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Preliminary investigation on schottky diode based ultra-broadband frequency selective and room-temperature operable ultra-flat Terahertz spectrometer

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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. Typically pulse energy measurements are carried out after each bunch compressor stage using Coherent Diffraction Radiation (CDR) in the THz domain typically using pyro-electric 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,***. A combination of detectors with ultra-broadband frequency selectivity can provide an extended flat frequency response from GHz to several THz. In this paper, we provide preliminary findings on designing of a multi-detector Schottky diode-based THz spectrometer with the necessary flat response up to 5 THz. The detector's frequency selectivity is determined by the antenna and its operating frequency range. Thus, we study several antenna configurations in order to achieve the desired ultra-wide flat frequency response.

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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