

## FABBRI Laura (14/9/2022)

### Personal Data

Name: Dr Laura Fabbri

### Employment and Education

#### *Currently*

Associate Professor, "Dipartimento di Fisica e Astronomia" (DIFA), Università di Bologna (UniBo).

Associate with research activity to Istituto Nazionale Fisica Nucleare (INFN).

Associate to CERN (Geneve, Switzerland) and DESY (Hamburg, Germany) physics laboratories.

2010 – 2018 Assistant Professor, Dipartimento di Fisica e Astronomia (DIFA), UniBo.

2010 Fixed-term researcher Istituto Nazionale Fisica Nucleare (INFN), Bologna.

2004 – 2010 Postdoc, Dipartimento di Fisica, Unibo.

2004 PhD in Physics, DIFA, UniBo, OBELIX Collaboration.

### Scholarships and Awards

2013 HEPP European Physics Society Award (High Energy and Particle Physics Prize of the European Physical Society) awarded together with the ATLAS collaboration for the discovery of the Higgs boson.

2005 Italian Physics Society Award (SIF) for scientific industriousness.

2004 Scholarship by UniBo for research activities within the LHCb experiment.

1999 Summer Student, Fermilab Summer Student – Chicago, Illinois (USA)

### National and International Cooperation

#### *High Energy Physics Experiments*

< 2005 Member of OBELIX and LHCb Collaborations at CERN and HERA-B at DESY.

>2005 **Member of ATLAS Collaboration at CERN.**

#### *Research and Development on Detector*

2008-2012 Member of INFN collaboration SLIM5, VIPIX (R&D of thin tracking systems in the field of high-energy physics),

2018-today Member of INFN collaboration ELOFLEX and FIRE (R&D of a thin and flexible organic sensor for detection of X, gamma and hadronic radiation)

### Institutional Activities and Academic Appointments

>2020 **Chair** of the Commission for the Third Mission of the DIFA.

2018-2021 Member of the Observatory for the Evaluation of Third Mission, **representative** of the Physical Sciences area in Unibo.

2016-2020 **Department delegate** for the European project PLOTINA (Promoting gender balance and inclusion in research, innovation and training).

2018 **Department delegate** for the project "Living our Values in Higher Education Institutions: a self-evaluation instrument for universities" promoted by the Magna Carta Observatory.

2014, 2018 **Member of the Board** of the DIFA.

>2011 Member of selecting committee to hire postdocs, scholarships and tutors, DIFA, UniBo.

2012-2017 Member of selecting commissions for the assignment of research grants and the requirement of a technologist (2015) for INFN.

### Outreach and Third Mission Activities

- 2021-22 Director of the Summer School “Officina di Narrazione della Scienza” dedicated to Science Communication by means of different narrative styles.
- 2020 Celebrations for the first centenary of Augusto Righi's demise (**organizing committee**) [<https://eventi.unibo.it/righi100>].
- 2020 **L.F.**, L.Righi, F. Spinozzi: “*AUGUSTO RIGHI. Catturare l'invisibile, Anticipare il futuro*”, Morellini ed., Milano, 2020, ISBN: 978-88-6298-811-7.
- >2020 National Prize for Scientific Dissemination (Dosi Award) – **National Jury**.
- >2018 National Prize for Scientific Dissemination (Asimov Award) - **Scientific Board**.
- >2017 European Research Night, **responsible** for public stand.
- >2017 Summer School “*Officina-Laboratorio*”, guidance activity to choose a degree programme (60 h/y), **responsible**.
- >2017 “ATLAS Open Data”, guidance activity to choose a degree programme (30 h/y), **tutor**.
- 2019 **Speaker**: “*Infinitamente grande, infinitamente piccolo. L'esperimento ATLAS presso il CERN di Ginevra*”, organized by Associazione Astronomica del Rubicone.
- 2018 Public discussion about the film: “Il Senso della Bellezza”, Cinema Tiberio (~ 200 people), **speaker**.

### Other activities

ICHEP2022 International conference, Bologna, 6-13 July 2022 (Scientific Secretary & LOC)

LHCP 2018 International conference, Bologna, 4-9 June 2018 (LOC)

Referee for NIM and EPJC scientific journal (2020 acknowledged as distinguished EPJ referee)

Referee of research proposals for MIUR: Rientro dei Cervelli, VQR and FARE;

Chair of the “Standard Model Physics” session during the 102nd Congress of the Italian Physics Society, held in Padua in September 2016.

### ATLAS activities

#### *Recent activities*

Physics analysis: as a co-supervisor of 1 PhD students on the search for the Higgs boson produced in association with a vector boson and decaying into a pair of b quarks, in the channel where the Z boson decays to a pair of charged leptons. The work was focused mostly on background studies and performing the analysis, which led to a first direct evidence for the coupling of the Higgs boson to b quarks. [[Phys. Lett. B 786 \(2018\) 59](#), [JHEP 05 \(2019\) 141](#)]

#### **Vector bosons cross-section**

**Responsible** for the luminosity determination by  $Z \rightarrow \mu\mu$  events with RUN1 data. The results were used for comparison with LHC and CMS values. [[Eur. Phys. J. C 71 \(2011\) 1630](#)]

**Responsible** for the  $Z \rightarrow \mu\mu$  channel in the first 13 TeV measurement of the inclusive cross-section of the vector bosons W and Z and their ratio [[Phys. Lett. B 759 \(2016\) 601](#)].

Study of production of vector bosons in association with jets distinguishing between jets coming from the hadronisation of heavy quarks. Co-responsible for the Z channel with RUN2 data. **Co-supervisor** of 1 PhD thesis awarded by INFN as the best PhD thesis in 2019 (“Premio Conversi”) [[JHEP 07 \(2020\) 44](#)]. Results presented by myself, on behalf of the ATLAS Collaboration, at the international conference “Low-X”, 26/9-1/10 2021, Elba (Italy).

## LUCID Detector

**Responsible** for Monte Carlo simulation and analysis of the data collected in the numerous beam tests.

**Co-responsible** for algorithms validation that, implemented directly on the frontend board, provide both instantaneous and integrated luminosity measurement.

**Responsible** for detector calibration.

Results have been presented by myself at four international conferences and workshops. I'm author of more than 100 talks, mostly presented in meetings of the LUCID Detector, Luminosity Task Force and Standard Model working group (in particular in the W/Z sub group)

## Previous or non-ATLAS Activities

Search for exotic states in proton-antiproton annihilation at rest (OBELIX)

- First direct evidence of a gluonic-state candidate [PDG C. Patrignani Chin. Phys. C, 40, 100001].

Dynamical selection rules in proton-antiproton annihilation (OBELIX).

- PhD Thesis [M.Bargiotti et al. (OBELIX Collaboration) EPJ C 35 (2004) 177-187]

B Physics

- Measurement of the bb production cross section in pN at 920 GeV (HERA-B)
- Study of sensitivity to  $\gamma$  angle of the CKM-matrix with  $B_{s/s}$  decay into two mesons (LHCb) . Presented by myself at the International Conference "Physic at LHC", 13-17 July 2004, Wien.
- Development of the b-tagging algorithms (LHCb).

Luminosity Measurements (HERA-B)

- Development of a new method for luminosity measurement based on the determination of the average number of interactions per bunch crossing [I.Abt et al. (HERA-B Collaboration) NIM.A 582 (2007) 401-412].

Research and Development on Detector (SLIM5, VIPIX, SUPERB, SHiP, ELOFLEX)

- **Data acquisition** and **analysis** during the beam test campaigns on a thin silicon tracker developed inside the SLIM5 collaboration. Presented by myself at "Frontier Detectors for Frontier Physics" - 11th Pisa Meeting on Advantage Detectors, 24-30 May 2009, La Biodola (Isola d'Elba);
- **Data acquisition** and **analysis** during the beam test campaigns on a thin silicon tracker based on vertically integrated technologies developed inside the VIPIX collaboration. Presented by myself at "Frontier Detectors for Frontier Physics" - 12th Pisa Meeting on Advantage Detectors, 20-26 May 2012, La Biodola (Isola d'Elba);
- **Development** of the prototype of the vertex detector for the SUPERB experiment, in synergy with the VIPIX collaboration;
- Study, via **Monte Carlo simulation**, of the Electromagnetic Calorimeter for the SHiP detector, to be installed at the CERN North Area . Talk at "Light Dark Matter 2017", 24-28 May 2017, La Biodola (Isola d'Elba);
- **Development** of a thin and flexible organic sensor for detection of X, gamma and hadronic radiation (ELOFLEX, Jan 2018).

## Scientific Output

[source: ISI/Web Of Science - ResearchID H-3442-2012 or ORCID 0000-0002-4002-8353]

1100+ papers on refereed journals

58300+ citations (average citations per item: 53.1)

h-index: 108

13 contributions as speaker to national and international conferences

## Teaching Activities

### PhD:

- > 2018 Member of the Faculty Staff of PhD School (“Collegio dei docenti di Dottorato”) in Science and Technologies for Cultural Heritage (STECH) in Ravenna.
- 2018 Lecturer of the course “Electroweak measurement at LHC”

### Bachelor:

- >2019 Advanced professional and research skills in physical sciences (LM-Physics)
- >2019 Transversal skills for physics-related professions (LM-Physics)
- >2019 General Physics – Mechanics, Thermodynamics, Electromagnetism (Aerospace and Mechanical Engineering – UniBo, Campus of Forlì)
- 2015-2018 General Physics - Mechanics (Building Engineering – UniBo, Campus of Ravenna)
- 2013-2015 General Physics Module – Wave-Motion Phenomena (Electronics and Telecommunications Engineering)
- 2011-2013 General Physics - Mechanics (Civil Engineering and Computer Engineering)
- 2008-2009 General Physics Module - Thermodynamics (Mechanical Engineering)

## Students supervision

- 2 PhD co-supervision in ATLAS
  - “Inclusive Z boson production and in association with b-jets in proton-proton collisions at 13 TeV with the ATLAS experiment.”
  - “Measurement of the Standard Model Higgs boson produced in association with a Z-boson and decaying into a pair of b-quarks in Run 2 data with ATLAS”
- 2 master students in Physics
  - **“Le immagini dei testi didattici di fisica delle scuole superiori: un’analisi di genere”**
  - “Ruolo dei laboratori nella didattica e nella ricerca: da Galilei a Righi fino ad oggi”
- 3 bachelor students in Physics
- 3 bachelor students in Energy Engineering

## Curriculum breve di Roberto Spighi

- **Posizione lavorativa:**
  - Ricercatore INFN di III livello presso la sezione di Bologna dal 16/10/1995 al 31/12/2005;
  - Ricercatore INFN di II livello dal 1/1/2006 presso la sezione di Bologna
- **Formazione:**
  - Laurea in Fisica presso l'Università degli Studi di Bologna conseguita il 22/7/1991 con lode;
  - Scuola di perfezionamento in Fisica (1992) presso l'Università degli Studi di Bologna;
  - Borsa di studio INFN nazionale della durata di 2 anni (1993-94);
- **Ruoli svolti nella sede INFN di Bologna**
  - Dal 2007-2010 membro della commissione di esame per gli assegni di ricerca INFN;
  - Membro della commissione di dottorato negli anni 2010 e 2021;
  - Responsabile del Servizio Tecnico Generale (STG) dal 1° gennaio 2021;
- **Ruoli nella ricerca**
  - 2017-oggi responsabile locale nella sede di Bologna dell'esperimento FOOT;
  - 2017-oggi membro del Collaboration Board dell'esperimento FOOT;
  - 2018-2020 coordinatore dell'Editorial Board dell'esperimento FOOT;
  - 2020-oggi coordinatore della fisica dell'esperimento FOOT;
- **Attività di ricerca**
  - 1991-22: partecipazione agli esperimenti: OBELIX, HERA-B, ATLAS, FOOT;
  - 1991-95: misure di branching ratio di annichilazioni di protone-antiprotone presso l'esperimento OBELIX;
  - 1995-2008: misure di sezioni d'urto e di polarizzazione di produzione di Charmonio presso l'esperimento HERA-B;
  - 2008-17: misure di produzione di coppie top-anti-top ( $t\bar{t}$ ) e  $t\bar{t}$  in associazione con un Bosone di Higgs ( $t\bar{t}H$ ) presso l'esperimento ATLAS;
  - 2017-22: misure di sezioni d'urto di produzione di frammenti nucleari finalizzati all'ottimizzazione dei trattamenti adroterapici e di radioprotezione per missioni spaziali di lunga durata.
  - 2020-22: proposta di convenzione INFN, Università di Bologna e Policlinico sant'Orsola per la realizzazione di 2 ciclotroni per i trattamenti adroterapici;
  - 2020-22: proposta di convenzione INFN, Università di Bologna e Policlinico Sant'Orsola per un progetto sui trapianti di fegato per l'assegnazione donatore-paziente;
  - 2020-22: membro dell'unità di crisi INFN CovidStat per l'analisi dei dati sul covid;
  - 2020-22: membro dell'unità di crisi del policlinico Sant'Orsola per l'analisi della situazione ospedaliera della città di Bologna a seguito della pandemia covid;
  - 2020: partecipazione con l'Agenzia per la Promozione della Ricerca Europea (APRE) al progetto "Horizon Europe", per progetti europei per lo studio della pandemia;
  - 2021: responsabile verso l'ESA (Agenzia Spaziale Europea) della misura effettuata presso il laboratorio tedesco di Darmstadt GSI sulla frammentazione nucleare;
  - Firmatario di oltre 1000 articoli con h-index 177 (fonte Inspire).
- **Attività didattica**
  - Membro della commissione di esame presso l'Università di Ingegneria di Bologna dal 1993
  - Docente del corso di Fisica 1 (meccanica) presso l'Università di Ingegneria di Bologna negli anni 2007, 2010, 2011 e 2012 (score medio di gradimento 98.5% su oltre 200 studenti).
  - Docente del corso di dottorato "Application of Nuclear Physics to Medicine" nel 2019 e 2020.
  - Docente del modulo "Application of Nuclear Physics" per la laurea magistrale in Fisica presso l'Università di Bologna dal 2019 ad oggi (score di gradimento 100%)

- Co-docente dal 2020 del corso di Elettromagnetismo per la laurea triennale in fisica con convenzione stipulata tra Università e INFN (score di gradimento oltre il 90%).
- Relatore di numerose tesi universitarie
- Relatore di 2 tesi di dottorato (una vincitrice del premio Conversi come miglior tesi di gruppo 1 dell'anno 2018);
- **Attività di Outreach**
  - 2009: organizzatore della manifestazione “La scienza si fa in 4” nella città di Bologna;
  - 2011-2015: responsabile delle masterclass per la sede INFN di Bologna;
  - 2013: partecipazione all'evento “Higgs in tour”;
  - 2014: responsabile della Notte dei Ricercatori per la città di Bologna
  - Oltre 40 interventi nelle scuole elementari, medie, superiori per attività di divulgazione.

# Curriculum Vitae prof. Mauro Villa

## Academic position and current roles

Full professor in Experimental Physics at the Bologna University since Sep. 2014.

Dean of the School of Science since Nov. 2018.

Coordinator of the “Open Physics Hub”, a 5-year project funded by the University of Bologna for the strategic development of the Department of Physics and Astronomy (<https://site.unibo.it/openphysicshub/en/>) – 2019-2023.

Spokesperson of the FOOT collaboration and National responsible of the FOOT experiment (INFN-CSN3)

Referee of JINST; reviewer of ERC projects; reviewer for the Italian research quality evaluation (VQR).

## Relevant scientific roles covered in the past

Local PI for the INFN research projects Slim5, SuperB, Diapix, SHiP (2005-2017).

Local responsible for two funded PRIN projects (2007, 2009).

Coordinator of several work packages related to electronics, Trigger and Data Acquisition in different experiments or initiatives (2005-2021).

Chair of the Publication Committee of the FOOT Collaboration (2019-2021).

Member of the Editorial board of the Hera-B experiment.

Coordinator for the Research and Third Mission activities in the Quality Assurance of the Bologna University (mar. 2013-apr 2018).

Selected member for the CUN area 02 for research evaluation in the Bologna University (2010-2016).

## Previous positions

Associate professor in Experimental Physics at the Bologna University (2005- 2014)

Researcher for the Istituto Nazionale di Fisica Nucleare (1995-2005)

**Scientific activity:** Prof. Villa has a long formation and experience on nuclear and subnuclear physics, on radiation detectors, on programming languages and programmable electronics. He started to work on low energy nuclear physics with antiprotons (Obelix experiment); after, he moved to high energy p-A nuclear collisions (Hera-B experiment), then to proton-proton collisions at LHC (ATLAS). Currently he works mostly in the FOOT experiment. He has performed fundamental physics researches in several areas of nuclear and sub-nuclear physics in large international collaborations (Obelix, Hera-B, LHC-B, Atlas, FOOT). In experiments with antinucleons, he studied light meson spectroscopy in search for new and/or resonant states and he studied the protonium annihilation dynamics measuring the branching fraction of two body decays. In p-A interactions (Hera-B), he studied charmonium states and he measured production cross sections of hadrons with open or hidden beauty. In ATLAS he has realized a new type of luminosity monitor for the ATLAS experiment used (with upgrades) as a reference LHC luminosity monitor and as an accelerator steering tool; he has participated to the trigger upgrade called FTK (Fast tracking with Associative Memories) and he has participated to the measurements of the Higgs-top quark associated production. In the microelectronic field, he has participated in the design and realization of new types of pixel matrices (MAPS) to be used in the next generation of particle experiments (projects SLIM5, DIAPIX and PRINs). He is active in the electronic field having realized several electronic boards with high-end FPGAs: the electronic boards used to measure the luminosity in ATLAS and the boards used in the

tests for FTK, as an example. He has been the responsible for several Trigger and Data Acquisition work packages (in Slim5, Diapix, PRIN2007, PRIN2009 and in the FOOT experiment). He has been the responsible for the Vertex Data Acquisition electronics in Super-B and for the Calorimeter electronics in Ship. Currently he is the spokesperson of the FOOT collaboration.

In addition, he had performed phenomenological studies in different fields: the CP symmetry violation (with a comprehensive study of the Cabibbo-Kobayashi-Maskawa) and the theoretical charmonium cross sections at different energies are the most relevant.

**Other activities:**

He is member of the scientific committee of the “Seminario Nazionale Rivelatori Innovativi” (National Seminar on Innovative detectors) since 2010. It is a hands-on school lasting usually one week, with traditional seminars in the morning and laboratory activities in the afternoons, that is held every two years in a different city. For the 2018 edition, held in Bologna, he served as a chair of the Local Organizing committee.

He is the author of four general physics textbooks for students in the courses of the Schools of Science and Engineering.

**Bibliometric data** on Jan, 2021

Scopus h\_index: 101

Scopus Citable papers: 1141

Scopus Total citations: 56190

Presenter at several international conferences.

**Teaching:** Several courses on base physics (mechanics, thermodynamics, electromagnetism, waves, for several bachelor degrees) and modern physics (for a master degree) at the Engineering School. In recent years he teaches *electromagnetism and waves* at the electronic and telecommunication engineering degree, *wave phenomena* at the bachelor degree in physics and *Advanced detectors* at the master degree in physics.

He is an author of two basic physics textbooks and two exercise books, which are all widely adopted.

More information can be found at <https://www.unibo.it/sitoweb/mauro.villa/>