

## ADVANCES IN BEAM OPTICS ANALYZER

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Calabazas Creek Research, Inc. (CCR) has made several advances to its Beam Optics Analyzer (BOA). BOA is now a mature, stable and very robust code. It provides accurate results and valuable information to assist microwave tube engineers. It has been used to design several devices including a multiple beam klystron, an inductive output tube and a multistage depressed collector. It is an adaptive mesh, finite element, charged particle trajectory modeling tool for designing 3D electron devices [1]. Its built-in optimizer allows designers to obtain optimal designs for Brillouin focused electron guns for traveling wave tubes and confined flow Pierce electron guns for high power devices [2].

Its mesher based on Simmetrix technology is tightly integrated with its finite element field solver to facilitate optimization and provide users ease to generate the initial mesh with fine grain control. Its nonlinear magnetostatic field solver expands the analysis capability of the designer and also allows him to use the same geometry for all three types of analyses, electrostatics, magnetostatics and beam optics. An analysis case can contain all three types, and switching among three is simply a click of a button.

BOA is fully parallelized. Its particle pusher and field solver use every available CPU cores. The GUI of BOA is powerful and intuitive allowing the user to create a case for a given geometry in matter of minutes. Its post-processor is able to plot particle trajectories selectively by its currents, ID's or generations, and electromagnetic fields in regions, on a surface, along an arbitrary line or even at a point. It is multithreaded allowing viewing results while the particle pusher, field solvers or optimizer is running.

This paper will present all BOA features in details, demonstrate its GUI in action and its post-processing capabilities.

1. R. Lawrence Ives, Thuc Bui, William Vogler, Jeff Neilson, Mike Read, Mark Shephard, Andrew Bauer, Dibyendu Datta, and Mark Deal, *Beam Optics Analysis - An Advanced 3D Trajectory Code*, AIP Conference Proceedings, 7th Workshop on High Energy Density and High Power RF, Vol. 807, pp. 292-298, January 3, 2006.

2. T. Bui, L. Ives, A. Attarian, J. David, H. Tran, M. Posth, *An Optimizer for Beam Optics Analyzer*, ICOPS, San Diego, 2009.