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MINUTES OF MTA PROGRESS MEETING
TUESDAY, AUGUST 1, 1950

Present: UCRL: Alvarez, Baker, Brown, Christy, Copenhagen, Dexter, Farly, Gordon, Latimer, Longacre, Martin, Martinelli, McMillan, Norton, Panofsky, Powell, Reynolds, Sewell, Twitchell

CRDC: Kent, Maker, Powell

AEC: Ball, Fidler, Thomas

Panofsky said that present design of the vacuum tank for Mark I provides for four banks of oscillators with nine to each bank. Eighteen oscillators will be used to power the Mark I. Since the extra oscillator positions that were provided for the possible physical extension of Mark I are no longer required for this purpose the number of ports in the tank can be reduced from 36 to 27. This will allow for 9 spare ports to be used for such experimental work as testing oscillator output, field emission loading, increasing beam current, for test equipment and for miscellaneous experimental uses. Maker said that the dollar saving in reducing the number of ports from 36 to 27 would be approximately $15,000 to $20,000. It was the consensus of opinion that it would be worthwhile to maintain the present floor associated with the fourth bank of ports as well as the ports themselves, since use for them may very easily develop.

Baker said that the best tube at present that is commercially available is the RCA 5831. This tube operates at about a one-megawatt level. This tube does have the disadvantage of numerous component parts, such as 48 filaments and the grid and beam focusing structures. It seems undesirable to supply the 100 megawatts for Mark II from tubes of this relatively small size and complexity. Baker said that MacKenzie has pointed out that if one scales up the calutron ion source as an electron source one would have a geometry for which the electron optics are rather well known. This would provide a filament about 3/8" wide and 18 inches long. This would increase the filament width by a factor of about 7 and increase the length by a factor of about $2\frac{1}{2}$ over that of the RCA 5831. The emission from this larger filament should thus be about 150 amperes. Forty such filaments would provide about 6000 peak amperes and, with an efficiency of between 80 and 90%, would permit about 1000 amperes r.m.s. component. By utilizing a structure which prevents the addition of the rf and dc voltage components one can safely increase the voltage to about 30 kv. This combination would thus yield about 25 megawatts of rf power. The dimensions of the tube would be about four feet in diameter and five feet in height. The power density on the plate would be about 700 watts per square centimeter, which is about 1/3 the power density of the RCA 5831. In addition to the foregoing, it is planned to simplify the oscillator design by incorporating the capacity of the resonating circuit in the tube itself. This will serve to simplify the transmission line and eliminate the requirement for many insulators by utilizing a direct tie to the tank. Baker said they are now engaged in the construction of a 1/4-scale model of this 25-megawatt resnatron type tube. This quarter-scale model will be built in two stages--the first of which will be to utilize a copper coated steel tank within which various structures will be tried in order to study the electron optics and structural characteristics for the proper frequency and to determine dimensions to within perhaps five percent. Following this, the internal structure will be refined and the required dimensions of the tube determined to within about two percent. The full-scale tube will be designed for 12.2 megacycles. The testing of a single 25-megawatt tube would require the rather heavy loading of the Mark I MTA.

Martin said that McMillan has designed an optical system for viewing the interior of the vacuum vessel which has a cone of vision of 60 degrees. Alvarez suggested that George Monk, of the Argonne Laboratory, be contacted for suggestions on such optical systems. Alvarez said that Monk is reported to have developed a periscope having a cone of visibility of almost 180 degrees.

Sewell reported on his latest experimental determinations of the positioning of drift tube supports. These results are given in Table I below:

Drift Tube Number	Displacement from Center Line of Drift Tube
1	- 1-7/8"
2	0
3	+ 2½"
4	+ 4-3/8"
5	+ 5"
6	+ 4-3/8"
7	+ 3-3/4"
8	+ 5/8"

Table I

A plus sign indicates that the stem joins the drift tube off-center in a direction toward the exit end of the accelerator, while a minus sign indicates an offset from the center point in the direction of the injection end of the accelerator. These values have been determined to an accuracy of ± 5/8" for the full-scale machine. McMillan questioned the fact that the deviations from the drift tube center point is not negative in all cases, to which Alvarez replied that this would be expected were the drift tube liner of constant diameter. He said that with the tapered liner the unit cells of the accelerator have curved surfaces and that this is the reason for the observed fluctuation of the displacements in Table I. McMillan said that the variation of the displacements appeared so random as to indicate that they are being influenced by miscellaneous mechanical or structural details of the particular model on which they were measured and that a distribution such as is found here may not be duplicated on the full-scale machine.

Panofsky said that the present agreement between calculated and measured electric fields in the accelerator is now so good as to render very unlikely any future changes in drift tube positions. It therefore appears that CRDC can supply the tank fabricator with the locations of the ports in the tank required for drift tube supports.

Russell H. Ball

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