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Wake field monitors - design, implementation and first experiences

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State of the art free electron laser and linear collider projects require a tight control of emittance dilution caused by transverse wake field of misaligned components. An attractive option in RF structures are wake field monitors (WFMs), measuring directly internal transverse higher order modes.

In collaboration between CERN, PSI and Sincrotrone Trieste, X band structures with integrated WFMs have been designed and manufactured, which will serve as longitudinal phase space linearizers for free electron lasers as the SwissFEL.

I will present the basic ideas in designing such a monitor and how to integrate this device into an accelerating structure without perturbing the basic properties of the accelerating mode. Furthermore, I will describe the practical implementation into the mechanical design. An interesting feature of the system is the front end, where we are currently developing an electro-optic version for transport and down conversion of the large bandwidth signals in the 15 GHz domain. As I will show, first tests with a basic prototype system used in the SwissFEL injector test facility SITF proved the basic concept as well as advanced features as the direct measurement of structure tilt via spectral analysis of the WFM signals.

Summary

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