

MOROCCAN DAY OF QUANTUM INFORMATION AND QUANTUM TECHNOLOGIES

CASABLANCA 25-26 December 2024

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## Morocco's Contributions to High-Energy Physics and Beyond: From Fundamental Discoveries to Real-World Applications

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### **Abstract :**

Morocco's growing contributions to High-Energy Physics (HEP), with a focus on our involvement in major international collaborations such as ATLAS at CERN, KM3NeT, and ANTARES. These endeavors showcase the country's active participation in cutting-edge research aimed at probing fundamental questions about the universe.

In the ATLAS experiment, our team has contributed to the analysis of proton-proton collisions, advancing the understanding of Standard Model processes and beyond, while exploring novel detector technologies and calibration techniques. In KM3NeT and ANTARES, we have been instrumental in neutrino detection, contributing to the exploration of astrophysical neutrino sources and advancing neutrino-based multimessenger astronomy.

Furthermore, we emphasize the development of HEP-inspired applications beyond fundamental research. These include advancements in machine learning techniques derived from HEP data analysis, their integration into AI-driven projects such as AI4TB, and the application of detection and imaging technologies in medical physics and radiation safety.