

**Outline USPAS Course on Advanced X-ray Sources
Fourth Generation Light Sources: II
Energy Recovery Linacs and Thomson Scatter Sources**

Lecturers

G. Krafft (Jefferson Lab) and I. Bazarov (Cornell University)

Subject Outline

Day 1

1. Radiation from undulators (GK, IB)
 - Radiation from an electric dipole
 - Weak-field (short) insertion devices
 - Strong-field insertion devices
2. Scaling Rules (GK, IB)
 - Flux
 - Brilliance
3. Thomson Scattering (GK)
 - Basics

Day 2

4. Average Brilliance/Scaling(GK)
 - General formula for spectral characteristics
 - Weak-field scattering
 - Strong-field scattering
 - Flux
 - Brilliance
5. Thomson Scatter Sources (IB)

Day 3

6. Thomson Scatter Sources and Laser Synchrotron Sources (IB)
 - Overview
 - Jefferson Lab
 - BNL
 - Berkeley
 - Duke
 - Idaho
 - NRL
 - Small Angle Thomson Scattering
 - Low Energy Storage Ring
7. ALS Short-Pulse Facility (IB)
8. RF and SRF (GK)

Day 4

9. ERLs and their properties (GK)
 - Beam Stability in ERLs (GK)
 - Design of ERLs (GK, IB)

10. ERL example (JLAB IRFEL) (GK)
11. ERL example (Cornell prototype and Phase II design) (IB)

Day 5

12. ERL examples (BNL, Berkeley, Japan, Erlangen, MARS, 4GLS) (IB)
13. Critical Future Problems to be solved (IB)

Lectures will be 9:00-12:00 am, and 1:30-3:00 pm on Monday through Thursday. Homework will be assigned every evening to be turned in the morning. There will generally be 3-5 problems, one or two Jackson-level derivations and several other problems that will be more like: filling in derivation steps or evaluating formulas in particular cases. Please bring along a calculator. We have not been able to set up any computer-lab demonstrations. Just the same, on completing the course you will have a thorough understanding of completing standard source parameter calculations.

Two previous USPAS documents will be distributed to you on arrival. "Characteristics of Synchrotron Radiation" by Kwang-Je Kim and Part I of Sam Krinsky's 1999 Lecture series on High Gain FELs.