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Ultra-fast arrival time feedback using BACCA at FLASH

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The longitudinal intra-bunch train beam-based feedback is used to correct arrival time fluctuations of the electron bunches at the free-electron laser in Hamburg (FLASH). The arrival time information is measured by a bunch arrival time monitor (BAM). The novel bunch arrival corrector cavity (BACCA) has been successfully commissioned and characterized. BACCA is a normal conducting RF cavity, located prior to the first bunch compressor, and acts as ultra-fast energy corrector. Due to the energy dependent path length through the magnetic chicane of the bunch compressor the cavity is used to stabilize the bunch arrival time. This fast energy corrector cavity acts together with the superconducting RF cavities for larger corrections in an intra-train beam-based feedback system. First measurements at FLASH show arrival time stabilities towards 5 fs (rms).

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