Spectrum Integrity designs ultra-high-speed digital, RF, and microwave PCBs which, at 20 to 110 GHz and beyond, are among the most challenging applications in industry. Its customer design challenges require a proprietary "outside the box" process. Yet at the same time, the company must interface with industry standard component libraries as well as the design review processes of its clients.

To design such esoteric designs, the company relies on a collection of very specialized tools. The native schematic capabilities in such tools have proved completely unusable. Spectrum Integrity had to rely instead on a third-party schematic tool that prevented synchronization of layout and schematic and no cross-probing capability. The process had become too disjointed.

Furthermore, there was no free external viewer feature for the board designs, and no simple way to export design files. The frequent client reviews were a tedious and long process. The company had tried to streamline the process using PADS, but its schematic capture tool was similarly inadequate, and its version control was missing critical built-in functionality.

Spectrum Integrity and its customers needed a more integrated design environment that could accommodate the magic of high-speed and RF PCB design.

" We can now use a mainstream tool for our ultra high-performance design work, and customize it so we don't have restrictions on getting creative. "

Michael Ingham Director of Engineering, Spectrum Integrity

The Solution

The company has adopted Altium Designer, and has seen an immediate improvement through its advanced features and integration across the design process.

"The Altium schematic program is very powerful," explains Michael Ingham, director of engineering at Spectrum Integrity. The design suite synchronizes with major component suppliers including Digi-Key, Mouser, and Newark, "an unexpected major benefit that has made our component engineering much more efficient." It also embeds component information to automate most of the effort of making accurate BOMs.

Spectrum Integrity also found it straightforward to customize the Altium Designer environment for the intricacies of RF design. "We added strategic, proprietary improvements to the tool suite to make them very powerful and efficient for RF and ultra-high-speed digital design," says Ingham. To streamline interaction with RF analysis, it exports board designs in Gerber data into a 3D field solver. After completing analysis, Altium Designer reads the files back in AutoCAD or DXF format, an easy process that retains net intelligence within the integrated tool suite. Also, Spectrum Integrity reports that creating custom footprints, with non-standard features, is much easier in Altium Designer than its old tool suites.

Automation within Altium Designer PCB layout helps streamline steps within the design process. For example, the application can apply real-time updating of split power planes during the course of design, saving manual retouching of those planes during design changes. "With our old tools, we would have to manually un-pour and re-pour power planes every time there was a change," says Ingham. "The pour feature in Altium saves us 75% of our time in this step."

Perhaps the biggest efficiency improvement occurs in data management. The version control features are very important to Spectrum Integrity, because RF designs often require multiple versions stretched across a very extensive review process. In addition, Altium Designer imports and exports across many popular formats, and includes a free design viewer. As Ingham explains, "It's the nature of our designs to produce many versions to share and review." His team has found that even the relatively simple task of creating PDF check plots has saved considerable process time and prevented the need for a third party program.

The Results

Except for two customers using legacy software, Spectrum Integrity now produces all of its designs using Altium Designer. “We can now use a mainstream tool for our ultra highperformance design work, and customize it so we don’t have restrictions on getting creative,” says Ingham.

Altium Designer’s ease of use and comprehensive training made adoption quick and painless. “The program was fairly intuitive and we were able to be productive after just a few days of study,” says Ingham. “Using the numerous available materials and very helpful videos, my engineers quickly became productive without the need for attending a dedicated training class. They were proficient in about half the time it took for learning PADS.”

Customer design reviews are much more efficient with Altium Designer due to the design viewer and automated PDF feature. “The ease of review allows customer reviews to be much more efficient and thorough, and it avoids unnecessary questions and steps. Our customers are very pleased.”

Finally, Altium Designer has automated the generation of Gerber manufacturing files, which saves time and minimizes manufacturing errors.

Product Information

Spectrum Integrity designs ultra-high-speed digital, RF, and microwave PCBs that process signals at frequencies from 20 to 110 GHz and above. The CAD screenshots show 12- and 14-layer ultra-high-speed digital applications successfully designed in Altium Designer. These examples have outer layer traces designed to support 50GHz signals and multiple inner layer traces designed to support 28GHz. These designs utilized complex geometries, split power planes, transmission lines, and coplanar vias successfully designed using a combination of Altium Designer and proprietary design techniques.

About Spectrum Integrity

Spectrum Integrity is a full-service engineering design service firm and solution provider for companies requiring outstanding hardware designs for advanced RF, high-speed, and semiconductor test applications.