THE COVERAGE AND SAMPLING LIMITATIONS OF LIDAR REMOTE SENSING EXPERIMENTS FROM THE SPACE SHUTTLE

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ABSTRACT

Various atmosphere remote sensing experiments using LIDAR are now being considered for Space Shuttle. One of the more practical, from a signal point of view, is a cloud LIDAR which could supplement passive observations from satellites. It might, for example, map thin cirrus to aid in the reduction of infrared temperature or constituent soundings. Signal/noise analyses of a single pulse measurement in several studies from Stanford Research Institute have defined achievable LIDAR parameters, but LIDAR experiment feasibility depends on additional factors as pointed out so well for satellites by Evans, Wiegman, Viezee, and Ligda in 1966. The dual requirements of coverage needed to support the satellite radiometer observations and of representative sampling in the process impose a stringent limitation on all Shuttle LIDAR remote sensing experiments. The many ramifications of these requirements during both day and night are explored here. In particular, they are shown to call for a repetition rate, and hence, electrical power for a conventional LIDAR which is, in many cases, far in excess of the Space Shuttle allotment to LIDAR experiments; even at night and for state-of-the-art improvements in filter and detector technology. If 16 km wide ribbon coverage is acceptable, night LIDAR observations from the Space Shuttle are quite feasible.

**On leave from the Department of Physics and Astronomy, University of Maryland, College Park, MD 20742

Work supported by NASA Grant NGR-47-003-087.