https://www.olympus-lifescience.com/en/microscope-resource/primer/java/filters/lctf/

图表, 折线图

描述已自动生成

The switching speed of the filter across the 10.5 nm tuning range was measured to be about 9\*10^-6s

气温和电压会影响center wavelength

图表

描述已自动生成

<https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=376808>

A **liquid crystal tunable filter** (**LCTF**) is an optical filter that uses electronically controlled [liquid crystal](https://en.wikipedia.org/wiki/Liquid_crystal) (LC) elements to transmit a selectable [wavelength of light](https://en.wikipedia.org/wiki/Wavelength_of_light) and exclude others. Often, the basic working principle is based on the [Lyot filter](https://en.wikipedia.org/wiki/Lyot_filter" \o "Lyot filter) but many other designs can be used.[[1]](https://en.wikipedia.org/wiki/Liquid_crystal_tunable_filter#cite_note-1) The main difference with the original Lyot filter is that the fixed [wave plates](https://en.wikipedia.org/wiki/Wave_plate) are replaced by switchable liquid crystal wave plates.

<https://en.wikipedia.org/wiki/Liquid_crystal_tunable_filter>

Spectral imaging systems based on liquid crystal tunable filters (LCTF) have been widely used in remote sensing, biomedicine, food industry and other fields due to their portability, fast tunability, convenient controllability, good image quality and low cost [[1–7](https://opg.optica.org/oe/fulltext.cfm?uri=oe-26-19-25226&id=398262#ref1%E2%80%937)]. LCTF-based spectral imaging systems capture the three-dimensional data cube of the scene, including two spatial dimensions and one spectral dimension. As shown in [Fig. 1(a)](https://opg.optica.org/oe/fulltext.cfm?uri=oe-26-19-25226&id=398262#g001), a typical LCTF-based hyperspectral imaging system consists of an imaging lens, followed by an LCTF and a detector array [[2](https://opg.optica.org/oe/fulltext.cfm?uri=oe-26-19-25226&id=398262#ref2)]. In the data acquisition stage, only a narrow-band spectrum of the scene can pass through the LCTF, and a quasi-monochromatic image of the scene is then acquired by the detector array at a time. In order to obtain the hyperspectral data cube across multitudes of wavelengths, **the scene is spectrally scanned by tuning the center wavelength of the LCTF.**

图示

描述已自动生成

Some LCTFs are designed to tune to a limited number of fixed wavelengths such as the red, green, and blue (RGB) colors while others can be tuned in small increments over a wide range of wavelengths such as the visible or near-infrared spectrum from 400 to the current limit of 2450 nm.

Traditionally, the LCTF was considered an ideal spectral filter with an approximately impulsive transmission function, and the filter output is approximated to a monochromatic image corresponding to its center wavelength [8]. However, practical LCTFs always have broader than desired bandwidths, and their transmittance is generally depicted using the real spectral signatures of LCTFs.

a shortcoming of LCTF-based spectral imagers is the inherent trade-off between the spectral resolution and optical throughput

文本

描述已自动生成

图示

描述已自动生成

Transmission function

Most current LCTFs are designed based on Lyot filters, which have the transmission functions as following [[10](https://opg.optica.org/oe/fulltext.cfm?uri=oe-26-19-25226&id=398262#ref10)]

文本

描述已自动生成

文本

描述已自动生成

图表

描述已自动生成

图表, 直方图

描述已自动生成

https://opg.optica.org/oe/fulltext.cfm?uri=oe-26-19-25226&id=398262

https://opg.optica.org/oe/fulltext.cfm?uri=oe-17-14-11426&id=183003