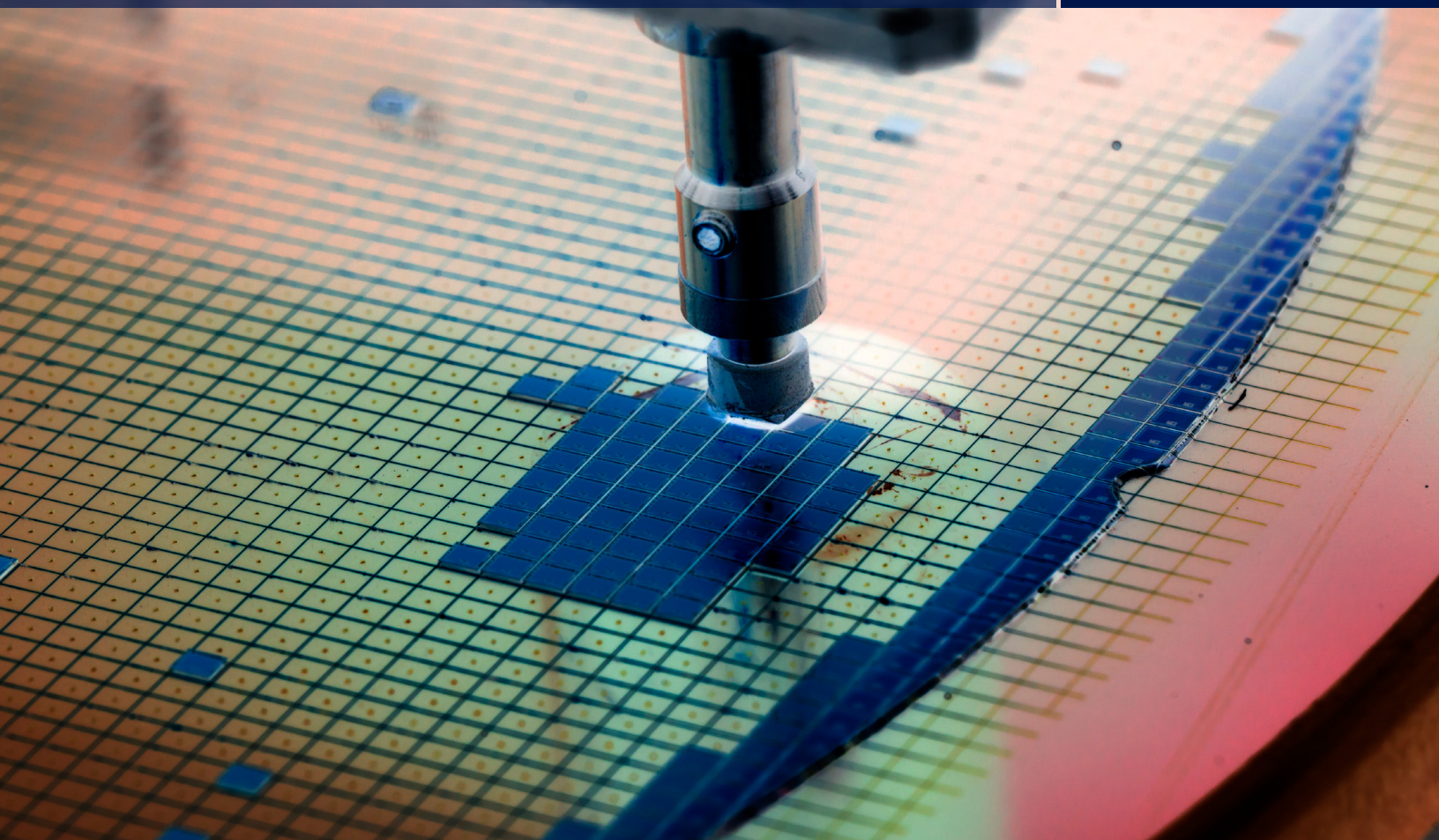




5G RF Design Startup Delivers Cutting-Edge GaN/GaAs Devices on Day One

Organization

- iconicRF, an RF design startup in Northern Ireland

Challenges

- Design complex circuits faster, with higher performance and manufacturing yield

Solutions

- PathWave Advanced Design System (ADS)

Results

- Decreased design and simulation time by 10%
- First pass success rate

The next generation of cellular applications requires complex devices that can amplify signals in the upper-gigahertz range while handling high-power density and high voltages. With 5G cellular networks becoming the focus of the RF (radio frequency) market, demand for GaN and GaAs power amplifiers is on the rise, as is the competition.

To achieve success in the growing wireless industry, a company must deliver cutting-edge devices at competitive speeds. Doing so requires powerful design and simulation tools that can accurately measure the high frequencies that 5G demands.

An RF design startup in Northern Ireland delivering custom monolithic microwave integrated circuit (MMIC) solutions recently found itself up against a substantial hurdle while working with GaN and GaAs technology. The company, iconicRF, grappled with how to quickly deliver the reliable GaN and GaAs device modeling and prototypes its customers demanded for a range of cellular, wireless, and aerospace applications. Using Keysight PathWave Advanced Design System (ADS) software, iconicRF found a way to reduce its risk of delivering high performance customer prototypes with a first pass success rate. PathWave ADS also decreased design and simulation time — all within a year of starting business.

The Challenge: Faster Solutions from Design to Prototype

The technology behind high-performance MMIC and module design is increasingly complex. Board sizes are shrinking, data rates are increasing, and the number of technologies on a single device is growing. That complexity is a key reason companies outsource complex designs to specialized RF design teams like iconicRF. But outsourcing places enormous pressure on the teams to create designs that are reliable, cost-effective, and efficient while still meeting customer demand to be first to market.

The challenges iconicRF faced in its 5G design efforts centered firmly on measurement accuracy and the need to perform high-frequency simulation. Measuring accurately at high frequencies required for next-generation cellular applications, up to 30 GHz, is difficult. Finding a software tool that can design and simulate 5G devices is rare. Additionally, designing next-generation devices requires electronic design automation software with high-frequency simulation capabilities that span design to prototype.

The Solution: A Trusted Design Tool to Ensure Accuracy and Speed

To ensure reliable and accurate results, iconicRF turned to Keysight. Keysight PathWave ADS is the industry's leading RF, microwave, signal integrity, and power integrity design platform (Figure 1). PathWave ADS integrates EM simulation, circuit design, and layout in a single tool that spans design to packaging. The designers saved significant import and export time throughout the design prototyping and test workflow. The algorithms in PathWave ADS are accurate and reliable, well beyond 28 GHz. Using the software and its high-frequency and co-simulation capabilities, iconicRF was able to quickly design, simulate, and optimize its customers' GaN and GaAs-based MMIC devices.

To aid test results visualization, the iconicRF team utilized the integrated features of PathWave ADS to evaluate measured load pull results (Figure 2). The team could quickly assess measured performance of the base cell and ensure the optimum matching topology for their RF and mmWave PA designs, all within the PathWave ADS simulator environment.

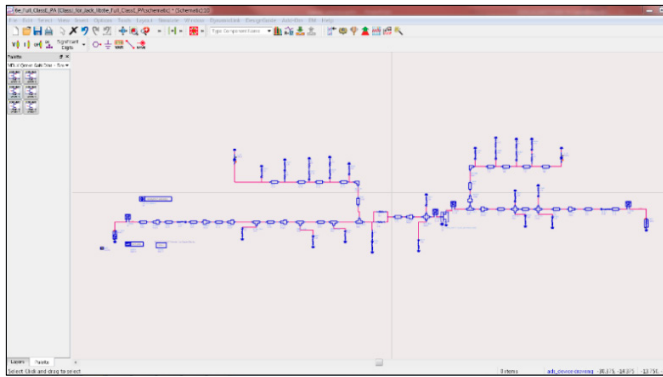


Figure 1. Rapid component creation, faster design iteration with ADS

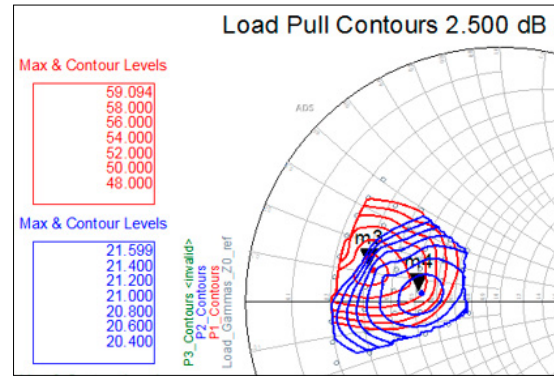


Figure 2. 28 GHz Measured Load Pull evaluated within the PathWave ADS data display

With PathWave ADS, iconicRF performed co-design and co-verification of its multi-technology components to bring the design from design specifications to fully working prototype within a short period of time.



Figure 3. 3D visualization with ADS Layout

A key feature of this rapid development was the new EM Simulator in PathWave ADS, **RFPro**. At millimeter wave frequencies packaging parasitics are increasingly important in the product design. RFPro not only allows the 3D visualization of the MMIC (Figure 3), but also helps designers perform EM circuit co-simulation on their designs. Using these capabilities, iconicRF was able to quickly fine-tune its circuit schematics, perform EM simulations at the package level (Figure 4), and verify its layouts to ensure the successful operation of its MMIC devices in the customer environment.



Figure 4. IconicRF mmWave Front End Module Package design, faster design iteration with integrated EM analysis

Using PathWave ADS allowed us to get up and running more quickly. We couldn't have entered this very competitive wireless market without it.

Lyndon Pattison, MMIC design engineer, iconicRF

The Results: First Pass Success of Prototypes; Increased Performance Accuracy

Thanks to PathWave ADS, iconicRF delivered cutting-edge GaN and GaAs design services and products to its customers across multiple industry sectors. The engineers at iconicRF developed their own compact models and used behavioral models within the PathWave ADS environment to ensure success. The integrated nature of the tool enabled iconicRF designers to decrease design and simulation time by 10%. At the same time, the software's accurate algorithms allowed iconicRF to deliver first pass success working prototypes to its customers. Using PathWave ADS and its enhanced capabilities, the company can now offer its customers the latest in RF innovation to enable the highest performance at the lowest cost. Even though iconicRF comprises just a small group of engineers, it can create cutting-edge device modeling and prototypes in a manner that matches enterprise-level companies. That gives the startup a distinct competitive edge in today's fast-growing wireless industry.



ICONIC RF

For more information on iconicRF, visit www.iconicrf.com

Related Information

- **Brochure:** [Keysight PathWave Advanced Design System](#), publication 5988-3326EN
- **Technical Overview:** [RFPro Electromagnetic \(EM\) Simulation Environment](#), publication 5992-3333EN

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