

# Curriculum Vitae

Franklin Hyunil Cho

## EDUCATION

- Aug. 2009 – Aug. 2015 Doctor of Philosophy in Physics  
Dissertation: *Development of High-Frequency Electron Paramagnetic Resonance (EPR) Spectrometer and Investigation of Paramagnetic Defects and Impurities in Diamonds by Multi-Frequency EPR Spectroscopy*  
University of Southern California  
Los Angeles, CA, U.S.A.
- Sept. 2005 – Sept. 2009 Bachelor of Science in Physics  
University of California, Santa Barbara  
Santa Barbara, CA, U.S.A.

## RESEARCH EXPERIENCE

- Oct. 2015 – Mar. 2019 *Postdoctoral Fellow*  
Department of Physics and Astronomy & Institute for Quantum Computing  
University of Waterloo, Waterloo, ON, Canada  
Advisor: Prof. Jonathan Baugh and Prof. Raymond Laflamme
- July 2015 *Visiting Scholar*  
Department of Physics and Astronomy & Institute for Quantum Computing  
University of Waterloo, Waterloo, ON, Canada  
Advisor: Prof. Jonathan Baugh and Prof. Raymond Laflamme
- Aug. 2011 – Aug. 2015 *Research Assistant*  
Department of Physics and Astronomy  
University of Southern California, Los Angeles, CA, U.S.A.  
Advisor: Prof. Susumu Takahashi
- May 2011 – Aug. 2011 *Research Assistant*  
Department of Biomedical Engineering  
  
Ulsan National Institute of Science and Technology, Ulsan, Republic of Korea  
Advisor: Prof. HyungJoon Cho
- May 2010 – May 2011 *Research Assistant*  
Superconducting Material and Devices Group  
Jet Propulsion Laboratory, Pasadena, CA, U.S.A.  
Advisor: Dr. Pierre M. Echternach

## HONORS AND AWARDS

2013	College Merit Fellowship University of Southern California
2012	College Merit Fellowship University of Southern California
2007	UCSB Foundation – Various Donor Scholarship University of California, Santa Barbara
2006	J & I Campbell Scholarship University of California, Santa Barbara

## PUBLICATIONS

1. *Faceting control of excited state splitting in TiO<sub>2</sub> nanocrystals enabled by oxygen-vacancy-induced redox chemistries*  
P. Yin, N. S. Garnet, M. Hegde, Y. Tan, F. H. Cho, J. Baugh, and Pavle V. Radovanovic  
Submitted to Journal of the American Chemical Society (2018)
2. *Investigation of near-surface defects of nanodiamonds by high-frequency EPR and DFT calculation*  
Z. Peng, T. Biktairov, F. H. Cho, U. Gerstmann, and S. Takahashi  
The Journal of Chemical Physics **150**, 134702 (2019)
3. *Gradient-based closed-loop quantum optimal control in a solid-state two-qubit system*  
G. Feng, F. H. Cho, H. Katiyar, J. Li, D. Lu, J. Baugh, and R. Laflamme  
Physical Review A **98**, 052341 (2018)
4. *Estimating the Coherence of Noise in Quantum Control of a Solid-State Qubit*  
G. Feng, J. J. Wallman, B. Buonacorsi, F. H. Cho, D. K. Park, T. Xin, D. Lu, J. Baugh, and R. Laflamme  
Physical Review Letters **117**, 260501 (2016)
5. *Electron spin resonance spectroscopy of small ensemble paramagnetic spins using a single nitrogen-vacancy center in diamond*  
C. Abeywardana, V. Stepanov, F. H. Cho, and S. Takahashi  
Journal of Applied Physics **120**, 123907 (2016)
6. *Direct Evidence of Solution-Mediated Superoxide Transport and Organic Radical Formation in Sodium-Oxygen Batteries*  
C. Xia, F. Russel, F. H. Cho, N. Sudhakar, B. Buonacorsi, S. Walker, M. Xu, J. Baugh, and L. Nazar  
Journal of the American Chemical Society **138**, 11219 (2016)
7. *230/115 GHz electron paramagnetic resonance/double electron-electron resonance spectroscopy*  
F. H. Cho, V. Stepanov, C. Abeywardana, and S. Takahashi  
Methods in Enzymology **563**, 95 (2015)

8. *High-frequency and high-field optically detected magnetic resonance of nitrogen-vacancy centers in diamond*  
Stepanov, F. H. Cho, C. Abeywardana, and S. Takahashi  
Applied Physics Letters **106**, 063111 (2015)
9. *Magnetic resonance spectroscopy using a single nitrogen-vacancy center in diamond*  
Abeywardana, V. Stepanov, F. H. Cho, and S. Takahashi  
Proceedings of Society of Photo-Optical Instrumentation Engineers **9269**, 92690K (2014)
10. *A high-frequency electron paramagnetic resonance spectrometer for multi-dimensional, multi-frequency, and multi-phase pulsed measurements*  
F. H. Cho, V. Stepanov, and S. Takahashi  
Review of Scientific Instruments **85**, 075110 (2014)
11. *Ultrafast 3D spin-echo acquisition improves Gadolinium-enhanced MRI signal contrast enhancement*  
S. H. Han, F. H. Cho, Y. K. Song, J. Paulsen, Y. Q. Song, Y. R. Kim, J. K. Kim, G. Cho, and H. Cho  
Scientific Reports **4** (2014)
12. *Grafting nitroxide radicals on nanodiamond surface using click chemistry*  
E. E. Romanova, R. Akiel, F. H. Cho, and S. Takahashi  
The Journal of Physical Chemistry A **117**, 11933 (2013)
13. *Magnetic field anisotropy based MR tractography*  
S. H. Han, Y. K. Song, F. H. Cho, S. Ryu, G. Cho, Y. Q. Song, and H. Cho  
Journal of Magnetic Resonance **212**, 386 (2011)

## TEACHING EXPERIENCE

Summer 2014	<i>Laboratory Teaching Assistant</i> PHYS 135A Physics for Life Sciences
Summer 2013	<i>Laboratory Teaching Assistant</i> PHYS 151 Fundamentals of Physics I: Mechanics and Thermodynamics
Spring 2012	<i>Teaching Assistant</i> PHYS 152 Fundamentals of Physics II: Electricity and Magnetism
Fall 2011	<i>Laboratory Teaching Assistant</i> PHYS 153 Fundamentals of Physics III: Optics and Modern Physics <i>Laboratory Teaching Assistant</i> PHYS 135A Physics for the Life Sciences <i>Teaching Assistant</i> PHYS 438B Introduction to Quantum Mechanics and its Applications
Spring 2010	<i>Laboratory Teaching Assistant</i> PHYS 151 Fundamentals of Physics I: Mechanics and Thermodynamics
Fall 2009	<i>Laboratory Teaching Assistant</i> PHYS 151 Fundamentals of Physics I: Mechanics and Thermodynamics

## PRESENTATIONS

### Oral:

1. F. H. Cho, G. Feng, J. Baugh, and R. Laflamme  
*Toward realizing algorithmic cooling in electron-nuclear system*  
Technion – Israel Institute of Technology  
Haifa, Israel (Dec. 26 – 30, 2017)
2. F. H. Cho, V. Stepanov, C. Abeywardana, R. Akiel, and S. Takahashi  
*High-frequency EPR and DEER spectroscopy to study impurities in nanodiamonds*  
Max Planck Institute for Biophysical Chemistry  
Göttingen, Lower Saxony, Germany (Feb. 12, 2014)
3. F. H. Cho, V. Stepanov, C. Abeywardana, and S. Takahashi  
*High-frequency EPR and DEER spectroscopy to study impurities in nanodiamonds*  
Institute for Quantum Computing, University of Waterloo  
Waterloo, ON, Canada (Jan. 12, 2014)
4. F. H. Cho, V. Stepanov, C. Abeywardana, R. Akiel, and S. Takahashi  
*High-frequency EPR and DEER spectroscopy to study impurities in nanodiamonds*  
56th Rocky Mountain Conference on Magnetic Resonance  
Denver, CO, U.S.A. (July 13 – 17, 2014)
5. F. H. Cho, C. Abeywardana, R. Akiel, V. Stepanov, and S. Takahashi  
*Development of high-frequency EPR spectrometer and investigation of impurities in nanodiamonds*  
Institute for Terahertz Science and Technology, University of California, Santa Barbara  
Santa Barbara, CA, U.S.A. (May 15, 2014)
6. F. H. Cho and S. Takahashi  
*Impurities and spin relaxations in nanodiamonds studied by multi-frequency electron spin resonance*  
American Physical Society March Meeting  
Denver, CO, U.S.A. (Mar. 3 – 9, 2014)

### Poster:

1. F. H. Cho, V. Stepanov, and S. Takahashi  
*High-frequency electron-nuclear double resonance spectroscopy*  
43rd John Stauffer Distinguished Lecture in the Sciences, University of Southern California  
Los Angeles, CA, U.S.A. (Apr. 16, 2015)
2. F. H. Cho, C. Abeywardana, R. Akiel, V. Stepanov, and S. Takahashi  
*High-frequency EPR and DEER spectroscopy to study impurities in nanodiamonds*  
42nd John Stauffer Distinguished Lecture in the Sciences, University of Southern California  
Los Angeles, CA, U.S.A. (Apr. 24, 2014)
3. F. H. Cho, R. Akiel, and S. Takahashi  
*Impurities and spin relaxations in nanodiamonds*  
55th Rocky Mountain Conference on Magnetic Resonance  
Denver, CO, U.S.A. (July 28 – Aug. 1, 2013)
4. F. H. Cho, E. E. Romanova, and S. Takahashi  
*Dynamic nuclear polarization of water by nitroxide radicals*  
40th John Stauffer Distinguished Lecture in the Sciences, University of Southern California  
Los Angeles, CA, U.S.A. (Apr. 12, 2012)

## TECHNICAL SKILLS

Extensive experience in programming and data acquisition using LabVIEW and MATLAB  
Proficiency in data analysis using MATLAB, Mathematica, and Origin  
Working knowledge of vacuum technology and cryogenics  
Skillful in AutoCAD and hands-on experience with various machine shop tools

## REFERENCES

1. Dr. Jonathan Baugh ([baugh@uwaterloo.ca](mailto:baugh@uwaterloo.ca))  
Associate Professor, Department of Chemistry & Institute for Quantum Computing  
University of Waterloo, Waterloo, ON, Canada
2. Dr. Raymond Laflamme ([laflamme@uwaterloo.ca](mailto:laflamme@uwaterloo.ca))  
Canada Research Chair  
Professor, Department of Physics and Astronomy & Institute for Quantum Computing  
University of Waterloo, Waterloo, ON, Canada
3. Dr. Susumu Takahashi ([susumuta@usc.edu](mailto:susumuta@usc.edu))  
Associate Professor, Department of Chemistry & Department of Physics and Astronomy  
University of Southern California, Los Angeles, CA, U.S.A.
4. Dr. HyungJoon Cho ([hjcho@unist.ac.kr](mailto:hjcho@unist.ac.kr))  
Associate Professor, Department of Biomedical Engineering  
Ulsan National Institute of Science and Technology, Ulsan, Republic of Korea