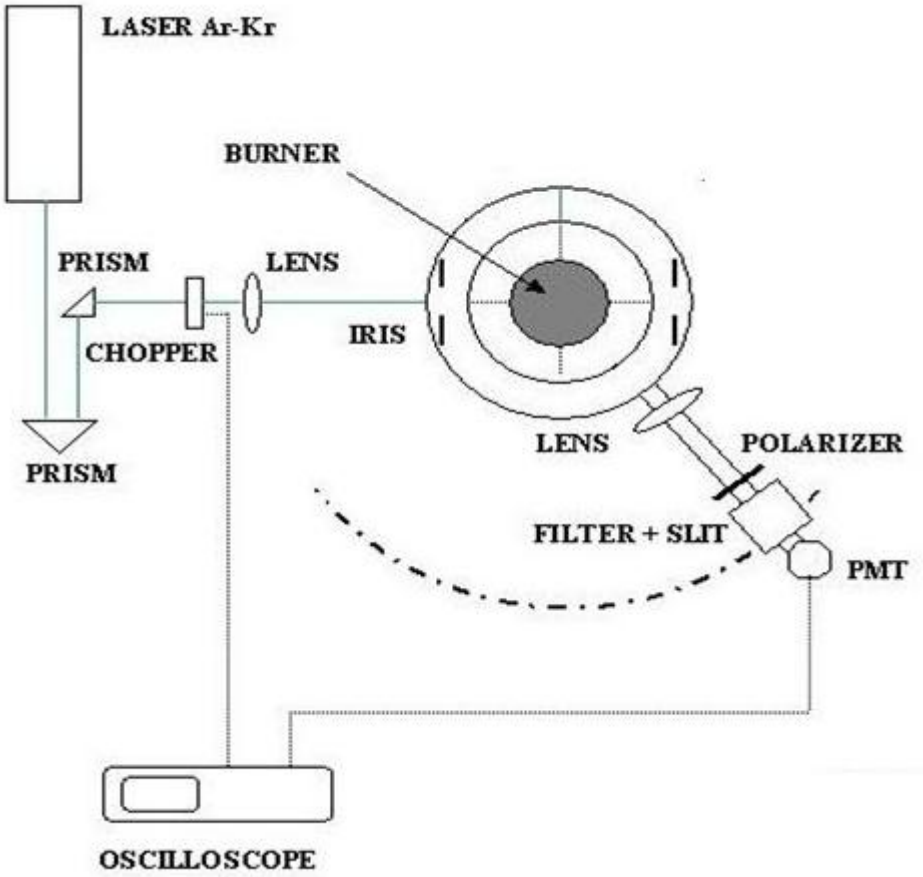
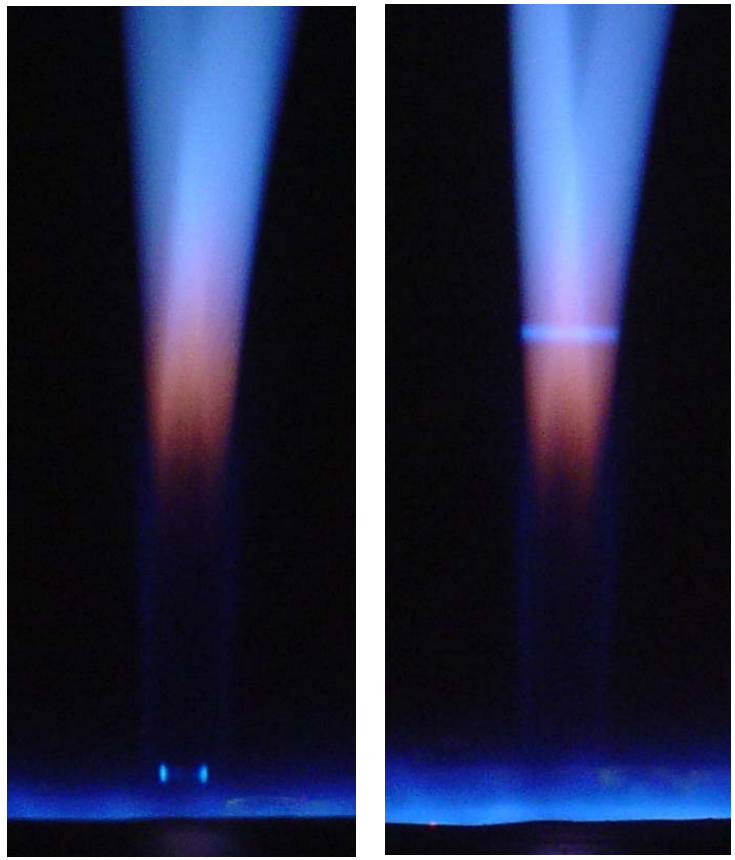
ON LINE DIAGNOSTICS



LASER LIGHT SCATTERING

(λ = 514 nm) at three different angles:
20°, 90 ° and 160°



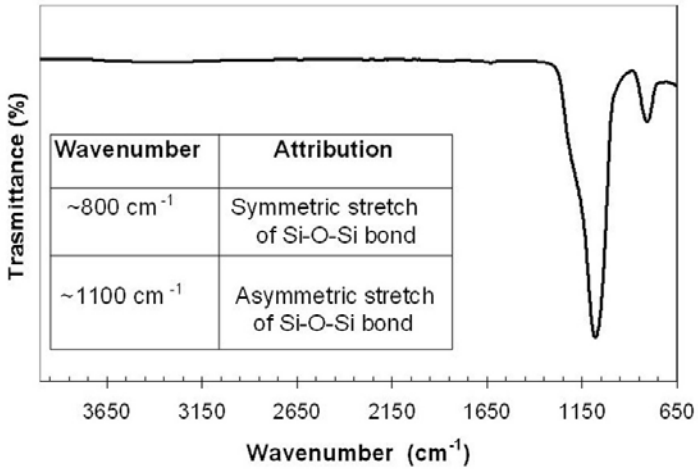
HYBRID BURNER NOT SUITABLE FOR LLS

✓ determination of the starting aggregation zone

SILICA Characterization

XRD⇒ amorphous structure

FTIR



A.L. Smith, Analysis of Silicones, -Chemical Analysis 254-255 (1974) John Wiley NY

ON LINE DIAGNOSTICS

Laser Induced Incandescence (LII)

LII resulted a powerful technique in soot diagnostics

LII Basic principles

- A rather strong laser power is sent on the particles by a pulsed laser

- Particles are overheated then emit a radiation.

HOW TO DISTINGUISH THIS RADIATION?

Intensity, spatial origin, time evolution

- The LII signal basically is determined, for a given substance:

1. in **INTENSITY** by the matter concentration inside the probe volume (material volume fraction)

2. in **DECAY TIME** by the **primary particle size** (still debated models)

ON LINE DIAGNOSTICS

Laser Induced Incandescence (LII)

FROM SOOT TO OTHER MATERIALS

- Soot is black and absorbs all wavelengths. Other materials have different features.

- Soot withstands high laser fluences, still emitting only a blackbody radiation. This could be not the same for other material (R. Vander Wal, Appl. Opt. 1999).

ON LINE DIAGNOSTICS

Laser Induced Incandescence (LII)

3. OUR APPLICATIONS ON TITANIA

ON LINE DIAGNOSTICS: LII

Nd YAG laser at:

1064nm

532nm

266 nm

Fluence at the probe volume:

625 mJ/cm2

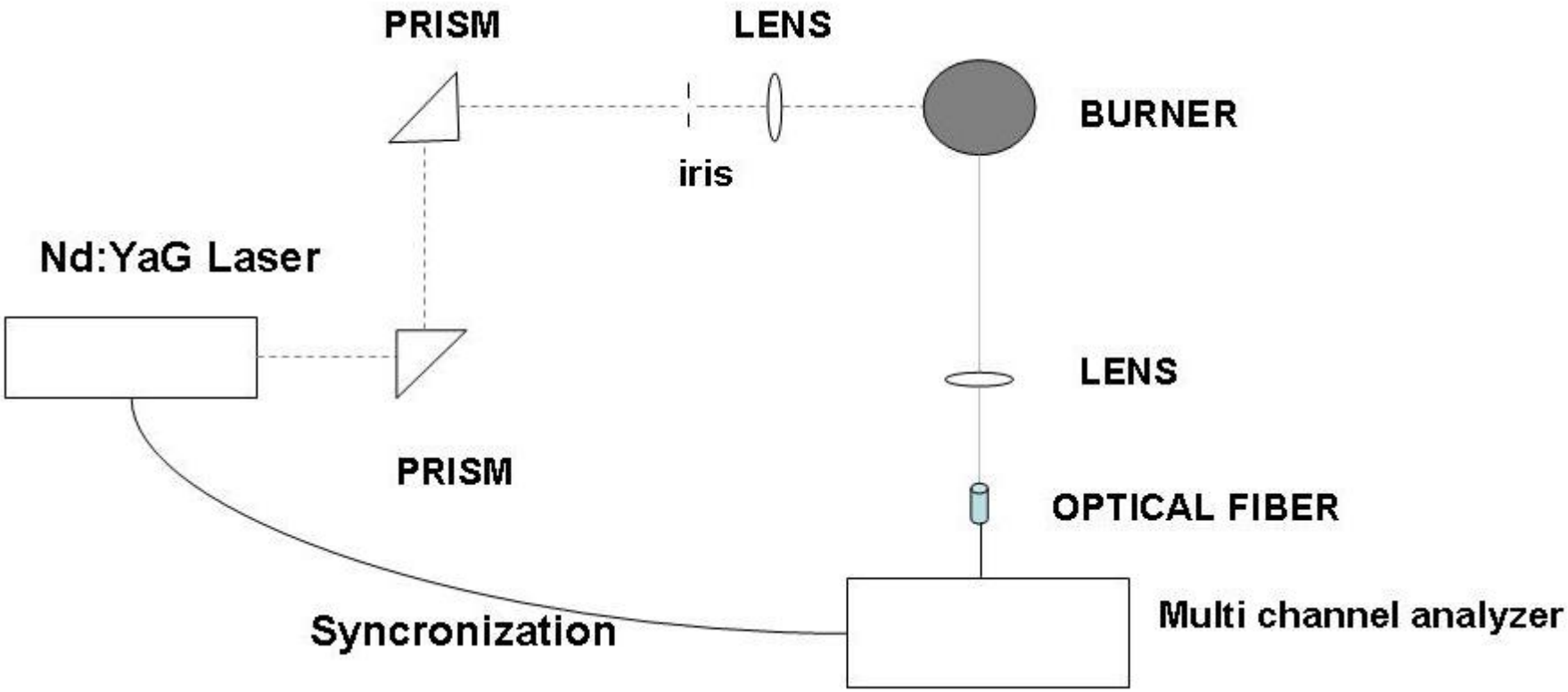
60 mJ/cm2

21.74 mJ/cm2

The outcoming signal analysed :

- ✓at a fixed (but variable) time as a function of wavelenght (LIE)
- ✓at a fixed wavelenght as a function of time

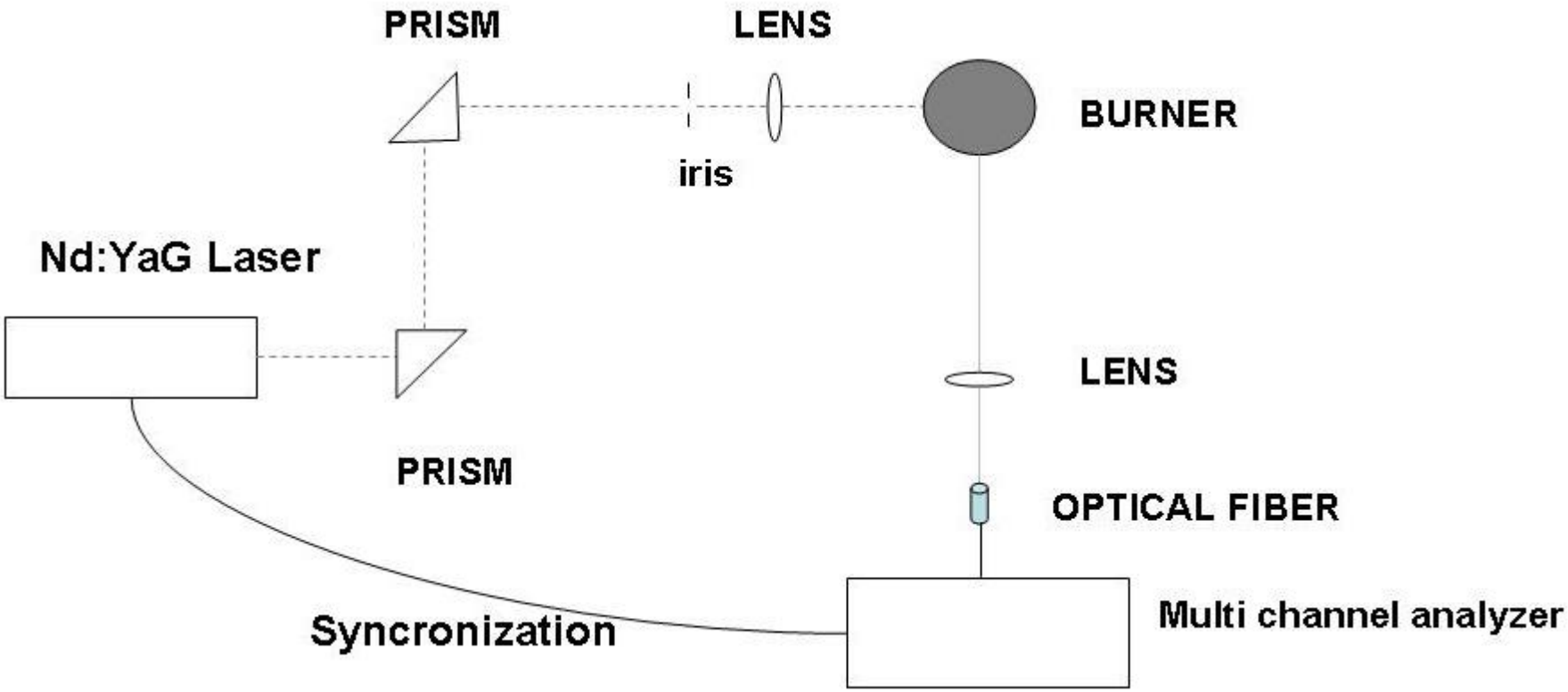
LIE Experimental setup



The gateable intensifier of the multichannel detector

- ✓ open synchronous with the laser pulse (PROMPT SIGNAL)
- ✓ open with a finely tunable delay (DELAYED SIGNAL)

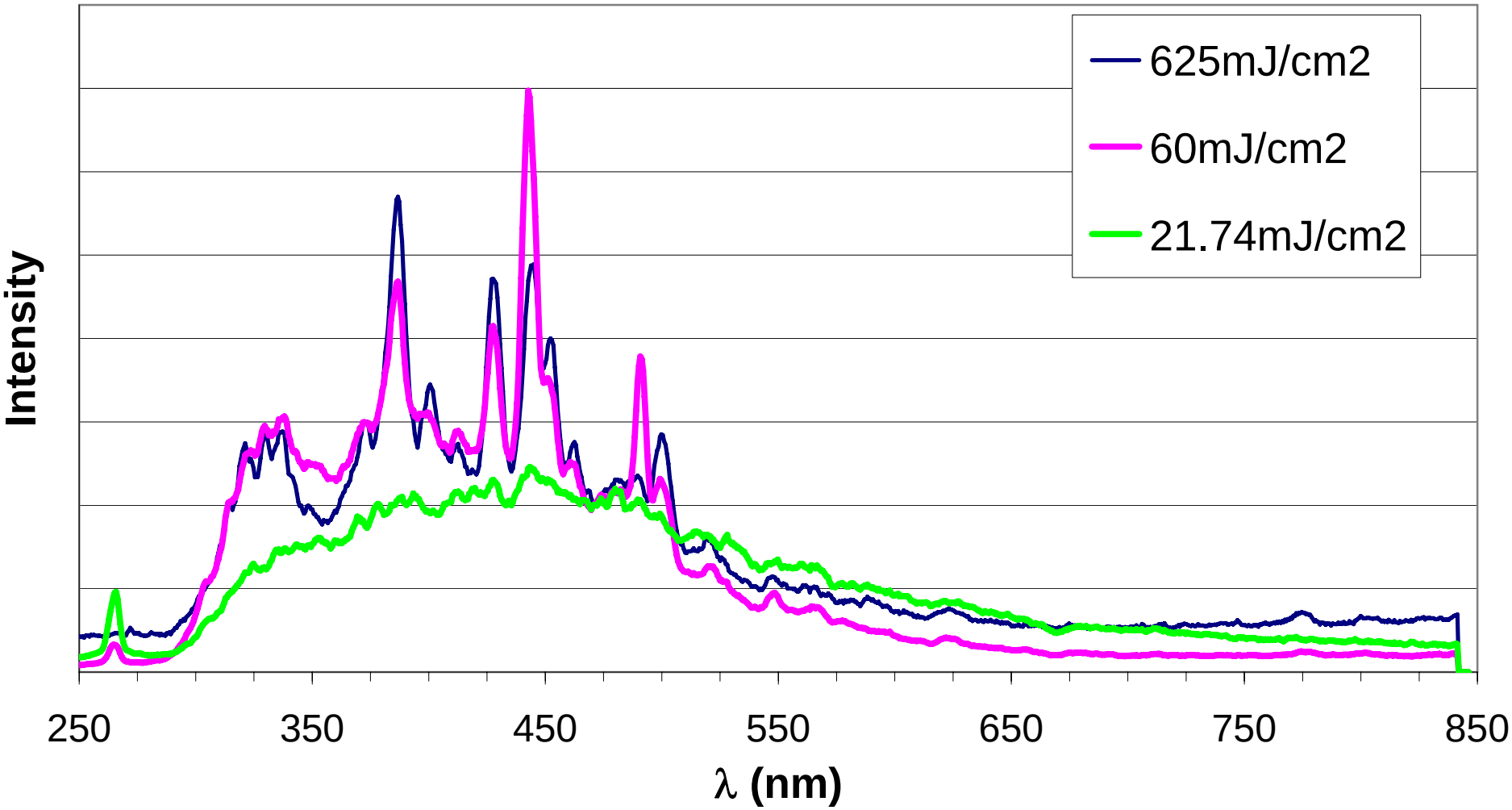
LIE Experimental setup



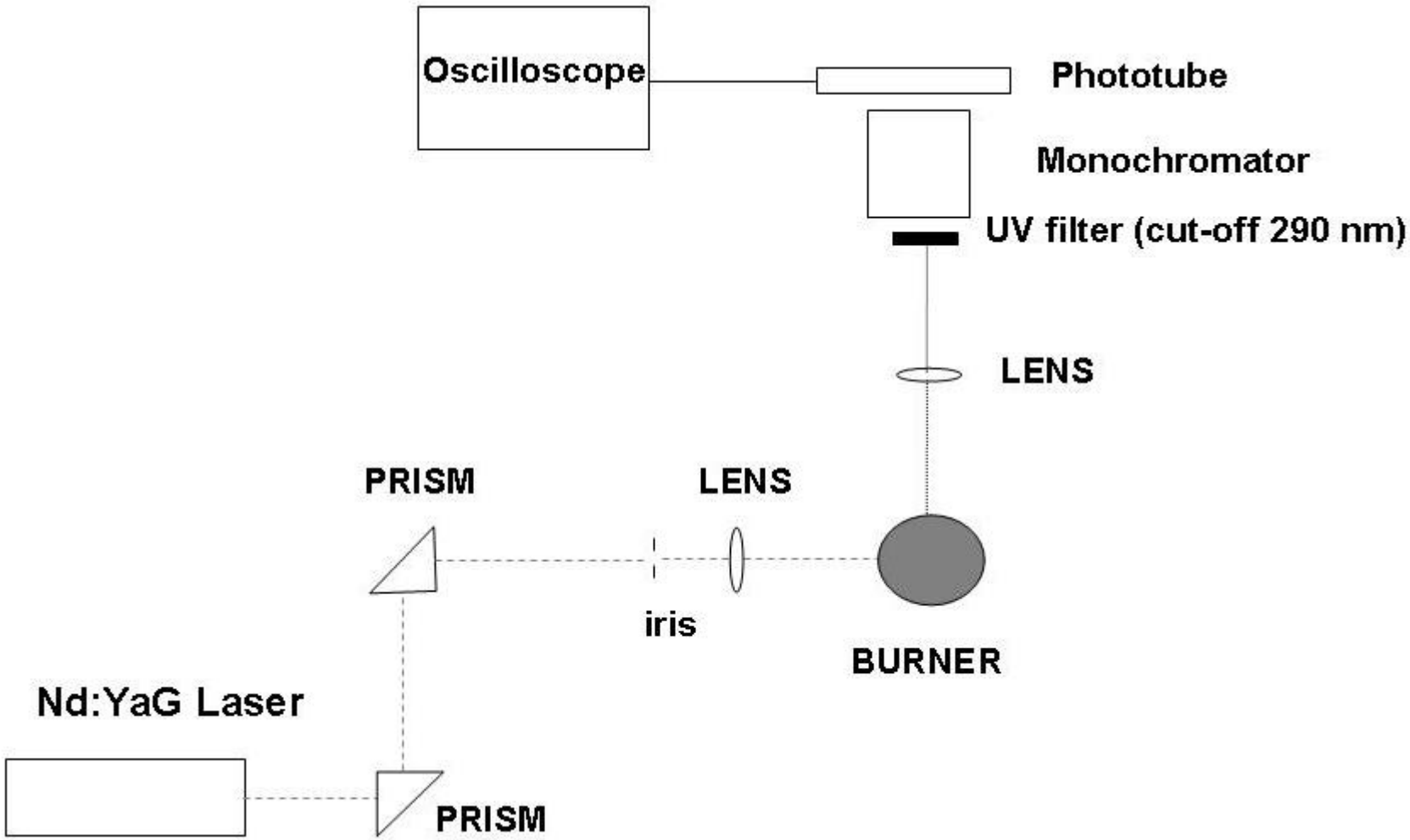
✓ the spectrum of the luminous pulse originated by the overheating caused by the laser (synchronous or delayed)

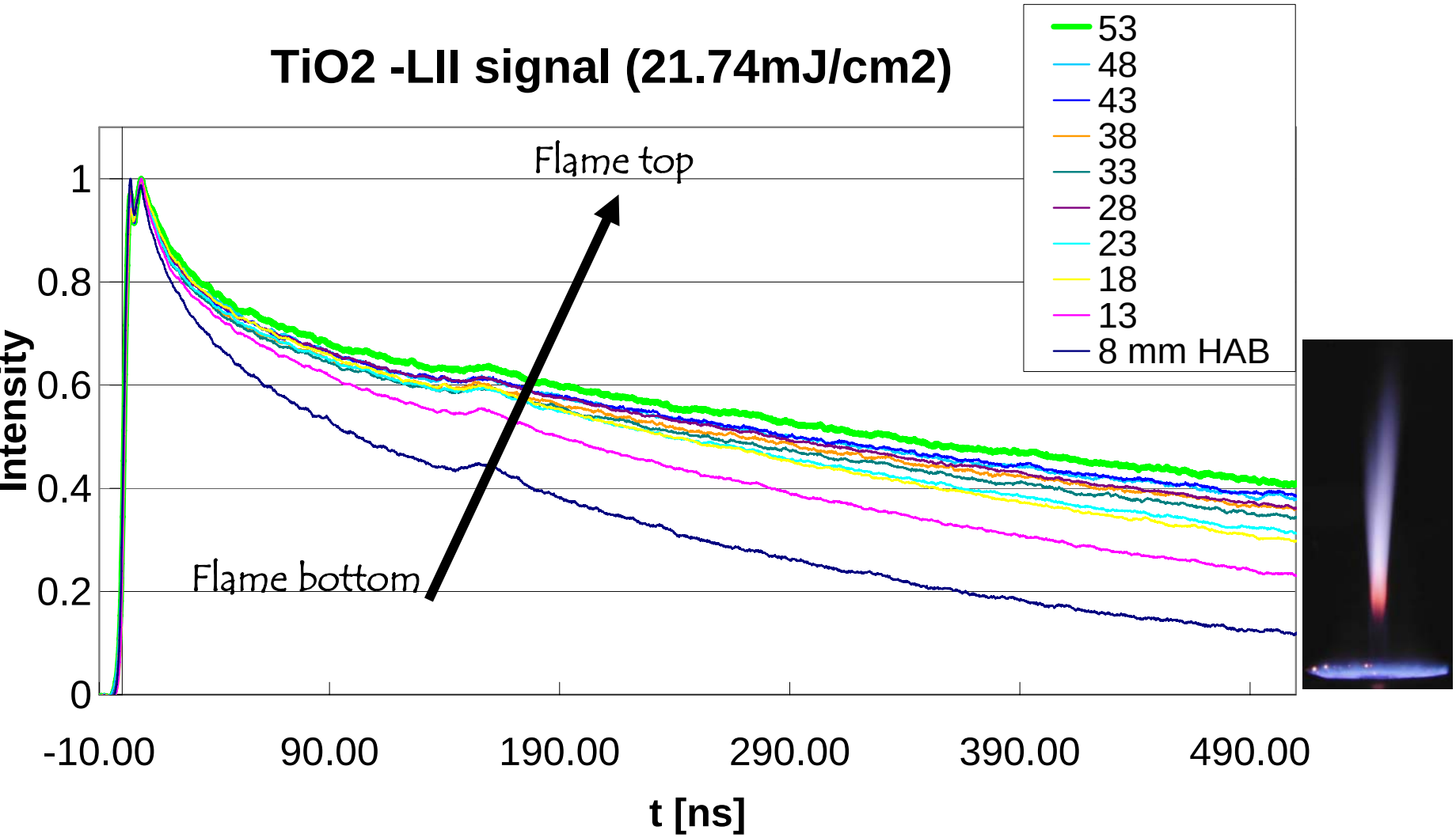
TiO2 - LIE prompt at 20 mm HAB

09/03/07



LII Experimental setup





✓ This offers, in principle, a signal sensitive to the particle size. At least a qualitative on-line monitoring is than possible

NEXT STEPS @ CNR in Italy

1. LII experiments on TiO2 flame and on SiO2 flame in the Hybrid burner

Why a period at PTL?

2. Coannular diffusion burner will be set to work ; LII on the diffusion flame by the coannular burner
3. Implementation of a massive collection tool
4. DLS analysis of powder suspensions (we already have the N5-Beckman Coulter instrument)
5. Set up of FSP and possibly LLS on the FSP