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August 4, 1975

To: G. B. Kistiakowsky and T. J. Bacher  
From: R. W. Williams  
Subject: Proposed photographic betatron

PUBLICLY RELEASABLE  
LANL Classification Group  
*Mark*  
6-5-98

FINAL DETERMINATION  
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L. M. Redman  
NOV 06, 1980  
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Greisen's memo of 27 June summarized the discussion of the interim committee on the advisability of acquiring a betatron to be used for "differential" experiments. It is possible now to elaborate somewhat on that memo, despite the rather uncertain state of the over-all program of the laboratory.

A. With regard to the use of such an instrument some types of experiment in which it would be valuable have been suggested by Peierls, Farratt, and Tuck.

1. Structure of detonation and shock waves. This type of experiment should lead to better equations of state, which are the most uncertain feature of the implosion calculations. Experiments at P-site with flash X-ray techniques have been successful, but are limited in accuracy by the finite size of focal spot, the finite and variable length of the pulse, the variable quality of the radiation, and the limitation on charge size. Penetration through heavy materials is also an important advantage of the betatron.

2. Use of better resolving power and larger scale in the observation of the formation of jets at free surfaces. This is particularly important for the hollow implosion. Jets in cracks may also require study.

3. Extension of the P-site work in Monroe jets. These may have importance for the Super, as well as for initiator design.

4. It may prove possible, by film density measurements, to make direct measurements of density in detonation and shock waves.

5. One of the chief advantages of such an instrument should be its flexibility, and the probability therefore that it will find application in problems which cannot now be foreseen.

B. These experiments would require an installation quite different from the present K-site one, since the betatron protection should be designed to bring a charge of perhaps 25 pounds as close as possible to the target. In a memo to Bacher, 30 July, Neddermeyer, Kerst, and Ayres have outlined the present status and proposed program of the K-site betatron. It is clear that this program will be very important to the implosion program; and also that a modification of K-site to encompass the experiments described above would interfere hopelessly with this program.

Kerst has pointed out that intensity considerations require that a photographic betatron operate at the highest available energy; i.e., 20 MeV. Even so, intensity may be a problem if it proves necessary to have the film more than 6 feet from the target. Recent model shots by Kerst, of a 6-inch aluminum sphere with 1-inch tuballoy core, film at 4 feet, looked somewhat promising.

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The surmise of a 25-pound charge limit arises from this  $1/r^2$  intensity limitation.

Rw: jr

R. W. Williams

cc. Oppenheimer  
Peierls  
Kerst  
Heddermeyer  
Parratt  
Tuck  
Greisen

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PER DOC REVIEW JAN. 1973**

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