)}\right]$$

Process	MG5_aMC			WHIZARD			
	$\sigma_{\rm LO}$[fb]	$\sigma_{\rm NLO}$[fb]	K	$\sigma_{\rm LO}$[fb]	$\sigma_{\rm NLO}$[fb]	K	$\sigma^{\rm std}_{\rm NLO}$
$e^+e^- \to jj$	622.70(5)	639.30(12)	1.027	622.737(8)	639.39(5)	1.027	0.69

$$W^{\mu\nu} = \frac{1}{4}\sum_{X_u}\frac{1}{2m_B}(2\pi)^3 \langle\bar B| J_H^{\dagger\mu}|X_u\rangle\langle X_u| J_H^\nu |\bar B\rangle\,\delta^{(4)}(p_B - q - p_{X_u})$$

Theoretical particle physics 37 scientists

Theory

- Precision calculations within in beyond the Standard model (SM)
  - Flavour physics
  - Perturbative calculations
  - Effective Theories, SCET
  - Sum rules
  - Lattice simulations
- Monte Carlo Studies
- Investigations of models beyond the SMl

Largest theoretical flavour physics group in the world

Centre for Particle Physics Siegen

Universität Siegen

Detector Develoment

Data Analysis | Machine Learning | ATLAS CERN | Pierre Auger | Ship CERN | Flavour Physics | Sum Rules | SCET | Monte Carlo | Multi Loop | Lattice

International composition of particle physics group https://cpps.physik.uni-siegen.de

Universität Siegen

CPPS Center for Particle Physics Siegen

Outline

1) Where is Siegen?

2) Physics in Siegen - - - a) excellent student staff ratio
3) Physics in Siegen - - - b) excellent research
4) Physics in Siegen - - - c) Particle physics

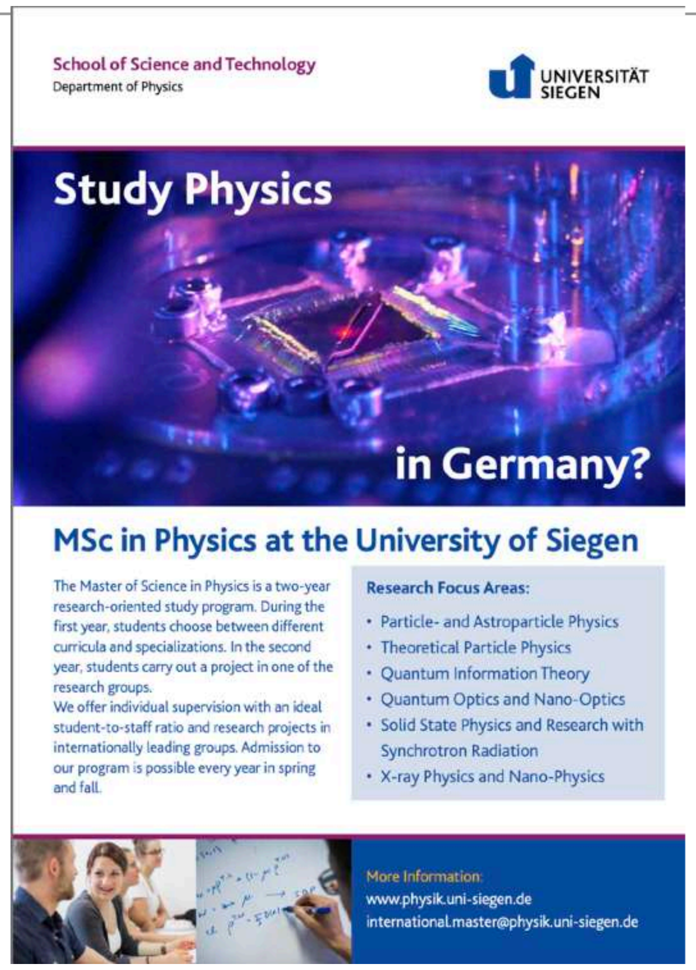
5) Master studies in Siegen

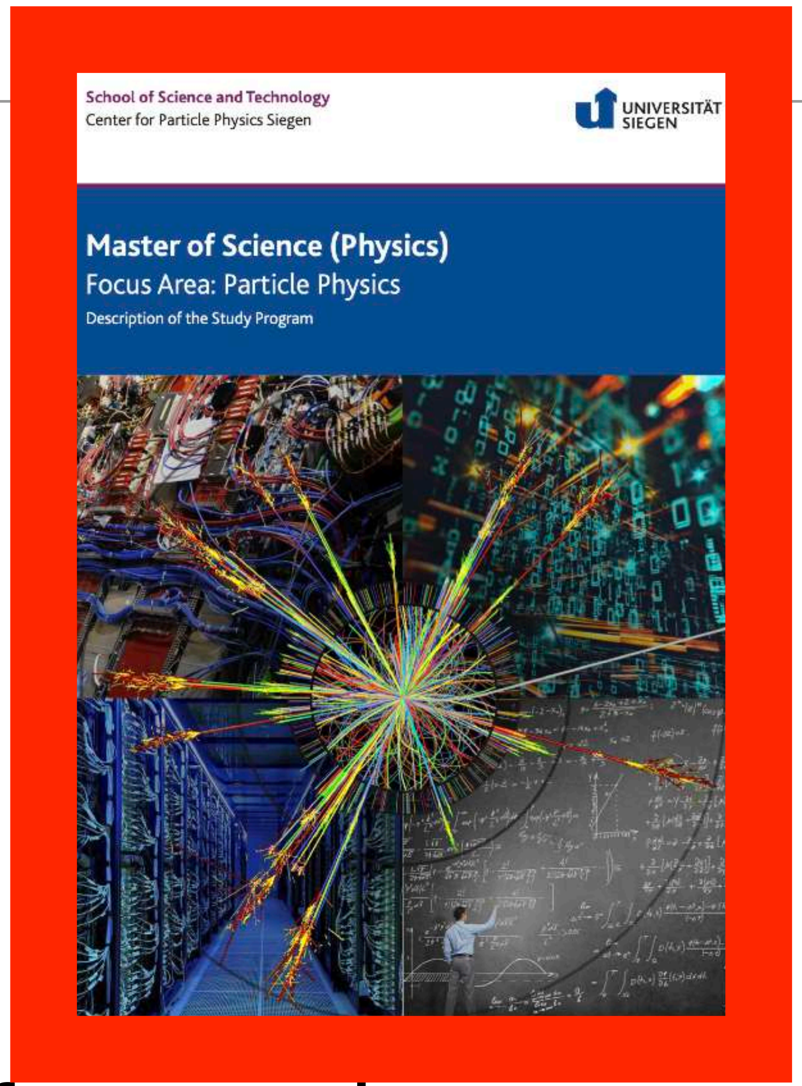
6) Living in Siegen

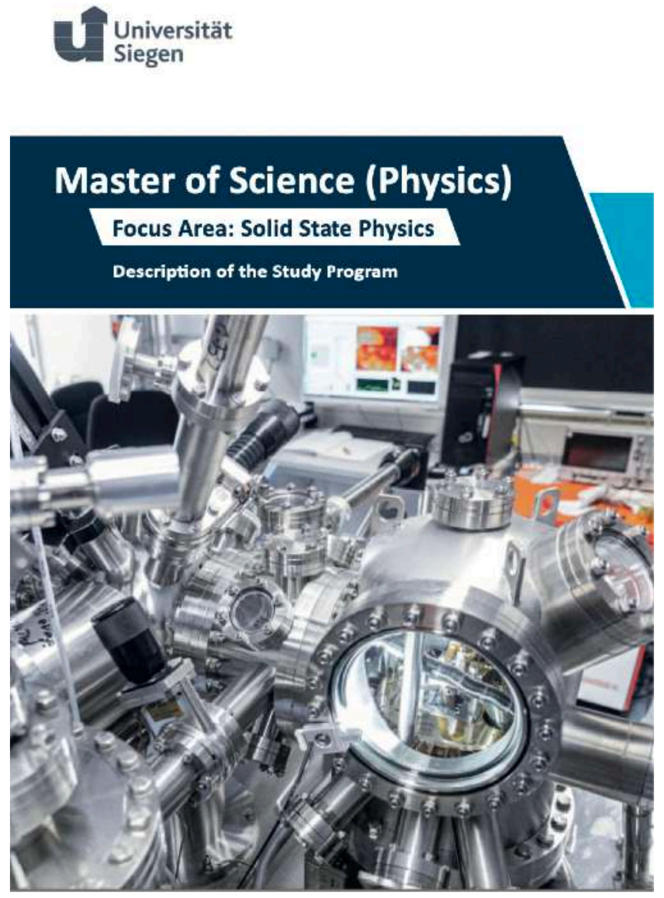
7) Physics fun in Siegen

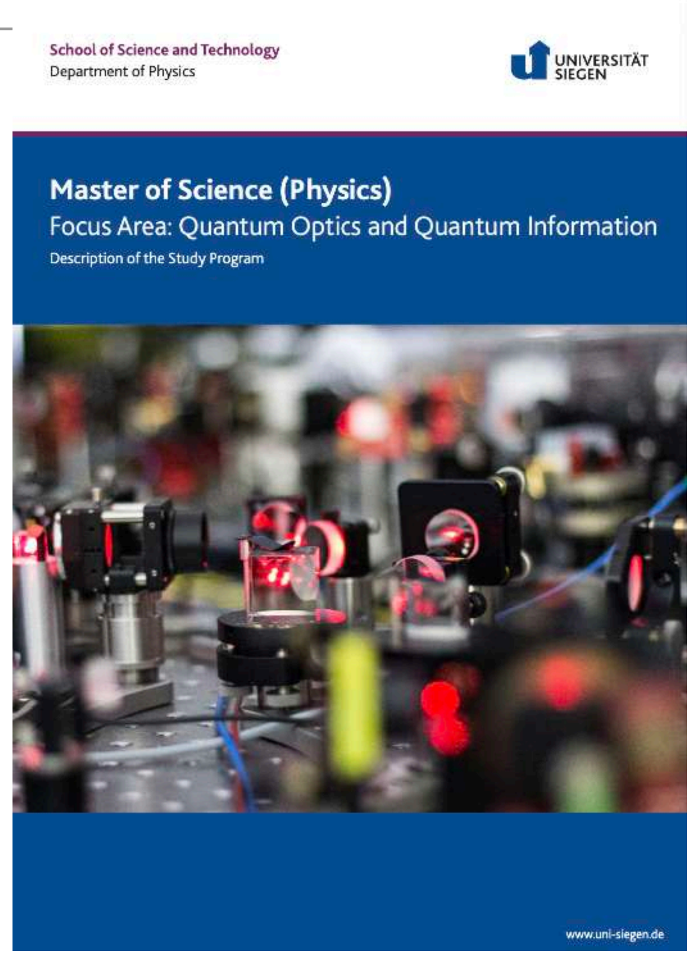
8) Summary & How to apply

Physics Studies in Siegen









- Bachelor (German)
- **Master (English)**
  - **General Master**
  - **Focus area particle physics**
  - Focus area quantum optics and quantum information
  - Focus area solid state physics

- Teaching in Physics
- MSc NanoScience and Nanotechnology
- MSc Quantum Science

[Link to brochure for master studies in particle physics]

Particle Physics Master studies

Universität Siegen

The CPPS offers a two-year **Master of Science (Physics)** degree with focus on **particle physics**.

The study program is **research oriented**, i.e. after its successful completion you will be qualified to understand and participate in topical research in particle physics, e.g. by **undertaking a PhD project**.

The program is designed for **four semesters:**

1. In the **first two semesters** the students attend specialized **lectures**, **seminars** and a **laboratory course**
   Can take longer depending on your previous education
2. one semester of **preparation for research work**
3. **master thesis** to be prepared during the last semester
   Thesis results often in a publication

CPPS Center for Particle Physics Siegen

Particle Physics Master studies

The curriculum offers ample flexibility to tailor your studies to your personal interests.

It is subdivided into four categories:

1. **Mandatory Courses:** Laboratory Course and Master Seminar (15 CP)
2. **Mandatory Electives:** Two **Core Modules** and one **Elective** in the chosen Focus Area (24 CP)
3. **Electives:** Further **Core Modules** and **Electives** (21 CP)
4. **Research Phase:** Preparation Phase, Training Phase and Master Thesis (60 CP)

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Particle Physics Master studies

Universität Siegen

For further information on the MSc course program, please consult
https://www.physik.uni-siegen.de/pruefungsamt/modbuchmsc_2019-en.pdf

- Core Modules
- Electives
- Mandatory Courses
- Research Phase

EPP	Experimental Particle Physics (ST)
CPPP	Concepts and Phenomena in Particle Physics (WT)
TPP1	Theoretical Particle Physics I (ST)
TPP2	Theoretical Particle Physics II (WT)

(9 CP each)

ID	Course Title	CP
A1	Data Analysis + Machine Learning	6
A2	Lab Course on Electronics	6
A3	Detector Physics	6
A4	Accelerator Physics II	3
D1	Astroparticle Physics	6
D2	Cosmology	6
D3	Physics at the Pierre Auger Obser.	6
D4	Physics at the LHC	6
E1	Flavour Physics	6
E2	Hadron Physics	6
E3	Collider Physics	6
E4	Higgs Physics	6
F1	Physics beyond the SM	6
F2	Effective Field Theories	6
F3	Calculation of Loop Diagrams	6
F4	Special Topics in QFT	3

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Particle Physics Master studies

Universität Siegen

A student with interests in **experimental particle physics** may choose the following modules:

- **Core Modules:**
  - Experimental Particle Physics (EPP)
  - Concepts and Phenomena in Particle Physics (CPPP)
- **Electives:**
  - Physics at the Large Hadron Collider
  - Detector Physics
  - Flavour Physics
  - Machine Learning
  - Accelerator Physics II

Semester 1	Semester 2	Semester 3	Semester 4
EPP	Physics at the LHC	Oral Exam	
	CPPP		
Detector Physics	Flavour Physics		
Machine Learning			
Accelerator Physics II			
Master Seminar	Laboratory Course	Preparation + Training	Master Thesis

Core Modules
Electives
Mandatory Courses
Research Phase

CPPS Center for Particle Physics Siegen

Particle Physics Master studies

Universität Siegen

Semester 1	Semester 2	Semester 3	Semester 4
CPPP	Flavour Physics	Oral Exam	
	TPP 1		
Physics at the LHC	Hadron Physics		
Cosmology	Special Topics in QFT		
Laboratory Course	Master Seminar	Preparation + Training	Master Thesis

A student with interests in **theoretical particle physics** may choose the following modules:

- **Core Module:**
  - Concepts and Phenomena in Particle Physics (CPPP)
  - Theoretical Particle Physics 1 (TPP 1)
- **Electives:**
  - Physics at the Large Hadron Collider
  - Cosmology
  - Flavour Physics
  - Hadron Physics
  - Special Topics in Quantum Field Theory

Legend (colour key):
- Core Modules
- Electives
- Mandatory Courses
- Research Phase

CPPS Center for Particle Physics Siegen

Additional online Courses

Universität Siegen

https://www.color-meets-flavor.de/lectures.html

color meets flavor

News Lectures Seminars Outreach

Color-Meets-Flavor

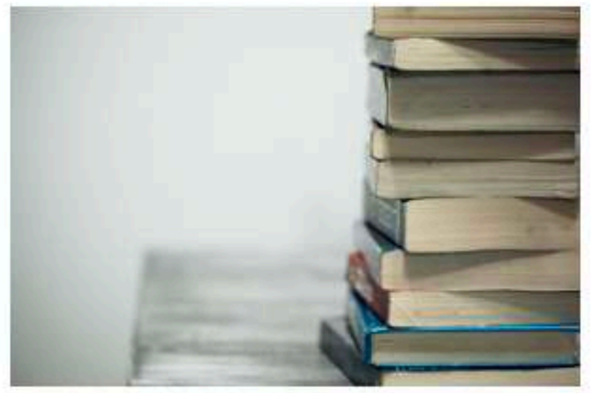
Bonn-Dortmund-Siegen-Jülich

Joint Activities

Welcome to our joint academic platform on high energy particle physics, a collaboration between Rheinische Friedrich-Wilhelms-Universität Bonn, Technische Universität Dortmund, Universität Siegen, and Forschungszentrum Jülich. The Color-Meets-Flavor project combines our strenghts in particle physics of quantum chromodynamics and flavor physics.

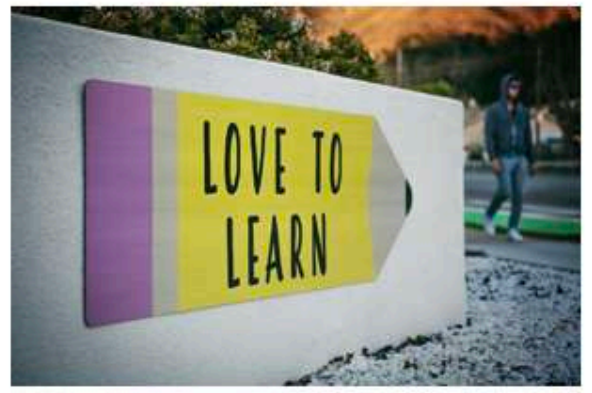
Here, students from all three universities can access advanced lectures in hadron and particle physics. We present shared seminars, news about our research and information about our outreach activities.

News



Lectures

Research seminars



Outreach

UNIVERSITÄT BONN | technische universität dortmund | Universität Siegen | JÜLICH Forschungszentrum

Courses Summer Semester 2025

Dortmund

Experimental Physics

Statistical Methods of Data Analysis 2

Prof. Dr. Johannes Albrecht (johannes.albrecht(at)tu-dortmund.de)
Prof. Dr. Mikhail Mikhasenko (Mikhail.Mikhasenko(at)rub.de)
Prof. Dr. Michael Schmelling (michael.schmelling(at)mpi-hd.mpg.de)

Two-week block course with lectures and exercises (in presence or via Zoom) taking place from July 21 to August 1.

Module Description (PDF)

Siegen

Theoretical Physics

Collider physics

Prof. Dr. Guido Bell (bell(at)physik.uni-siegen.de)
Lectures:
Mon: 14:15-15:45
Thu: 12:30-14:00 (alternating between lecture and tutorial)

For online participation from Bonn or Dortmund please contact bell(at)physik.uni-siegen.de before the first lecture.

Module announcement (PDF) Module description (PDF)

Bonn and Dortmund

Experimental Physics

Experimental aspects of particle physics

Prof. Dr. Johannes Albrecht (johannes.albrecht(at)tu-dortmund.de)
Prof. Dr. Slavomira Stefkova (sstefkov(at)uni-bonn.de)

Please write to one of the contact persons if you would like to participate. A Moodle room will follow shortly.

Module description (PDF)

Bonn, Dortmund, and Siegen

Experimental Physics

Flavor physics in experiment and theory - particle physics II

Prof. Dr. Johannes Albrecht (johannes.albrecht(at)tu-dortmund.de)
Prof. Dr. Alexander Lenz (alexander.lenz(at)uni-siegen.de)
Dr. Markus Prim (mprim(at)uni-bonn.de)

Please write to one of the contact persons if you would like to participate. A Moodle room will follow shortly.

Module description (PDF)

Previous Topics for Master theses

Universität Siegen

Master

Area	Date	Name	Title of Thesis
Experiment	2024	Tim Lukas Fehler	Hybrid Search for Photons with the Low-Energy Extensions of the Pierre Auger Observatory
Theory	04/2023	Dennis Heinemann	Study of e+ e- jet-rates in Soft-Collinear Effective Theory
Experiment	04/2023	Kaveh Kooshkjalali	Design, Construction, and Testing of a Cherenkov Coincidence Detector for Proton Beam Therapy
Theory	01/2023	Christian Schneider	Gradient-flow scale setting with tree-level improvement
Theory	01/2023	Daniel Busch	Classifying the Flavour Sector in Extensions of the Standard Model via Froggatt-Nielsen Charges
Theory	11/2022	Jakob Müller	Schranken an Physik jenseits des Standardmodells durch Lebensdauern von B Mesonen
Experiment	08/2022	Chiara Papior	Evaluating the capabilities of the Pierre Auger Observatory to search for axion-like particles
Theory	09/2022	Sebastian Edelmann	Next-to-Next-to-Leading Order Real-Virtual Corrections to Soft Functions with Massive Partons
Theory	09/2022	Anastasia Boushmelev	Quark masses and the heavy quark expansion
Experiment	11/2021	Vakhtang Ananiashvili	Improving the tttt event selection with Graph Neural Networks in multilepton final states at the ATLAS detector
Theory	07/2021	Sven Münker	Automated Calculation of Soft Functions for Massive Partons at Next-to-Leading Order
Theory	02/2021	Gustavo Adolfo Lara-Sánchez	Impact of TeV Scalar Leptoquarks on Flavor-violating Higgs Decays: An effective Field Theory approach
Experiment	12/2020	Tim-Philip Hücking	Pseudo Experiment Based Studies with RooFit of Fits to Events Weighted by the SPlot Technique for Application in the ATLAS B-Physics Data Analysis
Experiment	11/2020	Niklas Schwan	Improving Four-Top-Quark Event Classification with Deep Learning Techniques using ATLAS Simulation
Experiment	10/2020	Anna Bobrikova	Predicting the UHE photon flux from GZK-interactions of hadronic cosmic rays using CRPropa 3
Experiment	08/2020	Jan Joachim Hahn	Measurement of X-ray photons using an INGRID chip
Experiment	06/2020	Agha Mohammad Raza	Determination of Background from Misreconstructed Electrons in t-tbar-gamma Single Lepton Channel at the Sqrt[s]=13 TeV with 139 fb^-1 of ATLAS Data

CPPS Center for Particle Physics Siegen

Universität Siegen

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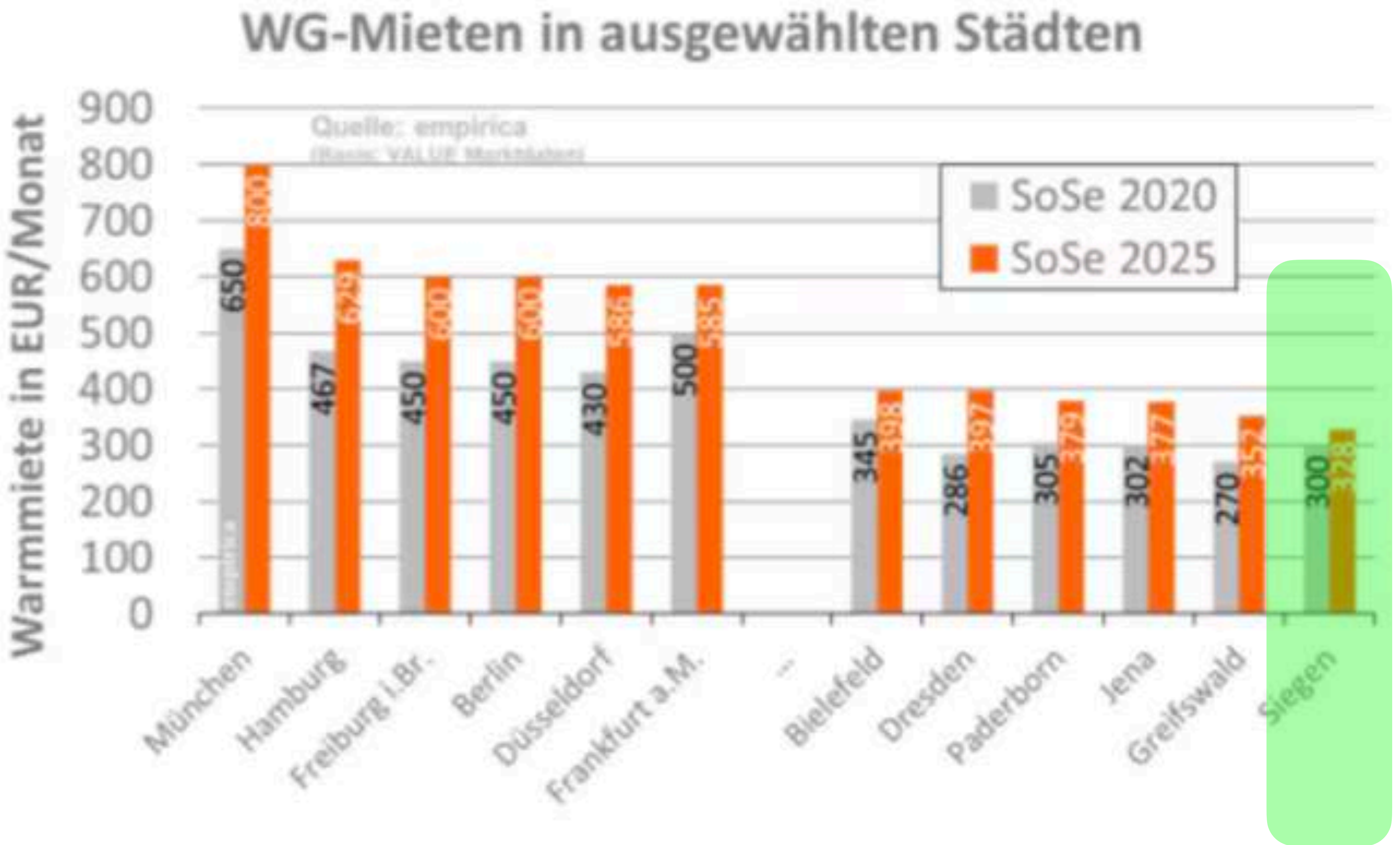
SUBATOMIC HEROES

Living in Siegen

Low living costs



Ranking of average renting costs in German university towns: Siegen ranks last, i.e. the lowest costs :-)

Quelle: empirica-Preisdatenbank (Basis: VALUE Marktdaten)

No tuition fees - administrative fee of currently 333 Euro per term

Low living costs

NUMBEO

Lebenshaltungskosten | Immobilienpreise

Lebenshaltungskosten in Siegen

	Index	
Living costs (w/o rent)	Lebenshaltungskosten-Index (ohne Miete):	55,81
Rent	Miet-Index:	13,08
Food	Lebensmittel-Index:	60,00
Rent	Gaststätten-Index:	49,28
Living costs	Index Lebenshaltungskosten + Miete:	36,85
Salary - costs	Örtliche Kaufkraft:	137,08

Compared to 100

Universität Siegen

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Physics Fun in Siegen

Higgs Centre for Theoretical Physics @HiggsCentre · Jul 18
Our #HiggsOnTheRoad is going to c-cbar at the #charm2023 conference in Siegen, Germany this week 👏

Max Hansen

8 323

John Ellis Visiting Siegen

Alexander Lenz @alexlenz42 · Jul 9
Entertaining our visitors at @UniSiegen : Hunt your BBQ in the forests around Siegen #higgs10

1 19

Universität Siegen

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SUBATOMIC HEROES

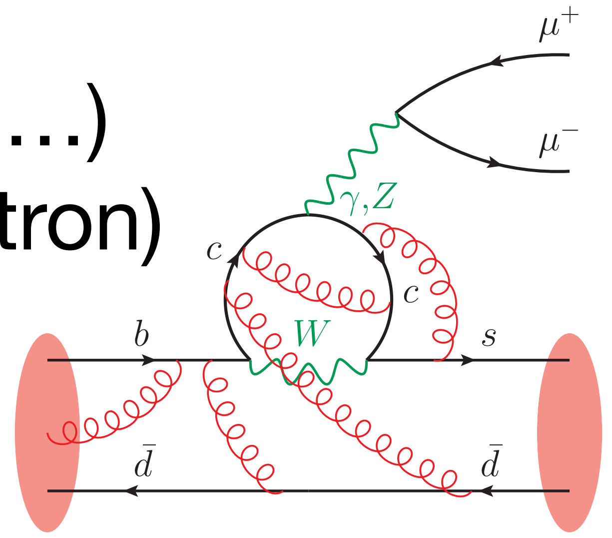
Studying Physics in Siegen - where else?

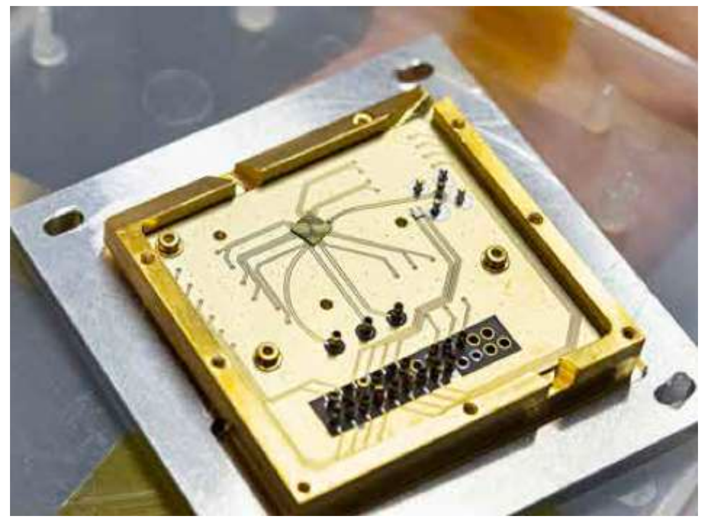
1. Sensational Staff-student ratio

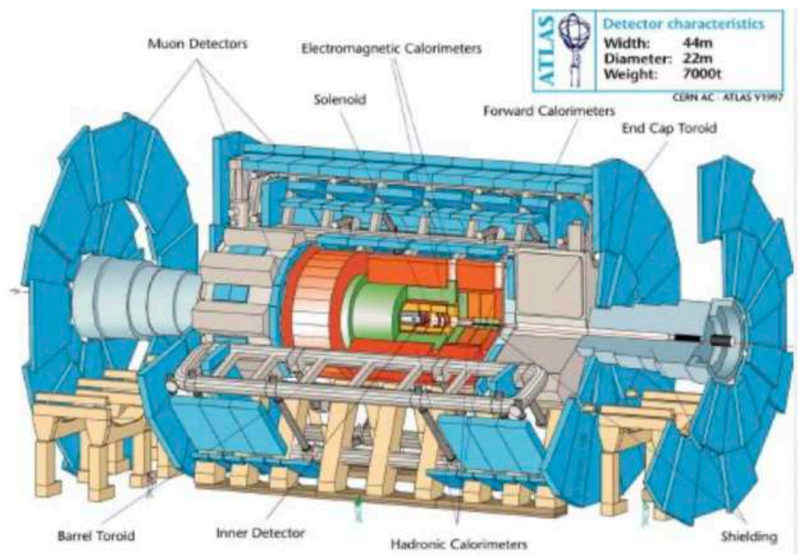
excellent student satisfaction —- classes taught in English

2. World leading in several areas, e.g.

- **Theoretical flavour physics** (Large 3rd party funding projects,…)
- **Experimental quantum optics** (own quantum computer, EleQtron)
- **Experimental particle physics** (ATLAS @ CERN, Auger,…)
- **X-ray physics** (DESY,…) **…**







3. Low living costs

Lowest renting costs in Germany

no-tuition fees

Administrative fee of currently 333 Euro per term

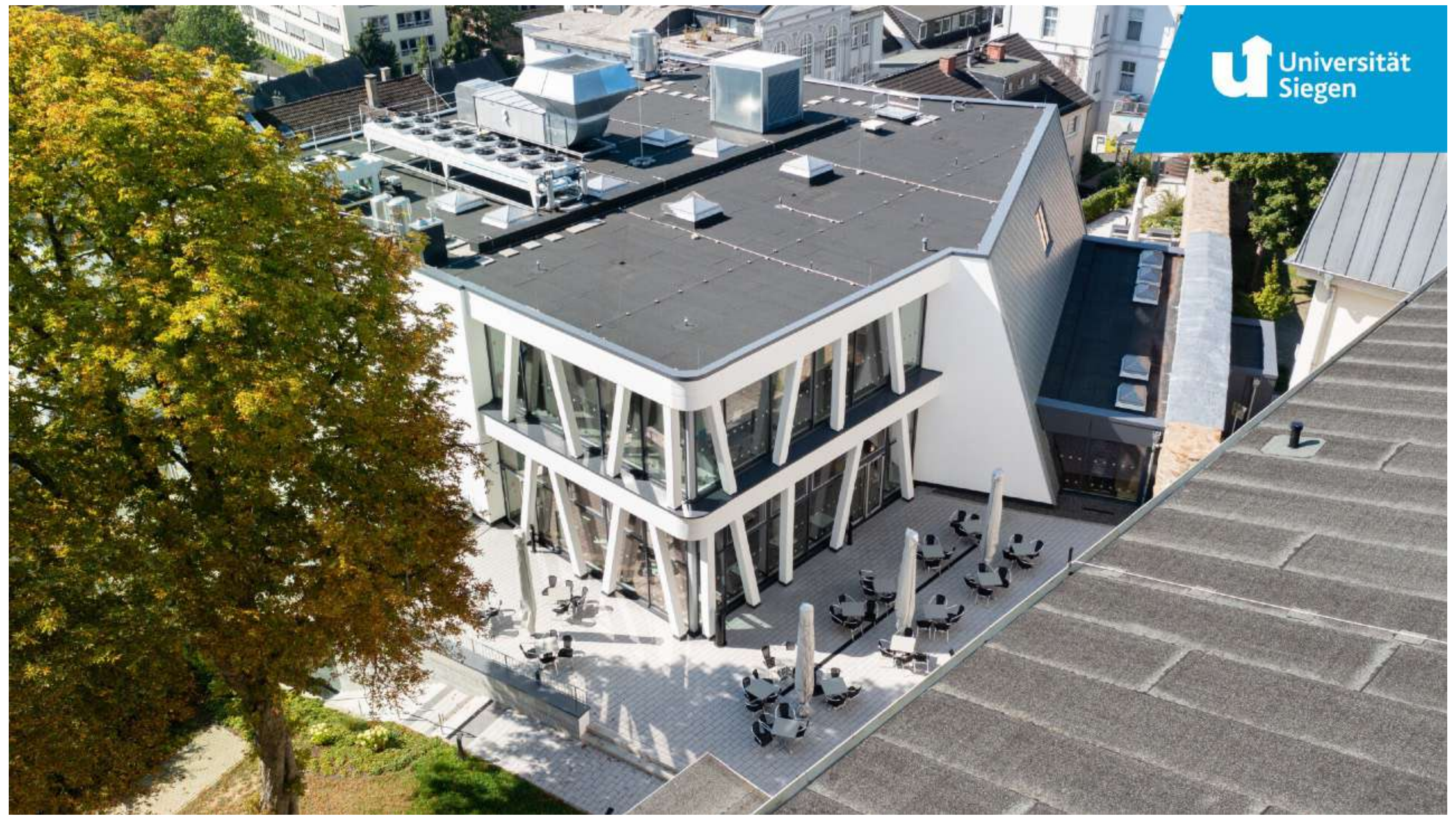
4. Amazing nature

5. Prepares perfectly for a follow-up PhD

6. Active student life

Willkommen bei der jDPG-Regionalgruppe Siegen

How to apply? Links at: https://cpps.physik.uni-siegen.de/master/



Applications should be submitted via the **online application portal** unisono of the university. At this page, you have to do the “Self-Registration” first. Please do not send any application documents via e-mail or regular mail.

You are encouraged to apply early, up to **3 months prior** to the deadline. Typically, it will take one month to notify you of our decision regarding your admission.

Universität Siegen

See you soon in Siegen