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Evaluation of green laser source additive manufacturing technology for accelerator applications with ultra-high vacuum requirements

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Additive Manufacturing (AM) offers different benefits such as efficient material usage, reduced production time and design freedom. Moreover, with continuous technological developments, AM expands in versatility and different material usage capabilities. Recently new energy sources have been developed for AM –green wavelength lasers, which provide better energy absorption for pure copper. Due to high thermal and electrical conductivity of copper, this novel AM technology is highly promising for various industries, particularly, there is a huge interest to use it for accelerator applications. In particular, these AM produced accelerator components should reach the associated Ultra High Vacuum (UHV) requirements. In this study, vacuum membranes of pure copper were produced by AM using a green laser source, in different thicknesses and built angles. Furthermore, a vacuum membrane helium leak tightness test was performed at room temperature by using a high-sensitivity mass spectrometer. Comparison of these test results was performed with previously established results. Through this study, novel knowledge and initial results are provided for green laser source AM technology usage for applications for UHV accelerator components.

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Footnotes

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