

# An Optical System for Parallel Acquisition of Raman Spectra from a 2-Dimensional Laser Beam Array

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## ABSTRACT

Researchers at the University of California, Davis have developed a method for acquiring Raman spectra from a plurality of laser interrogation spots in a two-dimensional array. This method can be used for parallel analysis of individual cells or for fast chemical imaging of specimens.

## FULL DESCRIPTION

Raman spectroscopy is a label-free technique for chemical analysis. It has broad applications such as in the analysis of individual biological cells without the need for exogenous labels, or in label-free chemical imaging. Current Raman microscopes have slow spectral acquisition speeds because they use a single laser focus to acquire a single Raman spectrum with a charge-coupled device (CCD). More advanced methods for parallel detection from multiple foci are limited by the number of pixel rows of the CCD along its vertical dimension. More than one source in a single pixel row results in signal crosstalk between channels, and the spectra from each source cannot be separated.

Researchers at the University of California, Davis have developed a method for detecting Raman spectra in a 2-D multifocal array by reconstructing individual spectral signals acquired from a plurality of two dimensional multifocal pattern arrays. A unique algorithm is used to retrieve individual spectra from each focus from the multiple superimposed patterns while avoiding spectral crosstalk. This method can significantly improve the spectral acquisition speed by up to two orders of magnitude compared to a single focus approach. The method has been combined with laser tweezers Raman spectroscopy (LTRS) for parallel analysis of individual cells and has been integrated with a Raman microscope to improve the speed of Raman imaging.

## APPLICATIONS

- ▶ High throughput cell analysis
- ▶ Pharmaceuticals
- ▶ Forensics
- ▶ Materials and life sciences
- ▶ Raman chemical imaging

## FEATURES/BENEFITS

- ▶ Improved analytical throughput and speed
- ▶ Reduced overlap and cross-talk of signal

## PATENT STATUS

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## OTHER INFORMATION

### KEYWORDS

parallel, 2-D, pattern  
 switched detection,  
 spectroscopy  
 measurement, Raman  
 spectroscopy,  
 hyperspectral imaging,  
 spatial light modulator

### CATEGORIZED AS

- ▶ **Biotechnology**
  - ▶ Other
- ▶ **Imaging**
  - ▶ Molecular
- ▶ **Materials & Chemicals**
  - ▶ Other
- ▶ **Research Tools**
  - ▶ Other

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,156,522	12/18/2018	2014-587

- ▶ **Sensors & Instrumentation**
  - ▶ Analytical
  - ▶ Other
  - ▶ Scientific/Research

#### RELATED CASES

2014-587-0

#### ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ [Imaging Modalities and Methods for Enhanced, Label-free Histopathology During Surgery](#)

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