are being used like higher integration density for digital circuits, better radiation tolerance and triple-well transistors. The digital readout has been completely redesigned to achieve low inefficiencies with increased hit rates and provide higher output data bandwidth. A description of the FE-I4 design is given, focusing on the digital and data processing blocks.

T 55.4 Mo 17:45 A125

The ATLAS Pixel Stave Emulator for Serial Powering — •Laura Gonella, Markus Cristinziani, Andreas Eyring, Fabian Hügging, Hans Krüger, and Norbert Wermes — Physikalisches Institut, Universität Bonn, Nußallee 12, D-53115 Bonn

A serial powering scheme is being developed for the upgrade of the ATLAS pixel detector in view of sLHC. It offers in fact significant advantages over the presently used parallel powering scheme, namely reduced material budget in active area and power losses on cables, smaller number of power supplies, and no need for external, distant regulation of voltages. The development of this powering scheme requires not only the design of custom-developed voltage regulators, the basic elements of serial powering, but also the early study of system aspects connected to it, for instance the safety of the powering chain and AC-coupled data transmission. To this aim a test system emulating an ATLAS pixel stave is being developed. It will provide a realistic environment to test both concepts and sub-components. Due to its flexibility, it will offer the possibility to study not only serial powering concepts, but more generally system aspects related to the ATLAS pixel detector. In particular alternative powering schemes, data coding schemes, physical layer data transmission, and Detector Control System concepts will also be evaluated with this test system. The description and development of the ATLAS pixel stave emulator will be presented and first results will be discussed.

T 55.5 Mo 18:00 A125

The Planar Pixel Sensors R&D Project (PPS) for the ATLAS Upgrade (exchanged with T 55.8) — •Daniel Muenstermann on behalf of the ATLAS PPS collaboration — TU Dortmund, Experimentelle Physik IV, D-44221 Dortmund

The ATLAS detector is a multi-purpose experiment at the Large Hadron Collider (LHC). Contrary to previous planning that relied on a design luminosity of 10^{34} cm^{-2} s^{-1}, it is now anticipated to increase LHC's luminosity in a continuous way up to more than $2 \cdot 10^{34}$ cm^{-2} s^{-1} in 2016. In a second step, a major upgrade of LHC could enable as much as 10^{35} cm^{-2} s^{-1} in 2021.

The luminosity enhancement will increase both, radiation levels as well as occupancy of the inner tracker. To cope with this, upgrades of the inner tracker will be necessary.

In 2008, an ATLAS R&D project[1] was founded to investigate the suitability of the proven and reliable planar pixel technology for the upgrades. The collaboration comprises 15 institutes from 7 countries with more than 70 scientists.

The presentation will briefly describe current plans for the ATLAS upgrades, the requirements for the sensors of the inner tracker and the role of planar pixel sensors. An overview of the workpackages within the R&D project will be given.

[1] see https://edms.cern.ch/document/966140

T 55.6 Mo 18:15 A125

Evaluation of Radiation Tolerant ATLAS Pixel Sensors under SuperLHC Conditions — Claus Gössling, Silke Herbst, Reiner Klingenberg, Daniel Muenstermann, •André Rummler, Georg Troska, Tobias Wittig, and Renate Wunstorf — TU Dortmund, Experimentelle Physik IV, D-44221 Dortmund

ATLAS is a multi-purpose detector at the **L**arge **H**adron **C**ollider (LHC). After the planned upgrade to SuperLHC, the pixel detector as the innermost part of the ATLAS tracker will have to withstand equivalent neutron fluences of up to $2 \cdot 10^{16} n_{eq} cm^{-2}$.
We determined the characteristics of silicon pixel devices (SingleChips) and other test structures irradiated either with 24 GeV protons at CERN PS or with reactor neutrons. The SingleChips that were used implement an n^+-in-n-bulk design and were taken from qualified ATLAS production wafers. **C**harge **c**ollection **e**fficiency (CCE) studies on those sensors are motivated by discrepancies between simulation results[Kli06] and recent measurements of strip detectors at such high fluences[Man08]. Furthermore, I-V-curves were taken in order to analyse the power dissipation. Results of these test series will be presented.

[Kli06] R.Klingenberg et al.,"Prediction of charge collection efficiency in hadron-irradiated pad and silicon detectors,"Nucl. Instr. and Meth. A **568** (2006) 34-40
[Man08] I.Mandić et al.,"Observation of full charge collection efficiency in n+p strip detectors irradiated up to $3 \cdot 10^{15} n_{eq} cm^{-2}$,"presentation at the RESMDD08, October 2008, Florence, Italy

T 55.7 Mo 18:30 A125

Halbleiterdetektoren im KATRIN-Experiment — •Udo Schmitt für die KATRIN-Kollaboration — Universität Karlsruhe (TH), Institut für Experimentelle Kernphysik

Das Karlsruhe Tritium Neutrinoexperiment (KATRIN) zur Bestimmung der Neutrinomasse aus dem Spektrum des Tritiumzerfalls basiert auf einer fensterlosen gasförmigen Tritiumquelle und einem hochauflösenden System zweier elektrostatischer Retardierungsspektrometer (MAC-E-Filter). Von großer Bedeutung ist dabei die Stabilität der Quelle (10^{11} Bq), deren Emission auf 0,1% stabil bleiben muss, um eine Sensitivität von $m_\nu < 0,2$eV/c^2 zu erreichen. Fluktuationen der Tritium-Säulendichte beeinflussen die spektrale Emission, müssen daher registriert und bei der Datenauswertung berücksichtigt werden. Dies leistet ein Halbleiter-Strahlmonitordetektor in Vorwärtsrichtung. Er soll das integrale Spektrum permanent mit hoher Präzision messen und wird unter Ultrahochvakuumbedingungen (10^{-11} mbar) im Strahlgang der Beta-Zerfallselektronen positioniert. Im Messbetrieb tritt dabei eine Zählrate im Bereich von 10^6 Ereignissen pro Sekunde und mm^2 auf.

Die höchstenergetischen Elektronen, die durch die beiden Spektrometer gelangen, werden von einem großflächigen, ortsauflösenden, monolithischen Hauptdetektor mit hoher Energieauflösung und niedrigem intrinsischen Untergrund analysiert. Der Vortrag stellt die spezifischen Anforderungen beider Detektorsysteme vor und zeigt den aktuellen Entwicklungsstatus.

Gefördert vom SFB TR 27 A2 „Neutrinos and Beyond“.

T 55.8 Mo 18:45 A125

Re-design of the ATLAS pixel detector for the insertable b-layer and Super-LHC upgrades (exchanged with T 55.5) — Claus Gössling, Jennifer Jentzsch, Reiner Klingenberg, Daniel Muenstermann, André Rummler, Georg Troska, •Tobias Wittig, and Renate Wunstorf — Experimentelle Physik IV, TU Dortmund, D-44221 Dortmund

The pixel detector is the innermost tracking detector of ATLAS which requires hermeticity to achieve good track reconstruction performance. Because the current sensor modules require an inactive safety margin around the active area, they have been shingled on top of each other's edge which deteriorates the thermal performance and adds complexity in the present detector.

For the insertable b-layer (IBL) and the SLHC upgrade of ATLAS, a flat arrangement of sensors is anticipated. If the inactive edge is reduced from 1100 μm to 100 μm - 400 μm (slim edge) the required hermeticity can be achieved. We conducted dicing trials close to the active area to determine how much of the safety margin can be safely omitted before and after irradiation; first results will be presented.

Besides, a prototype wafer design will be shown containing a possible IBL-sensor and other adapted sensor designs for the new read-out chip (FE-I4) as well as test structures for slim edge studies.

T 55.9 Mo 19:00 A125

Volldifferentielle Auslese von 3D Sensoren — •Michael Karagounis, Hans Krüger und Norbert Wermes — Universität Bonn, Physikalisches Institut, Nussallee 12, 53115 Bonn

Für die Auslese von Pixel- und Streifendetektoren werden hochsensible Schaltungen verwendet, die auf ein möglichst hohes Signal zu Rauschverhältnis hin optimiert werden. Neben den intrinsischen Rauschquellen des Detektorsystems, wie z.B. das Schrotrauschen des Sensorleckstroms, das thermische und 1/f Rauschen der in der Ausleseschaltung verwendeten Transistoren, wird das Signal auch durch Übersprechen zwischen digitalen und analogen Schaltungsteilen und externe Störquellen beeinflusst. Durch die Verwendung einer voll differentiellen Auslesearchitektur kann die Empfindlichkeit gegenüber Übersprecheffekten und Störungen auf der Betriebsspannung reduziert werden. Die Struktur eines neuartigen Sensortyps (3D Sensors), bei dem sowohl der n als auch der p Kontakt der Sensordioden auf der gleichen Seite des Sensors vorhanden sind, ermöglicht die Implementierung einer volldifferentiellen Auslese eines Pixeldetektors und vereinfacht die Umsetzung der volldifferentiellen Auslese bei Streifendetektoren. Es wird die Systematik für die Analyse volldifferentieller Schaltungen eingeführt und gezeigt, wie die volldifferentielle Schaltungsstruktur bei