

The Impact of Dissociator Cooling on the Intensity and Velocity Spread of the Beam in the SpinLab Atomic Beam Source

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At the SpinLab laboratory of the University of Ferrara, Italy, a two stage cooling system was installed along the dissociator tube of atomic beam source (ABS). Located between the hydrogen discharge and the nozzle, it has variable cooling power and several temperature sensors. With this tool, it is possible to observe correlations between the measured temperatures and the atomic beam intensity.

The existence of such a correlation is suggested by the new ABS constructed and installed at RHIC. The measured intensity of this ABS is 1.3 times larger than expected, 1.5 times greater than other ABS, and still unexplained. One of the differences between the RHIC ABS and the other systems is the cooling of the dissociator of the RHIC ABS, which provides a temperature gradient from the cooling water in the discharge region to the 75 K nozzle compared with other systems that cool only with water upstream of the nozzle.

A systematic study for different dissociator fluxes and nozzle diameters is underway at Spinlab, and the first indications are that lower cooling temperatures do indeed result in a small increase in beam intensity. Investigations of whether the small increase is accompanied by a narrowing of the beam's velocity distribution will also be presented.