

WAKEFIELDS IN COHERENT SYNCHROTRON RADIATION

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When the electron bunches in a storage ring are sufficiently short the electrons act coherently producing radiation several orders of magnitude more intense than normal synchrotron radiation. This is referred to as Coherent Synchrotron Radiation (CSR). Due to the potential of CSR to provide a good source of Terahertz radiation for our users, the Canadian Light Source (CLS) has been researching the production and application of CSR. CSR has been produced at the CLS for many years, and has been used for a number of applications. However, resonances that permeate the spectrum at wavenumber intervals of 0.074 cm^{-1} , and are highly stable under changes in the machine setup, have hampered some experiments. Analogous resonances were predicted long ago in an idealized theory. Through experiments and further calculations we elucidate the resonance and wakefield mechanisms in the CLS vacuum chamber. The wakefield is observed directly in the 30–110 GHz range by rf diodes. These results are consistent with observations made by the interferometer in the THz range. Also discussed will be some practical examples of the application of CSR for the study of condensed phase samples using both transmission and Photoacoustic techniques.