



Curriculum Vitae

Ivan R. Medvedev

PERSONAL

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EDUCATION

The Ohio State University

- **PhD in Physics** **2005**

Moscow Institute of Physics and Technology (MIPT)

- **M.S. in Physics and Applied Mathematics** **1998**
- **B.S. in Physics and Applied Mathematics** **1996**

TEACHING

Research Scientist – *The Ohio State University, Department of Physics* **2005-present**

- My duties as a researcher include the mentoring and supervision of graduate students pursuing their master's and doctoral degrees in our laboratory. As a research scientist I have been working with three graduate students; thus far one has successfully graduated with her master's degree in Physics in 2007.

Graduate Teaching Associate – *The Ohio State University, Department of Physics* **1998-2000**

- As a graduate teaching associate I taught introductory level Physics courses for undergraduate students. I provided laboratory and recitation instruction in Mechanics, Electricity and Magnetism, Optics, and Atomic Physics. In addition to in-class instruction, I routinely helped students during my office hours. My average work load was approximately 10 in-class hours per week with an average class size of 30 students.

Tutor **1995-2000**

- My training in physics and mathematics enabled me to provide private instruction in these disciplines to students of various levels during my undergraduate years at the Moscow Institute of Physics and Technology. I continued tutoring during the early years of my graduate education at the Ohio State University. My students ranged from middle school aged children to undergraduates at the time when I began my graduate school studies.

RESEARCH

Research Scientist - *The Ohio State University, Department of Physics***2005-present**

- My scientific interests are significantly influenced by my ongoing research in high resolution Sub-millimeter/TeraHertz spectroscopy. The sub-mm/THz spectral range has an immense analytical potential. Possible applications span medical breath analysis, chemical defense, atmospheric sciences, as well as astrophysics and astrochemistry. At the moment, development of the Analytical THz gas sensors and their availability is at its infancy. As a research scientist at the Ohio State University, I took a leading role in the development of a compact, versatile, portable analytical gas sensor.
- Better quantum mechanical models and new computational tools for spectral analysis are essential to extend our understanding of the high resolution ro-vibrational molecular spectra. While at the Ohio State University I worked on a wide range of spectroscopic projects and would like to continue my research on this subject. In particular, I am interested in spectroscopy of large amplitude vibrational mode, mode coupling and ro-vibrational dynamics.
- Interaction of the high intensity femtosecond laser pulses with atomic and molecular systems results in generation of a broadband spectrum of electromagnetic radiation including THz radiation. I am interested in employing this radiation for spectroscopic applications as well as correlating properties of the femtosecond pulse with characteristics of the generated THz radiation. In particular, in the ongoing research project, we are trying to establish relationship between Carrier-Envelope Phase (CEP) of the few femto-second long laser pulses and the intensity of the generated THz radiation.
- Applications of the THz radiation as a non-invasive and non-destructive method of biometric/medical imaging are rapidly emerging. In one of our recent projects we collaborated with a team of electrical engineers from the Ohio State University in testing novel point detectors and detector arrays intended for use in medical imaging.

Research Associate – *The Ohio State University, Department of Physics***2000-2005**

- The main technological achievement of my PhD thesis work was the design of a gas sensor based on the low-voltage solid state diode multiplier technology. This technology complements and is beginning to replace high voltage electron tubes which are traditionally used to generate radiation in Sub-millimeter/THz spectral range. This work opened a venue for the development of a compact analytical instrument based on heterodyne detection of radiation in the years following my PhD defense.
- In addition to experimental work, my PhD thesis contains theoretical analysis of the ro-vibrational spectra of several molecules of astrophysical interest. One of the molecules – ethyl formate has since been detected in the interstellar space based on the results of my spectroscopic analysis. In the course of my PhD work I also developed a set of software tools which aid in the assignment of broadband ro-vibrational spectra.

LANGUAGES

- English
- Russian

HOBBIES

- Running
- Photography
- Travel

PUBLICATIONS

Reviewed journal papers:

- 1 Ivan R. Medvedev, Christopher Neese, and Frank C. De Lucia, "A New Submillimeter/Terahertz Spectroscopic Sensor with 'absolute' specificity: Results and Comparisons," in preparation (2009).
- 2 Christoph P. Hauri, Ivan R. Medvedev, and Louis DiMauro, "Efficient terahertz emission from self-compressed filament pulses for loss-free and single-shot determination of the carrier-envelope phase," in preparation (2009).
- 3 Douglas T. Petkie, Mark Kipling, Ashely Jones, Paul Helminger, Ivan Medvedev, Atsuko Maeda, Markus Behnke, Brian J. Drouin, and Charles E. Miller, "The rotational spectra of the 6^1 , 7^1 , 8^1 , 9^1 and $5^1/9^2$ vibrational states of $H^{15}NO_3$," Journal of Molecular Spectroscopy 251 (1-2), 358-364 (2008).
- 4 Ivan R. Medvedev, Frank C. De Lucia, and Eric Herbst, "The millimeter- and submillimeter-wave spectrum of the trans- and gauche- conformers of ethyl formate," The Astrophysical Journal, Supplement Series, in press (2008).
- 5 Atsuko Maeda, Ivan R. Medvedev, Frank C. De Lucia, Eric Herbst, and Peter Groner, "The Millimeter- and Submillimeter-Wave Spectrum of $^{13}C_1$ -Methyl Formate [$H^{13}COOCH_3$] in the Ground State," The Astrophysical Journal, Supplement Series 175 (1), 139-146 (2008).
- 6 Zbigniew Kisiel, Ewa Bialkowska-Jaworska, Rebecca A. H. Butler, Douglas T. Petkie, Paul Helminger, Ivan R. Medvedev, and Frank C. De Lucia, "The rotational spectrum of chlorine nitrate ($ClONO_2$) in the four lowest nn_9 polyads," Journal of Molecular Spectroscopy, submitted (2008).
- 7 Peter Groner, Ivan R. Medvedev, Frank C. De Lucia, and Brian J. Drouin, "Rotational spectrum of acetone, CH_3COCH_3 , in the n_{17} torsional excited state," Journal of Molecular Spectroscopy 251 (1-2), 180-184 (2008).
- 8 Ivan R. Medvedev and Frank C. De Lucia, "An experimental approach to the prediction of complete millimeter and submillimeter spectra at astrophysical temperatures: applications to confusion-limited astrophysical observations," The Astrophysical Journal 656, 621-628 (2007).
- 9 Atsuko Maeda, Ivan R. Medvedev, Manfred Winnewisser, Frank C. De Lucia, Eric Herbst, Holger S. P. Muller, Monika Koerber, Christian P. Endres, and Stephan Schlemmer, "High-Frequency Rotational Spectrum of Thioformaldehyde, H_2CS , in the Ground Vibrational State," The Astrophysical Journal, Supplement Series 176 (2), 543-550 (2007).
- 10 Zbigniew Kisiel, Orest Dorosh, Manfred Winnewisser, Markus Behnke, Ivan R. Medvedev, and Frank C. De Lucia, "Comprehensive analysis of the FASSST rotational spectrum of $S(CN)_2$," Journal of Molecular Spectroscopy 246 (1), 39-56 (2007).
- 11 Peter Groner, Manfred Winnewisser, Ivan R. Medvedev, Frank C. De Lucia, Eric Herbst, and K. V. L. N. Sastry, "The millimeter- and submillimeter-wave spectrum of methyl carbamate [$CH_3OC(O)NH_2$]," The Astrophysical Journal, Supplement Series 169 (1), 28-36 (2007).
- 12 Manfred Winnewisser, Brenda P. Winnewisser, Ivan R. Medvedev, Frank C. De Lucia, Stephen C. Ross, and Larry M. Bates, "The hidden kernel of molecular quasi-linearity: Quantum monodromy," Journal of Molecular Structure 798 (1-3), 1-26 (2006).
- 13 Ivan R. Medvedev, Markus Behnke, and Frank C. De Lucia, "Chemical analysis in the submillimetre spectral region with a compact solid state system," The Analyst 131 (12), 1299-1307 (2006).
- 14 Atsuko Maeda, Ivan R. Medvedev, Frank C. De Lucia, and Eric Herbst, "The millimeter- and submillimeter-wave spectrum of iso-propanol (CH_3) $_2$ CHOH," The Astrophysical Journal, Supplement Series 166 (2), 650-658 (2006).
- 15 Brian J. Drouin, Charles E. Miller, Juliane L. Fry, Douglas T. Petkie, Paul Helminger, and Ivan R. Medvedev, "Submillimeter measurements of isotopes of nitric acid," Journal of Molecular Spectroscopy 236 (1), 29-34 (2006).
- 16 Oleg I. Baskakov, Brenda P. Winnewisser, Ivan R. Medvedev, and Frank C. De Lucia, "The millimeter wave spectrum of cis-HCOOH in the ground state and in the $\nu_9 = 1$ and $\nu_7 = 1$ excited vibrational states, and cis- $H^{13}COOH$ in the ground state," Journal of Molecular Structure 795 (1-3), 42-48 (2006).

- 17 Oleg I. Baskakov, Igor A. Markov, Eugen A. Alekseev, Roman A. Motiyenko, Jarmo Lohilahti, Veli-Matti Horneman, Brenda P. Winnewisser, Ivan R. Medvedev, and Frank C. De Lucia, "Simultaneous analysis of rovibrational and rotational data for the 4^1 , 5^1 , 6^1 , 7^2 , 8^1 , $7^1 9^1$ and 9^2 states of HCOOH," Journal of Molecular Structure 795 (1-3), 54-77 (2006).
- 18 Oleg I. Baskakov, Eugen A. Alekseev, Roman A. Motiyenko, Jarmo Lohilahti, Veli-Matti Horneman, Seppo Alanko, Brenda P. Winnewisser, Ivan R. Medvedev, and Frank C. De Lucia, "FTIR and millimeter wave investigation of the 7^1 and 9^1 states of formic acid HCOOH and $H^{13}COOH$," Journal of Molecular Spectroscopy 240 (2), 188-201 (2006).
- 19 Manfred Winnewisser, Ivan R. Medvedev, K. V. L. N. Sastry, Jacek Koput, Rebecca A. H. Butler, Frank C. De Lucia, and Eric Herbst, "The Millimeter- and Submillimeter-Wave Spectrum of Cyanofornamide," The Astrophysical Journal, Supplement Series 159, 189-195 (2005).
- 20 Brenda P. Winnewisser, Manfred Winnewisser, Ivan R. Medvedev, Markus Behnke, Frank C. De Lucia, Stephen C. Ross, and Jacek Koput, "Experimental confirmation of quantum monodromy: the millimeter wave spectrum of cyanogen isothiocyanate NCNCS," Physical review letters 95 (24), 243002 (2005).
- 21 Douglas T. Petkie, Paul Helminger, Markus Behnke, Ivan R. Medvedev, and Frank C. De Lucia, "The rotational spectra of the $7^1 9^1$, $6^1 9^1$, and 7^2 vibrational states of nitric acid," Journal of Molecular Spectroscopy 233 (2), 189-196 (2005).
- 22 Ivan R. Medvedev, Manfred Winnewisser, Brenda P. Winnewisser, Frank C. De Lucia, and Eric Herbst, "The use of CAAARS (Computer Aided Assignment of Asymmetric Rotor Spectra) in the analysis of rotational spectra," Journal of Molecular Structure 742 (1-3), 229-236 (2005).
- 23 Ivan R. Medvedev, Markus Behnke, and Frank C. De Lucia, "Fast analysis of gases in the submillimeter/terahertz with 'absolute' specificity," Applied Physics Letters 86 154105 (2005).
- 24 Ivan R. Medvedev, "Submillimeter wave/THz technology and rotational spectroscopy of several molecules of astrophysical interest," PhD thesis, advisor Frank C. De Lucia, Ohio State University, 2005.
- 25 Zbigniew Kisiel, Lech Pszczolkowski, Ivan R. Medvedev, Manfred Winnewisser, Frank C. De Lucia, and Eric Herbst, "Rotational spectrum of trans-trans diethyl ether in the ground and three excited vibrational states," Journal of Molecular Spectroscopy 233 (2), 231-243 (2005).
- 26 Markus Behnke, Ivan Medvedev, Manfred Winnewisser, Frank C. De Lucia, and Eric Herbst, "The Millimeter- and Submillimeter-Wave Spectrum of Oxiranecarbonitrile," The Astrophysical Journal, Supplement Series 152, 97-101 (2004).
- 27 Ivan Medvedev, Manfred Winnewisser, Frank C. De Lucia, Eric Herbst, Ewa Bialkowska-Jaworska, Lech Pszczolkowski, and Zbigniew Kisiel, "The millimeter- and submillimeter-wave spectrum of the trans-gauche conformer of diethyl ether," Journal of Molecular Spectroscopy 228 (2), 314-328 (2004).
- 28 Ivan Medvedev, Manfred Winnewisser, Frank C. De Lucia, Eric Herbst, Enyi Yi, Lai Peng Leong, Ryan P. A. Bettens, Ewa Bialkowska-Jaworska, Oleksandr Desyatnyk, Lech Pszczolkowski, and Zbigniew Kisiel, "The Millimeter- and Submillimeter-Wave Spectrum of the trans-trans Conformer of Diethyl Ether ($C_2H_5OC_2H_5$)," The Astrophysical Journal, Supplement Series 148, 593-597 (2003).

PRESENTATIONS

(underline indicates presenter)

Invited talks:

- 1 Ivan R. Medvedev, "An Experimental Approach to the Prediction of Complete Millimeter and Submillimeter Spectra at Astrophysical Temperatures", in EFI Mini-Symposium "Interstellar Molecules". 2007: Enrico Fermi Institute, University of Chicago.

Talks at conferences:

- 1 Christoph P. Hauri, Ivan Medvedev, Jonathan Wheeler, Chris Roedig, Gilles Doumy, and Louis F. DiMauro, "Absolute Carrier-Envelope Phase Signature in THz Emission from a Femtosecond Filament in Argon", in The Conference on Lasers and Electro-Optics (CLEO) and the Quantum Electronics and Laser Science Conference (QELS) (2008).

- 2 Ivan R. Medvedev, Frank C. De Lucia, and Paul Helminger, "Developments in Fast scan Submillimeter Spectroscopic Technique (FASSST) and Computer Aided Assignment of Asymmetric Rotor Spectra (CAAARS) software suite", in *63rd International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2008).
- 3 Sarah M. Fortman, Ivan R. Medvedev, and Frank C. De Lucia, "3-D submillimeter spectroscopy for astrophysics and spectral assignment.", in *63rd International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2008).
- 4 Sara Fortman, Christopher Neese, Ivan R. Medvedev, and Frank C. De Lucia, "3-D Submillimeter Spectroscopy for Astrophysics and Spectral Assignment", in *Midwest Astrochemistry Meeting* (Urbana, Illinois, 2008).
- 5 Holger S. P. Muller, Christian P. Endres, Stephan Schlemmer, Atsuko Maeda, Ivan Medvedev, Eric Herbst, Manfred Winnewisser, and Frank C. De Lucia, "Rotational spectroscopy of thioformaldehyde, H_2CS , in its four lowest excited vibrational, coriolis-coupled states", in *62nd International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2007).
- 6 Ivan R. Medvedev and Frank C. De Lucia, "An experimental approach to the prediction of complete millimeter and submillimeter spectra at astrophysical temperatures", in *62nd International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2007).
- 7 Atsuko Maeda, Ivan Medvedev, Eric Herbst, Manfred Winnewisser, Frank C. De Lucia, Holger S. P. Muller, Christian P. Endres, and Stephan Schlemmer, "Submillimeter-wave spectroscopy of thioformaldehyde, H_2CS , in its ground state", in *62nd International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2007).
- 8 Atsuko Maeda, Ivan Medvedev, Eric Herbst, Frank C. De Lucia, and Peter Groner, "Submillimeter-wave spectroscopy of $^{13}C_1$ -methyl formate in the ground state", in *62nd International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2007).
- 9 P. Groner, I. R. Medvedev, and Frank C. De Lucia, "The rotational spectrum of acetone in the second excited torsional state", in *62nd International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2007).
- 10 Manfred Winnewisser, Brenda P. Winnewisser, Ivan R. Medvedev, Frank C. De Lucia, and Stephen C. Ross, "The hidden kernel of molecular quasi-linearity: quantum monodromy", in *61st International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2006).
- 11 Douglas T. Petkie, Mark Kipling, Ashely Jones, Paul Helminger, Ivan Medvedev, Atsuko Maeda, Brian J. Drouin, and Charles E. Miller, "The rotational spectrum of $H^{15}NO_3$: all states below 1000 cm^{-1} ", in *61st International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2006).
- 12 Douglas T. Petkie, Paul Helminger, Ivan Medvedev, Atsuko Maeda, and Frank C. De Lucia, "The millimeter and submillimeter-wave rotational spectrum of the $8^1_9^1$, $6^1_7^1$, and 2^1 vibrational states of nitric acid", in *61st International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2006).
- 13 Ivan R. Medvedev, Brenda P. Winnewisser, Manfred Winnewisser, Markus Behnke, Frank C. De Lucia, Douglas T. Petkie, Ryan P. A. Bettens, and Zbigniew Kisiel, "Fast Scan Submillimeter Spectroscopic Technique (FASSST)", in *61st International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2006).
- 14 Z. Kisiel, O. Dorosh, I. R. Medvedev, M. Behnke, M. Winnewisser, F. C. De Lucia, and E. Herbst, "Analysis of interactions between excited vibrational states in the FASSST rotational spectrum of $S(CN)_2$ ", in *61st International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2006).
- 15 P. Groner, M. Winnewisser, I. R. Medvedev, F. C. De Lucia, and Eric Herbst, "Ground state rotational spectrum of methyl carbamate between 79 and 371 GHz", in *61st International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2006).
- 16 Peter Groner, Manfred Winnewisser, Ivan R. Medvedev, Frank C. De Lucia, and Eric Herbst, "Ground state rotational spectrum of methyl carbamate between 79 and 371 GHz", in *41st Midwest Regional Meeting of the American Chemical Society* (Quincy, IL, 2006).
- 17 B. P. Winnewisser, M. Winnewisser, I. R. Medvedev, M. Behnke, F. C. De Lucia, and S. C. Ross, "Experimental Confirmation Of Quantum Monodromy In The Millimeter Wave Spectrum Of $NCNCS$ ", in *60th International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2005).

- 18 I. R. Medvedev, M. Winnewisser, B. P. Winnewisser, F. C. De Lucia, and Herbst E., "The Use Of CAAARS (Computer Aided Assignment Of Asymmetric Rotor Spectra) In The Analysis Of Rotational Spectra", in *60th International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2005).
- 19 Z. Kisiel, O. Dorosh, I. R. Medvedev, M. Behnke, F. C. De Lucia, Herbst E., and M. Winnewisser, "Analysis Of The FASSST Rotational Spectrum Of $S(CN)_2$ ", in *60th International Symposium on Molecular Spectroscopy* (Columbus, OH, 2005).
- 20 O. I. Baskakov, B. P. Winnewisser, I. R. Medvedev, and F. C. De Lucia, "Rotational Transitions In The ν_9 And ν_7 Vibrational States of *cis*-HCOOH", in *60th International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2005).
- 21 M. Winnewisser, I. Medvedev, F. C. De Lucia, E. Herbst, and J. J. Christiansen, "The Millimeter- And Submillimeter-Wave Spectrum Of Cyanoformamide Revisited", in *59th International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2004).
- 22 D. T. Petkie, P. Helminger, I. Medvedev, M. Behnke, and F. C. De Lucia, "The Millimeter And Submillimeter-Wave Spectrum Of Nitric Acid: The $7^1_9^1$, $6^1_9^1$, And 7^2 Excited Vibrational States", in *59th International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2004).
- 23 I. Medvedev, M. Winnewisser, F. C. De Lucia, E. Herbst, E. Bialkowska-Jaworska, L. Pszczolkowski, and Z. Kisiel, "The Millimeter- And Submillimeter-Wave Spectrum Of *Trans*-Gauche Diethyl Ether ($C_2H_5OC_2H_5$)", in *59th International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2004).
- 24 I. Medvedev, M. Winnewisser, F. C. De Lucia, and E. Herbst, "Computer Aided Assignment Of Asymmetric Rotor Spectra (CAAARS)", in *59th International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2004).
- 25 Z. Kisiel, L. Pszczolkowski, F. C. De Lucia, E. Herbst, I. Medvedev, and M. Winnewisser, "Assignment Of The Lowest Excited Vibrational States In *Tt*-Diethyl Ether", in *59th International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2004).
- 26 I. Medvedev, M. Winnewisser, F. C. De Lucia, E. Herbst, Y. Enyi, and R. Bettens, "The Millimeter- And Submillimeter-Wave Spectrum Of Diethyl Ether ($C_2H_5OC_2H_5$)", in *58th International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2003).
- 27 M. Behnke, I. Medvedev, M. Winnewisser, and F. C. De Lucia, "A Pre-Biotic Species: The Rotational Spectrum Of Oxiranecarbonitrile", in *58th International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2003).
- 28 M. Behnke, I. Medvedev, R. Butler, M. Winnewisser, and F. C. De Lucia, "Extension And Enhancements To The Fast Scan Submillimeter Spectroscopy Technique (FASSST)", in *57th International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2002).
- 29 R. Butler, U. Fuchs, I. Medvedev, F. C. De Lucia, and E. Herbst, "The Millimeter- And Submillimeter-Wave Spectra Of Known And Likely Interstellar Molecules", in *56th International Symposium on Molecular Spectroscopy* (Columbus, Ohio, 2001).

Poster presentations:

- 1 H. S. P. Muller, C. P. Endres, S. Schlemmer, A. Maeda, I. R. Medvedev, E. Herbst, M. Winnewisser, and F. C. De Lucia, "Coriolis-coupling in the four lowest excited vibrational states of thioformaldehyde, H_2CS , studied by rotational spectroscopy", in *The 20th Colloquium on High Resolution Molecular Spectroscopy* (Dijon, France, 2007).
- 2 P. Groner, I. R. Medvedev, and F. C. De Lucia, "Rotational spectrum of acetone in the second excited torsional state", in *The 20th Colloquium on High Resolution Molecular Spectroscopy* (Dijon, France, 2007).
- 3 M. Elkeurti, L. H. Coudert, I. R. Medvedev, A. Maeda, F. C. De Lucia, A. R. W. Mckellar, and S. Toumi, "Microwave and far infrared spectra of acetaldehyde- d_1 ", in *The 20th Colloquium on High Resolution Molecular Spectroscopy* (Dijon, France, 2007).