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Performance of a longitudinal bunch by bunch feedback in a system with a passive harmonic cavity

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While designed to be inherently stable, the accelerator upgrade SLS 2.0 will have a longitudinal multi-bunch feedback system, to be used as a diagnostics device and as a fallback against unexpected problems. Modelling the performance of the system is complicated by the presence of a passive harmonic cavity introduced for longer bunch lengths and correspondingly higher stability thresholds, which has the following effects: the voltage of the harmonic cavity varies with the beam current leading to a variation of the synchronous frequency, specially pronounced in the initial injection at very low currents. Even at full current, the presence of the ion clearing gap provokes transients in the main and harmonic system leading to a transient variation of the synchronous frequency over the bunch train. Another effect of the RF transients is a variation in the synchronous phase over the bunch train, which leads to cross talk effects, the open loop gain starts to vary with the order of the coupled bunch oscillation. The feedback filter needs to take account of all these effects for a satisfactory performance.

Footnotes

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Region represented

Europe

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