

# Ahmet Kemal Demir

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## *Education*

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### **Massachusetts Institute of Technology**

Graduate Student in Physics

**September 2022 - Present**

### **Bilkent University**

Bachelor of Science in Physics

CGPA : 3.98/4.00 | Major GPA : 4.00/4.00

**September 2018 - June 2022**

**Senior Project:** Second Mode-Locking of Lasers / Robustness of self-organized systems against external noise: an exploration through mode-locked lasers

## *Research Experience*

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### **Massachusetts Institute of Technology**

Research Assistant, Photon Scattering Lab

**Supervisor:** Assoc. Prof. Riccardo Comin

**August 2022 - Present**

- Optical spectroscopy of two-dimensional/thin quantum materials.
- Fabricating and characterizing SERS substrates for signal enhancement from the spectroscopy of quantum materials.

### **University of Oxford**

Undergraduate Intern, Chen Group

**Supervisor:** Prof. Yulin Chen

**June 2021 - July 2021**

- Wrote computer programs to visualize 3D band structure of materials measured by ARPES in real time.

### **Bilkent - UNAM National Nanotechnology Research Center**

Undergraduate Research Assistant, Ultrafast Optics and Lasers Laboratory

**Supervisor:** Prof. F. Ömer Ilday

**January 2021 - July 2022**

- Set up a novel laser oscillator that can mode-lock in most known mode-locking regimes to quantify their respective robustness' against perturbations.
- Worked on modelling interactions of "strongly correlated" optical pulses in laser cavities with a modified complex Ginzburg-Landau equation.
- Worked on statistical physics of laser dynamics with feedback gain.

### **Middle East Technical University**

Undergraduate Research Assistant, Nanooptics Lab & GÜNAM

**Supervisor:** Assoc. Prof. Alpan Bek & Prof. Rasit Turan

**September 2019 - July 2022**

- Carried out COMSOL and Lumerical simulations to solve the interactions of nanoscale objects with electromagnetic waves. This often involved modelling structures of nano-objects from scratch by using TEM/SEM images. Examples include modelling silver nanoworms as a platform for surface enhanced Raman spectroscopy and silicon nanowires for light trapping applications.
- Designed a Surface Plasmon Resonance Spectrometer setup.

### **Leiden University**

Undergraduate Intern, Allan Lab

**Supervisor:** Assoc. Prof. Milan P. Allan

**June 2019 - August 2019**

- Analysed and processed data taken down via SI-STM in search of charge density waves in an underdoped Bi-2212 sample.
- Developed MATLAB algorithms to correct drifted/distorted maps and fit appropriate functions to the Van Hove peaks in those corrected spectra.

- Set up MATLAB GUIs for common data analysis functions.

## Journal Publications

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- Serena Nur Erkızan, Fırat İdikut, Özge Demirtaş, Arian Goodarzi, **Ahmet Kemal Demir**, Mona Borra, Ihor Pavlov, Alban Bek. “LIPSS for SERS: Metal Coated Direct Laser Written Periodic Nanostructures for Surface Enhanced Raman Spectroscopy”. *Advanced Optical Materials*. (2022). 10, 2200114.
- Alp Akbıyık, Nardin Avishan, Özge Demirtaş, **Ahmet Kemal Demir**, Emre Yüce, Alban Bek. “Laser Photochemical Nanostructuring of Silicon for Surface Enhanced Raman Spectroscopy”. *Advanced Optical Materials*. (2022). 10, 2200114.
- Nasim Seyedpour, Özge Demirtaş, **Ahmet Kemal Demir**, Alban Bek. “Shape and Deposition Angle Control of Silver Film-over-Nanosphere SERS Substrates”. *Nanotechnology*. (2021). 32, 505709.
- Ghazanfar Ali Khan, Özge Demirtaş, **Ahmet Kemal Demir**, Özlem Aytekin, Alban Bek, Arshad Saleem Bhatti, Waqqar Ahmed. “Fabrication of Flexible, Cost-Effective, and Scalable Silver Substrates for Efficient Surface Enhanced Raman Spectroscopy based Trace Detection”. *Colloids & Surfaces A*. (2021). 619, 126542.
- Nasim Seyedpour, **Ahmet Kemal Demir**, Jamileh Hajivandi, Hande Ciftpinar, Rasit Turan, Hamza Kurt, Alban Bek. “Nanosphere Concentrated Photovoltaics with Shape Control”. *Advanced Optical Materials*. (2021). 9, 2000943.

## Proceedings

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- Özge Demirtaş, Ghazanfar Ali Khan, Nasim Seyedpour, R. M. Faheem Iftikhar, İ. Murat Öztürk, **Ahmet Kemal Demir**, Waqqar Ahmed, Alban Bek. “SERS-based trace detection by size and shape controlled noble metal particles with high benefit-cost ratio”. *Proc. SPIE 11797, Plasmonics: Design, Materials, Fabrication, Characterization, and Applications*. (2021) XIX, 1179713. (Invited Talk)

## Presentations

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- Nasim Seyedpour (presenter), Özge Demirtaş, **Ahmet Kemal Demir**, Alban Bek. “Oblique-Angle Deposition of Silver Film Over Shape-Modified Nanosphere for SERS Substrates”. *Fotonik 2021: 22nd National Optics, Electro-optics, and Photonics Workshop. September 10, 2021 Ankara/Turkey* (Poster Presentation)
- F. Ömer Ilday (presenter), Özgün Yavuz, Aladin Choura, **Ahmet Kemal Demir**, Ghaith Makey, Serim Ilday. “Why does self-organization reduce entropy? Lessons from laser-driven pattern formation”. *Turkish Physical Society 37th International Physics Congress. September 1-5, 2021 Bodrum/Turkey*. (Plenary Talk)

## Scholarships and Awards

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- 2022-2023 Academic Year:** Lester Wolfe Fellowship, MIT Department of Physics.
- 2019-2020 Fall:** Best Project Award, Bilkent University Physics Department.
- 2019-Present:** Turkish Educational Foundation (TEV) Outstanding Success Scholarship.
- 2018-Present:** Comprehensive Scholarship of Bilkent University.
- 2018-Present:** National Undergraduate Scholarship Program (2205) by TÜBİTAK (The Scientific and Technological Research Council of Turkey).

## *Teaching Experience*

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### **Bilkent University**

**September 2020 - Present**

**2020-2021 Fall Term:** Teaching Assistant, PHYS 211: Waves, Optics and Thermodynamics.

- Assisted students with term projects and graded them.

**2020-2021 Spring Term:** Teaching Assistant, PHYS 212: Modern Physics.

- Assisted students with term projects and graded them.

**2021-2022 Fall Term:** Teaching Assistant, PHYS 211: Waves, Optics and Thermodynamics.

- Assisted students with term projects and graded them.

## *Computer Skills*

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- MATLAB
- COMSOL Multiphysics (Wave Optics Module)
- Ansys Lumerical FDTD Solutions
- Python
- Autodesk Fusion 360
- Autodesk Meshmixer
- SOLIDWORKS
- L<sup>A</sup>T<sub>E</sub>X