High-pressure behaviors of a niobium nitride single crystal$^1$ XIAO-JIA CHEN, VIKTOR V. STRUZHkin, ZHIGANG WU, RONALD E. COHEN, HO-KWANG MAO, RUSSELL J. HEMLEY, Geophysical Laboratory, Carnegie Institution of Washington, Washington, DC 20015, AXEL NØRLUND CHRISTENSEN, Højkolvej 7, DK-8210 Aarhus V, Denmark — We report the measurements of the high-pressure lattice structures, Raman-scattering spectra, and superconducting transition temperatures up to 50 GPa on a non-stoichiometric niobium nitride single crystal. The material remains the simple $B1$ NaCl structure over the whole pressure range with a bulk modulus of 348 GPa, comparable to that of cubic boron nitride. The pressure-induced phonon frequency shifts are obtained based on the Raman-scattering data. These results together with the calculated electronic density of states are used to explain our observed constant superconducting transition at 12.6 K under pressures in this material.

\textsuperscript{1}Work at Carnegie was supported by the US Department of Energy (DOE) (Grant Nos. DEFG02-02ER4595 and DEFC03-03NA00144) and Office of Naval Research (Grant No. N000140210506).

Xiao-Jia Chen
Geophysical Laboratory, Carnegie Institution of Washington
Washington, DC 20015

Date submitted: 22 Dec 2004