How to use FLUKA and flair simulation for beginner

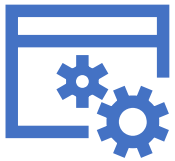
By Ink & Dr.Kim

Outline

Introduction

Create a model

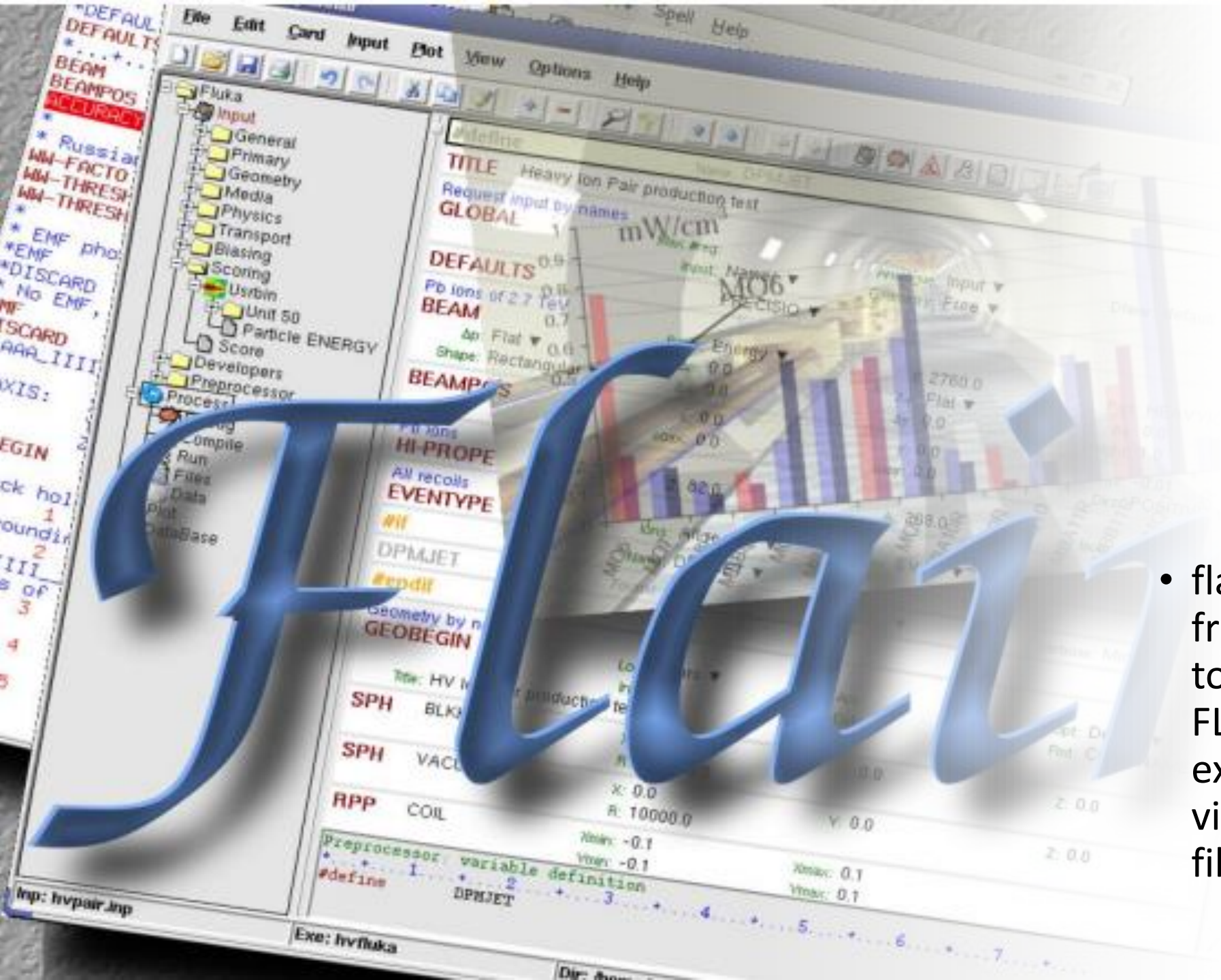
Export picture from flair



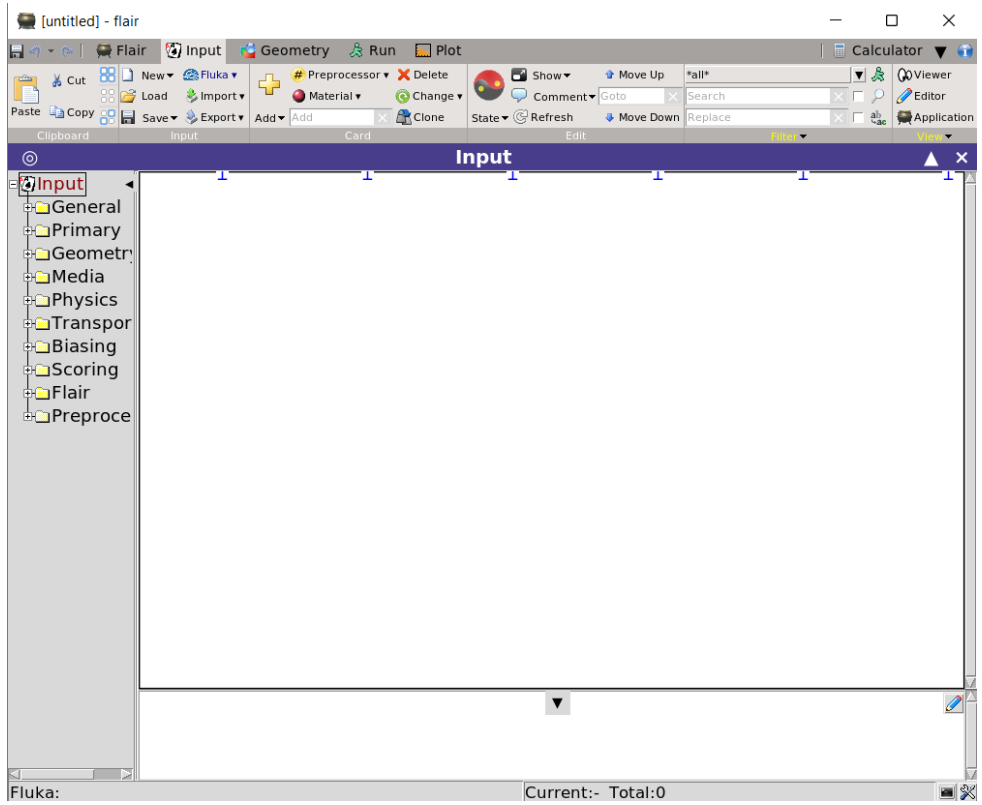
Run FLUKA in server

Introduction

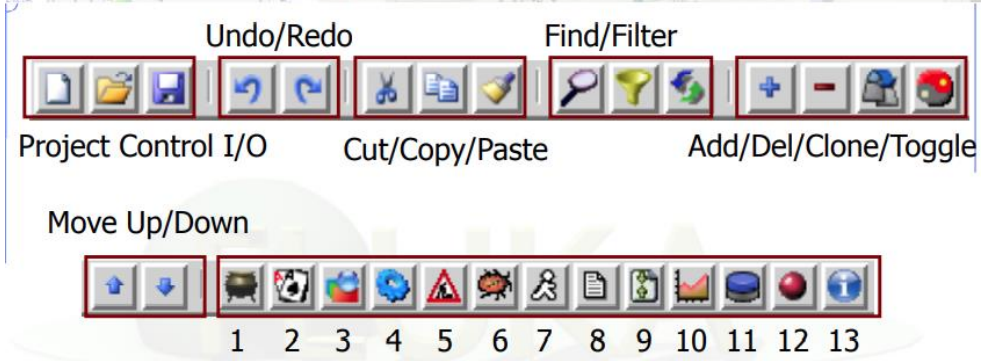
- FLUKA is Monte-Carlo simulation package which is a tool for calculations of particle transport and interactions with matter
- FLUKA can simulate with high accuracy the interaction and propagation in matter of about 60 different particles, including photons and electrons from 100 eV–1 keV to thousands of TeV, neutrinos, muons of any energy, hadrons of energies up to 20 TeV (up to 10 PeV by linking FLUKA with the DPMJET code)



- flair is an advanced user-friendly interface for FLUKA to facilitate the editing of FLUKA input files, execution of the code and visualization of the output files.



Toolbar

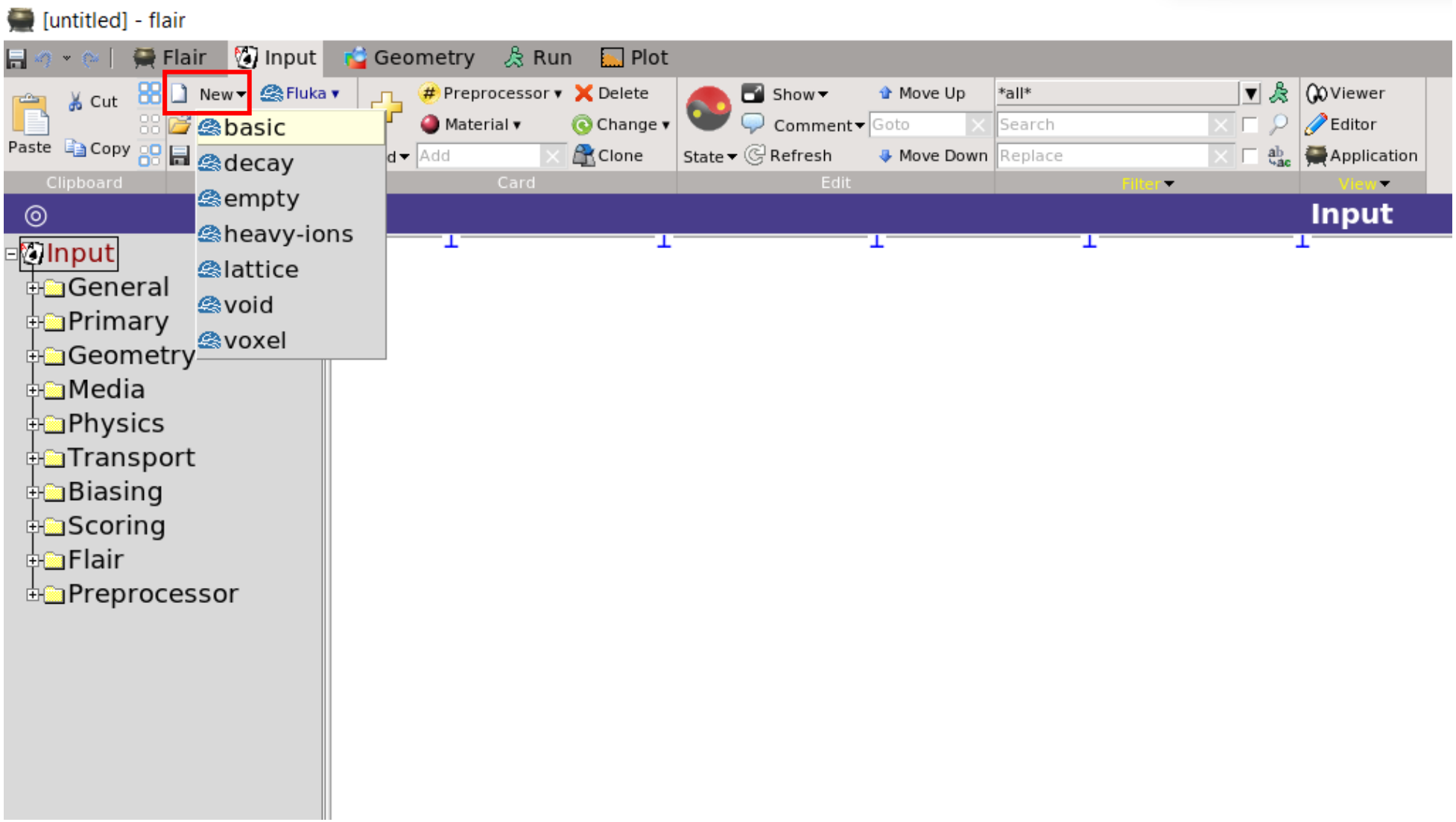


Quick Access to:

1. Project Frame
2. Input Editor
3. Geometry Editor (if installed)
4. Process Summary
5. Compile executables/Add user routines
6. Debug Geometry
7. Run/monitor simulations
8. View output files
9. Data merging
10. Plots
11. Databases (not yet functional)
12. Material Database
13. Help

How to create a model? (using flair)

1. Beam
2. Geometry
3. Region
4. Assign material


[untitled] - flair
Flair
Input
Geometry
Run
Plot
Cut
Paste
Copy
New
Fluka
basic
decay
empty
heavy-ions
lattice
void
voxel
Preprocessor
Material
Add
Delete
Change
Clone
Clipboard
Card
Show
Comment
State
Refresh
Move Up
Goto
Move Down
Edit
all
Search
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Filter
Viewer
Editor
Application
View
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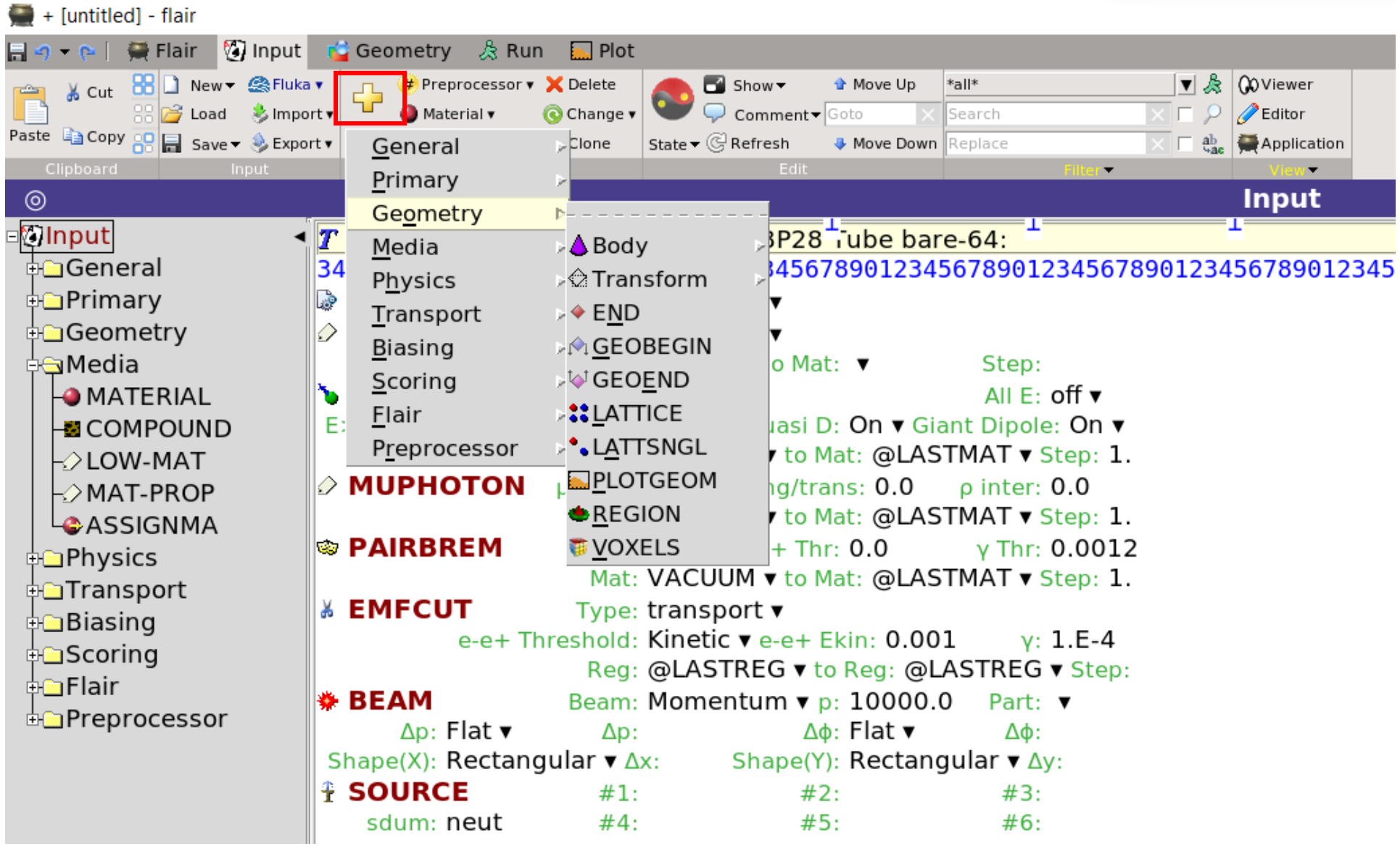
General
Primary
Geometry
Media
Physics
Transport
Biasing
Scoring
Flair
Preprocessor


+ [untitled] - flair
Flair
Input
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Run
Plot
Paste
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New
Load
Save
Fluka
Import
Export
Preprocessor
Material
Delete
Change
Clone
Show
Comment
State
Refresh
Move Up
Goto
Move Down
all
Search
Replace
Viewer
Editor
Application
Clipboard
Input
Edit
Filter
View
General
Primary
Geometry
Media
Physics
Transport
Biasing
Scoring
Flair
Preprocessor
Body
Transform
END
GEOBEGIN
GEOEND
LATTICE
LATTSNGL
PLOTGEOM
REGION
VOXELS
Input
MATERIAL
COMPOUND
LOW-MAT
MAT-PROP
ASSIGNMA
MUPHOTON
PAIRBREM
EMFCUT
BEAM
SOURCE
Step:
All E: off
Giant Dipole: On
to Mat: @LASTMAT Step: 1.
ρ inter: 0.0
γ Thr: 0.0012
Mat: VACUUM to Mat: @LASTMAT Step: 1.
Type: transport
e-e+ Threshold: Kinetic e-e+ Ekin: 0.001 γ: 1.E-4
Reg: @LASTREG to Reg: @LASTREG Step:
Beam: Momentum p: 10000.0 Part:
Δp: Flat Δp: Δϕ: Flat Δϕ:
Shape(X): Rectangular Δx: Shape(Y): Rectangular Δy:
#1: #2: #3:
sdum: neut #4: #5: #6:

Beam and position of beam

Define the beam characteristics

BEAM Beam: Energy ▾ E: 1e-06 Part: NEUTRON ▾

Δp: Flat ▾ Δp: Δϕ: Flat ▾ Δϕ:

Shape(X): Rectangular ▾ Δx: Shape(Y): Rectangular ▾ Δy:

Define the beam position

BEAMPOS x: 0 y: 0 z: 20

cosx: cosy: Type: NEGATIVE ▾

x-coordinate y-coordinate and z-coordinate of the spot center.

direction cosine of the beam

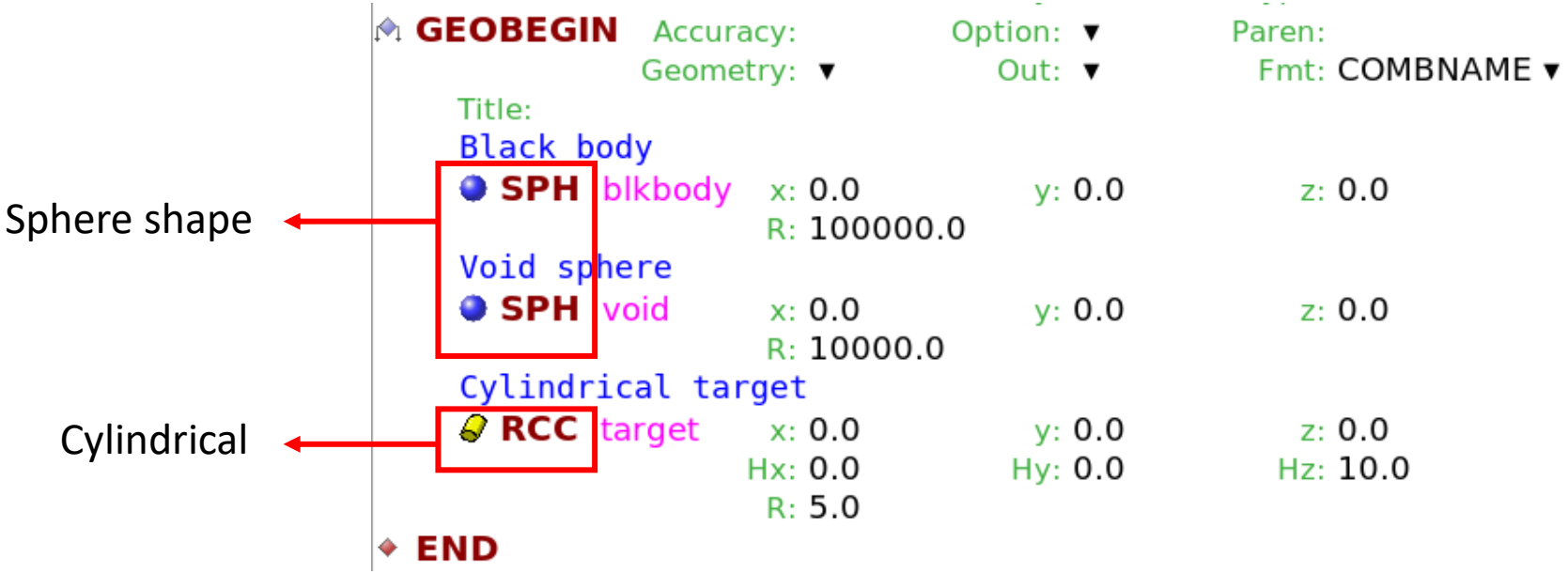
direction of the beam (Positive ↑, Negative↓)

```
*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....
BEAM          -1E-06                                                NEUTRON
```

```
*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....
BEAMPOS              0.        0.       20.                          NEGATIVE
```

* If we use source.f, we don't create BEAMPOS card.

Geometry

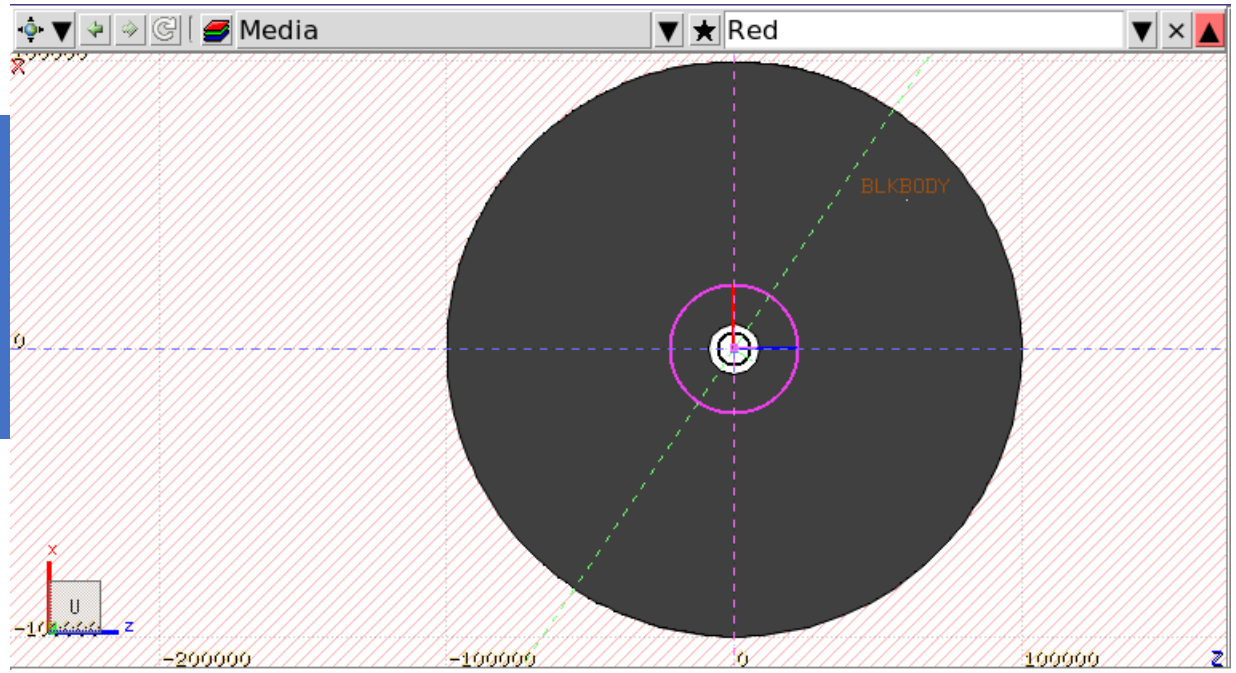


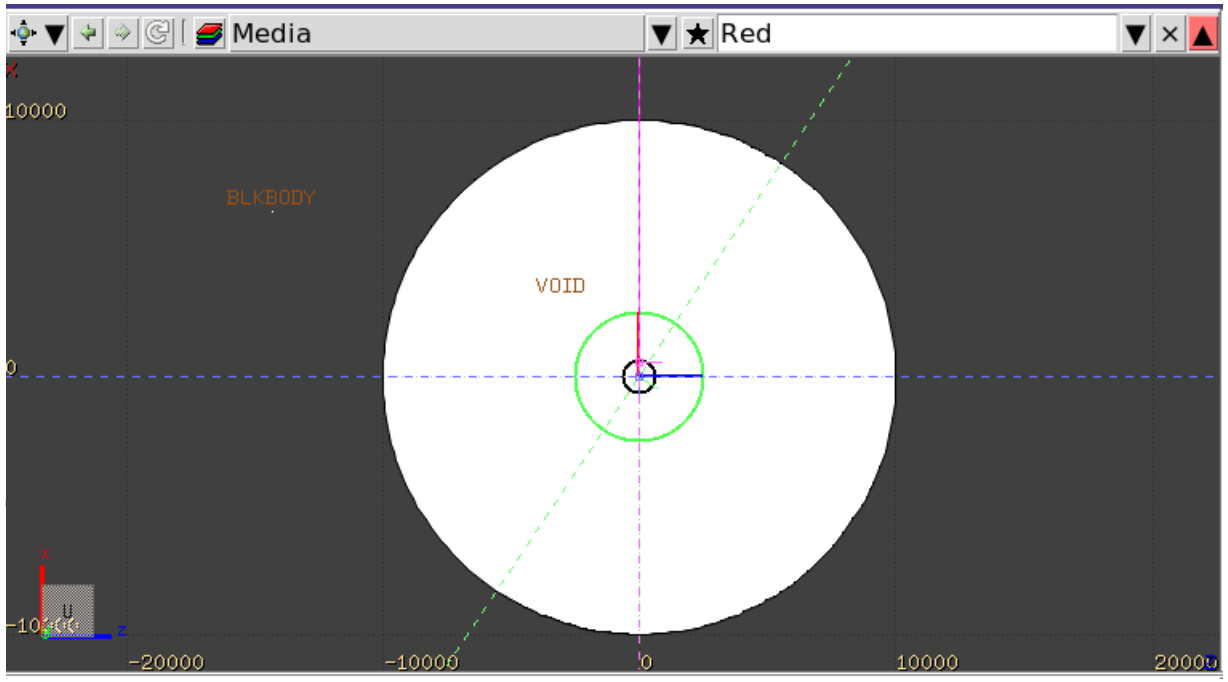

```
*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....
SPH blkbody     0.0 0.0 0.0 100000.0
*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....
RCC target      0.0 0.0 0.0 0.0 0.0 10.0 5.0
```

Region

```
Black hole
 REGION  BLKBODY          Neigh: 5
  expr: +blkbody -void
Void around
 REGION  VOID             Neigh: 5
  expr: +void -target
Target
 REGION  TARGET           Neigh: 5
  expr: +target
END
GEOEND                    : ▼
```

```
*...+....1....+....2....+....3....+....4....+..
BLKBODY       5 +blkbody -void
```





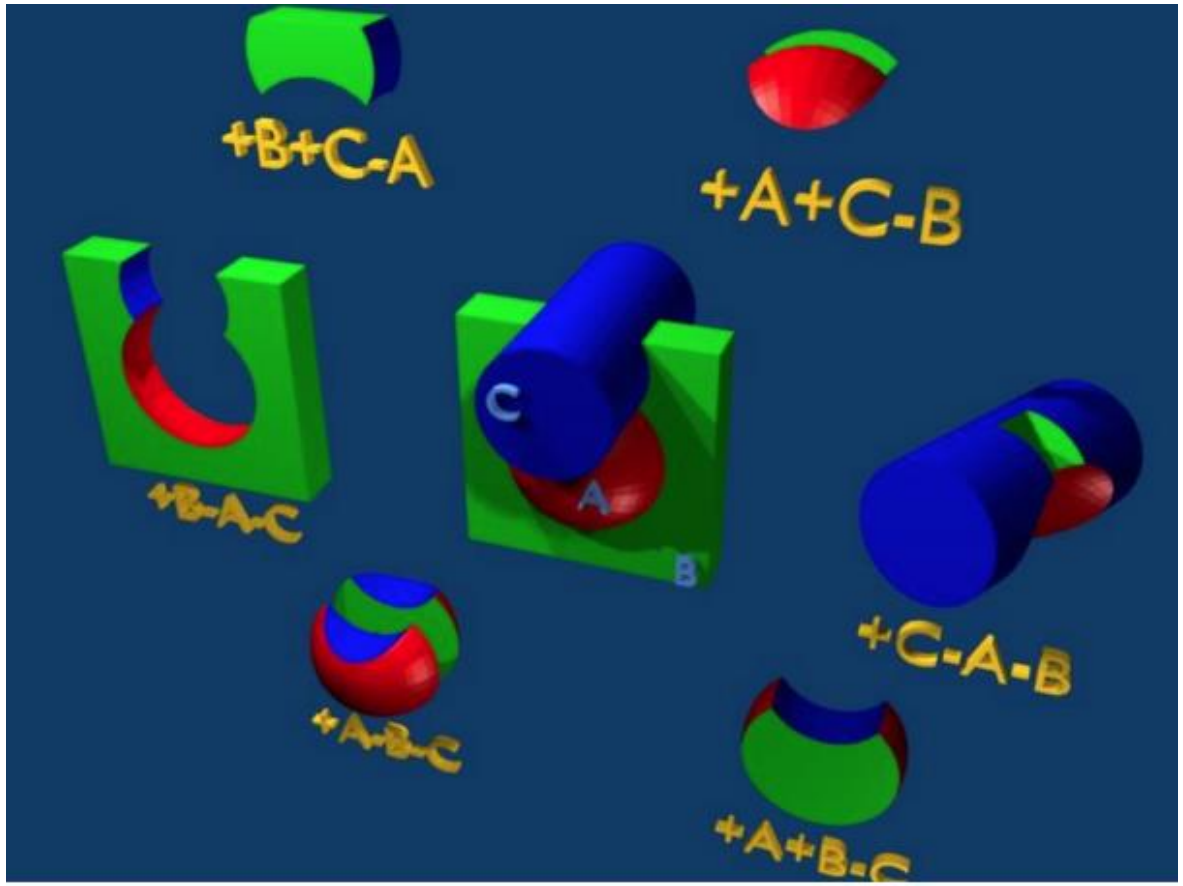
Concept

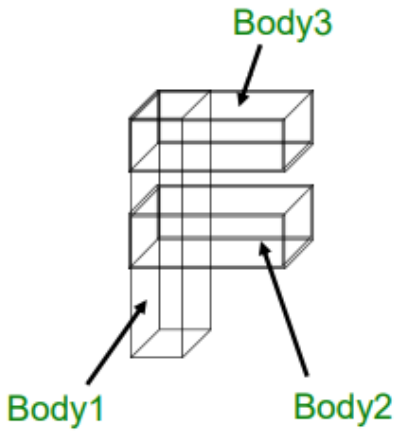
Regions are defined as combinations of bodies obtained by boolean operations:

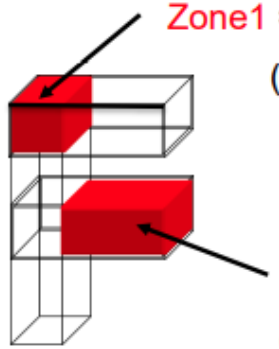
	Union	Subtraction	Intersection
Name based format	|	–	+
Fixed format	OR	–	+
Mathematically	$\cup$	$-$	$\cap$

Regions but must be of homogeneous material composition.

Each point of space must belong to one and only one region!







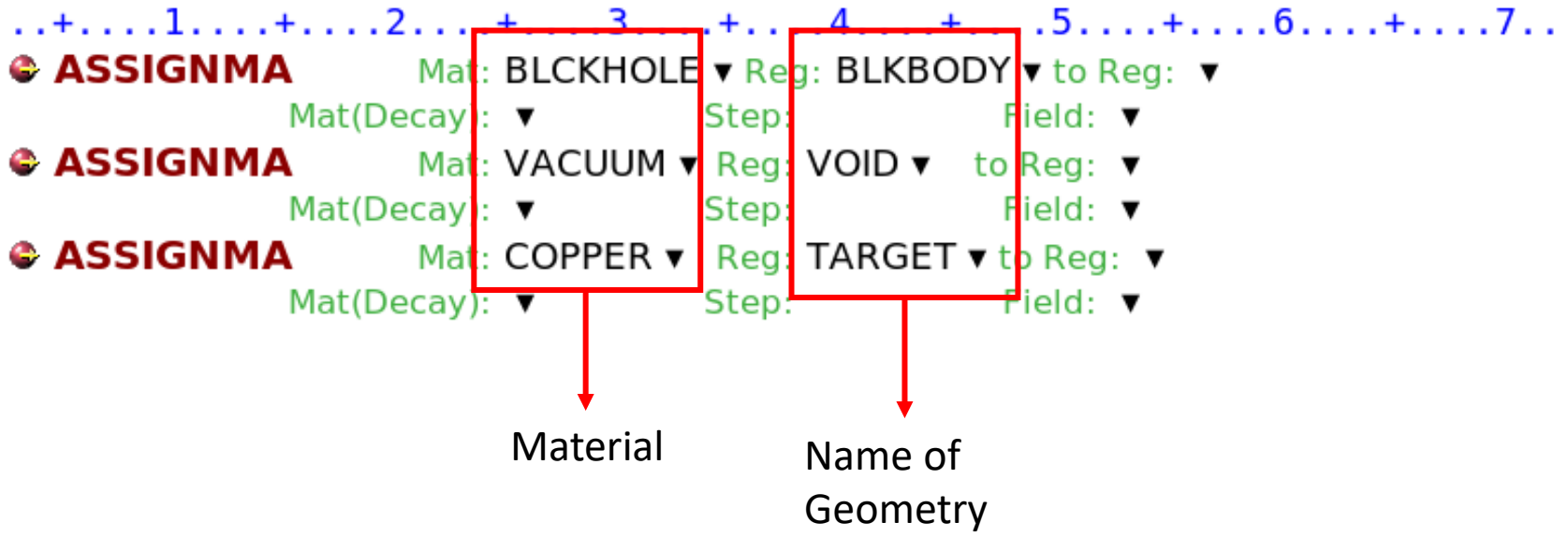
Zone1 = +Body1 +Body3

(Zone1 is the space common to Body1 and Body3)

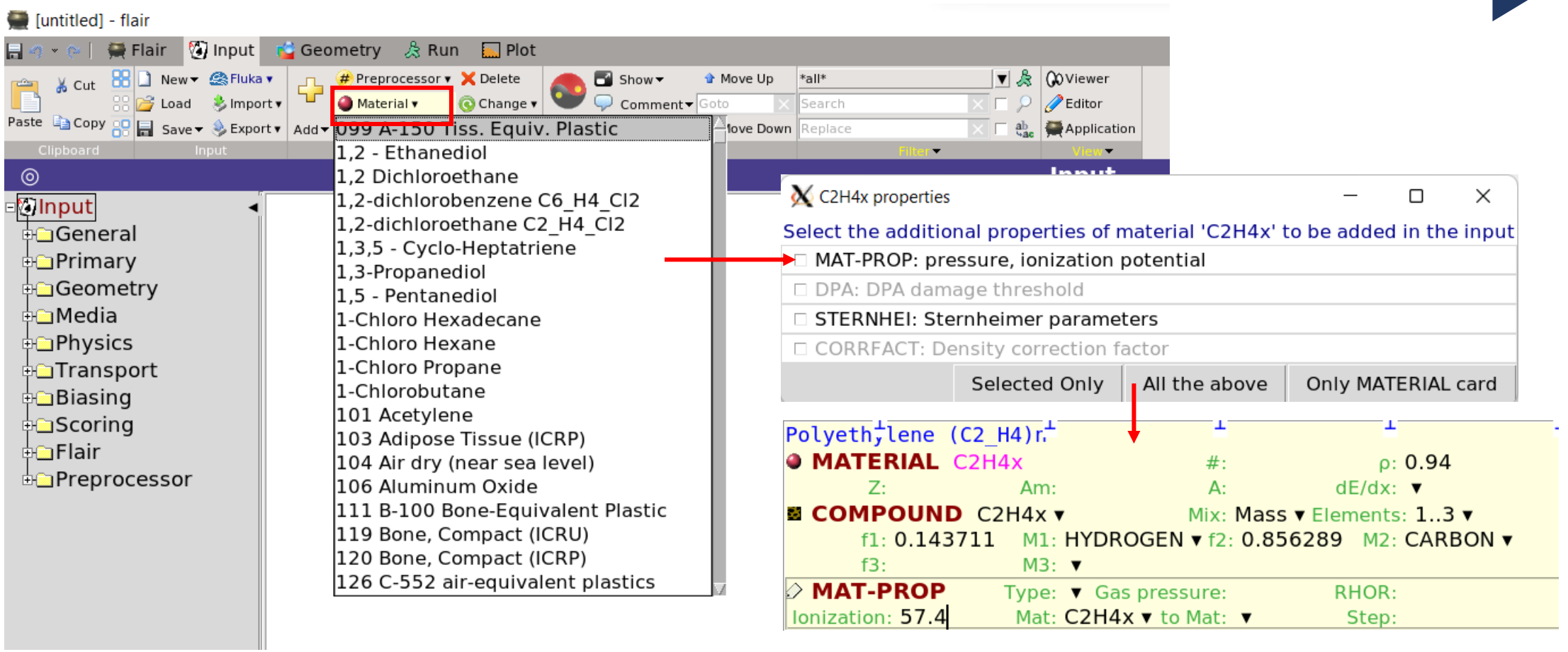
Zone2 = +Body2 –Body1

(Zone2 is the space inside of Body2 but outside of Body1)

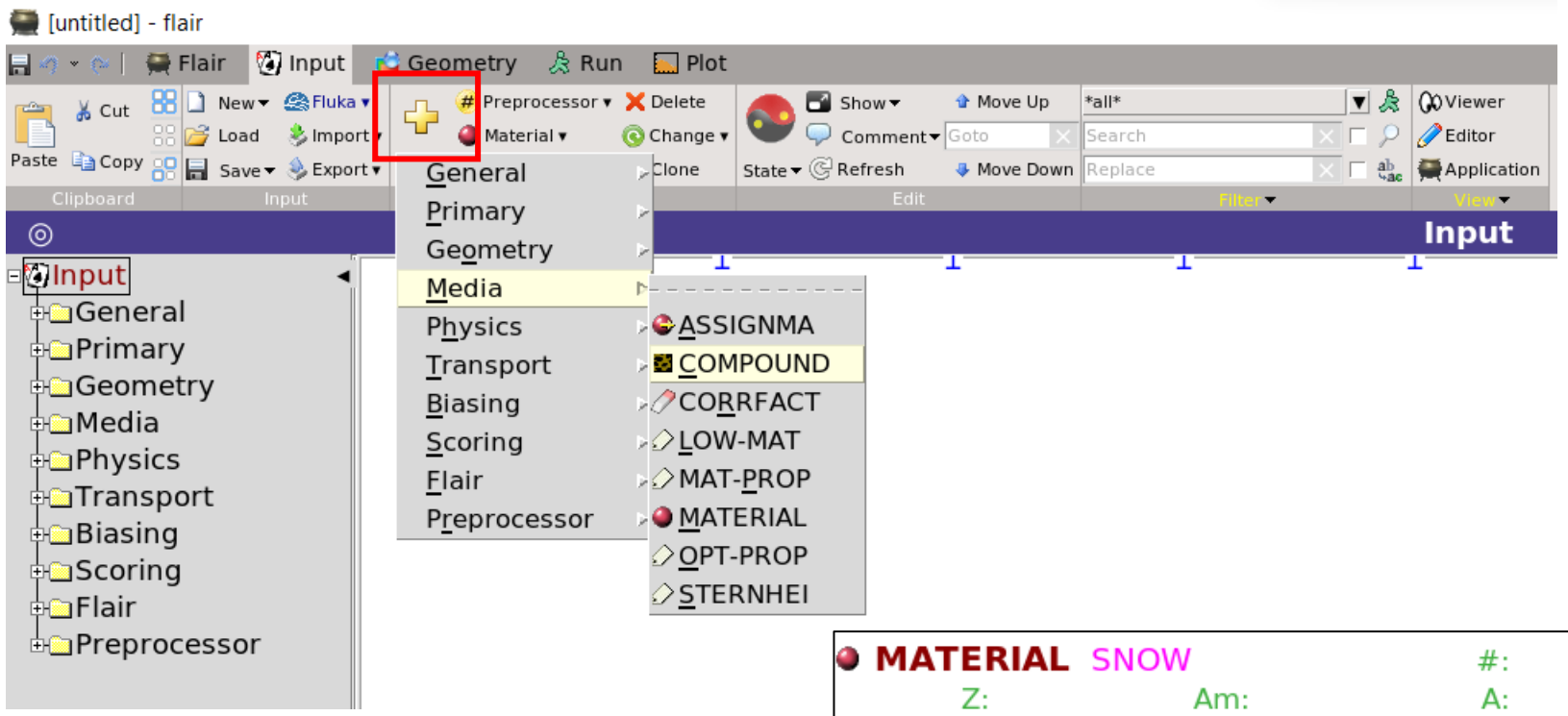
Assign Material



Materials and compound



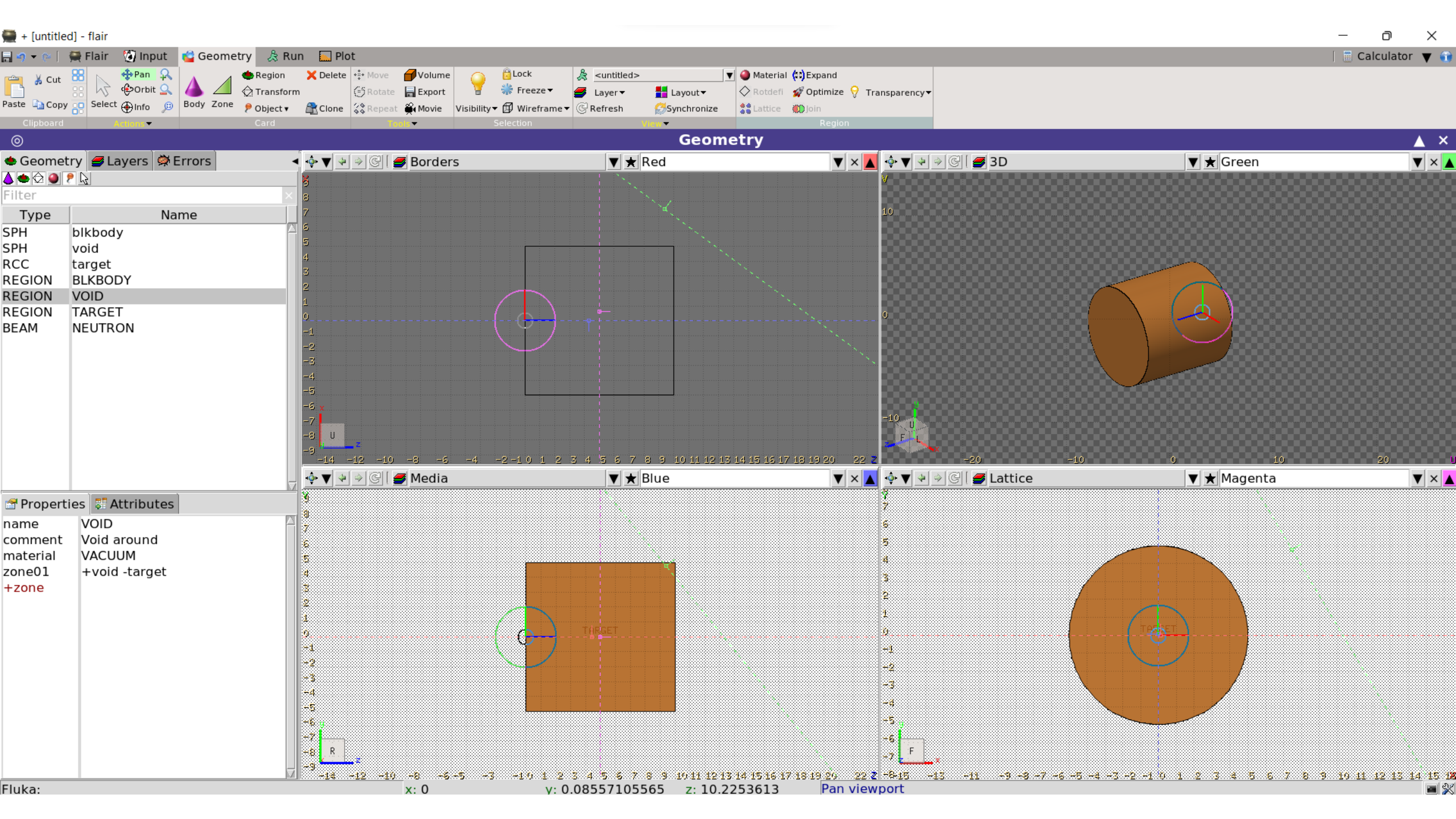
Materials and compound



MATERIAL SNOW #: ρ: 0.37
Z: Am: A: dE/dx: ▾
COMPOUND SNOW ▾ Mix: Atom ▾ Elements: 1..3 ▾
f1: 2.0 M1: HYDROGEN ▾ f2: 1.0 M2: OXYGEN ▾
f3: M3: ▾

Scoring

```
Set the random number seed
RANDOMIZ      Unit: 01 ▾      Seed:
Set the number of primary histories to be simulated in the run
START           No.:          Core: ▾
                Time:         Report: default ▾
STOP
```


+ [untitled] - flair
Flair
Input
Geometry
Run
Plot
Calculator
Paste
Cut
Copy
Select
Pan
Orbit
Info
Body
Zone
Region
Transform
Object
Delete
Clone
Move
Rotate
Repeat
Volume
Export
Movie
Visibility
Lock
Freeze
Wireframe
<untitled>
Layer
Refresh
Layout
Synchronize
Material
Rotdefi
Lattice
Expand
Optimize
Join
Transparency
Clipboard
Actions
Card
Tools
Selection
View
Region
Geometry
Layers
Errors
Filter
Type
Name
SPH blkbody
SPH void
RCC target
REGION BLKBODY
REGION VOID
REGION TARGET
BEAM NEUTRON
Properties
Attributes
name VOID
comment Void around
material VACUUM
zone01 +void -target
+zone
Borders
Red
3D
Green
Media
Blue
Lattice
Magenta
TARGET
Fluka:
x: 0
y: 0.08557105565
z: 10.2253613
Pan viewport

How to run FLUKA?

Running FLUKA in server

Materials are used → .inp files, mgdraw.f and source.f

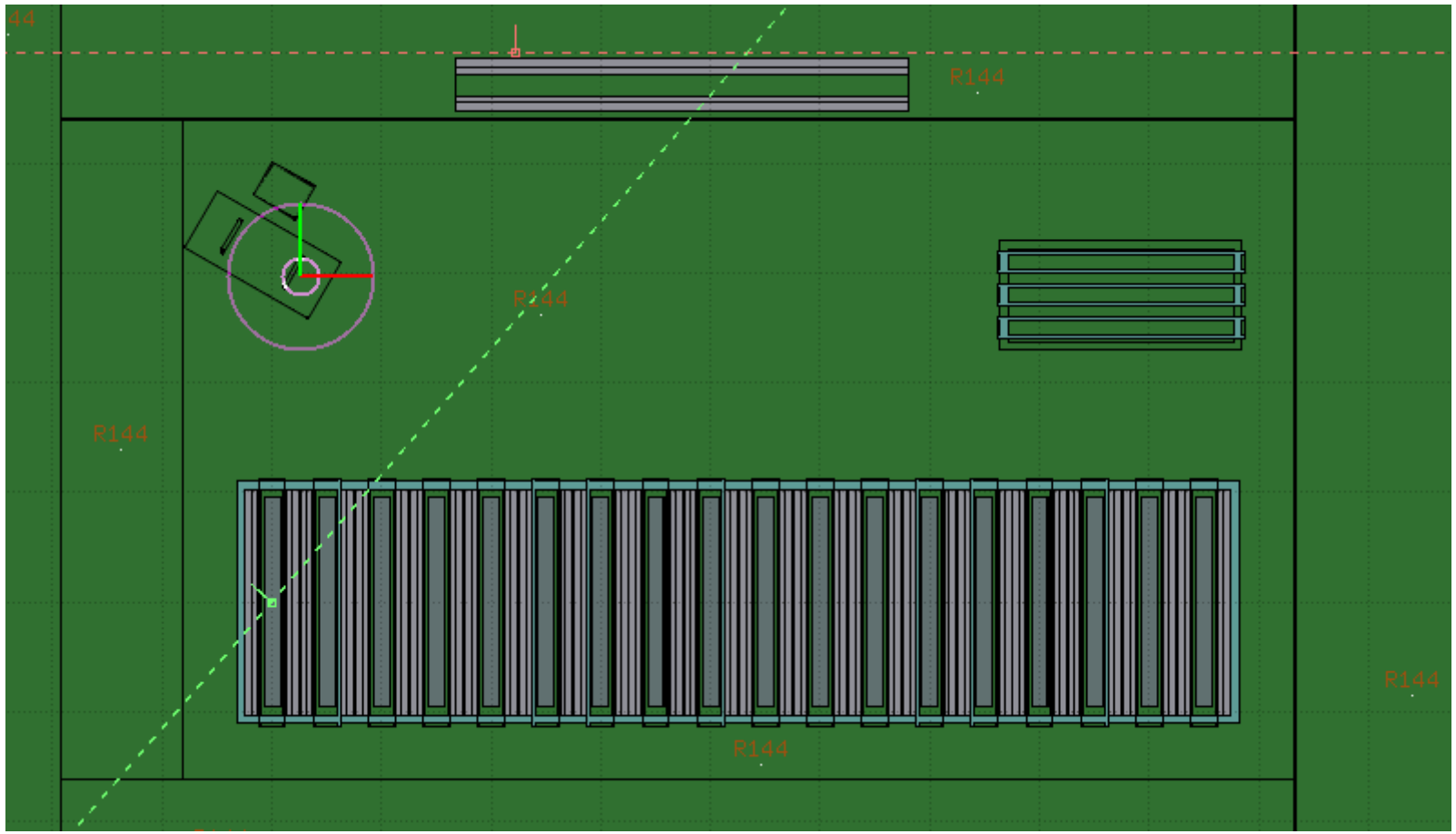
Create executable file by using **$ lfluka –m fluka –o {executable file name} mgdraw.f source.f**

Run by using **$ rfluka –N{start cycle} –M{end cycle} –e {executable file name} {.inp file}**

Or using nohup **$ nohup rfluka –N{start cycle} –M{end cycle} –e {executable file name} {.inp file} &**

We will get *_counts files

Thank you for your attention


44
R144
R144
R144
R144
R144