



CM-P00046163

PH III-74/14  
13 March 1974

To: Physics III Committee.

From: A. M. Habbestad, R. A. Esterlund, and P. Patzelt,  
Institut für Kernchemie, D-3550 Marburg/Lahn, Lahnberge,  
West Germany.

Subject: Proposal for Radiochemical Studies of High-energy  
Proton-induced Reactions at CERN I.

General Background: Recent work reported by L. Remsberg<sup>1)</sup> on the angular distribution of  $^{24}\text{Na}$  (and other light fragments) from the interaction of 28-GeV protons with targets of gold and uranium has shown that under the conditions cited the light fragment  $^{24}\text{Na}$  preferentially leaves the target in a sideways direction ( $90^\circ$  to the beam). This is in striking contrast to the results of earlier studies<sup>2-3)</sup>, where the angular distributions of light fragments have exhibited pronounced forward peaking. Examples are the work of J. B. Cumming et al.<sup>2)</sup> who studied  $^{24}\text{Na}$  from bismuth irradiated with 2.9-GeV protons, and A. M. Poskanzer et al.<sup>3)</sup> who measured angular distributions for all particle-stable nuclei with A less than 15 from the interaction of 5.5-GeV protons with uranium.

The information about angular distributions of heavier fragments emitted in the interaction of high-energy protons with heavy targets is limited. V. P. Crespo et al.<sup>4)</sup> studied angular distributions and other recoil properties for products in the fission mass-region from uranium irradiated with 2.2-GeV protons, and V. P. Crespo et al.<sup>5)</sup> also measured the angular distribution of  $^{149}\text{Tb}$  from gold at the same proton energy.

Since the angular distribution for the light fragments changes in form with increasing proton energy, it seems obvious that the behavior of heavy fragments would be of interest also. A study of the angular distributions of nuclides in the lanthanide region, produced from the interaction of protons in the energy region of 25 GeV with heavy targets would yield additional valuable information on the processes taking place at this energy, and hopefully give increased knowledge about the reaction mechanisms involved.

Proposed Experiment: Investigation of the angular distribution of products in the lanthanide region from irradiation of gold and uranium with 20 to 28 GeV protons. We will use a thin-target thick-catcher recoil-technique combined with chemical separation of the lanthanides from the catchers.

Machine-time Requirements: Four two-hour bombardments (gold and uranium each twice) PS in 1974-75.

Experimental Requirements: The irradiated target and catchers will be transported for chemistry and counting to Marburg, so there will be no need for laboratory space or equipment at CERN.

References:

- 1) L. Remsberg, talk presented at VIIth European Conference on Physics and Chemistry of Complex Nuclear Reactions, Ginosar, Israel, 31 Dec 1973 to 4 Jan 1974.
- 2) J. B. Cumming, R. J. Cross Jr., J. Hudis & A. M. Poskanzer, Phys. Rev. 134 1B, B167, 1964.
- 3) A. M. Poskanzer, G. W. Butler, and E. K. Hyde, Phys. Rev. C, Vol. 3, 882, 1971.
- 4) V. P. Crespo, J. B. Cumming and A. M. Poskanzer, Phys. Rev. 174, 1455, 1968.
- 5) V. P. Crespo, J. B. Cumming and J. M. Alexander, Phys. Rev. C, Vol. 2, 1777, 1970.