**ASCOT options parameters**

A sample set of ASCOT options is described in file [sample\_ascot\_input\_file.docx](file:///C:\Users\sscott\Documents\ripple\ASCOT_handover\sample_ascot_input_file.docx). It is partially self-documenting. There are several groups of options parameters:

1. **Simulation mode** (i.e. full Gyro-orbit versus guiding center)
2. Control of **time step** for integration
3. **End conditions**: when to declare that an orbit has been completed, e.g. it hit a wall, it crossed the LCFS, it thermalized, it exceeded some simulation time or CPU time limit, etc.
4. **Physics**: e.g. options to turn off Coulomb collisions
5. **Distributions**: control over the grid resolution for storing the computed alpha distribution function in phase space.
6. **Orbit recording**: control over whether to store the computed orbit, e.g. number of points to store and time step between times when the orbit parameters are store. If you ask to store N points but the orbit history contains more than N points, only the last N points in the orbit’s history will be stored.

You need to think carefully about the specification of orbit recording. First, if you ask to store too many time points (and/or ask for too many markers), the computer will run out of memory and you will get the dreaded segmentation fault. Second, you probably need to decide whether you want to store the entire orbit time history (e.g. from birth to thermalization) with coarse time resolution, or the just end of the orbit with fine time resolution.

The alpha velocity at birth is about 1.e3-7 meters, so if you ask for a recording time step of 3.e-9 sec you will get abou 4 cm between recording times. The circumference of the outside of SPARC is about 15 meters, so if q=4, I think you would need to follow the orbit for about 60 meters to get one poloidal orbit, which would require storing about 1500 time points if you ask for a time resolution of 3.e-9 sec.

The full thermalization time for alphas born at the plasma center is about 0.20 sec (there is IMHO a surprising variability in the thermalization time, even for alphas born at the same radius). So if you want to store the full orbit time history and you have determined that you have memory to store only 2000 time points, then you would need to specify a recording time interval of 0.2/2000 = 10-4 sec.

1. **Transport coefficients**: I have not used these options.

A high-level description of some of the most important options parameters is provided in file [preparing\_ascot\_input.docx](file:///C:\Users\sscott\Documents\ripple\ASCOT_handover\preparing_ascot_input.docx).