

RF Beam Noise Feedback System for the High-Luminosity LHC Crab Cavities

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The High-Luminosity Large Hadron Collider (HL-LHC) project at CERN is set to introduce a series of major upgrades across the LHC complex, including the implementation of crab cavities, applied for the first time in a hadron machine. These cavities are designed to increase beam luminosity by compensating for the geometric luminosity reduction caused by the crossing angle at the interaction points.

However, the crab cavity controller and RF power stage introduce additional phase noise into the system, which can lead to beam emittance growth if not properly mitigated. A new solution, known as the beam noise feedback system, is therefore being developed to suppress the impact of this noise.

This presentation will outline the main challenges of the project and introduce a potential mitigation strategy based on AMD RFSoc technology.

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