Online Monitoring and Calibration - ECal

Oct 17th 11

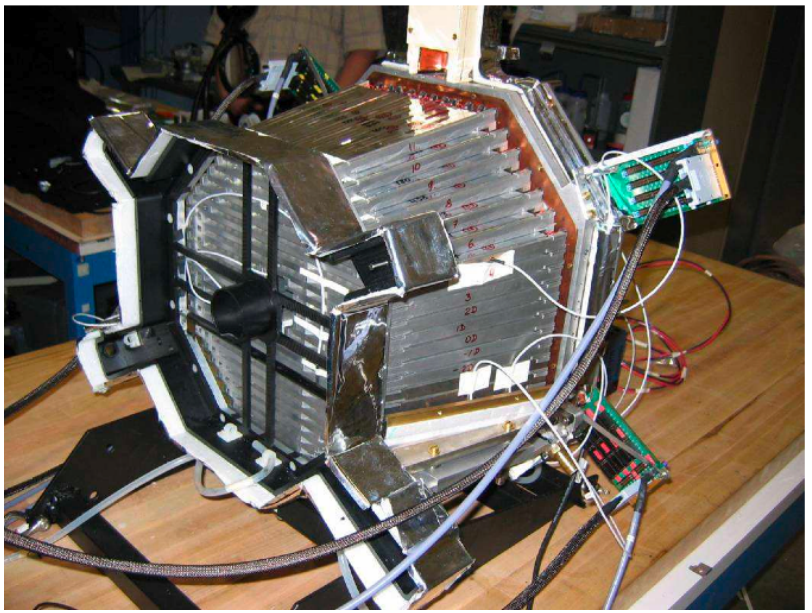
F.-X. Girod

Overview

1. **Existing tools**
   - Inner calorimeter
   - Performances of the IC
2. **Future tools**

The inner calorimeter

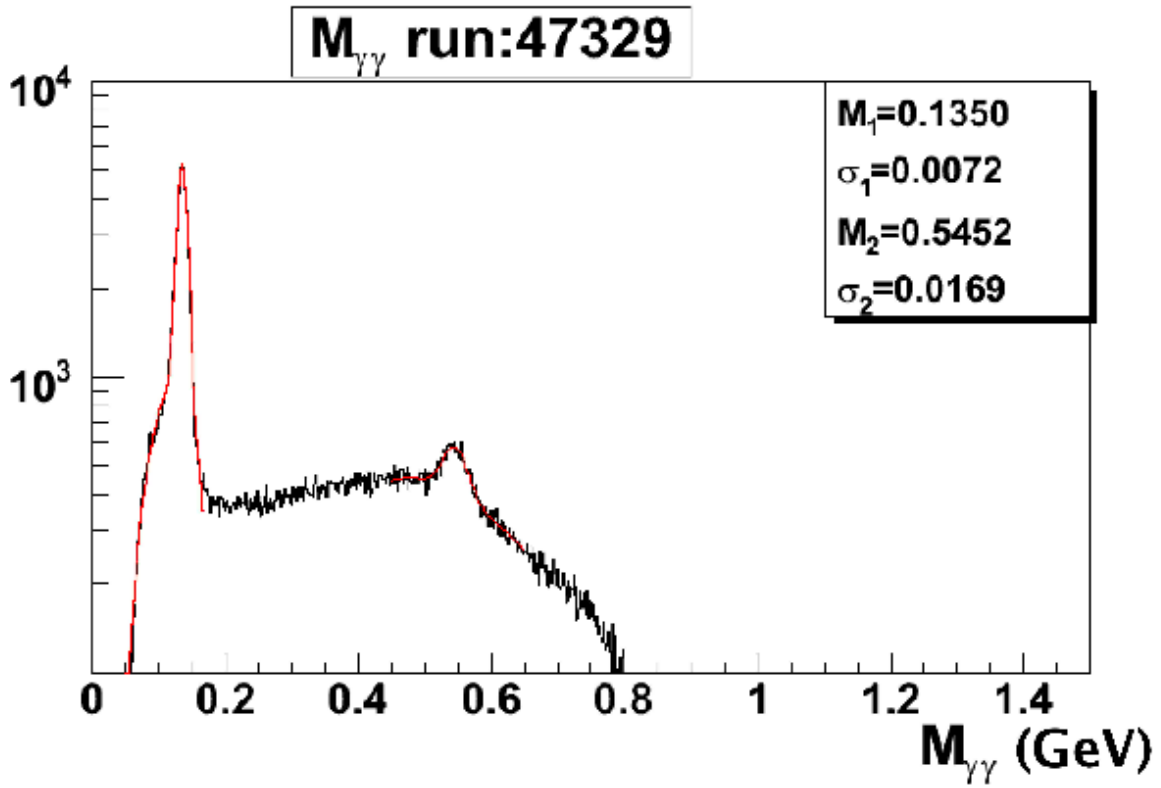
- 424 lead tungstate crystals, $1.3 \times 1.6 \times 16$ cm^3 read out with APDs
- quasi-pyramidal with appex $\sim$ 75 cm from the front face
- used down to 5° at luminosities in excess of 10^{35} s^{-1}cm^{-2}
- on ^{1}H, ^{2}D, ^{4}He, ^{14}C targets
- stabilized in temperature to 0.1 K
- equipped with a pulsed green laser monitoring system
- occupancies up to MHz above 50 MeV threshold



Performances of the IC

Energy calibration

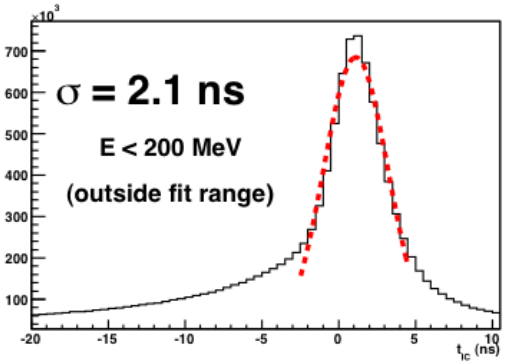
- Use two-cluster events to adjust the neutral pion mass peak
- Requires either a thin target or the knowledge of the vertex by coincidence
- energy resolution : $\frac{\sigma E}{E} = \frac{0.02}{E} \oplus \frac{0.033}{\sqrt{E}} \oplus 0.025$
- position resolution : $\sigma_x = \frac{0.18}{\sqrt{E/1\ \text{GeV}}}$ (cm)

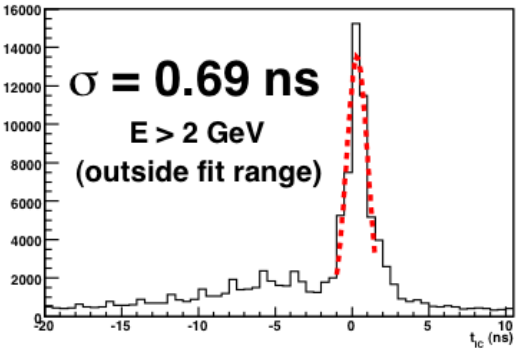


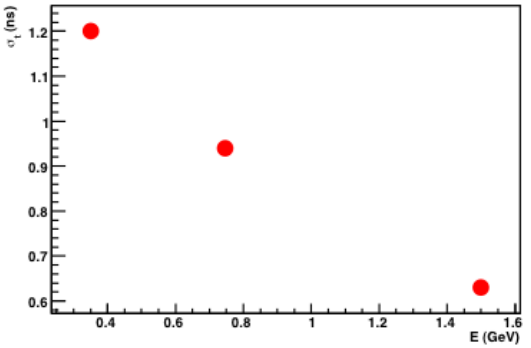
Performances of the IC

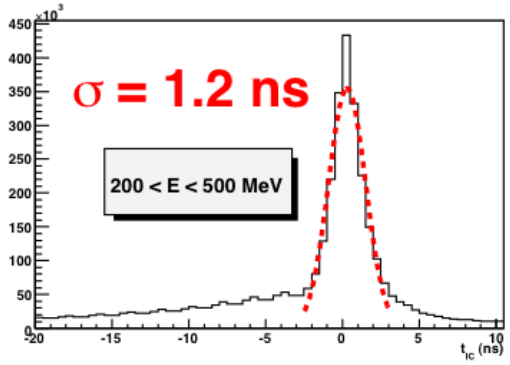
Time calibration

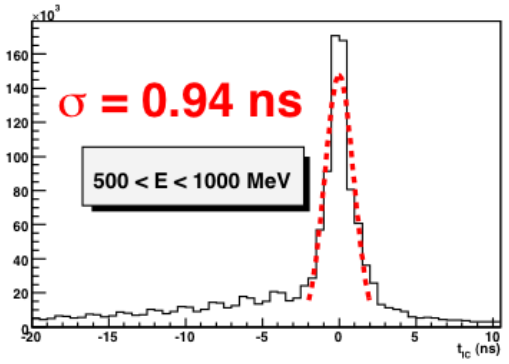
- The timing is performed w.r.t. the vertex time of the triggering particle
- Correction for timewalk gives resolution better than 1 ns

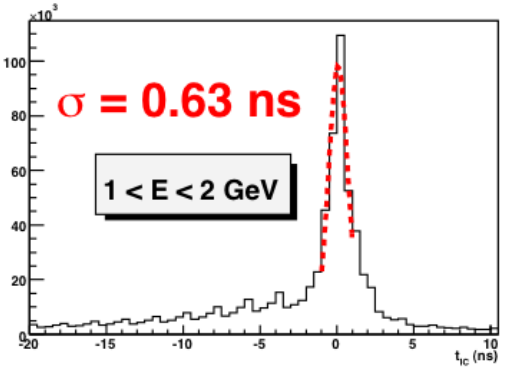








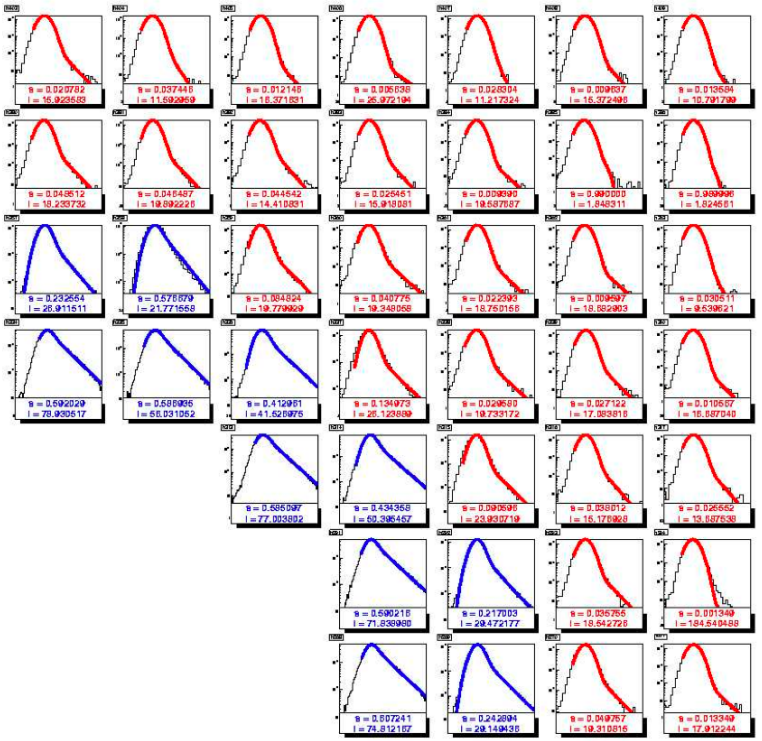




Performances of the IC

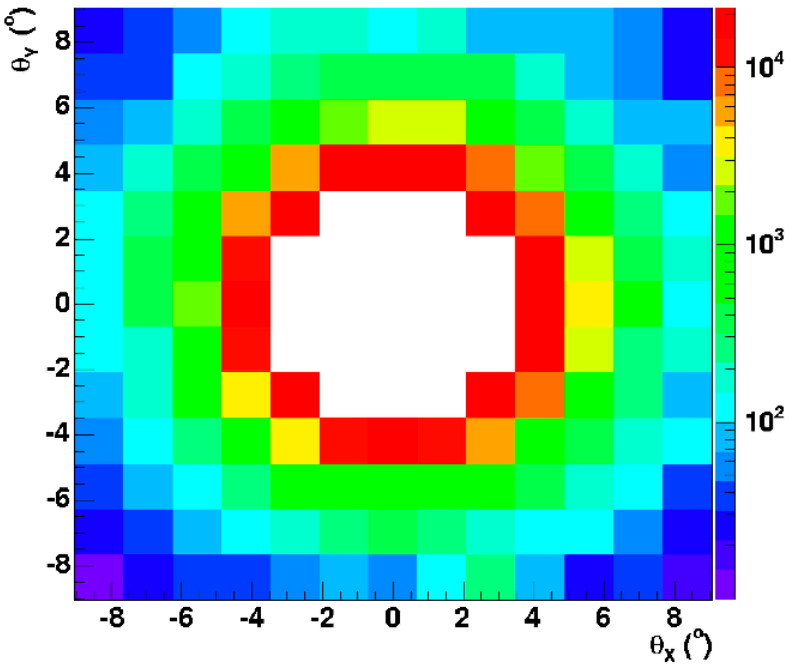
Radiation hardness and stability

- Fit the spectrum of random background = gaussian pedestal $\otimes$ exponential background
- More than 50% probability of pile-up within 180 ns, with $E_{\text{dep}} \approx 75$ MeV
- 10 Mrad/months resulted in little to no transparency loss



Performances of the IC

Radiation hardness and stability



Performances of the IC

Radiation hardness and stability

Vertical scale from -25% to +25%

Future tools

Online monitoring and control, offline

- times and amplitudes for separated pulses from new FADC board ∅
  includes question on data transport and format
  good news : general service work for CLAS12
- If we have laser injection : trigger configuration, control of light injection ✓
- EPICS record of temperature, control of HVs and alarm for temperature ✓
- Pedestal (baseline) runs ∅
- Calibration scheme and runs ✓
- Online occupancies ✓
- Online reconstruction (includes a tracker) ∅
- Dedicated runs for calibration and HV adjustements ✓
- Trigger studies ∅
- Minimum bias trigger for efficiency systematics ∅?
- Offline calibration (includes a tracker) ∅?