Heidi Barnes: DesignCon 2017 Engineer of the Year

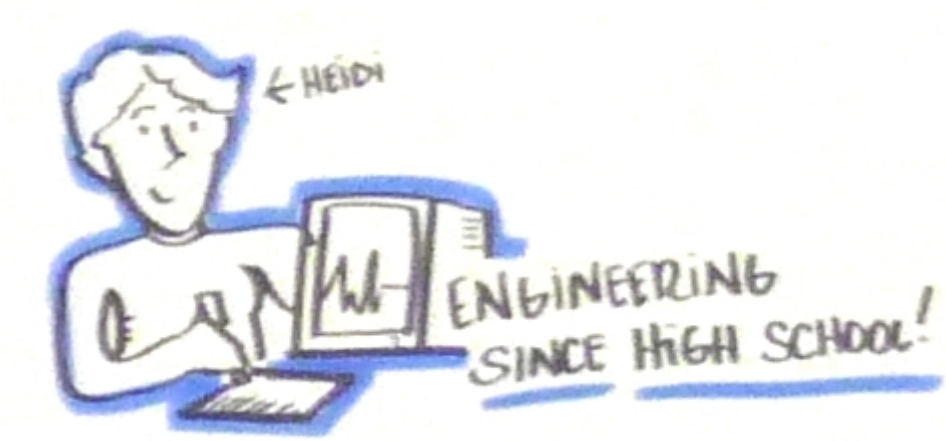
Martin Rowe - February 23, 2017

On February 2, 2017, Keysight's Heidi Barnes was named DesignCon's 2017 engineer of the year, beating out four other contenders. She's in good company, joining 2015 winner Eric Bogatin and 2016 winner Mike Steinberger. I spoke with Barnes by telephone on February 21, 2017.

Barnes knew in high school that engineering was her calling. "I loved math and science," she said. "They came easy for me and so the career chose me. I love learning how things work and fixing things." She applied for an internship at Hewlett-Packard in the early 1980s and was accepted, three years in a row. At HP Barnes learned the ins and outs of the HP8552 spectrum analyzer. She used that knowledge to get into CalTech where she worked in the physics lab learning to make semiconductors, capacitors, and solar cells. As a sophomore, she was the course's teaching assistant.

After graduating from CalTech, Barnes used her experience making solar cells working for Arco Solar, now part of Siemens, working on thin-film deposition.

Following her time at Arco Solar, Barnes moved to the south, taking a job at NASA in Mississippi, doing rocket engine testing where she applied her knowledge of sensors and systems.



When she decided to return to California, Barnes contacted her friends at HP and was offered a job in the semiconductor lab developing high-speed devices. After HP split off Agilent Technologies in 1999, Barnes moved to the ATE group designing load boards for high-speed semiconductor testers. Agilent spun off that business into Verigy, which was later acquired by Advantest.

After about a year with Advantest, Barnes went back to Agilent, working on circuit-simulation tools. "I Realized how important simulation would become for signal and power integrity and I needed better simulation tools to meet the design challenges," noted Barnes. "I saw an opportunity to work with EEsof (now Keysight ADS) in 2012.

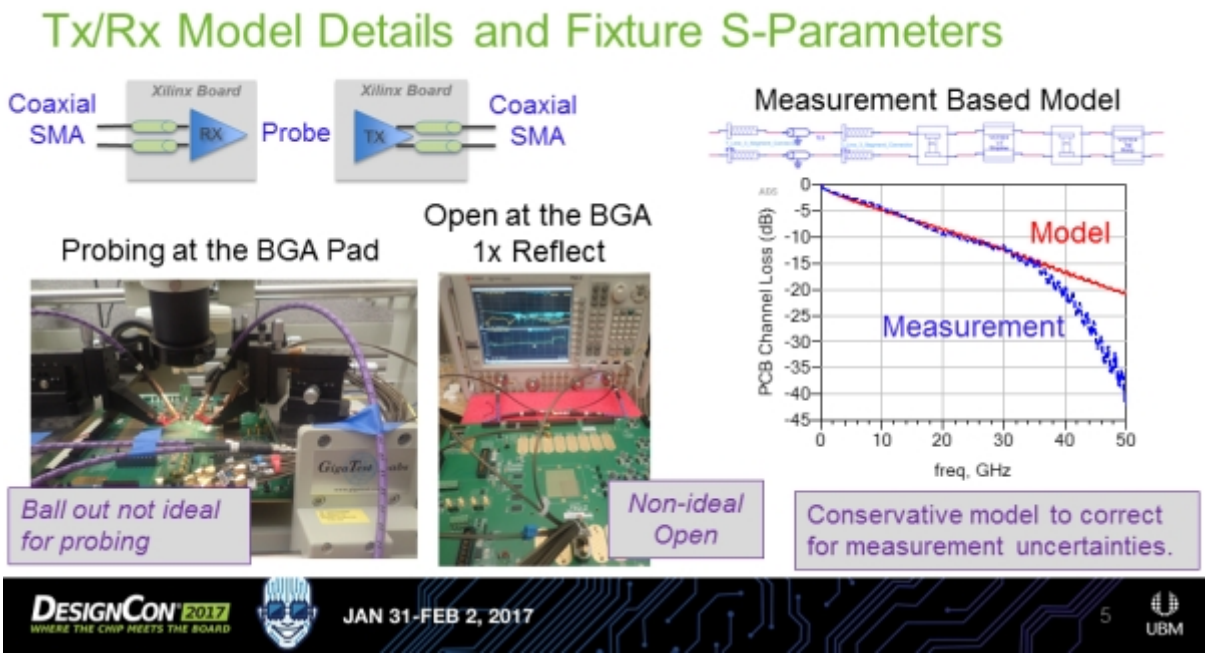
"When I returned to HP in 1997 after NASA," explained Barnes, "I was exposed to a lot of simulation tools. I did a lot of schematic simulations, data analysis, and layout." She continued using those tools at Agilent, Verigy, and Advantest, but as a customer. Thus she didn't get to see the development of those tools during that time.

> *We love that little ground symbol. It makes the math simple but in reality, it bites us when it comes to signal and power integrity.*

The EEsof tools were developed for RF/microwave design, but when Barnes moved into signal and power integrity—digital signal rates were reaching microwave frequencies at that time—Barnes was able to use the experience and apply it to signal and power integrity, but kept running into its limitations.

After rejoining Agilent in 2012, Barnes saw an opportunity to move into the EEsof group and help develop the tools she wished she had when designing boards for the ATE systems. Barnes then became a senior applications engineer with EEsof/ADS, focusing on signal/power integrity customers.

Barnes' involvement with DesignCon started when she was designing ATE load boards for HP prior to the Agilent spinoff. At that point she started working with customers who used the 93000 series semiconductor testers. "One of the great things about DesignCon," said Barnes, "is that you can write a 25-page application paper with customers where you describe a challenge and how you solved the problem. That's not so easy with IEEE conferences where papers need to be short and focus on a specific aspect of a project. We often take the main point of a DesignCon paper and use it as an IEEE paper."



At DesignCon 2017, Heidi Barnes presented a tutorial section describing how to obtain the Tx and Rx fixture S-parameters for improved simulation to measurement correlation, keeping in mind "Everyone believes measurements except the person who did the measuring, no one believes simulation except the person doing the simulation."

Every time high-speed signals get a speed increase, new problems arise. With that in mind, I asked Barnes to comment on the state of signal integrity. "It's been fun to see signal integrity move from the digital world of setup-and-hold to eye diagrams. Today, S-parameters have taken over. We're all concerned with transmissions, reflections, return loss, and other parameters that used to belong to microwave engineers. High-speed digital standards now include S-parameter measurements."

Barnes also sees how the sheer volume of data coming from Internet of Things and self-driving cars will have a further effect on signal integrity. RF and wireless will further collide with high-speed digital signals on boards, in systems, and in networks.

What advice does Barnes offer to young engineers? "Take advantage of opportunities when they arise," she said. "They don't come around multiple times and they can take you in a direction you hadn't planned on taking."

From a signal/power integrity perspective, Barnes reminds us of Bruce Archambeault's definition of ground, "a place for potatoes and carrots."

"Today, it's return current. EM fields will grab whatever metal is closest as its return path. We love that little ground symbol. It makes the math simple but in reality, it bites us when it comes to signal and power integrity."

Also see

- The myth called "ground"
- How do I know if my simulation correlates to reality?
- DesignCon paper and tutorial explain de-embedding
- Delay Line SI Puzzler, animation by Heidi Barnes

—Martin Rowe, Senior Technical Editor