# NASA TECH BRIEF

*NASA Pasadena Office*




## Laser Using Lead Chloride Vapor

**The problem:**

A laser wavelength output of 7,229 Å has been obtained using metallic lead vapor. This system, however, operates at an undesirably high temperature of 1,200° C.

**The solution:**

The same, 7,229-Å output can be obtained at a reduced operating temperature of 500° C using lead chloride.

**How it's done:**

The system is characterized as follows: A conventional fused-quartz laser tube with an 83-cm length and a 2.5-cm inside diameter is used. The lead chloride compound is spread on the bottom of the tube and is heated in a tubular furnace until it vaporizes.

By applying an electric discharge, the lead chloride vapor in the tube is dissociated into lead and chlorine atoms. The population inversion of the lead atoms is attained subsequently by a second discharge, before the chemical recombination of the lead and chlorine has occurred. A double-pulse power supply serves this purpose. An optimum time interval between the two discharges is required for maximum laser output. This time interval is thought to be the time required for the depletion of the population of the lower laser level following dissociation.

Present technical data obtained from the new laser is as follows: The optimum vapor pressure in the laser is 0.3 torr at a temperature of 500° C. The generated laser pulse is 25 ns, using helium buffer gas at 1 to 2 torr. The optimum output mirror transmittance and time delay are 80 percent and 150 $\mu$s, respectively. The maximum energy density and peak power density to date are 4 $\mu J/cm^3$ and 160 $W/cm^3$, respectively.

**Note:**

Requests for further information may be directed to:

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
Reference: TSP75-10128

**Patent status:**

NASA has decided not to apply for a patent.

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