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Coherent radiation studies for beam diagnostics and high-intensity THz sources at CLEAR

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We report on two years' studies of beam-based coherent radiation performed at the CLEAR facility of CERN. Coherent Cherenkov-diffraction radiation has been exploited for the design of novel beam instrumentation both for beam position and bunch length monitoring.

With the aim to reach high-intensity THz generation in view of THz-acceleration experiments, different mechanisms have been explored and directly compared, as transition/diffraction radiation, Cherenkov-diffraction radiation and Smith-Purcell radiation.

The pros and cons of each radiation mechanism have been experimentally highlighted in terms of peak power, pulse duration, monochromaticity and collimation.

Finally, the importance of the Electromagnetic Shadowing affecting compact experimental setups of coherent radiation production has been extensively characterized, revealing different features of the same phenomenon.

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