

June 24, 1959

To: E. L. Ginzton, R. B. Neal, J. Lebacqz, J. Jasberg, F. V. L. Pinder
 From: T. F. Turner
 Subject: M Modulator Switch Investigation

1. At the suggestion of Dr. Ginzton, we are making an extensive search of the country to find out which, if any, high power switches developed at other laboratories might be suitable for M, or at least reveal applicable art which could speed the development of a switch for M.

This memo is to report on the investigations undertaken so far, and those contemplated.

2.0 Thyratrons:

- 2.1 The best existing thyatron that is commercially available is the 1257B rated to hold off 40 KV and pass 2500 amperes. This is inadequate for our purposes but indicates that a successful thyatron could be developed in principal.
 - 2.2 We have no reliable way of estimating the probable life of a thyatron in our service at present. We are attempting to get information from T. Wiejek at Rome ADC on 1257 life in field installations in the hope that an educated guess of probable life can be made.
 - 2.3 On 6-22-59, Neal, Jasberg, Jones and Turner met with Engineering and management representatives of Kuthe division of I T and T, who were anxious to develop a thyatron specifically for this purpose. We outlined the necessary electrical requirements and more or less arbitrarily specified a minimum life of 2000 hours and a repairable type tube construction to them. They intend to develop a suitable tube with their own funds and will submit their estimate of the whole problem by about October 1. Jack Gordon, Chief Engineer Kuthe, A. K. Wing of ITT Research Labs, and Mr. Olrud representing Corporate Management attended.
 - 2.4 The chief engineer of Tung-Sol/Chattem, who also manufacture thyratrons, will be here some time in July. We will present the same problem to him at that time.
 - 2.5 GE has done some development work on tubes with nearly suitable ratings for the Signal Corps. The reports on this work will be obtained, and possibly the matter will be explored further with GE.
 - 2.6 Edgerton, Germeshausen, and Greer will also be contacted.
- ## 3.0 Spark Gaps:
- 3.1 On 6-23, Neal, Lebacqz, Jasberg and Turner visited Mr. Bill Baker, Bldg. 52, UCRL, Berkeley, and discussed with him the switch he has developed to hold off 30 KV and pass several megamperes for some pinch experiments.

This switch is described in detail in UCRL report S414 which is in hand and soon to be published in RSI. We were also given complete assembly drawings for the unit.

3.2 Very briefly, the gap operates at about 10 microns air pressure which results in less energy dissipation per pulse than for pressurized gaps and reduces wear. Deionization is of the order of 10 microseconds and jitter is a few millimicroseconds. Vaporized electrode material is cleverly removed from the teflon insulation by operating the gap above 10,000 amp/square inch where the teflon sublimates at an adequate rate to provide a new surface between pulses. This gap operates over a 30:1 voltage range.

Whether this approach will work for our application is not known, but an experimental gap of this type will soon be on trial.

3.3 Baker suggested that we talk to Don Hagerman and James Phillips at Los Alamos in regard to a promising gap design developed there. We understand this is a glass insulated three electrode vacuum gap used on Columbus.

3.4 The same group visited Sloan at UC. We were shown a staggered gap assembly using forced air and a sort of "travelling wave" trigger system. This type of gap will still require too frequent maintenance as it stands, but may lead to some useful development.

3.5 Contact has been made with Mr. Ed. H. Hulse, Head, Electronics Engineering Dept., UCRL, Livermore. Mr. Hulse is sending the following reports:

UCRL 5411 Development of Switching Components for Controlled Fusion Research.

UCRL 5290 An Electronically Triggered Mill-Micro Second Filter Spark Gap Switch.

LE 306-1 High Current Switch of Low Inductance.

In addition, he has invited us to visit during the week of 6-29 to discuss the problem in detail.

4.0 Ignitrons:

Hulse has indicated that new ignitrons may be suitable for our application. Nothing to report until we see him.

5. Hard Tubes:

Federicks, formerly at Rome indicates that some RCA Tetrodes are used by Air Force. We will get the information from Rome visit.

6.0 Exotic Switches:

Brobeck has placed Neal in contact with a midwestern company that claims to have a mercury switch using a dielectric igniter which is said to be applicable. We will wait till we see their proposal, if any.

7. Trips to be Made:

The following list is probably not complete, but represents the best information at the moment. The blanks in the chart below will be filled in as soon as possible.

Facility	Person(s)	Subject	Clearance Required	Notes
1. Livermore	Haise, Nish Craig	Gaps and ignitrons	none	
2. Rome	Tony Wiejek Ext. 71239	High power modulators (general)	Secret	Not avail- able on July 8
3. Ft. Monmouth		Thyratrons		
4. Syracuse GE		Thyratrons		
5. Lincoln	Bob Buttman	Modulators (general)		Buttman and Co. will be gone un- til July 25
6. Cambridge AFRC				
7. Princeton				
8. Los Alamos	James Phillips Don Hagerman	Gaps	?	Vacation un- til July 8
	M. Lovgert J. W. (Joe) Mather		None	Phoned 6-25 requested to visit before July 1, ar- range gate pass