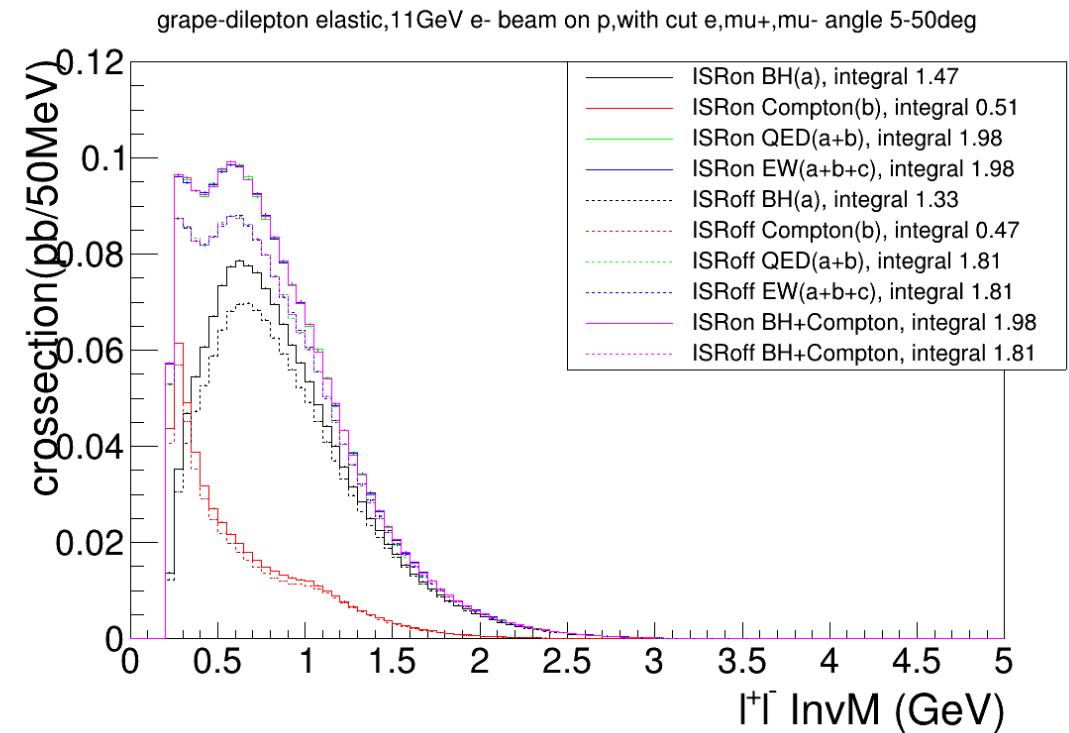
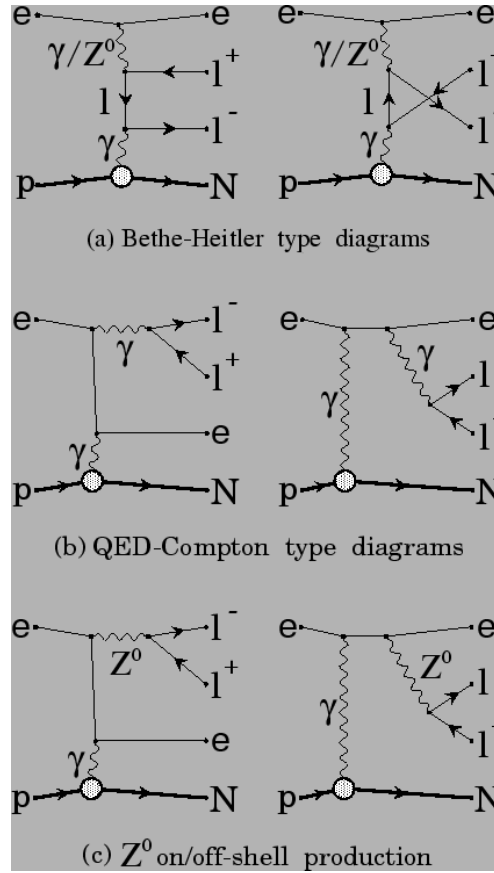


Grape-dilepton run modes

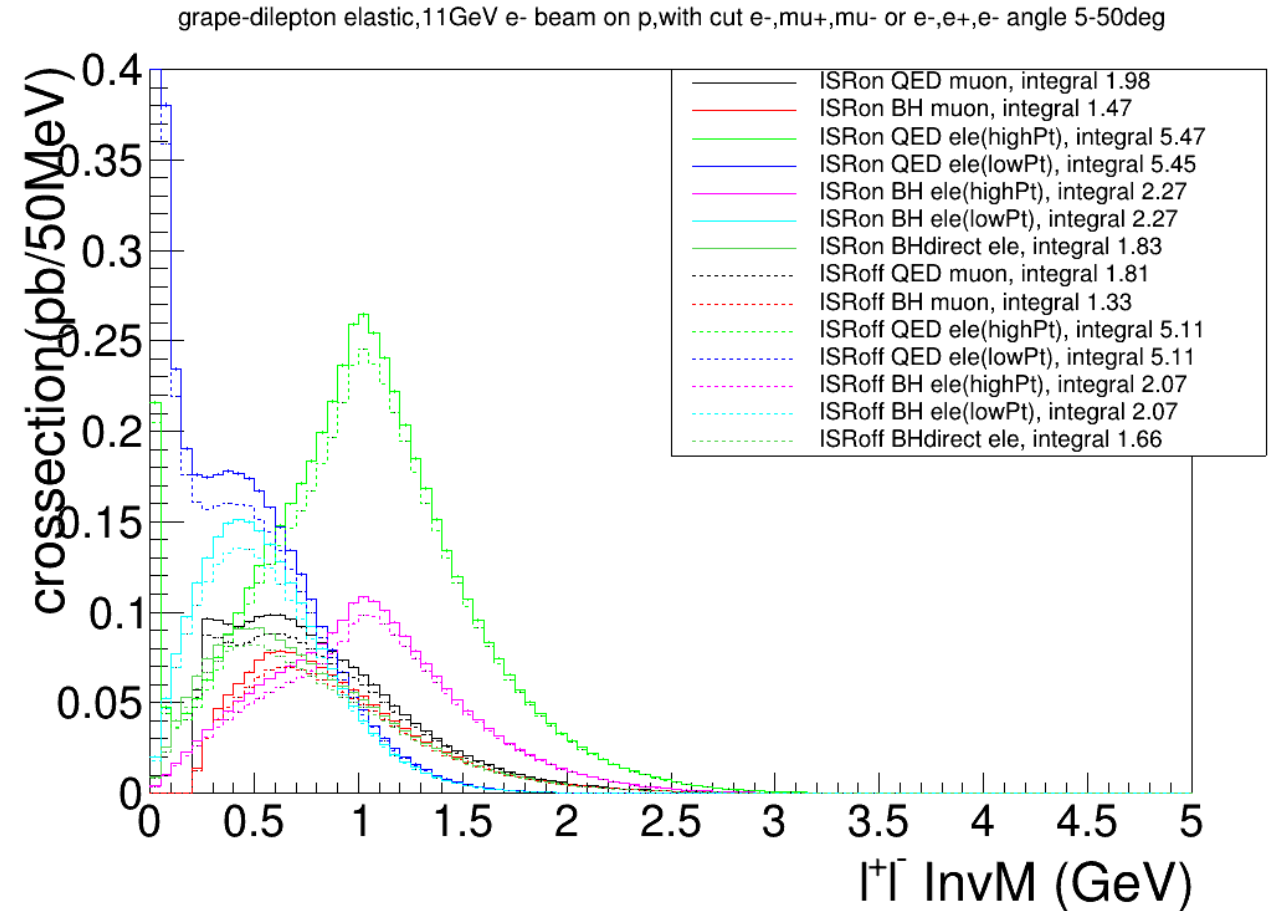
<https://research.kek.jp/people/tabe/grape>

- Grape-dilepton define 3 types of elastic reaction
 - BH(a), Compton(b), Z0(c)
- Grape-dilepton define 4 run modes
 - BH, Compton, QED=BH+Compton, EW=QED+Z0
- grape BH(a) except Z0 = EpIC BH2
- grape Compton(b) = EpIC BH1
- Grape can turn on and off for ISR (Initial state radiation for the beam lepton)
- The plot shows Z0 contribution can be ignored
- We should use grape mode QED(a+b) to compare with EpIC BH1+BH2 crosssection. Grape should be ISRoff because EpIC has no ISR yet
- We should use grape mode QED(a+b) with ISRon for rate estimation to be more accurate



Grape-dilepton muon and ele comparison

- Grape “QED ele”, “Compton ele” and “BH ele” modes have e-e- interference on, “BHdirect ele” mode has e-e- interference off
- grape doesn’t have “QEDdirect ele” or “Comptondirect ele” mode somehow
- Somehow “QED ele” mode produces many events with very small timelike photon mass and they mostly have both e- and e+ along beam axis
- Somehow “QED ele” has much larger crosssection than “BH ele”
- When e-e- interference on, we can select e- with high or low Pt
- If EpIC ele mode have e-e- interference on, we can compare to grape ISRoff QED ele (highPt) or ISRoff QED ele (lowPt). Otherwise, we can’t compare directly.
- BHdirect ele could be a direct comparison between grape and EpIC can have BH2 without interference



Compare grape-dilepton to data

- **Muon pair production in ep collisions at HERA**
<https://doi.org/10.1016/j.physletb.2004.01.003>
- HERA H1 data condition
 - e 27.6GeV p 920GeV
 - Two muons at θ 20-160deg
 - μ_1 $P_t > 2\text{GeV}$, μ_2 $P_t > 1.75\text{GeV}$
 - $Q_p > 5\text{GeV}$
- Grape-dilepton generator condition
 - elastic EW mode with ISRon
 - Same cuts except using μ^- $P_t > 2\text{GeV}$, μ^+ $P_t > 1.75\text{GeV}$ instead of $\mu_1 \mu_2$
- Comparison show they are in same order, but it's hard to do it more precise without more accurate HERA H1 geometry and momentum cuts?

