
Curriculum Vitæ

Andrea Villa

Personal Infos

Birthdate 13/02/1995

Citizenship Italian

Email andrea.villa@cern.ch andrea.villa7@unibo.it andrea.villa@bo.infn.it

Education

2020-present Ph.D in Physics - Alma Mater Studiorum University of Bologna

2020 Master Degree in Nuclear and Subnuclear Physics - Alma Mater Studiorum University of Bologna

Title of the thesis: *Measurement of y_{CP} with D^0 mesons from semileptonic B -meson decays at LHCb* ([fulltext](#)), Supervisor: Angelo Carbone, co-supervisors: Federico Betti, Lorenzo Capriotti

Marks: 110/110 with honours

2017 Bachelor Degree in Physics - Alma Mater Studiorum University of Bologna

Title of the thesis: *Misura della violazione della simmetria CP nei decadimenti $D^0 \rightarrow KK$ e $D^0 \rightarrow \pi\pi$* ([fulltext](#)), Supervisor: Angelo Carbone, co-supervisor: Federico Betti

Marks: 107/110

Research activities

The main focus of my research so far has been analysing data from the LHCb experiment searching for CP symmetry violation in several decays.

For my bachelor thesis I have been involved in the measurement of the difference of CP asymmetries of $D^0 \rightarrow KK$ and $D^0 \rightarrow \pi\pi$ decays. First I replicated the main result of the analysis, which was published in Phys. Rev. Lett. 122 (2019), and then I performed several cross-checks to ensure that the measurement was independent from the kinematic variables of the decays.

After that, for my master thesis I performed a measurement of the charm mixing observable y_{CP} with $D^0 \rightarrow KK$, $D^0 \rightarrow \pi\pi$, and $D^0 \rightarrow K\pi$ decays. The quantity y_{CP} quantifies the difference between the effective lifetime of D^0 decays to CP-eigenstates with respect to that of decays involving an equal mixture of CP-even and CP-odd states. The precise measurement of this quantity is very important as it is sensible to a broad class of non-Standard-Model processes that can introduce CP violation in D^0 mixing. The analysis involved performing the selection of the data, fitting the invariant mass distribution of the three samples in bins of the D^0 decay time, computing time-dependent reconstruction efficiencies using simulated data, and fitting the ratio of $D^0 \rightarrow KK$ (or $D^0 \rightarrow \pi\pi$) and $D^0 \rightarrow K\pi$ signal yields as a function of the decay time to extract the parameter of interest.

Finally, during my Ph.D. I am working on finalising the measurement of y_{CP} , while at the same time working on another analysis, namely the measurement of integrated CP asymmetries in $\Lambda_b^0 \rightarrow pK$ and $\Lambda_b^0 \rightarrow p\pi$ decays with the full Run 2 dataset from LHCb. This includes selecting all the two-body B-hadron decays from the dataset collected by the experiment from 2015 to 2018; finding the optimal configuration of kinematic and particle identification (PID) requirements to achieve the best statistical sensitivity on ACP; performing a simultaneous fit to the invariant-mass distribution of the 8 two-body final states to obtain the raw asymmetry from the data; computing estimates of all the possible experimental nuisance asymmetries, that are due to the hardware and software trigger reconstruction, to the detection asymmetry of the final-state particle, to the production asymmetry of the Λ_b^0 baryon, and to the different particle identification requirements for each final-state particle. To do this, I make use of simulated samples and calibration decays from data.

I was also responsible for implementing the software trigger algorithm for the reconstruction and selection of charmless two-body b-hadron decays at LHCb for the upcoming Run 3.

Teaching

- 2022/2023 Teaching tutor for the course of General Physics 1 (Classical Mechanics) for the Energetic Engineering degree
- 2021/2022 Teaching tutor for the courses of General Physics 1 (Classical Mechanics) for the Chemical and Environment Engineering degrees and General Physics 2 (Classical Electromagnetism) for the Energetic and Automation Engineering degrees

Students supervision

- 2022 Co-supervisor of two bachelor degree theses:
- Misura di y_{CP} nei decadimenti del mesone D^0 ad LHCb - A. Petrini
 - Ottimizzazione della selezione dei decadimenti $\Lambda_b^0 \rightarrow pK$ e $\Lambda_b^0 \rightarrow p\pi$ per la misura delle asimmetrie di CP - M. Caporale ([fulltext](#))

Publications

I appear as author of 52 papers (including preprints) signed by the LHCb Collaboration ([INSPIRE author page](#))

Alternatively, the list of published works can be found on my [ORCID](#) page.

Talks

Contributions to national and international conferences:

- May 2023 Talk at [LHCP 2023](#) with the title “[Hadronic B decay rate measurements at LHCb](#)”
Belgrade, Serbia
- Apr 2023 Talk at [IFAE 2023](#) with the title “Stato delle ricerche di violazione di CP nei decadimenti degli adroni beauty ad LHCb”
Catania, Italy

Aug 2022 Parallel talk at [CIPANP 2022](#) with the title “[CPV measurements from LHCb](#)”
Lake Buena Vista, FL, USA

Sep 2021 Communication at the [107° SIF National Congress](#) (virtual) with the title
“Measurement of the charm-mixing parameter y_{CP} with D^0 mesons from
semileptonic B decays at LHCb.”

Schools

May 2022 [INFN School of Statistics](#) - Paestum, Italy

Jul 2021 [Young Experimentalists and Theorists Institute \(YETI\) 2021](#) - Virtual

May 2021 [LHCb Impactkit 2021](#) - Virtual

Nov 2020 [LHCb Starterkit 2020](#) - Virtual

Sep 2020 [13th Inverted CERN Schools of Computing \(iCSC\) 2020](#) - Virtual

Apr 2019 [5th International School on High Energy Physics \(ISHEP\)](#) - Cargese, France