# Valerio Dao

# Curriculum Vitae

## Personal Details


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| *Place of birth:* | Genova, Italy |
| *Nationality:* | Italian |
| *Telephone:* | +1 6312029334 |
| *e-mail:* | valerio.dao@cern.ch |
| *languages:* | Italian (native), English / French (fluent), German (beginner) |


## Research Experience

My research activities have been carried out primarily in the context of the ATLAS collaboration which I joined in June 2008 and in the CERN EP department detector R&D group which I joined in 2018.

Feb. 2024 - Present — Assistant Professor, Stony Brook University (USA)

Jan. 2020 - Jan. 2024 — Research Physicist, CERN (CH)

Development of flavour-tagging techniques, measurements of $H \to b\bar{b}$ and $VH$ processes, characterisation of monolithic silicon CMOS detectors, ATLAS Inner Tracker Upgrade development.

Sep. 2017 - Dec. 2019 — Research Fellow, CERN (CH)

Observation and measurement of $H \to b\bar{b}$ and $VH$ processes, development of monolithic silicon CMOS detectors for future ATLAS tracking detectors at the HL-LHC.

Oct. 2016 - Aug. 2017 — Postdoctoral Researcher, Stony Brook University (USA)

Searches for the $H \to b\bar{b}$ process, calibration of flavour-tagging algorithms.

May 2014 - Sept. 2016 — Postdoctoral Researcher, Albert-Ludwigs-Universität Freiburg (DE)

Development of flavour-tagging algorithms, measurements of inclusive $WW$ production and vector-boson scattering, search for the $t\bar{t}H$ process.

March-May 2016 — Invited Fellow at Technische Universität (DE)

Preparation of vector-boson scattering measurements with LHC Run-2 data.

## Education

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| Nov. 2014 | Ph.D. in Particle Physics<br>Radboud Universiteit Nijmegen, Netherlands<br>Thesis: *"From $t\bar{t}$ measurements to the search for the associated production of the Higgs boson and a top quark pair with the ATLAS detector"*<br>Final Mark: 'cum laude' |
| Mar. 2008 | Laurea Specialistica in Fisica (Master degree in Physics)<br>Universitá degli Studi di Genova, Genoa, Italy<br>Thesis: *"Study of ATLAS Pixel detector performance for the first LHC data taking"*<br>Final Mark: 100/100 cum laude |
| Oct. 2005 | Laurea Specialistica in Fisica (Bachelor degree in Physics)<br>Universitá degli Studi di Genova, Genoa, Italy<br>Thesis: *"Fisica delle particelle e radiazione cosmica"*<br>Final Mark: 100/100 cum laude |
| Jul. 2002 | Diploma liceo scientifico tradizionale<br>Liceo Scientifico Nicoloso da Recco, Recco, Italy<br>Final Mark: 100/100 |

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## Awards

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| 2023 | Royal Society University Fellowship ( 2M over 8 years ) - Declined (Ass. Professorship at Stony Brook university) |
| 2017 | CERN Research Fellowship ($\sim$ 170 kCHF ) |

## Positions of responsibility within the ATLAS collaboration

**Group/sub-group convenerships**:

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| October 2023 - Present | Convener of the Higgs combination subgroup ($\sim$ 30 members). |
| Feb 2023 - Present | Member of ITk online software management team. |
| Oct. 2020 - Sept 2022 | Convener of the Flavour Tagging Group ($\sim$ 100 members). |
| Mar. 2017 - Mar. 2019 | Convener of the $H \to b\bar{b}$ Higgs Group ($\sim$ 100 members). |
| Oct. 2014 - Mar. 2016 | Convener of the Flavour Tagging Algorithms Group ($\sim$ 20 members). |

**Other (coordination) roles**:

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| June 2022 - Dec 2022 | Editor of full Run 2 invisible Higgs boson combination publication. |
| May 2019 - Nov. 2020 | Coordinator of the combination of searches for invisible Higgs-boson decays. |
| Jan. 2019 - Jan. 2021 | Co-responsible for test-beam activities and coordinator of laboratory measurements of the monolithic MALTA CMOS chip development. |
| Sep. 2018 - May 2020 | Analysis coordinator of the search for $VH(\to b\bar{b})$ in the *boosted* topology. |
| Oct. 2016 - May 2019 | Contact person between the Higgs Group and the Flavour Tagging Group. |
| Jan. 2016 - Mar. 2017 | Coordinator of the combination of the $t\bar{t}H$ analyses. |
| Oct. 2015 - Aug. 2016 | Analysis coordinator for the measurement of the $WW \to l\nu l\nu$ process. |

**Member of the Editorial Boards (ATLAS review committees) for the following publications**:

- *"Search for heavy neutral Higgs bosons A/H decaying to a $t\bar{t}$ pair in 1- and 2-lepton final states using 139 $fb^{-1}$ of $\sqrt{s}$ = 13 TeV protonproton collision data"*: ongoing

- *"Measurement of the $t\bar{t}t\bar{t}$ production cross section in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector"*: Eur. Phys. J. C 81 (2021)
- *"Performance of the ATLAS b-jet trigger in pp collisions at sqrt(s) = 13 TeV"*: Eur. Phys. J. C 80 (2020)
- *"Evidence for $t\bar{t}t\bar{t}$ production in the multilepton final state in proton-proton collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector"*: Eur. Phys. J. C 80 (2020) 1085
- *"Measurement of top quark pair differential cross-sections in the dilepton channel in pp collisions at $\sqrt{s} = 7$ and 8 TeV with ATLAS"*: Phys. Rev. D94 (2016) 092003

Appointed ATLAS Final Sign-off of 10 results.

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## Positions of responsibility outside the ATLAS collaboration

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| December 2023 - Present | Convener of VH LHC Higgs cross section working group subgroup . |
| May 2023 - Present | Members of the ECFA FCCee expert team for H→ss analysis. |

## Teaching and Supervision Experience

**Supervision/mentoring experience**:

- Co-advisor of G. Rupnik Boero's master thesis:"*A Transformer and Novel Triggers for the Search for Higgs Boson Pair Production in the $bb\tau\tau$ Final State with the ATLAS Detector*" (2024, Bologna University (IT) )
- Supervisor of detector R&D activities for two CERN Research Fellows: M. LeBlanc, G. Gustavino.
- Supervisor of 2-months master research project of Florian Haslbeck (Jan-Feb 2021, University of Amsterdam): "Reconstruction of b-hadron transverse momentum with regression techniques".
- Co-supervisor of R. Barrué (2020-present, Ph.D. student, LIP Lisbon (PT)): search for CP-violation effects in WH production.
- Co-supervisor of A. Montalbano (2017, Ph.D. student, Stony Brook University (USA)): search for VH H→bb process.
- Co-supervisor of G. Gonella (2015-2016, Ph.D. student, Freiburg University (DE)): measurement of VBS production in same sign WW final states.
- Directly mentoring of approx. 15 PhD students and 4 PostDocs in the analyses that I led.
- Co-supervisor of F. Bührer (2014-2016, Ph.D. student, Freiburg University (DE)): WZ production with Run 1 data.
- Technical supervisor of 25 1-year qualification project (as Flavour tagging convener)
- Co-advisor of C. Aimé's master thesis:"*Characterization of Mini-MALTA, a radiation hard monolithic CMOS detector for High Energy Physics*" (2019, University of Pavia and INFN Pavia (IT))
- Supervisor of two students at ROHSSIP2021 (CERN programme for Romanian high school students).
- Supervision of five CERN summer students in the years 2016, 2018, 2019 and 2022 on physics analysis, combined performance and hardware-related projects.

**Teaching experience**:

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| 2024 - Present | Teaching Professor, Stony Brook University (USA): |
| | Physics for Life science. |
| 2014 - 2015 | Teaching Assistant, University of Freiburg (DE): |
| | Undergraduate advanced physics laboratory courses. |
| 2009 - 2012 | Teaching Assistant, University of Geneva (CH): |
| | Undergraduate physics laboratory courses for geology and physics students. |
| | Teaching assistant for a Quantum Mechanics lectures. |

Since October 2018, I am eligible to teach particle physics at the University in Italy as professor.

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## Talks and seminars

**Main talks at international conferences**:

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| Dec. 2022 | PIXEL2022, Santa Fe, USA<br>Talk: *"Recent results from TowerJazz Malta"* |
| Mar. 2022 | Rencontres de Moriond EWK 2022, La Thuile, Italy<br>Talk: *"VHcc searches with the ATLAS experiment"* |
| Oct. 2020 | Higgs 2020, Virtual conference<br>Talk: *"Precision measurements of Higgs rates and differential cross sections"* |
| Sep. 2019 | TWEPP 2019, Santiago de Compostela, Spain<br>Talk: *"Increased radiation tolerance of CMOS sensors with small collection electrodes"* |
| Jan. 2019 | Excited QCD 2019, Schladming, Austria<br>Talk: *"Overview of the Higgs boson measurements with the ATLAS detector"* |
| Dec. 2017 | Symposium 25 Years of LHC Experimental Programme, CERN<br>Talk: *"Recent physics highlights from ATLAS"* |
| Dec. 2016 | Discovery Physics at the LHC, Kruger, South Africa<br>Talk: *"Electroweak results from ATLAS"* |
| Oct. 2015 | Higgs Couplings 2015, Durham, UK<br>Talk: *"Experimental results for ttH at ATLAS'* |
| Aug. 2013 | SUSY 2013, Trieste, Italy<br>Talk: *"Search for the Higgs boson in fermionic channels with the ATLAS detector"* |
| Jun. 2011 | Physics at LHC 2011, Perugia, Italy<br>Talk: *"Top Properties Measurement at ATLAS"* |
| May 2010 | XIV International Conference on Calorimetry in High Energy Physics (CALOR), Beijing, China<br>Talk: *"Commissioning of the ATLAS electron and photon trigger selection"* |

**Main talks at international and ATLAS internal workshops**:

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| Jul 2022 | Higgs@10 symposium, Birmingham, UK<br>Talk: *"Hbb/cc decays review"* |
| May 2019 | CMS Flavour Tagging Workshop, Dubrovnik, Croatia<br>Talk: *"VH (H→bb) studies at ATLAS"* |
| May 2018 | Higgs Toppings: Top-Higgs Interactions at the LHC Workshop, Benasque, Spain<br>Talk: *"Overview of Flavour tagging at ATLAS"* |
| Apr. 2015 | First Annual Meeting of ITN HiggsTools, Freiburg, Germany<br>Talk: *"From VV+jets measurement in Run 1 to VV scattering (ATLAS and CMS')"* |
| Nov. 2014 | ATLAS Run 2 Preparation Workshop, Aix-les-Bains, France<br>Talk: *"Developments in Flavour tagging for LHC Run 2"* |

**Invited seminars**:

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| 3 Apr. 2023 | Brokhaven national laboratory, USA, Title: *"The Beauty of the Higgs: measuring and exploiting the most popular Higgs boson decay at the LHC"* |
| 15 Feb. 2023 | Stony Brook University, USA, Title: *"The Beauty of the Higgs: measuring and exploiting the most popular Higgs boson decay at the LHC"* |
| 12 Apr. 2022 | University of Birmingham , UK, Title: *"Characterisation of monolithic pixel detectors for next generation experiments"* |
| 26 Nov. 2019 | Nijmegen University, NL, Title: *"Hunting the most popular Higgs boson decay at the LHC and Characterisation of monolithic pixel detectors for new generation experiments"* |
| 04 May 2018 | Universita' di Genova, Italy, Title: *"The beauty of the Higgs boson"* |
| 20 Oct. 2017 | University College London, UK , Title: *"VH(bb) physics at ATLAS"* |
| 1 May 2017 | Stony Brook University, USA , Title: *"The quest for ttH at ATLAS"* |
| 13 Jul. 2014 | Bonn University, Germany, Title: *"Search for associated production of the Higgs boson and a top quark pair at ATLAS"* |

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## Conference/workshop organization

**Workshop organisation**:

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| Oct. 2022 | ATLAS Flavour Tagging Workshop, Amsterdam, NL. |
| May 2019 | ATLAS Hbb Workshop, Genoa, IT. |
| Sep. 2017 | ATLAS Hbb/Flavour Tagging Workshop, Stony Brook, US. |

**Session organisation at international conferences and workshops**:

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| Aug. 2020 | ICHEP 2020, virtual: Co-organiser of the Higgs Boson sessions. |
| Apr. 2020 | LHCP 2020, virtual: Co-organiser of the Higgs Boson sessions. |
| July 2019 | SUSY 2018, Barcelona, ES: Co-organiser of Higgs Boson sessions. |
| May. 2016 | ATLAS Flavour Tagging Workshop, Bonn, DE: Co-organiser of Flavour Tagging Algorithms session. |

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## Selected Publications with significant contribution

**ATLAS physics analysis publications**:

1. ATLAS Collabotation, **"Search for the non-resonant production of Higgs boson pairs via gluon fusion and vector-boson fusion in the $bb\tau\tau$ final state in proton-proton collisions at $\sqrt{s} = 13TeV$ with the ATLAS detector"**, ATLAS-CONF-2023-071, Submitted to PRD
2. ATLAS Collaboration, **"Combination of searches for invisible decays of the Higgs boson using 139 $fb^{-1}$ of proton-proton collision data at $\sqrt{s} = 13$ TeV collected with the ATLAS experiment."**, Phys. Lett. B 842 (2023) 137963,
3. ATLAS Collaboration, **"A detailed map of Higgs boson interactions ten years after the discovery"**, Nature607, 5259 (2022).
4. ATLAS Collaboration, **"Combination of measurements of Higgs boson production in association with a W or Z boson in the $H \to b\bar{b}$ decay channel with the ATLAS experiment at $\sqrt{s} = 13$ TeV."**, ATLAS-CONF-2021-051.
5. ATLAS Collaboration, **"Measurement of the associated production of a Higgs boson decaying into b-quarks with a vector boson at high transverse momentum in $pp$ collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector"**, Phys. Lett. B 816 (2021) 136204.
6. ATLAS Collaboration, **"Measurements of WH and ZH production in the $H \to b\bar{b}$ decay channel in $pp$ collisions at $\sqrt{s} = 13$ with the ATLAS detector"**, Eur. Phys. J. C 81 (2021) 178
7. ATLAS Collaboration, **"Evaluation of theoretical uncertainties for simplified template cross section measurements of VH-associated production of the Higgs boson"**, ATL-PHYS-PUB-2018-035
8. ATLAS Collaboration, **"Measurement of $VH$, $H \to b\bar{b}$ production as a function of the vector-boson transverse momentum in 13 TeV $pp$ collisions with the ATLAS detector"**, JHEP 05 (2019) 141
9. ATLAS Collaboration, **"Observation of $H \to b\bar{b}$ decays and $VH$ production with the ATLAS detector"**, Phys. Lett. B 786 (2018) 59
10. ATLAS Collaboration, **"Evidence for the $H \to b\bar{b}$ decay with the ATLAS detector"**, JHEP 12 (2017) 024
11. ATLAS Collaboration, **"Evidence for the associated production of the Higgs boson and a top quark pair with the ATLAS detector"**, Phys. Rev. D 97 (2018) 072003
12. ATLAS Collaboration, **"Search for heavy resonances decaying into a $W$ or $Z$ boson and a Higgs boson in final states with leptons and $b$-jets in 36 fb$^{-1}$ of $\sqrt{s} = 13$ TeV $pp$ collisions with the ATLAS detector"**, JHEP 03 (2018) 174
13. ATLAS Collaboration, **"Measurement of the $W^+W^-$ production cross section in $pp$ collisions at a centre-of-mass energy of $\sqrt{s} = 13$ TeV with the ATLAS experiment"**, Phys. Lett. B 773 (2017) 354
14. ATLAS Collaboration, **"Measurement of $WW/WZ \to \ell\nu qq'$ production with the hadronically decaying boson reconstructed as one or two jets in $pp$ collisions at $\sqrt{s} = 8$ TeV with ATLAS, and constraints on anomalous gauge couplings"**, Eur. Phys. J. C 77 (2017) 563
15. ATLAS Collaboration, "**Search for the Standard Model Higgs boson decaying into $b\bar{b}$ produced in association with top quarks decaying hadronically in $pp$ collisions at $\sqrt{s} = 8$ TeV with the ATLAS detector**", JHEP 05 (2016) 160
16. ATLAS Collaboration, **"Search for the Standard Model Higgs boson produced in association with top quarks and decaying into $b\bar{b}$ in $pp$ collisions at $\sqrt{s} = 8$ TeV with the ATLAS detector"**, Eur. Phys. J. C (2015) 75:349

17. ATLAS Collaboration, **"Measurement of the top–anti-top production cross-section as a function of jet multplicity and jet transverse momentum produced in 7 TeV proton-proton collisions with the ATLAS detector"**, JHEP01(2015) 020
18. ATLAS Collaboration, **"Performance of the ATLAS Trigger System in 2010"**, Eur.Phys.J.C 72 (2012) 1849

**ATLAS performance publications**:

19. ATLAS Collaboration, "**Graph networks for flavor tagging"**, ATL-PHYS-PUB-2022-027
20. ATLAS Collaboration, "**Efficiency corrections for the identification of Boosted Higgs Bosons Decaying Into bb with the full LHC Run II dataset"**, ATL-PHYS-PUB-2021-035
21. ATLAS Collaboration, "**Identification of Boosted Higgs Bosons Decaying Into $b\bar{b}$ with Neural Networks and Variable Radius Subjets in ATLAS"**, ATL-PHYS-PUB-2020-019
22. ATLAS Collaboration, "**Topological B hadron decay reconstruction and identification of $b$-jets with JetFitter in the ATLAS experiment at the LHC**", ATL-PHYS-PUB-2018-025
23. ATLAS Collaboration, "**Measurement of $b$-tagging Efficiency of $c$-jets in $t\bar{t}$ Events Using a Likelihood Approach with the ATLAS Detector**", ATLAS-CONF-2018-001
24. ATLAS Collaboration, "**Expected performance of the ATLAS b-tagging algorithms in Run-2** ", ATL-PHYS-PUB-2015-022

**Non ATLAS physics analysis publications**:

25. R. Barrue′ et al., **"Simulation-based inference in the search for CP violation in leptonic WH production"**, JHEP 2024, 14 (2024).
26. J. de Blas et al., **"Focus topics for the ECFA study on Higgs / Top / EW factories**, arXiv: 2401.07564
27. N. Berger et al., **"Simplified Template Cross Sections - Stage 1.1"**, LHCHXSWG-2019-003, arXiv:1906.02754,

**Detector-related publications**:

28. M. van Rijnbach et al., **"Radiation hardness of MALTA2 monolithic CMOS imaging sensors on Czochralski substrates"**, Eur. Phys. J. C 84, 251 (2024)
29. M. van Rijnbach et al., **"Performance of the MALTA telescope"**, Eur. Phys. J. C 83, 581 (2023)
30. S. Ali et al., **"Performance in beam tests of carbon-enriched irradiated Low Gain Avalanche Detectors for the ATLAS High Granularity Timing Detector"**, 2023 JINST 18 P05005
31. F. Piro et al., **"A 1-$\mu$W radiation-hard front-end in a 0.18 $\mu$m CMOS process for the MALTA2 monolithic sensor."**, IEEE Trans. on Nucl. Sci., vol. 69, no. 6, pp. 1299-1309, June 2022,
32. M. Dyndal, V. Dao et al., **"MiniMALTA: Radiation hard pixel designs for small-electrode monolithic CMOS sensors for the High Luminosity LHC"**, 2020 JINST 15 P02005
33. M. Mironova et al.,**"Measurement of the relative response of TowerJazz Mini-MALTA CMOS prototypes at Diamond Light Source"**, NIMA 2019 163381
34. V. Dao, **"Increased radiation tolerance of CMOS sensors with small collection electrodes through accelerated charge collection."**, PoS(TWEPP2019) 137