A LYSO calorimeter for the SuperB factory

- Flavour physics at the SuperB factory is complementary to LHC for studying New Physics beyond the Standard Model in the b, c and τ sectors
- The SuperB detector is based on a re-optimization of the BaBar detector
  - The CsI(Tl) crystals Electromagnetic Calorimiter (EMC) is divided in two parts:
    - Barrel
      - Expected to survive SuperB radiation damage
      - Can sustain SuperB rates
    - Forward
      - SuperB radiation dose is a concern
      - Finer granularity and faster response are needed for SuperB rates

Crystal	CsI(Tl)	LYSO (Ce)
Density (g/cm^3)	4.51	7.1
Radiation Legth (cm)	1.85	1.14
Moliére Radius (cm)	3.5	2.3
Decay Time (ns)	1220	45
Light Output (%) (wrt NaI(Tl))	165	75

CsI(Tl) partially substituted with Lutetium and Yittrium Orthosilicate (LYSO) crystals

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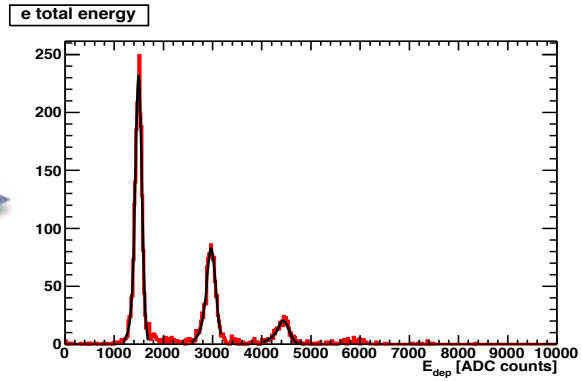
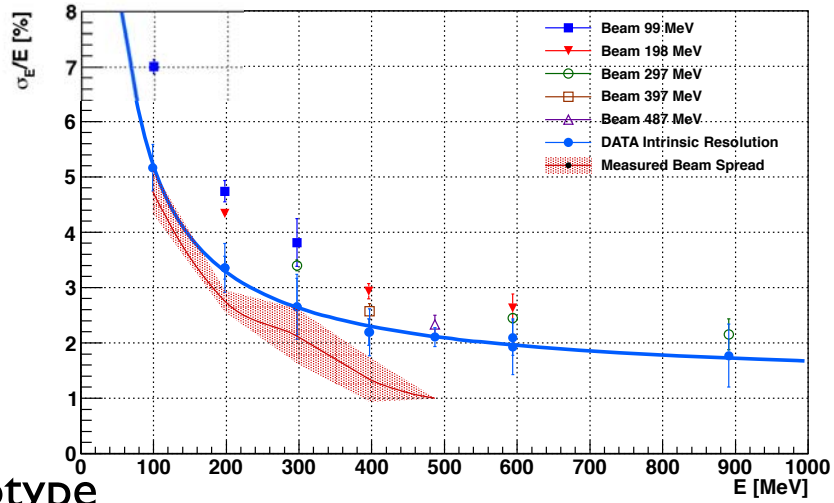
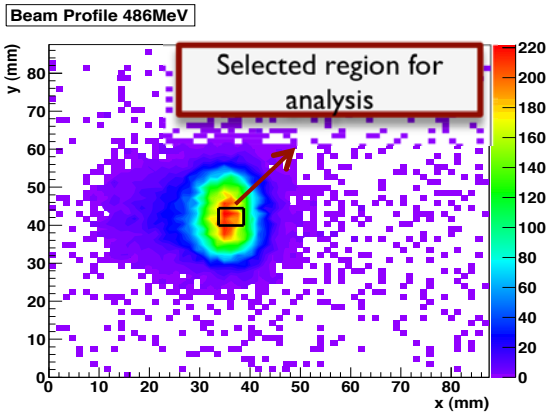
- LYSO calorimeter prototype:
  - 5x5 matrix of LYSO crystal (2.5x2.5x20 cm^3)
  - Beam test at Laboratori Nazionali di Frascati with e^- beam (50-500 MeV)
  - Silicon detector used to measure the incoming particles position
  - Beam energy spread evaluated from data by using also events with more than one e^- per spill







- LYSO EMC prototype resolution:

$$\frac{\sigma_E}{E} = \frac{1.1\%}{\sqrt{\mathrm{E(GeV}}} \oplus \frac{0.4\%}{\mathrm{E(GeV)}} \oplus 1.2\%$$