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Title:Assessing noise sources at synchrotron infrared ports
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Abstract:Today, the vast majority of electron storage rings delivering synchrotron radiation for general user operation offer a dedicated infrared port. There is growing interest expressed by various scientific communities to exploit the mid-IR emission in microspectroscopy, as well as the far infrared (also called THz) range for spectroscopy. Compared with a thermal (laboratory-based source), IR synchrotron radiation sources offer enhanced brilliance of about two to three orders of magnitude in the mid-IR energy range, and enhanced flux and brilliance in the far-IR energy range. Synchrotron radiation also has a unique combination of a broad wavelength band together with a well defined time structure. Thermal sources (globar, mercury filament) have excellent stability. Because the sampling rate of a typical IR Fourier-transform spectroscopy experiment is in the kHz range (depending on the bandwidth of the detector), instabilities of various origins present in synchrotron radiation sources play a crucial role. Noise recordings at two different IR ports located at the Swiss Light Source and SOLEIL (France), under conditions relevant to real experiments, are discussed. The lowest electron beam fluctuations detectable in IR spectra have been quantified and are shown to be much smaller than what is routinely recorded by beam-position monitors.
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