Abstract content
The CALICE collaboration has been developing calorimetry for particle flow algorithms based detectors. To measure particle shower development, a finely segmented calorimeter optimized for PFA must consist of millions of channels. A scintillator-based calorimeter with cells of size 30 x 30 x 3 mm3 and read out with silicon photo-multipliers (SiPMs) shows great promise. The construction and assembly challenges of a highly segmented, scintillator-SiPM calorimeter could be greatly reduced with full integration of the read out electronics into active calorimeter layers.
An integrated readout layer (IRL) comprised of a multi-channel electronics board instrumented with SiPMs paired to an monolithic array of scintillator cells, would eliminate much of the labor intensive production associated with individual readout cells. In this presentation we discuss the development and performance of injection molded polystyrene arrays of 2x2 dimpled scintillator cells with a thickness of 3mm and individual cell area of about 900 mm2. (The dimpled or concave shaped cells ensure uniformity of response for a SiPM positioned at the center of the cell.)
The performances of arrays of molded cells are compared to arrays of cells machined from sheets of polyvinyltolulene scintillator of same thickness.
To improve performance of molded array the depth of dimple of single injection molded cell needs to be optimized. The light output, uniformity, and cross talk of the molded and machined cells irradiated with a Sr-90 source and measured with a SiPM in current mode are reported. Plans for initial particle beam tests of the complete IRL will be also discussed.