

CHARACTERISTICS OF TWO GAMMA-RAY SURVEY METERS  
USED FOR INFLIGHT DOSE EQUIVALENT RATE MEASUREMENTS

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Abstract

Survey meters as developed for terrestrial environmental radiation dosimetry are recently also used for inflight measurements of cosmic radiation. In order to interpret the measured data correctly the characteristics of these instruments in a cosmic ray environment must be considered. The present investigations deal with established equipment, i.e., (a) a high pressure ionization chamber dose equivalent rate meter (Reuter-Stokes RSS-112) and (b) a scintillation dose-equivalent rate meter (Halle DLM 7908). Both equipment was applied during an extended GSF research programme in 1990/91 on "Radiation Exposure of Civil Aircrews and Passengers" on board of passenger aircraft of Lufthansa German Airlines (Boeing 747-400) for the major intercontinental flight routes.

The equipment was studied with respect to the following characteristics: Inherent background; linearity of the readings in low dose rate photon fields; response to cesium 137 gamma rays, high energy photons, high-energy charged particles and neutrons.

It is shown that each parameter may, under laboratory conditions, lead to significant differences in the dose equivalent rates as indicated by the two instruments. After evaluation and application of appropriate correction factors however the dose equivalent rates can be brought into good agreement. For completeness, the influence of the proposed corrections on the dose equivalent rates is quantified for cosmic ray field conditions as found on flight altitudes during the GSF inflight programme.