

To: E.L. Ginzton, K.G. Dedrick, J.H. Jasberg, C.B. Jones, R.B. Neal

From: T. F. Turner

Subject: PROJECT M MODULATOR COMMITTEE MEETING

December 4, 1958.

1. This committee meeting was held from 3 to 5 p.m. on November 25, 1958. Present were: Dedrick, Jones, Jasberg, Neal and Turner.

2. The meeting was called primarily to define the Modulator Committee's "duties and objectives". It is now proposed that the committee have as an objective the examination of several alternate modulator systems in order that the choice of an "optimum" system may be made. It was agreed that the criterion for an optimum system would be minimum "present worth" computed on the basis of installation, operating, and maintenance costs over a ten-year period and using a fixed interest rate (to be supplied by Mr. Pindar).

3. All the systems to be considered must meet the same performance specifications. Mr. Neal was requested to furnish the following information as soon as possible: pulse amplitude, length, rise and decay times, ripple, overshoot and droop, pulse repetition rate and whether fixed or variable.

4. The remainder of the meeting was given over to a discussion of various possible types of modulators and their features. For the record, the table below gives a fair summary of the alternatives considered:

<u>Type</u>	<u>Remarks</u>
Hard Tube	Not practical at these power levels because no switch tube is available for the voltages and currents involved. Even if tube available, power consumption of unit is excessive.
Line Type	We have the most experience with this type. Unit is comparatively efficient. Main weakness is the switch which may be either a thyratron (non presently suitable), a spark gap (requires maintenance and is unstable), or a magnetic core (under investigation). Energy storage capacitors are expensive and could be improved in reliability.
Pulsed Anode or Grid within Klystron	This system combines hard tube modulator with tube load. While present efforts at 100 kv are successful, much development would be required before possible to meet M specifications.
Pulse Synthesis	While it is possible to synthesize a pulse directly from its Fourier components, such a system could not be developed in time to meet M requirements.
Combination System	It may be desirable to consider various combinations, such as supplying a line modulator with magnetic switch from a synthesizer which merely delivers the correct charging waveshape.

5. For the present the Line-Type modulator looks like the best alternative.

The possibility of a magnetic switch is being actively investigated by Dedrick and Turner.

It is planned to submit specifications for a suitable thyatron to various competent manufacturers for an estimate of development possibility and cost in the near future.

Spark gap redesign will be considered when manpower is available. The Blumline and Darlington circuits should be re-evaluated for M application.

Turner reported briefly on a new type of pulse transformer geometry which has been tested at low power and promises better performance at lower cost.

6. Various types of distribution systems, monitor and control systems, etc. were discussed briefly. Additional specifications relating to these matters will be required as the machine philosophy is developed.

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