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Study of β-delayed proton decays at IDS: the cases of 33Ar and 31Ar

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^{31}Ar isotope is one of the most exotic β-delayed particle precursors, near the proton drip-line, with high Q-value and low proton separation energy. Due to these two factors, many channels are opened and β-delayed protons are emitted in the decay of this nucleus (one-proton, two-proton and even three-proton emission) [1].

Taking advance of the ISOLDE Decay Station (IDS) [2], the decay of ^{31}Ar was measured in the IS577 experiment, becoming the first of its kind (multi-particle emission) performed successfully at this installation. The aims of this experiment were the study of β2p and β3p channels, the identification of the β3pγ-decay, as well as to provide important information on the resonances of 30S and 29P (proton daughters), important for the astrophysical rp-process [3].

The set-up used consisted of 5 Double Sided Si Strip Detectors (DSSSD) backed by un-segmented Si-pad detectors in ΔE-E telescope configuration (Fig. 1). This Si-array is located inside the new *MAGISOL Si-Plugin Chamber*, installed by our collaboration at the permanent station IDS, devoted to β-decay measurements. In addition, there are 4 HPGe clover-detectors surrounding the chamber for gamma detection.
This set-up is very compact with both high efficiency (47% of 4π) and good energy resolution (25 keV) over a wide energy range for particle emission.

The decay of ^{33}Ar was also measured in the experiment, since this isotope is well suited for the energy calibration of the silicon detectors; it emitts β-delayed protons and their energies are well known. However, new low energy proton peaks are seen for the first time in this kind of β-decay works [4]. Thanks to the possibility of detecting p-ϒ coincidences with this set-up, the identification of these new peaks in the level scheme has been done.

Finally, new results in ^{31}Ar will be presented here too, such us the identification of proton emission from levels near the threshold in ^{30}S (β2p channel). These levels show competition between gamma and proton emission and their study is really important to understand some astrophysical processes.

[1] Proposal to the ISOLDE and Neutron ToF Committee, INTC-P-386, September 2013
[2] http://isolde-ids.web.cern.ch/isolde-ids/
[3] G.T. Koldste et al. Phys. Letters B 737 (2014) 383-387.
[4] N. Adimi et al. Phys. Review C 81, 024311 (2010)

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