

# Strange Quark Content of the Nucleon using the Yang-Mills gradient flow

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The Yang-Mills gradient flow can be used to calculate the strange quark scalar content in nucleons using Lattice QCD. Given the renormalization properties of flowed operators, the procedure promises a reduction of the uncertainties in the determination of the spin independent (SI) elastic cross section of dark matter models involving WIMP-nucleon interactions. Chiral symmetry and a small flow-time expansion relate the scalar density at zero flow time to the pseudo-scalar density at non-zero flow time which can be calculated accurately on a lattice. The pseudo-scalar density is calculated on a  $32^3 \times 64$  lattice using 2+1 flavor QCD gauge field configurations by PACS-CS with a spacing of  $a=0.0907$  fm,  $\beta=1.90$ ,  $m_\pi \approx 411$  MeV. We show a preliminary result for the flow-time dependent vacuum to pion matrix elements and we discuss how it can be used to extract the strange quark scalar content in nucleons.

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