Canadian Association
of Physicists

Association canadienne
des physiciens et physiciennes

Contribution ID: **361**   Type: **Oral (Non-Student) / Orale (non-étudiant(e))**

An Analytical study of the role of lattice conductivity in the enhancement of the thermoelectric figure of merit

Wednesday 9 June 2021 16:55 (3 minutes)

In an earlier study on the Wiedemann–Franz Law and the thermoelectric figure of merit (FoM), we studied the electronic effects in detail. We briefly investigated the role of the lattice thermal conductivity in enhancing the FoM and derived the characteristic equations in the form of an offset-logarithmic function (a special case of the generalized Lambert W function) [1]. This work follows up with analytical and numerical solutions to the offset-log function and provides better insight into the materials parameter space. We find the extrema of the lattice thermal conductivity and comment on its role in optimizing the figure of merit.

[1] Yadav, A., Deshmukh, P. C., Roberts, K., Jisrawi, N. M., & Valluri, S. R. (2019). "An analytic study of the Wiedemann–Franz law and the thermoelectric figure of merit", Journal of Physics Communications, 3 (10), 105001.

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Session Classification: W4-2 Theory and Condensed Matter (DTP/DCCMP) / Théorie et matière condensée (DPT/DPMCM)

Track Classification: Theoretical Physics / Physique théorique (DTP-DPT)