

Improvements to the Simulation of the NuMI Beam Line

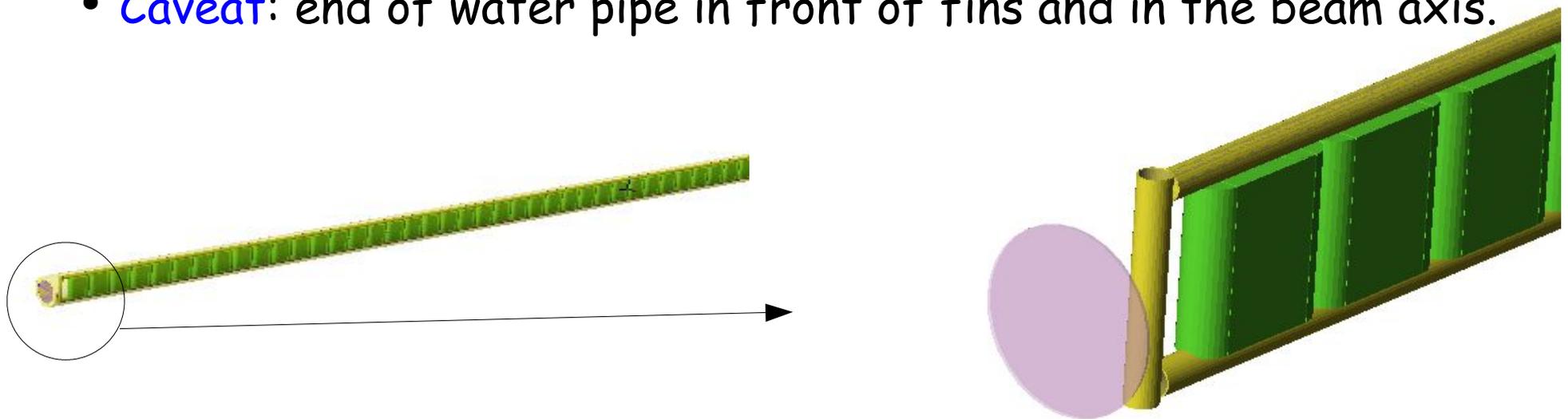
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- Hadron production
 - New FLUKA simulation of the target
- GEANT4 Simulation
 - Target hall geometry
 - Additional code: configurable geometry.

Fluka Simulation of the NuMI Target

- Current version written by Bob Zwaska and run with Fluka version 2001:
 - Reduced version of the water cooling pipes.
 - Simplified Al canister filled with vacuum.
 - Total number of graphite segments is 47.
 - Upstream and downstream Beryllium windows.
 - **Caveat**: end of water pipe in front of fins and in the beam axis.



Fluka Simulation of the NuMi Target (II)

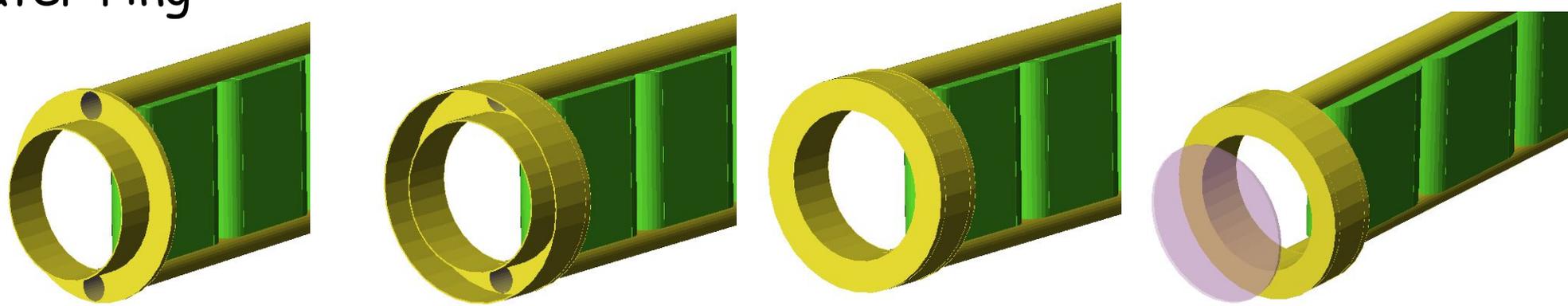
- New version:

- Input card and subroutine modified to run with FLUKA 2003.1b (note: new FLUKA version 2005.6 just released with the source code available for close friends)
- 48th horizontal graphite fin is now included.
- Downstream water pipe replaced by a water ring pipe.

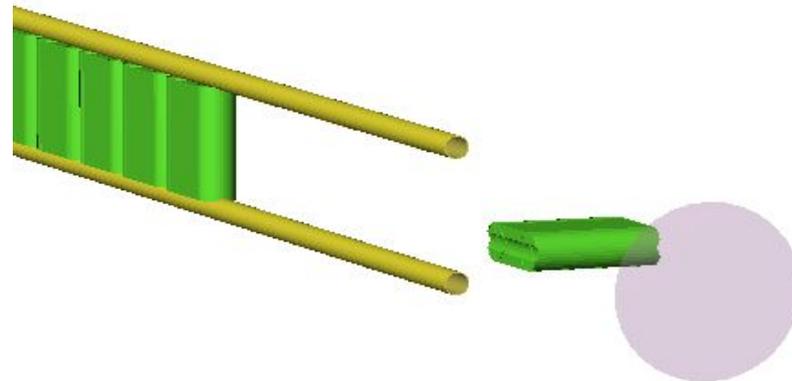


Details of the new FLUKA geometry of the target

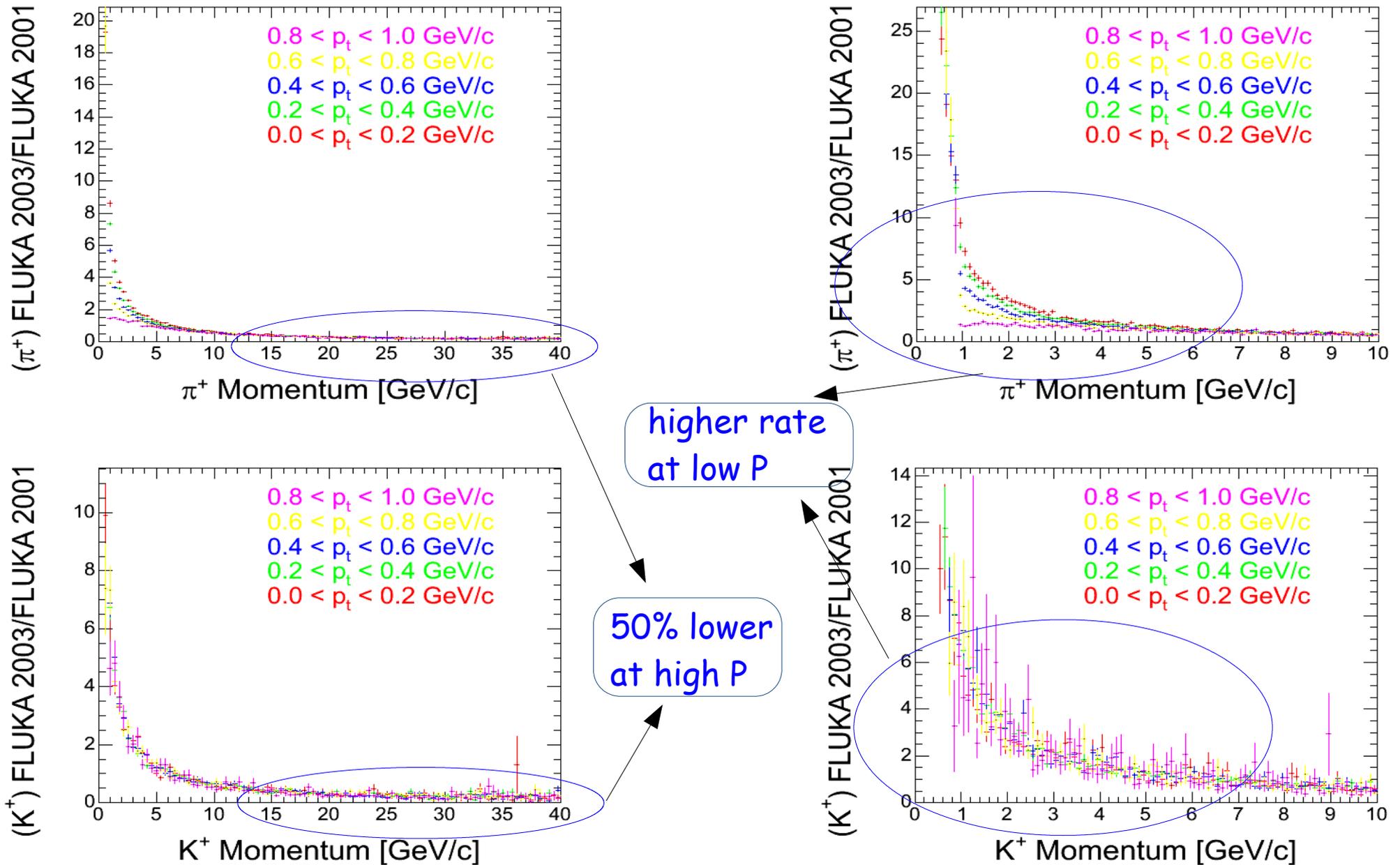
Water ring



Horizontal segment



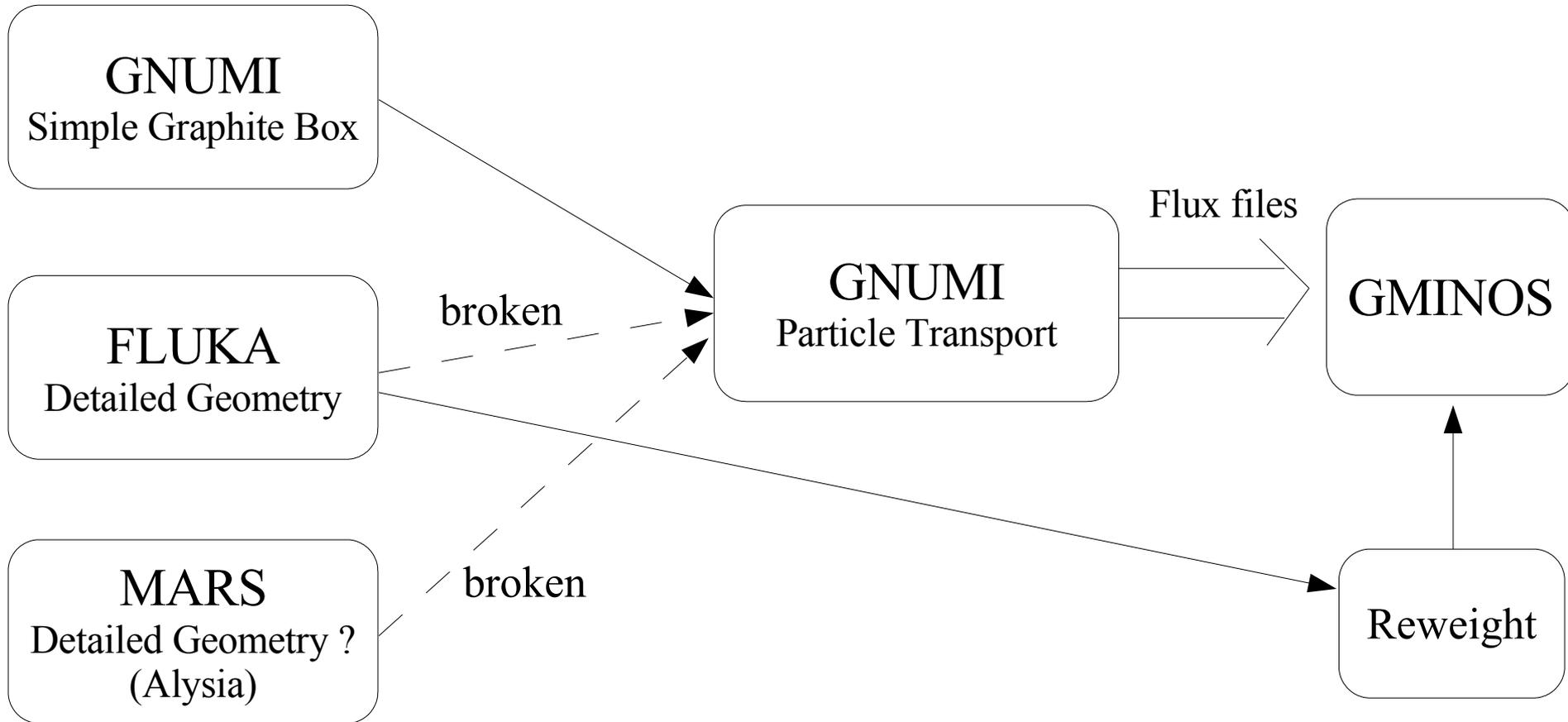
Differences between FLUKA 2003 and 2001 models



Input of Particle Distributions for GNUMI (GEANT3)

Target Geometry

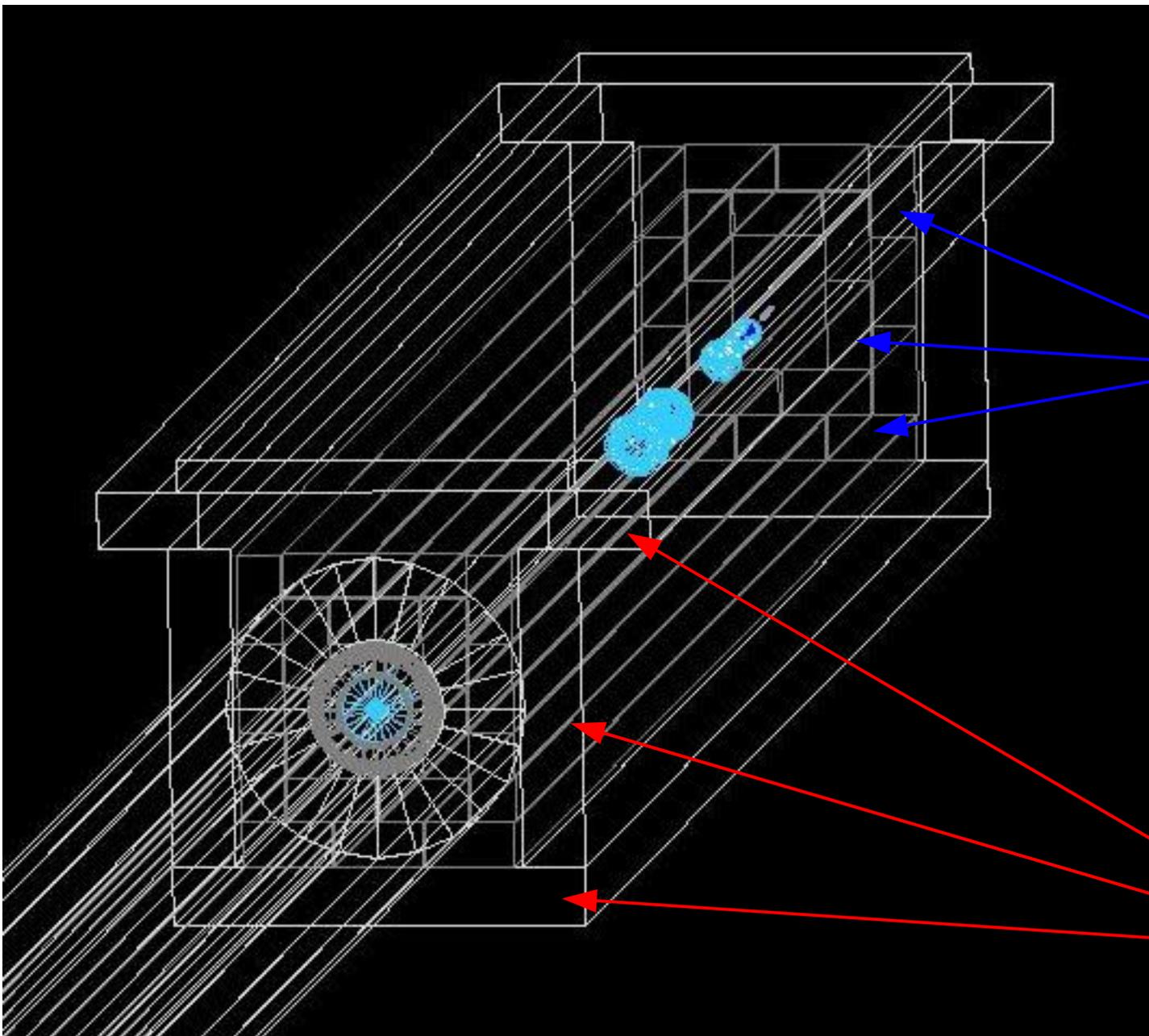
Horns, decay pipe, absorbers, etc.



Currently, Hyejoo and Tingjun working on restoring the file input functionality
New FLUKA geometry will be part of flux files V18.

- Additional code to modify interactive the geometry without the need of recompilation. Currently only these parameters are available for changes:
 - Target and Baffle position.
 - Horns current.
 - More parameters coming soon: Horn positions, etc.
- Our summer student, Zach Barnett, wrote a detailed geometry of the target hall:
 - Concrete chase.
 - Duratek blocks (extended along the target hall).

G4NUMI: Target Hall



Blue Duratek Blocks

Concrete chase

FLUKA Input files for GNUMI (Short-term for V18 flux files):

- Do we want to include more geometrical details? like the Baffle, Helium rather than vacuum, realistic target can?
- Study vertical and horizontal rotations of the target with respect to its center.

G4NUMI Simulation (Long-term):

- Clean code, remove memory leaks.
- Working on linking G4NUMI geometry with FLUKA:
 - Using FLUGG (a C++/Fortran wrapper for GEANT4 geometry)
 - Have to rip the guts of G4NUMI and use FLUKA as particle transport.