Symmetry and collectivity of mirror nuclei

Dr. Kathrin Wimmer

GSI/Darmstadt

Unlike any other physical system, the atomic nucleus represents a unique dual quantum many-body system. Its constituents, protons and neutrons, are assumed to be identical, except for their electric charge. They can be seen as two representations of the nucleon, with isospin components $t_z = \pm 1/2$ for neutrons and protons, respectively. Under the assumption of charge independence of the strong interaction, hence invariance under rotation in the isospin space, the excitation energy spectra of mirror nuclei should be identical. Isospin breaking effects, besides the dominating electromagnetic force, are usually studied through mirror energy differences, testing the charge symmetry and triplet energy differences, probing the charge independence of the nuclear force. However, a more rigorous way to test isospin symmetry are electromagnetic matrix elements which are also sensitive to the underlying wave functions. Electromagnetic transitions furthermore probe the shape of a nucleus and measure collective deformations.

In this talk, I will present the results of our studies of isospin symmetry performed at the Radioactive Isotope Beam Factory at the RIKEN Nishina Center in Japan. These studies address the interplay of isospin symmetry and the collective degrees of freedom.