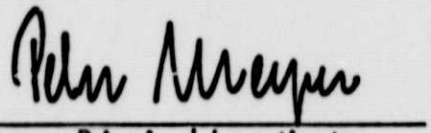
FINAL REPORT ON CONTRACT NAS 5-9096 WITH THE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

OGO-5 Experiment E-09
Cosmic Ray Electrons
Starting Date November 18, 1964

Submitted by
Laboratory for Astrophysics and Space Research
Enrico Fermi Institute
University of Chicago
Chicago, Illinois 60637

June 5, 1975



Peter Meyer, Principal Investigator
Professor of Physics
Department of Physics and Enrico Fermi Institute
Telephone (312) 753-8543

FINAL REPORT ON CONTRACT NAS-9096. EXPERIMENT E-09 ON OGO-5 COSMIC RAY ELECTRONS

The experiment E-09 on the OGO-5 spacecraft was designed and provided by the University of Chicago, the investigators being P. Meyer, C. Y. Fan, and J. L'Heureux. The instrument had a most distinguished history on the spacecraft, surviving from launch in 1968 without any failures, the life of the satellite and providing throughout its life a continuous and uninterrupted wealth of data that have led to a sizeable number of new discoveries.

Experiment E-09 was aimed at the study of the spectrum of cosmic ray and solar electrons in the 10 - 200 MeV energy range, a range that is very difficult or impossible to investigate from within the atmosphere even at balloon altitudes. It was the first, and at this time remains the only experiment capable of covering this energy range of electrons.

Rather than describing in detail the science that has resulted from the work with the OGO-5 instrument I shall refer to the published literature. The first measurement of the interplanetary cosmic ray electron spectrum from 10 to 200 MeV appeared in 1969 (C. Y. Fan, J. L'Heureux and Peter Meyer, Phys. Rev. Letters 23, 877, 1969), and the details of this study were published in 1972 (J. L'Heureux, C. Y. Fan and P. Meyer, Ap. J. 171, 363, 1972).

The first work on the solar emission of 10 to 200 MeV electrons was published in the proceedings of the 11th International Conference on Cosmic Rays (D. Datlowe, J. L'Heureux and P. Meyer, Acta Physica Acad. Sci. Hung. 29, Suppl. 2, 643, 1970). A detailed investigation of 30 flare electron spectra, intensity-time dependences, onset times, the derivation of the interplanetary diffusion coefficients constituted the thesis work of my student Datlowe (Dayton Datlowe, Solar Physics 17, 436, 1971).

Beginning in 1968 we investigated the modulation of the electron component. Modulation studies of electrons are of major importance since only for this component can the interstellar spectrum be estimated from radio observations. The OGO-5 data were used in addition to balloon studies and have contributed to a series of publications which deal with the determination of interplanetary diffusion coefficients and their application to the nuclear components (P. Meyer, P. J. Schmidt and J. L'Heureux, Proceedings of the 12th International Conference on Cosmic Rays 1971, p. 548; P. J. Schmidt, J. Geophys. Res. 77, 3295, 1972; G. Fulks, P. Meyer and J. L'Heureux, Proceedings of the 13th International Conference on Cosmic Rays 1973, Vol. 2, p. 753; G. Fulks, J. Geophys. Res. 80, 1701, 1975; J. L'Heureux and P. Meyer, Proceedings of the 14th International Conference on Cosmic Rays, 1975).

Two very recent developments have been investigated using our OGO-5 instrument. (1) The discovery of γ-ray bursts was used for a search of such events in our detector. Since our count rates are integrated over relatively long times, our instrument is not very sensitive for these short duration bursts. One of the largest such bursts was however found and reported (J. L'Heureux, Ap. J. Letters 187, 53, 1974). (2) The observation of a large flo[illegible]nergetic electrons from Jupiter's magnetosphere has opened the question on Jupiter's con[illegible]oution of the electron flux observed at Earth. We are further investigating the quiet time increases of low energy electrons in an attempt to discover a correlation with Jupiter (J. L'Heureux and P. Meyer, Proceedings of the 14th International Conference on Cosmic Rays 1975).

In summary, experiment E-09 on the OGO-5 spacecraft has been a most successful venture that has provided a large amount of new and significant results. We wish, at this time, to again express our thanks to the large number of people in various organizations who were instrumental for the success of the OGO-5 spacecraft.