

**Opportunity Title:** Future Millimeter Wave Wireless Systems Propagation in Modern Built and Secure Environments

**Opportunity Reference Code:** ICPD-2020-39

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

**Reference Code** ICPD-2020-39

**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.ora.gov/icpostdoc/index.html>.

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

**Application Deadline** 2/28/2020 6:00:00 PM Eastern Time Zone

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

Modern and future wireless technologies, such as fifth generation (5G), are utilizing increasingly higher frequencies into the millimetre wave and beyond with their associated ability to support higher information bandwidths.

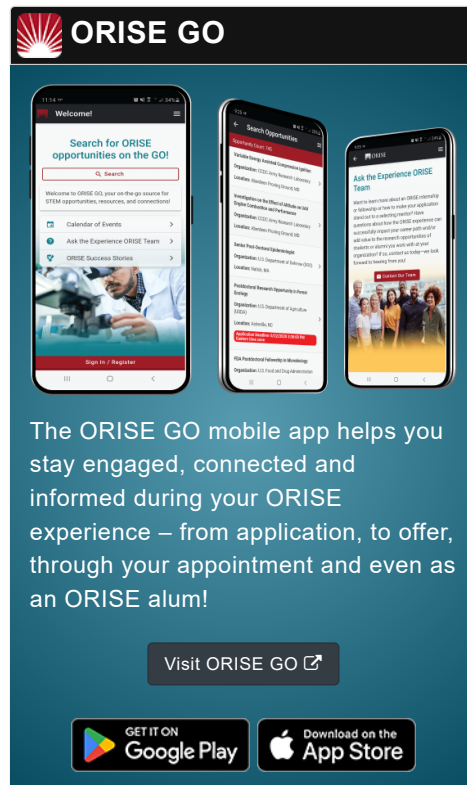
The increased path loss at these higher frequencies means that the density of wireless access points is also increasing resulting in a closer proximity to secure systems and raising associated electromagnetic security concerns.

Understanding the radio physics of radio propagation of high bandwidth signals at millimetre wave within, into and through buildings and the associated wider built environment is necessary for modelling the electromagnetic security threat posed by these new and emerging systems.

The approach is to produce a field portable system and undertake radio propagation measurements of high bandwidth millimetre wave links in representative (including overseas) built environments and develop a representative propagation model.

**Example Approaches:**

- Although existing radio propagation models exist for millimeter wave propagation there has been little work in recent years that takes into account the modern building materials and techniques used in modern building and the built environment, in particular the differences in these across the world.
- Current recommendations of the International Telecommunications Union, ITU, provides two separate recommendations for building entry loss and for clutter loss. *Recommendation ITU-R P.2109* predicts building entry loss for two types of buildings classified as thermally efficient and traditional buildings assuming

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a direct path which is not typical for base station mountings. *Recommendation ITU-R P.2108* predicts the loss due to clutter which includes buildings and other obstacles. Currently there is no model that combines clutter loss and building entry loss for typical base station deployments.

- Understanding millimetre wave propagation in and around the constructions of secure working environments is considerably lacking.

**Relevance to the Intelligence Community:**

To understand the exposure of secure electronic systems to the existing and future millimeter wave radio environment and assess the electromagnetic security threat posed by it.

**Key Words:** Millimeter Wave, Propagation, Radio Physics, Radio Propagation, Built Environments, Technical Security

## 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** (2 )
  - **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** (2 )
  - **Physics** (16 )
  - **Science & Engineering-related** (1 )
  - **Social and Behavioral Sciences** (27 )