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On the Relationship Between Line Broadening and Second-Order Transitions in Hot, Dense Plasmas RORY BAGGOTT, STUART MANGLES, STEVEN ROSE, Imperial College London — Recent measurements of opacity under solar conditions have suggested that widely-applied models may omit some key physics [Bailey et. al. 2015]. Subsequently, there has been interest in two-photon processes as a possible source of opacity [More et. al. 2017, Kruse and Iglesias 2019] and it has been suggested that two-photon absorption might be interpreted in terms of line broadening by background radiation. Likewise, the influence of electron collisions on absorption can be viewed either in terms of collisional line broadening or in terms of second-order electron-photon transitions. In this work, we examine the relationship between second-order transitions and existing treatments for line broadening and show that they share a common physical basis. This leads to the conclusion that two-photon and electron-photon processes cannot be considered in simple addition with existing calculations but should instead be thought of as an alternate limit for the line shape. Furthermore, this suggests a new approach to calculating opacity in windows between absorption lines.

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