

MARIA TERESA DOVA

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Instituto de Física La Plata (CONICET – UNLP) - Departamento de Física, Facultad de Ciencias Exactas, Universidad Nacional de La Plata (UNLP)

THE ATLAS EXPERIMENT AT THE LHC: BIG SCIENCE, NEW TECHNOLOGIES AND THE HUNT FOR NEW PHYSICS

Abstract: The ATLAS experiment at the CERN Large Hadron Collider (LHC) is one of the world's largest and most advanced scientific instruments, representing the paradigm of modern Big Science. It exemplifies how international collaboration and the interplay between fundamental research and technological innovation converge in the pursuit of knowledge. The discovery of the Higgs boson confirmed the final missing piece of the Standard Model, yet several important questions remain unanswered. Many proposed extensions aiming to address these limitations predict new particles or interactions that could be discovered at the LHC. This talk will highlight recent ATLAS results at the energy frontier, with emphasis on searches in the Higgs sector, dark matter candidates and other possible new phenomena. We will also look ahead to the High-Luminosity LHC (HL-LHC), which will deliver a dramatic increase in collisions and drive new developments in detector electronics and real-time data processing. Local contributions to these technological challenges will be briefly outlined.

About the speaker: María Teresa Dova holds a PhD in Physics (UNLP, 1988). She is Full Professor at the National University of La Plata (UNLP) and Senior Researcher at CONICET. She is the Director of the Institute of Physics La Plata (CONICET-UNLP), and was the former Chair of the Pierre Auger Observatory Collaboration Board (2001–2006). She led Argentina's participation in the ATLAS experiment at CERN. Her recent research contributions include the search and discovery of the Higgs boson, the determination of its properties, and the exploration of New Physics—such as dark matter and supersymmetry. She has authored hundreds of publications within the L3, ATLAS, and Auger collaborations, and has supervised more than 20 PhD and Master's theses. Deeply committed to science communication, she has spoken at TEDx events and is the author of *Qué es el bosón de Higgs?* (Paidós). She served on the Editorial Board of *Journal of Physics G* (IOP, UK, 2008–2014).

Her distinctions include the John Simon Guggenheim Fellowship (2002), the SCOPUS ELSEVIER-Secyt Prize (2007), Outstanding Woman of the Year (National Congress of Argentina, 2008), Distinguished Citizen of Buenos Aires Province (2015), The World Academy of Science (TWAS)-UNESCO Physics Prize (2022), the Konex Prize in Science and

Technology (2023), and the 2025 L'Oréal-UNESCO International Award For Women in Science, for Latin America and the Caribbean.
