ESRF	**Experiment title:** A high-pressure study of the homothetic volume collaps of Ba_8Si_{46} and K_8Si_{46} by non-resonant x-ray Raman scattering	**Experiment number:** HE-2146
Beamline: ID 16	**Date of experiment:** from: May 3, 2006 to: May 9, 2006	**Date of report:** June 8, 2007
Shifts: 18	**Local contact(s):** Dr. G. Vankó	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):
Henning Sternemann[1,*], Christian Sternemann[1,*], Andreas Schacht[1,*], John S. Tse[2,*], S. Desgrenier[3]
[1]Institute of Physics, University of Dortmund, D-44221 Dortmund, Germany
[2]Dept. of Physics and Engeneering Physics, University of Saskatchewan, Saskatoon, Canada
[3]Dept. of Physics, University of Ottawa, Ontario, Canada

Report:

The results of this experiment have been published in:

H. Sternemann, C. Sternemann, J. S. Tse, S. Desgreniers, Y. Q. Cai, G. Vankó, N. Hiraoka, A. Schacht, J. A. Soininen, and M. Tolan: "*Giant dipole resonance of Ba in Ba_8Si_{46}: An approach for studying high-pressure induced phase transitions of nanostructured materials*", Physical Review B **75**, 245102 (2007).

Abstract:

The giant dipole resonance of Ba embedded into the complex Si host lattice structure of Ba_8Si_{46} has been observed under ambient and high-pressure conditions. The measurements have been accomplished using nonresonant inelastic x-ray scattering for different momentum transfers. The resonance appears as a broad feature between 100- and 150-eV energy loss for low momentum transfer but vanishes for high momentum transfer. Calculations within the time-dependent local-density approximation have been performed by means of a real-space multiple-scattering Green's-function approach. The results reproduce the shape and the width of the observed resonance. Modulations of the giant resonance spectra are predicted by computations ranging from ambient pressure up to 20 GPa which can be used to study the local environment of the Ba guest. A corresponding experimental setup for high-pressure studies is presented, potential applications to study the phase transitions of Ba clathrates are discussed, and first experimental results are shown.