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RF system on a chip: a compact controller for SRF cavity field and detuning control

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For SRF cavity systems operated in continous wave (CW) at low effective beam loading as in Energy Recovery Linacs or Free Electron Lasers with rather low beam current, control of the tuning and counteracting any detuning caused by microphonics or Lorentz force driven coupled ponderomotive instability is mandatory to deliver and preserve a stable beam in longitudinal phase space regime.
To develop beyond the currently employed mTCA based LLRF systems, a compact RF on a chip system was developed, which features several potential applications.
Those range from a digital PLL to test and characterize the RF performance of cavities to a selection of detuning control algorithms, we have worked on in recent years, as e.g. a Kalman filter based state estimator controller [1] or an adaptive feedforward algorithm [2].
Here, we will show our first experimental findings with a TESLA style nine-cell SRF cavity operated in CW at our horizontal test facility HoBiCaT.

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Footnotes

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Primary author: USHAKOV, Andriy (Helmholtz-Zentrum Berlin für Materialien und Energie GmbH)

Co-authors: NEUMANN, Axel (Helmholtz-Zentrum Berlin für Materialien und Energie GmbH); ECHEVARRIA, Pablo (Helmholtz-Zentrum Berlin für Materialien und Energie GmbH)

Presenter: USHAKOV, Andriy (Helmholtz-Zentrum Berlin für Materialien und Energie GmbH)

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