Siddharth Maddali, Ph.D

Research Scientist (BBP Division)

KLA+

Education

Doctor of Philosophy (**Ph.D**) in *physics* (Carnegie Mellon University, 2016)
Master of Science (**M.S.**) in *physics* (Carnegie Mellon University, 2010)
Master of Science (**M.Sc**) in *physics* (Indian Institute of Technology Madras, 2009)
Bachelor of Science (**B.Sc**) in *physics* , *mathematics* , *electronics* (Bangalore University, 2007)

Experience

Research Scientist, KLA Corp. (KLA-Tencor)
Broadband Plasma (BBP) division, **Nov 2022 - present**

Assistant Scientist, Argonne National Laboratory
Synchrotron Radiation Studies of Materials group, ***Oct 2019 - Oct 2022***

Post-doctoral researcher, Argonne National Laboratory
Coherent diffraction imaging of materials structure, ***Jan 2017 - Sept 2019***

Post-doctoral researcher, National Energy Technology Laboratory
Materials discovery with machine learning, ***May 2016 - Sept 2016***

Graduate research assistant, Carnegie Mellon University
Department of Physics, ***2012 - May 2016***

Graduate teaching assistant, Carnegie Mellon University
Department of Physics, ***2009 - 2012***

Intern, National University of Singapore
Department of Physics, ***May 2008***

Research interests

<u>**Electromagnetics/Optics/Imaging**</u>:
Optical characterization
Coherent diffraction imaging (CDI) of tensor fields
Coherent dark-field x-ray microscopy (DFXM)
High-energy x-ray diffraction microscopy (HEDM)
Multiscale characterization with x-rays & other light probes
X-ray photon correlation spectroscopy (XPCS), dynamic light scattering (DLS)

<u>**Condensed matter physics**</u>:

Light-matter interaction
Crystallography
Meso/nanoscale structure & strain
Interfacial dynamics in polycrystals
Time-resolved methods of characterization
Photonics

Computational methods:
Computational electromagnetics
Inverse problems, phase retrieval
Signal processing and optimization
Data science, machine learning, reinforcement learning -based experimental control
High-performance computing and scientific software development

Presentations (⬜ = link to accepted abstract)

Invited (presenter)

1) Advanced Photon Source Scientific Computation Seminar, Argonne National Laboratory, Lemont, IL (March 2022) ⬜
2) Materials Science Division Colloquium, Argonne National Laboratory, Lemont, IL (October 2021) ⬜
3) Workshop on *Advanced Probes & Data Analytics for Enabling Single-Pulse Imaging under Dynamic Conditions*, Santa Fe, NM (August 2019)
4) The Minerals, Metals and Materials Society (TMS), San Antonio, TX (March 2019) ⬜
5) LANS seminar series, Mathematics & Computer Science Division, Argonne National Laboratory, Lemont, IL (Sept 2018) ⬜
6) Department of physics, Carnegie Mellon University, Pittsburgh, PA (May 2018)

Select contributed (presenter)

1) Gordon X-ray Science Seminar, Easton, MA (July-August 2019: seminar & poster; July-August 2017: discussion leader)
2) Coherence: International workshop on phase retrieval and coherent scattering, Port Jefferson, NY (June 2018)
3) Materials Research Society Spring Meeting & Exhibit, Phoenix, AZ (April 2018) ⬜
4) The Minerals, Metals and Materials Society (TMS), Orlando, FL (March 2015: Poster)
5) Materials Science and Technology (MS&T), Pittsburgh, PA (October 2014: seminar; October 2012: poster)

Miscellaneous (co-author)

1) The Minerals, Metals and Materials Society (TMS) 2023, San Diego, CA, 2023. ⬜
2) The American Physical Society (APS) March Meeting, Chicago, IL, 2022. ⬜
3) The Materials Research Society (MRS) Spring Meeting & Exhibit, Phoenix, AZ, 2018. ⬜
4) The American Physical Society (APS) March Meeting, New Orleans, LA, 2017. ⬜ ⬜

Awards and honors

Oak Ridge Institute for Science and Education (ORISE) post-doctoral fellowship (2016)
The Indian Institute of Technology Madras Merit Scholarship (2007-2009)
Bangalore University overall rank 5 (2007)

Research grants

ANL LDRD 2021-0012: *Coherence-enhanced dark-field imaging for structural heterogeneity in materials*

Role: Principal investigator

Professional activity

Society membership

Americal Physical Society (APS), Materials Research Society (MRS), The Minerals, Metals and Materials Society (TMS)

Editorial

Aug 2021 — present: Guest editor for *MDPI: Crystals* special issue: Synchrotron studies of materials.

Peer review Ⓡ

US Department of Energy: Basic Energy Sciences (BES) Program , Philosophical Magazine , Computational Materials Science , New Journal of Physics , Optics Letters , Physical Review X , Crystal Research and Technology , Journal of Applied Physics , Physical Review Letters , Physical Review B , IUCr Journal of Synchrotron Radiation , Optics Express , Journal of Applied Crystallography , Integrating Materials and Manufacturing Innovation

Organization

1) Workshop (Session chair): *Dark field x-ray microscopy for mesoscale phenomena in ordered materials at APS-U* : APS/CNM Users Meeting, Lemont, IL, USA (May 2022)
2) Workshop: *Advances in Phase Retrieval Methods for High-Resolution X-ray Imaging* , APS/CNM Users Meeting, Argonne National Laboratory, Lemont, IL, USA (August 2020)
3) Workshop: *Advanced Probes and Data Analytics for Enabling Single Pulse Imaging Under Dynamic Conditions* , Santa Fe, NM, USA (August 2019)

Technical reports

[1] R. Pokharel, C. Bolme, J. Bohon, A. Mandal, D. Pagan, F. Hofmann, **S. Maddali**, A. Rack, *Advanced probes and data analytics for enabling 3-D imaging under dynamic conditions* **LAUR-19-31832**, **Los Alamos National Laboratory**, 2019. `online` `LANL DMMSC`

[2] N. Krishnamurthy, **S. Maddali**, A. Verma, L. Bruckman, J. Carter, R. French, V. Romanov, J. Hawk, *Data analytics for alloy qualification* , **NETL-PUB-21550**, **National Energy technology Laboratory**, 2017. `DOI` `10.2172/1456238`

References

Dr. Stephan O. Hruszkewycz 🌐 ✉ ☎
Supervisor
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Dr. Robert M. Suter 🌐 ✉
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Dr. Anthony D. Rollett 🌐 ✉ 📞
Collaborator, materials science
Department of Materials Science and Engineering
Carnegie Mellon University
Pittsburgh, PA (USA)

Dr. Marc Allain 🌐 ✉
Collaborator, computation/mathematics
Institut Fresnel
Aix-Marseille University
Grenoble, France

Publications 🔍

[23] **S. Maddali**, T. D. Frazer, N. Delegan, K. J. Harmon, S. E. Sullivan, M. Allain, W. Cha, A. Dibos, I. Poudyal, S. Kandel, Y. S. G. Nashed, F. J. Heremans, H. You, Y. Cao and S. O. Hruszkewycz, *Concurrent multi-peak Bragg coherent x-ray diffraction imaging of 3D nanocrystal lattice displacement via global optimization*, **npj Computational Materials**, May 2023
DOI 10.1038/s41524 023 01022 7   preprint arxiv:2208.00970   Am score 3

[22] M. O. Hill, P. Schmiedeke, C. Huang, **S. Maddali**, X. Hu, S. O. Hruszkewycz, J. J. Finley, G. Koblm{\"u}ller and L. J. Lauhon, *3D Bragg Coherent Diffraction Imaging of Extended Nanowires: Defect Formation in Highly Strained InGaAs Quantum Wells*, **ACS Nano**, Nov 2022
DOI 10.1021/acsnano.2c06071   Am score 4

[21] N. Bertaux, M. Allain, J. Weizeorick, J. -S. Park, P. Kenesei, S. D. Shastri, J. Almer, M. J. Highland, **S. Maddali** and S. O. Hruszkewycz, *Sub-pixel high-resolution imaging of high-energy x-rays inspired by sub-wavelength optical imaging*, **Opt. Express**, Oct 2021
DOI 10.1364/OE.438945   Am score 1

[20] S. Kandel, **S. Maddali**, Y. S. G Nashed, S. O. Hruszkewycz, C. Jacobsen and M. Allain, *Efficient ptychographic phase retrieval via a matrix-free Levenberg-Marquardt algorithm*, **Opt. Express**, Jul 2021
DOI 10.1364/OE.422768   preprint arxiv:2103.01767   Am score 0

[19] M. J. Wilkin, **S. Maddali**, S. O. Hruszkewycz, A. Pateras, R. L. Sandberg, R. Harder, W. Cha, R. M. Suter and A. D. Rollett, *Experimental demonstration of coupled multi-peak Bragg coherent diffraction imaging with genetic algorithms*, **Phys. Rev. B**, Jun 2021
DOI 10.1103/PhysRevB.103.214103   Am score 3

[18] **S. Maddali**, J.-S. Park, H. Sharma, S. Shastri, P. Kenesei, J. Almer, R. Harder, M. J. Highland, Y. Nashed and S. O. Hruszkewycz, *High-Energy Coherent X-Ray Diffraction Microscopy of Polycrystal Grains: Steps Toward a Multiscale Approach*, **Phys. Rev. Applied**, Aug 2020
DOI 10.1103/PhysRevApplied.14.024085   preprint arxiv:1903.11815   Am score 0

[17] **S. Maddali**, P. Li, A. Pateras, D. Timbie, N. Delegan, A. L. Crook, H. Lee, I. Calvo-Almazan, D. Sheyfer, W. Cha, F. J. Heremans, D. D. Awschalom, V. Chamard, M. Allain and S. O. Hruszkewycz, *General approaches for shear-correcting coordinate transformations in Bragg coherent diffraction imaging. Part I*, **Journal of Applied Crystallography**, Apr 2020
DOI 10.1107/S1600576720001363   preprint arxiv:1909.05353   Am score 3

[16] Y. Cao, D. Sheyfer, Z. Jiang, **S. Maddali**, H. You, B. X. Wang, Z. G. Ye, E. M. Dufresne, H. Zhou, G. B. Stephenson and S. O. Hruszkewycz, *The Effect of Intensity Fluctuations on Sequential X-ray Photon Correlation Spectroscopy at the X-ray Free Electron Laser Facilities*, **Crystals**, December 2020
DOI 10.3390/cryst10121109   Am score 1

[15] **S. Maddali**, M. Allain, P. Li, V. Chamard and S. O. Hruszkewycz, *Detector Tilt Considerations in Bragg Coherent Diffraction Imaging: A Simulation Study*, **Crystals**, December 2020
DOI 10.3390/cryst10121150   preprint arxiv:2008.01843   Am score 3

[14] P. Li, **S. Maddali**, A. Pateras, I. Calvo-Almazan, S.O. Hruszkewycz, W. Cha, V. Chamard and M. Allain, *General approaches for shear-correcting coordinate transformations in Bragg coherent diffraction imaging. Part II*, **Journal of Applied Crystallography**, Apr 2020
DOI 10.1107/S1600576720001375   preprint arxiv:1909.05354   Am score 3

[13] I. Calvo-Almazan, A. P. Ulvestad, E. Colegrove, T. Ablekim, M. V. Holt, M. O. Hill, **S. Maddali**, L. J. Lauhon, M. I Bertoni, X. Huang, H. Yan, E. Nazaretski, Y. S. Chu, S. O. Hruszkewycz and M. E. Stuckelberger, *Strain Mapping of CdTe Grains in Photovoltaic Devices*, **IEEE Journal of Photovoltaics**, Oct 2019
DOI 10.1109/JPHOTOV.2019.2942487   Am score 1

[12] A. Ulvestad, S. O. Hruszkewycz, M. V. Holt, M. O. Hill, I. Calvo-Almazan, **S. Maddali**, X. Huang, H. Yan, E. Nazaretski, Y. S. Chu, L. J. Lauhon, N. Rodkey, M. I. Bertoni and M. E. Stuckelberger, *Multimodal X-ray imaging of grain-level properties and performance in a polycrystalline solar cell*, **Journal of Synchrotron Radiation**, Jul 2019
DOI 10.1107/S1600577519003606   Am score 1

[11] Yu-Feng Shen, **S. Maddali**, D. Menasche, A. Bhattacharya, G. S. Rohrer and R. M. Suter, *Importance of outliers: A three-dimensional study of coarsening in α-phase iron*, **Phys. Rev. Materials**, Jun 2019
DOI 10.1103/PhysRevMaterials.3.063611   Am score 1

[10] N. Krishnamurthy, **S. Maddali**, J. A. Hawk and V. N. Romanov, *9Cr steel visualization and predictive modeling*, **Computational Materials Science**, Mar 2019

DOI 10.1016/j.commatsci.2019.03.015 Am score 0

[9] S. Kandel, **S. Maddali**, M. Allain, S. O. Hruszkewycz, C. Jacobsen and Y. Nashed, *Using automatic differentiation as a general framework for ptychographic reconstruction*, ***Opt. Express***, Jun 2019

DOI 10.1364/OE.27.018653 preprint arxiv:1902.03920 Am score 1

[8] I. Calvo-Almazan, M. Allain, **S. Maddali**, V. Chamard and S. O. Hruszkewycz, *Impact and mitigation of angular uncertainties in Bragg coherent x-ray diffraction imaging*, ***Scientific Reports***, Apr 2019

DOI 10.1038/s41598 019 42797 4 Am score 10

[7] **S. Maddali**, M. Allain, W. Cha, R. Harder, J.-S. Park, P. Kenesei, J. Almer, Y. Nashed and S. O. Hruszkewycz, *Phase retrieval for Bragg coherent diffraction imaging at high x-ray energies*, ***Phys. Rev. A***, May 2019

DOI 10.1103/PhysRevA.99.053838 Am score 38

[6] A. Ulvestad, W. Cha, I. Calvo-Almazan, **S. Maddali**, S. M. Wild, E. Maxey, M. Dupraz and S. O. Hruszkewycz, *Bragg Coherent Modulation Imaging: Strain- and Defect- Sensitive Single Views of Extended Samples*, ***arXiv***, Jul 2018

preprint arxiv:1808.00115

[5] S. O. Hruszkewycz, **S. Maddali**, C. P. Anderson, W. Cha, K. C. Miao, M. J. Highland, A. Ulvestad, D. D. Awschalom and F. J. Heremans, *Strain annealing of SiC nanoparticles revealed through Bragg coherent diffraction imaging for quantum technologies*, ***Phys. Rev. Materials***, Aug 2018

DOI 10.1103/PhysRevMaterials.2.086001 Am score 0

[4] **S. Maddali**, I. Calvo-Almazan, J. Almer, P. Kenesei, J.-S. Park, R. Harder, Y. Nashed and S. O. Hruszkewycz, *Sparse recovery of undersampled intensity patterns for coherent diffraction imaging at high X-ray energies*, ***Scientific Reports***, Mar 2018

DOI 10.1038/s41598 018 23040 y preprint arxiv:1712.01108 Am score 1

[3] M. J. Highland, S. O. Hruszkewycz, D. D. Fong, C Thompson, P. H. Fuoss, I. Calvo-Almazan, **S. Maddali**, A. Ulvestad, E. Nazaretski, X. Huang, H. Yan, Y. S. Chu, H. Zhou, P. M. Baldo and J. A. Eastman, *In-situ synchrotron x-ray studies of the microstructure and stability of In2O3 epitaxial films*, ***Applied Physics Letters***, Oct 2017

DOI 10.1063/1.4997773 Am score 1

[2] L. Renversade, R. Quey, W. Ludwig, D. Menasche, **S. Maddali**, R. M. Suter and A. Borbely, *Comparison between diffraction contrast tomography and high-energy diffraction microscopy on a slightly deformed aluminium alloy*, ***IUCrJ***, Jan 2016

DOI 10.1107/S2052252515019995 Am score 1

[1] **S. Maddali**, S. Ta'asan and R. M. Suter, *Topology-faithful nonparametric estimation and tracking of bulk interface networks*, ***Computational Materials Science***, Dec 2016

DOI 10.1016/j.commatsci.2016.08.021 preprint arxiv:1601.04699 Am score 1