FEL ACTIVITY AND POSSIBLE DEVELOPMENTS AT ELETTRA

R.P. Walker

Sincrotrone Trieste, S.S. 14 Km. 163.5 Area Science Park,
34012 Basovizza, Trieste, Italy

Sincrotrone Trieste built and operates ELETTRA, Europe's first "third generation" synchrotron radiation facility optimised for the VUV/Soft X-ray spectral region. Having as an objective the supply of beams of increasing brightness for a continually more demanding user community, there is a natural interest in developing the next "fourth generation" of intense coherent light sources based on free-electron lasers (FELs). The two main related activities in this field will be described in this presentation.

The major practical activity is concerned with the storage ring FEL that has been developed on ELETTRA. Storage ring FELs offer several unique advantages as radiation sources for experimental exploitation, such as higher power, shorter wavelength and better tunability than available from conventional laser sources, as well as a MHz repetition rate with one-to-one synchronisation with synchrotron radiation. The present status of the EUropean storage ring FEL on ELETTRA (EUFELE) will be described, including recent lasing at 190 nm – the current world record for the shortest wavelength of an FEL of the oscillator type. The plans for the further development of the source and its initial exploitation for experiments, which will be pursued by means of a second EC RTD contract, will also be presented.

Despite their attractiveness for certain types of experiments, storage ring FELs are however naturally limited in wavelength by the need for high reflectivity mirrors. Alternative schemes based on high gain amplification are therefore under study. The project VXFEL that has recently been proposed would makes use of available infrastructure, in particular the operating 1 GeV injector linac for ELETTRA, in order to mount a comprehensive and cost-effective R&D programme for the development of the essential technologies that are required for the construction of a new generation of light sources (high brightness photoinjectors, bunch compression schemes, complex undulators, diagnostic systems etc.) as well as for their exploitation. Details of the VXFEL project, its integration with the existing linac, and the various phases of development that could eventually reach a wavelength of 10 nm will be described.