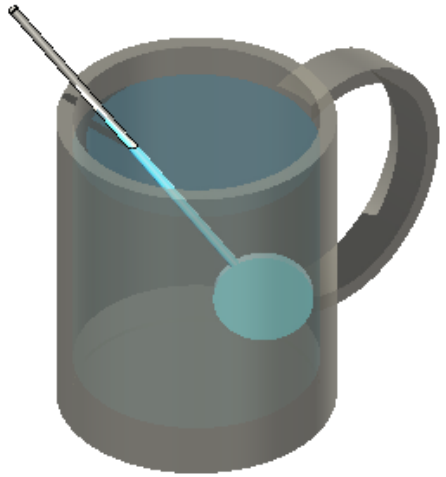
Standard output and errors exercise

Part 1: Common errors

- **Goal:** Identify common errors arising at every stage of a simulation.
  - Logic error in the input.
  - Initialization error
  - Interpretation of results
- Start with the provided input: **`Ex_common_errors.flair`**
  1. Identify errors flagged by Flair and fix them.
  2. Try to run and fix errors with the help of the output files.
  3. You should obtain meaningful results after fixing all errors!
- **Tips:**
  - There are exactly **6** problematic cards.
  - Is the structure of the input correct?
  - Are all necessary cards present?
  - Did you score something meaningful?

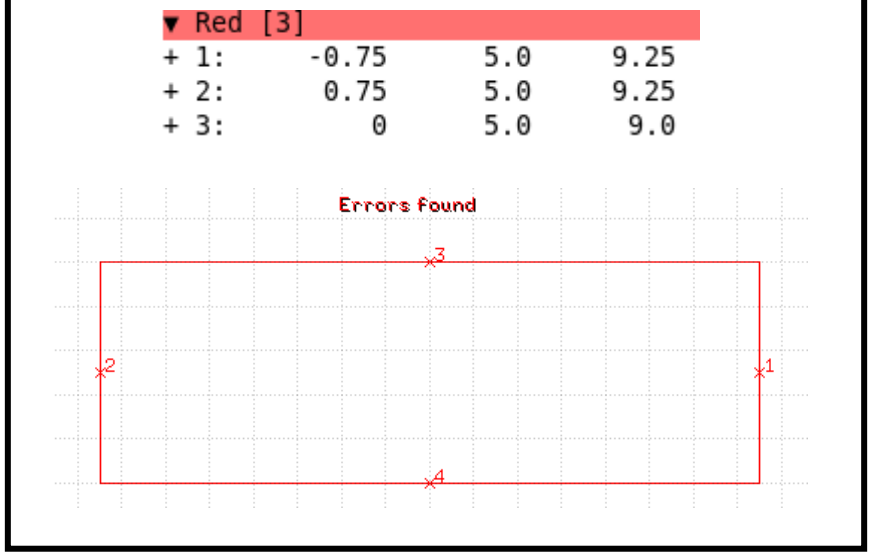


Simulation geometry

Part 2: Geometry errors

- **Goal:** Identify and fix geometry errors using Flair.
- Fundamental principle of a FLUKA geometry:
  - **All points of the geometry** (inside the black hole) **must belong to one, and only one, region!**
- Zone that belong to the same region can overlap.
- Flair only identify errors seen in viewports.
  - You may have to scan your geometry to find errors!
- Errors from undefined geometry are identified at runtime when a track enters a problematic region.
  - For complex geometries, the run time before crash may vary for each seed!
- Overlapping regions do not result in an error!

Error seen in the geometry editor



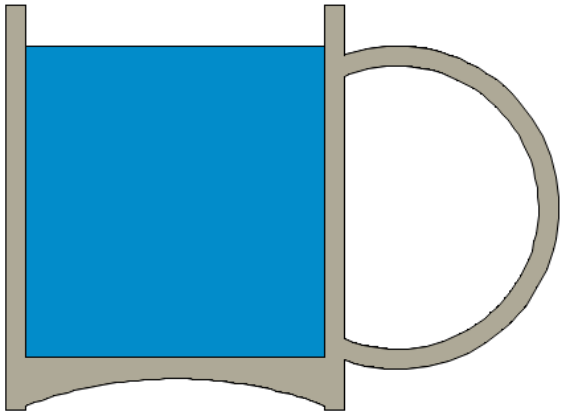
Error seen in .err file

```
Geofar: Particle in region     3 (cell #    0)
 in position  -7.430494027E-01  1.038108079E+00 -2.069882640E+00
 is now causing trouble, requesting a step of  3.412037681E+00 cm
 to direction  6.942274176E-01 -7.167656111E-01  6.553893047E-02
 end position  1.625680705E+00 -1.407523195E+00 -1.846261340E+00
 R2:  1.276632601E+00 R3:  2.431913843E+00 cm  error count:  0
 X*U   (2D): -1.259925439E+00 X*U   (3D): -1.395583334E+00 cm
 X*UOLD(2D): -4.302917469E-01 X*UOLD(3D): -8.337062315E-01 cm
 Kloop:         39, Irsave:      3, Irsav2:      3, error code: -3
 old direction -5.528191137E-01 -8.101889163E-01  1.948972743E-01,
 Particle index    7 total energy   2.727909804E-04 GeV  Nsurf
Try again to establish the current region  moving the particle of
We succeeded in saving the particle:  current region is n.     3 (
```

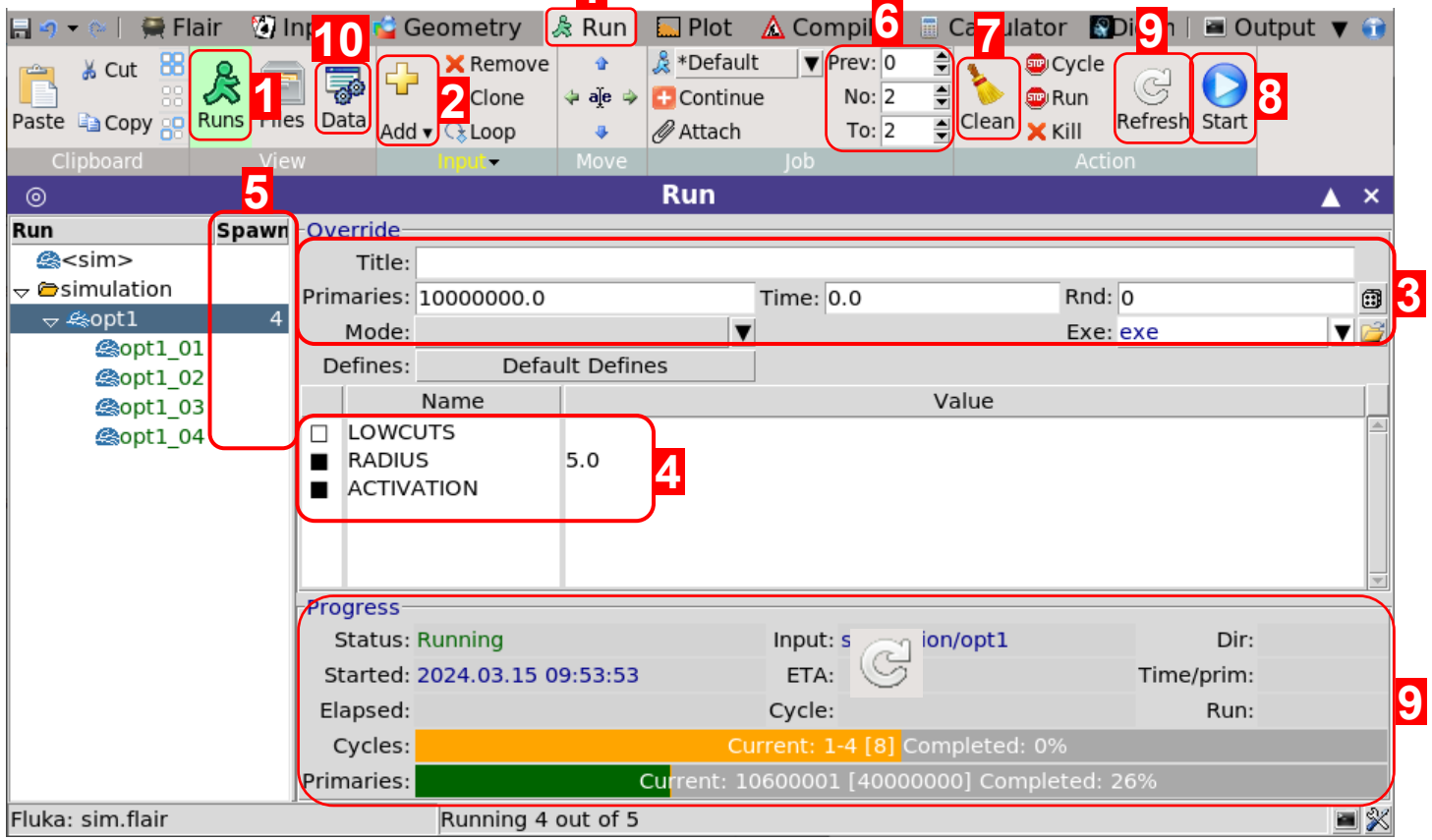
Part 2: Geometry errors

1. Open **`Ex_geo_error.flair`**
2. Run for 1’000 primaries.
3. Identify the cause of the error in the .err and .out files.
4. Find the problematic zones using the geometry editor.
    1. **Tip:** There are exactly two errors. You must move the viewports to find them.
5. Fix the geometry errors. Make sure they are cleared from the error tab.
6. Run again. Did the simulation end successfully?

Target geometry



Flair Cheat Sheet



Remember!

- You can **STOP** or **KILL** the run.
- You can edit your input while the simulation runs.

!!! WARNING !!!

- Mind the memory and CPU usage of your simulations!

1. Go to the ***Run* tab**, select ***Runs* view**.
2. Add **new folder** + Add **new run**.
3. Override the input run info:
   - **Number of primaries**
   - Title / Max. time per cycle / Seed / Exec.
4. Override/Define variables.
5. **Recommended:** Increase number of spawns
6. Set number of cycles per spawn
   - Recommend at least 5 cycles in total.
   - `num_cycles_tot = num_cycles_per_spawn * num_spawns`
7. ***Clean*** run files after change to input or run settings.
8. Click ***Start*** to launch the simulations.
9. Monitor the progress. Click ***Refresh*** to force update.
10. After all cycles end:
    - Go to the ***Data*** ( ) tab.
    - Click ***Process*** ( ) to combine all cycles and create simulation data files.
    - You may need to refresh ( ) and scan ( ) if detectors are missing.




FLUKA