

Energy Frontier Topical Group 5 (EF05)

Conveners: Michael Begel, Stefan Hoeche, Michael Schmitt

General scope: Strong Coupling, Precision observables, Jet Physics, Perturbative QCD calculations and MC simulations, Non-perturbative QCD dynamics

Many overlaps with EF01, 03, 04, 06, 07 and TF and CompF topical groups

Website: <https://snowmass21.org/energy/qcd>

Indico category: <https://indico.fnal.gov/category/1139/>

Group meetings on Mondays, 9:30am CDT/10:30am EDT/16:30 CERN

Active LOIs (primary EF05)

<https://snowmass21.org/loi>

- Perspectives for high-precision $\alpha_s(m_Z^2)$ determinations from future e^+e^- measurements at the FCC-ee (200)
- Precision measurements of α_s and its running at future colliders (217)
- Recommendations for more precise and robust assessment of experimental and systematic QCD uncertainties (219)
- Are Jets Universal? (220)
- Recommendations for better measurements of multi-parton interactions and the underlying event (212)
- Recommended benchmark measurements of hadron spectra, etc., to constrain non-perturbative QCD physics (213)
- An assessment of the strengths and weakness of existing MC event generators (214)
- Assessment of what can be learned from neutrino scattering data for non-perturbative physics (215)
- Uncertainties in perturbative QCD calculations and Monte-Carlo simulations (231)
- Uncertainties in simulations of non-perturbative QCD effects (232)
- Lattice-QCD Determinations of Quark Masses and the Strong Coupling α_s (257)
- High-precision $\alpha_s(m_Z^2)$ determinations from future FCC-ee $e^+e^- \rightarrow \text{hadrons}$ data below the Z peak (208)
- A Very Forward Hadron Spectrometer for the LHC (087)
- Gluon Saturation at the Electron Ion Collider (168)
- Higher twist effects in inclusive and diffractive nuclear structure functions (076)
- New frontiers in PDF analyses in the HL-LHC era (146)
- Snowmass LOI Les Houches Wishlist: placeholder (206))
- Exclusive Z decays (091)
- Jets and Jet Substructure at Future Colliders (140)
- EW and BSM physics at EIC (210)
- Forward jets and dense systems (025)

Active LOIs (secondary EF05)

<https://snowmass21.org/loi>

- Toward the N3LO accuracy of parton distribution functions (268)
- PDFs, α_s and Low-x Physics and at Future DIS Facilities (174)
- Jets and jet substructure in heavy-ion collisions (195)
- Forward Physics Facility (193)
- Numerical Lattice Gauge Theory (017)
- Emerging Computational Techniques for Jet Physics (046)
- Precise predictions for Higgs pair hadroproduction (127)
- Generative, Explainable Artificial Intelligence for Nuclear Physics and HEP (189)
- Letter of Intent: A Forward Calorimeter at the LHC (148)
- Measurement of the W mass and width at FCC-ee (166)
- Unitarity of CKM Matrix, $|\text{Vud}|$, Radiative Corrections and Semi-leptonic Form Factors (249)
- Probing Scalar and Tensor Interactions at the TeV Scale (192)
- EFT Analysis of the VVV process: a Letter of Interest for Snowmass 2021 (233)
- xFitter: An Open Source QCD Analysis Framework (040)
- The Femtography Project (159)
- Discovery potential of all-hadronic searches for vector-like quarks at future colliders (186)
- Probing High Scale Physics via Standard Model Parameters (012)
- Cold QCD Matter at High Densities (225)
- Constraining Physics Beyond the Standard Model using Electric Dipole Moments (230)
- Precision Lattice QCD in Support of BSM Searches (047)
- Using lattice QCD for the hadronic contributions to $\theta_{\text{muon}}-2$ (103)
- Bottom quark mass (262)
- Particle production and correlations in dilute-dense collisions in the CGC framework: finite-width target effects (270)
- Origin of Nuclear Shadowing and Antishadowing (267)

Restart after the pause

- We would like to invite you to give updates on your ongoing projects
 - During one of the group meetings
 - Via other Snowmass channels
- If you have new ideas and studies to propose, please let us know
 - So we can plan to include them in the final document
 - Make other topical groups / other frontiers aware of them
 - Help connect you to people working in similar directions
- **If you are new to Snowmass, join the EF05 mailing list and connect with us**
We would especially like to invite young scientists
- During this week's workshop we heard very nice talks on individual projects and summaries of workshops that happened during the pause
- We plan to cycle through the existing LOIs in the next few weeks
Ideally this might lead to a draft outline of the group report by end of 2021
This report is to be finalized by May 2022 (↗ A. Tricoli's slides on Monday)

Thank you for participating in the EF activities!

We look forward to your new ideas and contributions.

We are especially glad to work with such a vibrant and enthusiastic group.

Please send us suggestions, comments, etc.

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