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Experimental measurement of the second-order transit time factor in a single-cell RF cavity for relativistic electron beams

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In this paper, we present a concise measurement of the Second-Order Transit Time Factor (TTF) of the relativistic electron beams within the bunching cavity of the Coherent Electron Cooling (CeC) Pop Experiment. Our study outlines a specialized measurement methodology that tackles the unique challenges posed by the CeC accelerator environment. The results not only provide significant insights into controlling CeC beam dynamics but also critically validate the theoretical prediction of the Second-Order TTF for relativistic electron beams. This work advances our understanding of beam dynamics and enhances the efficiency and control of CeC-based systems.

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