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Towards a high-throughput laser ion source for CERN-MEDICIS

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Resonant laser ionization is an efficient and highly selective method for producing radioisotopes. In the laser ion source of ISOLDE –RILIS (Resonance Ionization Laser Ion Source), the laser interaction region is inside a metal tube which is heated to temperatures of up to 2200 degrees Celsius. This heating induces surface ionization from the walls of this so-called "hot cavity". If the overall ion load of laser and surface ionized species reaches a certain threshold, the efficient extraction of these ions is compromised. This effect is especially prevalent in facilities like CERN-MEDICIS which demand a high ion throughput and fast extraction. This work aims to present the limits of the current laser ion source at MEDICIS and introduce recent developments towards a new high throughput ion source. Parameters used to describe the ion confinement potential inside the ion source are presented (such as temperature distribution, neutrals density, electron density, ion survival, ion extraction etc). Experimental results as well as ion beam simulations are discussed, and the coupling of the ion source parameters is explored.

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