

# Coherent probe-pump-based Brillouin sensor for centimeter-crack detection

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We provide a theoretical explanation for a coherent probe-pump-based Brillouin sensor system that achieves centimeter spatial resolution with high-frequency resolution. It was recently discovered that, when a combination of cw and pulsed light (the probe beam) interacts with a cw laser (the pump beam), centimeter spatial resolution with high-frequency resolution can be achieved even though the probe-pulse duration is 1.5 ns [Opt. Lett. **29**, 1485 (2004)]. Our study reveals that the coherent portion inside the pulse length of these two interactions caused by the same phase is responsible for this behavior. It allows us to detect 1.5-cm outer-layer cracks on an optical ground-wire cable. © 2005 Optical Society of America

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