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MINUTES OF MEETING OF MTA ACCELERATOR COMMITTEE HELD APRIL 19, 1951

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INDEX NO. UCRL- 1253
This document contains 5 pages
This is copy 16 of 32 Series A

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Testing Accelerator

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MINUTES OF MEETING OF MTA ACCELERATOR COMMITTEE HELD APRIL 19, 1951

E. D. Fleckenstein

Berkeley, California

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MINUTES OF MEETING OF MTA ACCELERATOR COMMITTEE
HELD APRIL 19, 1951

Present: UCRL: Alvarez, Baker. Brobeck, Cooksey, Farly, Gordon, Hernandez, Lofgren, Longacre, McMillan, Norton, Panofsky, Reynolds, Van Atta, Wallace

CR&D: Fossati, Maker, Waithman

AEC: Fleckenstein, Moore

Baker presented pre-exciter plans for both the Mark I and Mark II accelerators.

Separate pre-exciters are to be used for Mark I. These pre-exciters will feed power to the cavity to give initial build-up through large loops which will be rotated out of the coupling position after the sub-exciters on the main oscillators have operated to hold the tank voltage.

It is considered possible to design equipment for use in conjunction with the main oscillators of Mark II which will allow build-up without using separate pre-exciters. The equipment to be used in conjunction with the main oscillators includes an amplifier and possibly an impedance transforming device to place an effective changing capacity at the coupling loops.

The amplifier is used only at the start-up and is switched out of the circuit before full voltage is applied to the oscillators.

The use of a saturable ferroxcube core reactance to reflect a changing capacity at the coupling loop is being studied. The use of barium titanate has also been considered for this. A mechanical system such as a movable plate type condenser capable of rapid capacity change could be placed at the coupling loops. Alvarez suggested a T-R box system to make the necessary capacity change. Baker stated that a continuous change is preferred over the step change a T-R box would give.

Brobeck asked if the ion locking load could be described in a power vs. time diagram. Baker stated that only the upper and lower conditions are known and that there is a large unknown region between. If one starts at 200 KV and reduces the voltage step-wise a point is reached at about 150 KV where the voltage can no longer be held and the load is dropped. If one starts at zero voltage and brings the tank up slowly, the tank voltage cannot be raised beyond 1500 volts regardless of the oscillator power. If the tank is raised to 300 KV and the oscillators shut off allowing the voltage to decay, the usual time constant decay curve is obtained except that at 6500 volts there is an abrupt drop to zero. These observations constitute all that is known about the ion locking load or multipactoring effect. McMillan asked about the 1500 volt limit. If this limit is passed can the voltage be raised slowly to full voltage. Baker said he inferred this but was not in a position to confirm it.

Lofgren reported that additional work has been done on the ratio of atomic ions to molecular ions in the injector beam. The molecular ion content of the beam is a sensitive function of arc current and the gas pressure. Beams with 90% atomic ions have been obtained; however, the injector is probably not usable because of the pressure necessary to obtaining such a beam.

Beams of from 65 - 70% atomic ions are now obtained and with additional work it is reasonable to expect beams of 80% atomic ions from an injector operating with usable pressures. Lofgren pointed out that the molecular ions are an additional heat load although this is not the most important objection. The main objection to their presence is the secondary electrons and consequently the X-rays produced when the electrons strike metal surfaces within the tank. Panofsky pointed out that the injector for 100 ma CW can be placed further from the first drift tube than the injector for 100 ma PW since this greater distance allows more flexibility in the design of focusing devices which may be necessary. Martinelli has determined from recent experiments that bunching is practical for a 100 ma beam and impractical for a 500 ma beam.

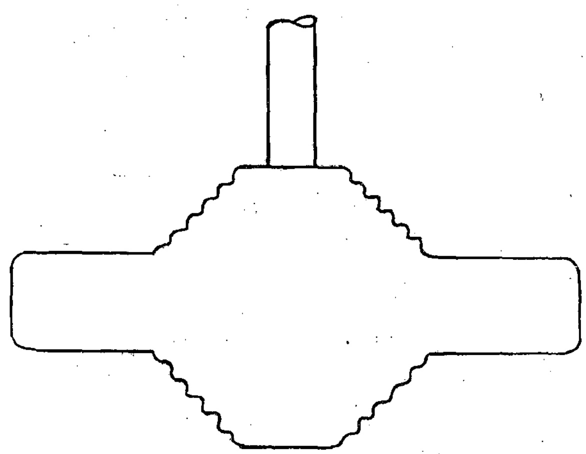
Panofsky described the structural arrangements being considered to support the half drift tube in Mark I which is to be used in testing the design of the high energy end of Mark II. A stem support from the top instead of a cantilever support from the end of the tank was considered simpler at first and the design proceeded along these lines. It now appears that a closer look at the cantilever support is desirable because of the complicated stem design required. Gordon pointed out that extensive redesign of the power and water supplies to the drift tube would have to be made if a cantilever support is used.

Longacre pointed out that none of the nozzles in the Mark I tank is located properly to allow inserting a gap splitter for testing the high energy end of Mark II. The gap splitter support will have to be curved to allow proper alginment. He agreed that we could probably get by with the curved stem now planned, and that we should not attempt to move the nozzle.

Brobeck discussed the necessity of having an interlock system to close the diffusion pump gates to prevent pump oil from getting into the tank if a failure occurs in the refrigeration system for the baffles. It was agreed that an interlock system is desirable and that the temperature detecting instrument should be located at the baffle. Maker said that such a system would be incorporated in the design.

Waithman reported on the ion pump work. Limited effort has been made because of the tentative plans for moving to Livermore. A probe has been inserted in a small vacuum chamber containing r-f fields of 200 megacycles. The direction of the current flowing in the probe would lead one to believe that positive ions are being collected; however, this cannot be so and must certainly be caused by a potential on the probe. McMillan stated that the probe is no doubt giving off electrons. A larger vacuum chamber will be set up at Livermore to continue study of this problem.

Brobeck sketched ideas considered for an expandable drift tube. An expandable drift tube with the bellows arranged as shown by the sketch is considered a good design from the mechanical standpoint.



Panofsky said he would make calculation on the r-f losses if a sketch showing the dimensions were given to him.

Panofsky pointed out that the expansion requirements as stated for such a drift tube are as follows: One half of the total expansion is needed to allow for tolerances and errors in fabrication and assembly and once these are corrected for no readjustment is necessary. The remaining half is needed for changes in dimensions resulting from temperature variations.

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