

Q29a

An Investigation of Possible Electric Dipole Emission from Interstellar PAHs and/or Dust Grains, using AKARI

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Rapidly spinning dust particles having a permanent electric dipole moment have been shown to be a likely carrier of the anomalous microwave emission (AME), a continuous excess of microwave flux in the 10 to 90 GHz range. Tiny dust grains, possibly polycyclic aromatic hydrocarbons (PAHs), are one suspect for the AME carrier, due to their size and abundance. We present an analysis of the most recent AKARI/Infrared Camera (IRC) all-sky surveys (having Zodiacal light removed) due to the effective PAH band coverage of its 9 μm survey to investigate 98 AME candidate regions identified by the Planck Collaboration et al. (2014). We supplement AKARI data with Infrared Astronomical Satellite (IRAS) data, and Planck High Frequency Instrument (HFI) data at 857 and 545 GHz and carry out a modified blackbody fitting. We find a positive trend between the optical depth and AME. We find that estimates of PAH abundance based on 1) 9 μm intensity scaled by G0, and 2) Full dust SED modeling, both fail to show any evidence of an AME-PAH correlation. We cannot offer strong support of a "spinning PAH" model, however we cannot rule out AME via non-PAH, small spinning dust (i.e. silicate-based). The results highlight a need for better understanding of PAH band emission and magnetic dipole emission from dust, and the strong need for higher resolution comparisons of the IR dust emission with AME.