DR. JONGSEOK LIM

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QUALIFICATIONS

2005 – 2011 **PhD, Physics**, KAIST, Daejeon, Korea
Thesis: Quantum Control in Two-Dimensional Fourier Transform Optical Spectroscopy

2001 – 2005 **B.S., Physics**, KAIST, Daejeon, Korea

EMPLOYMENT

2021 – present **Ernest Rutherford Fellow**
Imperial College London, London, UK
- **Measuring electron's electric dipole moment using an array of ultracold molecules**
- media: Imperial College News (link), Innovation News Network (link)

2021 – 2021 **Research Fellow**
Imperial College London, London, UK
- Led a research group to **Produce an array of ultracold molecules for the measurement of electron's electric dipole moment**
- Supervise PhD students and postdocs

2014 – 2021 **Postdoctoral Research Associate**
Imperial College London, London, UK
- Led a project **Production of ultracold molecules for the measurement of electron's electric dipole moment**
- Awarded STFC **Ernest Rutherford Fellowship**
- 5 first-author publications on ultracold molecules and 10 invited talks
- Secured 5 major research funding as a Principal Investigator, co-Investigator or named researcher, £4.6M in total
- Organized a weekly group seminar series

2012 – 2014 **Research Assistant Professor**
KAIST, Daejeon, Korea
- Devised a project **Implementation of ultrafast quantum gate**
- Managed a lab and led a team of 4 with an annual budget of £290k
- Secured a successful research grant of £1.7M as a named researcher

2011 – 2012 **Postdoctoral Research Fellow**
KAIST, Daejeon, Korea
- Established a collaboration with Center for Time and Frequency Metrology at Korea Research Institute of Standards and Science

2005 – 2011 **Doctoral Research Assistant**
KAIST, Daejeon, Korea
- Executed **Coherent control and multi-dimensional spectroscopy of cold atoms** using tailored femtosecond pulses

GRANTS AND AWARDS

February 2021 **STFC Ernest Rutherford Fellowship** (ST/V00428X/1)
Principal Investigator
811,462 GBP, Duration 60 months (01 Oct 2021 – 31 Sep 2026)

January 2020 **Gordon and Betty Moore Foundation grant** (#8864)
Co-Investigator, contributed to the proposal
614,400 GBP, Duration 39 months (10 Jan 2020 – 12 Mar 2023)

December 2019 **Alfred P. Sloan Foundation grant** (G-2019-12505)
Co-Investigator, contributed to the proposal
614,300 GBP, Duration 36 months (01 Jan 2020 – 31 Dec 2022)

October 2018 **STFC PPRP grant** (ST/S000011/1)
Named researcher, contributed to presentation of the proposal
1,725,622 GBP, Duration 48 months (30 Sep 2018 – 29 Sep 2022)

July 2018 **John Templeton Foundation grant** (Grant ID# 61104)
Named researcher, contributed to presentation of the proposal
888,745 GBP, Duration 33 months (01 Oct 2018 – 30 June 2021)

December 2013 **Samsung Science and Technology Foundation grant** (SSTF-BA1301-12)
Named researcher, co-designed the proposal
Approximately **1,754,000 GBP**, Duration 60 months (Sep2013 – Aug2018)

2012 – 2014 **Brain Korea 21 Research Professor Fellowship**
Awarded from National Research Foundation of Korea. Value: my salary over 19 months, totaling roughly **40,000 GBP** plus associated costs

2011 – 2012 **Brain Korea 21 Postdoctoral Fellowship**
Awarded from National Research Foundation of Korea. Value: my salary over 12 months, totaling roughly **21,000 GBP** plus associated costs

TEACHING EXPERIENCE

2018 – 2021 **Lecturer**
Imperial College London, London, UK
- MSc Research Skills
- MSc Quantum Systems: Cold Atomic Systems

2014 – 2017 **Demonstrator**
Imperial College London, London, UK
- Year 2 Computing demonstration and project supervisor
- Year 3 Lab demonstration
- Year 1 Lab demonstration and project supervisor

2005 – 2007 **Teaching Assistant**
KAIST, Daejeon, Korea
- Taught Applied Physics Laboratory to PhD students
- Taught Advanced Electromagnetic theory PhD students
- Taught Solid State Physics to 3rd year undergraduate students
- Taught General Physics to 1st year undergraduate students

STUDENT SUPERVISION

2014 – 2021 Supervised 4 PhD and 3 undergraduate students
Imperial College London, London, UK
- Co-authored two peer-reviewed papers with the PhD students.

2009 – 2014 Supervised 3 PhD and 1 undergraduate students
KAIST, Daejeon, Korea
- Co-authored seven peer-reviewed papers with the PhD students, and one peer-reviewed with the undergraduate student.

PROFESSIONAL ACTIVITIES

2020 – present Reviewer for New Journal of Physics

2019 – present Reviewer for Physical Review journals and Reviews of Modern Physics

2019 – present Grant Reviewer for National Science Foundation, US

2017 – present Reviewer for Computer Physics Communications

2016 – present Reviewer for Optics Communications

2014 – present Reviewer for Journal of the Optical Society of America B

March 2007 Launched a series of workshop, BK21 Young Physicists

PEER-REVIEWED JOURNAL PAPERS

[24] X. Alauze†, **Jongseok Lim**†, M. A. Trigatzis, S. Swarbrick, N. J. Fitch, B. E. Sauer, and M. R. Tarbutt, "An ultracold molecular beam for testing fundamental physics," Quantum Science and Technology 6, 044005 (2021).
†: These authors contributed equally to this work.

[23] N. J. Fitch†, **Jongseok Lim**†, E. A. Hinds, B. E. Sauer, and M. R. Tarbutt, "Methods for measuring the electron EDM using ultracold YbF molecules," Quantum Science and Technology 6, 014006 (2021).
†: These authors contributed equally to this work.

[22] C. Ho, J. A. Devlin, I. Rabey, P. Yzombard, **Jongseok Lim**, S. Wright, N. Fitch, E. A. Hinds, M. R. Tarbutt, and B. E. Sauer, "New techniques for a measurement of the electron's electric dipole moment," New Journal of Physics 22, 053031 (2020).

[21] Y. Song, **Jongseok Lim**, and J. Ahn, "Berry-phase gates for fast and robust control of atomic clock states," Physical Review Research 2 (2), 023045 (2020).

[20] W. Anukool, **Jongseok Lim**, Y. Song, and J. Ahn, "Quantum computing systems: a brief overview," Journal of Korean Physical Society 73, 841 (2018).

[19] **Jongseok Lim**, J. R. Almond, M. A. Trigatzis, J. A. Devlin, N. J. Fitch, B. E. Sauer, M. R. Tarbutt, and E. A. Hinds, “Laser cooled YbF molecules for measuring the electron’s electric dipole moment,” Physical Review Letters 120, 123201 (2018).

[18] **Jongseok Lim**, J. R. Almond, M. R. Tarbutt, D. T. Nguyen, T. C. Steimle, “The [557]-$X^2\Sigma^+$ and [561]-$X^2\Sigma^+$ bands of ytterbium fluoride, ^{174}YbF,” Journal of Molecular Spectroscopy 338, 81-90 (2017).

[17] **Jongseok Lim**, M. D. Frye, J. M. Hutson, and M. R. Tarbutt, “Modeling sympathetic cooling of molecules by ultracold atoms,” Physical Review A 92 (5), 053419 (2015).

[16] **Jongseok Lim**, H. Lee, S. Lee, C. Y. Park, and J. Ahn, “Ultrafast Ramsey interferometry to implement cold atomic qubit gates,” Scientific Reports 4, 5867 (2014).

[15] D. Han, K. Lee, **Jongseok Lim**, S. S. Hong, Y. K. Kim, and J. Ahn, “Terahertz lens made out of natural stone,” Applied Optics 52 (36), 8670-8675 (2013).

[14] H. Lee, H. Kim, **Jongseok Lim**, and J. Ahn, “Quantum interference control of a four-level diamond-configuration quantum system,” Physical Review A 88 (5), 053427 (2013).

[13] K. Lee, **Jongseok Lim**, and J. Ahn, “Young’s experiment with a double slit of sub-wavelength dimensions,” Optics Express 21 (16), 18805-18811 (2013).

[12] **Jongseok Lim**, H. Lee, and J. Ahn, “Review of cold Rydberg atoms and their applications,” Journal of Korean Physical Society 63 (4), 867-876 (2013).

[11] S. Lee, H. Lee, **Jongseok Lim**, J. Cho, C. Y. Park, and J. Ahn, “Coherent control of multiphoton ionization passage of excited-state rubidium atoms,” Physical Review A 86, 045402 (2012).

[10] **Jongseok Lim**, and K. Lee, and J. Ahn, “Ultrafast Rabi flopping in a three-level energy ladder,” Optics Letters 37 (16), 3378 (2012).

[9] **Jongseok Lim**, H. Lee, S. Lee, and J. Ahn, “Quantum control in two-dimensional Fourier transform spectroscopy,” Physical Review A 84, 013425 (2011).

[8] **Jongseok Lim**, H. Lee, J. Kim, S. Lee, and J. Ahn, “Coherent transients mimicked by two-photon coherent control of a three-level system,” Physical Review A 83, 053429 (2011).

[7] S. Lee, **Jongseok Lim**, C. Y. Park, and J. Ahn, “Strong-field quantum control of 2+1 photon absorption of atomic sodium,” Optics Express 19, 2266-2277 (2011).

[6] S. Lee, **Jongseok Lim**, J. Ahn, V. Hakobyan, and S. Guerin, “Strong-field two-photon transition by phase shaping,” Physical Review A 82, 023408 (2010).

[5] K. Jang, **Jongseok Lim**, J. Ahn, J. H. Kim, K. J. Yee, and J. S. Ahn, “Ultrafast Near-infrared Spectroscopic Study of Coherent Phonons in the Phase-Separated Manganite $La_{1/4}Pr_{3/8}Ca_{3/8}MnO_3$,” Physical Review B 81, 214416 (2010).

[4] M. Yi, K. Lee, **Jongseok Lim**, Y. Hong, Y. D. Jho, and J. Ahn, “Terahertz Waves Emitted from an Optical Fiber,” Optics Express 18, 13693–13699 (2010).

[3] K. Jang, **Jongseok Lim**, J. Ahn, J. H. Kim, K. J. Yee, J. S. Ahn, and S. W. Cheong, “Ultrafast IR Spectroscopic Study of Coherent Phonons and Dynamic Spin-Lattice Coupling in Multiferroic $LuMnO_3$,” New Journal of Physics 12 023017 (2010).

[2] **Jongseok Lim**, W. Lee, H. Sim, R. D. Averitt, J. M. Zide, A. C. Gossard, and J. Ahn, “Effect of nonuniform continuum density of states on a Fano resonance in semiconductor quantum wells,” Physical Review B 80, 035322 (2009).

[1] S. Lee, **Jongseok Lim**, and J. Ahn, “Strong-field two-photon absorption in atomic cesium: an analytical control approach,” Optics Express 17(9), 7648 (2009).

BOOK CHAPTERS

H. Kim, H. Lee, **Jongseok Lim**, and J. Ahn, *"Optimal Pulse Shaping for Ultrafast Laser Interaction with Quantum Systems,"* pp. 73-94; Book chapter in *"Progress in Ultrafast Intense Laser Science XI,"* Springer International Publishing (2015).

PATENTS

J. Ahn, K. Lee, M. Yi, **Jongseok Lim**,Y. Cho, Y. Hong, J. Jeong, "Device for terahertz emitter using thin indium arsenic film optical fiber and manufacturing method thereof", Korea Patent, 10-2009-0109168 (2009.11.12).

PEER-REVIEWED CONFERENCE ABSTRACTS

[11] Jaewook Ahn, **Jongseok Lim**, Jae-uk Kim, and Han-gyeol Lee, "Coherent Control in 2D Fourier Transform Optical Spectroscopy," Nonlinear Optics: Materials, Fundamentals and Applications, Hawaii, July 2011. DOI: 10.1364/NLO.2011.NFB5

[10] **Jongseok Lim**, Han-gyeol Lee, Sangkyung Lee, and Jaewook Ahn, "Quantum Control of Two-photon Inter-excited States Transitions," CLEO, Baltimore, May 2011. DOI: 10.1364/CLEO_AT.2011.JThB14

[9] Sangkyung Lee, **Jongseok Lim**, and Jaewook Ahn, "Strong-Field Quantum Control of Energy Ladder Climbing," CLEO, Baltimore, May 2011. DOI: 10.1364/CLEO_AT.2011.JThB49

[8] Sangkyung Lee, **Jongseok Lim**, and Jaewook Ahn, "Quantum Control of Strong-Field Ladder Climbing in Atomic Sodium," High Intensity Lasers and High Field Phenomena, Istanbul, February 2011. DOI: 10.1364/HILAS.2011.HWC11

[7] Sangkyung Lee, **Jongseok Lim**, Vahe Hakobyan, Stéphane Guérin, and Jaewook Ahn, "Intensity Invariance of Strong-Field Two-Photon Absorption," CLEO:QELS, San Jose, May 2010. DOI: 10.1364/QELS.2010.QTuE6

[6] Minwoo Yi, Kanghee Lee, **Jongseok Lim**, Jaewook Ahn, S. H. Shin, Jin-Dong Song, Youngbin Hong, and Young-Dahl Jho, "Terahertz Emission from Optical Fiber Tip and Near-Field Microscope Applications," CLEO, San Jose, May 2010. DOI: 10.1364/CLEO.2010.CWO2

[5] **Jongseok Lim**, Han-gyeol Lee, Sangkyung Lee, Kanghee Lee, and Jaewook Ahn, "Coherent Control of Wavefundtions in 2-D Fourier Transform Optical Spectroscopy," CLEO:QELS, San Jose, May 2010. DOI: 10.1364/QELS.2010.QFB6

[4] Kyeong-Jin Jang, **Jongseok Lim**, Jaewook Ahn, Jihee Kim, Ki-Ju Yee, and Jai Seok Ahn, "IR pump-probe study of phase separated hole-doped manganite, $La_{1/4}Pr_{3/8}Ca_{3/8}MnO_3$," International Conference on Infrared, Millimeter, and Terahertz Waves, Busan, November 2009. DOI: 10.1109/ICIMW.2009.5325552

[3] Kyeong-Jin Jang, **Jongseok Lim**, Jaewook Ahn, Jihee Kim, Ki-Ju Yee, Jai Seok Ahn, and Sang-Wook Cheong, "IR pump-probe study of multiferroic $LuMnO_3$," International Conference on Infrared, Millimeter, and Terahertz Waves, Busan, November 2009. DOI: 10.1109/ICIMW.2009.5324931

[2] Kyeong-Jin Jang, **Jongseok Lim**, Jihee Kim, Ki-Ju Yee, Jai Seok Ahn, and Jaewook Ahn, "Coherent Optical and Acoustic Phonons Coupled with the Charge-Ordering Phase Transition in $La_{1/4}Pr_{3/8}Ca_{3/8}MnO_3$," CLEO:QELS, Baltimore, May 2009. DOI: 10.1364/IQEC.2009.IWD4

[1] Kyeong-Jin Jang, **Jongseok Lim**, Jihee Kim, Ki-Ju Yee, Jai Seok Ahn, and Jaewook Ahn, "Coherent Optical Phonons in Multiferroic $LuMnO_3$," CLEO, Baltimore, May 2009. DOI: 10.1364/CLEO.2009.JTuD107

PRESENTATIONS

September2021	**(Invited)** "Production of ultracold molecules and their use for search for new physics," Korea Atomic Energy Research Institute, Korea.
May 2021	**(Invited)** "Revealing undiscovered forces using ultracold molecules," Departmental Seminar, KAIST, Korea.
April 2021	**(Invited)** "Measuring the electron electric dipole moment using an array of ultracold molecules," 2021 KPS Spring Meeting, Korea.
March 2021	**(Invited)** "Revealing undiscovered forces using ultracold molecules," Departmental Seminar, University of Groningen, the Netherlands.
July 2020	**(Invited)** "Ultracold Molecules and Their Applications," Departmental Seminar, Kyung Hee University, Korea.
April 2020	**(Invited)** "Controlled Ultracold Molecular Collisions," Departmental Seminar, Durham University, UK.
February 2020	**(Invited)** "Controlled Ultracold Molecular Collisions," Departmental Seminar, Columbia University, United States.
June 2019	**(Invited)** "Revealing undiscovered forces using ultracold molecules," Departmental Seminar, University of Birmingham, UK.
June 2019	**(Invited)** "Revealing undiscovered forces using ultracold molecules," Departmental Seminar, Columbia University, United States.
February 2019	**(Invited)** "Revealing undiscovered forces using ultracold molecules," The 2nd Asia-Pacific Workshop on Trapped Quantum Systems, Korea.
July 2018	"Ultracold YbF molecules for measuring the electron's electric dipole moment," The 26th International Conference on Atomic Physics, Barcelona, Spain.
July 2018	**(Invited)** "Laser cooled YbF molecules," Quantum Science with Ultracold Molecules Grant Meeting, Durham University, UK.
June 2018	**(Invited)** "Ultracold eEDM: a new experiment to measure the electron's electric dipole moment using ultracold molecules," Atomic, Molecular Physics Workshop, Korea.
September2017	"Laser cooling a molecular beam of YbF for measurement of the electron electric dipole moment," International Conference on Quantum, Atomic, Molecular and Plasma Physics, Glasgow, UK.
September2016	**(Invited)** "Laser cooling a beam of YbF for measurement of the electron electric dipole moment," MicroKelvin Molecules in a Quantum Array Grant Meeting, Imperial College London, UK.
July 2016	"Progress towards a cold, slow beam of YbF molecules for measuring the electron's electric dipole moment," The 25th International Conference on

	Atomic Physics, Korea.
March 2015	**(Invited)** “Sympathetic Cooling of Molecules in a Microwave Trap,” MicroKelvin Molecules in a Quantum Array Grant Meeting, Durham University, UK.
June 2013	“Implementation of Ultrafast Quantum Gates in electronic states of cold atoms,” The Gordon Research Conference on Atomic Physics, Boston, USA.
August 2011	“Quantum Control of Two-Photon Transitions between Intrashell Excited States with 2D Fourier Transform Spectroscopy,” The Gordon Research Conference on Quantum Control of Light and Matter, Boston, USA.
May 2011	“Quantum Interference Engineering of Two-photon Inter-excited state transition in a V-type,” Workshop on Advanced Lasers and Their Applications 2011, Korea.
May 2011	“Quantum Control of Two-Photon Inter-Excited States Transitions,” CLEO/QELS 2011, Baltimore, USA.
October 2010	“Quantum Control of Two-Photon Inter-excited State Transitions,” 2010 Korean Physical Society Fall Meeting, Korea.
May 2010	“Coherent Control of Wavefunctions in 2-D Fourier Transform Optical Spectroscopy,” CLEO/QELS 2010, San Jose, USA.
May 2010	“Coherent Control of Wavefunctions in 2-D Fourier Transform Optical Spectroscopy,” 2010 Asia Pacific Laser Symposium, Korea.
January 2010	“Advanced 2D Fourier transform spectroscopy in use of coherent control,” 2010 Optical Society of Korea Winter Meeting, Korea.
December 2008	“Control of Fano Coupling in Semiconductor Quantum Wells by Tuning the Density of Neighboring Extended Wannier-Stark States,” 2008 MRS Fall Meeting, Boston, USA.
October 2008	“The Effect of Dynamic Stark Shift on Resonant Two-Photon Absorptions,” 2008 Korean Physical Society Fall Meeting, Korea.
October 2007	“Fano Formula Extended with Non-uniform Density of Continuum States in Quantum Well Super-lattices,” 2007 Korean Physical Society Fall Meeting, Korea.
May 2006	“Creation and measurement of quantum wavepackets in Wannier-Stark energy ladders,” Workshop on Advanced Lasers and Their Applications 2006, Korea.
April 2006	“Fano Coupling Strengths in Wannier-Stark energy states of Biased GaAs-AlGaAs Superlattice,” 2006 Korean Physical Society Spring Meeting, Korea.
November 2005	“Variation of Fano Coupling Strength in Biased Semiconductor Superlattices by Induced Electric Field,” International Conference on Nanoscience and Nanotechnology, Korea.