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Four -particle decay of the excited 16O* quasi-projectile in the 16O + 12C reaction at 130 MeV.

In recent years experimental measurements and many theoretical investigations have been devoted to the decay and the structure of an excited 16O. *The main aim of these researches has been the quest for signatures of α-cluster structures of the 16O* at different excitation energies.
We have studied the decay of a 16O*Quasi projectile in 4 α-particles in the final state by the reaction 16O+12C at 130 MeV incident energy. The 4 α-particles have been detected by the GARFIELD+RCo apparatus at Laboratori Nazionali di Legnaro.*
We addressed our analysis to the search for non-statistical effects in the decay into four α-particles. We have therefore compared experimental data to the predictions of a statistical decay code (HFℓ), based on Hauser-Feshbach formalism, developed inside the collaboration. The peculiarity of this code is to include all the levels for light nuclei, taken from Nudat2 database. Discrepancies could be an indication of the importance of non statistical effects, such as clustering ones.
Since, for the presence of a large number of levels it is not possible to compare the decay of a single excited 16O level to calculations, we have studied the decay of a set of levels with a relative weight extracted from experimental results, taking into account the angular momentum of the various levels and extracting the angle and boost velocity from the experimental values.
The main information we compare to calculation is the weight of the different decay modes of the 16O, *in two 8Begs or in an α-particle and a 16O* (in the Hoyle state 0_2^+ at 7.65 MeV, 3− state at 9.64 MeV, or in an higher energy level), leaving the Quasi Target 12C in the ground or in the first excited state at 4.44 MeV.
Very different Branching Ratios for these decay channels between data and simulation have been found. This could be again, together with results of comparison between data and predictions obtained in other reactions, a signal of the importance of non statistical effects.

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