# PROTON DECAY OF $^{53}CO^{M}$ REVISITED

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on behalf of the JYFL – I199 experiment collaboration.

Branching ratios of exotic nuclear decay modes are difficult to measure experimentally given potentially low production cross section, which in turn are typically challenged by separation and detection efficiency. A novel combination of existing equipment, JYFLTRAP [1] and the TASISpec [2,3] decay station, was used to experimentally determine the branching ratio of the angular momentum l = 9 proton decay of the $I^{\pi} = 19/2^{-}$, 3174-keV isomer in the N = Z − 1 nucleus $^{53}$Co by means of quantum-state selective high-resolution particle-γ decay spectroscopy. The technique has been pioneered in case studies using SHIPTRAP [4] and TASISpec at GSI [5].

The observation of a weak proton-emission branch in the decay of the $I^{\pi} = (19/2^{-})$ $^{53}Co^{m}$ isomeric state marked the discovery of proton radioactivity in 1970 [6]. However, a branching ratio of $b_p \sim 1.5$ % could only be *estimated* based on model-dependent comparisons of anticipated peak cross-sections of different reaction products of the reaction p + $^{54}$Fe [7].

The Geant4 simulation toolkit has been modified to include, for the first time, the decay mode *proton emission*. In this talk, the usefulness of virtual Geant4 experiments in low-energy nuclear structure studies will be presented, exemplified with the proton decay of $^{53}Co^{m}$.

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