

The background features a complex, abstract visualization of polarized bosons. It consists of several swirling, vortex-like structures in various colors (yellow, orange, blue, purple, pink) arranged in a circular pattern. White arrows indicate the direction of rotation for each vortex. A large, faint white arrow curves around the perimeter of the vortices, pointing clockwise. The title "Polarized bosons" is centered in a bold red font.

Polarized bosons

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Image credit: Gemini

Experimental landscape (most recent results)

Diboson process	Result
WZ (arXiv:2211.09435 , JHEP 07 (2022) 032)	Joint and single polarization measurement
WZ in high p_T^Z (arXiv:2402.16365)	Measurement of polarization fractions in high p_T^Z regime and low p_T^{WZ} . Led to an improvement of 20-30% in doubly longitudinally polarized fraction.
$ZZ \rightarrow 4\ell$ (arXiv:2310.04350)	Joint polarization measurement, doubly longitudinal polarized fraction measured at 4.3σ
 $W^\pm W^\pm jj$ (arXiv:2310.04350)	Evidence of production of same-signed W pairs where at least one of the W-bosons is longitudinally polarized

Theory landscape (most recent)

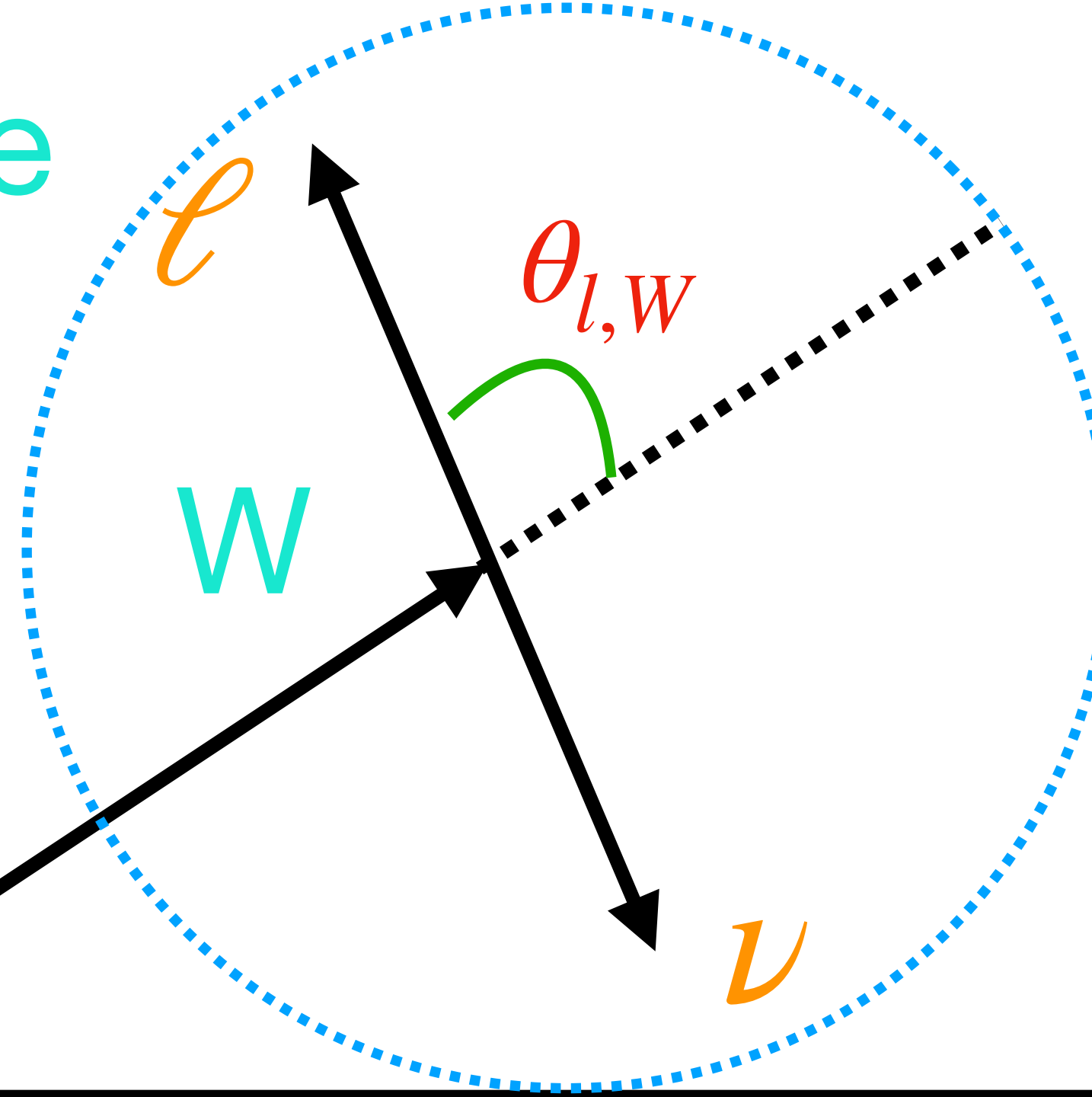
- Precise Standard-Model predictions for polarised Z-boson pair production and decay at the LHC: [arXiv:2505.09686](#)
- NLO EW and QCD corrections to polarised same-sign WW scattering at the LHC: [arXiv:2409.03620](#)
- NLO EW corrections to polarised W^+W^- production and decay at the LHC: [arXiv:2311.16031](#)
- Polarised-boson pairs at the LHC with NLOPS accuracy: [arXiv:2311.05220](#)

What we could do here at Les Houches and beyond

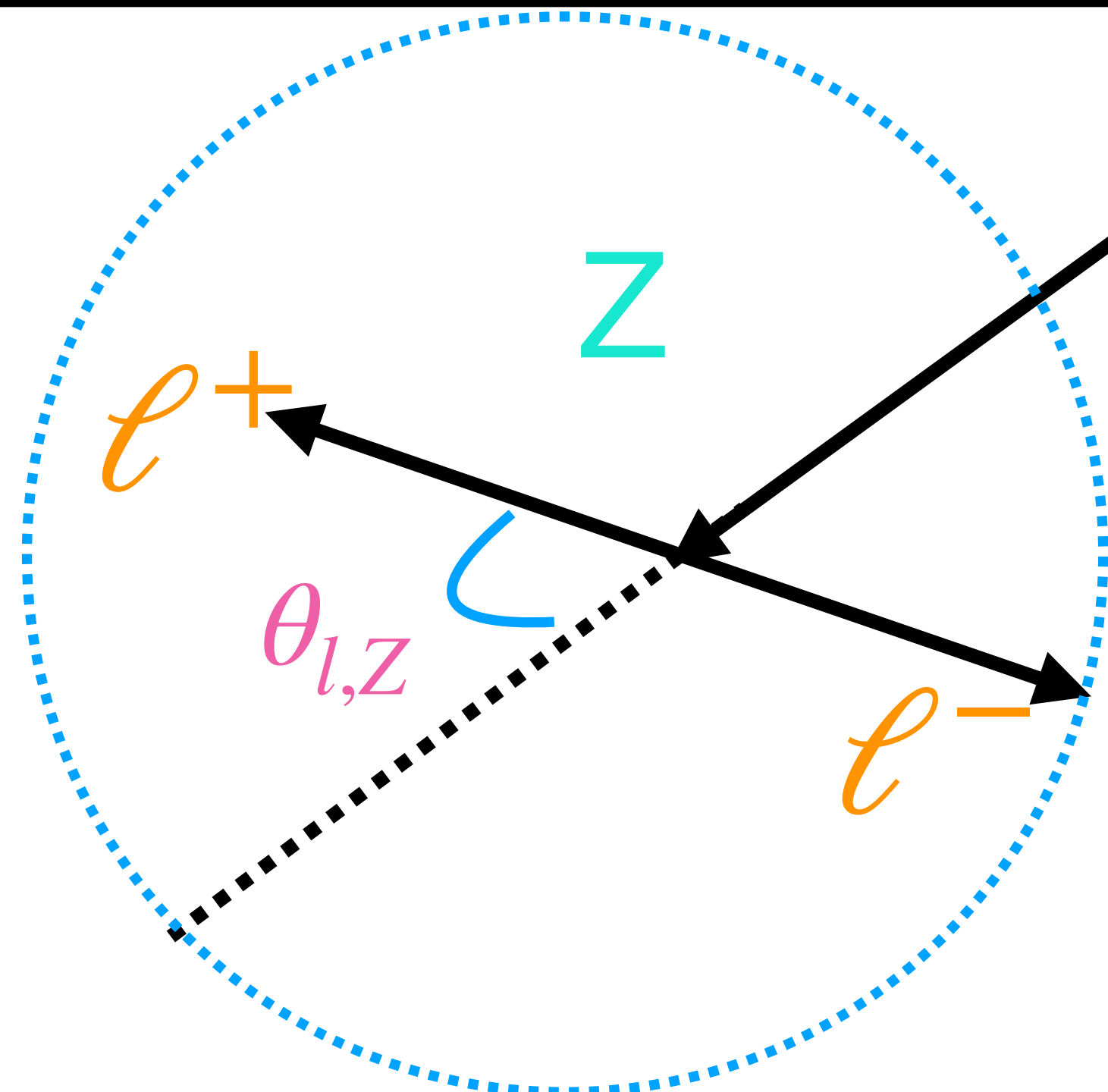
- Interplay of polarization states and EFT effects?
 - Given that experimentally we are achieving greater sensitivity to various rare processes including vector boson scattering, perhaps it makes sense to study interplay of dimension-6 and dimension-8 operators to the different polarization states
- To LO or NLO or both:
 - Radiation amplitude zero effect result from ATLAS reduced hadronic activity
 - How computationally intensive is generation of processes with off-shell components at SMEFT@NLO
- Tribosons and polarization:
 - Open area of research: lots to be done, identifying polarization states could help disentangle Higgs mediated mode from quartic and trilinear diagrams
- Also focus on single gauge boson production? Tau polarization in Z decays analysis published from CMS
- Finally: if we identify a few key areas, we can perform a phenomenological study as part of the COMETA initiative → key inputs to experiments as we head toward analyzing Run 3 data (we are well beyond doubling the dataset wrt Run 2)

Polarization is a frame-dependent measurement

W rest frame



WZ rest frame



Z rest frame