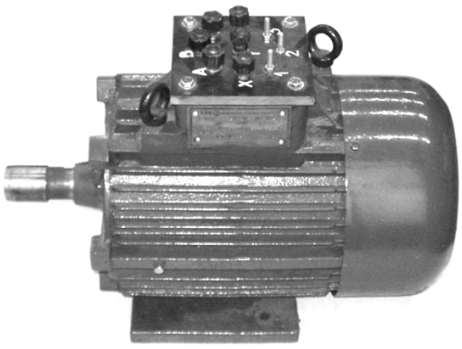
Induction Motor with Overlay

2D Technical Example Summary

Introduction

This paragraph is a summary of cases treated in detail in the technical paper: "2D Induction motor".

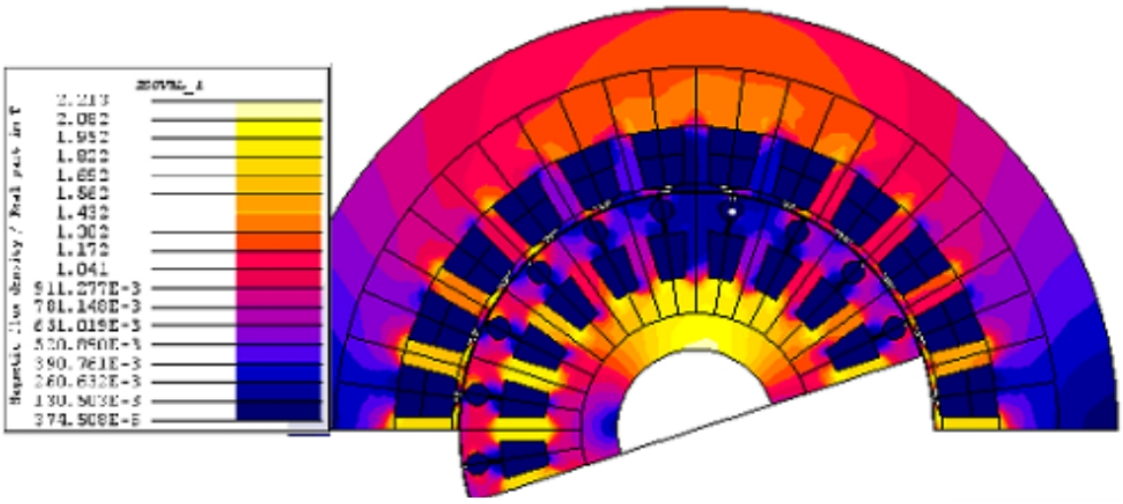
Applications	Flux main functions	Post-processed quantities
• Steady State AC Magnetic • Transient magnetic	• Sensors • Bertotti loss • Transient initialization • Macro	• Torque, Speed, Position • Current • Flux • Magnetic field • Iron loss • Joule loss • Mechanical power • Efficiency

Studied device	
The studied device is a 2-pole induction motor, 3-phase star connected, characterized by: • rated-load power, Pn = 7.5 kW • rated source voltage, Unf = 380 V (phase to null value) • rated source frequency, f1n = 50 Hz	 *Figure 1: View of the induction motor to be modelled*

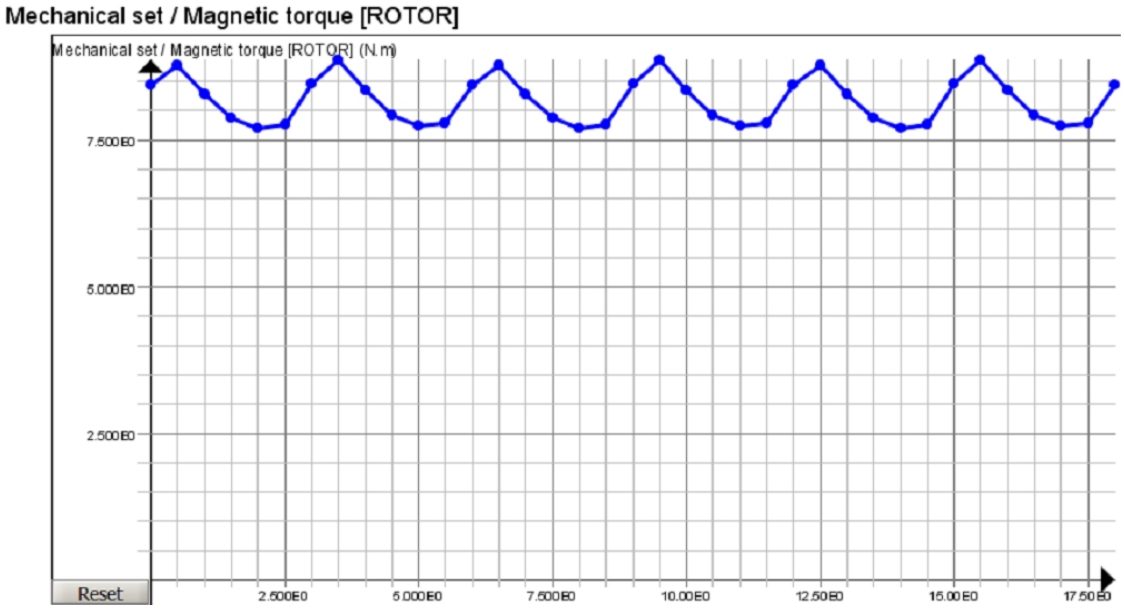
Example 1: Steady state magneto-harmonic analysis

The first case is a steady state magnetic AC study. This study is a parameterized magneto-harmonic analysis at different value of rotor position in order to determine the position where torque is equal to average value.

- Plot 2D curve of the electromagnetic torque
- Plot 2D curve of the currents



TORQUE

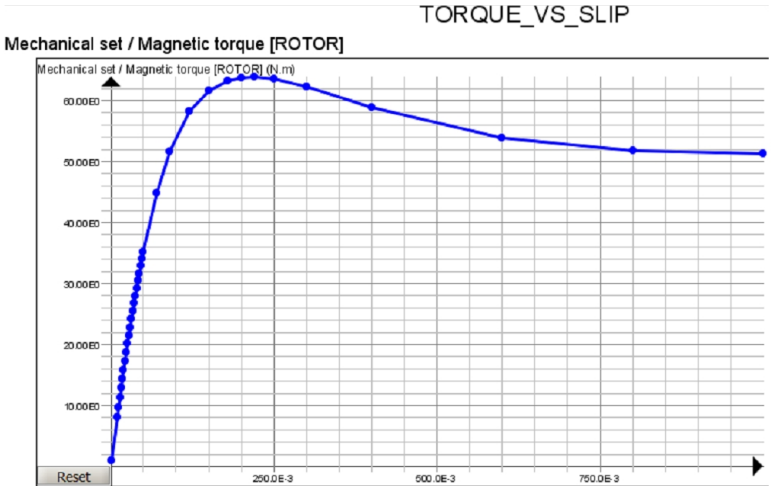


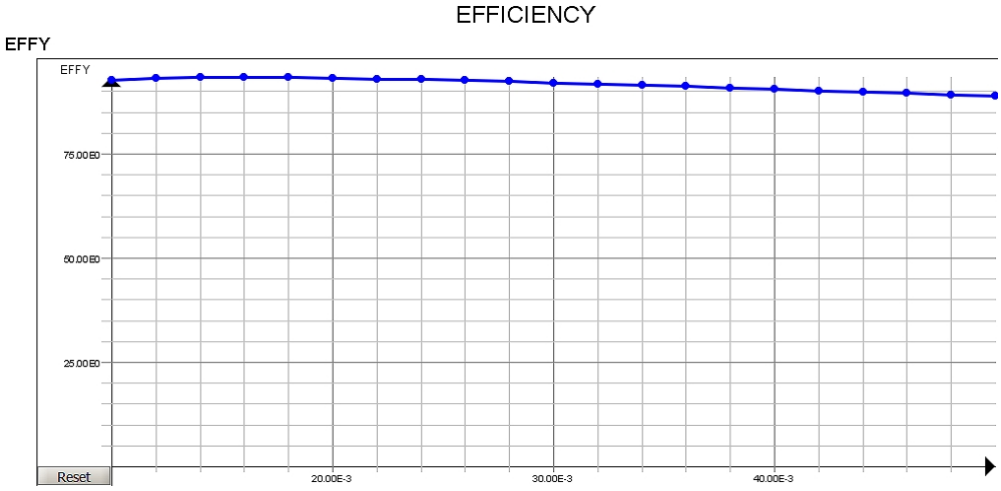
Example 2: Magneto-harmonic analysis with values of rotor slip

The second case is a steady state magnetic AC study.

This study is a parameterized magneto-harmonic analysis with values of rotor slip in order to evaluate the motor characteristics for rated load operation and display torque and current versus slip curves.

- Display graphic features
- Plot 2D curve of the electromagnetic torque
- Plot 2D curve of the efficiency
- Plot 2D curve of the power balance



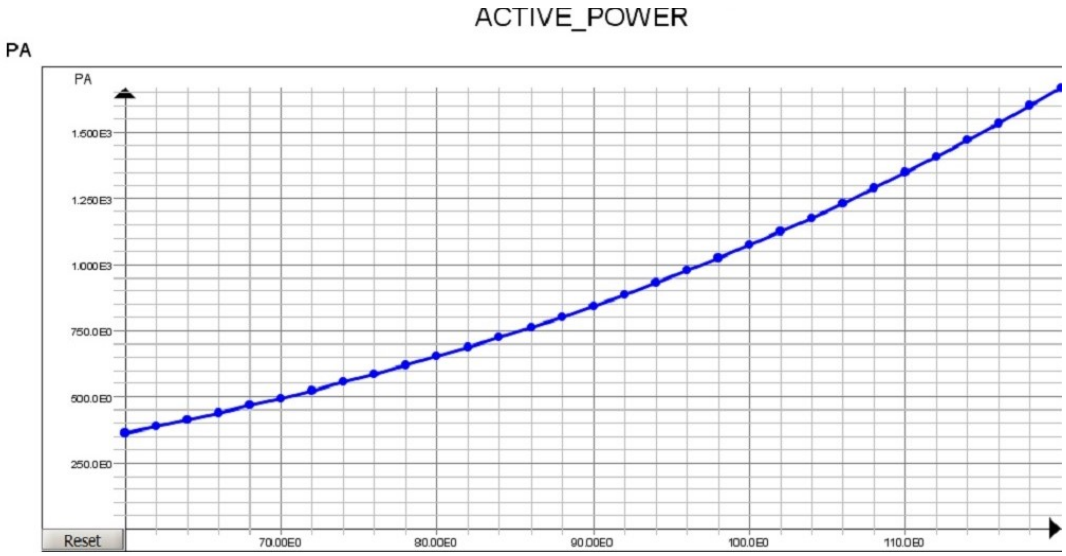


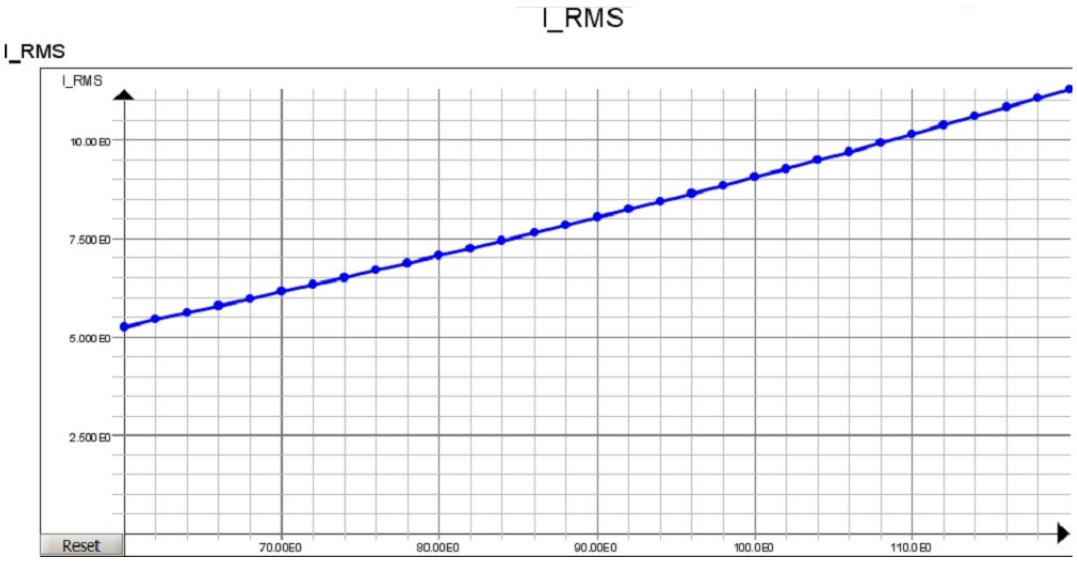
Example 3: Parametric analysis

The third case is a steady state magnetic AC study.

This simulation is a parametric analysis versus voltage in order to get no load current at locked rotor condition. With the previous case, at no load parameter value, it is possible then to obtain the parameters for the equivalent circuit of the machine.

- Display graphic features
- Plot 2D curve of the current
- Plot 2D curve of the active power
- Plot 2D curve of Joule loss in stator core





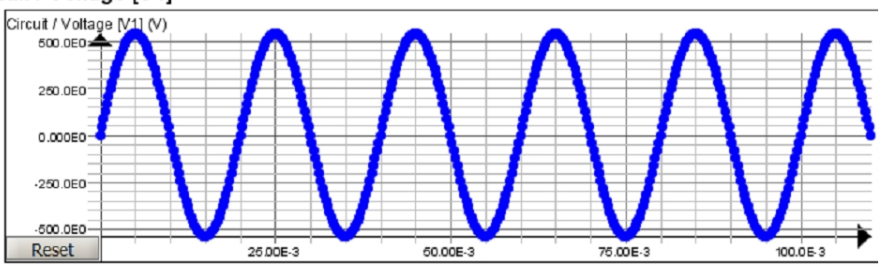
Example 4: Transient simulation for rated load

The fourth case is a transient study.

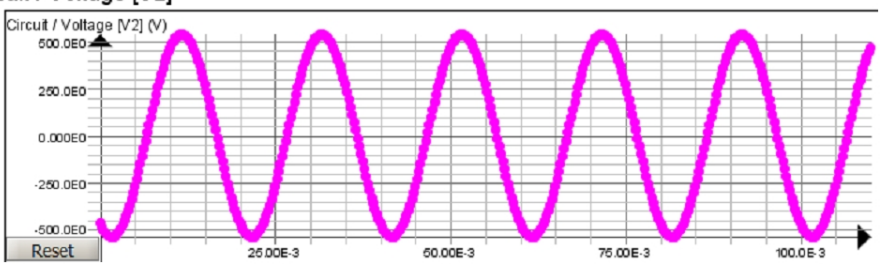
This study is a transient simulation for rated load, initialized from a previous steady state computation at rated conditions obtained from case 2.

- Plot 2D curve of the electromagnetic torque
- Plot 2D curve of the current bar rotor
- Plot 2D curve of the stator current

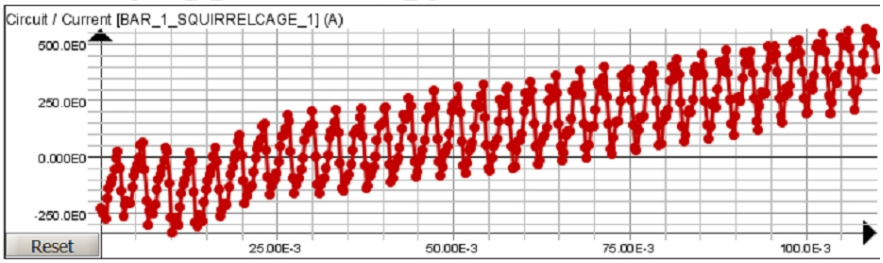
Circuit / Voltage [V1]



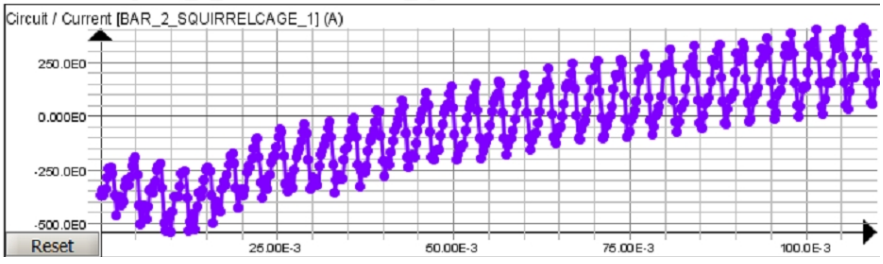
Circuit / Voltage [V2]



Circuit / Current [BAR_1_SQUIRRELCAGE_1]



Circuit / Current [BAR_2_SQUIRRELCAGE_1]



Example 5: Reproduction of real working condition of the motor

The fifth case is a transient study.

The purpose of this simulation is to reproduce real working condition of the motor, from the starting to the addition of the rated load and then applying a single phase fault in the stator windings, in order to display main quantities, like speed, torque, current, etc.

- Plot 2D curve of the phase current
- Plot 2D curve of the speed
- Plot 2D curve of the torque