Opportunity Title: All-optical sampling for THz bandwidth signals
Opportunity Reference Code: IC-18-25

Organization	Office of the Director of National Intelligence (ODNI)
Reference Code	IC-18-25
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://orau.org/icpostdoc/. If you have questions, send an email to ICPostdoc@orau.org. Please include the reference code for this opportunity in your email.
Application Deadline	3/12/2018 11:59:00 PM Eastern Time Zone
Description	**Research Topic Description, including Problem Statement:** New optical communication paradigms such as super channels could push the bandwidth of optical signals to 10 THz and beyond. Physical layer processing (i.e., pre-, post-, and mid-span) may be able to reduce the burden on digital post processors even as the signal bandwidths advance. One physical layer technology that may be useful for nonlinear distortion mitigation is an all-optical sampler. The primary goal of this research is to prove the feasibility of using an all-optical sampler for managing the bandwidth of a nonlinear optical processor for signals with bandwidths of 1 THz to 10 THz and beyond. Issues such as dynamic range, in band ripple, insertion loss, noise, etc. should be identified and quantified. **Example Approaches:** A sampled optical signal can be generated at a convenient IF (intermediate frequency) by FWM (four wave mixing) with an optical comb, then lumped-element optical filtering may be used to mitigate nonlinear distortions. After nonlinear filtering, the sampled optical signal can be Nyquist filtered and coherently detected or optically heterodyned to an appropriate band for transmission. By keeping the signal in the optical domain, nonlinear impairments can be reduced while continuing to make use of powerful digital processing to mitigate linear impairments as is done for modern systems. Example existing efforts in this area include: • C. Xu and X. Liu, “Postnonlinearity compensation with data-driven phase modulators in a phase-shift keying transmission,” Opt. Lett., Vol. 27(18), pp. 1619-1621, September 2002. • X. Liu, X. Wei, R.E. Slusher, C.J. McKinstrie, “Improving transmission performance in differential phase-shift-keyed systems by use of lumped nonlinear phase-shift compensation,” Opt. Lett., Vol. 27(18), pp. 1616-1618, September 2002. • S, Radic, “Parametric Signal Processing,” IEEE J. Sel. Topics Quantum Electron., vol 18, no. 2, pp. 670-680, Mar./Apr. 2012. • E. Temprana, E. Myslivets, B.P.-P. Kuo, L. Liu, V. Ataie, N. Alic, and S. Radic, “Overcoming Kerr-induced capacity limit in optical fiber transmission,” Science, Vol 348 Issue 6242, pp. 1445-1448, 26 June 2015.

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- X. Liu, A.R. Chraplyvy, P.J. Winzer, R.W. Tkach, and S. Chandrasekhar, “Phase-conjugated twin waves for communication beyond the Kerr nonlinearity limit,” Nature Photonics, DOI: 10.1038/nphoton.2013.109, May 2013.

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 👁)