

Chapter 14, The Million Degree Solar Corona, 1945-1946

Joe Pawsey and the Founding of Australian Radio Astronomy- Early Discoveries, from the Sun to the Cosmos

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ESM_14.1.pdf: Text of Pawsey's second report from August 1946

On 14 August 1946¹ Pawsey wrote a second report summarising his conclusions as he prepared for a joint paper with Martyn:

- (1) Measured intensities show a skew distribution with a very sharp cut-off on low side.
- (2) An explanation is that there are two causes at work simultaneously: (a) one with a wide range of random variations and of symmetrical distribution [the solar enhanced emission associated with sunspots]; (b) one with an approximate steady level. Since the level cannot be less than the steady level, the skew distribution results in the combination. [Fig. 14.1.1 shows Pawsey's sketch with the top component "a", middle is component "b" and bottom is the observed distribution.]
- (3) We associate the steady level with thermal radiation and the fluctuating one with phenomena associated with sunspots.
- (4) The value of the steady level is about 10^5 Jy. This corresponds to blackbody radiation from the whole disk at about 10^6 K [for a 30 arcmin sun].

D.F. Martyn has pointed out this corresponds to predictions from astrophysical data ... [Pawsey then presented the references to the results of Alfvén, Baumbach and Edlén² that summarised the optical evidence for a million-degree corona].
- (5) Further evidence for this hypothesis is given by the symmetrical [his emphasis] distribution of sunspot areas ... A correlation between sunspot areas and radiation is established but the distributions are dissimilar. This suggests another cause.

¹ NAA C3830 A1/1/5 Part 1

² For example, B.Edlén and P.Swing, "Term Analysis of the Third Spectrum of Iron (*Fe* III)", 1942, and S. Baumbach, "Strahlung, Ergiebigkeit Electronendichte der Sonnenkorona", 1937.

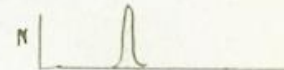
1. Measured intensities show a skew distribution with a very sharp cut-off on low side - See histogram.

2. An explanation is that there are two causes at work simultaneously.

(a) One with a wide range of random variations and of symmetrical distribution.



(b) One with a steady level (approx.).



Since the level cannot be less than the steady level the skew distribution results in the combination.

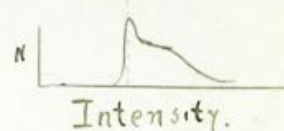


Fig. 14.1.1 Pawsey's sketch of the wide range of intensity observed at 200 MHz. The top is the range of full intensities associated with the enhanced emission related to sunspots, the middle is the quasi-steady level and the composite curve is shown at the bottom. From "Notes on Evidence of Detection of Million Degree Thermal Radiation from the Sun at 200 MHz", 14 August 1946. Courtesy of the National Archives of Australia: NAA C3830 A1/1/5 Part 1.