Proposal for CDR Simulation Chapter Plots

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summarizing our email thread…

Simulation & Analysis TF meeting
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HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

Simulation Chapter Goals

Goal of the chapter:

- estimate of particle composition and rate
- in each sector of the setup detector position
- independent of technologies
- motivate technologies chosen for each of these sectors

We have a lot of information in the spreadsheets

→ How do we present it?

Quantities of Interest:

- Number of particles
- Total energy

Want to know these:

→ as function of x

→ per area [mm^{-2}]

→ comparing e^+, e^-, γ

→ signal vs. background

    ($(S/B)_{max}$, $(S/B)_{min}$)

x N **(for each detector system/sector of the setup)**

Aim: Come up with a "standardized" set of histograms/numbers for all systems!

What is Background?

- What do we consider as background?
- What is "reconstructed" signal?
- Corner cases?

Backgrounds	**"Reco" Signal**	**Corner Cases**
IP & Fwd Systems e+LASER OFF ɣ+ LASER OFF	**IP & Fwd System** e/ɣ+ LASER ON secondaries, radiation etc.	particles re-scattered into "wrong" detector system (e.g. e^+ into e^- arm) backscattering from material
Initial Brems System "remove target" (reject events which have interaction in target z region)	**Initial Brems System** "with target" (events which have interaction in target z region)	

- beam-related BG
- in LUXE we measure BG in-situ in between LASER shots (LASER 1Hz, e-beam 10Hz)
- can subtract this background

Estimate from G4

- inseparable from signal
- need to estimate and unfold

Need to quantify!
Behaviour versus ξ?

Proposed Plots: Motivating the Technology

e⁻, e⁺, γ

Number of particles

x

Total energy sum

e⁻, e⁺, γ

x
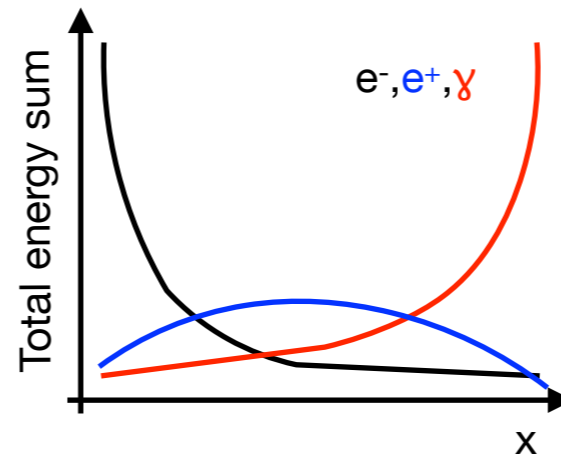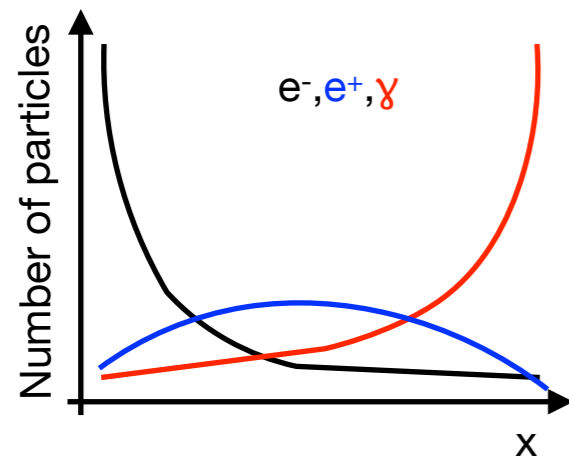
- we have steep spectra
- need to show at least once strong x-dependence
- for each det. system

⟨Number of particles/area⟩

e⁻, e⁺, γ

det 1   det 2   ...   det N

⟨energy/area⟩
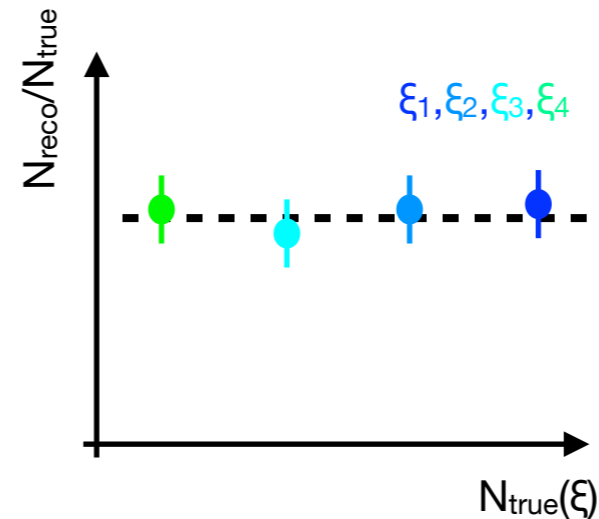
e⁻, e⁺, γ

det 1   det 2   ...   det N
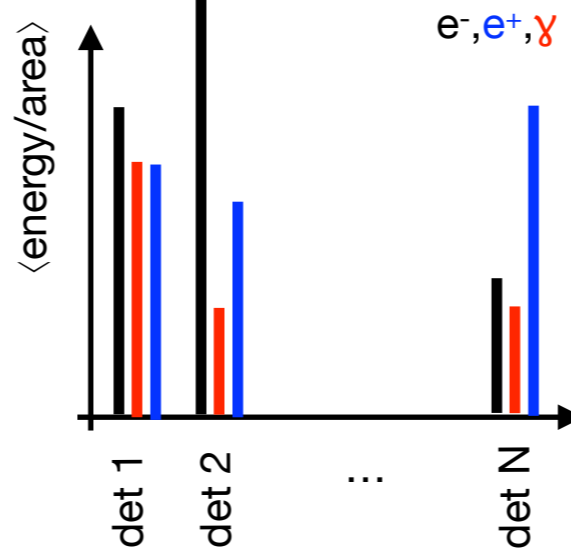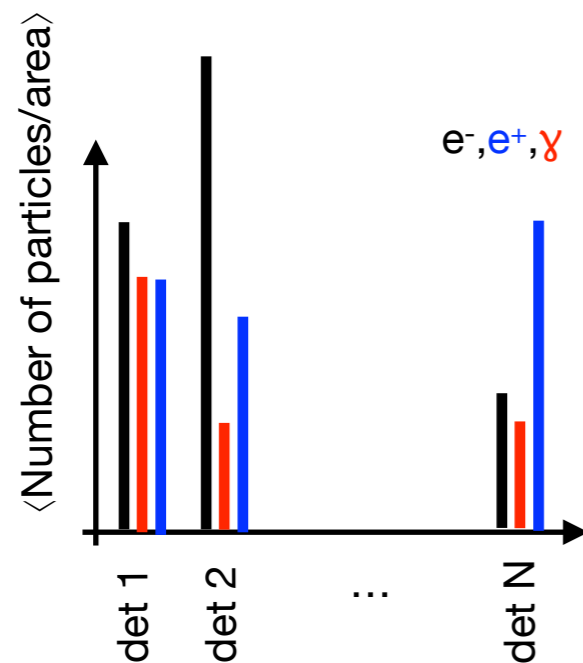
- (Noam already showed similar charts)
- very nice & compact summary
- only single number/system

Histograms and/or summary bar charts?
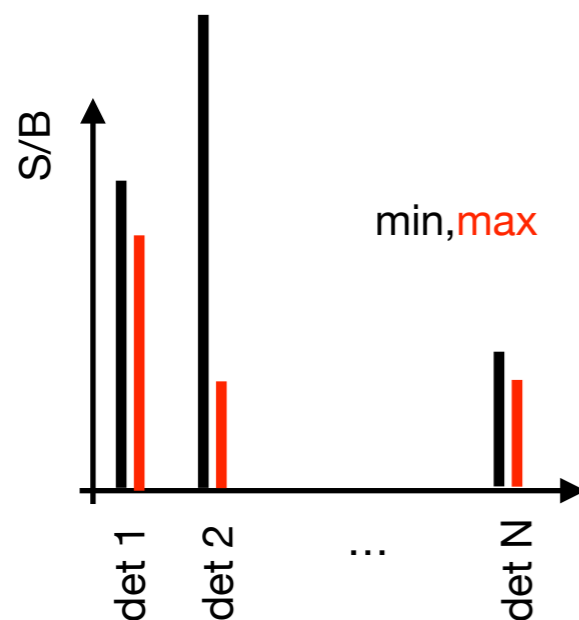
Proposed Plots: Signal and Background

Reco, Truth
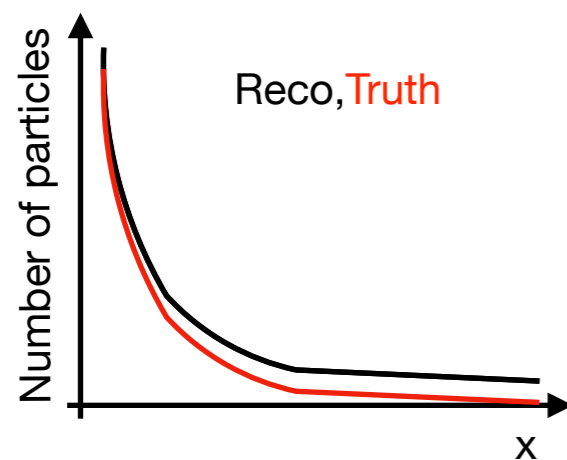
integrate over acceptance →

N_{reco}/N_{true}

$\xi_1, \xi_2, \xi_3, \xi_4$

$N_{true}(\xi)$

- can quantify how "reco effects" behave as function of ξ (ideally: flat)

S/B

min, max

det 1 det 2 ... det N

- S/B min and max per detector system
- S and B may have very different x-dependence
  → min. & max S/B value give fairer estimate

+ anything we forgot?

**John already made some nice plots for e+LASER IP
- iterating to come up with our "standard" set!**