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Quantum states of electromagnetic field interacting with a classical current and its application to radiation study

Originally synchrotron radiation problems were studied by classical methods. Later, quantum corrections were calculated, considering the emission of photons arising from electronic transitions between spectral levels. We consider an intermediate approach, in which electric currents generating the radiation are considered classical while the quantum nature of the radiation is taken into account exactly. Such an approach allows one to study one-photon and multi-photon radiation without using corresponding solutions of the Dirac equation.

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