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National Aeronautics and
Space Administration



TECHNOLOGY SOLUTION

Instrumentation

Standoff Ultra-Compact Micro-Raman Sensor

Easy to use Raman sensor for numerous applications

Traditional micro-Raman systems are capable of performing fine-scale mineralogy; but these are used for in situ analysis. Most of the micro-Raman systems are designed and implemented for dark room operation. Such Raman systems: (1) require sample collection and (2) require shielding of daylight background radiation. With the use of continuous wave (CW) lasers and a non-time gating detection approach, it is also difficult to distinguish the biofluorescence from the mineral luminescence. These limitations will significantly lower the capability of these micro-Raman systems in terms of the variety of samples that can be analyzed.

BENEFITS

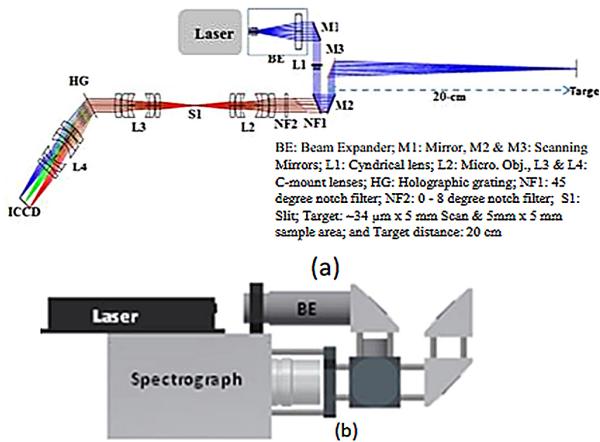
- Standoff ultra-compact Raman measurements at several centimeters range (no sample collection)
- Daytime or nighttime operation
- Detection of all minerals: light and dark
- Detection of water, biological, and organic compounds
- Detection of Raman signal in presence of fluorescence



THE TECHNOLOGY

Researchers at NASA Langley Research Center have developed a Standoff Ultra-Compact micro-Raman sensor that will provide a superior instrument for many commercial applications as well as future NASA missions. This sensor will be able to collect Raman spectra and rapidly generate mineralogical images of targets in the daytime from a distance of several centimeters without the need to collect the sample. This sensor is capable of inspection and identification of minerals, organics, and biogenic materials within several centimeters and with a high 10 micrometer resolution.

This instrument will solve some of the limitations (requiring sample collection and shielding of daylight background radiation) of the traditional micro-Raman systems to provide a superior instrument. The instrument will perform Raman spectroscopy from a miniature device (handheld or mounted on a small rover head). The instrument will allow investigation of mineralogy, biology, fluorescent trace elements, biological materials, polar ices, and gas hydrates. It will realize a very high resolution objective (micrometer) demonstrated to within 20 centimeters target distance.



The Stand-off Ultra-Compact Instrument

APPLICATIONS

The technology has several potential applications:

- Precious metals and jewelry analysis
- Narcotics identification
- Explosive detection
- Inspection of incoming raw materials, final product QC, and other applications in the pharmaceutical industry
- Contaminant detection and identification on silicon wafers
- Geological research

PUBLICATIONS

Patent No: 11,175,232