# Marco Valente

Office 138A, Isotopes Building, 24 Quai Ernest-Ansermet
1211 Genève (CH)
Office phone: +41 22 379 61 36
Skype name: marco.valente1992 marco.valente@cern.ch
LinkedIn: https://www.linkedin.com/in/valentemarco92/ marco.valente@unige.ch
ORCID: 0000-0002-0486-9569

## Personal informations

- **Address**: Rue du Vélodrome 7, 1205 Genève (Switzerland)
- **Date of birth**: 22.10.1992
- **Nationality**: Swiss
- **Languages**:
  - *Italian*: native language.
  - *English*: full professional proficiency (Master and Ph.D. degree language).
  - *French*: full professional proficiency (Bachelor degree language).
  - *German*: elementary proficiency.

## Career

### Summary

For my Ph.D. at the University of Geneva, I have had the opportunity to be an active member of the ATLAS collaboration at CERN and to work on different physics topics. I have provided important contributions to the commissioning of the ATLAS Particle Flow algorithm, a technique improving the ATLAS reconstruction of jets and Missing Transverse Momentum (MET) and which will become in Run 3 the baseline reconstruction technique for jets and MET in ATLAS. The SUSY analysis I am leading now explores new physics signatures with large jet multiplicities and it will become soon one of the first ATLAS analysis to use Particle Flow techniques. Additionally, I have provided important contributions to the design of the ATLAS Phase-II trigger system for High-Luminosity LHC (HL-LHC) with my studies on pileup suppression for jet and MET using online tracking information.

### Research interests

High Energy Particle Physics, Higgs Physics, Silicon Detectors, Jet and Missing Transverse Momentum reconstruction, Supersymmetry searches, Dark Matter searches, Triggers, Quantum Computing, Machine Learning.

## Education

- **Université de Genève** — Genève, Switzerland
  *Doctor of Philosophy (Ph.D.) in Physics* — *2016 - Present*
  Title: Searches for new physics in events with large jet multiplicity and Missing Transverse Momentum and constituent reconstruction techniques for hadronic observables at the ATLAS experiment.
  Supervisor: Prof. Anna Sfyrla, Université de Genève.

- **École Polytechnique Fédérale de Lausanne (EPFL)** — Lausanne, Switzerland
  *Master of Science (M. Sc.) in Physics* — *2014 - 2016*
  Dissertation: *Charm mixing and CP violation in $D^0 \to K^0_S K^+ K^-$ at the LHCb experiment.*
  https://lphe.epfl.ch/publications/theses/MasterThesis_Marco.pdf
  Supervisor: Prof. Tatsuya Nakada, École Polytechnique Fèderale de Lausanne.

- **École Polytechnique Fédérale de Lausanne (EPFL)** — Lausanne, Switzerland
  *Bachelor of Science (B. Sc.) in Physics* — *2011 - 2014*

## Honors and Awards

- *Ernst and Lucie Schmidheiny* Mobility Funding for Young Researchers — *April 2018*
- Dedicated Article on Sciences Switzerland
  https://naturalsciences.ch/service/news/80140-precision-with-a-broad-benefit — *September 2016*
- Europhysics Letters (EPL) Award for Best Poster Presentation — *August 2016*

## Professional Experience

- **Département de Physique Nucléaire et Corpusculaire (DPNC)** — Genève, Switzerland
  *Ph.D. Student, ATLAS experiment at CERN* — *March 2016 - present*
  - Lead analyzer and analysis contact for the new physics search in signatures with large jet multiplicities, zero lepton, MET and large radius jets [7, 6]. Contributions included: analysis of Full Run 2 data, evaluation of Particle Flow jets and MET reconstruction, optimization studies for signal regions definition, adaptive binning technique improving closure of multijets background estimation, exploration of Flavoured Dark Matter (FDM) and R-parity violating (RPV) models [3], organisation and chairing of regular analysis meetings.
  - Major contributions to the ATLAS Particle Flow MET reconstruction during LHC Run 2 and editor of the first ATLAS public document describing this technique [4].
  - Studies on the design of the new hardware track trigger system for the ATLAS Phase-II trigger upgrade. These studies evaluated the impact of different online tracking requirements on key HL-LHC physics signatures such as $HH \to b\bar{b}b\bar{b}$ and $ZH \to \nu\nu b\bar{b}$, and they represent a central piece in the performance chapter of the ATLAS Phase-II TDAQ TDR [1, 5].
  - Estimation and implementation of MET soft term systematic uncertainties for ATLAS analyses.
  - Studies of track-based pileup suppression techniques for jet triggers for Run 3 and end of Run 2.
  - Support with supervision of Master degree students graduating with a thesis on ATLAS data analysis.
  - Participation to ATLAS data taking activities as *trigger shifter* in the ATLAS Control Room (ACR).
- **European Organization for Nuclear Research (CERN)** — Genève, Switzerland
  *CERN Summer Student Supervisor* — *June 2018 - September 2018*
  - Project proposal and supervision of a CERN summer student (2018): Development of a novel technique, based on multivariate analysis, for neutral pileup mitigation using Particle Flow objects. Preliminary studies have shown better pileup rejection with respect to existing constituents pileup mitigation techniques.
  - Supervision of report writing: https://cds.cern.ch/record/2655145
- **Laboratoire des Physiques des Hautes Énergies (LPHE)** — Lausanne, Switzerland
  *Summer student* — *June 2015 - August 2015*
  - Contribution to the testing, assembly and delivery of the Scintillating Fiber (SciFi) modules for the Beam Gas Vertex monitor (BGV), an instrument aiming at measuring the LHC transverse beam size using non-invasive beam-gaz collisions.
    https://twiki.cern.ch/twiki/bin/view/BGV/WebHome
  - Laboratory activities included: assembly and testing of Scintillating Fibers (SciFi) modules, testing of electronic Front Ends and Silicon Photomultipliers (SiPMs).
- **Laboratoire des Physiques des Hautes Énergies (LPHE)** — Lausanne, Switzerland
  *Summer student* — *June 2014 - August 2014*
  - Creation of a portable $\beta$-spectrometer aiming at creating mono-energetic electron beams from a radioactive $\beta$ source for the testing of Scintillating Fiber (SciFi) modules for the LHCb tracking system.
  - Design and construction of a CsI-based calorimeter and triggering system for the energy calibration of the spectrometer.
  - Laboratory activities included: assembly and calibration of the $\beta$-spectrometer, data analysis.

## Teaching

- **Université de Genève** — Genève, Switzerland
  *Supervisor of Master student thesis* — *2018 - 2019*
  - Title: *Improving particle-flow stability to pile-up using machine learning at the ATLAS experiment*
  - Author: Julien Songeon
  - Supervisors: Prof. Anna Sfyrla, M.Sc. Marco Valente, Dr. Teng Jian Khoo
  - Thesis link: http://dpnc.unige.ch/MASTERS/MASTER_SONGEON.pdf
- **Université de Genève** — Genève, Switzerland
  *Graduate Student Teaching Assistant*
  - 11P091 - General Physics for Computer Scientists — Fall term *2019 - 2020*
  - 11P091 - General Physics for Computer Scientists — Spring term *2018 - 2019*
  - 11P091 - General Physics for Computer Scientists — Fall term *2018 - 2019*

- 11P090 - General Physics for Mathematicians — Spring term *2017 - 2018*
- 11P090 - General Physics for Mathematicians — Fall term *2017 - 2018*
- 11P985 - Physics Laboratory for Biologists — Fall term *2016 - 2017*

- **École Polytechnique Fédérale de Lausanne (EPFL)** — Lausanne, Switzerland
  *Undergraduate Student Teaching Assistant*
  - General Physics I for Pharmacists — Fall term *2015 - 2016*
  - PHYS-311 - Nuclear and particle physics — Fall term *2015 - 2016*
  - General Physics II for Pharmacists — Spring term *2014 - 2015*
  - General Physics I for Biologists — Spring term *2014 - 2015*
  - PHYS-101 - General Physics I for Computer Scientists — Fall term *2014 - 2015*
  - General Physics I for Biologists — Spring term *2013 - 2014*
  - General Physics II for Mathematicians — Spring term *2012 - 2013*

## Publications, Talks and Posters

### Publications

[1] M. Valente, *The ATLAS Trigger and Data Acquisition Upgrades for the High Luminosity LHC (HL-LHC)*, (2019). Proceedings for the European Physical Society Conference on High Energy Physics (EPS-HEP) 2019, ATL-DAQ-PROC-2019-020, https://cds.cern.ch/record/2692161.

[2] The ATLAS Collaboration, *Search for new phenomena in final states with large jet multiplicities and missing transverse momentum using $\sqrt{s}$ = 13 TeV proton-proton collisions recorded by ATLAS in Run 2 of the LHC*, (2020). ATLAS-CONF-2020-002, http://cds.cern.ch/record/2710420.

[3] The ATLAS collaboration, *Reinterpretation of searches for supersymmetry in models with variable R-parity-violating coupling strength and long-lived R-hadrons*, CERN Document Server (CDS), (2018). ATLAS-CONF-2018-003, http://cds.cern.ch/record/2308391.

[4] The ATLAS collaboration, *$E_T^{miss}$ performance in the ATLAS detector using 2015-2016 LHC p-p collisions*, CERN Document Server (CDS), (2018). ATLAS-CONF-2018-023, http://cds.cern.ch/record/2625233.

[5] The ATLAS Collaboration, *Technical Design Report for the Phase-II Upgrade of the ATLAS TDAQ System*, CERN Document Server (CDS), (2017). CERN-LHCC-2017-020, ATLAS-TDR-029, https://cds.cern.ch/record/2285584.

[6] The ATLAS Collaboration, *Search for new phenomena with large jet multiplicities and missing transverse momentum using large-radius jets and flavour-tagging at ATLAS in 13 TeV pp collisions*, JHEP, 12 (2017), p. 034. CERN-EP-2017-138, https://doi.org/10.1007/JHEP12(2017)034.

[7]

### Selected talks

[7] M. Valente, *Reconstruction improvements and model extensions of the ATLAS SUSY 0-lepton Multijets search*, (2018). https://indico.cern.ch/event/716246/. Annual Meeting of the Swiss Physics Society (SPS 2018).

[8] M. Valente, *Performance of Missing Transverse Momentum (MET) reconstruction in High Pileup*, (2018). https://cds.cern.ch/record/2632860. 26th International Conference on Supersymmetry and Unification of Fundamental Interactions (SUSY 2018).

[9] M. Valente, *Track-based pileup subtraction for jet and MET triggering at the HL-LHC ATLAS upgrade*, (2017). https://indico.cern.ch/event/611331/. Joint Annual Meeting of the Swiss Physics Society and Austrian Physical Society (SPS 2017).

[10] M. Valente, *Missing Transverse Momentum (MET) performance*, (2017). https://indico.cern.ch/event/642438/. ATLAS Hadronic Calibration Workshop (HCW 2017).

### Posters

[11] M. Valente, *ATLAS Trigger and Data Acquisition Upgrades for the High Luminosity LHC*, (2019). https://cds.cern.ch/record/2683456, European Physical Society Conference on High Energy Physics (EPS-HEP) 2019.

[12] M. Valente, *Performance of Missing Transverse Momentum (MET) reconstruction with the ATLAS detector*, (2017). http://cds.cern.ch/record/2253140, Large Hadron Collider Experiments Commitee (LHCC 2017).

## Outreach

I am currently involved in several Physics and Particle Physics outreach activities with public audiences ranging from high-school students to children and adults.

- Teaching of Particle Physics and CERN activities to Swiss High-School students at the *ATLAS International Physics Masterclass*. https://physicsmasterclasses.org
- Responsible and shifter at the *Nuit de la science* (Geneva) for the activity *Build Your Own Particle Detector* with LEGO.
  https://build-your-own-particle-detector.org/events/2016-07-geneva
  http://www.ville-ge.ch/culture/nuit/
- Illustration of CERN activities to public audience as member of the European Particle Physics Communication Network (EPPCN) at the 2019 *CERN Open Days*.
  https://opendays.cern
- ATLAS Visitor Center guide for CERN visitors.

## Skills

- **Coding Languages**: C++, Python, C, ROOT, PYROOT, Bash, Unix, Go
- **Libraries**: Keras, Tensorflow, Boost
- **Tools**: Git, Gitlab, Docker, JIRA, SLURM, Matlab
- **Other**: Teamwork, effective communication, public speaking, project management, learning, teaching, mentoring

## Other activities

**Swiss Civil Protection**
*Headquarter collaborator* *2011 - present*

- Collaborator for the strategical planning and logistics in case of natural disaster in the region of Mendrisio (Switzerland).
  https://www.babs.admin.ch/en/verbund.html