EXPERIMENTAL AND THEORETICAL STARK WIDTHS FOR Au II

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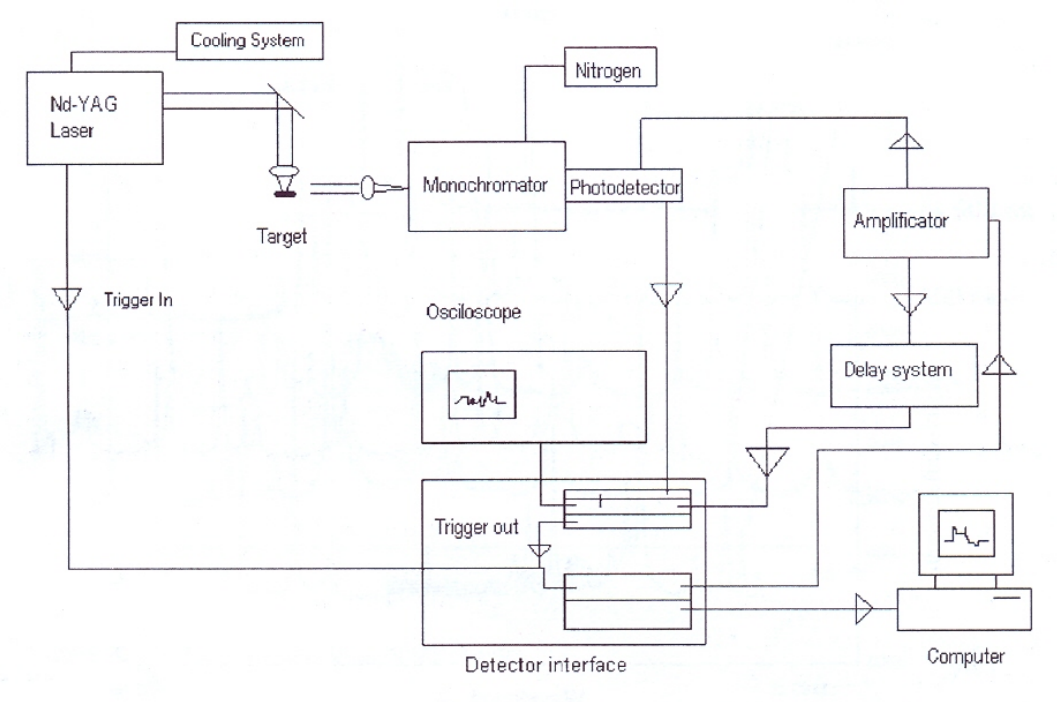
Introduction

- We have studied experimentally and theoretically the Stark widths from several lines of Au II, and, some of them not measured before.
- The interest:

  - the knowledge of its atomic structure to check the adequacy of theoretical models

  - its astrophysical importance because it contributes to the opacity in spectra of chemically peculiar stars (Leckrone et al. 1993).

Experiment



- The experimental plasma conditions were obtained from a Boltzmann plot of the temperature and by means of the Saha equation.

- The experimental work was performed in the facility provided by UCM (Universidad Complutense de Madrid) and employed the LIBS technique - Laser Induced Breakdown Spectroscopy.
- Nd:YAG laser beam focused → surface of the target (pure gold)→ generate the plasma.
- the neutral atom and other higher ions from gold were present
- some isolated lines were ruled out → self-absorption

Table 1. Experimental results for Stark full width at half maximum (FWHM) of Au II spectral lines . The electron density is $(1.45\pm0.23)\times 10^{17}$ cm^{-3} and the temperature is 16200±1400K.

λ(Å)	Transition	W_{exp}(Å)
1921.00	$6s(3/2,1/2)_2$-$6p(3/2,1/2)_1$	0.0338±0.0058
2044.59	$6s(3/2,1/2)_1$-$6p(3/2,1/2)_2$	0.0372±0.0072
2215.64	$6p(5/2,1/2)_2$-$7s(5/2,1/2)_3$	0.0424±0.0074

Theoretical calculations

The theoretical results were obtained using the modified semiempirical approach (Dimitrijević and Konjević 1980).

Table 2. This table shows electron-impact broadening parameters for Au II , calculated within modified semiempirical approach for a perturber density of 10^{17} cm^{-3} and temperatures from 5000 up to 50000K.

Temperature (K)	Transition	W_{th}(Å)	Transition	W_{th}(Å)
5000		0.041		0.147
10000		0.029		0.103
20000	6s(3/2,1/2)-6p(3/2,1/2)	0.020	6p(5/2,1/2)-7s(5/2,1/2)	0.072
30000	2015.8Å	0.016	2263.8Å	0.059
40000		0.014		0.053
50000		0.012		0.049

Comparison

λ (Å)	Transition	W_{exp}/W_{th}
1921.00	$6s(3/2,1/2)_2$-$6p(3/2,1/2)_1$	1.15
2044.59	$6s(3/2,1/2)_1$-$6p(3/2,1/2)_2$	1.12
2215.64	$6p(5/2,1/2)_2$-$7s(5/2,1/2)_3$	0.38

Thank you!