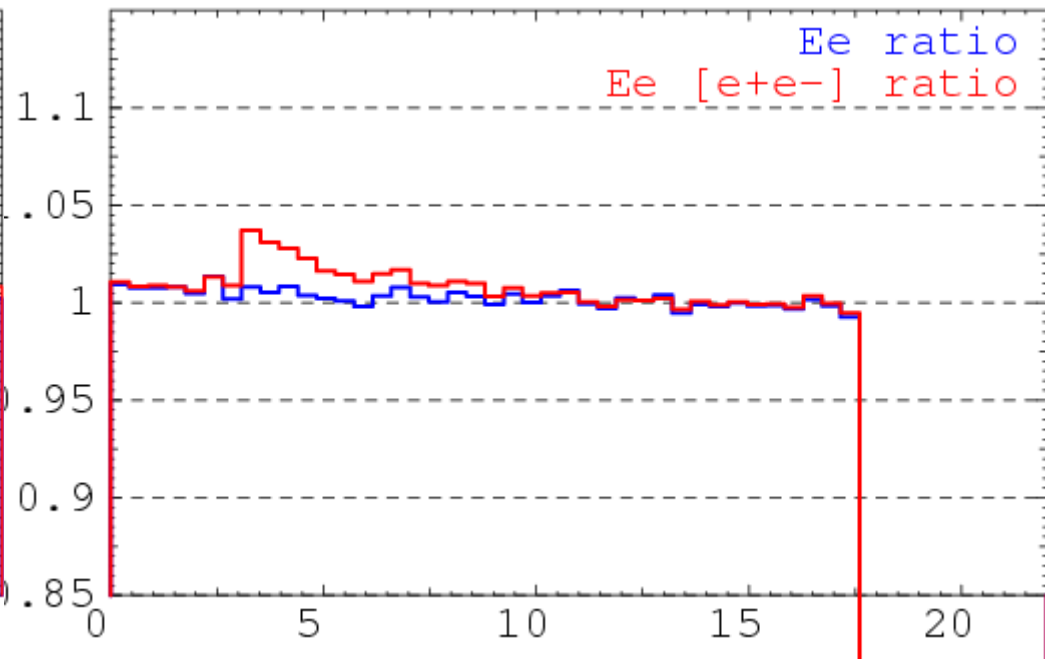
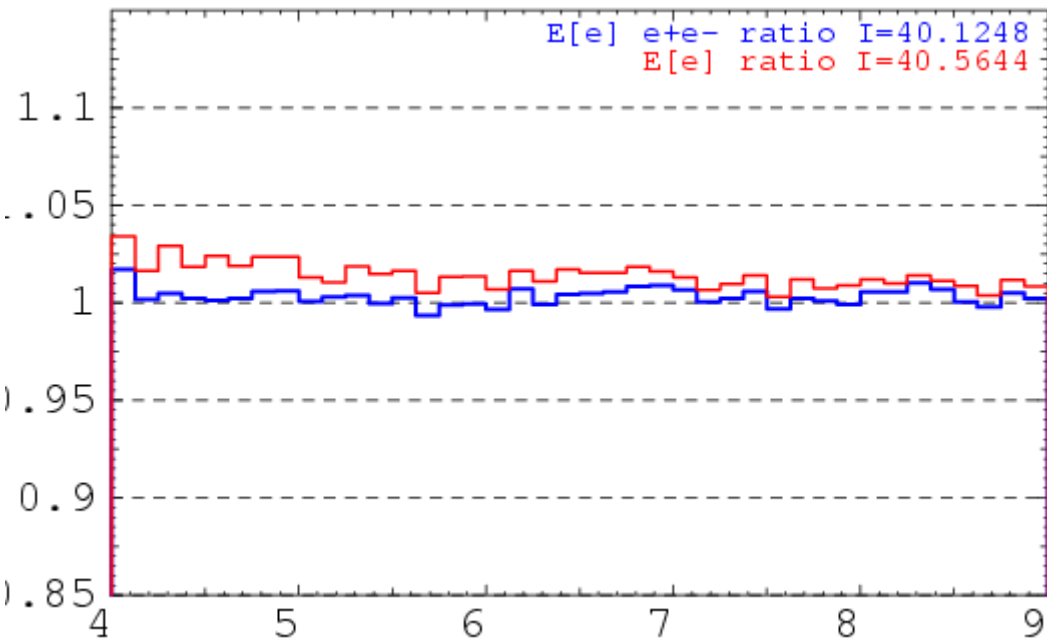
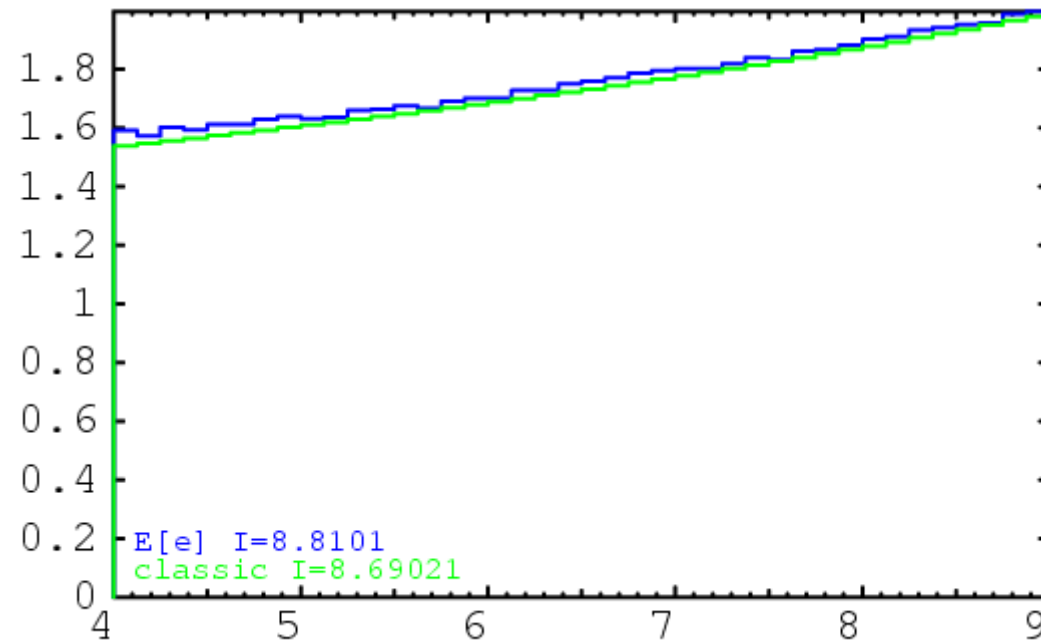


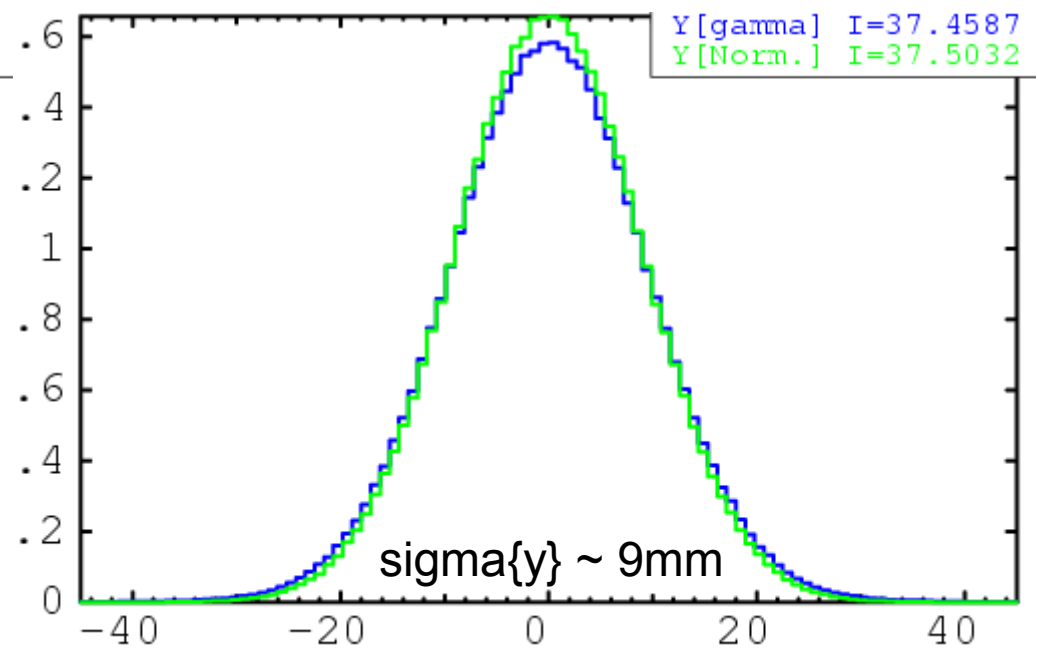
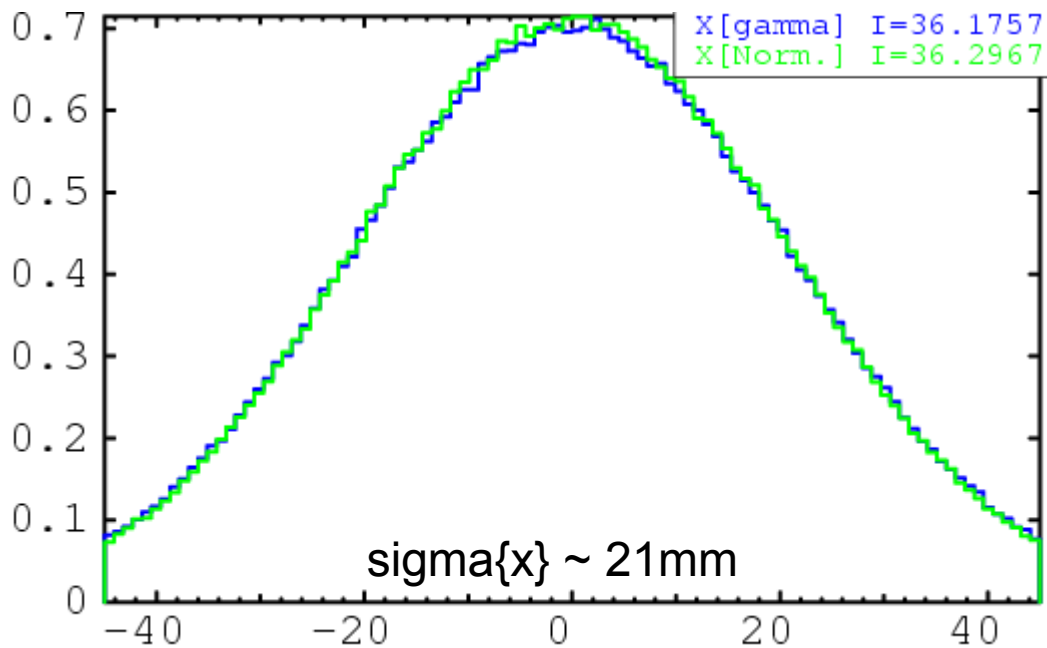
Bethe-Heitler process generator (updates)

V. Makarenko
DESY

Electron spectrum



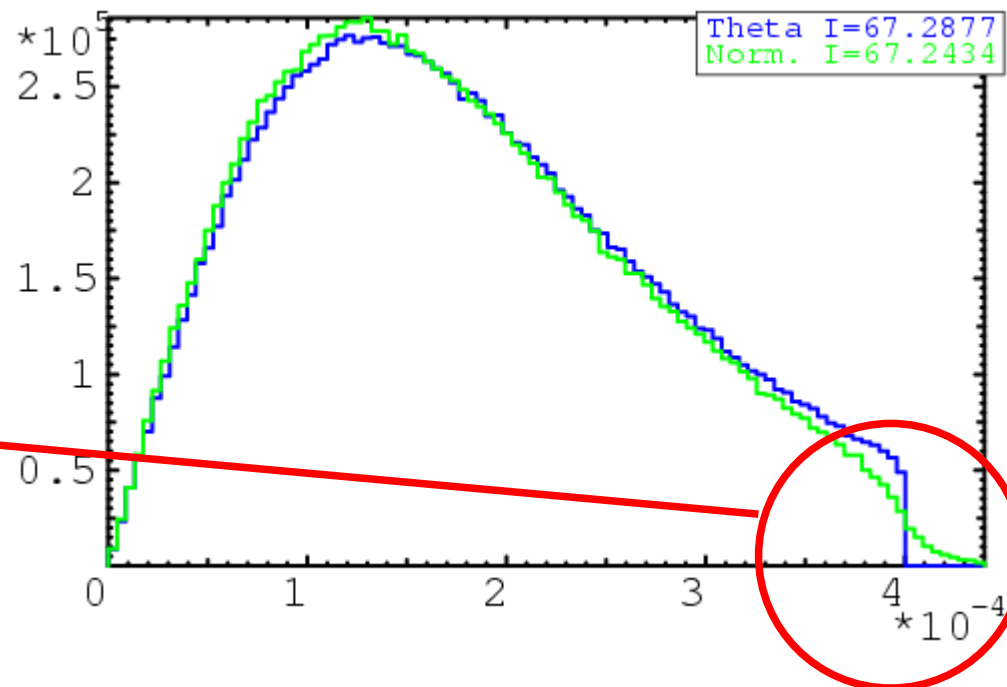
Angular effects



Error 1: One presumes all photons are captured by calorimeter.

Error 2: One estimates the fraction of photons outside calorimeter using classical formula.

Cal. size	Error 1, %	Error 2, %
1cm	3.5	0.6
4cm	0.3	0.1
>5 cm	<0.2	~0.



- several expressions for matrix elements are tested
- various algorithms for the phase space generation are used

The correction effect is $\sim +0.15\% \pm 0.2\%$

To improve this precision
the higher-order effects must be estimated (2-loops etc.)

Backup slides

Cross sections at $E[\gamma] > 10\text{GeV}$

1. Born-level process

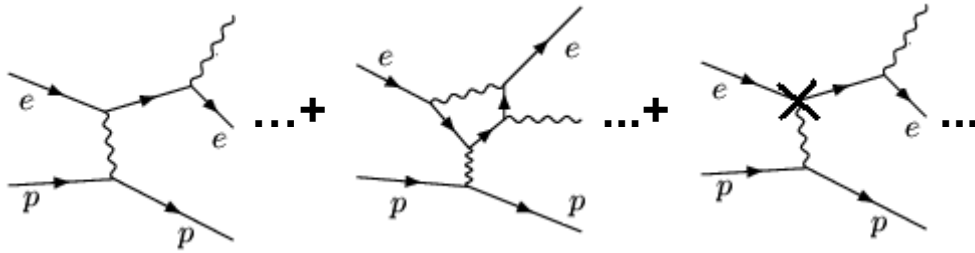
$\sim 39.02 \pm 0.01\text{mb}$

(classical: 39.01mb)

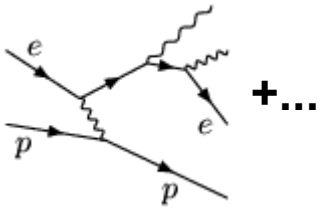
2. Including one-loop radiative correction

2.1. Born process + loops + counter-terms + soft photons

$37.06 \pm 0.02\text{mb}$



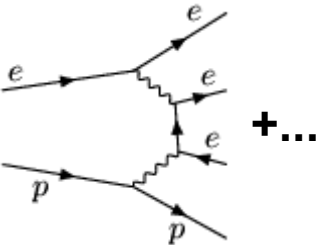
2.2. Radiative photons



$39.03 \pm 0.03(\text{stat}) + 0.03(\text{sys})\text{mb}$

$1.97 \pm 0.01(\text{stat.}) + 0.03(\text{sys.})\text{mb}$

3. Electron-positron pair production:



$0.063 \pm 0.001\text{mb}$

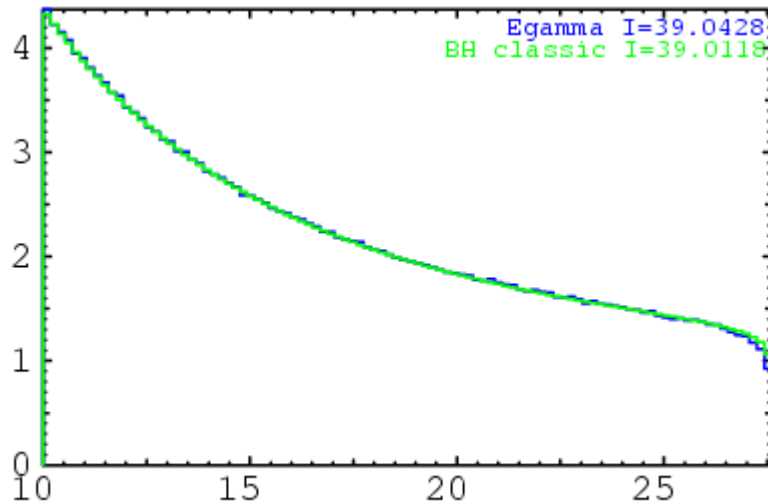
$5\text{GeV} < E[\text{any } e] < 10\text{GeV}$

stat. error $\sim$ sys. error

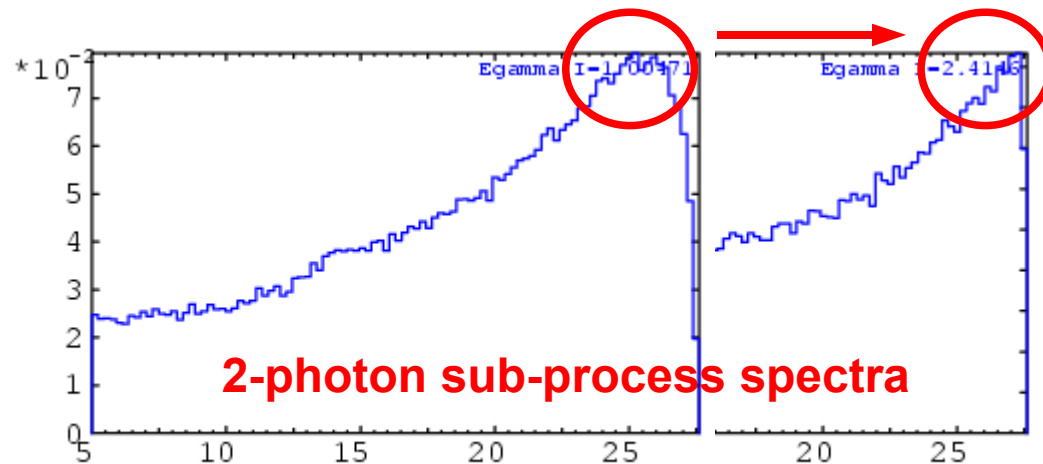
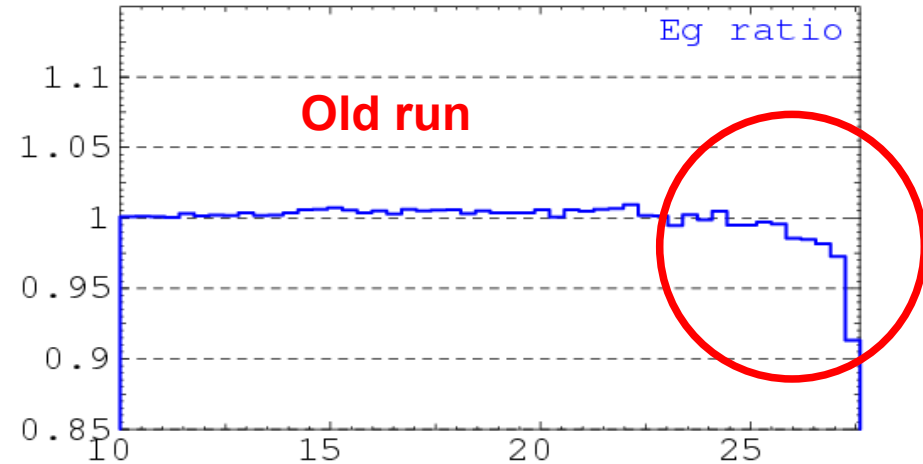
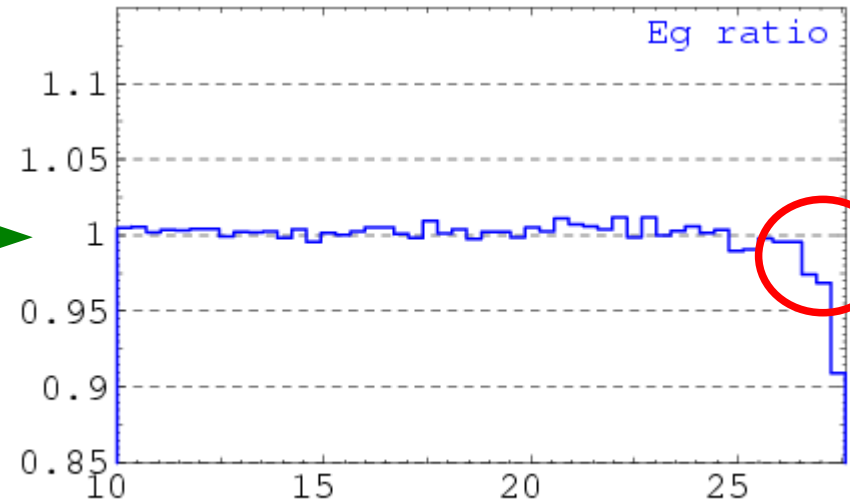
To be updated

Photon spectra discrepancy (at $E > 25$ GeV)

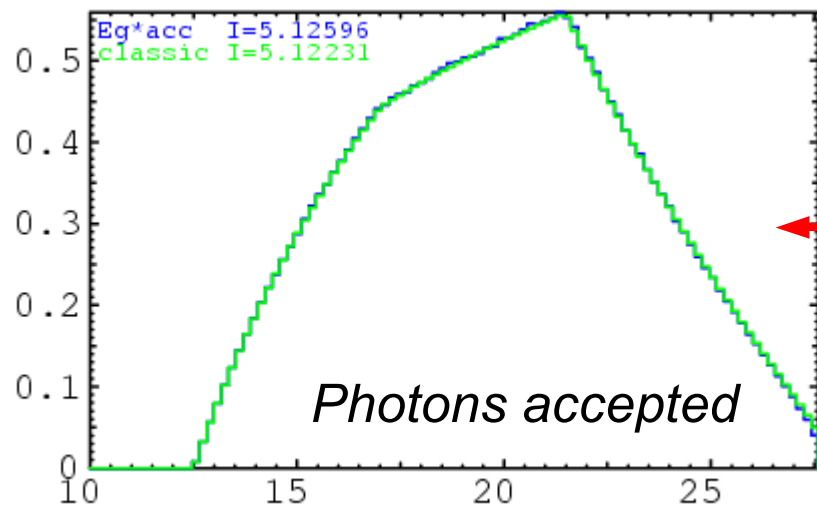
- No physical explanation → pure systematical error of integration



- This error is $\sim 0.1\%$ to the total CS
- This error is negligible if detector acceptance is applied



Problem:
the function has *cuts* in peaking region
(we integrate in the vicinity of IR-peak)



← **< 0.2 %**