# Evolution of Spectroscopy

## DLP® Technology is Enabling Breakthroughs in Spectrometer Design

### Material Analysis using DLP Technology

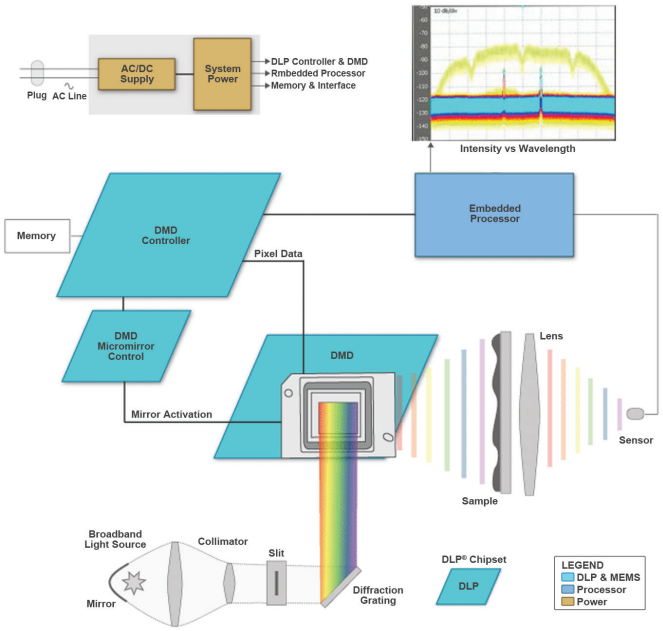
Spectroscopy is a powerful technique for recognizing and characterizing physical materials through the variations in absorption or emission of different wavelengths of light by a sample . The sample may be a material in any of the various physical phases: solid, liquid, gas, or plasma, and may be light emitting or light absorbing. The light used in spectroscopy may lie within the range of wavelengths visible to the human eye, or may be in the infrared or ultraviolet regions of the electromagnetic spectrum. Spectroscopy requires the spreading out of light into a rainbow of wavelengths, so that the variation in light intensity versus wavelength can be measured and recorded.

For many applications today, expensive, lab-based spectrometers are required to properly identify and characterize material composition. Industrial manufacturing, agriculture, law enforcement, and many more industries are seeking affordable, portable equipment to perform real-time material analysis in the field or on the assembly line. The digital micromirror device (DMD) is a highly efficient spatial light modulator that can enable compact spectrometers to meet these requirements. Mechanically robust, rugged designs are made possible by eliminating moving mirrors or gratings, and as a digital switching device, the DMD delivers constant results over time and temperature. In addition to high speed wavelength selection and filtering, the DMD also allows developers to attenuate individual wavelengths. Furthermore, spectrometers based on the DMD can be easily programmed for multiple materials, creating flexible optical engine designs to satisfy the demands from multiple applications.

**Order a development kit and get started today at www.ti.com/mems**

### Key Features and Benefits

- **Fully self-contained MEMS spatial light modulator**
  - Use single point sensor instead of expensive array detectors
  - Allows design of mechanically robust, rugged spectrometers for field use
  - No moving components required (mirrors, grating, etc)
- **Digitally program “scanned lines”, “matched filtering”, or “coded filtering”**
  - Flexibility to analyze multiple materials with a single spectrometer engine
  - No “analog drift” over time or temp
- **Pattern rates up to 32 kHz with optical switching speeds of ~2µs**
  - Obtain high speed and precise full spectrum scan data
  - Real-time data acquisition for applications such as inline inspection
- **Optically efficient from 365nm to 2500nm**
  - Supports UV, VIS and NIR spectrometers
- **Wide selection of DMD resolutions and package sizes**
  - Supports designs ranging from portable, low cost to high performance




**System Block diagram: DLP Spectroscopy**



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