P. Germain

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Notes by P. Lapostolle on R.F. Separators.

1) Brookhaven National Laboratories.

Since Kiesling has left BNL, J.P. Blewett and E.D. Courant are the only ones concerned with the R.F. separators at the moment.

The present ideas are still the same as the ones given in Blewett's lecture at the CERN Symposium (Sept. '59) or BNL internal report JPB/JDK-1 of August 18, 1959.

The scheme proposed does not include any beam transport or focusing device and is particularly concerned with R.F. structure for deflecting very fast particles.

E.D. Courant intends to study a more elaborate proposal including a focusing system and to estimate some acceptance figures for it.

J.P. Blewett intends to start model tests of the R.F. structure he has proposed as soon as he can be free from the AGS development. The merit of the structure proposed is the simplicity of construction making use of standard wave-guide elements assembled together. The important parameter to measure in the structure would be deflecting field/$(\text{R.F. power})^{1/2}$, parameter which one should like to get as big as possible; the method to measure this parameter has not yet been fixed.

2, Lawrence Radiation Laboratory, Berkeley.

M.R. Good who had made a report (UCRL 8929) on a radiofrequency separator for high energy particles on October 28, 1959, has now left Berkeley.

The groups who work on the Bevatron and could need some more efficient separators than the present electrostatic ones are placing very much concern in the experiments carried out by J.J. Murray on glass electrodes for D.C. separators (see the report of J.B. Adams)

H. Hereward is the only one taking interest in R.F. separators. Since he wrote his note (PS/Int. TH 58-8) on the subject, he has not thought very much about the R.F. separators. However, he still considers that the structure he

proposed then with the proviso of using a "strapping" device to splitt the modes is an interesting one to study. The aberration-free structure he also proposed is slightly more doubtful; he found the wave as the result of a convenient circular superposition of the rectangular waves (in a way very similar to the one which leads from an ordinary plane wave to a cylindrical one).

3. Stanford Laboratory.

W. Panofsky is very interested in the R.F. separators and Helm and Phillips are part-time working in the field.

The device described by Panofsky at the CERN Symposium, Sep . 1959, proves to be satisfactory for the present electron linear accelerator. But they are looking to extend its range of application to higher energies either for the present or future 10 to 30 GeV proton synchrotrons or for the 2-miles, 45-GeV linear accelerator if it is built.

There are at present two lines of approach.

a) R.F. structures. Phillips is doing some tests on the cavity used in the present R.F. separator: field measurements in the cavity and holes and Q measurements in order to explain the discrepancy of 0.5 found between theoretical and experimental deflections (HEPL 171).

R. Neal has done tests on the excitation of higher modesof TM_1 type in an ordinary disk loaded electron linac structure (HL Report No. 581) and Helm has carried out computations on this type of structure. It turns out from these studies that in the presence of an iris a pure TM_1 mode cannot exist but is always entangled with some TE_1 mode; however, one could expect a substantial deflection from such a wave. For a standard 10 cm wavelength structure the frequency range for that mode would be around 4000 Mcs and the dispersion characteristic is found experimentally very similar to the one of the standard TM mode.

A simple scaling of the standard linac sonstruction using the same technique is then considered as a very promising type of structure.

b) Separator scheme. W. Panofsky had already suggested in CERN (Note SC/7855) an arrangement using two 10 cm cavities for the separation of 10 GeV/c K mesons.

Another slightly different proposal (HEPL 181) has been made by B. Richter for separating π and K mesons of 10 GeV/c produced by an electron linac or a synchrotron.

The frequency proposed in these schemes is always 3000 Mcs but a big 1200 Mcs klystron delivering about 10 Mw on 10 μs pulses has also been designed in Stanford by Chodorov and is now manufactured by LITTON industries.

4. General Conclusions.

Nowhere a very big effort has been yet devoted to R.F. separators; but there are various reasons for that:

- in Brookhaven there is no time available until the AGS is completed.
- in Berkeley the Bevatron requirements are probably likely to be fulfilled by the glass technique if it turns out to be successful.
- in Stanford the need will only arrise with the two-miles linac if it is built.

However, even if there is not yet any specific experiment planned requiring an R.F. separator there is no doubt that the need will arise soon and the problem must be studied in CERN.

Two different directions of research should be taken:

a) R.F. structures including the choice of an optimum line or cavity and also studies about the maximum permissible R.F. field or R.F. breakdowns and possibly a consideration of low temperature techniques.

b) Separator scheme including design of momentum separation. beam transport and focusing system and estimation of the possible contamination by slits and apertures and comparison with D.C. separation for various ranges of momentum and different particles.

Distribution:(closed)

P.S. Parameter Committee members
Machine Group Committee

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