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(NASA-CR-179961) NONLINEAR INFRARED GENERATION IN AIKALI METAL VAPORS: STEADY STATE SUSCEPTIBILITIES AND DYNAMIC BEHAVIOR. EFFECTIVE RELAXATION RATES AND PRELIMINARY RAMAN GAIN PREDICTIONS FOR THE Cs SYSTEM G3/25 N87-13498
Unclas 43640

Technical Progress Report
to the
National Aeronautics and Space Administration (NASA)
Greenbelt, MD 20771

For the period: July 1, 1986 - December 31, 1986

Nonlinear Infrared Generation in Alkali Metal Vapors:
Steady State Susceptibilities and Dynamic Behavior
NAG 5-526

Effective Relaxation Rates and Preliminary
Raman Gain Predictions for the Cs System

from

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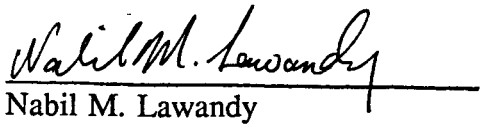
Report prepared by:



Nabil M. Lawandy
Associate Profesor of
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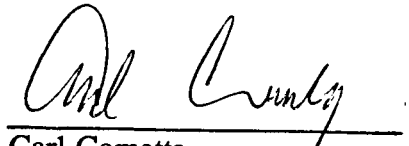


Carl Cometta
Executive Officer
Division of Engineering

18 December 1986

Effective Rates for the Cs System Pumped by Doubled Alexandrite Radiation

Laser Level: |8S 1/2>

Resonance Level: |3> = |8P 1/2>

$$\frac{1}{T_1} = \frac{1}{t_{8P8S}}$$

$$\frac{1}{T_2} = \frac{1}{t_{8P7S} + t_{7S6P} + t_{6P6S}} + \frac{1}{t_{8P6S}}$$

$$\frac{1}{T_3} = \left(t_{8S7P} + \frac{1}{1/t_{7P6S} + (t_{7P7S} + t_{7S6P} + t_{6P6S})^{-1}} \right)^{-1} + \frac{1}{t_{8S6P} + t_{6P6S}}$$

Laser Level: |9S 1/2>

Resonance Level: |8P 1/2>

$$\frac{1}{T_1} = \frac{1}{t_{9P9S}}$$

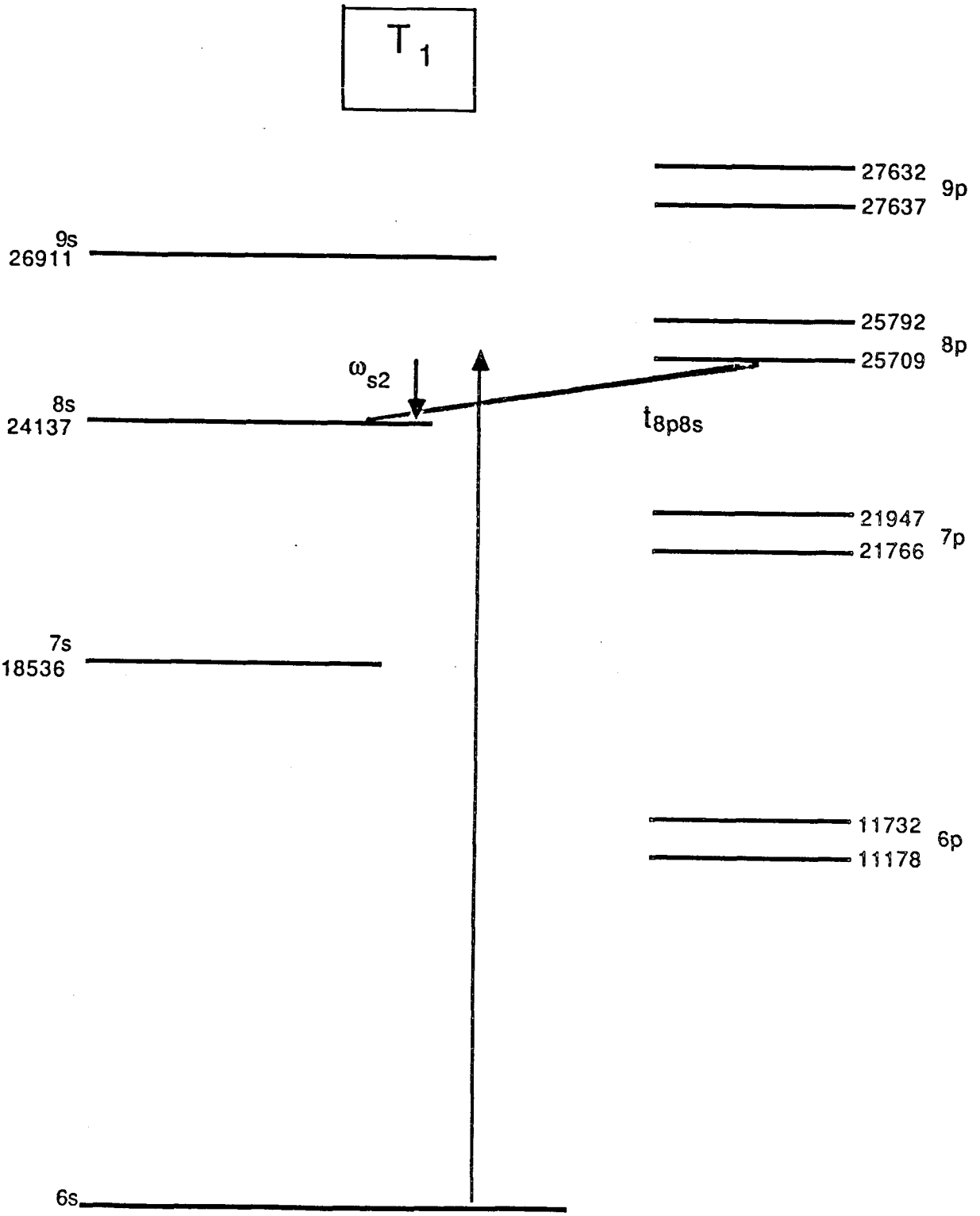
$$\frac{1}{T_2} = \frac{1}{t_{9P6S}} + \frac{1}{t_{9P8S} + t^{eff}_{8S6S}} + \frac{1}{t_{9P7S} + t_{7S6P} + t_{6P6S}}$$

$$\frac{1}{t^{eff}_{8S6S}} = \left(t_{8S7P} + \frac{1}{1/t_{7P6S} + (t_{7P7S} + t_{7S6P} + t_{6P6S})^{-1}} \right)^{-1} + \frac{1}{t_{8S6P} + t_{6P6S}}$$

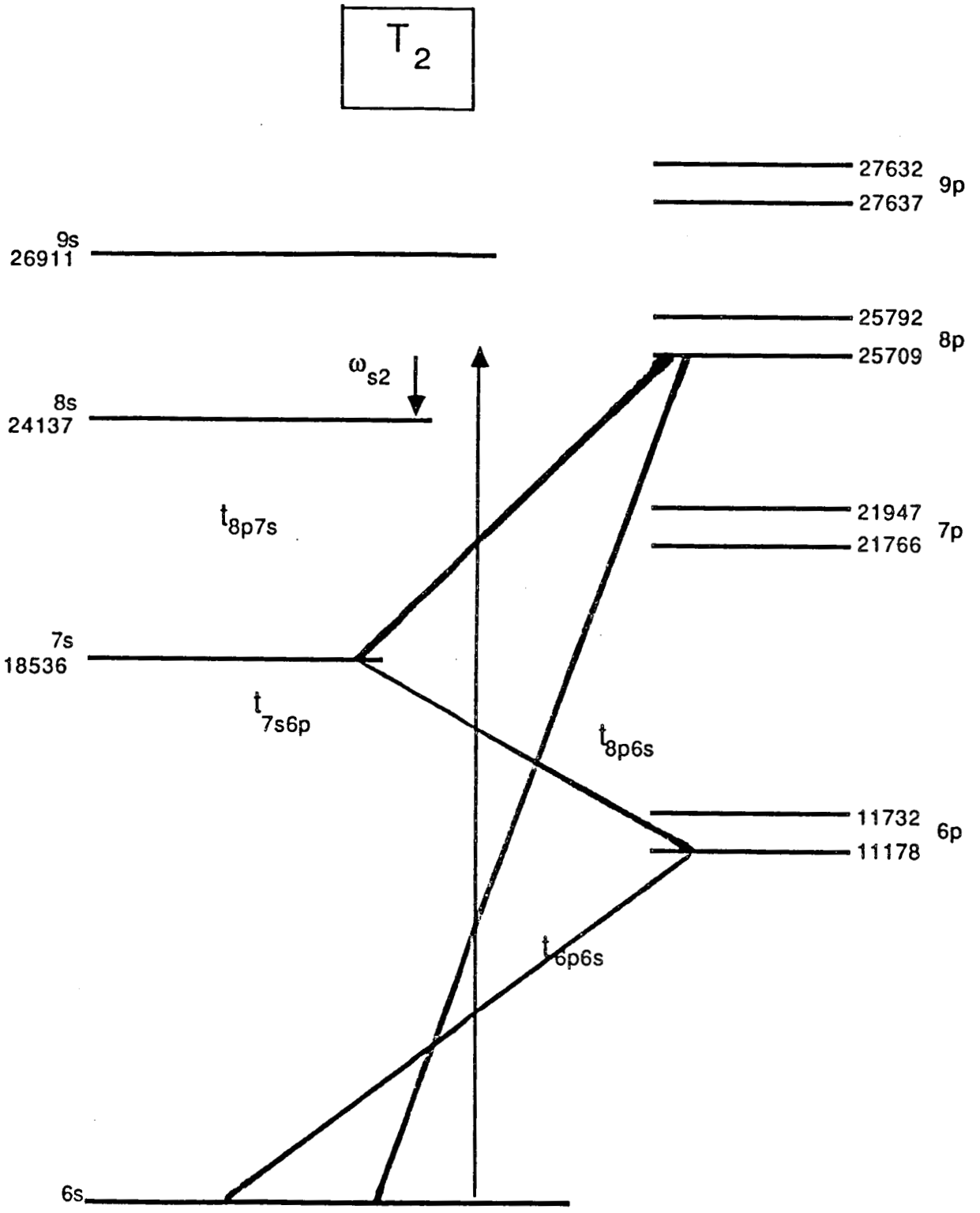
$$\frac{1}{T_3} = \frac{1}{t_{9S8P} + t^{eff}_{8P6S}} + \frac{1}{t_{9S7P} + t^{eff}_{7P6S}} + \frac{1}{t_{9S6P} + t_{6P6S}}$$

$$\frac{1}{t^{eff}_{7P6S}} = \frac{1}{t_{7P6S}} + \frac{1}{t_{7P7S} + t_{7S6P} + t_{6P6S}}$$

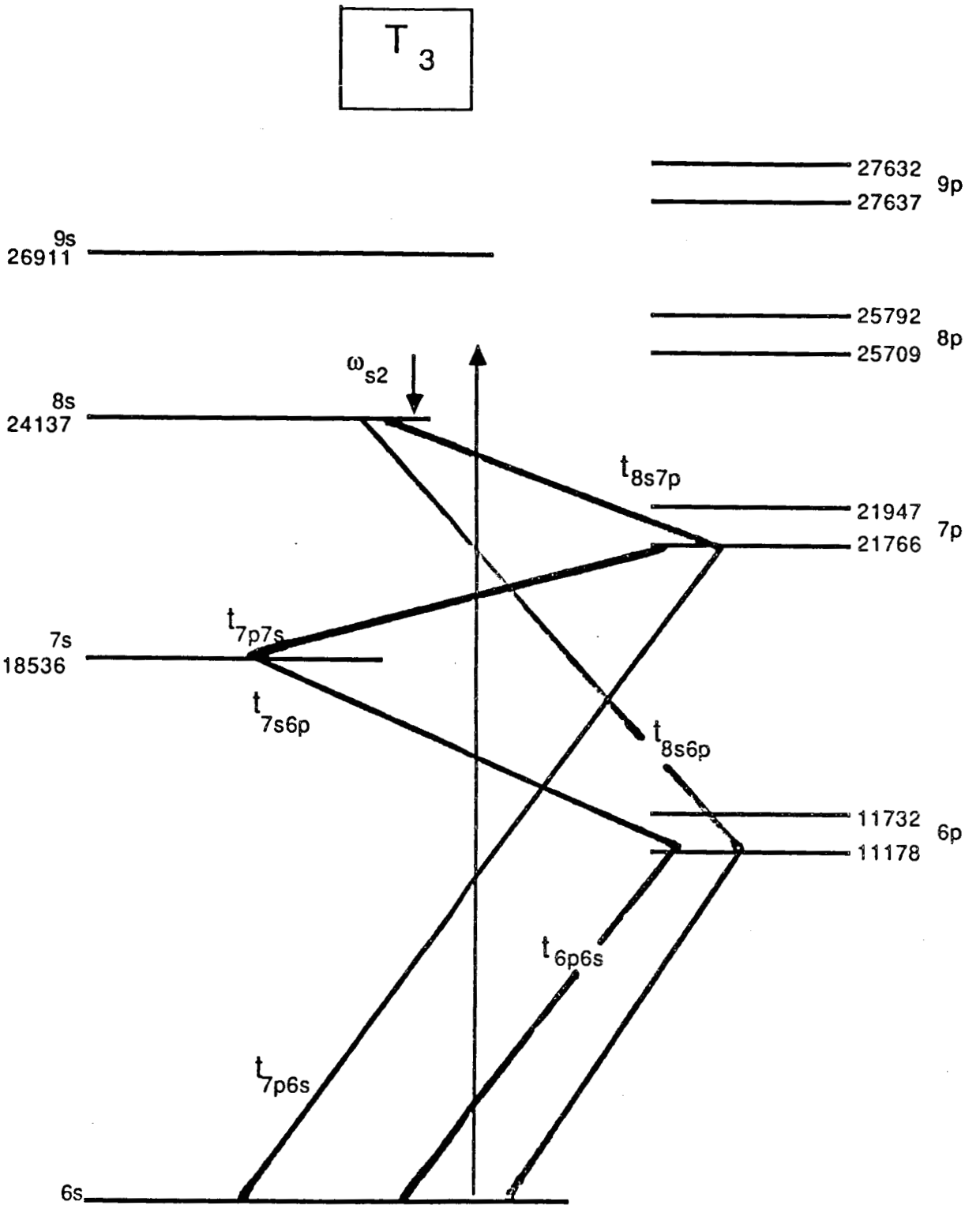
$$\frac{1}{t^{eff}_{8P6S}} = \frac{1}{t_{8P6S}} + \frac{1}{t_{8P7S} + t_{7S6P} + t_{6P6S}} + \frac{1}{t_{8P8S} + t^{eff}_{8S6S}}$$



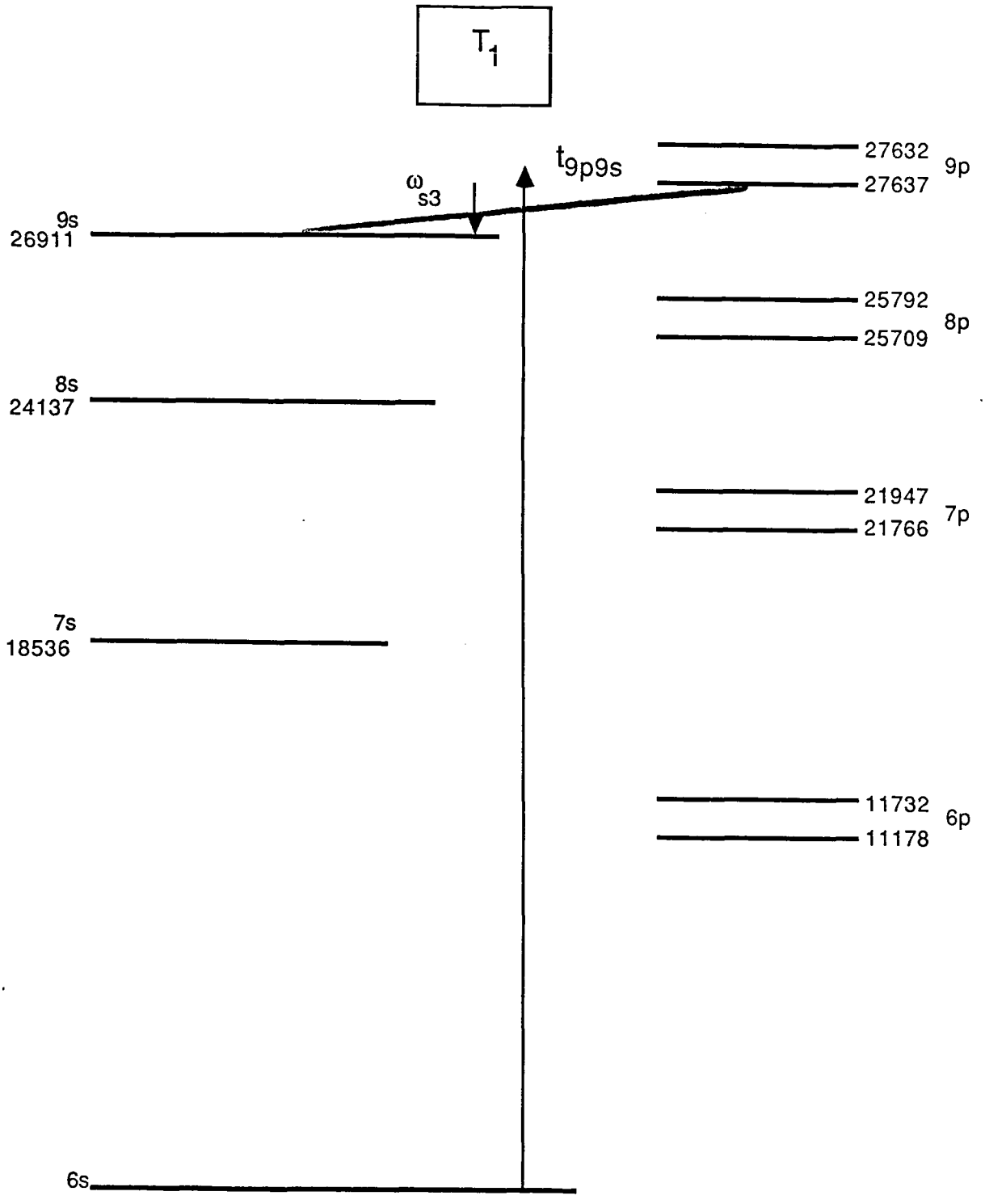
ENERGY LEVELS OF ATOMIC CESIUM



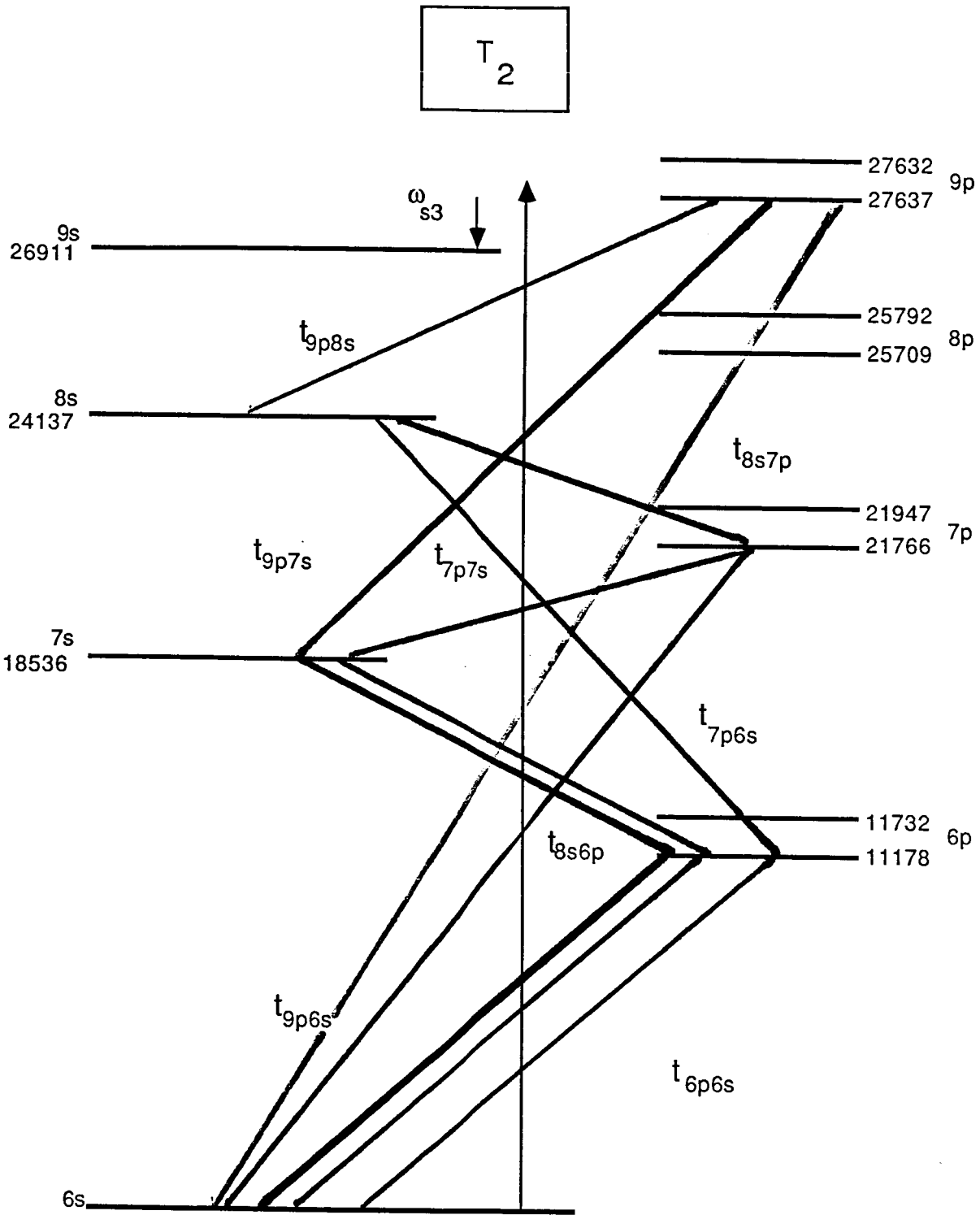
ENERGY LEVELS OF ATOMIC CESIUM



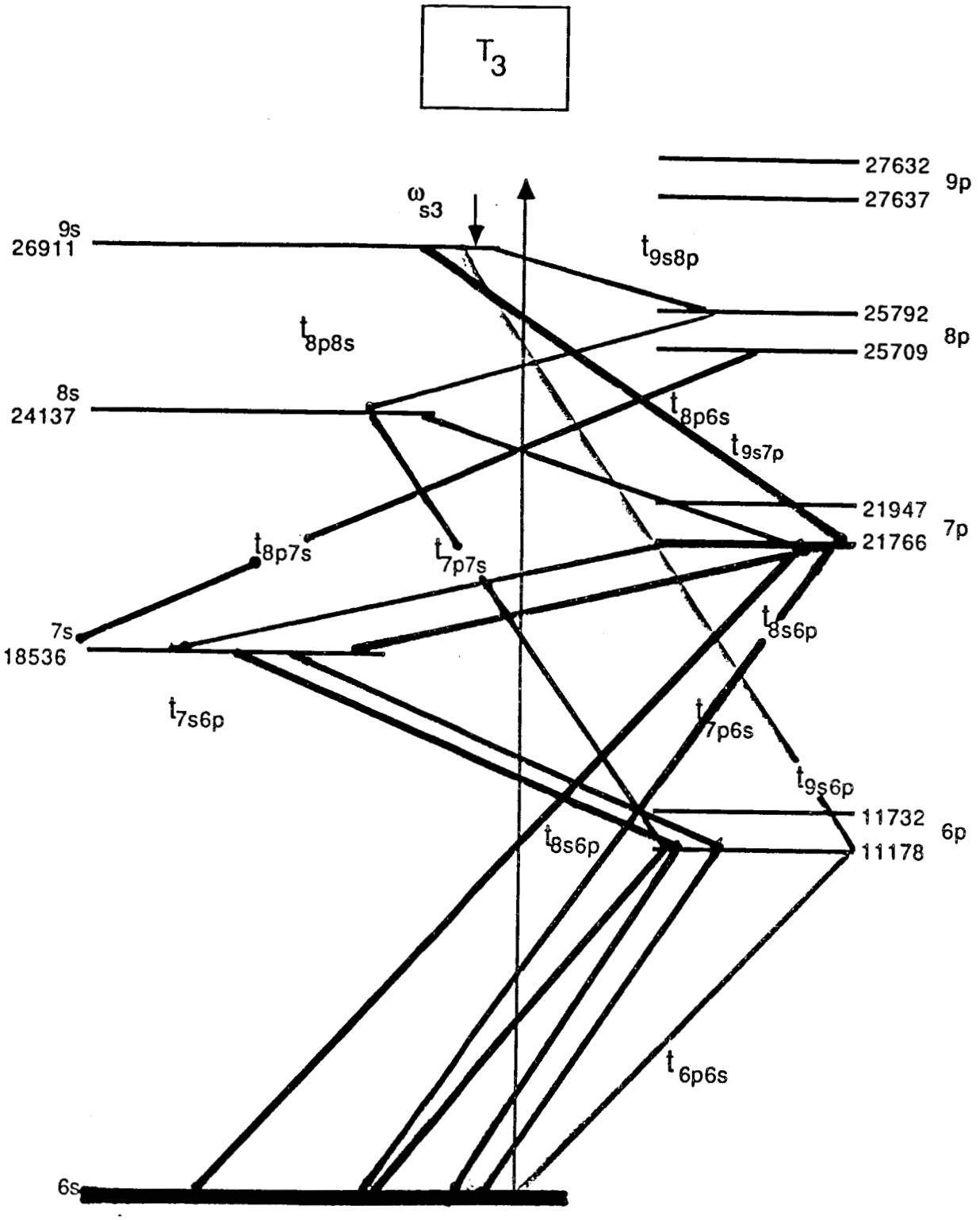
ENERGY LEVELS OF ATOMIC CESIUM



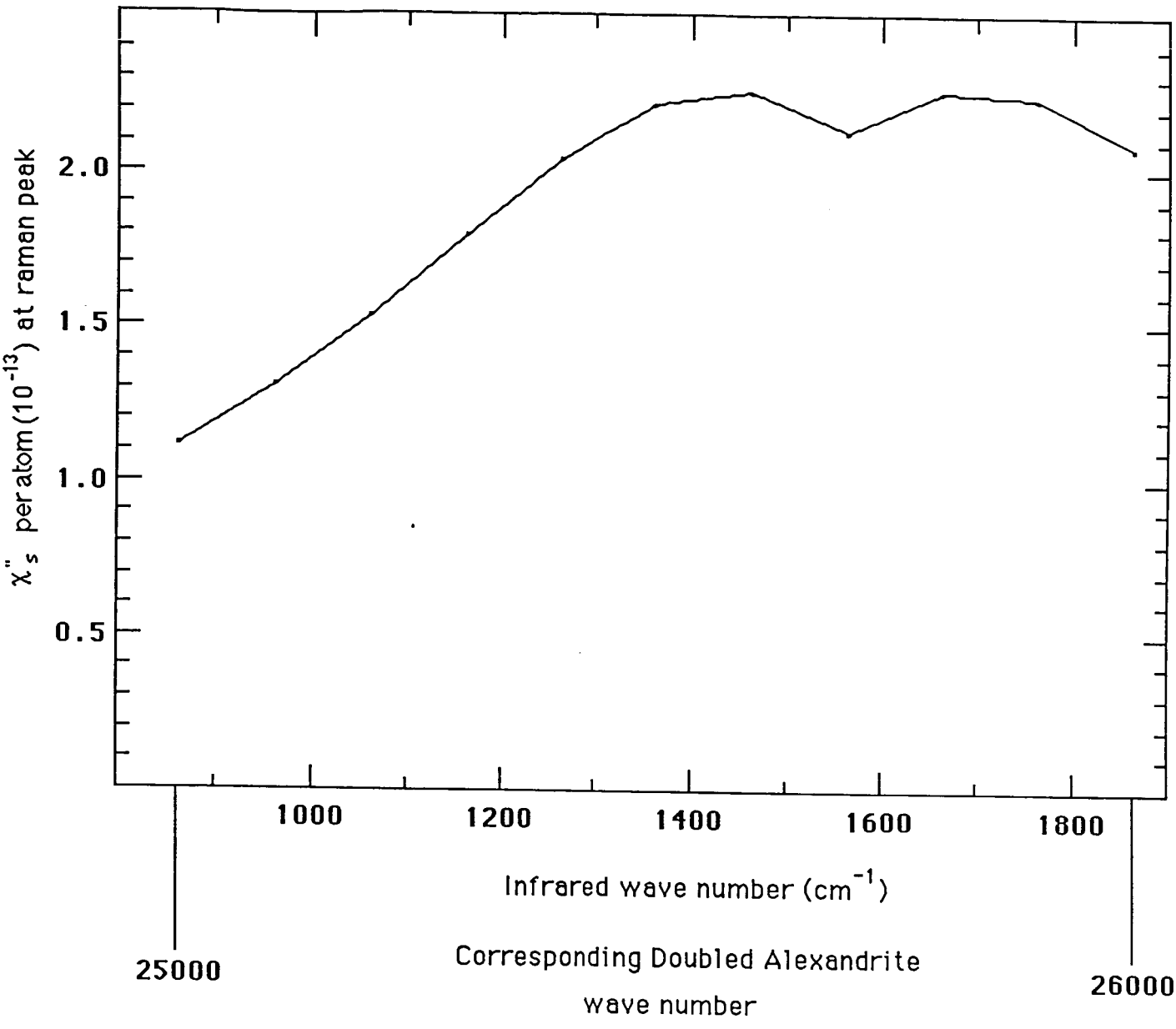
ENERGY LEVELS OF ATOMIC CESIUM



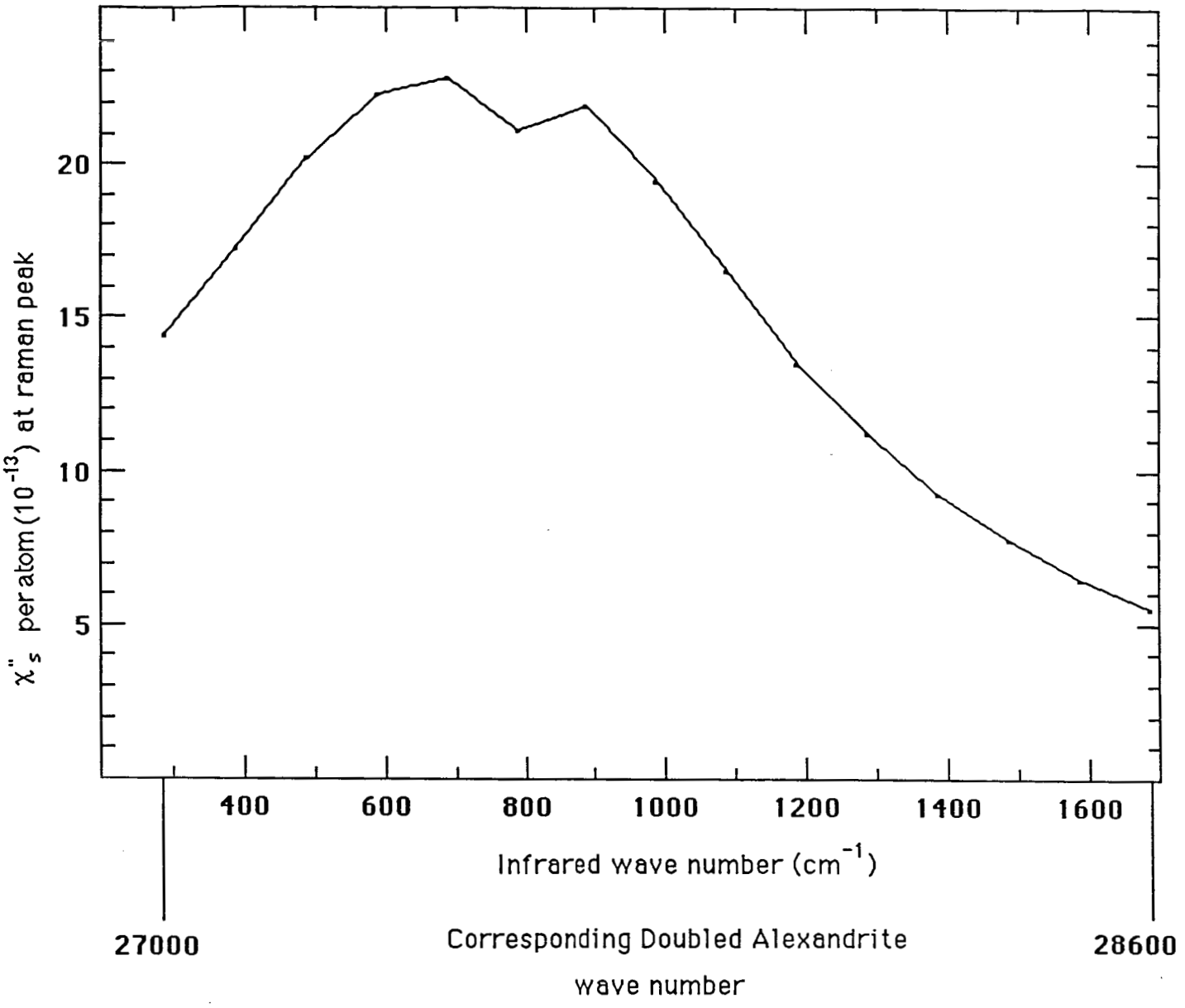
ENERGY LEVELS OF ATOMIC CESIUM



ENERGY LEVELS OF ATOMIC CESIUM



Pumped with a peak pulse height of 0.5MW
in a 200μ diameter spot size.
Cesium Raman Transition: 6s to 8s
Resonance Level 8p



Pumped with a peak pulse height of 0.5MW
in a 200μ diameter spot size.
Cesium Raman Transition: 6s to 9s
Resonance Level 9p