Model Construction

Start the CST EM STUDIO module without a project template and choose the M-Static solver (Fig. 9) on the “Home” ribbon.

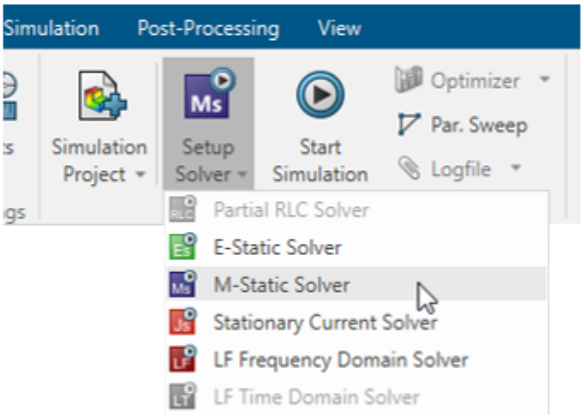

Figure 9: The location of the M-Static Solver on the Home ribbon.

Enter the parameters into the parameter list, as shown in Table. 1.

Parameter	Value	Description
a	5 m	Coil radius
d	a/2 (2.5 m)	Distance of coil from midpoint
I	1 A	Current around each coil

Table 1: Parameter list of the two charged spheres

On the “Modeling” ribbon, define the first loop as a circle with radius “a” centered around the origin, and then use the transform tool to move this circle by a distance of “-d” in the Z direction. Repeat this to create second loop, and move this circle by “d” in the Z direction (Fig. 10). Moving to the “Simulation” ribbon, convert these into current paths, each with current “I” (Fig. 11).

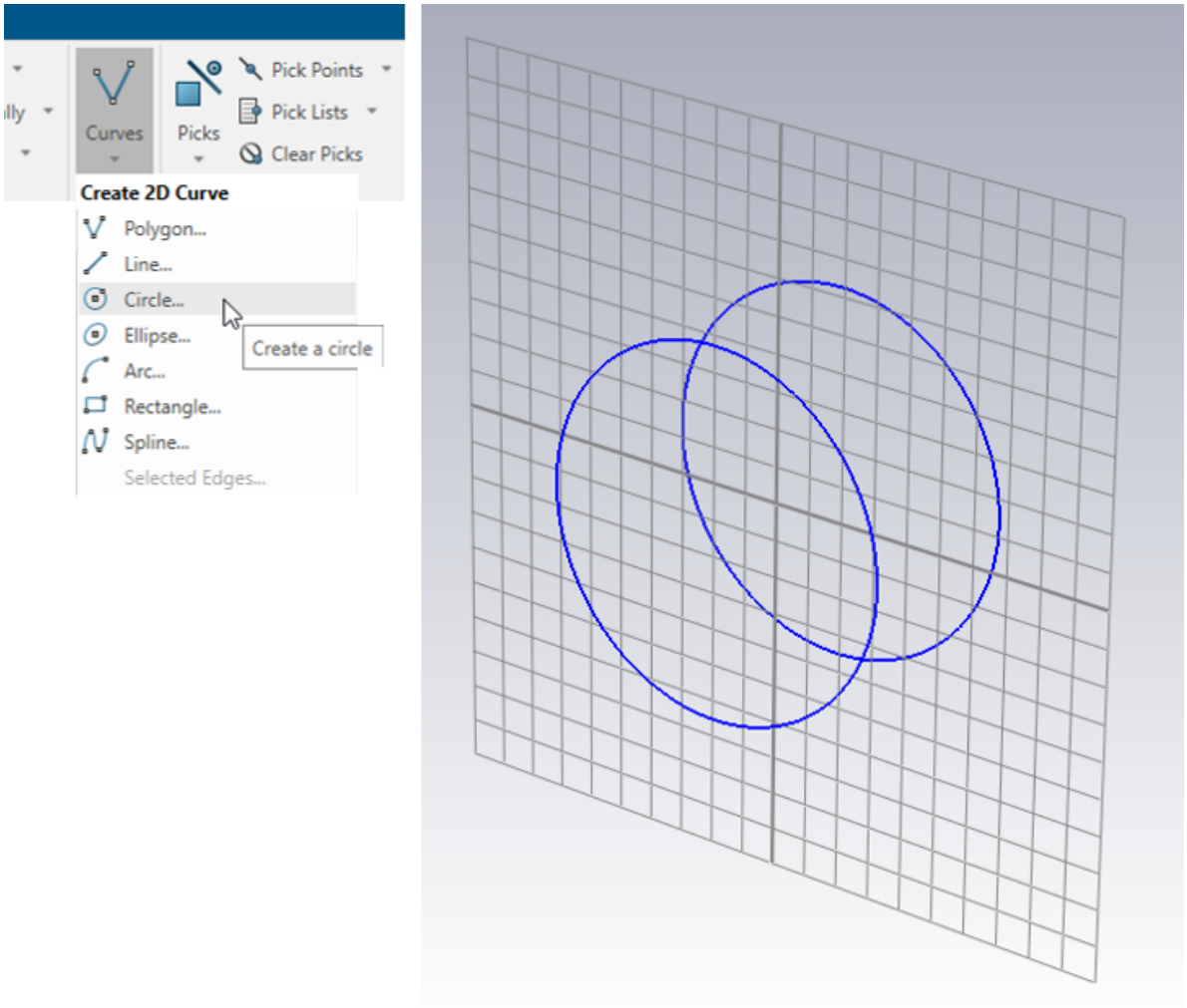

Figure 10: Circle definition, showing the two completed loops (right).

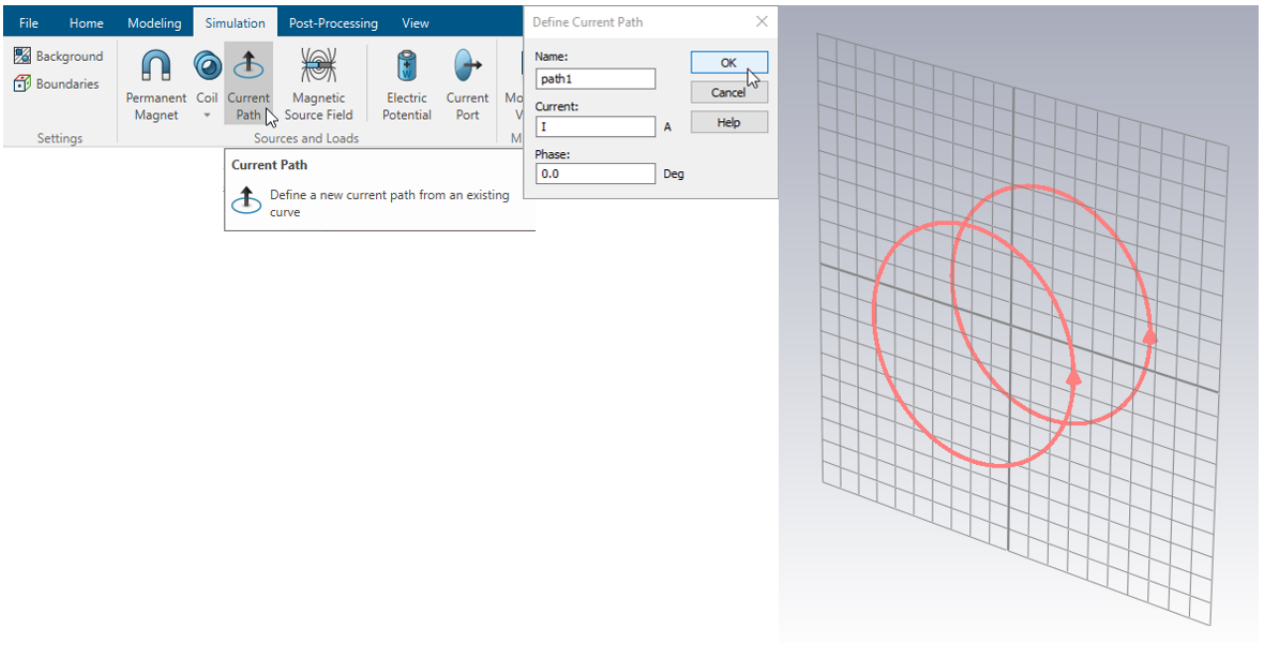

Figure 11: Current path definition, showing the two current paths with the current in the same direction.

Returning to the “Modeling” ribbon, activate the Working Coordinate System (WCS) and align it with the XZ plane (Fig. 12). Define a line running along the Z axis (which in the WCS corresponds to the U axis) from “-2*d” to “2*d” (Fig. 13). This will be used for post processing.

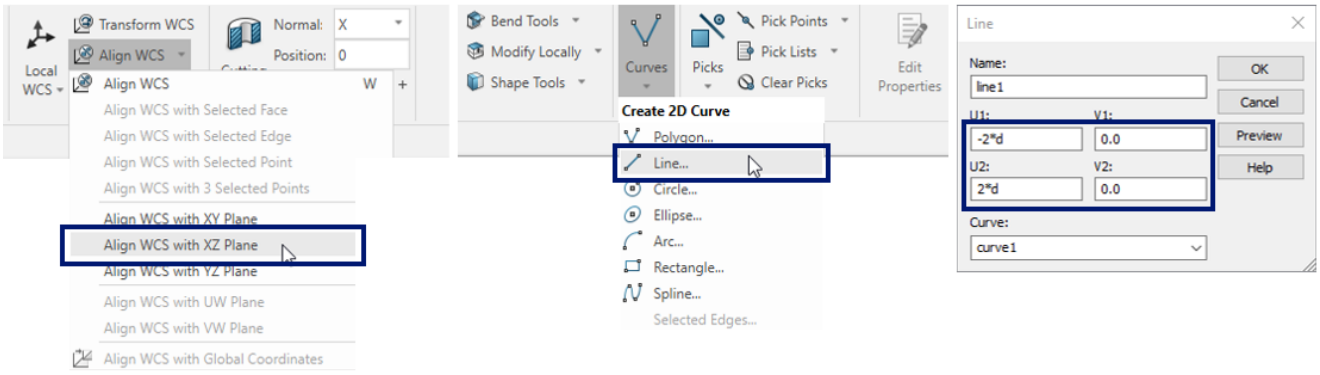

Figure 12: WCS activation and alignment.

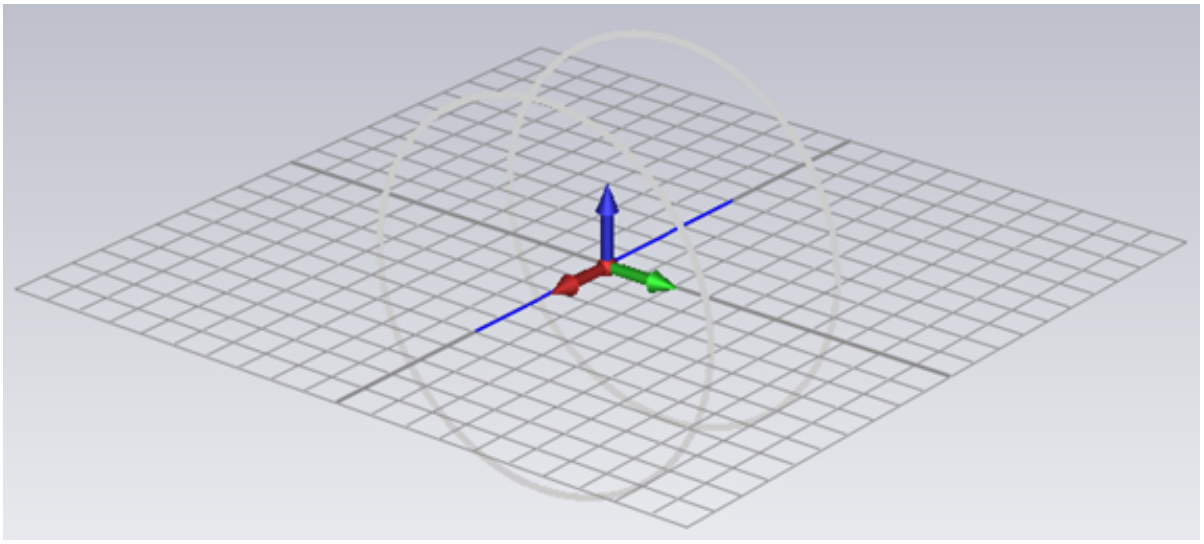

Figure 13: Definition of the line along the Z axis for field post processing.

Deactivate the WCS and define additional structures to refine the mesh. Define a torus around each circle, with large radius “a+a/10” and small radius “a-a/10”, made of vacuum. One torus is centered at “-d”, and the other at “d”. Define a cylinder around the Z axis, with an outer radius of “a/10” running from “-2*d” to “2*d” (Fig. 15).

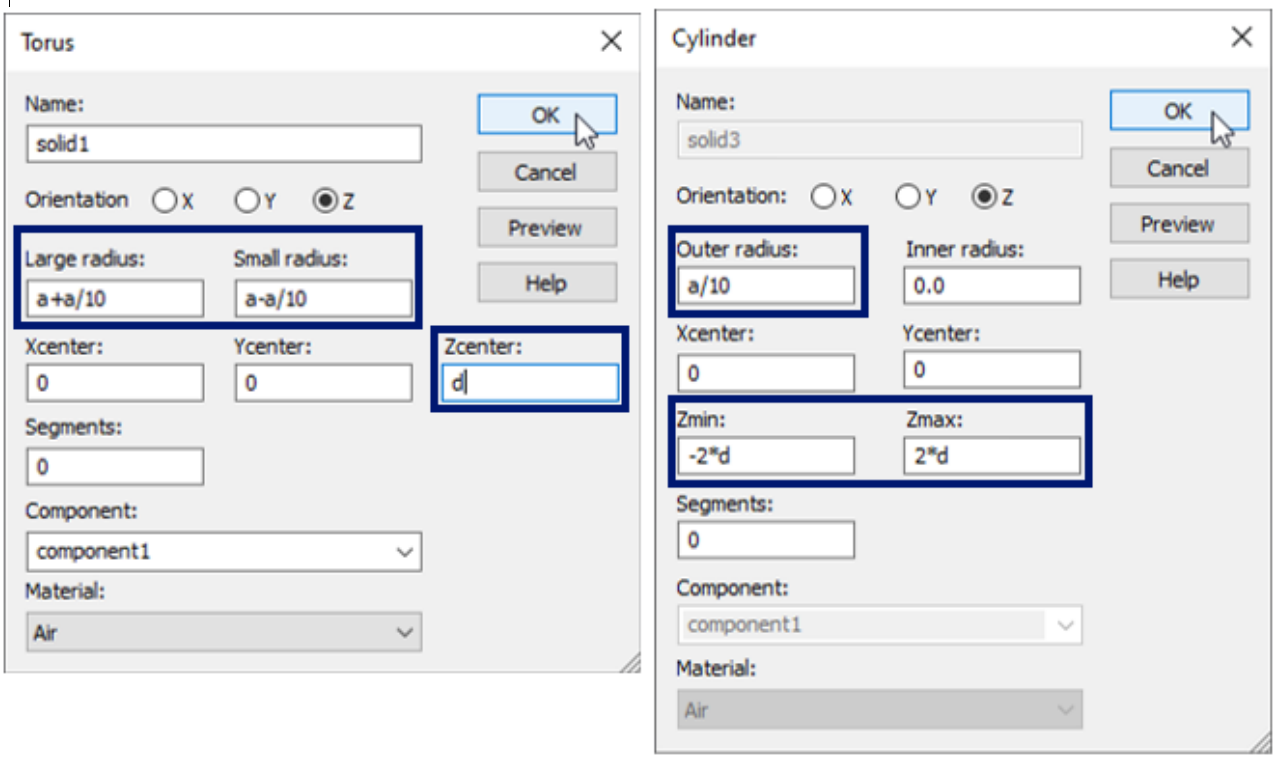

Figure 14: Air components for Mesh refinement.

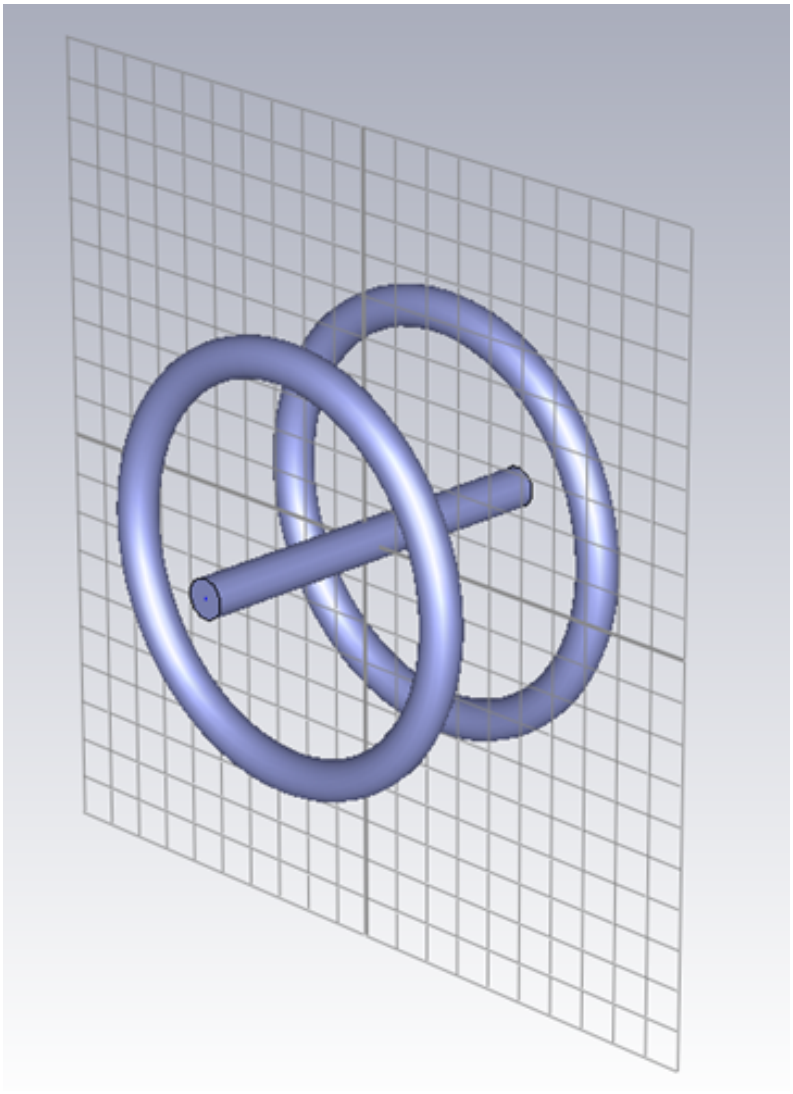

Figure 15: Dummy object definition.

The background properties specify “Normal” material with 10 meters of space in all direction. The boundaries should be open in all directions, and the symmetries should be defined as shown in Fig. 16, with electric symmetry in the YZ and XZ planes and magnetic symmetry in the XY plane.

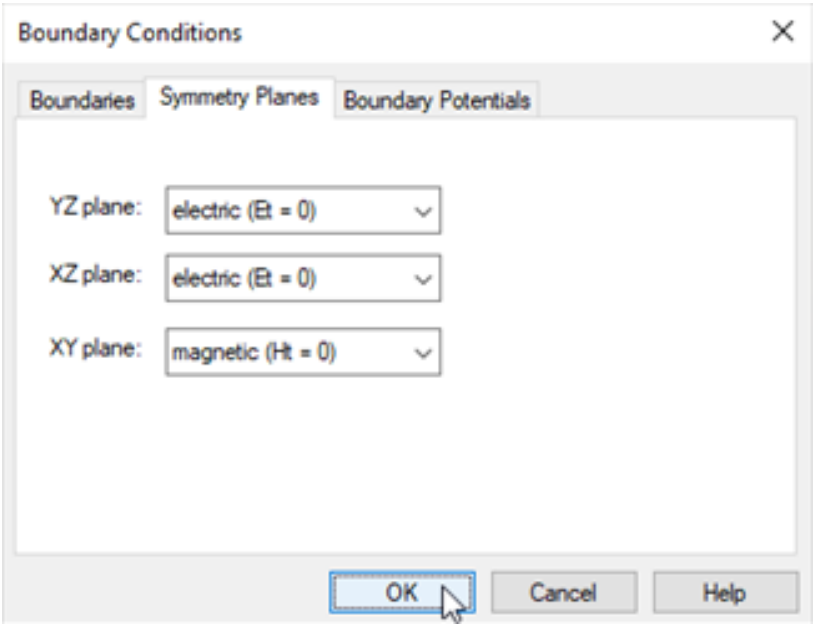

Figure 16: Symmetry plane settings.

Define Mesh Properties, and set "Cells per max model box edge" to 20 within the model and 6 in the background as shown in Fig. 16. In the Special Mesh Properties, set "Smooth mesh with equilibrate ratio" to 2 to reduce the amount of Mesh Cells.

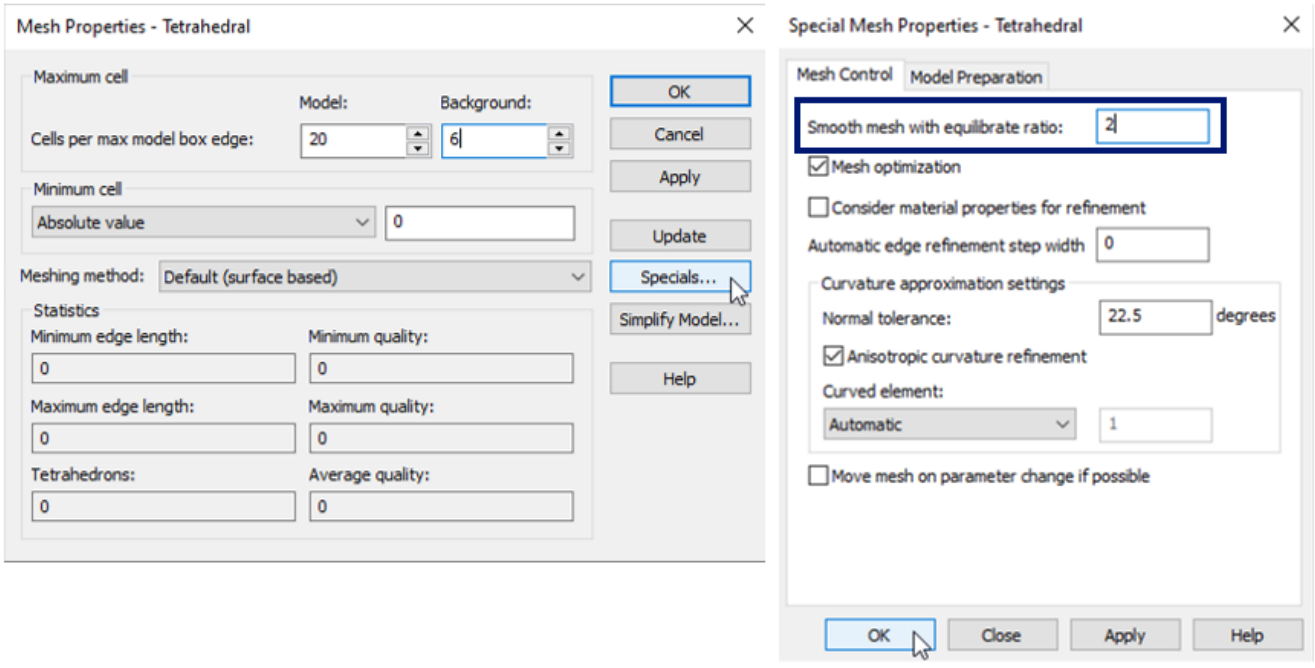

Figure 17: Mesh Properties dialog.

The model is now ready to be simulated with the magnetostatic solver. To avoid exceeding the mesh limit in the Student Edition, deactivate “Adaptive mesh refinement” in the “Setup Solver” dialog before running the solver. After simulation, the post processing results will appear in the Navigation Tree under “Tables”.