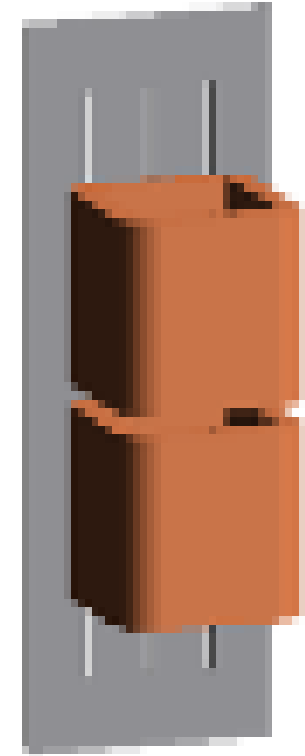


Field Loss in Power Transformer

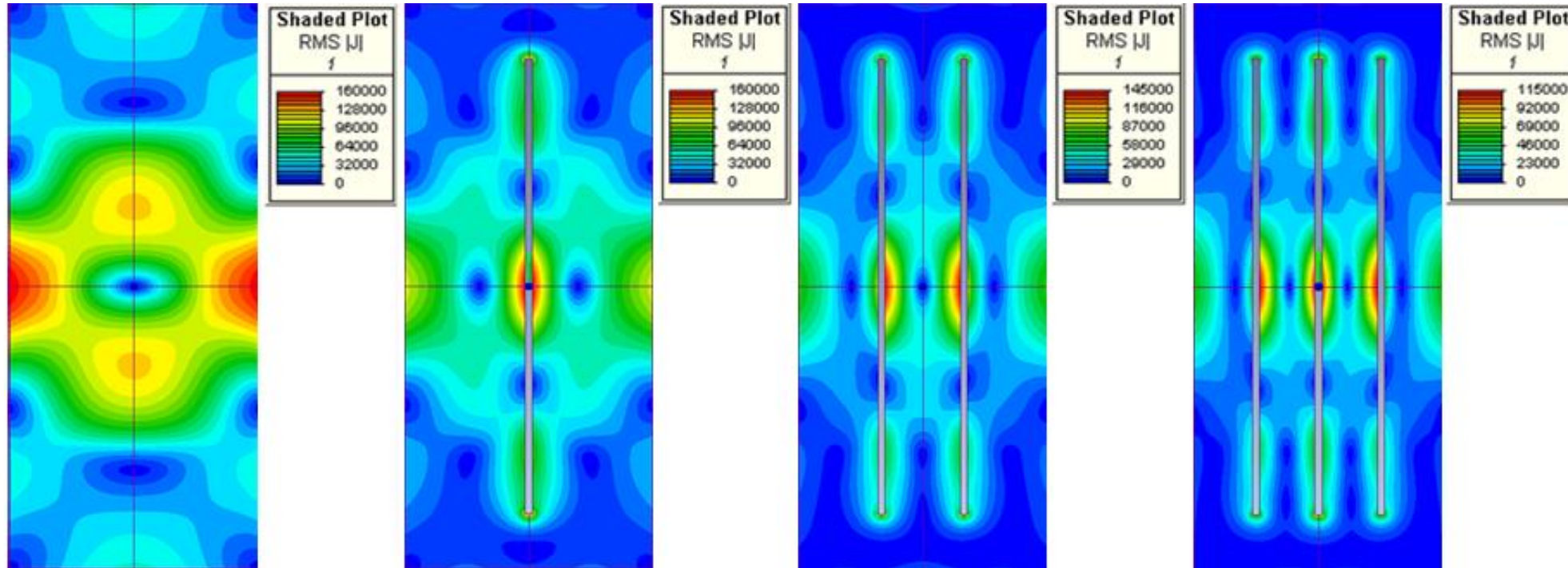
3-phase Transformer

Shielding can be used to substantially reduce magnetic field strengths outside of a transformer. Considerations such as its electric properties and geometry are needed to determine the type of shielding required. Presented here is MagNet's analysis of the second set of configurations from the family of benchmarks involving two exciting coils directed in opposite directions and shielded by a non-magnetic steel plate. The steel plate has four configurations; no slot, one slot, two slots and three slots. The eddy current losses are compared in all configurations to measured results. By taking advantage of symmetry present in the geometry, only a quarter of the model can be modelled, which decreases the time required to complete the simulation.

The following is based on the Testing Electromagnetic Analysis Methods (T.E.A.M.) Problem #21: 3-D Stray Field Loss Model: Benchmark Family. The benchmark can be found on the International Compumag Society's website.

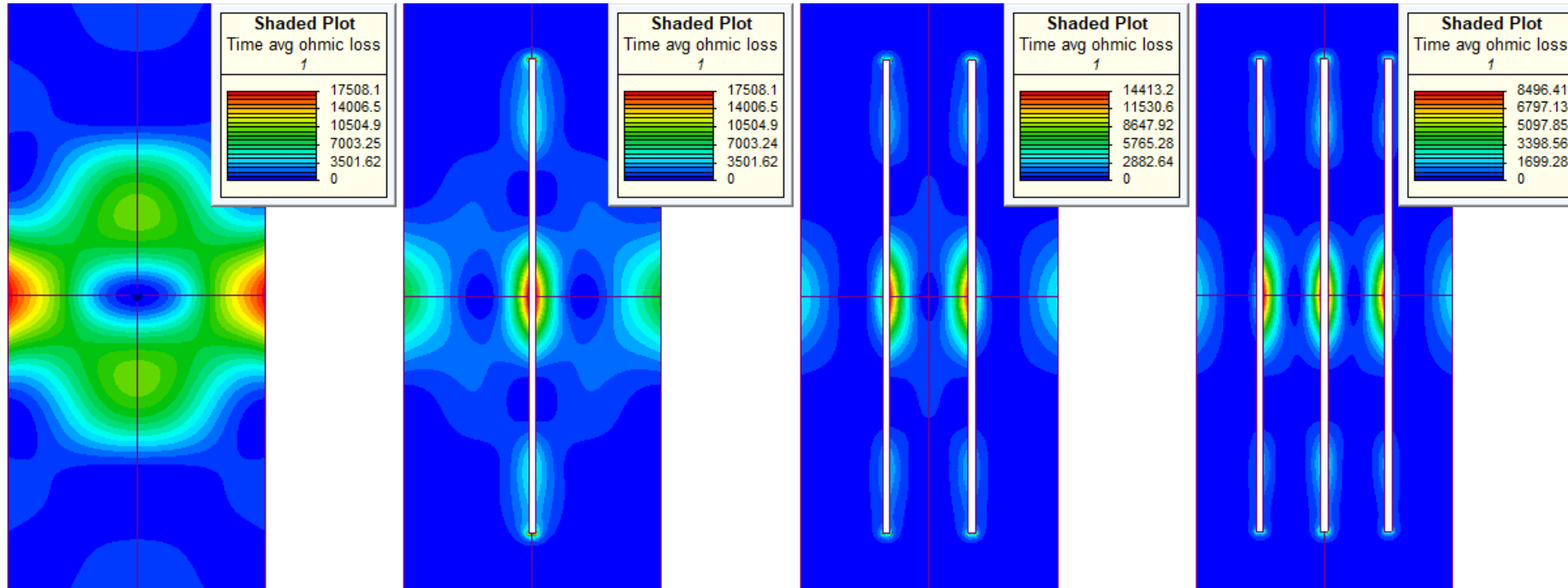


OHMIC LOSS FIELD PLOTS



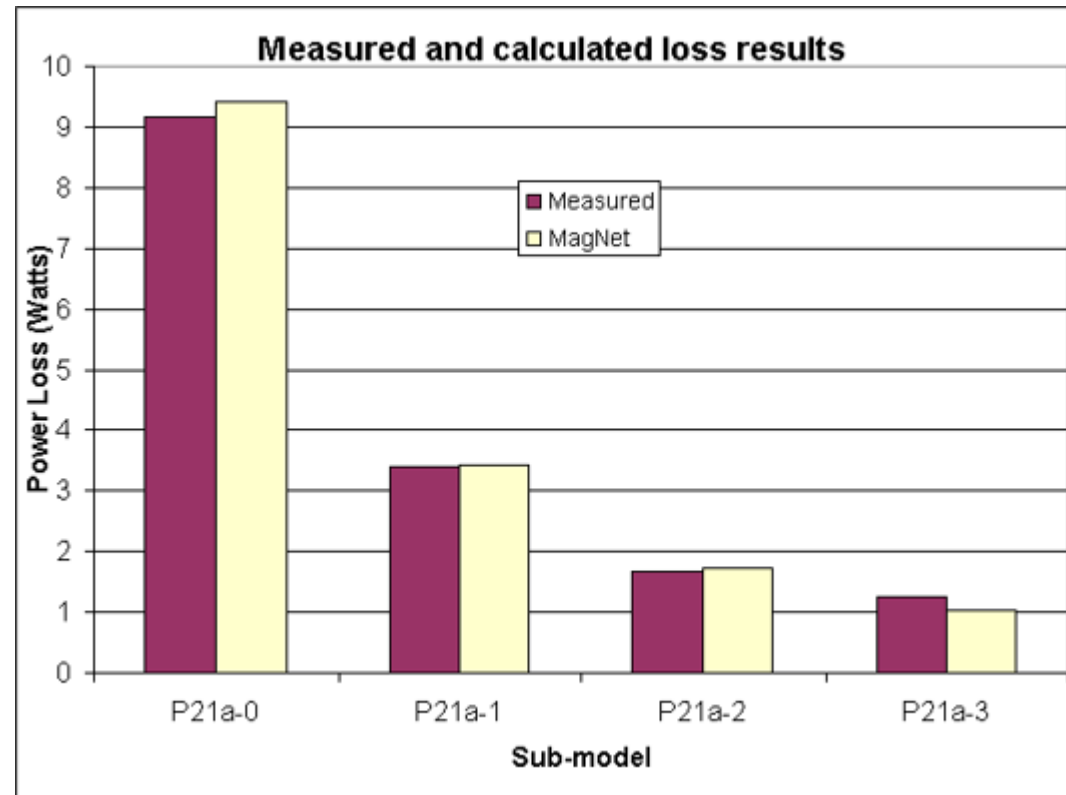
Since the sources powering the transformer are sinusoidal, MagNet's Time-Harmonic 3D solver can be used to simulate this model. Shown here are the shaded current density plots of the induced eddy currents in the four steel plate configurations.

OHMIC LOSS FIELD PLOTS



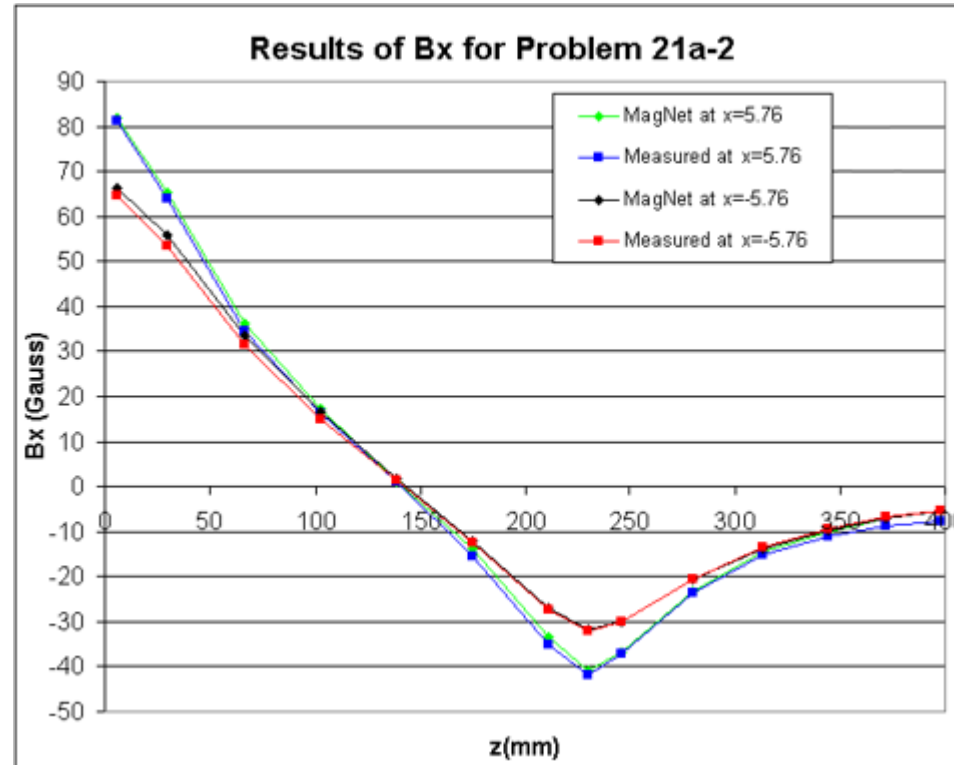
Along with shaded current density plots, MagNet's post-processor also automatically computes ohmic loss fields. Shown here are the shaded ohmic loss field plots for the four steel plate configurations.

GRAPHICAL COMPARISON BETWEEN MAGNET AND THE MEASURED RESULTS



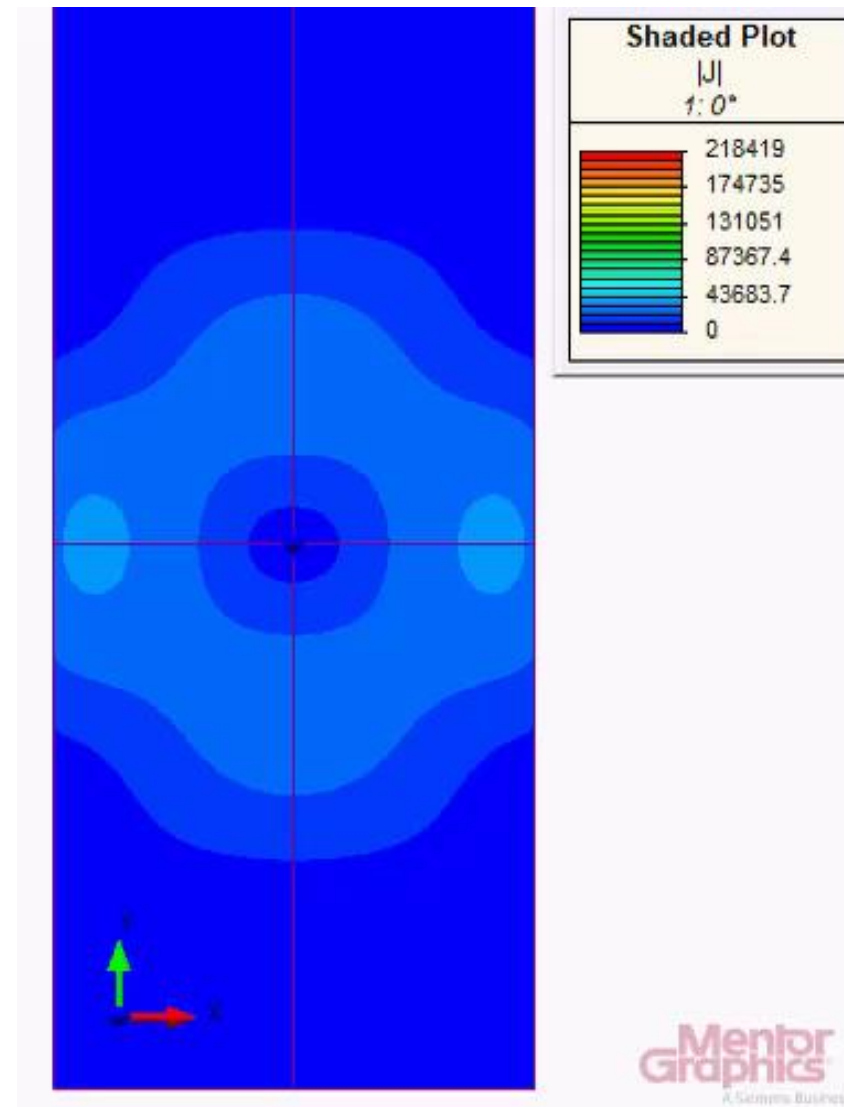
The integral of the ohmic loss field in MagNet is used to compare to the measured eddy current model of TEAM Problem 21a. Shown here is a graphical comparison of power losses for the four steel plate configurations.

GRAPHICAL COMPARISON BETWEEN MAGNET AND THE MEASURED RESULTS

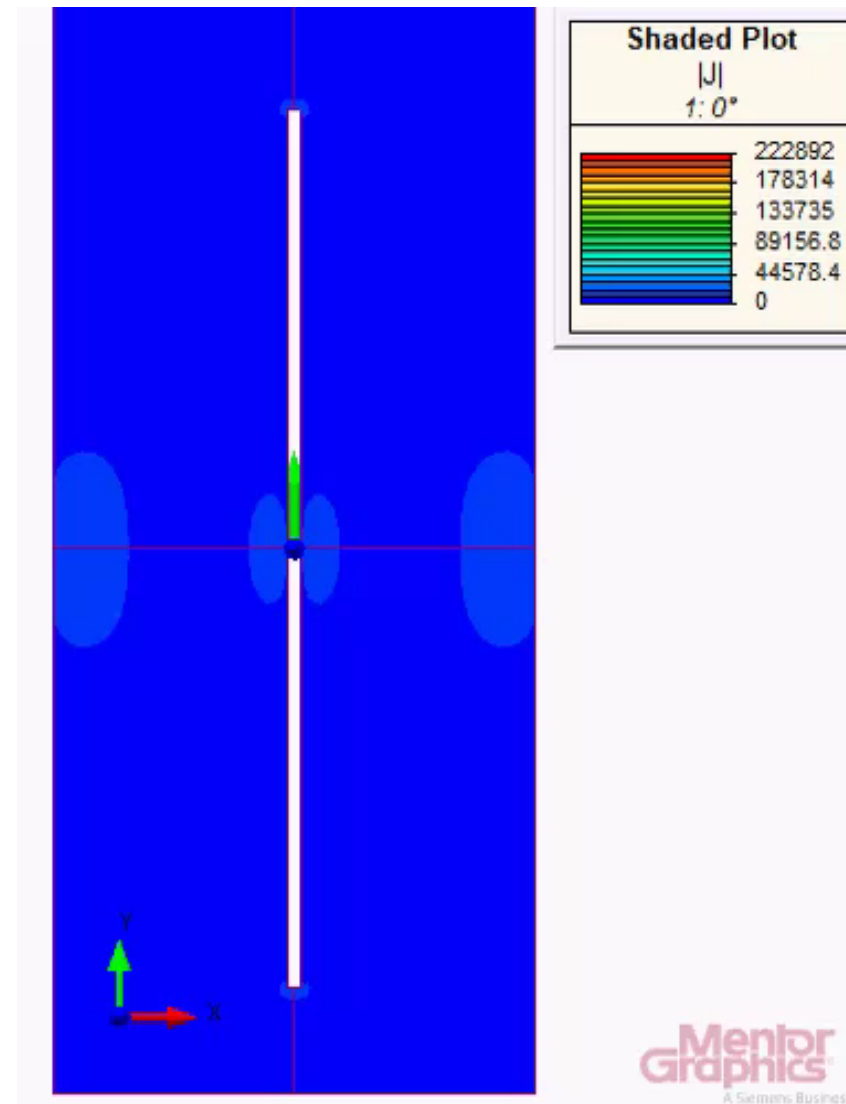


In addition to measured power loss values, TEAM Problem 21a also presents measured magnetic flux densities along contours off of the surface of the steel plate for configuration 21a-2. Shown here is a graphical comparison between MagNet and the measured results along the two contours.

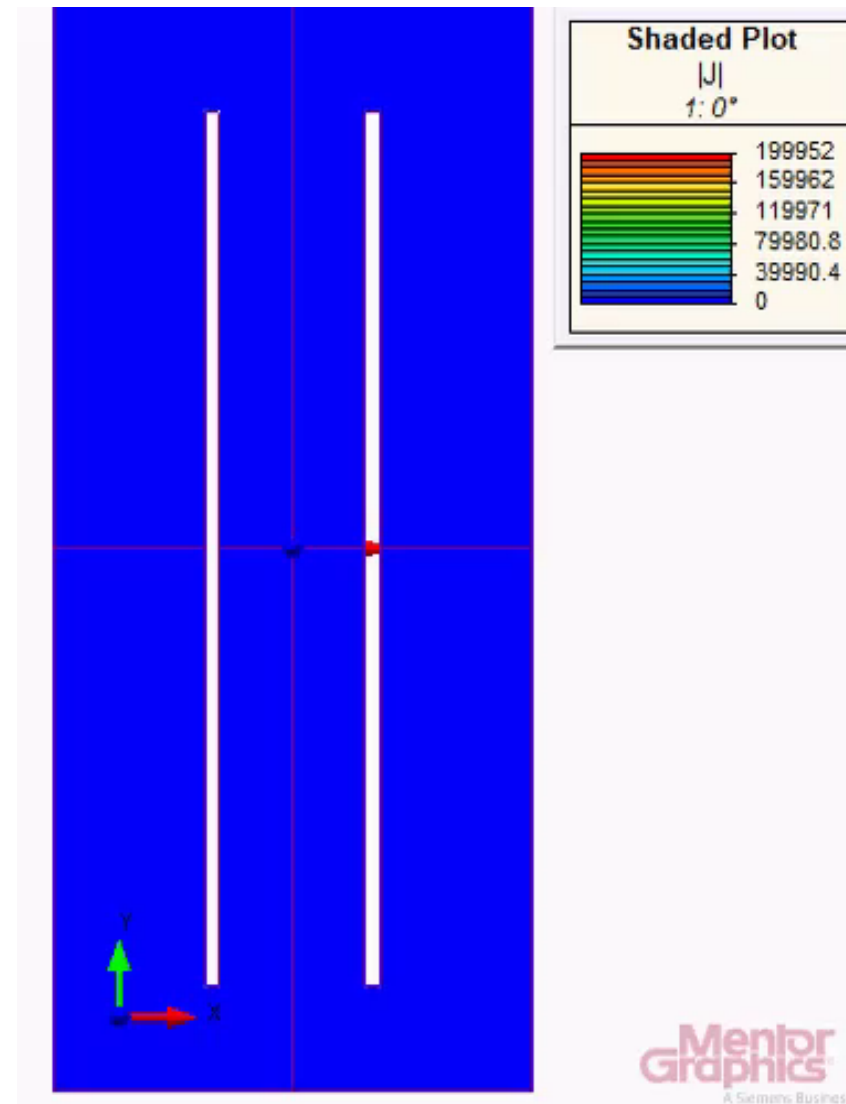
Current density animation of steel plate with no slots



Current density animation of steel plate with one slot



Current density animation of steel plate with two slots



Current density animation of steel plate with three slots

