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Experimental challenges to explore neutron-rich nuclei: progress and perspective of lifetime measurements with RI beams
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Studies of neutron-rich nuclei lying at the limits of stability are of great importance for understanding nuclear structure at extreme isospin, correlations of halo neutrons, as well as their impacts on astrophysical phenomena. Applications of Doppler-shift techniques to rare-isotope (RI) beam experiments have enabled level lifetime measurements of neutron-rich nuclei far from stability, offering new opportunities to investigate the evolution of nuclear shell structure and examine symmetries of nuclear many-body system. In this talk, recent progresses in lifetime measurement programs at National Superconducting Cyclotron Laboratory (NSCL) will be introduced. Experimental results on neutron-rich carbon and iron isotopes will be discussed in terms of suppressed or enhanced collectivity associated with unique shell structure of these isotopes. Future perspectives of lifetime measurements with re-accelerated RI beams and gamma-ray tracking detector arrays will also be presented.