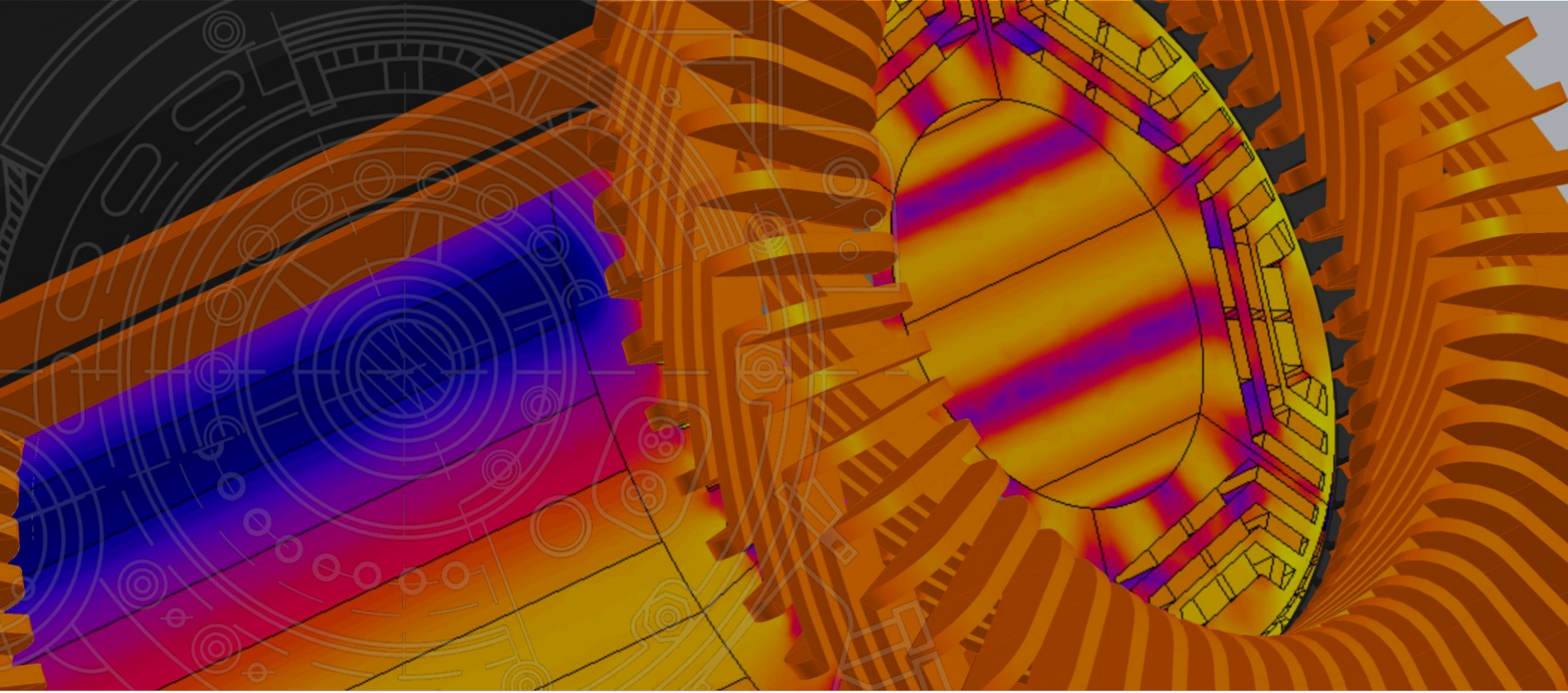


ALTAIR

CLAW POLE MOTOR

Flux 3D : project step by step

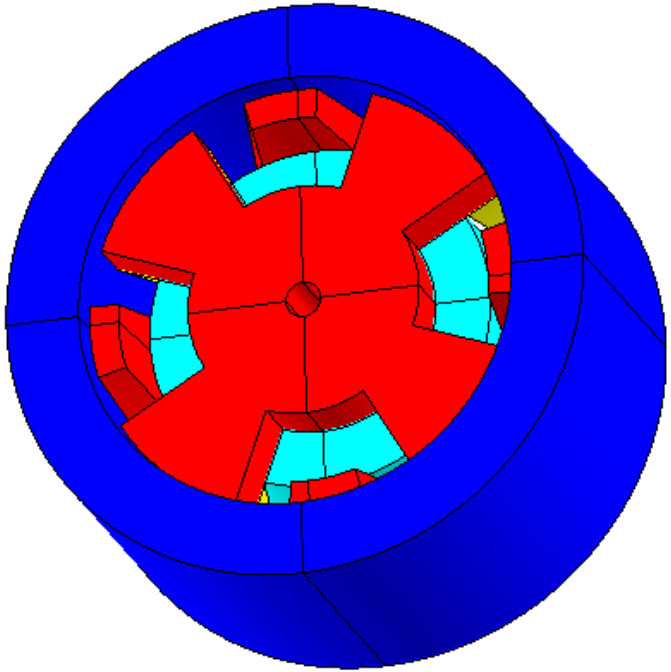
Summary

Create the 3D geometry

Mesh

Physics

Cogging Torque computation



Starting a new project : new project

Open Flux 12.1 supervisor

Select 3D

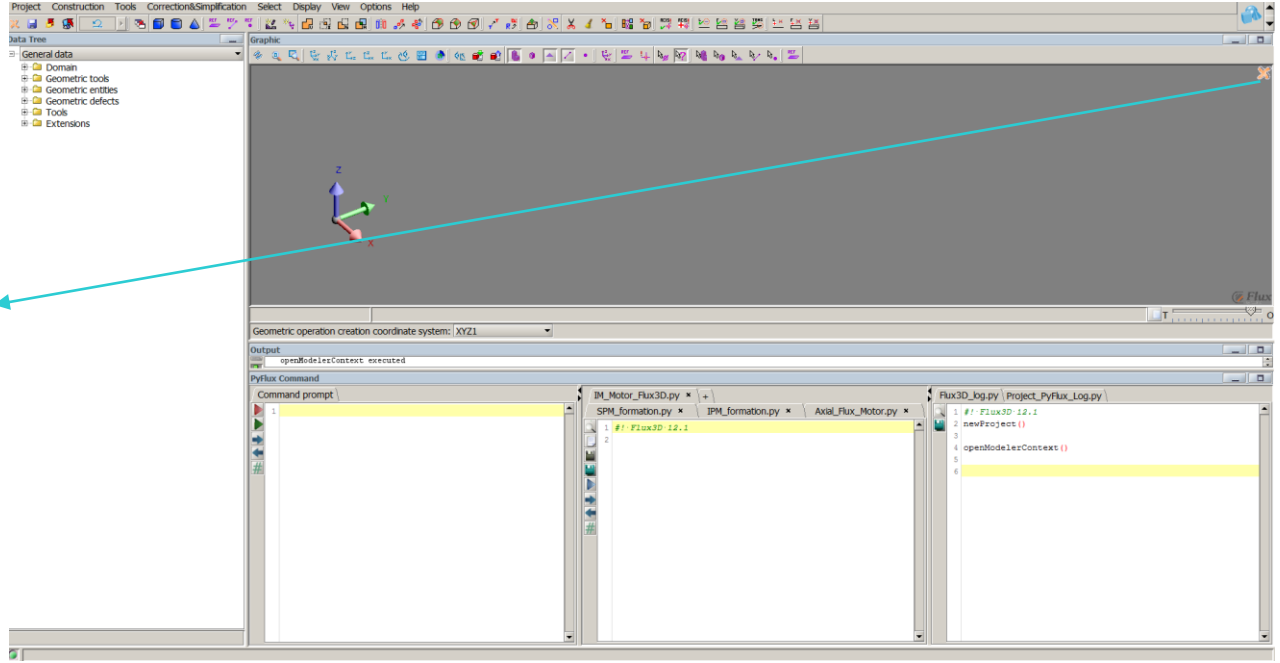
Start a new project

Start a new project

Create the 3D geometry

Leave the modeler context

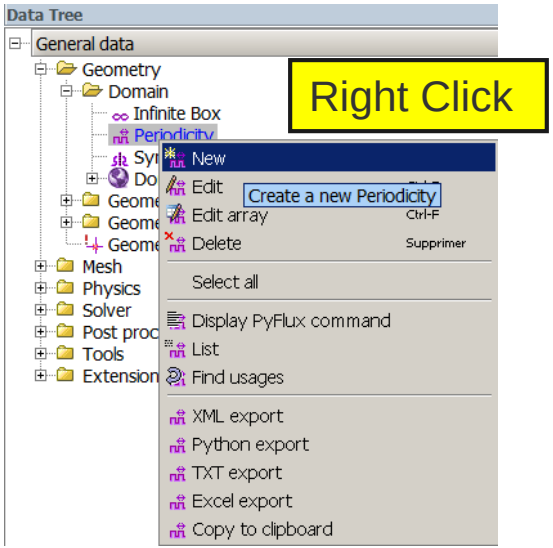
Leave the modeler

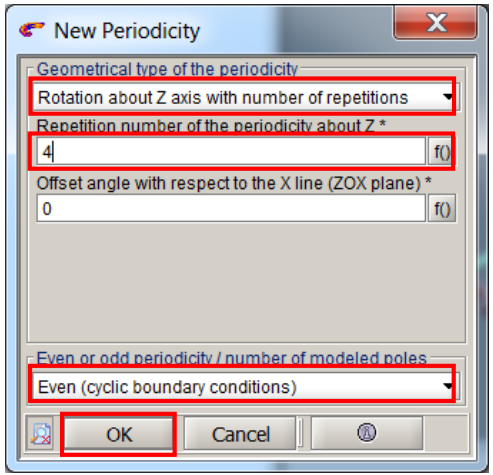


ALTAIR

Create the 3D geometry

Create periodicity

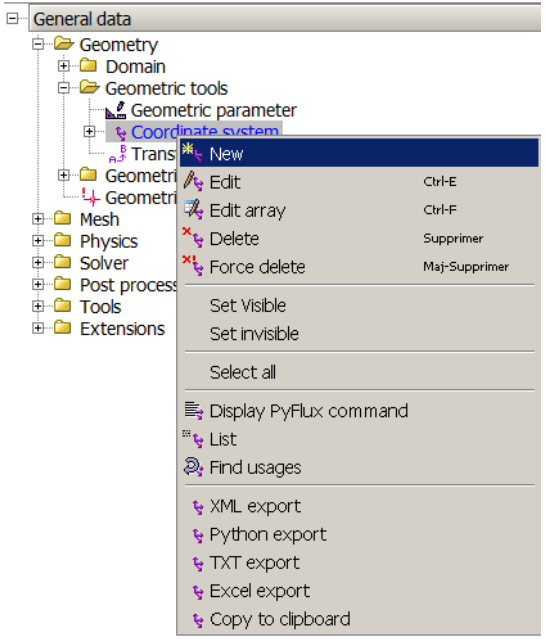


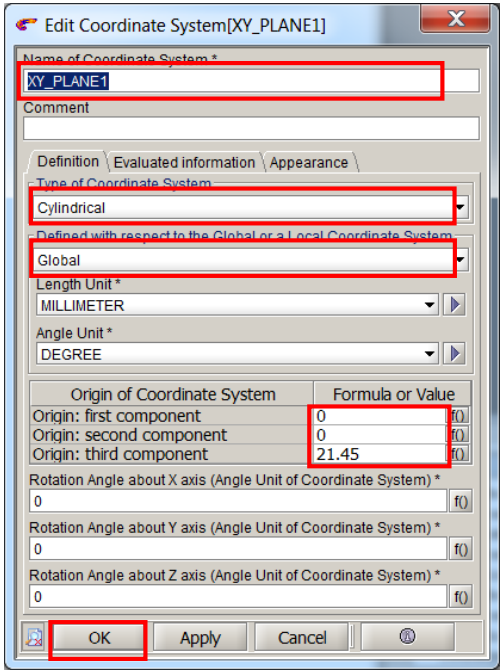


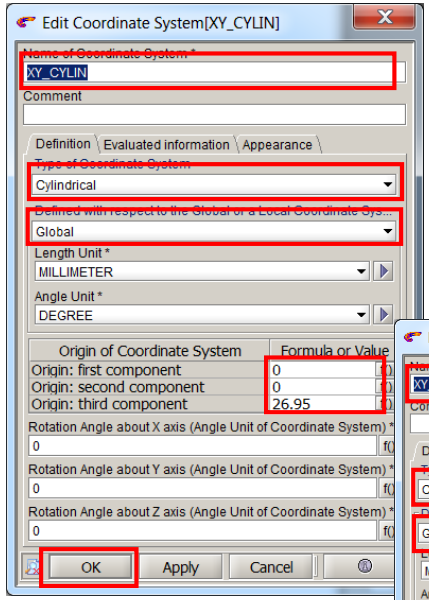
ALTAIR

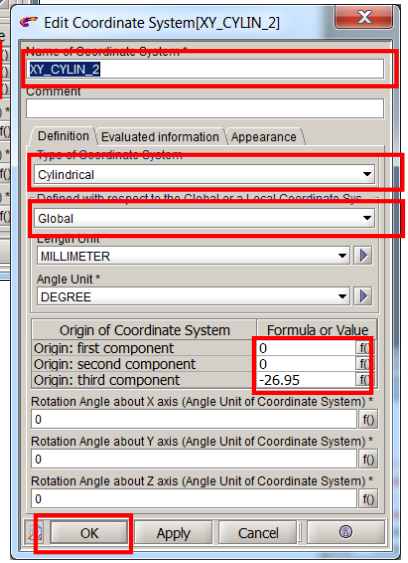
Create the 3D geometry

Create coordinate systems





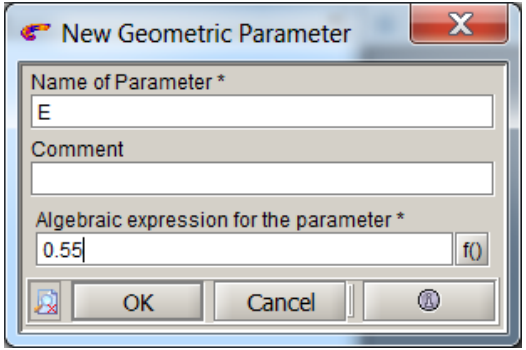


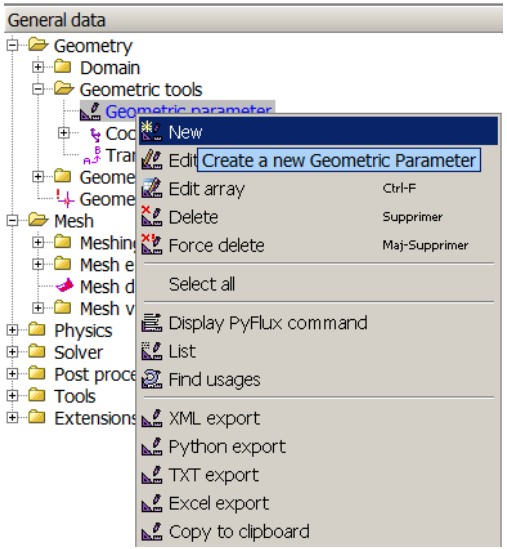


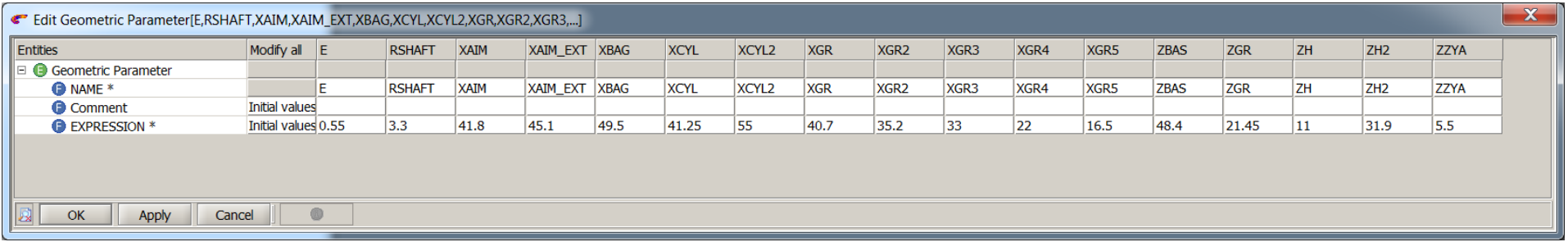
ALTAIR

Create the 3D geometry

Create geometric parameters







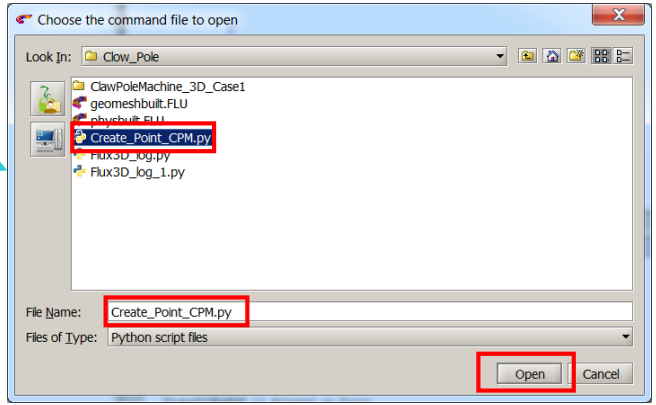
Entities	Modify all	E	RSHAFT	XAIM	XAIM_EXT	XBAG	XCYL	XCYL2	XGR	XGR2	XGR3	XGR4	XGR5	ZBAS	ZGR	ZH	ZH2	ZZYA
Geometric Parameter																		
NAME *		E	RSHAFT	XAIM	XAIM_EXT	XBAG	XCYL	XCYL2	XGR	XGR2	XGR3	XGR4	XGR5	ZBAS	ZGR	ZH	ZH2	ZZYA
Comment	Initial values																	
EXPRESSION *	Initial values	0.55	3.3	41.8	45.1	49.5	41.25	55	40.7	35.2	33	22	16.5	48.4	21.45	11	31.9	5.5

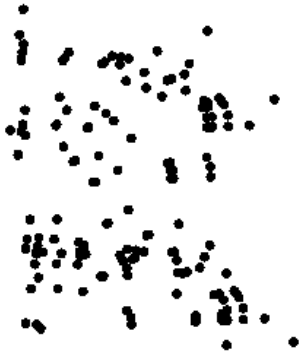
ALTAIR

Create the 3D geometry

Create Points and transformation

- Import python file: ‘Create_Point_CPM.py’



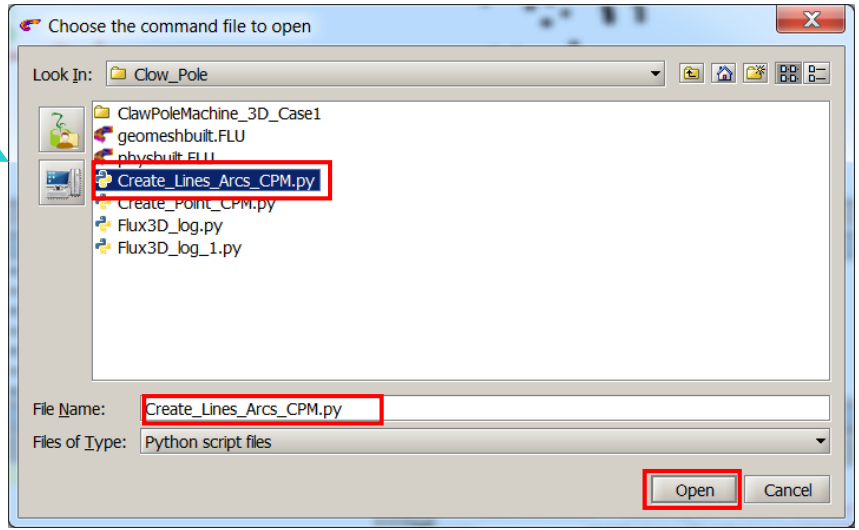


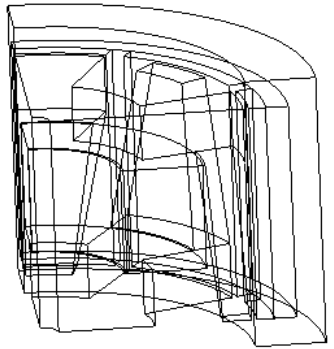
ALTAIR

Create the 3D geometry

Create Lines and arcs

- Import python file: ‘Create_Lines_Arcs_CPM.py’

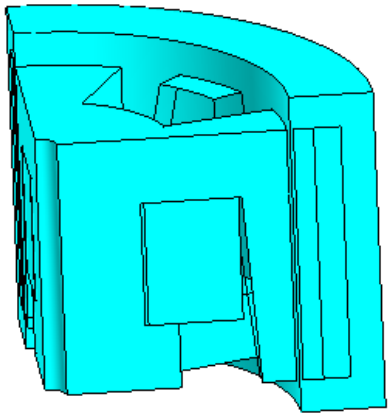




ALTAIR

Create the 3D geometry

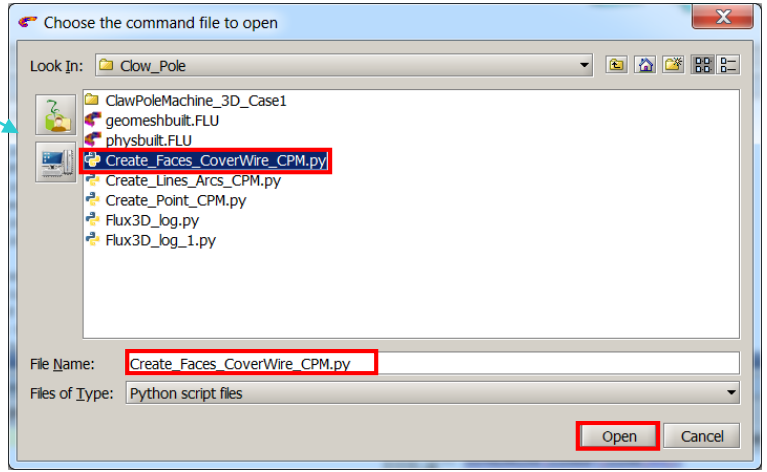
Build faces

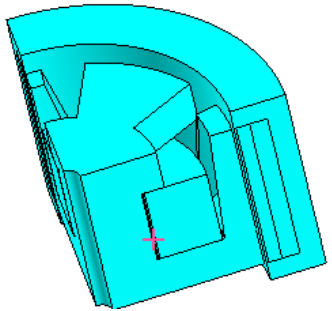


Create the 3D geometry

Build faces with “cover wire”

- Import python file: “Create_Faces_CoverWire_CPM_py”

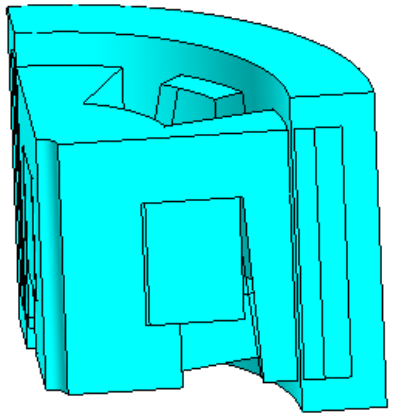




ALTAIR

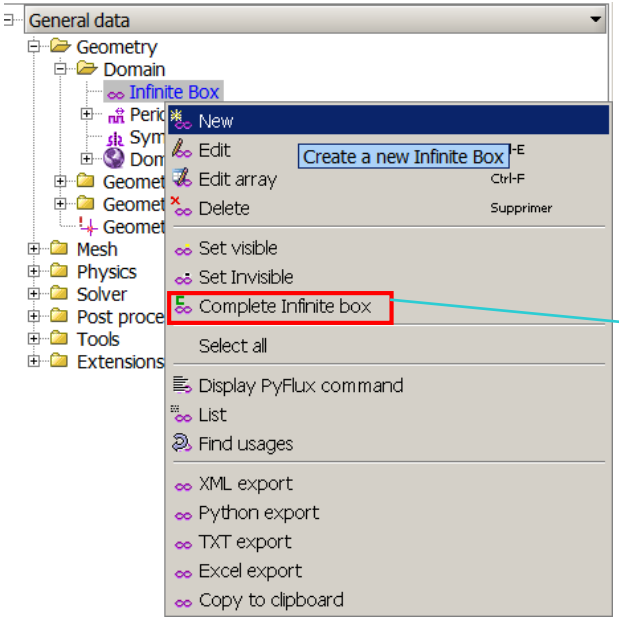
Create the 3D geometry

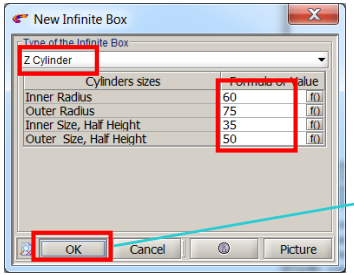
Build volumes

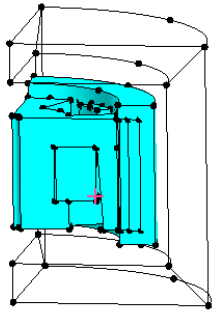


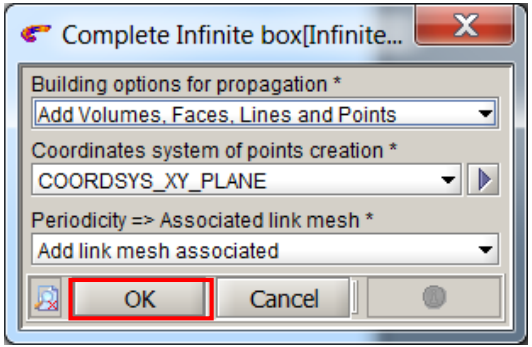
Create the 3D geometry

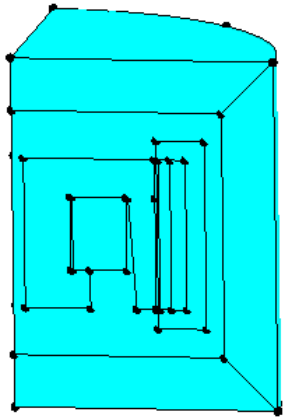
Create infinite box







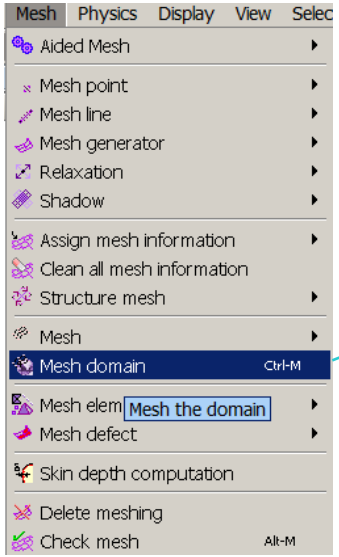


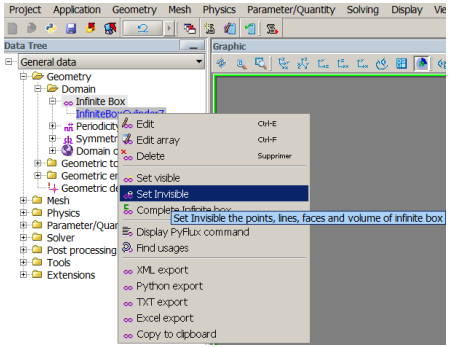


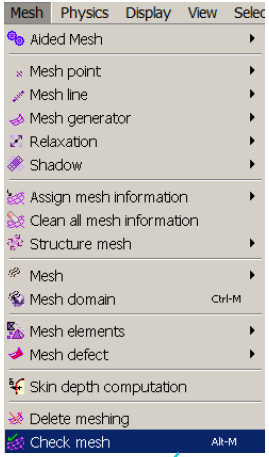
ALTAIR

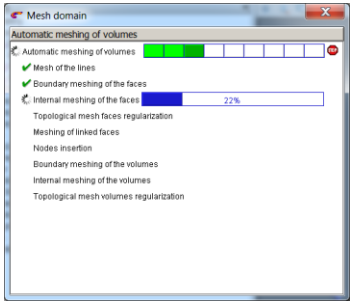
Mesh : mesh domain

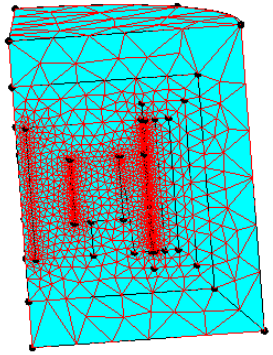
Mesh the device









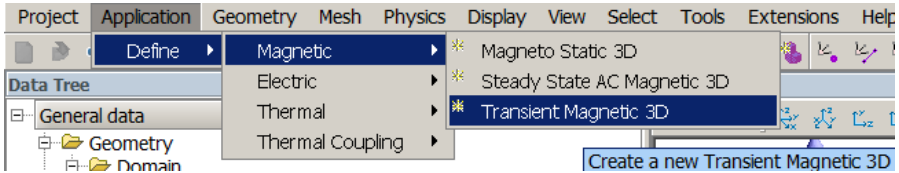


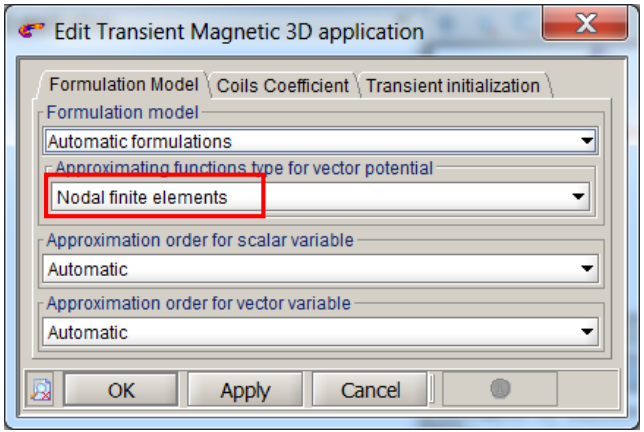
```
Volume elements :
   Number of elements not evaluated     : 0  %
   Number of excellent quality elements : 27.02  %
   Number of good quality elements      : 40.24  %
   Number of average quality elements   : 25.16  %
   Number of poor quality elements      : 7.58  %

Number of nodes : 8788
Number of line elements : 2222
Number of surface elements : 18831
Number of volume elements : 13809
Mesh order : 1st order
```


ALTAIR

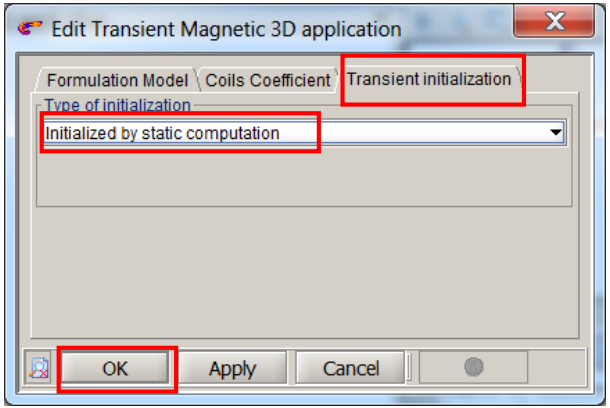
Physics of the geometry

Create an application





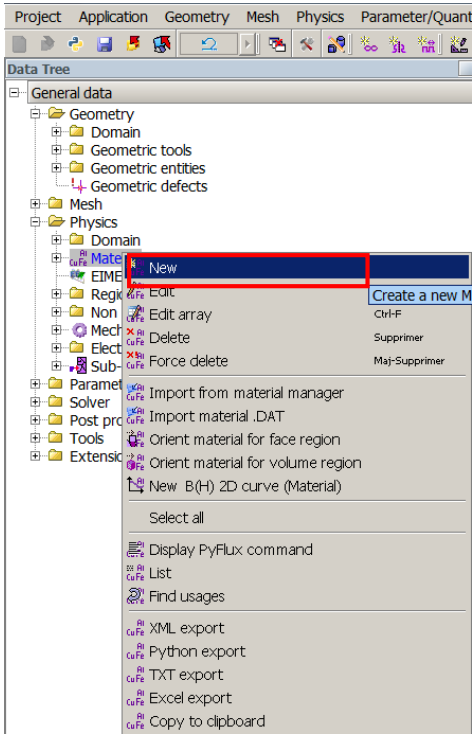
Click on OK

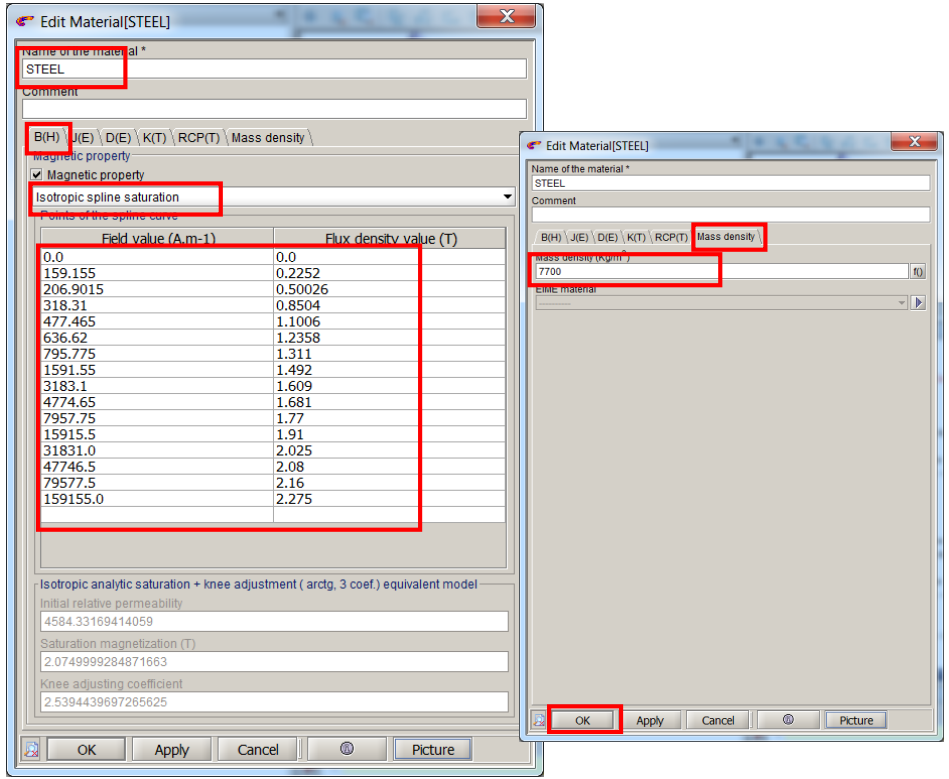


ALTAIR

Physics : create magnetic materials

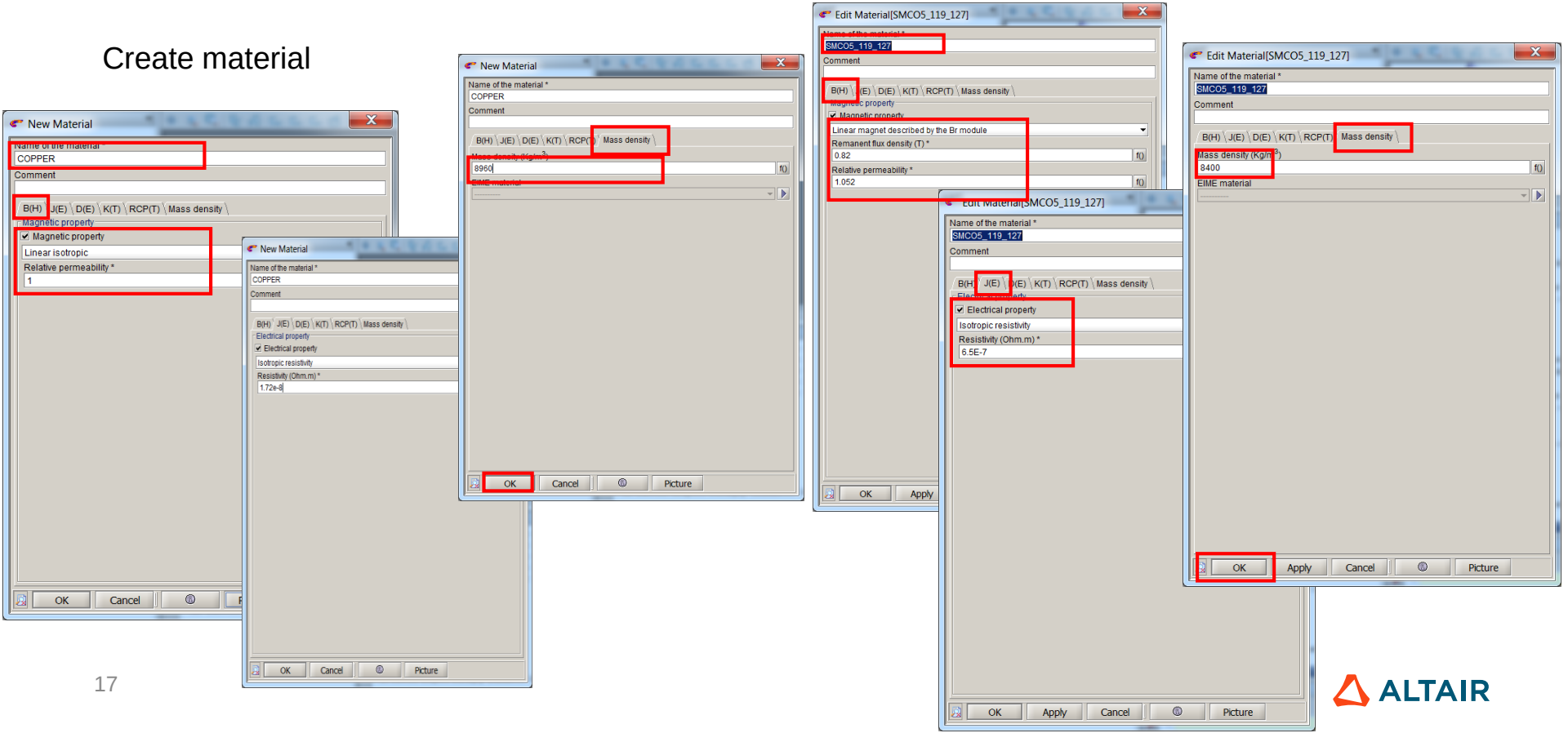
Create material





Physics : create magnetic materials

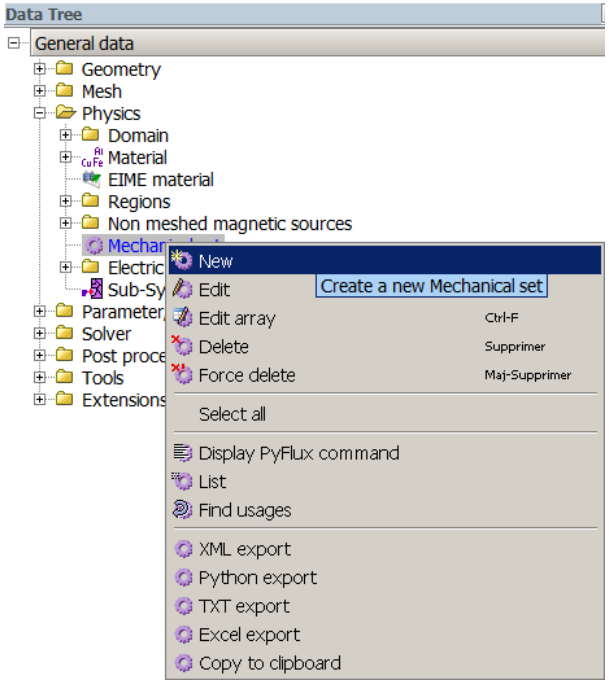
Create material

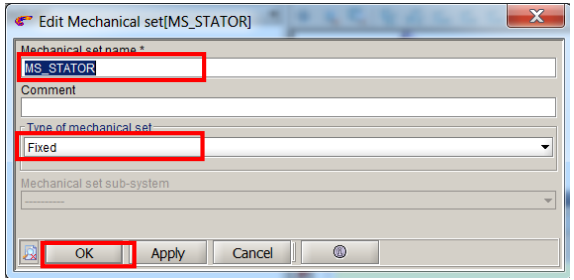


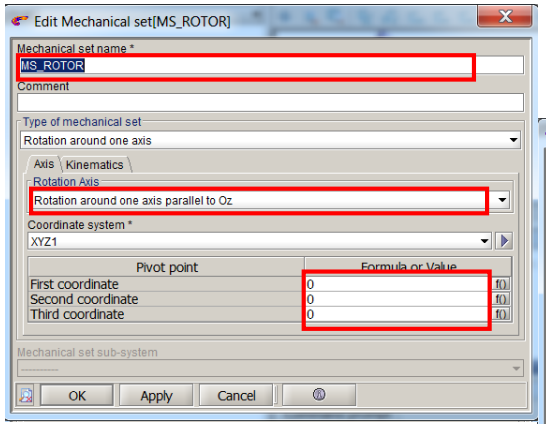
ALTAIR

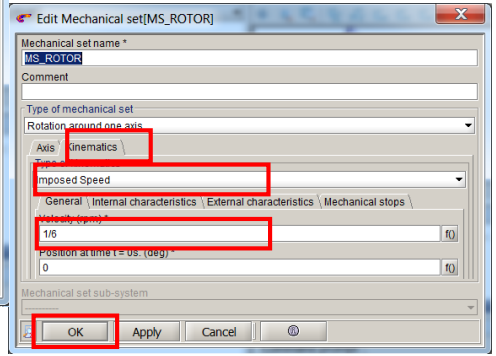
Physics : create mechanical sets

Stator and rotor







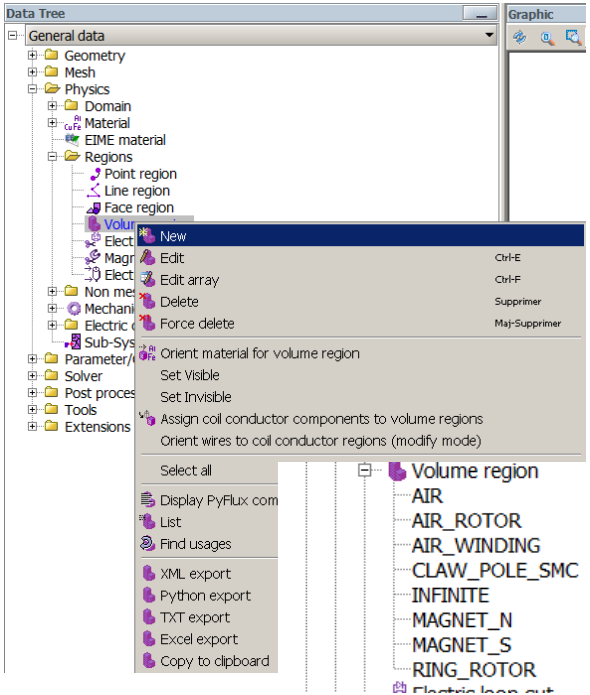


Click on OK

ALTAIR

Physics : volume regions

Create volume regions

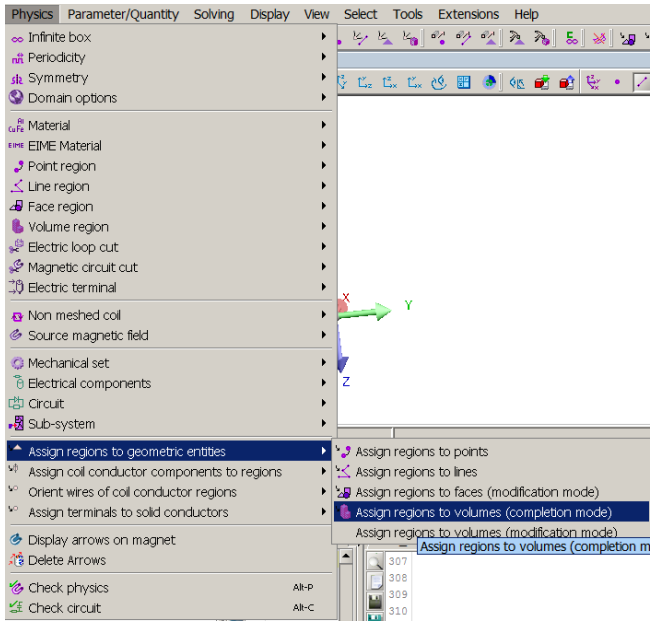


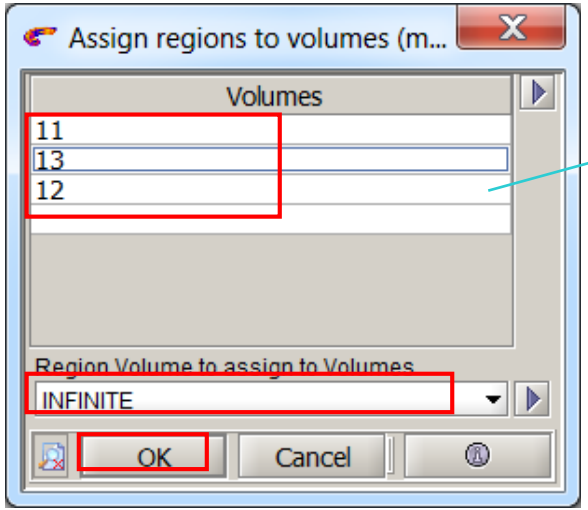
Volume regions	Type of region	Material	Mechanical sets
Infinite	Air or Vacuum	xxxx	MS_Stator
Air	Air or Vacuum	xxxx	MS_Stator
Air_Rotor	Air or Vacuum	xxxx	MS_Rotor
MAGNET_N	Magnetic non conducting region	SMCO5_119_127	MS_Rotor
MAGNET_S	Magnetic non conducting region	SMCO5_119_127	MS_Rotor
Air winding	Air or Vacuum	xxxx	MS_Stator
Clw_Pole_SMC	Magnetic non conducting region	STEEL	MS_Stator
Ring_Rotor	Magnetic non conducting region	STEEL	MS_Rotor

ALTAIR

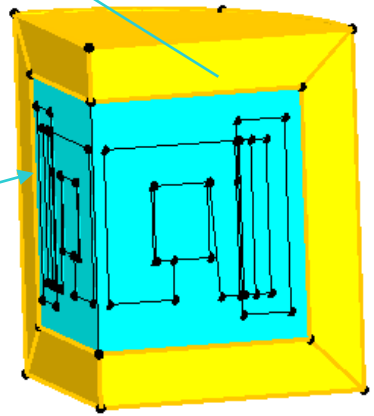
Physics : volume regions

Affectation of the volumes to the volume regions





Select the volume region

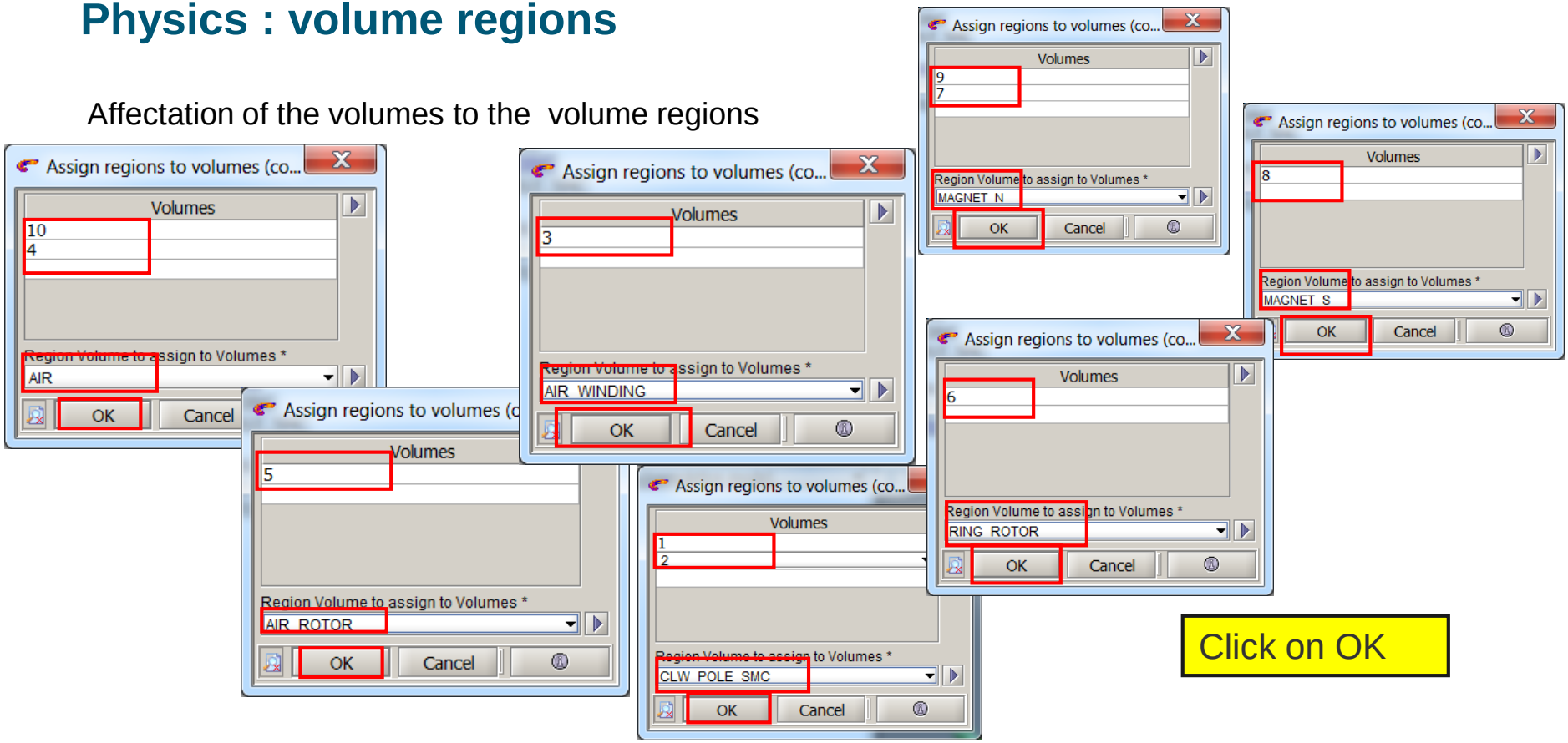


Click on OK

ALTAIR

Physics : volume regions

Affectation of the volumes to the volume regions



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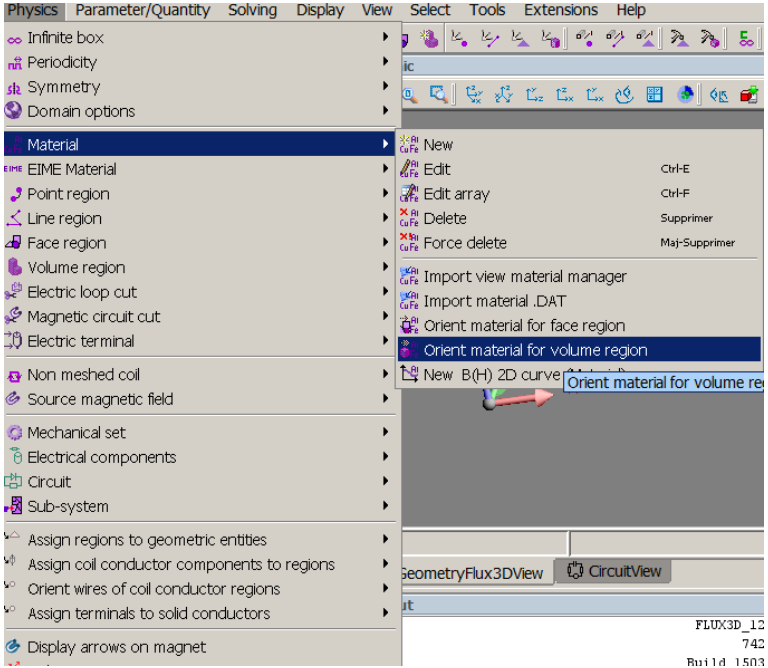
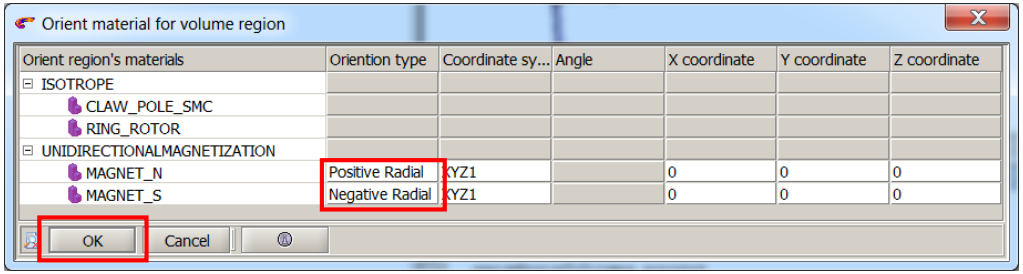
Physics : volume regions

Magnets orientation



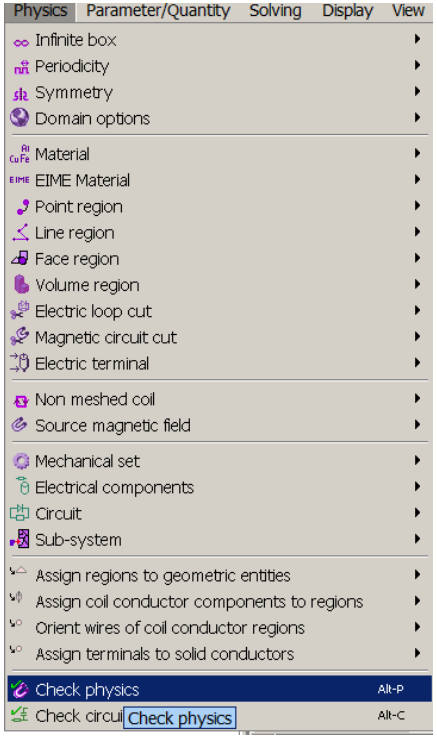


Save Project as:
GEMO_MESH_PHYSIC.FLU

ALTAIR

Physics : check physic

Check physic



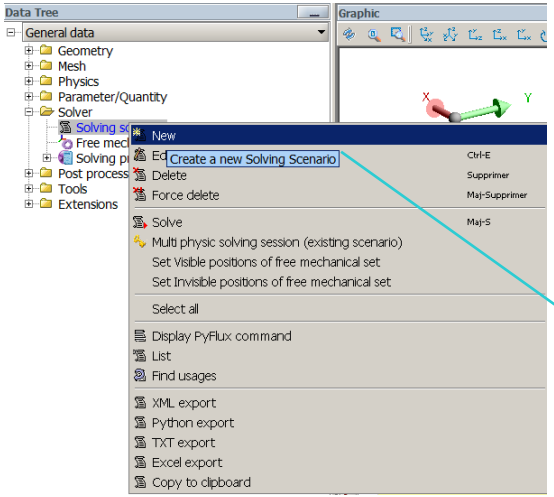
Save Project as:
GEOM_MESH_PHYSIC.FLU

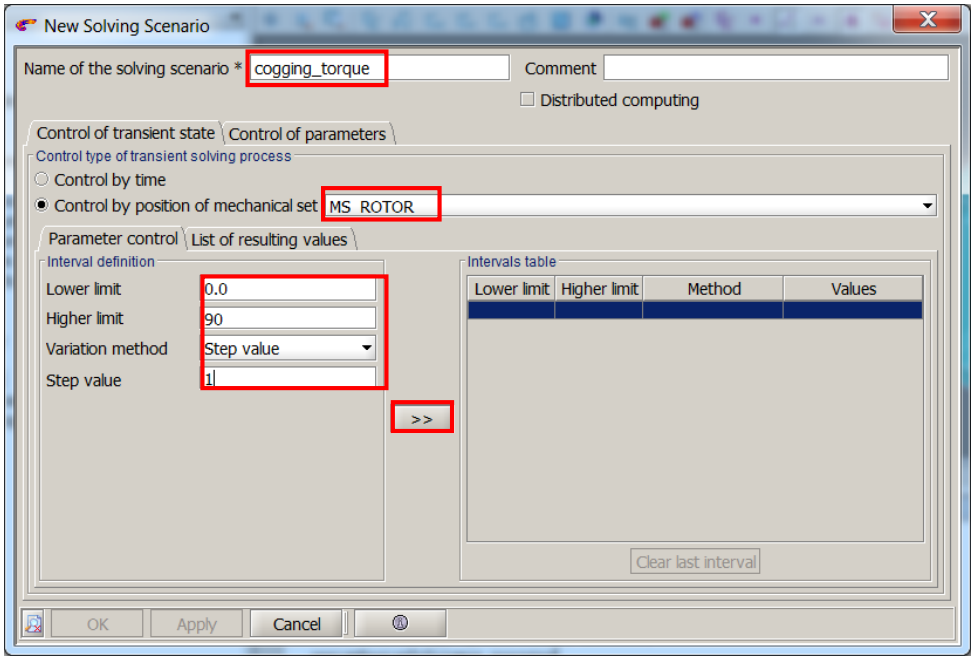
```
Begin of physical check ...
The final derivative of points defining the spline curve of material STEEL must be equal to Mu0. The final relative permeability is equal to: 1.14999958880135
Please, verify the properties of the material: STEEL
End of physical check.
   checkPhysic executed
```


ALTAIR

Solving

Create solving scenario to compute back EMF





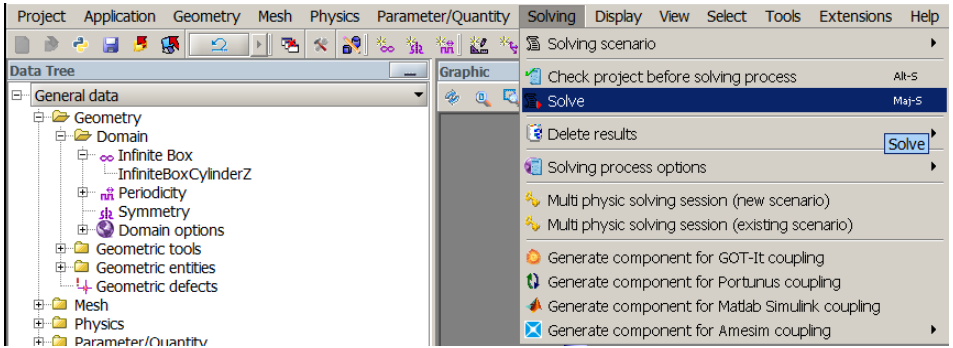
Click on OK

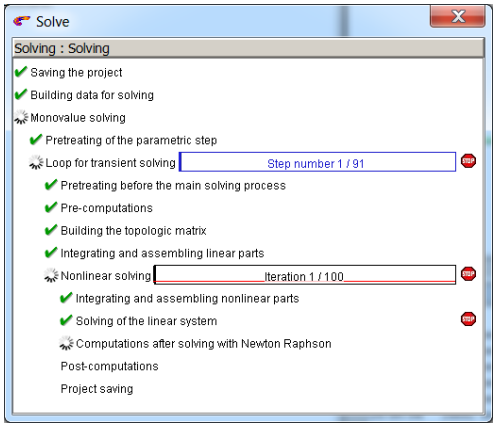
ALTAIR

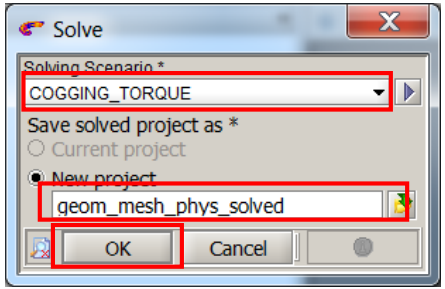
Solving

Create solving scenario to compute cogging torque

- Solving



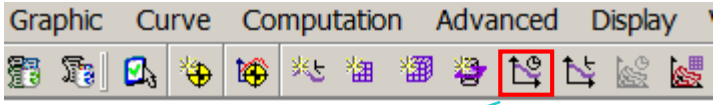


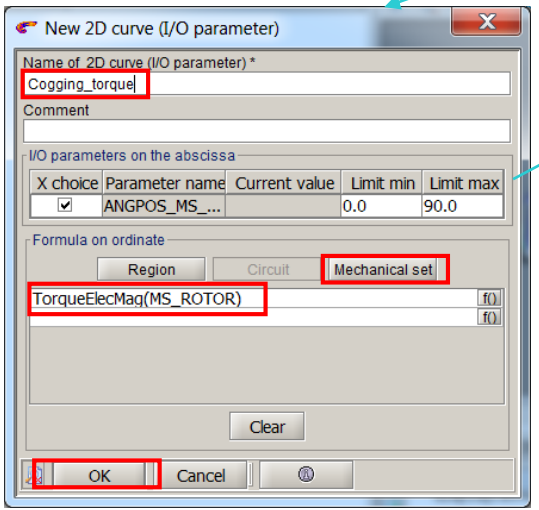


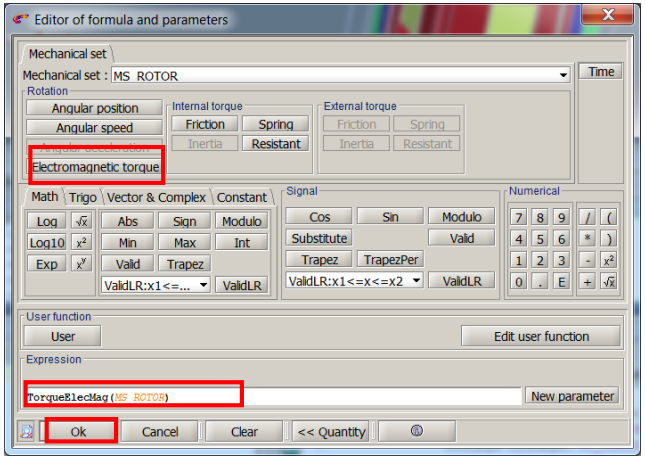
ALTAIR

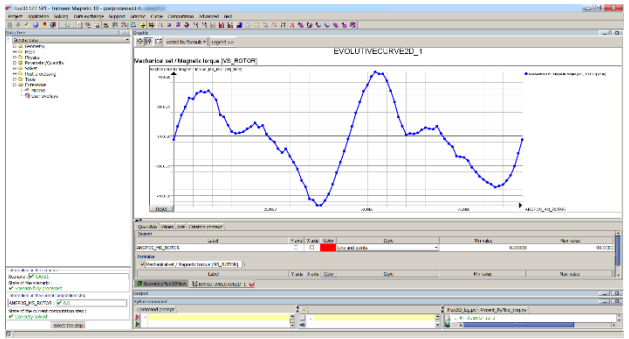
Post processing

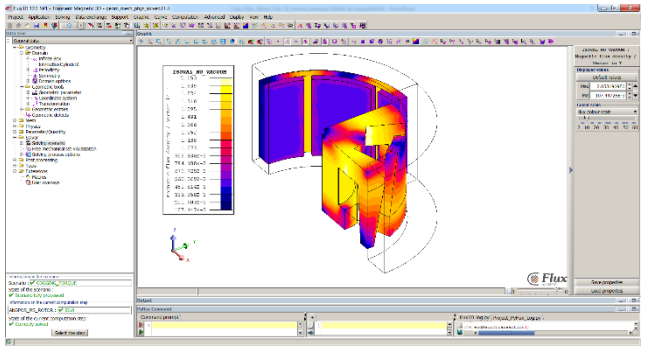
Cogging torque











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