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SP4: Bunch arrival-time monitoring for laser particle accelerators and Thomson scattering x-ray sources

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The ELBE center of high power radiation sources at Helmholtz-Zentrum Dresden-Rossendorf combines a superconducting CW linear accelerator with Terawatt- and Petawatt- level laser sources. Key experiments rely on precise timing and synchronization between the different radiation pulses. An online single shot monitoring system has been set up in order to measure the timing between the high-power Ti:Sa laser DRACO and electron bunches generated by the conventional SRF accelerator. This turnkey timing system is suitable for timing control of Thomson scattering x-ray sources and external injection of electron bunches into a laser wakefield accelerator. It uses a broadband RF pickup to acquire a probe of the particle bunch's electric field and modulates a fraction of the high power laser pulse in a fast electro-optical modulator. The amplitude modulation gives a direct measure for the timing between both beams. Using this setup a resolution of <200 fs RMS has been demonstrated. The contribution will show the prototype, first measurement results and will discuss future modification in order to improve the resolution of the system.

Primary author: Dr KUNTZSCH, Michael (HZDR)

Co-authors: KÖHLER, Alexander (HZDR); Dr IRMAN, Arie (HZDR); KRÄMER, Jacob (HZDR); COUPERUS, Jurjen (HZDR); ZARINI, Omid (HZDR); Dr MICHEL, Peter (HZDR); Dr LEHNERT, Ulf (HZDR); Prof. SCHRAMM, Ulrich (HZDR)

Presenter: Dr KUNTZSCH, Michael (HZDR)

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