

Infrared Synchrotron Radiation: production, properties and fundamental applications

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Today, most Synchrotron Radiation facilities offer a port dedicated to Infrared (IR) spectroscopy and spectro-microscopy. The high-quality of electron-beam in III-generation machines and the use of stabilized optics provide the required source stability for Fourier-Transform spectroscopy. Indeed the synchrotron radiation in the infrared, ranging from the Terahertz (THz, 1 meV), to the near-IR (1.5 eV), offer brightness 2–3 orders of magnitude higher than a laboratory-based IR source, a high degree of polarization, as well as light pulses in the 2–10 ps time scale.

In these lectures I will review the different method to extract Synchrotron Radiation in the spectral region ranging from THz to IR, its main physical properties as well as several fundamental applications spanning from Solid-State Physics, Material and Surface Science, Chemistry, Biology/Biomedicine, and Culturage heritage.

Finally, the potentialities of pulsed IR and THz radiation in pump-probe techniques will be discussed in the scenario of IV generation Free Electron laser machines.