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Radiation Laboratory

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MINUTES OF MTA PROGRESS MEETING
TUESDAY, APRIL 4, 1950

PRESENT: UCRL - Baker, Brobeck, Cooksey, Farly, Gordon, Latimer, Lawrence, Longacre, McMillan, Norton, Panofsky, Powell, Serber, Sewell, Thornton

CRDC - Kent, Maker

AEC - Ball, Fleckenstein

Brobeck: The taper in the liner may be small involving a change in tank diameter of about three feet in the sixty foot tank. However, the final taper might be twice this value. The taper required will not affect the building design unless it exceeds eight feet. The tank design has changed now to provide for concave spherical segments as closures for both ends. At the low energy end there will be a circular opening near the floor level through which drift tubes may be taken in and out of the tank. Having a spherical segment simplifies the reinforcing necessary around such an opening through the wall. This design also has the advantage of allowing much more room near the first drift tube for the injector. It is planned to have reinforcing rings at each oscillator. The distortion of tank diameter will be the order of 1" under the load of the drift tubes. The number of drift tubes is now seven thus providing for 7½ gaps. The inlet aperture has been reduced to nine inches. There will be a one-half gap at the exit end. At a frequency of 12.2 mc the energy comes out to be near 30 Mev. We hope to have the building drawings in the hands of the contractor by the first of July. We have made some flow diagrams to give to Standard Oil so they can begin thinking about the pipe layout outside the building. There is a question about booster pumps versus steam ejector. Looks like oil booster pumps will be practical but may be expensive.

Maker: The tank will be reinforced with rings spaced at 80" with longitudinal beams spaced at 18". This design weighs 1000 lbs. per linear foot less than the other. Provision is being made for anchoring along the length of the tank. There will be a 3" expansion in 700 feet of tank for a 60 degree temperature rize. This will require that the tank be divided into sections to provide expansion joints. The sections will then be anchored individually. We will have to anchor for a force of about 3 million pounds.

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McMillan - Why is the aperture always changing?

Panofsky - Increase of the frequency from the original value of 10.8 to the present value of 12.2 made the transit time less excessive in the original 12 inch aperture. The first two drift tube magnets will be stronger. They will take about twice the current, thus four times the power of the others.

Maker - How about weight?

Panofsky - This will also be double for the first two drift tubes. The magnets haven't been designed yet. There is lots of room inside the drift tubes - the outside diameter is of the order of 10'. There is lots of room.

Brobeck - There will be enough steam available in conjunction with the steam ejector pumps to heat the water to bake out the tank. What do people think about the idea?

Panofsky - I don't think it does any good. I think it only does good if you have some deliquescent solids around that you want to get rid of. As far as regular bakeout is concerned in a good vacuum system with clean surfaces and so on, we felt that from experience with the linear accelerator that heating during bakeout did no good. The pump down curves with and without heating were practically indistinguishable.

Thornton:- We have had some experience along that line in Y-12 too. It proved unnecessary in reasonably clean units. In beta we never used it.

Brobeck - Well then we will leave that off. It can always be added later on if anybody wants it.

Panofsky - I think if one did that, one would have to worry about the expansion of the tank.

Brobeck - No, I don't think so. Heat would only be provided on the liner and the tank wouldn't get very hot from it.

Panofsky - The liner would expand a foot.

Maker - The liner would expand 50% more than the tank.

Brobeck - We will leave this heating off and think about it.

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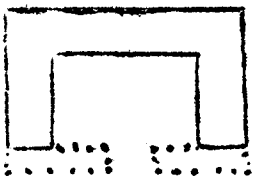
Sewell - We have only got a couple of results on the drift tube magnet model tests. I'll write down the numbers on them. I think it gives a trend on which way we're going on these focusing magnets. We have been testing magnets which have a cross section like this:



and we are trying to decide if the simple U shape will suffice or whether it will be necessary to add the extensions indicated. We have set a quality factor for these magnets , the reciprocal of which essentially gives the ampere turns required for a given focusing effect. The factors don't vary a whole lot. We have tested eight models. The quality factors vary from 1/5.2 to 1/4.5. But the surprising thing is that on the first calculations, figuring power and weight which are the really important factors, - the magnets which are smaller from the standpoint of weight and power required have the worst quality factor. The magnet having a quality factor of 1/4.5 would require 39 kw and weigh 8.4 tons while the magnet having the factor of 1/5.2 would require 35 kw and weigh three tons(for the first full drift tube). This is for the original design for the 4800 gauss over 1/4 of the repeat length which Panofsky has given. With poles the trouble comes in trying to keep the pole tips from saturating. This requires that the coils be moved out to make room for more iron in the poles, which in turn requires more iron in the return path and builds up the weight. For this reason, I doubt that the magnet with the quality factor of 1/4.5 will go in the drift tube. These tests were all run in the region of non-saturation. We can make better models once we reach some decision on this quality factor. These tests were not at full field strength but in the region where the field was a reasonably linear function of the current. We measured the flux density at various points along the return path and beefed up these magnets so the flux density would not go over 18 kilogauss on the full scale magnet. The magnets saturated badly around the tips. The actual values of $\int H^2 dl$ will vary a little between these models and the final magnet. We have been using the best figures available.

Panofsky - Are you doing any setting up on the Bee-Bee tests to determine the strength of the electric field in the cavity along the ion path.

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Sewell - We are planning on making tests on that at the present time. We are now making paddle measurements to determine the direction of the electric field. It looks like it works fine. We hold the paddle on nylon strings. It doesn't seem to disturb the resonant frequency at all, when the paddle is held perpendicular to the electric field.

Panofsky - You just slip in the paddle and swing it around. It does shift the resonant frequency until it is normal to the field. This is one of the first tests to make to determine the equi-potential lines for mounting drift tube supports.

Sewell - We will support the drift tubes on polystyrene rods and then determine the position of conducting supports from the results of the paddle measurements.

Norton - On the oscillator test phase of the program. All components have been ordered or are in construction and we hope to start the tests sometime between the middle and end of May. That will be in building 52. That comprises the oscillator tubes and enclosures, test cavity and power supply controls.

Baker - Power feed back into the pre-exciters will be about 40 kw out of the megawatt.

Panofsky - Maybe you can turn the pre-exciters off.

Norton - On the pilot model of the program we have completed the talks with possible manufacturers and engineers and expect to wind up talks with PG&E and with CRDC and we will have the final specifications in the hands of CRDC by the end of this week.

Panofsky - Phase angle still looks like 60-70 degrees.

Thornton - On the new cyclotron Judd came up from Rand and had some discussions with McMillan and Serber. One of them might like to comment on the theoretical situation. On the other matters some model testing has been done. It looks reasonably good. The major problem that needs to be investigated is what the field near the center of the magnet looks like. The model tests on that have not been done as yet. The decision has been made to go ahead on the electron model which will accelerate electrons to the same beta. This model will have a pole diameter of one meter, a field of 20 gauss and operate at 50 mc.

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Sewell - Those tests are still in progress. We have some numbers on them. With a 20" gap on the full scale machine which is 24' in diameter the field varies about a factor of 10 from high to low (100% to 10%) at the 100" radius. This is on a magnet with three 60° iron slugs on the poles.

Latimer - On the target. The chemistry group is starting from scratch. We recognize the target problem is most acute. We have no personnel with experience in the fabrication of uranium. We will have to organize a group as quickly as possible and get information from Argonne and other places that have the experience and then get the men and push that side of it as rapidly as we can. That is our most acute problem.

Brobeck - Alex Hildebrand will be working here for CRDC.