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## Magicity vs Superfluidity: Neutron correlations in the heavy F isotopes (online)

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Nuclear structure evolves dramatically in asymmetric systems, particularly near the drip lines. A notable example is the “Island of Inversion”, where the magic neutron number  $N=20$  breaks down, as established for proton number  $Z=10-13$ . We study the structure of the most neutron-rich Fluorine ( $Z=9$ ) isotopes around  $N=20$  using the SAMURAI spectrometer at RIBF/RIKEN. Measurements were performed in inverse and complete kinematics with radioactive-ion beams at  $\sim 250$  MeV/u incident on a LH2 target. The first measurement of the neutron-unbound  $30\text{F}$  isotope via the invariant mass method confirms the breakdown of the  $N=20$  magic number, thus extending the “Island of Inversion”, with significant consequences for the F and O isotopes. Large-scale shell model calculations suggest that  $^{29}\text{F}$  and  $^{28}\text{O}$  are superfluid nuclei where neutron pairs scatter between shells, potentially transitioning into a BEC-like regime with small size pairs. Future experiments are being developed to further investigate these correlations.

**Auteur principal:** KAHLBOW, Julian (Lawrence Berkeley National Laboratory)

**Orateur:** KAHLBOW, Julian (Lawrence Berkeley National Laboratory)