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Recoil- α -fission and recoil- α - α -fission chains stemming from element 115

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Products of the ⁴⁸Ca+²⁴³Am fusion-evaporation reaction were studied with the TASI Spec set-up [1, 2] behind TASCA [3-5]. Thirty correlated α -decay chains originating from different isotopes of E115 were observed [6, 7], produced with an overall production cross section of ≈ 10 pb. There are 1+22=23 five- α -long chains linked to the production of ^{287,288}115 [6], in agreement with 2+31=33 chains reported earlier [8]. The combined 22+31=53 chains associated with ²⁸⁸115 yield a statistically solid reference.

Besides these 'long chains', two recoil- α -fission and five recoil- α - α -fission chains are present in the TASI Spec data [7]. Interestingly, the interpretation and thus the assignment of these 'short chains' to a certain isotope of E115 turns out to be non-trivial. The issue is discussed with the help of Fig. 1: Panel (a) shows the relevant beginning of the long ²⁸⁸115 reference chain. The average values of the 2+5=7 new short chains in panel (b) are consistent with the numbers in panel (a). This indicates at first sight ~ 5 -15% fission or electron-capture branches of ²⁸⁴113 and ²⁸⁰Rg. However, this view is at variance with the interpretation of 3+1=4 short chains previously observed at Dubna [8] [panel (c)]. There, one chain, denoted 'D3', is significantly different from all the other E115 chains. However, only including this particular chain in the 3+1=4 averaging procedure generated a seemingly consistent link between E115 and E117 [8, 9] [panel (d)]. Panel (e) provides a refined interpretation of all published E117 data [9, 10]. The rightmost sequence averaged

over twelve E117 chains opens for a connection to E115 via 'D3', while the other ten E117 chains would be consistent with (a subset of) other E115 chains [11].

More high-quality spectroscopic data is obviously required. This is necessary to provide the foundation for a relevant nuclear-structure based interpretation of links between decay chains of these two odd-*Z* elements [7, 11].

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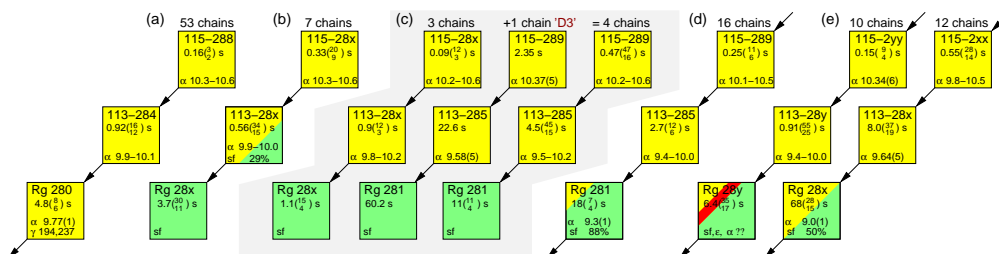


Figure 1: Average values from selections of decay chains of isotopes of E115 to E113 into Rg (*Z* = 111). (a) 53 ²⁸⁸115 reference chains [6, 8]. (b) Seven recoil- α - α -fission chains observed with TASI Spec [7]. (c) Data from all four recoil- α - α -fission 'Dubna chains' listed in Table III of Ref. [8]. (d) Sixteen chains associated with the decay of ²⁹³117, i.e. interpreted to populate the isotope ²⁸⁹115 [9]. (e) Possible re-interpretation [11] of all existing E117 decay data [9, 10].

