Is it the Florida humidity or are the antennas under my seat making me sweat?

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Executive Summary

On a typical hot and humid fall day in Gainesville with sweat dripping from my forehead, I climbed several stairs to reach my seat inside the University of Florida's (UF) Ben Hill Griffin Stadium, popularly known as, "The Swamp". As I neared the top row and top of the stadium, I noticed oval antenna enclosures 8-10 feet above my head adorned with the familiar Gator-head logo mounted on poles encircling the top of the stadium. While looking down the row for my seat number, I also noticed rectangular Wi-fi antenna enclosures mounted beneath the benches. Both installations support wireless connectivity for the 90,000+ fans who pack the stadium for one of the best game day experiences in college football.

The University Athletic Association stated in an August 9, 2019 release, "The $6.3 million Wi-fi project, which is in partnership with Extreme Networks and Verizon Business Markets, began in July with conduit, wiring and under seat enclosures that will house more than 1,100 wireless access points throughout the seating bowl". UF also installed a separate, distributed antenna system (DAS) as part of a campus-wide AT&T 4G deployment that includes 312 antennas in the oval enclosures lining the top of the football stadium (https://news.it.ufl.edu/infrastructure/uf-distributed-antenna-system-largest-in-u-s-higher-ed/).

5G is coming to a stadium near you

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Executive Summary...continued

UF understands students and fans alike, experience sports differently today than even just a few short years ago. As I sat at the top of the stadium with antennas directly under my seat and above my head, I watched numerous students turn their backs to the field, put their arms around each other or give a Gator chomp with their arms extended and pose for photos to be posted to their social media accounts. These posts serve as a great marketing tool for future ticket sales, recruitment of current high school students and the university in general and fans want to post directly from the game. However, with 5G on the near horizon, game day wireless usage will be much more than just Instagram posts.

Why 5G matters

5G is currently being deployed by commercial carriers across the country. It has the promise of providing a dramatic increase in download speed, network capacity and improved security for mobile devices. During a recent on-site test, Waterford engineers witnessed a Samsung 5G mobile device register over 2 gigabits per second (Gbps) download speed or over 10x faster than 4G. For reference, AT&T provided fiber to homes in Raleigh, NC with a top download speed of 1 Gbps. Current cable providers in Florida advertise 150 megabits per second or 13x slower than 5G.

Verizon currently advertises its partnership with the National Football League and has deployed 5G Ultra-Wideband (millimeter wave spectrum) in over 15 stadiums with plans to add additional stadiums in the coming year (https://www.verizonwireless.com/support/5g-mobile-faqs/#stadiums). With its increased network capacity and low latency, 5G will enable fans to use their mobile devices to greatly enhance their gameday experience (see below). Major college football programs, like the UF will certainly follow suit and upgrade to 5G as it becomes economically feasible.

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Beyond Snapchat and Instagram, new fan experiences using 5G

The possibilities beyond current social media apps are endless for the fan experience with 5G. Some early fan benefits include:

- User selected live and instant replay viewing angles
- In-game player and team analytics
- 8k Ultra High Definition (UHD) picture quality
- On-demand highlights from other games
- Camera analytics to ease traffic flow in the parking lot and improve foot traffic inside the stadium
- Less time waiting at concession stands, vendor kiosks and restrooms by directing fans to shorter lines
- Near real-time advanced security measures by integrating HD cameras with A/I

The challenge of deploying 5G in stadiums and arenas

Finding locations to install antennas, radios and the conduit necessary for fiber and power is a challenge in stadiums and arenas. For the past several decades, stadium architects have ensured their designs eliminate support structures that cause obstructed views for fans, thus reducing potential installation locations for antennas. If antennas are installed at the top of stadiums or on overhead catwalks, the signal may not reach fans closest to the field while those sitting in the highest rows may experience potentially harmful, higher levels of Radio Frequency (RF) exposure. As noted earlier, many facilities have been forced to install antennas under seats, while others have chosen handrails to provide network coverage, like the example provided here from the UF O'Connell Center where the basketball and volleyball teams play.

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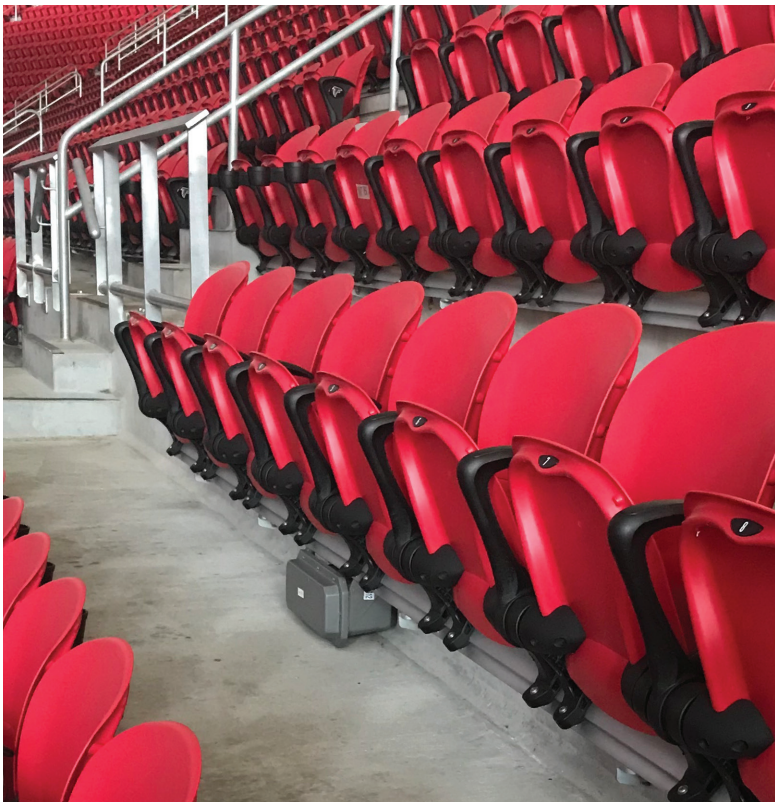
RF safety concerns

As antennas and radios are deployed closer to fans and sometimes under seats, RF exposure safety should be paramount. The Federal Communications Commission set forth guidelines for RF exposure for the general population for situations like fans in stadiums or arenas. The General Population/Uncontrolled exposure limits apply to those situations in which persons may not be aware of the presence of electromagnetic energy, where exposure is not employment-related, or where persons cannot exercise control over their exposure. Certainly, a fan with an antenna directly under his assigned seat cannot exercise control over his RF exposure and must rely on the facility owner and network provider to ensure Maximum Permissible Exposure (MPE) levels are within General Population limits.



Pre and post-installation analyses

Regulatory compliance companies, like Waterford use sophisticated modeling software, such as RoofMaster™ to determine whether proposed antenna, radio and power configurations will exceed General Population/Uncontrolled RF exposure limits. These analytical studies help guide the engineering of wireless networks specifically for exposure compliance before actual installation begins. RoofMaster™ takes into account significantly more data and variables for compliance than traditional RF network design tools. Once the network is installed, these same regulatory compliance companies will perform on-site data collection at numerous locations inside the facility to ensure the networks do not exceed Maximum Permissible Exposure levels where fans are enjoying the game.

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Recommendations

Colleges, facility owners, professional sports teams, as well as network providers all assume significant safety responsibility when providing wireless connectivity like Wi-Fi and 4G/5G distributed antennas systems (DAS). Some steps they can take to ensure fan safety include:

- Engage a regulatory compliance expert to perform a pre-installation, predictive MPE report using the proposed antenna models, locations and power levels
- Review and implement the suggested mitigation requirements outlined in the MPE report
- Complete a post-installation, on-site MPE survey to collect actual RF emission levels and generate a professional engineer-certified report
- Perform an annual predictive MPE report to ensure compliance or whenever the network provider makes changes to the equipment

Summary

5G has the promise to deliver tremendous benefits to the fan experience at places like The Swamp and other stadiums across the country. But network providers and the facility owners need to ensure the placement of antennas do not present an unnecessary health hazard for fans. My daughter, who is a student at UF, reduces her potential RF exposure by arriving late to the game (from a tailgate, of course) and leaving at halftime to watch the remainder of the game in a nearby campus establishment with air conditioning.

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About Waterford

Waterford Consultants was founded in 2004 and is a professional services organization specializing in FCC and FAA regulatory compliance, engineering, site development, and a host of software and technology-related offerings that service the wireless industry.

Waterford specializes in a diverse collection of technical and consulting services that continue to expand with significant focus given to utilizing the most innovative and tech-savvy solutions.

Waterford's clientele consists of the industry's leading carriers, tower and structure owners, engineering and site acquisition firms, as well as most local, state and federal government organizations.

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