Ernst Sichtermann
LBNL local EIC mtg.
March 22, 2022

Proposed ECCE Tracker

(ECCE proposal)

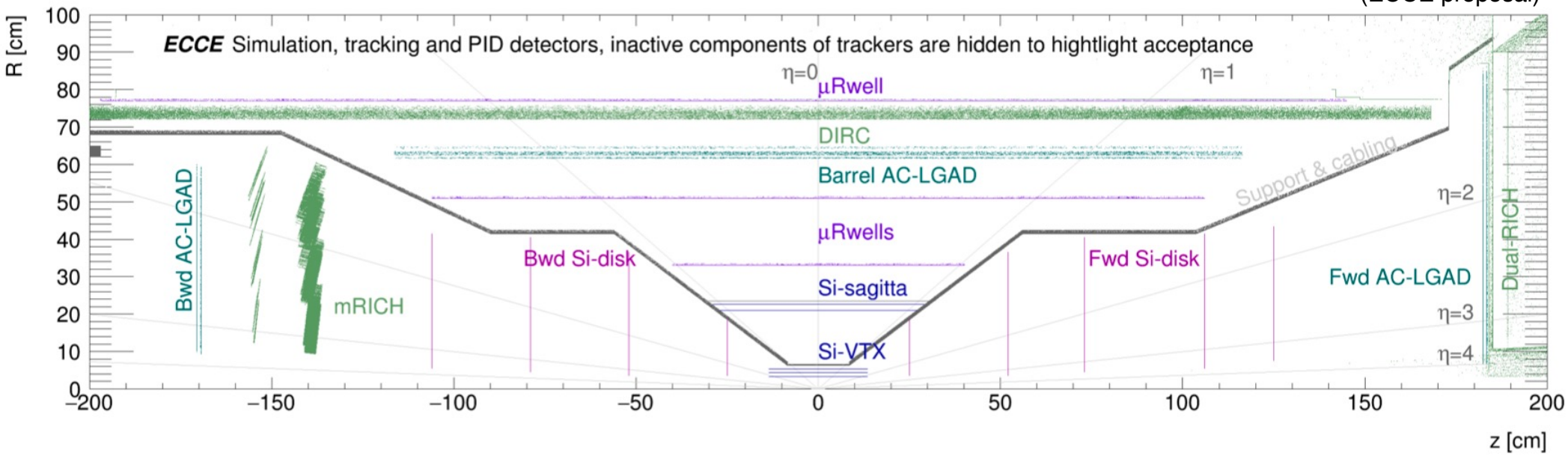


Figure 2.5: Schematic view of the ECCE tracker, including silicon, μRWELL, AC-LGAD, DIRC, mRICH and dRICH detector systems.

- Lots of commonality with the ATHENA proposal, most notably on sensors and aspects of layout,
- The proposal does not have sufficient detail, but gives me the impression that e.g. the sagitta layers are assumed to be $X/X_0 = 0.05\%$; differences in length and population of disk-arrays seem clear enough,
- Surprisingly and disappointingly, eRD16/18/25 are not referenced in the ECCE proposal and the EIC silicon consortium is mentioned only in the costing section.

Proposed ECCE Tracker dp/p Performance

(ECCE proposal)

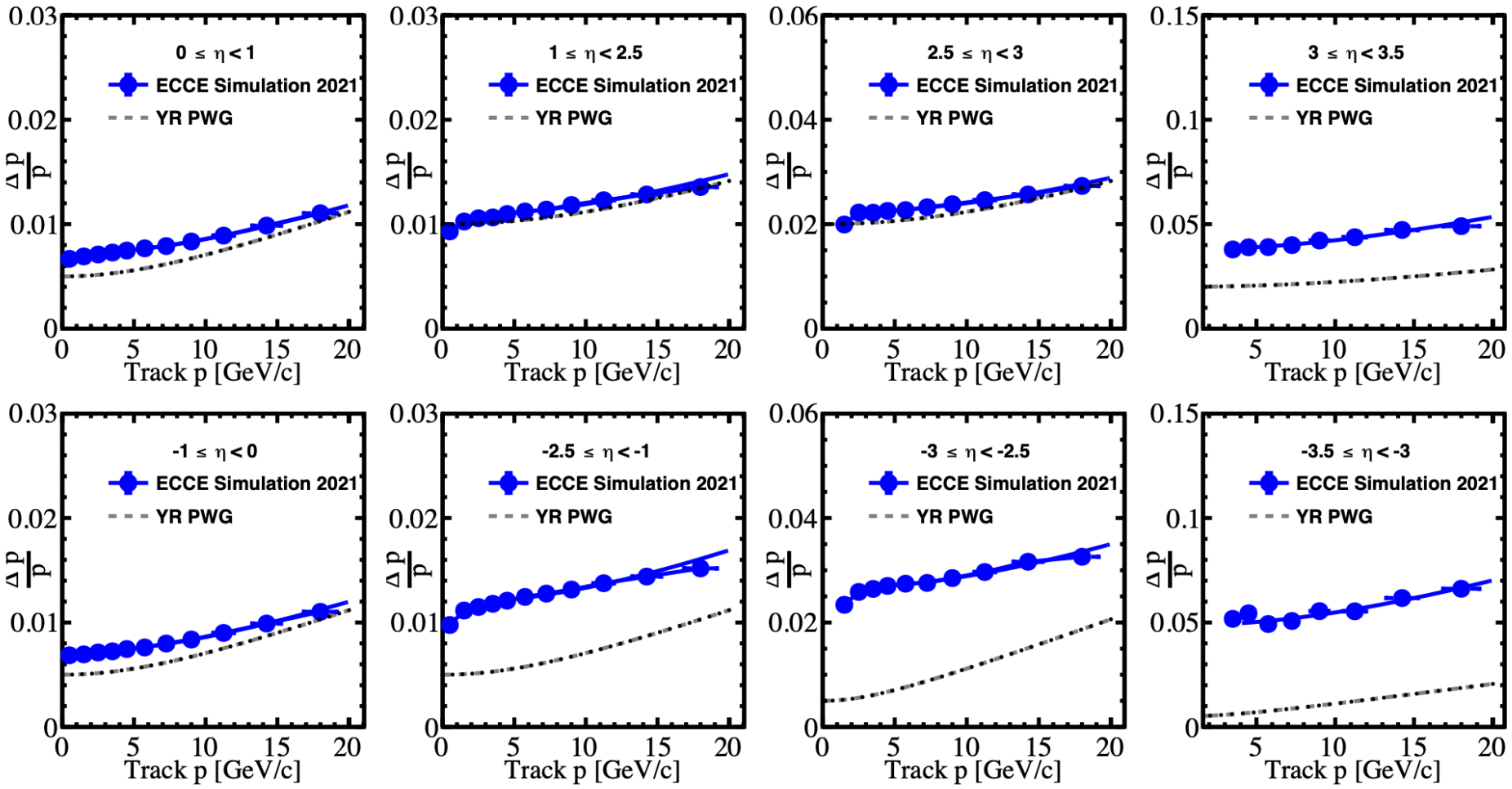
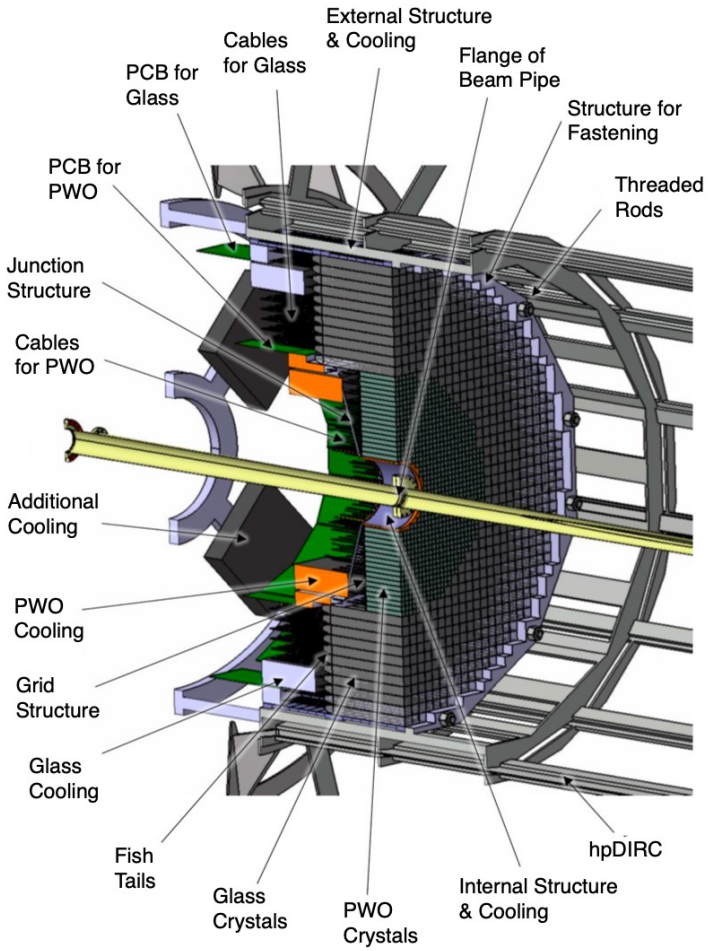


Figure 2.7: ECCE pion track momentum resolution (data points) with the EIC YR PWG requirements for the tracker indicated by the dashed lines. Note that the ECCE performance simulations take into account materials for readout and services. The impact of these can be observed most clearly in the bins covering the barrel/barrel endcap transition regions. As an integrated EIC detector with all subsystems operating in a complementary way, ECCE achieves the EIC physics goals as described in Chapter 3.

- The ECCE tracker, as proposed, meets the YR goals... where?
- If $X/X_0 = 0.05\%$ is indeed assumed for the sagitta layers, even the mid-rapidity region will benefit from revisiting for performance,
- Some gains can likely be had in the disk arrays; they simply do not look optimal to me,
- Differences from 1.5 vs 3.0 T and lever arms will not be recovered.
- (In-)sufficiency of hit points remains an open question.

Proposed nECal

(ATHENA proposal)



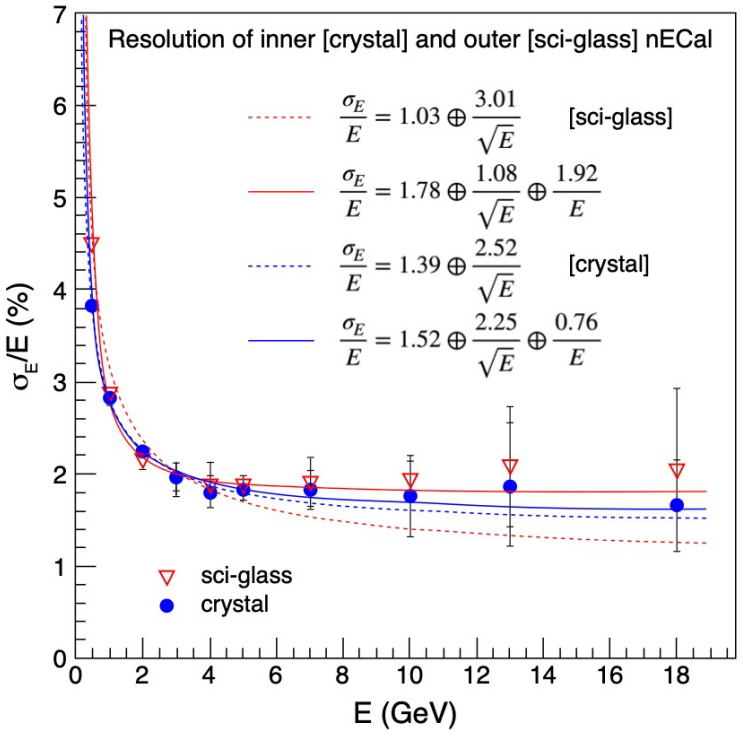
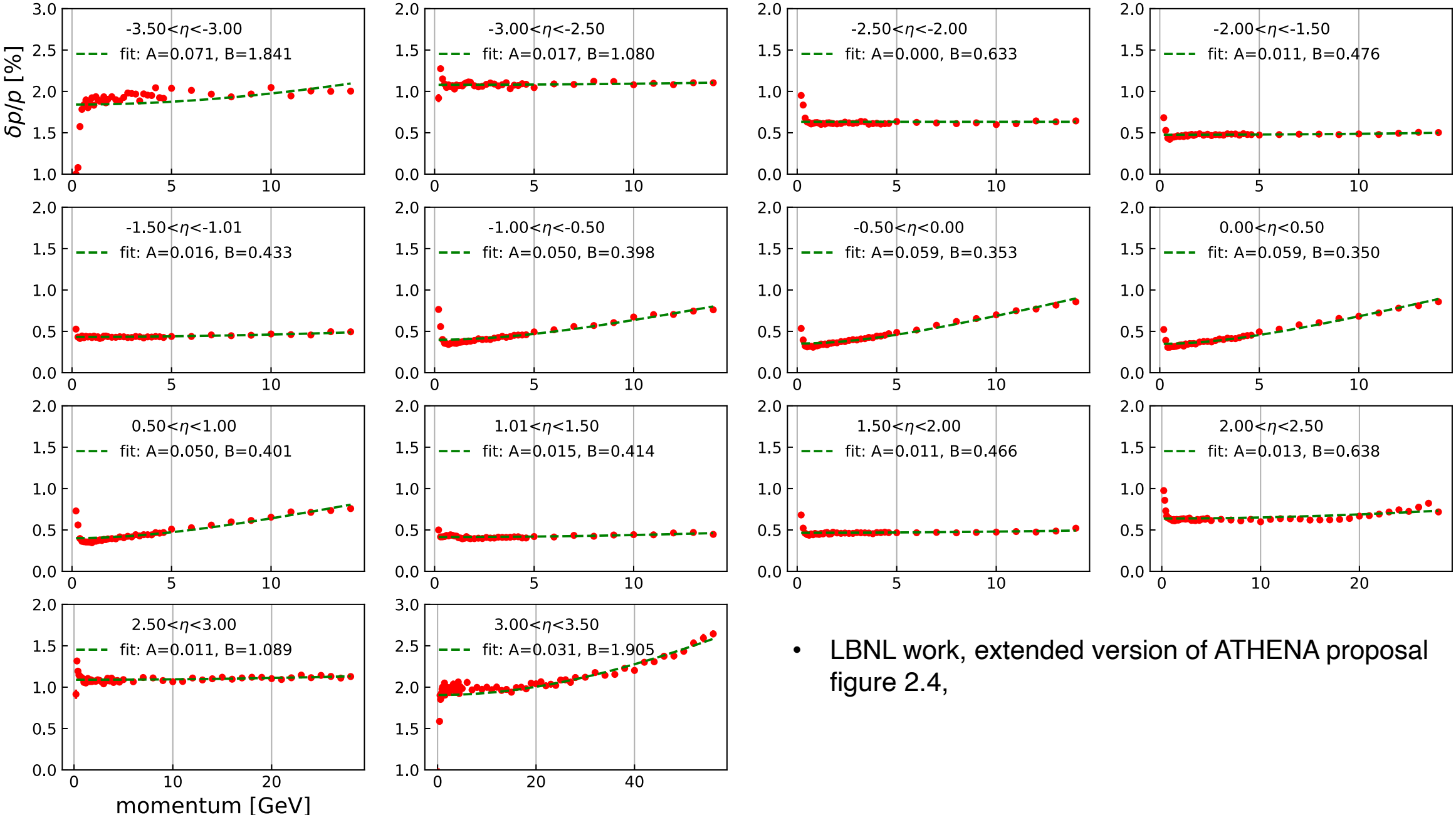


Figure 2.5: Left: The mechanical design of hybrid crystal/glass calorimeter nECal. Right: Expected nECal performance for the stand alone calorimeter, the energy resolution curves for inner $PbWO_4$ ($\sim 22\ X_0$) and outer SciGlass ($\sim 20\ X_0$) regions (FullSim).

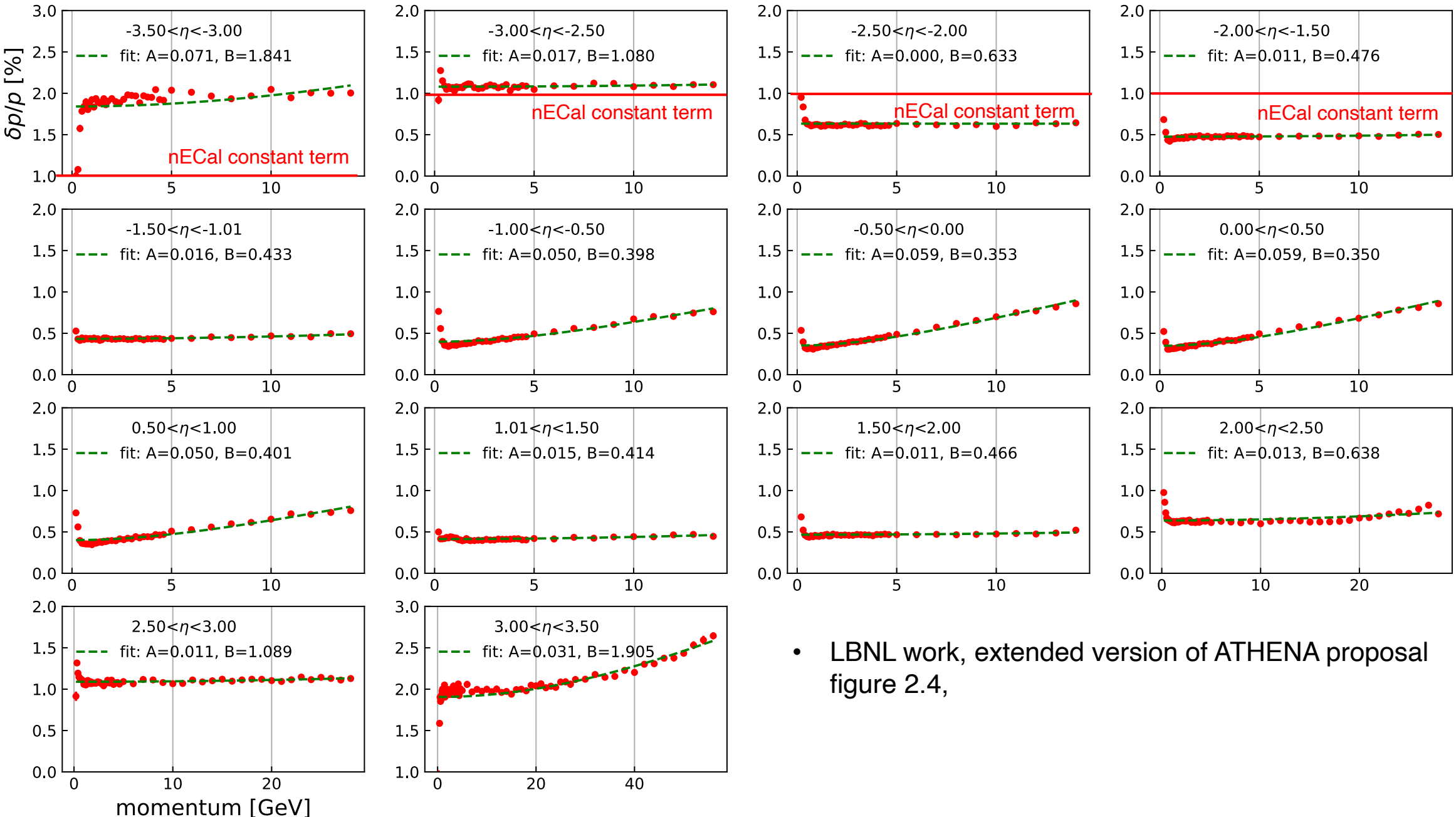
- nECal is essentially common to ECCE and ATHENA,
- Covers approximately $-3.5 < \eta < -1.5$,
- 2%/√E ⊕ 1% stated performance from the $PbWO_4$ crystals,
- Constant term matters and is affected, e.g., by fluctuations in energy transfer to inactive material in front and as part of the calorimeter,
- Much has been made about nECal, perhaps because it measures scattered electrons in e+A → e' + VM (+ A'),
- Not all physics is about e'

Proposed ATHENA Tracker dp/p Performance



- LBNL work, extended version of ATHENA proposal figure 2.4,

Proposed ATHENA Tracker dp/p Performance



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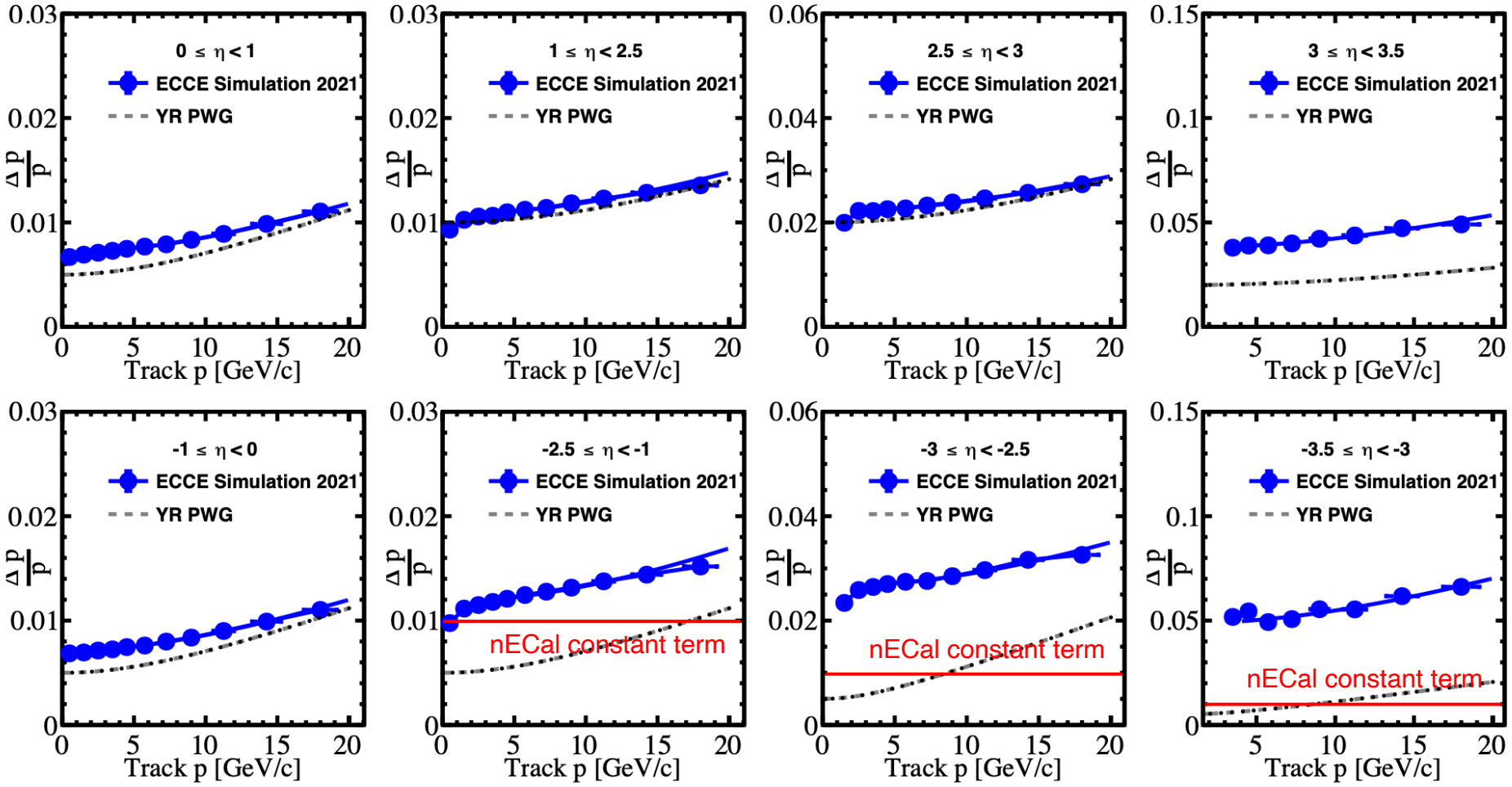

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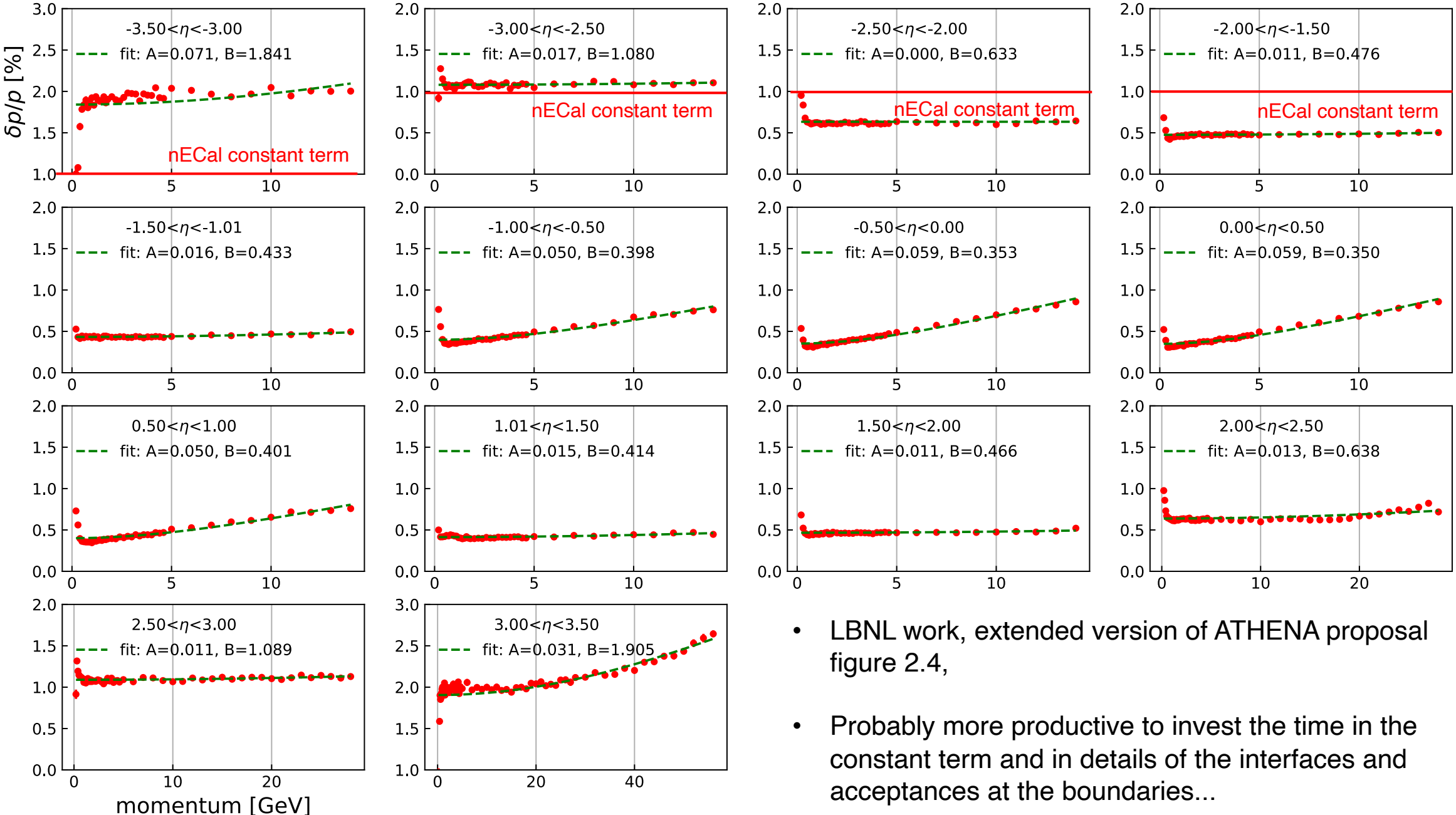
- Same 1% constant term overlayed on the ECCE simulated tracking performance and YR tracking goal,
- …

Proposed ATHENA Tracker dp/p Performance



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- Probably more productive to invest the time in the constant term and in details of the interfaces and acceptances at the boundaries...