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MINUTES OF MEETING OF MTA TARGET COMMITTEE HELD MAY 14, 1951

E. D. Fleckenstein

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RESEARCH SERVICE BRANCH
Atomic Energy Commission
Berkeley Area
Berkeley, California

MINUTES OF MEETING OF MTA TARGET COMMITTEE
HELD MAY 14, 1951

Present: UCRL: Brobeck, Brown, Grueling, Hanson, Kane, Latimer, Martin, Street, Van Atta

CR&D: Chaffe, Crandall, Davis, Fossati, Frankel, Hildebrand, Newson, Willmer

NAA: Taylor, Hunt

AEC: Fidler, Fleckenstein, Moore, Wallace

Wilmer presented the problem of beam power dissipation in the primary target, which involves the distribution of the beam intensity over the entire target surface. The method that has been studied to distribute the beam power over the largest surface is rotation of the beam in either a circular or Lissajous figure. Studies of the beam profile show that the intensity of the beam is highest at the center and drops off roughly as the inverse of the radius.

The maximum beam intensity in the circular sweeping case is found along the path followed by the center of the beam on the target. It can be shown that the average intensity along the path of the beam center will be of the order of the average beam intensity when the peak to average intensity in the beam is of the order of 30.

The ratio of beam radius to precession radius was varied to find the resulting ratio of peak to average intensity on the target. It was found that the smallest target size is obtained for a given maximum intensity on the target when the beam radius equals the target radius.

Sweeping the beam in Lissajous patterns of various ratios was considered as another method for reducing the peak to average intensity of the beam on the target. It was found by using a ratio of about 6/5 and a square target with sides four times beam radius that the ratio of peak intensity on the target to the average beam intensity could be reduced to about 0.75. This corresponds to a ratio of peak intensity on the target to average intensity on the target of 4.3/1.

Triangular beam sweeping has been considered because of the advantage of constant velocity and uniformity of spacing. It was found, however, that the maximum intensity point shifted to the center and was even greater for frequency ratios less than 7/6. For an approximated triangular wave formed by using harmonics imposed on the fundamental, an intensity ratio even better than the true triangular wave could be obtained. The best ratio obtained, using an optimum fraction of the third harmonic, was found to be about 20% better than the simple Lissajou figure and 35% better than circular precession.

Perpencidular scanning was not considered because the velocity at the turning points becomes zero, thereby allowing local hot spots to develop.

Willmer stated that if the sweeping fields deviated 90° out of phase from ideal conditions an entirely new pattern would result. Since any cross-over point would have four peaks per pattern, this would result in a 20% higher intensity in these spots.

Brobeck then suggested that spiral sweeping should be considered since this pattern would be good for the PW case. The disadvantage is that the beam would need to be interrupted when the intensity became too high.

Grueling asked if defocusing magnets had been considered. Van Atta replied that Panofsky had investigated and found no advantage since the magnet reduces both peak and average intensity but not the ratio of peak to average.

The question was raised as to whether a less intense beam over a larger target would be any advantage. Van Atta replied that the peak to average beam intensity would be high and a large fringe area would exist. This would mean a larger target with higher costs and greater neutron losses on the target beam hole.

Fossati presented the electrical arrangements that would allow the beam to scan the target in the 6/5 ratio Lissajous pattern. One 6-pole alternator would drive simultaneously a 20-pole generator to produce 200 cycles/sec. and a 24-pole generator to produce 240 cycles/sec. A second 2-pole alternator would simultaneously drive a 20-pole generator to produce 600 cycles/sec. and a 24-pole generator to produce 720 cycles. The above generators would be attached to two sets of two-phase magnet coils placed around the beam forming a sweeping magnetic field giving a 6/5 Lissajous pattern on the target. The higher frequency or third harmonic magnet is placed to receive the beam first and gives a slight initial deflection and the fundamental magnet being placed immediately following to give the major deflection. The power needed for sweeping will be in the order of 20,000 KVA and the over-all cost, which includes installation, in the order of $900,000. The precessional scanning beam will cost approximately $400,000 more than a circular beam.

Davis mentioned that his recent trip has shown that considerable data on metallurgy of thorium should be forthcoming in the near future from those areas concerned with this problem.

Since little information is available on the metallurgy of thorium, this data will be very helpful.

The trip will be discussed next meeting.

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