Beam Position Monitors for the LUNEX5 Project

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on behalf of the LUNEX5 diagnostic group

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LUNEX5 Project

- **LUNEX5** (free electron Laser Using a New accelerator for the Exploitation of X-ray radiation of 5th generation):
  - Build a prototype to **demonstrate 4th advance generation** using a **Conventional Linear Accelerator** (CLA)
  - Use the CLA in **low charge mode (10 pC max.)** to approach LWFA beam conditions
  - **Demonstrate FEL on LWFA** at short wavelength

Conventional Linear Accelerator CLA → 4G+
FEL “variable” line

Laser WakeField Accelerator LWFA → 5G
Seeding facilities

- 2012: Conceptual Design Report published, very good feedback from review comity
- 2013: ERC founding to demonstrate FEL on LWFA -> COXINEL project
• **COXINEL (COherent X-ray source INferred from Electrons accelerated by Lasers):**
  
  – Demonstrate beam transport from the source to the undulator
  – Demonstrate FEL amplification at 200 nm and then at shorter wavelength
  – Investigate and control FEL on LWFA performances

  **COXINEL layout**

• Among other diagnostics, **2 BPMs** are needed upstream and downstream the undulator
BPM specifications:

<table>
<thead>
<tr>
<th></th>
<th>COXINEL/ LUNEX5 (LWFA)</th>
<th>Lunex5 (cold CLA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bunch charge</td>
<td>10 pC</td>
<td>0.5 nC</td>
</tr>
<tr>
<td>Repetition rate</td>
<td>~ 1 Hz</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Bunch size(X/Y)</td>
<td>300 µm RMS</td>
<td>50 µm RMS</td>
</tr>
<tr>
<td>Bunch length</td>
<td>1-10 µm RMS</td>
<td>50 µm RMS</td>
</tr>
<tr>
<td>Range</td>
<td>± 1 mm</td>
<td>± 1 mm</td>
</tr>
<tr>
<td>Resolution (&lt; Sigma/10)</td>
<td>&lt; 30 µm</td>
<td>&lt; 5 µm</td>
</tr>
<tr>
<td>Pipe diameter</td>
<td>20 mm</td>
<td>20 mm</td>
</tr>
</tbody>
</table>