How to use RAA

---Beijing Eastforce Superconducting Technology Co., Ltd.

---www.eastfs.com

Step 1

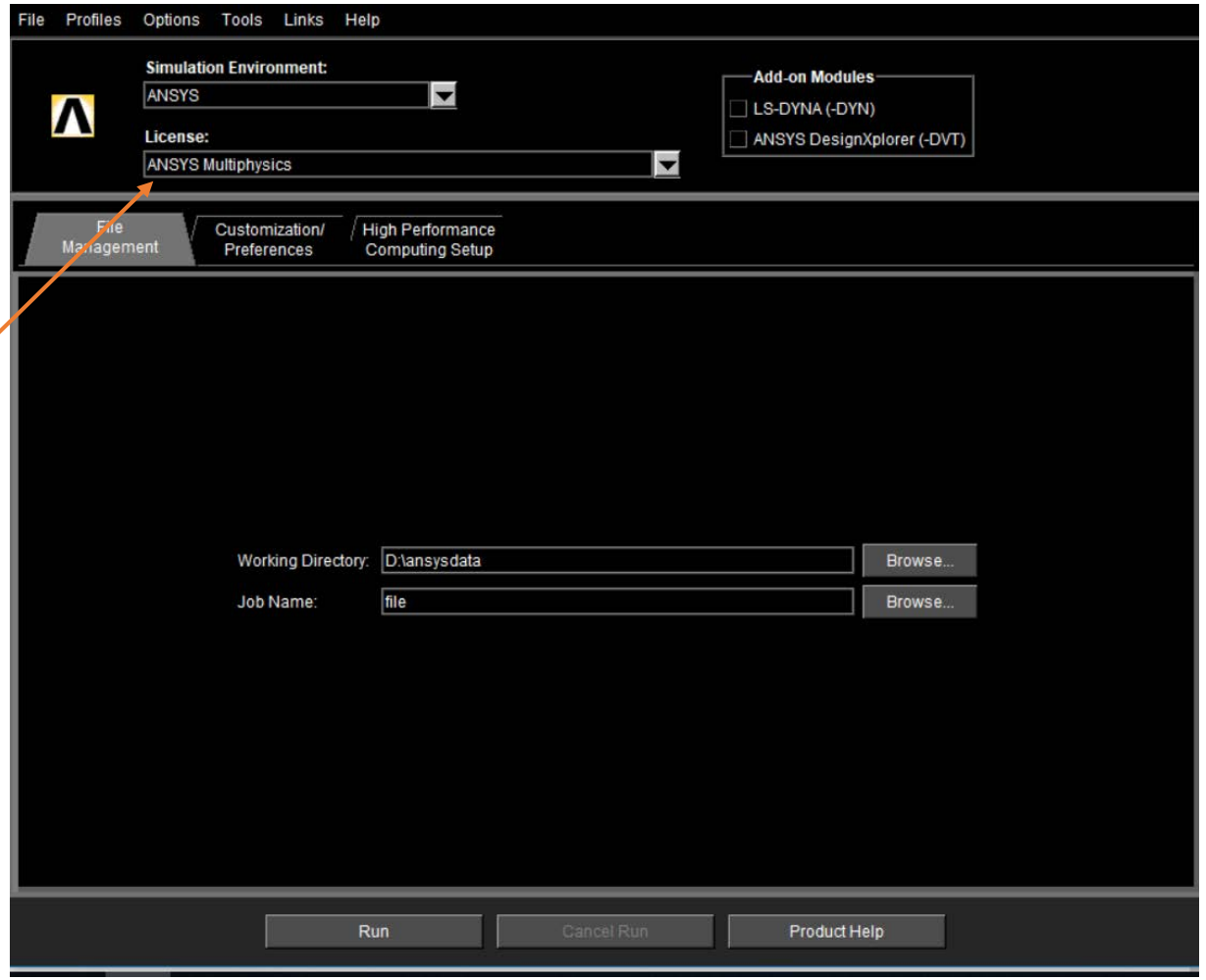
The RAA code has more than 1000 lines, written in ANSYS-APDL language. Before using the RAA code, make sure you have ANSYS with Multiphysics or Emag license on your computer. In general, the RAA is independent to the version of ANSYS. But we recommend ANSYS 14.5 and ANSYS 15.0. as the first choice.

Step 1-1

RUN “Mechanical APDL Product Launcher to set license and Working Directory

Step 1-2

Choose license to Multiphysics or Emag



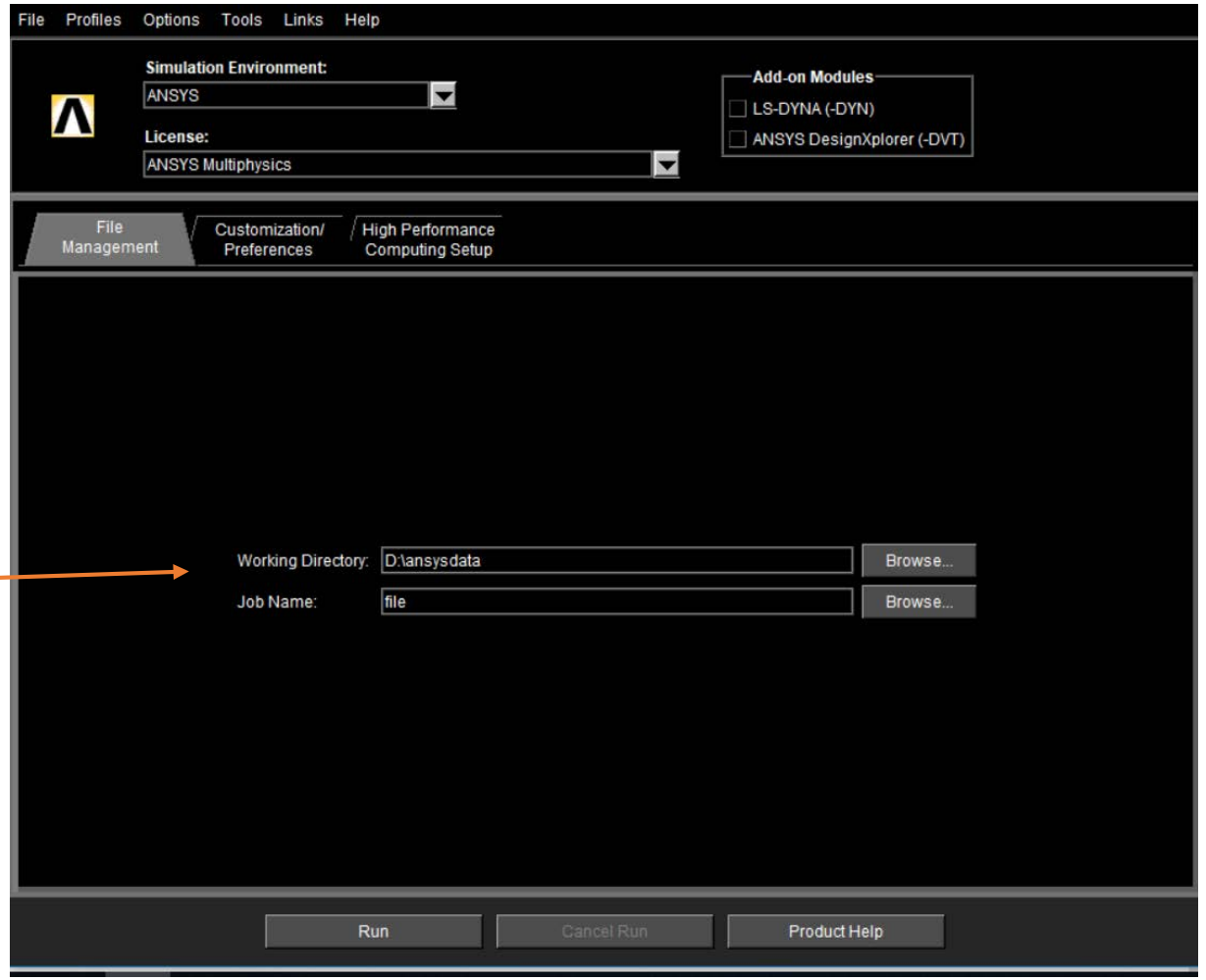
Step 2

Unzip all the ".mac" files into ANSYS working directory.

File description:

1. RAA_YBCO_step.mac --------- Parameter setting File
2. RAA_YBCO_main.mac--------- Geometric Modeling
3. RAA_YBCO_loop.mac----------Model iteration
4. RAA_YBCO_cal_up.mac--------- Loss Calculation
5. RAA_YBCO_output_up.mac------ Result Output

Set working directory

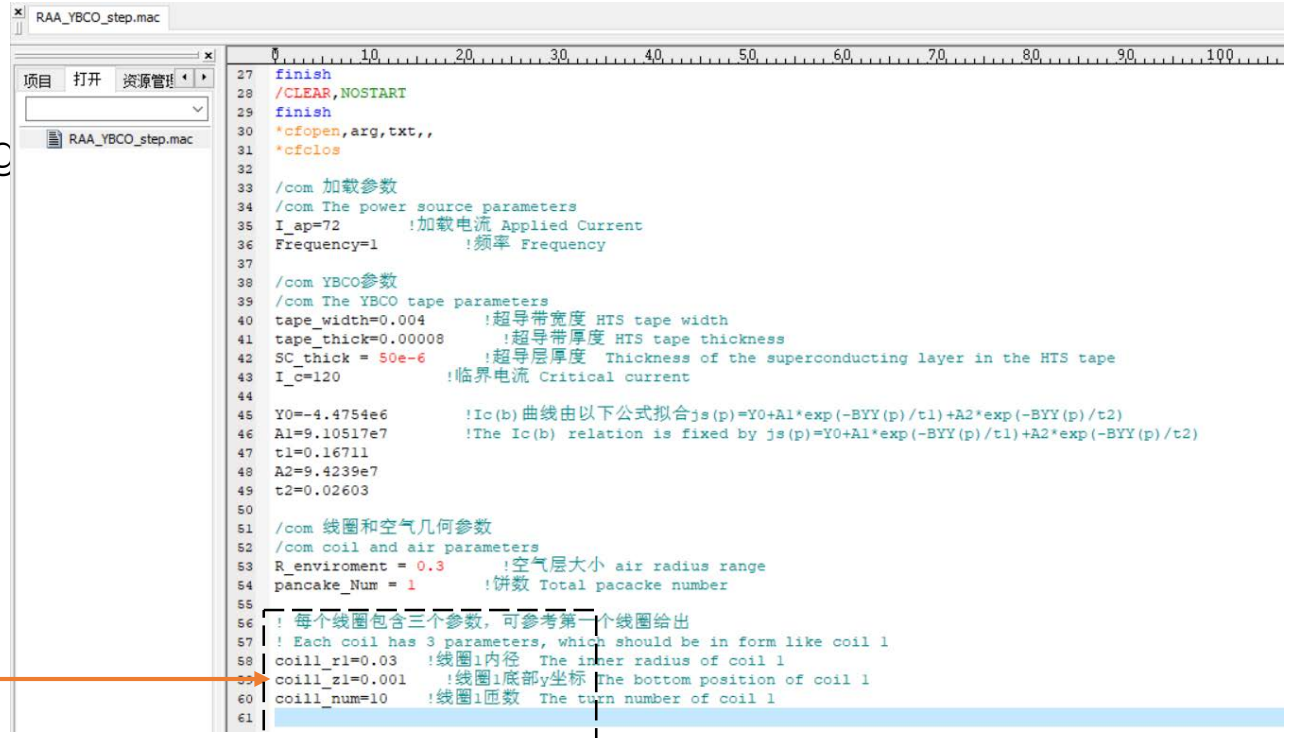


Step 3

The ".mac" file can be edited by any text editing software. We suggest UltraEdit as an editing tool.

File description:

1. RAA_YBCO_step.mac -------- Main File
2. RAA_YBCO_main.mac-------- Geometric Modeling
3. RAA_YBCO_loop.mac---------Model iteration
4. RAA_YBCO_cal_up.mac------- Loss Calculation
5. RAA_YBCO_output_up.mac---- Result Output



Set coil parameters, as many as 10 double pancake coils can be built in the model.

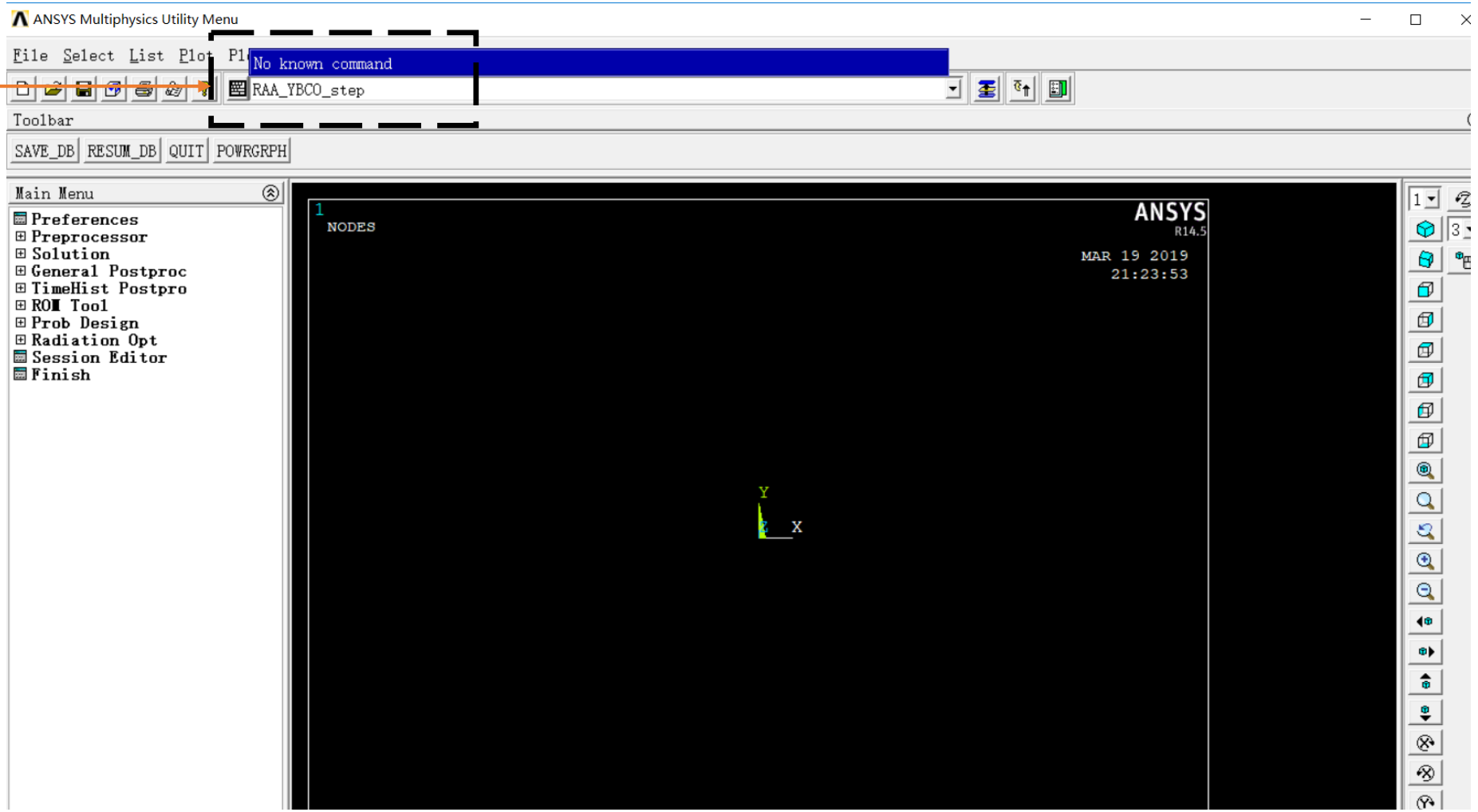
The program will run from file 1 to file 5. For the beginners who do not know so much about ANSYS, do **NOT** change any word from file 2 to 5. All you need to do is editing file 1 in which user can change the tape parameters and coil parameters. After editing the "RAA_YBCO_step.mac", save the file.

We recommend using default values without changing any parameters for the first run.

Step 4

RUN the ANSYS program; TYPE “RAA_YBCO_step” into the textbox and ENTER

TYPE the file name



Step 5

When the calculation is finished, open the RAA_YBCO_result.txt file in ANSYS working folder to get the results.

- The fist column indicates the number of the coil.
- The second column indicates the number of turn in each coil.
- The third column indicates the excitation current.
- The fourth column indicates the AC loss in each turn.

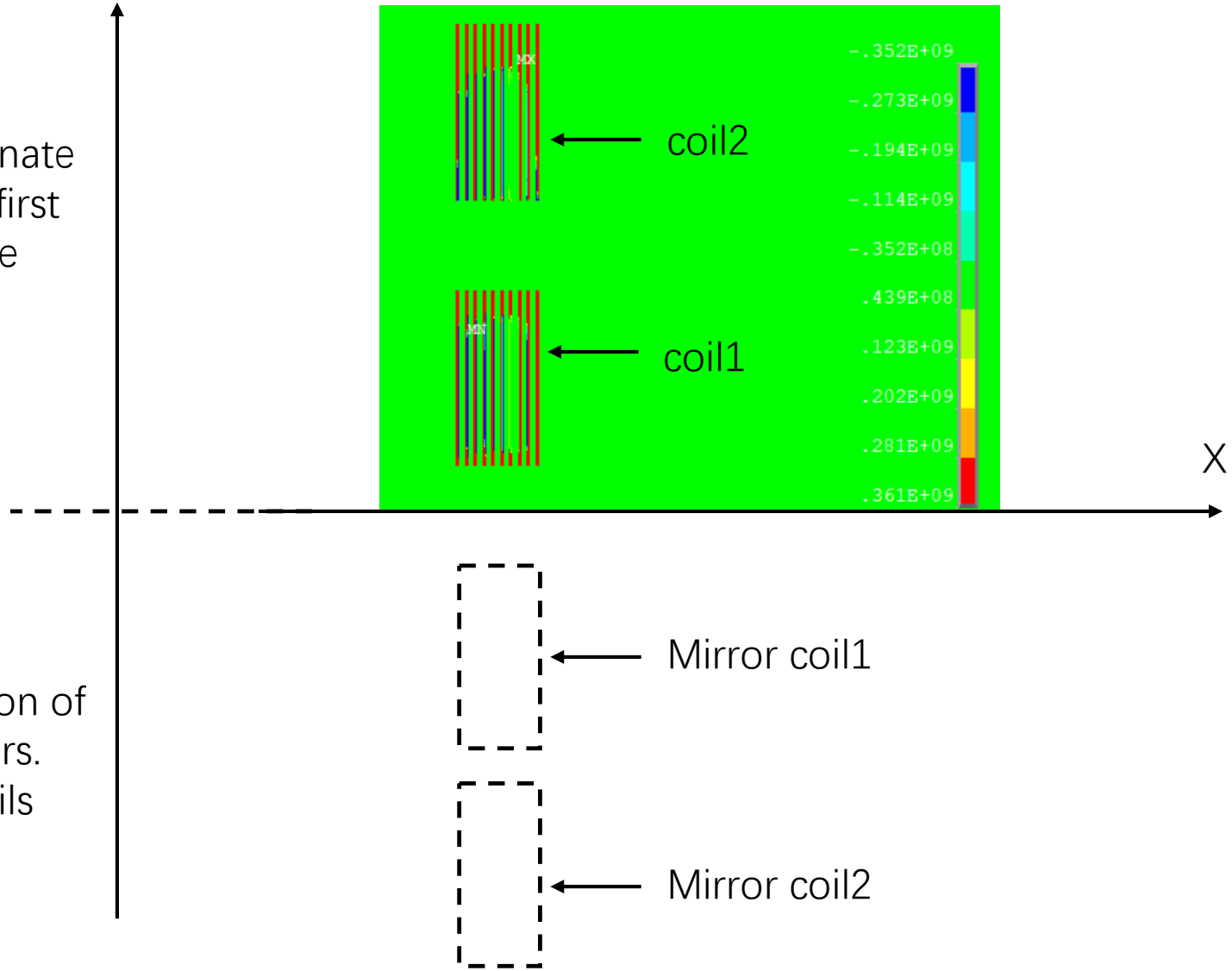
```
Total time used:           0.44944 Hour
The AC loss of the magnet is        0.907E-02 J/cycle

Coil_No    turn_No    Current    Loss (J/cycle/m)
1          1            60.00          0.139E-02
1          2            60.00          0.110E-02
1          3            60.00          0.899E-03
1          4            60.00          0.728E-03
1          5            60.00          0.688E-03
1          6            60.00          0.713E-03
1          7            60.00          0.736E-03
1          8            60.00          0.110E-02
1          9            60.00          0.112E-02
1          10           60.00          0.137E-02
2          1            60.00          0.476E-02
2          2            60.00          0.375E-02
2          3            60.00          0.329E-02
2          4            60.00          0.291E-02
2          5            60.00          0.269E-02
2          6            60.00          0.263E-02
2          7            60.00          0.263E-02
2          8            60.00          0.274E-02
2          9            60.00          0.321E-02
2          10           60.00          0.360E-02
2          11           60.00          0.442E-02
```

The AC loss of the magnet only takes account the winding in the first quadrant. To get the total loss including the mirror parts, you should multiply the factor of 2. (Please go to Step 6 to understand the mirror parts)

Step 6

Take a close look of current distribution and field distribution on winding

The coil is built in axisymmetric coordinate system and the winding is built in the first quadrant. ANSYS by defaults builds the mirror parts along X-axis



The figures shows the current distribution of the winding based on default parameters. The magnet consists of four 10-turn coils carrying 0.5Ic.

Enjoy simulation
Enjoy RAA