Characteristics and Properties of Synchrotron Radiation

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The formalism describing the main properties and mechanisms of synchrotron radiation can be sometimes complicated. However, the underlying physics is quite simple and primarily related to special relativity. We will describe in elementary terms the physical phenomena and show how they can be handled with rather uncomplicated theoretical approaches. On this basis, we will derive and discuss the main properties of synchrotron radiation: flux, spectral distribution, brightness, polarization, time structure. The same simplified approach will then be used to treat the free electron lasers, and in particular those emitting in the ultraviolet and x-ray regions.