Siddharth Maddali, Ph.D

Research Scientist, GPG/BBP Division (Broadband Plasma)

NOTE: Icons are clickable links.

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

Electromagnetics/Optics/Imaging:
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)

Condensed matter physics:
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
Funding: Argonne LDRD (Laboratory Directed Research and Development) program
Period: 1st Oct 2020 — 30th Sept 2023 (3 years)
Amount: $900,000

ANL LDRD 2019-0042: *Finding Critical Processes of Deformation in Structural Materials with Artificial Intelligence*

Role: Principal investigator
Funding: Argonne LDRD (Laboratory Directed Research and Development) program
Period: 1st Oct 2020 — 30th Sept 2021 (1 year)
Amount: $100,000

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
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Synchrotron Studies of Materials
Materials Science Division
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Dr. Robert M. Suter
Ph.D advisor
Department of physics
Carnegie Mellon University
Pittsburgh, PA (USA)

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

[24] Z. Xu, Y. -F. Shen, K. S. Naghibzadeh, X. Peng, M. Vivekanand, **S. Maddali**, D. Menasche, A. R. Krause, K. Dayal, R. M. Suter and G. S. Rohrer, *Grain boundary migration rates in polycrystalline α-Fe*, ***UNDER REVIEW***, Aug 2023

[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 13

[22] M. O. Hill, P. Schmiedeke, C. Huang, **S. Maddali**, X. Hu, S. O. Hruszkewycz, J. J. Finley, G. Koblmuller 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 2

[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 preprint arxiv:1811.06181 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

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