

## ACCELERATOR SEMINAR

# Radio-frequency cavity field measurements through free falling bead

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### Description

We propose a novel bead-falling measurement method for the precise and efficient mapping of electromagnetic fields within radio-frequency (RF) cavities, which are crucial components in the design of accelerators. The traditional bead-pull method, while effective, involves mechanical complexities and is prone to errors from wire perturbations. The innovative method reported here leverages the simplicity and accuracy of free-falling beads to mitigate these issues. This technique eliminates the need for a wire-pulley system, thereby simplifying the experimental setup and reducing potential mechanical errors. We introduce the development and operational principles of this new method, including the design of a compact, portable measurement device that integrates a bead/droplet release system and a bead detection system linked to a Vector Network Analyzer (VNA). The device has been tested with a three-gap buncher cavity and a scaled Alvarez-type cavity, demonstrating its ability to perform rapid, reliable field measurements under various challenging conditions, including low signal-to-noise ratios and environmental vibrations. The results confirm the method's superiority in precision and operational efficiency, potentially setting a new standard for RF cavity diagnostics and tuning.

**Thursday, August 28<sup>th</sup>, 2025 at 1:30 PM**

**side room lecture hall**  
**(SB1 1.200)**

**The seminar takes place exclusively in presence**

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Coordinator: Udo Weinrich  
Secretary: Paola Lindenberg

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