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The influence of gauge field smearing on discretisation effects

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When designing lattice actions, gauge field smearing is frequently used to define the lattice Dirac operator. Since the smearing procedure removes effects of ultraviolet fluctuations, the fermions effectively see a larger lattice spacing than the gauge fields. Creutz ratios, formed from ratios of rectangular Wilson loops, based on smeared gauge fields are an adequate observable to investigate the effect of smearing since they do not need renormalisation and provide a measure of the physical forces felt by the fermions. We study their behaviour at various smearing radii (fixed in lattice units) and in particular how the smearing influences the scaling towards the continuum limit. Since we employ the Wilson gradient flow as smearing, the same Creutz ratios have another, well defined continuum limit, when the flow time is fixed in physical units. We make an attempt to approximately separate the close-to-continuum region for smearing from the one of the physically flowed Creutz ratios.

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