



### Tutorial Title:

Motor drive design and evaluation using multi-domain tool suite for faster development process

### Organizer:

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### Abstract:

**Note: This tutorial leverages multiple solutions from Altair (Activate/Compose/Embed/PSIM ) and an evaluation copy of the products/license could be obtained from <https://altairone.com/Marketplace>**

A key objective with all designers is to reduce development time and costs. Motor drive development requires teams from different domains to work closely during the design process which involves design and development of the motor, power converter hardware, control algorithms, PCBs, automatic embedded code generation, EMI, etc. Simulation allows for rapid development and testing. A proper tool suite that can cover various aspects of the motor drive development process will allow more to be done in simulation, so that when prototypes are built, they can be tested and verified with confidence. Better prototyping means fewer design iterations to prove a design is ready for production deployment

This tutorial will present design workflows that leverage the full suite of Altair's tools for a comprehensive simulation to production grade motor drive development. The following aspects of the drive development will be considered:

- Power converter hardware design including device selection such as IGBT vs SiC devices
- Motor design
- Close loop control design
- Non-ideal switch models, PCB parasitics, and analysis of conducted EMI
- Complete motor drive efficiency map
- Embedded Firmware development and verification
- System level simulations such as:
  - Torque speed load profiles
  - Mechanical structure impacts
  - Tuning Control gains via interactive Hardware in the Loop

Where applicable automation and scripting will be utilized to reduce manual activities required by designers.

- The tutorial will showcase how different design tools can be used in various design stages. PSIM, power electronics simulation
- Flux, machine FEA simulation



- Activate/Compose, System model control and scripting
- Pollex PCB design
- Embed, Model based automatic code generation for drive development
- Motion Solve

#### Bio:

**Albert Dunford** received his undergraduate degree in applied science from UBC in 2007. He joined Powersim 9 years ago and is the primary technical contact ensuring user success for North American PSIM users ever since. He regularly hosts live webinars and generates tutorial videos on a wide range of topics covering the full spectrum of power converters and motor drives. Albert has worked closely with all customer types from graduate students to experienced designers in all industries to ensure that they can use the full depth of PSIM functionality for their simulation needs. Before joining Powersim, he worked on industrial voltage regulators/conditioners and with an applied bio-physics spin-off company, Boreal Genomics. With Boreal, he designed the electronics for a novel DNA separation method. The method, SCODA, utilizes high voltage rotating fields and changing thermal gradients to separate DNA based on sequence with applications including cancer detection.

**Sreeram Mohan** received his undergraduate degree in Electronics and Telecommunications from India. His career spanning across 16 years started as a technical support engineer supporting heterogeneous Software Defined Radio platforms involving DSP/FPGAs and serving in various roles spanning across Quality Engineering, software Development and contributed to specialized toolboxes in Model Based Development tools. He also served as a consultant at TCS (Tata Consultancy Services) in research projects on applying Artificial Intelligence for Prognostics/Diagnostics for Aircrafts resulting also in generated patented work around DPHM (Diagnostics Prognostics Health Monitoring) in Real time systems. In the current stint he is serving as a Vice President (Engineering and Product Management for Altair's Math and Systems portfolio of Model based tools).