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Plasma acceleration along arched magnetic flux tubes: observation, quantification, and analysis[1] EVE STENSON, PAUL BELLAN, Caltech — Magnetic flux tubes are fundamental structures that occur in a wide range of plasma settings, from the solar atmosphere to the interior of a tokamak. We have used a magnetized plasma gun to create individual, arched flux tubes in the laboratory. These flux tubes are highly reproducible and can be diagnosed via a variety of techniques, thereby facilitating quantitative investigations. The outstanding feature of the dynamics is a dramatic increase in the total length of the flux tube, during which the minor radius of the tube and the plasma density remain relatively constant. The resulting increase in particle number is made possible by bulk flows that accelerate plasma into the tube from both ends; "color-coded" dual gas plasmas have shown that the two flows are independent. The characteristic speed is determined by local mass density ρ and electric current I. These findings are quantitatively consistent with two interrelated MHD models: the hoop force (which explains the lengthening) and the "gobble" model (which explains the flows). [2]

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[2]P. M. Bellan, *Phys. Plasmas* 10 Pt 2, 1999 (2003).

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