ASACUSA Gas-Jet Target: Present Status And Future Development

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Abstract. A supersonic gas-jet target apparatus that have been prepared to study elementary processes of antiprotonic atoms formation using monoenergetic ultra-slow antiproton beams is described. We investigated an operation of this target with cryogenically cooled nozzle by both gas dynamic simulations and supersonic jet measurements. In result, the helium target density of 2×10^{12} atoms/cm^3 has been obtained.

For considerable increasing of the target density, a qualitative modification of the present target setup is suggested. The goal can be achieved by the use of pulsed high-pressure supersonic gas jet that operates in accordance with the pulsed mode of the MUSASHI penning trap. For this purpose an additional stage of differential pumping with a skimmer will be set into the present target setup. To avoid the clusters in the gas-jet target, a sonic nozzle equipped with a solenoid driven pulsed gas valve will be used at room or higher temperatures. The operation of this future version of the gas-jet target apparatus has been studied by means of detailed computer simulations. Results of these calculations for helium, which show availability of the pulsed gas target density of 3×10^{13} atoms/cm^3, are presented also.