

MARK IV REDESIGN COMMITTEE  
MINUTES OF MEETING NO.16  
July 20, 1960

In Attendance: K. Brown, B. Bunker, G. Loew, T. Turner, D. Goerz,  
A. Crabtree, P. Edwards, K. Mallory, J. Lebacqz,  
J. Whitson

Purpose of Meeting

The purpose of this meeting was to discuss pertinent factors involved in the Mark IV revision program. The key factors involved in the meeting's discussion were: first, the necessity of pre-checking  $2\pi/3$  accelerator sections and the vacuum system; second, questioning the inadvisability of leaving Project M without an operative accelerator during the period of the Mark IV revision; and, third, the question concerning paralleling operations by providing the metering and instrumentation program with immediately available facilities for equipment testing. Presentations were made at the meeting indicating the desirability of beginning work as soon as possible on studies of beam dynamics, beam monitoring, and various other vital instrumentation problems. On the other hand, the urgency of continuing the mechanical, vacuum, electrical control, and power system evaluation was pointed out. It was agreed that no decisions could be made at this meeting. Therefore, these minutes will summarize only the discussion.

Discussion

Various alternates were reviewed as follows:

1. Continue with the present Mark IV revision program. This will delay the beam dynamics, beam monitoring, and instrumentation studies program, for approximately 6 months or more.
2. Provide facilities for doing both as outlined in the Mark IV-B - Mark V program described below.

Leave the present Mark IV machine intact, and assemble a new accelerator from the parts that are now being made for the Mark IV revision. This second machine could be designated as Mark V and would be installed in connection with the Project M temporary building. This feature allows a preliminary check of vacuum components as well as electronics control features. The Mark IV accelerator would be in operation during this period. In this manner, an operative accelerator would be continuously available to the program,

in addition to adding the provision of an assembly for checking the vacuum system, electrical control, etc. The second machine called the Mark XV, could be moved to the Project M site at a later time.

Of the many factors involved. One of the most pressing is the order of priority and the means of accomplishing the two programs involved. Specifically, these two programs are: first, the mechanical, vacuum, electrical control, and power system evaluation; second, studies of beam dynamics, beam monitoring, and various instrumentation problems.

#### A Review of Proposals

The present Mark IV revision program was instituted for the purpose of: one, the construction and operation of two each  $2\pi/3$  accelerator sections; two, construction and evaluation of vacuum systems; three, provide a test vehicle for accelerator components and beam dynamic studies. This was to be accomplished in minimum time and minimum cost for the purpose of providing a greatly improved machine. In parallel with this Mark IV revision, a number of accelerator test cells were to be constructed for the purpose of carrying on current monitoring, beam spectrum measuring, and life test of components. These cells would be single accelerator sections arranged for ease of operation.

~~Proposal~~ number two

Proposal number two as indicated above, would involve the separate assembly and testing of vacuum systems, baking facilities, new vacuum control and electronic controls. This work would be undertaken at the old steam plant and in Room 12 of the M.L. The installation at the steam plant would involve new electron gun designs and full scale vacuum system consisting of pumps, manifold, vacuum valves, etc. Room 12 would become a laboratory for building and testing electronic controls. This program would be designated as the Mark IV-B - V. An estimate of the manpower required follows:

Modulators (2) - Turner  
Power System - Edwards  
Radiation Shielding and Buildings - Copenhagen  
RF Driver Stable Source - Granger Associates contract  
Deflection Magnet Supplies and Magnets - Contract to be let  
High Voltage Power Supplies - Contract to be let  
Water Cooling System, Heat Exchanger and Pumps - Crabtree/  
Bunker  
  
Klystrons (2) - Lebacqz  
Control Consoles - Leeman  
Gun Modulators and Power Supplies - Yingst

The necessary modifications following the evaluation tests of components and parts in Room 12 and at the

steam plant would be made by the team of Goerz, Whitson and Grabtree. This second program will leave the Mark IV accelerator intact. Construction would start immediately in the steam plant to put in a wall and to assemble the total mechanical components of the machine. All control parts would be designed on a module basis in order to allow these parts to be removed and re-installed at the final Project M site.

Action Required

Studies were initiated concerning the cost differences involved in the various proposed schemes. One comment questions the ability to get a new accelerator, Mark V, for less than \$250,000.

It is quite apparent that any change from the Mark IV revision program will require considerable drafting man hours. However, the present mechanical components that have been manufactured or are in the process of being delivered at the moment can be utilized fully. Relatively, few parts are required for this facet. However, the need for such apparatus as modulators, high voltage power supplies, will add to the expense of the alternate course.

copies to:

all in attendance  
R. B. Neal  
R. Leeman

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Comments

The consensus of opinion is that the present Mark IV machine performance prevents adequate measurements required for beam dynamics studies. Thus, the value of the Mark IV machine for a full program of study is questionable.

It was pointed out that the program for a beam dynamics, instrumentation, and monitoring equipment evaluation study is not available. It was suggested that this above program be outlined as an aid to the present study. On the other hand, the precise schedule of the mechanical, vacuum, electric power system, and controls evaluation program have been covered.

In connection with the alternate proposal, a serious consideration involves the availability of the temporary Project M building. If this building is late in completion delay will occur in the mechanical program.

In essence, have conditions changed such that the initial program for the Mark IV machine as outlined above has changed in emphasis?

Regardless of the above problems, there appears to be a necessity to test and check the vacuum system and components as well as the electrical system as soon as possible and preferably prior to installation in the Mark IV or perhaps the Mark V machine.

An important requirement exists for maintaining the present Mark IV machine undisturbed. Therefore, there is a necessity for a separate test facility for such devices as vacuum systems and electrical control systems. Thus a vital consideration is a separation of the mechanical and electrical development from the general program. This will allow the evaluation and study on vacuum systems, vacuum control, electrical control, and major assembly check out of not only the vacuum, but the rf components without interfering with a parallel program on monitoring and instrumentation.