

HZZ polarization + LumiCal Delphes simulation

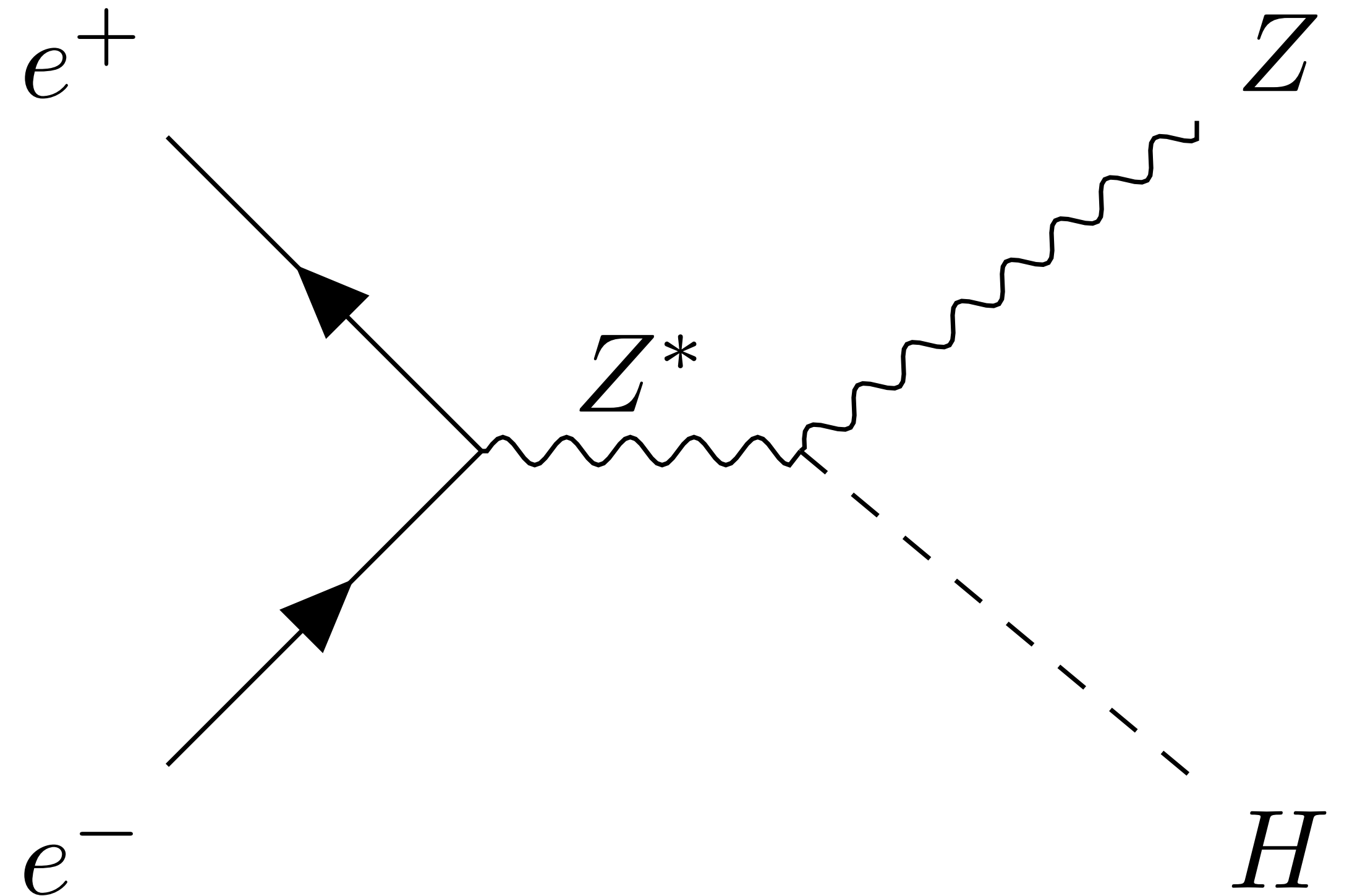
Egor Vasenin, Lebedev Physical Institute, March 16th, 2026

Outline

1. HZZ Polarisation
 1. Simulation
 2. Theoretical description
 3. Statistical analysis
2. LumiCal implementation in Delphes
 1. Geometry
 2. Energy resolution

HZZ polarization

- $e^+e^- \rightarrow Z^* \rightarrow HZ, Z \rightarrow 2l$ process has mainly s-wave in final state. Because of the spin-0 H boson, the polarization matrix of Z^* is perfectly inherited by the Z polarization matrix. This could be violated by any other waves contribution.
- Z^* polarisation matrix is equal to initial beam polarisation
- Z polarisation is obtained from $2l$ angular distributions



HZZ polarization

- We need to derive the theoretical formula relating $2l$ angular distributions to Z polarization matrix
- Generate MC samples, obtain Z polarization matrix and its statistical errors
- Derive Z^* polarization matrix from beam polarization
- Obtain sensitivity to imperfect inheritance of Z^* polarization matrix

LumiCal in Delphes

- The goal is to implement forward calorimeter for CEPC detector in Delphes, based on LumiCal
- Geometry is obtained from LumiCal .xml file
- Study energy resolution of the LumiCal, work with CEPCSW LumiCal group

LumiCal in Delphes

- LumiCal is designed to measure luminosity, therefore it is a calorimeter without tracker
- To make it a forward detector we need to assume some tracker before the LumiCal to distinguish photons and electrons
- Assume some 100% efficient tracker. What is the momentum resolution?