Basil Schneider

contact

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languages

German (native)
English (fluent)
French (moderate)
Croatian (beginner)
Norwegian (beginner)

computing

Linux
C++, Python, Rust
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
Nov '14 - Oct '15	**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

Oct '17 **IEEE Nuclear Science Symposium and Medical Imaging Conference**
Poster: "A new DAQ solution: *otsdaq*" Atlanta, GA, USA

Aug '17 **Meeting of the Division of Particles and Fields of the American Physical Society**
FNAL, Batavia, IL, USA
Speaker: "Searches for electroweakly produced supersymmetry with CMS"

May '17 **Phenomenology 2017 Symposium** Pittsburgh, PA, USA
Speaker: "Searches for supersymmetry in single or opposite-charged dilepton final states with CMS"

Jun '16 **49th Annual Fermilab Users Meeting** FNAL, Batavia, IL, USA
Poster: "Characterization of the pixel ASIC with a laser beam in the Outer Tracker upgrade of the CMS detector"

May '15 **Mitchell Workshop on Collider and Dark Matter Physics**
Texas A&M University, College Station, TX, USA
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** ETH, Zurich, Switzerland
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** EPF, Lausanne, Switzerland
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

journal publications

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
10.1016/j.physletb.2018.03.028

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

Sep '17 The Phase-2 Upgrade of the CMS Barrel Calorimeters Technical Design Report CERN-LHCC-2017-011

Apr '18 The Phase-2 Upgrade of the CMS Endcap Calorimeter Technical Design Report CERN-LHCC-2017-023

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

Jul '16 - Oct '16 **David Jin**
Summer Student at FNAL, University of Chicago

May '16 - Aug '16 **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 LHC data
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

leadership

Jan ’18 - now	**SUS Leptonic subgroup convener**
Oct ’16 - May ’17	**Coordinator of the Single Lepton dPhi Analysis group**

research experience

I have been a member of the ATLAS Collaboration and currently am a member of the CMS Collaboration. My research program in both collaborations has been driven by the search for supersymmetric (SUSY) particles. I focus on natural SUSY searches that could solve the hierarchy problem, as well as providing a dark matter candidate that could explain the relic abundance of dark matter particles that we see in the Universe. I either searched for light gluinos or light electroweakinos.

The success of my research program at the HL-LHC will depend upon the performance of the upgraded detector. Both the IBL upgrade at ATLAS and the Outer Tracker upgrade at CMS that I worked on, improved or will improve the tracking performance of the detector.

SUSY Search in two soft oppositely charged lepton final states in CMS

A corner stone of my research program is the hunt for higgsino-like least supersymmetric particles (LSP). Higgsino particles are elusive in nature. As the only mass term that enters the Higgs boson's radiative corrections at the tree level, it is the most important ingredient to control the mass of the Higgs boson and therefore the most important parameter to avoid fine tuning.

In the search for two soft opposite lepton final states, I first established a phenomenological minimal supersymmetric standard model (pMSSM), to complement the Simplified Models we are using and to understand if by using the simplified versions of the SUSY models, we indeed cover all the phase space and are not missing some corners. The model has also been used by a soft single lepton stop search, to assess if they are sensitive to higgsinos.

The results of this search have been published in a paper (arXiv:1801.01846 [hep-ex]) that has been submitted to PLB.

Upgrade study to assess the sensitivity in SUSY models at the HL-LHC

The HL-LHC upgrade implies extreme challenges for the design of the detector, but also for the reconstruction and identification of particles. By increasing the instantaneous luminosity, additional soft proton-proton collisions (pileup) are contaminating the hard process we are interested in. This poses a problem especially for soft objects, as for example in the search for SUSY in two soft oppositely charged lepton final states. It therefore needs to be carefully studied, how much the improved detector and the large dataset benefits the search and how much the additional pileup events hurt the sensitivity.

I carried out a study to assess the sensitivity with the Phase-2 detector in an environment with up to 200 pileup events, and will continue to do so for the Yellow Report. In my study I compared the performance of FullSim detector simulation with the ones from Delphes, measured reconstruction and identification efficiencies in FullSim samples and improved the Delphes detector simulation to match the one obtained by FullSim. I assessed the performance of the missing transverse momentum in both detector simulation and compared how much they degrade compared to Run-2, due to additional pileup events.

SUSY Search exploiting the $\Delta\phi$ variable in single lepton final states in CMS

With a small dataset of 13 TeV at hand, the discovery potential for strongly produced SUSY was much larger than for electroweakinos. Therefore I focused at the beginning of Run-2, on light gluinos, consider both decays mediated by light stops or light squarks.

In this search in a final state with exactly one lepton, I exploited the angle between the reconstructed W and the lepton to search for SUSY events. I organized the group meetings and lead the group to a publication in PLB (10.1016/j.physletb.2018.03.028) I streamlined and optimized the binning of this search, to maximize the sensitivity for a given signal and also represented the analysis group in the approval talk.

SUSY Search in single lepton final states in ATLAS

Shortly before the start of Run-2, we assessed the sensitivity we could expect for a search for light gluinos with a dataset of ? fb^{-1}. Skip this since it's only a CONF-NOTE?

SUSY Search in multi lepton final states in ATLAS

During my PhD I searched for electroweakly produced SUSY in final states with three leptons and R-parity violating signal in final states with four leptons. As one of the first SUSY searches in ATLAS, I introduced a binning covering a large parameter space and being sensitive to many different SUSY signals. I also optimized the signal regions in final states of three leptons including one tau.

I was also responsible for the statistical interpretations of results by calculating discovery p-values, exclusion contours and upper limits on model cross-sections. I helped implementing a data driven estimate of the most important background, WZ, in the three lepton final state. The tools developed during this process have also been used by other analyses. This effort has led to a total of 4 papers (Phys. Rev. D 93, 052002 (2016), Phys. Rev. D. 90, 052001 (2014), JHEP04(2014)169, Phys.Lett. B718 (2013) 841-859) , on which I have been a driving analyst.

Test several electrical prototypes of the Outer Tracker upgrade

I tested several electrical prototypes of the Outer Tracker upgrade. I characterized all available full-sized module assemblies with version 2 of the prototype ASIC called CBC. The results went into the TDR (link?). I also tested the hybrids that we received from the manufacturer before they have been distributed to the different institutes. In several testbeams I helped setting up the device in the test-beam area and was responsible for efficient data taking.

I also contributed to the development of *otsdaq*, which is an off-the-shell DAQ solution for high energy physics experiments. I adopted the software to be used for the Phase-2 Outer Tracker modules and

implementing the existing Phase-2 Outer Tracker software framework into *otsdaq*. I have introduced the tool to the Phase-2 Outer Tracker community by giving presentations and a hands-on session at the Phase-2 Outer Tracker Workshop.

Test optical receivers for suitability with IBL detector

For the IBL upgrade during Long-Shutdown-1 I have tested the optical readout components to be used off-detector. During these tests, I helped building up the IBL activities at the University of Bern. I have tested the feasibility of the usage for commerical products and selected the best suited candidate based on the experimental test data that I took. I also replaced optical transmitters that ceased to function during operation in Run-1.