

QUADRUPOLE COLLECTIVITY MEASUREMENTS  
IN EVEN-EVEN, NEUTRON-RICH SILICON AND  
SULFUR ISOTOPES APPROACHING  $N = 28$

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## ABSTRACT

QUADRUPOLE COLLECTIVITY MEASUREMENTS IN EVEN-EVEN,  
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An inelastic proton scattering experiment was performed at the National Superconducting Cyclotron Laboratory to study quadrupole collectivity in the even-even silicon and sulfur isotopes near  $N = 28$ . Experiments on neutron-rich sulfur isotopes have found significant collectivity and have been interpreted as pointing to the collapse of the  $N = 28$  shell gap. Narrowing of a proton subshell gap in the sulfur isotopes may, however, be responsible for the increased collectivity. This experiment gives a quantitative measurement of the decrease in collectivity between  $^{42}\text{S}$  and  $^{44}\text{S}$  showing that the  $N = 28$  shell gap does not vanish at  $Z = 16$ . In the silicon isotopes, the large, stable  $Z = 14$  subshell gap directly ties collective trends to the strength of the  $N = 28$  shell closure. Quadrupole collectivity and  $2_1^+$  excitation energies in the isotopes  $^{36,38,40}\text{Si}$  give clear evidence for the narrowing of the  $N = 28$  shell gap in the absence of strong proton collectivity.

*to my wife Bethany*

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