Detector Challenges of the Strong-Field QED Experiment LUXE at the European XFEL

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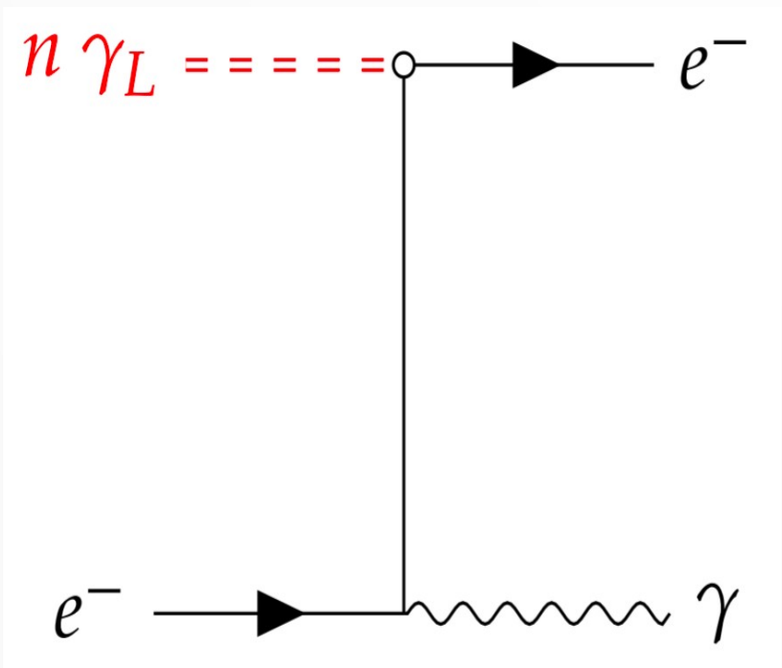
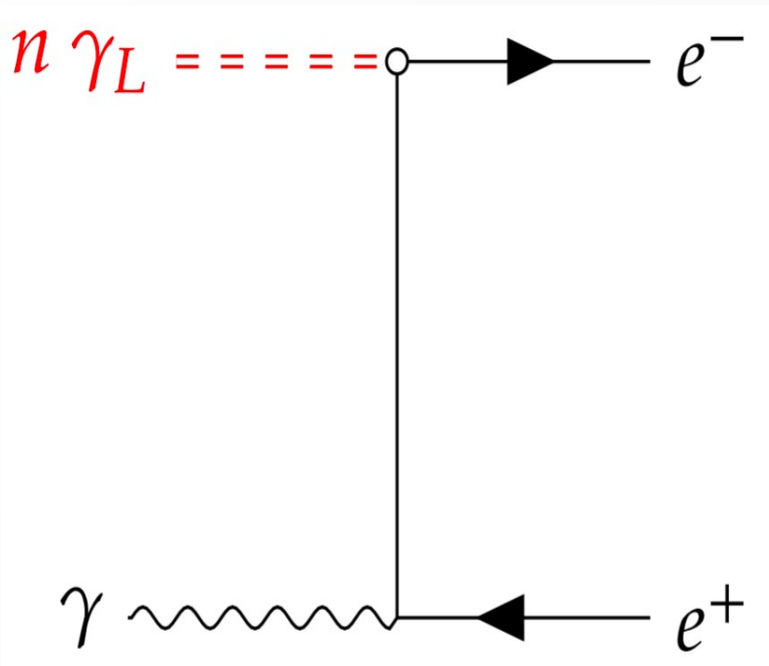
Strong-Field QED

- QED is a remarkably accurate theory… until it isn't, at high energy / intensity scales
  - Near Schwinger Limit, non-linear QED processes can occur
- LUXE intends to measure these processes with high-power LASER pulses & the XFEL electron beam





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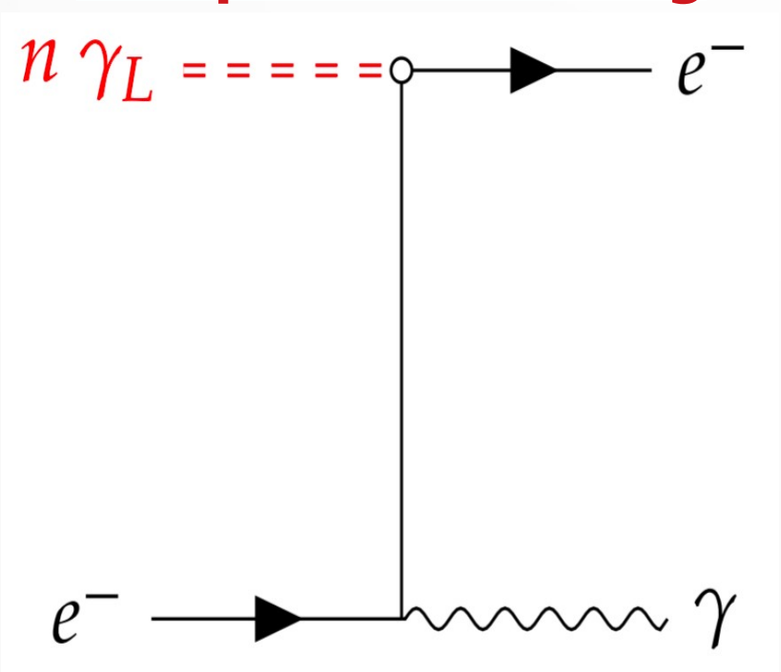
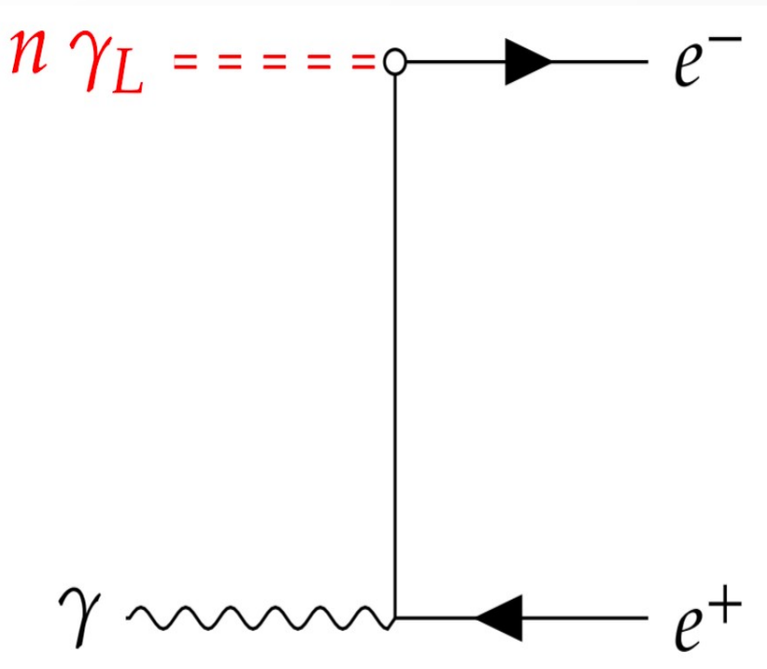
Non-Linear Compton Scattering

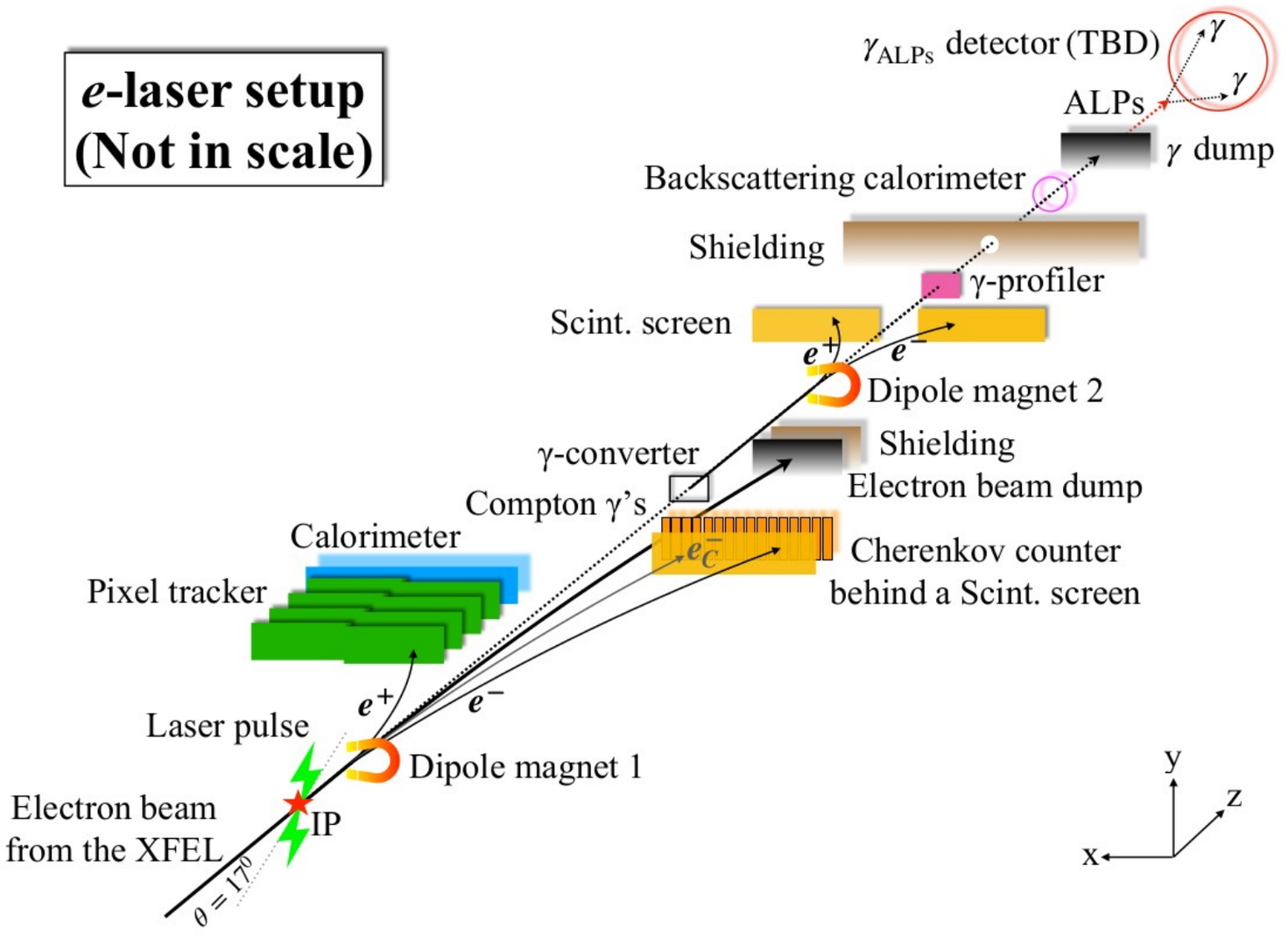


Multiphoton Breit-Wheeler



Detector Outline

<u>Key Detection challenges:</u>
a. ~10GeV electrons, in rates 10^7-10^9
b. ~10GeV photons, in rates 10^7-10^9 + directly measuring beam shape
c. ~5GeV positrons, in rates 10^{-3}-10^6 + in high background environment



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