Capitalizing on 35 years of innovation in the global context of design optimization and time-to-market reduction, Flux finite element software provides solutions to low-frequency electromagnetic and thermal simulation problems.

Flux includes an open and user-friendly interface that is easily coupled with other Altair software to address Multiphysics problems for a variety of systems in 2D, 3D and Skew modeling situations.

**Product Highlights**

Powered by best-in-class numerical techniques, Flux provides fast and accurate results. Featuring extended multi-parametric analysis capabilities, including electrical circuit and kinematic couplings, Flux helps you analyze, design, and optimize a wide range of systems.

**Numerous Applications**

- Rotating machines
- Linear actuators, solenoids
- Transformers & inductances
- Induction heating processes
- Sensors
- Cables, electric connections
- Electromagnetic compatibility

**Benefits**

**Accuracy**

Flux applies advanced numerical methods and well-adapted modeling techniques to produce the most accurate and reliable results in the shortest amount of time.

Flux developers are constantly improving the embedded solvers to increase simulation speed and enable the evaluation of thousands of design configurations.

**Interoperability**

Flux can be coupled with other 3D analysis software to create the most realistic multiphysics representations of phenomena. Considering a device as a component of a larger system or designing its control strategy is also possible by linking Flux to system level simulation tools. Different levels of interaction are possible, ranging from reduced model extraction to full co-simulation.

**Capabilities**

**Wide Field of Use**

- Magnetic, electric, and thermal fields
- Magnetic/dielectric/thermal coupling
- Mechanical coupling
- Multiphysics coupling
- Static, harmonic, and transient analysis

**Parametric Simulation**

Fundamental to working with Flux is defining geometric dimensions or physical characteristics with parameters. Linking several parameters together through equations is very easy. The influence of any parameter in a simulation event can be intuitively explored and visualized through multidimensional curves and animations of color shades or arrows.

Learn more: [altairhyperworks.com/flux](http://altairhyperworks.com/flux)
Flux density in an induction machine with Skew rotor

Flux induction heating application

15% gain on response time - Actuator response time optimization

- Parameterized analysis
- External circuit connection

**Powerful Geometric Description**
- An easy sketcher of 2D geometry, including parametric capabilities
- Embedded 3D modeler with fully parametrized modeling constructs
- Advanced CAD import & export functions
- Deforming and simplification capabilities
- A dedicated environment for electric rotating machines designed in 2D and 3D

**Easy and Flexible Mesh Generator**
The Flux® mesh generator provides different mesh types and meshing technologies that can be mixed in both 2D and 3D situations:
- Smart automatic mesh generation based on geometry & physics
- Fine manual control of mesh size and distribution
- Mapped mesh and linked mesh
- Auto-adaptive mesh refinement during solving in 2D & 3D

**Advanced Modeling Techniques for Accurate and Fast Results**
- Infinite box for open boundary problems
- Non-meshed coils
- Thin regions represented by surface models
- Fast evaluation of geometry skewing effect
- Non-linear anisotropic material behavior
- Hysteresis modeling
- Skin and proximity losses in windings

**Robust Solving**
- Fully parametric solver enables geometrical or physical parameter sweeps
- Several iterative and direct linear solvers with multiprocessing
- Non-linear solvers
- Distributed parametric studies across several cores or machines
- Auto-adaptive mesh and time-step parameter sweeps

**Post-Processing**
Flux® gives access to various quantities including:
- Electric and magnetic fields temperature
- Magnetic flux, inductances, energy
- Skin and Joule losses
- Position, velocity, force, torque, speed
- Skin effect visualization
- User-defined quantities
- Maps, isovalues, and vector plots
- Animations
- 2D and 3D curves
- Spectral analysis
- Cutting planes
- Look up tables for system simulation
- Export capabilities (Excel, text, and more)

**Multiphysics**
Flux provides fully cabled solutions to set up co-simulations and exports with specialized tools focusing primarily on magnetothermal and magneto-vibro-acoustics analysis.

**Magneto Thermal Analysis**
Coupling Flux with CFD simulation tools like AcuSolve, CD-Adapco STAR-CCM+ or ANSYS Fluent makes results even more powerful by taking into account fluid dynamics, and enhancing the accuracy of the thermal analysis. Efficient and accurate design is possible with Flux thanks to all the available thermal couplings!

**Vibroacoustic Coupling for Noise and Vibration Reduction**
Electromagnetic forces are the source of noise in electromagnetic structures. Flux is able to accurately compute these forces with vibration analysis tools such as OptiStruct, LMS Virtual.Lab, MSC Nastran or ANSYS Mechanical.

**Advanced System Integration**
Considering the component in its mechatronic environment is key to really optimizing its performance. Flux offers multiple couplings with system-level tools:
- Flux-Activate and Compose or MATLAB® Simulink for drive & control
- Flux-LMS Imagine.Lab Amesim for complex mechanical loads
- Flux-Portunus for mechatronic systems

**Simulation Process Automation**
- Define macros and interfaces
- Simplify processes from geometry generation to post-processing results via command language derived from Java and Python object-oriented languages.
- With its API, Flux can be driven by any kind software.

**Optimization**
Boost your Flux capabilities with Altair HyperStudy, a powerful and reliable optimizer that does not require you to be an expert in optimization methods. Well-adapted to drive FEM models, HyperStudy goes beyond simple parametric studies, which allows for significant gains in your designs.

**High Performance Computing (HPC) solutions**
Affordability of computers with multiple processors or clusters now brings new possibilities to simulate many design configurations concurrently. The distribution of parametric calculations is directly available in Flux for all applications.