JOHANNES GUTENBERG UNIVERSITÄT MAINZ
JG|U
Staudingerweg 7
55128 Mainz
physics@uni-mainz.de

PHYSICS INSTITUTE'S MEETING

AGENDA

July 3th/4th 2025

INTRODUCTION

On July 3rd and 4th our annual Physics Institute's Meeting will take place. This pamphlet will give you an overview of all planned talks, presentations & lab tours. We are looking forward to seeing you there!

OVERVIEW

July 3rd, 4pm: Science Slam at Lecture Hall C01
July 4th, 10am until 12pm: Lab Tours, Talks & Meet & Greet with different working groups
July 4th, 12pm: Lunch buffet

JULY 3RD

4:00 PM
SCIENCE SLAM

Our first ever Institute's meeting science slam will take place at lecture hall C01 (Schulz-Horner building)

Do you want to join as a participant?
We are still lookong for funny, exciting, and informative contributions!

How long? 7-10 minutes
Language: German or English

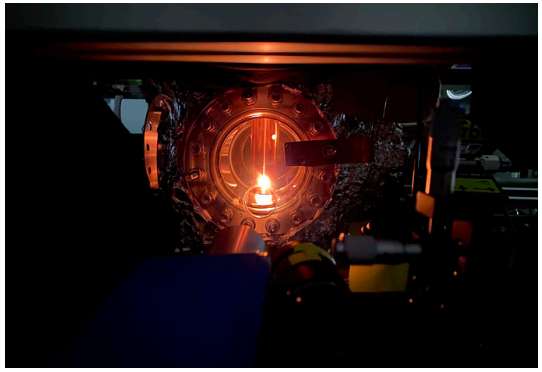
Let us know: science-slam-physik@uni-mainz.de

JULY 4TH

Cancelled

10:00 am **Lab Tour: Developing an intense cold a… …surements**

This project is a collaboration … …hydrogen efficient production a… beams. Devel… …eutrino mass measurem… …um: the Project 8 experiment. …goes beta decay, and the resulting …ted using cyclotron radiation emission spectr… …ion of electron energy can then be used to extract the …s.



Meeting Point: Staudingerweg 7, 5th floor, in front of the elevators

10:00 am & 11:00 am **Lab Tour: Laser Spectroscopy on Exotic Isotopes - Challenging Atomic and Isotope Physics**

We focus on laser-based ionization and spectroscopy of exotic elements to investigate their complex atomic and nuclear structures. As a reaction on the incident at Chernobyl reactor, the core of the lab - RISIKO mass separator - was build and is still in use to study the ultra-trace quantities of radionuclides, rare-earth elements for different applications, e.g. nuclear medicine or neutrino-mass determination, and heavy actinides towards research on super heavy elements.

Meeting Point: Staudingerweg 7, basement, in front of the elevators

JULY 4TH

10:00 am until 12:00 pm

Meet & Greet: Department of Physics Education

The lecturers from the Department of Physics Education present themselves, their fields of work and, if interested, their offers for future theses. In addition, you will have the opportunity to view experiments and materials from a teaching unit entitled “Energy turnaround in optics lessons - (how) is that possible?” In this lesson, pupils will find answers to the following questions:

- What can be done when a mountain village receives no direct sunlight for months on end?
- What are daylight guide systems? And how do they complement electric interior lighting?
- How do Fresnel collectors and parabolic collectors work? What role do these collectors play in solar energy plants?
- One third of mankind relies on firewood to prepare food. Are there no climate-friendly alternatives?

Meeting Point: Staudingerweg 7, Ground floor seating area (“Café Kleinknecht”)

10:00 am until 12:00 pm

Visions for Climate - The interfluencing exposition

The exhibition “Visions for Climate - The interfluencing exposition” at the Schule des Sehens presents artistic works by students that were created as part of the “Visions for Climate” lecture series. This series, which was first held at JGU in the winter semester of 2022/23, encouraged students from various disciplines to reflect on the climate crisis from their respective perspectives and process it in creative forms of expression. As part of the Institute’s Meeting you can find out more about this exhibition and the Visions for Climate initiative with posters and exhibits.

Meeting Point: Staudingerweg 7, Ground floor seating area (“Café Kleinknecht”)

JULY 4TH

10:00 am until 12:00 pm

Icecream & Insights - A talk with theoretical physicists

Are you interested in theoretical physics? And do you like ice cream?
Then you can combine the best of both worlds - drop by Theoretical High Energy Physics (THEP) group and have an informal chat with some of our members. They will be happy to answer your questions and explain the institute's research focus - in a relaxed atmosphere with ice cream and coffee.

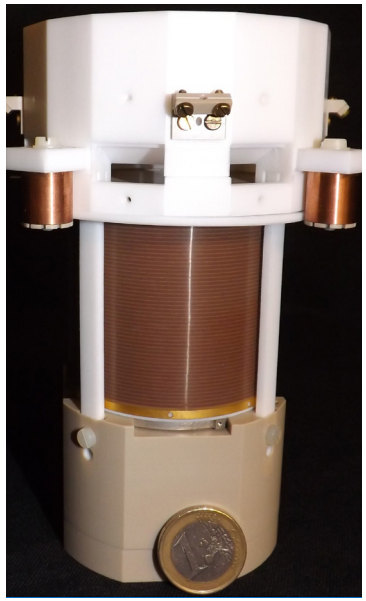
Meeting Point: Staudingerweg 9, Second floor, in front of room 02-124

10:00 am

Lab Tour: Visit of the laboratory of the Xenon group

The Xenon group of Physics Institute is part of the currently running XENONnT experiment. In addition, we perform research and development for a next generation xenon filled dark matter observatory. During this lab-tour we will show you our equipment to liquify and purify xenon, and our experimental platform where we test - on a small scale - dual-phase time projection chamber technology. We are looking forward to answer all questions you may have on the set-up or with respect to the work of the group in general.

Meeting Point: Staudingerweg 7, 3rd floor, in front of the elevators



JULY 4TH

10:00 am & 11:00 am

Poster discussion: “How to correct errors in quantum technology: quantum communication”

One of the most important elements in the field of quantum information is the concept of quantum error correction. Before its invention in 1995, it appeared ill-defined, since the classical approach of creating redundancy for a robust encoding of information cannot be directly applied due to the quantum mechanical no-cloning theorem. The solution of 1995 was to make use of the notion of entanglement. Here we discuss the most recent development of quantum error correction codes for protecting quantum states of light against loss and noise in a quantum communication channel which could ultimately lead to applications such as a quantum internet. In particular, the quantized oscillator states of light modes can be directly employed for encoding and, in principle, there is no need to rely on complicated entangled states with many physical qubits (for an example of a “quantum company” following this “continuous-variable” photonics approach, see https://www.xanadu.ai/).

Meeting Point: Staudingerweg 7, 5th floor, in front of room 05-530

10:00 am until 11:00 am

Lab Tour & Poster: Overview of the QUANTUM experiments at HIM

We are dedicated to the search for dark matter, the construction of magnetic sensors, the direction of laser beams into the sky, the measurement of magnetic signals from hearts, nerves, and even plants, the measurement of the effects of atomic parity violation in atoms, the capture of particles and antiparticles, and the performance of magnetic resonance experiments in the zero field.

Contact: Dmitry Budker (budker@uni-mainz.de)

Meeting Point: Helmholtz Institute Mainz, Staudingerweg 18, Foyer

JULY 4TH

10:00 am & 11:00 am

Lab Tour & Poster Exhibition: Scalable Quantum Computer with Ions

We discuss the basics of quantum computing, show the new clean room for trap fabrication, describe the operation of segmented traps for qubit register reconfiguration, the full electronic and optical control architecture, quantum compilation of algorithms, and show the fault tolerant plaquette readout in view of quantum error correction. The quantum computer platform is operated from the control room.

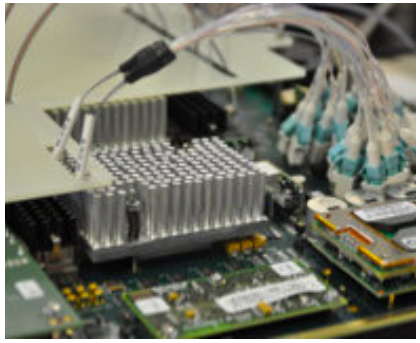
Max 12 persons each session. Contact for registration: stuckker@uni-mainz.de

Meeting Point: Staudingerweg 7, 2nd floor, in front of the elevators

10:30 am

Lab Tour: High Speed Electronics Lab

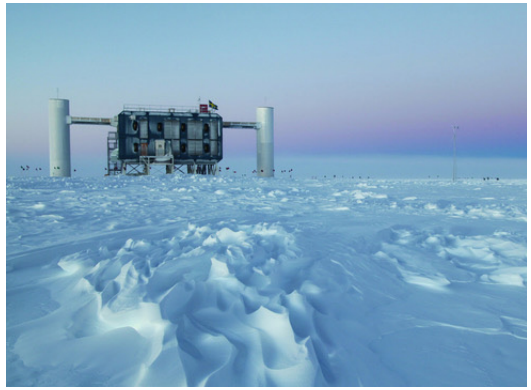
Particle detectors for collider experiments generate huge amounts of data that need to be reduced in real time before they can be stored permanently. For this purpose, dedicated high-density and ultra-fast electronics are being developed and built in Mainz, which can process data in real time and make filter decisions with the help of programmable logic components (FPGAs). The modules can process up to 3 Tbit/s with massively parallel algorithms. In the laboratory tour, we show the construction, operation and testing of these modules on site and report on the installation and commissioning that has just taken place in the ATLAS experiment in Geneva.



Meeting Point: Staudingerweg 7, 4th floor, in front of office 04-433

JULY 4TH

10:30 am Talk: Unfathomable neutrinos: measuring the ghost particles



How do you actually measure the mass of an elementary particle? And why are the masses of the neutrinos the only ones that are still unknown? How come neutrinos can change their “flavour” on their way through the earth? Why does it help to build a detector at the South Pole to make progress in this question? And what does all this have to do with neutrino masses? In this lecture, which is addressed to everyone (not only physicists), Professor Sebastian Böser will try to answer all these questions.

Meeting Point: Staudingerweg 7, 4th floor, ETAP seminar room (04-225)

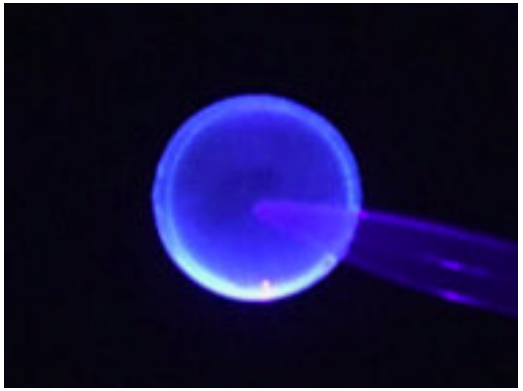
10:30 am & 11:30 am Poster discussion: How to correct errors in quantum technology: quantum computation

One of the most important elements in the field of quantum information is the concept of quantum error correction . Before its invention in 1995, it appeared ill-defined, since the classical approach of creating redundancy for a robust encoding of information cannot be directly applied due to the quantum mechanical no-cloning theorem. The solution of 1995 was to make use of the notion of entanglement. Since entanglement is so fundamental and since it may serve as a universal resource in quantum computation, recent approaches to fault-tolerant quantum computing aim to combine the quantum computational and quantum error correction features of entangled states. Here we discuss such schemes for photonic quantum computers based on entangled states of many optical qubits (for an example of a “quantum company” following this “discrete-variable” photonics approach, see https://psiquantum.com/).

Meeting Point: Staudingerweg 7, 5th floor, in front of room 05-530

JULY 4TH

11:00 am Lab Tour: Scintillator Lab



Scintillators are widely used as light-producing detection media in modern particle-physics experiments. The applications range from the cm-scale plastic scintillator tiles of the CALICE calorimeter to the 20,000 ton liquid-scintillator target of the JUNO neutrino experiment. The lab tour will show the most recent developments in organic, opaque and water-based scintillators of our Mainz laboratory as well as the table-top instruments that we use to determine light yield, fluorescence properties and light transparency.

Meeting Point: Staudingerweg 7, 5th floor, in front of the elevators

11:30 am Talk: Dark Matter

What is the mysterious matter that leads to the formation of structures such as galaxies, galaxy clusters, superclusters and corresponding empty spaces in the universe, and which has determined the development of the universe from the first minutes for the first 10 billion years and still plays a significant role today? Why can't we see this "dark" matter? And how do we hope to make it visible in the future? The lecture will present the problem and describe approaches we are working on to solve the puzzle.

Meeting Point: Staudingerweg 7, 4th floor, ETAP seminar room (04-225)

JULY 4TH

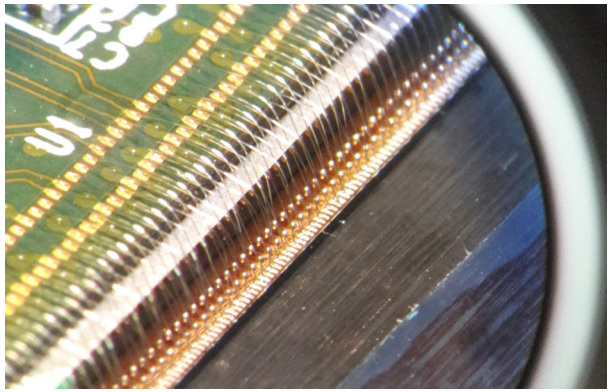
11:30 am Lab Tour: Optical sensors for the South Pole: detector development for extensions of the IceCube experiment

IceCube consists of 5160 light sensors distributed over 1km3 of deep glacial ice at the geographic South Pole. The sensors can timestamp the arrival time of individual photons. Through this instrumentation, the ice block acts as a telescope for exotic elementary particles (especially neutrinos) produced in the highest energy processes of the universe.For a detector extension, which is scheduled to be installed in the ice of Antarctica in 2025/2026, the AG Böser is developing novel light sensors. These increase the collection area strongly compared to the usually used photomultipliers by using wavelength-shifting color.

Meeting Point: Staudingerweg 7, 5th floor, in front of room 05-526

11:30 am Lab Tour: Timing detector at ATLAS

For the High Luminosity upgrade of the LHC, the assignment of tracks to interaction vertices exploits time measurements additionally to the spatial information, which by itself is not sufficient anymore. The ATLAS High Granularity Timing Detector (HGTD) consists of silicon detectors providing a time resolution of 50 ps per track. The single detector elements (modules) are made of two sensors with their read-out electronics and in our labs we glue, wire bond and test them.



Meeting Point: Staudingerweg 7, 5th floor, in front of office 05-324

AND LAST BUT NOT LEAST...

From 12:00 pm on...

Join us for lunch!

Enjoy a nice lunch with colleagues & students. Food includes a variety of vegetarian and vegan options as well as meat options. We are looking forward to seeing you there!

Meeting Point: Grass area between cross-shaped buildings (Staudingerweg 7 & 9)