

**Opportunity Title:** Novel Technologies for Power and Thermal Management of Millimeter Wave ESAs

**Opportunity Reference Code:** ICPD-2019-08



**Organization** Office of the Director of National Intelligence (ODNI)

**Reference Code** ICPD-2019-08

**How to Apply**

**Create and release your Profile on Zintellect** – Postdoctoral applicants must create an account and complete a profile in the on-line application system. **Please note: your resume/CV may not exceed 2 pages.**

**Complete your application** – Enter the rest of the information required for the IC Postdoc Program Research Opportunity. The application itself contains detailed instructions for each one of these components: availability, citizenship, transcripts, dissertation abstract, publication and presentation plan, and information about your Research Advisor co-applicant.

Additional information about the IC Postdoctoral Research Fellowship Program is available on the program website located at:  
<https://orise.orau.gov/icpostdoc/index.html>.

If you have questions, send an email to [ICPostdoc@orau.org](mailto:ICPostdoc@orau.org). Please include the reference code for this opportunity in your email.

**Application Deadline** 3/1/2019 6:00:00 PM Eastern Time Zone

**Description** **Research Topic Description, including Problem Statement:**

Power and thermal management of Radio Frequency (RF) electronics and Electronically Steered Arrays (ESA) requires improvement to support Size, Weight, and Power (SWaP) constrained platforms. Energy storage (power time product) available for these platforms demands energy-usage strategies with reconfigurable RF and digital electronic technologies. Research is needed to identify, design, and control RF and digital electronics in order to adaptively control the RF-digital channel as a function of power. One key aspect to viable power management is to rapidly recover the RF and digital channel fidelity when transitioning from power-off to power-on states or less to more resources. Key RF and digital components to be investigated are: low-noise and power amplifiers (LNAs, PAs), RF tuners, Analog to Digital Converters (ADC), and digital channelizers. Power requirements depend upon the specific application being performed; such as: receive mode (single-input or multiple inputs) versus transmit mode (single or multiple outputs). Additionally, the electronic density required for a two-dimensional ESA unfortunately increases as the square of the highest RF collected. An increase in ESA electronics requires proper power and thermal design, as well as, novel management techniques, specifically for ESAs operating in millimeter wave frequencies on SWaP constrained platforms.

**Example Approaches:**

- Research RF component designs that can be dynamically reconfigured to save power or boost performance. This could include powering off devices not in use, boosting power for better gain, applying or removing RF Interference canceling resources, variable sample rate and resolution of ADC designs, and performance adjustments of digital channelizers.
- Research a hybrid of analog and digital beamforming stages to reduce ESA DC-power density
- Research methods of thermal management of mmW ESAs
- Research alternative technologies to improve thermal dissipation and SWaP such as ESA elemental signal remoting and processing using power-efficient RF-photonics
- Research dynamic aperture thinning concepts
- Research use of RF optics to relax array element spacing.

**Relevance to the Intelligence Community:**

- Finding novel methods to overcoming challenges of power and thermal management for high density electronics and high frequency ESAs could allow for use on SWaP constrained platforms.

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**Key Words:** Millimeter Wave, Electronically Steerable Array, ESA, Phased Array, Dynamic Power management, Dynamic Thermal Management, SWAP

## Qualifications

### Postdoc Eligibility

- U.S. citizens only
- Ph.D. in a relevant field must be completed before beginning the appointment and within five years of the application deadline
- Proposal must be associated with an accredited U.S. university, college, or U.S. government laboratory
- Eligible candidates may only receive one award from the IC Postdoctoral Research Fellowship Program.

### Research Advisor Eligibility

- Must be an employee of an accredited U.S. university, college or U.S. government laboratory
- Are not required to be U.S. citizens

## Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.
- **Discipline(s):**
  - **Chemistry and Materials Sciences** (12 )
  - **Communications and Graphics Design** (6 )
  - **Computer, Information, and Data Sciences** (16 )
  - **Earth and Geosciences** (21 )
  - **Engineering** (27 )
  - **Environmental and Marine Sciences** (14 )
  - **Life Health and Medical Sciences** (45 )
  - **Mathematics and Statistics** (10 )
  - **Other Non-Science & Engineering** (5 )
  - **Physics** (16 )
  - **Science & Engineering-related** (1 )
  - **Social and Behavioral Sciences** (28 )