

MEMO NO. 4

KLYSTRON SPECIFICATIONS MEETING

February 4, 1959

Present: Ginston, Soderstrom, Sonkin, Jasberg, Legacz

1. Possibility of Use of Permanent Magnets on M Klystrons.

Because of the lack of manpower, no active work is being done on permanent magnets at the present time for the 23 Special Klystron. When a successful 23 Special tube has been tested with electro-magnets, careful magnetic field measurements will be made and Arnold Engineering will be contacted with a view of obtaining a permanent magnet which will duplicate this magnetic field.

In the meantime, additional data is being accumulated from Mark III Processing Station regarding the operation of the present Mark I klystrons at constant magnetic field and varying power output. The results up to now are basically the same as those reported in the memo of December 17, and no further comments will be made about this until additional data has been accumulated so statistical information is available.

It was also decided that the work which Varian has done on V-37 focusing by periodic magnet focusing should be looked into. The obvious advantage of periodic magnet focusing is the weight and cost of the magnet itself. It is my feeling that this particular aspect of the work will not be considered seriously, that is, no experiments will be performed on this phase of the work for at least another nine months. With the information obtained from Varian on the periodic focusing of the V-37, it should be possible to prepare a memo to be attached to the specifications of the tube for future reference. Jasberg and Turner are appointed as a subcommittee to obtain the information.

2. The frequency of the klystron is still fixed at 2856 megacycles (Stanford megacycles).

3. The question of most desirable pulse length could not be settled at this time. It will depend upon the phasing method of the machine, and additional information will be obtained from R. Neal on this as soon as possible. This new information will be introduced in the revised version of the klystron specifications to be issued about February 15.

4. The Specifications Committee of Project M has definitely specified the repetition frequency of the machine. It will be 360 pps for reduced peak power operation, and 180 pps for full peak power operation.

5. The M Specifications Committee has come up with some requests regarding the peak power output of the klystron specifications.

Under the phase 2 operation of the machine, the klystron should be capable of operation at a peak power output of 24 Mw minimum. During the first phase of the operation, it appears extremely desirable from an economic standpoint that the klystron be able to operate at 12 Mw peak power output minimum with a guaranteed life of at least 2000 hours.

Under these conditions, the initial complement of klystrons would be 240 instead of 480.

Guaranteeing a minimum klystron life of 2000 hours at this peak power appears entirely realistic if we specify at this time that the klystron shall have two parallel output waveguides, each one operating at 6 Mw. The reason for this statement is as follows:

a. Considering the window life, each window would operate at a peak power of approximately 6 Mw. Industrial experience indicates that the window life at 6 Mw peak and 4 or 5 kw average should be 2000 hours or better.

b. Concerning cathode life, experience indicates that well-processed cathodes operating in sealed-off tubes will have a life in excess of 2500 hours if the current density does not exceed 3 - 5 amperes per square centimeter. At 12 Mw peak power output level, the current density at the cathode of the 23 special klystron will be approximately 4 amperes per square centimeter. It can also be stated that at present the Mark I cathode operating continuously pumped is approaching 2000 hours life. It is felt that the life of a cathode operating at a pinched-off tube will be undoubtedly higher than that of a continuously pumped tube. Accordingly, it appears to be safe to request a life of 2000 hours at 12 Mw peak provided the tube is equipped with a double output system.

6. The specifications will be rewritten to include the fact that the tube will have two output windows, that the tube will have five cavities, that the minimum guaranteed gain would be 50 db, under typical operating conditions, and the typical operating conditions are now 12 Mw and 24 Mw instead of 6 Mw and 22 Mw as in the previous tentative specification.

7. The specifications should be retitled: Tentative Specifications for General Planning Only.

8. The next meeting will consider some of the detailed physical properties of the proposed klystron: length, position of output waveguide, heater connectors, lead shielding against radiation, coolant supply, etc.

9. Discussions with R. Neal indicate that the rf pulse length should be set at 2.5 μ sec to compensate for the dispersion in the drive line; also, a gain of 50 db appears very adequate for the drive method considered at present.

J. V. Lebacqz
February 6, 1959.

Copies to: Members of the Klystron and Specifications Committees.