Safirne kivete u laserskoj spektroskopiji

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General properties

Excellent - isolator,
thermal conduction,
transparency

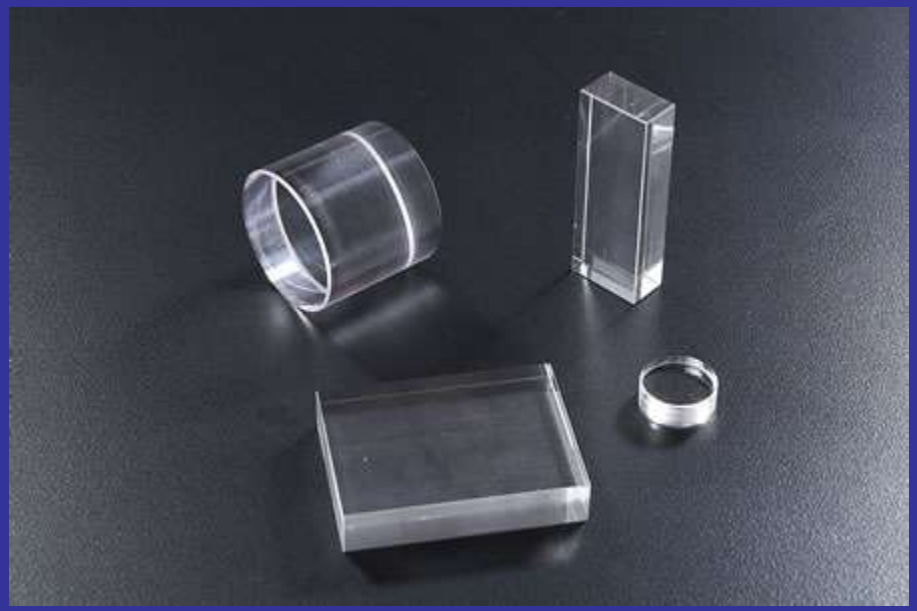
All sapphire cells different shapes

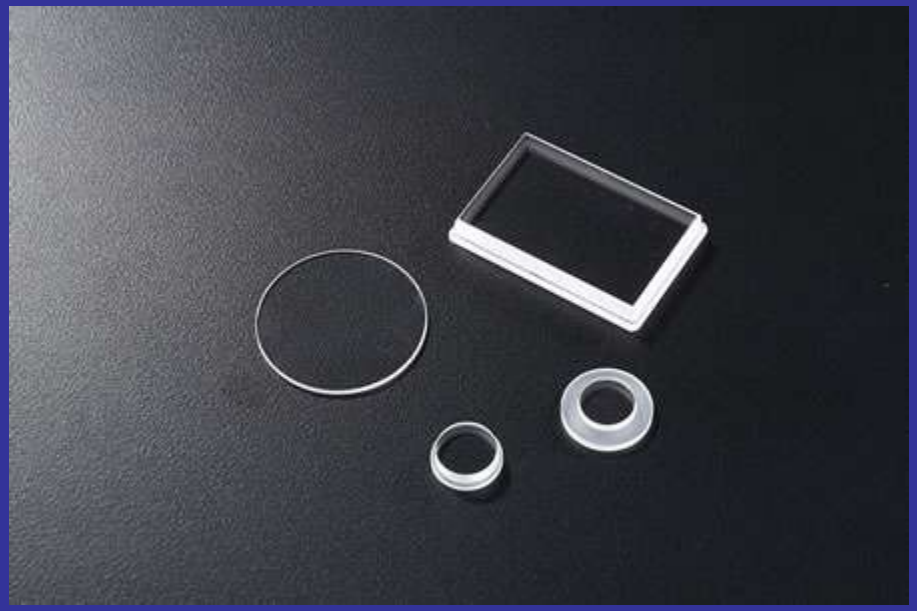
Heat-pipe ovens with sapphire windows

Show different LIF and absorption spectra

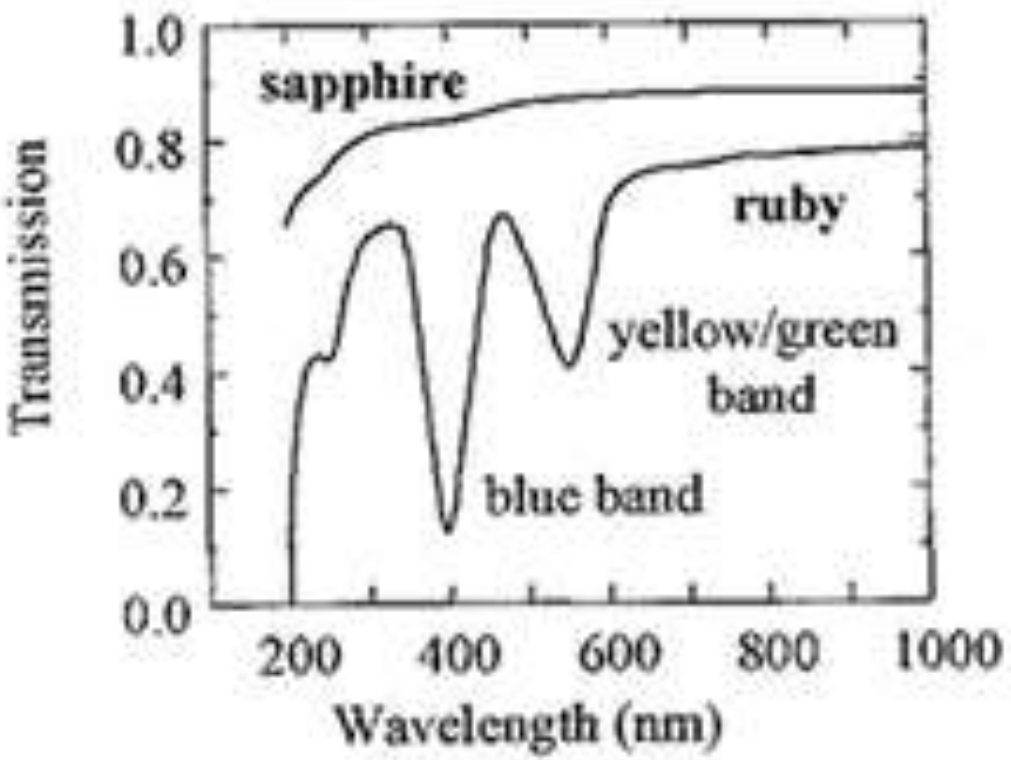
Extra-thin sapphire cells

High pressure alkali discharges

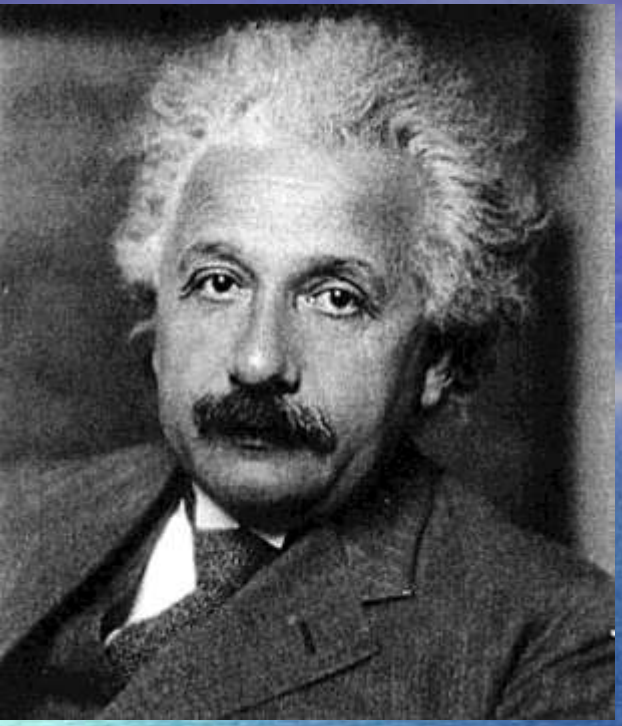


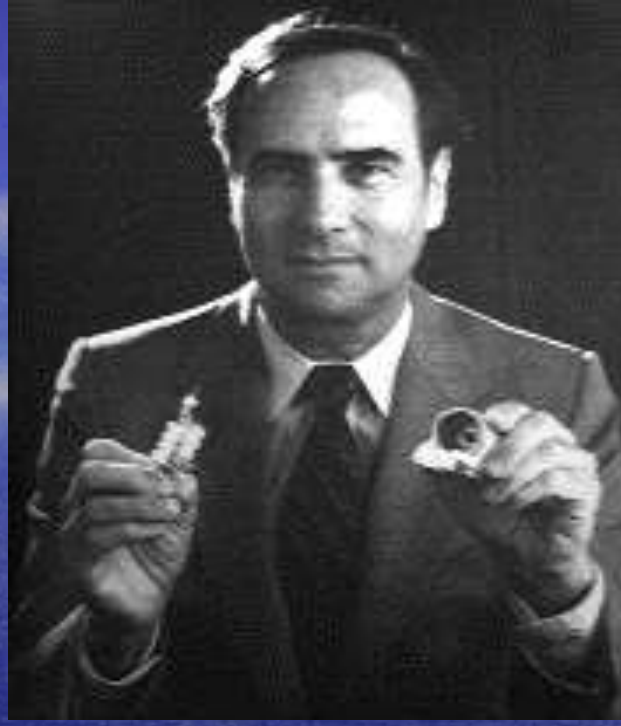


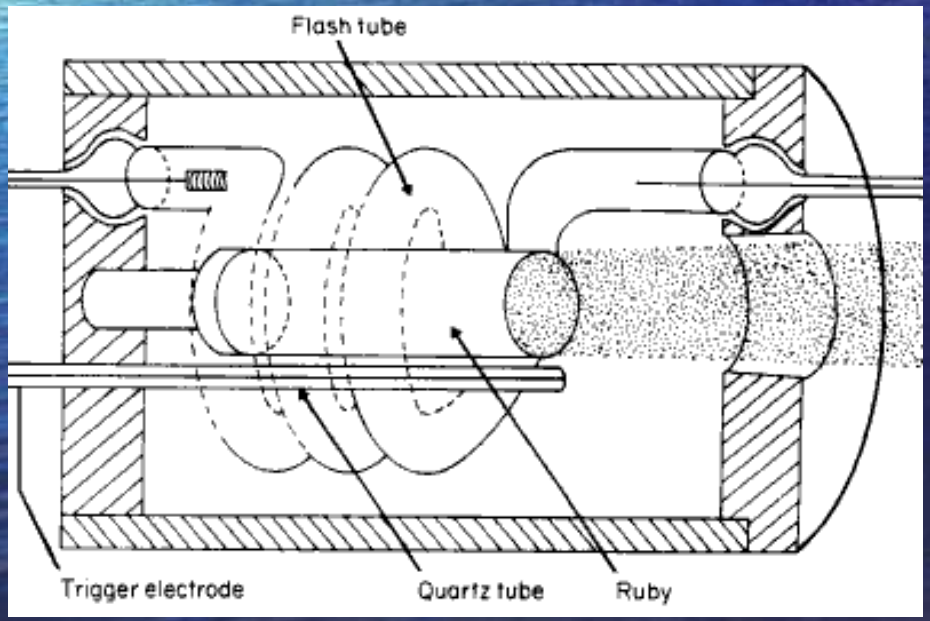
Transmission of sapphire in the UV, visible and near infrared spectrum



Clear Sapphire and Ruby Balls are both made from Crystalline Alumina.
Ruby or Ruby-Doped sapphire owes its red color to traces of chromium oxide
While their 'extreme' physical and chemical properties are basically the same,
the absorption of Green and Blue wavelengths is increased allowing Red to be transmitted.

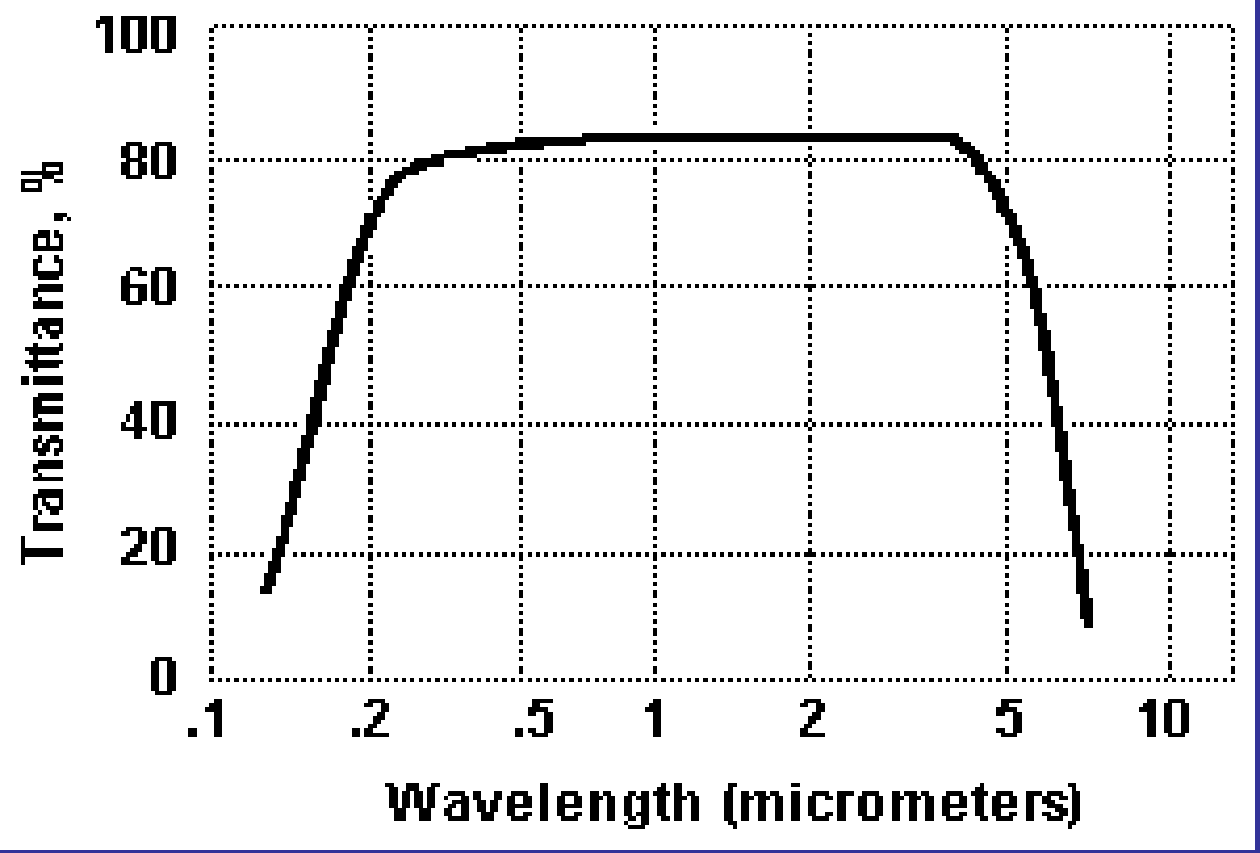




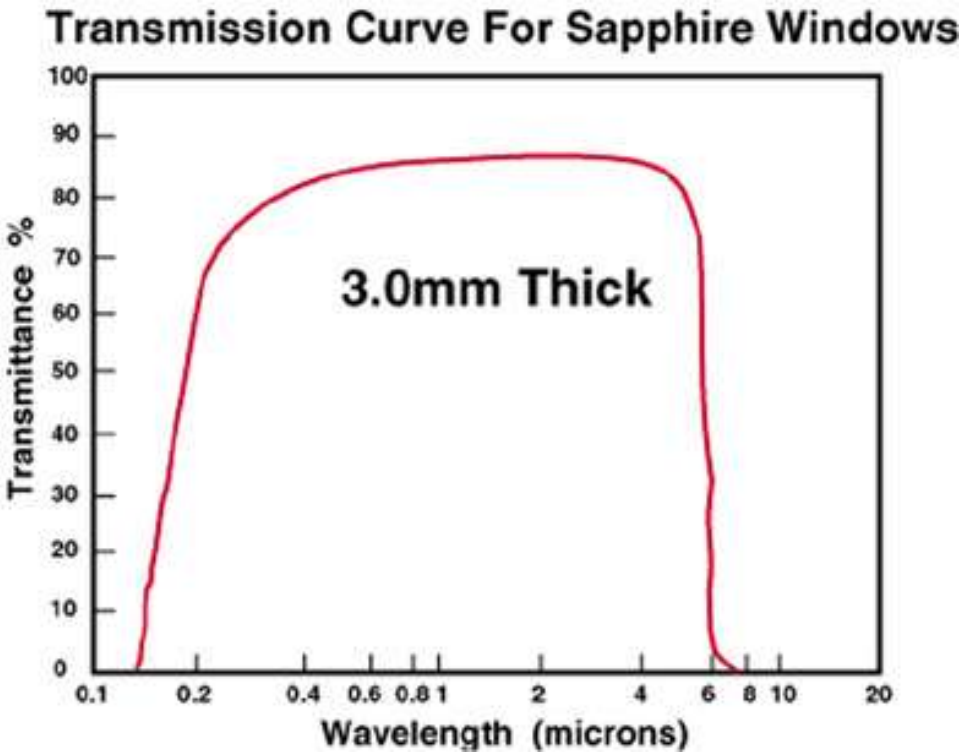


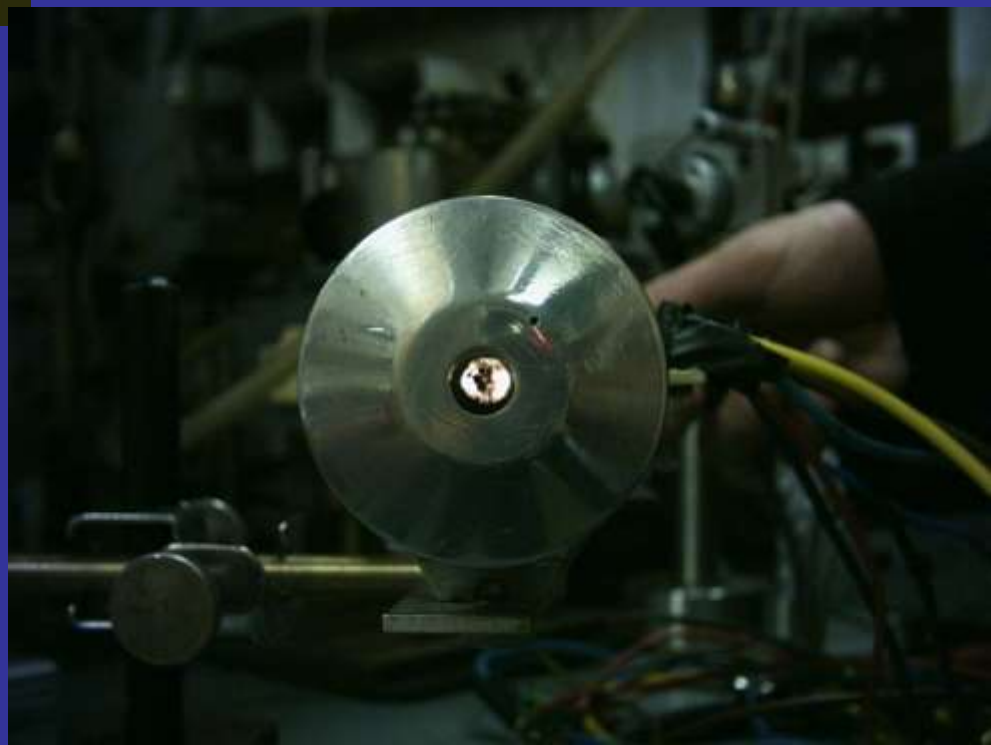
Theodore Harold Maiman
1927-2007

Ruby Laser Systems
Laser
Patent Number(s) 3,353,115

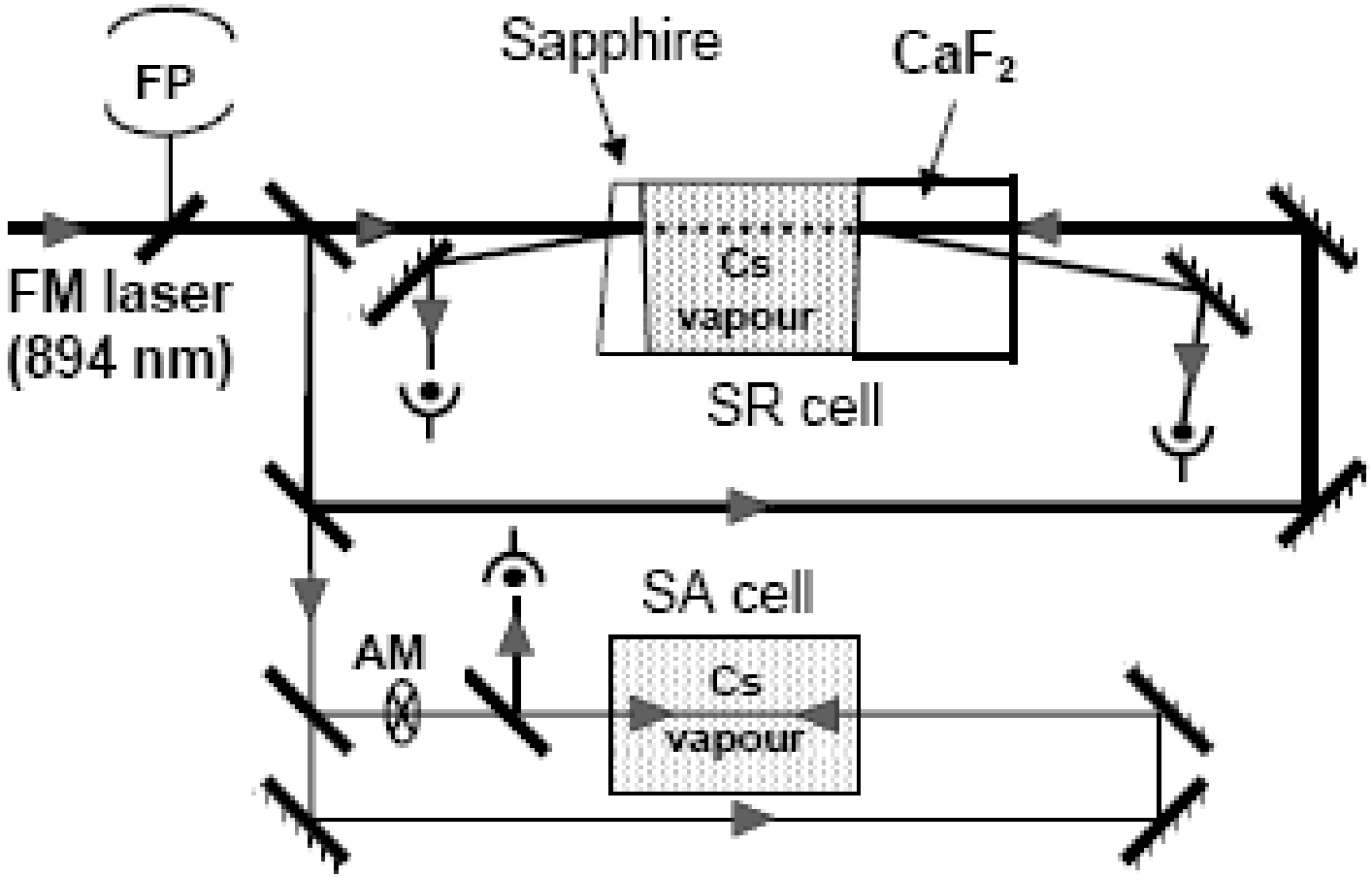


Single crystal sapphire possesses a unique combination of excellent optical, physical and chemical properties. The hardest of the oxide crystals, sapphire retains its high strength at high temperatures, has good thermal properties and excellent transparency. It is chemically resistant to common acids and alkali at temperatures up to 1000 °C as well as to HF below 300 °C. These properties encourage its wide use in hostile environments where optical transmission in the range from the visible to the near infrared is required.


Transmission Curve For Sapphire Windows
Transmittance %
100
90
80
70
60
50
40
30
20
10
0
3.0mm Thick
0.1
0.2
0.4
0.6
0.8
1
2
4
6
8
10
20
Wavelength (microns)




David Sarkisyan,
Ashtarak, Armenia


FP
Sapphire
CaF_2
FM laser
(894 nm)
Cs
vapour
SR cell
SA cell
AM
Cs
vapour

Femtosecondi laser
at 780 & 850 nm

Mirror with
a hole

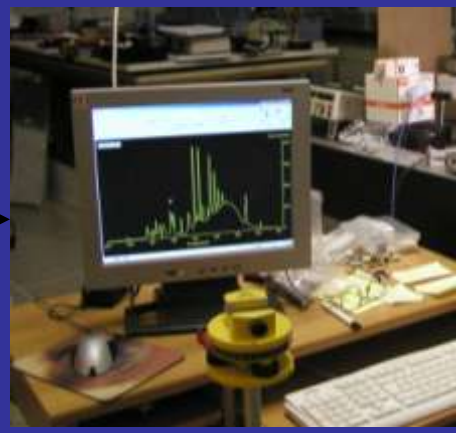
Rb & Cs sapphire cell

Lens

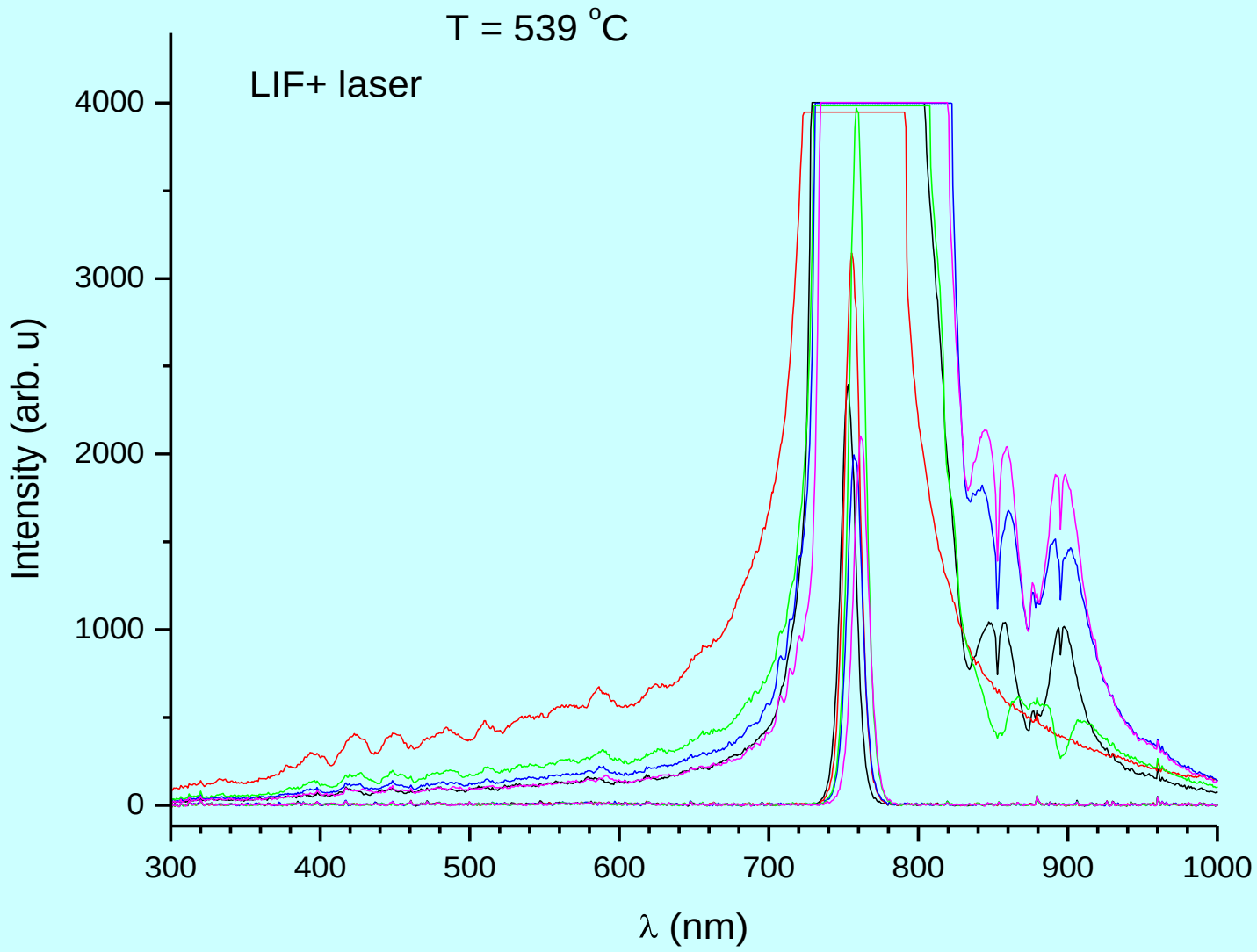
Polarizator

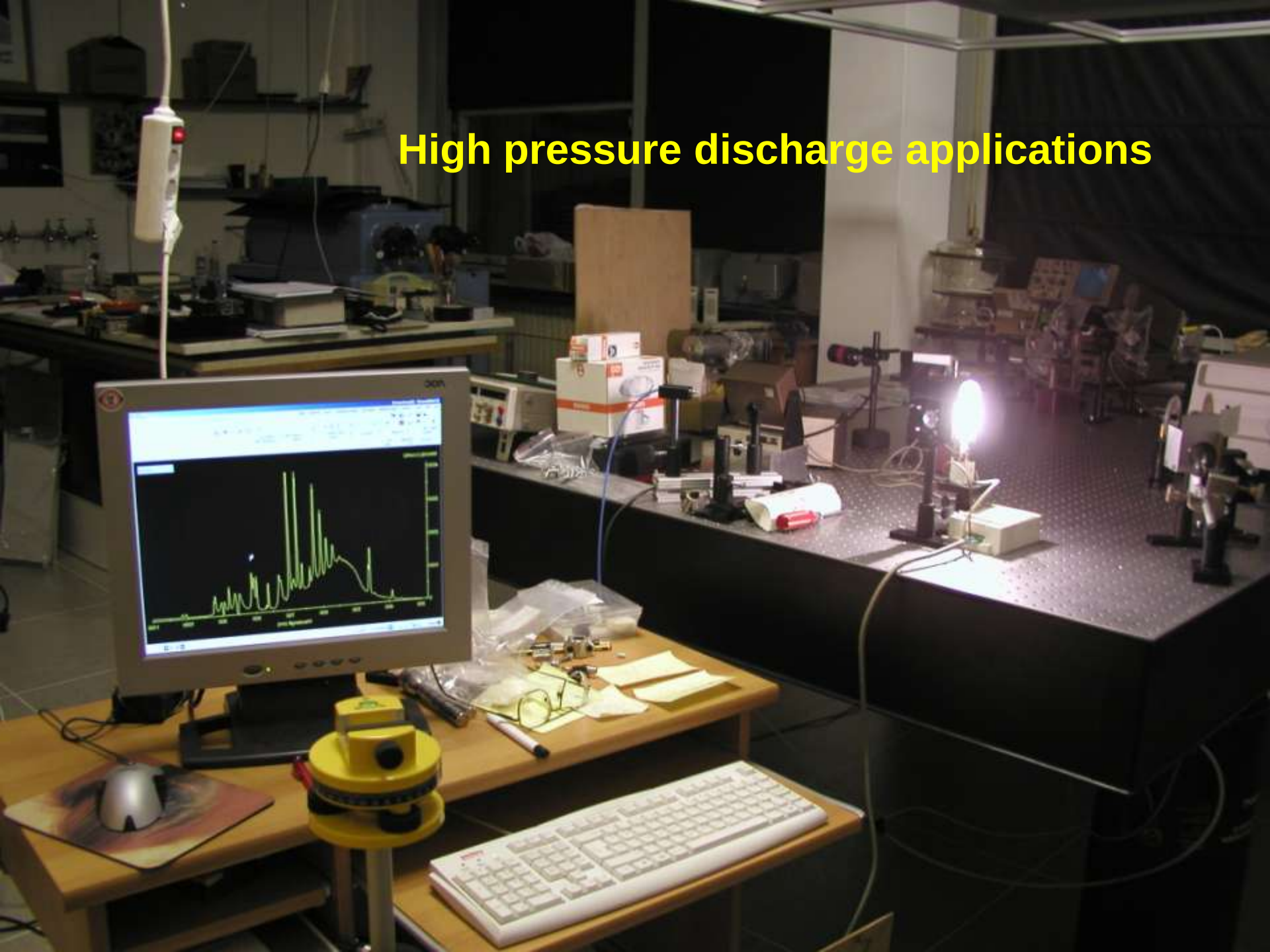
Optical
fiber

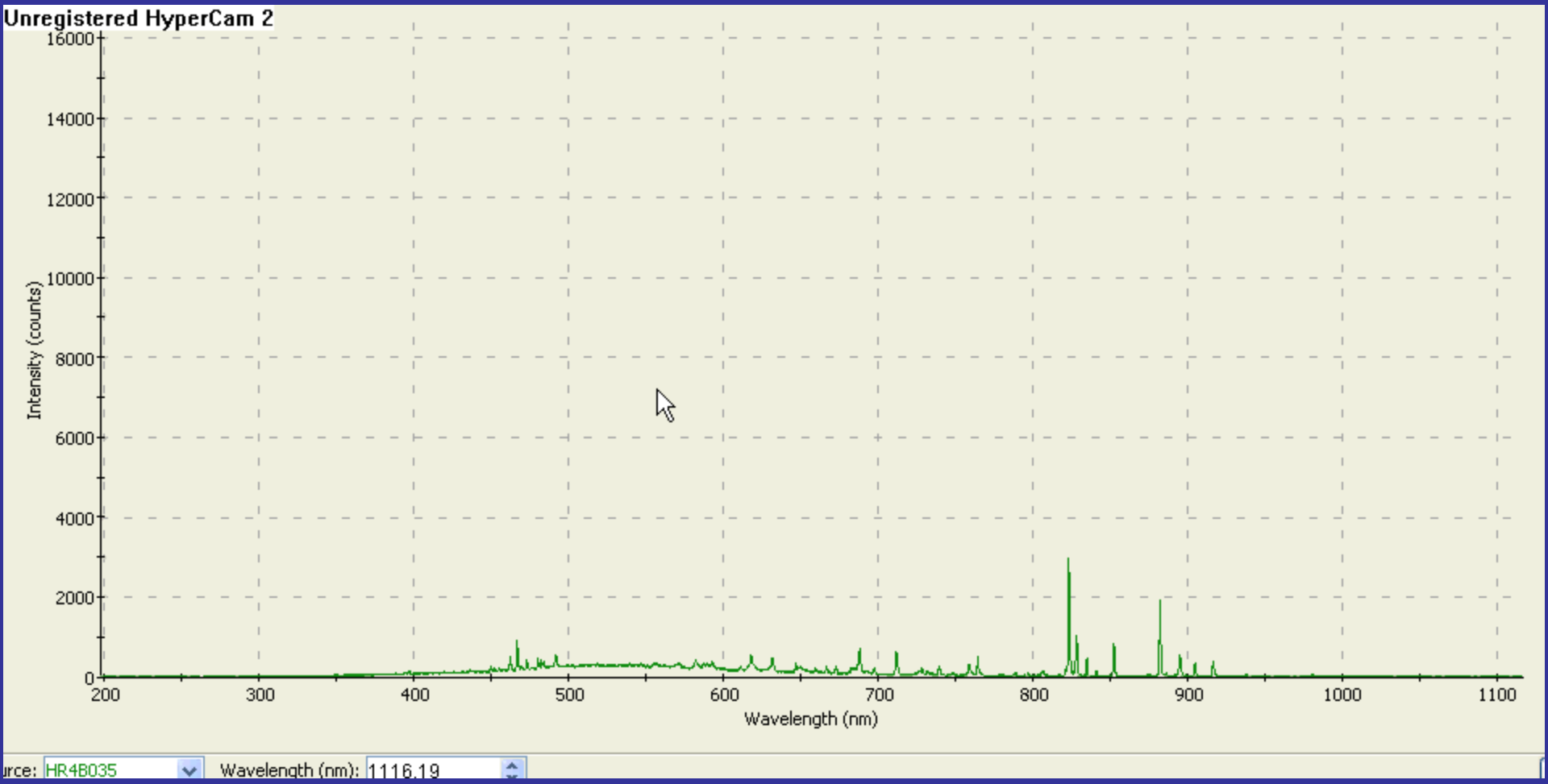
Spectrometer
OceanOptics
S-2000

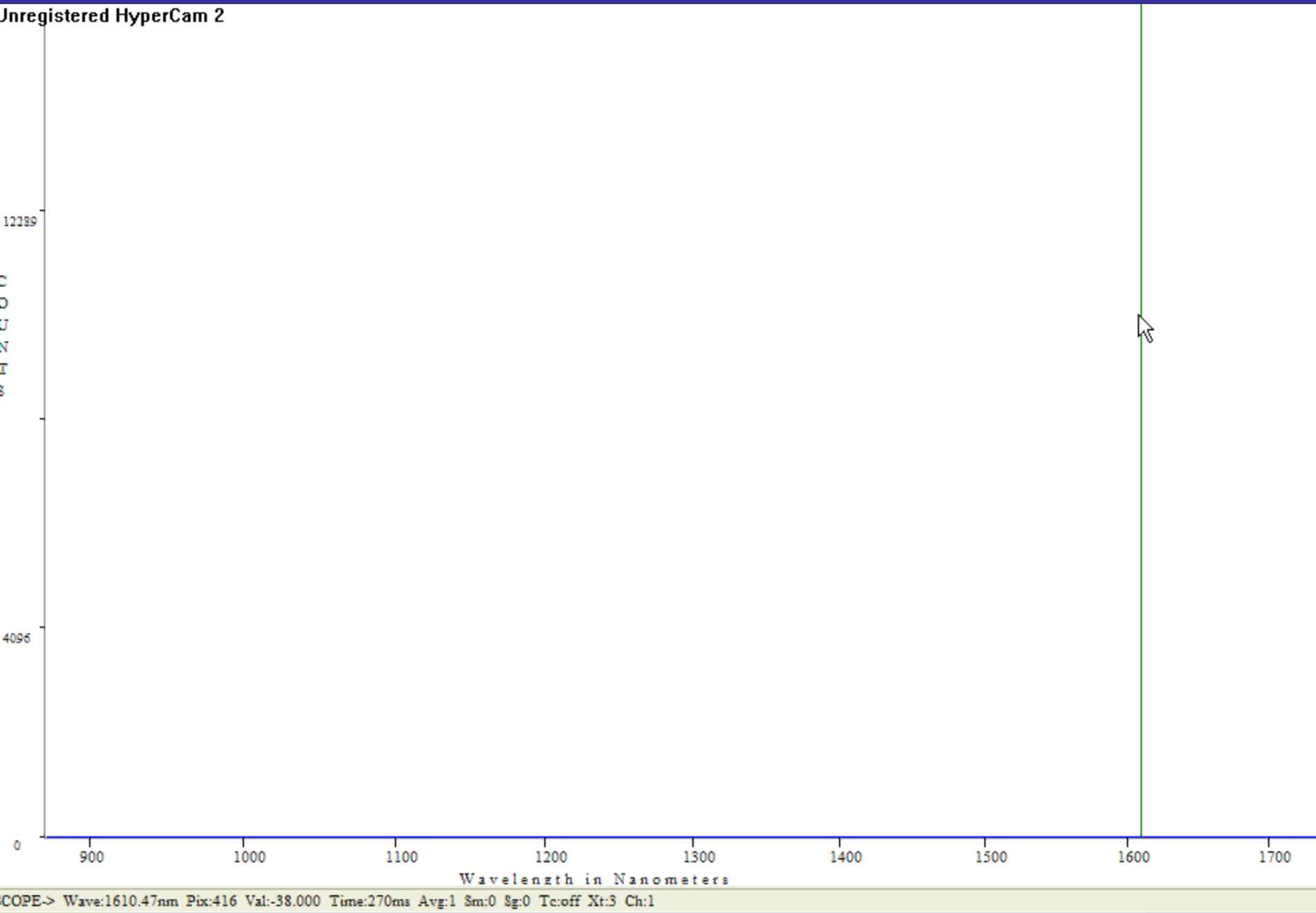


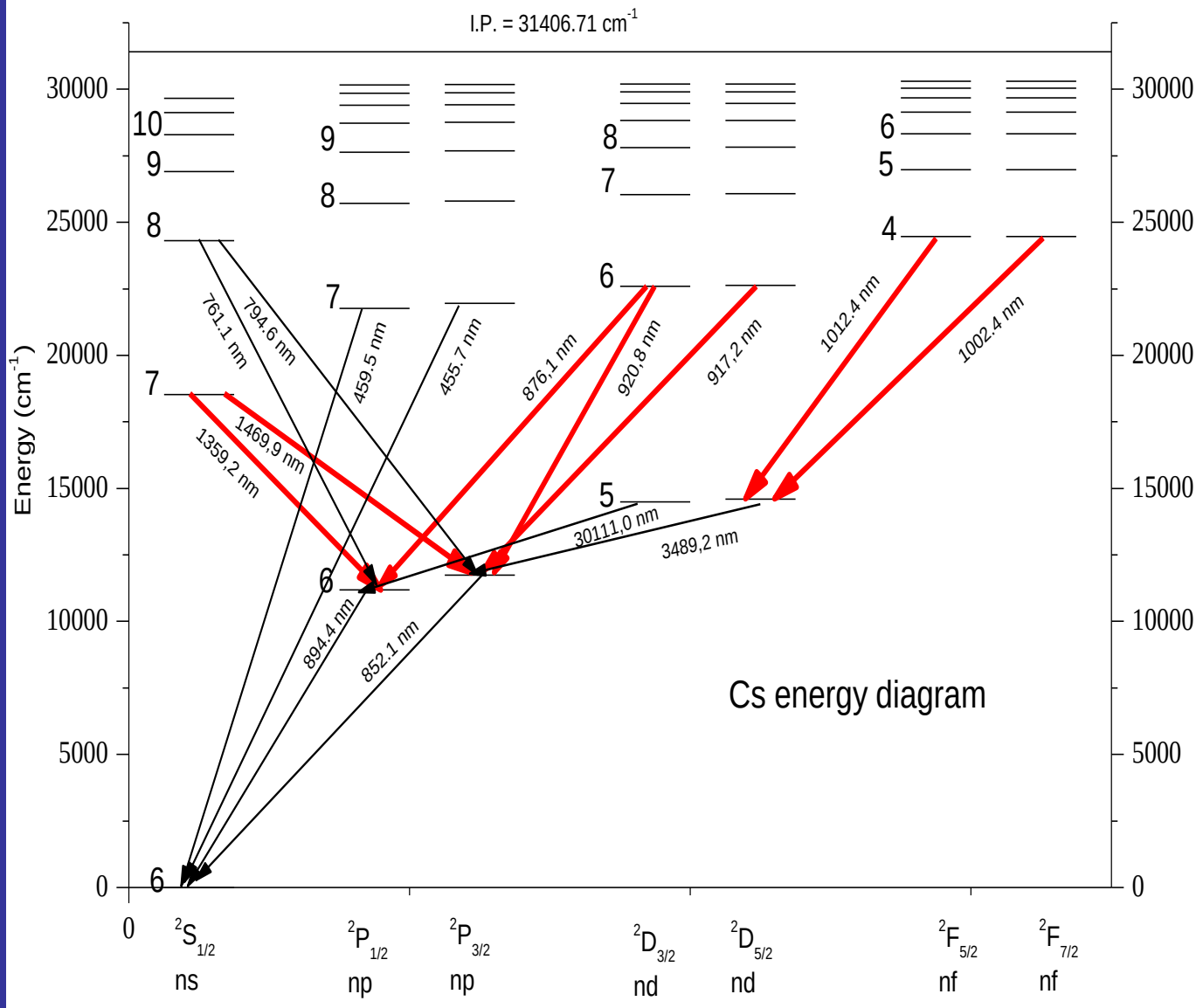
Lab-PC


T = 539 °C
LIF+ laser
Intensity (arb. u)
4000
3000
2000
1000
0
300
400
500
600
700
800
900
1000
λ (nm)


High pressure discharge applications


Unregistered HyperCam 2
16000
14000
12000
10000
8000
6000
4000
2000
0
Intensity (counts)
200
300
400
500
600
700
800
900
1000
1100
Wavelength (nm)
urce: HR4B035
Wavelength (nm): 1116.19


Unregistered HyperCam 2
12289
4096
0
900
1000
1100
1200
1300
1400
1500
1600
1700
Wavelength in Nanometers
COPE-> Wave:1610.47nm Pix:416 Val:-38.000 Time:270ms Avg:1 Sm:0 Sg:0 Tc:off Xt:3 Ch:1


I.P. = 31406.71 cm-1
Energy (cm-1)
30000
25000
20000
15000
10000
5000
0
10
9
8
7
6
9
8
7
6
8
7
6
5
6
5
4
761.1 nm
794.6 nm
459.5 nm
455.7 nm
876.1 nm
920.8 nm
917.2 nm
1012.4 nm
1002.4 nm
1469,9 nm
1359,2 nm
30111,0 nm
3489,2 nm
894.4 nm
852.1 nm
Cs energy diagram
0
2S1/2
ns
2P1/2
np
2P3/2
np
2D3/2
nd
2D5/2
nd
2F5/2
nf
2F7/2
nf

Conclusions

Basic AMO Science

Cs high pressure discharge presents an excellent source to study rich atomic and molecular phenomena

New Technology

Digital spectrometers offer rapid overview of the whole UV, visible, and near infrared spectrum at different conditions.

Applications

Improvement of the Cs white light source is possible through the understanding of the basic atomic, molecular, optical and plasma physics.

Thank you!

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