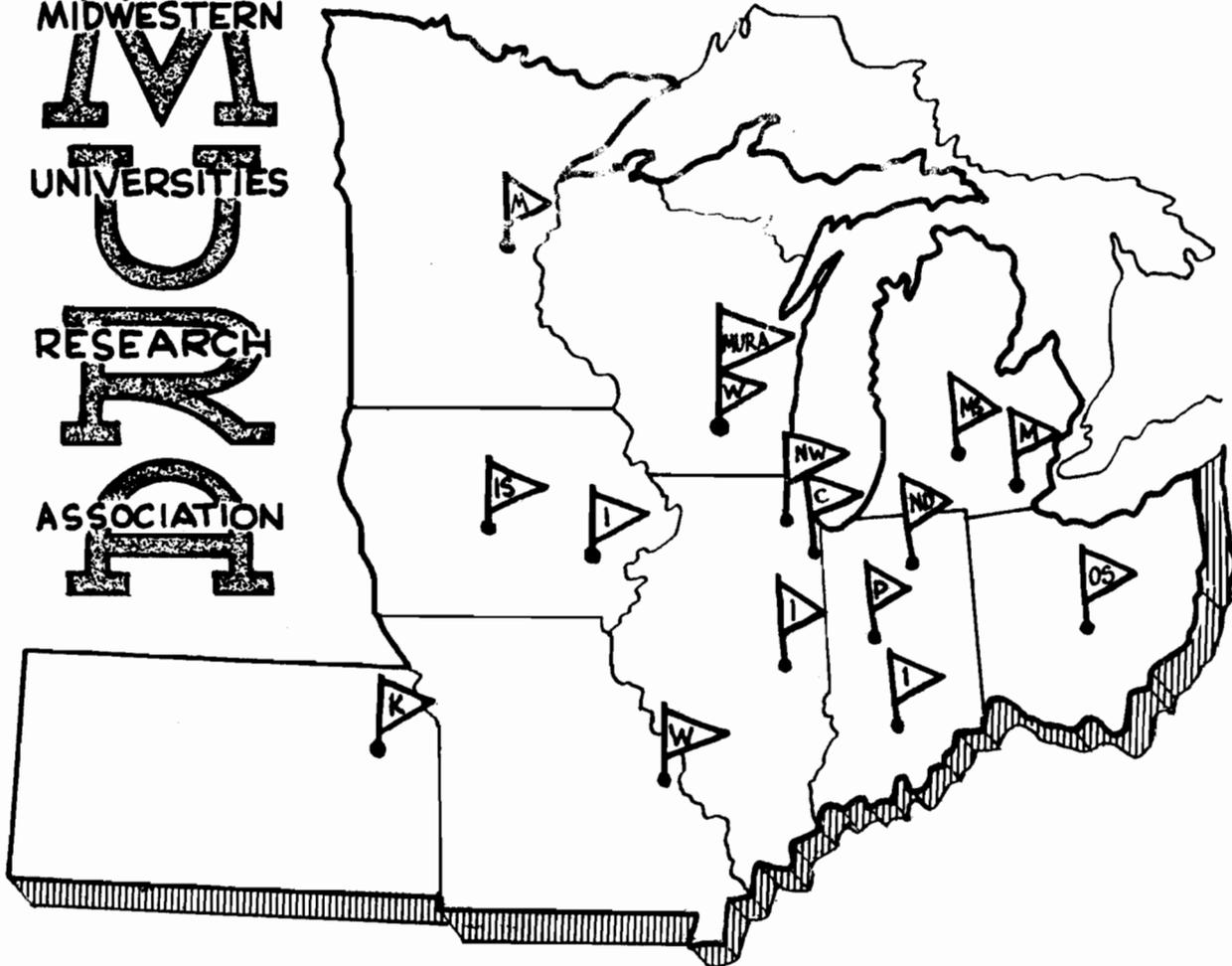




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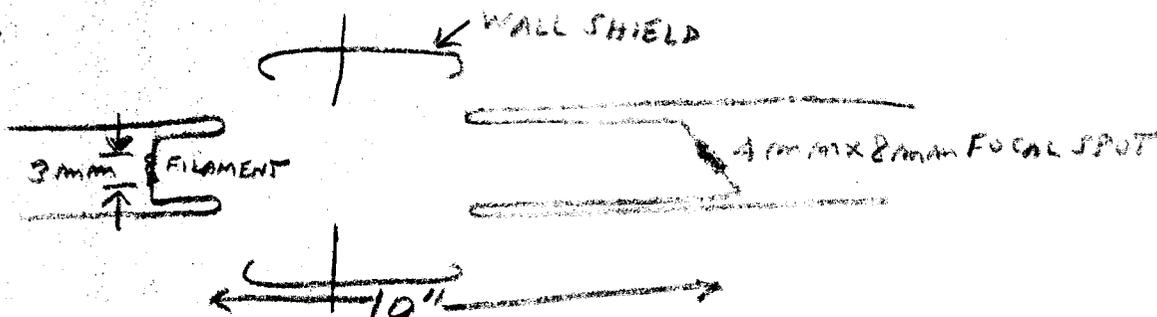


MIDWESTERN UNIVERSITIES RESEARCH ASSOCIATION*
REPORT ON VISIT TO MACHLETT LABORATORIES, INC.

D. W. Kerst**

February 11, 1957

The Machlett EG 302 x-ray tube can have a hole drilled in its copper anode to extract the beam. This tube goes to 300 K.V. and 50 M.A.



Around 100 Kev, which we might use, and below it does not emit much because the filament is buried to limit emission at low voltage. This cathode would have to be replaced with one with the filament flush in its surface to get the .5 amp emission which was requested, but such cathodes have been made by Machlett for other tubes and they can be installed in this tube and with some adjustment they would be expected to get close to a 4mm spot diameter or width. At 30 Kev it might be difficult to get the full .5 amp emission. For these high emissions the filament heating current must be pulsed for a couple seconds while numerous injection and stacking cycles are performed. For continuous injection 25 Ma to 100 Ma were requested and pulsing the filament is not essential at this low emission.

* Supported by Contract AEC #AT (11-1)-384

** On leave from University of Illinois

A rough guess at the one coordinate phase space follows:

The half angle containing beam rays must be

$$\alpha \sim \frac{.4 \text{ cm} / 2}{25 \text{ cm}} = .008 \text{ radians half angle}$$

$$\alpha D / 2 = .008 \times .2 \text{ cm} = .0016 \text{ cm Radians}$$

The accelerator aperture might be

$$\alpha_A \sim .05 \text{ radians half aperture}$$

$$D_A / 2 \sim 2 \text{ CM amplitude}$$

$$\text{or } \alpha_A D_A / 2 = 1 \text{ CM Radian}$$

Thus if the equilibrium orbit (or inflector) was moved to scan one dimension's phase space we could inject ~ 60 turns or ~ 30 Amps circulating in a bunch ready for acceleration. This is probably beyond the space charge limit. The second dimension might allow still more turns without scanning before the beam returned to the inflector. This simple estimate encouraged the whole idea although this may well not be anything like the injection manipulation finally chosen. Machlett will await further technical discussions.

While at Machlett, new high voltage switch tube DP1 for 125 Kev and 1.25 Amps which is being used with Picker pulsed x-ray equipment was described. This brought up a power supply possibility other than the usual pulse transformer for injection. The tube is a screengrid tube and it might be used to control injection voltage very precisely as well as to switch pulses or to pass steady long injections.