

# Standoff Chemical Sensing Wireless Network

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## Abstract

Optical remote chemical sensing is one of the most efficient non-contact chemical sensing technologies. Since many chemicals show molecular rotovibrational absorption in the mid-wave infrared and longwave infrared (MWIR/LWIR, 3-12  $\mu\text{m}$ ) spectral region, multispectral MWIR/LWIR sensing in the MWIR/LWIR can provide measurement of the chemical compositions and allows real-time identification of chemicals with high reliability. Because the multispectral remote chemical sensing technique doesn't need the de-absorption or replacement of sensing materials, it can avoid equipment contamination and allow continuous real-time chemical monitoring. In addition, the multispectral optical remote sensing technique can offer a much broader coverage area and detection distance than current chemical "sniffers", which requires physical contacts with chemicals to be detected.

The optical remote sensing units can be connected and form a wireless network that can provide distributed MWIR/LWIR optical remote chemical sensing with enhanced effectiveness, accuracy, and reliability. In addition, the MWIR/LWIR optical remote sensor network can provide additional information about the chemicals, including their exact location, distribution, dispersion area and spreading speed, etc.

In this talk, the working principle of the MWIR/LWIR optical remote chemical sensing wireless network will be presented together with the system design and implementation. The applications in chemical sensing, leak detection, environment monitoring, as well as explosive detection in security checkpoints will be discussed.

## Biography

Dr. Xuejun Lu is a Professor in the Department of Electrical and Computer Engineering of University Massachusetts Lowell (UML). He received his Ph.D. degree in Electrical Engineering from the University of Texas (UT) Austin in 2001. He worked as a postdoctoral research fellow at the microelectronic research center, UT Austin. He joined the department of Electrical and Computer Engineering of University Massachusetts Lowell as an assistant professor in September 2003. His research interests include: mid-wave and longwave infrared (MWIR/LWIR) focal plane array (FPA), Multi-color (band) IR sensors; LWIR image amplifier; Flexible thin-film transistors; chemical sensor; MWIR/LWIR emitters; Tera-hertz (THz) photodetectors; LWIR Electro-optic modulators based on intersubband transitions; High-quality ultra-uniform quantum dot and strained-layer superlattice (SLS) growth techniques.