Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **3137** Type: **Oral (Non-Student) / Orale (non-étudiant(e))**

Solar Cells_and the Lambert W Function

Thursday 9 June 2022 12:00 (15 minutes)

The Lambert W and Polylogarithm Functions have created a renaissance in solving problems in many diverse fields. They have found interesting and novel applications in areas such as solar cells, graphene, and double-gate metal-oxide semiconductor field-effect transistors (MOSFET).
The multi-branched Lambert W function is relevant to the problem of arrays of solar cells experiencing varying light conditions. To compensate for varying light, it is necessary to perform load balancing calculations for obtaining the maximum power from the array. That is particularly a challenge with mobile arrays, and with temporary shadows such as produced by chimneys and other obstructions. The computations are time-consuming because the current-voltage (I-V) equations are, in their usual form, implicit and iterative root-finding is used. A Lambert W function explicit solution in some models has been known since 2004. However, the Lambert W method when applied to real-life solar cells employs very large numbers (dimensionless) which cause arithmetic overflow in customary computer hardware. We have devised a variant solution, which is suitable for use on small computers such as low-cost field micro-controllers and is explicit. It has deterministic and modest time requirements. The I-V characteristic S shaped kink curves have non-ideal behaviour that has been Investigation in our work. Accurate simulations will give us a more optimum I-V curve, leading to better solar cell efficiency. The new technique can reduce the costs of implementing mobile solar power. The Lambert W function as well as its variant, the LogWright Function, are relevant in tackling problems of underflow and overflow in the simulations. An inflection point is frequently associated with poor performance of the organic solar cell. This needs to be carefully studied. The "ladder of Lambert W function representations" provides a convenient systematization of the process of converting coordinates.

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Session Classification: R2-2 Frontiers in Theoretical Physics II (DTP) | Frontières en physique théorique II (DPT)

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