HAMAMATSU Photonics Innovation Awards 2025

Understanding Laser Behavior Beyond Wavelength

A story written in wavelength drift, power stability, and time.

Following recent industry recognition for its polarization interferometric sensing approach, Coher Sense is translating award-winning photonics innovation into practical system diagnostics. In modern photonics systems, wavelength has long been the primary diagnostic parameter. Precision wavemeters, frequency references, and locking electronics ensure that lasers operate at the required spectral position. This metrological accuracy remains essential, however it is no longer sufficient to fully understand system performance.

Today's laser architectures are increasingly complex: multi-laser quantum platforms, tuneable spectroscopy sources, nonlinear conversion chains, and industrial laser processes all depend on long-term stability, power consistency, and predictable dynamic behaviour. A laser can be perfectly locked in wavelength, yet still drift thermally, fluctuate in output power, or exhibit mode instabilities that impact system outcomes. This is where behavioral observability becomes critical.

The KISA interferometric sensor platform developed by Coher Sense was designed to extend laser diagnostics beyond static wavelength readouts. By monitoring wavelength and optical power simultaneously, KISAs enable continuous visibility into laser dynamics under real operating conditions. Engineers and researchers gain insight into correlations between spectral drift and output power, detect instabilities earlier, and build a more complete understanding of system performance.

High-sensitivity photodetectors, such as those developed by Hamamatsu Photonics, play a key enabling role in this architecture, supporting the signal fidelity required for stable interferometric analysis across varying optical power levels.

Rather than replacing precision wavemeters, this approach complements them:

- Wavemeters lock lasers.
- KISAs help users understand them.

As photonics systems scale in complexity, from multi-laser quantum architectures to embedded industrial platforms, the transition from measurement to system understanding is accelerating.

From award recognition to real-world deployment, Coher Sense's mission remains consistent: enabling operational awareness and scalable diagnostics for the next generation of photonics systems. This collaboration between Coher Sense and Hamamatsu aims to further explore how advanced detection and interferometric sensing can support scalable, real-world photonics applications.

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