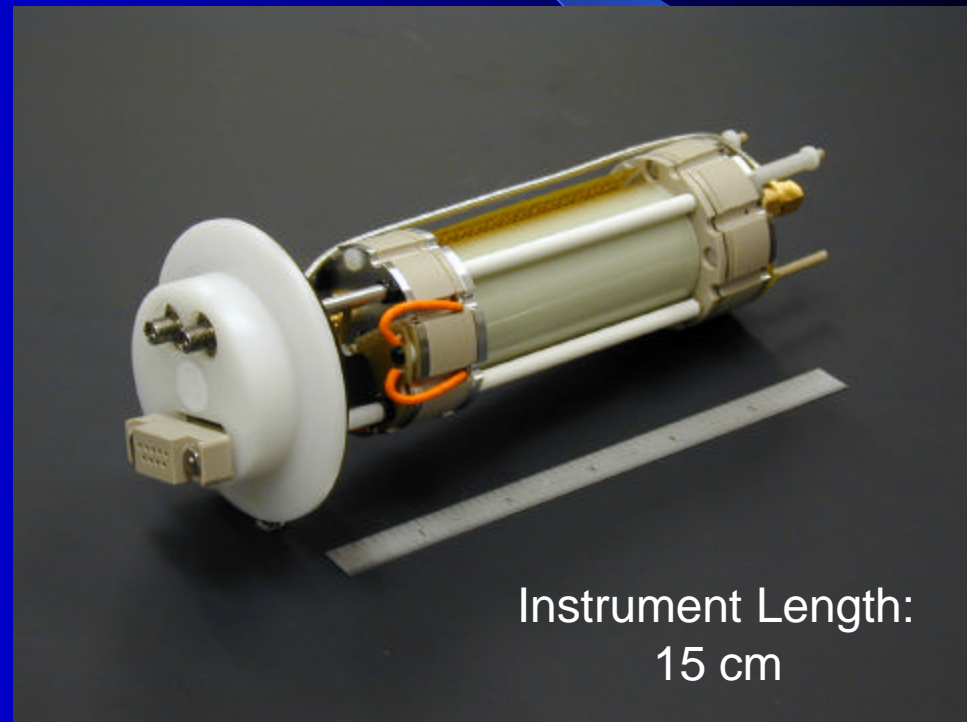
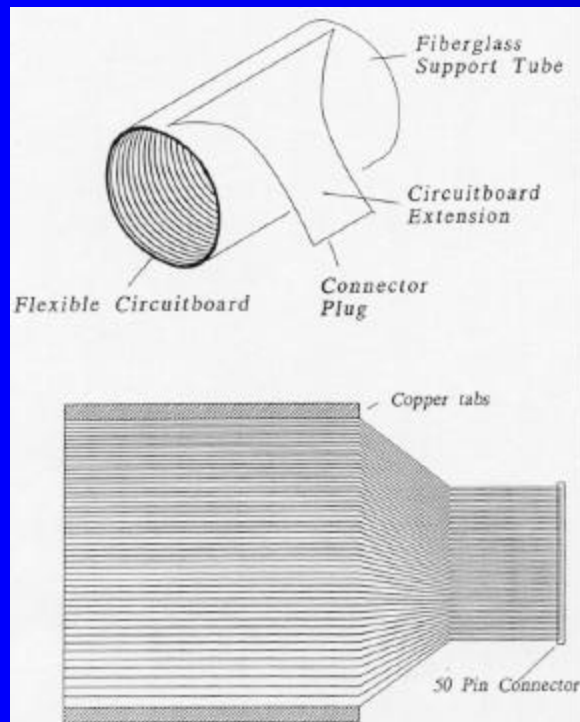
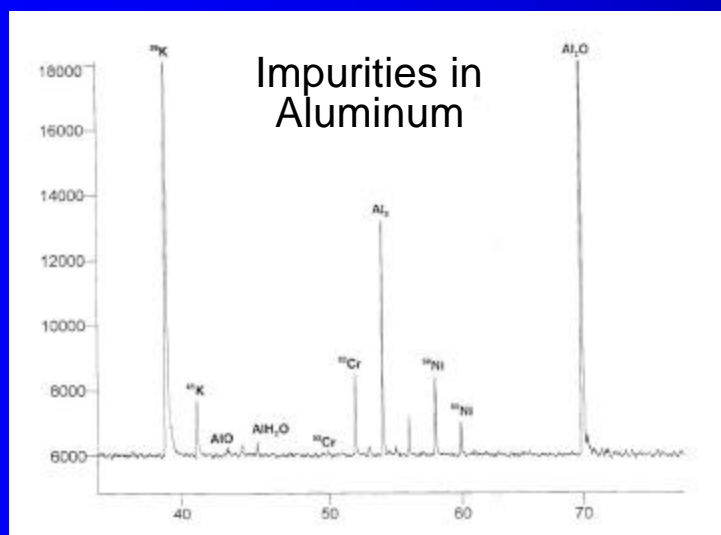


# Laser Desorption Mass Spectrometer

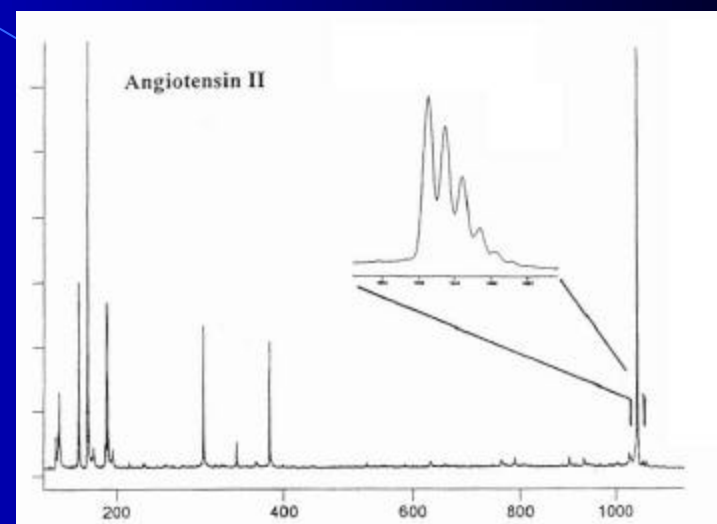
*New designs and fabrication techniques are being applied to further miniaturize TOF-MS for space.*



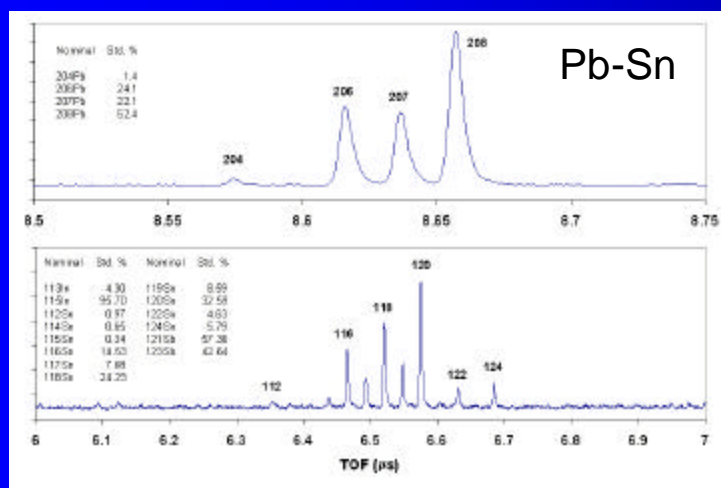
# Laser Desorption Mass Spectrometer



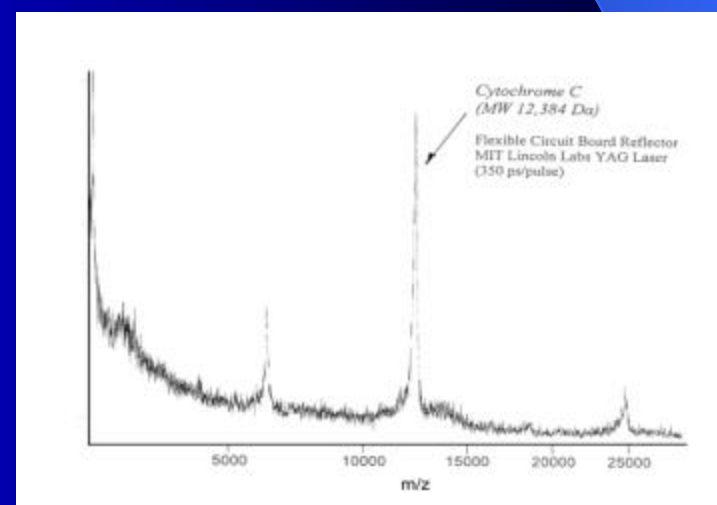
m/z



m/z

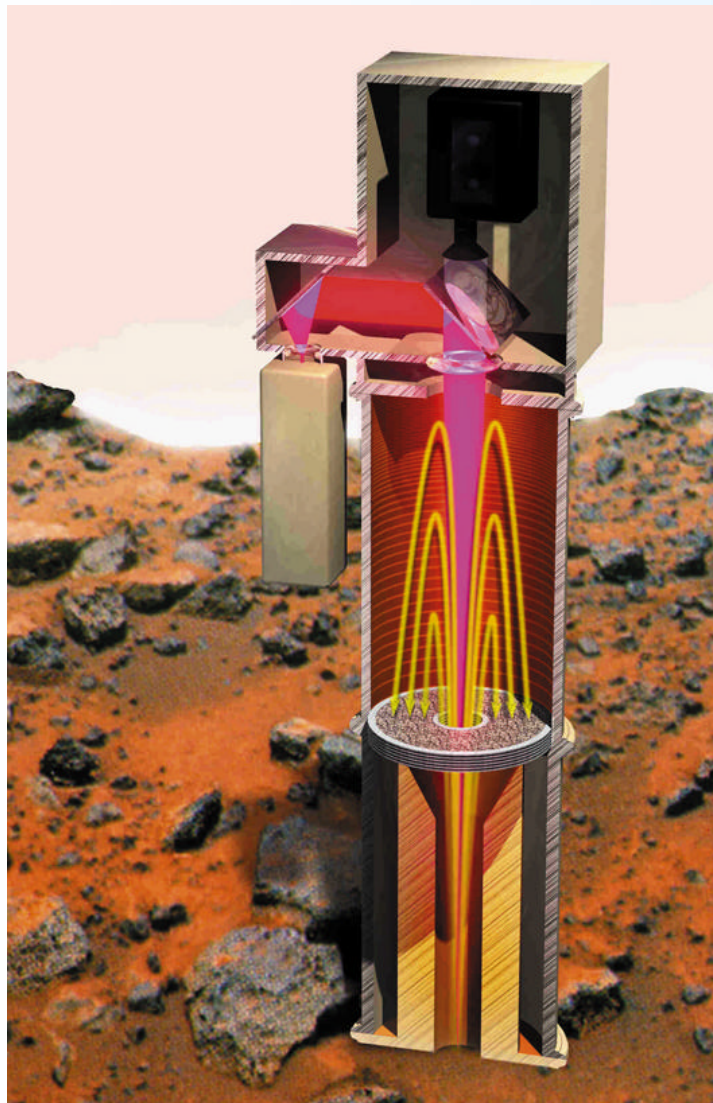


TOF (µs)

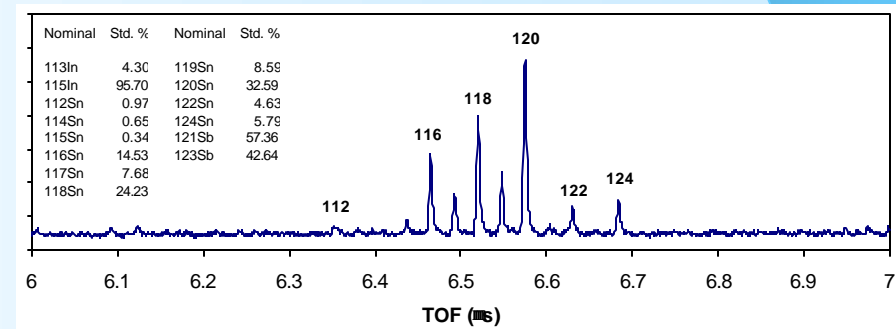
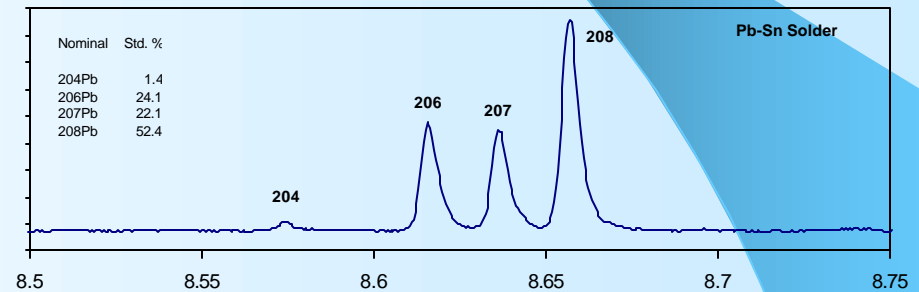


m/z

# Resonant Laser Methods for Instruments



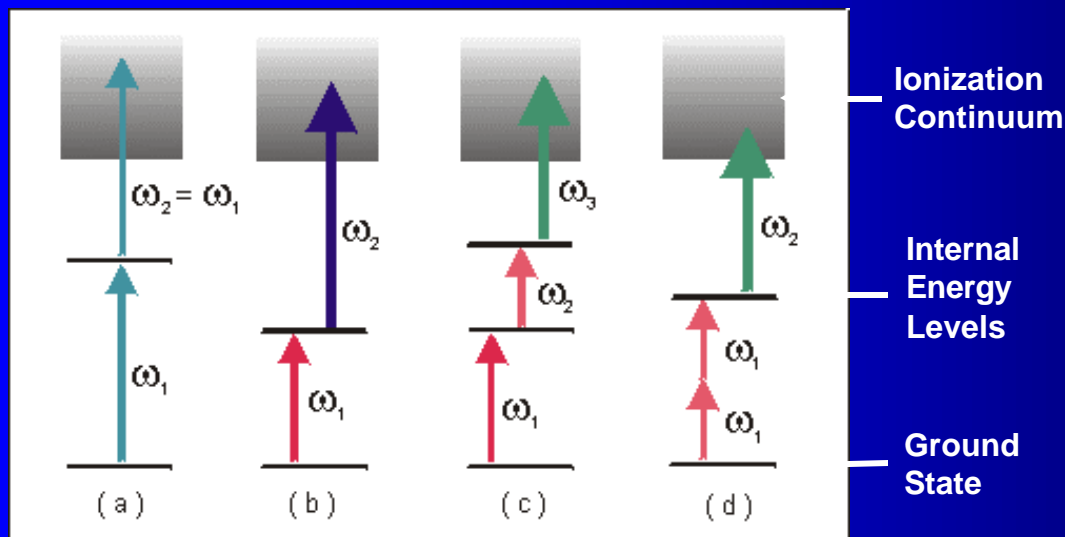
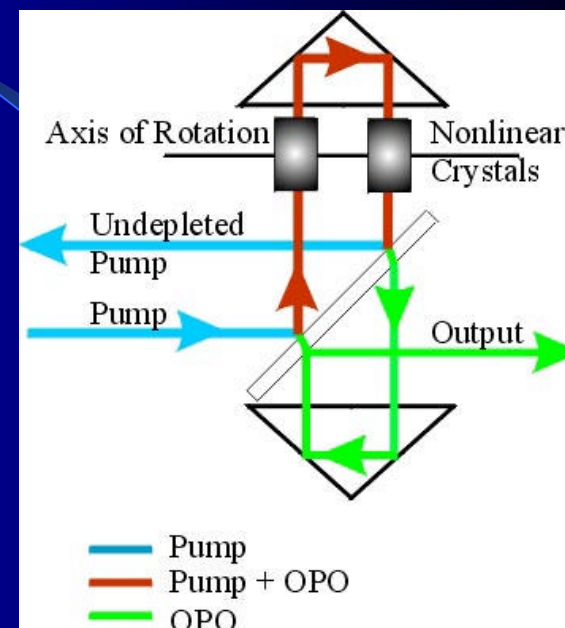
A miniature mass spectrometer, such as the time-of-flight microprobe, is an example of an instrument type that can benefit from resonant laser excitation and ionization.



# Resonant Laser Methods for Instruments

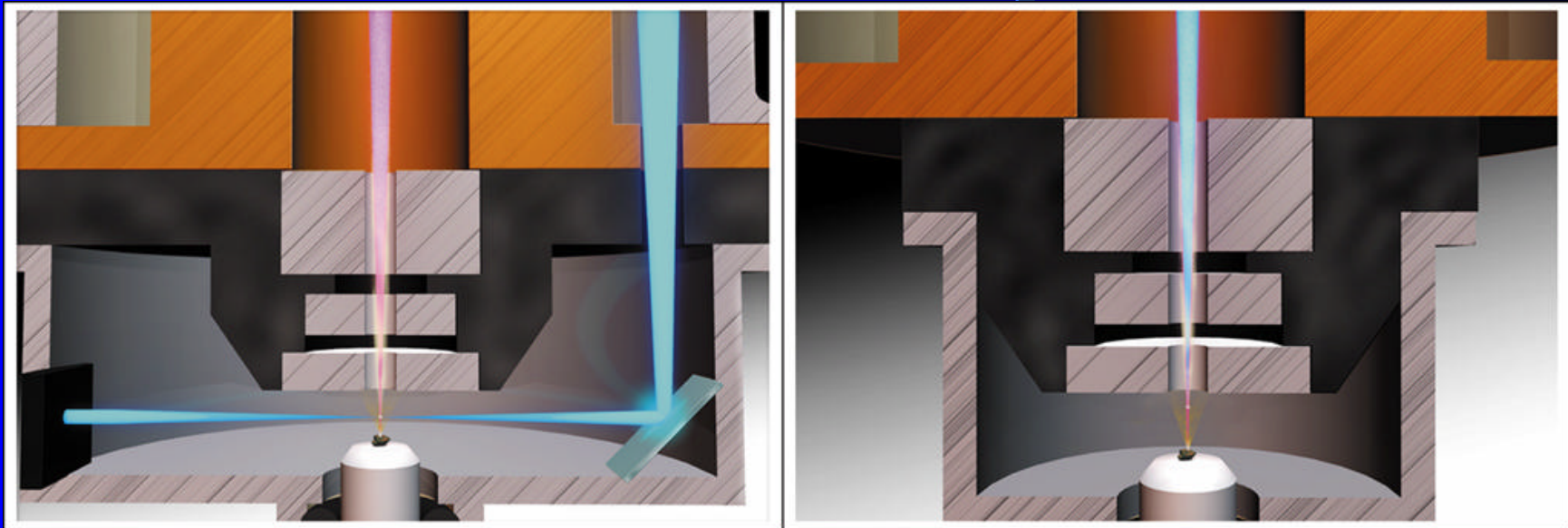
New miniature Optical Parametric Oscillator (OPO) technology may make it possible to perform tunable-laser spectroscopy *in situ*.

Elements and large organic molecules can be *selectively detected* using different wavelengths.



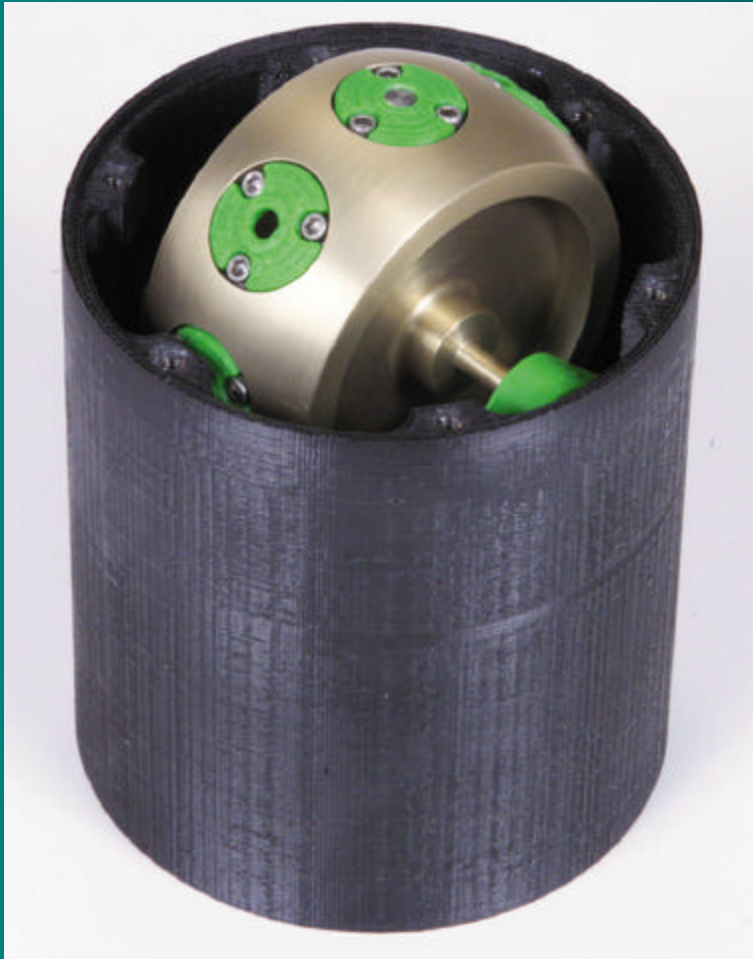
*The miniature OPO enables the design of a tunable, pulsed laser only a few cm on a side.*

# Resonant Laser Methods for Instruments



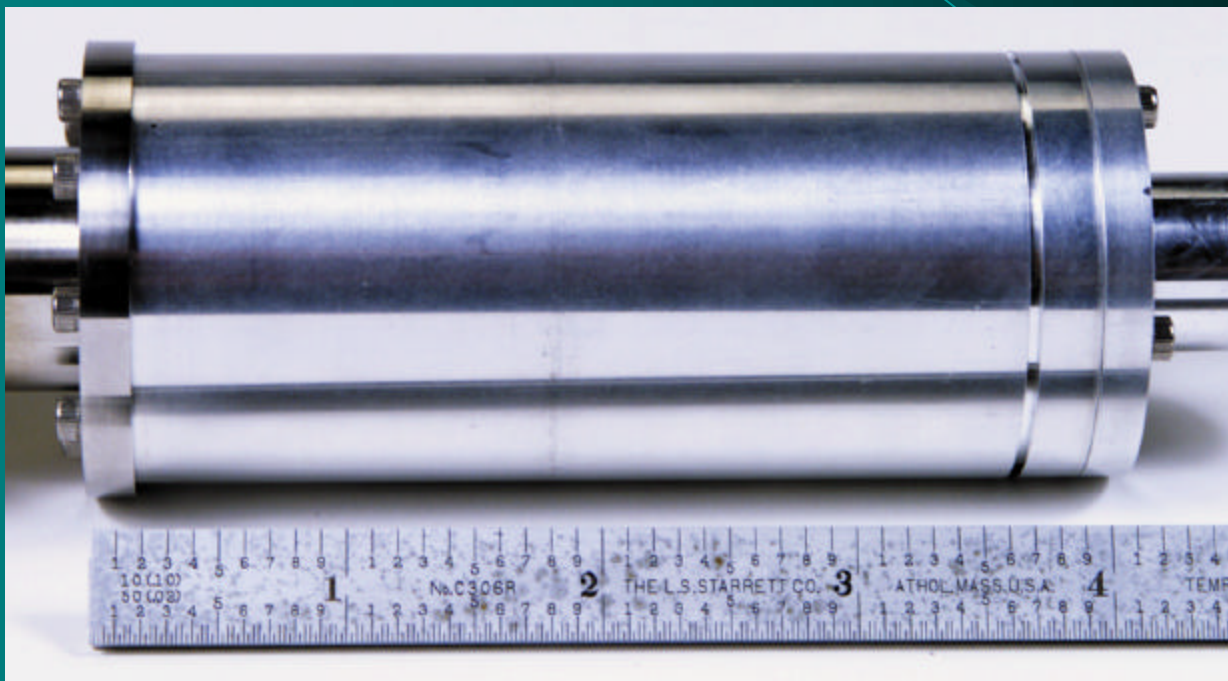
Two post-ionization geometries considered for miniature instruments. The lateral geometry (left) directs the optical parametric oscillator (OPO) output beam parallel to the sample surface. The coaxial geometry (right) couples the OPO beam through the primary laser optics, but focused just above the sample.

# Sample Handling and Vacuum Systems for Landed Instruments



Multi-probe *in situ* sampler wheel (left) prototype. The wheel supports multiple wells with SMA-spring-actuated probes, for acquisition and vacuum insertion. During operation (top), a probe tip extends to entrap particulate samples.

## Sample Handling and Vacuum Systems for Landed Instruments



The world's smallest turbomolecular pump was further developed in a realistic measurement environment and provides excellent characteristics for analyzing multiple acquired samples.