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Preliminary investigation on single-pixel Schottky diode based ultra-broadband THz detectors with ps-scale temporal resolution for future BCMs

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A Terahertz (THz) transition radiation monitor, as part of a Bunch compression monitor (BCM), is implemented for longitudinal bunch diagnostics at FELs such as ELBE, FLASH, or EuXFEL. Pulse energy measurements are typically carried out after each bunch compressor stage using coherent diffraction radiation (CDR) in the THz domain and pyroelectric detectors. For higher repetition rates in the MHz range, complex correction algorithms must be applied to correct signal pileup of the pyro-electric detector output, as well as limited signal-to-noise ratio, which can be overcome by using THz detectors with ultra-flat frequency response up to several THz. This work exhibits preliminary studies on developing an ultra-flat frequency response THz spectrometer. We present the developed single-pixel Schottky diode-based THz detector capable of single-shot measurements with a response time of 28.5 ps and IF bandwidth of ∼70 GHz. Further, the simulation result from the Schottky diode parameters is presented.

Footnotes

- R. Yadav, F. Ludwig, F. R. Faridi, et al., Sensors 23, 3469 (2023). ** R. Yadav, F. Ludwig, F. R. Faridi, et al., Opt. Express 32, 43407 (2024). *** R. Yadav, M. Kuntzsch, S. Preu, et al., IBIC2024, Beijing, Sep. 2024, pp. 562-565.

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