

Signal & Power Integrity Analysis: Time to think anew?

Old thought: "If I stop what I'm doing, I'll be lost and will never start again."

New thought: Sometimes, we have to stop and find our path.¹

Over the course of history, each new generation of scientists build upon previous discoveries to expand our knowledge of how 'it all works'. Sir Isaac Newton is probably a good starting point but he relied on many of his predecessors such as Copernicus, Galileo and Kepler. Newton's work, in the late 17th century, on gravitational forces gave his successors a step ladder for future work. Works by Maxwell, in the 19th century, unified the electrostatic and magnetism into an electromagnetism unified theory. Prior to Maxwell's work, many thought electrostatic and magnetism were two unrelated phenomena. Einstein continued to expand scientific reason with his general theory of relativity in the early 20th century. Kaluza and Klein continued to expand our knowledge with string theory combining the works of Maxwell and Einstein into a 5 dimensional space. Much of this work is theoretical and distant from our working lives but in time, we will benefit from this ground breaking research.²

Often times, these pioneers created new math to help explain, prove and defend their recent discoveries. Many of these scientists were labeled various names and only years later were given credit for transforming science. They were ahead of their time and their ideas were contrary to prevailing mindsets.

If we quickly examine the timeline for these major discoveries, they have accelerated their pace; no longer taking centuries before the next major discovery. This is similar to our product development; accelerating and requiring fewer resources to accomplish what could not be dreamt of a few years ago.

Closer to our every day work lives; advances are also taking place that can have immediate benefits to how we complete our work. All it takes is for us to 'Think Anew' and shed some outdated mindsets and methodologies.

How does this apply to signal and power integrity analysis? If we backtrack to Maxwell's contributions, he unified electric and magnetic fields into a set of mathematical equations that are the basis for Signal Integrity analysis tools. His works were published in the mid 19th century. Since that time, as geometries continue to shrink and use new materials, additional physical phenomena have been measured and mathematical advances have been developed. Most recently, research at the



Georgia Institute of Technology has lead to a new methodology, Multi-layered Finite Difference Method (M-FDM), and means to accurately take into account new phenomena that are seen in these structures; aperture coupling, wrap around currents, gap field coupling and return path discontinuities. Once these were discovered and better understood, new mathematical methods were developed to allow accurate simulation and fast analysis.

The latest generation of EM solvers can now combine the strength of Full and Fast solvers AND reduce or eliminate their weaknesses. EM solvers based on the Multi-layer Finite Difference Method (M-FDM) are creating a new generation of solvers that neither fit in the Full nor Fast solver categories. Our product, Sphinx for Signoff, changes the paradigm. In addition to measuring the latest phenomena with new mathematical methods, we have focused on the Use Case model and simplified the currently cluttered analysis environment with a streamlined GUI and Batch process approach. Rather than constructing a time domain analysis environment where you have to create complex Spice netlists that include IBIS models, complex macro models and any other models or waveforms to perform analysis, we offer a fast, efficient and accurate frequency domain analysis.

E-System Design is 'thinking anew' and we believe a better solution exists for the industry. A design and analysis tool that enables users to rapidly produce sign-off quality accurate Signal AND Power integrity results, with fewer resources and less headaches. Sphinx for Signoff provides a new methodology and a new way of accurately capturing the effects that are seen in today's state of the art designs while providing an intuitive environment which is easier to learn (or remember) and reduces the complexity seen in many of today's current generation of Signal Integrity tools.

Sphinx for Signoff - Maybe it is time to 'Think Anew' and explore a new approach.

¹**Time to think anew about your fears, Business Management Daily**, By Executive Leadership, <http://www.businessmanagementdaily.com/articles/13758/1/Time-to-think-anew-about-your-fears/Page1.html>, 6/1/2005

²Berman, David, "**String Theory: From Newton to Einstein and beyond**", +Plus Magazine...living mathematics, <http://plus.maths.org/issue45/features/berman/index.html>, December 2007

