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Multiple Ion Beam Creation in Expanding Plasmas[1] EARL SCIME, West Virginia University — We present experimental evidence for the spontaneous formation of multiple double layers within a single divergent magnetic field structure. Downstream of the divergent magnetic field, multiple accelerated ion populations are observed. The similarity of the accelerated ion populations observed in these laboratory experiments to ion populations observed in the magnetosphere and in numerical simulations suggests that the observation of a complex ion velocity distribution alone is insufficient to distinguish between simple plasma expansion and magnetic reconnection. Further, the effective temperature of the aggregate ion population is significantly larger than the temperatures of the individual ion population components, suggesting that insufficiently resolved measurements could misidentify multiple beam creation as ion heating. Ions accelerated in randomly oriented electric fields that mimic heating would have an ion heating rate dependent on the ion charge and mass that is qualitatively consistent with recent experimental observations of ion heating during magnetic reconnection. We also discuss these results in light of recent observations of double layer formation during reconnection.

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