Basil Schneider

contact

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languages

German (native)
English (fluent)
French (moderate)

computing

Linux
C++, Python
Root, RooFit, RooStats
bash, sed, awk
git, svn
LaTeX
VHDL

besides physics

Cycling
Hiking
Music

education & employment

Nov '14 - now	**Postdoctoral Fellow** at the **ATLAS experiment**	TRIUMF
Jan '11 - Jul '14	**Ph.D.** at the **ATLAS experiment** Ph.D. Thesis: A general approach to search for supersymmetry at the LHC by combining signal enhanced kinematic regions using the ATLAS detector (Supervisor: Prof. A. Ereditato)	University of Bern
Sep '08 - Mar '10	**Master** of Science in **Theoretical Physics** Master Thesis: The partition function of meromorphic conformal field theories at higher genus (Supervisor: Prof. M. Gaberdiel)	ETH Zurich
Oct '04 - Sep '08	**Bachelor** of Science in **Experimental Physics** Bachelor Thesis: Untersuchung der Cluster-Struktur von Elastomerpartikeln durch Simulation des Aggregationsvorganges und Partikelgrössen mittels dynamic light scattering (Supervisor: Dr. Cornelius Gauer)	ETH Zurich
Sep '04	**Comprehensive entrance exam** Exam at the level of a Matura	ETH Zurich

conferences

Jun '15	**USATLAS Workshop at University of Illinois at Urbana-Champaign** Invited speaker for plenary session: "Supersymmetry in run 2"
May '15	**Mitchell Workshop on Collider and Dark Matter Physics** Speaker: "Supersymmetry searches in ATLAS"
May '13	**1st LHC Physics Conference, Barcelona, Spain** Poster: "Search for direct production of charginos and neutralinos in events with three leptons and missing transverse momentum in 21 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV with the ATLAS detector"
Jun '12	**Swiss Physical Society** Speaker: "New Optical receiver modules for the insertable B-Layer at the ATLAS project"
Jun '11	**Physics at LHC, Perugia, Italy** Poster: "SUSY Searches at ATLAS in Multilepton Final States with Jets and Missing Transverse Energy"
Jun '11	**Swiss Physical Society** Speaker: "Insertable b-Layer: A new layer for the ATLAS detector at CERN"

organization

Sep '11	**Co-organizer of outreach event: Nacht der Forschung** Performing experiments in public and discussing results
Aug '12	**Co-organizer of workshop: SUSY Statistical Interpretations workshop** Wrap up lessons learned in previous round of publications and spot possible improvements for next round

supervision

Dec '12 - Mar' 14 **Benjamin Gerber**
MSc student, University of Bern

Nov '14 - now **Matthew Gignac**
PhD student, University of British Columbia

Dec '14 - now **Felix Cormier**
MSc student, University of British Columbia

teaching

Jan '11 - now **Lab Course** University of Bern
Supervising and assisting Physics undergraduate students working on fundamental experiments in mechanics and electronics

Jan '11 - now **Physics for Biologists** University of Bern
Assisting 1st year Physics course

Jul '11 - now **Private lessons for high-school graduates** Interlink Schulberatung GmbH
Private lessons in Mathematics, Statistics and Physics

2007/2008 **Teaching assistant** ETH Zurich
Teaching assistant for environmental science students in Calculus

papers

I am co-author of 302 ATLAS publications; for a full list, see http://inspirehep.net/author/profile/B.Schneider.1
Publications where my contributions are substantial:

May '14 — Search for supersymmetry in events with four or more leptons in $\sqrt{s}$ = 8 TeV pp collisions with the ATLAS detector — arXiv:1405.5086 [hep-ex]

Feb '14 — Search for direct production of charginos and neutralinos in events with three leptons and missing transverse momentum in $\sqrt{s}$ = 8 TeV pp collisions with the ATLAS detector — JHEP04(2014)169

Aug '12 — Search for direct production of charginos and neutralinos in events with three leptons and missing transverse momentum in $\sqrt{s}$ = 7 TeV pp collisions with the ATLAS detector — Phys.Lett. B718 (2013) 841-859

public notes

Jul '15 — First look at proton proton collision data at $\sqrt{s}$ = 13 TeV in preparation for a search for squarks and gluinos in events with missing transverse energy, jets, and an isolated electron or muon — ATL-PHYS-PUB-2015-029

Mar '15 — Expected sensitivity studies for gluino and squark searches using the early LHC 13 TeV Run-2 dataset with the ATLAS experiment — ATL-PHYS-PUB-2015-005

Jun '14 — A general approach to search for supersymmetry at the LHC by combining signal enhanced kinematic regions using the ATLAS detector (PhD thesis) — CERN-THESIS-2014-056

Mar '13 — Search for supersymmetry in events with four or more leptons in 21 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV with the ATLAS detector — ATLAS-CONF-2013-036

Mar '13 — Search for direct production of charginos and neutralinos in events with three leptons and missing transverse momentum in 21 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV with the ATLAS detector — ATLAS-CONF-2013-035

Nov '12 — Search for direct production of charginos and neutralinos in events with three leptons and missing transverse momentum in 13.0 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV with the ATLAS detector — ATLAS-CONF-2012-154

Nov '12 — Search for Supersymmetry in events with four or more leptons in 13 fb^{-1} pp collisions at $\sqrt{s}$ = 8 TeV with the ATLAS detector — ATLAS-CONF-2012-153

proceedings

Jun '13 — Search for direct production of charginos and neutralinos in events with three leptons and missing transverse momentum in 21 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV with the ATLAS detector — ATL-PHYS-PROC-2013-145

Nov '11 — The ATLAS IBL BOC Demonstrator — ATL-INDET-PROC-2011-038

Oct '11 — SUSY Searches at ATLAS in Multilepton Final States with Jets and Missing Transverse Energy — ATL-PHYS-PROC-2011-201

internal notes

Jul '15	First look at proton proton collision data at $\sqrt{s}$ = 13 TeV in preparation for a search for squarks and gluinos in events with missing transverse energy, jets, and an isolated electron or muon	ATL-COM-PHYS-2015-718
May '15	ATLAS Large eta task force report	ATL-COM-UPGRADE-2015-013
Feb '15	Expected sensitivity of search for squarks and gluinos in events with isolated leptons, jets and missing transverse momentum at $\sqrt{s}$ = 13 TeV with the ATLAS detector	ATL-COM-PHYS-2015-133
Jan '15	Re-interpretations and combinations of electroweak limits in 20.3 fb^{-1} pp collisions at $\sqrt{s}$ = 8 TeV with the ATLAS detector	ATL-COM-PHYS-2015-011
Dec '13	Search for supersymmetry in events with four or more leptons in $\sqrt{s}$ = 8 TeV pp collisions with the ATLAS detector	ATL-COM-PHYS-2013-1621
Oct '13	Search for supersymmetry in events with three leptons and missing transverse momentum in 21 fb^{-1} pp collisions at $\sqrt{s}$ = 8 TeV with the ATLAS detector	ATL-PHYS-INT-2013-021
Jul '13	Search for supersymmetry in events with three leptons and missing transverse momentum in 20.3 fb^{-1} pp collisions at $\sqrt{s}$ = 8 TeV with the ATLAS detector	ATL-COM-PHYS-2013-888
Dec '12	Search for Supersymmetry in events with four or more leptons in 20.7 fb^{-1} pp collisions at $\sqrt{s}$ = 8 TeV with the ATLAS detector	ATL-COM-PHYS-2012-1819
Dec '12	Search for Supersymmetry in events with four or more leptons in 13 fb^{-1} pp collisions at $\sqrt{s}$ = 8 TeV with the ATLAS detector	ATL-PHYS-INT-2012-096
Dec '12	Search for supersymmetry in events with three leptons and missing transverse momentum in 13 fb^{-1} pp collisions at $\sqrt{s}$ = 8 TeV with the ATLAS detector	ATL-PHYS-INT-2012-095
Sep '12	SUSY Searches in the Final States with Three Leptons and Missing Transverse Momentum at ATLAS	ATL-PHYS-INT-2012-059

references

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outreach

Nov ’13 - now **Official ATLAS underground guide**

Mar ’12 - Mar ’13 **Masterclasses**
Helping high school students performing measurements on real data from LHC

Sep ’11 **Nacht der Forschung**
Presenting LHC physics on a poster and answering questions of the public in a research outreach event at the University of Bern

awards

Mar ’15 **Faculty award winner of the University of Bern**
Award for the best PhD thesis in physics at the University of Bern in the year 2014

Research statement

Physics program

Despite its success, the Standard Model of Particle Physics is known to be only an effective theory. The most well known extension to the Standard Model is Supersymmetry (SUSY). It could solve several short comings of the Standard Model, most notably the hierarchy problem and the missing dark matter candidate. The understanding of the nature of dark matter is one of the biggest goals of physics right now. Even when it would not be explained within SUSY, searches for SUSY particles cover a wide range of the phase-space, due to its nature with many unknown parameters. Now that we discovered the Higgs Boson, SUSY searches will become the driving force for finding thitherto unknown particles. It is of outmost importance to carry on these efforts, even when first searches didn't show any hint of SUSY particles. The unknown SUSY breaking mechanism could drive the particles to higher masses without interfering with naturalness arguments.

Strongly charged SUSY particles have the highest production cross-section for a given mass at the LHC. However, no signs of these particles have been found so far and it might be that electroweak SUSY particles have a considerable lower mass and become the dominant SUSY process at the LHC. During my term as a PhD student at the University of Bern I mainly worked on an electroweak SUSY search in a final state with three leptons. I developed a method to optimize and bin a signal region. By applying my method, I successfully pushed existing exclusion limits on SUSY particle masses by about 100 GeV in a specific model, without the use of additional data. I was the leading analyst in this search and also carried out the statistical interpretation of the search results. The paper was published in JHEP (JHEP04(2014)169) and also presented in the CERN courier journal. In total I worked on three papers and four ATLAS-CONF notes, all with a final state of either three or four leptons. For two publications, I represented the analysis group on a SUSY approval. I'm still working in close collaboration with the SUSY electroweak group to help finalizing the run 1 legacy paper that summarises all searches for electroweakinos with the 8 TeV dataset.

When the LHC underwent a technical overhaul, the center of mass energy was raised from 8 TeV to 13 TeV. With the new dataset, I contributed to searches for strongly produced SUSY, since it has the highest discovery potential with small amount of data. It was shown (ATL-PHYS-PUB-2015-005) that for a final state with one lepton, even a few inverse femtobarn are enough, to have better sensitivity as the full 8 TeV dataset. For example in a given model, a gluino with mass 1.4 TeV could already show a 3 σ excess with 5 fb^{-1}, where the existing 95 % confidence level exclusion limit is between 1.2 and 1.3 TeV.

For the upcoming searches, naturalness arguments can lead the way. Hence a search for light stop's or gluino's should be carried out at high priority. Searches for light electroweakinos will become relevant, once we accumulated a sufficiently large amount of data.

Detector

As a PhD student I worked on the readout electronics of the insertable b-layer (IBL). The IBL is a fourth layer which was inserted as innermost layer into the existing three layer pixel detector. It was the main upgrade activity during the first long shutdown in 2014 and 2015.

I tested optical receivers to be used for the readout for reliability, frequency and input sensitivity. I defined the tests and performed them, using amongst others FPGA's. The University of Bern joined the IBL effort and the contribution to the optical receivers testing made Bern a key collaborator within the IBL readout community.

For my postdoctoral fellow position at TRIUMF, I joined the Inner Tracker (ITk) effort, a new tracker to be implemented during the phase 2 upgrade for the High Luminosity LHC around 2025. I started by using the validation software used for the present Inner Detector and applying it to ITk geometries and contributed to the studies to make a physics case for a large eta extension (up to $\eta = 4$) of the ITk. This software package is still in development and I represent the ITk responsible.

I further studied the effects of a new algorithm called TIDE (Tracking in dense environments), which was developed for run 2. In using this new algorithm for ITk geometries, I can help make decisions on the not yet fully defined detector layout. I supervise a PhD student in studying efficiencies as a function of the number of pixel and strip layers. All these studies are an important input to the ITk community in defining the best layout of the inner tracker.