Contribution ID: **5** Type: **Poster**

# A Low-Level Radio Frequency (LLRF) Control System for Multiple Superconducting Cavities Based on MicroTCA.4

*Wednesday, 23 October 2024 21:04 (1 minute)*

In modern particle accelerators, multiple superconducting cavities are often driven simultaneously by one high-power klystron, thereby reducing the cost of the power supplies. The CEPC RF system contains 96 cryomodules for 650 MHz 2-cell cavities. Each cryomodule contains six 650 MHz 2-cell cavities, driven by a single high-power klystron. This approach significantly reduces the cost of the power supply but introduces several challenges for high-precision control of superconducting cavities, such as gradient differences due to individual cavity variations, frequency offsets caused by Lorentz force detuning, and the calibration of vector sum of amplitudes and phases for multiple cavities. This paper introduces the design of a MicroTCA.4 based Low-Level Radio Frequency (LLRF) control system for multi-cavity control, which will be used for the horizontal testing of the CEPC 650MHz superconducting cavities. Based on the vector-sum control principle, the system utilizes IQ sampling, feedforward-feedback control, and other techniques, eventually achieved high-precision amplitude and phase control and frequency tuning of six superconducting cavities.

**Primary authors:** GAO, Wenbin (IHEP); GAN, Nan (IHEP); ZHOU, Zusheng (IHEP); ZHAI, Jiyuan (IHEP); MA, Xinpeng (IHEP)

**Presenter:** GAO, Wenbin (IHEP)

**Session Classification:** Poster

**Track Classification:** Accelerator: 02: Accelerator technology