

List of ScanWave™ or sMIM publications etc.:

1. Johnston, S. R., Ma, E. Y., & Shen, Z. X. (2018). Optically coupled methods for microwave impedance microscopy. *Review of Scientific Instruments*. <https://doi.org/10.1063/1.5011391>
2. Johnston, S. R., Yang, Y., Cui, Y. T., Ma, E. Y., Kämpfe, T., Eng, L. M., ... Shen, Z. X. (2017). Measurement of surface acoustic wave resonances in ferroelectric domains by microwave microscopy. *Journal of Applied Physics*. <https://doi.org/10.1063/1.4997474>
3. Cui, Y. T., Ma, E. Y., & Shen, Z. X. (2016). Quartz tuning fork based microwave impedance microscopy. *Review of Scientific Instruments*. <https://doi.org/10.1063/1.4954156>
4. Wei, Z., Cui, Y. T., Ma, E. Y., Johnston, S., Yang, Y., Chen, R., ... Chen, X. (2016). Quantitative theory for probe-sample interaction with inhomogeneous perturbation in near-field scanning microwave microscopy. *IEEE Transactions on Microwave Theory and Techniques*. <https://doi.org/10.1109/TMTT.2016.2537801>
5. Lai, K., Nakamura, M., Kundhikanjana, W., Kawasaki, M., Tokura, Y., Kelly, M. A., & Shen, Z.-X. (2010). Microwave imaging of mesoscopic percolating network in a manganite thin film. *ArXiv.Org, e-Print Archive, Condensed Matter*.
6. Ma, E. Y., Bryant, B., Tokunaga, Y., Aeppli, G., Tokura, Y., & Shen, Z. X. (2015). Charge-order domain walls with enhanced conductivity in a layered manganite. *Nature Communications*, 6(May), 1–6. <https://doi.org/10.1038/ncomms8595>
7. Lai, K., Nakamura, M., Kundhikanjana, W., Kawasaki, M., Tokura, Y., Kelly, M. A., & Shen, Z. X. (2010). Mesoscopic percolating resistance network in a strained manganite thin film. *Science*, 329(5988), 190–193. <https://doi.org/10.1126/science.1189925>
8. Lai, K., Ji, M. B., Leindecker, N., Kelly, M. A., & Shen, Z. X. (2007). Atomic-force-microscope-compatible near-field scanning microwave microscope with separated excitation and sensing probes. *Review of Scientific Instruments*, 78(6). <https://doi.org/10.1063/1.2746768>
9. Lai, K., Kundhikanjana, W., Kelly, M., & Shen, Z. X. (2008). Modeling and characterization of a cantilever-based near-field scanning microwave impedance microscope. *Review of Scientific Instruments*, 79(6). <https://doi.org/10.1063/1.2949109>
10. Manganites, R., Wu, X., Petralanda, U., Zheng, L., Ren, Y., Hu, R., & Cheong, S. (2017). Low-energy Structural Dynamics of Ferroelectric Domain Walls in Hexagonal I . *ArXiv:1702.06205*, (May), 1–9.
11. Johnston, S. R., Ma, E. Y., & Shen, Z. X. (2018). Optically coupled methods for microwave impedance microscopy. *Review of Scientific Instruments*. <https://doi.org/10.1063/1.5011391>
12. Lai, K., Peng, H., Kundhikanjana, W., Schoen, D. T., Xie, C., Meister, S., ... Shen, Z. X. (2009). Nanoscale electronic inhomogeneity in In₂Se₃nanoribbons revealed by microwave impedance microscopy. *Nano Letters*, 9(3), 1265–1269. <https://doi.org/10.1021/nl900222j>

13. Lai, K., Kundhikanjana, W., Peng, H., Cui, Y., Kelly, M. A., & Shen, Z. X. (2009). Tapping mode microwave impedance microscopy. *Review of Scientific Instruments*, 80(4). <https://doi.org/10.1063/1.3123406>
14. Scrymgeour, D. A., Baca, A., Fishgrab, K., Simonson, R. J., Marshall, M., Bussmann, E., ... Misra, S. (2017). Determining the resolution of scanning microwave impedance microscopy using atomic-precision buried donor structures. *Applied Surface Science*, 423, 1097–1102. <https://doi.org/10.1016/j.apsusc.2017.06.261>
15. Cui, Y. T., Wen, B., Ma, E. Y., Diankov, G., Han, Z., Amet, F., ... Shen, Z. X. (2016). Unconventional Correlation between Quantum Hall Transport Quantization and Bulk State Filling in Gated Graphene Devices. *Physical Review Letters*, 117(18), 1–6. <https://doi.org/10.1103/PhysRevLett.117.186601>
16. Ponath, P., Fredrickson, K., Posadas, A. B., Ren, Y., Wu, X., Vasudevan, R. K., ... Demkov, A. A. (2015). Carrier density modulation in a germanium heterostructure by ferroelectric switching. *Nature Communications*, 6, 6067. <https://doi.org/10.1038/ncomms7067>
17. Manganites, R., Wu, X., Petralanda, U., Zheng, L., Ren, Y., Hu, R., & Cheong, S. (2017). Low-energy Structural Dynamics of Ferroelectric Domain Walls in Hexagonal I . *Science Advances*, 3(May), 1–9.
18. Hu, W., Lee, J., Kao, M., Yang, H., Wolf, P. De, & Amster, O. (2016). Device Dielectric Quality analysis and Fault Isolation at the contact level by scanning Microwave Impedance Microscopy. In *International Symposium for Testing and Failure Analysis*.
19. Wu, D., Li, X., Luan, L., Wu, X., Li, W., Yogeesh, M. N., ... Lai, K. (2016). Uncovering edge states and electrical inhomogeneity in MoS₂ field-effect transistors. *Proceedings of the National Academy of Sciences*, 113(31), 201605982. <https://doi.org/10.1073/pnas.1605982113>
20. Huber, H. P., Humer, I., Hochleitner, M., Fenner, M., Moertelmaier, M., Rankl, C., ... Kienberger, F. (2012). Calibrated nanoscale dopant profiling using a scanning microwave microscope. *Journal of Applied Physics*, 111(1). <https://doi.org/10.1063/1.3672445>
21. Castellanos-gomez, A., Vicarelli, L., Prada, E., Tuca, S., Badino, G., Gramse, G., ... Katan, A. J. (2016). Spatial conductivity mapping of unprotected and capped black phosphorus using microwave microscopy. *2D Materials*, 3(2), 1. <https://doi.org/10.1088/2053-1583/3/2/021002>
22. Monti, T., Tselev, A., Udoudo, O., Ivanov, I. N., Dodds, C., & Kingman, S. W. (2016). High-resolution dielectric characterization of minerals: A step towards understanding the basic interactions between microwaves and rocks. *International Journal of Mineral Processing*, 151, 8–21. <https://doi.org/10.1016/j.minpro.2016.04.003>
23. Tselev, A., Velmurugan, J., Ievlev, A. V., Kalinin, S. V., & Kolmakov, A. (2016). Seeing through Walls at the Nanoscale: Microwave Microscopy of Enclosed Objects and Processes in Liquids. *ACS Nano*, 10(3), 3562–3570. <https://doi.org/10.1021/acsnano.5b07919>
24. Tselev, A., Yu, P., Cao, Y., Dedon, L. R., Martin, L. W., Kalinin, S. V, & Maksymovych, P. (2016). in ferroelectric thin films, (May), 1–9. <https://doi.org/10.1038/ncomms11630>

25. Tselev, A., Yu, P., Cao, Y., Dedon, L. R., Martin, L. W., Kalinin, S. V., & Maksymovych, P. (2016). Microwave a.c. conductivity of domain walls in ferroelectric thin film. *Nature Communications*, 7(May), 11630. <https://doi.org/10.1038/ncomms11630>
26. Wu, D., Pak, A. J., Liu, Y., Zhou, Y., Wu, X., Zhu, Y., ... Lai, K. (2015). Thickness-Dependent Dielectric Constant of Few-Layer In₂Se₃ Nanoflakes. *Nano Letters*, 15(12), 8136–8140. <https://doi.org/10.1021/acs.nanolett.5b03575>
27. Tuteja, M., Koirala, P., Palekis, V., MacLaren, S., Ferekides, C. S., Collins, R. W., & Rockett, A. A. (2016). Direct Observation of CdCl₂ Treatment Induced Grain Boundary Carrier Depletion in CdTe Solar Cells Using Scanning Probe Microwave Reflectivity Based Capacitance Measurements. *The Journal of Physical Chemistry C*, acs.jpcc.6b00874. <https://doi.org/10.1021/acs.jpcc.6b00874>
28. Kundhikanjana, W., Sheng, Z., Yang, Y., Lai, K., Ma, E. Y., Cui, Y., ... Tang, Q. (2015). Direct Imaging of Dynamic Glassy Behavior in a Strained Manganite Film. *Physical Review Letters*, 265701(December), 1–5. <https://doi.org/10.1103/PhysRevLett.115.265701>
29. Seabron, E., MacLaren, S., Xie, X., Rotkin, S. V., Rogers, J. A., & Wilson, W. L. (2015). Scanning Probe Microwave Reflectivity of Aligned Single-Walled Carbon Nanotubes: Imaging of Electronic Structure and Quantum Behavior at the Nanoscale. *ACS Nano*, acsnano.5b04975. <https://doi.org/10.1021/acsnano.5b04975>
30. Ma, E. Y., Cui, Y., Ueda, K., Tang, S., Chen, K., Tamura, N., ... Shen, Z.-X. (2015). Mobile Metallic Domain Walls in an All-in-All-Out Magnetic Insulator. *Science*, 350(6260), 538.
31. Tang, Q. C., Yang, Y. L., & Li, X. (2011). Bi-stable frequency up-conversion piezoelectric energy harvester driven by non-contact magnetic repulsion. *Smart Mater. Struct.*, 20. <https://doi.org/10.1088/0964>
32. Friedman, S., Yang, Y., & Amster, O. (2015). Advances in imaging and quantification of electrical properties at the nanoscale using Scanning Microwave Impedance Microscopy (sMIM). In *APS March Meeting*.
33. Friedman, S., & Amster, O. (2014). Imaging and quantification of electrical properties at the nanoscale using Scanning Microwave Impedance Microscopy (sMIM). In *APS March Meeting*.
34. Ma, E. Y., Bryant, B., Tokunaga, Y., Aeppli, G., Tokura, Y., & Shen, Z.-X. (2015). Charge-order domain walls with enhanced conductivity in a layered manganite. *Nature Communications*, 6(May), 7595. <https://doi.org/10.1038/ncomms8595>
35. Tuteja, M., Koirala, P., MacLaren, S., Collins, R., & Rockett, A. (2015). Direct observation of electrical properties of grain boundaries in sputter-deposited CdTe using scan-probe microwave reflectivity based capacitance measurements. *Applied Physics Letters*, 107(14), 142106. <https://doi.org/10.1063/1.4932952>
36. Liu, Y., Ghosh, R., Wu, D., Ismach, A., Ruoff, R., & Lai, K. (2014). Mesoscale imperfections in MoS₂ atomic layers grown by a vapor transport technique. *Nano Letters*, 14, 4682–4686. <https://doi.org/10.1021/nl501782e>
37. Ma, E. Y., Calvo, M. R., Wang, J., Lian, B., Mühlbauer, M., Brüne, C., ... Shen, Z.-X. (2015). Unexpected edge conduction in mercury telluride quantum wells under broken

- time-reversal symmetry. *Nature Communications*, 6, 7252.
<https://doi.org/10.1038/ncomms8252>
38. Kim, J.-S., Liu, Y., Zhu, W., Kim, S., Wu, D., Tao, L., ... Akinwande, D. (2015). Toward air-stable multilayer phosphorene thin-films and transistors. *Scientific Reports*.
<https://doi.org/10.1038/srep08989>
39. Ren, Y., Yuan, H., Wu, X., Chen, Z., Iwasa, Y., Cui, Y., ... Lai, K. (2015). Direct Imaging of Nanoscale Conductance Evolution in Ion-Gel- Gated Oxide Transistors. *Nano Letters*, 15, 4730–4736. <https://doi.org/10.1021/acs.nanolett.5b01631>
40. Liu, Y., Tan, C., Chou, H., Nayak, A., Wu, D., Ghosh, R., ... Lai, K. (2015). Thermal Oxidation of WSe₂ Nanosheets Adhered on SiO₂/Si Substrates. *Nano Letters*.
<https://doi.org/10.1021/acs.nanolett.5b02069>
41. Zhengyu Wang, Micheal A. Kelly, Zhi-Xun Shen, Gang Wang, Xiao-Dong Xiang, & Jeffery T. Wetzel. (2002). Evanescent Microwave Probe Measurement of Low-k Dielectric Films. *Journal of Applied Physics*. <https://doi.org/10.1063/1.1513882>
42. Yang, Y. L., Lai, K. J., Tang, Q. C., Kundhikanjana, W., Kelly, M., Shen, Z. X., & Li, X. (2011). A shielded cantilever-tip microwave probe for micro/nano surface imaging of conductive properties. In *2011 IEEE 24th International Conference on Micro Electro Mechanical Systems (MEMS)*.
43. Wang, Z., Kelly, M. A., Shen, Z. X., Shao, L., Chu, W. K., & Edwards, H. (2005). Quantitative measurement of sheet resistance by evanescent microwave probe. *Applied Physics Letters*. <https://doi.org/10.1063/1.1891296>
44. Kundhikanjana, W., Yang, Y., Tanga, Q., Zhang, K., Lai, K., Ma, Y., ... Shen, Z.-X. (2013). Unexpected surface implanted layer in static random access memory devices observed by microwave impedance microscope. *Semiconductor Science and Technology*.
<https://doi.org/10.1088/0268-1242/28/2/025010>
45. Yang, Y., Lai, K., Tang, Q., Kundhikanjana, W., Kelly, M. a, Zhang, K., ... Li, X. (2012). Batch-fabricated cantilever probes with electrical shielding for nanoscale dielectric and conductivity imaging. *Journal of Micromechanics and Microengineering*.
<https://doi.org/10.1088/0960-1317/22/11/115040>
46. Hong, S. S., Kundhikanjana, W., Cha, J. J., Lai, K., Kong, D., Meister, S., ... Cui, Y. (2010). Ultrathin topological insulator Bi₂Se₃ nanoribbons exfoliated by atomic force microscopy. *Nano Letters*, 3118. <https://doi.org/10.1021/nl101884h>
47. Yang, Y., Ma, E. Y., Cui, Y.-T., Haemmerli, A., Lai, K., Kundhikanjana, W., ... Shen, Z.-X. (2014). Shielded piezoresistive cantilever probes for nanoscale topography and electrical imaging. *Journal of Micromechanics and Microengineering*.
<https://doi.org/10.1088/0960-1317/24/4/045026>
48. Lai, K., Kundhikanjana, W., Peng, H., Cui, Y., Kelly, M. A., & Shen, Z. X. (2009). Tapping mode microwave impedance microscopy. *Review of Scientific Instruments*.
<https://doi.org/10.1063/1.3123406>
49. Haemmerli, A. J., Nielsen, R. T., Kundhikanjana, W., Harjee, N., Lai, K., Yang, Y. L., ... Pruitt, B. L. (2012). Low-impedance shielded tip piezoresistive probe enables portable Microwave Impedance Microscopy. In *Micro Electro Mechanical Systems (MEMS), 2012 IEEE 25th International Conference on*.
<https://doi.org/10.1109/memsys.2012.6170145>

50. Yang, Y., Ma, Y., Haemmerli, A., Lai, K., Kundhikanjana, W., Hajee, N., ... Shen, Z.-X. (2013). Piezoresistive Cantilever Probes for Simultaneous Nanoscale Topography and Conductivity Imaging. In *Micro Electro Mechanical Systems (MEMS), 2013 IEEE 26th International Conference on* (p. 323).
51. Kundhikanjana, W., Lai, K., Wang, H., Dai, H., Kelly, M. A., & Shen, Z. (2009). Hierarchy of Electronic Properties of Chemically Derived and Pristine Graphene Probed by Microwave Imaging. *Nano Letters*. <https://doi.org/10.1021/nl901949z>
52. Kundhikanjana, W., Lai, K., Kelly, M. A., & Shen, Z.-X. (2011). Cryogenic microwave imaging of metal- insulator transition in doped silicon. *Review of Scientific Instruments*.
53. Lai, K., Kundhikanjana, W., Kelly, M., & Shen, Z. X. (2008). Modeling and characterization of a cantilever-based near-field scanning microwave impedance microscope. *Review of Scientific Instruments*.
54. Lai, K., Kundhikanjana, W., Kelly, M. A., & Shen, Z. X. (2008). Calibration of shielded microwave probes using bulk dielectrics. *Applied Physics Letters*.
55. Lai, K., Ji, M. B., Leindecker, N., Kelly, M. A., & Shen, Z. X. (2007). Atomic-force-microscope-compatible near-field scanning microwave microscope with separated excitation and sensing probes. *Review of Scientific Instruments*.
56. Lai, K., Kundhikanjana, W., Kelly, M., & Shen, Z.-X. (2011). Nanoscale microwave microscopy using shielded cantilever probes. *Applied Nanoscience*. <https://doi.org/10.1007/s13204-011-0002-7>
57. Lai, K., Peng, H., Kundhikanjana, W., Schoen, D. T., Xie, C., Meister, S., ... Shen, Z.-X. (2009). Nanoscale Electronic Inhomogeneity in In₂Se₃ Nanoribbons Revealed by Microwave Impedance Microscopy. *Nano Letters*. <https://doi.org/10.1021/nl900222j>
58. Lai, K., Kundhikanjana, W., Kelly, M. A., Shen, Z.-X., Shabani, J., & Shayegan, M. (2011). Imaging of Coulomb-Driven Quantum Hall Edge States. *Physical Review Letters*, 107, 176809.
59. Harjee, N., Haemmerli, A., Goldhaber-Gordon, D., & Pruitt, B. L. (2010). Coaxial tip piezoresistive scanning probes with sub-nanometer vertical displacement resolution. In *Sensors, 2010 IEEE*. <https://doi.org/10.1109/icsens.2010.5689882>
60. Lai, K., Nakamura, M., Kundhikanjana, W., Kawasaki, M., Tokura, Y., Kelly, M. A., & Shen, Z.-X. (2010). Mesoscopic Percolating Resistance Network in a Strained Manganite Thin Film. *Science*, 329(9), 190. <https://doi.org/10.1126/science.1189925>
61. Haemmerli, A. J., Nielsen, R. T., Kundhikanjana, W., Harjee, N., Goldhaber-Gordon, D., Shen, Z. X., & Pruitt, B. L. (2012). Low-impedance shielded tip piezoresistive probe enables portable microwave impedance microscopy. *Micro & Nano Letters*. <https://doi.org/10.1049/mnl.2011.0679>
62. Friedman, S., Amster, O., & Yang, Y. (2014). Recent advances in scanning Microwave Impedance Microscopy (sMIM) for nano-scale measurements and industrial applications. *International Society for Optics and Photonics*. <https://doi.org/10.1117/12.2063138>