Dual-readout calorimetry — RD52 — CERN

Participating Institutes Texas Tech University, Iowa State University, Korea University, Kyungpook National University, INFN (Pavia, Pisa, Cagliari, Rome, Cosenza, Lecce), Tufts, LIP Lisbon, CERN

Description/Concept Measure scintillation and Cerenkov light independently in optical fibers and measure neutron content event-by-event. Current small modules are dominated by lateral leakage.

Milestones Twentry nine papers published in NIM on all aspects of dual readout calorimetry, including crystal dual readout. GEANT (FTFP_HP) simulations of a large copper module yield an energy resolution approximately represented by $\sigma/E \approx 30\%/\sqrt{E}$ for pion-induced showers.

Future Activities/Priorities Measure the difference between pion-induced and proton-induced hadronic showers; measure the time history of light at 5 GHz. Build a large module 4 ton for final test of hadronic performance.

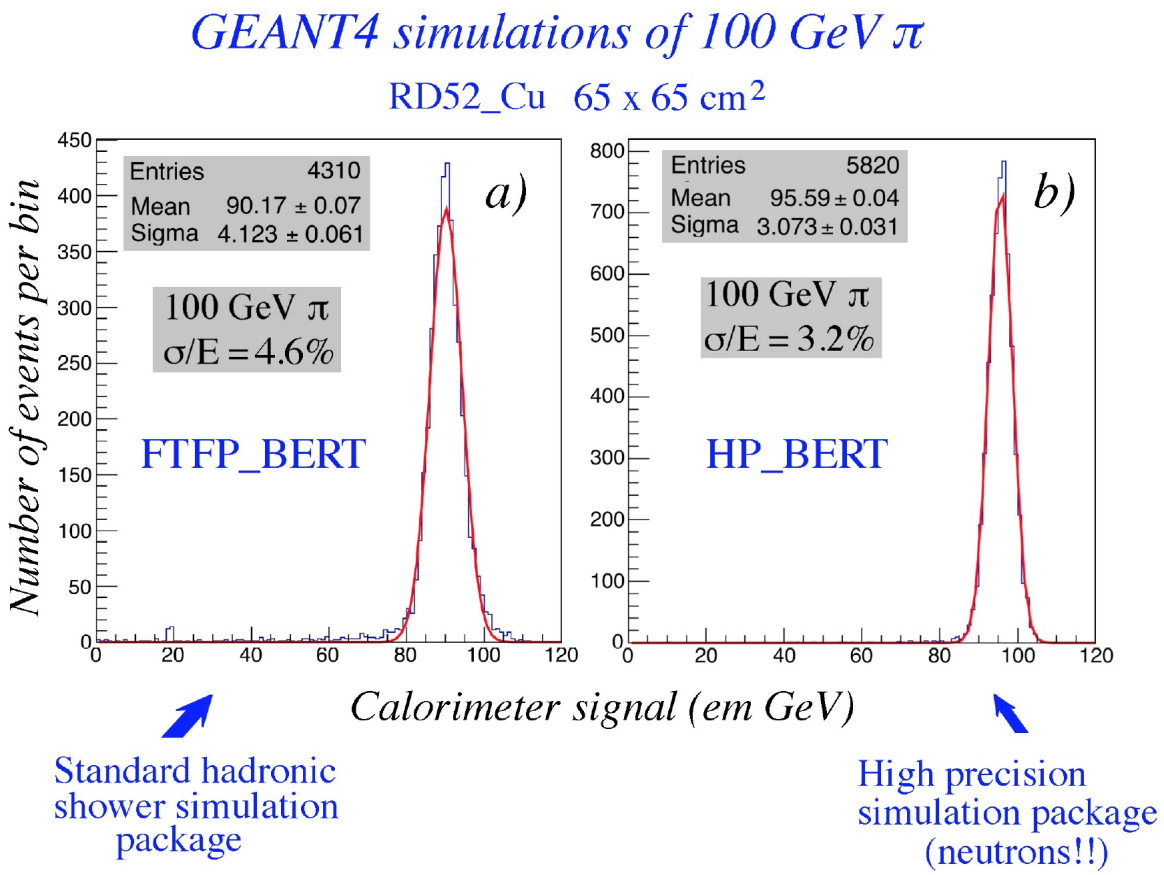

Figure 1: The raw pulse height distribution simulated from two GEANT4 physics lists. The latter one does a more correct treatment of the neutrons in the hadronic cascade and, therefore, better represents the dual-readout response of a hadronic calorimeter.

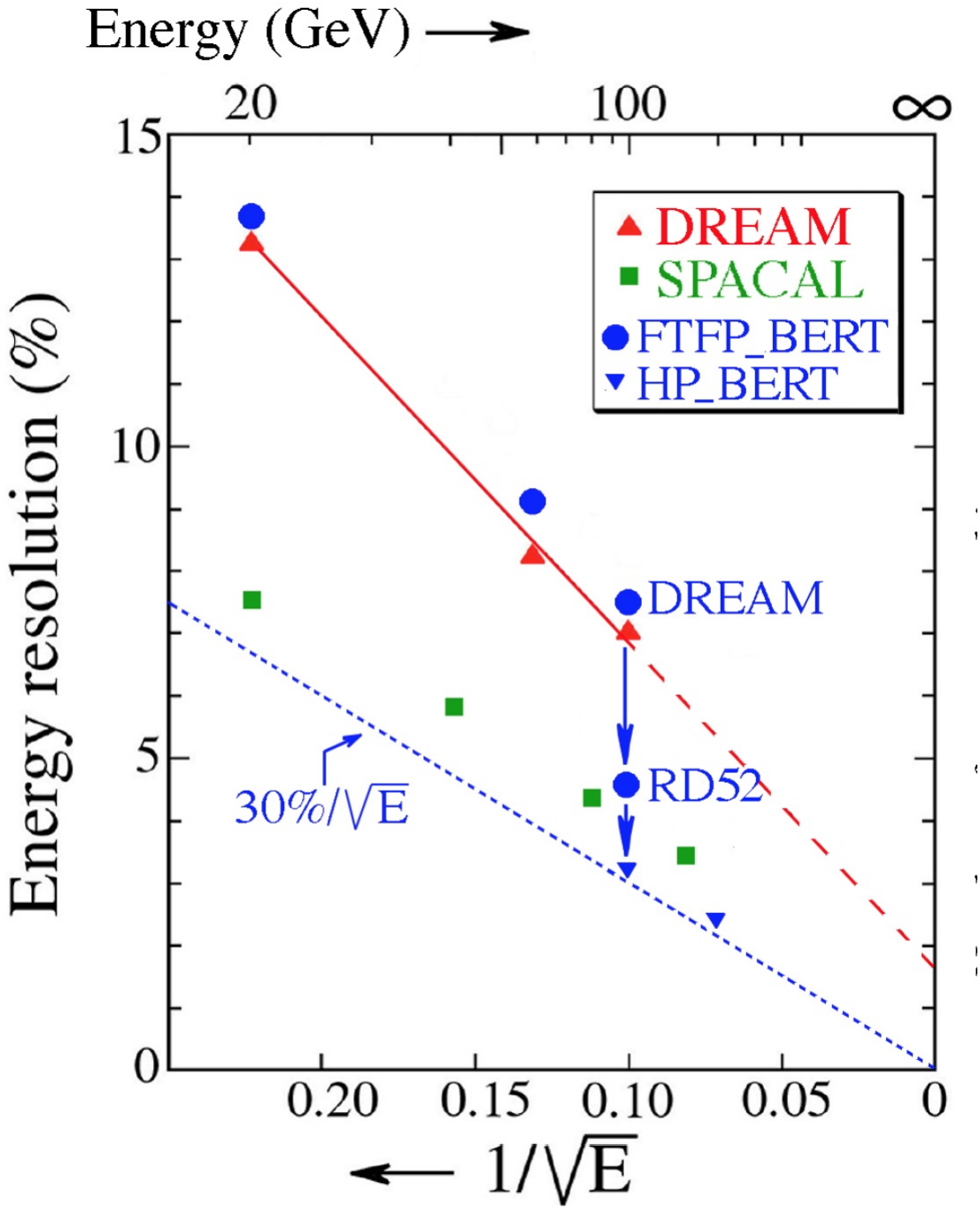

Figure 2: The Gaussian-fitted energy resolution of compensating and dual-readout fiber calorimeters. The RD52 copper-fiber dual readout energy resolutions at 100 GeV and 200 GeV energies for incident pions are shown as the inverted blue diamonds with the label caption "HP_BERT". The dotted line is a resolution of $\sigma/E = 30\%/\sqrt{E}$ with zero constant term. The GRANT result seems to have a constant term of about 0.5%.