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MINUTES OF MEETING OF MTA REVIEW COMMITTEE HELD APRIL 15, 1952 AT LIVERMORE

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MINUTES OF MEETING OF MTA REVIEW COMMITTEE
HELD APRIL 15, 1952
AT LIVERMORE

Present: UCRL: Alvarez, Brobeck, Farly, Lawrence, Latimer, Lofgren, Martin, McMillan, Pitzer, Reynolds, Thornton, Twitchell, Sewell, Wallace

CR&D: Cope, Brighton, Fossetti, Hildebrand, Miller, Mayer, Myers, Salisbury, Wyatt

AEC: Fidler, Moore, O'Donnell, Tarbox

Farly reported for Norton on the RCA tube contract. By September 1951, RCA had designed a shielded-grid tube, type A-2332, capable of over one megawatt rf output CW as compared to the 0.6 megawatt output from the RCA tube 5381. By changing circuit components and transmission lines and using the A-2332 tube, a reduction in capital costs of two megabucks can be realized. Since the A-12 program has been postponed, it was decided to extend the RCA contract to determine the possibility of obtaining 1.6 - 2.0 megawatts output per tube. The extended contract will freeze tube design by September 1952, allowing three months from September through December for development of production specifications.

RCA will soon be able to make preliminary tests, but resonance load tests at 12 - 20 megacycles will still be conducted at Berkeley and Livermore. It is expected that all of the above oscillator tubes for A-12 will be fabricated by June 1954.

Baker is determining methods of assembling and coupling the RCA oscillator tubes to the A-12 cavity, keeping in mind the desire for simplified transmission lines.

Alvarez summarized the research problems which should be studied on Mark I.

1. The effect of the drift tube magnets on the ability to hold rf voltage and also the effect of the drift tube magnets on the beam.

2. The possibility of tapering the drift tube bias from center to each end to prevent P.I.G. discharge.

3. The determination of the highest gradient obtainable.

4. An investigation of graphite as a drift tube surface material for spark elimination.

5. Design of a sensitive spark detection unit which will crowbar the tank before destructive sparking occurs.

6. New methods for shielding pre-exciter transmission line loops from rf feedback to eliminate the rotating seal problem.

7. Methods to prevent electrical surges from being transmitted back through the magnet feed lines, thereby stopping sparking in magnet generators.

8. A new amplifier design and automatic tuning circuit is needed to control the phase drifting in the A-12 cavity.

9. A study of the effect of beam load on the rf frequency. This can be studied for the first time, since the A-12 will have a large beam current.

10. Design of an injector for A-12 with a high beam current which will eliminate the intense central core of ions. Preliminary studies indicate such an injector is possible by allowing the ions from an arc source to form a rotating beam around a central electrode placed axially through an outer cylinder. The outer cylinder is divided into drift tube sections that are rf modulated. A D.C. potential between outer cylindrical conductor and central wire conductor forms an attractive field toward the central wire. The central charged wire in the beam center overcomes the radial space charge forces and the resulting stability provides sufficient time to bunch and accelerate the ions with the rf modulated drift tubes.

11. Determination of the effect of misaligning drift tubes to reduce the peak to average beam profile.

12. A study of the electrical field configuration in the cavity during sparking.

Thornton asked about the manpower requirements for the above work and also the time scale involved. Alvarez suggested that Hildebrand's group could undertake this work with the Radiation Laboratory personnel acting as consultants. It was thought this program would be a long-term affair.

Salisbury reported that the Livermore vacuum laboratory had obtained a pumping speed on the mercury rectangular pumps of 18,000 liters per second with only one jet in place. It is thought that two jets will allow a pumping speed of 20,000 liters per second. The optimum pressure of 1×10^{-5} millimeters of mercury has been obtained. The power required for operation of this pump is 2.5 kilowatts.

A mercury vapor detection unit which utilizes resonance absorption has been designed to detect the mercury vapor which might backstream into the main tank. Ion gauges are not considered desirable for mercury vapor detection because the gauges indicate total ions present and not specifically the mercury ions.

The study is being made of the possibility of gold- or copper-plating the mercury diffusion pump baffles so that better heat transfer may be obtained.

Myers reported that the magnetic repulsion forces between the first two drift tubes is below 3000 pounds since the addition of steel shims to provide a return flux path. The drift tube stems and supports are deflected one gap length from the normal position when both magnets are excited.

Fossetti reported that a study had been made of the effect on the main power station when the 300 megawatts in the A-12 cavity is crowbarred to ground. Since the power station must shortly shut down when relieved of its load, it was desired to shunt the power through a bank of ignitron tubes to a dummy load consisting of a 12' x 12' x 8' deep water pool. This load would allow the power plant to continue operating at its rated output and thereby be able to supply power to the A-12 when again needed. The cost of installing the dummy load with the accompanying electrical equipment is estimated to be 4 megabucks.

Lofgren reported on the ion pump development. The hot cathodes which are used in the ion pump are still burning out with the longest life approximately three days. The pumping speed is 7,000 liters per second with a base pressure of 2×10^{-6} mercury. This pump has now operated approximately 400 hours. The use of cold cathodes was found to make the pump unstable. A new pump 18 inches in diameter and 3 feet in length will be built to study cathode life.

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