INTRODUCTION

• SOLEIL is the French 3rd generation light source routinely operating since 2007 with a low emittance (3.9 nm·rad) and high intensity (430 mA) beam.

<table>
<thead>
<tr>
<th>Energy [GeV]</th>
<th>2.75</th>
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<tbody>
<tr>
<td>Current [mA]</td>
<td>430 (multibunch)</td>
</tr>
<tr>
<td>Horizontal emittance [nm·rad]</td>
<td>3.9</td>
</tr>
<tr>
<td>Betatron tunes</td>
<td>( (16,10,23) )</td>
</tr>
<tr>
<td>RF frequency [MHz]</td>
<td>352.2</td>
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</table>

SOLEIL original lattice functions over 1/8th of the ring showing long (SDL), medium (SDM) and short (SDC) straight sections.

• The purpose of the application of Multi-Objective Genetic Algorithms (MOGA) is to optimize the linear and non-linear beams dynamics and to search for unexplored solutions.

THE OPAC NETWORK

• This PhD project is enrolled in Optimization of the Performance of any Particle Accelerator (OPAC) since December of 2012. OPAC is a new network that trains the next generation of researchers in accelerator science and technology in the Framework of Marie Curie Actions. Today, OPAC have 22 students distributed in Europe.

• List of network partners:
  - University of Liverpool, UK
  - CELLS-ALBA, Spain
  - CERN, Switzerland
  - CIVIDEC Instrumentation GmbH, Austria
  - COSYLAB d.d., Slovenia
  - Computer Simulation Technology, Germany
  - GSI Helmholtz Centre for Heavy Ion Research, Germany
  - Instrumentation Technologies, Slovenia
  - Royal Holloway University of London, UK
  - Société Civile Synchrotron SOLEIL, France
  - Universidad de Sevilla / Centro Nacional de Aceleradores, Spain

• EXPLORE new challenging optics for reducing the effective horizontal emittance of SOLEIL by at least a factor 2 while keeping a large enough beam lifetime and injection efficiency.

• Apply experimentially these new findings for the beamlines of SOLEIL: propose a set of experiments in order to check the benefits of lower horizontal emittance lattices based on photon flux, brightness, and spectral property measurement.

• Evaluate exotic optics to reach sub nanometric horizontal effective emittance. The output of this work will propose directions for large modifications of the design of the storage ring lattice.

REFERENCES: