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
HTML, CSS
LaTeX

besides physics

Cycling
Hiking
Music

education & employment

Nov '15 - now	**Research Associate** at the **CMS experiment**	FNAL
	Mainly involved in Phase-2 tracker upgrade (Outer Tracker) and SUSY searches	
Nov '14 - Oct '15	**Postdoctoral Fellow** at the **ATLAS experiment**	TRIUMF
	Mainly involved in Phase-2 tracker upgrade (ITk) and SUSY searches	
Jan '11 - Jul '14	**Ph.D.** at the **ATLAS experiment**	University of Bern
	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)	
Sep '08 - Mar '10	**Master** of Science in **Theoretical Physics**	ETH Zurich
	Master Thesis: The partition function of meromorphic conformal field theories at higher genus (Supervisor: Prof. M. Gaberdiel)	
Oct '04 - Sep '08	**Bachelor** of Science in **Experimental Physics**	ETH Zurich
	Bachelor Thesis: Untersuchung der Cluster-Struktur von Elastomerpartikeln durch Simulation des Aggregationsvorganges und Partikelgrössen mittels dynamic light scattering (Supervisor: Dr. Cornelius Gauer)	
Sep '04	**Comprehensive entrance exam**	ETH Zurich
	Exam at the level of a Matura	

conferences

Oct '17	**IEEE Nuclear Science Symposium and Medical Imaging Conference** Poster: "A new DAQ solution: *otsdaq*"
Aug '17	**Meeting of the Division of Particles and Fields of the American Physical Society** Speaker: "Searches for electroweakly produced supersymmetry with CMS"
Jul '17	**CMS Phase-2 Outer Tracker Workshop** Speaker: "A flexible and scalable DAQ system for CMS: *otsdaq*" Leading hands-on session: "*otsdaq*"
May '17	**Phenomenology 2017 Symposium** Speaker: "Searches for supersymmetry in single or opposite-charged dilepton final states with CMS"
Apr '17	**CMS SUSY Workshop** Speaker: "Reinterpreting the soft opposite sign lepton search in a higgsino pMSSM"
Jun '16	**49th Annual Fermilab Users Meeting** Poster: "Characterization of the pixel ASIC with a laser beam in the Outer Tracker upgrade of the CMS detector"
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

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
Sep '11	**Co-organizer of outreach event: Nacht der Forschung** Performing experiments in public and discussing results

papers

I am co-author of 475 ATLAS publications and 111 CMS publications; for a full list, see
http://inspirehep.net/author/profile/B.Schneider.1
Publications with substantial contributions from me:

Mar '18   Production and Integration of the ATLAS Insertable B-Layer
arXiv:1803.00844 [physics.ins-det]

Jan '18   Search for new physics in events with two soft oppositely charged leptons and missing transverse momentum in proton-proton collisions at $\sqrt{s}$ = 13 TeV
arXiv:1801.01846 [hep-ex]

Sep '17   Search for supersymmetry in events with one lepton and multiple jets exploiting the angular correlation between the lepton and the missing transverse momentum in proton-proton collisions at $\sqrt{s}$ = 13 TeV
arXiv:1709.09814 [hep-ex]

Sep '16   Search for supersymmetry in events with one lepton and multiple jets in proton-proton collisions at $\sqrt{s}$ = 13 TeV   Phys. Rev. D 95, 012011 (2017)

Sep '15   Search for the electroweak production of supersymmetric particles in $\sqrt{s}$ = 8 TeV pp collisions with the ATLAS detector
Phys. Rev. D 93, 052002 (2016)

May '14   Search for supersymmetry in events with four or more leptons in $\sqrt{s}$ = 8 TeV pp collisions with the ATLAS detector   Phys. Rev. D. 90, 052001 (2014)

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

Dec '16	Search for new physics in the compressed mass spectra scenario using events with two soft opposite-sign leptons and missing transverse momentum at $\sqrt{s}$ = 13 TeV CMS PAS SUS-16-025
Aug '16	Search for supersymmetry in events with one lepton and multiple jets in proton-proton collisions at $\sqrt{s}$ = 13 TeV in 2016 CMS PAS SUS-16-019
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

supervision

Dec '14 - Nov '15   **David Jin**
Summer Student at FNAL, University of Chicago

Dec '14 - Nov '15   **Christian Leefmans**
Summer Student at FNAL, Cornell University

Dec '14 - Nov '15   **Felix Cormier**
MSc student at CERN, University of British Columbia

Nov '14 - Nov '15   **Matthew Gignac**
PhD student at CERN, University of British Columbia

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

teaching

Jan '11 - May '14   **Lab Course**   University of Bern
Supervising and assisting Physics undergraduate students working on fundamental experiments in mechanics and electronics

Jan '11 - May '14   **Physics for Biologists**   University of Bern
Assisting 1st year Physics course

Jul '11 - May '14   **Private lessons for high-school graduates**   Interlink Schulberatung GmbH
Private lessons in Mathematics, Statistics and Physics

Jun '08   **Exam preparation**   ETH Zurich
Exam preparation for 1st year Physics and Mathematics students

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

outreach

Jan '16	**FNAL Open House** Explaining the purpose and the mission of Fermilab to the public
Nov '13 - now	**Official ATLAS underground guide** Showing the ATLAS detector to the public during LHC shutdowns
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

references

Prof. Antonio Ereditato   PhD supervisor
Laboratory for High Energy Physics, University of Bern
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Prof. Michele Weber   PhD supervisor
Laboratory for High Energy Physics, University of Bern
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CERN
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Dr. Tobias Flick   IBL Off-Detector Coordinator
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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. Since 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 production 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 published paper (JHEP04(2014)169) was 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. As example in a given model, a gluino with mass 1.4 TeV could already show a $3\,\sigma$ 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 have 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 other tools FPGA's, which I programmed with VHDL. 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. The aforementioned 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 help making 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.