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Beta-delayed particle emission from ^{21}Mg

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The beta-decay of the proton rich nuclei ^{21}Mg was used as a calibration source for the IS507 experiment. The aim of the experiment was to study the beta-decay of ^{20}Mg with a dedicated charged particle detection setup consisting of two opposing ΔE-E telescopes. As ^{21}Mg is close in mass to ^{20}Mg and is a known beta-delayed proton emitter, with intense proton branches, it is suitable for energy calibrations. A closer look at the data reveals new decay channels not previously seen in the decay of ^{21}Mg. Clear signs of beta-delayed alpha emission and new beta-delayed proton channels were evident.

A detailed investigation of the alpha spectrum has led to the conclusion that four beta-delayed alpha branches are measured, ^{21}Mg(β)^{21}Na(α)^{17}F, going through high-lying resonances in ^{21}Na. Coincidences between the two opposing ΔE-E telescopes have led to the conclusion that a weak decay channel via the decay chain ^{21}Mg(β)^{21}Na(p)^{20}Ne(α)^{16}O is also seen for the first time.

The proton spectrum measured gives rise to a new interpretation of the decay scheme. Due to the use of a DSSSD detector beta summing is reduced to a negligible level. Together with recent measurements of elastic scattering of protons on ^{20}Ne this has led to a new tentative interpretation of the decay scheme. Confirmation of this new interpretation would be possible in the remaining beam time at the new ISOLDE Decay Station, where detection of coincident gamma rays is possible.

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