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A low energy linac solution for 3D scanning applications

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Due to a recent interest in scanning thinner containers such as cars or aviation unit load devices (ULDs), lower energy linac solutions are required in order to obtain sufficient image contrast. In this work, we present the complete design of a C-band, bi-periodic, 2 MeV electron linac to fulfil this need. Multi-objective optimisation techniques are employed to optimise the RF cavities for maximum shunt impedance and to optimise the cell lengths/amplitudes of the bunching cavities to achieve a 90% capture efficiency. A full thermal analysis of the system, including the X-ray target, has been performed to explore the thermal management of the system, including a CFD analysis to estimate the effectiveness of typical thermal approximations made during the design process. Finally, a novel RF system for connecting and firing multiple linacs sequentially to generate quasi-3D images is described.

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Footnotes

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Yes

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