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MEDeGUN Commissioning Results

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MEDeGUN [1] is an electron gun to be used in an Electron Beam Ion Source (EBIS) designed to serve as C^{6+} injector for LINAC-based 2nd generation hadron therapy facilities [2]. The latter require short pulses of at least 8×10^8 particles with a repetition rate of 400 Hz, which exceeds the possibilities of currently used electron cyclotron resonance ion sources (ECRIS) and EBISes.

The design of MEDeGUN is based on a combination of electrostatic and magnetic compression, which is commonly referred to as Brillouin gun. As previous devices have shown, it is very difficult to achieve the design goals in this configuration due to the high sensitivity of the electron beam to any field imperfection. Therefore the number of interfaces between the cathode, Wehnelt and anode electrodes has been limited to only two and their machining tolerances of 20 Microns have been kept during manufacturing.

In spring 2017 the MEDeGUN assembly was installed in the TWINEBIS test bench at CERN [3]. We have since then propagated the first electron beam. We will here present the commissioning results and discuss them with respect to the design goals and the possible application in the medical sector.

References

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- [2] A. Shornikov and F. Wenander, "Advanced Electron Beam Ion Sources (EBIS) for 2nd generation carbon radiotherapy facilities," Journal of Instrumentation, vol. 11, p. T04001, 2016. [Online]. <https://doi.org/10.1088/1748-0221/11/04/T04001>.
- [3] M. Breitenfeldt et. al., "The TwinEBIS setup: Machine description," Nuclear Instruments and Methods in Physics Research Section A, 859, p. 102, 2016. [Online]. <http://dx.doi.org/10.1016/j.nima.2016.12.037>

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