

## XII. GEOPHYSICAL RESEARCH\*

### Research Staff

Dr. G. W. Grams  
Dr. W. D. Halverson

### Graduate Students

S. J. Bless  
J. B. DeWolf

D. F. Kitrosser  
H. C. Koons

### RESEARCH OBJECTIVES

The Geophysics Research Group suffered a loss in the death, in July 1967, of Professor Francis Bitter. In the last period of his life Professor Bitter had initiated experiments to study the effects of pulsed, intense magnetic fields and of the resulting pressures on metallic conductors. Preliminary results on the achievement of megagauss fields have been reported;<sup>1, 2</sup> the experiments will continue.

Our research more specifically directed to problems of interest in the atmospheric sciences, during the past year, has also yielded notable results:

1. Spectral analyses of the laser light scattered from atmospheric molecules and aerosols, carried out with a Fabry-Perot spectrometer of relatively low resolution have yielded the ratio of molecular-to-aerosol component in the laboratory air. This work will continue in the direction of increased resolution.

2. Measurements of the electron temperature and density in a reflex discharge have been obtained with the aid of a cw laser and synchronous detection schemes. Efforts are being made, toward obtaining spectra at small angles showing collective effects.

3. Analyses of the results of previous optical radar experiments (in particular, the 1966 noctilucent cloud observations) have continued.

4. Observations of OH air glow radiation in the (8-3) vibrational rotational band have continued, and a trend of variation in the intensity and excitation temperature throughout the night, possibly connected with the fluctuations of ozone, has been found.

G. Fiocco has spent the fall term on leave at the European Space Research Institute and the Euratom-Cea Laboratorio Gas Ionizzati, in Frascati. Collaborative research has been started with these, as well as other Italian, groups. He has participated in the design of an elaborate interferometer with on-line computer and of a high-aperture spectrograph, in optical studies on the time development of fog and its diffusion, and in plasma-scattering experiments.

The research outlined here will continue during the coming year. One specific aim would be to implement an optical radar for spectral studies of the atmospheric echoes; of particular interest is an absolute measurement of the ratio of the aerosol-to-molecular component, and of the motion of the neutrals (including turbulence, as indicated by conditions of anomalous diffusion).

G. Fiocco

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References

1. F. Bitter, S. J. Bless, and G. Fiocco, "Preliminary Experiments with a Fast Z-pinch Capacitor Discharge: The Generation of High Pressures in Solids," Quarterly Progress Report No. 86, Research Laboratory of Electronics, M.I.T., July 15, 1967, pp. 53-57.
2. F. Bitter, "Histoire des Champs Magnétique Intenses, et de leur Contributions à la Physique" (Proc. International Conference of the Centre National de la Recherche Scientifique on 'Intense Magnetic Fields, Their Production and Applications', Grenoble (Isère), France, September 18-21, 1966), pp. 19-29.