The Beams and Applications Seminar Series

Energy Recovery Linacs and Ponderomotive Spectral Broadening

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Bldg. 401, rm B2100

Friday, January 13, 10:00 am

Host: K.-J. Kim, ASD

This talk will consist of two parts. In the first part of the talk the idea of using an energy recovered linac (ERL) as a light source will be reviewed. One of the main requirements for new 4th generation light sources is the ability to produce short pulses of electrons, which leads to short pulses of X-rays. Such X-rays are anticipated to have significant applications in time-resolved structure studies. Work has begun exploring light sources based on energy recovery linacs, which may be able to produce short-pulse X-rays at an average brilliance exceeding that in present day storage ring sources. In the second part of this talk, X-ray production by Thomson Scattering is discussed. The problem of electron motion in intense laser fields and the radiation generated by this motion has been investigated almost as long as the laser has been around. Early investigations centered on mass shifts in intense electromagnetic fields, and were soon followed by complete solutions of the problem assuming that the laser is CW with constant amplitude. The earliest investigations of insertion devices used very similar estimates, assuming constant field strength and hence constant mass shift and radiation red shift, to estimate flux and brilliance. A theory developed to cover the general case of illumination by an intense pulsed laser is used to show that typical radiation spectra from the interaction of electrons with pulsed lasers are very substantially broadened beyond that expected from simple constant-mass-shift uncertainty-principle based arguments. The correct result arises by including the ponderomotive effect of the laser beam and the variable red shift it causes in the emitted radiation.

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