# SCOTTSDALE CHRISTIAN ACADEMY:

## A Case Study in Successfully Addressing Electromagnetic Radiation Concerns


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## Project Summary

In the Fall of 2019, administrators from Scottsdale Christian Academy (SCA) in Phoenix, AZ contacted Waterford Consultants LLC, a national FCC regulatory compliance and professional services firm specializing in radio frequency (RF) emissions and human exposure, to help them address growing parental concerns surrounding 5G emissions from a wireless carrier installation on their K-12 campus (Fig.1).

Fig 1 - Antennas at Gym Room (1 of 2 Locations)

The installation had been in place since 2003, but the wireless carrier recently decided to add dual-band antennas which sparked questions about 5G transmitting on campus and possible exposure concerns. Administrators and board members met with families who threatened to withdraw their children from the school and transfer them elsewhere as a result of the plethora of online, 5G-related hysteria. Protests were organized outside a nearby wireless provider's store with local media outlets covering their concerns (Genovese, J., 2025) (Fig.2).[1]


Fig. 2 – Public Protest

## RF Survey and Study

The wireless carrier is transmitting across several licensed frequency bands ranging from 600MHz to 2.1 GHz from the rooftop of the gymnasium, approximately 30 feet above ground level. The SCA campus is expansive, covering over 14 acres including playgrounds, a football field and baseball facilities.

Waterford was engaged by SCA to complete both an *on-site* electromagnetic emissions (EME) survey and a *predictive* study using data provided by the carrier. For the purpose of analyzing potential human exposure to RF emissions, over (135) measurements were taken on rooftops, open walkways, playgrounds and inside the gymnasium, weight room, media center and classrooms.

All accessible rooftop areas in front of antennas were inspected. Measurement collection was performed using a calibrated Narda survey meter and broadband probe (300 kHz to 50 GHz) and was consistent with FCC and Narda procedures, regarding the location of the probe to the RF source - making slow sweeping motions over the area that a person would occupy. In using this broadband instrument, the results represent the cumulative contributions of all RF sources at the

measurement locations. Examples of these sources include antennas supporting TV and FM broadcast, cellular and WIFI router operations as well as RF-enabled mobile devices such as cellular phones that may be in the vicinity of the measurement location. Power density values were recorded as a percentage of the FCC General Population limits.

The wireless carrier reported that a radio supporting LTE operations on 2100 MHz was out-of-service during the survey. Since MPE levels are proportional to transmitted power levels, measurement results in the foreground of this antenna may be adjusted upward by a worst-case factor of 1.3 to account for this operation.


Fig. 3 – RF Measurement Locations on Rooftops

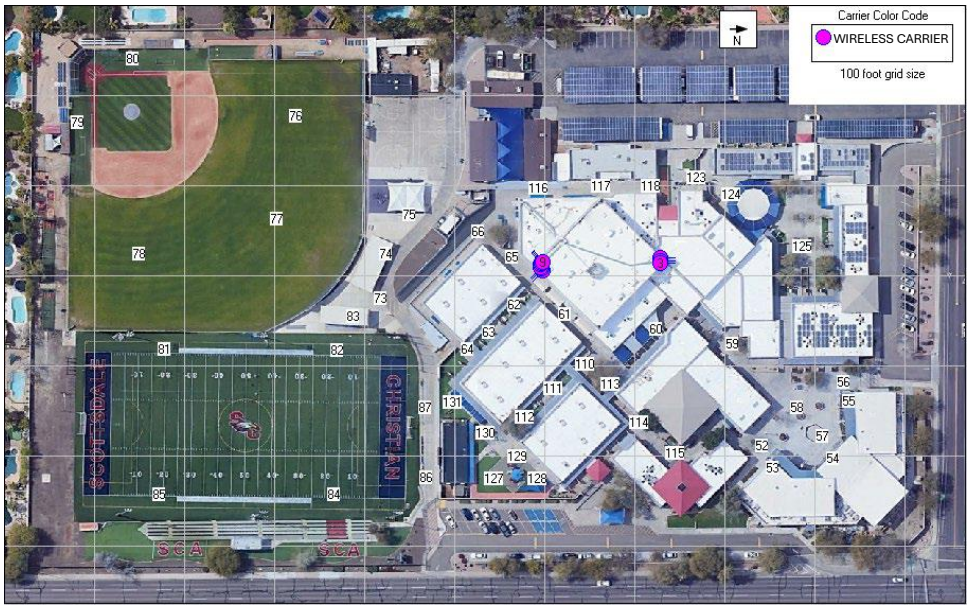


Fig. 3 – RF Measurement Locations at Ground Level

During the survey, measurements of cumulative RF power densities at accessible walking surfaces on rooftops, at ground level and at interior spaces were found to be below the FCC General Population limits.

In addition to the aforementioned on-site survey, Waterford completed a predictive analysis which graphically modeled the RF environment. This computational approach considers 100% utilization and maximum possible equipment operating power to represent 'worst-case' exposure conditions.

The following plots show the spatial average predicted power density level at any given location as a percentage of the FCC General Population limits. These plots depict the cumulative exposure based on all RF sources listed in the Antenna Inventory. Per FCC compliance criteria, cumulative MPE levels below 100% are safe and no special action is needed to maintain a safe environment.

Exposure to non-ionizing radiation at a given spatial average power density level, during the appropriate time interval, determines hazard. MPE predictions are not dependent on the exposure duration as only the intensity of the exposure is calculated. In this manner, areas of concern are identified and delineated from areas where exposures will not exceed the FCC limits. Recommendations for mitigating these zones are recommended in this report. Rules for access to impacted area are based on policy set by property management and may include RF alerting signage and restricted access.

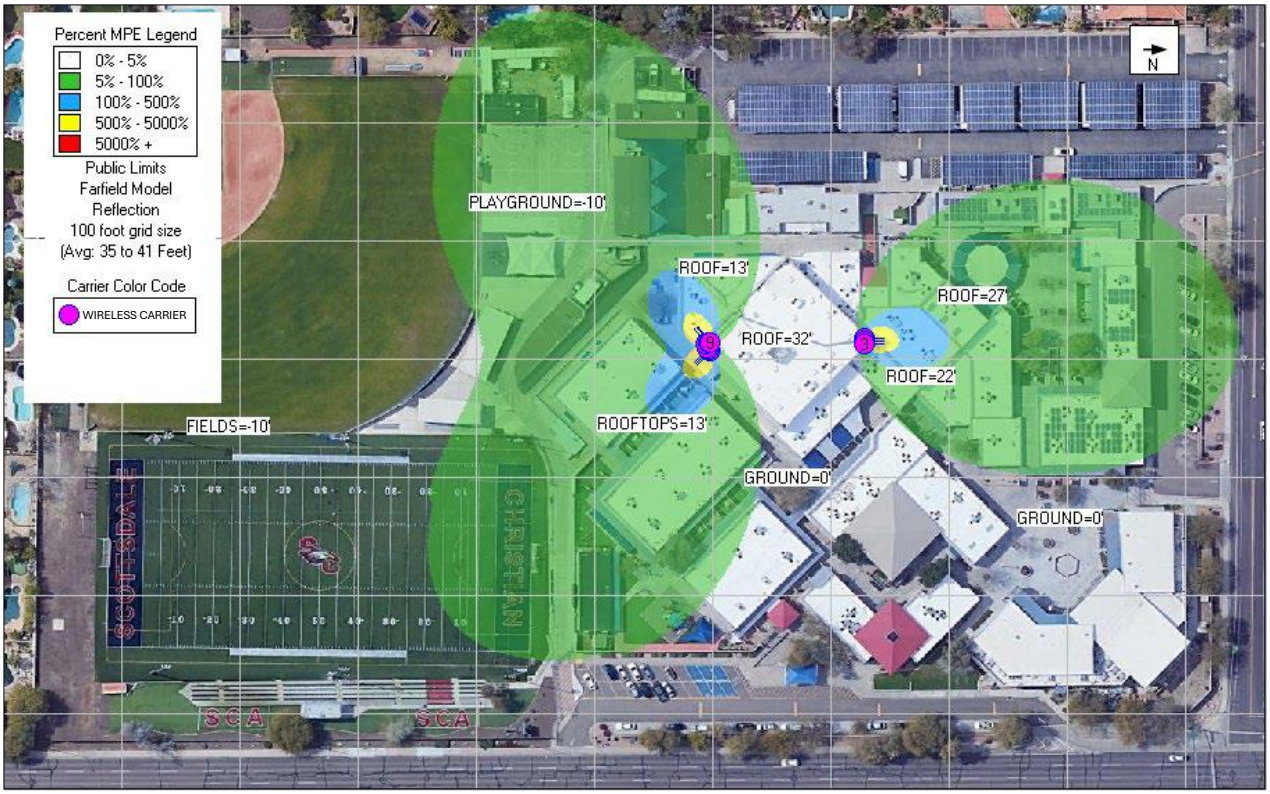


Fig. 4 – Predicted MPE as % of FCC General Population Limits (Antenna Level)

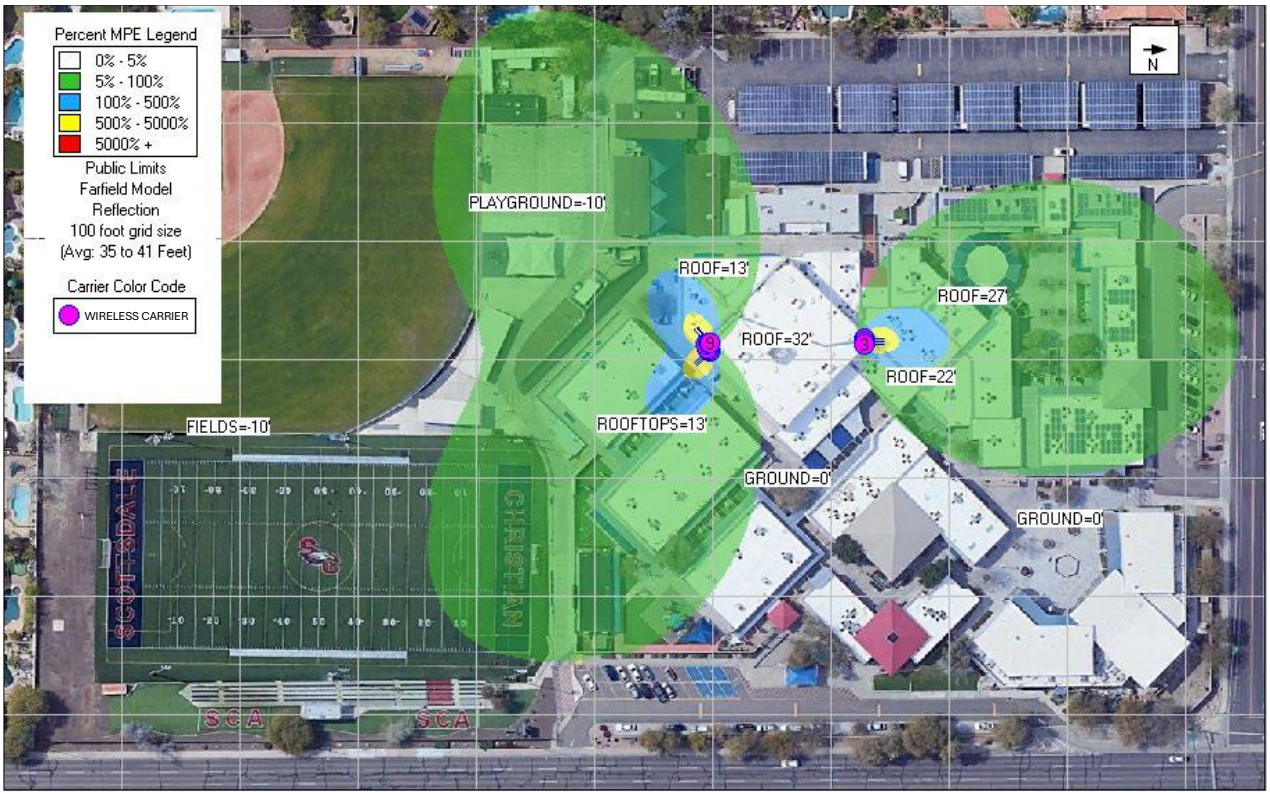


Fig. 5 – Predicted MPE as % of FCC General Population Limits (Ground Level)

The reference plane for each plot is indicated in the caption and legend. For example, "Antenna Level" appearing in the legend indicates that the RF plot depicts spatially averaged predicted power densities at the antennas' centerline-height … an area which the public cannot occupy and a worker can only occupy via alternative equipment such as a boom-lift or crane. Plots are produced for each accessible level or walking surface and areas that are not accessible do not include a corresponding plot.

Using prescribed methods for worst-case assessment of the proposed operations, predictive modeling indicates that RF power density levels will be *below* the FCC General Population limits at accessible areas to students, staff and visitors at this campus.

RF alerting signs were posted at the antennas to provide notification of potential conditions in front of the antennas. For areas beyond this zone, no special action was required to maintain a safe environment and there is no time limit for safe activities in these regions.

## The Results

A few days after completing the analyses, Waterford delivered a professional engineer-certified report to SCA that included results from both the *on-site survey* and the *predictive analysis*. The actual field measurements showed **no rooftop location exceeded 1.9% of the Maximum Permissible Exposure (MPE) limits** for the General Population as set forth by the Federal Communications Commission (FCC) Rules (47 C.F.R. § 1.1310). **Ground measurements**

**revealed similar results while in-building measurements did not exceed 3.4% of the MPE limits** for the General Population. The highest *in-building* measurement was found in the media center where several wireless routers, servers, computers and fluorescent lights are located and likely contributed to the cumulative measurement results.

Using wireless industry standard methods for 'worst-case assessment' of the proposed wireless carrier operations at this site, predictive modeling using RFMaster™ software indicated RF power density levels *below* the FCC General Population limits in areas accessible to students, staff and visitors on the campus and thus, were deemed compliant and safe.

## Communications

Throughout the process, the Waterford team assisted SCA by reviewing and editing talking points for school board members, drafting responses to concerned parent inquiries, and authoring clear and accurate communications concerning the results of the studies. Waterford helped educate the administration on "5G" and the basics of radio frequency exposure so they could effectively address concerned parents, staff and the media. This included providing access to Waterford's on-line RF safety training.

## Final Steps

SCA quickly recognized the fact that RF environments constantly change and requested that Waterford install two (2) Radio Frequency Infrastructure Sentry (RFIS™) devices on adjacent rooftop locations with direct line of sight to the transmitting antennas. Representing the latest in RF compliance management technology, the RFIS™ devices continually monitor the RF environment on a 24/7/365 basis and convey the relevant emissions data on a web portal accessed by SCA administrators. Alert notifications triggered in real-time, when applicable, are transmitted via email if cumulative RF measurements exceed the FCC General Population exposure limits or when other alert notification criteria are met.

**The RFIS™ solution enables SCA to take a *proactive* approach to ensuring a safe RF environment on campus at all times and address parental concerns rather than be limited to relying on a traditional RF compliance assessment methods which consider static data based solely on either computational analysis or a one-time, on-site field measurement**.

SCA expanded the on-line RF safety training to those employees and vendors who might access the rooftops and encounter the transmitting antennas. Waterford will also review and provide updates to the SCA safety plan to ensure RF safety is adequately addressed, including the use of personal RF monitoring devices.

## ABOUT THE AUTHOR

Steve Baier-Anderson has worked in the wireless industry since 1990 as an engineering consultant and cellular network engineer. Prior to his leadership role as Chief Technical Officer for Waterford, Mr. Baier-Anderson held key roles in the design, deployment and optimization of 2G, 3G, and 4G technologies in the Mid-Atlantic region for Verizon Wireless. He holds a BS in Electrical Engineering from the University of Maine and an MS in Systems Engineering from Johns Hopkins University.

## REFERENCES

1. John Genovese (@JEGenovese), November 2019

   *Two dozen parents (and others concerned) of students at Scottsdale Christian Academy protesting against @TMobile 5G tower on top of school building, @abc15.*
   *https://x.com/JEGenovese/status/1195000295564070915*