Ansys

CASE STUDY /

Ansys + Intel

Ansys and EMA Help Intel Achieve the Impossible: EMI Simulation of an Entire Server

"The tool is now there to simulate an entire server at once, but we are still learning how to use it. I will consider the project with Ansys and EMA3D to be finished when I can say to you that I have this product in the design stage and we caught a problem and were able to solve it before we saw it in the lab. To me that's what complete success looks like. By the end of this year, we should be able to get rid of our EMI problems."

Cesar Mendez-Ruiz
Signal Integrity Engineer / Intel

Electromagnetic interference (EMI) is a common problem in the electronics sector, especially as IC devices continue to get smaller and customers expect everything to work faster. Having so many electronic components in small spaces increases the risk of EMI. Intel was looking for a way to simulate the interactions and interference of a whole server at once as the ultimate way of understanding their products.

CHALLENGES

Simulating an entire server at once had never been done before. To do so, Intel requested greater interoperability and functionality of HFSS, SIwave, and EMA3D Cable software in the following ways:

- EMA3D Cable to import solved fields from SIwave and HFSS for Intel's electronic device sub-components. Once the fields were imported, Intel needed the ability to rotate and translate the position of the sub-components within the enclosure.
- Intel often used EMI absorbing tapes, so EMA3D Cable must have an ability to simulate thin, magnetically lossy materials.
- Intel needed EMA3D to have a sub-grid capability to increase the resolution of key parts of the simulation geometry.
- EMA3D Cable is a time-domain simulation product. However, Intel needed the capability to simulate frequency-dependent materials.

TECHNOLOGY USED

- Ansys HFSS
- Ansys SIwave
- EMA3D Cable

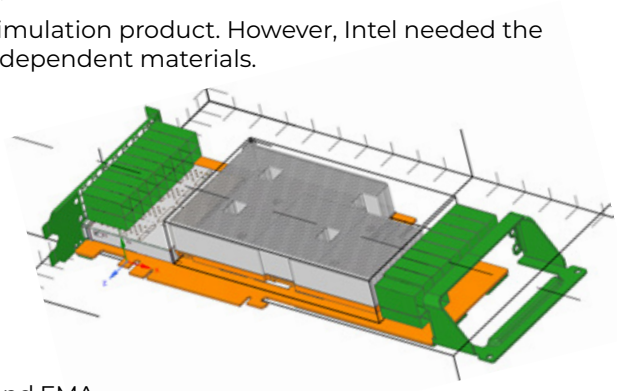

Fig 1. PCIE module (top cover not shown) with sub-grid defined in heat sink area for smaller cell size only in this region

ENGINEERING SOLUTION

Over the course of two years, Ansys and EMA worked closely with Intel engineers to modify the EMA3D software, with validation by Intel at each step. They improved the meshing speed by substituting a voxel grid mesh instead of the traditional tetrahedra used by the finite element method, resulting in a forgiving mesh that can be completed much faster than before. To model the cables connecting PCBs, EMA3D combined two solvers: the solver for the 3D structure that uses the voxel grid mesh, and a solver based on multi-conductor transmission line theory for the cables. This combination yields a one-dimensional line that shows the cable placement and a 2D cross section that reveals what's inside that one-dimensional line.

BENEFITS

Intel engineers now have the ability to:

- Simulate an entire server, simulating all 6 cards in a server at once, as opposed to having to simulate one card 6 separate times previously
- Create a subdomain inside a domain so engineers can define a smaller cell size and mesh better in areas where a smaller mesh is needed
- Use EMA3D Cable to simulate the cabling and the thin wiring and then integrate both solutions together
- Simulate the EMI effects of frequency-dependent materials in electronic components

COMPANY DESCRIPTION

At Intel, we create world-changing technology that improves the life of every person on the planet. We are inspired to:

- Drive innovation that makes the world safer, builds healthy and vibrant communities, and increases productivity.
- Harness our reach around the globe to better society, business, and the planet.
- Push ourselves and our industry peers to be more responsible, inclusive, and sustainable.

We have big ambitions, and a growing sense of urgency to work with others and address world challenges no one can tackle alone.

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