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Update on pion scalar radii with $N_f = 2 + 1$ Clover-improved Wilson fermions

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We give a status update on our analysis of the pion scalar form factors $F_S^{\pi,f}$, $f = l, 0, 8$ and the associated radii $\langle r_S \rangle_\pi^{l,0,8}$. Our lattice results are computed on a large set of 18 CLS gauge ensembles with $N_f = 2 + 1$ Wilson Clover-improved sea quarks. These ensembles cover four values of the lattice spacing $a = 0.049\text{fm} \ldots 0.086\text{fm}$, a pion mass range of 130MeV to 350MeV and many different physical volumes. The precise determination of the notorious quark disconnected contributions together with large and fine ensembles in the vicinity of physical quark masses allow us to achieve an unprecedented momentum resolution for $F_S^{\pi,f}$.
In addition to ensembles on the $\text{tr}[M] = \text{const}$ trajectory ensembles on a trajectory with constant strange quark mass $m_s \approx \text{phys}$ have now been included as well. Further improvements compared to what has been presented at the previous Lattice conference include, but are not limited to: Increased gauge statistics on our most chiral ensembles by a factor 2 to 3, a factor ~ 4 increase in the number of measurements for the two-point functions used in the computation of the $2 + 1$ quark-disconnected diagrams, and an enhanced method for the subtraction of the vacuum expectation value on ensembles with open boundary conditions.

The ground state matrix elements are extracted with controlled systematics using several ansätze and the radii are obtained from a z-expansion fitted to the $Q^2-dependence of the resulting form factors. The physical extrapolation of these results is carried out using NLO chiral perturbation theory to parametrize the quark mass dependence.

Primary author: OTTNAD, Konstantin (University of Mainz)

Co-author: VON HIPPEL, Georg (University of Mainz)

Presenter: OTTNAD, Konstantin (University of Mainz)

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