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**EASTERN KENTUCKY UNIVERSITY**  
**Department of Physics and Astronomy**  
**Study of Proton and Neutron Activation**  
**of Metal Samples in Low Earth Orbit**

**October 26, 1984**

**Quarterly Technical Report**

**Contract # NAS8-35180**

**(Principal Investigator: C. E. Laird)**

**Prepared for**

**George C. Marshall Space Flight Center**  
**Marshall Space Flight Center, Alabama 35812**

**(NASA-CR-171183) STUDY OF PROTON AND**  
**NEUTRON ACTIVATION OF METAL SAMPLES IN LOW**  
**EARTH ORBIT Quarterly Technical Report**  
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**EASTERN KENTUCKY UNIVERSITY**

**Richmond, Kentucky 40475**



## QUARTERLY REPORT

During the last quarter of activity under NASA Contract NAS8-35180, as extended, the following activities have been undertaken:

1. the analysis of the gamma-ray spectra taken from samples flown in Spacelab I has been continued with the analysis of twenty additional spectra supplied by the Space Science Laboratory.
2. the search for and review of neutron and proton activation cross-sections needed to analyze the results of the LDEF activation measurements has been continued. Additional calculations of neutron induced activation for the LDEF samples are being done as relevant cross sections are located.
3. the data analysis plan for the LDEF and Spacelab II samples is continually under development.
4. the measurement of relevant cross-sections has begun with activation of samples of V, Co, In, and Ta at the Indiana University Cyclotron Facility.
5. the preparation of an extended gamma-ray calibration source continues through the development of a proper technique to accurately deposit equal quantities of radioactive material onto a large number of points on the source.

Copies of the analyses of the most recent spectra taken from the Spacelab I samples will soon be sent to Dr. G. Fishman at MSFC. These analyses will be performed with the gamma-ray analysis program SAMPO. This should conclude the analyses of the activation of the Spacelab I samples.

The search for neutron and proton activation cross section continues. A tabulation of excitation functions for Co, Ni and Ta up to 85 MeV has been obtained from F. J. Haasbroek, of the National Physical Research Laboratory, Pretoria, South Africa. This tabulation confirms the values deduced from the report of the South African group referred to in the last report. Unfortunately, no other cross sections were forthcoming from this group.

Inquiries have been made to locate proton and neutron reaction cross section which have not been published. Dr. S. Raman of Oak Ridge National Laboratory reported that he knew of no such data and suggested that Brookhaven National Laboratory be contacted. Of course, Brookhaven had previously been contacted and the data base available there has been previously obtained. Informal contacts with Dr. Phillip Young of Los Alamos National Laboratory and others has not yet yielded any new cross-sectional data. The most useful data has come from a copy of the dissertation of Dr. Michael Sadler which was supplied by Dr. Tom Ward at IUCF. Other contacts will be made in the following quarter.

The measurement of relevant cross-sections with a nuclear accelerator has begun with the cooperation of Dr. Tom Ward of

Indiana University Cyclotron Facility. Samples of V, Co, In, and Ta have been activated at proton energies of 197 and 200 MeV. The gamma rays emitted from these samples have been counted with a Ge(Li) spectrometer system. Approximately fifty spectra have been stored on floppy diskettes and the most efficient way of transferring these to the VAX at Eastern Kentucky University is presently being determined. Following preliminary analyses of these spectra, further activations will be performed.

During the next quarter activities will continue on items 2-5 previously listed. Further considerations of the results of item 1 will be made to ascertain whether or not additional analysis is needed.

Below is a summary of expenditures (to the nearest dollar) under this extended contract as of October 30, 1984. The expenditures to date are in line with the work completed and the contracted funds are sufficient to complete the contract.

Account Name	Allocation	Disbursed
Salaries-Faculty	6,461.00	4,661.00
Salaries-Student	3,225.00	2,804.00
Employee Benefits	1,163.00	1,068.00
Travel	1,160.00	575.00
Duplicating and Reproduction	75.00	1.00
Educational Supplies	80.00	9.00
Computer Usage	1,262.00	511.00
Indirect Cost	1,074.00	770.00
Total	14,500.00	10,399.00