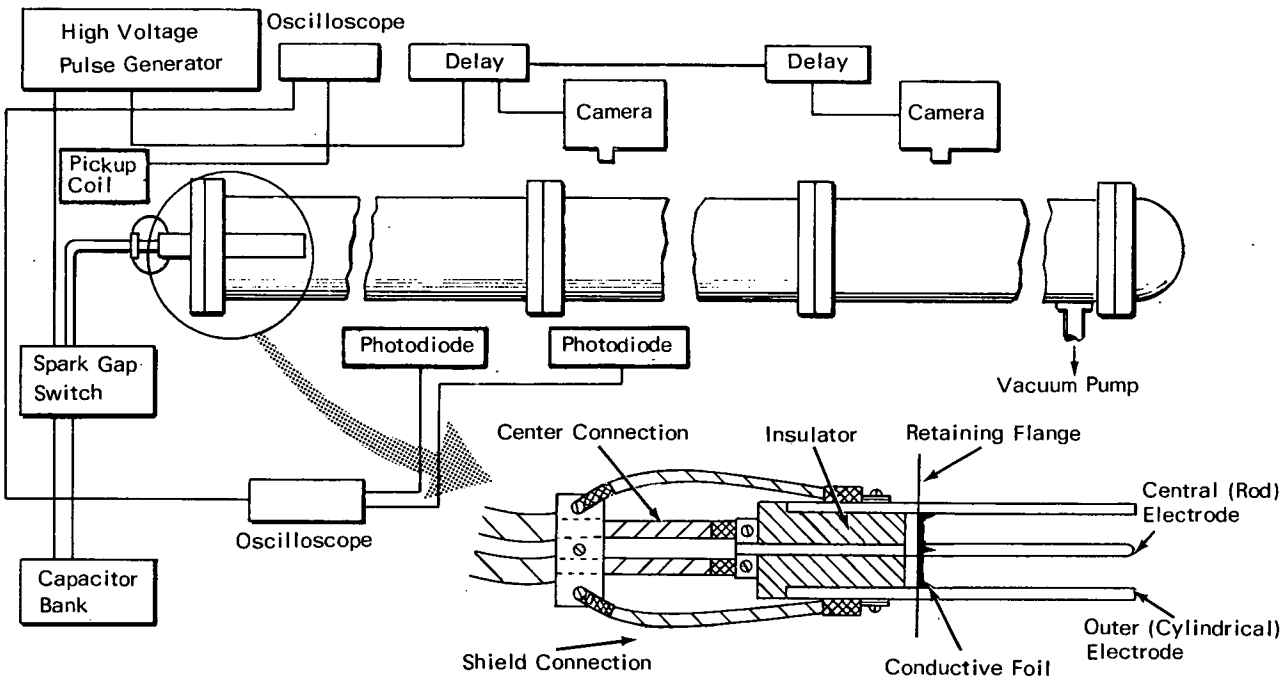
NASA TECH BRIEF

Marshall Space Flight Center

High Density Plasma Gun Generates Plasmas at 190 Kilometers Per Second



Detail: Longitudinal Section of New Generator

A plasma gun fitted with a thin metal-foil disc produces dense plasmas with extremely high velocities. The disc (of aluminum or lithium) positions or localizes the gas to be ionized during the electrical discharge cycle, overcoming the major limiting factor in obtaining such plasmas.

The disc, which is positioned to form a shorting path between the two coaxial electrodes (see fig.), is cut a little oversize so that the periphery folds over the surface of the outer electrode. A 20,000 V capacitor bank with a capacitance of 45 to 80 mF ionizes the disc and is discharged by a spark gap switch, which is triggered by a high voltage pulse. The maximum velocity of the plasma is obtained when the foil is positioned to yield an acceleration time which is exactly equal to the duration of the first quarter cycle of the capacitor bank. The acceleration time is measured with respect to the exhaust end of the plasma gun.

The trigger pulse also activates two cameras which sequentially photograph the plasma front traveling down the vacuum chamber. Two photo-

(continued overleaf)

diode sensors detect the optical radiation from the plasma. Using the data on the elapsed time between the output of the sensors and on their physical separation, the velocity of the plasma can be calculated. Data obtained from the instrumentation setup indicates that the expanding plasma front travels at about 190 km/sec, in comparison to plasmas of only 50 to 60 km/sec previously achieved.

Note:

Requests for further information may be directed to:

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Reference: B71-10383

Patent status:

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(MFS-20589)