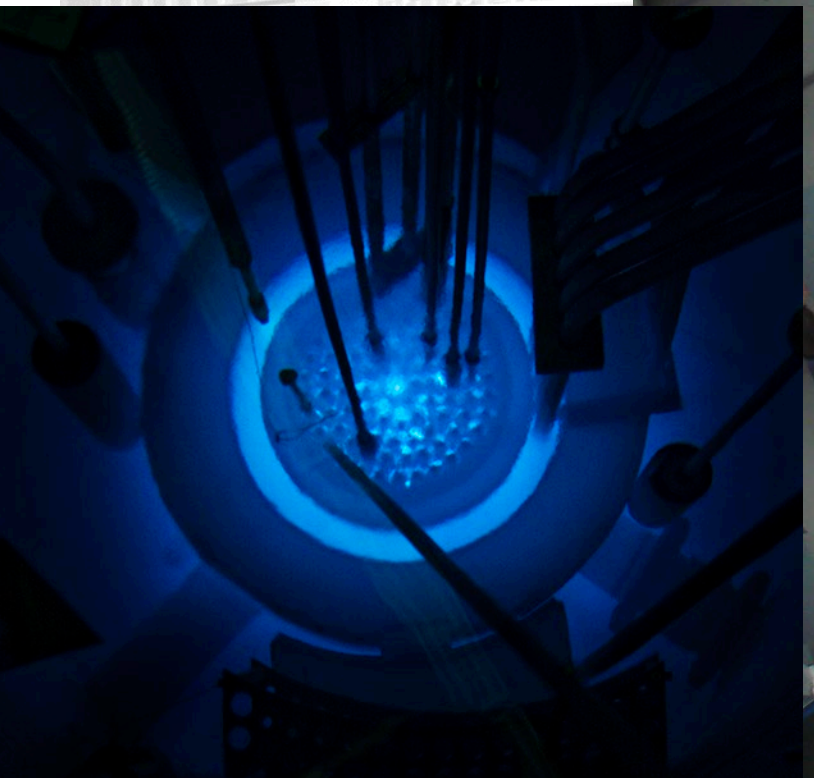
Vorstellung der Lehre am Atominstitut 2023/24W

12 Forschungsgruppen
1 TRIGA Center
~150 Mitarbeiter
~100 Studenten

HEPHY

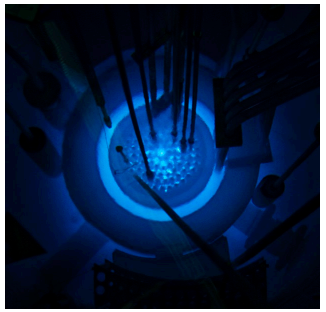
ATOMINSTITUT

Wissenschaft
Ausbildung
Expertise

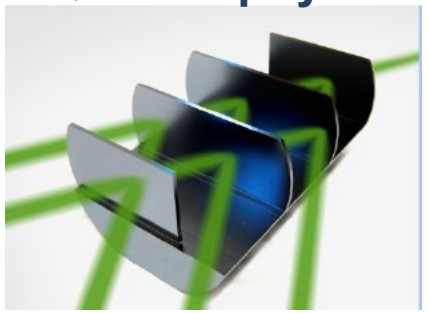


TRIGA Center Atominstitut

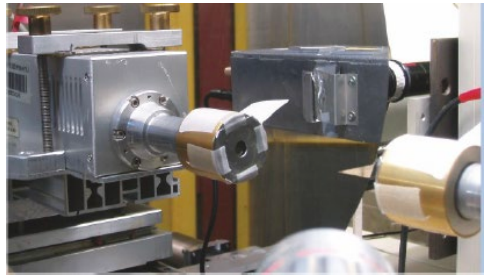
TRIGA Center



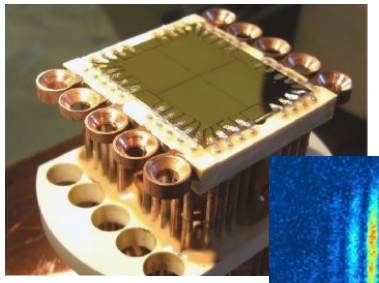
Neutronen- & Quantenphysik

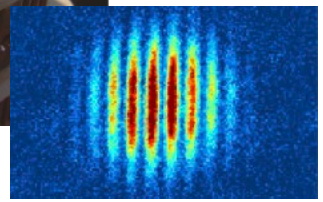


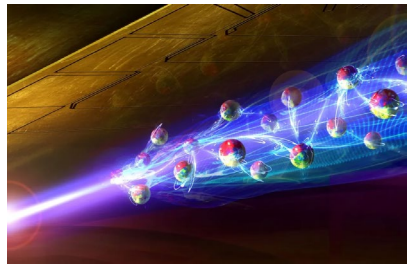
Strahlenphysik



Atomphysik & Quantenoptik

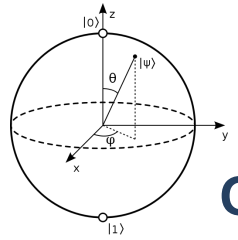


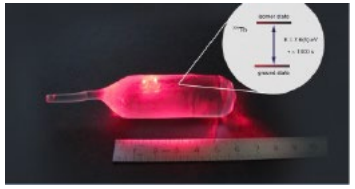




Atominterferometrie

ATOMINSTITUT

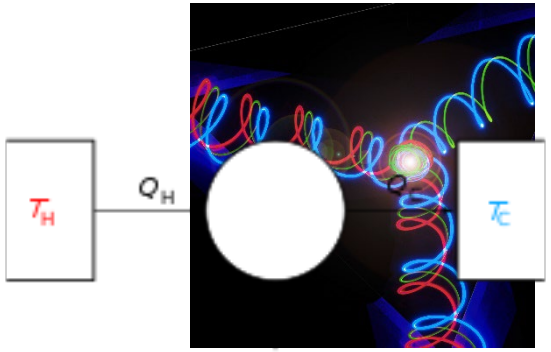




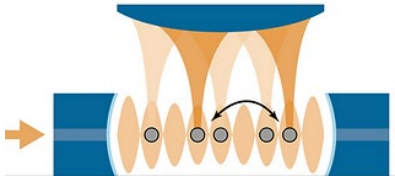
Quantenmetrologie

Kern- & Teilchenphysik

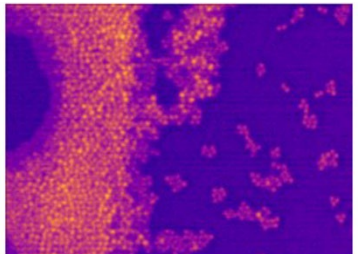
Tieftemperaturphysik & Supraleitung



QUanten Information & Thermodynamik



Experimentelle Quanteninformation



Quantenoptik & Sensorik

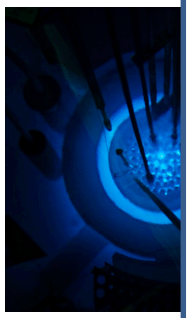
Neutronen-
interferometrie

Strahlenphysik
& Radiochemie

Ultrakalte Gase

Quantensimulation

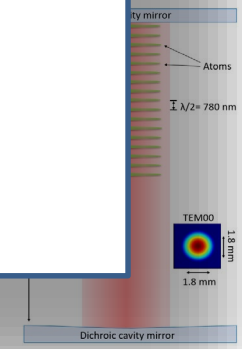
Reaktor-
phys

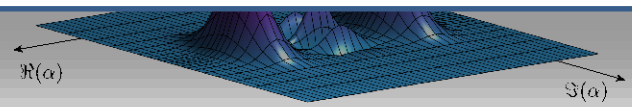


Dunkle
& Kosm

- **Vorlesungen**
- **Praktika, Seminare**
- **Projekt- und Masterarbeiten**

en-
logie





Tieftemperaturphysik
& Supraleitung

Quanteninformation
& Quantenthermodynamik

Quantenoptik & Cavity QED

Nach der Vorbesprechung ...

Fragen und Antworten bei Kaffee & Kuchen !

TECHNISCHE UNIVERSITÄT WIEN

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www.ati.ac.at

Quantum Science & Quantum Technology

▪ Atominterferometrie	Ph. Haslinger
▪ Atom- und Quantenphysik	J. Schmiedmayer
▪ Experimentelle Quanteninformation	J. Leonard
▪ Festkörperquantenoptik und Nanophotonik	S. Skoff
▪ Quanteninformation & Thermodynamik	M. Huber
▪ Quantenmetrologie	T. Schumm

VCQ - Vienna Center for Quantum Science & Technology
www.vcq.at

Quantum S&T – Lectures

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Series of lectures in a 4-semester curriculum

• **Quantum Optics** I & II Leonard, Holten	141.A10 141.A11	WS 2023 SS 2024
• **Quantum Technology** I & II P. Haslinger, J. Leonard, J. Schmiedmayer, Schumm	141.A16 141.A17	WS 2024 SS 2023
• **Atoms - Light - Matter Waves** J. Schmiedmayer, P. Haslinger	141.212	WS 2023
• **Atomic/Molecular Physics - Metrology** T. Schumm	141.A35	WS 2023
• **Quantum Information Theory** I & II M. Huber, N. Friis	141.282 141.A11	WS 2023 SS 2024
• **Quantum Thermodynamics** I & II M. Huber, N. Friis	141.B22	WS 2024 SS 2025
• **Einführung in die exp. Quantenphysik mit Qubit Systemen** S. Sponar	141.280	WS 2023

Seminars (every semester):

- **Advances in Quantum Science and Quantum Technology**
  141.B11, Wednesdays 16:15, Atominstitut, Stadionallee 2
- **Neutron, Solid-State and Quantum Physics**
  141.543, Fridays 10:00, Atominstitut, Stadionallee 2
- **VCQ Colloquium: Complex Quantum Systems**
  141.271, Mondays 17:00 @ Boltzmanngasse 5, Lise Meitner Hall www.vcq.at

students & postdocs

external speakers

Quantum S&T – Lab experience

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4-Semester Curriculum

Hands-on Lab experience:

- **Praktikum: Quantum Physics** 4 ECTS **141.A86**
  Haslinger, Sponar, Manz, Schachinger, Schumm, Schmiedmayer, Abele, Schneider

  Lab course where you can experience first hand the basic phenomena of Quantum Physics.
  Brand-new setups, small teams (2-3)
  Sign up for labs by mail to: barbara.stross@tuwien.ac.at

- **Projektarbeiten** (also bachelor projects) 10 ECTS

  Experience real lab research, about 6 weeks full time, small teams (1-3)
  Contact the supervisor for planning (at least 1 month in advance)
  - **Quantum Optics** (Bayer-Skoff, Haslinger, Leonard) **141.095**
  - **Nanophotonics** (Bayer-Skoff, Schumm) **141.A13**
  - **Atomuhren und Quantenmetrologie** (Schumm) **141.A27**
  - **Ultracold Atoms and Spectroscopy** (Schmiedmayer, Schumm, Haslinger) **141.214**
  - **Quantum Technology** (Schmiedmayer, Rabl, Leonard) **141.A15**
  - **Quanteninformation & Quantenthermodynamik** (Huber) **141.B28**

VCQ Colloquium

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All winter semester talks take place on Mondays at **Lise Meitner Lecture Hall at UNIVIE** (Boltzmanngasse 5, 1. Stk., 1090 Wien) with a **starting time of 5 PM**.

Schedule of VCQ Colloquium Winter Semester 2023/2024		
6.11.2023	Philippe Grangier	Institut Polytechnique De Paris
27.11.2023	Wolfram Pernice	University of Münster
4.12.2023	Ido Kaminer	Israel Institute of Technology
15.01.2024	Eleni Diamanti	CNRS, Paris
29.01.2024	Rachel Grange	ETH Zurich

Please note, the schedule is subject to change.

More information at www.vcq.quantum.at

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AQUTEM

FFG

Atom-Interferometry

(Quantum Electron Optics)

Philipp Haslinger

www.haslingerlab.com

Start

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Der Wissenschaftsfonds.

ESQ
Discovery

VCQ
Vienna Center for Quantum Science and Technology

Hands-on Lab experience

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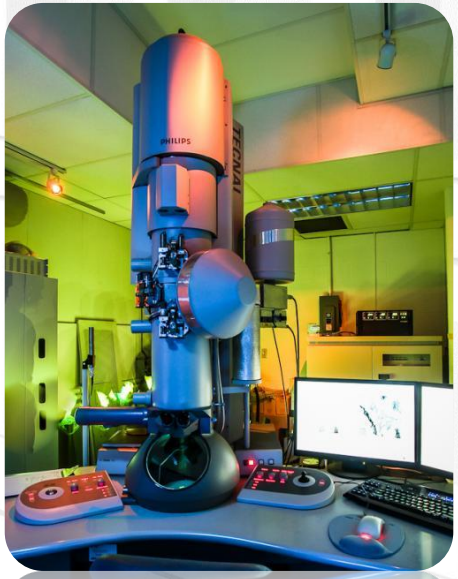
- **Praktikum: Quantenphysik** 4 ECTS **141.A86**

Haslinger, Sponar, Manz, Schachinger, Schumm, Schmiedmayer, Abele, Schneider

Lab course where you can experience first hand the basic phenomena of Quantum Physics.
Brand-new setups, one afternoon each, small teams
Sign up for labs by mail to: barbara.stross@tuwien.ac.at

Please sign up before 13.10.2023

- Verschränkte Photonen / Bell-Ungleichung
- HeNe-Laser
- Kernspinresonanz (NMR)
- Laserspektroskopie von Rubidium
- Topological phases with neutrons (am Reaktor, ATI)
- Interferenz am Doppelspalt mit einzelnen Elektronen (am USTEM)



Electron Microscopy @ USTEM


Neutron Interferometry @ ATI

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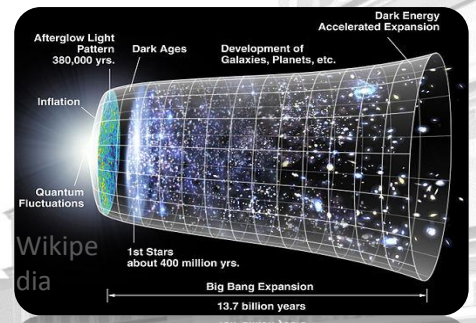
Lattice Atom Interferometry

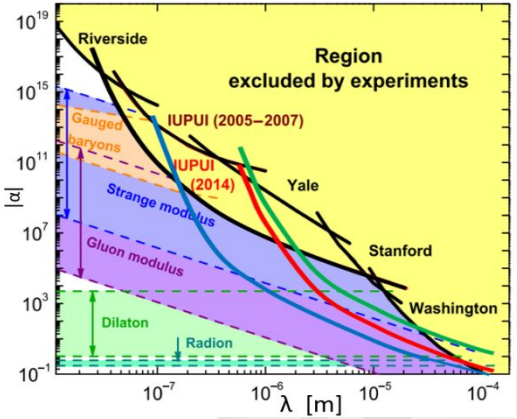
Philipp Haslinger

The Dark Universe

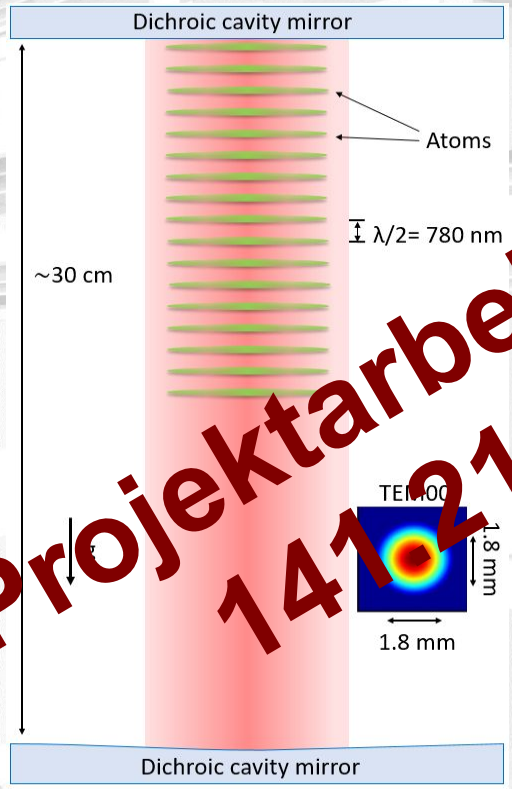


- Discover or rule out many models

Short Range Forces

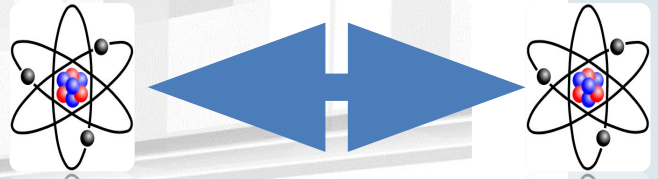


- At 10 µm, forces >10^4 x gravity possible
- Sense effects beyond the standard model: string theory...



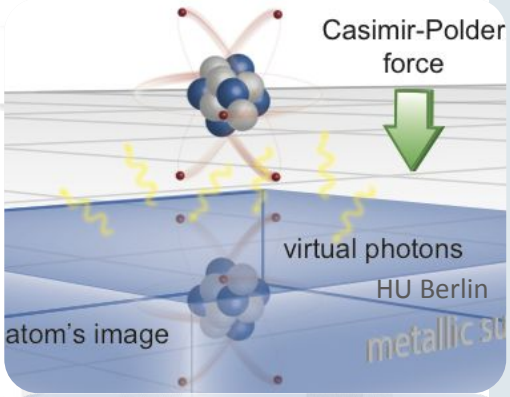
- Atoms: perfect test-particles
- Ultra long interaction times
- Map pot. energy landscape
- Miniaturized quantum sensor

Light-Induced Interaction



- Mechanical effects of thermal light
- BEC, Ultracold gasses, astrophysics,...

Casimir–Polder Interaction



- Interaction from quantum fluctuation
- Temperature & spatial dependence

Projektarbeiten 1411214

Ultrafast – Electron Microscopy

Projekt/Masterarbeiten 141.095

Controlling Quantum Systems with Modulated Electron Beams
D. Rätzel, D. Hartley, O. Schwartz, P. Haslinger
Physical Review Research 3, (2), 023247 (2021)

Entangled Electron – Photon Pairs in Electron Microscopy

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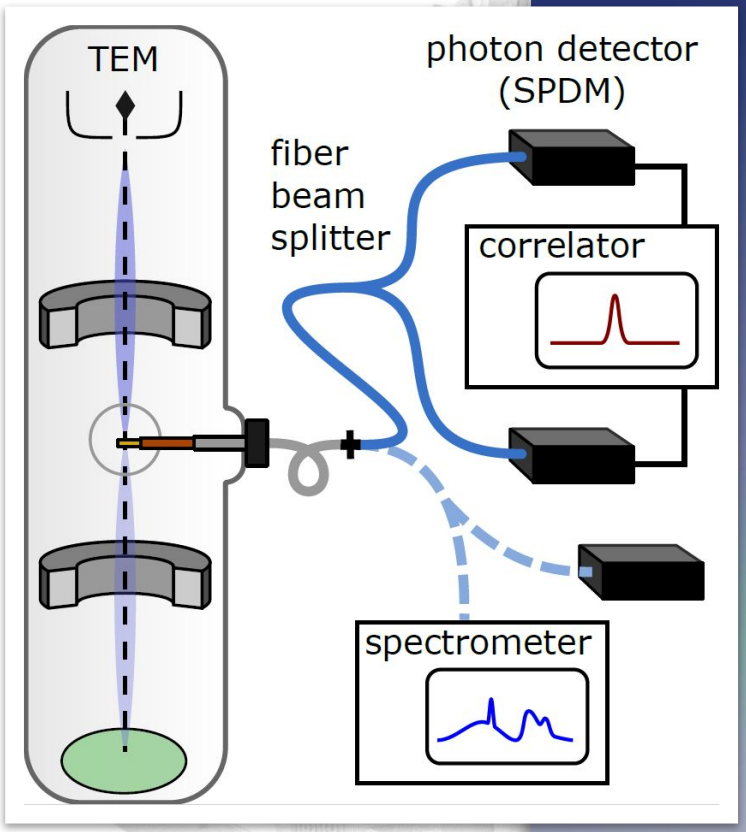

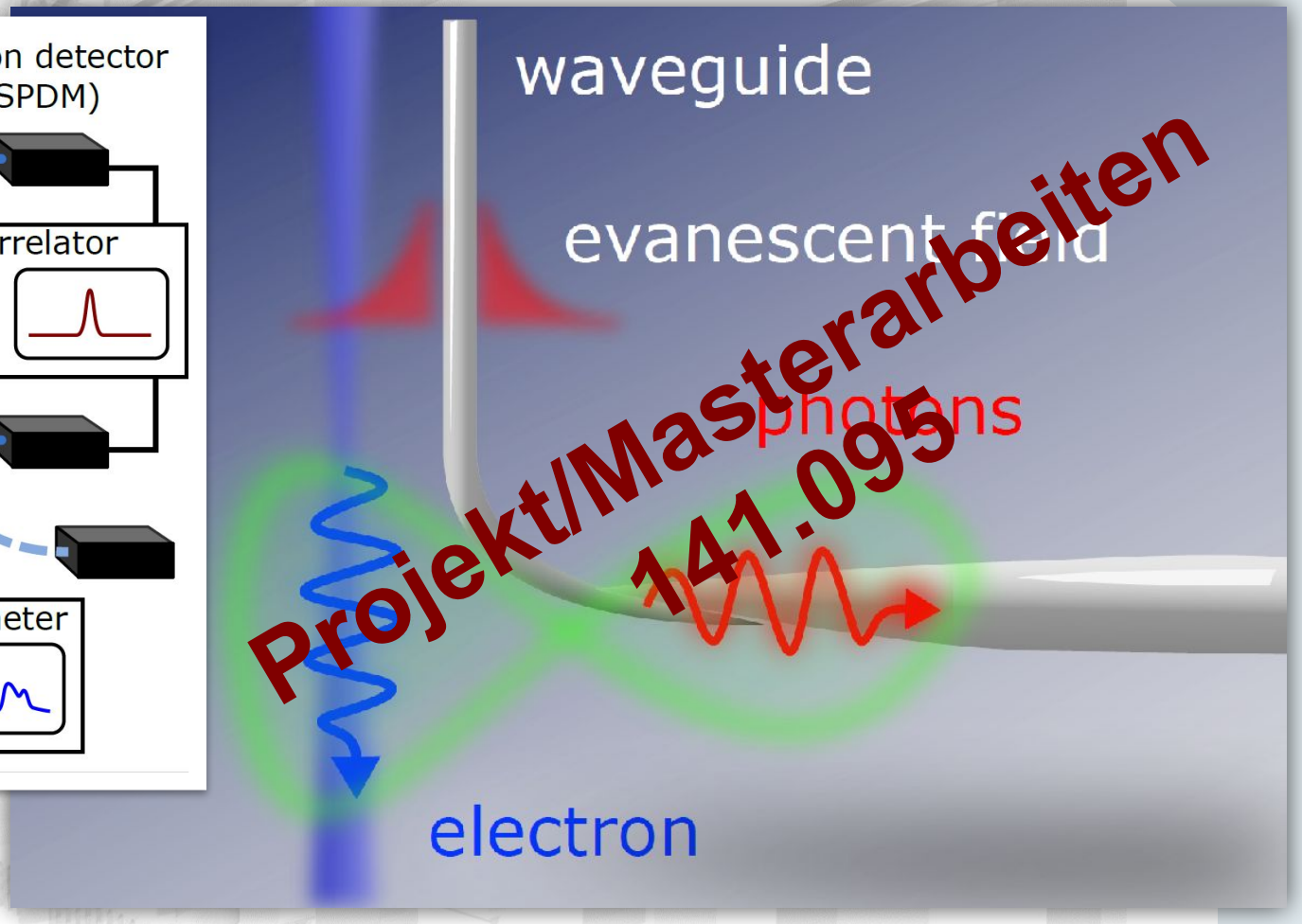

Projekt/Masterarbeiten 141.095

Discrimination of coherent and incoherent cathodoluminescence using temporal photon correlations
M. Scheucher, T. Schachinger, T. Spielauer, M. Stöger-Pollach, P. Haslinger
Ultramicroscopy 241, 113594 (2022)

www.haslingerlab.com

philipp.haslinger@tuwien.ac.at

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Experimental Quantum Information

Julian Léonard

www.quantuminfo.com

Start

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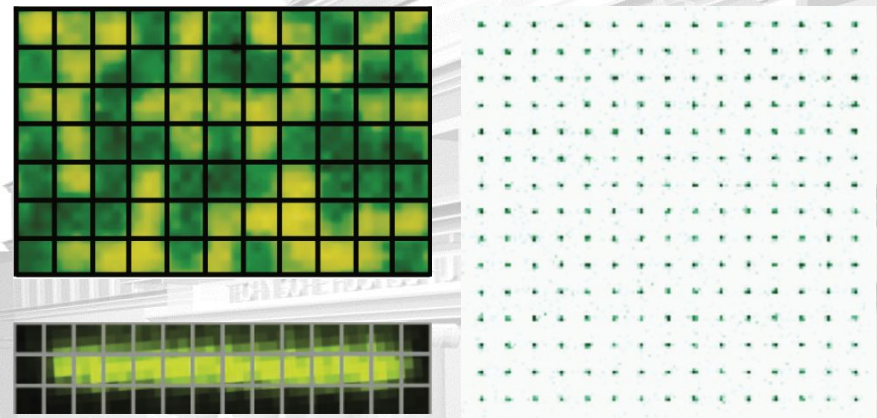
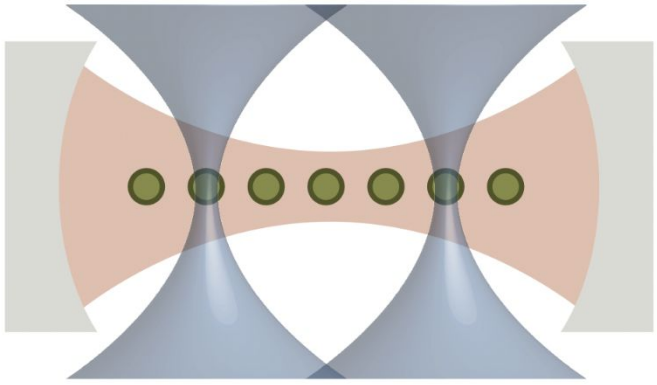
Quantum Information: Research

Building quantum systems atom by atom



Neutral atoms: a leading platform for quantum simulation/computation

- Perfect isolation
- Unmatched size & scalability
- Accessible length- and time scales
- Single-qubit control & readout



Build a next-generation quantum processor:

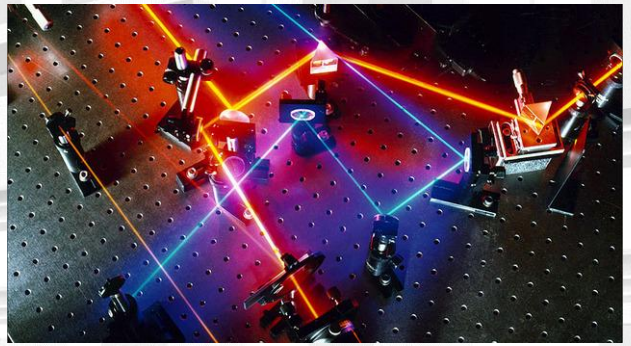
- Quantum gas microscopy
- Optical tweezers
- Strong light-matter coupling
- Non-local entanglement

Quantum Information: Teaching

Student projects: Projekt-/Masterarbeiten

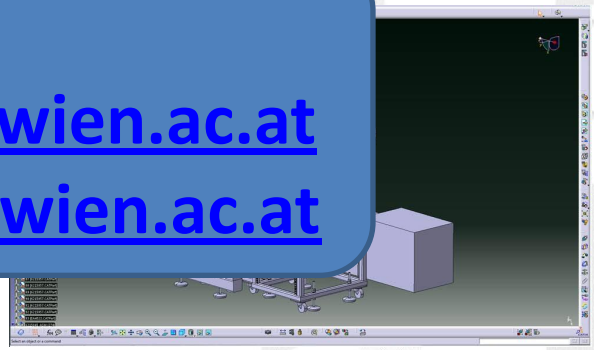
Various topics, e.g.:

Beam shaping, design of high-NA optical systems (e.g. Zemax)



Laser systems: atomic spectroscopy, optical frequency locks, beam shaping

Development and prototyping of PCBs (e.g. Altium, with electronics workshop)



Mechanical design and prototyping (CAD, mechanical workshop)

Contact:

julian.leonard@tuwien.ac.at

marvin.holten@tuwien.ac.at

Quantum Information: Teaching

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www.ati.ac.at

Lecture: 141.A10 Quantum Optics I (Leonard/Holten)

Do. 11:00-13:00 seminar room DB yellow 07 (first lecture on October 5th)

Quantum optics provides the framework of many fundamental aspects of quantum physics, and it forms the basis of today's quantum technologies, such as quantum computing and quantum communication.

In this course, we will answer:

- Why is the vacuum is not empty and how an atom feels it
- What entanglement is and how we can create and harness it
- Why there is spontaneous emission
- How quantum mechanics lets us communicate privately
- How you can make light move slower than you walk
- How a quantum computer works and how to build it

The course is the first part of a two-semester lecture, second part (Quantum Optics II) will be read in the spring term.

Contact: julian.leonard@tuwien.ac.at

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QUantum Information &Thermodynamics

Marcus Huber
&
the QUIT Physics group

Start
FWF Der Wissenschaftsfonds.
erc
ESQ Discovery
VCQ Vienna Center for Quantum Science and Technology

Quantum Information Theory

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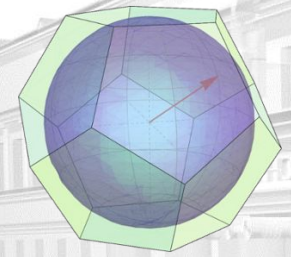
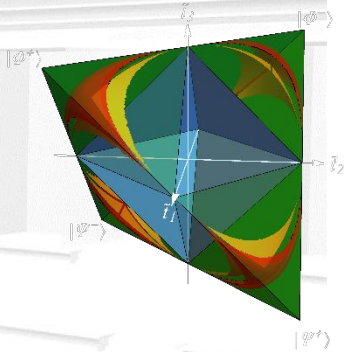
Quantum Information in Complex Quantum Systems



- Bloch representation & entropy characterisation
- Entanglement in high-dimensional systems
- Multipartite entanglement beyond LOCC
- Device-independent characterisation
- Entanglement in quantum networks



- High-dimensional protocols
- Quantum communication beyond QKD
- Modeling realistic channels
- Multipartite key distribution

Quantum Cryptography

Quantum Photonics

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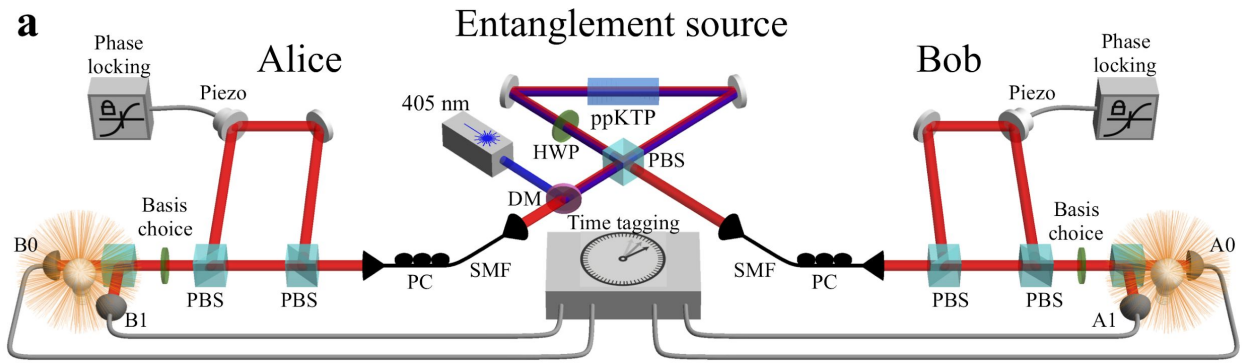
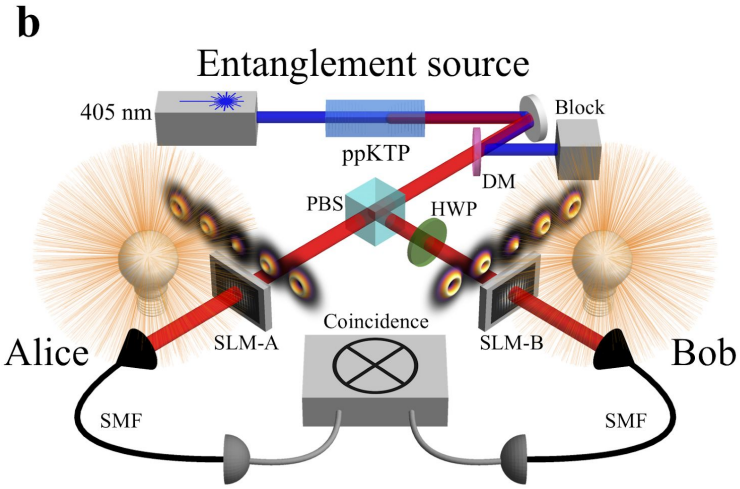
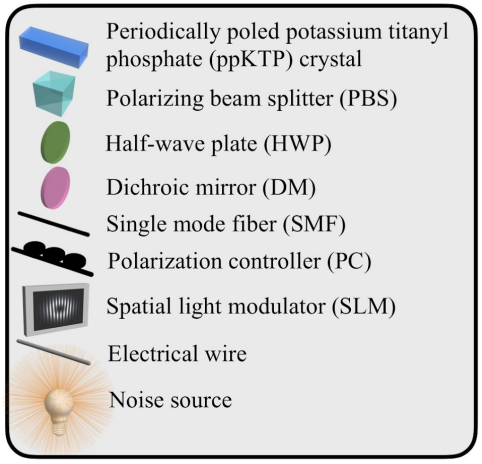
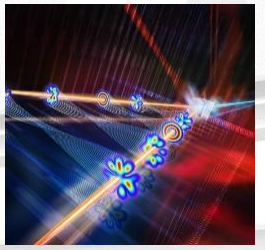
High-dimensions: how many bits per photon?

- Energy-time entangled photons



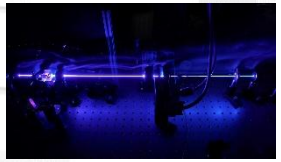






Channels

- Free space
- Multicore fibres



- Spatial modes of light: entanglement and measurements

Quantum Thermodynamics

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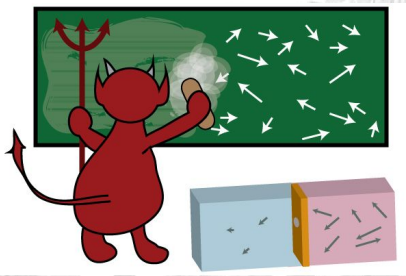
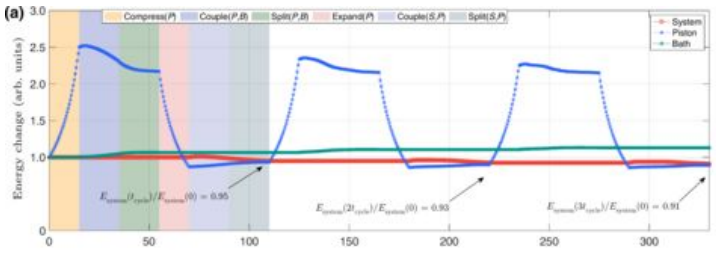


Fundamental Thermodynamics

- Foundation of physics: ultimate limits to knowledge & acquisition of information
- Thermodynamic protocols: cooling on a quantum computer & limits to correlations
- Entropy and the arrow of time
- Thermodynamics & complexity



Applied Thermodynamics

- Modeling realistic thermal machines (open quantum systems & many-body theory)
- Quantum Field Thermal Machines (with Jörg Schmiedmayer)

Quantum Technologies

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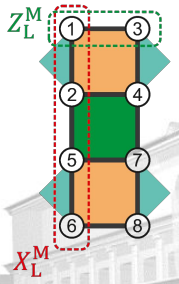
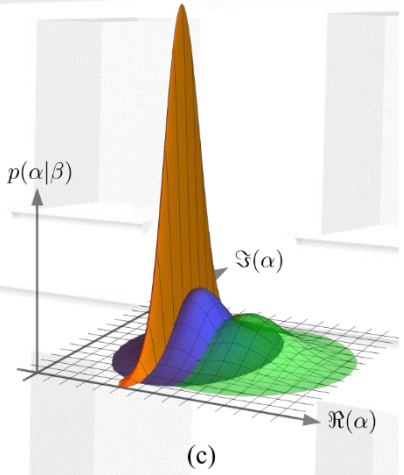
Quantum Computing

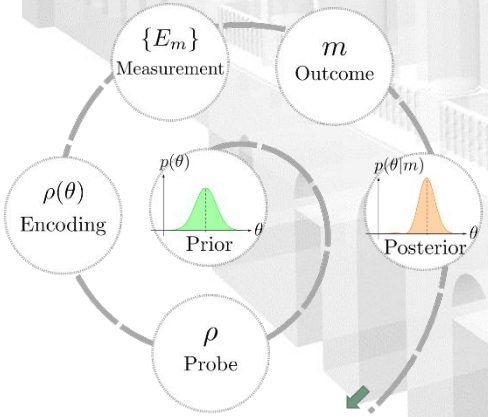


- High-dimensional quantum-computing architectures
- Quantum error correction
- Black-box subroutines
- Implemention (theory) in quantum-optical systems

Quantum Optics Theory

- Gaussian and non-Gaussian states of light
- Correlations & entanglement in CV systems





Quantum Metrology

- Bayesian and frequentist estimation techniques
- Metrology for error mitigation in quantum networks
- Fundamental limits to thermometry

TU WIEN

ATOMINSTITUT
www.ati.ac.at

Solid-State Quantum Optics and Nanophotonics

Sarah Skoff

www.skofflab.com

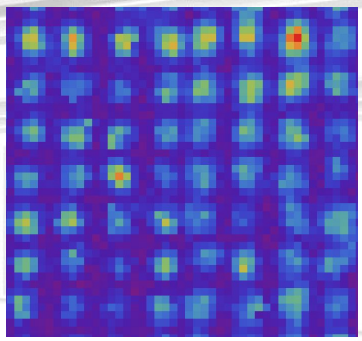
FWF
Der Wissenschaftsfonds.

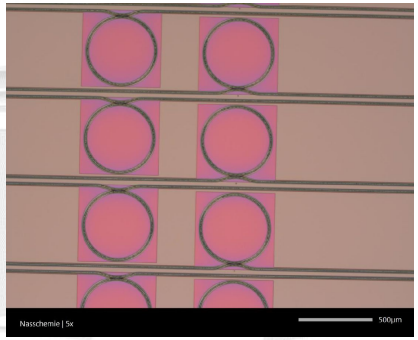
VCQ
Vienna Center for Quantum Science and Technology

Solid-State Quantum Optics and Nanophotonics Research

New quantum technologies based on quantum emitters in solid-state materials (e.g. 2D materials) and nanophotonics

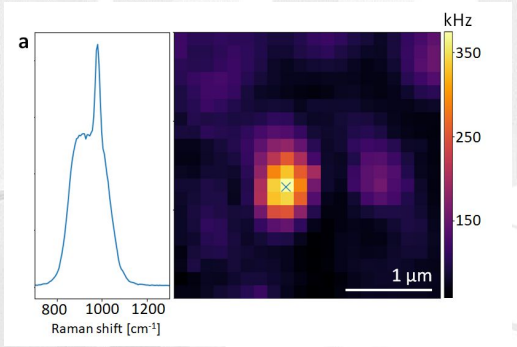
- Implementing **strong light-matter interactions** on the level of **single photons** and **single quantum emitters**
- Developing new technologies **for photonic quantum networks**

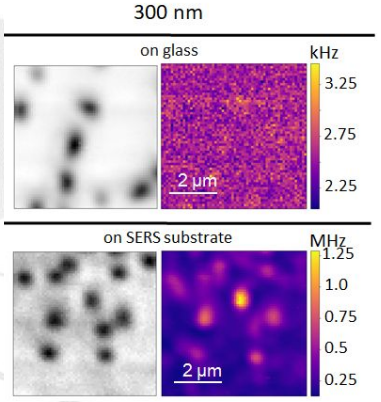




Nanophotonic platforms for precision sensing

- **Detection and spectroscopy** of nanoparticles**,** in particular **nanoplastic** via **nanophotonic platforms**, such as **plasmonic** substrates.





Solid-State Quantum Optics and Nanophotonics

Teaching

Bachelor-, Project- and Masterprojects (141.095, 141.A13):

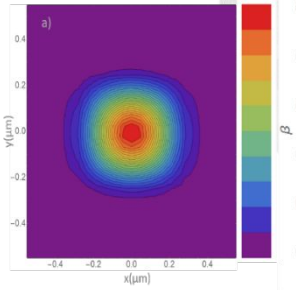
(available again from WS2024 onwards)

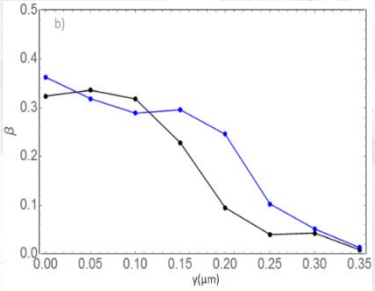
Please contact:
sarah.skoff@tuwien.ac.at

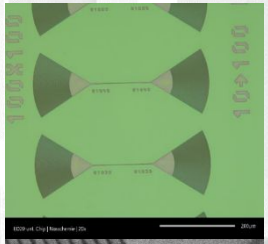
- **Participation in current research projects in the lab**
- Topics: quantum emitters in hexagonal boron nitride, detection of nanoplastic, …

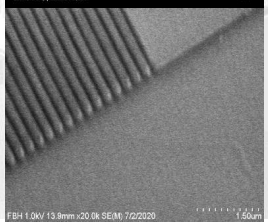
- **Smaller self-contained projects on nanophotonics and spectroscopy**

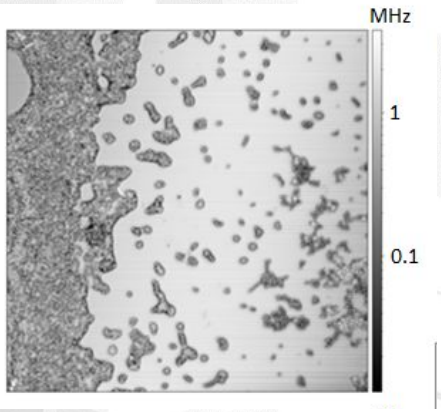
Topics: simulation of nanophotonic components (FDTD), characterisation of waveguide structures, homebuilt diode lasers, laser locks,…

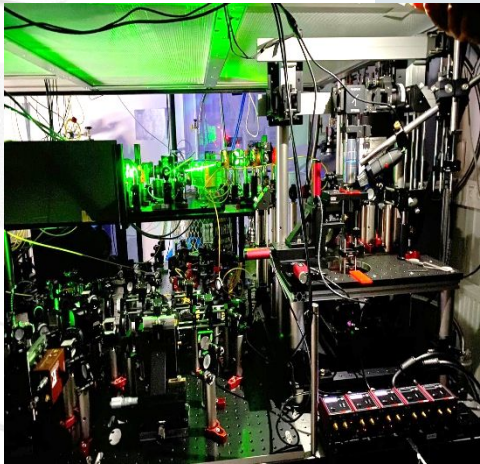












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AQUnet
Austrian Quantum Fiber Network

AQUclock
Austrian Quantum Clock

Quantum-Metrology

Thorsten Schumm

Kjeld Beeks, Georgy. Kazakov,
Stephanie Manz, Martin Pimon,
Enikoe Seres, Josef Seres,
Tomas Sikorsky

VCQ
Vienna Center for Quantum Science and Technology

erc

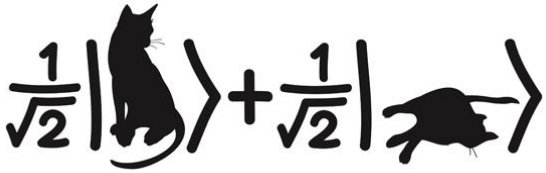
FFG
Promoting Innovation.

Funded by the Austria Research Promotion Agency

Group research focus

Precision measurements based on quantum effects:

- „superposition-based“ quantum sensors

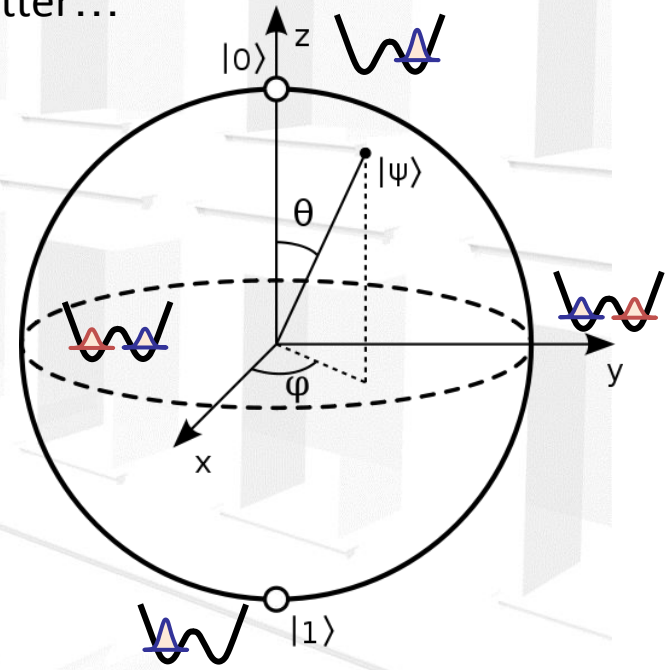


„Internal“ state superpositions

- atomic clocks (MW, optical, UV...?)
- applications in navigation, communication, geodesy…
- fundamental research: interaction constants, dark matter…
- **research project:** a nuclear clock with Thorium-229

„External“ state superpositions

- de-localized wave functions of matter
- matter wave interferometry
- measurements of tilt, rotation, accelleration
- fundamental research: quantum-classical boundary
- **research project:** Caesium-BEC-interferometer



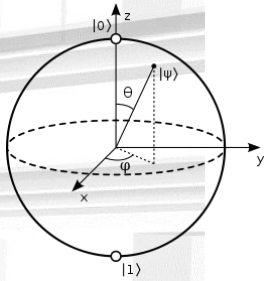
Teaching

Lectures

141.A35 Atomic/molecular physics - metrology Wednesday 10:00-12:00 Sem. DB gelb 07

start 11.10.2023

- introduction to atomic and molecular physics
- metrology applications: spectroscopy, clocks, gravimetry
- mandatory for Master Energie + Messtechnik, everybody welcome!!!

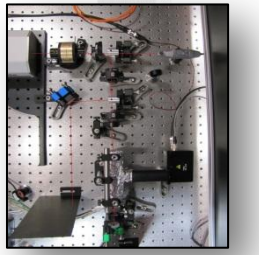


Projektarbeiten (also suited for bachelor projects)

141.A27 Atomic clocks and quantum metrology

book early!

- hands on projects embedded into research group
- topics: lasers, spectroscopy, experimental control, programming...



contact: Thorsten.Schumm@tuwien.ac.at

Praktikum

141.A12 Fundamental experiments on quantum physics

book early!

- nuclear magnetic resonance (NMR)
- single versus two-photon interference
- Einstein-Podolski-Rosen / Bell experiment
- neutron interferometry at TRIGA reactor

contact: Barbara.Stross@ati.ac.at

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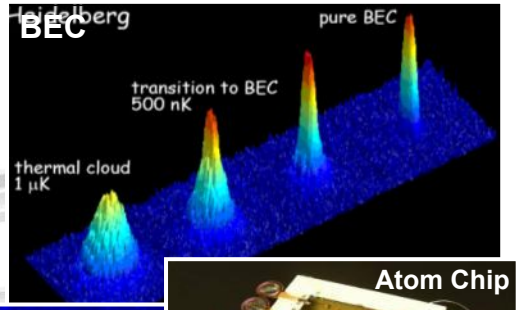
Atom- und Quantenphysik

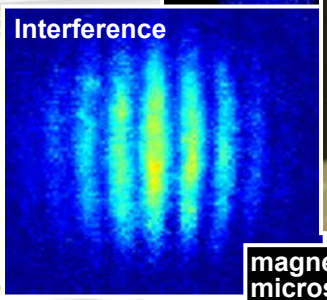
I. Mazets, M. Prüfer, S. Erne
J. Schmiedmayer

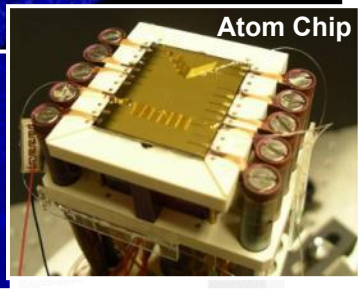
WITTGENSTEIN
CoQuS ComplexQuantumSystems
FWF Der Wissenschaftsfond
erc
SEVENTH FRAMEWORK PROGRAMME
VCQ Vienna Center for Quantum Science and Technology

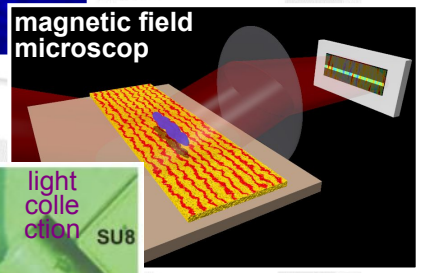
Understanding and Implementing Quantum Physics

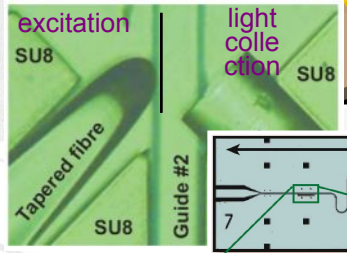
- fundamental research
  - quantum degenerate Bose and Fermi gases
  - coherence and de-coherence
  - quantum simulations
  - quantum field theories in the Lab
  - connecting quantum systems
- applications in devices
  - Quantum memory
  - Quantum repeater
- technologies
  - lasers, optics
  - imaging and image processing
  - super conductivity and cryogenic technology
  - experimental control and active feedback
  - nano fabrication and micro optics

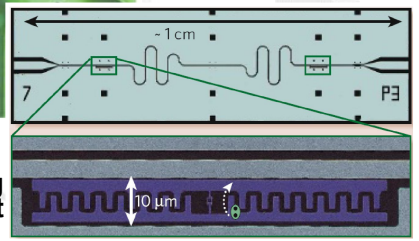












Atom- und Quantenphysik

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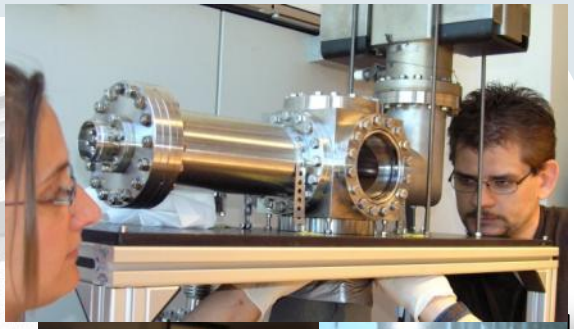
Projektarbeit 141.214: Ultracold Atoms and Spectroscopy

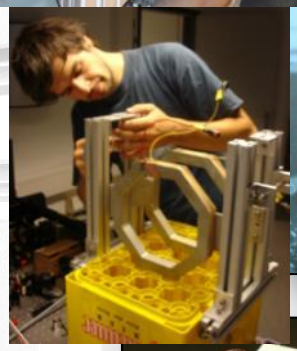
10 ECTS points, located at ATI



A laser cooling setup built up exclusively by students

gain hands-on experience on...

laser physics, high-resolution spectroscopy, feedback and frequency stabilisation, acousto-optics, polarization vacuum technology, laser cooling and trapping, digital imaging and image analysis

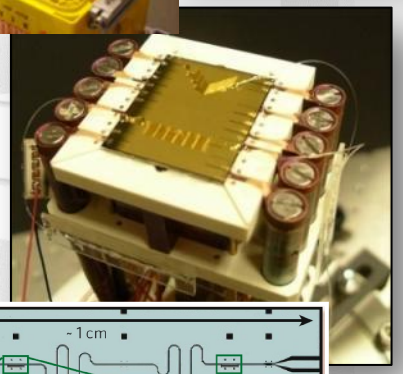


format: teams of 1-2, successive bottom-up segments, 4 weeks full time, fully WIKI based documentation (see homepage for info),

contact: schmiedmayer@atomchip.org

Projektarbeit 141.A15: Quantum Technology

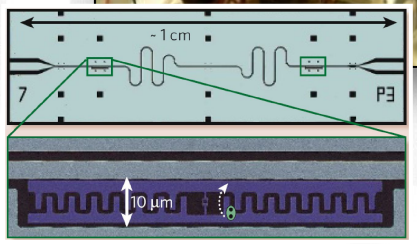
10 ECTS points, located at ATI



merging microfabrication with optics and superconducting quantum circuits

gain hands-on experience on...

Nano fabrication, micro optics, single photon optics and detectors, micro wave engineering, micro wave resonators, cryogenics, superconductivity, quantum electronics



contact: schmiedmayer@atomchip.org

Können auch als Bachelorarbeit angerechnet werden !

Atom- und Quantenphysik

ATOMINSTITUT
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Lecture:

- **Atoms-Light-Matterwaves** **141.212** **WS 2024**
  J. Schmiedmayer, Ph. Haslinger, S. Erne et al. …..

Introduction into the physics of laser cooling, atom trapping and matter waves.
Topics will include: Repeat of basic atomic physics and quantum optics, atom-light interaction, laser cooling and trapping of atoms and ions, matter wave interferometry, …

The lecture will be continuation in next semester as:
Macroscopic Quantum Systems 141.231
discussing quantum degenerate ultra cold matter.

location: **Atominstitut** (Stadionallee 2),
language: English
First Lecture: 18. Oktober 14h c.t. Bibliothek Atominstitut
we will fix the other dates then
format: 3 Blocks: 2 afternoons for lectures and 1 afternoon for student talks
dates and times will be arranged flexible (with 2x coffee break)
exam: 72 hour take home exam. All tools except other people are allowed
Short term-paper on a recent scientific publication
Write a report (max 4 pages).
Short discussion on the term paper to determine the grade.

CoQuS
ComplexQuantumSystems

TECHNISCHE UNIVERSITÄT WIEN

Kern- und Teilchenphysik

Lehrveranstaltungen im Wintersemester 2023/24

TECHNISCHE UNIVERSITÄT WIEN

Vortragende aus drei Instituten

Atominstitut

- M. Faber , A. Hirtl, H. Leeb, F. Reindl, E. Renner und J. Schieck
- M. Benedikt (CERN)

Institut für Hochenergiephysik (HEPHY) der ÖAW

- T. Bergauer, H. Eberl, L. Einfalt, M. Jeitler, J. Schieck, W. Waltenberger, C. Wulz

Stefan-Meyer-Institut (SMI) der ÖAW

- J. Marton

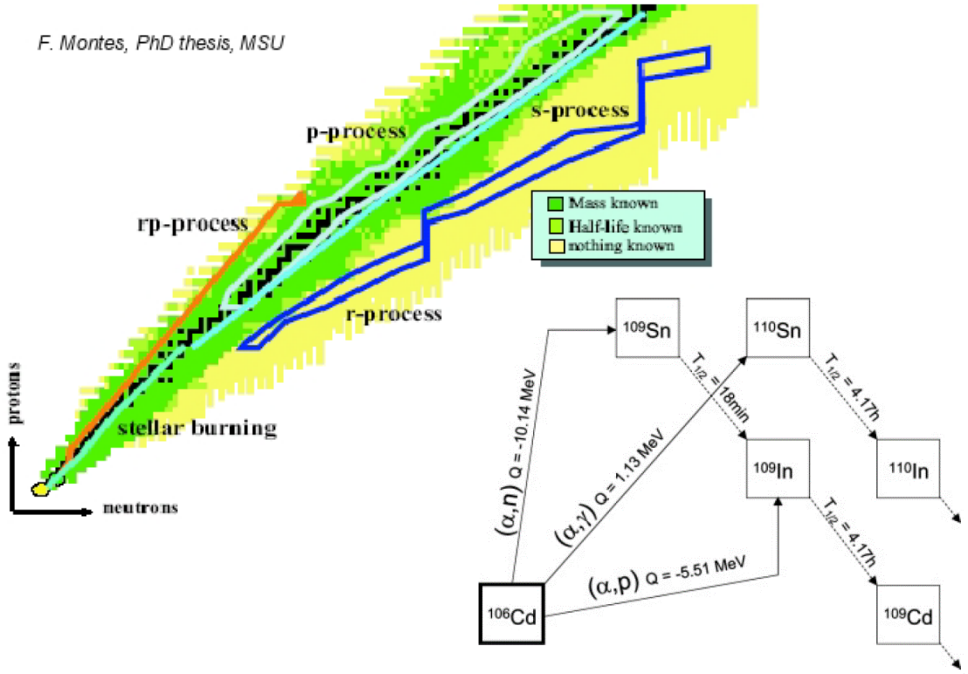
TECHNISCHE UNIVERSITÄT WIEN

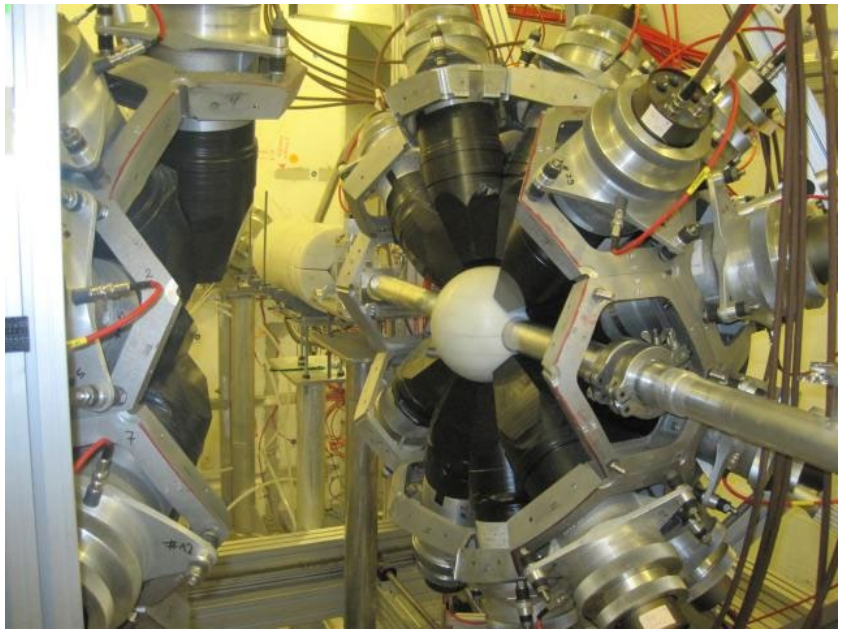
Fünf Forschungsbereiche

- Kernphysik und nukleare Astrophysik
- Feldtheorien und Hadronenphysik
- Experimentelle Teilchenphysik
- Medizinische Strahlenphysik
- Beschleunigerphysik

Kernphysik und nukleare Astrophysik (Leeb)

- Beschreibung von Kernreaktionen an den Grenzen der Stabilität, relevant für Astrophysik und nukleare Technologien
- Verbindung von Reaktionstheorie mit modernen Kernstrukturtheorien





Feldtheorien und Hadronenphysik (Faber)

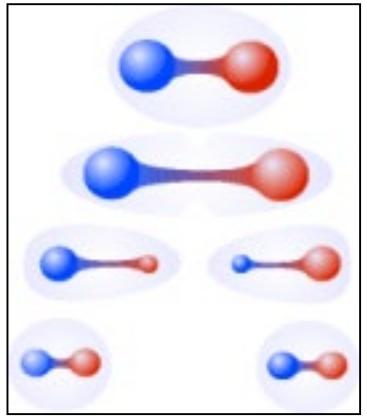
Hadronenphysik

- Beschreibung exotischer Atome und Verständnis der Annihilation
- chirale Feldtheorie

Feldtheorien

- Verständnis der QCD bei niedrigen q-Werten (z.B. Confinement)
- Gittereichtheorien, Solitonmodell

Flußschlauch zwischen Quark-Antiquark aus QCD Gittereichrechnungen



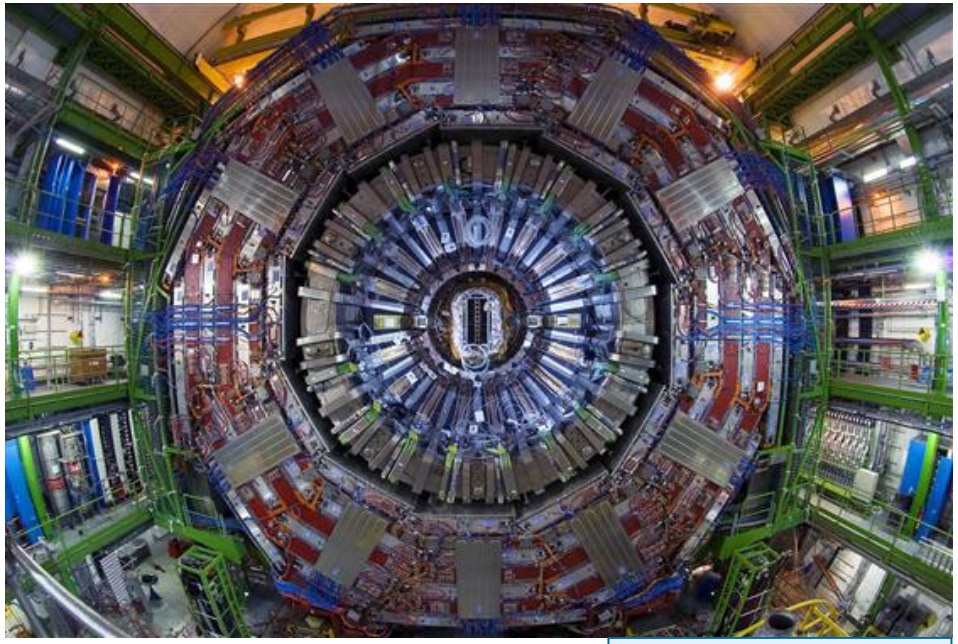
Quark-Antiquark Wechselwirkung

Experimentelle Teilchenphysik – HEPHY (Schieck u.v.a.)

- Verständnis des Standardmodells, Higgs-Teilchen, CP-Verletzung, Suche nach neuer Physik
- Suche nach Dunkler Materie
- Neutrinophysik
- Entwicklung von Detektoren

Experimente

- LHC@CERN, BELLE@KEK
- Suche nach dunkler Materie CRESST und COSINUS @LNGS
- Neutrinophysik NUCLEUS@CHOOZ
- Theoretische Teilchenphysik



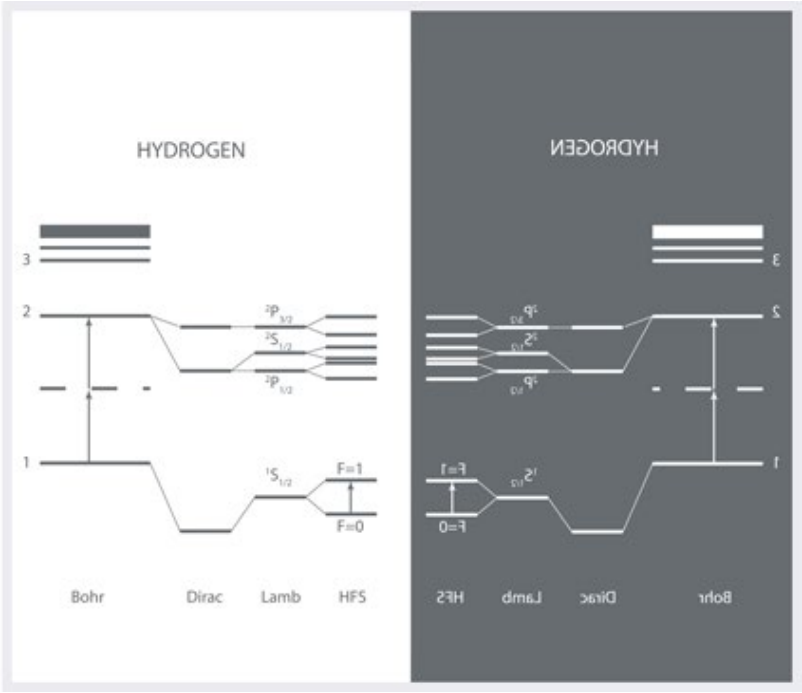
CMS Detektor

Experimentelle Teilchenphysik – SMI (Marton u.v.a.)

- Antimaterie-Materie-Symmetrie
- Hadronenphysik – Untersuchung der starken Wechselwirkung mit Strangeness
- exotische Atome

Experimente

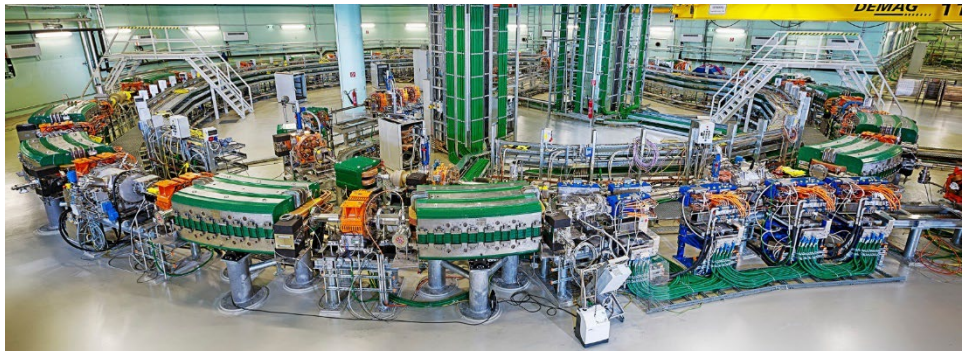
- ASACUSA@CERN
- ALICE@CERN
- DAPHNE@LNF
- VIP2@LNGS



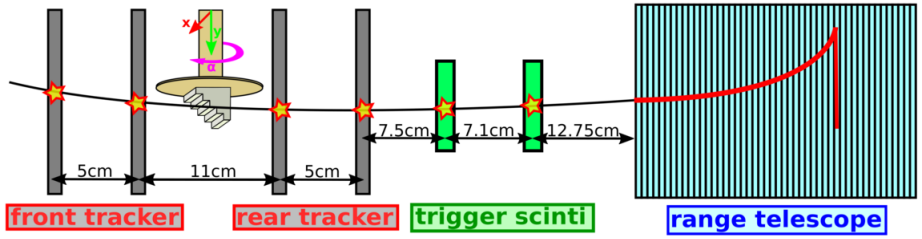
Medizinische Strahlenphysik (Bergauer & Hirtl u.v.a.)

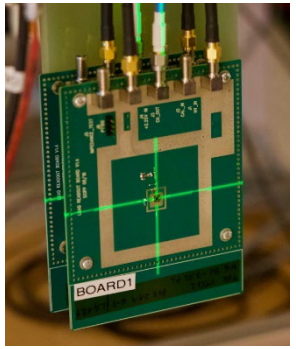
Experimente am Forschungs- & Therapiezentrum MedAustron

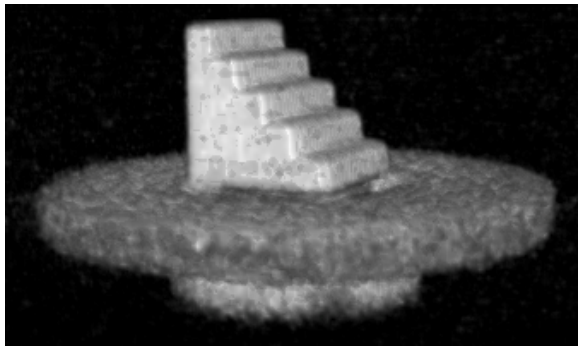
- Ionenbildgebung – pCT
- Anwendungen der Teilchenphysik in der Medizin
- Entwicklung von Teilchendetektoren



pCT set-up am MedAustron







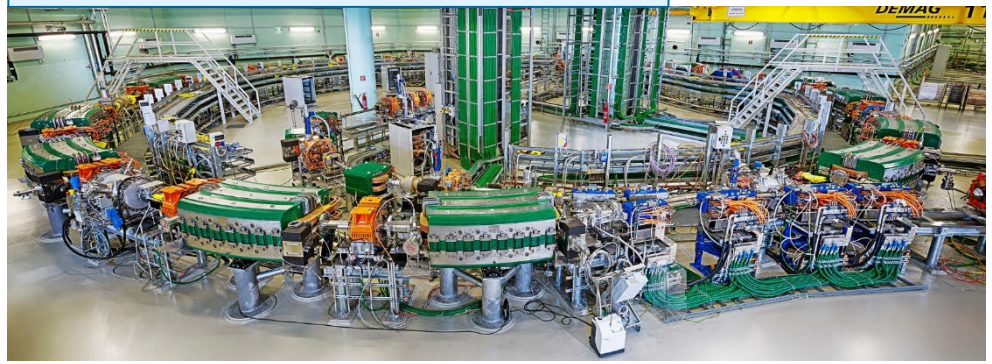
Beschleunigerphysik (Benedikt & Renner u.v.a.)

- Verständnis der Strahldynamik in Teilchenbeschleunigern
- Weiterentwicklung von Techniken zur Strahlmanipulation
- Planung und Realisierbarkeitsstudien zukünftiger Beschleunigeranlagen

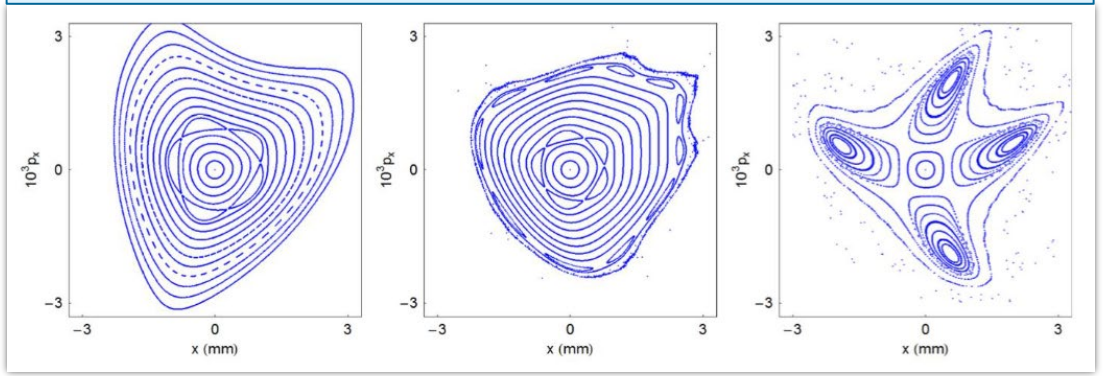
Methoden & Framework

- Simulationen und/oder Messungen
- Arbeiten in Kollaboration mit oder an Beschleunigerzentren (MedAustron, CERN, …)

Medizinisches Synchrotron am MedAustron



Phasenporträt von Teilchen in einem Speicherring mit nicht linearen Magnetfeldkomponenten



H. BARTOSIK– FIRST TASTE ON NONLINEAR DYNAMICS

Übersicht der LVA (VO, UE, SE, LU)

LVA Name & Vortragende	LVA Nummer
Aktuelle Kernstrukturmethoden (VO), Leeb	141.B29
Astro-Teilchenphysik (VO), Jeitler, Wulz	142.094
Einführung in die Modelle der Elementarteilchenphysik I (VO, UE), Eberl	141.B00, 141.B01
Experimente am MedAustron Teilchenbeschleuniger - Angewandte Teilchenphysik und medizinische Physik (LU), Bergauer, Hirtl u.a.	141.A99
Pfadintegrale in der Quantenmechanik und Quantenfeldtheorie (VO), Faber	142.725
Physics of Exotic Atoms (VO), Marton	142.072
Physik der Atmosphäre (VO), Leeb	142.769
Quantenchromodynamik I (VO), Faber	142.197

Übersicht der LVA (VO, UE, SE, SV)

LVA Name & Vortragende	LVA Nummer
Seminar über Atomare und Subatomare Physik (SE), Schieck u.a.	142.069
Seminar über medizinische Strahlenphysik und Ionentherapie (SE), Hirtl	141.B19
Statistische Methoden der Datenanalyse (SV, UE), Einfalt, Reindl, Waltenberger	142.340, 142.351
Suche nach der Dunklen Materie (VO), Schieck	141.A49
Teilchenbeschleuniger (VO), Benedikt, Renner u.a.	141.944

Projektarbeiten (PR) & Bachelorarbeiten

- Unter Anleitung durchgeführte wissenschaftliche Arbeiten an aktuellen Forschungsprojekten eingebettet in aktive Forschungsgruppen
  - Dauer in Summe etwa 4 – 6 Wochen Vollzeit
- Beginn jederzeit nach Vereinbarung
  - Kontakt mit Betreuer bzw. Betreuerin der Projektarbeit
- Abschluss durch wissenschaftliches Ergebnis sowie schriftliche Dokumentation (Protokoll)

Machen Sie mit und kontaktieren Sie uns einfach!

Projektarbeiten (PR) & Bachelorarbeiten

LVA Name & Vortragende	LVA Nummer
Projektarbeiten Angewandte Strahlenphysik, Hirtl u.a.	141.079
Projektarbeit Beschleunigerphysik, Benedikt, Renner	141.287
Projektarbeit Experimentelle Teilchenphysik, Krammer u.a.	142.039
Projektarbeit Kernphysik, Benedikt, Leeb	141.A22
Projektarbeit Methoden der Teilchenphysik, Schieck u.a.	141.A45
Projektarbeit Nukleare Astrophysik, Benedikt, Leeb	141.A21
Projektarbeit Starke Wechselwirkung, Faber	142.045
Projektarbeit Strahlenschutz und Dosimetrie, Hirtl u.a.	141.018
Projektarbeit Subatomare Physik, Faber, Marton	142.088

Kontakt

Kernphysik und nukleare Astrophysik

- H. Leeb: helmut.leeb@tuwien.ac.at

Feldtheorien und Hadronenphysik

- M. Faber: manfried.faber@tuwien.ac.at

Experimentelle Teilchenphysik

- J. Schieck: jochen.schieck@tuwien.ac.at
- T. Bergauer: thomas.bergauer@oeaw.ac.at
- J. Marton: johann.marton@oeaw.ac.at
- F. Reindl: florian.reindl@tuwien.ac.at

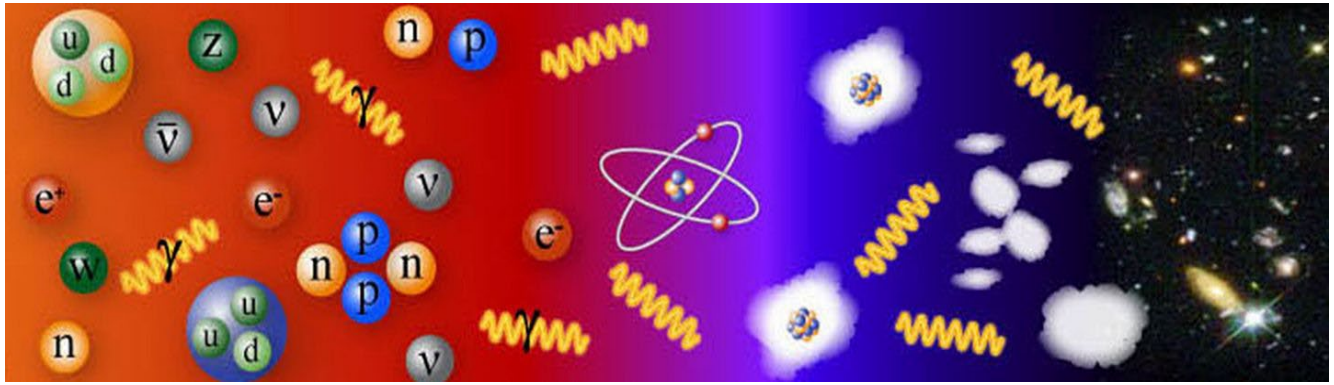
Kontakt

Medizinische Strahlenphysik

- A. Hirtl: albert.hirtl@tuwien.ac.at
- T. Bergauer: thomas.bergauer@oeaw.ac.at

Beschleunigerphysik

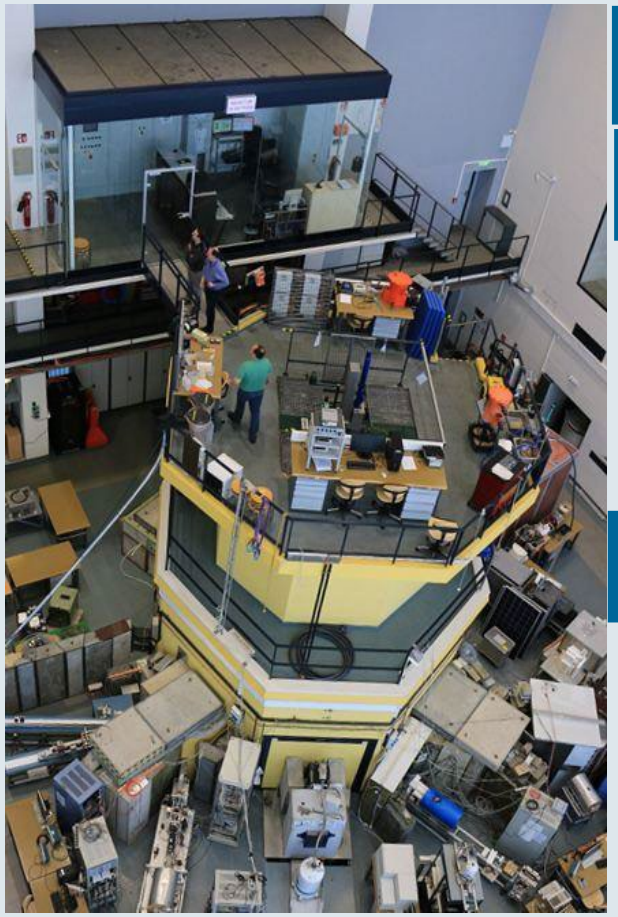
- E. Renner: elisabeth.renner@tuwien.ac.at



Vielen Dank für Ihre Aufmerksamkeit!

Lehre am TRIGA Center Atominstitut

Das TRIGA Center Atominstitut ist ein Zentrum unter dem Vizerektorat für Forschung und Innovation



Leitung & Bewilligungsinhaber
Musilek

Reaktor-Betriebsleitung	Strahlenschutz	Nukleare Sicherheit	Security
Leitung: Villa Stv.: Bergmann	Leitung: Hainz Stv.: Musilek Veit-Öller	Leitung: Sterba Stv.: Welch	Leitung: Sterba Stv.: Villa Veit-Öller

TRIGA* Reaktor	CLIP** Radiochemie
Leitung: Villa Bergmann *Operateure:* Stummer Trunner	Leitung: Sterba Rosecker Welch *Labor:* Foster Nemetz

Reaktor - CLIP - Strahlenschutz

* Training, Research, Isotope Production, General Atomics
** Center for Labelling and Isotope Production

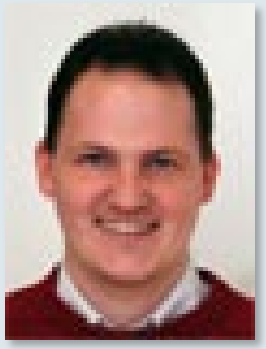
TRIGA Reaktor

- Projektarbeiten
  - 141.080 Projektarbeit Reaktortechnik (8.0)
- Vorlesungen
  - 141.537 Reaktorphysik (2.0)
  - 141.032 Reaktortechnik I (2.0)
- Laborübungen
  - 141.A87 Praktische Übungen am Reaktor (4.0)

- Vortragende und Betreuer:

Mario Villa

Helmuth Böck



Robert Bergmann

Reaktor - CLIP - Strahlenschutz

Center for Labelling and Isotope Production

- Projektarbeiten
  - 141.167 Projektarbeit Radiochemie (8.0)
- Vorlesungen
  - 141.295 Radiochemie 2 Radiopharmazeutische Chemie (2.0)
  - 141.399 Archäometrie (2.0)
- Laborübungen
  - 141.106 Archäometrie (2.0)
  - 141.600 Radionuklidbestimmung in Umweltproben (4.0)

Reaktor - CLIP - Strahlenschutz

- Vortragende und Betreuer:

Johannes H. Sterba

Jan Welch

Veronika Rosecker

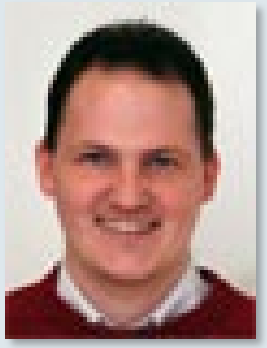
Strahlenschutz

- Projektarbeiten
  - 141.018 Projektarbeit Strahlenschutz und Dosimetrie (8.0)
  - 141.079 Projektarbeit Angewandte Strahlenphysik (8.0)
- Übungen
  - 141.075 Rechenmethoden des Strahlenschutzes I (1.0)
- Vorlesungen
  - 141.010 Technischer Strahlenschutz I (3.0)

- Vortragende und Betreuer:

Andreas Musilek

Dieter Hainz



Robert Bergmann

Monika Veit-Öller

Reaktor - CLIP - Strahlenschutz

Wir freuen uns auf Ihre Teilnahme!

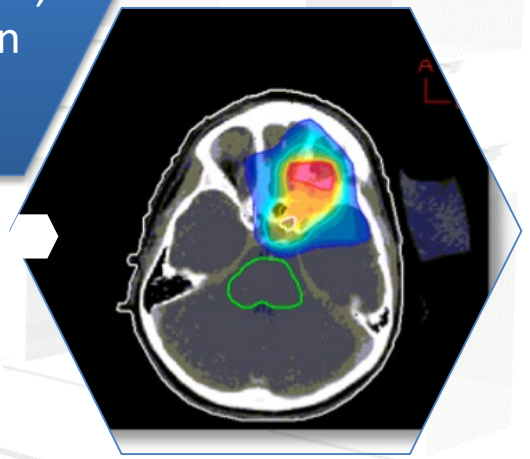
Reaktor - CLIP - Strahlenschutz

Strahlenphysik

Strahlenphysik: Leitung Christina Streli

Röntgenphysik

Medizinische Strahlenphysik, MedAustron



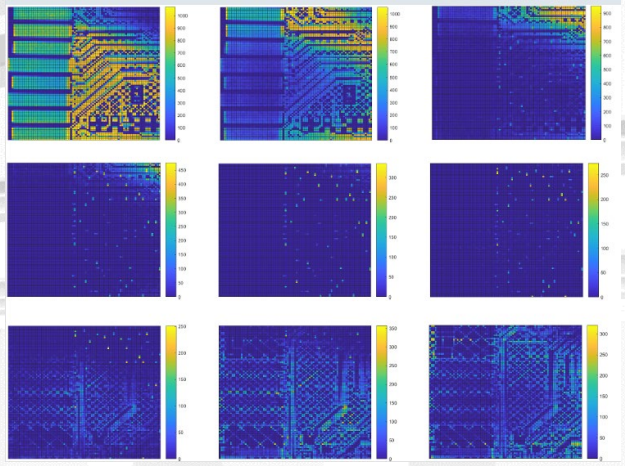
Röntgenspektrometrie:
Spurenelementanalytik im parts per billion Bereich

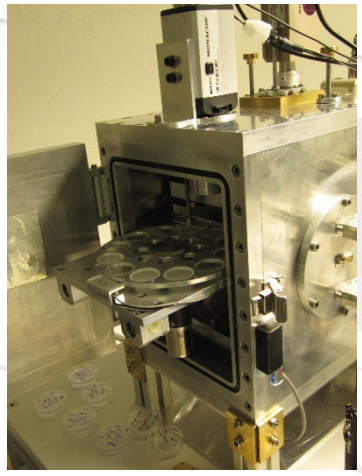
- **Materialcharakterisierung**
  - Charakterisierung von Implantaten in Silizium-Wafern
  - Charakterisierung ultradünner Schichten im Nanometer-bereich auf Silizium-Wafern
  - Spurenelemente im menschlichen Gewebe
  - Waferoberflächenanalytik

- **Umweltanalytik**
  - Flüssigkeiten: Nachweis von Blei im Trinkwasser
  - Spurenelementanalyse von Aerosolen in Luft

Röntgenspektrometrie:
Zerstörungsfreie ortsaufgelöste Elementverteilung

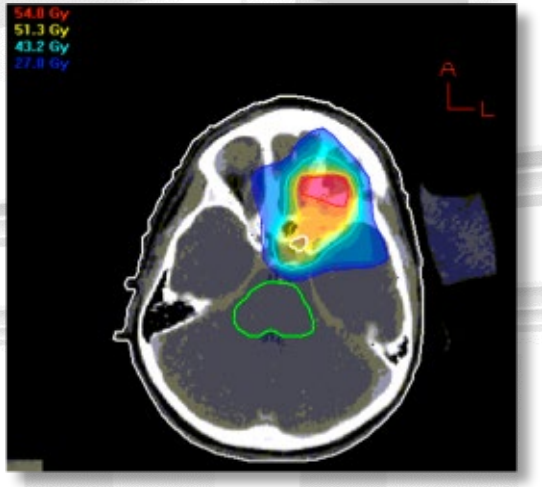
- Methodenentwicklung
  - 3D Element Imaging
  - Tiefenprofilanalytik im Nanometerbereich
  - Entwicklung von Spektrometer für spezielle Aufgabenstellungen





Strahlenphysik

- ## Medizinische Strahlenphysik
  - Diagnostik
  - Nuklearmedizin
  - Strahlentherapie



- ## MedAustron

  Internationales Tumortherapie- und Forschungszentrum mit Protonen und Kohlenstoffionen
  - Experimentelles Programm zur
    - Mikrodosimetrie
    - Bildgebung mittels Ionen – Protonen CT

Strahlenphysik – gemeinsam mit XRC, KTP und TRIGA-Center

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Strahlung vielseitig nutzen,
den verantwortungsvollen Umgang lehren!


C. Streli


K. Poljanc


D. Ingerle (XRC)


A. Hirtl (KTP)

XRC… Röntgenzentrum KTP…. Kern- und Teilchenphysik

VORLESUNGEN im WINTERSEMESTER 2023

141.281 VO Radioökologie (wird noch bekanntgegeben)
141.599 VO Strahlenphysikal. und gesellschaftliche Aspekte des Strahlenschutzes (Poljanc)
141.944 VO Teilchenbeschleuniger (Benedikt)- siehe auch KTP

PROJEKT- UND BACHELORARBEITEN IM WINTERRSEMESTER 2023

141.110 PA Projektarbeit Elektronen- und Röntgenphysik (Streli u.a.)
141.153 PA Projektarbeit Röntgenanalytik (Streli u.a.)
141.018 PA Projektarbeit Strahlenschutz und Dosimetrie (gemeinsam mit TRIGA Center)
141.079 PA Projektarbeiten Angewandte Strahlenphysik (gemeinsam mit TRIGA Center)

TECHNISCHE UNIVERSITÄT WIEN

ATOMINSTITUT

Tieftemperaturphysik und Supraleitung

Michael Eisterer, Morteza Asiyaban, Alexander Bodenseher, Florian Semper, Raphael Unterrainer

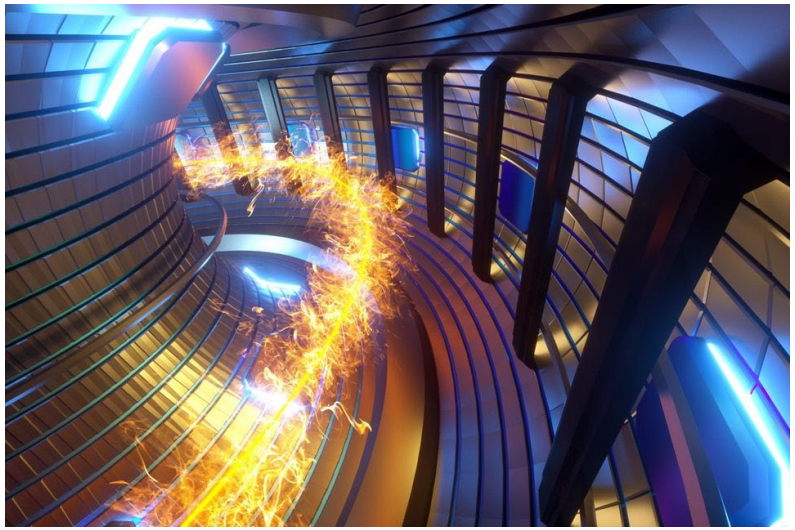
Lehrveranstaltungspräsentation, 3. Oktober 2023

Unsere Themenschwerpunkte

- Magnetische Eigenschaften von Supraleitern
  - Neue Materialen, Anisotropie
- Stromtransport in Supraleitern
  - Flusslinienverankerung
  - Granularitätseffekte und Stromperkulation
- Strahlungsresistenz von Magnetmaterialien

In Zusammenarbeit mit

- CERN
- EUROfusion
- MIT
- Univ. Oxford, Cambridge
- …..



Lehrveranstaltungen

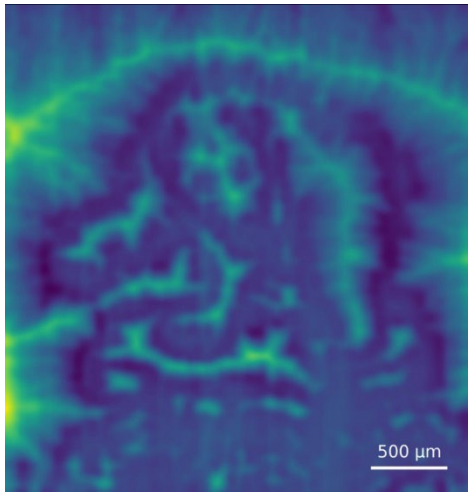
- 141.685 VO Supraleitung
  (Vorbesprechung 4.10., 16:15h, Sem.R. DB gelb 05 A)
- 141.058 SE Low Temperature Physics Seminar
  (Vorbesprechung 9.10., 16:15h, Atominstitut)

Bachelor-, Projekt-, Masterarbeiten:

- Messen, Daten interpretieren
- Experimentelle Auf-/Umbauten
- Prozesssteuerung
- Numerische Modellierung

Methoden

- Magnetisierungsmessungen: SQUID, Vibrationsmagnetometer
- Resistive Messungen (bis 1000 A, 17 T)
- Raster-Hallsondenmikroskopie



TU WIEN

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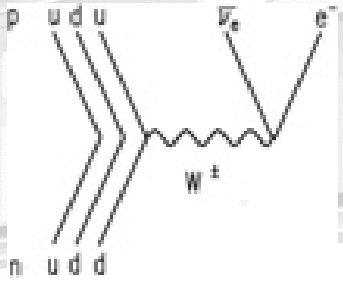
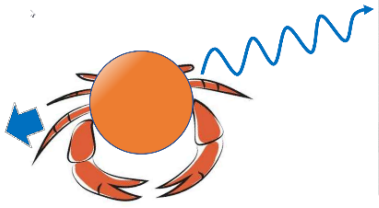
Neutronen- und Quantenphysik

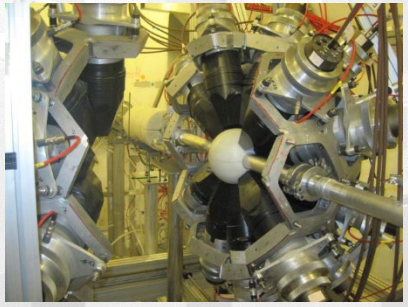
H. Abele, G. Badurek, Y. Hasegawa, E. Jericha,
M. Pitschmann, R. Sedmik, S. Sponar,
M. Suda, J. Summhammer, M. Zawisky

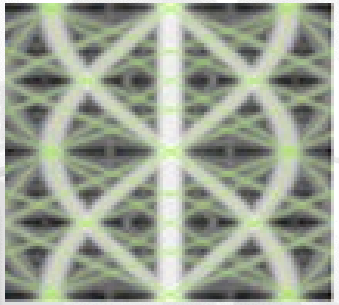
Forschungsschwerpunkte:

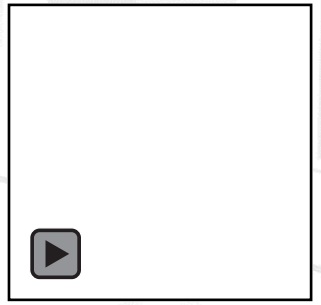
- Präzisionsexperimente zur Teilchenphysik
- Gravitationstests durch Quanteninterferenz
- Grundlegende Tests der Quantenmechanik
- Interferenzexperimente mit Neutronen
- Neutronenradiographie und 3D-Computertomographie
- Polarisierte Neutronen, Entwicklung neutronenoptischer Methoden
- Stellare Nukleosynthese, neue Konzepte in der Kerntechnik
- Neutrinodetektion und kryogene Kristalle











Vorlesungen:

141.B16 **Gravitation and Cosmology I** Abele, Pitschmann
Di 09:00-11:00 / Beginn 03.10. / HS 15

142.081 **Biological and Medical Applications of Nuclear Physics I** Badurek
Block 12:00-14:00 / Beginn Mo 06.11. / ATI HS - siehe TISS!

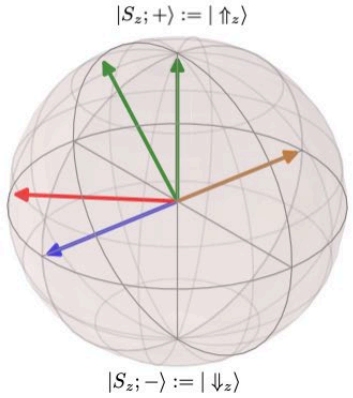
141.234 **Fundamental Physics with Coherent X-Rays and Neutrons** Hasegawa
siehe TISS

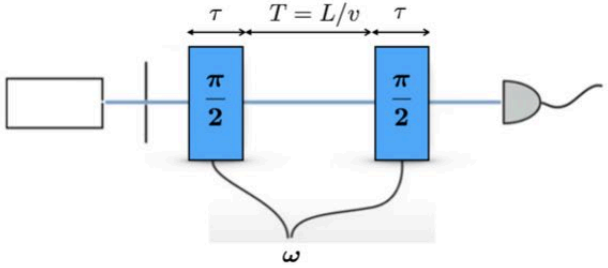
142.318 **Neutronen- und Kernphysik** Jericha
Vorbesprechung Do 05.10. 12:00 / Zoom

138.057 **Festkörperspektroskopie** Jericha, Reissner
Mi 10:00-12:00 / Beginn 11.10. / FH SemR DB gelb 09

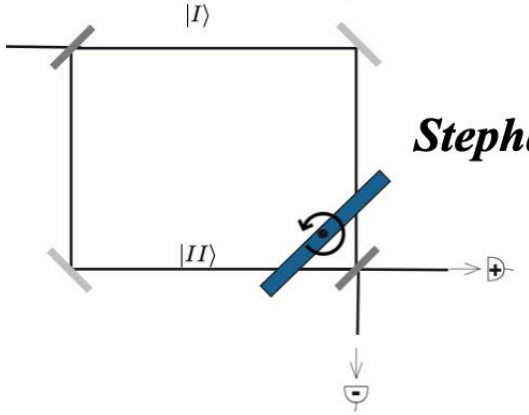
141.280 **Experimentelle Quantenphysik mit Qubit Systemen** Sponar
Mi 16:00-18:00 / Beginn 11.10. / ATI Bibliothek

Vorlesungen:

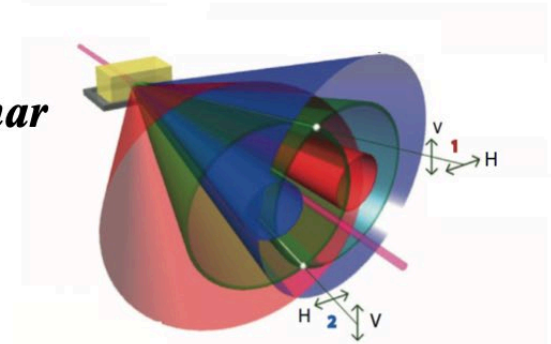




Einführung in die experimentelle Quantenphysik mit Qubit Systemen (VO 141.280)



Stephan Sponar



$$|\Psi^{2\gamma}_{\text{Bell}}\rangle = \frac{1}{\sqrt{2}}\left(|\text{H}\rangle_1|\text{V}\rangle_2 + |\text{V}\rangle_1|\text{H}\rangle_2\right)$$

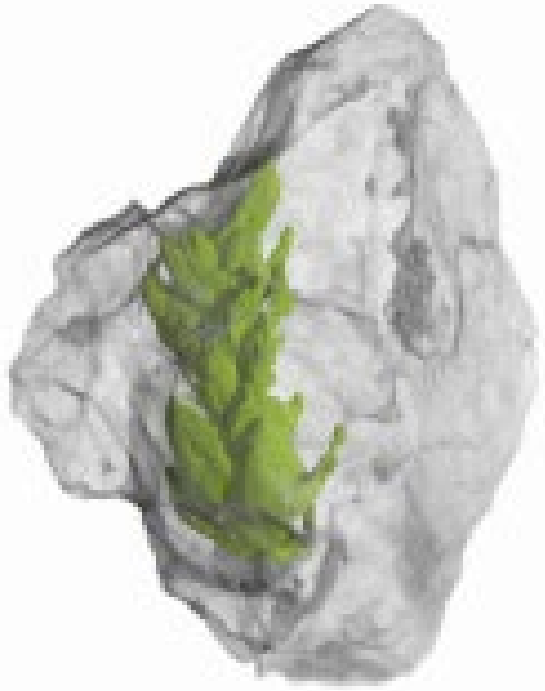
Vorbesprechung: 04.10.2023, 16:00, FH Hörsaal 5 - TPH

Praktika:

141.A78 **Praktikum aus Neutronenphysik** Abele, Hasegawa, Jericha, Sponar, Zawisky

Vorbesprechung Do 05.10., 12:00–12:30 / Zoom

Praktikum 27.11. – 07.12.2023 09:30-16:30



Praktika:

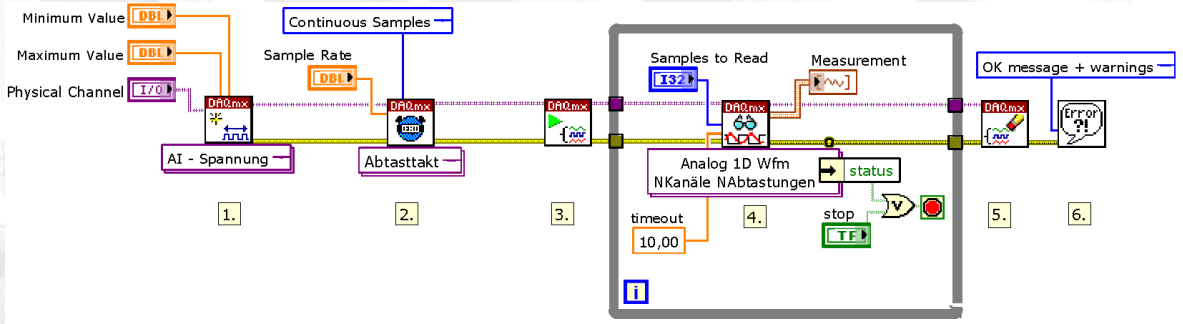
141.A78 **Praktikum aus Neutronenphysik** — Abele, Hasegawa, Jericha, Sponar, Zawisky

Vorbesprechung Do 05.10., 12:00–12:30 / Zoom
Praktikum 27.11. – 07.12.2023 09:30-16:30

141.A76 **Graphical Programming and Experiment Control** — Jericha

Vorbesprechung Do 05.10., 12:30-13:00 / Zoom
Praktikum 17.10.-31.10.2023 10:00-17:00

141.A86 **Quantenphysik** — Schumm *et al.* *(Abele, Sponar)*

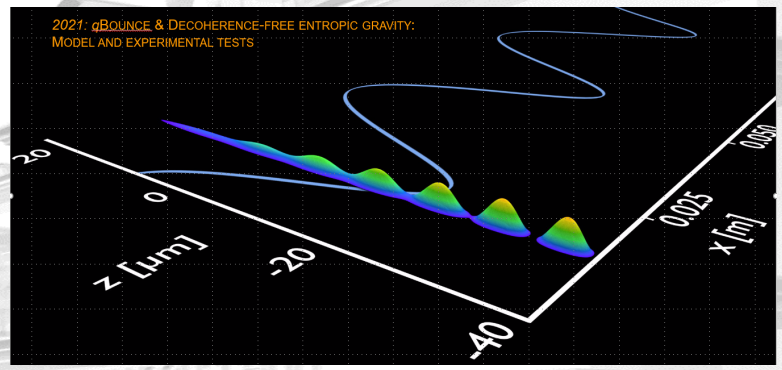


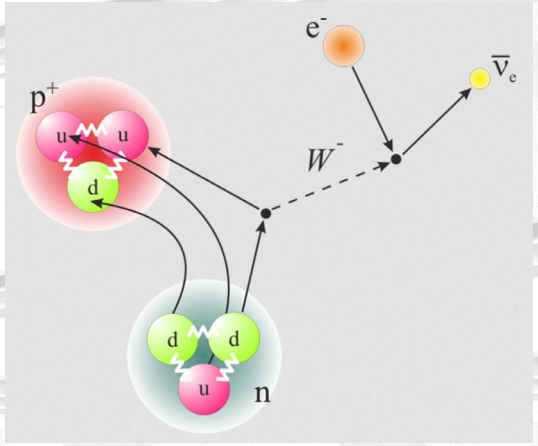
Seminare:

141.543	**Neutronen- und Festkörperphysik** Fr 10:00–12:00 / Beginn 06.10. / ATI HS	Schmiedmayer, Abele, Schumm, Haslinger
141.B11	**Advances in Quantum Science and Quantum Technology** Mi 16:00-18:00 / Beginn 11.10. / ATI HS	Schumm, Schmiedmayer, Abele, Huber, Haslinger
142.069	**Atomare und Subatomare Physik** Mo 16:00–17:30 / Beginn 09.10. / HEPHY Bibliothek	Schieck, Schwanda, Abele, Leeb, Reindl

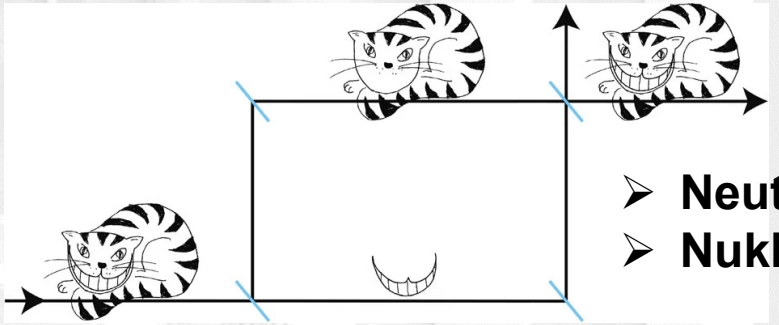
Frühstücksseminar der Neutronengruppe
ATI Essraum / Do 09:30 – 10:30 / Beginn 13.10.

Projektarbeiten / Bachelorarbeiten:

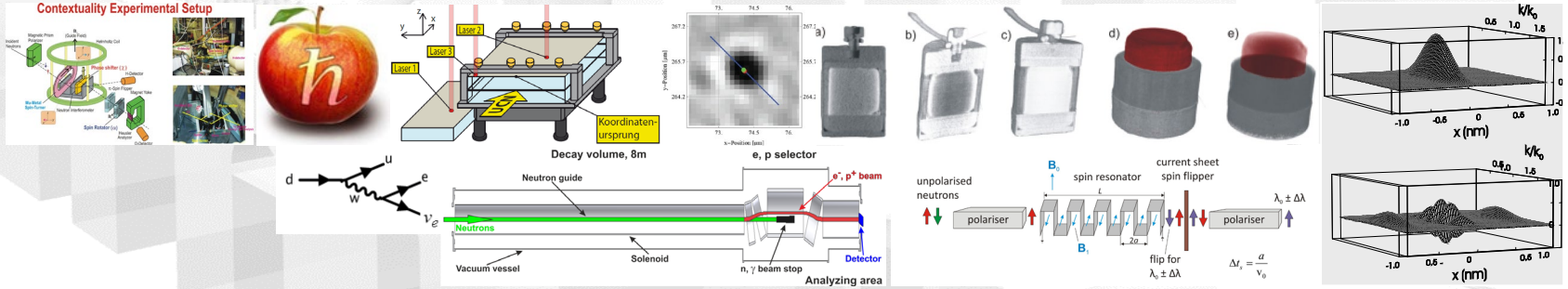




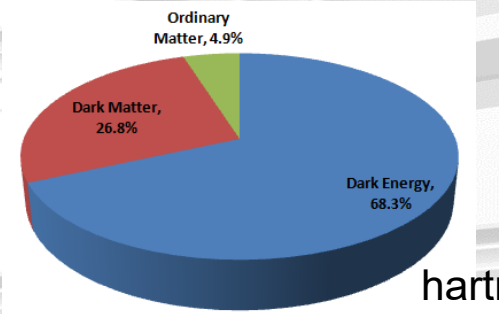
- Gravitation und Quantenmechanik
- Neutronenphysik
- Schwache Wechselwirkung
- Experimentelle Hadronenphysik



- Neutronenoptik
- Nukleare Festkörperphysik

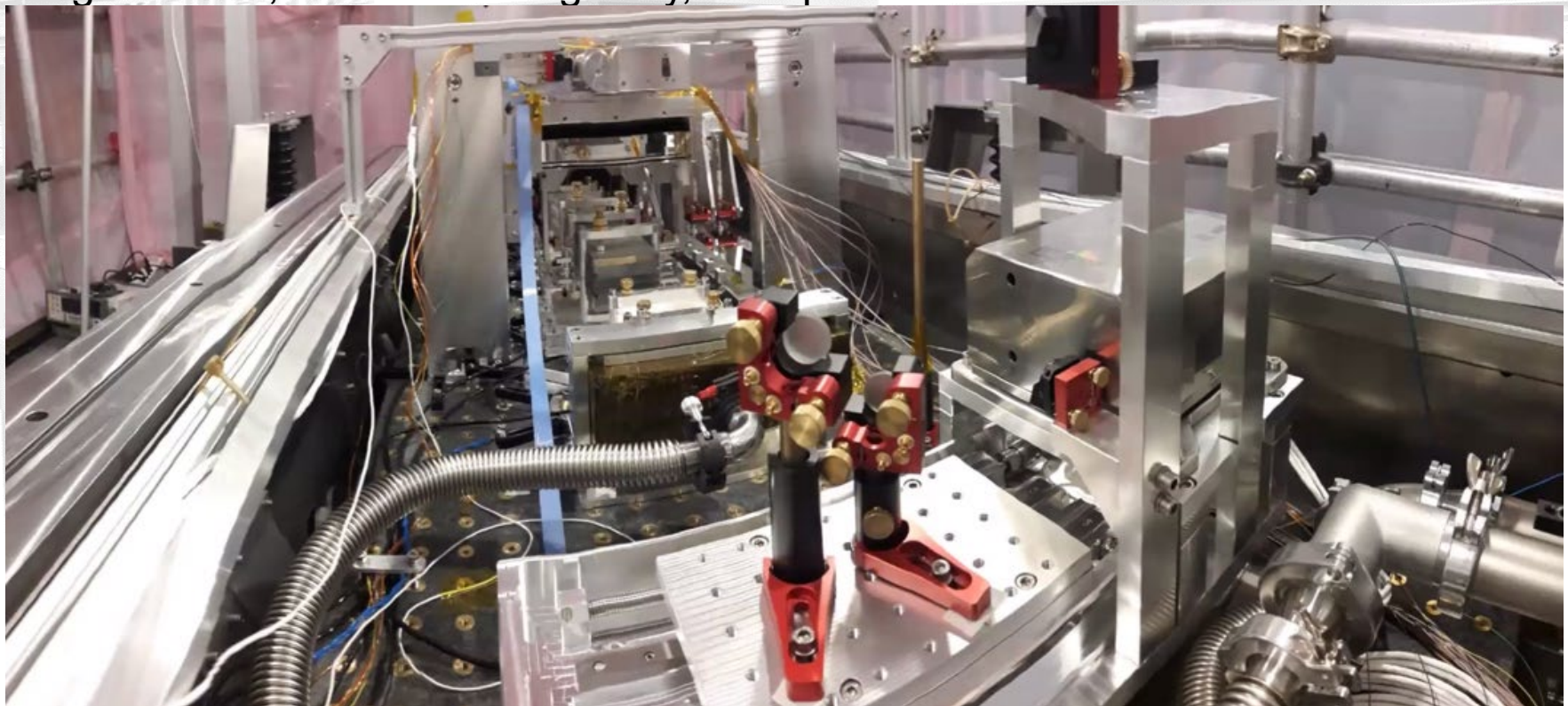


PA / BA Gravitation & Quantenmechanik: *q*BOUNCE ILL, Grenoble + Vienna



- Quantum states in the gravitational potential
- Potential to probe Dark Energy theories with *q*BOUNCE
- Preparation of a neutron‘s charge measurement
- Instrument control in the submicron regime
- Origine of gravitation, non-Riemann gravity, entropic force

hartmut.abele@tuwien.ac.at



Munich: Neutron Beta Decay & High Precision Experiments, PERC

Spokesperson: B. Maerkisch, TU München,Time & Project Manager: E. Jericha, TU Wien

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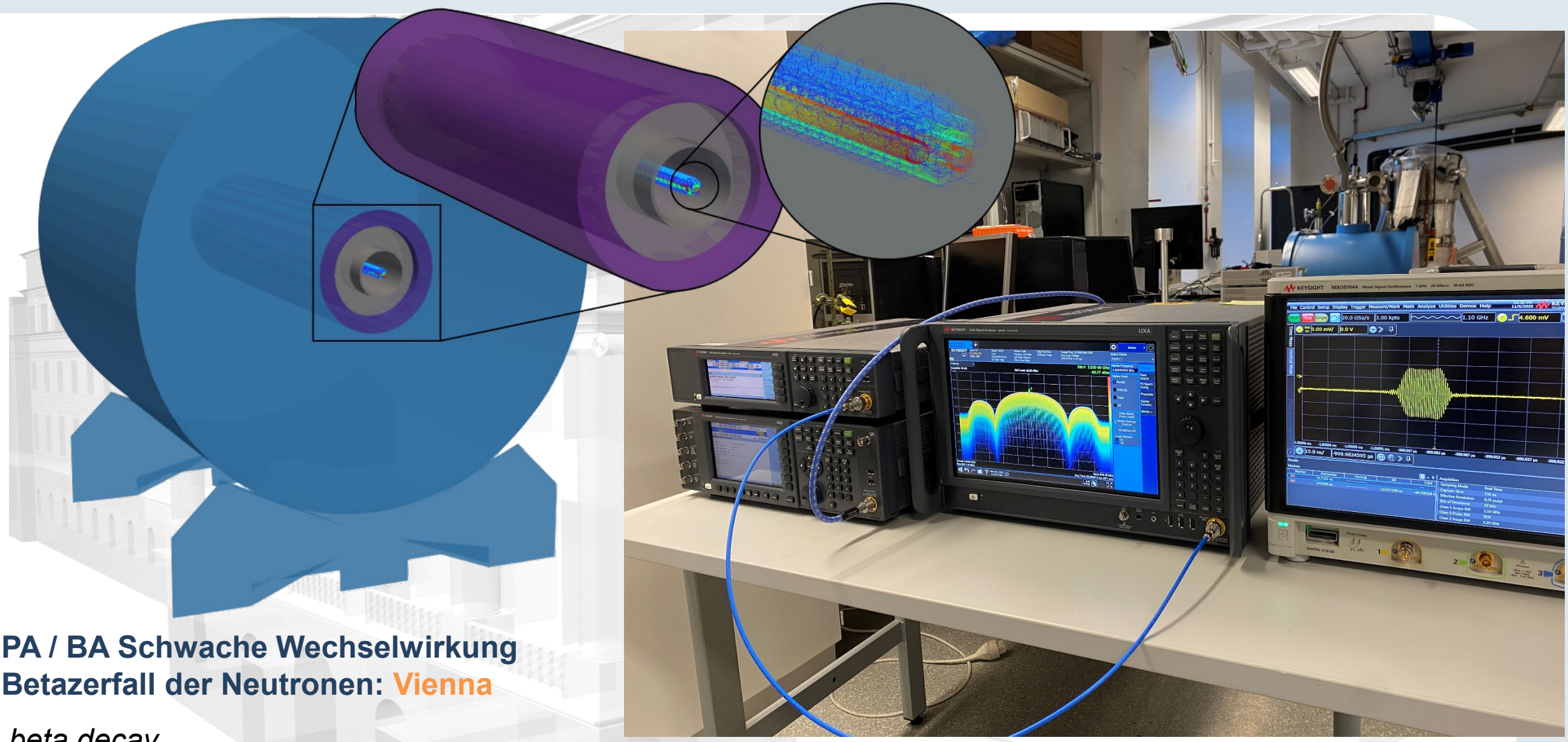


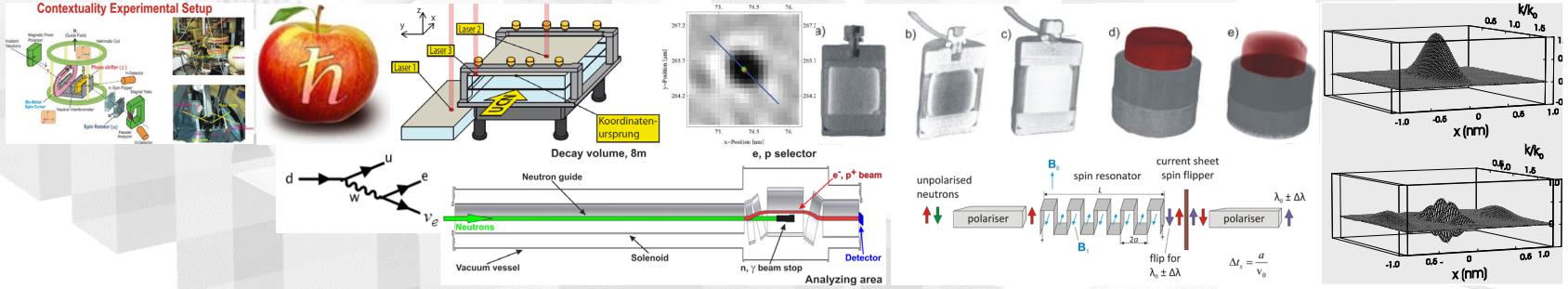
PA / BA Schwache Wechselwirkung
Betazerfall der Neutronen: Vienna

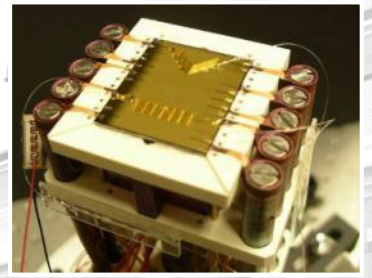
beta decay
CREScent: measurement of the cyclotron radiation of electrons

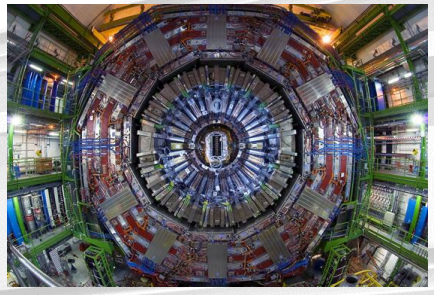
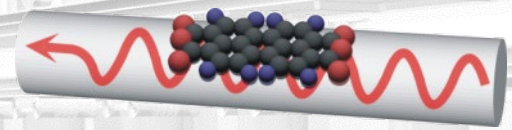
hartmut.abele@tuwien.ac.at
erwin.jericha@tuwien.ac.at

Projektarbeiten / Bachelorarbeiten:

141.A95	**Gravitation und Quantenmechanik** Test der Gravitation mit Quanteninterferenz	Abele, Sedmik Pitschmann
141.A96	**Schwache Wechselwirkung** Physik jenseits des Standardmodells	Abele, Jericha
141.026	**Projektarbeit Neutronenoptik**	Hasegawa, Sponar
142.025	**Projektarbeit Nukleare Festkörperphysik**	Jericha, Badurek
142.026	**Projektarbeit Experimentelle Hadronenphysik**	Jericha, Abele, Zawisky
141.102	**Projektarbeit Neutronenphysik**	Abele, Hasegawa, Zawisky, Suda Summhammer





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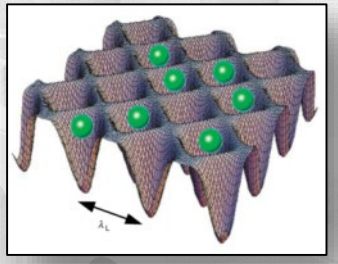
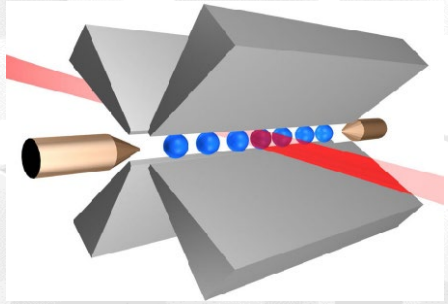


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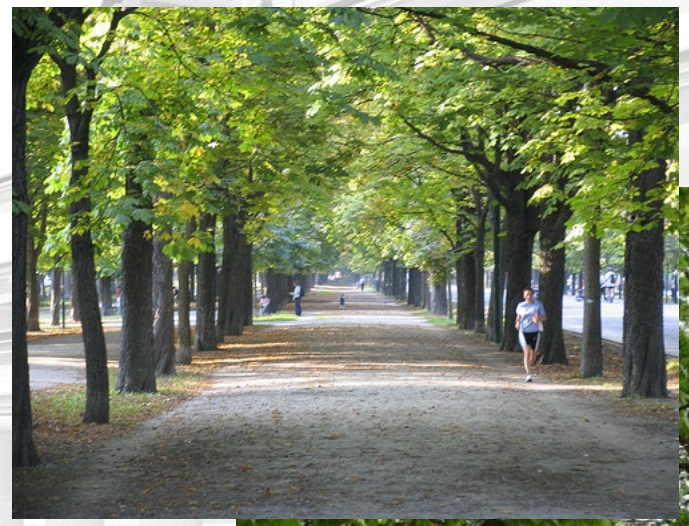

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