JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Welcome to the W Boson Mass Workshop January 2017

Prof. Dr. Matthias Schott

The City of Mainz

- Mainz is small town, but capital of Rhineland-Palatinate
  - Next to the river Rhine (with some quite nice castles)
  - 20 Minutes from Frankfurt International Airport
- Founded by romans 2K years ago
- The cathedral is only 1000 years old (and burnt down several times)
- Time-Magazine's man of the millennium: Johannes Gutenberg, who invented the printing press in Mainz

History of the University

- Founded in 1477 and reopened by the French occupation forces in 1946
  - Campus University (old french military camp)
- 150 Institutes and Clinics
  - All subjects (except engineering)
- 37.000 students
  - Top Ten of German University
  - Bachelor,
  - Master
  - PhD

Physics in Mainz

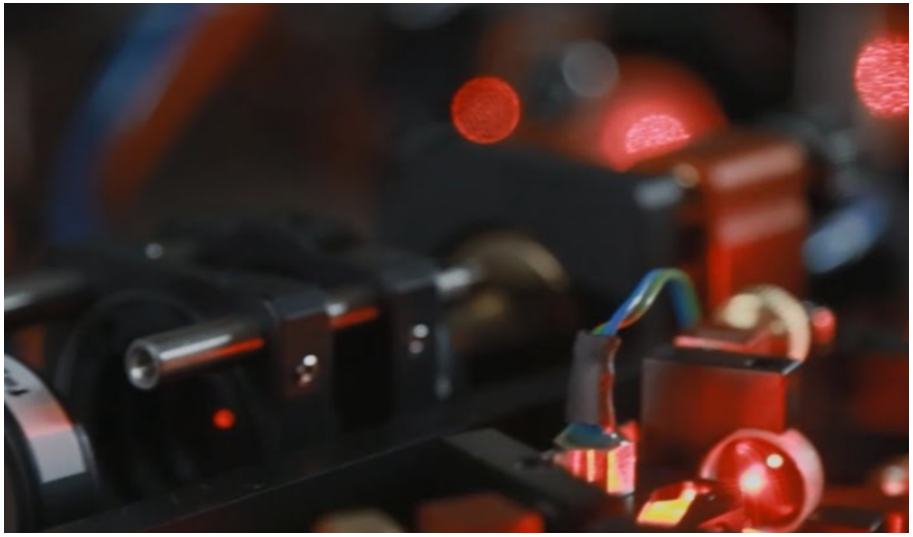
- 60 professors and research groups
- 500 bachelor and master students
- 200 PhD students

- Main Directions of Research
  - Nuclear Physics
  - Elementary Particle Physics (Experiment and Theory)
  - Atomic Precision Physics
  - Solid-State Physics (Experiment and Theory)
  - Meteorology and Atmosphere

Physics in Mainz: PRISMA Cluster of Excellence

- In 2012: University of Mainz was selected within the federal "excellence initiative" for a cluster of excellence PRISMA
  - 50 Million Euros investment over 5 years

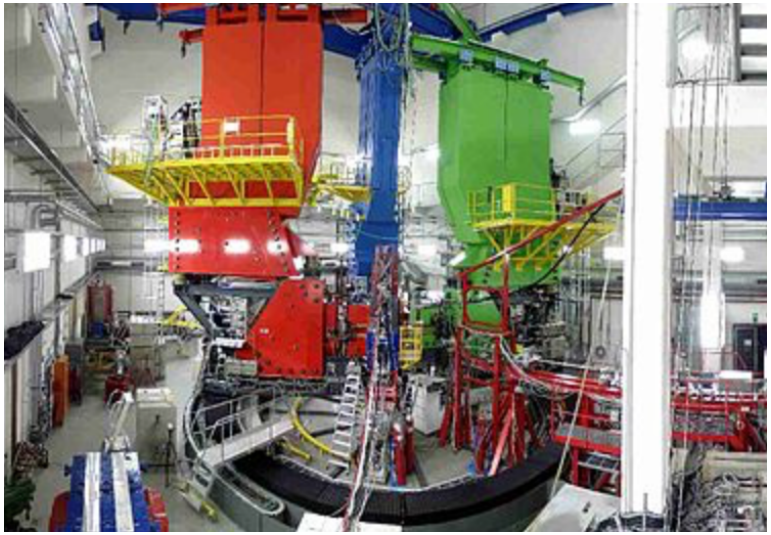
- Research Topics
  - A: Fundamental Interactions
  - B: Origin of Mass and Physics beyond the Standard Model
  - C: Structure of Matter
  - D: Theoretical Concepts and Mathematical Foundations

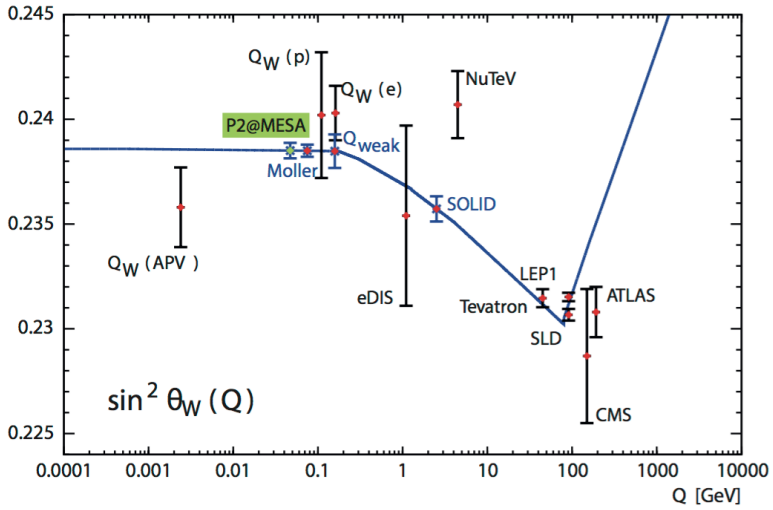


Physics in Mainz: Accelerators

- Mainz Microtron (MAMI)
  - High intensity elecron beams of up to 100 µA es up to 1,5 GeV
    - Nucleon Structure functions
    - Proton Radius Puzzle
    - Test-Beams
    - Hidden Photon Searches

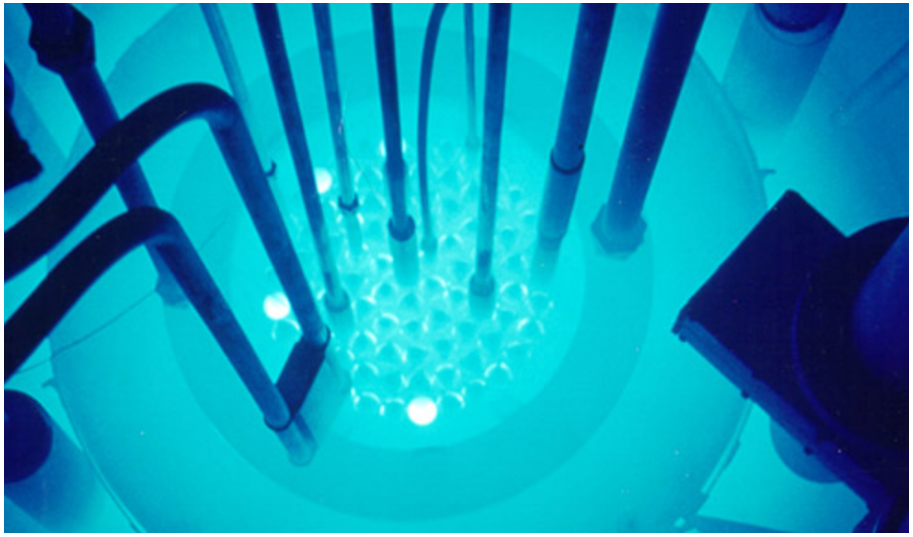
- Mainz Energy Recovery Supercond. Accelerator (MESA)
  - Measurement of the weak mixing angle at low Q
  - Hidden Photons
  - Magnetic Moment of Proton
  - Dark Matter in Beam Dumps
  - …





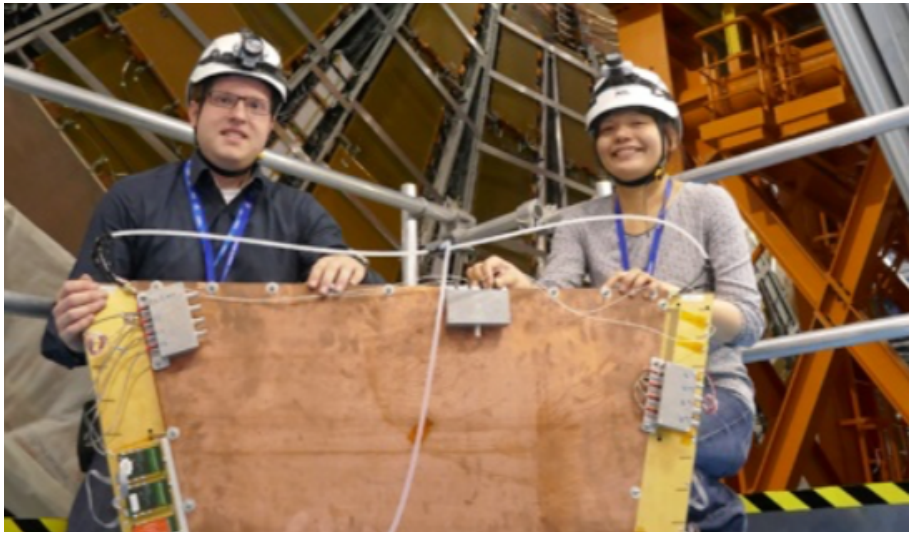
Physics in Mainz: Triga Reactor

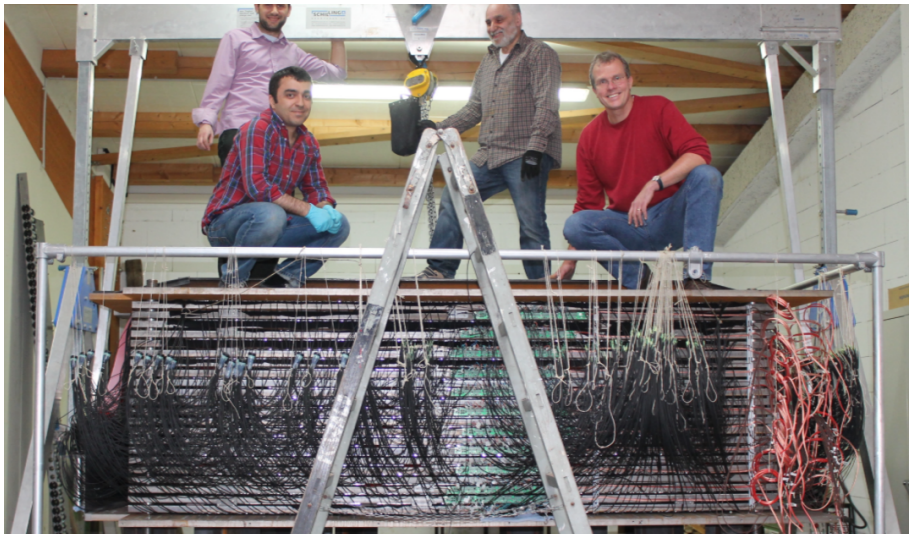
- Unique research reactor
  - 250 MW peak power (every five minutes)
  - Radiations Tests
  - International leading source of Ultra-Cold Neutrons
    - Design goal: 100/cm^3
- τSPECT Experiment to measure the neutron lifetime
  - First phase: precision of 1s
  - Final phase: precision of 0.3s



Physics in Mainz: CERN

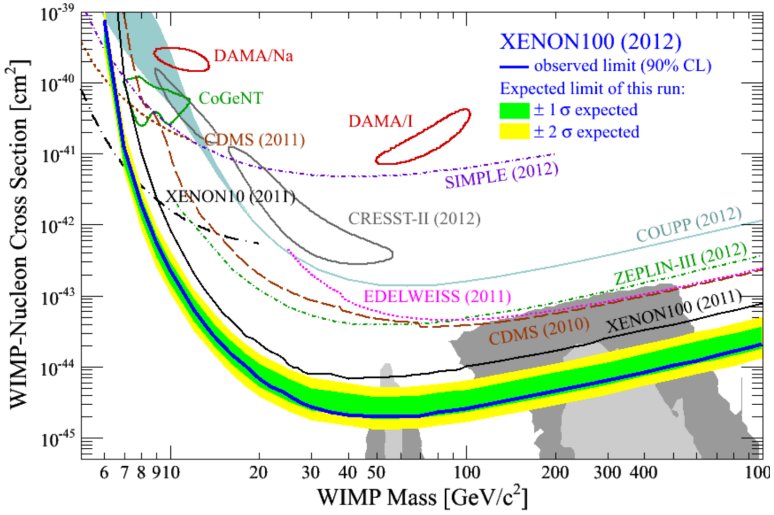
- ATLAS Hardware
  - Liquid Argon Calorimeter
  - Fast Trigger Electronics
  - New Small Wheel (Micromegas Construction)
- ATLAS Physics
  - Dark Matter / SUSY
  - BSM Models
  - Top-Physics
  - W-Boson Mass
- NA62
  - Construction of Calorimeter
  - Rare Decay Searches

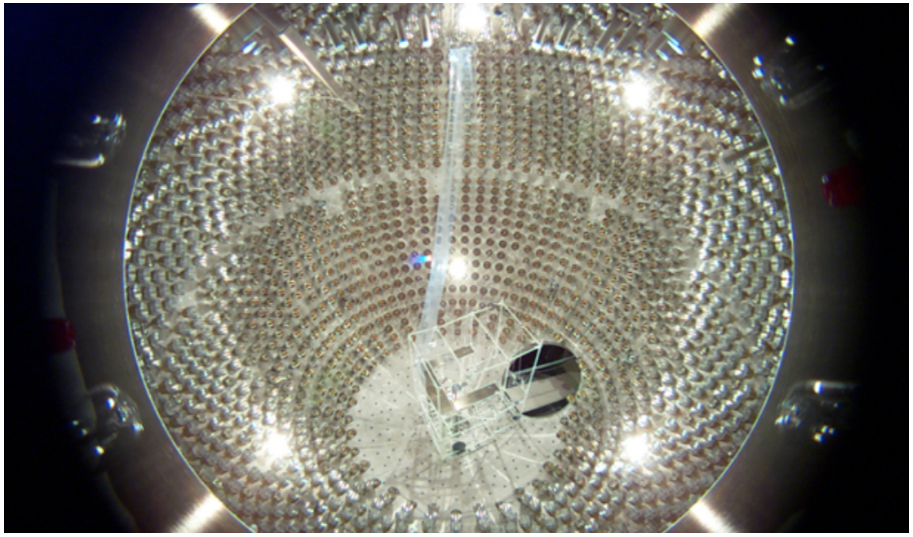




Physics in Mainz: Astro- and Neutrino Physics

- IceCube
  - Databases
  - Muon reconstruction
- JUNO
- Borexino / SOX
- Xenon100 / Xenon1T





Physics in Mainz: MITP

- Mainz Institute for Theoretical Physics
- Scientific Programs
  - several programs per year
  - lasting for a period of up to four weeks.
  - Organized by a small team of external scientists in collaboration with one or more local researchers.
  - attended by up to 25 scientists at any given time
- Topical Workshops (focused one-week workshops)

SCIENTIFIC PROGRAMS JGU CAMPUS MAINZ

Amplitudes: Practical and Theoretical Developments
Fabrizio Caola CERN, Herbert Gangl Univ. Durham, Jaroslav Trnka UC Davis, Johannes Henn, Stefan Müller-Stach, Stefan Weinzierl JGU
February 6-17, 2017

Quantum Vacuum and Gravitation: Testing General Relativity in Cosmology
Manuel Asorey Univ. Zaragoza, Emil Mottola LANL, Ilya L. Shapiro Fed. Univ. Juiz de Fora, Andreas Wipf Univ. Jena
March 13-24, 2017

Low-Energy Probes of New Physics
Peter Fierlinger, Martin Jung TU Munich, Susan Gardner Univ. Kentucky
May 2-24, 2017

The TeV Scale: A Threshold to New Physics?
Csaba Csaki Cornell, Christophe Grojean DESY, Andreas Weiler TU Munich, Pedro Schwaller JGU
June 12-July 7, 2017

Diagrammatic Monte Carlo Methods for QFTs in Particle-, Nuclear-, and Condensed Matter Physics
Christof Gattringer Univ. Graz, Dean Lee North Carolina State Univ., Shailesh Chandrasekharan Duke Univ.
September 18-29, 2017

TOPICAL WORKSHOPS JGU CAMPUS MAINZ

Quantum Methods for Lattice Gauge Theories Calculations
Ignacio Cirac MPI for Quantum Optics, Simone Montangero Univ. Ulm, Peter Zoller Univ. Innsbruck
February 6-10, 2017, Schloss Waldthausen

Women at the Intersection of Mathematics and High Energy Physics
Sylvie Paycha Univ. Potsdam, Kasia Rejzner Univ. York, Katrin Wendland Univ. Freiburg, Gabriele Honecker JGU
March 6-10, 2017

Geometry, Gravity and Supersymmetry
Vicente Cortés Univ. Hamburg, José Figueroa-O'Farrill Univ. Edinburgh, George Papadopoulos King's College London
April 24-28, 2017

Foundational and Structural Aspects of Gauge Theories
Claudio Dappiaggi Univ. Pavia, Marco Benini Univ. Potsdam, Klaus Fredenhagen Univ. Hamburg
May 29-June 6, 2017

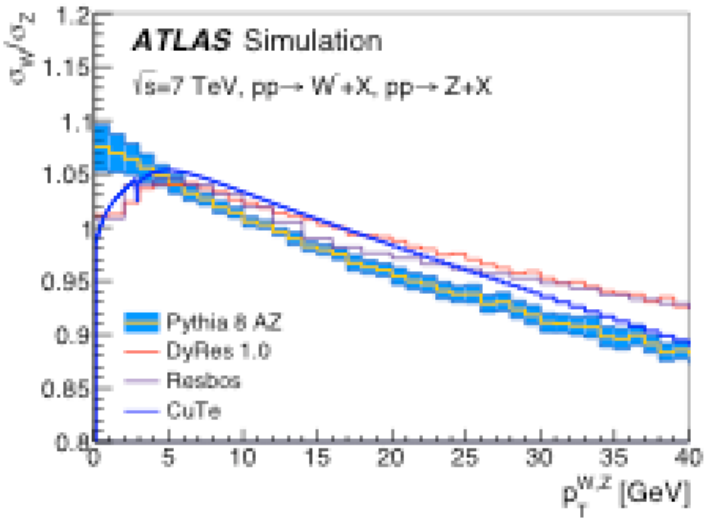
Supernova Neutrino Observations: What can we learn and do?
Hans-Thomas Janka MPI for Astrophysics, Georg Raffelt MPI for Physics, Lutz Köpke, Michael Wurm JGU
October 9-13, 2017

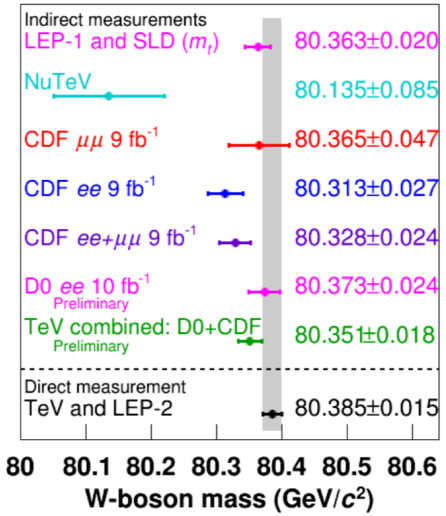
MITP SUMMER SCHOOL

Joachim Kopp, Felix Yu, Anna Kaminska, Maikel De Vries, Matthias Neubert JGU
August 2017, Erbacher Hof Mainz

Goals of the Workshop

- Review the experimental status
  - Challenge the methods, chosen by the experiments
- Review the theoretical status
- Discuss physics modelling
  - PDFs
  - $p_T(W) / p_T(Z)$
  - Electroweak Corrections
  - Fixed order calculations
- Prepare next steps





What you should know – Social Program

- Internet
  - Eduroam
  - Otherwise: contact us

- Good news
  - Coffee-breaks, lunch, snacks are included in the conference fee
  - No conference fee
- Bad news
  - Conference dinner is not included

- Mainz City Tour: 19:00
- Dinner: 20:00
  - Haus des Weines
  - Next to the theater

Samuel Webb

Andreas Düdder

Agenda - Thursday (might be flexible)

13:30 → 14:00 **Welcome to the University of Mainz** — 30m
Speakers: Matthias Neubert (Johannes Gutenberg Universitat Mainz) , Matthias Schott (Johannes-Gutenberg-Universitaet Mainz (DE))

14:00 → 15:30 **Latest Experimental Results and Discussions: Physics Modeling and Uncertainties by the Experiments**

- 14:00 **Summary of the ATLAS Experiments (20+10)** — 30m
  Speaker: Stefano Camarda (CERN)
  wmass_physmod.p...
- 14:30 **Summary of the CMS Experiment (20+10)** — 30m
  Speaker: Luca Perrozzi (Eidgenoessische Technische Hochschule Zuerich (CH))
- 15:00 **Summary of the D0 Experiment (20+10)** — 30m
  Speaker: Rafael Coelho Lopes De Sa (Fermi National Accelerator Lab. (US))

15:30 → 16:00 **Coffee Break** — 30m

16:00 → 16:40 **Discussion on EW Aspects (20+20)** — 40m
Speaker: Stefan Dittmaier (Albert-Ludwigs-Universitaet Freiburg (DE))

16:40 → 17:20 **Discussion on the Vector Boson Transverse Momentum Aspects (20+20)** — 40m
Speakers: Frank Tackmann (Deutsches Elektronen-Synchrotron (DE)) , Frank Tackmann

17:20 → 17:40 **News on Resbos** — 20m
Speaker: Joshua Isaacson (Michigan State University)

17:40 → 18:00 **W Boson Mass and BSM Constraints** — 20m
Speaker: Chris Hays (University of Oxford (GB))

18:00 → 20:00 **City Tour Though Mainz and Workshop Dinner** — 2h

Agenda - Friday (might be flexible)

09:00 → 09:40	**Discussion on PDF Aspects (20+20)** **Speaker**: Jan Kretzschmar (University of Liverpool (GB))	40m	
09:40 → 10:00	**ABMP16 PDFs** **Speaker**: Sergey Alekhin (DESY-Zeuthen)	20m	
10:00 → 10:30	**Discussion of Higher Order QCD corrections + Polarization (20+10)**	30m	
10:30 → 10:50	**Factorization of the Drell-Yan qT spectrum with massive quarks** **Speakers**: Daniel Samitz (DESY) , Frank Tackmann	20m	
10:50 → 11:10	**Coffee Break**	20m	
11:10 → 11:30	**Separating electroweak and strong interaction effects** **Speaker**: Zbigniew Andrzej Was	20m	
11:30 → 11:50	**Theoretical contributions and uncertainties to MW** **Speaker**: Prof. Fulvio Piccinini	20m	
11:50 → 12:10	**Exact O(alpha^2L) CEEX EW Calculations** **Speakers**: Scott Alan Yost (The Citadel - The Military College of South Carolina (US)) , Scott Yost (The Citadel)	20m	
12:10 → 12:30	**MW theory calculations** **Speaker**: Sven Heinemeyer (CSIC (Madrid, ES)) sven.pdf	20m	

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Summary

- Enjoy your stay in Mainz
- In case of any problems or difficulties, do not hesitate to call us
  - Mobile: 0049 160 7664781