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X-band TDS simulations and commissioning

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Understanding of both driver and witness bunches in beam-driven plasma-wakefield acceleration (PWFA) experiments is critical in order to gain a deeper insight into what happens behind the scenes of the plasma cell i.e. validation of theory and control over the acceleration processes. However, witness bunches with lengths on the order of several femtoseconds are difficult to temporally resolve with traditional diagnostic methods. In order to characterise the longitudinal phase space of these short bunches a new polarisable transverse deflection RF structure (TDS) working in the X-Band range (11.99 GHz) will be installed at the FLASHForward facility at DESY. To assess the capabilities and limitations of this device during its upcoming operation, as well as to optimise the sometimes challenging transport of the accelerated electrons from the plasma cell to the TDS, particle tracking simulations have been performed. Here the results of these simulations for scenarios including external and internal injection will be presented.

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