

# Curriculum Vitae

## Dr. Frank Simon

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## CAREER

- 10/2007–  
present      Research Group Leader at Max-Planck-Institute for Physics, Munich, Germany.  
Competitive tenure track, granted tenure as senior staff scientist and group leader in 2011.
- 05/2005 –  
09/2007      Postdoctoral Associate and Senior Postdoctoral Associate at the  
Massachusetts Institute of Technology, Laboratory for Nuclear Science, Cambridge, MA, USA.
- 2002 – 2005      Graduate Research Assistant at Max-Planck-Institute for Physics, Munich, Germany.
- 2000 – 2001      Research stay at CERN, Geneva, Switzerland.

## EDUCATION

- 02/2005      Doctorate (Dr. rer. nat.) from TU München, Germany.
- 11/2001      Diploma in Physics from TU München, Germany.
- 1998–2001      Studies of physics at TU München, Germany.
- 1997–1998      Studies of physics at TU Darmstadt, Germany.

## RESEARCH PROFILE

Physics at lepton and hadron colliders, emphasizing Top quark and Higgs boson physics at future  $e^+e^-$  colliders, B meson and  $\tau$  lepton physics at B-factories and proton spin and heavy ion physics at hadron colliders. Detector and algorithm development for high-energy physics experiments, in particular in the area of highly granular hadronic calorimetry and particle flow algorithms, micro-pattern gas detectors and time projection chambers. Important contributions to the following experiments and projects: CALICE, ILC, CLIC, FCC-ee, Belle & Belle II (KEK), DUNE (Fermilab), STAR (BNL RHIC), COMPASS (CERN SPS).

Extensive experience in science management and coordination, as current chair of the LHC Experiments Committee (LHCC) at CERN, and as spokesperson of the CALICE collaboration (2015 - 2019), an international collaboration with approximately 300 members developing highly granular calorimeters.

## SCIENTIFIC MANAGEMENT &amp; COORDINATION (SELECTION)

- since 2021 Member of International Advisory Committee of ECFA Study Group on Physics, Experiment and Detector for a future Higgs Factory.
- since 2021 Member of ILC International Development Team WG3 Steering Group.
- since 2020 Chair of the Institute Board of the CALICE Collaboration.
- since 2020 Regional Shift Manager of the Belle II Collaboration.
- 2015 – 2019 Spokesperson of the CALICE Collaboration.
- 2014 – 2020 Coordinator of the calorimetry workpackage in the EU Horizon 2020 project AIDA-2020.
- since 2016 Member of the Executive Team of the CLIC Detector & Physics (CLICdp) Collaboration.
- since 2016 Member of the Detector Board of the Helmholtz Alliance “Physics at the Terascale”.
- 2014 - 2016 Founding chair of the Conference Coordination Group of the Linear Collider Collaboration Physics & Detectors.
- 2013 – 2015 First chair of the Institute Board of the CLIC Detector & Physics Study.
- 2008 – 2015 Member of the Institute Assembly of the Helmholtz Alliance “Physics at the Terascale”.
- 2007 – 2010 Member of the STAR collaboration council and of the STAR publication policy board.

## COMMISSIONS OF TRUST (SELECTION)

- since 2019 Chair of the CERN LHC Experiments Committee (LHCC). Member of the CERN Scientific Policy Committee and of the CERN Research Board.
- 2021 – 2024 Member of “BMBF Gutachterausschuss Teilchen” (Review panel for particle and nuclear physics grants of BMBF, Germany).
- since 2020 Member of Particle Data Group.
- 2017 – 2019 Chair of the CERN LHC Resources Scrutiny Group. Reviewing operations budgets and phase 2 upgrade plans of LHC experiments. Ex-officio member of CERN Resources Review Board and core member of the CERN LHC Experiments Committee Upgrade Cost Group.
- 2020 Remote expert referee for the European Research Council.
- since 2017 Member of Advisory Board of the CERN research activities of the Czech Republic.
- since 2013 Moderator of arXiv.org.
- since 2012 Member of review panels for BMBF, Germany; Fermilab, USA; IN2P3, and CNRS, France; MOST, China.
- since 2007 Regular reviewer for several journals, including the European Physics Journal C, Physics Letters B and Nuclear Instruments and Methods A.

## SCIENTIFIC ACTIVITIES AND ACHIEVEMENTS (SELECTION)

*Future Electron-Positron Colliders* (since 2007)

- Top quark physics at future lepton colliders, in particular the study of a scan of the top quark pair production threshold, including the measurements of the mass, width and Yukawa coupling, taking theory systematics and parametric uncertainties into account, for ILC, CLIC and FCC-ee; top quark mass measurements in the continuum at ILC and CLIC.
- Higgs boson physics at future linear colliders, study of the potential for  $H \rightarrow b\bar{b}, c\bar{c}, gg$  decays at ILC and CLIC and different global fits of all CLIC Higgs boson measurement projections.
- Beyond-the-Standard-Model physics at CLIC, including the production at heavy squarks with the 3 TeV stage and flavour-changing neutral current top quark decays with the first energy stage of CLIC.
- Central contributions to the development and optimization of the CLIC Detector (CLICDet) and International Large Detector (ILD) detector concepts for CLIC and ILC.

*Highly Granular Calorimetry* (since 2007)

- Development of software compensation to improve the energy reconstruction of hadronic showers in highly granular calorimeters and in particle flow algorithms.
- Contributions to the construction, commissioning and operation of the CALICE analog hadron calorimeter prototypes, including time calibration, global reconstruction software and simulation framework.
- Detailed studies of the spatial and time structure of hadronic showers in electromagnetic and hadronic calorimeters with steel and tungsten absorbers, including the development of a calibration technique based on the identification of track segments within showers.
- Development of scintillator tile geometries optimized for direct readout with embedded SiPMs as a first step towards the SiPM-on-tile technology now adopted in CALICE and for the CMS highly granular calorimeter (HGCAL) upgrade at the LHC.

*Belle and Belle II* (since 2008)

- Search for exotic  $\tau$  lepton decays and calibration of lepton identification performance with first Belle II data.
- Construction and installation of a SiPM-on-tile based detector system for the measurement of backgrounds in SuperKEKB, detailed studies of injection and other backgrounds during SuperKEKB commissioning, development of a background-rate based fast beam abort trigger.
- Contributions to the development of the DEPFET-based pixel detector for Belle II, in particular to the optimization of the detector layout, to mechanics and cooling and to the software framework of Belle II.
- Study of time-dependent CP violation in charmless  $B$  meson decays and measurement of QED background with Belle.

*DUNE* (since 2017)

- Development of a conceptual design for the electromagnetic calorimeter for the DUNE near detector and first performance studies for photons,  $\pi^0$ , neutrons and particle identification.

*Concepts for Axion Search Experiments* (2014 – 2017)

- Contributions to the design of the working principle of axion search experiments based on dielectric haloscopes, initial studies for the magnet concepts of the MADMAX experiment.

*Proton-driven Plasma Wakefield Acceleration* (2008 – 2010)

- Simulation studies to investigate secondary particle production, beam divergence and potential radiation damage for beamline elements in proton-driven plasma wakefield acceleration.

*Proton Spin and Heavy Ion Physics at RHIC (2002 – 2010)*

- First measurement of the double longitudinal spin asymmetry and cross section of  $\pi^0$  production in polarized proton collisions with STAR at RHIC, studies of jet fragmentation.
- Measurement of the production of forward  $\Lambda$  baryons in  $d$ +Au collisions with STAR at RHIC.
- Implementation of a simulation framework of the STAR forward TPCs, instrumental for the centrality definition and for the discovery of the absence of final-state jet quenching in  $d$ +Au collisions with STAR at RHIC.

*Development of Micropattern Gas Detectors (2000 – 2009)*

- Development of Gas Electron Multiplier (GEM) tracking detectors, including the establishment of a collaboration with small company for GEM foil production, for the Forward GEM Tracker of STAR at MIT.
- Development, construction and commissioning of GEM tracking detectors for COMPASS in the group of Fabio Sauli at CERN.

## TEACHING (SELECTION)

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| since 2018 | Lectures for 3 <sup>rd</sup> and 4 <sup>th</sup> year physics master students at TU München, "Particle Physics at Colliders and in the High Energy Universe" and "Particle Physics with Accelerators and Natural Sources". 2 hours per week plus 1 hour per week journal club, both Winter and Summer semester. A total of 4 semesters to date. Consistently positive evaluations by students. |
| 2008–2018  | Lectures for 3 <sup>rd</sup> and 4 <sup>th</sup> year physics master students at TU München, "Particle Physics with high-energy Colliders (Higgs & Co)" and "Particle Physics with cosmic and ground-based Accelerators". 2 hours per week both Winter and Summer semester. A total of 21 semesters. Consistently positive evaluations by students.  |
| 10/2016    | "Highlight Lecture" on Physics for new incoming Bachelor students at TU München, invited by the TUM mathematics, physics and informatics student council.  |
| since 2008 | Lectures at different international particle physics schools on topics of experimental physics and HEP instrumentation.  |
| since 2008 | Lectures on basics of particle physics at regular continuing education events for Bavarian high school teachers, organized by the Excellence Clusters 'Universe' and 'ORIGINS'.  |
| since 2012 | Lectures on particle physics and LHC detectors at LHC Masterclasses in Munich, focusing on ATLAS.  |

## STUDENT SUPERVISION

Since October 2007, I am leading a research group at the Max-Planck-Institute for Physics. Within that group, I am responsible for the supervision of PhD, MSc and BSc students. To date, I have supervised 11 PhD theses, 12 MSc / Diploma theses and 4 BSc theses. I have also served as external reviewer for one PhD thesis at the University of Lyon, and for two PhD theses at the University of Utrecht.

## SELECTED PUBLICATIONS

A selection of publications showing between one and four per project, giving an impression of the range of my research activities. To each of these publications I have made important contributions. A full list of publications also including conference papers is available at <https://inspirehep.net/author/profile/F.Simon.1>.

*Review Articles*

- F. Simon, "Silicon Photomultipliers in Particle and Nuclear Physics," Nucl. Instrum. Meth. A **926**, 85 (2019).
- G. Moortgat-Pick *et al.*, "Physics at the  $e^+e^-$  Linear Collider," Eur. Phys. J. C **75**, 371 (2015).
- N. Brambilla *et al.*, "Heavy quarkonium: progress, puzzles, and opportunities," Eur. Phys. J. C **71**, 1534 (2011).

*Linear Collider Physics & Reconstruction*

- H. Abramowicz *et al.*, [CLICdp Collaboration], “Top-Quark Physics at the CLIC Electron-Positron Linear Collider,” JHEP **11**, 003 (2019).
- H. Abramowicz *et al.*, [CLICdp Collaboration], “Higgs Physics at the CLIC Electron-Positron Linear Collider,” Eur. Phys. J. C **77**, 475 (2017).
- H. L. Tran, K. Krüger, F. Sefkow, S. Green, J. Marshall, M. Thomson and F. Simon, “Software compensation in Particle Flow reconstruction,” Eur. Phys. J. C **77**, 698 (2017).
- K. Seidel, F. Simon, M. Tesar and S. Poss, “Top quark mass measurements at and above threshold at CLIC,” Eur. Phys. J. C **73**, 2530 (2013).

*CALICE*

- L. M. S. de Silva and F. Simon, “Effects of misalignment on response uniformity of SiPM-on-tile technology for highly granular calorimeters,” JINST **15**, P06030 (2020).
- C. Adloff *et al.* [CALICE Collaboration], “The Time Structure of Hadronic Showers in highly granular Calorimeters with Tungsten and Steel Absorbers,” JINST **9**, P07022 (2014).
- C. Adloff *et al.* [CALICE Collaboration], “Hadronic energy resolution of a highly granular scintillator-steel hadron calorimeter using software compensation techniques,” JINST **7**, P09017 (2012).
- F. Simon, C. Soldner, “Uniformity Studies of Scintillator Tiles directly coupled to SiPMs for Imaging Calorimetry,” Nucl. Instrum. Meth. **A620**, 196-201 (2010).

*Belle II*

- P. M. Lewis *et al.*, “First Measurements of Beam Backgrounds at SuperKEKB,” Nucl. Instrum. Meth. A **914**, 69 (2019).

*DUNE*

- L. Emberger and F. Simon, “A highly granular calorimeter concept for long baseline near detectors,” J. Phys. Conf. Ser. **1162**, no. 1, 012033 (2019) [arXiv:1810.03677 [physics.ins-det]].

*Smaller Projects*

- A. Caldwell *et al.* [MADMAX Working Group], “Dielectric Haloscopes: A New Way to Detect Axion Dark Matter,” Phys. Rev. Lett. **118**, 091801 (2017).
- A. Caldwell, K. Lotov, A. Pukhov, F. Simon, “Proton-driven plasma-wakefield acceleration”, Nature Physics **5**, 363 (2009).

*STAR*

- B. I. Abelev *et al.* [STAR Collaboration], “Longitudinal double-spin asymmetry and cross section for inclusive neutral pion production at midrapidity in polarized proton collisions at  $\sqrt{s} = 200$  GeV,” Phys. Rev. D **80**, 111108(R) (2009).
- F. Simon *et al.*, “Development of Tracking Detectors with industrially produced GEM Foils,” IEEE Trans. Nucl. Sci. **54**, 2646 (2007).
- J. Adams *et al.* [STAR Collaboration], “Evidence from d + Au measurements for final-state suppression of high  $p_T$  hadrons in Au + Au collisions at RHIC”, Phys. Rev. Lett. **91**, 072304 (2003).

*COMPASS*

- M. C. Altunbas *et al.*, “Construction, test and commissioning of the triple-GEM tracking detector for COMPASS”, Nucl. Instrum. Meth. A **490**, 177 (2002).