
(Hands-on)
Physics process parameters

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Outline

- Exercise 1
 - Range Cut (Production Cut) in Physics process
- Exercise 2
 - Variation of physics constructors
- Exercise 3
 - How to Change the initial random seeds

Beam condition (Simulation of uniform beam exposure)

1. Invoke Galet

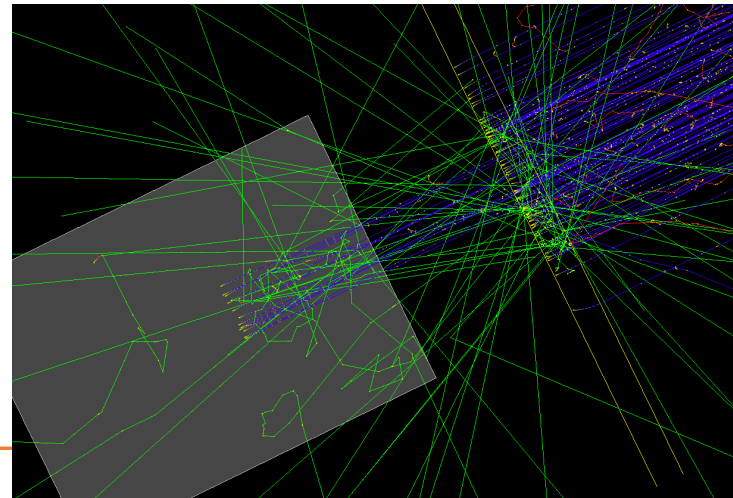
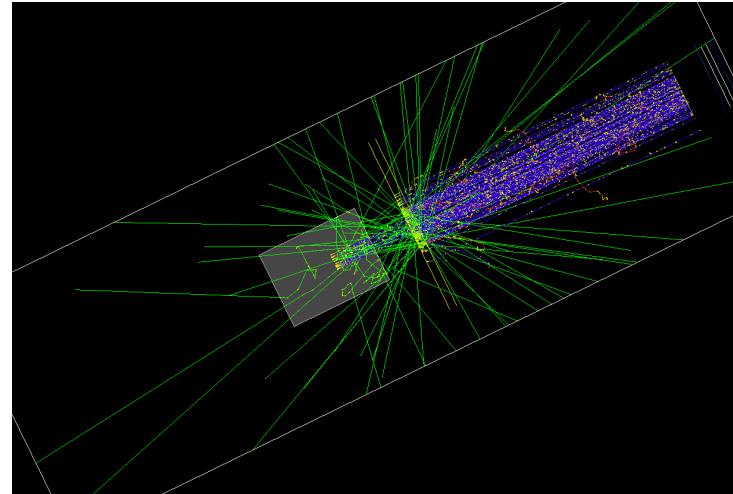
```
./Galet
```

2. Define uniform beam using gps

```
/gps/particle proton  
/gps/energy 150. MeV  
/gps/direction 0. 0. -1.  
/gps/position 0. 0. 130. cm  
/gps/pos/type Beam  
/gps/pos/sigma_x 50.0 mm  
/gps/pos/sigma_y 50.0 mm
```

3. Generates 100 protons

```
/run/beamOn 100
```

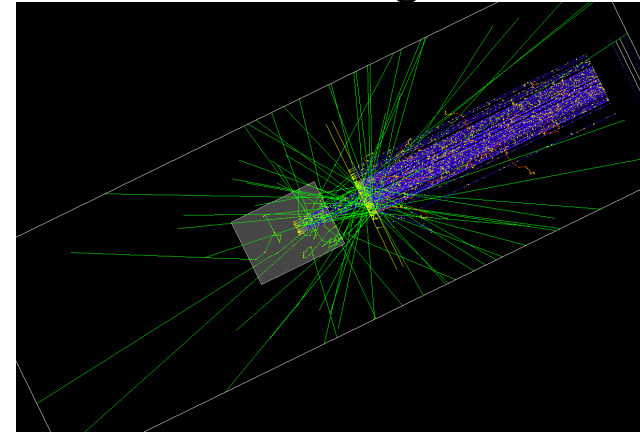


Exercise 1 Range Cut (Production Cut) in Physics process

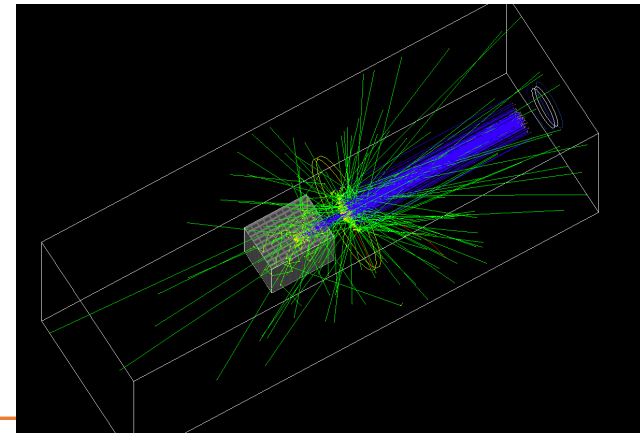
- Check influence of the RangeCut variation
 - Run the application
 - Set the RangeCut to be **1 km**
 - Generates 100 protons
- Answer
 - Run with default (1mm) SetCut
 - `/run/beamOn 100`

 - Run with 1 km SetCut
 - `/run/setCut 1 km`
 - `/run/beamOn 100`

Default 1. mm RangeCut



w/ 1km RangeCut



Exercise 2 Variation of physics constructors

- The physics process can be replaced in unit of physics constructor
 - The physics constructors are listed in **phys.mac** (Listed in next slide)
 - Attention
 - In each category, only one (or none) physics constructor should be selected.
 - Try different combination of physics constructors

Exercise 4 Variation of physics constructors

phys.mac

```
#####  
# EM processes including generic ions.  
#####  
#/Galet/physics/register G4EmStandardPhysics  
#/Galet/physics/register G4EmStandardPhysics_option1  
#/Galet/physics/register G4EmStandardPhysics_option2  
/Galet/physics/register G4EmStandardPhysics_option3  
#/Galet/physics/register G4EmStandardPhysics_option4  
#/Galet/physics/register G4EmLivermorePhysics  
#/Galet/physics/register G4EmPenelopePhysics  
#/Galet/physics/register G4EmDNAPhysics  
#####  
# EMExtra processes  
#####  
#/Galet/physics/register G4EmExtraPhysics  
#####  
# Elastic process for hadrons.  
#####  
/Galet/physics/register G4HadronElasticPhysics  
#####  
# Inelastic processes except for ions.  
#####  
#/Galet/physics/register G4HadronPhysicsFTFP_BERT  
#/Galet/physics/register G4HadronPhysicsFTFP_BERT_HP  
#/Galet/physics/register G4HadronPhysicsFTFP_BERT_TRV  
/Galet/physics/register G4HadronPhysicsFTF_BIC  
#/Galet/physics/register G4HadronPhysicsQGSP_BERT  
#/Galet/physics/register G4HadronPhysicsQGSP_BERT_HP  
#/Galet/physics/register G4HadronPhysicsQGSP_BIC  
#/Galet/physics/register G4HadronPhysicsQGSP_BIC_HP  
#/Galet/physics/register G4HadronPhysicsQGSP_FTFP_BERT  
#/Galet/physics/register G4HadronPhysicsQGS_BIC  
#/Galet/physics/register G4HadronPhysicsShielding
```

```
#####  
# Stopping Physics (Capture)  
#####  
/Galet/physics/register G4StoppingPhysics  
#####  
# Radioactive decay  
#####  
/Galet/physics/register G4RadioactiveDecayPhysics  
#####  
# Inelastic Ions physics including Generic Ions.  
#####  
/Galet/physics/register G4IonBinaryCascadePhysics  
#/Galet/physics/register G4IonINCLXXPhysics  
#/Galet/physics/register G4IonQMDPhysics  
#/Galet/physics/register G4IonPhysics  
#####  
# Decay Physics  
#####  
/Galet/physics/register G4DecayPhysics  
#  
#####  
# Optical Physics  
#####  
##/Galet/physics/register G4OpticalPhysics  
#  
#  
#####  
# ParallelWorld Physics parallelWorldName:s Layeredmass:b  
#####  
##/Galet/physics/pwProcess paraWorld1 true  
#
```

Exercise 3 Changing initial random seeds

- We sometimes need to repeat a simulation with the same condition to increase statistics.
 - In such cases, the initial random seed need to be changed for every run.
 - w/o changing the initial random seeds, the simulation results become completely same.
- Try to change the initial random seed and run the simulation by:

`/random/setSeeds 1 2` ← **at least two integer numbers are required**

(A) Example answer

- Examine the same initial number gives the same event
 - `/random/setSeeds 1 2`
 - `/run/beamOn 1`
 - `/random/setSeeds 1 2`
 - `/run/beamOn 1`

(B) Example answer

- Examine the different initial number gives the different event
 - `/random/setSeeds 1 2`
 - `/run/beamOn 1`
 - `/random/setSeeds 1 4`
 - `/run/beamOn 1`