Simulation update

Last time:

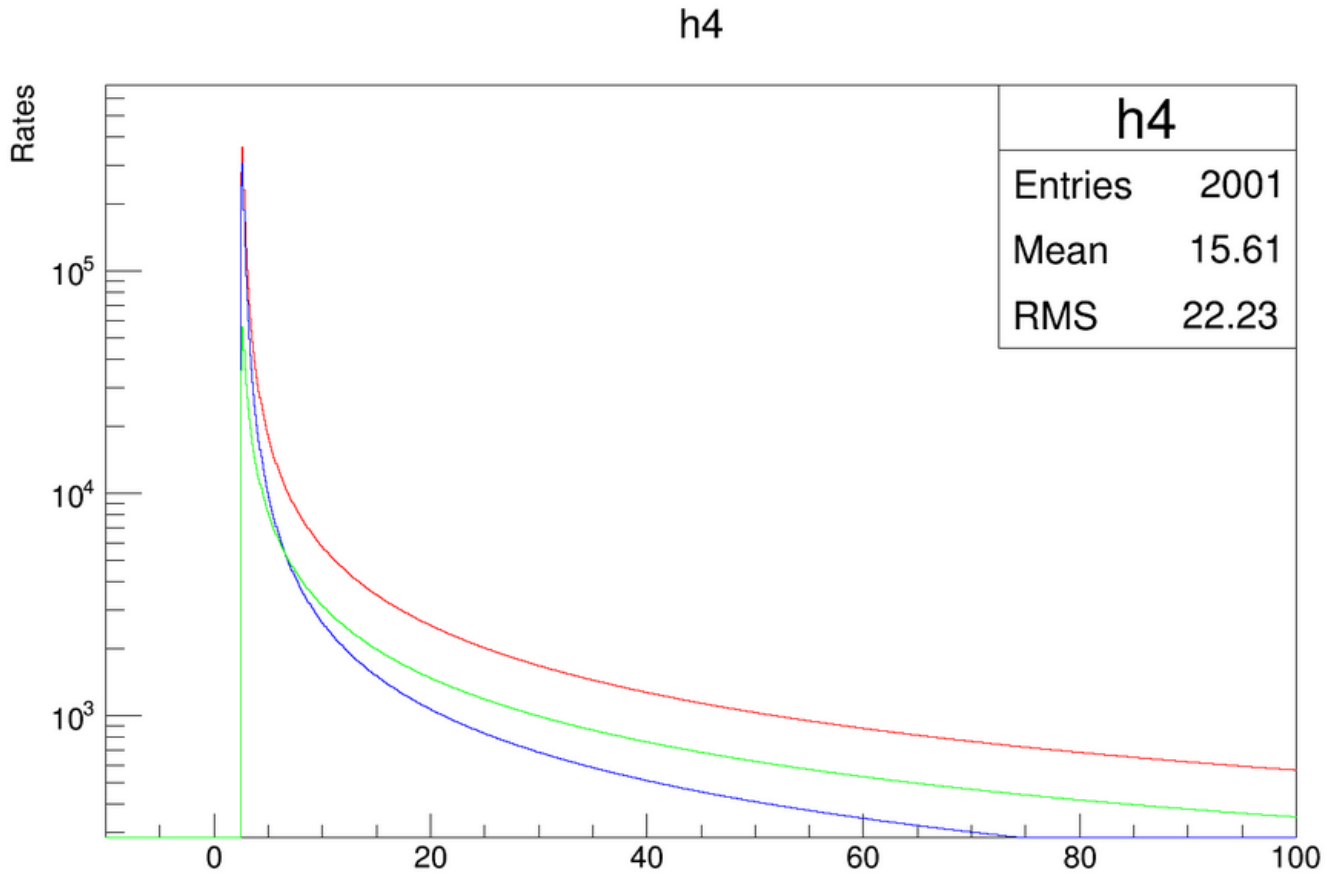
- Radiation tail from carbon target
- Internal bremsstrahlung:

  Peaking approximation versus exact calculation
- Multi-photon effect

Last time

Radiation Tail from Carbon target

One Fixed energy and angle



- Red: total
- Green: Internal
- Blue: External

Last time

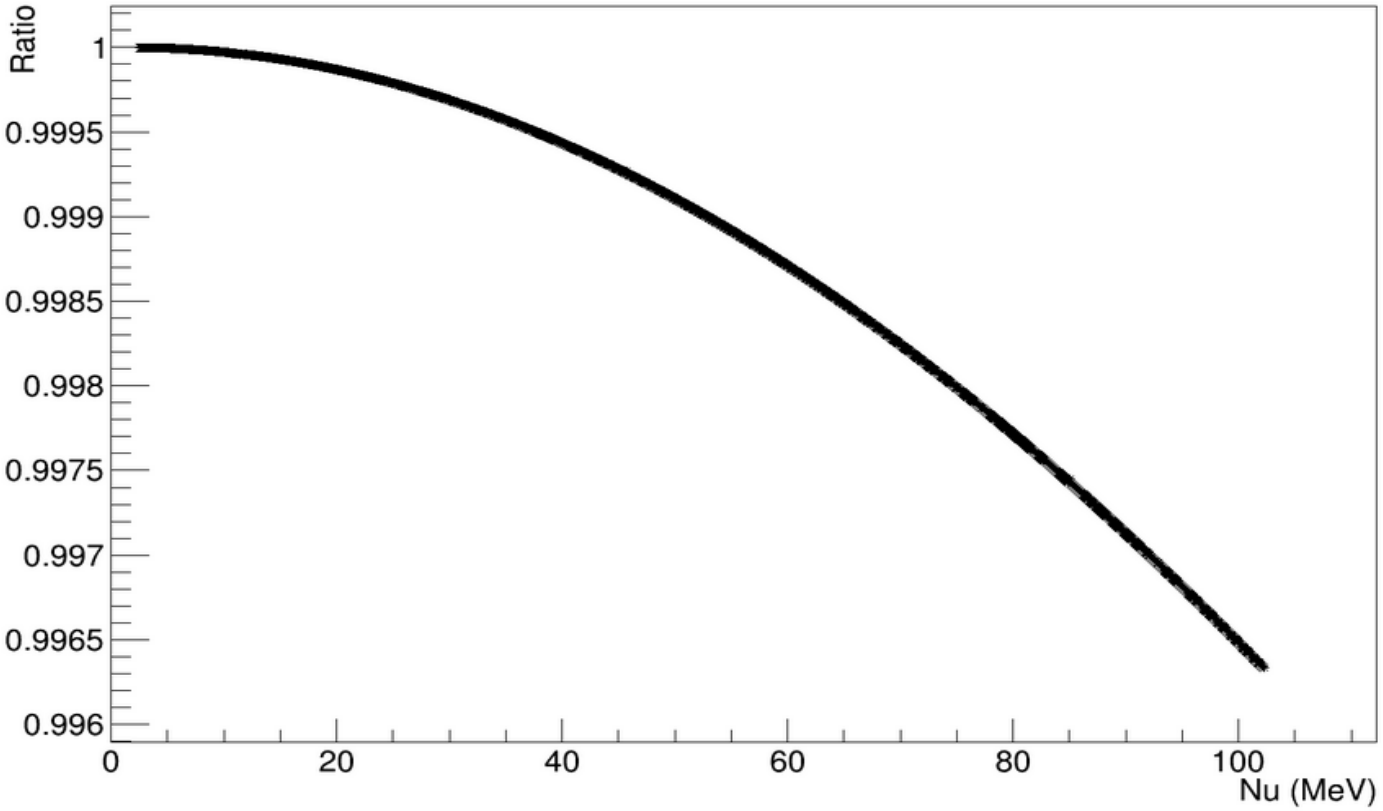
Peak-approximation v.s. exact cacluation

Internal

One Fixed energy and angle

Ratio= peak-approximation method/exact calculation

Agree within 1% in deltaE within 5%



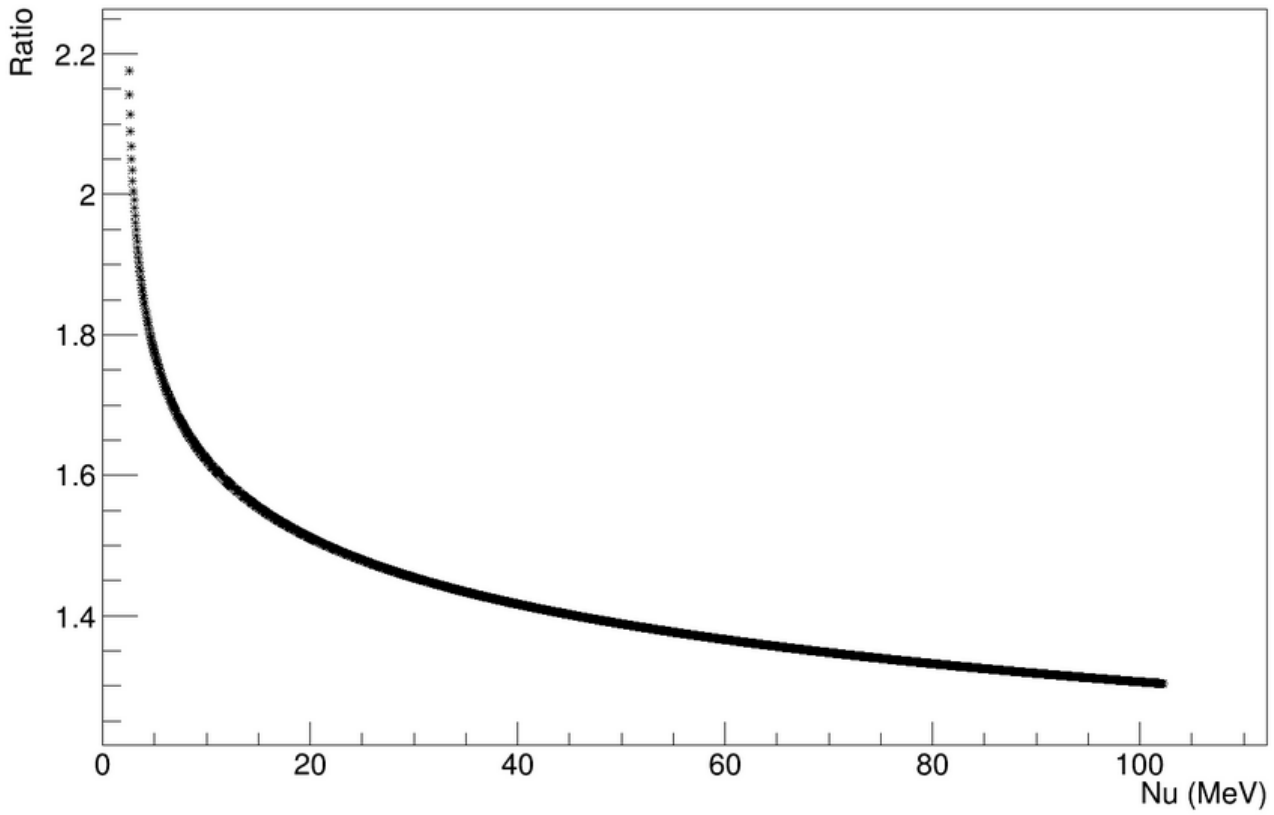
Last time

Multi-photon Radiation

One Fixed energy and angle

Ratio= without multi-photon correction/within

Assume soft-photon radiation



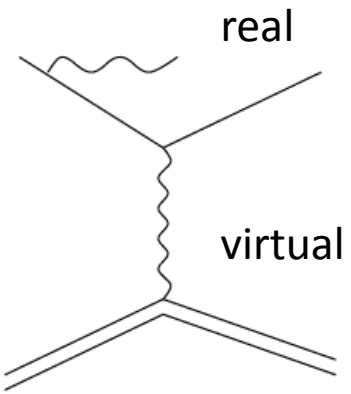
Concepts

- Real photon

  In diagram, only one end of lines are attached/four momentum is 0

- Virtual photon

  Both end of lines are attached



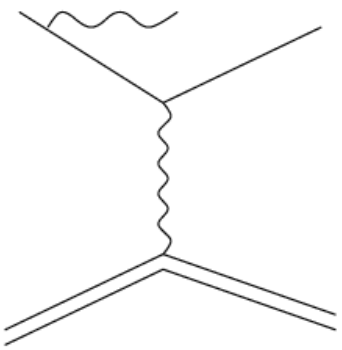
- Soft photon

  Three-Momentum smaller than some energy, not detectable

- Hard photon

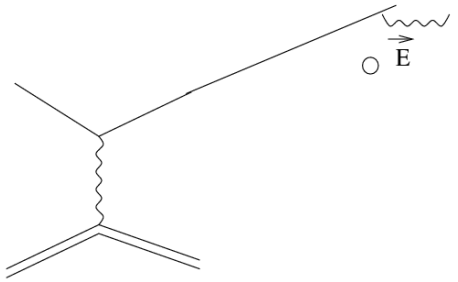
  Three-Momentum larger than some energy

Concepts



- Internal Bremsstrahlung

  bremsstrahlung in the field of scattering nucleus



- External Bremsstrahlung

  bremsstrahlung in the field of another nucleus

- Straggling effect

  Through material, loss energy , the exact energy during scattering undefined
  assume the target divided by half (when t<0.1), ~1% (0.5E--E)

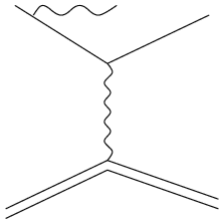
- Multi-photon correction

  Multi soft photon radiation

Concepts

- Peak approximation
  Most of photons are emitted along the incident or scattered electron

- Exact Internal Bremsstrahlung Calculation
  Assume one-photon exchange and only electron detected
  Integral of phase space



- Radiative tail

K is arbitrary

  Lost energy , real bremsstrahlung
  basic cross section (+ radiative correction) integrated to include real photons

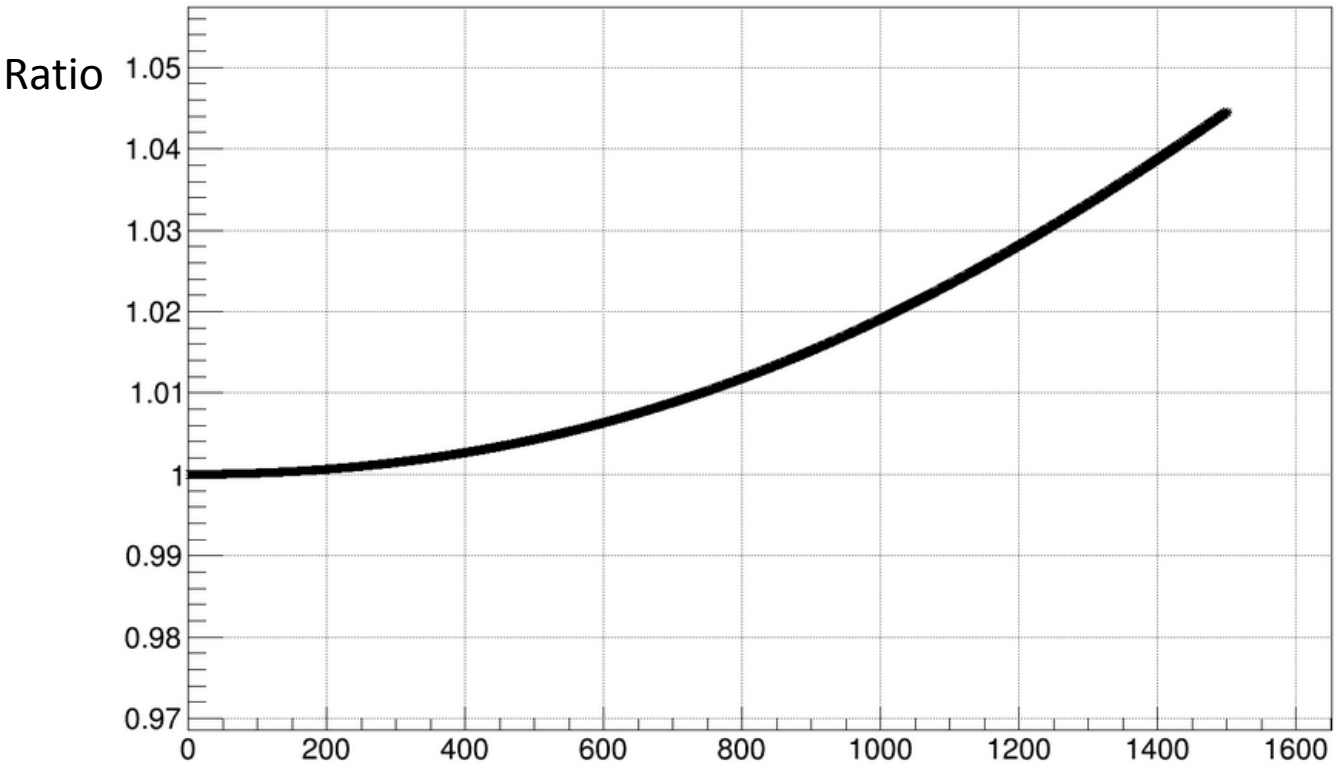
- Radiative correction
  A correction to a basic scattering process : emission and reabsorption of virtual photons and emission of real soft photons (peak correction)

Peak-approximation v.s. exact cacluation

Internal

Ratio= peak-approximation method/exact calculation

One Fixed energy (2.2253GeV) and angle (5.785 degree) Nitrogen



NH3 target
T~0.03

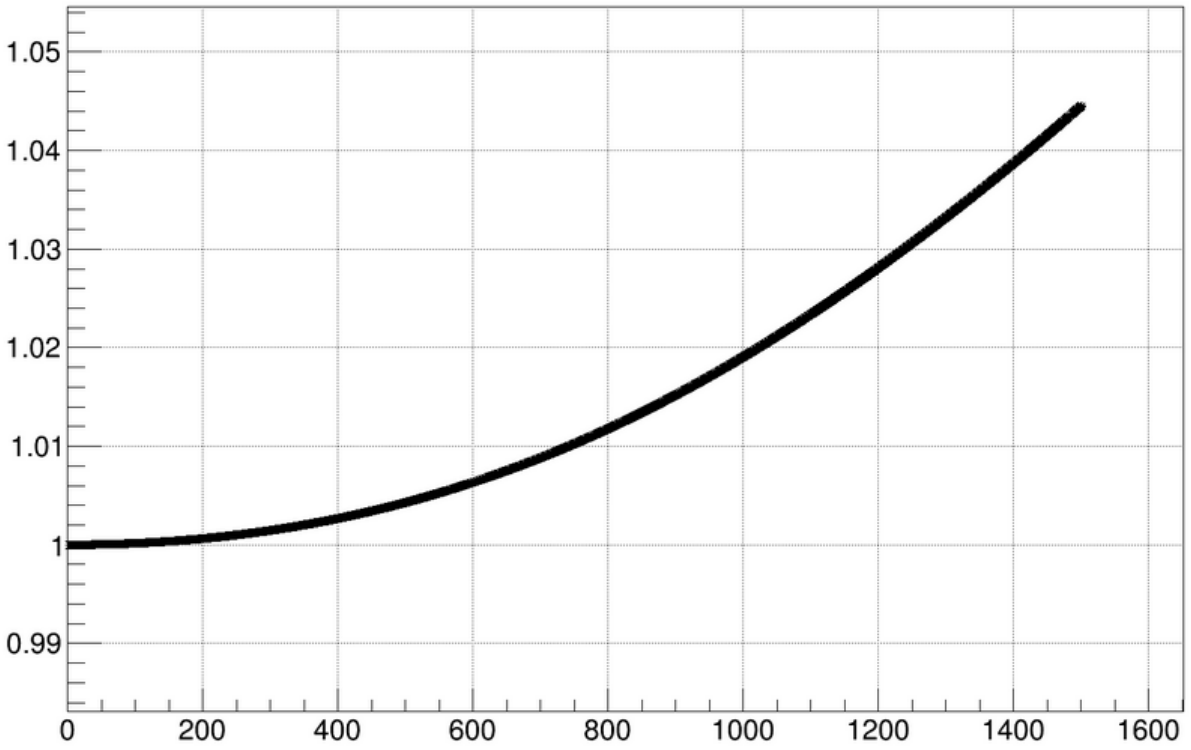
Multi-photon included

Peak-approximation v.s. exact cacluation

Internal

Ratio= peak-approximation method/exact calculation

One Fixed energy (2.2253GeV) and angle (5.785 degree) Nitrogen



T~0.1

Multi-photon Included

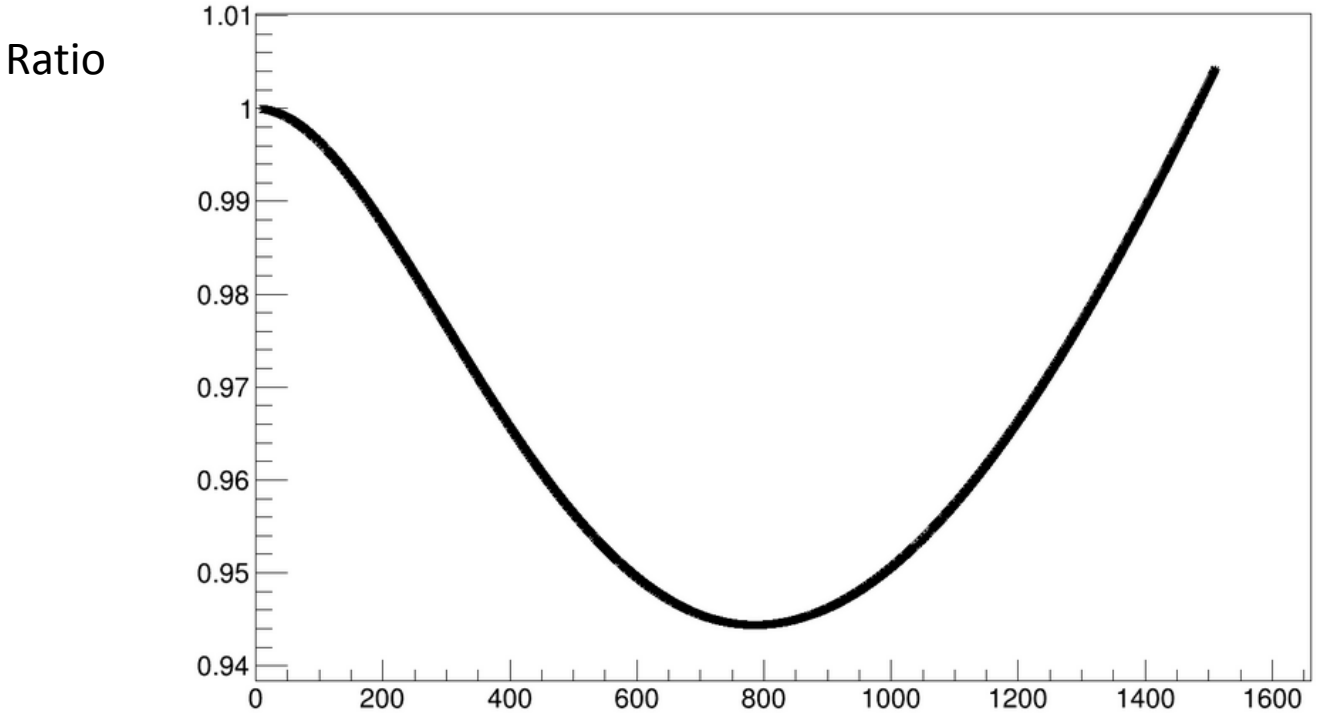
No much change

Peak-approximation v.s. exact cacluation

Internal

Ratio= peak-approximation method/exact calculation

One Fixed energy (2.2253GeV) and angle (5.785 degree) Carbon



T~0.1

Multi-photon Included

Depends on XS

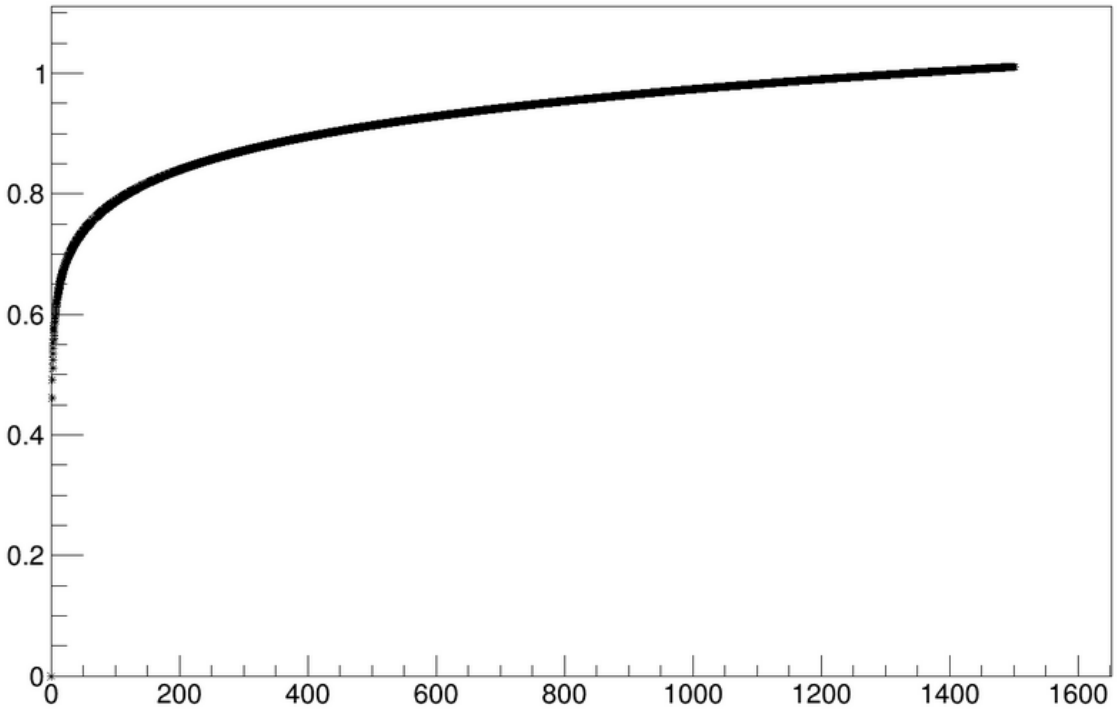
Exact cacluation

Internal

Ratio= exact (t=0.1)/exact (t=0.032) calculation

One Fixed energy (2.2253GeV) and angle (5.785 degree) Nitrogen

Ratio



Multi-photon Included

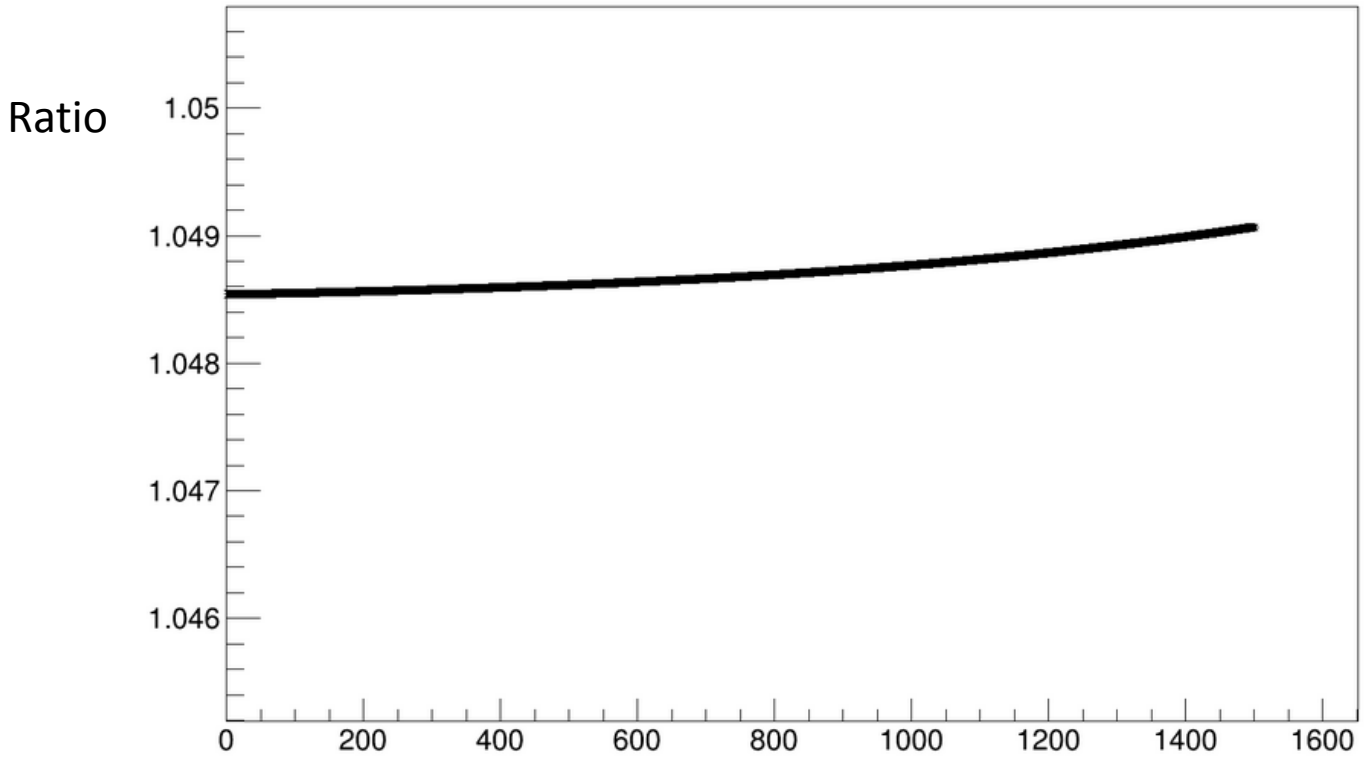
Nu (MeV)

Exact cacluation

Internal

Ratio= exact (t=0.1)/exact (t=0.032) calculation

One Fixed energy (2.2253GeV) and angle (5.785 degree) Nitrogen

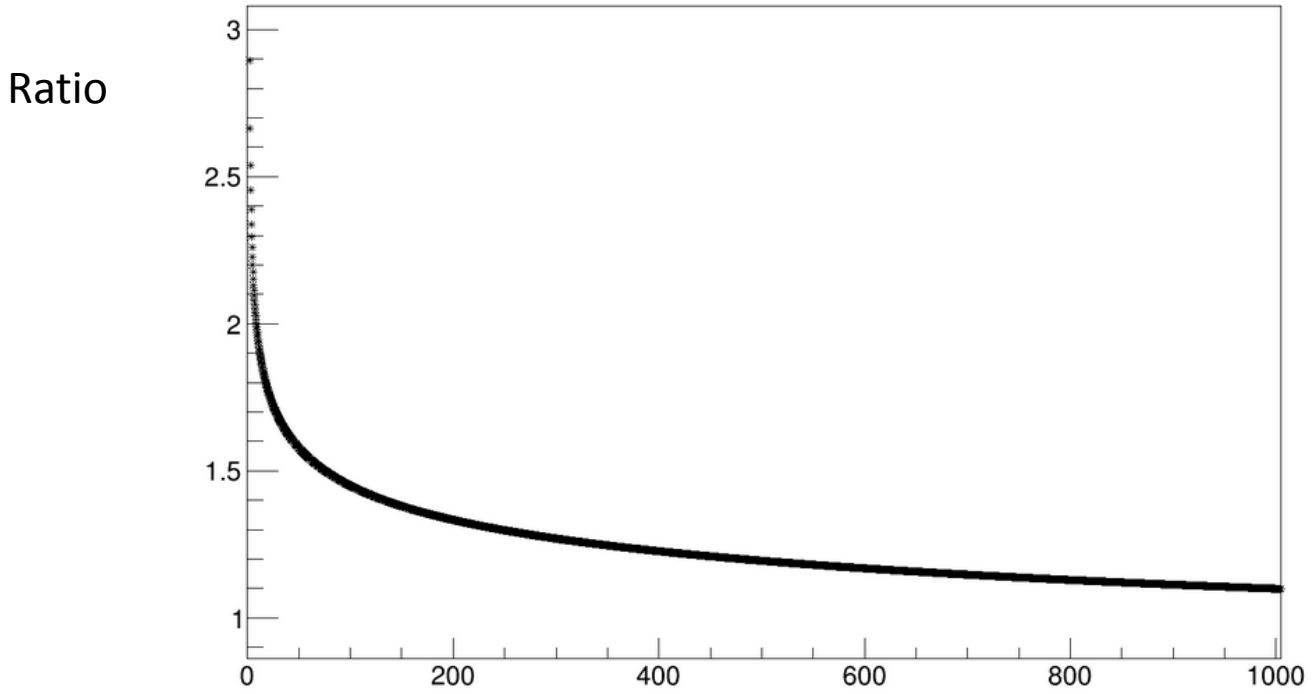


Multi-photon
Not Included

Multi-photon correction

NH3 target T~0.03

One Fixed energy (2.2253GeV) and angle (5.785 degree) Nitrogen



Simulation Steps

- Step
- Gun (E, θ) → energy loss model (ionization+bremsstrahlung)

  → CS with radiation correct

  → distribution → CS weighted

CS with radiation correct:

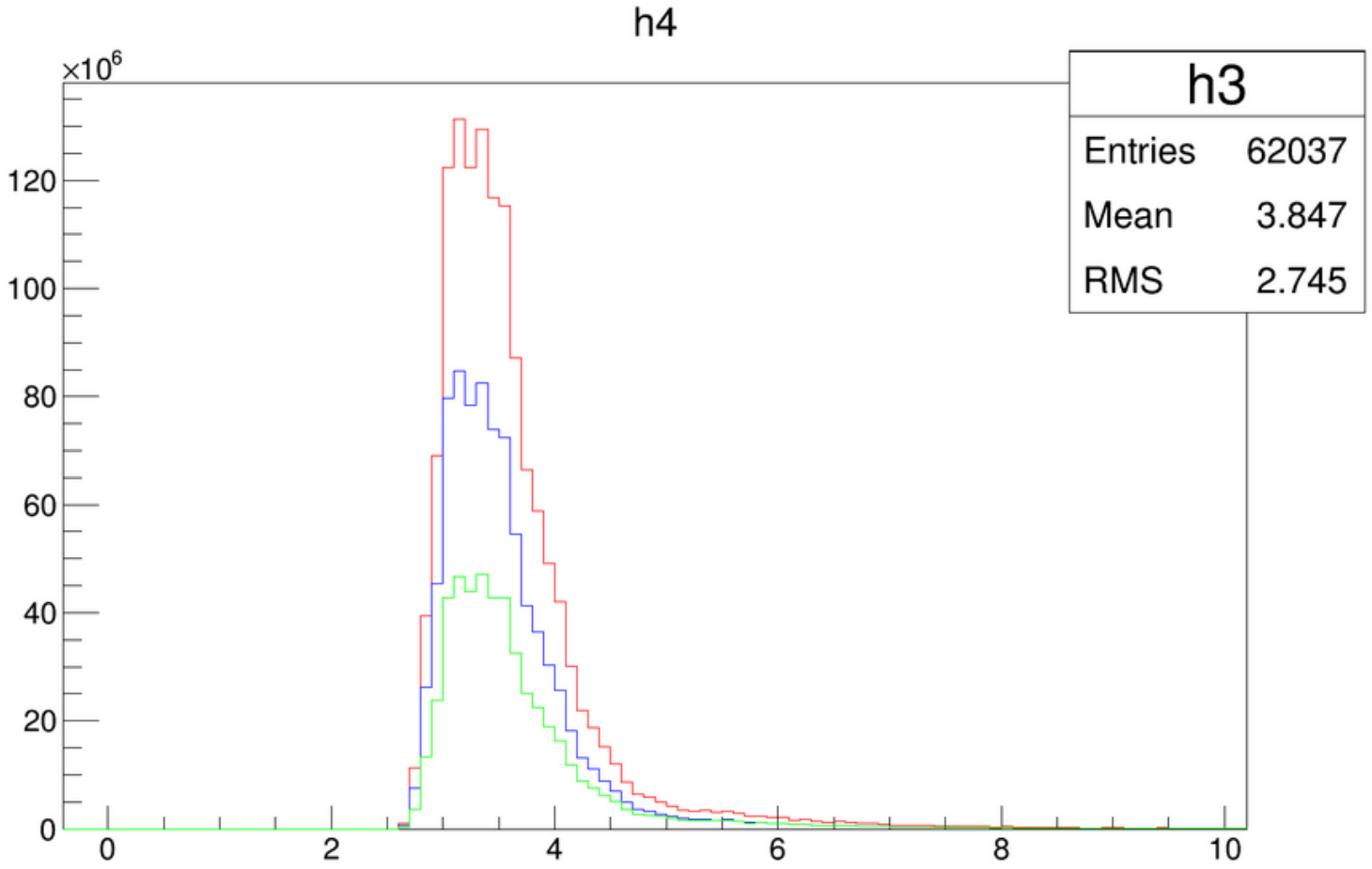
✓ Internal Bremsstrahlung

✓ External Bremesstrahlung

✓ Draggling effect

✓ Multi-photon effect

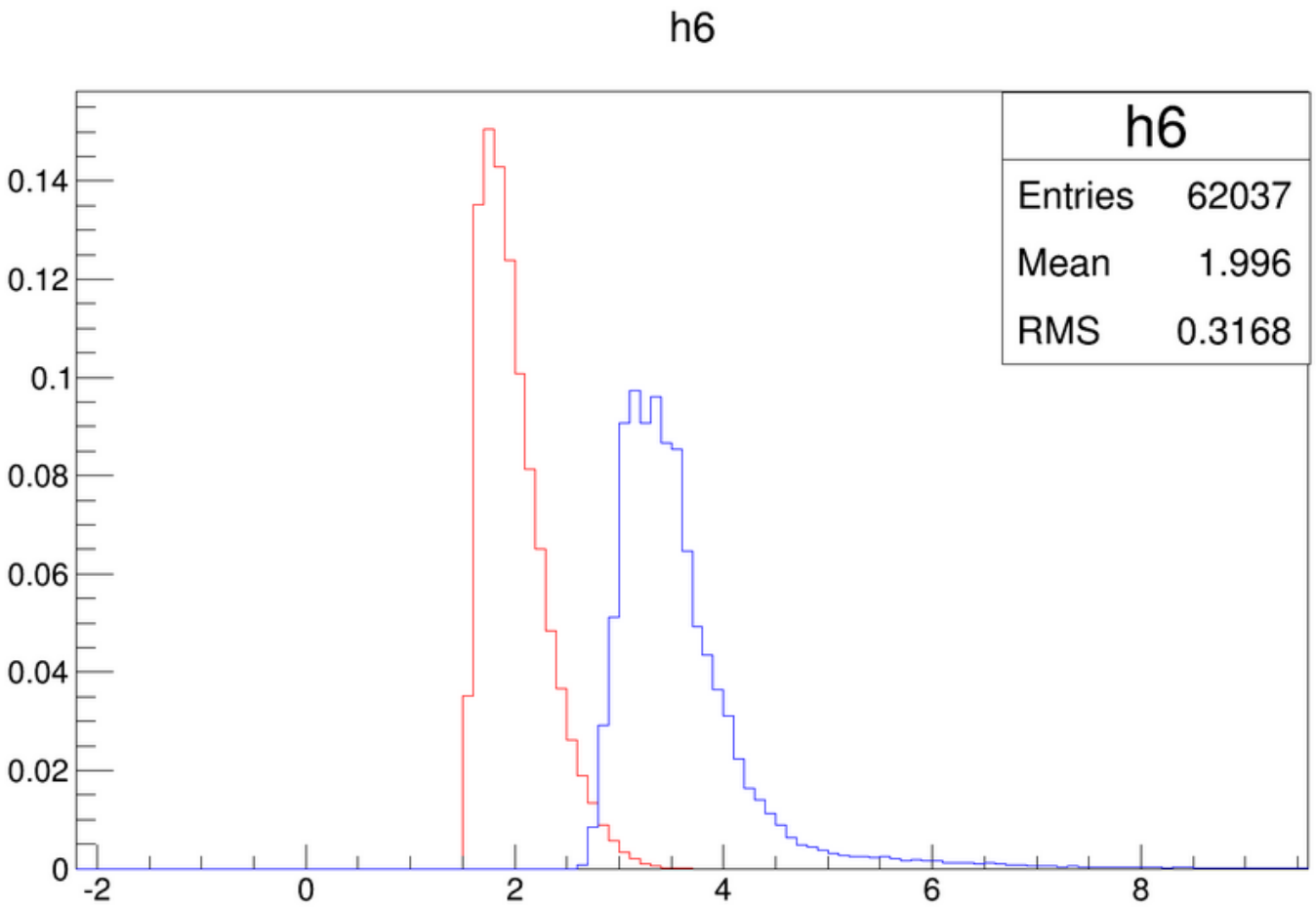
Carbon target



- Red: total
- Green: Internal
- Blue: External

Nu (MeV)

Carbon target



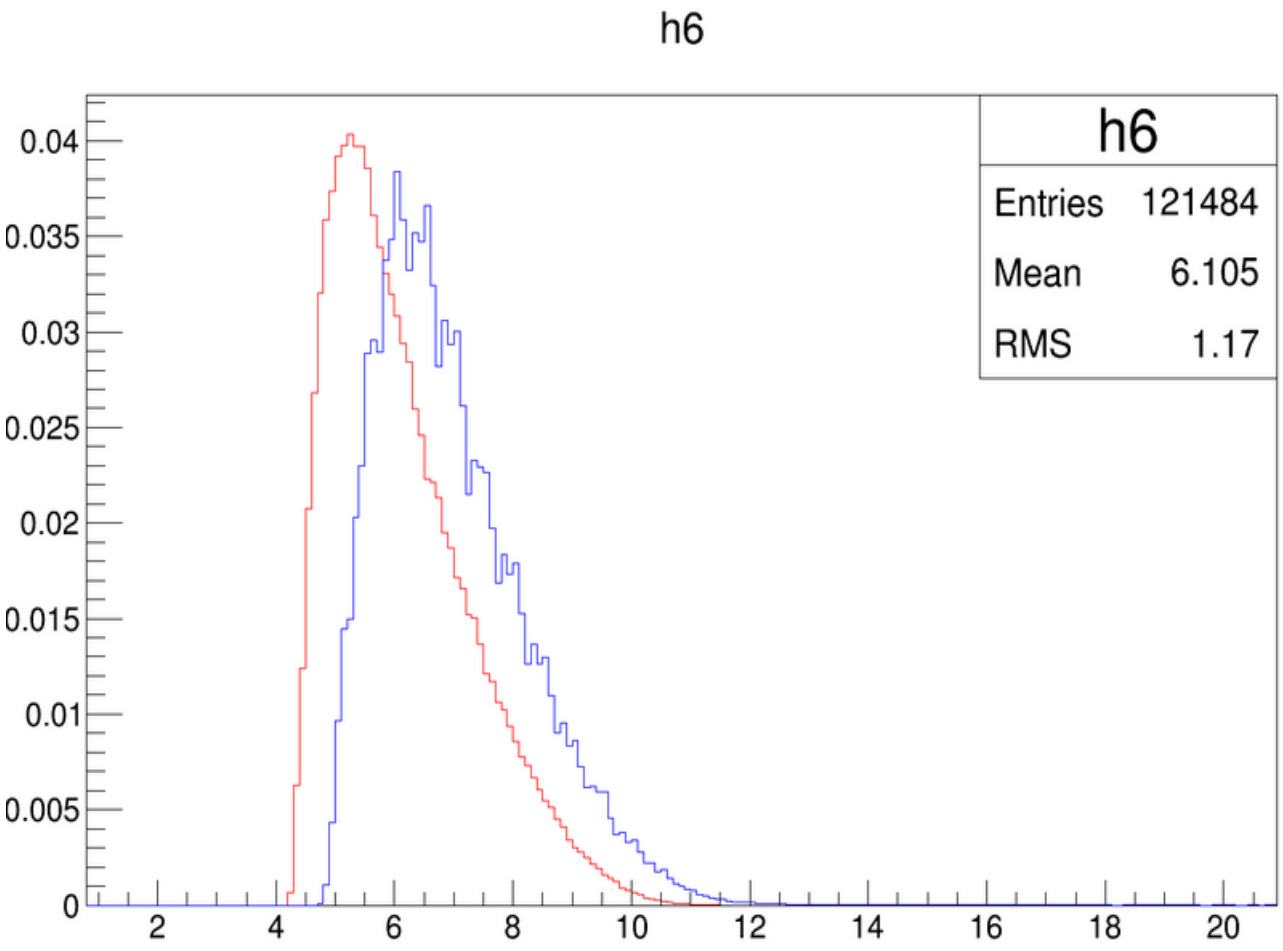
Red:

Begin distribution

Blue:

End distribution

Dummy target



- Red:
  Begin distribution
- Blue:
- End distribution