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 \( \tau \) sectors.

- The SuperB detector is based on a re-optimization of the BaBar detector.

  - The CsI(Tl) crystals Electromagnetic Calorimeter (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

<table>
<thead>
<tr>
<th>Crystal</th>
<th>CsI(Tl)</th>
<th>LYSO (Ce)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density (g/cm³)</td>
<td>4.51</td>
<td>7.1</td>
</tr>
<tr>
<td>Radiation Legth (cm)</td>
<td>1.85</td>
<td>1.14</td>
</tr>
<tr>
<td>Molière Radius (cm)</td>
<td>3.5</td>
<td>2.3</td>
</tr>
<tr>
<td>Decay Time (ns)</td>
<td>1220</td>
<td>45</td>
</tr>
<tr>
<td>Light Output (%) (wrt NaI(Tl))</td>
<td>165</td>
<td>75</td>
</tr>
</tbody>
</table>

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

Alessandro Rossi
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- **LYSO calorimeter prototype:**
  - 5x5 matrix of LYSO crystal (2.5x2.5x20 cm³)
  - 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:**
  \[
  \frac{\sigma_E}{E} = \frac{1.1\%}{\sqrt{E(\text{GeV})}} \oplus \frac{0.4\%}{E(\text{GeV})} \oplus 1.2\%
  \]

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