Investigation of mixed-symmetry states in $^{49}$Sn by means of high-resolution electron and proton scattering — O. Burda\textsuperscript{1}, N. Botha\textsuperscript{2}, J. Carter\textsuperscript{3}, R.W. Fearick\textsuperscript{2}, S.V. Förtsc\textsuperscript{1}, C. Fransen\textsuperscript{1,4}, M. Kuhar\textsuperscript{1}, A. Lenhardt\textsuperscript{1}, P. von Neumann-Cosel\textsuperscript{3}, R. Neveling\textsuperscript{4}, N. Pietralla\textsuperscript{6}, V.Yu. Ponomarev\textsuperscript{1}, A. Richter\textsuperscript{5}, E. Sideras-Haddad\textsuperscript{3}, R. Smith\textsuperscript{4}, and J. Wambach\textsuperscript{1} — 1Institut für Kernphysik, Technische Universität Darmstadt — 2Physics Department, University of Cape Town — 3School of Physics, University of the Witwatersrand — 4Thena LABS, Somerset West — 5Institut für Kernphysik, Universität zu Köln — 6Department of Physics and Astronomy, SUNY Stony Brook

The nucleus $^{49}$Mo is a well studied example for the existence of one-phonon and two-phonon mixed-symmetry (ms) states [1]. High-resolution electron scattering (at the S-DALINAC) and proton scattering (at the Thena LABS) experiments were performed studying the excitation of 2$^+$ states. Energy resolutions $\Delta E \approx 20$ keV (FWHM) were achieved. Due to sensitivity of $(e,e')$ and $(p,p')$ reactions to the one-phonon components of the wave function a combined analysis of the measured form factors and angular distributions provides a unique test of the phonon character of the wave function. Furthermore, the purity of two-phonon states can be extracted. Comparison to QPM, shell-model and IBA-2 calculations is presented. Furthermore, the purity of two-phonon states can be extracted. Comparision to QPM, shell-model and IBA-2 calculations is presented. Supported by the DFG through SFB 634 and Ne 679/2-1.

Pre-equilibrium emission in 1.2 GeV proton induced reactions between Al and Th — Frank Goldenbaum\textsuperscript{1}, Claus-Michael Herrbach\textsuperscript{2}, Dietrich Hilscher\textsuperscript{2}, Ulrich Jahnke\textsuperscript{2}, V.G. Tischchenko\textsuperscript{3}, Joel Galin\textsuperscript{1}, Alain Letourneau\textsuperscript{3}, Alain P. Dietley Felges\textsuperscript{1}, Ludwik Pienkowski\textsuperscript{4}, Udo Schroeder\textsuperscript{3} and Jan Toke\textsuperscript{5} — 1Forschungszentrum Jülich GmbH, D-52428 Jülich — 2Hahn-Meitner Institut, D-14109 Berlin — 3GANIL, F-14076 Caen — 4Heavy Ion Laboratory, 02-093 Warszawa, Poland — 5Univ Rochester, NY 14627 USA

Proton induced spallation reactions at 1.2 GeV incident energy with targets of Al and Th have been studied. Energy spectra and angular distributions for $^\text{6}_\text{Li}$ and $^\text{7}_\text{Be}$ isotopes have been measured and compared to results of intra-nuclear cascade and statistical model calculations. While the evaporation, mean excitation energy and linear momentum transfer is in good agreement with the data, pre-equilibrium emission cannot be accounted for in these simulations. For deuterons, pre-equilibrium emission is shown to be well described by surface coalescence while other mechanisms are required for $^4$He and heavier clusters.

Timescale of fission in GeV proton induced reactions — Frank Goldenbaum\textsuperscript{1}, Claus-Michael Herrbach\textsuperscript{2}, Dietrich Hilscher\textsuperscript{2}, Ulrich Jahnke\textsuperscript{2}, Joel Galin\textsuperscript{1}, Alain Letourneau\textsuperscript{3}, Udo Schroeder\textsuperscript{3} and V.G. Tischchenko\textsuperscript{3} — 1Forschungszentrum Jülich GmbH, D-52428 Jülich — 2Hahn-Meitner Institut, D-14109 Berlin — 3GANIL, F-14076 Caen — 4Univ Rochester, NY 14627 USA

The excitation energy dependence of fission probability $P_f$ in 2.5 GeV proton induced reactions on Au, Bi, and U has been studied whereby $E^*$ is deduced eventwise form the multiplicity of evaporated light particles. Irrespective of the initial fissility for all three target nuclei at the highest $E^*$ of 1000 MeV $P_f$ amounts to approx. 30%. Intra-nuclear-cascade/statistical model calculations provide a very satisfying reproduction of the observed evolution of $P_f(E^*)$ with $E^*$. No extra transient delay is introduced showing fission to be decided upon very fast and early in the long deexcitation chain towards scission. The fast decision to fission is supported by the observation that a major part (about 80% at $E^*=600-900$MeV) of all evaporated alpha particles is emitted prior to scission — showing the entire fission process being relatively slow.