Haewook Han

Associate Professor
Department of Electrical Engineering
School of Interdisciplinary Bioscience & Bioengineering
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EDUCATION

Ph.D.	**Jan 1995**	Electrical Engineering University of Illinois at Urbana-Champaign, USA
M. S.	**Feb 1988**	Electrical Engineering Seoul National University, Seoul, Korea.
B. S.	**Feb 1986**	Electrical Engineering Seoul National University, Seoul, Korea.

RESEARCH INTERESTS

Nano-Bio THz Photonics

- Compact THz Sources (THz Antennas and THz Photomixers)
- High-Precision and Real-time THz Comb Spectroscopy
- THz Photonic Crystals Fibers
- THz Biomedical Sensing and Imaging
- THz Near-field Microscopy (THz-NFM)
- THz Hydration Dynamics in Biomolecular Systems
- THz Dynamics in Quantum Matters (Graphene and VO_2)

Nanophotonic Devices

- Photonic Crystals and LEDs
- Nanophotonic CMOS Image Sensors

TEACHING EXPERIENCE

Undergraduate Courses	EECE231	Basic Circuit Theory
	EECE261	Electromagnetics
	EECE303	Physical Electronics: Semiconductor Fundamentals
	EECE411	Fundamentals of Photonics
	EECE490U	Mathematical Method in Physical Electronics
Graduate Courses	EECE555	Physics of Optical Materials and Devices
	EECE676	Guided Waves and Integrated Optics
	EECE695	Semiconductor Electrodynamics
	EECE695X	THz Imaging and Sensing
	EECE695U	THz Spectroscopy and Applications
	EECE695V	Solid State Electrodynamics
	EECE695W	THz Photonic Devices
	EECE75B	THz Technology

PROFESSIONAL EXPERIENCE

Jan 1997 – Present	**Assistant and Associate Professors** Department of Electrical Engineering POSTECH Pohang, Korea
Aug 2015 – Present	**Director** Center for THz Industrial Applications Advanced Pohang Technology Partnership (AP-TP) Program Research Institute of Industry Science and Technology (RIST), POSCO
Oct 2011 – Sep 2014	**Director** Center for Smart LED Lighting System New Strategic Technology Program Pohang Steel Company (POSCO) and POSCOLED
Apr 2004 – Mar 2009	**Director** National Research Laboratory for Nano-THz Photonics Korean Ministry of Science and Technology
Jan 2004 – Jun 2004	**Visiting Professor** Center for THz Research Rensselaer Polytechnic Institute, USA
Oct 1998 – Sep 2001	**Director** Center for THz Photonics, Creative Research Initiatives Program Korean Ministry of Science and Technology
Jan 1995 – Jan 1997	**Member of Technical Staff** AT&T Bell Laboratories, Murray Hill, U.S.A.

AWARDS AND HONORS

Mar 2015	**Best Patent Award** Image sensor having micro lens (Korea/USA/Japan/Germany/China) **"*Selected as a Strategic Patent for SK-Hynix"*** SK-Hynix
Mar 2014	**Best Patent Award** CMOS image sensor having optical block area (Korea/USA/China) SK-Hynix
Oct 2010	**Best Paper Award** The Korean Information Display Society
Oct 2009, Jul 2008, Jan 2007	**Best Paper Award** Optical Society of Korea
Jun 2008	**Best Paper Award** The Korean Biochip Society
Jan 2006	**Best Paper Award** The Institute of Electronics and Information Engineers
Aug 1990 – Jul 1993	**Government Overseas Scholarship ($60,000)** The Korean Ministry of Education

PROFESSIONAL ACTIVITIES

Membership

- Institute of Electrical and Electronics Engineers (IEEE)
- Optical Society of America
- Korean Physics Society, Optical Society of Korea
- Korea Terahertz Forum, THz-Bio Quantum Forum

Editorial Board

Mar 2017 – present **Associate Editor**
IEEE Nanotechnology (TNANO Letters)

Aug 2015 –May 2016 **Guest Editor-in-Chief**
"Special Issue on THz Near-Field Microscopy and Applications"
IEEE Transactions on Terahertz Science and Technology

Jan 2014 – present **Associate Editor**
IEEE Transactions on Terahertz Science and Technology

Jan 2012 – Dec 2015 **Member of Editorial Board**
Journal of Infrared, Millimeter, and Terahertz Waves

Journal Reviewer

- **OSA**: Optics Express, Journal of Optical Society of America
- **AIP**: Applied Physics Letters, Journal of Applied Physics
- **IRMMW-THz**: Journal of Infrared, Millimeter, and THz Waves
- **IEEE**: Transactions on THz Science and Technology, Photonics Technology Letter
  Journal of Selected Topics of in Quantum Electronics
- **IET**: Electronics Letters
- **ACS**: Nano Letters
- **VCH**: Advanced Materials

International Academic Society

Jun 2015 – present **Founding Chair**
The International Society of Nano-Bio Photonics

Oct 2011 – present **Founding President**
THz-Bio Quantum Forum
(Interdisciplinary Collaboration Members from Korea, USA, and Hong Kong)

Oct 2010 – present **Founding Vice President**
Korea THz Forum

International Conference Organization

Chair
- International Workshop on Nano-Bio Photonics (Nano-Bio Photonics 2015)

Program Chair
- International THz-Bio Workshop (2009 – 2016)
- The 34th International Conference on Infrared, Millimeter and Terahertz Waves (IRMMW-THz 2009)
- Korea-Japan Joint Workshop on THz Technology (2007), etc.

Advisory/Program Committees
- IEEE NANOMED (2015)
- IRMMW-THz (2006, 2008 – 2010, 2013 – 2017)
- CLEO-PR (1999, 2015)
- GSMM (2010, 2014), and etc.

MAJOR RESEARCH FUNDING

Government Projects

Mar 2009 – Feb 2016 **Group-2 PI (**Director: Gun-Sik Park)
"*THz-Bio Interaction*"
Center for THz-Bio Application Systems, Ministry of Education
Total funding: 350,000,000 KW (~**$320,000**)

Aug 2011 – Dec 2012 **PI**
"*THz Dynamics of Quantum Matters*"
Information Technology Elite Education Program, Ministry of Knowledge Economy
Total funding: 125,000,000 KW (~**$110,000**)

Apr 2005 – Mar 2010 **Director**
National Research Lab for Nano-THz Photonics, Korea Research Foundation
"*THz Near-Field Microscopes with Nanometer Resolution*"
- Total funding: 1,200,000,000 KW (~**$1,100,000**)

Oct 1998 – Sep 2001 **Director**
"*Tunable Coherent THz Sources and Their Applications*"
Center for THz Photonics
Creative research Initiative Program
Ministry of Science and Technology (MOST)
Total funding: 1,400,000,000 KW (~**$1,300,000**)
***This is the 1st government-funded THz project in Korea.**

Industry Projects

Aug 2015 – Jul 2016 **Director**
"Development of THz Nondestructive Inspection Systems"
Advanced Pohang Technology Partnership (AP-TP) Program
POSCO and Research Institute of Industrial Science and Technology (RIST)
Total funding: 1,000,000,000 KW (~**$900,000**)
***This is the first and largest project for THz commercialization in Korea.**

Aug 2010 – present **Director**
"Nanophotonic CMOS Image Sensors (CIS)"
Advanced Pohang Technology Partnership (AP-TP) Program

Oct 2010 – Feb 2012 **Director**
"Smart LED Lighting Systems"
New Strategic Technology Initiative Program, POSCO and POSCOLED
Total funding : 2,200,000,000 KW (~**$2,000,000**)
*** This is the largest university project for LED industry in Korea**

Mar 2004 – Feb 2009 **"Ultra-slim LED BLUs"**
LG Display
Total funding : 300,000,000 KW (~**$280,000**)

Mar 2004 – Feb 2007 **"Photonic Crystal LEDs"**
Samsung Electronics
Total funding : 150,000,000 KW (~**$140,000**)

BOOK

G. S. Park, Yong Hyup Kim, Haewook Han, Joon Koo Han, Jaewook Ahn, Joo-Hiuk Son, Woong-Yang Park, and Young Uk Jeong, Convergence of Terahertz Sciences in Biomedical Systems, Springer (2012).

INTERNATIONAL JOURNAL PUBLICATIONS

1. S. Lee, H. Kang, Y. Do, G. Lee, J. Kim, and H. Han, "High-precision THz Dielectric Spectroscopy of Tris-HCl Buffer," **Journal of the Optical Society of Korea**, vol. 20, pp. 431-434 (2016)

2. H. Han, G. Davies, G. Akalin, and K. Tanaka, "Introduction to the Special Issue on Terahertz Near-Field Microscopy and Applications," **IEEE Transactions on terahertz Science and Technology**, vol. 6, pp. 353-355 (2016).

3. N. Hussain, T. K. Nguyen, H. Han, I. Park, "Minimum Lens Size Supporting the Leaky-Wave Nature of Slit Dipole Antenna at Terahertz Frequency," **International Journal of Antennas and Propagation**, vol. 2016, Article ID 5826957, 8 pages, (2016).

4. Y. Do, S. Lee, K. Moon, and H. Han, "Optimum Operating Conditions for Terahertz Scattering-Type Near-Field Microscopes," **Journal of Infrared, Millimeter, and Terahertz Waves**, vol. 37, pp. 939-943 (2016).

5. Nalinikanth Kotagiri, Joshua Sakon, Haewook Han, Vladimir P. Zharov, and Jin-Woo Kim, "Fluorescent ampicillin analogues as multifunctional disguising agents against opsonization," ***Nanoscale***, vol. 8, pp. 12658-12667 (2016).

6. Arvind Sinha, Elizabeth M. Martin, Ki Taek Lim, Danielle Julie Carrier, Haewook Han, Vladimir P. Zharov, and Jin-Woo Kim, "Cellulose Nanocrystals as Advanced Green Materials for Biological and Biomedical Engineering," **Journal of Biosystems Engineering**, vol. 40, pp. 373-393 (2016).

7. Kiwon Moon, Hongkyu Park, Jeonghoi Kim, Youngwoong Do, Soonsung Lee, Gyuseok Lee, Hyeona Kang, and Haewook Han, "Subsurface Nanoimaging by Broadband Terahertz Pulse Near-Field Microscopy," ***Nano Letters***, vol. 15, pp. 549-552 (2015).

8. Euna Jung, Hongkyu Park, Kiwon Moon, Meehyun Lim, Youngwoong Do, Haewook Han, Hyuck Jae Choi, Byung-Hyun Min, Sangin Kim, Ikmo Park, and Hanjo Lim, "THz time-domain spectroscopic imaging of human articular cartilage," ***Journal of Infrared Millimeter Terahertz Waves***, vol. 33, pp. 593-598 (2012).

9. Kiwon Moon, Youngwoong Do, Meehyun Lim, and Haewook Han, "Quantitative coherent scattering spectra in apertureless terahertz pulse near-field microscopes," ***Applied Physics Letters*** , vol. 101, p. 011109 (2012).

10. Euna Jung, Hyuck Jae Choi, Meehyun Lim, Hyeona Kang, Hongkyu Park, Haewook Han, Byung-hyun Min, Sangin Kim, Ikmo Park, and Hanjo Lim, "Quantitative analysis of water distribution in human articular cartilage using terahertz time-domain spectroscopy," ***Biomedical Optics Express***, vol. 3, pp. 1110-1115 (2012).

11. Meehyun Lim, Sung-Jin Choi, Gyu-Seok Lee, Myeong-Lok Seol, Youngwoong Do, Yang-Kyu Choi, and Haewook Han, "Terahertz time-domain spectroscopy of anisotropic complex conductivity tensors in silicon nanowire films," ***Applied Physics Letters***, vol. 100, pp. 211102 (2012).

12. Hongkyu Park, Edward P. J. Parrott, Fan Fan, Meehyun Lim, Haewook Han, Vladimir G. Chigrinov, and Emma Pickwell-MacPherson, "Evaluating liquid crystal properties for use in terahertz devices," ***Optics Express***, vol. 20, pp. 11899-11905 (2012).

13. T. K. Nguyen, T. A. Ho, I. Park, H. Han, "Full-wavelength dipole antenna on a GaAs membrane covered by a frequency selective surface for a terahertz photomixer," ***Progress in Electromagnetics Research***, vol. 131, pp. 441-455 (2012).

14. Kiwon Moon, Euna Jung, Meehyun Lim, Youngwoong Do, and Haewook Han, “Quantitative analysis and measurements of near-field interactions in terahertz microscopes,” ***Optics Express***, vol. 19, pp. 11539-12544 (May 2011).

15. Truong Khang Nguyen, Thi Anh Ho, Haewook Han, and Ikmo Park, “Numerical study of self-complementary antenna characteristics on substrate lenses at terahertz frequency,” ***Journal of Infrared Millimeter Terahertz Waves***, vol. 33, pp. 1123-1137 (2012).

16. Truong Khang Nguyen, Haewook Han, and Ikmo Park, “Full-wavelength dipole antenna on a hybrid GaAs membrane and Si lens for a terahertz photomixer,” ***Journal of Infrared Millimeter Terahertz Waves***, vol. 33, pp. 333-347 (2012).

17. K.-S. Park and H. Han, “Index theorem, spin Chern Simons theory and fractional magnetoelectric effect in strongly correlated topological insulators,” ***arXiv:1105.6316v1*** *[cond-mat.str-el]* (also submitted to *PRB*).

18. Kiwon Moon, Euna Jung, Meehyun Lim, Youngwoong Do, and Haewook Han, “Terahertz Near-Field Microscope: Analysis and Measurements of Scattering Signals,” ***IEEE Transactions on Terahertz Science and Technology***, vol. 1, pp. 164-168 (2011).

19. K.-S. Park, D. Kim , H. Han, C.H. Park, “Current issues of iron-based superconductors,” ***Current Applied Physics***, vol. 11, pp. S33-S41 (2011).

20. Euna Jung, Meehyun Lim, Kiwon Moon, Youngwoong Do, Soonsung Lee, Haewook Han, Hyuck Jae Choi, Kyoung-Sik Cho, and Kyu-Rae Kim, “Terahertz Pulse Imaging of Micro-metastatic Lymph Nodes in Early-stage Cervical Cancer Patients,” ***Journal of the Optical Society of Korea***, vol. 15, pp. 155-160 (Jun. 2011).

21. K.-S. Park and H. Han, “Dirac quantization and fractional magnetoelectric effect in interacting topological insulators,” ***Physical Review B***, vol. 82, pp. 153101-4 (2010).

22. Insang Woo, Truong Khang Nguyen, Haewook Han, Hanjo Lim, and Ikmo Park, “Four-leaf-clover-shaped antenna for a THz photomixer,” ***Optics Express***, vol. 18, pp. 18532-18542 (2010).

23. Kyungho Han, Truong Khang Nguyen, Ikmo Park, and Haewook Han, “Terahertz Yagi-Uda Antenna for High Input Resistance,” ***J. Infrared Millimeter Terahertz Waves***, vol. 31, pp. 441-454 (2010).

24. J. Kim, Y. Han, K. Moon, E. Jung, and H. Han, “Direct differential optical detection of the oscillation amplitude of tuning forks for atomic force microscopy,” ***Journal of The Korean Physical Society***, vol. 54, pp. 1738-1741 (2009).

25. Y. Han, M. Cho, H. Park, K. Moon, E. Jung, and H. Han, “Terahertz Time-domain Spectroscopy of Ultra-high Reflectance Photonic Crystal Mirrors,” ***Journal of The Korean Physical Society***, vol. 2, pp. 508-511 (2009).

26. M. Cho, J. Kim, H. Park, Y. Han, K. Moon, E. Jung, and H. Han, “Highly birefringent terahertz polarization maintaining plastic photonic crystal fibers,” ***Optics Express***, vol. 16, pp. 7-12 (Jan. 2008).

27. Euna Jung, Jeonghoi Kim, Younho Han, Kiwon Moon, Meehyun Lim, and Haewook Han, “Terahertz Time Domain Spectroscopy of Crystalline alpha-Lactose Monohydrate,” ***Biochip Journal***, vol. 2, pp. 296-299 (Dec. 2008).

28. K. Moon, S. Lee, and H. Han, “Nearly flat donor and acceptor bands of two-dimensional photonic crystals with periodic vacancy defects,” ***Journal of The Korean Physical Society***, vol. 54, pp. 1738-1741 (Feb. 2007).

29. Minsu Cho, Hongkyu Park, Younho Han, and Haewook Han, “Air-guiding photonic crystal waveguides for Terahertz radiation,” ***Proceedings of SPIE***, vol. 6351, pp. 6351I1-6351I4 (2006).

30. Hongkyu Park, Jeonghoi Kim, Euna Jung, Wonjun Choi, Jungil Lee, and Haewook Han, “Enhanced

terahertz emission from InAs quantum dots on GaAs," ***Proceedings of SPIE***, vol. 6352, pp. 63521Z1-63521Z4 (2006).

31. Minsu Cho, Hongkyu Park, Jeonghoi Kim, and Haewook Han, "Highly birefringent terahertz plastic photonic crystal fibers," ***Proceedings of SPIE***, vol. 6351, pp. 6351031-6351034 (2006).

32. Jeonghoi Kim, Changsu Kim, and Haewook Han, "Holographic nanolithography techniques for the fabrication of microcavity arrays," ***Proceedings of SPIE***, vol. 6352, pp. 63513T1-63513T4 (2006).

33. Sung Ho Hwang, Jae Cheol Shin, Jin Dong Song, Won Jun Choi, Jung Il Lee, Haewook Han, and Seung-Woong Lee, "Characteristics of thermal treated quantum-dot infrared photodector," ***Japanese Journal of Applied Physics***, vol. 44, pp. 5696-5699 (2005).

34. S. Hwang, J. Shin, J. Song, W. Choi, J.I. Lee, and H. Han, "Detection wavelength tuning of InGaAs/GaAs quantum dot infrared photodetector with thermal treatment," ***Microelectronic Journal***, vol. 36, pp. 3-6 (2005).

35. S. H. Hwang, J. C. Shin, J. D. Song, W. J. Choi, J. I. Lee, H. Han, and S.-W. Lee, "Photovoltaic $In_{0.5}Ga_{0.5}As$/GaAs quantum dot infrared photodetector with a single-sided $Al_{0.3}Ga_{0.7}As$ layer," ***Microelectronic Engineering***, vol. 78-79, pp. 229-232 (2005).

36. Tao Yuan, Hongkyu Park, Jingzhou Xu, Haewook Han, and X.-C. Zhang, "Field-induced THz wave emission with nanometer resolution," ***Proceedings of SPIE***, vol. 5649, pp. 1-8 (2005).

37. S. H. Hwang, J. C. Shin, J. D. Song, W. J. Choi, J. I. Lee, H. Han, and E. K. Kim, "Investigation of detection wavelength in quantum dot infrared photodetector," ***Journal of The Korean Physical Society***, vol. 45, pp. 202-205 (2004).

38. K. Kim, S. Kim, H. Han, I. Park, and H. Lim, "Compact microstrip lowpass filter using shunt open stubs and coupled slots on ground plane," ***Electronics Letters***, vol. 40, pp. 313-314 (2004).

39. S. K. Hong, I. V. Smetanin, and H. Han, "Resonant THz emission in a grating-coupled quantum well driven by DC current," ***International Journal of Modern Physics B***, vol. 17, pp. 6067-6071 (2003).

40. 6. H. Han, H. Park, M. Cho, and J. Kim, "Terahertz pulse propagation in a plastic photonic crystal fiber," ***Applied Physics Letters***, vol. 80, no. 15, pp. 2634-2636 (2002).

41. Byeong Hoon Park, Seung Duk Baek, Jun Yeon Kim, Joongwoo Bae, Haewook Han, and O'Dae Kwon, "Optical sensing by using photonic quantum ring lasers and resonance-enhanced photodetectors," ***Optical Engineering***, vol. 41, no. 6, pp. 1339-1345 (2002).

42. H. Park, M Cho, J. Kim, and H. Han, "Terahertz pulse transmission in photonic crystal fibres," *Physics in Medicine and Biology*, vol. 47, pp. 3765-3769 (2002).

43. I. V. Smetanin and H. Han, "A new type of terahertz frequency range instability of dc current in "thick" ballistic field-effect transistors," ***Journal of Russian Laser Research***, vol. 22, no. 6, pp. 481-487 (2001).

44. I. V. Smetanin and H. Han, "Resonance selective excitation of terahertz plasma waves in a semiconductor quantum well using two-color laser radiation," ***Journal of Russian Laser Research***, vol. 22, no. 5, pp. 403-409 (2001).

45. Seon-Ju Kim and Haewook Han, "Precipitation in As-ion-implanted and annealed InAs," ***Japanese Journal of Applied Physics***, vol. 40, pp. 6323-6324 (2001).

46. Nak-Jin Son, Haewook Han, and O-Dae Kwon, "Spatially-controllable quatum well intermixing with stripe-size dependence in AlGaAs heterostructures," ***Japanese Journal of Applied Physics***, vol. 37, pp. 4818-4821 (1998).

47. J. Hong, S. J. Pearton, W. S. Hobson, and H. Han, "Selective and non-selective wet chemical etching of $GaAs_{0.93}P_{0.07}$," ***Solid-State Electronics***, vol. 39, no. 11, pp. 1675-1677 (Nov. 1996).

48. H. Han, P. N. Freeman, W. S. Hobson, N. K. Dutta, J. Lopata, J. D. Wynn, and S. N. G. Chu, " High-speed modulation of strain-compensated InGaAs-GaAsP-InGaP multiple-quantum-well lasers," ***IEEE Photonics Technology Letters***, vol. 8, no. 9, pp. 1133-1135 (Sep. 1996).

49. J. W. Lee, K. N. Lee, S. J. Pearton, C. R. Abernathy, W. S. Hobson, H. Han, and J. C. Zopler, "Si, Be, C ion implantation in $GaAs_{0.93}P_{0.07}$," ***Journal of Applied Physics***, vol. 80, no. 4, pp. 2296-2299 (1996).

50. N. K. Dutta, W. S. Hobson, D. Vakhshoori, H. Han, P. N. Freeman, J. F. de Jong, and J. Lopata, "Strain compensated InGaAs-GaAsP-InGaP laser," ***IEEE Photonics Technology Letters***, vol. 8, no. 7, pp. 852-854 (1996).

51. D. Vakhshoori, W. S. Hobson, H. Han, J. Lopata, G. E. Henein, J. D. Wynn, J. deJong, M. L. Schnoe, and G. J. Zydzik, "980nm spread index laser with strain compensated InGaAs/GaAsP/InGaP and 90% fibre coupling efficiency," ***Electronics Letters***, vol. 32, no. 11, pp. 1007-1008 (1996).

52. H. Han, D. V. Forbes, and J. J. Coleman, "InGaAs-AlGaAs-GaAs strained-layer quantum-well heterostructure square ring lasers," ***IEEE Journal of Quantum Electronics***, vol. 31, no. 11, pp. 1994-1997 (1995).

53. H. Han and J. J. Coleman, "Two-dimensional rectangular lattice distributed feedback lasers: a coupled-mode analysis of TE guided modes," ***IEEE Journal of Quantum Electronics***, vol. 31, no. 11, pp. 1947-1954 (1995).

54. H. Han and J. J. Coleman, "Lateral-mode discrimination in ridge waveguides by misaligned total internal reflection mirrors," ***IEEE Photonics Technology Letters***, vol. 7, no. 7, pp. 715-717 (1995).

55. H. Han, N. Holehouse, D. V. Forbes, and J. J. Coleman, "Monolithic serial InGaAs-GaAs-AlGaAs laser diode arrays," ***IEEE Photonics Technology Letters***, vol. 6, no. 9, pp. 1059-1061 (1994).

56. T. M. Cockerill, D. V. Forbes, H. Han, and J. J. Coleman, "Monolithic integration of a strained-layer InGaAs-GaAs-AlGaAs quantum-well laser with a passive waveguide by selective-area MOCVD," ***IEEE Photonics Technology Letters***, vol. 4, no. 4, pp. 448-450 (1993).

57. H. Han, M. E. Favaro, D. V. Forbes, and J. J. Coleman, "$In_xGa_{1-x}As$- $Al_yGa_{1-y}As$-GaAs strained-layer quantum-well heterostructure circular ring lasers," ***IEEE Photonics Technology Letters***, vol. 4, no. 8, pp. 817-819 (1992).

58. Haewook Han and Ki-Woong Whang, "The effects of a surface magnetic field on reactive ion etching, *Journal of Applied Physics*, vol. 69, no. 1, pp. 447-451 (1991).

INVITED TALKS at INTERNATIONAL CONFERENCES (2010-2017)

1. Youngwoong Do, Soonsung Lee, Jin-Woo Kim, and Haewook Han, “THz near-Field Microscopes: Optimum Operation Conditions,” Cancun, Mexico (2017).

2. Kiwon Moon, Youngwoong Do, Haewook Han, “Recent Progress in THz Near-Field Microscopes,” The 25th International Conference on Advanced Laser Technologies, Pusan, Korea (2017).

3. Haewook Han and Jin-Woo Kim, “THz time-domain spectroscopy of biomolecular materials,” The 9th IEEE International Conference on Nano/Molecular Medicine and Engineering, Hawaii, USA (2015).

4 Jin-Woo Kim and Haewook Han, “Programmable nanoscale building blocks for epitaxial self-assembly of multifunctional nanostructures,” The 9th IEEE International Conference on Nano/Molecular Medicine and Engineering, Hawaii, USA (2015).

5 Kiwon Moon, Hongkyu. Park , Jeonghoi Kim , Youngwoong Do , Soonsung Lee , Gyuseok Lee , Hyuna Kang , and Haewook Han, “Subsurface broadband THz pulse near-field microscopy,” The 6th International THz-Bio Workshop, Seoul, Korea (2015).

6. Kiwon Moon, Hongkyu. Park , Jeonghoi Kim , Youngwoong Do , Soonsung Lee , Gyuseok Lee , Hyuna Kang, and Haewook Han, “Subsurface Broadband THz Pulse Near-Field Microscopy,” The 40th International Conference on Infrared, Millimeter, and Terahertz Waves, Hong Kong (2015).

7 Haewook Han et al., “Introduction to nano-bio THz photonics,” The 1st International Workshop on Nano-Bio Photonics, Pohang, Korea (2015) **[Plenary Talk]**.

8. Haewook Han et al., “THz spectroscopy of liquid water,” The 5th International THz-Bio Workshop, Seoul, Korea (2014).

9. Haewook Han et al., “Quantitative terahertz near-field microscope,” The 7th International Conference on Advanced Vibrational Spectroscopy,” Kobe, Japan (2013).

10. Gyuseok Lee, Meehyun Lim, Sung-Jin Choi, Myeong-Lok Seol, Youngwoong Do, Yang-Kyu Choi, and Haewook Han, “Terahertz spectroscopy of silicon nanowires,” The 8th Asia-Pacific Microwave Photonics Conference (2013).

11. Haewook Han et al, “Quantitative terahertz pulse near-field microscope,” Japanese THz Forum (2013).

12. Haewook Han et al., “Quantitative spectroscopic terahertz near-field microscope,” The 4th International THz-Bio Workshop, Seoul, Korea (2013).

13. Kiwon Moon, Meehyeon Lim, Youngwoong Do, and Haewook Han, “Quantitative spectroscopic terahertz near-field microscope,” The 12th International Conference on Near-Field Optics, Nanophotonics and Related techniques, Donostia-San Sebastian, Spain (2012).

14. Gyuseok Lee, Meehyun Lim, Sung-Jin Choi, Myeong-Lok Seol, Youngwoong Do, Yang-Kyu Choi, and Haewook Han, “Terahertz spectroscopy of silicon nanowires,” The 2nd International Symposium on Terahertz Nanoscience, Okinawa, Japan (2012).

15. Youngwoong Do, Kiwon Moon, and Haewook Han, “Real-Time THz time-Domain spectroscopy based on asynchronous optical sampling,” The 3rd International THz-Bio Workshop, Seoul, Korea (2012).

16. Kiwon Moon, Meehyun Lim, Youngwoong Do, and Haewook Han, “Near-field interaction in terahertz pulse microscopes,” The 4th Japan-Korea Joint Workshop on THz Technology, Nagoya, Japan (2011).

17. Euna Jung, Kiwon Moon, Meehyun Lee, and Haewook Han, “Estimation of hydration numbers in aqueous solution using THz time domain spectroscopy,” The 35th International Conference on Infrared, Millimeter, and Terahertz Waves, Rome, Italy (2010).

18. Kiwon Moon, Euna Jung, Meehyun Lim, Youngwoong. Do, and Haewook Han, “Real-time THz comb time-

domain spectroscopy," IEEE Photonics Society, Winter Topicals, Majorca, Spain (2010).

19. Kiwon Moon, Euna Jung, Meehyun Lim, Youngwoong. Do, and Haewook. Han, "THz spectroscopy of biomoecules," The 1st International THz-Bio Workshop, Seoul, Korea (2010).

MAJOR PATENTS

THz Photonics

1. Haewook Han, et al., “Tuning-fork based near field probe for spectral measurement, near-field microscope using the same, and spectral analysis method using near-field microscope”
   KR 1014668070000 (2014.11.24), US 14/339,955 (2014.07.24, Pending)
   Original patent for “THz Pulse Scattering-Type Near-Field Microscope”

2. Haewook Han, et al., “Plastic photonic crystal fiber for terahertz wave transmission and method for manufacturing thereof”
   US8009952 (2011.08.30)
   Original patent for “THz Plastic Photonic Crystal Fibers”

3 Haewook Han, et al., “Plastic photonic crystal fiber for terahertz wave transmission and method for manufacturing thereof”
   US8009951 (2011.08.30)
   Original patent for “THz Plastic Photonic Crystal Fibers”

Nanophotonic Image Sensors

**The following patents can also be used for THz image sensor in future*.

4. Haewook Han et al., “CMOS image sensor having an overcoating layer of differing thickness and manufacturing method thereof”
   KR 10-1387558 (2014.04.15)

5. Haewook Han et al., “Image sensor having micro lens”
   KR 1020140031981 (2014.03.19, pending)
   SK-Hynix Best Patent Award (2015), selected as a “SK-Hynix Strategic Patent”
   Currently applied to SK-Hynix production line

6. Haewook Han et al., “CMOS image sensor having optical block area”
   US 10-2014-0031981 (2014-03-19), pending
   SK-Hynix Best Patent Award (2014)
   Currently applied to SK-Hynix CMOS image sensor production line

7. Haewook Han et al., “CMOS image sensor having optical block area”
   US 14041744 (2013.09.30, pending)
   SK-Hynix Best Patent Award (2014)
   Currently applied to SK-Hynix CMOS image sensor production line

8. Haewook Han et al., “Infrared pass filter and CMOS image sensor having the same”
   KR 10-1348254 (2013.12.30)

LEDs and LCDs

9. Haewook Han et al., “Light emitting diode and manufacturing method thereof”
   KR 10-1426288 (2014-07-29)

10. Haewook Han et al., “Exposure apparatus, method of two dimensional holographic lithography using the same and method of forming optical crystal using the same”
    KR 10-1322255 (2013.10.21), US/China/Japan pending

11. Haewook Han et al., “Edge type back light unit and liquid crystal display using the same”
    KR 10-2010-00501182 (2010.5.28).

Optics Components

**The following patents can also be used for THz optics components*.

12. Haewook Han et al., “Fresnel Lens”
    KR 10-1555600 (2015.09.18)
13. Haewook Han, et al., “Optical sheet for adapting housing space”
    KR 10-1359971 (2014-02-03)

14. Haewook Han, and et al., “Color mixing lens with light receiving portion, color mixing portion, and light emission portion, and liquid crystal display device having the same”
    US8937692 (2015.01.20)

15. Haewook Han, and et al., “LED lens for super wide angle and high uniformity ratio of illumination”
    KR 10-1359972 (2014.02.03)

16. Haewook Han, and et al., “Color mixing lens and liquid crystal display device having the same”
    US8345185 (2013.01.01)

NATIONAL-LEVEL GRANT REVIEW

Government Grants

May 2014	Selection Committee (Physics) **Creative Research Center (3+3+3 years, ~$600,000/year)** **Leading Researcher Program** National Research Foundation of Korea
May 2013	Final Evaluation Committee (Physics) **Science Research Center in Physics (4+3 years, ~$1,000,000/year)** **Leading Researcher Program** National Research Foundation of Korea

Samsung Foundation Grants

Feb 2016	Evaluation Committee (THz Technology) **ICT Convergence Program (2+2 years, ~$500,000/year)** Samsung Future Technology Foundation
Feb 2015	Selection Committee (THz Technology) **ICT Convergence Program (2+2 years, ~$500,000/year)** Samsung Future Technology Foundation
Feb 2014	Selection Committee (THz Technology) **ICT Convergence Program (2+2 years, ~$500,000/year)** Samsung Future Technology Foundation