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Development of a homogeneous, isotropic, and high dynamic range calorimeter for the study of primary cosmic rays in space experiments

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The concept of a homogeneous, isotropic, and high dynamic range calorimeter has been developed and a prototype has been built and tested. The most suitable geometry was found to be cubic and isotropic, so as to detect particles arriving from every direction in space, thus maximizing the acceptance; granularity is achieved by subdividing the cubic volume in smaller cubic crystals. A dual readout of each crystal with two independent photodiodes ensures the high dynamic range.

The prototype calorimeter consists of cubic CsI(Tl) crystals with a 36 mm edge. Each is coupled to two photodiodes. One with a large area for small signals and a second of much smaller area for large signals from showers. For the preliminary tests only the large area diodes have been used coupled to a CASIS chip especially developed for high dynamic range applications. Two prototypes have been built and preliminary tests with high energy ions and muon beams are reported.

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