Electronic Warfare / Electronic Protection (EW/EP)
S&T Priority Steering Council

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Standard Form 298 (Rev. 8-98)  
Prescribed by ANSI Std Z39-18
Electronic Warfare: Military action involving the use of electromagnetic (EM) and directed energy to control the electromagnetic spectrum (EMS) or to attack the enemy.

**Electromagnetic Spectrum Management**

**EP**
- Protect EM systems against EM interference

**EA**
- Degrade, disrupt, deceive, & deny adversary EM system signals, processing, and C2 functions

**DE (EA)**
- Induced currents or voltages

**ES**
- Tactical sensing for real-time response

**Cyber Attack**
- Operations intended to manipulate adversary info and/or cyber systems

**ISR/SIGINT**
- Intelligence, Surveillance and Reconnaissance gathering systems

**PSYOP/MISO**
- Induce alarms or failures / influence ideology

**Counter-DE**
- Protect non-EM system against EM interference and DE (Weapon)

**C3**
- Command, Control and Communications (voice, data, info)

**DE (Weapon)**
- Thermal / radiation bombardment
EW/EP Problem Statement

Rapidly evolving challenges to spectrum dominance threaten blue force lethality and survivability

Exacerbating this situation are:

• The asymmetric advantage that lower cost and widespread technology offers our adversaries against our multi-billion $ investments in military systems,

• The rapid pace of technology advancement leading to increasing potential for technology surprise,

• Pressure for EW operations across all war-fighting domains (air, sea, land, space, and cyber),

• The worldwide availability of advanced technology that is making our adversaries’ use of the EMS much more complex and sophisticated, and

• The increasingly congested EM environment
EW/EP Tech Challenges & Desired End States

- **TC1: Cognitive, Adaptive Capabilities**
  - Effectively outpace adversary decision and technical options

- **TC2: Coordinated / Distributed / Network-Enabled Systems**
  - Spatially and temporally diverse responsiveness to dense and complex threat environments

- **TC3: Preemptive / Proactive Effects**
  - Real-time sensing, assessment and optimization of EA effectiveness

- **TC4: Broadband / Multispectral Systems**
  - Widest possible spectral extent to our control of the EMS

- **TC5: Modular / Open / Software-Configurable Architectures**
  - Timely deployment or insertion of advanced EW in response to rapidly changing conditions

- **TC6: Advanced Electronic Protection Techniques & Technology**
  - Allow unfettered operations in the increasingly dense EMS environment
EW/EP PSC Gaps & Opportunities

Game-Changing RF/Mixed Signal Component Technologies

- Agile, high dynamic range receiver electronics
- Agile, wideband transmitter electronics
- Affordable/modular agile beam antennas

Game-Changing EO/IR Component Technologies

- Next generation multispectral IR Focal Plane Arrays (FPAs)
- Multispectral, high power lasers
- Multispectral optics & optical phase control

Underlying technology enablers

- Nitride semiconductor family (GaN/InN/AlN)
- Ultra-precision clocks/oscillators (nsec → psec → fsec)
Broad Agency Announcements

- Industry responses to the grand challenges identified in this brief should engage in dialogue with the PSC leadership
- The following Broad Agency Announcements (BAAs) may also provide an avenue for specific ideas:

**Air Force**
BAA 09-01-PKS: “Sensor Technology Research, Development, Test & Evaluation Open-Ended Broad Agency Announcement (STROEB) II”

**Army**
BAA W15P7T-09-R-S152: "United States Army Communications-Electronics Research Development and Engineering Command Intelligence and Information Warfare Directorate Broad Agency Announcement I2WD 2009“

**Navy**
Summary and Conclusion

- Electronic Warfare is a critical enabler for Air, Land, Sea, Space, and Cyber operations.
- Independent systems- & components-level analyses converged on a short list of long term game-changing tech challenges...
  - Cognitive / adaptive capabilities
  - Networked distributed coherent systems
  - Simultaneous Tx & Rx (STAR)

... enabled by highly linear, agile, high dynamic range, wideband / multispectral Tx & Rx components, precision clocks/oscillators, and active phase controlled apertures

- Roadmaps being finalized/configured to achieve an integrated systems and components EW investment strategy
EW/EP PSC Membership

PSC Lead: Jay Kistler ASD(R&E)
PSC Deputy: Dr. Karl Dahlhauser ASD(R&E)
Air Force: David Hime (Lead), Marv Potts, Dr. Steve Schneider
Army: Dr. Paul Zablocky (Lead)
Navy: Dr. Peter Craig (Lead), Dr. Gerry Borsuk, Dr. Frank Klemm
DARPA Liaison: Chris Earl

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Dr. Dave Abe (Navy SME)
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Dr. Michael Wrabach (Army)
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