Brushless SPM motor with skewed stator

Skew Application Note Summary

This application note deals with the modeling of a brushless SPM motor (surface permanent magnets) with skewed stator, with Flux Skew.

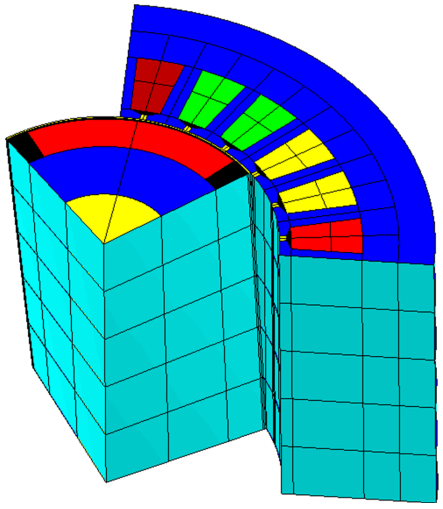
Applications	Flux main functions	Post-processed quantities
• Magneto Static • Transient Magnetic	• Rotating motion, Mechanical set • Kin. = imposed speed, coupled load, multi-static • Sensor, Multiparametric	• Magnetic quantities • Kinematic quantities, Circuit quantities • Cogging torque • Spectral analysis, Back electromotive force (bemf)

Studied device

The studied device, represented in figure opposite, is a brushless SPM motor (surface permanent magnets) with skewed stator (skewed slots). The permanent magnet machines become very attractive because of their specific characteristics (high torque, high efficiency rate ...).

It includes the following elements:

- a fixed part (stator) including yoke, slots and windings
- an air gap
- a movable part (rotor) with magnets



In practice

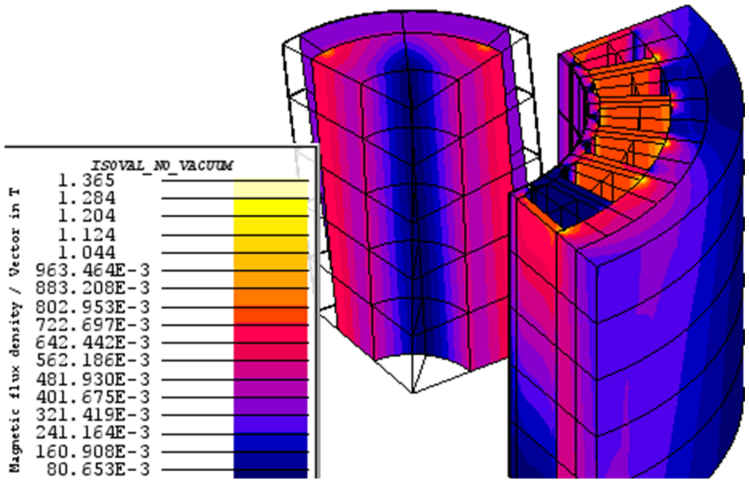
Open example = Open Flux + Run the pyFlux command file

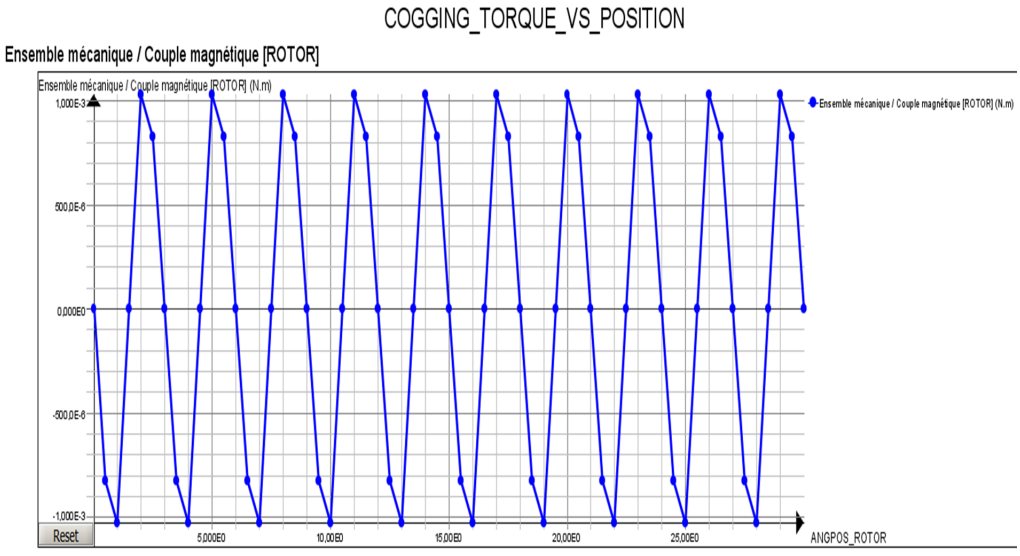
- Recommended memory configuration (standard): 1000 MiB Num + 50 MiB Char + 300 MiB GUI
- Computation time: 10 min < t < 30 min [64 bit - 16 GB RAM - 2.2 GHz]

Example 1: Cogging torque computation

This example deals with the cogging torque computation.

A Magneto Static analysis of the device is performed.



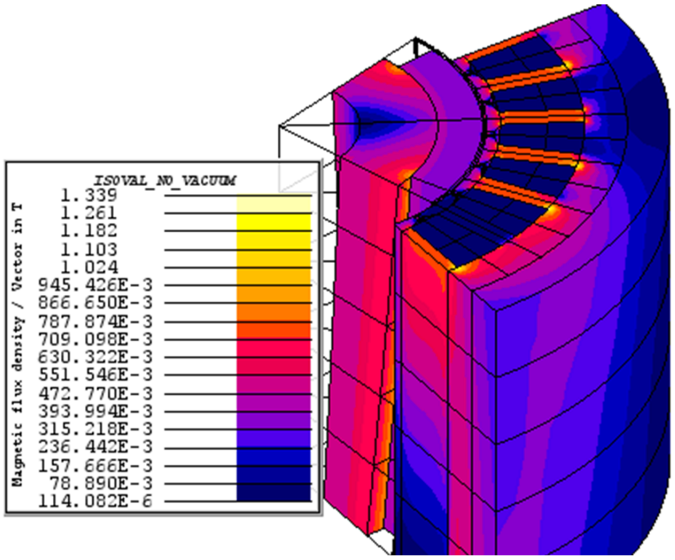


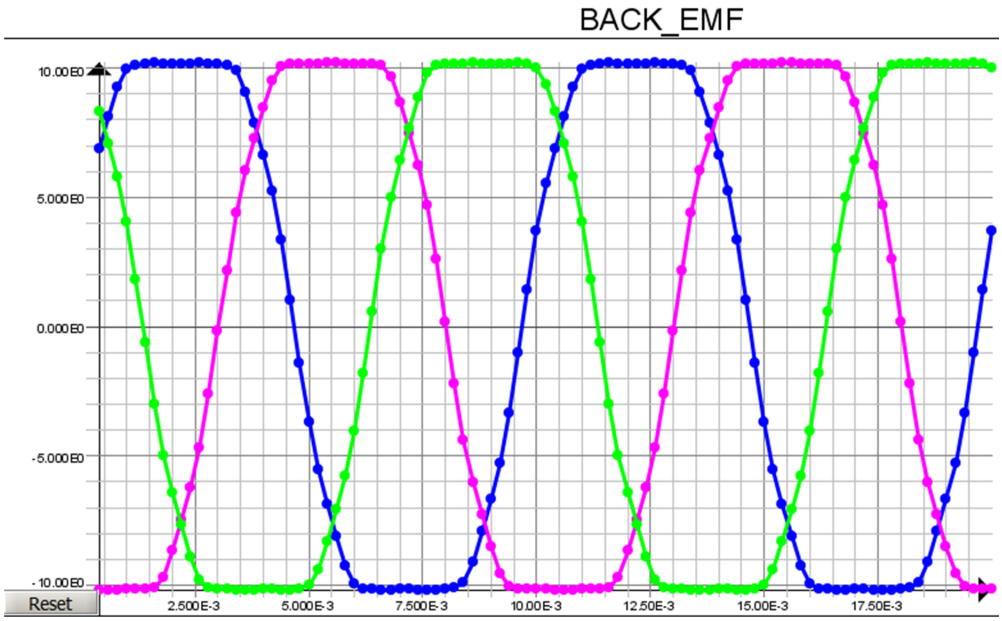
	Without skew	With skew
Cogging torque (N.m)	3 e-3	1 e-3

Example 2: Back electromotive force (bemf) computation

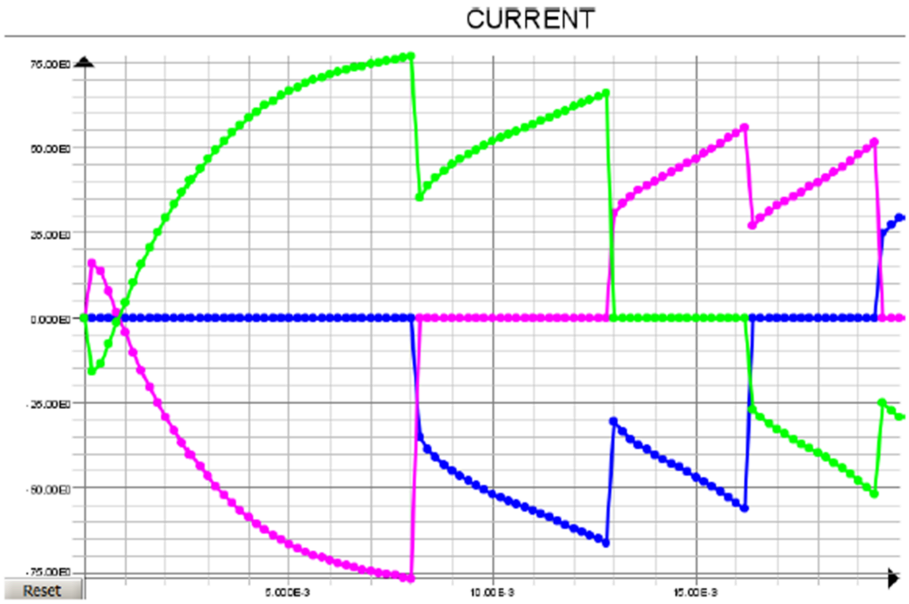
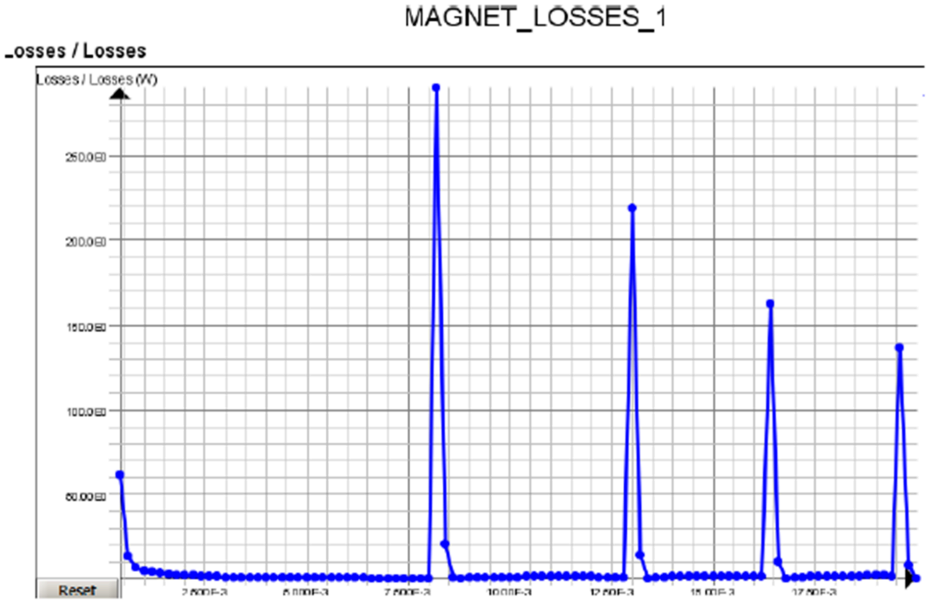
This example deals with the back EMF computation.

A Transient Magnetic analysis of the device is performed.





Example 3: Losses in magnets and current through coils

A Transient Magnetic analysis of the device is performed.

- Compute core losses on magnet
- Plot 2D curves of current in the coil