Optically-enhanced field emission from nano-patterned cathodes

Class meetings: 2hrs once a week on Tuesday or Thursday

Instructor:
Philippe Piot, Prof. of Physics
LaTourette Hall, room 226
Tel: 815 753 6473 (NIU)
630 840 8128 (Fermilab)
e-mail: piot@nicadd.niu.edu
(Please use sensible e-mail subject headings)

Course description:
During this research course, the student will be introduced to field emission of bright electron bunches from nano-patterned photocathodes. The ultimate purpose of the class is to explore the possible applications of these cathodes to form high-brightness electron bunches or beams consisting of multiple bunches transversely displaced. The latter type of beams could lead to the production of coherent short-wavelength radiation while high-brightness single bunch are ideal candidate to drive tabletop free-electron lasers employing optical undulators.

Note: no textbook is required and material will be provided during class meetings.

Assessment & grading:
The assessment will consist of weekly discussion and computer work. The grading will be as follows:

- Discussion of concepts presented in the reading materials 50%
- Beam dynamics simulations 50%

The numeric average grade will be computed and a letter grade will be assigned following the

<table>
<thead>
<tr>
<th>Letter grade</th>
<th>Percentage points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>≥ 85%</td>
</tr>
<tr>
<td>A-</td>
<td>≥ 80%</td>
</tr>
<tr>
<td>B+</td>
<td>≥ 75%</td>
</tr>
<tr>
<td>B</td>
<td>≥ 70%</td>
</tr>
<tr>
<td>B-</td>
<td>≥ 65%</td>
</tr>
<tr>
<td>Grade</td>
<td>Percentage</td>
</tr>
<tr>
<td>-------</td>
<td>------------</td>
</tr>
<tr>
<td>C+</td>
<td>≥ 60%</td>
</tr>
<tr>
<td>C</td>
<td>≥ 50%</td>
</tr>
<tr>
<td>D</td>
<td>≥ 40%</td>
</tr>
<tr>
<td>F</td>
<td>&lt; 40%</td>
</tr>
</tbody>
</table>

Further information on NIU’s grading system can be found at http://www.niu.edu/regrec/grading/gradingfaqs.shtml

Accessibility:
If you need an accommodation for this class, please contact the Disability Resource Center (RDC) as soon as possible. The DRC coordinates accommodations for students with disabilities. It is located on the 4th floor of the Health Services Building, and can be reached at 815-753-1303 (V) or drc@niu.edu. Also, please contact me privately as soon as possible so we can discuss your accommodations. The sooner you let us know your needs, the sooner we can assist you in achieving your learning goals in this course.

Syllabus:

Part 1: optically-enhanced field emission & plasmonic cathodes

Reading material:


Part 2: Modeling nano-patterned cathodes using WARP

Reading material:


Part 3: Simulation and characterization of pulsed electron beam produced by nanopatterned cathodes:

The student will carry numerical simulations based on the material studied under parts 1 and 2 and investigate the application the properties of the generated electron bunches along with possible application to advanced accelerator concepts.