

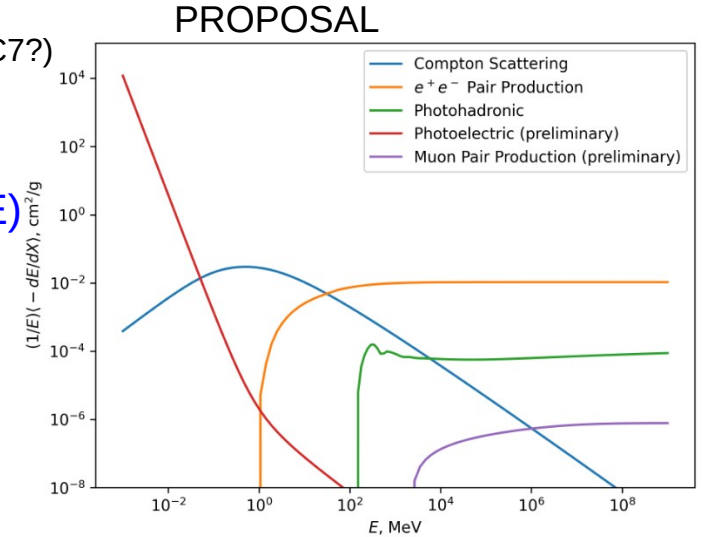
Photohadronic interactions in C8

* photon + nucleus \rightarrow hadrons

* lepton + nucleus (photon* + nucleus) \rightarrow lepton + hadrons (not in C7?)

Status in C8 in 2022:

- cross section included in PROPOSAL (pion threshold to HE)
- NO secondaries:



A. Sandrock EM-meeting 03.02.2022

Photohadronic interactions in C8

C8 workshop, Jun. 13th 2023

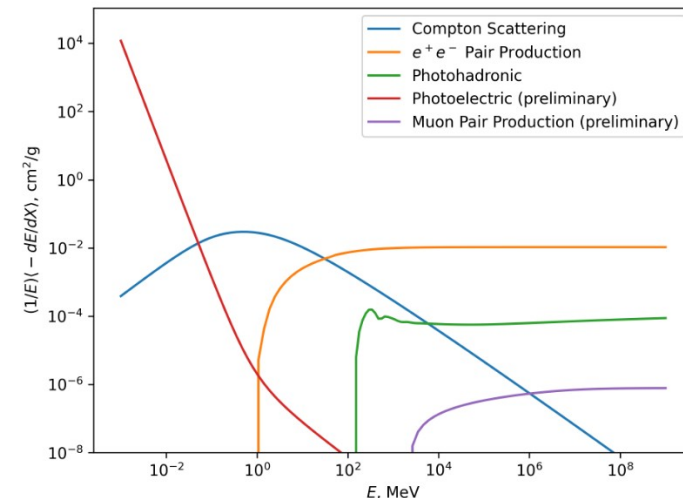
- * photon + nucleus \rightarrow hadrons
- * lepton + nucleus (photon* + nucleus) \rightarrow lepton + hadrons (not in C8)

Status in C8:

- part of PROPOSAL module (HadronicPhotonModel)
- cross section: PROPOSAL (pion threshold to HE)
- secondaries:
 - + any HE hadronic interaction model (Elab>80GeV)
 - + LE photon + nucleon interactions w SOPHIA
- SOPHIA is NOT a stand-alone process

```
// energy threshold for high energy hadronic model. Affects LE/HE switch for
// hadron interactions and the hadronic photon model in proposal
HEPEnergyType heHadronModelThreshold = 80_GeV;
corsika::proposal::Interaction emCascade(
| | env, sophia, sibyll.getHadronInteractionModel(), heHadronModelThreshold);
// NOT available for PROPOSAL due to interface trouble
```

PROPOSAL



A. Sandrock EM-meeting 03.02.2022

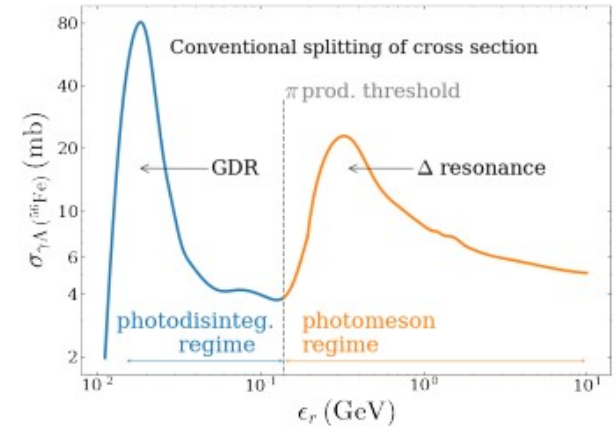
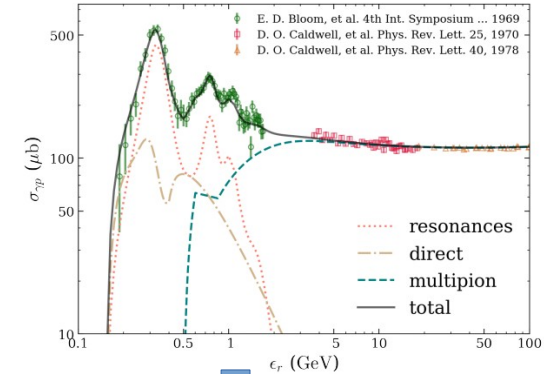
What is missing ?

* test with QGSjet or Epos

* Nuclear interactions

- Photon + nucleus interaction!
 - Final state interactions
 - Fermi broadening
 - Photo-disintegration (~MeV: nucleus resonances!)
 - intra-nuclear cascade
- ==> ALL in FLUKA! (see A. Ferrari's talk yesterday)
- required:
- switch off photo-hadronic in PROPOSAL (#594)
 - extend FLUKA interface for photons (#588)

Fedynitch et al. JCAP 11 (2019) 007

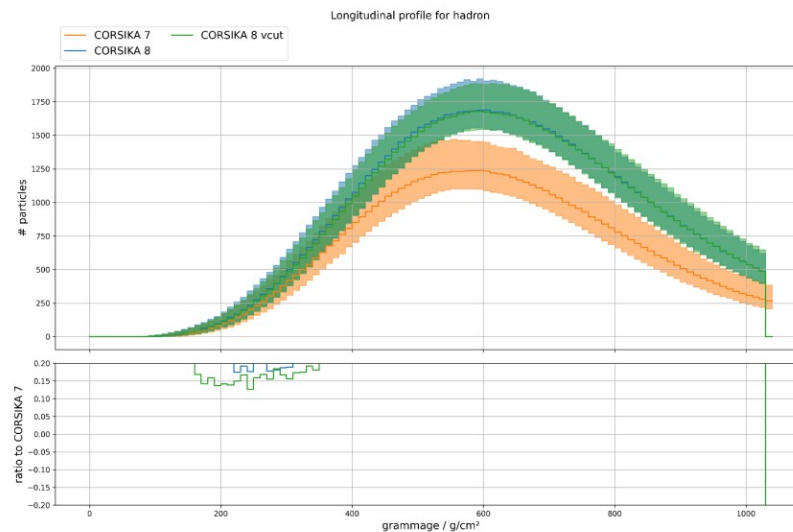
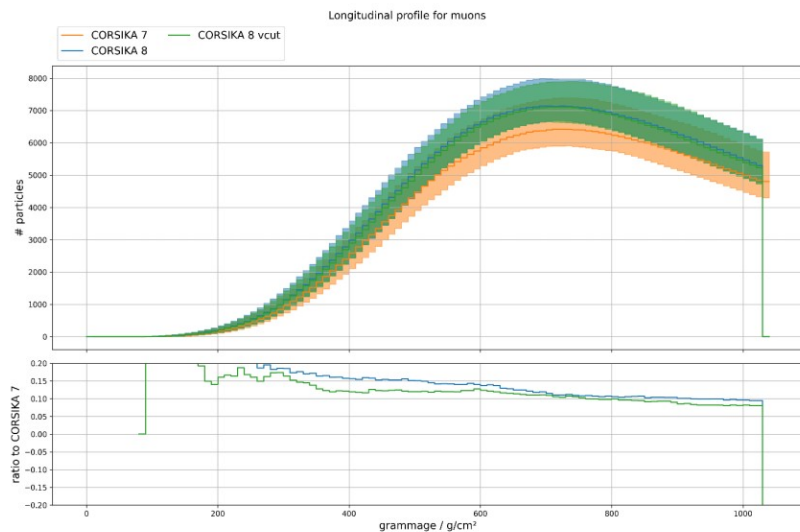


Effect on EAS?

From A. Sandrock's talk yesterday

10 PeV, 0.5 GeV

Longitudinal profiles for muons and hadrons



→ more hadrons/muons in photon showers simulated with C8
Additional photohadronic ?

Compared with photohadronic in C7

Corsika 7:

Cross section:

photon-nucleon

photon*-nucleon ??

Secondary production:

- Sibyll above Ethr

- HDPM below ?

Corsika 8:

Cross section:

photon-nucleon

photon*-nucleon

Secondary production:

- Sibyll above Ethr

- SOPHIA below