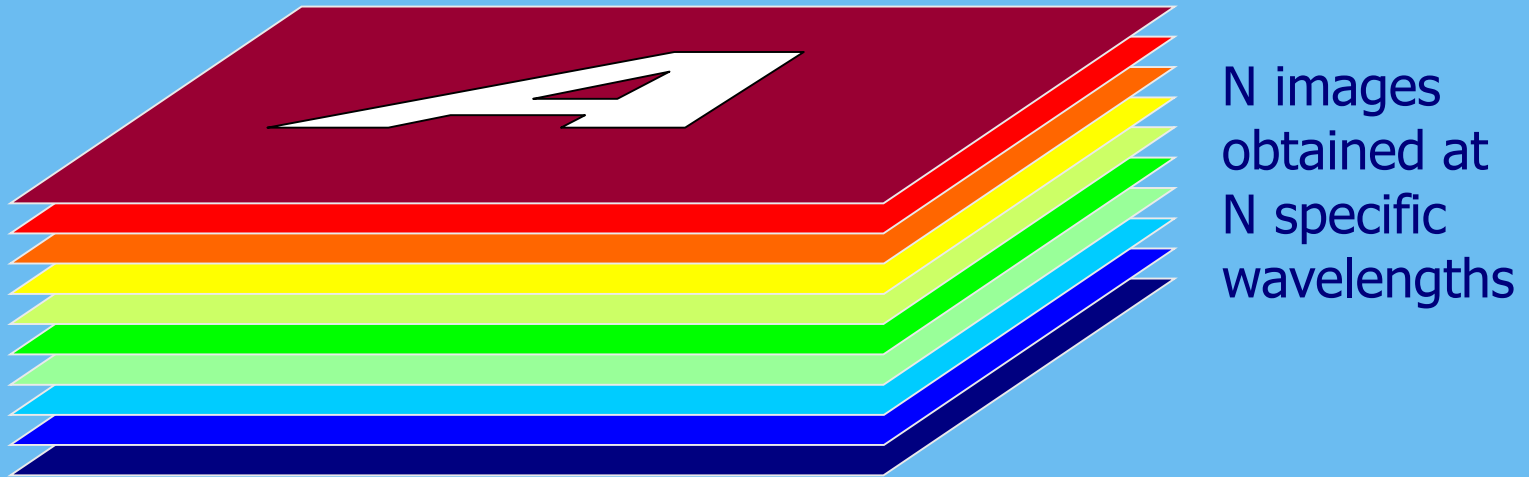
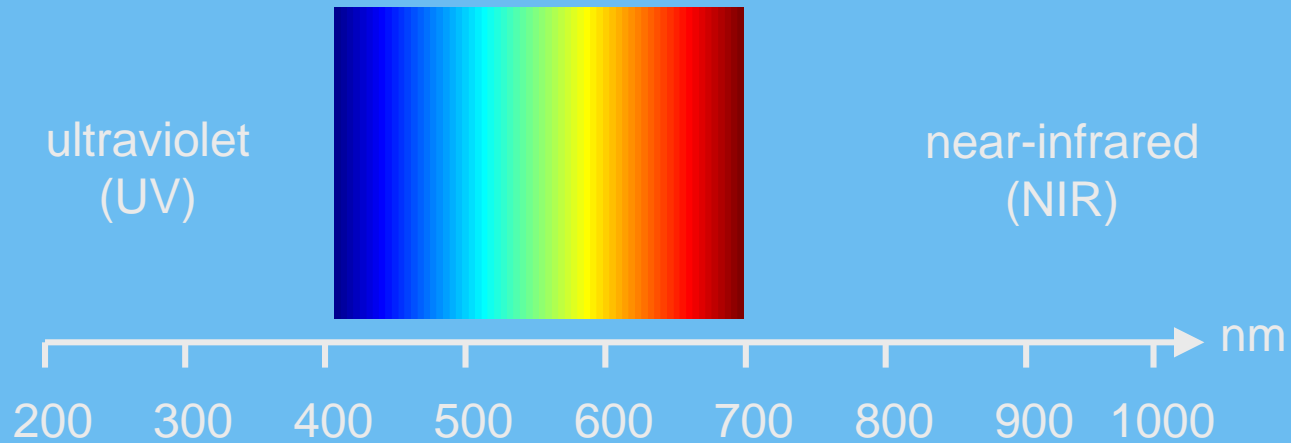


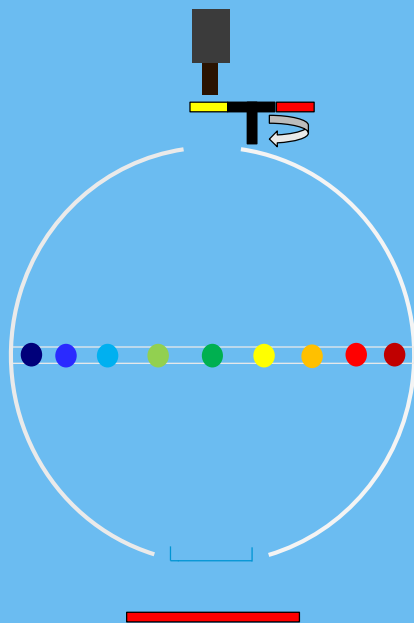
VideometerLab for combined  
spectral reflectance and  
fluorescence imaging



# LED spectral imaging



# Videometer BSQ Spectral Imaging



Camera and lens

Emission filter changer

Integrating sphere

LEDs of multiple wavelengths

Sample is placed in target opening

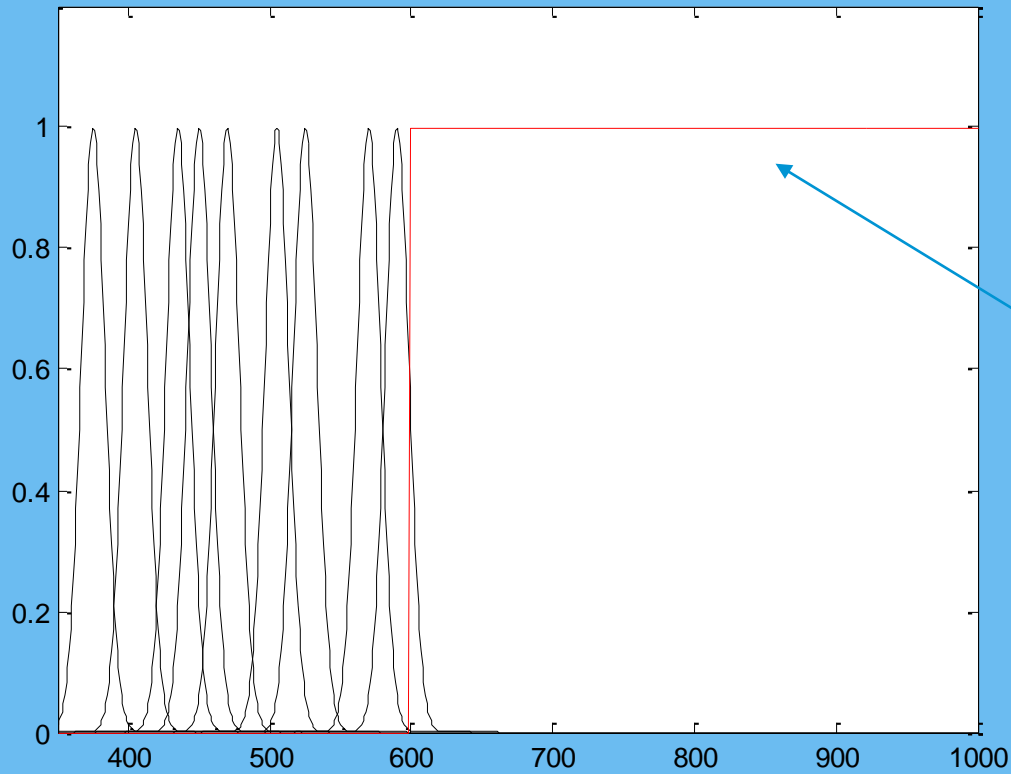
Backlight or background



- LEDs: Stable, durable, large selection, rapidly developing technology
- Up to 20 different high-resolution reflectance bands acquired sequentially in 0.5-1.5 seconds
- May be combined with emission filters, backlight, and darkfield illuminant



# Multispectral fluorescence



Long pass  
emission filter  
(up to 5)

LED strobos



# Emission filter changer

- 5 emission filter apertures where the first is usually left empty for reflectance imaging
- Typically 4 apertures for long pass (LP) filters (fluorescence) or short pass (SP) filters (upconversion). Band pass filters (BP may also be used)
- All filters must be 25 mm diameter and up to 3 mm thickness. Possible suppliers are e.g.
  - Andover Corporation (thickness is typically 1.5 mm unmounted)  
[http://www.andovercorp.com/Web\\_store/Edge\\_Filters/steep\\_edge\\_filters.php](http://www.andovercorp.com/Web_store/Edge_Filters/steep_edge_filters.php)
  - Semrock (be aware that mounted filters are 3.5 mm thick)  
<http://www.semrock.com/filtersRefined.aspx?id=21&page=1&so=0&recs=100>
  - Edmund Optics (thickness is typically 3 mm unmounted)  
<http://www.edmundoptics.com/optics/optical-filters/longpass-edge-filters/high-performance-od-4-longpass-filters/3044>

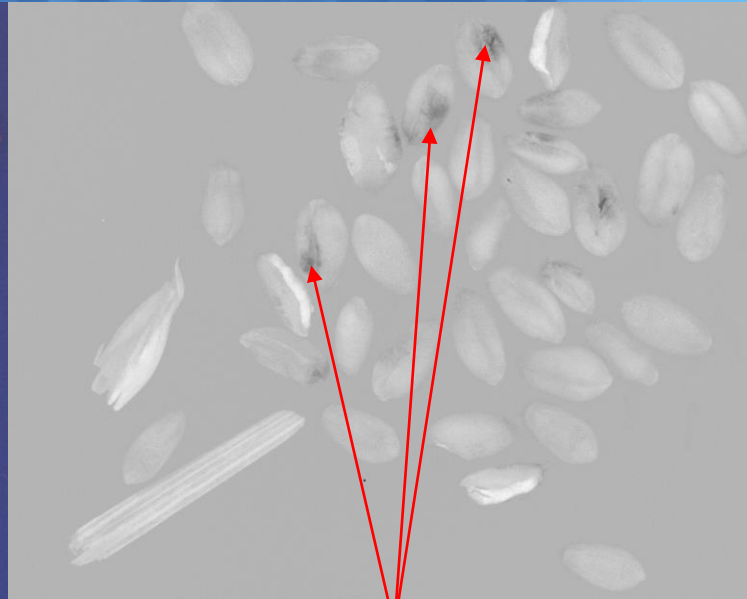


# Emission filter set

- Standard emission filter sets
  1. LP OD4 400 nm, 500 nm, 600 nm, 700 nm
  2. LP OD4 450 nm, 550 nm, 650 nm, 700 nm
- Customized filter sets available
- Easy filter set configuration in software
- Adaptive setting of exposure time and optimal dynamic range
- One image obtained from each combination of LED excitation strobe and emission filter. LED strobes in the pass band of emission filters are usually omitted.

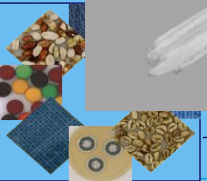


# Wheat with Bunt 4 spores per seed



Bunt mycelium ?

Bunt spores are dark spots



# Fusarium fluorescence





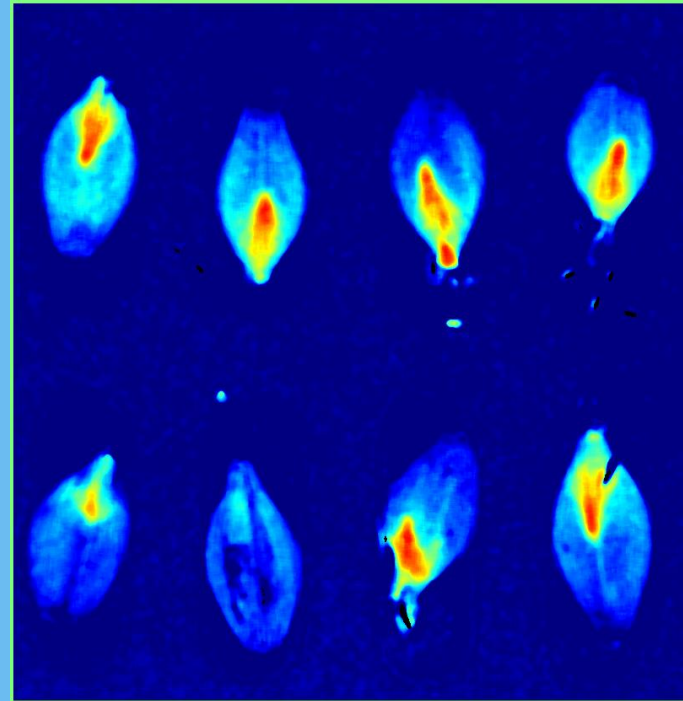
# Acrospire in barley malt



Acrospire visible



# Acrospire measurement



Kernel turned the  
wrong way

