

## Opera Optimizer Module

The most important thing we build is trust

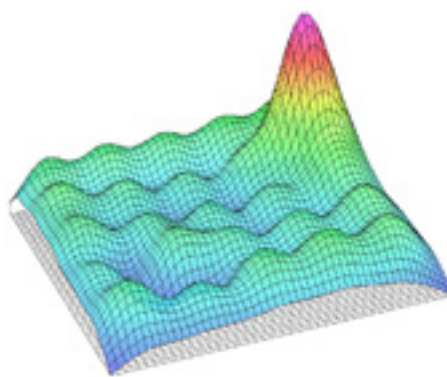
The Optimizer software tool can assist users in achieving optimal designs. Fully integrated with Opera, it can enable quick and easy investigations of possible design spaces for multiphysics problems. It uses an efficient optimization algorithm that combines deterministic and stochastic methods that is used to solve single and multi-objective optimization problems.

Users can set optimization problems in minutes, and leave their computer to work out the best solution for one, or multiple goals. The Optimizer saves an enormous amount of the normal design effort needed to realise a company's design goals – whether they are lowest cost, highest performance, simplest to manufacture, smallest size (or any other parameters).

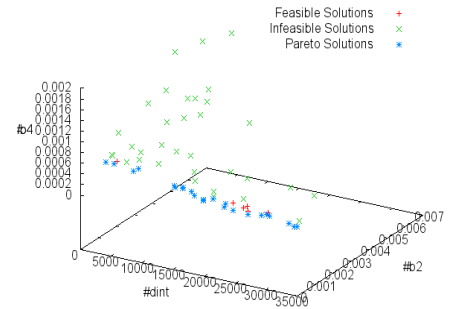
Users can choose optimization variables from any of the user defined variables in Opera, allowing them to vary geometry data, drives and even material data in order to achieve desired objectives. By defining inequality and equality constraints users can restrict the range of the design space. They can define different levels of constraints, depending on whether they can be evaluated as a feasible design during the model creation phase or obtained as an output of the finite element analysis.

The Optimizer offers users solutions to both single objective and multi-objective problems. By defining the optimization objectives as the output of the simulation the Optimizer can then evaluate and store these. This offers users an informative set of results which they can interrogate to select the optimal design.

The Opera Optimizer uses a design of experiments method to determine the best distribution of the initial designs in the design space. Based on the mathematical model of the design space obtained using Kriging interpolation, the module deploys a stochastic method (Particle Swarm Optimization) to further advance the optimal front. The complete set of solutions is usually known as a population and each of its components (in this case the models) are known as individuals.



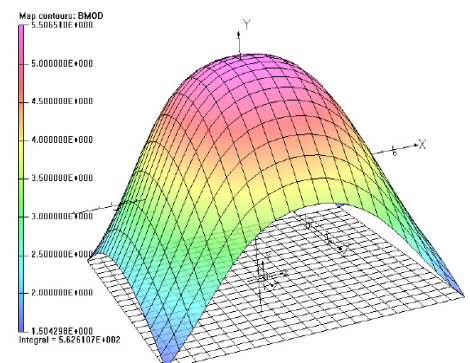
In multi-objective scenarios, the algorithm identifies Pareto-optimal solutions for which no other designs have been found that are better or equivalent for all objective functions. The user can choose to store the finite element solutions of the entire population, only of the individuals



that make up the Pareto front or to store the results and re-create the optimal models after the optimization is complete.

Users can define easily optimization problems using the dedicated dialogs which allow users to set:

- Design variables, along with numerical limits
- Inequality and equality constraints
- Objective functions and whether they are to be minimized or maximized

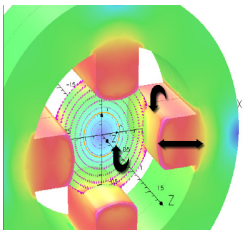


## Opera Optimizer Module

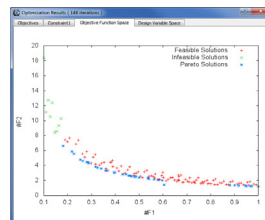
The most important thing we build is trust

The optimization process itself can be controlled by the user by means of:

- Termination criteria for the optimization algorithm
- Design of the initial population distribution, where the user can choose from a Standard Hammersley sequence or a regular grid
- Set of solution databases to keep

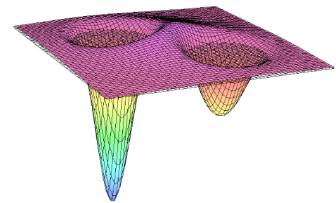


The results of the Opera optimization are displayed in the Optimization Results tab where they are dynamically updated. Optimization individuals are ranked and colour coded, with the Pareto-optimal solutions presented at the top of the list.



Graphical output of the optimization data is also available, displaying the evolution of the optimization objectives (as a function of generation number), the objectives space and design space.

The user has the option of modifying optimization objectives and constraints while the optimization is running. This allows a real-time re-calibration of the optimization problem and a change in the optimization aim. In addition, optimizations can be temporarily halted and the data files moved to other disk locations or computers where the optimization can be restarted.



The Optimizer also supports a parameter sweep using a regular grid in design variable space.

## Customer Support

We provide support to Opera users from our offices in the UK and the USA, and through a worldwide network of local representatives. Our support engineers have an extensive knowledge of EM analysis and applications, and are available to assist both existing and prospective customers with their design requirements.

For more information about Opera and multi-physics simulation for EM devices and systems, please refer to our website [operaFEA.com](http://operaFEA.com). This website includes links to application specific websites that contain information, including a range of technical publications, videos and webinars, of interest to engineers and scientists involved in electromagnetic design and analysis.

### Cobham Technical Services UK

Network House, Langford Locks,  
Kidlington, Oxfordshire, OX5 1LH  
T: +44 (0)1865 370151  
F: +44 (0)1865 370277  
E: [vectorfields.info@cobham.com](mailto:vectorfields.info@cobham.com)

### USA

1700 N Farnsworth Ave,  
Aurora, IL 60505, USA.  
T: +1 (630) 851 1734  
F: +1 (630) 851 2106  
E: [vectorfieldsinc.info@cobham.com](mailto:vectorfieldsinc.info@cobham.com)



[operaFEA.com](http://operaFEA.com)