Search for fingerprints of Tetrahedral symmetry in ^{156}Gd

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We propose to report on the analysis of the first experiment on ^{156}Gd of the TetraNuc [Tetrahedral Nuclei] collaboration involving more than 15 institutions. A key feature of the pure tetrahedral symmetry, as compared with the regular octupole one, is that the quadrupole moment of the nuclei should vanish. As a consequence, the fingerprint should be the presence of rotational bands identified only by E1 out-of-band transitions with no in-band E2 transitions.
Therefore the main goals of this experiment are the following:

1. Search for the vanishing E2 transitions in order to possibly establish the upper bounds for the appearance of such symmetry in ^{156}Gd;
2. Precisely establish the E2/E1 branching ratios between the intra-band E2 and inter-band E1 transitions to the ground-state band. In the previous works, some of these ratios were reported one to two orders of magnitude larger than those in the traditional pear shape octupole bands;
3. Search for the parity-doublet partners of the tetrahedral-band with both even and odd spins;

The experiment was carried out with an alpha beam at JUROGAM (Jyväskylä) allowed to collect a significant set of triple (or more) Germanium coincidences at low spin and quite high excitation energy. This reaction appeared to be the most effective one to populate the rotational band interpreted as tetrahedral and possibly its partners. The pre analysis is now finished and we will present the preliminary results recently obtained.