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7. Development of a Portable Low Background α and β Detection Module based on Micromegas and Waveform Digitizing Electronics

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This presentation introduces a Time Projection Chamber (TPC) system based on Micromegas, designed for low background α and β detection. The system comprises a TPC and an anti-coincidence Micromegas detector, both manufactured using a thermal bonding method. Additionally, the system includes a power module, front-end electronics, and back-end electronics, all integrated to achieve high precision and stability in low background detection.

The power module provides high voltage for drift and avalanche processes, ensuring stable power for the readout electronics. The front-end electronics amplify and convert signals from the Micromegas, while the back-end electronics handle digitization, trigger selection, data compression, information extraction, and data uploading. This integrated approach ensures seamless operation and reliable data for analysis.

A distinctive aspect of the TPC is its ability to accurately log particle trajectories and ionization, aiding in superior discrimination between α, β, and background. This precision reduces the need for extensive shielding, thus enhancing system portability and reducing size. Enhanced tracking and identification capabilities are vital for reliable detection.

Additional testing, including baseline measurements, spatial resolution tests, and source counting rate evaluations, have been introduced. Initial results illustrate the system's effectiveness in distinguishing low-energy α and β particles with notable accuracy and sensitivity, supported by high spatial resolution and gain.

In conclusion, the low background α and β detection system based on Micromegas shows broad prospects for low background detection applications.

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