ABSOLUTE INTENSITIES IN THE SOLAR X-RAY SPECTRUM NEAR MINIMUM ACTIVITY

J.N. VAN GILS and W. DE GRAAFF
Space Research Laboratory, Utrecht, The Netherlands

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Abstract. Rocket measurements of absolute intensities in the solar X-ray spectrum on November 4, 1964 around 16:35 UT yield the following results: $1.8 \times 10^{-2}$ erg cm$^{-2}$ sec$^{-1}$ (wavelength band 44-60 Å); and $1.5 \times 10^{-3}$ erg cm$^{-2}$ sec$^{-1}$ (wavelength band 8-15 Å). These values were obtained under nearly quiet minimum conditions of the sun.

Solar X-ray intensities were measured in the wavelength bands between 8-15 Å, and between 44-60 Å, during a rocket flight on November 4, 1964. The measurements were carried out with proportional photon counters on board a Véronique rocket, which was launched by the French National Centre for Space Research (CNES) at Hammaguir in Northern Africa (lat. 31° N, long. 3° W), at about 16:35 UT. Energy discrimination between the two bands was achieved by means of counter efficiency and pulse amplitude discrimination (Figure 1).

During the time of launch, the sun was nearly quiet, as is indicated by the Fraunhofer Institute map of that date, by K3 spectroheliograms, by magnetic observations, and by radio observations (Solar-Geophysical Data, December 1964). Furthermore, the measurements took place close to solar minimum-activity conditions, as follows from the work of LANDINI, Russo, and TAGLIAFERRI (1967), who compared the flux of the Solar Radiation satellite 44-60 Å photometer with radio fluxes at 20 and 10.7 cm. According to these results, the weekly average flux in the 44-60 Å band in the first week of November, 1964, was about 35% higher than the minimum value recorded during the months May-August 1964. It follows that the present results can be regarded as deviating only slightly from those for solar minimum quiet conditions.

Measurements were taken at various altitudes between 50 and 153 km, according to the spinning motion of the rocket of about two revolutions per minute. The results for one of the counters are shown in Figure 2, giving the number of photons in each wavelength region counted per rocket revolution, as a function of altitude. The results of the other counter, which seemed to be influenced by an apparent solar uv-flux penetrating to below 50 km of altitude, were rejected.

Extrapolation of the results to the top of the atmosphere was performed with the aid of atmospheric tables given in CIRA 1965. For the conversion of count rates into energy fluxes assumptions had to be made about the energy spectrum of the incoming radiation. In the long wavelength region from 43.7-60 Å, the line-emission spectrum observed by AUSTIN et al. (1966) was used, according to which most of the intensity.
Fig. 1. Total quantum counting efficiency, including transmission through 6.4 μ mylar window, absorption in 125 cm.cm Hg of argon gas, and pulse amplitude discrimination at 8, 15, and 45 Å, for proportional counter flown in Véronique rocket on November 4, 1964, given as a function of wavelength.

Fig. 2. Number of photons counted per rocket revolution, given as a function of altitude.