

# THz microspectroscopy using coherent synchrotron radiation

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Coherent synchrotron radiation (CSR) from LINACs and storage rings is a tool which closes the ‘gap’ between microwaves and thermal black body radiation by offering powerful and broadband radiation in the THz-range. During the past few years, at BESSY a new technique to generate powerful, stable, coherent sub-THz and THz-radiation from the electron storage ring has been developed [1]. The recent reports on this new brilliant coherent far infrared broadband source have found considerable international interest. The spectral range at around 1 mm wavelength (0.3 THz) which can be only poorly accessed by conventional sources is now covered by operating BESSY in special machine modes. Here, up to  $10^8$  more brilliance than from a black body source has been achieved. The feasibility of using the coherent synchrotron radiation in scientific applications has been proven at the infrared beamline IRIS [2]: the Josephson plasma resonance in the sub-THz region of optimally doped  $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_8$  could be measured for the first time [3]. In addition, the high power of the CSR from the storage ring enables near-field microspectroscopy experiments in the sub-cm and mm wavelength range. Spectral images from biological samples can be obtained with a lateral resolution much lower than the wavelength involved as demonstrated on living leaves [4] and on human tooth samples. The production of stable, high power, coherent synchrotron radiation at THz and sub-THz frequencies at BESSY opens a new region in the electromagnetic spectrum offered at synchrotron radiation sources which can now be applied for imaging, spectroscopic and microscopic methods in solid state physics, biology, and medicine.

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