Highlight on Advanced Topics

FLUKA Beginner's Course

This is not the end …

- As said in the first day, most applications can be run through data-cards only, exploiting the FLUKA built-in capacities
- Sometimes, more is needed...
- A set of templates User Routines is provided in the $FLUPRO/usermvax directory
- All common and default parameters are located in $FLUPRO/flukapro
- These can be modified by the user to fit his input/output needs

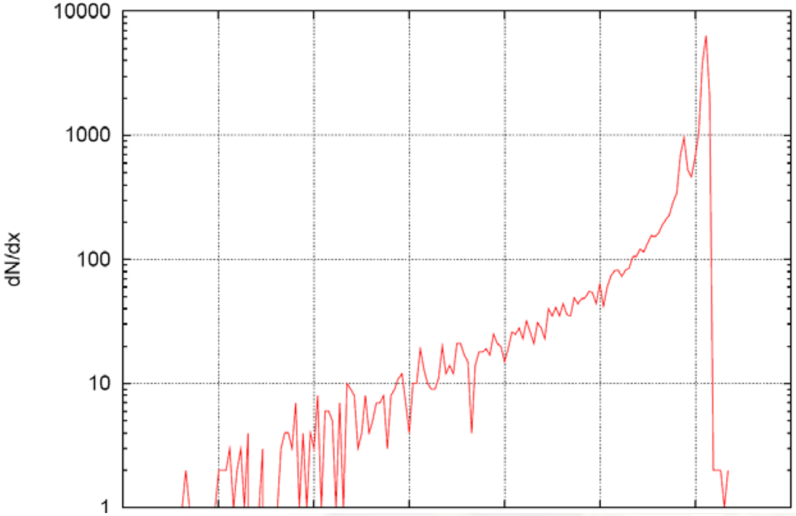
- We'll give here some hints of what can be done, more can be found in the manual, in the fluka-discuss archive, or

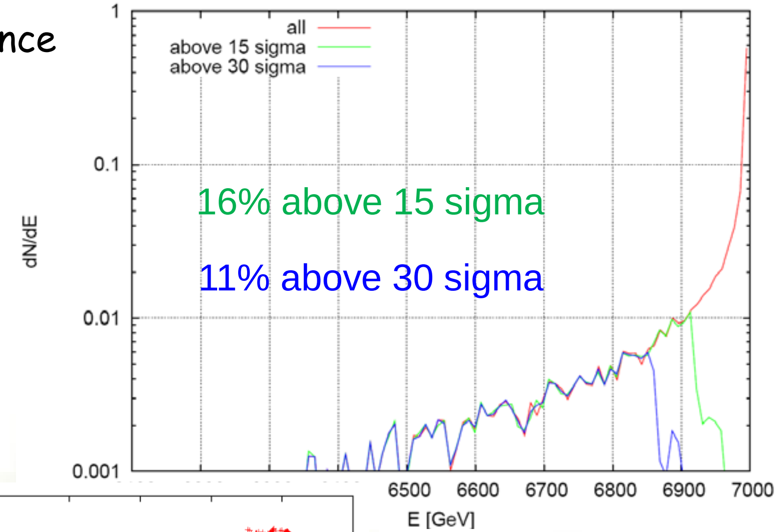
at the third FLUKA advanced course and workshop

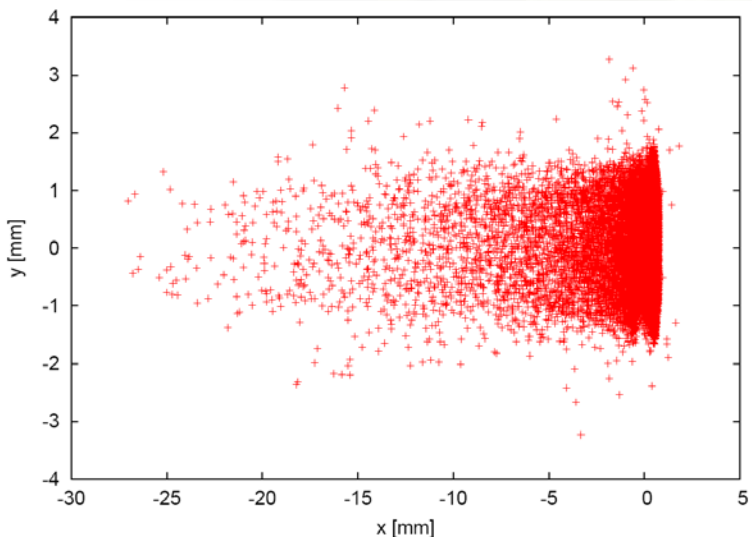
to be held in ? perhaps next year

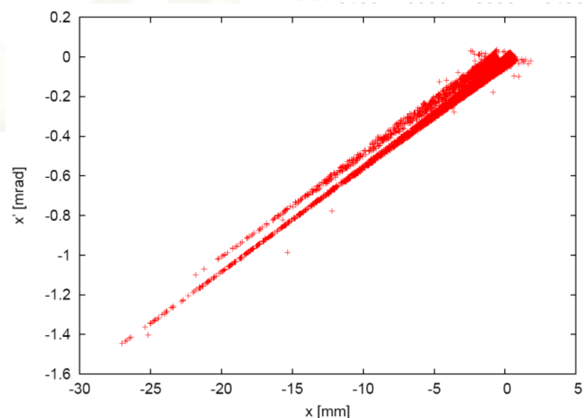
Implementing customized beam distributions - 1

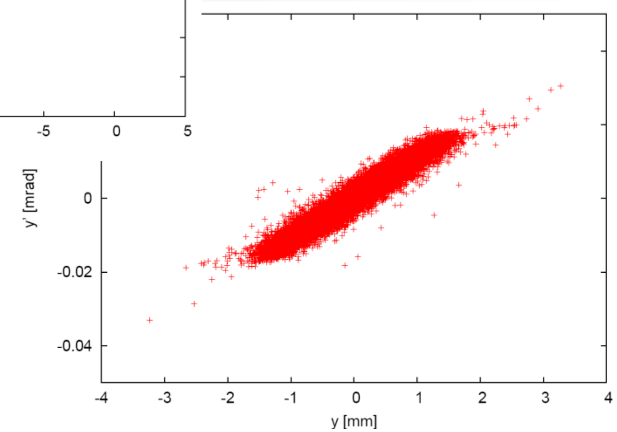
LHC proton beam at the Dispersion Suppressor entrance











Implementing customized beam distributions - 2

Input card: SOURCE

User routine: $FLUPRO/usermvax/source.f
to be linked in one's own executable !

In source.f

you can sample beam particle position, direction, and energy
from an external file or any (analytic or numerical) distribution

you can assign different weights to primary particles

you can load reaction products in the same primary history

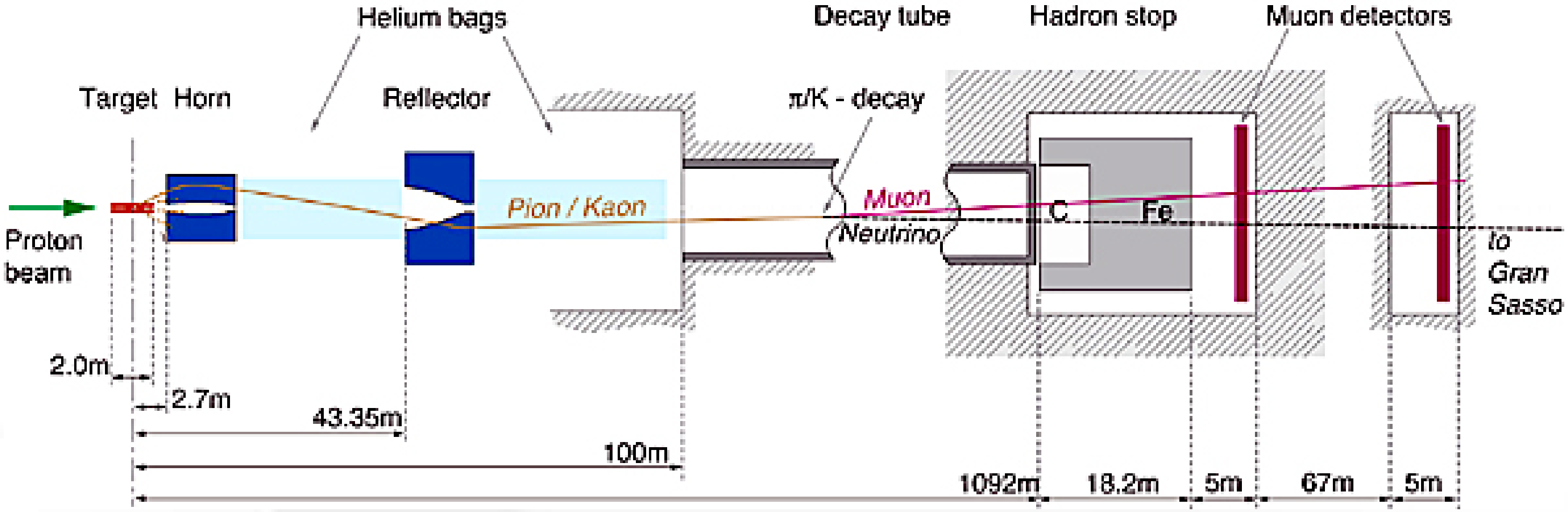
several sampling routines already exist in the FLUKA code

parameters input in the SOURCE card are available

a BEAM card with a momentum/energy higher than the maximum one is still needed
for initialization purposes (to define the tabulation limit)

Implementing magnetic field - 1

CERN Neutrino to Gran Sasso



The two magnetic lenses (blue in the sketch) align positive mesons towards the Decay tunnel, so that neutrinos from the decay are directed to GranSasso, 730~km away

Negative mesons are deflected away

The lenses have a finite energy/angle acceptance

Implementing magnetic field - 2

Input card: ASSIGNMA

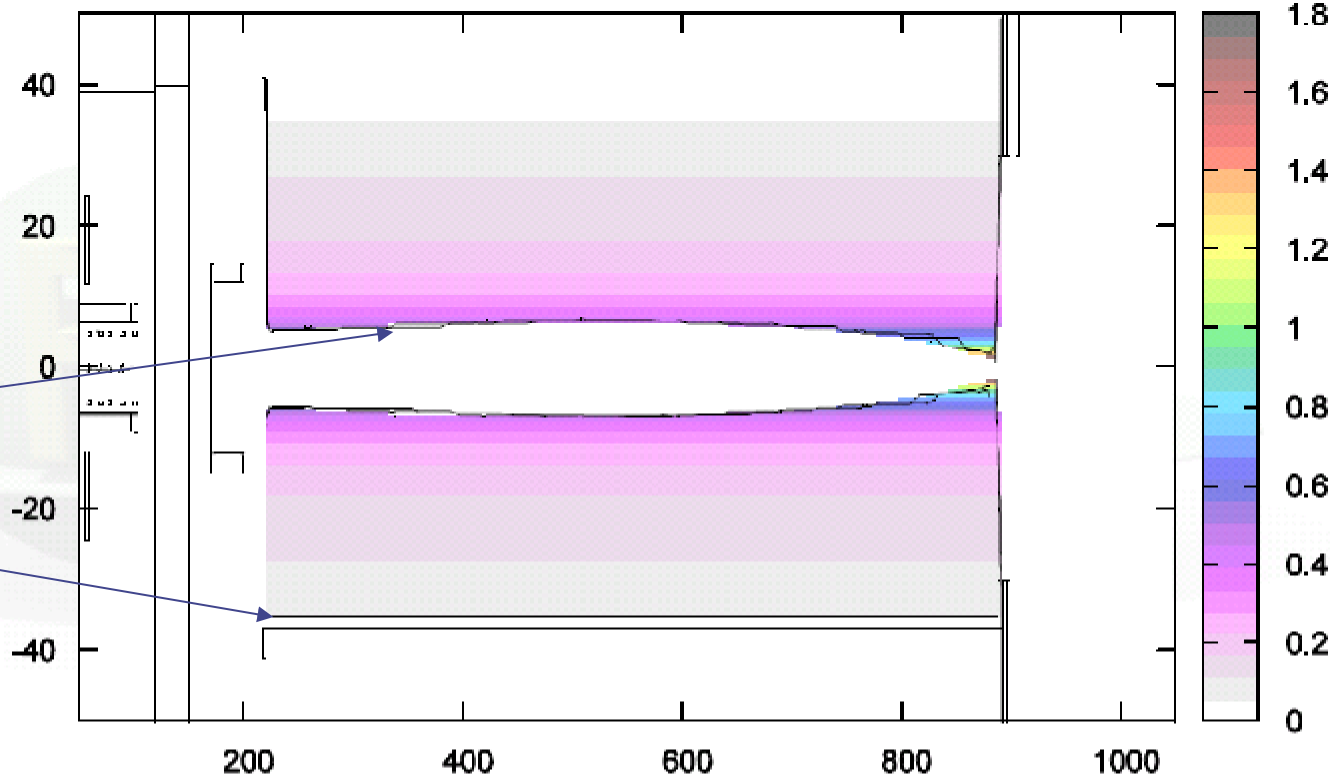
User routine: $FLUPRO/usermvax/magfld.f

to be linked in one's own executable !

A current ≈150kA, pulsed, circulates through the Inner and Outer conductors

The field is toroidal, B÷1/R

Magnetic field intensity in the CNGS horn




HHLPR 782

Implementing magnetic field - 4

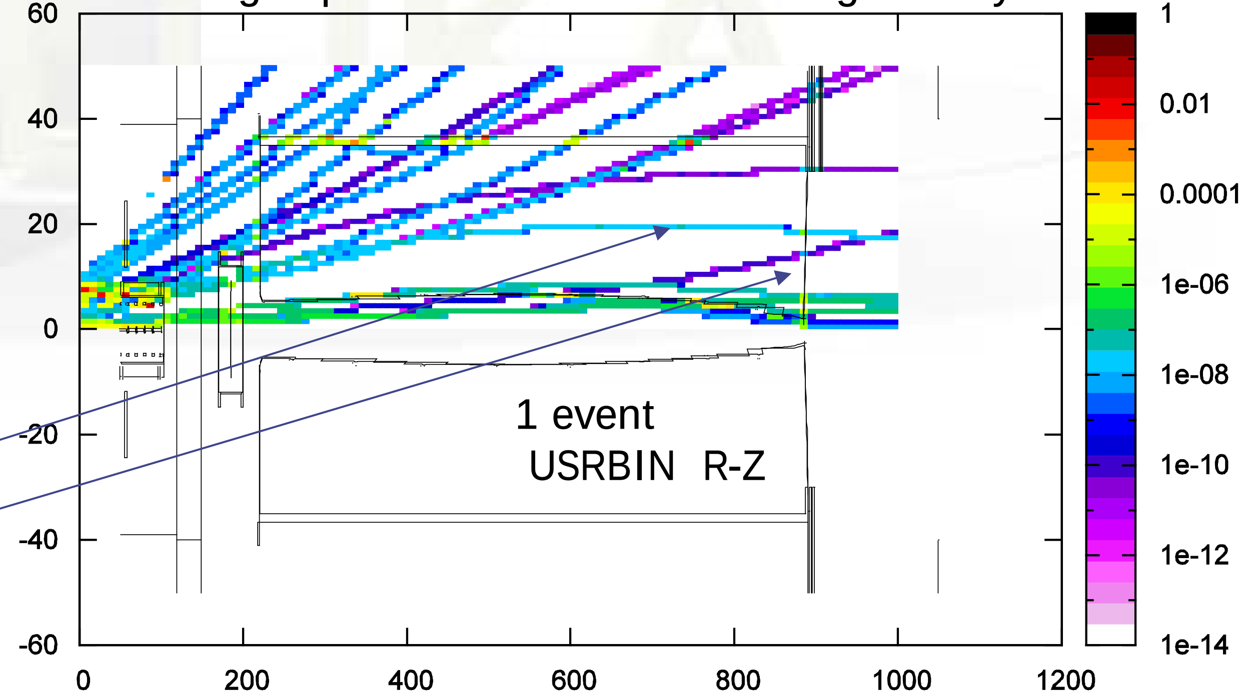
```
SUBROUTINE MAGFLD ( X, Y, Z, BTX, BTY, BTZ, B, NREG, IDISC )

IF ( NREG .EQ. NRHORN ) THEN
      RRR = SQRT ( X**2 + Y**2 )
      BTX =-Y / RRR
      BTY = X / RRR
      BTZ = ZERZER
      B   = 2.D-07 * CURHOR / 1.D-02 / RRR
END IF
```

In magfld.f

you can define the magnetic field
analytically or
by interpolating an external map

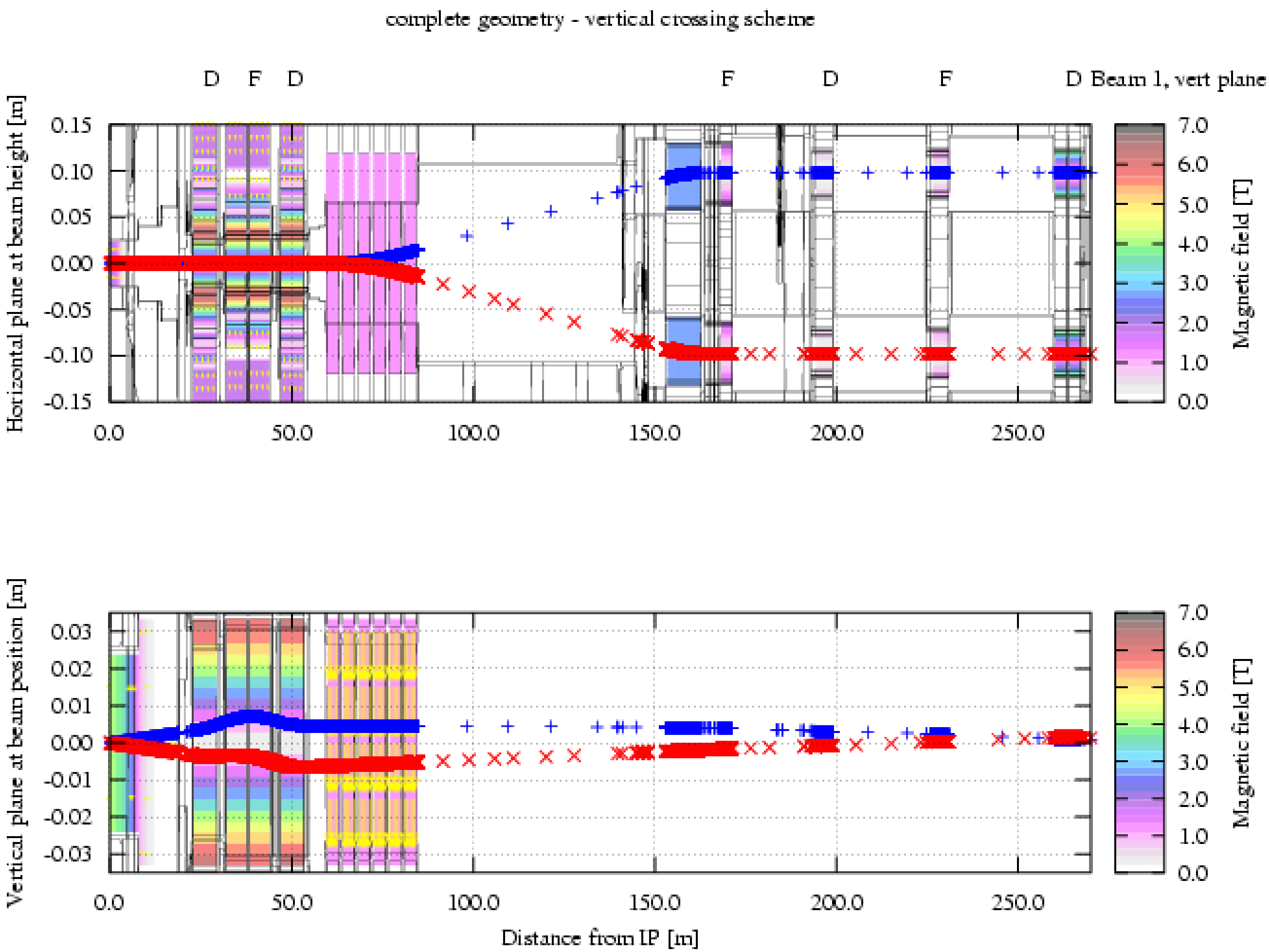
charged particle tracks in the CNGS geometry



Focused
De-focused
Escaping...many

Implementing customized scoring - 1

beam crossing in ATLAS



Implementing customized scoring - 2

Input card: USERDUMP

User routine: $FLUPRO/usermvax/mgdraw.f
to be linked in one's own executable !

In mgdraw.f

you can get particle trajectories and (continuous and local) energy losses

you can go over reaction products

you can access information at each boundary crossing, particle step, energy deposition event, *interaction*

In mdstck.f (for which no activating card is needed) as well,
with the additional – dangerous – possibility of influencing the subsequent transport of secondaries

Implementing customized scoring-3

Input card: USERWEIG

User routines: $FLUPRO/usermvax/comscw.f
$FLUPRO/usermvax/fluscw.f

to be linked in one's own executable !

In comscw.f

you can apply a user defined weight (even discard) on deposited energy, stars or residual nuclei

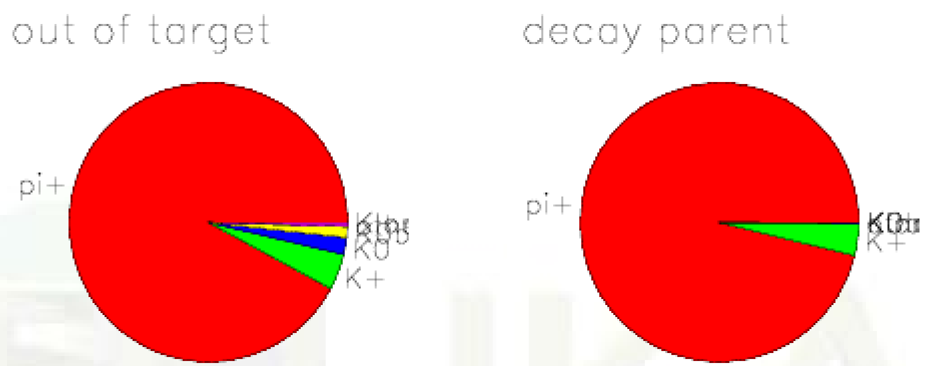
you can extract information (and dump it on a file) about the involved particles

In fluscw.f

same as comscw.f for fluence scoring

Implementing customized flags

identification of ancestors of muon-neutrinos reaching Gran Sasso



ancestor as exiting the target

parent decaying in ν_μ

No input card

User routines: $FLUPRO/usermvax/stuprf.f
$FLUPRO/usermvax/stupre.f

to be linked in one's own executable !

In stuprf.f

you can keep track of the particle origin

stupre.f applies in case of electrons, photons and positrons

Implementing region independent importance biasing

Input card: BIASING

User routines: $FLUPRO/usermvax/usimbs.f

to be linked in one's own executable !

usimbs.f

is called for every particle step in user selected regions in order to return the change in the importance from the beginning to the end of the step, in a region-independent way!
It doesn't produce as accurate results as the manual region importance biasing, but it is a great time saver as segmenting a complex geometry can be a cumbersome task