

# Neutron deficient exotic nuclei and the Physics of the "proton rich side" of the nuclear chart



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## Superallowed Fermi decays: precise $T_{1/2}$ and branching ratios measurements

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Through the studies of Fermi transitions between  $0^+$  analog states with  $T = 1$  (superallowed transitions), nuclear physics provides a valuable test of the Standard Model of particle physics. These transitions depend only on the vector part of the weak interaction, and according to the conserved vector current (CVC) hypothesis, their strength  $F_t$  is a constant. Then this value is used to determine the  $V_{ud}$  term in the CKM quark mixing matrix, that should be unitary.

The constant  $F_t$  strength determination requires very high precision measurement of the decay energy  $Q_{EC}$  (related to masses) and of the partial half-life of the transition (parent nucleus half-life  $T_{1/2}$  and branching ratio BR), but it also requires some theoretical corrections of the experimental values. Then, beside the search for "new physics" if deviations from the standard model are observed, such studies are a very sensitive test of the theoretical descriptions used to calculate those corrections.

In this presentation, I will give a general view of the landscape of nuclei of interest for those studies, with a focus on recent experimental results concerning the  $T_{1/2}$  and BR measurements that we performed at Jyväskylä university and ISOLDE at CERN :  $^{26}\text{Si}$ ,  $^{30}\text{S}$ ,  $^{42}\text{Ti}$ ,  $^{38}\text{Ca}$  and  $^{62}\text{Ga}$ . These results have to be compared with other measurements that have been performed worldwide, showing the strong activity in this field. Finally, expectations and limitations for further studies will be addressed.

### Summary

**Primary author(s)** : GIOVINAZZO, Jérôme (CENBG / IN2P3 / CNRS)

**Presenter(s)** : GIOVINAZZO, Jérôme (CENBG / IN2P3 / CNRS)

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