Splitting of the Giant Monopole Resonance in ^{154}Sm

D. H. Youngblood, Y. -W. Lui and H. L. Clark

It was shown a number of years ago that the giant monopole resonance (GMR)[1,2] splits in deformed nuclei. The GQR splits because the oscillation occurs with orientations along the different axes, while the GMR splits because of interference with the GQR. A calculation was carried out by Garg et al.[1] for splitting of the GMR following the schematic model of Kishimoto [3] assuming it split into K = 0 and 2 components.

We investigated[4] the giant resonance region in ^{154}Sm (where β~0.3) using inelastic scattering of 240 MeV α particles where excellent peak to continuum ratios are obtained and where the competing pickup-breakup reactions are well above the region where GQR and GMR strength is expected, and reported E0 and E2 distributions which illustrated a broadening consistent with the calculations of Abgrall *et al.*[5] However we have recently improved our analysis techniques[6] and are able to obtain multipole distributions with both smaller uncertainties and in much finer steps. Thus we have reanalyzed the ^{154}Sm data reported in Ref. 4 and extracted strength distributions in 300 keV energy steps rather than the 1 – 1.5 MeV steps of ref. 4. The E0 distribution obtained for ^{154}Sm is shown in Fig. 1 where the two components of the GMR are now clearly apparent. The Abgrall et al.

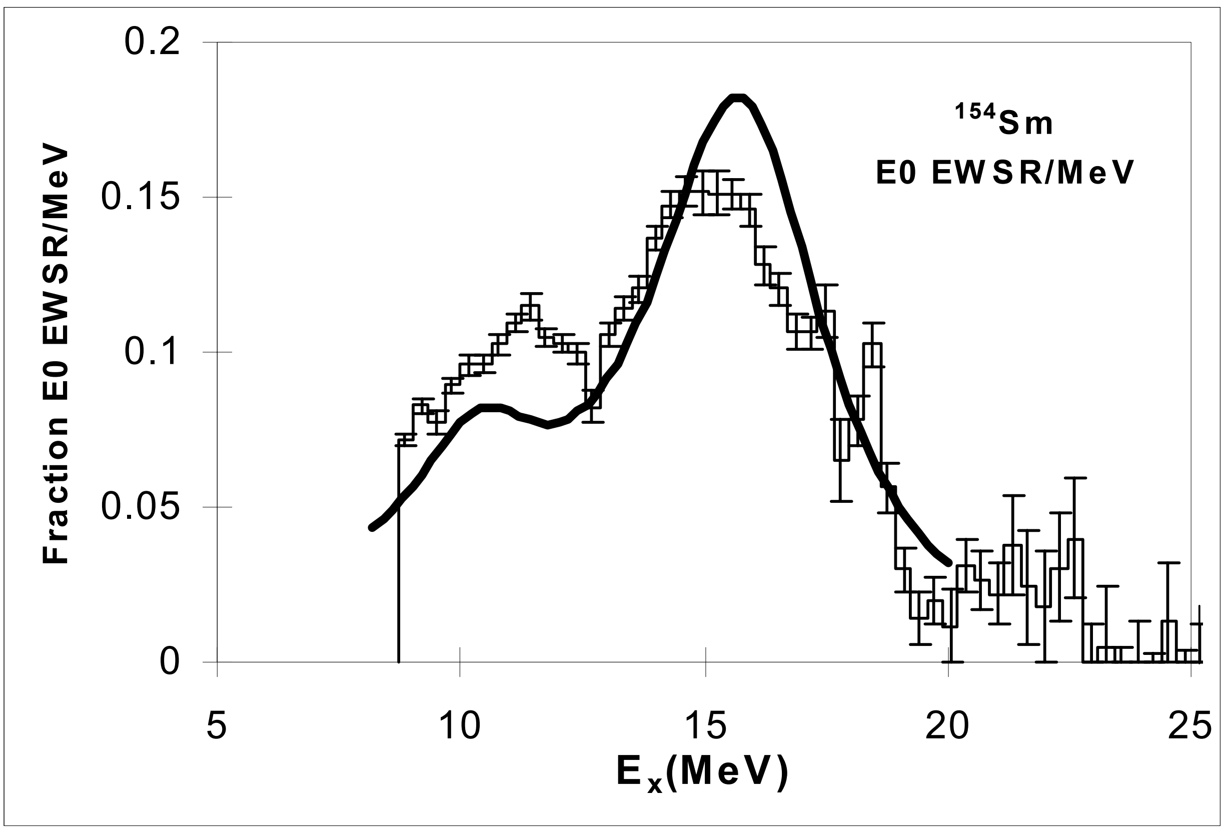

Figure 1: The fraction of the E0 ^{154}Sm is shown by the histogram. The error bars represent the uncertainty due to the fitting of the angular distributions. The thick line is the prediction of Abgrall *et al.*[5]

prediction is shown superimposed.

References

[1] U. Garg, P. Bogucki, J. D. Bronson, Y. -W. Lui, C. M. Rozsa, and D.H. Youngblood, Phys. Rev . Let. **45**, 1670(1980).

[2] H. P. Morsch, M. Rogge, P. Turek, C. Mayer-Boricke, and P. Decowski, Phys. Rev. C **25**, 2939(1982).

[3] T. Kishimoto, J. M. Moss, D. H. Youngblood, J. D. Bronson, C. M. Rozsa, D. R. Brown and A. D. Bacher, Phys. Rev. Lett. **35**, 552(1975).

[4] D. H. Youngblood, Y. -W. Lui and H. L. Clark, Phys. Rev. C **60**, 067302 (1999).

[5] Y. Abgrall, B. Morand, E. Caurier, and N. Grammaticos, Nucl. Phys. **A346**, 431(1980).

[6] D. H. Youngblood, Y. -W. Lui and H. L. Clark, Phys. Rev. C **63**, 067301 (2001).