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Onset of collectivity in neutron-rich Fe isotopes

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The lifetimes of the first excited 2^+ states in ^{62}Fe and ^{64}Fe have been measured in an experiment at GANIL using the Recoil-Distance Doppler Shift technique. The iron nuclei were populated in multi-nucleon transfer reactions between a ^{238}U beam at 6.5 MeV/A and a ^{64}Ni target. A degrader foil at micrometer distances from the target was used to slow the reaction products before entering the VAMOS spectrometer for identification. The Doppler shift of the gamma rays emitted before and after the degrader foil was measured with the EXOGAM germanium detector array.

The lifetimes give evidence for a strong increase in collectivity from ^{62}Fe to ^{64}Fe . The results are compared to new large-scale shell model calculations and HFB-based configuration mixing calculations. The large $B(E2)$ value in ^{64}Fe can be related to the occupation of the neutron $g_{9/2}$ and $d_{5/2}$ orbitals. Many parallels are found between the neutron-rich Fe isotopes below ^{68}Ni and the so-called 'island of inversion' around ^{32}Mg .

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no

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yes

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no

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