

# The Power to Predict – Innovations and Increased Demand for the World's Most Powerful S-Band Weather Radars

Richard Stedronsky

EEC

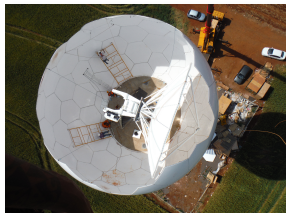
Enterprise, AL USA

sted@eecweathertech.co  
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## Overview

Beginning in 1971, Enterprise Electronics Corporation (EEC) has delivered over 140 S-Band weather radars around the globe. This represents the most of any dedicated manufacturer of commercial weather radar systems in the world. Although numerous advances in X- and specifically C-Band weather radar technologies and economics have made these types of systems somewhat more appealing, the demand for S-Band weather radars continues to expand, as do the technologies related to S-Band radar operations. EEC continues to design and manufacture new innovations to keep pace with mounting S-Band weather radar market demand for customers around the world



EEC S-Band Radar Installation in Brazil

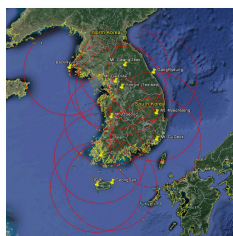
## S-Band vs. C-Band

Numerous advancements in weather radar technologies and algorithms have aided in addressing some of the key limitations of C-Band weather radar systems. Specifically, polarimetric radar has improved the performance of C-Band radar with respect to one of the key limitations; signal attenuation. However, recent studies continue to support the science that not only will S-Band radars always suffer from less attenuation than C-Band systems, but in cases of mixed precipitation types or instances of large hydrometeors, C-Band systems continue to struggle.

A recent joint publication by the University of Oklahoma (USA) & University of Bonn (Germany) noted that, in cases where the hydrometeors were either hail or rain mixed with hail, there appears to be no standard, firm C-Band correction algorithm available. Additionally, another study undertaken by the University of Oklahoma, Kyungpook National University (Korea) & Environment Canada demonstrates that when hydrometeors (specifically raindrops) exceed 4.5mm in diameter, the effects of resonance scattering, causing the droplets to behave like Mie scatterers, results in noticeably inaccurate (higher) C-Band reflectivity values.

## Customer Applications - Korea

In 2012, EEC and partner STX Engine Co. of Korea won a competitive contract to deliver 11 massive dual-polarization S-Band Klystron systems to the Korean Meteorological Administration (KMA) over the course of 6 years. The KMA oversees meteorological services for the Republic of Korea, a country with over 50 million people. The Republic of Korea has been involved in weather monitoring and forecasting for over 60 years, and the KMA has a legacy of staying on the cutting edge of industry technology.



Projected Coverage Map for KMA S-Band Network (Once Complete)



8.5m Antenna for a KMA S-Band System Undergoing Testing at EEC

In addition to the local geographic and climate challenges Korea presented, EEC also faced the challenges of designing, manufacturing and delivering the world's first-ever dual-polarization S-Band Klystron radar network. The total network, once complete, will provide for 11 operational systems and 1 test bed system. Furthermore, EEC was challenged to deliver an antenna designed to meet higher performance requirements than the currently accepted standard set by the NWS NEXRAD network. To this end, and in keeping with a tradition of defining the industry, EEC designed and implemented a number of key innovations to ensure project success, including:

- New I-Series Pedestal System- 25% lighter than NEXRAD
- New Integrated Drive Motor – no external gearbox/encoder
- New 8.5m Composite Antenna – industry-leading side lobes
- Digital Direct Synthesis (DDS) STALO – reduces phase noise
- High-Precision Pulse Profilers – enables system monitoring



Operational EEC S-Band Radar System on Baengnyeong Island in Korea

## Customer Applications – Univ. of Louisiana at Monroe

Earlier this year, EEC secured a contract to deliver another large dual-polarization S-Band system, this time to the University of Louisiana at Monroe (ULM). Established in 1931, ULM is a public, coeducational university located in Monroe, LA USA and part of the University of Louisiana System. ULM has over 8,800 enrolled students and over 60 programs for bachelor, master, and doctoral study. ULM also boasts the state's only atmospheric science program, making this project a natural fit.



ULM's S-Band System Undergoing Testing at the EEC Factory in Enterprise, AL



Installed EEC S-Band Radar System at ULM

Much like the KMA, ULM faced key geographic challenges when it came to selection of radar system type and siting. Although terrain was not an issue, location with respect to the current NWS NEXRAD network was. Currently, Monroe sits in what is considered a coverage gap between the two closest NEXRAD radars in Shreveport, Louisiana and Jackson, Mississippi. In addition to NEXRAD coverage gap challenges, overall funding for the project was also a major concern. ULM began discussions with the US Department of Homeland Security to secure funds for this project as far back as 2008. The focus of these efforts was to show the value the radar data would have for not only the nearby NWS forecast offices, who would be able to fill the gap in current coverage, but also for local and state emergency managers.

## Summary

Although new attenuation correction procedures, along with traditional up-front cost benefits, have somewhat increased support for C-Band systems, demand continues to rise for S-Band solutions. This escalation has been especially noticeable in cases of national weather radar networks and in areas exposed to various, widespread severe weather threats. In addition to the case studies presented above, EEC has also recently delivered a network of S-Band radars into Tanzania, and has expanded its presence in Brazil by installing numerous S-Band radar systems to support not only university research, but also the 2014 FIFA World Cup and the upcoming 2016 Summer Olympics.

With the ultimate long-range view, maximum penetration of severe storms, and minimum attenuation, S-Band weather radars continue to be the leading choice for covering huge expanses of land and water, all while providing for the most accurate analysis of severe weather phenomena. No product line offering is complete without a powerful, professional, state-of-the-art S-Band weather radar solution.

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