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Tuning the strange quark mass and the hadron mass spectrum for 2+1 quark flavours

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QCD lattice simulations with 2+1 flavours typically start at rather large up-down and strange quark masses and extrapolate first the strange quark mass to its physical value and then the up-down quark mass. An alternative method of tuning the quark masses is discussed here in which the singlet quark mass is kept fixed, which ensures that the kaon always has mass less than the physical kaon mass. It can also take into account the different renormalisations (for singlet and non-singlet quark masses) occurring for non-chirally invariant lattice fermions and so allows a smooth extrapolation to the physical quark masses. This procedure enables a wide range of quark masses to be probed, including the case with a heavy up-down quark mass and light strange quark mass.

Numerical results show the correct order for the baryon octet and decuplet spectrum and an extrapolation to the physical pion mass gives mass values to within a few percent of their experimental values.

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