# Short CV Saverio Minutoli

Senior Technologist | Electronic Engineer | R&D and Technology Transfer Expert

## Profile

Experienced Senior Technologist with over 35 years in high-level research and development for experimental physics and industrial applications. Proven expertise in advanced electronics, data acquisition systems, detector technologies, and technology transfer. Leadership roles in international collaborations at CERN, SLAC, and INFN. Skilled in team and project management, innovation, and multidisciplinary coordination.

## Education

Ph.D. in Electronic, Information and Telecommunication Engineering, University of Genoa (2009)
Thesis: T1 Detector Readout Engineering for TOTEM (LHC)

Professional Engineering License, University of Genoa (2005) – Score: 220/220

MSc in Electronic Engineering, University of Genoa (2005) – Summa cum Laude

High School Diploma in Electronics, Technical Institute G. Marconi, Messina (1981)

## Current Positions

Senior Technologist & High Technology Department Manager, INFN-Genoa (2023–Present)

Technology Transfer Manager, INFN-Genoa (2021–Present)

TOTEM Experiment Project Leader, CERN (Ongoing since 2006)

Deputy Head of Electronics Design, INFN-Genoa (2013–Present)

Chief Technologist – LHCb RICH Upgrade, CERN & INFN-Genoa

## Key Project Experience

TOTEM at LHC (CERN): Led design and deployment of the T1 detector's full DAQ chain and slow control. Coordinated Front-End and Back-End electronics and first-level trigger.

LHCb RICH Detector Upgrades: Lead for SiPM and MaPMT Baseboards, high voltage systems, and innovative cooling solutions.

CT-PPS (CMS–TOTEM): Senior designer for fast, high-resolution silicon trackers for proton-proton collision studies.

TIMESPOT R&D: Developed precision timing detectors with picosecond resolution and FPGA-based tracking.

KM3NeT ARCA Submarine Network: Project Manager for electro-optical interlink cable systems (PNRR initiative).

ASTRACT / EIC_Net Projects: Developed advanced power supply and fast front-end electronics for LAPPD detectors.

Technology Transfer: Ongoing patent generation and industry collaboration; inventor of multiple patents in the medical field.

## Teaching & Academia

Contract Professor, University of Genoa – Department of Physics
Courses: Electronics and Data Acquisition, Applied Electronics
PhD and MSc level (2021–2023)

Invited expert and committee member for INFN and international reviews (DarkSide, LHCb, KM3Net)

## Technical Expertise

Hardware & System Design: FPGA, DSP, uP/uC, VHDL, Verilog

DAQ & Trigger Systems: VME-based, custom ASICs, optical fiber transmission

Embedded Systems: Real-time control, precision timing, noise optimization

Mechanical Integration: 2D/3D CAD, FEM modeling, additive manufacturing

Software & Tools:
- Design: Mentor Xpedition, Altium, ORCAD, HyperLynx
- Programming: C/C++, Python, Matlab, LabView
- Protocols: CAN-BUS, Modbus, I2C, RS232/485, SPI
- Platforms: Windows, Linux, Unix

## Training & Certifications

Project Management (RINA Academy, INFN)
IP & Technology Transfer (INFN, 2021)
Advanced electronics, cryogenics, signal integrity, neural networks
Siemens, Mentor Graphics, ALTERA certified trainings

## Publications & Patents

Publications: Co-author of ~90 international papers, including in NIM A, LHCb TDRs, CMS reports.

Patents:
- Method for hydroxyapatite-based dental cleaning (WO2019224693A1)
- Multiple patents on RFID-enabled medical device components

## Languages

Italian (native)

English (fluent – reading, writing, speaking)

French (intermediate)

**Curriculum Vitae: Lucia Consiglio**

***Titoli di Studio***

***29 Ottobre 2003*** Laurea magistrale in Fisica ad indirizzo elettronico presso l'Università di Napoli "Federico II" con votazione **110/110 e lode**.
***Titolo della tesi:*** *"Sviluppo di un Controller per la lettura dell'elettronica di front-end per l'esperimento OPERA".*
**23 Maggio 2007** Dottorato di Ricerca in Fisica Fondamentale ed Applicata presso l'Università di Bologna "Alma Mater Studiorum".
***Titolo della tesi***: "Algorithms for the analysis of neutrino interactions in the OPERA-like Emulsion Cloud Chambers" *www.slac.stanford.edu/spires*

***Qualifiche***

**Dal 2019** Tecnologo INFN 3 livello afferente all'Unità Funzionale Nuova Officina Assergi (NOA)
**Dal 2017** Abilitazione Scientifica Nazionale a Professore di Seconda Fascia SC 02/A1 valida fino ad Aprile 2029.
**2017** Cultore della materia e membro di commissione d'esame per l'insegnamento di "Laboratorio di Fisica III" per il corso di Laurea in Fisica presso l'Universita' Federico II di Napoli.
**2016** Cultore della materia per l'insegnamento "Fisica Generale I" per il Corso di Laurea in Chimica presso l'Universita' Federico II di Napoli.

***Partecipazione a collaborazioni internazionali e progetti***

Dal **2024** membro della collaborazione DRD2
**Dal 2018** a oggi membro della collaborazione DarkSide-20k
**Dal 2017 al 2020** membro della collaborazione CTA
**Dal 2016 al 2017** membro del progetto regionale METROPOLIS per la formazione di Tecnologi di ricerca esperti nell'applicazione di tecniche e metodologie di gestione e mitigazione del rischio del sistema urbano.
**Dal 2011 al 2016** membro del progetto di Muon Radiography
**Dal 2008 al 2011** membro della collaborazione PAMELA
**Dal 2004** membro della collaborazione OPERA

***Incarichi di responsabilita' e coordinamento***

**LNGS**
**Da Febbraio 2025** Convener del WG2 DRD2 Industry Connections & Technology Transfer.
**Da Febbraio 2024** Rappresentante LNGS nell'Institutional Board di DarkSide-20k
**Dal 2023** Manager per la produzione delle TPC Photo Detection Units (PDU) di DarkSide 20k.
**Dal 2022** Responsabile locale e coordinatore delle attività del gruppo LNGS DarkSide-20k (20 persone tra studenti, postdoc e tecnici) nonché della formazione degli shifters e del personale operante in camera pulita NOA
**Dal 2022** Responsabile della linea di packaging e di test presso la camera pulita NOA.
**Dal 2020** Task leader dei test criogenici dell'elettronica di readout e della qualificazione delle tile dell'esperimento DarkSide-20k.
Task leader dei test e validazione della MotherBoard, MotherBoard ¼ e MotherBoard Plus.
Task leader dell'assemblaggio delle PDU di DarkSide-20k nella camera pulita di NOA.
**2018-2020** Coordinatore dei test del sistema di trasmissione ottica del segnale dei SiPM dall'interno del criostato a temperatura ambiente e dell'R&D dei connettori.
**Napoli 2017** Responsabile dell'attività di test e caratterizzazione dei singoli sensori FBK per la camera del medio telescopio p-SCT di CTA.
**Napoli 2016** Responsabile dell'R&D di un rivelatore di muoni da pozzo, basato sulla tecnologia dei SiPM.

**LNGS 2014-2015** Responsabile della Stazione di Scanning dei microscopi per l'analisi dei doppietti di emulsione "Changeable Sheets" dell'esperimento OPERA presso i LNGS.
Responsabile della formazione degli shifters (tecnici, studenti e contrattisti) presso la stazione di scanning.
Coordinatore dell'analisi dei "Changeable Sheets" per l'esperimento OPERA.
**Napoli 2011-2014** Responsabile della radiografia muonica con le emulsioni nucleari a Napoli.
Coordinatore del working group di misura e analisi delle emulsioni nucleari a Napoli.
Coordinatore della misura e analisi delle emulsioni sul fascio al GSI.
**Bologna 2004-2008** Responsabile della misura e analisi delle emulsioni nucleari a Bologna.
Responsabile di R&D per lo scanning automatico e l'analisi delle emulsioni nucleari dell'esperimento OPERA.
Coordinatore di due test su fascio al CERN.
Coordinatore di un test su fascio PEANUT al FermiLab.

***Ruoli di coordinamento/servizio***

**Da Ottobre 2023** Responsabile del reparto dell'Unità funzionale NOA per l'assenblaggio e test di fotosensori e dispositivi elettronici
**Dal 2022** Responsabile locale e coordinatore delle attività del gruppo LNGS DarkSide-20k.
**Dal 2021** Responsabile locale LNGS per la sigla di divulgazione DARK nel Comitato di Coordinamento Terza Missione
**Dal 2024** Guida Preposto LNGS per visite ai Laboratori Sotterranei
**2024** Certificatore di conformità di un accordo quadro e forniture sopra soglia
**Dal 2022** RUP per servizi e forniture sotto e sopra soglia, per la facility di produzione dei fotosensori nella Nuova Officina Assergi

***Attività editoriale***

Coordinatore e autore principale della Production Readiness Review delle TPC PDU di DarkSide-20k 2025
Membro dell' Editorial Board della sezione High-Energy and Astroparticle Physics di Frontiers in Physics e Frontiers in Astronomy and Space Sciences.
Co-autore della PDU Final Design Review 2022
Co-autore del Technical Design Report 2021 dell'esperimento DarkSide-20k
Reviewer di proceedings per la conferenza 15th Topical Seminar on Innovative Particle and Radiation Detectors (IPRD 19)

***Partecipazioni a conferenze e congressi***
**2025** *"RICH 2025 XII Internation Workshop on Ring Imaging Cherenkov detectors" (Mainz)*
*Titolo: Nuova Officina Assergi: the inNOvAtive facility for the production of large area Silicon photodetectors*
**2024** *"XIII International Conference on New Frontiers in Physics" Kolymbari (Crete)*
*Titolo: Light readout in DarkSide-20k: from Silicon Photo Multiplier dies to the Photo Detection Units integration in the NOA packaging facility*
**2024** *19th TREDI Workshop on Advanced Silicon Radiation Detectors, Torino Feb. 2024*
*Titolo: "DarkSide-20k Photo Detection Unit production in NOA"*
**2023** *XVIII International Conference on Topics in Astroparticle and Underground Physics* 2023 *Vienna*
Titolo: *"Nuova Officina Assergi: new perspectives beyond DarkSide-20k"*
***2022*** *"INFN Workshop on Future Detectors" Bari*
*Titolo: "Nuova Officina Assergi: a new reality for novel SiPM-based detector production"* **(relazione su invito)**
***2022 "****XI International Conference on New Frontiers in Physics" Kolymbari (Crete)*
*Titolo: "New SiPM technology for light detection in DarkSide-20k"* **(relazione su invito)**
**2021** ***"****2021 IEEE Nuclear Science Symposium and Medical Imaging Conference"* *(online)*
Titolo: *"DarkSide-20k: new technologies for light detection"*
**2021 "***107 SIF Congress"*
Titolo*: "New developments in the SiPM cryo-electronics for Dark Matter low background experiments" (***Migliore comunicazione**)
**2019 "***15th Topical* Seminar *on Innovative Particle and Radiation Detectors" Siena*
Titolo: "*The cryogenic electronics for SiPM readout in DarkSide*"

**2018** " *11 th CRIS 2018 "Entering the Era of Multi-Messenger Astronomy" Capo Passero*
Titolo: *" A Scuola di Astroparticelle"* **(relazione su invito)**
Titolo: *" Performance of the FBK NUV HD technology for the realization of a camera prototype based on Silicon Photo Multipliers for the CTA project "*
**2014** "*20th IMEKO TC-4 International Symposium" Benevento"* **(relazione su invito)**
Titolo*: "Muon radiography – a new technique for volcanology and geophysics"*
**2013** "*3rd International Conference on New Frontiers in Physics", Kolymbari, (Crete)*
Titolo: *"Determination of the cosmic muon charge ratio in the OPERA experiment"*
**2013** *" ICATPP2013" Villa Olmo (Como)*
Titolo*: "Nuclear Emulsion technique for volcanoes radiography with cosmic ray muons: status of art and future perspectives"*
**2013** *"SIF 2013", Trieste*
Titolo: *"Radiografia muonica con la tecnica delle emulsioni nucleari"*
**2012** *"12th Pisa Meeting on Advanced Detectors" La Biodola, Isola d'Elba*
Titolo: *"Nuclear emulsion detectors: an application to volcanoes' Muon Radiography"*
**2009** *"International Conference on Topics in Astroparticle and Underground Physics 09" Roma*
Titolo: *"PAMELA sub-detector capability in light nuclei identification"*
**2009** *"Rome International Cosmic Ray Conference 2009", Roma*
Titolo: *The ToF system for the PAMELA experiment: In flight performances"*
**2006** *"SIF 2006" Torino*
Titolo: *"Misura e analisi di emulsioni nucleari con obiettivo a secco"*

***Organizzazioni di congressi scientifici o tecnologici e scuole***

Membro del Local Organizing Committee della Gran Sasso Hands-on 2025 PhD schoool
2 Masterclass di DarkSide a Febbraio e Dicembre 2024
Gran Sasso Summer School per gli studenti nativi americani @LNGS edizione 2023-2024-2025
DarkSide collaboration meeting presso LNGS (2022-2023-2024)

***Attivita' Didattica***

**A.A. 2017-2018** Attivita' formativa complementare a supporto dell'insegnamento di "Laboratorio di Fisica I" per il corso di Laurea in Fisica dell'Universita' di Napoli tenuto dalla Prof. G. Fiorillo.
**A.A. 2015-2016** Attivita' formativa complementare a supporto dell'insegnamento di Fisica Generale I per il Corso di Laurea in Chimica dell'Universita' di Napoli tenuto dal Prof. S. Capozziello.
**A.A. 2012-2013** Attivita' formativa complementare a supporto dell'insegnamento di "Fisica II – Elettromagnetismo e Ottica" per il corso di Laurea in Fisica dell'Universita' di Napoli tenuto dal Prof. G. De Lellis.

***Tutor***

Supervisor di assegnisti e studenti:
Andrea Marasciulli - Assegno Senior (INFN bando n. 25415/2023) di durata triennale
Paolo Salomone - Borsa per neolaureati magistrali (INFN bando n. 26496/2024) di durata annuale
Lorenzo Lippolis - Borsa di Studio CSN2 per laureandi/neolaureati (INFN bando n. 27024/2024) di durata trimestrale
Devidutta Gahan - Assegno Senior per stranieri (INFN bando n. 27077/2024) di durata biennale
Francesco D'Ambrosio - Borsa di Studio CSN2 per laureati I livello (INFN bando n. 27636/2025) di durata 3 settimane
Farris Farouki, Olivia Thornton , Rosie Harris (Williams College MA, USA) - 3 mesi
Aras Repond (University of California Riverside) - 3 mesi

Supervisor di 5 studenti per 3 settimane/anno nel contesto della Gran Sasso Summer School dal 2023 al 2026

***Attivita' di terza missione e trasferimento della conoscenza***

Partecipazione all'organizzazione e allo svolgimento delle seguenti manifestazioni:

"Sharper" Notte Europea dei Ricercatori L'Aquila (Settembre 2025)
Visita ai Laboratori Sotterranei per 20 studenti triennali dell'Università di Napoli (Giugno 2025)
"Sharper" Notte Europea dei Ricercatori L'Aquila (Settembre 2024)
Masterclass di DarkSide nel Liceo Scientifico "Andrea Bafile" a L'Aquila (Dicembre 2024)
Masterclass di DarkSide nell'Istituto Superiore "Ottavio Colecchi" a L'Aquila (Febbraio 2024)
"Sharper" Notte Europea dei Ricercatori, Napoli (2018).
International Cosmic-Ray Day (2017, 2018)
"A scuola di Astroparticelle" Seconda Edizione (2018)
Visite guidate al telescopio di muoni a Toledo (2017-2018)
Seminario su invito dal titolo "I raggi cosmici e l'esperimento Auger" presso il Liceo Scientifico L. A. Seneca di Bacoli (Na).
Esperto esterno del Liceo L. A. Seneca di Bacoli (Na) per il programma Alternanza Scuola Lavoro 2018
Tutor del Liceo scientifico N. Cortese di Maddaloni (CE) nell'ambito del concorso "A scuola di Astroparticelle 2018"
Co-tutor del I.T.I. Pacinotti di Scafati per le attivita' in esterno nell'ambito del concorso "A scuola di Astroparticelle 2018"
Co-Tutor del Liceo Statale R.Caccioppoli di Scafati per le attivita' in Alternanza Scuola Lavoro presso il laboratorio di scanning dell'esperimento OPERA.
Futuro Remoto Science Festival (2017)
Esperto esterno del L. G. Galilei nell'ambito del concorso "A scuola di Astroparticelle 2017" (primo premio per il progetto presentato)
Seminario su invito dal titolo "Le origini dell'universo" presso il Liceo G.Galilei di Napoli.
Seminario su invito dal titolo "I raggi cosmici: che scoperta!" presso il Liceo G. Galilei di Napoli nell'ambito del concorso "A scuola di Astroparticelle 2017".
Esperto esterno presso il Liceo Classico O. Flacco di Portici (Na) nell'ambito del Progetto PON 2017-2013 dal titolo "Fisicando" (30 ore) (2014)
Seminario presso i LNGS dal titolo "Alla ricerca della Materia Oscura" nell'ambito della visita guidata ai LNGS per studenti di Fisica del terzo anno (2013)
Esperto esterno presso l'I. G. Nevio, Napoli nell'ambito del Progetto PON 2017-2013 dal titolo "L'insegnamento del metodo scientifico" (2013)
Esperto esterno presso il Liceo G. Galilei di Napoli nell'ambito del Progetto PON 2017-2013 dal titolo "Ottica che passione" (30 ore) (2011).
Incarico di Progettista e Collaudatore di un Laboratorio Scientifico presso l'I.C. Don Milani di Portici (2011)
Esperto esterno presso l'I.C. M. Melloni di Portici nell'ambito del Progetto PON 2017-2013 "Fisica: impariamo giocando" (25 ore) (2011).
Visite guidate al CERN per studenti del Corso di Laurea in Fisica dell'Universita' di Bologna (2005,2006)

***Aggiornamento professionale e scuole***

**2017** *Sexten Astrophysics School-Gamma-Ray Astrophysics with CTA*
**2013** *INFN School of statistics (Vietri sul mare)*
**2008** *"Neutrino Oscillation Workshop" (Otranto)*
**2006** *"61st Scottish Universities Summer School in Physics, St.Andrews (Scozia)*
**2005** *"XV Giornate di Studio sui Rivelatori", Torino*
**2004** *VII School of "Non Accelerator Astroparticle Physics", ICTP Trieste.*

***Corsi di perfezionamento certificati***

**2024** Corso di formazione RUP livello intermedio (INFN Genova)
**2023** Corso di formazione Preposti LNGS per Guida visite LNGS

**2023** Corso di formazione “gas compressi e fluidi criogenici” (INFN online)
**2023** Corso di formazione “rischio laser” (INFN online)
**2020** LabView NXG (INFN & National Instruments)
**2020** Corso RUP livello intermedio **(**INFN online**)**
**2020** R per l’analisi dei dati @INFN-CNAF Bologna
**2019** Il rumore nell’elettronica di front-end @INFN Napoli
**2015** Geant4 @GSSI INFN L’Aquilabrava
**2014** LabView Core I & II @INFN Napoli
**2003** LabView Basic @INFN Napoli

***Competenze tecniche***

Microscopi automatici, strumentazione da laboratorio (oscilloscopi, VNA, multimetri, alimentatori, moduli per acquisizione dati (CAEN, National Instruments, NIM, CAMAC, VME). Rivelatori di particelle: RPC, scintillatori, emulsioni nucleari, SiPM. Test e validazione di schede di front-end e indirizzamento di dispositivi elettronici, elettronica analogica criogenica per la lettura dei segnali dai SiPM. Trasmissione ottica. Test e caratterizzazioni di SiPM a temperatura ambiente e criogenica. Acquisizione e analisi dei dati.

***Competenze informatiche***

C/C++, R, Shell scripting, SQL, LABVIEW, EAGLE.
SISTEMI OPERATIVI WINDOWS/ LINUX
ROOT, LATEX, Microsoft OFFICE.

***Pubblicazioni ed elaborati tecnici***

Co-autore di oltre 60 pubblicazioni su rivista con referee, oltre 30 proceedings.

**Assergi 16/08/2025**

# Curriculum Vitae
# Antonino Sergi

## Personal Data

Address: Dipartimento di Fisica, University of Genova, Via Dodecaneso 33, 16146, Genova
E-mail: Antonino.Sergi@cern.ch

## Qualifications

- (2018) Italian scientific abilitation as Associate Professor
- (2005) PhD in Physics, University of Rome "La Sapienza".
  Thesis title: "Development of a dating system based on ESR method"
- (2001) Undergraduate Degree in Physics, 110/110 cum laude, University of Rome "La Sapienza". Experimental thesis in elementary particle physics within the BaBar Collaboration:
  "Measurement of $B^- \to D^{*0} l^- \bar{\nu}_l$"; this is related to $|V_{cb}|$ determination and for other $B$ studies, like $B \to \tau\nu$.

## Employment

- (2023-present) Associate Professor, University of Genova, IT
- (2020-2023) Senior Lecturer, University of Genova, IT
- (2018-2021) CERN Project associate, for LHCb Upgrade
- (2018-2020) Senior Research Fellow (EU and STFC funding), University of Birmingham, UK
- (2013-2018) STFC Ernest Rutherford Fellowship, University of Birmingham, UK
- (2010-2013) CERN Fellowship, CERN
- (2008-2010) Research contract at the Department of Physics, University of Perugia, IT
- (2007) Research contract at INFN Perugia, IT.
- (2005-2006) Collaboration contracts at the University of Rome "La Sapienza", IT

## Positions of responsibility in international collaborations

- (2024-present) LHCb Detector Electronics Task Force co-coordinator
- (2019-2023) LHCb RICH upgrade commissioning coordinator
- (2019-2020) NA62 KTAG project leader
- (2016-2020) ProtoDUNE Online data monitoring coordinator
- (2016-2020) NA62 Computing coo(2016-present)rdinator
- (2015-present) LHCb RICH upgrade DAQ integration coordinator
- (2015-2017) NA62 period Run Coordinator
- (2014-2017) NA62 TDAQ and RunControl expert
- (2014-2018) NA62 KTAG deputy project leader
- (2013-present) NA62 KTAG expert
- (2008-2020) NA62 software coordinator
- (2010-2012) NA62 Straw Spectrometer test beam coordinator
- (2009) NA62 RICH test beam coordinator
- (2007) NA62 RICH photodetectors quality assurance and test beam installation
- (2003-2006) TAUWER experiment proponent

# Research activities

In my early career, as undergraduate and PhD student, I explored a variety of research lines, **seeking a deeper understanding of fundamental physics** and a way to maximise my impact, even if I knew it would have probably kept my career from progressing for a while; I studied **theoretical physics**, while exploring experimental **particle physics in BaBar**, experimental **astroparticle physics designing and proposing my own experiment**, and exploited applied physics to acquire technical expertise.

Since I moved back to experimental particle physics, my career has been centred around the investigation of **rare phenomena in flavour physics**. I have an extensive and proven track record of leading a wide variety of development projects and data-taking experiments through personal example. I identify, push and carry out whatever needs to be done to ensure success, as well as taking physics analyses through to publications. I have long standing experience in the ultra-rare kaon decay experiment, **NA62**, which is searching for physics beyond the Standard model. Three years ago, and at the same time as maintaining my leading roles in NA62, I joined **LHCb**, initially taking on technical responsibilities for the upgrade of RICH system that make best use of my expertise from NA62, and I am now taking on physics analysis with the aid of one of my PhD students. Finally, I have joined the **DUNE/ProtoDUNE** project as part of a new initiative in the Birmingham group, where my 'hands on' skills proved invaluable to our contribution to the experiment.

- **Data analysis**
  - **LHCb**

    I studied the $K \to \pi\mu\mu$ rare decay (with PhD student Zarebski), a flavour changing neutral current decay that is heavily suppressed but well predicted in the Standard Model, and can be used also as a baseline to **search for Lepton Number Violation**. This work profited from the past and current experience on the same decay mode studied in NA62.

    I was appointed as one of the analysis reviewers, and completed the review for the measurement of the relative branching ratio $\Lambda_b \to \psi(2S)\Lambda/\Lambda_b \to J/\psi\Lambda$.
  - **NA62**

    In 2017 I supervised two master students in a search for excess in leptonic decays with three neutrinos

    In 2016 I supervised two master students in feasibility studies comparing the performance of **multivariate analysis** and cut-based analysis for rare kaon decays, as preliminary work for **search for Lepton Number Violation**, giving promising results.

    Between 2014 and 2015 I performed the analysis of the 2014 test run data to establish the rate performance of the Cedar-KTAG detector, implementing a dedicated beam simulation to investigate anomalous events observed in the data, and supervised the analysis of the 2012 test run data to establish the rate performance of the Cedar-KTAG detector equipped with half of the photodetectors and readout [366].

    Between 2009 and 2012 I performed the analysis of test beam data both for the STRAW and the RICH to establish performance limitations and to validate the front-end electronics [382], [379].

    In 2008 I refined the analysis of the RICH test beam data to understand higher order instrumental effects [384].

    In 2007-2010 I studied the $K \to e\nu\gamma$ decay (with one of my PhD students) as support for the measurement of $K_{e2}/K_{\mu 2}$, based on data collected during 2007[380]. In particular I studied the performances of the main triggering detector; I then studied the effect of its instabilities and of the detector readout on the data and on this measurement.

    In 2009 I also studied the performances of the proposed NA62 detector and the background evaluation, using data collected during special runs of NA48 (with one of my Master students) [380].

- **Detector development**
  - **LHCb**

    Upgrade of the Ring Imaging Cherenkov Detectors for the LHC higher luminosity phase.

    I was **invited as project associate at CERN**, to expand my activities to the setup of the commissioning lab and contribute to the strategy for tests, with and without beam, and developments in order to meet the schedule for the installation during the next long shutdown of the LHC.

    I was responsible for the **integration tests** of the elementary module for the new RICH system, from the photodetector to the readout. I **implemented the first functional version of the firmware for the front-end readout board** during the first integration test, pioneering the integration with the new readout and successfully setting up a system that allows to work both on integration and on development by the RICH group and the readout group. I built on the early development and **finalized the radiation-hard firmware for the front-end readout board** that will be used for data taking in Run 3.

    I am responsible for the **RICH-specific component of the firmware of the TELL40**, the newly designed readout board for LHCb, which, through **lossless data compression**, allows to exploit its full bandwidth, thus **reducing by about 30%** the required hardware and computing infrastructure. I lead the **development of the firmware and control software for irradiation tests at CHARM** of the FPGA that will be used in the front-end board, to test the suitability of the chosen hardware.

I also set up in Birmingham an **ageing test for one of the PMT models** that are now used in the current upgrade, and demonstrated the compatibility of its gain variation with the front-end electronics.

– **NA62**

* KTAG: the Cedar-KTAG is a differential Čerenkov detector (Cedar) developed and built in the '70s, refurbished with a state of the art light collection and detection system (KTAG) to identify kaons in the unseparated beam line, coping with 50MHz kaon rate while having stringent requirements of time resolution and pion contamination [366].
  Since 2013, I have worked on the Cedar-KTAG detector, after a close collaboration started in 2009. Initially I led dry runs to **test front-end and readout electronics**, including **irradiation tests** at the ISIS facility at RAL, to measure the radiation hardness of the KTAG TEL62 (common readout board for most NA62 detectors). I **commissioned all the KTAG components** in laboratory head of the final installation at CERN: the optical readout modules (light box), consisting in 48 PMTs, the light collection system and the front-end electronics. I **setup a test bench for time resolution measurement**, and equalization studies for the basic optical readout components
  In 2019 I have been **leading the study for a future upgrade**, which aims to a factor 4 improvement in time resolution and rate capability; in parallel also a redesign of the optics is being pursued, to optimize the detector for using hydrogen as radiator.
  In 2014 I was **responsible for the KTAG installation and commissioning**. The installation was successfully completed and to schedule, achieving 100% channels working, negligible noise, and exceeded the performance requirements.
  Since 2014 I have been **the main Cedar-KTAG detector expert**, responsible for the maintenance, repair and successful operation, and the deputy project leader.
* STRAW: the Straw Spectrometer is a low mass ($< 2\%X_0$) tracker designed to operate in vacuum (P$<$ $10^{-6}$mbar) with momentum and angular resolution better than 1% and 60 $\mu$rad respectively.
  In 2010 I joined the Straw Spectrometer CERN group, working on several aspects of the detector.
  **I characterized the front-end electronics**. I was **run coordinator of the test beam at the SPS**, and prepared a 64 straw prototype to validate mechanics and performance; the test was successful and I used the test data to understand the specifications and requirements, both from the mechanical and electronics point of view; I identified intrinsic limits of the detector and margins for improvement, followed by a substantial modification of part of the electronics chain.
  I made leading contributions to the **definition of the quality control procedures** and parameters for the construction of the first module of the first chamber, establishing a successful recipe that was adopted throughout. I set up of a **micromegas-based telescope as a reference tracker for tests**, both with cosmic rays and beam, in preparation for a second test beam, to validate of the final electronics.
* RICH: the RICH detector is a conventional ring imaging Cherenkov detectorequipped with about 2000 photomultipliers (PM).In 2007 a full length prototype was built and tested at the CERN SPS, equipped with 96 PMs of two different types, followed by a test in 2009 with 414 PMs.
  During 2007 I was **responsible for laboratory tests and preliminary characterization of the PMs**, and for the construction of the prototype at CERN. I then supervised the data taking, and **designed and implemented the software for raw data decoding and analysis**. Subsequently I produced the results regarding **detector performances**, including understanding of higher-order effects: time resolution of 65 ps, better than required for the experiment proposal; Cherenkov angle resolution of 50 $\mu$rad; track angular resolution of 100 $\mu$rad RMS; final determination of the photomultiplier type to be used in the final detector.
  In 2009 I was **responsible for the prototype test at CERN**. I updated the **data acquisition system**, to sustain a trigger rate of at least 10kHz with 512 channels; I integrated the **decoding and analysis software** within the NA62 reconstruction, as a starting point to reach the complete integration of simulation, acquisition and reconstruction. I conducted the first **test of a DAQ RICH system based on TELL1 board**, which integrates also trigger capability, performed with 400 PMs pulsed with a laser. I performed the first **characterization of the apparatus up to the front-end electronics**.I **designed and performed a measurement of absolute quantum efficiency** [383] of a sample of PMs, used as normalization for a single electron response curve of all PMs for inclusion the simulation. Finally, I performed **data analysis**, verifying the time resolution and measuring the $\pi/\mu$ separation, and developing an algorithm for the absolute time reconstruction. The results demonstrated that the RICH detector performances were in line with the NA62 requirements [382]
* Other detector support
  During my service as period **Run Coordinator, Run Control and TDAQ expert** I substantially contributed to the efficient and successful data taking in 2015-2017, debugging critical readout and trigger components.
  During 2014 pilot run, I gave an essential contribution to the establishment of data taking, which enabled the early performance assessments of the experiment.
  Prior to the pilot run, I made **major contributions to the tests and debugging of the common readout system** and identified critical points in the trigger and data rate sustainability; this led to changes in the system that later allowed the TDAQ to approach its design performance.

In its 2007 phase, the NA62 experiment has performed a four-months run to measure $K_{e2}/K_{\mu 2}$, as a test of Lepton Flavour Universality. I periodically took responsibility for the charged and neutral **hodoscope detectors control and maintenance**, and for the related trigger.

- **Software development**
  - **ProtoDUNE**

    I was responsible for the development and commissioning of the **online data monitoring**. I lead the development of data decoding libraries to ensure integration with the existing software and optimize workload and performance. This software has been used for the ColdBox tests, where the Anode Plane Assemblies (APAs) were connected for the first time to the full electronics chain in cryogenic conditions, to assess the quality of the components, verify the grounding scheme and investigate integration problems. I designed the architecture to ensure scalability, in order to eventually expand this project from ProtoDUNE to the Far Detector of DUNE. The implementation for ProtoDUNE was succesfully completed before the beginning of the data taking, and it has been used for monitoring the data taken both with beam and cosmic rays.
  - **NA62**

    I was the **KTAG project leader**, supervising the preparation of the current detector for the next data taking and leading developments for future upgrades. I was the overall **Computing Coordinator**; duties include the oversight of resource usage and data management. Since 2008 I was the **offline software coordinator**, following my initial work towards a usable and reliable single tool for simulation and data analysis.

    I have also been the **main software developer of simulation and analysis tools**; their use allowed the design of the experiment to be refined, and provided a transparent and flexible tool for data exploitation.

    In 2016 I developed and commissioned a data processing system, including calibration, which enabled an automatic fast data stream selection for quasi-online data quality evaluation. This allowed to progressively improve the data quality during data taking. I also designed and defined analysis software modules architecture, and developed an analysis tool to evaluate the efficiency of each Level0 trigger primitive.

    In 2015 I designed and coordinated the development of an automatic data calibration procedure, and applied it to the whole data sample collected in 2015, providing optimised resolutions for physics analysis. I also supervised performance studies for level 1 trigger algorithms based on the RICH detector.

    During 2007-2014, I did some **pioneering work in the simulation and reconstruction**, that formed the basis of my role as main developer and responsibility positions.

    I integrated the official software for the digitisation for the Spectrometer, based on my previous experimental work, and supervised the implementation of a trackless multi ring reconstruction algorithm for the RICH. I implemented event overlay for simulation, and potentially data, and the Level0 trigger simulation. I supervised the implementation of the Charged Hodoscope reconstruction and the KTAG reconstruction, based on the well established RICH one, developed by me previously. I prepared an online monitor system, and used it during a test beam of the Cedar-KTAG detector; it is now used for all detectors in NA62. I supervised the development of the simulation and reconstruction for the Liquid Kripton calorimeter. In 2008-2011 I was the main developer of the offline software for the sub-detectors Spectrometer, RICH and Inner Ring Calorimeter, implementing the simulation and digitisation for each sub-detector, and the RICH reconstruction, exploiting the test beam data as proving ground; I designed and implemented a simple framework to include the GEANT4 simulation of the full detector, the reconstruction and the tools for event display; I developed a GEANT4 simulation of the RICH detector prototypes to finalize the analysis of the 2007 test data and improve the understanding of higher order effects [384].

# Research Grants

- Ernest Rutherford Fellowship (2013): 526 kGBP
- Co-Investigator of the Birmingham Particle group Consolidated Grant (1/13 of the total) : amount 4.22 MGBP

# Teaching activities

- (2005-present) Supervisor or co-supervisor of 9 master theses and 4 PhD theses in LHCb and NA62
- (2023-present) Supervisor, reviewer or referee for undergraduate degree theses about LHCb and ATLAS, Genova
- (2020-present) Lecturer for *Year 2 Laboratory*, for the undergraduate degree course in Physics, Genova
- (2020-present) Lecturer for *Laboratory of Fundamental Interactions and Astrophysics*, for the undergraduate degree course in Physics, Genova
- (2021-2022) Lecturer for *Year 3 Laboratory*, for the undergraduate degree course in Physics, Genova

- (2015-2017) Lecturer for *Year 3 Introduction to C++ course*, Birmingham; I completely redesigned the course to put emphasis on object-oriented concepts and techniques; consequently I also redesigned the example classes and the assigned projects.
- (2015-2017) Co-supervisor of summer students (HiSPARC, air shower energy and direction reconstruction), Birmingham
- (2016) Supervisor of 2 summer students (NA62 data analysis, LHCb readout firmware study), Birmingham
- (2015, 2016) Supervisor of 2 students per year, for Year 4 particle physics projects, Birmingham
- (2014-2015) Demonstrator for *Year 2 Lab*, Birmingham
- (2014, 2016) Co-supervisor of 1 summer student (HiSPARC, installation and characterization), Birmingham
- (2013-2014) Demonstrator for *Year 1 Lab and Computing Lab*, Birmingham
- (2011) Preparation and supervision of a laboratory experience for *EDIT school at CERN*
- (2009) Post-Graduate lecture for PhD students in Physics, on *K Mesons: from CP violation to rare decays*, Perugia
- (2008-2009) Teaching assistant for academic courses of *"General Physics Part I (Mechanics and thermodynamics)"* and *"General Physics Part II (Electromagnetism)"* for the undergraduate degree course in Physics, Perugia
- (2007-2009) Advisor for 5 undergraduate degree theses about the development of the RICH of NA62, Perugia
- (2003) Laboratory assistant for the course of *"Laboratory of Nuclear and Subnuclear Physics"* for degree course in Physics, Rome
- (2001-2002) Teaching assistant for academic courses of *"General Physics Part I (Mechanics and thermodynamics)"* and *"General Physics Part II (Electromagnetism)"* for the degree course in Informatics and *"Laboratory of Systems and Signals"* for the degree course in Physics, Rome

## Professional development

- (2016) Introduction to FPGA Design using Xilinx Vivado, STFC Rutherford Appleton Laboratory
- (2010) Goal Directed Project Management course, CERN
- (2002) Attendance to Physics School "B. Touscheck", INFN, Frascati, Italy.
- (2001) Visitor at SLAC, develop a data selection algorithm for *BaBar* experiment, needed to measure the Branching Ratio of $B^- \to D^{*0} l^- \bar{\nu}_l$
- (2000) CERN summer student, develop a software for the alignment system of ATLAS muon spectrometer.

## Academic Citizenship

- (2016-present) Science and Technology Facility Council Project Peer Review Panel project reviewer
- (2016-2017) Particle Physics Group Seminars organiser, University of Birmingham
- (2015-2018) Member of the UK Particle Physics User Advisory Committee
- (July 2014) Member of the local organizing committee"XI International Conference on Hyperons, Charm and Beauty Hadrons".

## Public Engagement

- (2014-2020) Continuous support to the high-energy cosmic ray project for schools (HiSPARC), providing expertise for detector assembly and installation
- (2014-2020) School visits with our particle detectors: cloud chamber, spark chamber, cosmic telescope
- (Occasionally) Guide for visits at the NA62 experiment

## Talks at International Conferences

- **September 2022** "11th International Workshop on Ring Imaging Cherenkov Detectors (RICH2022)". Oral presentation with title "The LHCb RICH Upgrade"
- **September 2017** "The 19th International Workshop on Neutrinos from Accelerators (NUFACT2017)". Oral presentation with title "New limits on heavy neutrinos from NA62"
- **September 2016** "Hadronic Contribution to New Physics". **Invited** oral presentation with title "Status and prospects of the NA62 experiment"
- **June 2015** "The 2015 International Conference on Applications of Nuclear Techniques". Oral presentation with title "The kaon identification system in the NA62 experiment at CERN SPS"
- **July 2014** "37th International Conference of High Energy Physics". Oral presentation with title "Prospects for $K^+ \to \pi^+ \nu\overline{\nu}$ observation at CERN in NA62"
- **August 2013** "Rencontres du Vietnam, Windows on the Universe". **Invited** oral presentation with title "Latest results from the NA62 and NA48 experiments at CERN"
- **September 2012** "Physics in Collisions 2012". **Invited** oral presentation with title "Recent results from NA62"
- **June 2011** "Technology and Instrumentation in Particle Physics 2011". Intervention at the *Parallel Session: Gaseous Detectors* with an oral presentation with title "NA62 spectrometer: a low mass straw tracker"
- **October 2010** "Heavy Quarks and Leptons 2010". Intervention with an oral presentation with title "Measurement of $BR(K \to e\nu_e)/BR(K \to \mu\nu_\mu)$ in NA62"
- **March 2009** "Technology and Instrumentation in Particle Physics 2009". Intervention at the *Parallel Session: Particle Identification and Photon Detectors* with an oral presentation with title "The NA62 RICH Detector"
- **February 2009** "Lake Louise Winter Institute 2009". Intervention with an oral presentation with title "Search for New Physics in NA62"
- **June 2008** "SORMA West 2008". Intervention at the *Parallel Session: Radiation Measurements in Physics* with an oral presentation with title "NA62 RICH"
- **March 2008** "Incontri di Fisica delle Alte Energie". Intervention at the *Parallel Session: Calcolo, Rivelatori e Nuovi Acceleratori* with an oral presentation with title "Il RICH di NA62"
- **September 2003** "18th International Radiocarbon Conference". Intervention at the *poster session* with a poster: "About efficiency of copper-walled carbon dioxide filled proportional counters"

## Research Seminars

- (2016) University of Manchester: *Recent results and prospects from the NA62 experiment*
- (2016) University of Cambridge: *Recent results and prospects from the NA62 experiment*
- (2012) University of Birmingham: *Recent results from kaon physics*
- (2012) University of Liverpool: *NA62: a hermetic detector for ultra rare kaon decays*
- (2011) CERN Divisional seminar: *NA62: a hermetic detector for ultra rare kaon decays*

## Main Publications[1,2]

These results were the earliest achievable with the newly commissioned NA62, therefore I focused my effort in ensuring that sufficient statistics was available with good data quality; the performance of the detector as well as the calibration procedures I developed allowed to reach competitive results with simple and quick analyses:

- Eduardo Cortina Gil et al. "Search for heavy neutral lepton production in $K^+$ decays". In: *Phys. Lett. B* 778 (2018), pp. 137–145. DOI: 10.1016/j.physletb.2018.01.031. arXiv: 1712.00297 [hep-ex]
- Cristina Lazzeroni et al. "Search for heavy neutrinos in $K^+ \to \mu^+ \nu_\mu$ decays". In: *Phys. Lett. B* 772 (2017), pp. 712–718. DOI: 10.1016/j.physletb.2017.07.055. arXiv: 1705.07510 [hep-ex]

[1] * Corresponding author
[2] † Major contribution

The NA62 detector requirements have been driven by its main physics goal. In order to ensure the feasibility of the measurement of $K^+ \to \pi^+\nu\overline{\nu}$, I worked on detectors, simulation, reconstruction, data acquisition and trigger: I pushed the time resolution performance up to a 30% beyond its design goal, I allowed, through my simulation, several improvements in the detector layout and I played a crucial role in the commissioning of the experiment. Since any other kaon decay is a background for this signal, the detector has the potential to identify them all; this means that all those of physics interest, whether for Chiral Perturbation Theory or Lepton Flavour/Number Violation, to name two, can be studied as well, therefore offering a significant physics opportunity:

- Eduardo Cortina Gil et al. "First search for $K^+ \to \pi^+\nu\bar{\nu}$ using the decay-in-flight technique". In: *Phys. Lett. B* 791 (2019), pp. 156–166. DOI: 10.1016/j.physletb.2019.01.067. arXiv: 1811.08508 [hep-ex]
- † Eduardo Cortina Gil et al. "The Beam and detector of the NA62 experiment at CERN". in: *JINST* 12.05 (2017), P05025. DOI: 10.1088/1748-0221/12/05/P05025. arXiv: 1703.08501 [physics.ins-det]
- * Evgueni Goudzovski et al. "Development of the kaon tagging system for the NA62 experiment at CERN". in: *Nucl. Instrum. Meth. A* 801 (2015), pp. 86–94. DOI: 10.1016/j.nima.2015.08.015. arXiv: 1509.03773 [physics.ins-det]
- * B. Angelucci et al. "Pion-muon separation with a RICH prototype for the NA62 experiment". In: *Nucl. Instrum. Meth. A* 621 (2010), pp. 205–211. DOI: 10.1016/j.nima.2010.05.062
- * Francesca Bucci, Gianmaria Collazuol, and Antonino Sergi. "The NA62 RICH detector". In: *Nucl. Instrum. Meth. A* 623 (2010). Ed. by Hiroyuki Iwasaki, Takeshi K. Komatsubara, and Yasuhiro Sugimoto, pp. 327–329. DOI: 10.1016/j.nima.2010.02.237
- * Antonino Sergi. "Test beam data analysis and simulation of a RICH prototype for the NA62 experiment". In: *IEEE Trans. Nucl. Sci.* 56.3 (2009). Ed. by A. Burger et al., pp. 1405–1411. DOI: 10.1109/TNS.2009.2013854
- * G. Anzivino et al. "Construction and test of a RICH prototype for the NA62 experiment". In: *Nucl. Instrum. Meth. A* 593 (2008), pp. 314–318. DOI: 10.1016/j.nima.2008.05.029

In the early years of my career I endeavoured myself in the design of an astroparticle physics experiment, covering simulation and sensitivity studies for the conceptual design, and detector development and testing. The aim was to establish a novel technique in the detection of Ultra High Energy cosmic neutrinos, test the existing limits on the flux and related models, and develop it into an instrument for neutrino astronomy. Unfortunately it was not funded, but I believe that it would have helped to shed light on the "hot spot" observed by the Pierre Auger Observatory and Telescope Array:

- † M. Iori and A. Sergi. "An orientable time of flight detector for cosmic rays". In: *Nucl. Instrum. Meth. A* 588 (2008). Ed. by Antonio Capone et al., pp. 151–154. DOI: 10.1016/j.nima.2008.01.030. arXiv: 0712.2445 [astro-ph]
- † M. Iori et al. "Study of a detector array for upward tau air-showers". In: (Feb. 2006). arXiv: astro-ph/0602108

# Publications[3,4]


[1] R. Aaij et al. "Analysis of Neutral B-Meson Decays into Two Muons". In: *Phys. Rev. Lett.* 128.4 (2022), p. 041801. DOI: 10.1103/PhysRevLett.128.041801. arXiv: 2108.09284 [hep-ex].

[2] R. Aaij et al. "First Measurement of the Z→$\mu$+$\mu$- Angular Coefficients in the Forward Region of pp Collisions at s=13 TeV". In: *Phys. Rev. Lett.* 129.9 (2022), p. 091801. DOI: 10.1103/PhysRevLett.129.091801. arXiv: 2203.01602 [hep-ex].

[3] R. Aaij et al. "Observation of the decay $\Lambda_b^0 \to \Lambda_c^+\tau^-\overline{\nu}_\tau$". In: *Phys. Rev. Lett.* 128.19 (2022), p. 191803. DOI: 10.1103/PhysRevLett.128.191803. arXiv: 2201.03497 [hep-ex].

[4] R. Aaij et al. "Precise determination of the $B_s^0$–$\overline{B}_s^0$ oscillation frequency". In: *Nature Phys.* 18.1 (2022), pp. 1–5. DOI: 10.1038/s41567-021-01394-x. arXiv: 2104.04421 [hep-ex].

[5] R. Aaij et al. "Search for massive long-lived particles decaying semileptonically at $\sqrt{s} = 13$ TeV". In: *Eur. Phys. J. C* 82.4 (2022), p. 373. DOI: 10.1140/epjc/s10052-022-10186-3. arXiv: 2110.07293 [hep-ex].

[6] R. Aaij et al. "Searches for rare $B_s^0$ and $B^0$ decays into four muons". In: *JHEP* 03 (2022), p. 109. DOI: 10.1007/JHEP03(2022)109. arXiv: 2111.11339 [hep-ex].

[7] Roel Aaij et al. "$J/\psi$ photoproduction in Pb-Pb peripheral collisions at $\sqrt{s_{NN}}$= 5 TeV". In: *Phys. Rev. C* 105.3 (2022), p. L032201. DOI: 10.1103/PhysRevC.105.L032201. arXiv: 2108.02681 [hep-ex].

[8] Roel Aaij et al. "Angular Analysis of $D^0 \to \pi^+\pi^-\mu^+\mu^-$ and $D^0 \to K^+K^-\mu^+\mu^-$ Decays and Search for $CP$ Violation". In: *Phys. Rev. Lett.* 128.22 (2022), p. 221801. DOI: 10.1103/PhysRevLett.128.221801. arXiv: 2111.03327 [hep-ex].


[3] * Corresponding author
[4] † Major contribution

[9] Roel Aaij et al. "Centrality determination in heavy-ion collisions with the LHCb detector". In: *JINST* 17.05 (2022), P05009. DOI: 10.1088/1748-0221/17/05/P05009. arXiv: 2111.01607 [nucl-ex].

[10] Roel Aaij et al. "Constraints on the CKM angle $\gamma$ from $B^{\pm} \to Dh^{\pm}$ decays using $D \to h^{\pm}h'^{\mp}\pi^0$ final states". In: *JHEP* 07 (2022), p. 099. DOI: 10.1007/JHEP07(2022)099. arXiv: 2112.10617 [hep-ex].

[11] Roel Aaij et al. "Evidence for a new structure in the $J/\psi p$ and $J/\psi \bar{p}$ systems in $B_s^0 \to J/\psi p\bar{p}$ decays". In: *Phys. Rev. Lett.* 128.6 (2022), p. 062001. DOI: 10.1103/PhysRevLett.128.062001. arXiv: 2108.04720 [hep-ex].

[12] Roel Aaij et al. "Identification of charm jets at LHCb". In: *JINST* 17.02 (2022), P02028. DOI: 10.1088/1748-0221/17/02/P02028. arXiv: 2112.08435 [hep-ex].

[13] Roel Aaij et al. "Measurement of $\chi_{c1}(3872)$ production in proton-proton collisions at $\sqrt{s} = 8$ and 13 TeV". In: *JHEP* 01 (2022), p. 131. DOI: 10.1007/JHEP01(2022)131. arXiv: 2109.07360 [hep-ex].

[14] Roel Aaij et al. "Measurement of prompt charged-particle production in pp collisions at $\sqrt{\mathrm{s}} = 13$ TeV". In: *JHEP* 01 (2022), p. 166. DOI: 10.1007/JHEP01(2022)166. arXiv: 2107.10090 [hep-ex].

[15] Roel Aaij et al. "Measurement of the $B_s^0 \to \mu^+\mu^-$ decay properties and search for the $B^0 \to \mu^+\mu^-$ and $B_s^0 \to \mu^+\mu^-\gamma$ decays". In: *Phys. Rev. D* 105.1 (2022), p. 012010. DOI: 10.1103/PhysRevD.105.012010. arXiv: 2108.09283 [hep-ex].

[16] Roel Aaij et al. "Measurement of the charm mixing parameter $y_{CP} - y_{CP}^{K\pi}$ using two-body $D^0$ meson decays". In: *Phys. Rev. D* 105.9 (2022), p. 092013. DOI: 10.1103/PhysRevD.105.092013. arXiv: 2202.09106 [hep-ex].

[17] Roel Aaij et al. "Measurement of the lifetimes of promptly produced $\Omega_c^0$ and $\Xi_c^0$ baryons". In: *Sci. Bull.* 67.5 (2022), pp. 479–487. DOI: 10.1016/j.scib.2021.11.022. arXiv: 2109.01334 [hep-ex].

[18] Roel Aaij et al. "Measurement of the Nuclear Modification Factor and Prompt Charged Particle Production in $p-Pb$ and $pp$ Collisions at $\sqrt{s_{NN}}$=5 TeV". In: *Phys. Rev. Lett.* 128.14 (2022), p. 142004. DOI: 10.1103/PhysRevLett.128.142004. arXiv: 2108.13115 [hep-ex].

[19] Roel Aaij et al. "Measurement of the photon polarization in $\Lambda_b^0 \to \Lambda\ \gamma$ decays". In: *Phys. Rev. D* 105.5 (2022), p. L051104. DOI: 10.1103/PhysRevD.105.L051104. arXiv: 2111.10194 [hep-ex].

[20] Roel Aaij et al. "Measurement of the W boson mass". In: *JHEP* 01 (2022), p. 036. DOI: 10.1007/JHEP01(2022)036. arXiv: 2109.01113 [hep-ex].

[21] Roel Aaij et al. "Observation of $\Lambda_b^0 \to D^+p\pi^-\pi^-$ and $\Lambda_b^0 \to D^{*+}p\pi^-\pi^-$ decays". In: *JHEP* 03 (2022), p. 153. DOI: 10.1007/JHEP03(2022)153. arXiv: 2112.02013 [hep-ex].

[22] Roel Aaij et al. "Observation of an exotic narrow doubly charmed tetraquark". In: *Nature Phys.* 18.7 (2022), pp. 751–754. DOI: 10.1038/s41567-022-01614-y. arXiv: 2109.01038 [hep-ex].

[23] Roel Aaij et al. "Observation of the $B^0 \to \overline{D}^{*0}K^+\pi^-$ and $B_s^0 \to \overline{D}^{*0}K^-\pi^+$ decays". In: *Phys. Rev. D* 105.7 (2022), p. 072005. DOI: 10.1103/PhysRevD.105.072005. arXiv: 2112.11428 [hep-ex].

[24] Roel Aaij et al. "Observation of the doubly charmed baryon decay $\Xi_{cc}^{++} \to \Xi_c'^{+}\pi^+$". In: *JHEP* 05 (2022), p. 038. DOI: 10.1007/JHEP05(2022)038. arXiv: 2202.05648 [hep-ex].

[25] Roel Aaij et al. "Observation of Two New Excited $\Xi_b^0$ States Decaying to $\Lambda_b^0K^-\pi^+$". In: *Phys. Rev. Lett.* 128.16 (2022), p. 162001. DOI: 10.1103/PhysRevLett.128.162001. arXiv: 2110.04497 [hep-ex].

[26] Roel Aaij et al. "Search for the radiative $\Xi_b^- \to \Xi^-\gamma$ decay". In: *JHEP* 01 (2022), p. 069. DOI: 10.1007/JHEP01(2022)069. arXiv: 2108.07678 [hep-ex].

[27] Roel Aaij et al. "Study of $\mathrm{B_c^+}$ decays to charmonia and three light hadrons". In: *JHEP* 01 (2022), p. 065. DOI: 10.1007/JHEP01(2022)065. arXiv: 2111.03001 [hep-ex].

[28] Roel Aaij et al. "Study of coherent $J/\psi$ production in lead-lead collisions at $\sqrt{\mathrm{s_{NN}}} = 5$ TeV". In: *JHEP* 07 (2022), p. 117. DOI: 10.1007/JHEP07(2022)117. arXiv: 2107.03223 [hep-ex].

[29] Roel Aaij et al. "Study of the doubly charmed tetraquark $T_{cc}^+$". In: *Nature Commun.* 13.1 (2022), p. 3351. DOI: 10.1038/s41467-022-30206-w. arXiv: 2109.01056 [hep-ex].

[30] Roel Aaij et al. "Study of Z Bosons Produced in Association with Charm in the Forward Region". In: *Phys. Rev. Lett.* 128.8 (2022), p. 082001. DOI: 10.1103/PhysRevLett.128.082001. arXiv: 2109.08084 [hep-ex].

[31] Roel Aaij et al. "Test of lepton universality in beauty-quark decays". In: *Nature Phys.* 18.3 (2022), pp. 277–282. DOI: 10.1038/s41567-021-01478-8. arXiv: 2103.11769 [hep-ex].

[32] Roel Aaij et al. "Tests of lepton universality using $B^0 \to K_S^0\ell^+\ell^-$ and $B^+ \to K^{*+}\ell^+\ell^-$ decays". In: *Phys. Rev. Lett.* 128.19 (2022), p. 191802. DOI: 10.1103/PhysRevLett.128.191802. arXiv: 2110.09501 [hep-ex].

[33] R. Aaij et al. "First measurement of the *CP*-violating phase in $B_s^0 \to J/\psi(\to e^+e^-)\phi$ decays". In: *Eur. Phys. J. C* 81.11 (2021), p. 1026. DOI: 10.1140/epjc/s10052-021-09711-7. arXiv: 2105.14738 [hep-ex].

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[35] R. Aaij et al. "Measurement of prompt-production cross-section ratio $\sigma(\chi_{c2})/\sigma(\chi_{c1})$ in $p$Pb collisions at $\sqrt{s_{NN}} = 8.16$ TeV". In: *Phys. Rev. C* 103 (2021), p. 064905. DOI: 10.1103/PhysRevC.103.064905. arXiv: 2103.07349 [hep-ex].

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[37] R. Aaij et al. "Measurement of the CKM angle $\gamma$ in $B^\pm \to DK^\pm$ and $B^\pm \to D\pi^\pm$ decays with $D \to K^0_S h^+ h^-$". In: *JHEP* 02 (2021), p. 169. DOI: 10.1007/JHEP02(2021)169. arXiv: 2010.08483 [hep-ex].

[38] R. Aaij et al. "Search for long-lived particles decaying to $e^\pm \mu^\mp \nu$". In: *Eur. Phys. J. C* 81.3 (2021), p. 261. DOI: 10.1140/epjc/s10052-021-08994-0. arXiv: 2012.02696 [hep-ex].

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