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A system to measure isomeric state half-lives in the 10 ns to 10 μ s range

Review of Scientific Instruments **85**, 073501 (2014); <https://doi.org/10.1063/1.4886814>D. L. Toufen^{1,2, a)}, P. R. P. Allegro¹, N. H. Medina¹, J. R. B. Oliveira¹, E. W. Cybulska¹, W. A. Seale¹, R. Linares³, M. A. G. Silveira⁴, and R. V. Ribas¹[View Affiliations](#)[View Contributors](#)Topics 
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ABSTRACT

The Isomeric State Measurement System (SISMEI) was developed to search for isomeric nuclear states produced by fusion-evaporation reactions. The SISMEI consists of 10 plastic phoswich telescopes, two lead shields, one NaI(Tl) scintillation detector, two Compton suppressed HPGe γ -ray detectors, and a cone with a recoil product catcher. The new system was tested at the 8 UD Pelletron tandem accelerator of the University of São Paulo with the measurement of two known isomeric states: ^{54}Fe , 10^+ state ($E = 6527.1(11)$ keV, $T_{1/2} = 364(7)$ ns) and the $5/2^+$ state of ^{19}F ($E = 197.143(4)$ keV, $T_{1/2} = 89.3(10)$ ns). The results indicate that the system is capable of identifying delayed transitions, of measuring isomeric state lifetimes, and of identifying the feeding transitions of the isomeric state through the delayed γ - γ coincidence method. The measured half-life for the 10^+ state was $T_{1/2} = 365(14)$ ns and for the $5/2^+$ state, $100(36)$ ns.

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