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Phase and Amplitude Drift Calibration of the RF Detectors in FELs LLRF Systems

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One of the key components of Low-Level RF systems (LLRF) in Free Electron Lasers (FELs) is the RF field detector that converts the detected cavity field signal to an intermediate frequency (IF) for digital sampling. Temperature and humidity changes cause amplitude and phase drifts of the RF field detectors. These drifts significantly limit the LLRF system precision and they cannot be corrected automatically by digital control loops based on standard signals. The paper presents a subsystem which measure exact values of these drifts and provides opportunities for their calibration. For that purpose, a special Drift Calibration Module (DCM) has been designed which cooperates with the microTCA for physics (MTCA.4) based LLRF system. A method of the calibration, the DCM hardware and firmware overview are presented. Laboratory and in-operation results are demonstrated as well.

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