ULTRA- FAST HIGH POWER TEA N_2 LASER

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Since the first observation[1] of laser action in the second positive band of N_2 ($C^3\Pi \longrightarrow B^3\Pi_g$) at 3371° A, during a fast rising high current discharge, N_2 lasers of diverse designs and of varying dimensions have already been reported[2-4] some emitting output powers as high as 10 MW of good pulse stability and of pulse durations ranging from a few ps to about 10 ns, from simple TEA devices.

In this paper we report the performance of a high power pulsed Blumlein TEA N_2 Laser that was designed in the form of a parallel plate capacitor, the total capacitance estimated to be almost 4.5 nF. It consisted of a grounded Al plate separated from the top plate, which was connected to a HT power supply, by 3 layers of 0.125 mm thick Mylar. The top plate consisted of two sections, one a triangular shaped Al plate, one edge of which was bent upwards to act as an electrode, and the other comprising 25, Cu strips of breadth 9 mm placed parallel to each other 2 cm apart. The Cu strips were interconnected at one end by inductance coils thus permitting slow charging, but with no coupling, when the blumlein circuit was switched on, the other end of the strips being wound round a glass rod to be used as the second elect rode. The channel length was 38 cm while the electrode separation was 3 mm.

The laser operated at 25 kV and at atmospheric pressure was triggered by overvolting a pressurized spark gap. Initially with no end mirrors, it was found to emit, bright coherent beams from both ends, the introduction of an aluminized mirror at one end increasing the output power by atleast four folds. The intensity was estimated to be about 500 kW and the pulse duration 1ns, typical of segmented electrode arrangements. From the far field pattern obtained the beam quality was reasonably good.

References:

Heard H. (1963) Nature, 16, 667.

Armandilo E. and Kearsley A.J. (1982), Appl. Phys. Letts.,41,611.

Santa I. et.at.,(1986), IEEE J Quant Electer.,QE-22, 2174.

Oliveira - dos Santos B. et.al. (1986), Appl.Phys.,B.41, 241.