Highlights on Advanced Topics

21st FLUKA Beginner's Course

ALBA Synchrotron (Spain)

April 8-12, 2019

This is not the end…

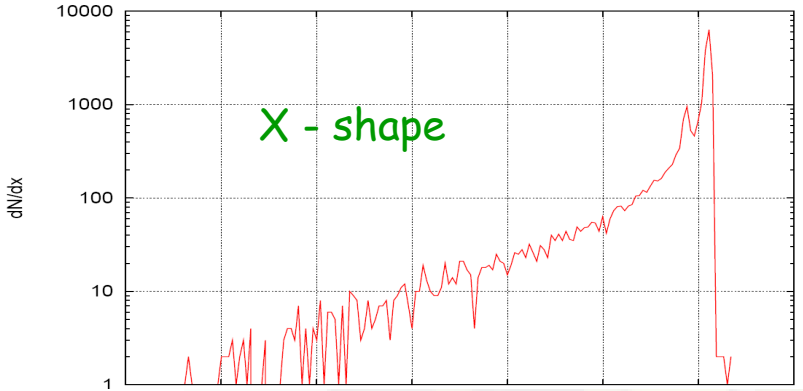
- As said on the first day, most applications require data-cards only, exploiting the FLUKA built-in capacities
- Sometimes, more is needed…
- Template User Routines are provided in $FLUPRO/usermvax
- Routines can be modified by the user to fit his input/output needs
- All shared parameters and variables (in COMMON blocks) are located in $FLUPRO/flukapro
- We'll give here some hints of what can be done, more can be found in the manual, in the fluka-discuss archive, or…

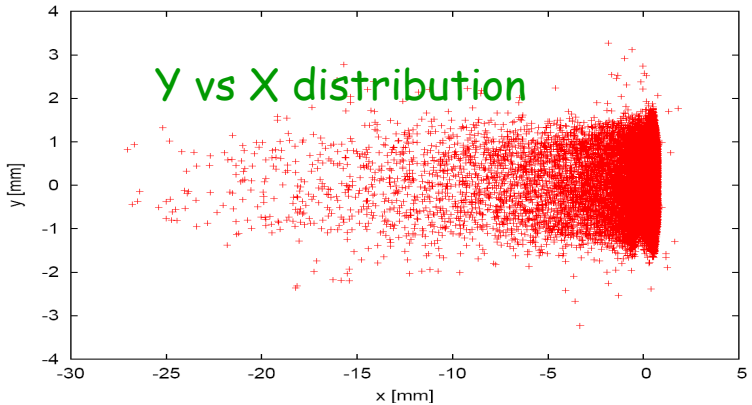
at the next FLUKA advanced course and workshop

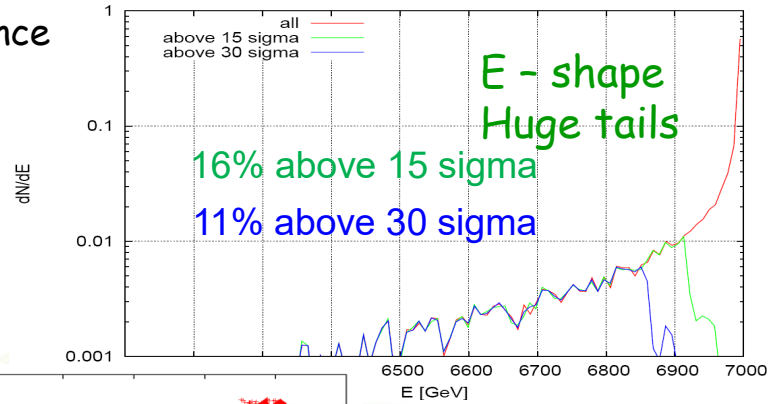
dates and venue not yet defined

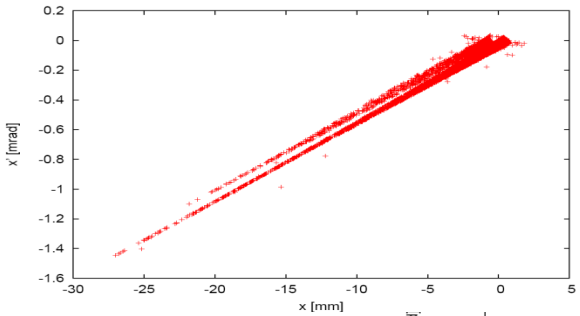
Implementing customized beam distributions - 1

LHC proton beam at the Dispersion Suppressor entrance

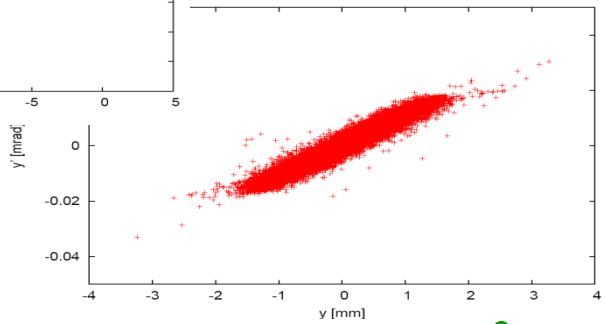








Divergency depends on position



Implementing customized beam distributions - 2

Input card: SOURCE Template user routine: $FLUPRO/usermvax/source.f

source.f must be linked in one's own executable !

It is possible to sample beam particle position, direction, and energy from an external file or a distribution

It is possible to assign different weights to primary particles

It is possible to load reaction products in the same primary history

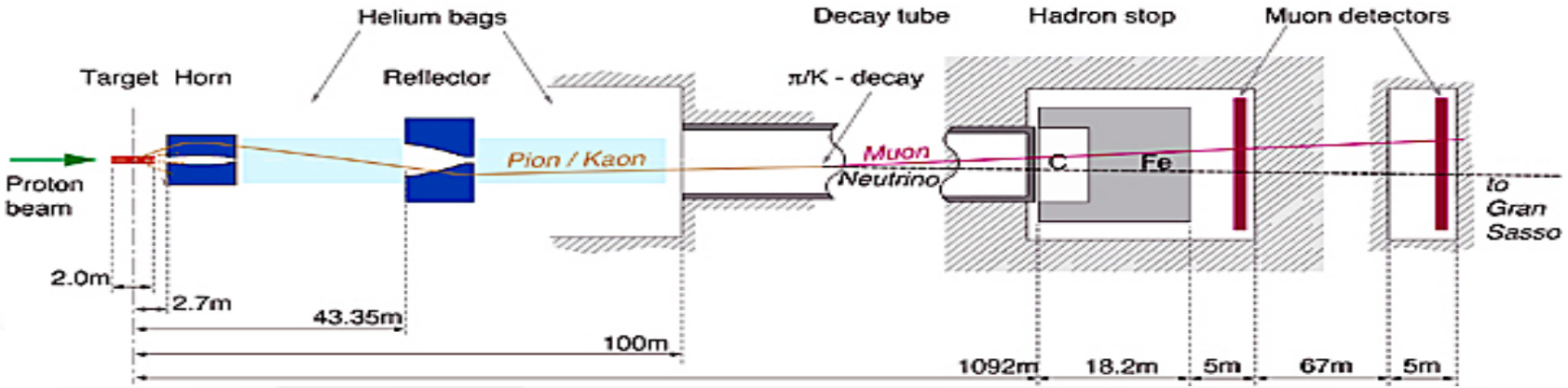
several sampling routines already exist in the FLUKA code (e.g. Gaussian)

Input parameters can be passed via the SOURCE card

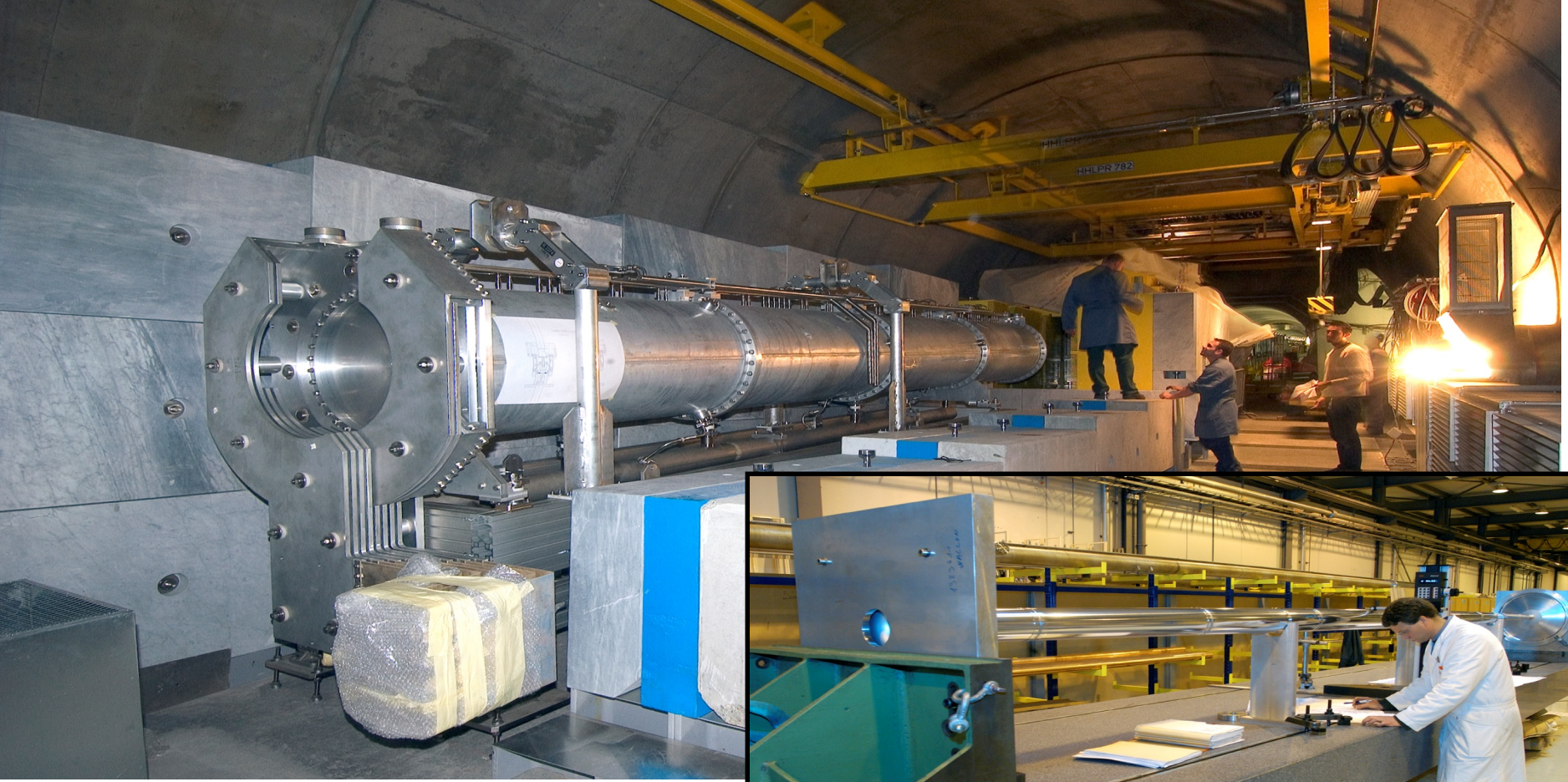
a BEAM card with a momentum/energy higher than the maximum one is still needed for initialization purposes (to define the tabulation limit)

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 Gran Sasso, 730~km away
Negative mesons are deflected away
The lenses have a finite energy/angle acceptance


HHLPR 782

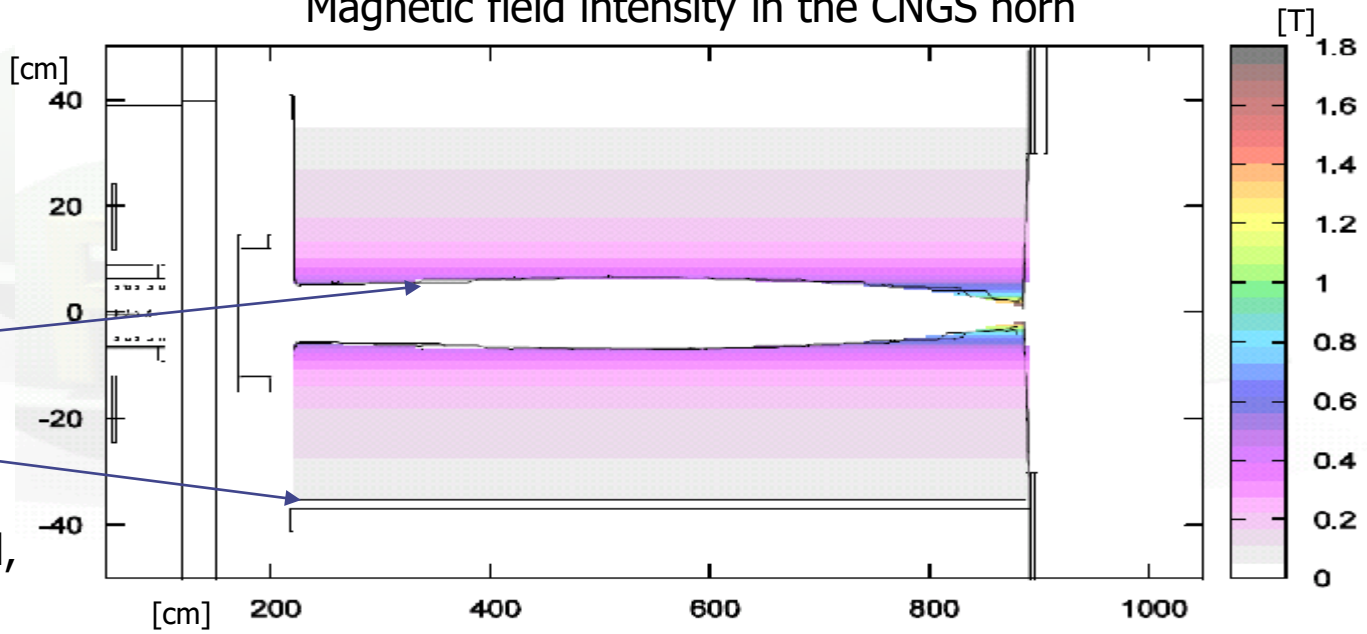
Implementing magnetic field - 2

Input card: ASSIGNMA Template user routine: $FLUPRO/usermvax/magfld.f

magfld.f must be linked in one's own executable !

A ≈150kA current, pulsed, circulates through the Inner and Outer conductors
The field is toroidal, B÷1/R

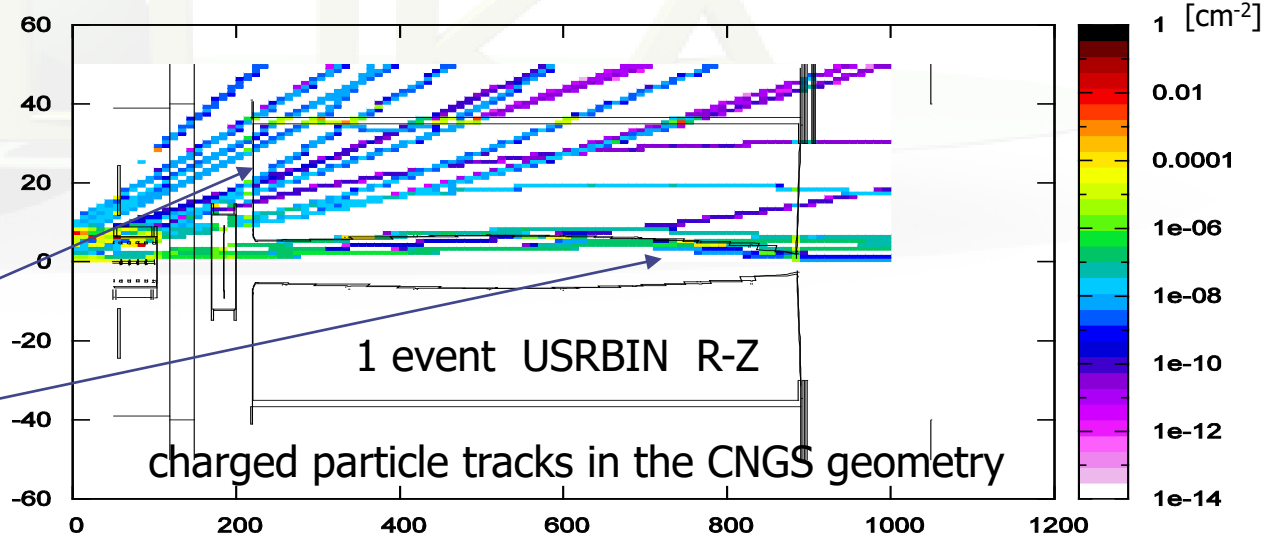
Magnetic field intensity in the CNGS horn



Implementing magnetic field - 3

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

Possible to define the magnetic field analytically or by interpolating an external map



De-focused
focused
Many Escaping

Access detailed n

Input card: USERDUMP Template user routine: $FLUPRO/usermvax/mgdraw.f

mgdraw.f must be linked in one's own executable !

It is possible to get particle trajectories and (continuous and local) energy losses

It is possible to access information at each boundary crossing, particle step, energy deposition event, interaction

It is possible to look at reaction products

Implementing customized scoring

Input card: USERWEIG

Template user routines: $FLUPRO/usermvax/fluscw.f (for fluence scoring)

$FLUPRO/usermvax/comscw.f (for density-like scoring)

???scw.f must be linked in one's own executable !

It is possible to apply a user defined weight (even zero) to deposited energy, residual nuclei, etc.

It is possible to extract information about the particles involved (and dump it into a file)

Implementing customized flags

No input card

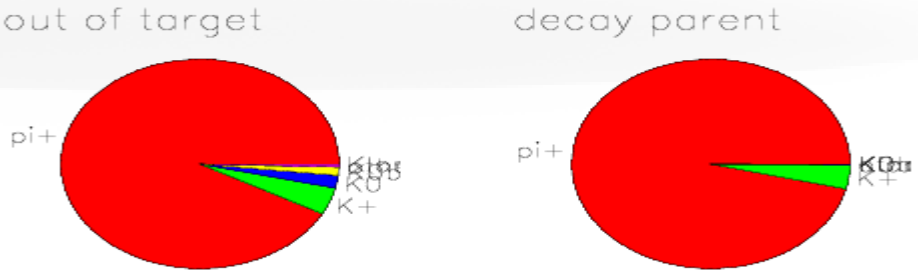
Template user routines: $FLUPRO/usermvax/stupre.f (for e.m. particles)

$FLUPRO/usermvax/stuprf.f (for other particles)

stupr?.f must be linked in one's own executable !

It is possible to keep track of particles properties like its origin

identification of ancestors of muon-neutrinos reaching Gran Sasso



ancestor as exiting the target

parent decaying in ν_μ

Implementing region independent importance biasing

Input card: BIASING Template user routine: $FLUPRO/usermvax/usimbs.f

usimbs.f must be linked in one's own executable !

It is call at every step in user-selected regions and allows to change the importance of a particle independently from the region

It doesn't require to segment the geometry in many regions to use region importance biasing

It can be time-consuming in implementation and CPU-time

Next FLUKA course

FLUKA advanced course and workshop
18-22 November 2019 @ NEA (Paris)

Registration to open in the forthcoming weeks

Info on:

www.fluka.org
www.oecd-nea.org/dbcps/training-courses