Coulomb excitation of the presumably super-deformed band in ^{42}Ca - preliminary results from the first AGATA Demonstrator experiment

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The Coulomb excitation experiment to study the presumably super-deformed band in ^{42}Ca was performed in February 2010 at LNL Legnaro using the gamma-ray spectrometer AGATA Demonstrator coupled to the charged particle detection set-up DANTE [1]. Gamma-rays from Coulomb excited ^{42}Ca nuclei were measured in coincidence with calcium projectiles back-scattered on the ^{208}Pb target and detected by three position-sensitive MCP detectors forming the DANTE array. The AGATA Demonstrator spectrometer consisting of three clusters was used for the first time in a nuclear physics experiment. The performance of the novel experimental set-up will be presented.

The motivation for the study was the observation of a rotational structure in ^{42}Ca which is similar to the previously identified super-deformed bands in several A~40 nuclei such as ^{40}Ca [2], ^{36,38}Ar [3-5]. Lifetime measurements in ^{42}Ca using the Doppler-shift attenuation method [6], suggest a smaller deformation of the band built on the second 0^+ state (1837 keV) than in the case of ^{40}Ca. On the other hand, the moment of inertia of this band was found to be very similar to the one of the super-deformed band in ^{40}Ca [7]. Another argument for the highly-deformed character of this band was the observation of its preferential feeding by the low energy component of the highly split GDR decaying from ^{46}Ti [8].

In order to resolve the existing ambiguities concerning the deformation of the presumably super-deformed band, an attempt has been made to measure directly the B(E2) values in 42Ca using the Coulomb excitation technique.

In the present experiment the transitions deexciting the presumably super-deformed band were observed for the first time following the Coulomb excitation. Low lying states in the yrast band were also populated via multiple Coulex. Preliminary results of the measurement will be reported and the further analysis aiming at describing the collective structure of ^{42}Ca will be discussed.

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