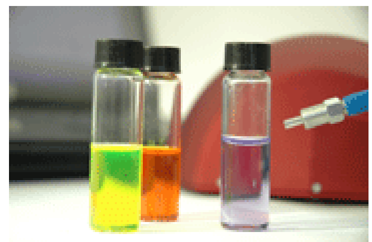
Fourier Transfrom Spectrometer (FTS):

How does it work?

The ARCspectro V-NIR products family uses the so-called Lamellar Grating Interferometer. The Lamellar Grating Interferometer is a grating having a variable depth. Contrary to the Michelson interferometer, which splits the amplitude at the beamsplitter, the Lamellar Grating Interferometer splits the wavefront at the grating and, consequently, does not need a beamsplitter. By using MEMS technology, we have been able to build the first truly portable, handheld scanning Fourier Transform Spectrometer, which makes the ARCspectro V-NIR products family unrivaled.

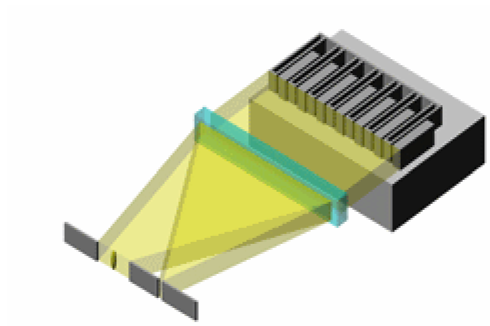


What is MEMS technology?

Micro Electro Mechanical Systems (MEMS) is the art of silicon micro-machining. It includes a variety of devices. After MEMS components have been built and used as sensors for chemical and physical signals, pumps, motors, and much more, the integration of optics, or the use of MEMS in combination with optical signals has considerably grown in the last years. MEMS technology is compatible with integrated circuit technology and therefore allows batch processing. This makes MEMS highly attractive.
ARCoptix large expertise in micro-systems includes the integration of optical functionalities with MEMS in order to achieve high-end optical systems and sensors.

Why using MEMS technology?

The fabrication of MEMS uses technologies that are now state-of-the art in semiconductors, leading to miniaturization, reliability, precision and high volume productions.
Thanks to our longstanding experience in silicon micromachining, we are able to provide advanced solutions for VIS and near-IR spectroscopy.



Advantages of a Fourier Transfrom Spectrometer (FTS):

Throughput Advantage:

A Fourier Transform spectrometer (FTS) does not use a slit (or glass fiber) to limit the individual frequency reaching the sample and detector as a grating spectrometer does. Overall, more energy reaches the sample and hence the detector in an FTS than in a dispersive spectrometer. This means, for a comparable source and total integration time (sum of all the single measurement for the scanning FTS), that the signal-to-noise ratio of a spectrum measured on an FTS is higher than the signal-to-noise ratio attained on a grating spectrometer .

Multiplex advantage:

A scanning FTS basically measure an interferogram on a photodiode over time and calculates its Fourier transform to find the spectrum. Every single measurement point that measure the interferogram contains information of each wavelength of the light being measured. In contrast to a dispersive (or grating spectrometer) where a pixel contains only (and the whole) information of a single wavelength. So for a small band spectrum (laser line) only one or two pixels will contribute to the spectrum in a grating spectrometer. In a FTS every measurement (interferogram) will contribute to the final spectrum and we will theoretically get a better signal to noise ratio equal to the root mean square of the number of measurement with the photo-diode that records the interferogram.
Notice that this advantage is not valid anymore if broadband spectra without emission or absorption lines are considered.

Precision Advantage:

For similar reasons mentioned for the multiplex advantage, the FTS is capable to determined the position of a peak (absorption or emission line) with much more precision than a grating spectrometer. Indeed, in the dispersive the precision is limited by the covered spectral divided by the number of pixels. In a FTS information of the emission or absorption line is spread over all the measurement points (taken over time with a single photodiode) and mathematical Fourier transform methods permits to determine the peak or dip position with much more accuracy.