

## (1). Metamaterials for Accessible and High-Performance MRI

### [A wireless volumetric metamaterial resonator for breast MRI](#)

Y. Liu<sup>#</sup>, X. Zhu<sup>#</sup>, C.A. LeBedis, S.W. Anderson, X. Zhang\*  
*arXiv*, 2026, preprint arXiv:2607.26360

### [A wireless reconfigurable metasurface for enhanced parallel magnetic resonance imaging](#)

Y. Liu<sup>#</sup>, X. Zhu<sup>#</sup>, K. Wu<sup>#</sup>, A. Kaliaev, C.A. LeBedis, S.W. Anderson, X. Zhang\*  
*arXiv*, 2026, preprint arXiv:2605.24791

### [Circularly polarized metamaterial cage for homogeneous signal-to-noise ratio enhancement in magnetic resonance imaging](#)

Y. Liu<sup>#</sup>, X. Zhu<sup>#</sup>, K. Wu<sup>#</sup>, S.W. Anderson, X. Zhang\*  
*Advanced Materials*, 2026, **38**(41): e16569

### [Metamaterial-enabled hybrid receive coil for enhanced magnetic resonance imaging capabilities](#)

X. Zhu<sup>#</sup>, K. Wu<sup>#</sup>, S.W. Anderson, and X. Zhang\*  
*Advanced Science*, 2025, **12**(3): 2410907

### [Conformal metamaterials with active tunability and self-adaptivity for magnetic resonance imaging](#)

K. Wu<sup>#</sup>, X. Zhu<sup>#</sup>, X. Zhao<sup>#</sup>, S.W. Anderson, and X. Zhang\*  
*Research*, 2024, **7**: 0560

### [Wireless, customizable coaxially shielded coils for magnetic resonance imaging](#)

K. Wu<sup>#</sup>, X. Zhu<sup>#</sup>, S.W. Anderson, and X. Zhang\*  
*Science Advances*, 2024, **10**(24): eadn5195

### [Wearable coaxially-shielded metamaterial for magnetic resonance imaging](#)

X. Zhu<sup>#</sup>, K. Wu<sup>#</sup>, S.W. Anderson, and X. Zhang\*  
*Advanced Materials*, 2024, **36**(31): 2313692

### [Computational-design enabled wearable and tunable metamaterials via freeform auxetics for magnetic resonance imaging](#)

K. Wu<sup>#</sup>, X. Zhu<sup>#</sup>, T.G. Bifano, S.W. Anderson, and X. Zhang\*  
*Advanced Science*, 2024, **11**(26): 2400261

### [Helmholtz coil-inspired volumetric wireless resonator for magnetic resonance imaging](#)

X. Zhu<sup>#</sup>, K. Wu<sup>#</sup>, S.W. Anderson, and X. Zhang\*  
*Advanced Materials Technologies*, 2023, **8**(22): 2301053

### [Auxetics-inspired tunable metamaterials for magnetic resonance imaging](#)

K. Wu<sup>#</sup>, X. Zhao<sup>#</sup>, T.G. Bifano, S.W. Anderson, and X. Zhang\*  
*Advanced Materials*, 2022, **34**(6): 2109032

### [Nonreciprocal magnetic coupling using nonlinear meta-atoms](#)

X. Zhao<sup>#</sup>, K. Wu<sup>#</sup>, C. Chen<sup>#</sup>, T.G. Bifano, S.W. Anderson, and X. Zhang\*  
*Advanced Science*, 2020, **7**(19): 2001443

[Intelligent metamaterials based on nonlinearity for magnetic resonance imaging](#)

X. Zhao<sup>#</sup>, G. Duan<sup>#</sup>, K. Wu<sup>#</sup>, S.W. Anderson, and X. Zhang\*  
*Advanced Materials*, 2019, **31**(49): 1905461

[Boosting magnetic resonance imaging signal-to-noise ratio using magnetic metamaterials](#)

G. Duan<sup>#</sup>, X. Zhao<sup>#</sup>, S.W. Anderson, and X. Zhang\*  
*Communications Physics — Nature*, 2019, **2**: 35

## (2). Metamaterials for Acoustics and Wireless Sensing

[Physics-aware machine-learning-driven inverse design of broadband ultra-open acoustic metamaterials](#)

Z. Yang<sup>#</sup>, M. Li<sup>#</sup>, X. Xie<sup>#</sup>, A. Chen<sup>#</sup>, T.G. Bifano, and X. Zhang\*  
*Advanced Science*, 2026, **13**: e76894

[Phase gradient ultra open metamaterials for broadband acoustic silencing](#)

Z. Yang<sup>#</sup>, A. Chen<sup>#</sup>, X. Xie<sup>#</sup>, S.W. Anderson, and X. Zhang\*  
*Scientific Reports — Nature*, 2025, **15**: 21434

[Electrically-shielded coil-enabled battery-free wireless sensing for underwater environmental monitoring](#)

K. Wu<sup>#</sup>, X. Zhu<sup>#</sup>, S.W. Anderson, and X. Zhang\*  
*Advanced Science*, 2025, **12**(14): 2414299

[Two-sided acoustic modulator for broadband and individual control of reflected and transmitted sound waves](#)

A. Chen<sup>#</sup> and X. Zhang\*  
*Physical Review Applied*, 2024, **22**(4): 044010

[A robust near-field body area network based on coaxially-shielded textile metamaterial](#)

X. Zhu<sup>#</sup>, K. Wu<sup>#</sup>, X. Xie<sup>#</sup>, S.W. Anderson, and X. Zhang\*  
*Nature Communications*, 2024, **15**: 6589

[Angle-variant metamaterial with reconfigurable phase modulation](#)

A. Chen<sup>#</sup>, Z. Yang<sup>#</sup>, S.W. Anderson, and X. Zhang\*  
*Physical Review Applied*, 2024, **21**(1): 014062

[Composite acoustic metamaterial for broadband low-frequency acoustic attenuation](#)

A. Chen<sup>#</sup>, Z. Yang<sup>#</sup>, X. Zhao<sup>#</sup>, S. Anderson, and X. Zhang\*  
*Physical Review Applied*, 2023, **20**(1): 014011

[Broadband labyrinthine acoustic insulator](#)

A. Chen<sup>#</sup>, X. Zhao<sup>#</sup>, Z. Yang<sup>#</sup>, S. Anderson, and X. Zhang\*  
*Physical Review Applied*, 2022, **18**(6): 064057

[Metamaterial-enhanced near-field readout platform for passive microsensor tags](#)

K. Wu<sup>#</sup>, G. Duan<sup>#</sup>, X. Zhao<sup>#</sup>, C. Chen<sup>#</sup>, S.W. Anderson, and X. Zhang\*  
*Microsystems & Nanoengineering — Nature*, 2022, **8**: 28

[Ultra-open acoustic metamaterial silencer based on Fano-like interference](#)

R. Ghaffarivardavagh<sup>#</sup>, J. Nikolajczyk<sup>#</sup>, S. Anderson, and X. Zhang\*  
*Physical Review B*, 2019, **99**(2): 024302

[Horn-like space-coiling metamaterials toward simultaneous phase and amplitude modulation](#)

R. Ghaffarivardavagh<sup>#</sup>, J. Nikolajczyk<sup>#</sup>, R.G. Holt, S. Anderson, and X. Zhang\*  
*Nature Communications*, 2018, **9**: 1349

**(3). Photonic and Terahertz Metamaterials & Microsystems**

[Reconfigurable quasi-BIC Terahertz metasurfaces through MEMS-induced symmetry breaking](#)

Z. Yang<sup>#</sup>, J. Zhang, S. Lee, X. Xie<sup>#</sup>, R.D. Averitt, and X. Zhang\*  
*Advanced Optical Materials*, 2026, **14**(9): e03164

[Diatom Cribellum-inspired hierarchical metamaterials: Unifying perfect absorption towards subwavelength color printing](#)

X. Xie<sup>#</sup>, Y. Huang<sup>#</sup>, Z. Yang<sup>#</sup>, A. Li<sup>#</sup>, and X. Zhang\*  
*Advanced Materials*, 2024, **36**(33): 2403304

[All-silicon active bound states in the continuum terahertz metamaterials](#)

Y. Huang<sup>#</sup>, K. Kaj, Z. Yang<sup>#</sup>, E. Alvarado, W. Man, Y. Zhang, V. Ramaprasad, R.D. Averitt, and X. Zhang\*  
*Optics & Laser Technology*, 2024, **179**: 111176

[Tunable bound states in the continuum in a reconfigurable terahertz metamaterial](#)

Y. Huang<sup>#</sup>, K. Kaj, C. Chen<sup>#</sup>, Z. Yang<sup>#</sup>, R.D. Averitt, and X. Zhang\*  
*Advanced Optical Materials*, 2023, **11**(4): 2300559

[Complementary vanadium dioxide metamaterial with enhanced modulation amplitude at terahertz frequencies](#)

Y. Huang<sup>#</sup>, X. Wu<sup>#</sup>, J. Schalch, G. Duan<sup>#</sup>, C. Chen<sup>#</sup>, X. Zhao<sup>#</sup>, K. Kaj, H-T Zhang, R. Engel-Herbert, R.D. Averitt, and X. Zhang\*  
*Physical Review Applied*, 2022, **18**(5): 054086

[Broadband terahertz silicon membrane metasurface absorber](#)

Y. Huang<sup>#</sup>, K. Kaj, C. Chen<sup>#</sup>, Z. Yang<sup>#</sup>, S.R. Haque, Y. Zhang, X. Zhao<sup>#</sup>, R.D. Averitt, and X. Zhang\*  
*ACS Photonics*, 2022, **9**(4): 1150–1156

[On-demand terahertz surface wave generation with microelectromechanical-system-based metasurface](#)

C. Chen<sup>#</sup>, K. Kaj, X. Zhao<sup>#</sup>, Y. Huang<sup>#</sup>, R.D. Averitt, and X. Zhang\*  
*Optica*, 2022, **9**(1): 17–25

[Tunable toroidal response in a reconfigurable terahertz metamaterial](#)

C. Chen<sup>#</sup>, K. Kaj, Y. Huang<sup>#</sup>, X. Zhao<sup>#</sup>, R.D. Averitt, and X. Zhang\*  
*Advanced Optical Materials*, 2021, **9**(22): 2101215

[Ultrathin terahertz triple-band metamaterial absorbers: Consideration of interlayer coupling](#)

C. Chen<sup>#</sup>, S. Can<sup>#</sup>, J. Schalch, X. Zhao<sup>#</sup>, G. Duan<sup>#</sup>, R.D. Averitt, and X. Zhang\*  
*Physical Review Applied*, 2020, **14**(5): 054021

[Terahertz investigation of bound states in the continuum of metallic metasurfaces](#)

X. Zhao<sup>#</sup>, C. Chen<sup>#</sup>, K. Kaj, I. Hammock, Y. Huang<sup>#</sup>, R.D. Averitt, and X. Zhang<sup>\*</sup>  
*Optica*, 2020, **7**(11): 1548–1554

[Polarization insensitive, metamaterial absorber-enhanced long-wave infrared detector](#)

C. Chen<sup>#</sup>, Y. Huang<sup>#</sup>, K. Wu<sup>#</sup>, T.G. Bifano, S.W. Anderson, X. Zhao<sup>#</sup>, and X. Zhang<sup>\*</sup>  
*Optics Express*, 2020, **28**(20): 28843–28857

[Real-time tunable phase response and group delay in broadside coupled split-ring resonators](#)

X. Zhao<sup>#</sup>, J. Zhang, K. Fan<sup>#</sup>, G. Duan<sup>#</sup>, J. Schalch, G.R. Keriser, R.D. Averitt, and X. Zhang<sup>\*</sup>  
*Physical Review B*, 2019, **99**(24): 245111

[Diatom frustule-inspired metamaterial absorbers: The effect of hierarchical pattern arrays](#)

A. Li<sup>#</sup>, X. Zhao<sup>#</sup>, G. Duan<sup>#</sup>, S.W. Anderson, and X. Zhang<sup>\*</sup>  
*Advanced Functional Materials*, 2019, **29**(22): 1809029

[Integrating microsystems with metamaterials towards metadvice](#)

X. Zhao<sup>#</sup>, G. Duan<sup>#</sup>, A. Li<sup>#</sup>, C. Chen<sup>#</sup>, and X. Zhang<sup>\*</sup>  
*Microsystems & Nanoengineering — Nature*, 2019, **5**: 5

[Optically modulated ultra-broadband all-silicon metamaterial terahertz absorbers](#)

X. Zhao<sup>#</sup>, Y. Wang<sup>#</sup>, J. Schalch, G. Duan<sup>#</sup>, K. Cremin, J. Zhang, C. Chen<sup>#</sup>, R.D. Averitt, and X. Zhang<sup>\*</sup>  
*ACS Photonics*, 2019, **6**(4): 830–837

[Implementing infrared metamaterial perfect absorbers using dispersive dielectric spacers](#)

X. Zhao<sup>#</sup>, C. Chen<sup>#</sup>, A. Li<sup>#</sup>, G. Duan<sup>#</sup>, and X. Zhang<sup>\*</sup>  
*Optics Express*, 2019, **27**(2): 1727–1739

[Electromechanically tunable metasurface transmission waveplate at terahertz frequencies](#)

X. Zhao<sup>#</sup>, J. Schalch, J. Zhang, H.R. Seren<sup>#</sup>, G. Duan<sup>#</sup>, R.D. Averitt, and X. Zhang<sup>\*</sup>  
*Optica*, 2018, **5**(3): 303–310

[Analysis of the thickness dependence of metamaterial absorbers at terahertz frequencies](#)

G. Duan<sup>#</sup>, J. Schalch, X. Zhao<sup>#</sup>, J. Zhang, R.D. Averitt, and X. Zhang<sup>\*</sup>  
*Optics Express*, 2018, **26**(3): 2242–2251

[Identifying the perfect absorption of metamaterial absorbers](#)

G. Duan<sup>#</sup>, J. Schalch, X. Zhao<sup>#</sup>, J. Zhang, R.D. Averitt, and X. Zhang<sup>\*</sup>  
*Physical Review B*, 2018, **97**(3): 035128

[A three-dimensional all-metal terahertz metamaterial perfect absorber](#)

M. Wu<sup>#</sup>, X. Zhao<sup>#</sup>, J. Zhang, K. Cremin, J. Schalch, G. Duan<sup>#</sup>, R.D. Averitt, and X. Zhang<sup>\*</sup>  
*Applied Physics Letters*, 2017, **111**(5): 051101

[Voltage-tunable dual-layer terahertz metamaterials](#)

X. Zhao<sup>#</sup>, K. Fan<sup>#</sup>, J. Zhang, G.R. Keiser, G. Duan<sup>#</sup>, R.D. Averitt, and X. Zhang<sup>\*</sup>  
*Microsystems & Nanoengineering — Nature*, 2016, **2**: 16025

#### (4). Artificial Intelligence for Medical Imaging & MRI

[NeuroBridge: Bridging multi-task MRI knowledge for neurodegenerative disease diagnosis](#)

M. Li<sup>#</sup>, G. Shen<sup>#</sup>, C.W. Farris, and X. Zhang<sup>\*</sup>

*arXiv*, 2026, preprint arXiv:2607.01401

[Few-shot deployment of pretrained MRI transformers in brain imaging tasks](#)

M. Li<sup>#</sup>, G. Shen<sup>#</sup>, C.W. Farris, and X. Zhang<sup>\*</sup>

*Frontiers in Artificial Intelligence*, 2026, **9**: 1771088

[Magnetic resonance image processing transformer for general accelerated image restoration](#)

G. Shen<sup>#</sup>, M. Li<sup>#</sup>, S.W. Anderson, C.W. Farris, and X. Zhang<sup>\*</sup>

*Scientific Reports — Nature*, 2025, **15**: 40064

[Regularization by neural style transfer for MRI field-transfer reconstruction with limited data](#)

G. Shen<sup>#</sup>, Y. Zhu, M. Li<sup>#</sup>, R. McNaughton<sup>#</sup>, H. Jara, S.B. Andersson, C.W. Farris, S.W. Anderson, and X. Zhang<sup>\*</sup>

*Frontiers in Artificial Intelligence*, 2025, **8**: 1579251

[Learning to reconstruct accelerated MRI through K-space cold diffusion without noise](#)

G. Shen<sup>#</sup>, M. Li<sup>#</sup>, C.W. Farris, S.W. Anderson, and X. Zhang<sup>\*</sup>

*Scientific Reports — Nature*, 2024, **14**: 21877

[Attention hybrid variational net for accelerated MRI reconstruction](#)

G. Shen<sup>#</sup>, B. Hao, M. Li<sup>#</sup>, C.W. Farris, I.C. Paschalidis, S.W. Anderson, and X. Zhang<sup>\*</sup>

*APL Machine Learning*, 2023, **1**(4): 046116

#### (5). Diatom-Enabled Functional Materials

[Diatom Cribellum-inspired hierarchical metamaterials: Unifying perfect absorption towards subwavelength color printing](#)

X. Xie<sup>#</sup>, Y. Huang<sup>#</sup>, Z. Yang<sup>#</sup>, A. Li<sup>#</sup>, and X. Zhang<sup>\*</sup>

*Advanced Materials*, 2024, **36**(33): 2403304

[Diatom frustule-inspired metamaterial absorbers: The effect of hierarchical pattern arrays](#)

A. Li<sup>#</sup>, X. Zhao<sup>#</sup>, G. Duan<sup>#</sup>, S.W. Anderson, and X. Zhang<sup>\*</sup>

*Advanced Functional Materials*, 2019, **29**(22): 1809029

[Silica nanowire growth on \*Coscinodiscus Species\* diatom frustules via vapor-liquid-solid process](#)

A. Li<sup>#</sup>, X. Zhao<sup>#</sup>, S. Anderson, and X. Zhang<sup>\*</sup>

*Small*, 2018, **14**(47): 1801822

[Towards uniformly oriented diatom frustule monolayers: Experimental and theoretical analyses](#)

A. Li<sup>#</sup>, W. Zhang<sup>#</sup>, R. Ghaffarivardavagh<sup>#</sup>, X. Wang<sup>#</sup>, S.W. Anderson, and X. Zhang<sup>\*</sup>

*Microsystems & Nanoengineering — Nature*, 2016, **2**: 16064

[Biologically enabled micro- and nanostencil lithography using diatoms](#)

J. Cai<sup>#</sup>, X. Wang<sup>#</sup>, A. Li<sup>#</sup>, S.W. Anderson, and X. Zhang<sup>\*</sup>

*Extreme Mechanics Letters*, 2015, **4**: 186–192