

2019 DMSMS Team Achievement Award

Generalized Emulation of Microcircuits (GEM) Advanced Microcircuit Emulation (AME), DLA J6 Land and Maritime

PREFACE: In the late 1980's, DLA recognized that microcircuit obsolescence threatened the readiness of many American defense systems. Numerous systems in the armed forces were designed and developed in the 1960's and 1970's. For example, the U.S. Air Force began flying the F-15 Eagle tactical fighter in 1972, and the U.S. Navy first tested the Aegis phased array radar at sea in 1973. Because of continued advancements in semiconductor technology, the original suppliers stopped manufacturing the microelectronic components used in these and other systems. DLA contracted with SRI to begin research and development on how to best replace obsolete microcircuits with standardized, modern integrated circuits. DLA and SRI collaborated to develop the Generalized Emulation of Microcircuits (GEM) Program. Using its on-site trusted semiconductor foundry and deep knowledge of IC design/development, SRI produces on-demand, Class Q microcircuits matching the Form-Fit-Function-Interface (F3I) criteria of the required microcircuit. DLA is developing the next generation of F3I microcircuit Emulation capability through the Advanced Microcircuit Emulation (AME) Program to further alleviate growing IC obsolescence issues caused by the continued rapid advancements in technology. This unique and successful arrangement has countless successes and is an ongoing effort to coordinate future obsolescence issues as it relates to microcircuits. The emphasis towards microcircuit obsolescence is driven by the fact that over 50 percent of DLA's DMSMS cases are microcircuits.

Emulation is the key to the development of the new designed F3I microcircuits. To date there has not been a single reported field failure of an AME/GEM microcircuit. Over 155,000 parts have been delivered to DLA, the Services, other Government Agencies, and Weapons system Defense contractors without a single reported field failure.

The overall process of developing and qualifying (Qualified Manufacturing List (QML) MIL-PRF-38535) typically is a 24-week process. Once qualified, depending on the device and coding, the production and insertion testing generally takes another 24 weeks. Even though some projects, due to complexity, have taken longer than a year, the average timeframe from R&D to production is less than one year.

- Four notable projects have been completed by the AME, R&D phase. These programs represent qualifying hundreds if not thousands of parts on the DLA Standard Microcircuit Cross-Reference (SMCR). The four programs are: .25 micron technology targeting Application Specific Integrated Circuits (ASICs) and Field Programmable Gate Arrays (FPGAs), .35 micron technology or large gate arrays to expand ASICs, FPGAs, and Programmable Logic Devices (PLDs), and 20 volt OpAmp program for linear, non-digital devices, and the 256K Static Random Access Memory (SRAM) program for the High Density SRAM and ROM memory devices.

- Implementation has begun –The product lines either have qualified or are in the process of final QML qualification.

The AME/GEM Program supports all the Military Services, other Government Agencies (e.g. Department of Energy (DOE), Kansas City National Security Campus (KCNSC)), and Foreign Military Sales (FMS) and Weapon system Defense contractors. The AME/GEM Program is capable of manufacturing over 25,000 different part numbers.

- The Program supports over 562 weapons platforms. GEM not only supports aging weapon systems, but also newer platforms B-1, B-2, F-15, F-16, F-18, F-22. Patriot Missile, Sea Sparrow Missile, Trident Missile.
- We have supported DOE having completed 2 of the 3 items in demand from KCNSC and are in the final stages of completing the 3rd item for production. Issues had to be resolved in how DOE could purchase parts directly from SRI, along with challenges associated with the exchange of sensitive information. These issues had to be addressed by the DLA AME/GEM PMs and Contracting Officer Technical Representative (COTR).
- The AME/GEM Team has addressed the counterfeit mitigation program to a zero risk level and all but eliminating the possibility of malicious devices or coding of the silicon die.

The AME/GEM program over the years of producing replacement, F3I parts to the Services and U.S. Government Agencies has yielded an estimated cost avoidance of \$2B in system re-design.