Upgraded Bunch-Arrival-Time Monitors for the European XFEL Reaching Below 3fs Time Resolution

First Results Evaluating the BAM Performance and Jitter Behaviour of the Electron Bunches.

Marie K. Czwalinna, (DESY) On behalf of the Special Diagnostics team, and many others.

MT ARD ST3 Annual meeting 2019 GSI, Darmstadt



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Results and Outlook

Whole detection chain from Optical Synchronisation to BAM system



 $\frac{600 \ \mu s}{t}$ $\frac{100 \ ms}{t}$ $\frac{100 \ ms}{t}$ $\frac{100 \ ms}{t}$ $\frac{100 \ fs}{t}$ $\frac{100 \ fs}{t}$

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- □ BAMs with single shot resolution of <3fs @250pC
- Correlation between equivalent BAMs
 - \rightarrow Measure for overall synchronisation level <1.5fs rms

Outlook

Suppression of low frequency noise up to 25kHz from pulse to pulse with an intra-train beam-based Feedback to reach 4fs rms stability

