

DR. ANATAEL CABRERA SERRA

Spanish/European. 30th March 1977

ORCID - INSPIRE-HEP - GOOGLE-SCHOLAR

Experimental particle physicist, specialised in neutrino sciences since DPHIL at the University of Oxford (2005-2001; UK). Scientist staff (CNRS since 2007; no teaching duties), currently affiliated with the IJCLAB and former director (2014-2021) the UNDERGROUND LNCA at the EDF Chooz Nuclear Reactor (France). I invented LIQUIDO (2012) and led major operations mainly in **DOUBLE CHOOZ** but also **JUNO** experiments where I invented today's detector **DUAL CALORIMETRY SYSTEM**. Throughout my career, I acquired recognised expertise in neutrino physics, detection (design and optimisation), instrumentation hardware (optical readout, electronics and scintillation systems), simulations, and high-precision (absolute and relative) physics analyses, including the complex multi-detector setups for permille systematics control. I serve as (co)spokesperson of the **SUPERCHOOZ** (in exploration since 2022; EDF-CNRS), **CLOUD** (since 2023; 11 countries), **ANTIMATTER-OTECH** (since 2020; 5 countries with nuclear industry; EIC-UKRI funded), **LPET-OTECH** (since 2021; CNRS-INSERM; ANR funded), **DOUBLE CHOOZ** (since 2017; 7 countries), and **LIQUIDO** (since 2016; 11 countries). I created most of the scientific international consortia and collaborations I worked on in the context of fundamental science and innovation, including the former **JUNO-SPMT** (8 countries). Academically, I am also active in mentoring (2 Marie Curie Intra-European fellows and 14 postdocs), supervision (14 PhD theses), scientific dissemination (including outreach), and tight international collaborations with institutions in the Americas, Asia and Europe.

Today's work is structured into three main scientific threads. First, **high precision neutrino physics** focused on measurements of θ_{13} (DOUBLE CHOOZ, SUPERCHOOZ), θ_{12} , δm^2 , Δm^2 (JUNO, SUPERCHOOZ), *Mass Ordering* (mainly JUNO), including **new physics searches** via the violation of fundamental symmetries such as Unitarity or CPT (CLOUD, SUPERCHOOZ). Second, the **exploration of novel scientific opportunities with LIQUIDO** in neutrino (sun, reactors, accelerators, geoneutrinos, supernovae, etc.) and rare decays ($\beta\beta$, proton, etc.) physics. Third, the development of OTECH projects on potential **innovation for medical and nuclear (EDF) industries** and cooperation with instrumentation-specialised industry (KURARAY).

ACADEMIC POSITIONS & AFFILIATIONS

since 2007 **CNRS SCIENTIST** (France)
 since 2020 Scientist. Irene Joliot-Curie Laboratory. Université Paris-Saclay (Orsay, France)
 2021-2014 Director. LNCA Underground Laboratory. CNRS/CEA (Chooz, France)
 2019-2018 Scientist. Linear Accelerator Laboratory. Université Paris-Saclay (Orsay, France)
 2018-2007 Scientist. AstroParticle & Cosmology Laboratory. Université Diderot (Paris, France)
 2008-2006 **MARIE CURIE INTRA-EUROPEAN FELLOW**. AstroParticle & Cosmology Laboratory. CNRS (Paris, France)
 2006-2005 **POSTDOC RESEARCHER**. Collège de France. CNRS (Paris, France)

EDUCATION & DEGREES

2005-2001 **DPHIL/PHD IN PARTICLE PHYSICS**. University of Oxford (UK). MINOS experiment (FNAL, US)
 2004 Marie Curie Training Fellow. European Center of Theoretical Physics (Trento, Italy)
 2001-1998 **BSc PHYSICS**, High Energy Astrophysics & Instrumentation (1st Class). University of Leeds (UK)
 2001 Researcher Student (LHCb). CERN (Switzerland)
 2000 CERN Summer Research Student (Delphi/LHCb). CERN (Switzerland)

SCIENTIFIC RESPONSIBILITIES & MANAGEMENT

INTERNATIONAL RESPONSIBILITIES (time dedication >75%).

since 2023 Co-Spokesperson, **CLOUD** International Collaboration [20 institutions in 11 countries]*
 since 2022 Spokesperson, **SUPERCHOOZ PATHFINDER** Collaboration [CNRS and EDF]*
 since 2021 Spokesperson, **LPET-OTECH** Collaboration [5 institutions between CNRS & INSERM]*
 since 2020 Coordinator/Leadership, **ANTIMATTER-OTECH** Consortium [6 academic institutions and EDF industry]*
 since 2020 Leadership, **JUNO'S DUAL-CALORIMETRY**. Task Force within the JUNO International Collaboration
 since 2017 Spokesperson, **DOUBLE CHOOZ**. International Collaboration [26 institutions in 7 countries]*
 since 2016 Co-Spokesperson, **LIQUIDO**. International Collaboration [24 institutions in 11 countries]*

NATIONAL RESPONSIBILITIES: CNRS COORDINATION

since 2021 **ANTIMATTER-OTECH/CLOUD & SUPERCHOOZ** Projects*: 3 national laboratories
 since 2022 **LPET-OTECH** Project*: 4 national laboratories
 2019-2018 **JUNO** Experiment*: 5 national laboratories
 since 2018 **LIQUIDO** Project*: 5 national laboratories
 2023-2014 **DOUBLE CHOOZ** Experiment*: 4 national laboratories
 2021-2014 **LNCA UNDERGROUND LABORATORY*** CNRS/CEA/EDF. CHOOZ NUCLEAR REACTOR PLANT (France)

PREVIOUS COORDINATION ROLES ENTRUSTED BY THE **JUNO** INTERNATIONAL COLLABORATION

2020-2015 DUAL-CALORIMETRY & SMALL-PMT (from conception) Detector Systems
 2015-2013 Electronics & Online (including conception)

PREVIOUS COORDINATION ROLES ENTRUSTED BY THE **DOUBLE CHOOZ** INTERNATIONAL COLLABORATION

2018-2009 PHYSICS ANALYSIS: Full Collaboration (2018-2015) & European Analysis (2012-2009)
 2015-2011 ENERGY RECONSTRUCTION & DETECTION SYSTEMATICS
 2018-2007 DETECTORS COMMISSIONING & OPERATIONS (2018-2009) & ELECTRONICS-DAQ-ONLINE (2015-2007)
 2013-2005 Data Analysis Framework (DOGS; 2013-2006) & Detector Simulation Framework (ROSS; 2011-2005)

SCIENTIFIC ORGANISATION, COMMITTEES & EVENTS

since 2015 Funding Agencies Review: Canada (NSERC), Spain & Switzerland
 Peer Review of Publications: Nature, JHEP, JINST, NIM-A (typically ~1 publication per year)
 2020-2018 Host & Scientific Organising Committee. National $\beta\beta$ Physics Workshop (France)
 2018 Scientific Organising Committee: "Multi-PMT Technology for Large Neutrino Detector" Workshop
 2020-2015 Reactor- θ_{13} Group (Daya Bay, Double Chooz, RENO). Steering Committee
 2013 Convener: Neutrino Physics. Conference EPS-HEP Neutrino (Sweden)
 2010 Convener: Low Energy Neutrino Physics. Conference Neutrino Oscillation Workshop (Italy)

ACADEMIC HOSTING OF VISITING PROFESSORS

- 2023-2022 Sabbatical of Prof. M. Chen (Queen's University, Canada) at IJCLab (France)
Novel opaque scintillators, new techniques for cosmogenic background mitigation, solar and $\beta\beta$ physics with LiquidO
Coordination*: **EMILIE DU CHÂTELET**, Univeristé Paris-Saclay (Paris)
- 2021-2020 Sabbatical of Prof. H. Nunokawa (PUC University, Brasil) at IJCLab (France)
Phenomenological programmes of SuperChooz, CLOUD, and LiquidO and JUNO's mass ordering potential
- 2018-2016 Sabbatical of Prof. F. Suekane (Tohoku University, Japan) at APC (France)
First LiquidO prototype designs, physics potential with LiquidO and collaboration (co-spokesperson)
Coordination*: **BLAISE PASCAL CHAIRE**, École Normal Supérieur (Paris)

ACADEMIC/SCIENTIFIC MENTORING

16 RESEARCHERS: 2 Marie Curie Intra-European Fellows and 14 Post-Doc Researchers (including 7 co-mentoring)

ACADEMIC SUPERVISION

Context: Either directly or through effective supervision, leading to the main thesis results.

14 PHD STUDENTS (2 on-going). Many co-supervisions with institutions in Brasil, China, France, Japan, Russia, US

11 MASTER STUDENTS' FINAL YEAR RESEARCH from institutions in China, France, Japan, Spain, US

ACADEMIC TRAINING

Context: Minimal teaching activities due to other many responsibilities – no duties as CNRS scientist.

Specialised Research Schools: VSON (2022), VSON (2021), IMFP (2021), ISAPP School (2018)

~10 Lectures for PhD Research Courses – Université de Paris-Sorbonne, etc.

SCIENTIFIC/INNOVATION COLLABORATIONS/CONSORTIA & ROLES

- since 2023 Leadership Cooperation with KURARAY (Japan): Innovation (co-development of new fibre technology)
- since 2017 Leadership Cooperation with EDF (France): Innovation (reactor monitoring instrumentation) & Research
- since 2023 Co-Leadership* (Foundation): **CLOUD** International Collaboration (~80 scientists, 11 countries)
- since 2022 Leadership* (Foundation): **SUPERCHOOZ PATHFINDER**. CNRS & EDF Collaboration (France)
- since 2020 Leadership* (Foundation): **LPET-OTECH** Consortium (~20 scientists, France)
- since 2020 Leadership* (Foundation): **ANTIMATTER-OTECH** Consortium (~50 scientists in Europe and **EDF**)
- since 2016 Co-Leadership* (Foundation): **LIQUIDO** International Collaboration (~100 scientists, 11 countries)
- since 2013 Coordination(s)*: **JUNO** International Collaboration (~700 scientists, 18 countries)
- since 2005 Leadership*/Coordination(s): **DOUBLE CHOOZ** International Collaboration (~100 scientists, 7 countries)
- 2022-2018 Coordinator*: CNRS-Japan (Tohoku University) Particle Physics Laboratory. Context: LiquidO
- 2022-2015 Coordinator*: CNRS-South Korea (SNU) Particle Physics Laboratory. Context: Reactor Neutrinos.
- 2020-2014 Coordinator*: CNRS-China (IHEP) Particle Physics Laboratory Project: JUNO
- 2018-2014 Coordinator*: CNRS-Russia (Kurchatov Institute) Particle Physics Laboratory. Context: Double Chooz
- 2015-2013 Coordinator*: CNRS-Japan (KEK Laboratory) Particle Physics Laboratory. Context: Double Chooz.

SCIENTIFIC GRANTS, PUBLICATIONS, COMMUNICATION & OUTREACH

- 2024 Funding **ANR (DUALCALOPERMILLEJUNO 0.58M€)**. High Precision Neutrino Research in JUNO
- 2023 Funding **EU-HOP'ON (SHINE 1.3M€)**. Innovation on Novel Scintillation Formulations & Optical Fibre Readout
- 2021 Funding **EIC-PATHFINDER (ANTIMATTER-OTECH 5.7M€)**. Innovation on Nuclear Reactor Industry
- 2021 Funding **ANR (TEP-OTECH 0.65M€)**. Innovation on Medical Physics & Industry
- 2020 Funding **ERC-SyG** ("A" & Interviewed: not obtained). Fundamental Neutrino Physics
- 2015 Funding **ERC-CoG** ("A" & Interviewed: not obtained). LiquidO-based R&D on Fundamental Neutrino Physics
- since 2014 Funding **CNRS NATIONAL: LiquidO, Double Chooz, JUNO & LNCA laboratory**
10 First Results/Project Releases / colloquia (3 CERN, 2 FNAL, 3 KEK, 1 IHEP) / 3 talks Neutrino Conference
>90 Publications (mostly peer reviewed). Further details in **ORCID**
>800 Collaboration Internal Documents in Double Chooz, JUNO, LiquidO, CLOUD/AntiMatterOTech, etc.
≥150 National / International Conference and Workshops
≥100 International Conferences Contributions (Talks & Posters)
≥100 Seminars. Many Institutions in the Americas, Asia and Europe
Up to ~10 outreach science articles – 1 Derived Radio Program
- 2007-2009 Outreach Project in Paris-based High Schools (cosmic rays detector) – Scientist Responsible

EXPERIMENTAL EXPERIENCE & EXPERTISE HIGHLIGHTS

- since 2020 Conceptual Design (testing): **NOVEL OPTICAL FIBRE TECHNOLOGY** – co-development with Kuraray (Japan)
- since 2018 Conceptual Design & First Sensitivity: **GeV LIQUIDO DETECTOR/EXPERIMENT**
- since 2016 Conceptual Design & First Sensitivity: **MULTI-TON $\beta\beta$ LIQUIDO DETECTOR/EXPERIMENT**
- since 2014 Conceptual Design (testing): **NOVEL OPAQUE SCINTILLATOR(S) TECHNOLOGY – TIIQ collaboration (2023)**
- 2023-2022 Conceptual Design & First Sensitivity: **CLOUD-III EXPERIMENT** (under exploration)
- 2023-2020 Conceptual Design & First Sensitivity: **CLOUD-II EXPERIMENT** (under exploration)
- 2020 Conceptual Design & First Sensitivity: **ANTIMATTER-OTECH PROJECT / CLOUD-I** (under construction)
- 2020-2019 Conceptual Design & First Sensitivity: **LPET-OTECH PROJECT** (under exploration)
- 2019-2017 Conceptual Design & First Sensitivity: **SUPERCHOOZ EXPERIMENT** (under exploration)
- 2020-2015 Conceptual Design: **ASIC BATTERY ELECTRONICS CARD**. Context: **JUNO**
- 2019-2015 Conceptual Design: **LIQUIDO'S PROTOTYPE READOUT SYSTEM** (μ SiC, SiC, SiBB cards)
- 2016-2015 Conception, Design: **JUNO's PMT Occulting Light Concentrator** (not retained)
- 2022-2014 Conception, Design (TDR level) & Construction: **JUNO SPMT SYSTEM** (25,000 3" PMT with full readout)
- 2020-2014 Invention/Conception, Design & Implementation: **JUNO DUAL CALORIMETRY DETECTOR**
- 2015-2014 Conception & Design (CDR level): **JUNO LPMT READOUT** (FADC system digitisation expertise)
- 2020-2012 Invention/Conception, Design & Prototyping: **LIQUIDO DETECTION**
- 2018-2008 Construction, Commissioning & Running (10 years): **DOUBLE CHOOZ DETECTOR(S)**
- 2012-2007 Design, Commissioning & Running: **DOUBLE CHOOZ FADC READOUT & DAQ/ONLINE**
- 2009-2005 Conception & Implementation: **DOUBLE CHOOZ ANALYSIS FRAMEWORK & READOUT SIMULATION**
- since 2003 Expertise in **MULTI-DETECTOR SYSTEMATIC CONTROL** (MINOS, Double Chooz, SuperChooz, JUNO \oplus TAO)

SCIENTIFIC RESULTS DISSEMINATION HIGHLIGHTS

Non-exhaustive list of the most recent and relevant latest official results releases (presentations, publications, etc.), including publications under active and ongoing preparation (typically in collaboration).

reviewing	[1] LIQUIDO COLLAB. <u>Stochastic Confirmant Experimental Demonstration</u>
writup	[2] LIQUIDO COLLAB. <u>GeV-scale Neutrino Detection & Methodology</u>
writup	[3] A. Cabrera & H. Nunokawa <i>et al.</i> <u>Unitarity Violation Explorations in Neutrino Physics</u> (phenomenology)
writup	[4] LIQUIDO COLLAB. <u>LiquidO-based Potential of $\beta\beta$-Decay Explorations</u>
writup	[5] SUPERCHOOZ COLLAB. <u>First Experiment Publication</u>
preparation	[6] A. Cabrera & M. Chen <i>et al.</i> <u>Cosmogenic Background in $\beta\beta$-Decay Explorations</u>
preparation	[7] Small Author List. <u>New Optical Fibre Technology & Methodology</u>
2024 [Ref]	[8] A. Cabrera. OPAQUE SCINTILLATION. ECFA-DRD Workshop, CERN. <u>First Review on Topic</u>
2023 [Ref]	[9] A. Cabrera & Y. Han <i>et al.</i> <u>Neutrino Detector Dual Calorimetry Conception</u>
2023 [Ref]	[10] A. Cabrera & CLOUD COLLAB. <u>Neutrino Telescope Conference (Venice): First Release of the Experiment</u>
2023 [Ref]	[11] LIQUIDO COLLAB (A. Cabrera <i>et al.</i>). <u>Novel LiquidO-based Potassium Geoneutrino Methodology</u>
2023 [Ref]	[12] A. Cabrera & LIQUIDO COLLAB. <u>FNAL Neutrino Colloquium: Review Project Status & Latest Developments</u>
2022 [Ref]	[13] A. Cabrera. CERN EP-Colloquium: <u>First Experiment Release of SUPERCHOOZ</u>
2022 [Ref]	[14] A. Cabrera & LPET-OTECH COLLAB. <u>IEEE Conference (Milano): First Experiment Release</u>
2022 [Ref]	[15] A. Cabrera & LIQUIDO COLLAB. <u>Neutrino Conference (Soeul): Proof of LiquidO's Detection</u>
2022 [Ref]	[16] JUNO COLLAB (A. Abusleme <i>et al.</i>). <u>Chinese Physics C: Neutrino Oscillations Per mille Precision Sensitivity</u>
2021 [Ref]	[17] JUNO COLLAB (A. Abusleme <i>et al.</i>). <u>JHEP: JUNO's Dual Calorimetry Calibration</u>
2021 [Ref]	[18] LIQUIDO COLLAB (A. Cabrera <i>et al.</i>). <u>Nature Communications Physics: First LiquidO Publication</u>
2020 [Ref]	[19] A. Cabrera <i>et al.</i> <u>Nature Physics Reports: Early Discovery Potential of Neutrino Mass Ordering</u> (phenomenology)
2020 [Ref]	[20] DOUBLE CHOOZ COLLAB (H. de Kerret <i>et al.</i>). <u>Nature Physics: First Multi-Detector Results</u>
2019 [Ref]	[21] P. Ochoa-Ricoux <i>et al.</i> <u>DUNE Module Opportunity Workshop. BNL (US) First Release LIQUIDO GeV-Physics</u>
2019 [Ref]	[22] A. Cabrera & LIQUIDO COLLAB. <u>CERN Detector Seminar: First LiquidO Official Release</u>
2018 [Ref]	[23] A. Cabrera & LIQUIDO COLLAB. <u>NOW Conference (Ostuni): First LiquidO-$\beta\beta$ Pre-Release</u>
2016 [Ref]	[24] A. Cabrera & DOUBLE CHOOZ COLLAB. <u>CERN EP-Colloquium: First Multi-Detector Results Release</u>
2016 [Ref]	[25] A. Cabrera & DOUBLE CHOOZ COLLAB. <u>Neutrino Conference (London): First Multi-Detector Release</u>
2016 [Ref]	[26] A. Cabrera. <u>FROST Workshop (FNAL): First Release of JUNO's Dual Calorimetry Detector Design</u>
2012 [Ref]	[27] DOUBLE CHOOZ COLLAB (Abe Y. <i>et al.</i>). <u>Physics Review Letters: First Positive Evidence of θ_{13}</u>
2010 [Ref]	[28] A. Cabrera & DOUBLE CHOOZ COLLAB. <u>Neutrino Conference (Athens) First Detector Data Release</u>

LANGUAGES [CEFR]: Spanish (native,C2), English (C2), French (C2), Italian (fluent), Portuguese (basic)

* Indicates the responsibilities/roles involving the management of resources (personnel and funding).