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Electromagnetic Actuators Modeling, Simulation and Optimization

Electromagnetic Actuators Simulation and Optimization

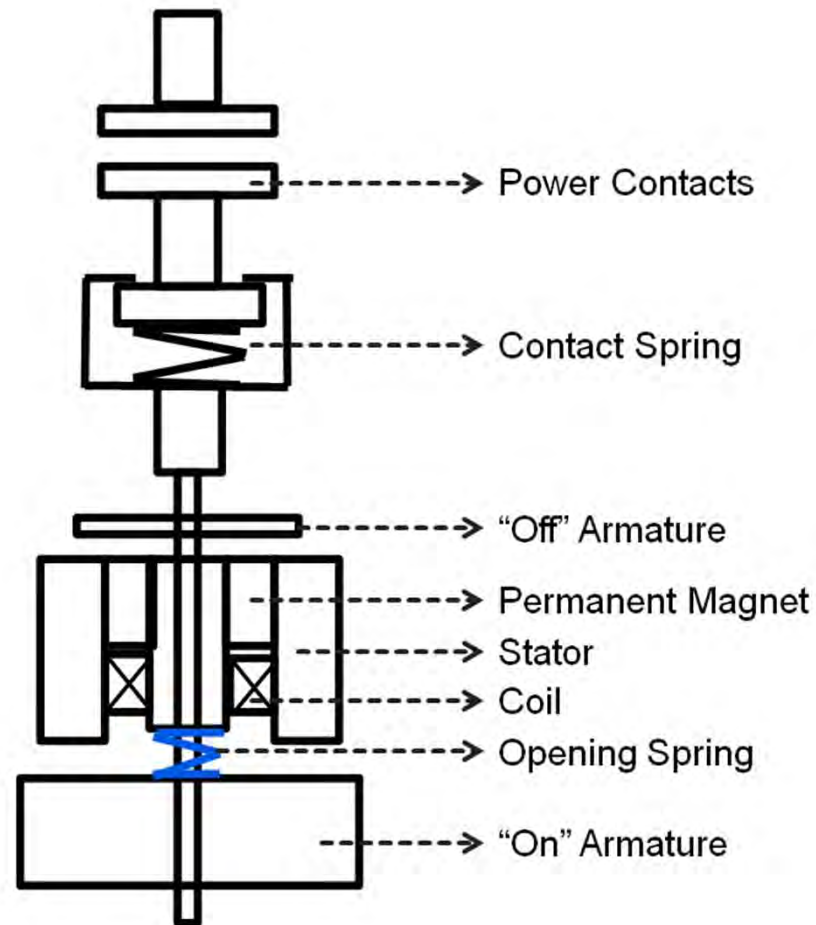
GridShield recloser



- The ABB 3-phase GridShield® recloser is a well known medium voltage protection device in which single coil actuators are used as the main component driving the opening and closing of the device
- It has the ability to perform as a recloser, sectionalizer or automated load break switch.
- The proven design is rated for 10,000 full load operations

Electromagnetic Actuators Simulation and Optimization

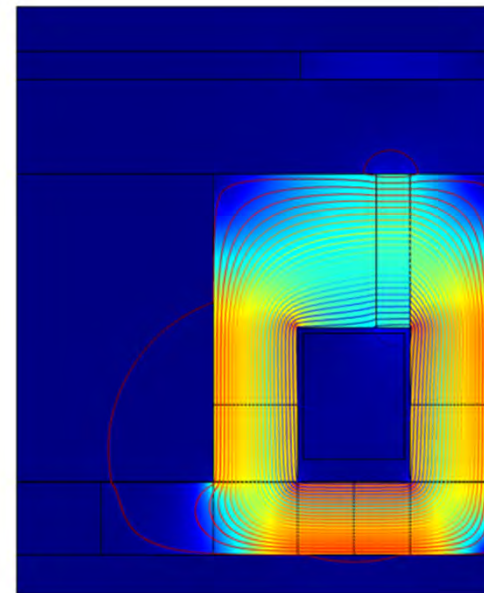
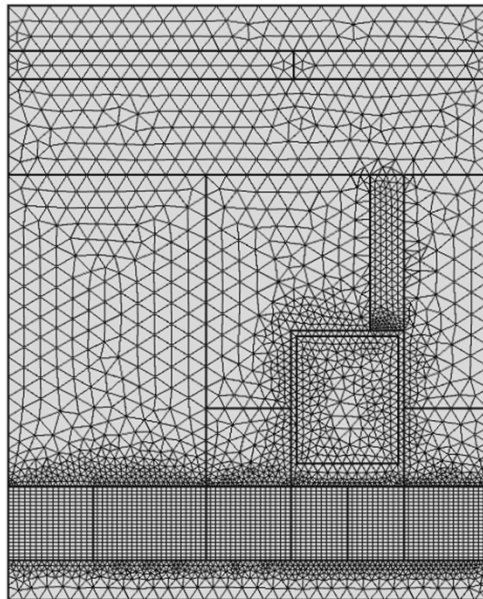
Operating Principle



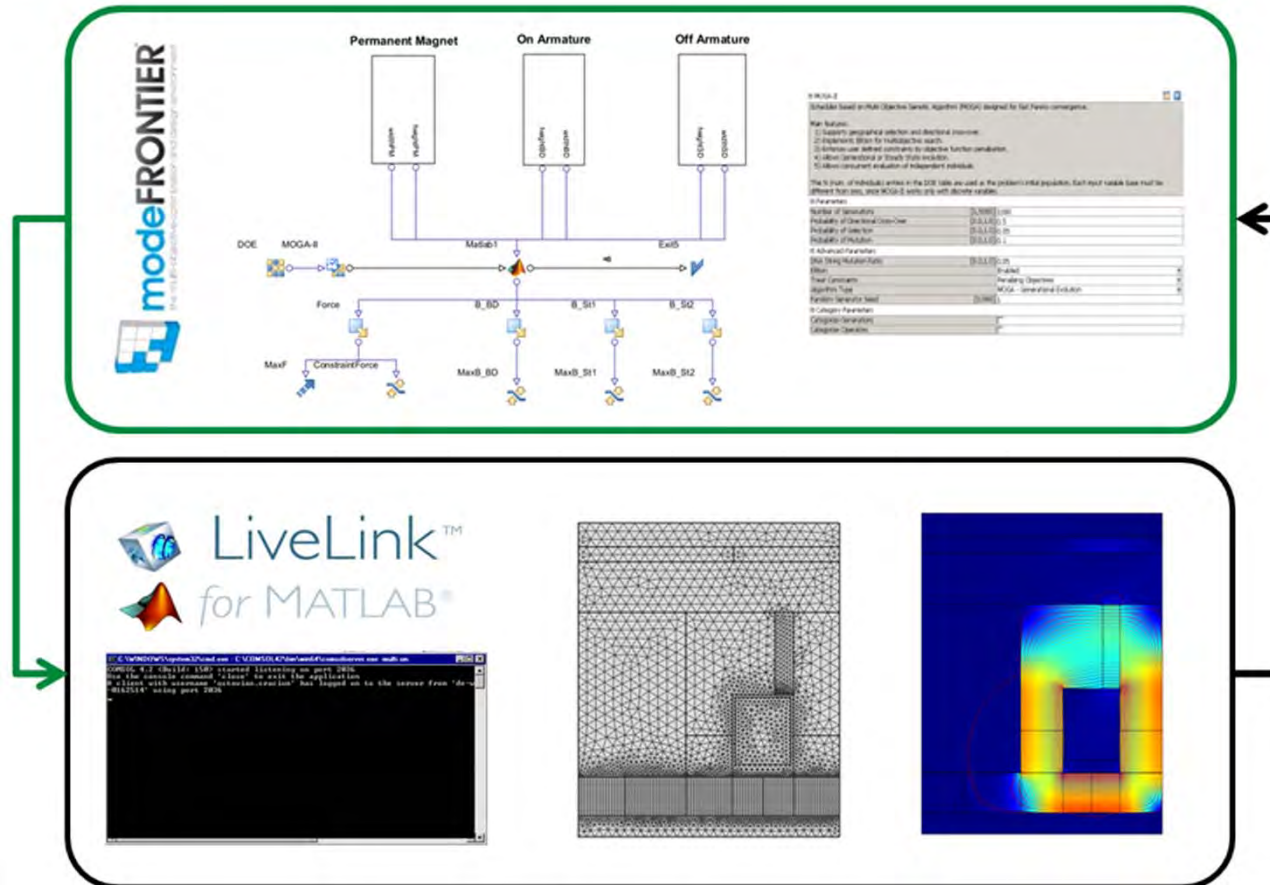
Electromagnetic Actuators Simulation and Optimization

2D Static Simulations

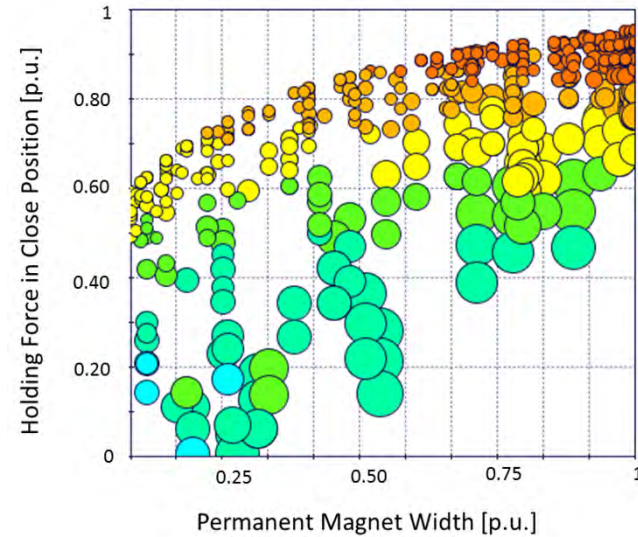
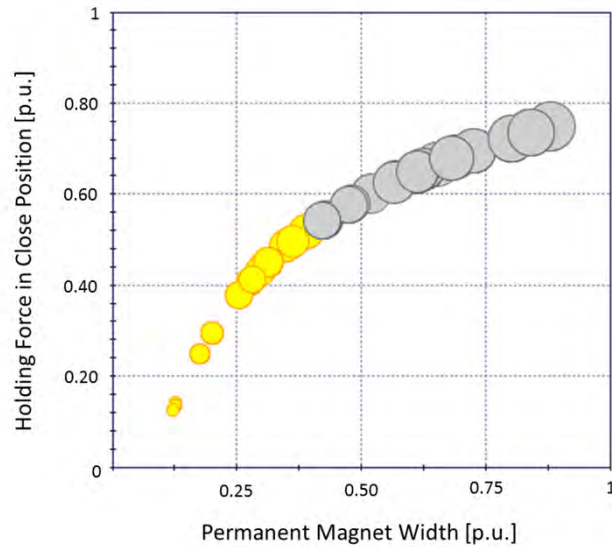
- The 2D Static Actuator modeling involves the usage of the magnetic fields interface.
- The multi-turn coil domain feature is being used for the actuator's coil modeling.
- The holding force in close and open position is being computed (based on the Maxwell Surface Stress Tensor).



Electromagnetic Actuators Simulation and Optimization Optimization Approach



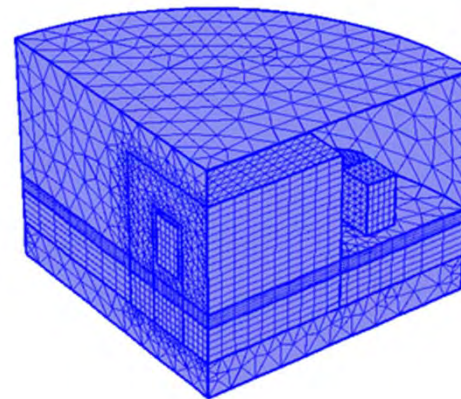
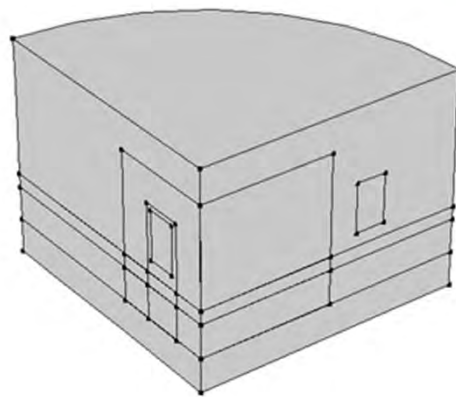
Electromagnetic Actuators Simulation and Optimization Optimization Results



Electromagnetic Actuators Simulation and Optimization

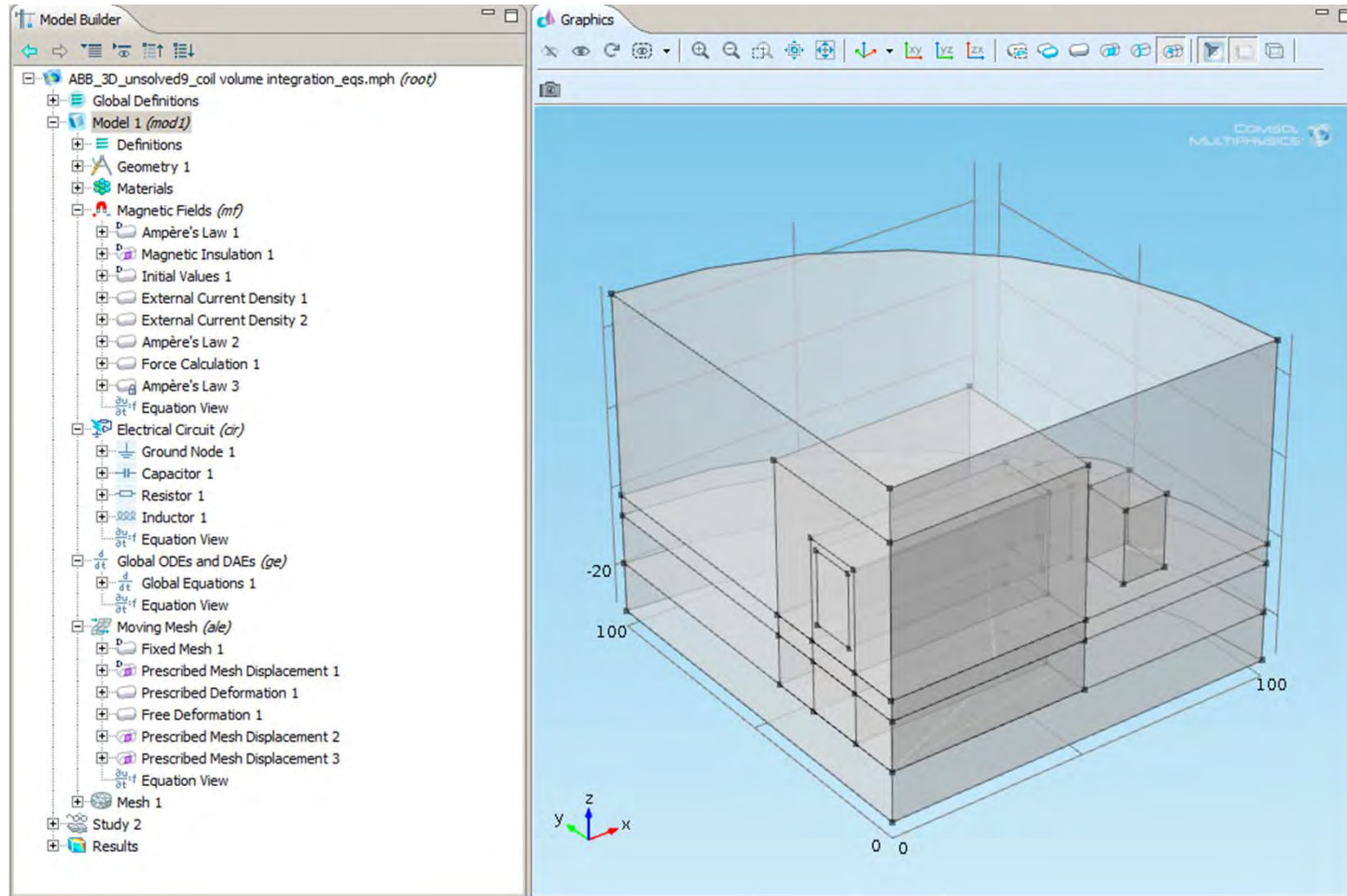
3D Dynamic Simulation

- Actuators dynamic modeling requires the coupling of:
 - Magnetic Fields (mf) Interface
 - Electric Circuit (cir) Interface
 - Moving Mesh (ale) Interface
 - Global ODEs and DAEs (ge) Interface



Electromagnetic Actuators Simulation and Optimization

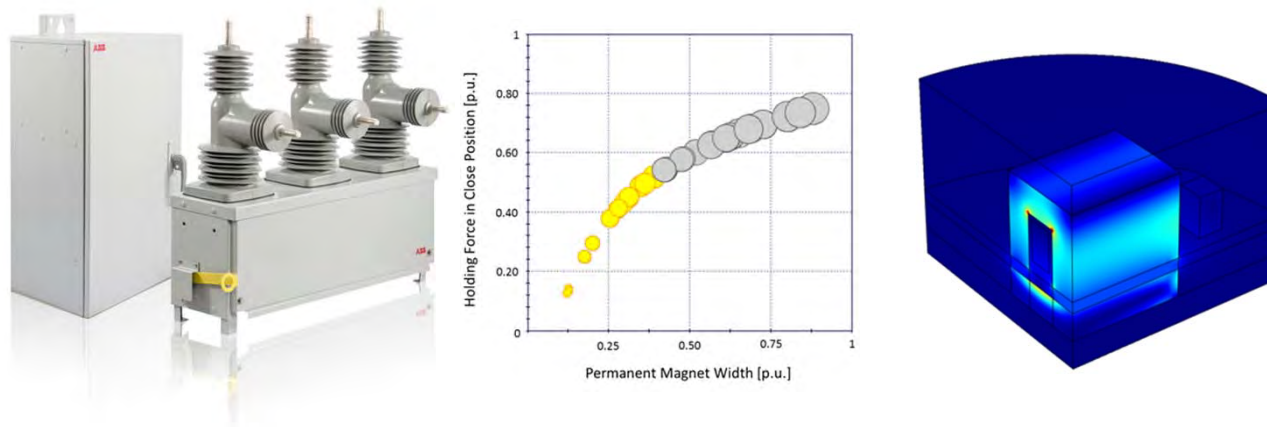
3D Dynamic Simulation



Electromagnetic Actuators Simulation and Optimization

Conclusion and future work

- FE simulation and optimization study platform for medium voltage reclosers.
- The influence of different design parameters is analyzed in order to enable the robust design of switching devices.
- Further work will focus on the 3D dynamic modeling by using of the new V4.3a functionalities - especially with regards to the coil modeling (Numerical Coil or Multiturn Coil Domain)



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