CANCER DETECTION BY ENDOSCOPIC FREQUENCY-DOMAIN FLUORESCENCE LIFETIME IMAGING (FD-FLIM)

Thesis presented at the
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by
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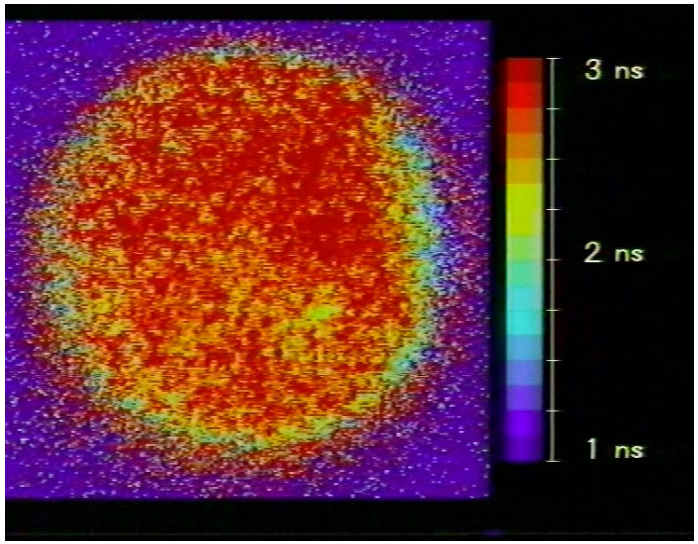
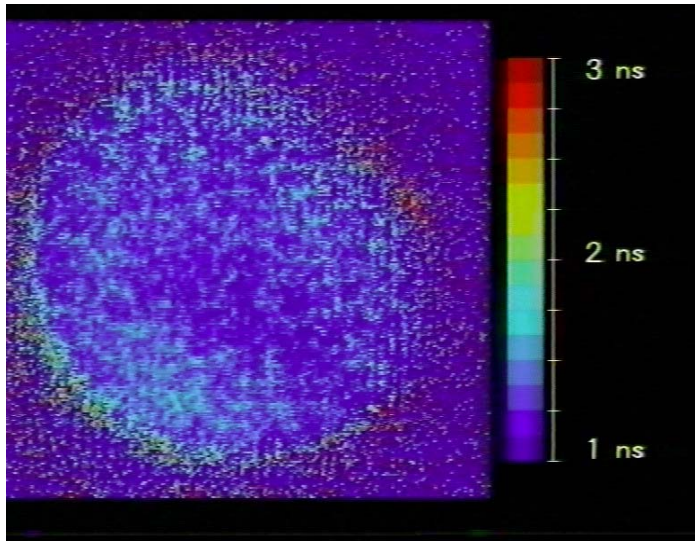
Fluorescence lifetime imaging

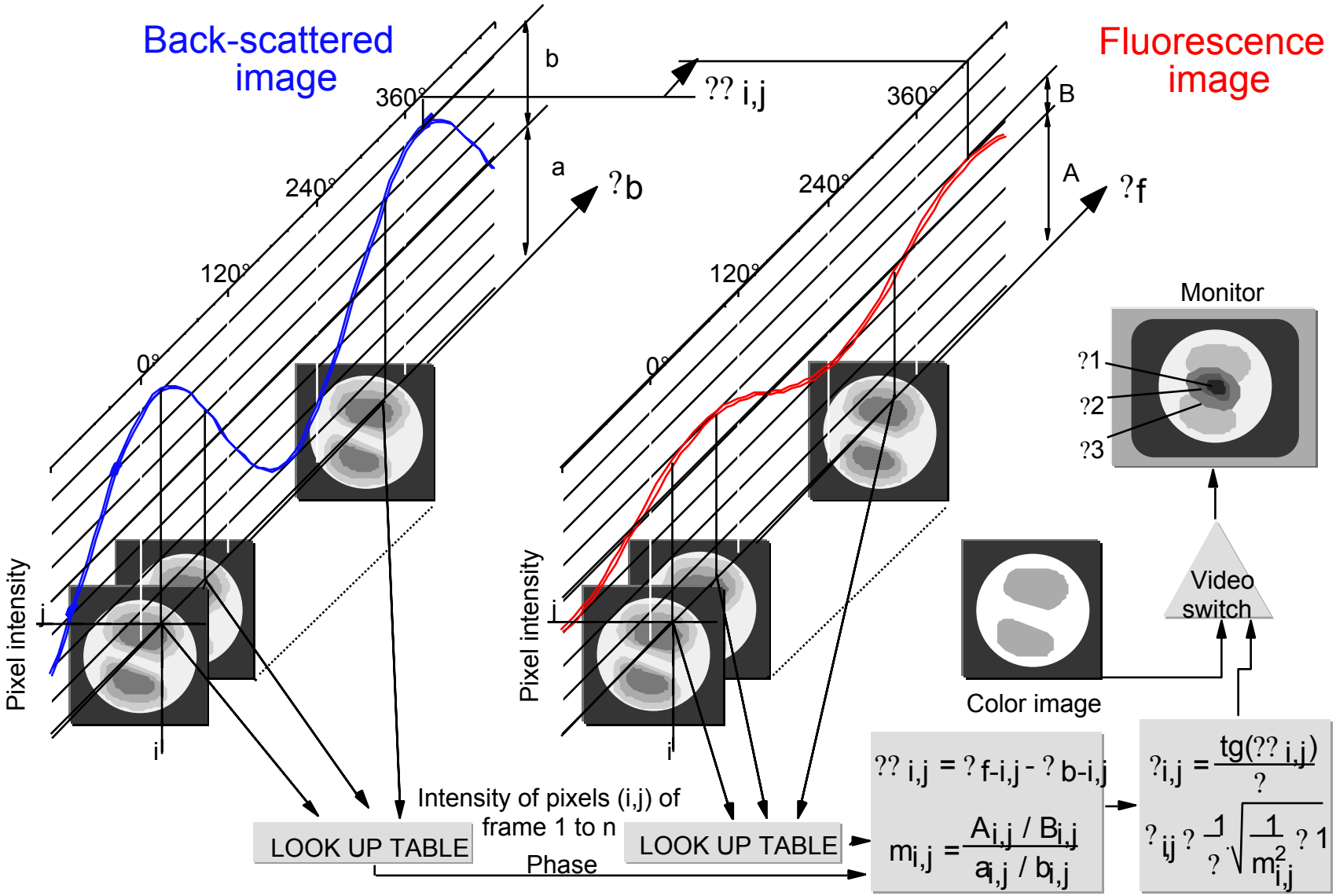


Rhodamin B in Ethanol. Fluorescence lifetime = 2.8 ns. Phase calculation.

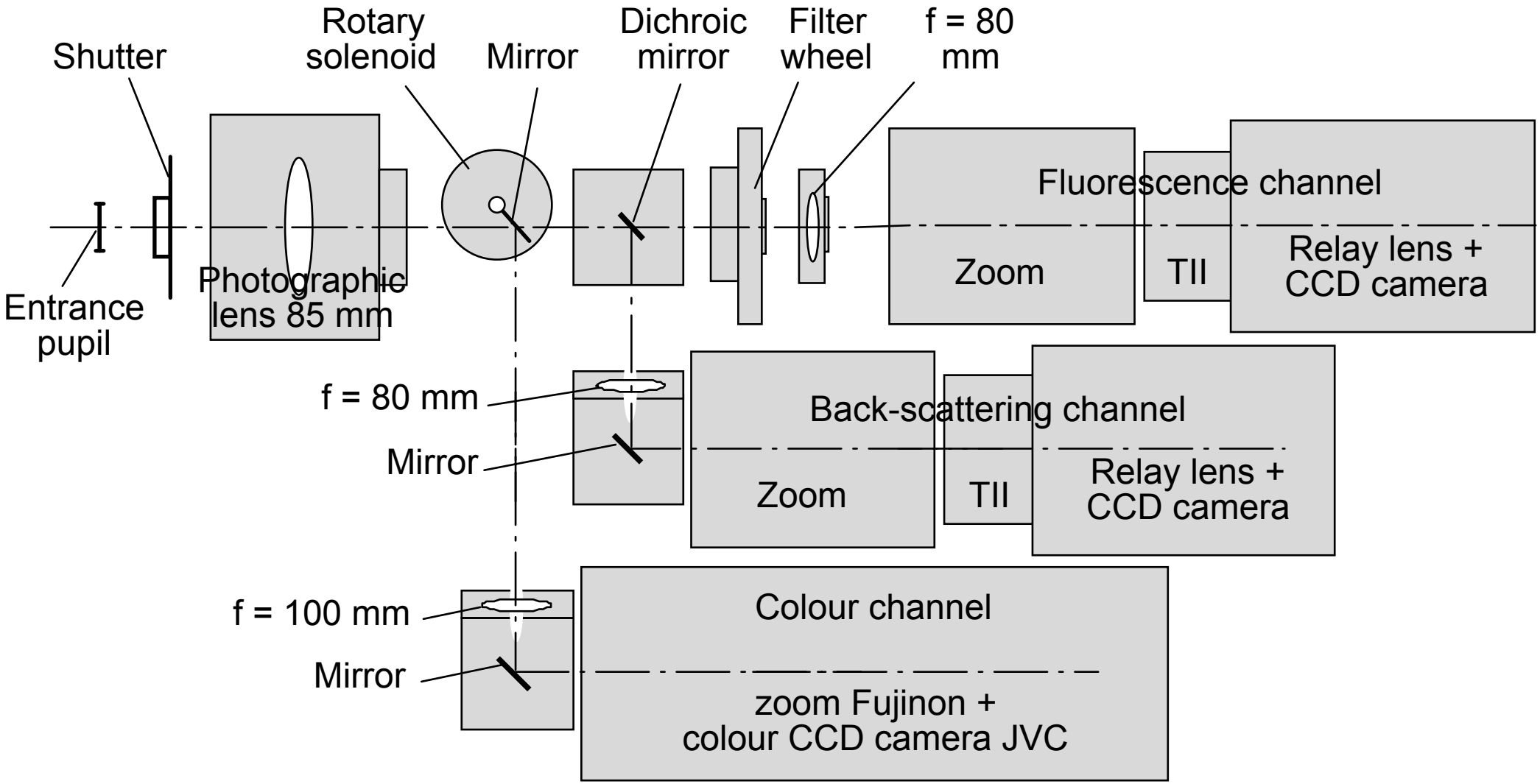


Rhodamin B in water. Fluorescence lifetime = 1.7 ns. Phase calculation.

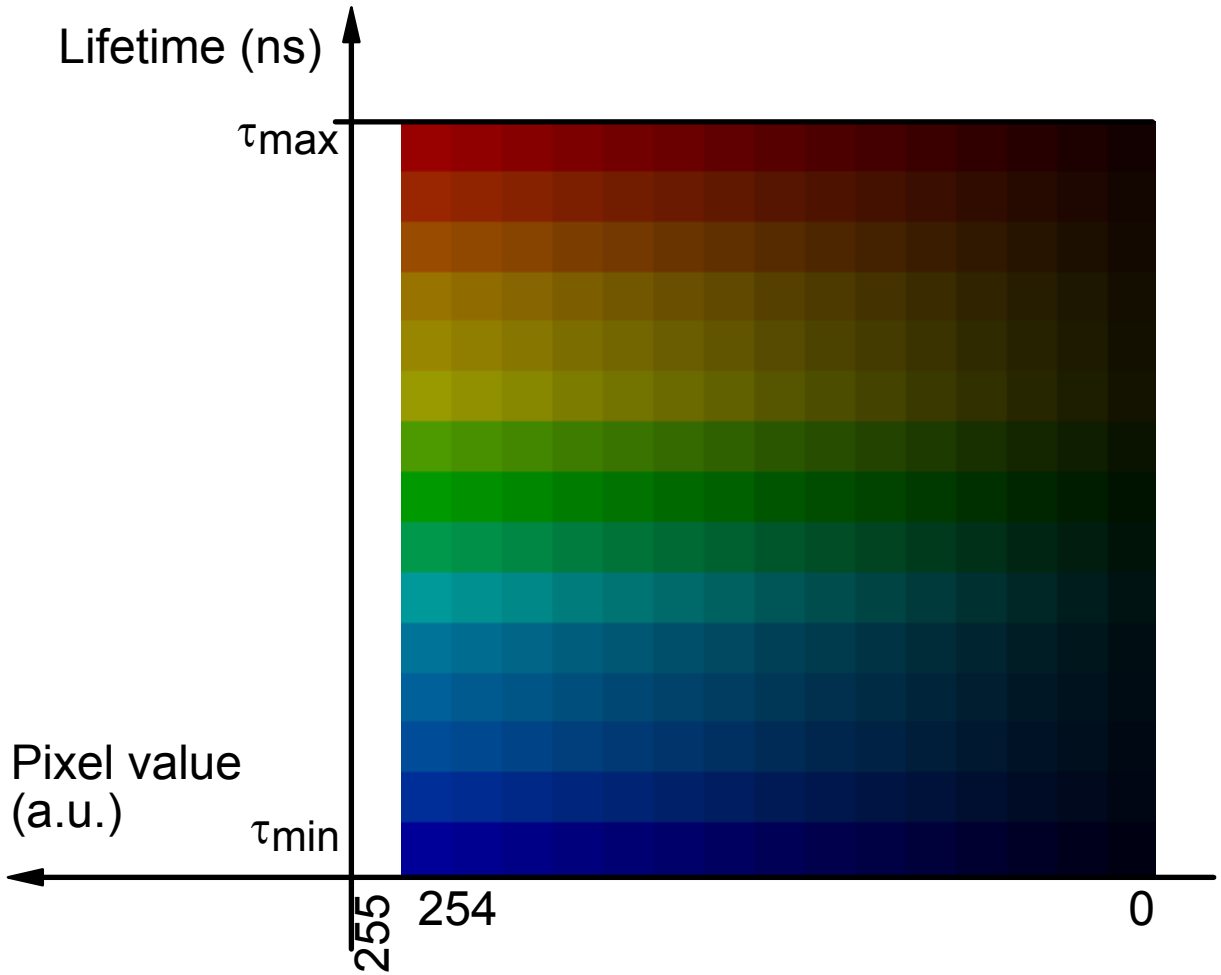
PRINCIPLES


Back-scattered image
Fluorescence image
b
a
B
A
?? i,j
?b
?f
360°
240°
120°
0°
Pixel intensity
i
j
Monitor
?1
?2
?3
Video switch
Color image
Intensity of pixels (i,j) of frame 1 to n
Phase
LOOK UP TABLE
LOOK UP TABLE
?? i,j = ? f-i,j - ? b-i,j
m i,j = A i,j / B i,j / a i,j / b i,j
? i,j = tg(?? i,j) / ?
? ij ? 1 / ? √(1 / m² i,j ? 1

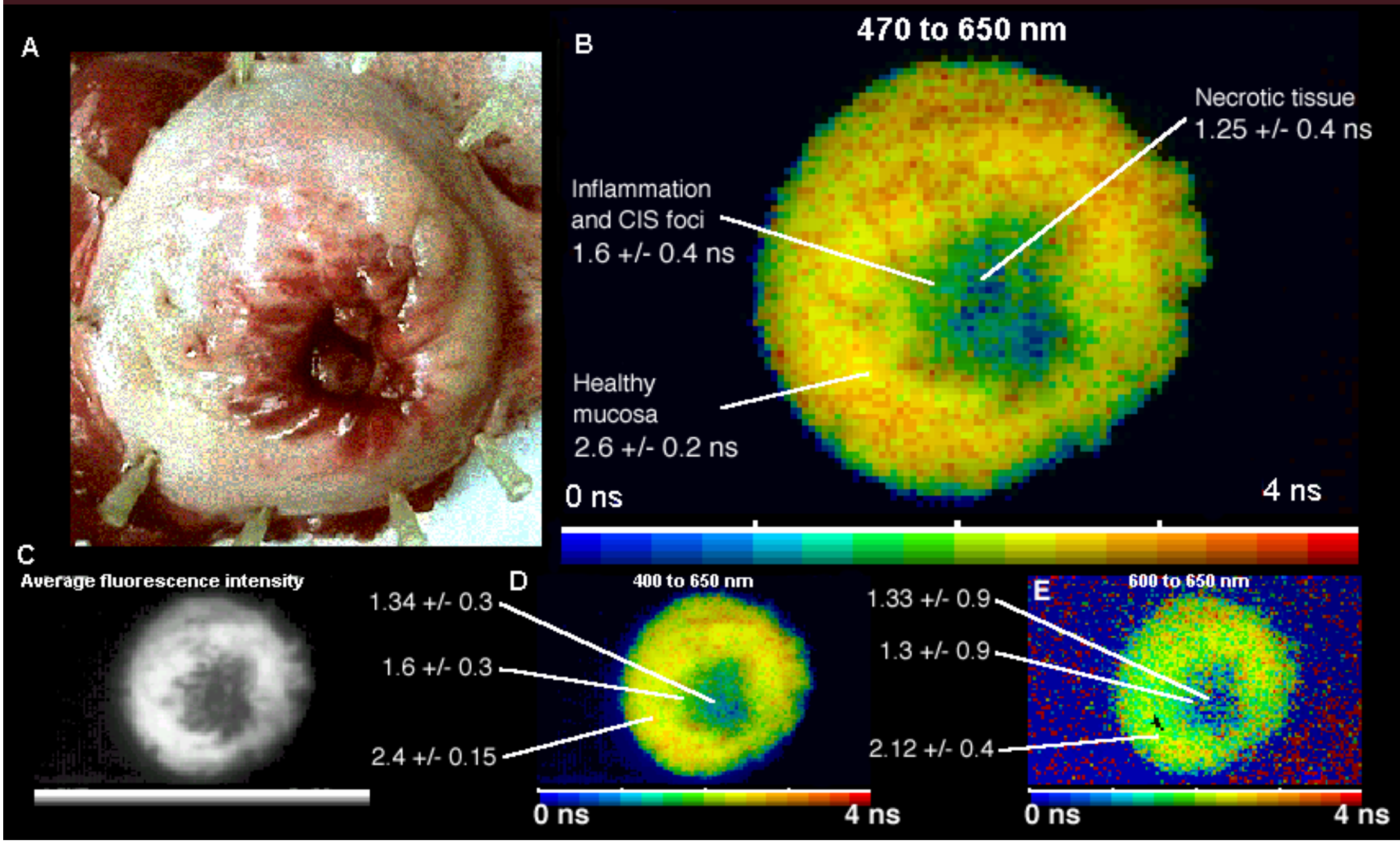
Instrumentation Optical Set-up



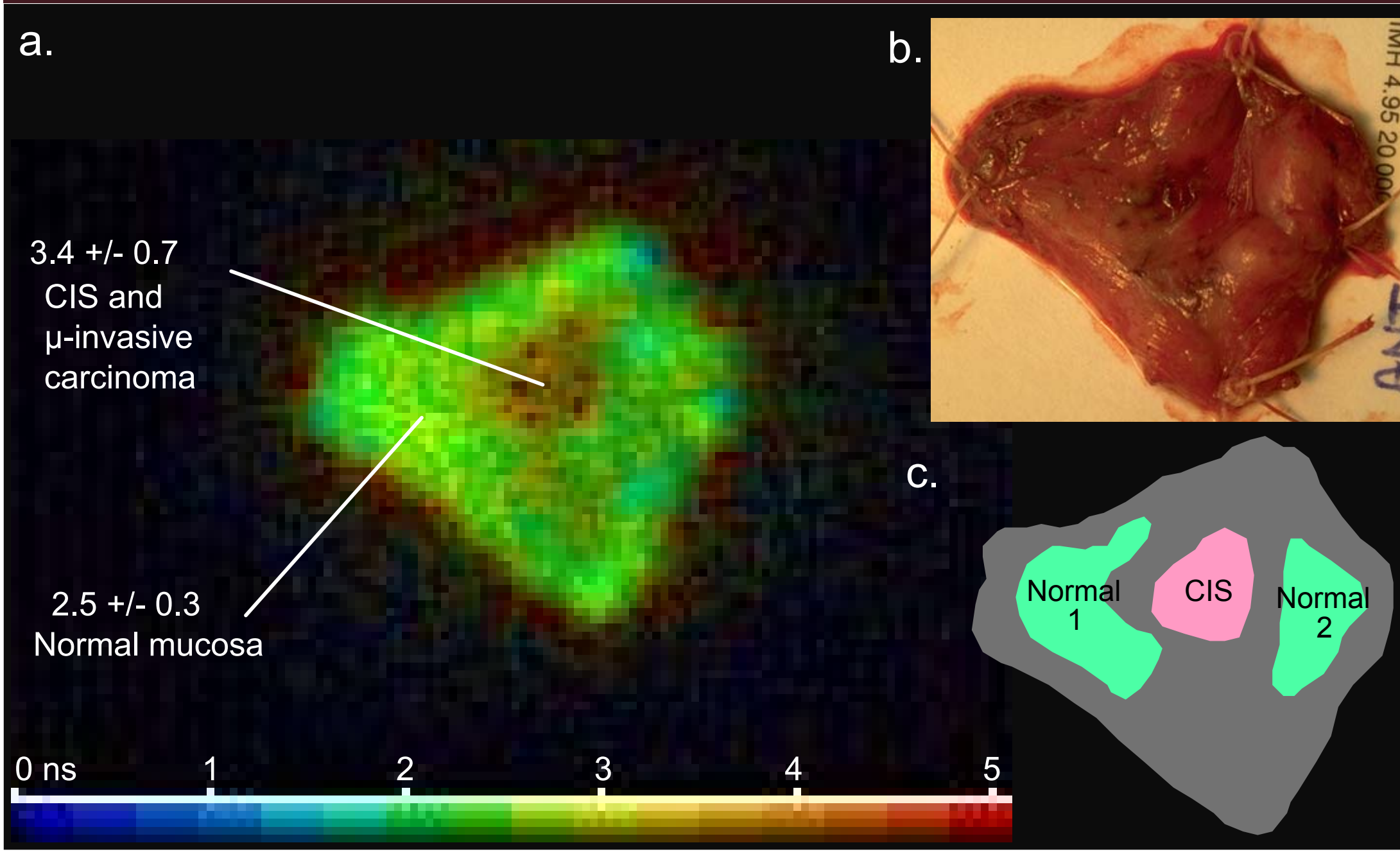
Colour Coding Principle



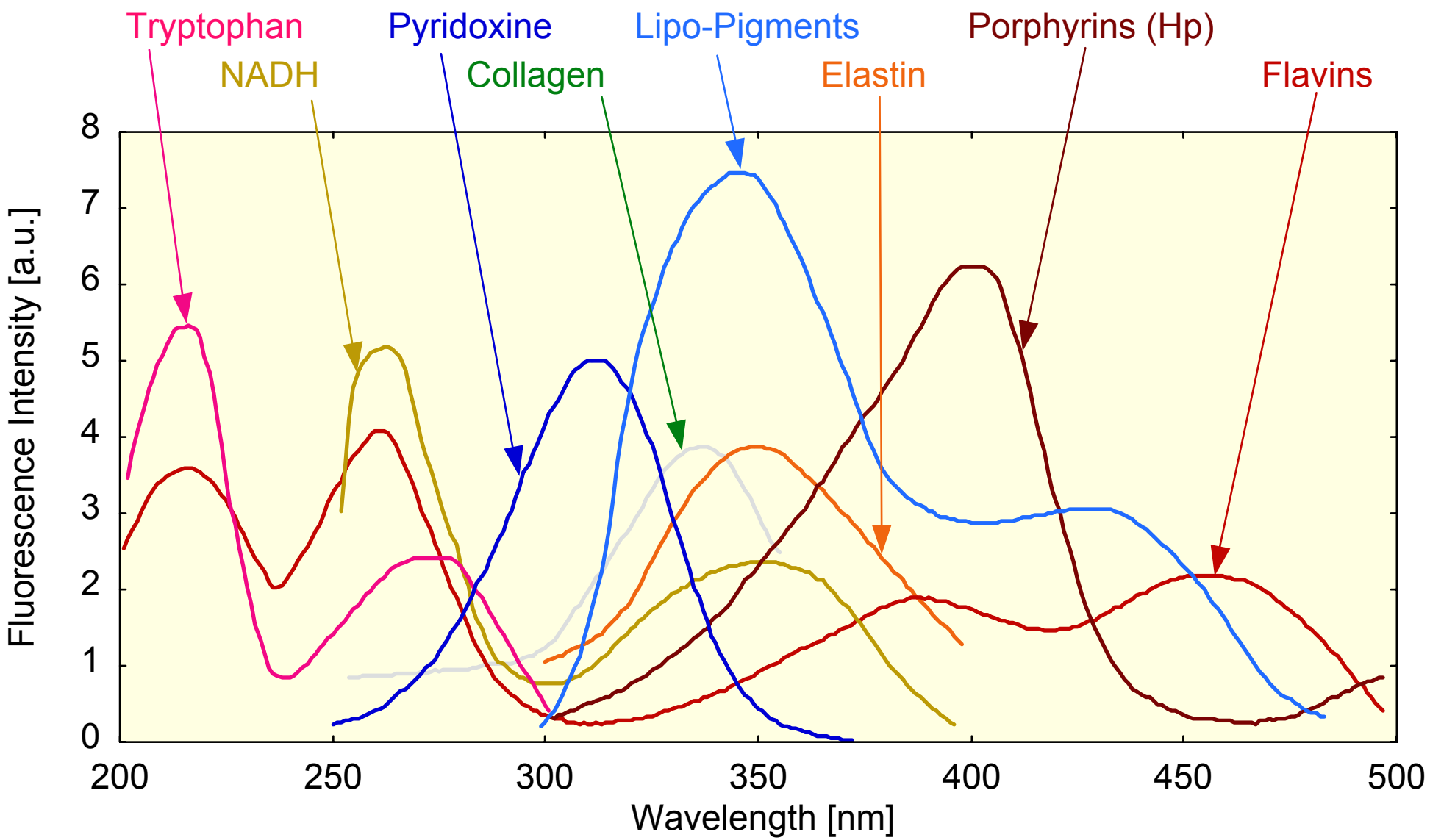
Case #2: Urinary Bladder, excitation med-UV



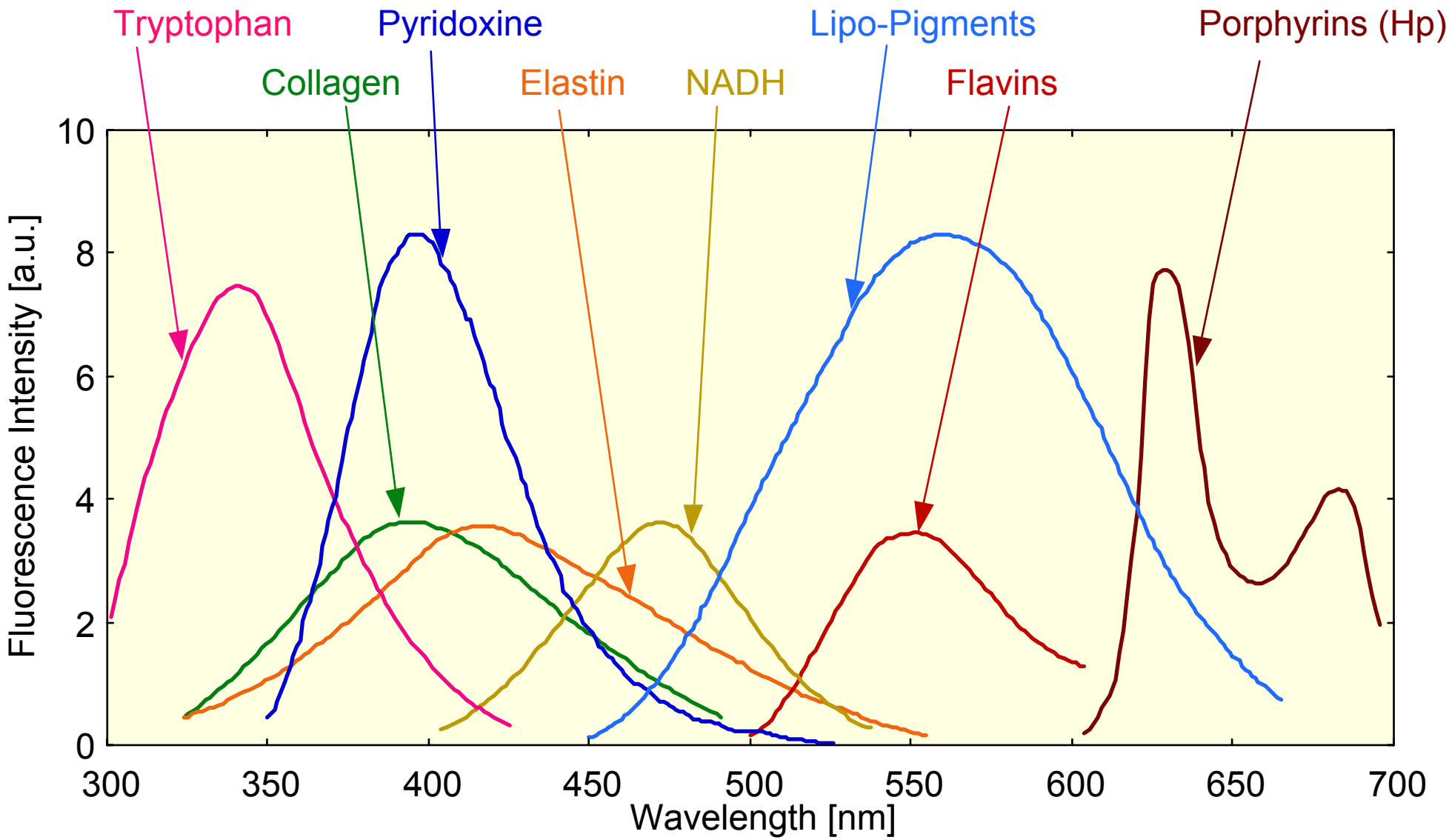
Case #4: Oral Cavity Mucosa, excitation 417 nm



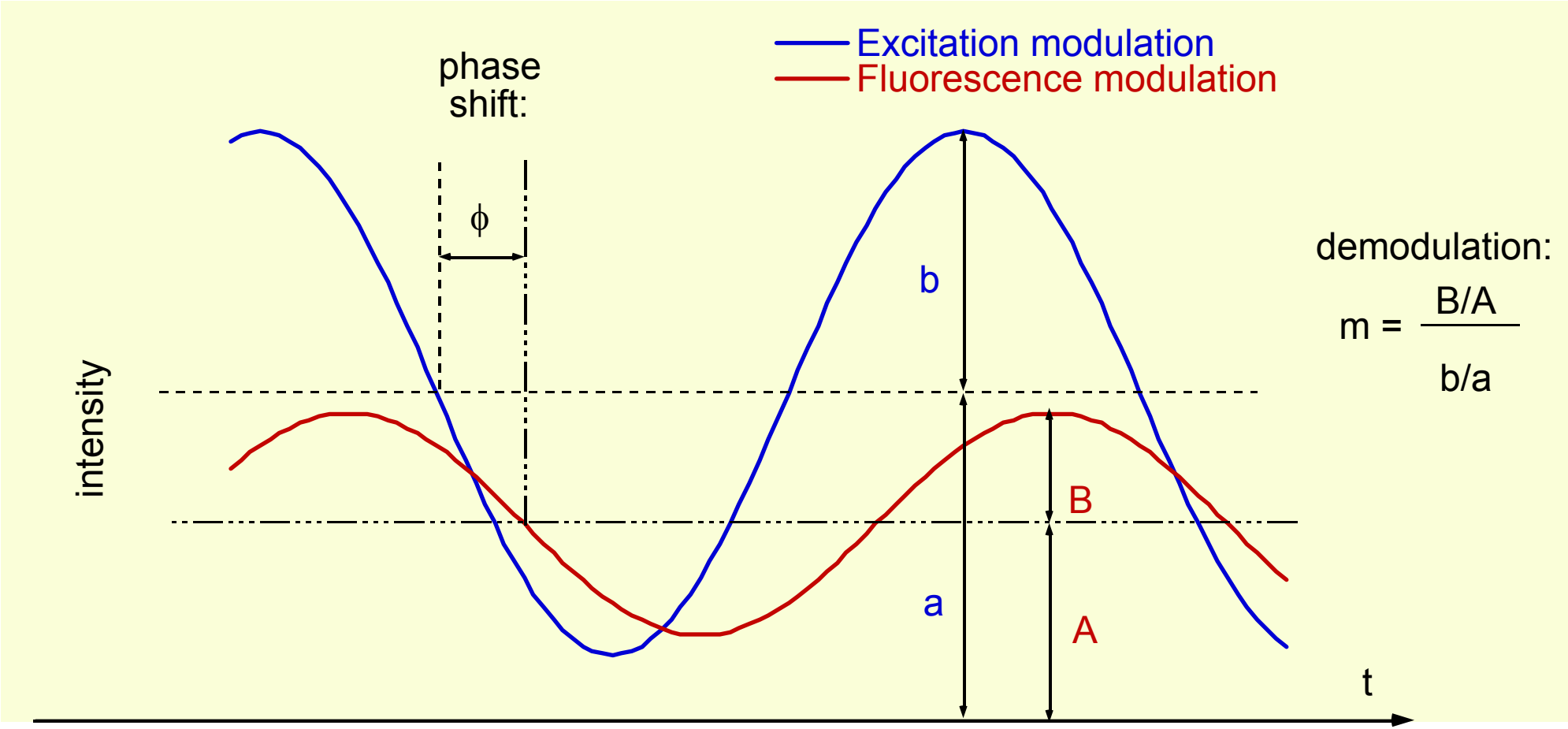
Excitation Spectra of some Bio-molecules



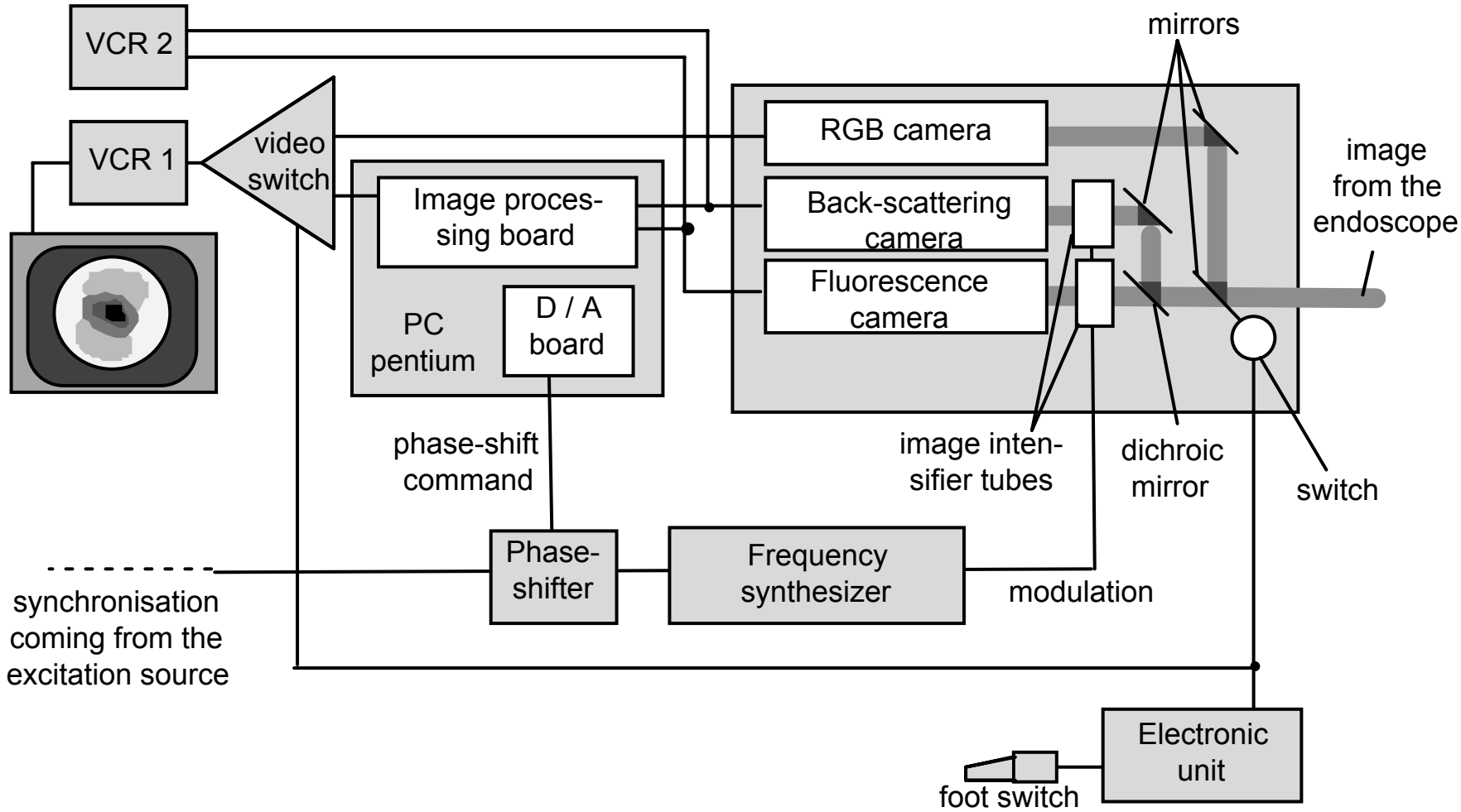
Emission Spectra of some Bio-molecules



Frequency-Domain Principle (5)



Instrumentation Detection Unit



Instrumentation Set-up