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ANGULAR REFLECTIVITY OF SCOTCHLITE IN LIQUID HYDROGEN*

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"Scotchlite"** reflective sheeting has been used successfully as a bright field retrodirective illuminator in several bubble chambers. The material appears to be a feasible way of illuminating the very large bubble chambers currently being designed by several laboratories. The superior performance of exposed bead Scotchlite, Type FE582,in air indicated that this material might serve well in such an application and led us to measure its relative brightness at various angles of incidence while immersed in liquid hydrogen.

A schematic arrangement of the test is shown in Figure No. 1. The optical parameters were chosen to be approximately the same as those of the Stanford Linear Accelerator Center 40-inch Hydrogen Bubble Chamber. Collimated light from a projection bulb (3250^{o}K color temperature) was directed by the beam splitter onto a slit located immediately in front of the concentric dewars. A thin flat stainless steel plate was brazed to a tube mounted in the inner dewar and held vertical by an O-ring bearing seal. The tube could be rotated by hand; an attached protractor indicated the angular position of the plate below. Type FE582 Scotchlite was glued to one side of the plate and Type SPR704, Lot 32A,Scotchlite was attached to the other side for comparison. Type SPR704, Lot 32A,is the mylar overcoated Scotchlite presently being used in the SLAC 40-inch Hydrogen Bubble Chamber. The retrodirected light from the Scotchlite passed through the slit and was focused by the lens on the fiber optics light pipe. The intensity of the light was measured by a photomultiplier, Model RCA931A.

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**Registered trademark of the Minnesota Mining and Manufacturing Company.

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As the solid angle of the "Scotchlite" subtended at the detector remains constant, the relative brightness is directly proportional to the photomultiplier output, which in turn is a function of the angular position of the "Scotchlite" carrier.

Measurements of the angular reflectivity were made both in hydrogen and in dry air at atmospheric pressure, in successive runs.

The results are shown in Figure No. 2. We conclude that uncoated "Scotchlite" of the FE582 variety is not suitable in its present form for bright field illumination use in liquid hydrogen bubble chamber.

We wish to thank B. Sukiennicki for suggesting these measurements and for valuable comments.

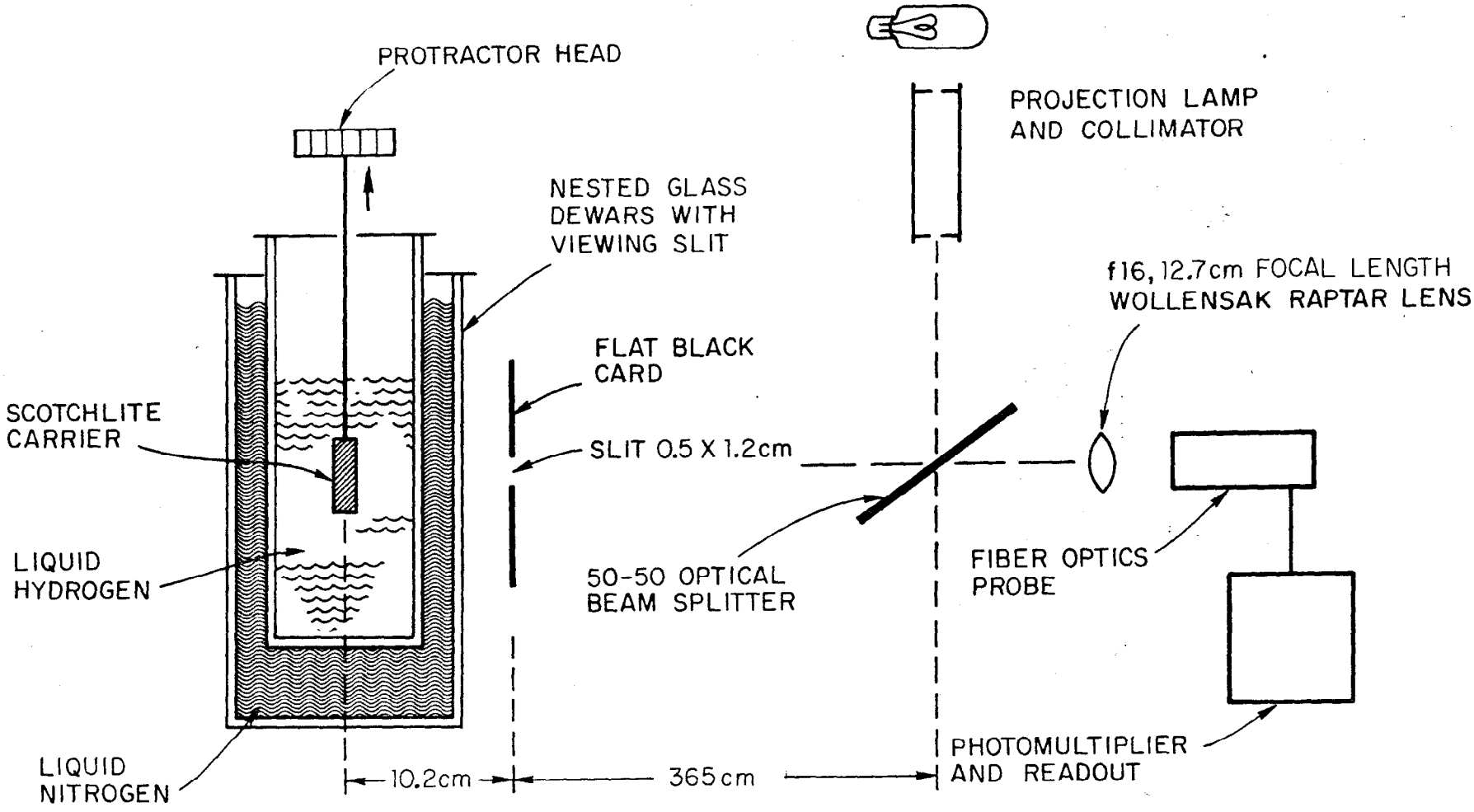
PROTRACTOR HEAD
NESTED GLASS DEWARS WITH VIEWING SLIT
PROJECTION LAMP AND COLLIMATOR
f16, 12.7cm FOCAL LENGTH WOLLENSAK RAPTAR LENS
FLAT BLACK CARD
SCOTCHLITE CARRIER
SLIT 0.5 X 1.2cm
LIQUID HYDROGEN
50-50 OPTICAL BEAM SPLITTER
FIBER OPTICS PROBE
LIQUID NITROGEN
10.2cm
365cm
PHOTOMULTIPLIER AND READOUT
951A1

FIG. 1

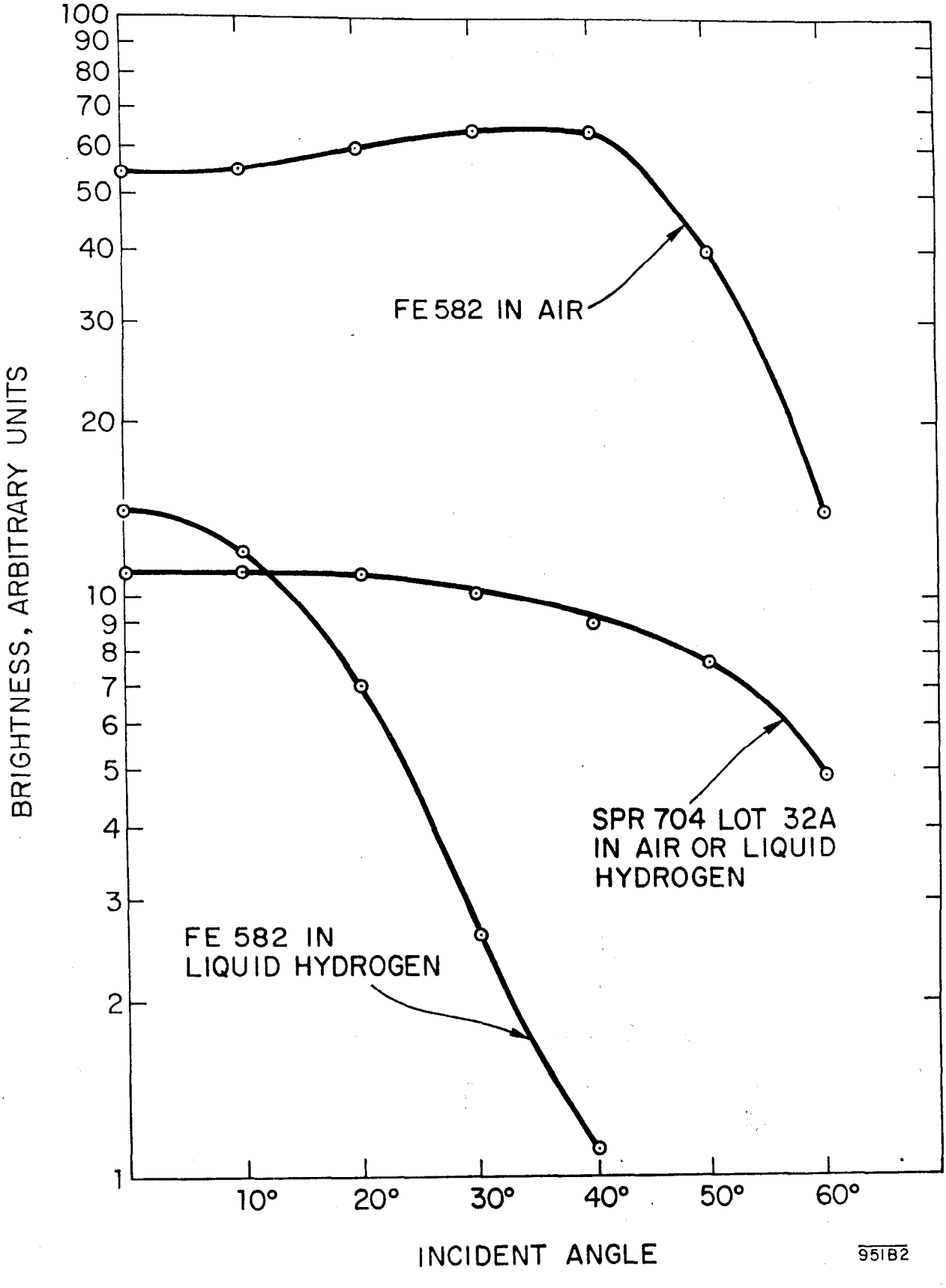
BRIGHTNESS, ARBITRARY UNITS
100
90
80
70
60
50
40
30
20
10
9
8
7
6
5
4
3
2
1
FE 582 IN AIR
SPR 704 LOT 32A
IN AIR OR LIQUID
HYDROGEN
FE 582 IN
LIQUID HYDROGEN
10°
20°
30°
40°
50°
60°
INCIDENT ANGLE
951B2

FIG. 2