Rekstad, Tveter, and Guttormsen Reply: We are grateful to Hansen for his interesting Comment [1] on our Letter [2].

The nuclear chaotic regime is not very accurately described theoretically, and we believe the possible disagreement between Hansen and us is partly due to this lack of precision. Our Letter [2] tried to answer the following simple question: Does the K quantum number influence the γ decay rates of neutron capture states? The experimental evidence for a K-dependent transition probability from the capture state to low-lying levels with good K quantum numbers seems convincing and is not opposed by Hansen. Hence, at an excitation energy of ≈ 8 MeV, the K quantum number has not vanished, but still affects the decay pattern significantly. The subject of this discussion is what the result means for the interpretation in terms of nuclear chaos.

Hansen refers to the abstract version of our conclusion, that the obtained result contradicts the hypothesis that K is completely mixed in the neutron resonance region. In our Letter this conclusion is expressed more precisely: "Nuclear states at an excitation energy of 8–8.5 MeV, produced in neutron capture, have vital K quantum numbers equal to those expected from the normal spin-coupling scheme for low-energy states."

This picture is incompatible with the idea of a chaotic regime as described in our introduction, where the term "complete K mixing" was explained as "all K components are present in the resonance wave function in approximately equal portions, and the reduced intensity or transition probability is governed by spin and parity only." In the random-matrix model describing complete configuration mixing, each basis state is assumed to mix independently. Correlations between amplitudes of configurations with the same K values in fact implies partial K conservation. The content of a given K value in a specific resonance state will be given by the sum of the squared amplitudes for all components having this spin projection. In the case of total mixing, the variance of this sum will be much smaller than the variance of each individual, independently Porter-Thomas-distributed term. For a sufficient number of participating basis configurations, the K distribution is expected to be approximately equal for all resonances and given by the statistical level density as a function of K.

Hansen assumes that "those resonances that have large components with $K=3,4$ in their wave function will be favored both in the neutron capture and in the subsequent $M1$ and $E1$ decays connecting to states with $K=2$–5." In this statement, it is taken for granted that the K distributions in the resonance region differ from state to state and that significant K anisotropies may exist for individual resonance levels. Our experimental data indicate that this is indeed the case.

This assumption is presumably sufficient to explain the observations without demanding a correlation between the entrance and the exit channel. Nevertheless, we find Hansen's attempt to describe our results quantitatively by means of correlation effects very interesting.

According to Hansen, the states with large $K=3,4$ components are selected in the neutron capture process, with cross sections proportional to the Porter-Thomas-distributed entrance-channel contributions in the resonance wave functions. It is not evident from our Letter [2], but we used thermal-neutron-capture data in our analysis, not the data obtained with 1–2-keV neutrons of Refs. [3,4]. Hence, the ensemble of resonance states populated is actually much smaller than our readers may have been led to believe. It is not obvious to us how this will influence the correlation analysis.

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Received 8 July 1991
PACS numbers: 23.20.Ck, 05.45.+b, 21.10.−k, 27.70.+q

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