

MAGCOUPLER MODULE

For co-simulation with JMAG for finite element analysis

Linking FEA motor design to circuit simulation

The MagCoupler Module provides the dynamic link for co-simulation between PSIM and JMAG. With the link, the power converter and control portion of a system can be implemented and simulated in PSIM, while electric machines and other magnetic devices can be implemented and solved in JMAG. The MagCoupler Module is very easy to use, and the link can be easily set up with minimum user effort.

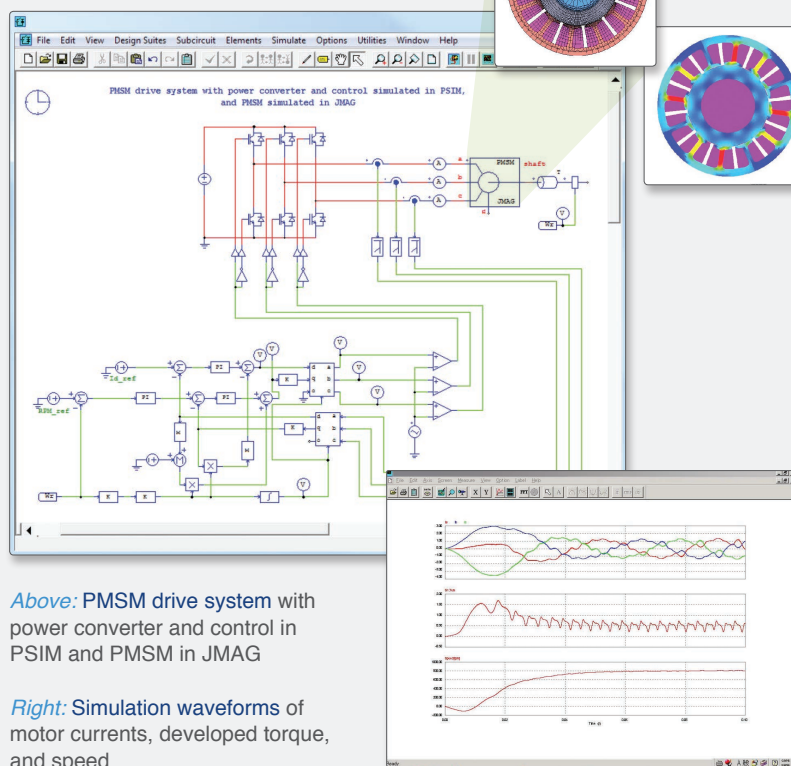
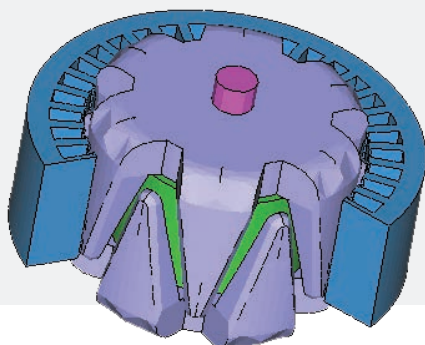
JMAG is a leading finite element analysis (FEA) software for electromagnetic field analysis. It supports the development and design of electrical and magnetic devices such as motors, actuators, and circuit components. JMAG features friendly user interface, powerful mesh generation and editing capability, robust and accurate solver, and comprehensive material database. It is particularly

suitable for rotating devices such as electric machines.

With the MagCoupler Module, motor designers can interface and test their motor design with the intended power converters and control schemes, and optimize the design based on performance, size, and cost. At the same time, the MagCoupler Module expands PSIM's capability to finite element analysis. One can simulate electric machines based on machine dimension, structure, and materials, thus eliminating the need to extract or derive machine parameters. This gives more accurate results that take into account magnetic saturation and losses, time harmonics and space harmonics, and other nonlinear effects that would be difficult to consider otherwise.

FEATURES AND BENEFITS

- Easy to set up; minimum user input
- Complete system simulation with power electronics, control, and electric machines
- Accurate machine modeling in finite element analysis



Above: PMSM drive system with power converter and control in PSIM and PMSM in JMAG

Right: Simulation waveforms of motor currents, developed torque, and speed

MAGCOUPLER-RT MODULE

For link with JMAG-RT files

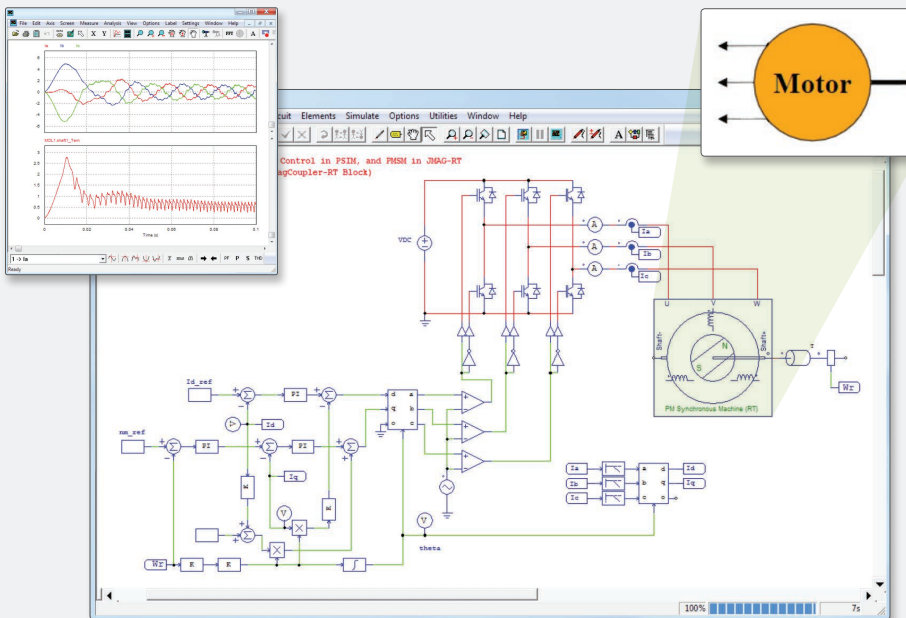
All the benefit but none of the cost of finite element analysis

The MagCoupler-RT Module provides the interface between PSIM and JMAG-RT data files. JMAG-RT is an add-on function of JMAG software. It generates a JMAG-RT data file which is a behavior model of an electromagnetic device such as an electric machine. The behavior model is another way of modeling electromagnetic devices as compared to a finite element model in JMAG.

JMAG-RT data files are obtained by running JMAG simulation in advance, and are stored in a lookup table form. During the PSIM simulation, JMAG is no longer needed, and PSIM interfaces directly with the JMAG-RT data.

The main advantage of JMAG-RT is that, since JMAG-RT data are obtained from JMAG simulation, the accuracy of a JMAG-RT model is comparable to that of a dynamic JMAG model. However, since JMAG is not involved in the simulation, the simulation speed is much faster.

With the MagCoupler-RT Module, one has all the benefit but none of the computational cost of finite element analysis.



Above right: JMAG-RT Model

Above: PMSM drive with power converter and control in PSIM

FEATURES AND BENEFITS

- Easy to set up
- Accurate motor modeling in finite element analysis (FEA)
- Much faster than dynamic link with FEA software

