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Introduction to synchrotron radiation

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Relativistic charged particles forced to move along curved trajectories by applied magnetic fields emit electromagnetic radiation called Synchrotron Radiation. Nowadays electron storage rings are routinely used to provide synchrotron radiation to users in a wide spectral range from infrared to hard X-rays. Thanks to the characteristics of this radiation, it can be considered a very powerful tool for investigating the properties of matter in many different fields like molecular and atomic physics, cell biology, medical applications, nanotechnology, catalysis and cultural heritage. Up to now five generations of synchrotron radiation sources emitting radiation with very different properties have been developed; the fourth generation, based on free-electron lasers, already produces high power and ultrafast pulses of highly coherent radiation. In this lecture, the main characteristics and properties of synchrotron radiation sources and of the produced radiation are introduced and explained using a simplified approach.