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Title:Far-IR/THz spectral characterization of the coherent synchrotron radiation emission at diamond IR beamline B22
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Abstract:Diamond is the new UK 3rd generation light source that opened to users since 2007 and now allocates more than 22 operational beamlines. Beamline B22 is dedicated to Infrared microspectroscopy and started operations in December 2009. By exploiting the Diamond SR source brightness it is optimized for mid-IR (2-25 um wavelength) absorption spectroscopy, for fingerprint microprobe analysis and imaging mostly in Life Sciences but also Materials Sciences and Cultural Heritage. Vibrational spectroscopy analysis on condensed matter and material sciences can be performed at B22 by means of Fourier transform IR interferometry in a broader range from the visible up to the so-called THz region. Due to the uniquely wide B22 front end design (30×50 mrad 2 angle and about 32 mm vacuum vessel internal height), the IR beamline B22 operational range spans across the far-IR/THz region, with effective performances tested up to 2 mm wavelength or, equivalently, well below 0.15 THz (FE cut off ~4 mm wavelength). Especially in low-alpha mode of operation of Diamond, by compressing the e- bunch length to a few millimeters coherent SR emission can be stimulated at comparable wavelengths. In the far-IR, a dramatic intensity increase can be observed at Diamond even at only a few uA of circulating current. A summary of the first performances so far achieved in the Far-IR/THz on the IR beamline B22 is here reported for what concerns the CSR emission at Diamond; this is for the storage ring running in dedicated low-alpha mode both in a stable configuration, as well as in the so-called "bursting" or unstable CSR emission. The former is particularly interesting to reach the longest wavelengths (<20 cm -1) so to address the lower energy vibrational modes in condensed matter, the latter is promising for the wider spectral far-IR/THz coverage allowed (around 100 cm-1), and consequently appealing for extending the spectroscopy capability into a broader range of applications.

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