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MINUTES OF MEETING OF MTA REVIEW COMMITTEE HELD NOVEMBER 20, 1951 AT LIVERMORE

Milton F. Moore

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MINUTES OF MEETING OF MTA REVIEW COMMITTEE
HELD NOVEMBER 20, 1951
AT LIVERMORE

Present: UCRL: Alvarez, Bradner, Brobeck, Cooksey, Latimer, Lawrence, Lofgren, Norton, Thornton, Twitchell, Van Atta

CR&D: Cope, Davis, Hildebrand, Kent Mayer, Miller, Powell

UCRL Consultant: Panofsky

AEC: Brown, Fleckenstein, Moore, O'Donnell

Mayer summarized the Mark I construction status. The weld tests and strength tests will be completed this week. It is expected that evacuation of the tank will take place approximately November 24. A classified area is being established on the second and third floors of the accelerator building in preparation for the oscillator installation. The No. 1 power supply is on test, with the remaining power supplies to be tested shortly. Helium leak testing is to start immediately.

It is expected that the first Hg converted diffusion pump will be received from DPI about November 21. The remaining pumps will be shipped by the middle of December. Hildebrand mentioned that DPI tests on pumps showed the following pumping speeds at various temperatures:

5,500 - 6,000	liters/sec	@	25° C	H_2O	cooled
8,700 - 9,000	"	"	" 10° C	"	"
11,000 - 17,000	"	"	" 5° C	"	"

The first pump will be tested at Livermore under the above conditions, prior to installation on Mark I, to confirm the DPI tests.

Lofgren reported on the new developments in ion pumps. A new model of the design shown in Figure 1 has given excellent results.

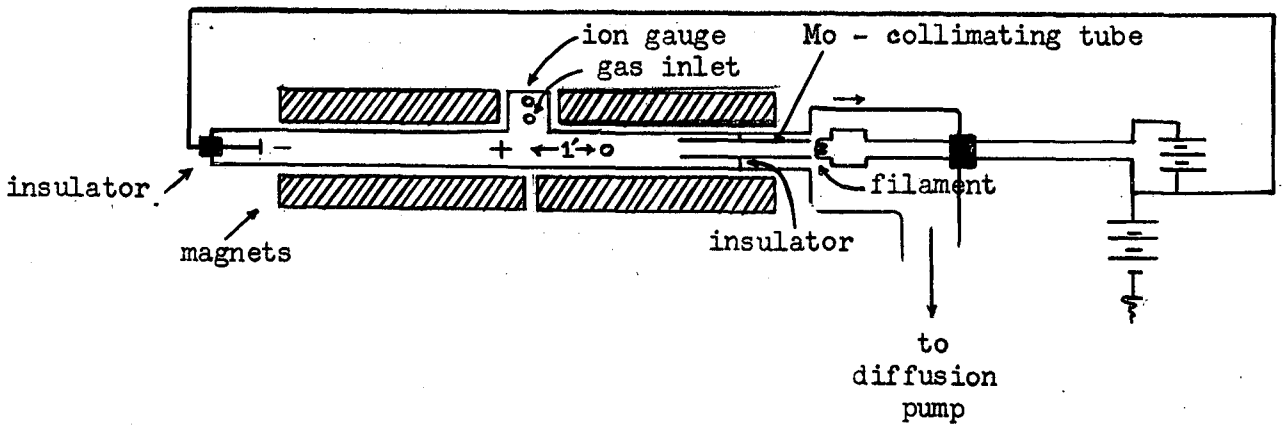

Figure 1

The pipe is 12 feet long and 5 inches in diameter, with a solenoid magnet placed along the entire pipe. An air inlet 1/4" in diameter is attached at the center with a separate opening about 3" in diameter to provide for an ion gauge. Using this model a vacuum of 3.3×10^{-6} mm Hg, a pumping speed of 1900 liters/sec, and a center-to-end pressure ratio of from 500-1000 was attained. If a leak equal to that at the center is placed in the pipe about one foot from the main inlet, no pressure increase at the center is noted. It is thought that the discharge is actually taking place in the region near the inlet, hence additional inlets increase the discharge areas but do not increase the pressure. The ability to maintain a discharge apparently requires a high pressure only near the filament.

Lawrence pointed out that, since additional inlets do not increase pressure, it is indicated that a very high pumping speed can be attained from a long pump.

If a 2-foot diameter by 20-foot long discharge can be obtained, a pumping speed of over one million l/sec will be possible. This is a factor of 1000 greater than the pumping speeds of Hg diffusion pumps (48 x 5000 l/sec) or 150,000 l/sec for Mark I.

A question was asked as to whether the discharge extinguished at lower pressure--i.e., whether the arc was dependent on the pressure. Lawrence replied that this was not the case since under a perfect vacuum the discharge could be maintained because the filaments are supplying sufficient electrons to ionize the gas at the outlet. Alvarez asked

whether any significant change in pressure occurred if the length of the pipe was increased. Lofgren reported that by blocking off one half of the pipe and then slowly increasing the length a slight decrease in pressure was noted.

Lawrence summarized the present theory on ion pumps. The number of ions formed is independent of the vacuum in the central region of the pipe. Ionization is maintained by the electrons from the filament. A back pressure of 1 micron is required to make the pump operate. All molecules in the pipe are ionized. A larger arc area gives a greater ionizing volume and hence a greater pumping speed. The power needed for ion pumps is comparable to that required for Hg pumps; however, Hg pumps require additional power for refrigeration which is not needed for ion pumps.

Alvarez suggested that one possibility for design of an ion pumping system on A-12 is a series of discharges lengthwise in the bottom portion of the tank and shielded from the resonant cavity by a grid structure.

Bradner discussed the recent Q and low power tests on the Mark I containing no other external parts except transmission lines. A Q of 255,000 $\pm$ 0.3% was obtained, which is 14% lower than theoretical.

A Q 20% lower than theoretical was expected, based upon experience with the Radiation Laboratory 40' linear accelerator.

The cavity was excited by a single pre-exciter oscillator to a power level of 200 kw during the low power tests. Prior to the test it was decided that a temperature rise in the cavity walls of 200° C would indicate a hot spot and require inspection and repair. The maximum rise obtained was 6° C. During these tests one of the transmissions shorted out. Cause of this failure is not known.

A general discussion brought out the fact that uranium depleted either to 0.4% or 0.5% is all that would be available instead of material depleted to 0.3%. By using the material with the higher U-235 and a D_2O moderator the Pu^{239} production will be increased from 5 moles/day to 8 or 10 moles/day.

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