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UCRL-1070
Technology - Materials
Testing Accelerator

UNIVERSITY OF CALIFORNIA
RADIATION LABORATORY

Contract No. W-7405-eng-48

CALIFORNIA RESEARCH & DEVELOPMENT COMPANY
Contract No. AT(11-1)-74

MINUTES OF MTA PROGRESS MEETING HELD JANUARY 2, 1951

Russell H. Ball

Berkeley, California

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RESEARCH SERVICE BRANCH
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MINUTES OF MTA PROGRESS MEETING
HELD JANUARY 2, 1951

Present: UCRL: Alvarez, Brobeck, Cork, Dimmick, Farly, Gordon, Hanson, Judd, Latimer, Lawrence, Lofgren, Longacre, McMillan, Norton, Panofsky, Reynolds, Sewell, Thornton, Twitchell, Van Atta, Wallace

CRDC: Avery, Chaffe, Cope, Crandall, Davis, Hansen, Hildebrand, Maker, Powell, Waithman

AEC: Ball, Fidler

General Electric: Webster

Argonne: Monk

Brobeck announced that Dr. George Monk from the Argonne National Laboratory is visiting Berkeley for a few days to assist us in the design of periscopes for viewing the interior of Mark I and Mark II.

Brobeck said that a sample of the ceramic material intended for use by the General Ceramic Company to fabricate the cylindrical section to fit within the beam precessor has been received and found to leak under helium test. Lofgren suggested the use of a baked-on plastic varnish to stop leaks in the ceramic. Latimer said that General Electric has a new varnish on the market which is designed for this purpose. Hildebrand said that Corning Glass Company submitted a bid for the fabrication of this piece from glass and although their bid was considerably higher than that of General Ceramic it may be advisable to utilize glass in view of the poor vacuum characteristics of the ceramic.

Brobeck said that the L-2 cavity requirements have been written up and have been checked by both the Radiation Laboratory and CR&D. CR&D is now proceeding with engineering studies. This tank will be a copper-clad tank similar to the B-1 test cavity in Building 52. It will be constructed at Livermore in one of the existing buildings and will be designed to hold 4,000,000 volts. This will give a field gradient approximately equal to that expected in Mark II. Maker said that it is intended to invert this test cavity with respect to the B-1 cavity and mount it in a hole in the ground to minimize shielding requirements.

Brobeck said that tentative requirements have been written up for the long drift tube test with the Mark I cavity. There are a number of alternatives

which remain to be decided, such as: which end of the tank will support the 1/2 drift tube, how many nozzles will be required, and the design of the drift tube magnet for the full drift tube. This focusing magnet will require 50% more of the product of copper and power than the largest Mark I drift tube. This increase may be taken as either copper or power or both. He said Panofsky has estimated that the biasing required on the full drift tube will be 40 KV rather than the previously estimated figure of 15 KV. The drift tube stem will have to be redesigned to provide the necessary additional insulation. In the discussion that followed, several methods of isolating the magnet supply were discussed. These include insulated couplings, isolation transformer, ignitron rectifier, and a belt-driven generator.

Panofsky said that in view of the present data on production of X-rays there is a problem deciding which field gradient will be safe from the standpoint of X-ray loading. It is now generally agreed that a voltage gradient of 1/3 Mev per foot is a conservative figure. This would make the Mark II machine about 1000 feet long. A second point of interest is the scaling law of various effects with the field gradient. One of the latter items is the variation of required focusing magnet power as a function of field gradient. If the injector voltage is maintained proportional to the field gradient then the focusing magnet power will be reduced. If, however, the injection voltage is maintained at a constant value while the field gradient is reduced the focusing magnet power remains constant to a first approximation. Panofsky said that the electron accelerating model of Mark I is being moved from Building 52 to Building 51 (Bevatron Building) because of the high X-ray background produced in the former location by the B-1 test cavity. Among other things it is desired to determine from this model whether the design values for focusing magnet power are satisfactory. Satisfactory operation of this model has been obtained, but under conditions such that the focusing magnets did not check the design values. However, it has now been found that some of the drift tube magnets had shorted turns. The resistance of the winding of one was low by a factor of two. All that can be said at present is that a ratio of output to input current can be maintained which corresponds to a phase acceptance angle of 180°. Experimental verification of the adequacy of the present focusing magnet designs must await the winding of new magnets for this model. This work is now underway. Rewinding of the magnets for the drift tubes of this model is being undertaken during the move to Building 51. It has been found possible to adjust the operating parameters of the model so as to produce a hollow beam.

Lofgren said the new injector is scheduled for initial tests during the first part of February 1951. With the present equipment, ion currents of 3 amperes have been obtained. It is not considered possible to achieve currents higher than this with the present power supply. They have been spending some time cleaning up details applicable to the operation of the new injector and also anticipating the solution to some possible difficulties with the new unit. In the latter category they have been doing some work with electrostatic lenses which are built at an angle with the axis such that it will be possible, if

necessary, to displace the source off the axis and inject the ions at an angle. This would allow the particles responsible for back bombardment of the ion source to be caught on a water-cooled target.

Sewell said that measurements have been completed on the 10th scale Mark I cavity. They have been experimenting recently using pump-out holes with skirts in the lower half of the cavity. Before the pumping-out holes were installed the measured Q was 93% of the Q calculated from magnetic field measurements. Upon installation of the pump-out holes with skirts the measured Q decreased an additional 7%. This additional change in Q is larger by a factor of 4 than had been expected. The effect of placing a copper sheet outside the tank adjacent to the pump-out holes indicated that very little energy was being lost by radiation. It therefore appears that essentially all of the losses occurring are in the copper. Since Panofsky feels that he can calculate these losses with a higher degree of accuracy than they can be measured experimentally, and in view of the difficulty of making the experimental determination, further experimentation with this cavity is not planned. It has been concluded that although the skirts may not be required on the pump-out holes to reduce radiated power it seems advantageous to use them to minimize sparking outside the liner such as has occurred on the 32-Mev linac.

Hansen said that erection of the steel for the accelerator building at Livermore began today. About 500 of the 800 tons of steel required for the building have been delivered to date. Erection of the steel for the building is scheduled to take 4 weeks. This will permit floors for receiving some of the equipment to be completed in 2 or 3 weeks. Most of the heavy electrical equipment for power supply No. 1 is ready for shipment. Twelve of the support ribs and about 2/3 of the No. 14 end ring of the vacuum tank have been installed. The other end ring is being assembled on the ground. Steel plates on the vacuum tank are about 80% in place and about 60% welded. The welding is being freon tested. The vessel is 50 to 55% complete over-all. Fabrication of the liner has not yet begun since the time to date has been spent in testing methods of fabrication. A lease has been arranged for a fabricating shop and necessary equipment so that the liner can all be fabricated in one area. The foundation blocks are in place for power supplies 2, 3, and 4, and they are out for bids on the installation of equipment for power supplies 1, 2, 3, and 4. Practically all of the tunnels are finished for conduit piping, etc. The foundation has been poured for the large motor generator set for power supply No. 1. The foundation for the building to house the power distribution equipment is being poured. Testing and re-assembly of the Kinney pumps is underway. About 40% of the piping for the vacuum system has been fabricated and vacuum tests on this portion have not located a single leak. The cooling tower foundations are being poured and the basins for these are nearly finished. The security fence is about 2/3 complete. We are behind our original optimistic schedule about a month and are planning to draw up a new schedule within the next week.

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