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Observation of a Secondary Beam Using a Flag and TV Camera

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Reported by J.W. Glenn

Subject Observation of a Secondary Beam Using a Flag and TV Camera

Introduction

Using a P22 phosphor coated flag in the A1 secondary beam, monitored by a "moon light" camera with a f1.8 lens, a beam spot was visable with fluxes of less than 2×10^5 $\pi/cm^2/sec$ at the edge of the spot. Using "Radelin" flags and a f1.0 lens, observation of beams of about 10^4 $parts/cm^2/sec$ is expected.

Method

A flag coated with P22 phosphor, obtained by I.H. Chiang at Berkeley, was placed in the A1 beam to the MPS, upstream of their hydrogen target. Observing this flag was a RCA "silicon intensifier target" camera mounted with a f1.8 lens. The flag and camera were both in a light-tight box.

With a beam intensity of approximately 4×10^6 π's per 1.2 second spill, the flag was centered on the beam and the picture video taped. Though taping degraded the picture a bit, the beam size was measurable and was 1.3" horizontal and 0.5" vertical (± 20%). This was about one-half the full beam widths as measured from typical beam hodoscope profiles at this location, as provided by A. Etkin.

Results

From the profiles about one-third of the 4×10^6 π/sec passed through the observed spot of 0.65 square inches. Thus, the average density in the spot was approximately 2.5×10^5 $\pi/cm^2/sec$. At the edges of the spot the density was down by about a factor of two, so the "critical" flux for this setup was $\gtrsim 10^5$ $\pi/cm^2/sec$.

In May, this P22 flag was installed on the D223 flag drive and the sensitivity of this material was compared to the "standard" aluminum oxide flags. The P22 phosphor coated flag was found to be about twice as sensitive as the "standard" flag.

Comments

This sensitivity of 1-2 x 10^5 $\pi/cm^2/sec$ is consistent with the "standard" flag sensitivity of 10^9 $part/cm^2/sec$ as the TV was 1000 times more sensitive than a standard TV and the flag a factor of two.

Use of a "Radelin" flag with about ten times the sensitivity and a f1.0 lens should give a factor of 30 over this setup, implying a TV camera and flag should be able to observe a spot with about 10^4 $part/cm^2/sec$ densities. Use of "starlight" cameras would provide another factor of 10 but their high (approximately $30K) cost and fragility prohibit wide-spread use.

mvh