Direct quantitative observation of a negative-parity intruder state in $^{28}$Ne$^1$ P.G. HANSEN, J.R. TERRY, D. BAZIN, B.A. BROWN, C.M. CAMPBELL, J.A. CHURCH, J.M. COOK, A.D. DAVIES, D.C. DINCA, J. ENDERS, A. GADE, T. GLASMACHER, J.L. LECOEY, W.F. MUELLER, H. OLLIVER, B.M. SHERRILL, K. YONEDA, National Superconducting Cyclotron Laboratory, Michigan State University, J.A. TOSTEVIN, Dept. of Physics, University of Surrey, Guildford, UK — We present results for the neutron knockout from a 70 MeV beam of $^{28}$Ne interacting with a $^9$Be target. The projectile residues were detected in the high-resolution S-800 spectrograph and excited levels were identified via gamma-ray coincidences observed with the array of segmented germanium detectors SeGA. Events not coincident with gamma rays amounted to 38%. These were predominantly associated with a momentum distribution with a clear $l=3$ shape corresponding to a spectroscopic factor of close to unity, so that, on the average, at least one of the 18 neutrons in the projectile must be in an $f_{7/2}$ orbital. This confirms for the first time the strong presence of $f$-shell intruders in the ground state predicted for this nucleus in the Monte-Carlo shell-model calculations by Utsuno et al., Phys. Rev. C 60, 054315 (1999).

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