Infrared Synchrotron Radiation in Storage Rings: Limitations and New Possibilities

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Since the first discovery in 1947, synchrotron radiation (SR) has been working as an indispensable tool in photon science, particularly in the spectral regions that cannot be covered by conventional lasers. Infrared (IR) is one of such spectral regions; highly-brilliant IR SR available in storage rings has contributed to many scientific and industrial applications.

Nowadays, SR facilities all over the world are planning to upgrade their storage rings toward realization of the so-called “diffraction limited storage ring” (DLSR), for enhancing the brilliance and spatial coherence by reducing the electron emittance. The reduced emittance significantly improves the source performances of SR in shorter-wavelength regions such as the soft and hard x-ray regions. However, this is not the case in the IR region because the IR SR in most storage rings is already “diffraction limited”. Thus, the realization of DLSR does not necessarily have a great impact on the performances of IR SR.

The above discussion suggests that we need to discuss another way for enhancing the source performances of IR SR. In this talk, limitations to the achievable performance of IR SR in typical storage rings are discussed, together with possibilities to implement a new concept for extending the capability of IR SR.