Some (current) research interests

Alexander Karlberg

CERN Theory Department Retreat 2022

$\langle x(t)|\psi\rangle$

Undergrad at NBI (’07 - ’12)

DPhil in Oxford (’12 - ’16)

Postdoc in Zürich (’16 - ’19)

Postdoc in Oxford (’19 - ’22)

Fellow at CERN (’22 - . . .)

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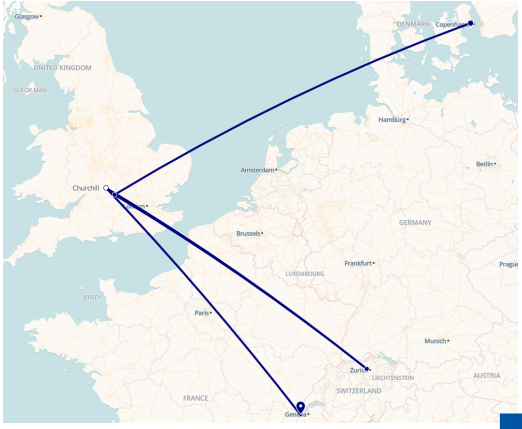
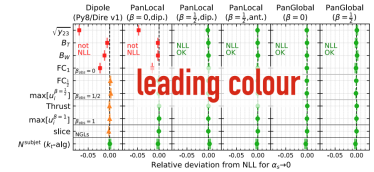
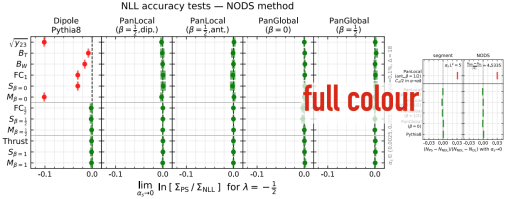
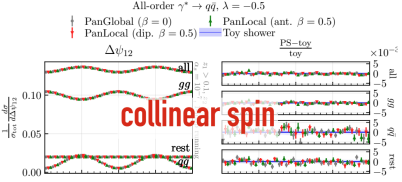
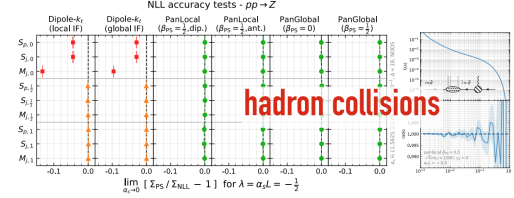


PanScales - improving (understanding?) showers



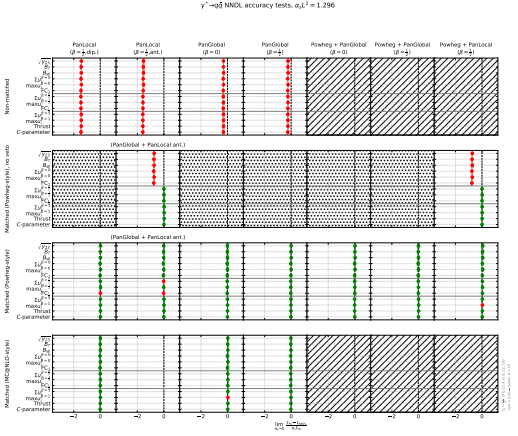






PanScales - beyond NLL

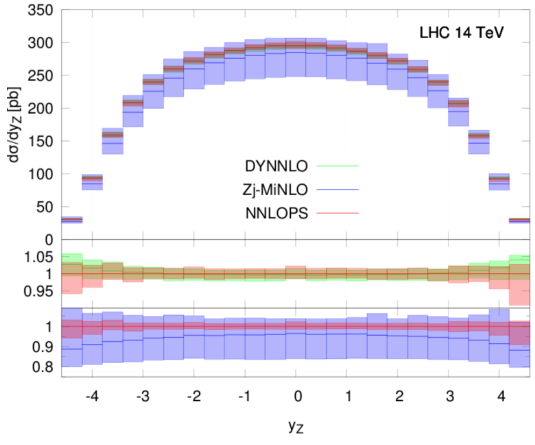
- NLO matching and NLL showers
  - What modifications are needed to preserve NLL accuracy with POWHEG and MC@NLO?
  - Can we improve the logarithmic accuracy through matching (eg NNDL for event shapes)?



PanScales - beyond NLL

- NLO matching and NLL showers
  - What modifications are needed to preserve NLL accuracy with POWHEG and MC@NLO?
  - Can we improve the logarithmic accuracy through matching (eg NNDL for event shapes)?
- Paths to NNLL
  - Is it possible to modify/improve current NLL showers such that they reach NNLL without changing the underlying dipole structure?
  - Can we devise new shower formulations that naturally get NNLL?
  - What is the impact of NNLL terms in the shower?
- Phenomenology of NLL showers
  - Study the impact of NLL showers for the LHC (and future colliders), eg m_W measurements
  - Come up with ways of measuring spin correlations in jets at the LHC

NNLOPS matching



The matching of parton showers and next-to-next-to-leading order calculations is now well-established for colour-singlet production.

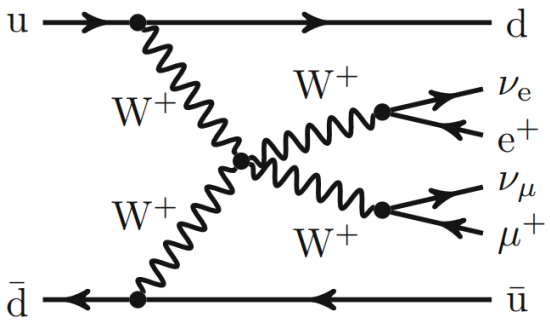
With the advent of (N)NLL showers it will become important to understand if current NNLO+PS matching schemes retian NLL.

If not- can we easily modify them so that they do?

Can we also get improved logarithmic accuracy with a little more work?

This will be fundamental for the LHC precision program.

POWHEG and Vector Boson Scattering



Vector Boson Scattering one of the more exotic processes accessible at the LHC

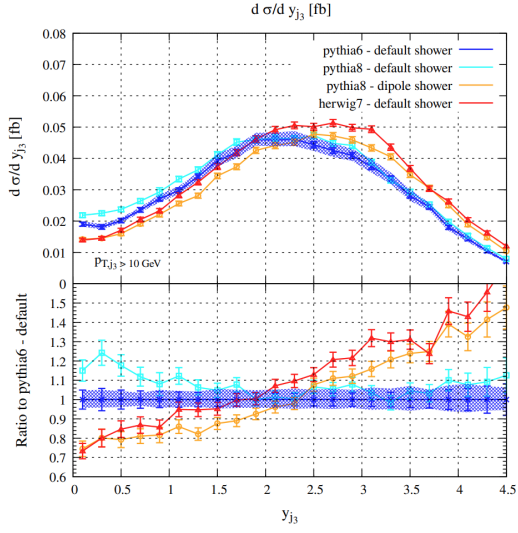
Sensitive to new physics in the EW sector

Surprisingly sensitive to parton shower details

1) Can we understand if some showers are doing something wrong (indications that pythia is breaking coherence)

2) Can we improve the way POWHEG handles t-channel processes?

POWHEG and Vector Boson Scattering



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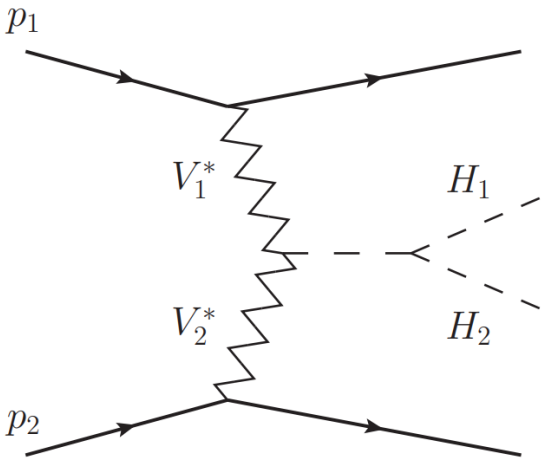
Vector Boson Fusion



Vector Boson Fusion second largest Higgs production mode at the LHC

Both theoretically and experimentally very clean

Computed through N3LO in QCD and NLO in EW $\rightarrow$ theoretically one of the best understood processes at the LHC

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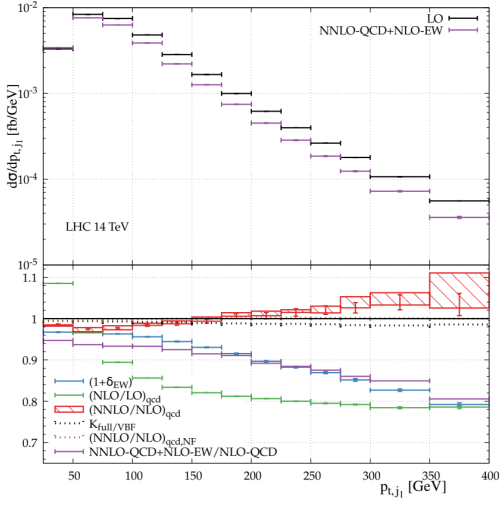

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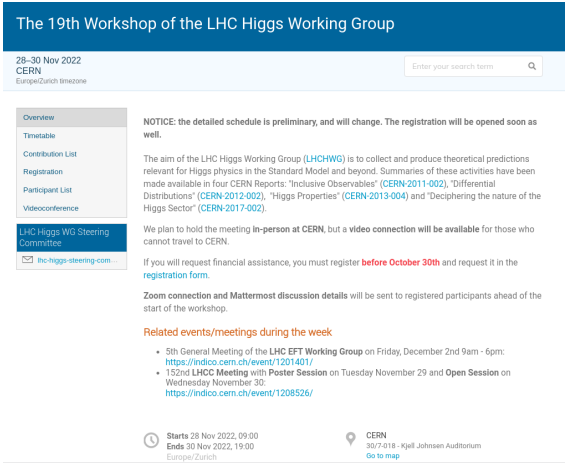
LHCHWG



Convener of Working Group 1 of the LHC Higgs Working Group (and VBF convener in the past).

Many TH members involved as sub-group conveners in the past and present (currently Emanuele Bagnaschi, Silvia Ferrario Ravasio, Alex Huss).

Get involved and join the annual workshop later this month!