

# RaptorX™

High-capacity Electromagnetic Modeling



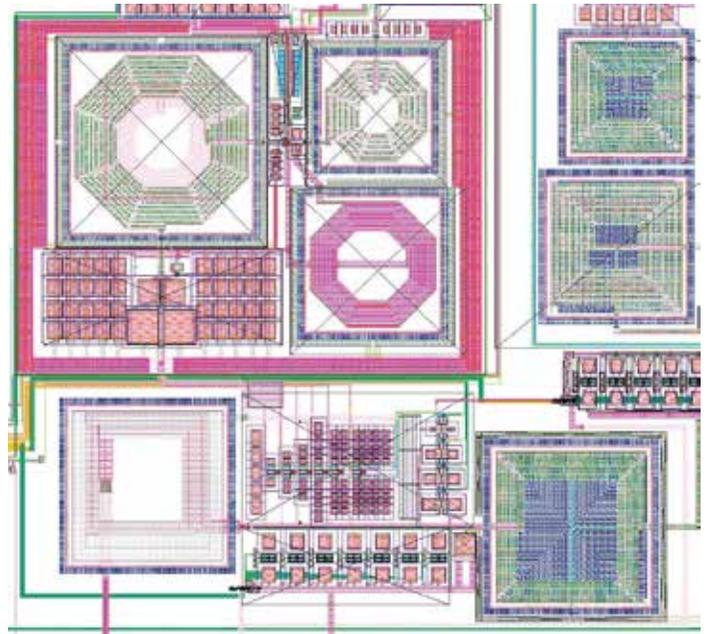
RaptorX™ is a novel pre-LVS EM modeling software for the electromagnetic expert and the IC design engineer. The limitless capacity of its engine in combination with highly accurate results and blazing fast modeling times are the core differentiating factors compared to any other traditional EM tool currently available.



# Pushing the limits on capacity

As the complexity of the circuit increases, your design may include hundreds of ports or nets. RaptorX is the only product in the market which can calculate RLCK parasitics for highly complex circuits such as full custom blocks, power grids, and clock trees.

RaptorX can accurately extract any arbitrary routing and layouts with planes (solid or perforated), round shapes, MiM/MoM capacitors, etc.

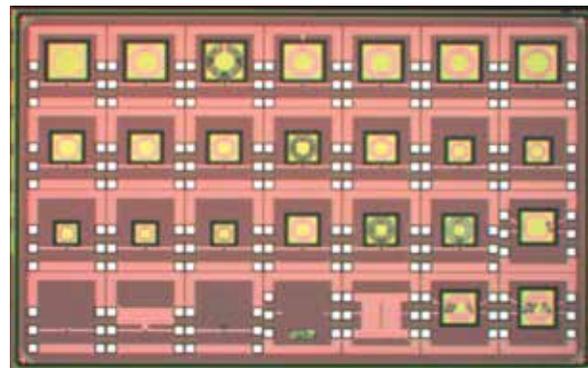


# Unprecedented modeling and simulation speed

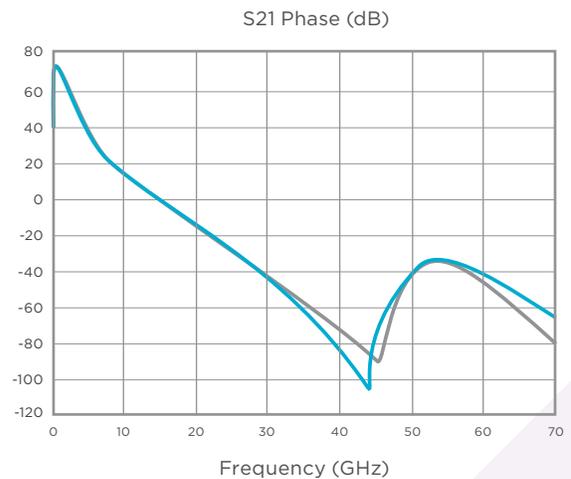
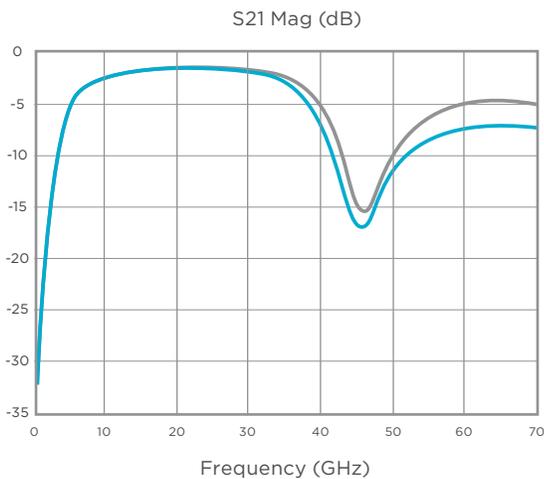
With RaptorX, RLCK modeling and simulation is completed in minutes compared to other solutions which can take hours. Furthermore, its speed accelerates linearly with the number of cores.

# Proven Accuracy

Helic benchmarks the accuracy of its modeling engine against lab measured data from hundreds of devices implemented in silicon every year. The pool of measured devices now numbers over 3000 and covers all production technology nodes. Models are benchmarked against measurement up to 110GHz. A large number of designs based on Helic models are in production across multiple customers serving multiple market applications.

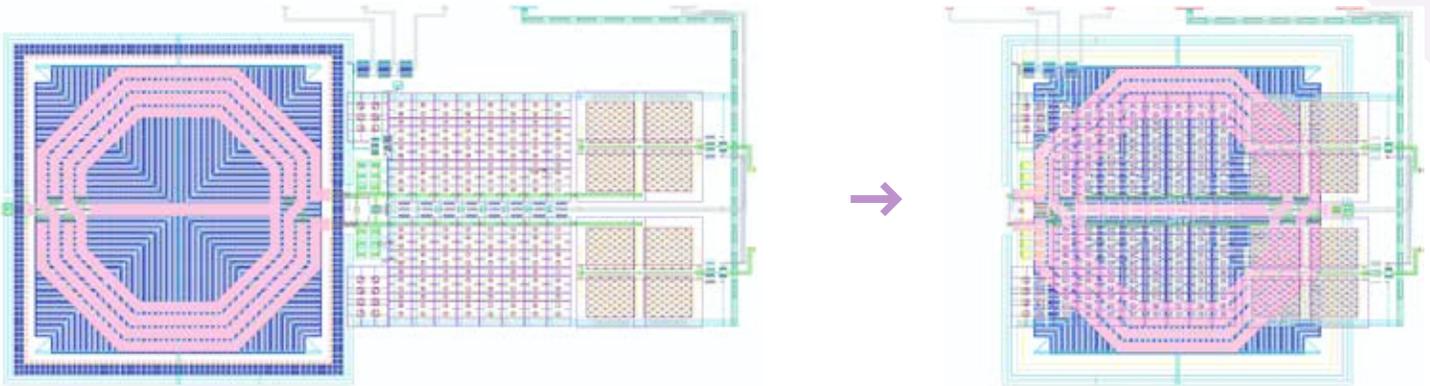


RaptorX Model ———  
Measurement ———



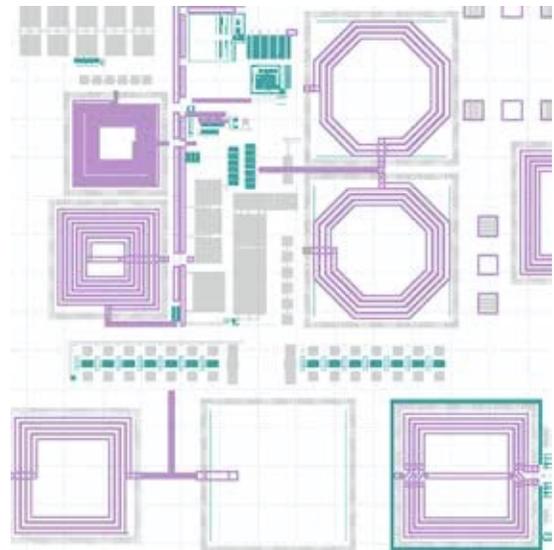
# Meet your area reduction goals: Model spirals over dense routing

The exploding costs of nanoscale silicon processes force design managers to come up with innovative design architectures such as the placement of actives under or inside the white space of inductors. Risky design techniques that were considered “science fiction” a few years ago are now becoming the trend. To alleviate risk and minimize re-spins that cost money and time, designers need a very high capacity and accurate modeling tool like RaptorX that can meet their toughest capacity demands and allow them to model the electromagnetic effect of inductors over dense routing, capacitor arrays and active devices.



## Extremely user-friendly

- » Allows point-and-click net-based net selection process
- » Provides easy handling of one type of port or use of existing layout pins and labels
- » Allows addition and exclusion of nets through a very simple to use interface, enabling “what-if” analysis for the evaluation of crosstalk among blocks
- » Supports batch runs for routine jobs
- » Unlike other EM solvers, RaptorX doesn't require definition of boundary conditions and special types of ports
- » Due to its ease of use, RaptorX can be instrumental in debugging discrepancies between silicon measurements and circuit simulations.



## Output models support all circuit analyses

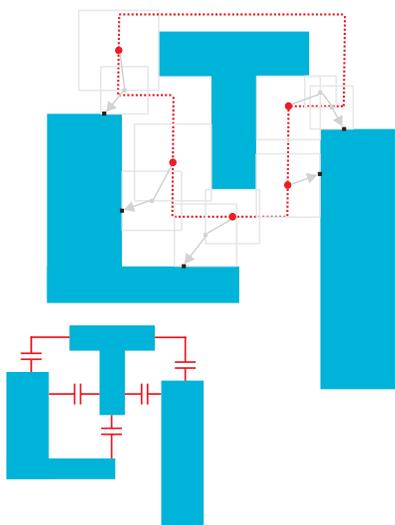
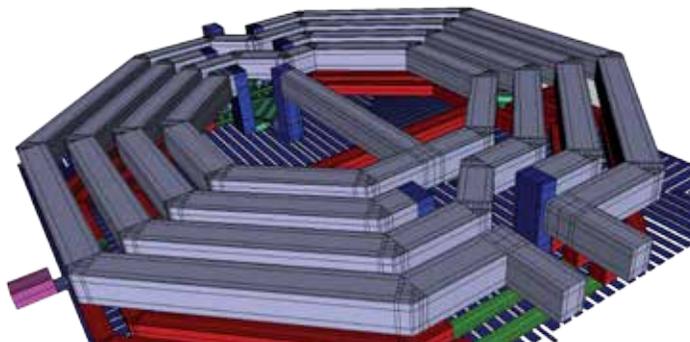
- » RaptorX produces models that are guaranteed to be causal and passive. The tool produces RLCK netlist models and s-parameter models simultaneously.
- » The RLCK netlist is highly compacted and enables very efficient time-domain analyses like transient, noise and shooting analyses.
- » The s-parameter models are accurate to DC and are well suited for AC, harmonic balance, SP and other frequency domain analyses.

# Highest accuracy with Helic's new electromagnetic engine

The RLCK engine that powers the core of VeloceRF pushes the frequency and capacity limits and outperforms any other electromagnetic modeling tool currently available in the market. Helic's RLCK modeling engine comprises the following modules:

## Layout Processing

The need to model electromagnetic effects from DC up to mm-wave frequencies calls for special handling of layouts. A novel full 3D meshing algorithm segments the conductors' volume into small cells suitable for accurate modeling of capacitance, inductance and resistance. The engine computes all the Layout Dependent Effects (LDE) before the meshing step.

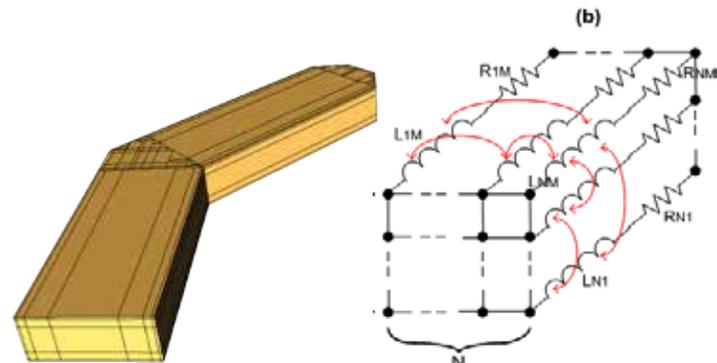
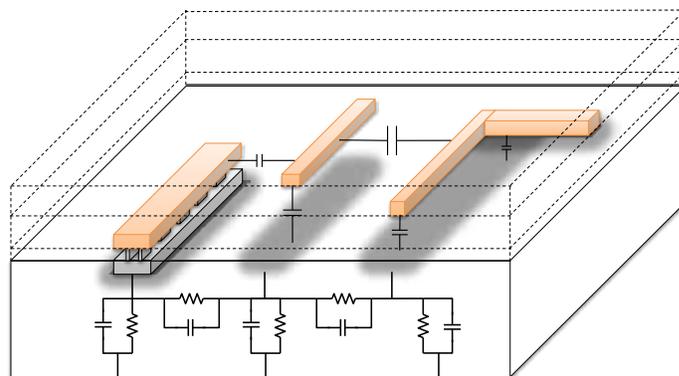


## Capacitance Extraction

Helic's 3D capacitance extraction methodology uses a sophisticated stochastic sampling algorithm based on the Random Walk theory for calculating the electric field along the Gaussian surfaces and corresponding coupling capacitances between arbitrary shaped conductors. The solver calculates with the highest accuracy the distributed 3D electric field, using stochastic sampling and a sophisticated numerical solution of the multi-layer Green's function. The method does not use any kind of pattern matching look-up tables or averaging and is free of conductor discretization bottlenecks. It scales way better with circuit size than boundary or volume meshing methods and demonstrates the best computing efficiency since Random Walk is an inherently parallel and extremely fast algorithm.

## Substrate Model Extraction

Helic's unique extraction engine models substrate coupling effects with a distributed RC network. A stochastic Monte Carlo based methodology and a 3D substrate model allows for very fast and accurate extraction of the distributed RC substrate network. The method employs a random-walk algorithm that allows characterization of multiple substrate layers using appropriate Green's functions without the need of three-dimensional discretization. The parallel nature of both capacitance and substrate modeling algorithms offers scalability and extraction times superior to any other method.



## Inductance and Resistance Modeling

Combines the accuracy of a full-wave electromagnetic (EM) modeling engine with the flexibility and interoperability of spice netlist output. Extracted models fully capture inductance and resistance behavior from DC up to mm-wave frequencies. Extremely accurate, capturing all electromagnetic phenomena, including current distributions, skin and proximity effects.



# Model Everything

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