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# MINUTES OF MTA PROGRESS MEETING
## TUESDAY, AUGUST 15, 1950

Present: UCRL: Alvarez, Brobeck, Dexter, Farly, Gordon, Lawrence, Longacre, Martin, Martinelli, Norton, Reynolds, Serber, Sewell, Street, Thornton, Twitchell, Van Atta

RAND: Judd

CRDC: Cope, Crandall, Hildebrand, Maker, Powell

AEC: Ball, Fleckenstein

Maker presented drawings showing the present design status for the provision of periscopes with which to view the interior of the liner. He said it would require twenty periscopes to see all parts of the cavity. These would be placed in four rows of four each along the accelerator and two in each end wall of the accelerator. Hildebrand said he believed that it would cost between 3 and 5 thousand dollars for each such periscope installed. Alvarez said that the regions in the tank that are important to view are the coupling loops and drift tube. Hildebrand suggested only the four periscopes necessary to see the coupling loops be installed initially and that additional openings be provided to which these periscopes could be moved if it should be required to view other areas. It was decided that the requirements for viewing the interior of the tank would be reviewed by a smaller group so that a decision can be made for an economical distribution of the minimum number of periscopes. Gordon suggested that it might be desirable to provide two or more ports for direct viewing to assist in the alignment and accurate determination of the position of the drift tubes.

Brobeck said that Pitzer during his recent visit requested that a determination be made on the effect on the Mark I schedule of changing the design so as to accelerate protons instead of deuterons. Brobeck said that it now appears that a two months delay would be caused if this were done. Protons require only 1/4 the focusing magnet power of deuterons, however if the present values of magnetic field tangential to the end surfaces of the drift tubes were still required to suppress electron emission this saving could not be realized. He said that one consideration in the change is that if the machine were designed to operate on deuterons and serious difficulties were encountered, the field gradient could be cut in half and protons could be accelerated to one-half the deuteron energy. However, if the machine were designed for protons and would not operate properly at full potential gradient, it could not be made to operate at all.

Hildebrand read to the group the tentative specifications of the 20 mc drydock which were formulated at the meeting held August 11, 1950. These specifications

are attached as an appendix to this report. The specifications were approved and CRDC was requested to proceed with their studies.

Cope read to the group the introductory summary of the August 11, 1950 report on feasibility of Mark II. Inasmuch as copies of this feasibility report are available to recipients of these minutes this summary has been omitted from these minutes.

Russell H. Ball

Distribution:
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APPENDIX

BERKELEY, CALIFORNIA
August 14, 1950

LARGE OSCILLATOR DRYDOCK

MEMORANDUM

A meeting was held on August 11 to discuss the requirements for and the major design parameters of a large oscillator drydock, which had been agreed to in principle at the previous Tuesday MTA meeting. Those present included Messrs. Brobeck, Norton, Farly, Panofsky, Longacre, Hildebrand, Fossati, and Maker. Listed below is a summary of the principle conclusions which were tentatively reached at this meeting:

OBJECTIVES:

The following principle objectives were agreed to govern the design of the drydock:

1. The drydock cavity will be used to test oscillators up to 25 megawatt capacity at 20 megacycles. Specifically, it will be used to test the 4 to 6 megawatt tubes which will probably be used for the Mark II accelerator and will be adequate with "coupled out power" to test the 25 megawatt oscillators, which are also being developed. The initial design will not provide power for these large tubes, but will accommodate a larger power supply when furnished.

2. Initially, the cavity can be used to test the 1 to 2 megawatt tubes being provided for Mark I at 12 megacycles. This, however, is not important, as a smaller drydock cavity is to be built immediately for use for these small tubes prior to completion of the large drydock.

3. The large cavity will be used to test drift tubes up to 20 megacycles and with magnets in full scale operation. This will be for the primary purpose of checking possible discharge troubles. It will permit the solution of such troubles with design alterations to a single drift tube. Without this facility it would be necessary to experiment with design on all of the 8 drift tubes in Mark I in the event that troubles are experienced in the start up of the 60' Mark I accelerator.

4. Copper clad steel will be used for this drydock cavity in order to test this system of construction and develop design details which can later be used for the Mark II accelerator.

DESIGN SPECIFICATIONS:

The following tentative design specifications were agreed to for purposes of initial studies:

1. The cavity liner will be 31.6 feet inside diameter by 15.9 feet inside length with no taper and with no provision for movement of the end diaphragm for tuning unless such provision can be made inexpensively and for the primary purpose of developing designs compatible with the use of copper clad steel in the cylindrical shell.

2. The drydock will have no beam.

3. The cavity will be provided with a single suspended drift tube in the center of the cavity with an approximate length of 5.96 feet and a diameter of 5.04 feet. This drift tube will be provided with a magnet and operated at a biased potential and will be spaced approximately 2 feet from a half drift tube hung on each end of the liner. These half drift tubes will probably also be furnished with magnets.

4. The cavity must be designed to permit rapid access for alterations to drift tube and other design features for experimental purposes. There was considerable discussion of the relative merits of a horizontal or vertical split cavity, a centrally located end entrance, or an end design which would be suitable for reuse in the Mark II accelerator. It was agreed that in addition to providing relatively rapid access, as compared to a production machine, and to providing good electrical contact, the design might be such as to be reused in Mark II accelerator. However, this is not a major consideration and should be disregarded in the event that it would appreciably delay the construction schedule or seriously increase the cost.

5. A very rapid pump down time is desirable to avoid delays in getting in and out of the cavity. This will necessitate either a fairly large separate vacuum system or locating the cavity to permit common use of vacuum equipment with the 60 foot accelerator.

6. The shielding required for the cavity must be such as to protect against x-rays of approximately 5,000,000 volts and 100 ma.

6A. Initially, the cavity will be operated with the power supply being purchased for the small cavity for 1 to 2 megawatt tubes. The liner cooling will, therefore, be designed for 2 1/2 megawatts, but must provide for a later increase to 5 megawatts of heat load.

7. When a larger power supply is provided for testing 4 to 6 megawatt tubes, it will be necessary to couple out extra power with one or two extra transmission lines removing the power with cooling water flowing through the transmission lines. Connections for two extra transmission lines will, therefore, be installed for this purpose.

8. An adequate power supply will presumably be purchased at a later date for testing the 4 to 6 megawatt tubes on this cavity. But there was considerable discussion regarding the pros and cons of providing eventually a power supply adequate for 25 megawatt tube tests vs. using the Mark I power supply for this purpose. If the 25 megawatt tubes were tested at 12 megacycles, they could be tested on Mark I. If, on the other hand, they are designed, as planned, for 20 megacycles, they will be tested on this test cavity with considerable power coupled out. In order to use the Mark I power supply for 20 megacycle tests and 30,000 volts, the power supply would have to be altered and could prcbably not be quickly reconverted to continue operation for Mark I without considerable lost time to Mark I. This question is only pertinent at the moment insofar as it might influence the location of the large test cavity.

9. In addition to the two transmission lines mentioned above, the cavity should have nozzles for two oscillators and one pre-excitor.

10. There was considerable discussion of the location and housing for the cavity. The UCRL personnel are strong in their belief that it should be placed in-doors. If it is placed in an existing building, this will put it some distance from Mark I, and complicate, although not obviate, the possibility of the use of joint power and vacuum facilities. If it is located near to Mark I, it will be necessary either to relocate a large existing building or construct a new building. Mr. Brobeck believes that the special requirements for this building are such as to make the construction of a new building highly desirable. It was agreed that a rough survey would be made of the pros and cons of the three basic alternatives; i.e., building a new building, relocating an old building, or using an existing old building.

11. It is very desirable that this drydock facility be completed as soon as possible, and in any event, not later than the completion of Mark I. Inasmuch as this is a fairly substantial project, which will compete for design capacity with Mark I and perhaps with Mark II, no estimate of approximate schedule was made at the meeting.

The UCRL will further substantiate the tentative design specifications given above and the CR&D will proceed with sufficient preliminary designs to include rough cost estimates, time schedules, and presentation of alternative locations and housing provisions. In doing this work, it will be recognized that the completion of this test facility is urgent, but we plan to subordinate it to the prosecution of key items of design involved in maintaining schedule on Mark I.

A. HILDEBRAND