

PEM031-P01

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Lorentz transform of thermal radiation

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The Lorentz transform of thermal radiation has been investigated from the view point of relativistic statistical mechanics. It is well known the thermal radiation from a black body has Planck distribution since the beginning of the 20th century. Its spectrum observed from a moving body was investigated in connection with the CMB (Cosmic Microwave Background), and result shows the spectrum has so called "bi-directional temperature"(Bracewell and Conklin, 1968; Henry et al., 1968; Peebles and Wilkinson, 1968); this spectrum has been actually observed later.

The calculation in these studies was the result of pure mathematical manipulation, and it cannot give insight to thermodynamical meaning of the bi-directional temperature. There have been several attempts to understand the bi-directional temperature from the view point of thermodynamics in recent years, however, to the author's opinion, they are not successful enough to derive the bi-directional temperature in a self-consistent way.

In the present study the bi-directional temperature has been derived based on the inverse temperature four vector proposed by van-Kampen (1968) and Israel (1976). The inverse temperature four vector has, in contrast to the bi-directional temperature, clear meaning to understand relativistic thermodynamical processes. Therefore, it can provide a useful tool to understand thermal radiation processes in space.

Papers cited in the above can be found in the reference list of the following paper:
Nakamura, T.K., *Europhys.Lett.*88:20004,2009; arXiv:0910.0164

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Inverse Temperature Four Vector