

# Curriculum vitæ of Giuseppe Carratta

## Personal Data


Birth Date: 06/05/1993

Birth Place: Cosenza

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Current Position: Post-Doc at University of Bologna

## Education

- 2018-2021 PhD in Particle Physics at Alma Mater Studiorum - Università di Bologna (Dottorato di ricerca in Fisica, XXXIV Ciclo).  
Thesis title: “*Search for Type-III SeeSaw heavy leptons in leptonic final states using proton-proton collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector*”.  
Supervisors: Chiar.mo Prof. M. Sioli, Dott. A. Sidoti, Co-Supervisor: Dott. M. Franchini.  
Date of discussion: 18 March 2022.  
Commission evaluation: Excellent.  
<https://cds.cern.ch/record/2805679>
- 2015-2018 Master Physics Degree with a score of 110/110 at Alma Mater Studiorum - Università di Bologna, Corso di Laurea Magistrale in Fisica.  
Thesis title: “*Search for type-III Seesaw heavy leptons using proton-proton collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector.*” - Supervisor: Prof. M. Sioli, Co-Supervisors: Dott. M. Franchini, Dott. G. Ucchielli  
<https://amslaurea.unibo.it/16404/>
- 2012-2015 Bachelor Physics Degree with a score of 103/110 at Alma Mater Studiorum - Università di Bologna, Corso di Laurea in Fisica.  
Thesis titled: “*Studio di cavità Fabry-Perot per laser ultrastabili.*” - Supervisor: Prof. M. Prevedelli.  
<http://amslaurea.unibo.it/9585/>

## Physics Analysis in ATLAS

**ATLAS Exotics Physics Working Group - MultiLepton Cluster:** search for Type-III SeeSaw heavy leptons and doubly-charged Higgs in multileptonic final states. Framework developer, main responsible of the multi-lepton final state analysis and the fit procedure (2018-ongoing);

**ATLAS Isolation and Fake Forum (IFF) Working Group:** development of a common fake-factor for all the analyses in ATLAS (2020-ongoing).

## Detector Activities

**ATLAS Collaboration:** ATLAS Calo/FWD shifter (2022);

**ATLAS LUCID Collaboration:** development of the LUCID detector simulations for both Run3 and Run4. Installation and calibration of the new PMTs for the next Run. Development of the new TDAQ system (2019-2022);

**ATLAS ITk Collaboration:** development of an interface to store QC and DCS results in a local database(2019, Qualification Task). Test and preparation of ITk pixel modules (ongoing).

## Awards

16 February 2023 Winner of the ATLAS Thesis Award 2022. 8 winners over more than 30 nominations.  
<https://atlas.cern/Updates/News/2022-thesis-awards>

## Grants

12/2021-11/2023 Post-doc scholarship at the University of Bologna, competitive selection;  
07/2021-10/2021 University Fellowship (Marco Polo) for LUCID detector activities at CERN.  
11/2018-10/2021 Funded PhD at University of Bologna with 11 scholarships available over more than 80 candidates.

## Responsibilities

2024-ongoing ATLAS ITk production manager for the Italian cluster;  
2023-ongoing ATLAS Italia Outreach National Coordinator;  
Coordinator of the outreach activities of the entire ATLAS Italia Collaboration.  
2023-ongoing Scientific Secretariat of the 59th Course of the [International School of subnuclear physics](#); *Searching the unexpected: energy, luminosity, precision, small signals*, Erice (Italy);  
Organization and revision of the lectures transcriptions to be published in the school proceeding.  
2023-ongoing Local Coordinator of the [Art & Science](#) project in Bologna;  
Coordination of the Bologna group within the Art & Science project, aimed at high-school students. Planning of seminars on different topics and organization of the visit to the Bologna INFN section.  
2022-ongoing ATLAS Italia Social Media manager;  
Coordination of a group of more than 10 people to create virtual contents for the ATLAS Italia social media.  
2022-ongoing Reviewer for the DCS and Thermal Cycle site qualification inside the ATLAS ITk Pixel Collaboration;  
Member of a three people group to evaluate the satisfaction of the qualification criteria of the institutes joining the production process of the ATLAS ITk Pixel modules.  
2022-2023 Author of the DCS and Thermal Cycle site qualification document inside the ATLAS ITk Pixel Collaboration;  
One of the three author of the qualification document which sets the criteria to be satisfied by the institutes qualification in order to test the ATLAS ITk Pixel modules.  
2022 Member of the ICHEP 2022 Local Organizing Committee, Bologna (Italy).  
<https://www.ichep2022.it/ichep2022/#local-organizing-committee>  
Contents creation for the ICHEP 2022 social media  
2022 Editor of the ICHEP 2022 Newsletter, Bologna (Italy).  
<https://www.ichep2022.it/>  
2019-2021 ATLAS LUCID Simulation;  
Responsible and maintainer of the simulation framework used by the ATLAS LUCID Collaboration.  
2019-2020 ATLAS ITk Pixel Italy Database.  
Responsible and maintainer of the database used by the ATLAS ITk Pixel Italy Collaboration, used to store different tests data.

## Analysis Research activities

Search for Type-III SeeSaw heavy leptons in multileptonic final states:

The subject of my analysis activity is the study of a mechanism Beyond the Standard Model, the so called Type-III SeeSaw, introduced to provide in a natural way the generation of the neutrino masses. The problem about neutrino masses became clear when neutrino oscillation experiments gave us indirect limits on the mass values, much smaller than those of the charged leptons, but clearly different from zero, pointing out a naturalness problem in the theory. In the Type-III SeeSaw mechanism a neutrino is considered a Majorana particle which acquires mass by the mediation of new massive fermions with zero hypercharge in the adjoint representation of  $SU(2)_L$ , resulting in two heavy Dirac charged leptons,  $L^\pm$ , and a heavy Majorana neutral lepton,  $N^0$ , which are assumed to be degenerate in mass. These heavy leptons are searched through the process  $pp \rightarrow W^*/Z^*/\gamma^* \rightarrow L^\pm N^0/L^\pm L^\mp$  where heavy leptons decay in vector bosons and leptons, using data collected with ATLAS detector at  $\sqrt{s} = 13$  TeV. The topology of the considered final states involves two, three and four light leptons, jets and missing transverse energy (MET) associated to SM neutrinos.

These heavy leptons, unlike the case of Type-I SeeSaw model, are predicted to be produced in pairs through gauge coupling in the pp collision at LHC energies.

As the main analyser of this project, I constantly presented updates on this search at the weekly Lepton + X meetings, Editorial Board meetings and at the Paper Approval Meeting (PAM) to receive the green light required to start the publication process.

The ATLAS detector collected a large amount of data with such final states and I joined the analysis group since my master thesis. To guarantee a good sensitivity to the model, I proposed to group the three and four leptons events in different categories in order to consider all the possible heavy leptons decay channels. For the trilepton channel, the categorisation is made in terms of jet multiplicities and  $Z$  boson decay modes, while for the four-lepton channel the total charge of the final state is considered. Three kinds of analysis regions, *signal*, *validation* and *control*, were defined for each event category. The region of the phase space where the signal is expected to produce an excess over the SM expectation is defined as *signal region* (SR); the *control region* (CR) is defined in order to constrain a specific background, while the *validation region* (VR) is considered to evaluate the background estimation. To maximize the signal significance in specific phase space regions, a common preselection based on leptons'  $p_T$  and MET was performed for each analysis region containing three leptons. Several additional cuts were implemented looking at the invariant mass of the three and four leptons, the scalar sum of all the objects  $p_T$  plus MET and the transverse masses of the leading leptons. After all the cuts used to defined the different CRs, VRs and SRs for the two considered channels, no excesses over the SM background predictions were observed and no evidence for heavy leptons production was found. Therefore I could extract the signal strength (the ratio between the measured cross section and the one predicted by the SM) based on a likelihood fit. From this procedure I was able to set an upper limit on the heavy leptons cross section independently for the three- and four-lepton channels and also for a combination of them. As final result, I combined the obtained exclusion limits with the one previously published focused on the two leptons plus two jets final state, providing for the first time the exclusion limit considering all the most important Type-III SeeSaw decays channels. These results were published during the 2020 in a paper for the two-lepton channel with an excluded limit of 790 GeV (see Paper [S.2](#)) and in 2021 summer for the multileptonic final state in another paper (see Paper [S.1](#)) with an excluded limit of 910 GeV.

This analysis has been used as benchmark in two additional works performed as parts of two theses (see Thesis [MT.1](#) and Thesis [BT.2](#)), which extend its purpose. The former is related to the development of a software framework that allows users to process a typical data analysis workflow of the ATLAS experiment on High Performance Computing systems. The developed analysis framework has been tested on the computing resources of the Open Physics Hub project and on the CINECA Marconi100 cluster,

in view of the switch-on of the Leonardo supercomputer, foreseen in 2023. The latter introduces a multivariate (MVA) approach on one of the channels considered by the analysis, using different MVA methods (Likelihood, Fisher Linear Discriminant, Boosted Decision Trees (BDT) and Multilayer Perceptron). The results of this thesis have showed a significant improvement with respect to the same channel defined by a cut-and-count approach.

### **Activity within IFF Collaboration:**

During the analysis development one of my main goals was the background estimation, mainly focused on the misidentified leptons contribution, the so-called *fake-leptons*. In this period, I understood the necessity of a good fake leptons estimation in order to perform a precise analysis measurements. For this reason, in the second year of my PhD, I started a project within the IFF Working Group. This project is focused on the estimation of fake lepton contributions, considering wide lepton phase space. In many analyses inside the ATLAS Collaboration, several fake estimation techniques have been used, in order to have an estimation for each analysis configuration. In this work, the final result will be a common fake factor shared among all the categories as the same object definitions are used.

Up to now the project focused on single lepton and two leptons events (using the Tag & Probe method) looking for the dependence of the fake-factor (FF) on kinematic variables, such as lepton  $p_T$  and MET, the number of jets and b-jets, and the lepton selections used to define the analysis objects. Many lepton selections used in ATLAS analysis have been tested providing an initial FF dependence evaluation. The current step is to derive the FF distributions for leptons in different phase spaces exploiting several derivations used by the SUSY and Exotic groups of the ATLAS Collaboration, to check the different FF values among the single lepton and the two leptons events applying specific cuts to increase the presence of non-prompt objects.

## **Detector Activity**

### **Activity within ITk Collaboration:**

During the first year of PhD my activity has been also focused on technical task for the ATLAS Collaboration. For this purpose, I have been involved in the Inner Tracker (ITk) group for the tracker upgrade.

From 2026 on, LHC is expected to provide an integrated luminosity of  $\sim 4000 \text{ fb}^{-1}$  with an average number of inelastic proton-proton collisions per beam crossing of  $\sim 200$  (*High-Luminosity LHC*) to improve the precision of Standard Model (SM) measurement and Beyond SM searches. The current ATLAS Inner Tracker will require an upgrade due to higher radiation levels, higher track multiplicities and data rate foreseen in the HL-LHC operational conditions. In this context, the Inner Tracker the Inner Tracker was redesigned in order to improve tracking efficiency and resolution, impact parameter and vertex resolution and to reduce the material in high  $\eta$  region.

I took part in the testing stage of the pixel-modules to study their performance and characteristics during data acquisition. At this stage, the construction of  $\sim 10000$  modules per pixel is planned. Then these modules will be assembled, certified and sent to the loading sites to be integrated in a more complex system. My work concerned the setup of the pixel module readout system toward the pixel module qualification phase (quality assurance (QA) and quality certification (QC)). Different algorithms to store and analyse QC and detector control system (DCS) data in a database were developed to improve the data acquisition system. The database system is based on a MongoDB environment, a NoSQL database which uses JSON-like documents with schema structure. I developed a local database in Bologna to store and analyse data from all the interfaced systems to be used by all the institutes involved in the testing stage.

In October 2021 I won a Post-doc scholarship for “Tests and preparation of the pixel modules for the ATLAS Inner tracker” at University of Bologna. The ATLAS Bologna group is involved in the test stage and in the future construction of the ITk detector, mainly focusing on the pixel modules. My work is performed looking for the optimization of the different test setups, through the development of DAQ and DCS systems to be used during the module tests in several conditions. Tests are performed in a clean room to operate in a safety way where modules parameters are continuously monitored and then stored in databases to be analysed.

### **Activity within LUCID Collaboration:**

At the beginning of the second year of my PhD, I have been involved in the LUCID Collaboration. LUCID (LUminosity Cherenkov Integrating Detector) is a forward detector of the ATLAS Experiment employed to measure luminosity for individual bunch crossing, online and offline (for physics analyses), and in any LHC configuration. Due to the relevant role of the luminosity precision in every physics measurement and search, the development and maintenance of LUCID are of a crucial importance for the ATLAS Collaboration. As a first step, I updated the official simulation framework, based on GEANT-4, considering the current version of the LUCID Geometry. Then, as the developer and the maintainer of the framework, I implemented several changes to have a more stable structure inside the official framework used by the ATLAS Simulation group. As a final step, I started to study different LUCID configurations to have the preliminary results using the prototype geometries for the future LHC runs, such as Run 3 and High-Luminosity LHC. An important step of this work was also the visualization process of these prototypes, used to check possible overlaps with the other components of the ATLAS detector and to provide event displays of the LUCID detector. The results were in agreement with an independent simulation provided by the ATLAS Simulation group.

During the Marco Polo grant, in the July-October 2021 period, I went to CERN to perform several works within the LUCID Collaboration. Despite the generally good performance of the detector, LUCID experienced several problems especially at the end of Run-2: for example the loss of several PMTs due to radiation-induced ageing, and the still insufficient flexibility of the DAQ system when facing with these issues. First, I started to test and to calibrate, with a Bismuth source, both old and new PMTs powered with a CAEN mainframe, in order to measure the signal amplitude values to determine the gain. Then, I installed a series of PMTs directly on the LUCID detector and performed all needed tests to check the presence and good quality of the signals from the sensors. To finalize this work, I developed a new custom DCS system, based on WinCCOA, to determine the High-Voltage (HV) needed on the dynodes, including boosters, of each PMT to produce a non-zero current also during no-collisions periods in order to avoid the PMTs to be in the so-called sleeping mode.

After the installation of the LUCID Side-A in the ATLAS detector, I installed new HV boards in the ATLAS service cavern to connect the LUCID-Side A to the whole ATLAS electronic system. The last step of this installation chain was the connection of all the channels to the Front End of the LUCID readout system, called LUCROD (LUCid ReadOut Driver), which is located in the ATLAS detector cavern. Finally, I performed several tests using the new custom DCS system where I also implemented the monitoring of the PMT currents and crate temperatures. In addition, I provided an innovative PMT calibration system based on a  $^{207}\text{Bi}$  radioactive source deposited on the PMT quartz window. First, I have mapped the channels in Object Kernel Support (OKS) according to the connection to the LUCROD to guarantee a correct elaboration of the data by the DAQ system and its correct communication to the DCS system, where high voltage corrections are computed and applied.

## Supervised Theses

### Master Theses:

**MT.1 Co-supervisor** of a master thesis in Physics - Curriculum Nuclear and Subnuclear Physics of the student Federico Andrea Guillaume Corchia with the title “Deployment of a data analysis workflow of the ATLAS experiment on HPC systems”.

<https://amslaurea.unibo.it/26221/>

Date of discussion: 15 July 2022

**MT.2 Co-supervisor** of a master thesis in Physics - Curriculum Nuclear and Subnuclear Physics of the student Silvia De Luca with the title “Search for scalar and vector doubly charged bosons with Run2 data collected by the ATLAS experiment at LHC”.

<https://amslaurea.unibo.it/23285/>

Date of discussion: 28 May 2021

### Bachelor Theses:

**BT.1 Co-supervisor** of a bachelor thesis in Physics course of the student Federico Ciampiconi with the title “Search for doubly charged bosons in multi-lepton final states using proton-proton collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector”.

<https://amslaurea.unibo.it/28975/>

Date of discussion: 16 June 2023

**BT.2 Co-supervisor** of a bachelor thesis in Physics course of the student Giulio Benuzzi with the title “Studio di un approccio multivariato per la ricerca di leptoni pesanti con l’esperimento ATLAS a LHC”.

<https://amslaurea.unibo.it/19154/>

Date of discussion: 18 October 2019

## Teaching Experience at University of Bologna

09/2023-09/2024 **Teaching Tutor** at course of “Elettromagnetismo (A-L and M-Z)”, Physics Degree, under the supervision of Prof. A. Zoccoli and Prof. L. Rinaldi

<http://www.unibo.it/it/didattica/insegnamenti/insegnamento/2023/492765>

09/2023-12/2023 **Teaching Tutor** at course of “Laboratorio di Meccanica e Termodinamica (A-L)”, Physics Degree, under the supervision of Prof. M. Cuffiani

<https://www.unibo.it/it/didattica/insegnamenti/insegnamento/2023/484591>

09/2023-12/2023 **Teaching Tutor** at course of “Laboratorio di Meccanica e Termodinamica (M-Z) (Modulo 2)”, Physics Degree, under the supervision of Prof. N. Jacazio

<http://www.unibo.it/it/didattica/insegnamenti/insegnamento/2023/484592>

03/2023-05/2023 **Teaching Tutor** at course of “Laboratorio di Meccanica e Termodinamica (A-L)”, Physics Degree, under the supervision of Prof. M. Cuffiani

<http://www.unibo.it/it/didattica/insegnamenti/insegnamento/2022/484591>

03/2023-05/2023 **Teaching Tutor** at course of “Laboratorio di Meccanica e Termodinamica (M-Z) (Modulo 2)”, Physics Degree, under the supervision of Prof. N. Jacazio

<http://www.unibo.it/it/didattica/insegnamenti/insegnamento/2022/484592>

11/2022-11/2023 **PhD Course** “Higgs measurements and New Physics searches at the LHC” at PhD in Physics.

<https://phd.unibo.it/physics/en/lectures/measure>

- 11/2022-12/2022 **Teaching Tutor** at course of “Laboratorio di Meccanica e Termodinamica (A-L) (Modulo 2)”, Physics Degree, under the supervision of Prof. S. Braibant  
<https://www.unibo.it/it/didattica/insegnamenti/insegnamento/2022/484591>
- 11/2022-12/2022 **Teaching Tutor** at course of “Laboratorio di Meccanica e Termodinamica (M-Z)”, Physics Degree, under the supervision of Prof. S. Valentinetti  
<https://www.unibo.it/it/didattica/insegnamenti/insegnamento/2022/484592>
- 01/2022-05/2022 **Teaching Tutor** at course of “Laboratorio di Meccanica e Termodinamica”, Physics Degree, under the supervision of Prof. S. Valentinetti  
<https://www.unibo.it/it/didattica/insegnamenti/insegnamento/2021/434313>
- 07/2021 **Acquisition of 24 credits** in anthropo-psycho-pedagogical disciplines and didactic methodologies and technologies at Alma Mater Studiorum - Università di Bologna.  
[https://www.dropbox.com/s/2ujyknycgvr7kt/autocert\\_24\\_CFU.pdf?dl=0](https://www.dropbox.com/s/2ujyknycgvr7kt/autocert_24_CFU.pdf?dl=0)
- 09/2019-09/2021 **Teaching Tutor** at course of “Fisica Generale T”, Computer Engineering Degree, under the supervision of Prof. Lorenzo Rinaldi.  
<https://www.unibo.it/it/didattica/insegnamenti/insegnamento/2019/434891>
- 06/2019-02/2020 **Teaching Tutor** at course of “Fenomeni Termici”, Physics Degree, under the supervision of Prof. Maximiliano Sioli.  
<https://www.unibo.it/en/teaching/course-unit-catalogue/course-unit/2018/434312>
- 03/2019-06/2019 **Teaching Tutor** at course of “Fisica Generale T ”, Building Engineering Degree at Campus of Ravenna, under the supervision of Prof. S. Valentinetti.  
<https://www.unibo.it/en/teaching/course-unit-catalogue/course-unit/2018/414325>;
- 09/2015-06/2018 **Teaching Tutor** at Laboratory of “Elementi di Programmazione per la Fisica” course, Physics Degree, under the supervision of Prof. G.Servizi.  
<http://www.scienze.unibo.it/it/corsi/insegnamenti/insegnamento/2017/412272>;
- 03/2018-06/2018 **Teaching Tutor** at course of “Fisica con Esercitazioni ”, Chemistry and Technologies for the Environment and Materials Degree at Campus of Faenza, under the supervision of Prof. M. Ridolfi.  
<http://www.scienze.unibo.it/it/corsi/insegnamenti/insegnamento/2017/368542>;
- 10/2016-05/2017 **Part-time collaboration (150 hours)** at Laboratory of “Laboratorio di Fisica 2” course (Schedule 1 and 3), Physics Degree, under the supervision of Prof. F.Boscherini and L.Pasquini.  
<http://www.scienze.unibo.it/it/corsi/insegnamenti/insegnamento/2016/328894>;
- 10/2016-01/2017 **Teaching Tutor** at Laboratory of “L’insegnamento della fisica: aspetti teorici e aspetti sperimentali” course, Physics Degree, under the supervision of Prof. B.Pecori.  
<http://www.scienze.unibo.it/it/corsi/insegnamenti/insegnamento/2016/346761>;

## Languages

- Italian:** Mother tongue;
- English:** good speaking, writing and reading;
- French:** elementary speaking, writing and reading.

## Computer Skills

- Programming Languages:** C, C++, C# , python, shell scripting, java, HTML;
- Database program:** MongoDB (NoSQL database program);
- HEP Frameworks:** ROOT, ATHENA, GRID, HistFitter, GEANT4;

**Electronic design and hardware description:** LabView, WinCC, VHDL, OPC Unified Architecture, JCOP Framework;

**Other software/tools:** Microsoft Office, G Suite, Apple Suite, Salome-Meca (pre- and post-processing for numerical simulation), Unity (game-engines), git.

## Conferences/Workshops with Personal Contribution

- 4-8 December 2023 G. Carratta “*Searches for new phenomena in final states with taus using the ATLAS detector*” - The 17th International Workshop on Tau Lepton Physics (TAU2023), University of Louisville, Kentucky - USA. Plenary talk with proceeding.  
<https://indico.cern.ch/event/1303630/contributions/5526210/>
- 28 August-1 September 2023 G. Carratta “*Sharing ATLAS Science: engaging the public*” - XVIII International Conference on Topics in Astroparticle and Underground Physics (TAUP2023), University of Vienna, Vienna, Austria. Parallel talk with proceeding.  
<https://indico.cern.ch/event/1199289/contributions/5445757/>
- 6-13 July 2022 G. Carratta “*A new ATLAS Visitor Centre*” - 41th International Conference on High Energy Physics at Fiera Congressi, Bologna, Italy. Poster with proceeding.  
<https://agenda.infn.it/event/28874/contributions/169879/>
- 16-20 May 2022 G. Carratta “*Exotic Higgs decays, incl. new scalars (ATLAS+CMS)*” - 10th Large Hadron Collider Physics Conference (LHCP2022), *Virtual Conference*. Parallel talk with proceeding.  
<https://indico.cern.ch/event/1109611/contributions/4771752/>
- 5-10 Sept. 2021 G. Carratta “*Search for type-III seesaw heavy leptons in leptonic final states in pp collision at  $\sqrt{s}=13$  TeV with the ATLAS detector*” - 22th Particles and Nuclei International Conference (PANIC2021), *Virtual Conference*. Poster contribution with proceeding.  
<https://indico.lip.pt/event/592/contributions/3452/>
- 28 July-5 August 2020 G. Carratta “*Search for Type-III SeeSaw heavy leptons in multileptonic final states using  $139\text{ fb}^{-1}$  of pp collision at  $\sqrt{s} = 13$  TeV with the ATLAS detector*” - 40th International Conference on High Energy Physics (ICHEP2020), *Virtual Conference*. Poster contribution with proceeding.  
<https://indico.cern.ch/event/868940/contributions/3818187/>
- 18-21 June 2019 G. Carratta “*Search for type-III Seesaw heavy leptons using proton-proton collisions with the ATLAS detector at  $\sqrt{s} = 13$  TeV.*” - 10th Young Researcher Meeting at Università degli Studi di Roma “Tor Vergata”, Roma, Italy. Plenary talk with proceeding.  
<http://www.iphsnet.com/wp/ym/events/10yrm/>
- 8-10 April 2019 G. Carratta “*Search for exotic particles in multi-leptonic final states with the ATLAS detector*” - IFAE 2019 - Incontri di Fisica delle Alte Energie at Centro Congressi Partenope, Napoli, Italy. Poster contribution with proceeding.  
<https://agenda.infn.it/event/17945/contributions/87268/>
- 23-27 Sept. 2018 G. Carratta “*Search for type-III Seesaw heavy leptons using proton-proton collisions with the ATLAS detector at  $\sqrt{s} = 13$  TeV.*” - 104th National Congress of the Italian physical Society at the Università della Calabria, Arcavata di Rende (CS), Italy. Parallel talk.  
[https://www.sif.it/.../atti\\_congresso\\_104.pdf](https://www.sif.it/.../atti_congresso_104.pdf)
- 7-11 May 2018 G. Carratta “*Search for exotic particles at the LHC*” - 4<sup>th</sup> BCD ISHEP 2018, International School of High Energy Physics Cargèse International School, Corsica, France.  
<https://www.ithephy.eu/sc4.html>



## ATLAS Internal Workshop

- 18-20 Sept. 2023 G. Carratta “*Tracker in Phase 2: Assembly and qualification of the Pixel Modules*” - XVI Workshop ATLAS Italia at Hotel Aqua, Rimini, Italy. Plenary talk.  
<https://agenda.infn.it/event/36576/timetable/#49-tracker-in-phase-2-assembly>
- 26-30 Sept. 2022 G. Carratta “*Fake (light) leptons ( including ABCD method + template fit method)*” - ATLAS Exotics Workshop 2022 at Nikhef, Amsterdam, Netherlands.  
<https://indico.cern.ch/event/1147662/contributions/4988724/>
- 27-29 June 2022 G. Carratta “*LUCID in Run3 and preparation for Phase2*” - XV Workshop ATLAS Italia at Polo Fibonacci, Pisa, Italy. Plenary talk.  
<https://agenda.infn.it/event/29726/contributions/163721/>
- 29 September 2021 “*Search for type-III seesaw heavy leptons in leptonic final states*” - ATLAS Italia Young, *Virtual Workshop*. Plenary session.  
<https://indico.cern.ch/event/1058256/contributions/4497423/>
- 15 September 2021 “*LPX searches for Moriond*” - ATLAS Physics and Performance Week, *Virtual Workshop*. Plenary session.  
<https://indico.cern.ch/event/1064560/contributions/4475836/>
- 10-11 July 2019 G. Carratta “*Local Database*” - ITk Italy DAQ Workshop, Bologna, Italy. Plenary session.  
<https://indico.cern.ch/event/830525/#b-341929-database-database>

## School/Workshop Attendance

- 27/02/2023- 3/03/2023 JCOP Framework and WinCC-OA, CERN.
- 3-10 June 2022 XXXIII International Seminar of Nuclear and Subnuclear Physics Francesco Romano”, Otranto (LE), Italy.  
<https://agenda.infn.it/event/30254/>
- 16-19 May 2022 ATLAS Itk Pixel Module QC Workshop 2022. CERN - Meyrin, Switzerland.  
<https://indico.cern.ch/event/1151523/>
- 14-18 Sept. 2021 Scuola Estiva ONSCI - Officina di Narrazione della Scienza. Virtual School organized by the Department of Physics and Astronomy - University of Bologna, Italy.  
<https://site.unibo.it/officina-di-narrazione-della-scienza/it>
- 7-12 June 2021 The Ninth Annual Large Hadron Collider Physics (LHCP2021). Virtual Conference: <https://indico.cern.ch/event/905399/>
- 23–25 Sept. 2020 ATLAS Exotics + SUSY Workshop 2020. Virtual Workshop.  
<https://indico.cern.ch/event/898965/>
- 25–30 May 2020 The Eighth Annual Large Hadron Collider Physics (LHCP2020). Virtual Conference.  
<https://indico.cern.ch/event/856696/>
- 9–13 Dec. 2019 ATLAS physics workshop “Run 2 Physics, Reaching New Height”. CERN - Meyrin, Switzerland.  
<https://indico.cern.ch/event/822577/>
- 11-15 Nov. 2019 4th ATLAS Machine Learning Workshop. CERN - Meyrin, Switzerland.  
<https://indico.cern.ch/event/844092/>

- 11-14 June 2019 ATLAS Exotics + HDBS Workshop  
Villa Doria D'Angri, Napoli, Italy  
<https://indico.cern.ch/event/801402/>
- 27-31 May 2019 Interpreting the LHC Run 2 Data and Beyond  
The Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy  
<http://indico.ictp.it/event/8679/other-view?view=ictptimetable>
- 4-9 June 2018 The Sixth Annual Large Hadron Collider Physics conference - LHCP 2018  
Bologna, Italy  
<http://lhcp2018.bo.infn.it/>

## Outreach activity

- 2023-ongoing Tutor of the Hands-On Physics project. <https://www.hopscuola.it/>
- 2022-ongoing Member of the joint team Bologna/Ferrara for the IV Edition of the Art & Science project. <https://artandscience.infn.it/>
- 2022-ongoing Member of the Emilia-Romagna Scientific Committee for the Asimov Prize.  
<https://www.premio-asimov.it/regioni/emilia-romagna>
- 2022-ongoing Member of the management group of the official ATLAS Italia website. <https://web.infn.it/atlas/>
- 2021-ongoing Member of the INFN group participating in the Modena Games Festival: PlayMo.  
<https://www.play-modena.it/en/>
- 2022 Tutor of the *Officina-Laboratorio*, activity of the PCTO (Percorsi per le Competenze Trasversali e per l'Orientamento) project. It is a summer school for high-school students aiming to design teaching and learning experiences.  
<https://fisica-astronomia.unibo.it/it/.../officina-laboratorio>
- 2019 Participation at the *European Researchers' Night 2019* during the speed-dating talking about “Fundamental particles and interactions: what are they, as we discover them, is there an “exotic physics”?”  
<http://events.iasfbo.inaf.it/speed-dating-2019/>
- 2019 Tutor of the *Alternanza Scuola Lavoro* (INFN), project for the high-school students. It consists in a week of particle physics working experience using [ATLAS Open Data and Tools](https://agenda.infn.it/event/19031/sessions/14618/#20190704).  
<https://agenda.infn.it/event/19031/sessions/14618/#20190704>
- 2016-2019 Founder and active member of Local Committees of Bologna, associated to the AISF (*Associazione Italiana Studenti di Fisica*), a branch of the European Association **{iaps}** (*International Association of Physics Students*);
- 2019 Jury member of the International Physicists' Tournament (IPT) National Selection, Politecnico di Milano, Milano.
- 2018 Helper of the Italian team at the 2018 IPT, MIPT, Moscow.
- 2017 Helper of the winning team at the 2018 IPT National Selection, Politecnico di Milano, Milano.
- 2018 Organising member of the second edition of “Sulle Spalle dei Giganti” a series of three conferences at the “Accademia delle Scienze” in Bologna focusing on recent Nobel prizes in physics.
- “L'Osservazione delle Onde Gravitazionali” - Nobel Prize 2017.  
**Speakers:** Prof. R. Balbinot (Università di Bologna) and Prof. E. Coccia (Director of Gran Sasso Science Institute);

- “La scoperta delle Transizioni Topologiche di Fase” - Nobel Prize 2016.  
**Speakers:** Prof. C. Degli Esposti Boschi and Prof. E. Ercolessi (Università di Bologna);
- “La scoperta dell’Oscillazione dei Neutrini” - Nobel Prize 2016.  
**Speakers:** Prof. S. Bertolucci (Director of Research and Scientific Computing at CERN), Dr. M. Selvi (Università di Bologna).

2017

Organising member of the first edition of “Sulle Spalle dei Giganti”, a series of three conferences at the “Accademia delle Scienze” in Bologna with topic about important experiment realized in Bologna from XVII century to the second half of '900.

- “L’esperimento più bello della Fisica. L’interferenza di elettroni singoli”.  
**Speakers:** Dr. G. Lulli (CNR-IMM), Prof. O. Levrini and Prof. G. Pozzi (Università di Bologna);
- “Fisica dalle Torri. Sui moti della Terra: Riccioli e Guglielmini”.  
**Speakers:** Prof. M. T. Borgato (Università di Ferrara) and Prof. Palmonari (Università di Bologna);
- “Righi-Marconi: un legame indissolubile”.  
**Speakers:** Prof. G. Dragoni (Università di Bologna) and Prof. G. Falciassecca (Fondazione Guglielmo Marconi, Accademico delle Scienze).

<http://ai-sf.it/blog/2017/05/19/BO-accademiascienze/>

## Publications

### Proceedings:

- PR.1** G. Carratta [ATLAS] “Sharing ATLAS Science: engaging the public”  
[PoS\(TAUP2023\)325](#)
- PR.2** G. Carratta [ATLAS,CMS] “Exotic Higgs decays, including new scalars”  
[PoS\(LHCP2022\)223](#)
- PR.3** G. Carratta [ATLAS] “A new ATLAS Visitor Centre”  
[PoS\(ICHEP2022\)972](#)
- PR.4** G. Carratta [ATLAS] “Search for Type-III SeeSaw heavy leptons in leptonic final states in  $pp$  collisions at  $\sqrt{s} = 13\text{TeV}$  with the ATLAS Detector”  
[PoS \(PANIC2021\) 139](#)
- PR.5** G. Carratta [ATLAS] “Search for Type-III SeeSaw heavy leptons in dileptonic final states using  $139\text{ fb}^{-1}$  of  $pp$  collision at  $\sqrt{s} = 13\text{TeV}$  with the ATLAS Detector”  
[PoS \(ICHEP2020\) 297](#)
- PR.6** G. Carratta [ATLAS] “Search for Type-III SeeSaw heavy leptons with the ATLAS Detector at the LHC using  $\sqrt{s} = 13\text{ TeV}$  up to  $140\text{ fb}^{-1}$ ”  
[J. Phys.: Conf. Ser. \*\*1548\*\* 012032](#)
- PR.7** G. Carratta [ATLAS] “Search for exotic particles in multileptonic final states with the ATLAS detector”  
[Nuovo Cim.C \*\*43\*\* \(2020\) no.2-3, 69](#)

As an active member of the ATLAS experiment I am the co-author of 319 papers (including proceedings) within the ATLAS Collaboration. I have an  $h$ -index of 56 with an average number of citations of 32.5 over all the published papers.

### Selected papers:

- S.1** G. Aad *et al.* [ATLAS], “Search for type-III seesaw heavy leptons in leptonic final states in  $pp$  collisions at  $\sqrt{s} = 13\text{ TeV}$  with the ATLAS detector,” [Eur. Phys. J. C \*\*82\*\* \(2022\) no.11, 988](#).  
2 citation on [Scopus](#) (76th percentile) on last update (19 January 2023) with a Field-Weighted citation impact of 1.4.  
In 2022 European Physical Journal C had a CiteScore of 8.2, SJR and SNIP are no available for this year [based on Scopus](#).  
**Personal Contribution:** Main analyser, analysis framework developer, fake-factor studies and estimation, background and event selection studies, full statistical analysis including the combination with two-lepton channel.  
This paper gave me the opportunity to present the results during the *10th Young Researcher Meeting* and *PANIC2021* with their corresponding proceedings, reported in [PR.6](#) and [PR.4](#).
- S.2** G. Aad *et al.* [ATLAS], “Search for type-III seesaw heavy leptons in dilepton final states in  $pp$  collisions at  $\sqrt{s} = 13\text{ TeV}$  with the ATLAS detector,” [Eur. Phys. J. C \*\*81\*\* \(2021\) no.3, 218](#).  
21 citations on [Scopus](#) (96th percentile) on last update (19 January 2023) with a Field-Weighted citation impact of 3.96.  
In 2021 European Physical Journal C had a CiteScore of 8.3, an SJR of 1.563 and a SNIP 1.278, [based on Scopus](#).  
**Personal Contribution:** Analysis framework developer, fake-factor studies and

estimation, statistical analysis, feedback from the multilepton studies.

This paper gave me the opportunity to present the results during *IFAE 2019* and *ICHEP2020* with their corresponding proceedings, reported in [PR.7](#) and [PR.5](#).

- S.3** G. Aad *et al.* [ATLAS], “Search for doubly charged Higgs boson production in multi-lepton final states using  $139 \text{ fb}^{-1}$  of proton–proton collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector”, [Eur. Phys. J. C \*\*83\*\* \(2023\) no.7, 605](#).

**Personal Contribution:** Selection optimisation, signal modelling, analysis framework developer, fake-factor studies.

This paper gave me the possibility to present the results during *IFAE 2019* and *LHCP2022* with their corresponding proceedings, reported in [PR.7](#) and [PR.2](#).

### Papers originated from my PhD Thesis:

- O.1** G. Aad *et al.* [ATLAS], see Paper in [S.1](#)  
**O.2** G. Carratta [ATLAS] (2021). see Proceeding in [PR.4](#).

### Public Notes with personal contributions:

- PN.1** ATLAS Collaboration, “The LUCID 3 detector for the ATLAS Phase-II Upgrade”.  
<https://cds.cern.ch/record/2780604>

**Personal Contribution:** Simulation of the detector prototypes for LHC Run-3 and HL-LHC, detector assembly.

This work gave me the opportunity to present the LUCID upgrades during the ATLAS Italia Workshop.

### Other papers within the ATLAS Collaboration:

Last update: 18 July 2023.

The updated list of all the publication is available at this link:

<https://inspirehep.net/authors/1878262>

- P.1** G. Aad *et al.* [ATLAS], “A search for R-parity-violating supersymmetry in final states containing many jets in  $pp$  collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” [arXiv:2401.16333 [hep-ex]].
- P.2** G. Aad *et al.* [ATLAS], “Operation and performance of the ATLAS tile calorimeter in LHC Run 2,” [arXiv:2401.16034 [hep-ex]].
- P.3** G. Aad *et al.* [ATLAS], “Search for pair production of higgsinos in events with two Higgs bosons and missing transverse momentum in  $\sqrt{s} = 13$  TeV  $pp$  collisions at the ATLAS experiment,” [arXiv:2401.14922 [hep-ex]].
- P.4** G. Aad *et al.* [ATLAS], “Search for nearly mass-degenerate higgsinos using low-momentum mildly-displaced tracks in  $pp$  collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” [arXiv:2401.14046 [hep-ex]].
- P.5** G. Aad *et al.* [ATLAS], “Search for new phenomena with top-quark pairs and large missing transverse momentum using  $140 \text{ fb}^{-1}$  of  $pp$  collision data at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” [arXiv:2401.13430 [hep-ex]].
- P.6** G. Aad *et al.* [ATLAS], “Combination of searches for pair-produced leptoquarks at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” [arXiv:2401.11928 [hep-ex]].
- P.7** G. Aad *et al.* [ATLAS], “The ATLAS Trigger System for LHC Run 3 and Trigger performance in 2022,” [arXiv:2401.06630 [hep-ex]].

- P.8** G. Aad *et al.* [ATLAS], “Measurement of the total and differential cross-sections of  $t\bar{t}W$  production in  $pp$  collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” [arXiv:2401.05299 [hep-ex]].
- P.9** G. Aad *et al.* [ATLAS], “Search for heavy resonances in final states with four leptons and missing transverse momentum or jets in  $pp$  collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” [arXiv:2401.04742 [hep-ex]].
- P.10** G. Carratta, “Sharing ATLAS Science: engaging the public,” PoS **TAUP2023** (2024), 325 doi:10.22323/1.441.0325
- P.11** G. Aad *et al.* [ATLAS], “Study of high-momentum Higgs boson production in association with a vector boson in the  $qqbb$  final state with the ATLAS detector,” [arXiv:2312.07605 [hep-ex]].
- P.12** G. Aad *et al.* [ATLAS], “Inclusive and differential cross-section measurements of  $t\bar{t}Z$  production in  $pp$  collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector, including EFT and spin-correlation interpretations,” [arXiv:2312.04450 [hep-ex]].
- P.13** G. Aad *et al.* [ATLAS], “Search for short- and long-lived axion-like particles in  $H \rightarrow aa \rightarrow 4\gamma$  decays with the ATLAS experiment at the LHC,” [arXiv:2312.03306 [hep-ex]].
- P.14** G. Aad *et al.* [ATLAS], “Measurement of jet substructure in boosted  $t\bar{t}$  events with the ATLAS detector using 140 fb<sup>-1</sup> of 13 TeV  $pp$  collisions,” [arXiv:2312.03797 [hep-ex]].
- P.15** G. Aad *et al.* [ATLAS], “Measurement of the Z boson invisible width at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” [arXiv:2312.02789 [hep-ex]].
- P.16** G. Aad *et al.* [ATLAS], “Search for the decay of the Higgs boson to a Z boson and a light pseudoscalar particle decaying to two photons,” [arXiv:2312.01942 [hep-ex]].
- P.17** G. Aad *et al.* [ATLAS], “Evidence for the  $VH, H \rightarrow \tau\tau$  process with the ATLAS detector in Run 2,” [arXiv:2312.02394 [hep-ex]].
- P.18** G. Aad *et al.* [ATLAS], “Measurement and interpretation of same-sign W boson pair production in association with two jets in  $pp$  collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” [arXiv:2312.00420 [hep-ex]].
- P.19** G. Aad *et al.* [ATLAS], “Search for light long-lived neutral particles from Higgs boson decays via vector-boson-fusion production from  $pp$  collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” [arXiv:2311.18298 [hep-ex]].
- P.20** G. Aad *et al.* [ATLAS], “Combination of searches for resonant Higgs boson pair production using  $pp$  collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” [arXiv:2311.15956 [hep-ex]].
- P.21** G. Aad *et al.* [ATLAS], “Measurement of  $ZZ$  production cross-sections in the four-lepton final state in  $pp$  collisions at  $\sqrt{s} = 13.6$  TeV with the ATLAS experiment,” [arXiv:2311.09715 [hep-ex]].
- P.22** G. Aad *et al.* [ATLAS], “Simultaneous energy and mass calibration of large-radius jets with the ATLAS detector using a deep neural network,” [arXiv:2311.08885 [hep-ex]].
- P.23** G. Aad *et al.* [ATLAS], “Observation of quantum entanglement in top-quark pairs using the ATLAS detector,” [arXiv:2311.07288 [hep-ex]].
- P.24** G. Aad *et al.* [ATLAS], “Search for a CP-odd Higgs boson decaying into a heavy CP-even Higgs boson and a Z boson in the  $\ell^+\ell^-t\bar{t}$  and  $\nu\bar{\nu}b\bar{b}$  final states using 140 fb<sup>-1</sup> of data collected with the ATLAS detector,” [arXiv:2311.04033 [hep-ex]].

- P.25** G. Aad *et al.* [ATLAS], “Search for Resonant Production of Dark Quarks in the Dijet Final State with the ATLAS Detector,” [arXiv:2311.03944 [hep-ex]].
- P.26** G. Aad *et al.* [ATLAS], “Improving topological cluster reconstruction using calorimeter cell timing in ATLAS,” [arXiv:2310.16497 [physics.ins-det]].
- P.27** G. Aad *et al.* [ATLAS], “Studies of new Higgs boson interactions through non-resonant HH production in the  $b\bar{b}\gamma\gamma$  final state in pp collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” JHEP **01** (2024), 066 doi:10.1007/JHEP01(2024)066 [arXiv:2310.12301 [hep-ex]].
- P.28** G. Aad *et al.* [ATLAS], “Search for non-resonant Higgs boson pair production in the  $2b + 2\ell + E_{\text{T}}^{\text{miss}}$  final state in  $pp$  collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” [arXiv:2310.11286 [hep-ex]].
- P.29** G. Aad *et al.* [ATLAS], “Study of  $Z \rightarrow l\ell\gamma$  decays at  $\sqrt{s} = 8$  TeV with the ATLAS detector,” [arXiv:2310.11574 [hep-ex]].
- P.30** G. Aad *et al.* [ATLAS], “Search for direct production of electroweakinos in final states with one lepton, jets and missing transverse momentum in pp collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” JHEP **12** (2023), 167 doi:10.1007/JHEP12(2023)167 [arXiv:2310.08171 [hep-ex]].
- P.31** G. Aad *et al.* [ATLAS], “Evidence of pair production of longitudinally polarised vector bosons and study of CP properties in  $ZZ \rightarrow 4\ell$  events with the ATLAS detector at  $\sqrt{s} = 13$  TeV,” JHEP **12** (2023), 107 doi:10.1007/JHEP12(2023)107 [arXiv:2310.04350 [hep-ex]].
- P.32** G. Aad *et al.* [ATLAS], “Measurement of  $t$ -channel single-top-quark production in  $pp$  collisions at  $\sqrt{s} = 5.02$  TeV with the ATLAS detector,” [arXiv:2310.01518 [hep-ex]].
- P.33** G. Aad *et al.* [ATLAS], “Measurement of the production cross-section of  $J/\psi$  and  $\psi(2S)$  mesons in  $pp$  collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” [arXiv:2309.17177 [hep-ex]].
- P.34** G. Aad *et al.* [ATLAS], “Search for the exclusive  $W$  boson hadronic decays  $W^{\pm} \rightarrow \pi^{\pm}\gamma$ ,  $W^{\pm} \rightarrow K^{\pm}\gamma$  and  $W^{\pm} \rightarrow \rho^{\pm}\gamma$  with the ATLAS detector,” [arXiv:2309.15887 [hep-ex]].
- P.35** G. Aad *et al.* [ATLAS], “A precise determination of the strong-coupling constant from the recoil of  $Z$  bosons with the ATLAS experiment at  $\sqrt{s} = 8$  TeV,” [arXiv:2309.12986 [hep-ex]].
- P.36** G. Aad *et al.* [ATLAS], “Search for flavour-changing neutral tqH interactions with  $H \rightarrow \gamma\gamma$  in pp collisions at  $\sqrt{s} = 13$  TeV using the ATLAS detector,” JHEP **12** (2023), 195 doi:10.1007/JHEP12(2023)195 [arXiv:2309.12817 [hep-ex]].
- P.37** G. Aad *et al.* [ATLAS], “A precise measurement of the Z-boson double-differential transverse momentum and rapidity distributions in the full phase space of the decay leptons with the ATLAS experiment at  $\sqrt{s} = 8$  TeV,” [arXiv:2309.09318 [hep-ex]].
- P.38** G. Aad *et al.* [ATLAS], “Electron and photon energy calibration with the ATLAS detector using LHC Run 2 data,” [arXiv:2309.05471 [hep-ex]].
- P.39** G. Aad *et al.* [ATLAS], “Search for the  $Z\gamma$  decay mode of new high-mass resonances in pp collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” Phys. Lett. B **848** (2024), 138394 doi:10.1016/j.physletb.2023.138394 [arXiv:2309.04364 [hep-ex]].
- P.40** G. Aad *et al.* [ATLAS and CMS], “Evidence for the Higgs Boson Decay to a Z Boson and a Photon at the LHC,” Phys. Rev. Lett. **132** (2024), 021803 doi:10.1103/PhysRevLett.132.021803 [arXiv:2309.03501 [hep-ex]].

- P.41** G. Aad *et al.* [ATLAS], “Azimuthal angle correlations of muons produced via heavy-flavor decays in 5.02 TeV Pb+Pb and  $pp$  collisions with the ATLAS detector,” [arXiv:2308.16652 [nucl-ex]].
- P.42** G. Aad *et al.* [ATLAS], “Measurements of longitudinal flow decorrelations in  $pp$  and Xe+Xe collisions with the ATLAS detector,” [arXiv:2308.16745 [nucl-ex]].
- P.43** G. Aad *et al.* [ATLAS], “Measurement of the centrality dependence of the dijet yield in  $p$ +Pb collisions at  $\sqrt{s_{\text{NN}}} = 8.16$  TeV with the ATLAS detector,” [arXiv:2309.00033 [nucl-ex]].
- P.44** G. Aad *et al.* [ATLAS], “Electron and photon efficiencies in LHC Run 2 with the ATLAS experiment,” [arXiv:2308.13362 [hep-ex]].
- P.45** G. Aad *et al.* [ATLAS], “Differential cross-section measurements of the production of four charged leptons in association with two jets using the ATLAS detector,” JHEP **01** (2024), 004 doi:10.1007/JHEP01(2024)004 [arXiv:2308.12324 [hep-ex]].
- P.46** G. Aad *et al.* [ATLAS], “Measurement of the  $t\bar{t}$  cross section and its ratio to the Z production cross section using  $pp$  collisions at  $s=13.6$  TeV with the ATLAS detector,” Phys. Lett. B **848** (2024), 138376 doi:10.1016/j.physletb.2023.138376 [arXiv:2308.09529 [hep-ex]].
- P.47** G. Aad *et al.* [ATLAS], “Software Performance of the ATLAS Track Reconstruction for LHC Run 3,” [arXiv:2308.09471 [hep-ex]].
- P.48** G. Aad *et al.* [ATLAS], “Search for vector-boson resonances decaying into a top quark and a bottom quark using  $pp$  collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” JHEP **12** (2023), 073 doi:10.1007/JHEP12(2023)073 [arXiv:2308.08521 [hep-ex]].
- P.49** G. Aad *et al.* [ATLAS], “Measurement of the Higgs boson mass with  $H \rightarrow \gamma\gamma$  decays in  $140 \text{ fb}^{-1}$  of  $s=13$  TeV  $pp$  collisions with the ATLAS detector,” Phys. Lett. B **847** (2023), 138315 doi:10.1016/j.physletb.2023.138315 [arXiv:2308.07216 [hep-ex]].
- P.50** G. Aad *et al.* [ATLAS], “Search for magnetic monopoles and stable particles with high electric charges in  $\sqrt{s} = 13$  TeV  $pp$  collisions with the ATLAS detector,” JHEP **11** (2023), 112 doi:10.1007/JHEP11(2023)112 [arXiv:2308.04835 [hep-ex]].
- P.51** G. Aad *et al.* [ATLAS], “Combined measurement of the Higgs boson mass from the  $H \rightarrow \gamma\gamma$  and  $H \rightarrow ZZ^* \rightarrow 4\ell$  decay channels with the ATLAS detector using  $\sqrt{s} = 7, 8$  and 13 TeV  $pp$  collision data,” Phys. Rev. Lett. **131** (2023), 251802 doi:10.1103/PhysRevLett.131.251802 [arXiv:2308.04775 [hep-ex]].
- P.52** G. Aad *et al.* [ATLAS], “Observation of  $W\gamma\gamma$  triboson production in proton-proton collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” Phys. Lett. B **848** (2024), 138400 doi:10.1016/j.physletb.2023.138400 [arXiv:2308.03041 [hep-ex]].
- P.53** G. Aad *et al.* [ATLAS], “Search for single vector-like B quark production and decay via  $B \rightarrow bH(b\bar{b})$  in  $pp$  collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” JHEP **11** (2023), 168 doi:10.1007/JHEP11(2023)168 [arXiv:2308.02595 [hep-ex]].
- P.54** G. Aad *et al.* [ATLAS], “Measurement of the  $B_s^0 \rightarrow \mu\mu$  effective lifetime with the ATLAS detector,” JHEP **09** (2023), 199 doi:10.1007/JHEP09(2023)199 [arXiv:2308.01171 [hep-ex]].
- P.55** G. Aad *et al.* [ATLAS], “Performance and calibration of quark/gluon-jet taggers using  $140 \text{ fb}^{-1}$  of  $pp$  collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” [arXiv:2308.00716 [hep-ex]].
- P.56** G. Aad *et al.* [ATLAS], “Pursuit of paired dijet resonances in the Run 2 dataset with ATLAS,” Phys. Rev. D **108** (2023) no.11, 112005 doi:10.1103/PhysRevD.108.112005 [arXiv:2307.14944 [hep-ex]].



- P.57** G. Aad *et al.* [ATLAS], “Search for quantum black hole production in lepton+jet final states using proton-proton collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” [arXiv:2307.14967 [hep-ex]].
- P.58** G. Aad *et al.* [ATLAS], “Search for heavy Higgs bosons with flavour-violating couplings in multi-lepton plus b-jets final states in pp collisions at 13 TeV with the ATLAS detector,” JHEP **12** (2023), 081 doi:10.1007/JHEP12(2023)081 [arXiv:2307.14759 [hep-ex]].
- P.59** G. Aad *et al.* [ATLAS], “Search for a new heavy scalar particle decaying into a Higgs boson and a new scalar singlet in final states with one or two light leptons and a pair of  $\tau$ -leptons with the ATLAS detector,” JHEP **10** (2023), 009 doi:10.1007/JHEP10(2023)009 [arXiv:2307.11120 [hep-ex]].
- P.60** G. Aad *et al.* [ATLAS], “Search for singly produced vector-like top partners in multilepton final states with  $139 \text{ fb}^{-1}$  of  $pp$  collision data at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” [arXiv:2307.07584 [hep-ex]].
- P.61** G. Aad *et al.* [ATLAS], “Search for new phenomena in two-body invariant mass distributions using unsupervised machine learning for anomaly detection at  $\sqrt{s} = 13$  TeV with the ATLAS detector,” [arXiv:2307.01612 [hep-ex]].
- P.62** G. Aad *et al.* [ATLAS], “Search for pair production of squarks or gluinos decaying via sleptons or weak bosons in final states with two same-sign or three leptons with the ATLAS detector,” [arXiv:2307.01094 [hep-ex]].
- P.63** G. Aad *et al.* [ATLAS], “Search for leptoquark pair production decaying into  $t\bar{e}e^+$  or  $t\mu^-\bar{t}\mu^+$  in multi-lepton final states in  $pp$  collisions at 13 TeV with the ATLAS detector,” [arXiv:2306.17642 [hep-ex]].
- P.64** G. Carratta [ATLAS and CMS], “Exotic Higgs decays, including new scalars (ATLAS+CMS),” PoS **LHCP2022** (2023), 223 doi:10.22323/1.422.0223
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