We seek contributions from government, academia and industry in a broad set of critical technology areas supporting Government microcircuit applications. Authors are encouraged to review the technical topic area descriptions below and submit your abstract to the technical topic area most closely aligned with your abstract. If you are unsure which technical topic area to submit to please contact the GOMACTech Technical Program Chair – Steve Hary at stephen.hary@us.af.mil

GOMACTech 2017 Technical Topic Areas

Radiation Hardened Technologies, Designs & Systems

Papers are sought detailing R&D work related to advancing the state of art in radiation-hard microelectronics in the following areas

- Radiation Hardened Technologies and Systems featuring research on current rad-hard technology programs, including captive IC processing, rad-hard fabrication through trusted commercial foundries and manufacturing innovation. Also of interest are rad-hard systems under development for DoD applications and radiation test guidelines for critical applications.
- Radiation Hard Characterization Methods and Mechanisms featuring research on novel radiation hard characterization methods, basic mechanisms of radiation effects in novel nano-devices, and research on developing atomic-scale understanding of radiation effects and in atomic-scale defects. Methods of interest include but are not limited to electrically detected magnetic resonance and laser induced quantification of SEE effects.
- Radiation Hardened by Design (RHBD) electronics research, from an applied, design perspective. Research areas of interest include design tools for sub-100nm technologies, radiation mechanisms and mitigation in high-speed analog and mixed-signal circuitry, and scalable RHBD techniques.
- Rad Hard and Space Applications including all aspects of computing in the space radiation environment from high reliability critical control applications to high through put data processing. Subjects can include all aspects of space processing from traditional radiation hard by process and design through software fault tolerance and real number parity calculations.

Trust, Security and Counterfeit Technologies

Papers are sought in broad areas including novel techniques for measuring and verifying trust and assurance and defining, creating, establishing thresholds and confidence in trust or assurance of microelectronics products. Particular areas of interest include verification and validation techniques for detecting tampering, exploitation and counterfeiting in microelectronics products, novel techniques for preventing and being resilient to malicious actions and counterfeiting in the microelectronics supply chain. Programmable systems are also of particular interest, including vulnerabilities in programmable microelectronics as well as new approaches to monitoring and protecting programmable products and their features against exploitation. Finally novel techniques that can be applied to diagnose potential exploitations confirm actual counterfeits or tampering and develop evidence of the origin of anomalies and intent of adversaries and techniques that can be used to effectively screen for these exploitations.

RF Technologies, Components and Systems

Papers are sought in the broad field of RF technologies from low frequency to mm-wavelengths and beyond, with particular emphasis on microsystem design and demonstrations of:

1. Reconfigurable electronics, self-healing circuits
2. Phased Arrays, Beamforming, on-chip antenna integration
3. High-efficiency and broadband high-frequency linear power amplifiers, with emphasis on thermal design and management
4. Heterogeneous Integration of process technologies implementing complex on-chip functionalities
5. Systems-On-a-Chip, mixed signal circuits, high speed data interface and transport between chips.
6. High sensitivity, high dynamic range receiver technologies

Contributions in areas tackling new challenges and/or demonstrating new capabilities in the RF technology field are also welcomed.

EO/IR Technologies, Components and Systems

Papers are sought in the area of EO/IR technologies, components, and systems. This area of research entails the development of electro-optic hardware that supports government related applications such as infrared countermeasures, passive imagers, LADAR concepts, and EO/IR characterization systems. Relevant component technologies include infrared focal plane arrays, read-in and read-out integrated circuits, lasers, beamsteering concepts, and integrated assemblies.

Digital Technologies, Components and Systems

Papers are sought that detail current advances in the design and development of high performance, low power digital solutions to meet the ever-increasing needs of DoD applications. Novel digital circuits and circuit design techniques, components including ASICs, FPGAs, Systems-on-a-Chip, microprocessors and microcontrollers, and technologies that facilitate advanced digital design are of interest.

Photonic Technologies

Papers are sought for Photonic Technologies, which is the application of opto-electronics to enhance or replace electronics for critical government applications. Photonic technologies span Radio Frequency (RF), analog, and digital domains. RF photonics is attractive for signal transmission and processing in sensors systems due to benefits of light weight, low-loss, wide bandwidth and high frequency over conventional electronics. Particular areas of interest include RF Photonic phased-array beamforming, antenna remoting, signal processing (e.g. RF up/down conversion), and simultaneous transmit and receive (STAR) applications using both bulk and highly integrated approaches. Digital photonics is already prolific in digital networks and advances in robust and rugged optical interconnects and integration with electronics for government applications is of interest.

High Performance Microsystems

Papers are sought detailing R&D work related to advancing the state of art in microsystems, focusing on activities in the high performance regime. "Microsystems" generally refers to a single chip or some type of highly integrated multi-chip assembly. That chip or assembly could be monolithic or heterogeneous in composition, but this topic is mainly intended for relating advances in technologies that account for functionality and performance of the microsystem beyond a straight digital focus. "High performance" generally refers to major advancements in one or more of a set of critical parameters like functions, speed, bandwidth, frequency, power, dynamic ranges, etc. The parameter space of interest is open-ended to give broad ability to offerors to provide reports on progress in the technologies of greatest relevance for their end-use application. Examples of some high performance microsystems include but are not limited to Smart Adaptive Electronics, Sensors and Advanced Processors, Cognitive Radios, Adaptive Transmitters, Agile Wideband Hugh Dynamic Range Receivers, Reconfigurable Integrated Chips.

Power Electronics and Emerging Power Technologies

Papers are sought covering all aspects of power electronics R&D from materials development and basic devices to circuits and systems. Submissions are encouraged in the areas of wide- and ultrawide-bandgap material development and device results (GaN, SiC, Ga2O3, AlN, and Diamond), pulsed power, wireless power transfer, and novel power distribution architectures.

Packaging, Integration, Thermal and Control Technologies

Papers are sought detailing R&D related to post-chip fab technological work on integration, advanced packaging, and thermal management. "Integration" work refers to technologies that can be used to combine different types of chips together in seamless and new ways (2.5D, 3D integration, and interposers are examples, but others are encouraged). "Packaging" refers to the broader technology area of assembling chips into completed assemblies and encompasses materials, processes, and interconnections (electrical and possibly others). Work in "thermal and control technologies" refers to efforts in advancing new types of cooling and thermal solutions for a diverse array of chips needed for defense applications (including but not limited to GaN amplifiers and high performance 3D computer chips).

Emerging Technologies

Papers are sought detailing application of emerging technologies sot government microsystem applications. Emerging technologies are a critical enabler for new information, signal and data processing capabilities of the future. The scope of technologies sought includes, but is not limited to, new concepts, devices, and components for integrated photonics, quantum information S&T, quantum sensing S&T, quantum communications, neuroelectronics to include neuromorphic concepts, devices, and circuits, and bioelectronics sensors to include flexible electronics. It also includes new concepts and devices for IC's beyond Moore's Law for example to include novel 3D technologies and heterogeneous integration of novel devices, hetero-epitaxial devices, carbon based electronic devices, and spintronic technologies (spin-torque, spin-wave, etc.).

This Technical Topic Area seeks contributed papers pertaining to this wide range of novel device technologies to meet future national defense and security requirements.

(Advanced material development, processes, and new manufacturing approaches, for the devices and circuits of this Technical Topic Area are to be submitted to the Technical Topic Area on Advanced Materials and Processing).

Advanced Materials and Processing

Advanced materials and processing approaches provide the catalyst for enhancing existing technologies, enable the use of current technologies in new ways, and are central to pioneering new technological areas. In particular, government systems seek advanced materials that lead to breakthroughs in the RF/millimeter/THz regimes. Likewise, beyond-Si materials for radiation-hardened electronics, and power electronics are sought after. These may include Ge, III-V, GaN, AlN, oxide semiconductors, along with materials for extreme electrostatic control including carbon nanotubes, graphene, black phosphorous, and transition metal dichalcogenides. Understanding novel materials-driven phenomena like phase-changes, spin transport/lifetime, etc., are also of interest for future government systems. Finally, novel processing approaches have recently enabled the integration of dissimilar materials/devices onto a single substrate forming hybrid systems. This compilation of materials and devices gives rise to novel systems with enhanced performance that may also be flexible, soft, and potentially transient, thereby broadening their range of government system applicability.

This Technical Topic Area seeks contributed papers pertaining to this wide range of advanced materials and processes technologies and are expected to be more fundamental investigations.

(Advanced and novel devices and components that apply the materials and processes highlighted in this Technical Topic Area should be submitted to the more applied Technical Topic Areas including Emerging Technologies if none directly apply).