Theory and computation highlights in May, 2020

(Contribution to the Director's Monthly Report to JSABOD)

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The USQCD Collaboration, comprising the majority of researchers working on lattice QCD across the nuclear and high-energy communities in the US, held its annual "All Hands Meeting" virtually at Jefferson Lab on the 1-2 May, followed by a half-day meeting on software for lattice QCD. An important element of the meeting was discussion and presentation of proposals submitted to the Scientific Program Committee of USQCD for time on the USQCD computing facilities at BNL, FNAL and JLab, as well as discussion of the future activities and strategy of the collaboration. Theory staff, Dr. Richards chaired the local organization committee. Director Stuart Henderson delivered the Welcome Remarks. Deputy Director Bob McKeown delivered one of two topical talks, describing the achievements of and opportunities for the 12 GeV program at JLab, and Phiala Shanahan (MIT) presented the other talk describing her work on developing AI algorithms for lattice QCD. Over 90 people registered for the event, and up to 80 people participated at one time, quite an achievement for the first USQCD virtual All-Hands Meeting.

Theorists from JPAC reanalyzed the omega → 3pi decay together with the omega pi^0 transition form factor, in order to resolve some surprising previous discrepancies between theoretical predictions and experimental measurements [arXiv:2006.01058]. Previous theoretical predictions were based on unsubtracted dispersion relation of the omega → 3pi amplitude based on Khuri-Treiman equations. Within this framework, they have used a once-subtracted dispersion for the omega → 3pi amplitude, and have found that their predictions for the Dalitz-plot parameters are in good agreement with the experimental determination by the BESIII collaboration. At the same time, using this amplitude as an input for the omega pi^0 transition form factor, they are also able to reproduce the experimental data on this observable by the NA60 and MAMI collaborations.

Transverse momentum moments of spin-dependent cross sections are central to many phenomenological studies of hadron structure, but their scale dependence is poorly understood. For example, the transverse momentum-weighted integrals of correlation functions such as the Sivers transverse momentum dependent (TMD) function can be interpreted in terms of both collinear functions and intrinsic transverse momentum. Theory Center staff, Jianwei Qiu and Ted Rogers, shows that nontrivial corrections to a commonly used formula connecting TMD and collinear correlation functions are needed [arXiv:2004.13193]. These corrections suggest that a TMD evolution treatment is most appropriate for applications whose aim is to study intrinsic transverse momentum.