approaches predict maximum excitation of a Ramanactive vibrational mode with period T when the pulse has an FWHM duration $\tau \approx 0.42\,T$.

This work was supported by the Robert A. Welch Foundation (Grant A-0929) and the China Scholarship Council, and we wish to thank the Texas A&M University Supercomputing Facility for the use of its parallel computing resources.

- * allen@tamu.edu
- S. De Silvestri, J. G. Fujimoto, E. P. Ippen, E. B. Gamble Jr., L. R. Williams, and K. A. Nelson, Chem. Phys. Lett. 116, 146 (1985).
- [2] Y.-X. Yan, E. B. Gamble Jr., and K. A. Nelson, J. Chem. Phys. 83, 5391 (1985).
- [3] A. M. Weiner, D. E. Leaird, G. P. Wiederrecht, and K. A. Nelson, Science 247, 1317 (1990).
- [4] H. J. Zeiger, J. Vidal, T. K. Cheng, E. P. Ippen, G. Dresselhaus, and M. S. Dresselhaus, Phys. Rev. B 45, 768 (1992).
- [5] C. J. Bardeen, Q. Wang, and C. V. Shank, Phys. Rev. Lett. 75, 3410 (1995).
- [6] A. Nazarkin and G. Korn, Phys. Rev. A 58, R61 (1998).
- [7] A. Nazarkin, G. Korn, M. Wittmann, and T. Elsaesser, Phys. Rev. Lett. 83, 2560 (1999).
- [8] R. A. Bartels, S. Backus, M. M. Murnane, and H. C. Kapteyn, Chemical Physics Letters 374, 326 (2003).
- [9] S.-Y. Lee, D. Zhang, D. W. McCamant, P. Kukura, and R. A. Mathies, J. Chem. Phys. 121, 3632 (2004).
- [10] H. Niikura, D. M. Villeneuve, and P. B. Corkum, Phys. Rev. Lett. 92, 133002 (2004).
- [11] B. Torralva, T. A. Niehaus, M. Elstner, S. Suhai, Th. Frauenheim, and R. E. Allen, Phys. Rev. B 64, 153105 (2001).
- [12] G. P. Zhang and T. F. George, Phys. Rev. Lett. 93, 147401 (2004); Phys. Rev. B 73, 035422 (2006).
- [13] U. Banin, A. Bartana, S. Ruhman, and R. Kosloff, J. Chem. Phys. 101, 8461 (1994).
- [14] T. J. Smith and J. A. Cina, J. Chem. Phys. 104, 1272 (1996).
- [15] T. E. Stevens, J. Hebling, J. Kuhl, and R. Merlin, Physica Status Solidi (b) 215, 81 (1999).
- [16] H. Rabitz, R. de Vivie-Riedle, M. Motzkus, and K. Kompa, Science 288, 824 (2000).
- [17] T. C. Weinacht, R. Bartels, S. Backus, P. H. Bucksbaum, B. Pearson, J. M. Geremia, H. Rabitz, H. C. Kapteyn, and M. M. Murnane, Chem. Phys. Lett. 344, 333 (2001).
- [18] R. A. Bartels, T. C. Weinacht, S. R. Leone, H. C.

- Kapteyn, and M. M. Murnane, Phys. Rev. Lett. 88, 033001(2002).
- [19] A. Assion, T. Baumert, M. Bergt, T. Brixner, B. Kiefer, V. Seyfried, M. Strehle, and G. Gerber, Science 282, 919 (1998).
- [20] K. T. Tsen, S.-W. D. Tsen, C.-L. Chang, C.-F. Hung, T. C. Wu, and J. G. Kiang, Virol. J. 4, 50 (2007).
- [21] K. T. Tsen, S.-W. D. Tsen, O. F. Sankey, and J. G. Kiang, J. Phys.: Condens. Matter 19, 472201 (2007).
- [22] E. C. Dykeman and O. F Sankey, Phys. Rev. Lett. 100, 028101 (2008).
- [23] E. C. Dykeman and O. F Sankey, J. Phys.: Condens. Matter 21, 505102 (2009).
- [24] S. L. Dexheimer, D. M. Mittleman, R. W. Schoenlein, W. Vareka, X. -D. Xiang, A. Zettl, and C. V. Shank, in *Ultrafast Phenomena VIII*, edited by J. L. Martin, A. Migus, G. A. Mourou, and A. H. Zewail, (Springer-Verlag, Berlin, 1993) p. 81.
- [25] H. Hohmann, C. Callegari, S. Furrer, D. Grosenick, E. E. B. Campbell, and I. V. Hertel, Phys. Rev. Lett. 73, 1919 (1994).
- [26] M. Boyle, T. Laarmann, K. Hoffmann, M. Hedén, E. E. B. Campbell, C. P. Schulz, and I. V. Hertel, Eur. Phys. J. D 36, 339 (2005).
- [27] T. Laarmann, I. Shchatsinin, A. Stalmashonak, M. Boyle, N. Zhavoronkov, J. Handt, R. Schmidt, C. P. Schulz, and I. V. Hertel, Phys. Rev. Lett. 98, 058302 (2007).
- [28] V. R. Bhardwaj, P. B. Corkum, and D. M. Rayner, Phys. Rev. Lett. 91, 203004 (2003).
- [29] Carbon Nanotubes, Advanced Topics in the Synthesis, Structure, Properties and Applications, edited by A. Jorio, G. Dresselhaus, and M. S. Dresselhaus (Springer, Berlin, 2008).
- [30] H. J. Liu and C. T. Chan, Phys. Rev. B 66, 115416 (2002).
- [31] M. Hulman, H. Kuzmany, O. Dubay, G. Kresse, L. Li, Z. K. Tang, P. Knoll, and R. Kaindl, Carbon 42, 1071 (2004).
- [32] J. S. Graves and R. E. Allen, Phys. Rev. B 58, 13627 (1998).
- [33] Y. R. Shen and N. Bloembergen, Phys. Rev. 137, A1787 (1965).
- [34] D. Porezag, Th. Frauenheim, Th. Köhler, G. Seifert, and R. Kaschner, Phys. Rev. B 51, 12947 (1995).
- [35] G. Seifert, D. Porezag, and Th. Frauenheim Int. J. Quantum Chem. 58, 185 (1996). See http://www.dftb.org and http://www.dftb-pluse.info for the currently best versions.
- [36] R. E. Allen, Phys. Rev. B 78, 064305 (2008) and references therein.