Response to Referee Report on *"Physics case for low-$\sqrt{s}$ QCD studies at FCC-ee"*

The Authors

December 5, 2025

Introduction

We are pleased that the referees find our manuscript well written and recognize its potential to open a new pathway for QCD studies at intermediate energies using e^+e^- collisions at the future FCC-ee collider. Below, we address the specific concerns raised.

1 Report 2 by Referee 2 on 2025-6-12 (Invited Report)

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Report 2 by Anonymous (Referee 2) on 2025-6-12 (Invited Report)
Strengths

1- timely 2- predicts important input for FCC program 3- written clearly, briefly and comprehensively
Report
The authors report on two interesting options to generate data samples for lower-than LEP CM energy hadronic
final states in electron position annihilation events at the FCC-ee. Input from existing data sets is very
limited and the input from these data to tuning Monte Carlo event generators and understanding QCD effects
is highly desirable. The study is a contribution to the 2025 update of the European strategy for Particle
Physics.

The authors offer two possible avenues to achieve these data sets at the FCC-ee. One is the usage of events
with initial- or final state photon radiation at the dedicated high luminosity run at the Z pole. Reasonable
simulation of events shows that selected data sets will contain still well over a billion events at a number
of low energy bins of 5 GeV size, which will cover the CM energy range between 20 and 91 GeV. The second
avenue would be to have dedicated runs at lower energies. The latter option would clearly benefit from pure
data samples that might be easier to compare systematically to existing observables from LEP and other
colliders.

Still, the study shows that both avenues should lead to very interesting physics results and would give
very important input to understanding QCD effects of various kinds.
Recommendation

Publish (easily meets expectations and criteria for this Journal; among top 50%)
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1.1 Feedback

We are pleased that the relevance, clarity, and potential impact of our study have been appreciated. We agree that both proposed approaches (radiative return and dedicated low-energy runs) offer complementary paths toward enriching the FCC-ee physics program and improving our understanding of QCD in a previously underexplored regime.

Sincerely,
The Authors