

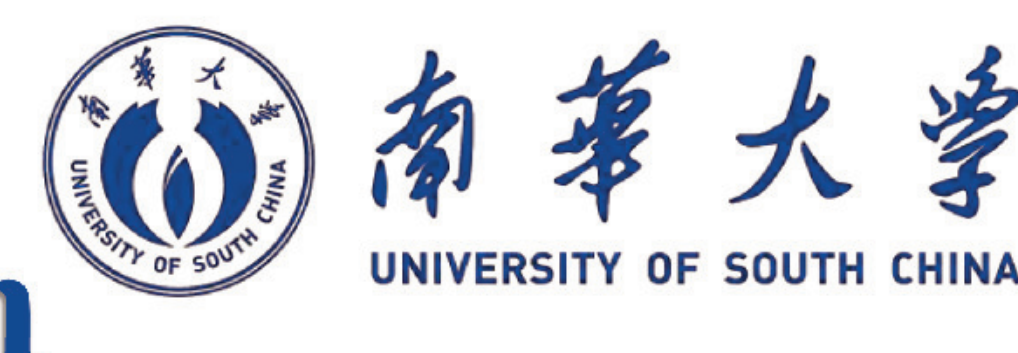


北京大学
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Research on a novel cosmic ray muon imaging system based on plastic scintillation



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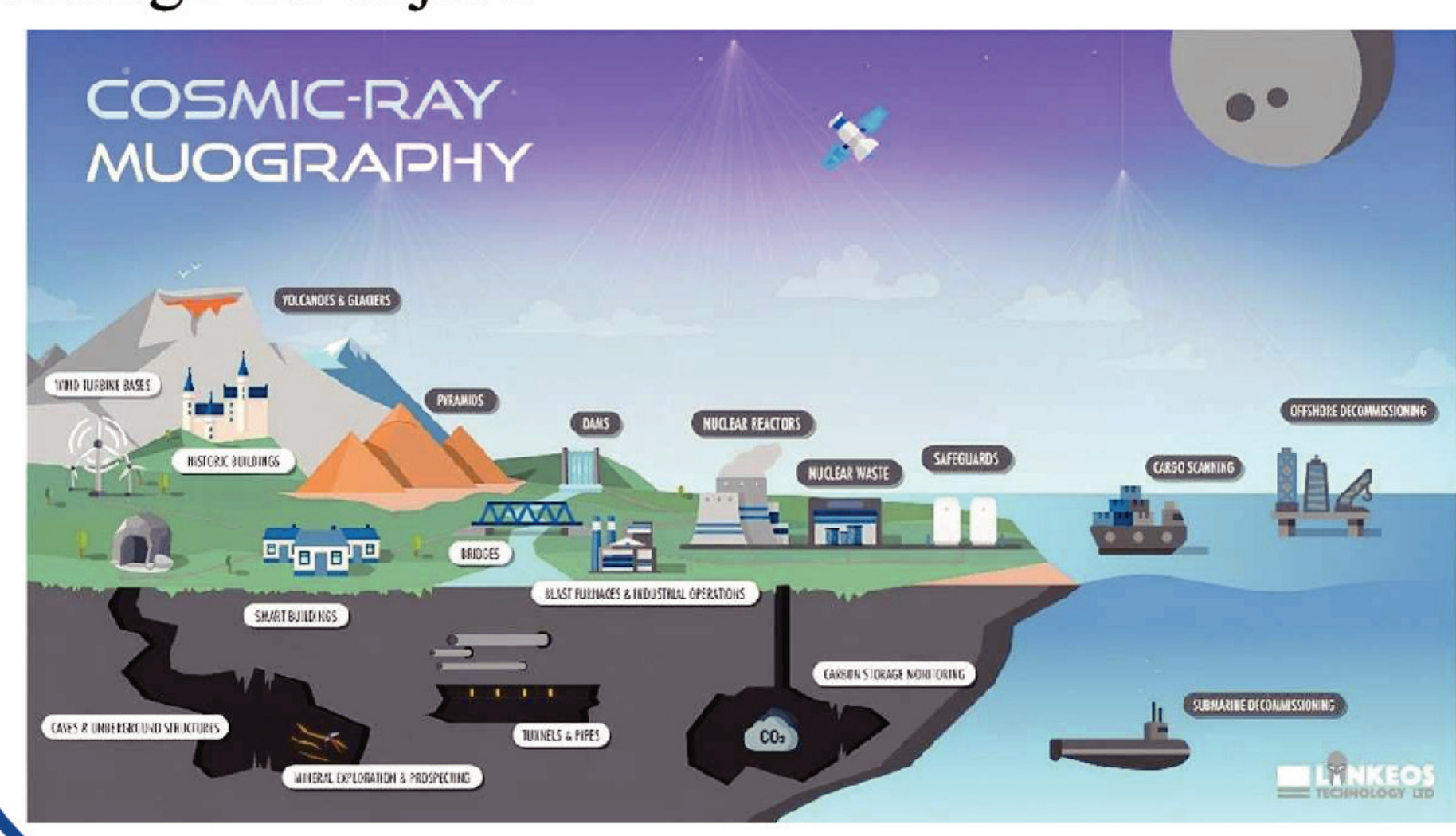


Abstract

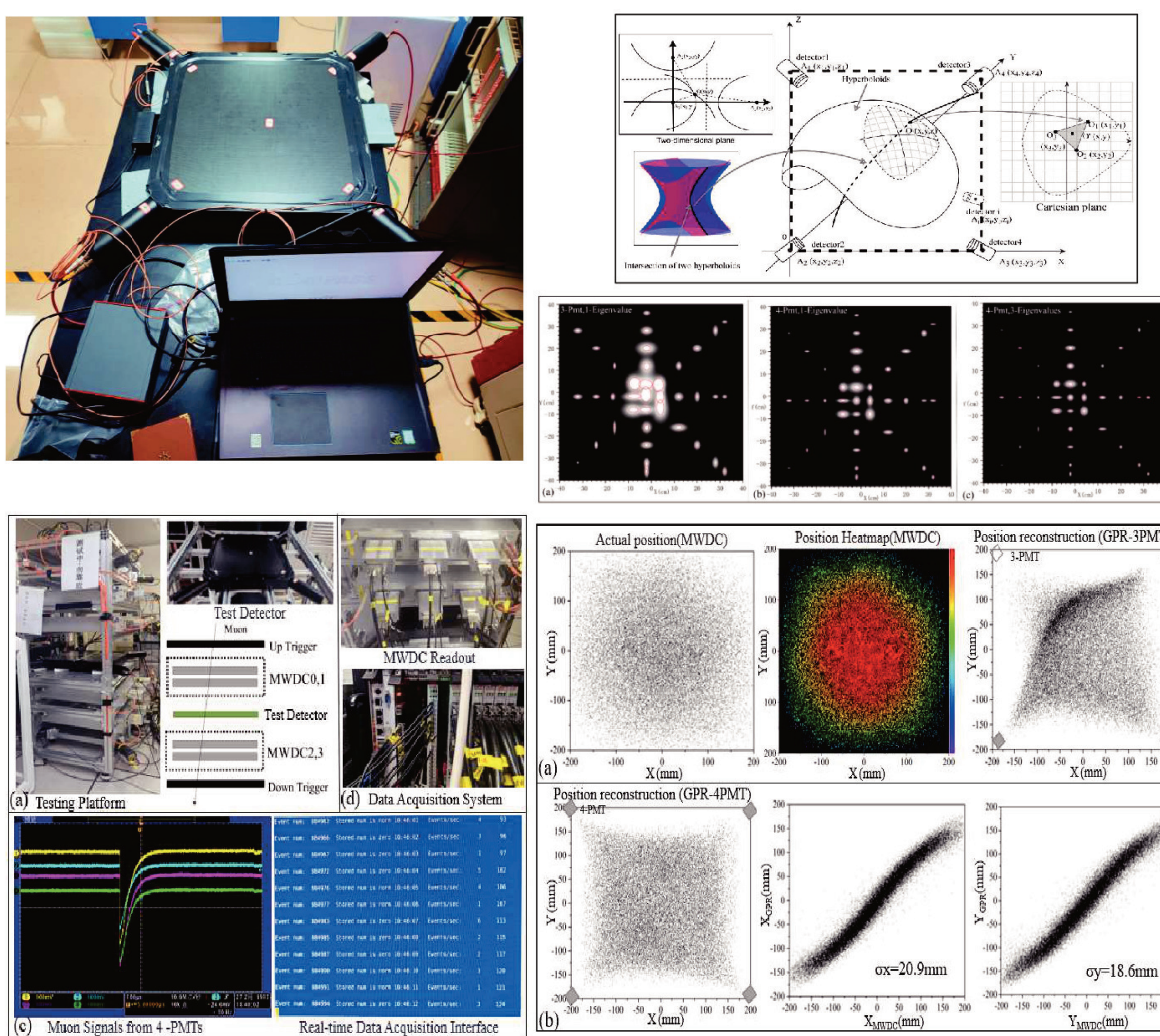
This report presents two innovative muon detection systems developed by the University of South China for transmission imaging technology. The first system introduces a muon detector employing large-area plastic scintillator four corner coupling PMT for pit exploration methods. The second approach involves the design of a compact muon imaging system utilizing plastic scintillator strips coupled with SiPM, tailored specifically for drilling methods enabling deep underground exploration. Simultaneously, a spatial angle muon positioning algorithm suitable for this system was developed. Furthermore, a novel density inversion algorithm was devised for mineral resource exploration, leveraging the capabilities of the two distinct muon imaging systems. Integration of muon imaging data with gravity data enabled the coupling of multiple imaging technologies for enhanced mineral resource exploration. The outcomes of this project are expected to introduce groundbreaking technologies and equipment for imaging the exploration of deep precious metal mineral resources.

Introduction

The muon transmission imaging technique achieves non-destructive imaging of large-scale objects by measuring the flux difference and angular distribution of muons before and after passing through the object.

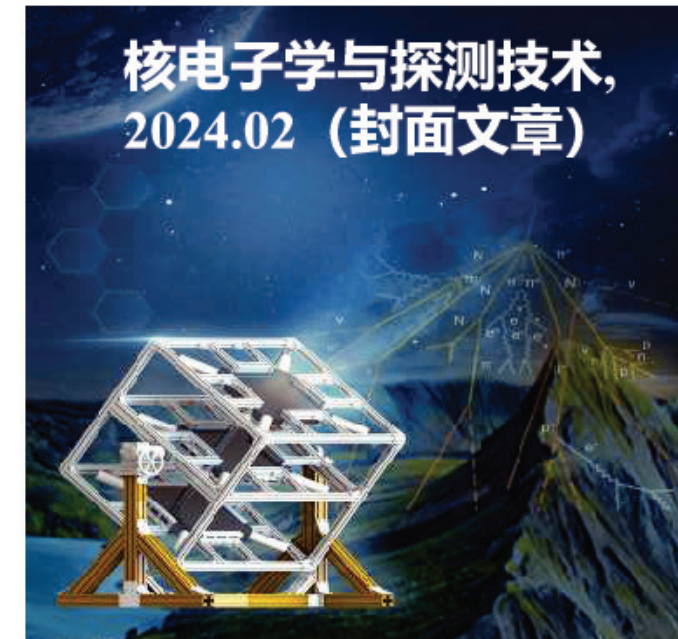


Results



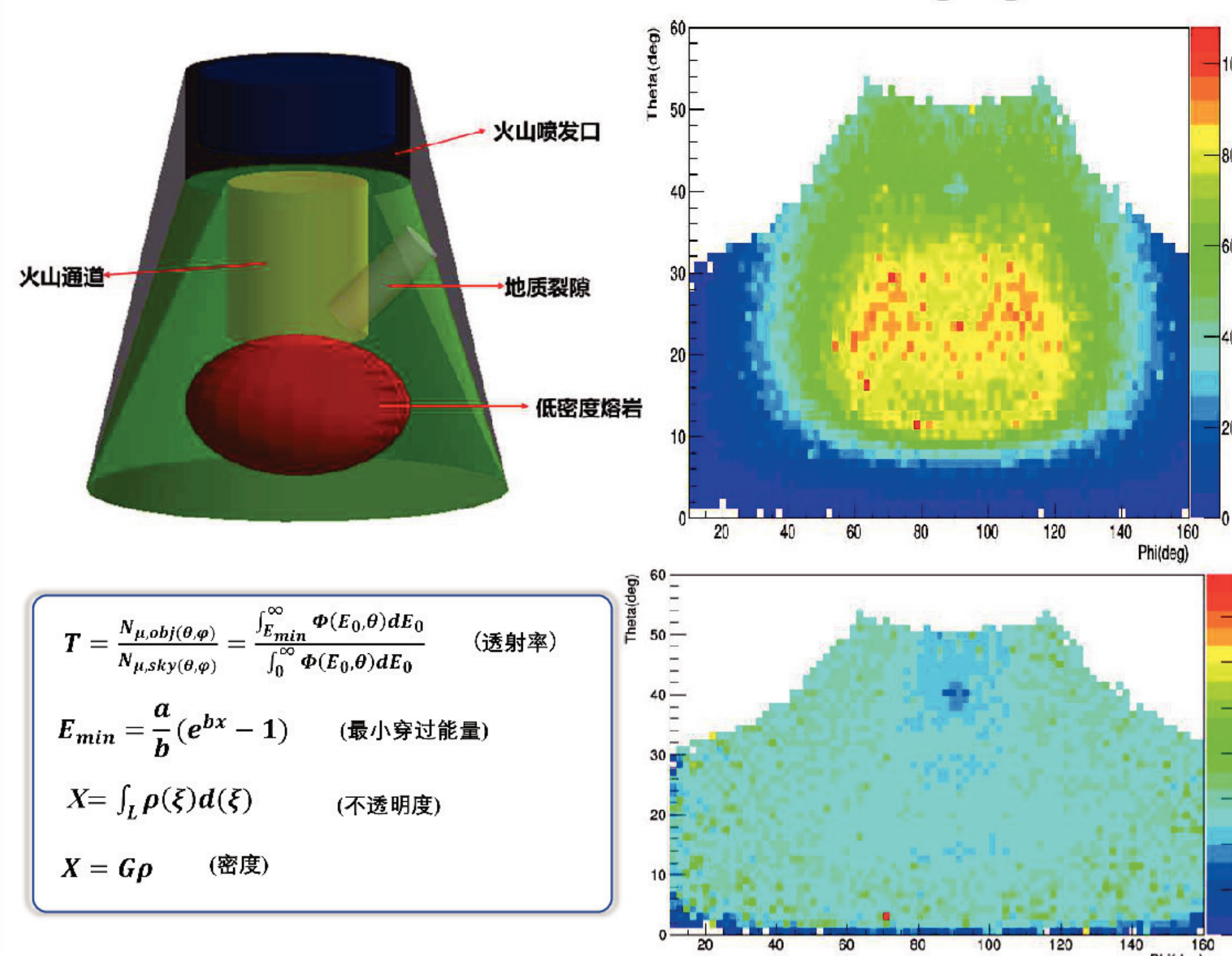
A novel muon imaging system based on a large-area unsegmented plastic scintillator couple with four-corner PMTs are proposed, which has the advantages of simple structure, easy setup, fewer electronic readout channels and portability.

Related experiments were conducted at the proximity of objects, achieving a position resolution of 27.9mm.

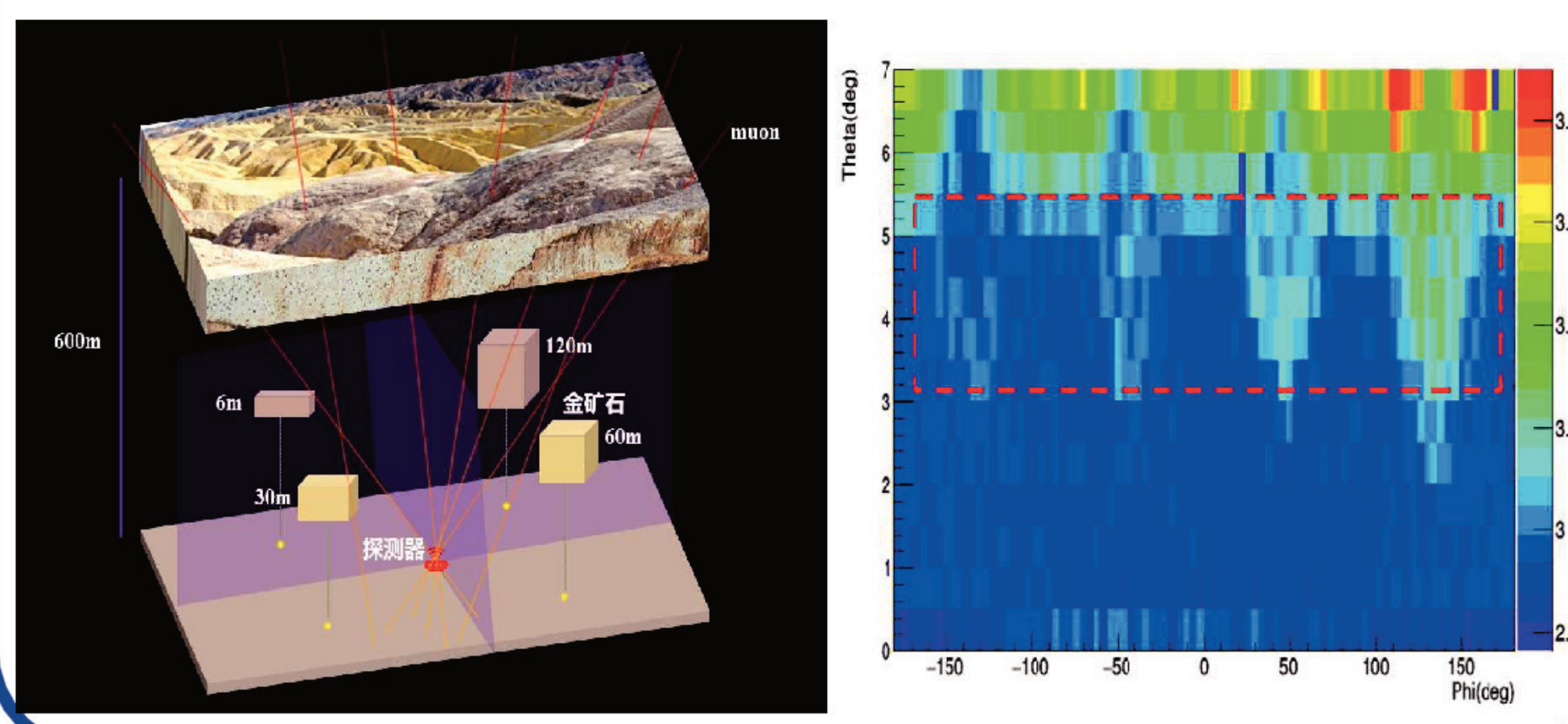


Research on Simulation of Imaging Algorithms

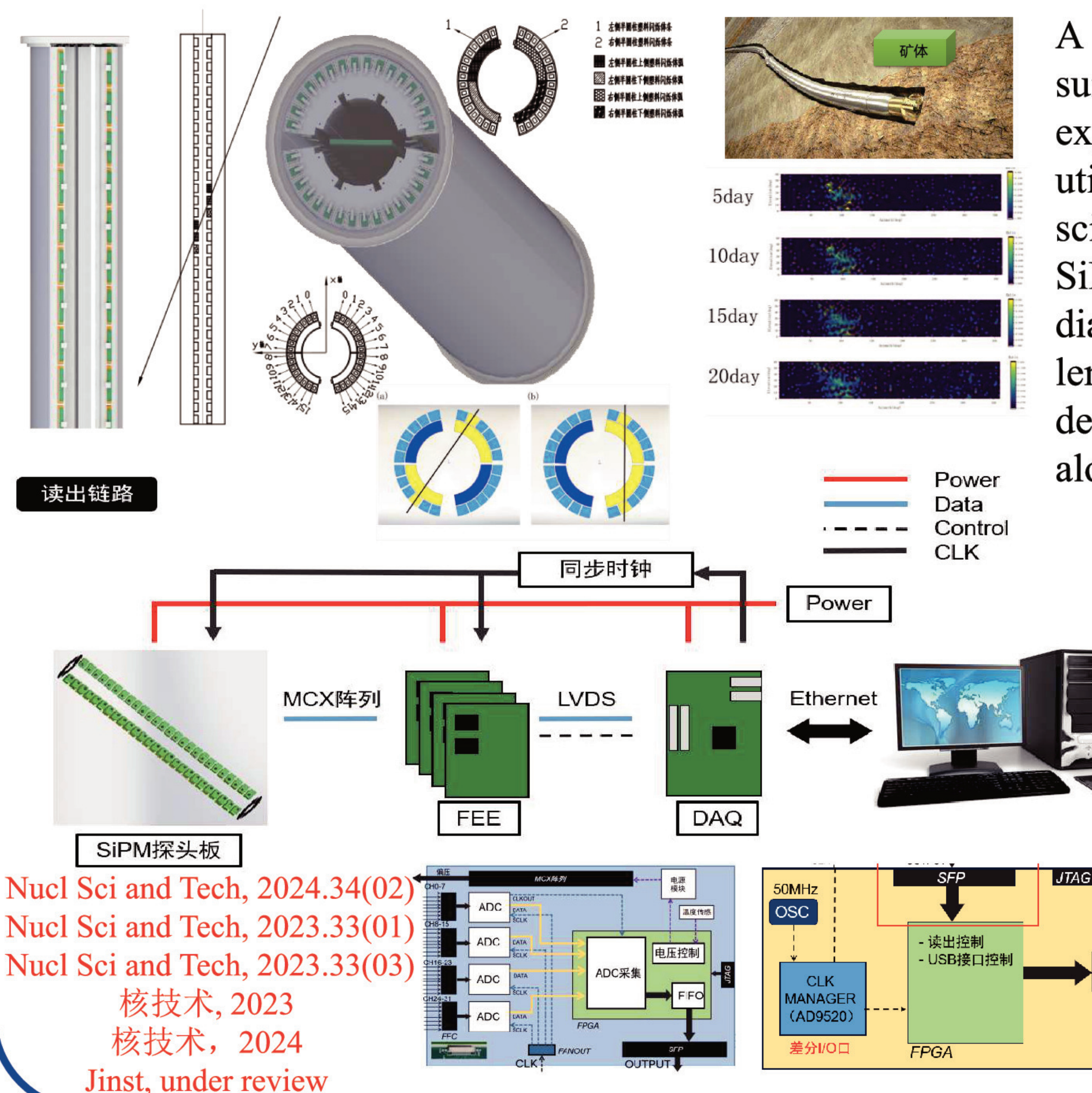
Research on Volcano Model Imaging



Density distribution of gold mines at 600 meters underground



A muon imaging system suitable for deep geological exploration is proposed, utilizing wedge-shaped plastic scintillator strips coupled with SiPM structure, with a diameter of 100mm and a length of 1m, capable of detecting deep underground along with the drill bit.



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