ISR photons comparison*: whizard 2.7 and KKMC

Paweł Sopicki
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**basic variables*

Some intro...

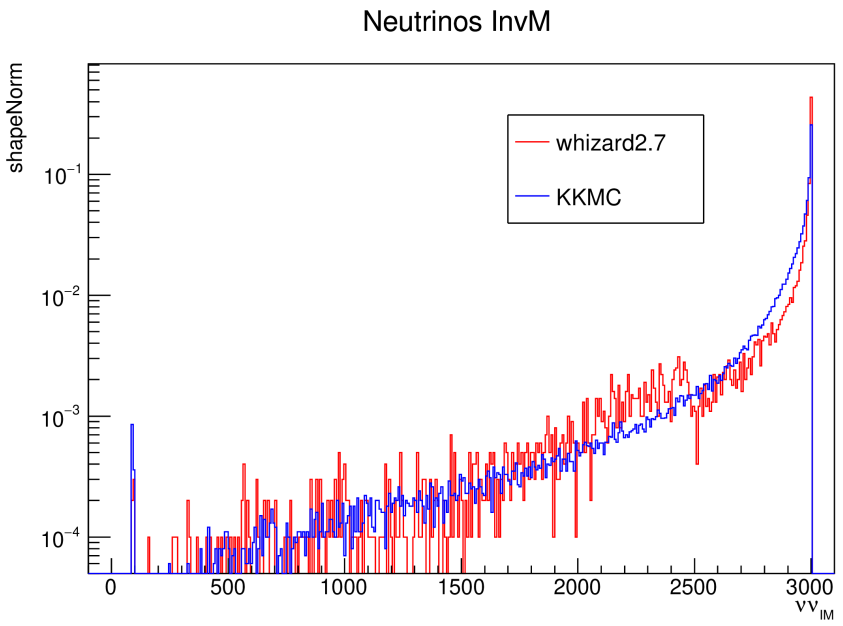
- What for?
  - Cross check of the ISR spectra
  - Crucial for i.e. mono-photon events
- Tools
  - Whizard2.7: basic CLIC ‘magic-maker’
  - KKMC: LEP-devised MC
    - 3TeV works without EW corrections
  - Process: e-e+ → νν
  - ISR multpl:
    - Whiz:
      - 2 basic ISR with is_q_max=1GeV
      - 1-3 ME photons starting from 1GeV
    - Kkmc 1 to 8

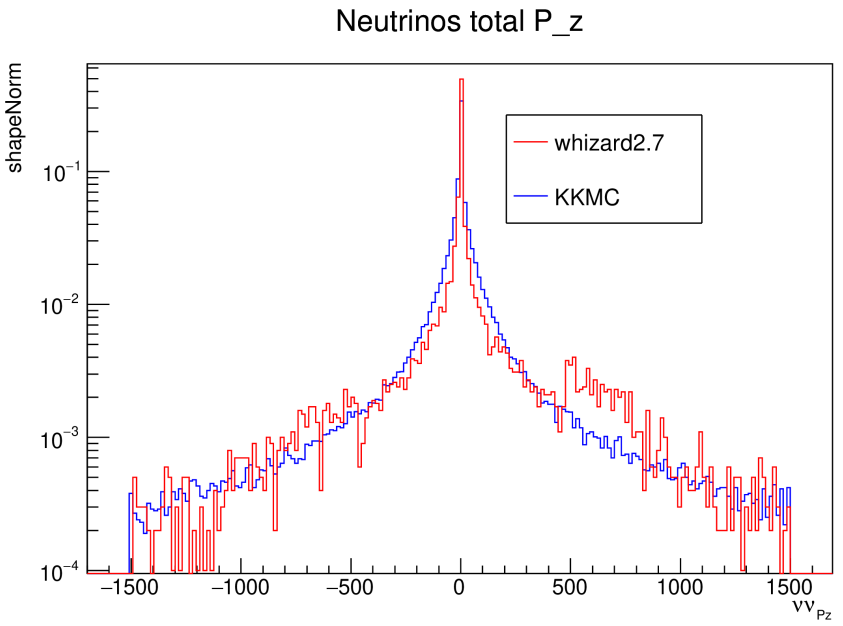
Some intro...

- Merging procedure
  - isr_q_max = 1 GeV
    - Checked: cuts nicely
  - Add 1-3 ME photons selected using such cuts (momentum transfer between e+/e- and photon)
    - Seems to work, but slows down the generation of events significantly.. any comments from experts?
- ‘Visible’ photons – rough cut of 10°
- Strange cross section behaviour: adding cuts results in higher values!
  - reported to Whizards, no fix yet

```
cuts =
let subevt @meA = select if Index > 2 [A]
in
let real re1 = eval E  [extract index 1 [electron]]
in
let real re2  = eval E  [extract index 1 [positron]]
in
all 2*sqrt(re1*E)*sin(Theta/2.) > 1 GeV [@meA]
and
all 2*sqrt(re2*E)*cos(Theta/2.) > 1 GeV [@meA]
and
all Theta > 0.15 degree [@meA,@meA]
```

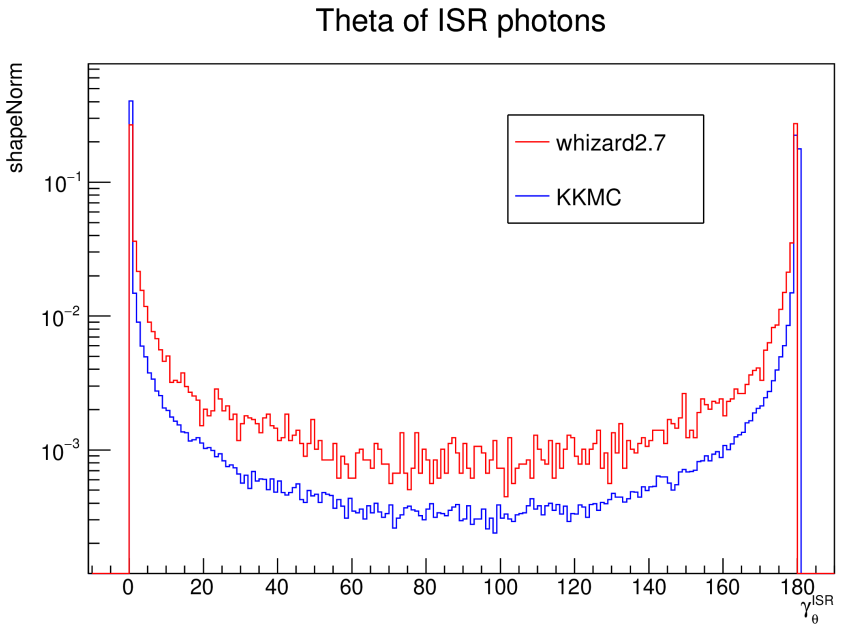
Neutrinos – no cuts

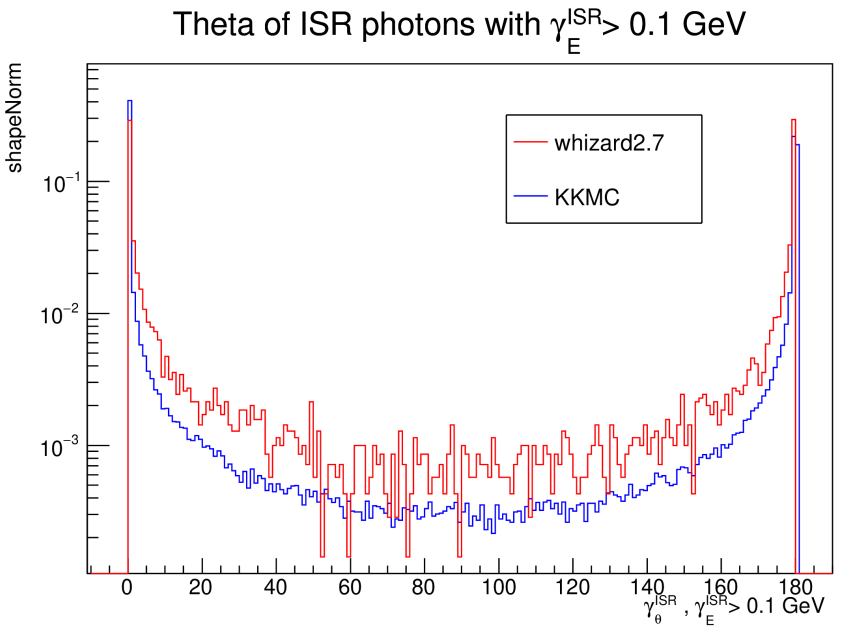




Is the difference in #generated_events
(100k for KKMC and 10k for Whiz)
enough to explain the ‘bumps’?

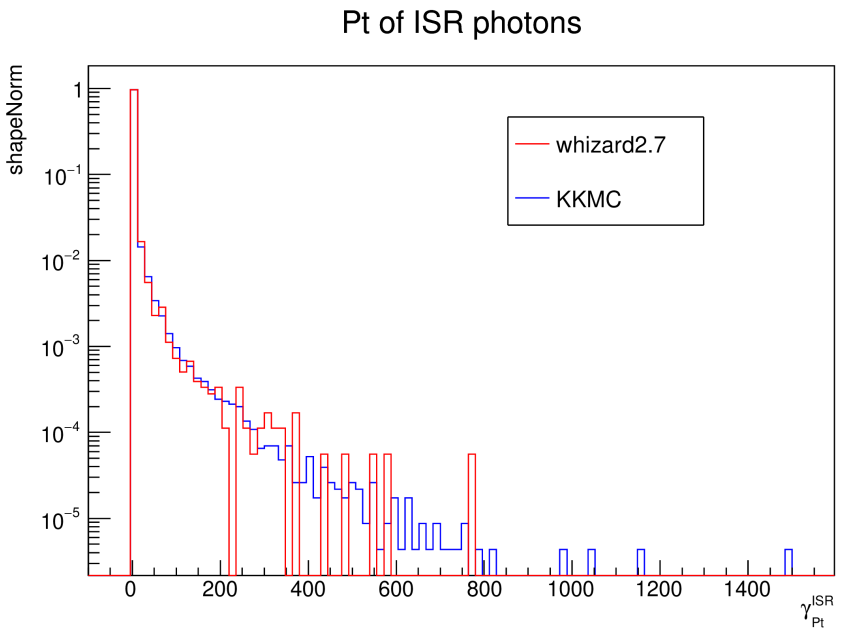
Photon angular distributions

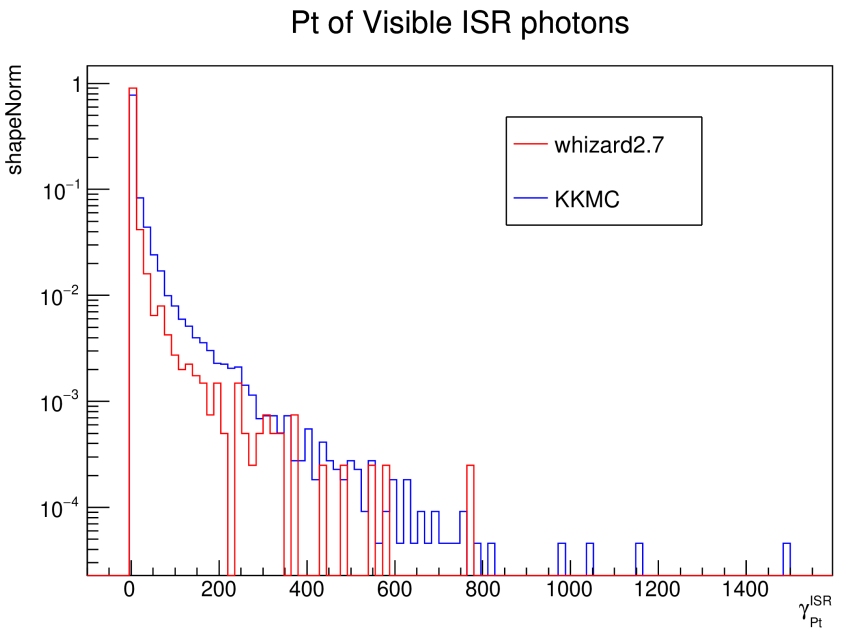




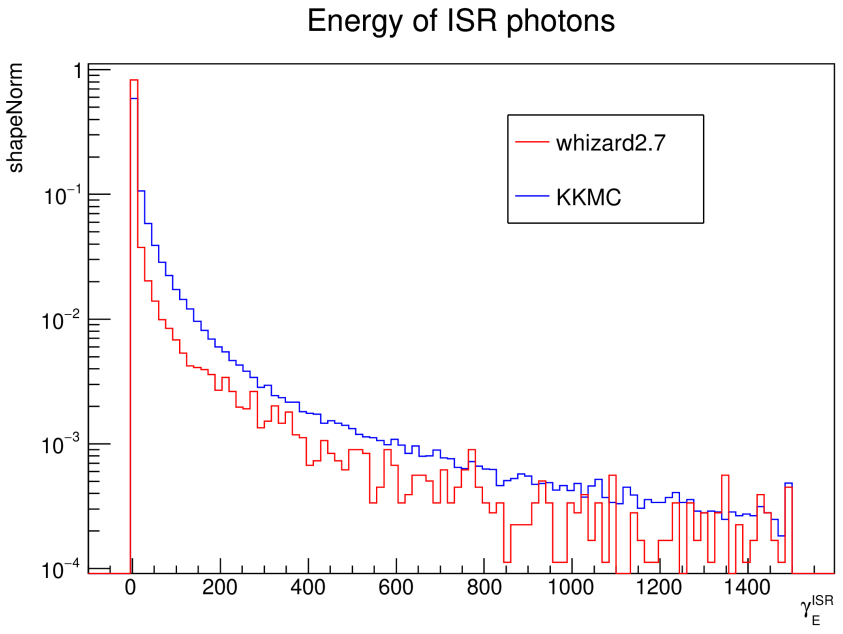
From now on per ‘Visible’ are taken photons
with 10° cut on both sides

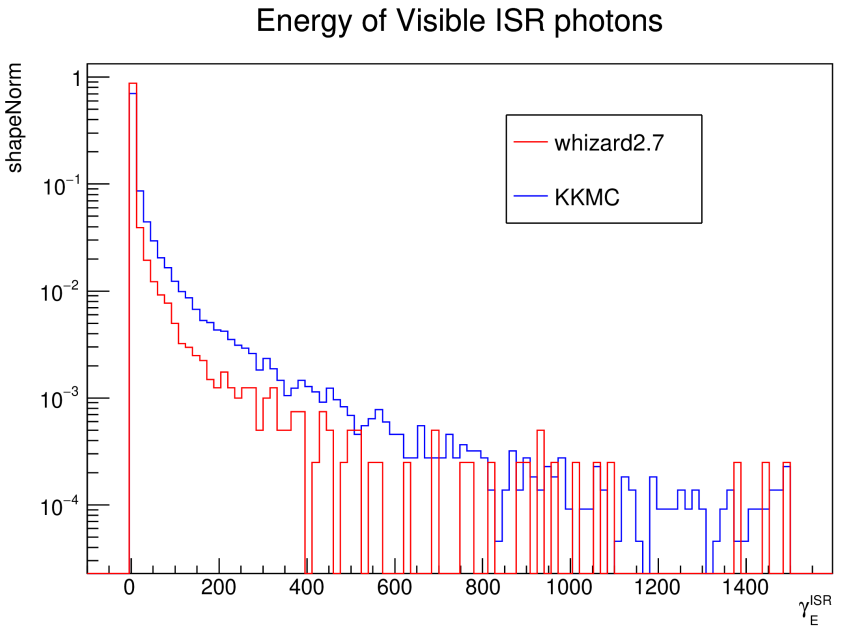
Photons Pt


Pt of ISR photons
shapeNorm
whizard2.7
KKMC
γ_{Pt}^{ISR}

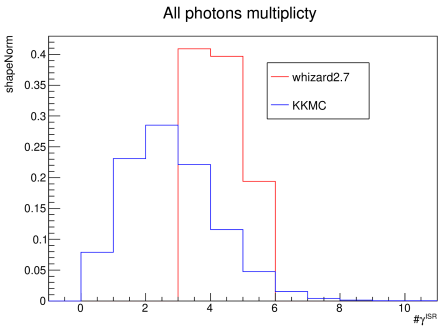

Pt of Visible ISR photons
shapeNorm
whizard2.7
KKMC
γ_{Pt}^{ISR}

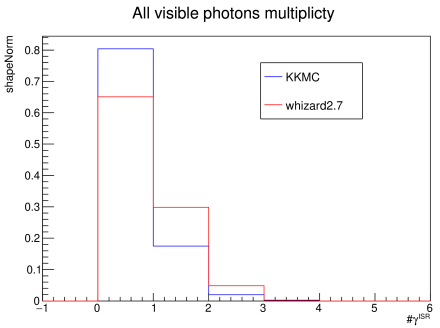
Photons' energies

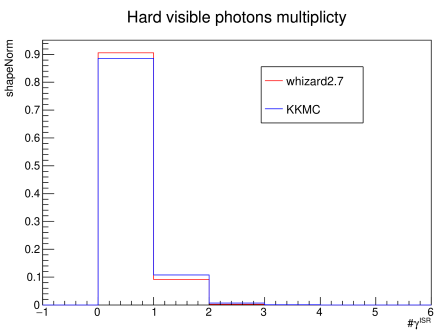




Photon multiplicities

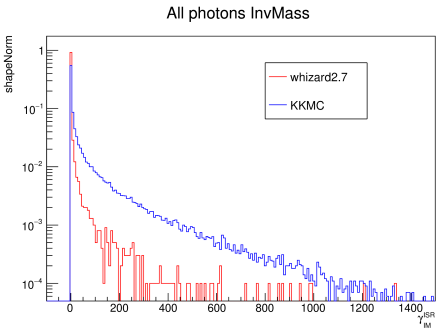


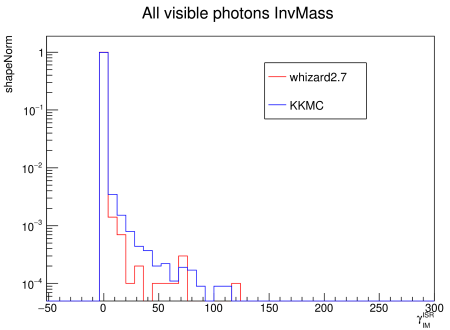


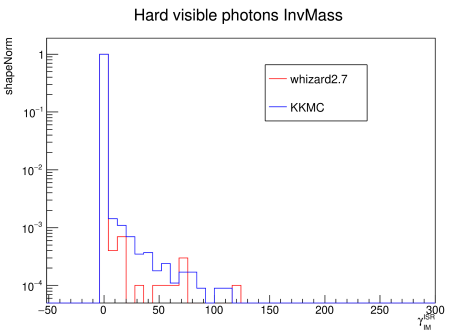


- ‘Visible’ - 10deg cut on both sides
- ‘Hard’ - photon energy greater than 1 GeV

Photon Invariant Masses





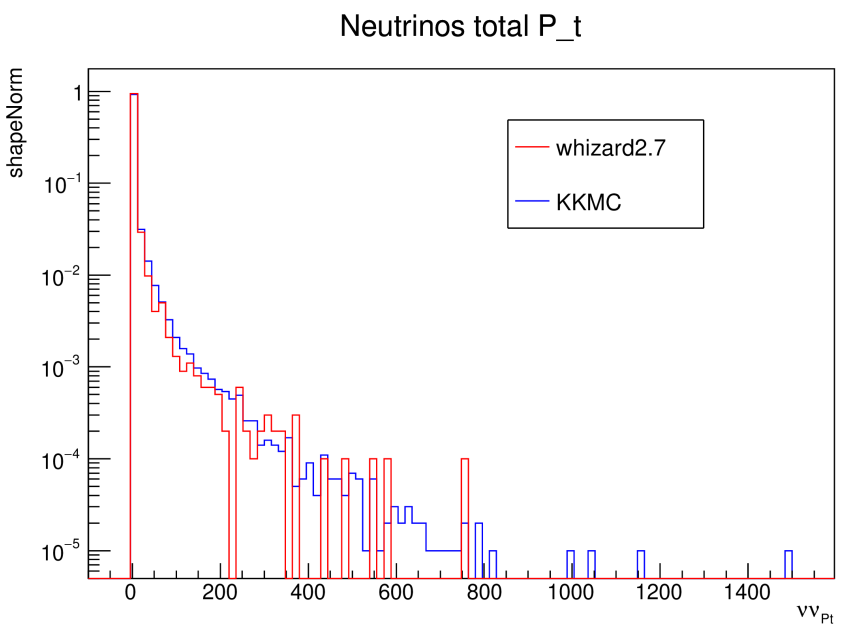


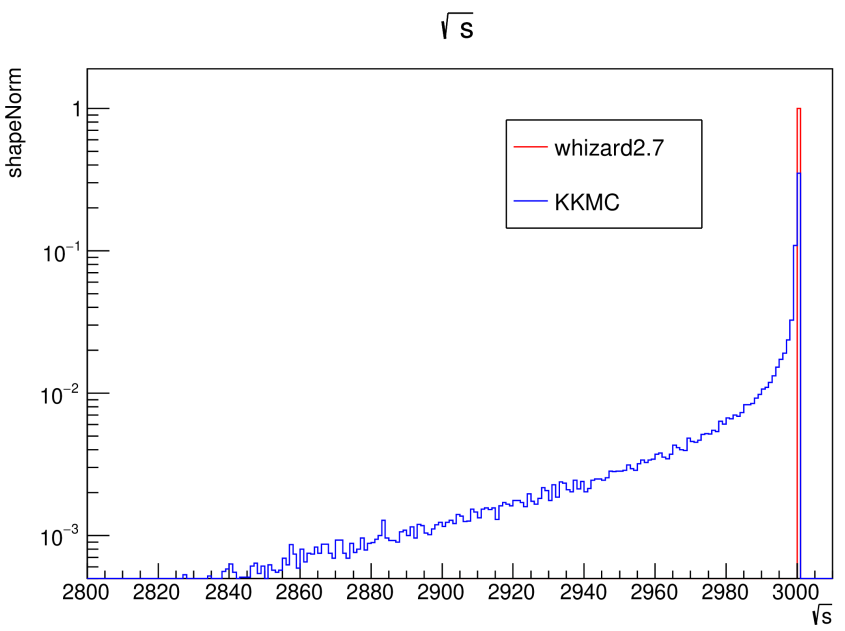
- Summing up 4-vec of all (visible and/or hard) photons in the event

Conclusions & Outlook

- Shapes for photons energies and hard photons multiplicities agree nicely.
- Dicrepancies in invariant masses and neutrino pair kinematics
- Merging procedure needs a bit more tests and could use a tuning in terms of generation speed-up

Backups


Neutrinos total P_t
shapeNorm
whizard2.7
KKMC
$\nu\nu_{Pt}$


$\sqrt{s}$
shapeNorm
whizard2.7
KKMC
$\sqrt{s}$