

Netzwerk Teilchenwelt

Coordinated Outreach and Recruitment
of Young Talents in Germany

Netzwerk Teilchenwelt

- ▶ 30 universities/research labs + CERN
 - ▶ Joint outreach in particle physics and astroparticle physics, since 2020 also for nuclear and hadron physics
 - Bundle existing activities
 - Share structure and programs
- ➔ High visibility and impact

RECFA evaluation 2014 for Germany

„The Committee considers that the German activities are **exemplary** and constitute a **highly professional way** of raising public interest in science and would like to congratulate the German community on its achievements in this regard.“



- ▶ Project team: TU Dresden / DESY@Zeuthen / CERN
- ▶ hubs at: Bonn / Mainz / Münster

Multi-step program for high school students



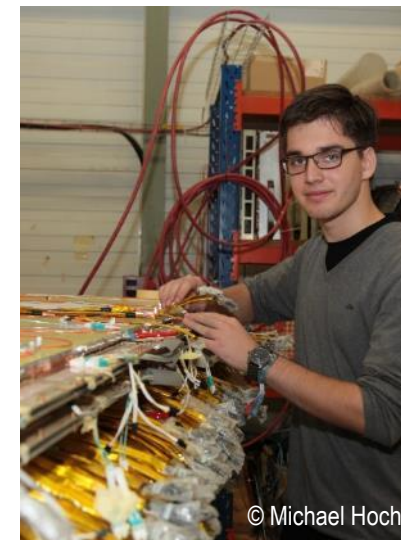
Masterclasses



Active engagement,
detector project



4d CERN
workshops



own research
projects

Number of students/y



28.07.2020



Uta Bilow, TU Dresden



Offers for High School Students

Basic program

- ▶ Masterclasses: Measurements with real data
 - ATLAS (2x), CMS, LHCb, ALICE (2x)
 - Pierre-Auger-Observatory
 - IceCube
 - Cosmic@Web with 9 experiments
 - More from hadron and nuclear physics on p.15
- ▶ Own measurements with particle detectors
 - Scintillation counter (CosMO)
 - Cherenkov counter (Kamiokannen)
 - Various research tasks: Detector understanding, investigation of physical phenomena
- ▶ Each research lab/university focuses on their experiments and activities



Own research projects

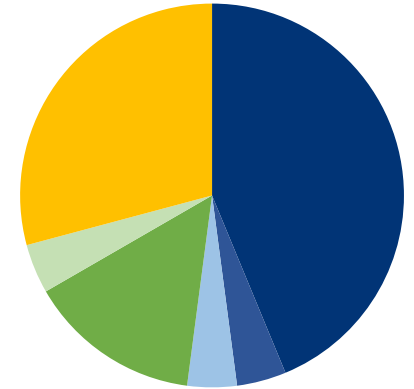
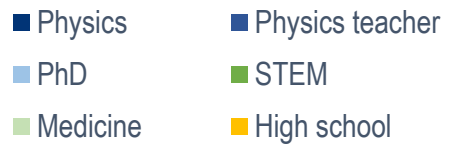
- ▶ Deep Learning Models for Energy Estimation in CMS HGCAL L1 Trigger (Felix Hansen)
- ▶ First data classification at the InGrid detector at the CAST experiment using deep learning (Caroline Kohl)
- ▶ The AWAKE experiment (Björn Dörschel)
- ▶ The effects of radiation on the CMS pixel detector (Katharina Ploog)
- ▶ Machine-learning based identification of highly collimated electron pairs from boosted Z boson decays (Sophia Veneris)



Fellow program to promote young talents



- ▶ 190 people, 50% female (program launched in 2017)
 - ▶ Mainly alumni of CERN workshops
 - Now often studying physics or shortly before that (pie chart)
 - ▶ Local offers: Internships, excursions, invitation to outreach events, colloquia, regulars' table etc.
 - ▶ Central offers: Fellow physics school (pwd „intro“), national physics conference attendance etc.
- Close connection between highly motivated students and research groups





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Facilitators

- ▶ 150 PhD and Master students are engaged in Netzwerk Teilchenwelt. They guide Masterclasses and supervise students' research projects.
- ▶ Facilitators get reimbursement of expenses and travel cost.
- ▶ Netzwerk Teilchenwelt offers training courses on communication, didactics, and presentation techniques (important skills also for own career!).
- ▶ As role models, they influence students' career-related aspirations and choices.

Teachers as multipliers

► Development of material

- Teaching material for schools, 4 volumes (>20k printed, >35k downloaded)
- Portal Leifi Physik: Chapter on particle physics
- Particle profile cards
- GeoGebra Analysis of Bubble Chamber images
- Context material

► Teacher training „Forschung trifft Schule“, funded by:

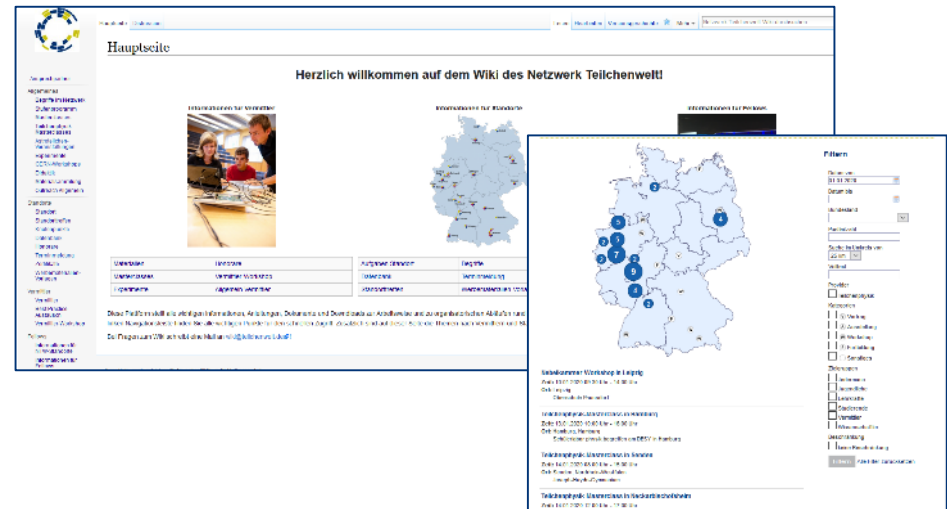
- 2-day training: Introduction to particle physics, 6 trainings p.a.
- Summer School at CERN: 6 days, once per year



Central Coordination @TU Dresden provides:

Structure

- Data base (people, schools, events)
- Event calendar
- Wiki



Material

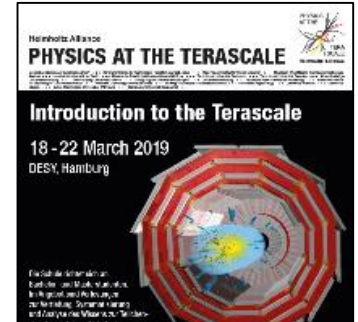
- Detector sets
- DIY cloud chamber sets
- Context material
- Kit for facilitator (shirt, bag)



Central Coordination @TU Dresden provides:

Organisation

- Fellow physics school
- Fellow meeting
- Training for facilitators



Communication

- Website
- Social Media
- Newsletter
- Mailings





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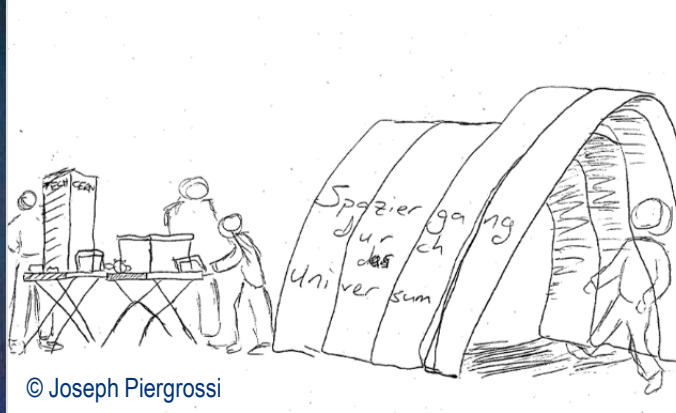
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Activities in the current funding period

- ▶ Continue and consolidate existing programs
- ▶ Reach out to more target groups
 - General public
 - Journalists
- ▶ More topics from other fields of physics of the smallest particles
 - Hadron and nuclear physics
- ▶ **KONTAKT: KO**mmunikation, Nachwuchsgewinnung und Teilhabe der **Allgemeinheit** an Erkenntnissen auf dem Gebiet der **Kleinsten Teilchen**
- ▶ **Funded as integral part of research** within the German research framework program ErUM
- ▶ Netzwerk Teilchenwelt + Weltmaschine have joined forces





New target groups: journalists and the „uninterested“ general public

► VR headsets

- Apps from various experiments (LHC, also Belle II, IceCube)
- loan to Netzwerk Teilchenwelt research labs, central maintenance

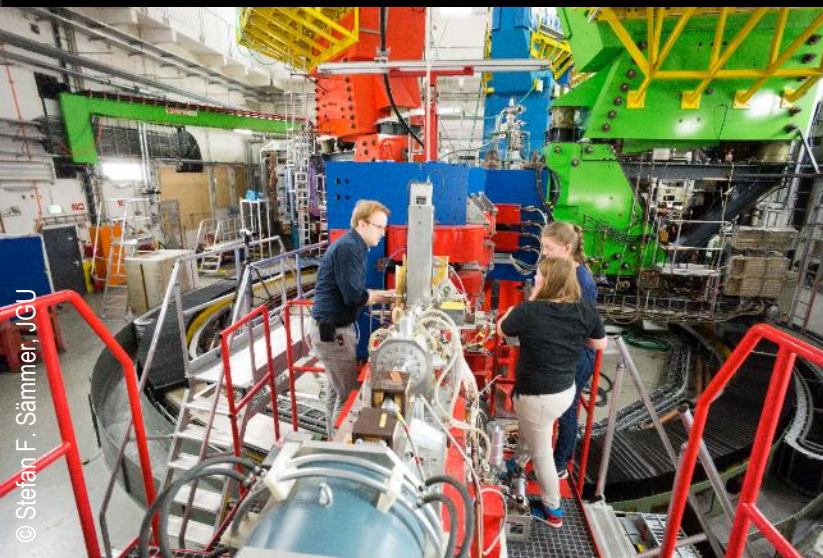
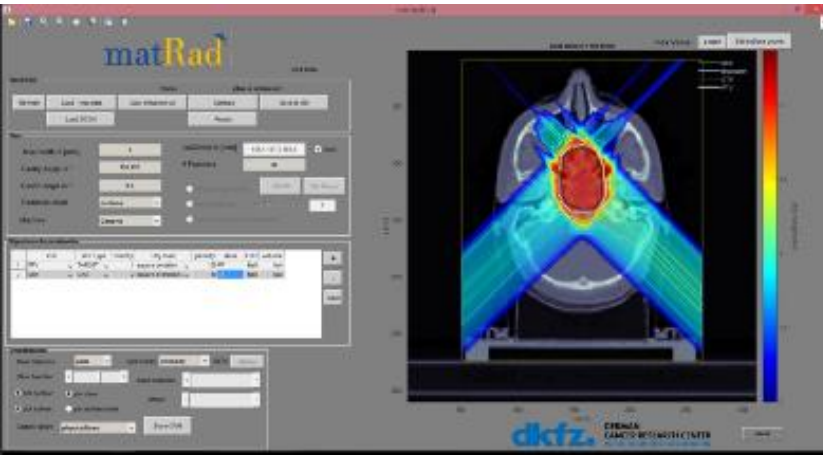
► Interactive mobile exhibition modul

- Setup in <1h
- Tour stops planned across Germany
- in shopping malls, town squares, and near railway stations
- reaches groups that are less likely to access science

► Journalist trip to CERN

- + media training for scientists...

More topics from other fields of physics of the smallest particles



- ▶ Hadron and nuclear physics
 - Hadron therapy Masterclass
 - Belle II Masterclass
 - PANDA Masterclass (under development)
 - Scattering experiments Masterclass
 - exhibits
 - 1 week Summer course for high school students
 - Detector school for fellows

COVID-19 and Netzwerk Teilchenwelt

- ▶ Lockdown! Now: Restart with online offers and adapted concepts
- ▶ Masterclass@home
 - Masterclasses delivered online to groups of individual students
 - Lectures + data analysis spread over two afternoons
- ▶ Fellow online seminar
 - „Neutrino afternoon“: Introductory talk, virtual tour at KATRIN, demonstration of neutrino pendulum and lecture on neutrino oscillations
- ▶ Virtual Fellow Meetings (social activity)
- ▶ Online-Seminar on science communication for facilitators
 - Planned for Oct 2020
- ▶ Teacher training@home „From collision to discovery“
 - 1 afternoon, 5 h

Summary



- ▶ Germany has a nationwide network for outreach and recruitment of young talent, which comprises 30 research labs and universities.
- ▶ High school students can engage in a wide range of activities, from Masterclasses and detector projects to programs at CERN and own research projects.
- ▶ A Fellow program bridges the gap between high school and research groups.
- ▶ The central project coordination provides structures, material, organisation and communication for all research labs.
- ▶ Regional hubs foster the integration of further research topics from hadron and nuclear physics and provide regional support.
- ▶ Netzwerk Teilchenwelt is funded as integral part of research.



Thank you for listening!



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PROJEKTLEITUNG



PARTNER



SCHIRMHERRSCHAFT



FÖRDERER

GEFÖRDERT VOM



Bundesministerium
für Bildung
und Forschung



DR. HANS RIEGEL-STIFTUNG



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