7. The Design of a New High Speed Scaling Circuit

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With the development of nuclear research it becomes neccesary to construct a high speed and a more reliable scaler suitable for high rate of counting. For this purpose we have analysed the operation of the well-known Eccles-Jordan trigger circuit, which is generally used.

According to our studies, vacuum tubes with high *gm* and small interelectrode capacitance, and low plate resistance are suitable for the high speed scaling circuit. However, one can not obtain large output voltage in this case. We should especially take care to avoid the over driving in such a circuit, since the plate over driving causes oscillation in the circuit, and the grid over driving changes the grid bias and decreases the counting power of the circuit. Concerning the reliability of the scaling circuit, we analysed rigorously its negative resistance characteristic and found the following results. The reliability of the trigger circuit essentially depends upon its symmetrical condition, which affects also the resolving power. By the use of pentodes resolving power and reliability can be improved to a great extent. Further, we can simplify the circuit considerably by the application of dynatron tubes, because they have negative resistance characteristic in the curve of plate voltage *versus* plate current.

For this reason mentioned above, we have designed a high speed scaling circuit, called S-D-1 scaling circuit, using dynatron tubes. Further studies, however are now in progress.

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8. The Pumping Speed Ratio of H_2 to D_2 of Oil Diffusion Pump

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It has come into question that the pumping speeds of the oil diffusion pump for light gases do not agree with Goede's theory. The reason of this discrepancy was ascribed by several workers to the diffusing back of light gases from fore vacuum side to high vacuum side through the jet of the diffusion pump. To observe this back diffusion phenomenon more precisely, we measured and compared the speeds especially for hydrogen and deuterium which seemed to give the least relative errors in the experimental results.