

Detection in HPLC-Qualification

Qualification of Detectors in HPLC

- Selectivity
- Sensitivity and detection limit
- Stability
- Linear range
- Dynamic Range
- Reproducibility
- Sampling Rate and Response Times
- Volume
- Maintenance

Properties of Detectors

SELECTIVITY



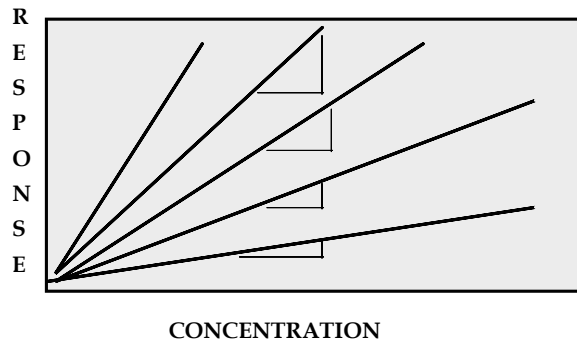
SPECIFIC



UNIVERSAL

A selective detector allows one to see only components of interest despite of their co-elution with any others.

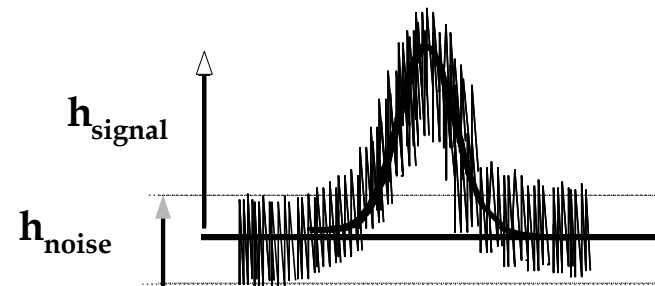
Sensitivity



Sensitivity of a detector is not the minimum amount that can be detected.

Signal to Noise

$$h_{\text{signal}} = 2 \times h_{\text{noise}}$$

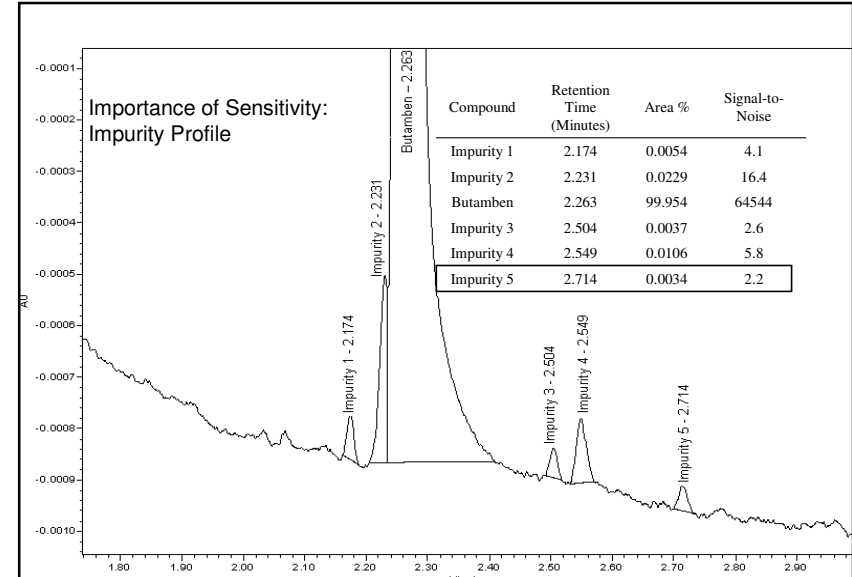


Detection in HPLC-Qualification

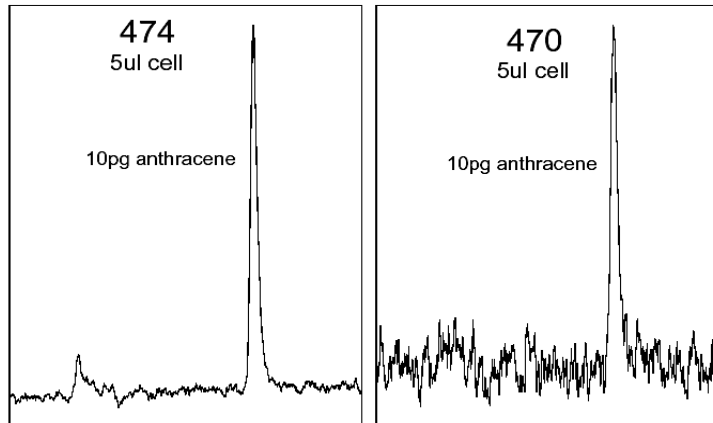
LOD & LOQ

Limit of detection Lowest concentration that can be detected **Signal-to-noise ratio of 2:1 or 3:1**

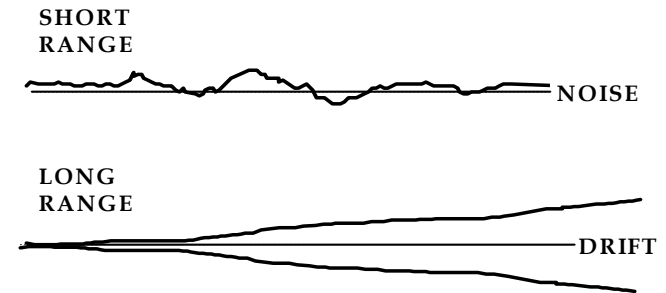
Limit of quantitation Lowest concentration that can be determined with acceptable precision. **Signal-to-noise ratio of 10:1**



Detector Noise



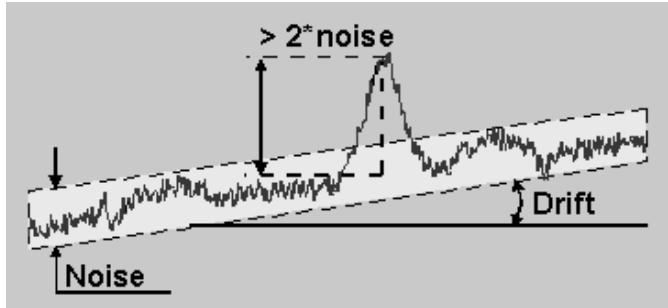
Baseline Stability



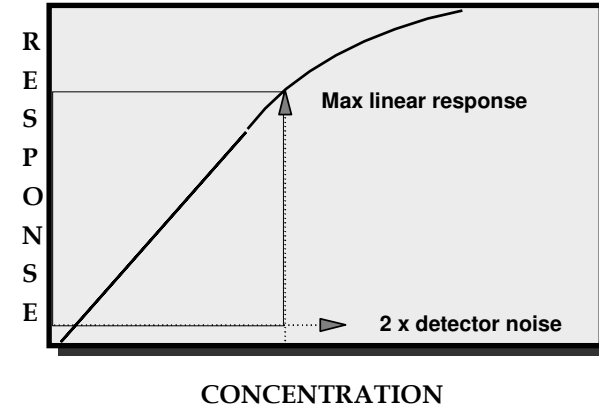
Detection in HPLC-Qualification

Noise and Drift

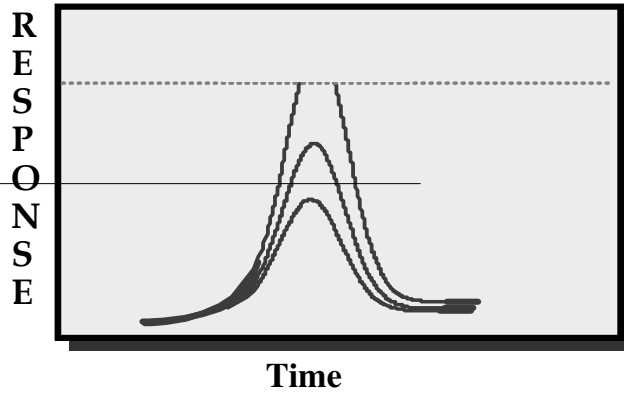
Noise, drift, and smallest detectable peak.



Linearity-Linear Dynamic Range

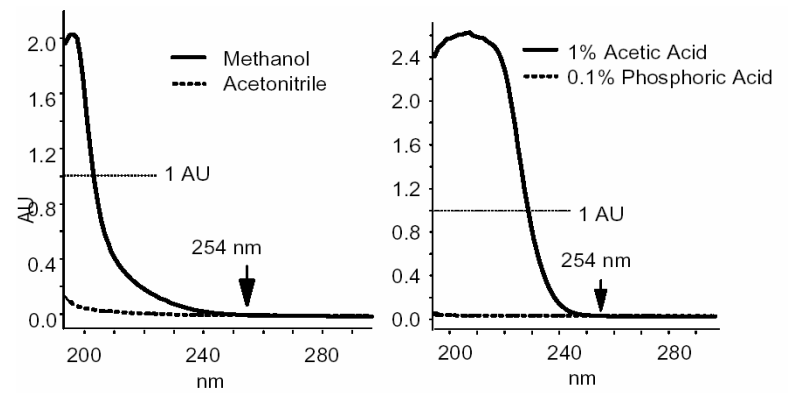


Dynamic Range

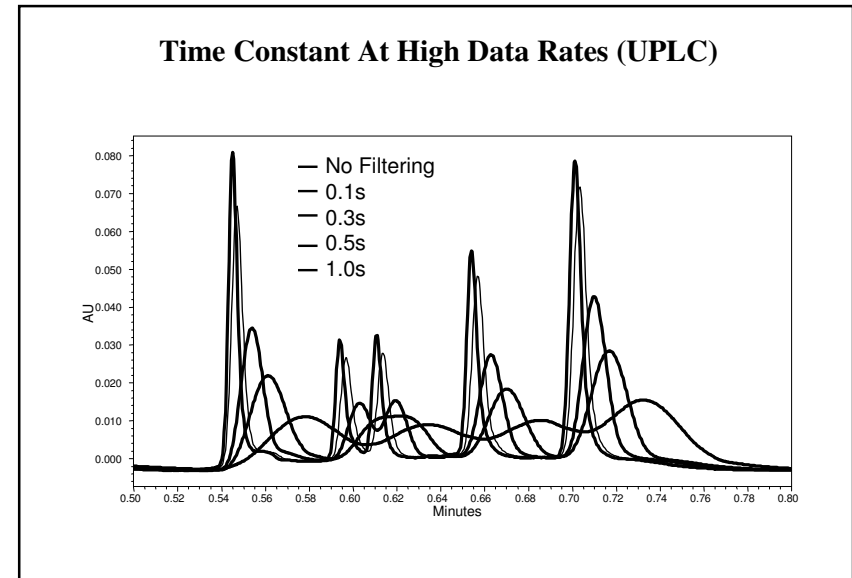
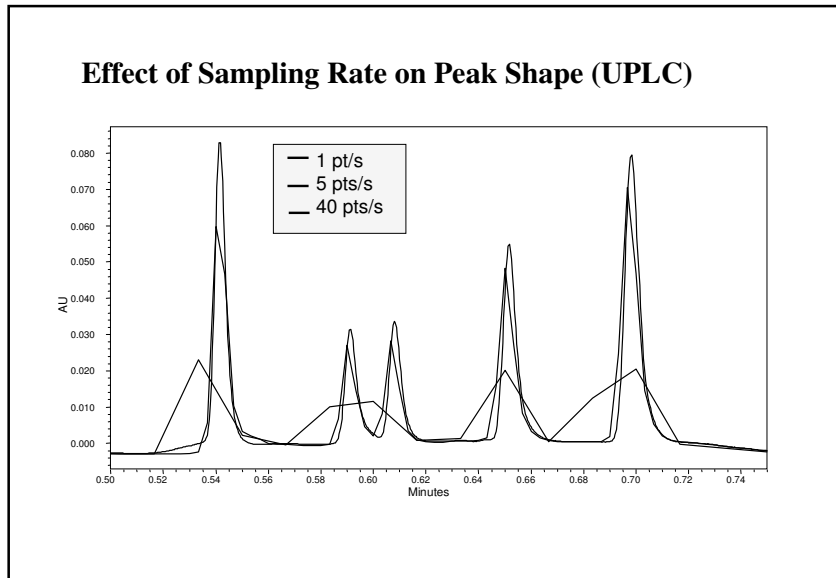
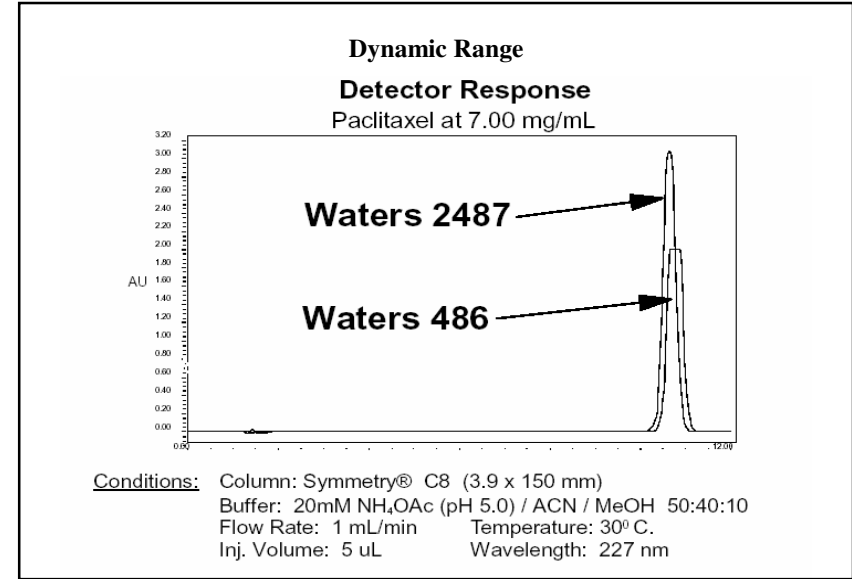
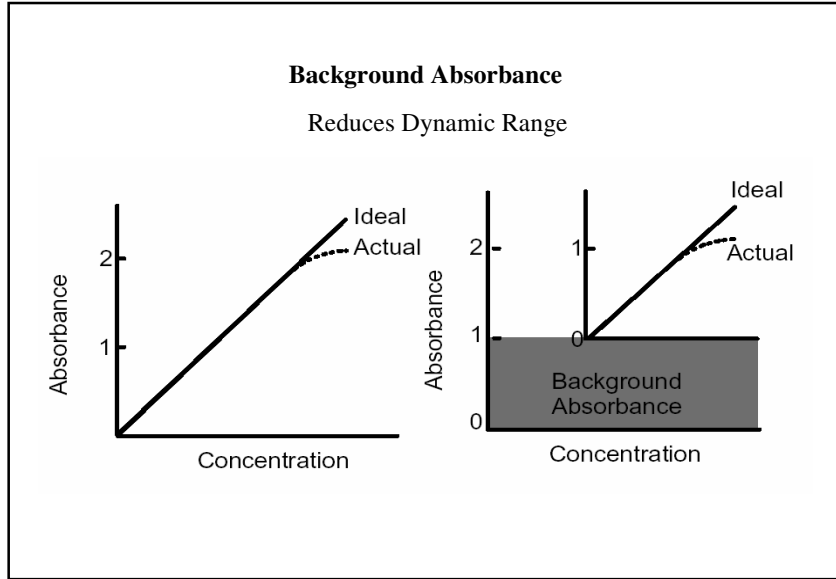


The range of solute concentration over which the detector continues to respond to changes in solute concentration

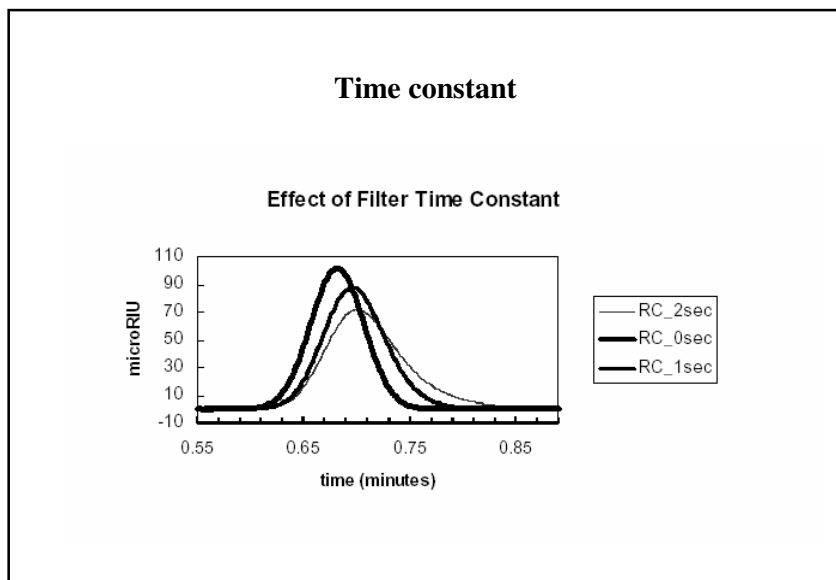
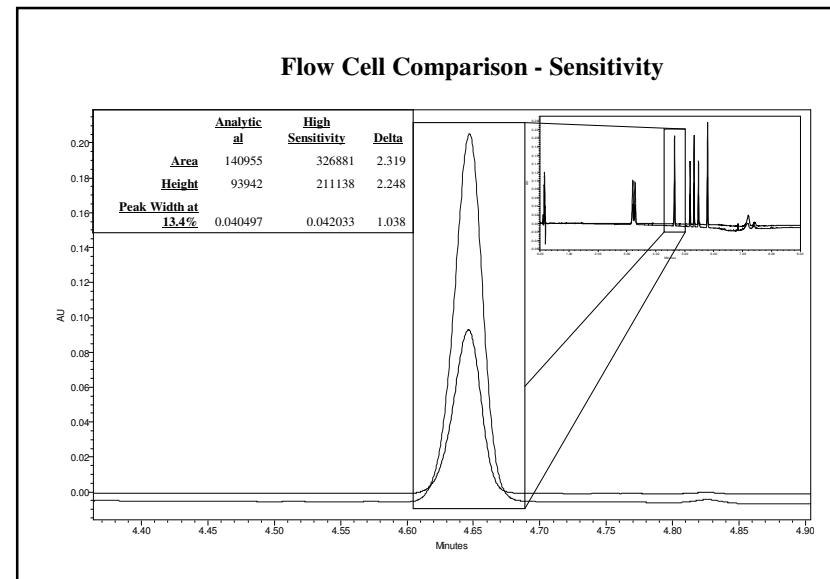
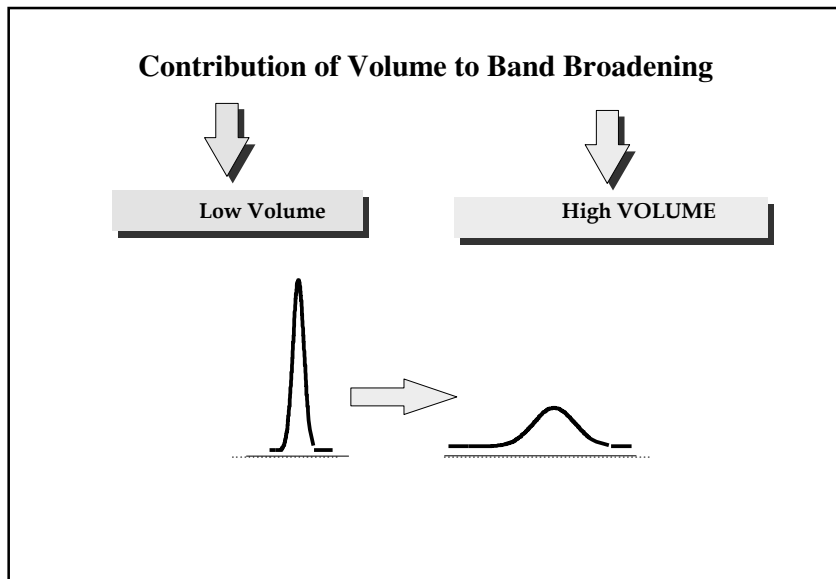
Background Response



Detection in HPLC-Qualification



Detection in HPLC-Qualification



- ### Maintenance
- Flow Cell & Optics– UV-VIS, Fluorescence, RI
 - Electrode – Conductivity and Electrochemical
 - Nebulizer – ELS and MS

Detection in HPLC-Qualification

Wavelength Accuracy Test

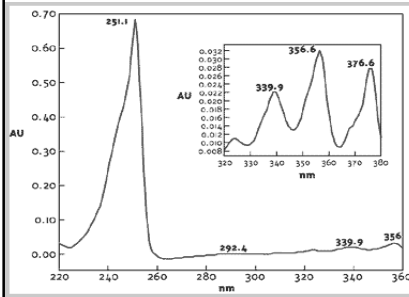


Figure 1. Spectrum of anthracene solution (1 mg/mL in acetonitrile) from Waters 996 PDA detector shows the annotations of I_{max} . The inset shows an expanded view of the bands centered between 320 and 380 nm.

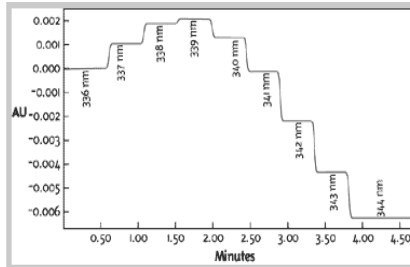


Figure 2. Calibrations of a UV-vis detector (Waters 2487) of anthracene is determined to be at 339 nm for this. The autozero on wavelength function in the detector nactivated for this test.

Specifications

	2487	HP1100 MWD	TSP 3000HR	Shimadzu 10AP
Noise	0.35×10^{-5}	1×10^{-5}	2×10^{-5}	$0.35 \times 10^{-5}^*$
Drift	1×10^{-4}	2×10^{-3}	2×10^{-4}	2×10^{-4}
Linearity	2.5AU	2AU	1.8AU	Not Reported**
Bandwidth	5nm	1-16nm	2.8nm	8nm
Internal Filter	Er	Ho	N/A	N/A
Lamp	D2	D2/W	D2/W	D2/W

* With 2sec TC

** Says Range to 2.5AU