**Seungchul Kim**

Assistant Professor/Pusan National University, Dept. of Optics and Mechatronics Engineering

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**Education**

2005 - 2009: Ph.D. in Mechanical Engineering, **KAIST,** Daejeon, Korea

Thesis: High Harmonic Generation in the range of EUV Light by Resonant Plasmon Field Enhancement, Advisor: Prof. Seung-Woo, Kim

2003 – 2005: Ph. D. - M.S joint program in Mechanical Engineering, **KAIST,** Daejeon, Korea

Research project: Development of metrological atomic force microscope for precision laser interferometer, Advisor: Prof. Seung-Woo, Kim

1998 – 2003: B.S. in Mechanical Engineering, **KAIST,** Daejeon, Korea

(Minor: Electrical Engineering)

1996 – 1998: **Hansung Science high school**, Seoul, Korea

**Executive Summary**

**Expertise:**

i) Advancing the ultrafast metrologies and its interdisciplinary ultrafast science & applications combining the ultra-precision in length, time, and frequency metrologies.

ii) Ultra precision dimensional metrology based on the optical frequency comb of frequency stabilized mode locked laser system.

iii) Theoretical & experimental knowledge in nano-plasmonics, ultrafast plasmonics & non-linear nanophotonics for developing novel scanning microscopy and spectroscopy.

iv) Experimental knowledge in nano-fabrications.

v) Development of THz spectroscopy system for material science/biomedical applications.

**Publications:** 23 high impact journals including Nature, Nature Photonics and Nature communications

**Presentations:** 20+ talks (14 invited) at US & Germany and international conferences, meeting and workshops

**Honors and Awards:** 4 awards including KAIST best scholarship of the year (SUKLIM)

**Press Releases:** 15+ media interests in online news, science magazines and reviewed articles

**5 prominent Publications** (see the full publication list)

**Seungchul Kim**\*, J. Jin\*, Y.-J. Kim, I.-Y. Park, Y. Kim, and S.-W. Kim, “High harmonic generation by resonant plasmon field enhancement,” *Nature*, **453**, 757-760, 2008

(**I.F. 38.597, Citations: 1086 in google scholar**, Featured in News and Views at Nature, Research highlights at Nature Nanotechnology and Nature Asia-Pacific, News at IEEE spectrum online, News at physicsworld, News at Laser Focus, News and Features at Photonics) \***Co-first Author**

I.-Y. Park\*, **Seungchul Kim,**\* J. Choi\*, D.-H. Lee, Y.-J. Kim, M. F. Kling, M. I. Stockman, and S.-W. Kim, “Plasmonic generation of ultrashort extreme-ultraviolet light pulses,” *Nature Photonics*, **5**, 677-681, 2011

(**I.F. 27.254, Citations: 217 in google scholar**, Featured in News and Views at Nature photonics, SPIE newsroom & physicsworld) \***Co-first Author**

X. T. Geng, B. Chun, J. H. Seo, K. Seo, H. Yoon, D. Kim, Y.-J. Kim\*, and **Seungchul Kim**\*, “Frequency comb transferred by surface plasmon resonance,” *Nature Communications* **7**, 10685, 2016 (**I.F. 12.124**) \***Co-corresponding Author**

S. Han, H. Kim, Y. W. Kim, Y.-J. Kim, **Seungchul Kim**, I.-Y. Park, and S.-W. Kim, “High harmonic generation by strongly enhanced femtosecond pulses in metal-sapphire nanostructure waveguide,” *Nature Communications* 7, 13105, 2016 (**I.F. 12.124**) **Co-author**

H. Kim, S. Han, Y.W. Kim, **Seungchul Kim**, S.-W. Kim, “Generation of Coherent Extreme-Ultraviolet Radiation from Bulk Sapphire Crystal,” *ACS photonics*, **4**, 1627-1632, 2017 (**I.F. 6.7**)

(**JCR top 7 % in Optics**) **Co-author**

**Research Grants** (**Principal Investigator**)

* **Principal Investigator**(Peer-Reviewed) of the ‘Young Researcher ProgramProject, 210,000,000 KRW in total, 2017-2020 (funded by the NRF, Republic of Korea).
* **Principal Investigator**(Peer-Reviewed) of the ‘Junior Research Group program’ Project, 2,000,000,000 KRW in total, 2011-2015 (funded by the MaxPlanck-POSTECH research initiative, Pohang, Republic of Korea).
* **Principal Investigator**(Peer-Reviewed) of the ‘Junior Research Group program’ Project, 2,000,000,000 KRW in total, 2011-2015 (funded by the MaxPlanck-POSTECH research initiative, Pohang, Republic of Korea).
* **Principal Investigator**(Peer-Reviewed) of the ‘MOLIT Creative Research Program: Development of a Micrometer-level Laser-based Imaging System for Pore-scale Physical Processes in Soils’ Project, 200,000,000 KRW in total, 2014-2016 (funded by the MOLIT of the Republic of Korea). **2 years more extension after evaluation(2016~2018)**
* **Principal Investigator**(Peer-Reviewed) of the ‘NRF General Research Program: Light-fast nano electronics at PHz frequency’ Project, 155,000,000 KRW in total, 2013-2016 (funded by the National Research Foundation of the Republic of Korea).

**Selected Publications** (see the full publication list)

N. Anh, B. Chun, S. Choi, D.-E. Kim, **Seungchul Kim**,\* and Y.-J. Kim\*, “Frequency-comb-referenced plasmonic phase spectroscopy,” *Nature Physics*, under Review, 2018

\*Co-corresponding Author

S. Han, L. Ortmann, H. Kim, Y. W. Kim, T. Oka, A. Chacon, B. Doran, M. Ciappina, M. Lewenstein, S.-W. Kim\*, **Seungchul Kim**\*, A. Landsman, “Nonlinear susceptibilities from high-harmonic generation in sapphire,” *Nature Photonics*, under Review, 2018

\*Co-corresponding Author

H. Kim, S. Han, Y.W. Kim, **Seungchul Kim**, S.-W. Kim, “Generation of Coherent Extreme-Ultraviolet Radiation from Bulk Sapphire Crystal,” *ACS photonics*, **4**, 1627-1632, 2017 (**I.F. 6.7**)

(**JCR top 7 % in Optics**)

X. T. Geng, B. Chun, J. H. Seo, K. Seo, H. Yoon, D. Kim, Y.-J. Kim\*, and **Seungchul Kim**\*, “Frequency comb transferred by surface plasmon resonance,” *Nature Communications* **7**, 10685, 2016 (**I.F. 12.124**) \***Co-corresponding Author**

K. Lee, I. Hwang, N. Kim, D. Choi, H.-D. Um, **Seungchul Kim**, and K. Seo, “17.6%-Efficient radial junction solar cells using silicon nano/micro hybrid structures,” *Nanoscale*, **30**, 14473-14479, 2016

(**JCR top 8 % in materials science**)

S. Han, H. Kim, Y. W. Kim, Y.-J. Kim, **Seungchul Kim**, I.-Y. Park, and S.-W. Kim, “High harmonic generation by strongly enhanced femtosecond pulses in metal-sapphire nanostructure waveguide,” *Nature Communications* 7, 13105, 2016 (**I.F. 12.124**)

**Seungchul Kim**\*, J. Jin\*, Y.-J. Kim, I.-Y. Park, Y. Kim, and S.-W. Kim, “Kim et al. reply,” *Nature*, **485**, E1-E3, 2012

(**I.F. 38.597, Citations: 57**) \***Co-first Author**

I.-Y. Park\*, **Seungchul Kim,**\* J. Choi\*, D.-H. Lee, Y.-J. Kim, M. F. Kling, M. I. Stockman, and S.-W. Kim, “Plasmonic generation of ultrashort extreme-ultraviolet light pulses,” *Nature Photonics*, **5**, 677-681, 2011

(**I.F. 27.254, Citations: 217 in google scholar**, Featured in News and Views at Nature photonics, SPIE newsroom & physicsworld) \***Co-first Author**

**Seungchul Kim**\*, J. Jin\*, Y.-J. Kim, I.-Y. Park, Y. Kim, and S.-W. Kim, “High harmonic generation by resonant plasmon field enhancement,” *Nature*, **453**, 757-760, 2008

(**I.F. 38.597, Citations: 1086 in google scholar**, Featured in News and Views at Nature, Research highlights at Nature Nanotechnology and Nature Asia-Pacific, News at IEEE spectrum online, News at physicsworld, News at Laser Focus, News and Features at Photonics) \***Co-first Author**

**Research Experience Summary**

**Dept. of Optics & Mechatronics Engineering, College of Nanoscience and Nanotechnology, Pusan National University,** Busan, Korea (2016.8 - current)

Assistant professor

**Max Planck Center for Attosecond Science,** Max Planck POSTECH Korea Research Initiative, Pohang, Korea (2011-2016)

Junior Research Group leader (**Principal Investigator**)

**Dept. of Physics, POSTECH**, Pohang, Korea (2012-2016)

Adjunct assistant Professor

* Ultrafast imaging/spectroscopy of plasmonics in nano/micro devices and its interdisciplinary applications including ultrafast plasmonic device(ultrafast-PEEM)
* Ultrafast laser pump-probe microscopy of nanoplasmonic field
* Ultrafast laser beam line system with 300 kHz repetition rate high power OPCPA laser system
* Scanning laser microscopy/spectroscopy
* Ultra-precision nano-bio spectroscopy based on optical frequency comb of frequency stabilized mode locked laser system(Atomic clock referenced nano-optical spectroscopy)
* Light-fast PHz transient nano electronics based on Carrier envelope phase controlled ultrafast laser system
* THz spectroscopy for complex composition of material

\*Research collaboration Groups (10+ Groups)

Prof. Dong-Eon Kim at POSTECH, Prof. Martin Aeschilmann at University of Kaiserslautern(Germany), Dr. Lefteris Goulielmakis at MPQ(Germany), Prof. Matthias F. Kling at LMU(Germany), Prof. Ulf Kleineburg at LMU(Germany), Prof. Seung-Woo Kim at KAIST, Prof. Young-Jin Kim at Nanyang Technological University (Singapore), Prof. Peter Hommelhoff at Universität Erlangen-Nürnberg(Germany), Prof. Tae-Hyuk at KAIST, Dr. Jae-Hun Park at PAL

**Max-Planck institute of Quantum Optics (MPQ)**, Garching, Germany (2012-2013)

Visiting Research professor (PI: Prof. F. Krausz & Prof. Matthias F. Kling)

* Time resolved ultrafast pump-probe photoemission spectroscopy of nanoplasmonic field
* Nonlinear photoemission spectroscopy of nanoparticle in strong field regime
* Attosecond streaking of plasmonic field in Au nano tip

**KAIST institute for Optical Science and Technology,** Daejeon, Korea (2009-2011)

Postdoctoral Associate (Prof. Seung-Woo Kim)

* Advanced multi-MHz repetition rate XUV pulse generation via surface plasmon polariton
* Dimensional metrology(length, surface) based on optical frequency comb
* Ultrafast DUV pulse generation with plasmonically enhanced NIR pulse by surface third harmonic generation
* Phase shift laser interferometer for thickness measurement of Si wafer and ITO film

**KAIST, Billionth Uncertainty Precision Engineering Research Group**, Daejeon, Korea (2003-2009)

Affiliate scientist (PI: Prof. Seung-Woo Kim)

* Advanced multi-MHz repetition rate XUV pulse generation via surface plasmon resonance
* Nanofabrication via strong field evaporation of near field enhancement of AFM tip
* Volumetric interferometer for metrological Atomic Force Microscopy
* Ultra precision nanofabrication via Focused Ion Beam system.

**KAIST, Applied Heat Transfer Lab**, Daejeon, Korea (2002)

Undergraduate Research Intern (Advisor: Prof. Sung-Jin Kim)

* Design simulation of microchannel for fluid mixing

**Full Publication List**

1. Sungho Choi, Xiao Tao Geng, Dong-Eon Kim, and **Seungchul Kim**\*, “Carrier envelope phase dependent electron emission in ultrafast plasmonic vortex lens,” *Nature Communications*, 2018 in preparation (**corresponding author**)
2. Sungho Choi, Dong-Eon Kim, and **Seungchul Kim**\*, “Observation of ultrafast strong field plasmonic coupling in concentric double ring structure,” *Applied Physics Letters*, 2018 in preparation (**corresponding author**)
3. N. Anh, B. Chun, S. Choi, D.-E. Kim, **Seungchul Kim**,\* and Y.-J. Kim\*, “Frequency-comb-referenced plasmonic phase spectroscopy,” *Nature Physics*, under Review, 2018
4. Seunghwoi Han, Lisa Ortmann, Hyunwoong Kim, Yong Woo Kim, Takashi Oka, Alexis Chacon, Brent Doran, Marcelo Ciappina, Maciej Lewenstein, Seung-Woo Kim, Seungchul Kim, Alexandra Landsman, “Nonlinear susceptibilities from high-harmonic generation in sapphire,” *Nature Physics*, submitted, 2018
5. Hyunwoong Kim, Seunghwoi Han, Yong Woo Kim, **Seungchul Kim**, and Seung-Woo Kim, “Generation of Coherent Extreme-Ultraviolet Radiation from Bulk Sapphire Crystal,” *ACS photonics*, 4, 1627-1632, 2017
6. Yong-Min Kim , Tae-Hyuk Kwon, and **Seungchul Kim,** “Measuring elastic modulus of bacterial biofilms
7. in a liquid phase using atomic force microscopy,” *Geomechanics and Engineering*, 12, 5, 863-870, 2017
8. Gi-Jun Lee, Tae-Hyuk Kwon, and **Seungchul Kim**\*, “Effect of Moisture Content and Particle Size on Extinction Coefficients of Soils Using Terahertz Time-Domain Spectroscopy,” *IEEE Transactions on Terahertz Science and Technology*, 5, 529-535, 2017 (**corresponding author**)
9. Seunghwoi Han, Hyunwoong Kim, Yong Woo Kim, Young-Jin Kim, **Seungchul Kim**, In-Yong Park and Seung-Woo Kim**\*,** “High harmonic generation by strongly enhanced femtosecond pulses in metal-sapphire nanostructure waveguide,” *Nature Communications, 7, 13105,* 2016
10. Kangmin Lee, Inchan Hwang, Namwoo Kim, Deokjae Choi, Han-Don Um, **Seungchul Kim**, and Kwanyong Seo, “17.6%-efficient radial junction solar cells using silicon nano/micro hybrid structure,” *nanoscale*, 30, 14473-14479, 2016
11. Xiao Tao Geng, Byung Jae Chun, Ji Hoon Seo, Kwanyong Seo, Hana Yoon, Dong-Eon Kim, Young-Jin Kim\*, and **Seungchul Kim**\*, “Frequency comb transferred by surface plasmon resonance,” *Nature Communications*, **7**, 10685, 2016 (**corresponding author**)
12. Sungho Choi, Marcelo F. Ciappina\*, John A. Perez-Hernandez, Alexander S. Landsman, Young-Jin Kim, **Seungchul Kim**\*, and Dong-Eon Kim, “Active tailoring of nano-antenna plasmonic field using few-cycle laser pulses,” *Physical Review A (R,)* **93**, 021405(R), 2016(**corresponding author**)
13. Byungnam Ahn, Johannes Schötz, William A. Okell, Frederik Süßmann, Benjamin Förg, **Seungchul Kim**, Matthias F. Kling, and Dong Eon Kim, “Optimization of a nanotip on a surface for the ultrafast probing of propagating surface plasmons,” *Optics Express*, **24**, No. 1, 2016
14. Stephan Prinz, Matthias Haefner, Catherine Yuriko Teisset, Robert Bessing, Knut Michel, Yeon Lee, Xiao Tao Geng, **Seungchul Kim**, Dong Eon Kim, Thomas Metzger, and Marcel Schultze, “CEP-stable, sub-6 fs, 300-kHz OPCPA system with more than 15 W of average power,” *Optics Express*, **23**, No. 2, 2015
15. **Seungchul Kim**\*, Ojoon Kwon, and Tae-Woo Lee, “Lightfast optical current in dielectric by plasmonically induced local field,” *SPIE Proceedings,* **9170**, 2014 (**corresponding author**)
16. Dong-Hyub Lee, Joonhee Choi, **Seungchul Kim**, In-Yong Park, Seunghwoi Han, Hyunwoong Kim, and Seung-Woo Kim, “Observation of strongly enhanced ultrashort pulses in 3-D metallic funnel-waveguide,” *Optics Express*, **22**, No. 14, 2014
17. Young-Jin Kim, Ian Coddington, William C. Swann, Nathan R. Newbury, Joohyung Lee, **Seungchul Kim**, and Seung-Woo Kim, “Time-domain stabilization of carrier-envelope phase in femtosecond light pulses,” *Optics Express*, **22**, No. 10, pp. 11788-11796, 2014
18. Woo-Deok Joo, Seungman Kim, Jiyong Park, Keunwoo Lee, Joohyung Lee, **Seungchul Kim**, Young-Jin Kim, and Seung-Woo Kim, "Femtosecond laser pulses for fast 3-D surface profilometry of microelectronic step-structures," *Optics Express*, **21** No. 13, 2013
19. Ying-Ying Yang, Armin Scrinzi, Anton Husakou, Qian-Guang Li, Sarah L. Stebbings, Frederik Süßmann, Hai-Juan Yu, **Seungchul Kim**, Eckart Rühl, Joachim Herrmann, Xue-Chun Lin, and Matthias F. Kling, “High-harmonic and single attosecond pulse generation using plasmonic field enhancement in ordered arrays of gold nanoparticles with chirped laser pulses,” *Optics Express*, **21** No. 2, 2013
20. In-Yong Park, Joonhee Choi, Dong-Hyub Lee, Seunghwoi Han, **Seungchul Kim**\*, and Seung-Woo Kim\*, “Generation of EUV radiation by plasmonic field enhancement using nano-structured bowties and funnel-waveguides,” *Ann. Phys*. **525**, 87-96, 2013(**corresponding author**)
21. Woo-Deok Joo, Jiyong Park, Seungman Kim, **Seungchul Kim**, Yunseok Kim, Seung-Woo Kim, and Young-Jin Kim, "Phase Shifting Interferometry for Large-sized Surface Measurements by Sweeping the Repetition Rate of Femtosecond Light Pulses," *International journal of precision engineering and manufacturing*, **14**, 2013
22. Joonhee Choi, **Seungchul Kim**, In-Yong Park, Dong-Hyub Lee, Seunghwoi Han, and Seung-Woo Kim, “Generation of isolated attosecond pulses using a plasmonic funnel-waveguide,” *New journal of physics*, **14**, 103038, 2012
23. **Seungchul Kim**, Jonghan Jin, Young-Jin Kim, In-Yong Park, Yunseok Kim, and Seung-Woo Kim, “Kim et al. reply,” *Nature*, **485**, E1-E3, 2012
24. In-Yong Park\*, **Seungchul Kim**\***,** Joonhee Choi\*, Dong-Hyub Lee, Young-Jin Kim, Matthias F. Kling, Mark I. Stockman, and Seung-Woo Kim, “Plasmonic generation of ultrashort extreme-ultraviolet light pulses,” *Nature Photonics*, **5**, 677-681, 2011 (\***Equally contributed 1st author**)
25. **Seungchul Kim**, In-Yong Park, Joonhee Choi, and Seung-Woo Kim, “High harmonic generation by plasmonic enhancement of femtosecond pulse laser,” *Progress in ultrafast intense laser science VI*, **6,** 129-144, 2011 (invited)
26. **Seungchul Kim**, Jonghan Jin, Young-Jin Kim, In-Yong Park, Yunseok Kim, and Seung-Woo Kim, “High harmonic generation by resonant plasmon field enhancement,” *Nature*, **453**, 757-760, 2008

*News and Views* at Nature as “An easier route to high harmony”; *Research highlights* at Nature Nanotechnology as “Nanophotonics: Into the EUV”: *Research highlights* at Nature Asia-Pacific as “UV light from gold nano-bow ties”; *News* at ieee spectrum online as “Tabletop EUV light source continued”; *News* at physicsworld.com as “Extreme UV light made easy”; *News* at Laser Focus World as “High-harmonic generation: new EUV source is compact”; *News and Features* at Photonics.com as “Bow-tie enhances EUV”.

1. In-Yong Park, **Seungchul Kim**, Joonhee Choi, and Seung-Woo Kim, “Plasmonic field enhancement for generating ultrafast extreme-ultraviolet light pulses,” *SPIE Proceedings* **8096,** 80960V, 2011
2. Joonhee Choi, **Seungchul Kim**, In-Yong Park, and Seung-Woo Kim, “High harmonic generation by guided surface plasmon polaritons”, *SPIE Proceedings* **7757,** 77571D, 2010
3. In-Yong Park, **Seungchul Kim**, Joonhee Choi, and Seung-Woo Kim, “Design of nanostructures for high harmonic generation by localized surface plasmon resonance”, *SPIE Proceedings* **7394,** 73940V, 2009
4. Seung-Woo Kim, **Seungchul Kim**, In-Yong Park, and Jonghan Jin, “High harmonics generation by plasmonic field enhancement,” *SPIE Proceedings* **7394,** 73940U, 2009
5. **Seungchul Kim** and Seung-Woo Kim, “AFM-based nanofabrication with femtosecond pulse laser radiation,” *SPIE Proceedings* **6324**, 63240S, 2006

**Awards and Honors**

* KAIST SUKLIM Scholarship 2009

(1 person per year in KAIST),

* BK21 representative Paper Award 2009

(3 person per year in dep. of mechanical engineering, KAIST )

* Award by president of KIMM(Korea Institute of Machinery & Materials) 2009

(1 person per year in dep. of mechanical engineering, KAIST )

* Representative Researches top 60 2009

(60 top research topics in Korea, given by Ministry of education, science and technology)

* Samsung Advanced Institute of Technology 2002

Best internship award