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Observation of Time-Reversal Symmetry Breaking in the Non-Centrosymmetric Superconductor Re6Zr[1] MARTIN R. LEES, Physics Department, University of Warwick, Coventry, CV4 7AL, U.K., ADRIAN D. HILLIER, ISIS facility, STFC Rutherford Appleton Laboratory, Harwell Science and Innovation Campus, Oxfordshire, OX11 0QX, U.K., BAYAN MAZIDIAN, JAMES F. ANNETT, H. H. Wills Physics Laboratory, University of Bristol, Tyndall Avenue, Bristol BS8 1TL, U.K., JORGE QUINTANILLA, SEPnet and Hubbard Theory Consortium, School of Physical Sciences, University of Kent, Canterbury CT2 7NH, U.K., DONALD MCK. PAUL, RAVI SINGH, GEETHA BALAKRISHNAN, Physics Department, University of Warwick, Coventry, CV4 7AL, U.K. — We have investigated the superconducting state of the non-centrosymmetric compound Re_6Zr using magnetization, heat capacity, and muon-spin relaxation/rotation (μSR) measurements. Re_6Zr has a superconducting transition temperature, $T_c = 6.75 \pm 0.05$ K. Transverse-field μSR experiments, used to probe the superfluid density, suggest an s-wave character for the superconducting gap. However, zero and longitudinal-field μSR data reveal the presence of spontaneous static magnetic fields below T_c indicating that time-reversal symmetry is broken in the superconducting state and an unconventional pairing mechanism. An analysis of the pairing symmetries identifies the ground states compatible with time-reversal symmetry breaking.

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