

EXPERIMENTAL AND DATA ANALYSIS TECHNIQUES FOR COSMIC RAY AND RADIATION MEASUREMENT

Advances in nuclear science and technology continue to expand the role of radiation and particle detection in areas ranging from fundamental physics to environmental monitoring and nuclear safety. Accurate measurement and interpretation of radiation and cosmic ray events require improved experimental techniques combined with sophisticated data analysis approaches. This work presents a study of modern experimental and computational methods used for the detection and analysis of cosmic rays and ionizing radiation in laboratory and environmental conditions.

The study focuses on detector-based measurement systems designed to record high-energy particle interactions and radiation events. Emphasis is placed on signal processing, background noise reduction, and statistical analysis methods that enhance the reliability and precision of experimental results. In addition, computational tools and data analysis frameworks are applied to identify patterns within large datasets generated by radiation detection systems. These approaches allow for improved characterization of cosmic ray interactions and environmental radiation levels.

The results demonstrate how integrated experimental and analytical techniques can significantly improve measurement accuracy, detection sensitivity, and data interpretation in nuclear science research. Such advancements contribute to broader applications in nuclear safety, environmental radiation monitoring, and health physics, while also supporting the development of future experimental programmes in nuclear and particle physics.

This work highlights the importance of interdisciplinary collaboration between experimental physics, data science, and nuclear technology in addressing emerging challenges in radiation detection and nuclear research infrastructures.

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