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The development and beam test result of high granularity crystal calorimeter prototype of VLAST

Very Large Area gamma ray Space Telescope (VLAST) is the next generation of flagship space observatory, which has a high acceptance of up to 10 m ˆ 2 · sr in the GeV - TeV range and strong detection capability in the MeV - GeV range. Its comprehensive performance is expected to be more than 10 times higher than that of the Fermi Large Area Telescope (Fermi-LAT). VLAST has four sub-detectors: plastic scintillators as an anti-coincidence detector, silicon strip tracker with low energy gamma-ray convertors which are made of CsI (Tl) crystal, and a high energy 3D imaging calorimeter. The radiation length is about 20, and its sensitive area is close to 10 m ˆ 2 level. One option of this 3D calorimeter is designed by cubic BGO crystals with size of 3 × 3 × 3 cm ˆ 3. We have designed and developed a small calorimeter prototype which has 10 layers with 5 × 5 BGO crystal cubes per layer. Two avalanche photodiodes are coupled with every BGO crystal to achieve a 10 ˆ 6 high dynamic range. The cosmic ray test results show the MIPs signals are much clearer. The prototype assembled with other sub-detectors have been tested in CERN SPS and PS beam using high energy electrons and hadrons. The performance of the cubic calorimeter will be shown, include the energy linearity, resolution, and particle identification ability.

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