



An Israeli FEL User Facility - Radiation Source Features and User Applications

The Israeli FEL Consortium:

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Recent measurements of the radiation characteristics of the tandem FEL prove that the device operates as a high quality, tunable radiation source in the mm wave regime. Tuning range of 60% around a central frequency of 100 GHz was demonstrated by varying the tandem accelerator energy from 1 to 1.5 MeV with 1 – 1.5 Amp. Beam current. Fourier transform limited linewidth of $\Delta f/f < 10^{-5}$ was measured in single-mode lasing operation. The FEL power in pulse operation (10 μ sec) was 10 kWatt. Operating the FEL at high repetition rate with 0.1 to 1 mSec pulses will make it possible to obtain high average power (1 kWatt) and narrow linewidth (10⁻⁷).

Based on these exceptional properties of the FEL as a high quality spectroscopic tool and as a source of high average power radiation, the FEL consortium, supported by a body of 10 radiation user groups from various universities and research institutes, embark on a new project for development of an Israeli FEL radiation user laboratory. The laboratory is presently in a design and building stage in the academic campus in Ariel. The FEL will be moved to this laboratory after completion of X-ray protection structure in the allocated building.

In the first phase of development, the radiation user laboratory will consist of three user stations:

- a. Spectroscopic station (low average power). Material studies are planned in the fields of H.T.S.C., sub-micron semiconductor devices, gases.
 - b. Material processing station (high average power). Experiments are planned in the fields of thin film ceramic sintering (including H.T.S.C.), functionally graded materials, surface treatment of metals, interaction with biological tissues.
 - c. Atmospheric study station. Experiments are planned in the fields of aerosol, dust and clouds mapping, remote sensing of gases, wide-band mm wave communication
- The FEL experimental results and the user laboratory features will be described.