First considerations for beam stability at ALBA

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ALBA Team

Contents

• The ALBA project
  – Status
  – Lattice
• Requirements for beam stability
  – The site
  – Alignment
  – Other requirements
  – Help!
ALBA Project

Synchrotron Light Source in Barcelona (Spain)
3 GeV accelerator
30 beamlines (5 on day one)
50 - 50 Spanish Government, - Catalan Government
Total Budget 180 M€

First beam for users 2010

ALBA Status

• Recruiting going on (director and section heads appointed, ~40 people).
• Site selected, study of the ground and vibrations under way.
• Contract negotiations for the design of the building and facility under way.
• Lattice almost fixed.
• Not much work on beam stability yet, but now is the time to think. We can save a lot of work and pain later if we take the right decisions now.
Beam Stability

Timetable

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Urbanisation</td>
<td>01.2005 – 01.2006</td>
</tr>
<tr>
<td>Building construction</td>
<td>01.2006 – 07.2007</td>
</tr>
<tr>
<td>Linac</td>
<td></td>
</tr>
<tr>
<td>Call for tender</td>
<td>01.2005 – 06.2005</td>
</tr>
<tr>
<td>Installation and commissioning</td>
<td>08.2007 – 12.2007</td>
</tr>
<tr>
<td>Booster</td>
<td></td>
</tr>
<tr>
<td>Call for tender for components</td>
<td>03.2005 – 12.2005</td>
</tr>
<tr>
<td>Construction</td>
<td>2006 – 2007</td>
</tr>
<tr>
<td>Installation and commissioning</td>
<td>01.2008 – 09.2008</td>
</tr>
<tr>
<td>Storage Ring</td>
<td></td>
</tr>
<tr>
<td>Call for tender for components</td>
<td>02.2005 – 12.2005</td>
</tr>
<tr>
<td>Construction</td>
<td>2006 – 2007</td>
</tr>
<tr>
<td>Storage Ring Commissioning</td>
<td>11.2008 – 06.2009</td>
</tr>
<tr>
<td>Beam Lines Commissioning</td>
<td>07.2009 – 04.2010</td>
</tr>
<tr>
<td>Beam for users</td>
<td>05.2010</td>
</tr>
</tbody>
</table>

Optics

- DBA-like, 16 cell.
- The dipole has a large quad component.
- 4x8 m Long
- 12x4.1 m Med
- 8x2.1 m Short
- ~4 nm-rad
Beam sizes

- Our scientific case puts priority in the spectral flux density, requiring small cross section at the IDs.

- The last step of the lattice design is to find the right compromise between dispersion in the straight sections, reduction of the emittance, chromaticity correction and beam size.
Site Study

<table>
<thead>
<tr>
<th>Boring</th>
<th>Depth (m)</th>
<th>Instrumentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>70</td>
<td>Micrometer</td>
</tr>
<tr>
<td>2A</td>
<td>70</td>
<td>Micrometer</td>
</tr>
<tr>
<td>3A</td>
<td>70</td>
<td>Micrometer</td>
</tr>
<tr>
<td>4I</td>
<td>35</td>
<td>Slope indicator</td>
</tr>
<tr>
<td>5P</td>
<td>70</td>
<td>Extensiometer</td>
</tr>
<tr>
<td>6P</td>
<td>70</td>
<td>Extensiometer</td>
</tr>
<tr>
<td>1B</td>
<td>14,21,47,60</td>
<td>Piezometer</td>
</tr>
<tr>
<td>2B</td>
<td>15,23,45,65</td>
<td>Piezometer</td>
</tr>
<tr>
<td>3B</td>
<td>14,21,45,58</td>
<td>Piezometer</td>
</tr>
</tbody>
</table>

• Remote data acquisition
• Periodically crosscheck manual/remote
• Monthly reports

First results of the site study
Conclusions

- Two phases study:
  - Soil characterization + 3 months measurements
- Report due soon
- Long period Monitoring
  - Report due August 2005
- Undisturbed site.
- Geological characteristics as expected.
- Main components clay, limes and marl, no significant layers of sands.
- Predictable behavior of the components of the soil.
- No significant differential movements detected up to now.

Very preliminary vibration study
Some results

- Good train
- Passenger train
- Factory
- Rotatory machines
- Sea Waves

Comparison
Conclusions

- First results do not show anything dramatically wrong BUT:
  - Short measurement period.
  - Industrial activity in the area slowed down at the time of the measurements.
  - Home made noise will increase the vibration.
- Longer term measurement campaign is starting this December.

The Site. Conclusions

- The proposed site is not the ideal location for a light source. The reasons for selecting it were not technical.
- With the information we have today it is good enough for the required purpose.
- The analysis of vibrations is the critical part.
- The preliminary result do not show any factor that will prevent the installation of a light source on the site at a reasonable cost.
Alignment, girders and correction system

- Magnets in girders.
  - Bending in the same girder as the other magnets.
- Correctors in sextupoles.
- As many BPMs as possible, but limited in position and number due the small circumference and compact arrangement.
- Requiring good alignment (30 µm for elements in girders, 100 µm for girders).

Open questions

- Correctors: Extra coils in the sextupoles or in the quadrupoles.
- Girders: How many degrees of freedom they really need.
- Temperature control:
  - Same temperature in tunnel and experimental hall or different ones?
  - Temperature stability in the tunnel.