

CALL FOR PAPERS
IEEE Sensors Reviews Special Issue on
**Photonic Sensors for Precision Sensing:
Fiber-Optic, Integrated, Plasmonic, and Metasurface Platforms**

Rationale and Motivation

Photonic sensors are moving from proof-of-concept demonstrations toward quantitative sensing instruments for applications that require not only high sensitivity, but also accuracy, repeatability, stability, calibration, and uncertainty control. Fiber-optic sensors, integrated photonic sensors, plasmonic sensors, and metasurface-enabled sensors are often reviewed as separate communities; however, they share common challenges in optical transduction, interrogation, noise management, packaging, environmental robustness, and experimental validation.

This Special Issue will provide an authoritative forum for review, tutorial, and perspective articles that synthesize recent progress in these platforms from the viewpoint of precision sensing. The emphasis is on how photonic devices can deliver reliable, traceable, and deployable measurements through rigorous device physics, modeling, calibration strategies, uncertainty analysis, and system-level validation.

The topic is timely because several photonic platforms are simultaneously reaching maturity: advanced fiber-optic sensing and distributed sensing, chip-scale photonic integrated circuits, microresonators and photonic crystals, plasmonic and surface-enhanced transduction, and dielectric or hybrid metasurfaces for compact spectral, angular, phase, and polarization control. A focused Special Issue can clarify the state of the art, identify performance limits, and highlight pathways from laboratory prototypes to robust precision sensing systems.

Distinctive Focus and Differentiation

This Special Issue is not intended to be a broad collection on general photonic sensing. Its distinctive identity is precision sensing: quantitative, uncertainty-aware optical sensing that connects device-level physics with calibrated measurement performance and realistic deployment constraints.

Submissions should therefore go beyond generic sensor demonstrations and address at least one of the following cross-cutting aspects: physical limits of detection and resolution; signal-to-noise and drift mechanisms; calibration and uncertainty budgets; selectivity and cross-sensitivity; reproducibility and benchmarking; packaging and environmental robustness; scalable interrogation; or validation in relevant application settings.

Scope and Key Subtopics

Authoritative review, tutorial, and perspective papers are sought in areas including, but not limited to:

Photonic sensing fundamentals and performance limits

- Optical transduction mechanisms and light-matter interaction
- Resonant, interferometric, evanescent-field, and near-field sensing
- Noise sources, drift, stability, resolution, and dynamic range

Integrated photonic sensor platforms

- Silicon, silicon nitride, lithium niobate, InP, polymer, and hybrid photonic circuits
- Ring resonators, Mach-Zehnder interferometers, photonic crystals, optomechanical sensors, and on-chip spectrometers
- Microfluidic integration, multiplexing, packaging, and wafer-scale testing

Metasurface-enabled sensing

- Dielectric, plasmonic, active, tunable, and hybrid metasurfaces for sensing
- BIC-based, resonant, spectral, polarimetric, angular, and imaging approaches
- Flat-optics interrogation, compact spectroscopy, and multifunctional sensing surfaces

Packaging, interrogation, and system integration

- Optical readout architectures, sources, detectors, spectrometers, and electronics
- Thermal, mechanical, chemical, and environmental robustness of packaged sensors
- Portable, remote, multiplexed, and deployable photonic sensing systems

Fiber-optic sensor platforms

- Fiber Bragg gratings, interferometric sensors, specialty fibers, and lab-on-fiber devices
- Distributed fiber sensing based on Rayleigh, Brillouin, and Raman scattering
- Harsh-environment, biomedical, structural, industrial, and energy applications

Plasmonic and nanophotonic sensing

- Surface plasmon resonance, localized plasmon resonance, SERS, and nanoantenna-based sensors
- Biofunctionalization, chemical selectivity, surface effects, and interfacial phenomena
- Hybrid plasmonic-photonic architectures and enhanced light-matter interaction

Precision measurement, calibration, and uncertainty

- Uncertainty budgets, traceability, calibration protocols, and reference measurements
- Cross-sensitivity compensation, selectivity, limit of detection, limit of quantification, and reproducibility
- Model-based design, multiphysics simulation, data-driven correction, and uncertainty-aware signal processing

Application-driven validation and benchmarks

- Biomedical, environmental, chemical, food, agricultural, structural, industrial, aerospace, marine, and energy sensing
- Benchmark datasets, comparative evaluation, long-term stability studies, and field validation
- Standards, best practices, and reproducible reporting for photonic precision sensing

Article Types

- Critical review papers that synthesize the state of the art and identify unresolved challenges.
- Tutorial papers that explain physical principles, design methods, calibration procedures, uncertainty analysis, or interrogation strategies.
- Perspective papers that define emerging directions, roadmaps, benchmarks, and best practices for photonic precision sensing.

Expected Impact and Target Communities

The Special Issue is expected to serve as a reference point for researchers and practitioners who develop optical sensing technologies and need a clear view of performance limits, practical design trade-offs, and routes to reliable deployment. It will help bridge communities that are often separated by platform, including fiber-optic sensing, integrated photonics, plasmonics, metasurfaces, optical metrology, biophotonics, chemical sensing, structural health monitoring, environmental monitoring, industrial sensing, and harsh-environment sensing.

The target audience includes academic researchers, national laboratories, industrial R&D groups, sensor manufacturers, photonic foundries and packaging communities, metrology-oriented researchers, and application specialists seeking robust optical sensing solutions.

Submission and Review Process

Solicited and invited papers shall undergo the standard IEEE Sensors Reviews peer-review process. All manuscripts must be submitted online via the [IEEE Author Portal](#). When submitting, please indicate in the manuscript type or

special issue menu that the paper is intended for the "Photonic Sensors for Precision Sensing: Fiber-Optic, Integrated, Plasmonic, and Metasurface Platforms" Special Issue. Authors are encouraged to suggest names of potential reviewers for their manuscripts. For manuscript preparation and submission, please follow the [Information for Authors](#) at the IEEE Sensors Reviews web page.

Deadlines

| Milestone | Proposed date |
|---|----------------------|
| Manuscript Submission | January 31, 2027 |
| Notification of Acceptance | April 30, 2027 |
| Final Manuscript published in IEEE Xplore | June 15, 2027 |
| Tentative date of paper section | September 2027 |

Proposed Guest Editors

| Role | Name, affiliation, and email | Coverage |
|-------------------|---|---|
| Guest Editor / AE | Prof. Francesco Dell'Olio Polytechnic University of Bari, Italy francesco.dellolio@poliba.it | Integrated photonic sensors; device physics; sensor modeling and validation |
| Guest Editor / AE | Prof. Daniele Tosi Nazarbayev University, Kazakhstan daniele.tosi@nu.edu.kz | Fiber-optic sensors; biomedical and distributed sensing; optical interrogation |
| Guest Editor / AE | Dr. Nageswara Lalam National Energy Technology Laboratory (NETL) U.S. Department of Energy, USA Nageswara.Lalam@netl.doe.gov | Fiber-optic and optical sensors; harsh- environment and energy applications |
| Guest Editor | Dr. Teresa Natale Polytechnic University of Bari, Italy teresa.natale@poliba.it | Photonic sensing; device-level characterization; early-career researcher |