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## An open-source Python tool for the Maxwell eigenvalue problem and multipacting analysis in axisymmetric elliptical cavity structures

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Multipacting is a phenomenon arising from the emission and subsequent multiplication of charged particles in accelerating radiofrequency (RF) cavities, which can limit the achievable RF power. Predicting field levels at which multipacting occurs is crucial for optimizing cavity geometries. This paper presents a new open-source Python code for analyzing multipacting in 2D axisymmetric cavity structures.

The code leverages the NGSolve framework to solve the Maxwell Eigenvalue Problem (MEVP) to obtain the cavity's resonant modes' electromagnetic fields. The relativistic Lorentz force equation governing the motion of charged particles is then integrated using the fields within the cavity. Benchmarking against existing multipacting analysis tools is performed to validate the code's accuracy and efficiency. The open-source nature of the code fosters further development and customization for specific applications.

### Footnotes

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