

Sangsik Kim

Associate Professor of Electrical Engineering
Korea Advanced Institute of Science and Technology (KAIST)
E3-2, 291 Daehak-ro, Yuseong-gu,
Daejeon 34141, Republic of Korea

March, 2024
sangsik.kim@kaist.ac.kr
+82 (042)-350-7472
<https://kimgroup.kaist.ac.kr>

EDUCATION

Purdue University	Ph.D. in Electrical & Computer Engineering	2015
Purdue University	M.S. in Electrical & Computer Engineering	2014
Seoul National University	B.S. in Electrical & Computer Engineering	2008

APPOINTMENTS

2022 – present	Associate Professor , Electrical Engineering, KAIST
2017 – 2022	Assistant Professor , Electrical & Computer Engineering, Texas Tech University Adjunct Faculty , Physics & Astronomy, Texas Tech University
2017	Postdoc , National Institute of Standards and Technology (NIST), Gaithersburg, MD
2016	Postdoc , Electrical & Computer Engineering, Purdue University
2009 – 2015	Research Assistant , Electrical & Computer Engineering, Purdue University

AWARDS

- **2022 NSF CAREER Award**, National Science Foundation (NSF)
- **2021 Young Investigator Award**, Korean-American Scientists and Engineers Association (KSEA)
- **2020 Whitacre Research Award**, Texas Tech University

RESEARCH OVERVIEW

- **On-Chip Integrated Nanophotonics with Metamaterials and Plasmonics**
 - High-density photonic chip integration and modal engineering using subwavelength grating (SWG) metamaterials [*NSF CAREER*, *Optica* (2020), *Nature Communications* (2018)]
 - High-performance silicon photonic polarization management using SWG metamaterials [high extinction-ratio: *Opt. Lett.* (2021), ultra-broadband: *Opt. Lett.* (2021)] and hybrid plasmonic waveguide [*Sci. Rep.* 2015, *Opt. Express* 2015, *Opt. Express* 2014]
 - Metamaterial fiber-to-chip [*US Patent* 2019] and strip-to-slot [*Opt. Express* 2016] couplers
- **On-Chip Microcombs and Nonlinear/Quantum Photonics**
 - On-chip quantum processing platform development using quantum microcombs
 - On-chip microcomb generations with dispersion engineered microresonators, overcoming the material dispersion limit [*Nature Communications* (2017), *Opt. Lett.* (2018)]
 - Dispersion-engineered nonlinear process [*JLT* 2021, *Opt. Express* 2019, *Opt. Express* 2016]
 - Development of high- Q silicon nitride microresonators [*Optica* 2016]
- **On-Chip Hybrid Integration and Photonic Exceptional Points**
 - Exceptional points in passive waveguides with polynomial decay and constant-intensity radiation [*Nature Nanotechnology* (2022)] and their applications to nonlinear photonics
 - Hybrid integration of photonic chips with atomic system: extreme mode converters to interface photonic mode and free-space beams [*Light: Science & Applications* (2018), *Optica* (2018)]
 - Development of on-chip SWG in-plane metalens system & hybridization of microcombs and microfluidics for high precision dual-comb spectroscopy and sensing [*NSF CAREER*]

PUBLICATIONS

* Corresponding author, † Equal contribution

• Journal Publications

- [1] G. Kim, H. Kim, Y. Jeon, I. Kim, S. Kim, **S. Kim**, and J. Kim, “Scalable hot carrier assisted silicon photodetector array based on ultrathin gold film,” *Nanophotonics* (2024). [[web](#)]
- [2] D. Pimbi, M. Mia, N. Jaidye, I. Ahmed, M. Hasan, S. Ahmed, and **S. Kim**^{*}, “Integrated polarization-free Bragg filters with subwavelength gratings for photonic sensing,” *Optics Express* **32**(2), 2147-2161 (2024). [[web](#)]
- [3] **S. Kim**^{*}, “Silicon photonic Bessel–Gaussian beam generation unlocks new possibilities for long-range sensing,” *Light: Science & Applications* **12**, 141 (2023). [[web](#)] (News & Views)
- [4] M. Kabir, M. Mia, I. Ahmed, N. Jaidye, S. Ahmed, **S. Kim**^{*}, “Anisotropic leaky-like perturbation with subwavelength gratings enables zero crosstalk,” *Light: Science & Applications* **12**, 135 (2023). [[web](#)]
- [5] I. Ahmed, N. Jaidye, S. Ahmed, M. Mia, and **S. Kim**^{*}, “High-density integrated delay line using extreme skin-depth subwavelength grating waveguides,” *Optics Letters* **48**, 1662-1665 (2023). [[web](#)]
- [6] D. Pimbi, M. Hasan, M. Mia, N. Jaidye, and **S. Kim**^{*}, “Polarization-independent photonic Bragg grating filter with cladding asymmetry,” *Optics Letters* **48**, 1192-1195 (2023). [[web](#)]
- [7] M. Mia, N. Jaidye, I. Ahmed, and **S. Kim**^{*}, “Broadband integrated polarization splitter and rotator using subwavelength grating claddings,” *Optics Express* **31**, 4140-4151 (2023). [[web](#)]
- [8] S. Kachiraju, I. Nekrashevich, I. Ahmed, H. Farooq, L. Chang, **S. Kim**, and M. Kim^{*}, “Coupled surface plasmon-phonon polariton nanocavity arrays for enhanced mid-infrared absorption,” *Nanophotonics* **11**, 4489-4498 (2022). [[web](#)]
- [9] A. Yulaev^{†,*}, **S. Kim**^{†,*}, Q. Li, D. Westly, B.J. Roxworthy, K. Srinivasan, and V.A. Aksyuk^{*}, “Exceptional points in lossy media lead to deep polynomial wave penetration with spatially uniform power loss,” *Nature Nanotechnology* **17**, 583-589 (2022). ([†]equal contribution). [[web](#)]
- [10] M. Mia, S. Ahmed, N. Jaidye, I. Ahmed, and **S. Kim**^{*}, “Mode-evolution-based ultra-broadband polarization beam splitter using adiabatically tapered extreme skin-depth waveguide,” *Optics Letters* **46**, 4490-4493 (2021). [[web](#)]
- [11] S. Ahmed, M. Mia, I. Ahmed, N. Jaidye, and **S. Kim**^{*}, “Ultra-high extinction-ratio polarization beam splitter with extreme skin depth waveguide,” *Optics Letters* **46**, 2164-2167 (2021). [[web](#)]
- [12] S. Fatema, M. Mia, and **S. Kim**^{*}, “Multiple mode couplings in a waveguide array for broadband near-zero dispersion and supercontinuum generation,” *Journal of Lightwave Technology* **39**, 216-222 (2021). [[web](#)]

- [13] M. Mia, S. Ahmed, I. Ahmed, Y. Lee, M. Qi, and **S. Kim**^{*}, “Exceptional coupling in photonic anisotropic metamaterials for extremely low waveguide crosstalk,” *Optica* **7**, 881-887 (2020). [[web](#)]
- [14] M. Mia, N. Jaidye, and **S. Kim**^{*}, “Extremely high dispersions in heterogeneously coupled waveguides,” *Optics Express* **27**, 10426-10437 (2019). [[web](#)]
- [15] **S. Kim**, D. Westly, B.J. Roxworthy, Q. Li, A. Yulaev, K. Srinivasan, and V.A. Aksyuk^{*}, “Photonic waveguide to free-space Gaussian beam extreme mode converter,” *Light: Science & Applications* **7**, 72 (2018). [[web](#)]
- [16] G. Moille, Q. Li, **S. Kim**, D. Westly, and K. Srinivasan^{*}, “Phase-locked two-color single soliton microcombs in dispersion-engineered Si₃N₄ resonators,” *Optics Letters* **43**, 2772-2775 (2018). ([Editors’ Pick](#)) [[web](#)]
- [17] S. Jahani[†], **S. Kim**[†], J. Atkinson, F. Kalthor, W.D. Newman, P. Shekhar, J.C. Wirth, K. Han, V. Van, R.G. DeCorby, L. Chrostowski, M. Qi^{*}, and Z. Jacob^{*}, “Controlling evanescent waves using silicon photonic all-dielectric metamaterials for dense integration,” *Nature Communications* **9**, 1893 (2018). ([†][equal contribution](#)). [[web](#)]
- [18] M.T. Hummon, S. Kang, D.G. Bopp, Q. Li, D.A. Westly, **S. Kim**, S. Fredrick, S.A. Diddmas, K. Srinivasan, V.A. Aksyuk, and J.E. Kitching^{*}, “Photonic chip for laser stabilization to an atomic vapor at a precision of 10⁻¹¹,” *Optica* **5**, 443-449 (2018). [[web](#)]
- [19] **S. Kim**, K. Han, C. Wang, J. A. Jaramillo-Villegas, X. Xue, C. Bao, Y. Xuan, D. E. Leaird, A. M. Weiner, and M. Qi^{*}, “Dispersion engineering and frequency comb generation in thin silicon nitride concentric microresonators,” *Nature Communications* **4**, 1345 (2017). [[web](#)]
- [20] Y. Xuan, Y. Liu, L.T. Varghese, A.J. Metcalf, X. Xue, P. Wang, K. Han, J.A. Jramillo-VilleGas, **S. Kim**, M. Teng, Y. Lee, B. Niu, L. Fan, J. Wang, D.E. Leaird, A.M. Weiner, and M. Qi^{*} “High-*Q* silicon nitride microresonators exhibiting low-power frequency comb initiation,” *Optica* **11**, 1171-1180 (2016). [[web](#)]
- [21] K. Han, **S. Kim**, J. Wirth, M. Teng, Y. Xuan, B. Niu and M. Qi^{*}, “Strip-slot direct mode converter,” *Optics Express* **24**, 6532-6541 (2016). [[web](#)]
- [22] **S. Kim**^{*} and M. Qi, “Broadband second-harmonic phase-matching in dispersion engineered slot waveguides,” *Optics Express* **24**, 773-786 (2016). [[web](#)]
- [23] **S. Kim**^{*} and M. Qi, “Mode-evolution based polarization rotation and coupling between silicon and hybrid plasmonic waveguides,” *Scientific Reports* **5**, 18378 (2015). [[web](#)]
- [24] **S. Kim**^{*} and M. Qi, “Polarization rotation and coupling between silicon waveguide and hybrid plasmonic waveguide,” *Optics Express* **23**, 9968–9978 (2015). [[web](#)]
- [25] **S. Kim**, M. Man, M. Qi, and K. J. Webb^{*}, “Angle-insensitive and solar-blind ultraviolet bandpass filter,” *Optics Letters* **39**, 5784–5787 (2014). [[web](#)]
- [26] **S. Kim**^{*} and M. Qi, “Copper nanorod array assisted silicon waveguide polarization beam splitter,” *Optics Express* **22**, 9508–9516 (2014). [[web](#)]

- [27] **S. Kim**, Y. Xuan, V. P. Drachev, L. T. Varghese, L. Fan, M. Qi, and K. J. Webb*, “Nanoimprinted plasmonic nanocavity arrays,” *Optics Express* **21**, 15081–15089 (2013). [[web](#)]
- [28] L. T. Varghese, L. Fan, Y. Xuan*, C. Tansarawiput, **S. Kim**, and M. Qi*, “Resistless nanoimprinting in metal for plasmonic nanostructures,” *Small* **9**, 3778–3783 (2013). [[web](#)]

PROFESSIONAL AFFILIATIONS

- *Senior Member of Optical Society of America (OSA)*
- *Senior Member of IEEE and IEEE Photonic Society (IPS)*
- *Member of American Physical Society (APS)*
- *Member of Society of Photographic Instrumentation Engineers (SPIE)*
- *Member of Korean American Scientists and Engineers Association (KSEA)*