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Area-dependence of spin-triplet supercurrent in ferromagnetic Josephson junctions[1] YIXING WANG, WILLIAM P. PRATT, JR., NORMAN O. BIRGE, Department of Physics and Astronomy, Michigan State University, East Lansing, MI 48824 — Spin-triplet supercurrents in strong ferromagnetic Josephson junctions were reported by several groups in 2010. At the same time, the 0-π current-phase relationship of the spin-triplet supercurrent was predicted to be controllable by the magnetization orientations of different ferromagnetic layers. Our junctions contain a series of ferromagnetic layers consisting of a synthetic antiferromagnet Co/Ru/Co sandwiched between two thin magnetic layers such as PdNi or Ni [1]. When looking along the direction of current flow, one should obtain 0 junctions if the rotation direction of magnetizations is the same from one to the next, and π junctions when the opposite rotation direction is the case. Since our magnetic layers have multiple domains in the virgin state, we should expect 0 and π phases to alternate randomly in different locations in the junctions. The critical current in the virgin state should scale with the square-root of the junction area. After aligning the outer ferromagnetic layers in the same direction with an external field, the current-phase relation should be uniform across the whole junction area and the critical current should be proportional to the junction area. We will present data confirming this expectation for the magnetized state, whereas the situation for the virgin state is presently unclear.

[1] T.S. Khaire, M.A. Khasawneh, W.P. Pratt Jr and N.O. Birge, *Phys. Rev. Lett.* 104 137002 (2010).

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