Contribution ID: **9** Type: **not specified**

RTU Institute of Particle Physics and Accelerator Technologies activities in accelerator projects and additive manufacturing examination for accelerator applications

Riga Technical University Institute of Particle Physics and Accelerator Technology is involved in accelerator projects where our contributions are in accelerator technologies innovation and development as well as in accelerator medical applications. Our team contribute in Innovation Fostering in Accelerator Science and Technology, Heavy Ion Therapy Research and Integration plus and Next Ion Medical Machine Study projects.

Additive Manufacturing (AM) is already well-established for various manufacturing applications, providing many benefits such as design freedom, novel and complex cooling designs for the parts and different performance improvements, as well as significantly reducing the production time. All those advantages can be useful also for accelerator usage. Therefore, within the Innovation Fostering in Accelerator Science and Technology project, ongoing work is related to AM usage and evaluation for accelerator applications. Where tests were performed to ensure the Ultra High Vacuum (UHV) compatibility and the voltage holding capability of the surfaces.

UHV requirements were tested by helium leak tightness test at room temperature by using a high-sensitivity mass spectrometer for AM-built membranes. The leakage test showed that AM built 1mm wall thickness providing He leak tightness. Through this study, novel knowledge and results are provided for green laser source AM technology usage for applications for UHV accelerator components.

To characterize voltage holding capability for AM surfaces (as-built condition), a series of high electric field tests were performed on pure copper electrodes by using the CERN pulsed high-voltage DC system. During the testing process, a high vacuum was maintained. Initial results prove the capability of AM electrodes to hold a high electric field (40 MV/m) while having low breakdown rates. These are crucial results for further AM technology usage for different AM pure-copper accelerator components.

Type of contribution

Talk

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