



# GAME-CHANGING 5G ANTENNA DESIGN

## DESIGNING A 5G MIMO ANTENNA FOR AN NFL STADIUM USING ALTAIR® FEKO®

### About the Customer

Venti Group helps creative organizations find solutions to their antenna needs using extensive simulation, both for creating designs and determining antennas' expected performance in real-world situations.

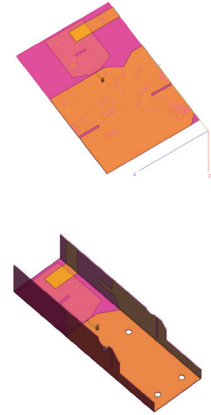
One of Venti's vital customers is a leader in the distributed antenna system (DAS) market and known for wireless infrastructure innovation. The client is focused on optimizing antenna performance while reducing cost, shrinking visual impact, and providing superior antenna products for small cell and DAS markets.



Our team was able to rapidly deliver design revisions and simulate accurate RF environmental effects on the antenna. Thanks to Feko, we didn't have to test in place every time a design change occurred, saving us a great deal of time during the project.

Hank Adamany,  
CEO, Venti Group

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### Their Challenge

Ahead of the 2022 National Football League (NFL) championship game, the client's Tier 1 partner was commissioned to install a 5G network in the stadium that would support all major cellular carriers. In the past, stadium venues have used sector antennas. But due to the volume of data usage in these stadiums today, these antennas can no longer meet the challenge. The goal was to provide 5G coverage over all 5G frequency bands. The antennas needed to function in a very specific location that's not ideal from a radio frequency (RF) standpoint: under a seat near a concrete floor. Also, due to the limited space under the stadium seats, the antennas needed to be compact.

### Our Solution

When designing the antenna, Altair® Feko® proved invaluable. With it, the team could know within a few hours how a design change would impact antennas. If needed, they could re-optimize it and have it ready within 3-4 days, a significant upgrade versus the week or two it takes to prototype a new antenna/plastic design. Feko enabled rapid turnaround times on these design revisions and let the team simulate RF environmental effects, which was vital since there wasn't time to build and test physical prototypes every time a design change occurred.

The software gave the team the means to quickly evaluate possible solutions as challenges multiplied and packaging restrictions surfaced. These challenges included needing to resize the antenna for proper seat functioning, antenna cable routing logistics, needing to alter the mounting to ensure antennas could survive being pressure-washed, and more. As specific RF requirements and size restrictions increased, it seemed as though it'd be impossible for this antenna to rise to the occasion. Thankfully, Feko ensured that the basic antenna design remained viable and would still function as intended - despite being folded and shrunk due to space restrictions. In the end, the team called the design "the antenna we couldn't kill."

### Results

Using Feko, the Venti team and their antenna met the considerable challenges needed to function during the 2022 NFL championship game. Thanks to the client's High Data Rate Seat Antenna System, more data was handled during the 2022 game than in all previous championship games combined. According to Verizon, customers used 30.4 terabytes of data. According to AT&T, customers on average saw a download speed of 169.5 Mbps on its 5G+ services. These antennas helped create an uninterrupted stadium experience on one of the world's biggest stages.

To learn more, please visit [altair.com/feko](https://altair.com/feko)

LEFT: Installed stadium venue antenna (Credit: Paul Kapustka, STR)

TOP RIGHT: Original design  
BOTTOM RIGHT: Final design



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