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Have the Diffuse Cosmic X-rays an Anisotropic Component?

We have recently shown[1] that if one assumes that the far-infrared radiation[2] is galactic, then inverse Compton scattering of these photons with cosmic ray electrons would explain the flux and the energy spectrum of diffuse X-rays. We also predicted a large anisotropy which seemed to be at variance with experimental data which indicated that diffuse X-rays are isotropic within about 10 per cent. Recent measurements by Cooke, Griffiths and Pounds[3], however, now present evidence in support of the existence of anisotropy. They observed excess X-rays from the region of the galactic equator in the 1·4 to 18 keV region with an intensity of 0·3 photons $(\text{cm}^2\ \text{s rad})^{-1}$ near $l = 260°$, increasing to 0·5 near $l = 300°$ in the Centaurus region. Perhaps these results indicate that the diffuse X-rays result from two separate mechanisms, one producing an isotropic component and the other an anisotropic component! Thus, in the light of these new results, we feel it is worth while to look more closely at the predictions of our model regarding anisotropy. The X-ray flux I is directly proportional[1] to the integration path-length L. Restricting our present discussion to the galactic equatorial plane corresponding to the measurements of Cooke *et al.*[3], it follows by simple geometry that the X-ray flux at a longitude l, $I(l)$ say, is proportional to

$$\frac{L}{R} = \frac{a}{R}\cos l + \left\{1 - \left(\frac{a}{R}\right)^2 \sin^2 l\right\}^{1/2} \qquad (1)$$

where R is the radius of the galaxy and a is the distance from the Earth to the centre of the galaxy. Taking $a/R = 2/3$ we obtain

$$I(300°)/I(260°) = 1·8 \qquad (2)$$

in good agreement with the value of 1·7 obtained by Cooke *et al.*[3]. We also obtain

$$I(350°)/I(260°) = 2·6 \qquad (3)$$

to be compared with the experimental upper limit[3] of 3·3. This gives us added confidence in our model, but it is

clearly desirable to have much more experimental confirmation of the anisotropy measured by Cooke *et al.*[3].

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